Safety functions and solutions using Preventa

Catalogue

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Schneider Electric

Safety Functions and Solutions using Preventa

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Safety functions
Selection of protective functions

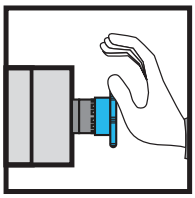
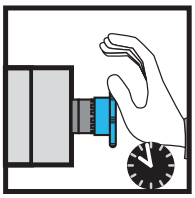
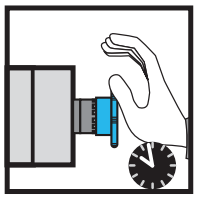
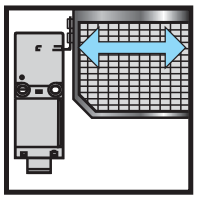
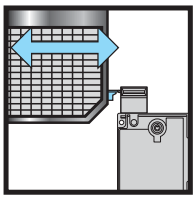
On the basis of the risk estimation established, the designer will select one or more protective functions that will meet the needs.
The standards classify these functions into two distinct groups.

Emergency stops

This function, required on all machines, is not considered as a principal method of risk reduction. It supplements other protective measures (standard EN/ISO 12100).

Depending on the type of stop, the standard recognises three categories (see details below):
- emergency stop categories 0 or 1,
- controlled stop categories 1 or 2, generally used with variable speed drives (please refer to our specific Variable Speed Drive catalogues).

Selection of safety function families

	Emergency stop			Protective solutions	
				Protective functions	
				Control of access to hazardous zones	
	Stop category 0	Stop category 1	Stop category 2	Interlocking Guard	
				Without guard locking	With guard locking
					
Access to hazardous zones:					
■ Free, frequent to continuous	-	-		-	-
■ Occasional (e.g.: once per shift) or frequent *(1)*	-	-		X	X
Protection for all personnel	-	-		X	X
Stopping time of a dangerous movement:					
■ Short	X	-		X	-
■ Long (high inertia)	-	X		-	X
■ Long (high inertia) ; power is maintained on actuators	-	-	X	-	-

(1) in case of risk of ejection.

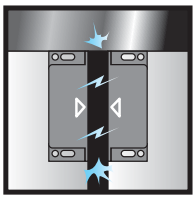
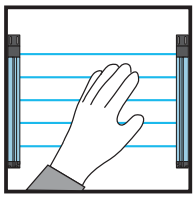
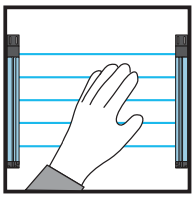
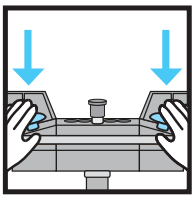
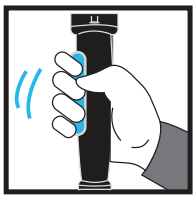
X	: The function provides the solution as long as the recommended use limits are complied with.
(X)	: The use of this function is possible but is not recommended.
-	: The function does not provide the solution.

Safety functions
Selection of protective functions *(continued)*

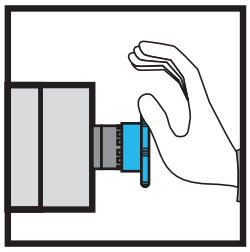
Protection methods

The functions selected, as shown in the chart below, are based on two criteria:

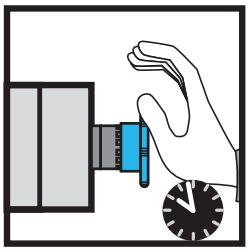
1 persons may occasionally enter the hazardous zones or may work continuously within a hazardous zone,
2 the methods adopted to reduce the risks involve the use of defined functions.

				Starting and enabling of dangerous movements	
Coded magnetic switch	Light curtains		Safety mats	Two-hand control station	Enabling switch (grip switch)
	ESPE	ESPE with muting function			
					
-	X	X	X	X	-
X	(X)	(X)	(X)	(X)	X
X	X	X	X	X	X
X	X	X	X	X	X
-	-	-	-	-	-
-	-	-	-	-	-

Safety functions
Emergency stop function
and Principal protective functions
Guards without guard locking device
Guards with guard locking device

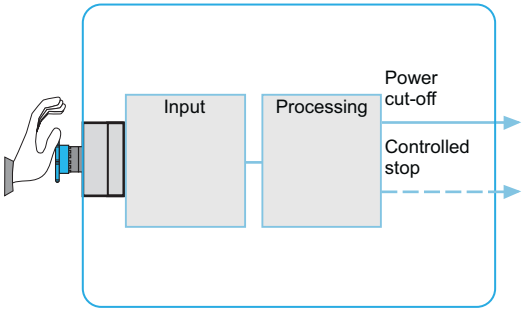


Stop category 0

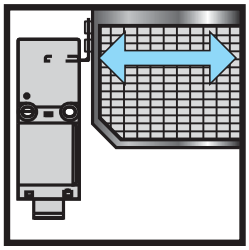


Stop category 1

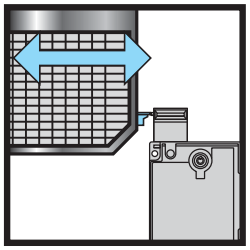
Emergency stop function



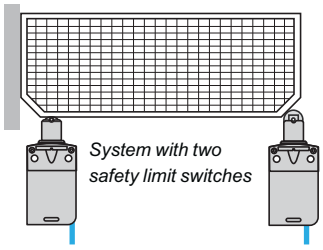
Sub-elements of the emergency stop function



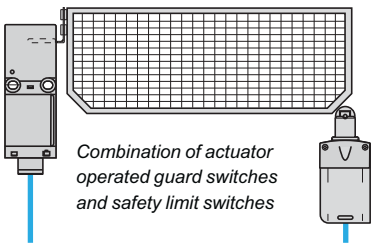
Guard without guard locking device



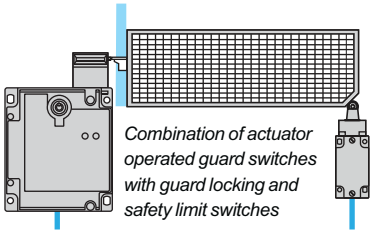
Guard with guard locking device



System with two safety limit switches



Combination of actuator operated guard switches and safety limit switches



Combination of actuator operated guard switches with guard locking and safety limit switches

Emergency stop function

International standard EN/ISO 13850 (which replaces standard EN 418) specifies the functional requirements and design principles of emergency stop devices.
It applies to all machines, whatever type of energy is used to control this function.

When the emergency stop instruction ceases, the effect must be maintained until it is reset. Manual resetting must only be possible in the location where the instruction was given.
Resetting must not start the machine, but simply enable the starting cycle.
Restarting of the machine must not be possible until the emergency stop has been reset.

The standard allows two types of stop:
- category 0 : stopping by immediate cutting-off of power or mechanical disconnection between the dangerous components,
- category 1 stop: controlled stopping with power maintained to the actuator to achieve stopping (braking for example), then cut-off of power when standstill is reached.

The choice between these two stopping methods is determined by an evaluation of the machine-related risks.

This function includes several sub-functions but is generally represented by the drawings opposite.

The operator interface may be:
- a pushbutton equipped with a mushroom head,
- a cable actuated switch,
- a foot switch.

Guards without guard locking device

On a large number of potentially dangerous machines, the operator must be kept at a distance during operation, but needs to take action when the machine is stopped to position a part, remove a product or adjust a tool.

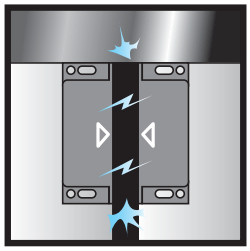
An effective means of protection is to install a guard which, according to the type of installation, will cut-off the power to the motor if an attempt is made to open it during the machine operating phase.
In all cases, it must not be possible to restart the machine until the guard is closed.

Depending on the level of protection required, the system will comprise two conventional limit switches or a combination of protected, actuator operated guard switches to prevent tampering.

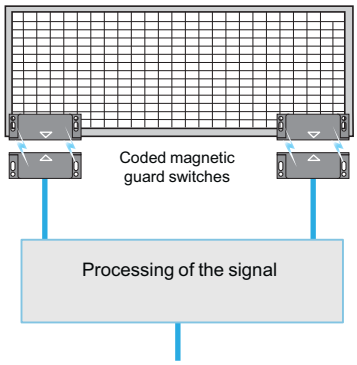
Guards with guard locking device

This type of guard is necessary for potentially dangerous machines with high inertia (long rundown time).
The guard is interlocked (by a solenoid for example); it cannot be opened until the machine has come to a complete standstill.

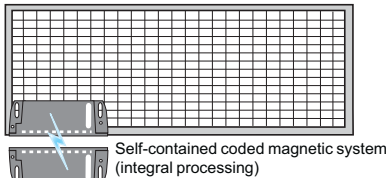
Safety functions
Principal protective functions *(continued)*
Coded magnetic guard switch and system
Safety light curtains



Coded magnetic guard switch



Functions of coded magnetic guard switches



Functions of a coded magnetic guard switch system

Coded magnetic guard switch and system

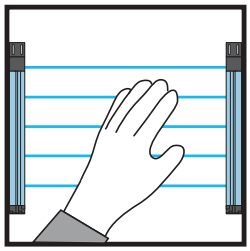
A non-contact solution is often used on industrial machines fitted with a door or guards with imprecise guiding.
It is particularly suitable for machines subjected to frequent washing or splashing of liquids as well as small machines with a single guard for self-contained systems.

Depending on the models used, the sensing distance will be between 5 and 10 mm.

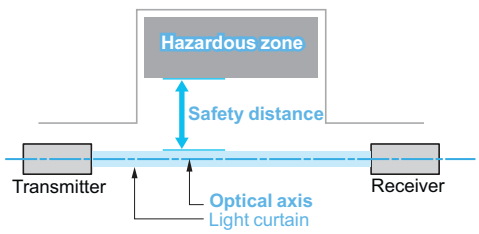
The reed contacts used for the coded magnetic switches cannot withstand short-circuits and the switches always incorporate a resistor in series. Their operation can therefore only be guaranteed with the associated processing module.

The Hall-effect self-contained systems with integral processing do not require any further processing of the signal.

The illustrations opposite show the functions of coded magnetic guard switches and of a system.



Safety light curtain



Safety light curtains

Safety light curtains are electro-sensitive systems (Electro-Sensitive Protective Equipment) designed to protect persons working in the vicinity of machinery, by stopping dangerous movements when a light beam is broken.

The absence of a door or guard reduces loading, inspection or tool changing times.

This type of system, defined by standards EN/IEC 61496-1 and EN/IEC 61496-2, is frequently used with machines such as:
- presses,
- machine tools,
- assembly lines, etc.

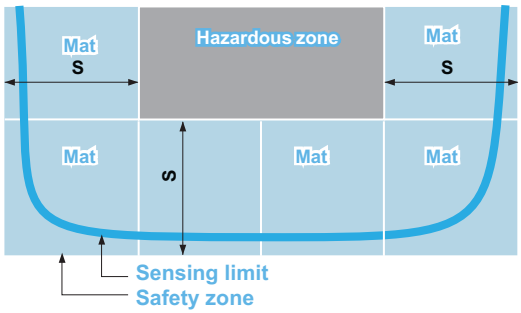
The machine must be designed so that it is impossible to gain access to dangerous movements without breaking one or more of the light beams.
In addition, the movement must be stopped whatever the entry speed of the operator into the hazardous zone.

The diagram opposite illustrates the operation of a light curtain.

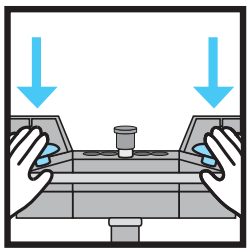
Safety functions
Principal protective functions *(continued)*
Safety mats
Two-hand control stations



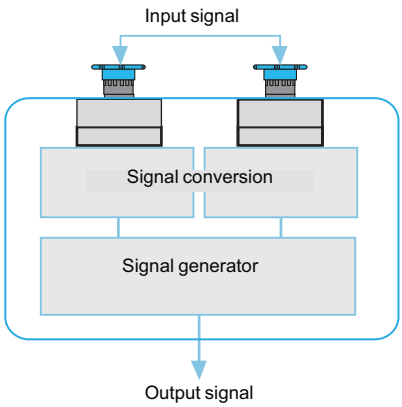
Safety mat



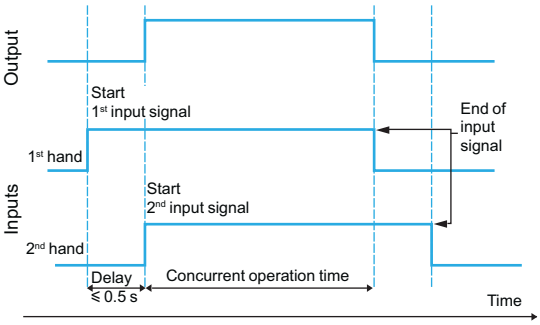
Example of a safety mat application



Two-hand control station



Functions of a two-hand control station



Functional diagram of a two-hand control station

Safety mats

Safety mats are used to detect persons walking across or standing on the mat or objects falling onto the mat.
Standards EN 1760-1/ISO 13856 define their performance.

Any detection of an object on the mat initiates stopping of any dangerous machine movement.
Restarting can be controlled manually or automatically, depending on the configuration of the associated processing unit.

When pressure is applied, the mat distorts locally and the integrated sensors are short-circuited.
The special design of these sensors requires that the mat and the detection module be matched.

In general, several mats are used to cover the safety zone.
The safety distance **S**, defined by the standard, takes into account the speed at which a person can cross the safety zone to reach the hazardous zone.

Two-hand control stations

Standards ISO 13851 and EN 574 define this device.
It requires simultaneous operation by both hands in order to start and maintain operation of a machine.
It therefore provides protection exclusively for the person operating it.

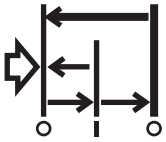
A diagram representing the function is given opposite; it must meet the following requirements:
- concurrent, maintained operation of the two input controls for the same period of time,
- synchronous operation; the delay between the two signals must not exceed 0.5 s,
- prevention of accidental operation (mechanical guard),
- protection against tampering.

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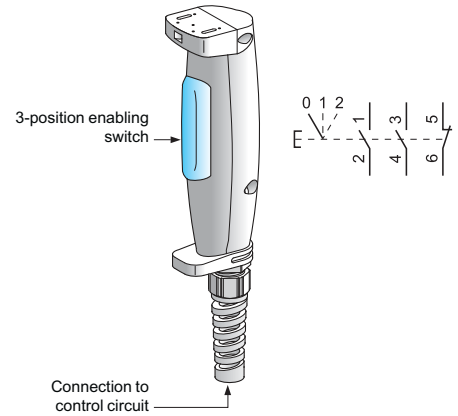
Safety functions
Principal protective functions *(continued)*
Enabling switch (grip switch)



Enabling switch



Marking identifying an enabling switch



Enabling switch XY2 AU1:
2 enabling functions,
3 positions + 1 N/C

Enabling switch

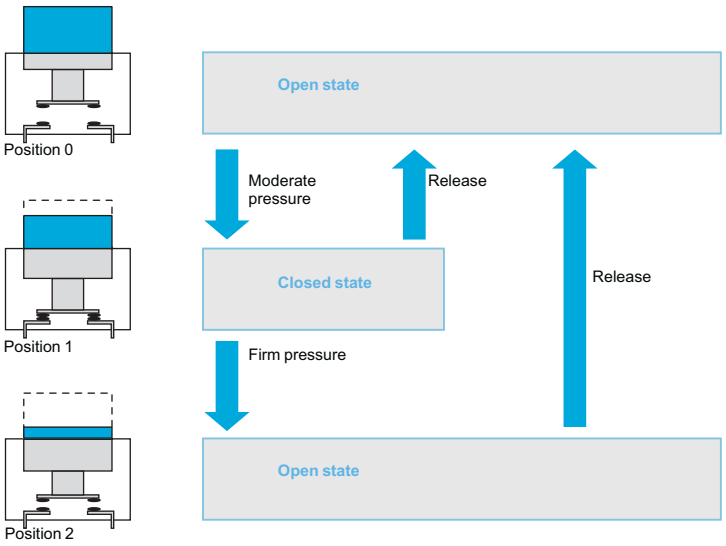
Enabling switches, allow authorised personnel to carry out maintenance, adjustment or programming operations within hazardous zones of machines, provided certain conditions are met.
These devices conform to standards EN/IEC 60947-5-8 and EN/IEC 60204-1.
In effect, to gain access, these operations, often performed at reduced speed, must be selected by authorised personnel using selectors with key or equivalent.

Important note: the enabling switch alone must not lead to the actuation of any dangerous movements associated with the machine; a secondary, intentional, control action is required from the operator.

All devices which conform to the standard must be identified by the marking scheme shown opposite.

Operating principle
The three possible states are:
- position 0: contact open (control operator at rest),
- position 1: contact closed (control operator depressed to normal enabling position),
- position 2: contact open (control operator fully depressed).

When the switch is depressed in position 1, it must return to position 0 when released.
The switch must change from position 1 to position 2 when pressed more firmly. When it is released from position 2 to position 0, the switching contact must not close.



Operating principle of an enabling switch

Safety functions
Selection of Preventa safety solutions

The table below indicates the associated control solutions for each safety function.
The Schneider Electric range of safety control solutions comprises four product families:
- dedicated safety modules with one or two safety functions,
- configurable controllers managing several safety functions,
- safety monitors and interfaces dedicated to the AS-Interface system, allowing use of a single medium for control and safety,
- safety PLCs used within complex safety systems.

		Product families		
		Safety modules	Configurable safety controllers	
				
Architecture		Simple machines	Machines with several safety functions	
Setting-up		Wired link	Configurable by pushbuttons	Configurable by software
Diagnostics		LED	LED	LED
		-	-	PC
		Solid-state outputs	Solid-state outputs	Modbus serial link (RTU), CANopen, Profibus DP
Functions	Emergency stop monitoring	XPS AC, XPS AF, XPS AK, XPS AR, XPS AX	X	X
	Monitoring of emergency stop and of a guard with timer	XPS ATE, XPS AV	X	X
	Monitoring of a guard with safety switch	XPS AC, XPS AF, XPS AK, XPS AR, XPS AX	X	X
	Monitoring of a guard with coded magnetic switch	XPS DMB, XPS DME	X	X
	Monitoring of safety mats and sensitive edges	XPS AK	X	X
	Two-hand control station (type IIIC acc. EN 574)	XPS BC, XPS BF	-	X
	Two-hand control station (type IIIA acc. EN 574)	XPS BA	-	-
	Monitoring of type 4 safety light curtains, solid-state outputs and test function	XPS AFL, XPS AR, XPS AK	X	X
	Monitoring of single-beam photo-electric sensors (transmitter + receiver) with test input and built-in muting function	XPS CM	-	-
	Monitoring of 2 to 4 type 2 and type 4 light curtains	XPS LCD	-	X
	Monitoring of a type 4 light curtain with relay output	-	-	X
	Monitoring muting function of 2 light curtains with transistor outputs	XPS LCM	-	-
	Monitoring of an enabling switch	XPS VC	X	X
	Zero speed detection on motor	XPS VNE	-	X
	Monitoring the position of a lift cabin	XPS DA	-	X
	Dynamic valve monitoring on linear hydraulic presses	XPS PVT	-	X
	Dynamic monitoring of double-bodied solenoid valves	XPS PVK	-	X
	Safety stop at top dead centre with automatic overtravel monitoring on eccentric presses	XPS OT	-	X
	Safety foot switch	-	-	X

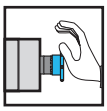
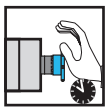
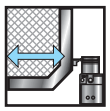
XPS AC, XPS AF,... : The product family provides the function.
X : The product family provides the function after programming (by means of pushbutton or software, depending on the product).
- : The product family does not provide the function.

AS-Interface “safety at work” safety interfaces and monitors			Safety PLCs
			
Machines using AS-Interface			Communication network
Interface to be connected	Built-in interfaces	Monitor library configurable by software	Programmable by software
-	-	LED	LED
-	-	PC	PC
-	-	AS-Interface	Modbus serial link (RTU), Modbus TCP/IP, Profibus DP
ASI SSLB4, ASI SSLE4, ASI SSLE5	ASI SEA1C, ASI SSK1C, ASI SSLE4, ASI SSLE5	X	X
-	-	-	X
ASI SSLC1, ASI SSLC2, ASI SSLLS	-	X	X
ASI SSLC1, ASI SSLC2, ASI SSLLS	-	X	X
-	-	X	X
2 x ASI SSLC2	-	X	X
-	-	X	X
-	-	X	X
-	-	-	-
-	-	X	X
ASI SSLC1, ASI SSLC2, ASI SSLLS	-	X	X
-	-	-	-
-	-	-	X
-	-	-	X
-	-	-	X
-	-	-	X
-	-	-	X
-	-	-	X
ASI SSLC1, ASI SSLC2, ASI SSLLS	-	X	X

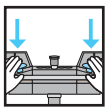
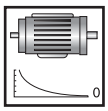
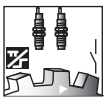
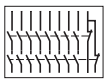
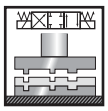
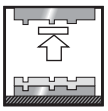
Safety functions
Selection of Preventa safety products

This selection table indicates which safety products to select, according to the required safety functions.

Final selection will be made by consulting the specific catalogue pages for each of these products.

			Safety control solution						
			Emergency stop		Prevention functions				
					Control of access to hazardous zones				
			Stop category 0	Stop category 0+1	Interlocking guard with and without guard locking	Coded magnetic switch	ESPE light curtains	ESPE light curtains with muting function	Safety mats
									
	EN/ISO 13849	EN/IEC 62061							
Safety modules *One safety function, Hard wired.*	max. Category 1, PL = b	SIL 1	-	-	-	-	-	-	-
	max. Category 2, PL = c	SIL 1	-	-	-	-	XPS CM	XPS CM	-
	max. Category 3, PL = d	SIL 2	XPS AC, XPS AFL	XPS ATE (cat. 1 stop)	XPS AC	XPS DMB, XPS DME	XPS AFL	-	XPS AK
	max. Category 4, PL = e	SIL 3	XPS AF, XPS AK, XPS AR	XPS ATE (cat. 0 stop), XPS AV	XPS AF, XPS AK, XPS AR	XPS DMB, XPS DME	XPS AFL, if OSSDs are tested by ESPE	XPS CM, XPS LCM	-
Configurable safety *Several safety functions controllers, Hard wired, Fieldbus for diagnostics (only for XPS MC).*	max. Category 1, PL = b	SIL 1	-	-	-	-	-	-	-
	max. Category 2, PL = c	SIL 1	-	-	-	-	-	-	-
	max. Category 3, PL = d	SIL 2	-	-	-	-	-	-	-
	max. Category 4, PL = e	SIL 3	XPS MP, XPS MC	XPS MC	XPS MP, XPS MC	XPS MP, XPS MC	XPS MP, XPS MC	XPS MC	XPS MP, XPS MC
AS-Interface "safety at work" safety monitors and interfaces *Several safety functions, Safety Network, Fieldbus for diagnostics.*	max. Category 1, PL = b	SIL 1	-	-	-	-	-	-	-
	max. Category 2, PL = c	SIL 1	-	-	-	-	-	-	-
	max. Category 3, PL = d	SIL 2	-	-	-	-	-	-	-
	max. Category 4, PL = e	SIL 3	X	X	X	X	X	-	-
Safety PLCs *Several safety functions, Safety Network, Fieldbus for diagnostics.*	max. Category 1, PL = b	SIL 1	X	X	X	X	X	X	X
	max. Category 2, PL = c	SIL 1	X	X	X	X	X	X	X
	max. Category 3, PL = d	SIL 2	X	X	X	X	X	X	X
	max. Category 4, PL = e	SIL 3	X	X	X	X	X	X	X

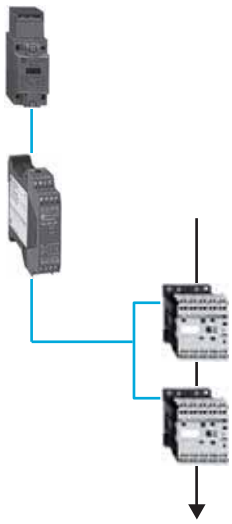
XPS AC, ... : The solution is specifically provided by the products indicated.
X : The solution is provided by the products.
- : The solution is not provided by the products.

Starting and enabling of dangerous movements		Safety monitoring functions				Functions for specific machines		
Two-hand control station	**Enabling switch (grip switch)**	**Zero speed detection (remanent voltage)**	**Zero speed detection/safety speed reduction**	**Safety timer**	**Increasing the number of safety contacts**	**Safety valve monitoring**	**Safety function for presses**	**Lift cabin levelling and door monitoring**
								
XPS BA	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	XPS VNE	-	XPS TSA XPS TSW	-	-	-	-
XPS BC, XPS BF	XPS VC	-	-	-	XPS ECM, XPS ECP	XPS PVT, XPS PVK	XPS OT	XPS DA
XPS BA	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
XPS MC	XPS MP, XPS MC	-	XPS MC	XPS MC	-	XPS MC	XPS MC	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-
X	-	-	-	**X**	-	-	-	-
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**
X	**X**	-	**X**	**X**	**X**	**X**	**X**	**X**

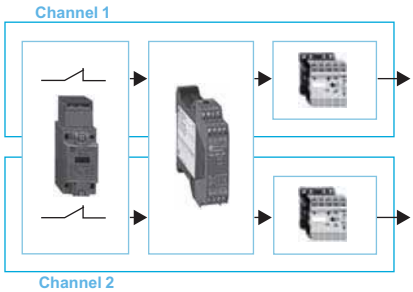
Safety functions
Application examples
Optimised compact machine



Typical application: compact packaging machine



Scheme of the safety-related part of a packaging machine control circuit



Functional representation of the scheme conforming to EN/ISO 13849-1

Optimised compact machine

To aid understanding, we are presenting three application examples covering typical cases encountered in machines.
These examples are extracts from the ***Preferred Implementations*** proposed by Schneider Electric.
For clarity, only the safety functions will be detailed and, in all cases, the calculation methods corresponding to the following two standards will be used:
- standard EN/ISO 13849-1, which has replaced EN 954-1 that cannot be used after November 2009, defines Performance Levels **PL**,
- standard EN/IEC 62061 defines Safety Integrity Levels **SIL**.

A detailed presentation of these two standards is given on page 6/10.

Typical applications

Compact and repetitive machines, hard wired. We will choose a packaging machine as an example.

Description of safety functions

This application uses several motors which must be stopped when the safety guard is opened.
The estimated level of risk reduction for this function of the machine requires a performance level **PL = d** or a safety integrity level **SIL = 2**.
It will therefore be necessary to use:
- an XCS A guard switch 2-pole N/C + N/C,
- an XPS AC safety module,
- two LC1 K contactors in series.

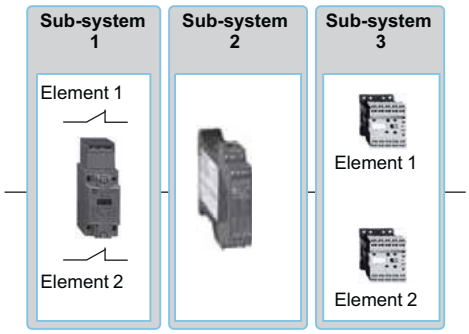
Connections are by means of conventional wiring.

Calculation and component selection for a PL = d

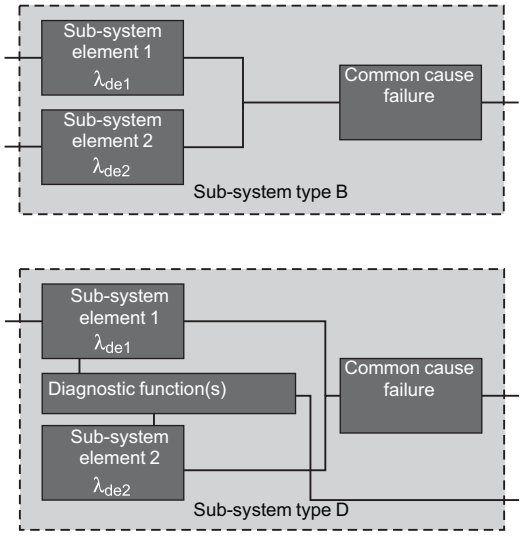
To achieve the required performance level, two redundant channels must be used, corresponding to category 3. The calculation is shown in the table below.

Cycle time (s)			**60**	
Number of hours' operation per day (h)			**24**	
Number of days' operation per year			**365**	
Number of operations per year			**525 600**	
		Requirement: PL = d	**Channel 1**	**Channel 2**
Input (sensors) XCS A	B_{10}	-	1 000 000	1 000 000
	% dangerous failure	-	20%	20%
	$B10_d$	-	5 000 000	5 000 000
	$MTTF_d$	-	95.13	95.13
	DC	-	0.0%	0.0%
Processing unit (safety module) XPS AC	$MTTF_d$	-	315.5	315.5
	DC	-	99.9%	99.9%
Output (actuator) LC1 K	B_{10}	-	1 000 000	1 000 000
	% dangerous failure	-	73%	73%
	B_{10d}	-	1 369 863	1 369 863
	$MTTF_d$	-	156.38	156.38
	DC	-	99.0%	99.0%
Safety function	$MTTF_{dC}$	$10 \leqslant MTTF_d < 30$	23.48	23.48
	DC_{avg}	$60\% \leqslant DC < 99\%$	**79.1%**	
	$MTTF_d$ for the different channels	Category 3	**19.21**	

Safety functions
Application examples *(continued)*
Optimised compact machine *(continued)*



Functional representation of the scheme conforming to EN/IEC 62061



Architectures selected for the sub-systems

Optimised compact machine *(continued)*

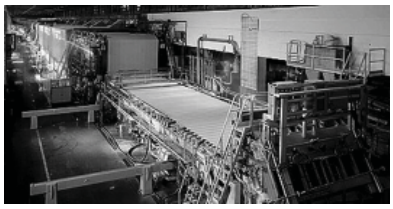
Calculation and component selection for a SIL = 2

For sub-system 1, we will use a type B architecture: the safety guard switch contains redundant contacts.
Sub-system 2 is type D : diagnostics are performed by the mechanically-linked auxiliary contacts built-into the contactors and connected to the XPS AC safety module that incorporates this function.

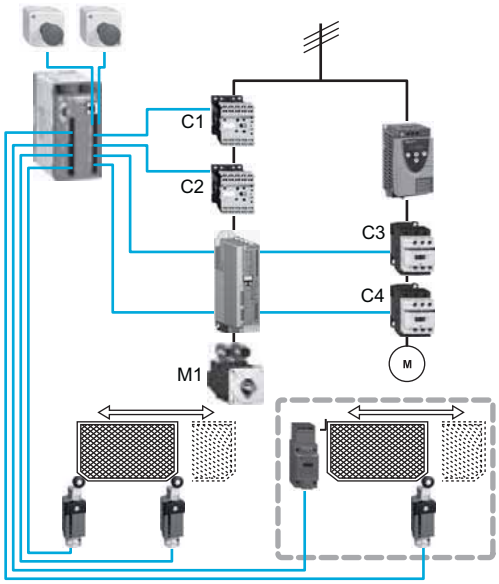
The calculation method is shown in the table below.
The result conforms to the requirements.

Cycle time (s)				**60**	
Cycle time in hours (h)				**0.16667**	
Number of cycles per hour				**60**	
		Type of sub-system	**Require-ment**	**Element 1**	**Element 2**
Input (sensor) XCS A	B_{10} (operations)	-	-	1 000 000	1 000 000
	Portion of dangerous failures %	-	-	20%	20%
	λ	-	-	$6.00E^{-06}$	$6.00E^{-06}$
	λ_D	-	-	$1.20E^{-06}$	$1.20E^{-06}$
	β	-	-	10%	
	Life expectancy in years			10	
	Life expectancy or test interval T1 (h)	-	-	87 600	
	DC	-	-	0.0 %	0.0 %
	PFH_{DSSB}	Sub-system B HFT = 1 no diagnostic function	SIL = 2	$1.30E^{-08}$	
Processing unit (safety module) XPS AC	PFH_{DSSD}	Sub-system D HFT = 1 diagnostic function	SIL = 2	$1.75E^{-09}$	
	DC	-	-	99.9%	
Output (actuator) LC1 K	B_{10} (operations)	-	-	1 000 000	1 000 000
	Portion of dangerous failures %	-	-	73%	73%
	λ	-	-	$6.00E^{-06}$	$6.00E^{-6}$
	λ_D	-	-	$4.38E^{-06}$	$4.38E^{-06}$
	β	-	-	5 %	
	Life expectancy in years			20	
	Life expectancy or test interval T1 (h)	-	-	175 200	
	DC	-	-	99%	99%
	PFH_{DSSB}	Sub-system D HFT = 1 diagnostic function	SIL = 2	**$4.73E^{-07}$**	
Safety-related control function	PFH_{DSRECS}		$10^{-7} \leq ... < 10^{-6}$	**$2.64E^{-07}$**	

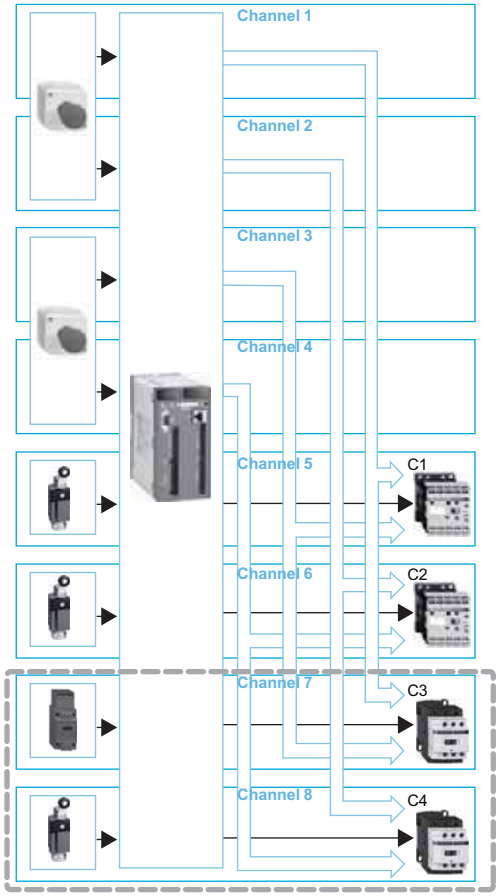
Safety functions
Application examples *(continued)*
Upgradable compact machine



Printing machine



***Safety-related** part of a printing machine scheme (the calculation is made on the portion of circuit surrounded in grey)*



Functional analysis of the scheme conforming to EN/ISO 13849-1

Upgradable compact machine

Typical applications

This type of machine is generally integrated into a manufacturing process and must be suited to the customer's process. To facilitate upgrading, a CanOpen fieldbus is used
Examples: woodworking machines, printing machines, packaging machines.

Description of safety functions

Protection systems will limit the possibility of access to hazardous areas.
As the risk for operators is high, a performance level **PL= e** or a safety integrity level **SIL = 3** will be required.
It will therefore be necessary to use protective systems (partially represented on the scheme) such as guards, light curtains, etc.

The complexity of the circuit leads to selection of a controller to provide all the emergency stop and safety functions. It offers the advantage of being able to communicate the operating states and diagnostics on the fieldbus.
Contactors in series cut-off the power in variable speed drives.
Safety connections are made by means of conventional wiring.
The control system is monitored via a CanOpen fieldbus.

Calculation and component selection for a PLr = e

The required Performance Level of safety necessitates the use of category 4 products (redundancy and self-monitoring).
In compliance with standard EN/ISO 13849-1, the functional analysis is performed by splitting into channels. The figure opposite represents channels 1 to 8 which ensure operation of the scheme.
It should be noted that the contactors are common to several channels:
- C1 is common to channels 1, 3, 5
- C2 is common to channels 2, 4, 6
- C3 is common to channels 3, 7
- C4 is common to channels 4, 8

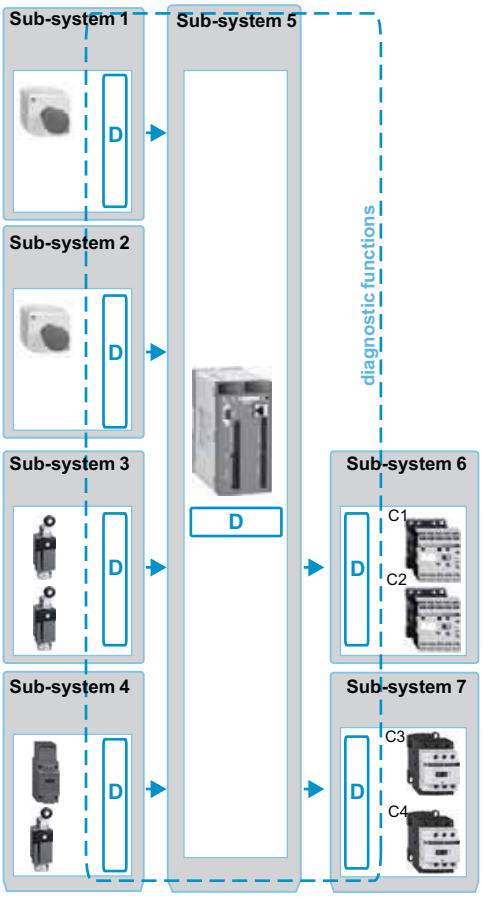
For clarity, the calculation shown below only relates to channels 7 and 8.

Cycle time (s)	**360**
Number of hours' operation per day (h)	**24**
Number of days' operation per year	**365**
Number of operations per year	**87600**

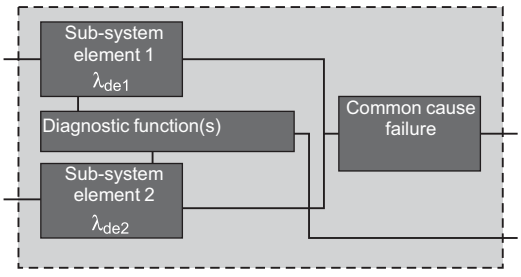
		Requirement: PL = e	Channel 7	Channel 8
Input (sensors) XCS PA, XCS M	B_{10}		1 000 000	10 000 000
	% dangerous failures		20%	20%
	B_{10d}		5 000 000	50 000 000
	$MTTF_d$		570.78	5707.76
	DC		99.0%	99.0%
Processing unit (controller) XPS MC	$MTTF_d$		76.6	76.6
	DC		99.6%	99.6%
Output (actuator) LC1 K	B_{10}		1 000 000	1 000 000
	% dangerous failures		73%	73%
	B_{10d}		1 369 863	1 369 863
	$MTTF_d$		156.38	156.38
	DC		99.0%	99.0%
Safety function	$MTTF_{dC}$	$30 \leq MTTF_d < 100$	47.17	50.96
	DC_{avg}	$DC \geq 99\%$	**99.4%**	
	$MTTF_d$ for the different channels	Category 4	**49.09**	

Schneider Electric version: 3.0 38815-EN _Ver3.0_OK250408.indd

Safety functions
Application examples *(continued)*
Upgradable compact machine *(continued)*



Functional representation of the scheme conforming to EN/IEC 62061



*Architecture of a type **D** sub-system*

Upgradable compact machine *(continued)*

Specification of SRECS and calculation and component selection for a SIL = 3

As in the previous calculation, **we will analyse the safety functions associated with motors M1**.
On the figure representing the break-down into sub-systems, the required level SIL= 3 necessitates a type **D** architecture for each sub-system: in addition to redundancy of the circuits, it includes a diagnostic function.

It should be noted that the diagnostic functions are provided by the XPS MC controller: it monitors operation of the sensors and contactors.

The calculation method is shown in the table below.
The result conforms to the SIL3 requirements.

Cycle time (s)				**360**	
Cycle time in hours (h)				**0.1**	
Number of cycles per hour				**10**	
		Type of sub-system	**Require-ment**	**Element 1**	**Element 2**
Input (sensors) XCS PA, XCS PM	B_{10} (operations)			1 000 000	10 000 000
	Proportion of dangerous failures %			20%	20%
	λ			$1.00E^{-06}$	$1.00E^{-07}$
	λ_D			$2.00E^{-07}$	$2.00E^{-08}$
	β			5%	
	Life expectancy in years			10	
	Life expectancy or test interval T1 (h)			87 600	
	DC			99.0%	99.0%
	PFH_{DSSD}	Sub-system **D** HFT = 1 diagnostic function	SIL = 3	$5.50E^{-09}$	
Processing unit (controller) XPS MC	PFH_{DSSD}	Sub-system **D** HFT = 1 diagnostic function	SIL = 3	$1.29E^{-08}$	
	DC			99.6%	
Output (actuators) 2 x LC1 D	B_{10} (operations)			1 000 000	1 000 000
	Proportion of dangerous failures %			73%	73%
	λ			$1.00E^{-06}$	$1.00E^{-06}$
	λ_D			$7.30E^{-07}$	$7.30E^{-07}$
	β			5%	
	Life expectancy in years			20	
	Life expectancy or test interval T1 (h)			175 200	
	DC			99.0%	99.0%
	PFH_{DSSD}	Sub-system **D** HFT = 1 diagnostic function	SIL = 3	**$3.73E^{-08}$**	
Safety-related control function	PFH_{DSRECS}		$10^{-8} \leq ... < 10^{-7}$	**$5.57E^{-08}$**	

2

Preventa safety PLCs, XPS MF

Selection guide: Preventa safety PLCs, XPS MF 2/2

Preventa safety compact PLCs, XPS MF40. . . . . 2/4

Preventa safety compact PLCs, XPS MF31/30/35. . . . . 2/18

Preventa safety modular PLC, XPS MF60:

- Rack, power supply and central processing unit 2/34
- "In rack" analogue input card 2/50
- "In rack" analogue output card 2/52
- "In rack" mixed card: counting inputs/digital outputs 2/54
- "In rack" digital input card (24 digital inputs). 2/56
- "In rack" digital input card (32 digital inputs). 2/58
- "In rack" digital I/O card 2/60
- "In rack" relay output card 2/62

Communication on network and bus 2/64

Programming software XPSMFWIN
for Preventa safety compact and modular safety PLCs, XPS MF 2/68

Selection guide: safety remote input/output modules, XPS MF1/2/3 . . . . . 2/74

- Safety remote input modules, XPS MF1 . . . . . 2/76
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Preventa safety controllers

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Preventa safety modules

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Type XPS AC,
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Type XPS AV and XPS ATE,
for Emergency stop and switch monitoring 2/178

Type XPS AF,
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Type XPS AFL,
for Emergency stop, switch and safety light curtain monitoring 2/190

Type XPS AR,
for Emergency stop, switch or safety light curtain monitoring. 2/194

Type XPS AK,
for Emergency stop, switch, sensing mat/edges
or safety light curtain monitoring 2/200

Type XPS VC,
for enabling switch monitoring 2/206

Type XPS BA, XPS BC and XPS BF,
for electrical monitoring of two-hand control stations 2/208

Type XPS LCD,
for monitoring 2 to 4 safety light curtains type 2 and type 4 . . . . . 2/216

Type XPS LCM,
for the "muting" function of type 2 and type 4 safety light curtains. 2/220

Type XPS ECM and XPS ECP,
for increasing the number of safety contacts. 2/228

Type XPS TSA and XPS TSW,
for safety time delays *2/232*

Type XPS DMB and XPS DME,
for coded magnetic switch monitoring *2/236*

Type XPS VNE,
for zero speed detection *2/242*

Type XPS DA,
for lift control *2/248*

Type XPS PVT,
for dynamic monitoring of hydraulic valves on linear presses *2/250*

Type XPS PVK,
for dynamic monitoring of double-bodied solenoid valves *2/254*

Type XPS OT,
for safety stop with automatic overtravel monitoring and control *2/258*

Dimensions *2/262*

Safety solutions on AS-Interface cabling system

Selection guide: Safety monitors and interfaces ***2/264***

Safety monitors *2/266*

Safety interfaces *2/270*

Safety modules integrated in automation platform

Selection guide: Preventa safety modules for automation platform ***2/274***

Modicon TSX Micro automation platform *2/276*

Modicon Premium automation platform *2/280*

Safety automation system solutions
Preventa safety PLCs
Compact and modular, XPS MF

Presentation

*Products referenced **XPS MF31222, XPS MF3022** and **XPS MF35●●** are marked **HIMatrix F31, HIMatrix F30** and **HIMatrix F35** (manufactured by Hima, sold by Schneider Electric).*

Compact PLCs:
■ Designed for use with numerous machine safety functions and for the protection of personnel.
■ Designed for use in safety related parts of control systems up to category 4 conforming to EN 954-1, up to performance level "e" conforming to EN/ISO 13849-1, and up to SIL 3 conforming to EN/IEC 61508.








User memory	Application	250 kB			
	Data	250 kB			
Response time		Depending on size of application			
Maximum consumption		8 A			9 A
Supply		External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)			
Inputs	**Digital**	Number of channels	**24**, configurable, not electrically isolated	**20**, not electrically isolated	**24**, not electrically isolated
		Current at state 0	1.5 mA max. at ⎓ 24 V	1.5 mA max., 1.25 mA at 5 V	
		Current at state 1	3.5 mA at ⎓ 24 V 4.5 mA at ⎓ 30 V	≥ 2 mA at ⎓ 15 V	> 2 mA at ⎓ 15 V 3.5 mA at ⎓ 24 V 4.5 mA at ⎓ 30 V
	Analogue	Number of channels	–	–	– **8**, single-pole
		Range: voltage/current	–	–	– 0…10 V/0…20 mA *(1)*
	Counting	Number of channels	–	–	– **2**
		Current	–	–	– 1.4 mA at ⎓ 5 V, 6.5 mA at ⎓ 24 V
Outputs	**Digital**	Number of channels	**24**, configurable, not electrically isolated	**8** *(2)*, not electrically isolated	**8**, not electrically isolated
		Output current	Chnls. 1 to 3, 5 to 7, 9 to 11, 13 to 15, 17 to 19, 21 to 23: 0.5 A at 60°C Channels 4, 8, 12, 16, 20 and 24: 1 A at 60 °C, 2 A at 50°C	Channels 1 to 3 and 5 to 7: 0.5 A at 60 °C Channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C	
	Analogue	Number of channels	–	–	– –
		Range: voltage/current	–	–	– –
	Relay	Number	–	–	– –
		Switching voltage	–	–	– –
	Line control		**2 x 4**	*(2)*	*(2)* –
Input/output connections			Removable screw terminals are provided with all Safety compact PLCs Reference **XPS MF40●●** is also provided with cage clamp terminal		
Communication on Ethernet network			**By integrated RJ45 switched Ethernet communication ports**		
■ **Safe communication** using SafeEthernet protocol			yes	yes	yes yes
■ **Non safe communication** using Modbus TCP/IP protocol, server (slave)			yes (**XPS MF4002/4022/4042**)	yes (**XPS MF31222**)	yes (**XPS MF3022**) yes (**XPS MF3502/ MF3522/MF3542**)
Communication on fieldbus					
Non safety using Modbus RTU protocol, slave (RS 485)			yes (**XPS MF4020/4022**)	–	yes (**XPS MF3022**) yes (**XPS MF3522**)
Non safety using PROFIBUS DP protocol, (V0 slave)			yes (**XPS MF4040/4042**	–	– yes (**XPS MF3542**)
Safety PLC type			**XPS MF400●/MF402●/ MF404●**	**XPS MF31222**	**XPS MF3022** **XPS MF3502/ MF3522/MF3542**
See page			2/12	2/27	2/27 2/27
"In rack" card type			–	–	– –
See page			–	–	– –

(1) With 500 Ω shunt. (2) The digital outputs can be configured as line control outputs.

Modular PLC XPS MF60: metal rack **XPS MFGEH01** with slots for power supply module **XPS MFPS01**, central processing unit **XPS MFCPU22** and six “in rack” I/O cards.
- Designed for use with numerous machine safety functions and for the protection of personnel.
- Designed for use in safety related parts of control systems up to category 4 conforming to EN 954-1, up to performance level “e” conforming to EN/ISO 13849-1, and up to SIL 3 conforming to EN/IEC 61508.



500 kB						
500 kB						
Depending on size of application						
30 A max., 32 A external fuse						
External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)						
–	–	–	**24**, electrically isolated	**32** *(2)*, electrically isolated	**24** *(2)*, electrically isolated	–
–	–	–	–	1 mA at 5 V	1 mA at 5 V	–
–	–	–	⩾ 2.2 mA at 79 V	2 mA at ⎓ 10 V, 5 mA at ⎓ 24 V	2 mA at ⎓ 10 V, 5 mA at ⎓ 24 V	–
8 single-pole or **4** 2-pole, configurable, electrically isolated	–	–	–	–	–	–
- 10…+ 10 V/0…20 mA *(1)*	–	–	–	–	–	–
–		**2**	–	–	–	–
–	–	0.8 A at ⎓ 3.3 V 0.1 A at ⎓ 5 V 0.1 A + output current at ⎓ 24 V	–	–	–	–
–	–	**4**	–	–	**16** *(3)*, electrically isolated	–
–	–	0.5 A per channel, 2 A max. per “in rack” card	–	–	2 A per channel at 30 °C, 8 A max. at 30 °C per “in rack” card	–
–	**8**, electrically isolated	–	–	–	–	–
–	- 10…10 V / 0…20 mA	–	–	–	–	–
–	–	–	–	–	–	**8**
–	–	–	–	–	–	⎓ 6…250 V
–	–	–	–	–	*(3)*	–
Removable screw terminals are provided with “in rack” I/O cards and Power supply module						
By integrated RJ45 switched Ethernet communication ports						
yes						
yes						
yes						
yes						

XPS MFGEH01 (rack) + XPS MFPS01 (power supply) + XPS MFCPU22 (central processing unit) + “in rack” I/O cards (to be selected from below)

2/44

XPS MFAI801	XPS MFAO801	XPS MFCIO2401	XPS MFDI2401	XPS MFDI3201	XPS MFDIO241601	XPS MFDO801
2/51	2/53	2/55	2/57	2/59	2/61	2/63

(1) With 250 Ω or 500 Ω shunt. (2) Digital inputs can be supplied by the line control outputs of the same I/O card. (3) The digital outputs (n° 1… n° 16) can be configured as line control outputs.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40



XPS MF4000
XPS MF4002



XPS MF4020
XPS MF4022



XPS MF4040
XPS MF4042

Presentation

Preventa compact safety PLCs **XPS MF40●●** enable the monitoring of simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

Designed for use with numerous machine safety functions, these compact safety PLCs are intended for use in safety related parts of control systems.
They can manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

The compact safety PLC range **XPS MF40●●** comprises of 6 versions that are differentiated by their non safety related communication protocols.

Compact PLCs	Digital Inputs/Outputs	Line control outputs	Communication		
			On Ethernet network		On fieldbus
			Safety protocol	Non safety protocol	
XPS MF4000	24, configurable	8	SafeEthernet	–	–
XPS MF4002	24, configurable	8	SafeEthernet	Modbus TCP/IP Server	–
XPS MF4020	24, configurable	8	SafeEthernet	–	Modbus serial Slave (RTU)
XPS MF4022	24, configurable	8	SafeEthernet	Modbus TCP/IP Server	Modbus serial Slave (RTU)
XPS MF4040	24, configurable	8	SafeEthernet	–	PROFIBUS DP V0 slave
XPS MF4042	24, configurable	8	SafeEthernet	Modbus TCP/IP Server	PROFIBUS DP V0 slave

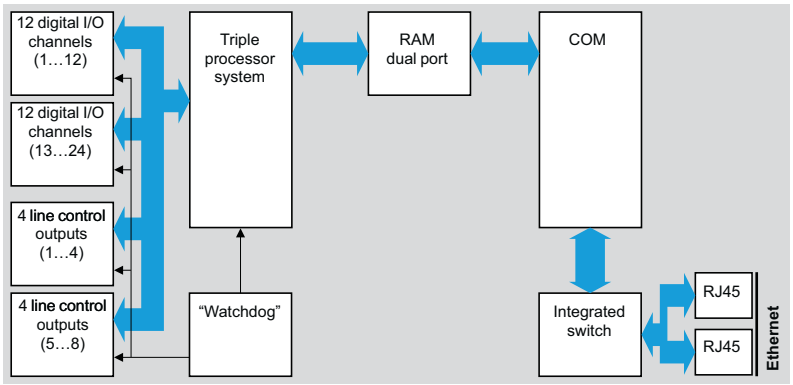
Safety PLCs

In order to meet safety requirements, the compact safety PLCs **XPS MF40●●** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level “e” conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between the safety PLCs and the safety remote I/O modules (**Special Switch**).

■ **Redundancy**: the triple processor integrated in the compact safety PLCs analyses and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the three processors and compared in real-time.
■ **Self-monitoring (“Watchdog”)**: the compact safety PLCs continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety PLCs on the Ethernet network, whilst avoiding signal collisions and excessive amounts of data on the network.

Functional synoptics

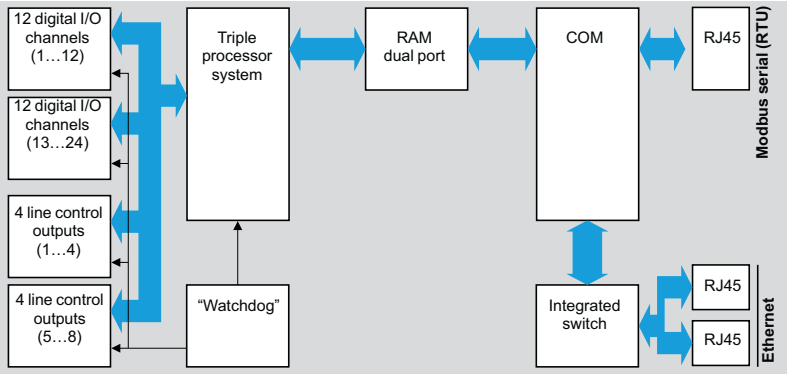
Compact safety PLCs XPS 4000/MF4002



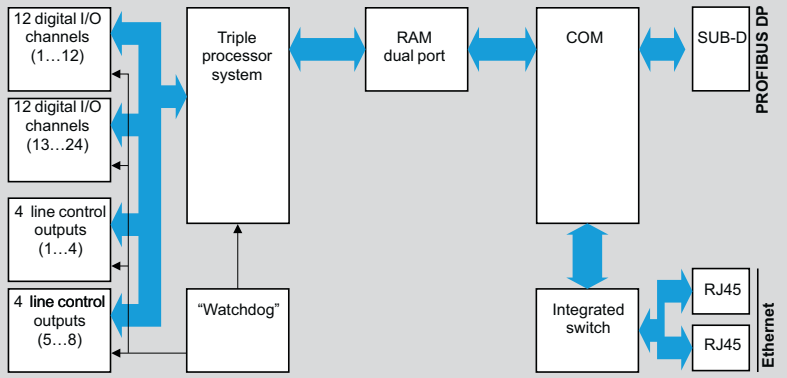
Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF 40

Functional synoptics *(continued)*

Compact safety PLCs XPS MF4020/MF4022



Compact safety PLCs XPS MF4040/MF4042



Line control for safety PLCs XPS MF40●●

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety PLCs.

The line control outputs 1 to 8 are connected to the digital inputs of the same circuit.

Example: Emergency stop pushbutton with two normally closed (N/C) contacts that are supplied by two different line control outputs connected via these two normally closed contacts and fed into the inputs of the safety PLCs

Programming automated safety functions

Software **XPS MFWIN** (reference SSV1XPSMFWIN) running on a PC enables the programming of all safety remote I/O modules and safety PLCs, as well as configuration of the communication settings.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40

Compact safety PLCs **XPS MF40●●** incorporate:
- ■ 24 configurable I/O channels
- □ digital inputs
- □ or digital outputs
- ■ and 8 (2 x 4) line control output channels.

Digital inputs

Compact safety PLCs **XPS MF40●●** incorporate up to 24 digital inputs for the connection of safety related input devices, such as emergency stop contacts, magnetic switches, light curtains, etc.

Compact PLCs	Digital inputs		
	N°	Safety detection	Safety dialogue
XPS MF4000	24	Limit switches, Guard switches, with reset and with actuator, Safety light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…
XPS MF4002	24		
XPS MF4020	24		
XPS MF4022	24		
XPS MF4040	24		
XPS MF4042	24		

Digital outputs

Compact safety PLCs **XPS MF40●●** incorporate up to 24 digital outputs for the connection of safety related output devices, such as contactors, illuminated beacons, sirens, etc.

Compact PLCs	Digital outputs		
	N°	Safety actuators	Safety dialogue
XPS MF4000	24	Contactors-motors, Contactors-reversing, Variable speed drives...	Beacons and indicator banks, Rotating mirror beacons, Sirens…
XPS MF4002	24		
XPS MF4020	24		
XPS MF4022	24		
XPS MF4040	24		
XPS MF4042	24		

Line control outputs

Compact PLCs	Line control outputs	
	N°	
XPS MF4000	8 (2 x 4)	Short-circuit and line break monitoring
XPS MF4002		
XPS MF4020		
XPS MF4022		
XPS MF4040		
XPS MF4042		

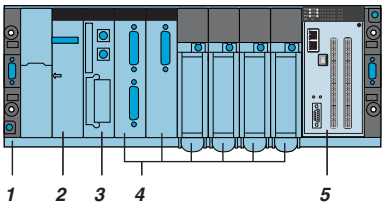
Remote inputs and outputs

In addition to the inputs/outputs integrated as standard, compact safety PLCs **XPS MF40●●** can be connected to safety remote input modules **XPS MF1** and/or safety remote output modules **XPS MF2** and/or safety remote mixed I/O modules **XPS MF3**.
The safety remote input, output and mixed I/O modules can be located within the vicinity of the machines to be monitored, thus reducing cabling.

Communication between these safety remote I/O modules and safety PLCs **XPS MF40●●** is performed on an Ethernet network using the SafeEthernet safety protocol, via the integrated RJ45 switched Ethernet communications ports.

Integrating safety PLCs XPS MF40 on a Premium automation platform

Designed for mechanical integration on a Premium automation platform, safety PLCs **XPS MF40●●** occupy 2 slots on the Premium rack **TSX RKY**.
There is interaction between the two programming environments (Unity and XPSMFWIN): the variables defined using software **XPSMFWIN** can be retrieved by Unity (platform programming software) by using a tool included in Safety Suite V2.



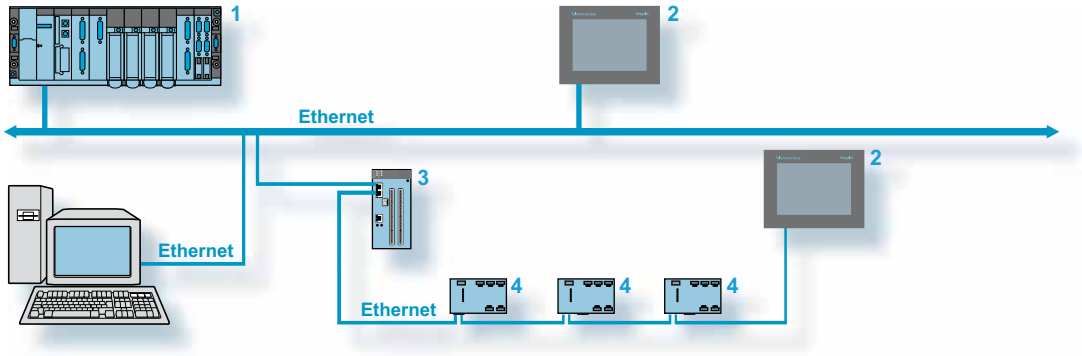
*Example of mechanical integration of a compact safety PLC **XPS MF40** on a Premium automation platform.*

1 *Premium rack*
2 *Power supply module*
3 *Premium processor module*
4 *Other Premium modules (communication, I/O)*
5 *Compact safety PLC **XPS MF40***

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40

Safety communication on Ethernet network

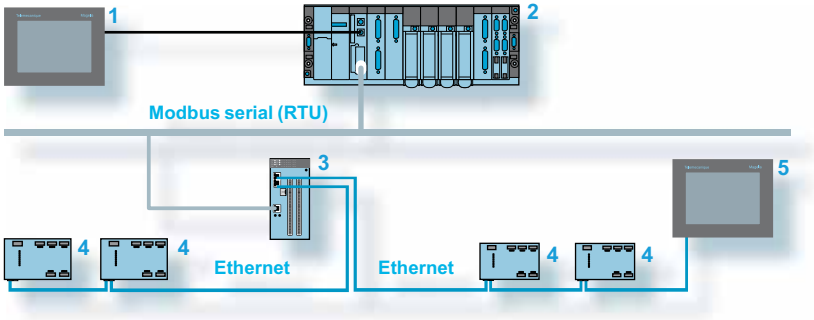
Communication between the PC, Magelis graphic terminals or automation platform (Premium) and the compact safety PLCs **XPS MF40●●** is achieved by **Ethernet** network connection via the integrated RJ45 switched Ethernet communication ports of the compact PLCs.



1 Premium automation platform: Modbus TCP/IP client.
2 Graphic terminal **XBT GT**: Modbus TCP/IP client.
3 Safety PLCs **XPS MF40●●**: Modbus TCP/IP servers.
4 Safety remote I/O modules **XPS MF1/2/3**. They communicate with safety PLCs **XPS MF40●2** using the SafeEthernet protocol.

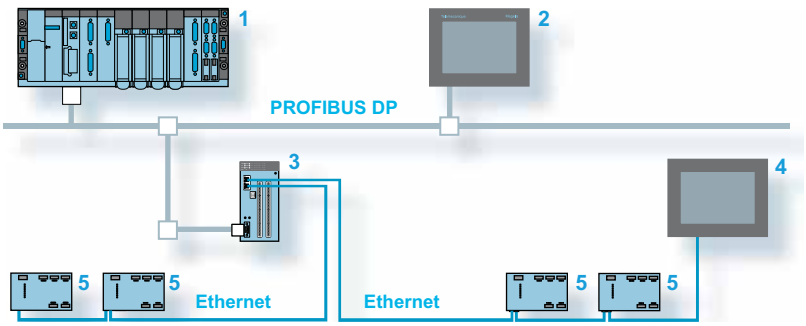
Communication on Modbus serial (RTU) and PROFIBUS DP fieldbus

■ On **Modbus serial (RTU)**, safety PLCs **XPS MF4020** and **XPS MF4022** are slaves of the Premium automation platform and Magelis graphic terminal.
They are connected to the Modbus serial network via their RJ45 connector.



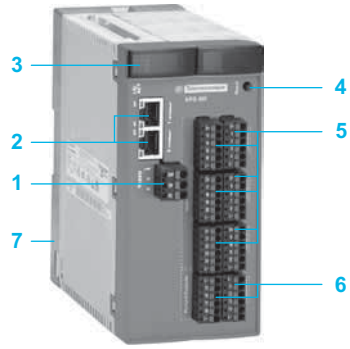
1 Graphic terminal **XBT GT**: Modbus serial (RTU) master.
2 Premium automation platform: Modbus serial (RTU) master.
3 Safety PLCs **XPS MF402●**: Modbus serial (RTU) slave, Modbus TCP/IP server.
4 Safety remote I/O modules **XPS MF1/2/3**. They communicate with safety PLCs **XPS MF402●** using the SafeEthernet protocol.
5 Graphic terminal **XBT GT**: Modbus serial (RTU) client.

■ On **PROFIBUS DP**, safety PLCs **XPS MF4040** and **XPS MF4042** are slaves of the Premium automation platform and Magelis graphic terminal.
They are connected to the PROFIBUS DP network via their SUB-D 9-pin connector.



1 Premium automation platform: PROFIBUS DP master.
2 Graphic terminal **XBT GT**: PROFIBUS DP master.
3 Safety PLC **XPS MF404●**: PROFIBUS DP slave, Modbus TCP/IP server.
4 Graphic terminal **XBT GT**: Modbus TCP/IP client.
5 Safety remote I/O modules **XPS MF1/2/3**. They communicate with safety PLCs **XPS MF404●** using the SafeEthernet protocol.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40

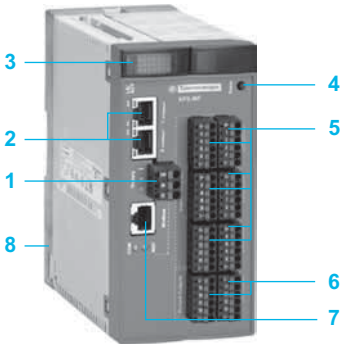


Description

Safety PLCs XPS MF4000/MF4002

On the front face of the enclosure:

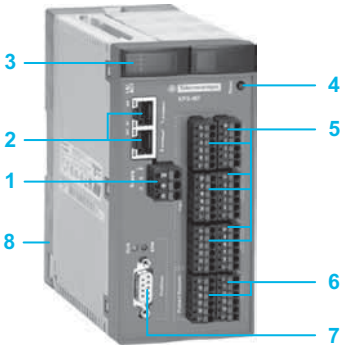
1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP/IP server protocol).
3 Process status LEDs.
4 One “Reset” button.
5 Six terminal blocks *(1)* for connection of configurable digital I/Os.
6 Two terminal blocks *(1)* for connection of line control outputs.
7 **On the rear face**: one removable plate with spring fixing for mounting on 35 mm ⊔ rail.



Safety PLCs XPS MF4020/MF4022

On the front face of the enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus server protocol).
3 Process status LEDs.
4 One “Reset” button.
5 Six terminal blocks *(1)* for connection of configurable digital I/Os.
6 Two terminal blocks *(1)* for connection of line control outputs.
7 One RJ45 connector for connection on Modbus serial (RTU), with 2 process status LEDs.
8 **On the rear face**: one removable plate with spring fixing for mounting on 35 mm ⊔ rail.



Safety PLCs XPS MF4040/MF4042

On the front face of the enclosure:

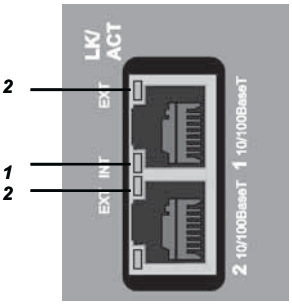
1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP/IP server protocol).
3 Process status LEDs.
4 One “Reset” button.
5 Six terminal blocks *(1)* for connection of configurable digital I/Os.
6 Two terminal blocks *(1)* for connection of line control outputs.
7 One SUB-D (9-pin female) connector for connection on PROFIBUS DP, with 2 process status LEDs.
8 **On the rear face**: one removable plate with spring fixing for mounting on 35 mm ⊔ rail.

*(1) Removable Screw and Cage clamp terminals are provided with compact safety PLCs **XPS MF40**.*

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40



Process status LEDs



***1** Internal Ethernet LED*
***2** External Ethernet LEDs*



Modbus serial (RTU) LEDs



PROFIBUS DP LEDs

LED details

Process status LEDs on safety PLCs XPS MF40●●

LED	Colour	Status	Meaning
1…24	Green	On	Channels configured as inputs: input signal being received. Channels configured as outputs: output signal being sent.
T1…T8	Green	On	Line control outputs active.
PWR	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
PG	Yellow	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
ERR	Red	On	Software error or hardware fault detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
FAU	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred whilst writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energised state.
		Off	The CPU is in “ERROR” state (see ERR).
FOR	Green	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the triple processor is started.
		Off	Force mode not activated.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.

Ethernet LEDs on safety PLCs XPS MF40●●

LK/ACT external	Green	Off	No connection/link established.
		On	Connection established/link established.
		Flashing	External data exchange (speed 10…100 Mbps).
LK/ACT internal	Green	Off	No connection/link established.
		On	Connection established/link established.
		Flashing	Internal data exchange (speed 10…100 Mbps).

Modbus serial (RTU) LEDs on safety PLCs XPS MF4020/MF4022

COM	Yellow	Off	No bus network signals being received or transmitted.
		On	Bus network signals being received or transmitted.
RDY	Green	Off	Transmission power not available.
		On	Equipment on.

PROFIBUS DP LEDs on safety PLCs XPS MF4040/MF4042

RUN	Green	Off	Equipment not connected or not operational.
		On	Equipment operational.
ERR	Red	Off	Transmission power not available or the slave is exchanging data.
		On	Connection to other equipment is established but no data exchange is possible. Bus disconnected or bus Master not available.
		Flashing	A configuration error has occurred and no data exchange is possible.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40

Environment			
Compact safety PLC type			**XPS MF4000/4002, XPS MF4020/4022, XPS MF4040/4042**
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1, EN/ISO 13849-1 and EN/IEC 61508)			Category 4 (EN 954-1), Performance level "e" (EN/ISO 13849-1), Safety integrity level: SIL 3 (EN/IEC 61508)
Product certifications			IEC 61511 part 1-3: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 2005, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001
Ambient air temperature conforming to EN/IEC 61131-2	Operating	**°C**	0…+ 60
	Storage	**°C**	- 40…+ 85
Relative humidity			95% (supply not connected)
Degree of protection	Enclosure		IP 20
Pollution			Degree of pollution II
Altitude		**m**	< 2000
Protection class			Class II, conforming to EN/IEC 61131-2
Electromagnetic compatibility			Conforming to EN/IEC 61131-2
Vibration resistance conforming to EN/IEC 61131-2	Operating		1 g, frequency 9…150 Hz
Shock resistance conforming to EN/IEC 61131-2	Operating		15 g (duration 11 ms), unit test whilst operating, 2 cycles per axis
Resistance to electrostatic discharges conforming to EN/IEC 61000-4-2		**kV**	4 contact, 8 air discharge
Immunity to high frequency interference conforming to EN/IEC 61000-4-3		**V/m**	10 (80 MHz…2 GHz), amplitude modulation 80%
Electrical characteristics			
Supply	Voltage	**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)
	Voltage limits		- 15…+ 20 %
Maximum consumption		**A**	8
Idle current		**A**	0.5
Immunity to momentary supply interruptions		**ms**	10
Protection			Internal fuse, 10 A
Response time		**ms**	Depending on size of application
Clock			Supplied by backup capacitor for 1 week following loss of supply
User memory	Application	**kB**	250
	Data	**kB**	250
LED display			Yes
Digital inputs			
Number	Inputs not electrically isolated		24, configurable channels
Permissible current	At state 0	**mA**	1.5 max. at ⎓ 24 V
	At state 1	**mA**	3.5 at ⎓ 24 V, 4.5 at ⎓ 30 V
Input supply			3 x ⎓ 20 V/100 mA (on 24 V)
Input resistance		**kΩ**	< 7
Overvoltage protection		**V**	- 10, + 35
LED display			Yes, see page 2/9
Maximum distance of equipment		**m**	300
Digital outputs			
Number	Outputs not electrically isolated		24, configurable channels
Output voltage		**V**	⎓ 24 ± 2
Output current	Channels 1 to 3, 5 to 7, 9 to 11, 13 to 15, 17 to 19, 21 to 23	**A**	0.5 at 60 °C
	Channels 4, 8, 12, 16, 20 and 24	**A**	1 at 60 °C, 2 at 50 °C
Minimum load		**mA**	2 per channel
Leakage current at state 0		**mA**	1 max. at 2 V
Response to overload			Shutdown of outputs concerned with cyclic reconnection
Total output current		**A**	7 max., shutdown of all outputs if exceeded with cyclic reconnection
LED display			Yes
Maximum distance of equipment		**m**	300
Line control outputs			
Number	Outputs not electrically isolated		8 (2 x 4)
Output voltage		**V**	20, depending on the supply voltage
Output current		**mA**	60
Minimum load		**mA**	None
Response to overload			4 x ≥ 19.2 V/60 mA (on 24 V), short-circuit current
LED display			Yes

Presentation: page 2/4 | Characteristics: page 2/10 | References: page 2/12 | Dimensions, mounting: page 2/15 | Connections: page 2/16

Communication

Ethernet network

Safety communication using SafeEthernet safety protocol

Compatibility			**XPS MF4000/MF4002, XPS MF4020/MF4022, XPS MF4040/MF4042**
Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)

Non safety communication using Modbus TCP/IP protocol

Compatibility			**XPS MF4002, XPS MF4022, XPS MF4042**
Connection ports	Number and type		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
	Master/Slave		Server (slave)
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)
Transparent Ready service	Class		A10
	Standard Ethernet TCP/IP communication services (supported by compact safety PLCs XPS MF40)		Modbus TCP/IP server.
			Modbus TCP/IP messaging (reading/writing of data words) Modbus identification requests
	TCP port		Standard 502
	Max. number of Modbus TCP/IP connections		1 to 20

Modbus serial (RTU)

Compatibility			**XPS MF4020, XPS MF4022**
Serial link ports	Number and type		1 x RJ45
	Master/Slave		Slave, V0
Addressing			122 slave addresses
Physical layer			RS 485
Medium			Shielded dual twisted pair cable

PROFIBUS DP

Compatibility			**XPS MF4040, XPS MF4042**
Serial link ports	Number and type		1 x SUB-D 9-pin female
	Master/Slave		Slave, V0
Physical layer			RS 485
Medium			Shielded dual twisted pair cable

Connections *(1)*

Type of connection			**Removable screw clamp terminal blocks** *(2)*	**Removable spring terminal blocks** *(2)*
Supply connection	Number of terminal blocks		1	1
	For 1 cable without cable end		Solid or flexible 0.2…2.5 mm^2, AWG 24-12	–
	For 1 flexible cable with or without plastic cable end		0.25…2.5 mm^2, AWG 23-14	–
	For 2 cables of same diameter, without cable end		–	Solid or flexible 0.2…2.5 mm^2, AWG 24-12
	For 2 cables of same diameter, flexible without cable end		–	0.25…2.5 mm^2, AWG 23-12
	For 2 cables of same diameter, flexible with plastic cable end		–	0.25…2.5 mm^2, AWG 23-12
Cable connection	Tightening torque	**Nm**	0.5	–
	Bared length	**mm**	10	9
Connection to digital input channels, digital output channels, line control output channels	Number of terminal blocks		8	8
	For 1 cable without cable end		Solid or flexible 0.14…1.5 mm^2, AWG 25-15	–
	For 1 flexible cable without cable end		0.25…1.5 mm^2, AWG 23-15	–
	For 1 flexible cable with plastic cable end		0.25…0.5 mm^2, AWG 23-20	–
	For 2 cables of same diameter, without cable end		–	Solid or flexible: 0.14…1.5 mm^2, AWG 26-16
	For 2 cables of same diameter, flexible without cable end		–	0.25…0.34 mm^2, AWG 22
	For 2 cables of same diameter, flexible with plastic cable end		–	0.5 mm^2, AWG 20
Cable connection	Tightening torque	**Nm**	0.22…0.25	–
	Bared length	**mm**	9	9

(1) AWG: American Wire Gauge.
(2) Removable Screw and Cage Clamp terminals provided with safety PLCs ***XPS MF40●●****.*

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40



XPS MF4000
XPS MF4002



XPS MF4020
XPS MF4022



XPS MF4040
XPS MF4042

Compact safety PLCs

⎓ 24 V supply

Digital Inputs or Outputs	Line control outputs	Communication on Ethernet network SafeEthernet protocol	Ethernet network Modbus TCP/IP protocol	Modbus serial (RTU)	PROFIBUS DP	Reference	Weight kg
0…24 configurable channels	2 x 4	Yes	–	–	–	**XPS MF4000**	1.000
			Yes, server	–	–	**XPS MF4002**	1.000
			–	Yes, slave	–	**XPS MF4020**	1.000
			Yes, server	Yes, slave	–	**XPS MF4022**	1.000
			–	–	Yes, V0 slave	**XPS MF4040**	1.000
			Yes, server	–	Yes, V0 slave	**XPS MF4042**	1.000

Configuration software

■ Reference **SSV1XPSMFWIN** is the full version of software **XPSMFWIN** version 4.1 and must be installed if no previous version of this software has been installed.
■ Reference **SSVXPSMFWINUP** is an update for software **XPSMFWIN** and can be used if **SSV1XPSMFWIN** has been installed using Safety Suite V1. An update from version 4.1 to version 4.1-6150 for the software **XPSMFWIN** will then be performed.

Description	Operating system	Details	Languages	Reference	Weight kg
Configuration software XPSMFWIN for programming compact safety PLCs CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	English, German, French	**SSV1XPSMFWIN**	0.520
XPSMFWIN software update CD-ROM + user manual	Windows 2000, Windows XP	Software update available on Safety Suite V2 software pack	English, German, French	**SSVXPSMFWINUP**	0.520

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40



ABL 8RPS24050



ABL 1REM24025

Phaseo regulated switch mode power supplies

Mains input voltage	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conformity to standard IEC EN 61000-3-2 and IEC EN 60950	Reference	Weight
V	⎓ V	W	A				kg
Universal range, single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
∿ **100…120 V/200...500** - 15%, + 10% 50/60 Hz	24...28.8	72	3	Auto/Manual	Yes	**ABL 8RPS24030**	0.300
		120	5	Auto/Manual	Yes	**ABL 8RPS24050**	0.700
		240	10	Auto/Manual	Yes	**ABL 8RPS24100**	1.000
Dedicated range, single-phase connection							
∿ **100…240** *(1)* wide range, 47…63 Hz	12	60	5	Auto	No	**ABL 1REM12050**	0.440
	24	60	2.5	Auto	No	**ABL 1REM24025**	0.440
∿ **100...120/200...240** *(2)*	24	240	10	Auto	No	**ABL 1REM24100**	0.880



XBT GT2130, XBT GT2330



XBT GT4330



XBT GT5●30



XBT GT6330



XBT GT7340

Magelis multifunction graphic terminals with touch sensitive screen and on-board Ethernet *(1) (2)*

Supply voltage ⎓ 24 V

Description		Ports: serial and communication (type of link)	Application memory	Reference	Weight kg
5.7"	Monochrome black and white STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBT GT2130**	1.000
	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBT GT2330**	1.000
7.5"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT4330**	1.800
10.4"	Colour STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT5230**	3.000
	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT5330**	3.000
12.1"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT6330**	3.000
15"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT7340**	5.600

(1) Service instructions, USB connectors locking device and fixing kit included.
(2) Other operator dialogue terminals, industrial PCs: please refer to our "Human Machine Interface" catalogue.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40


490 NTW 000●●

Connecting cables for network and bus

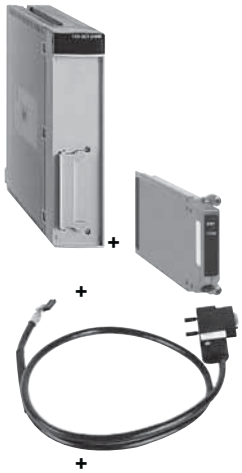
Connection to Ethernet network

Description	Pre-fitted connectors	Length (m)	Reference	Weight kg
Shielded twisted pair cables, straight through	2 RJ45 connectors For connection to DTE (Data Terminal Equipment)	2	**490 NTW 000 02** *(1)*	–
		5	**490 NTW 000 05** *(1)*	–
		12	**490 NTW 000 12** *(1)*	–
		40	**490 NTW 000 40** *(1)*	–
		80	**490 NTW 000 80** *(1)*	–
Shielded twisted pair cables, crossed wires	2 RJ45 connectors For connection between hubs, switches and transceivers	5	**490 NTC 000 05** *(1)*	–
		15	**490 NTC 000 15** *(1)*	–
		40	**490 NTC 000 40** *(1)*	–
		80	**490 NTC 000 80** *(1)*	–

Connection to Modbus serial link

Description	Use		Length (m)	Reference	Weight kg
	From	To			
Trunk cables, shielded dual twisted pair, RS 485	Compact safety PLCs XPS MF4020/MF4022 (RJ45)	Modbus splitter box LU9 GC3 (RJ45)	100	**TSX CSA 100**	5.680
			200	**TSX CSA 200**	10.920
			500	**TSX CSA 500**	30.000
	Graphic terminals XBT GT (SUB-D 9-pin)	Modbus splitter box LU9 GC3 (RJ45)	2.5	**XBT Z938** *(2)*	0.210
Adaptor for cable XBT Z938	SUB-D 9-pin (XBT GT)	XBT Z938 (SUB-D 25-pin)	0.2	**XBT ZG909**	–

Description	Characteristics	Sold in lots of	Unit reference	Weight kg
End of line adaptors For RJ45 connector	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 RC**	0.200
	R = 150 Ω	2	**VW3 A8 306 R**	0.010


TSX PBY 100

PROFIBUS DP bus connection components

Description	Profile	Services	Reference	Weight kg
PROFIBUS DP module set for Premium PLCs	Master, 12 Mbps	Class 1 and Class 2 master V0 functions, see characteristics. PROFIBUS FMS messaging not supported	**TSX PBY 100**	0.870

Description	Use	Reference	Weight kg
Remote inputs/outputs on PROFIBUS DP bus	Advantys STB network interface module	**STB NDP 2112**	0.140
	Momentum communication module	**170 DTN 110 00**	–
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	Intermediate connection	**490 NAD 911 04**	–
	Intermediate connection and terminal port	**490 NAD 911 05**	–

Description	Length (m)	Reference	Weight kg
PROFIBUS DP connecting cables	100	**TSX PBS CA 100**	–
	400	**TSX PBS CA 400**	–

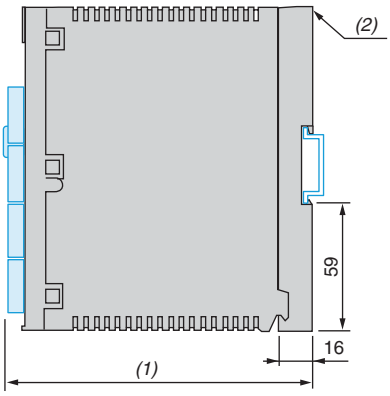
Description		Reference	Weight kg
Replacement parts	Main bus junction box	**490 NAE 911 00**	–
	PCMCIA card	**467 NHP 811 00**	–

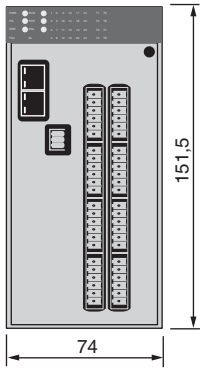

490 NAD 911 03

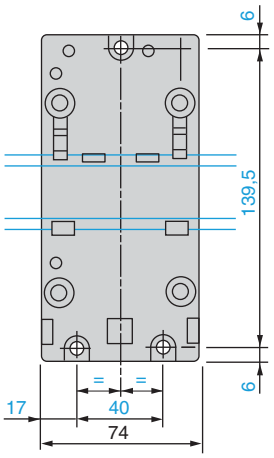
*(1) Cable conforming to standard EIA/TIA-568 category 5 and IEC 1180/EN 50 173 class D. For UL and CSA 22.1 approved cables, add the letter **U** to the end of the reference.*
*(2) Requires adaptor **XBT ZG909**.*

Dimensions

XPS MF40●●





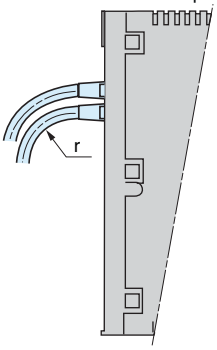


(1) 153 mm with screw terminal block, 151.4 mm with spring terminal block.
(2) Removable plate with spring fixing for mounting on 35 mm ⊥ rail.

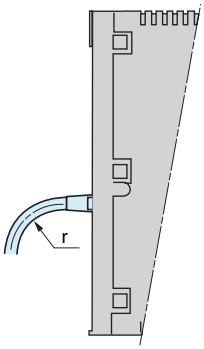
Mounting

Mounting precautions relating to connectors

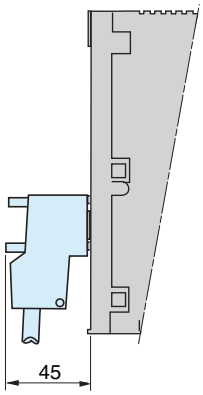
Access to Ethernet network	Access to Modbus serial link (RTU)	Access to Profibus DP bus
RJ45 socket (SafeEthernet protocol, Modbus TCP/IP server protocol)	RJ45 socket	Connector 490 NAD 911 03 in SUB-D 9-pin socket



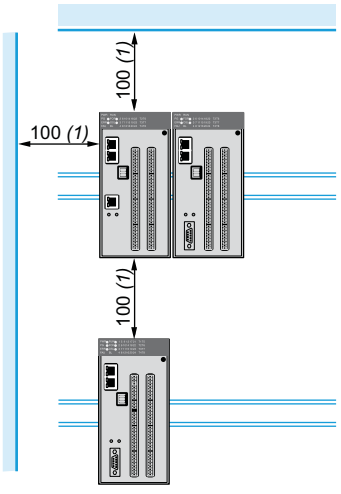
r = 22.5 min.

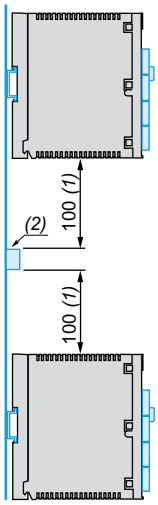


r = 22.5 min.



Mounting in panel or enclosure

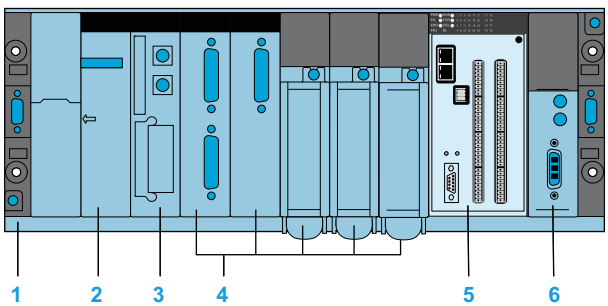




(1) Minimum recommended value.
(2) Prefabricated electrical ducting for passage of cables.

Mounting on Premium rack

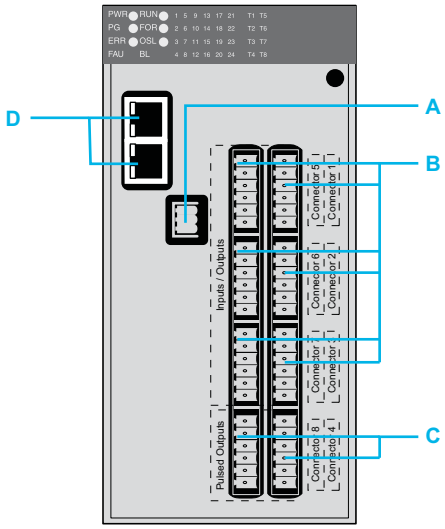
Mechanical mounting only, without connection to either the back plane bus or to the Premium platform supply



1 Premium rack
2 Premium supply
3 Premium CPU
4 Premium I/O module
5 Safety PLC **XPS MF40●●** (occupies 2 slots)
6 Premium As-interface master

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40

Connections



XPS MF4000/MF4002

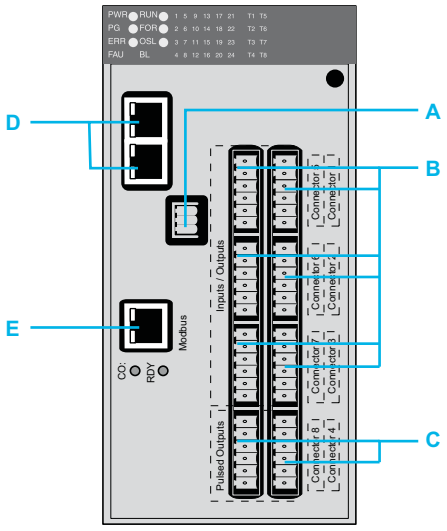
XPS MF4000/MF4002, XPS MF4020/MF4022, XPSMF4040/MF4042

Item	Connection	Connector	Screw	Function
A	**Supply**	Supply	24 V	⎓ 24 V
			0 V	⎓ 24 V (reference pole)
			FE	Earth *(1)*
B	**Digital Inputs or Outputs**	Connector 1	S+	Supply to Inputs 1 to 4
			1	Input/Output 1
			2	Input/Output 2
			3	Input/Output 3
			4	Input/Output 4
			L-	Inputs/Outputs 1 to 4 common
		Connector 2	S+	Supply to Inputs 5 to 8
			5	Input/Output 5
			6	Input/Output 6
			7	Input/Output 7
			8	Input/Output 8
			L-	Inputs/Outputs 5 to 8 common
		Connector 3	S+	Supply to Inputs 9 to 12
			9	Input/Output 9
			10	Input/Output 10
			11	Input/Output 11
			12	Input/Output 12
			L-	Inputs/Outputs 9 to 12 common
		Connector 5	S+	Supply to Inputs 13 to 16
			13	Input/Output 13
			14	Input/Output 14
			15	Input/Output 15
			16	Input/Output 16
			L-	Inputs/Outputs 13 to 16 common
		Connector 6	S+	Supply to Inputs 17 to 20
			17	Input/Output 17
			18	Input/Output 18
			19	Input/Output 19
			20	Input/Output 20
			L-	Inputs/Outputs 17 to 20 common
		Connector 7	S+	Supply to Inputs 21 to 24
			21	Input/Output 21
			22	Input/Output 22
			23	Input/Output 23
			24	Input/Output 24
			L-	Inputs/Outputs 21 to 24 common
C	**Line control outputs**	Connector 4	L-	Outputs 1 to 4 common
			1	Line control Output 1 (T1)
			2	Line control Output 2 (T2)
			3	Line control Output 3 (T3)
			4	Line control Output 4 (T4)
			L-	Outputs 1 to 4 common
		Connector 8	L-	Outputs 5 to 8 common
			5	Line control Output 5 (T5)
			6	Line control Output 6 (T6)
			7	Line control Output 7 (T7)
			8	Line control Output 8 (T8)
			L-	Outputs 5 to 8 common

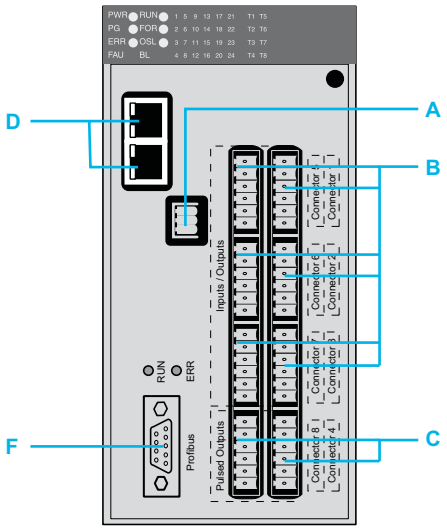
(1) Earthed when mounting on plate or rail.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF40

Connections *(continuous)*



XPS MF4020/MF4022



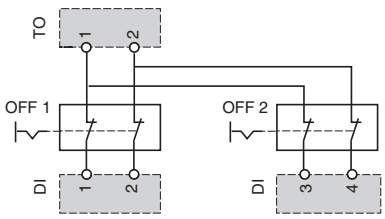
XPS MF4040/MF4042

XPS MF4000/MF4002, XPS MF4020/MF4022, XPSMF4040/MF4042

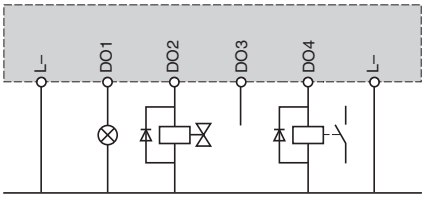
Item	Connection	Type	Function
D	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with references: XPSMF4002, XPSMF4022, XPSMF4042		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.
XPS MF4020/MF4022			
E	**Communication**	RJ45 (Modbus)	**XPS MF4020/MF4022**: slaves on Modbus serial (RTU)
XPS MF4040/MF4042			
F	**Communication**	SUB-D 9-pin female (Profibus)	**XPS MF4040/MF4042**: slaves on PROFIBUS DP

Connections examples

Actuator connections to the outputs



Emergency stop connections (line control)



Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35



XPS MF31222



XPS MF3022



XPS MF35●●

*Products referenced **XPS MF31222, XPS MF3022** and **XPS MF35●●** are marked **HIMatrix F31**, **HIMatrix F30** and **HIMatrix F35** (manufactured by Hima, sold by Schneider Electric).*

Presentation

Preventa compact safety PLCs **XPS MF31/30/35** enable the monitoring of simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

Designed for use with numerous machine safety functions, these compact safety PLCs are intended for use in safety related parts of control systems.
They can manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

The compact safety PLC range **XPS MF31/30/35** comprises 5 versions that are differentiated by their characteristics, detailed below.

Compact PLCs	Inputs			Outputs Digital	Communication	
	Digital	Analogue	Counter		On Ethernet network	On fieldbus
XPS MF31222	20	–	–	8 *(1)*	For all compact PLCs XPS MF31/30/35 using SafeEthernet safety protocol, and with non safety protocol Modbus TCP/IP server	–
XPS MF3022	20	–	–	8 *(1)*		Modbus serial Slave (RTU)
XPS MF3502	24	8	2	8		–
XPS MF3522	24	8	2	8		Modbus serial Slave (RTU)
XPS MF3542	24	8	2	8		PROFIBUS DP V0 slave

Safety PLCs

In order to meet safety requirements, the compact safety PLCs **XPS MF31/30/35** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level “e” conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between the safety PLCs and the safety remote I/O modules (**Special Switch**).

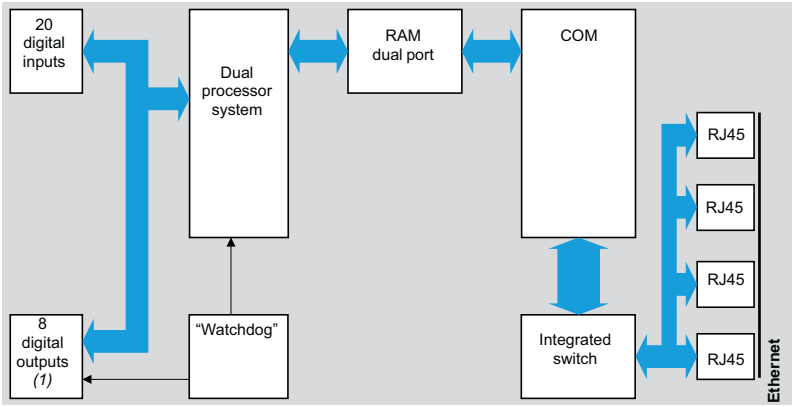
■ **Redundancy**: the dual processor integrated in the compact safety PLCs analyses and compares the data received from the safety inputs and outputs.
The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.

■ **Self-monitoring (“Watchdog”)**: the compact safety PLCs continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.

■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety PLCs on the Ethernet network, whilst avoiding signal collisions and excessive amounts of data on the network.

Functional synoptics

Compact safety PLC XPS MF31222

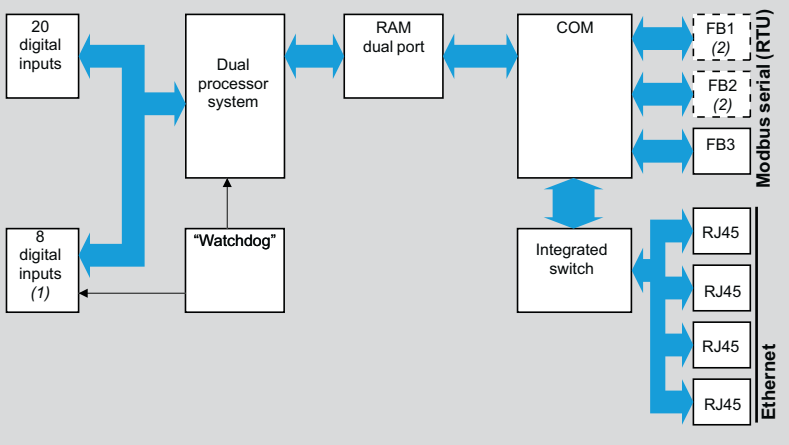


(1) Digital outputs can be configured for line control.

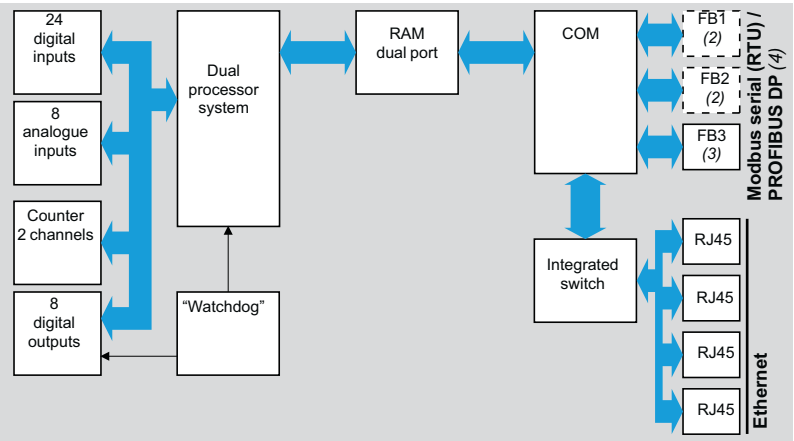
Safety automation system solutions
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Functional synoptics *(continued)*

Compact safety PLC XPS MF3022



Compact safety PLCs XPS MF35●●



Line control for XPS MF31222 and XPS MF3022

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety PLC inputs.

Digital outputs 1 to 8 are connected to the digital inputs of the same circuit.

Example: Emergency stop pushbutton with two normally closed (N/C) contacts that are supplied by two different line control outputs connected via these two normally closed contacts and fed into the inputs of the safety PLCs.

Programming automated safety functions

Software **XPSMFWIN** (reference SSV1XPSMFWIN) running on a PC enables the programming of all safety remote I/O modules and safety PLCs, as well as configuration of the communication settings.

(1) Digital outputs can be configured for line control.
(2) FB1 and FB2 not used.
*(3) FB3 not available on safety PLC **XPS MF3502**.*
(4) Depending on model.

Safety automation system solutions
Preventa safety PLCs
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Digital inputs

Compact safety PLCs **XPS MF3●●●●** incorporate up to 24 digital inputs for the connection of safety related input devices.

Compact PLCs	Digital inputs		
	N°	Safety detection	Safety dialogue
XPS MF31222	20	Limit switches, Guard switches, with reset and with actuator, Safety light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…
XPS MF3022	20		
XPS MF3502	24		
XPS MF3522	24		
XPS MF3542	24		

Analogue inputs

Compact safety PLCs **XPS MF35●●** incorporate 8 analogue measuring inputs that receive analogue safety related signals from the machines to be monitored *(1)*.

Compact PLCs	Analogue inputs with transmitter supply	
	N°	Functions
XPS MF3502	8	Closed circuit scanning of input channels, Single-pole measuring of 0 to 10 V voltages, Measuring 0 to 20 mA currents using shunt
XPS MF3522	8	
XPS MF3542	8	

Counter inputs

Compact safety PLCs **XPS MF35●●** incorporate 2 independent and configurable counting channels:

- as a counting function, independent to the direction of counting,
- as a counting function, dependent to the direction of counting,
- or as a counting function via an absolute encoder with Gray code.

Compact PLCs	Counting inputs		
	N°	⎓ 5 V	⎓ 24 V
XPS MF3502	2	Incremental encoders	Sensors, 2/3-wire PNP/NPN
XPS MF3522	2		
XPS MF3542	2		

Digital outputs

All compact safety PLCs **XPS MF●●●●** incorporate 8 digital outputs for connection to signalling equipment and machines to be controlled *(1)*.

Compact PLCs	Digital outputs		
	N°	Safety actuators	Safety dialogue
XPS MF31222	8	Contactors-motors, Control relays, Variable speed drives.	Beacons and indicator banks, Rotating mirror beacons, Sirens…
XPS MF3022	8		
XPS MF3502	8		
XPS MF3522	8		
XPS MF3542	8		

Remote inputs and outputs

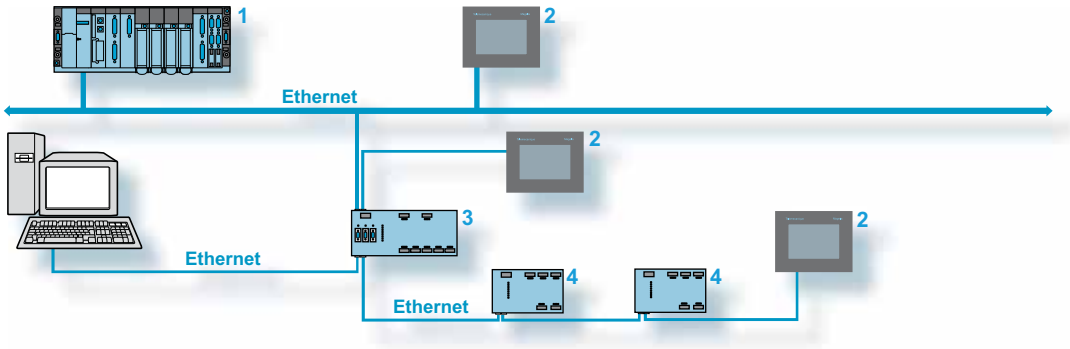
In addition to the inputs/outputs integrated as standard, compact safety PLCs **XPS MF31/30/35** can be connected to safety remote input modules **XPS MF1** and/or safety remote output modules **XPS MF2** and/or safety remote mixed I/O modules **XPS MF3**.
The safety remote input, output and mixed I/O modules can be located within the vicinity of the machines to be monitored, thus reducing cabling.
Communication between these safety remote I/O modules and compact safety PLCs **XPS MF31/30/35** is performed on an Ethernet network using the SafeEthernet safety protocol, via the Integrated RJ45 switched Ethernet communications ports.

(1) Use shielded dual twisted pair cables, maximum length 300 m, short-circuit unused analogue inputs.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35

Safety communication on Ethernet network

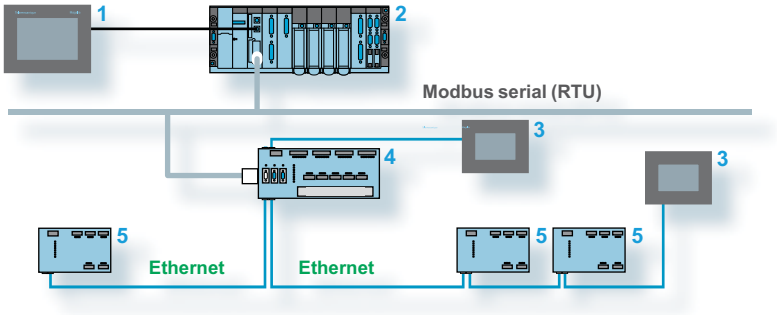
Communication between the PC, Magelis graphic terminal or automation platform (Premium) and the compact safety PLCs is achieved by **Ethernet** network connection via the Integrated RJ45 switched Ethernet communications ports of compact PLCs **XPS MF31/30/35**.



1 Premium automation platform: Modbus TCP/IP client.
2 Graphic terminal **XBT GT**: Modbus TCP/IP client.
3 Safety PLC **XPS MF31/30/35**: Modbus TCP/IP server.
4 Safety remote I/O modules **XPS MF1/2/3**. They communicate with safety PLCs **XPS MF31/30/35** using the SafeEthernet protocol.

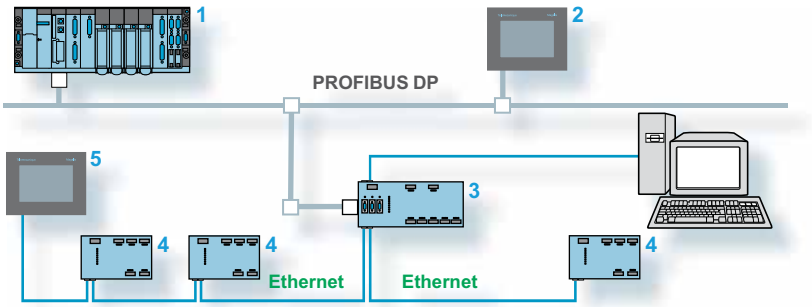
Communication on Modbus serial (RTU) and PROFIBUS DP fieldbus

■ On **Modbus serial (RTU)**, safety PLCs **XPS MF3022** and **XPS MF3522** are slaves of the Premium automation platform and Magelis graphic terminals.
They are connected to the Modbus serial network via their SUB-D 9-pin connector (FB3).



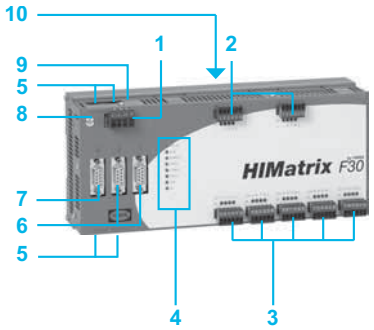
1 Graphic terminal **XBT GT**: Modbus serial (RTU) master.
2 Premium automation platform: Modbus serial (RTU) master.
3 Graphic terminal **XBT GT**: Modbus serial (RTU) client.
4 Safety PLC **XPS MF3022** or **XPS MF3522**: Modbus serial (RTU) slave, Modbus TCP/IP server.
5 Safety remote I/O modules **XPS MF1/2/3**. They communicate with safety PLCs **XPS MF3●●2** using the SafeEthernet protocol.

■ On **PROFIBUS DP**, safety PLC **XPS MF3542** is a slave of the Premium automation platform and Magelis graphic terminal.
It is connected to the PROFIBUS DP network via its SUB-D 9-pin connector (FB3).



1 Premium automation platform: PROFIBUS DP master.
2 Graphic terminal **XBT GT**: PROFIBUS DP master.
3 Safety PLC **XPS MF3542**: PROFIBUS DP slave, Modbus TCP/IP server.
4 Safety remote I/O modules **XPS MF1/2/3**. They communicate with safety PLC **XPS MF3542** using the SafeEthernet protocol.
5 Graphic terminal **XBT GT**: Modbus TCP/IP client.

Safety automation system solutions
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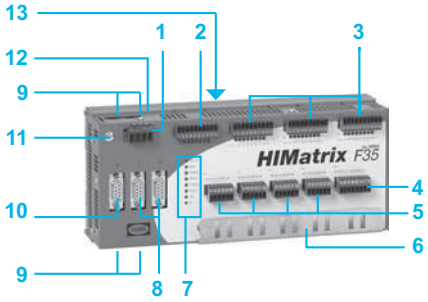


Description

Safety PLCs XPS MF31222 and XPS MF3022

On the front face of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block).
3 Five terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
4 Eight process status LEDs.
5 Four integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP/IP server protocol).
6 On **XPS MF3022** only: two unused SUB-D connectors (FB1 and FB2).
7 On **XPS MF3022** only: one SUB-D 9-pin connector for connection on Modbus serial (RTU) (FB3).
8 One earth connection screw.
9 **On the top**: one “Reset” button.
10 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.



Safety PLCs XPS MF35●●

On the front face of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 One terminal block *(1)* for connection of digital outputs, with four digital output status LEDs.
3 Three terminal blocks *(1)* for connection of digital inputs, with input status LED (eight LEDs per terminal block).
4 One terminal block *(1)* for connection of 2 counting input channels.
5 Four terminal blocks *(1)* for connection of analogue inputs.
6 One plate for securing shielded analogue input connection cables.
7 Eight process status LEDs.
8 Two unused SUB-D connectors (FB1 and FB2).
9 Four integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP/IP server protocol).
10 One type SUB-D 9-pin connector (FB3) for connection on PROFIBUS DP (**XPS MF3542**) or Modbus serial (RTU) (**XPS MF3522**).
11 One earth connection screw.
12 **On the top**: one “Reset” button.
13 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.

*(1) Removable screw terminals are provided with compact safety PLCs **XPS MF31/30/35**.*

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35







Status LED details

Compact safety PLCs XPS MF31222, XPS MF3022 and XPS MF35●●

LED	Colour	Status	Meaning
FB1, FB2	–	–	Not used.
FB3	Orange	On	Communication on Modbus serial or PROFIBUS DP *(1)* active.
Inputs 1 to 20	Orange	On	Inputs active.
Outputs 1 to 8	Orange	On	Outputs active.
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energised state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware fault detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred whilst writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

(1) Depending on PLC model.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35

Environment

Compact safety PLC type			XPS MF31222	XPS MF3022	XPS MF3502, XPS MF3522, XPS MF3542
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1, EN/ISO 13849-1 and EN/IEC 61508)			Category 4 (EN 954-1), Performance level "e" (EN/ISO 13849-1), Safety integrity level: SIL 3 (EN/IEC 61508)		
Product certifications			IEC 61511: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 1990, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001		IEC 61511: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 1990, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001, EN 54-2: 1997, NFPA 72: 2002
Ambient air temperature conforming to EN 61131-2	For operation	**°C**	0…+ 60		
	For storage	**°C**	- 40…+ 85		
Relative humidity			95% (supply not connected)		
Degree of protection	Enclosure		IP 20		
Pollution			Degree of pollution II		
Altitude		**m**	< 2000		
Protection class			Class II, conforming to EN/IEC 61131-2		
Electromagnetic compatibility			Conforming to IEC 61131-2		
Vibration resistance conforming to EN 61131-2	Operating		1 g, frequency 9…150 Hz		
Shock resistance conforming to EN 61131-2	Operating		15 g (duration 11 ms), unit test whilst operating, 2 cycles per axis		
Resistance to electrostatic discharges conforming to EN/IEC 61000-4-2		**kV**	4 contact, 8 air discharge		
Immunity to high frequency interference conforming to EN/IEC 61000-4-3		**V/m**	10 (80 MHz…2 GHz), amplitude modulation 80%		

Electrical characteristics

Supply	Voltage	**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)		
	Voltage limits		- 15…+ 20%		
Maximum consumption		**A**	8	8	9
Idle current		**A**	0.4	0.5	0.75
Immunity to momentary supply interruptions		**ms**	10		
Protection			Internal fuse		
Response time		**ms**	Depending on size of application		
Clock			Supplied by backup capacitor for 1 week following loss of supply		
User memory	Application	**kB**	250		
	Data	**kB**	250		
LED display			Yes		
Digital inputs					
Number	Inputs not electrically isolated		20		24
Permissible current	At state 0	**mA**	1.5 max., 1 mA at 5 V	1.5 max., 1.25 mA at 5 V	1.5 max., 1 mA at 5 V
	At state 1	**mA**	≥ 2 at ⎓ 15 V	> 2 at ⎓ 15 V	Approx. 3.5 at ⎓ 24 V Approx. 4.5 at ⎓ 30 V
Input supply			5 x 20 V/100 mA (on 24 V)		20 V/100 mA
Input protection			Protected against short-circuits, short-circuits to earth		
Overvoltage protection		**V**	500, conforming to IEC 61000-4-5		
Switching point		**V**	Typically 7.5		–
Current		**mA**	> 2 (⎓ 15 V)		–
LED display			Yes		
Maximum distance of equipment		**m**	100		
Digital outputs					
Number	Outputs not electrically isolated		8, configurable for line control		8
Output voltage		**V**	⎓ 24 ± 2		
Output current	Channels 1 to 3 and 5 to 7	**A**	0.5 at 60 °C		
	Channels 4 and 8	**A**	1 at 60 °C, 2 at 50 °C		
Minimum load		**mA**	2 per channel		
Leakage current at state 0		**mA**	1 max. at 2 V		
Response to overload			Shutdown of outputs concerned with cyclic reconnection		
Total output current		**A**	7 max., shutdown of all outputs if exceeded with cyclic reconnection		
LED display			Yes		
Distance maximale des équipements		**m**	100		

Characteristics: page 2/24 | References: page 2/27 | Dimensions, mounting: page 2/30 | Connections: page 2/32 | Presentation: page 2/18

Electrical characteristics *(continued)*

Compact safety PLC type			XPS MF3502, XPS MF3522, XPS MF3542
Analogue inputs			
Number	Inputs not electrically isolated		8, single-pole
External shunt		Ω	250 or 500 depending on application
Input values	Nominal value	**V**	⎓ 0…10
		mA	0…20, with 500 Ω shunt
	Service value	**V**	⎓ 0.1…11.5
		mA	0/4…23, with 500 Ω shunt
Input impedance		**MΩ**	1
Maximum distance of equipment		**m**	300
Internal resistance of signal source		Ω	≤ 500
Overvoltage protection		**V**	+ 15, - 4
Resolution (A/D converter)			12-bit
Safety accuracy			± 2%
LED display			Yes
Counting inputs			
Number	Counter		2, not electrically isolated
	Inputs		3 on each pole (A, B, Z)
Input voltages	High threshold 5 V	**V**	4…6
	High threshold 24 V	**V**	13…33
	Low threshold 5 V	**V**	0…0.5
	Low threshold 24 V	**V**	- 3…5
Input currents		**mA**	1.4 at 5 V 6.5 at 24 V
Input impedance		**kΩ**	3.7
Maximum distance of equipment		**m**	500, with shielded dual twisted pair cable
Up/down counting resolution			24-bit
Input frequency		**kHz**	100, at 5 and 24 V
Triggering			On falling edge
Edge steepness		**V/µs**	1
LED display			Yes

Communication

Compatibility			XPS MF31222	XPS MF3022	XPS MF3502, XPS MF3522, XPS MF3542
Ethernet network: safety communication using SafeEthernet protocol					
Transmission	Communication ports		Integrated 4 RJ45 switched Ethernet communications ports		
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation		
Structure			10BASE-T/100BASE-TX		
Medium			Dual twisted pair cable, category 5D or better (Ethernet)		
Ethernet network: Non-safety related communication using Modbus TCP/IP protocol					
Connection Ports	Number and type		Integrated 4 RJ45 switched Ethernet communication ports		
	Baud rate	**Mbps**	100 Half Duplex, 10 Full Duplex, Autonegotiation		
	Master/Slave		Server (slave)		
Structure			10BASE-T/100BASE-TX		
Medium			Dual twisted pair cable, category 5D or better (Ethernet)		
Transparent Ready Services	Class		A10		
	Standard Ethernet TCP/IP communication services		Modbus TCP/IP Server		
			Modbus TCP/IP messaging (reading/writing of data words)		
			Modbus identification request		
	TCP port		Standard 502		
	Max. number of Modbus TCP/IP connections		1 to 20		
Modbus serial (RTU)					
Serial link ports	Number and type		–	1 x SUB-D 9-pin female (FB3)	
	Master/Slave		–	Slave	
Addressing			–	122 slave addresses	
Physical layer			–	RS 485	
Medium			–	Shielded dual twisted pair cable	
PROFIBUS DP					
Serial link ports	Number and type		–	–	1 x SUB-D 9-pin female
	Master/Slave		–	–	Slave, V0
Physical layer			–	–	RS 485
Medium			–	–	Shielded dual twisted pair cable

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35

Connections *(1)*

Safety PLC type			XPS MF31222	XPS MF3022	XPS MF3502, XPS MF3522, XPS MF3542
Type of connection			Screw clamp terminal blocks *(2)*		
Supply connection	Number of terminal blocks		1		
	For 1 cable without cable end		Solid or flexible 0.2…2.5 mm^2, AWG 24-12		
	For 1 flexible cable with or without plastic cable end		0.25…2.5 mm^2, AWG 22-16		
	For 2 cables of same diameter, without cable end		Solid or flexible 0.2…1.5 mm^2, AWG 24-12		
	For 2 cables of same diameter, flexible without cable end		0.25…1.0 mm^2, AWG 22-18		
	For 2 cables of same diameter, flexible with plastic cable end		0.5…1.5 mm^2, AWG 22-16		
Digital input channel and output channel connection	Number of terminal blocks		5 (inputs) and 2 (outputs)	5 (inputs) and 2 (outputs)	3 (inputs) and 1 (output)
	For 1 cable without cable end		Solid or flexible 0.14…1.5 mm^2, AWG 28-16		
	For 1 flexible cable without cable end		0.25…1.5 mm^2, AWG 22-16		
	For 1 flexible cable with plastic cable end		0.25…0.5 mm^2, AWG 22-20		
	For 2 cables of same diameter, without cable end		Solid: 0.14…0.5 mm^2, AWG 28-20 Flexible: 0.14…0.75 mm^2, AWG 28-18		
	For 2 cables of same diameter, flexible without cable end		0.25…0.34 mm^2, AWG 22		
	For 2 cables of same diameter, flexible with plastic cable end		0.5 mm^2, AWG 20		
Analogue input channel connection	Number of terminal blocks		–	–	4
	For 1 cable without cable end		–	–	Solid or flexible 0.14…1.5 mm^2, AWG 28-16
	For 1 flexible cable without cable end		–	–	0.25…1.5 mm^2, AWG 22-16
	For 1 flexible cable with plastic cable end		–	–	0.25…0.5 mm^2, AWG 22-20
	For 2 cables of same diameter, without cable end		–	–	Solid: 0.14…0.5 mm^2, AWG 28-20 Flexible: 0.14…0.75 mm^2, AWG 28-18
	For 2 cables of same diameter, flexible without cable end		–	–	0.25…0.34 mm^2, AWG 22
	For 2 cables of same diameter, flexible with plastic cable end		–	–	0.5 mm^2, AWG 20
Counting channel connection	Number of terminal blocks		–	–	1
	For 1 cable without cable end		–	–	Solid or flexible 0.14…1.5 mm^2, AWG 28-16
	For 1 flexible cable without cable end		–	–	0.25…1.5 mm^2, AWG 22-16
	For 1 flexible cable with plastic cable end		–	–	0.25…0.5 mm^2, AWG 22-20
	For 2 cables of same diameter, without cable end		–	–	Solid: 0.14…0.5 mm^2, AWG 28-20 Flexible: 0.14…0.75 mm^2, AWG 28-18
	For 2 cables of same diameter, flexible without cable end		–	–	0.25…0.34 mm^2, AWG 22
	For 2 cables of same diameter, flexible with plastic cable end		–	–	0.5 mm^2, AWG 20
Cable connection	Tightening torque	Nm	0.22…0.25		
	Bared length	mm	9		

(1) AWG: American Wire Gauge.
(2) Removable screw terminals are provided with compact safety PLCs ***XPS MF31/30/35****.*

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35



XPS MF31222



XPS MF3022



XPS MF35●●

*Products referenced **XPS MF31222, XPS MF3022** and **XPS MF35●●** are marked **HIMatrix F31**, **HIMatrix F30** and **HIMatrix F35** (manufactured by Hima, sold by Schneider Electric).*

Compact safety PLCs

⎓ **24 V supply**

Inputs			Outputs Digital	Communication on				Reference	Weight kg
				Ethernet network		Modbus serial (RTU)	PROFIBUS DP		
Digital	Analogue	Counting		Safe Ethernet protocol	Modbus TCP/IP server protocol				
20	–	–	8	Yes	Yes	–	–	**XPS MF31222**	1.000
						Yes Slave	–	**XPS MF3022**	1.200
24	8	2	8	Yes	Yes	–	–	**XPS MF3502**	1.200
						Yes Slave	–	**XPS MF3522**	1.200
						–	Yes V0 slave	**XPS MF3542**	1.200

Configuration software

■ Reference **SSV1XPSMFWIN** is the full version of software **XPSMFWIN** version 4.1 and must be installed if no previous version of this software has been installed.

■ Reference **SSVXPSMFWINUP** is an update for software **XPSMFWIN** and can be used if **SSV1XPSMFWIN** has been installed using Safety Suite V1. An update from version 4.1 to version 4.1-6150 for the software **XPSMFWIN** will then be performed.

Description	Operating system	Details	Languages	Reference	Weight kg
Configuration software XPSMFWIN for programming compact safety PLCs CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	English, German, French	**SSV1XPSMFWIN**	0.520
XPSMFWIN software update CD-ROM + user manual	Windows 2000, Windows XP	Software update available on Safety Suite V2 software pack	English, German, French	**SSVXPSMFWINUP**	0.520

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35



ABL 8RPS24050

Phaseo regulated switch mode power supplies

Mains input voltage	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conformity to standard IEC EN 61000-3-2 and IEC EN 60950	Reference	Weight
V	⎓ V	W	A				kg
Universal range, single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
∿ **100…120 V/200...500** - 15%, + 10% 50/60 Hz	24...28.8	72	3	Auto/Manual	Yes	**ABL 8RPS24030**	0.300
		120	5	Auto/Manual	Yes	**ABL 8RPS24050**	0.700
		240	10	Auto/Manual	Yes	**ABL 8RPS24100**	1.000
Dedicated range, single-phase connection							
∿ **100…240** *(1)* wide range, 47…63 Hz	12	60	5	Auto	No	**ABL 1REM12050**	0.440
	24	60	2,5	Auto	No	**ABL 1REM24025**	0.440
∿ **100...120/200...240** *(2)*	24	240	10	Auto	No	**ABL 1REM24100**	0.880



ABL 1REM24025

Magelis multifunction graphic terminals with touch sensitive screen and on-board Ethernet *(1) (2)*

Supply voltage ⎓ 24 V

Description		Ports: serial and communication (type of link)	Application memory	Reference	Weight kg
5.7"	Monochrome black and white STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBT GT2130**	1.000
	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBT GT2330**	1.000
7.5"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT4330**	1.800
10.4"	Colour STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT5230**	3.000
	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT5330**	3.000
12.1"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT6330**	3.000
15"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT7340**	5.600



XBT GT2130, XBT GT2330



XBT GT4330



XBT GT5●30



XBT GT6330



XBT GT7340

(1) Service instructions, USB connectors locking device and fixing kit included.
(2) Other operator dialogue terminals, industrial PCs: please refer to our "Human Machine Interface" catalogue.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35



490 NTW 000●●

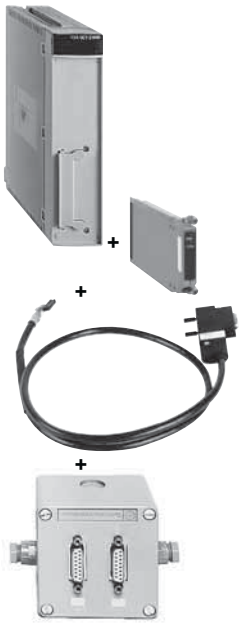
Connecting cables for network and bus

Connection to Ethernet network

Description	Pre-fitted connectors	Length (m)	Reference	Weight kg
Shielded twisted pair cables, straight through	2 RJ45 connectors For connection to DTE (Data Terminal Equipment)	2	**490 NTW 000 02** *(1)*	–
		5	**490 NTW 000 05** *(1)*	–
		12	**490 NTW 000 12** *(1)*	–
		40	**490 NTW 000 40** *(1)*	–
		80	**490 NTW 000 80** *(1)*	–
Shielded twisted pair cables, crossed wires	2 RJ45 connectors For connection between hubs, switches and transceivers	5	**490 NTC 000 05** *(1)*	–
		15	**490 NTC 000 15** *(1)*	–
		40	**490 NTC 000 40** *(1)*	–
		80	**490 NTC 000 80** *(1)*	–

Connection to Modbus serial link

Description	Use		Length (m)	Reference	Weight kg
	From	To			
Modbus serial link connecting cables	Compact PLCs XPS MF3022/3522 + adaptor XPS MFADAPT (RJ45)	Modbus splitter box LU9 GC3 (RJ45)	0.3	**VW3 A8 306 R03**	0.025
			1	**VW3 A8 306 R10**	0.060
			3	**VW3 A8 306 R30**	1.130
		Premium module TSX SCY 21601 (SUB-D 25-pin)	0.3	**XPS MCSCY**	–
	Graphic terminals XBT GT (SUB-D 9-pin)	Modbus splitter box LU9 GC3 (RJ45)	2.5	**XBT Z938** *(2)*	0.210
Adaptor for cable XBT Z938	SUB-D 9-pin (XBT GT)	XBT Z938 (SUB-D 25-pin)	0.2	**XBT ZG909**	–
Adaptor SUB-D 9-pin/RJ45	Compact PLCs (SUB-D 9-pin)	Connecting cables for Modbus serial link (RJ45)	–	**XPS MFADAPT**	–



TSX PBY 100

Description	Characteristics	Sold in lots of	Unit reference	Weight kg
End of line adaptors For RJ45 connector	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 RC**	0.200
	R = 150 Ω	2	**VW3 A8 306 R**	0.010

PROFIBUS DP bus connection components

Description	Profile	Services	Reference	Weight kg
PROFIBUS DP module set for Premium PLCs	Master, 12 Mbps	Class 1 and Class 2 master V0 functions, see characteristics. Profibus FMS messaging not supported	**TSX PBY 100**	0.870

Description	Use	Reference	Weight kg
Remote inputs/outputs on PROFIBUS DP bus	Advantys STB network interface module	**STB NDP 2112**	0.140
	Momentum communication module	**170 DTN 110 00**	–
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	Intermediate connection	**490 NAD 911 04**	–
	Intermediate connection and terminal port	**490 NAD 911 05**	–



490 NAD 911 03

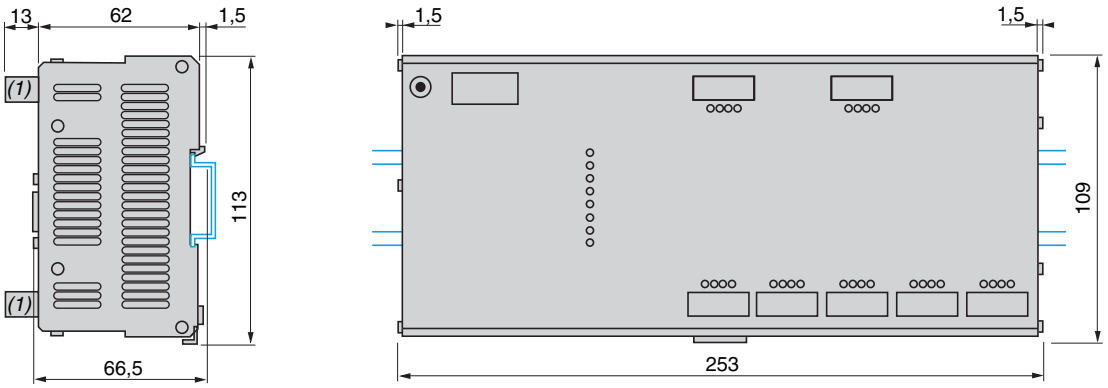
Description	Length (m)	Reference	Weight kg
PROFIBUS DP connecting cables	100	**TSX PBS CA 100**	–
	400	**TSX PBS CA 400**	–

Description		Reference	Weight kg
Replacement parts	Main bus junction box	**490 NAE 911 00**	–
	PCMCIA card	**467 NHP 811 00**	–

*(1) Cable conforming to standard EIA/TIA-568 category 5 and IEC 1180/EN 50 173 class D. For UL and CSA 22.1 approved cables, add the letter **U** to the end of the reference.*
(2) Requires adaptor XBT ZG909.

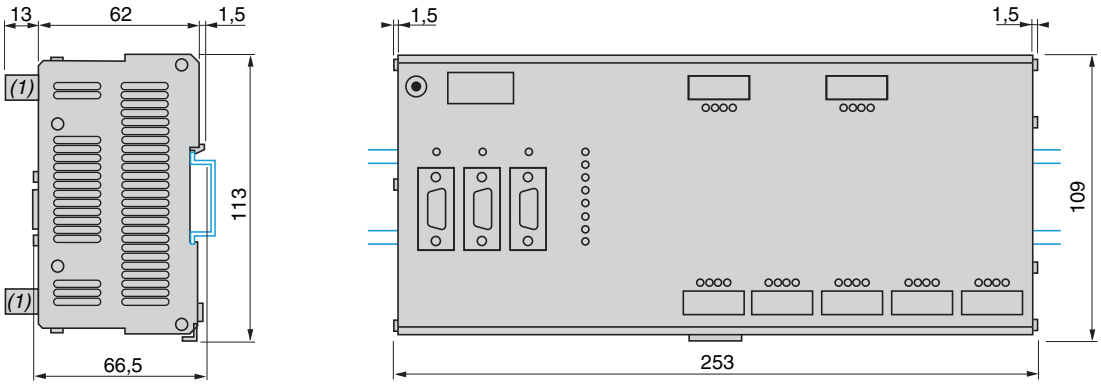
Dimensions

XPS MF31222



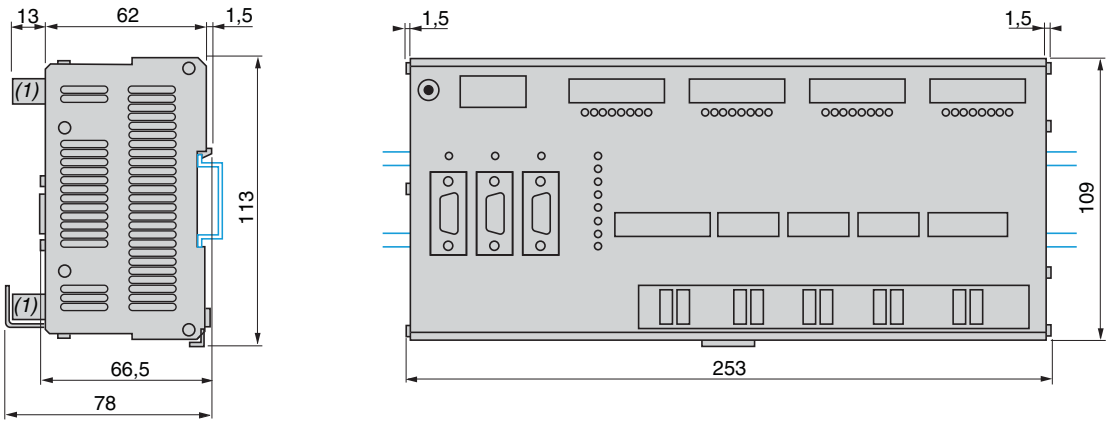
*(1) Removable screw terminals are provided with compact safety PLC **XPS MF31222**.*

XPS MF3022



*(1) Removable screw terminals are provided with compact safety PLC **XPS MF3022**.*

XPS MF35●●



*(1) Removable screw terminals are provided with compact safety PLC **XPS MF35●●**.*

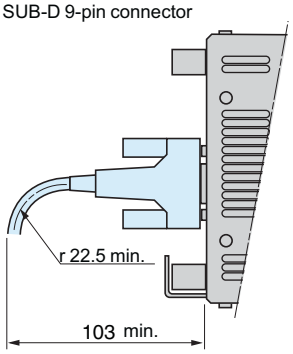
Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35

Mounting

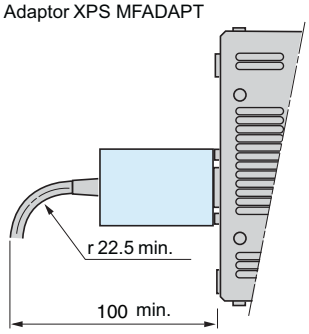
Mounting precautions relating to connectors

Access to Modbus serial link (RTU)

SUB-D 9-pin connector

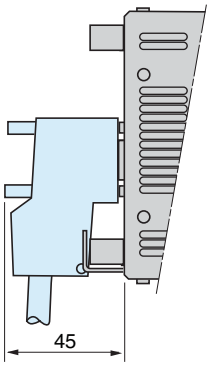


Adaptor XPS MFADAPT



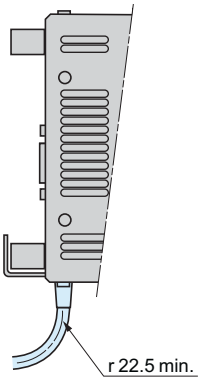
A ccess to PROFIBUS DP

Connector 490 NAD 911 03

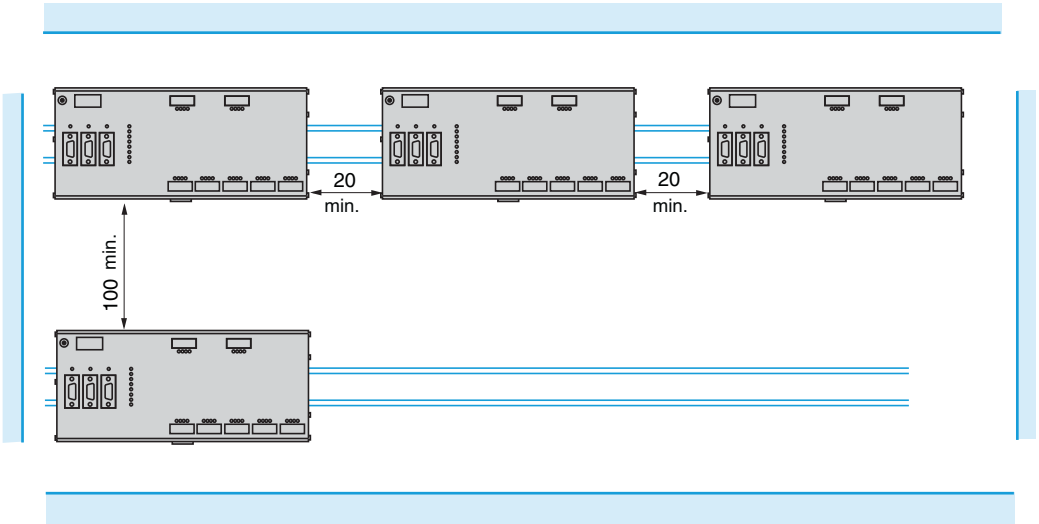


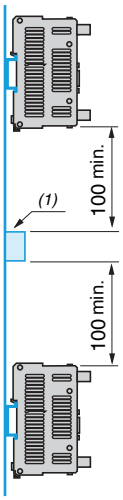
Access to Ethernet network

RJ45 socket (SafeEthernet protocol, Modbus TCP/IP server protocol)



Mounting in panel or enclosure



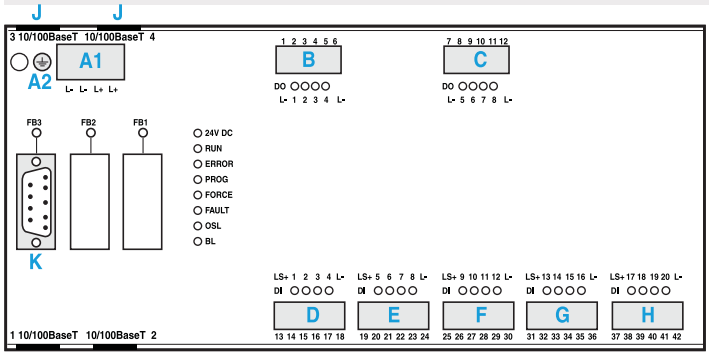


(1) Prefabricated electrical ducting for passage of cables.

Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35

Connections

XPS MF31222, XPS MF3022



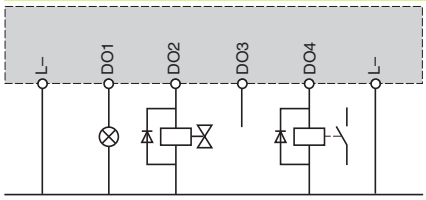
Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Earth**		⏚	Earth
B	**Outputs Digital**	1	L-	Outputs common
		2	1	Output 1
		3	2	Output 2
		4	3	Output 3
		5	4	Output 4 (for increased load)
		6	L-	Outputs common
C	**Outputs Digital**	7	L-	Outputs common
		8	5	Output 5
		9	6	Output 6
		10	7	Output 7
		11	8	Output 8 (for increased load)
		12	L-	Outputs common
D	**Inputs Digital**	13	LS+	Sensor supply for inputs 1 to 4
		14	1	Digital input 1
		15	2	Digital input 2
		16	3	Digital input 3
		17	4	Digital input 4
		18	L-	Inputs common
E	**Inputs Digital**	19	LS+	Sensor supply for inputs 5 to 8
		20	5	Digital input 5
		21	6	Digital input 6
		22	7	Digital input 7
		23	8	Digital input 8
		24	L-	Inputs common
F	**Inputs Digital**	25	LS+	Sensor supply for inputs 9 to 12
		26	9	Digital input 9
		27	10	Digital input 10
		28	11	Digital input 11
		29	12	Digital input 12
		30	L-	Inputs common

Item	Connection	Screw N°	Screw	Function
G	**Inputs Digital**	31	LS+	Sensor supply for inputs 13 to 16
		32	13	Digital input 13
		33	14	Digital input 14
		34	15	Digital input 15
		35	16	Digital input 16
		36	L-	Inputs common
H	**Inputs Digital**	37	LS+	Sensor supply for inputs 17 to 20
		38	17	Digital input 17
		39	18	Digital input 18
		40	19	Digital input 19
		41	20	Digital input 20
		42	L-	Inputs common

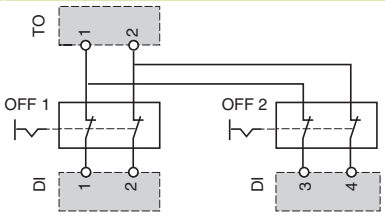
Item	Connection	Type	Function
K	**Communication**	SUB-D 9-pin (FB3)	**XPS MF3022**: slave on Modbus serial (RTU)
J	**Programming**	Integrated 4 RJ45 switched Ethernet Communication ports	Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPSMF Safety PLCs and Remote I/Os)		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with references: XPSMF3022, and XPSMF31222		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.

Connection examples

Actuator connections to the outputs



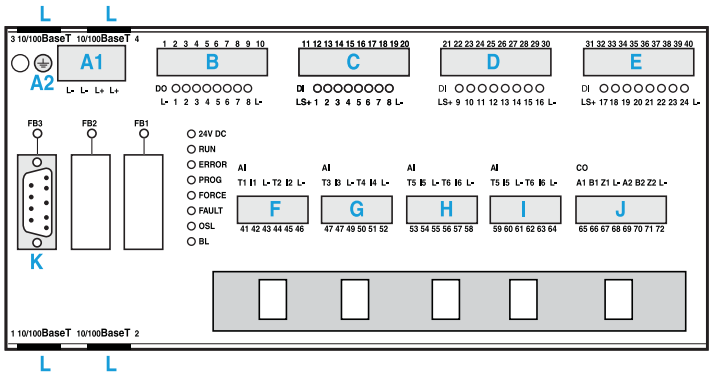
Emergency stop connections (line control)



Safety automation system solutions
Preventa safety PLCs
Compact, XPS MF31/30/35

Connections

XPS MF35●●

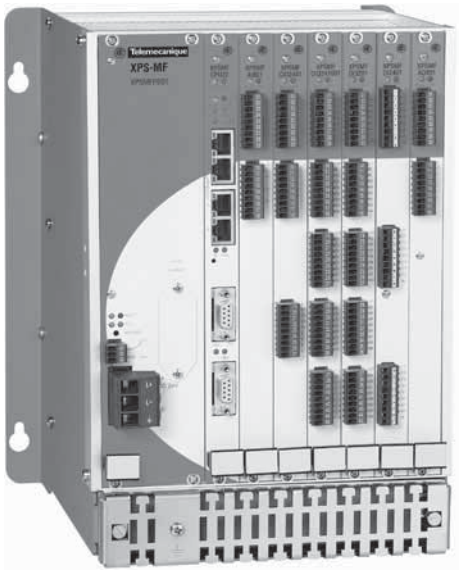


Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Earth**	–	⏚	Earth
B	**Outputs - Digital**	1	L-	Outputs common
		2	1	Digital output 1
		3	2	Digital output 2
		4	3	Digital output 3
		5	4	Digital output 4 (for increased load)
		6	5	Digital output 5
		7	6	Digital output 6
		8	7	Digital output 7
		9	8	Digital output 8 (for increased load)
		10	L-	Outputs common
C	**Inputs - Digital**	11	LS+	Sensor supply for inputs 1 to 8
		12	1	Digital input 1
		13	2	Digital input 2
		14	3	Digital input 3
		15	4	Digital input 4
		16	5	Digital input 5
		17	6	Digital input 6
		18	7	Digital input 7
		19	8	Digital input 8
		20	L-	Inputs common
D	**Inputs - Digital**	21	LS+	Sensor supply for inputs 9 to 16
		22	9	Digital input 9
		23	10	Digital input 10
		24	11	Digital input 11
		25	12	Digital input 12
		26	13	Digital input 13
		27	14	Digital input 14
		28	15	Digital input 15
		29	16	Digital input 16
		30	L-	Inputs common
E	**Inputs - Digital**	31	LS+	Sensor supply for inputs 17 to 24
		32	17	Digital input 17
		33	18	Digital input 18
		34	19	Digital input 19
		35	20	Digital input 20
		36	21	Digital input 21
		37	22	Digital input 22
		38	23	Digital input 23
		39	24	Digital input 24
		40	L-	Inputs common

Item (cont.)	Connection	Screw N°	Screw	Function
F	**Inputs - Analogue**	41	T1	Transmitter supply 1
		42	I1	Analogue input 1
		43	L-	Inputs common
		44	T2	Transmitter supply 2
		45	I2	Analogue input 2
		46	L-	Inputs common
G	**Inputs - Analogue**	47	T3	Transmitter supply 3
		48	I3	Analogue input 3
		49	L-	Inputs common
		50	T4	Transmitter supply 4
		51	I4	Analogue input 4
		52	L-	Inputs common
H	**Inputs - Analogue**	53	T5	Transmitter supply 5
		54	I5	Analogue input 5
		55	L-	Inputs common
		56	T6	Transmitter supply 6
		57	I6	Analogue input 6
		58	L-	Inputs common
I	**Inputs - Analogue**	59	T7	Transmitter supply 7
		60	I7	Analogue input 7
		61	L-	Inputs common
		62	T8	Transmitter supply 8
		63	I8	Analogue input 8
		64	L-	Inputs common
J	**Inputs - Counter**	65	A1	Input A1 or bit 0 (LSB)
		66	B1	Input B1 or bit 1
		67	Z1	Input Z1 or bit 2 (MSB)
		68	L-	Inputs common
		69	A2	Input A2 or bit 0 (LSB)
		70	B2	Input B2 or bit 1
		71	Z2	Input Z2 or bit 2 (MSB)
		72	L-	Inputs common

Item	Connection	Type	Function
K	**Communication**	SUB-D 9-pin (FB3)	**XPS 3522**: slave on Modbus serial (RTU) **XPS 3542**: slave V0 on PROFIBUS DP
L	**Programming**	Integrated 4 RJ45 switched Ethernet Communication ports	Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with references: XPS MF3502, XPS MF3522 and XPSMF3542		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other non-safety related components (e.g HMI Magelis, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
Rack, power supply and CPU



Modular safety PLC XPS MF60, fitted with 6 different "in rack" I/O cards

Presentation

Safety PLC **XPS MF60** offers a modular solution for monitoring simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

Designed for use with numerous machine safety functions, this modular safety PLC is intended for use in safety related parts of control systems.
It can manage up to:
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

Modularity

The safety PLC **XPS MF60** is a modular system comprising a metal housing or rack, fitted with a power supply module, a CPU and "in rack" I/O cards.
■ Various types of "in rack" I/O cards are catalogue listed and are selected according to the application.
■ Mounting the "in rack" cards is a simple operation using the guide rails (6 slots). Electrical connection is automatic and assured by the back plane bus of the rack.
■ The mounting order of the "in rack" I/O cards is open to the user, but the order, however, must correspond to the programming software.
■ The removal of the "in rack" cards, performed with the supply switched-off, is facilitated by a grip at the base of the cards.
■ Covering plates for unused "in rack" I/O card slots are available to protect the system in polluted environments.

Composition of the modular safety PLC XPS MF60

Minimum basic equipment	Optional "in rack" I/O cards	
	Type	Details
Metal rack XPS MFGEH01 with back plane bus assuring electrical connection of components installed + metal securing plate for shielded cables (EMC), two cooling fans **+** **a power supply module (⎓ 24 V) XPS MFPS01**, **+** **a central processing unit XPS MFCPU22** with 4 x RJ45 integrated switched Ethernet ports for Programming, and for Safety and non-safety related communication on Ethernet (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP/IP server protocol) and in addition a SUB-D (FB2) connector for communication on Modbus serial (RTU)	XPS MFAI801	8 single-pole analogue inputs or 4 2-pole analogue inputs
	XPS MFAO801	8 analogue outputs
	XPS MFCIO2401	2 counting inputs, 4 digital outputs
	XPS MFDI2401	24 digital inputs (⎓ 110 V / ∿ 127 V)
	XPS MFDI3201	32 digital inputs
	XPS MFDIO241601	24 digital inputs, 16 digital outputs
	XPS MFDO801	8 relay outputs (∿ 6…250 V)

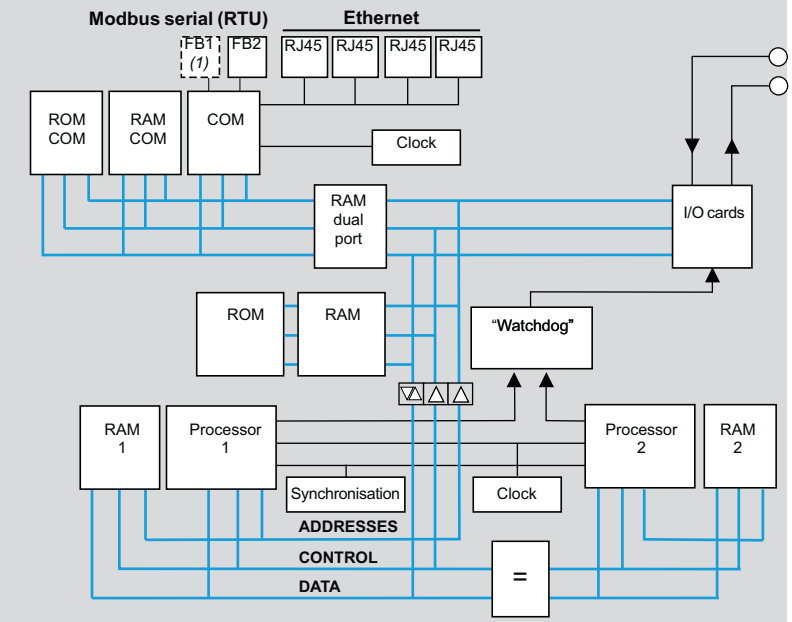
Safety PLCs

In order to meet safety requirements, the modular safety PLC **XPS MF60** incorporates two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level "e" conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between the safety PLCs and the safety remote I/O modules (**Special Switch**).
■ **Redundancy**: the 2 processors integrated in the modular safety PLC analyse and compare the data received from the safety inputs and outputs.
The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring ("Watchdog")**: the modular safety PLC continuously monitors the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety PLC on the Ethernet network, whilst avoiding signal collisions and excessive amounts of data on the network.

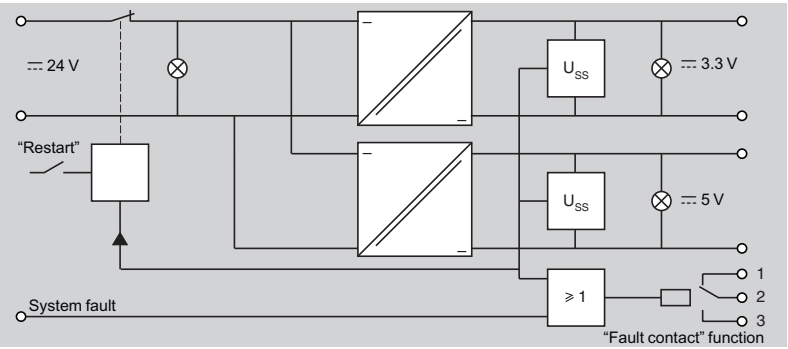
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Modular, XPS MF60
Rack, power supply and CPU

Functional synoptics

Central processing unit XPS MFCPU22



Power supply module XPS MFPS01



Line control for "in rack" I/O card XPS MFDIO241601 and "in rack" input card XPS MFDI3201

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety PLCs.
The digital outputs 1 to 16 of card **XPS MFDIO241601** are connected to the digital inputs of the same card or to the digital inputs of card **XPS MFDI3201**.

(1) FB1 not used.

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XPS MFDI2401



XPS MFDI3201



XPS MFAI801

Safety inputs and outputs (continued)

Programming automated safety functions

Software **XPSMFWIN** (reference SSV1XPSMFWIN) running on a PC enables the programming of all safety remote I/O modules and the modular safety PLCs, as well as configuration of the communication settings.

Safety inputs and outputs

The modularity of the PLC **XPS MF60** allows the user to select and install, in the six slots of the rack, various input, output and input/output cards to alter the number and type of safety inputs and/or outputs to be monitored.
6 identical cards can be installed in the same rack.
The cards listed (see below and next page) indicate the number of inputs and outputs available for connection to the machines to be monitored.

Digital input cards *(1)*

Cards	Digital inputs		
	N°	Type	
		Safety detection	Safety dialogue
XPS MFDI2401	24	Limit switches, Guard switches, with reset and with actuator, Safety light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head emergency stops, Enclosures for control and signalling units, Two-hand control stations…
XPS MFDI3201	32		

Analogue input card *(1) (2)*

Card	Analogue measuring inputs	
	N°	Functions
XPS MFAI801	8 single-pole or 4 2-pole	Closed circuit scanning of input channels, Single-pole measuring of 0 to 10 V voltages, 2-pole measuring of -10 to +10 V voltages, Single-pole measuring of 0 to 20 mA currents

(1) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.
(2) Use shielded dual twisted pair cables, maximum length 300 m, short-circuit unused analogue inputs.

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XPS MFCIO2401



XPS MFDIO241601



XPS MFAO801



XPS MFDO801

Safety inputs and outputs *(continued)*

Mixed I/O cards *(1)*

Card	Counting inputs			Digital outputs	
	N°	⎓ 5 V	⎓ 24 V	N°	Type
XPS MFCIO2401	2	Incremental encoders	Sensors 2/3-wire PNP/NPN	4	**Safety actuators** Contactors-motors, Control relays, Variable speed drives. **Safety dialogue** Beacons and indicator banks, Rotating mirror beacons,
		Independent and configurable counting inputs (one channel for counting and one channel for increasing or decreasing counting direction)			

Card	Digital inputs		Digital outputs	
	N°	Type	N°	Type
XPS MFDIO241601	24	**Safety detection** Limit switches, Guard switches, with reset and with actuator, Safety light curtains type 2 and type 4, Safety mats and sensing edges… **Safety dialogue** Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…	16	**Safety actuators** Contactors-motors, Control relays, Variable speed drives. **Safety dialogue** Beacons and indicator banks, Rotating mirror beacons, Sirens…

Analogue output card *(1) (2)*

Card	Analogue outputs	
	N°	Functions
XPS MFAO801	8	Closed circuit scanning of output channels, Single-pole measuring of 0 to 10 V voltages, Measuring, using shunt, 0/4 to 20 mA currents (with 500 Ω external resistor)

Relay output card *(1) (2)*

Card	Relay outputs	
	N°	Type
XPS MFDO801	8	**Safety actuators** Contactors-motors, Control relays, Variable speed drives. **Safety dialogue** Beacons and indicator banks, Rotating mirror beacons, Sirens…

Remote inputs and outputs

In addition to the inputs/outputs available as standard on the optional “in rack” cards, the modular safety PLC **XPS MF60** can be connected to safety remote input modules **XPS MF1** and/or safety remote output modules **XPS MF2** and/or safety remote mixed I/O modules **XPS MF3**.
The safety remote input, output and mixed I/O modules can be located within the vicinity of the machines to be monitored, thus reducing cabling.
Communication between these safety modules and the safety PLC **XPS MF60** is performed on an Ethernet network using the SafeEthernet safety protocol, via the integrated RJ45 switched Ethernet communications ports.

(1) Removable screw terminal blocks are provided with the power supply and “in rack” I/O cards.
(2) Use shielded dual twisted pair cables, maximum length 300 m, short-circuit unused analogue inputs.

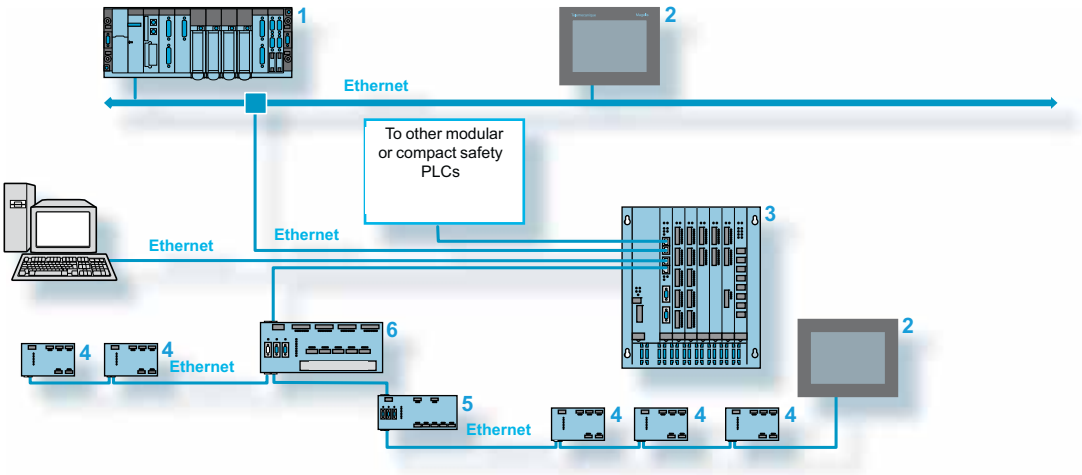
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Communication

Safety communication on Ethernet network

Communication between the PC, Magelis graphic terminals or automation platform (Premium) and the modular safety PLC is achieved by the **Ethernet** network connection via the integrated RJ45 switched Ethernet communications ports of the modular safety PLC.

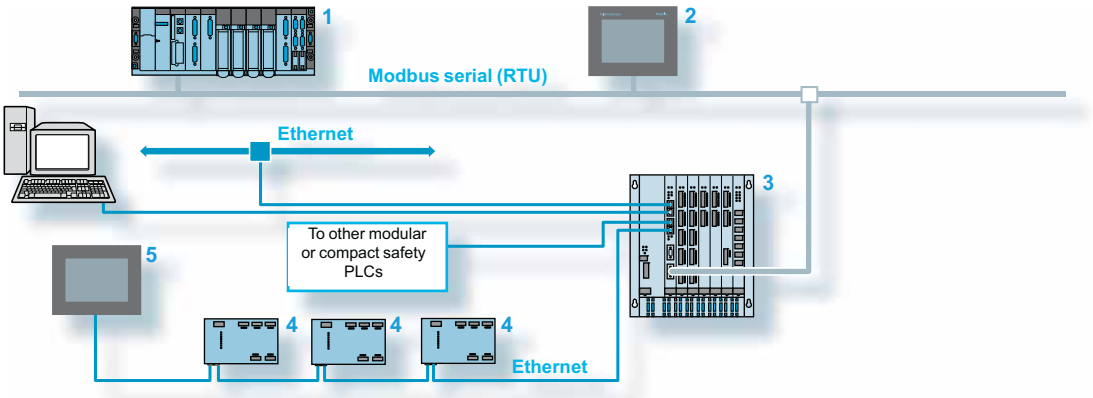
Modular PLC	Communication protocols	
	safety	non safety
XPS CPU22	SafeEthernet	Modbus TCP/IP server (slave)



1 Premium automation platform: Modbus TCP/IP client.
2 Graphic terminal **XBT GT**: Modbus TCP/IP client.
3 Modular safety PLC: Modbus TCP/IP server.
4 Safety remote I/O modules **XPS MF1/2/3**. They communicate with compact and modular safety PLCs using the SafeEthernet protocol.
5 Compact safety PLC **XPS MF31/30**: Modbus TCP/IP server.
6 Compact safety PLC **XPS MF35●●**: Modbus TCP/IP server.

Communication on Modbus serial (RTU) fieldbus

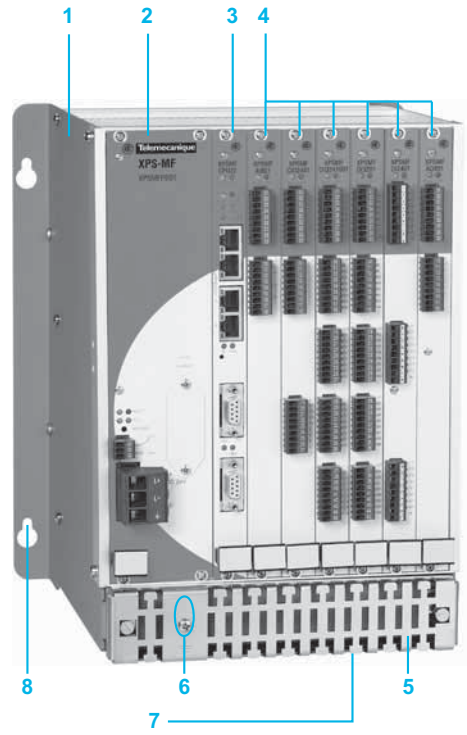
On Modbus serial (RTU), the modular safety PLC is a slave of the Premium automation platform and Magelis graphic terminal.
It is connected to the Modbus serial network via its SUB-D 9-pin connector (FB2).



1 Graphic terminal **XBT GT**: Modbus serial (RTU) master.
2 Premium automation platform: Modbus serial (RTU) master.
3 Modular safety PLC: Modbus serial (RTU) slave, Modbus TCP/IP server.
4 Safety remote I/O modules **XPS MF1/2/3**. They communicate with the modular safety PLC using the SafeEthernet protocol.
5 Graphic terminal **XBT GT**: Modbus serial (RTU) client.

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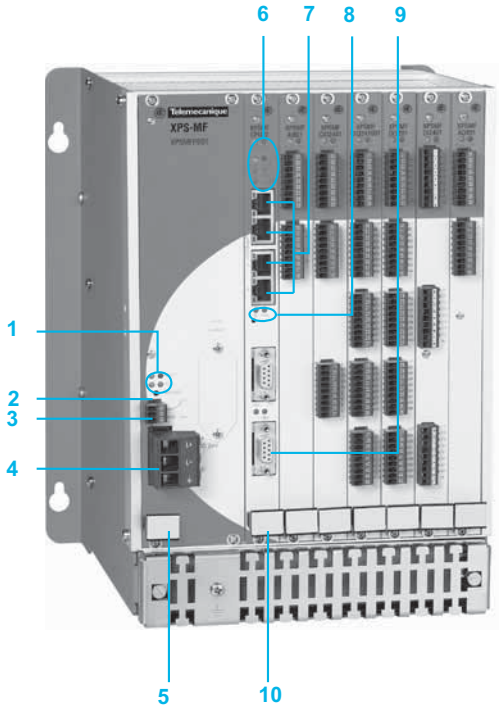


Description

Modular safety PLC

Modular assembly comprising:

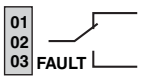
1 A metal rack **XPS MFGEH01**.
2 A ⎓ 24 V power supply module **XPS MFPS01**.
3 A central processing unit **XPS MFCPU22**.
4 Six optional “in rack” I/O cards (back plane bus assures the electrical connection of “in rack” cards installed, the power supply module and the CPU).
5 A metal plate for securing shielded analogue input connection cables (EMC),
6 One earth connection screw.
7 Two cooling fans (beneath the metal rack).
8 Four Ø 14 mm elongated holes for mounting the rack on a vertical support.



Power supply module XPS MFPS01 and Central processing unit XPS MFCPU22 comprising:

1 Four voltage status LEDs (FAULT, 24 V, 3.3 V or 5 V).
2 A RESTART button (accessible using fine pointed tool).
3 A 3-pole terminal block (3 captive screws) for “Fault contact” function *(1)*.
4 A ⎓ 24 V supply terminal block, including earth connection *(2)*.
5 A grip to assist installation/removal of the power supply module.
6 Seven process status LEDs.
7 Four integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for Programming, and for Safety and non-safety related communication on Ethernet. (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP server protocol).
8 Two process status LEDs.
9 A SUB-D 9-pin connector (FB2) for connection on Modbus serial (RTU) (FB1 not used), with process status LED.
10 A grip to assist installation/removal of the CPU.

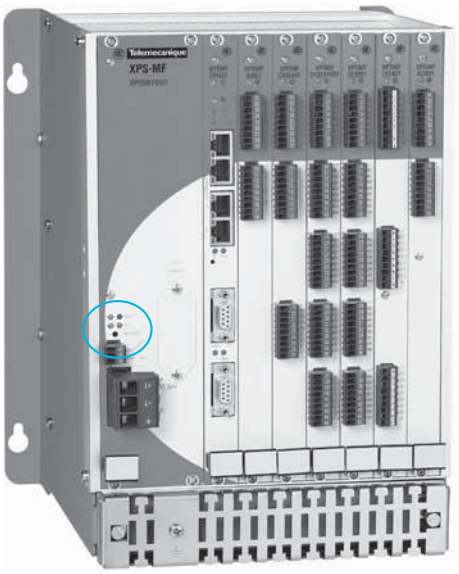
*(1) “**Fault contact**” function: the power supply module incorporates a volt-free changeover contact. Operating errors occurring in the system are read and displayed by the LEDs. The errors are analysed on the programming PC:*



Contact positions	Status
1-2 closed (2-3 open)	Normal operation of the PLC.
1-2 open (2-3 closed)	Absence of supply to the PLC or the CPU is in ERROR STOP mode.

(2) Removable screw terminal blocks are provided with the power supply and “in rack” I/O cards.

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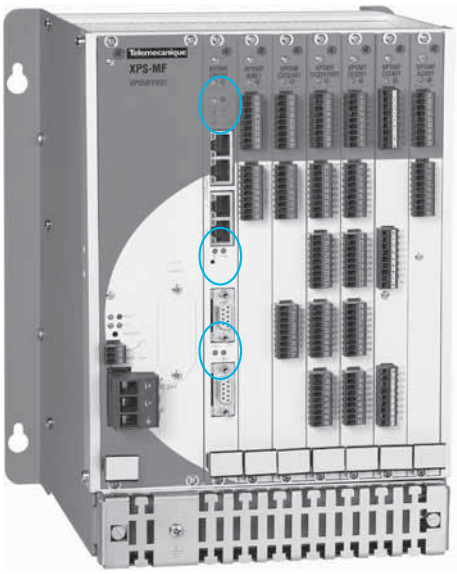


LED details

Power supply module XPS MFPS01

LED	Colour	Status	Meaning
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
3.3 VDC	Green	On	⎓ 3.3 V voltage present.
		Off	No voltage.
5 VDC	Green	On	⎓ 5 V voltage present.
		Off	No voltage.
FAULT	Orange	On	Operating error.
			The user application has caused an error.
			The system configuration is defective.
			Replace module.
		Off	None of the above errors have occurred.

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LED details *(continued)*

Central processing unit XPS MFCPU22

LED	Colour	Status	Meaning
RUN	Green	On	Program in operation: CPU in STOP or RUN mode.
		Flashing	A new programming system will be downloaded.
		Off	The CPU is in “ERROR” state (see ERROR).
ERR	Red	On	Software error or hardware fault detected by the CPU. The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded. The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset. The process can only be started again from the PC.
		Flashing	In the event of all the LEDs being on, restarting has detected a system error, a new operating system (OS) must be loaded.
		Off	No error detected.
FB1	–	–	Not used.
FB2	Orange	On	Communication on Modbus serial link active.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Off	The CPU is in “ERROR” state (see ERROR).
STOP	Red	On	The CPU is in STOP mode and no program can be executed.
			The outputs are in the waiting state for the correct supply.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the terminal.
		Off	CPU operating. A new programming system will be downloaded.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	CPU changing from INIT state to STOP state. The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FAULT	Orange	On	Program error.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred whilst writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
FORCE	Orange	On	CPU in RUN mode and force is active.
		Flashing	Program in STOP mode, but force is prepared and activated if the program restarts.
		Off	Force not activated.
OSL	Orange	Flashing	Operating system and backup loading active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

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Environment

Modular safety PLC			Rack XPS MFGEH01 + power supply module XPS MFPS01 and central processing unit XPS MFCPU22
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1, EN/ISO 13849-1 and EN/IEC 61508)			Category 4 (EN 954-1), Performance level “e” (EN/ISO 13849-1), Safety integrity level: SIL 3 (EN/IEC 61508)
Product certifications			EN/IEC 61508, part 1-7: 2000, IEC 61511 part 1-3: 2004, DIN VDE 0116: 1989, EN 50156-1: 2004, EN 12067-2: 2004, EN 298: 2003, EN 230: 1990, NFPA 85: 2001, EN/IEC 61131-2: 2003, EN 61000-6-2: 2001, EN 61000-6-4: 2001 EN 54-2: 1997, NFPA 72: 2002
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	Rack, power supply module and CPU: 0…+ 60
	Storage	**°C**	■ Rack **XPS MFGEH01**: - 40…+ 85, ■ Power supply module **XPS MFPS01**: □ - 40…+ 85, without backup battery □ - 30…+ 85, with backup battery ■ Central processing unit **XPS MFCPU22**: - 40…+ 85
Relative humidity			95% (supply not connected)
Degree of protection	Enclosure		IP 20 with covering plate on unused “in rack” I/O card slots
Pollution			Degree of pollution II
Altitude		**m**	< 2000
Protection class			Class II, conforming to EN/IEC 61131-2
Electromagnetic compatibility			Conforming to EN/IEC 61131-2
Vibration resistance conforming to EN 61131-2	Operating		1 g, frequency 10…150 Hz, unit test whilst operating, 10 cycles per axis
Shock resistance conforming to EN 61131-2	Operating		15 g (duration 11 ms), unit test whilst operating, 2 cycles per axis
Resistance to electrostatic discharges conforming to EN/IEC 61000-4-2		**kV**	4 contact, 8 air discharge
Immunity to high frequency interference conforming to EN/IEC 61000-4-3		**V/m**	10 (26 MHz…1 GHz)
Rack material			Metal alloy

Electrical characteristics

Supply	Voltage	**V**	⎓ 24 (External supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)
	Voltage limits		- 15… + 20% (power supply module) - 20… + 25%
Output voltage of power supply module		**V**	⎓ 3.3 / 10 A
		V	⎓ 5 / 2 A
Maximum consumption		**A**	30 max., 32 A external fuse
Immunity to momentary supply interruptions		**ms**	10
Protection			Internal fuse
Response time		**ms**	Depending on size of application
Backup capacitor			Approximately 1 week for diagnostics and time information Program is not effected
Clock			Yes
Operational data of CPU			⎓ 3.3 V/1.5 A
			⎓ 5 V/1 A
User memory	Application	**kB**	500
	Data	**kB**	500
LED display			Yes

Communication

Ethernet network: safety communication using SafeEthernet protocol

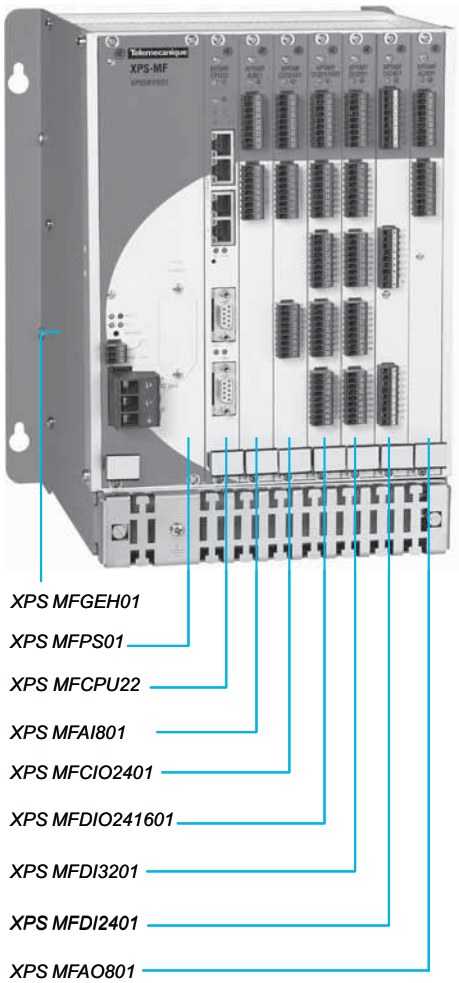
Compatibility			Central processing unit XPS MFCPU22
Transmission	Communication ports		Integrated 4 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)
Functions	Control of:		Transmitted data: duplication, loss, bit changing. Addressing of transmitted and received messages. Data sequence: repetition, loss of data, change. Data reception time: delay, repetition, echo
	Diagnostics on:		CPU, user program, communication, operating voltage and temperature, inputs & outputs

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Communication *(continuous)*			
Compatibility			**Central processing unit XPS MFCPU22**
Ethernet network: Non-safety related communication using Modbus TCP/IP protocol			
Connection Ports	Number and type		Integrated 4 RJ45 switched Ethernet communication ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
	Master/Slave		Server (slave)
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)
Transparent Ready Services	Class		A10
	Standard Ethernet TCP/IP communication services		Modbus TCP/IP Server
			Modbus TCP/IP messaging (reading/writing of data words)
			Modbus identification requests
	TCP port		standard 502
	Max. number of Modbus TCP/IP connections		1 to 20
Modbus serial (RTU)			
Serial link ports	Number and type		1 x SUB-D 9-pin female (FB2)
	Master/Slave		Slave
Addressing			122 slave addresses
Physical layer			RS 485
Connections *(1)*			
Power supply module			**XPS MFPS01**
Type of connection			Removable screw terminal blocks *(2)*
Supply connection	Number of terminal blocks		1
	For 1 cable without cable end		Solid or flexible 0.75…16 mm^2, AWG 19
	For 1 flexible cable with or without plastic cable end		0.5…16 mm^2, AWG 20
	For 2 cables of same diameter, without cable end		Solid or flexible 0.75…6 mm^2, AWG 19
	For 2 cables of same diameter, flexible without cable end		0.5…4 mm^2, AWG 20
	For 2 cables of same diameter, flexible with plastic cable end		0.5…6 mm^2, AWG 20
"In rack" I/O card			**XPS MFAI801, XPS MFAO801, XPS MFCIO2401, XPS MFDI2401, XPS MFDI3201, XPS MFDIO241601, XPS MFDO801**
Type of connection			Removable screw terminal blocks *(2)*
Digital input channel and output channel connection	Number of terminal blocks		Depending on "in rack" I/O card type
	For 1 cable without cable end		Solid or flexible: 0.14…1.5 mm^2, AWG 28-16
	For 1 flexible cable without cable end		0.25…1.5 mm^2, AWG 22-16
	For 1 flexible cable with plastic cable end		0.25…0.5 mm^2, AWG 22-20
	For 2 cables of same diameter, without cable end		Solid: 0.14…0.5 mm^2, AWG 28-20 Flexible: 0.14…0.75 mm^2, AWG 28-18
	For 2 cables of same diameter, flexible without cable end		0.25…0.34 mm^2, AWG 22
	For 2 cables of same diameter, flexible with plastic cable end		0.5 mm^2, AWG 20
Analogue input channel and output channel connection	Number of terminal blocks		Depending on "in rack" I/O card type
	For 1 cable without cable end		Solid or flexible: 0.14…1.5 mm^2, AWG 28-16
	For 1 flexible cable without cable end		0.25…1.5 mm^2, AWG 22-16
	For 1 flexible cable with plastic cable end		0.25…0.5 mm^2, AWG 22-20
	For 2 cables of same diameter, without cable end		Solid: 0.14…0.5 mm^2, AWG 28-20 Flexible: 0.14…0.75 mm^2, AWG 28-18
	For 2 cables of same diameter, flexible without cable end		0.25…0.34 mm^2, AWG 22
	For 2 cables of same diameter, flexible with plastic cable end		0.5 mm^2, AWG 20
Counting channel connection	Number of terminal blocks		Depending on "in rack" I/O card type
	For 1 cable without cable end		Solid or flexible: 0.14…1.5 mm^2, AWG 28-16
	For 1 flexible cable without cable end		0.25…1.5 mm^2, AWG 22-16
	For 1 flexible cable with plastic cable end		0.25…0.5 mm^2, AWG 22-20
	For 2 cables of same diameter, without cable end		Solid: 0.14…0.5 mm^2, AWG 28-20 Flexible: 0.14…0.75 mm^2, AWG 28-18
	For 2 cables of same diameter, flexible without cable end		0.25…0.34 mm^2, AWG 22
	For 2 cables of same diameter, flexible with plastic cable end		0.5 mm^2, AWG 20
Cable connection	Tightening torque	**Nm**	0.22…0.25
	Bared length	**mm**	9

(1) AWG: American Wire Gauge.
(2) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.

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Modular PLC (⎓ 24 V supply)

Minimum basic equipment

Description	Reference	Weight kg
Metal rack *(1)* **fitted with:** □ a back plane bus, assuring electrical connection of components installed: power supply module, CPU and "in rack" cards □ two cooling fans □ a metal securing plate for shielded cables (EMC)	**XPS MFGEH01**	–
⎓ **24 V power supply module** *(1)*	**XPS MFPS01**	0.820
CPU *(1)* **fitted with:** □ 4 x integrated RJ45 (type 10BASE-T/100BASE-TX) switched ports for Programming, and for Safety and non-safety related communication on Ethernet. (safety related using SafeEthernet protocol and Non-safety related using Modbus TCP/IP server protocol □ 1 x SUB-D 9-pin port (FB2) for access to Modbus serial (RTU)	**XPS MFCPU22**	0.280

Optional "in rack" I/O cards

Description	Functions		Reference	Weight kg
	Inputs	Outputs		
"In rack" I/O card *(1)*	Analogue: 8 single-pole or 4 2-pole, configurable	–	**XPS MFAI801**	0.240
	–	8 analogue	**XPS MFAO801**	0.280
	2 counting	4 digital	**XPS MFCIO2401**	0.260
	24 digital (⎓ 110 V / ∿ 127 V)	–	**XPS MFDI2401**	0.260
	32 digital	–	**XPS MFDI3201**	0.260
	24 digital	16 digital *(2)*	**XPS MFDIO241601**	0.260
	–	8 relay ≂ 6…250 V	**XPS MFDO801**	0.600

(1) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.
(2) Configurable for line control.

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Preventa safety PLCs
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Configuration software

■ Reference **SSV1XPSMFWIN** is the full version of software **XPSMFWIN** version 4.1 and must be installed if no previous version of this software has been installed.
■ Reference **SSVXPSMFWINUP** is an update for software **XPSMFWIN** and can be used if **SSV1XPSMFWIN** has been installed using Safety Suite V1. An update from version 4.1 to version 4.1-6150 for the software **XPSMFWIN** will then be performed.

Description	Operating system	Details	Languages	Reference	Weight kg
Configuration software XPSMFWIN for programming modular safety PLCs CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	English, German, French	**SSV1XPSMFWIN**	0.520
XPSMFWIN software update CD-ROM + user manual	Windows 2000, Windows XP	Software update available on Safety Suite V2 software pack	English, German, French	**SSVXPSMFWINUP**	0.520

Accessories for modular PLC

Description	For use with	Reference	Weight kg
Covering plate	Unused “in rack” I/O card slots	**XPS MFBLK**	–

Safety automation system solutions
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Modular, XPS MF60
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ABL 8RPS24050

Phaseo regulated switch mode power supplies

Mains input voltage	Output voltage	Nominal power	Nominal current	Auto-protect reset	Conformity to standard IEC EN 61000-3-2 and IEC EN 60950	Reference	Weight
V	⎓ V	W	A				kg
Universal range, single-phase (N-L1) **or 2-phase** (L1-L2) **connection**							
∿ **100…120 V/200...500** - 15%, + 10% 50/60 Hz	24...28.8	72	3	Auto/Manual	Yes	**ABL 8RPS24030**	0.300
		120	5	Auto/Manual	Yes	**ABL 8RPS24050**	0.700
		240	10	Auto/Manual	Yes	**ABL 8RPS24100**	1.000
Dedicated range, single-phase connection							
∿ **100…240** *(1)* wide range, 47…63 Hz	12	60	5	Auto	No	**ABL 1REM12050**	0.440
	24	60	2.5	Auto	No	**ABL 1REM24025**	0.440
∿ **100...120/200...240** *(2)*	24	240	10	Auto	No	**ABL 1REM24100**	0.880



ABL 1REM24025

Magelis multifunction graphic terminals with touch sensitive screen and on-board Ethernet *(1) (2)*

Supply voltage ⎓ 24 V

Description		Ports: serial and communication (type of link)	Application memory	Reference	Weight kg
5.7"	Monochrome black and white STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBT GT2130**	1.000
	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	16 Mb	**XBT GT2330**	1.000
7.5"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 1 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT4330**	1.800
10.4"	Colour STN	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT5230**	3.000
	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT5330**	3.000
12.1"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT6330**	3.000
15"	Colour TFT	1 x SUB-D 9-pin (RS 232C or RS 422/485 serial link to PLCs) 1 x RJ45 (RS 485 serial link) 2 x USB (peripheral connection and application transfer) 1 x RJ45 (Ethernet TCP/IP, 10BASE-T/100BASE-TX)	32 Mb	**XBT GT7340**	5.600



XBT GT2130, XBT GT2330



XBT GT4330



XBT GT5●30



XBT GT6330



XBT GT7340

(1) Service instructions, USB connectors locking device and fixing kit included.
(2) Other operator dialogue terminals, industrial PCs: please refer to our "Human Machine Interface" catalogue.

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
Rack, power supply and CPU



490 NTW 000●●

Connecting cables for network and bus

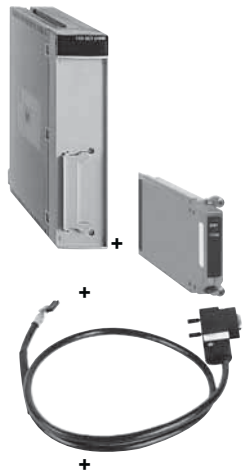
Connection to Ethernet network

Description	Pre-fitted connectors	Length (m)	Reference	Weight kg
Shielded twisted pair cables, straight through	2 RJ45 connectors For connection to DTE (Data Terminal Equipment)	2	**490 NTW 000 02** *(1)*	–
		5	**490 NTW 000 05** *(1)*	–
		12	**490 NTW 000 12** *(1)*	–
		40	**490 NTW 000 40** *(1)*	–
		80	**490 NTW 000 80** *(1)*	–
Shielded twisted pair cables, crossed wires	2 RJ45 connectors For connection between hubs, switches and transceivers	5	**490 NTC 000 05** *(1)*	–
		15	**490 NTC 000 15** *(1)*	–
		40	**490 NTC 000 40** *(1)*	–
		80	**490 NTC 000 80** *(1)*	–

Connection to Modbus serial link

Description	Use		Length (m)	Reference	Weight kg
	From	To			
Trunk cables, shielded dual twisted pair, RS 485	Compact safety PLCs XPS MF4020/MF4022 (RJ45)	Modbus splitter box LU9 GC3 (RJ45)	100	**TSX CSA 100**	5.680
			200	**TSX CSA 200**	10.920
			500	**TSX CSA 500**	30.000
	Graphic terminals XBT GT (SUB-D 9-pin)	Modbus splitter box LU9 GC3 (RJ45)	2.5	**XBT Z938** *(2)*	0.210
Adaptor for cable XBT Z938	SUB-D 9-pin (XBT GT)	XBT Z938 (SUB-D 25-pin)	0.2	**XBT ZG909**	–
Adaptor SUB-D 9-pin/RJ45	Compact PLCs (SUB-D 9-pin)	Connecting cables for Modbus serial link (RJ45)	–	**XPS MFADAPT**	–

Description	Characteristics	Sold in lots of	Unit reference	Weight kg
End of line adaptors For RJ45 connector	R = 120 Ω, C = 1 nF	2	**VW3 A8 306 RC**	0.200
	R = 150 Ω	2	**VW3 A8 306 R**	0.010



PROFIBUS DP bus connection components

Description	Profile	Services	Reference	Weight kg
PROFIBUS DP module set for Premium PLCs	Master, 12 Mbps	Class 1 and Class 2 master V0 functions, see characteristics. PROFIBUS FMS messaging not supported	**TSX PBY 100**	0.870

Description	Use	Reference	Weight kg
Remote inputs/outputs on PROFIBUS DP bus	Advantys STB network interface module	**STB NDP 2112**	0.140
	Momentum communication module	**170 DTN 110 00**	–
Connectors for remote I/O communication module	Line terminators	**490 NAD 911 03**	–
	Intermediate connection	**490 NAD 911 04**	–
	Intermediate connection and terminal port	**490 NAD 911 05**	–

Description	Length (m)	Reference	Weight kg
PROFIBUS DP connecting cables	100	**TSX PBS CA 100**	–
	400	**TSX PBS CA 400**	–

Description	Reference	Weight kg
Replacement parts	Main bus junction box	**490 NAE 911 00**	–
	PCMCIA card	**467 NHP 811 00**	–

TSX PBY 100

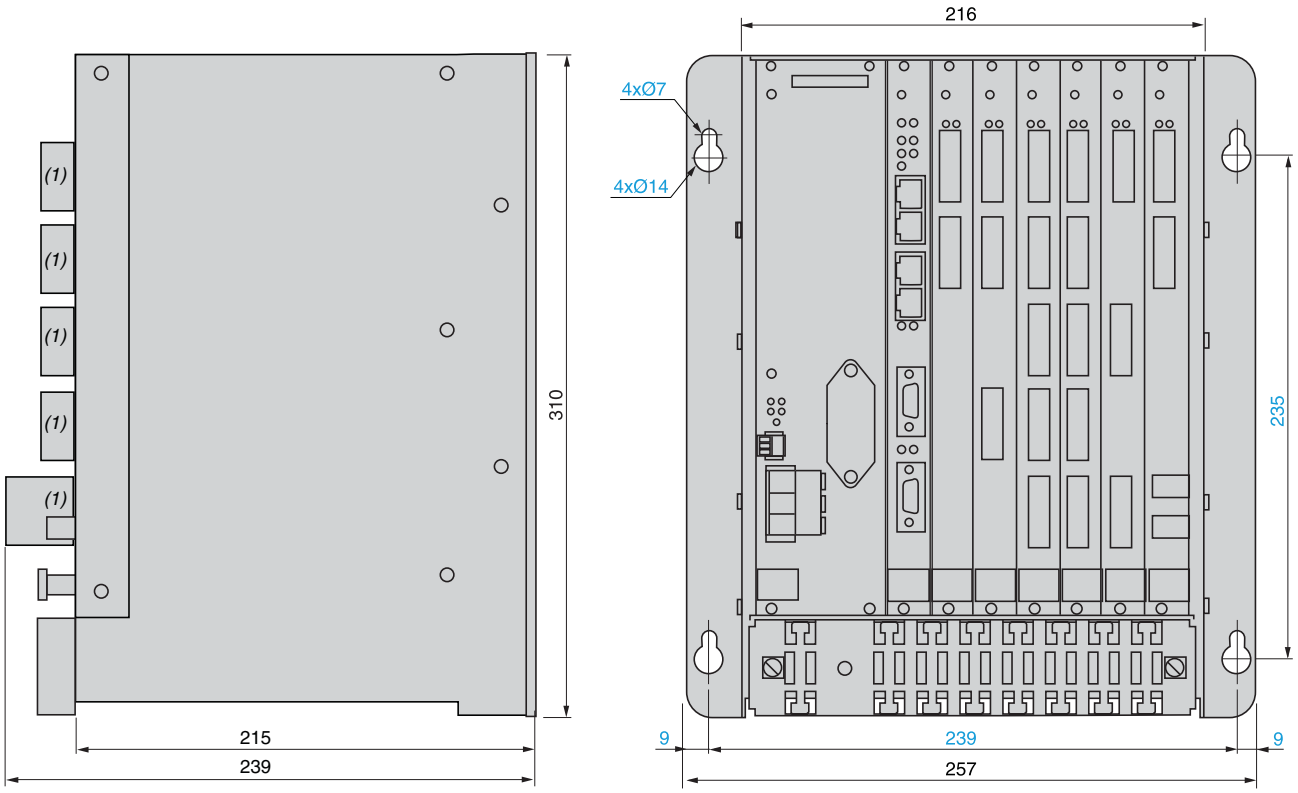


490 NAD 911 03

*(1) Cable conforming to standard EIA/TIA-568 category 5 and IEC 1180/EN 50 173 class D. For UL and CSA 22.1 approved cables, add the letter **U** to the end of the reference.*
(2) Requires adaptor XBT ZG909.

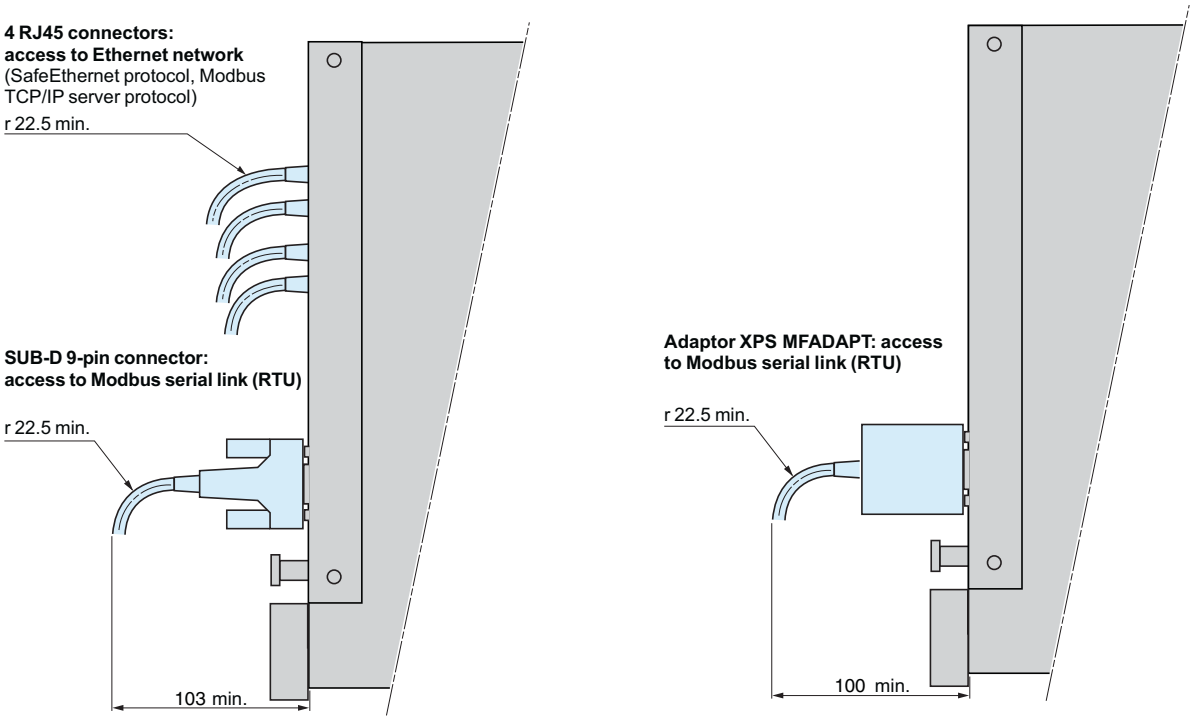
Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
Rack, power supply and CPU

Dimensions
XPS MF60



(1) Removable screw terminal blocks are provided with the power supply and "in rack" I/O cards.

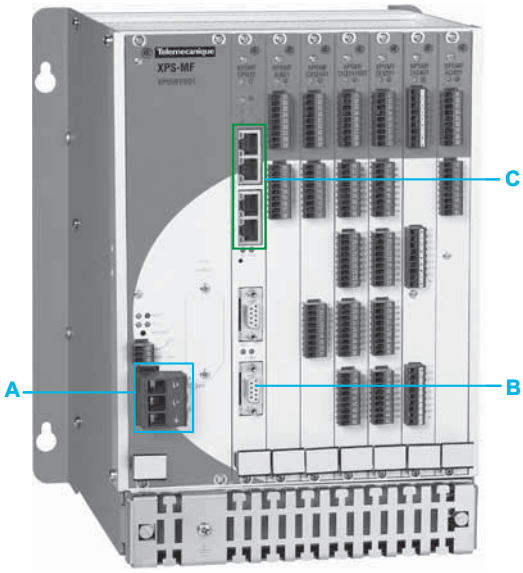
Mounting precautions relating to connectors
Access to Modbus serial link (RTU) and Ethernet network



Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
Rack, power supply and CPU

Connections

Power supply module and CPU

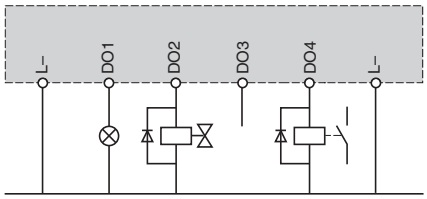


Item	Connection	Screw	Function
A	**Supply**	L+	⎓ 24 V
		L-	⎓ 24 V (reference pole)
		⏚	Earth

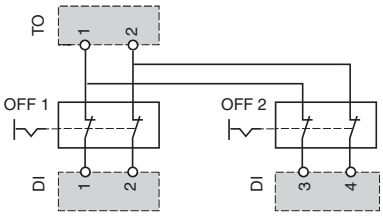
Item	Connection	Type	Function
B	**Communication**	SUB-D 9-pin female (FB2)	**XPS MFCPU22**: slave on Modbus serial (RTU)
C	**Programming**	Integrated 4 RJ45 switched Ethernet Communication ports	Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and the programming terminal in a point to point or via an Ethernet network for programming, setting IP address etc.
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.
	Non-Safe Communication available with: XPS MF60 (reference XPS MFCPU22		Either of the four switched Ethernet ports can be used to create a connection between the safety PLC and other non- safety related components (e.g HMI Magelis, standard PLCs, Scada systems,etc.) this can be established in a point to point way or via an Ethernet network.

Connection examples

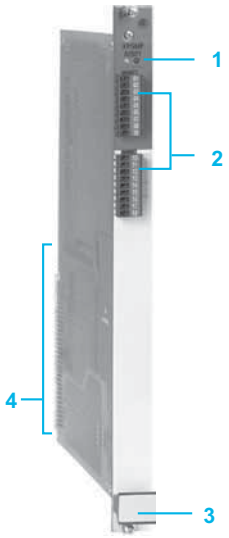
Actuator connections to the outputs



Emergency stop connections (line control)



Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
"In rack" analogue input card



Presentation

The "in rack" analogue input card **XPS MFAI801** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

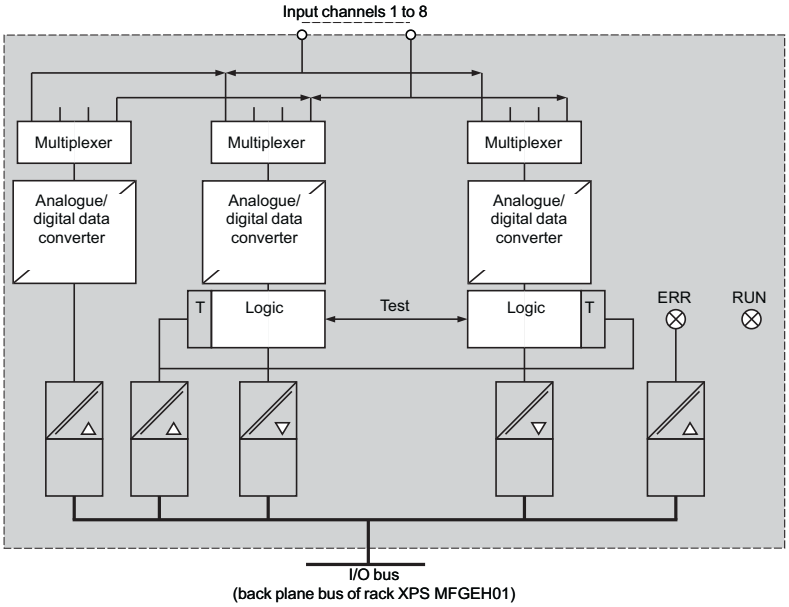
■ It incorporates 8 analogue inputs:
□ electrically isolated from the back plane bus of rack **XPS MFGEH01**,
□ configured by choice of connection for managing eight single-pole or four 2-pole functions.

■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Input values *(1)*

Number	Type	Voltage	Current	Value range	Example
8 inputs	Single-pole	± 10 V	–	± 1000	Single-pole measuring of 0 to 10 V voltages
		–	0...20 mA	0...1000 *(2)* 0...2000 *(3)*	Measuring 0 to 20 mA currents using shunt
4 inputs	2-pole	± 10 V	–	± 1000	Closed circuit scanning of input channels

Functional synoptic



Description

On the front face of the card:
1 Two process status LEDs (RUN, ERR).
2 Two removable screw terminal blocks (9 terminals per block) for connection of inputs *(4)*.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH01**.

LED details

LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

(1) The unused input channels must be short-circuited on the reference pole (L-).
(2) With 250 Ω external shunt.
(3) With 500 Ω external shunt.
*(4) Removable screw terminals are provided with the "in rack" card **XPS MFAI801**.*

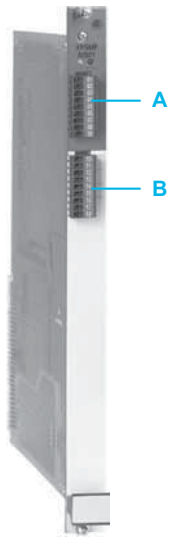
Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
"In rack" analogue input card

Characteristics

Card type			XPS MFAI801
Number of analogue inputs			8 single-pole inputs (± 10 V / 0…20 mA) or 4 2-pole inputs (± 10 V), electrically isolated, configurable by choice of connection
Supply	Voltage	**V**	⎓ 24, supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01
	Voltage limits		- 15…+ 20%
Signal	Usable range	**V**	± 10.25
		mA	0...+ 20.5 (with shunt)
	Nominal value	**V**	± 10
		mA	0...+ 20 (with shunt)
Maximum input signal		**V**	± 10.7
Shunt for current measurement		Ω	250 or 500
Overvoltage protection		**V**	⎓ - 15…+ 15 (30 V range)
Input resistance	d.c.	**MΩ**	1
Operational data			⎓ 24 V/380 mA ⎓ 3.3 V/150 mA
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	0…+ 60
	Storage	**°C**	- 40…+ 85
Resolution	Effective		9-bit
	Maximum		12-bit
Output voltage			± 1% max.
Safety accuracy			± 1% max.
Transient deviation			± 1% max.
Value acquisition renewal			Once per CPU cycle
Processing time			Approximately 45 µs
Connections			See page 2/43

References

Description	Number of channels	Voltage Current	Reference	Weight kg
Analogue input card	8 single-pole	± 10 V 0...20 mA *(1)*	**XPS MFAI801**	0.240
	4 2-pole	± 10 V		



XPS MFAI801

Connections

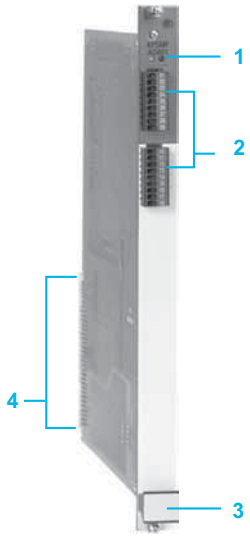
Item	Connection	Screw N°	Screw	Function
A	**Analogue inputs**	01	L1+	Analogue input 1
		02	L-	Input 1 (reference pole)
		03	L2+	Analogue input 2
		04	L-	Input 2 (reference pole)
		05	L3+	Analogue input 3
		06	L-	Input 3 (reference pole)
		07	L4+	Analogue input 4
		08	L-	Input 4 (reference pole)
		09	⏚	Earth/Shielding
B	**Analogue inputs**	10	L5+/L1-	Analogue input 5
		11	L-	Input 5 (reference pole)
		12	L6+/L2-	Analogue input 6
		13	L-	Input 6 (reference pole)
		14	L7+/L3-	Analogue input 7
		15	L-	Input 7 (reference pole)
		16	L8+/L4-	Analogue input 8
		17	L-	Input 8 (reference pole)
		18	⏚	Earth/Shielding

Configuration of analogue inputs

Connection	…	with …	Connection	…	with …
8 single-pole inputs	L1+	L-	**4 2-pole inputs**	L1+	L5+/L1-
	L2+	L-		L2+	L6+/L2-
	L3+	L-		L3+	L7+/L3-
	L4+	L-		L4+	L8+/L4-
	L5+/L1-	L-			
	L6+/L2-	L-			
	L7+/L3-	L-			
	L8+/L4-	L-			

(1) With a 250 Ω or 500 Ω external shunt.

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” analogue output card



Presentation

The analogue output card **XPS MFAO801** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 8 configurable analogue outputs (0…20 mA, 0…+ 10 V or - 10…+ 10 V):

□ For selection of the type of voltage/current measurement: a switch enables selection of 6 functions for each output channel.

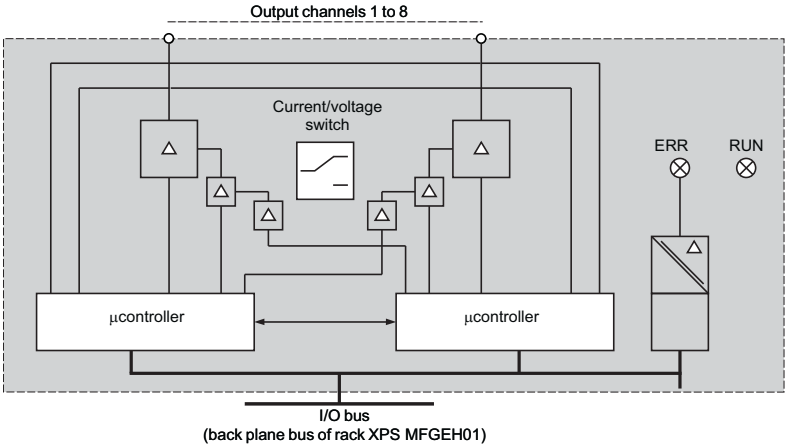
Switch position	Outputs	
	Voltage ± 10 V	Current 0…+ 20 mA
1	–	On
2	–	On
3	–	On
4	On	–
5	On	–
6	On	–

□ Selection of measuring scale using software **XPSMFWIN**: the “Properties” sub-menu displays the scale options in the “Type” window (…FS1000 or …FS2000).

Configurable output values				
Type	Voltage	Current	Value range	
			Half scale (version FS1000)	Full scale (version FS2000)
8 analogue outputs	–	0…20 mA	0...+ 1000	0...+ 2000
	0…+ 10 V	–	0...+ 1000	0…+ 2000
	- 10...+ 10 V	–	- 1000...+ 1000	- 2000...+ 2000

■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Functional synoptic



Description

On the front face of the card:

1 Two process status LEDs (RUN, ERR).
2 Two removable screw terminal blocks (9 terminals per block) for connection of outputs *(1)*.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH01**.

LED details			
LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPS MFAO801**.*

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” analogue output card

Characteristics

Card type			XPS MFAO801
Number of outputs			8 analogue outputs
Supply	Voltage	**V**	⎓ 24 (supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01)
	Voltage limits		- 15…+ 20%
Nominal output values		**V**	± 10 (- 10…+ 10)
		mA	0...+ 20
Maximum output value		**V**	± 10.25
		mA	0...+ 21
Overvoltage protection		**V**	24
Output resistance	Current	Ω	⩽ 600
	Voltage	**k**Ω	> 1
Operational data			3.3 V/130 mA 5 V/280 mA 24 V/630 mA
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	0…+ 60
	Storage	**°C**	- 40…+ 85
Resolution	Effective		7-bit
	Maximum		12-bit
Symmetrical tolerance			± 1% max.
Safety accuracy			± 1% max.
Processing time			Approximately 45 µs
Connections			See page 2/43

References

Description	Number of channels	Configuration		Reference	Weight kg
		Current	Voltage		
Analogue output card	8	0...20 mA	- 10…+ 10 V	**XPS MFAO801**	0.280



XPS MFAO801

Connections

Item	Connection	Screw N°	Screw	Function
A	**Analogue outputs**	01	O1+	Analogue output 1
		02	O1-	Output 1 (reference pole)
		03	O2+	Analogue output 2
		04	O2-	Output 2 (reference pole)
		05	O3+	Analogue output 3
		06	O3-	Output 3 (reference pole)
		07	O4+	Analogue output 4
		08	O4-	Output 4 (reference pole)
		09	⏚	Earth/Shielding
B	**Analogue outputs**	10	O5+	Analogue output 5
		11	O5-	Output 5 (reference pole)
		12	O6+	Analogue output 6
		13	O6-	Output 6 (reference pole)
		14	O7+	Analogue output 7
		15	O7-	Output 7 (reference pole)
		16	O8+	Analogue output 8
		17	O8-	Output 8 (reference pole)
		18	⏚	Earth/Shielding

Safety automation system solutions

Preventa safety PLCs
Modular, XPS MF60
"In rack" mixed card: counting inputs/digital outputs

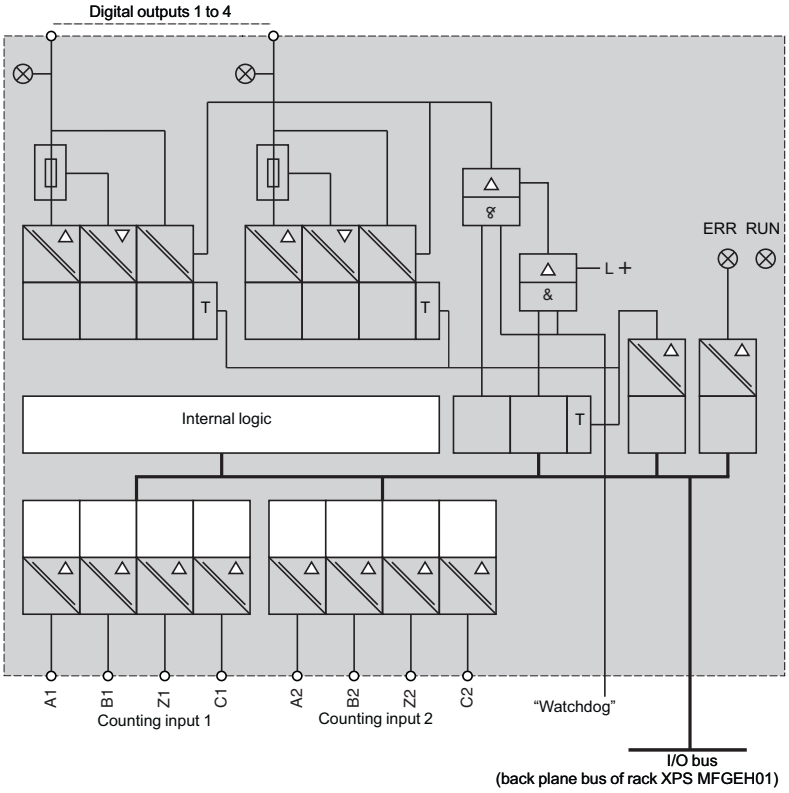
Presentation

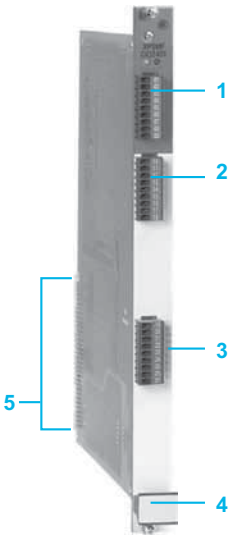
The mixed counting input and digital output card **XPS MFCIO2401** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level "e" conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates:
□ 2 24-bit independent and configurable counting channels (one channel for counting and one channel for increasing or decreasing counting direction). They are configured using software **XPSMFWIN**.
□ 4 digital outputs.

■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Functional synoptic





Description

On the front face of the card:
1 Two process status LEDs (RUN, ERR).
2 Two removable screw terminal blocks (9 terminals per block) for connection of inputs *(1)*.
3 One removable screw terminal block (9 terminals) for connection of outputs *(1)* with four output status LEDs.
4 Grip to assist installation/removal.
5 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH01**.

LED details

LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the "in rack" card **XPS MFCIO2401**.*

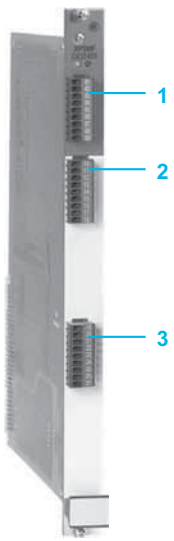
Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” mixed card: counting inputs/digital outputs

Characteristics

Mixed card type			XPS MFCIO2401
Supply	Voltage	**V**	⎓ 24 (supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01)
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	0…+ 60
	Storage	**°C**	- 40…+ 85
Counting inputs			
Number	Counter		2
	Inputs		4 on each pole (A, B, Z, C)
Input voltage		**V**	⎓ 5 or 24
Input current		**mA**	≤ 3
Input resistance		**kΩ**	3.7
Counting frequency		**MHz**	0…1
Resolution			24-bit
Time base accuracy			0.2%
Operational data			⎓ 3.3 V/0.8 A ⎓ 5 V/0.1 A ⎓ 24 V / 0.1 A + output current
Maximum distance of equipment		**m**	500, with shielded dual twisted pair cable
Input connections			See page 2/43
Digital outputs			
Number			4
Output voltage		**V**	⎓ 18.4…26.8
Output current		**A**	0.5 per channel, 2 max. per card. Continuous short-circuit proof
Internal volt drop		**V**	3 max. at 0.5 A
Minimum current		**mA**	2 per channel
Permissible current	At state 0	**mA**	1 mA max. at 2 V
Current consumption		**V**	⎓ 24 / 0.1 A + output current
Output connections			See page 2/43

References

Description	Characteristics	Reference	Weight kg
Mixed I/O card	■ 2 x 24-bit counting inputs, configurable: 5 V…24 V ■ 4 digital outputs	**XPS MFCIO2401**	0.260

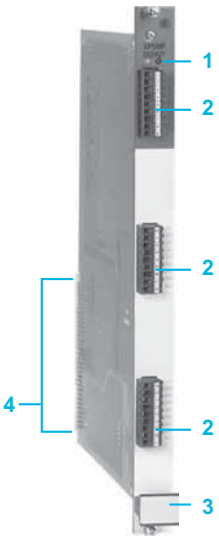


XPS MFCIO2401

Connections

Item	Connection	Screw N°	Screw	Function
1	**Counting input**	01	C-	Common reference pole
		02	A1	Input A1 or bit 1
		03	B1	Input B1 or bit 2
		04	Z1	Input Z1 or bit 3
		05	C1	Input C1 or bit 4
		06	C-	Common reference pole
		07	C-	Common reference pole
		08	C-	Common reference pole
		09	C-	Common reference pole
2	**Counting input**	10	C-	Common reference pole
		11	A2	Input A2 or bit 1
		12	B2	Input B2 or bit 2
		13	Z2	Input Z2 or bit 3
		14	C2	Input C2 or bit 4
		15	C-	Common reference pole
		16	C-	Common reference pole
		17	C-	Common reference pole
		18	C-	Common reference pole
3	**Digital outputs**	19	L-	Common reference pole
		20	1	Digital output 1
		21	2	Digital output 2
		22	3	Digital output 3
		23	4	Digital output 4
		24	L-	Common reference pole
		25	L-	Common reference pole
		26	L-	Common reference pole
		27	L-	Common reference pole

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” digital input card

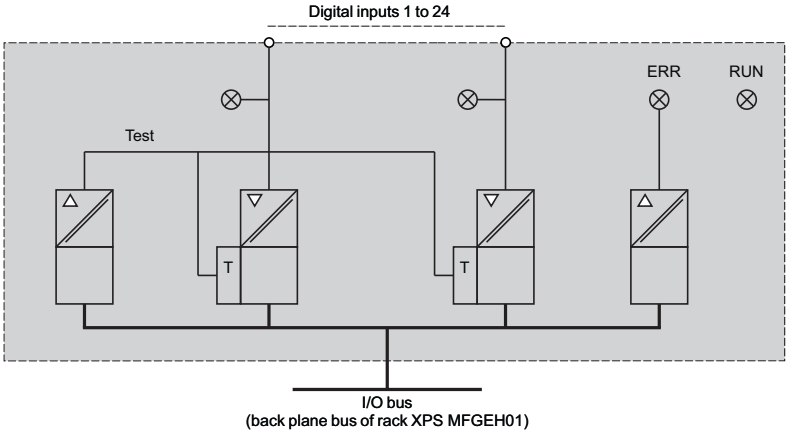


Presentation

The digital input card **XPS MFDI2401** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 24 ⎓ 110 / ∿ 127 V digital inputs that are configurable using software **XPSMFWIN**.
■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Functional synoptic



Description

On the front face of the card:
1 Two process status LEDs (RUN, ERR).
2 Three removable terminal blocks (9 terminals per block) for connection of inputs *(1)*, each with eight input status LEDs.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH01**.

LED details

LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPS MFDI2401**.*

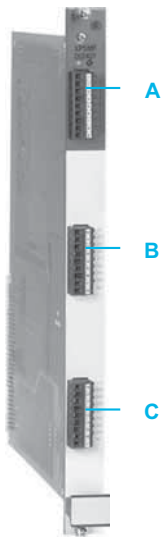
Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” digital input card

Characteristics

Input card type			XPS MFDI2401
Supply	Voltage	**V**	⎓ 24 (supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01)
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	0…+ 60
	Storage	**°C**	- 40…+ 85
Number of inputs			24, electrically isolated
Nominal voltage		**V**	⎓ 110/∿ 127 (single-phase)
Input voltage	At state 0	**V**	⩽ 20
	At state 1	**V**	⩾ 79
Input current	At state 1	**mA**	⩾ 2.2 at 79 V
Operational data			⎓ 3.3 V/0.05 A ⎓ 24 V / 0.1 A (79 V at state 1)
LED display			Yes
Connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 12 mm max. cable with connection to earth of rack XPS MFGEH01

References

Description	Characteristics	Reference	Weight kg
Input card	24 digital inputs ⎓ 110 V / ∿ 127 V	**XPS MFDI2401**	0.260



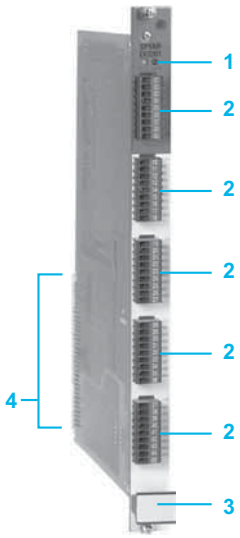
XPS MFDI2401

Connections

Item	Connection	Screw N°	Screw	Function
A	**Digital inputs**	01	I1	Input 1
		02	I2	Input 2
		03	I3	Input 3
		04	I4	Input 4
		05	I5	Input 5
		06	I6	Input 6
		07	I7	Input 7
		08	I8	Input 8
		09	N/-	Common reference pole
B	**Digital inputs**	10	I9	Input 9
		11	I10	Input 10
		12	I11	Input 11
		13	I12	Input 12
		14	I13	Input 13
		15	I14	Input 14
		16	I15	Input 15
		17	I16	Input 16
		18	N/-	Common reference pole
C	**Digital inputs**	19	I17	Input 17
		20	I18	Input 18
		21	I19	Input 19
		22	I20	Input 20
		23	I21	Input 21
		24	I22	Input 22
		25	I23	Input 23
		26	I24	Input 24
		27	N/-	Common reference pole

Safety automation system solutions

Preventa safety PLCs
Modular, XPS MF60
“In rack” digital input card

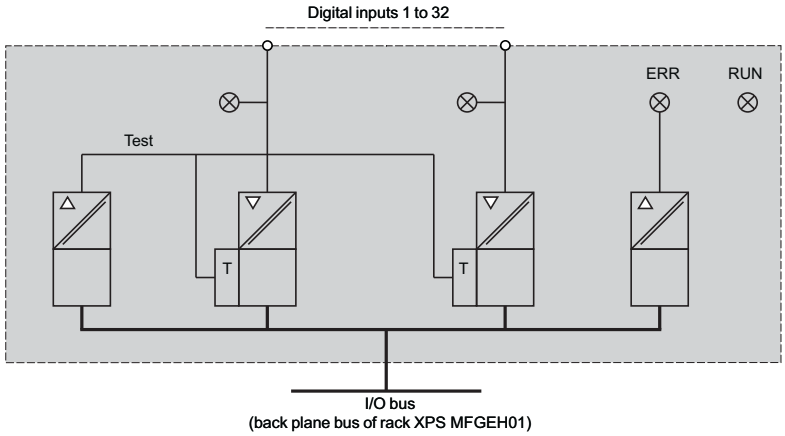


Presentation

The digital input card **XPS MFDI3201** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 32 digital inputs that are configurable using programming software **XPSMFWIN**.
■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Functional synoptic



Line control for card XPS MFDI3201

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety PLCs.

Description

On the front face of the card:
1 Two process status LEDs (RUN, ERR).
2 Five removable terminal blocks (9 terminals per block) for connection of inputs *(1)*, with a status LED for each input terminal.
3 Grip to assist installation/removal.
4 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH01**.

LED details

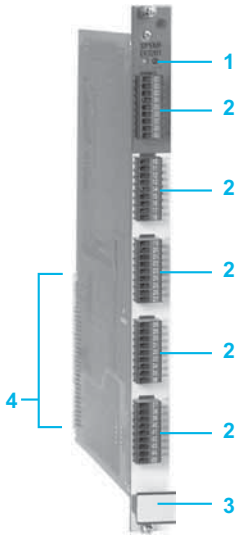
LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPS MFDI3201**.*

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” digital input card

Characteristics

Input card type			XPS MFDI3201
Supply	Voltage	**V**	⎓ 24, supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	0…+ 60
	Storage	**°C**	- 40…+ 85
Number of digital inputs			32, electrically isolated
Nominal voltage		**V**	⎓ 24
Input voltage	At state 0	**V**	5 max.
	At state 1	**V**	10…30
Input current	At state 0	**mA**	1.0 at 5 V
	At state 1	**mA**	2 at 10 V, 5 at 24 V
Operational data			⎓ 3.3 V / 0.05 A, ⎓ 24 V / 0.2 A
LED display			Yes
Connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 12 mm max. cable with connection to earth of rack XPS MFGEH01



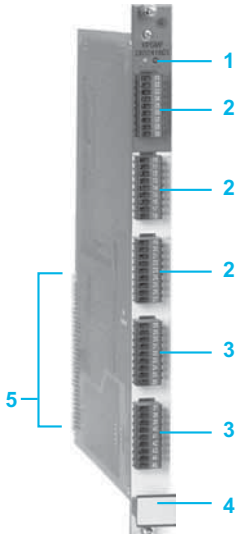
References

Description	Characteristics	Reference	Weight kg
Input card	32 digital inputs	**XPS MFDI3201**	0.260

Connections

Item	Connection	Screw N°	Screw	Function
A	**Digital inputs**	01	LS+	Supply for inputs 1 to 7
		02	I1	Input 1
		03	I2	Input 2
		04	I3	Input 3
		05	I4	Input 4
		06	I5	Input 5
		07	I6	Input 6
		08	I7	Input 7
		09	EGND	Reference pole
B	**Digital inputs**	10	LS+	Supply for inputs 8 to 14
		11	I8	Input 8
		12	I9	Input 9
		13	I10	Input 10
		14	I11	Input 11
		15	I12	Input 12
		16	I13	Input 13
		17	I14	Input 14
		18	EGND	Reference pole
C	**Digital inputs**	19	LS+	Supply for inputs 15 to 21
		20	I15	Input 15
		21	I16	Input 16
		22	I17	Input 17
		23	I18	Input 18
		24	I19	Input 19
		25	I20	Input 20
		26	I21	Input 21
		27	EGND	Reference pole
D	**Digital inputs**	28	LS+	Supply for inputs 22 to 28
		29	I22	Input 22
		30	I23	Input 23
		31	I24	Input 24
		32	I25	Input 25
		33	I26	Input 26
		34	I27	Input 27
		35	I28	Input 28
		36	EGND	Reference pole
E	**Digital inputs**	37	LS+	Supply for inputs 29 to 32
		38	I29	Input 29
		39	I30	Input 30
		40	I31	Input 31
		41	I32	Input 32
		42	EGND	Reference pole
		43	EGND	Reference pole
		44	EGND	Reference pole
		45	EGND	Reference pole

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” digital I/O card



Presentation

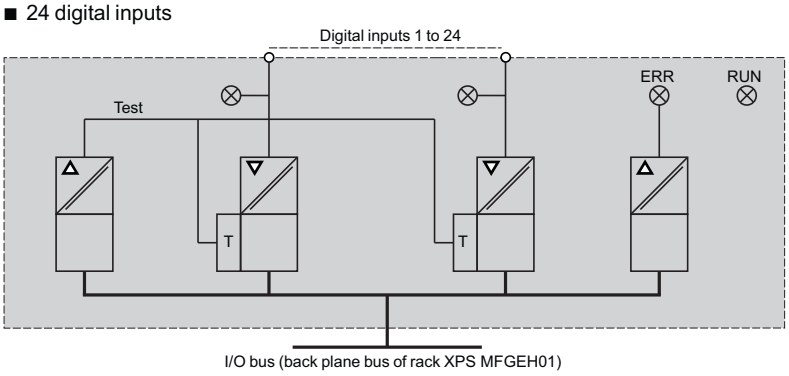
The digital I/O card **XPS MFDIO241601** is designed to manage up to:
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 24 digital inputs and 16 digital outputs.

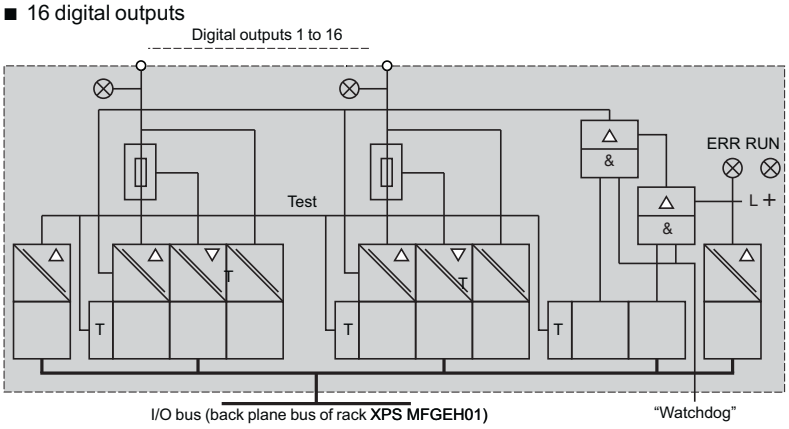
■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Functional synoptics

■ 24 digital inputs



■ 16 digital outputs



Line control for card XPS MFDIO241601

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety PLCs.

Description

On the front face of the card:

1 Two process status LEDs (RUN, ERR).
2 Three removable terminal blocks (9 terminals per block) for connection of inputs *(1)*, each with eight input status LEDs.
3 Two removable screw terminal blocks (9 terminals per block) for connection of outputs *(1)*, each with eight output status LEDs.
4 Grip to assist installation/removal.
5 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH01**.

LED details

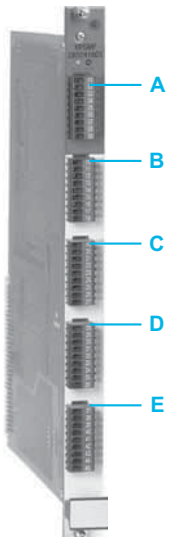
LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPS MFDIO241601**.*

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
"In rack" digital I/O card

Characteristics

I/O card type			XPS MFDIO241601
Supply	Voltage	V	⎓ 24, supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	°C	0…+ 60
	Storage	°C	- 40…+ 85
Digital input and output connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 12 mm max. cable with connection to earth of rack XPS MFGEH01
Digital inputs			
Number			24, electrically isolated
Nominal input voltage		V	⎓ 24
Input voltage	At state 0	V	5 max.
	At state 1	V	10…30
Input current	At state 0	mA	1.0 at 5 V
	At state 1	mA	2 at 10 V, 5 at 24 V
Operational data			⎓ 3.3 V / 0.3 A, ⎓ 24 V / 0.5 A
Digital outputs			
Number			16, electrically isolated
Output voltage		V	⎓ 18.4…26.8
Internal volt drop			2 V max. at 2 A
Output current	At 30 °C	A	2 per output channel, 8 max. per card. Continuous short-circuit proof
Minimum current		mA	2 per channel
Permissible current	At state 0	mA	1 max. at 2 V



XPS MFDIO241601

References

Description	Characteristics	Reference	Weight kg
I/O card	■ 24 digital inputs ■ 16 digital outputs, configurable for line control	**XPS MFDIO241601**	0.260

Connections

Digital inputs

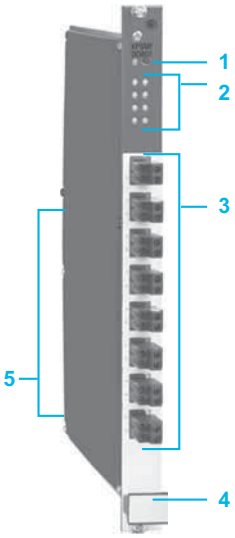
Item	Connection	Screw N°	Screw	Function
A	**Digital inputs**	01	LS+	Supply for inputs 1 to 8
		02	I1	Input 1
		03	I2	Input 2
		04	I3	Input 3
		05	I4	Input 4
		06	I5	Input 5
		07	I6	Input 6
		08	I7	Input 7
		09	I8	Input 8
B	**Digital inputs**	10	LS+	Supply for inputs 9 to 16
		11	I9	Input 9
		12	I10	Input 10
		13	I11	Input 11
		14	I12	Input 12
		15	I13	Input 13
		16	I14	Input 14
		17	I15	Input 15
		18	I16	Input 16
C	**Digital inputs**	19	LS+	Supply for inputs 17 to 24
		20	I17	Input 17
		21	I18	Input 18
		22	I19	Input 19
		23	I20	Input 20
		24	I21	Input 21
		25	I22	Input 22
		26	I23	Input 23
		27	I24	Input 24

Digital outputs

Item	Connection	Screw N°	Screw	Function
D	**Digital outputs**	28	L-	Reference pole for outputs 1 to 8
		29	O1	Output 1
		30	O2	Output 2
		31	O3	Output 3
		32	O4	Output 4
		33	O5	Output 5
		34	O6	Output 6
		35	O7	Output 7
		36	O8	Output 8

Item	Connection	Screw N°	Screw	Function
E	**Digital outputs**	37	L-	Reference pole for outputs 9 to 16
		38	O9	Output 9
		39	O10	Output 10
		40	O11	Output 11
		41	O12	Output 12
		42	O13	Output 13
		43	O14	Output 14
		44	O15	Output 15
		45	O16	Output 16

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
“In rack” relay output card

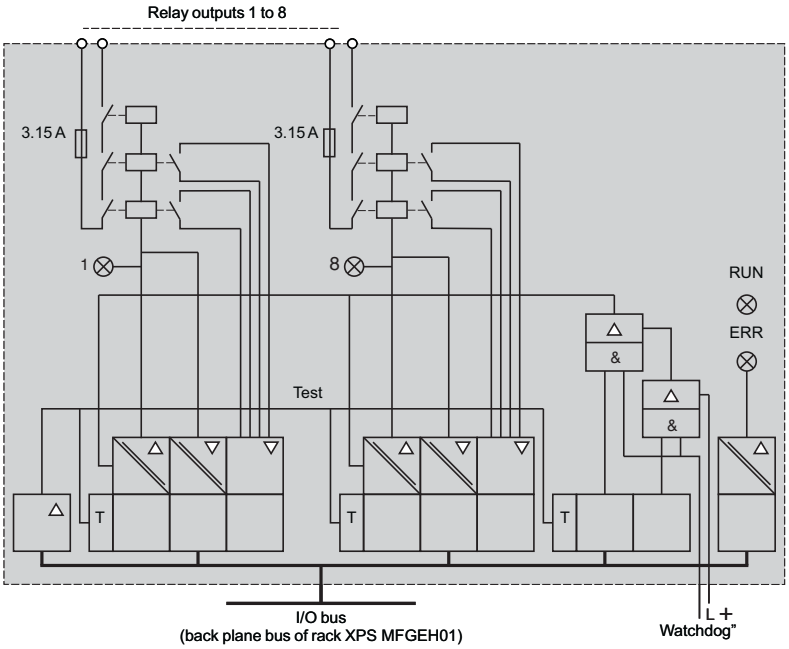


Presentation

The relay output card **XPS MFDO801** is designed to manage up to :
- category 4 conforming to EN 954-1,
- performance level “e” conforming to EN/ISO 13849-1,
- SIL 3 (safety integrity level) conforming to EN/IEC 61508.

■ It incorporates 8 relay safety outputs (3.15 A fuse) that are configurable using software **XPSMFWIN**.
■ The card can be installed in rack **XPS MFGEH01** as many times as required in the six slots available.

Functional synoptic



Description

On the front face of the card:
1 Two process status LEDs (RUN, ERR).
2 Eight output status LEDs.
3 Eight removable screw terminal blocks (2 terminals per block) for connection of outputs *(1)*.
4 Grip to assist installation/removal.
5 **On the rear**: terminals for automatic electrical connection to the back plane bus of rack **XPS MFGEH0**.

LED details

LED	Colour	Status	Meaning
RUN	Green	On	Voltage present.
		Off	No voltage.
ERR	Red	On	Card defect or external error, diagnostics response.
		Off	No error regarding the card or on the channels.

*(1) Removable screw terminals are provided with the “in rack” card **XPS MFDO801**.*

Safety automation system solutions
Preventa safety PLCs
Modular, XPS MF60
"In rack" relay output card

Characteristics

Output card type			XPS MFDO801
Supply	Voltage	**V**	⎓ 24, supplied by rack XPS MFGEH01 incorporating power supply module XPS MFPS01
	Voltage limits		- 15…+ 20%
Ambient air temperature conforming to EN 61131-2	Operating	**°C**	0…+ 50 *(1)*
	Storage	**°C**	- 40…+ 85
Number and type of outputs			8 relay outputs, volt-free, with N/O contact
Relay	Type		2 safety relays with positively guided contacts
	Degree of protection		IP 40
	Contact material		Silver alloy, gold flashed
	Switching time	**ms**	30 approx.
	Reset time	**ms**	20 approx.
	Bounce time	**ms**	30 approx.
	Mechanical life		≥ 10 million operating cycles
	Electrical durability		≥ 250 000 operating cycles on full load (resistive) and ≤ 0.1 operating cycles/s
Switching voltage		**V**	⎓ 6 V…250 V
Switching current		**A**	3.15 A with internal fuse Breaking capacity 100 A
Switching capacity	a.c.	**VA**	700 max., cos ϕ = 1
	d.c. (non inductive)		≤ ⎓ 30 V: 95 W max. (3.15 A) ≤ ⎓ 70 V: 40 W max. (0.5 A) ≤ ⎓ 110 V: 33 W max. (315 A) With suitable external fuse
Operational data			⎓ 3.3 V / 0.2 A, ⎓ 24 V ± 10% *(1)* / 0.7 A
LED display			Yes
Connections			Shielded dual twisted pair cable recommended to provide protection against electromagnetic interference, or Ø 12 mm max. cable with connection to earth of rack XPS MFGEH01

(1) Limited system data.

References

Description	Characteristics	Reference	Weight kg
Output card	8 relay outputs ⎓ 6 V…250 V	**XPS MFDO801**	0.600



XPS MFDO801

Connections

Item	Connection	Screw N°	Screw	Function
A	**Relay output**	01	1	Contact 1, terminal A
		02		Contact 1, terminal B
B	**Relay output**	03	2	Contact 2, terminal A
		04		Contact 2, terminal B
C	**Relay output**	05	3	Contact 3, terminal A
		06		Contact 3, terminal B
D	**Relay output**	07	4	Contact 4, terminal A
		08		Contact 4, terminal B
E	**Relay output**	09	5	Contact 5, terminal A
		10		Contact 5, terminal B
F	**Relay output**	11	6	Contact 6, terminal A
		12		Contact 6, terminal B
G	**Relay output**	13	7	Contact 7, terminal A
		14		Contact 7, terminal B
H	**Relay output**	15	8	Contact 8, terminal A
		16		Contact 8, terminal B

Safety automation system solutions
Preventa safety PLCs
Compact and modular, XPS MF
Communication on network and bus

Presentation

To communicate, Preventa compact and modular safety PLCs **XPS MF** are fitted with:
■ Integrated 2 or 4 RJ45 Ethernet switched ports for transfer Safety and Non-safety related data (Safety Related using SafeEthernet protocol, Non-Safety Related using Modbus TCP/IP protocol),
■ and/or serial communication ports for transferring non safety related data.

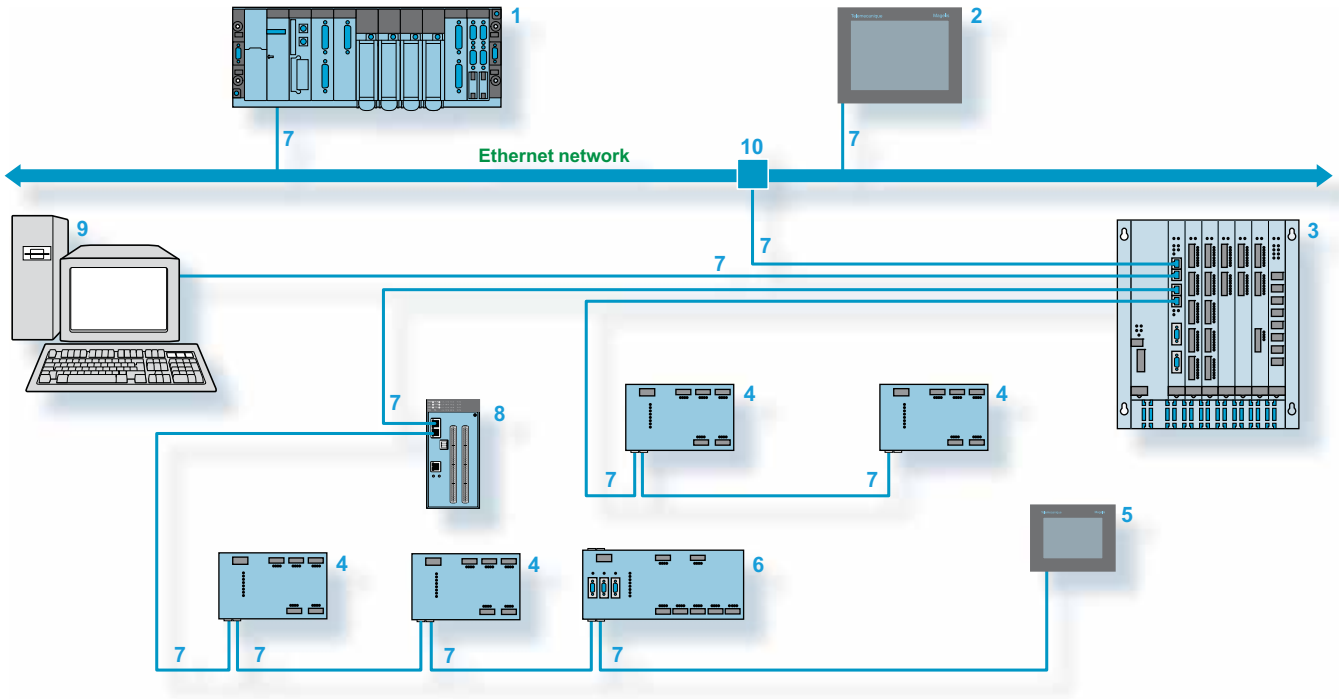
Safety communication on a single network
The Ethernet network supports the SafeEthernet protocol: physically, a single network is possible for communication between:
□ safety products (SafeEthernet protocol),
□ non safety related products (Modbus TCP/IP and other protocols),
□ safety related and non safety related products (Modbus TCP/IP protocol).

Communication on more than one network: a minimum of two separate cabling systems are established.
□ An Ethernet network with Modbus TCP/IP protocol is used for communication between non safety related products and the safety PLCs.
□ An Ethernet network with SafeEthernet protocol is used for communication between the safety PLCs **XPS MF** and safety remote I/O modules **XPS MF1/2/3**.
□ A Modbus serial network with Modbus serial (RTU) protocol is used for communication between the safety PLCs **XPS MF** and non safety related products.
□ A PROFIBUS DP network with PROFIBUS protocol is used for communication between the safety PLCs **XPS MF** and non safety related products.

Safety PLCs	Communication on Ethernet network			Communication on fieldbus	
Compact	**Port** (number x type)	**SafeEthernet protocol: safe communication**	**Modbus TCP/IP protocol: non safe communication**	**Modbus serial (RTU) protocol**	**PROFIBUS DP protocol**
XPS MF31222	4 x RJ45	yes	yes	no	no
XPS MF3022	4 x RJ45	yes	yes	yes (slave) / 1 x SUB-D (9-pin)	no
XPS MF3502	4 x RJ45	yes	yes	no	no
XPS MF3522	4 x RJ45	yes	yes	yes (slave) / 1 x SUB-D (9-pin)	no
XPS MF3542	4 x RJ45	yes	yes	no	yes (slave) / 1 x SUB-D (9-pin)
XPS MF4000	2 x RJ45	yes	no	no	no
XPS MF4002	2 x RJ45	yes	yes	no	no
XPS MF4020	2 x RJ45	yes	no	yes (slave) / 1 x RJ45	no
XPS MF4022	2 x RJ45	yes	yes	yes (slave) / 1 x RJ45	no
XPS MF4040	2 x RJ45	yes	no	no	yes (slave) / 1 x SUB-D (9-pin)
XPS MF4042	2 x RJ45	yes	yes	no	yes (slave) / 1 x SUB-D (9-pin)
Modular					
XPS MFCPU22 (central processing unit)	4 x RJ45	yes	yes	yes (slave) / 1 x SUB-D (9-pin)	no

Safety automation system solutions
Preventa safety PLCs
Compact and modular, XPS MF
Communication on network and bus

Connection on Ethernet network



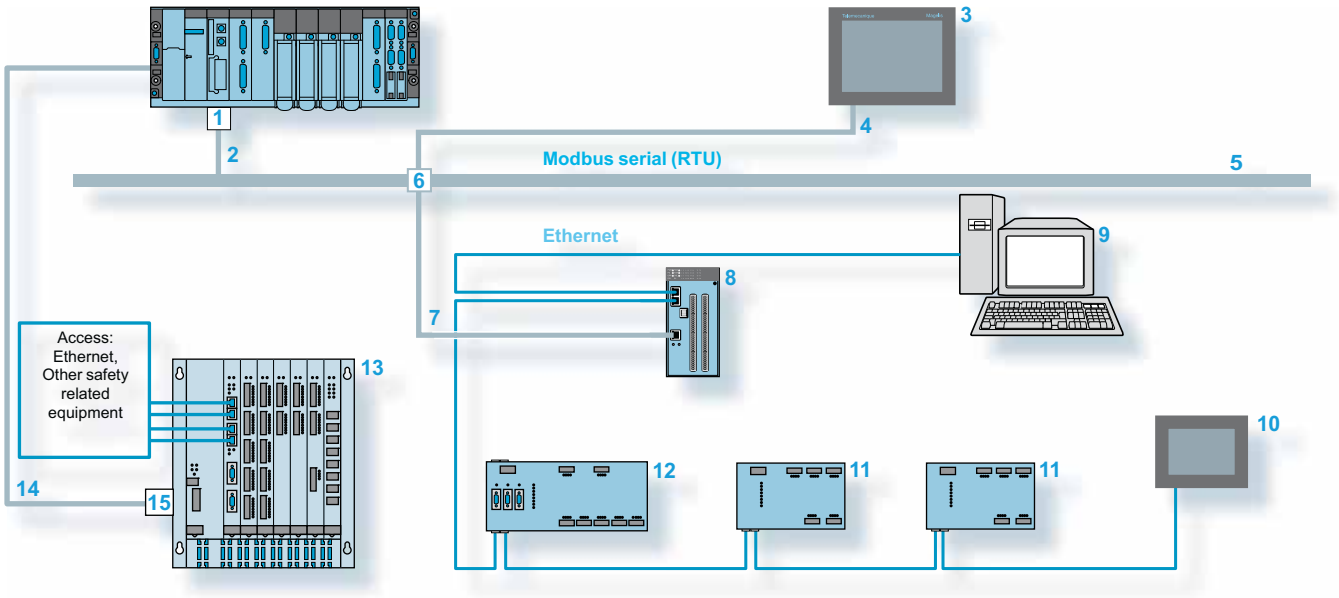
1 Premium processor **TSX P57 ●634M/●623M** or module **TSX ETY 4103** on Premium automation platform: Modbus TCP/IP client (master).
2 Graphic supervision terminal **XBT GT5230**: Modbus TCP/IP client (master).
3 Modular safety PLC **XPS MF60**: Modbus TCP/IP server (slave).
4 Safety remote I/O modules **XPS MF1/2/3**.
5 Graphic supervision terminal **XBT GT2130**: Modbus TCP/IP client (master).
6 Compact safety PLCs **XPS MF31/30/35**: Modbus TCP/IP server (slave).
7 Shielded twisted pair cables **490 NTW 000 ●●**, lengths 2…80 m.
8 Compact safety PLCs **XPS MF40**: Modbus TCP/IP server (slave).
9 Programming PC.
10 Ethernet connector.

Characteristics

Protocol		**SafeEthernet**	
Compatibility with compact and modular safety PLCs		**XPS MF4000, XPS MF4002, XPS MF4020, XPS MF4022, XPS MF4040, XPS MF4042**	**XPS MF31222, XPS MF3022, XPS MF3502, XPS MF3522, XPS MF3542, XPS MFCPU22 (central processing unit of modular PLC XPS MF60)**
Transmission	Speed (Baud rate)	100 Mbps Half duplex, 10 Mbps Full duplex, Autonegotiation	
	Communication ports	Integrated 2 RJ45 switched Ethernet communications ports	Integrated 4 RJ45 switched Ethernet communications ports
	Medium	Dual twisted pair cable, category 5D or better	
Structure		10BASE-T/100BASE-TX	
Transparent Ready service	Class	A10	
	Standard Ethernet TCP/IP communication services (supported by compact and modular safety PLCs)	Modbus TCP/IP	
		Modbus TCP/IP messaging (reading/writing of data words) Modbus identification requests	
	TCP port	Standard 502	
	Max. number of TCP/IP connections	1 to 20	

Safety automation system solutions
Preventa safety PLCs
Compact and modular, XPS MF
Communication on network and bus

Connection on Modbus serial (RTU)



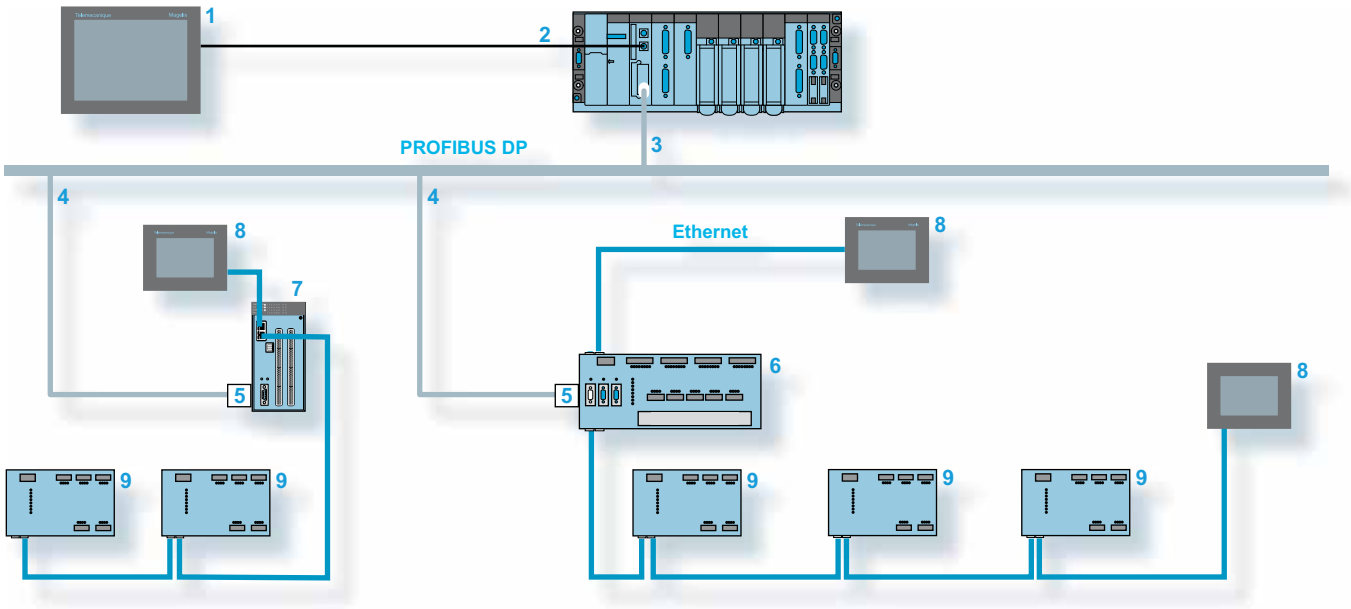
1 Premium module **TSX SCY 21601**: access to Modbus serial, on a Premium automation platform: Modbus serial (RTU) master.
2 Cable **TSX SCY CM6030**.
3 Graphic supervision terminal **XBT GT5230**: Modbus serial (RTU) master.
4 Cable **XBT Z938** + adaptor **XBT ZG909**.
5 Cables **VW3 A83 ●6R●●** for Modbus serial, lengths 0.3…3 m.
6 Modbus serial splitter box **LU9 GC3** for equipment connection.
7 Cables **TSX CSA ●00** for Modbus serial, lengths 100…500 m.
8 Compact safety PLCs **XPS MF4020/MF4022**: Modbus serial (RTU) slaves, Modbus TCP/IP server.
9 Programming PC.
10 Graphic supervision terminal **XBT GT2130**: Modbus serial (RTU) client.
11 Safety remote I/O modules **XPS MF1/2/3**.
12 Compact safety PLCs **XPS MF3022/3522:** Modbus serial (RTU) slaves, Modbus TCP/IP server.
13 Modular safety PLC **XPS MF60**, Modbus serial (RTU) slaves, Modbus TCP/IP server.
14 Direct connection cables **XPS MCSCY** for safety PLCs to Premium module **TSX SCY 21601**, length 0.3 m.
15 Connector **XPS MFADAPT** (RJ45/SUB-D 9-pin male) for connector FB2 or FB3, depending on PLC.

Characteristics

Bus type			**Modbus serial (RTU)**		
Compatibility with compact and modular safety PLCs			**XPS MF3022, XPS MF3522**	**XPS MF4020, XPS MF4022**	**XPS MFCPU22 (CPU of modular PLC XPS MF60)**
Serial link port		Number and type	1 x SUB-D 9-pin female (FB3)	1 x RJ45 (Modbus)	1 x SUB-D 9-pin female (FB2)
		Master/Slave	Slave		
Addressing			122 slave addresses. Addressing range: 1…247		
Medium			Shielded twisted pair cable		
Physical layer			RS 485		
Services			13 Modbus functions (reading/writing of bits and words, event counters, connection events, diagnostics, identification)		
	Functions	**Code**	Modbus slave		
		01	Reading n bits of output		
		02	Reading n bits of inputs		
		03	Reading n words of output		
		04	Reading n words of inputs		
		23	Reading/writing variables		
		15	Writing bit variables		
		16	Writing word variables		
		05	Writing 1 bit of output		
		06	Writing 1 word of output		
		08	Diagnostics		
		43	Reading equipment identification		
Transmission	**Binary transfer rate (bps)**		115 200, 76 800, 62 500, 57 600, 38 400, 19 200, 9600, 4800, 2400, 1200, 600, 300. Default value: 57 600		
Elements	**Parity**		None. Odd. Even. Default value: even		
	Stop bit		Standard. 1 stop bit. 2 stop bits. Default value: standard		

Safety automation system solutions
Preventa safety PLCs
Compact and modular, XPS MF
Communication on network and bus

Connection on PROFIBUS DP



1 Graphic terminal connected to TER/AUX port of Premium automation platform: PROFIBUS DP master.
2 Connecting cable **XBT Z968** (RS 485) + adaptor **XBT ZG909**.
3 PROFIBUS module **TSX PBY 100** on Premium processor: PROFIBUS DP master.
4 Connecting cable **TSX PBS CA ●00**, lengths 100 and 400 m.
5 Connector **490 NAD 911 03** (SUB-D 9-pin male) on the FB3 connector of safety PLC **XPS MF3542** or on the “PROFIBUS” connector of safety PLC **XPS MF4040/MF4042**.
6 Compact safety PLC **XPS MF3542**: PROFIBUS DP slaves, Modbus TCP/IP server.
7 Compact safety PLCs **XPS MF4040/MF4042**: PROFIBUS DP slaves, Modbus TCP/IP server.
8 Graphic supervision terminal **XBT GT2130**: Modbus TCP/IP client.
9 Safety remote I/O modules **XPS MF1/2/3**.

Characteristics

Bus type		**PROFIBUS DP**	
Compatibility with compact safety PLCs		**XPS MF3542**	**XPS MF4040, XPS MF4042**
Serial port	Number and type	1 x SUB-D 9-pin female (FB3)	1 x SUB-D 9-pin female (PROFIBUS)
	Master/Slave	Slave, V0	
Physical layer		RS 485	
Topology		Linear, with line terminators at each end	
Medium		Shielded twisted pair cable	
Number of slaves		32 slaves on each segment, 126 slaves maximum with repeaters	
Data exchange speed		9.6 kbps…12 Mbps, depending on the length of the segment (1200 m…100 m)	

Safety automation system solutions

Programming software XPSMFWIN for Preventa compact and modular safety PLCs XPS MF

Presentation

Conforming to standard IEC 61131-3, programming software **XPSMFWIN** is designed for programming all safety PLCs **XPS MF** and safety remote I/O modules. This safety software is part of the Safety Suite V2 software pack.

To create a program the user can use predefined function blocks, such as the elementary logic functions and certified function blocks, by dragging the blocks into the software programming area.
The “drag and drop” operation of the Windows programming environment enables quick and simple creation of configurations.

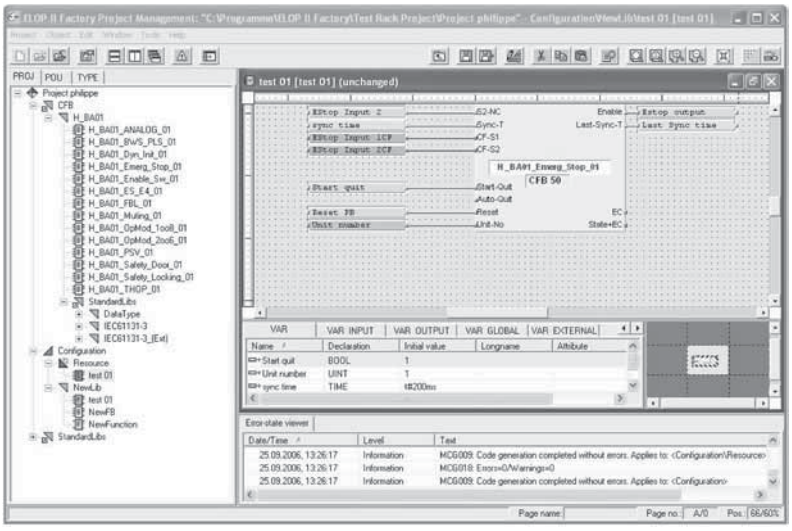
Using the **XPSMFWIN** software, it is possible to program complete systems comprising several safety PLCs and safety remote I/O modules.
The conditions detailed in the software manual must be adhered to and a complete report accompanying the certificate should be established.

Reference

■ Reference **SSV1XPSMFWIN** is the full version of software **XPSMFWIN** version 4.1 and must be installed if no previous version of this software has been installed.
■ Reference **SSVXPSMFWINUP** is an update for software **XPSMFWIN** and can be used if **SSV1XPSMFWIN** has been installed using Safety Suite V1. An update from version 4.1 to version 4.1-6150 for the software **XPSMFWIN** will then be performed.

Description	Operating system	Composition	Language	Reference	Weight kg
Configuration software XPSMFWIN for programming compact XPS MF40●●, XPS MF3● and modular XPS MF60 safety PLCs	Windows 2000, Windows XP	CD-ROM + user manual	English, German, French	**SSV1XPSMFWIN** *Available with Safety Suite V2 software pack for safety systems*	0.520
XPSMFWIN software update	Windows 2000, Windows XP	CD-ROM + user manual	English, German, French	**SSVXPSMFWINUP** *Software update available on Safety Suite V2 software pack*	0.520

Installation



Software XPSMFWIN: project management

Software **XPSMFWIN** uses an electronic key (dongle) for protection against unauthorised use.

A USB dongle is available. It must be connected to the PC before the software is installed.
Drivers must also be installed on the computer to recognise the dongle. These drivers are included with software **XPSMFWIN** and are automatically installed during installation.
To install software **XPSMFWIN**:
□ Connect the dongle.
□ Insert the **SSV1XPSMFWIN** software CD-ROM into the computer.
□ Launch installation.
□ Select the preferred language from the configuration menu.
□ Follow the guided installation procedure for the software.
□ Restart the computer.
□ Launch the software by clicking on the Safety Suite icon on the desktop.

The computer hardware requirements are as follows:
■ Processor (Intel Pentium II 400 MHz minimum, Intel Pentium III 800 MHz recommended).
■ RAM (128 Mb minimum, 256 Mb recommended).
■ Graphics card (2 Mb XGA, 1024 x 768, 256 colours minimum, 8 Mb XGA, 1280 x 1024 True colour recommended).
■ Hard disk (1 Gigabyte minimum).
■ Operating system:
□ Windows 2000 Professional with Service Pack 1 or higher.
□ Windows XP with Service pack 1.

Safety automation system solutions

Programming software XPSMFWIN for Preventa compact and modular safety PLCs XPS MF

Safety related communication

Safety related communication for the safety systems is performed using SafeEthernet protocol.
SafeEthernet is a TCP/IP based protocol that uses highly intelligent switches to provide extremely reliable deterministic communication.
Connection is made automatically between the master and slaves when assigning the slaves to the corresponding masters. Transmission speeds of up to 100 Mbps in Half duplex mode and 10 Mbps in Full duplex mode can be achieved and using Autonegotiation ensures the correct baud rates for the connection.
Each safety PLC can manage up to 64 safety connections. These 64 connections can comprise safety remote I/Os and other safety PLCs.
Communication between two safety PLCs is established via a Peer-Peer link. This Peer-Peer communication enables data between two or more safety PLCs to be communicated safely.
The connectivity of all the equipment enables centralised or decentralised networks to be established. It also enables safety PLCs and safety remote I/O modules to be connected anywhere on the network with only the assigning of an IP address, to each module, in the software.

Interface

XPSMFWIN features two distinct windows, one for internal configuration and one for hardware management.

- Project management

This window enables creation, archiving and recalling of all the user programs. It contains all the logic functions and predefined certified function blocks.

- Hardware management

This window enables all hardware specific data, inputs and outputs and signal transfer between safety controllers to be defined, as well as the various safety PLCs being used or safety remote I/O modules.

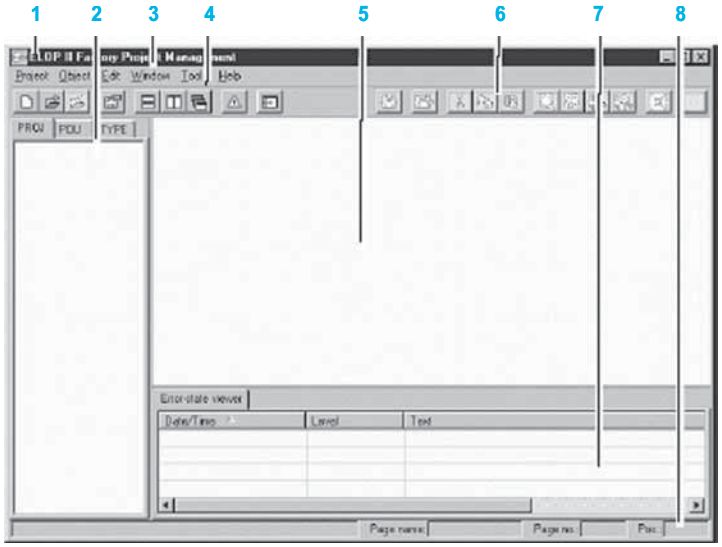
Items included in the XPSMFWIN interface

- Menu and title bar
- Toolbar and status bar
- Windows layout, structure window and work space
- Error display window

XPSMFWIN is a program offering numerous functions and features intuitive, Windows style, operation, making it a very user-friendly programming environment.

Project Management window layout

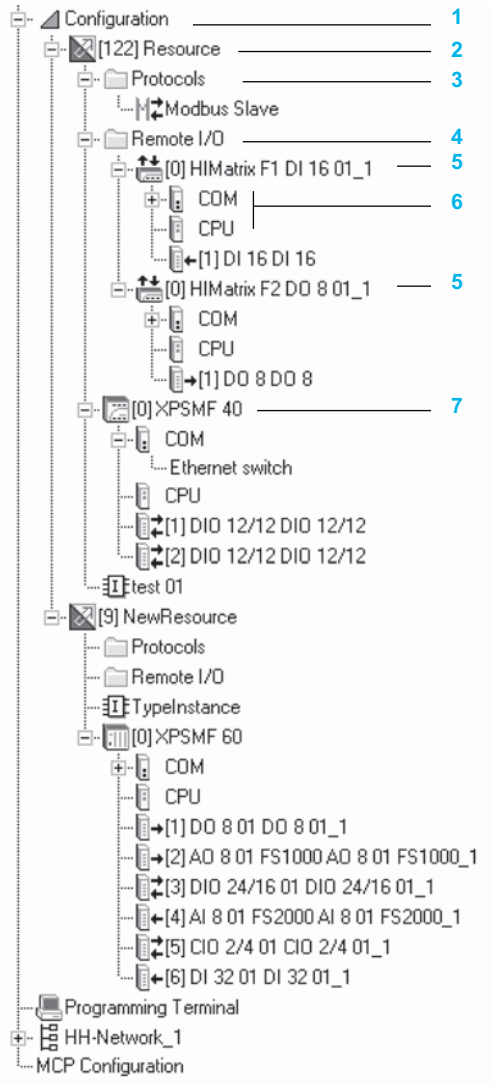
On launching software **XPSMFWIN**, the standard screen shown below opens.
This screen generally includes the following items:



1 Title bar.
2 Structure window.
3 Menu bar.
4 Project management toolbar.
5 Work space.
6 FBD (Function Block Diagram) editor toolbar.
7 Error display window.
8 Status bar with coordinate information of the function plan editor.

Safety automation system solutions

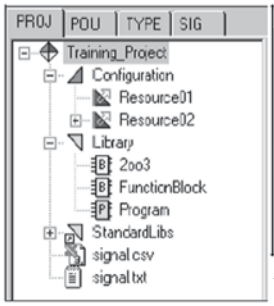
Programming software XPSMFWIN for Preventa compact and modular safety PLCs XPS MF



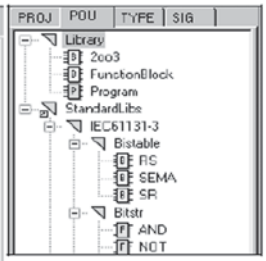
Structure window

1 Configuration.
2 Resource folder.
3 Communication protocols.
4 Remote I/O folder.
5 Remote I/O type.
6 Components and modules.
7 Resource type.

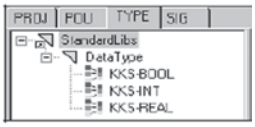
The structure window displays the hierarchical structure of the project. Selecting one of three views provides the user with different levels of detail.



Complete project



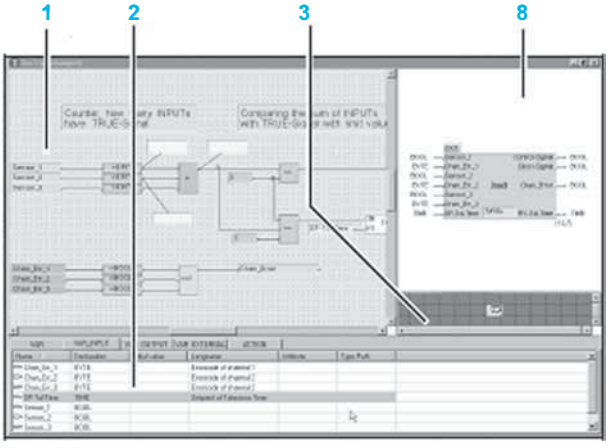
All POUs (Program Organisation Units)



All data types

FBD (Function Block Diagram) editor

Using this editor, the user can create function blocks in FBD (Function Block Diagram) language or SFC (Sequential Function Chart) language.
The FBD editor comprises the following panes:



1 Drawing field.
2 Variable declaration editor.
3 Overview window.
4 Interface declaration editor.

Safety automation system solutions

Programming software XPSMFWIN for Preventa compact and modular safety PLCs XPS MF

Programming

Software **XPSMFWIN** enables programming of the entire range of Preventa safety PLCs **XPS MF**.
The powerful and easy to use methodology of this software enables users to quickly and simply familiarise themselves with the product. The Windows based look and user-friendliness provides users with trouble free operation of the software.

On launching the software, the program's start-up assistant opens simultaneously. This assistant enables the user to easily open a new or existing file, delete a file or archive a file. Once a new or existing file is opened, the user quickly accesses the working environment.

Configuration

The user can begin creating a configuration as soon as a personal library is set-up, that will contain the user configuration(s).
Once the personal library is opened, the user can use the standard library function blocks (And, Or, Not, Flip-Flop, etc.) to create exactly what is required.

The user drags the function blocks into the configuration environment and places them where required. Once the function blocks are placed, the user can define specific signals or variables for the inputs and outputs.

The Hardware menu enables assigning of all the signals to the relevant inputs and outputs.

From within the Hardware menu the relevant safety PLCs are selected using the pull-down menu of each resource.
To add additional safety PLCs a new resource is easily created and assigned with the type of safety PLC.

Up to 64 remote inputs/outputs can be assigned to each safety PLC.
Once all the safety PLCs and remote I/Os have been selected, the signals can be simply connected to the relevant safety modules.
The "drag and drop" function enables defining of the inputs and outputs.

Therefore, configuration is very quick and simple.
Once all the inputs and outputs have been defined the user can compile the entire program, which is performed in the configuration menu.
Compilation must be performed twice and the results of both compilations printed and compared. If both results match, the program can be downloaded via the Ethernet RJ45 communication port on any of the safety PLCs.

Program execution

The program will automatically be stored in all the safety PLCs.
The safety PLCs can then execute the configuration and full diagnostics can be viewed on screen.
The software incorporates various diagnostic options that can be used to quickly identify the presence of errors. Some of these diagnostic options are "On-line test": which displays the logic condition of all the I/Os. Others allow the user to view the status of the transmission line, the cycle time and errors that have occurred on the communication line.

The programming tool enables the user to create and design to suit their needs. Other certified function blocks are available, which enable the overall configuration time to be further reduced. Included in these additional blocks are "Muting" and "Emergency stop" functions, together with 12 other certified functions.

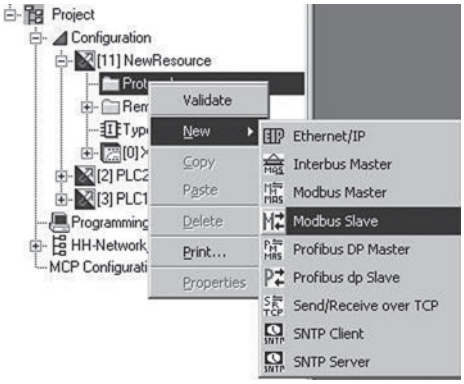
Modbus TCP/IP, Modbus serial (RTU) and PROFIBUS DP protocols are included in software **XPSMFWIN**. They can be used for non safety related data transfer.

Safety automation system solutions
Programming software XPSMFWIN for Preventa compact and modular safety PLCs XPS MF

Non safety related communication protocols

Modbus TCP/IP server (slave)

The **XPS MF** range of safety PLCs (**XPS MFCPU22**, **XPS MF40●2**, **XPS MF35●2**, **XPS MF3022** and **XPS MF31222**) allow the communication of non safety related data on an Ethernet network via a Modbus TCP/IP link.

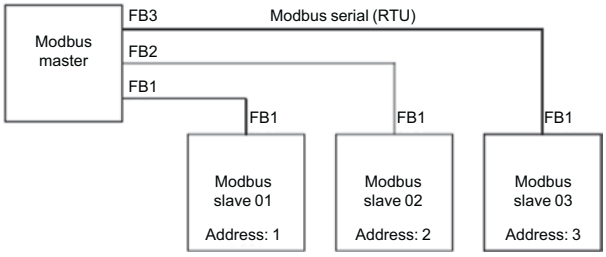


On the Ethernet network, several masters (clients) can read data provided by several slaves (servers).

Creation of Modbus TCP/IP servers is quick and simple: Select Protocols / New / Modbus Slave.

Modbus serial (RTU)

The **XPS MF** range of safety PLCs (**XPS MFCPU22**, **XPS MF402●**, **XPS MF352●** and **XPS MF3022**) allow the communication of non safety related data on a Modbus serial (RTU) link.
On the Modbus serial network, a master can read the data provided by several slaves on a network segment.



Creation of Modbus (RTU) servers is quick and simple: Select Protocols / New / Modbus Slave.
Select the serial option in the properties window to activate, then select the signals to send and receive from your standard automation system equipment.

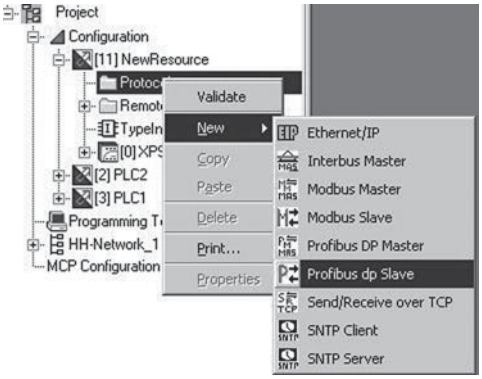
Safety automation system solutions

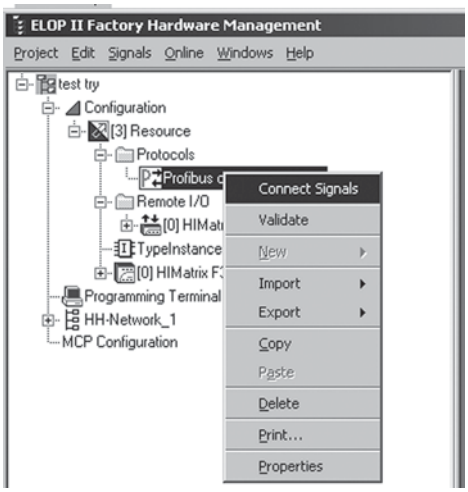
Programming software XPSMFWIN for Preventa compact and modular safety PLCs XPS MF

Non safety related communication protocols

PROFIBUS DP

To create a PROFIBUS DP slave on a resource (PLC), a project must be created. Safety PLCs **XPS MF404●** and **XPS MF3542** are PROFIBUS DP V0 slaves. Within hardware management, assignment of PROFIBUS DP slaves is simple: Select Protocols / New / PROFIBUS DP slave from the protocol tag of a resource.





The PROFIBUS DP Slave menu contains the following fields:
□ Connect signals tab: for connecting the inputs and outputs to and from the safety PLC, and predefined signals for diagnostics.
□ Import and Export tool: used for importing and exporting the signal list to/from a .CSV format file (format that can be imported into a standard automation PLC).
□ Properties tab: enabling setting of the station address, interface, baud rate and data refresh rate.

Safety automation system solutions
Preventa safety PLCs
Compact and modular, XPS MF
Safety remote input, output and input/output modules
XPS MF1/2/3

2

Presentation

Remote input, output and input/output modules:
- Location: within the vicinity of machines to be monitored.
- Extension of the I/O capacity of compact and modular safety PLCs.
- Designed for use in safety related parts of control systems up to category 4 conforming to EN 954-1, up to performance level “e” conforming to EN/ISO 13849-1, and up to SIL 3 conforming to EN/IEC 61508.







*Products referenced **XPS MF1DI1601** and **XPS MF2●●●●●●** are marked **HIMatrix F1DI** and **HIMatrix F2DI** (manufactured by Hima, sold by Schneider Electric).*

User memory		Application	–		
		Data	–		
Response time			Depending on size of application		
Maximum consumption			0.8 A	0.5 A	9 A
Supply			External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)		
Inputs	**Digital**	Number of channels	16, not electrically isolated	–	–
		Current at state 0	1.5 mA max., 1 mA at 5 V	–	–
		Current at state 1	≥ 2 mA at ⎓ 15 V	–	–
	Analogue	Number of channels	–	–	–
		Range: voltage/current	–	–	–
	Counting	Number of channels	–	–	–
		Current	–	–	–
Outputs	**Digital**	Number of channels	–	4, not electrically isolated	16, not electrically isolated
		Output current	–	5 A max.	1 A max. at 60 °C, 2 A max. at 40 °C
	Analogue	Number of channels	–	–	–
		Range: voltage/current	–	–	–
	Relay	Number	–	–	–
		Switching voltage	–	–	–
	Line control	Number	4, not electrically isolated	–	–
		Current/Voltage	60 mA/20 V	–	–
Input/output connections			Removable screw terminal blocks *(1)*		
Safety communication on Ethernet network using SafeEthernet protocol			Yes, access to network via integrated 2 RJ45 switched Ethernet communications ports		
Safety remote I/O module type			**XPS MF1DI1601**	**XPS MF2DO401**	**XPS MF2DO1601**
See page			2/78	2/85	

*(1) Removable screw terminal blocks are provided with safety remote I/O modules **XPS MF1/2/3**.*



*Products referenced **XPS MF2●●●●●●●** and **XPS MF3●●●●●●●** are marked **HIMatrix F2DO** and **HIMatrix F3...** (manufactured by Hima, sold by Schneider Electric).*

–					
–					
Depending on size of application					
0.6 A	0.6 A	8 A	14 A	8 A	0.8 A
External ⎓ 24 V supply (with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)					
–	–	8, not electrically isolated	16, not electrically isolated	20, not electrically isolated	–
–	–	1.5 mA max. 1.25 mA at ⎓ 5 V	1.5 mA max. 1 mA at ⎓ 5 V	1.5 mA max. 1.25 mA at ⎓ 5 V	–
–	–	> 2 mA at ⎓ 15 V	> 2 mA at ⎓ 15 V	⩾ 2 mA at ⎓ 15 V	–
–	–	–	–	–	8 single-pole
–	–	–	–	–	⎓ 0…10 V/0…20 mA *(1)*
–	–	–	–	–	–
–	–	–	–	–	–
–	–	8 DO+ (reference pole L-) 2 DO- (reference pole S+)	8 2-pole or 16 single-pole, not electrically isolated	8, not electrically isolated *(2)*	–
–	–	DO+: channels 1 to 3 and 5 to 7: 0.5 A at 60 °C channels 4 and 8: 1 A at 60 °C, 2 A at 40 °C DO-: channels 1 and 2: 1 A at 60 °C	2 A max. at 40 °C, 1 A max. at 60 °C, 10 mA min.	Channels 1 to 3 and 5 to 7: 0.5 A at 60 °C Channels 4 and 8: 1 A at 60 °C, 2 A at 50 °C	–
–	–	–	–	–	4 non safety related outputs
–	–	–	–	–	Usable range: 0…20 mA Nominal range: 4…20 mA
8	16	–	–	–	–
⩾ 5 V, ⩽ ⎓ 250 V/ ∼ 250 V	⩾ 5 V, ⩽ ⎓ 30 V/ ∼ 60 V	–	–	–	–
–	–	2, not electrically isolated		–	–
–	–	60 mA/20 V	60 mA/20 V	–	–
Removable screw terminal blocks *(3)*					
Yes, access to network via integrated 2 RJ45 switched Ethernet communications ports					
XPS MF2DO801	**XPS MF2DO1602**	**XPS MF3DIO8801**	**XPS MF3DIO16801**	**XPS MF3DIO20802**	**XPS MF3AIO8401**
2/85		2/97			

(1) With 500 Ω shunt
(2) Configurable for Line control.
*(3) Removable screw terminal blocks are provided with safety remote I/O modules **XPS MF1/2/3**.*

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XPS MF1DI1601

*This product, referenced **XPS MF1DI1601**, is marked **HIMatrix F1DI** (manufactured by Hima, sold by Schneider Electric).*

Presentation

XPS MF1DI1601 is a compact safety remote input module which is designed to extend the input capacity of safety PLCs **XPS MF,** either compact or modular, to which it is associated.
The communication with either the compact or modular safety PLCs is managed via one of its' integrated 2 RJ45 switched Ethernet communications ports.
The safety remote input module **XPS MF1DI1601** does not have a user program: it receives its instructions from its' parent safety PLC.

Safety remote input module XPS MF1DI1601

Remote digital inputs		
N°	**Safety detection**	**Safety dialogue**
16	Limit switches, Guard switches, with reset and with actuator, Safety light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…

Remote line control outputs	
N°	
4	Short-circuit and line break monitoring

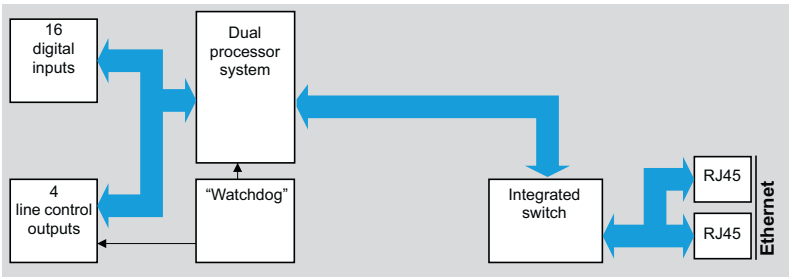
Line control

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety modules.
Example: The line control outputs 1 to 4 are connected to the digital inputs 1 to 16.

Safety PLCs

In order to meet safety requirements, the safety remote input module **XPS MF1DI1601** incorporates two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level "e" conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between this safety remote input module and the safety PLCs (**Special Switch**).
■ **Redundancy**: the dual processor integrated in the safety remote input module **XPS MF1DI1601** analyses and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring ("Watchdog")**: the safety remote input module **XPS MF1DI1601** continuously monitors the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs of the safety module on the Ethernet network, whilst avoiding signal collisions and excessive amounts of data on the network.

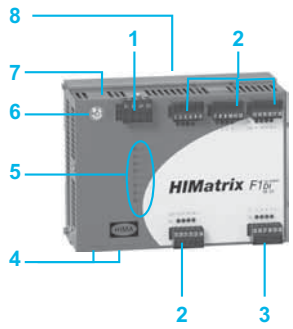
Functional synoptic



Safety communication on Ethernet network

The safety input module **XPS MF1DI1601** incorporates two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, that enable communication on the Ethernet network using SafeEthernet communication protocol and therefore, data exchange with compact or modular safety PLCs **XPS MF**.

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Description

Safety remote input module XPS MF1DI1601

On the front face of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Four terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
3 One terminal block *(1)* for connection of digital line control outputs, with four digital output status LEDs.
4 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
5 Eight process status LEDs.
6 One earth connection screw.
7 **On the top**: one “Reset” button.
8 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.

Status LED details

Safety remote input module XPS MF1DI1601

LED	Colour	Status	Meaning
Inputs 1…16	Orange	On	Inputs active.
Outputs 1…4	Orange	On	Outputs active.
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energised state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware fault detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred whilst writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

*(1) Removable screw terminals are provided with safety input module **XPS MF1DI1601**.*

Safety automation system solutions
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Characteristics

Safety remote input module type			XPS MF1DI1601
Supply voltage		**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)
Voltage limits		**V**	- 15…+ 20%
Ambient air temperature	For operation	**°C**	0…+ 60
	For storage	**°C**	- 40…+ 85
Degree of protection			IP 20
Response time		**ms**	Depending on size of application
Current consumption		**A**	0.8 max.
Backup battery			None
Digital inputs			
Number			16, not electrically isolated
Permissible current	At state 1	**mA**	≥ 2 at ⎓ 15 V
	At state 0	**mA**	1.5 max., 1 mA at 5 V
Switching point		**V**	Typically 7.5
Switching time		**µs**	250
Input supply			4 x 19.2 V/40 mA (on 24 V), protected against short-circuits
Line control outputs			
Number			4, not electrically isolated
Output voltage		**V**	20 (approximately, depending on the supply voltage)
Output current		**mA**	60
Minimum load			None
Response to overload			4 x ≥ 19.2 V, short-circuit current 60 mA at 24 V
Connections			See page 2/26

Communication

Ethernet network: safety communication using SafeEthernet protocol			
Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	Mbps	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)

References



XPS MF1DI1601

*This product, referenced **XPS MF1DI1601**, is marked **HIMatrix F1DI** (manufactured by Hima, sold by Schneider Electric).*

Safety remote input module (⎓ 24 V supply)

For use with	Digital inputs	Line control outputs	Ports	Reference	Weight kg
Safety PLCs, modular XPS MF60 or compact XPS MF40 and XPS MF31/30/35	16	4	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF1DI1601**	0.700

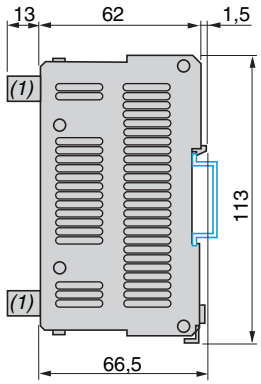
Connecting cables

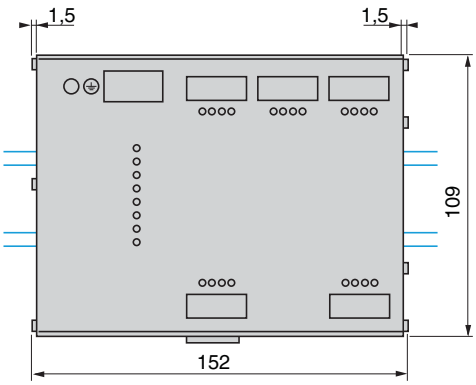
Description	For	Reference	Weight kg
Ethernet network connecting cables	Connection between safety remote input modules and modular or compact safety PLCs XPS MF RJ45 connector fitted at each end	See 2/29	–

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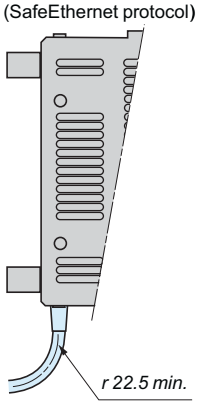
Dimensions

XPS MF1DI1601





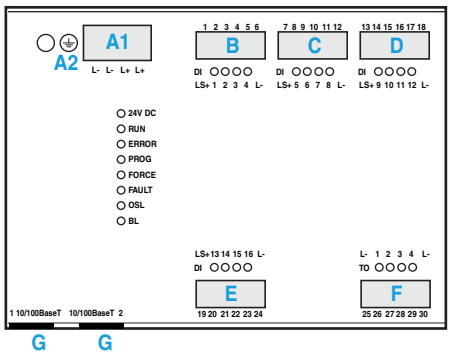
RJ45 connector for access to Ethernet network (SafeEthernet protocol)



*(1) Removable screw terminals are provided with safety input module **XPS MF1DI1601**.*

Connections

XPS MF1DI1601



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Earth**	–	⏚	Earth
B	**Digital inputs**	1	LS+	Sensor supply for inputs 1 to 4
		2	1	Digital input 1
		3	2	Digital input 2
		4	3	Digital input 3
		5	4	Digital input 4
		6	L-	Reference pole
C	**Digital inputs**	7	LS+	Sensor supply for inputs 5 to 8
		8	5	Digital input 5
		9	6	Digital input 6
		10	7	Digital input 7
		11	8	Digital input 8
		12	L-	Reference pole
D	**Digital inputs**	13	LS+	Sensor supply for inputs 9 to 12
		14	9	Digital input 9
		15	10	Digital input 10
		16	11	Digital input 11
		17	12	Digital input 12
		18	L-	Reference pole
E	**Digital inputs**	19	LS+	Sensor supply for inputs 13 to 16
		20	13	Digital input 13
		21	14	Digital input 14
		22	15	Digital input 15
		23	16	Digital input 16
		24	L-	Reference pole
F	**Line control outputs**	25	L+	Outputs common
		26	1	Output 1
		27	2	Output 2
		28	3	Output 3
		29	4	Output 4
		30	L-	Outputs common

Item	Connection	Type	Function
G	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPSMF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

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XPS MF2DO401



XPS MF2DO1601



XPS MF2DO801



XPS MF2DO801

*Products referenced **XPS MF2●●●●●●** are marked **HIMatrix F2 DO...** (manufactured by Hima, sold by Schneider Electric).*

Presentation

XPS MF2DO●●●● are compact safety remote output modules which are designed to extend the output capacity of safety PLCs **XPS MF**, either compact or modular, to which they are associated.
The communication with either the compact or modular safety PLCs is managed via one of its' integrated 2 RJ45 switched Ethernet communications ports.
Safety modules **XPS MF2DO●●●●** do not have a user program: they receive their instructions from its' parent safety PLC.

Safety remote output modules XPS MF2DO●●●●

Safety output modules	Remote outputs		
	Nb	Type	
XPS MF2DO401	**4**	Digital power outputs	**Safety actuators:** Contactors-motors, Control relays, Variable speed drives… **Safety dialogue:** Beacons and indicator banks, rotating mirror beacons, sirens…
XPS MF2DO1601	**16**	Digital outputs	
XPS MF2DO801	**8**	Relay outputs	
XPS MF2DO1602	**16**	Relay outputs	

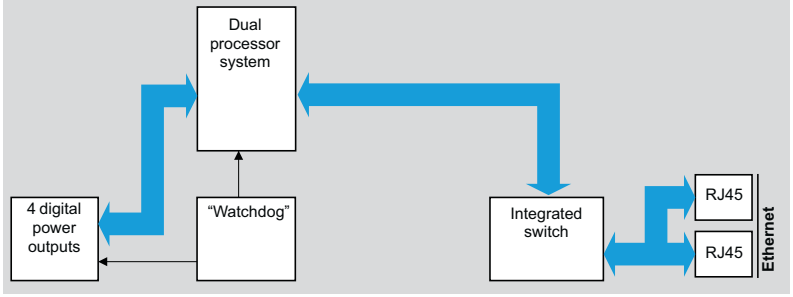
Safety PLCs

In order to meet safety requirements, the safety remote output modules **XPS MF2DO●●●●** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level "e" conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between these safety remote output modules and the safety PLCs (**Special Switch**).

■ **Redundancy**: the dual processor integrated in the safety remote output modules **XPS MF2** analyses and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring ("Watchdog")**: the safety remote output modules **XPS MF2** continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the outputs of the safety modules on the Ethernet network, whilst avoiding signal collisions and excessive amounts of data on the network.

Functional synoptics

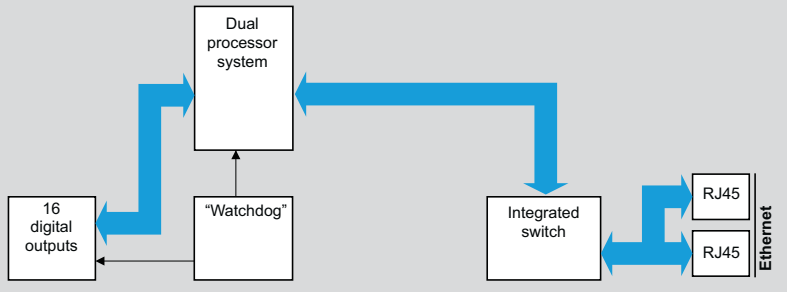
Remote output module XPS MF2DO401



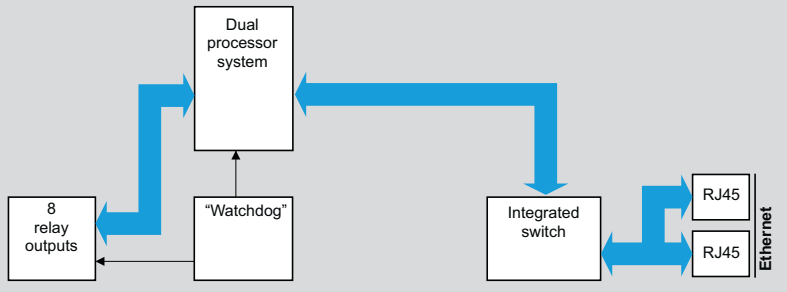
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Functional synoptics (continued)

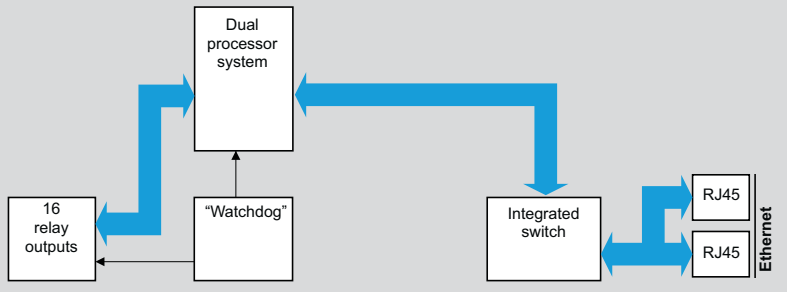
Remote output module XPS MF2DO801



Remote output module XPS MF2DO801



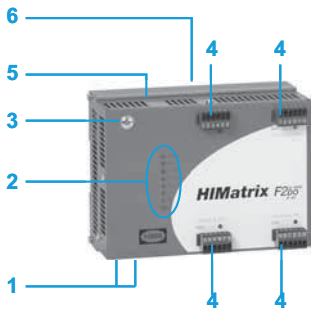
Remote output module XPS MF2DO1602



Safety communication on Ethernet network

The safety remote output modules **XPS MF2DO●●●●** incorporate two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, that enable communication on the Ethernet network using SafeEthernet communication protocol and therefore, data exchange with compact or modular safety PLCs **XPS MF**.

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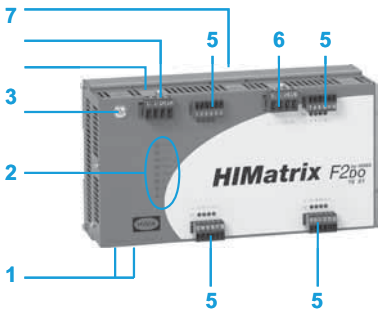


Description

Remote output module XPS MF2DO401

On the front face of the metal enclosure:

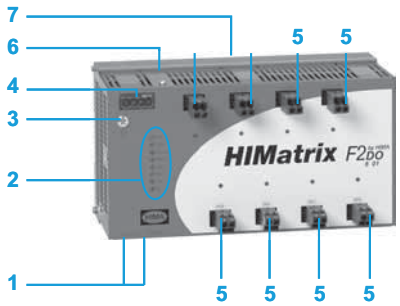
1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 Eight process status LEDs.
3 One earth connection screw.
4 Four terminal blocks *(1)* for connection of digital outputs, with output status LED (one LED per terminal block).
5 **On the top**: one “Reset” button.
6 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.



Remote output module XPS MF2DO1601

On the front face of the metal enclosure:

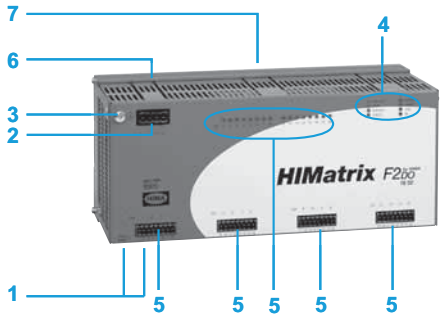
1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 Eight process status LEDs.
3 One earth connection screw.
4 One terminal block *(1)* for ⎓ 24 V supply.
5 Four terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block).
6 One terminal block for connection of output channels.
7 **On the top**: one “Reset” button.
8 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.



Remote output module XPS MF2DO801

On the front face of the metal enclosure:

1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 Eight process status LEDs.
3 One earth connection screw.
4 One terminal block *(1)* for ⎓ 24 V supply.
5 Eight terminal blocks *(1)* for connection of relay outputs, with output status LED (one LED per terminal block).
6 **On the top**: one “Reset” button.
7 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.



Remote output module XPS MF2DO1602

On the front face of the metal enclosure:

1 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
2 One terminal block *(1)* for ⎓ 24 V supply.
3 One earth connection screw.
4 Eight process status LEDs.
5 Four terminal blocks *(1)* for connection of relay outputs, with relay output status LEDs.
6 **On the top**: one “Reset” button.
7 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.

*(1) Removable screw terminals are provided with the safety output modules **XPS MF2**.*

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Safety remote output modules XPS MF2

Status LED details

Safety remote output modules XPS MF2DO●●●●

LED	Colour	Status	Meaning
Outputs 1…16	Orange	On	Outputs active.
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energised state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware fault detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred whilst writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

Safety automation system solutions
Preventa safety PLCs
Compact and modular
Safety remote output modules XPS MF2

Characteristics

Safety remote output module type			XPS MF2DO401	XPS MF2DO1601	XPS MF2DO801	XPS MF2DO1602
Supply voltage		**V**	⎓ 24 (external supply with separate protection conforming to EN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)			
Voltage limits		**V**	- 15…+ 20%			
Ambient air temperature	For operation	**°C**	0…+ 60			
	For storage	**°C**	- 40…+ 85			
Degree of protection			IP 20			
Response time		**ms**	Depending on size of application			
Maximum current consumption		**A**	0.5	9 per group Residual: 0.2 per group	0.6	
External fuse			10 A, slow blow			
Backup battery			None			
Connections			See page 2/26			
Digital outputs						
Number of outputs			4, not electrically isolated	16, not electrically isolated	–	
Permissible output channel current		**A**	20 max.	16 max.	–	
Output current		**A**	5 max.	1 max. at 60 °C 2 max. at 40 °C	–	
Maximum lamp load		**W**	60	10 for 1 A outputs 25 for 2 A outputs	–	
Maximum inductive load		**mH**	500	500	–	
Maximum leakage current	At state 0	**mA**	1 at 1 V	1 at 2 V	–	
Response to overload			Shutdown of outputs concerned with cyclic reconnection		–	
Relay outputs						
Relay type per channel			–	–	2, with positively guided contacts 1 magnetic, high resolution	
Outputs	Number		–	–	8	16
	Type				N/O volt-free contacts (diversity factor)	
Switching voltage		**V**	–	–	⩾ 5, ⩽ ⎓ 250 V/ ∼ 250 V	⩾ 5, ⩽ ⎓ 30 V/ ∼ 60 V
Switching current		**mA**			3 A, with internal fuse Breaking capacity 100 A	3.15 A, with internal fuse Breaking capacity 100 A
Switching capacity (non inductive)	∼	**VA**	–	–	240 max., cos φ > 0.5	48 max., cos φ > 0.5
	Up to ⎓ 30 V	**W**			90 max. (3.15 A internal fuse)	
	Up to ⎓ 70 V	**W**			35 max. (0.5 A internal fuse)	–
	Up to ⎓ 127 V	**W**			30 max. (315 A internal fuse)	–
Contact material			–	–	Silver alloy	
Mechanical life			–	–	⩾ 1 million operating cycles	
Electrical life			–	–	⩾ 250 000 operating cycles on full load (resistive) and ⩽ 0.1 operating cycles/s	

Communication

Ethernet network: safety communication using SafeEthernet protocol

Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation
Structure			10BASE-T/100BASE-TX
Medium			Dual twisted pair cable, category 5D or better (Ethernet)

Characteristics: page 2/84 | References: page 2/85 | Dimensions, mounting: page 2/86 | Connections: page 2/88 | Presentation: page 2/80

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References



XPS MF2DO401



XPS MF2DO1601



XPS MF2DO801



XPS MF2DO1602

*Products referenced **XPS MF2●●●●●●** are marked **HIMatrix F2 DO...** (manufactured by Hima, sold by Schneider Electric).*

Safety remote output modules (⎓ 24 V supply)

For use with	Outputs		Ports	Reference	Weight kg
	Digital	Relay			
Safety PLCs, modular XPS MF60 or compact XPS MF40 and XPS MF31/30/35	4	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF2DO401**	0.800
	16	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF2DO1601**	0.850
	–	8	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF2DO801**	1.300
	–	16	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF2DO1602**	2.000

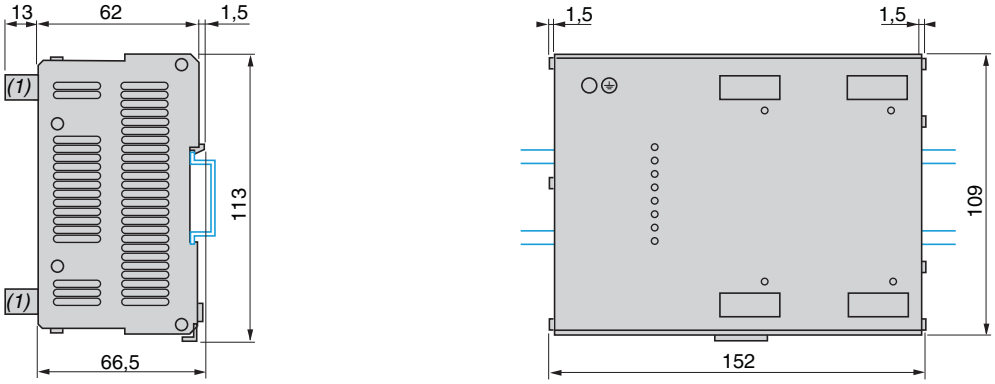
Connecting cables

Description	For	Reference	Weight kg
Ethernet network connecting cables	Connection between safety remote output modules and modular or compact safety PLCs XPS MF RJ45 connector fitted at each end	See page 2/29	–

2

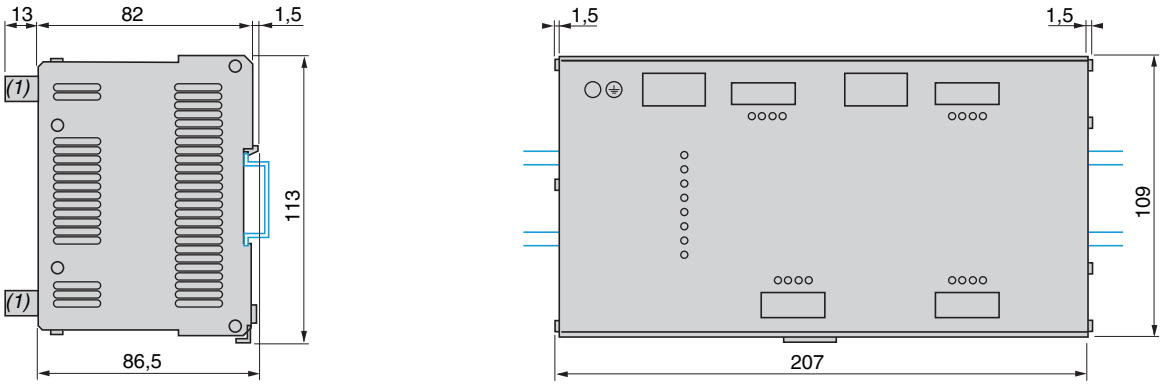
Dimensions

XPS MF2DO401



*(1) Removable screw terminals are provided with the safety output modules **XPS MF2DO401**.*

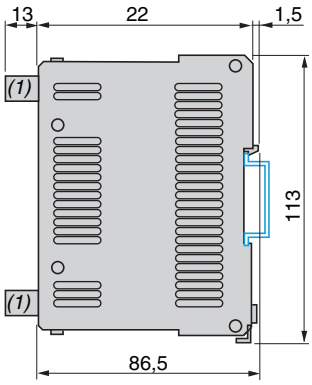
XPS MF2DO1601

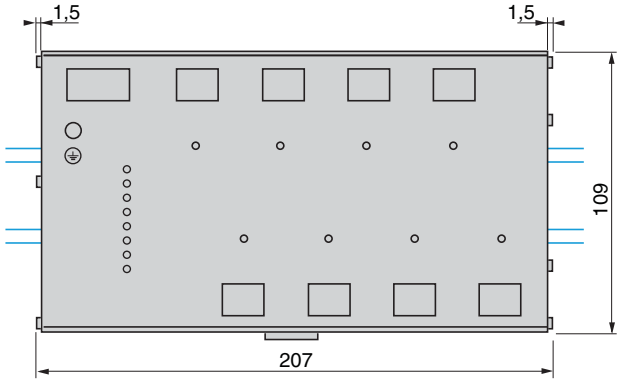


*(1) Removable screw terminals are provided with the safety output modules **XPS MF2DO1601**.*

Dimensions

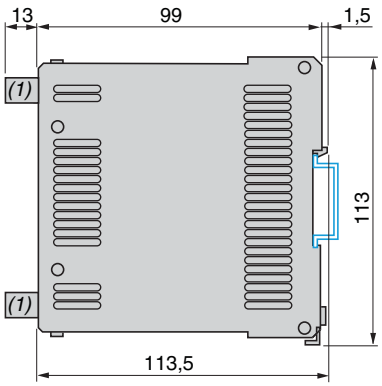
XPS MF2DO801

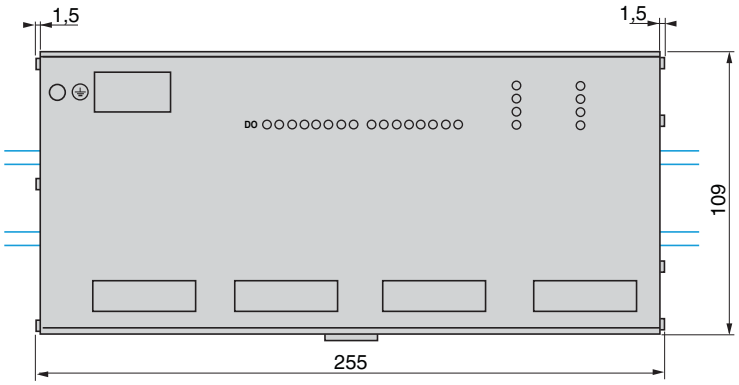




*(1) Removable screw terminals are provided with the safety output modules **XPS MF2DO801**.*

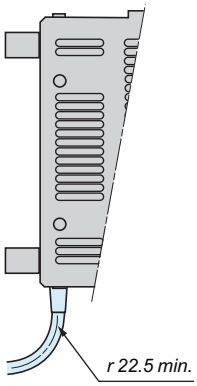
XPS MF2DO1602





*(1) Removable screw terminals are provided with the safety output modules **XPS MF2DO1602**.*

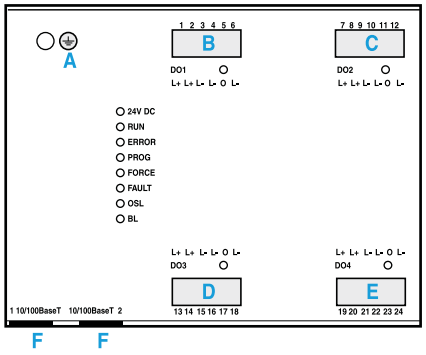
RJ45 connector for access to Ethernet network (SafeEthernet protocol)



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Connections

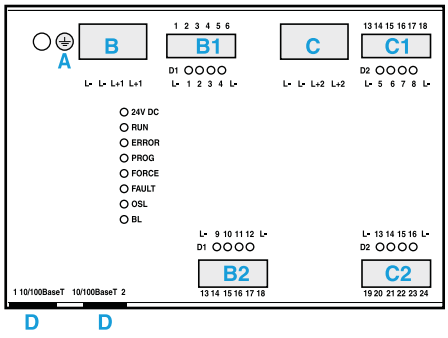
XPS MF2DO401



Item	Connection	Screw N°	Screw	Function
A	**Earth**	–	⏚	Earth
B	**Digital output 1**	1	L+	Supply for output 1
		2	L+	Supply for output 1
		3	L-	Reference pole
		4	L-	Reference pole
		5	O	Digital output 1
		6	L-	Reference pole
C	**Digital output 2**	7	L+	Supply for output 2
		8	L+	Supply for output 2
		9	L-	Reference pole
		10	L-	Reference pole
		11	O	Digital output 2
		12	L-	Reference pole
D	**Digital output 3**	13	L+	Supply for output 3
		14	L+	Supply for output 3
		15	L-	Reference pole
		16	L-	Reference pole
		17	O	Digital output 3
		18	L-	Reference pole
E	**Digital output 4**	19	L+	Supply for output 4
		20	L+	Supply for output 4
		21	L-	Reference pole
		22	L-	Reference pole
		23	O	Digital output 4
		24	L-	Reference pole

Item	Connection	Type	Function
F	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

XPS MF2DO1601



Item	Connection	Screw N°	Screw	Function
A	**Earth**	–	⏚	Earth
B	**Supply**	–	L-	Reference pole
		–	L-	Reference pole
		–	L+	Supply for outputs 1, 2, 3, 4, 9, 10, 11, 12
		–	L+	Supply for outputs 1, 2, 3, 4, 9, 10, 11, 12
B1	**Digital outputs**	1	L-	Reference pole
		2	1	Digital output 1
		3	2	Digital output 2
		4	3	Digital output 3
		5	4	Digital output 4
		6	L-	Reference pole
B2	**Digital outputs**	13	L-	Reference pole
		14	9	Digital output 9
		15	10	Digital output 10
		16	11	Digital output 11
		17	12	Digital output 12
		18	L-	Reference pole
C	**Supply**	–	L-	Reference pole
		–	L-	Reference pole
		–	L+	Supply for outputs 5, 6, 7, 8, 13, 14, 15, 16
		–	L+	Supply for outputs 5, 6, 7, 8, 13, 14, 15, 16
C1	**Digital outputs**	7	L-	Reference pole
		8	5	Digital output 5
		9	6	Digital output 6
		10	7	Digital output 7
		11	8	Digital output 8
		12	L-	Reference pole
C2	**Digital outputs**	19	L-	Reference pole
		20	13	Digital output 13
		21	14	Digital output 14
		22	15	Digital output 15
		23	16	Digital output 16
		24	L-	Reference pole

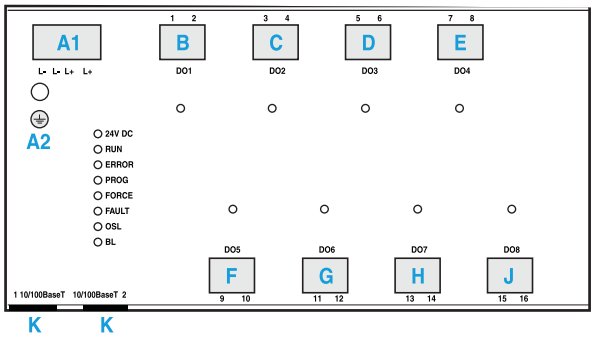
Item	Connection	Type	Function
D	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Characteristics: page 2/84 | References: page 2/85 | Dimensions, mounting: page 2/86 | Connections: page 2/88 | Presentation: page 2/80

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Connections

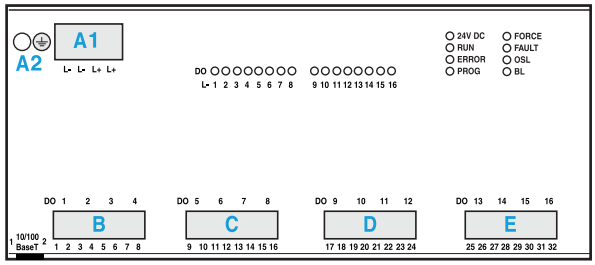
XPS MF2DO801



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	Supply for relay outputs
		–	L+	Supply for relay outputs
		–	L-	Reference pole
		–	L-	Reference pole
A2	**Earth**	–	⏚	Earth
B	**Relay output 1**	1	–	Contact 1, terminal A
		2	–	Contact 1, terminal B
C	**Relay output 2**	3	–	Contact 2, terminal A
		4	–	Contact 2, terminal B
D	**Relay output 3**	5	–	Contact 3, terminal A
		6	–	Contact 3, terminal B
E	**Relay output 4**	7	–	Contact 4, terminal A
		8	–	Contact 4, terminal B
F	**Relay output 5**	9	–	Contact 5, terminal A
		10	–	Contact 5, terminal B
G	**Relay output 6**	11	–	Contact 6, terminal A
		12	–	Contact 6, terminal B
H	**Relay output 7**	13	–	Contact 7, terminal A
		14	–	Contact 7, terminal B
J	**Relay output 8**	15	–	Contact 8, terminal A
		16	–	Contact 8, terminal B

Item	Connection	Type	Function
K	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

XPS MF2DO1602



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	Supply for relay outputs
		–	L+	Supply for relay outputs
		–	L-	Reference pole
		–	L-	Reference pole
A2	**Earth**	–	⏚	Earth
B	**Relay outputs 1 to 4**	1	–	Contact 1, terminal A
		2	–	Contact 1, terminal B
		3	–	Contact 2, terminal A
		4	–	Contact 2, terminal B
		5	–	Contact 3, terminal A
		6	–	Contact 3, terminal B
		7	–	Contact 4, terminal A
		8	–	Contact 4, terminal B
C	**Relay outputs 5 to 8**	9	–	Contact 5, terminal A
		10	–	Contact 5, terminal B
		11	–	Contact 6, terminal A
		12	–	Contact 6, terminal B
		13	–	Contact 7, terminal A
		14	–	Contact 7, terminal B
		15	–	Contact 8, terminal A
		16	–	Contact 8, terminal B
D	**Relay outputs 9 to 12**	17	–	Contact 9, terminal A
		18	–	Contact 9, terminal B
		19	–	Contact 10, terminal A
		20	–	Contact 10, terminal B
		21	–	Contact 11, terminal A
		22	–	Contact 11, terminal B
		23	–	Contact 12, terminal A
		24	–	Contact 12, terminal B
E	**Relay outputs 13 to 16**	25	–	Contact 13, terminal A
		26	–	Contact 13, terminal B
		27	–	Contact 14, terminal A
		28	–	Contact 14, terminal B
		29	–	Contact 15, terminal A
		30	–	Contact 15, terminal B
		31	–	Contact 16, terminal A
		32	–	Contact 16, terminal B

Item	Connection	Type	Function
F	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

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XPS MF3DIO8801



XPS MF3DIO16801



XPS MF3DIO20802



XPS MF3AIO8401

*Products referenced **XPS MF3●●●●●●** are marked **HIMatrix F3...** (manufactured by Hima, sold by Schneider Electric).*

Presentation

XPS MF3DIO/AIO are compact safety remote input/output modules which are designed to extend the I/O capacity of safety PLCs **XPS MF**, either compact or modular, to which they are associated.
The communication with either the compact or modular safety PLCs is managed via one of its' integrated 2 RJ45 switched Ethernet communications ports.
Safety modules **XPS MF3DIO/AIO** do not have a user program: they receive their instructions from its' parent safety PLC.

Safety remote mixed I/O modules XPS MF3DIO/AIO

Mixed I/O safety modules	Remote inputs		Remote outputs	
	N°	Type	N°	Type
XPS MF3DIO8801	**8**	Digital	**8 DO+ / 2 DO-**	Digital
			2	Line control
XPS MF3DIO16801	**16**	Digital	**8 2-pole or 16 single-pole**	Digital
			2	Line control
XPS MF3DIO20802	**20**	Digital	**8**	Digital
XPS MF3AIO8401	**8**	Analogue	**4**	Analogue (non safety outputs)

Examples of remote inputs of safety modules XPS MF3●IO●●●●●

■ **Digital inputs**

Safety actuators	Safety detection	Safety dialogue
Contactors-motors, Control relays, Variable speed drives…	Limit switches, Guard switches, with reset and with actuator, Safety light curtains type 2 and type 4, Safety mats and sensing edges…	Mushroom head Emergency stops, Enclosures for control and signalling units, Two-hand control stations…

■ **Analogue inputs**

Closed circuit scanning of input channels,
Single-pole measuring of 0 to 10 V voltages,
Measuring, using shunt, 0/4 to 20 mA currents (with 500 Ω external resistor).

Examples of remote outputs of safety modules XPS MF3●IO●●●●●

■ **Digital outputs**

Safety actuators	Safety dialogue
Contactors-motors, Control relays, Variable speed drives…	Beacons and indicator banks, Rotating mirror beacons, Sirens…

■ **Line control outputs**

Short-circuit and line break monitoring

■ **Analogue outputs**

Closed circuit scanning of output channels,
Single-pole measuring of 0 to 10 V voltages,
Measuring, using shunt, 0/4 to 20 mA currents (with 500 Ω external resistor).

Characteristics: page 2/95
References: page 2/97
Dimensions, mounting: page 2/98
Connections: page 2/100

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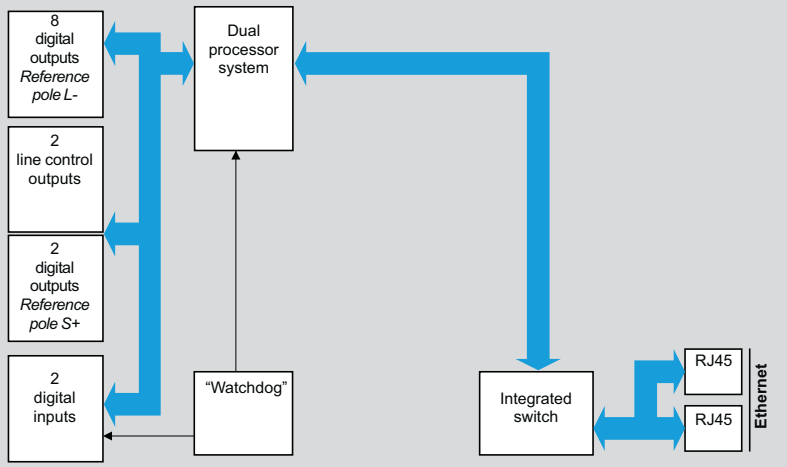
Safety PLCs

In order to meet safety requirements, the safety remote mixed I/O modules **XPS MF3●IO●●●●●** incorporate two essential functions (**Redundancy** and **Self-monitoring)** complying to category 4 conforming to EN 954-1 and performance level “e” conforming to EN/ISO 13849-1 in addition to the SafeEthernet safety communication protocol between these safety remote mixed I/O modules and the safety PLCs (**Special Switch**).

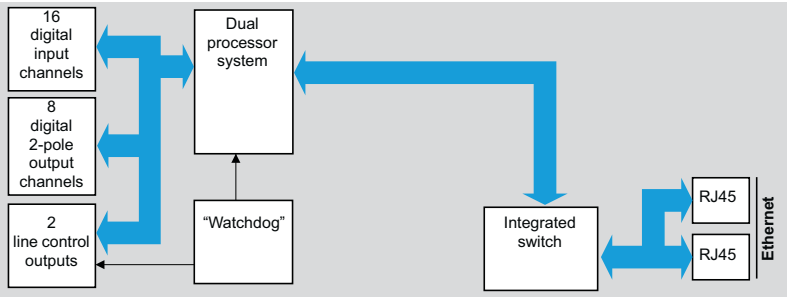
■ **Redundancy**: the dual processor integrated in safety modules **XPS MF3●IO●●●●●** analyses and compares the data received from the safety inputs and outputs. The incoming and outgoing data (programmed values and received values) are received in parallel by the two processors and compared in real-time.
■ **Self-monitoring (“Watchdog”)**: the safety remote mixed I/O modules **XPS MF3●IO●●●●●** continuously monitor the data processing cycle and the execution of tasks, and intervenes if the cycle time does not conform to the predefined value.
■ **The integrated switch (Special Switch)** stores for a very short time and sends at very high speed the data provided by the inputs and outputs of the safety modules on the Ethernet network, whilst avoiding signal collisions and excessive amounts of data on the network.

Functional synoptics

Remote mixed I/O module XPS MF3DIO8801



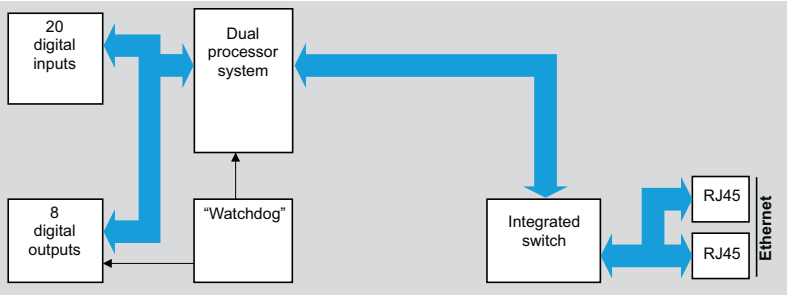
Remote mixed I/O module XPS MF3DIO16801



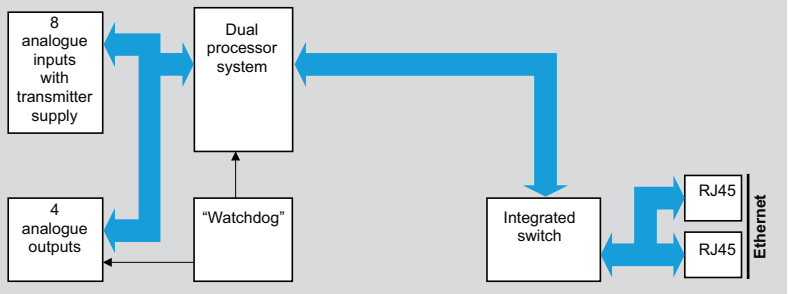
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Functional synoptics *(continued)*

Remote mixed I/O module XPS MF3DIO20802



Remote mixed I/O module XPS MF3AIO8401



Line control

Line control is a means of short-circuit and line break monitoring.
Using line control outputs enables SIL 3 (EN/IEC 61508) and category 4 (EN 954-1) safety to be achieved. The line control outputs send a high signal with a very short low signal, thus enabling a wiring fault (short-circuit, line break) to be seen at the inputs of the safety modules.

Examples

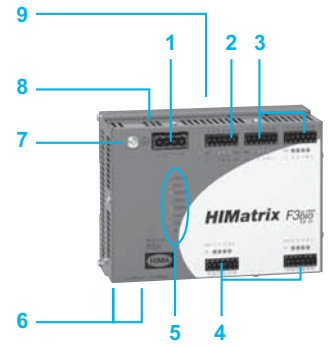
□ For **XPS MF3DIO8801** and **XPS MF3DIO16801**, the line control outputs 1 and 2 are connected to the digital inputs of the same circuit.

□ For **XPS MF3DIO20802**, the digital outputs 1 to 8 are connected to the digital inputs of the same circuit.

Safety communication on Ethernet network

The safety remote mixed I/O modules **XPS MF3●IO●●●●** incorporate two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, that enable communication on the Ethernet network using SafeEthernet communication protocol and therefore, data exchange with compact or modular safety PLCs **XPS MF**.

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Safety remote mixed I/O modules XPS MF3

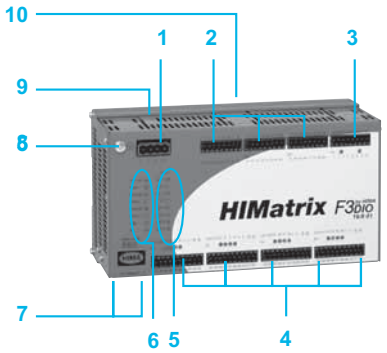


Description

Remote mixed I/O module XPS MF3DIO8801

On the front face of the metal enclosure:

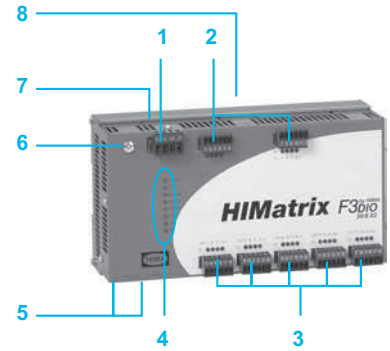
1 One terminal block *(1)* for ⎓ 24 V supply.
2 One terminal block *(1)* for connection of line control outputs, with four line control output status LEDs.
3 Two terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block).
4 Two terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
5 Eight process status LEDs.
6 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
7 One earth connection screw.
8 One “Reset” button (on the top).
9 **On the rear face:** One spring operated fixing device for mounting on 35 mm ⊔ rail.



Remote mixed I/O module XPS MF3DIO16801

On the front face of the metal enclosure:

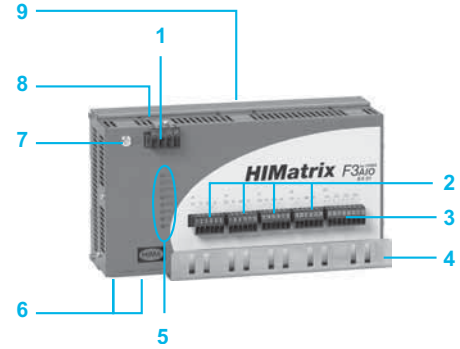
1 One terminal block *(1)* for ⎓ 24 V supply.
2 Three terminal blocks for connection of digital output channels.
3 One terminal block *(1)* for connection of line control outputs.
4 Four terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
5 Sixteen digital output status LEDs.
6 Eight process status LEDs.
7 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
8 One earth connection screw.
9 One “Reset” button (on the top).
10 **On the rear face:** One spring operated fixing device for mounting on 35 mm ⊔ rail.



Remote mixed I/O module XPS MF3DIO20802

On the front face of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Two terminal blocks *(1)* for connection of digital outputs, with output status LED (four LEDs per terminal block)
3 Five terminal blocks *(1)* for connection of digital inputs, with input status LED (four LEDs per terminal block).
4 Eight process status LEDs.
5 Two RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
6 One earth connection screw.
7 One “Reset” button (on the top).
8 **On the rear face:** One spring operated fixing device for mounting on 35 mm ⊔ rail.



Remote mixed I/O module XPS MF3AIO8401

On the front face of the metal enclosure:

1 One terminal block *(1)* for ⎓ 24 V supply.
2 Four terminal blocks *(1)* for connection of analogue inputs.
3 One terminal block *(1)* for connection of analogue outputs.
4 One metal plate for securing shielded analogue input/output connection cables (EMC).
5 Eight process status LEDs.
6 TwTwo RJ45 (type 10BASE-T/100BASE-TX) integrated switched ports, for connection on Ethernet network and for configuring IP address.
7 One earth connection screw.
8 One “Reset” button (on the top).
9 **On the rear face**: one spring operated fixing device for mounting on 35 mm ⊔ rail.

*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPS MF3DIO/AIO**.*

Safety automation system solutions
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Status LED details

Safety remote mixed I/O modules XPS MF3●IO●●●●●

LED	Colour	Status	Meaning
24 VDC	Green	On	⎓ 24 V voltage present.
		Off	No voltage.
RUN	Green	On	Normal service mode, loaded program running, the PLC receives I/O messages, communication and hardware/ software tests carried out.
		Flashing	The CPU is in STOP and is not executing any user application. All the outputs are reset to a safe, de-energised state.
		Off	The CPU is in “ERROR” state (see ERROR).
ERROR	Red	On	Software error or hardware fault detected by the CPU.
			The monitoring program (Watchdog) has triggered the STOP state of the process because the programmed cycle time has been exceeded.
			The CPU has stopped the execution of the user application, ended all hardware and software tests and all outputs have been reset.
			The process can only be started again from the PC.
		Off	No errors detected.
PROG	Orange	On	The CPU is being loaded with a new configuration.
		Flashing	The FLASH ROM is being loaded with a new operating system.
		Off	No loading of configuration or operating system.
FORCE	Orange	On	The CPU is in RUN mode and force is active.
		Flashing	The system is not processing (STOP), but force is prepared and is activated if the dual processor is started.
		Off	Force mode not activated.
FAULT	Orange	On	Error display for line control.
			The user application has caused an error.
			The system configuration is defective.
			The loading of a new operating system was defective and the operating system is corrupt.
		Flashing	An error has occurred whilst writing to FLASH ROM memory (during updating of the operating system).
			One or more I/O errors have occurred.
		Off	None of the above errors have occurred.
OSL	Orange	Flashing	Emergency loading of the operating system is active.
BL	Orange	Flashing	COM in INIT_Fail state.
RJ45	Green	On	Full duplex mode operation.
		Flashing	Signal collision.
		Off	Half duplex mode operation, no collision.
	Yellow	On	Connection established.
		Flashing	Interface active.

Characteristics: page 2/95 | References: page 2/97 | Dimensions, mounting: page 2/98 | Connections: page 2/100

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Characteristics

Safety remote mixed I/O module type			XPS MF3DIO8801	XPS MF3DIO16801	XPS MF3DIO20802	XPS MF3AIO8401
Supply voltage		**V**	⎓ 24 (external supply with separate protection conforming toEN/IEC 60950, SELV (Safety Extra Low Voltage) or PELV (Protection Extra Low Voltage) rated)			
Voltage limits		**V**	- 15…+ 20%			
Ambient air temperature	For operation	**°C**	0…+ 60			
	For storage	**°C**	- 40…+ 85	- 40…+ 85 without battery	- 40…+ 85	
Degree of protection			IP 20			
Response time		**ms**	Depending on size of application			
Maximum current consumption		**A**	8	14 (max. load) Residual: 0.6	8 (max. load) Residual: 0.4	0.8
External fuse			10 A, slow blow	16 A, slow blow	–	–
Backup battery			None	–	None	None
Connections			See page 2/26			

Digital inputs

Safety remote mixed I/O module type			XPS MF3DIO8801	XPS MF3DIO16801	XPS MF3DIO20802
Number	Inputs not electrically isolated		8	16	20
Voltage	At state 1	**V**	⎓ 15…30		
		mA	> 2 at ⎓ 15 V		≥ 2 at ⎓ 15 V
	At state 0	**V**	⎓ 5 max.		
		mA	1.5 max. 1.25 at ⎓ 5 V	1.5 max. 1 at ⎓ 5 V	1.5 max. 1.25 at ⎓ 5 V
Switching voltage		**V**	7.5	7.5	7.5
Switching time		**µs**	–	250	–
Supply		**V**	2 x 20 V/100 mA at 24 V, protected against short-circuits	4 x 20 V/40 mA at 24 V, protected against short-circuits, buffered for 20 ms. 20 V/2 A total at 22 V, protected against short-circuits, not buffered Max. current 2 A at 60 °C	5 x 20 V/100 mA at 24 V, protected against short-circuits
LED display			Yes		

Digital outputs

Safety remote mixed I/O module type			XPS MF3DIO8801	XPS MF3DIO16801	XPS MF3DIO20802
Number	Outputs not electrically isolated		8 DO+ (reference pole L-)	8 x 2-pole or 16 x single-pole	8
			2 DO- (reference pole S+)		
Output voltage		**V**	⎓ 24 ± 2	⎓ 24 ± 3	⎓ 24 ± 2
Output current	Channels 1 to 3 and 5 to 7	**A**	DO+: 0.5 at 60 °C	2 max. at 40 °C 1 max. at 60 °C 10 mA min.	0.5 at 60 °C
	Channels 4 and 8	**A**	DO+: 1 at 60 °C, 2 at 40 °C		1 at 60 °C, 2 at 50 °C
	Channels 1 and 2	**A**	DO-: 1 at 60 °C	–	–
Lamp load	Channels 1 to 3 and 5 to 7	**W**	DO+: 10	25 max.	–
	Channels 4 and 8		DO+: 25		
	Channels 1 and 2		DO-: 25		
Inductive load	Channels 1 to 3 and 5 to 7		DO+: 500	500 mH max.	–
	Channels 4 and 8		DO+: 500		
	Channels 1 and 2		DO-: 500		
Line break		**kΩ**	–	> 5	–
Short-circuit threshold		Ω	–	< 10	–
Minimum load		**mA**	2 per channel		
Leakage current at state 0		**mA**	1 max. at 2 V		
Response to overload			Shutdown of outputs concerned with cyclic reconnection		
Total output current		**A**	7 max.	9 max. (14 A for 2 ms)	7 max.
			Shutdown of all outputs if exceeded with cyclic reconnection		
LED display			Yes		

2

Characteristics *(continued)*

Line control outputs

Module type			XPS MF3DIO8801	XPS MF3DIO16801
Number	Outputs not electrically isolated		2	2
Output voltage		**V**	20, depending on the supply voltage	
Output current		**mA**	60	
Minimum load			None	
Response to overload			4 x ≥ 19.2 V/60 mA (on 24 V), short-circuit current	
LED display			Yes	

Analogue inputs

Safety remote mixed I/O module type			XPS MF3AIO8401
Number	Inputs not electrically isolated		8, single-pole
External shunt		Ω	250 or 500 depending on application
Input values	Nominal value	**V**	⎓ 0…10
		mA	0…20, with 500 Ω shunt
	Service value	**V**	⎓ 0.1…11.5
		mA	0/4…23, with 500 Ω shunt
Input impedance		**MΩ**	2
Maximum distance of equipment		**m**	300
Internal resistance of signal source		Ω	≤ 500
Overvoltage protection		**V**	+ 15, - 4
Resolution			12-bit
Safety accuracy			± 2%
LED display			No

Analogue outputs

Safety remote mixed I/O module type			XPS MF3AIO8401
Number	Outputs not electrically isolated		4 non safety outputs with breaking of safety common
Signal	Nominal range	**mA**	4…20
	Usable range	**mA**	0…20
Load impedance		Ω	600 max.
Maximum distance of equipment		**m**	300
Resolution			12-bit
Relative error			± 1%
LED display			No

Communication

Ethernet network: safety communication using SafeEthernet protocol

Safety remote mixed I/O module type			XPS MF3DIO8801	XPS MF3DIO16801	XPS MF3DIO20802	XPS MF3AIO8401
Transmission	Communication ports		Integrated 2 RJ45 switched Ethernet communications ports			
	Baud rate	**Mbps**	100 Half duplex, 10 Full duplex, Autonegotiation			
Structure			10BASE-T/100BASE-TX			
Medium			Dual twisted pair cable, category 5D or better (Ethernet)			

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XPS MF3DIO8801



XPS MF3DIO16801



XPS MF3DIO20802



XPS MF3AIO8401

Products referenced ***XPS MF3●●●●●●*** *are marked* ***HIMatrix F3...*** *(manufactured by Hima, sold by Schneider Electric).*

References

Safety remote mixed I/O modules (⎓ 24 V supply)

For use with	Inputs		Outputs			Ports	Reference	Weight kg
	Digital	Analogue	Digital	Line control	Analogue			
Safety PLCs, modular XPS MF60 or compact XPS MF40 and XPS MF31/30/35	8	–	8 DO+ 2 DO-	2	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF3DIO8801**	1.000
	16	–	8 x 2 or 16 x 1	2	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF3DIO16801**	1.300
	20	–	8 *(1)*	–	–	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF3DIO20802**	1.000
	–	8	–	–	4	Integrated 2 RJ45 switched Ethernet communications ports	**XPS MF3AIO8401**	0.950

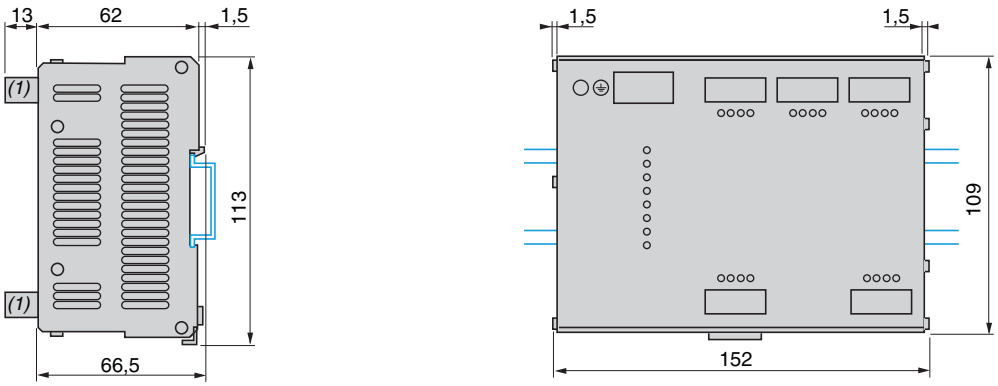
Connecting cables

Description	For	Reference	Weight kg
Ethernet network connecting cables	Connection between safety remote mixed I/O modules and modular or compact safety PLCs XPS MF. RJ45 connector fitted at each end	See page 2/29	–

(1) Configurable for line control.

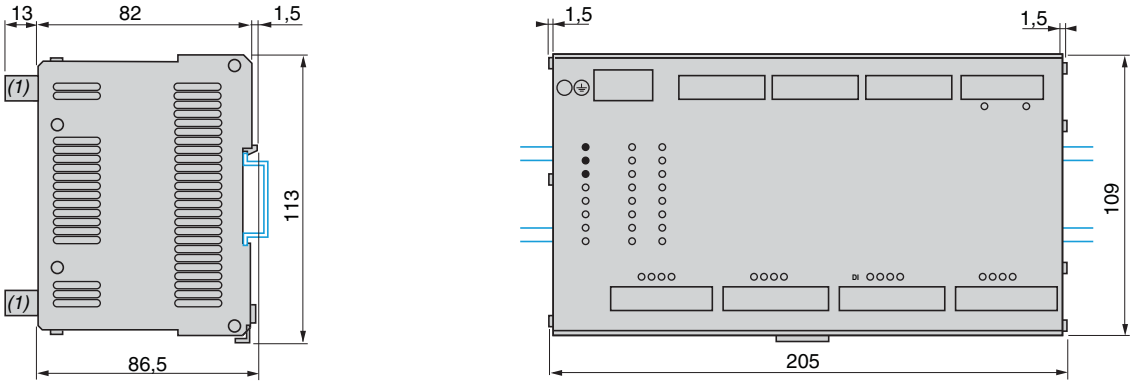
2

XPS MF3DIO8801



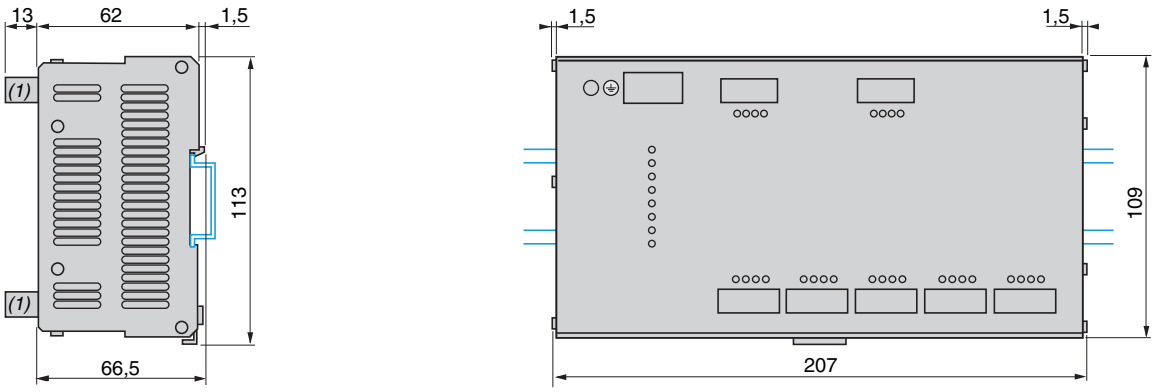
*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPS MF3DIO8801**.*

XPS MF3DIO16801



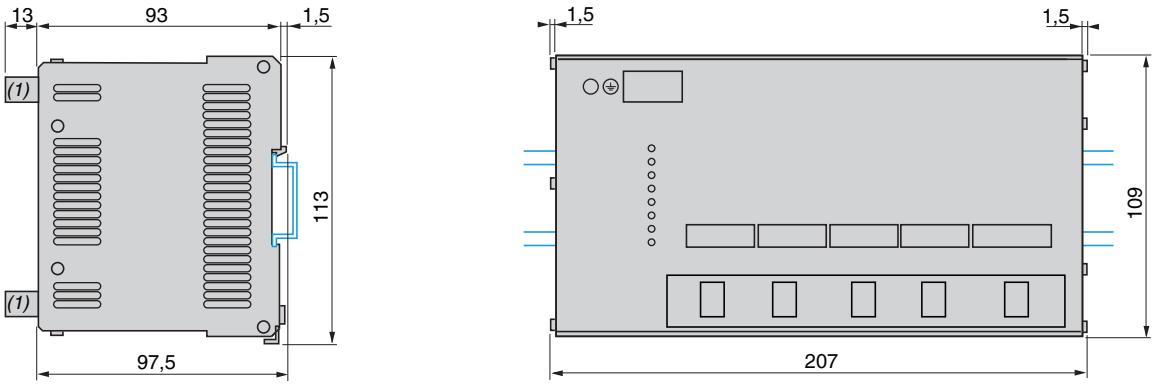
*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPS MF3DIO16801**.*

XPS MF3DIO20802



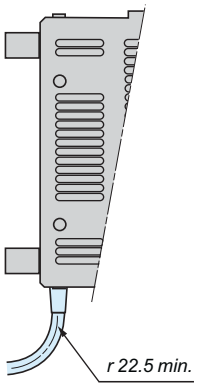
*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPS MF3DIO20802**.*

XPS MF3AIO8401



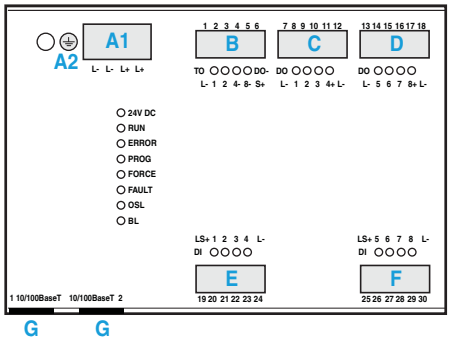
*(1) Removable screw terminals are provided with the safety remote mixed I/O modules **XPS MF3AIO8401**.*

RJ45 connector for access to Ethernet network (SafeEthernet protocol)



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XPS MF3DIO8801



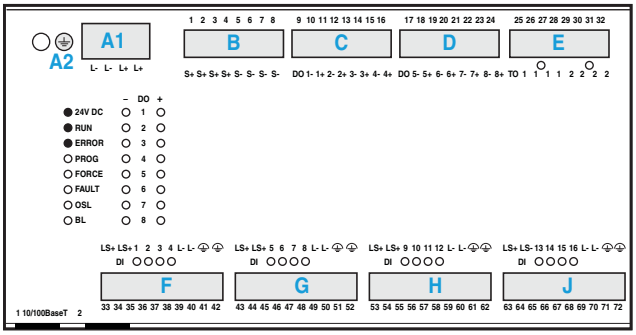
Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L-	⎓ 24 V (reference pole)
		–	L-	⎓ 24 V (reference pole)
		–	L+	⎓ 24 V
		–	L+	⎓ 24 V
A2	**Earth**	–	⏚	Earth
B	**Outputs - Line control/ Digital**	1	L-	Reference pole
		2	1	Line control output 1
		3	2	Line control output 2
		4	4-	Digital output 4- (for increased load)
		5	8-	Digital output 8- (for increased load)
		6	S+	Reference pole
C	**Outputs - Digital**	7	L-	Reference pole
		8	1	Digital output 1
		9	2	Digital output 2
		10	3	Digital output 3
		11	4+	Digital output 4+ (for increased load)
		12	L-	Reference pole
D	**Outputs - Digital**	13	L-	Reference pole
		14	5	Digital output 5
		15	6	Digital output 6
		16	7	Digital output 7
		17	8+	Digital output 8+ (for increased load)
		18	L-	Reference pole
E	**Inputs - Digital**	19	LS+	Sensor supply for inputs 1 to 4
		20	1	Digital input 1
		21	2	Digital input 2
		22	3	Digital input 3
		23	4	Digital input 4
		24	L-	Reference pole
F	**Inputs - Digital**	25	LS+	Sensor supply for inputs 5 to 8
		26	5	Digital input 5
		27	6	Digital input 6
		28	7	Digital input 7
		29	8	Digital input 8
		30	L-	Reference pole

Item	Connection		Function
G	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

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Connections

XPS MF3DIO16801



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Earth**	–	⏚	Earth
B	**Supply of single-pole digital outputs**	1	S+	–
		2	S+	–
		3	S+	–
		4	S+	–
		5	S-	–
		6	S-	–
		7	S-	–
		8	S-	–
C	**Outputs - Digital**	9	1-	Output 1
		10	1+	Output 1
		11	2-	Output 2
		12	2+	Output 2
		13	3-	Output 3
		14	3+	Output 3
		15	4-	Output 4
		16	4+	Output 4
D	**Outputs - Digital**	17	5-	Output 5
		18	5+	Output 5
		19	6-	Output 6
		20	6+	Output 6
		21	7-	Output 7
		22	7+	Output 7
		23	8-	Output 8
		24	8-	Output 8
E	**Outputs - Line control**	25	1	Output 1
		26	1	Output 1
		27	1	Output 1
		28	1	Output 1
		29	2	Output 2
		30	2	Output 2
		31	2	Output 2
		32	2	Output 2

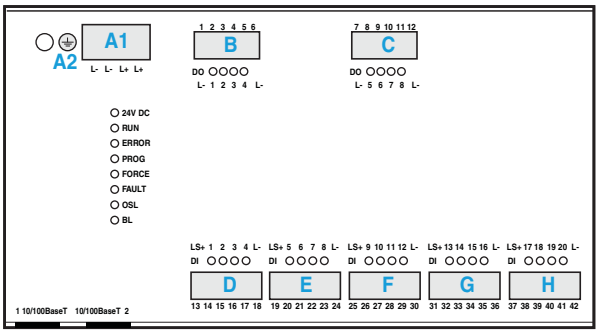
Item (cont.)	Connection	Screw N°	Screw	Function
F	**Inputs - Digital**	33	LS+	Sensor supply for inputs 1 to 4 (not protected)
		34	LS+	Sensor supply for inputs 1 to 4 (protected)
		35	1	Input 1
		36	2	Input 2
		37	3	Input 3
		38	4	Input 4
		39	L-	⎓ 24 V (reference pole)
		40	L-	⎓ 24 V (reference pole)
		41	PA	Electrically clean earth
		42	PA	Electrically clean earth
G	**Inputs - Digital**	43	LS+	Sensor supply for inputs 5 to 8 (not protected)
		44	LS+	Sensor supply for inputs 5 to 8 (protected)
		45	5	Input 5
		46	6	Input 6
		47	7	Input 7
		48	8	Input 8
		49	L-	⎓ 24 V (reference pole)
		50	L-	⎓ 24 V (reference pole)
		51	PA	Electrically clean earth
		52	PA	Electrically clean earth
H	**Inputs - Digital**	53	LS+	Sensor supply for inputs 9 to 12 (not protected)
		54	LS+	Sensor supply for inputs 9 to 12 (protected)
		55	9	Input 9
		56	10	Input 10
		57	11	Input 11
		58	12	Input 12
		59	L-	⎓ 24 V (reference pole)
		60	L-	⎓ 24 V (reference pole)
		61	PA	Electrically clean earth
		62	PA	Electrically clean earth
J	**Inputs - Digital**	63	LS+	Sensor supply for inputs 13 to 16 (not protected)
		64	LS+	Sensor supply for inputs 13 to 16 (protected)
		65	5	Input 13
		66	6	Input 14
		67	7	Input 15
		68	8	Input 16
		69	L-	⎓ 24 V (reference pole)
		70	L-	⎓ 24 V (reference pole)
		71	PA	Electrically clean earth
		72	PA	Electrically clean earth

Item	Connection		Function
K	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

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Connections

XPS MFDIO20802



Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Earth**		⏚	Earth
B	**Outputs - Digital**	1	L-	Outputs common
		2	1	Output 1
		3	2	Output 2
		4	3	Output 3
		5	4	Output 4 (for increased load)
		6	L-	Outputs common
C	**Outputs - Digital**	7	L-	Outputs common
		8	5	Output 5
		9	6	Output 6
		10	7	Output 7
		11	8	Output 8 (for increased load)
		12	L-	Outputs common
D	**Inputs - Digital**	13	LS+	Sensor supply for inputs 1 to 4
		14	1	Digital input 1
		15	2	Digital input 2
		16	3	Digital input 3
		17	4	Digital input 4
		18	L-	Inputs common
E	**Inputs - Digital**	19	LS+	Sensor supply for inputs 5 to 8
		20	5	Digital input 5
		21	6	Digital input 6
		22	7	Digital input 7
		23	8	Digital input 8
		24	L-	Inputs common
F	**Inputs - Digital**	25	LS+	Sensor supply for inputs 9 to 12
		26	9	Digital input 9
		27	10	Digital input 10
		28	11	Digital input 11
		29	12	Digital input 12
		30	L-	Inputs common
G	**Inputs - Digital**	31	LS+	Sensor supply for inputs 13 to 16
		32	13	Digital input 13
		33	14	Digital input 14
		34	15	Digital input 15
		35	16	Digital input 16
		36	L-	Inputs common
H	**Inputs - Digital**	37	LS+	Sensor supply for inputs 17 to 20
		38	17	Digital input 17
		39	18	Digital input 18
		40	19	Digital input 19
		41	20	Digital input 20
		42	L-	Inputs common

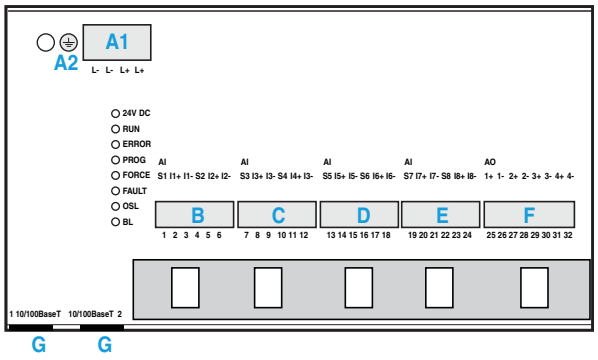
Item	Connection		Function
J	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Characteristics: page 2/95
References: page 2/97
Dimensions, mounting: page 2/98
Connections: page 2/100

Safety automation system solutions
Preventa safety PLCs
Compact and modular
Safety remote mixed I/O modules XPS MF3

Connections

XPS MF3AIO8401

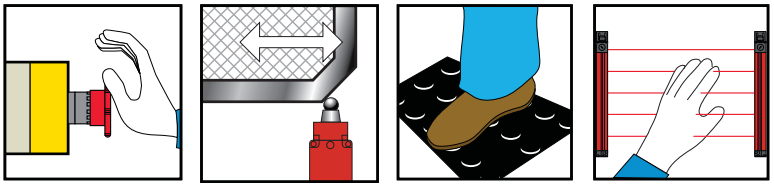


Item	Connection	Screw N°	Screw	Function
A1	**Supply**	–	L+	⎓ 24 V
			L+	⎓ 24 V
			L-	⎓ 24 V (reference pole)
			L-	⎓ 24 V (reference pole)
A2	**Earth**		⏚	Earth
B	**Inputs - Analogue**	1	S1	Transmitter supply 1
		2	I1+	Input 1
		3	I1-	Reference pole
		4	S2	Transmitter supply 2
		5	I2+	Input 2
		6	I2-	Reference pole
C	**Inputs - Analogue**	7	S3	Transmitter supply 3
		8	I3+	Input 3
		9	I3-	Reference pole
		10	S4	Transmitter supply 4
		11	I4+	Input 4
		12	I4-	Reference pole
D	**Inputs - Analogue**	13	S5	Transmitter supply 5
		14	I5+	Input 5
		15	I5-	Reference pole
		16	S6	Transmitter supply 6
		17	I6+	Input 4
		18	I6-	Reference pole
E	**Inputs - Analogue**	19	S7	Transmitter supply 7
		20	I7+	Input 7
		21	I7-	Reference pole
		22	S8	Transmitter supply 8
		23	I8+	Input 8
		24	I8-	Reference pole
F	**Outputs - Analogue**	25	O1+	Output 1
		26	O1-	Output 1 reference pole
		27	O2+	Output 2
		28	O2-	Output 2 reference pole
		29	O3+	Output 3
		30	O3-	Output 3 reference pole
		31	O4+	Output 4
		32	O4-	Output 4 reference pole

Item	Connection		Function
G	**Programming**	Integrated 2 RJ45 switched Ethernet Communication ports	Either of the two switched Ethernet ports can be used to create a connection between the safety remote I/O and the programming terminal in a point to point or via an Ethernet network for setting the IP address
	Safe Communication (all XPS MF Safety PLCs and Remote I/Os)		Either of the two switched Ethernet ports can be used to create a connection between the safety PLC and other safety related components (e.g other XPS MF safety PLCs or Safety Remote I/O modules) this can be established in a point to point way or via an Ethernet network.

Safety automation system solutions
Preventa safety controllers

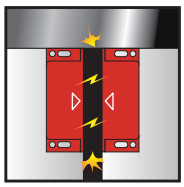
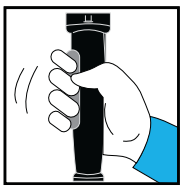
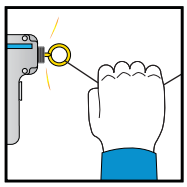
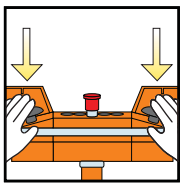
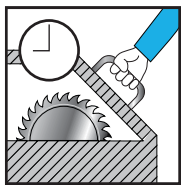
Applications



Modules	**Controllers for monitoring 2 independent safety functions simultaneously.** **User selection of 2 functions from a choice of 15.** **Programmable from front face of controller.**



Functions		□ Emergency stop monitoring □ Switch monitoring □ Enabling switch monitoring □ Sensing mat or edges monitoring □ Light curtain monitoring, relay output type □ etc.
Conformity to standards		EN 954-1 - category 4/ISO 13849-1, EN/IEC 60204-1, DIN V VDE 801 + A1, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1
Product certifications		UL, CSA, BIA
Number of circuits		
	Safety	6 N/O (3 N/O per function)
	Additional	3 solid-state outputs for signalling to PLC
Display		12 LEDs
Supply voltage		⎓ 24 V
Communication	CANopen bus	–
	Profibus bus	–
	Modbus network	–
Module type		**XPS MP**
Page		2/108

Configurable controllers using software, for several independent safety functions: selection of safety functions using configuration software running on Windows (16 or 32 inputs and 8 independent safety outputs)



- ◻ Emergency stop monitoring
- ◻ Limit switch monitoring
- ◻ Two-hand control monitoring
- ◻ Safety light curtain monitoring, with or without “muting” function
- ◻ Enabling switch monitoring, coded magnetic switch monitoring
- ◻ Safety mat monitoring
- ◻ Hydraulic press solenoid valve monitoring
- ◻ Eccentric press safety stop at top dead centre monitoring. Zero speed detection
- ◻ Hydraulic press monitoring
- ◻ Eccentric press monitoring
- ◻ Foot switch monitoring
- ◻ Chain shaft breakage monitoring
- ◻ Safe tool
- ◻ Position selector

EN 954-1 - category 4/ISO 13849-1,
IEC 61508 - SIL 3,
EN/IEC 60204-1,
EN 1760-1/ISO 13856-1,
EN/IEC 60947-5-1,
EN/IEC 61496-1,
EN 574/ISO 13851,
EN 954-1/ISO 13849-1

UL, CSA, TÜV

4 N/O (2 N/O per function) + 6 solid-state

1 “muting” signalling output

LED display on front face

⎓ 24 V

Via SUB-D 9-pin male connector, only on XPS MC16ZC and XPS MC32ZC

Via SUB-D 9-pin female connector, only on XPS MC16ZP and XPS MC32ZP

Via RJ45 connector, on all controllers XPS MC●●Z●

XPS MC

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Safety automation system solutions
Preventa safety controllers type XPS MP
With pre-defined functions

Presentation

Operating principle

Preventa safety controller modules XPS MP are designed to conform with category 4 of the standard EN 954-1/ISO 13849-1.
They enable two independent safety functions (selected from a choice of 15 pre-defined configurations) to be performed using the same product. Configuration selection is easily made using 3 buttons on the front face of the module.

These 15 pre-programmed safety functions provide a solution for the majority of safety applications up to level 4 conforming to the standard EN 954-1/ISO 13849-1, for example: monitoring Emergency stops, limit switches, safety mats and sensing edges, enabling switches, coded magnetic switches, type 4 relay output safety light curtains conforming to EN/IEC 61496-1 (for example, light curtains type XUS L. Safety controllers XPS MP incorporate 6 safety outputs (3 per function) and 3 solid-state signalling outputs for signalling to the process PLC.

To aid diagnostics, the modules have LEDs on the front face which provide information on the monitoring circuit status. They also indicate and assist selection of the 2 required configurations.

	Configuration	Synchronisation time	Type of start *(1)*		Start test	Notes
			Automatic or unmonitored	Monitored		
Functions disabled	**0**	–	–	–	–	Factory setting
Emergency stop monitoring, 1-channel wiring (category 2)	**1**	–	X	–	–	–
	2	–	–	X	–	–
Emergency stop monitoring, 2-channel wiring, or guard monitoring (category 4)	**3**	Unlimited	X	–	X	–
	4	Unlimited	–	X	X	–
	5	1.5 s	X	–	X	–
	6	1.5 s	–	X	X	–
	7	Unlimited	X	–	–	–
	8	Unlimited	–	X	–	–
Guard monitoring for injection press or blowing machine (category 4)	**9**	1.5 s	–	X	X	Uses both safety outputs *(2)*
Enabling grip switch monitoring (3 position switch) (category 4)	**10**	–	X	–	X	The start button acts as start-up preparation
Sensing mat and edges monitoring (category 3)	**11**	–	X	–	–	Mats with circuit making contacts
	12	–	–	X	–	
Relay output safety light curtain monitoring (category 4)	**13**	0.5 s	–	X	X	–
Coded magnetic switch monitoring (category 4)	**14**	1.5 s	X	–	–	Magnetic switches with 2 contacts, 1 N/O and 1 N/C
	15	1.5 s	–	X	–	

(1) Automatic start: there is no start contact or it is shunted.
Unmonitored start: the output is activated on closing of the start contact.
Monitored start: the start input is monitored so that there is no start-up in the event of the start contact being shunted or the start circuit being closed for more than 10 seconds.
Start-up is triggered following activation of the start button (push-release function) on opening of the contact.
(2) Tool zone guard with 3rd switch.
Additional rear guard (optional) with automatic start. The opening of the guard cuts all outputs.

Safety automation system solutions
Preventa safety controllers type XPS MP
With pre-defined functions

Characteristics

Module type			XPS MP11123	XPS MP11123P
Conformity to standards			EN/IEC 60204-1, DIN V VDE 801 + A1, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1	
Product certifications			UL, CSA, BIA	
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.	
Supply		**V**	⎓ 24	
Voltage limits			- 20…+ 20%	
Consumption		**W**	≤ 5	
Module inputs fuse protection			Internal, electronic	
Start button monitoring			Yes/No (depending on configuration selected)	
Control unit voltage Between input terminals C1-I1, C2-I2, C3-I3, C4-I4, C5-I5 or C6-I6		**V**	24 (at nominal supply voltage)	
Calculation of wiring resistance RL between input terminals		Ω	100 max. Maximum cable length: 2000 m	
Synchronisation time between inputs		**s**	0.5, 1.5 or unlimited, depending on configuration selected	
Outputs	Voltage reference		Volt-free	
	Number and type of safety circuits		3 N/O per function (6 N/O total) (13-14, 23-24, 33-34, 43-44, 53-54, 63-64)	
	Number and type of additional circuits		3 solid-state	
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13		24 V/1.5 A L/R = 50 ms	
	Breaking capacity of solid-state outputs		24 V/20 mA	
	Max. thermal current (Ithe) for each group of 3 outputs		3.3 A for all 3 outputs, or 6 A for 1 output and 2 A for the other 2 outputs, or 2 A for 1 output and 4 A for the other 2 outputs	
	Max. total thermal current	**A**	20	
	Output fuse protection		4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current	**mA**	10	
	Minimum voltage	**V**	17	
Electrical durability			See page 2/172	
Response time on input opening		**ms**	< 30	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display			12	
Operating temperature		**°C**	- 10…+ 55	
Storage temperature		**°C**	- 25…+ 85	
Degree of protection conforming to IEC 60529	Terminals		IP 20	
	Enclosure		IP 40	
Connections	Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection, without cable end		Solid or flexible cable: 0.14… 2.5 mm^2	Solid or flexible cable: 0.2… 2.5 mm^2
	1-wire connection, with cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
			With bezel, flexible cable: 0.25…1.5 mm^2	With bezel, flexible cable: 0.25…2.5 mm^2
	2-wire connection, without cable end		Solid or flexible cable: 0.14…0.75 mm^2	Solid cable: 0.2…1 mm^2 Flexible cable: 0.2…1.5 mm^2
	2-wire connection, with cable end		Without bezel, flexible cable: 0.25…1 mm^2	
			Double, with bezel, flexible cable: 0.5…1.5 mm^2	

Safety automation system solutions

Preventa safety controllers type XPS MP

With pre-defined functions



XPS MP11123



XPS MP11123P

References

Description	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight kg
Modules for 2 independent safety functions	Integrated in module	3 N/O per function (6 N/O total)	3 solid-state	⎓ 24 V	**XPS MP11123**	0.320
	Removable from module	3 N/O per function (6 N/O total)	3 solid-state	⎓ 24 V	**XPS MP11123P**	0.320

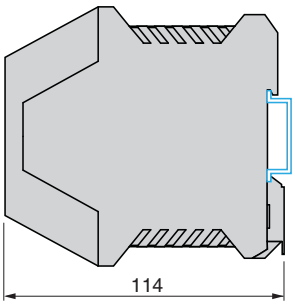
Safety automation system solutions

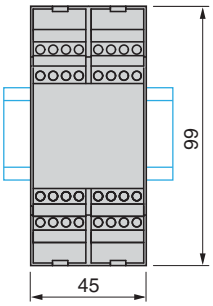
Preventa safety controllers type XPS MP

AM1 DP200 rail mounting

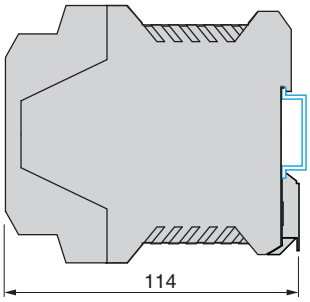
Dimensions

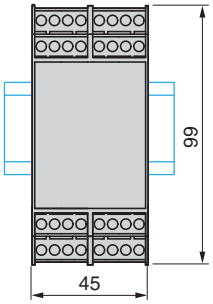
XPS MP●●●●



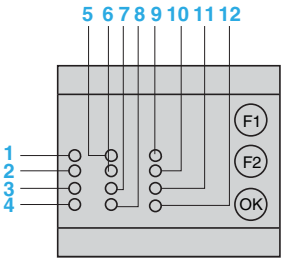


XPS MP●●●●P





LED details



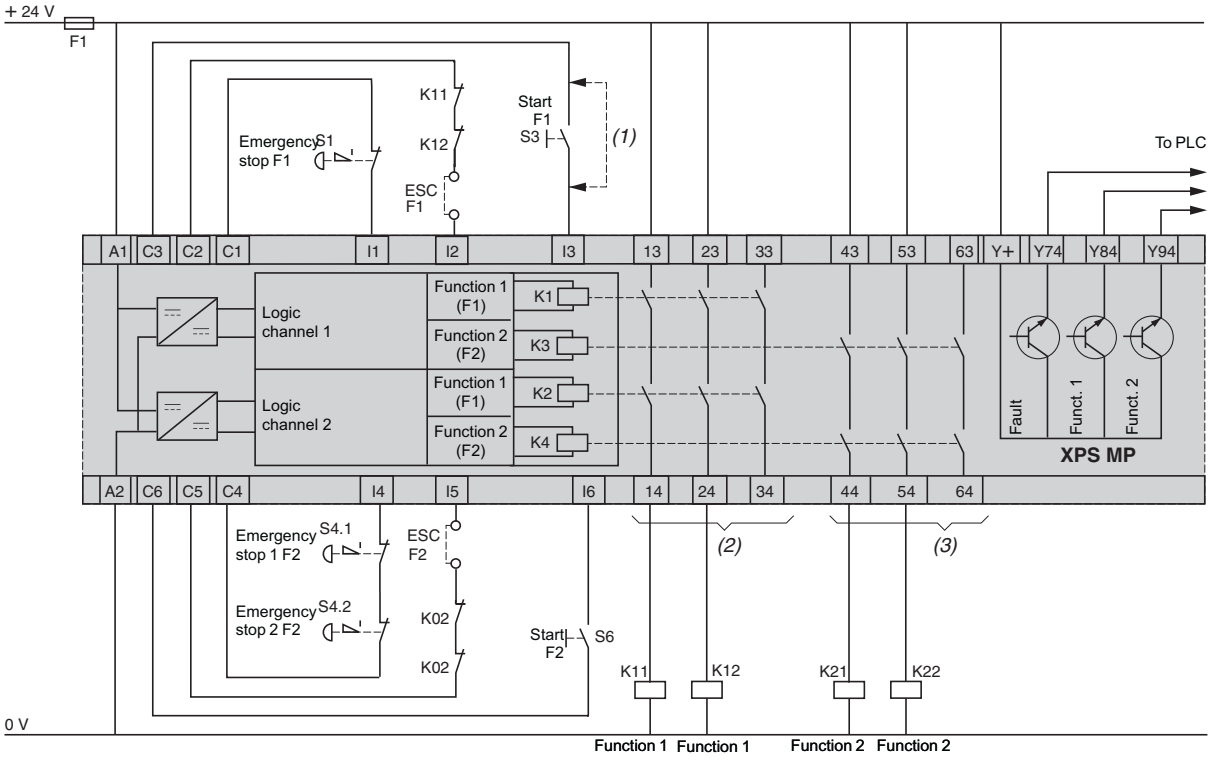
1-2-3	Function 1 configuration code.
4	K1/K2 status (function 1, N/O safety outputs closed).
5-6-7	Function 2 configuration code.
8	K3/K4 status (function 2, N/O safety outputs closed).
9	Supply voltage A1-A2.
10	Fault.
11	Function 1 configuration.
12	Function 2 configuration.
F1, F2, OK:	Configuration buttons.

Safety automation system solutions
Preventa safety controllers type XPS MP
With pre-defined functions

XPS MP

Emergency stop monitoring, 1-channel wiring

Configuration 1 (1-channel Emergency stop, automatic or unmonitored start) = function 1.
Configuration 2 (1-channel Emergency stop, monitored start) = function 2.

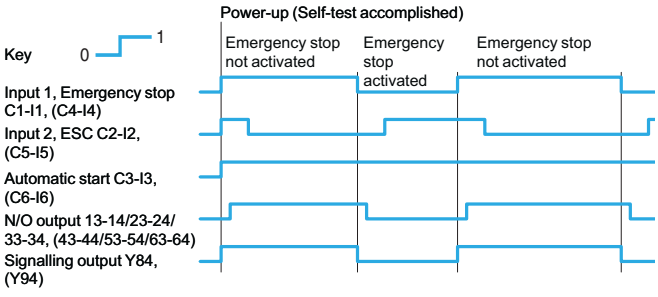


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

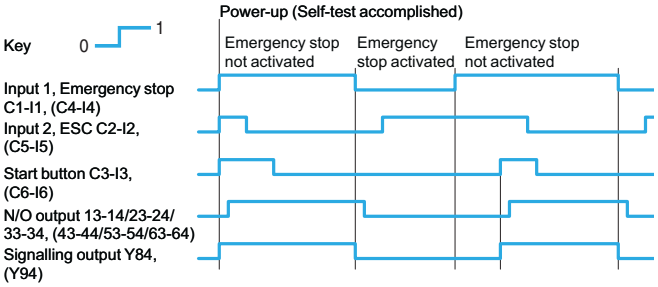
Configuration 1

Automatic start



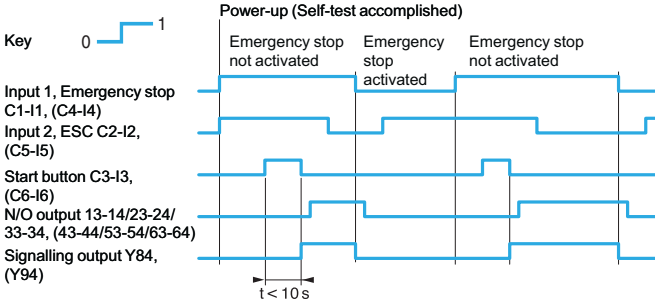
Configuration 1

Unmonitored start



Configuration 2

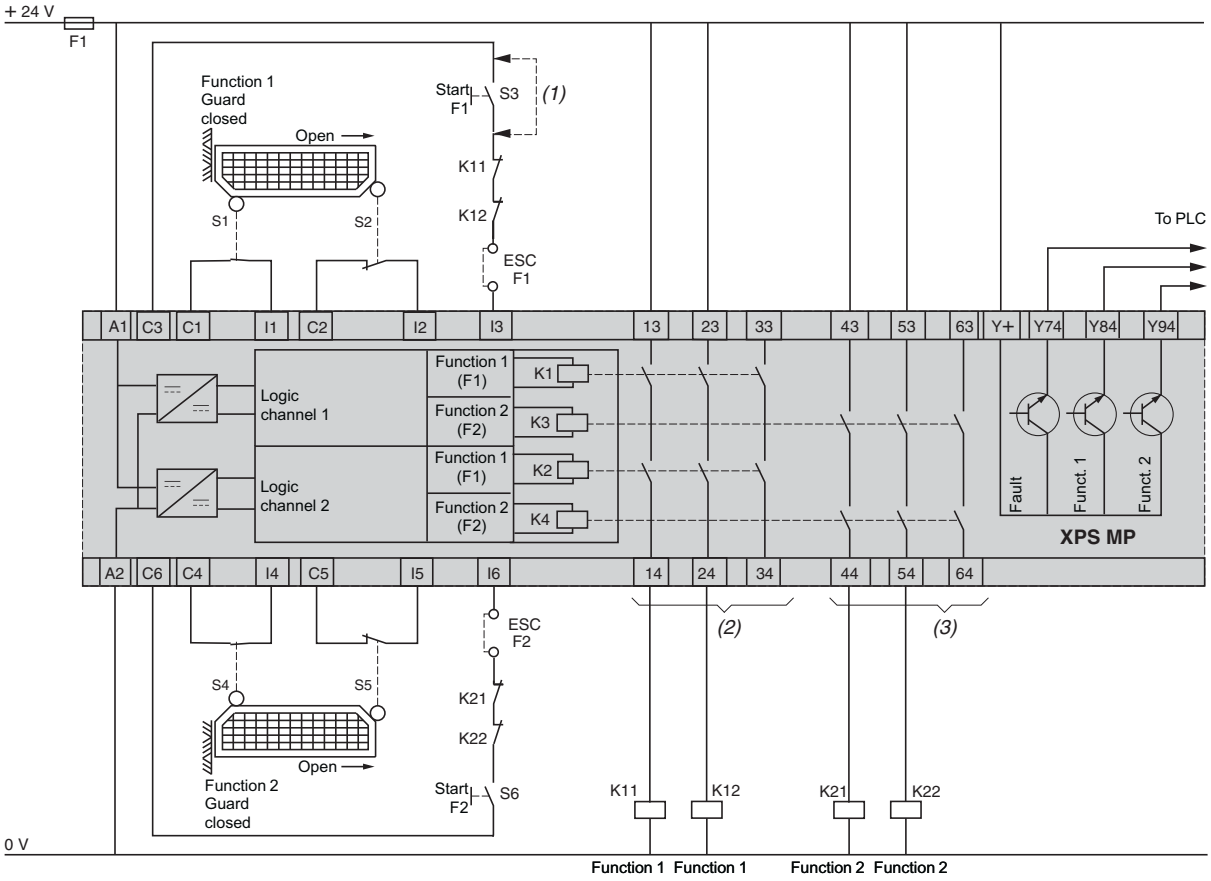
Monitored start



XPS MP

Guard monitoring with start test

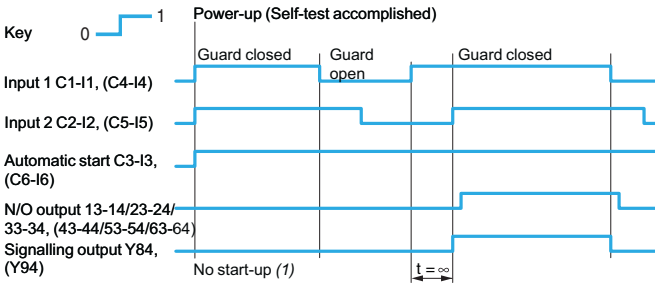
Configuration 3 (locking of guard with start test, automatic or unmonitored start) = function 1.
Configuration 4 (locking of guard with start test, monitored start) = function 2.



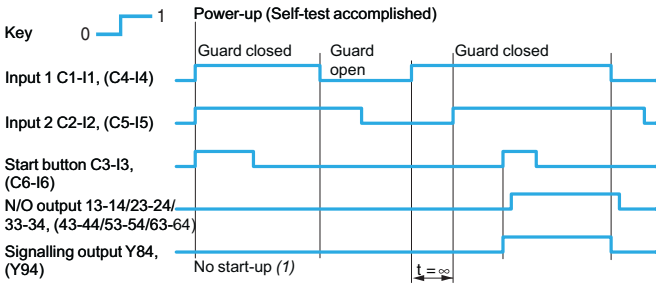
(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

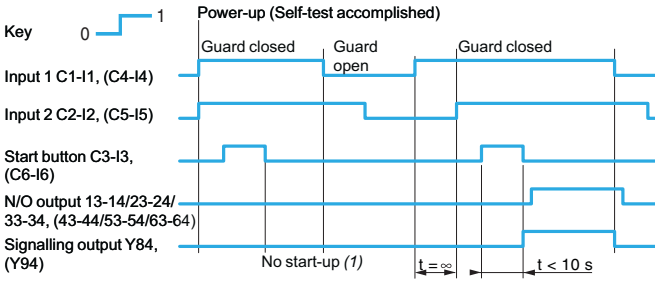
Configuration 3
Automatic start



Configuration 3
Unmonitored start



Configuration 4
Monitored start



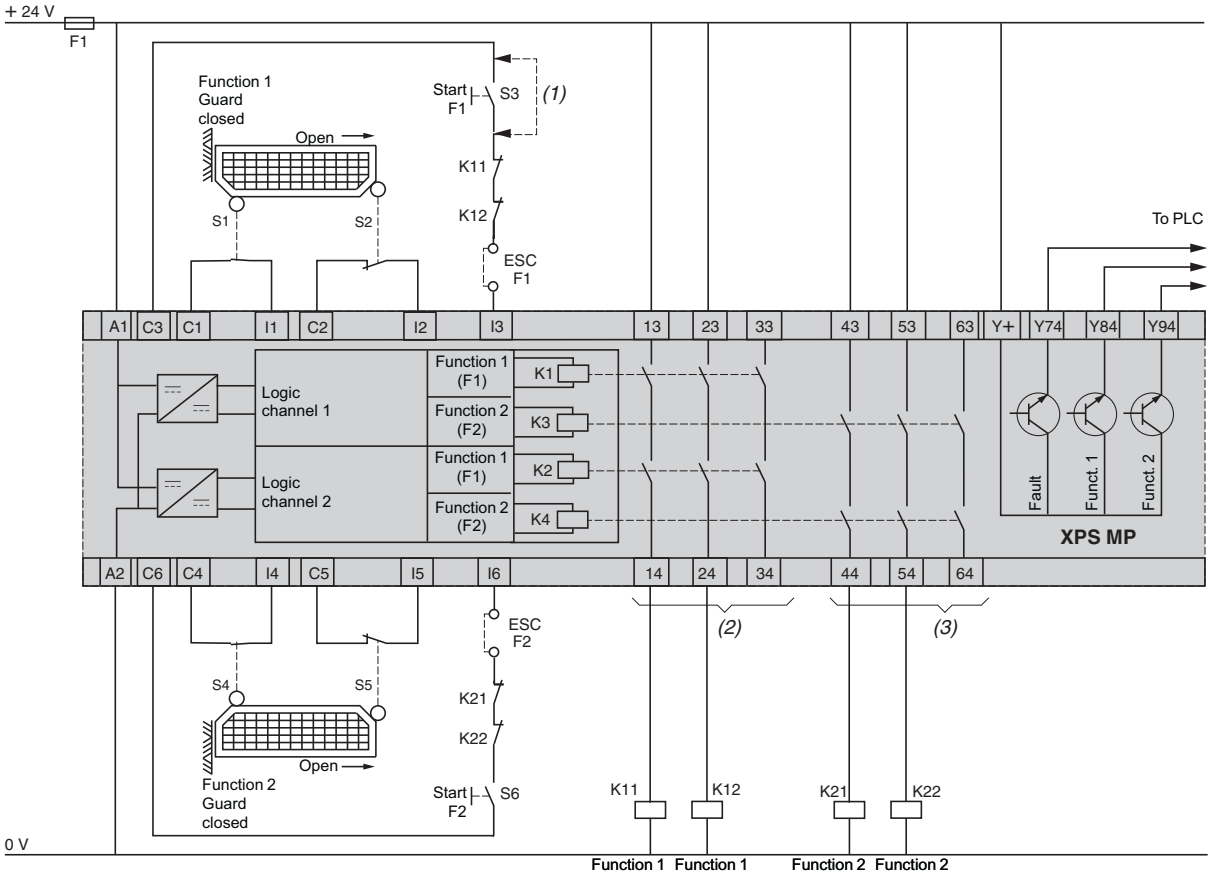
(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

2

XPS MP

Guard monitoring with start test and synchronisation time = 1.5 ms

Configuration 5 (locking of guard with start test, automatic or unmonitored start) = function 1.
Configuration 6 (locking of guard with start test, monitored start) = function 2.

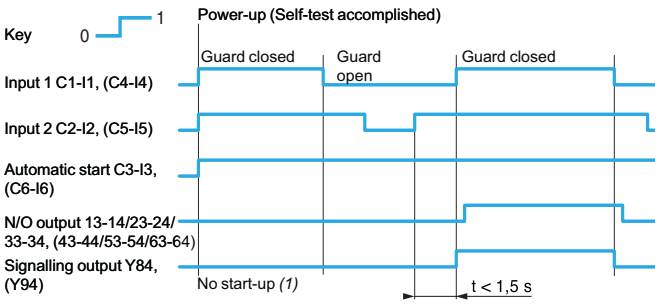


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

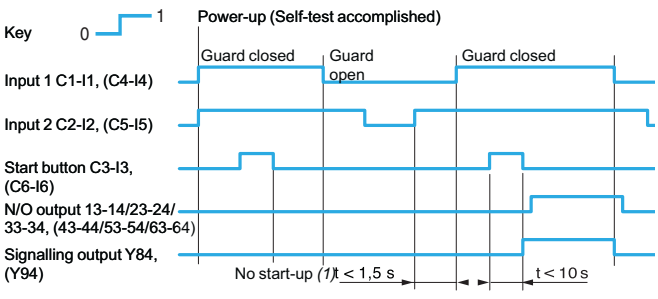
Configuration 5

Automatic start



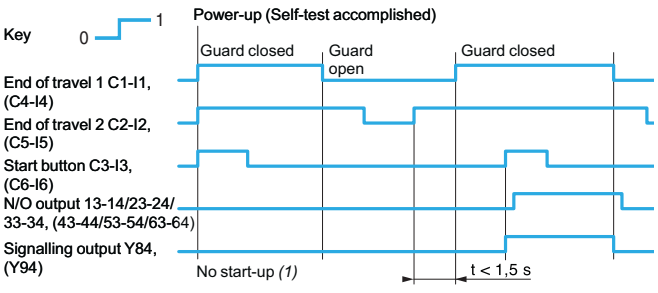
Configuration 6

Monitored start



Configuration 5

Unmonitored start

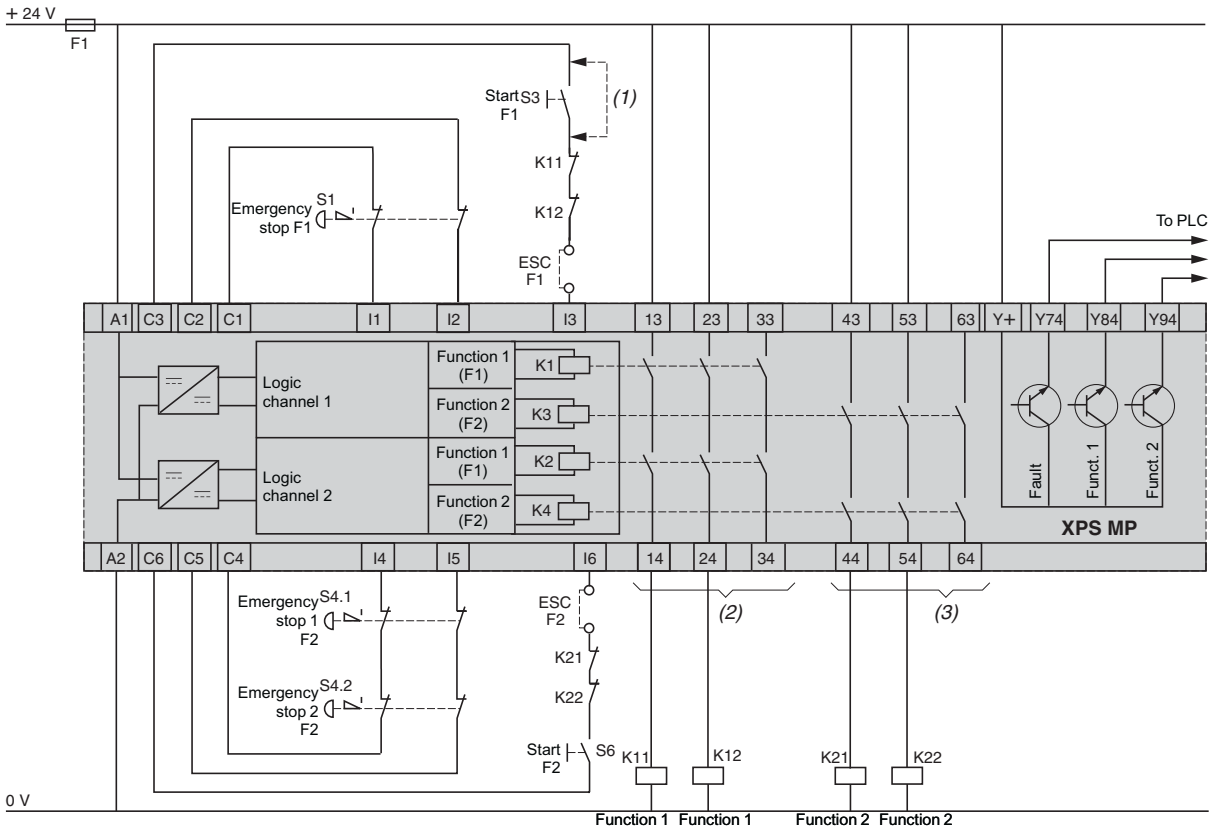


(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

XPS MP

Emergency stop monitoring, 2-channel wiring

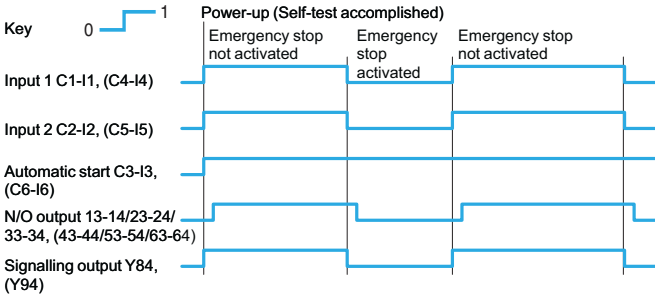
Configuration 7 (2-channel Emergency stop, automatic or unmonitored start) = function 1.
Configuration 8 (2-channel Emergency stop, monitored start) = function 2.



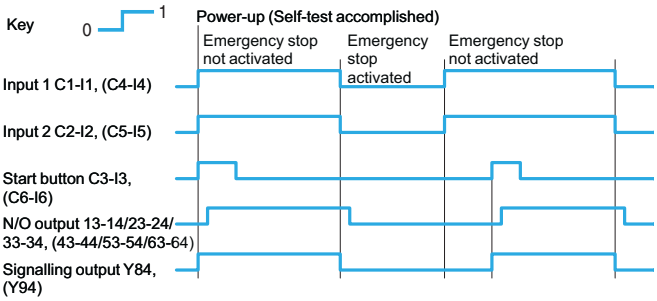
(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

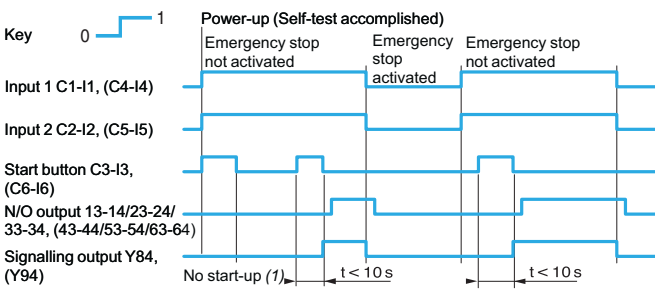
Configuration 7
Automatic start



Configuration 7
Unmonitored start



Configuration 8
Monitored start



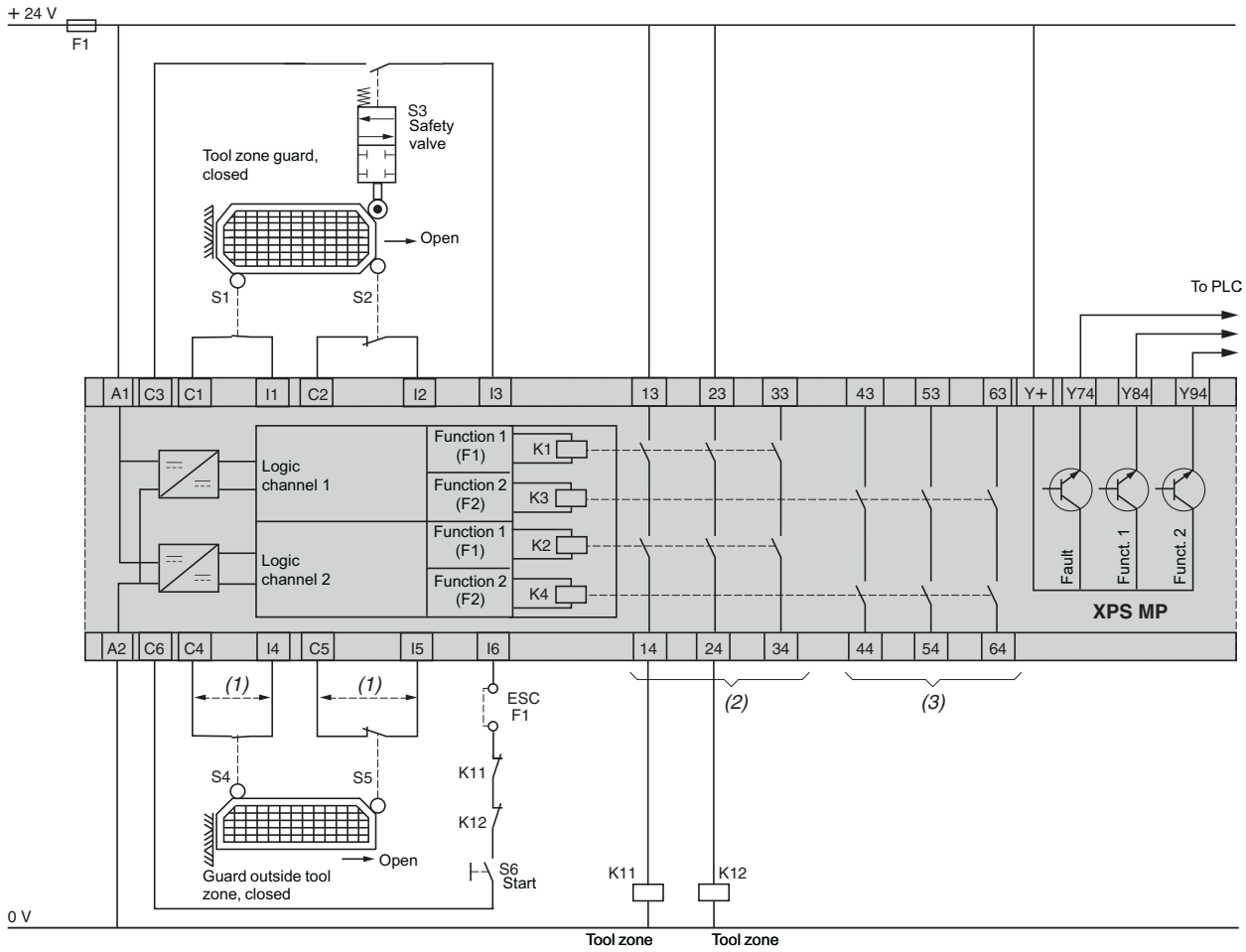
(1) Start button control: the start button must not be activated on power-up.

2

XPS MP

Guard monitoring for injection press or blowing machine

Configuration 9 (this configuration uses both functions of the controller. Only function 1 is configured).



(1) If sensors S4 and S5 are not used, terminals C4-I4 and C5-I5 must be linked.

(2) Safety outputs for tool zone.

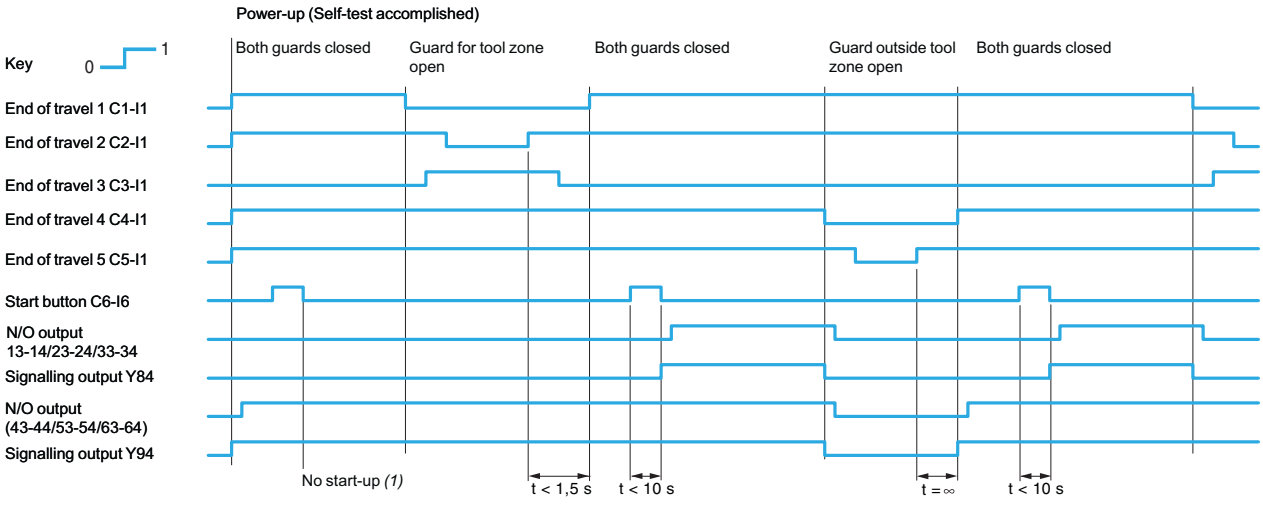
(3) Safety outputs for rear access safety doors.

In configuration mode 9, the N/C contacts of the relays or contactors controlled via outputs 43-44, 53-54, 63-64 cannot be monitored by the feedback loop (ESC).

ESC = External start conditions.

Functional diagram

Configuration 9



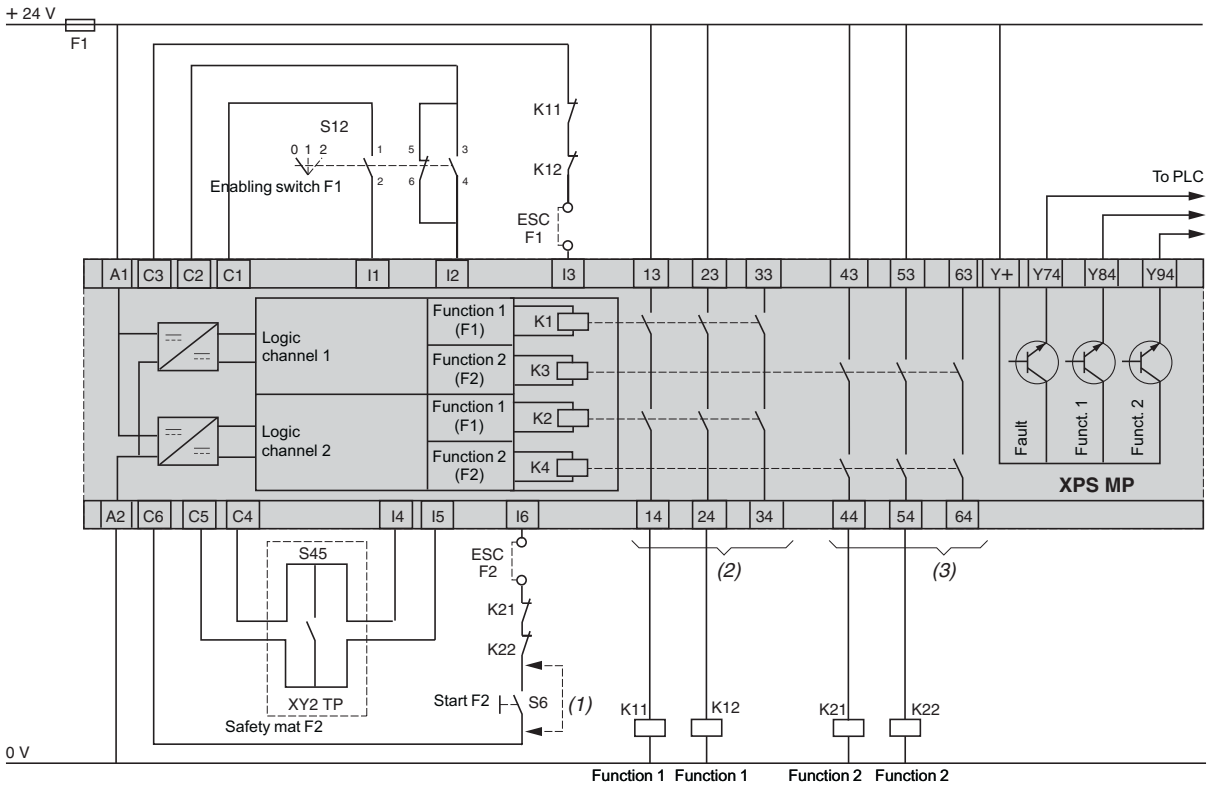
(1) Prevention of start-up necessary: to check the sensors connected, open and reclose the guard.

Presentation: page 2/106
Characteristics: page 2/107
References: page 2/108
Dimensions: page 2/109
Connections: page 2/110

XPS MP

Enabling switch monitoring, safety mat monitoring

Configuration 10 (enabling switch monitoring, with or without start-up preparation) = function 1.
Configuration 11 (safety mat monitoring, automatic or unmonitored start) = function 2.

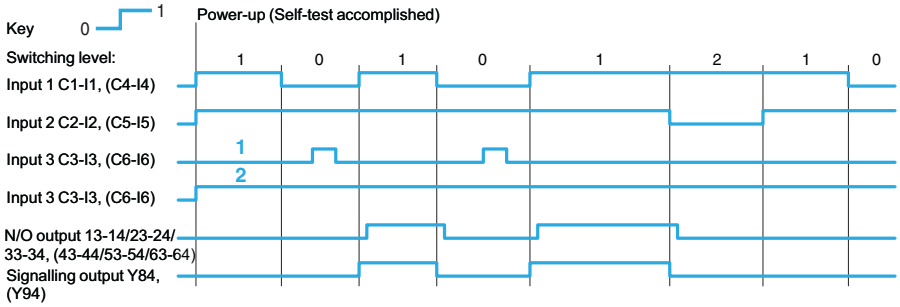


(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

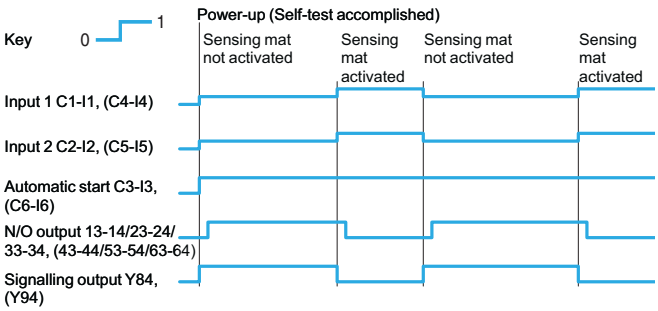
Configuration 10

Enabling switch

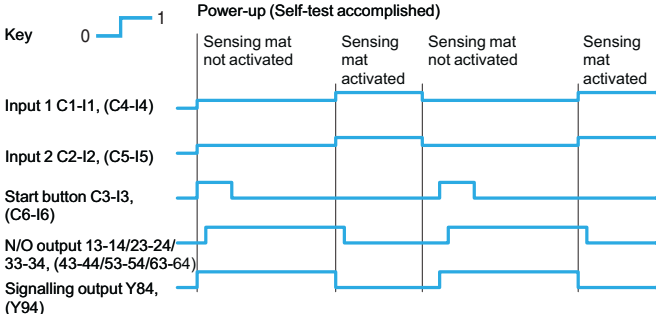


Configuration 11

Safety mat with automatic start



Safety mat with unmonitored start

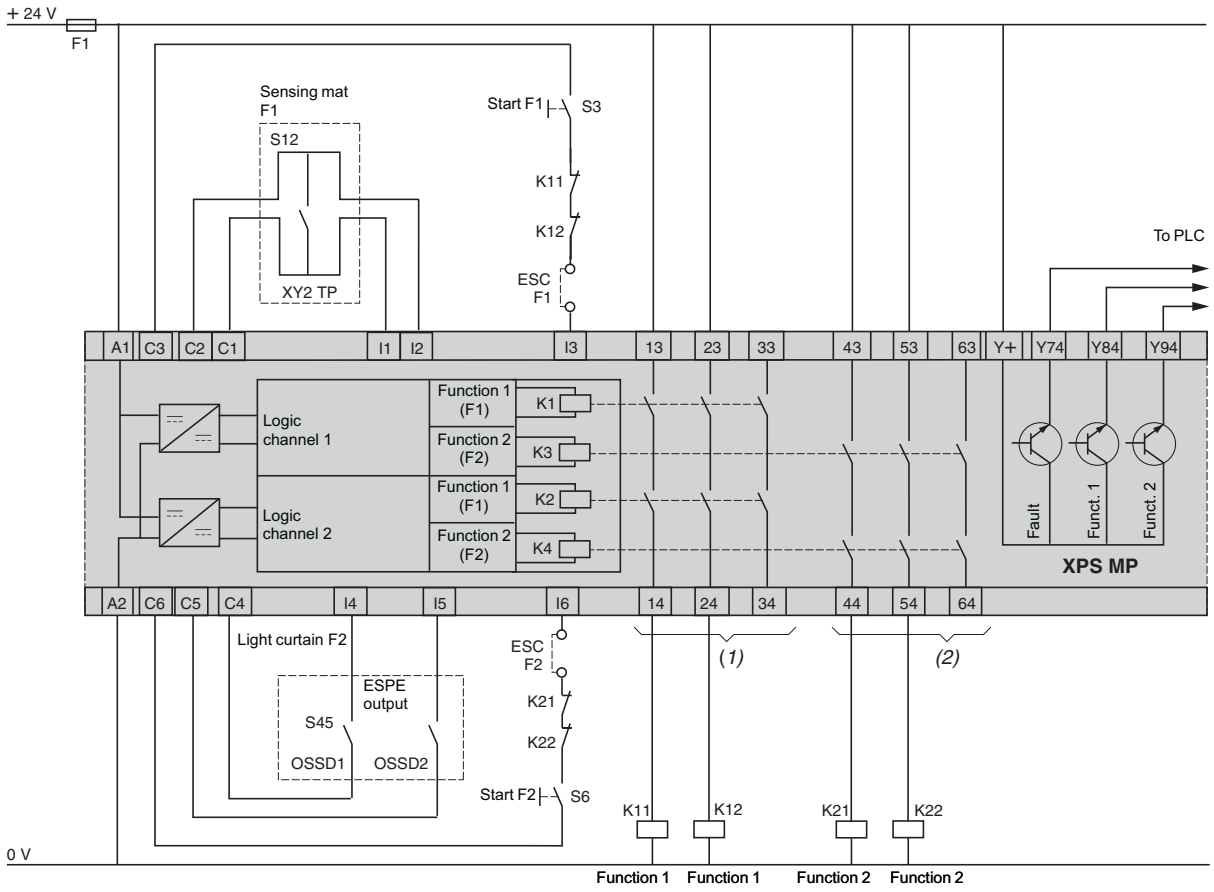


2

XPS MP

Safety mat monitoring, safety light curtain monitoring

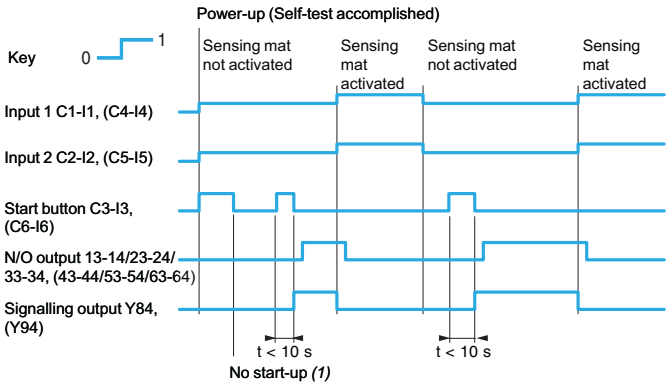
Configuration 12 (sensing mat monitoring, monitored start) = function 1.
Configuration 13 (light curtain monitoring, monitored start; synchronisation time = 0.5 s) = function 2.



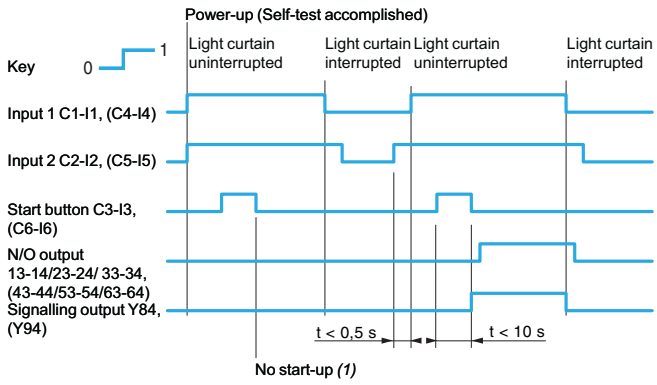
(1) Function 1 safety outputs.
(2) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

Configuration 12
Sensing mat with monitored start



Configuration 13
Light curtain with monitored start

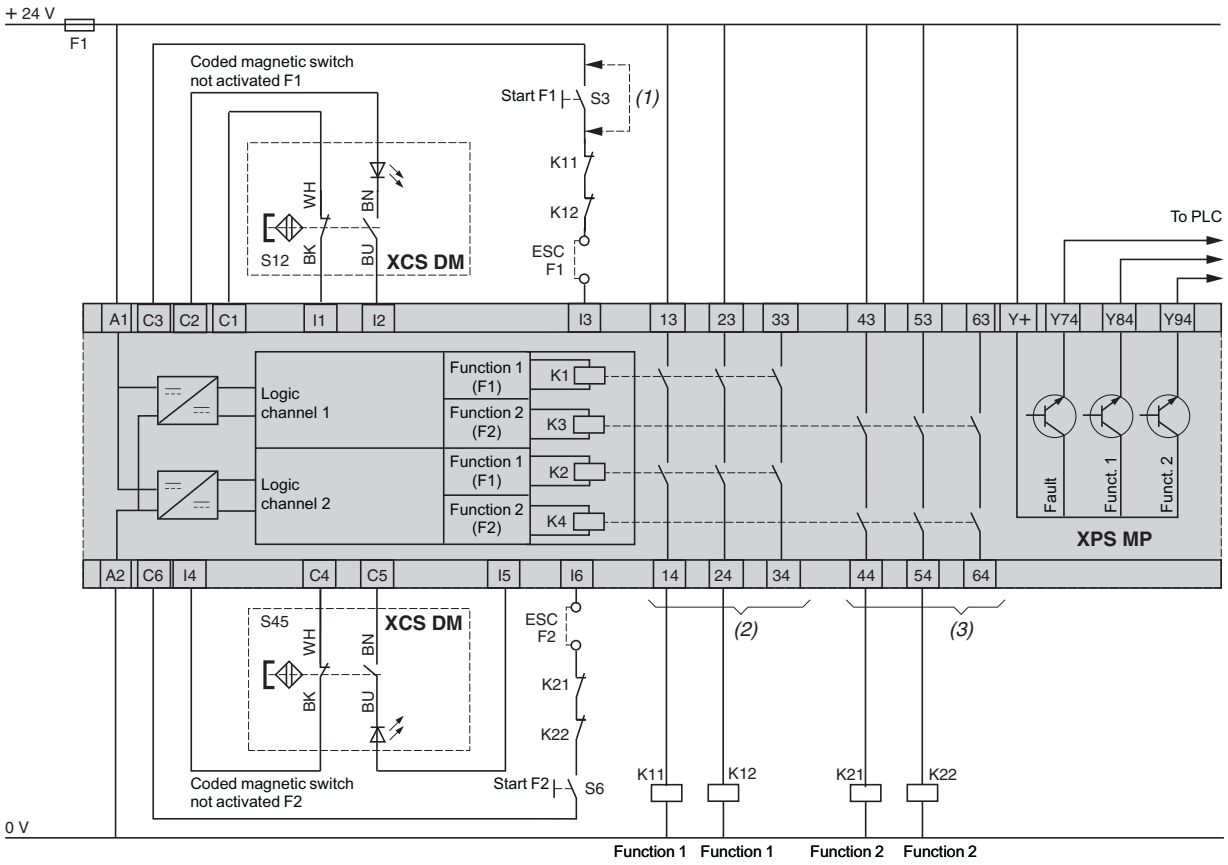


(1) Start button control: the start button must not be activated on power-up.

XPS MP

Coded magnetic switch monitoring

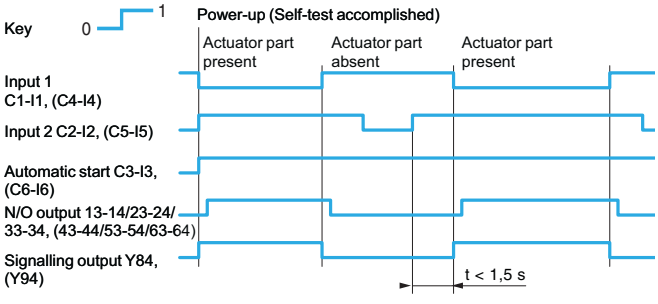
Configuration 14 (automatic or unmonitored start, synchronisation time = 1.5 s) = function 1.
Configuration 15 (monitored start, synchronisation time = 1.5 s) = function 2.



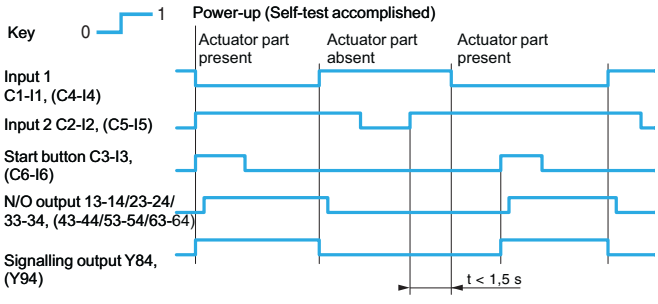
(1) Automatic start.
(2) Function 1 safety outputs.
(3) Function 2 safety outputs.
ESC = External start conditions.

Functional diagrams

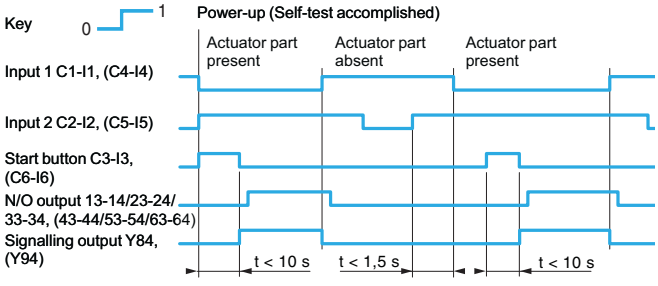
Configuration 14
Automatic start



Configuration 14
Unmonitored start



Configuration 15
Monitored start



Safety automation system solutions

Preventa configurable safety controllers type XPS MC

105739



XPS MC16ZC

105545



XPS MC32ZC

Presentation

Configurable safety controllers XPS MC●●Z● are designed to provide a solution for safety applications requiring conformity to category 4 of standard EN 954-1/EN/ ISO 13849-1 and SIL 3 requirements of standard IEC 61508.
The range of configurable safety controllers comprises 6 products, each with different technical characteristics.

Configurable controllers	Safety inputs	Safety outputs *(1)*	Communication via		
			CANopen bus	Profibus bus	Modbus serial link
XPS MC16Z	16	6 + 2 x 2	–	–	Yes, slave
XPS MC16ZC	16	6 + 2 x 2	Yes, slave	–	Yes, slave
XPS MC16ZP	16	6 + 2 x 2	–	Yes, slave	Yes, slave
XPS MC32Z	32	6 + 2 x 2	–	–	Yes, slave
XPS MC32ZC	32	6 + 2 x 2	Yes, slave	–	Yes, slave
XPS MC32ZP	32	6 + 2 x 2	–	Yes, slave	Yes, slave

Line control

The safety inputs are supplied by the various control outputs *(2)*, in such a manner so as to monitor for short-circuits between the inputs, short-circuits between each input and earth or the presence of residual voltages.
The controller, assisted by the control outputs, continuously tests all the connected inputs. As soon as an error is detected on an input, all the outputs associated with this input are disconnected. Safety outputs associated with other inputs remain active.

Configuration

Safety controllers XPS MC●●Z● are configurable and addressable using software XPS MCWIN running on a PC. Connection accessories required: see page 2/125.

Connections

For connection of safety inputs and outputs, safety controllers XPS MC●●Z● can be fitted with a choice of:
- screw connectors type XPS MCTS●●, or
- spring clip connectors type XPS MCTC●●.

These connectors are to be ordered separately, see page 2/124.

(1) 8 independent safety outputs = 6 solid-state safety outputs + 2 x 2 relay outputs (4 relay outputs with guided contacts).
(2) 8 control outputs are available but they are not safety outputs.

Safety automation system solutions
Preventa configurable safety controllers type XPS MC

Safety functions

Configuration of the safety functions is carried out using software XPSMCWIN which is available on the Safety Suite V2 CD-ROM.

30 certified safety functions are available with this software and they are easily assignable to the safety outputs. The safety functions have multiple combination possibilities and various starting conditions.

The safety functions are:
- certified in accordance with EN 954-1/EN/ISO 13849-1 and IEC 61508,
- configurable in controller XPS MC using software XPSMCWIN which is available on the Safety Suite V2 software pack.

All 8 safety outputs are suitable for use in safety related parts of control systems conforming to category 4 of EN 954-1/EN/ISO 13849-1 and each output can disconnect one of its safety circuits.

Main safety functions

- Emergency stop monitoring, with or without time delay, 1 or 2-channel wiring
- Two-hand control (type III-C conforming to EN 574/ISO 13851)
- Guard monitoring with 1 or 2 limit switches
- Guard monitoring for injection presses and blowing machines
- Magnetic switch monitoring
- Sensing mat monitoring
- Light curtain (type 4 conforming to EN/IEC 61496, relay or solid-state output) monitoring
- Zero speed detection
- Dynamic monitoring of hydraulic valves on linear presses
- Monitoring safety stop at top dead centre on eccentric press
- Safety time delays
- “Muting” function of light curtains
- Enabling switch monitoring, 2 or 3 contact
- Hydraulic press
- Eccentric press
- Foot switch monitoring
- Chain shaft breakage monitoring
- Position selector

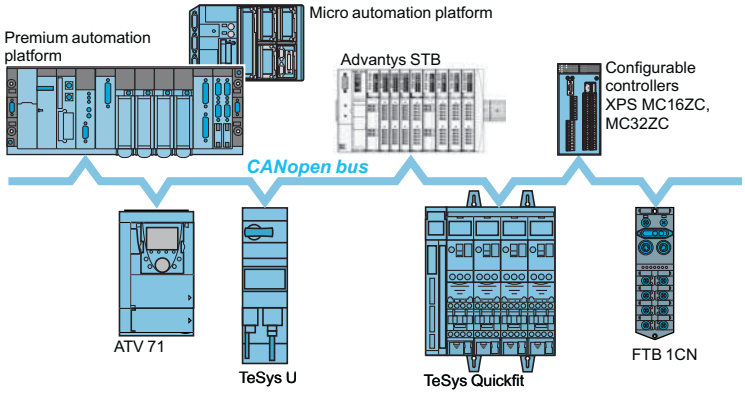
Application schemes and functional diagrams

See from page 2/126

Safety automation system solutions
Preventa configurable safety controllers type XPS MC

Communication

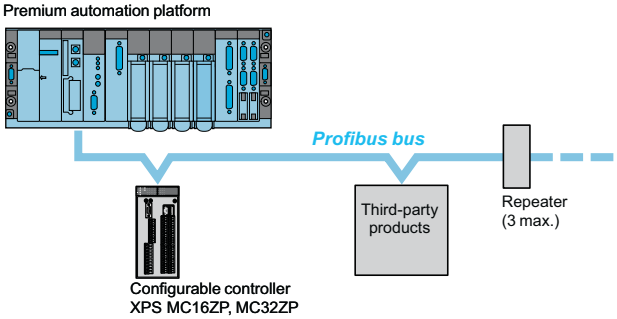
CANopen fieldbus



Configurable safety controllers XPS MC●●ZC incorporate a SUB-D 9-pin male connector for direct connection on CANopen bus.

CANopen bus is an open bus that ensures deterministic and reliable access to the real-time data of automation equipment. The bus uses a shielded dual twisted pair on which a maximum of 127 devices can be connected by chaining. The data rate varies between 10 Kbps and 1Mbps depending on the length of the bus (5000 m to 20 m).

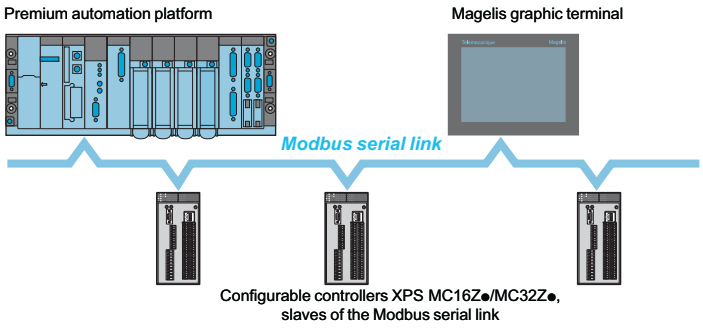
Profibus bus



Configurable safety controllers XPS MC●●ZP incorporate a SUB-D 9-pin female connector for connection on Profibus bus.
Configurable safety controllers XPS MC●●ZP are slaves on the Profibus bus.

Profibus bus is a fieldbus that meets industrial communication requirements. The topology of the Profibus bus is of the linear type with a centralised master/slave type access procedure. The physical link is a single shielded twisted pair.

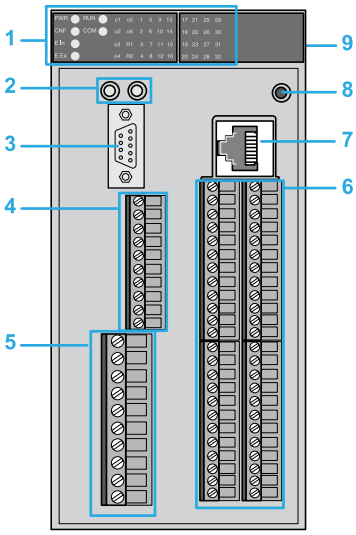
Modbus serial link



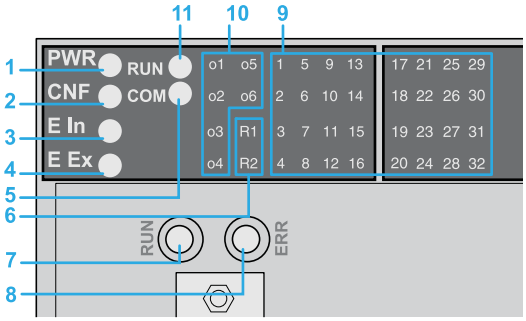
Configurable safety controllers XPS MC●●Z● MC incorporate a Modbus communication interface (RJ45 connector) for configuration and diagnostics.
This interface enables connection of the controllers to:
- a PC (configuration),
- a PLC (diagnostics), or
- an operator dialogue terminal (diagnostics).

The Modbus serial link comprises a master station (Premium automation platform) and slave stations (configurable controllers XPS MC16/32Z●).
Two exchange mechanisms are possible:
- **Question/response:** the questions from the master are addressed to a given slave. The response is expected by return from the interrogated slave.
- **Distribution:** the master distributes a message to all the stations of the Modbus serial link. The latter execute the order without transmitting a reply.

Safety automation system solutions
Preventa configurable safety controllers type XPS MC



Configurable safety controller XPS MC●●Z●, with screw connectors



Illuminated display

Description

Configurable safety controllers XPS MC●●Z●

Front face of controllers:

1 LED display and system diagnostics.
2 Two LEDs for CANopen or Profibus *(1)* connection status.
3 SUB-D 9-pin male connector for connection on CANopen bus (**XPS MC16ZC/ MC32ZC**)
or SUB-D 9-pin female connector for connection on Profibus bus (**XPS MC16ZP/ MC32ZP**).
4 Solid-state safety output and “muting” indicator light terminals.
5 Power supply (⎓ 24 V) and relay safety output terminals.
6 Control output terminals for power supply to safety inputs and safety input terminals.
7 RJ45 connector for connection on Modbus serial link.
8 RESET button (resetting of controller).

Rear face of controllers:

9 Fixing plate for mounting on rail.

(1) Depending on controller model.

LED details

LED	Colour	Status	Meaning
1 PWR	Green	On	Supply voltage present.
2 CNF	Yellow	On	In configuration mode.
		Flashing	Not configured, initial power-up.
3 E In	Red	On	Internal error: all safety outputs deactivated.
4 E Ex	Red	On	External error: all safety outputs associated with the defective circuit are deactivated.
5 COM	Green	On	Controller communicating via the TER (RJ45) connection.
6 R1, R2	Green	On	Relay outputs 13/14, 23/24, 33/34 and 43/44 activated.
		Flashing	Fault on these outputs.
7 RUN	Green	Off	Hardware OK for the Profibus bus or the CANopen bus.
		On	Communicating on Profibus bus or on CANopen bus. Normal status.
8 ERR	Red	On	Communication impossible, configuration error, damaged cabling or absence. Bus deactivated
		Off	Communicating on CANopen or Profibus bus. Normal status.
		Flashing (x 1)	Warning limit reach.
		Flashing (x 2)	Control event error on CANopen bus.
		Flashing (x 3)	Synchronisation error on CANopen bus.
9 1…16 1…32	Green	On	Input circuit closed.
		Flashing	Error detected on input relating to LED.
10 o1…o6	Green	On	Solid-state output activated.
		Flashing	Short-circuit, fault on output.
11 RUN	Green	On	Run mode.
		Flashing	Changing from run mode to stop mode.

Safety automation system solutions
Preventa configurable safety controllers type XPS MC

Characteristics

Configurable safety controller type				XPS MC16Z and MC32Z, XPS MC16ZC and MC32ZC, XPS MC16ZP and MC32ZP
Conformity to standards				EN/IEC 60204-1, EN 1760-1/ISO 13856-1, EN/IEC 60947-5-1, EN/IEC 61496-1, EN 574/ISO 13851, EN 954-1/EN/ISO 13849-1, IEC 61508
Product certifications				UL, CSA, TÜV
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/EN/ISO 13849-1 and IEC 61508)				Category 4 max. (EN 954-1/EN/ISO 13849-1), SIL 3 max. (IEC 61508)
Supply voltage			**V**	⎓ 24 ± 20%
Maximum consumption			**W**	12
Fuse protection			**A**	16 gL max.
Start button monitoring				Configurable
Control circuit voltage				28.8 V/13 mA (between input terminals C1-I1 to C8-I16, resp. I32)
Calculation of wiring resistance RL			Ω	100 max, maximum cable length: 2000 m (Between input terminals)
Synchronisation time between inputs			**s**	Depending on configuration selected
Outputs	**Relay**	Voltage reference		Volt-free
		Safety circuit		2 N/O per function (4 N/O total) (13-14, 23-24, 33-34, 43-44)
		Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
		Breaking capacity in DC-13		24 V/1.5 A L/R = 50 ms
		Thermal current (Ithe) for each group of 2 outputs	**A**	6 for 1 output and 2 for the other, **or** 4 for both outputs.
		Current limit	**A**	Ith ≤ 16 (with several relay output circuits simultaneously loaded)
		Output fuse protection	**A**	4 gL or 6 quick blow
		Minimum current	**mA**	10 *(1)*
		Minimum voltage	**V**	17 *(1)*
	Solid-state	Breaking capacity		24 V/2 A
		Safety circuit		6 solid-state (O1, O2, O3, O4, O5, O6)
		Current limit	**A**	Ith ≤ 6.5 (with several solid-state output circuits simultaneously loaded)
Electrical durability				See page 2/172
Response time on input opening			**ms**	Response time = 20 or 30, configurable using software XPSMCWIN □ if 20 for controllers XPS MC●●Z●: 30 for a safety mat □ if 30 for controllers XPS MC●●Z●: 45 for a safety mat
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to IEC 60647-5-1, DIN VDE 0110 part 1)
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to IEC 60647-5-1, DIN VDE 0110 part 1)
LED display				30 (XPS MC16Z), 46 (XPS MC32Z) 32 (XPS MC16ZC/MC16ZP, 48 (XPS MC32ZC/MC32ZP)
Temperature	Operating		**°C**	- 10…+ 55
	Storage		**°C**	- 25…+ 85
Degree of protection				IP 20 conforming to EN/IEC 60529 (connector and enclosure)

(1) The controller is also capable of switching low power loads (17 V/10 mA minimum) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

Safety automation system solutions
Preventa configurable safety controllers type XPS MC

Communication

Modbus serial link

Compatibility			**XPS MC16Z, XPS MC32Z, XPS MC16ZC, XPS MC32ZC, XPS MC16ZP, XPS MC32ZP**
Serial link ports	Number and type		1 x RJ45
	Status		Slave
Data exchange			14 words
Addressing			1 …247
Baud rate		**bps**	1200, 2400, 4800, 9600 or 19200
Parity			Even, odd, none
Fixed parameters			RTU (Remote Terminal Unit) mode 1 start bit / 8 data bits 1 stop bit stop with “even” or “odd” parity 2 stop bits without parity
Functions supported			01: 8-bit output data / 32-bit input data (0 = OFF, 1 = ON) 02: 32-bit input data / 8-bit output data (0 = OFF, 1 = ON) 03: information and errors

CANopen bus

Compatibility			**XPS MC16ZC, XPS MC32ZC**
Serial link ports	Number and type		1 x SUB-D 9-pin male
	Status		Slave
Data exchange			14 words By included dual port memory: only data addresses, diagnostics, but no baud rates
Parameters (adjustable using software XPSMCWIN)	Baud rate	**Kbps**	20, 50, 125, 250, 500, 800
		Mbps	1
	Address		1…127

Profibus bus

Compatibility			**XPS MC16ZP, XPS MC32ZP**
Serial link ports	Number and type		1 x SUB-D 9-pin female
	Status		Slave
Data exchange			14 words By included dual port memory: only data addresses
Parameters	Baud rate	**Mbps**	12
	Address		1…125

Connections

Type			**Separate plug-in screw connector XPS MCTS●● *(1)***	**Separate plug-in spring clip connector XPS MCTS●● *(1)***
Power supply and relay output terminals				
1 conductor	Without cable end		Solid or flexible cable: 0.2…2.5 mm², AWG 24-12	
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…2.5	
		mm²	With bezel, flexible cable: 0.25…2.5	
2 conductors	Without cable end	**mm²**	Solid or flexible cable: 0.2…1.5	–
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…1.5	–
		mm²	Double, with bezel, flexible cable: 0.5…1.5	Double, with bezel, flexible cable: 0.5…1
Tightening torque of screw terminals		**Nm**	0.5…0.6	–
Wire stripping length		**mm**	10	
Other terminals				
1 conductor	Without cable end		Solid or flexible cable: 0.14…1.5 mm², AWG 28-16	
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…1.5	
		mm²	With bezel, flexible cable: 0.25…0.5	
2 conductors	Without cable end	**mm²**	Solid cable: 0.14…0.5 Flexible cable: 0.14…0.75	–
	With cable end	**mm²**	Without bezel, flexible cable: 0.25…0.34	–
		mm²	Double, with bezel, flexible cable: 0.5	–
Enclosure fixing (conforming to DIN EN 50022)			Metal adaptor for fixing on ⊔ 35 mm metal rail	

(1) To be ordered separately.

Safety automation system solutions

Preventa configurable safety controllers type XPS MC

105569



XPS MC16Z

105570



XPS MC32Z

105739



XPS MC16ZC

105545



XPS MC32ZC

105540



XPS MC16ZP

105546



XPS MC32ZP

References

Configurable safety controllers (connector not included)

Number of inputs	Number of outputs		Communication (Link and bus)	Reference	Weight kg
	Relay	Solid-state			
16	**4 (2 x 2)**	**6**	Modbus	**XPS MC16Z**	0.820
			Modbus, CANopen	**XPS MC16ZC**	0.820
			Modbus, Profibus	**XPS MC16ZP**	0.820
32	**4 (2 x 2)**	**6**	Modbus	**XPS MC32Z**	0.840
			Modbus, CANopen	**XPS MC32ZC**	0.840
			Modbus, Profibus	**XPS MC32ZP**	0.840

Plug-in connectors for configurable safety controllers *(1)*

Description	For use with	Reference	Weight kg
Screw connectors	XPS MC16Z, MC16ZC, MC16ZP	**XPS MCTS16**	0.080
	XPS MC32Z, MC32ZC, MC32ZP	**XPS MCTS32**	0.110
Spring clip connectors	XPS MC16Z, MC16ZC, MC16ZP	**XPS MCTC16**	0.080
	XPS MC32Z, MC32ZC, MC32ZP	**XPS MCTC32**	0.110

Configuration software

■ Reference XPS MCWIN is the full version of configuration software XPSMCWIN version 2.10 and must be installed if no previous version of this software has been installed.

■ Reference SSVXPSMCWINUP is an update for software XPSMCWIN and can be used if SSVXPSMCWINUP has been installed using Safety Suite V1. An update from version 2.0 to version 2.10 for the software XPSMCWIN will then be performed.

Description	Operating system	Details *(2)*	Languages	Reference	Weight kg
Configuration software for controllers XPS MC●●Z● CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	EN, FR, DE, IT, ES, PT	**XPS MCWIN**	0.520
XPSMCWIN software update CD-ROM + user manual	Windows 2000, Windows XP	Software available on Safety Suite V2 software pack	EN, FR, DE, IT, ES, PT	**SSVXPSMCWINUP**	0.520

(1) To be ordered separately to the controllers.
(2) EDS and GSD files are available on the XPSMCWIN configuration software CD-ROM.


XPS MCCPC


TSX PCX 1031


490 NT● 000 ●●


TSX CUSB485

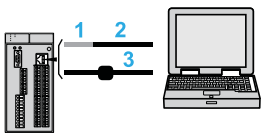

TSX CAN TDM4


ABL 8RPS24100

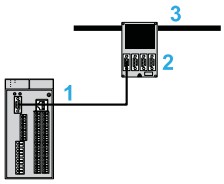
References

Connecting cables *(1)*

Function			Length m	Reference	Weight kg
Diagnostics using Magelis operator dialogue terminal type XBT GT			3	**VW3 A8 306 R30**	1.130
Configuration software	1	Adaptor: RJ45 socket/PC connection cables	–	**XPS MCCPC**	0.011
	2	Cable to PC serial port (type SUB-D9)	2.5	**TSX PCX 1031**	0.170
	3	Straight shielded twisted pair cables, EIA/TIA 568 standard (RJ45 connector at each end)	2	**490 NTW 000 02**	–
			5	**490 NTW 000 05**	–
			12	**490 NTW 000 12**	–
		Straight shielded twisted pair cables, UL and CSA 22.1 approved (RJ45 connector at each end)	2	**490 NTW 000 02U**	–
			5	**490 NTW 000 05U**	–
			12	**490 NTW 000 12U**	–
	with	RJ45/PC USB port converter *(2)*	0.4	**TSX CUSB485**	–



Function	Medium		Length m	Reference	Weight kg
Modbus serial link access	Premium automation platform TSX SCY 21601		–	**XPS MCSCY**	–
CANopen bus access	1	CANopen connection cables (fitted with: 1 SUB-D 9-pin female connector at each end)	0.3	**TSX CANCADD03**	–
			1	**TSX CANCADD1**	–
			3	**TSX CANCADD3**	–
			5	**TSX CANCADD5**	–
	2	CANopen tap-off box	–	**TSC CANTDM4**	–
	3	Standard CANopen cables	50	**TSX CANCA50**	–
			100	**TSX CANCA100**	–
			300	**TSX CANCA300**	–
Profibus bus access			100	**TSX PBS CA100**	–
			400	**TSX PBS CA400**	–



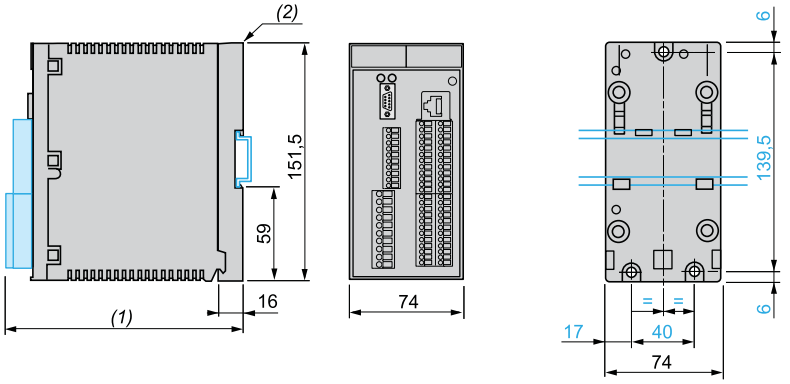
Accessories *(1)*

Regulated switch mode power supply, single-phase	Output voltage: ⎓ 24…28.8 V Nominal current: 10 A Nominal power: 240 W		**ABL 8RPS24100**	1.000

(1) To be ordered separately.
*(2) The converter **TSX CUSB485** is installed using **Driver Pack V2.3**. This "driver" is available on the Safety Suite V2 software pack or downloadable from our site: www.schneider-electric.com*

Dimensions, mounting

XPS MC●●Z●



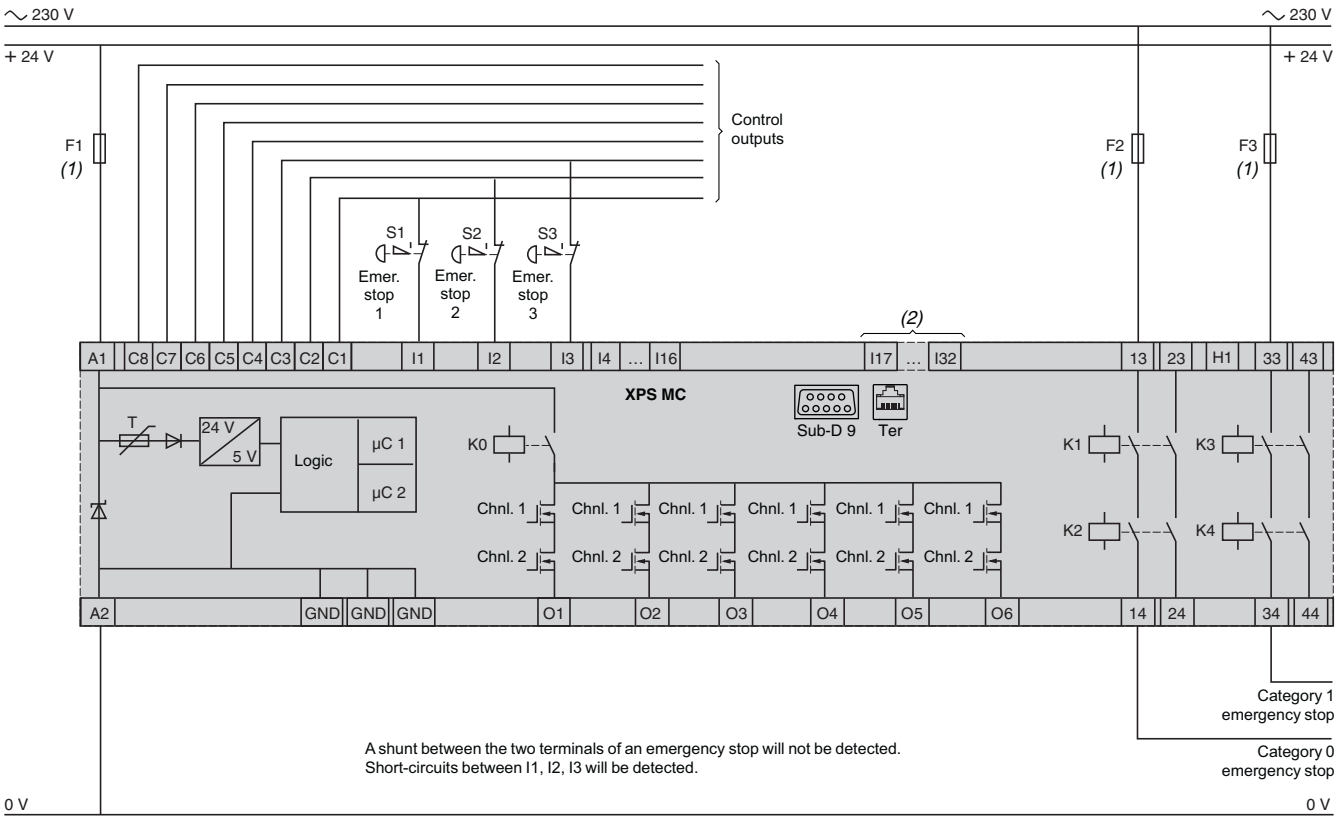
(1) 153 mm with screw connector XPS MCTS●●. 151.4 mm with spring clip connector XPS MCTC●●.
(2) Metal adaptor for fixing on metal ⊔ 35 mm rail.

Safety automation system solutions
Preventa configurable safety controllers
Type XPS MC

Emergency stop monitoring, with or without time delay, 1-channel wiring, with automatic start

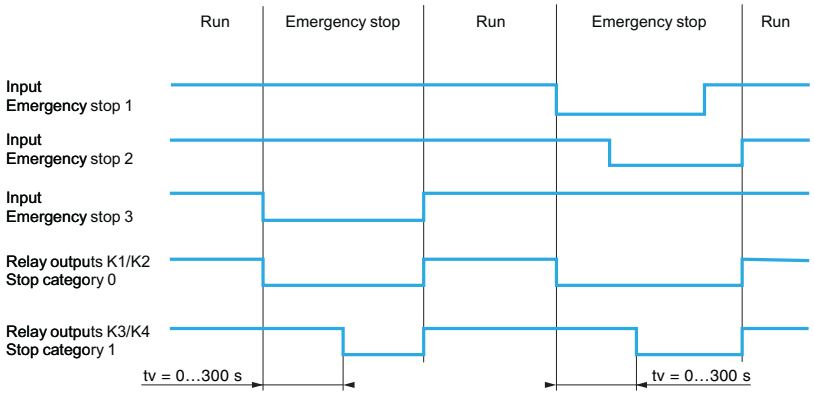
Category 4 achieved with necessary precautions taken to eliminate input circuit faults.

Application scheme



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagram

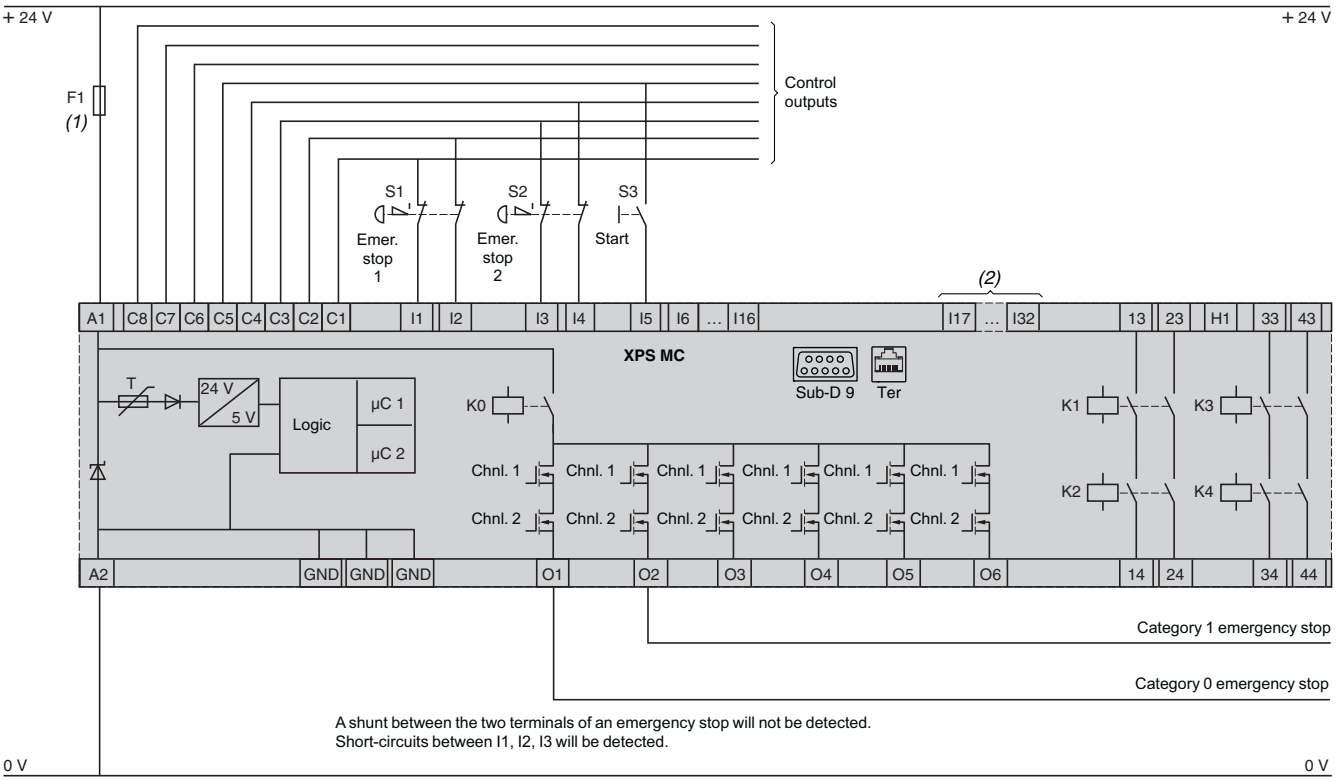


tv = delay time

Emergency stop monitoring, with or without time delay, 2-channel wiring, with start button

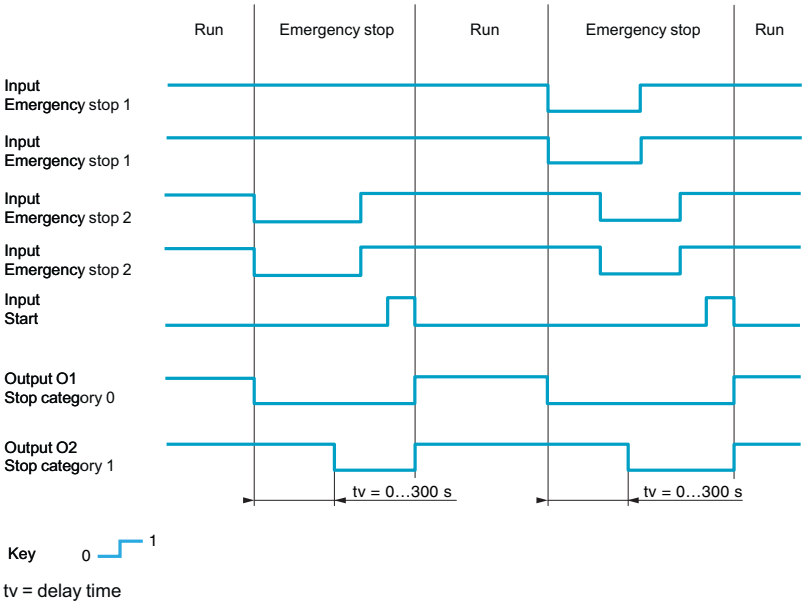
Category 4 conforming to standard EN 954-1.

Application scheme



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagram

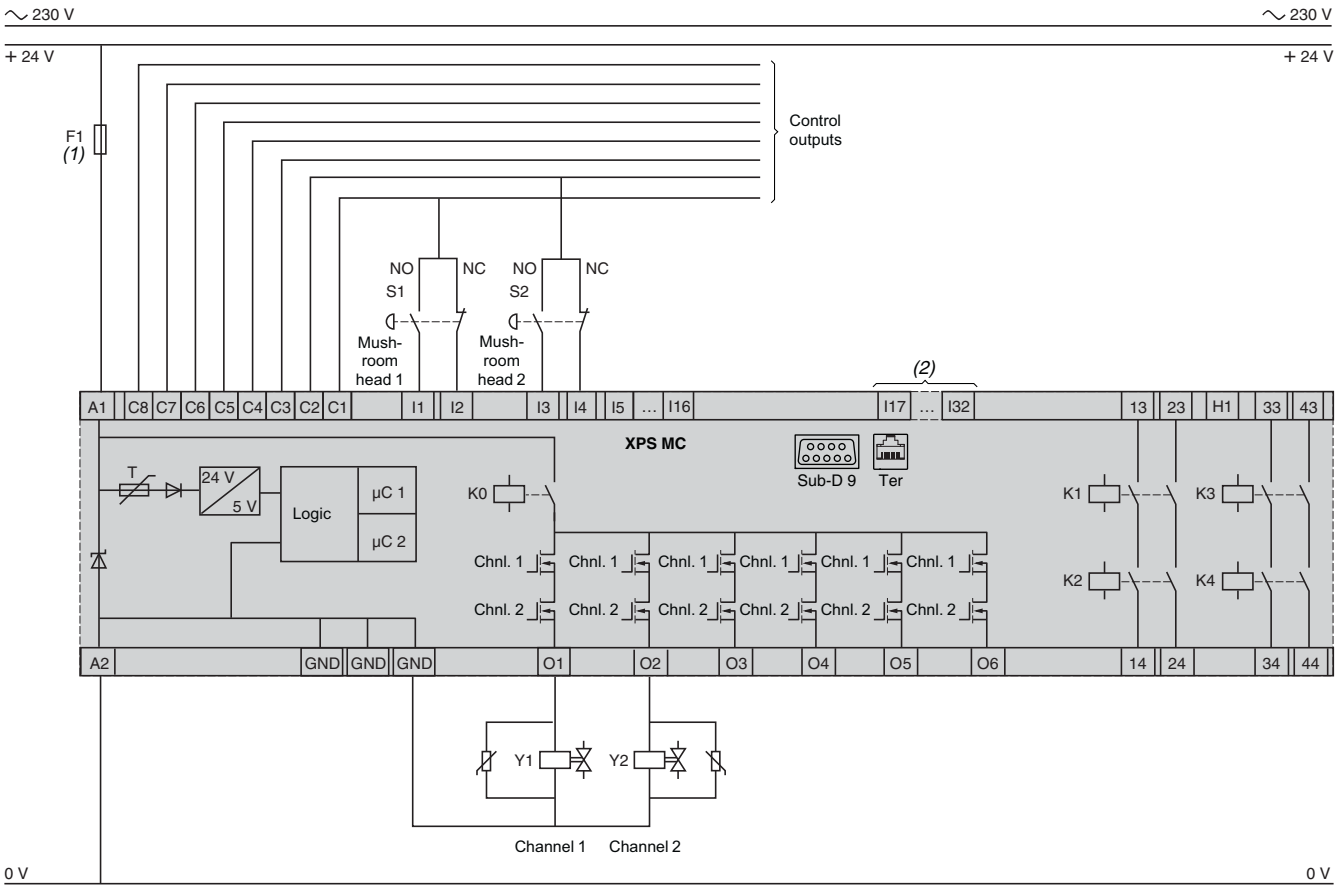


2

Two-hand control (type III-C conforming to EN 574-1)

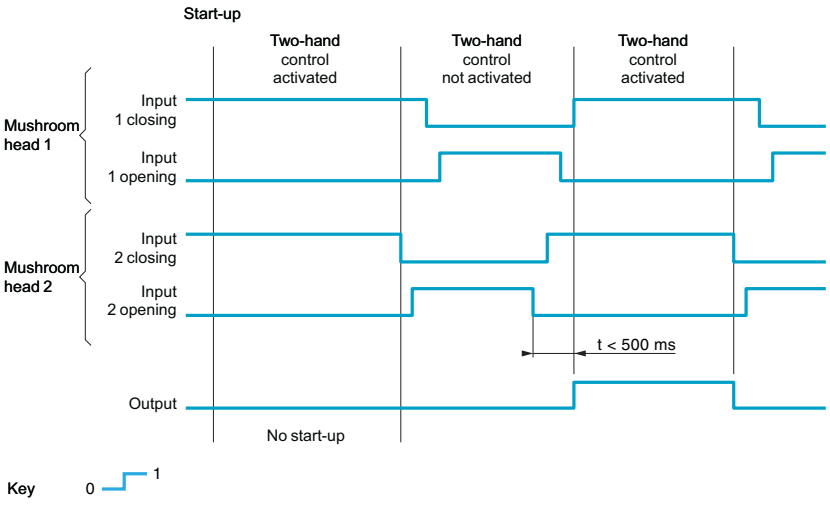
Category 4 conforming to standard EN 954-1.

Application scheme



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagram

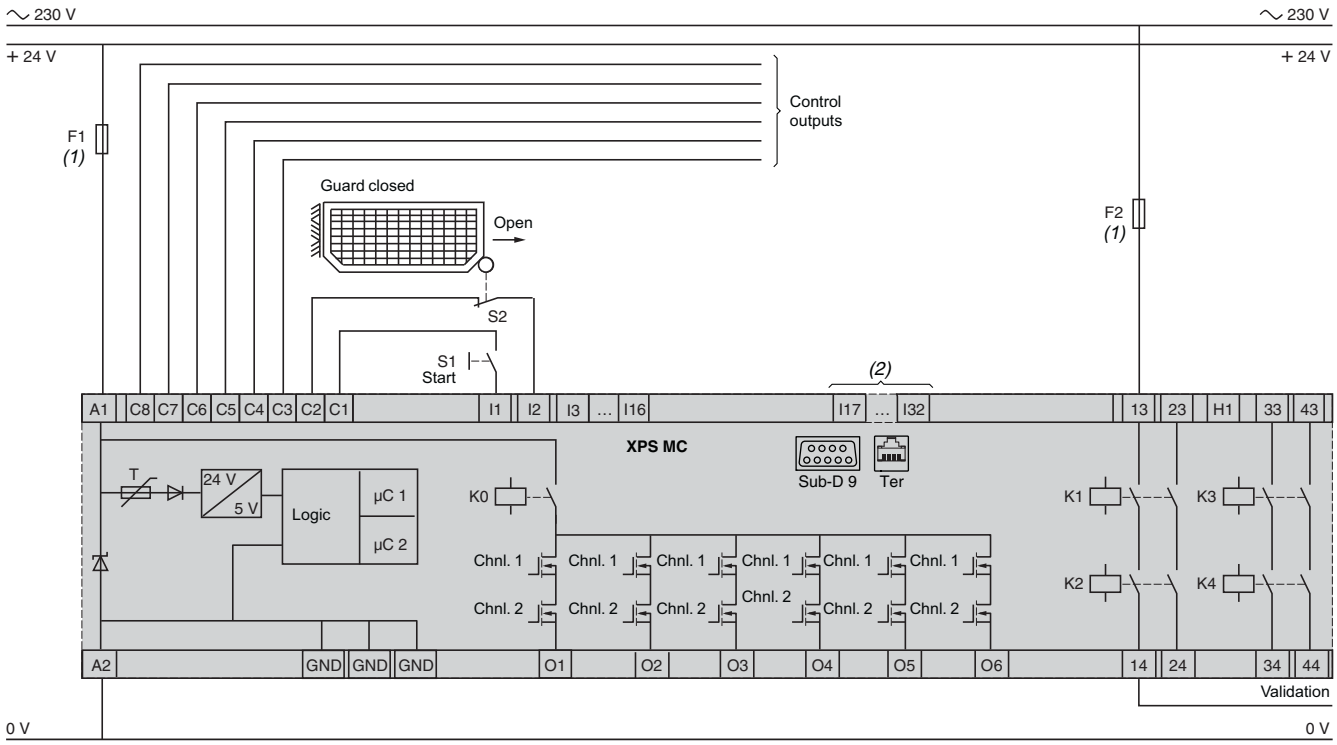


tv = delay time

Guard monitoring with 1 limit switch

Category 1 conforming to standard EN 954-1.

Application scheme

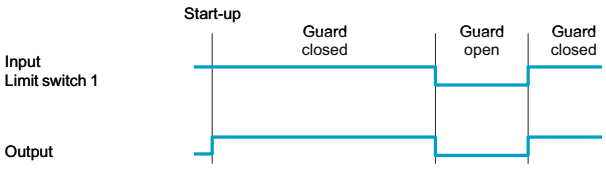


*(1) Technical characteristics for maximum rating of fuses, **see page** 2/122.*
(2) Only applicable to XPS MC32Z●.

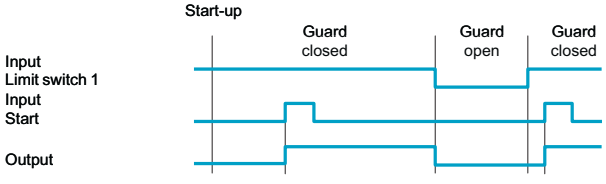
Functional diagrams

Start test = NO

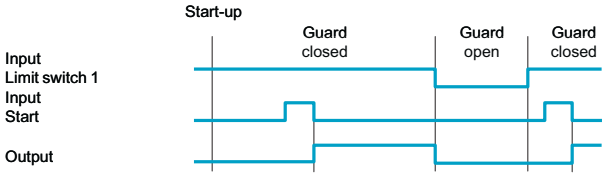
Automatic start



Rising edge monitored start

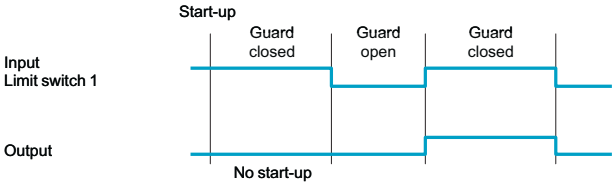


Falling edge monitored start

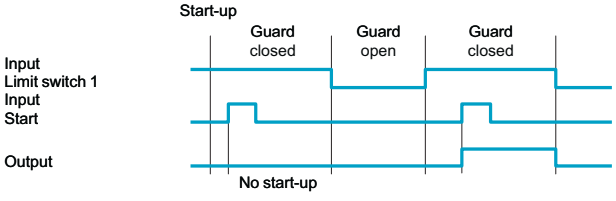


Start test = YES

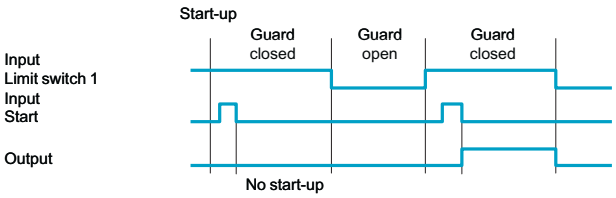
Automatic start



Rising edge monitored start



Falling edge monitored start



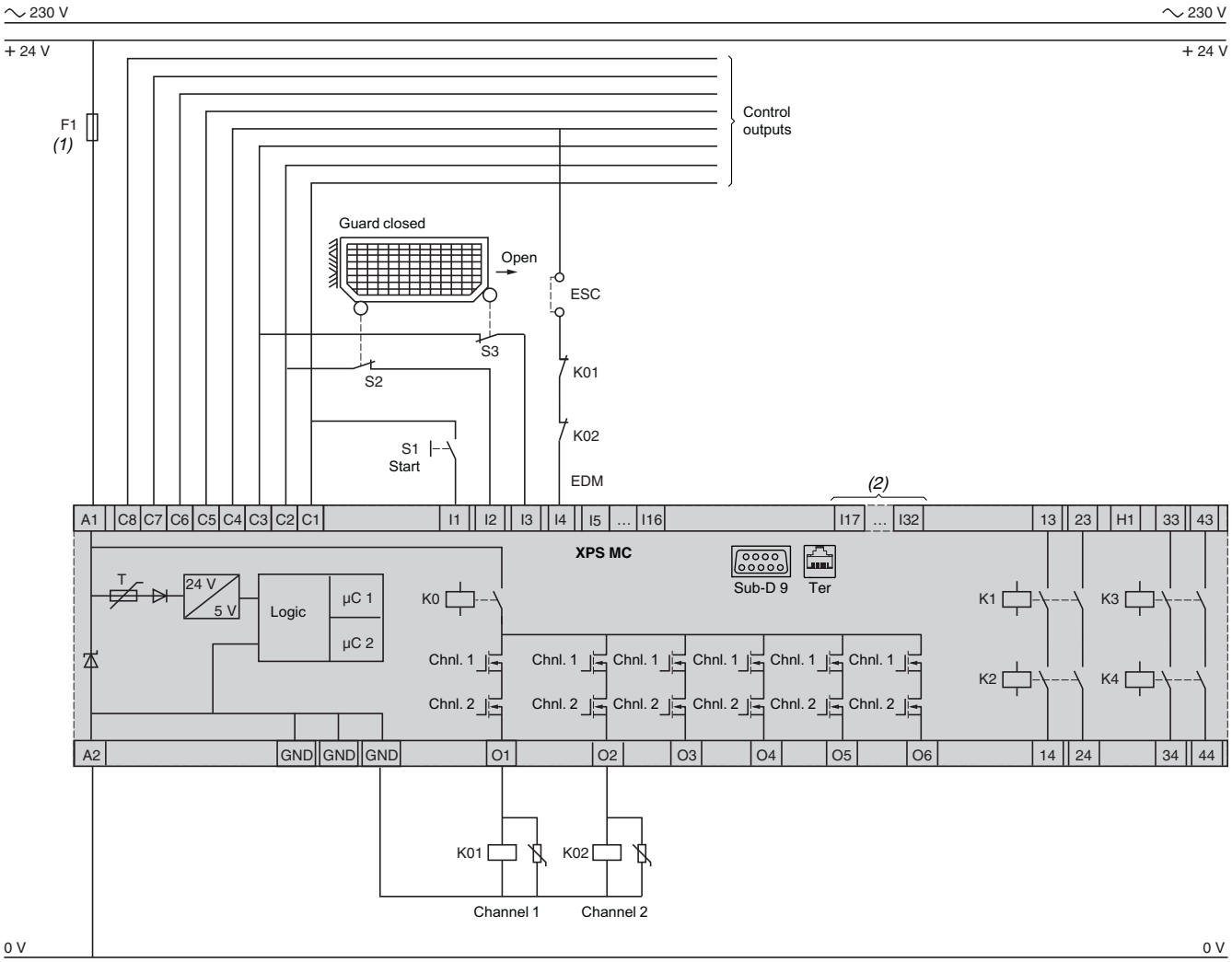
Key 0 1

2

Guard monitoring with 2 limit switches

Category 4 conforming to standard EN 954-1.

Application scheme



ESC = external start conditions
EDM = external devices monitoring

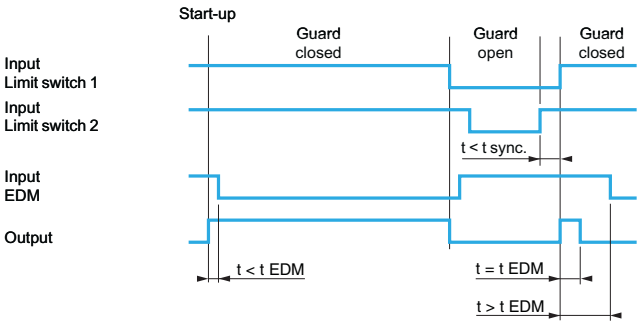
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Guard monitoring with 2 limit switches (continued)

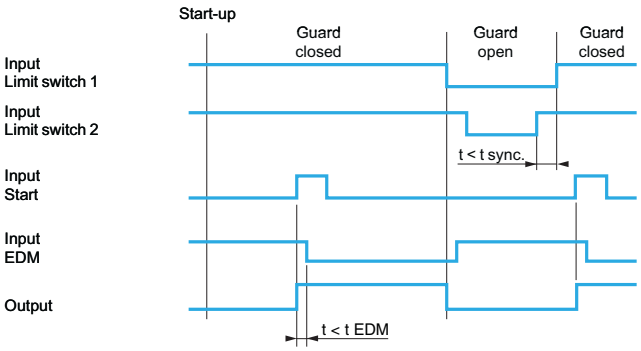
Functional diagrams

Start test = NO

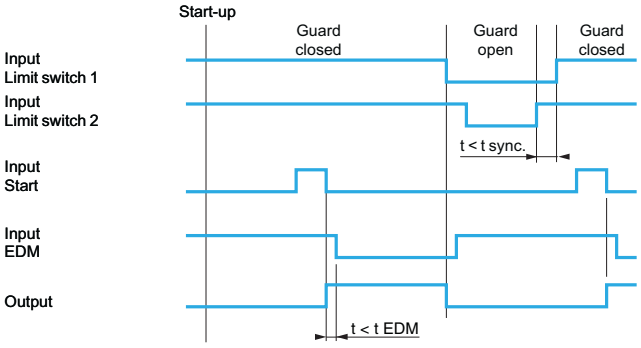
Automatic start



Rising edge monitored start

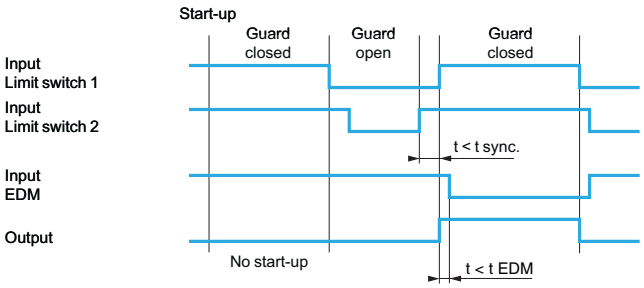


Falling edge monitored start

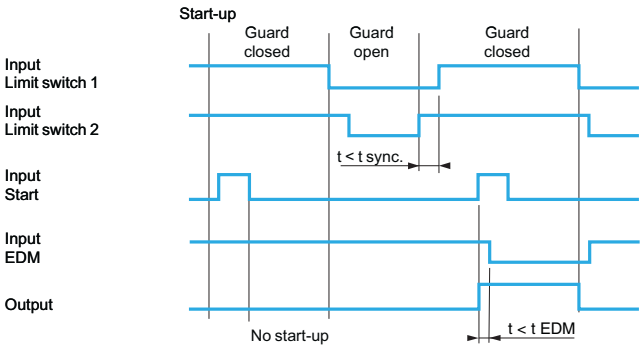


Start test = YES

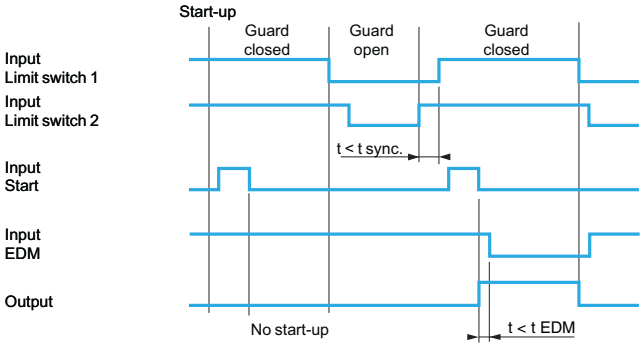
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 — 1

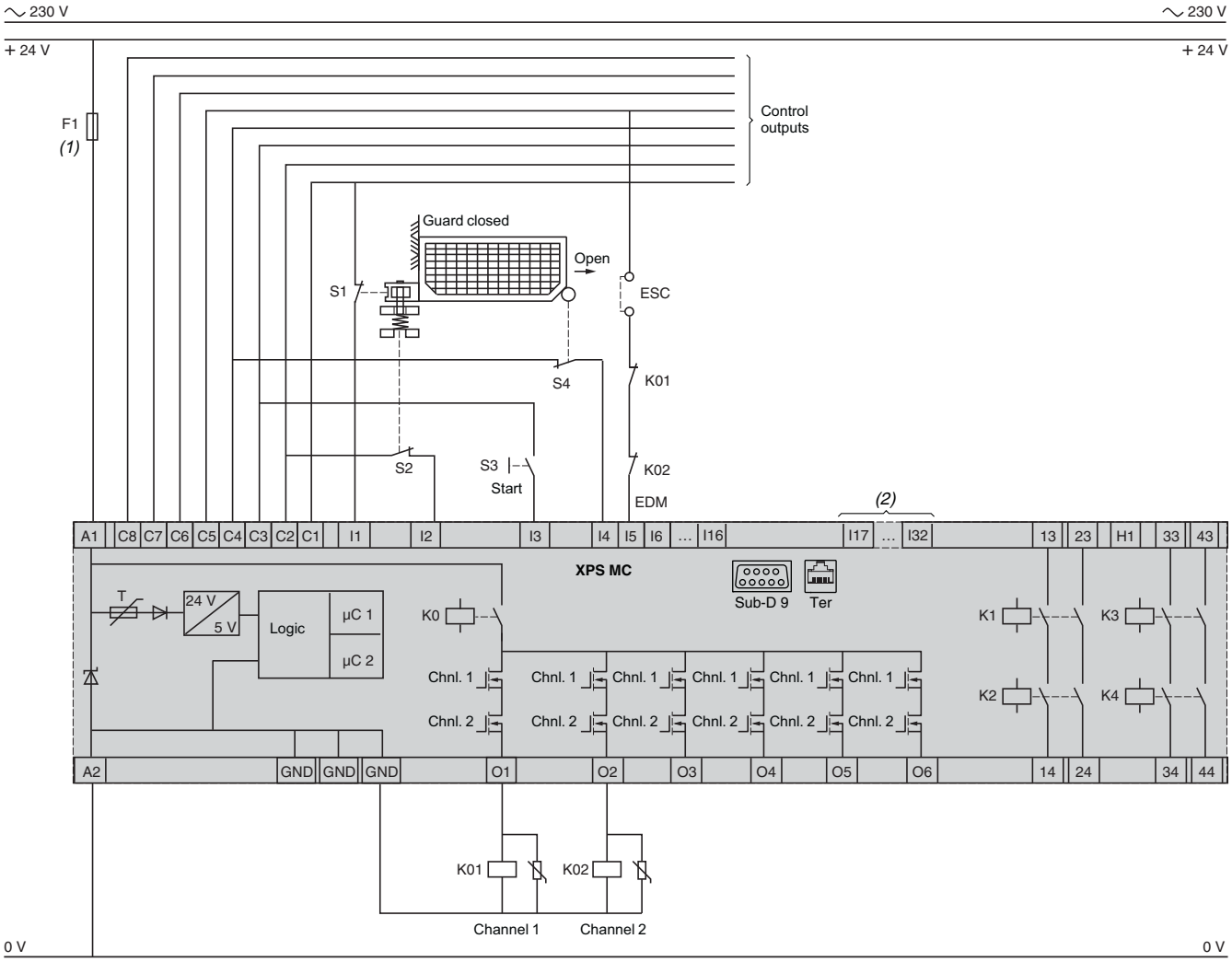
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronisation time

2

Guard monitoring with 2 limit switches, with guard locking

Category 4 conforming to standard EN 954-1.

Application scheme



ESC = external start conditions
EDM = external devices monitoring

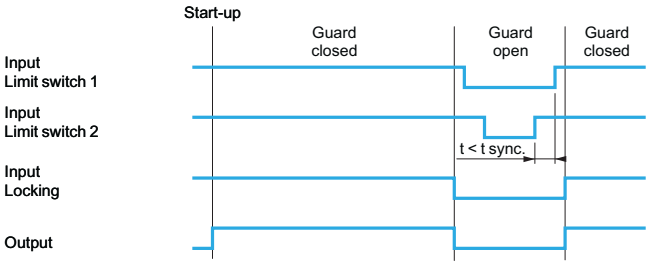
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Guard monitoring with 2 limit switches, with guard locking (continued)

Functional diagrams

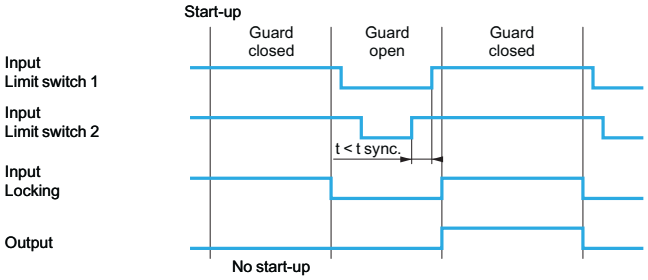
Start test = NO

Automatic start

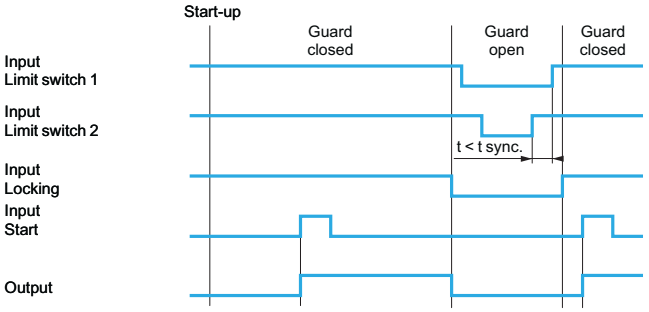


Start test = YES

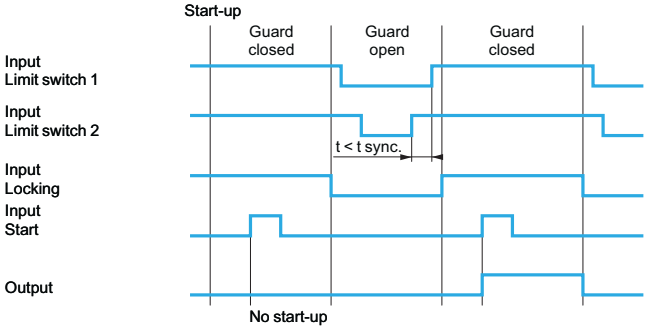
Automatic start



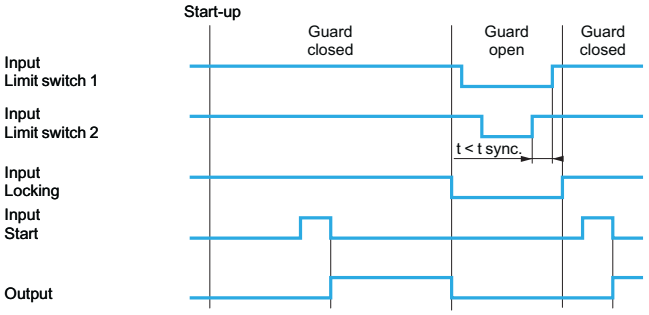
Rising edge monitored start



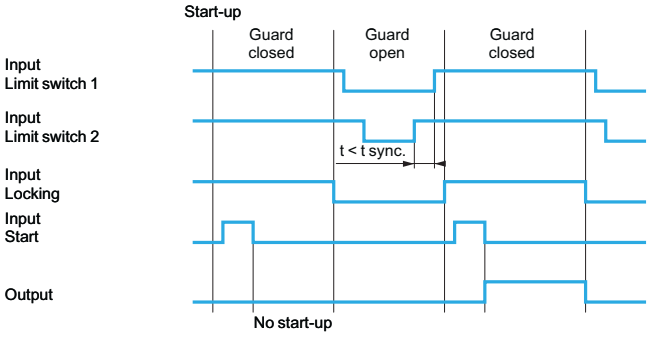
Rising edge monitored start



Falling edge monitored start



Falling edge monitored start



Key 0 ⌐ 1

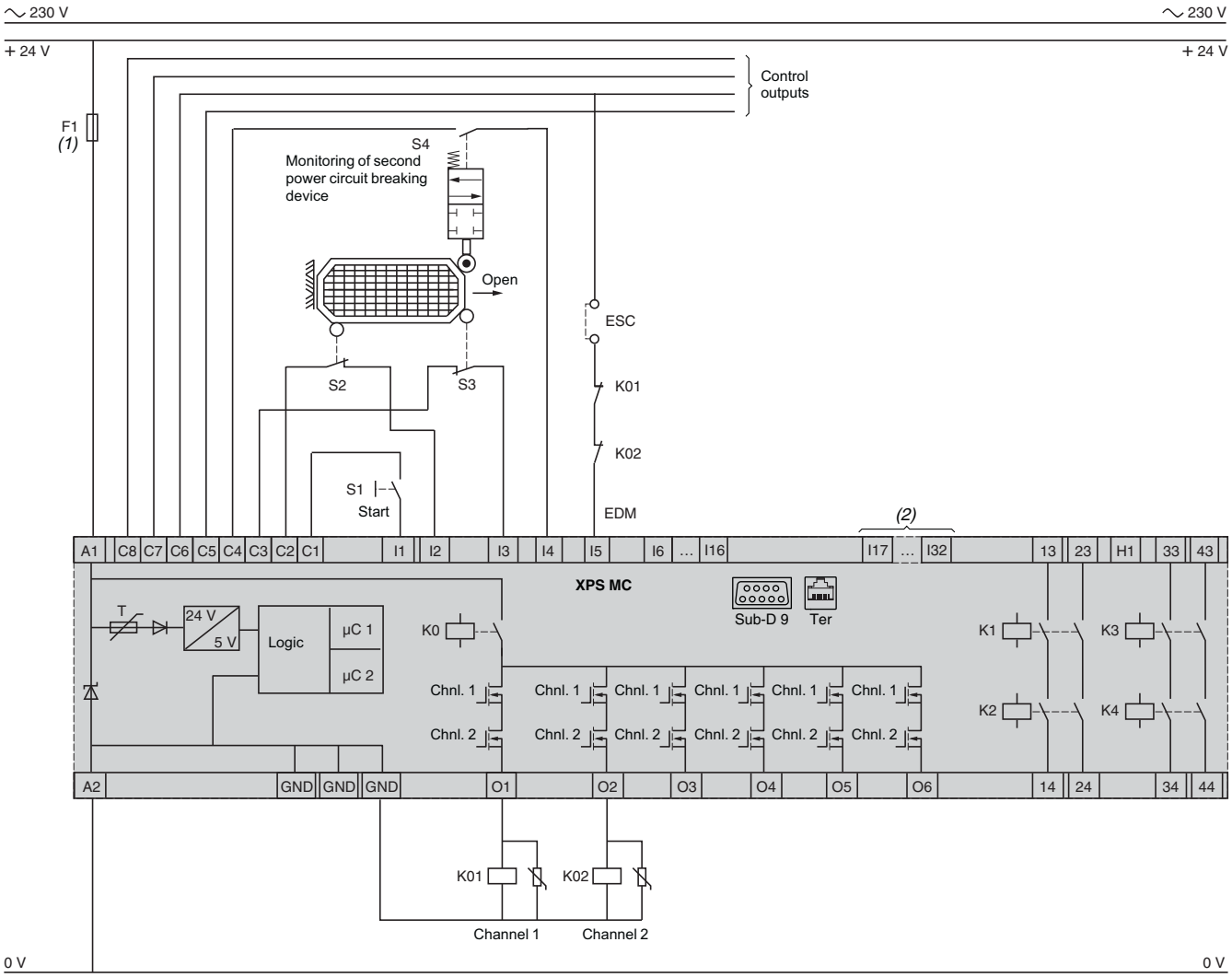
t sync. = synchronisation time

2

Guard monitoring for injection presses and blowing machines

Category 4 conforming to standard EN 954-1.

Application scheme



ESC = external start conditions
EDM = external devices monitoring

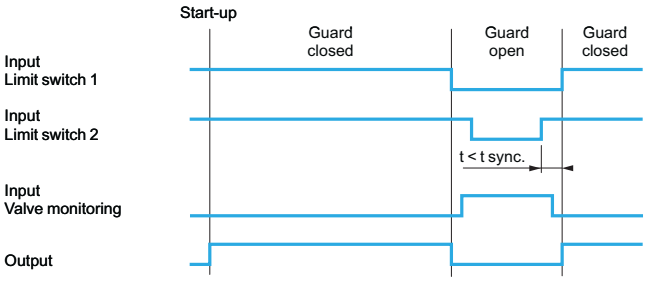
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Guard monitoring for injection presses and blowing machines (continued)

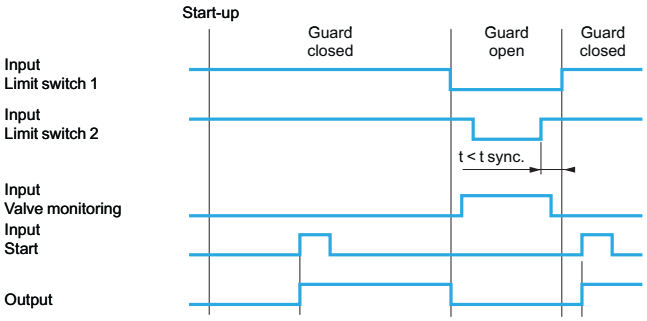
Functional diagrams

Start test = NO

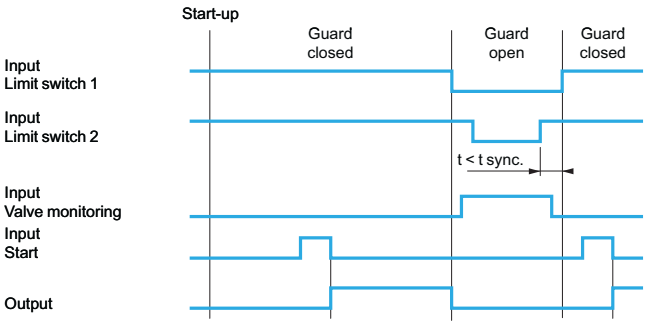
Automatic start



Rising edge monitored start

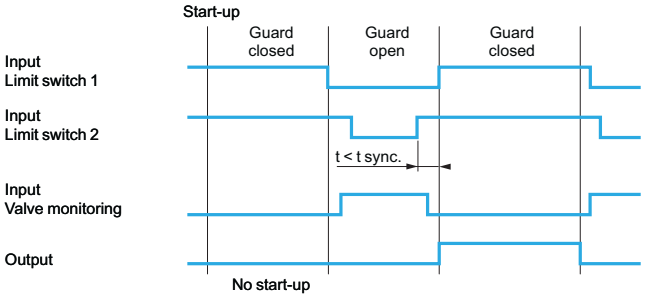


Falling edge monitored start

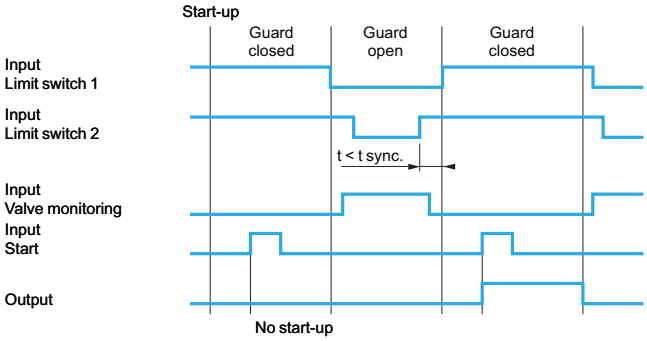


Start test = YES

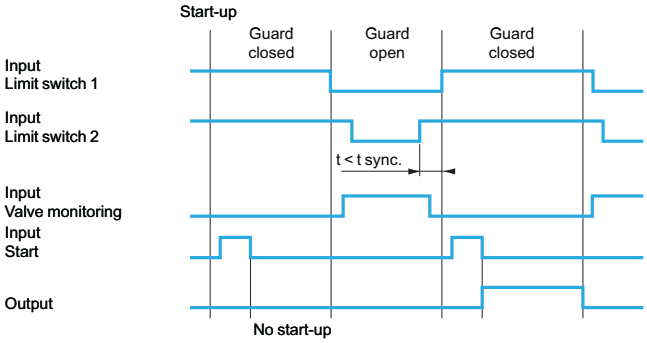
Automatic start



Rising edge monitored start



Falling edge monitored start



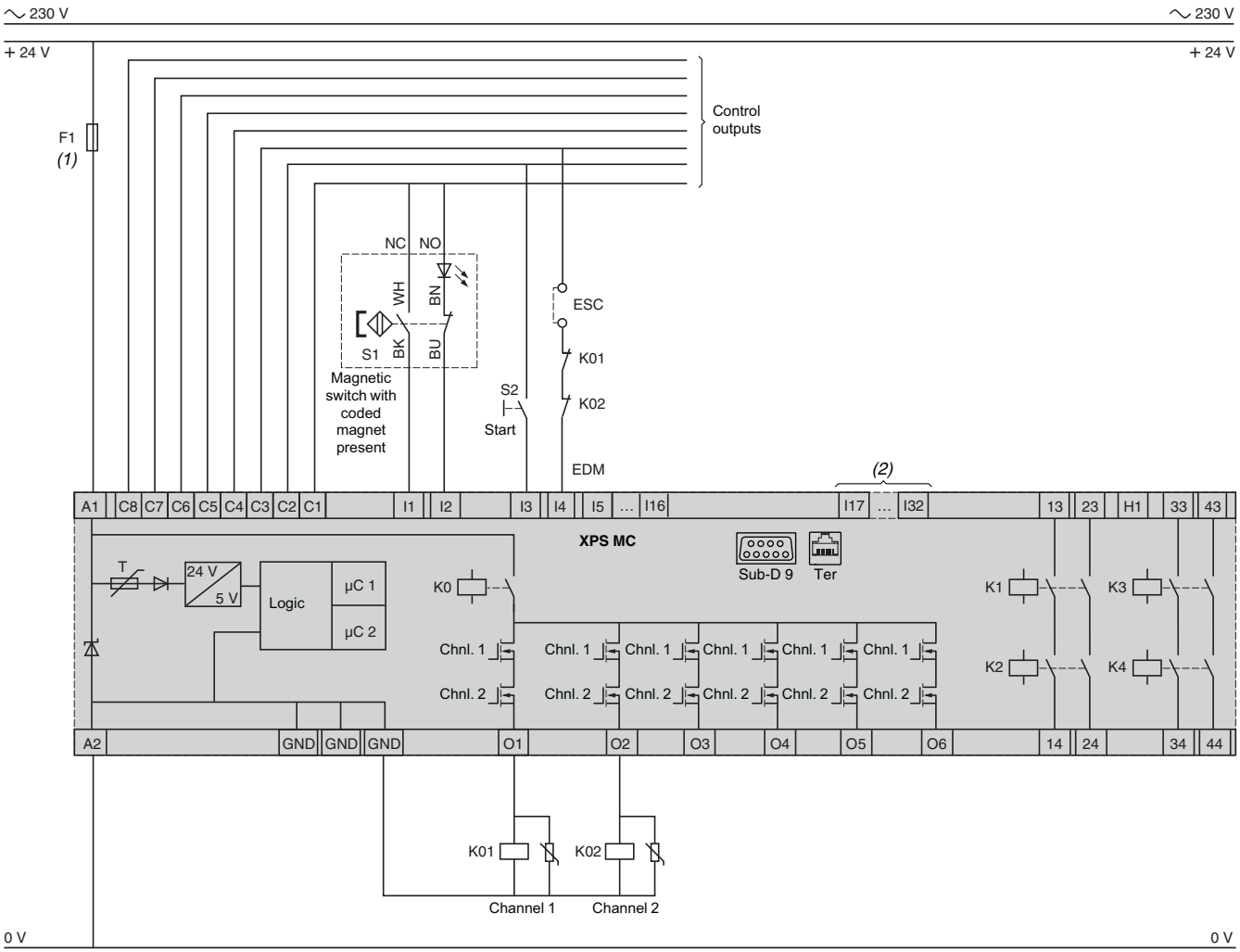
Key 0 ⌐ 1

t sync. = synchronisation time

2

Magnetic switch monitoring

Application scheme



ESC = external start conditions
EDM = external devices monitoring

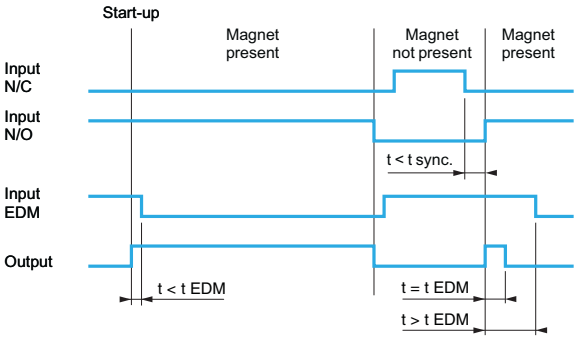
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Magnetic switch monitoring (continued)

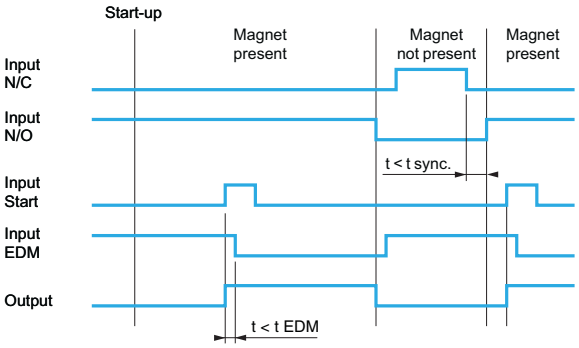
Functional diagrams

Start test = NO

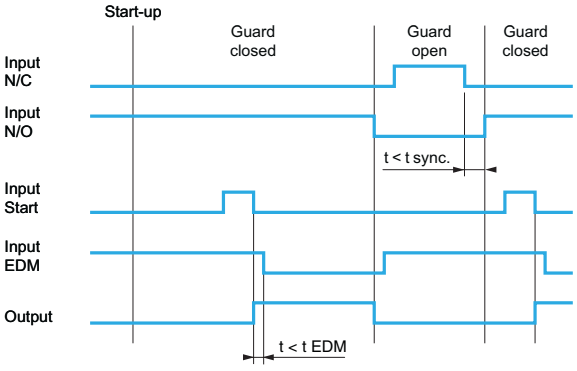
Automatic start



Rising edge monitored start

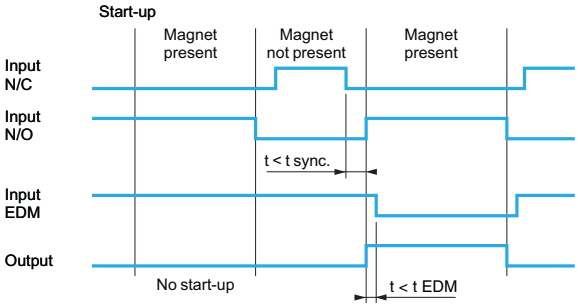


Falling edge monitored start

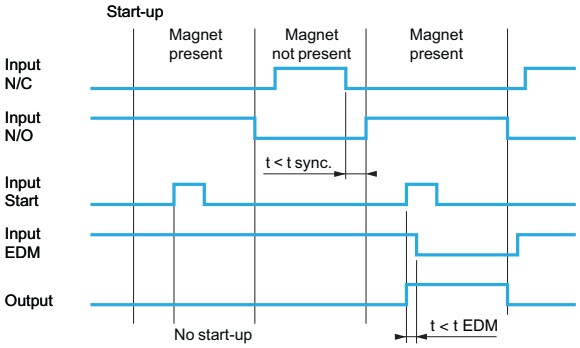


Start test = YES

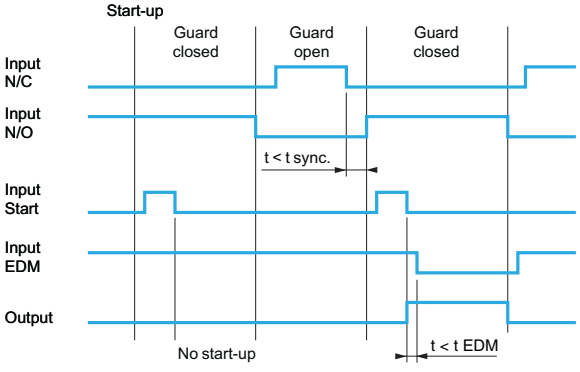
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 → 1

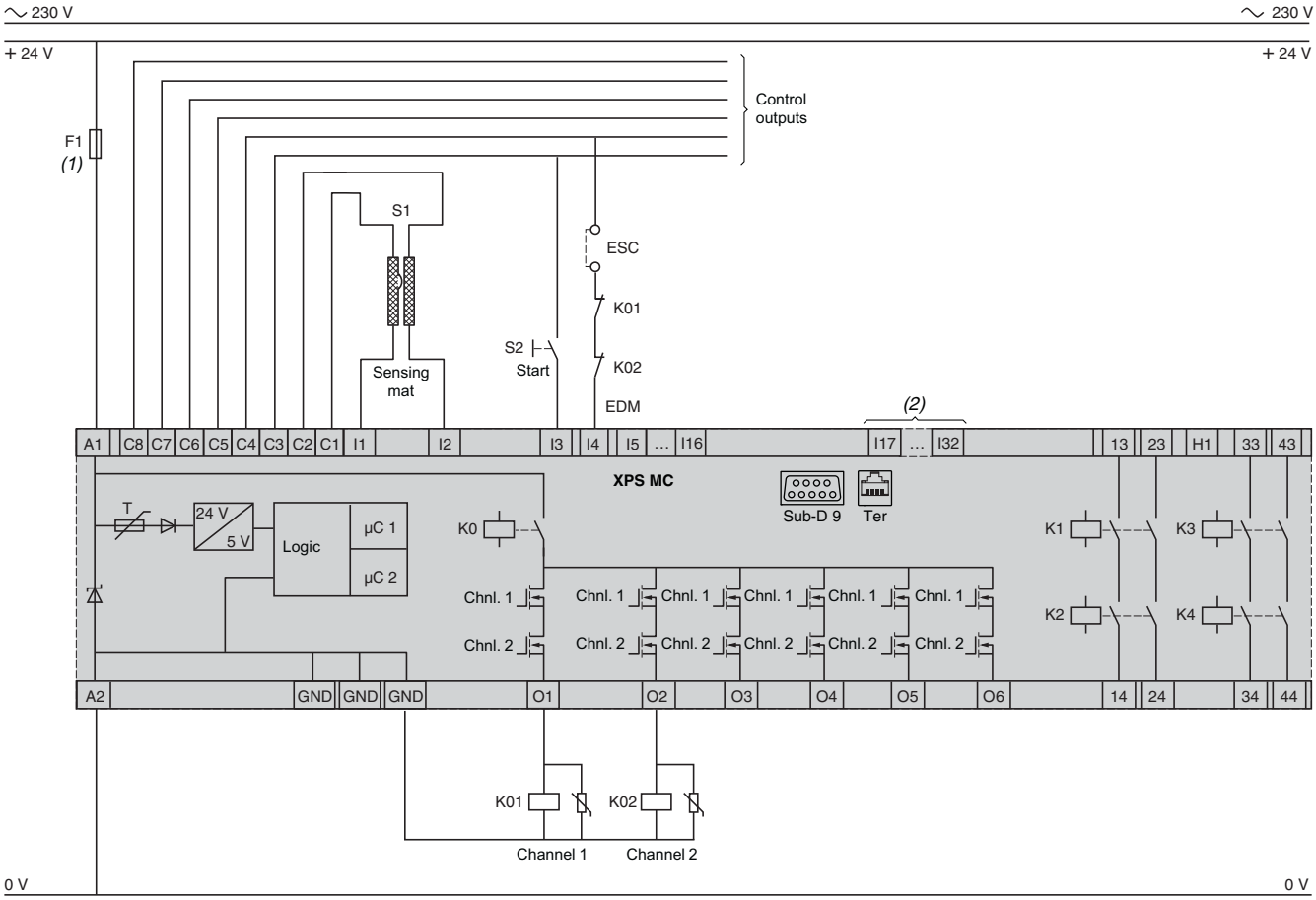
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronisation time

2

Sensing mat monitoring

- Category 3 conforming to standard EN 954-1.
- Control outputs connected to a sensing mat cannot be used for other items.

Application scheme



ESC = external start conditions
EDM = external devices monitoring

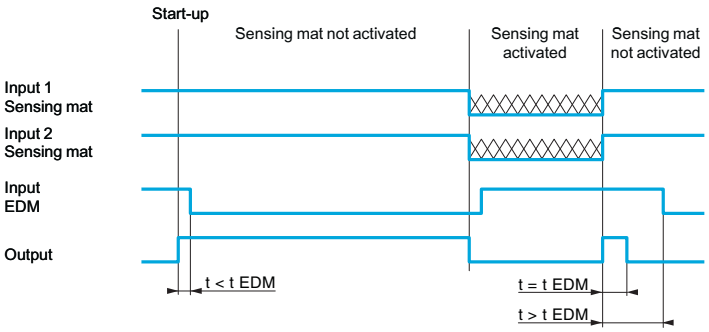
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Sensing mat monitoring (continued)

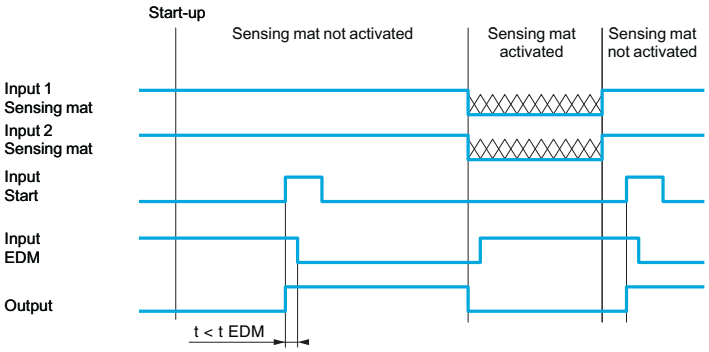
Functional diagrams

Start-up test

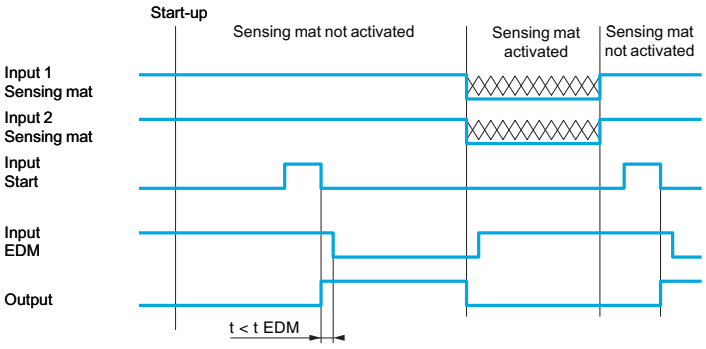
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 1

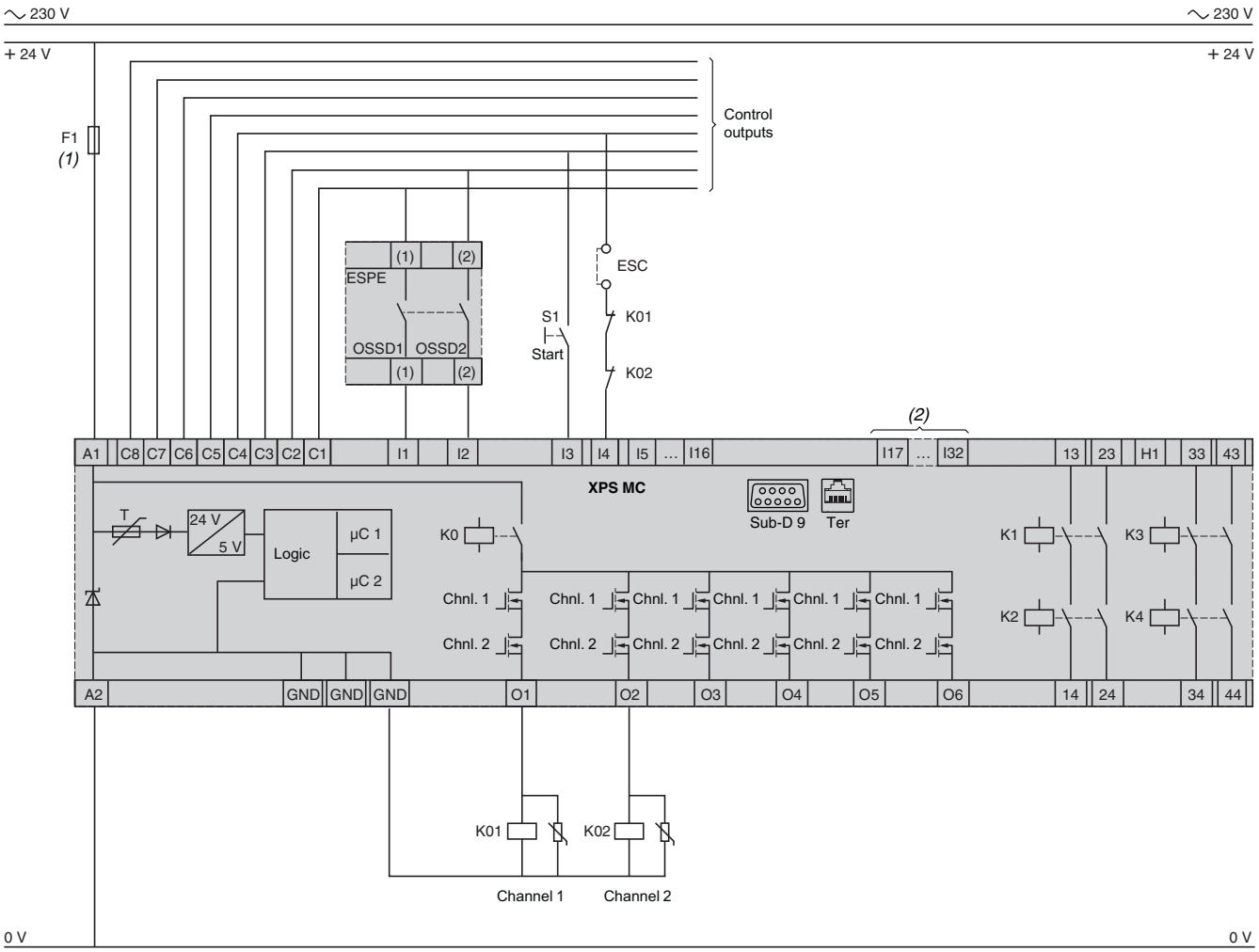
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices

2

Light curtain monitoring, relay output type

Category 4 conforming to standard EN 954-1.

Application scheme



ESC = external start conditions
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device

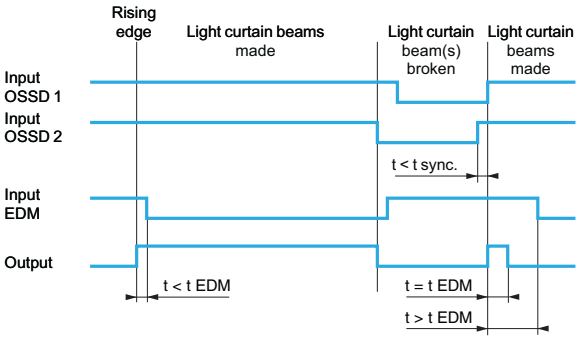
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Light curtain monitoring, relay output type (continued)

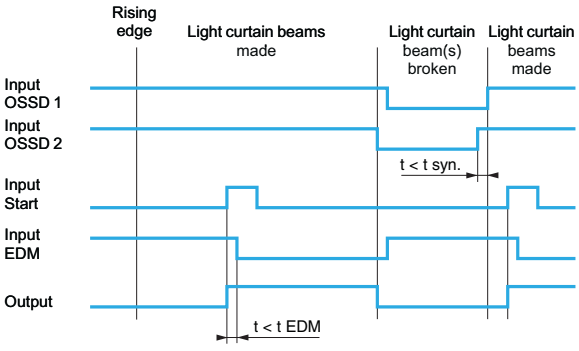
Functional diagrams

Start test = NO

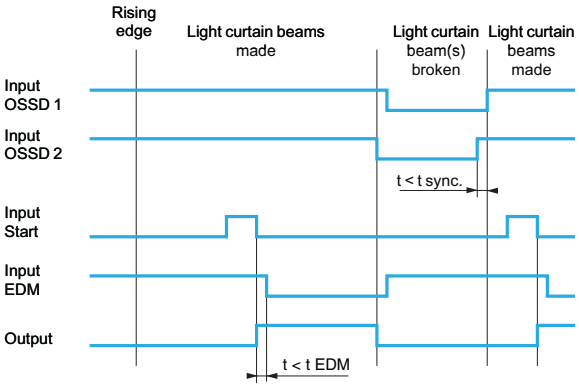
Automatic start



Rising edge monitored start

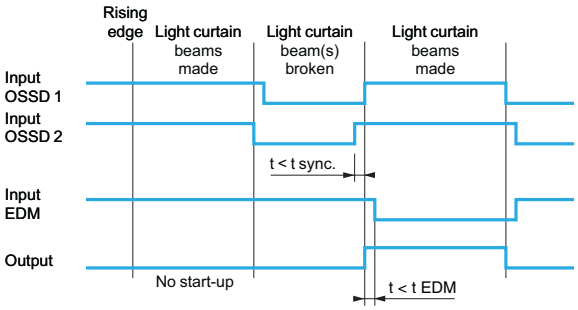


Falling edge monitored start

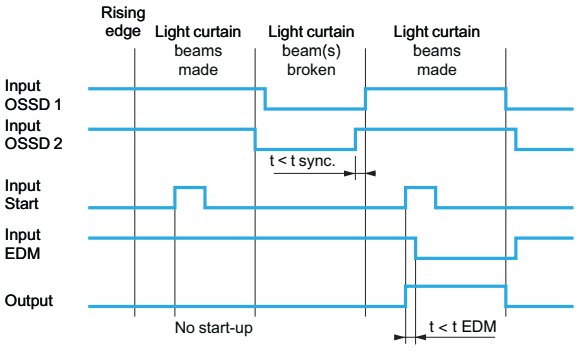


Start test = YES

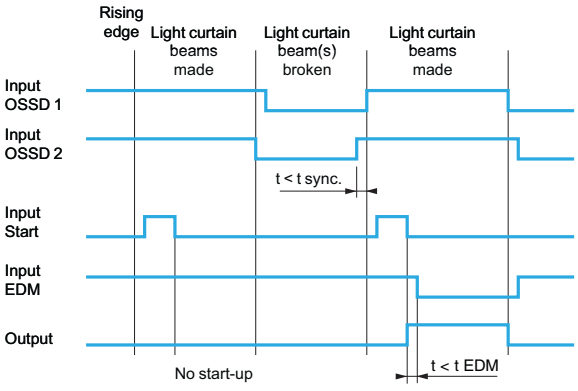
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 ⌐ 1

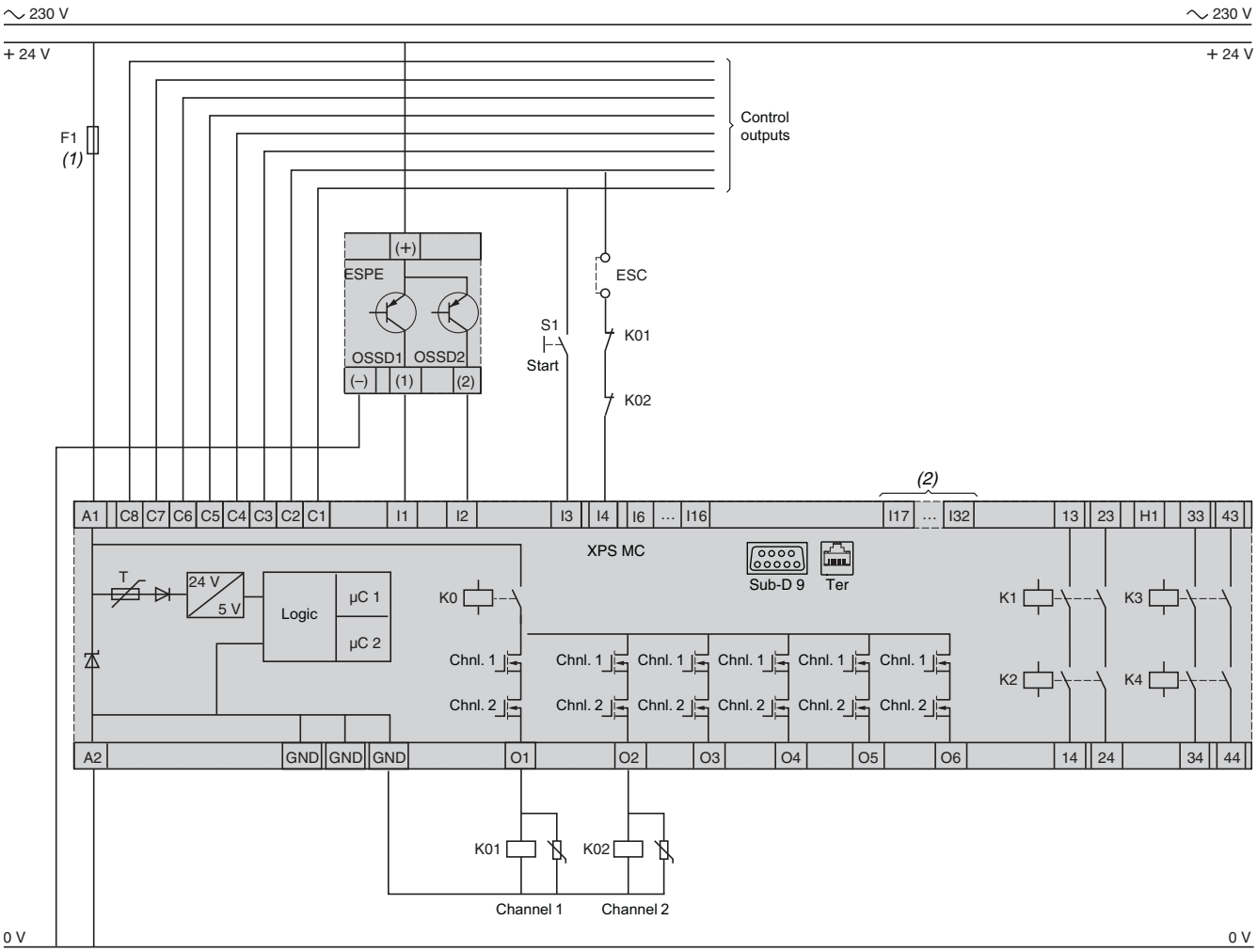
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronisation time

2

Light curtain monitoring, solid-state output type

Category 4 conforming to standard EN 954-1.

Application scheme



ESC = external start conditions
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device

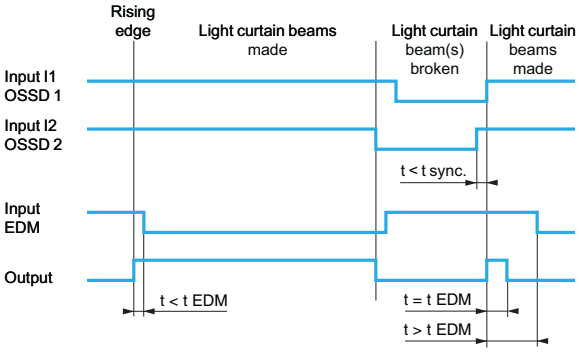
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Light curtain monitoring, solid-state output type (continued)

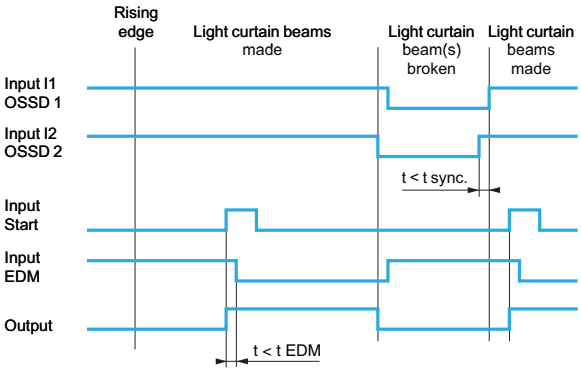
Functional diagrams

Start test = NO

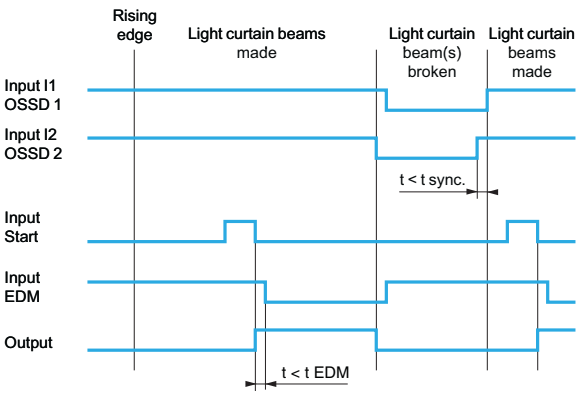
Automatic start



Rising edge monitored start

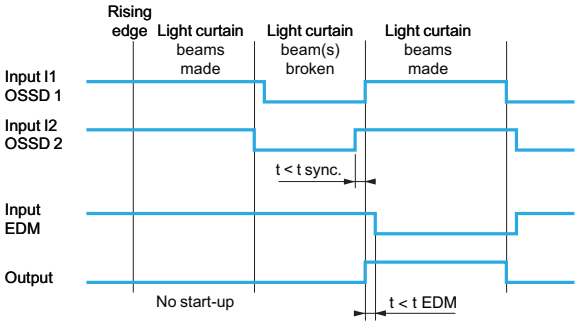


Falling edge monitored start

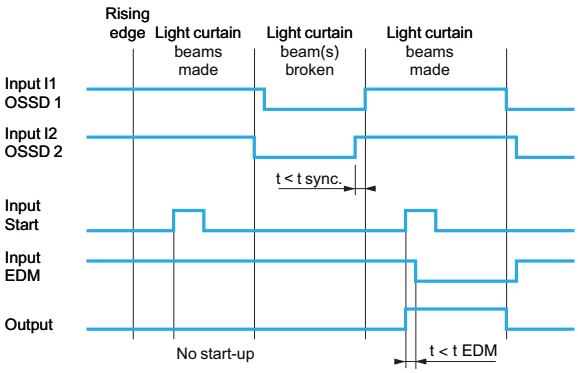


Start test = YES

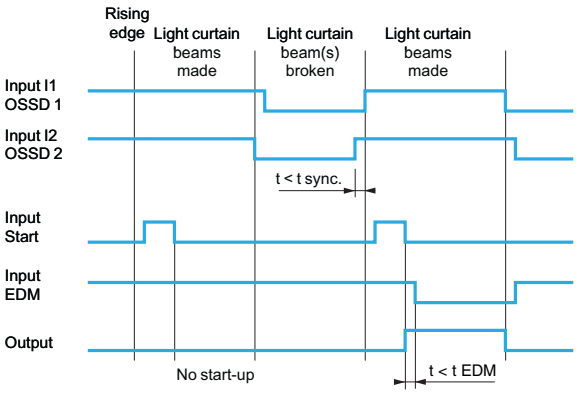
Automatic start



Rising edge monitored start



Falling edge monitored start



Key 0 — 1

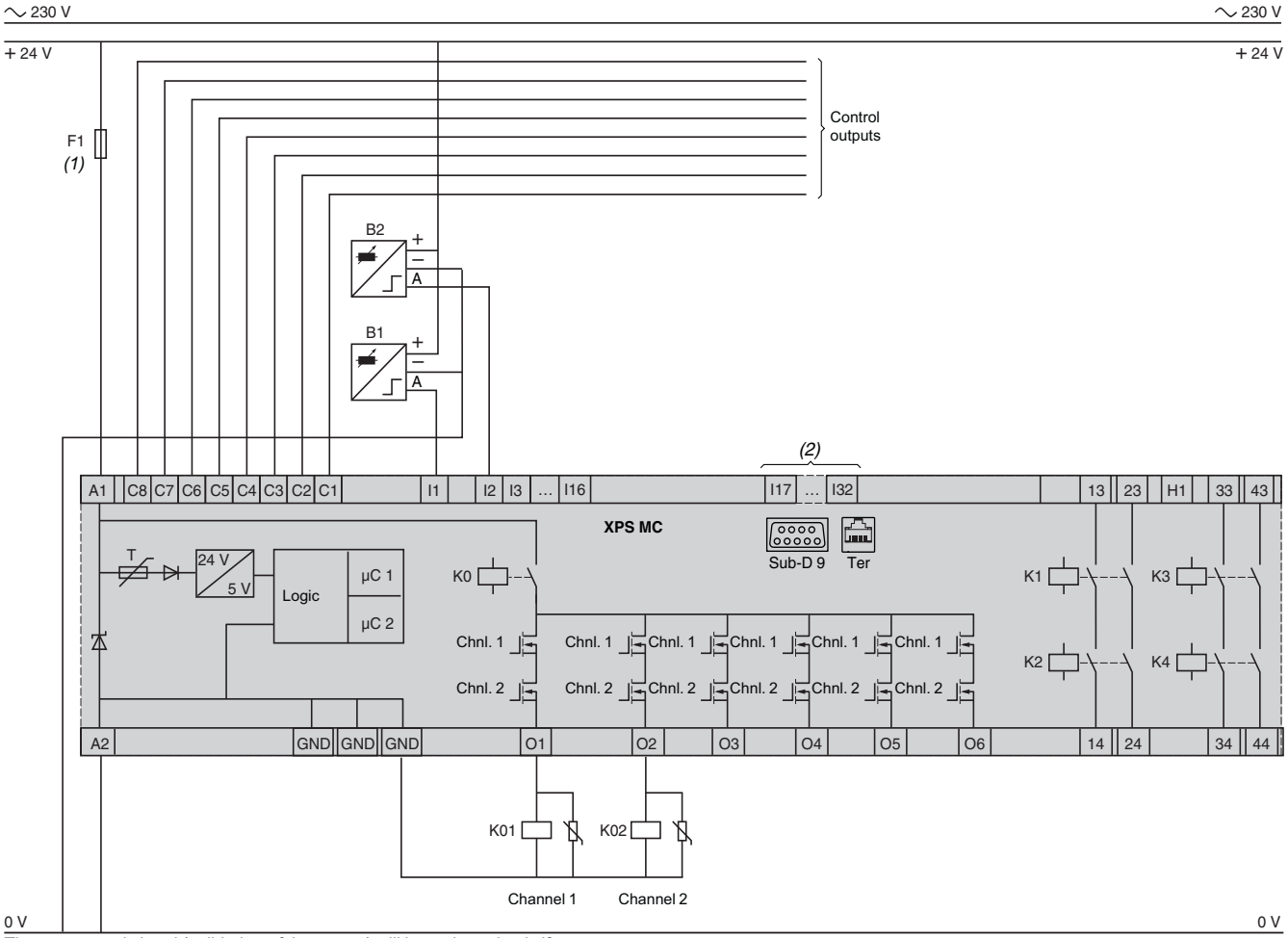
EDM = external devices monitoring
t EDM = maximum monitoring time of external devices
t sync. = synchronisation time

2

Zero speed detection

Category 4 conforming to standard EN 954-1.

Application scheme

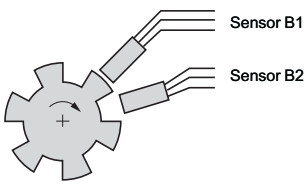


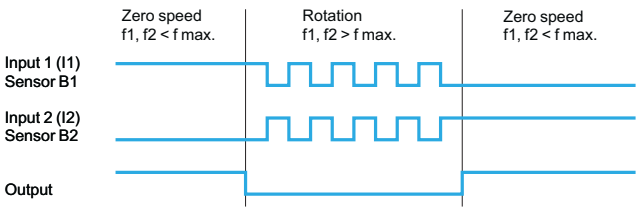
The zero speed signal (validation of the output) will be activated only if:
1: one input is in a high state,
2: the other input is in a low state,
3: the frequency of the two inputs is less than the stated value.

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.
(3) Only one "Zero speed detection" function can be connected to an XPS MC controller, and only to the inputs i1 and i2.

Functional diagram

Sensor control

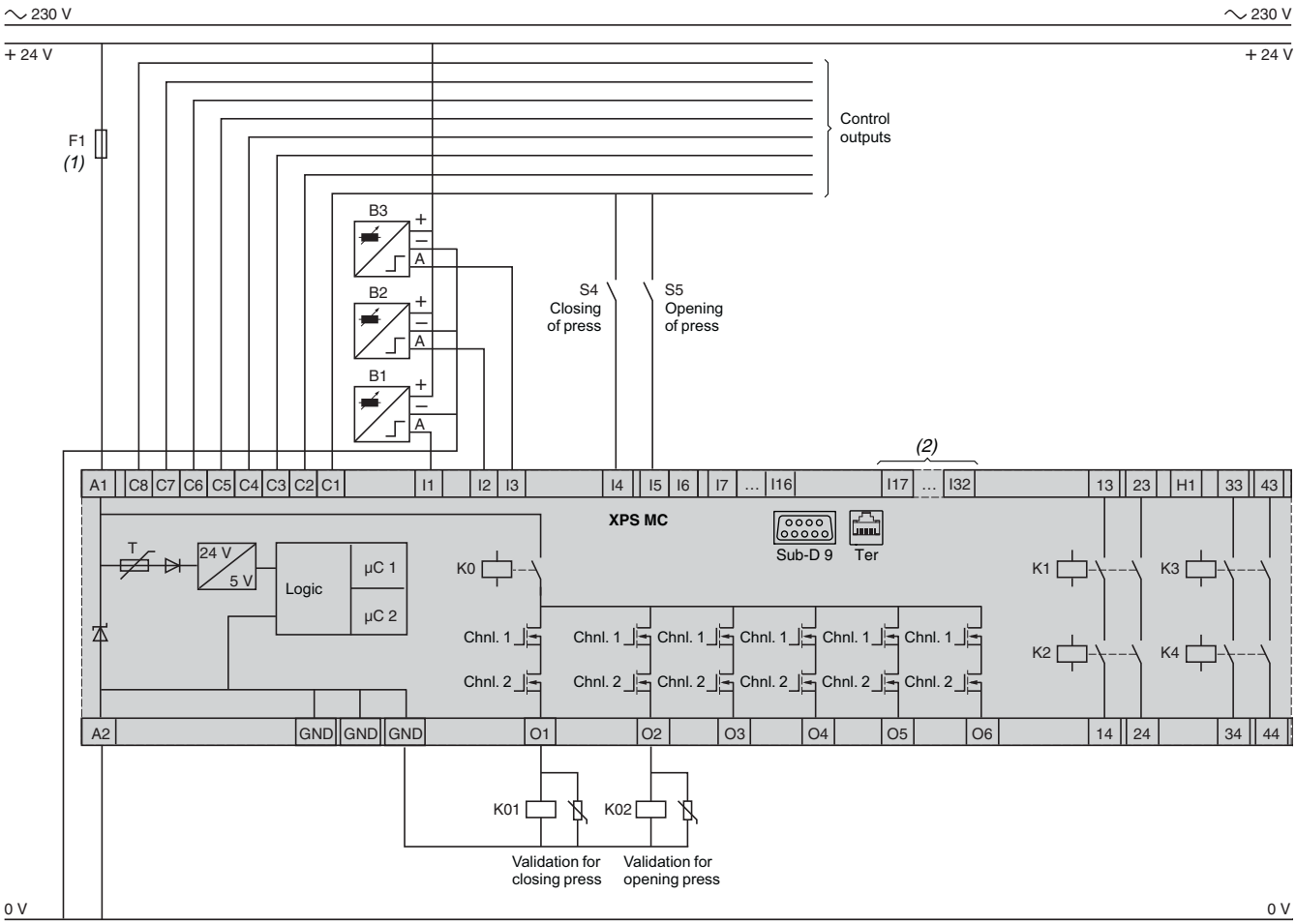




Dynamic monitoring of hydraulic valves on linear presses

Category 4 conforming to standard EN 954-1.

Application scheme

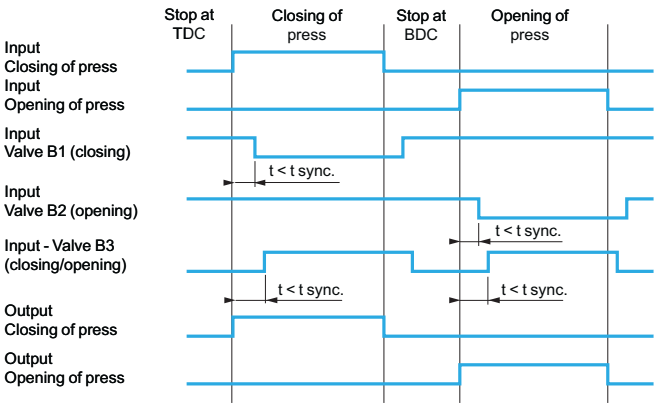


ESC = external start conditions

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagrams

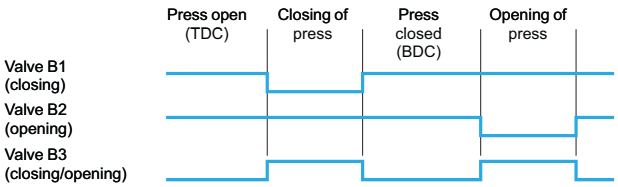
Valve control



Key 0 1

BDC = Bottom Dead Centre
TDC = Top Dead Centre
t sync. = synchronisation time

Valve sensor signals



***Note:** The valve sensor signals must function as described above.*

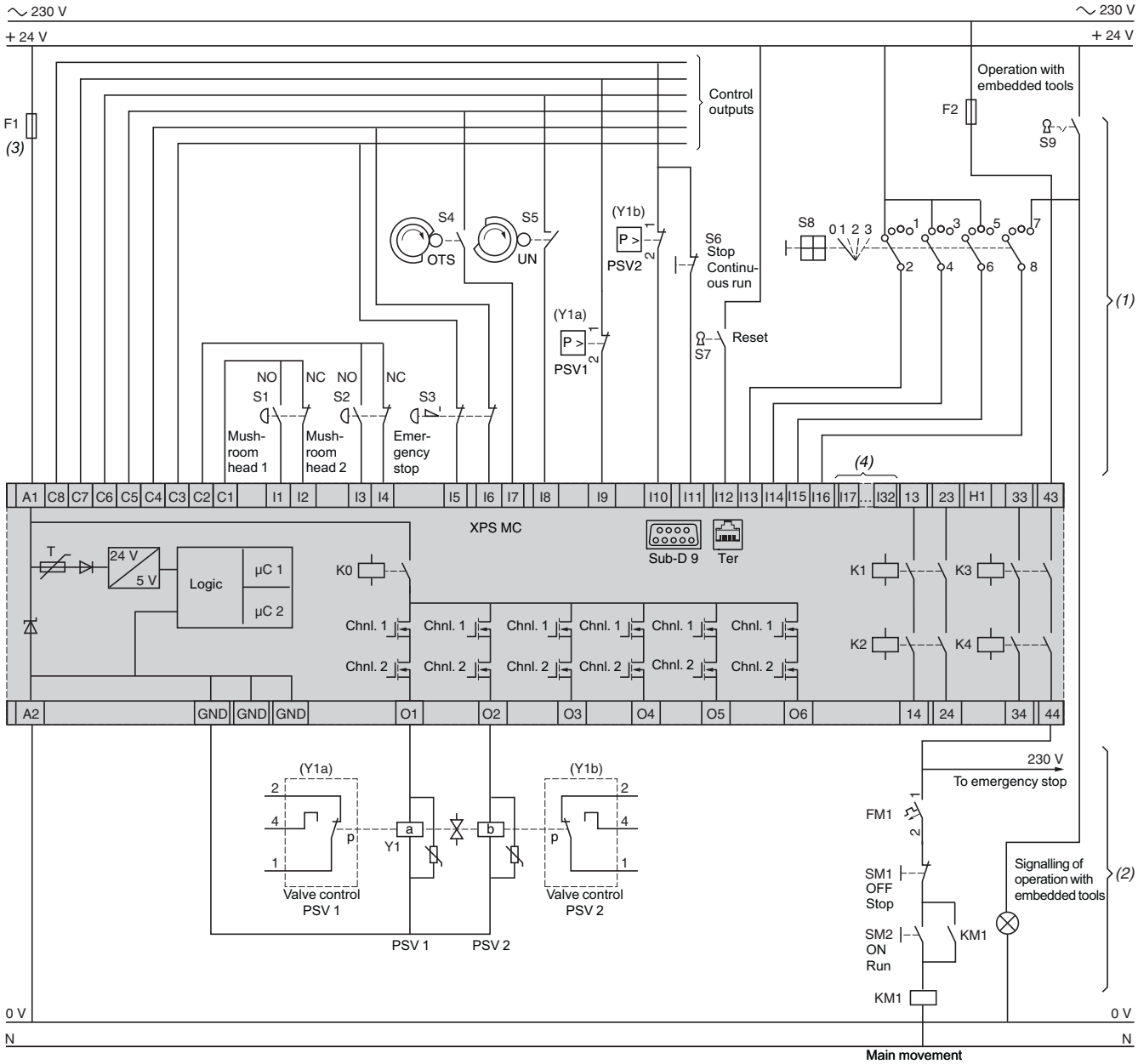
Safety automation system solutions
Preventa configurable safety controllers
Type XPS MC

Monitoring safety stop at top dead centre on eccentric press

- Category 4 conforming to standard EN 954-1.
- This function comprises several monitoring modes including:
  - Safety stop at top dead centre *(1)*,
  - monitoring braking travel,
  - as an option, dynamic monitoring of doubled-bodied solenoid valves *(2)*.

2

Application scheme

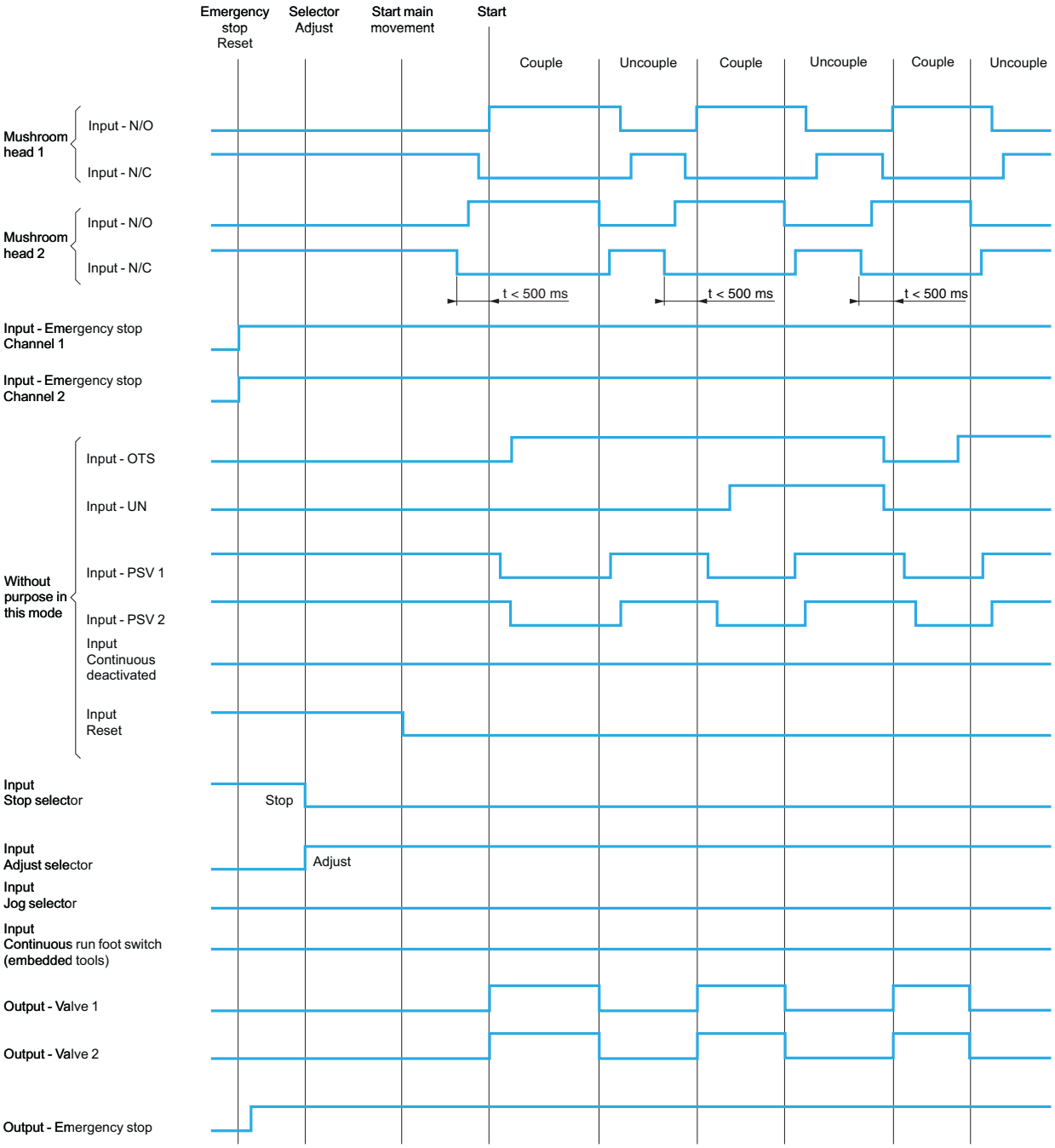


S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog,
3 - automatic continuous run.
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve

(3) Technical characteristics for maximum rating of fuses, see page 2/122.
(4) Only applicable to XPS MC32Z●.

Monitoring safety stop at top dead centre on eccentric press (continued)

Functional diagram in adjust mode



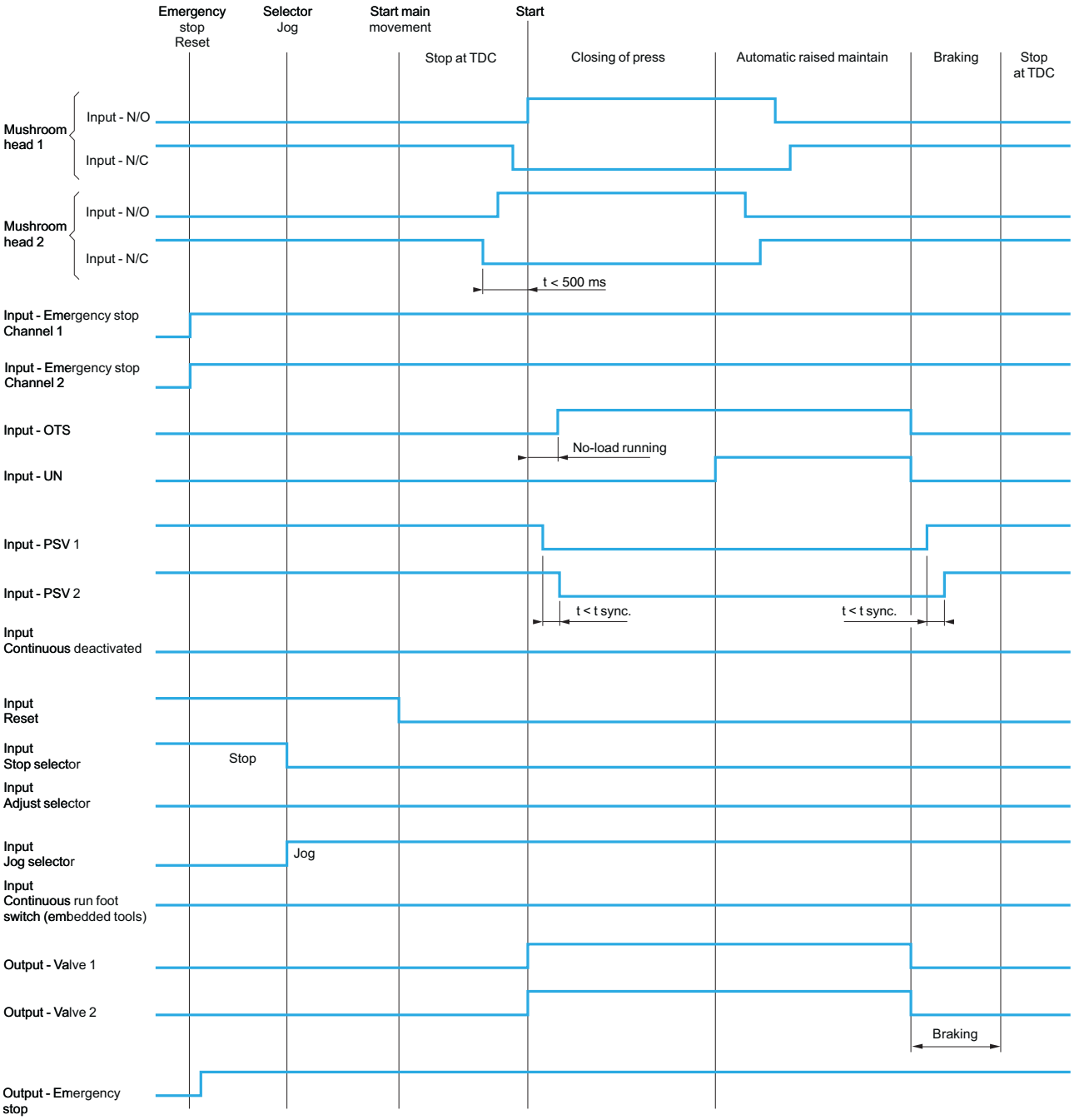
Key 0 — 1

OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
t sync = synchronisation time

2

Monitoring safety stop at top dead centre on eccentric press (continued)

Functional diagram in jog mode

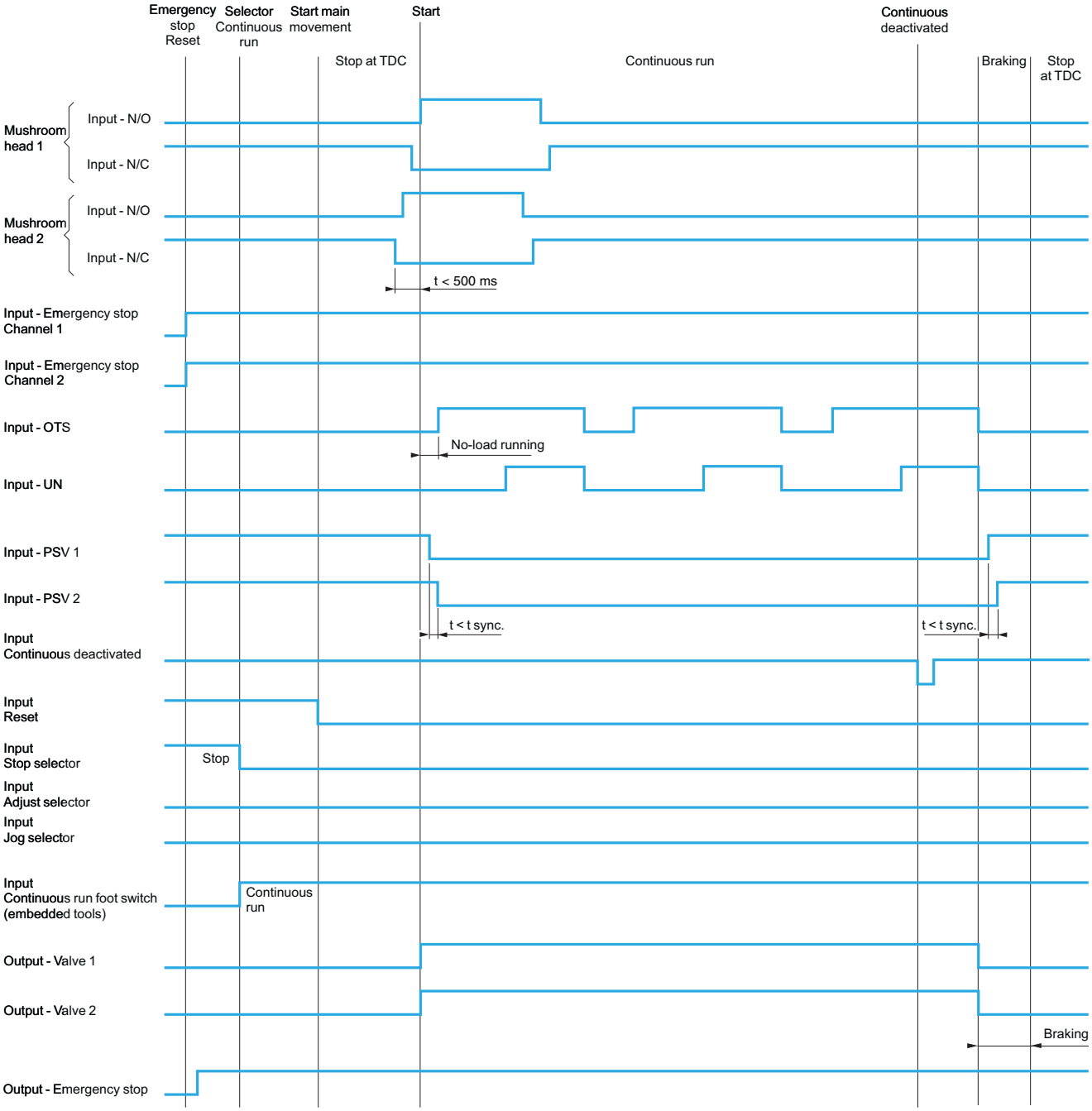


Key 0 1

BDC = Bottom Dead Centre
TDC = Top Dead Centre
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
t sync = synchronisation time

Monitoring safety stop at top dead centre on eccentric press (continued)

Functional diagram in automatic continuous run mode



Key 0 1

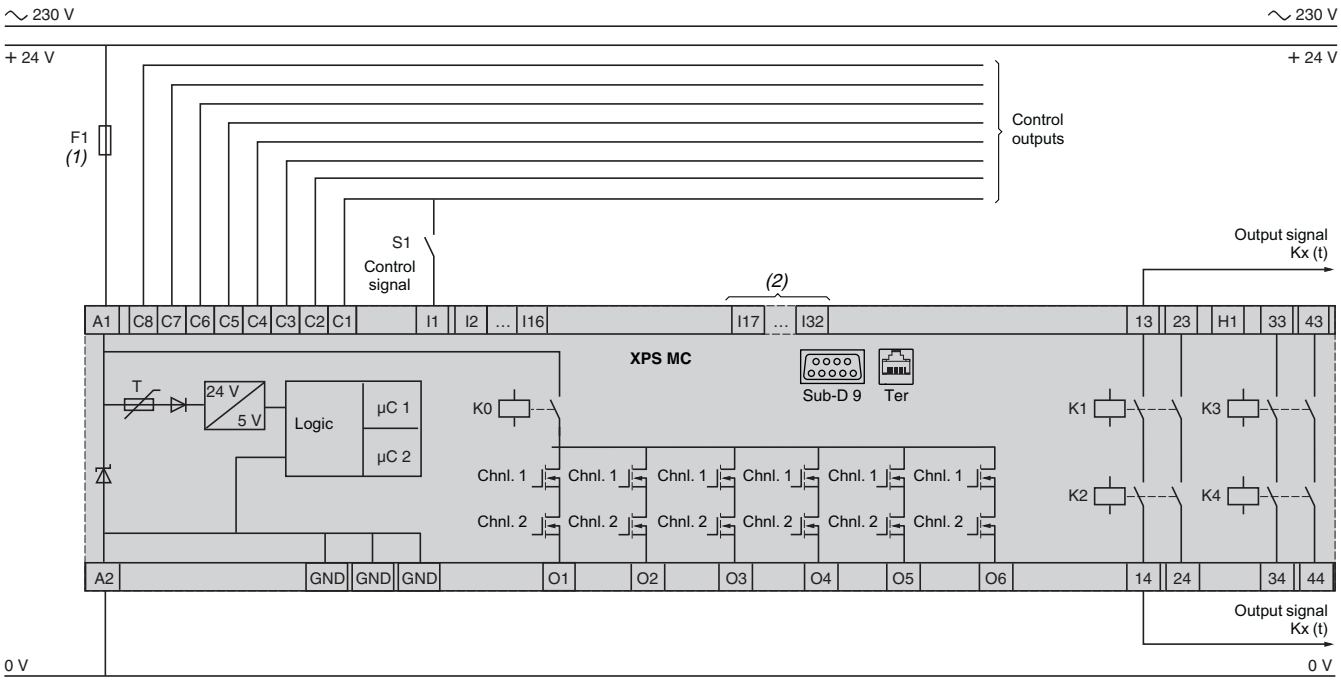
BDC = Bottom Dead Centre
TDC = Top Dead Centre
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
t sync = synchronisation time

2

Safety time delays

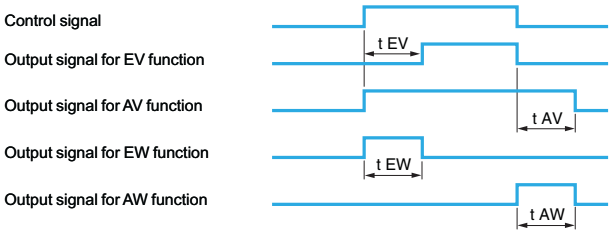
Category 4 conforming to standard EN 954-1.

Application scheme



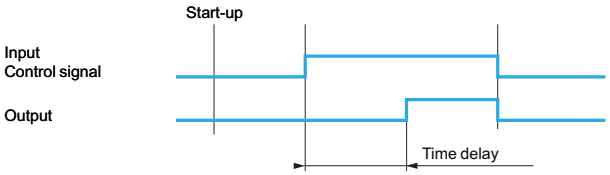
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagrams

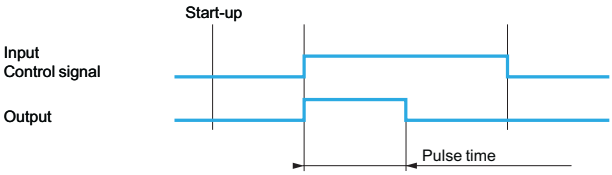


Functions:
EV = On-delay
AV = Off-delay
EW = Pulse on energisation
AW = Pulse on de-energisation

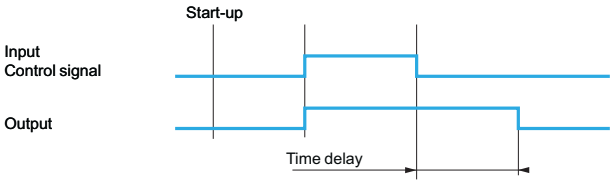
On-delay



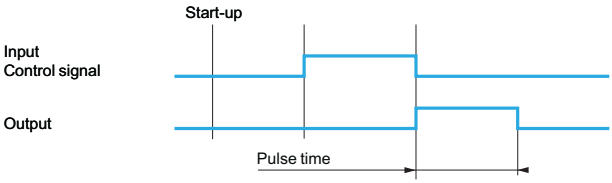
Pulse on energisation



Off-delay



Pulse on de-energisation

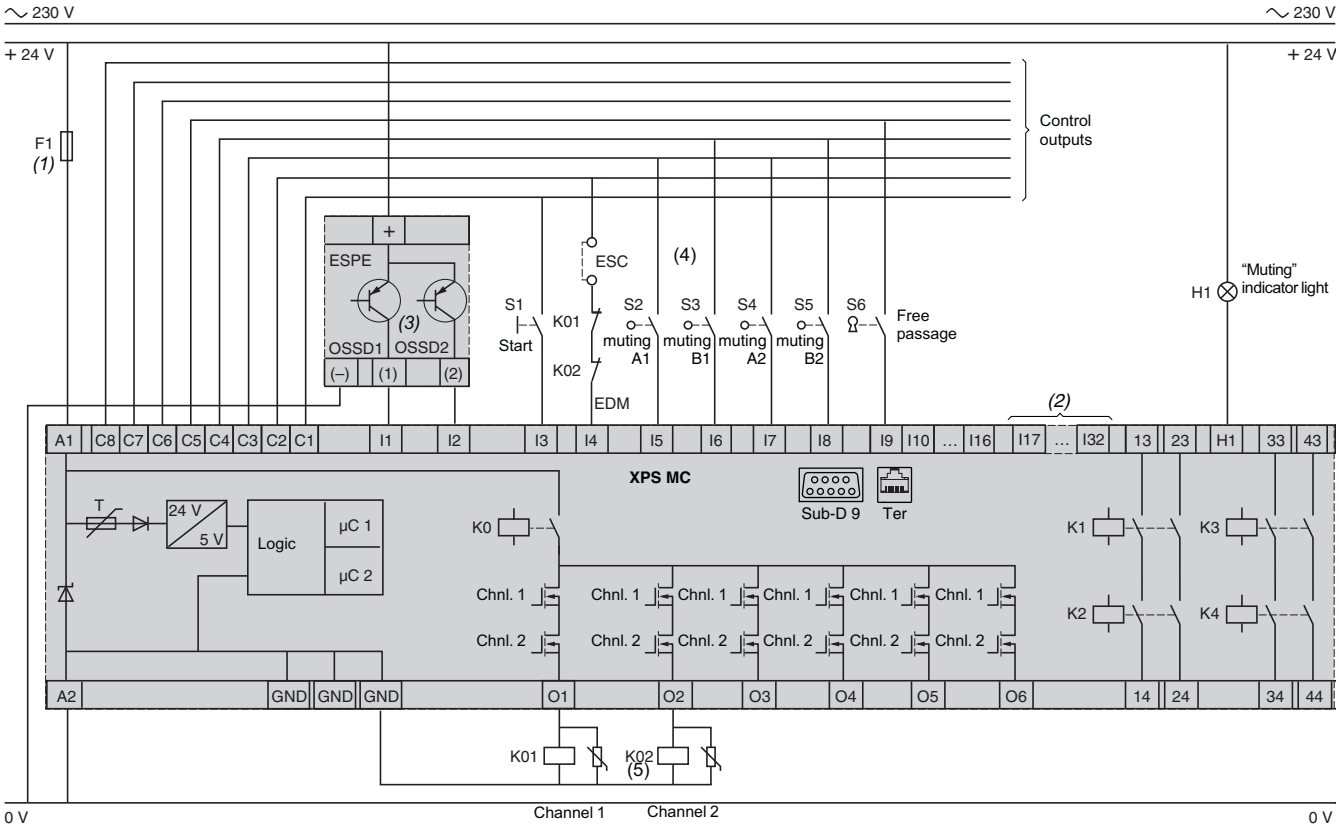




"Muting" function for light curtains

Category 4 conforming to standard EN 954-1.

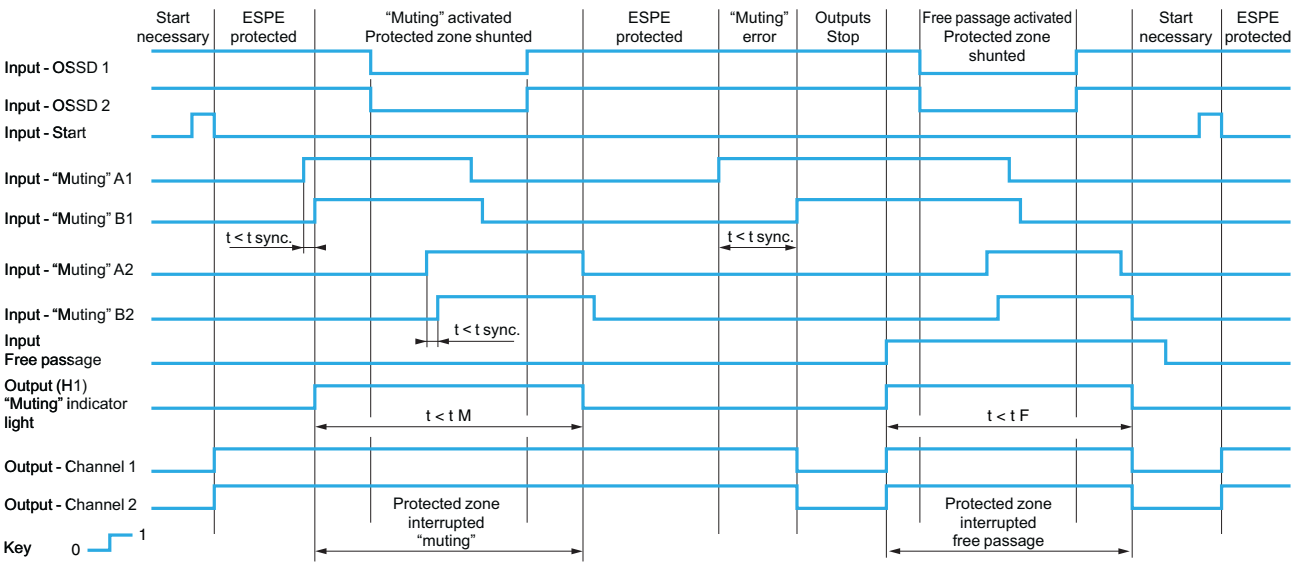
Application scheme



ESC = external start conditions
EDM = external devices monitoring
ESPE = electro-sensitive protection equipment
OSSD1/OSSD2 = output signal switching device

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.
(3) A light curtain with relay outputs can also be used with the "Muting" function.
(4) Only one "Muting" function can be connected to an XPS MC controller.
(5) Example using 2 safety outputs to control 2 contactors linked to one safety function.

Functional diagram



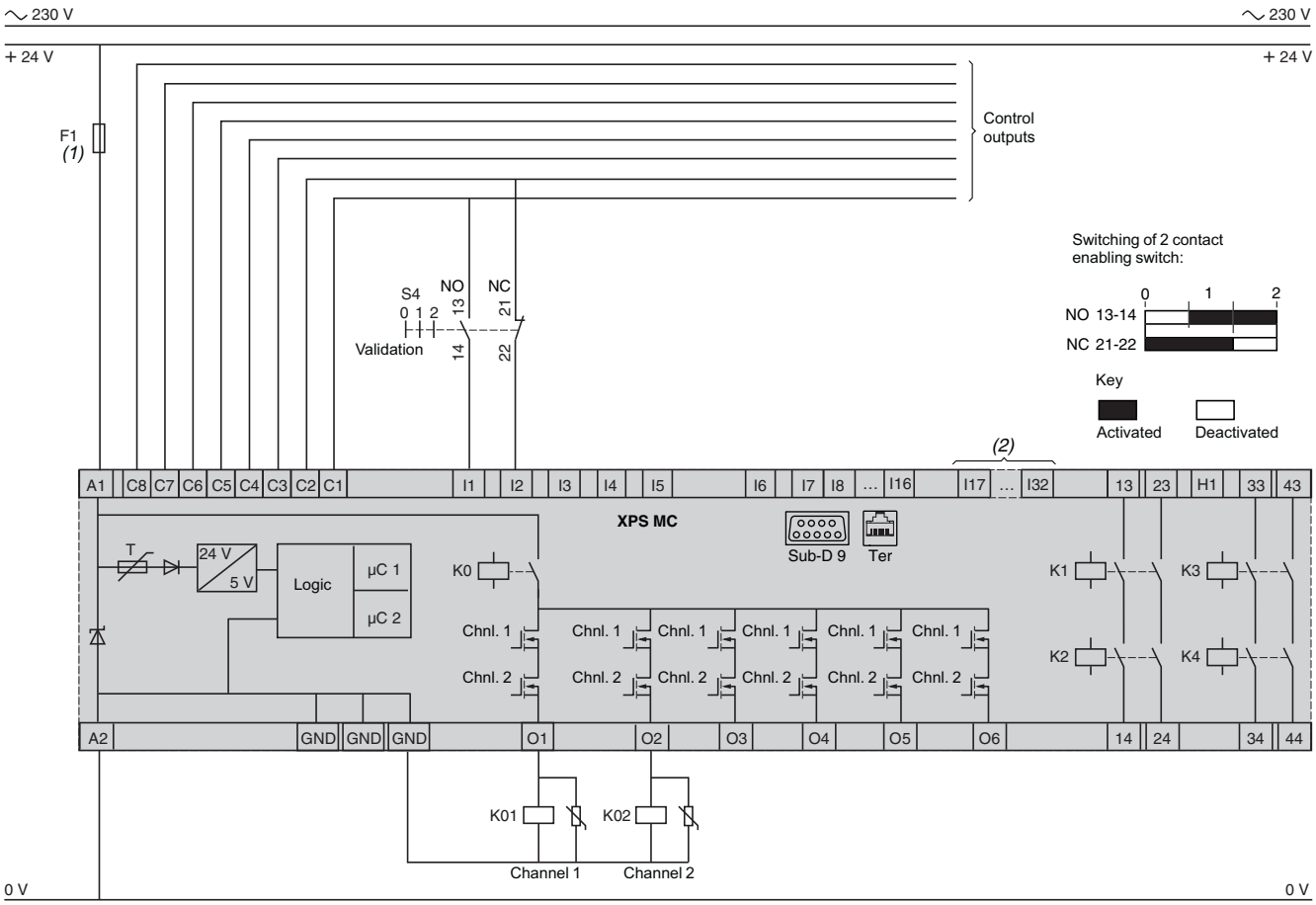
tM = "Muting" time
tF = free passage activation time
t sync. = synchronisation time

2

Enabling switch monitoring, 2 contact type

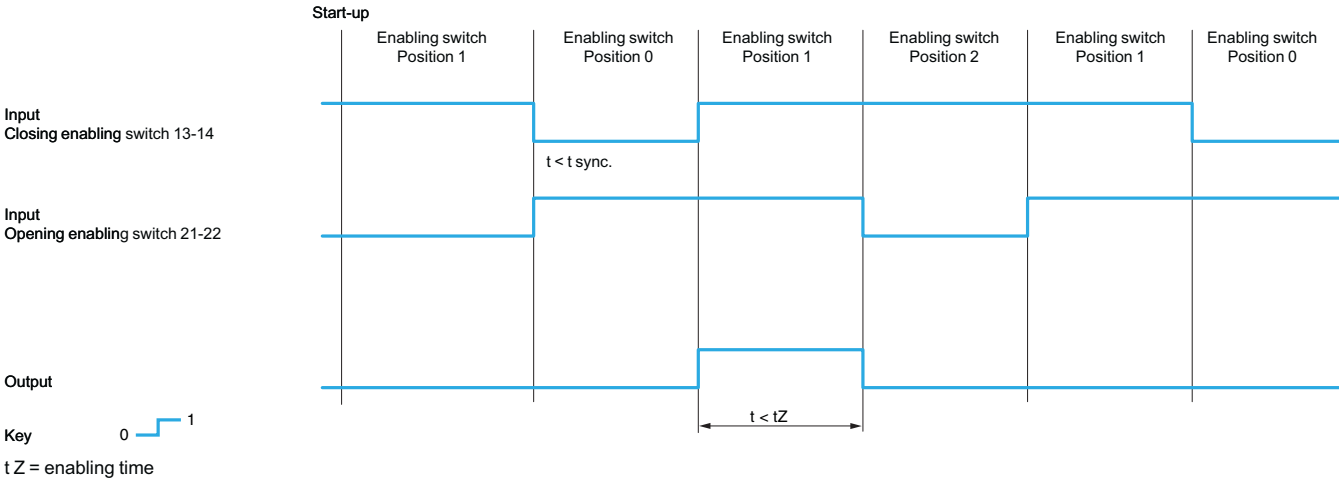
Category 1 conforming to standard EN 954-1.

Application scheme



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagram

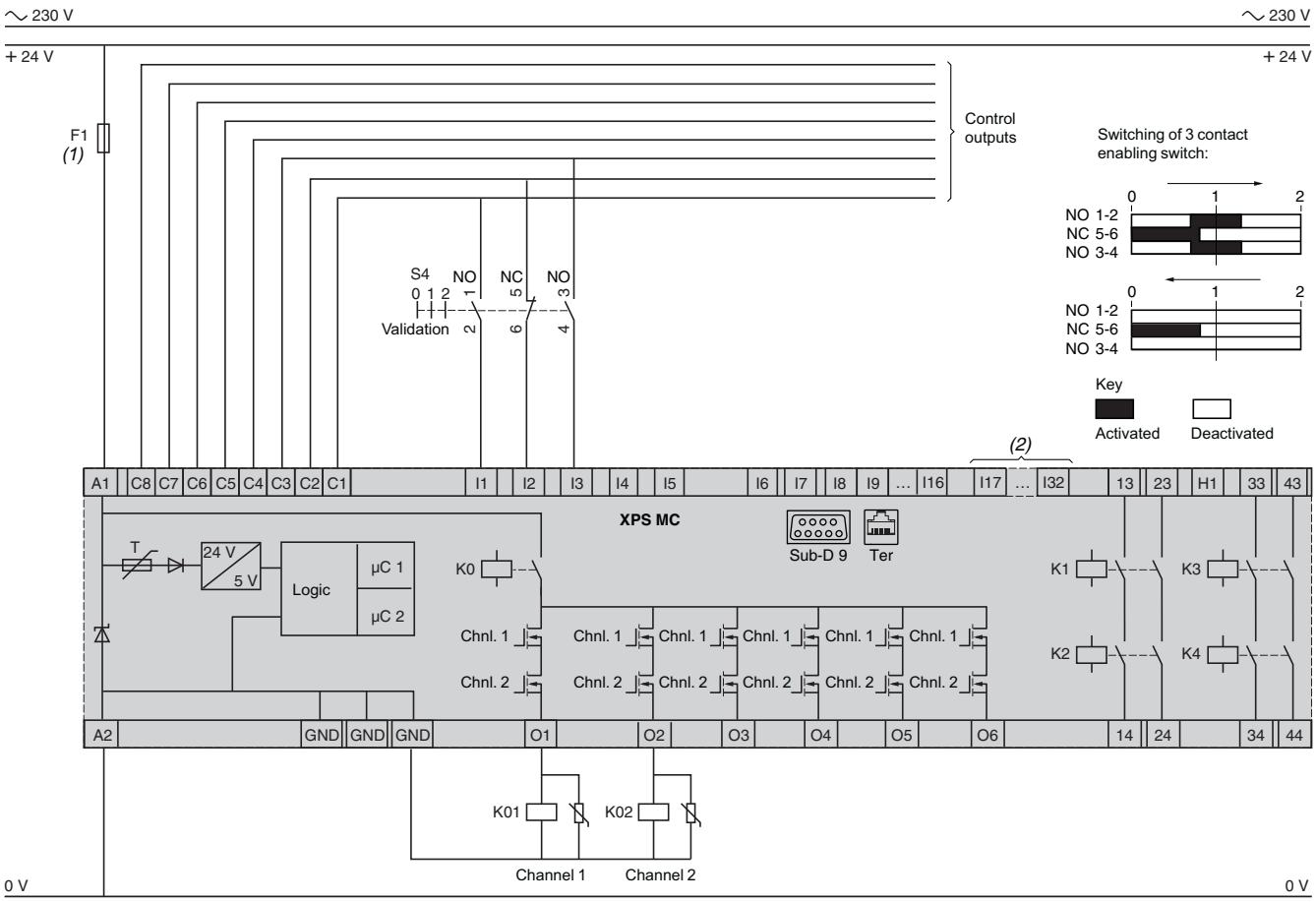


t Z = enabling time

Enabling switch monitoring, 3 contact type

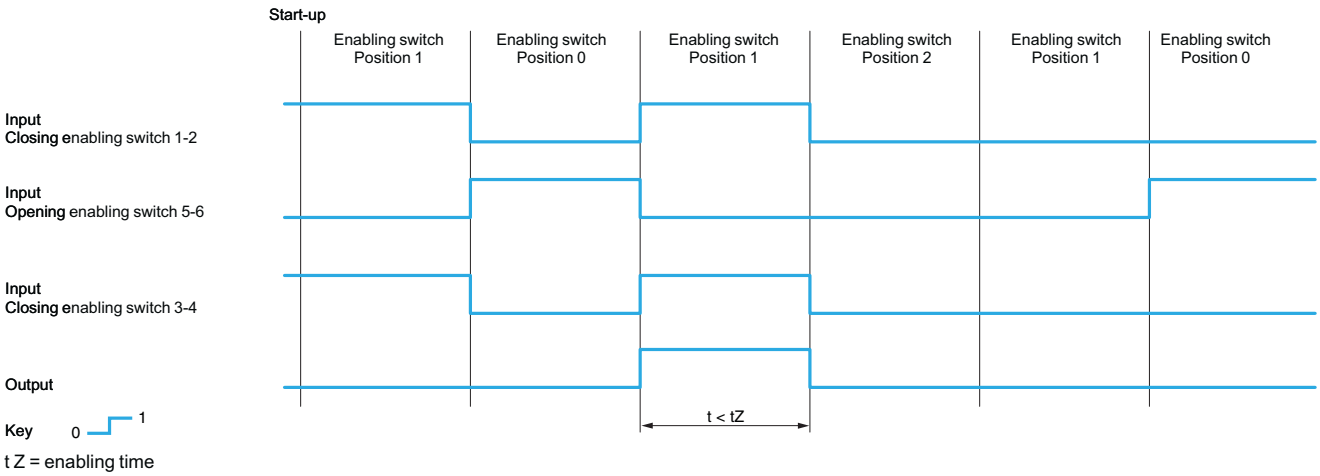
Category 4 conforming to standard EN 954-1.

Application scheme



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagram



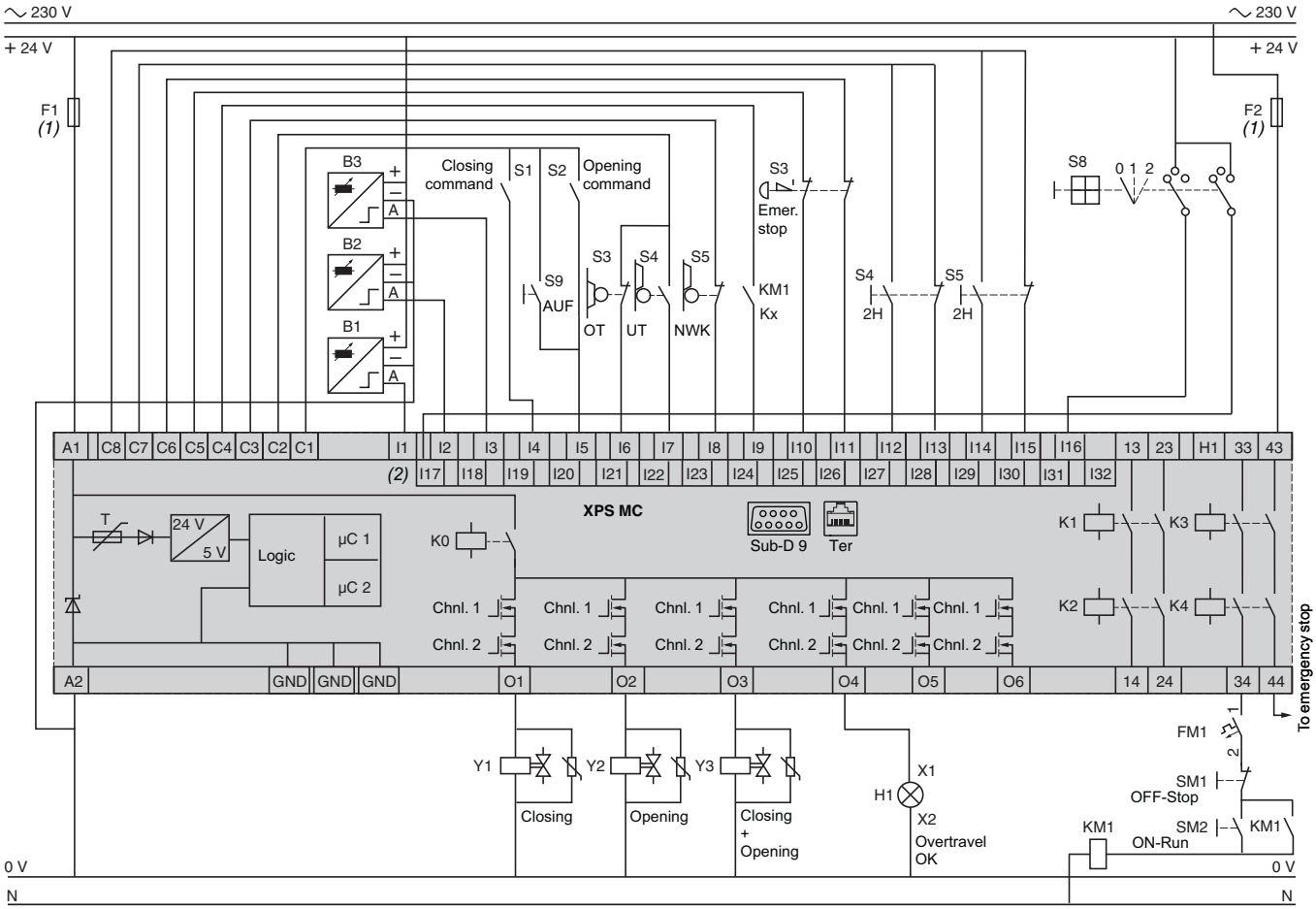
t Z = enabling time

2

Hydraulic press

Category 4 conforming to standard EN 954-1.

Application scheme



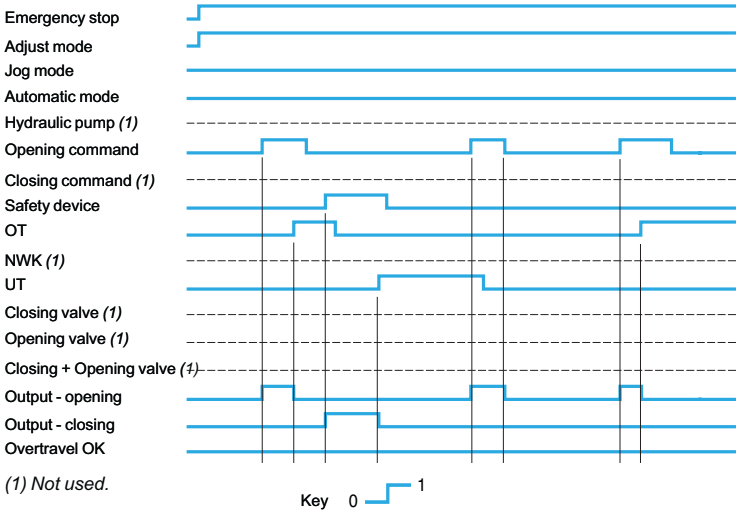
S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog.

AUF = open, to be used in inching.
OT = Limit switch associated with top dead centre (TDC).
UT = Limit switch associated with bottom dead centre (BDC).
NWK = overtravel monitoring.

(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z● (I17…I32).

Functional diagram

Hydraulic press, adjust mode

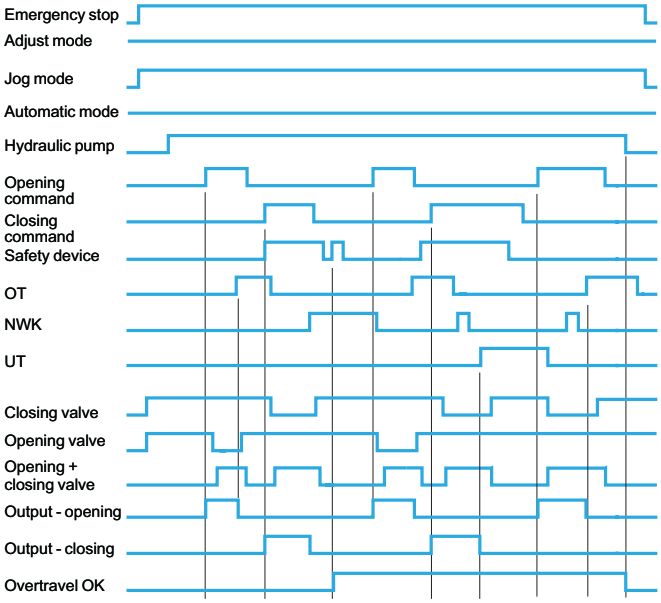


(1) Not used.

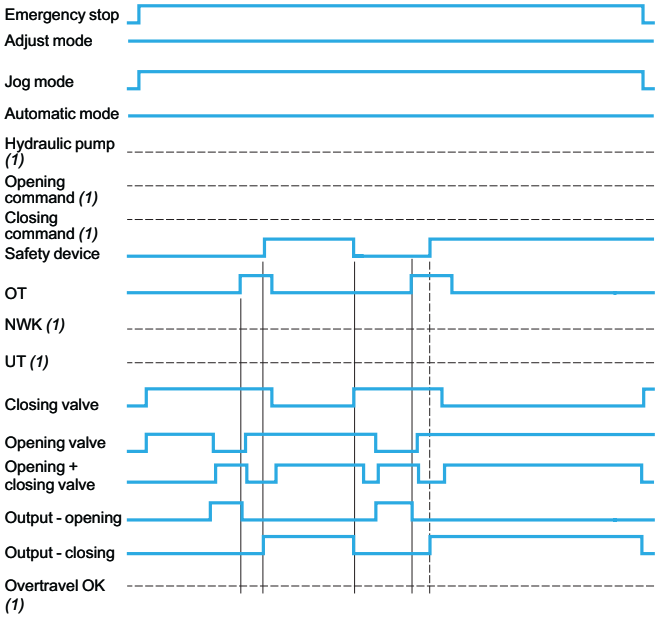
Hydraulic press

Functional diagrams *(continued)*

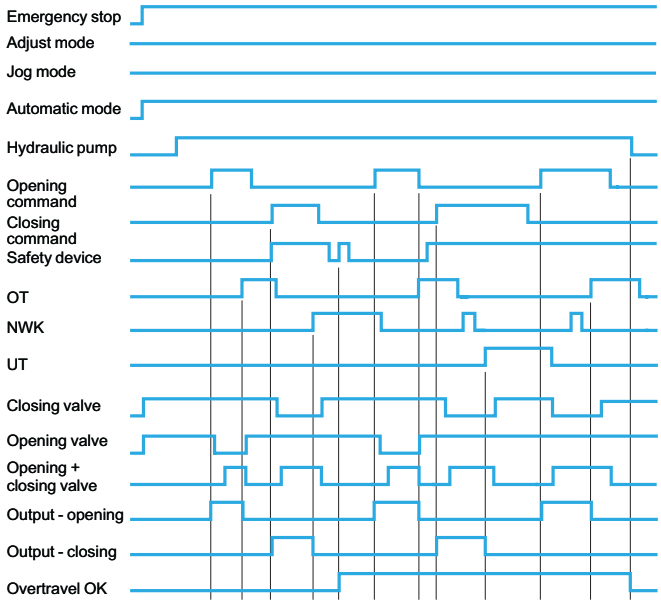
Hydraulic press, mode = jog, with overtravel monitoring and opening and closing control coming from the automation platform



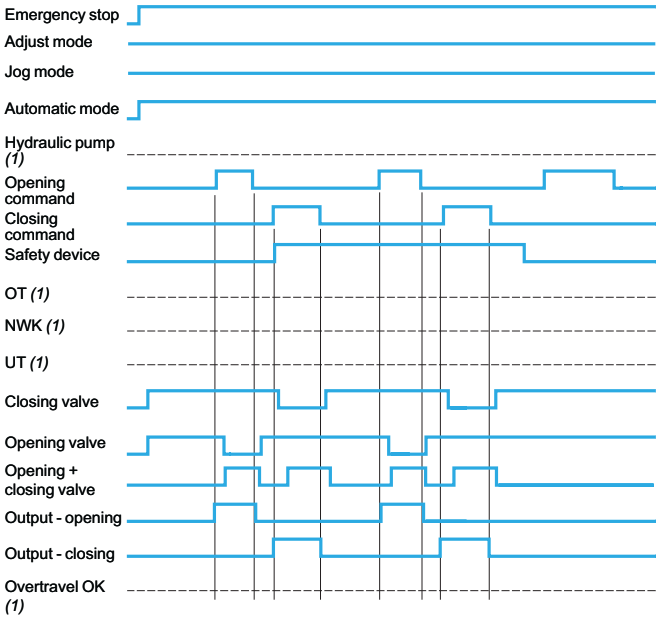
Hydraulic press, mode = jog



Hydraulic press, mode = automatic, with overtravel monitoring and opening and closing control coming from the automation platform



Hydraulic press, mode = automatic



Key 0 — 1

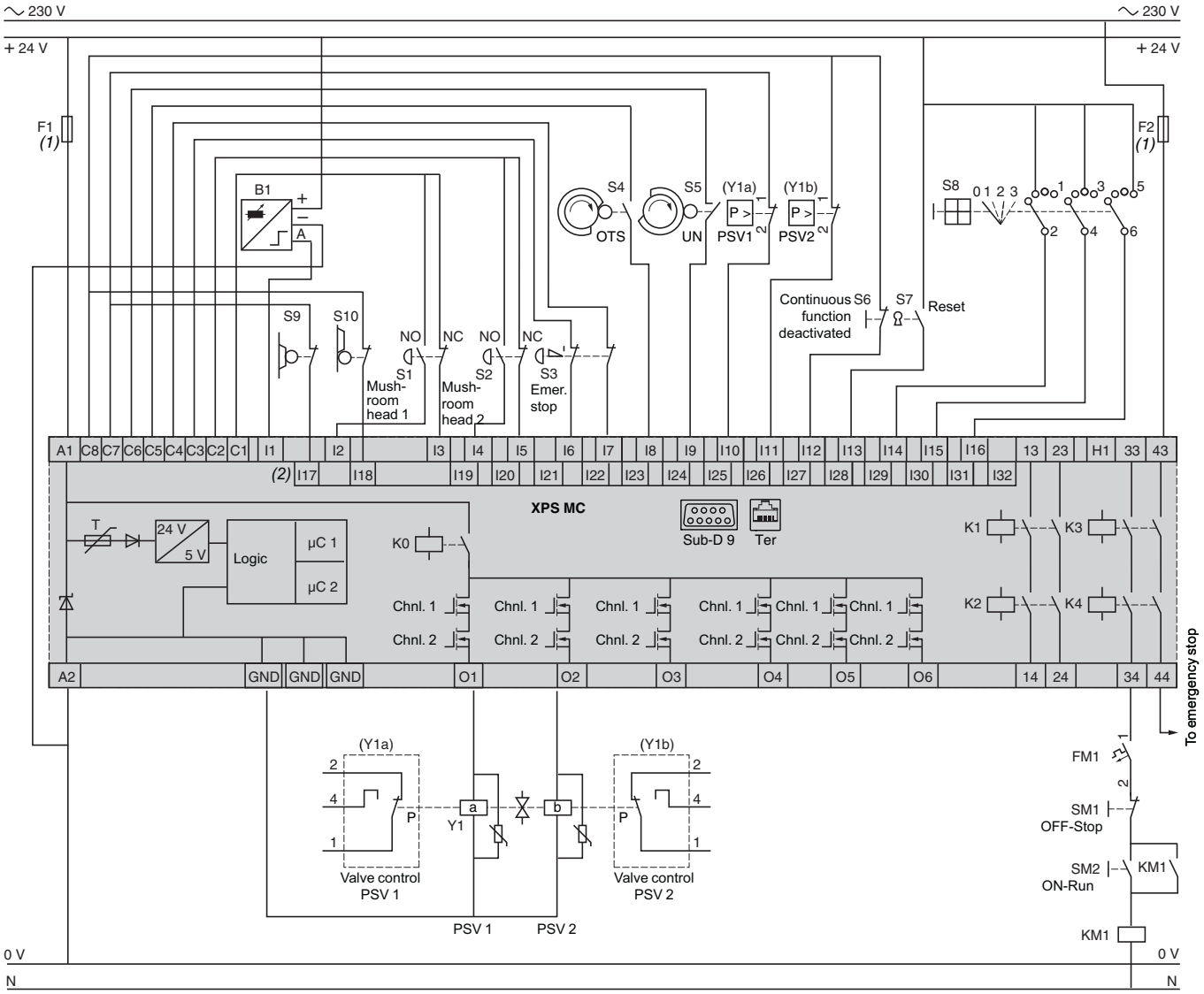
(1) Not used.

2

Eccentric press

Category 4 conforming to standard EN 954-1.

Application scheme

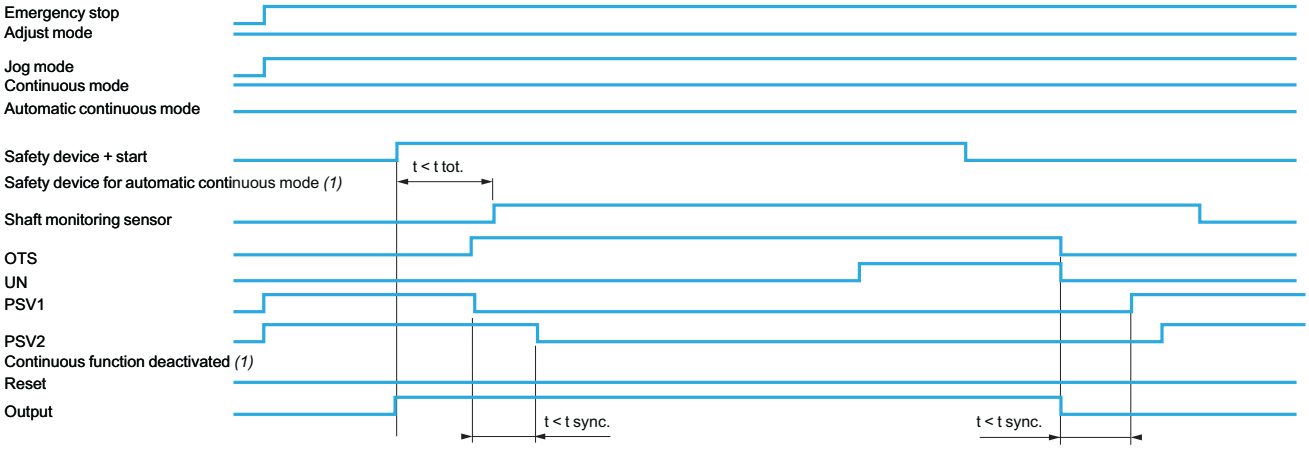


S8: Operating modes:
0 - stop,
1 - adjust,
2 - jog,
3 - automatic continuous run.
OTS = Limit switch associated with top dead centre (TDC)
UN = Limit switch associated with bottom dead centre (BDC)
PSV = safety valve
B1 = sensor at tooth wheel in cam switch mechanism.
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z● (I17…I32).

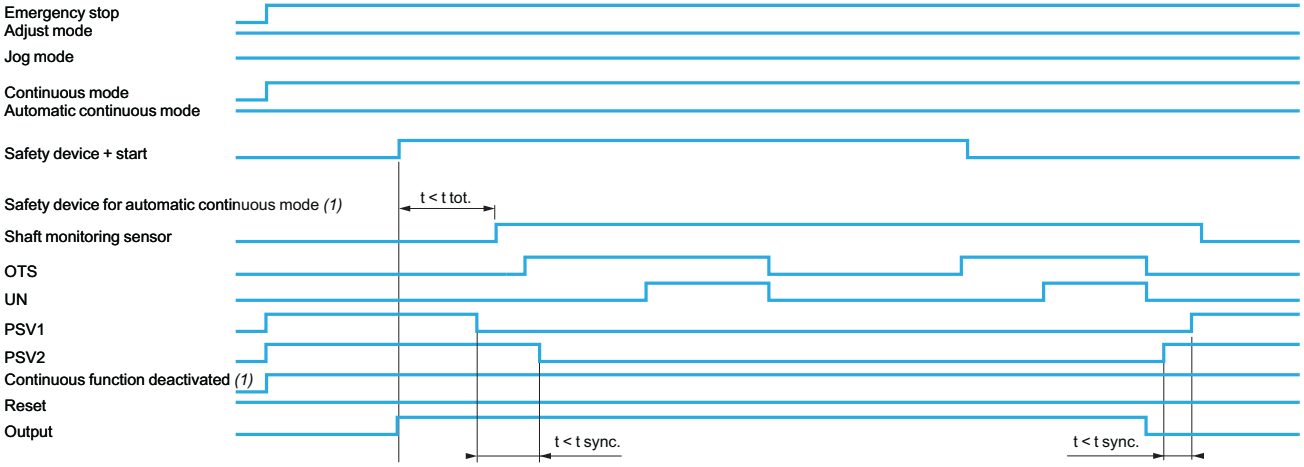
Eccentric press (continued)

Functional diagrams

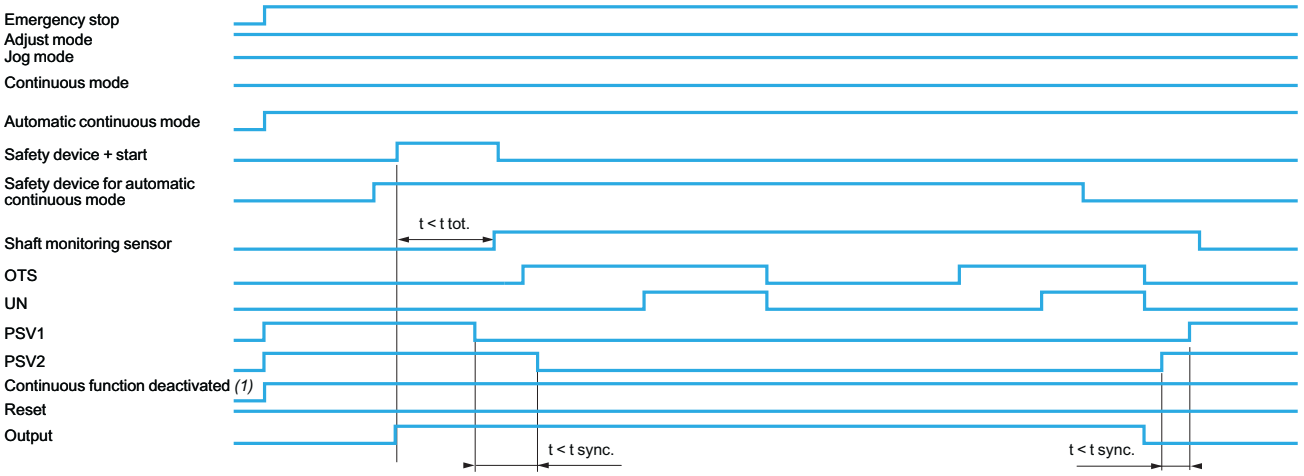
Eccentric press: Jog



Eccentric press: Continuous



Eccentric press: automatic continuous



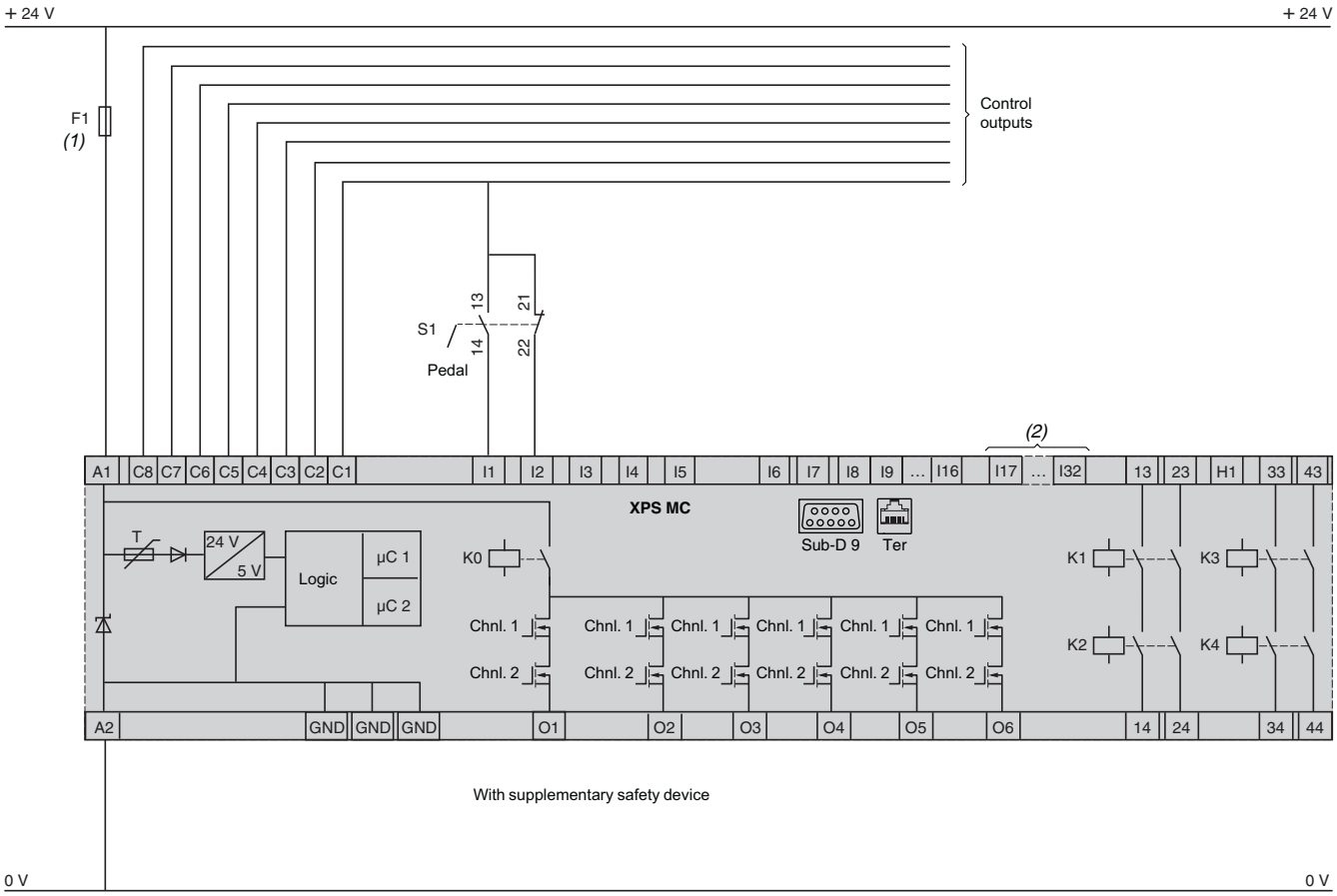
Key 0 — 1

t sync. = synchronisation time
t tot. = dead time
(1) Not used.

2

Foot switch monitoring

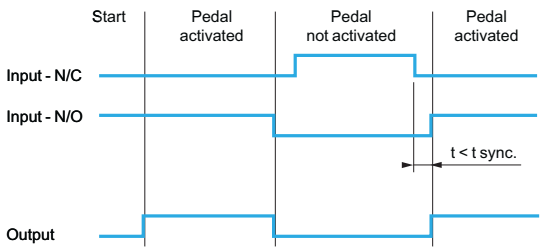
Application scheme



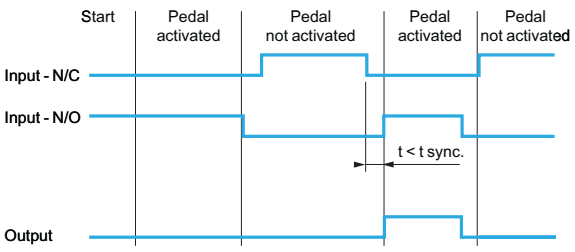
(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagrams

Without start interlock



With start interlock

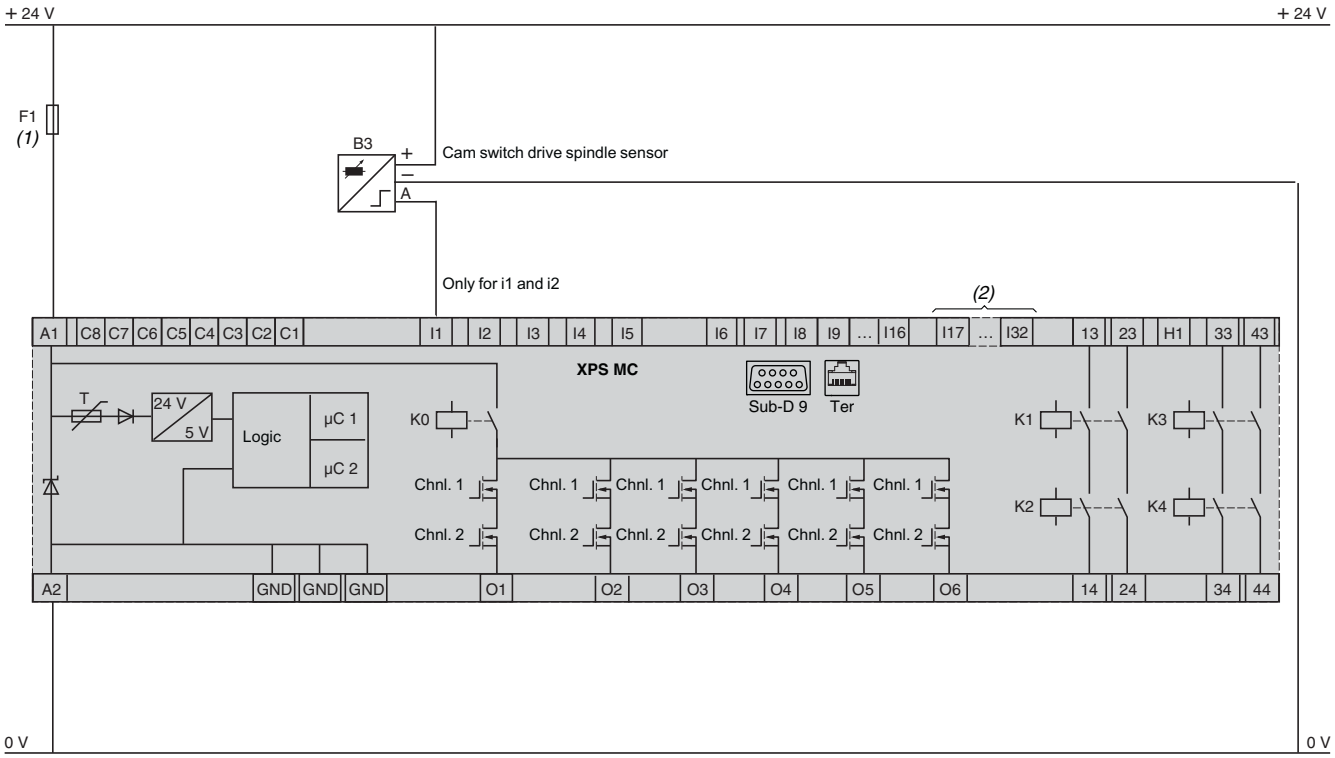


Key 0 1

t sync. = synchronisation time

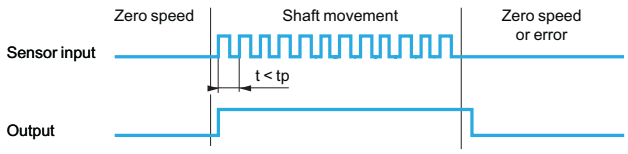
Chain shaft breakage monitoring

Application scheme



(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Functional diagrams



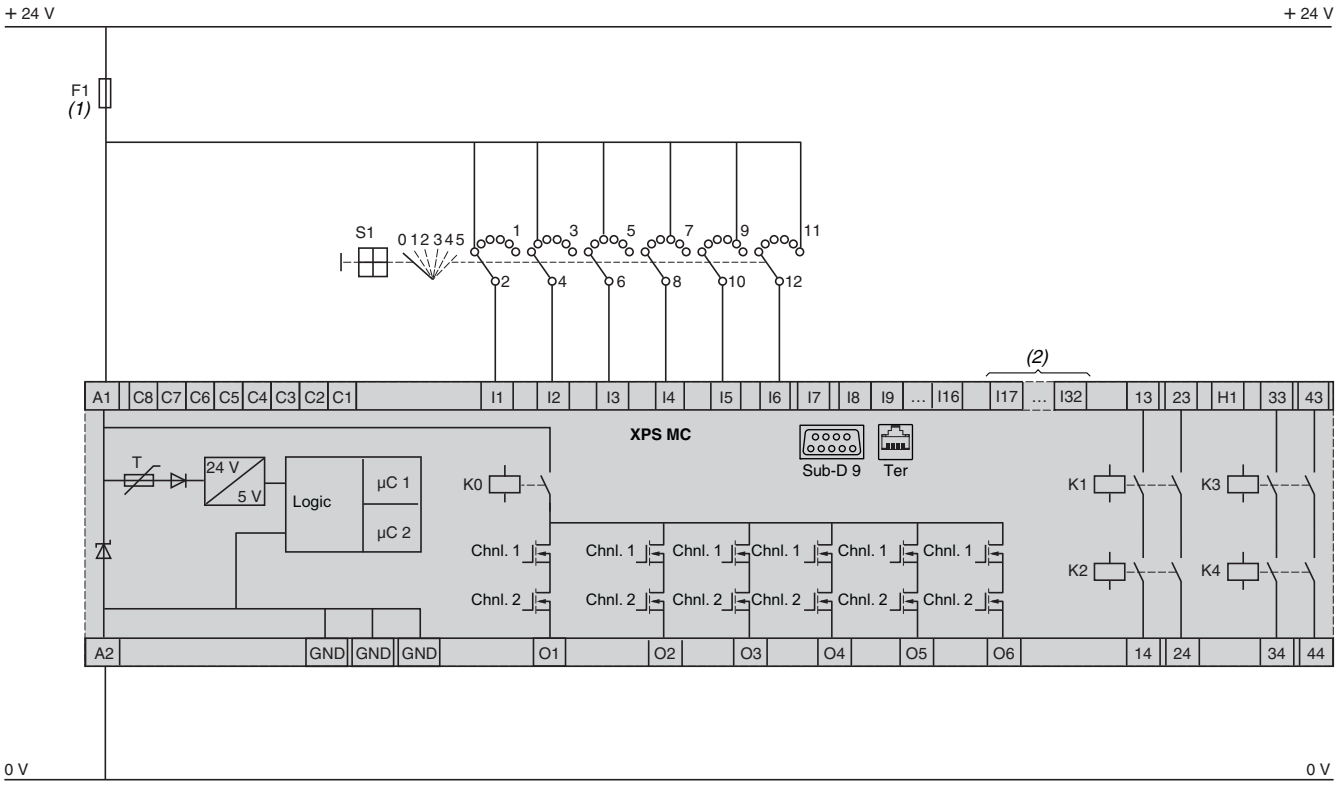
Key 0 1

tp = pulse time

2

Position selector

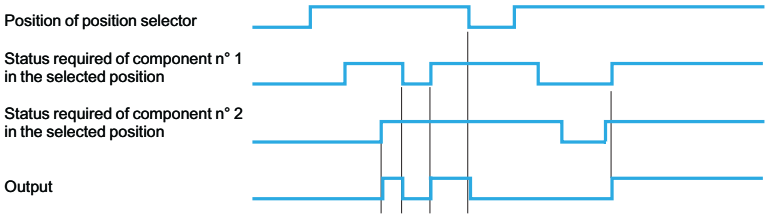
Application scheme

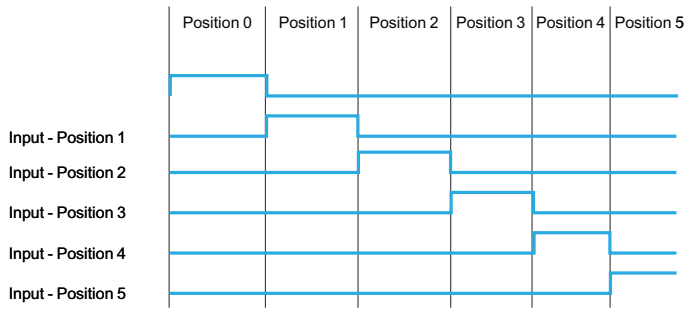


(1) Technical characteristics for maximum rating of fuses, see page 2/122.
(2) Only applicable to XPS MC32Z●.

Position selector (continued)

Functional diagrams

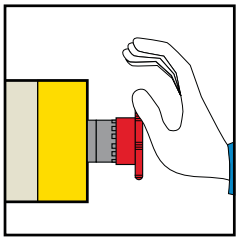
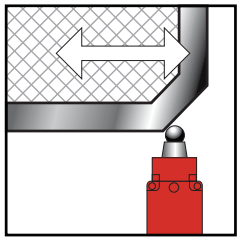
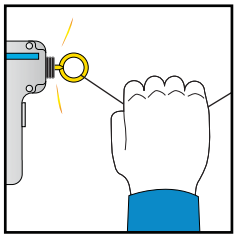




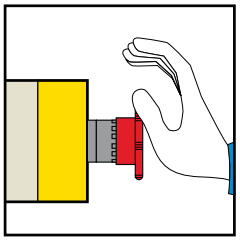


Safety automation system solutions
Preventa safety modules

Applications

Modules	**For Emergency stop and switch monitoring**		
			
Conformity to standards	EN 954-1 - category 3/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN ISO 13850, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1	EN 954-1 - category 4/EN/ ISO 13849-1, (instantaneous contacts) EN 954-1 - category 3/ ISO 13849-1 (time delay contacts), EN/IEC 60204-1, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2	EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, DIN V VDE 801 + A1, EN/ISO 13850, EN 1088/ISO 14119, EN/IEC 60947-1 A11, EN/IEC 60947-5-1
Product certifications	UL, CSA, BG	UL, CSA, BG	UL, CSA, BIA
Number of circuits			
Safety	3 N/O	2 N/O instantaneous + 3 N/O time delay	3 N/O instantaneous + 3 N/O time delay
Additional	1 solid-state output for signalling to PLC	4 solid-state output for signalling to PLC	3 solid-state outputs for signalling to PLC
Display	2 LEDs	4 LEDs	11 LEDs
Supply voltage	∼ and ⎓ 24 V ∼ 48 V ∼ 115 V ∼ 230 V	∼ and ⎓ 24 V ∼ 115 V ∼ 230 V	⎓ 24 V
Synchronisation time between inputs	Unlimited	75 ms (automatic start)	Unlimited or 1.5 s (depending on wiring)
Input channel voltage			
24 V/48 V version	∼ and ⎓ 24 V/∼ 48 V	⎓ 24 V/–	⎓ 24 V/–
24 V/48 V or 110 V/120 V/230 V version	∼ 115 V/230 V –	∼ 48 V/48 V –	– –
Module type	**XPS AC**	**XPS ATE**	**XPS AV**
Pages	2/175	2/180	



For Emergency stop and switch monitoring



EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2

UL, CSA, BG

3 N/O

–

3 LEDs

∿ and ⎓ 24 V

Unlimited

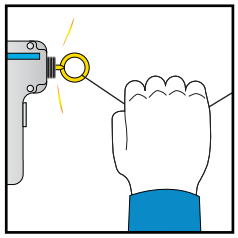
⎓ 24 V/–

–

–

XPS AF

2/187



For Emergency stop, switch or solid-state output safety light curtain monitoring

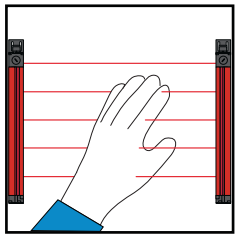


EN 954-1 - category 3, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2 EN/IEC 61496-1 (type 4) Category 4 for the monitoring of light curtains type 4 with solid state outputs and test function

UL, CSA, BG

XPS AFL

2/190





EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1, EN/IEC 60947-5-1

UL, CSA, BG

7 N/O

2 N/C + 4 solid-state outputs for signalling to PLC

4 LEDs

∿ and ⎓ 24 V
∿ 115 V and ⎓ 24 V
∿ 230 V and ⎓ 24 V

⎓ 24 V/–

∿ 24 V/24 V
–

XPS AR

2/195



For Emergency stop, switch, sensing mat/edges or solid-state output safety light curtain monitoring



EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN/IEC 60947-1 + A11

UL, CSA, BG

3 N/O instantaneous

1 N/C + 4 solid-state outputs for signalling to PLC

4 LEDs

∿ and ⎓ 24 V
∿ 48 V
∿ 110 V and ⎓ 24 V
∿ 120 V and ⎓ 24 V
∿ 230 V and ⎓ 24 V

Unlimited or 2 s, 4 s (depending on wiring)

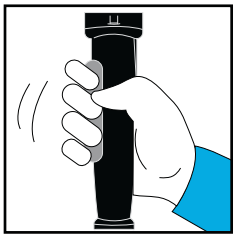
⎓ 24 V/–

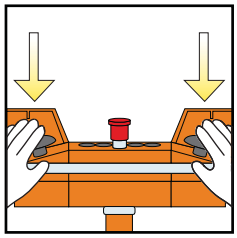
–
⎓ 24 V/24 V/24 V

XPS AK

2/201

2

Applications		
Modules		**For enabling switch monitoring**
		
Conformity to standards		EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 61326 + A1 DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)
Product certifications		UL, CSA, BIA
Number of circuits		
	Safety	2 N/O
	Additional	2 solid-state outputs for signalling to PLC
Display		3 LEDs
Supply voltage		⎓ 24 V
Synchronisation time between inputs		–
Input channel voltage		
	24 V/48 V version	24 V/–
	115 V/230 V version	–
Module type		**XPS VC**
Pages		2/206



For electrical monitoring of two-hand control stations



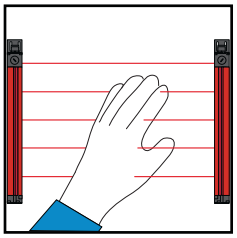




EN 954-1 - category 1/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III A/ISO 13851, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III C/ISO 13851, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN 574 type III C/ISO 13851, EN/IEC 60947-1, EN/IEC 60947-5-1, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)
UL, CSA	UL, CSA, INRS	UL, CSA, BIA
1 N/O	2 N/O	2 N/O
1 N/C	1 N/C	2 solid-state outputs for signalling to PLC
2 LEDs	3 LEDs	3 LEDs
∿ and ⎓ 24 V ∿ 115 V ∿ 230 V	⎓ 24 V ∿ 24 V ∿ 115 V ∿ 230 V	⎓ 24 V
500 ms	500 ms	500 ms
⎓ 24 V/–	⎓ 24 V (⎓ 24 V) ⎓ 48 V (∿ 24 V)	⎓ 24 V/–
∿ 24 V/24 V	∿ 48 V/48 V	–
XPS BA	**XPS BC**	**XPS BF**
2/211		2/211

Safety automation system solutions
Preventa safety modules

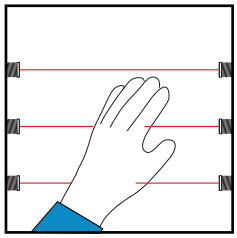
Applications



Modules		**For monitoring 2 to 4 type 2 and type 4 light curtains (transmitter-receiver pair)**

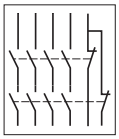
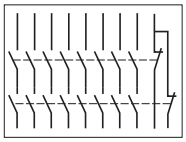


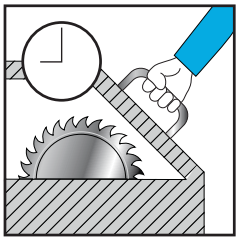
Functions		Protects access to a hazardous zone by associating the module with 2 to 4 light curtains type XUS L
	Built-in “muting” function	No
Conformity to standards		EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 61496-1, EN/IEC 61496-2
Product certifications		UL, CSA, TÜV
Number of circuits		
	Safety	2 solid-state PNP (N/O)
	Additional	1 PNP N/O + 1 NPN N/O output for signalling to PLC
Display		9 LEDs + 2-digit display
Supply voltage		⎓ 24 V
Module type		**XPS LCD**
Pages		2/217

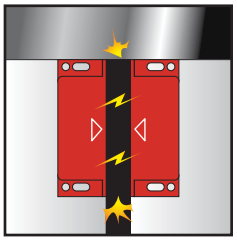


For control of 1 to 4 single-beam photo-electric sensors XU2 S (transmitter-receiver pair)	For monitoring type 4 light curtains Compact and slim ranges
	
Protects access to a hazardous zone by associating the module with 1 to 4 single-beam photo-electric sensors	Protects access to a hazardous zone by associating the module with light curtains XUS L
	2 transmitter-receiver pairs
Yes	Yes
EN 954-1 - category 2/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 61496-1, EN/IEC 60947-5-1, EN/IEC 60947-1	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 61496-1, EN/IEC 61496-2
UL, CSA, BIA	UL, CSA, TÜV
2 N/O	2 solid-state
4 solid-state PNP N/O outputs for signalling to PLC	1 PNP + 1 NPN output for signalling to PLC
4 LEDs	14 LEDs + 2-digit display
⎓ 24 V	
XPS CM	**XPS LCM**
3/134	2/222

Safety automation system solutions
Preventa safety modules

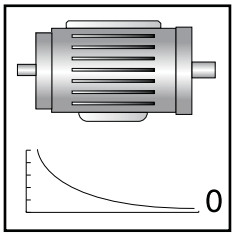
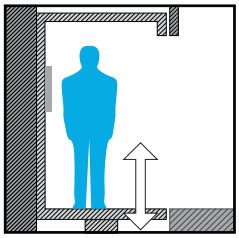
Applications			
Modules	**For increasing the number of safety contacts**		
			
Functions	Allows additional safety contacts to be added to another module		
Conformity to standards	EN 954-1 - category 4/EN/ISO 13849-1 (when connected to the appropriate module), EN/IEC 60204-1, EN/IEC 60947-5-1	EN 954-1 - category 4/EN/ISO 13849-1 (when connected to the appropriate module), EN/IEC 60204-1, EN/IEC 60947-5-1	
Product certifications	UL, CSA	UL, CSA	
Number of circuits			
Safety	4 N/O	8 N/O	
Additional	1 N/C + 1 solid-state output for signalling to PLC		
Display	3 LEDs		
Supply voltage	∼ and ⎓ 24 V ∼ 115 V ∼ 230 V		
Module type	**XPS ECM**	**XPS ECP**	
Pages	2/229		

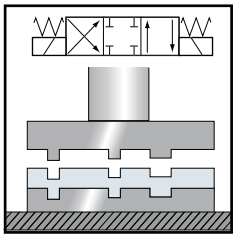


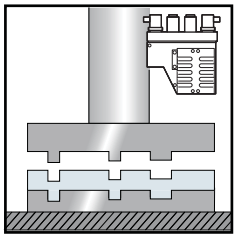


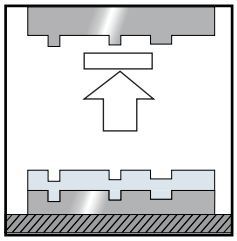
For the monitoring of applications requiring safety time delays		For coded magnetic switch monitoring	
		For 2 max.	For 6 max.
			
Unlocking of guards after a safety time delay for machines with long rundown time	Shunting contact in association with XPS VNE modules for zero speed detection, solenoid valve monitoring, etc.	For monitoring 2 to 6 coded switches, depending on model	
EN 954-1 - category 3/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1	EN 954-1 - category 3/EN/ ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1	EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-5-3, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)	EN 954-1 - category 4/EN/ ISO 13849-1, EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-5-3, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)
UL, CSA, BG	UL, CSA, BG	UL, CSA, BIA	UL, CSA, BIA
1 N/O time delayed	1 N/O pulse type	2 N/O	
2 N/C + 2 solid-state outputs for signalling to PLC		2 solid-state outputs for signalling to PLC	
4 LEDs		3 LEDs	15 LEDs
~ and ⎓ 24 V ~ 115 V ~ 230 V		⎓ 24 V	
XPS TSA	**XPS TSW**	**XPS DMB**	**XPS DME**
2/233		2/237	

Safety automation system solutions
Preventa safety modules

Applications			
Modules		**For zero speed detection of a.c. or d.c. motors which produce a remanent voltage in their windings due to residual magnetism**	**For lift control**
			
Functions		Detecting the stopping of the motor by measuring the remanent voltage in the stator windings (compatible with electronic motor control devices such as: variable speed drives, d.c. injection brakes, etc.)	Checks the height of the cabin when it stops at a landing in order to compensate for any difference generated by variation of the load in the cabin
Conformity to standards		EN 954-1 - category 3/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN 81-1, EN 81-2, EN/IEC 60947-5-1, EN 50082-2, EN 12015, EN 12016
Product certifications		UL, CSA, BG	UL, CSA, TÜV
Number of circuits	Safety	1 N/O + 1 N/C	2 N/O
	Additional	2 solid-state outputs for signalling to PLC	
Display		4 LEDs	4 LEDs
Supply voltage		⎓ 24 V ∿ 115 V ∿ 230 V	∿ or ⎓ 24 V ∿ 115 V ∿ 230 V
Module type		**XPS VNE**	**XPS DA**
Pages		2/243	2/249







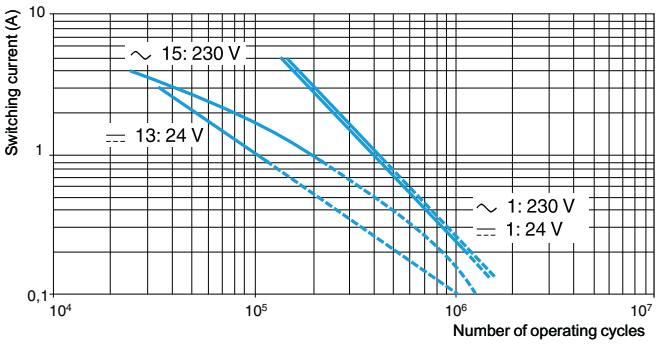
For dynamic monitoring of hydraulic valves on linear presses	For dynamic monitoring of double-bodied solenoid valves	For safety stop at top dead centre with automatic overtravel monitoring and control
		
Dynamic monitoring of the position of the valve pistons of the hydraulic safety system on linear presses. Dangerous movements of the machine are allowed when the correct change of signal occurs	Dynamic monitoring of double-bodied safety solenoid valves on eccentric presses. The device prevents engagement of the clutch and engages the brake if a fault occurs in the solenoid valve	Automatic monitoring of the stopping distance at each cycle + maintain open function for eccentric presses
EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 693, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 692, EN 50082-2	EN 954-1 - category 4/EN/ISO 13849-1, EN/IEC 60204-1, EN/IEC 60947-5-1, EN 692, EN 50082-2
UL, CSA	UL, CSA	UL, CSA
2 N/O + 1 N/C	1 N/O + 1 N/C	3 N/O
–	4 solid-state outputs for signalling to PLC	
8 LEDs		
⎓ 24 V	⎓ 24 V ∿ 115 V ∿ 230 V	– ∿ 115 V ∿ 230 V
XPS PVT	**XPS PVK**	**XPS OT**
2/251	2/255	2/260

2

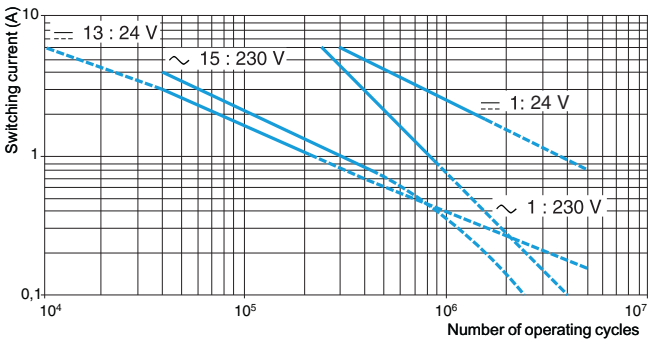
Electrical durability

Electrical durability curves of safety contacts conforming to EN 60947-5-1, table C2

XPS AC, XPS TSA, XPS TSW, XPS BA, XPS BC, XPS CM, XPS DA, XPS OT, XPS PVK, XPS PVT, XPS VNE

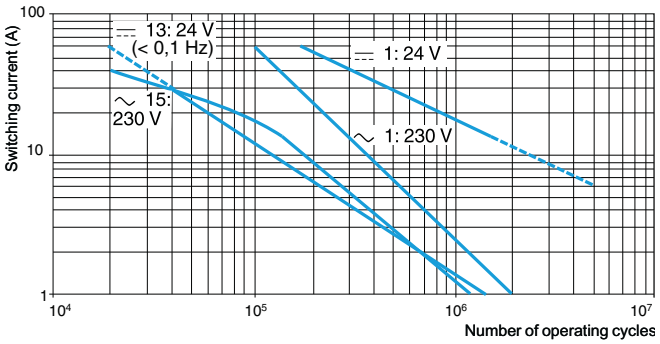


XPS ECM, XPS ECP

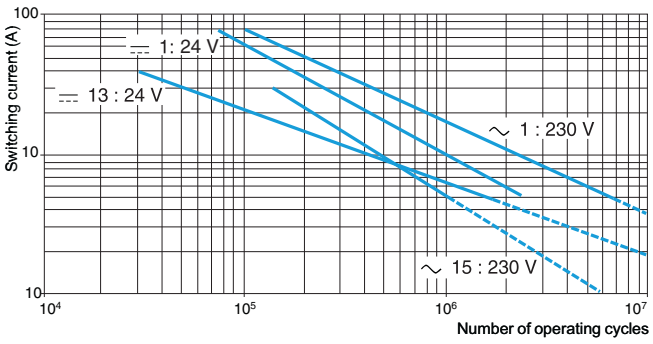


XPS ATE

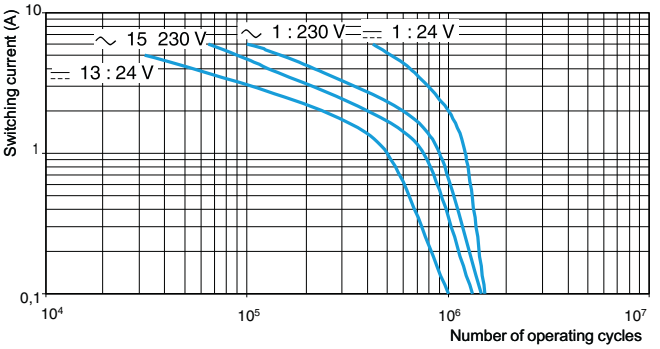
24 V ⎓ version



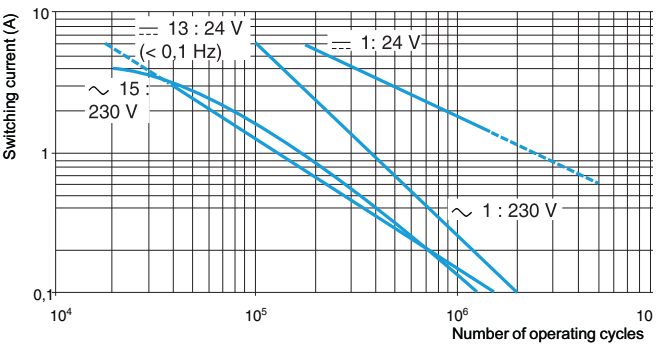
115 V ∿ + 230 V ∿ version



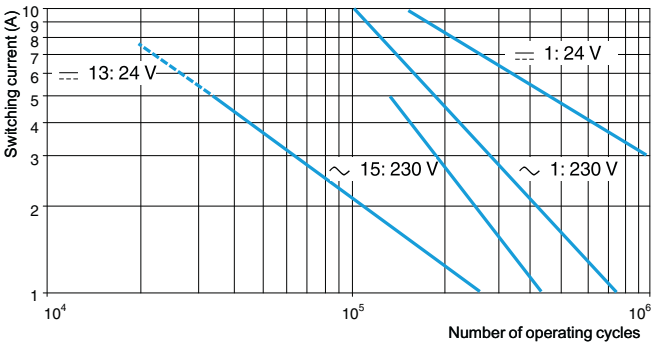
XPS AF, XPS AK, XPS AFL



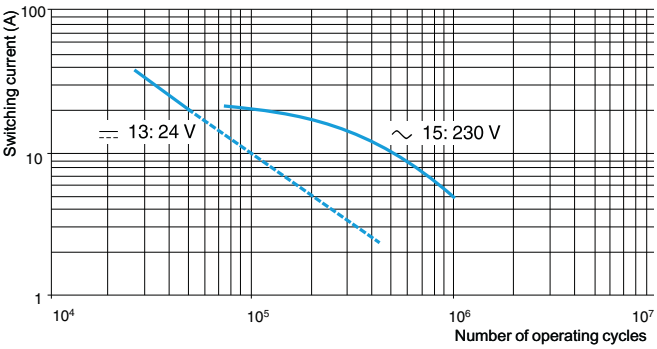
XPS AV, XPS MP, XPS VC, XPS BF, XPS MC



XPS AR



XPS DMB, XPS DME



Electrical durability (continued)

Definition of tests

Determination of electrical durability conforming to EN 60947-5-1 (table C2)

Type of current	Utilisation category	Start-up			Breaking		
		Current	Voltage	Cos φ	Current	Voltage	Cos φ
a.c. supply	AC-15	10 x Ie	Ue	0.7	Ie	Ue	0.4
Type of current	**Utilisation category**	**Start-up**			**Breaking**		
		Current	**Voltage**	**T0.95**	**Current**	**Voltage**	**T0.95**
d.c. supply	DC-13	Ie	Ue	50 ms	Ie	Ue	50 ms

Ie: operational current measured.
Ue: operational voltage measured.
Cos φ: power factor.
T0.95: time taken to reach 95% of nominal current.

The tests are carried out with a frequency of 6 switching operations per minute and with no additional protection of the components connected to the safety outputs. The use of additional protection for the components connected to the safety outputs significantly increases the durability of the safety outputs.

Determination of the breaking capacity conforming to EN 60947-5-1 (table 4)

Utilisation category	Start-up			Breaking			Total number of switching operations	Switching operations per minute for 1…1000 switching operations	Switching operations per minute for 1001…6050 switching operations	Minimum duration of switching operation
	Current	Voltage	Cos φ	Current	Voltage	Cos φ				
AC-15	10 x Ie	Ue	0.3	Ie	Ue	0.3	6050	60	6	50 ms
Utilisation category	**Start-up**			**Breaking**			**Total number of switching operations**	**Switching operations per minute for 1…1000 switching operations**	**Switching operations per minute for 1001…6050 switching operations**	**Minimum duration of switching operation**
	Current	**Voltage**	**T0.95**	**Current**	**Voltage**	**T0.95**				
DC-13	Ie	Ue	50 ms	Ie	Ue	50 ms	6050	60	6	50 ms

Ie: operational current measured.
Ue: operational voltage measured.
Cos φ: power factor.
T0.95: time taken to reach 95% of nominal current.

Notes:
The maximum values for the breaking capacity of the safety outputs in the various utilisation categories are not fixed and depend on the power factor and on the switching frequency. The test definition for the “breaking capacity” and “durability” tables in the European standard EN 60947-5-1 uses different values for the power factor and the switching frequency.

The power factor (cos φ) in the “breaking capacity” table (0.3) is greater than that in the “durability” table (0.7).

In the “breaking capacity” table, the switching frequency of the safety outputs is higher for the first 1000 switching operations (60 per minute) than that for 1001 to 6050 switching operations (6 per minute).

Consequently, the maximum breaking capacity values determined using the “breaking capacity” table are lower than those in the “durability” table.

Safety automation system solutions
Preventa safety modules type XPS AC
For Emergency stop and switch monitoring

Operating principle

Safety modules XPS AC are used for monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088/ISO 14119. They provide protection for both the machine operator and the machine by immediately stopping the dangerous movement on receipt of a stop instruction from the operator, or on detection of a fault in the safety circuit itself.

To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status.

The XPS AC module has 3 safety outputs and a solid-state output for signalling to the PLC.

Characteristics

Module type			**XPS AC**	**XPS AC●●●●P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 3 max.	
Conformity to standards			EN 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1 + A11, EN/IEC 60947-5-1	
Product certifications			UL, CSA, BG	
Supply	Voltage	**V**	∼ and ⎓ 24, ∼ 48, ∼ 115, ∼ 230	
	Voltage limits		- 20…+ 10% (∼ 24 V) - 20…+ 20% (⎓ 24 V) - 15…+ 10% (∼ 48) - 15…+ 15% (115 V) - 15…+10% (230 V)	
	Frequency	**Hz**	50/60	
Consumption		**W**	< 1.2 (⎓ 24 V)	
		VA	< 2.5 (∼ 24 V) < 6 (∼ 48 V) < 7 (∼ 115 V) < 6 (∼ 230 V)	
Start button monitoring			No	
Control unit voltage (at nominal supply voltage)			Identical to supply voltage	
	24 V version	**V**	∼ 24 (approx. 90 mA), ⎓ 24 (approx. 40 mA)	
	48 V version	**V**	∼ 48 (approx. 100 mA)	
	115 V version	**V**	∼ 115 (approx. 60 mA)	
	230 V version	**V**	∼ 230 (approx. 25 mA)	
Outputs	Voltage reference		Volt-free	
	Number and type of safety circuits		3 N/O (13-14, 23-24, 33-34)	
	Number and type of additional circuits		1 solid-state	
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13		24 V/2 A L/R = 50 ms	
	Max. thermal current (Ithe)	**A**	6	
	Max. total thermal current	**A**	10.5	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	**A**	4 gG (gl) or 6 fast acting	
	Minimum current	**mA**	10	
	Minimum voltage	**V**	17	
Electrical durability			See page 2/172	
Response time on input opening		**ms**	< 100	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)		**kV**	3 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display			2	
Operating temperature		**°C**	- 10…+ 55	
Storage temperature		**°C**	- 25…+ 85	
Degree of protection conforming to EN/IEC 60529	Terminals		IP 20	
	Enclosure		IP 40	

Connections: page 2/176
Dimensions: page 2/262

Characteristics

Module type			XPS AC	XPS AC●●●●P
Connection	Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end	Solid or flexible cable: 0.14…2.5 mm²	Solid or flexible cable: 0.2…2.5 mm²
		With cable end	Without bezel, flexible cable: 0.25…2.5 mm²	
			With bezel, flexible cable: 0.25…1.5 mm²	With bezel, flexible cable: 0.25…2.5 mm²
	2-wire connection	Without cable end	Solid or flexible cable: 0.14…0.75 mm²	Solid cable: 0.2…1 mm², flexible cable: 0.2…1.5 mm²
		With cable end	Without bezel, flexible cable: 0.25…1 mm²	
			Double, with bezel, flexible cable: 0.5…1.5 mm²	

References



XPS AC●●●●P

Description	Type of terminal block connection	Number of instantaneous opening safety circuits	Additional outputs	Supply	Reference	Weight kg
Safety modules for Emergency stop and switch monitoring	Integrated in module	3	1 solid-state	∿ and ⎓ 24 V	**XPS AC5121**	0.160
				∿ 48 V	**XPS AC1321**	0.210
				∿ 115 V	**XPS AC3421**	0.210
				∿ 230 V	**XPS AC3721**	0.210
	Removable from module	3	1 solid-state	∿ and ⎓ 24 V	**XPS AC5121P**	0.160
				∿ 48 V	**XPS AC1321P**	0.210
				∿ 115 V	**XPS AC3421P**	0.210
				∿ 230 V	**XPS AC3721P**	0.210

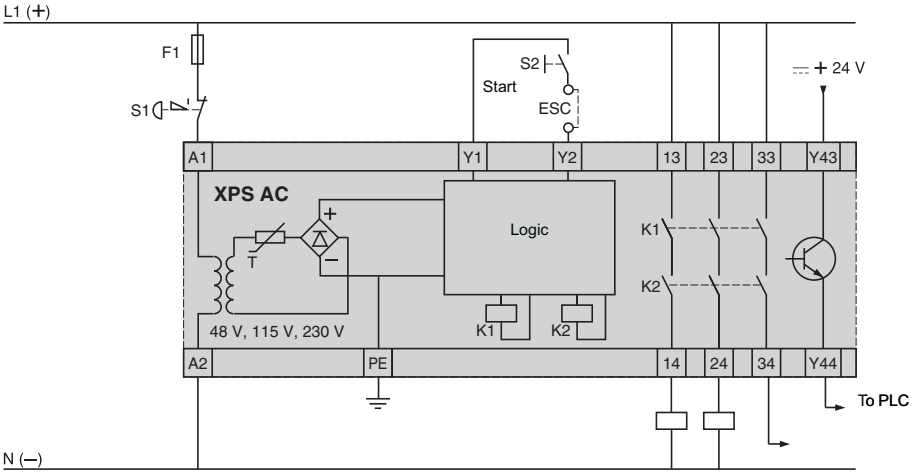
Connections: page 2/176
Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS AC
For Emergency stop and switch monitoring

2

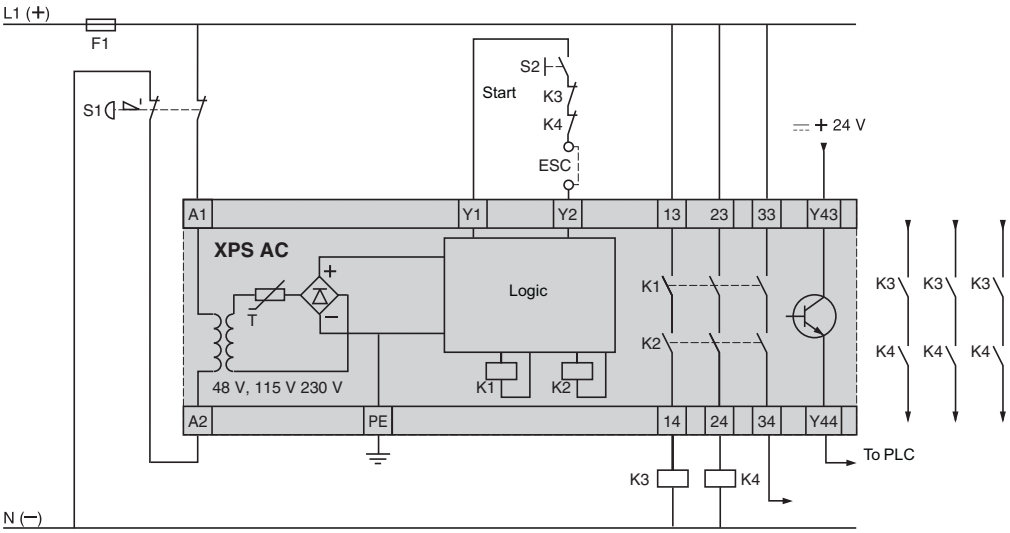
XPS AC

Module XPS AC associated with an Emergency stop button with 1 N/C contact



Y1-Y2: Feedback loop.
ESC: External start conditions.

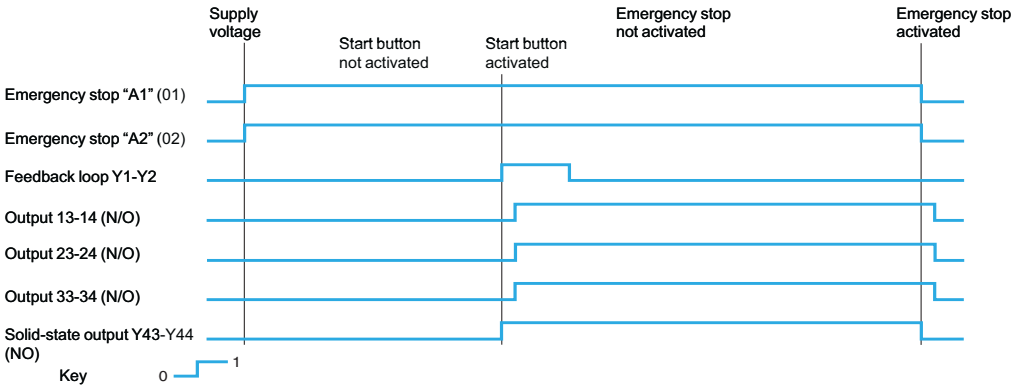
Module XPS AC associated with an Emergency stop button with 2 N/C contacts (recommended application)



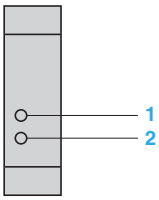
Y1-Y2: Feedback loop.
ESC: External start conditions.

XPS AC

Functional diagram of module XPS AC



LED details



1 Supply voltage A1-A2.
2 K1-K2 status (N/O safety outputs closed).

Safety automation system solutions

Preventa safety modules types XPS AV, XPS ATE

For Emergency stop and switch monitoring

Operating principle

Safety modules XPS AV and XPS ATE are used for monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1 and also meet the safety requirements for the electrical monitoring of switches in protection devices conforming to standard EN 1088/ISO 14119.
They provide protection for both the machine operator and the machine by immediately stopping the dangerous movement on receipt of a stop instruction from the operator, or on detection of a fault in the safety circuit itself.

In addition to the stop category 0 instantaneous opening safety outputs (3 for XPS AV and 2 for XPS ATE), the modules incorporate stop category 1 time delay outputs (3 for XPS AV and 3 for XPS ATE) which allow for controlled deceleration of the motor components until a complete stop is achieved (for example, motor braking by variable speed drive).
At the end of the preset delay, the supply is disconnected by opening the time delay output circuits.
For module XPS AV, the time delay of the 3 output circuits is adjustable, in 15 preset values, between 0 and 300 seconds using selector buttons.
For module XPS ATE, the time delay of the 3 output circuits is adjustable between 0 and 30 seconds using a 12-position selector switch.
Module XPS AV also incorporates 3 solid-state signalling outputs for signalling to the process PLC. Module XPS ATE incorporates 4 solid-state signalling outputs for signalling to the process PLC.
To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type			XPS AV11113 and AV11113P	XPS ATE●●●● and ATE●●●●P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/EN/ISO 13849-1)			Category 4 max.	Category 4 max. (instantaneous safety outputs) Category 3 max. (time delay safety outputs)
Conformity to standards			EN/IEC 60204-1, DIN V VDE 801 + A1, EN/ISO 13850, EN 1088/ISO 14119, EN/IEC 60947-1 A11, EN/IEC 60947-5-1	EN/IEC 60204-1, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2
Product certifications			UL, CSA, BIA	UL, CSA, BG
Supply	Voltage	**V**	⎓ 24	∿ and ⎓ 24, ∿ 115, ∿ 230
	Voltage limits		- 20…+ 20%	- 20…+ 10% (24 V) - 15…+ 15% (115 V) - 15…+ 10% (230 V)
	Frequency	**Hz**	–	50/60
Consumption		**W**	< 5	< 8
Module inputs fuse protection			Internal, electronic	Internal, electronic
Adjustable time delay		**s**	0…300	0…30
Start button monitoring			Yes/No (configurable by terminal connections)	Yes/No (configurable by terminal connections)
Control unit voltage (at nominal supply voltage)			Between input terminals S21-S22, S31-S32 or S11-S12	Between input terminals S11-S12, S21-S22 or S11-B1
	24 V version	**V**	24	24
	115 V, 230 V version	**V**	–	48
Calculation of wiring resistance RL between input terminals		Ω	100 max. Maximum cable length: 2000 m	RL max. = $\frac{\text{U int - U min.}}{\text{I min.}}$ Ue = true voltage applied to terminals A1-A2 U int (terminals S11-S21) = supply voltage Ue - 3 V (24 V version) U int between 42 V and 45 V, with typical value = 45 V (115 V, 230 V version) Calculated max. RL must be equal to or greater than the true value

References: page 2/180 | Connections: page 2/181 | Dimensions: page 2/262 | Characteristics: page 2/178

Safety automation system solutions

Preventa safety modules types XPS AV, XPS ATE

For Emergency stop and switch monitoring

Characteristics (continued)

Module type				XPS AV11113	XPS AV11113P	XPS ATE●●●●	ATE●●●●P
Synchronisation time between inputs			**s**	For guard: 1.5 For Emergency stop: unlimited		Approx. 0.075 For automatic start, terminals S33-Y2 and Y3-Y4 linked	
Outputs	Voltage reference			Volt-free		Volt-free	
	Number and type of instantaneous opening safety circuits			3 N/O (03-04, 13-14, 23-24)		2 N/O (13-14, 23-24, 33-34)	
	Number and type of time delay opening safety circuits			3 N/O (37-38, 47-48, 57-58)		3 N/O (57-58, 67-68, 77-78)	
	Number and type of additional circuits			3 solid-state		4 solid-state	
	Breaking capacity in AC-15	Instantaneous outputs	**VA**	C300: inrush 1800, maintained 180		C300: inrush 1800, maintained 180	
		Time delay outputs	**VA**	C300: inrush 1800, maintained 180		C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13	Instantaneous outputs		24 V/1.25 A L/R = 50 ms		24 V/1.0 A L/R = 50 ms	
		Time delay outputs		24 V/1.25 A L/R = 50 ms		24 V/1.0 A L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20 mA		–	
	Max. thermal current (Ithe)	Instantaneous outputs	**A**	3.3 for all 3, or 6 for 1 and 2 for 2, or 4 for 2 and for 2 for 1		5	
		Time delay outputs	**A**	3.3 for all 3, or 6 for 1 and 2 for 2, or 4 for 2 and 2 for 1		2.5	
	Max. total thermal current		**A**	20		8	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	Instantaneous outputs	**A**	4 gG or 6 fast acting		6 gG	
		Time delay outputs	**A**	4 gG or 6 fast acting		4 gG	
	Minimum current		**mA**	10 *(1)*		10 *(1)*	
	Minimum voltage		**V**	17 *(1)*		17 *(1)*	
Electrical durability				See page 2/172			
Response time on instantaneous opening inputs			**ms**	< 30		< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN//IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)			
Rated impulse withstand voltage (Uimp)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)			
LED display				11		4	
Operating temperature			**°C**	- 10…+ 55			
Storage temperature			**°C**	- 25…+ 85			
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20			
		Enclosure		IP 40			
Connections		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block	Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm²	Solid or flexible cable: 0.2…2.5 mm²	Solid or flexible cable: 0.14…2.5 mm²	Solid or flexible cable: 0.25…2.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm²			
				With bezel, flexible cable: 0.25…1.5 mm²	With bezel, flexible cable: 0.25…2.5 mm²	With bezel, flexible cable: 0.25…1.5 mm²	With bezel, flexible cable: 0.25…2.5 mm²
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm²	Solid cable: 0.2…1 mm² Flexible cable: 0.2… 1.5 mm²	Solid or flexible cable: 0.14…0.75 mm²	Solid cable: 0.2…1 mm² Flexible cable: 0.2…1.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…1 mm²			
				Double, with bezel, flexible cable: 0.5…1.5 mm²			

(1) The module is also capable of switching low power loads (17 V/10 mA) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

Safety automation system solutions

Preventa safety modules types XPS AV, XPS ATE

For Emergency stop and switch monitoring

103244



XPS AV11113

103245



XPS AV11113P

105571



XPS AT●●●●

References

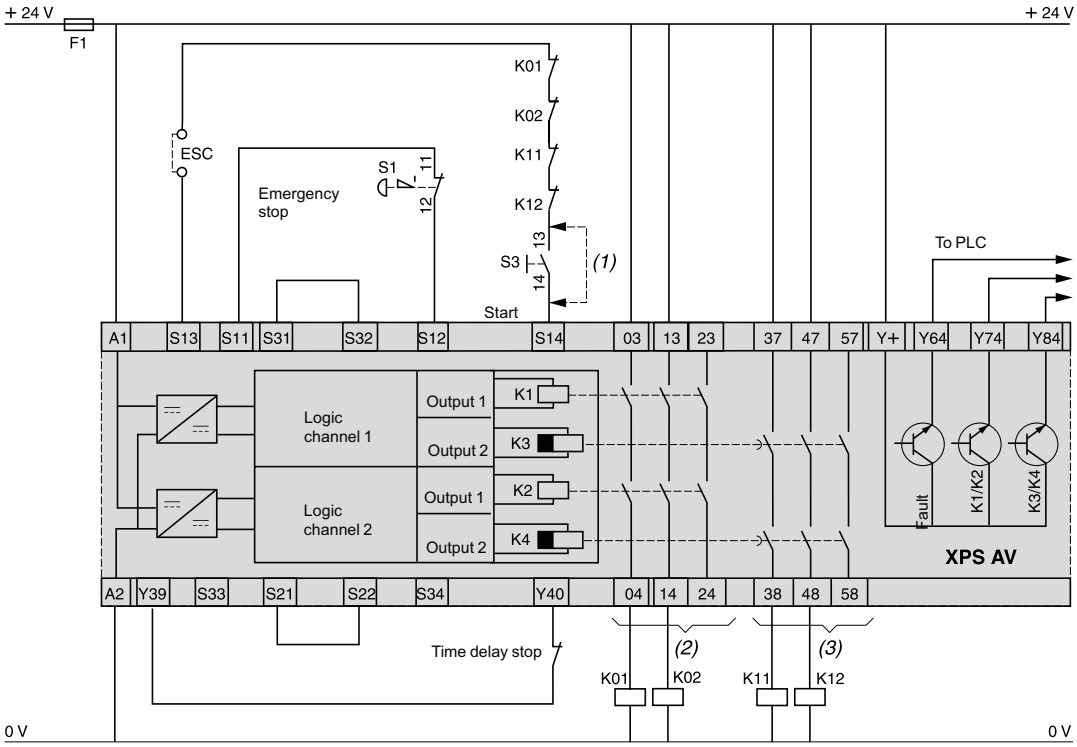
Description	Number of safety circuits	Additional outputs	Supply	Type of terminal block connection	Reference	Weight kg
Safety modules for Emergency stop and switch monitoring	6 N/O (3 N/O time delay)	3 solid-state	⎓ 24 V	Integrated in module	**XPS AV11113**	0.320
	6 N/O (3 N/O time delay)	3 solid-state	⎓ 24 V	Removable from module	**XPS AV11113P**	0.320
	5 N/O (3 N/O time delay)	4 solid-state	∼/⎓ 24 V	Integrated in module	**XPS ATE5110**	0.280
				Removable from module	**XPS ATE5110P**	0.280
			∼ 115 V	Integrated in module	**XPS ATE3410**	0.380
				Removable from module	**XPS ATE3410P**	0.380
			∼ 230 V	Integrated in module	**XPS ATE3710**	0.380
				Removable from module	**XPS ATE3710P**	0.380

References: page 2/180 | Connections: page 2/181 | Dimensions: page 2/262 | Characteristics: page 2/178

Safety automation system solutions
Preventa safety modules type XPS AV
For Emergency stop and switch monitoring

XPS AV

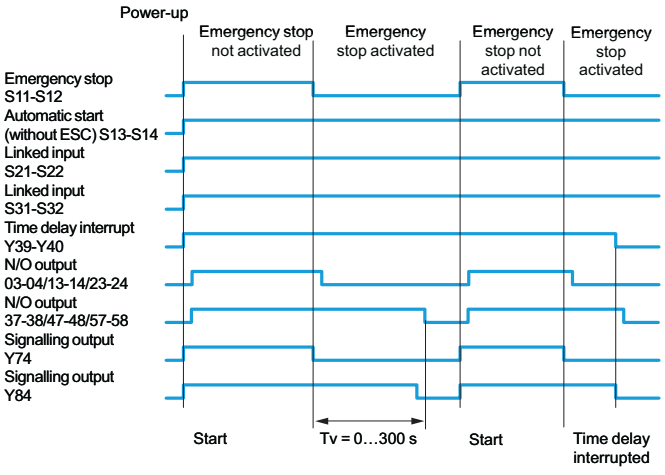
Module XPS AV associated with an Emergency stop button with 1 N/C contact, automatic start or unmonitored start



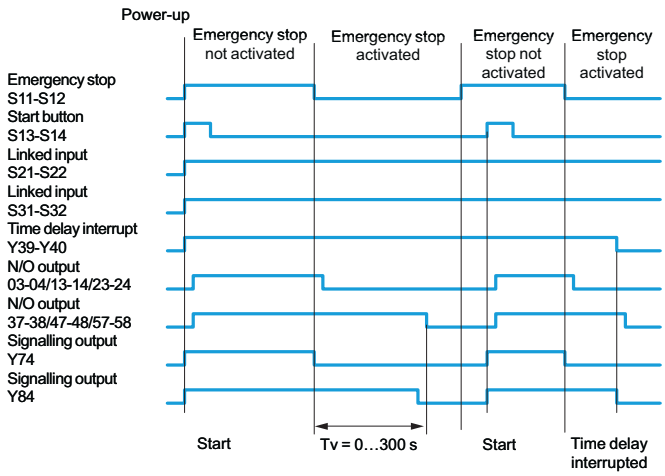
(1) Link for automatic start.
(2) Instantaneous opening safety outputs (stop category 0).
(3) Time delay opening safety outputs (stop category 1).
ESC = External start conditions.

Functional diagrams

Automatic start



Unmonitored start



Automatic start
There is no start contact or it is shunted.

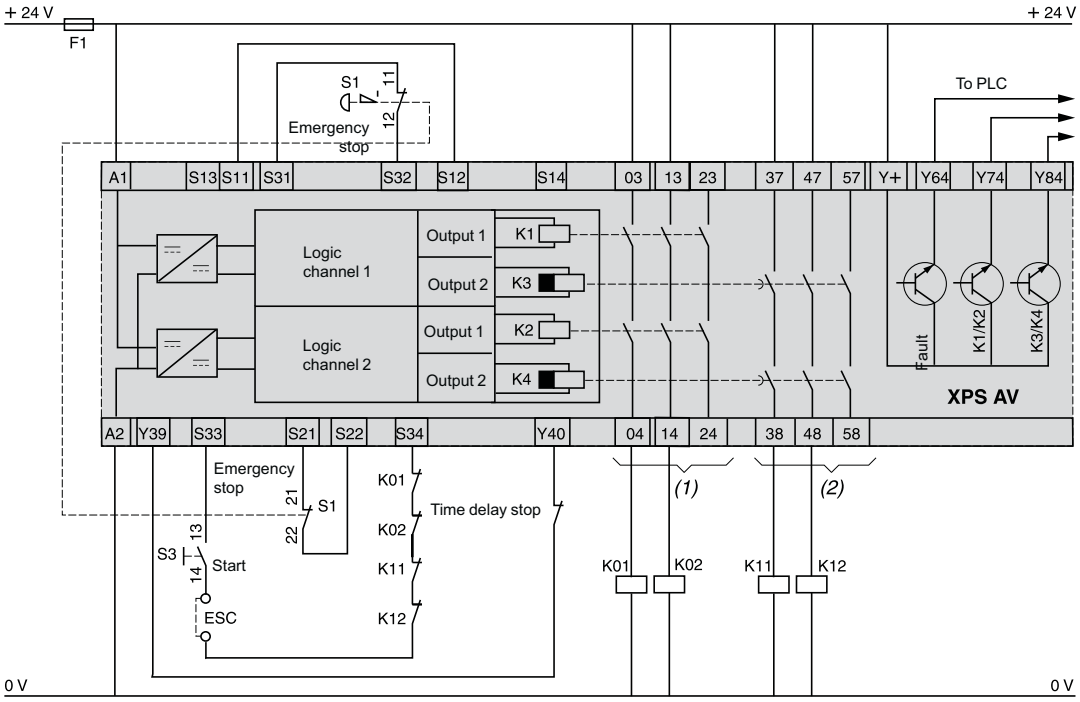
Unmonitored start
The output is activated on closing of the start contact.

Monitored start
The start input is monitored so that there is no start-up in the event of the start contact being shunted or the start circuit being closed for more than 10 seconds. Start-up is triggered following activation of the start button (push-release function) on opening of the contact.

2

XPS AV

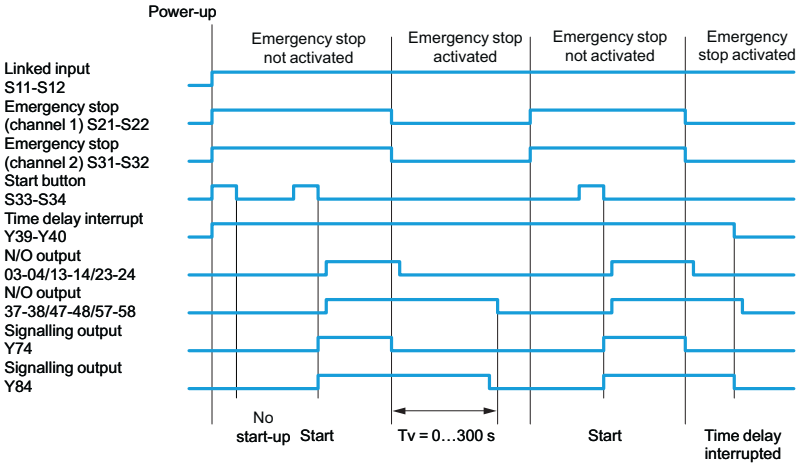
Module XPS AV associated with an Emergency stop button with 2 N/C contacts, monitored start



(1) Instantaneous opening safety outputs (stop category 0).
(2) Time delay opening safety outputs (stop category 1).
ESC = External start conditions.

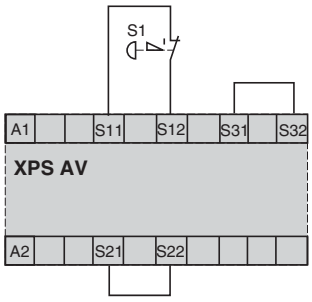
Functional diagram

Monitored start

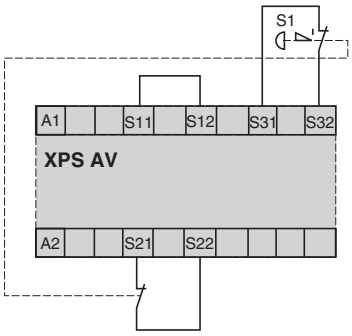


Emergency stop monitoring function configuration

1-channel wiring



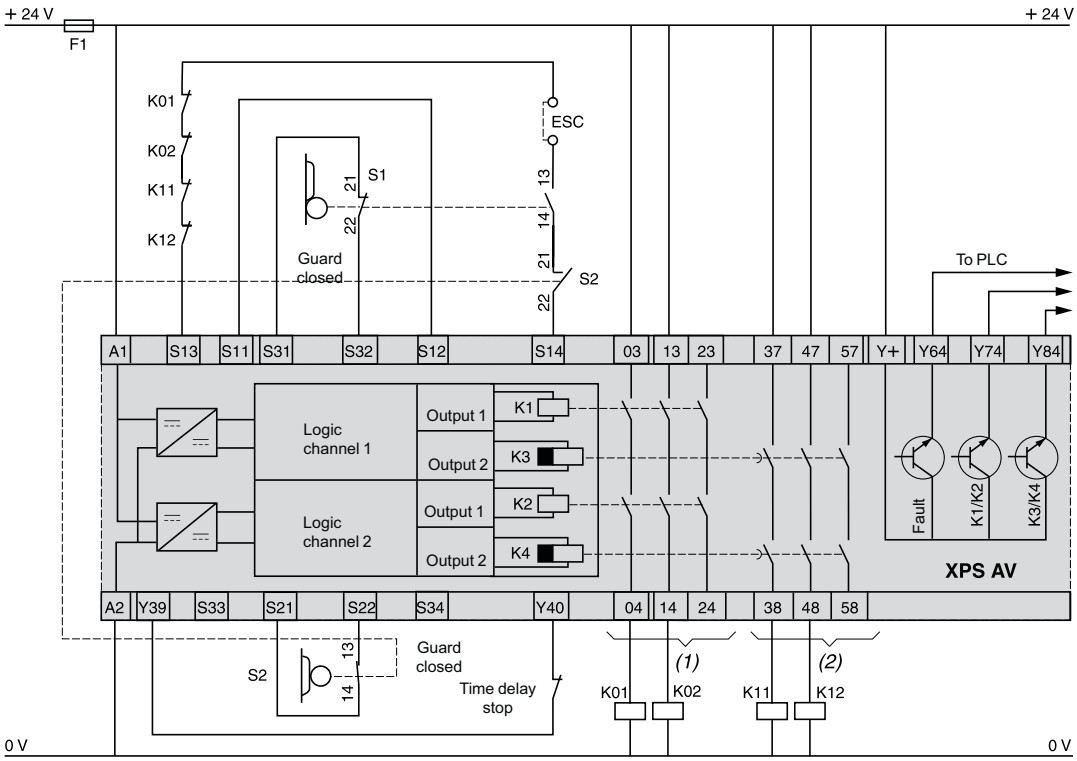
2-channel wiring, with short-circuit detection



References: page 2/180
Connections: page 2/181
Dimensions: page 2/262
Characteristics: page 2/178

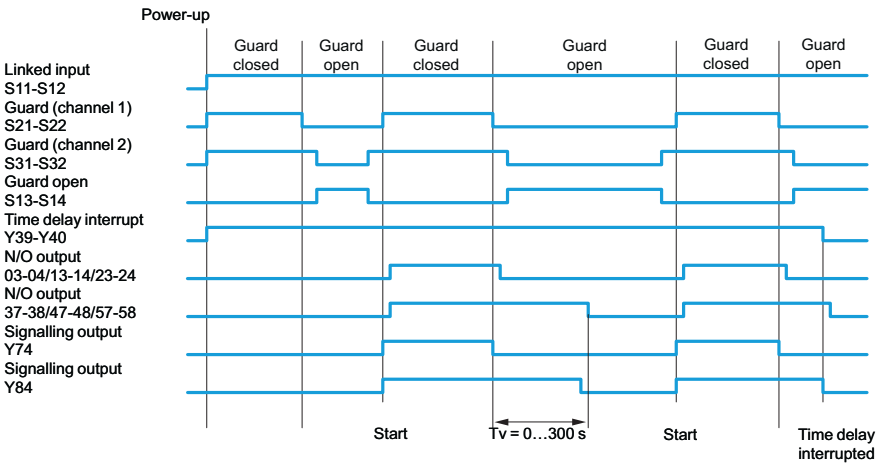
XPS AV

Monitoring of a movable guard associated with 2 switches
Automatic start (diagram shown for guard closed)

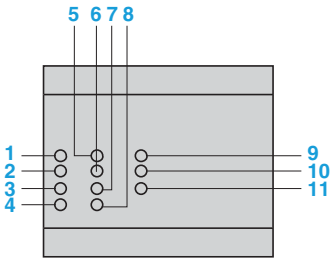


(1) Instantaneous opening safety outputs (stop category 0).
(2) Time delay opening safety outputs (stop category 1).
ESC = External start conditions.

Functional diagram



LED details

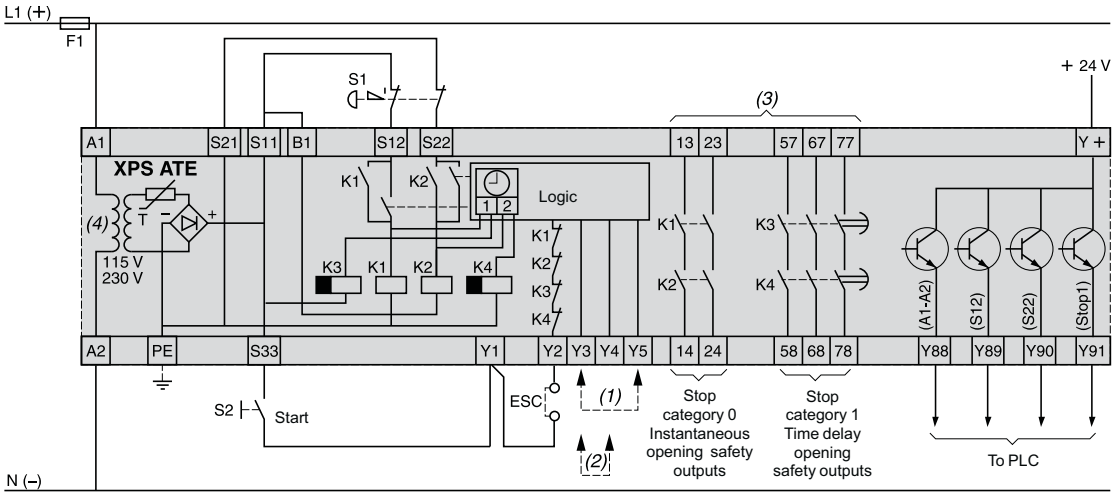


1 S12 input status.
2 S22 input status.
3 S32 input status.
4 S34 input status.
5 S14 input status.
6 Y40 input status (time delay stop).
7 K1/K2 status (N/O instantaneous opening safety outputs).
8 K3/K4 status (time delay opening safety outputs).
9 Supply voltage A1-A2.
10 Fault.
11 Configuration mode

2

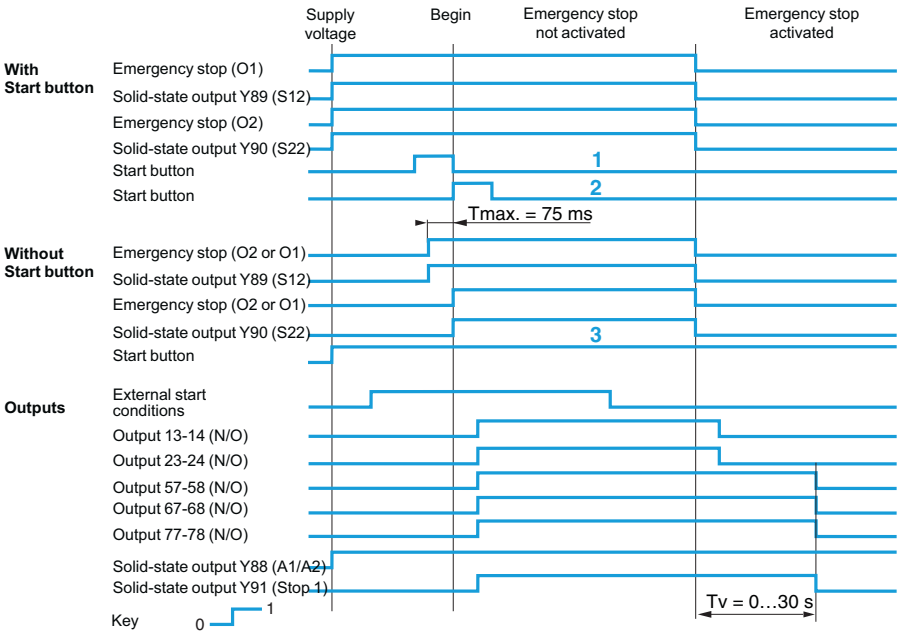
XPS ATE

Module XPS ATE associated with an Emergency stop button



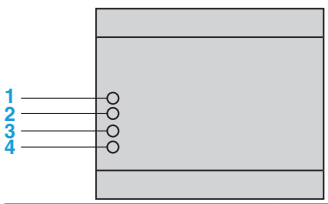
S1: Emergency stop button with 2 N/C contacts (recommended application).
S2: Start button.
ESC: External start conditions.
Y1 (S33) - Y2: Feedback loop.
F1: 4 A max.
(1) With start button monitoring.
(2) Without start button monitoring.
(3) The outputs must be fuse protected. Technical characteristics for maximum rating of fuses, see page 2/178.
(4) ∿ 115/230 V only.

Functional diagram of module XPS ATE with Emergency stop button monitoring



1 With start button monitoring (Y3-Y5 connection).
2 Without start button monitoring (Y3-Y4 connection).
3 Without start button (connection Y3-Y4 and S33-Y1).
Tv: adjustable time.

Description des DEL

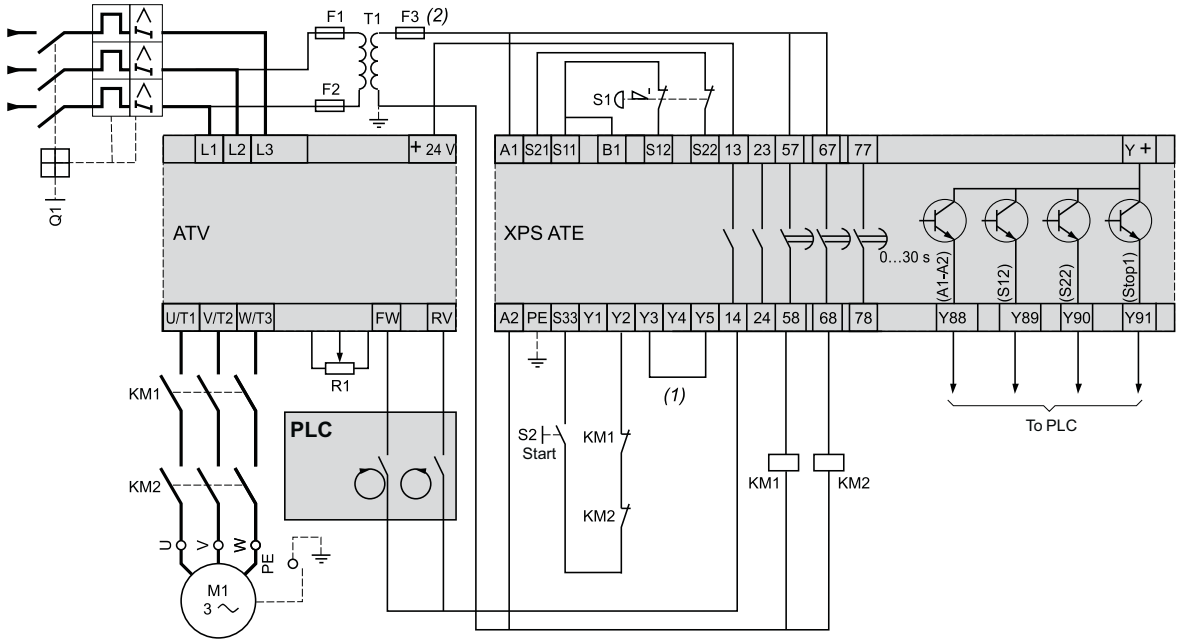


1 Supply voltage A1-A2, internal electronic fuse status.
2 S12 (A) input status.
3 S22 (B) input status.
4 Stop category 1 outputs closed.

References: page 2/180
Connections: page 2/181
Dimensions: page 2/262
Characteristics: page 2/178

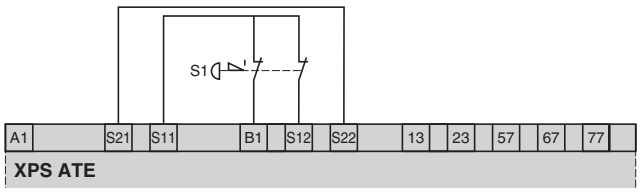
XPS ATE

Example of a safety circuit combining an Emergency stop module with a variable speed drive



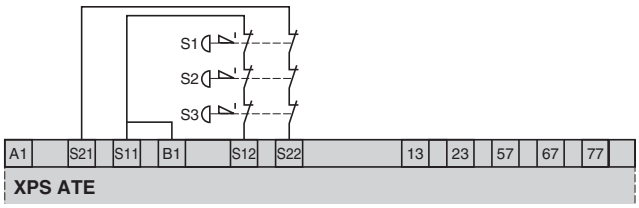
S1: Emergency stop button with 2 N/C contacts (recommended application).
S2: Start button
(1) With start button monitoring.
(2) Technical characteristics for maximum rating of fuses, see page 2/178.

Connection with 1 Emergency stop button



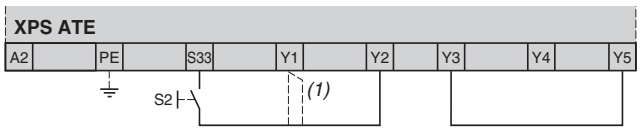
Both input channels are supplied at the same potential.
S1: Emergency stop button with 2 N/C contacts.
A short-circuit between the 2 inputs is not detected.

Connection with multiple Emergency stop buttons



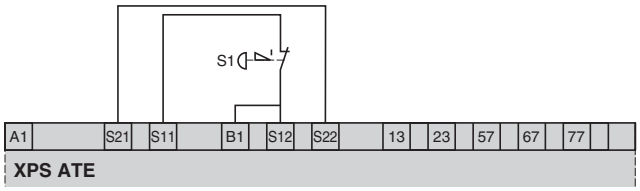
The 2 input channels are supplied at different potentials.
A short-circuit between the 2 inputs is detected.

Configuration with start button monitoring
(functional diagram for Start button 1, see page 2/181)



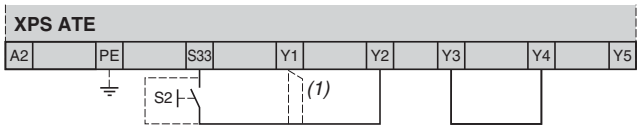
(1) Auxiliary terminal (to be used to separate the feedback loop from the wiring to the start button).

Monitoring an Emergency stop button with 1 N/C contact



S1: Emergency stop button with 1 N/C contact.
Not all faults are detected: a short-circuit on the Emergency stop button is not detected.

Configuration without start button monitoring
(functional diagram for Start button 2, see page 2/181)



(1) Auxiliary terminal (to be used to separate the feedback loop from the wiring to the start button).

Safety automation system solutions
Preventa safety modules type XPS AF
For Emergency stop and switch monitoring

Operating principle

Safety modules XPS AF are designed to conform with category 4 of the standard EN 954-1/ISO 13849-1.
They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119.

Housed in a compact enclosure, the modules have 3 safety outputs.
Preventa safety modules XPS AF●●●●P incorporate removable terminal blocks, thus optimising machine maintenance.
To aid diagnostics, the modules have 3 LEDs on the front face which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				XPS AF5130	XPS AF5130P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24	
	Voltage limits			- 15…+ 10%	
	Frequency		**Hz**	50/60	
Consumption			**VA**	≤ 5	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				Yes/No (configurable by terminal connections)	
Control unit voltage and current				⎓ 24 V/30 mA approx. (at nominal supply voltage)	
Maximum wiring resistance RL			Ω	90	
Synchronisation time between inputs A and B				Unlimited	
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			3 N/O (13-14, 23-24, 33-34)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	6	
	Max. total thermal current		**A**	18	
	Output fuse protection		**A**	4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time on input opening			**ms**	≤ 40	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm²	Solid or flexible cable: 0.2…2.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm²	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm²	With bezel, flexible cable: 0.25…2.5 mm²
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm²	Solid cable: 0.2…1 mm², flexible cable: 0.2…1.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…1 mm²	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm²	Double, with bezel, flexible cable: 0.5…1.5 mm²

References: page 2/187 Connections: page 2/187 Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS AF
For Emergency stop and switch monitoring

References



XPS AF5130



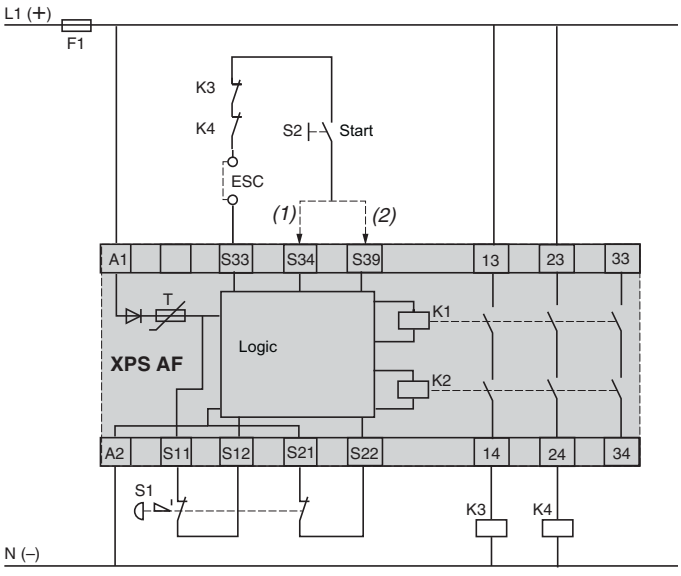
XPS AF5130P

Description	Type of terminal block connection	Number of safety circuits	Supply	Reference	Weight kg
Safety modules for Emergency stop and limit switch monitoring	Integrated in module	3	∿ and ⎓ 24 V	**XPS AF5130**	0.250
	Removable from module	3	∿ and ⎓ 24 V	**XPS AF5130P**	0.250

Connections

XPS AF

Module XPS AF associated with an Emergency stop button with 2 N/C contacts



(1) With start button monitoring.
(2) Without start button monitoring.
ESC = External start conditions.

Principle, characteristics:
page 2/186

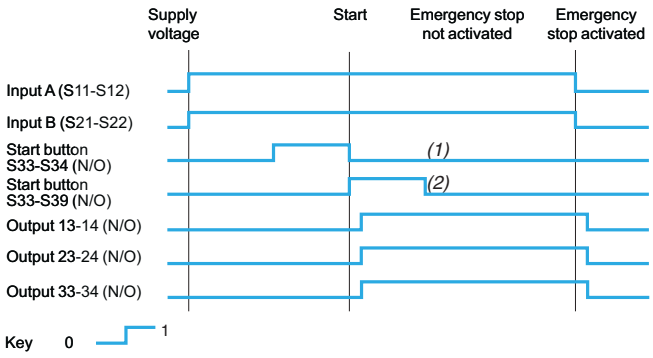
Dimensions:
page 2/262

2

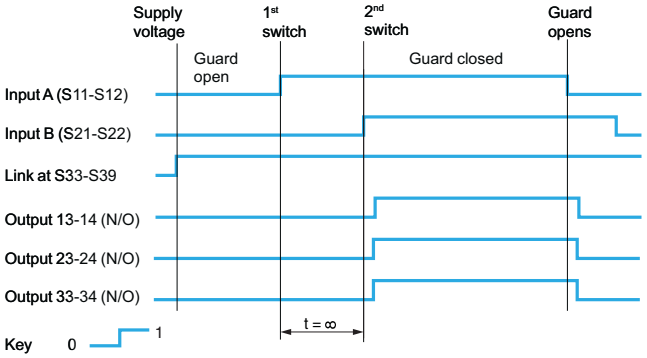
XPS AF

Functional diagrams

Emergency stop function

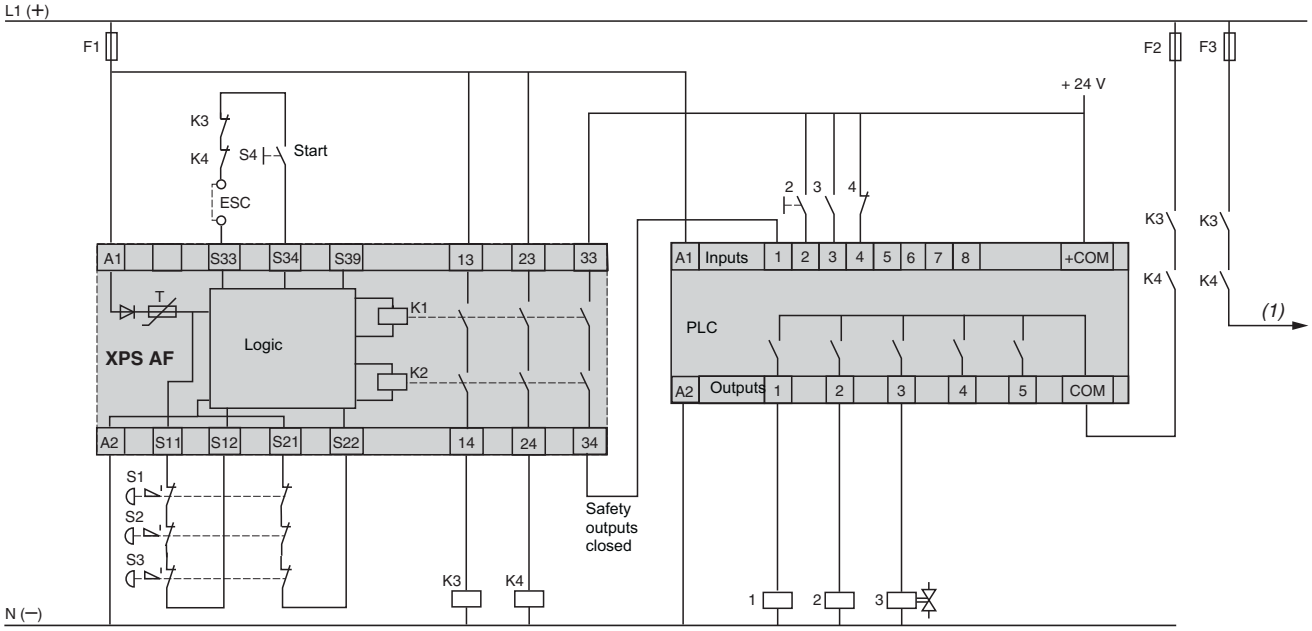


Guard function with automatic start



(1) With start button monitoring.
(2) Without start button monitoring.

Module XPS AF with connection of multiple Emergency stop buttons, combined with a PLC



(1) Other circuits controlled by the XPS AF module. ESC = External start conditions.

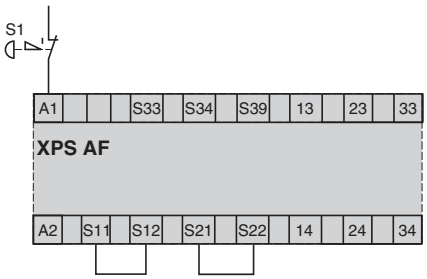
Principle, characteristics: page 2/186
References: page 2/187
Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS AF
For Emergency stop and switch monitoring

XPS AF

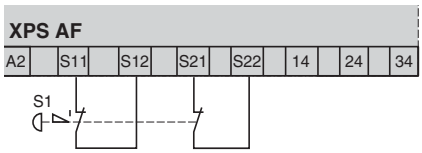
Emergency stop monitoring function configuration

1-channel wiring

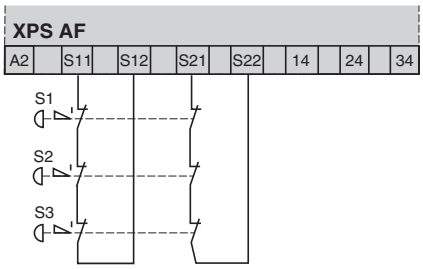


Emergency stop button with a single N/C contact.
Not all faults are detected: a short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring

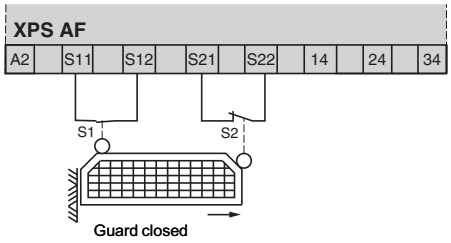


Emergency stop button with 2 N/C contacts (recommended application).
The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

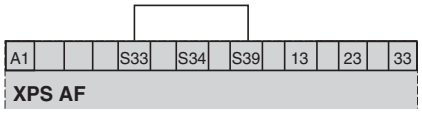


Connection of multiple Emergency stop buttons with 2 N/C contacts (recommended application).
The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

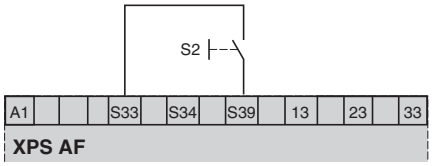
Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N/O contact, switch 2 with N/C contact)



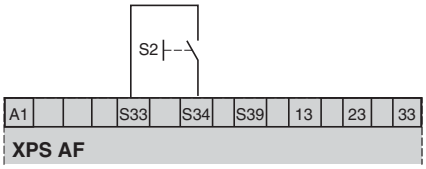
Configuration with automatic or manual start



Automatic start.

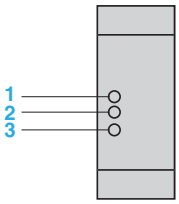


Without start button monitoring, manual reset.



Function: push-release.
With start button monitoring, manual reset.

LED details



1 Supply voltage A1-A2, fuse status.
2 Relay K1 energised.
3 Relay K2 energised.

Principle, characteristics: page 2/186
References: page 2/187
Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules type XPS AFL

For Emergency stop, switch and safety light curtain monitoring

Operating principle

Safety modules XPS AFL are designed to conform with category 3 of the standard EN 954-1.
They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119.

They can also be used for monitoring type 4 light curtains conforming to EN/IEC 61496-1 which have solid-state safety outputs with test function (for example, light curtains type XUS L, see page 3/113. This system would be conforming to category 4 of standard EN 954-1/EN/ISO 13849-1.

Housed in a compact enclosure, the modules have 3 safety outputs.
Preventa safety modules XPS AFL●●●●P incorporate removable terminal blocks, thus optimising machine maintenance.
To aid diagnostics, the modules have 3 LEDs on the front face which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				**XPS AFL5130**	**XPS AFL5130P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1)				Category 3 Category 4 for the monitoring of light curtains type 4 with solid state outputs and test function	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN 50082-2, EN/IEC 61496-1 (type 4)	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24	
	Voltage limits			- 15…+ 10%	
	Frequency		**Hz**	50/60	
Consumption			**VA**	≤ 5	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				No (configurable by terminal connections)	
Control unit voltage and current				⎓ 24 V/30 mA approx. (at nominal supply voltage)	
Maximum wiring resistance RL			Ω	90	
Synchronisation time between inputs A and B				Unlimited	
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			3 N/O (13-14, 23-24, 33-34)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	6	
	Max. total thermal current		**A**	18	
	Output fuse protection		**A**	4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time on input opening			**ms**	≤ 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm²	Solid or flexible cable: 0.2…2.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm²	
		With cable end		With bezel, flex. cable: 0.25…1.5 mm²	With bezel, flexible cable: 0.25…2.5 mm²
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm²	Solid cable: 0.2…1 mm², flexible cable: 0.2…1.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…1 mm²	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm²	

References: page 2/191 | Connections: page 2/192 | Dimensions: page 2/262 | Characteristics: page 2/190

Safety automation system solutions

Preventa safety modules type XPS AFL

For Emergency stop, switch and safety light curtain monitoring

References

	Description	Type of terminal block connection	Number of safety circuits	Supply	Reference	Weight kg
103240  *XPS AFL5130*	**Safety modules for Emergency stop, switch and safety light curtain monitoring**	Integrated in module	3	∿ and ⎓ 24 Vh	**XPS AFL5130**	0.250
103241  *XPS AFL5130P*		Removable from module	3	∿ and ⎓ 24 V	**XPS AFL5130P**	0.250

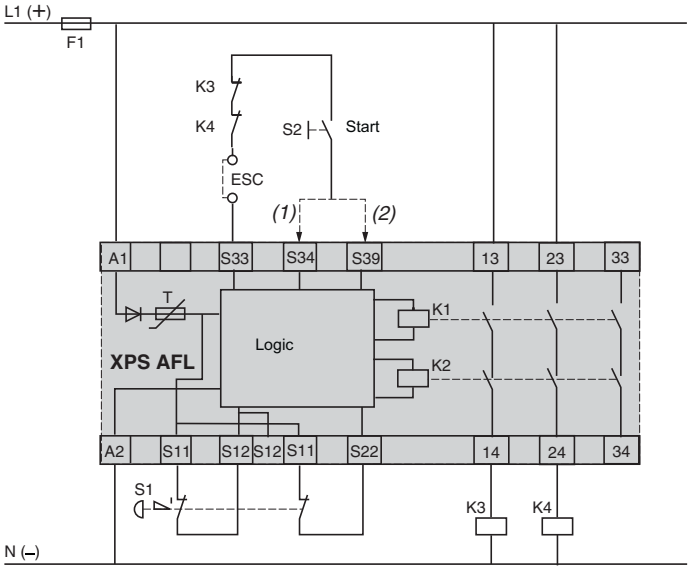
Safety automation system solutions

Preventa safety modules type XPS AFL

For Emergency stop, switch and safety light curtain monitoring

XPS AFL

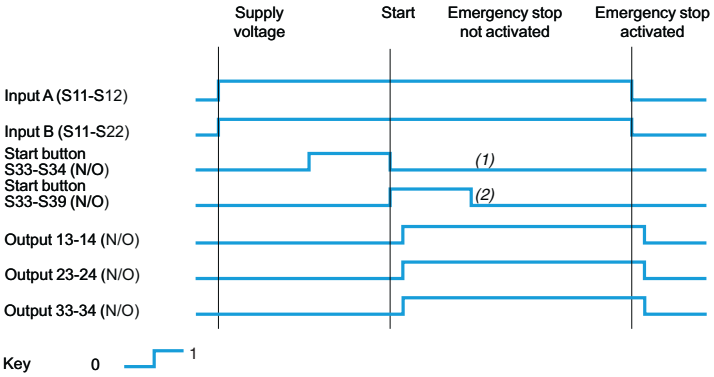
Module XPS AFL associated with an Emergency stop button with 2 N/C contacts



(1) With start button monitoring.
(2) Without start button monitoring.
ESC: External start conditions.

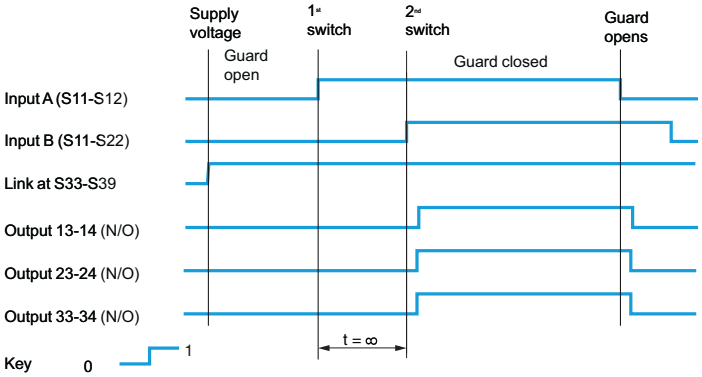
Functional diagrams

Emergency stop function



(1) With start button monitoring.
(2) Without start button monitoring.

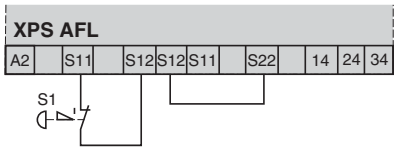
Guard function with automatic start



XPS AFL

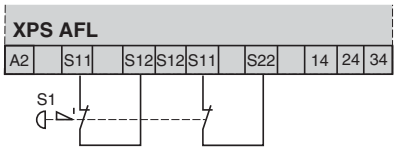
Emergency stop monitoring function configuration

1-channel wiring
Emergency stop button with a single N/C contact



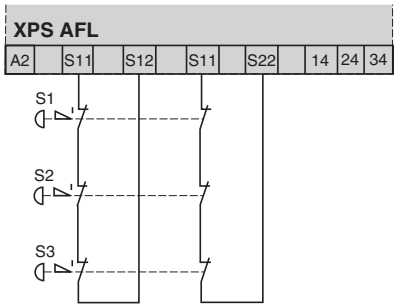
A short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring
Emergency stop button with 2 N/C contacts



A short-circuit between the 2 inputs is not detected.

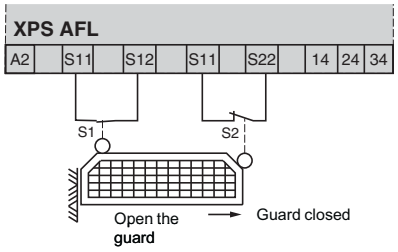
2-channel wiring
Connection of multiple Emergency stop buttons



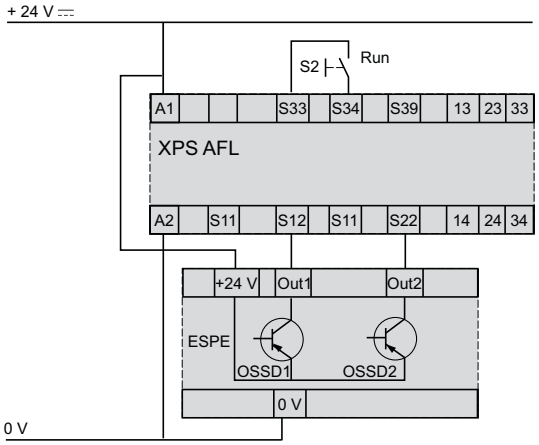
A short-circuit between the 2 inputs is not detected.

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N/O contact, switch 2 with N/C contact)

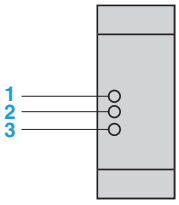
Without short-circuit detection



Monitoring of electro-sensitive protection equipment (ESPE)



LED details



1 Supply voltage A1-A2, fuse status.
2 Relay K1 energised.
3 Relay K2 energised.

Safety automation system solutions

Preventa safety modules type XPS AR

For Emergency stop, switch or safety light curtain monitoring

Operating principle

Safety modules XPS AR meet the requirements of category 4 of the standard EN 954-1/EN/ISO 13849-1 and are designed for the following safety applications:

■ Monitoring Emergency stop circuits conforming to EN/ISO 13850 and EN/IEC 60204-1.

■ Electrical monitoring of switches activated by protection devices conforming to standard EN 1088/ISO 14119.

■ Monitoring type 4 safety light curtains conforming to EN/IEC 61496-1 which have solid-state safety outputs with test function (for example, light curtains type XUS L, conforming to category 4 of standard EN 954-1/ISO 13849-1.

In addition to 7 safety outputs, modules XPS AR incorporate 2 relay signalling outputs and 4 solid-state signalling outputs for signalling to the process PLC.

Safety modules XPS AR●●●●●●P incorporate removable terminal blocks, thus optimising machine maintenance.

To aid diagnostics, the modules have 4 LEDs on the front face which provide information on the monitoring circuit status.

The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				**XPS AR3●1144**	**XPS AR3●1144P**
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/EN/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 13850, EN/IEC 60947-1, EN/IEC 60947-5-1	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24, ∼ 115, ∼ 230	
	Voltage limits	⎓ 24 V	**%**	- 15…+ 10	
		∼ 24 V	**%**	- 15…+ 10	
		∼ 115 V	**%**	- 15…+ 15	
		∼ 230 V	**%**	- 15…+ 10	
	Frequency		**Hz**	50/60	
Consumption				⎓ 24 V version: < 4 W, ∼24 V version: < 7 VA, 115/230 V version: < 9 VA	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				Yes/No (configurable by terminal connections)	
Control unit voltage and current (between terminals S11-S52 and S21-S22). 24 V, 115 V and 230 V version			**V**	⎓ 24 (20 mA approx.) (at nominal supply voltage)	
Maximum wiring resistance RL (between terminals S11-S52 and S21-S22)			Ω	50	
Synchronisation time between inputs A and B Automatic start, terminals S33, S34 linked			**ms**	100	
Safety outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			7 N/O (13-14/23-24/33-34/43-44/53-54/63-64/73-74)	
	Number and type of additional outputs			4 solid-state (Y31-Y32, Y31-Y64, Y31-Y74, Y31-Y35)	
	Number and type of auxiliary contacts			2 N/C (81-82/91-92)	
	Breaking capacity in AC-15		**VA**	B300 (inrush: 3600, maintained: 360)	
	Breaking capacity in DC-13			24 V/2 A, L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20mA	
	Max. thermal current (Ithe)		**A**	10	
	Max. total thermal current		**A**	40	
	Output fuse protection		**A**	6 gG or 10 fast acting, conforming to EN/IEC 947-5-1, DIN VDE0660 part 200	
	Minimum current		**mA**	170	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time on input opening			**ms**	< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				4	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC 529				Terminals: IP 20, enclosure: IP 40	
Connection	Type			Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm²	Solid or flexible cable: 0.2…2.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm²	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm²	With bezel, flexible cable: 0.25…2.5 mm²
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm²	Solid cable: 0.2…1 mm², flex. cable: 0.2…1.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…1 mm²	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm²	

References: page 2/195 | Connections: page 2/196 | Characteristics: page 2/194 | Operating, principle: page 2/194

Safety automation system solutions

Preventa safety modules type XPS AR

For Emergency stop, switch or safety light curtain monitoring

580011



XPS AR3●1144

References

Description	Type of terminal block connection	Number of safety circuits	Additional outputs/ solid-state outputs to PLC	Supply	Reference	Weight
				V		kg
Safety modules for Emergency stop, switch or safety light curtain monitoring	Integrated in module	7	2 / 4	∼ 24 ⎓ 24	**XPS AR311144**	0.300
				∼ 115 ⎓ 24	**XPS AR351144**	0.400
				∼ 230 ⎓ 24	**XPS AR371144**	0.400
	Removable from module	7	2 / 4	∼ 24 ⎓ 24	**XPS AR311144P**	0.300
				∼ 115 ⎓ 24	**XPS AR351144P**	0.400
				∼ 230 ⎓ 24	**XPS AR371144P**	0.400

Safety automation system solutions

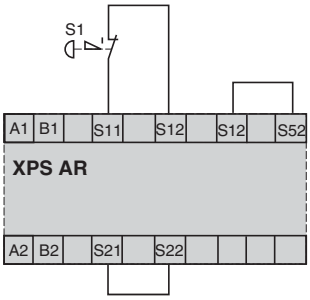
Preventa safety modules type XPS AR

For Emergency stop, switch or safety light curtain monitoring

XPS AR

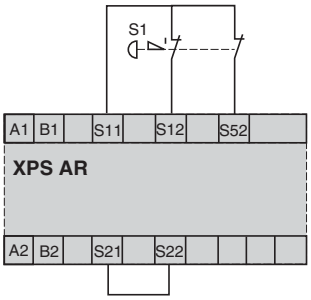
Emergency stop monitoring function configuration

1-channel wiring
Emergency stop button with a single N/C contact

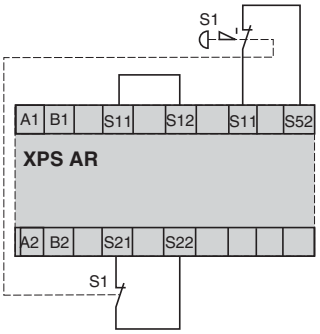


Not all faults are detected:
a short-circuit on the Emergency stop pushbutton is not detected

2-channel wiring
Emergency stop button with 2 N/C contacts, without short-circuit detection

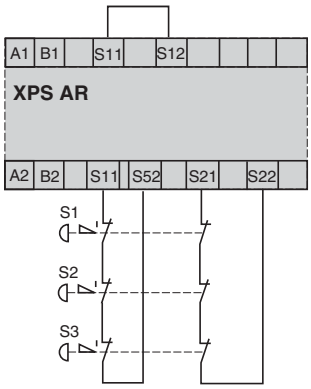


Emergency stop button with 2 N/C contacts, with short-circuit detection (recommended application)



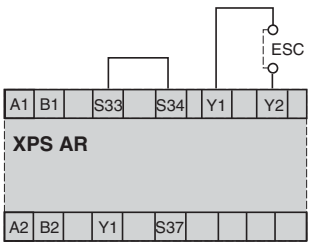
The 2 input channels are supplied at different potentials.
A short-circuit between the 2 inputs is detected

Connection of multiple Emergency stop buttons with 2 N/C contacts (recommended application)

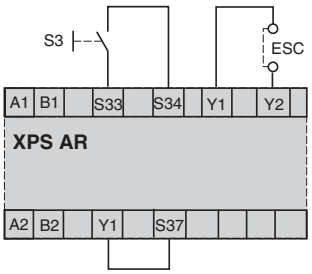


Start configurations

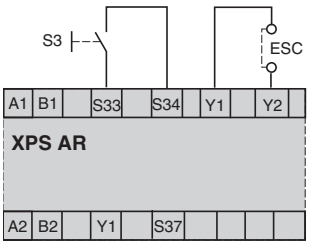
Automatic start



With start button monitoring



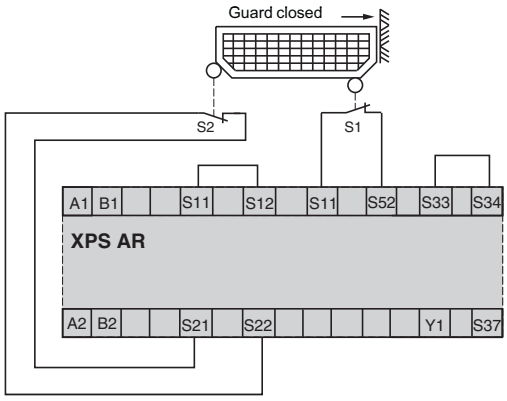
Without start button monitoring



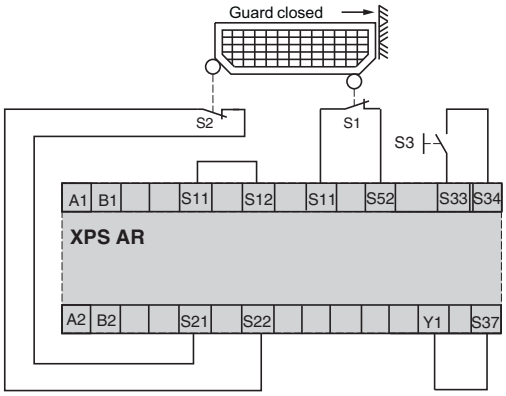
XPS AR

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N/O contact, switch 2 with N/C contact)

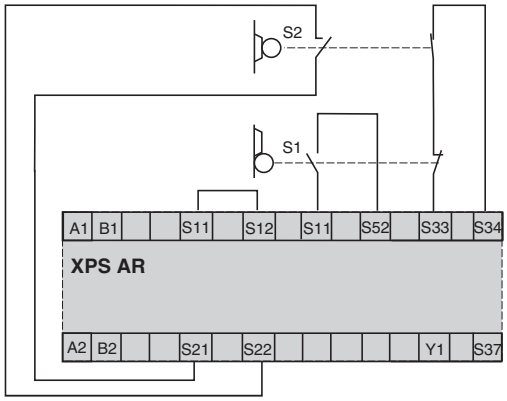
Automatic start, without synchronisation time monitoring



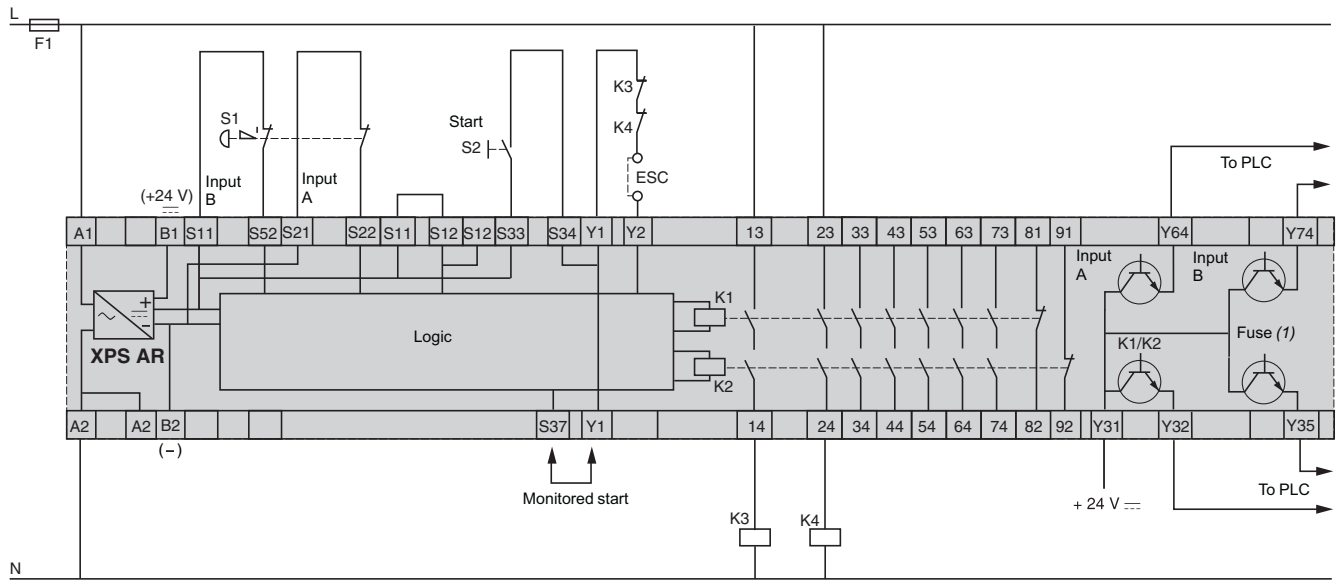
Manual start by start button



Monitoring of a movable guard associated with 2 switches in combined mode and automatic start
(shown with guard open)



Module XPS AR associated with an Emergency stop button with 2 N/C contacts



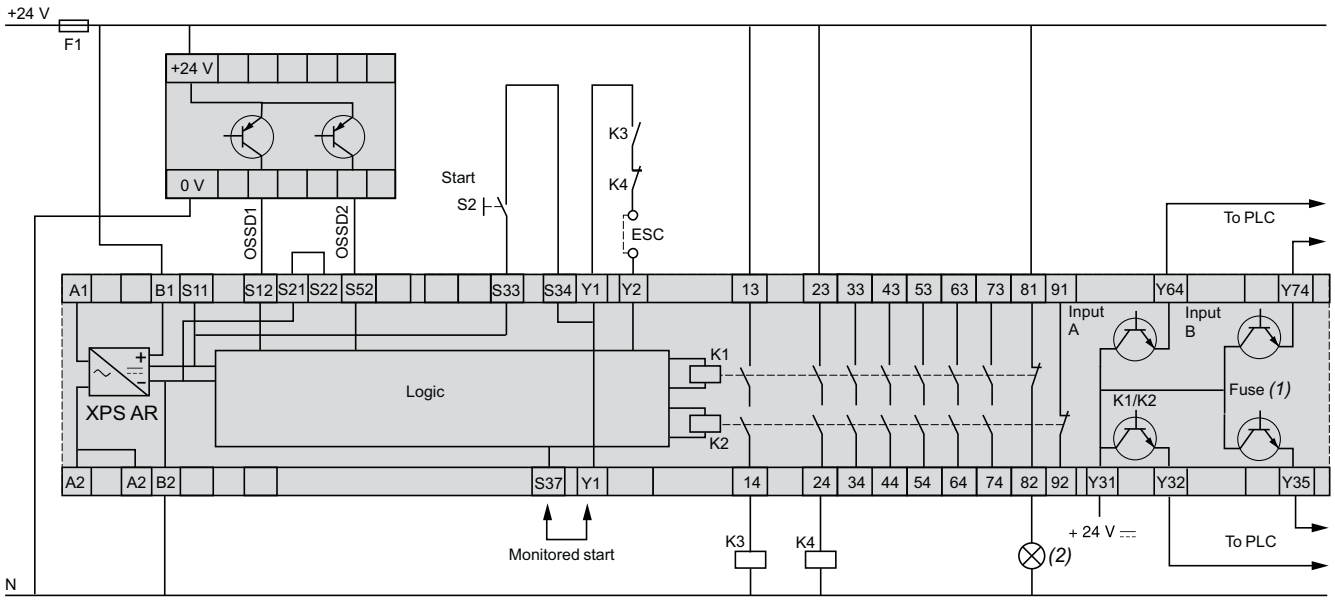
Supply connection according to voltage:
~ across terminals A1/A2, or ⎓ 24 V across terminals B1/B2

ESC: External start conditions
(1) Operating status of internal electronic fuse

2

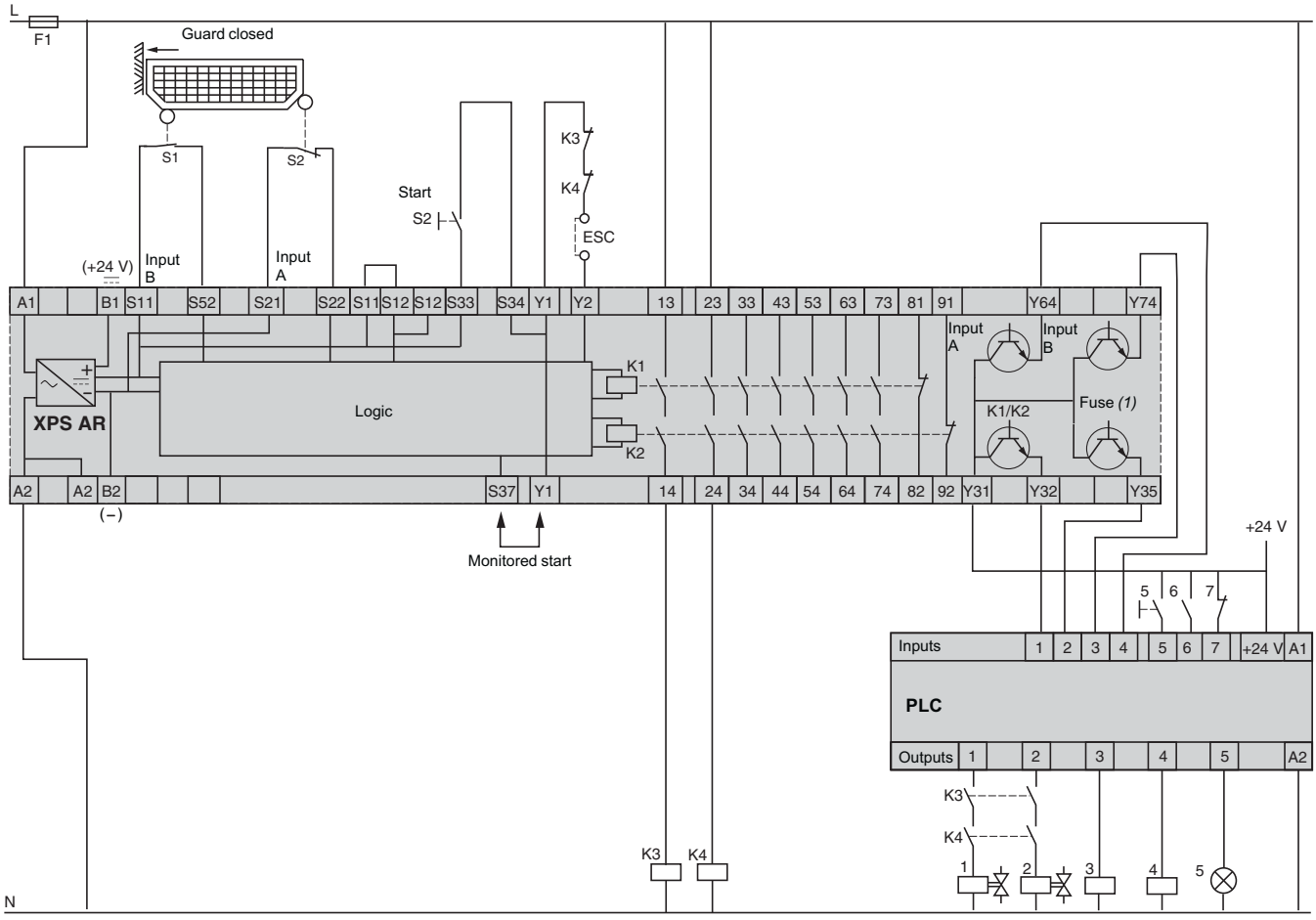
XPS AR

Module XPS AR for monitoring electro-sensitive protection equipment (ESPE)



ESC: External start conditions
(1) Operating status of internal electronic fuse
(2) ESPE indicator light deactivated

Example of safety circuit combining module XPS AR for switch monitoring and a PLC



ESC: External start conditions
(1) Operating status of internal electronic fuse

References: page 2/195 | Connections: page 2/196 | Characteristics: page 2/194 | Operating, principle: page 2/194

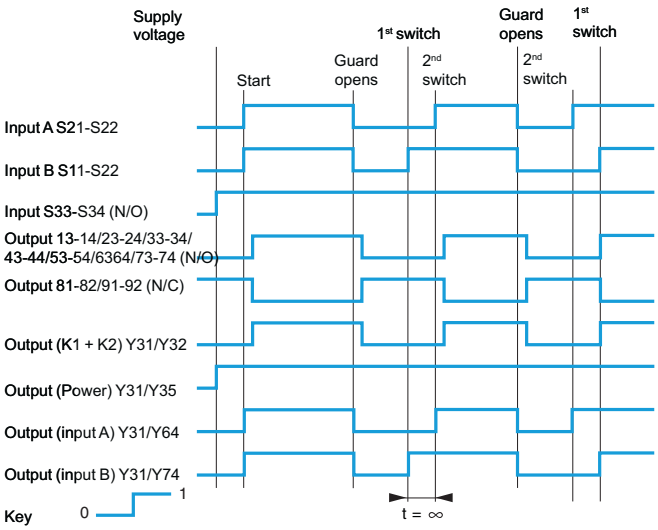
Safety automation system solutions

Preventa safety modules type XPS AR

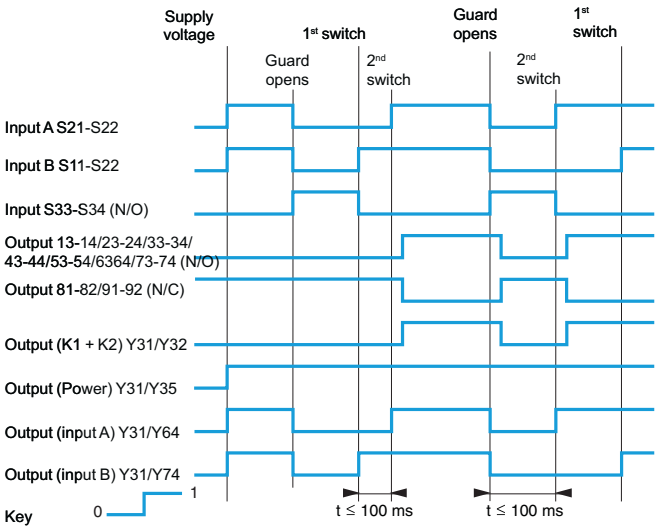
For Emergency stop, switch or safety light curtain monitoring

Functional diagrams of module XPS AR

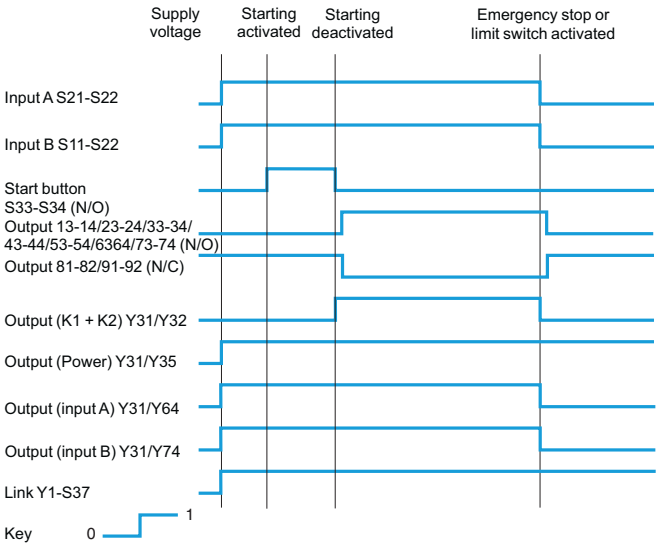
Limit switch monitoring function with automatic start



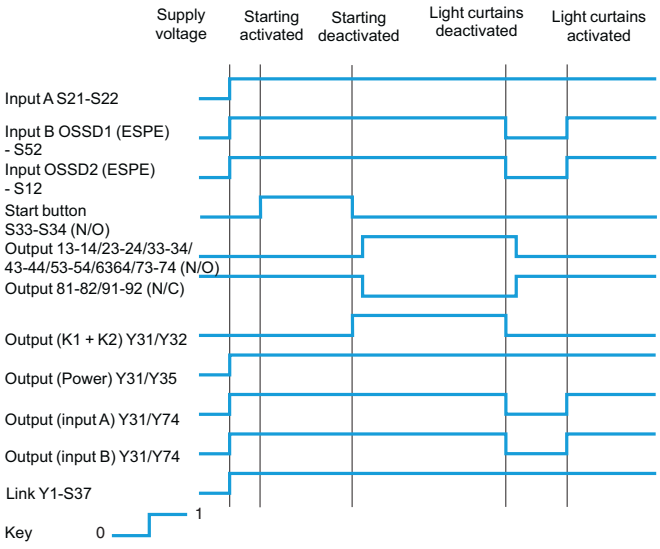
Limit switch monitoring function with automatic start and synchronisation time monitoring



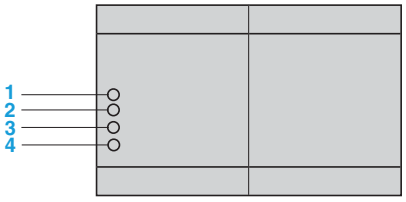
Emergency stop monitoring or limit switch monitoring function with monitored start



Light curtain monitoring (ESPE) function, curtains with solid-state outputs, and monitored start



LED details



1 Supply voltage A1-A2, internal electronic fuse status
2 Input S22 (A)
3 Input S52 (B)
4 K1/K2 status (N/O safety outputs closed)

Safety automation system solutions

Preventa safety modules type XPS AK

For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

Operating principle

Safety modules XPS AK are designed to conform with category 4 of the standard EN 954-1/ISO 13849-1.
They are used for:
■ Monitoring Emergency stop circuits conforming to standards EN/ISO 13850 and EN/IEC 60204-1.
■ Electrical monitoring of switches activated by protection devices, with optional selection of synchronisation time between signals.
■ Monitoring 4-wire sensing mats or edges.
■ Monitoring type 4 light curtains conforming to EN/IEC 61496-1 which have solid-state safety outputs with test function (for example, light curtains type XUS L, conforming to the category 4 of standard EN 954-1/ISO 13849-1.
Housed in a compact enclosure, the modules have 3 safety outputs, a relay signalling output and 4 solid-state signalling outputs for signalling to the process PLC.
Preventa safety modules XPS AK●●●●P incorporate removable terminal blocks, thus optimising machine maintenance.
To aid diagnostics, the modules have 4 LEDs on the front face which provide information on the monitoring circuit status.
The Start button monitoring function is configurable depending on the wiring.

Characteristics

Module type				**XPS AK3●1144**	**XPS AK3●1144P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/ISO 13850, EN/IEC 60947-1 + A11	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24, ∼ 48, ∼ 110 and ⎓ 24, ∼ 120 and ⎓ 24, ∼ 230 and ⎓ 24	
	Voltage limits			- 15…+ 10%	
	Frequency		**Hz**	50/60	
Consumption	24 V version		**VA**	≤ 5	
	110/120/230 V versions			≤ 6	
Module inputs fuse protection				Internal, electronic	
Start button monitoring				Yes/No (configurable by terminal connections)	
Control unit voltage and current between terminals S21-S22, S31-S32				⎓ 24 V/30 mA approx. (at nominal supply voltage)	
Maximum wiring resistance RL between terminals S21-S22, S31-S32			Ω	28	
Synchronisation time between inputs A and B (terminals S21-S22, S31-S32)			**s**	Automatic start: 2 or 4 depending on wiring Manual start (start button between S33 and S34): unlimited	
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			3 N/O (13-14, 23-24, 33-34)	
	Number and type of additional circuits			1 N/C (41-42) + 4 solid-state	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20 mA, 48 V/10 mA	
	Max. thermal current (Ithe)		**A**	6	
	Max. total thermal current		**A**	18	
	Output fuse protection		**A**	4 gG or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time on input opening			**ms**	≤ 40	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				4	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection	Conforming to IEC 60529	Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm^2	Solid or flexible cable: 0.2…2.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
		With cable end		With bezel, flxbl. cable: 0.25…1.5 mm^2	With bezel, flexible cable: 0.25…2.5 mm^2
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm^2	Solid cable: 0.2…1 mm^2, flexible cable: 0.2…1.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…1 mm^2	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm^2	

References: page 2/201 Connections: page 2/202 Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules type XPS AK

For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

References

DF565754



XPS AK3●1144

DF565755



XPS AK3●1144P

Description	Type of terminal block connection	Number of safety circuits	Outputs: Additional / Solid-state for PLC	Supply	Reference	Weight kg
Safety modules for Emergency stop, switch, sensing mat/edges or safety light curtain monitoring	Integrated in module	3	1 / 4	∼ 24 V ⎓ 24 V	**XPS AK311144**	0.300
				∼ 110 V ⎓ 24 V	**XPS AK361144**	0.400
				∼ 120 V ⎓ 24 V	**XPS AK351144**	0.400
				∼ 230 V ⎓ 24 V	**XPS AK371144**	0.400
	Removable from module	3	1 / 4	∼ 24 V ⎓ 24 V	**XPS AK311144P**	0.300
				∼ 48 V	**XPS AK331144P**	0.300
				∼ 110 V ⎓ 24 V	**XPS AK361144P**	0.400
				∼ 120 V ⎓ 24 V	**XPS AK351144P**	0.400
				∼ 230 V ⎓ 24 V	**XPS AK371144P**	0.400

Principle, characteristics: page 2/200
Connections: page 2/202
Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules type XPS AK

For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

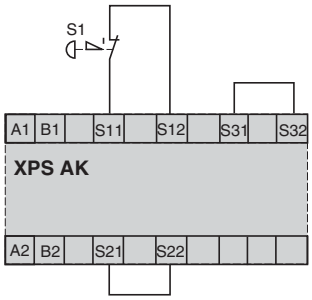
2

XPS AK

Emergency stop monitoring function configuration

1-channel wiring

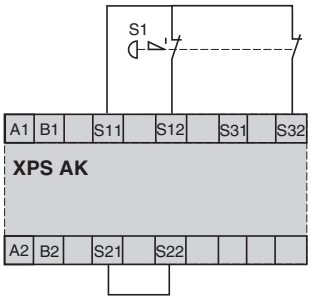
Emergency stop button with a single N/C contact



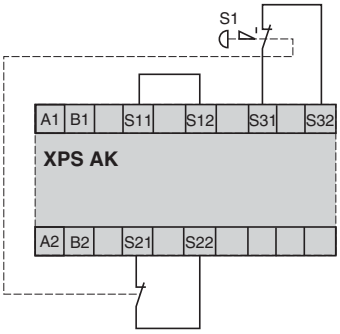
Not all faults are detected: a short-circuit on the Emergency stop pushbutton is not detected.

2-channel wiring

Emergency stop button with 2 N/C contacts, without short-circuit detection

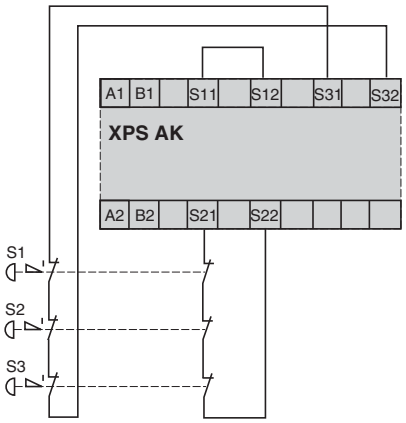


Emergency stop button with 2 N/C contacts, with short-circuit detection (recommended application)



The 2 input channels are supplied at different potentials. A short-circuit between the 2 inputs is detected.

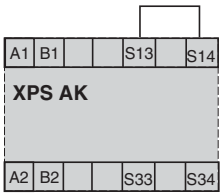
Connection of multiple Emergency stop buttons with 2 N/C contacts (recommended application).



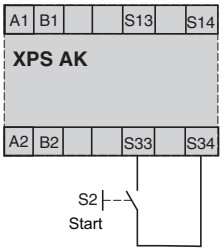
The 2 input channels are supplied at different potentials.
A short-circuit between the 2 inputs is detected.

Start configurations

Automatic start

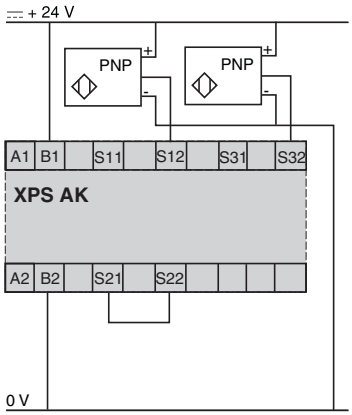


With start button monitoring

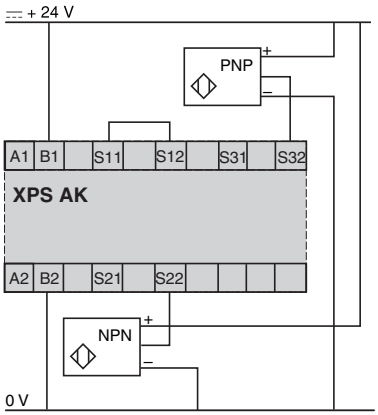


Proximity sensor monitoring

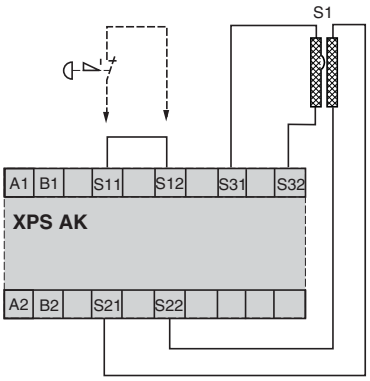
Proximity sensors with PNP outputs
Without short-circuit detection



Proximity sensors with NPN and PNP outputs
With short-circuit detection



Sensing mat or edges monitoring



Principle, characteristics: page 2/200
References: page 2/201
Dimensions: page 2/262

Schneider Electric

Safety automation system solutions

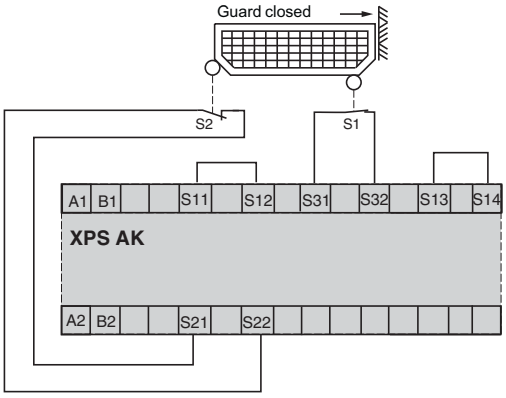
Preventa safety modules type XPS AK

For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

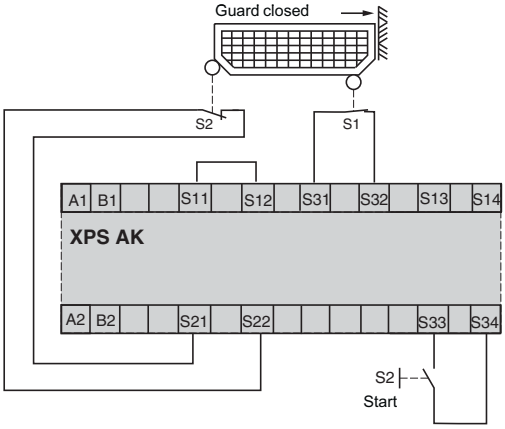
XPS AK

Monitoring of a movable guard associated with 2 switches with 1 contact each in combined mode (switch 1 with N/O contact, switch 2 with N/C contact)

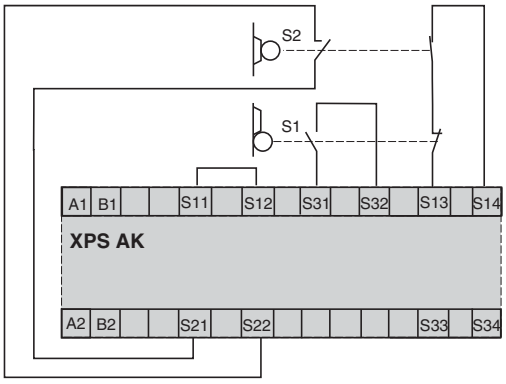
Automatic start, without synchronisation time monitoring



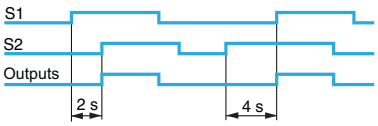
Manual start by Start button



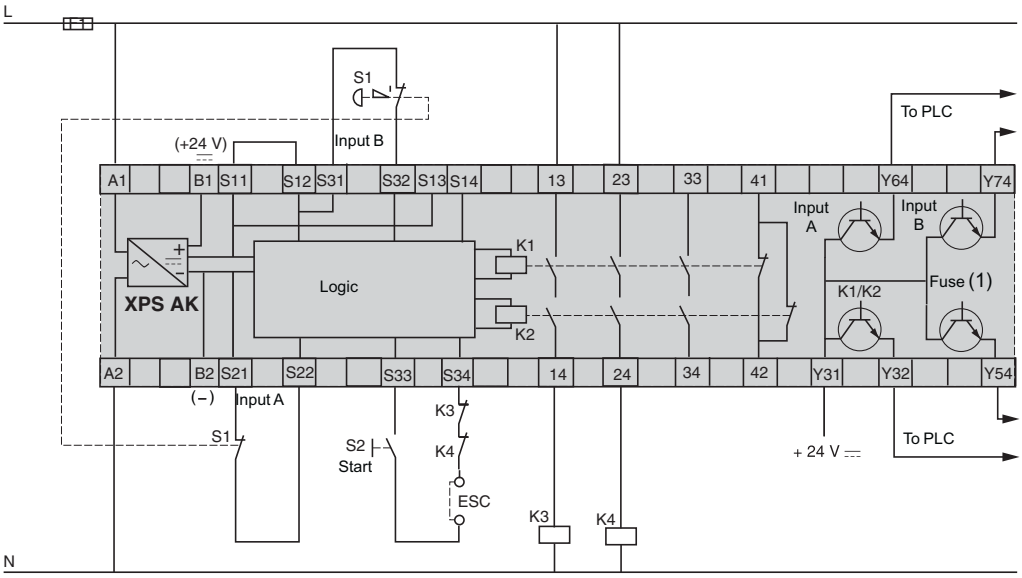
Monitoring of a movable guard associated with 2 switches and automatic start
(shown with guard open)



Functional diagram of outputs



Module XPS AK associated with an Emergency stop button with 2 N/C contacts



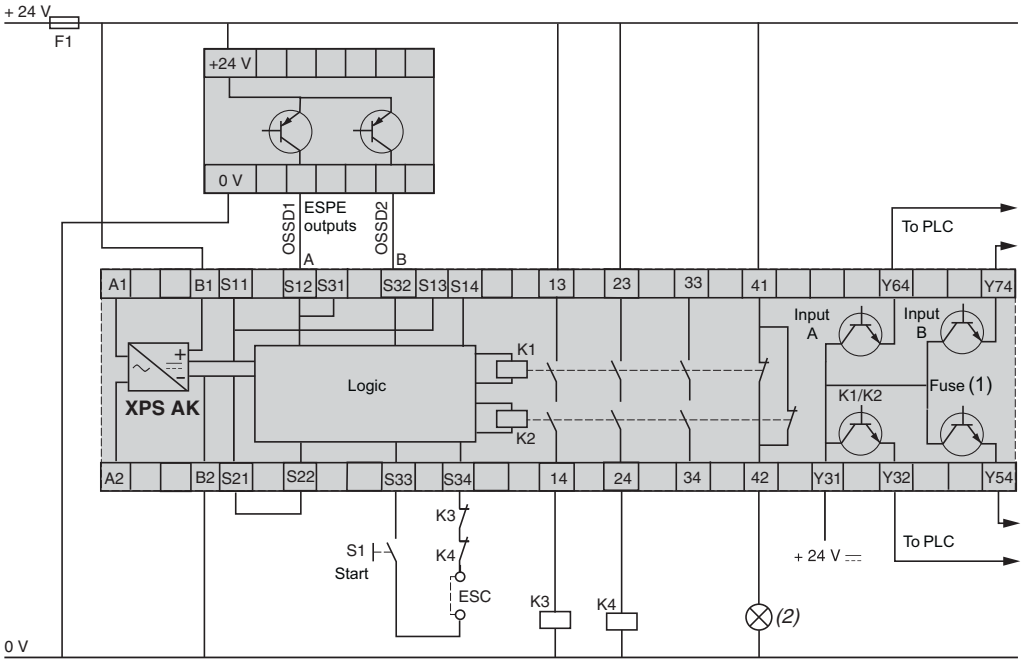
Supply connection according to voltage: ∿ across terminals A1/A2, or ⎓ 24 V across terminals B1/B2.
(1) Operating status of internal electronic fuse.
ESC: External start conditions.

Principle, characteristics: page 2/200
References: page 2/201
Dimensions: page 2/262

2

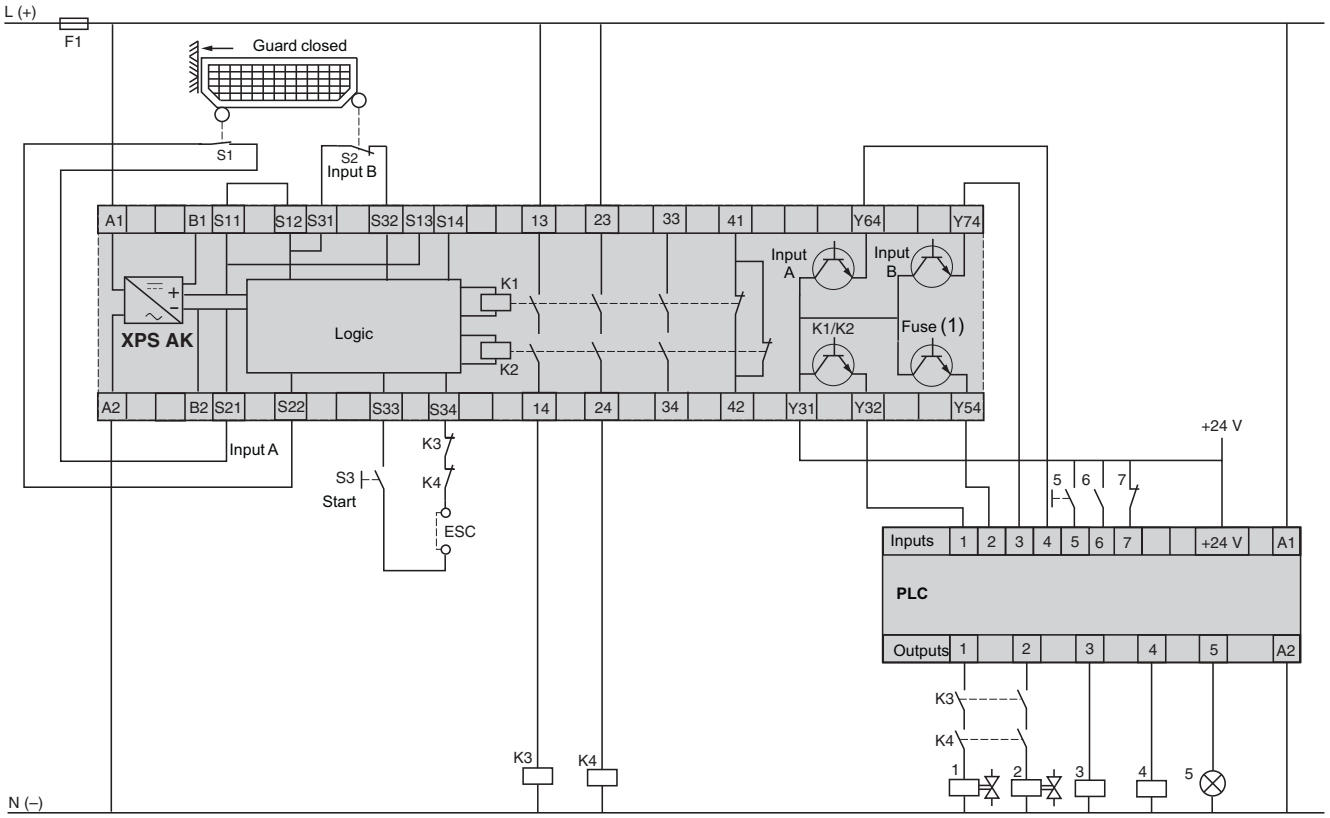
XPS AK

Module XPS AK for monitoring electro-sensitive protection equipment (ESPE)



(1) Operating status of internal electronic fuse.
(2) ESPE indicator light deactivated.
ESC: External start conditions.

Example of safety circuit combining module XPS AK for limit switch monitoring and a PLC



(1) Operating status of internal electronic fuse.
ESC: External start conditions.

Principle, characteristics: page 2/200
References: page 2/201
Dimensions: page 2/262

Safety automation system solutions

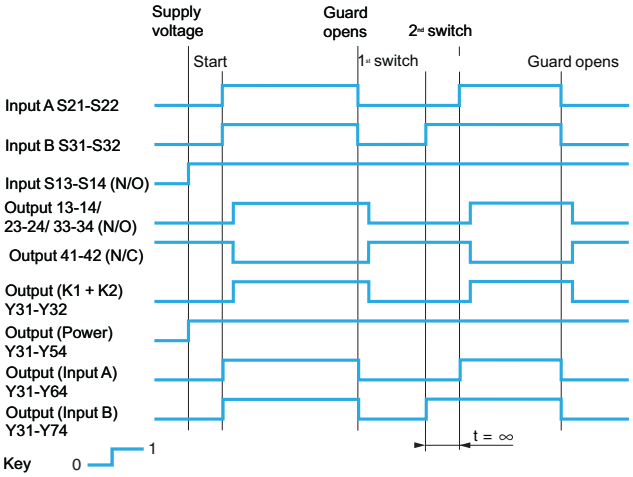
Preventa safety modules type XPS AK

For Emergency stop, switch, sensing mat/edges or safety light curtain monitoring

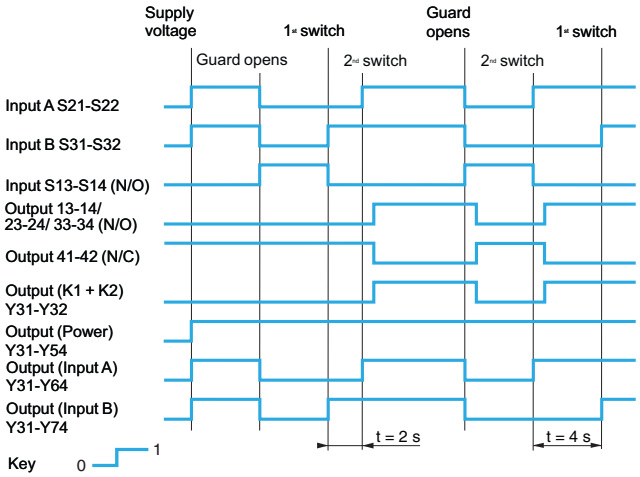
XPS AK

Functional diagrams

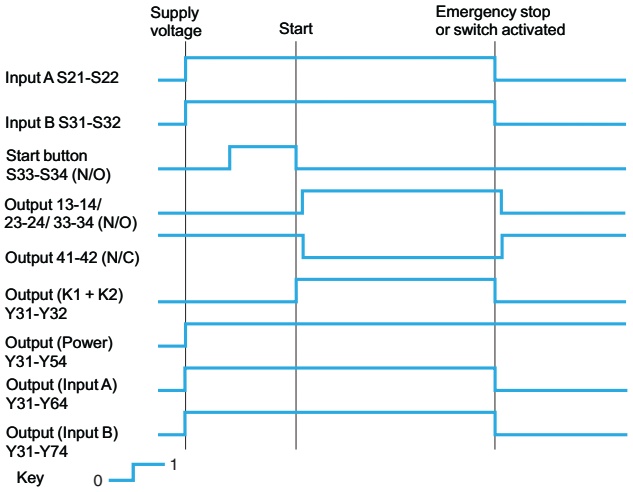
Switch monitoring function with automatic start



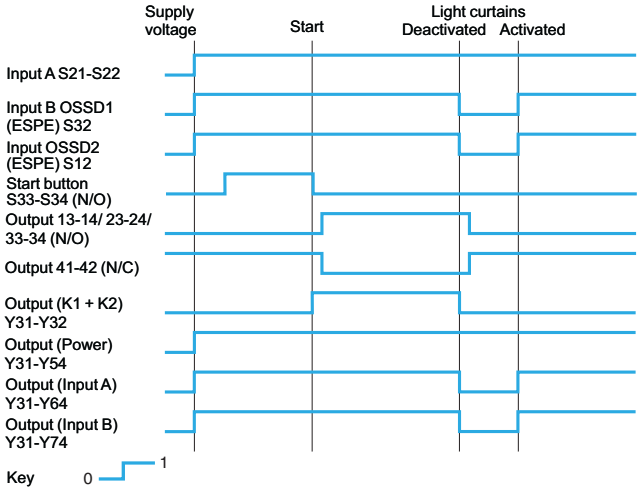
Switch monitoring function with automatic start and synchronisation time monitoring



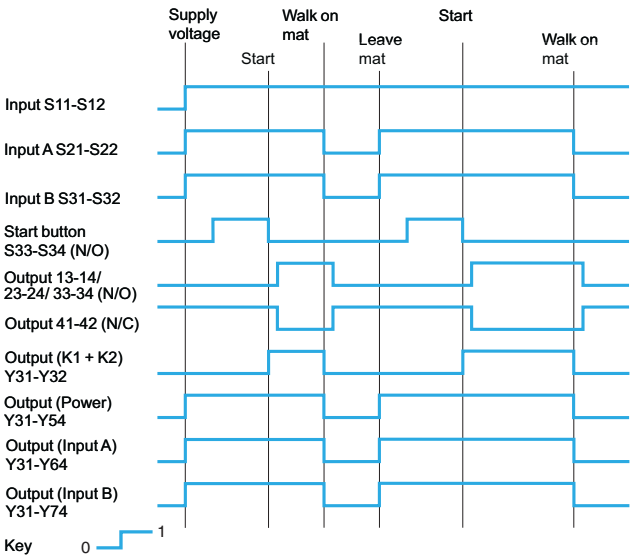
Emergency stop monitoring or switch monitoring function



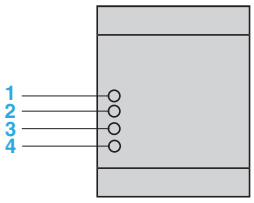
Light curtain monitoring (ESPE) function, curtains with solid-state outputs



Sensing mat or edge monitoring function, with monitored start



LED details



1 Supply voltage A1-A2, fuse status.
2 Input S22 (A).
3 Input S32 (B).
4 K1/K2 status (N/O safety outputs closed).

Principle, characteristics: page 2/200
References: page 2/201
Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS VC
For enabling switch monitoring

Operating principle

The enabling grip switch system, comprising an enabling switch XY2 AU and a monitoring module XPS VC, enables authorised personnel to carry out adjustment, programming or maintenance operations within hazardous zones of machines providing certain conditions are met.

To be accessible, such operations are often carried out at reduced speed, and must be intentionally selected by authorised persons by means of a selector switch or key switch. Once the selection is made, the enabling switch system temporarily takes over from the hazardous zone's usual protection measures. Caution: The enabling switch system alone must not cause dangerous movements of the machine to be activated; a second intentional control action on the part of the operator is required. In addition, each person remaining in the hazardous zone must be provided with an individual enabling switch to ensure their own safety.

Characteristics

Module type				**XPS VC1132**	**XPS VC1132P**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Supply (Ue) conforming to IEC 38	Voltage		**V**	⎓ 24	
	Voltage limits	⎓ 24 V		- 20…+ 20%	
Consumption			**W**	< 2.5	
Module inputs fuse protection				Internal, electronic	
Maximum wiring resistance RL between the module and the enabling grip switch			Ω	100	
Control unit voltage and current				24 V/8 mA	
Safety outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			2 N/O (terminals 13-14, 23-24)	
	Number and type of solid-state outputs			2	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, sealed: 180	
	Breaking capacity in DC-13			24 V/1.5 A L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	4.2	
	Max. total thermal current		**A**	8.4	
	Output fuse protection		**A**	4 gG or 6 fast acting	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time on input opening			**ms**	< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Ambient air temperature			**°C**	For operation: - 10…+ 55, for storage: - 25…+ 85	
Degree of protection conforming to IEC 60529				Terminals: IP 20, enclosure: IP 40	
Connection	Type			Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14… 2.5 mm^2	Solid or flexible cable: 0.2…2.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm^2	With bezel, flexible cable: 0.25…2.5 mm^2
	2-wire connection	Without cable end		Solid or flexible cable: 0.14… 0.75 mm^2	Solid cable: 0.2…1 mm^2, flexible cable: 0.2…1.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…1 mm^2	
		With cable end		With bezel, flexible cable: 0.5… 1.5 mm^2	

References



XPS VC1132P

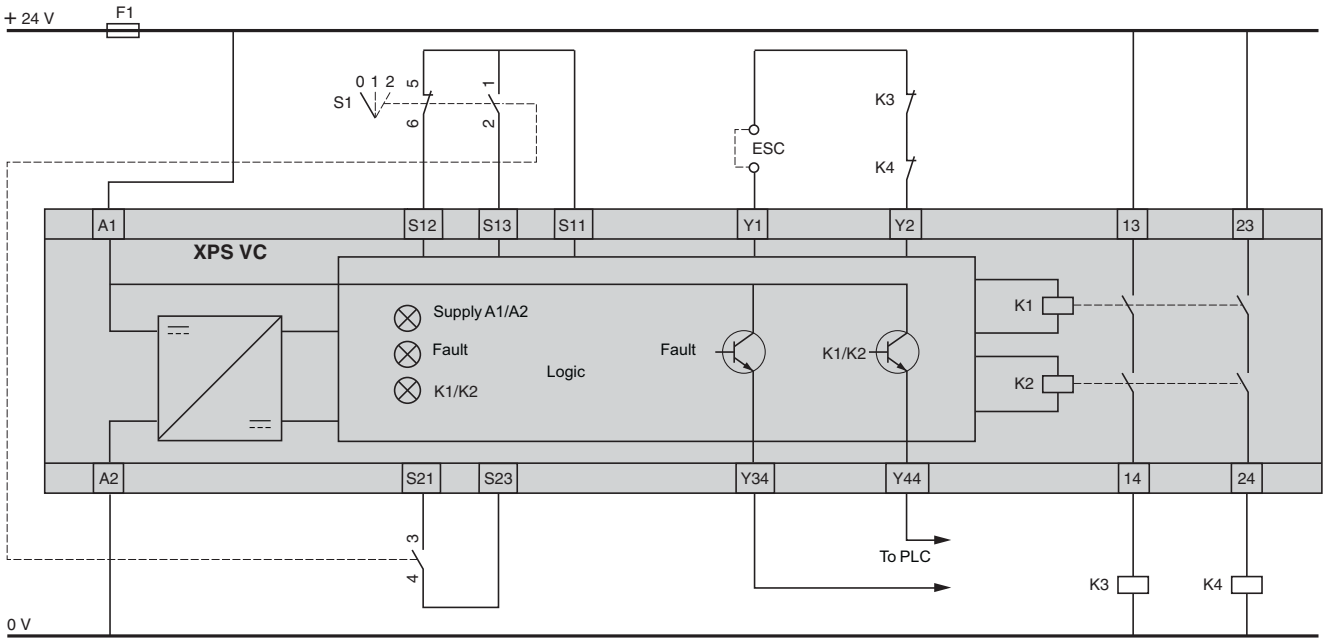
Description	**Type of terminal block connection**	**Number of safety circuits**	**Solid-state outputs for PLC**	**Supply**	**References**	**Weight**
				V		**kg**
Safety modules for enabling switch monitoring	Integrated in module	2 N/O	2	⎓ 24	**XPS VC1132**	0.250
	Removable from module	2 N/O	2	⎓ 24	**XPS VC1132P**	0.250

Dimensions:
page 2/262

Safety automation system solutions
Preventa safety modules type XPS VC
For enabling switch monitoring

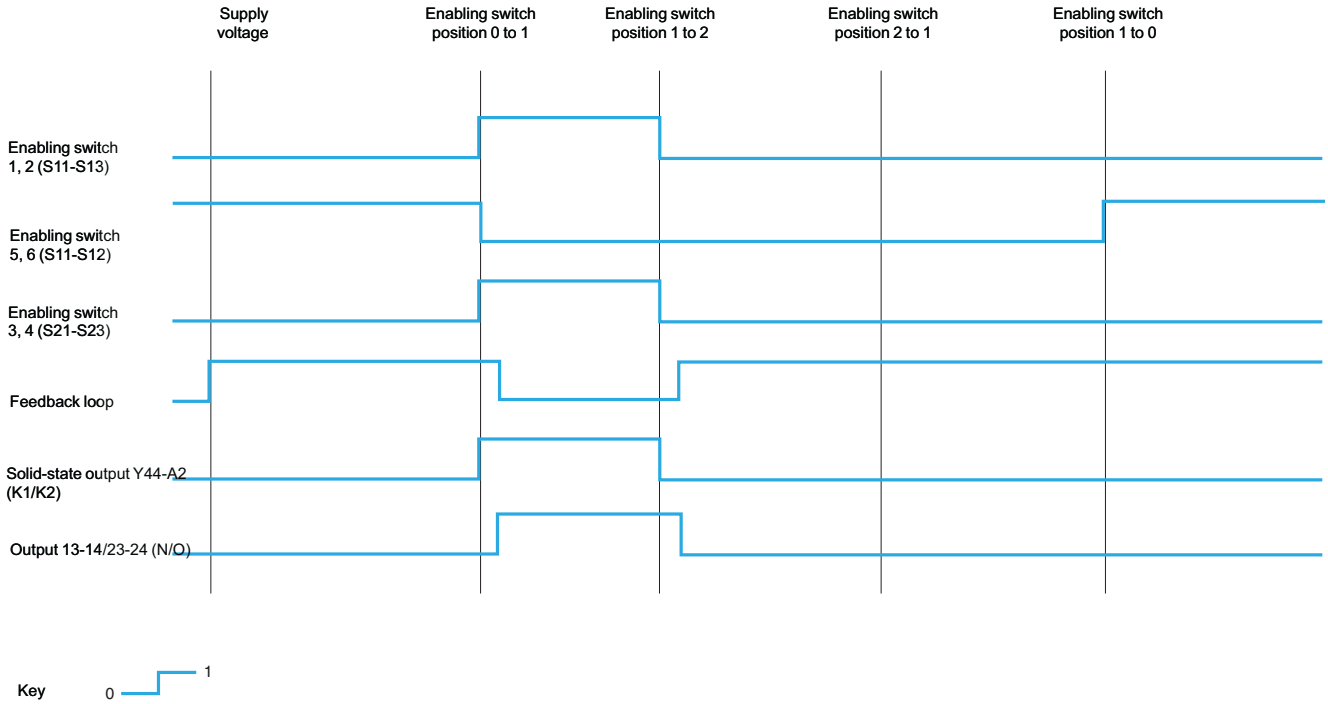
XPS VC

Wiring diagram

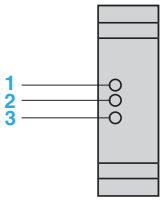


ESC: External start conditions.

Functional diagram of module XPS VC

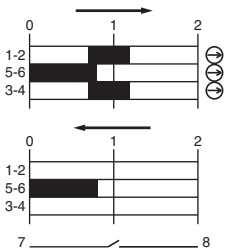


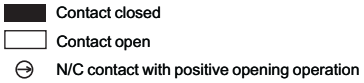
LED details



1 Supply voltage A1-A2, internal electronic fuse status.
2 Fault signalling.
3 Safety outputs closed.

Contact states





Safety automation system solutions

Preventa safety modules types XPS BA, XPS BC, XPS BF

For electrical monitoring of two-hand control stations

Operating principle

Two-hand control stations are designed to provide protection against hand injury. They require machine operators to keep their hands clear of the dangerous movement zone.

The use of two-hand control is an individual protective measure, which can safely protect only one operator. Separate two-hand control stations must be provided for each operator in a multiple-worker environment.

Safety modules XPS BA, BC and BF for two-hand control stations comply with the requirements of European standard EN 574/ISO 13851 for two-hand control systems.

The control stations must be designed and installed such that they cannot be activated involuntarily or easily rendered inoperative. Depending on the application, the requirements of type C standards specific to the machinery involved must be met (additional personal protection methods may have to be considered).

To initiate a dangerous movement, both operators (two-hand control pushbuttons) must be activated within an interval ≤ 0.5 s (synchronous activation). If one of the two pushbuttons is released during a dangerous operation, the control sequence is cancelled. Resumption of the dangerous operation is possible only if both pushbuttons are returned to their initial position and reactivated within the required time interval.

The safety distance between the control units and the hazardous zone must be sufficient to ensure that when only one operator is released, the hazardous zone cannot be reached before the dangerous movement has been completed or stopped.

Characteristics: page 2/209 | Selection, references: page 2/211 | Connections: page 2/212 | Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules types XPS BA, XPS BC

For electrical monitoring of two-hand control stations

Characteristics

Module type				XPS BA	XPS BC
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 1 max.	Category 4 max.
Conformity to standards				EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574/ISO 13851 type III A, EN 50082-2	EN/IEC 60204-1, EN/IEC 60947-5-1, EN 574 type III C/ISO 13851, EN 50082-2
Product certifications				UL, CSA	UL, CSA, INRS
Supply	Voltage		**V**	⎓ 24, ∿ 115, ∿ 230	⎓ 24, ∿ 24, ∿ 115, ∿ 230
	Voltage limits			- 20…+ 20% (⎓ 24 V), - 20…+ 10% (∿ 24 V), - 15…+ 15% (∿ 115 V), - 15…+ 10% (∿ 230 V)	- 20…+ 10% (⎓ 24 V), - 15…+ 10% (∿ 24 V), - 15…+ 15% (∿ 115 V), - 15…+ 10% (∿ 230 V)
	Frequency		**Hz**	50/60	
Consumption			**VA**	< 20 (apparent power)	< 6
Module inputs fuse protection				Internal, electronic	
Inputs				S1: 1 N/C + N/O, S2: 1 N/C + N/O	
Two-hand control type Conforming to EN 574/ISO 13851				III A	III C
Synchronisation time			**s**	0.5 maximum	
Control unit voltage	⎓ 24 V version		**V**	24	24
	∿ 24 V, 115 V, 230 V version		**V**	24	48
Minimum voltage and current				**Between terminals T11-T12, T11-T13**	**Between terminals T11-T13, T21-T23**
	U min./I min. - ⎓ 24 V version (20 °C)			18 V/30 mA	18 V/140 mA
	U min./I min. - ∿ 24 V/115 V/230 V version (20 °C)			18 V/30 mA	30 V/50 mA
Calculation of wiring resistance RL (for XPS BC only) between terminals T11-T13, T21-T23 as a function of the internal supply voltage U int (terminals T13-T23)			Ω	–	RL max. = $\frac{\text{U int - U min.}}{\text{I min.}}$ Ue = true voltage applied to terminals A1-A2 U int = supply voltage Ue -1 V (24 V version) (115 V, 230 V version) RL max. must not exceed 50 Ω U int between 30.5 V and 35 V, with typical value = 35 V
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			1 N/O (11-14)	2 N/O (13-14, 23-24)
	Number and type of additional circuits			1 N/C (11-12)	1 N/C (31-32)
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	5	2.5
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG or 6 fast acting	4 gG
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time			**ms**	< 25	< 30
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				2	3
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connections		Type		Captive screw clamp terminals	
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm^2	
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm^2	
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm^2	
		With cable end		Without bezel, flexible cable: 0.25…1 mm^2	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm^2	

Principle: page 2/208 | Selection, references: page 2/211 | Connections: page 2/212 | Dimensions: page 2/262

2

Characteristics

Module type				XPS BF1132	XPS BF1132P
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.	
Conformity to standards				EN/IEC 60204-1, EN 574 type III C/ISO 13851, EN/IEC 60947-1, EN/IEC 60947-5-1, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)	
Product certifications				UL, CSA, BIA	
Supply		Voltage	**V**	⎓ 24	
		Voltage limits		- 20…+ 20%	
Consumption			**W**	< 2.5	
Module inputs fuse protection				Internal, electronic	
Inputs				S1: 1 N/C + N/O, S2: 1 N/C + N/O	
Two-hand control type				III C conforming to EN 574/ISO 13851	
Synchronisation time			**s**	0.5 maximum	
Control unit voltage			**V**	24 V/8 mA	
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			2 N/O (13-14, 23-24)	
	Number and type of additional circuits			2 solid-state (type 24 V - 20 mA)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Max. thermal current (Ithe)		**A**	4.2	
	Max. total thermal current		**A**	8.4	
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG or 6 fast acting	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Response time			**ms**	< 20	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				3	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC/EN 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals	Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.14…2.5 mm^2	Solid or flexible cable: 0.2…2.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
		With cable end		With bezel, flexible cable: 0.25…1.5 mm^2	With bezel, flexible cable: 0.25…2.5 mm^2
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm^2	Solid cable: 0.2…1 mm^2, flexible cable: 0.2…1.5 mm^2
		With cable end		Without bezel, flexible cable: 0.25…1 mm^2	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm^2	

Principle: page 2/208 | Selection, references: page 2/211 | Connections: page 2/212 | Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules types XPS BA, XPS BC, XPS BF

For electrical monitoring of two-hand control stations

Selection

Standard EN 574/ISO 13851 defines the selection of two-hand controls according to the control system category.
The following table details the three types of two-hand control conforming to EN 574/ISO 13851.
For each type, it lists the operating characteristics and minimum requirements.

Requirements of standard EN 574/ISO 13851	Type I	Type II	Type III		
			A	B	C
Use of both hands (simultaneous action)	■	■	■	■	■
Link between input and output signals	■	■	■	■	■
Output signal inhibited	■	■	■	■	■
Prevention of accidental operation	■	■	■	■	■
Tamper-proof	■	■	■	■	■
Output signal reinitialised		■	■	■	■
Synchronous action (specified time limit)			■	■	■
Use of proven components (Category 1 conforming to EN 954-1/ ISO 13849-1)	■		XPS BA●●		
Redundancy with partial error detection (Category 3 conforming to EN 954-1/ ISO 13849-1)		■		XPS BC XPS BF	
Redundancy + Self-monitoring (Category 4 conforming to EN 954-1/ ISO 13849-1)					XPS BC XPS BF
Two-hand control station	XY2 SB●●				

■ Meets the requirements of standard EN 574/ISO 13851

■ Conforming to standard EN 954-1/ISO 13849-1

References



XPS BA●●●●



XPS BC●●●●



XPS BF1132P

Description	Type conforming to standard EN 574/ ISO 13851	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight kg
Safety modules for electrical monitoring of two-hand control stations	III A	Integrated in module	1 N/O	1 N/C	∼ or ⎓ 24 V	**XPS BA5120**	0.200
					∼ 115 V	**XPS BA3420**	0.200
					∼ 230 V	**XPS BA3720**	0.200
	III C	Integrated in module	2 N/O	1 N/C	⎓ 24 V	**XPS BC1110**	0.400
					∼ 24 V	**XPS BC3110**	0.400
					∼ 115 V	**XPS BC3410**	0.400
					∼ 230 V	**XPS BC3710**	0.400
			2 N/O	2 solid-state	⎓ 24 V	**XPS BF1132**	0.150
		Removable from module	2 N/O	2 solid-state	⎓ 24 V	**XPS BF1132P**	0.150

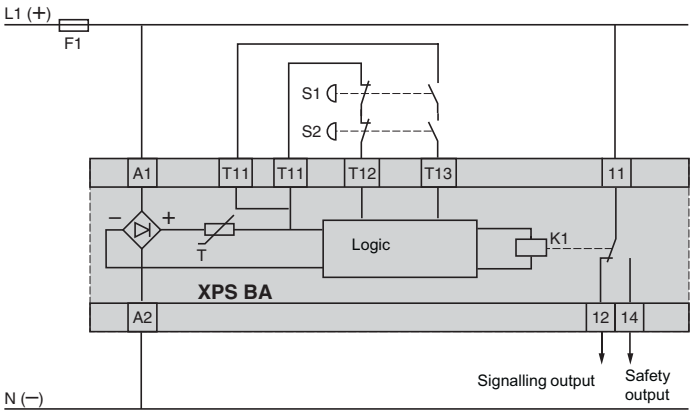
Principle: page 2/208 Characteristics: page 2/209 Connections: page 2/212 Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS BA
For electrical monitoring of two-hand control stations

XPS BA

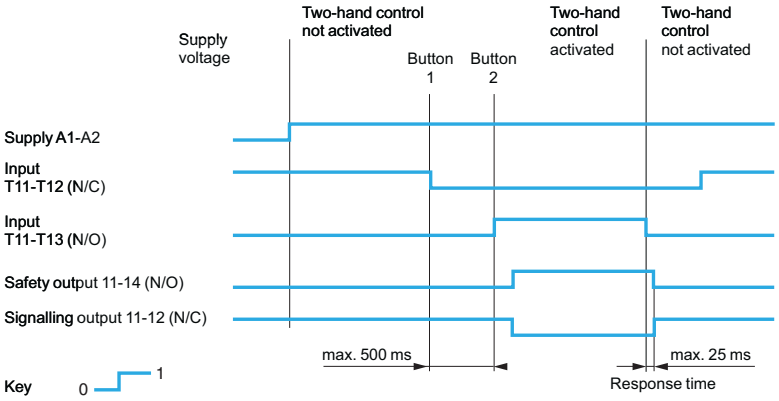
Module XPS BA associated with a two-hand control station

Type III A conforming to EN 574/ISO 13851

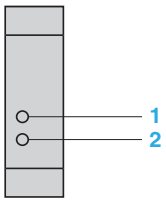


S1 and S2: pushbuttons. Must not be used for applications (presses) which require a type III C module (XPS BC).

Functional diagram of module XPS BA



LED details (XPS BA)



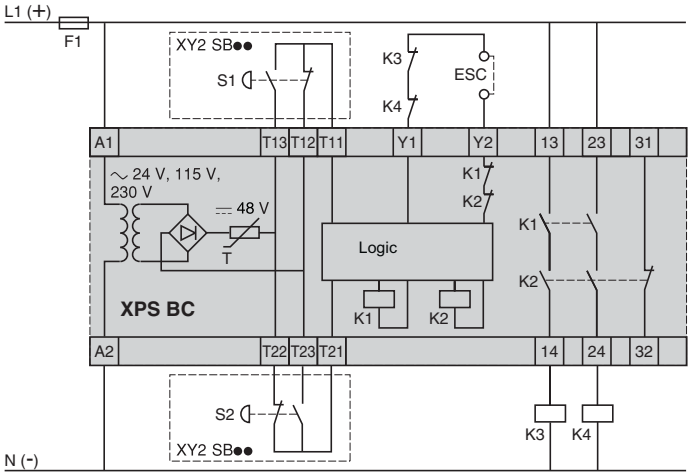
1 Supply voltage A1-A2.
2 K1 status (N/O safety output 11-14 closed).

Principle: page 2/208
Characteristics: page 2/209
Selection, references: page 2/211
Dimensions: page 2/262

XPS BC

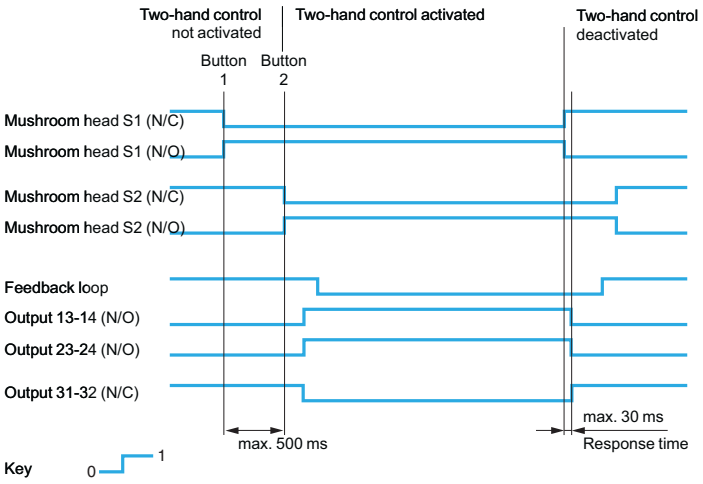
Module XPS BC associated with a two-hand control station

Type III C conforming to EN 574/ISO 13851

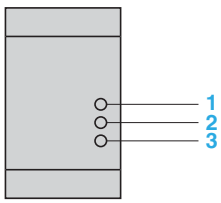


ESC: external start conditions.
Y1-Y2: feedback loop.
Output (31-32) must not be used as a safety circuit. It can be used for non-dangerous machine movements.

Functional diagram of module XPS BC



LED details (XPS BC)

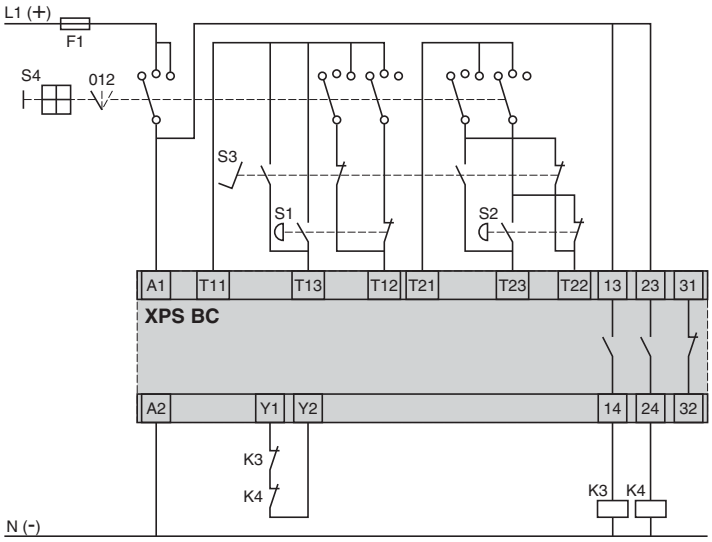


1 Supply voltage A1-A2, S1-S2. LED 1 indicates that buttons S1 and S2 are correctly connected.
2 Feedback loop Y1-Y2.
3 K1-K2 status (N/O safety outputs closed).

2

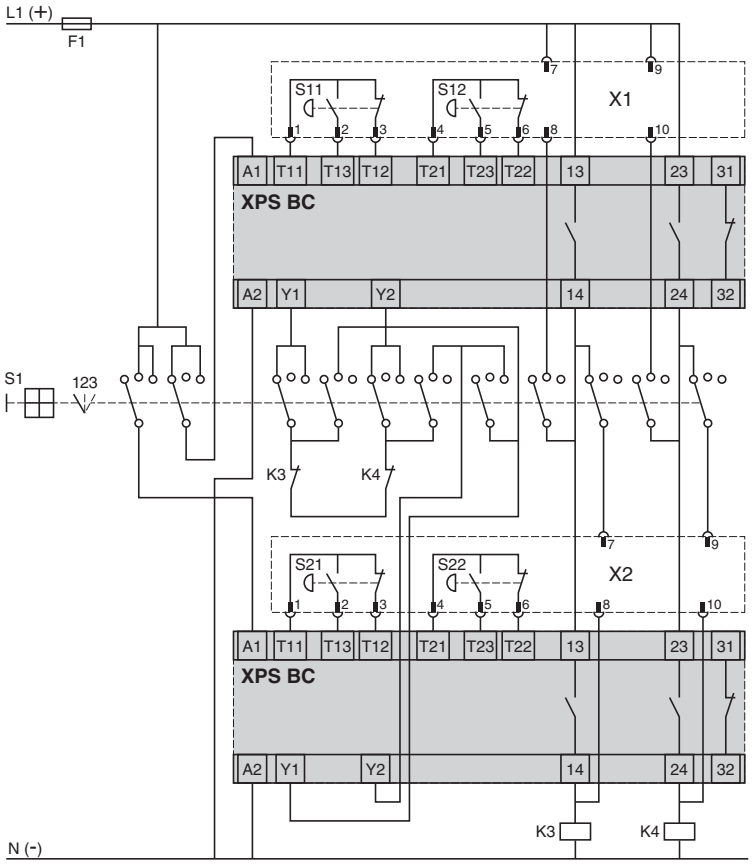
XPS BC

Module XPS BC associated with a two-hand control station and a foot switch



S4 selector switch:
0 = stop
1 = control station
2 = foot switch
S1-S2: two-hand control station pushbuttons
S3: foot switch

Modules XPS BC associated with 2 two-hand control stations



When operator 1 is absent: replace terminal block X1 by X3 and physically remove the two-hand control station.

When operator 2 is absent: replace terminal block X2 by X3 and physically remove the two-hand control station.

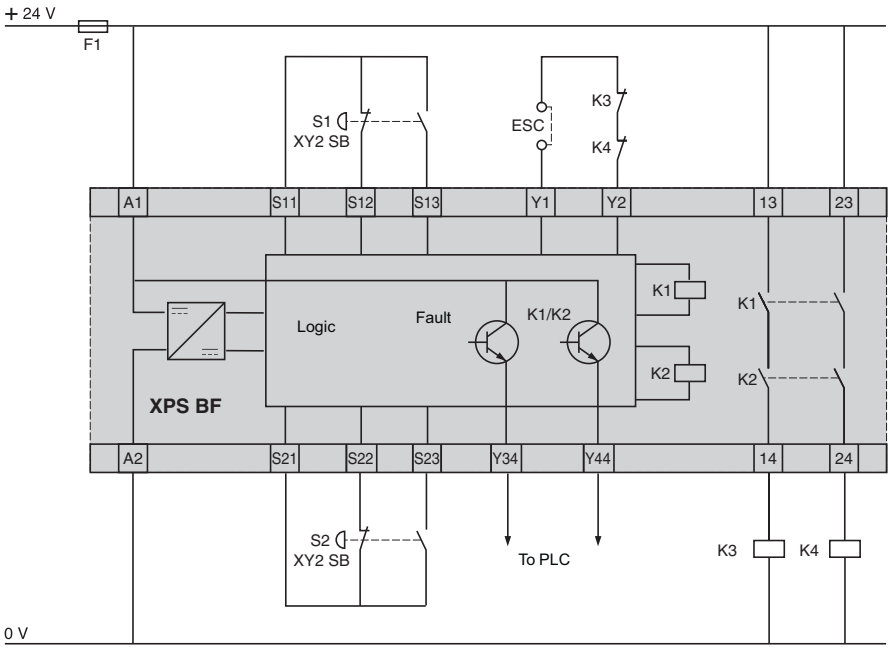


S1 selector switch:
1 = operator 1
2 = operator 2
3 = operator 1 and operator 2
S11-S12, S21-S22: two-hand control station pushbuttons

Safety automation system solutions
Preventa safety modules type XPS BF
For electrical monitoring of two-hand control stations

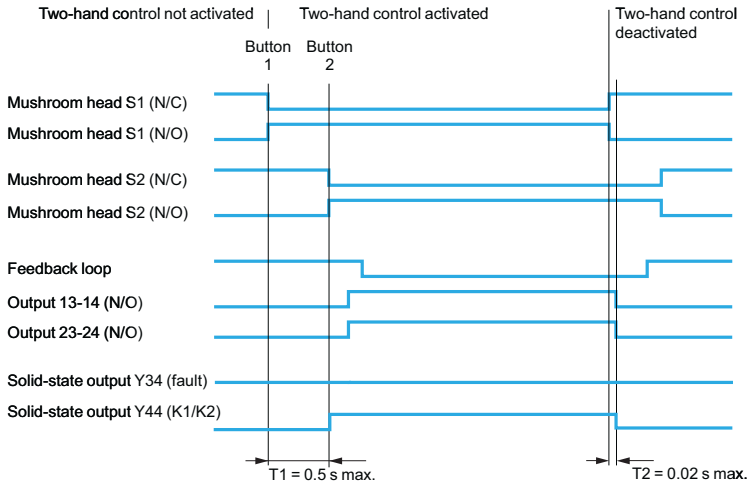
XPS BF

Module XPS BF associated with a two-hand control station



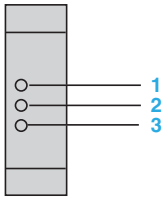
ESC: External start conditions.
Y1-Y2: feedback loop

Functional diagram of module XPS BF





LED details (XPS BF)



1 Supply voltage A1-A2 (fuse status).
2 Fault signalling.
3 K1-K2 status (N/O safety outputs closed).

Safety automation system solutions

Preventa safety module XPS LCD

for monitoring 2 to 4 safety light curtains type 2 and type 4

Operating principle

The safety monitoring module XPS LCD1141 enables independent monitoring of 2 to 4 light curtains type 2 and type 4.
Each output of the light curtain is separately connected to the inputs of the safety monitoring module, which either authorises or prevents activation of its two safety outputs.
The module manages starting and EMD/MPCE functions and therefore, the light curtains connected to it must be configured for automatic start and the EDM/MPCE function deactivated. The safety monitoring module XPS LCD1141 provides the supply and also manages, in addition to its own auxiliary outputs (1 PNP and 1 NPN), the auxiliary outputs of the light curtains.
At the slightest intrusion through one or more light beams of any of the light curtains, the outputs of the safety monitoring module open. This also applies in the event of any internal fault or output relay(s) fault (subject to the EDM/MPCE configuration on the module).
The light curtain system conforms to the standard EN/IEC 61496-1 (type 4).
The Preventa safety monitoring module XPS LCD1141 incorporates removable terminal blocks, thus optimising machine maintenance.
To aid diagnostics, the safety monitoring module has 9 LEDs and a 2-digit display on the front face which provide information on the monitoring circuit status.

Environmental characteristics

Safety monitoring module type			**XPS LCD1141**
Certifications			CE, TÜV, CSA, UL
Ambient air temperature		**°C**	Operation: 0…+ 55; storage: - 25…+ 75
Relative humidity			95% maximum, without condensation
Degree of protection			IP 20
Shock and vibration resistance	Conforming to EN/IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms. Vibration resistance: 5…55 Hz max. on all 3 axes
Materials			ABS thermoplastic enclosure
Mounting			35 mm rail

Electrical characteristics

Power supply		**V**	⎓ 24 ± 10%
Current		**A**	10 max.
Response time		**ms**	< 1
Safety outputs			2 solid-state PNP outputs (N/O), 625 mA on ⎓ 24 V
Alarm or auxiliary output			1 solid-state PNP (N/O), 500 mA on ⎓ 24 V, and 1 solid-state NPN (N/O),100 mA on ⎓ 24 V, output
Monitoring activation of output switching devices (EDM/MPCE)		**mA**	50 ± 20% on ⎓ 24 V
Signalling			9 LEDs plus 2-digit display
Functions			-Auto/Manual, manual 1st cycle, -Monitoring of external switching devices (EDM: External Devices Monitoring), -Restart request indicator light, -Display of operating modes and alarm by 9 LEDs and 2-digit display. Selection of Auto/Manual, blanking relay monitoring, floating/blanking and blanking + floating/ blanking relay monitoring using configuration switches behind front face of module. -Independent monitoring of 2 to 4 safety light curtains.
Monitoring of external switching devices (EDM = External Devices Monitoring)			Monitoring of the function (open or closed) as well as the response time of the power components. Parameterable using configuration switches.
Start input		**mA**	50 at 24 V
Connection	Type		Captive screw clamp terminals, removable terminal block
1-wire connection	Without cable end		Solid cable: 4 mm^2
	Without cable end		Flexible cable: 0.14...1.5 mm^2
	With cable end		Without bezel, flexible cable: 0.14…1.5 mm^2
2-wire connection	Without cable end		Solid cable: 0.14...1.5 mm^2
	Without cable end		Flexible cable: 0.14...7.5 mm^2

Reference: page 2/217 Dimensions: page 2/217 Connections: page 2/218

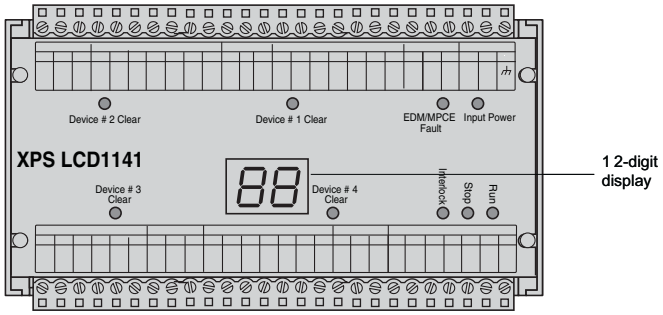
Safety automation system solutions

Preventa safety module XPS LCD

for monitoring 2 to 4 safety light curtains type 2 and type 4

Description

The safety monitoring module XPS LCD has 9 LEDs and a 2-digit display on the front face.



Reference

107800-55-M



XPS LCD1141

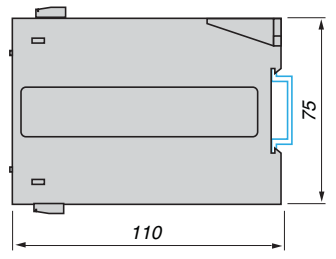
Description	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight
				V		kg
Safety module for monitoring 2 to 4 safety light curtains type 2 and type 4	Removable from module	2 PNP	5 (4 PNP + 1 PNP or NPN)	⎓ 24 V	**XPS LCD1141**	0.750

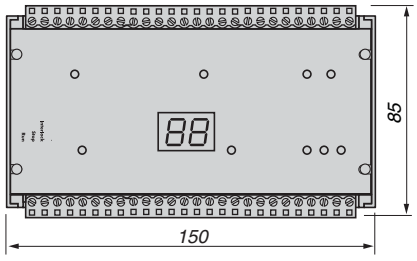
Dimensions

Safety monitoring module

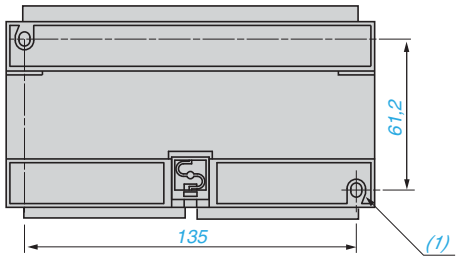
XPS LCD1141

Mounting on 35 mm rail





Rear view



(1) 2 elongated holes Ø 4 x 5.7.

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Dimensions: page 2/217
Connections: page 2/218

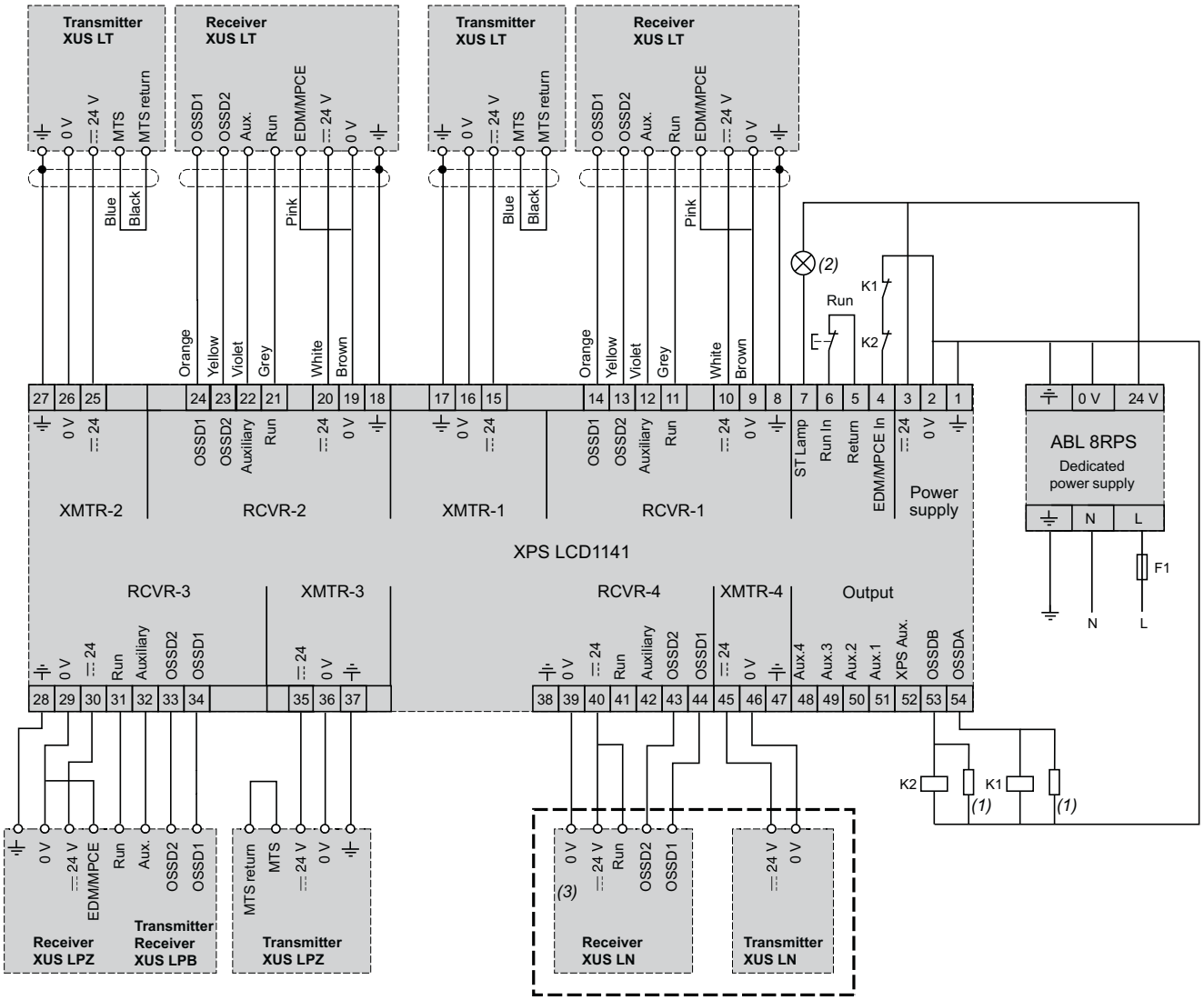
Safety automation system solutions

Preventa safety module XPS LCD

for monitoring 2 to 4 safety light curtains type 2 and type 4

Connection via the safety monitoring module XPS LCD1141

Example: configuration with light curtains XUS LT, XUS LP and XUS LN



(1) Arc suppressor.
(2) Restart request indicator light.
(3) When module XPS LCD1141 is used with a type 2 light curtain (example: XUS LN), the entire protection system is downgraded to category 2.

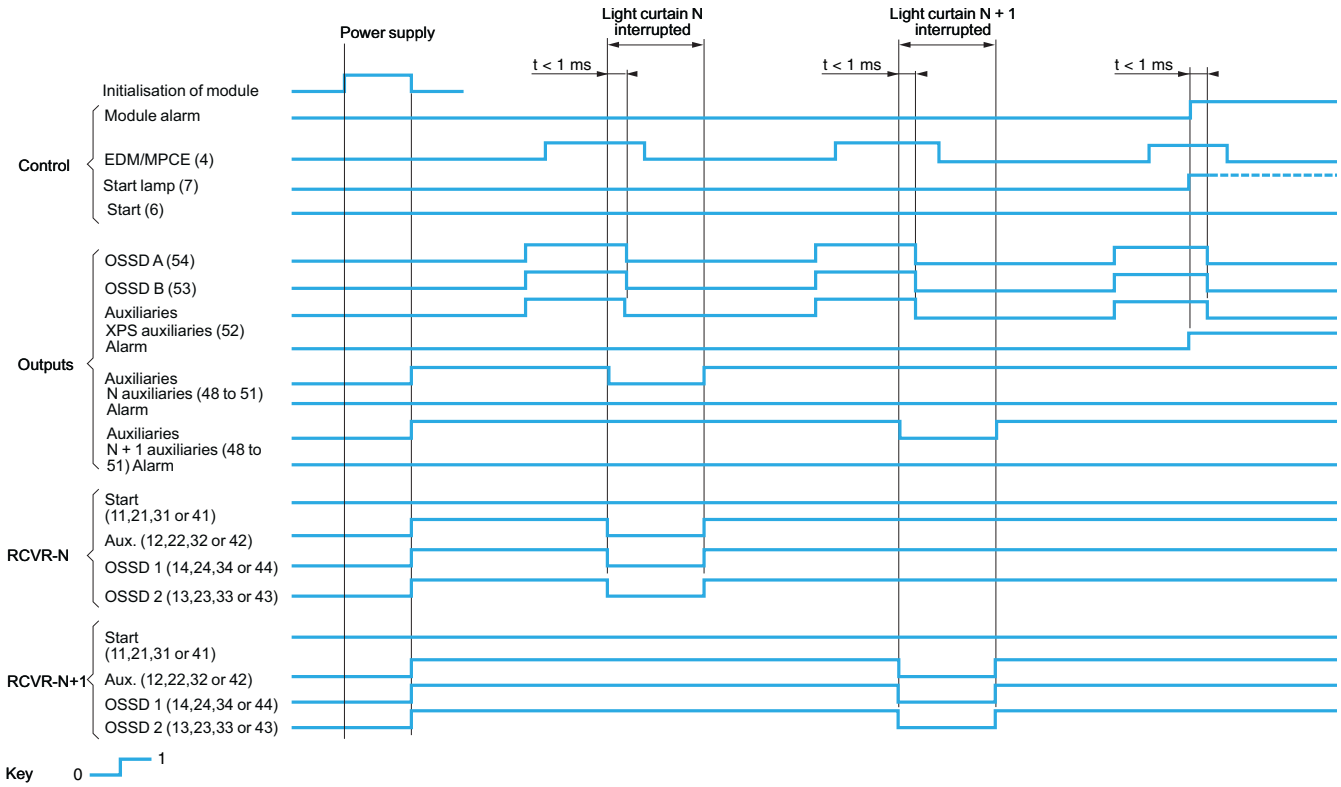
Reference: page 2/217
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Safety automation system solutions

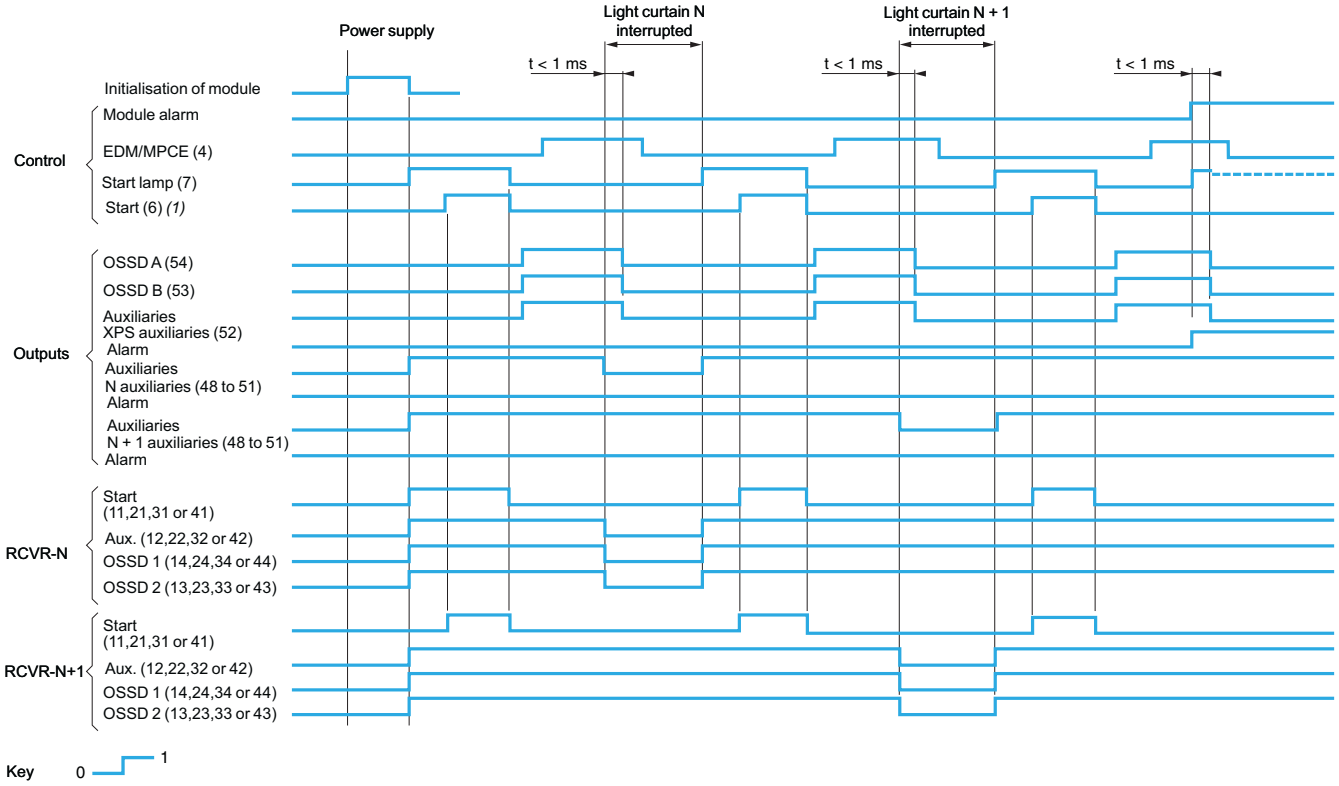
Safety solutions on AS-Interface cabling system
Preventa safety module XPS LCD
for monitoring 2 to 4 safety light curtains type 2 and type 4

Functional diagram of module XPS LCD1141

Automatic start and restart mode



Manual start and restart mode



(1) Start button.

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Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

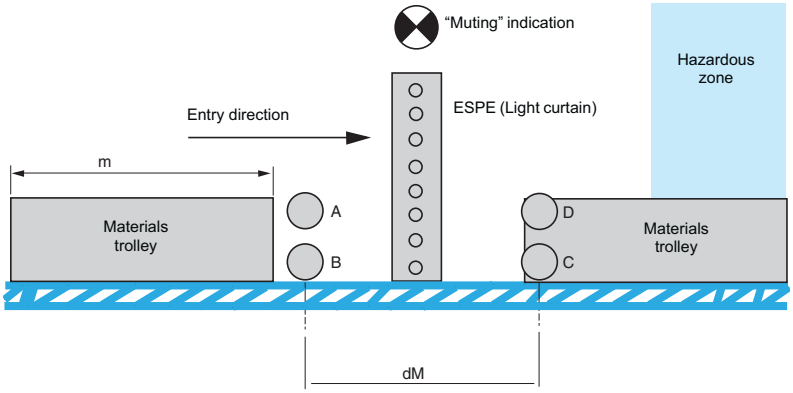
Operating principle

Safety modules XPS LCM are used with type 4 light curtains conforming to EN/IEC 61496-1 to provide a system inhibiting the light curtain protection, i.e. “muting”. This function enables the automatic passage of parts for machining or loaded pallets, without interrupting the transportation movement within the zone protected by the electro-sensitive protection equipment (ESPE) system. In addition to the electro-sensitive protection and safety modules XPS LCM, the system comprises 4 to 8 inhibition sensors, 2 indicator lights and a key switch to reset the system to the initial state in the event of a sequence error.

When the system is switched on by the start command and the light curtain protection not interrupted, the main circuit is closed by the safety outputs of the XPS LCM modules (solid-state safety outputs). In addition to safety outputs, the modules incorporate signalling outputs for sending system status information to the PLC. Either 5 or 14 LEDs and a 2-digit display, mounted on the front face of the module, provide information on the safety circuit status.

An interruption of the protection field monitored by the electro-sensitive protection equipment causes instantaneous opening of the safety outputs; the process PLC receives a stop command and the LED display mounted on the front face indicates the change of state of the safety circuits. The “open” state is maintained until the module is restarted using the Start button.

The “muting” function cannot be activated by supplying the inhibition sensors unless the safety outputs have been switched on beforehand. To trigger the “muting” function, the inhibition devices must be activated within the 3 second time interval. During the activated “muting” phase, materials can be transported through the protection field without deactivating the safety outputs. In the event of intrusion into the hazardous zone, a person cannot activate the inhibition sensors in the same way and the system stops.
Whilst the “muting” function is activated, a “muting” status indicator light is controlled by the XPS LCM module. A fault at indicator light level (short-circuit, open circuit) is immediately recognised and deactivates the “muting” function. The indicator light only illuminates when a “muting” signal is generated and indicates the inhibition of the protection function.



ESPE: electro-sensitive protection equipment (light curtain).
A, B, D, C: “muting” sensors.
m: trolley length and dM = distance between A, B and D, C.

Conditions to be observed for the “muting” function

- The “muting” sensors must either be thru-beam type XUB 0BPSNL2 + XUB 0BKSNL2T, polarised reflex type XUB 0BPSNL2 + XUC Z50 or mechanical limit switches with contacts.
- dM ≤ m to obtain continuous validation of the “muting” function.
- Avoid the intrusion of persons during the “muting” phase. This phase is indicated by the indicator light connected to the “muting” indicator output of the XPS LCM module.
- A materials trolley must provide the “muting” signal before entering the protection field and cease it once it has cleared all the sensors of the protection field on exiting.

Characteristics: page 2/221 | References: page 2/222 | Dimensions: page 2/223 | Connections: page 2/224

Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

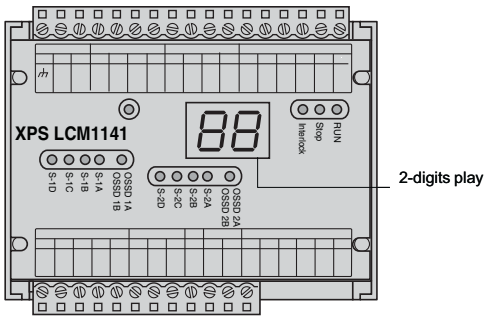
Characteristics

Module type			XPS LCM1150
Certifications			CE, TÜV, CSA, UL
Products designed for max. use in safety related parts of control systems	Conforming to EN 954-1/ ISO 13849-1		Category 4
Ambient air temperature	For operation	**°C**	0…+ 55
	For storage	**°C**	- 25…+ 75
Degree of protection conforming to IEC 529	Terminals		IP 20
	Enclosure		IP 20
Power supply	Voltage	**V**	⎓ 24
	Voltage limits		- 10…+ 10%
Maximum consumption		**W**	< 150
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)
Rated impulse withstand voltage (Uimp)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)
Number of light curtains monitored			1 or 2 transmitter-receiver pairs
Inputs for “muting” sensors			
- number of inputs to be monitored			2 to 4 per “muting” function
- supply voltage of sensors		**V**	24
- output current of each sensor		**mA**	< 20
Type of “muting” sensors			Thru-beam, polarised reflex or sensors with volt-free contacts
Synchronisation time of “muting” sensors		**s**	3 or unlimited
Maximum “muting” time		**min**	2 or unlimited
Safety outputs			
- number and type			2 PNP (terminals 1 and 2), 0.625 A at 24 V
- max. thermal current (Ithe)	1 output	**A**	–
	2 outputs	**A**	2 x 0.108
	3 outputs	**A**	–
	3 contacts	**A**	–
Auxiliary outputs			1 PNP (terminal 5) + 1 NPN (terminal 6)
- breaking capacity of solid-state PNP outputs		**mA**	24 V/500
- breaking capacity of solid-state NPN outputs		**mA**	24 V/100
“Muting” indicator light power		**W**	1 to 7 max.
Response time on input change of state		**ms**	1
Signalling			14 LEDs plus 2-digit display
Connection	Type		Captive screw clamp terminals, removable terminal block
1-wire connection	Without cable end		Solid cable: 4 mm^2
	Without cable end		Flexible cable: 0.14...1.5 mm^2
	With cable end		Without bezel, flexible cable: 0.14…1.5 mm^2
2-wire connection	Without cable end		Solid cable: 0.14...1.5 mm^2
	Without cable end		Flexible cable: 0.14...7.5 mm^2

Presentation: page 2/220 References: page 2/222 Dimensions: page 2/223 Connections: page 2/224

Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains



Description

XPS LCM1150

To aid diagnostics, the safety monitoring module has 14 LEDs and a 2-digit display on the front face which provide information on the monitoring circuit status.

108001-38-M



XPS LCM1150

References

Safety module

Description	Type of terminal block connection	Number of safety circuits	Auxiliary outputs	Supply	Reference	Weight
						kg
Safety module for “muting” function	Removable from module	2 PNP	1 PNP + 1 NPN	⎓ 24 V	**XPS LCM1150**	0.660

Spare parts

Description	Power	Reference	Weight
	W		kg
“Muting” indicator light kit	5	**XSZ CM01**	0.012
Replacement bulbs for “muting” indicator light kit comprising one lot of 10 replacement bulbs and 1 removal/insertion tool XBF-X13	1 to 7	**XSZ CM02**	0.016

Characteristics: page 2/221 | Presentation: page 2/220 | Dimensions: page 2/223 | Connections: page 2/224

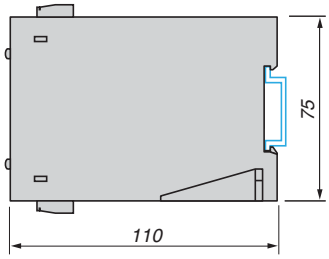
Safety automation system solutions

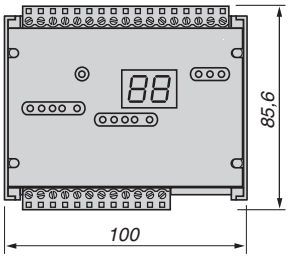
Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

Dimensions

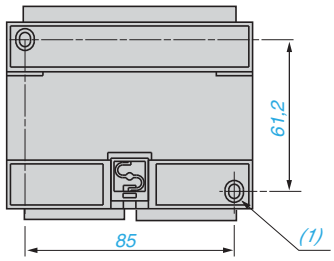
XPS LCM1150

Mounting on 35 mm rail



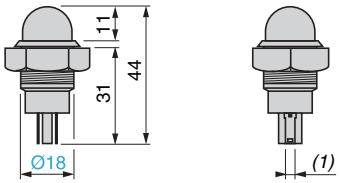


Rear view



(1) 2 elongated holes Ø 4 x 5.7

“Muting” indicator light kit XSZ CM01



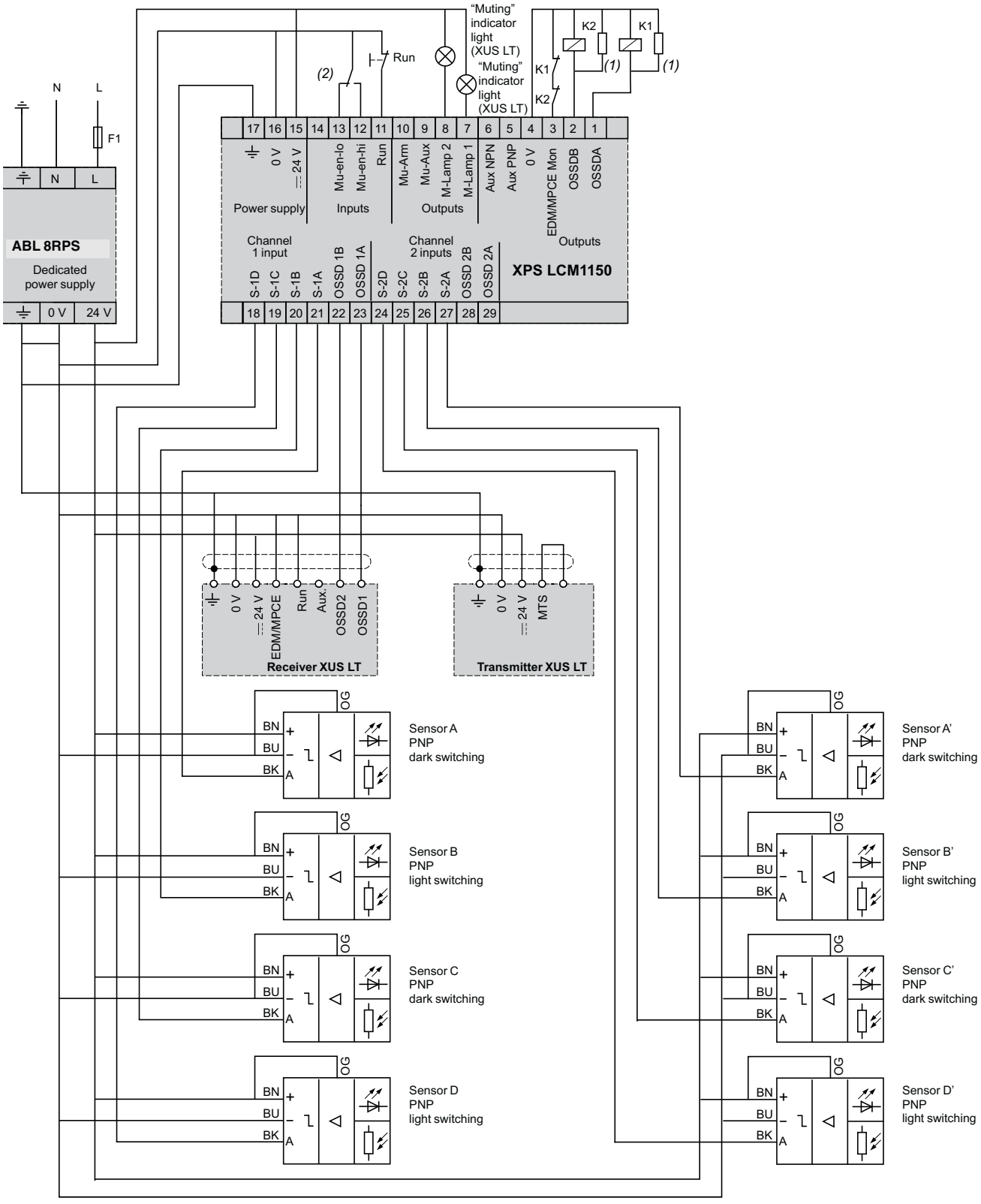
(1) Faston connector 4.7.

Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

Connection via the safety monitoring module XPS LCM1150

Example: configuration with light curtains XUS LT



(1) Arc suppressor.
(2) Inhibition activation/deactivation key switch.

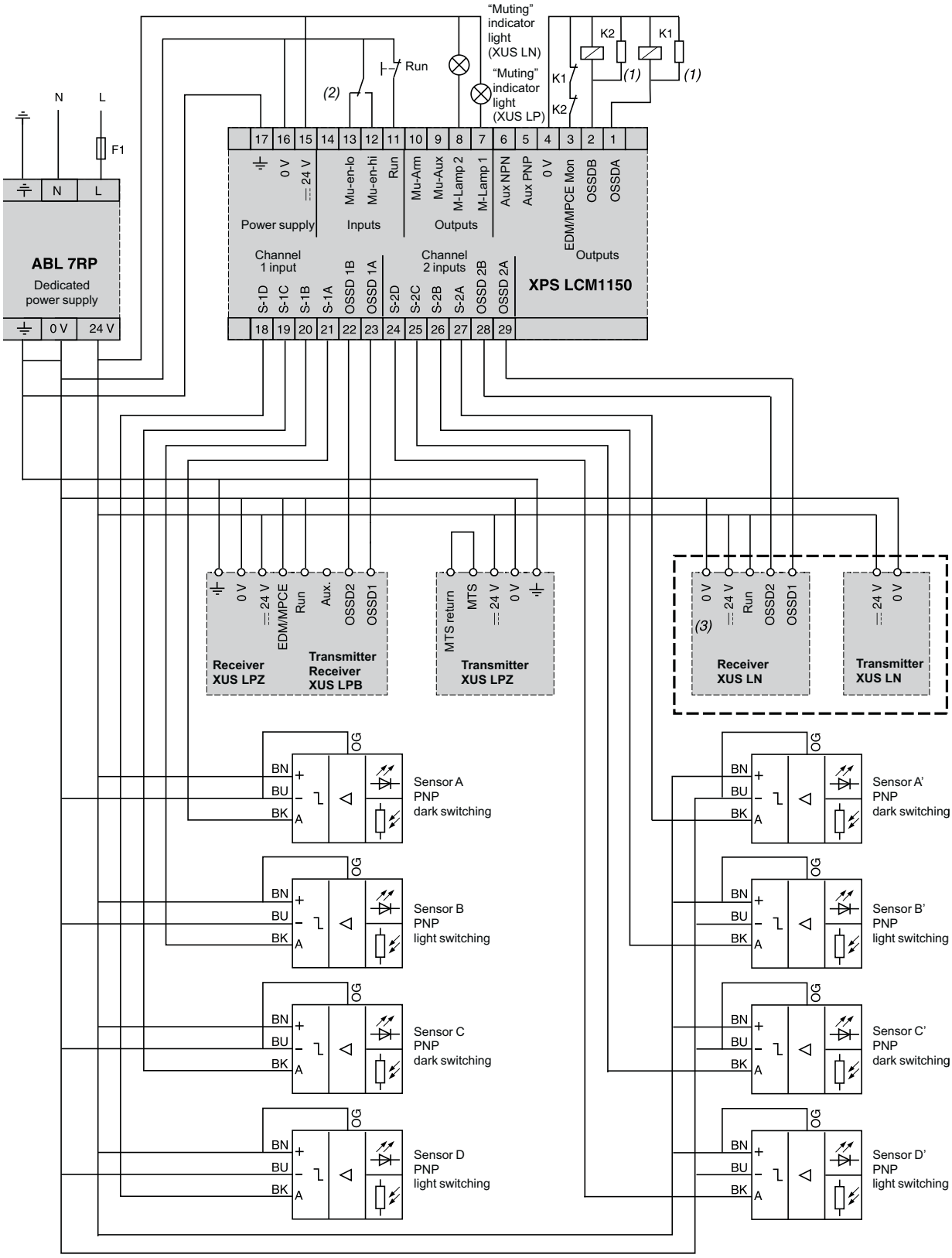
Characteristics: page 2/221 | Presentation: page 2/220 | Dimensions: page 2/223 | References: page 2/222

Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

Connection via the safety monitoring module XPS LCM1150

Example: configuration with 2 light curtains XUS LP and XUS LN



(1) Arc suppressor.
(2) Inhibition activation/deactivation key switch.
(3) When module XPS LCM1150 is used with a type 2 light curtain (example: XUS LN), the entire protection system is downgraded to category 2.

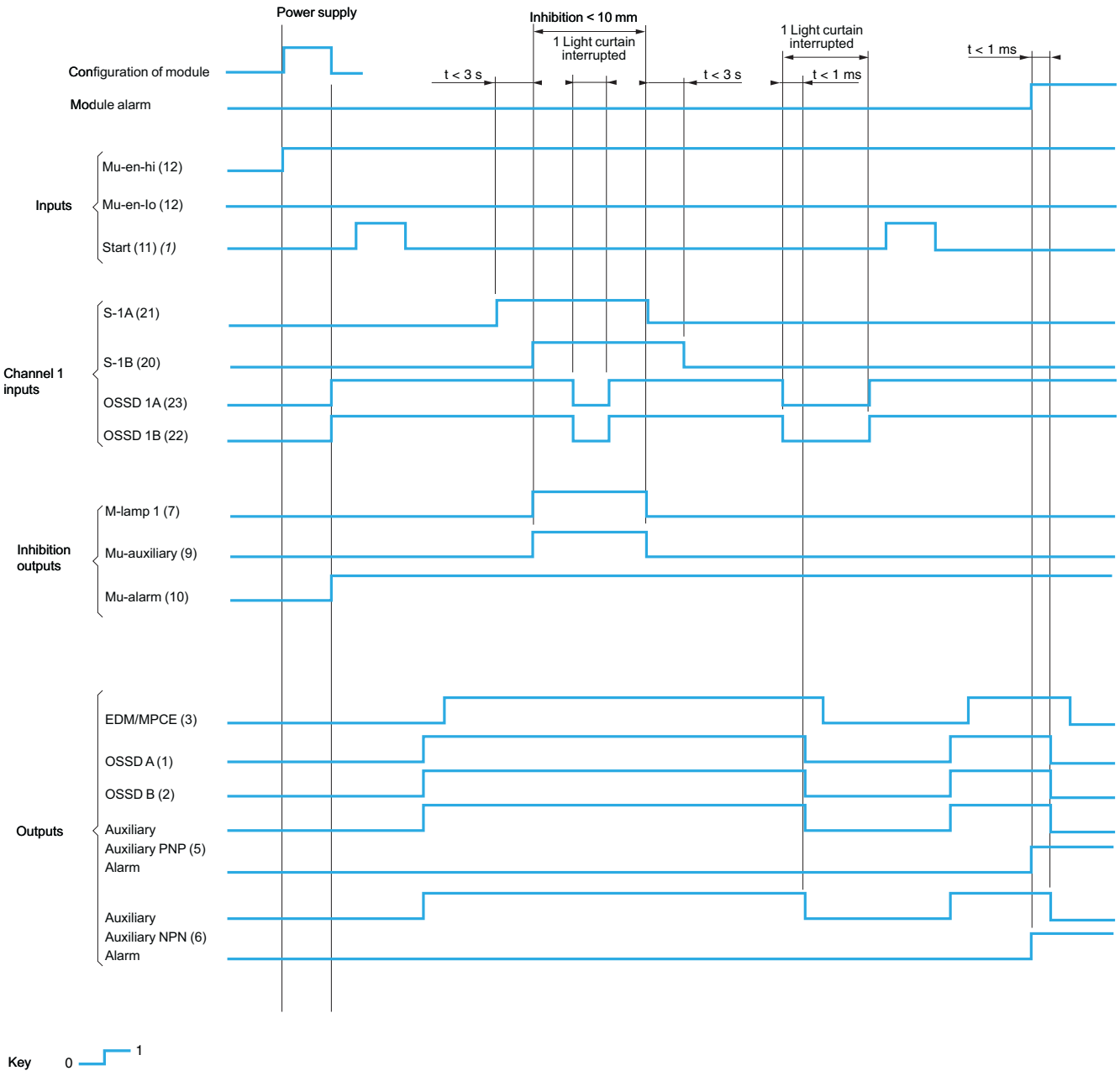
Characteristics: page 2/221 | Presentation: page 2/220 | Dimensions: page 2/223 | References: page 2/222

Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

Functional diagram of safety monitoring module XPS LCM1150

“Start/restart interlock” mode with 2 sensors



(1) Press Start button.

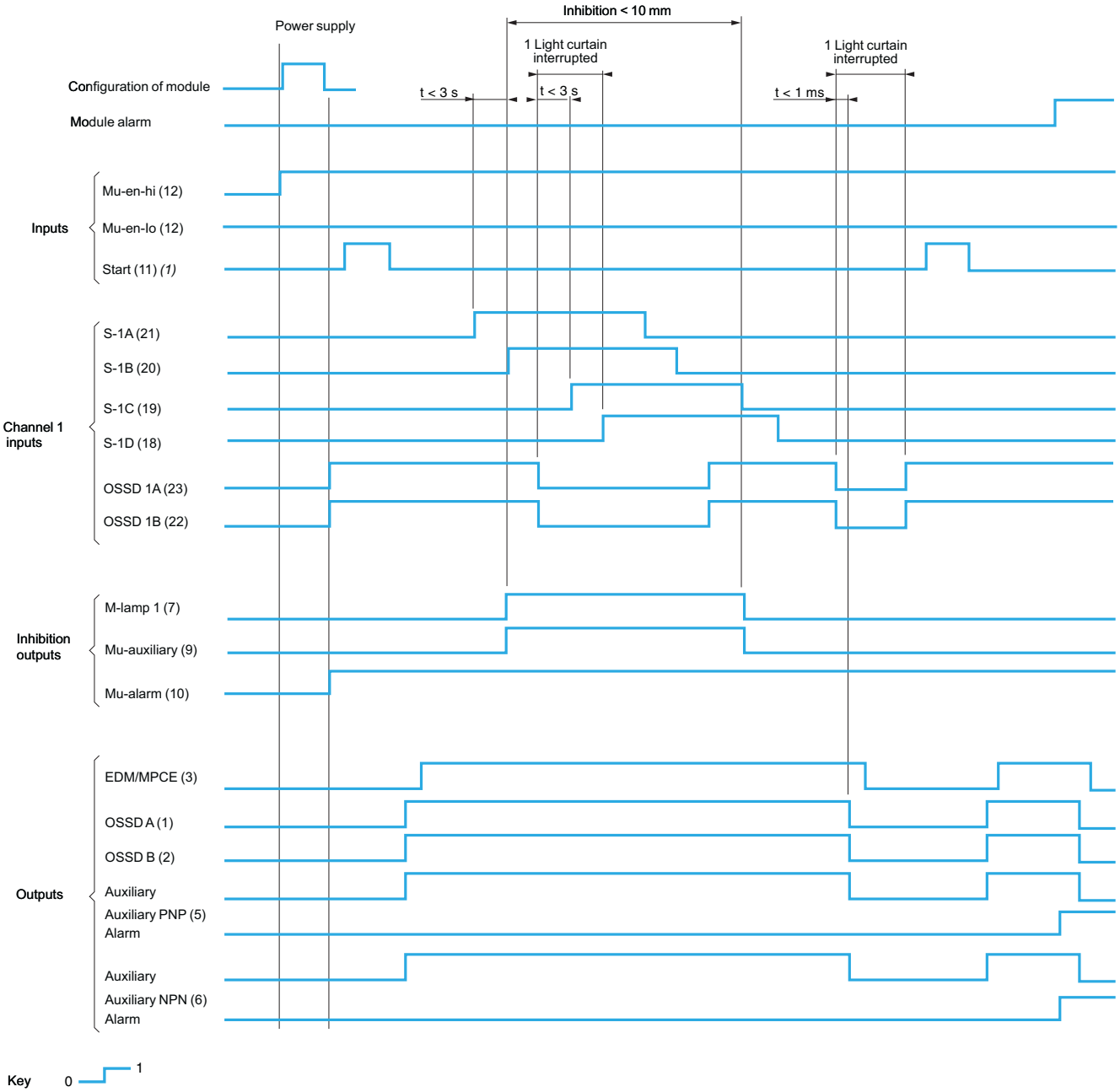
Characteristics: page 2/221 | Presentation: page 2/220 | Dimensions: page 2/223 | References: page 2/222

Safety automation system solutions

Safety monitoring module
Preventa XPS LCM
for the “muting” function of type 2 and type 4 safety light curtains

Functional diagram of safety monitoring module XPS LCM1150

“Start/restart interlock” mode with 4 sensors



(1) Press Start button.

Safety automation system solutions

Preventa safety modules types XPS ECM, XPS ECP

For increasing the number of safety contacts

Operating principle

Safety modules XPS EC●, for increasing the number of safety contacts, are available as additions to Preventa XPS base modules (Emergency stop, limit switch, two-hand control, etc.).
They are used to increase the number of safety output contacts of the base modules.

Characteristics

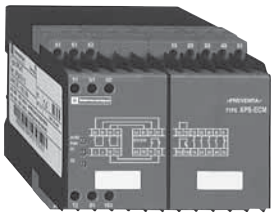
Module type			XPS ECM	XPS ECP
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max. (when connected to the appropriate module)	
Conformity to standards			EN 60204-1, EN/IEC 60947-5-1	
Product certifications			UL, CSA	
Supply	Voltage	**V**	∼ and ⎓ 24, ∼ 115, ∼ 230	
	Voltage limits		- 20…+ 10% (∼ 24 V), - 20…+ 20% (⎓ 24 V), - 15…+ 15% (∼ 115 V), - 15…+ 10% (∼ 230 V)	
	Frequency	**Hz**	50/60	
Consumption	24 V	**VA**	< 5	
	115 V/230 V	**VA**	< 6	
Module inputs fuse protection			Internal, electronic	
Outputs	Voltage reference		Volt-free	
	Number and type of safety circuits		4 N/O (13-14, 23-24, 33-34, 43-44)	8 N/O (13-14, 23-24, 33-34, 43-44, 53-54, 63-64, 73-74, 83-84)
	Number and type of additional circuits		1 N/C (41-42) + 1 solid-state	1 N/C (91-92) + 1 solid-state
	Breaking capacity in AC-15	**VA**	B300: inrush 3600, maintained 360	
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms	
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA	
	Max. thermal current (Ithe)	**A**	6	
	Max. total thermal current	**A**	24	30
	Output fuse protection	**A**	6 gG	
	Minimum current (volt-free contact)	**mA**	10 (conforming to EN/IEC 60947-5-1, VDE 0660 part 200)	
	Minimum voltage (volt-free contact)	**V**	17	
Electrical durability			See page 2/172	
Response time on input opening		**ms**	< 20	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN//IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)	
LED display			3	
Operating temperature		**°C**	- 10…+ 55	
Storage temperature		**°C**	- 25…+ 85	
Degree of protection conforming to IEC 60529	Terminals		IP 20	
	Enclosure		IP 40	
Connection	Type		Captive screw clamp terminals: without cable end 1 x 4 mm^2, with cable end 2 x 2.5 mm^2	

Connections: page 2/230
Dimensions: page 2/262

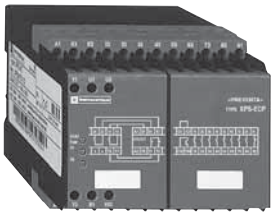
Safety automation system solutions

Preventa safety modules types XPS ECM, XPS ECP

For increasing the number of safety contacts



XPS ECM



XPS ECP

References

Description	Number of safety circuits	Additional outputs	Solid-state outputs for PLC	Supply	Reference	Weight kg
Safety modules for increasing the number of safety contacts, for use with XPS base modules	4	1	1	∼ and ⎓ 24 V	**XPS ECM5131**	0.550
				∼ 115 V	**XPS ECM3431**	0.650
				∼ 230 V	**XPS ECM3731**	0.650
	8	1	1	∼ and ⎓ 24 V	**XPS ECP5131**	0.550
				∼ 115 V	**XPS ECP3431**	0.650
				∼ 230 V	**XPS ECP3731**	0.650

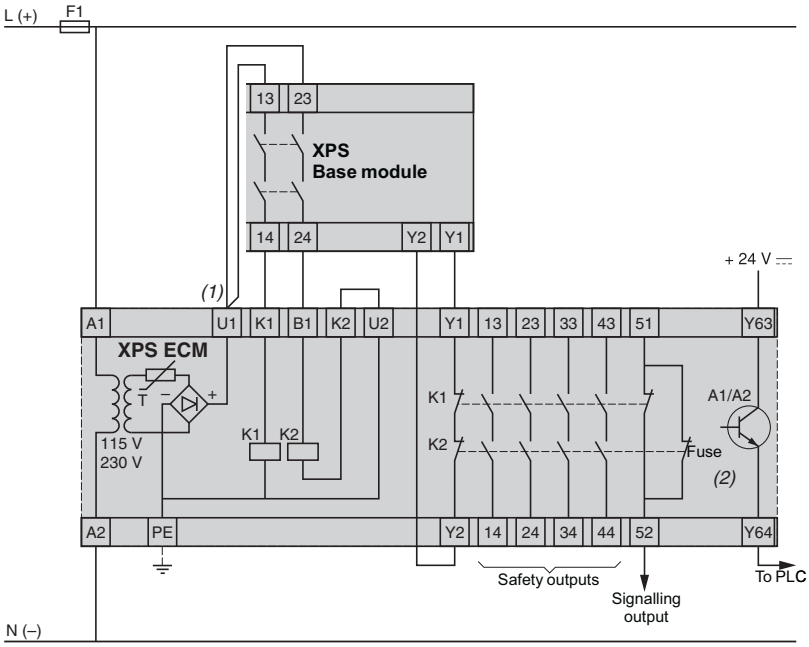
2

Connections: page 2/230

Dimensions: page 2/262

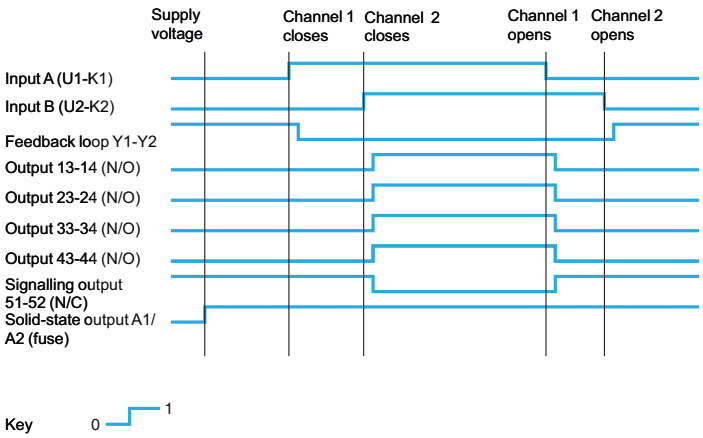
Safety automation system solutions
Preventa safety modules type XPS ECM
For increasing the number of safety contacts

XPS ECM
Wiring diagram



(1) When installing base modules and modules for increasing the number of safety contacts into different electrical enclosures, run separate cables for terminals U1-13 and U1-23.
(2) Operating status of internal electronic fuse.

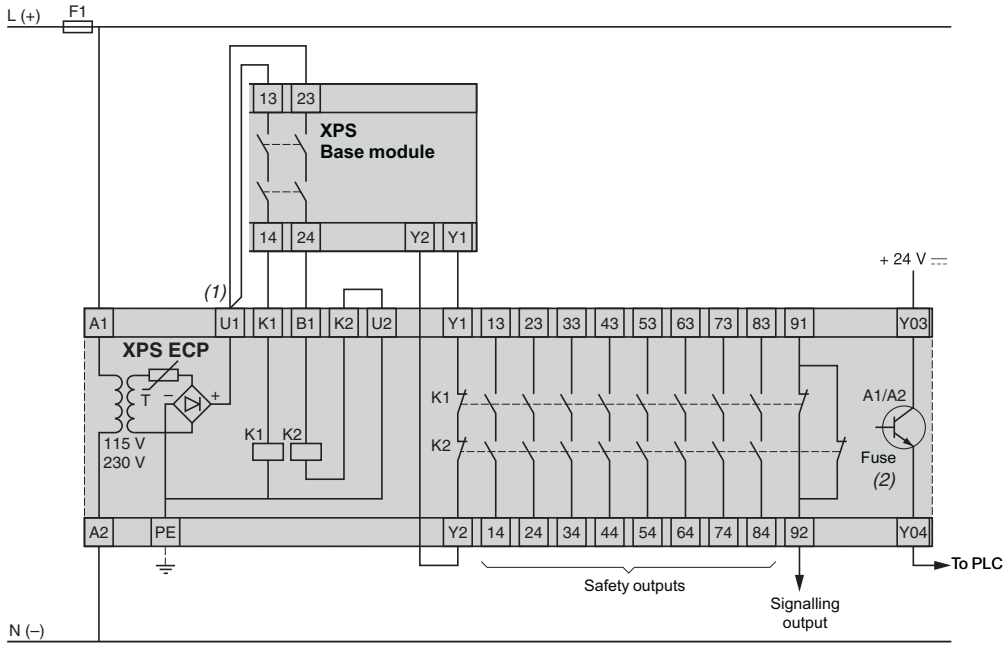
Functional diagram



Safety automation system solutions
Preventa safety modules type XPS ECP
For increasing the number of safety contacts

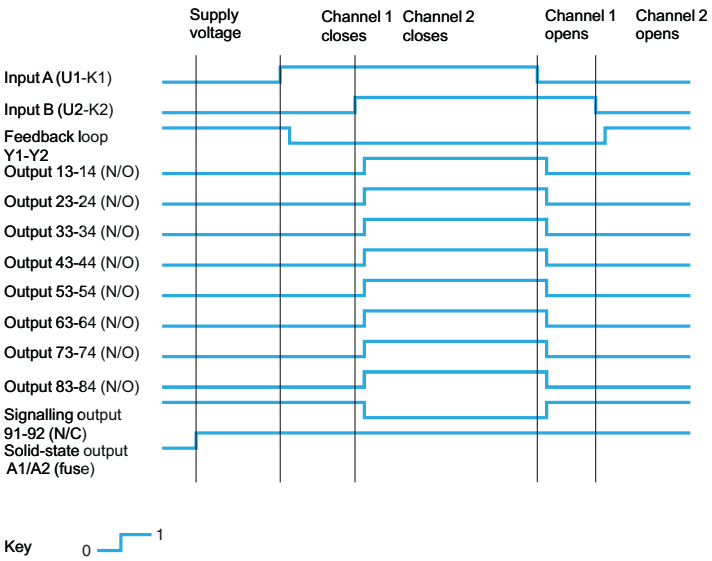
XPS ECP

Wiring diagram



(1) When installing base modules and modules for increasing the number of safety contacts into different electrical enclosures, run separate cables for terminals U1-13 and U1-23.
(2) Operating status of internal electronic fuse.

Functional diagram



Safety automation system solutions

Preventa safety modules types XPS TSA, XPS TSW

For safety time delays

Operating principle

Safety modules XPS TSA and XPS TSW are used in applications requiring safety time delays:

■ modules XPS TSA in applications with interlocking on high inertia machines with long rundown time (guards unlocked after safety time delay has elapsed),

■ modules XPS TSW in applications with a safety switchover contact (shunting contact in association with XPS VN modules for zero speed detection, solenoid valve monitoring, etc.).

The time delay of safety circuits can be set to 16 preset values, using 2 selectors located on the front face of the modules.

To aid diagnostics, the modules have LEDs which provide information on the monitoring circuit status and 2 solid-state outputs for signalling to the process PLC.

In addition, their removable terminal blocks optimise machine maintenance.

Characteristics

Module type				XPS TSA	XPS TSW
Product designed for max. use in safety related parts of control systems (conforming to EN 60954-1/ISO 13849-1)				Category 3 max.	
Conformity to standards				EN/IEC 60204-1, EN/IEC 60947-5-1	
Product certifications				UL, CSA, BG	
Supply	Voltage		**V**	∼ and ⎓ 24, ∼ 115, ∼ 230	
	Voltage limits			- 15…+ 15% (⎓ 24 V) - 20…+ 10% (∼ 24 V) - 15…+ 15% (115 V) - 15…+ 10% (230 V)	
	Frequency		**Hz**	50/60	
Consumption	⎓ 24		**VA**	< 2.3	
	∼ 24 V			< 4.3	
	∼ 115			< 6.5	
	∼ 230 V			< 5.5	
Module inputs fuse protection				Internal, electronic	
Time delay			**s**	1…31 (16 positions)	–
Pulse time			**s**	–	0.1…3.1 (16 positions)
Outputs	Voltage reference			Volt-free	
	Number and type of safety circuits			1 N/O (17-18) + 2 N/C (25-26, 35-36)	
	Number and type of additional circuits			2 solid-state (Y53-Y54, Y63-Y64)	
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms	
	Breaking capacity of solid-state outputs			24 V/20 mA, 48 V/10 mA	
	Max. thermal current (Ithe)		**A**	6	
	Output fuse protection		**A**	4 gG (gI) or 6 fast acting, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200	
	Minimum current		**mA**	10	
	Minimum voltage		**V**	17	
Electrical durability				See page 2/172	
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)	
LED display				4	
Operating temperature			**°C**	- 10…+ 55	
Storage temperature			**°C**	- 25…+ 85	
Degree of protection conforming to IEC 60529		Terminals		IP 20	
		Enclosure		IP 40	
Connection		Type		Captive screw clamp terminals, removable terminal block	
	1-wire connection	Without cable end		Solid or flexible cable: 0.2…2.5 mm^2	
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm^2	
		With cable end		With bezel, flexible cable: 0.25…2.5 mm^2	
	2-wire connection	Without cable end		Solid cable: 0.2…1 mm^2, flexible cable: 0.2…1.5 mm^2	
		With cable end		Without bezel, flexible cable: 0.25…1 mm^2	
		With cable end		Double, with bezel, flexible cable: 0.5…1.5 mm^2	

References: page 2/233 Connections: page 2/233 Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules types XPS TSA, XPS TSW

For safety time delays

References



XPS TSA●●●●P

Description	Number of safety circuits	Number of additional outputs	Supply	Reference	Weight kg
Safety modules for applications with interlocking on high inertia machines	1 delayed	2 N/C + 2 solid-state to PLC	~ and ⎓ 24 V	**XPS TSA5142P**	0.250
			~ 115 V	**XPS TSA3442P**	0.360
			~ 230 V	**XPS TSA3742P**	0.360



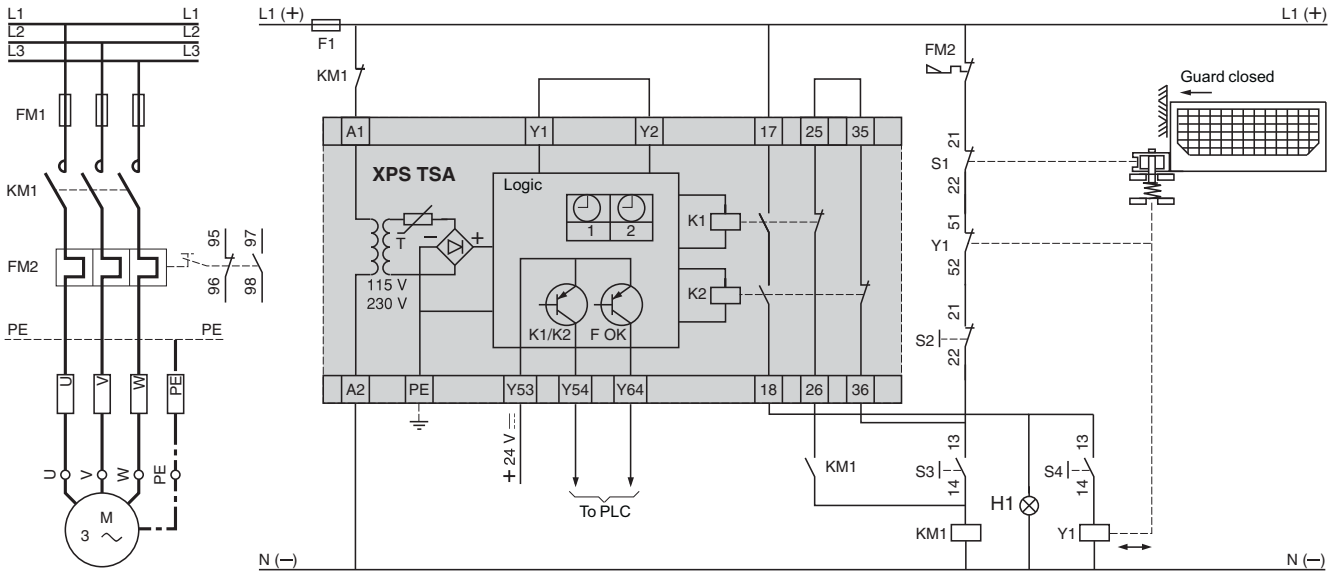
XPS TSW●●●●P

Description	Number of safety circuits	Number of additional outputs	Supply	Reference	Weight kg
Safety modules for applications with safety switchover contact	1 pulse type	2 N/C + 2 solid-state to PLC	~ and ⎓ 24 V	**XPS TSW5142P**	0.250
			~ 115 V	**XPS TSW3442P**	0.360
			~ 230 V	**XPS TSW3742P**	0.360

Connections

XPS TSA

Delayed unlocking of a guard application



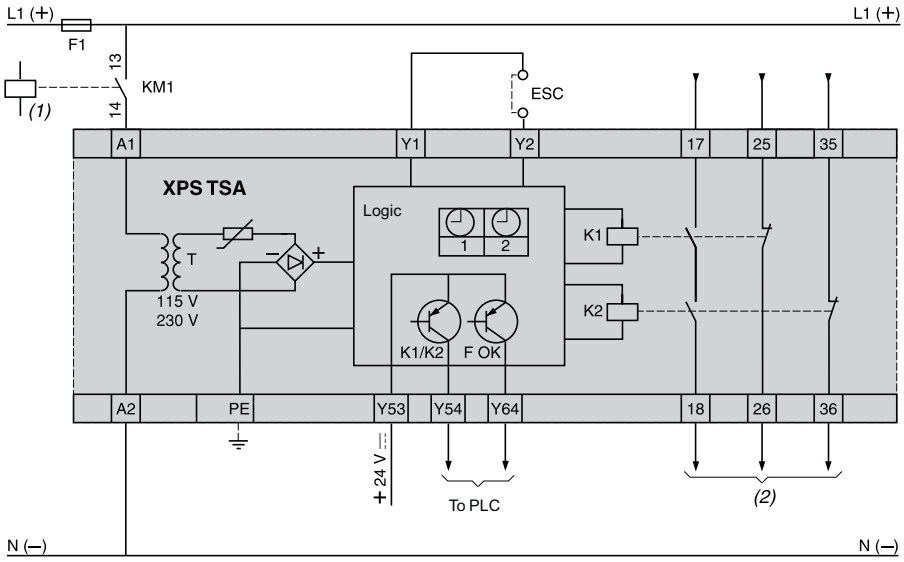
Principle, characteristics: page 2/232

Dimensions: page 2/262

2

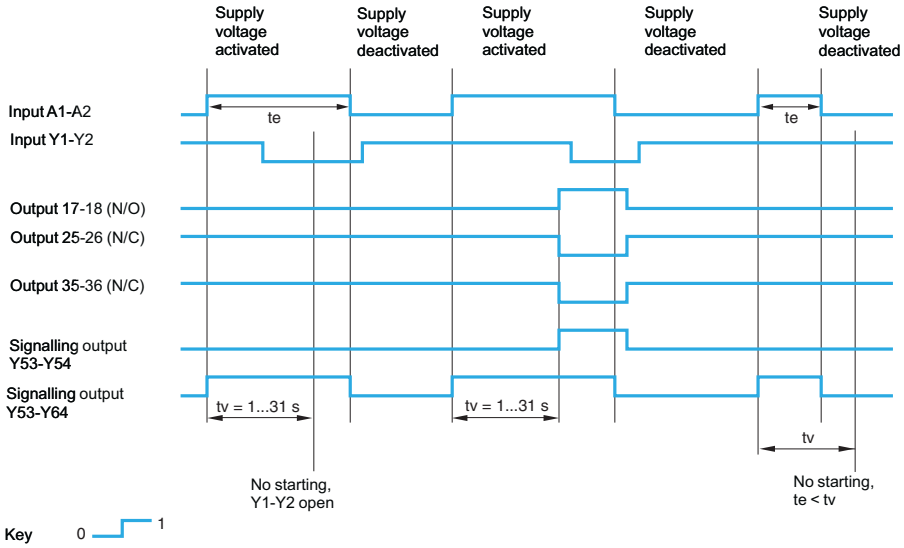
XPS TSA

Wiring diagram



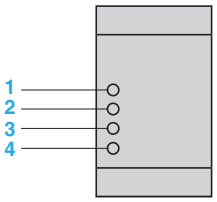
(1) Signal to be delayed.
(2) Volt-free relay outputs with on-delay.
ESC: External start conditions.

Functional diagram of module XPS TSA



te: power-up time
tv: delay time

LED details (XPS TSA, XPA TSW)

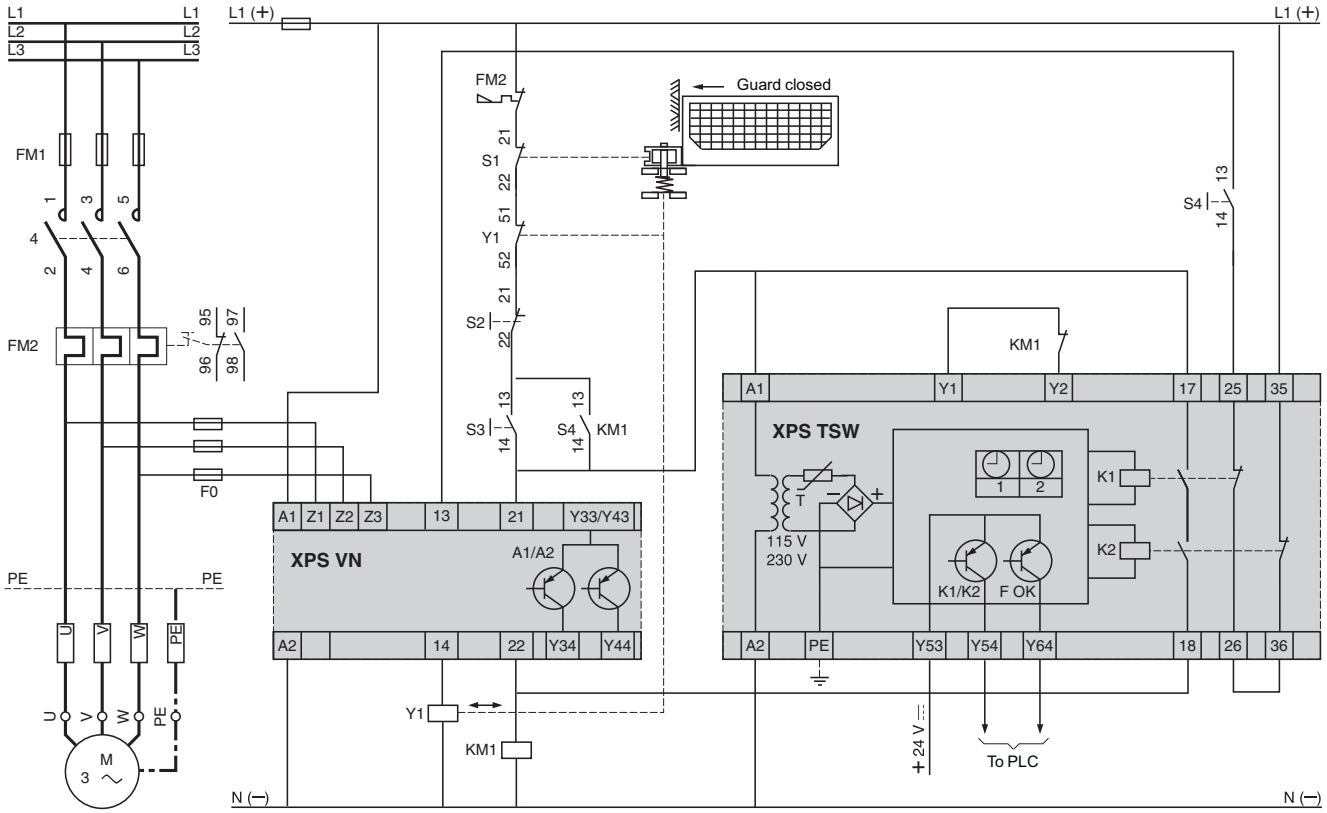


1 Supply voltage A1-A2 (fuse status).
2 Safety output closed.
3 Feedback loop Y1-Y2 status.
4 Time function active.

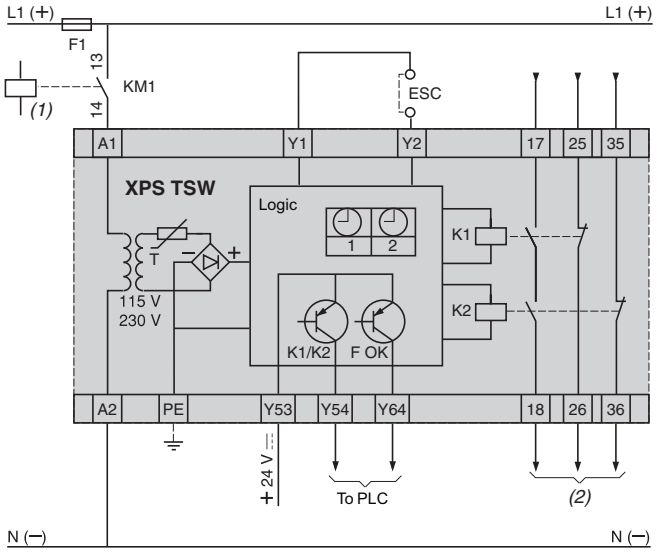
Principle, characteristics: page 2/232
References: page 2/233
Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS TSW
For safety time delays

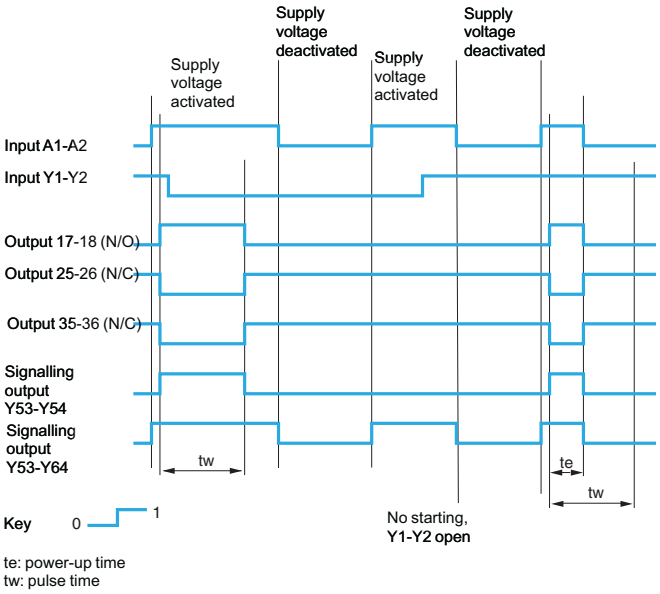
XPS TSW
Guard unlocking application using zero speed detection



Wiring diagram



Functional diagram of module XPS TSW



te: power-up time
tw: pulse time

(1) Control signal.
(2) Volt-free relay outputs with pulse time delay.
ESC: External start conditions.
LED details: see page 2/234.

Principle, characteristics: page 2/232
References: page 2/233
Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules types XPS DMB, XPS DME

For coded magnetic switch monitoring

Operating principle

Safety modules XPS DMB and XPS DME are specifically designed for monitoring coded magnetic safety switches. They incorporate two safety outputs and two solid-state outputs for signalling to the process PLC.
Conforming to category 4 of EN 954-1/ISO 13849-1, modules XPS DMB can monitor two independent sensors and modules XPS DME can monitor up to six independent sensors.
To monitor a higher number of magnetic switches using these safety modules, the magnetic switches can be connected in series, while meeting the requirements of category 3 of EN 954-1/ISO 13849-1.

Safety modules XPS DM●●●●●P incorporate removable terminal blocks, thus optimising machine maintenance.

To aid diagnostics, the modules have LEDs on the front face which provide information on the monitoring circuit status.

Characteristics

Module type				**XPS DMB1132**	**XPS DME1132**	**XPS DMB1132P**	**XPS DME1132P**
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.			
Conformity to standards				EN/IEC 60204-1, EN 1088/ISO 14119, EN/IEC 60947-5-1, EN/IEC 60947-5-3, DIN V VDE 0801 (1990), DIN V VDE 0801 A1 (1994)			
Product certifications				UL, CSA, BIA			
Supply (Ue) conforming to IEC 38	Voltage		**V**	⎓ 24			
	Voltage limits	⎓ 24 V		- 20…+ 20%			
Consumption			**W**	< 2.5	< 3.5	< 2.5	< 3.5
Module inputs fuse protection				Internal, electronic			
Maximum wiring resistance RL between the module and the coded magnetic switches			Ω	100			
Control unit voltage and current				28 V/8 mA			
Synchronisation time between magnetic switch inputs			**s**	< 0.5			
Safety outputs	Voltage reference			Volt-free			
	Number and type of safety circuits			2 N/O			
	Number and type of solid-state outputs			2			
	Breaking capacity in AC-15		**VA**	C300: inrush 1800, sealed: 180			
	Breaking capacity in DC-13			24 V/1.5 A, L/R = 50 ms			
	Max. thermal current (Ithe)		**A**	6			
	Max. total thermal current		**A**	12			
	Output fuse protection		**A**	4 gG or 6 fast acting			
	Minimum current		**mA**	10			
	Minimum voltage		**V**	17			
Electrical durability				See page 2/172			
Response time on input opening			**ms**	< 20			
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)			
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)			
LED display				3	15	3	15
Ambient air temperature			**°C**	For operation: - 10…+ 55, for storage: - 25…+ 85			
Degree of protection conforming to IEC 60529				Terminals: IP 20, enclosure: IP 40			
Connection	Type			Captive screw clamp terminals		Captive screw clamp terminals, removable terminal block	
	1-wire connection	Without cable end		Solid or flexible cable: 0.14… 2.5 mm²		Solid or flexible cable: 0.2…2.5 mm²	
		With cable end		Without bezel, flexible cable: 0.25…2.5 mm²			
		With cable end		With bezel, flexible cable: 0.25…1.5 mm²		With bezel, flexible cable: 0.25…2.5 mm²	
	2-wire connection	Without cable end		Solid or flexible cable: 0.14…0.75 mm²		Solid cable: 0.2…1 mm², flexible cable: 0.2…1.5 mm²	
		With cable end		Without bezel, flexible cable: 0.25…1 mm²			
		With cable end		With bezel, flexible cable: 0.5… 1.5 mm²			

Connections: page 2/238
Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules types XPS DMB, XPS DME

For coded magnetic switch monitoring



XPS DMB1132●



XPS DME1132

References

Description	Type of terminal block connection	Number of safety circuits	Solid-state outputs for PLC	Supply V	Reference	Weight kg
Safety module for monitoring 2 coded magnetic switches	Integrated in module	2 N/O	2	⎓ 24	**XPS DMB1132**	0.250
Safety module for monitoring 6 coded magnetic switches	Integrated in module	2 N/O	2	⎓ 24	**XPS DME1132**	0.300
Safety module for monitoring 2 coded magnetic switches	Removable from module	2 N/O	2	⎓ 24	**XPS DMB1132P**	0.250
Safety module for monitoring 6 coded magnetic switches	Removable from module	2 N/O	2	⎓ 24	**XPS DME1132P**	0.300

Connections:
page 2/238

Dimensions:
page 2/262

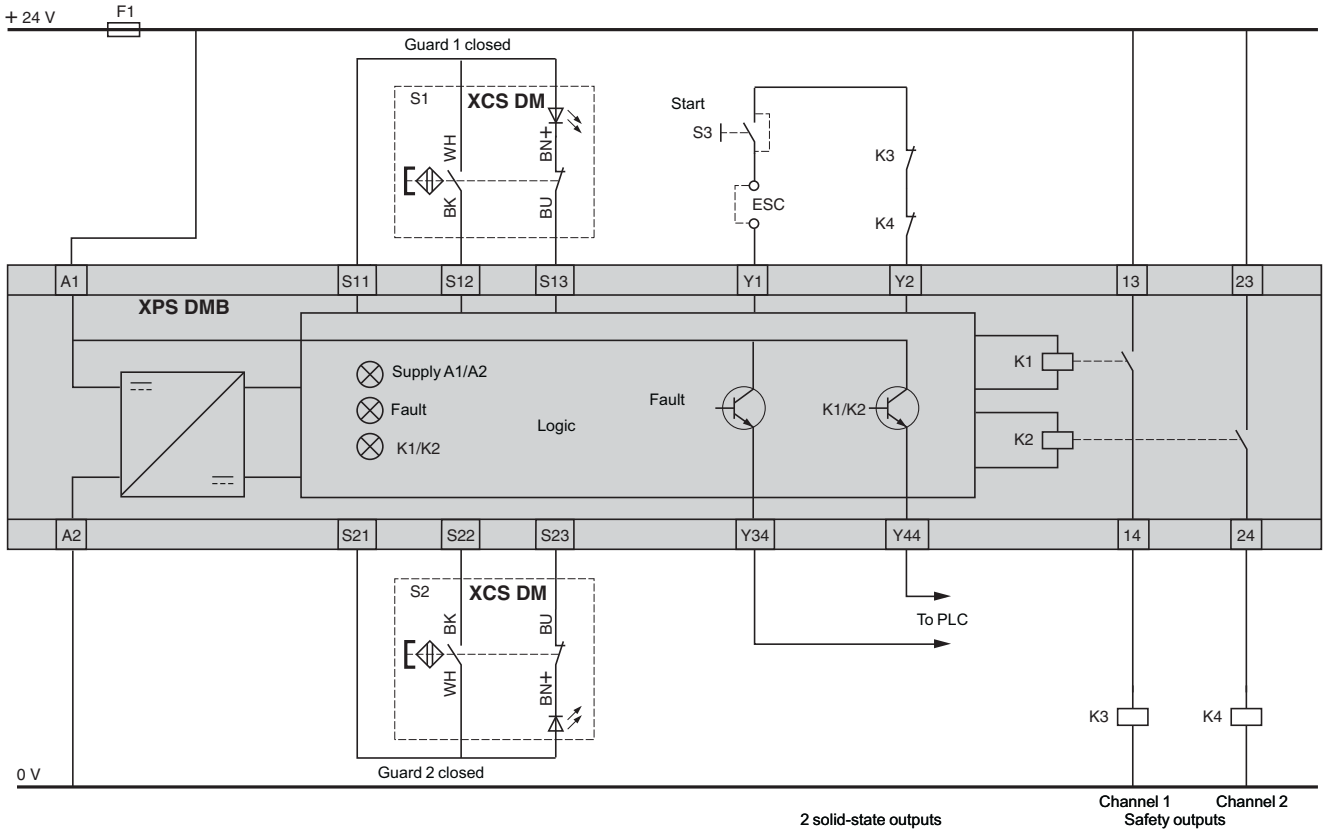
Safety automation system solutions

Preventa safety modules types XPS DMB, XPS DME

For coded magnetic switch monitoring

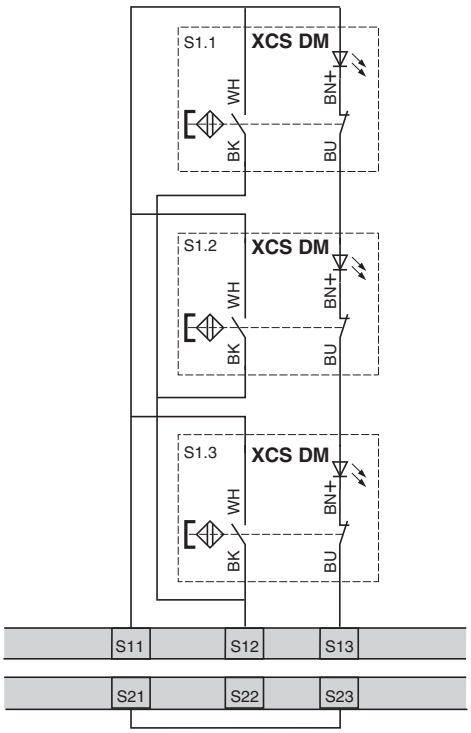
XPS DMB

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N/C + N/O (N/C staggered) contact.
For example with 3-pole N/C + N/C + N/O contact see page 3/58



ESC: External start conditions.

Wiring to category 3 conforming to EN 954-1/ISO 13849-1. Example with 3 switches with 2-pole N/C + N/O (N/C staggered) contacts.



Input: S11, S12, S13 or S21, S22, S23.
Input not used: terminals S21-S23 linked.

Principle: page 2/236 | Characteristics: page 2/236 | References: page 2/237 | Dimensions: page 2/262

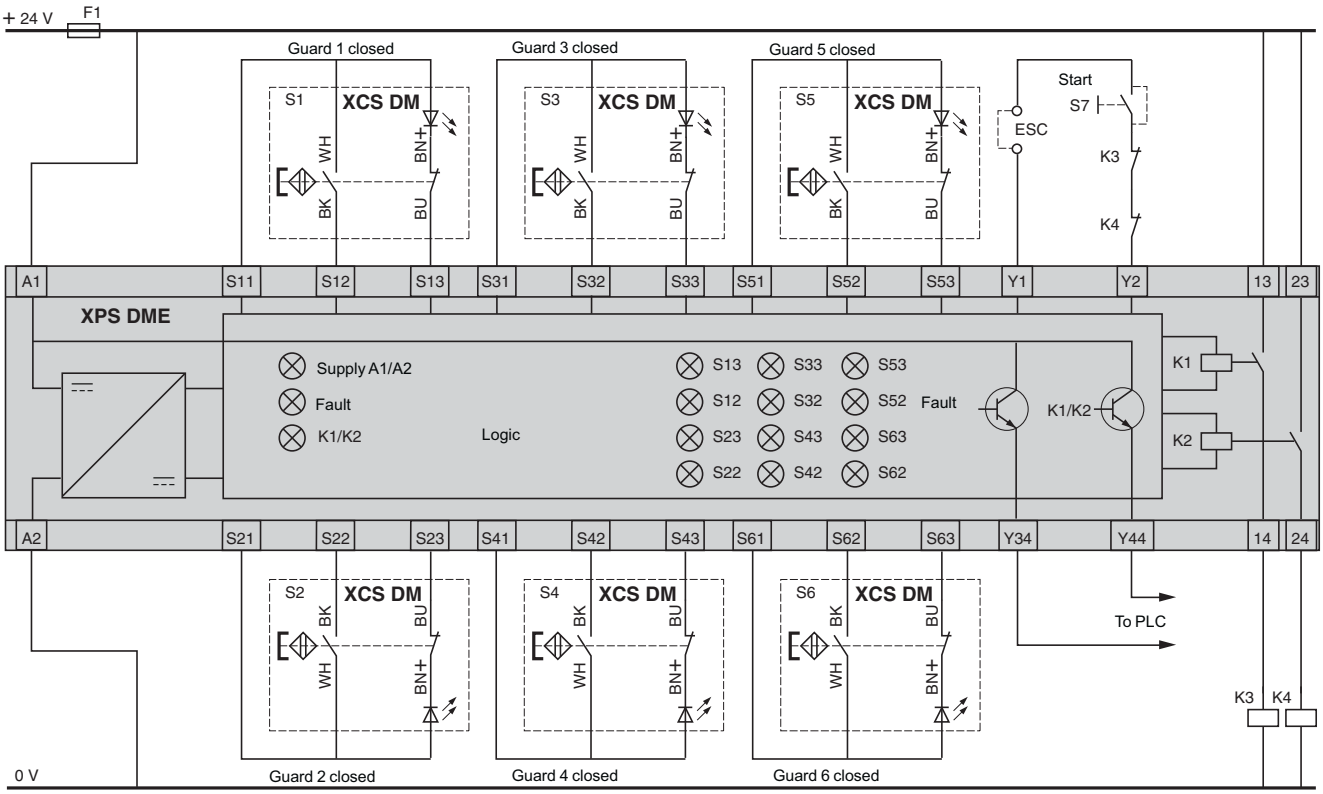
Safety automation system solutions

Preventa safety modules types XPS DMB, XPS DME

For coded magnetic switch monitoring

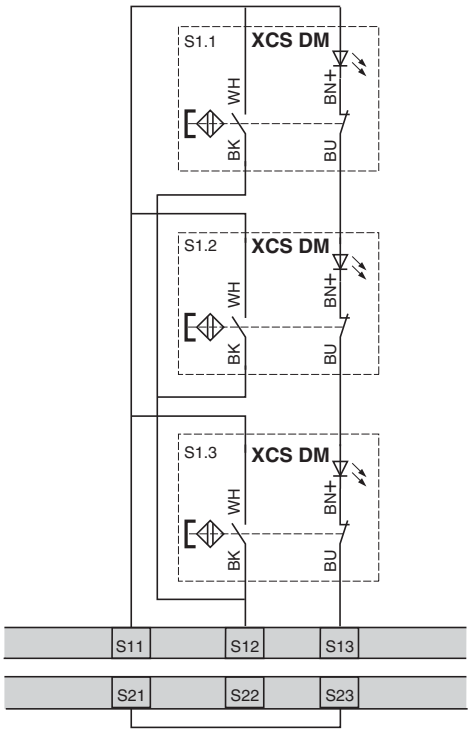
XPS DME

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N/C + N/O (N/C staggered) contact



ESC: External start conditions.

Wiring to category 3 conforming to EN 954-1/ISO 13849-1. Example with 3 switches with 2-pole N/C + N/O (N/C staggered) contacts.



Input: S11, S12, S13 or S21, S22, S23 or S31, S32, S33 or S41, S42, S43 or S51, S52, S53 or S61, S62, S63.
Input not used: terminals S●1-S●3 (S21-S23, S31-S33, S41-S43, S51-S53, S61-S63) linked.

Principle: page 2/236 | Characteristics: page 2/236 | References: page 2/237 | Dimensions: page 2/262

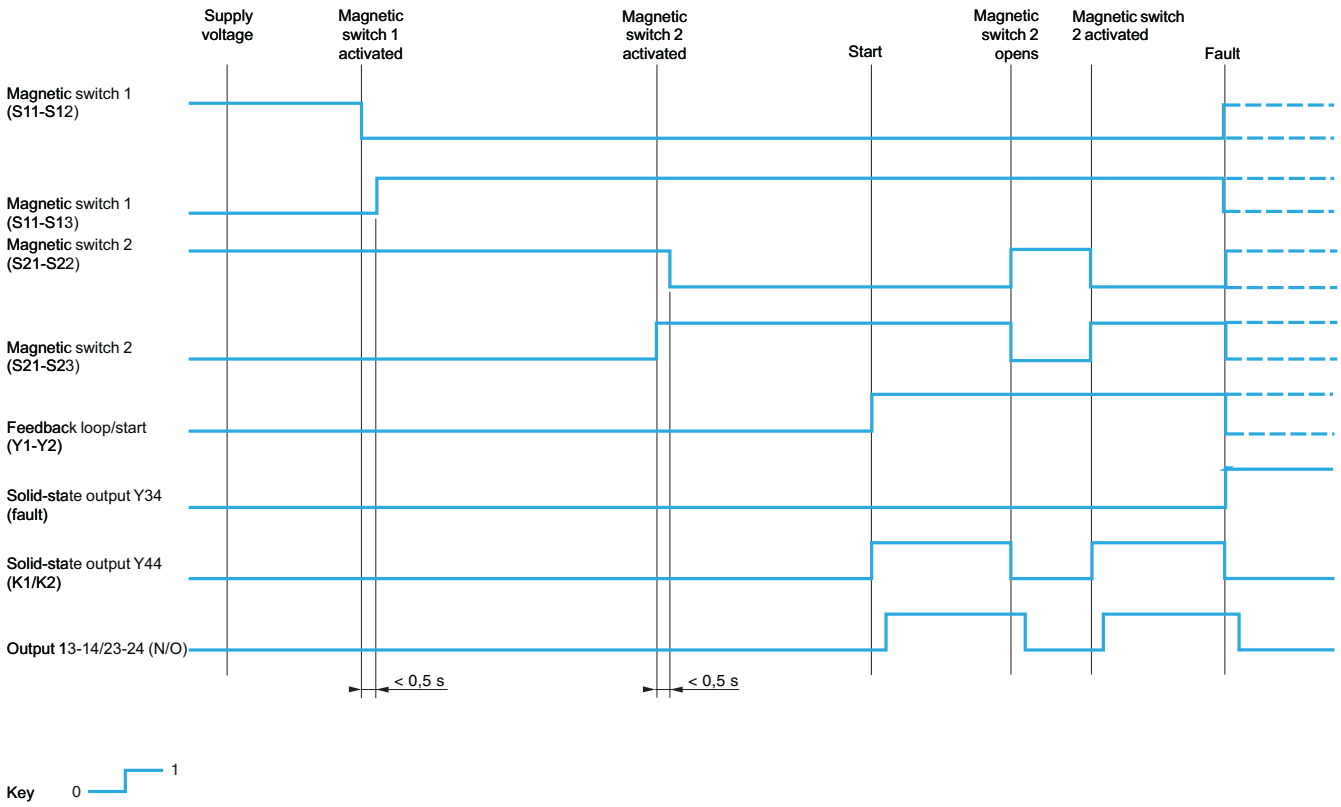
Safety automation system solutions

Preventa safety modules types XPS DMB, XPS DME

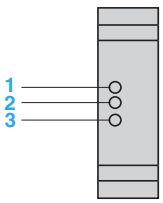
For coded magnetic switch monitoring

XPS DMB

Functional diagram



LED details



1 Supply voltage A1-A2, internal electronic fuse status.
2 Fault signalling.
3 Safety outputs closed.

Principle: page 2/236
Characteristics: page 2/236
References: page 2/237
Dimensions: page 2/262

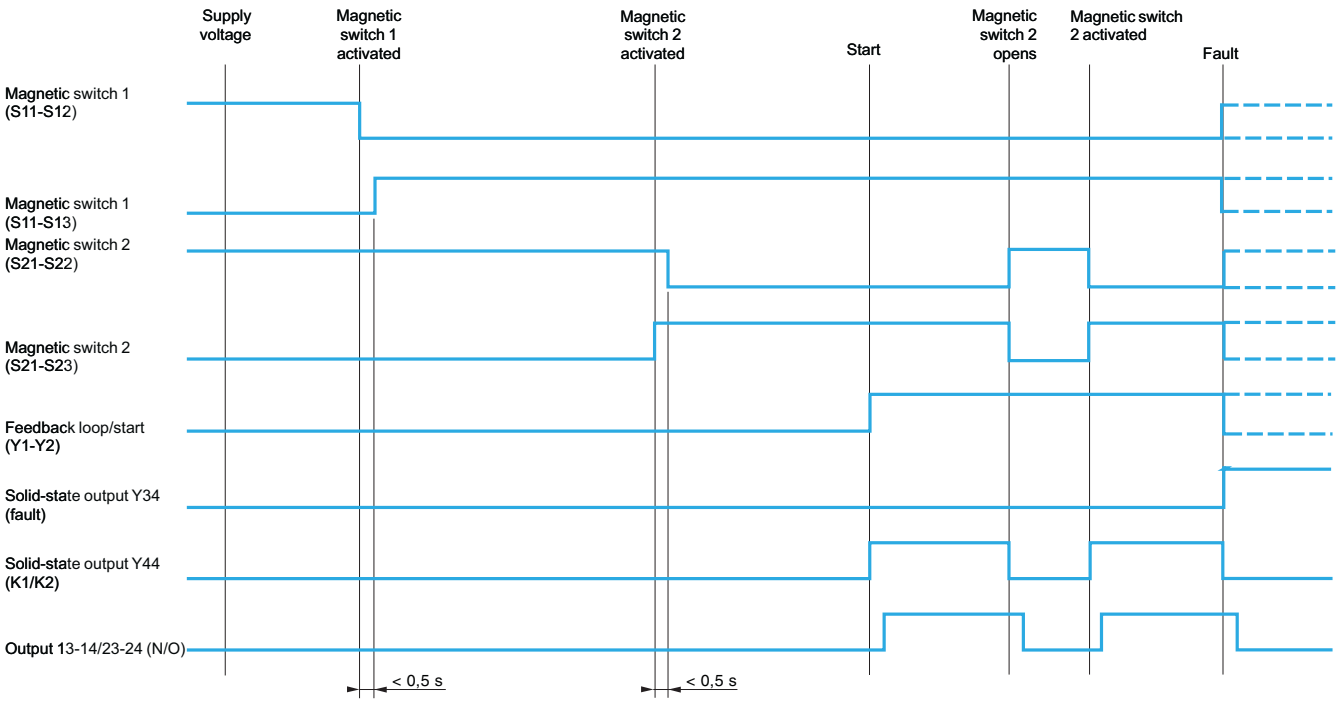
Safety automation system solutions

Preventa safety modules types XPS DMB, XPS DME

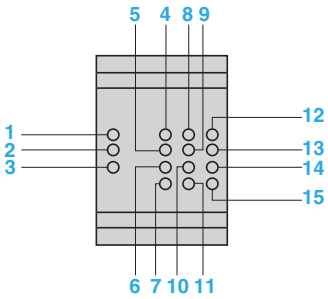
For coded magnetic switch monitoring

XPS DME

Functional diagram



LED details



1 Supply voltage A1-A2, internal electronic fuse status.
2 Fault signalling.
3 Safety outputs closed.
4 Magnetic switch 1 activated.
5 Magnetic switch 1 deactivated.
6 Magnetic switch 2 activated.
7 Magnetic switch 2 deactivated.
8 Magnetic switch 3 activated.
9 Magnetic switch 3 deactivated.
10 Magnetic switch 4 activated.
11 Magnetic switch 4 deactivated.
12 Magnetic switch 5 activated.
13 Magnetic switch 5 deactivated.
14 Magnetic switch 6 activated.
15 Magnetic switch 6 deactivated.

Principle: page 2/236
Characteristics: page 2/236
References: page 2/237
Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS VNE
For zero speed detection

Operating principle

Preventa safety modules XPS VNE for zero speed detection are used to detect the stop condition of electric motors. Their most common applications include: providing the unlock signal for electrically interlocked sliding or removable machine guards, controlling rotation direction signals for reversing motors and engaging locking brakes after a motor has come to a standstill.

As electric motors run down, a remanent voltage is produced in the windings of the motor due to residual magnetism. This voltage is proportional to the speed of the motor and, therefore, decreases as the motor comes to a standstill.
This remanent voltage is measured in a redundant manner so as to detect the stop condition of the motor. The cabling between the motor windings and the inputs of the XPS VNE module is also monitored to prevent a cabling breakage or fault being seen as a stopped motor.
A transformer should not be used to connect the motor to terminals Z1, Z2 and Z3 since there is no monitoring of the connection with the motor winding via the resistance monitoring.

Modules XPS VNE are suitable for detecting the stop condition of all types of a.c. or d.c. motor driven machines which, when the motor runs down, produce a remanent voltage in the windings due to residual magnetism. These machines can be controlled by electronic devices, such as variable speed drives or d.c. injection brakes.
The input filters for standard XPS VNE modules are designed for a frequency of up to 60 Hz.
For motors operating at a frequency higher than 60 Hz, which therefore produce a high frequency remanent voltage, special modules XPS VNE●●●●HS should be used.

Modules XPS VNE have 2 potentiometers mounted on the front face of the module which allow independent adjustment of the switching threshold for each input circuit. This allows adjustment for different types of motors and application requirements.

To aid diagnostics, modules XPS VNE have 4 LEDs and 2 solid-state outputs to provide information on the status of the zero speed detection circuit.

Connections:
page 2/244

Dimensions:
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Safety automation system solutions
Preventa safety modules type XPS VNE
For zero speed detection

Characteristics

Module type				XPS VNE
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 3 max.
Conformity to standards				EN 60204-1, EN/IEC 60947-5-1, EN 50082-2
Product certifications				UL, CSA, BG
Supply	Voltage		**V**	⎓ 24 ∿ 115 ∿ 230
	Voltage limits			- 15…+ 10% (⎓ 24 V) - 15…+ 15% (∿ 115 V) - 15…+ 10% (∿ 230 V)
	Frequency		**Hz**	50/60 (115 V, 230 V)
Consumption			**W**	⩽ 3.5 (⎓ 24 V)
			VA	⩽ 7.5 (∿115 V), ⩽ 7 (∿ 230 V)
Frequency of motor power supply			**Hz**	⩽ 60 Hz (XPS VN●●42), > 60 Hz (XPS VN●●42HS)
Inputs	Maximum voltage between terminals Z1 - Z2 - Z3		**V**	500 rms
	Detection threshold		**V**	0.01 - 0.1 (adjustable)
Outputs	Voltage reference			Volt-free
	Number and type of safety circuits			1 N/O (13-14), 1 N/C (21-22)
	Number and type of additional circuits			2 solid-state
	Breaking capacity in AC-15			C300 (inrush: 1800 VA/maintained: 180 VA)
	Breaking capacity in DC-13			24 V/1.5 A - L/R = 50 ms (contact 13-14) 24 V/1.2 A - L/R = 50 ms (contact 21-22)
	Breaking capacity of solid-state outputs			24 V/20 mA, 48 V/10 mA
	Max. thermal current (Ithe)		**A**	2.5
	Output fuse protection		**A**	4 gG, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200
	Minimum current (volt-free contact)		**mA**	10 *(1)*
	Minimum voltage (volt-free contact)		**V**	17 *(1)*
Electrical durability				See page 2/172
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp)			**kV**	4 (overvoltage category III, conforming to EN//IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
LED display				4
Operating temperature			**°C**	- 10…+ 55
Storage temperature			**°C**	- 25…+ 85
Degree of protection Conforming to IEC 60529		Terminals		IP 20
		Enclosure		IP 40
Connection		Type		Captive screw clamp terminals, removable terminal block
	1-wire connection	Without cable end		Solid or flexible cable: 0.2…2.5 mm²
		With cable end		Without bezel, solid or flexible cable: 0.25…2.5 mm²
				With bezel, solid or flexible cable: 0.25…2.5 mm²
	2-wire connection	Without cable end		Solid cable: 0.2…1 mm², flexible cable: 0.2…1.5 mm²
		With cable end		Without bezel, flexible cable: 0.25…1 mm²
				With bezel, flexible cable: 0.5…1.5 mm²

(1) The module is also capable of switching low power loads (17 V/10 mA) provided that the contact has not been used for switching high power loads (possible contamination or wear of the gold layer on the contact tips).

References



XPS VNE

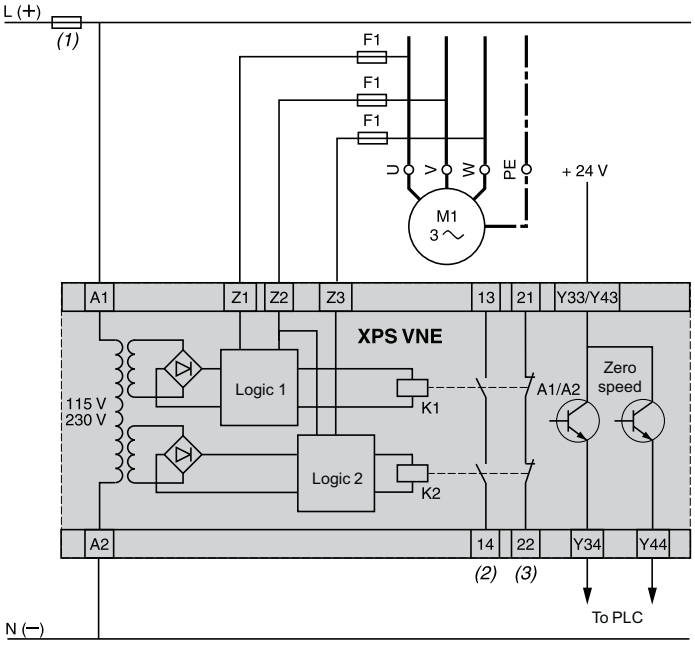
Description	Number of safety circuits	Solid-state outputs for PLC	Supply	Frequency of motor power supply	Reference	Weight kg
Safety modules for zero speed detection	2	2	⎓ 24 V	⩽ 60 Hz	**XPS VNE1142P**	0.500
				> 60 Hz	**XPS VNE1142HSP**	0.500
			∿ 115 V	⩽ 60 Hz	**XPS VNE3442P**	0.600
				> 60 Hz	**XPS VNE3442HSP**	0.600
			∿ 230 V	⩽ 60 Hz	**XPS VNE3742P**	0.600
				> 60 Hz	**XPS VNE3742HSP**	0.600

Connections: page 2/244
Dimensions: page 2/262

Safety automation system solutions
Preventa safety modules type XPS VNE
For zero speed detection

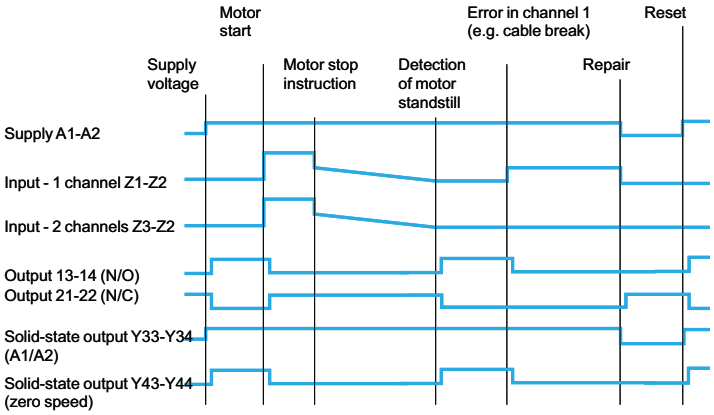
XPS VNE

Wiring diagram



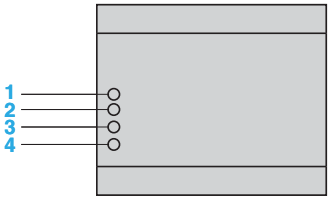
(1) Technical characteristics for establishing maximum rating of fuses, see page 2/243.
(2) Disengagement in event of stop.
(3) Motor running.
F1 = 2 A

Functional diagram of module XPS VNE



Key 0 1
The voltages at terminals Z1, Z2 and Z3 are indicated solely for the purposes of schematic diagram representation.

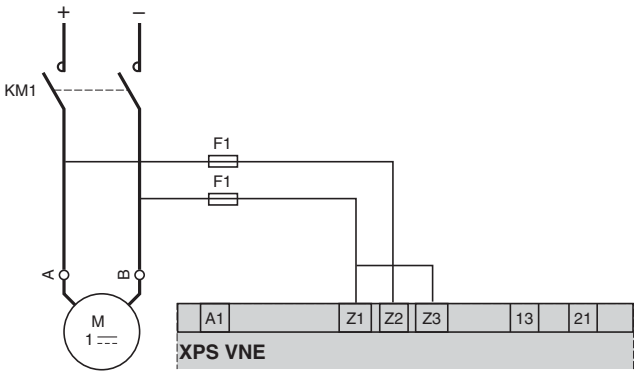
LED details



1 Supply voltage A1-A2.
2 Stop detected by channel 1.
3 Stop detected by channel 2.
4 Motor stop condition detected by both channels within time window.

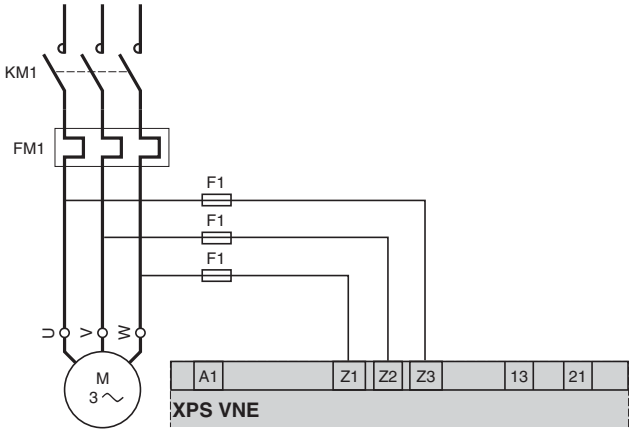
Principle: page 2/242
Characteristics: page 2/243
References: page 2/243
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Module XPS VNE associated with a d.c. motor



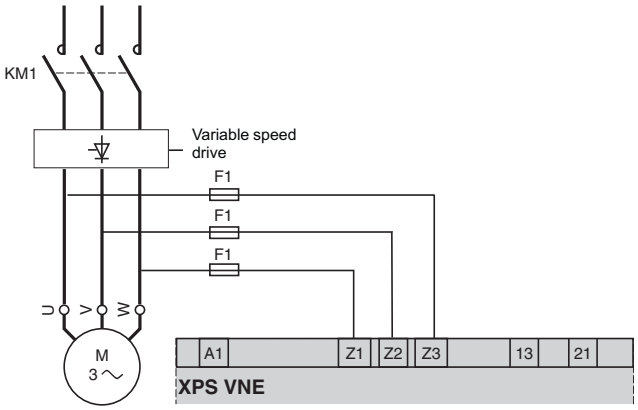
F1 = 2 A

Module XPS VNE associated with a 3-phase motor



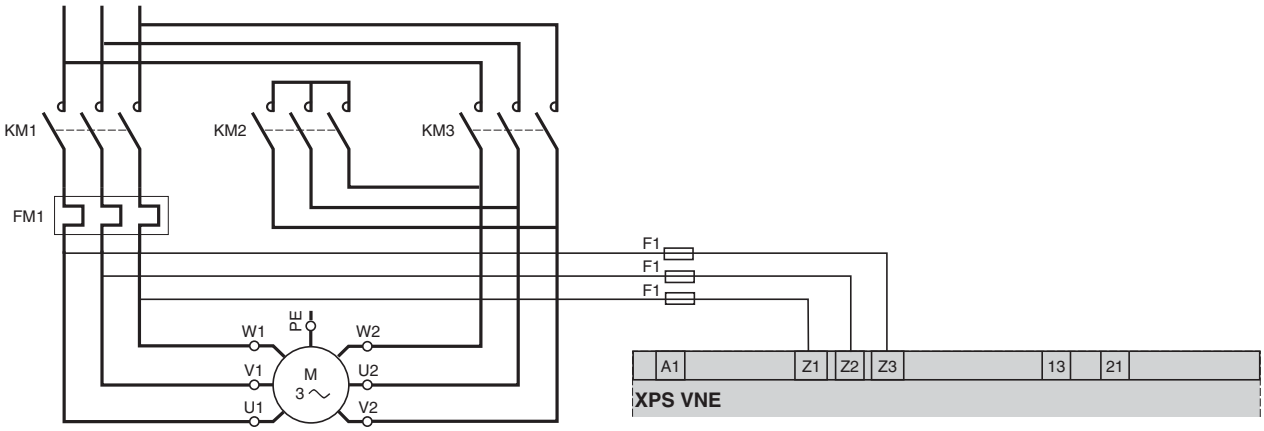
F1 = 2 A

Module XPS VNE associated with a 3-phase motor + variable speed drive



F1 = 2 A

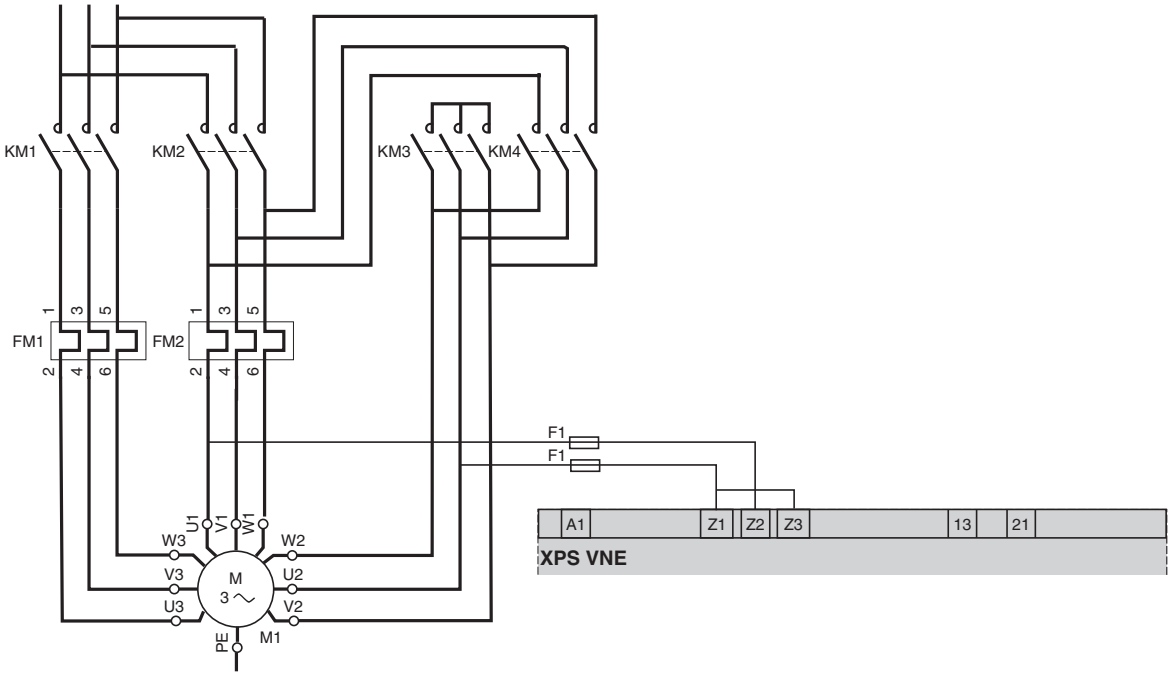
Module XPS VNE associated with a 3-phase motor with start-delta starting



F1 = 2 A
KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
The “Star” contactor (KM3) must be closed after the motor is de-energised, in order to allow detection of zero speed.

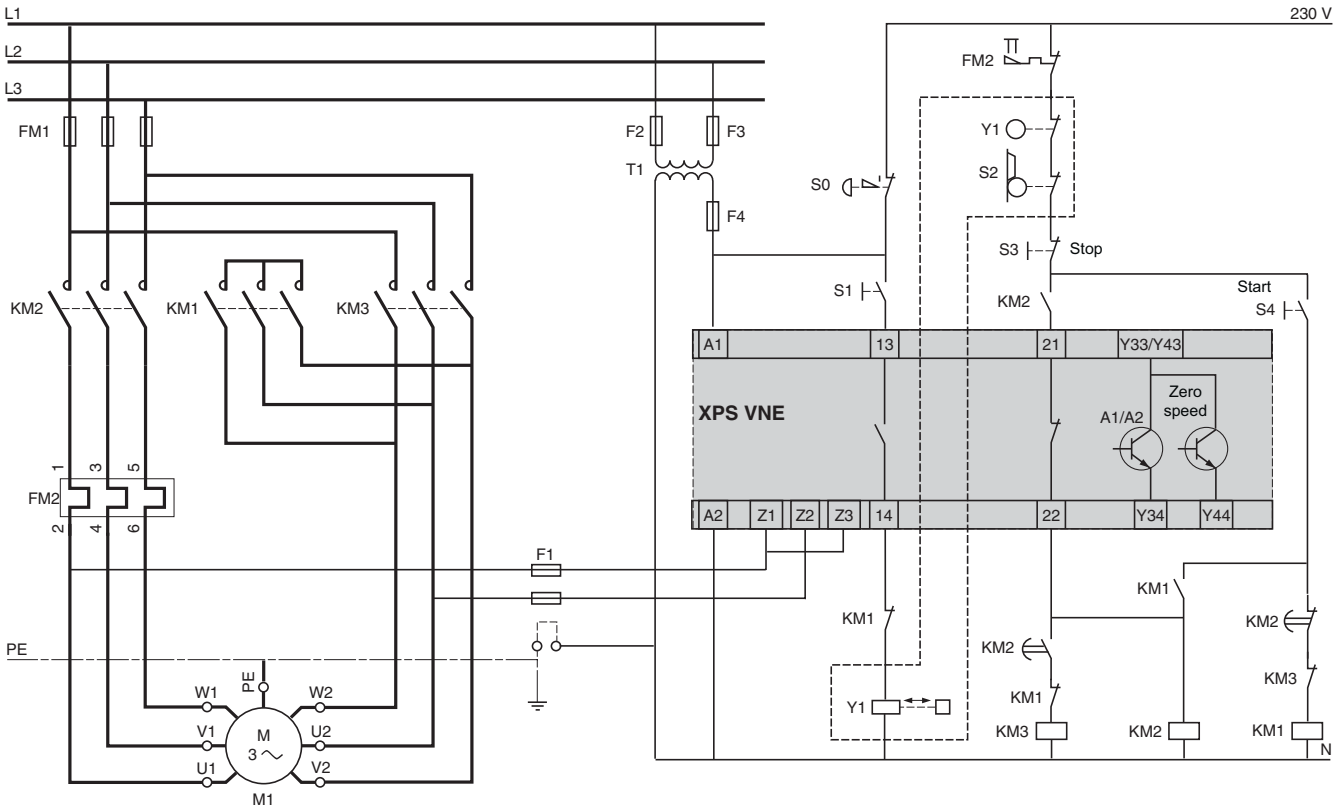
2

Module XPS VNE associated with a 3-phase motor with variable number of poles and star-delta starting

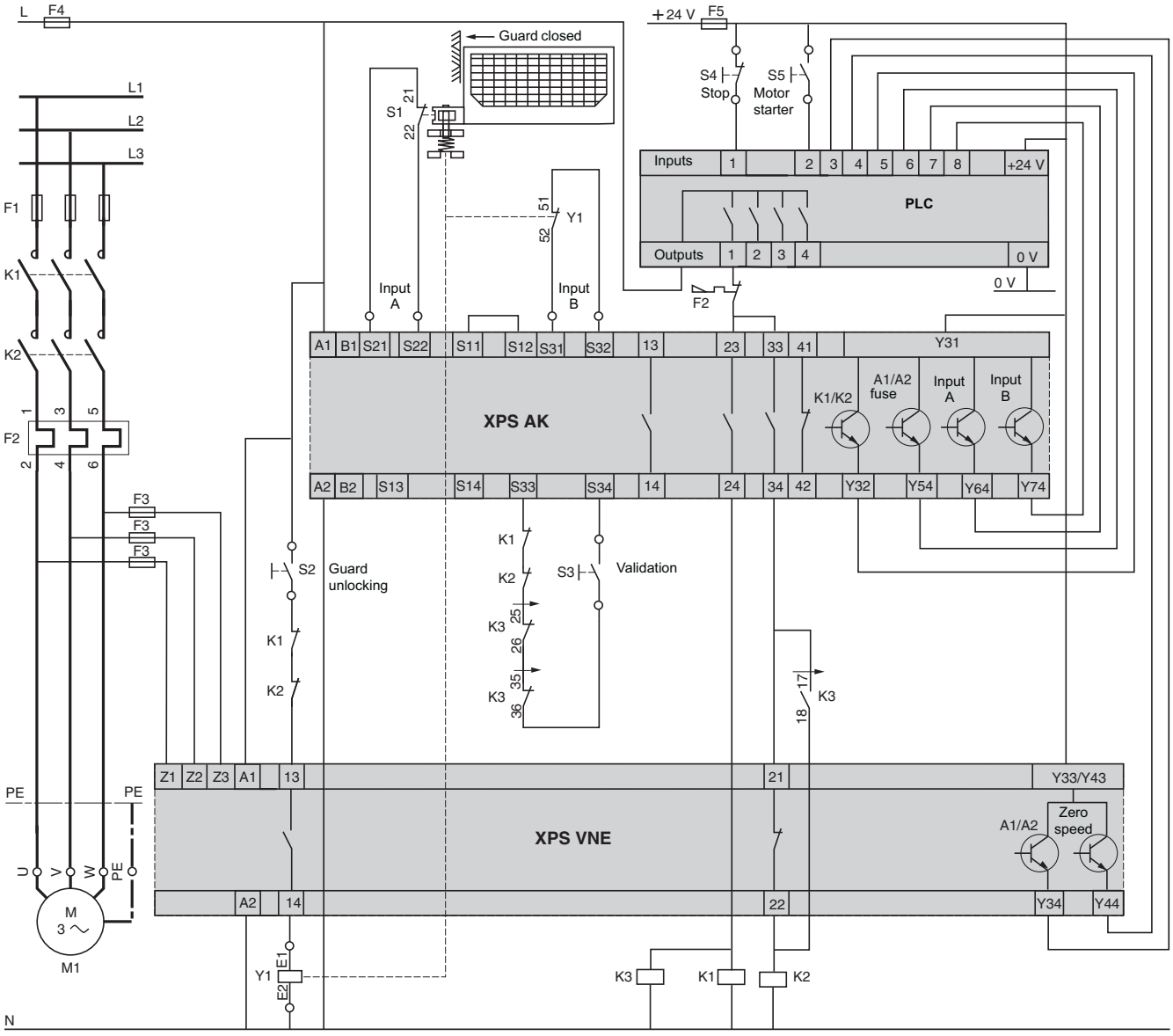


F1 = 2 A
KM1: Fast rotation speed
KM2: Slow rotation speed
KM3: Star
KM4: Delta

Module XPS VNE associated with a star-delta motor starter and guard switch type XCS E



Association of safety modules XPS VNE and XPS AK

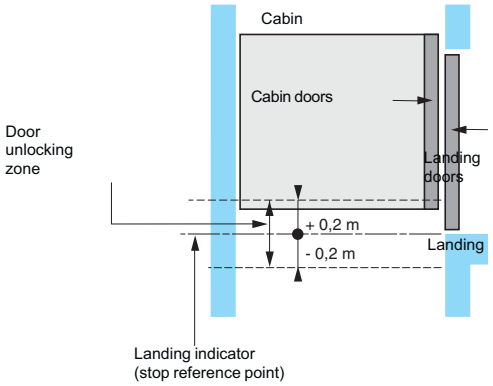


S1 + Y1: Guard switch with solenoid locking on de-energisation, type XCS E or XCS L

Pulse on de-energisation relay XPS TSW

Safety automation system solutions
Preventa safety modules type XPS DA
For lift control

Operating principle



When the cabin is parked at a landing, with the doors open, some lifts automatically correct their level (isolevelling) in relation to the landing in order to compensate for any differences generated by modification of the load in the cabin.
During this operation, European standard EN-81 recommends that the presence of the cabin be checked within a zone of +/- 0.2 m around the landing (door unlocking zone), by means of a safety circuit which will cause the cabin to stop if it moves out of the specified zone.

The use of a safety module XPS DA, which checks the presence of the cabin in the specified zone at two points, meets this requirement.
The module incorporates two safety outputs and two solid-state outputs for signalling functions. Four LEDs on the front face of the module provide visual indication of the status of the safety circuit.
The position of the cabin in relation to the landing is detected by two limit switches in the lift shaft. It is also possible to use non-contact sensors (magnetic sensors with reed contact).
When the cabin reaches the preset position and when it is within the permissible tolerances in relation to the landing, the two safety circuits in safety module XPS DA close and allow isolevelling of the cabin with the doors open. Any change in one of the input signals (cabin outside the specified zone) or detection of a fault (break in the wiring, short-circuit, etc.) causes immediate opening of the safety outputs in the XPS DA module and subsequent stopping of the cabin.

Characteristics

Module type			**XPS DA**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.
Conformity to standards			EN 81-1, EN 81-2, EN/IEC 60947-5-1, EN 50082-2, EN 12015, EN 12016
Product certifications			UL, CSA, TÜV
Supply	Voltage	**V**	∼ and ⎓ 24, ∼ 115, ∼ 230
	Voltage limits		- 20…+ 10% (∼ 24 V), - 20…+ 20% (⎓ 24 V), - 15…+ 15% (∼ 115 V), - 15…+ 15% (∼ 230 V)
	Frequency	**Hz**	50/60
Maximum consumption	24 V	**VA**	< 9
	115 V/230 V	**VA**	< 10
Module inputs fuse protection			Internal, electronic
Control unit voltage between S11-S12, S21-S22		**V**	24 (24 V version), 48 (115 V, 230 V versions)
Protection of the control unit contacts			By limitation of the maximum current in the event of short-circuit (< 185 mA)
Minimum voltage and current between terminals S11-S12, S21-S22 (inputs A and B)	U min./I min. - 24 V version (20 °C)		16 V/70 mA
	U min./I min. - 115 V/230 V version (20 °C)		41 V/25 mA
Calculation of wiring resistance RL between terminals S11-S12, S21-S22 as a function of the internal supply voltage U int (terminals S11-S21)		Ω	$RL\ max. = \frac{U\ int - U\ min.}{I\ min.}$ Ue = true voltage applied to terminals A1-A2 U int = supply voltage Ue - 3 V (24 V version) U int between 42 V and 45 V, with typical value = 45 V (115 V, 230 V version) RL max. must not exceed 50 Ω
Synchronisation time between inputs A and B, automatic start, linked terminals S33-S34 and Y3-Y4		**ms**	Approx. 300
Outputs	Voltage reference		Volt-free
	Number and type of safety circuits		2 N/O (13-14, 23-24)
	No. and type of additional circuits		2 solid-state
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms
	Breaking capacity of solid-state outputs		24 V/20 mA
	Max. thermal current (Ithe)	**A**	2.5
	Output fuse protection		6 A fast acting, 4 gG, conforming to EN/IEC 60947-5-1, DIN VDE 0660 part 200
	Minimum current (volt-free contact)	**mA**	10
	Minimum voltage (volt-free contact)	**V**	17
	Max. total thermal current		5
Electrical durability			See page 2/172
Response time on input opening		**ms**	< 40
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display			4
Operating temperature		**°C**	- 10…+ 65
Storage temperature		**°C**	- 25…+ 85
Degree of protection conforming to IEC 60529			Terminals: IP 20. Enclosure: IP 50
Connection	Type		Captive screw clamp terminals: without cable end 1 x 4 mm^2, with cable end 2 x 2.5 mm^2

Safety automation system solutions

Preventa safety modules type XPS DA

For lift control

References



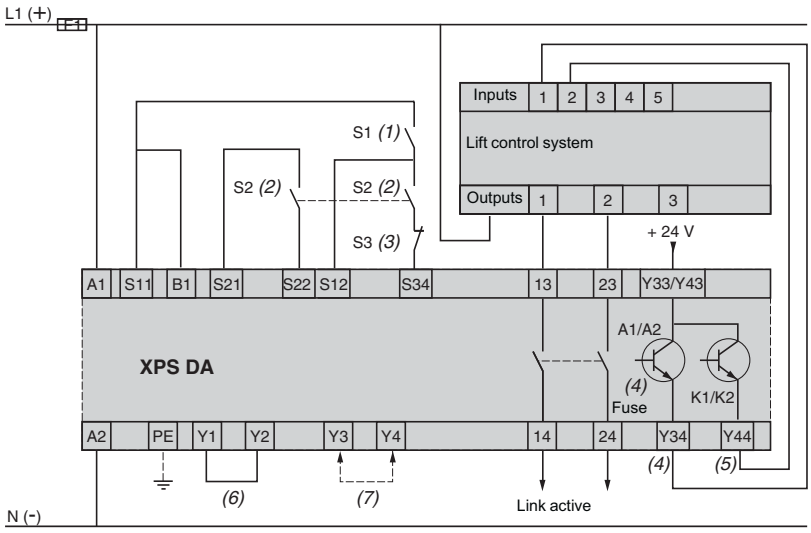
XPS DA

Description	Number of safety circuits	Solid-state outputs for PLC	Supply	Reference	Weight kg
Safety modules for lift control	2	2	∿ and ⎓ 24 V	**XPS DA5142**	0.350
			∿ 115 V	**XPS DA3442**	0.450
			∿ 230 V	**XPS DA3742**	0.450

Connections

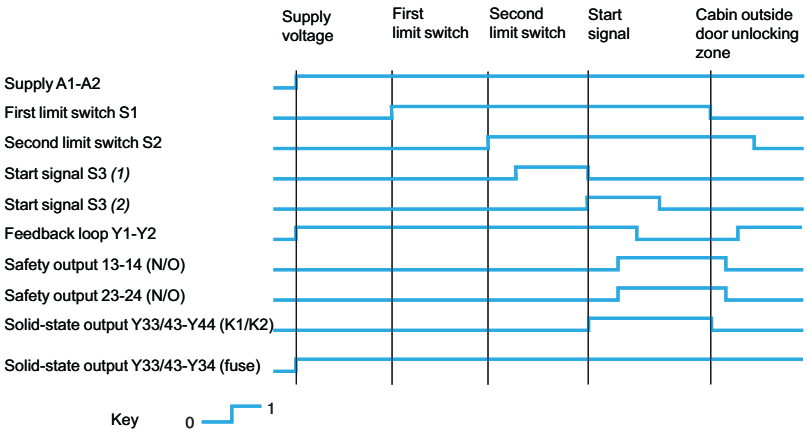
XPS DA

Module XPS DA associated with a lift control system



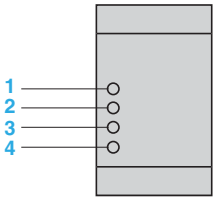
(1) Limit switch S1 (cabin position).
(2) Limit switch S2 (cabin position).
(3) Enable instruction given by the lift control system.
(4) Operating status of internal electronic fuse.
(5) Output status (only permissible for functions not relating to safety).
(6) Feedback loop.
(7) Without start signalling monitoring (Y3-Y4 linked).

Functional diagram of module XPS DA



(1) With start signal monitoring, Y3-Y4 open.
(2) Without start signalling monitoring, Y3-Y4 linked.

LED details



1 Supply voltage A1-A2.
Fuse status.
2 Input S12 (A).
3 Input S22 (B).
4 K1/K2 status (N/O safety outputs closed).

Dimensions:
page 2/262

Safety automation system solutions

Preventa safety module type XPS PVT

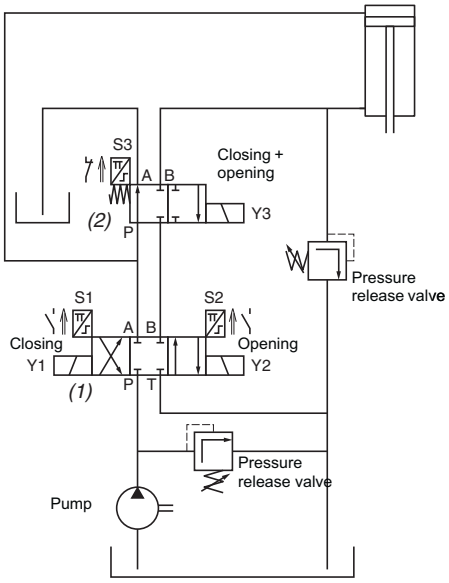
For dynamic monitoring of hydraulic valves on linear presses

Operating principle

Safety module XPS PVT is specifically designed for monitoring hydraulic safety system valves which control the movements of potentially dangerous machines.
The operating principle of this module is explained in the circuit diagram of a hydraulic safety system for linear presses (see below).

This hydraulic safety system features a 3 position piston which controls the up and down stroke of the operating cylinder. The circuit is equipped with a safety valve, to complete the redundant system. This circuit must be activated to enable the up and down stroke of the cylinder.
If either of the 2 pistons becomes defective (for example, due to a broken spring or to oil contamination), and the valve piston shifts from its normal position towards the open position, the XPS PVT module will detect it and prevent resumption of the piston stroke.
Proximity sensors integrated in the valve to detect the piston positions and connected to the XPS PVT module must be damped when the valve coils are in the de-energised state (zero position).
The sensor circuits of the XPS PVT module are designed to allow connection of NPN and PNP proximity sensors or sensing components. Either 2-wire or 3-wire types can be used.
The wiring diagram on page 2/252 shows how to connect proximity sensors.

Hydraulic safety system circuit operating on a linear press.
Monitoring of valves in position 0.



(1) 3 position hydraulic valve.
(2) 2 position hydraulic valve.

Connections:
page 2/252

Dimensions:
page 2/262

Safety automation system solutions

Preventa safety module type XPS PVT

For dynamic monitoring of hydraulic valves on linear presses

Characteristics

Module type				XPS PVT
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)				Category 4 max.
Conformity to standards				EN 60204-1, EN/IEC 60947-5-1, EN 693, EN 50082-2
Product certifications				UL, CSA
Supply	Voltage		**V**	⎓ 24
	Voltage limits			- 10…+ 10%
Consumption			**W**	< 6
Outputs	Voltage reference			Volt-free
	Number and type of safety circuits			2 N/O (13-14, 33-34) + 1 N/C (21-22)
	Number and type of additional circuits			–
	Wiping time		**ms**	100 (minimum value)
	Breaking capacity	AC-15	**VA**	C300: inrush 1800, maintained 180
		DC-13	**VA**	24 V/1.5 A - L/R = 50 ms
	Max. thermal current (Ithe)		**A**	2.5
	Output fuse protection, using fuses conforming to EN/IEC 60947-5-1, VDE 0660 part 200		**A**	4 gG
	Minimum current		**mA**	10
	Minimum voltage		**V**	17
Electrical durability				See page 2/172
Response time			**ms**	< 15
Rated insulation voltage (Ui)			**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)			**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display				8
Operating temperature			**°C**	- 10…+ 55
Storage temperature			**°C**	- 25…+ 85
Degree of protection conforming to IEC 60529		Terminals		IP 20
		Enclosure		IP 40
Polycarbonate enclosure		Type		Removable
		Number of terminals		20
Connection		Type		Captive screw clamp terminals: without cable end 2 x 2.5 mm², with cable end 2 x 1.5 mm², min. Ø 0.5 mm

Reference



XPS PVT

Description	Display	Supply	Reference	Weight kg
Safety module for dynamic monitoring of hydraulic valves on linear presses	8 LEDs	⎓ 24 V	**XPS PVT1180**	0.540

Connections: page 2/252

Dimensions: page 2/262

Safety automation system solutions

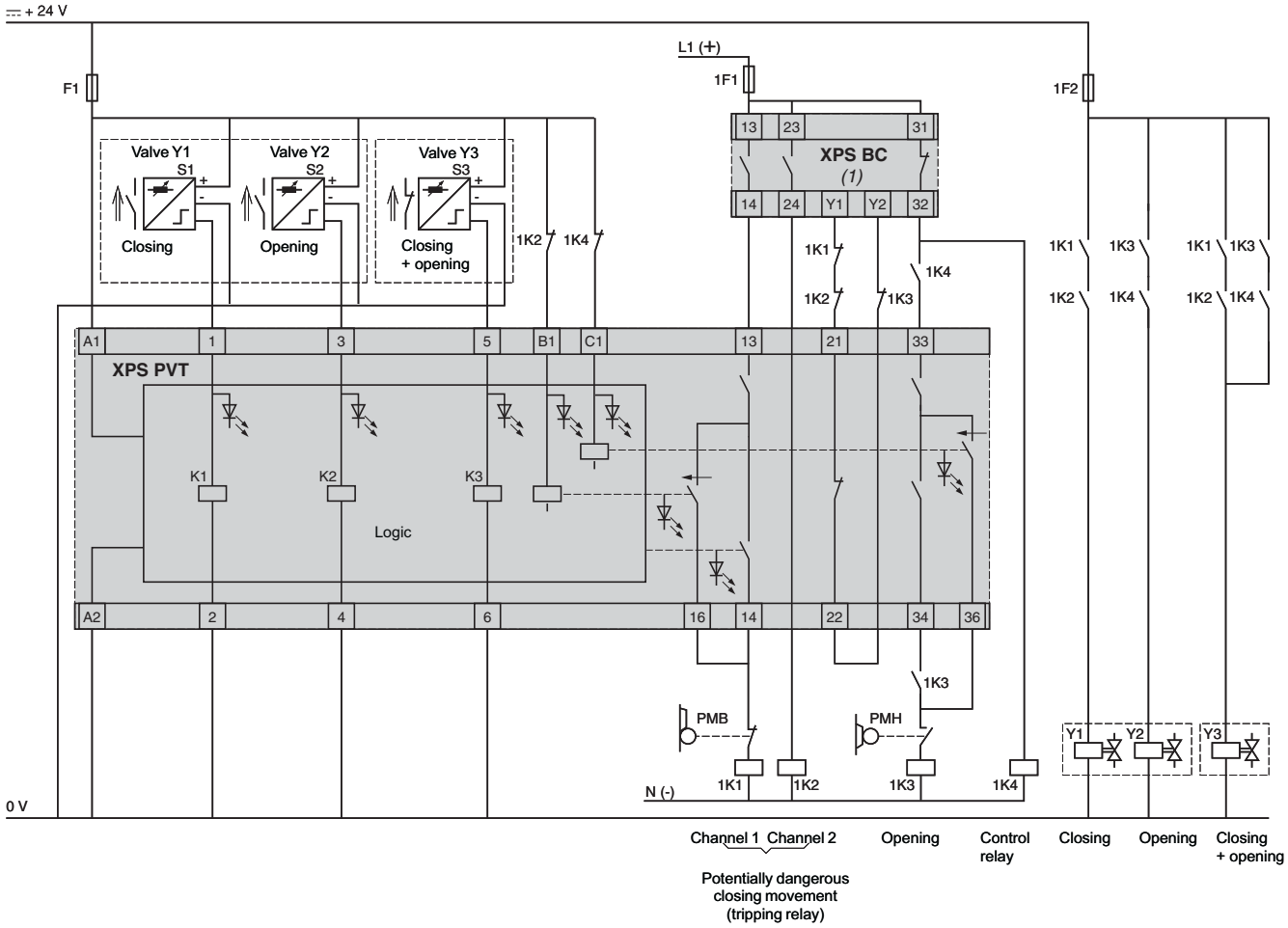
Preventa safety module type XPS PVT

For dynamic monitoring of hydraulic valves on linear presses

2

XPS PVT

Wiring diagram for module XPS PVT



(1) Two-hand control or presence sensor outputs.

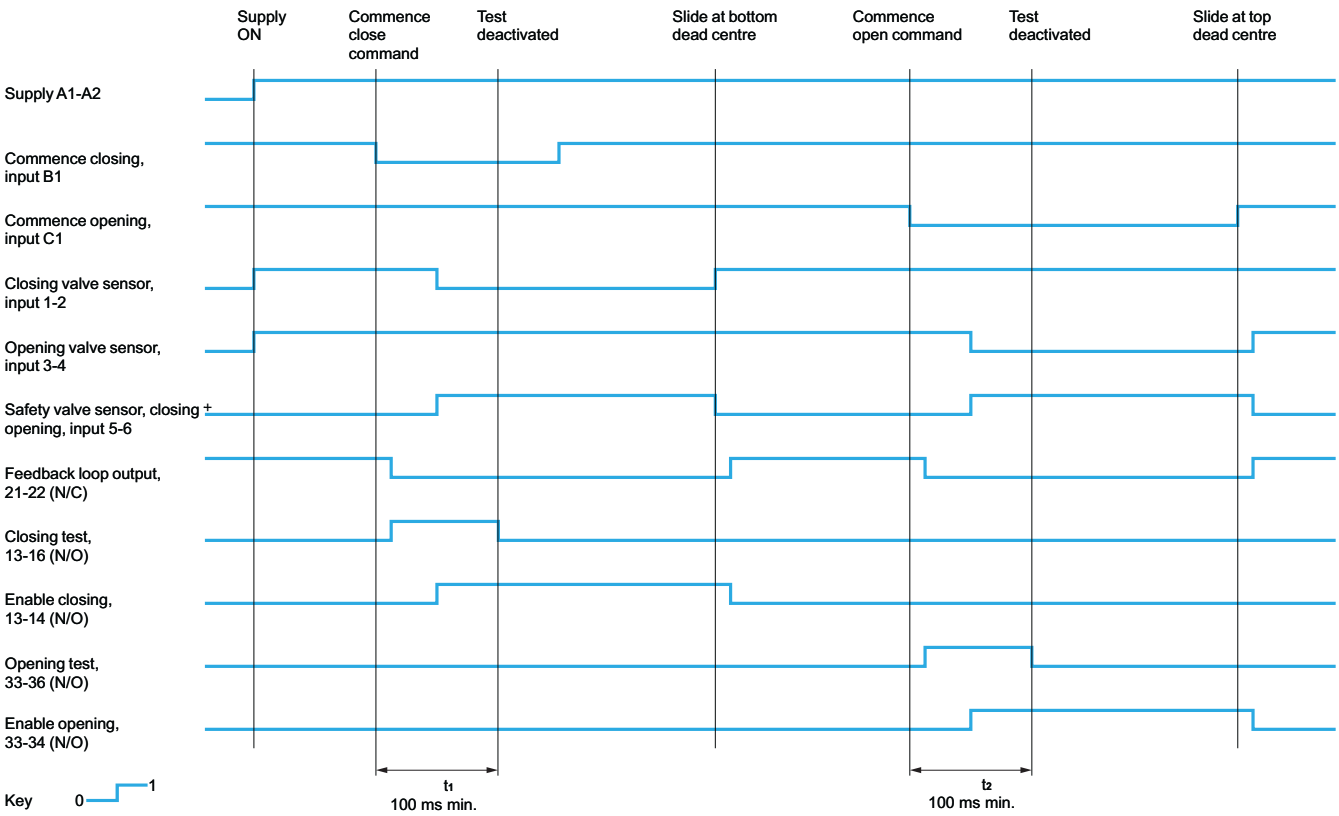
Safety automation system solutions

Preventa safety module type XPS PVT

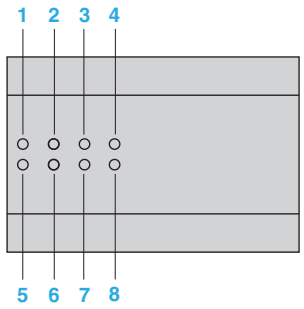
For dynamic monitoring of hydraulic valves on linear presses

XPS PVT

Functional diagram of module XPS PVT



LED details



1 Closing command.
2 Closing test.
3 Opening command.
4 Opening test.
5 Opening valve (Y2) in position 0.
6 Closing enabled.
7 Safety valve (Y3) activated.
8 Closing valve (Y2) in position 0.

Principle: page 2/250
Characteristics: page 2/251
References: page 2/251
Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules type XPS PVK

For dynamic monitoring of double-bodied solenoid valves

Operating principle

Safety module XPS PVK is specially designed for dynamic monitoring of the safety valves in eccentric presses, conforming to European standard EN 692.
This standard establishes the specifications related to safety control systems for presses equipped with friction clutches.
To meet the requirements of this standard, the clutch/brake control must be monitored dynamically.

This function is provided by a double-bodied solenoid valve (safety valve for presses) which performs the functions of two valves mounted in one body.
The position of the two valve pistons can be monitored by proximity sensors, mechanical limit switches or pressure switches.
Module XPS PVK checks for the correct operation of the double-bodied safety valves at 3 points in the cycle.
- Start at top dead centre: checks the rest position of the two valves.
- Take-on point (transfer function): checks that the two valves are in the “activated” (energised) position.
- Press stop trigger point: checks that the two valves return to the rest position.

Return must be simultaneous for both valves within a defined time period.
To set up an automatic disconnect of the XPS PVK module at the first machine stroke, a N/C auxiliary contact mounted on the main control contactor or on another contactor/relay, activated at the same time, can be wired to terminals 7 and 8 in parallel with the RESET button.
If a fault is detected during the cycle, the XPS PVK module will stop the slide stroke and will also inhibit the start of another cycle.

Characteristics

Module type			**XPS PVK**
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.
Conformity to standards			EN 60204-1, EN/IEC 60947-5-1, EN 692, EN 50082-2
Product certifications			UL, CSA
Supply	Voltage	**V**	⎓ 24, ∿115, ∿ 230
	Voltage limits		- 10…+ 10% (⎓ 24 V) - 15…+ 15% (∿ 115 V) - 15…+ 10% (∿ 230 V)
	Frequency	**Hz**	50/60
Consumption	⎓ 24 V	**W**	< 9
	∿ 115 V/230 V	**VA**	< 16
Outputs	Voltage reference		Volt-free
	Number and type of safety circuits		1 N/O (13-14) transfer function + 1 N/C (21-22) feedback loop
	Number and type of additional circuits		4 solid-state outputs
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms
	Max. thermal current (Ithe)	**A**	2.5
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA
	Output fuse protection	**A**	4 gG, conforming to EN/IEC 60947-5-1, VDE 0660 part 200
	Minimum current (volt-free contacts)	**mA**	10
	Minimum voltage (volt-free contacts)	**V**	17
Response time		**ms**	< 40
Electrical durability			See page 2/172
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display			8
Operating temperature		**°C**	- 10…+ 55
Storage temperature		**°C**	- 25…+ 85
Degree of protection Conforming to IEC 60529	Terminals		IP 20
	Enclosure		IP 40
Polycarbonate enclosure	Type		Removable
	Number of terminals		32
Connection	Type		Captive screw clamp terminals: without cable end 2 x 2.5 mm^2, with cable end 2 x 1.5 mm^2, min. Ø 0.5 mm

References: page 2/255 Connections: page 2/255 Dimensions: page 2/262

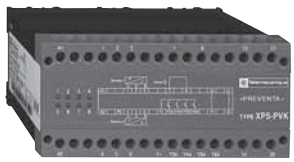
Safety automation system solutions

Preventa safety modules type XPS PVK

For dynamic monitoring of double-bodied solenoid valves

References

DF566750



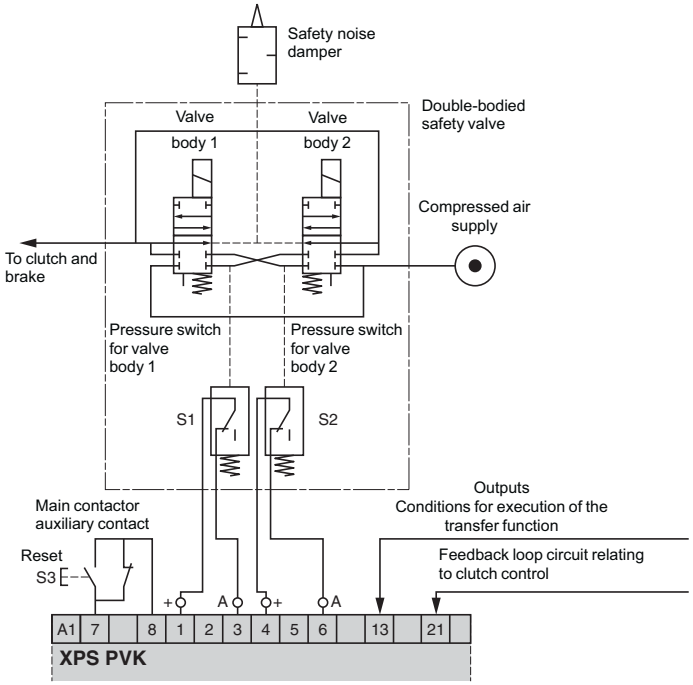
XPS PVK

Description	Display	Supply	Reference	Weight kg
Safety modules for dynamic monitoring of double-bodied solenoid valves	8 LEDs	⎓ 24 V	**XPS PVK1184**	0.700
		~ 115 V	**XPS PVK3484**	0.900
		~ 230 V	**XPS PVK3784**	0.900

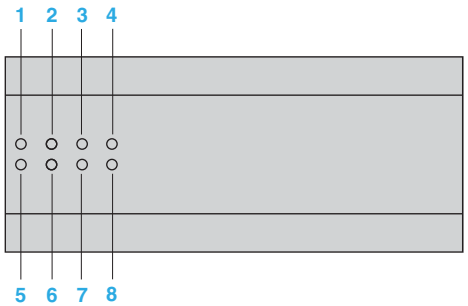
Connections

XPS PVK

Monitoring of a press safety valve by an XPS PVK module



LED details



1 ⎓ internal supply n° 1.
2 ⎓ internal supply n° 2.
3 Valve n° 1 blocked.
4 Valve n° 2 blocked.
5 Ready for monitoring
6 Disconnect synchronised.
7 Reset.
8 Valves 1 and 2 energised.

Principle, characteristics: page 2/254
Dimensions: page 2/262

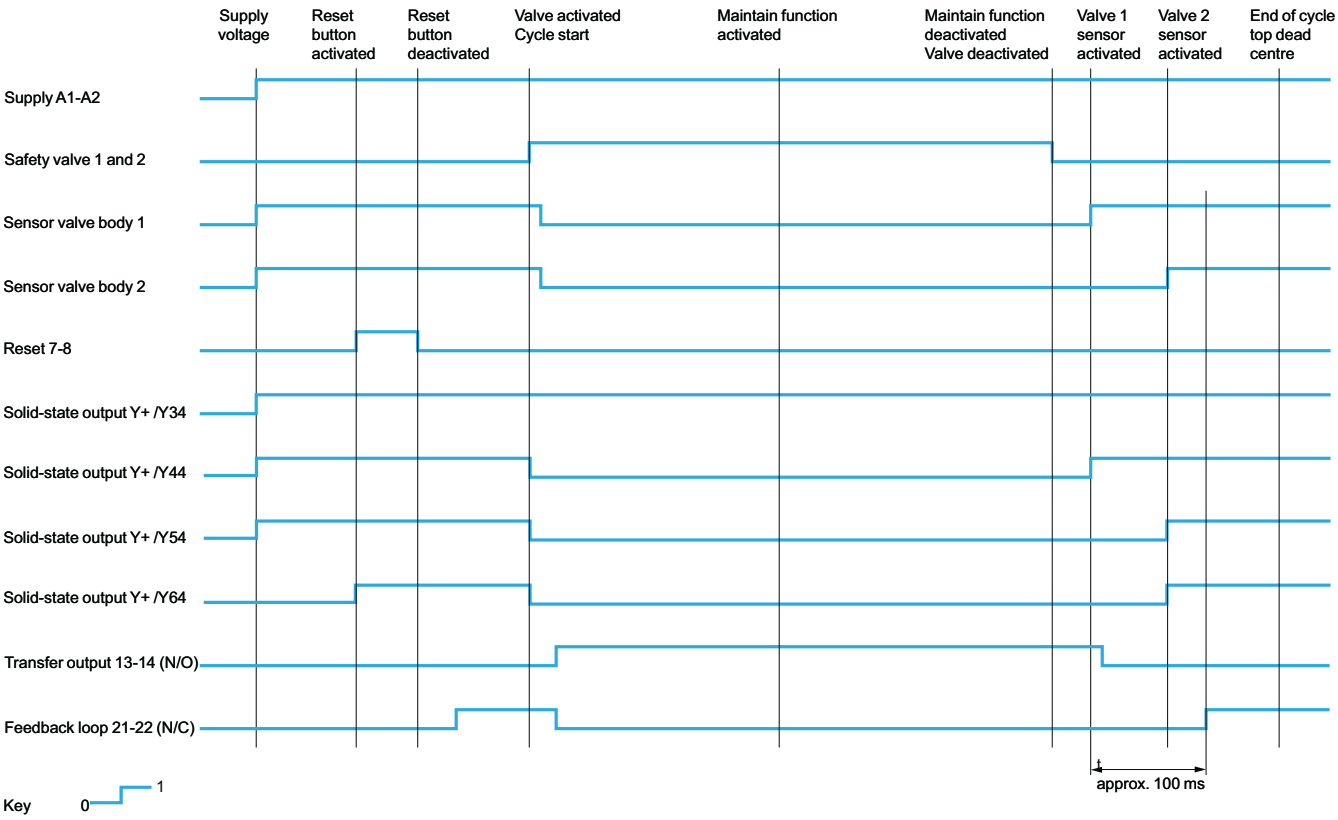
Safety automation system solutions

Preventa safety modules type XPS PVK

For dynamic monitoring of double-bodied solenoid valves

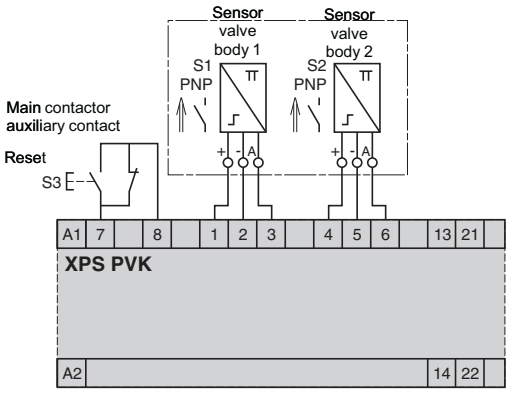
XPS PVK

Functional diagram of module XPS PVK

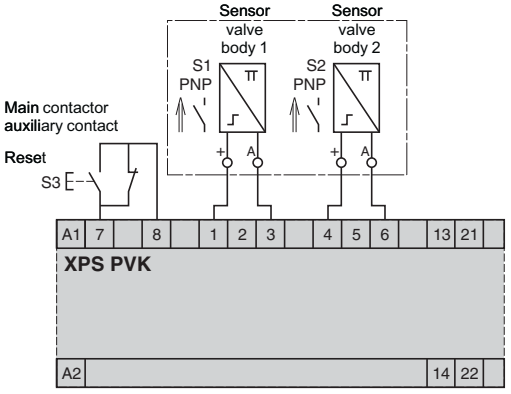


Connection of module XPS PVK with 3-wire (or 2-wire) proximity sensors

3-wire sensors



2-wire sensors



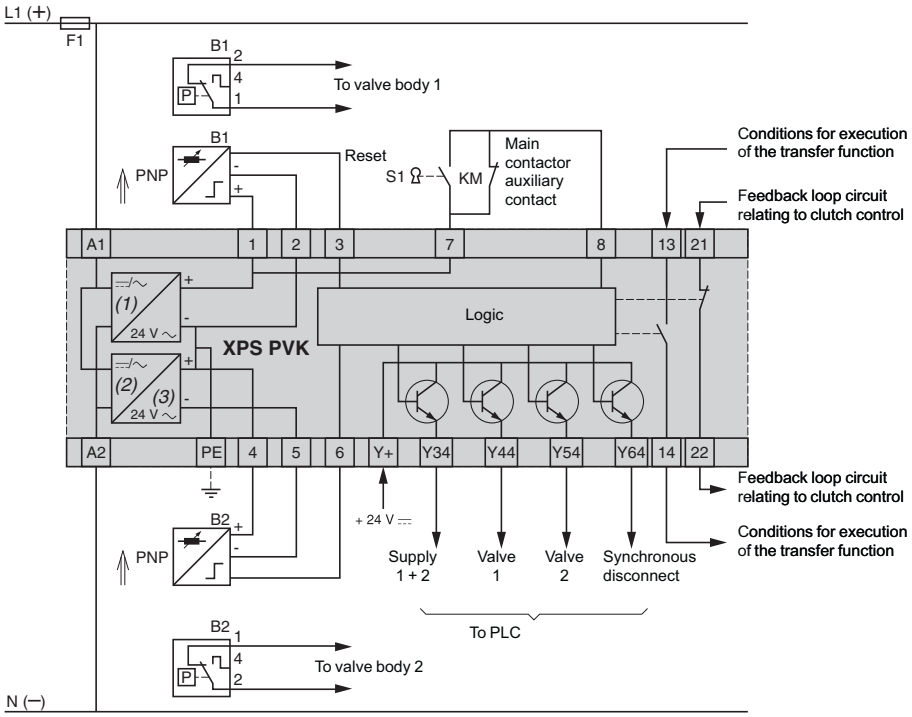
Principle, characteristics: page 2/254
Dimensions: page 2/262

Schneider Electric

Safety automation system solutions
Preventa safety modules type XPS PVK
For dynamic monitoring of double-bodied solenoid valves

XPS PVK

Connection of module XPS PVK with an eccentric press safety valve



(1) Internal supply n° 1.
(2) Internal supply n° 2.
(3) For a ⎓ 24 V version: integrated ⎓/⎓ adaptor.

Principle, characteristics: page 2/254
Dimensions: page 2/262

Safety automation system solutions

Preventa safety modules type XPS OT

For safety stop with automatic overtravel monitoring and control

Operating principle

Safety module XPS OT is used on eccentric presses to monitor overtravel and ensure that the press slide stops in a non-dangerous position, that is, top dead centre (TDC) during normal (non-emergency) operation. Use of this module, designed in accordance with standard EN 692 relating to mechanical press safety, makes it possible to create a redundant, self-monitoring control system.

The two essential functions of this safety module are to:

■ **Trigger the end of cycle stop sequences slightly before top dead centre (at point A) so as to come to complete stop at TDC.**

After TDC, the permissible overtravel is approximately 10°. The safety module immediately detects any overtravel. Overtravel is indicative of braking device deterioration and, in this case, jog mode must be used to move the slide back to TDC. The next cycle will be inhibited to allow maintenance to be performed on the braking device (cam 1).

■ Take over control monitoring during the dangerous part of the cycle (slide downstroke). Any stop instruction issued between TDC (0°) and point C (approximately 150° after TDC) causes an immediate stop of the press. **This approximate value of 150° corresponds to the 8 mm tool closure dimension (safety point)**.

When a stop instruction is issued after this safety point, the press completes the cycle and comes to a complete stop at TDC (cam 2).

Control of the dangerous part of the cycle (generally the slide downstroke) is usually activated from a two-hand control station associated with a safety module (type XPS BC) monitoring this station to qualify as a category 4 control system according to standard EN 954-1/ISO 13849-1.

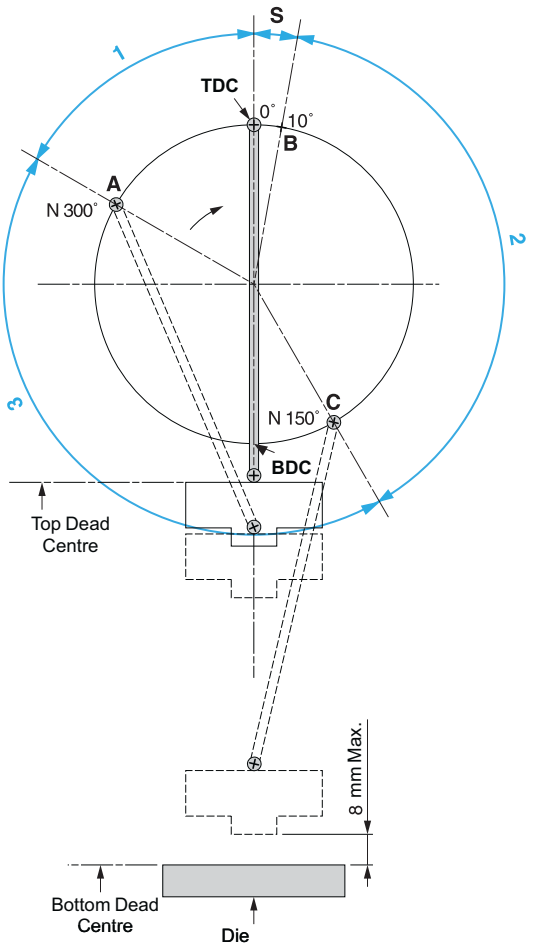
Overtravel monitoring is performed **on each cycle** by safety module XPS OT.

Characteristics: page 2/260 | References: page 2/260 | Connections: page 2/261 | Dimensions: page 2/262

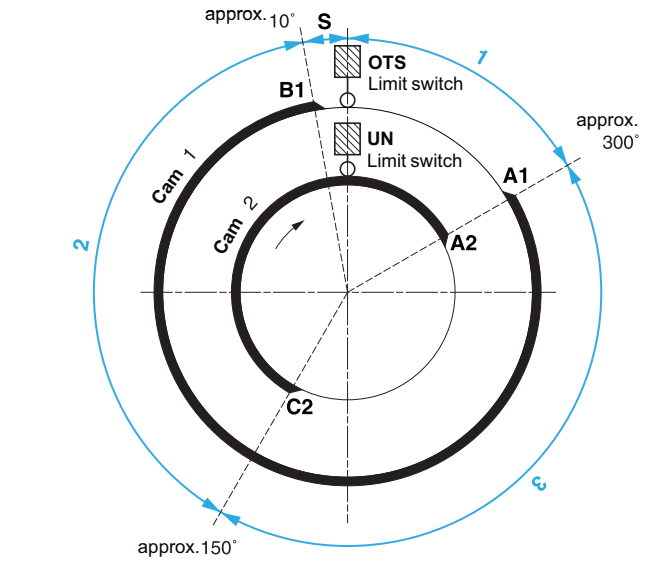
Safety automation system solutions
Preventa safety modules type XPS OT
For safety stop with automatic overtravel monitoring and control

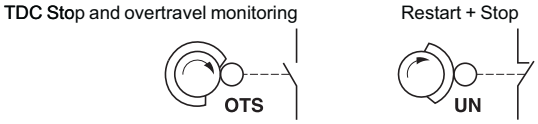
Operating principle (continued)

Press diagram



Control cams diagram





1 Permissible overtravel zone.
2 Dangerous zone (usually slide downstroke).
3 Non-dangerous zone (usually slide upstroke).

S Permissible overtravel.
A Stop instruction trip point.
B Point at which permissible overtravel is exceeded (a stop instruction issued after point **B** will lock up the press).
C Takeover point, beyond which the press will complete its cycle up to **TDC**.
TDC Top dead centre, actual stopping zone of the press.
BDC Bottom dead centre.

Cam operation
Cam 1 is associated with the **OTS** limit switch (LS), cam 2 with the **UN** limit switch (the limit switches must be located on different cams for safety reasons).
The **OTS** limit switch is deactivated at TDC, at which point the **UN** limit switch is activated.
Point A1 of **cam 1** is located approximately 300° after TDC and, when reached, the press stops and comes to a standstill: **A1 is the press stop trigger point.**
Point B1, located approximately 10° after TDC, constitutes the end of cam 1: **If B1 is exceeded during stopping**, the overtravel is abnormally long, **the press locks up** and the next cycle is inhibited.
Point A2 of cam 2 functions like point A1 on cam 1 (contact state of the **UN** limit switch reversed in relation to the state of the **OTS** limit switch).
Point C2, located approximately 150° after TDC, corresponds to the 8 mm tool closing dimension. Stop instructions issued after C2 is reached are not executed until point A2 is reached.

Characteristics: page 2/260
References: page 2/260
Connections: page 2/261
Dimensions: page 2/262

Safety automation system solutions

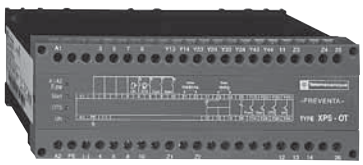
Preventa safety modules type XPS OT

For safety stop with automatic overtravel monitoring and control

Characteristics

Module type			XPS OT
Product designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.
Conformity to standards			EN 60204-1, EN/IEC 60947-5-1, EN 692, EN 50082-2
Product certifications			UL, CSA
Supply	Voltage	**V**	∼ 115, ∼ 230
	Voltage limits		- 15…+ 15% (115 V) - 15…+ 10% (230 V)
	Frequency	**Hz**	50/60
Consumption		**VA**	< 12
Module inputs fuse protection			Internal, electronic
Outputs	Voltage reference		Volt-free
	Number and type of safety circuits		3 N/O (11-12, 11-13, 11-14)
	Number and type of additional circuits		4 solid-state outputs
	Breaking capacity in AC-15	**VA**	C300: inrush 1800, maintained 180
	Breaking capacity in DC-13		24 V/1.5 A - L/R = 50 ms
	Breaking capacity of solid-state outputs		24 V/20 mA, 48 V/10 mA
	Max. thermal current (Ithe)	**A**	2.5
	Output fuse protection	**A**	4 gG, conforming to EN/IEC 60947-5-1, VDE 0660 part 200
	Minimum current (volt-free contacts)	**mA**	10
	Minimum voltage (volt-free contacts)	**V**	17
Electrical durability			See page 2/172
Response time		**ms**	< 20
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 & 2)
Rated impulse withstand voltage (Uimp.)		**kV**	4 (overvoltage category III, conforming to EN/IEC 60947-1, DIN VDE 0110 parts 1 & 2)
LED display			4
Operating temperature		**°C**	- 10…+ 55
Storage temperature		**°C**	- 25…+ 85
Degree of protection conforming to IEC 60529	Terminals		IP 20
	Enclosure		IP 40
Polycarbonate enclosure	Type		Removable
	Number of terminals		42
Connection	Type		Captive screw clamp terminals: - without cable end 2 x 2.5 mm^2, - with cable end 2 x 1.5 mm^2, - min. Ø 0.5 mm

References



XPS OT

Description	Display	Supply	Reference	Weight kg
Safety modules for safety stop with automatic overtravel monitoring and control	4 LEDs	∼ 115 V	**XPS OT3444**	1.100
		∼ 230 V	**XPS OT3744**	1.100

Principle: page 2/258

Dimensions: page 2/262

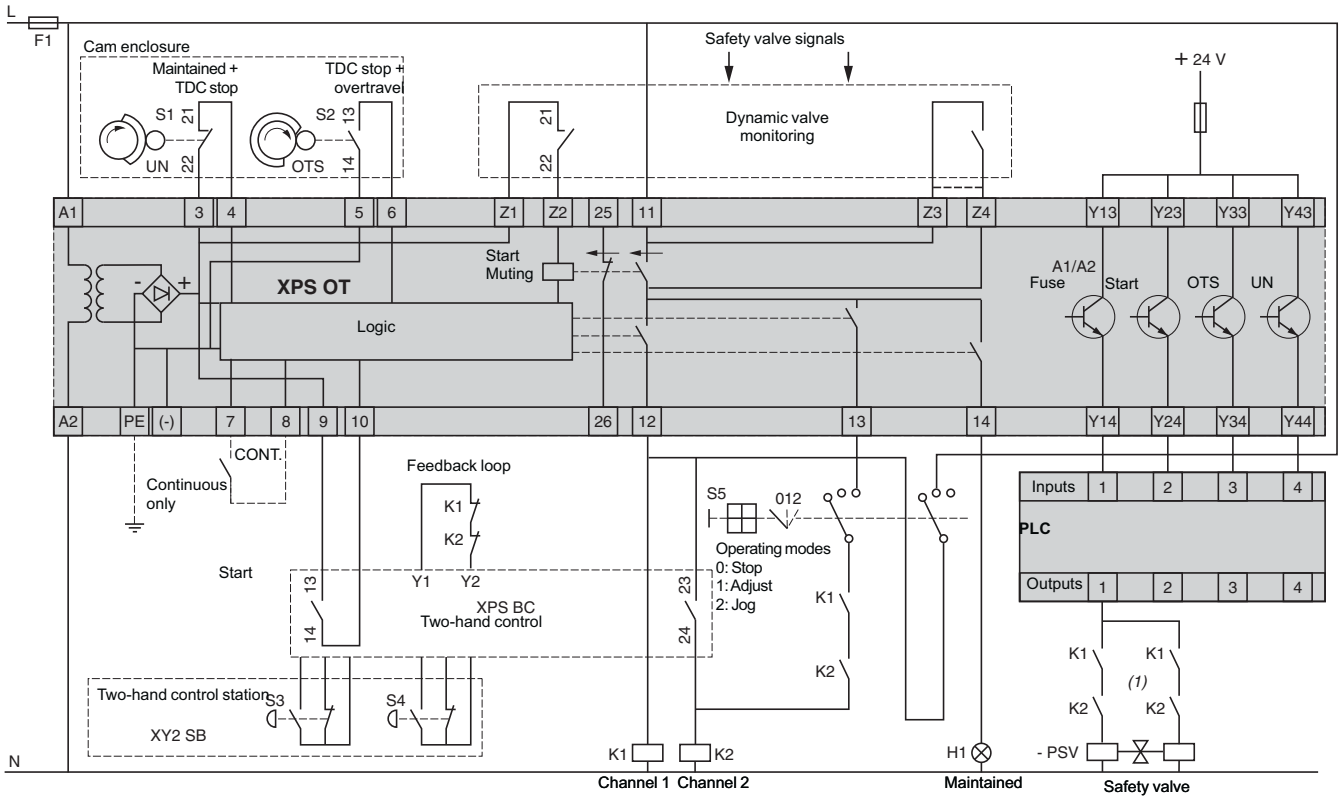
Safety automation system solutions

Preventa safety modules type XPS OT

For safety stop with automatic overtravel monitoring and control

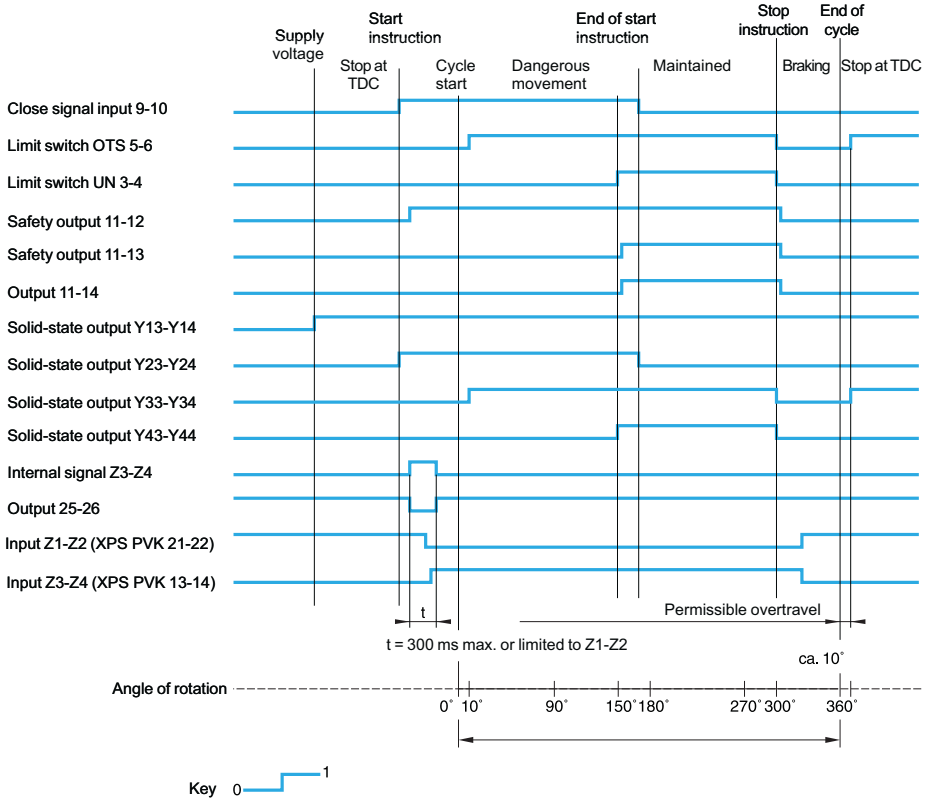
XPS OT

Wiring diagram

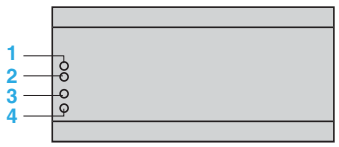


(1) The 2 coils of the safety valve must be wired separately.

Functional diagram



LED details



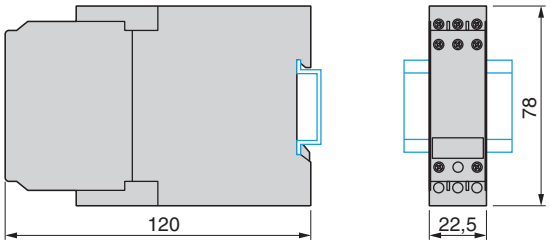
1 Voltage present on terminals A1/A2.
2 Close instruction.
3 **OTS** limit switch activated.
4 **UN** limit switch activated.

Principle: page 2/258
Dimensions: page 2/262

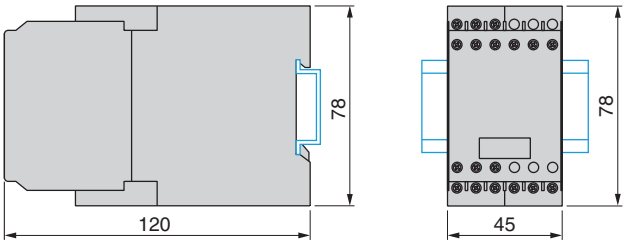
2

Dimensions

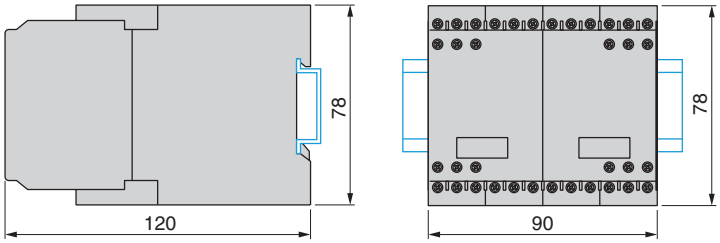
XPS BA



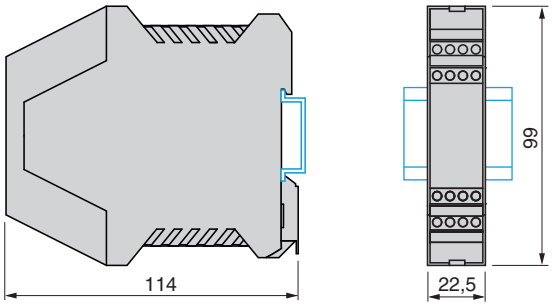
XPS BC, XPS DA



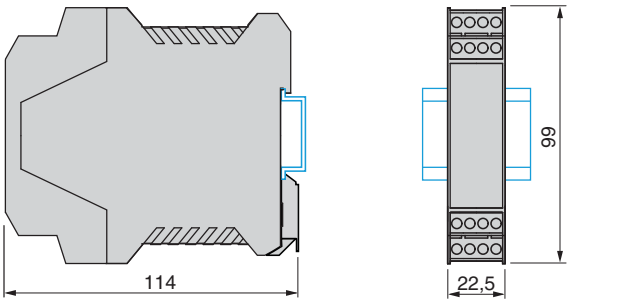
XPS ECM, XPS ECP



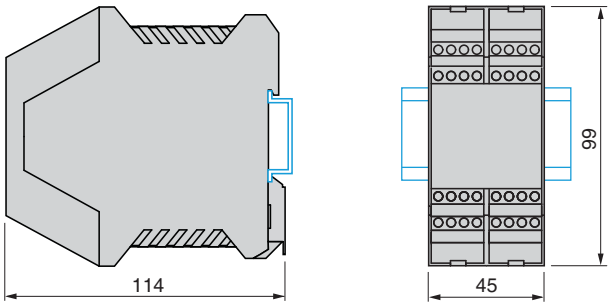
XPS AC●●●●, XPS AF●●●●, XPS AFL●●●●, XPS DMB●●●●, XPS VC●●●●, XPS BF●●●●



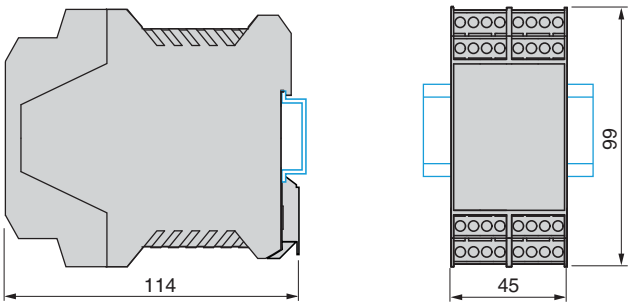
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XPS AK●●●●, XPS AV●●●●, XPS CM●●●●, XPS DME●●●● XPS ATE●●●●



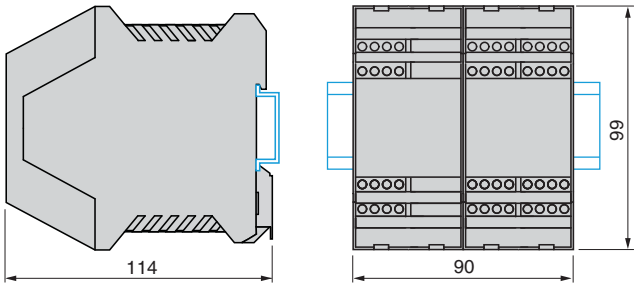
XPS AK●●●●P, XPS AV●●●●P, XPS CM●●●●P, XPS TSA●●●P, XPS TSW●●●●P, XPS DME●●●●P, XPS ATE●●●●P, XPS VNE●●●●P



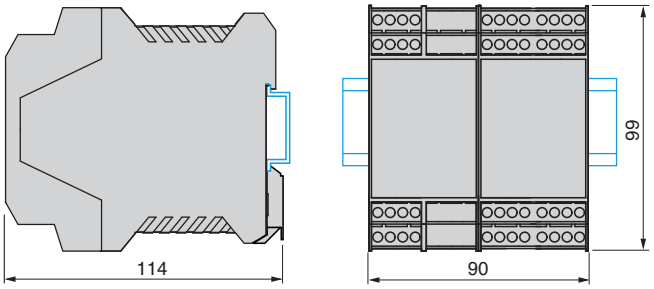
Safety automation system solutions
Preventa safety modules
AM1 DP200 rail mounting

Dimensions

XPS AR●●●●●●

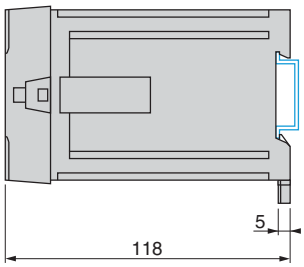


XPS AR●●●●●●P

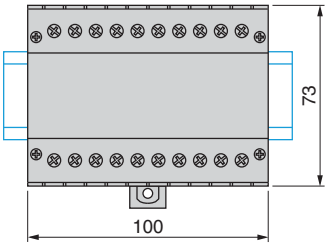


XPS PVT, XPS PVK

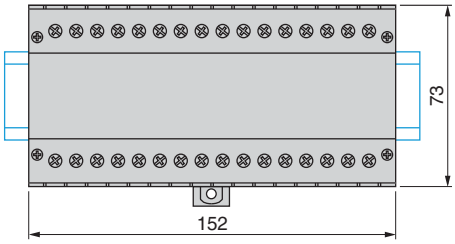
Common side view



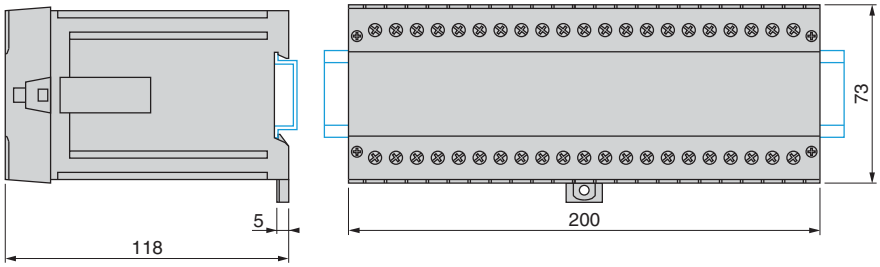
XPS PVT



XPS PVK



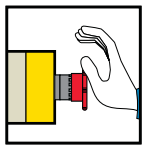
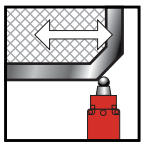
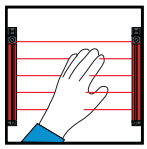
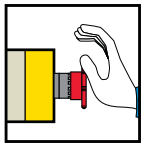
XPS OT

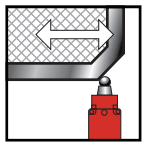
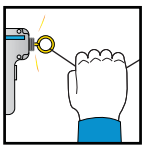
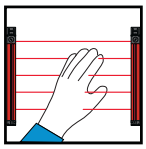
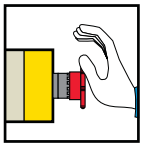
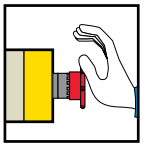


Mounting

All safety modules: 35 mm ⊔ rail fixing.

Safety automation system solutions
Safety solutions on AS-Interface cabling system
Safety monitors and interfaces

Applications	Safety monitors on AS-Interface cabling system		Safety interfaces on AS-Interface cabling system	
				
AS-Interface "Safety at work"	Safety is incorporated into the AS-Interface cabling system by adding a monitor and a safety interface connected together with other standard AS-Interface components on the AS-Interface line			
				
Functions	Safety applications integrated on the AS-Interface line. Emergency stop, safety switches and light curtain monitoring		Emergency stop interfaces	
			Metal	Plastic
AS-Interface profile	7.F		0.B.F.F	0.B.F.F
Addressing	Using configuration software ASISWIN2		Using adjustment terminal ASI TERV2 and adaptor ASI SAD1	
Conformity to standards	IEC 61508 (2000), EN 954-1 (1997) - category 4/ISO 13849-1, EN/IEC 60204-1 (1998), EN 50295 (1999), EN 61000-6-2 (2000), EN 50081-2 (1993), EN/IEC 61496-1 (1997), EN/IEC 60947-5-1 (1997), EN 574 (1996)/ISO 13851		EN 954-1 - category 4/ISO 13849-1, EN/IEC 60947-5-1, EN/IEC 60204-1, EN/ISO 13850 (pending), EN/IEC 60947-5-5 (pending)	
Product certifications	UL, CSA, TÜV		UL, CSA, TÜV	
Number of safety circuits	2 N/O	2 x 2 N/O	–	
Number of additional circuits	1 solid-state output for signalling to PLC	2 solid-state outputs	–	
Display	5 LEDs	8 LEDs	2 LEDs	
Supply	⎓ 24 V		By AS-Interface line	
Type	**ASI SAFEMON1●**	**ASI SAFEMON2●**	**ASI SSLB●**	
Page	2/268	2/268	2/272	





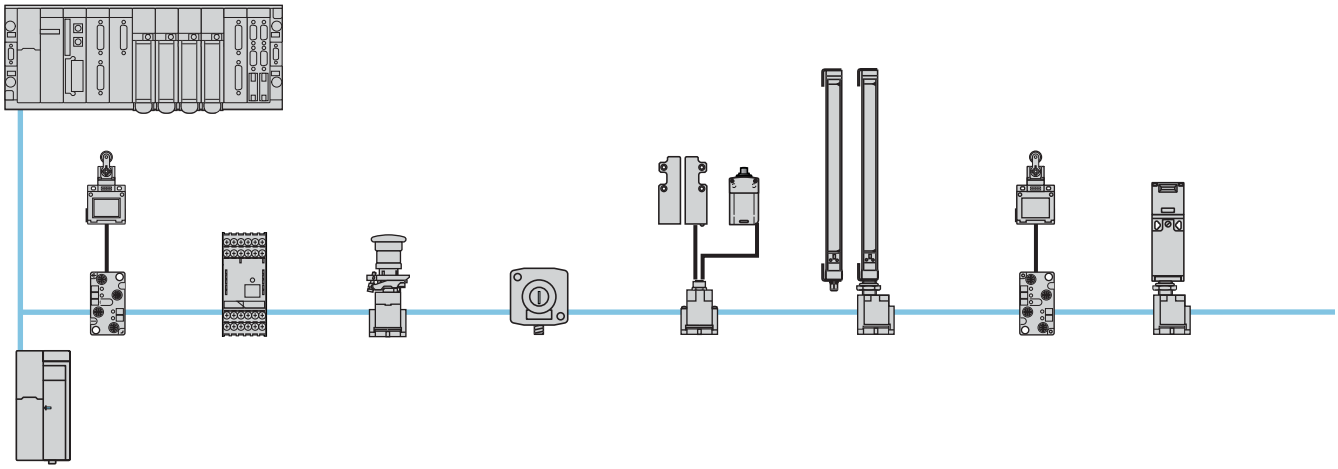




Interfaces for safety products			Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K	Interfaces for mounting in enclosure for Harmony® Ø 22 mm Emergency stop mushroom head pushbuttons
1 x M12 entry	2 x M12 entries	1 x ISO M16 entry	1 x M12 entry	Connector
0.B.F.F	0.B.F.F	0.B.F.F	0.B.F.F	
Using adjustment terminal ASI TERV2 and adaptor ASI SAD1			Using adjustment terminal ASI TERV2	
EN 954-1 - category 4/ISO 13849-1, EN/IEC 60947-5-1, EN/IEC 60204-1			EN 1088/ISO 14119, EN/IEC 61496-1, EN/IEC 60947-5-3, EN 574/ISO 13851 IEC/EN 60204-1, EN/ISO 12100, EN/ISO 13850	
UL, CSA, TÜV			UL, CSA, TÜV	
–			–	
–			–	
2 LEDs			–	
By AS-Interface line			By AS-Interface line	
ASI SSLC●		**ASI SSLLS**	**ASI SE●1C**	**ASI SSLE●**
2/272			2/272	

2

Operating principle



AS-Interface, the recognised cabling system for sensors and actuators, has evolved. Standard process information and information relating to safety can now be transmitted over the same cable. Capable of managing safety functions up to level 4 of standard EN-954-1/ISO 13849-1 and conforming to standard IEC 61508 (2000), the AS-Interface “Safety at work” system meets the needs of the most common safety applications, such as:

- monitoring of Emergency stops with instantaneous break contacts (stop category 0),
- monitoring of Emergency stops with delayed break contacts (stop category 1),
- monitoring of switches with and without interlocking,
- monitoring of light curtains, etc.

Parameters for options relative to the selected safety function (for example, start button monitoring) may be set for all pre-defined, certified functions.
Safety is incorporated into the AS-Interface cabling system by adding a safety monitor and safety interfaces connected together with other standard AS-Interface components on the yellow cable.
Safety information is exchanged only between the safety monitor, the AS-Interface line master and the safety interfaces. This is transparent for the other standard AS-Interface components.
Based on this principle, AS-Interface cabling systems that are already installed can be updated with safety functions without having to replace the existing components (masters, I/O interfaces, power supplies, etc.). Safety circuits are diagnosed readily, and with no additional wiring, by the standard AS-Interface cabling system master communicating with the safety monitor(s) via the yellow cable.

The ASI SWIN2 configuration software is included on the “Safety Suite V2” CD-ROM.
The AS-Interface “Safety at work” system is configured using software ASI SWIN2 running on Windows. A library of pre-defined and certified safety functions is made available by the software and the user can graphically select the desired safety functions, even at the last minute, by using the “Drag and drop” method in the configuration software. Knowledge of a programming language or specific tools is not necessary to parameter the system. The configuration is loaded into the safety monitor(s) by means of a PC by carrying out a secure serial transmission and using the parameter setting connector on the front face of the monitor.

To meet various safety requirements, the AS-Interface “Safety and work” monitor is available in two versions:

- monitors for basic monitoring of safety devices,
- monitors for enhanced monitoring of safety devices.

AS-Interface “Safety at work” monitors for basic and enhanced monitoring are available with:

- 1 safety output with 2 contacts, or
- 2 independent safety outputs with 2 x 2 contacts.

In addition to safety outputs with volt-free contacts, AS-Interface “Safety at work” safety monitors are equipped, depending on the model, with one or two solid-state signalling outputs and LEDs on the front face to indicate the status of the system and of the monitoring circuits. To monitor more safety functions simultaneously or to stop several safety circuits at different locations, an increased number of safety monitors can be used in an AS-Interface cabling system.
The safety interfaces are connected directly on the yellow cable via an insulation displacement connector (IDC). Their addressing is carried out using self-addressing via the AS-Interface cabling system master or manually, using addressing terminal ASISTERV2.
The compactness of the safety interfaces enables their direct attachment to control devices such as Emergency stop buttons or switches. In addition to interfaces that can be attached to products, versions with 1 or 2 M12 connectors are also available.

Monitoring functions

	AS-Interface "Safety at work" monitors	
	For basic monitoring of safety devices ASI SAFEMON1, ASI SAFEMON2	For enhanced monitoring of safety devices ASI SAFEMON1B, ASI SAFEMON2B
Monitoring of safety devices	■ Emergency stops ■ Safety switches ■ Safety light curtains	■ Emergency stops ■ Safety switches ■ Safety light curtains ■ Button for validation of linked devices ■ Conditionally dependent devices ■ Devices with bouncing contacts
Logic functions	■ "OR" (up to 2 devices)	■ "OR" (up to 6 devices) ■ "AND" ■ "FLIP FLOP" ■ On-delay ■ Off-delay ■ "PULSE" on positive edge
External devices monitoring (EDM)	■ Feedback loop	■ Feedback loop ■ Feedback loop monitoring over the AS-Interface cabling system
Start devices	■ Automatic start ■ Start monitored by the AS-Interface cabling system slave ■ Start monitored by connection to monitor ■ Start monitored by the safety interface	■ Automatic start ■ Start monitored by the AS-Interface cabling system slave ■ Start monitored by connection to monitor ■ Start monitored by the safety interface
Output devices	■ Stop category 1 ■ Stop category 0	■ Stop category 1 ■ Stop category 0

Characteristics

AS-Interface "Safety at work" monitor type			**ASI SAFEMON1, ASI SAFEMON1B** **ASI SAFEMON2, ASI SAFEMON2B**
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 conforming to EN 954-1/ISO 13849-1
Conformity to standards			IEC 61508 (2000), EN/IEC 60204-1 (1998), EN 50295 (1999), EN 61000-6-2 (2000), EN 50081-2 (1993), EN/IEC 61496-1 (1997), EN/IEC 60947-5-1 (1997), EN 574 (1996)/ISO 13851
Product certifications			UL, CSA, TÜV
AS-Interface profile			7.F
Consumption on AS-Interface line		**mA**	44
Type of protection (suitable only for use in electronic rooms/ electrical enclosures with a minimum IP 54 degree of protection)			IP 20
Operating voltage Ub		**V**	⎓ 24 ± 15%
Rated operating current		**mA**	150: **ASI SAFEMON1, ASI SAFEMON1B** 200: **ASI SAFEMON2, ASI SAFEMON2B**
Response duration		**ms**	< 40
Pick-up delay		**s**	< 10
Inputs	"Start"		Opto-electronic coupler input (active when High), input current approximately 10 mA à ⎓ 24 V
	"Protection control (EDM)"		Opto-electronic coupler input (active when High), input current approximately 10 mA at ⎓ 24 V
Outputs	"Safety on" indication		PNP transistor output, 200 mA
	Safety		Volt-free N/O contacts, max. contact load
Fuse protection			External, with max. of 4 A MT
Operating temperature		**°C**	- 20…+ 60
Storage temperature		**°C**	- 30…+ 70
Enclosure	Material		Polyamide PA66
	Mounting		Clip-on fixing on ⊔ rail conforming to EN 50022

Note: The impedance of a safety monitor must be taken into account when selecting the number of interfaces on the AS-Interface cabling system, even if it is used in "watchdog" mode.
The technical details of the system are described in the Schneider Electric AS-Interface guide, in the safety monitor hardware and software manuals and in the configuration software on "*www.schneider-electric.com*".

Safety automation system solutions
Safety solutions on AS-Interface cabling system
AS-Interface “Safety at work” monitors



ASI SAFEMON●

References

AS-Interface “Safety at work” monitors

Type	Number of safety circuits	Solid-state outputs for PLC	Supply	Reference	Weight kg
For basic monitoring of safety devices	2 N/O	1	⎓ 24 V	**ASI SAFEMON1**	0.350
	2 x 2 N/O	2	⎓ 24 V	**ASI SAFEMON2**	0.450
For enhanced monitoring of safety devices	2 N/O	1	⎓ 24 V	**ASI SAFEMON1B**	0.350
	2 x 2 N/O	2	⎓ 24 V	**ASI SAFEMON2B**	0.450

Configuration software

■ Reference ASI SWIN2 is the full version of configuration software AS-Interface “Safety at work” version 2+ and must be installed if no previous version of this software has been installed.
■ Reference SSVASISWINUP is an update for software AS-Interface “Safety at work” and can be used if ASI SWIN2 has been installed using Safety Suite V1. An update from version 2.03 to version 2.+ for the configuration software AS-Interface “Safety at work” will then be performed.

Description	For use with	Operating system	Languages	Reference	Weight kg
AS-Interface “Safety at work” configuration software CD-ROM + user manual	□ Safety monitors ASI SAFEMON1/2 for basic monitoring of safety devices □ Safety monitors ASI SAFEMON●B for enhanced monitoring of safety devices	Windows 95, Windows 98, Windows ME, Windows NT®, Windows 2000, Windows XP	EN, FR, DE, IT, ES, PT	**ASI SWIN2** *Software available on Safety Suite V2 software pack*	0.520
ASI SWIN2 software update CD-ROM + user manual	□ Safety monitors ASI SAFEMON1/2 for basic monitoring of safety devices □ Safety monitors ASI SAFEMON●B for enhanced monitoring of safety devices	Windows 95, Windows 98, Windows ME, Windows NT®, Windows 2000, Windows XP	EN, FR, DE, IT, ES, PT	**SSVASISWINUP** *Software update available on Safety Suite V2 software pack*	0.520



ASITERV2

Setting-up and diagnostic tools

Description	Application	Reference	Weight kg
Adjustment terminal	Addressing and diagnostics of AS-Interface V2.1 interfaces AS-interface I/O test whilst powered-up AS-Interface interface diagnostics	**ASI TERV2**	0,500
AS-Interface line analyser	Identification of transmission errors on the AS-Interface line	**ASI SA01**	0,160



ASI SA01

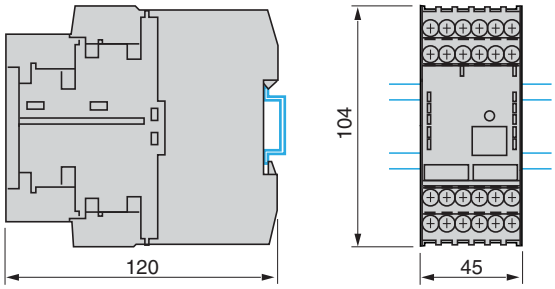
Accessories

Description	Function	Reference	Weight kg
Cables	Parametering, RS 232	**ASI SCPC**	0.100
	Transfer between 2 monitors	**ASI SCM**	0.500

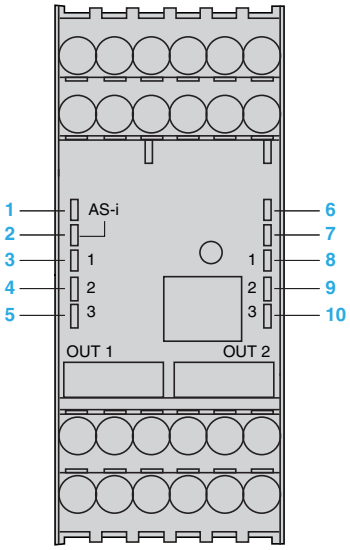
Operating principle: page 2/266
Characteristics: page 2/267
References : page 2/268
Dimensions: page 2/269

Dimensions

ASI SAFEMON●, ASI SAFEMON●B



LED details



ASI SAFEMON1, ASI SAFEMON1B

1 AS-Interface line supply (green)
2 AS-Interface line fault (red)
3 Restart signal (yellow)
4 Safety outputs closed (green)
5 Safety outputs open (red) or output error (flashing red)

ASI SAFEMON2, ASI SAFEMON2B

Output 1

1 AS-Interface line supply (green)
2 AS-Interface line fault (red)
3 Restart signal (yellow)
4 Safety outputs closed (green)
5 Safety outputs open (red) or output error (flashing red)

Output 2

6 AS-Interface line supply (green)
7 AS-Interface line fault (red)
8 Restart signal (yellow)
9 Safety outputs closed (green)
10 Safety outputs open (red) or output error (flashing red)

Safety automation system solutions
Safety solutions on AS-Interface cabling system
Safety interfaces

Operating principle

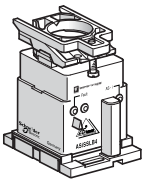
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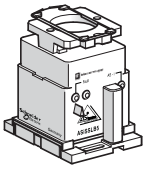
Safety circuits are diagnosed readily, and with no additional wiring, by the standard AS-Interface cabling system master communicating with the safety monitor via the yellow cable.

Presentation

Interfaces for Harmony® Ø 22 mm Emergency stop

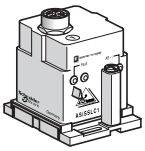


Metal

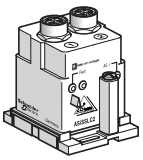


Plastic

Interfaces for products with M12 connector

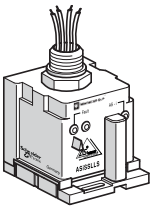


1 x M12 entry



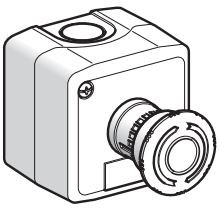
2 x M12 entries

Interfaces for products with ISO entry

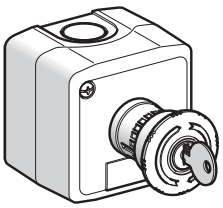


ISO M16 or M20 entry

Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K, with M12 entry

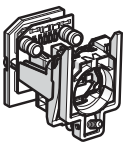


“Turn to release”

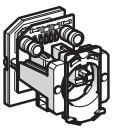


Key release (n° 455)

Interfaces for mounting in enclosure for Harmony® Ø 22 mm Emergency stop mushroom head pushbuttons



Metal



Plastic

Operating principle: page 2/270
Characteristics: page 2/271
References : page 2/272
Dimensions, connections: page 2/273

Safety interface type			ASI SSLB4	ASI SSLB5	ASI SSLC1	ASI SSLC2	ASI SSLLS	ASI SEA1C	ASI SEK1C	ASI SSLE4	ASI SSLE5
Environment											
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1/ISO 13849-1)			Category 4 max.								
Conformity to standards			EN/IEC 60947-5-1, EN/IEC 60204-1, EN/ISO 13850 (pending), EN/IEC 60947-5-5 (pending)		EN/IEC 60947-5-1, EN/IEC 60204-1			EN 1088/ISO 14119, EN/IEC 61496-1, EN/IEC 60947-5-3, EN 574/ISO 13851 EN/IEC 60204-1, EN/ISO 12100, EN/ISO 13850			
Product certifications			UL, CSA, TÜV					UL, CSA			
Degree of protection	Conforming to IEC 529		IP 20		IP 67			IP 65		IP 00	
AS-Interface profile			0.B.F.F								
Addressing			Using adjustment terminal ASI TERV2								
Ambient air temperature	For operation	**°C**	- 10…+ 55								
	For storage	**°C**	- 25…+ 85								
Mechanical characteristics											
Mechanical durability	In thousands of operating cycles		0.3		–		–	0.3		–	
Shock resistance			10 gn								
Vibration resistance			5 gn								
Electrical characteristics											
Supply by AS-Interface line	Voltage	**V**	Via AS-Interface, ⎓ 24								
	Voltage limits		- 15…+ 15%								
Consumption		**W**	1.2								
Consumption on AS-Interface line		**mA**	45								
Connection on AS-Interface line	IDC (Insulation Displacement Connector)		■		–		■	–		–	
	Connector (type)		–		■ (M12)		–	■ (M12)		■	

***Note**: The technical details of the system are described in the Schneider Electric AS-Interface guide, in the safety monitor hardware and software manuals and in the configuration software on "www.schneider-electric.com".*

Safety automation system solutions
Safety solutions on AS-Interface cabling system
Safety interfaces


580116

ASI SSLB4 + ZB4 BS844


580117

ASI SSLB5 + ZB5 AS844


580118

ASI SSLC1


580119

ASI SSLC2


580120

ASI SSLLS


105580

ASI SEA1C


105581

ASI SEK1C


105582

ASI SSLE4


105583

ASI SSLE5


105967

ASI SAD1

References

Interfaces for Ø 22 Emergency stop

Type	Type of contact	Connection on AS-Interface line	Reference	Weight kg
Metal	N/C + N/C	IDC	**ASI SSLB4**	0.080
Plastic	N/C + N/C	IDC	**ASI SSLB5**	0.040

Interfaces for products with connector

Type	Number of contacts	Connection on AS-Interface line	Reference	Weight kg
1 x M12 entry *(1)*	2	Connector	**ASI SSLC1**	0.040
2 x M12 entries *(1) (2)*	2	Connector	**ASI SSLC2**	0.050

Interfaces for products with ISO entry

Type	Number of contacts	Connection on AS-Interface line	Reference	Weight kg
1 x ISO M16 entry *(1) (3)*	2	IDC	**ASI SSLLS**	0.040

Interfaces premounted in Emergency stop mushroom head pushbutton stations XAL K

Type	Number of contacts	Connection on AS-Interface line	Reference	Weight kg
"Turn to release"	2	Connector	**ASI SEA1C**	0.170
Key release (n° 455) *(4)*	2	Connector	**ASI SEK1C**	0.190

Interfaces for mounting in enclosure for Harmony® Ø 22 mm Emergency stop mushroom head pushbuttons

Type	Number of contacts	Connection on AS-Interface line	Reference	Weight kg
Metal	2	Connector	**ASI SSLE4**	0.060
Plastic	2	Connector	**ASI SSLE5**	0.025

Addressing accessories

Description	Application	Reference	
Adaptor specifically for safety interfaces type ASI SSLB●, ASI SSLC●, ASI SSLLS	Connection to adjustment terminal ASI TERV2	**ASI SAD1**	0.060

Setting-up and diagnostic tools

Description	Application	Reference	
Adjustment terminal	Addressing and diagnostics of AS-Interface V2.1 interfaces AS-Interface I/O test whilst powered-up AS-Interface interface diagnostics	**ASI TERV2**	0,500
AS-Interface line analyser	Identification of transmission errors on the AS-Interface line	**ASI SA01**	0,160

Accessories

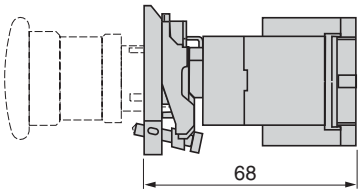
Type	Material	Unit reference	Weight kg
Adaptor for ISO M20 (sold in lots of 5)	Metal	**DE9 RI2016**	0.040
Ø 40 red mushroom head Emergency stop buttons, turn to release *(4)*	Metal	**ZB4 BS844**	0.060
	Plastic	**ZB5 AS844**	0.050
Ø 40 red mushroom head Emergency stop buttons, key release (n° 455) *(4)*	Metal	**ZB4 BS944**	0.098
	Plastic	**ZB5 AS944**	0.071

*(1) To be used with yellow AS-interface "standard" version cable **XZC B●●●●●**.*
*The yellow AS-interface "TPE" version cable **XZC B●●●●●H** cannot be used with the safety interfaces **ASI SSLC●** and **ASI SSLLS**.*
*(2) Only use pre-wired connectors **XZ CP1541L●**.*
(3) For ISO M20 product, see adaptor.
(4) For other "mushroom head" buttons, please refer to our "Control and signalling components" catalogue.

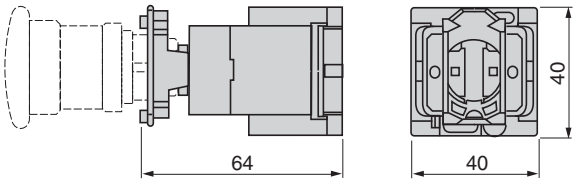
Operating principle: page 2/270 | Characteristics: page 2/271 | References : page 2/272 | Dimensions, connections: page 2/273

Dimensions

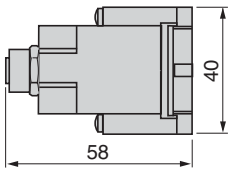
ASI SSLB4



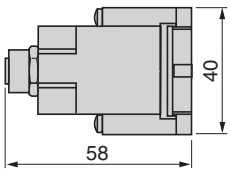
ASI SSLB5

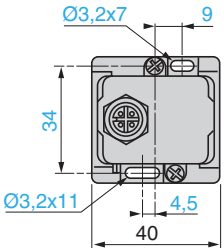


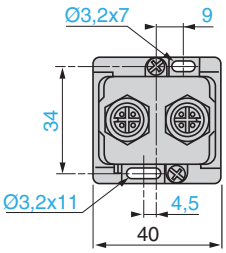
ASI SSLC1



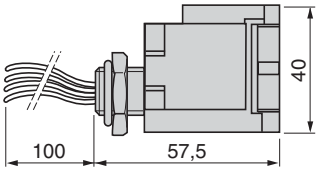
ASI SSLC2

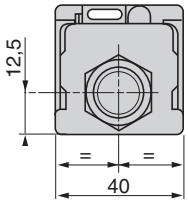




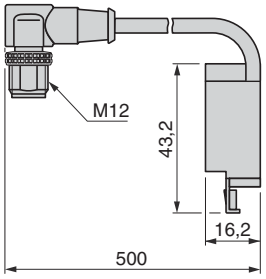


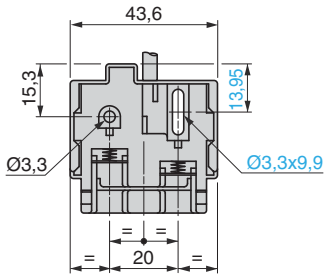
ASI SSLLS



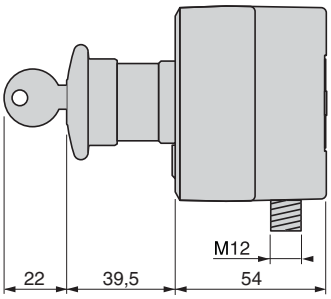


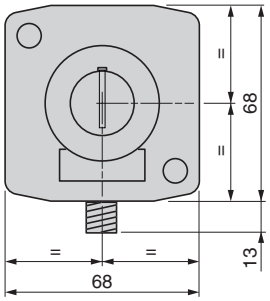
ASI SAD1

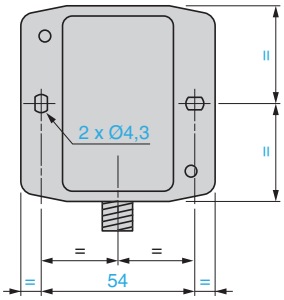




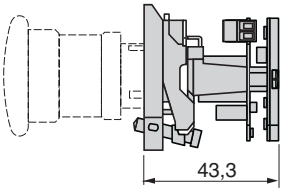
ASI SE●1C

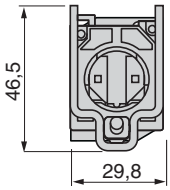




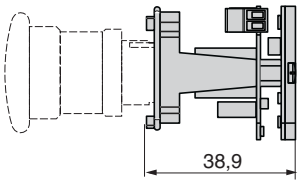


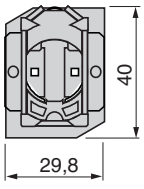
ASI SSLE4





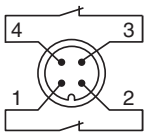
ASI SSLE5



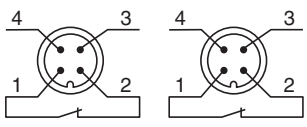


Connections

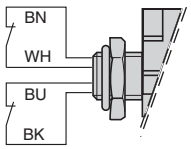
ASI SSLC1



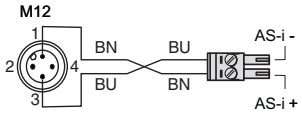
ASI SSLC2



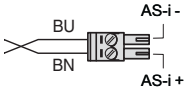
ASI SSLLS



ASI SE●1C



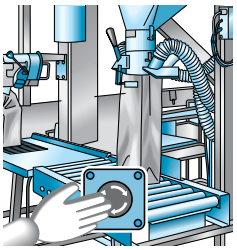
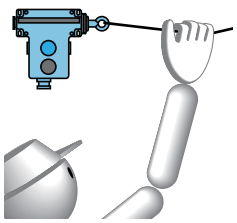
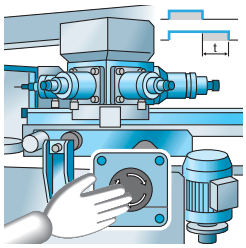
ASI SSLE●



Operating principle: page 2/270
Characteristics: page 2/271
References : page 2/272
Dimensions, connections: page 2/273

2

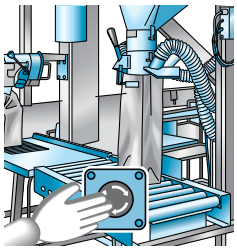
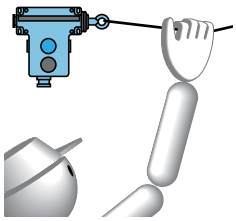
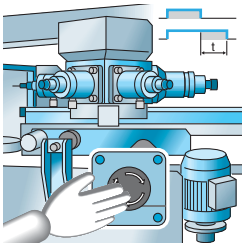
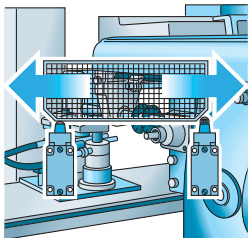
Applications

Modules	**For Emergency stop and limit switch monitoring (modules integrated in TSX Micro PLCs)**



Conforming to standards		EN 954-1 - category 3/ISO 13849-1, pr EN 954-2, EN 1088/ISO 14119, IEC 61508-SIL 2, EN/IEC 60204-1, EN/ISO 12100, EN/ISO 13850
Number of safety outputs		2 N/O
Number of dual or single contact safety inputs		4 N/C
PLC diagnostics	Input contacts	10 bit
	Reset and feedback loop inputs	1 bit
	Reading output control signal	1 bit
	Supply monitoring	1 bit
Display		10 LED
Supply voltage		⎓ 24 V
PLC type		TSX Micro
Module type		**TSX DPZ 10D2A**
Pages		2/278

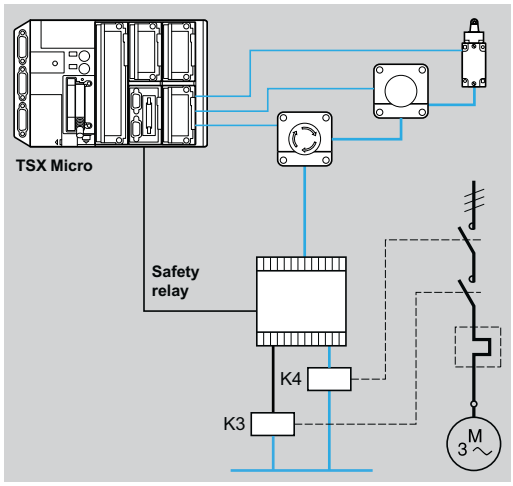





For Emergency stop and limit switch monitoring (modules integrated in TSX Premium PLCs)

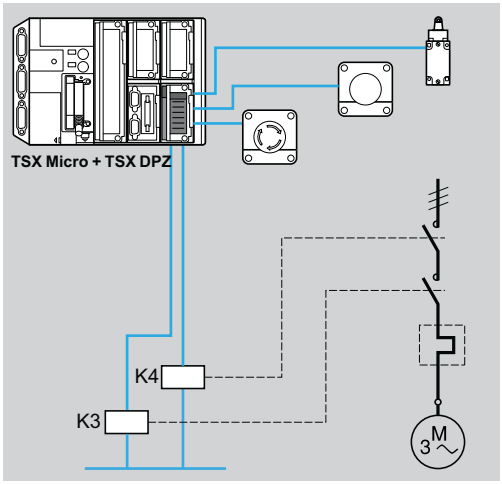



EN 954-1 - category 4/ISO 13849-1, EN 1088/ISO 14119, pr IEC 61508-SIL 3, EN/IEC 60204-1, EN/ISO 12100, EN/ISO 13850		
2 N/O		4 N/O
12 N/C		
24 bit		
2 bit		
1 bit		
1 bit		
28 LED		
⎓ 24 V		
TSX Premium		
TSX PAY 262		**TSX PAY 282**
2/284		2/284

Safety automation system solutions
Modicon TSX Micro automation platform
Preventa safety module type TSX DPZ



Solution with safety relay and separate PLC



Simplification using the safety module integrated in the PLC

Presentation

The TSX DPZ 10D2A Emergency stop monitoring module integrated into the TSX Micro PLC combines:

- The ease of use of Preventa safety modules.
- PLC diagnostics performance.

It also maintains all the advantages of a standard PLC (extended choice of I/O, ease of installation, flexibility of hardware and software developments, etc).

The TSX DPZ 10D2A Emergency stop monitoring module combines a Preventa (XPS) hard-wired safety relay and a discrete acquisition function in a half-slot, for full diagnostics of input contacts and the state of safety circuit outputs.

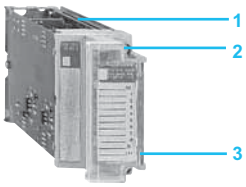
The TSX DPZ 10D2A safety module is used to interrupt one or more Emergency or safety stop control circuits in complete safety, in accordance with EN/IEC 60204-1.

The proven safety of hard-wired technology and the capacity of the TSX Micro PLC make module TSX DPZ 10D2A the optimum solution for making machines more reliable, safer, more compact and more cost-effective.

Application developments requiring safety systems and PLC diagnostics

LModule TSX DPZ 10D2A is suitable for Emergency stop and limit switch monitoring applications, requiring a level of safety up to category 3 *(1)* according to EN 954-1/ ISO 13849-1 (safety related parts of control systems).

(1) For more information on control system safety categories, please consult the chapter 6 of this catalogue.



Description

Emergency stop monitoring module TSX DPZ 10D2A comprises:

1 A metal casing with a locking system for fixing the module in its slot. This system is only accessible when the screw terminal block is removed.

2 A removable screw terminal block for connecting sensors and preactuators.

3 A cover giving access to the screw terminal block, which also holds the marker legend.

Characteristics: page 2/278 References: page 2/278 Connections: page 2/279

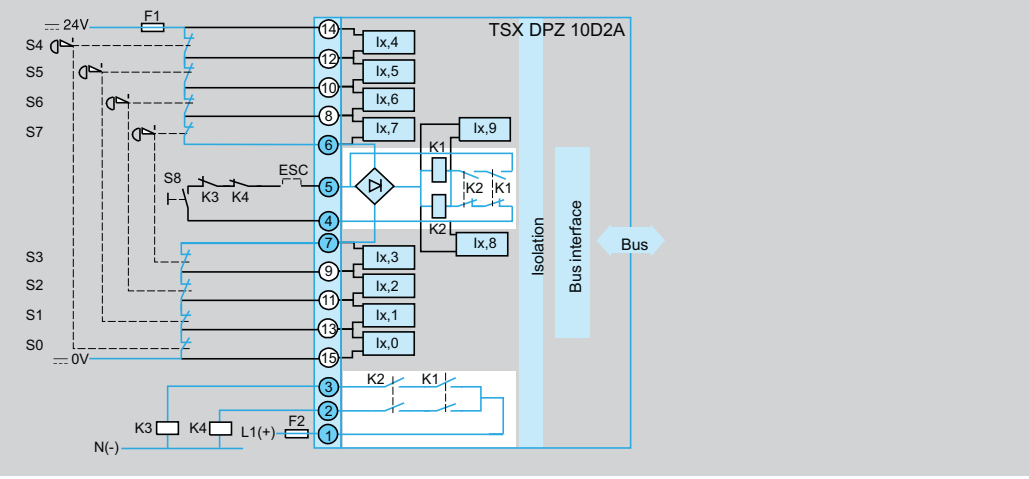
Safety automation system solutions
Modicon TSX Micro automation platform
Preventa safety module type TSX DPZ

Safety module TSX DPZ 10D2A provides the following functions:
- Monitoring of 1 to 4 dual (or single), N/C (normally closed) contacts in pushbuttons, Emergency stops or limit switches on safety guards for an Emergency stop or immediate safety stop system (category 0 Emergency stop conforming to EN/ISO 13850).
- Hard-wired safety module identical to Preventa safety module XPS:
  - 2 N/O safety output circuits,
  - category 3.
- Safety module independent of the TSX Micro PLC processor: **the PLC does not affect the safety module.**
- 10 LEDs on the TSX Micro PLC display panel: power supply failure and full diagnostics of the safety system.
- Electronic data acquisition units for full diagnostics of the safety system:
  - reading the state of the 8 pushbutton or limit switch inputs,
  - reading the enable input and the feedback loop,
  - reading the control signal of the 2 safety outputs,
  - monitoring the external power supply for the module.

This electronic data acquisition is designed so that the first failure will not adversely affect the safety function.
If the safety system uses more sensors, it is possible to daisy-chain several TSX DPZ 10D2A modules.

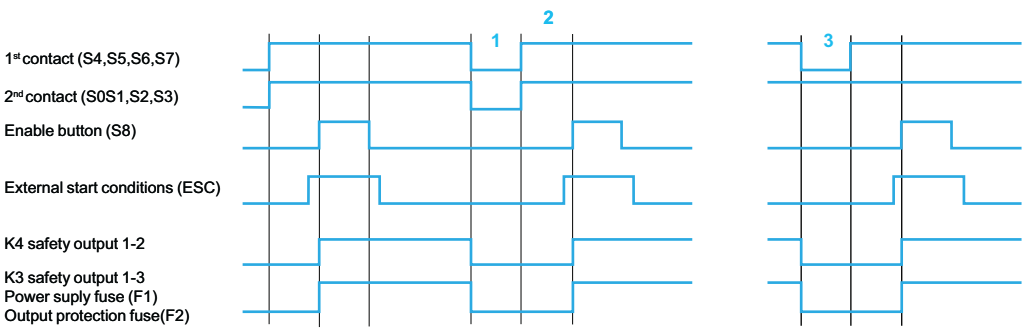
Schematic diagram

To ensure correct operation of the safety function whatever the first failure, the following must be used :
- At the inputs: Emergency stop pushbuttons or safety limit switches with dual contacts.
- At the outputs: if relaying is required, use relays with guided contacts.
- Module power supply: use an F1 protection fuse (see characteristics on page 2/278).



6-7	Control of the safety system.
1-2 et 1-3	Safety outputs, volt-free.
4-5	Feedback loop and run enable (ESC: additional enable conditions).
14-15	Monitoring of module ⎓ 24 V external power supply.
14-12, 12-10, 10-8, 8-6, 7-9, 9-11, 11-13, 13-15	8 read channels for the Emergency stop pushbutton or limit switch contacts

Functional diagram



1 Emergency stop or limit switch activated.
2 Emergency stop reset or limit switch closed.
3 Error on contact S0…S3.

Characteristics: page 2/278
References: page 2/278
Connections: page 2/279

Safety automation system solutions
Modicon TSX Micro automation platform
Preventa safety module type TSX DPZ

Standards and certifications

Standards	Whole machine	Electrical equipment of industrial machines		EN/IEC 60204-1, EN 12100
		Emergency stop device		EN/ISO 13850
	Product	Safety of machinery: safety related parts of control systems		EN 954-1 category 3/ISO 13849-1, pr EN 954-2, EN 1088/ISO 14119 IEC 61508 (SIL 2)
	PLC	Specific requirements		IEC 1131-2 or EN 61131-2, CSA 22-2, UL 508
Certifications				BG, INERIS, INRS, UL, CSA

General characteristics

Power supply	Nominal voltage	**V**	⎓ 24
	Limit operating voltage	**V**	⎓ 21.6…30
	Error signalling	**V**	⎓ < 16
	Maximum consumption	**mA**	< 200
Protection via external F1 fuse	Conforming IEC 947-5-1	**A**	1 (gl)
Consumption on internal 5 V		**mA**	< 20
Isolation		**kV**	4 (overvoltage category III, degree of pollution 2)

Characteristics of discrete inputs

Nominal voltage		**V**	⎓ 24
Modularity	Emergency stop or limit switch discrete inputs		8
	Feedback loop discrete input		1
Logic			Positive
Inrush current		**A**	10/100 µs
Isolation between input and earth		**V rms**	1500 - 50/60 Hz for 1 minute
Power	Dissipated in the module	**W**	< 4.5

Characteristics of safety relay outputs

Modularity				2 volt-free outputs			
Limit operating voltage	a.c.		**V**	∼ 19…264			
	d.c.		**V**	⎓ 17…250			
Max. thermal current (I the)			**A**	1.25			
Minimum current			**mA**	10			
a.c. load	Inductive AC-15 duty	Voltage	**V**	**∼ 24**	**∼ 48**	**∼ 110**	**∼ 220**
		Power	**VA**	30	60	140	165
d.c. load	Inductive DC-13 duty (L/R = 100 ms)	Voltage	**V**	**⎓ 24**			
		Power	**VA**	30			
Response time			**ms**	< 100			
Type of contacts				AgNi gold flashed			
External output protection via F2 fuse	Conforming IEC 947-5-1		**A**	4 (gl)			
Isolation between input and earth	Insulation voltage conforming DIN VDE 0110 part 2		**V**	300			
	Test voltage		**V rms**	2000-50/60 Hz for 1 minute			

Environment

Temperatures	Operation	**°C**	- 10 °C…+ 60 °C
	Stockage	**°C**	- 25 °C…+ 60 °C
Degree of protection			IP 20 conforming IEC 529
Connecting cable c.s.a.	Without cable end	**mm²**	1 x 0.8 minimum
	With cable end	**mm²**	2 x 1 maximum

Reference

Inputs number	**Voltage**	**Safety outputs**	**Connection Format**	**Reference**	**Weight kg**
4 Emergency stops or limit switches (dual or single contacts) **1 Start button**	⎓ 24 V	2 "N/O" (volt-free) 1.25 A (I the)	Via screw terminal block (suplied) Half-format	**TSX DPZ 10D2A**	0.280



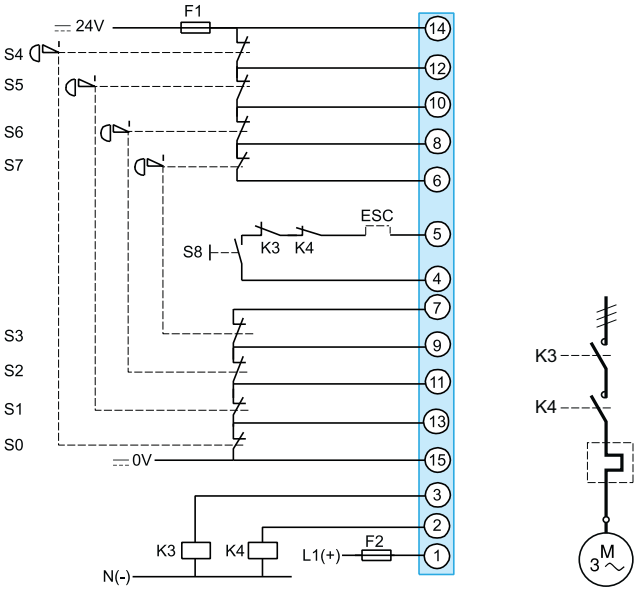
TSX DPZ 10D2A

Connections:
page 2/279

Safety automation system solutions
Modicon TSX Micro automation platform
Preventa safety module type TSX DPZ

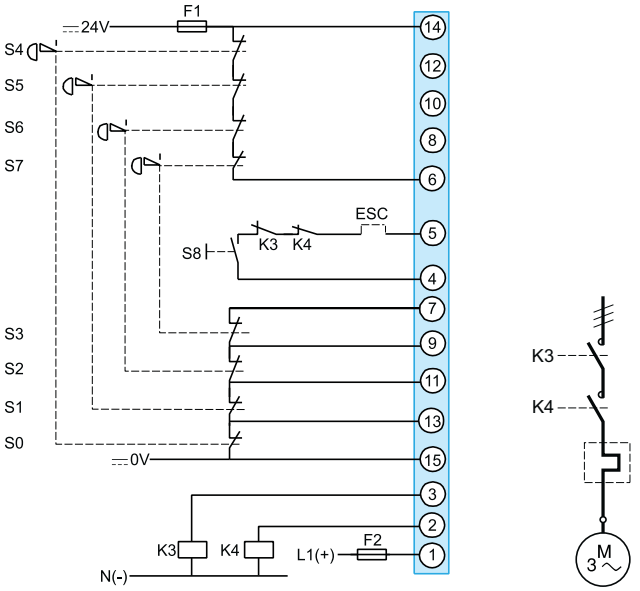
Category 3 wiring diagrams (redundant inputs and outputs): recommended applications

Connection of 4 sensors with dual contacts



The states of all the contacts in the input circuit are read by the PLC. The consistency test carried out by the PLC program on the input contacts enables it to signal and locate precisely the faulty contact(s).
When using less than 4 dual contacts, the input terminals not in use must be linked. For example, if contacts S0 and S4 are not in use, a bridge is required between terminals 14 and 12 and terminals 13 and 15.

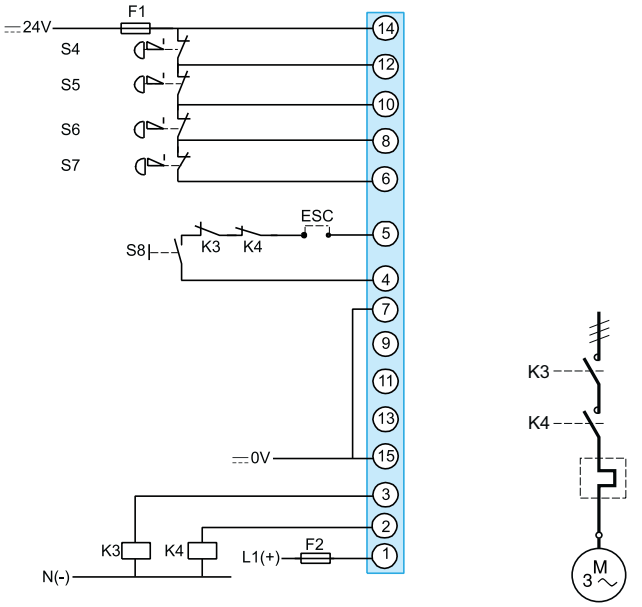
Connection of 4 sensors with dual contacts for existing installations



Suitable for use with existing wiring; with one contact on the safety module and one contact for diagnostics, this wiring enables global reading of the state of contacts S4 to S7 and individual reading of contacts S0 to S3.
The consistency test carried out by the PLC program on the inputs enables it to signal any inconsistency with partial location of the fault.

Wiring diagram with single contacts

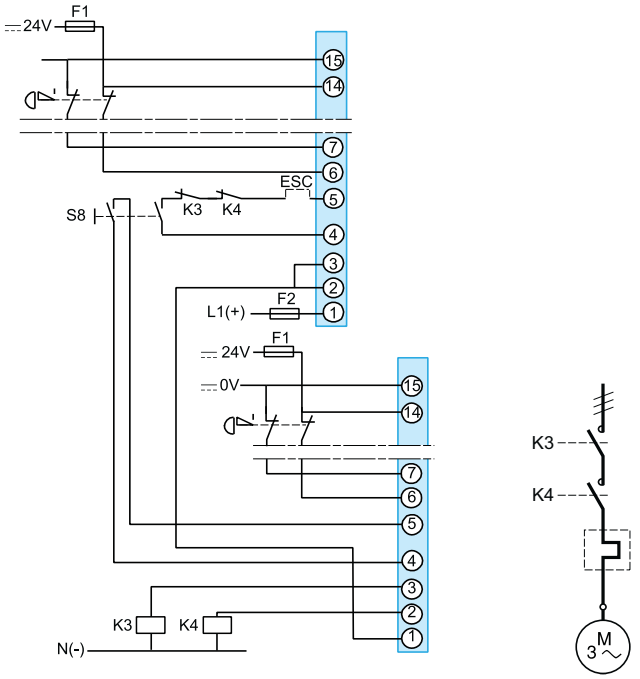
Connection of 4 sensors with dual contacts



Not all faults are detected. A short-circuit on a pushbutton or limit switch is not detected.
When using less than 4 single contacts, the input terminals not in use must be linked.
For example, if contact S5 is not in use, a bridge is required between terminals 10 and 12.

Connecting TSX DPZ 10D2A modules in series

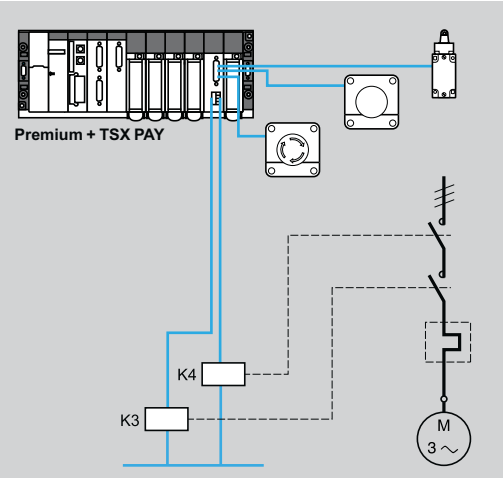
Connection of 4 sensors with dual contacts for existing installations



The connection of safety relay outputs in series enables diagnostics for up to 32 single or dual contact pushbuttons or limit switches. The number of modules connected in series is limited by the number of slots available on the TSX Micro PLC.

Characteristics: page 2/278
References: page 2/278

Safety automation system solutions
Modicon Premium automation platform
Preventa safety modules type TSX PAY



Presentation

TSX PAY safety modules integrated in the Premium PLC combine :
- the simplicity of use of Preventa safety modules
- the high performance of PLC diagnostics

in addition to the advantages of a standard PLC (extended choice of I/O, simplicity of setup, flexibility for hardware and software developments, etc).

TSX PAY safety modules incorporate in a single module, a Preventa (XPS) hard-wired safety block and an electronic data acquisition unit for complete diagnostics of input contacts and the state of outputs in the safety system.

TSX PAY safety modules are used to safely interrupt one or more Emergency stop or safety stop control circuits according to the standards EN/IEC 60204-1 and EN/ISO 13850.

The proven safety of hard-wired technology and the performance of Premium PLCs make the TSX PAY modules the optimum solution for creating machines which are more available, safer, more compact and lower in cost.

Solution for applications requiring safety systems and high-performance diagnostics

The solution, integrated safety modules, enables complete diagnostics on the entire safety system. This diagnostics quickly locates the faulty contact, pushbutton cables, or limit switch, without additional contacts on the inputs and without any additional wiring.

TSX PAY safety modules have their own power supplies and operate independently of the PLC processor.

TSX PAY modules are suitable for Emergency stop and limit switch monitoring applications, demanding a level of safety up to category 4 according to standard EN 954-1/ISO 13849-1 (parts of control systems relating to safety).

Functions

TSX PAY modules offer the following functions:

- Monitoring of 1 to 12 double or single pushbutton contacts, Emergency stop and limit switches for safety guards for an Emergency stop or immediate stop safety system (Emergency stop category 0 according to standard EN/ISO 13850).
- Hard-wired safety block identical to Preventa XPS safety modules:
  - 2 or 4 N/O (normally open) safety outputs,
  - 12 double contact inputs.
- Safety block independent of the Premium PLC processor: the PLC does not operate on the safety module.
- 28 LEDs on the module display block: for complete diagnostics of the safety system.
- Electronic data acquisition units for complete diagnostics of the safety system:
  - read the status of the 24 inputs (image of the status of the 12 pushbuttons or limit switches)
  - read the enable input,
  - read the feedback loop,
  - read the safety outputs control,
  - monitor the external power supply of the module.

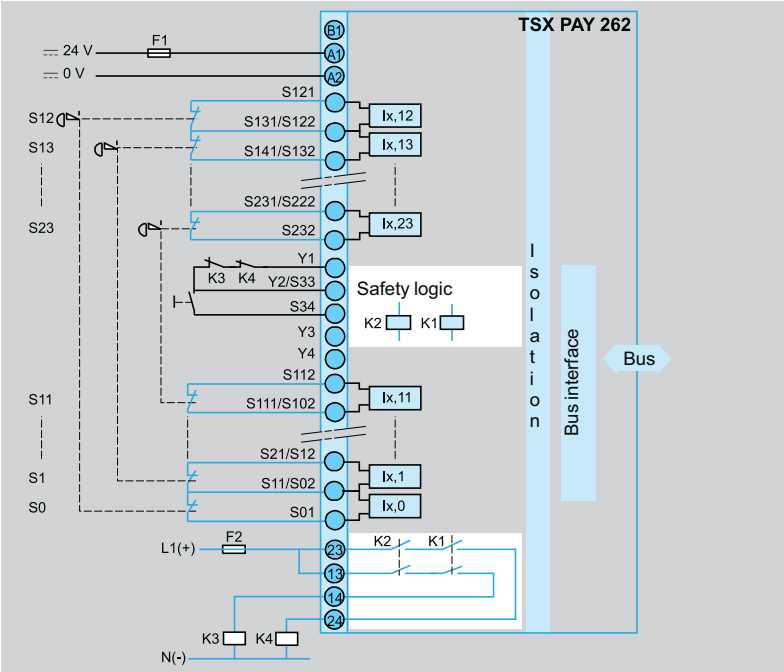
This electronic data acquisition is designed so that the safety function is not compromised by any failure. If the safety system uses more sensors, it is possible to connect several TSX PAY modules.

Characteristics: page 2/283 References: page 2/284 Connections: page 2/285

Safety automation system solutions
Modicon Premium automation platform
Preventa safety modules type TSX PAY

TSX PAY 262 module schematic

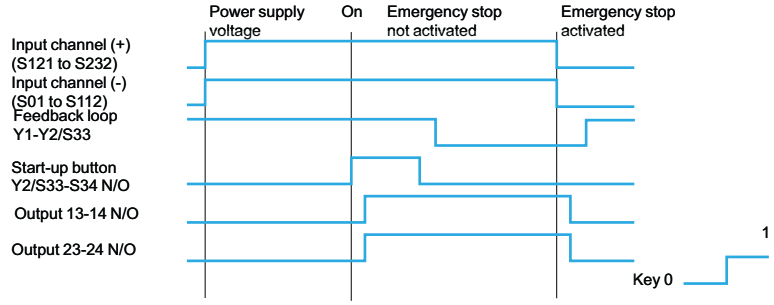
To ensure the safety function irrespective of the first failure, it is compulsory to use:
- For the inputs: Emergency stop pushbuttons or safety limit switches with double contacts
- For the outputs: if relaying is necessary, use a guided contact relay
- On the module power supply : an F1 protection fuse (see page 2/283 characteristics).



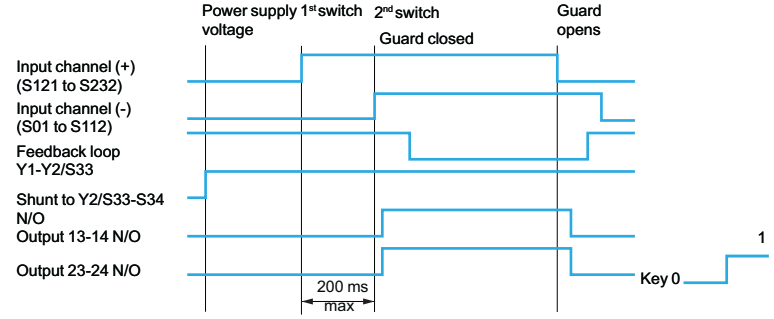
13-14 et 23-24	Safety outputs, volt-free
Y1-Y2/S33:	Feedback loop
Y2/S33-S34:	Run enable
Y3-Y4:	Choice of reactivation mode, see page 2/285
S121 à S232:	12 contacts on (+) input channel
S01 à S112:	12 contacts on (+) input channel
A1-A2:	⎓ 24 V external power supply
B1:	Selection of double or single contact wiring

Functional diagrams

Emergency stop function

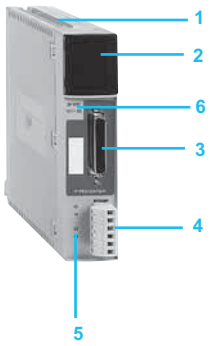


Protective function with automatic start-up



Characteristics: page 2/283
References: page 2/284

Safety automation system solutions
Modicon Premium automation platform
Preventa safety modules type TSX PAY



Description

TSX PAY safety modules comprise on the front panel :

1 A rigid IP 20 casing to hold and protect the electronic card.

2 A display block (32 LEDs) showing operating modes, faults and the status of the safety system.

3 A high density 44-way SUB-D connector for connecting the safety system.

4 A 6-way removable screw terminal block for connecting the safety outputs.

5 Marking for labelling the safety outputs.

6 Marking for the external power supply of the module.

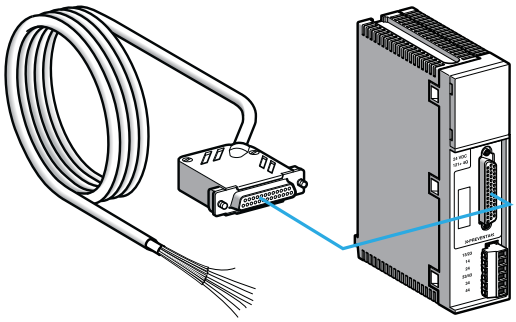
Connection principle

Two types of connection for TSX PAY safety modules are available:

Standard wiring

A TSX CPP 301 three metre cable is fitted with a 44-way SUB-D moulded, elbow connector at one end, and flying leads differentiated by a colour code at the other end.

This wiring system conforms to the standard EN 954-1/ISO 13849-1.



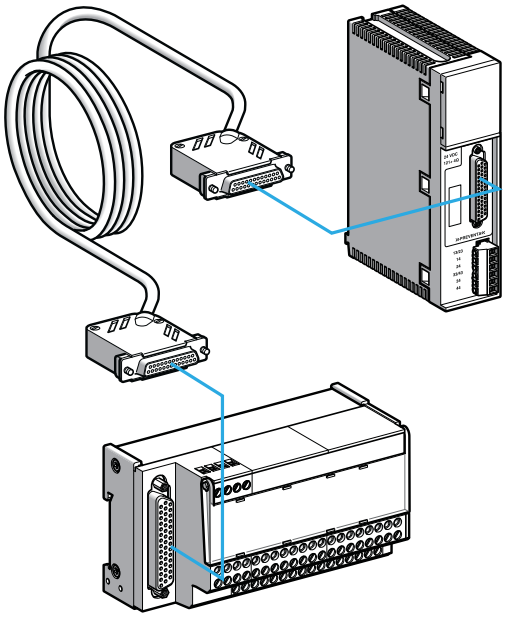
Fast wiring

Using the Telefast 2 pre-wired system facilitates the installation of TSX PAY safety modules by giving access to inputs on the safety system via screw terminals.

Connection is carried out using TSX CPP ●02 cables fitted with 44-way SUB-D moulded, elbow connectors at both ends.

The Telefast ABE 7CPA13 sub-base enables the connection of 12 double or single contact inputs, the power supply, reset inputs and the feedback loop.

This wiring system conforms to the standard EN 954-1/ISO 13849-1.



Characteristics: page 2/283
References: page 2/284
Connections: page 2/285

Safety automation system solutions
Modicon Premium automation platform
Preventa safety modules type TSX PAY

Standards and certifications							
Type of modules				**TSX PAY 262**		**TSX PAY 282**	
Standards	Machine	Machine electrical equipment		EN/IEC 60204-1, EN/ISO 12100			
		Emergency stop equipment		EN/ISO 13850			
	Product	Machine safety-parts of control systems relating to safety		EN 954-/ISO 13849-11 category 4, EN 1088/ISO 14119 pr IEC 61508 (SIL 3)			
	PLC	Specific requirements		IEC 61131-2 (EN 61131-2), CSA 22-2, UL 508			
Product certifications				BG, UL, CSA			
General characteristics							
Power supply		Nominal voltage	**V**	⎓ 24			
		Operating voltage limit	**V**	⎓ 19,2…30			
		Fault indication	**V**	⎓ < 20			
		Maximum consumption	**mA**	200			
Protection by external F1 fuse		Conforming to IEC 947-5-1	**A**	1 gG			
Consumption on internal 5 V			**mA**	< 150			
Isolation			**kV**	4 (overvoltage category III, degree of pollution 2)			
Characteristics of discrete inputs							
Modularity		Emergency stop or limit switch discrete inputs		12 double or single contacts			
		Reset PB input		1			
		Feedback loop input		1			
		Reset PB monitoring input		1			
		Double or single contact selection input		1			
Logic				Positive			
IEC 1131 conformity				Type 1			
Courant d'appel		Maximum	**A**	0,5			
Isolation between input and earth			**V eff**	500 - 50/60 Hz for 1 min			
Power		Dissipated in the module	**W**	< 5			
Characteristics of safety relay outputs							
Modularity				2 volt-free outputs		4 volt-free outputs	
Operating voltage limit		a.c	**V**	∿ 19…250			
		d.c	**V**	⎓ 17…127			
Maximum thermal current (Ithe)			**A**	2,5			
Minimum current			**mA**	30			
a.c. load	Inductive AC-15 duty	Voltage	**V**	∿ 24	∿ 48	∿ 110	∿ 220
		Power	**VA**	60	120	280	550
d.c. load	Inductive DC-13 duty (L/R = 100 ms)	Voltage	**V**	⎓ 24			
		Power	**VA**	60			
Response timee			**ms**	< 10			
Type of contact				AgCdO gold plated			
External protection of outputs by F2 fuse		Conforming to IEC 947-5-1	**A**	4 gG			
Cross-section of connecting cables		Without cable end	**mm²**	0.2…2.5			
		With cable end	**mm²**	1,5			
Isolation between input and earth		Insulation voltage conforming to DIN VDE 0110 part 2	**V**	300			
		Test voltage	**V eff**	1500 - 50/60 Hz for 1 min			
Environment							
Temperature		Operation	**°C**	0 °C …+ 60 °C			
		Storage	**°C**	- 25 °C …+ 70 °C			
Degree of protection		Conforming to IEC 529		IP 20			

References: page 2/284
Connections: page 2/285

Safety automation system solutions
Modicon Premium automation platform
Preventa safety modules type TSX PAY



TSX PAY 262



TSX PAY 282



ABE-7CPA13

Safety modules

Type of input ⎓ 24 V	Safety outputs	Connections	Reference *(1)*	Weight kg
12 Emergency stops or limit switches (double or single contacts), 1 reset button, 1 feedback loop, 1 reset monitor	2 N/O (volt-free) 2.5 A (Ithe)	Inputs: 44-way SUB-D connector Outputs: screw terminal (supplied)	**TSX PAY 262**	0.430
	4 N/O (volt-free) 2.5 A (Ithe)	Inputs: 44-way SUB-D connector Outputs: screw terminal (supplied)	**TSX PAY 282**	0.490

Connection accessory

Description	For connection on screw terminal	Type of connector on TSX PAY 2●2	Reference	Weight kg
Telefast 2 sub-base for TSX PAY 2●2 modules	Safety system, reset, monitoring and loop inputs Power supply ⎓ 24 V	SUB-D, 44-way	**ABE 7CPA13**	0.290

Connecting cables

Use	From TSX PAY 2●2 module	To	Length	Reference	Weight kg
For fast wiring	44-way SUB-D connector	ABE-7CPA13 sub-base	1 m	**TSX CPP 102**	0.160
			2 m	**TSX CPP 202**	0.260
			3 m	**TSX CPP 302**	0.360
For standard wiring	44-way SUB-D connector	Flying leads with colour-coded wires	3 m	**TSX CPP 301**	0.330

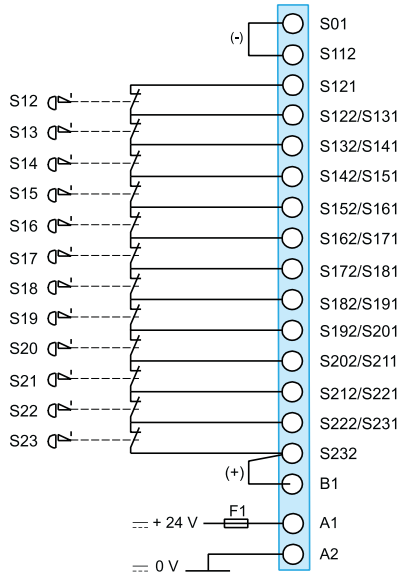
(1) Product supplied with a multilingual quick reference guide.

Characteristics: page 2/283
Connections: page 2/285

Safety automation system solutions
Modicon Premium automation platform
Preventa safety modules type TSX PAY

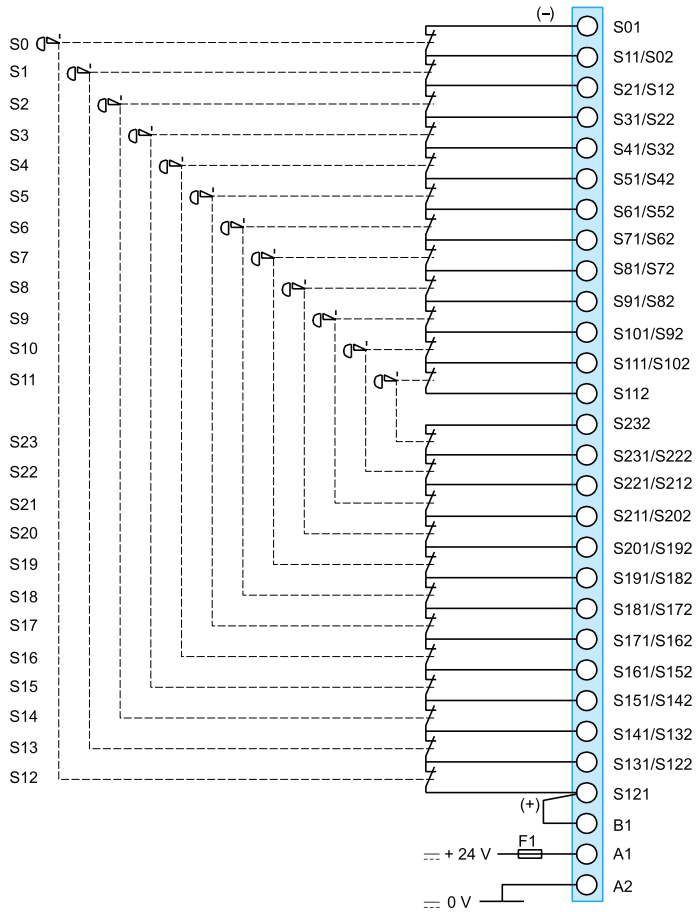
Input channel connection schemes

Wiring 1 input channel: single contact



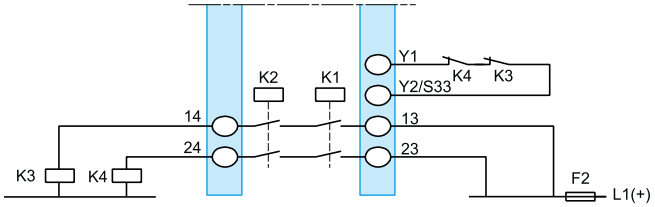
Single contact wiring is not suitable for applications which require a category 3 or 4 safety level.
Not all faults are detected, a short-circuit on a contact is not detected.
When using less than 12 single contacts, connect the input terminals which are not being used.
For applications with more than 12 single contacts, it is possible to use several TSX PAY modules by wiring the outputs in series.

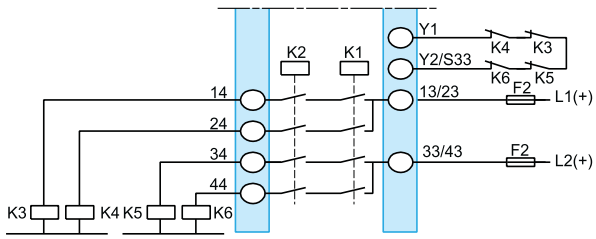
Wiring 2 input channels: double contacts



Double contact wiring of the inputs is necessary for creating applications which require a category 3 or 4 safety level.
When prompted, all the first faults are detected and located. A short-circuit between the 2 inputs is detected.
When using less than 12 double contacts, connect the input terminals which are not being used.
For applications with more than 12 double contacts, it is possible to use several TSX PAY modules by wiring the outputs in series.

Safety output connection schemes



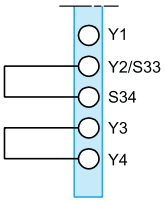


The design of a category 3 or 4 immediate stop system requires redundancy and checking, on request, of the power supply breaker devices.

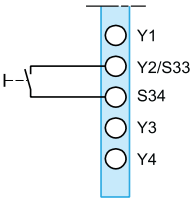
The wiring of N/C contacts (K3 and K4) enables this check on each request. Relays K3 and K4 must be mechanically linked contact relays.

When TSX PAY modules cut the power directly, it is necessary to connect the terminals Y1 and Y2/S33.

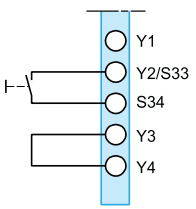
Reset function configurations



Automatic start-up



Manual reset without start button monitoring



Manual reset with start button monitoring

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References: page 2/284

Safety detection solutions

Safety switches

Selection guide: Safety switches . . . . . 3/2 to 3/5

General . . . . . *3/6 to 3/17*

Guard switches, safety switches

■ Presentation, General characteristics *3/18*
■ Metal, types XCS A, XCS B, XCS C, XCS E
□ Turret head,1 or cable entries M20 x 1.5 . . . . . *3/20*
□ Cable entries tapped for n° 13 (Pg 13.5) cable gland *3/22*
□ Cable entries tapped 1/2" NPT *3/24*
■ Plastic, double insulated, fixed head,
type XCS MP, Pre-cabled, length m, 5 m or 10 m *3/32*
■ Plastic, turret head,
types XCS PA, XCS TA and XCS TE,
□ 1 or cable entries M16 x 1.5. . . . . *3/36*
□ Cable entries tapped for n° 11 (Pg 11) cable gland *3/38*
□ Cable entries tapped 1/2" NPT *3/40*

Guard switches with rotary lever or spindle operator

■ Presentation, General characteristics *3/46*
■ Plastic, double insulated, turret head,
types XCS PL, XCS TL, XCS PR and XCS TR
□ 1 or cable entries M16 x 1.5 . . . . . *3/48*
□ Cable entries tapped for n° 11 (Pg 11) cable gland *3/50*
□ Cable entries tapped 1/2" NPT *3/52*

Coded magnetic switches

■ Presentation, General characteristics *3/54*
■ Plastic,
□ pre-cabled. *3/56*
□ connector on flying lead. *3/57*
■ Accessories. *3/58*

Coded magnetic systems

■ Presentation, General characteristics *3/66*
■ Plastic, solid-state PNP type output,
□ Pre-cabled connection *3/68*
□ M12 connector connection *3/69*
■ Accessories. *3/70*

Safety limit switches

Miniature design, metal

■ Presentation, General characteristics *3/74*
■ Pre-cabled, type XCS M *3/76*

Compact design, Complete switches

■ Presentation, General characteristics *3/78*
■ Metal, type XCS D, with 1 cable entry *3/80*
■ Plastic, type XCS P, with 1 cable entry *3/82*

Safety mats

Selection guide: Safety mats 3/84

Preventa safety mats, type XY2 TP 3/86

Protect Area Design: Software configurator for safety installations incorporating light curtains or safety mats. 3/88

Safety light curtains

Selection guide: Safety light curtains 3/96

General 3/98

Safety light curtains, type 4

For finger or hand protection

■ Compact light curtains with solid-state output, type XUS LT 3/104

For body protection

■ Compact light curtains with solid-state output, type XUS LP 3/112
■ with connector 3/113
■ with terminal block. 3/114

Safety light curtains, type 2

For hand protection

■ Slim, compact light curtains with solid-state output, type XUS LN 3/120

For body protection

■ Preventa safety modules and single-beam photo-electric sensors, type XPS CM 3/134

Accessories for safety light curtains types 2 and 4 . . . . . 3/124

Safety detection solutions
Safety switches

Applications		**Protection of operators by stopping the machine when the actuator (attached to machine guard) is withdrawn from the head of the switch**		
		All heavy industrial machines, with quick rundown time *(1)*		**All heavy and light industrial machines, with slow rundown time** *(2)*
Device		**Guard switches**		
		 811019	 811020	 811021
Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n°14, JIS C4520		
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100		
Product certifications		UL, CSA		
Enclosure		Metal		
Degree of protection		IP 67		
Dimensions (w x h x d) in mm	Switch	40 x 113.5 x 44	52 x 113.5 x 44	98 x 146 x 44
	Fixings	30 x 60	30 x 60	88 x 95
Features		Without locking of actuator. Turret head: 8 positions for insertion of actuator.	Manual locking and unlocking of actuator by pushbutton or key operated lock (can be mounted on left or right-hand side of switch head). Turret head: 8 positions for insertion of actuator.	Locking and unlocking of actuator by solenoid (either on energisation or on de-energisation). Manual unlocking (using key lock) of actuator in abnormal conditions. Turret head: 8 positions for insertion of actuator.
Contact blocks		Safety contacts actuated by the actuator. Slow break with positive opening operation		
		N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered) N/C + N/C + N/C		N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered) N/C + N/C + N/C + N/C + N/O auxiliary contact with positive opening operation, controlled by solenoid
Connection		Screw clamp terminals. Tapped entry for n° 13 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT		
		1 cable entry		2 cable entries
Type references		**XCS A**	**XCS B, XCS C**	**XCS E**
Page		3/18		

(1) Stopping time of machine less than time taken for operator to access hazardous zone.
(2) Stopping time of machine greater than time taken for operator to access hazardous zone.

All light industrial machines, with quick rundown time *(1)*	**All light industrial machines, with slow rundown time** *(2)*









IEC/EN 60947-5-1, IEC 68-2-30, UL 508, CSA C22-2 n° 14, JIS C4520			
IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100			
cULus, BG	UL, CSA		
Plastic			
IP 67			
30 x 87 x 15	30 x 93.5 x 30	52 x 114.5 x 30	110 x 93.5 x 33
Centres: 20/22		Centres: 20/22 or 40.3	Centres: 20/22
Without locking of actuator. Fixed head. 2 positions for insertion of actuator.	Without locking of actuator. Optional accessory: guard retaining device. Turret head: 8 positions for insertion of actuator.		Locking and unlocking of actuator by solenoid (either on energisation or on de-energisation). Turret head: 8 positions for insertion of actuator.
Safety contacts actuated by the actuator. Slow break with positive opening operation			
N/C + N/O (N/O staggered) N/C + N/C N/C + N/C + N/O (N/O staggered) N/C + N/C + N/C	N/C + N/O N/C+N/O (N/O staggered) N/O + N/C make before break N/C + N/C N/C + N/O + N/O (2 N/O staggered) N/C + N/C +N/O N/C + N/C + N/O (N/O staggered)	N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered) N/C + N/C + N/C	N/C + N/O (N/O staggered) N/O + N/C make before break N/C + N/C + N/C auxiliary contact with positive opening operation, controlled by solenoid
Pre-cabled, 4 or 6 x 0.5 mm^2, L = 2 or 5 or 10 m	Screw clamp terminals. Tapped entry for n° 11 cable gland, tapped ISO M16 x 1.5 or tapped 1/2" NPT.		
–	1 cable entry	2 cable entries	1 cable entry
XCS MP	**XCS PA**	**XCS TA**	**XCS TE**
3/18			

3

Applications		**Protection of operators by stopping the machine when the operating lever (attached to hinged machine guard) is displaced by 5°** **All light industrial machines fitted with hinged or rotary protective covers with small opening radius**		**Protection of operators by stopping the machine when the guard hinge rotates through 5°** **All light industrial machines fitted with hinged access doors**	
Device		**Safety switches with rotary lever operating head**		**Spindle operated safety switches**	
					
Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n°14, JIS C4520			
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100			
Product certifications		UL, CSA			
Enclosure		Plastic			
Degree of protection		IP 67			
Dimensions (w x h x d or Ø) in mm	Switch	30 x 87.5 x 30	52 x 108.4 x 30	30 x 96 x 30	52 x 117 x 30
	Fixings	Centres: 20/22	Centres: 20/22 or 40.3	Centres: 20/22	Centres: 20/22 or 40.3
Features		2 types of lever: straight or elbowed (flush with rear of switch) 3 lever positions: to left, centred or to right Turret head: 4 positions.		2 types of spindle: length 30 mm or 80 mm Turret head: 4 positions.	
Contact blocks or outputs		Slow break safety contacts with positive opening operation N/C contacts open when lever displaced by more then 5°			
		N/C + N/O (N/O staggered) N/C + N/C N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered)	N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered) N/C + N/C + N/C	N/C + N/O (N/O staggered) N/C + N/C N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered)	N/C + N/O + N/O (2 N/O staggered) N/C + N/C + N/O (N/O staggered) N/C + N/C + N/C
Connection		Tapped entry for n° 11 cable gland, tapped ISO M16 x 1.5 or tapped 1/2" NPT			
	Screw terminals	1 cable entry	2 cable entries	1 cable entry	2 cable entries
	Pre-cabled	–	–	–	–
	Connector	–	–	–	–
Type references		**XCS PL**	**XCS TL**	**XCS PR**	**XCS TR**
Page		3/46			

Protection of operators by stopping the machine when the gate is opened					Protection of operators by stopping the machine when the gate is opened	
All light industrial machines fitted with access gates with imprecise guidance and/or subjected to frequent washing					All machines with quick rundown time	
Coded magnetic switches, pre-cabled or with connector on flying lead			Coded magnetic system		Limit switches	
 540096	 540097	 540098	 525582		 540099	 107872-8-Q
IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14			IEC 61508, EN/IEC 62601 (SIL 2 and SIL 3), EN 13849-1 (Category 3 and 4), EN/IEC 60947-1, EN/IEC 60947-2, EN/IEC 60947-5-3		IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14	
IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100			EN 1088/ISO 14119		IEC/EN 60204-1, EN 1088/ISO 14119	
UL, CSA BG combined with safety modules XPS AF, XPS DM, XPS MP			UL, CSA, TÜV		UL, CSA	
Plastic			Plastic		Metal or plastic	
IP 66 and IP 67 for pre-cabled version IP 67 for connector on flying lead version			IP 66, IP 67 and IP69K for pre-cabled version IP 67 for connector version		IP 66, IP 67 and IP 68	
16 x 51 x 7	25 x 88 x 13	Ø 30, L 38.5	34 x 100 x 32		30 x 50 x 16	31 x 34 x 89
16	78	–	82		20	
3 approach directions		1 approach direction	9 approach directions		Plunger or rotary head Head adjustable in 15° steps throughout 360°	
Independent Reed type contacts operated by coded magnet Contacts change state from a distance of 8 mm (5 mm for XCS DMC) Must be used with a Preventa safety module			Self-contained system not requiring use of safety module or non-magnetic slim		N/C contacts with positive opening operation	
N/C + N/O (N/C staggered) N/O + N/O (1 N/O staggered)	N/C + N/O (N/C staggered) N/O + N/O (1 N/O staggered) N/C + N/C + N/O (1 N/C staggered) N/C + N/O + N/O (1 N/O staggered)	N/C + N/O (N/O staggered) N/O + N/O (1 N/O staggered)	2 **PNP type Solid-state outputs** XCS DM4 : EDM function + 1 alarm output		N/C + N/C + N/O (N/O staggered) slow break N/C + N/C + N/O and N/C + N/C + N/O + N/O snap action	
–			–		XCS D and XCS P: tapped entry for Pg 13.5 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT	
–	–	–	–		–	1 cable entry
2 contacts: 4 x 0.25 mm², L = 2 or 5 or 10 m	2 contacts: 4 x 0.25 mm², 3 contacts: 6 x 0.25 mm² L = 2 or 5 or 10 m	2 contacts: 4 x 0.25 mm² L = 2 or 5 or 10 m	XCS DM3 : 6 x 0,25 mm² XCS DM4 : 8 x **0,25 mm²** L = 2 or 5 or 10 m		XSC M: 7 x 0.5 mm², or 9 x 0.34 mm², L = 1 or 2 or 5 m	
M8 on 0.15 m flying lead	M12 on 0.15 m flying lead	M12 on 0.15 m flying lead	M12 connector (A coding)		–	
XCS DMC	**XCS DMP**	**XCS DMR**	**XCS DM3/XCS DM4**		**XCS M**	**XCS D/XCS P**
3/56 and 3/57			3/66		3/74	3/82

Safety detection solutions
Guard switches

Refer to standards EN/ISO 12100-2 and EN 1088/ISO 14119

Removable or moveable protective guards for potentially dangerous machine functions must be used in conjunction with locking or interlocking devices.
Application requiring an interlocking device: high inertia (long rundown time) machines.
An interlocking device must be used when the rundown time is greater than the time it takes for a person to reach the danger zone.
This device ensures that the guard remains locked until the potentially dangerous movement has stopped.

Guard switches

The mechanical actuator guard switches, specifically designed for machine guarding applications, provide an ideal solution for the locking or interlocking of movable guards associated with industrial machinery. They meet the requirements of standards EN/ISO 12100, EN 294/ISO 13852, EN 1088/ISO 14119 and IEC/EN 60204-1.
They contribute to the protection of operators working on potentially dangerous machines by breaking the start control circuit of the machine when a protective guard is opened or removed, using **positive opening operation contacts**, thus stopping the dangerous movement of the machine.
The removal/opening of the guard (after the dangerous movement has stopped) can either be:
- at the time the machine is switched-off for low inertia machines (machines where the rundown time is less than the time it takes for the operator to access the hazardous zone), or
- delayed for high inertia machines (machines where the rundown time is greater than the time it takes for the operator to access the hazardous zone).

Control circuit categories

Guard switches used in conjunction with a PREVENTA safety module enable designers, with reference to EN 954-1/ISO 13849-1, to establish category 4 control systems.
Safety related parts of control systems should be developed taking into account the results of an appropriate Risk Assessment (EN 1050/ISO 14121 - EN/ISO 12100 - 1 and 2).

Safety of personnel

The start command for the machine can only be initiated following correct operation of the guard switch.
On its release, the N/C safety contacts are opened by **positive action** or, for coded magnetic switches, change state **(must be monitored using a PREVENTA safety module)**.

Safety of operation

Guard switches incorporate slow break or snap action contacts with **positive opening operation** (except for coded magnetic switches where this is not possible).
For mechanical actuator guard switches, on closing of the guard the actuator fitted to it enters the head of the switch, operates the multiple interlock device and closes the N/C contacts. For coded magnetic switches, the presence of the magnet causes the contacts to change state.

Safety in use

All guard switches are designed to accept a few millimetres of misalignment between the actuator and the switch in order to compensate for mechanical play, vibration, etc.

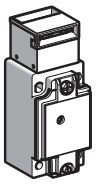
Design to minimise defeat

Both mechanically and magnetically actuated guard switches are designed to be operated by specific actuators so that they cannot be defeated in a simple manner using common tools, rods, metal plates, simple magnets, etc. When loosening the fixing screws for re-orientation of the turret head on mechanical actuator guard switches, the head itself remains attached to the switch body and the contact states remain unchanged.
All guard switches and safety limit switches are designed in such a manner that it is virtually impossible to adjust the head setting, remove the switch or gain access to the contacts without using the appropriate tool.
There are various methods for obtaining a higher level of tamper proofing, for example:
- using a cage device to prevent the insertion of a spare actuator or magnet, or any other foreign body,
- fixing the actuator or coded magnet to the guard by means that make it very difficult to remove (riveting or welding).

Safety detection solutions
Guard switches

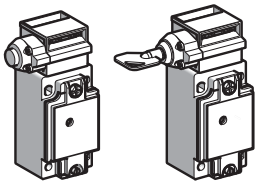
Metal case guard switches with mechanical actuator

Without locking of actuator



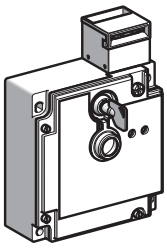
Metal case guard switches for use on machines **with low inertia** and operating in normal conditions (no vibration or shock and guard mounted vertically, without risk of rebound on closing), thus eliminating unintentional opening of the guard.

With locking of actuator and manual unlocking



Metal case guard switches for use on heavy machines **with low inertia** and operating in **arduous conditions** (shock or vibration exist), whereby the guard could open unintentionally.
A key operated lock or a pushbutton enables the positive locking of the guard and its subsequent unlocking.

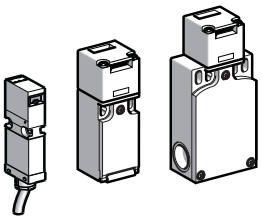
With interlocking and locking of actuator by solenoid



Metal case guard switches for use on machines **with high inertia** or necessitating a controlled opening of the protective guard.
The locking of the moving guard can either be on de-energisation or energisation of the solenoid.
A key operated lock enables manual unlocking of the guard in the event of an interlocking circuit malfunction, and also provides extra safety for maintenance personnel likely to be working on the machine.
The switches incorporate 2 LEDs: one indicating guard “open/closed” and the other, guard “locked/unlocked”.

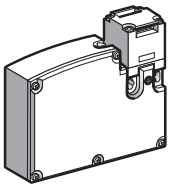
Plastic case guard switches with mechanical actuator

Without locking of actuator



Plastic case guard switches for use on light machines **with low inertia.**
For use in arduous conditions (shock or vibration exist, guard not vertical or risk of rebound on closing) where the guard could open unintentionally, a **guard retaining device (XCS PA or XCS TA)** is available as an accessory.

With interlocking and locking of actuator by solenoid

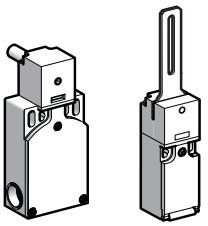


Plastic case guard switches for use on machines **with high inertia** or necessitating a controlled opening of the protective guard.
The locking of the moving guard can either be on de-energisation or energisation of the solenoid.
A special tool enables manual unlocking of the guard in the event of an interlocking circuit malfunction, and also provides extra safety for maintenance personnel likely to be working on the machine.

Safety detection solutions
Guard switches, safety limit switches and coded magnetic systems

Rotary lever and spindle operated guard switches for hinged guards

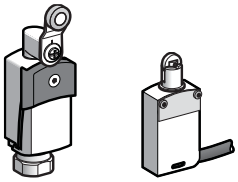
With head for rotary movement (lever or spindle)



Plastic case guard switches with straight or elbowed operating lever or spindle operator.
Specifically designed for small industrial machines fitted with small sized **hinged doors, covers or protective guards**.
They protect the operator by immediately stopping the dangerous movement of the machine as soon as the rotary lever or spindle displacement reaches an angle of 5°.

Safety limit switches

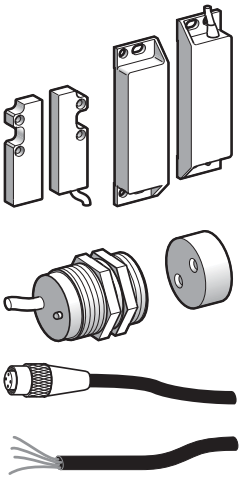
With head for linear movement (plunger) or rotary movement (lever)



Metal or plastic case limit switches.
For use on machines with low inertia and also on machines with high inertia, when used in conjunction with actuator operated guard switches, for monitoring access doors and/or guards. When used on their own, they are always installed in “positive mode” or combined in pairs, with one switch being in “positive mode” and the other in “negative mode”.

Coded magnetic guard switches

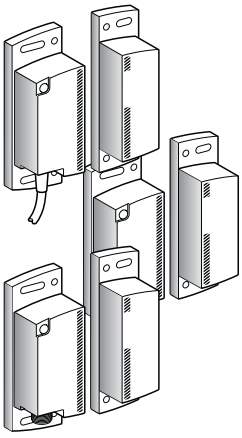
With an associated coded magnet



Plastic case guard switches for use on machines with low inertia.
Specifically designed for industrial machines fitted with **doors, covers or guards with imprecise guiding**.
They are ideally suited for machines subjected to frequent washing or liquid spray.
They protect the operator by immediately stopping any dangerous movement, as soon as the distance between the switch and its magnet is greater than 8 or 5 mm, depending on the switch model.

Coded magnetic systems

With dedicated transmitter

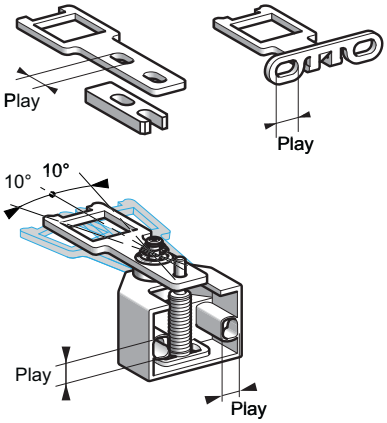


Plastic case system for use on machines with low inertia.
Specifically designed for industrial machines fitted with **one or more doors, covers or guards with imprecise guiding**.
They are ideally suited for machines subjected to frequent washing or liquid spray and that are not necessarily equipped with an enclosure or control cabinet.
These self-contained category 3 (SIL 2) or 4 (SIL 3) systems protect the operator by immediately stopping any dangerous movement, as soon as the distance between the transmitter and receiver is greater than 10 mm.

Safety detection solutions
Metal case guard switches

Actuators

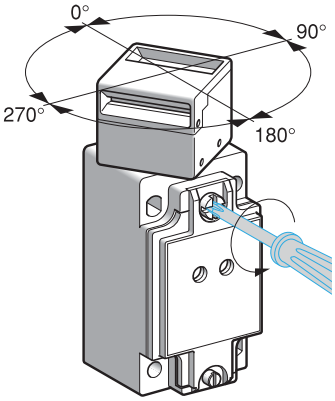
The actuators are common to all metal case guard switches



Their oblong fixing holes enable simple adjustment when mounting on moving guards.
A pivoting actuator (both horizontally and vertically) is available when using guard switches in conjunction with hinged guards or guards with imprecise guiding.
Straight actuators are supplied with an adaptor shank for simple replacement of an **XCK J** guard switch by an **XCS** switch, without the need to drill additional fixing holes for the switch or actuator.

Turret head

All metal case guard switches are fitted with a square turret head which can be rotated through 360° in 90° steps

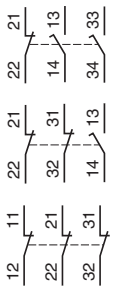


8 directions of actuation are possible for the actuator:
- 4 in the horizontal plane,
- 4 from above the switch (4

alternative positions of the actuator slot, depending on the orientation of the head).
When loosening the fixing screw for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged.

Safety contacts

Metal case guard switches incorporate a **3-pole contact block** with positive opening operation, which is actuated by insertion or withdrawal of the actuator attached to the guard.



The withdrawal of the actuator opens the N/C safety contact(s), even in the event of the contact sticking or welding.
The 3-pole contact block enables redundant safety circuits to be established (for example: N/C + N/C or N/C + N/O) and also, to provide signalling (for example: PLC, illuminated beacon, etc.).

LED indicators

An orange LED (optional for guard switches type XCS A, XCS B and XCS C, standard for guard switches type XCS E) **indicates the position of the machine guard:**



LED illuminated: actuator not inserted in head of switch, N/C contact(s) open, guard open.



LED not illuminated: actuator inserted in head of switch, N/C contact(s) closed, guard closed.

A green LED (incorporated on guard switches type XCS E) **indicates the locking of the machine guard:**



LED not illuminated: actuator not inserted in head of switch: the machine cannot be operated,

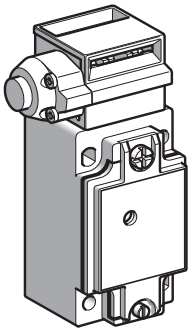


LED illuminated: actuator inserted in head of switch **and actuator locked**. The machine is either ready for starting, running or decelerating to a standstill.

3

Manual locking/unlocking by pushbutton or key operated lock on XCS B and XCS C

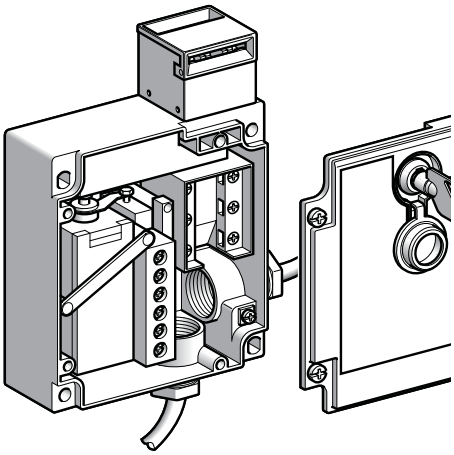
The pushbutton or key operated lock fitted to guard switches type XCS B and XCS C allows manual locking/unlocking of the machine guard



Their use is not necessary for the normal operation of the guard switch.
For ease of access, the pushbutton or lock may be mounted on the right or the left of the guard switch head.
For guard switches type XCS C, when the machine guard is locked (key in position “LOCK”), the resistance to forcible withdrawal of the actuator fitted to the guard is **150 daN**.
The key is removable from the locking device in the “LOCK” position.

Locking/unlocking by solenoid on XCS E

Guard switches type XCS E incorporate a solenoid for locking/unlocking of the machine guard

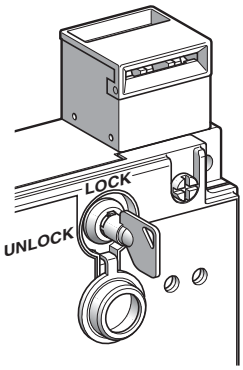


With the machine guard closed and locked, the resistance to forcible withdrawal of the actuator fitted to the guard is **200 daN**.

In addition to the 3-pole contact block, positively operated by the actuator fitted to the guard, XCS E guard switches incorporate a **N/C + N/O or N/C + N/C contact block mechanically linked to the solenoid**.
The N/C contact(s) are for use in the safety circuit of the machine and the N/O contact for signalling the status of the solenoid.

Key operated lock on XCS E

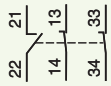
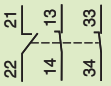
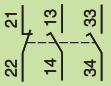
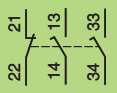
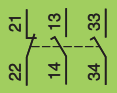
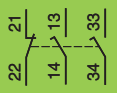
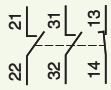
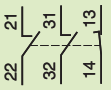
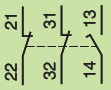
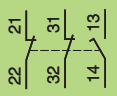
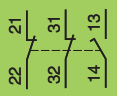
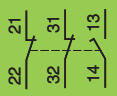
Guard switches type XCS E are fitted with a key operated lock allowing the unlocking of the machine guard whilst being held in the lock position by the solenoid (for use by authorised personnel only)



The manual unlocking of the guard using the key operated lock is useful in the following cases:
- whilst the machine is undergoing maintenance (with the key turned to the “UNLOCK” position and then removed, the level of protection is higher in preventing an accidental machine start. The safety for maintenance personnel is thus improved),
- in the event of a power failure,
- in the event of an interlocking circuit malfunction (interlocked condition maintained: positive safety). The electrical supply providing the unlocking via the solenoid always takes priority over manual unlocking using the key operated lock.

The lock fitted to standard guard switches has key withdrawal from the “LOCK” and “UNLOCK” positions.

Example of operation for an XCS E guard switch with locking on de-energisation of solenoid

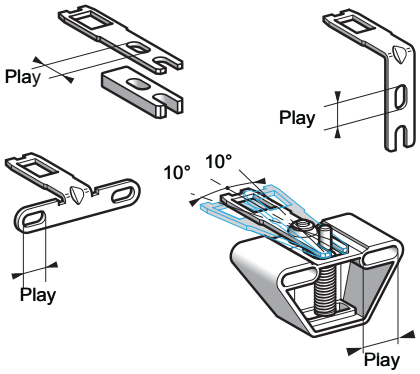
Machine status	Stopped, de-energised	Stopped, energised	Stopped, ready to start	Running	Stopping sequence	Stopped, energised
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free	Free	Free	Locked	Locked	Free
Solenoid status	"O" (de-energised)	"1" (energised)	"1" (energised)	"O" (de-energised)	"O" (de-energised)	"1" (energised)
3-pole contact state for XCS E5●●●						
3-pole contact state for XCS E7●●●						
Functions	Machine at rest.	Machine cannot be operated.	Guard closed, actuator can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact states (N/C + N/O) of solenoid						
Contact states (N/C + N/C) of solenoid						
Orange LED						
Green LED						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

3

3

Actuators

The actuators are common to all plastic case guard switches



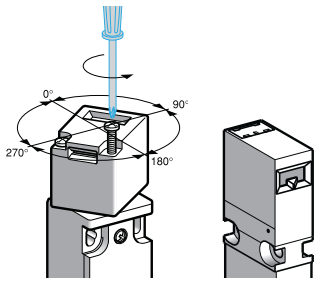
Their oblong fixing holes enable simple adjustment when mounting on moving guards.

A pivoting actuator (both horizontally and vertically) is available when using guard switches in conjunction with hinged guards or guards with imprecise guiding.

Straight actuators are supplied with an adaptor shank for simple replacement of an **XCK P** guard switch by an **XCS PA** switch, or an **XCK T** guard switch by an **XCS TA** switch, without the need to drill additional fixing holes for the switch or the actuator.

Turret head

Guard switches XCS PA, XCS TA and XCS TE are fitted with a square turret head which can be rotated through 360° in 90° steps. Guard switches XCS MP have a fixed head



8 directions of actuation are possible for the actuator:
- 4 in the horizontal plane (1 for **XCS MP**),
- 4 from above the switch (1 for **XCS MP**)

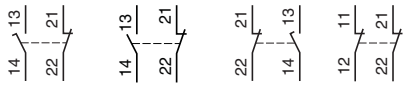
(4 alternative positions of the actuator slot, depending on the orientation of the head).

When loosening the 2 fixing screws for re-orientation of the operating head, the head itself remains attached to the body and the contact states remain unchanged **(XCS PA, XCS TA, XCS TE)**.

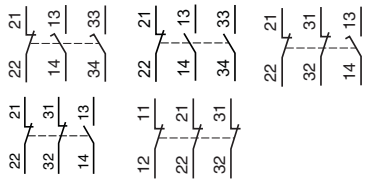
Safety contacts

The guard switches incorporate either a 2-pole contact block (XCS MP, XCS PA and XCS TE) or a 3-pole contact block (XCS MP, XCS PA and XCS TA), with positive opening operation, which is actuated by insertion or withdrawal of the actuator attached to the guard

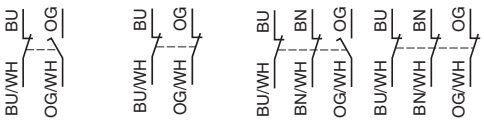
XCS PA, XCS TE



or **XCS PA, XCS TA**



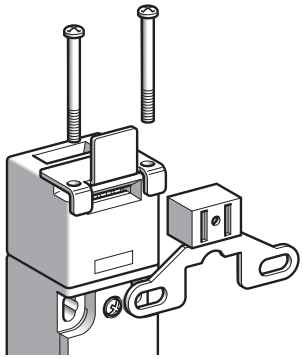
or **XCS MP**



In addition, guard switches type XCS TE incorporate a N/C contact block (with positive opening operation) actuated by the solenoid. The N/C contact is for use in the safety circuit of the machine. The withdrawal of the actuator opens the N/C safety contact(s), even in the event of the contact sticking or welding.
The 2-pole N/C + N/C or 3-pole N/C + N/C + N/O or N/C + N/C + N/C (XCS TA/MP only) contact block enables category 3 control circuits to be established conforming to
EN 954-1/ISO 13849-1 by using both N/C safety contacts in redundancy, or a category 1 control circuit by using one N/C contact in the safety circuit and the other N/C contact for signalling (for example: PLC, illuminated beacon, etc.). Alternatively, these guard switches used in conjunction with a **PREVENTA XPS** safety module establish a category 4 control circuit. Designers should follow the relevant recommendations for validation of control systems.

Guard retaining device

The guard retaining device XCS Z21 can be used with all plastic case guard switches type XCS PA and XCS TA that are used in conjunction with either the wide (XCS Z12) or pivoting (XCS Z13) actuator



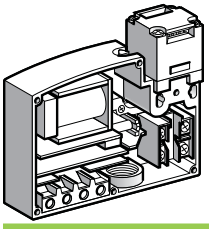
It assists in holding the guard closed by providing an extra retaining force of 5 daN.

It is specially suited for use with light machines operating in arduous conditions (vibration, mechanical shock, guard not vertical, risk of guard rebound on closing, etc.).

It can be used for horizontal actuator actuation directions as well as those from above.

Locking/unlocking by solenoid on XCS TE

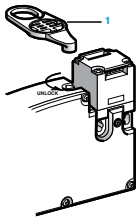
Guard switches type XCS TE incorporate a solenoid for locking/unlocking of the machine guard



With the machine guard closed and locked, the resistance to forcible withdrawal of the actuator fitted to the guard is **50 daN**.
In addition to the 2-pole contact block, positively operated by the actuator fitted to the guard, XCS TE guard switches incorporate a **N/C contact block mechanically linked to the solenoid**.
The N/C contact is for use in the safety circuit of the machine.

Unlocking by special tool for XCS TE

Guard switches type XCS TE are supplied with a special tool 1 that enables unlocking of the machine guard whilst being held in the locked position by the solenoid (for use by authorised personnel only)



The manual unlocking of the guard using the tool 1 is useful in the following cases:
- whilst the machine is undergoing maintenance (with the tool turned to the "UNLOCK" position and then removed, the level of protection is higher in preventing an accidental machine start. The safety for maintenance personnel is thus improved),
- in the event of a power failure,
- in the event of an interlocking circuit malfunction (interlocked condition maintained: positive safety). The electrical supply providing the unlocking via the solenoid always takes priority over manual unlocking using the special tool.

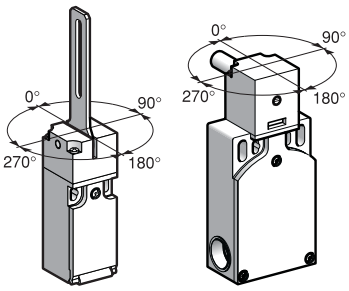
Example of operation for an XCS TE guard switch with locking on de-energisation of solenoid

Machine status	Stopped, de-energised	Stopped, energised	Stopped, ready to start	Running	Stopping sequence	Stopped, energised
Guard position	Open	Open	Closed	Closed	Closed	Closed
Guard status	Free	Free	Free	Locked	Locked	Free
Solenoid status	"O" (de-energised)	"1" (energised)	"1" (energised)	"O" (de-energised)	"O" (de-energised)	"1" (energised)
2-pole contact state for XCS TE5●●●						
2-pole contact state for XCS TE7●●●						
Functions	Machine at rest.	Machine cannot be operated.	Guard closed, actuator can be locked. It will be locked as soon as the start instruction is given.	Start instruction given, the machine is running.	Stop instruction given, the machine stops gradually (deceleration then complete stop of motor).	Machine has stopped. The guard can be opened.
Contact state of solenoid						
Safety circuit of the machine	Open	Open	Open	Closed	Closed	Open

Safety detection solutions
Rotary lever and spindle operated guard switches

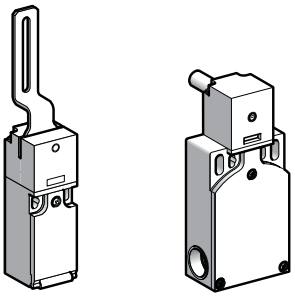
Presentation

Turret head



Guard switches for hinged covers or guards, featuring a hinged lever or spindle operator, incorporate a turret head that can be rotated through 360° in 90° steps.
Two additional self-locking screws are included with each switch for positive fixing of the head.

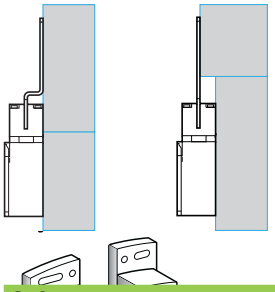
2 types of body



XCS PL *XCS TR*

- Plastic case, narrow, with 1 cable entry for **XCS PL** and **XCS PR**.
- Plastic case, wide, with 2 cable entries for **XCS TL** and **XCS TR**.

2 types of operating lever, 2 spindle lengths



- **Levers**

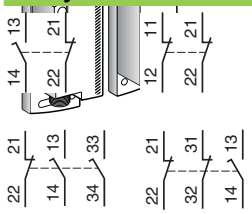
Straight or elbowed (flush with rear of switch), making the lever switches suitable for use with all types of hinged guards, whether:
- flush with the machine framework (use a switch with an elbowed flush lever),
- overhanging in relation to the machine framework (use a switch with a straight lever).

3 alternative operating lever positions allow the switches to be used with guards that open to the left, centre or right.

- **Spindle operators**

2 spindle lengths: 30 or 80 mm.

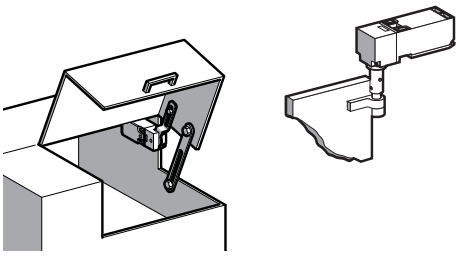
Safety contacts



Guard switches **XCS PL** and **XCS PR** incorporate a 2-pole or 3-pole contact block, with positive opening operation. The contact arrangements can be: N/C **+ N/O (N/O staggered), N/C + N/C,** N/C + N/O + N/O (2 N/O staggered) or N/C + N/C + N/O (N/O staggered).
Guard switches **XCS TL** and **XCS TR** incorporate a 3-pole contact, with positive opening operation. The contact arrangements can be: N/C + N/O + N/O (2 N/O staggered) or N/C + N/C + N/O) (N/O staggered).
Opening of the N/C safety contact(s) occurs when the operating lever or spindle is displaced by an angle equal to or greater than 5°.

Applications

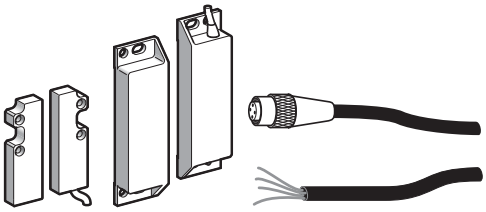
These guard switches provide a solution for monitoring **hinged protective guards** with small opening radius on machines with low inertia (no rundown time).
They are specially suitable for existing machines which need to be brought in-line with the latest standards and directives since they can be used in conjunction with existing covers, including those whose mounting is somewhat imprecise.
Mounting of the guard switch improves the machine operator's level of safety by limiting the opening of the protective guard and reducing the risk of touching any moving parts before they have come to a stop.

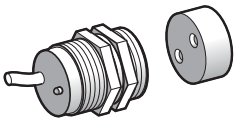


Safety detection solutions
Coded magnetic guard switches and systems

Presentation

Coded magnetic switches





3 types of case

- PBT plastic body
- Compact rectangular, **XCS DMC**
- Standard rectangular, **XCS DMP**
- Cylindrical Ø 30, **XCS DMR**
- Pre-cabled, length 2 m, 5 m or 10 m
- Connector on flying lead connection:
  - M8: DMC
  - M12: DMP, DMR

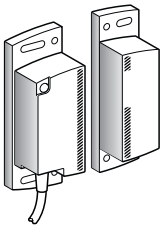
Contacts

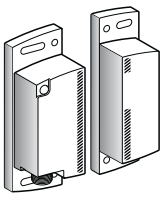
Coded magnetic switches are fitted with 2-pole **(XCS DMC/XCS DMR/XCS DMP)** or 3-pole **(XCS DMP)** Reed type contacts and are available with or without a “guard closed” LED indicator.
The N/C and N/O contacts change state as soon as the magnet is at a distance from the sensor of approximately 8 mm for types **XCS DMP** and **XCS DMR** and approximately 5 mm for type **XCS DMC**.

Connection

When used in safety circuits, the Reed technology contacts must always be used in conjunction with a Preventa safety module.

Coded magnetic systems with dedicated transmitter





1 type of case

- PBT plastic body
- Self-contained range: category 3 (SIL 2) **XCS DM3** and category 4 (SIL 3) **XCS DM4**.
- Pre-cabled, length 2 m, 5 m or 10 m
- Flying lead with M12 connector

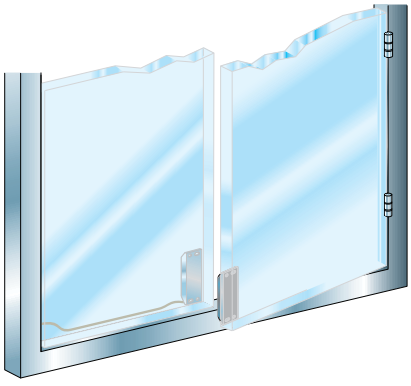
Technology

Coded “Hall effect” detection
PNP safety outputs
Integrated self-monitoring using micro-processors.
Detection distance from 0 to 10 mm obtained on approach of dedicated transmitter XCS DMT.

Functions

- Dynamic EDM (External Device Monitoring) only for **XCS DM4**,
- Fault and short-circuit detection,
- Output diagnostics (non safety related) only for XCS DM4
- LED indicator
- Possible chaining of up to a maximum of 32 systems for **XCS DM3** only.

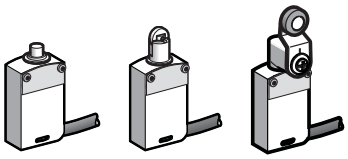
Applications



These switches provide a solution for monitoring moveable machine guards fitted to machines with quick rundown times.
They are particularly suitable for guards without accurate guidance and for use in difficult environments (dust, liquids, etc.).
Installing self-contained systems provides an optimum solution (no control system required).
They enable
- monitoring of one or several guards (opening, closing) on small machines,
- savings in space and the elimination of enclosures and/or control cabinets.

Presentation

With head for linear movement (plunger) or rotary movement (lever)



- Narrow metal case.
- Compact **XCS M**
- With protective plate, preventing both access to the fixing screws or adjustment of the head by non authorised personnel.
- Torx fixing screws.
- A removable cable entry to facilitate wiring.

Contacts

XCS M3 limit switches are fitted with 3-pole contacts and **XCS M4** switches are fitted with 4-pole contacts. 4 versions of complete switches are available incorporating these contacts:

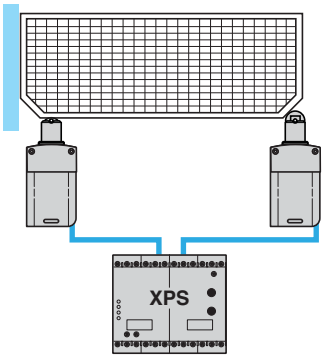
- metal end plunger,
- roller plunger,
- thermoplastic roller lever,
- diameter 19 mm steel roller lever.

Connection

Pre-cabled switches, either 7 x 0.5 mm² or 9 x 0.34 mm².

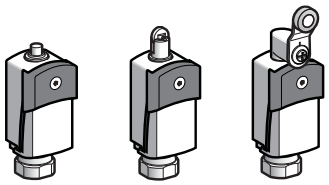
Applications

These switches provide a solution for monitoring covers, guards or grilles on machines with low inertia (quick rundown time), either in conjunction with actuator operated guard switches or not.
When used on their own, they are always installed in “positive mode” or combined in pairs, with one switch being in “positive mode” and the other in “negative mode”, and can, when connected to Preventa safety modules, establish a category 4 safety control system.



Presentation

With head for linear movement (plunger) or rotary movement (lever)



- Compact metal case **XCS D** and plastic case **XCS P**.
- With protective plate, preventing both access to the fixing screws or adjustment of the head by non authorised personnel.
- Torx fixing screws.
- A removable cable entry to facilitate wiring.

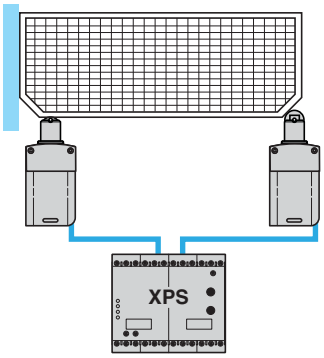
Contacts

XCS P3●●●● and **XCS D3●●●●** limit switches are fitted with 3-pole contacts.
4 versions of complete switches are available incorporating these contacts:

- metal end plunger,
- roller plunger,
- thermoplastic roller lever,
- diameter 19 mm steel roller lever.

Applications

These switches provide a solution for monitoring covers, guards or grilles on machines with low inertia (quick rundown time), either in conjunction with actuator operated guard switches or not.
When used on their own, they are always installed in “positive mode” or combined in pairs, with one switch being in “positive mode” and the other in “negative mode”, and can, when connected to Preventa safety modules, establish a category 4 safety control system.



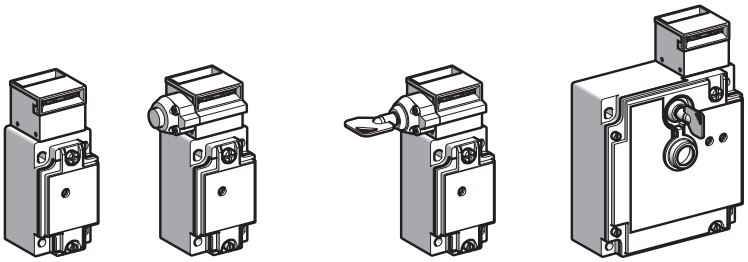
Safety detection solutions

Guard switches, actuator operated

Metal, types XCS A, XCS B, XCS C and XCS E
Plastic, double insulated, turret head,
types XCS MP or XCS PA or XCS TA and XCS TE

Metal, types XCS A, XCS B, XCS C, XCS E

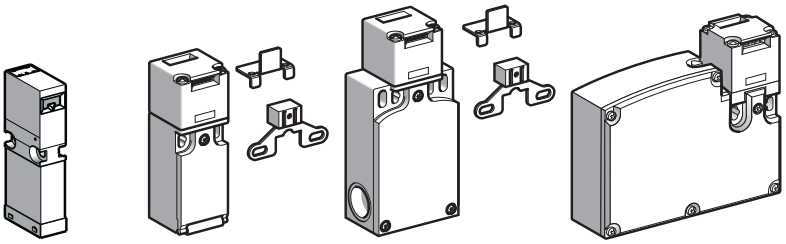
Guard switches with or without locking of the actuator



Pages 3/20 to 3/25

Plastic, types XCS MP, XCS PA XCS TA, XCS TE

Guard switches with or without locking of the actuator



Pages 3/32 and 3/36 to 3/41

Environment characteristics

Guard switch type		XCS A, XCS B, XCS C, XCS E (metal)	XCS MP, XCS PA, XCS TA, XCS TE (plastic)
Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14	
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119, EN/ISO 12100	
Product certifications		UL, CSA	UL, CSA (c UL for **XCS MP**)
Protective treatment		Standard version: “TC”	
Ambient air temperature	For operation	- 25…+ 70 °C (- 25…+ 40 °C for **XCS E** and - 25…+ 60 °C for **XCS TE**)	
	For storage	- 40…+ 70 °C (- 25…+ 80 °C for **XCS MP**)	
Vibration resistance		5 gn (10…500 Hz) conforming to IEC/EN 60068-2-6 (6 gn (10…55 Hz) for **XCS MP**)	
Shock resistance		10 gn (duration 11 ms) conforming to IEC/EN 60068-2-27 (50 gn (duration 11 ms) for **XCS MP**)	
Electric shock protection		Class I conforming to IEC/EN 60536	Class 2 conforming to IEC/EN 60536
Degree of protection		**IP 67 conforming to IEC/EN 60529 and IEC/EN 60947-5-1** *(1)*	
Cable entry		1 entry (**XCS A, XCS B, XCS C**) or 2 entries (**XCS E**) tapped for n° 13 (Pg 13.5) cable gland, tapped M20 or tapped 1/2" NPT	1 entry (**XCS PA and XCS TE**) or 2 entries (**XCS TA**) tapped for n° 11 (Pg 11) cable gland, tapped M16 or tapped 1/2" NPT (with adaptor) for **XCS TA** and **XCS TE**
Connecting cable		–	Pre-cabled, either 4 x 0.5 mm^2 or 6 x 0.5 mm^2 (**XCS MP**)
Materials		XCS A/B/C/E Zamak case	XCS MP/PA/TA/TE/PL/TL/PR/TR Polyamide PA66 fibreglass impregnated enclosure
		Actuators (all types): steel XC60, surface treated	

(1) Live parts of these switches are protected against the penetration of dust and water. However, when installing take all necessary precautions to prevent the penetration of solid bodies, or liquids with a high dust content, into the actuator aperture. Not recommended for use in saline atmospheres.

Safety detection solutions

Guard switches, actuator operated
Metal, types XCS A, XCS B, XCS C and XCS E
Plastic, double insulated, turret head, types XCS MP or XCS PA or XCS TA and XCS TE

Contact block characteristics

Rated operational characteristics		2 and 3 contact, slow break	**XCS A**, **XCS B**, **XCS C**, **XCS TA**, **XCS PA**: ∼ AC-15, A300: Ue = 240 V, Ie = 3 A or Ue = 120 V, Ie = 6 A **XCS E**, **XCS TE**: ∼ AC-15, B300: Ue = 240 V, Ie = 1.5 A or Ue = 120 V, Ie = 3 A **XCS MP**: ∼ AC-15, C300: Ue = 240 V, Ie = 0.75 A or Ue = 120 V, Ie = 1.5 A All models: ⎓ DC-13, Q300: Ue = 250 V, Ie = 0.27 A or Ue = 125 V, Ie = 0.55 A conforming to IEC/EN 60947-5-1
		2 contact, snap action	**XCS PA**: ∼ AC-15, A300: Ue = 240 V, Ie = 3 A; Ithe = 10 A ⎓ DC-13, Q300: Ue = 250 V, Ie = 0.27 A or Ue = 125 V, Ie = 0.55 A conforming to IEC/EN 60947-5-1
		3 contact, snap action	**XCS PA**: ∼ AC-15, B300: Ue = 240 V, Ie = 1.5 A; Ithe = 6 A ⎓ DC-13, R300: Ue = 250 V, Ie = 0.1 A or Ue = 125 V, Ie = 0.55 A conforming to IEC/EN 60947-5-1
Conventional thermal current in enclosure			**XCS A**, **XCS B**, **XCS C**, **XCS PA** (2 & 3 slow break contact and 2 snap action contact versions) **XCS E, XCS TE, XCS PA** (3 snap action contact version): Ithe = 6 A **XCS MP**: Ithe = 2.5 A
Rated insulation voltage		2 and 3 contact	3 contacts (**XCS A, XCS B, XCS C, XCS E, XCS TA**), 2 contacts (**XCS PA, XCS TE**), 2 and 3 contacts (**XCS MP**): Ui = 500 V conforming to IEC/EN 60947-1; Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
		3 contact	**XCS PA** and **XCS TE**: Ui = 400 V degree of pollution 3 conforming to IEC 60947-1 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage		2 and 3 contact	3 contacts (**XCS A, XCS B, XCS C, XCS E, XCS TA**), 2 contacts (**XCS PA, XCS TE**), 2 and 3 contacts (**XCS MP**): Uimp = 6 kV conforming to IEC/EN 60947-5-1
		3 contact	**XCS PA**: Uimp = 4 kV conforming to IEC/EN 60947-5-4
Positive operation			N/C contact(s) with positive opening operation conforming to IEC/EN 60947-5-1, Section 3
Resistance across terminals			≤ 30 mΩ conforming to IEC/EN 60947-5-4
Short-circuit protection		2 and 3 contact	3 contacts (**XCS A**, **XCS B**, **XCS C**, **XCS E**, **XCS TA**), 2 contacts (**XCS PA**, **XCS TE**), 2 and 3 contacts (**XCS MP**): 10 A cartridge fuse type gG (gl)
		3 contact	**XCS PA**: 6 A cartridge fuse type gG (gl)
Connection	Pre-cabled		4 x 0.5 mm² or 6 x 0.5 mm² (**XCS MP**), PVC
	Screw clamp terminals	2 contact, snap action	**XCS PA**, **XCS TA**: Clamping capacity, min: 1 x 0.34 mm², max: 2 x 1.5 mm²
		2 and 3 contact	3 contacts **(XCS A, XCS B, XCS C, XCS E, XCS TA)**, 2 contacts **(XCS PA, XCS TE)**: Clamping capacity, min: 1 x 0.5 mm², max: 2 x 1.5 mm² with or without cable end
		3 contact	**XCS PA**: clamping capacity, min: 1 x 0.34 mm², max: 1 x 1 mm² or 2 x 0.75 mm²

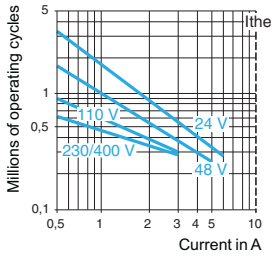
Electrical durability

Conforming to IEC/EN 60947-5-1 Appendix C.
Utilisation categories AC-15 and DC-13.
Maximum operating rate: 3600 operating cycles/hour.
Load factor: 0.5

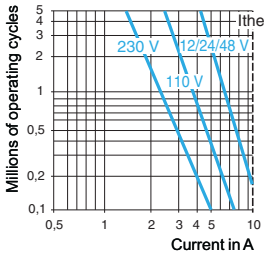
Only applicable to **XCS MP**: Conforming to IEC/EN 60947-5-1 Appendix C.
Utilisation categories AC-15 and DC-13.
Maximum operating rate: 900 operating cycles/hour.

a.c. supply
∼ 50/60 Hz
⎓ inductive circuit

2 snap action contact version



3 contact version XCS A/B/C/E/TA and 2 slow break contact version



d.c. supply ⎓
Power broken in W for 5 million operating cycles.

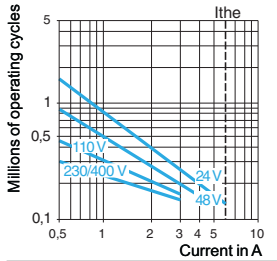
Voltage	V	24	48	120
⎓	W	10	7	4

Voltage	V	24	48	120
⎓	W	13	9	7

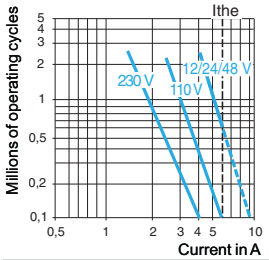
For XE2S P●151 on ∼ or ⎓, N/C and N/O contacts simultaneously loaded to the values shown with reverse polarity.

a.c. supply
∼ 50/60 Hz
⎓ inductive circuit

3 snap action contact version XCS PA



3 slow break contact version XCS PA



d.c. supply ⎓
Power broken in W for 5 million operating cycles.

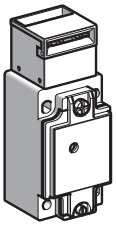
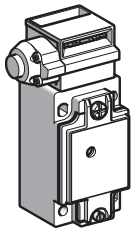
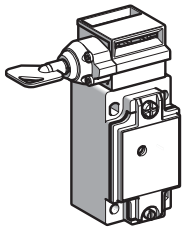
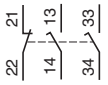
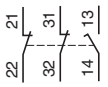
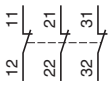
Voltage	V	24	48	120
⎓	W	3	2	1

Voltage	V	24	48	120
⎓	W	4	3	2

Safety detection solutions

Guard switches

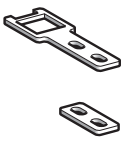
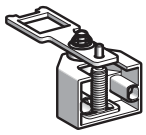
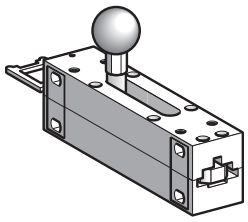
Metal, turret head *(1)*, types XCS A, XCS B, XCS C and XCS E
1 or 2 cable entries M20 x 1.5 *(2)*

Type of switch	Without locking of actuator		With locking of actuator, manual unlocking *(3)*	
				
LED indication on opening of N/C contacts	Without	1 orange LED ≂ 24/48 V	Without	Without
References of switches without actuator (⊖ **N/C contact with positive opening operation**)				
3-pole N/C + N/O + N/O (2 N/O staggered) slow break *(4)* 	**XCS A502** ⊖	**XCS A512** ⊖	**XCS B502** ⊖	**XCS C502** ⊖
3-pole N/C + N/C + N/O (N/O staggered) slow break *(4)* 	**XCS A702** ⊖	**XCS A712** ⊖	**XCS B702** ⊖	**XCS C702** ⊖
3-pole N/C + N/C + N/C slow break *(4)* 	**XCS A802** ⊖	–	–	–
Weight (kg)	0.440	0.440	0.475	0.480

Complementary characteristics not shown under General characteristics (3/19)

Actuation speed	Maximum: 0.5 m/s, minimum: 0.01 m/s
Resistance to forcible withdrawal of actuator	**XCS B** and **XCS C**: 1500 N; **XCS E**: 2000 N
Mechanical durability	**XCS A and XCS E: > 1 million operating cycles** **XCS B and XCS C: 0.6 million operating cycles**
Maximum operating rate	For maximum durability: 600 operating cycles per hour
Minimum force for extraction of actuator	≥ 20 N
Cable entry	**XCS A**, **XCS B**, **XCS C**: 1 cable entry. **XCS E**: 2 cable entries Entries tapped M20 x 1.5 for ISO cable gland. Clamping capacity 7 to 13 mm
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of actuators

				
Description	Straight actuator	Actuator with wide fixing	Pivoting actuator	Latch for sliding doors (Padlockable in open position)
For guard switches XCS A, B, C, E	**XCS Z01**	**XCS Z02**	**XCS Z03**	**XCS Z05**
Weight (kg)	0.020	0.020	0.095	0.600

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
*(2) For cable entries tapped for n° 13 (Pg 13.5) cable gland, replace the last number in the reference (2) by **1** (see page 3/22).*
*Example: **XCS A502** becomes **XCS A501**.*
(3) Unlocking by pushbutton for XCS B●●● and by key operated lock for XCS C●●●.
(4) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.

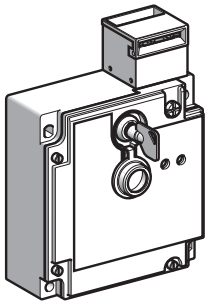
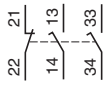
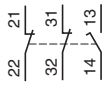
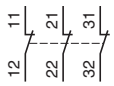
Other versions: please consult your Regional Sales Office.

Dimensions: page 3/27 and 3/28
Schemes: page 3/29

Safety detection solutions

Guard switches

Metal, turret head *(1)*, types XCS A, XCS B, XCS C and XCS E
1 or 2 cable entries M20 x 1.5 *(2)*

Type of switch	**With interlocking, locking by solenoid**						
							
Type of interlocking	**Locking on de-energisation and unlocking on energisation of solenoid** *(3)*. To order a guard switch with locking on energisation and unlocking on de-energisation of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCS E5312** becomes **XCS E5512**..						
LED indication	Orange LED: "guard open" signalling. Green LED: "guard closed and locked" signalling.						
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)		∿ or ⎓ 48 V (50/60 Hz on ∿)	∿ or ⎓ 110/120 V *(4)* (50/60 Hz on ∿)		∿ or ⎓ 220/240 V *(4)* (50/60 Hz on ∿)	
Type of contact on solenoid	N/C + N/O	2 N/C	N/C + N/O	N/C + N/O	2 N/C	N/C + N/O	2 N/C
References of switches without actuator (⊖ N/C contact with positive opening operation)							
3-pole N/C + N/O + N/O (2 N/O staggered) slow break *(5)* 	**XCS E5312** ⊖	–	–	–	–	**XCS E5342** ⊖	–
3-pole N/C + N/C + N/O (N/O staggered) slow break *(5)* 	**XCS E7312** ⊖	**XCS E73127** ⊖	–	**XCS E7332** ⊖	**XCS E73327** ⊖	**XCS E7342** ⊖	**XCS E73427** ⊖
3-pole N/C + N/C + N/C slow break *(5)* 	**XCS E8312** ⊖ *(6)*	**XCS E83127** ⊖ *(6)*	**XCS E8322** ⊖ *(6)*	–	–	–	–
Weight (kg)	1.140	1.140	1.140	1.140		1.140	

Solenoid characteristics					
Load factor	100%				
Rated operational voltage	∿ **or** ⎓ **24 V**	∿ **or** ⎓ **24 V**	∿ **or** ⎓ **48 V**	∿ **or** ⎓ **110/120 V**	∿ **or** ⎓ **220/240 V**
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to IEC/EN 60947-1				
Service life	20 000 hours				
Consumption	Inrush: 10 VA. Sealed: 10 VA				

LED indicator characteristics		
Rated insulation voltage	50 V conforming to IEC/EN 60947-1	250 V conforming to IEC/EN 60947-1
Current consumption	7 mA	7 mA
Rated operational voltage	∿ **or** ⎓ **24/48 V**	∿ **110/240 V**
Voltage limits	∿ or ⎓ 20...52 V (including ripple)	∿ 95...264 V (including ripple)
Service life	100 000 hours	100 000 hours
Protection against overvoltages	Yes	Yes

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
*(2) For cable entries tapped for n° 13 (Pg 13.5) cable gland, replace the last number in the reference (2) by **1** (see page 3/23).*
*Example: **XCS E5312** becomes **XCS E5311**.*
(3) A key operated lock enables forced opening of the interlocking mechanism, by authorised personnel, allowing withdrawal of the actuator and subsequent opening of the N/C safety contacts.
(4) For use on ⎓ 110/120 V or ⎓ 220/240 V, remove the LED indicator module.
(5) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(6) Switches supplied with a single green LED.

Other versions: please consult your Regional Sales Office.

Dimensions:
page 3/27 and 3/28

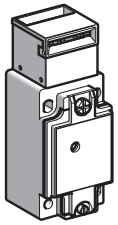
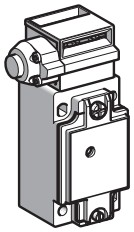
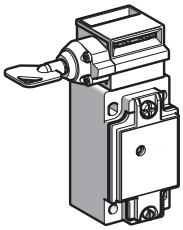
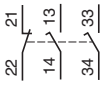
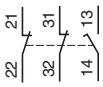
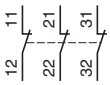
Schemes:
page 3/29

Safety detection solutions

Guard switches

Metal, turret head *(1)*, types XCS A, XCS B, XCS C and XCS E

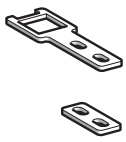
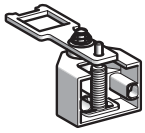
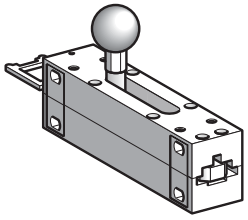
Cable entries tapped for n° 13 (Pg 13.5) cable gland

Type of switch	**Without locking of actuator**			**With locking of actuator, manual unlocking** *(2)*			
							
LED indication on opening of N/C contacts	Without	1 orange LED ⎓ 24/48 V	1 orange LED ∿ 110/240 V	Without	1 orange LED ⎓ 24/48 V	Without	1 orange LED ⎓ 24/48 V
References of switches without actuator (⊖ **N/C contact with positive opening operation)**							
3-pole N/C + N/O + N/O (2 N/O staggered) slow break *(3)* 	**XCS A501** ⊖	**XCS A511** ⊖	**XCS A521** ⊖	**XCS B501** ⊖	**XCS B511** ⊖	**XCS C501** ⊖	**XCS C511** ⊖
3-pole N/C + N/C + N/O (N/O staggered) slow break *(3)* 	**XCS A701** ⊖	**XCS A711** ⊖	**XCS A721** ⊖	**XCS B701** ⊖	–	**XCS C701** ⊖	–
3-pole N/C + N/C + N/C slow break *(3)* 	**XCS A801** ⊖	–	–	**XCS B801** ⊖	–	**XCS C801** ⊖	–
Weight (kg)	0.440	0.440	0.440	0.475	0.475	0.480	0.480

Complementary characteristics not shown under General characteristics (3/19)

Actuation speed	Maximum: 0.5 m/s, minimum: 0.01 m/s
Resistance to forcible withdrawal of actuator	**XCS B** and **XCS C**: 1500 N; **XCS E**: 2000 N
Mechanical durability	**XCS A and XCS E: > 1 million operating cycles** **XCS B and XCS C: 0.6 million operating cycles**
Maximum operating rate	For maximum durability: 600 operating cycles per hour
Minimum force for extraction of actuator	≥ 20 N
Cable entry	**XCS A**, **XCS B**, **XCS C**: 1 cable entry. **XCS E** : 2 cable entries Entries tapped for n° 13 cable gland conforming to NF C 68-300 (DIN Pg 13.5). Clamping capacity 9 to 12 mm
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of actuators

				
Description	Straight actuator	Actuator with wide fixing	Pivoting actuator	Latch for sliding doors (Padlockable in open position)
For guard switches XCS A, B, C, E	**XCS Z01**	**XCS Z02**	**XCS Z03**	**XCS Z05**
Weight (kg)	0.020	0.020	0.095	0.600

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) Unlocking by pushbutton for XCS B●●● and by key operated lock for XCS C●●●.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.

Other versions: please consult your Regional Sales Office.

Dimensions:
page 3/27 and 3/28

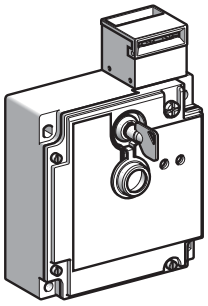
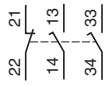
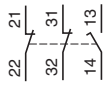
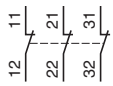
Schemes:
page 3/29

Safety detection solutions

Guard switches

Metal, turret head *(1)*, types XCS A, XCS B, XCS C and XCS E

Cable entries tapped for n° 13 (Pg 13.5) cable gland

Type of switch	With interlocking, locking by solenoid							
								
Type of interlocking	**Locking on de-energisation and unlocking on energisation of solenoid** *(2)*. To order a guard switch with locking on energisation and unlocking on de-energisation of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCS E5311** becomes **XCS E5511**.							
LED indication	Orange LED: "guard open" signalling. Green LED: "guard closed and locked" signalling.							
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)		∿ or ⎓ 48 V (50/60 Hz on ∿)		∿ or ⎓ 110/120 V *(3)* (50/60 Hz on ∿)		∿ or ⎓ 220/240 V *(3)* (50/60 Hz on ∿)	
Type of contact on solenoid	N/C + N/O	2 N/C	N/C + N/O	2 N/C	N/C + N/O	2 N/C	N/C + N/O	2 N/C
References of switches without actuator (⊖ N/C contact with positive opening operation)								
3-pole N/C + N/O + N/O (2 N/O staggered) slow break *(4)* 	**XCS E5311** ⊖	**–**	**XCS E5321** ⊖	**–**	**XCS E5331** ⊖	**–**	**XCS E5341** ⊖	**–**
3-pole N/C + N/C + N/O (N/O staggered) slow break *(4)* 	**XCS E7311** ⊖	**XCS E73117** ⊖	**XCS E7321** ⊖	**XCS E73217** ⊖	**XCS E7331** ⊖	**XCS E73317** ⊖	**XCS E7341** ⊖	**XCS E73417** ⊖
3-pole N/C + N/C + N/C slow break *(4)* 	**XCS E8311** ⊖ *(5)*	**XCS E83117** ⊖ *(5)*	**–**	**–**	**XCS E8331** ⊖ *(5)*	**XCS E83317** ⊖	**–**	**XCS E83417** ⊖
Weight (kg)	1.140		1.140		1.140			
Solenoid characteristics								
Load factor	100%							
Rated operational voltage	∿ **or** ⎓ **24 V**		∿ **or** ⎓ **48 V**		∿ **or** ⎓ **110/120 V**		∿ **or** ⎓ **220/240 V**	
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to IEC/EN 60947-1							
Service life	20 000 hours							
Consumption	Inrush: 10 VA. Sealed: 10 VA							
LED indicator characteristics								
Rated insulation voltage	50 V conforming to IEC/EN 60947-1				250 V conforming to IEC/EN 60947-1			
Current consumption	7 mA				7 mA			
Rated operational voltage	∿ **or** ⎓ **24/48 V**				∿ **110/240 V**			
Voltage limits	∿ or ⎓ 20...52 V (including ripple)				∿ 95...264 V (including ripple)			
Service life	100 000 hours				100 000 hours			
Protection against overvoltages	Yes				Yes			

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) A key operated lock enables forced opening of the interlocking mechanism, by authorised personnel, allowing withdrawal of the actuator and subsequent opening of the N/C safety contacts.
(3) For use on ⎓ 110/120 V or ⎓ 220/240 V, remove the LED indicator module.
(4) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(5) Switches supplied with a single green LED.

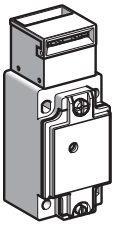
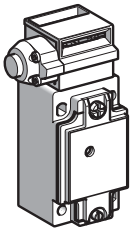
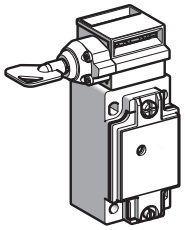
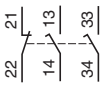
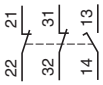
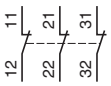
Other versions: please consult your Regional Sales Office.

Dimensions: page 3/27 and 3/28
Schemes: page 3/29

Safety detection solutions

Guard switches

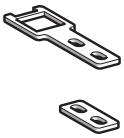
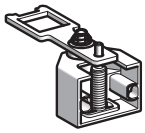
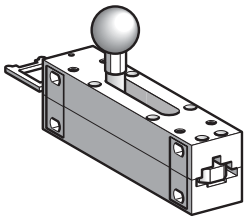
Metal, turret head *(1)*, types XCS A, XCS B, XCS C and XCS E
Cable entries tapped 1/2" NPT

Type of switch	Without locking of actuator			With locking of actuator, manual unlocking *(2)*			
							
LED indication on opening of N/C contacts	Without	1 orange LED ⎓ 24/48 V	1 orange LED ~ 110/240 V	Without	1 orange LED ⎓ 24/48 V	1 orange LED ~ 110/240 V	Without
References of switches without actuator (⊖ N/C contact with positive opening operation)							
3-pole N/C + N/O + N/O (2 N/O staggered) slow break *(3)* 	**XCS A503** ⊖	–	**XCS A523** ⊖	**XCS B503** ⊖	–	–	–
3-pole N/C + N/C + N/O (N/O staggered) slow break *(3)* 	**XCS A703** ⊖	**XCS A713** ⊖	**XCS A723** ⊖	**XCS B703** ⊖	**XCS B713** ⊖	**XCS B723** ⊖	**XCS C703** ⊖
3-pole N/C + N/C + N/C slow break *(3)* 	**XCS A803** ⊖	–	–	**XCS B803** ⊖	–	–	**XCS C803** ⊖
Weight (kg)	0.440	0.440	0.440	0.475	0.475	0.475	0.480

Complementary characteristics not shown under General characteristics (page 3/19)

Actuation speed	Maximum: 0.5 m/s, minimum: 0.01 m/s
Resistance to forcible withdrawal of actuator	**XCS B** and **XCS C**: 1500 N; **XCS E**: 2000 N
Mechanical durability	**XCS A and XCS E: > 1 million operating cycles** **XCS B and XCS C: 0.6 million operating cycles**
Maximum operating rate	For maximum durability: 600 operating cycles per hour
Minimum force for extraction of actuator	≥ 20 N
Cable entry	**XCS A**, **XCS B**, **XCS C**: 1 cable entry **XCS E**: 2 cable entries Entries tapped for 1/2" NPT (USAS B2-1) conduit
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of actuators

				
Description	Straight actuator	Actuator with wide fixing	Pivoting actuator	Latch for sliding doors (Padlockable in open position)
For guard switches XCS A, B, C, E	**XCS Z01**	**XCS Z02**	**XCS Z03**	**XCS Z05**
Weight (kg)	0.020	0.020	0.095	0.600

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) Unlocking by pushbutton for XCS B●●● and by key operated lock for XCS C●●●.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.

Other versions: please consult your Regional Sales Office.

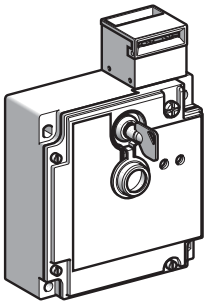
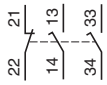
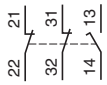
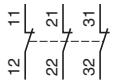
Dimensions: page 3/27 and 3/28
Schemes: page 3/29

Safety detection solutions

Guard switches

Metal, turret head *(1)*, types XCS A, XCS B, XCS C and XCS E

Cable entries tapped 1/2" NPT

Type of switch	With interlocking, locking by solenoid			
				
Type of interlocking	**Locking on de-energisation and unlocking on energisation of solenoid** *(2)*. To order a guard switch with locking on energisation and unlocking on de-energisation of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCS E5313** becomes **XCS E5513.**			
LED indication	Orange LED: "guard open" signalling. Green LED: "guard closed and locked" signalling.			
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)		∿ or c 110/120 V *(3)* (50/60 Hz on ∿)	
Type of contact on solenoid	N/C + N/O	2 N/C	N/C + N/O	2 N/C
References of switches without actuator (⊖ N/C contact with positive opening operation)				
3-pole N/C + N/O + N/O (2 N/O staggered) slow break *(4)* 	**XCS E5313** ⊖	**–**	**XCS E5333** ⊖	**–**
3-pole N/C + N/C + N/O (N/O staggered) slow break *(4)* 	**XCS E7313** ⊖	**XCS E73137** ⊖	**XCS E7333** ⊖	**XCS E73337** ⊖
3-pole N/C + N/C + N/C slow break *(4)* 	**XCS E8313** ⊖ *(5)*	**–**	**–**	**–**
Weight (kg)	1.140			

Solenoid characteristics

Load factor	100 %	
Rated operational voltage	∿ **or** ⎓ **24 V**	∿ **or** ⎓ **110/120 V**
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to IEC/EN 60947-1	
Service life	20 000 heures	
Consumption	Inrush: 10 VA. Sealed: 10 VA	

LED indicator characteristics

Rated insulation voltage	50 V conforming to IEC/EN 60947-1	250 V conforming to IEC/EN 60947-1
Current consumption	7 mA	7 mA
Rated operational voltage	∿ **or** ⎓ **24/48 V**	∿ **110/240 V**
Voltage limits	∿ or ⎓ 20...52 V (including ripple)	∿ 95...264 V (including ripple)
Service life	100 000 hours	100 000 hours
Protection against overvoltages	Yes	Yes

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) A key operated lock enables forced opening of the interlocking mechanism, by authorised personnel, allowing withdrawal of the actuator and subsequent opening of the N/C safety contacts.
(3) For use on ⎓ 110/120 V, remove the LED module.
(4) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(5) Switches supplied with a single green LED.

Other versions: please consult your Regional Sales Office.

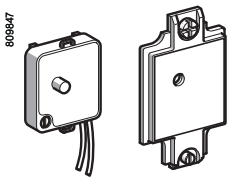
Dimensions:
page 3/27 and 3/28

Schemes:
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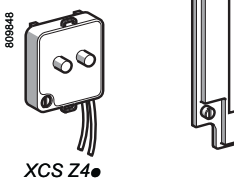
Safety detection solutions

Guard switches

Metal, turret head, types XCS A, XCS B, XCS C and XCS E



XCS Z3●



XCS Z4●



XCS Z90

Separate components

Description	For use with	Supply voltage	Reference	Weight kg
1 orange LED indicator module with cover, seal and 2 fixing screws	XCS A XCS B XCS C	∼ or ⎓ 24/48 V	**XCS Z31**	0.040
		∼ 110/240 V	**XCS Z32**	0.040
1 orange LED + 1 green LED indicator module with cover + lock *(1)*, seal and 4 fixing screws (2 keys included for lock)	XCS E73●●	∼ or ⎓ 24/48 V	**XCS Z43**	0.175

(1) Lock incorporated as standard on guard switches XCS E: key withdrawal in LOCK and UNLOCK positions.

Description	For use with	Key withdrawal positions from lock	Unit reference	Weight kg
Blanking plugs for operating head slot (Sold in lots of 10)	XCS A, XCS B, C, XCS E	–	**XCS Z27**	0.050
Keys for interlock "forced opening" device (Sold in lots of 10)	XCS B, C, XCS E	–	**XCS Z25**	0.100
Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included)	XCS A, XCS B, C, XCS E	–	**XCS Z90**	0.055

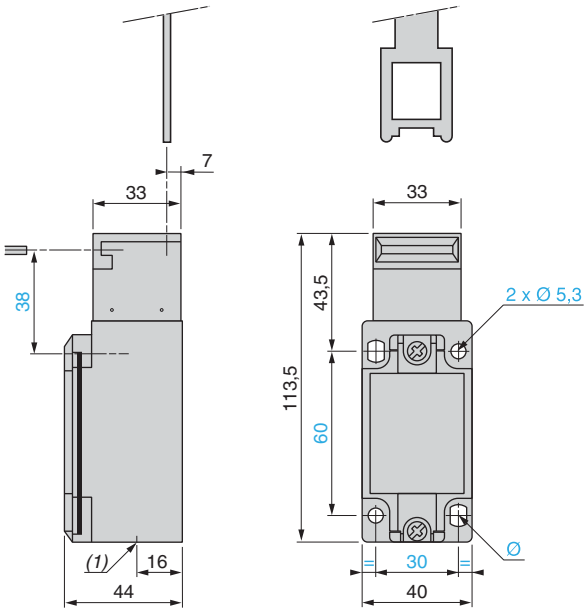
Description	For use with	Unit reference	Weight kg
1/2" NPT conduit adaptor (Sold in lots of 5)	XCS A, XCS B, XCS C, XCS E	**DE9 RA2012**	0.048
M20 x 1.5 adaptor (Sold in lots of 5)	XCS A, XCS B, XCS C, XCS E	**DE9 RA13520**	0.010

Dimensions:
pages 3/27 and 3/28

Schemes:
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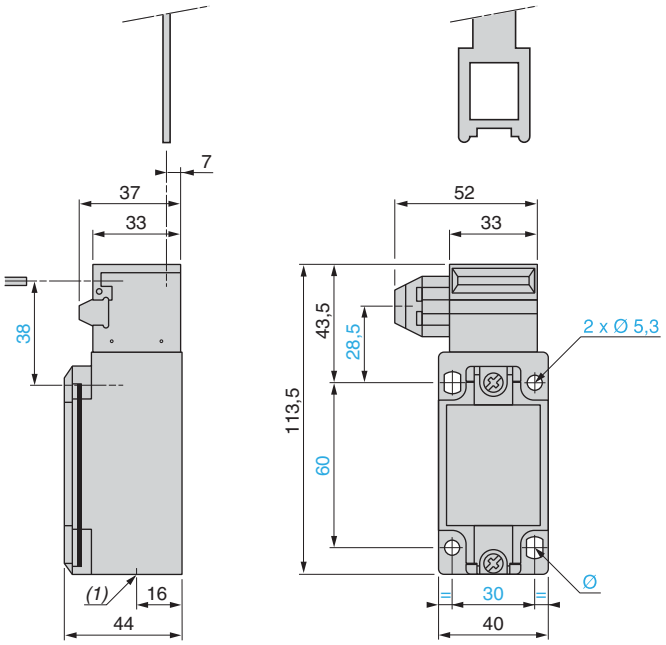
Safety detection solutions
Guard switches
Metal, turret head, types XCS A, XCS B, XCS C and XCS E

Dimensions
Guard switches
XCS A●●●



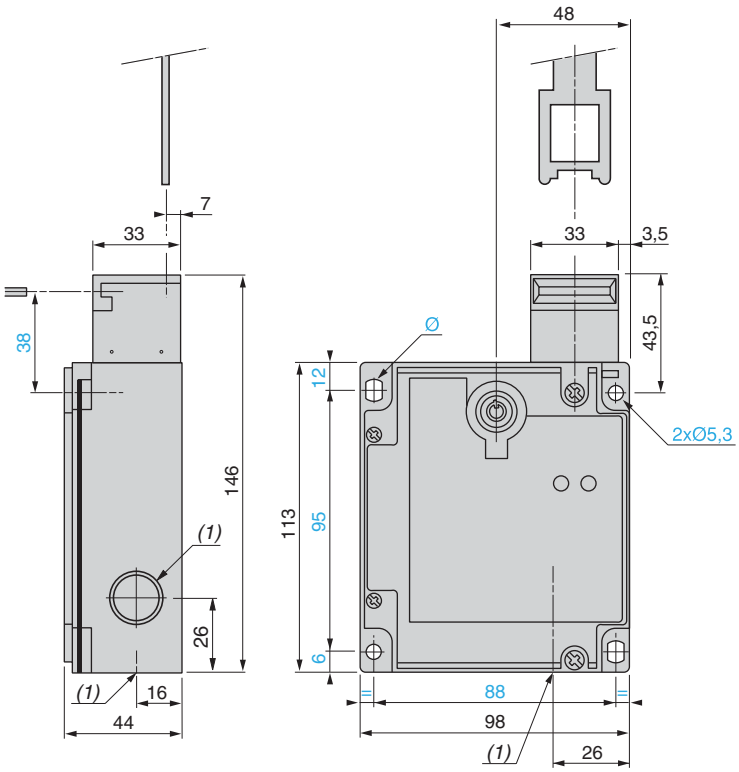
(1) 1 tapped entry for cable gland
Ø: 2 elongated holes Ø 5.3 x 7.3

XCS B●●●, XCS C●●●



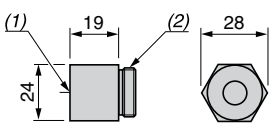
(1) 1 tapped entry for cable gland
Ø: 2 elongated holes Ø 5.3 x 7.3

Guard switches
XCS E●●●●



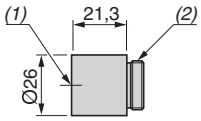
(1) 1 tapped entry for cable gland
Ø: 2 elongated holes Ø 5.3 x 7.3

M20 x 1.5 adaptor
DE9 RA13520



(1) M20 x 1.5 tapped entry
(2) Pg 13.5 threaded shank

1/2" NPT conduit adaptor
DE9 RA2012



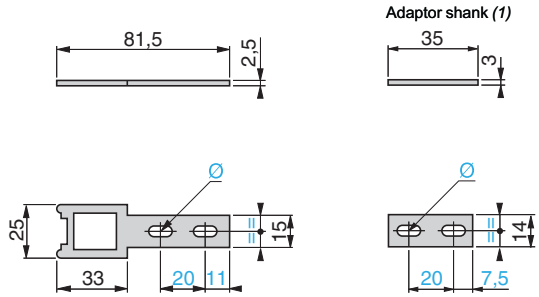
(1) Tapped entry for 1/2" NPT conduit
(2) M20 x 1.5 threaded shank

References:
pages 3/20 to 3/25

Schemes:
page 3/29

Dimensions (continued)

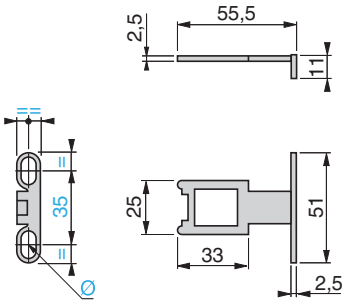
XCS Z01



(1) Adaptor (included with actuator XCS Z01) for replacing, without drilling additional fixing hole, a guard switch XCK J with actuator ZCK Y07 by a guard switch XCS A, B, C or E with actuator XCS Z01.

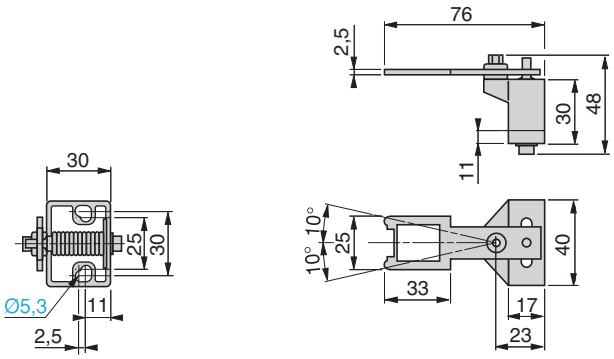
Ø: 2 elongated holes Ø 5.3 x 10

XCS Z02



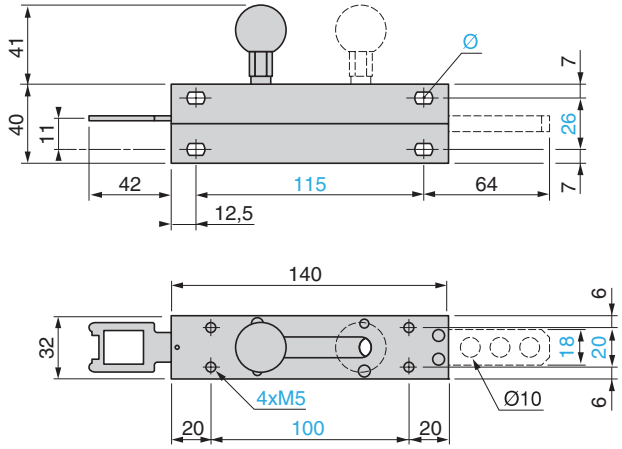
Ø: 2 elongated holes Ø 5.3 x 10

XCS Z03



Fixing axis % related to actuator.

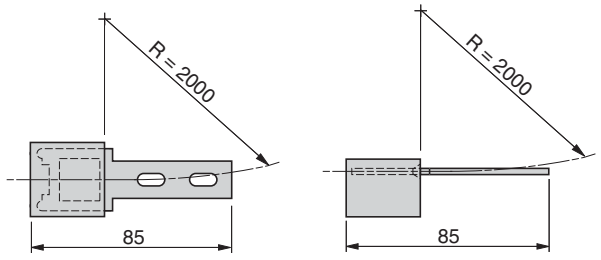
XCS Z05



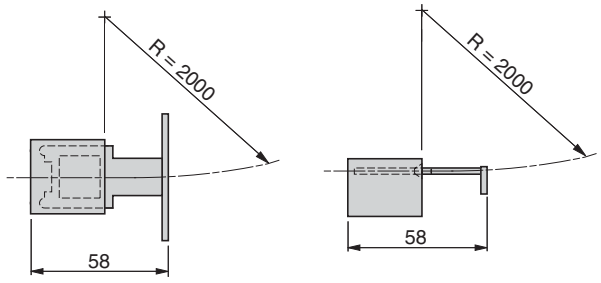
Ø: 4 elongated holes Ø 5.3 x 7.3

Operating radius required for actuator

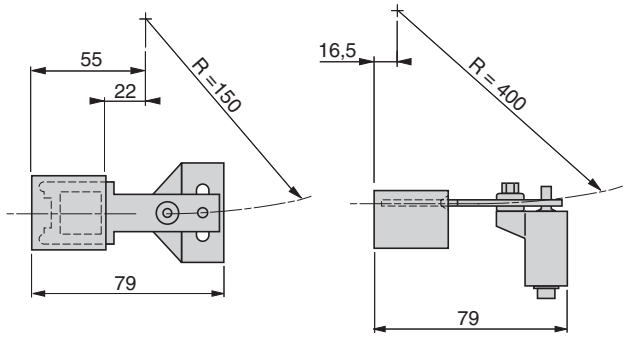
XCS Z01



XCS Z02



XCS Z03



R = minimum radius

References:
pages 3/20 to 3/25

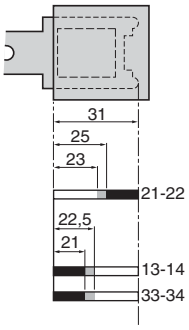
Schemes:
page 3/29

Safety detection solutions
Guard switches
Metal, turret head, types XCS A, XCS B, XCS C and XCS E

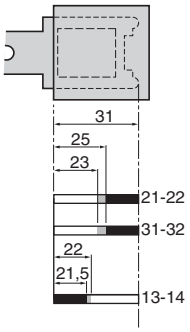
Setting-up

Functional diagrams

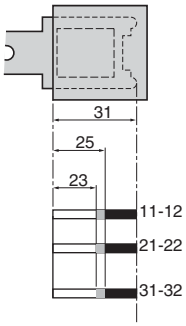
XCS ●5●●●



XCS ●7●●●



XCS ●8●●●



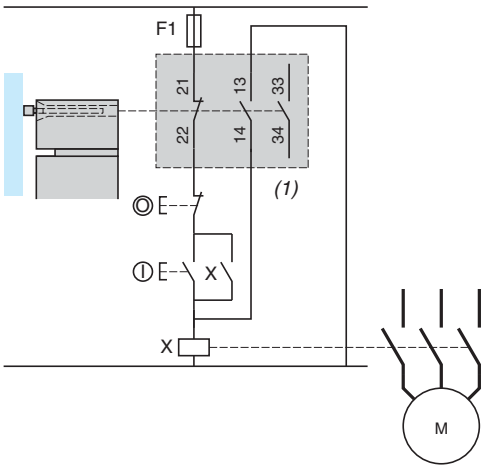
Contact operation

- Contact closed
- Contact open
- Unstable

Schemes
Note: These schemes are given as examples only, the designer must refer to the relevant safety standards for guidance

Wiring to category 1 conforming to EN 954-1/ ISO 13849-1

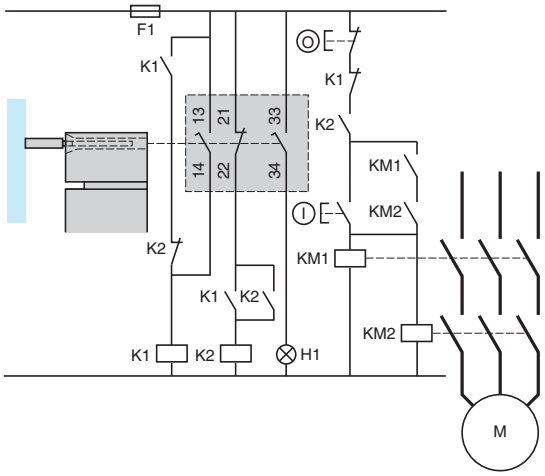
Example with 3-pole N/C + N/O + N/O contact and protection fuse to prevent shunting of the N/C contact, either by cable damage or by tampering.



(1) Signalling contact

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Example with 3-pole N/C + N/O + N/O contact with mixed redundancy of the contacts and the associated control relays. To activate K1, it is necessary to remove and re-insert the actuator when the supply is switched on.



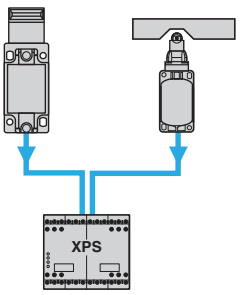
H1: “actuator not inserted” indicator

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Wiring method used in conjunction with Preventa safety module

(The guard switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy)

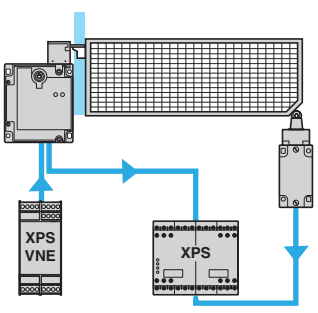
Method for machines with quick rundown time (low inertia)

Locking or interlocking device based on the principle of redundancy and self-monitoring.
The safety modules ensure these functions.



Locking of actuator and operation in positive mode associated with a safety module.

Method for machines with long rundown time (high inertia)



Interlocking device for actuator fitted on guard and zero speed detection.

References:
pages 3/20 to 3/25

Dimensions:
pages 3/27 and 3/28

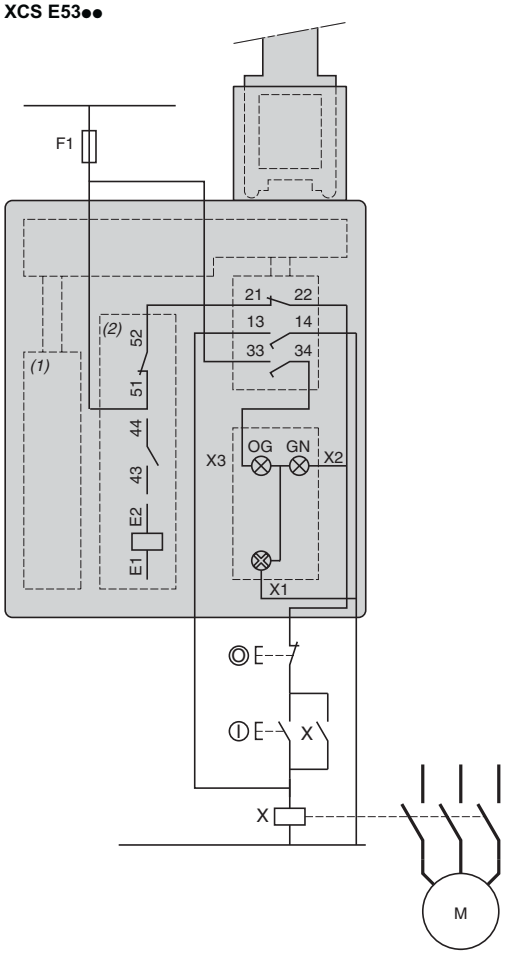
Safety detection solutions
Guard switches with solenoid interlocking
Metal, turret head, type XCS E

Wiring to category 1 conforming to EN 954-1/ISO 13849-1

Wiring examples with protection fuse to prevent shunting of the N/C contact, either by cable damage or by tampering.

Locking on de-energisation, N/C + N/O + N/O

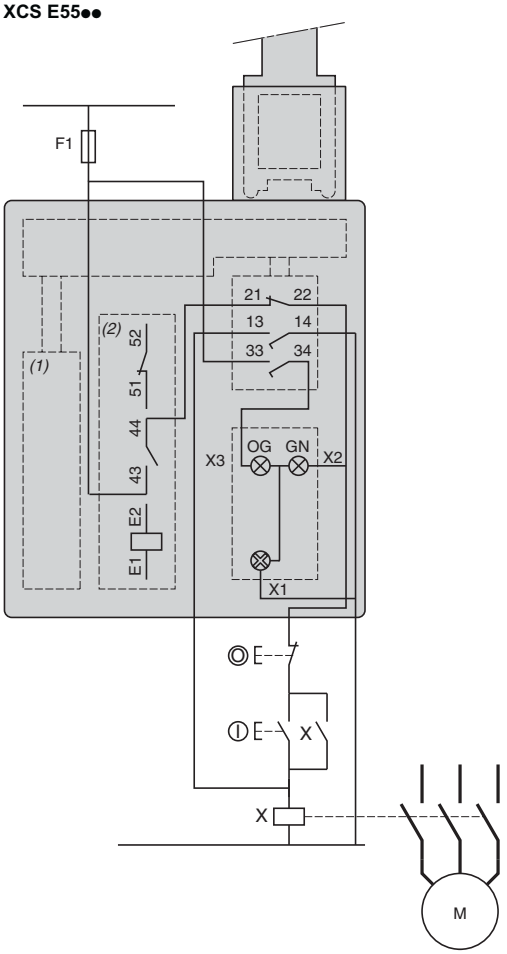
XCS E53●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
43-44: Solenoid signalling contact
13-14: Safety contact, available for redundancy
33-X1: LED (orange): actuator withdrawn
51-X1: LED (green): actuator inserted and locked
21-52: Safety pre-wiring obligatory

Locking on energisation, N/C + N/O + N/O

XCS E55●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
51-52: Solenoid signalling contact
13-14: Safety contact, available for redundancy
33-X1: LED (orange): actuator withdrawn
43-X1: LED (green): actuator inserted and locked
21-44: Safety pre-wiring obligatory

Note: *These schemes are given as examples only, the designer must refer relevant safety standards for guidance.*

References:
pages 3/20 to 3/25

Dimensions:
pages 3/27 and 3/28

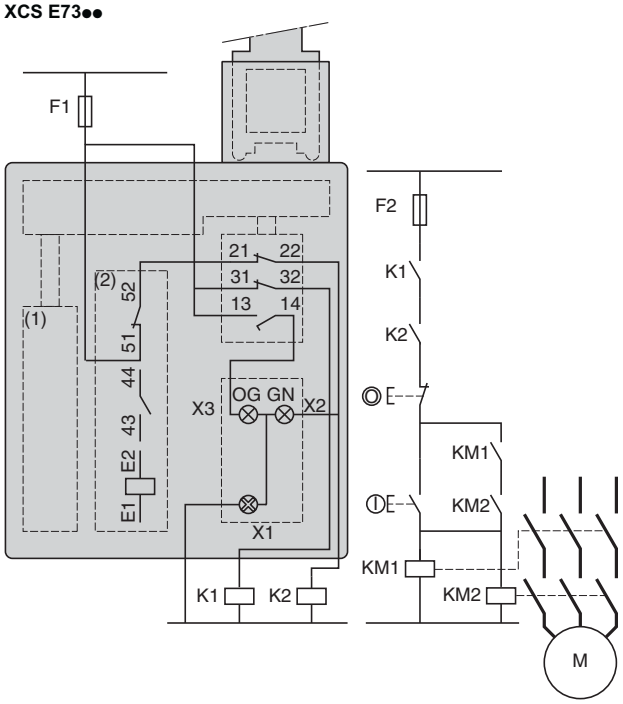
Safety detection solutions
Guard switches with solenoid interlocking
Metal, turret head, type XCS E

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Wiring examples with redundancy for the guard switch contacts, without monitoring or redundancy in the power circuit

Locking on de-energisation, N/C + N/C + N/O

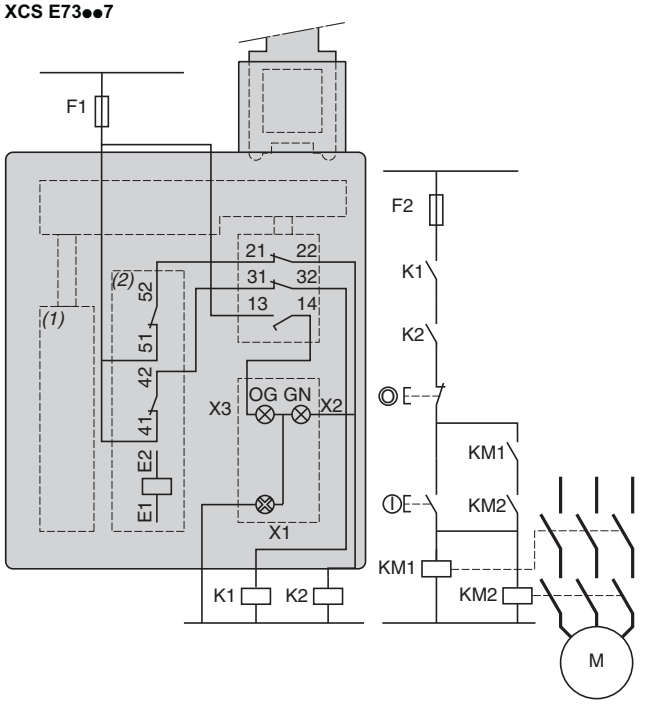
XCS E73●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
43-44: Solenoid signalling contact
21-22 and 31-32: Safety contacts, available for redundancy
13-X1: LED (orange): actuator withdrawn
51-X1: LED (green): actuator inserted and locked
21-52: Safety pre-wiring obligatory

Locking on de-energisation, N/C + N/C + N/O

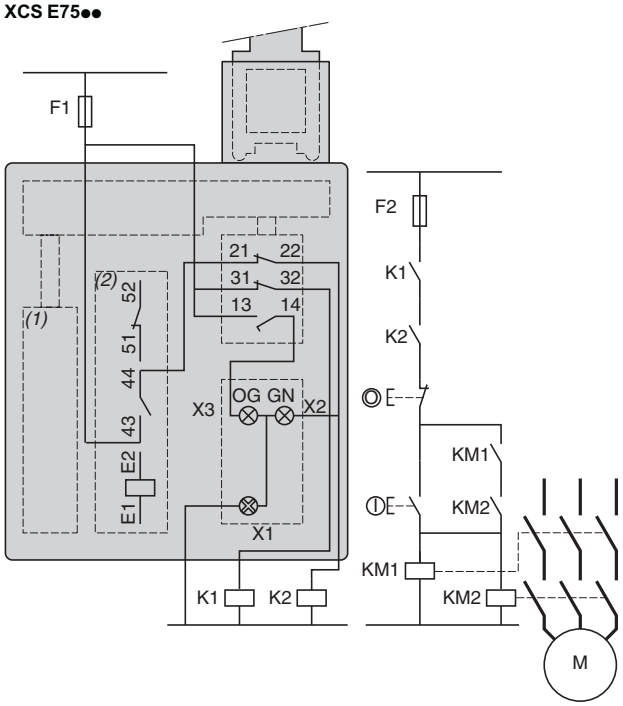
XCS E73●●7



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
41-42 and 51-52: Solenoid signalling contacts
21-22 and 31-32: Safety contacts, available for redundancy
13-X1: LED (orange): actuator withdrawn
51-X1: LED (green): actuator inserted and locked
21-52 and 42-31: Safety pre-wiring obligatory

Locking on energisation, N/C + N/C + N/O

XCS E75●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
51-52: Solenoid signalling contact
21-22 and 31-32: Safety contacts, available for redundancy
13-X1: LED (orange): actuator withdrawn
43-X1: LED (green): actuator inserted and locked
21-44: Safety pre-wiring obligatory

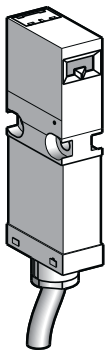
References:
pages 3/20 to 3/25

Dimensions:
pages 3/27 and 3/28

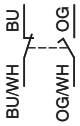
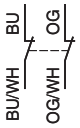
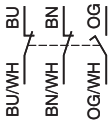
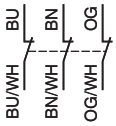
Safety detection solutions

Safety switches

Plastic, double insulated, fixed head, type XCS MP
Pre-cabled, length 2 m, 5 m or 10 m

Type of switch	Without locking of operating key
	

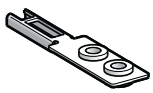
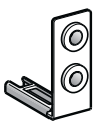
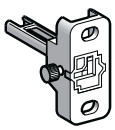
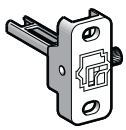
References of switches without operating key (⊖ N/C contact with positive opening operation) *(1)*

2-pole N/C + N/O **break before make, slow break** *(2)*		**XCS MP59L●** ⊖
2-pole N/C + N/C **slow break** *(2)*		**XCS MP79L●** ⊖
3-pole N/C + N/C + N/O **break before make, slow break** *(2)*		**XCS MP70L●** ⊖
3-pole N/C + N/C + N/C **slow break** *(2)*		**XCS MP80L●** ⊖
Weight (kg)		0.110

Complementary characteristics not shown under general characteristics (page 3/19)

Actuation speed	Maximum: 1.5 m/s, minimum: 0.05 m/s
Resistance to forcible withdrawal of operating key	8 N
Mechanical durability	**> 1 million operating cycles**
Connection	Pre-cabled, 4 x 0.5 mm² or 6 x 0.5 mm²
Maximum operating rate	For maximum durability: 1200 operating cycles per hour
Minimum force for extraction of key	≥ 8 N

References of operating keys

Description	Straight key	Right-angled key	Pivoting key For right-hand door	Pivoting key For left-hand door
				
For switches XCS MP	**XCS Z81**	**XCS Z84**	**XCS Z83**	**XCS Z85**
Weight (kg)	0.015	0.025	0.085	0.085

Spare parts

Description	Unit reference	Weight kg
Blanking plugs (Sold in lots of 10)	**XCS Z29**	0.005

*(1) Blanking plug for operating head slot included with switch (3). Basic reference, to be completed: replace the ● by 2 for a 2 m long cable, by 5 for 5 m long cable or by 10 for a 10 m long cable. Example: **XCS MP59L●** becomes **XCS MP59L10** for a switch with a 10 m long cable.*
(2) Schematic diagrams shown represent the contact states whilst the operating key is inserted in the head of the switch.

Dimensions:
page 3/33

Connections:
page 3/34

Safety detection solutions

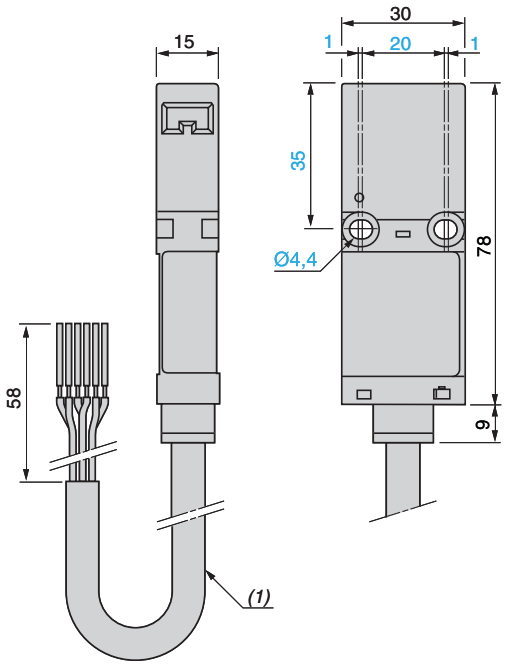
Safety switches

Plastic, double insulated, fixed head, type XCS MP

Pre-cabled, length 2 m, 5 m or 10 m

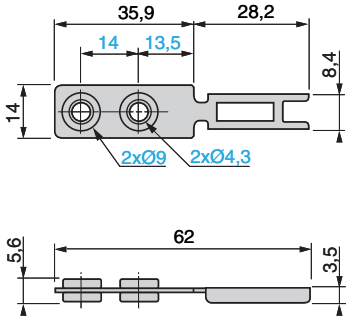
Dimensions

XCS MP

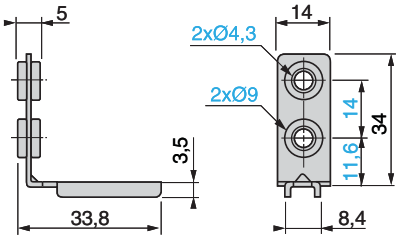


(1) Ø 7.6, length 2, 5 or 10 m.

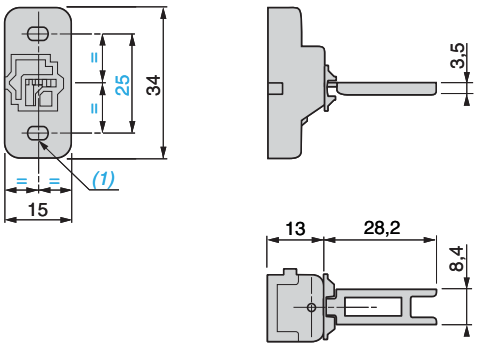
XCS Z81



XCS Z84

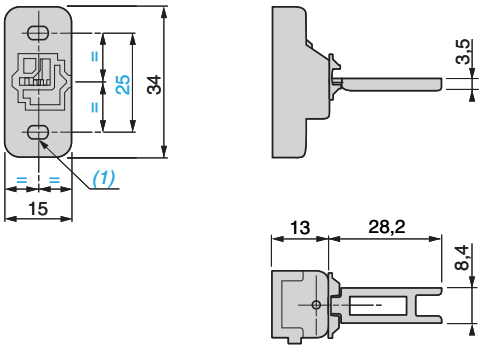


XCS Z83



(1) 2 elongated holes Ø 4.2 x 6.

XCS Z85



(1) 2 elongated holes Ø 4.2 x 6.

Characteristics:
page 3/32

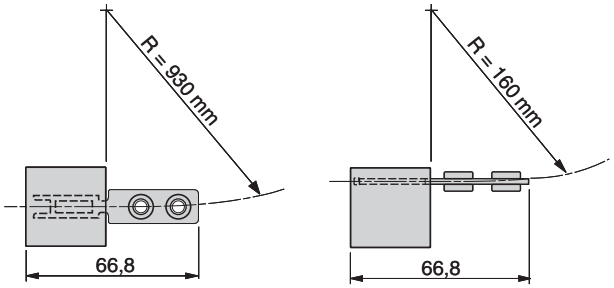
Safety detection solutions

Safety switches

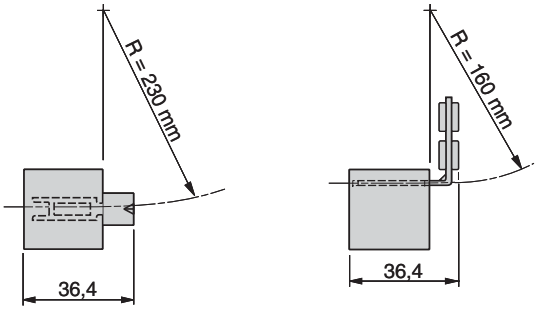
Plastic, double insulated, fixed head, type XCS MP
Pre-cabled, length 2 m, 5 m or 10 m

Operating radius required for key

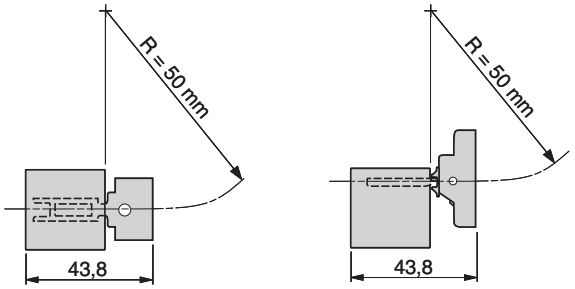
XCS Z81



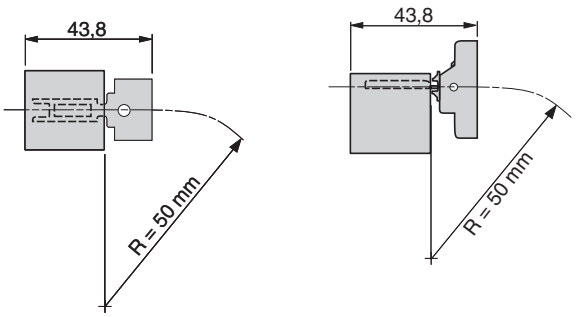
XCS Z84



XCS Z83

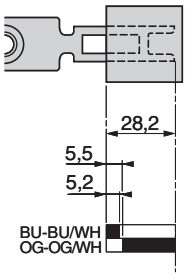


XCS Z85

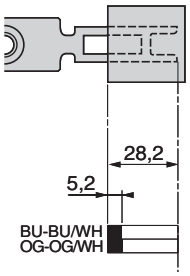


Functional diagrams

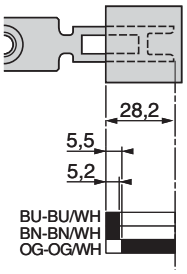
XCS MP59●



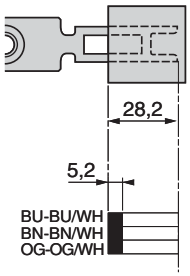
XCS MP79●



XCS MP70●



XCS MP80●



Contact operation

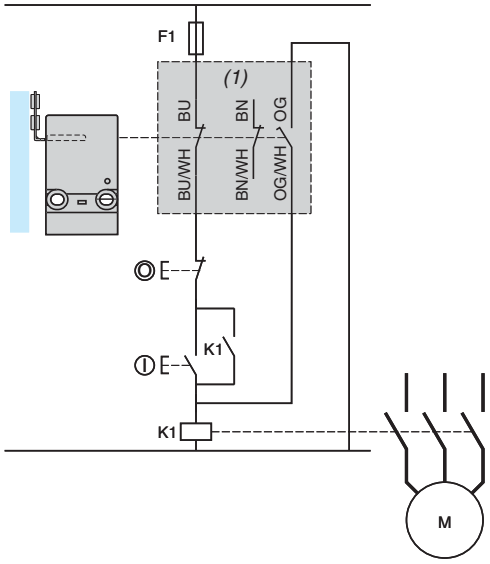
Contact closed
Contact open

Safety detection solutions
Safety switches
Plastic, double insulated, fixed head, type XCS MP
Pre-cabled, length 2 m, 5 m or 10 m

Connections

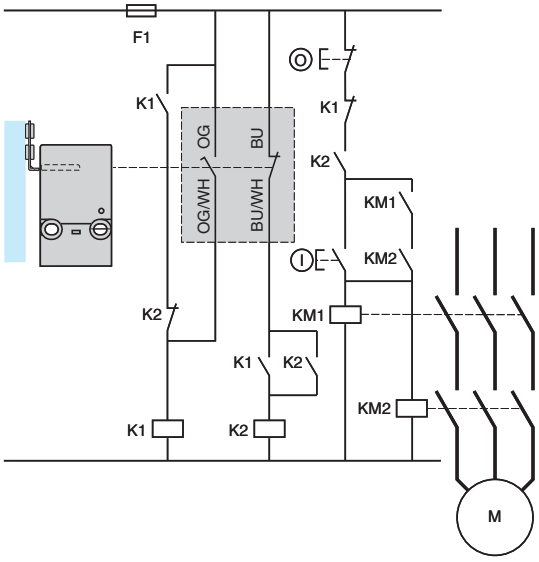
Wiring to category 1 conforming to EN 954-1/ ISO 13849-1

Example with 3-pole N/C + N/C + N/O contact and protection fuse to prevent shunting of the N/C contact, either by cable damage or by tampering.



Wiring to category 3 conforming to EN 954-1/ISO 13849-1

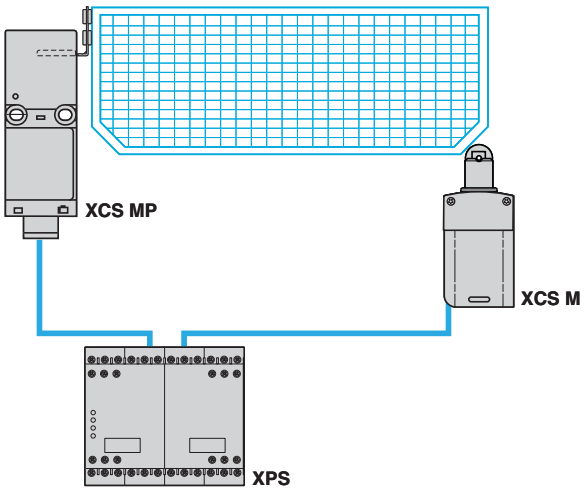
Example with 2-pole N/C + N/O contact with mixed redundancy of the contacts and the associated control relays.
Operating key withdrawal and re-insertion necessary on power-up, in order to activate K1.



(1) Signalling contact

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Wiring method used in conjunction with Preventa safety module
(the key operated safety switch is generally used in conjunction with a standard limit switch)

Method for machines with quick rundown time (low inertia)
Locking or interlocking mechanism uses the principles of redundancy and autocheck.
The safety modules ensure these functions.

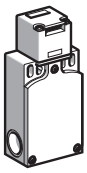


Locking by operating key and actuation in positive mode associated with a safety module

Safety detection solutions

Guard switches

Plastic, turret head *(1)*, types XCS PA, XCS TA and XCS TE
1 or 2 cable entries M16 x 1.5 *(2)*

Type of switch	Without locking of actuator	
		
References of switches without actuator (⊖ **N/C contact with positive opening operation**)		
2-pole N/C + N/O *(3)* break before make slow break 	**XCS PA592** ⊖	–
2-pole N/C + N/O *(3)* snap action 	**XCS PA192** ⊖	
2-pole N/O + N/C *(3)* make before break slow break 	**XCS PA692** ⊖	–
2-pole N/C + N/C *(3)* slow break 	**XCS PA792** ⊖	–
2-pole N/C + N/C *(3)* snap action 	**XCS PA292** ⊖	
3-pole N/C + N/O + N/O *(3)* (2 N/O staggered) slow break 	**XCS PA892** ⊖	**XCS TA592** ⊖
3-pole N/C + N/C + N/O *(3)* (N/O staggered) slow break 	**XCS PA992** ⊖	**XCS TA792** ⊖
3-pole N/C + N/C + N/O *(3)* snap action 	**XCS PA492** ⊖	–
3-pole N/C + N/C + N/C *(3)* slow break 	–	**XCS TA892** ⊖
Weight (kg)	0.110	0.160

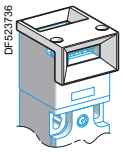
Complementary characteristics not shown under General characteristics (page 3/19)

Actuation speed	Maximum: 0.5 m/s, minimum: 0.01 m/s
Resistance to forcible withdrawal of actuator	**XCS PA, XCS TA**: 10 N (50 N using actuators **XCS Z12** or **XCS Z13** together with guard retaining device **XCS Z21**) **XCS TE**: 500 N
Mechanical durability	**XCS PA, XCS TA: > 1 million operating cycles** **XCS TE: 1 million operating cycles**
Maximum operating rate	For maximum durability: 600 operating cycles per hour
Minimum force for positive opening	≥ 15 N
Cable entry	**XCS PA**, **XCS TE**: 1 entry tapped M16 x 1.5 for ISO cable gland **XCS TA**: 2 entries tapped M16 x 1.5 for ISO cable gland
	Clamping capacity 7 to 10 mm
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel..

References of accessories


809927

XCS Z91


DF523736

XCS Z200

Description	For use with	Unit reference	Weight kg
Blanking plugs for operating head slot (Sold in lots of 10)	XCS PA, XCS TA, XCS TE	**XCS Z28**	0.050
Tool for forced opening of interlocking device (Sold in lots of 10)	XCS TE	**XCS Z100**	0.050
Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included)	XCS PA, XCS TA, XCS TE	**XCS Z91**	0.053
Centreur de clé-languette *(4)* (Vis de fixation fournis)	XCS PA, XCS TA, XCS TE	**XCS Z200**	0.022

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
*(2) For cable entries tapped for n° 11 (Pg 11) cable gland, replace the last number in the reference (2) by **1** (see page 3/38)*
*Example: XCS PA592 becomes **XCS PA591**.*
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(4) Do not use with XCS Z91.

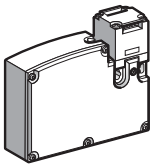
Other versions: please consult your Regional Sales Office

Dimensions: page 3/42 and 3/43
Schemes: page 3/44

Safety detection solutions

Guard switches

Plastic, turret head *(1)*, types XCS PA, XCS TA and XCS TE
1 or 2 cable entries M16 x 1.5 *(2)*

Type of switch	With interlocking, locking by solenoid
	
Type of interlocking	**Locking on de-energisation and unlocking on energisation of solenoid** *(3)*. To order a guard switch with locking on energisation and unlocking on de-energisation of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCS TE5312** becomes **XCS TE5512.**
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)

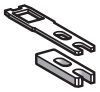
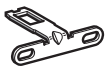
References of switches without actuator (⊖ N/C contact with positive opening operation)

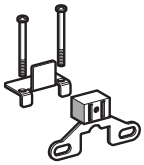
2-pole N/C + N/O *(4)* break before make slow break		**XCS TE5312** ⊖
2-pole N/C + N/C *(4)* slow break		**XCS TE7312** ⊖
Weight (kg)		0.360

Solenoid characteristics

Load factor	100 %
Rated operational voltage	**∿ or ⎓ 24 V**
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to IEC/EN 60947-1
Service life	20 000 hours
Consumption	10 VA max.

References of actuators and guard retaining device

Description	Straight actuator	Actuator with wide fixing *(5)*		Pivoting actuator	Right-angled actuator	Guard retaining device *(6)*
For guard switches XCS PA, TA, TE	**XCS Z11**	**XCS Z12**	**XCS Z15**	**XCS Z13**	**XCS Z14**	**XCS Z21**
Weight (kg)	0.015	0.015	0.012	0.085	0.025	0.080

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
*(2) For cable entries tapped for n° 11 (Pg 11) cable gland, replace the last number in the reference (2) by **1** (see page 3/39).*
*Example: **XCS TE5312** becomes **XCS TE5311**.*
(3) A special tool included with the guard switch enables forced opening of the interlocking mechanism, by authorised personnel, allowing withdrawal of the actuator and subsequent opening of the N/C safety contacts.
(4) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(5) 2 actuator lengths, XCS Z12: L = 40 mm, XCS Z15: L = 29 mm.
(6) Only for use with guard switches XCS PA and XCS TA (without the actuator centering device XCS Z200), used in conjunction with actuators XCS Z12, XCS Z13 or XCS Z15.

Other versions: please consult your Regional Sales Office.

Dimensions:
page 3/42 and 3/43

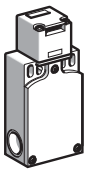
Schemes:
page 3/44

Safety detection solutions

Guard switches

Plastic, turret head *(1)*, types XCS PA, XCS TA and XCS TE

Cable entries tapped for n° 11 (Pg 11) cable gland

Type of switch		Without locking of actuator			
					
References of switches without actuator (⊖ **N/C contact with positive opening operation)**					
2-pole N/C + N/O *(2)* break before make slow break		**XCS PA591**	⊖	–	
2-pole N/C + N/O *(2)* snap action		**XCS PA191**	⊖		
2-pole N/O + N/C *(2)* make before break slow break		**XCS PA691**	⊖	–	
2-pole N/C + N/C *(2)* slow break		**XCS PA791**	⊖	–	
2-pole N/C + N/C *(2)* snap action		**XCS PA291**	⊖		
3-pole N/C + N/O + N/O *(2)* (2 N/O staggered) slow break		**XCS PA891**	⊖	**XCS TA591**	⊖
3-pole N/C + N/O + N/O *(2)* snap action		**XCS PA391**	⊖		
3-pole N/C + N/C + N/O *(2)* (N/O staggered) slow break		**XCS PA991**	⊖	**XCS TA791**	⊖
3-pole N/C + N/C + N/O *(2)* snap action		**XCS PA491**	⊖	–	
3-pole N/C + N/C + N/C *(2)* slow break		–		**XCS TA891**	⊖
Weight (kg)		0.110		0.160	

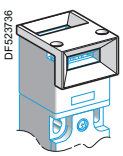
Complementary characteristics not shown under General characteristics (page 3/19)

Actuation speed	Maximum: 0.5 m/s, minimum: 0.01 m/s
Resistance to forcible withdrawal of actuator	**XCS PA**, **XCS TA**: 10 N (50 N using actuators **XCS Z12** or **XCS Z13** together with guard retaining device **XCS Z21**). **XCS TE**: 500 N
Mechanical durability	**XCS PA, XCS TA: > 1 million operating cycles; XCS TE: 1 million operating cycles**
Maximum operating rate	For maximum durability: 600 operating cycles per hour
Minimum force for positive opening	≥ 15 N
Cable entry	**XCS PA, XCS TE:** 1 entry tapped for n° 11 cable gland conforming to NF C 68-300 (DIN Pg 11). **XCS TA**: 2 entries tapped for n° 11 cable gland conforming to NF C 68-300 (DIN Pg 11). Clamping capacity 7 to 10 mm.
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of accessories



XCS Z91



XCS Z200

Description	For use with	Unit reference	Weight kg
Blanking plugs for operating head slot (Sold in lots of 10)	XCS PA, XCS TA, XCS TE	**XCS Z28**	0.050
Tool for forced opening of interlocking device (Sold in lots of 10)	XCS TE	**XCS Z100**	0.050
Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included)	XCS PA, XCS TA, XCS TE	**XCS Z91**	0.053
Actuator centering device *(3)* (Fixing screws included)	XCS PA, XCS TA, XCS TE	**XCS Z200**	0.022
1/2" NPT conduit adaptor (Sold in lots of 10)	XCS PA/TA/TE	**DE9RA1012**	0.048
M16 x 1.5 adaptor (Sold in lots of 10)	XCS PA/TA/TE	**DE9RA1016**	0.048

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(3) Do not use with XCS Z91.

Other versions: please consult your Regional Sales Office

Dimensions: page 3/42 and 3/43

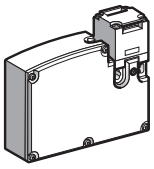
Schemes: page 3/44

Safety detection solutions

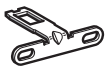
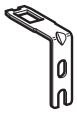
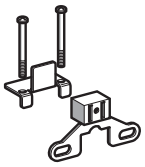
Guard switches

Plastic, turret head *(1)*, types XCS PA, XCS TA and XCS TE

Cable entries tapped for n° 11 (Pg 11) cable gland

Type of switch	With interlocking, locking by solenoid		
			
Type of interlocking	**Locking on de-energisation and unlocking on energisation of solenoid** *(2)*. To order a guard switch with locking on energisation and unlocking on de-energisation of the solenoid, replace the 2nd number *(3)* by **5** in the references shown below. Example: **XCS TE5311** becomes **XCS TE5511.**		
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)	∿ or ⎓ 120 V (50/60 Hz on ∿)	∿ or ⎓ 230 V (50/60 Hz on ∿)
References of switches without actuator (⊖ N/C contact with positive opening operation)			
2-pole N/C + N/O *(3)* break before make slow break 	**XCS TE5311** ⊖	**XCS TE5331** ⊖	**XCS TE5341** ⊖
2-pole N/O + N/C *(3)* make before break slow break 	**XCS TE6311** ⊖	**–**	**–**
2-pole N/C + N/C *(3)* slow break 	**XCS TE7311** ⊖	**XCS TE7331** ⊖	**XCS TE7341** ⊖
Weight (kg)	0.360	0.360	0.360
Solenoid characteristics			
Load factor	100 %		
Rated operational voltage	**∿ or ⎓ 24 V**	**∿ or ⎓ 120 V**	**∿ or ⎓ 230 V**
Voltage limits	- 20%, + 10% of the rated operational voltage (including ripple on ⎓) conforming to EN/IEC 60947-1		
Service life	20 000 hours		
Consumption	10 VA max.		

References of actuators and guard retaining device

						
Description	Straight actuator	Actuator with wide fixing *(5)*		Pivoting actuator	Right-angled actuator	Guard retaining device *(4)*
For guard switches XCS PA, TA, TE	**XCS Z11**	**XCS Z12**	**XCS Z15**	**XCS Z13**	**XCS Z14**	**XCS Z21**
Weight (kg)	0.015	0.015	0.012	0.085	0.025	0.080

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.

(2) A special tool included with the guard switch enables forced opening of the interlocking mechanism, by authorised personnel, allowing withdrawal of the actuator and subsequent opening of the N/C safety contacts.

(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.

(4) Only for use with guard switches XCS PA and XCS TA (without the actuator centering device XCS Z200), used in conjunction with actuators XCS Z12, XCS Z13 or XCS Z15.

(5) 2 actuator lengths, XCS Z12: L = 40 mm, XCS Z15: L = 29 mm.

Other versions: please consult your Regional Sales Office.

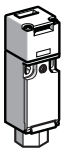
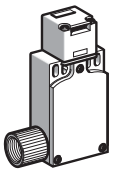
Dimensions:
page 3/42 and 3/43

Schemes:
page 3/44

Safety detection solution

Guard switches

Plastic, turret head *(1)*, types XCS PA, XCS TA and XCS TE
Cable entries tapped 1/2" NPT

Type of switch		Without locking of actuator			
					
References of switches without actuator (⊖ N/C contact with positive opening operation)					
2-pole N/C + N/O *(2)* break before make slow break		**XCS PA593**	⊖	–	
2-pole N/C + N/O snap action		**XCS PA193**	⊖		
2-pole N/O + N/C *(2)* make before break slow break		**XCS PA693**	⊖	–	
2-pole N/C + N/C *(2)* *slow break*		**XCS PA793**	⊖	–	
2-pole N/C + N/C snap action		**XCS PA293**	⊖		
3-pole N/C + N/O + N/O *(2)* (2 N/O staggered) slow break		**XCS PA893**	⊖	**XCS TA593**	⊖
3-pole N/C + N/C + N/O *(2)* (N/O staggered) slow break		**XCS PA993**	⊖	**XCS TA793**	⊖
3-pole N/C + N/C + N/O snap action		**XCS PA493**	⊖	–	
3-pole N/C + N/C + N/C *(2)* slow break		–		**XCS TA893**	⊖
Weight (kg)		0.110		0.160	

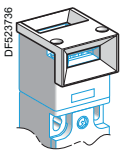
Complementary characteristics not shown under General characteristics (page 3/19)

Actuation speed	Maximum: 0.5 m/s, minimum: 0.01 m/s
Resistance to forcible withdrawal of actuator	**XCS PA**, **XCS TA**: 10 N (50 N using actuators **XCS Z12** or **XCS Z13** together with guard retaining device **XCS Z21**) **XCS TE**: 500 N
Mechanical durability	**XCS PA, XCS TA: > 1 million operating cycles; XCS TE: 1 million operating cycles**
Maximum operating rate	For maximum durability: 600 operating cycles per hour
Minimum force for positive opening	≥ 15 N
Cable entry	**XCS PA**: 1 entry tapped for 1/2" NPT (USAS B2-1) conduit. **XCS TE**: 1 entry tapped 11 mm and fitted with metal adaptor DE9 RA1012 for 1/2" NPT (USAS B2-1) conduit. **XCS TA**: 2 entries tapped 11 mm, 1 fitted with metal adaptor DE9 RA1012 for 1/2" NPT (USAS B2-1) conduit. Second entry fitted with blanking plug.
Materials	Body: zamak. Head: zamak. Safety screws: 5-lobe torque. Protective plate: steel.

References of accessories


809927

XCS Z91


DF523736

XCS Z200

Description	For use with	Unit reference	Weight kg
Blanking plugs for operating head slot (Sold in lots of 10)	XCS PA, XCS TA, XCS TE	**XCS Z28**	0.050
Tool for forced opening of interlocking device (Sold in lots of 10)	XCS TE	**XCS Z100**	0.050
Padlocking device to prevent insertion of actuator, for up to 3 padlocks (padlocks not included)	XCS PA, XCS TA, XCS TE	**XCS Z91**	0.053
Actuator centering device *(3)* (Fixing screws included)	XCS PA, XCS TA, XCS TE	**XCS Z200**	0.022

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(3) Do not use with XCS Z91.

Other versions: please consult your Regional Sales Office

Dimensions:
page 3/42 and 3/43

Schemes:
page 3/44

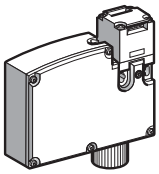
Schneider Electric

Safety detection solutions

Guard switches

Plastic, turret head *(1)*, types XCS PA, XCS TA and XCS TE

Cable entries tapped 1/2" NPT

Type of switch	With interlocking, locking by solenoid
	
Type of interlocking	**Locking on de-energisation and unlocking on energisation of solenoid** *(2)*. To order a guard switch with locking on energisation and unlocking on de-energisation of the solenoid, replace the 2nd number (3) by **5** in the references shown below. Example: **XCS TE7313** becomes **XCS TE7513.**
Supply voltage of solenoid	∿ or ⎓ 24 V (50/60 Hz on ∿)

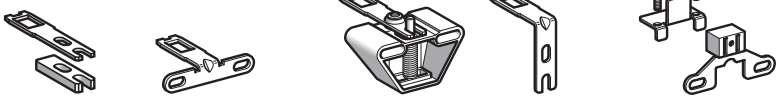
References of switches without actuator (⊖ N/C contact with positive opening operation)

2-pole N/C + N/C slow break *(3)*		**XCS TE7313** ⊖
Weight (kg)		0.360

Solenoid characteristics

Load factor	100%
Rated operational voltage	**∿ or ⎓ 24 V**
Voltage limits	- 20%, +10% of the rated operational voltage (including ripple on ⎓) conforming to IEC/EN 60947-1
Service life	20 000 hours
Consumption	10 VA max.

References of actuators and guard retaining device



Description	Straight actuator	Actuator with wide fixing *(5)*		Pivoting actuator	Right-angled actuator	Guard retaining device *(4)*
For guard switches XCS PA, TA, TE	**XCS Z11**	**XCS Z12**	**XCS Z15**	**XCS Z13**	**XCS Z14**	**XCS Z21**
Weight (kg)	0.015	0.015	0.012	0.085	0.025	0.080

(1) Head adjustable in 90° steps throughout 360°. Blanking plug for operating head slot included with switch.
(2) A special tool included with the guard switch enables forced opening of the interlocking mechanism, by authorised personnel, allowing withdrawal of the actuator and subsequent opening of the N/C safety contacts.
(3) Schematic diagrams shown represent the contact states whilst the actuator is inserted in the head of the switch.
(4) Only for use with guard switches XCS PA and XCS TA (without the actuator centering device XCS Z200), used in conjunction with actuators XCS Z12, XCS Z13 or XCS Z15.
(5) 2 actuator lengths, XCS Z12: L = 40 mm, XCS Z15: L = 29 mm.

Other versions: please consult your Regional Sales Office.

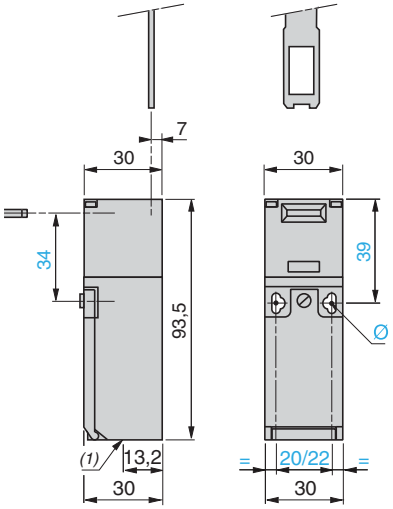
Dimensions:
page 3/42 and 3/43

Schemes:
page 3/44

Safety detection solutions
Guard switches
Plastic, turret head, types XCS PA, XCS TA and XCS TE

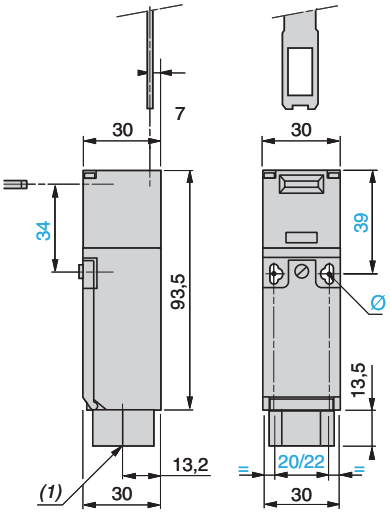
Dimensions

XCS PA•91, XCS PA•92



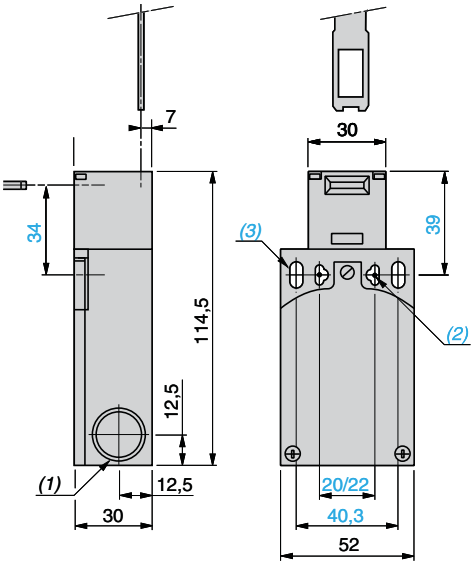
(1) 1 tapped entry for cable gland
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres

XCS PA•93



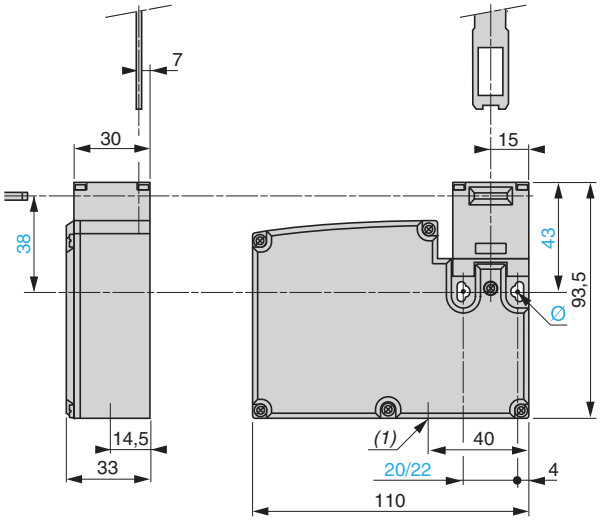
(1) 1 tapped entry for 1/2" NPT conduit
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres

XCS TA•9•



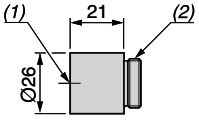
(1) 2 tapped entries for cable gland or 1/2" NPT conduit adaptor
(2) 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
(3) 2 elongated holes Ø 5.3 x 13.3

XCS TE••••



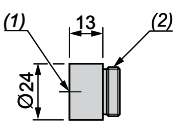
(1) 1 tapped entry for cable gland or 1/2" NPT conduit adaptor
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres

1/2" NPT conduit adaptor
DE9 RA1012



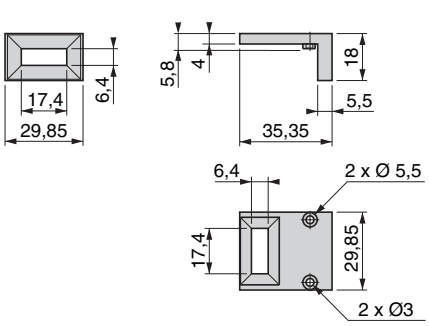
(1) Tapped entry for 1/2" NPT conduit
(2) Pg 11 threaded shank

M16 x 1.5 adaptor
DE9 RA1016



(1) M16 x 1.5 tapped entry
(2) Pg 11 threaded shank

Actuator centering device
XCS Z200



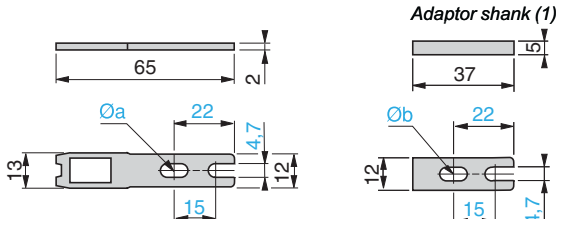
References:
pages 3/36 to 3/41

Schemes:
page 3/44

Schneider Electric

Dimensions (continued)

XCS Z11

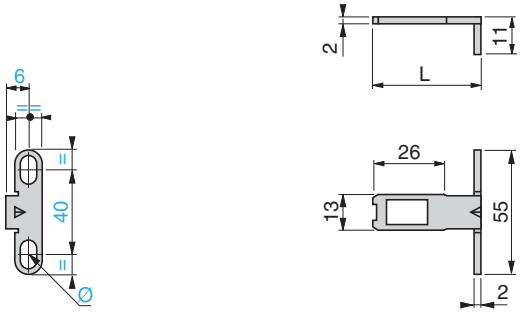


(1) Adaptor (included with actuator XCS Z11) for replacing, without drilling additional fixing hole, a guard switch XCK T with actuator XCK Y01 by a guard switch XCS TA with actuator XCS Z11.

Ø a: 2 elongated holes Ø 4.7 x 10

Ø b: 1 elongated hole for M4 or M4.5 screw

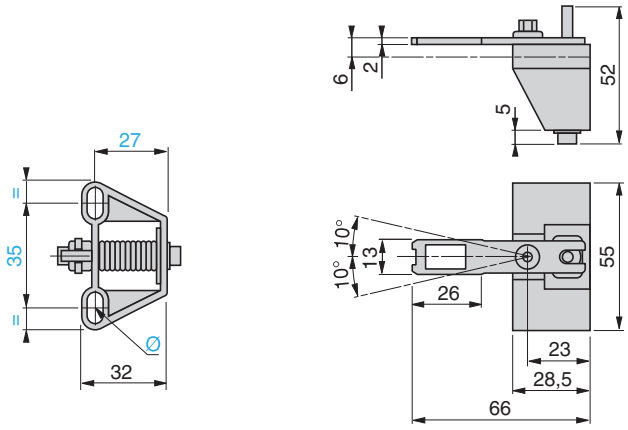
XCS Z12, XCS Z15



Ø: 2 elongated holes Ø 4.7 x 10

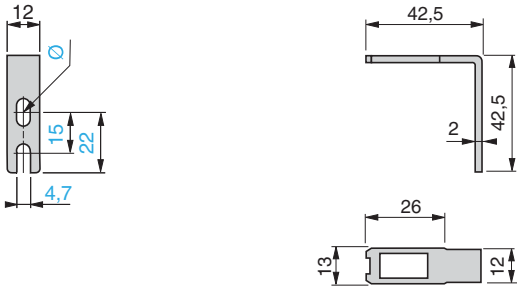
L = 40 mm (XCS Z12) or 29 mm (XCS Z15)

XCS Z13



Ø: 2 elongated holes Ø 4.7 x 10

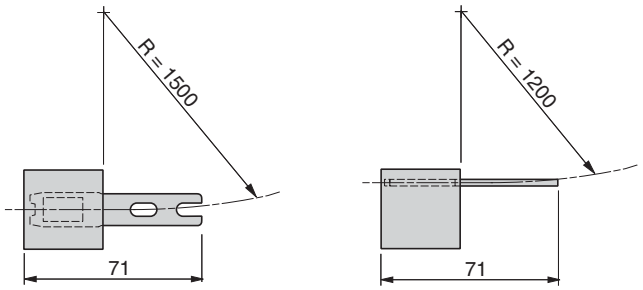
XCS Z14



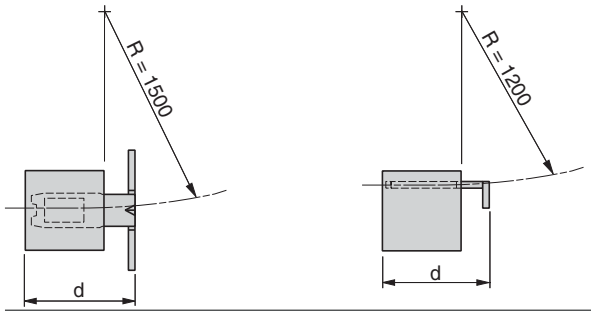
Ø: 1 elongated hole Ø 4.7 x 10

Operating radius required for actuator

XCS Z11

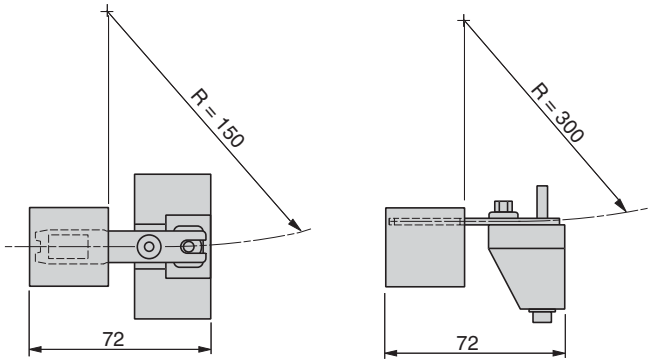


XCS Z12, XCS Z15

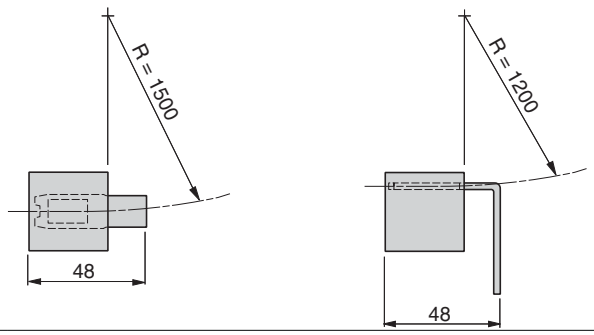


d = 46 mm (XCS Z12) or 35 mm (XCS Z15)

XCS Z13



XCS Z14



R = minimum radius

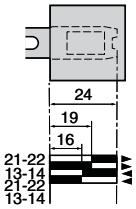
References:
pages 3/36 to 3/41

Schemes:
page 3/44

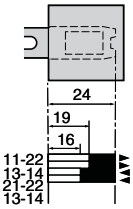
Safety detection solutions
Guard switches
Plastic, turret head, types XCS PA, XCS TA and XCS TE

Setting-up
Functional diagrams

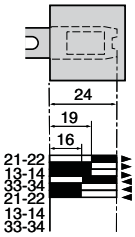
XCS PA1●●



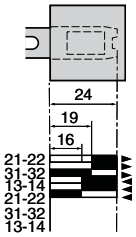
XCS PA2●●



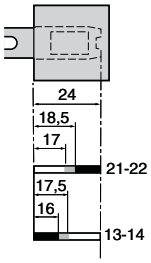
XCS PA3●●



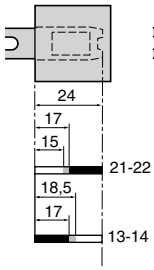
XCS PA4●●



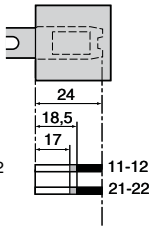
XCS PA5●●, XCS TE5●●●



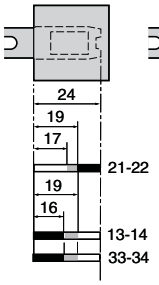
XCS PA6●●, XCS TE6●●●



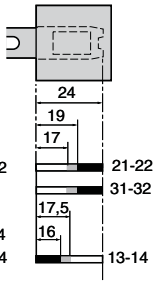
XCS PA7●●, XCS TE7●●●



XCS TA5●●, XCS PA8●●



XCS TA7●●, XCS PA9●●

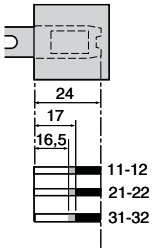


Contact operation

■ Contact closed ▭ Contact open ▨ Unstable

Setting-up
Functional diagrams

XCS TA8●●



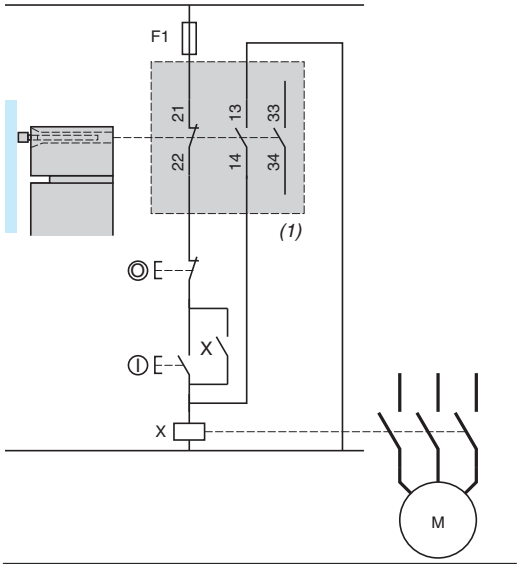
Contact operation

■ Contact closed
▭ Contact open
▨ Unstable

Schemes
Note: These schemes are given as examples only, the designer must refer to the relevant safety standards for guidance

Wiring to category 1 conforming to EN 954-1/ ISO 13849-1

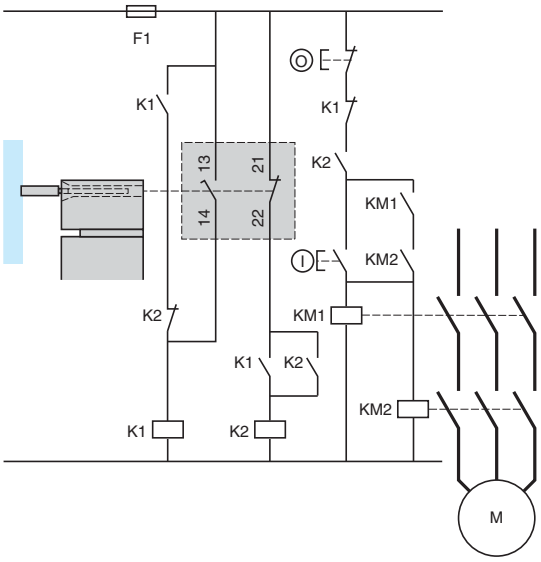
Example with 3-pole N/C + N/O + N/O contact and protection fuse to prevent shunting of the N/C contact, either by cable damage or by tampering.



(1) Signalling contact

Wiring to category 3 conforming to EN 954-1/ ISO 13849-1

Example with 2-pole N/C + N/O contact with mixed redundancy of the contacts and the associated control relays. To activate K1, it is necessary to remove and re-insert the actuator when the supply is switched on.

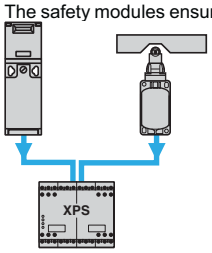


Wiring to category 4 conforming to EN 954-1/ISO 13849-1
Wiring method used in conjunction with safety module

(The guard switch should be used in conjunction with a safety limit switch to give electrical/mechanical redundancy)

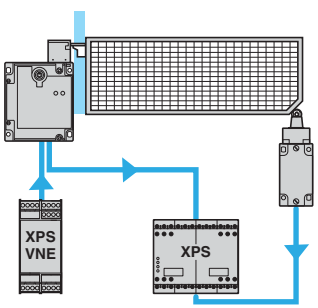
Method for machines with quick rundown time (low inertia)

Locking or interlocking device based on the principle of redundancy and self-monitoring. The safety modules ensure these functions.



Locking of actuator and operation in positive mode associated with a safety module.

Method for machines with long rundown time (high inertia)



Interlocking device for actuator fitted on guard and zero speed detection.

References: pages 3/36 to 3/41
Dimensions: pages 3/42 and 3/43

Schneider Electric

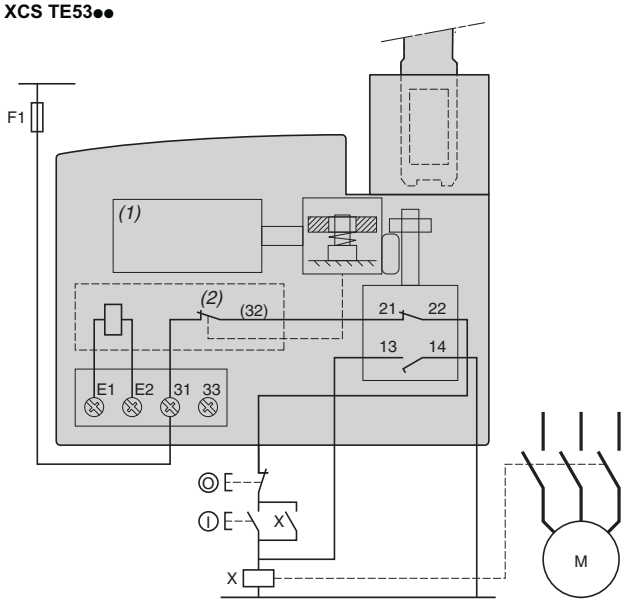
Schemes (continued)

Wiring to category 1 conforming to EN 954-1/ISO 13849-1

Wiring examples with protection fuse to prevent shunting of the N/C contact, either by cable damage or by tampering

Locking on de-energisation

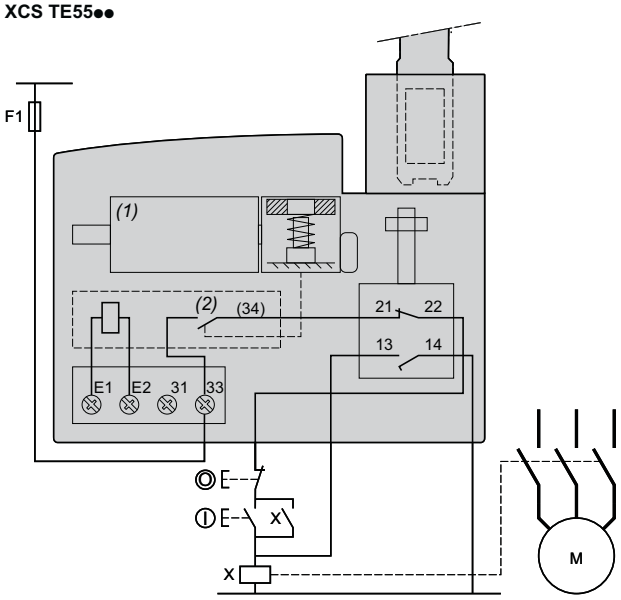
N/C + N/O
XCS TE53●●



(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
13-14: Safety contact, available for redundancy or signalling

Locking on energisation

N/C + N/O
XCS TE55●●



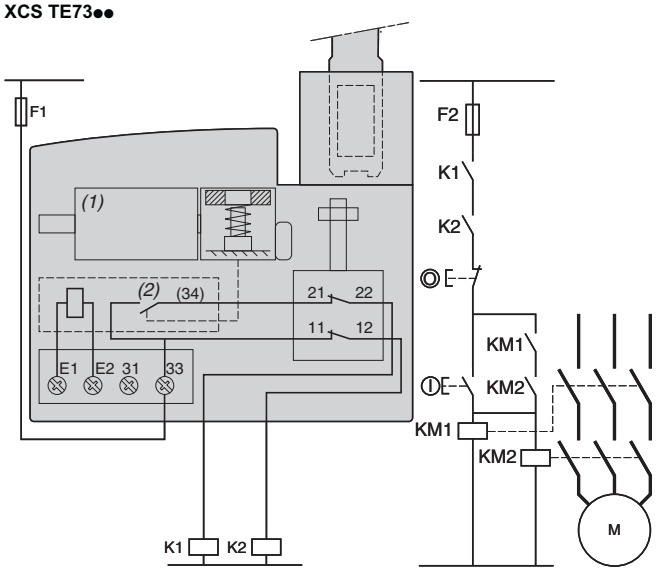
(1) Solenoid
(2) Auxiliary contact
E1-E2: Solenoid supply
13-14: Safety contact, available for redundancy or signalling

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Wiring examples with redundancy for the guard switch contacts, without monitoring

Locking on de-energisation

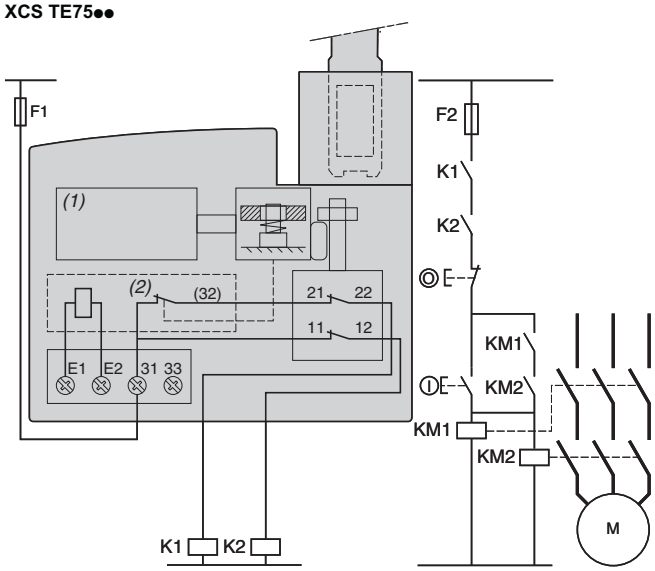
N/C + N/C
XCS TE73●●



(1) Solenoid
(2) Solenoid auxiliary contact
E1-E2: Solenoid supply
11-12: Safety contact, available for redundancy

Locking on energisation

N/C + N/C
XCS TE75●●



(1) Solenoid
(2) Solenoid auxiliary contact
E1-E2: Solenoid supply
11-12: Safety contact, available for redundancy

References:
pages 3/36 to 3/41

Dimensions:
pages 3/42 and 3/43

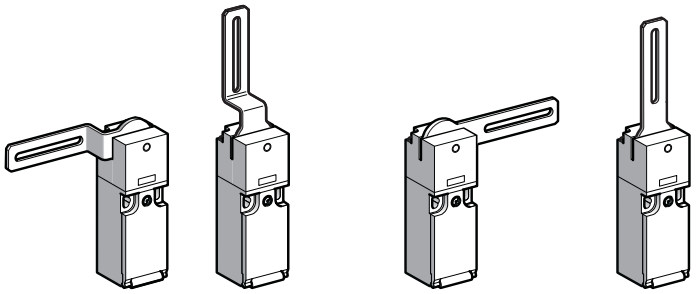
Safety detection solutions

Guard switches with lever or spindle operator

Plastic, double insulated, turret head,
types XCS PL, XCS TL, XCS PR and XCS TR

XCS PL with 1 cable entry

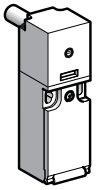
With rotary operating head, with elbowed lever (flush with rear of switch) or straight lever, for hinged covers and guards



Pages 3/48, 3/50 and 3/52

XCS PR with 1 cable entry

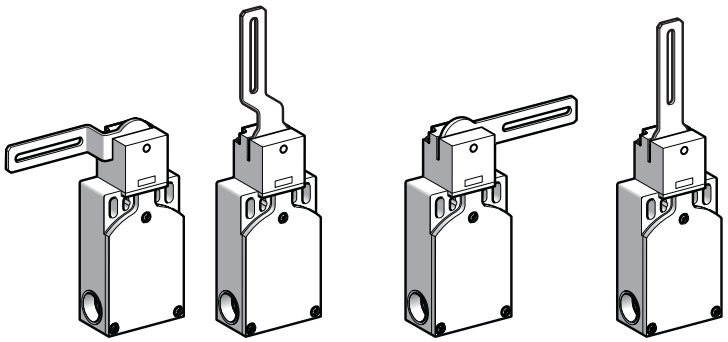
With rotary operating head, with spindle operator, for hinged covers and guards



Pages 3/48, 3/50 and 3/52

XCS TL with 2 cable entries

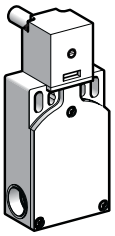
With rotary operating head, with elbowed lever (flush with rear of switch) or straight lever, for hinged covers and guards



Pages 3/48, 3/50 and 3/52

XCS TR with 2 cable entries

With rotary operating head, with spindle operator, for hinged covers and guards



Pages 3/48, 3/50 and 3/52

Safety detection solutions

Guard switches with lever or spindle operator
Plastic, double insulated, turret head,
types XCS PL, XCS TL, XCS PR and XCS TR

Environment characteristics

Conformity to standards	Products	EN/IEC 60947-5-1, EN/IEC 60947-5-4, UL 508, CSA C22-2 n° 14
	Machine assemblies	EN/IEC 60204-1, EN 1088/ISO 14119, EN/ISO 12100
Product certifications		UL, CSA, BG
Protective treatment		Standard version: “TC” and “TH”
Ambient air temperature	For operation	- 25…+ 70 °C
	For storage	- 40…+ 70 °C
Vibration resistance		50 gn (10…500 Hz) conforming to IEC 60068-2-6
Shock resistance		50 gn (duration 11 ms) conforming to IEC 60068-2-27
Electric shock protection		Class 2 conforming to IEC 60536
Degree of protection		**IP 67 conforming to IEC 60529**
Cable entry		Depending on model, either: 1 tapped entry for n° 11 (Pg 11) cable gland, tapped M16 x 1.5 or tapped 1/2" NPT
Materials		Polyamide PA66 fibre glass impregnated case Stainless steel lever and fixings

Contact block characteristics

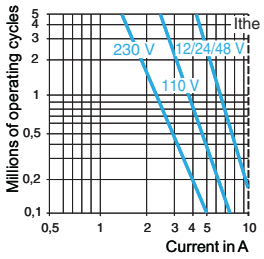
Rated operational characteristics	2 and 3 contact versions slow break	**XCS PL, XCS TL, XCS PR, XCS TR**: ∼ AC-15, A300: Ue = 240 V, Ie = 3 A or Ue = 120 V, Ie = 6 A All models: ⎓ DC-13, Q300: Ue = 250 V, Ie = 0.27 A or Ue = 125 V, Ie = 0.55 A conforming to IEC/EN 60947-5-1
Rated insulation voltage	2 and 3 contact versions	**XCS PL, XCS TL, XCS PR, XCS TR** : Ui = 500 V conforming to IEC/EN 60947-1 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
	3 contact version	**XCS PL, XCS PR**: Ui = 400 V degree of pollution 3 conforming to IEC 60947-1 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage	2 and 3 contact versions	**XCS PL, XCS TL, XCS PR, XCS TR**: Uimp = 6 kV conforming to IEC/EN 60947-5-1
	3 contact version	**XCS PL, XCS PR**: Uimp = 4 kV conforming to IEC/EN 60947-5-4
Positive operation		N/C contacts with positive opening operation conforming to EN/IEC 60947-5-1 Section 3
Resistance across terminals		⩽ 30 mΩ conforming to EN/IEC 60947-5-4
Short-circuit protection	2 and 3 contact versions	**XCS PL, XCS TL, XCS PR, XCS TR**: 10 A cartridge fuse type gG (gl)
	3 contact version	**XCS PL, XCS PR**: 6 A cartridge fuse type gG (gl)
Connection	2 contact version	**XCS PL, XCS TL, XCS PR, XCS TR**: Clamping capacity, min: 1 x 0.5 mm², max: 2 x 1.5 mm² with or without cable end
	3 contact version	**XCS PL, XCS PR**: Clamping capacity, min: 1 x 0.34 mm², max: 1 x 1 mm² or 2 x 0.75 mm²
Minimum actuation speed	3 contact version	0.01 m/second

Electrical durability

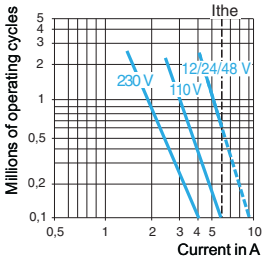
Conforming to EN/IEC 60947-5-1 Appendix C.
Utilisation categories AC-15 and DC-13.
Maximum operating rate: 3600 operating cycles/hour.
Load factor: 0.5

a.c. supply
∼ 50/60 Hz
⎓⎓ inductive circuit

2 and 3 slow break contact versions



3 slow break contact version (XCS PL/TR)



d.c. supply ⎓

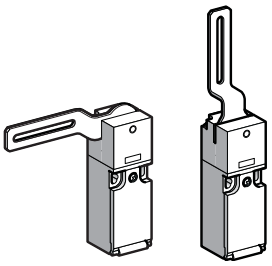
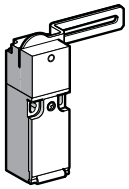
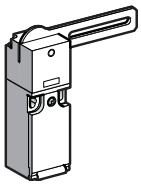
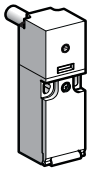
Power broken in W for 1 million operating cycles

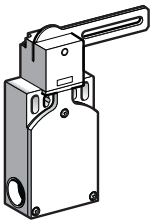
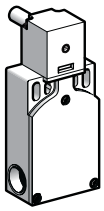
Voltage	V	24	48	120
⎓⎓	W	13	9	7

Safety detection solutions

Guard switches with lever or spindle operator

Plastic, double insulated, turret head *(1)*,
types XCS PL, XCS TL, XCS PR and XCS TR
1 or 2 cable entries M16 x 1.5 *(2)*

Type	Elbowed lever (flush with rear of switch)			Straight lever	Spindle
					
Operator	To left	Centred	To right	To right OR to left	Length 30 mm *(3)*
References (→ N/C contact with positive opening operation)					
2-pole N/C + N/O break before make slow break	XCS PL592 →	XCS PL582 →	XCS PL572 →	XCS PL562 →	XCS PR552 →
2-pole N/C + N/C slow break	–	–	–	XCS PL762 →	XCS PR752 →
3-pole N/C + N/O + N/O (2 N/O staggered) slow break	–	–	–	XCS PL862 →	–
3-pole N/C + N/C + N/O (N/O staggered) slow break	–	–	–	XCS PL962 →	XCS PR952 →
Weight (kg)	0.095	0.095	0.095	0.095	0.105

Type	Straight lever	Spindle
		
Operator	To right OR to left	Length 30 mm *(3)*
References (→ N/C contact with positive opening operation)		
3-pole N/C + N/O + N/O (2 N/O staggered) slow break	XCS TL562 →	–
3-pole N/C + N/C + N/O (N/O staggered) slow break	XCS TL762 →	XCS TR752 →
3-pole N/C + N/C + N/C slow break	–	XCS TR852 →
Weight (kg)	0.145	0.155

Complementary characteristics not shown under General characteristics (page 3/47)

Tripping angle	5°
Mechanical durability	**1 million operating cycles**
Minimum torque	For tripping: 0.1 N.m; for positive opening: 0.25 N.m (XCS PL and XCS PR), 0.45 N.m (XCS TL and XCS TR)
Cable entry	**XCS P●**: 1 entry tapped M16 x 1.5 for ISO cable gland. Clamping capacity 7 to 10 mm **XCS T●**: 2 entries tapped M16 x 1.5 for ISO cable gland. Clamping capacity 7 to 10 mm (switch supplied with 1 entry fitted with blanking plug)

(1) Head adjustable in 90° steps throughout 360°. Switches supplied with 2 additional self-locking screws for positive fixing of the head.
*(2) For cable entries tapped for n° 11 (Pg 11) cable gland, replace the last number in the reference (2) by **1** (see page 3/50).*
*Example: XCS PL592 becomes **XCS PL591**.*
*(3) For switches with 80 mm spindle: replace the 2nd number in the reference (5) by **6**. Example: **XCS PR562**. The weight increases by 0.032 kg.*

Other versions: please consult your Regional Sales Office.

Safety detection solutions

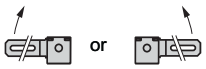
Guard switches with lever or spindle operator

Plastic, double insulated, turret head *(1)*,
types XCS PL, XCS TL, XCS PR and XCS TR
1 or 2 cable entries M16 x 1.5 *(2)*

Operation

Operator displacement

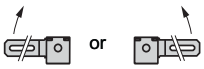
XCS PL•62



XCS PL•82



XCS TL•62



XCS PR•52

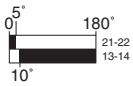


XCS TR•52

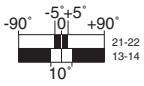


Functional diagrams

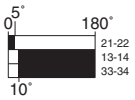
XCS PL592, PL572, PL562



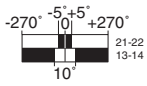
XCS PL582



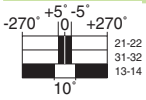
XCS TL562



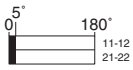
XCS PR552



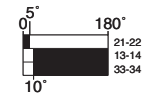
XCS TR752



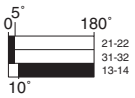
XCS PL762



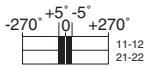
XCS PL862



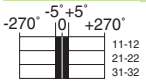
XCS TL762



XCS PR752



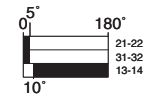
XCS TR852



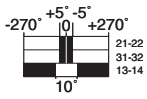
Contact operation

■ contact closed
□ contact open

XCS PL962

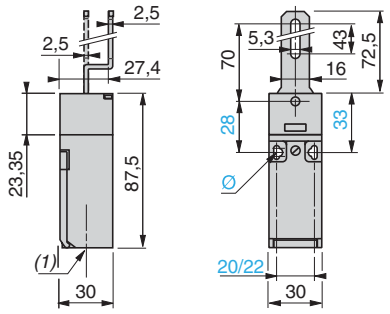


XCS PR952



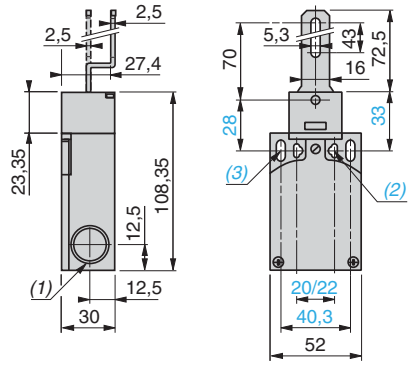
Dimensions

XCS PL••2



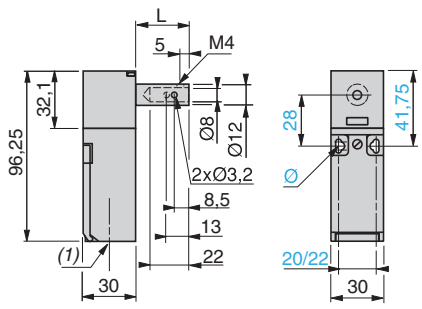
(1) 1 cable entry tapped M16 x 1.5
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres

XCS TL••2



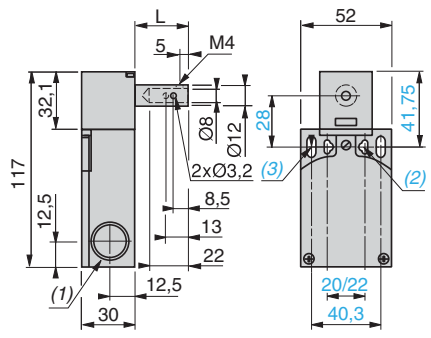
(1) 2 cable entries tapped M16 x 1.5
(2) 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
(3) 2 elongated holes Ø 5.3 x 13.3

XCS PR••2



(1) 1 cable entry tapped M16 x 1.5
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
L = 30 (XCS PR•52) or 80 (XCS PR•62)

XCS TR••2

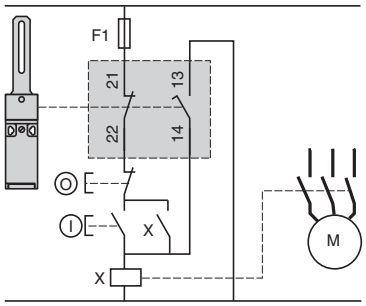


(1) 2 cable entries tapped M16 x 1.5
(2) 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
(3) 2 elongated holes Ø 5.3 x 13.3
L = 30 (XCS TR•52) or 80 (XCS TR•62)

Wiring schemes

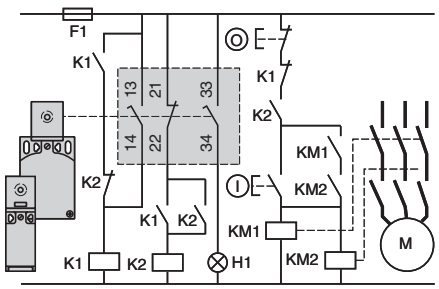
Category 1 to EN 954-1/ISO 13849-1

Example with cable short-circuit protection fuse



Category 3 to EN 954-1/ISO 13849-1

Example with 3-pole N/C + N/O + N/O contact with mixed redundancy of the contacts and the associated control relays.

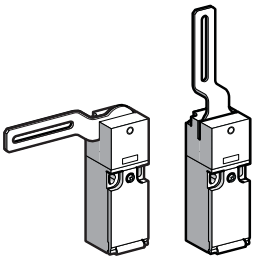
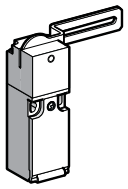
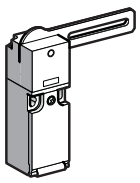
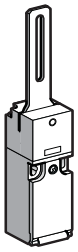
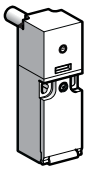
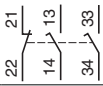
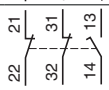


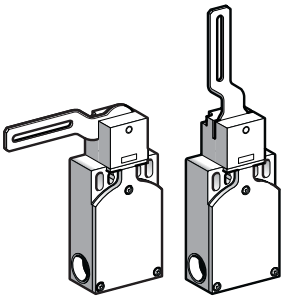
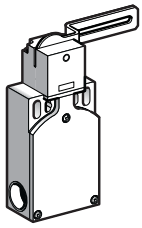
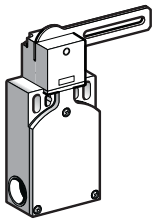
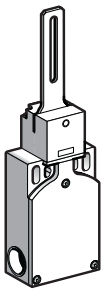
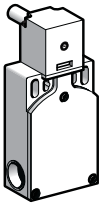
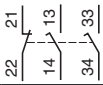
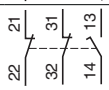
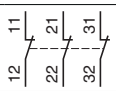
To activate K1, the lever or spindle must be rotated when the supply is switched on. **H1: "lever or** spindle displaced from initial position" indicator. When used in conjunction with an XPS safety module and another safety switch, the rotary lever or spindle operator guard switch can provide a category 3 or 4 control and monitoring system for moving guards to EN 954-1/ISO 13849-1.

Safety detection solutions

Guard switches with lever or spindle operator

Plastic, double insulated, turret head *(1)*,
types XCS PL, XCS TL, XCS PR and XCS TR
Cable entries tapped for n° 11 (Pg 11) cable gland

Type	Elbowed lever (flush with rear of switch)			Straight lever		Spindle
						
Operator	To left	Centred	To right	To right OR to left	Centred	Length 30 mm *(2)*
References (⊖ N/C contact with positive opening operation)						
2-pole N/C + N/O break before make slow break 	**XCS PL591** ⊖	**XCS PL581** ⊖	**XCS PL571** ⊖	**XCS PL561** ⊖	**XCS PL551** ⊖	**XCS PR551** ⊖
2-pole N/C + N/C slow break 	**XCS PL791** ⊖	**XCS PL781** ⊖	**XCS PL771** ⊖	**XCS PL761** ⊖	**XCS PL751** ⊖	**XCS PR751** ⊖
3-pole N/C + N/O + N/O (2 N/O staggered) slow break 	–	–	–	–	–	**XCS PR851** ⊖
3-pole N/C + N/C + N/O (N/O staggered) slow break 	–	**XCS PL981** ⊖	–	–	–	**XCS PR951** ⊖
Weight (kg)	0.095	0.095	0.095	0.095	0.095	0.105

						
Operator	To left	Centred	To right	To right OR to left	Centred	Length 30 mm *(2)*
References (⊖ N/C contact with positive opening operation)						
3-pole N/C + N/O + N/O (2 N/O staggered) slow break 	–	**XCS TL581** ⊖	–	**XCS TL561** ⊖	**XCS TL551** ⊖	**XCS TR551** ⊖
3-pole N/C + N/C + N/O (N/O staggered) slow break 	**XCS TL791** ⊖	**XCS TL781** ⊖	**XCS TL771** ⊖	**XCS TL761** ⊖	**XCS TL751** ⊖	**XCS TR751** ⊖
3-pole N/C + N/C + N/C slow break 	–	**XCS TL881** ⊖	**XCS TL871** ⊖	**XCS TL861** ⊖	–	**XCS TR851** ⊖
Weight (kg)	0.145	0.145	0.145	0.145	0.145	0.155

Complementary characteristics not shown under General characteristics (page 3/47)

Tripping angle	5°
Mechanical durability	**1 million operating cycles**
Minimum torque	For tripping: 0.1 N.m; for positive opening: 0.25 N.m (XCS PL and XCS PR), 0.45 N.m (XCS TL and XCS TR)
Cable entry	**XCS P●**: 1 entry tapped for n° 11 cable gland conforming to NF C 68-300 (DIN Pg 11). Clamping capacity 7 to 10 mm **XCS T●**: 2 entries tapped for n° 11 cable gland conforming to NF C 68-300 (DIN Pg 11). Clamping capacity 7 to 10 mm (switch supplied with 1 entry fitted with blanking plug)

(1) Head adjustable in 90° steps throughout 360°. Switches supplied with 2 additional self-locking screws for positive fixing of the head.
*(2) For switches with 80 mm spindle: replace the 2nd number in the reference (5) by **6**. Example: **XCS PR561**. The weight increases by 0.032 kg.*

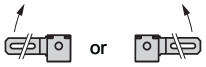
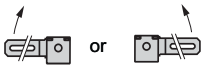
Other versions: please consult your Regional Sales Office.

Safety detection solutions

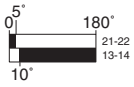
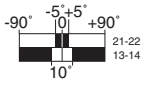
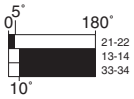
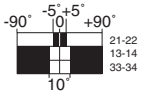
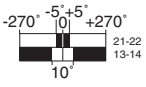
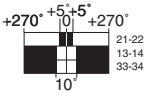
Guard switches with lever or spindle operator
Plastic, double insulated, turret head,
types XCS PL, XCS TL, XCS PR and XCS TR
Cable entries tapped for n° 11 (Pg 11) cable gland

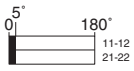
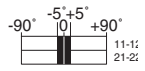
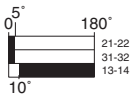
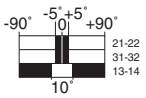
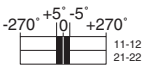
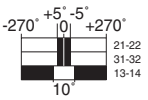
Operation

Operator displacement

XCS PL•91, PL•71, PL•61	XCS PL•81, PL•51	XCS TL•91, TL•71, TL•61	XCS TL•81, TL•51	XCS PR•51	XCS TR•51
					

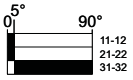
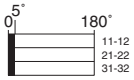
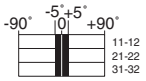
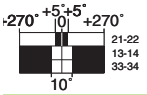
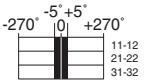
Functional diagrams

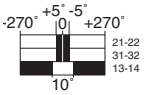
XCS PL591, PL571, PL561	XCS PL581, PL551	XCS TL561	XCS TL581, TL551	XCS PR551	XCS TR551
					

XCS PL791, PL771, PL761	XCS PL781, PL751	XCS TL791, TL771, TL761	XCS TL781, TL751	XCS PR751	XCS TR751
					

Contact operation

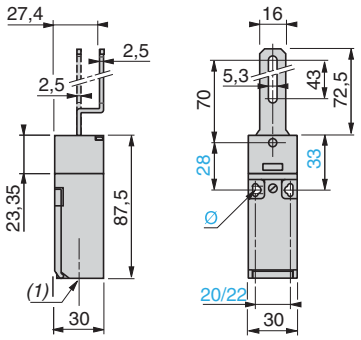
■ contact closed
□ contact open

XCS PL981	XCS TL871, TL861	XCS TL881, TL851	XCS PR851	XCS TR851
				

XCS PR951


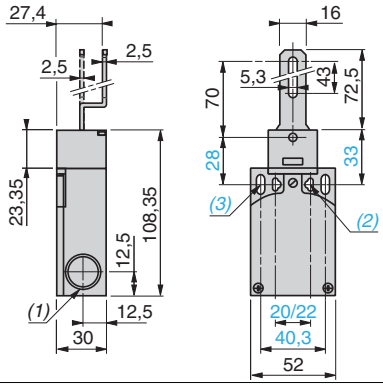
Dimensions

XCS PL••1



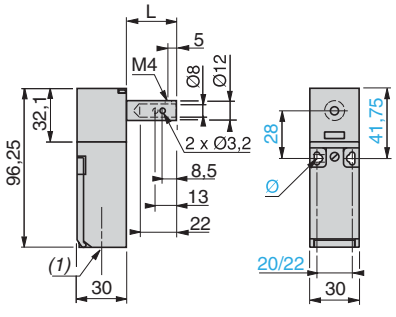
(1) 1 tapped entry for n° 11 cable gland
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres

XCS TL••1



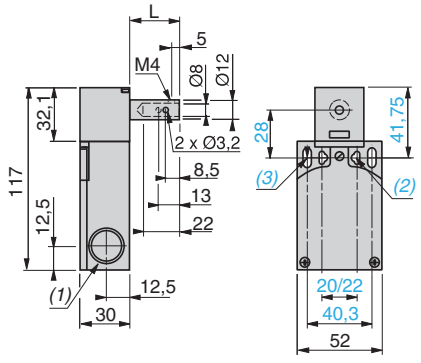
(1) 2 tapped entries for n° 11 cable gland
(2) 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
(3) 2 elongated holes Ø 5.3 x 13.3

XCS PR••1



(1) 1 tapped entry for n° 11 cable gland
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
L = 30 (XCS PR•51) or 80 (XCS PR•61)

XCS TR••1

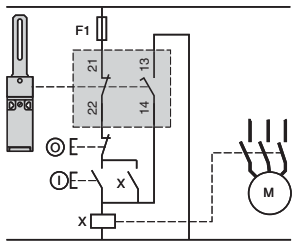


(1) 2 tapped entries for n° 11 cable gland
(2) 2 elongated holes Ø 4.3 x 8.3 on 22 centres, 2 holes Ø 4.3 on 20 centres
(3) 2 elongated holes Ø 5.3 x 13.3
L = 30 (XCS TR•51) or 80 (XCS TR•61)

Wiring schemes

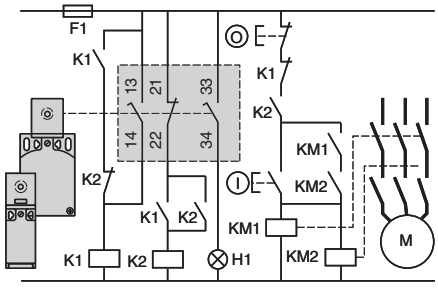
Category 1 to EN 954-1/ISO 13849-1

Example with cable short-circuit protection fuse



Category 3 to EN 954-1/ISO 13849-1

Example with 3-pole N/C + N/O + N/O contact with mixed redundancy of the contacts and the associated control relays

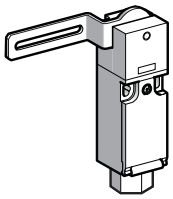
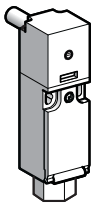


To activate K1, the lever or spindle must be rotated when the supply is switched on. **H1: "lever or** spindle displaced from initial position" indicator. When used in conjunction with an XPS safety module and another safety switch, the rotary lever or spindle operator guard switch can provide a category 3 or 4 control and monitoring system for moving guards to EN 954-1/ISO 13849-1.

Safety detection solutions

Guard switches with lever or spindle operator

Plastic, double insulated, turret head *(1)*,
types XCS PL, XCS TL, XCS PR and XCS TR
Cable entries tapped 1/2" NPT

Type	Elbowed lever (flush with rear of switch)	Spindle
		
Operator	To left	Length 30 mm
References (⊖ N/C contact with positive opening operation)		
2-pole N/C + N/C slow break 	**XCS PL793** ⊖	**XCS PR753** ⊖
Weight (kg)	0.110	0.120

Complementary characteristics not shown under General characteristics (page 3/47)	
Tripping angle	5°
Mechanical durability	**1 million operating cycles**
Minimum torque	For tripping: 0.1 N.m; for positive opening: 0.25 N.m (XCS PL and XCS PR), 0.45 N.m (XCS TL and XCS TR)
Cable entry	XCS P●: 1 entry tapped for 1/2" NPT (USAS B2-1) conduit. XCS T●: 2 entries tapped 11 mm, 1 fitted with metal adaptor DE9 RA1012 for 1/2" NPT (USAS B2-1) conduit and 1 fitted with blanking plug.

(1) Head adjustable in 90° steps throughout 360°. Switches supplied with 2 additional self-locking screws for positive fixing of the head.

Other versions: please consult your Regional Sales Office.

Safety detection solutions

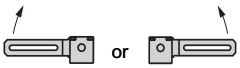
Guard switches with lever or spindle operator

Plastic, double insulated, turret head, types XCS PL, XCS TL, XCS PR and XCS TR
Cable entries tapped 1/2" NPT

Operation

Operator displacement

XCS PL793

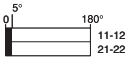


XCS PR753

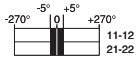


Functional diagrams

XCS PL793



XCS PR753

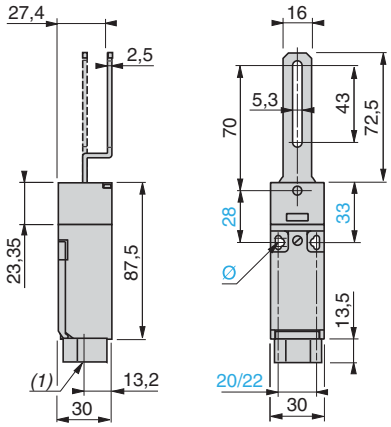


Contact operation

■ contact closed □ contact open

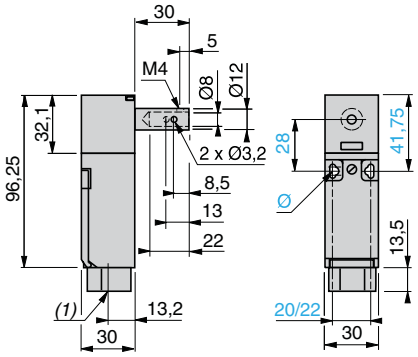
Dimensions

XCS PL793



(1) 1 entry tapped for 1/2" NPT conduit
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres,
2 holes Ø 4.3 on 20 centres

XCS PR753

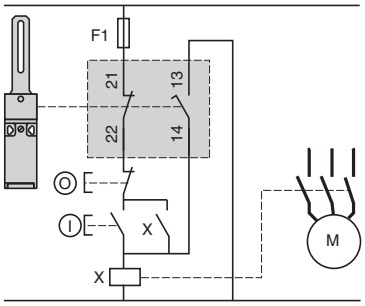


(1) 1 entry tapped for 1/2" NPT conduit
Ø: 2 elongated holes Ø 4.3 x 8.3 on 22 centres,
2 holes Ø 4.3 on 20 centres

Wiring schemes

Category 1 conforming to EN 954-1/ISO 13849-1

Example with cable short-circuit protection fuse

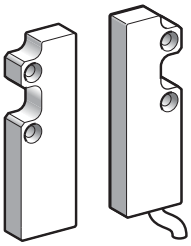


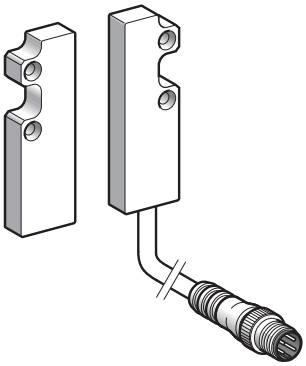
Safety detection solutions
Coded magnetic switches
Plastic

XCS DMC

Rectangular, compact: 51 x 16 x 7

Pre-cabled connection	Connector on flying lead connection



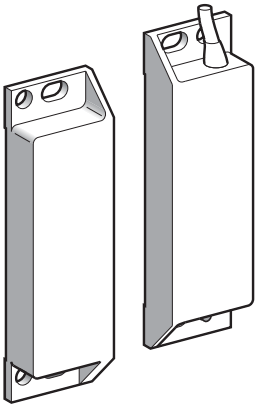


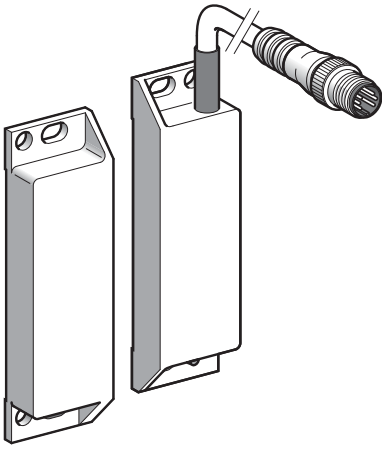
Pages 3/56 and 3/57

XCS DMP

Rectangular, standard: 88 x 25 x 13

Pre-cabled connection	Connector on flying lead connection



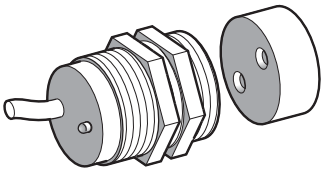


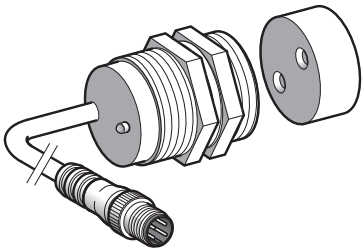
Pages 3/56 and 3/57

XCS DMR

Cylindrical, diameter: 30, length: 38.5

Pre-cabled connection	Connector on flying lead connection





Pages 3/56 and 3/57

Safety detection solutions
Coded magnetic switches
Plastic

Environment

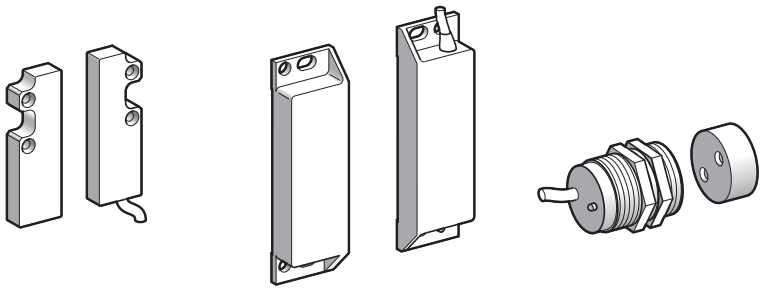
Conformity to standards	Products		IEC/EN 60947-5-1, UL 508, CSA C22 2 n° 14
	Machine assemblies		IEC/EN 60204-1, EN/ISO 12100, EN 1088/ISO 14119 (XCS DM●5●● only)
Product certifications			UL-CSA, BG
Protective treatment			Standard version: "TH"
Ambient air temperature	For operation	**°C**	- 25…+ 85
	For storage	**°C**	- 40…+ 85
Vibration resistance			10 gn (10…150 Hz) conforming to IEC 60068-2-6
Shock resistance			30 gn (11 ms) conforming to IEC 60068-2-7
Sensitivity to magnetic fields		**mT**	≥ 0.3
Electric shock protection			Class II conforming to IEC 60536
Degree of protection	Conforming to IEC 60529		IP 66 and IP 67 for coded magnetic switches with pre-cabled connection IP 67 for coded magnetic switches with connector on flying lead connection
Materials			Thermoplastic case (PBT) PVC cable (ROHS)

Contact block characteristics

Rated operational characteristics				Ue: ⎓ 24 V, Ie: 100 mA max.
Rated insulation voltage (Ui)				Ui: ⎓ 100 V
Rated impulse withstand voltage (U imp)			**kV**	2.5 conforming to EN/IEC 60947-5-1
Resistance across terminals		Contact with LED	Ω	57
		Contact without LED	Ω	10
Protection (not using safety module)				External cartridge fuse: 500 mA gG (gl)
Connection	XCS DMC			Pre-cabled, 4 x 0.25 mm², length: 2, 5 or 10 m depending on model or M8 connector on 0.15 m flying lead
	XCS DMP	2 contact model		Pre-cabled, 4 x 0.25 mm², length: 2, 5 or 10 m depending on model or M12 connector on 0.15 m flying lead
		3 contact model		Pre-cabled, 6 x 0.25 mm², length: 2, 5 or 10 m depending on model or M12 connector on 0.15 m flying lead
	XCS DMR			Pre-cabled, 4 x 0.25 mm², length: 2, 5 or 10 m depending on model or M12 connector on 0.15 m flying lead
Contact material				Rhodium
Electrical durability				1.2 million operating cycles
Maximum switching voltage			**V**	⎓ 100
Switching capacity		Contact with LED	**mA**	5…100
		Contact without LED	**mA**	0.1…100
Insulation resistance			**M**W	1000
Maximum breaking capacity		Contact with LED	**VA**	3
		Contact without LED	**VA**	10
Maximum switching frequency			**Hz**	150

Safety detection solutions
Coded magnetic switches
Plastic, pre-cabled

Type	Rectangular		Cylindrical
	Compact 51 x 16 x 7	Standard 88 x 25 x 13	Diameter 30 Length 38.5



References of switches *(1)* ⚠ must be used in conjunction with safety modules XPS, see pages 3/62 to 3/64

Contact states shown are with the magnet positioned in front of the switch

2-pole N/C + N/O (N/C staggered)	**XCS DMC5902**	**XCS DMP5902**	**XCS DMR5902**
2-pole N/O + N/O *(2)* (1 N/O staggered)	**XCS DMC7902**	**XCS DMP7902**	**XCS DMR7902**
3-pole N/C + N/C + N/O (1 N/C staggered)	–	**XCS DMP5002**	–
3-pole N/C + N/O + N/O *(2)* (1 N/O staggered)	–	**XCS DMP7002**	–
2-pole N/C + N/O (N/C staggered)	**XCS DMC5912**	**XCS DMP5912**	**XCS DMR5912**
2-pole N/O + N/O *(2)* (1 N/O staggered)	**XCS DMC7912**	**XCS DMP7912**	**XCS DMR7912**
3-pole N/C + N/C + N/O (1 N/C staggered)	–	**XCS DMP5012**	–
3-pole N/C + N/O + N/O *(2)* (1 N/O staggered)	–	**XCS DMP7012**	–
Weight (kg)	0.101	0.180	0.146

(1) Magnetic switch + coded magnet (XCS ZC●●●●).
Switch pre-cabled with 2 m long cable. For other cable lengths, replace the last number of the reference (2) by 5 for a 5 m long cable or by 10 for a 10 m long cable.
*Example: rectangular, compact switch with N/C + N/O contacts and 10 m cable becomes **XCS DMC59010**.*
(2) Only to be wired in conjunction with an XPS AF module (see page 3/63).

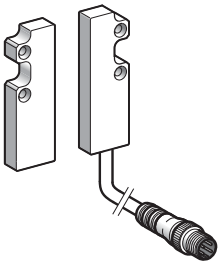
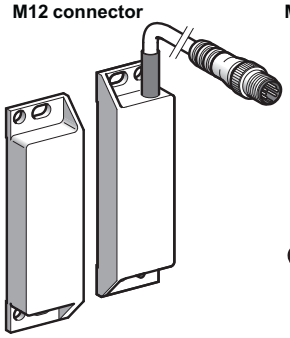
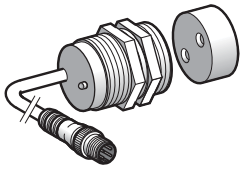
Complementary characteristics not shown under General characteristics (page 3/55)

Operating zone	Sao: 5 mm Sar: 15 mm	Sao: 8 mm Sar: 20 mm	Sao: 8 mm Sar: 20 mm
Approach directions	3 directions	3 directions	1 direction

Accessories (page 3/58)

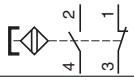
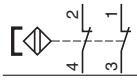
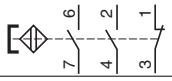
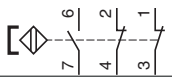
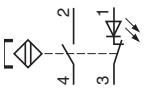
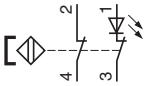
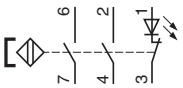
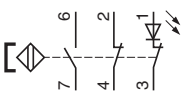
Dimensions:
page 3/60

Safety detection solutions
Coded magnetic switches
Plastic, connector on flying lead

Type	Rectangular		Cylindrical
	Compact 51 x 16 x 7	Standard 88 x 25 x 13	Diameter 30 Length 38.5
	M8 connector	**M12 connector**	**M12 connector**
			

References of switches *(1)* ⚠ must be used in conjunction with safety modules XPS, see pages 3/62 to 3/64

Contact states shown are with the magnet positioned in front of the switch

2-pole N/C + N/O (N/C staggered)		**XCS DMC590L01M8**	**XCS DMP590L01M12**	**XCS DMR590L01M12**
2-pole N/O + N/O *(2)* (1 N/O staggered)		**XCS DMC790L01M8**	**XCS DMP790L01M12**	**XCS DMR790L01M12**
3-pole N/C + N/C + N/O (1 N/C staggered)		–	**XCS DMP500L01M12**	–
3-pole N/C + N/O + N/O *(2)* (1 N/O staggered)		–	**XCS DMP700L01M12**	–
2-pole N/C + N/O (N/C staggered)		**XCS DMC591L01M8**	**XCS DMP591L01M12**	**XCS DMR591L01M12**
2-pole N/O + N/O *(2)* (1 N/O staggered)		**XCS DMC791L01M8**	**XCS DMP791L01M12**	**XCS DMR791L01M12**
3-pole N/C + N/C + N/O (1 N/C staggered)		–	**XCS DMP501L01M12**	–
3-pole N/C + N/O + N/O *(2)* (1 N/O staggered)		–	**XCS DMP701L01M12**	–
Weight (kg)		0.101	0.180	0.146

(1) Magnetic switch + coded magnet (XCS ZC●●●●).
(2) Only to be wired in conjunction with an XPS AF module (see page 3/63).

Complementary characteristics not shown under General characteristics (page 3/55)

Operating zone	Sao: 5 mm Sar: 15 mm	Sao: 8 mm Sar: 20 mm	Sao: 8 mm Sar: 20 mm
Approach directions	3 directions	3 directions	1 direction

Accessories (page 3/58)

Dimensions:
page 3/60

Safety detection solutions
Coded magnetic switches
Accessories

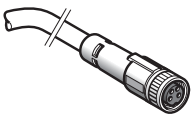
Accessories			
Accessories for coded magnetic switches	**XCS DMC●●●2 XCS DMC●●●L**	**XCS DMP●●●2 XCS DMP●●●L**	**XCS DMR●●●2 XCS DMR●●●L**
Fixing clamp	–		**XSZ B130**
Weight (kg)	–		0.080
Additional coded magnet	**XCS ZC1**	**XCS ZP1**	**XCS ZR1**
Weight (kg)	0.009	0.050	0.018
Non-magnetic shims	**XCS ZCC** (lot of 2)	**XCS ZCP** (lot of 2)	**XCS ZCR**
Weight (kg)	0.008	0.012	0.002

3

Pre-wired female connectors for conne ctor version switches Pre-wired connector characteristics				
Pre-wired connector type		**XZ CP0941L●, XZ CP1041L●**	**XZ CP29P11L●**	**XZ CP1141L●, XZ CP1241L●**
Type of connection		Screw threaded (metal clamping ring)	Screw threaded (metal clamping ring)	Screw threaded (metal clamping ring)
Number of contacts		4	8	4
Degree of protection		IP 67 (with clamping ring correctly tightened)		
Ambient air temperature	Static	- 35…+ 90 °C	- 35…+ 90 °C	- 35…+ 90 °C
	Dynamic	- 5…+ 90 °C	- 5…+ 90 °C	- 5…+ 90 °C
Cabling		Ø 5.2 mm cable, wire c.s.a.: 4 x 0.34 mm^2	Ø 5.2 mm cable, wire c.s.a.: 8 x 0.25 mm^2	Ø 5.2 mm cable, wire c.s.a.: 4 x 0.34 mm^2
LED signalling		–	–	–
Nominal voltage		∼ 60 V, ⎓ 75 V	∼ 250 V, ⎓ 300 V	∼ 250 V, ⎓ 300 V
Nominal current		4 A	2 A	4 A
Insulation resistance		> 10^9 Ω	> 10^9 Ω	> 10^9 Ω
Contact resistance		⩽ 5 mΩ	⩽ 5 mΩ	⩽ 5 mΩ

References of pre-wired connectors

503627



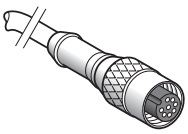
XZ CP0941L●

503626



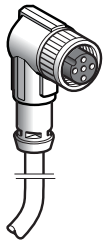
XZ CP1041L●

534640



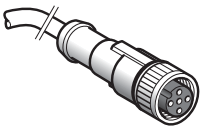
XZ CP29P11L●

503630



XZ CP1241L●

563352



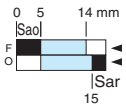
XZ CP1141L●

Type of connector	Number of pins	For use with	Type	Cable length m	Reference	Weight kg
Female, M8	4	XCS DMC●●●L	Straight	2	**XZ CP0941L2**	0.080
				5	**XZ CP0941L5**	0.180
				10	**XZ CP0941L10**	0.360
			Elbowed	2	**XZ CP1041L2**	0.080
				5	**XZ CP1041L5**	0.180
				10	**XZ CP1041L10**	0.360
Female, M12	8	XCS DMP●●●L	Straight	2	**XZ CP29P11L2**	0.100
				5	**XZ CP29P11L5**	0.290
				10	**XZ CP29P11L10**	0.470
Female, M12	4	XCS DMR●●●L/ XCS DMP●●●L	Straight	2	**XZ CP1141L2**	0.090
				5	**XZ CP1141L5**	0.190
				10	**XZ CP1141L10**	0.370
			Elbowed	2	**XZ CP1241L2**	0.090
				5	**XZ CP1241L5**	0.190
				10	**XZ CP1241L10**	0.370

Dimensions: page 3/61

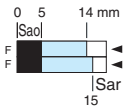
Function diagrams with magnet present (pre-cabled version)

XCS DMC59●●



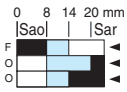
Colour
(N/O): BN/BU
(N/C): BK/WH

XCS DMC79●●



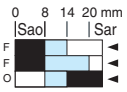
Colour
(N/O): BN/BU
(N/O): BK/WH

XCS DMP50●●



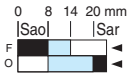
Colour
(N/O): BN/BU
(N/C): BK/WH
(N/C): GY/PK

XCS DMP70●●



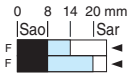
Colour
(N/O): BN/BU
(N/O): BK/WH
(N/C): GY/PK

XCS DMR59●●/XCS DMP59●●



Colour
(N/O): BN/BU
(N/C): BK/WH

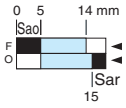
XCS DMR79●●/XCS DMP79●●



Colour
(N/O): BN/BU
(N/O): BK/WH

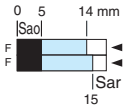
Function diagrams with magnet present (connector on flying lead version)

XCS DMC59●●



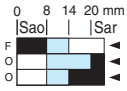
Pin
(N/O): 1/3
(N/C): 4/2

XCS DMC79●●



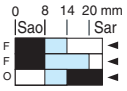
Pin
(N/O): 1/3
(N/O): 4/2

XCS DMP50●●



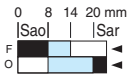
Pin
(N/O): 1/3
(N/C): 4/2
(N/C): 6/7

XCS DMP70●●



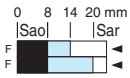
Pin
(N/O): 1/3
(N/O): 4/2
(N/C): 6/7

XCS DMR59●●/XCS DMP59●●



Pin
(N/O): 1/3
(N/C): 4/2

XCS DMR79●●/XCS DMP79●●



Pin
(N/O): 1/3
(N/O): 4/2

Contact closed

Contact open

Contact unstable

Sao: assured operating distance.
Sar: assured tripping distance.
Conforming to EN/IEC 60947-5-3.

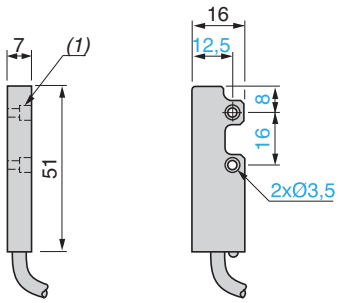
References:
pages 3/56 and 3/57

Safety detection solutions
Coded magnetic switches
Plastic

Coded magnetic switches

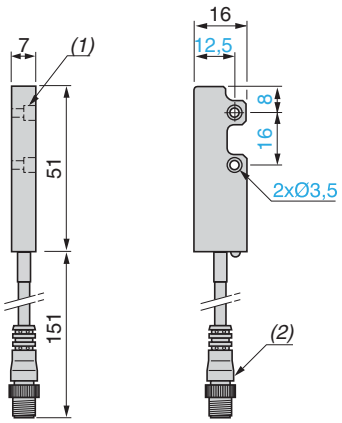
XCS DMC

Pre-cabled connection



(1) Counterbored: Ø 6 x 3.5 mm.

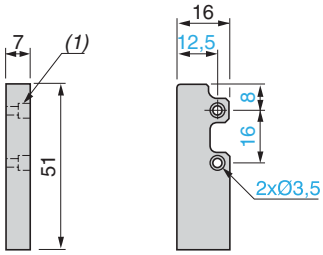
Connector on flying lead connection



(1) Counterbored: Ø 6 x 3.5 mm.
(2) M8 4-pin connector.

Coded magnet for XCS DMC

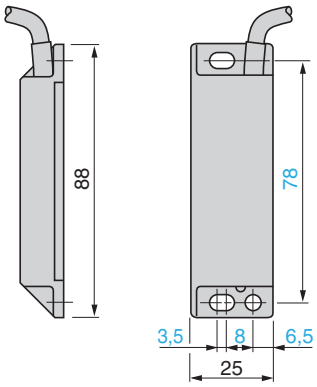
XCS ZC1



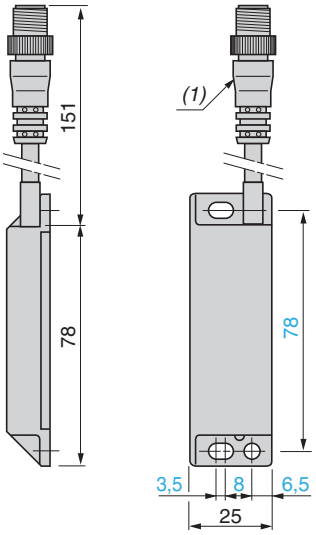
(1) Counterbored: Ø 6 x 3.5 mm.

XCS DMP

Pre-cabled connection



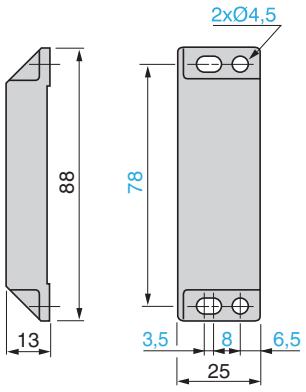
Connector on flying lead connection



(1) 4 or 6-pin M12 connector.

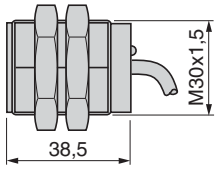
Coded magnet for XCS DMP

XCS ZP1

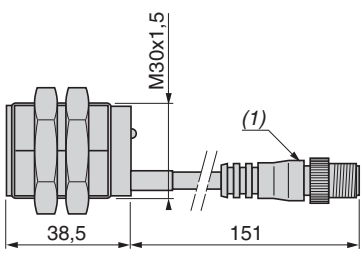


XCS DMR

Pre-cabled connection



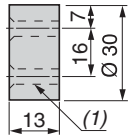
Connector on flying lead connection



(1) M12 4-pin connector.

Coded magnet for XCS DMR

XCS ZR1

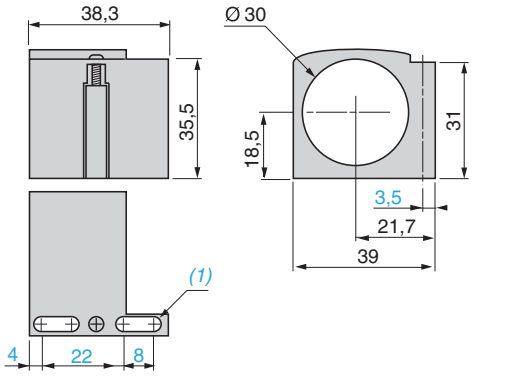


(1) 2 x Ø 4.3, countersunk: Ø 7.5 at 45°.

References:
pages 3/56 and 3/56

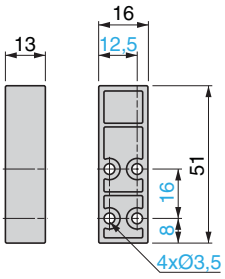
Accessories

Fixing clamp
XSZ B130

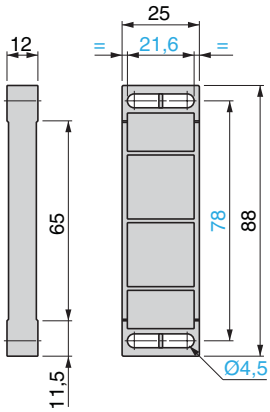


(1) 2 elongated holes Ø 4 x 8.

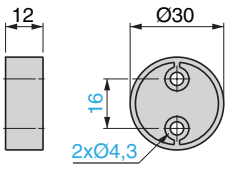
Non-magnetic shims
XCS ZCC



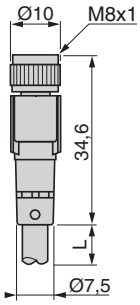
XCS ZCP



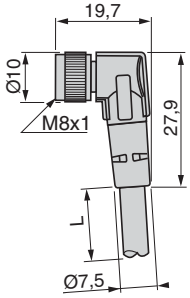
XCS ZCR



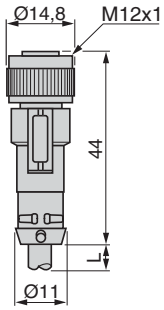
Pre-wired female connectors
XZ CP0941L●



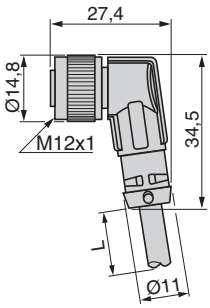
XZ CP1041L●



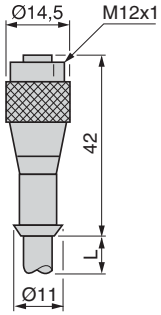
XZ CP1141L●



XZ CP1241L●

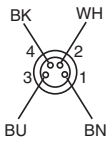


XZ CP29P11L●

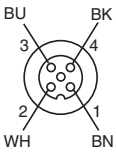


Schemes

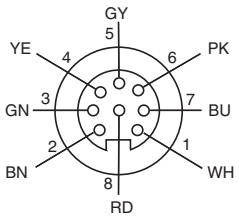
M8 pre-wired female connector
XZ CP0941L●



M12 pre-wired female connector
XZ CP1141L●, XZ CP1241L●

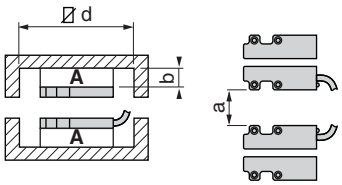


XZ CP29P11L●

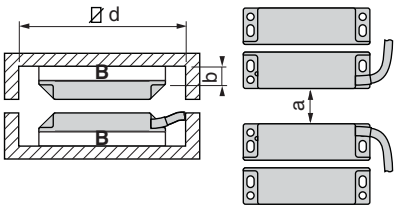


Mounting

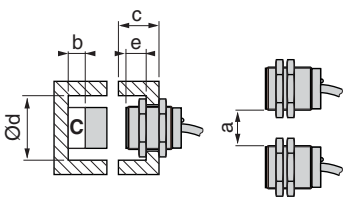
XCS DMC



XCS DMP



XCS DMR



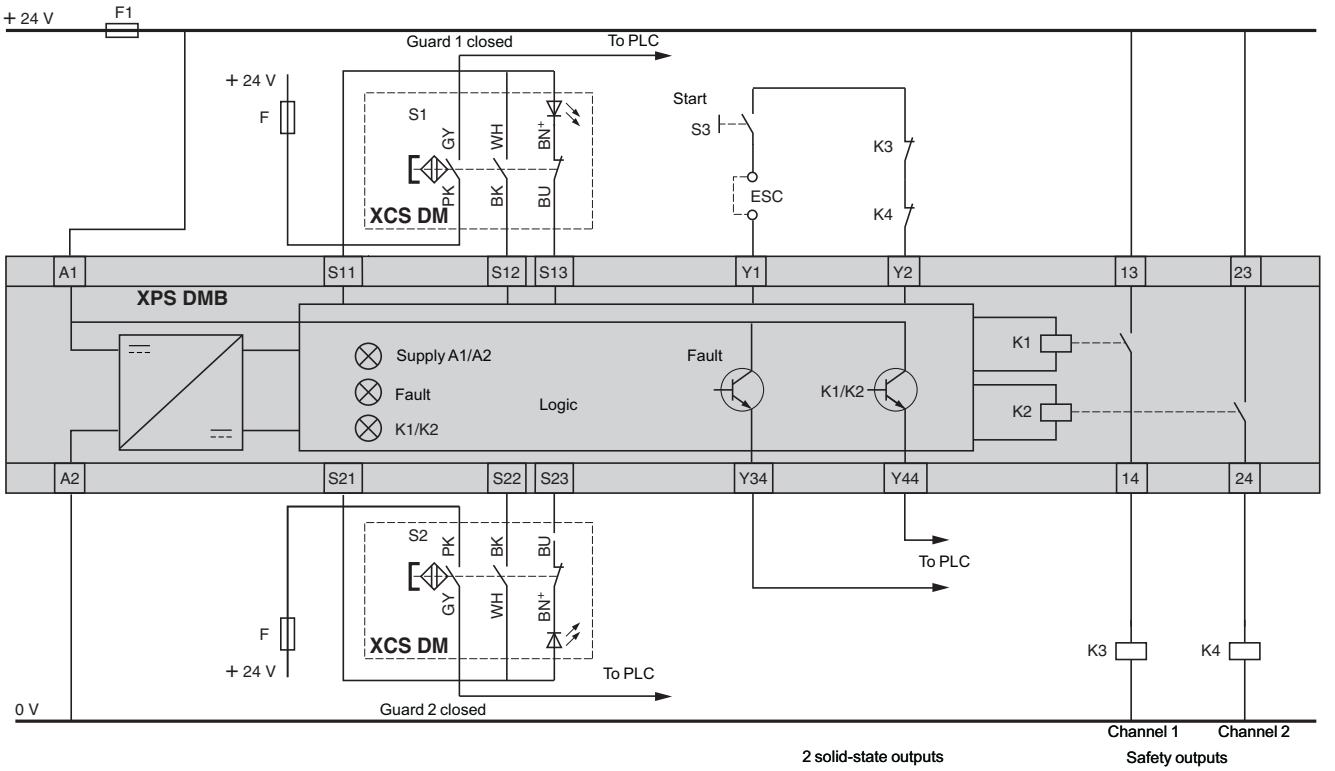
XCS	a	b	c	d	e
DMC	40	13 min.	–	81 x 55	–
DMP	100	10 min.	–	118 x 55	–
DMR	40	12 min.	> 10	Ø 45	20
		–	> 10	Ø 45	13
		12 min.	< 10	–	20
		–	< 10	–	17

Non-magnetic shims	
A	XCS ZCC
B	XCS ZCP
C	XCS ZCR

Safety detection solutions
Coded magnetic switches
Plastic, pre-cabled

XCS DMP5●●● with XPS DMB

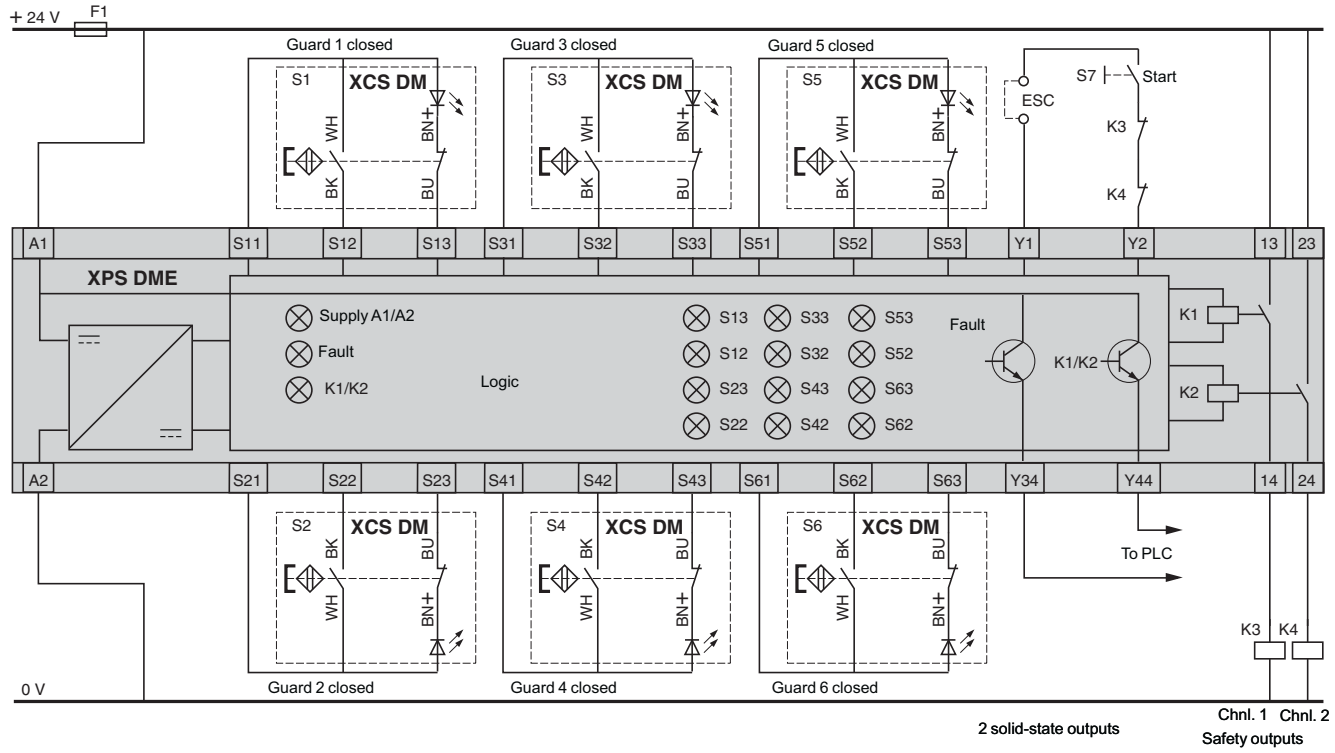
Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 3-pole N/C + N/C + N/O (1 N/C staggered) contact.



ESC: External start conditions.

XCS DMC5●●●, XCS DMP5●●●, XCS DMR5●●● with XPS DME

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N/C + N/O (N/C staggered) contact.



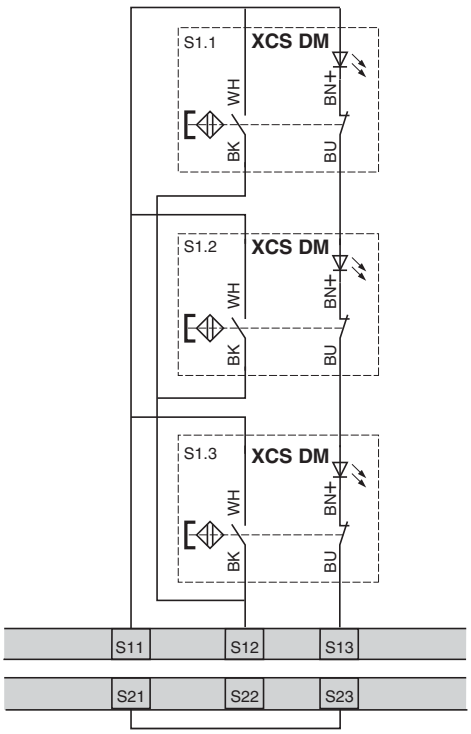
ESC: External start conditions.

References:
pages 3/56 and 3/57

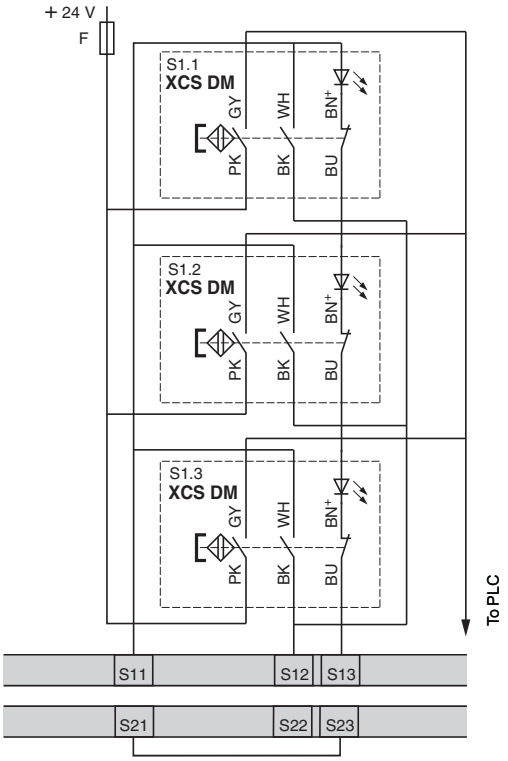
Connection of up to 3 magnetic switches, with an LED on one input, with XPS DM● *(1)*

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Example with 2-pole N/C + N/O contact



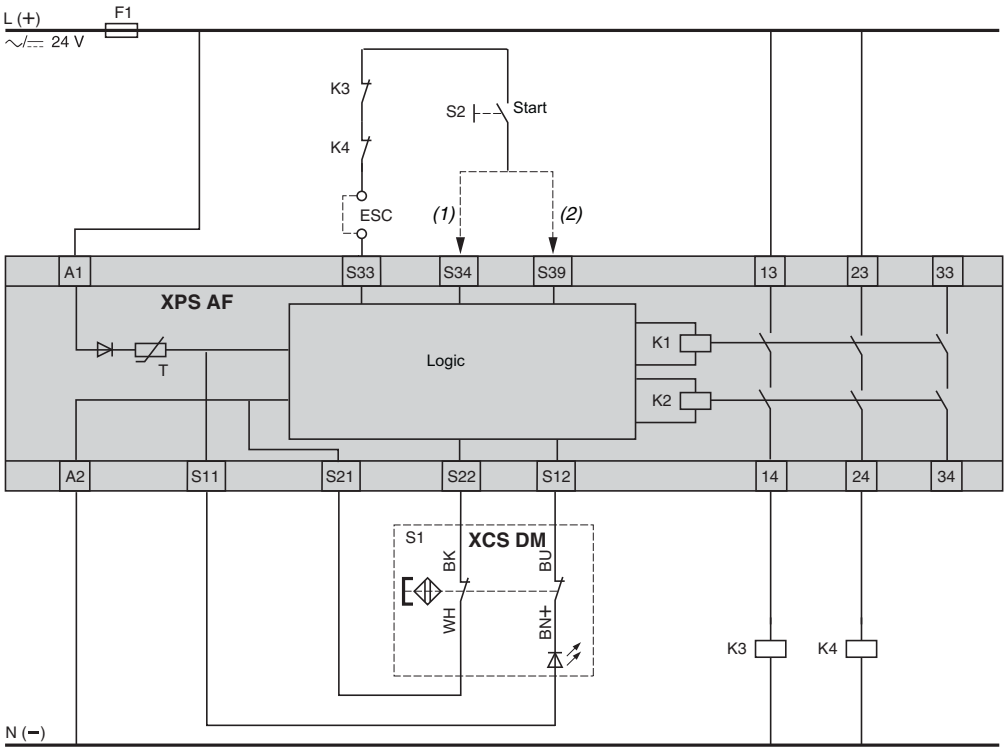
Example with 3-pole N/C + N/C + N/O contact



(1) Input: S11, S12, S13 or S21, S22, S23.

XCS DM●7●●● with XPS AF

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N/C + N/C contact (not conforming to standard EN 1088/ISO 14119)

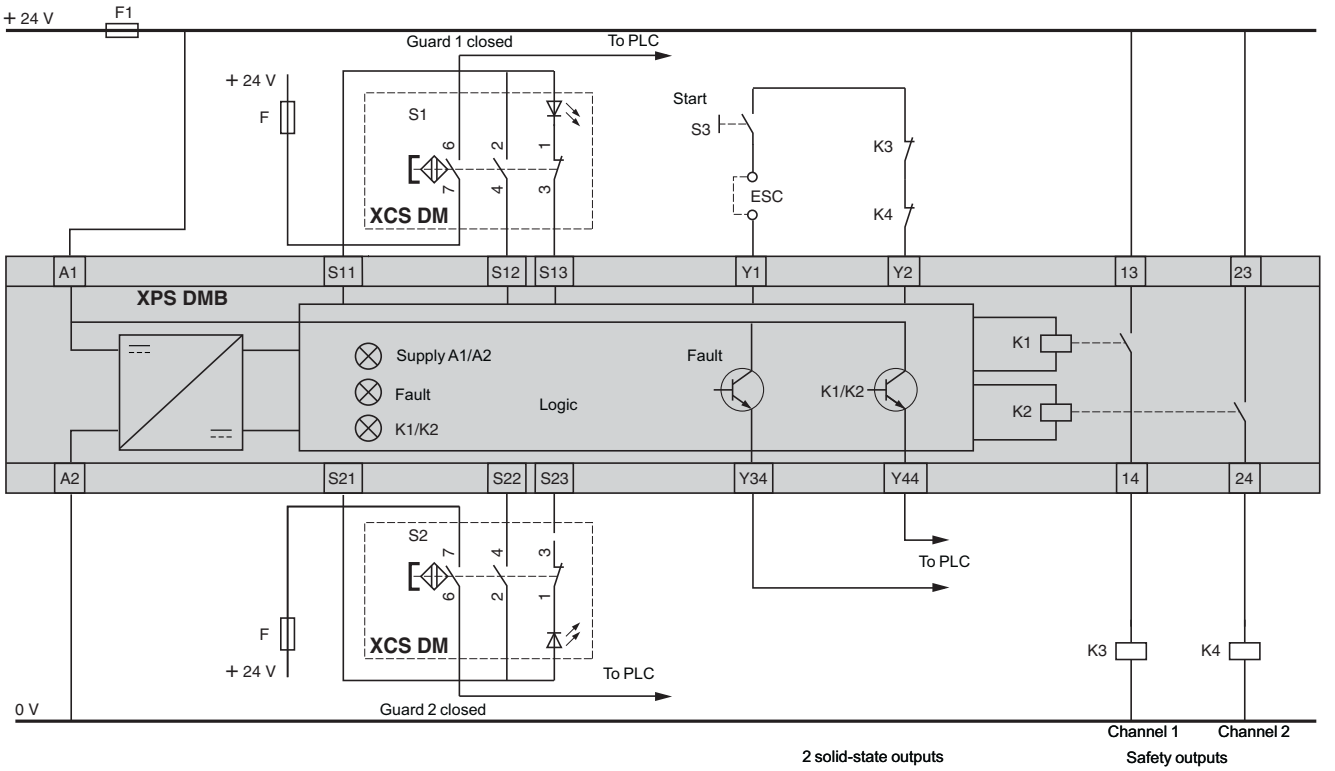


(1) With start button monitoring.
(2) Without start button monitoring.
ESC: External start conditions.

Safety detection solutions
Coded magnetic switches
Plastic, connector on flying lead

XCS DMP5●●● with XPS DMB

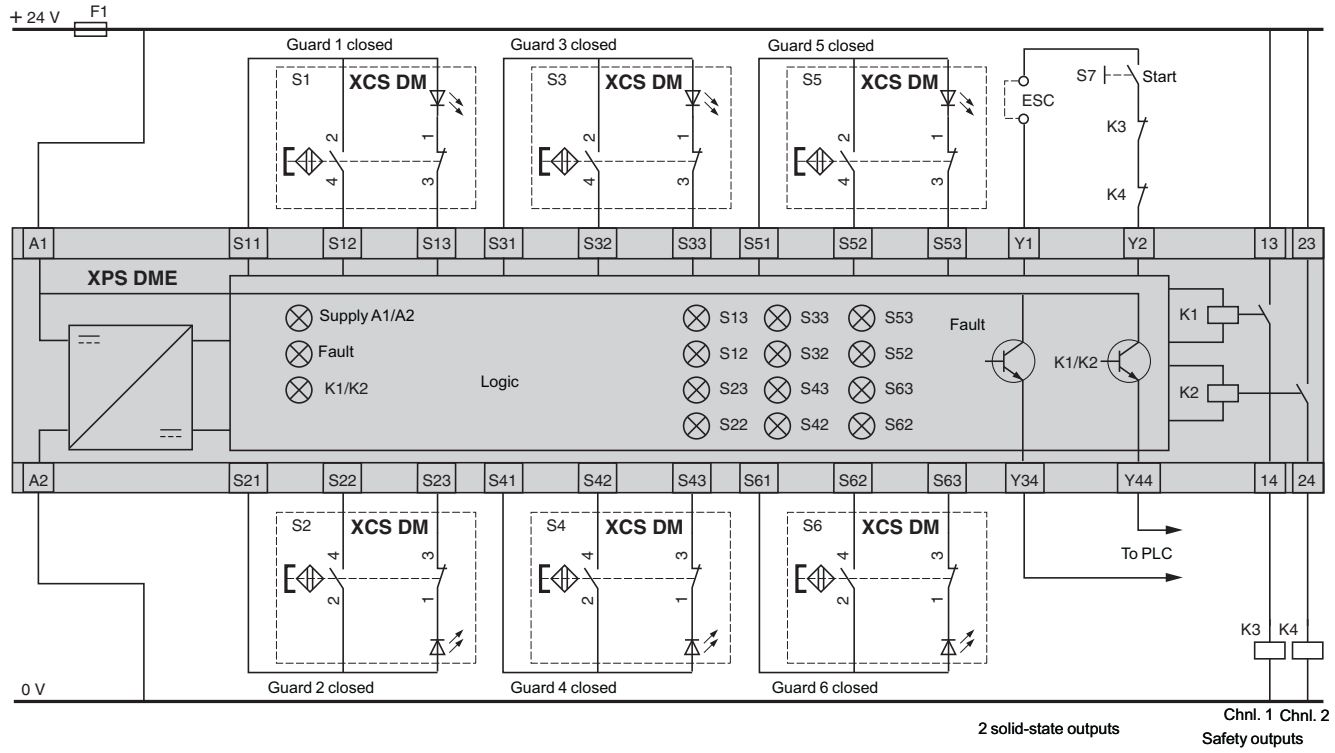
Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 3-pole N/C + N/C + N/O (1 N/C staggered) contact.



ESC: External start conditions.

XCS DMC5●●●, XCS DMP5●●●, XCS DMR5●●● with XPS DME

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N/C + N/O (N/C staggered) contact.



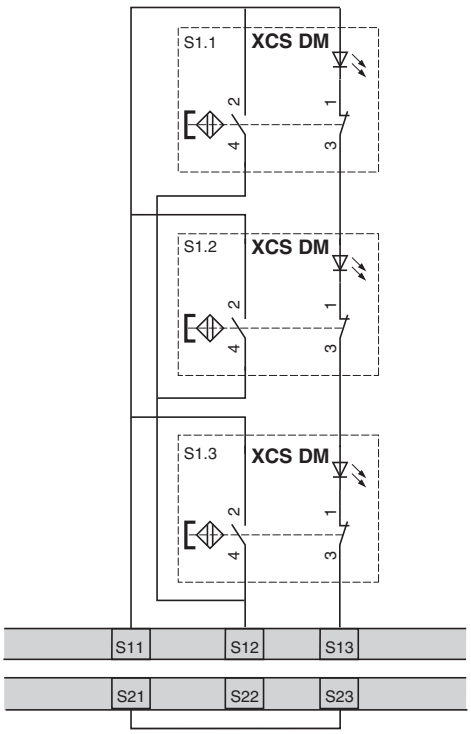
ESC: External start conditions.

References:
pages 3/56 and3/57

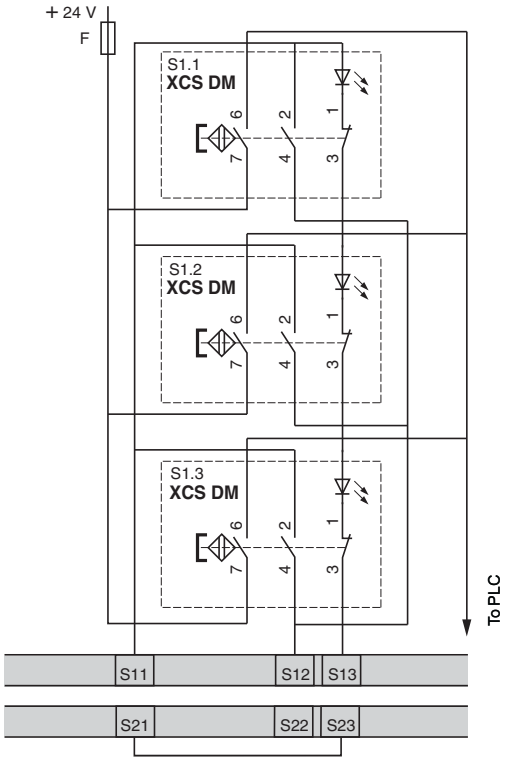
Connection of up to 3 magnetic switches, with an LED on one input, with XPS DM● *(1)*

Wiring to category 3 conforming to EN 954-1/ISO 13849-1

Example with 2-pole N/C + N/O contact



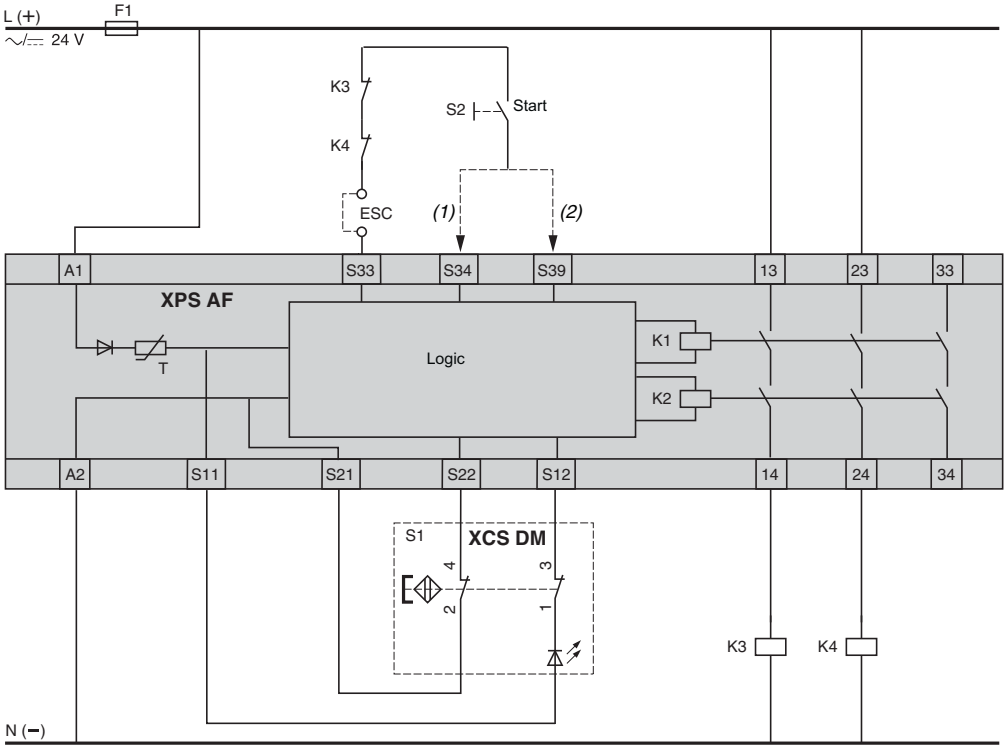
Example with 3-pole N/C + N/C + N/O contact



(1) Input: S11, S12, S13 or S21, S22, S23.

XCS DM●7●●● with XPS AF

Wiring to category 4 conforming to EN 954-1/ISO 13849-1. Example with 2-pole N/C + N/C contact (not conforming to standard EN 1088/ISO 14119)



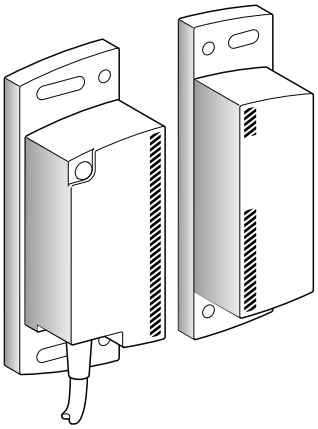
(1) With start button monitoring.
(2) Without start button monitoring.
ESC: External start conditions.

Safety detection solutions
Coded magnetic systems

Coded magnetic system Pre-cabled connection

SIL 2 and 3/Categories 3 and 4

XCS DM3791●● /XCS DM4801●●

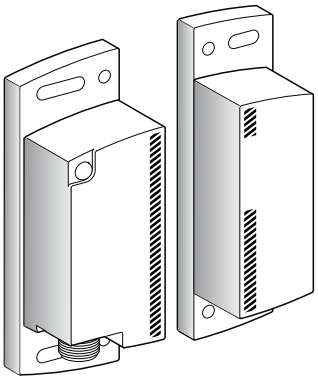


Page 3/68

Coded magnetic system M12 connector connection

SIL 2 and 3/Categories 3 and 4

XCS DM3791M12/ XCS DM4801M12



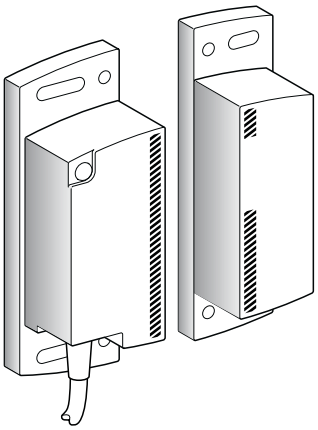
Page 3/69

Safety detection solutions
Coded magnetic systems

Coded magnetic system type			SIL2/Category 3 XCS DM3	SIL3/Category 4 XCS DM4
Environment				
Conformity to standards			IEC 61508, EN/IEC 62061(SIL2 and SIL3), EN 13849-1 (Category 3 and Category 4), EN 1088/ISO 14119, EN/IEC 60947-5-1; EN/IEC 60947-5-2 ; EN/IEC 60947-5-3	
Product certifications			CE, UL, CSA, TÜV	
Ambient air temperature	For operation	°C	-25...+70°C	
	For storage	°C	-40...+85°C	
Vibration resistance	Conforming to IEC 60068-2-6		10 gn (10…500 Hz)	
Shock resistance	Conforming to IEC 60068-2-7		30 gn, 11 ms	
Sensitivity to magnetic fields		mT	≤ 0,5	
Electric shock protection	Conforming to IEC 61140		Class III	
Degree of protection	Conforming to IEC 60529		Pre-cabled version: IP 66, IP 67 Connector version: IP 67	
	Conforming to DIN 40050		Pre-cabled version: IP 69K	
Materials			Thermoplastic case (PBT); PVC cable	
Characteristics				
Rated operational characteristics			Ub : ⎓ 24 V + 10% - 20%	
Rated insulation voltage (Ui)			Ui : ⎓ 36V	
Rated impulse withstand voltage (U imp)	Conforming to EN 60947-5-1	kV	2,5	
Integrated output protection			Overload and short-circuit protection	
Connection	Conforming to IEC 60947-5-2-A3 and IEC 61076		Pre-cabled, 6 x 0.25 mm², length: 2, 5 or 10 m depending on model or M12 connector (A coding)	Pre-cabled, 8 x 0.25 mm², length: 2, 5 or 10 m depending on model or M12 connector (A coding)
Cable diameter		mm	6,1 +/-0,3	
Cable resistance		mΩ/m	90	
Safety outputs (OSSD) **(Output Signal Switching Devices)**			2 PNP type (NO) solid-state outputs, 1.5 A (2 A up to 60°C), ⎓ 24 V (short-circuit protected)	
Alarm output			–	1 solid-state output, 0.5 A, ⎓ 24 V, PNP
Signalling			LED (green/red/orange)	
Maximum switching frequency		Hz	3	
Activation delay		ms	100	
Discordance time		s	2	
HFT (Hardware Fault Tolerance)			1	
			Test interval: 12 months	
Tightening torque		Nm	1,8 maxi.	
Chaining in series			32 maximum with 2 m long cable	–
Functions				
Functions			- LED status signalling	- Auto/Manual start via “Start”input - Monitoring of external switching devices (EDM: External Devices Monitoring) - Display of operating modes (LED) - Monitoring of the function (open or closed) as well as the response time of the power components.

Safety detection solutions
Coded magnetic systems
Plastic, solid-state PNP type output

Type	Magnetic system with dedicated transmitter
	Pre-cabled connection



References

Description	Type of connection	SIL2/Category 3	SIL3/Category 4	Weight kg
Magnetic system with dedicated transmitter *(1)*	Pre-cabled, L = 2 m	**XCS DM379102**	**XCS DM480102**	0,320
	Pre-cabled, L = 5 m	**XCS DM379105**	**XCS DM480105**	0,480
	Pre-cabled, L = 10 m	**XCS DM379110**	**XCS DM480110**	0,745

(1) Self-contained system not requiring use of safety module or non-magnetic shim.

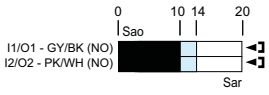
Detection characteristics

Assured operating distance	Sao : 10 mm
Assured tripping distance	Sar : 20 mm
Approach directions	9
Approach speed	0,01 m/s mini

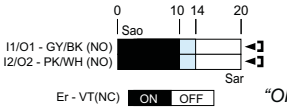
Output status (pre-cabled connection)

Output states shown are with the dedicated transmitter positioned in front of the receiver.

XCS DM3791●●



XCS DM4801●●

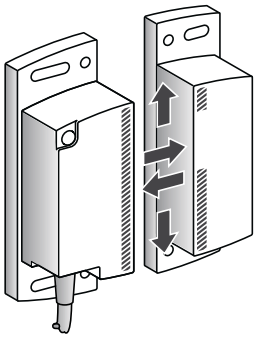


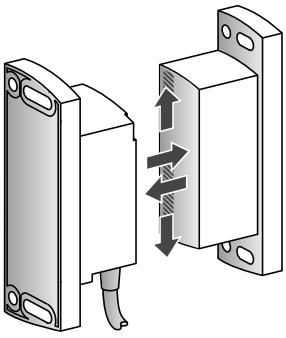
"OFF" = Error

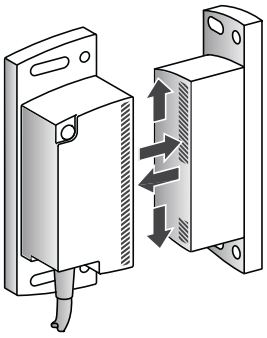
Output closed
Output open
Transitional state

Sao : Assured operating distance.
Sar : Assured tripping distance.
Conforming to EN/IEC 60947-5-3

Approach directions

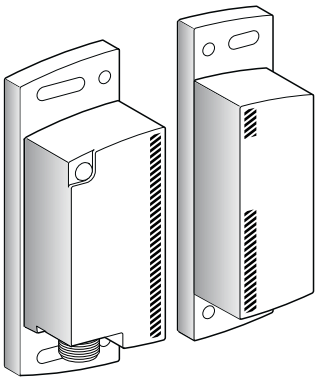






Safety detection solutions
Coded magnetic systems
Plastic, solid-state PNP type output

Type	Magnetic system with dedicated transmitter
	M12 connector connection



References

Description	Type of connection	SIL2/Category 3	SIL3/Category 4	Weight kg
Magnetic system with dedicated transmitter *(1)*	M12 connector	**XCS DM3791M12**	**XCS DM4801M12**	0,215

1) Self-contained system not requiring use of safety module or non-magnetic shim.

Detection characteristics

Assured operating distance	Sao : 10 mm
Assured tripping distance	Sar : 20 mm
Approach directions	9
Approach speed	0,01 m/s mini

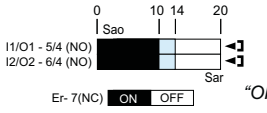
Output status (pre-cabled connection)

Output states shown are with the dedicated transmitter positioned in front of the receiver.

XCS DM3791M12



XCS DM4801M12



"OFF" = Error

Output closed
Output open
Transitional state

Sao : Assured operating distance.
Sar : Assured tripping distance.
Conforming to EN/IEC 60947-5-3

Accessories

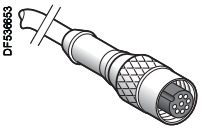
Description	For use with	Reference	Weight kg
Replacement dedicated transmitter	XCS DM3/4●●●02/05/10 XCS DM3/4●●●M12	**XCS DMT**	0,100
Arc suppressor (pair)	XCS DM3/4●●●02/05/10 XCS DM3/4●●●M12	**XUS LZ500**	0,020

Pre-wired female connectors for connector version coded magnetic systems

Pre-wired connector characteristics

Pre-wired connector type			XZ CP29P12L●
Type of connection			Screw threaded (metal clamping ring)
Number of contacts			8
Degree of protection			IP 67 (with clamping ring correctly tightened)
Ambient air temperature	Operation	**°C**	- 25 ...+ 70
	Storage	**°C**	- 40…+ 85
Cabling	Conforming to IEC 60947-5-2		Ø 6.1 mm PUR cable, wire c.s.a.: 8 x 0.25 mm^2
LED signalling			–
Nominal current		**A**	2
Insulation resistance		Ω	> 10^9
Contact resistance		**mΩ**	⩽ 5

References of pre-wired connectors



XZ CP29P12L●

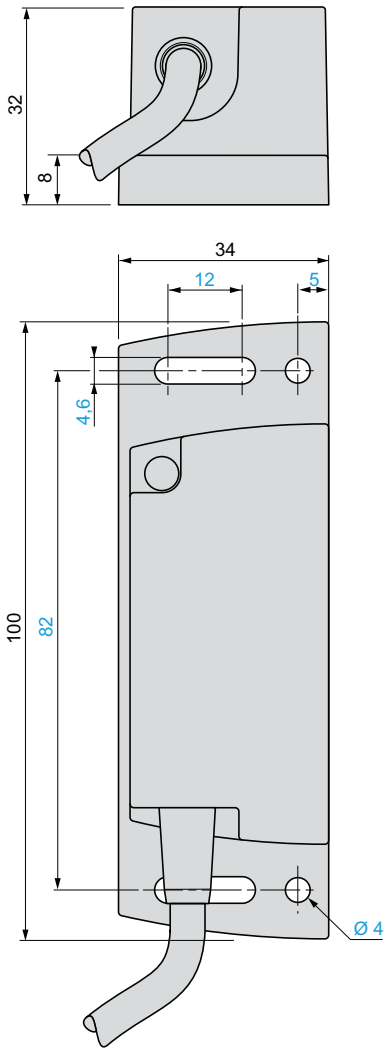
Type of connector	No. of contacts	For use with	Type	Cable length m	Reference	Weight kg
Female, M12 (Coding A)	8	XCS DM3/4●●●02 XCS DM3/4●●●05 XCS DM3/4●●●10	Straight	2	**XZ CP29P12L2**	0,100
				5	**XZ CP29P12L5**	0,290
				10	**XZ CP29P12L10**	0,470

Safety detection solutions
Coded magnetic systems
Plastic

Coded magnetic systems

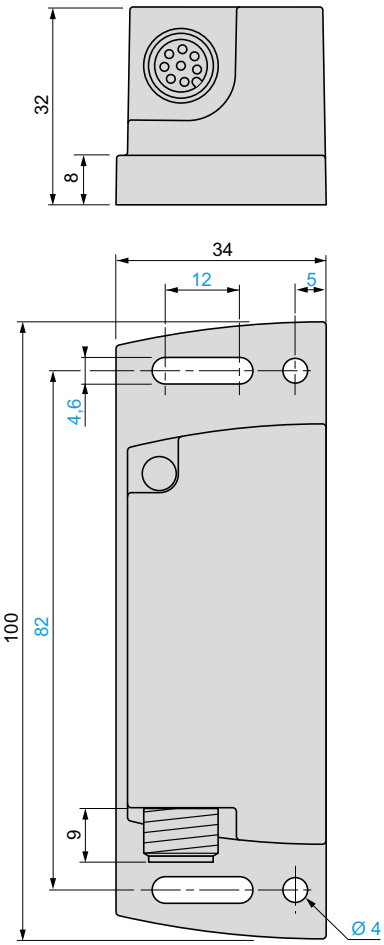
Pre-cabled connection

XCS DM3/4●●●02/05/10



M12 connector (Coding A) connection

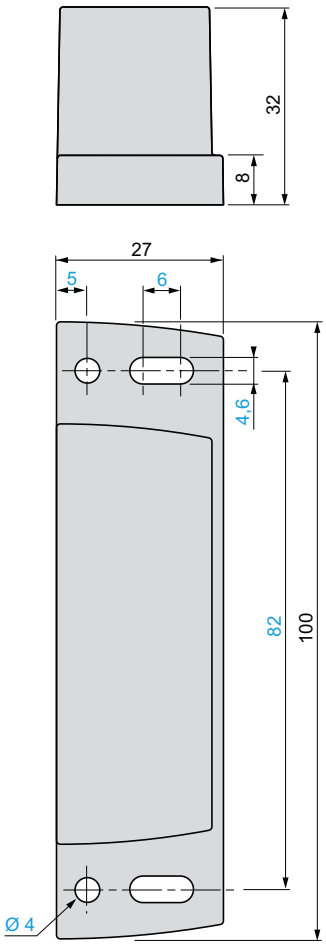
XCS DM3/4●●●M12



Accessory

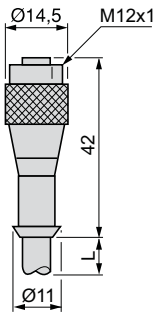
Replacement dedicated transmitter

XCS DMT



Pre-wired female connectors

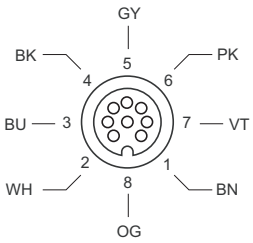
XZ CP29P12L●



Connection

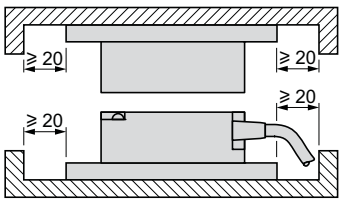
M12 pre-wired female connector

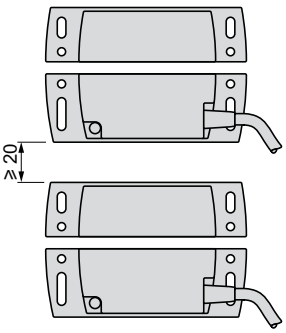
XZ CP29P12L●

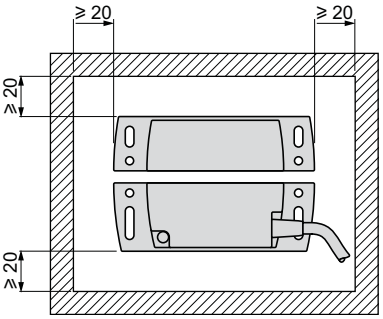


Mounting

XCS DM3/DM4





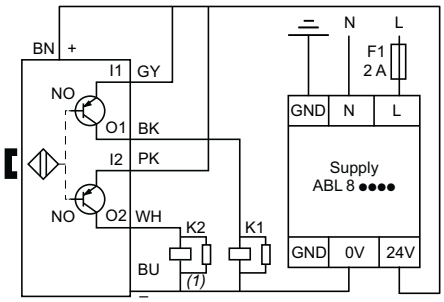


Schemes

Category 3 (this Category 3 scheme can attain SIL2)

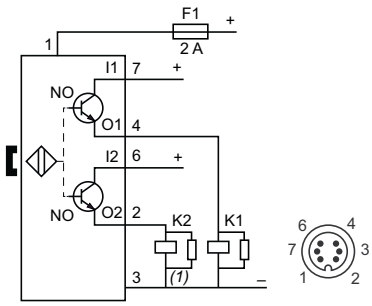
Pre-cabled connection

XCS DM3791●●



M12 connector (A coding) connection

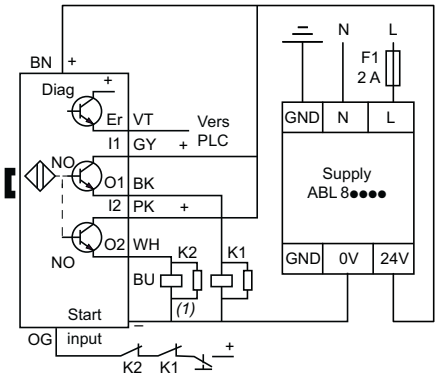
XCS DM3791M12



SIL3/Category 4

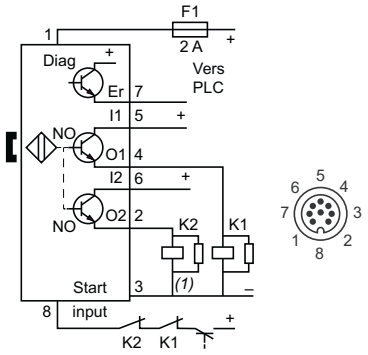
Pre-cabled connection

XCS DM4801●●



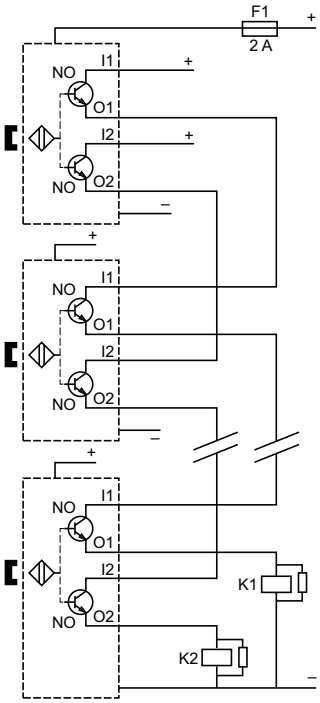
M12 connector (A coding) connection

XCS DM4801M12



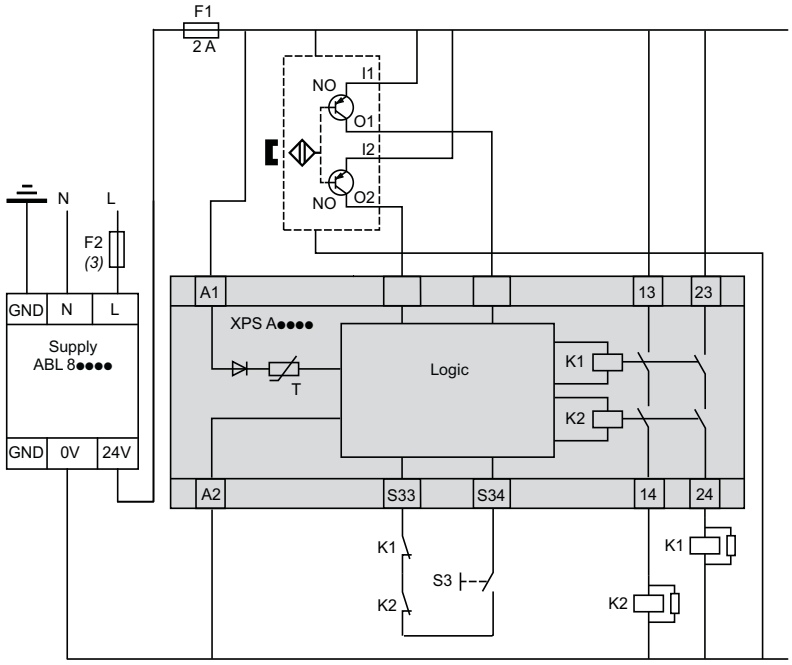
Chaining coded magnetic systems *(2)*

XCS DM3791●●



Wiring to SIL3/Category 4 with Preventa module

Example: XCS DM3●●●●● + XPS AFL5130

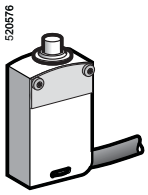


(1) Mechanically linked contacts
(2) Maximum chaining: 32 maximum with 2 m long cable.
(3) 2A maxi

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M

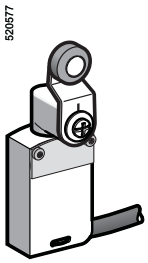
XCS M
pre-cabled

With head for linear movement (plunger). Fixing by the body



Page 3/76

With head for rotary movement (lever). Fixing by the body



Page 3/76

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M

Environment

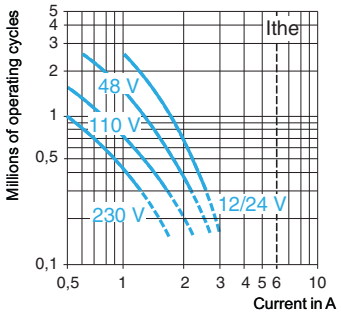
Conforming to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 No. 14
	Machine assemblies	IEC/EN 60204-1, EN 1088
Product certifications		UL, CSA
Protective treatment		Standard version: “TC”
Ambient air temperature		Operation: - 25...+ 70 °C. Storage: - 40…+ 70 °C
Vibration resistance		XCS M snap action: 5 gn. XCS M slow break: 25 gn (10…500 Hz) conforming to IEC 60068-2-6
Shock resistance		25 gn, (18 ms) conforming to IEC 60068-2-27
Electric shock protection		Class I, conforming to IEC 6140 and NF C 20-030
Degree of protection		**IP 66, IP 67 and IP 68** *(1)* **conforming to IEC 60529; IK 06 conforming to EN 50102**
Materials		Body: zamak. Head: zamak. Safety fixings: 5-lobe torque. Protective plate: steel.
Repeat accuracy		0.05 mm on the tripping points with 1 million operating cycles for head with end plunger

Contact block characteristics

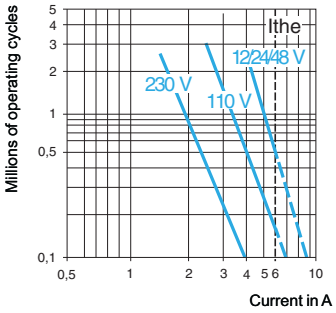
Rated operational characteristics	**~ AC-15; B300 (Ue = 240 V, Ie = 1.5 A)** **⎓ DC-13 ; R300 (Ue = 250 V, Ie = 0.1 A), conforming to IEC 60947-5-1 Appendix A, EN 60947-5-1**
Rated insulation voltage	Ui = 400 V degree of pollution 3 conforming to IEC 60947-5-1 Ui = 300 V conforming to UL 508, CSA C22-2 No. 14
Rated impulse withstand voltage	U imp = 4 kV conforming to IEC 60947-1, IEC 60664
Positive operation (depending on model)	N/C contacts with positive opening operation conforming to IEC/EN 60947-5-1 Appendix K
Resistance across terminals	≤ 25 mΩ conforming to IEC 60255-7 category 3
Short-circuit protection	6 A cartridge fuse type gG (gl)
Minimum actuation speed	Snap action contact: 0.01 m/minute Break before make, slow break: 6 m/minute
Electrical durability	■ Conforming to 60947-5-1 Appendix C ■ Utilisation category AC-15 and DC-13 ■ Maximum frequency: 3600 operating cycles/hour ■ Load factor: 0.5

a.c. supply
~ 50/60 Hz
⎓ inductive circuit

XCS M snap action (N/C+ N/C + N/O, N/C+ N/C + N/O + N/O contacts)



XCS M slow break (N/C+ N/C + N/O contact)



d.c. supply ⎓

Power broken in W for 5 million operating cycles

Voltage	V	24	48	120
⎓	W	3	2	1

Power broken in W for 5 million operating cycles

Voltage	V	24	48	120
⎓	W	4	3	3

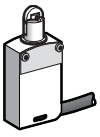
(1) Protection against prolonged immersion: the test conditions are subject to agreement between the manufacturer and the user.

Safety detection solutions

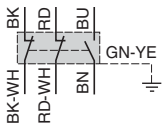
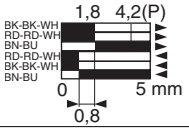
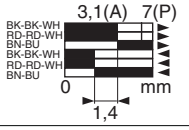
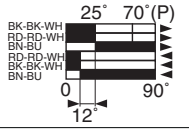
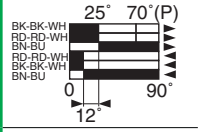
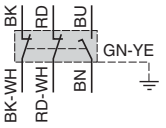
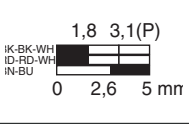
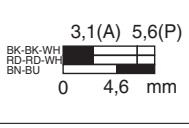
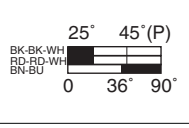
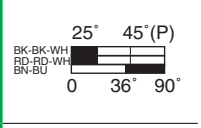
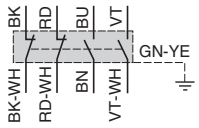
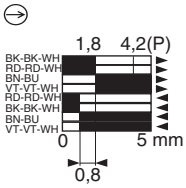
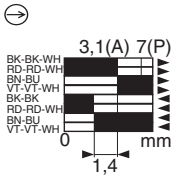
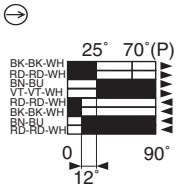
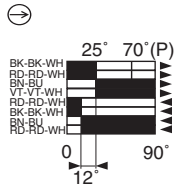
Safety limit switches

Miniature design, metal, type XCS M

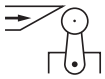
Pre-cabled

Type of head	Plunger (fixing by the body)		Rotary (fixing by the body)	
				
Type of operator	Metal end plunger	Roller plunger	Thermoplastic roller lever	Steel roller lever

References

	**3-pole N/C+N/C+N/O snap action contact**	**XCS M3910L1** 	**XCS M3902L1** 	**XCS M3915L1** 	**XCS M3916L1** 
	**3-pole N/C+N/C+N/O break before make, slow break contact**	**XCS M3710L1** 	**XCS M3702L1** 	**XCS M3715L1** 	**XCS M3716L1** 
	**4-pole N/C+N/C+N/O+N/O snap action contact**	**XCS M4110L1** 	**XCS M4102L1** 	**XCS M4115L1** 	**XCS M4116L1** 
Weight (kg)	0.165	0.170	0.205	0.210	
Contact operation	■ *closed* ▭ *open*		*(A) = cam displacement* *(P) = positive opening point* ⊖ *N/C contact with opening positive operation*		

Complementary characteristics not shown under general characteristics (page 3/75)

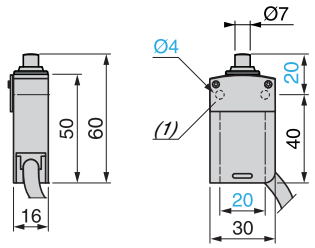
Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		0.5 m/s	0.5 m/s	1.5 m/s
Mechanical durability		10 million operating cycles		
Minimum force or torque	Tripping	8.5 N	7 N	0.5 N.m
	Positive opening	42.5 N	35 N	0.1 N.m
Cabling	3-pole contacts	PvR pre-cabled, 7 x 0.5 mm², length 1 m (1)		
	4-pole contacts	PvR pre-cabled, 9 x 0.34 mm², length 1 m (1)		

(1) For a 2 m long cable, replace L1 with L2.
For a 5 m long cable, replace L1 with L5.

Safety detection solutions
Safety limit switches
Miniature design, metal, type XCS M
Pre-cabled

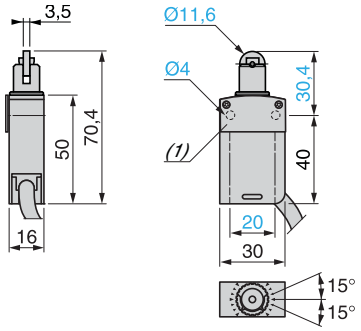
Dimensions

XCSM ●●10L1

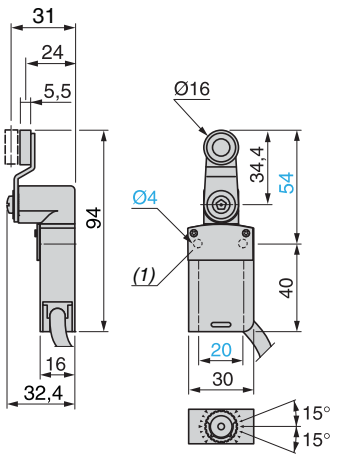


(1) Protective plate fixed by 5-lobe torque safety screws.

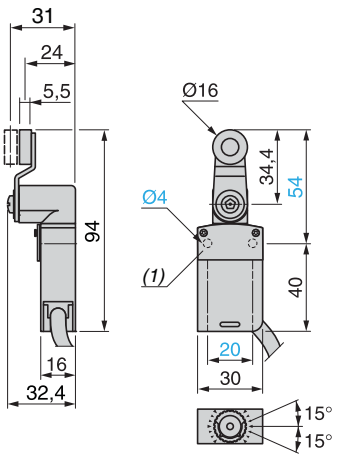
XCSM ●●02L1



XCSM ●●15L1



XCSM ●●16L1

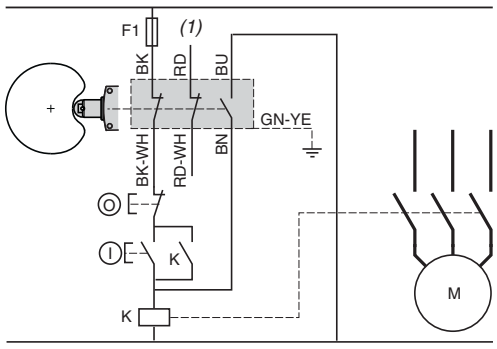


(1) Protective plate fixed by 5-lobe torque safety screws.

Connections

Wiring to category 1 conforming to EN 954-1/ IEC 13849-1

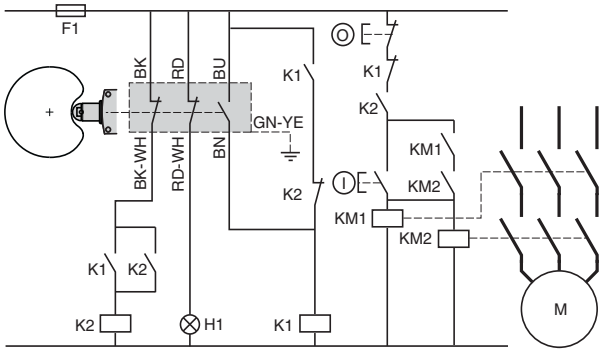
Example with 3-pole N/C+N/C+N/O contact and protection fuse to prevent shunting of the N/C contacts, either by cable damage or by tampering.



(1) Signalling contact

Wiring to category 3 conforming to EN 954-1/IEC 13849-1

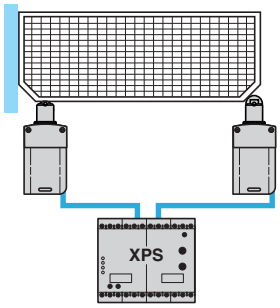
Example with 3-pole N/C+N/C+N/O contact with mixed redundancy of the contacts and the associated control relyas. Opening and closing of the guard necessary to activate K1.



H1: “guard closed” indicator light

Example of guard monitoring using 2 switches and 1 safety module (category 4)

Operation in positive and negative (combined) mode



Safety detection solutions

Safety limit switches

Compact design, metal, type XCS D
Compact design, plastic, type XCS P

■ XCS D, XCS P
with 1 cable entry
conforming to EN 50047

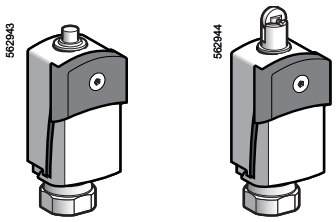
□ With head for linear movement (plunger)

XCS D



Pages 3/80 and 3/81

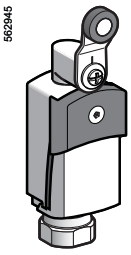
XCS P



Pages 3/82 and 3/83

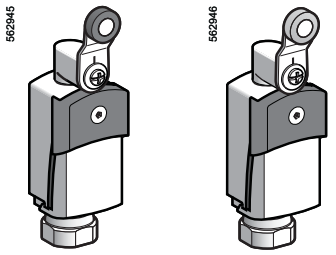
□ With head for rotary movement (lever)

XCS D



Pages 3/80 and 3/81

XCS P



Pages 3/82 and 3/83

Safety detection solutions
Safety limit switches
Compact design, metal, type XCS D
Compact design, plastic, type XCS P

Environmental characteristics

Conformity to standards	Products	IEC/EN 60947-5-1, UL 508, CSA C22-2 n° 14
	Machine assemblies	IEC/EN 60204-1, EN 1088/ISO 14119
Product certifications		UL, CSA
Protective treatment	Standard version	"TC"
Ambient air temperature	For operation	- 25…+ 70 °C
	For storage	- 40…+ 70 °C
Vibration resistance	Conforming to IEC 60068-2-6	25 gn (10…500 Hz)
Shock resistance	Conforming to IEC 60068-2-27	50 gn (11 ms)
Electric shock protection		Class I conforming to IEC 61140 and NF C 20-030 for **XCS D**
		Class II conforming to IEC 61140 and NF C 20-030 for **XCS P**
Degree of protection	Conforming to IEC 60529	**IP 66 and IP 67**
	Conforming to EN 50102	**IK 06 for XCS D** **IK 04 for XCS P**
Repeat accuracy		0.1 mm on the tripping points, with 1 million operating cycles for head with end plunger
Cable entry	Depending on model	Tapped entry for 13.5 cable gland, tapped ISO M20 x 1.5 or tapped 1/2" NPT
Materials		**XCS D** zamak bodies and heads, **XCS P** plastic bodies, zamak heads Plastic protective cover, secured by 5-lobe socket head safety screw

Contact block characteristics

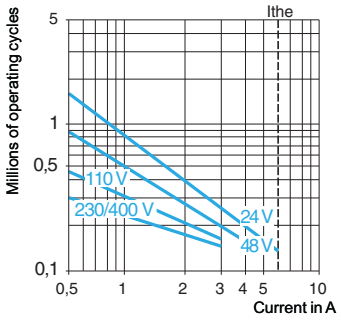
Rated operational characteristics		~ AC-15; B300 (Ue = 240 V, Ie = 1.5 A); Ithe = 6 A ⎓ DC-13; R300 (Ue = 250 V, Ie = 0.1 A), conforming to IEC/EN 60947-5-1 Appendix A
Rated insulation voltage		Ui = 400 V degree of pollution 3 conforming to EN/IEC 60947-1 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage		U imp = 4 kV conforming to EN/IEC 60947-1, IEC 60664
Positive operation (depending on model)		N/C contacts with positive opening operation conforming to IEC/EN 60947-5-1 Appendix K
Resistance across terminals		≤ 25 mΩ conforming to IEC 60255-7 category 3
Short-circuit protection		6 A cartridge fuse type gG (gl)
Connection (screw clamp terminals)		Clamping capacity, min: 1 x 0.34 mm^2, max: 1 x 1 mm^2 or 2 x 0.75 mm^2
Minimum actuation speed (for head with end plunger)	Snap action	0.01 m/minute
	Slow break	6 m/minute

Electrical durability

- Conforming to EN/IEC 60947-5-1 Appendix C
- Utilisation categories AC-15 and DC-13
- Maximum operating rate: 3600 operating cycles/hour
- Load factor: 0.5

a.c. supply
~ 50/60 Hz
inductive circuit

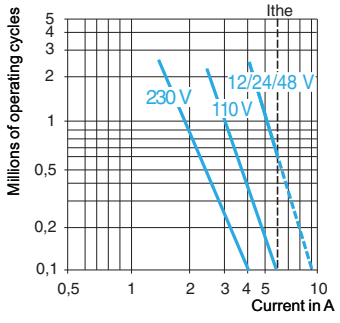
Snap action contacts



Power broken in W for 5 million operating cycles.

Voltage	V	24	48	120
inductive	W	3	2	1

Slow break contacts



Power broken in W for 5 million operating cycles.

Voltage	V	24	48	120
inductive	W	4	3	2

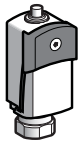
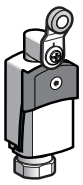
d.c. supply ⎓

Safety detection solutions

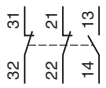
Safety limit switches

Compact design, metal, type XCS D

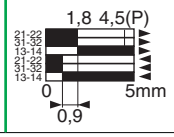
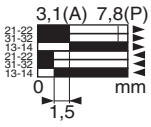
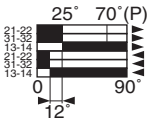
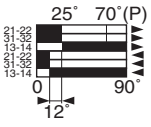
Complete switches with 1 cable entry

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N/C + N/C + N/O snap action contact				
With ISO M20 x 1.5 cable entry				
	XCS D3910P20 ⊖	**XCS D3902P20** ⊖	**XCS D3918P20** ⊖	**XCS D3919P20** ⊖
With Pg 13.5 cable entry				
	XCS D3910G13 ⊖	**XCS D3902G13** ⊖	**XCS D3918G13** ⊖	**XCS D3919G13** ⊖
With 1/2" NPT cable entry				
	XCS D3910N12 ⊖	**XCS D3902N12** ⊖	**XCS D3918N12** ⊖	**XCS D3919N12** ⊖
Weight (kg)	0.215	0.220	0.255	0.255

Contact functional diagrams



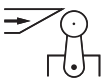
3-pole N/C + N/C + N/O snap action contact

Contact operation

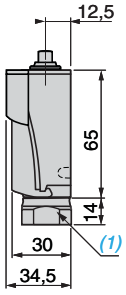
■ *contact closed* *(A) = cam displacement*
□ *contact open* *(P) = positive opening point*
⊖ *N/C contact with positive opening operation*

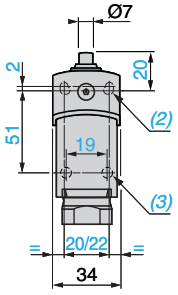
Complementary characteristics not shown under general characteristics (page 3/79)

Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		0.5 m/s		1.5 m/s
Mechanical durability (in millions of operating cycles)		15	10	
Minimum force or torque	For tripping	15 N	12 N	0.1 N.m
	For positive opening	45 N	36 N	0.25 N.m
Cable entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

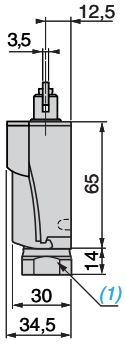
Dimensions

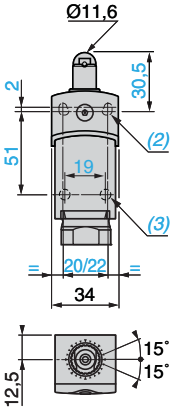
XCS D3●10●●●





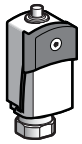
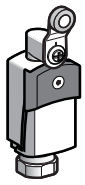
XCS D3●02●●●



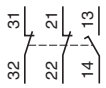


(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø 4.3 x 6.3 mm on 22 mm centres or 2 holes Ø 4.3 on 20 mm centres.
(3) 2 x Ø 3 holes for studs, depth 4 mm.

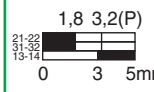
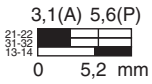
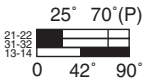
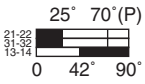
Safety detection solutions
Safety limit switches
Compact design, metal, type XCS D
Complete switches with 1 cable entry

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N/C + N/C + N/O break before make, slow break contact				
With ISO M20 x 1.5 cable entry				
	XCS D3710P20 ⊖	**XCS D3702P20** ⊖	**XCS D3718P20** ⊖	**XCS D3719P20** ⊖
With Pg 13.5 cable entry				
	XCS D3710G13 ⊖	**XCS D3702G13** ⊖	**XCS D3718G13** ⊖	**XCS D3719G13** ⊖
With 1/2" NPT cable entry				
	XCS D3710N12 ⊖	**XCS D3702N12** ⊖	**XCS D3718N12** ⊖	**XCS D3719N12** ⊖
Weight (kg)	0.215	0.220	0.255	0.255

Contact functional diagrams



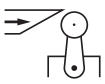
3-pole N/C + N/C + N/O break before make, slow break contact

	 1,8 3,2(P) 21-22 31-32 13-14 0 3 5mm	 3,1(A) 5,6(P) 21-22 31-32 13-14 0 5,2 mm	 25° 70°(P) 21-22 31-32 13-14 0 42° 90°	 25° 70°(P) 21-22 31-32 13-14 0 42° 90°

Contact operation

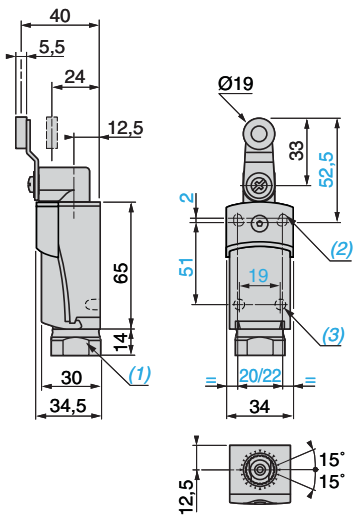
■ *contact closed* *(A) = cam displacement*
□ *contact open* *(P) = positive opening point*
⊖ *N/C contact with positive opening operation*

Complementary characteristics not shown under general characteristics (page 3/79)

Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		0.5 m/s		1.5 m/s
Mechanical durability (in millions of operating cycles)		15	10	
Minimum force or torque	For tripping	15 N	12 N	0.1 N.m
	For positive opening	45 N	36 N	0.25 N.m
Cable entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCS D3●18●●●, XCS D3●19●●●



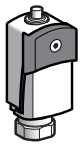
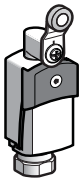
(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø 4.3 x 6.3 mm on 22 mm centres or 2 holes Ø 4.3 on 20 mm centres.
(3) 2 x Ø 3 holes for studs, depth 4 mm.

Safety detection solutions

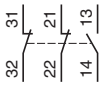
Safety limit switches

Compact design, plastic, type XCS P

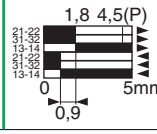
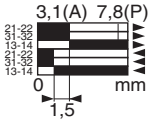
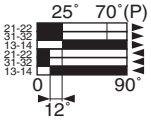
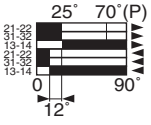
Complete switches with 1 cable entry

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N/C + N/C + N/O snap action contact				
With ISO M20 x 1.5 cable entry				
	XCS P3910P20 ⊖	**XCS P3902P20** ⊖	**XCS P3918P20** ⊖	**XCS P3919P20** ⊖
With Pg 13.5 cable entry				
	XCS P3910G13 ⊖	**XCS P3902G13** ⊖	**XCS P3918G13** ⊖	**XCS P3919G13** ⊖
With 1/2" NPT cable entry				
	XCS P3910N12 ⊖	**XCS P3902N12** ⊖	**XCS P3918N12** ⊖	**XCS P3919N12** ⊖
Weight (kg)	0.215	0.220	0.255	0.255

Contact functional diagrams

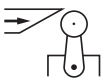


3-pole N/C + N/C + N/O snap action contact

Contact operation				

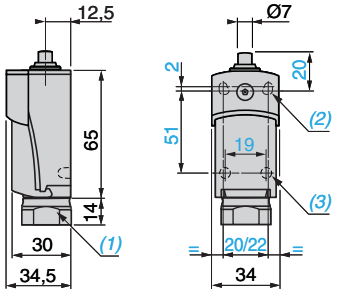
contact closed *(A) = cam displacement*
contact open *(P) = positive opening point*
⊖ *N/C contact with positive opening operation*

Complementary characteristics not shown under general characteristics (page 3/79)

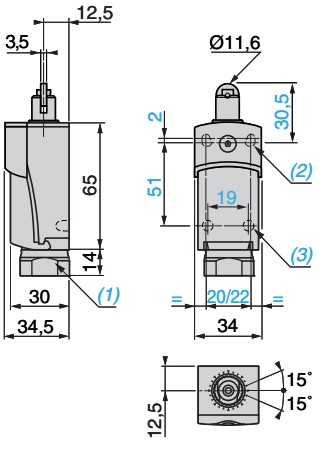
Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		0.5 m/s		1.5 m/s
Mechanical durability (in millions of operating cycles)		15	10	
Minimum force or torque	For tripping	15 N	12 N	0.1 N.m
	For positive opening	45 N	36 N	0.25 N.m
Cable entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCS P3●10●●●

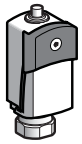
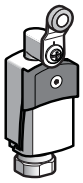


XCS P3●02●●●

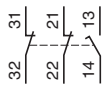


(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø 4.3 x 6.3 mm on 22 mm centres or 2 holes Ø 4.3 on 20 mm centres.
(3) 2 x Ø 3 holes for studs, depth 4 mm.

Safety detection solutions
Safety limit switches
Compact design, plastic, type XCS P
Complete switches with 1 cable entry

Type of head	Plunger		Rotary	
				
Type of operator	Metal end plunger	Steel roller plunger	Thermoplastic roller lever	Steel roller lever
References of complete switches with 3-pole N/C + N/C + N/O break before make, slow break contact				
With ISO M20 x 1.5 cable entry				
	XCS P3710P20 ⊖	**XCS P3702P20** ⊖	**XCS P3718P20** ⊖	**XCS P3719P20** ⊖
With Pg 13.5 cable entry				
	XCS P3710G13 ⊖	**XCS P3702G13** ⊖	**XCS P3718G13** ⊖	**XCS P3719G13** ⊖
With 1/2" NPT cable entry				
	XCS P3710N12 ⊖	**XCS P3702N12** ⊖	**XCS P3718N12** ⊖	**XCS P3719N12** ⊖
Weight (kg)	0.215	0.220	0.255	0.255

Contact functional diagrams



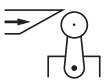
3-pole N/C + N/C + N/O break before make, slow break contact



Contact operation

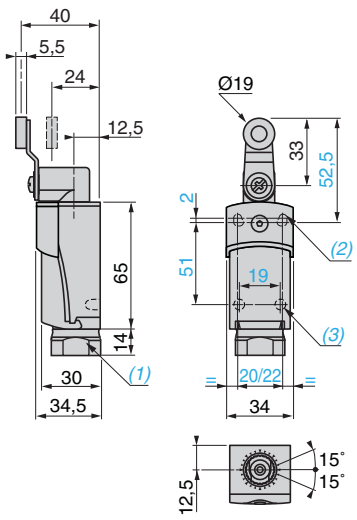
contact closed *(A) = cam displacement*
contact open *(P) = positive opening point*
⊖ *N/C contact with positive opening operation*

Complementary characteristics not shown under general characteristics (page 3/79)

Switch actuation		On end	By 30° cam	
Type of actuation				
Maximum actuation speed		0.5 m/s		1.5 m/s
Mechanical durability (in millions of operating cycles)		15	10	
Minimum force or torque	For tripping	15 N	12 N	0.1 N.m
	For positive opening	45 N	36 N	0.25 N.m
Cable entry		1 entry tapped M20 x 1.5 mm for ISO cable gland, clamping capacity 7 to 13 mm 1 entry tapped Pg 13.5 for cable gland, clamping capacity 9 to 12 mm 1 entry tapped for 1/2" NPT (USAS B2-1) conduit		

Dimensions

XCS P3●18●●●, XCS P3●19●●●



(1) Tapped entry for ISO M20 x 1.5 or Pg 13.5 cable gland or 1/2" NPT conduit.
(2) 2 elongated holes Ø 4.3 x 6.3 mm on 22 mm centres or 2 holes Ø 4.3 on 20 mm centres.
(3) 2 x Ø 3 holes for studs, depth 4 mm.

Safety detection solutions
Safety mats

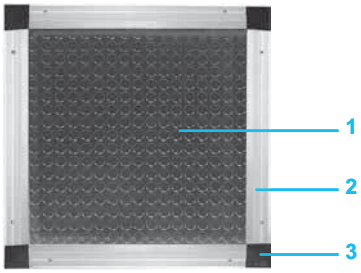
Applications	**Packaging, conveyor systems, materials handling, warehousing, storage, etc.**	
Function	**Zone protection keeping machine operators away from dangerous movements.**	
		
Conforming to standards	EN 1760-1, EN 60947-5-1, EN 60204-1, UL 508, CSA C22-2 No. 14	
Product certifications	Category 3 safety conforming to EN 954-1, BG with safety modules **XPS A K** and **XPS MP/MC**, cULus	
Degree of protection	IP 67	
Dimensions (mm)	500 x 500	500 x 750
Response time	≤ 40 ms with **XPS AK**, ≤ 30 ms with **XPS MP**/MC	
Type of outputs	2 cables; 2 conductors on male/female connectors diameter 8	
Sensitivity	Single mat: > 20 kg Group of mats: > 35 kg	
Maximum supply voltage	⎓ 30 V	
Unit type	**XY2 TP1**	**XY2 TP2**
Page	3/89	

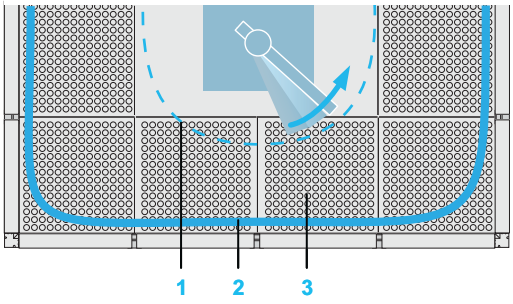




Category 3 safety conforming to EN 954-1, BG with safety modules **XPS AK** and **XPS MP/MC**, cULus	
IP 67	
750 x 750	750 x 1250
≤ 40 ms with **XPS AK,** ≤ 30 ms with **XPS MP/MC**	
2 cables; 2 conductors on male/female connectors diameter 8	
Single mat: > 20 kg Group of mats: > 35 kg	
⎓ 30 V	
XY2 TP3	**XY2 TP4**
3/89	

Safety detection solutions
Preventa safety mats
Type XY2 TP





Presentation

Zone protection

The equipment comprises category 3 safety mats, installed in front of or around potentially dangerous machines and/or robots. They provide a protection zone between machine operators and any dangerous movements.
They form protection zones that are mainly designed to ensure the safety of personnel.
They thus supplement safety devices by enabling free access for the loading/unloading of machines.
The safety mats are used either in conjunction with safety modules or combined with other zone protection systems. They are particularly suited for use in polluted environments (dust, oil, etc.).
"Protect Area Design" configuration software *(1)* enables design and setting-up of the installation.

Applications

Safety mats are mainly used in:
- assembly and packaging lines,
- conveying and handling lines,
- warehousing and storage systems.

Description

- A safety mat comprises:
  - a sensing zone **1**,
  - a border comprising aluminium rails **2**
  - and rail corners which secure the assembly **3**.
- Safety mats can be butt mounted in order to define the safety zone.
- Mats are electrically interconnectable, without loss of sensitivity.

Operating principle

Safety modules type XPS AK and safety controllers type XPS MP/MC used in conjunction with safety mats XY2 TP establish a category 3 safety device conforming to standard EN 954-1/ISO 13849-1.

■ The hazardous zone **1** is defined by the dangerous movement of a machine.
■ The safety zone **2**, defined in accordance with standard EN 999/ISO 13855, comprises one or several butt mounted safety mats **3** (10 maximum for XPS AK and 30 maximum for XPS MP/MC).

■ Safety mats are used for detecting persons stepping onto the mat or falling objects in accordance with standard EN 1760-1/ISO 13856;
- weight > 20 kg for a single mat,
- weight > 35 kg for a group of mats.

■ Any detection of movement on the safety mat immediately instigates the stopping of the dangerous movement of the machine to be made safe. The resetting of the machine can be performed manually or automatically, depending on the wiring configuration of the safety module within the process.
■ The safety mats can also be used for detection applications not related to safety.

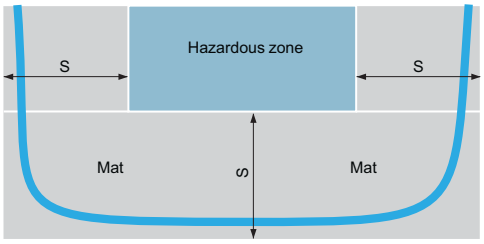
Directives and standards

■ The safety mats conform to the following standards:
- EN/ISO 12100,
- EN 1050/ISO 14121,
- EN/IEC 60947-5-1,
- EN 954-1/ISO 13849-1,
- EN 1760-1/ISO 13856-1,
- EN/IEC 60204-1,
- UL 508,
- CSA C22-2 n° 14.

■ The safety mats are c UL us and BG (when used in conjunction with safety modules XPS AK and safety controllers type XPS MP/MC) certified and approved.

(1) See pages 3/92 to 3/94.

Safety detection solutions
Preventa safety mats
Type XY2 TP



S = minimum distance between the hazardous zone and the detection limit.
Safety zone

Installation precautions

Standard EN 999/ISO 13855 defines:
- the minimum distance between the hazardous zone and the detection limit of the device furthest away from the hazardous zone, see calculation below,
- the body approach speed.

Standard EN 1760-1/ISO 13856-1 states the following requirements:
- surface layout drawing,
- surface preparation,
- handling and connection,
- starting and testing.

Safety rules

Detection of failures liable to compromise safety and stopping of the machine
The design of the machine and its control system must be to the same level of safety as that of the safety mat system in order to ensure the immediate stopping of the machines dangerous movement as soon as the hazardous zone is entered.
It must not be possible to enter the protected zone without tripping the protection system. Therefore, safety mats must be installed in such a way that they cannot be avoided.
The machine can only be restarted if no danger exists and no personnel are present in the hazardous zone.

Calculation of the minimum safety distance according to the application

Standard EN 999/ISO 13855 states the following calculation of distance:
- Safety mat installed on a flat surface:
  S = (1600 mm/s x (t1 + t2)) + 1200 mm.
- Safety mat installed on a step:
  S = (1600 mm x (t1 + t2)) + (1200 mm - 0.4H).

S = minimum distance in mm, in a horizontal plane, between the hazardous zone and the detection limit of the device furthest away from the hazardous zone.
T = overall response time = t1 + t2.
t1 = maximum time in seconds between activation of the detection function (safety mat) and the changeover of the output signal switching devices to the inhibited state (e.g. safety module type XPS AK).
t2 = response time of machine in seconds. Time required to stop the dangerous movement of the machine.
H = distance above reference plane (e.g. height of step in mm).

Note: in all cases S > 750 mm.

Example of an application processed using "Protect Area Design" software *(1)*
- Unintentional access to the hazardous zone of a machine must be detected by a safety device.
- The estimated risk combined with a very dusty environment indicates that a floor mounted sensing device (safety mat) would be appropriate.
- The stopping time of the machine is 300 ms and the response time of the sensing device is ≤ 40 ms.

Calculation formula: S = (1600 mm/s x T) + (1200 mm - 0.4 x H) = (1600 x 0.34) + (1200 - 0) = 1744 mm.

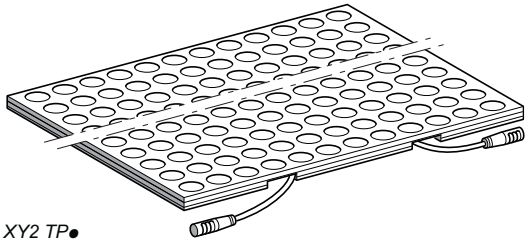
(1) See pages 3/92 to 3/94.

Safety detection solutions
Preventa safety mats
Type XY2 TP

Environment			
Products designed for max. use in safety related parts of control systems (conforming to EN 954-1)			Category 3 max.
Conformity to standards	Products		EN/IEC 60947-5-1, EN 1760-1/ISO 13856-1, UL 508, CSA C22-2 n° 14
	Machine assemblies		IEC/EN 60204-1, EN 999/ISO 13855, EN/ISO 12100
Product certifications			BG with safety modules XPS AK and XPS MP/MC, cULus
Ambient air temperature	For operation	**°C**	+ 5…+ 55
	For storage	**°C**	- 20…+ 70
Sensitivity	Single mat	**kg**	> 20
	Group of mats	**kg**	> 35
Electric shock protection			Class III conforming to EN/IEC 61140
Degree of protection			IP 67 conforming to IEC 60529
Type of covering			NBR, pelleted appearance
Materials of mounting accessories	Rail connectors and corners		Polyacetal
Electrical characteristics			
Rated operational characteristics			⎓ 30 V/100 mA
Contact	Material		Aluminium
	Type		N/O (1-3)
	Resistance	Ω	≤ 5 (closed state)
		MΩ	10 (open state)
	Response time	**ms**	20
Mechanical durability	In millions of operating cycles		> 1
Connection			2 PUR flying leads (length 100 mm, 2 x 0.5 mm² conductors) with Ø 8 male/female, IP 67 connector
Mechanical characteristics			
Maximum permissible load on mat		**N/cm²**	2000
Compression			5 tonnes max.
Rated impulse withstand voltage			U imp = 6 kV conforming to EN/IEC 60947-1, EN/IEC 60664
Maximum number of mats per safety module			10
Tensile strength		**N/mm²**	7
Resistance to friction		**mg**	120
Shore A hardness			70 ± 5
Amount of stretch to tear		**%**	250
Behaviour in fire (DIN 4102)			B2
Resistance to incandescent materials			Resistant
Chemical resistance *(1)*	Acetone		Resistant
	Alkaline washing water		
	Ammonia		
	Caustic potassium solution		
	Citric acid		
	Greases		
	Hydrochloric acid, 10% solution		
	Methylated spirits		
	Oil, ASTM N° 1/2/3		
	Petrol		
	Resistance to ultraviolet rays		
	Water		
	Acetic acid		Limited resistance
	Brake fluid		
	Cutting compound		
	Methyl alcohol		
	Nitrated solution		
	Sodium hydroxide		
	Stamping oil		

(1) The resistance of the covering to the products listed is valid for an ambient temperature of 23 °C, provided there is no surface deterioration.

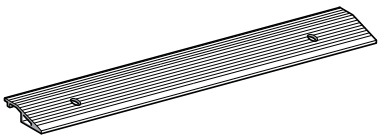
Safety detection solutions
Preventa safety mats
Type XY2 TP



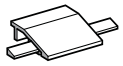
XY2 TP●

Safety mats

Dimensions (mm)	Reference	Weight kg
500 x 500 x 11	**XY2 TP1**	4.400
500 x 750 x 11	**XY2 TP2**	6.600
750 x 750 x 11	**XY2 TP3**	9.800
750 x 1250 x 11	**XY2 TP4**	16.400



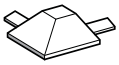
XY2 TZ●0



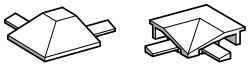
XY2 TZ1



XY2 TZ2



XY2 TZ4



XY2 TZ5

Accessories for grouping mats

Description	Length (mm)	Sold in lots of	Unit reference	Weight kg
Rails	194	2	**XY2 TZ10**	0.450
	394	2	**XY2 TZ20**	0.500
	444	2	**XY2 TZ30**	0.710
	494	2	**XY2 TZ40**	0.770
	644	2	**XY2 TZ50**	1.000
	694	2	**XY2 TZ60**	1.080
	744	2	**XY2 TZ70**	1.100
	1194	2	**XY2 TZ80**	1.860
	1244	2	**XY2 TZ90**	2.000
Rail connectors *(1)*	56	2	**XY2 TZ1**	0.150
	6	2	**XY2 TZ2**	0.050
External corner *(1)*	–	4	**XY2 TZ4**	0.100
Kit comprising: 1 internal corner + 1 external corner XY2 TZ4 *(1)*	–	1	**XY2 TZ5**	0.050

(1) With 2 knock-out cable entries.

Reference of Protect Area Design software

Description	Compatibility	Language	Reference	Weight kg
Protect Area Design software configurator, supplied on CD-ROM	Windows 98 / NT / 2000 and XP	French/ English	**SIS CD104200**	0.085

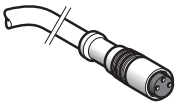
Safety detection solutions
Preventa safety mats
Jumper cables Ø 8 mm-M8 and M8-M8

Characteristics

Type of connection		Clip-in male and female connectors (without locking)
Degree of protection		IP 68 (with connectors correctly clipped together)
Ambient air temperature	**°C**	- 25…+ 90
Conductor c.s.a.	**mm²**	2 x 0.5
Cable diameter	**mm**	4.5
Nominal voltage	**V**	⎓ and ∿ 60
Nominal current	**A**	4
Insulation resistance	Ω	> 10^8
Contact resistance	**mΩ**	≤ 15

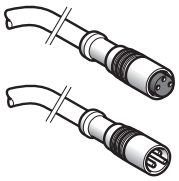
References

805906



XZC RTPA●

510124

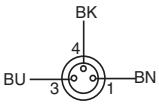


XZ CPTP0●●●●●

Description	Number of conductors	Length of PUR cable (m)	Reference	Weight kg
Male-female jumper cable, M8, straight *(1)* For connection between mats in rail or to another cable	2	0.33	**XZC RTPA1**	0.005
		0.54	**XZC RTPA2**	0.005
		0.79	**XZC RTPA3**	0.010
		1.08	**XZC RTPA4**	0.010
		1.29	**XZC RTPA5**	0.020
		1.33	**XZC RTPA6**	0.020
		1.58	**XZC RTPA7**	0.020
		2.58	**XZC RTPA8**	0.060
1 pre-wired female connector + 1 pre-wired male connector, Ø 8 mm straight For connection to the safety module	2	2	**XZC PTP0104L2**	0.050
		5	**XZC PTP0205L5**	0.110
		10	**XZC PTP0306L10**	0.215

(1) The maximum number of jumper cables that can go through a rail is 4.

Connections



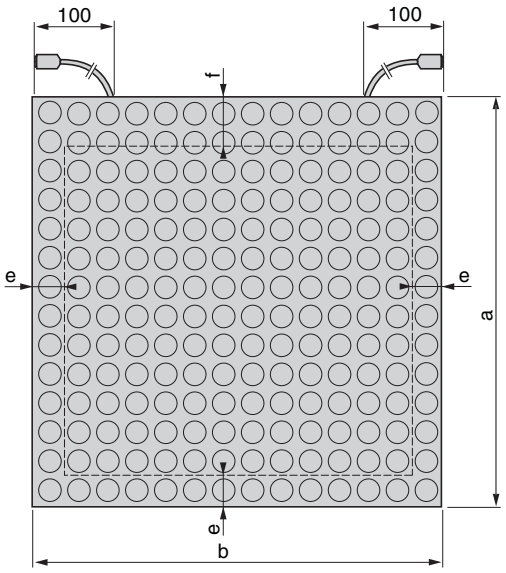
BU: (-) blue
BN: (+) brown
BK: (Output) black

Safety detection solutions
Preventa safety mats
Type XY2 TP

Dimensions

Pressure sensitive safety mats

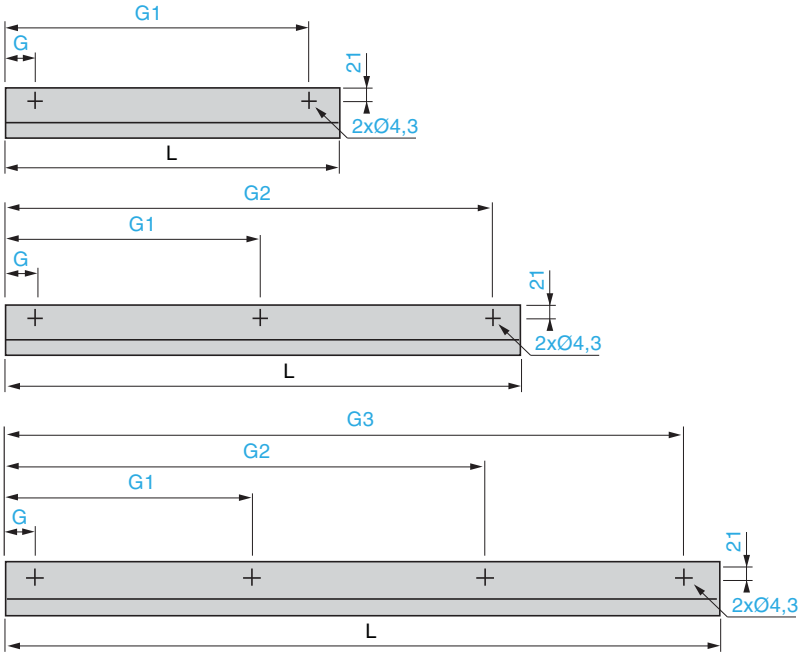
XY2 TP●



XY2	a	b	Thickness
TP1	500	500	11
TP2	750	500	11
TP3	750	750	11
TP4	1250	750	11
e: dead zone = 10 mm			
f: dead zone = 25 mm			

Aluminium rails

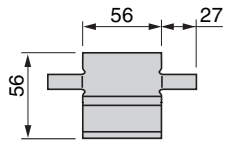
XY2 TZ●0



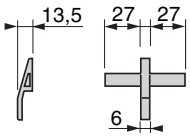
XY2	L	G	G1	G2	G3
TZ10	194	50	144	–	–
TZ20	394	50	344	–	–
TZ30	444	50	394	–	–
TZ40	494	50	444	–	–
TZ50	644	50	322	594	–
TZ60	694	50	347	644	–
TZ70	744	50	372	694	–
TZ80	1194	50	413	776	1144
TZ90	1244	50	431	812	1194

Rail connectors

XY2 TZ1

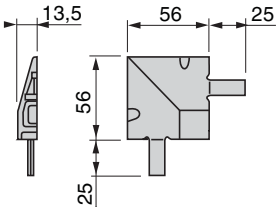


XY2 TZ2



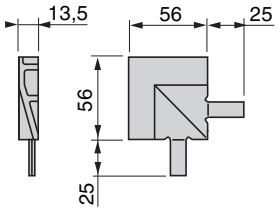
External corner

XY2 TZ4



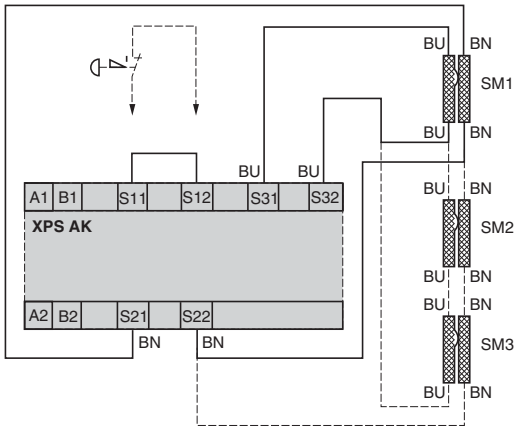
Internal corner

Sold in kit XY2 TZ5



Connections

Wiring example to category 3, with an XPS AK module



Safety detection solutions
Protect Area Design
Software configurator for safety installations incorporating light curtains or safety mats

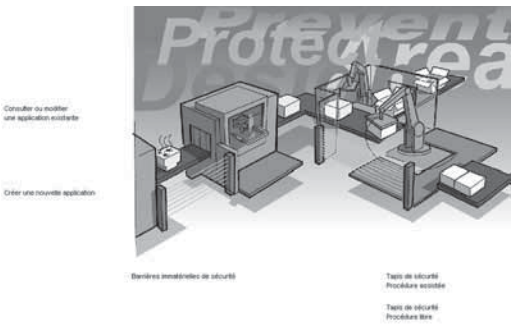
Presentation

Preparation and standards

Before using the configurator, it is necessary to perform the following 2 procedures: risk assessment in accordance with EN 1050/ISO 14121 and risk reduction in accordance with EN/ISO 12100-1, in order to decide the contribution of the risk from the light curtain or safety mat and to select the appropriate control system category.

The Protect Area Design software

Protect Area Design software is a configurator that enables selection of the zone protection device (sensing mats, light curtains) required for safety applications.
This software enables the user, via a graphic interface, to create, test or modify a safe working area in the vicinity of a potentially dangerous machine.
Having established the predefined fields (desired control system category, dimensions of the machine, etc.), the Protect Area Design software calculates the safety distance in relation to the reaction time of the machine, the light curtain and the approach direction to the hazardous zone. It then displays a recommended safety protection solution and creates the list of products (references, quantities and accessories to be used).
Protect Area Design software is user-friendly and compatible with Windows 98, NT, 2000 and XP.



Home screen

Main functions of the software

The software enables creation of an application using the procedures stated below or selection from applications previously established:
- assisted procedure for light curtains,
- unassisted or assisted procedure for sensing mats.

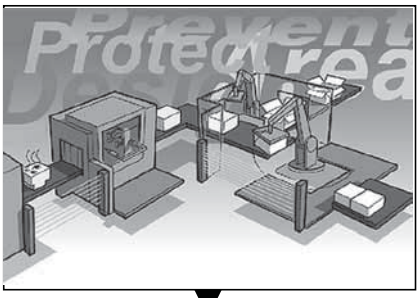
Reference of Protect Area Design software

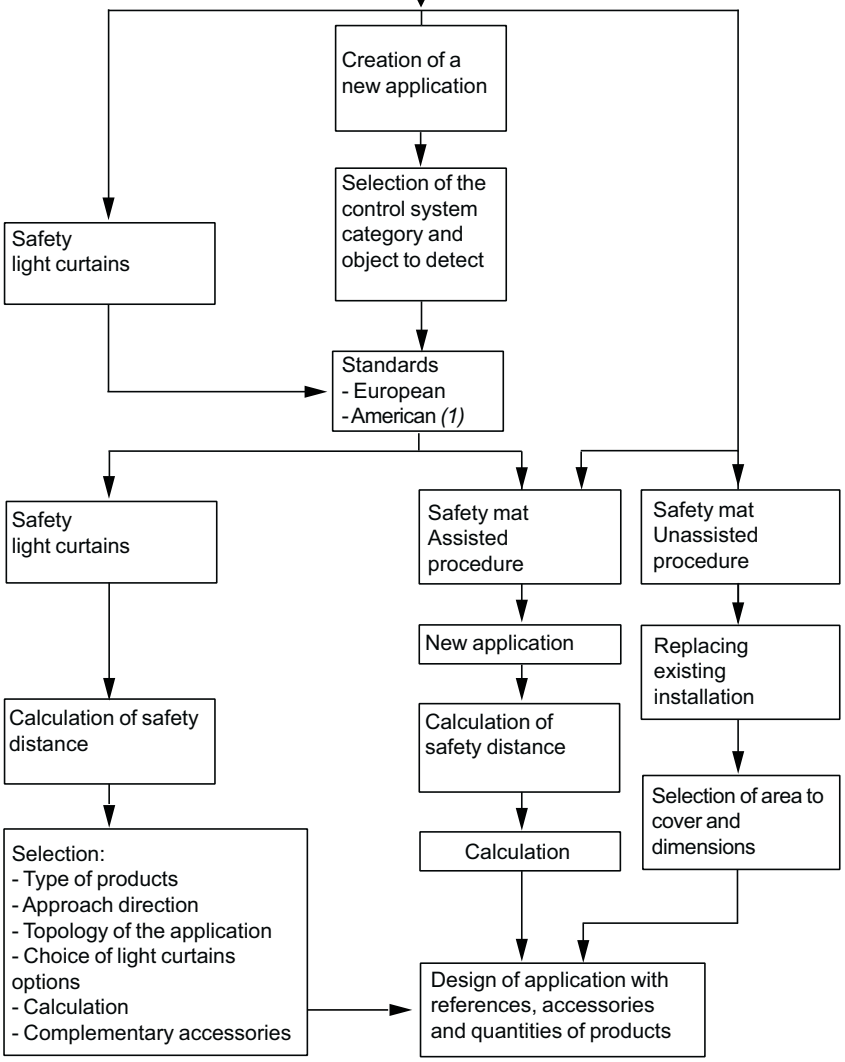
Description	Compatibility	Language	Reference	Weight kg
Protect Area Design software configurator supplied on CD-ROM	Windows 98 / NT / 2000 and XP	French/English	**SIS CD104200**	0.085

Safety detection solutions

Protect Area Design

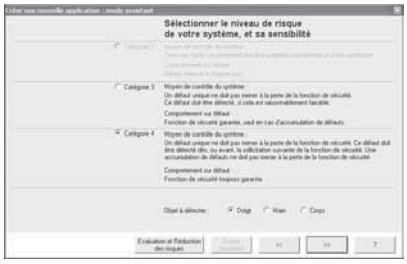
Software configurator for safety installations incorporating light curtains or safety mats





(1) Light curtains only.

Safety detection solutions
Protect Area Design
Software configurator for safety installations incorporating light curtains or safety mats



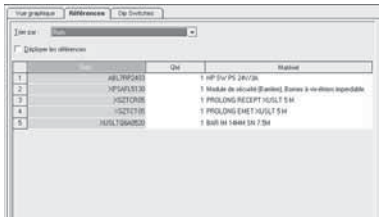
Control system category and its sensitivity



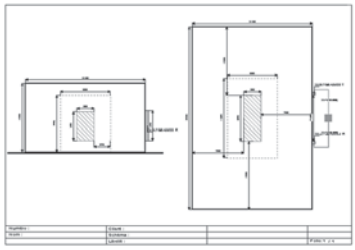
Type of approach into the hazardous zone



Description of the installation and calculation of safety distance



List of products



Graphical representation of the light curtain configuration

Configuration of light curtains

The Protect Area Design software enables selection of the type of application depending on the approach movement (at right-angles, parallel to, at an angle) into the hazardous zone.

■ For configuration in “Assisted procedure” mode the software enables access to the following menus:

□ selection of the control system category and object to detect,

□ description of the machine and its reaction time,

□ selection of a type of application depending on the approach direction into the hazardous zone,

□ calculation and selection of the following parameters:

- detection capability: finger, hand or whole body
- type of output: alarm/auxiliary,
- protection: Lexan cover *(1)* or IP 67 tube *(1)*,
- monitoring modules options: 2 to 4 light curtains,
- muting modules option: 1 light curtain and 1 or 2 light curtains,
- light curtain options: EDM *(2)*, MTS *(1)*, Blanking *(2)*,

Floating blanking *(2)* (1 or 2 light beams).

On-screen results

Following calculation of the safety distance, the software displays the following results:

■ component selection (description of products),

■ graphical representation of the configuration,

■ list of selected components (references and quantities),

■ configuration of products.

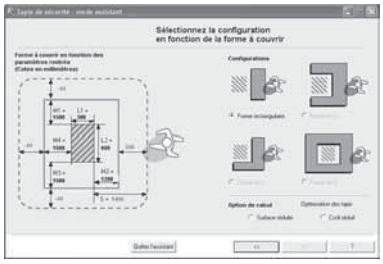
(1) See page 3/104.

(2) For further information, refer to pages 3/98 to 3/103.

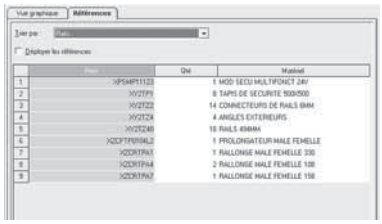
Safety detection solutions
Protect Area Design
Software configurator for safety installations incorporating light curtains or safety mats



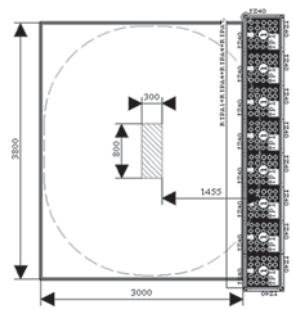
Description of the installation



Configuration according to the zone to cover



List of products



Graphical representation of the sensing mat configuration

Configuration of safety mats

The Protect Area Design software enables determination of the shape to be covered and optimisation of the use of mats using proposed solutions such as “Coverage of the zone to be protected” or “Optimised coverage of the zone to be protected”.

■ For configuration in “Assisted procedure” mode the software enables access to the following menus:

□ description of the installation: description of the machine, reaction time,

□ description of the structure and access to the hazardous zone,

□ selection of configuration according to the zone to be covered,

□ calculation.

■ For configuration in “Unassisted procedure” mode the software enables access to the following menus:

□ replacement of an existing installation,

□ selection of surface to cover and measurements.

On-screen results

Following calculation of the safety distance, the software displays the following results:

■ component selection (description of products),

■ graphical representation of the configuration,

■ list of selected components (references and quantities).

Safety detection solutions
Safety light curtains

Applications		**Materials handling, packaging, etc.**
Functions		**Finger protection (14 mm) or hand protection (30 mm)**
Device		Safety light curtains, type 4
		Multi-beam, infrared transmission, light curtains (1 transmitter-receiver pair)
		Compact model, solid-state safety outputs (PNP)



Conformity	Product standards	ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, type 4 (ESPE) conforming to IEC 61496-1 and 2
	European directives	Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC
Product certifications		CE, TUV, UL, CSA
Degree of protection		IP 65 (IP 67 with protection tube)
Cross-section		35 mm x 50 mm
Height protected	Conforming to EN 999	260…1390 mm (finger protection) 350…2095 mm (hand protection)
Nominal sensing distance		0.3…7.5 m (finger protection) 0.3…9 m or 0.3…20 m (hand protection)
Response time		Depending on height protected: 20…40 ms (finger protection) Depending on height protected: 20…35 ms (hand protection)
Type of outputs	Safety	2 solid-state PNP outputs (N/O) ⎓ 24 V, ≤ 500 mA Short-circuit protection
	Auxiliary	1 solid-state 100 mA, ⎓ 24 V, PNP or NPN output depending on model
Main functions **"Muting" function** (inhibition of the light curtain "detection" function)		Functions integrated in the light curtain: Auto/Manual start and manual 1st cycle, - EDM (external devices monitoring), - test input, - Blanking (ECS/B), Floating Blanking (FB) and Blanking + Floating Blanking, - Muting via external module
Supply voltage		⎓ 24 V ± 20%, 2 A
Type references		**XUS LT**
Pages		3/105 to 3/107

Packaging, conveyor systems, materials handling, warehousing, stocking, etc.

Body protection (300, 400, 500 and 600 mm)	**Hand protection (30 mm)**	**Body protection**
Safety light curtains, type 4	Safety light curtains, type 2	Safety light curtains, type 2
1 to 6 beam light curtains with infrared transmission (1 transmitter-receiver pair)	Multi-beam light curtains with infrared transmission (1 transmitter-receiver pair)	Single-beam, infrared transmission, light curtains (Preventa safety monitoring module + 1 to 4 thru-beam photo-electric sensors)
Type 4 model, solid-state output	Slim, compact model, solid-state output Automatic or manual start	Type 2 model, relay outputs (N/O)
		
ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, type 4 (ESPE) conforming to IEC 61496-1 and 2	IEC 61496-1 and IEC 61496-2 type 2 (ESPE)	IEC 60947-1, EN 61496-1, EN 60825-1, UL 508, type 2 (ESPE) conforming to IEC 61496-1 and 2
Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336/EEC	Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336/EEC	Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336/EEC EN 60825-1 (emission class 1)
CE, TUV, UL, CSA	CE, TUV. UL, CSA	CE type approval BIA/Cologne. UL, CSA
IP 67	IP 65	IP 67
52 mm x 55 mm	28.5 mm x 32 mm	Ø of sensors: 18 mm
750…1800 mm (1 to 6 light beams)	150…1500 mm (hand protection)	750…1200 mm (1 to 4 light beams)
0.8…20 m or 0.8…70 m dpg. on configuration 0.8…8 m for light curtains with passive receiver	0.3…15 m	8 m
< 16…< 24 ms depending on light beam coding selected	14…24 ms	< 20 ms (sensors + safety module)
2 solid-state PNP outputs (N/O) ⎓ 24 V, ≤ 650 mA Short-circuit protection	2 solid-state PNP outputs (N/O) ⎓ 24 V, ≤ 500 mA Short-circuit protection	Solid-state PNP Preventa safety module XPS CM outputs 2 guided contact relays, each 1 N/O AC-15: C300, 1800 VA inrush, 180 VA maintained DC-13: ⎓ 24 V/1.5 A, L/R = 50 ms Maximum thermal current = 2.5 A
1 solid-state 100 mA, ⎓ 24 V PNP output	1 x 100 mA, ⎓ 24 V PNP alarm output	⎓ 24 V, 20 mA
Functions integrated in the light curtain: Auto/Manual start and manual 1st cycle, - EDM (external devices monitoring), - test input, - 3 light beam codings available, - Muting via external module	Functions integrated in the light curtain: - automatic or manual start depending on version - Muting via external module	"Muting" integrated in the safety monitoring module XPS CM
⎓ 24 V ± 20%, 2 A	⎓ 24 V ± 20%, 2 A	Safety module XPS CM: ⎓ 24 V (19…29 V) Sensors XU2 S: ⎓ 24 V (10…30 V)
XUS LP●●●●	**XUS LNG5C●●●●, XUS LNG5D●●●●**	**XU2 S●●●●●●● + XPS CM**
3/113	3/121	3/134 and 3/135

Safety detection solutions
Safety light curtains

Presentation

Protection of personnel

Safety light curtains are electro-sensitive protection equipment (ESPE) designed for the protection of persons operating or working in the vicinity of machinery, by stopping the dangerous movement of parts as soon as one of the light beams is broken.
In particular, they provide protection to ensure the **safety of personnel** operating dangerous machinery (annex IV of 98/37/EC) but they are equally suitable for use with many other types of machines. They make it possible to protect personnel whilst allowing free access to machines.

The absence of a door or guard reduces the time required for loading, inspection or adjustment operations as well as making access easier.

Directives and standards

Conformity to standards

These light curtains conform to:
- European Machinery Safety Directive 98/37/EC and European Work Equipment Directive 89/655/EEC,
- Low Voltage Directives 73/23/EEC and 93/68/EEC and also, the Electromagnetic Compatibility Directive 89/336/EEC,
- Standard EN/IEC 61496-1, EN/IEC 61496-2 (electro-sensitive protection equipment: ESPE),
- Standard EN 60825 (emission power),
- Standard EN 999/ISO 13855 (installation positioning),

These light curtains are UL, CSA and TÜV certified.

Application sectors

Main applications

- Application sectors for type 2 products:
  - assembly and packaging lines,
  - conveying and handling lines,
  - warehousing and storage systems,
  - waste disposal skips.

- Types of machine requiring the use of type 4 products:
  - presses (all types), shears and trimmers,
  - hoisting equipment,
  - saws (all types),
  - machine tools (lathes, milling machines, machining centres),
  - woodworking machines (planing machines, lathes, spindle moulding machines, side and face milling cutters),
  - textile machinery (carding machines, weaving looms, steam rooms),
  - assembly machines,
  - assembly robots.

Safety rules

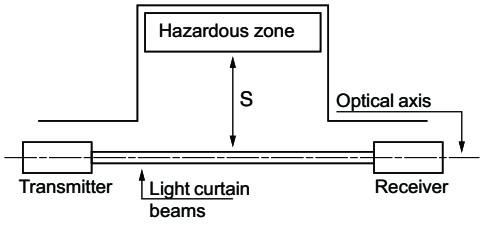
Detection of failures

Detection of failures liable to compromise safety and stopping of the machine

The design of the machine and its control system must be to the same level of safety as that of the safety light curtain in order to ensure the immediate stopping of the machines dangerous movement as soon as the hazardous zone, protected by the light curtain, is entered.

It must not be possible to enter the protected zone without breaking the protective light beams. The safety light curtain must therefore be installed in such a manner that the light beams cannot be avoided.
The machine can only be restarted if no danger exists and no personnel are present in the hazardous zone. The risk that persons might be inside the protected zone but out of the protective light beams must be addressed.

Installation rules



These are defined in standard EN 999. In particular:
- the safety distance between the light curtain and the hazardous zone,
- the body approach speed,
- multiple single-beam devices,
- multi-beam light curtains.

Calculation of minimum safety distance S between the light curtain and the hazardous zone

S = K (t1 + t2) + C (general formula)

S = minimum distance in mm
K = body approach speed (or of part of the body) in mm/s
t1 = response time of protection device in s
t2 = stopping time of machine (dangerous movements) in s
C = additional distance in mm

■ For single-beam light curtains:
K = 1600 mm/s
C = 1200 mm for a single beam
C = 850 mm for several beams
The heights protected are as follows:

Number of beams	Heights protected (mm)
4	300, 600, 900, 1200
3	300, 700, 1100
2	400, 900
1	750

■ For multi-beam light curtains:
K = 2000 mm/s
C = 8 (d - 14) where **d** = detection capacity of the light curtain

Special rules for presses

The use of safety light curtains and mechanical protectors on metal working presses is governed by specific standards and rules.
The standards specify that only safety light curtains or mechanical protectors must be used as safety devices so that, if a person enters the protective field whilst the dangerous movement is in progress, the machine stops as quickly as possible. “Quick stopping” means stopping of the ram before the operator can reach the hazardous zone, taking into account their speed of movement.

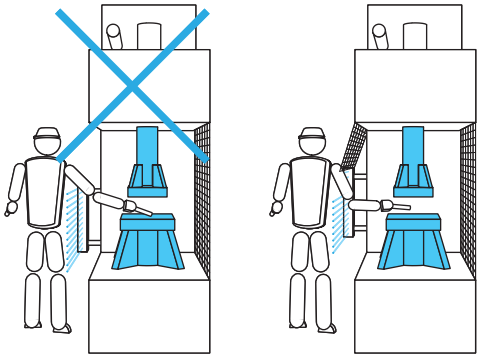
The continuous self-monitoring function of safety light curtains is essential for metal working press applications. If a fault occurs in the safety device, the potentially dangerous machine must be stopped automatically.

Once the protected zone is clear, the movement which was started and then interrupted by entry into the zone must not resume its normal travel, even after a Reset button has been pressed. Resetting must restart the movement from the beginning of the cycle. **The safety light curtain must allow starting of a dangerous movement only if its correct operation has been proved** (by pushing a test rod into the hazardous zone, or by means of an automatic device) and if a Reset button (start interlock) has been reactivated.

The safety distance S is calculated in a special way for:
- mechanical presses: refer to **EN 692**,
- hydraulic presses, pneumatic folding machines, shears, bending and shaping machines: refer to **prEN 693**.

Safety detection solutions
Safety light curtains

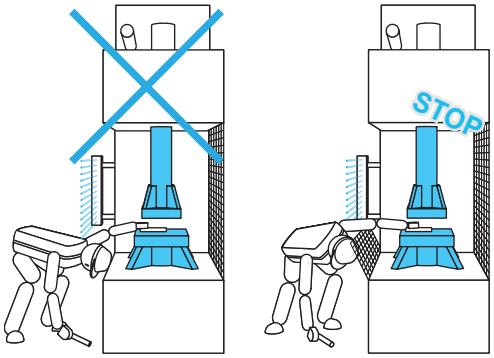
Prevention of access over top of light curtain



Without additional safety device: insufficient degree of protection

With additional safety device: light beam(s) broken, the machine stops

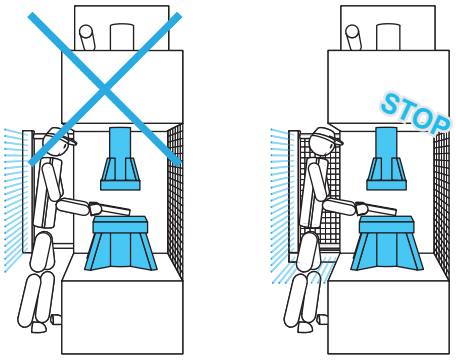
Prevention of access from beneath the light curtain



Without additional safety device: insufficient degree of protection

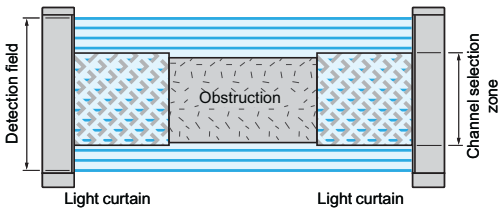
With additional safety device: light beam(s) broken, the machine stops

Prevention of access from rear of light curtain



Without additional safety device: insufficient degree of protection

With additional safety device: light beam(s) broken, the machine stops



Addition of solid protection to the light curtain when using channel selection

Additional safety devices

Safety light curtains can only be used on machines on which the movement of working components can be **stopped at any time during a hazardous phase**.

These light curtains provide a stop signal, not a control instruction. This stop signal must be stored.

Clearing of the light curtain must not result in restarting of moving parts.

Subsequent restarting must only be possible by means of deliberate operation of the appropriate control device, after having checked that there is no longer any danger.

Electrical interfacing between the light curtain and the machine circuits must correspond to the machine standard specifications.

Where safety light curtains do not provide an adequate degree of protection due to their location, additional suitable safety devices or additional light curtains must be used in order to prevent operators from entering the protective light curtain and reaching the hazardous zone (EN 294/ISO 13852, EN 811/ISO 13853, or from remaining in the area between the hazardous zone and the safety light curtain (EN 999/ISO 13855).

The position and size of these additional safety devices must be such that it is **impossible for operators to reach the hazardous zone** in any way whatsoever (over the top, from beneath, from behind or from the side) **without breaking the beams of the light curtain**.

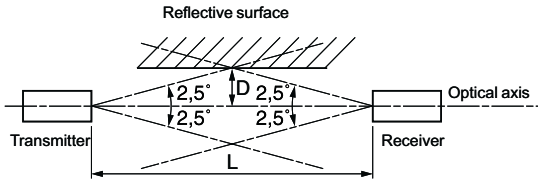
These additional safety devices must be:
- either fixed
(if possible, screwed or welded to the machine),
- or moving
(with continuous monitoring of their position if they have to open).

It must be impossible for operators to disconnect or cut-out the switching circuits for these additional safety devices.

Protection for “blanking” or “floating blanking” functions

The “blanking” (inhibition of light beams) or “floating blanking” (floating inhibition of light beams) functions create non protected areas in the detection field. These non protected areas are required for some applications. If an obstruction does not completely fill these unprotected areas, one of two actions must be implemented:
- an increase of safety distance to take into account a larger opening in the light curtain,
- the area not filled by an obstruction must be guarded by a solid protection method (mechanical barrier: metal plate or unfolded structure).

Installation precautions



Reflective surface

The devices must be installed such that the transmitter and associated receiver are mounted facing each other and correctly aligned for both height and angle.

The aperture angle of the optics and transmitter/receiver alignment tolerance are ± 2.5°.

Reflective surfaces located alongside the optical axis could result in stray reflections interfering with the beams which are the furthest away from the axis and, in consequence, prevent detection of an object entering the hazardous zone. The direct beam could then be joined by a stray reflected beam and this latter beam would not be broken when the object is in the axis.

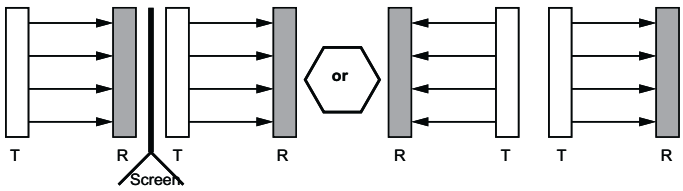
For this reason, prEN 50100-1 and 2 and EN/IEC 61496-1 specify a minimum distance **D** whereby:
- for 0 < **L** < 3 m, **D = 131 mm**,
- for **L** > 3 m, **D = (0.035 x L) + 5** (with a minimum limit value of 131 mm).

D = minimum distance between the light curtain and reflective surface in mm
L = sensing distance of the light curtain in mm

Mutual interference

Certain installation configurations may require the installation of 2 (or more) safety light curtains side by side.

In this case, setting-up as indicated below is recommended.



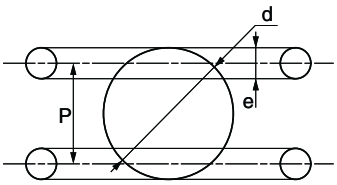
Environments subject to interference

Industrial applications sometimes place products in extreme operating conditions, mainly due to:

■ **Electromagnetic interference** generated by the proximity of variable speed drives, welding machines or walkie-talkies.
The products in the XUS L range are designed to be immune to such interference. They conform to:
- level 3 according to EN/IEC 61496-1,
- resistance to interference caused by variable speed drives.

■ **Light interference** (conformity to standard EN/IEC 61496-2).

Definitions



Detection capacity (d)

This is the smallest diameter (object) that a type 4 safety light curtain is capable of detecting with absolute certainty.

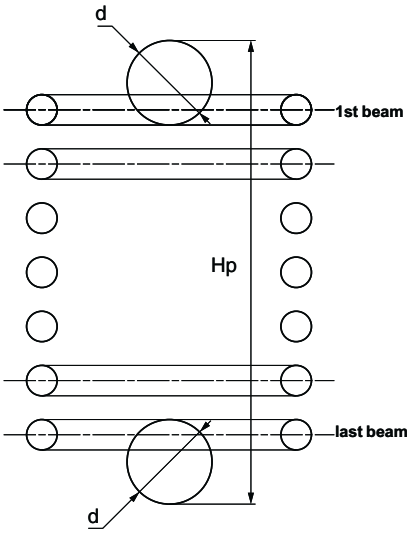
d = P + e

P: distance between the axis of 2 adjacent beams
e: diameter of the beams

XUS L range	P (mm)	e (mm)	d (mm)
XUS L● Finger protection	10.7	3.3	14
XUS L● Hand protection	21	9	30

Protected height (Hp)

According to prEN 50100-2, this is the zone (or height) within which an object of equal diameter to the detection capacity **d** is detected with absolute certainty.



Response time

European standard EN 999/ISO 13855 fully incorporates the various aspects of "response time" in the formula for calculating the minimum safety distance (see page 3/99):

S = K (t1 + t2) + C

with, in particular:

- **t1**: response time of the protection device (in s). This is the time indicated for the XPS CE and XUS L ranges. It is the total time between detection by the device and switching of the output component.

- **t2**: stopping time of the machine and, in particular, of its dangerous movements (in s). This information is supplied by the machine manufacturer. It is the time between the stop instruction and the actual stop of the dangerous mechanical components.

Functions

Protection mode
AUTO/MAN (automatic/manual): this is what standard EN/IEC 61496 calls start (or restart) interlock of the safety light curtain:
- in AUTO mode: on power-up or after the beams have been cleared, the light curtain resets itself automatically (closing of the OSSD output safety circuits),
- in MANUAL mode: on power-up or after the beams have been cleared, the light curtain keeps its output safety circuits in the “open” position. Pressing (and releasing) the reset button will cause actual resetting of the light curtain (and closing of its OSSD output safety circuits).

Note: in all cases, a general start instruction for the machine will trigger its actual start-up.

Monitoring of external switching devices
Also called EDM (External Devices Monitoring) by standard EN/IEC 61496, this consists of monitoring the function (open or closed), together with the time taken to reach that condition, of the machines power switching components.

Auxiliary output
This is a low power solid-state output for signalling, when configurable (XUS LM/ XUS LP), to the automation system. This output closes when the light curtain switches to run mode.

Alarm
This is a low power solid-state output for signalling to the automation system. This output closes when the light curtain switches to alarm mode.

Signalling
LED display of operating modes and alarm.

Alignment aid
Display by visible infrared LED of each beam broken.

Muting (inhibition)
When activated, the “muting” function inhibits the detection function of the light curtain.
Activation (or deactivation) is achieved by means of standard sensors (photo-electric or other). When activated, a signal is sent to the automation system. This function is used to allow objects to access the hazardous zones during the process.
Signalling informs the operator or operators that they are not protected.

Blanking
This function makes it possible to inhibit detection by a selected group of light beams in the light curtain (and not all the beams as with muting). This function (adapted to the size of the objects) allows the presence of objects during process operations.
Caution when using: the detection capacity changes. This imposes a greater safety distance. In addition, the use of additional protection each side of the object present must be included, in order to prevent any intrusion into the free areas.

Floating blanking
This function makes it possible to inhibit one or two light beams (adjacent or otherwise), anywhere in the light curtain. This configuration is used, for example, for metal plate feeding applications on folding presses or shears.

Blanking plus floating blanking
The Blanking (fixed inhibition of light beams) and Floating Blanking (moving inhibition of one or two light beams) functions can be combined. Caution, these applications require complementary safety measures.

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output

Light curtain type			XUS LTQ6●●●● (14 mm)	XUS LTR5●●●●● (30 mm)	XUS LTY5●●●●● (30 mm)
Environmental characteristics					
Conformity to standards			ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1 and EN/IEC 61496-2 (Type 4)		
Certifications			CE, TUV, UL, CSA		
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC		
Ambient air temperature	Operating	**°C**	0…+ 55		
	For storage	**°C**	- 25…+ 75		
Relative humidity			95% maximum, without condensation		
Degree of protection			IP 65		
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms, Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm		
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 20% fibreglass impregnated polycarbonate.		
Fixings			End brackets (included)		
Optical characteristics					
Minimum detection capacity		**mm**	14 (finger)	30 (hand)	
Nominal sensing distance (Sn)		**m**	0.3…7.5	0.3…9	0.3…20
Height protected		**mm**	260…1390	350…2095	
Effective aperture angle (EAA)			2.5° at 3 m (3° when used with IP 67 protection tube)		
Light source			GaAlAs LED, 850 nm		
Immunity to ambient light			Conforming to IEC/EN 61496-2		
Electrical characteristics					
Response time		**ms**	20…40	20…35	
Power supply			⎓ 24 V ± 20% 2 A conforming to EN/IEC 61496 and EN/IEC 60204-1		
	Transmitter	**mA**	285		
	Receiver	**A**	1.4 (with maximum load)		
Maximum current consumption (no-load)	Transmitter	**mA**	285		
	Receiver	**mA**	300		
Immunity to interference			Conforming to EN 61496-1		
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N/O) outputs ≤ 500 mA, ⎓ 24 V (Short-circuit protected)		
Alarm output			1 solid-state output 100 mA, ⎓ 24 V, PNP or NPN depending on model		
Monitoring activation of output switching devices (MPCE/EDM)			50 mA, ⎓ 24 V		
Signalling	Transmitter		1 LED (power supply)		
	Receiver		4 LEDs (stop, run, interlock, ECS/B Blanking or FB Floating Blanking)		
Connections *(1)*	Transmitter		M12, 5-pin, male connector on 0.25 m flying lead		
	Receiver		M12, 8-pin, male connector on 0.25 m flying lead		
Conductor c.s.a.	Transmitter	**mm²**	0.34. Tinned wires.		
	Receiver	**mm²**	Power supply and output signals: 0.5 (white, orange and yellow wires); 0.34 (grey, pink and violet wires). Tinned wires.		
Cable resistance	Transmitter	Ω	0.056 per metre for 0.34 mm² c.s.a. cable		
	Receiver	Ω	0.040 per metre for 0.5 mm² c.s.a. cable		
Cable lengths		**m**	Pre-wired connectors with screened (60% coverage) cable lengths of 5, 10, 15 and 30 m are available separately. The maximum cable length is 60 m, depending on the load current and power supply.		
Tightening torque			Receiver end cap assembly screw: 0.9 Nm		
Functions					
Functions			- Auto/Manual, manual 1st cycle, - Monitoring of external switching devices (EDM: External Devices Monitoring), - Test (MTS: Monitoring Test Signal), - Blanking (ECS/B), - Floating Blanking (FB), - Alignment aid by display of each light beam broken, - LED display of operating modes and alarm. Selection of Auto/Manual, blanking relay monitoring, floating/blanking and blanking + floating/blanking relay monitoring by configuration switches.		
Monitoring of external switching devices (EDM = External Devices Monitoring)			Monitoring of the function (open or closed) as well as the response time of the power components. Parameterable using configuration switches.		
"Test" function			Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion)		
"Muting" function (inhibition)			Possible with external module **XPS LCM1150**		

(1) Pre-wired female connectors to be ordered separately, see page 3/106.

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output



XUS LTQ6A●●●●



XUS LTR/Y●●●●●●

Transmitter-receiver pairs for finger protection *(1)*

Detection capacity 14 mm. Sensing distance 0.3 to 7.5 m.

■ 2 PNP safety outputs

Height protected	Response time	Number of light beams	Alarm output	Reference *(2) (3)*	Weight
mm	ms				kg
260	20	24	PNP	**XUS LTQ6A0260**	4.000
350	20	32	PNP	**XUS LTQ6A0350**	4.270
435	20	40	PNP	**XUS LTQ6A0435**	4.530
520	25	48	PNP	**XUS LTQ6A0520**	4.800
610	25	56	PNP	**XUS LTQ6A0610**	5.060
700	25	64	PNP	**XUS LTQ6A0700**	5.330
785	30	72	PNP	**XUS LTQ6A0785**	5.600
870	30	80	PNP	**XUS LTQ6A0870**	5.860
955	35	88	PNP	**XUS LTQ6A0955**	6.720
1045	35	96	PNP	**XUS LTQ6A1045**	6.990
1130	35	104	PNP	**XUS LTQ6A1130**	7.250
1215	40	112	PNP	**XUS LTQ6A1215**	7.520
1305	40	120	PNP	**XUS LTQ6A1305**	7.780
1390	40	128	PNP	**XUS LTQ6A1390**	8.050

(1) Supplied with a test rod, 2 sets of 2 brackets with fixings and a user guide with certificate of conformity and 1 arc suppressor set.
Pre-wired female connectors to be ordered separately, see page 3/107.
*(2) To order a transmitter-receiver pair with an NPN alarm output, replace the letter **A** by the letter **B** in the reference.*
*Example: reference XUS LTQ6A0260 becomes **XUS LTQ6B0260**, with an NPN alarm output.*
*(3) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LTQ6A0260 becomes **XUS LTQ6A0260R** for the receiver only.*
*To order a transmitter only, replace the letter A or B by **E** and add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LTQ6A0260 becomes **XUS LTQ6E0260T** for the transmitter only.*

Transmitter-receiver pairs for hand protection *(1)*

Detection capacity 30 mm. Sensing distance 0.3 to 9 m.

■ 2 PNP safety outputs

Height protected	Response time	Number of light beams	Alarm output	Reference *(2) (3)*	Weight
mm	ms				kg
350	20	16	PNP	**XUS LTR5A0350**	4.270
520	20	24	PNP	**XUS LTR5A0520**	4.800
700	20	32	PNP	**XUS LTR5A0700**	5.330
870	20	40	PNP	**XUS LTR5A0870**	5.860
1045	25	48	PNP	**XUS LTR5A1045**	6.990
1215	25	56	PNP	**XUS LTR5A1215**	7.520
1390	25	64	PNP	**XUS LTR5A1390**	8.050
1570	30	72	PNP	**XUS LTR5A1570**	8.580
1745	30	80	PNP	**XUS LTR5A1745**	9.110
1920	35	88	PNP	**XUS LTR5A1920**	9.640
2095	35	96	PNP	**XUS LTR5A2095**	10.160

Detection capacity 30 mm. Sensing distance 0.3 to 20 m.

■ 2 PNP safety outputs

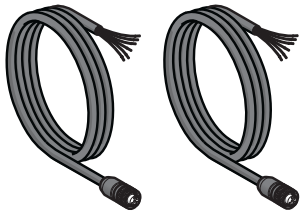
To order a transmitter-receiver pair with a sensing distance 0.3 to 20 m, replace the letter **R** by **Y**.
Example: reference XUS LTR5A0350 becomes **XUS LTY5A0350**, with a sensing distance 0.3 to 20 m.

(1) Supplied with a test rod, 2 sets of 2 brackets with fixings and a user guide with certificate of conformity and 1 arc suppressor set.
Pre-wired female connectors to be ordered separately, see page 3/107.
*(2) To order a transmitter-receiver pair with an NPN alarm output, replace the letter **A** by the letter **B** in the reference.*
*Example: reference XUS LTR5A0350 becomes **XUS LTR5B0350**, with an NPN alarm output.*
*(3) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LTR5A0350 becomes **XUS LTR5A0350R** for the receiver only.*
*To order a transmitter only, replace the letter A or B by **E** and add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LTR5A0350 becomes **XUS LTR5E0350T** for the transmitter only.*

Other versions Combining type 4 safety light curtains with external module for muting function.
See pages 2/220 to 2/225.

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output

563528



XSZ TCT●● *XSZ TCR●●*

531506



XUZ LZ100

Separate components

Power supplies, 90° mirror adaptors, protective covers, anti-vibration kit, fixing bases

See pages 3/124 to 3/127

Accessories

Description	Usage	Length m	Reference	Weight kg
Fixings kit (2 brackets)	For light curtains XUS LT	–	**XUS LZ213**	0.100
Pre-wired female connectors	Transmitter type	5	**XSZ TCT05**	0.360
		10	**XSZ TCT10**	0.690
		15	**XSZ TCT15**	1.000
		30	**XSZ TCT30**	1.930
	Receiver type	5	**XSZ TCR05**	0.460
		10	**XSZ TCR10**	0.900
		15	**XSZ TCR15**	1.290
		30	**XSZ TCR30**	2.440
End cap with connector	Receiver type	–	**XUS LZ222**	0.010
Validation kit	For light curtains XUS LT	–	**XUS LZ100**	0.007
Arc suppressor (pair)	All types of light curtain	–	**XUS LZ500**	0.020
Protection tube (see page 3/107)				
User guide on CD-ROM	All types of light curtain	–	**XUS LZ450**	0.010

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output

IP 67 protection tubes for compact light curtains XUS LT			XUSLZ7●●●●
Environmental characteristics			
Air temperature	For operation	°C	0...+ 40
	For storage	°C	- 25...+ 70
Degree of protection			IP 67 conforming to IEC 60529
Material			Acrylic
Sensing distance (Sn) **reduction coefficient**			0.90
Environmental chemicals			
Chemical resistance	Aliphatic hydrocarbons		Resistant
	Alkalis		
	Aqueous solutions		
	Detergents and cleaners		
	Inorganic diluted acids		
	Chlorinated or aromatic hydrocarbons		Limited resistance
	Esters		
	Ketones		
Environmental resistance	Adverse weather, sunlight (UV)		Resistant
	Humidity		
	Immersion in water		

3

References of IP 67 protection tubes

108048



XUS LZ7●●●

Description	For use with	Height mm	Reference	Weight kg
IP 67 protection tubes for XUS LT●●● transmitter-receiver pair (0.90 Sn) *(1)* (Sold in sets of 2)	XUSLT●●●260	262.9	**XUS LZ70260**	2.700
	XUSLT●●●350	350	**XUS LZ70350**	2.700
	XUSLT●●●435	436	**XUS LZ70435**	2.700
	XUSLT●●●520	523.8	**XUS LZ70520**	3.200
	XUSLT●●●610	610.9	**XUS LZ70610**	3.200
	XUSLT●●●700	697.7	**XUS LZ70700**	3.200
	XUSLT●●●785	784.6	**XUS LZ70785**	3.200
	XUSLT●●●870	871.1	**XUS LZ70870**	3.200
	XUSLT●●●955	958.6	**XUS LZ70955**	3.200
	XUSLT●●●1045	1045.5	**XUS LZ71045**	4.100
	XUSLT●●●1130	1132	**XUS LZ71130**	4.100
	XUSLT●●●1215	1219.5	**XUS LZ71215**	4.500
	XUSLT●●●1305	1306.3	**XUS LZ71305**	4.500
	XUSLT●●●1390	1393.4	**XUS LZ71390**	4.500
	XUSLT●●●1570	1567.4	**XUS LZ71570**	6.800
	XUSLT●●●1745	1741.4	**XUS LZ71745**	6.800
	XUSLT●●●1920	1915.4	**XUS LZ71920**	6.800
	XUSLT●●●2095	2089.7	**XUS LZ72095**	6.800

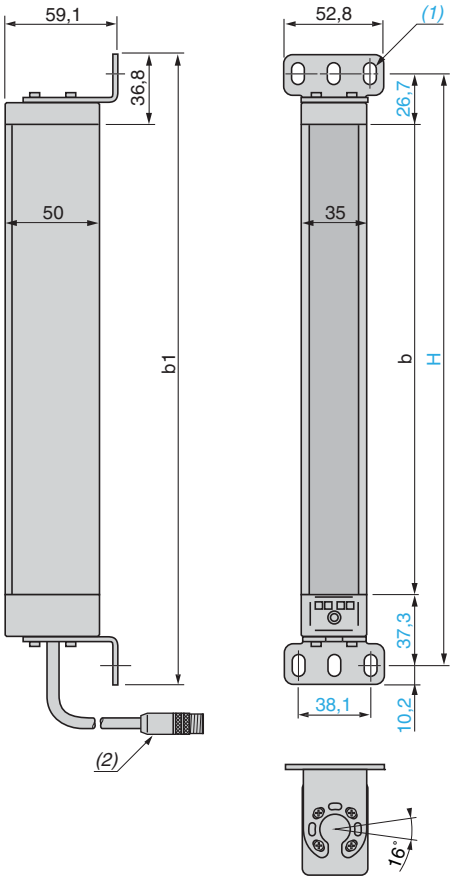
(1) Sensing distance reduction coefficient to be taken into account for each pair of IP 67 protection tubes used.

Dimensions:
page 3/109

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output

Light curtains

XUS LT●●●



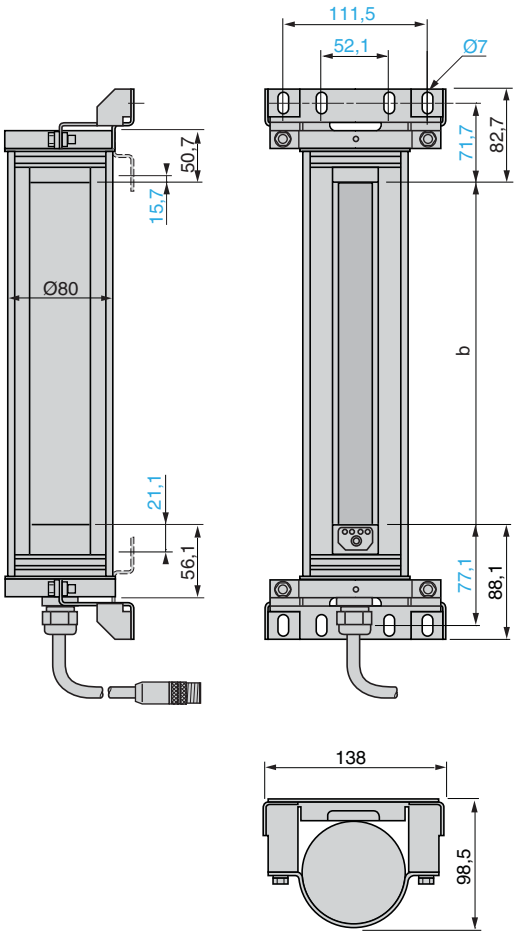
XUS	b	b1	H	Height protected
LT●●●0260	263	347.3	327	260
LT●●●0350	351	435.3	415	350
LT●●●0435	438	522.3	502	435
LT●●●0520	523	607.3	587	520
LT●●●0610	613	697.3	677	610
LT●●●0700	700	784.3	764	700
LT●●●0785	785	869.3	849	785
LT●●●0870	871	955.3	935	870
LT●●●0955	958	1042.3	1022	955
LT●●●1045	1046	1130.3	1110	1045
LT●●●1130	1133	1217.3	1197	1130
LT●●●1215	1219	1303.3	1283	1215
LT●●●1305	1306	1390.3	1370	1305
LT●●●1390	1394	1478.3	1458	1390
LT●●●1570	1570	1654.3	1634	1570
LT●●●1745	1746	1830.3	1810	1745
LT●●●1920	1920	2004.3	1984	1920
LT●●●2095	2095	2179.3	2159	2095

(1) 6 elongated holes 11.45 x 6.75 mm.
(2) M12 male connector on 0.27 m flying lead.

General: pages3/98 to 3/103 | Characteristics: page 3/104 | References: page 3/105 | Connections: pages 3/110 and 3/111

Protection tube for compact light curtains XUS LT

XUS LZ7●●●●



XUS	b
LZ70260	263
LZ70350	351
LZ70435	438
LZ70520	523
LZ70610	613
LZ70700	700
LZ70785	785
LZ70870	871
LZ70955	958

XUS	b
LZ71045	1046
LZ71130	1133
LZ71215	1219
LZ71305	1306
LZ71390	1394
LZ71570	1570
LZ71745	1746
LZ71920	1920
LZ72095	2095

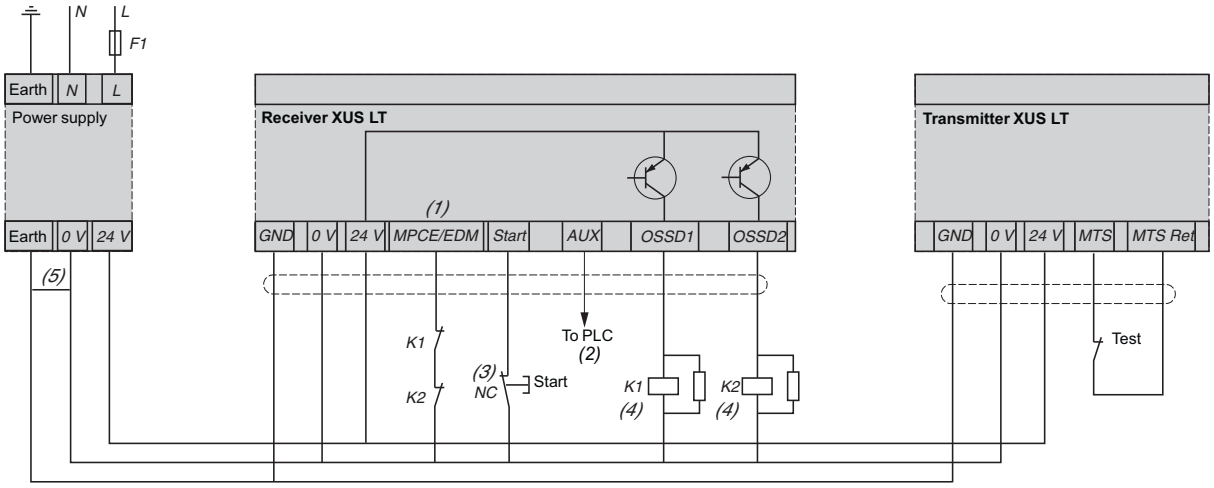
General:
pages 3/98 to 3/103

Characteristics:
page 3/107

References:
page 3/107

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output

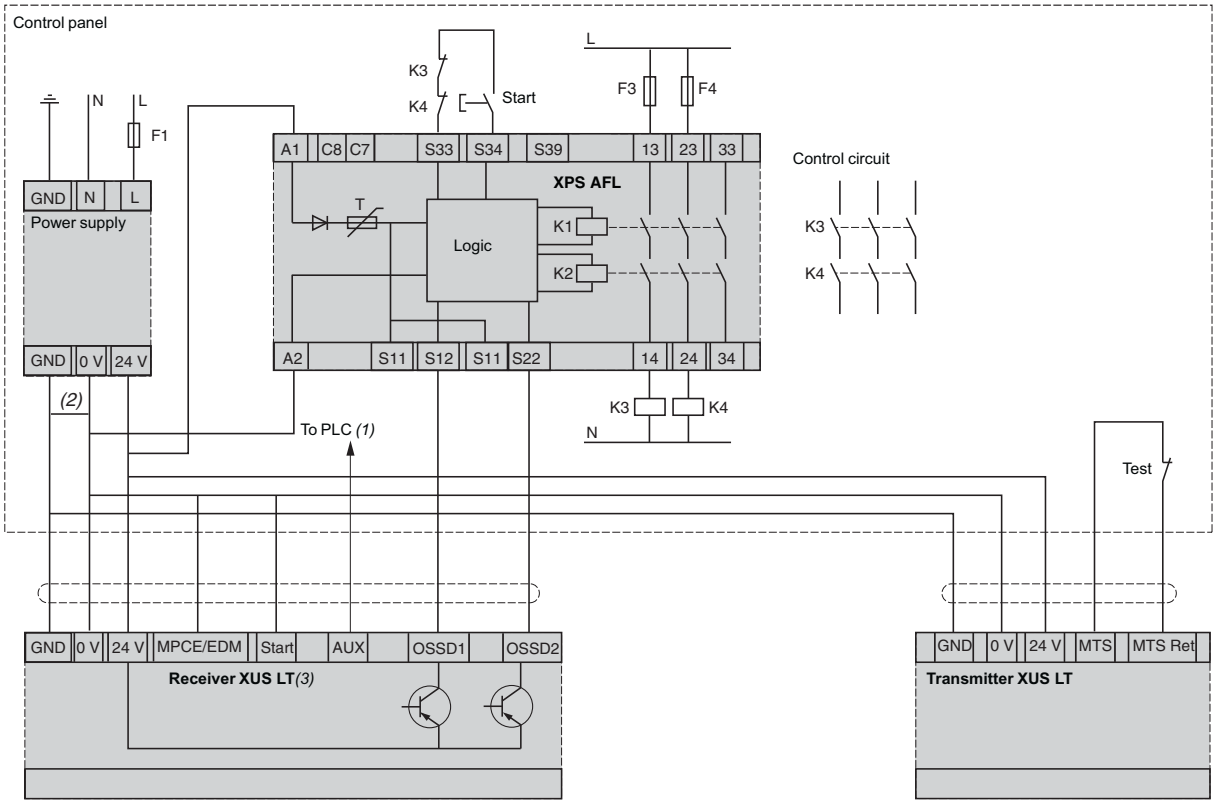
Direct connection with XUS LT●●●



(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the 0 V line.
(4) The MPCE/EDM coils must be protected using the arc suppressors included in the documentation kit.
(5) Connect the 0 V terminal to earth.

Note: *There must not be an unscreened connection exceeding 1 m in length (for example: start button, auxiliary outputs, power supply, MPCE/EDM, OSSD1 and OSSD2). Relays K1 and K2 must have mechanically linked contacts.*

Connection via a Preventa XPS AFL module



(1) The auxiliary output connects to a PLC (optional).
(2) Connect the 0 V terminal to earth.
(3) The light curtain must be configured with MPCE/EDM OFF and with automatic start.

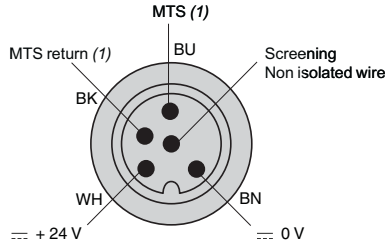
Note: *There must not be an unscreened connection exceeding 1 m in length (for example: start button, auxiliary outputs, power supply, MPCE/EDM, OSSD1 and OSSD2). Relays K1 and K2 must have mechanically linked contacts.*

General: pages 3/98 to 3/103 | Characteristics: page 3/104 | References: page 3/105 | Dimensions: page 3/108

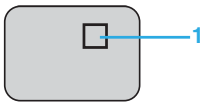
Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LT with solid-state output

Transmitter

Remote connector of transmitter



Transmitter status indicator

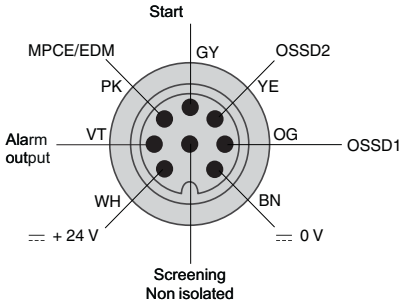


1 Yellow LED

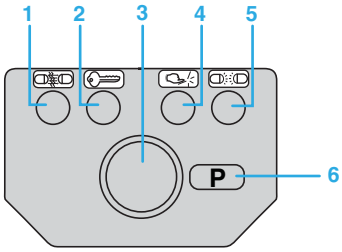
(1) Light curtain test input.

Receiver

Remote connector of receiver

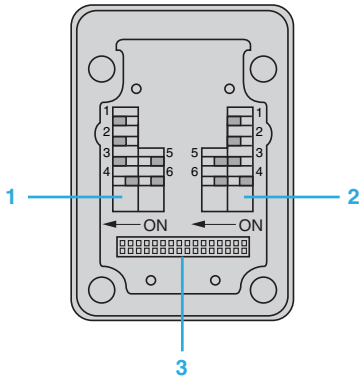


Receiver status indicator



1 Blanking or floating blanking orange LED
2 Interlock or Alarm yellow LED
3 Connector
4 Machine stop red LED
5 Machine run green LED
6 Programming button

Configuration indicator



1 Switches A
2 Switches B
3 Connector

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

Light curtain type			XUS LP●●●●
Environmental characteristics			
Conformity to standards			ANSI/RIA R15.06, ANSI B11:19-1990, OSHA 1910.217(C), OSHA 1910.212, EN/IEC 61496-1-2 for type 4 ESPE
Certifications			CE, TUV, UL, CSA
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC
Ambient air temperature	Operating	**°C**	0…+ 55
	For storage	**°C**	- 25…+ 75
Relative humidity			95% maximum, without condensation
Degree of protection			IP 65 and IP 67
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms, Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 20% fibreglass impregnated polycarbonate. Front face: acrylic.
Fixings			End brackets (included)
Optical characteristics			
Minimum detection capacity		**mm**	300, 400, 500, 600 and single beam (Body protection)
Nominal sensing distance (Sn)		**m**	0.8 to 20 or 0.8 to 70 depending on configuration and 0.8 to 8 m for light curtains with passive receiver
Height protected			Depending on number of light beams, see table on page 3/99
Effective aperture angle (EAA)			2.5° at 3 m
Light source			GaAlAs LED, 850 nm
Immunity to ambient light			Conforming to EN/IEC 61496-2
Electrical characteristics			
Response time		**ms**	< 16…< 24 depending on light beam coding selected
Power supply			⎓ 24 V ± 20% 2 A conforming to EN/IEC 61496 and EN/IEC 60204-1
	Transmitter	**mA**	100
	Receiver	**A**	1.6 (with maximum load)
Maximum current consumption (no-load)	Transmitter	**mA**	100
	Receiver	**mA**	300
Immunity to interference			Conforming to EN/IEC 61496-1
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N/O) outputs ≤ 650 mA, ⎓ 24 V (Short-circuit protected)
Auxiliary output			1 solid-state output 100 mA, ⎓ 24 V, PNP
Monitoring activation of output switching devices (MPCE/EDM)			50 mA, ⎓ 24 V
Signalling	Transmitter		1 LED (power supply)
	Receiver		3 LEDs (stop, run, interlock) and a 2-digit display for diagnostics
Connections *(1)*	Transmitter		M12, 5-pin, male connector or terminal block
	Receiver		M12, 8-pin, male connector or terminal block
Conductor c.s.a.	Transmitter/receiver pre-wired connector	**mm²**	0.35. Tinned wires.
Cable resistance	Transmitter/receiver	Ω	0.055 per metre for 0.35 mm² c.s.a. cable
Cable lengths		**m**	Pre-wired connectors with cable lengths of 5, 10, 15 and 30 m are available separately. The maximum cable length is 120 m, depending on the load current and power supply.
Functions			
Functions			Start: - Auto/Manual, manual 1st cycle, - Monitoring of external switching devices (EDM: External Devices Monitoring), - Test (MTS: Monitoring Test Signal) for XUS LPZ only, - Alignment aid by display of each light beam broken, - Display of operating modes and alarm by LEDs and 2-digit display. Selection of Auto/Manual, relay monitoring, alarm or auxiliary output functions, light beam coding and selection of sensing distance using configuration switches.
Monitoring of external switching devices (EDM = External Devices Monitoring)			Monitoring of the function (open or closed) as well as the response time of the power components. Parameterable using configuration switches.
"Test" function			Instigates the stop instruction of the light curtain by opening the contact (simulated intrusion)
"Muting" function (inhibition)			Possible with external module **XPS LCM1150**

(1) Pre-wired female connectors to be ordered separately, see page 3/115

General: pages 3/98 to 3/103 | References: pages 3/113 and 3/114 | Dimensions: pages 3/116 and 3/117 | Connections: pages 3/118 and 3/119

Safety detection solutions

Safety light curtains, type 4

Compact light curtains XUS LP with solid-state output, with connector

105561



XUS LPZ1AM

105558



XUS LPZ3A●●●●M

Transmitter-receiver pairs for body protection *(1)*

Detection capacity 300, 400, 500, 600 mm and single beam.
Sensing distance 0.8 to 20 m and 0.8 to 70 m (depending on configuration)

■ 2 PNP safety outputs

Detection capacity	Response time Light beam coding			Number of light beams	Auxiliary output	Reference *(2)*	Weight
	A	B	C				
mm	ms	ms	ms				kg
–	< 24	< 20	< 16	1	PNP	**XUS LPZ1AM**	4.500
500	< 24	< 20	< 16	2	PNP	**XUS LPZ2A0500M**	6.300
600	< 24	< 20	< 16	2	PNP	**XUS LPZ2A0600M**	6.700
400	< 24	< 20	< 16	3	PNP	**XUS LPZ3A0400M**	7.200
500	< 24	< 20	< 16	3	PNP	**XUS LPZ3A0500M**	8.600
300	< 24	< 20	< 16	4	PNP	**XUS LPZ4A0300M**	8.200
300	< 24	< 20	< 16	5	PNP	**XUS LPZ5A0300M**	9.500
300	< 24	< 20	< 16	6	PNP	**XUS LPZ6A0300M**	10.400

(1) Supplied with 2 sets of 2 brackets with fixings and a user guide with certificate of conformity.
Pre-wired female connectors to be ordered separately, see page 3/115.
*(2) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LPZ2A0600M becomes **XUS LPZ2A0600MR** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LPZ2A0600M becomes **XUS LPZ2A0600MT** for the transmitter only.*

Transmitter-receiver pairs for body protection, with passive receiver *(1)*

Detection capacity 500 and 600 mm. Sensing distance 0.8 to 8 m

■ 2 PNP safety outputs

105559



XUS LPB2●●

Detection capacity	Response time Light beam coding			Number of light beams	Auxiliary output	Reference *(2)*	Weight
	A	B	C				
mm	ms	ms	ms				kg
500	< 24	< 20	< 16	2	PNP	**XUS LPB2A500M**	6.300
600	< 24	< 20	< 16	2	PNP	**XUS LPB2A600M**	6.700

(1) Supplied with 2 sets of 2 brackets with fixings and a user guide with certificate of conformity.
Pre-wired female connectors to be ordered separately, see page 3/115.
*(2) To order a passive receiver, replace the letter **M** by the letter **P** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LPB2A500M becomes **XUS LPB2A500P** for the passive receiver.*
*To order a transmitter only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LPB2A600M becomes **XUS LPB2A600MR** for the transmitter only.*

Other versions

Combining type 4 safety light curtains with external module for muting function.
See pages 2/220 to 2/225.

Safety detection solutions

Safety light curtains, type 4

Compact light curtains XUS LP with solid-state output, with terminal block



XUS LPZ1AB



XUS LPZ3A●●●●B

Transmitter-receiver pairs for body protection *(1)*

Detection capacity 300, 400, 500, 600 mm and single beam.
Sensing distance 0.8 to 20 m and 0.8 to 70 m (depending on configuration)

■ 2 PNP safety outputs

Detection capacity	Response time Light beam coding			Number of light beams	Auxiliary output	Reference *(2)*	Weight
	A	B	C				
mm	ms	ms	ms				kg
–	< 24	< 20	< 16	1	PNP	**XUS LPZ1AB**	4.500
500	< 24	< 20	< 16	2	PNP	**XUS LPZ2A0500B**	6.300
600	< 24	< 20	< 16	2	PNP	**XUS LPZ2A0600B**	6.700
400	< 24	< 20	< 16	3	PNP	**XUS LPZ3A0400B**	7.200
500	< 24	< 20	< 16	3	PNP	**XUS LPZ3A0500B**	8.600
300	< 24	< 20	< 16	4	PNP	**XUS LPZ4A0300B**	8.200
300	< 24	< 20	< 16	5	PNP	**XUS LPZ5A0300B**	9.500
300	< 24	< 20	< 16	6	PNP	**XUS LPZ6A0300B**	10.400

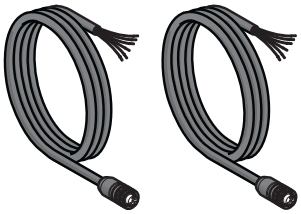
(1) Supplied with 2 sets of 2 brackets with fixings and a user guide with certificate of conformity.
*(2) To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LPZ2A0600B becomes **XUS LPZ2A0600BR** for the receiver only.*
*To order a transmitter only, add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LPZ2A0600B becomes **XUS LPZ2A0600BT** for the transmitter only.*

Other versions

Combining type 4 safety light curtains with external module for muting function.
See pages 2/220 to 2/225.

Safety detection solutions
Safety light curtains, type 4
Accessories for compact light curtains XUS LP

563528



XSZ PCT●● *XSZ PCR●●*

Separate components

Power supplies, 90° mirror adaptors, protective covers, anti-vibration kit, fixing bases

See pages 3/124 to 3/131.

Accessories

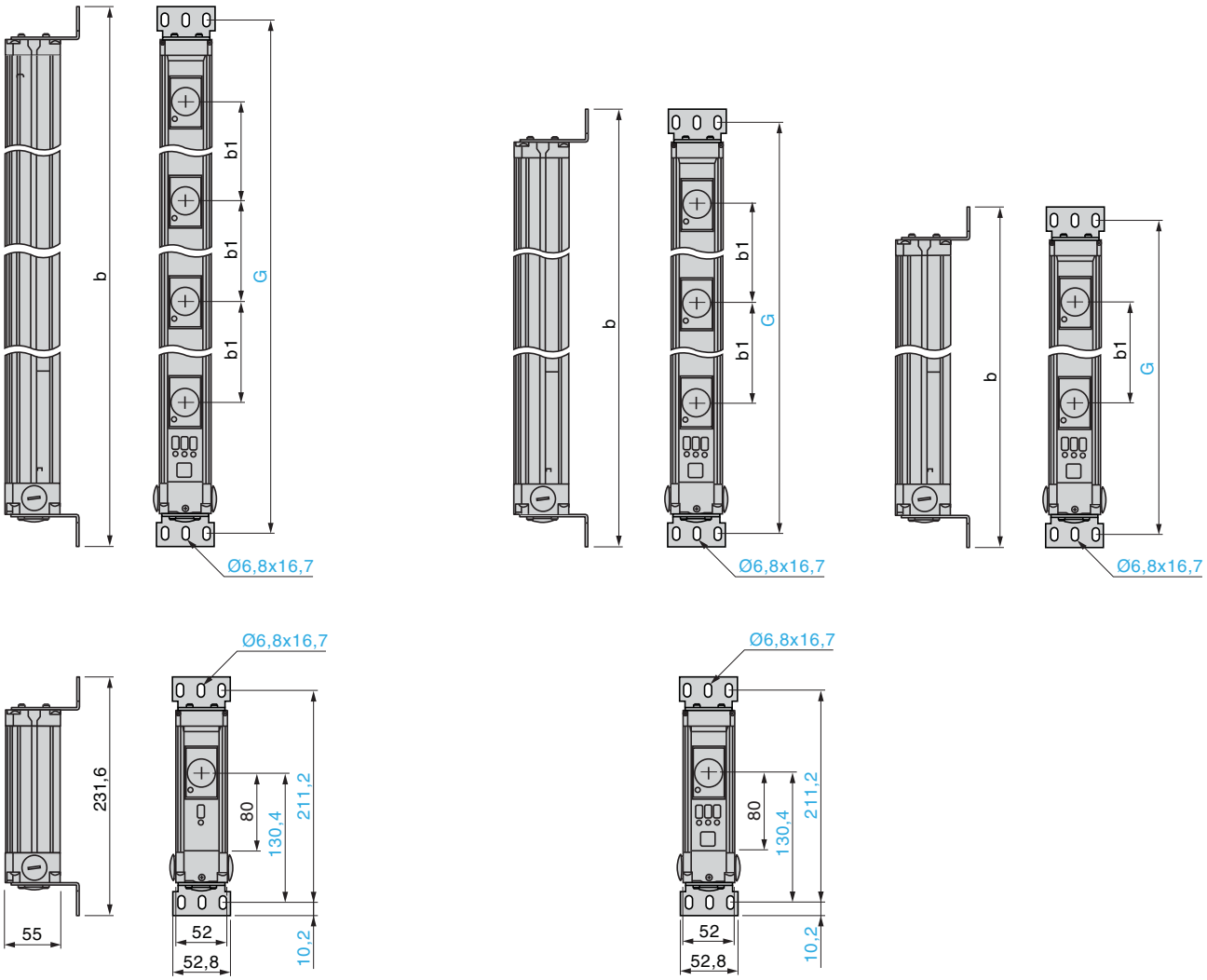
Description	Usage	Length m	Reference	Weight kg
Fixings kit (2 brackets)	For light curtains XUS LP	–	**XUS LZ219**	0.450
Pre-wired female connectors	Transmitter type	5	**XSZ PCT05**	0.350
		10	**XSZ PCT10**	0.700
		15	**XSZ PCT15**	1.020
		30	**XSZ PCT30**	2.020
	Receiver type	5	**XSZ PCR05**	0.350
		10	**XSZ PCR10**	0.700
		15	**XSZ PCR15**	1.020
		30	**XSZ PCR30**	2.020
Sliding nuts for side fixing (4 nuts)	–	–	**XUS LZ320**	0.450
User guide on CD-ROM	All types of light curtain	–	**XUS LZ450**	0.020
Arc suppressor (pair)	All types of light curtain	–	**XUS LZ500**	0.020

Dimensions:
pages 3/116 and 3/117

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

Light curtains

XUS LPZ●●●

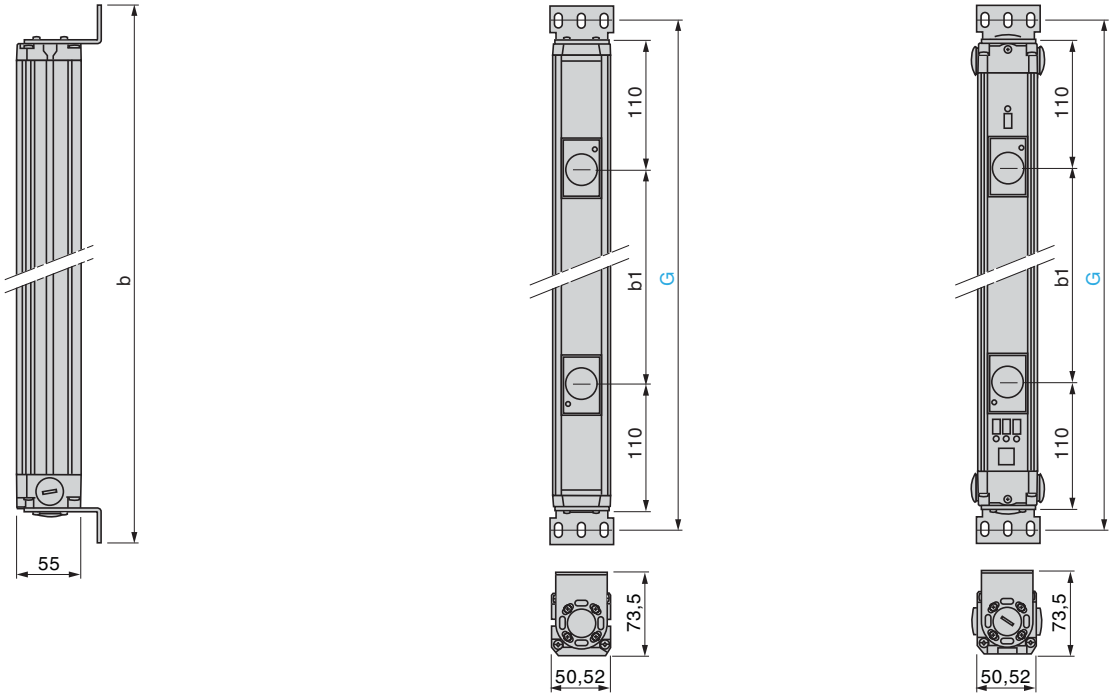


XUS	b	b1	G
LPZ1A●	231,6	–	220.7
LPZ2A0500●	731,6	500	720.7
LPZ2A0600●	831,6	600	820.7
LPZ3A0400●	1031,6	400	1020.7
LPZ3A0500●	1231,6	500	1220.7
LPZ4A0300●	1141,1	300	1120.7
LPZ5A0300●	1431,6	300	1411.2
LPZ6A0300●	1731,6	300	1711.2

General: pages 3/98 to 3/103
Characteristics: page 3/112
References: pages 3/113 and 3/114
Connections: pages 3/118 and 3/119

Light curtains

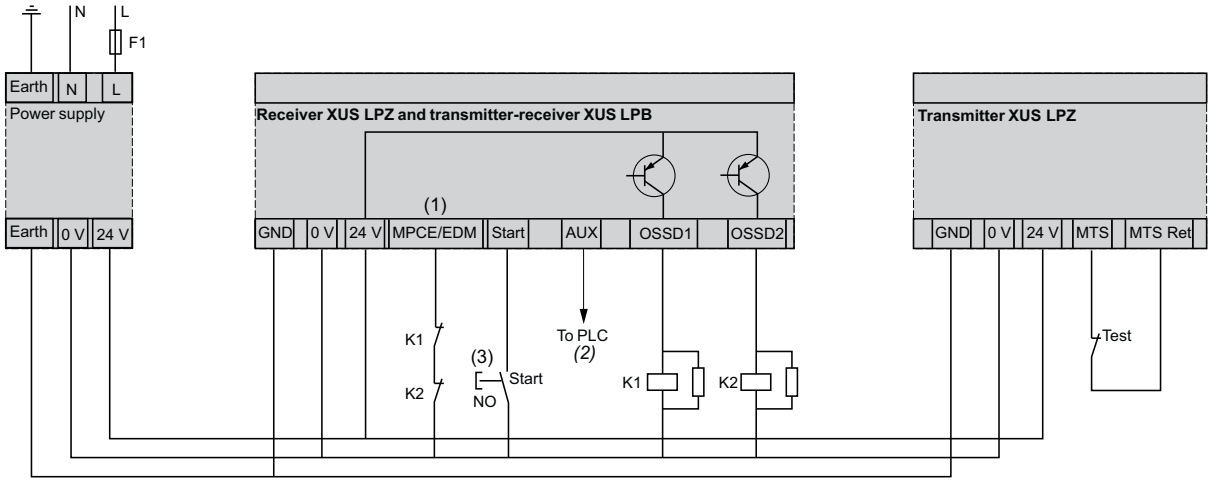
XUS LPB●●●



XUS	b	b1	G
LPB2A500M	781.1	500	760.7
LPB2A600M	881.1	600	860.7

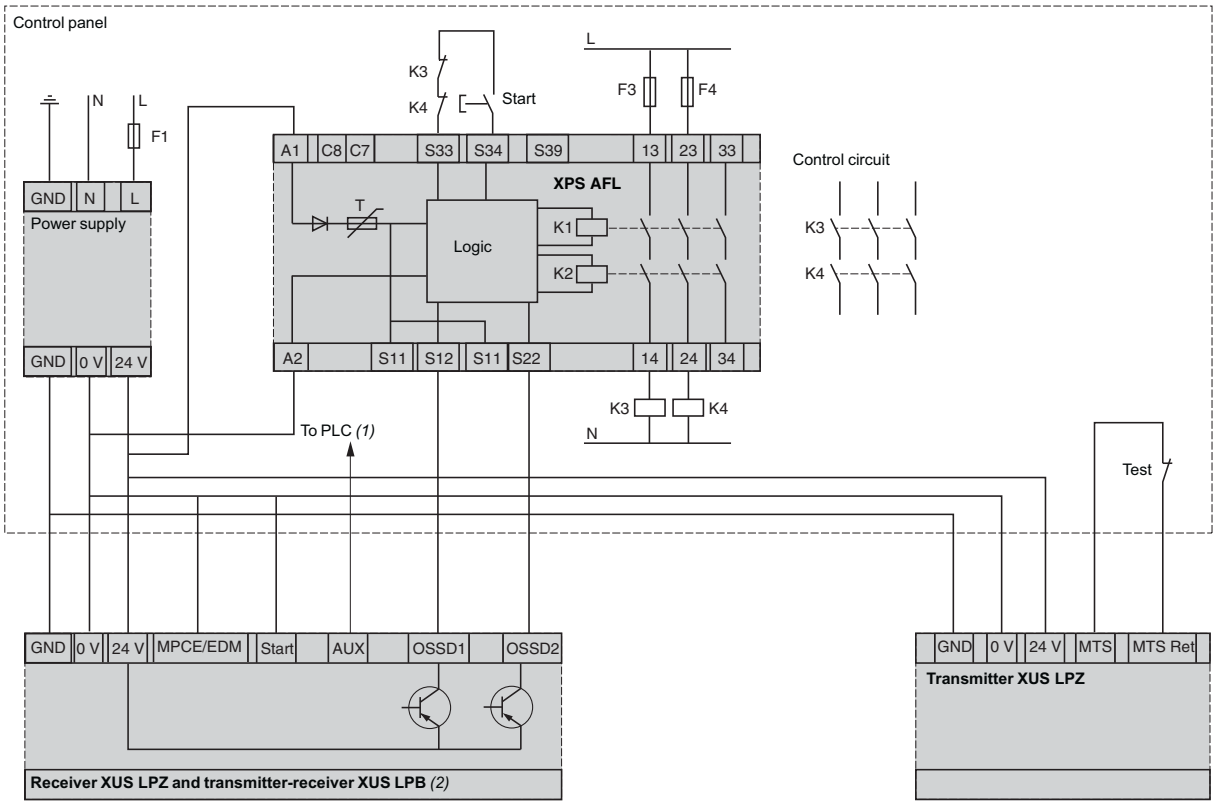
Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

Direct connection with XUS LP●●●



(1) For testing prior to installation, the user can select MPCE/EDM OFF (default factory setting). In this case, the MPCE/EDM line must be connected to the 0 V line of the system.
(2) The auxiliary output connects to a PLC (optional).
(3) If remote start is not used, connect the start line to the 0 V line.

Connection via a Preventa XPS AFL module



(1) The auxiliary output connects to a PLC (optional).
(2) The light curtain must be configured with MPCE/EDM OFF and with automatic start.

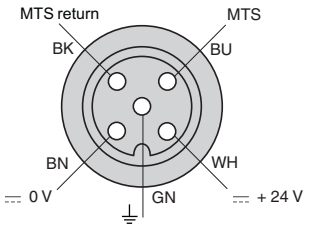
General: pages 3/98 to 3/103
Characteristics: page 3/112
References: pages 3/113 and 3/114
Dimensions: pages 3/116 and 3/117

Safety detection solutions
Safety light curtains, type 4
Compact light curtains XUS LP with solid-state output

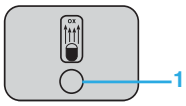
XUS LPZ/LPB●

Transmitter

Pre-wired connector of transmitter (XUS LPZ)

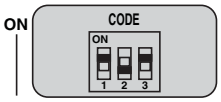


Transmitter status indicator

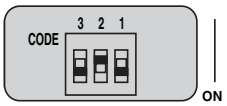


1 Yellow LED

Configuration indicator XUS LPZ

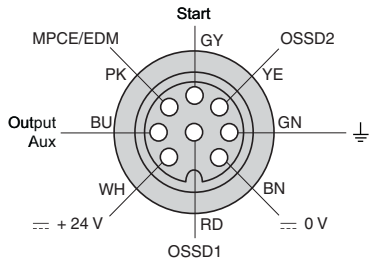


Configuration indicator XUS LPB

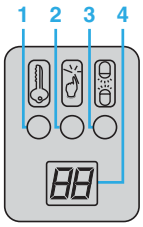


Receiver

Pre-wired connector of receiver (XUS LPZ) and pre-wired connector of transmitter-receiver (XUS LPB)

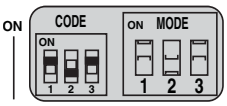


Receiver status indicator

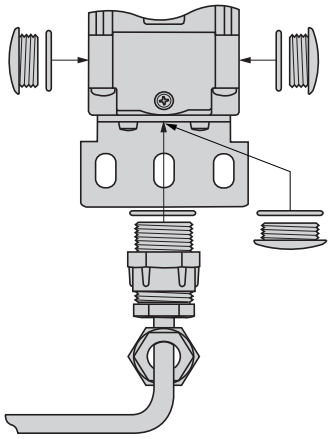


1 Interlock or Alarm yellow LED
2 Machine stop red LED
3 Machine run green LED
4 2-digit display

Configuration indicator XUS LPZ and XUS LPB

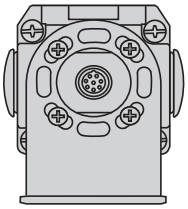


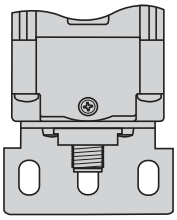
Connection to terminal block





Connection to M12 connector





3

Safety detection solutions
Safety light curtains, type 2
Slim, compact light curtains XUS LN with solid-state output

Light curtain type			XUS LNG●●●● (30 mm)
Environmental characteristics			
Conformity to standards			IEC 61496-1 and IEC 61496-2 (Type 2 ESPE)
Certifications			CE, TUV, UL, CSA
European directives			Machinery directive 98/37/EC, Work equipment directive 89/655/EEC and EMC directive 89/336 EEC
Ambient air temperature	Operating	**°C**	0…+ 55
	For storage	**°C**	- 25…+ 75
Relative humidity			95% maximum, without condensation
Degree of protection			IP 65
Shock and vibration resistance	Conforming to IEC 61496-1		Shock resistance: 10 gn, impulse 16 ms, Vibration resistance: 10…55 Hz, amplitude: 0.35 ± 0.05 mm
Materials			Casing: aluminium with electrostatically applied red (RAL 3000) polyester paint finish; end caps: 30% fibreglass impregnated nylon; front face: acrylic.
Fixings			End brackets (included)
Optical characteristics			
Minimum detection capacity		**mm**	30 (Hand)
Nominal sensing distance (Sn)		**m**	0.3…15
Height protected		**mm**	150…1500
Effective aperture angle (EAA)			5° at 3 m conforming to IEC 61496-1 and IEC 61496-2 (Type 2 ESPE)
Light source			GaAlAs LED, 880 nm
Immunity to ambient light			Conforming to IEC/EN 61496-2
Electrical characteristics			
Response time		**ms**	14…24
Power supply			⎓ 24 V ± 20% 2 A conforming to IEC 61496 and IEC 60204-1 (- 10% using the EDM function)
	Transmitter	**mA**	50
	Receiver	**A**	1.09 (with maximum load)
Maximum current consumption (no-load)	Transmitter	**mA**	50
	Receiver	**mA**	90
Immunity to interference			Conforming to EN 61496-1 and EN 61496-2
Safety outputs OSSD (Output Signal Switching Devices)			2 solid-state PNP (N/O) outputs ≤ 500 mA, ⎓ 24 V (Short-circuit protection)
Signalling	Transmitter		2 LEDs (power supply and diagnostic)
	Receiver		4 LEDs (stop, run, top alignment and bottom alignment)
Connections *(1)*	Transmitter		M12, 4-pin, male connector
	Receiver		M12, 5-pin, male connector
Pre-wired connectors c.s.a.	Transmitter/Receiver	**mm²**	0.25. Tinned wires.
Cable resistance	Transmitter/Receiver	Ω	0.093 per metre for 0.25 mm² c.s.a. cable
Cable lengths		**m**	Pre-wired connectors with cable lengths of 3, 10 and 30 m are available separately. The maximum cable length is 50 m, depending on the load current and power supply.
Functions			
Functions			■ Start: □ Automatic: model **XUSLNG5C** □ Manual: model **XUSLNG5D** ■ Alignment aid using 2 LEDs ■ LED display of operating modes ■ Monitoring of external switching devices EDM/MPCE
"Muting" function (inhibition)			Possible with external module **XPS LCM1150**

(1) Pre-wired female connectors to be ordered separately, see page 3/121.

References: page 3/121
Dimensions: page 3/122
Connections: pages 3/122 and 3/123

Safety detection solutions

Safety light curtains, type 2

Slim, compact light curtains XUS LN with solid-state output



XUS LNG5●●●●●

Transmitter-receiver system for hand protection *(1)*

Detection capacity 30 mm. Sensing distance 0.3 to 15 m.

■ 2 PNP safety outputs - Automatic start

Height protected	Response time	Number of light beams	Alarm output	Reference *(2)*	Weight
mm	ms				kg
150	14	7	PNP	**XUS LNG5C0150**	2.700
300	15	14	PNP	**XUS LNG5C0300**	2.900
450	16	21	PNP	**XUS LNG5C0450**	3.200
600	17	28	PNP	**XUS LNG5C0600**	3.400
750	18	35	PNP	**XUS LNG5C0750**	3.600
900	19	42	PNP	**XUS LNG5C0900**	3.900
1050	20	49	PNP	**XUS LNG5C1050**	4.100
1200	21	56	PNP	**XUS LNG5C1200**	4.300
1350	22	63	PNP	**XUS LNG5C1350**	4.500
1500	23	70	PNP	**XUS LNG5C1500**	4.800

■ 2 PNP safety outputs - Manual start

Height protected	Response time	Number of light beams	Alarm output	Reference *(2)*	Weight
mm	ms				kg
150	14	7	PNP	**XUS LNG5D0150**	2.700
300	15	14	PNP	**XUS LNG5D0300**	2.900
450	16	21	PNP	**XUS LNG5D0450**	3.200
600	17	28	PNP	**XUS LNG5D0600**	3.400
750	18	35	PNP	**XUS LNG5D0750**	3.600
900	19	42	PNP	**XUS LNG5D0900**	3.900
1050	20	49	PNP	**XUS LNG5D1050**	4.100
1200	21	56	PNP	**XUS LNG5D1200**	4.300
1350	22	63	PNP	**XUS LNG5D1350**	4.500
1500	23	70	PNP	**XUS LNG5D1500**	4.800

(1) Supplied with a test rod, 2 sets of 2 brackets with fixings and a user guide with certificate of conformity and 1 arc suppressor set.
***Pre-wired female connectors to be ordered separately**, see below.*

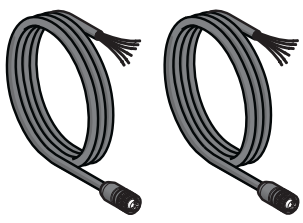
*(2) To order a transmitter only, replace the letter C or D by **E** and add the letter **T** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LNG5C0150 becomes **XUS LNG5E0150T** for the transmitter only.*
*To order a receiver only, add the letter **R** to the end of the reference for the corresponding transmitter-receiver pair.*
*Example: reference XUS LNG5C0150 becomes **XUS LNG5C0150R** for the receiver only.*

Other versions

Combining type 2 safety light curtains with external module for muting function and monitoring 2 to 4 light curtains. See pages 2/220 to 2/225.

Accessories

Description		For use with	Length m	Reference	Weight kg
Fixings kit (2 brackets)		Light curtains XUS LN	–	**XUS LZ218**	0.450
Pre-wired female connectors	Transmitter type	Light curtains XUS LN	3	**XSZ NCT03**	0.680
			10	**XSZ NCT10**	0.910
			30	**XSZ NCT30**	1.360
	Receiver type	Light curtains XUS LN	3	**XSZ NCR03**	0.680
			10	**XSZ NCR10**	0.910
			30	**XSZ NCR30**	1.360
Arc suppressor (pair)		All types of light curtain	–	**XUS LZ500**	0.020
User guide on CD-ROM		All types of light curtains and accessories	–	**XUS LZ450**	0.020



XSZ NCT●● *XSZ NCR●●*

Separate components

Power supplies, 90° mirror adaptors, anti-vibration kit and fixing bases

See pages 3/124, 3/126 and 3/127

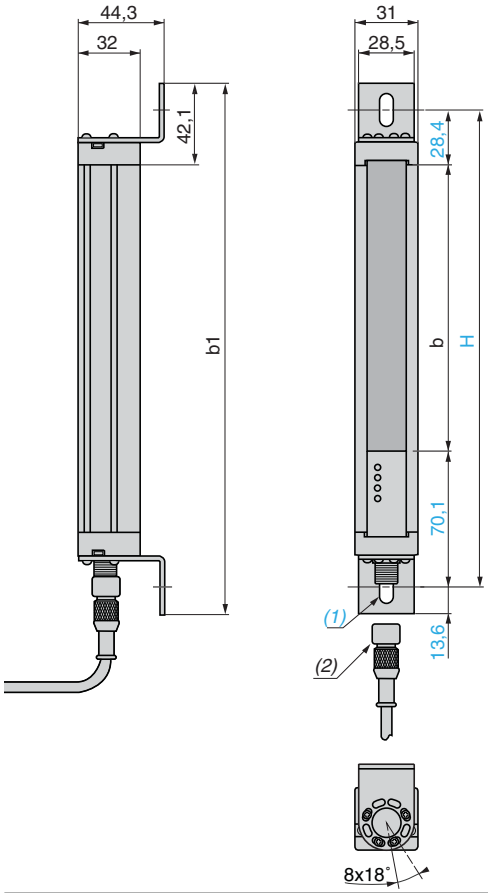
References: page 3/121
Dimensions: page 3/122
Connections: pages 3/122 and 3/123

3

Dimensions

Slim, compact light curtains

XUS LN●●●



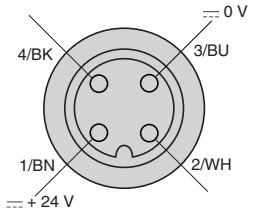
XUS	b	b1	H	Height protected
LN●●●0150	147	272	245.6	150
LN●●●0300	294	419	392.6	300
LN●●●0450	441	566	539.5	450
LN●●●0600	588	713	686.6	600
LN●●●0750	735	860	833.6	750
LN●●●0900	882	1007	980.6	900
LN●●●1050	1029	1154	1127.6	1050
LN●●●1200	1176	1301	1274.6	1200
LN●●●1350	1323	1448	1421.6	1350
LN●●●1500	1470	1595	1568.6	1500

(1) 1 elongated hole Ø 6.75 x 16.75 mm.
(2) M12 male connector.

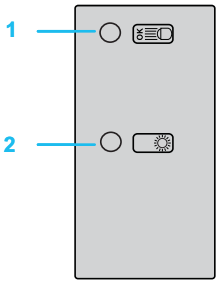
Connections

Transmitter

Pre-wired connector of transmitter XSZ NCT



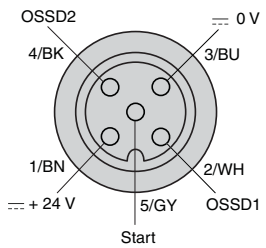
Transmitter status indicator



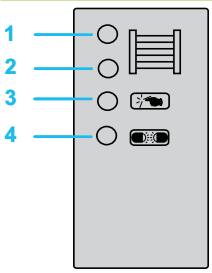
1 Interlock or Alarm
yellow LED
2 Switch-on/Machine run
green LED

Receiver

Pre-wired connector of receiver XSZ NCR



Receiver status indicator



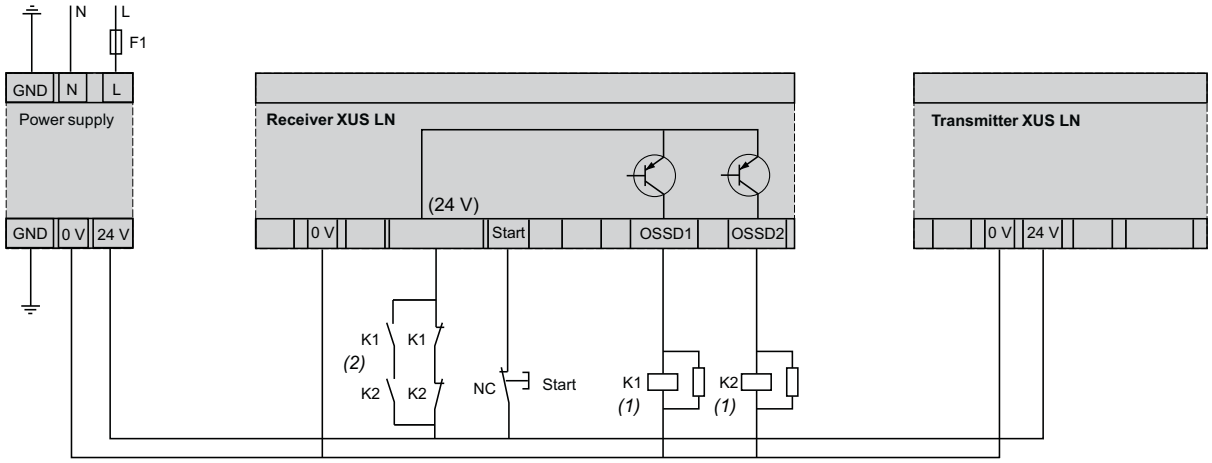
1 Top alignment
yellow LED
2 Bottom alignment
yellow LED
3 Stop
red LED
4 Run
green LED

Characteristics:
page 3/120

References:
page 3/121

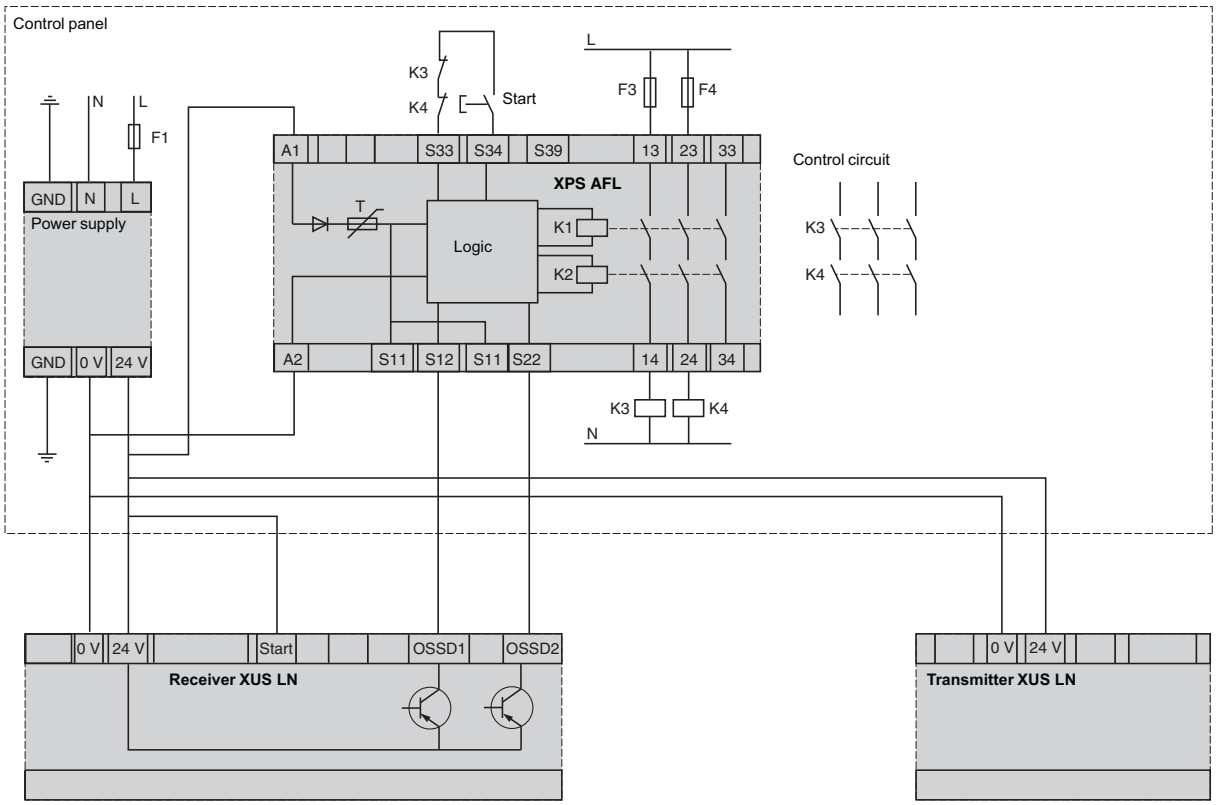
Connections (continued)

Direct connection with XUS LNG5D●●●

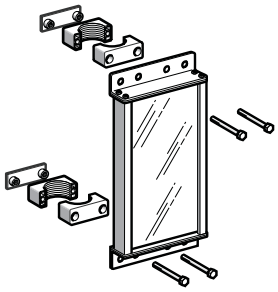


(1) The K1 and K2 coils must be protected using the arc suppressors included in the documentation kit.
(2) For the EDM function, contactors LC1D●●BD and control relays CAD●●BD, CA4KN●●BW3 and CA3KN●●BD are recommended (for more information on contactors and control relays, please refer to our "Motor starter solutions" catalogue).

Connection of light curtain XUS LN5C●●● via a Preventa XPS AFL module



3



XUS ZM/ZA●●●●

90° mirror adaptor for light curtains

Description	For use with light curtains			Height *(2)*	Reference	Weight
	XUS LT	XUS LP	XUS LN	mm		kg
Glass mirror (0.88 Sn) *(1)*						
90° mirror adaptor with rotatable fixings	–	XUS LPZ1A●	–	140	**XUS ZM0102**	1.040
	–	–	–	191	**XUS ZM0152**	1.300
	XUS LT●●●0260	–	XUS LN●●●0150	343	**XUS ZM0305**	1.900
	XUS LT●●●0350 XUS LT●●●0435	–	XUS LN●●●0300	495	**XUS ZM0457**	2.500
	–	–	XUS LN●●●0450	546	**XUS ZM0508**	2.800
	XUS LT●●●0520	XUS LP●2A500●	–	648	**XUS ZM0610**	3.200
	XUS LT●●●0610	XUS LP●2A0600●	XUS LN●●●0600	749	**XUS ZM0711**	3.700
	XUS LT●●●0700	–	–	800	**XUS ZM0762**	3.800
	XUS LT●●●0785	–	XUS LN●●●0750	851	**XUS ZM0813**	4.000
	XUS LT●●●0870	XUS LPZ3A0400●	–	953	**XUS ZM0914**	4.500
	XUS LT●●●0955		XUS LN●●●0900	1054	**XUS ZM1016**	5.000
	XUS LT●●●1045	XUS LPZ3A0500●	–	1105	**XUS ZM1067**	5.200
	XUS LT●●●1130	XUS LPZ4A0300●	XUS LN●●●1050	1257	**XUS ZM1219**	5.900
	XUS LT●●●1215 XUS LT●●●1305	XUS LPZ5A0300●	XUS LN●●●1200	1359	**XUS ZM1321**	6.300
	–	–	XUS LN●●●1350	1410	**XUS ZM1372**	6.500
	XUS LT●●●1390	–	–	1461	**XUS ZM1422**	6.700
	–	–	XUS LN●●●1500	1562	**XUS ZM1524**	7.200
	XUS LT●●●1570	XUS LPZ6A0300●	–	1664	**XUS ZM1626**	7.600
	XUS LT●●●1745	–	–	1867	**XUS ZM1830**	8.500
	XUS LT●●●1920	–	–	2172	**XUS ZM2134**	9.800
	XUS LT●●●2095	–	–	2172	**XUS ZM2134**	9.800
Stainless steel mirror (0.82 Sn) *(1)*						
90° mirror adaptor with rotatable fixings	–	XUS LPZ1A●	–	140	**XUS ZA0102**	1.090
	–	–	–	191	**XUS ZA0152**	1.300
	XUS LT●●●0260	–	XUS LN●●●0150	343	**XUS ZA0305**	2.000
	XUS LT●●●0350 XUS LT●●●0435	–	XUS LN●●●0300	495	**XUS ZA0457**	2.700
	–	–	XUS LN●●●0450	546	**XUS ZA0508**	3.000
	XUS LT●●●0520	XUS LP●2A500●	–	648	**XUS ZA0610**	3.500
	XUS LT●●●0610	XUS LP●2A0600●	XUS LN●●●0600	749	**XUS ZA0711**	3.900
	XUS LT●●●0700	–	–	800	**XUS ZA0762**	4.200
	XUS LT●●●0785	–	XUS LN●●●0750	851	**XUS ZA0813**	4.400
	XUS LT●●●0870	XUS LPZ3A0400●	–	953	**XUS ZA0914**	4.500
	XUS LT●●●0955		XUS LN●●●0900	1054	**XUS ZA1016**	5.400
	XUS LT●●●1045	XUS LPZ3A0500●	–	1105	**XUS ZA1067**	5.600
	XUS LT●●●1130	XUS LPZ4A0300●	XUS LN●●●1050	1257	**XUS ZA1219**	6.400
	XUS LT●●●1215 XUS LT●●●1305	XUS LPZ5A0300●	XUS LN●●●1200	1359	**XUS ZA1321**	6.800
	–	–	XUS LN●●●1350	1410	**XUS ZA1372**	7.000
	XUS LT●●●1390	–	–	1461	**XUS ZA1422**	7.300
	–	–	XUS LN●●●1500	1562	**XUS ZA1524**	7.800
	XUS LT●●●1570	XUS LPZ6A0300●	–	1664	**XUS ZA1626**	8.300
	XUS LT●●●1745	–		1867	**XUS ZA1830**	9.200
	XUS LT●●●1920	–	–	2172	**XUS ZA2134**	10.600
	XUS LT●●●2095	–	–	2172	**XUS ZA2134**	10.600



ABL 8RPS24050

Power supplies for light curtains XUS LT/LN/LP *(3)*

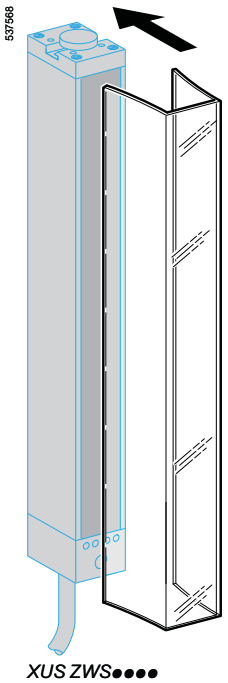
Input voltage	Secondary			Reset	Conforming to standard EN 61000-3-2	Reference	Weight
	Output voltage	Nominal power	Nominal current				kg
Single phase (N-L1) **or 2-phase** (L1-L2) **connection**							
~ 100…120 V - 200...500 V - 15 %,+ 10 % 50/60 Hz	24...28.8 V ⎓	72 W	3 A	Auto/man	Yes	**ABL 8RPS24030**	0.300
		120 W	5 A	Auto/man	Yes	**ABL 8RPS24050**	0.700
		240 W	10 A	Auto/man	Yes	**ABL 8RPS24100**	1.000

(1) Sensing distance reduction coefficient to be taken into account for each 90° mirror adaptor used.
(2) Usable reflective height.
(3) For full information, please refer to the Phaseo Power Supplies catalogue.

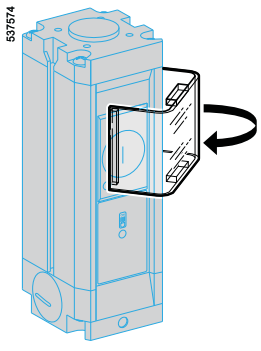
Dimensions : pages 3/8 and 3/9
Schémas : page 3/8

Protective covers for light curtains XUSLT/XUSLP			XUS ZWS●●●●
Environmental characteristics			
Air temperature	For operation	°C	0...+ 55
	For storage	°C	- 25...+ 70
Material			Lexan
Sensing distance (Sn) **reduction coefficient**			0.91 *(1)*
Environmental chemicals			
Chemical resistance	Acids		Resistant
	Aliphatic hydrocarbons		
	Alcohols		Limited resistance
	Alkalis		
	Detergents and cleaners		
	Greases and oils		
	Silicone oils and greases not containing alkaline products		
	Amines		Not resistant
	Aromatic hydrocarbons		
	Detergents and cleaners containing alkaline products		
	Esters		
	Halogenated hydrocarbons		
	Ketones		
	Silicone oils and greases containing alkaline products		

References of protective covers



XUS ZWS●●●●



XUS ZWSP

Description	For use with	Height mm	Reference	Weight kg
Lexan protective covers for transmitter-receiver pair (0.91 Sn) *(1)* (Sold in sets of 2)	XUSLT●●●260	293	**XUS ZWS0260**	1.500
	XUSLT●●●350	380	**XUS ZWS0350**	1.570
	XUSLT●●●435	467	**XUS ZWS0435**	1.620
	XUSLT●●●520	554	**XUS ZWS0520**	1.680
	XUSLT●●●610	641	**XUS ZWS0610**	1.740
	XUSLT●●●700	728	**XUS ZWS0700**	1.800
	XUSLT●●●785	815	**XUS ZWS0785**	1.860
	XUSLT●●●870	902	**XUS ZWS0870**	1.920
	XUSLT●●●955	989	**XUS ZWS0955**	3.470
	XUSLT●●●1045	1075	**XUS ZWS1045**	3.530
	XUSLT●●●1130	1163	**XUS ZWS1130**	3.590
	XUSLT●●●1215	1249	**XUS ZWS1215**	3.650
	XUSLT●●●1305	1336	**XUS ZWS1305**	3.710
	XUSLT●●●1390	1423	**XUS ZWS1390**	3.780
	XUSLT●●●1570	1597	**XUS ZWS1570**	3.900
	XUSLT●●●1745	1771	**XUS ZWS1745**	4.080
	XUSLT●●●1920	1945	**XUS ZWS1920**	4.450
	XUSLT●●●2095	2120	**XUS ZWS2095**	4.820

Description	For use with	Height mm	Reference	Weight kg
Lexan protective covers for single beam device (0.91 Sn) *(1)* (Sold in sets of 2)	XUSLP	62.48	**XUS ZWSP**	0.450

(1) Sensing distance reduction coefficient to be taken into account for each pair of Lexan protective covers used.

Dimensions:
page 3/128

Anti-vibration kit

Selection according to weight and application

Weight classes

Light curtain type	Height mm	Weight class 1	2	3	4
XUS LN	150...600	•			
	750...1500		•		
XUS LTQ	260…1045		•		
	1130…1390			•	
XUS LTR/Y	250…870		•		
	1045…1390		•		
	1570…2095			•	
XUS L PZ1A	–			•	
XUS LPZ2A0500 and XUS LPZ2A0600	–			•	
XUS LPZ3A0400	–			•	
XUS LPZ3A0500	–				•
XUS LPZ4A0300	–			•	
XUS LPZ5A0300 and XUL LPZ6A0300	–				•
XUS LPB2A500 and XUS LPB2A600	–			•	

Type of mirror adaptors	Height mm	Weight class 1	2	3	4
XUS ZM *(1)*	102	•			
	305...457		•		
	508…711			•	
	813…1016				•
XUS ZA	102	•			
	305…1067		•		
	1219…1626			•	
	1830…2134				•

(1) Use of the anti-vibration kit is not recommended for mirror adaptors greater than 1016 mm in height.

Applications

Weight class	Anti-shock applications *(1)* Shear mounted: Number of fixings per head *(3)*	Shear mounted: Reference	Compression mounted: Number of fixings per head *(3)*	Compression mounted: Reference	Anti-vibration applications *(2)* Shear mounted: Number of fixings per head *(3)*	Shear mounted: Reference	Compression mounted: Number of fixings per head *(3)*	Compression mounted: Reference
1	2	XSZ SMK	not recommended		2 or 4	XSZ SMK	2	XSZ SMK1
	2	XSZ SMK1			2 or 4	XSZ SMK1		
2	2 or 4	XSZ SMK	2	XSZ SMK1	2 or 4	XSZ SMK	2	XSZ SMK
	2 or 4	XSZ SMK1			2 or 4	XSZ SMK1	2 or 4	XSZ SMK1
					2	XSZ SMK2		
3	4	XSZ SMK	2	XSZ SMK	2 or 4	XSZ SMK	2 or 4	XSZ SMK
	4	XSZ SMK1	2 or 4	XSZ SMK1	4	XSZ SMK1	4	XSZ SMK1
	2 or 4	XSZ SMK2			2 or 4	XSZ SMK2		
4	4	XSZ SMK	2	XSZ SMK	4	XSZ SMK	2	XSZ SMK
	4	XSZ SMK1	4	XSZ SMK1	4	XSZ SMK1	4	XSZ SMK1
	2	XSZ SMK2			2 or 4	XSZ SMK2		

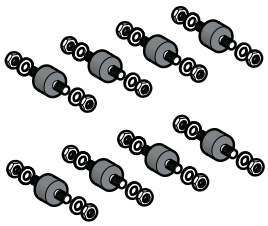
(1) Low frequency, high amplitude applications, such as punching presses where a powerful shock can exist.
(2) High frequency, low amplitude applications, such as offset printing machines where constant vibration can exist.
(3) Head: transmitter, receiver or mirror.

Shock absorber characteristics

Characteristics per shock absorber		Compression mounted: Maximum load (kg)	Torque (Nm)	Natural frequency (Hz)	Shear mounted: Maximum load (kg)	Torque (Nm)	Natural frequency (Hz)
For anti-vibration kit	**XSZ SMK**	8.16	25.16	11	1.36	3.13	9.5
	XSZ SMK1	2.177	10.86	14	1.13	2.34	9
	XSZ SMK2	24.94	107.39	13	10.43	14.94	7.5

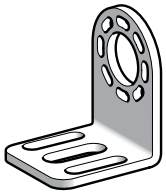
References of anti-vibration kits

537563



XSZ SMK

537570



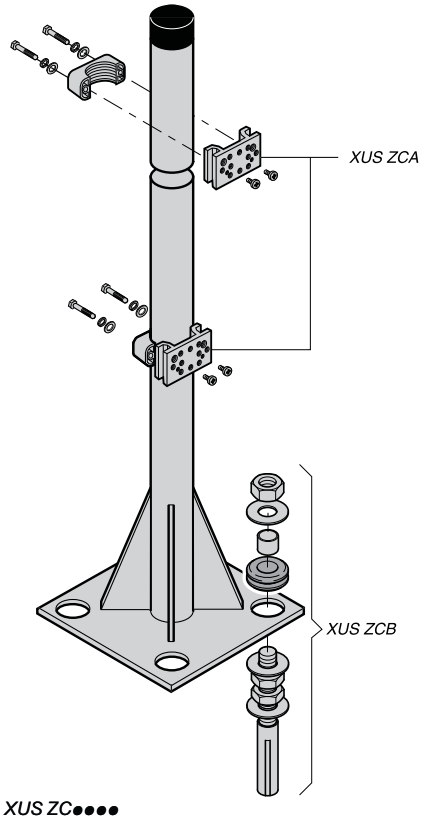
XUS LZ227

Description	For use with	Reference	Weight kg
Anti-vibration kit kit comprising 8 shock absorbers, stud fixing. 16 washers and 16 nuts included with kit.	All types of light curtain and 90° mirror adaptors	**XSZ SMK**	0.030
		XSZ SMK1	0.020
		XSZ SMK2	0.045
Fixings kit for XUS LN (2 brackets)	Anti-vibration kit	**XUS LZ227**	0.450

Dimensions: page 3/129

Fixing base for light curtains and mirrors			XUS ZC●●●●
Environmental characteristics			
Ambient air temperature	Operating	°C	- 25…+ 70
	For storage	°C	- 25…+ 70
Materials			Fixing base: steel End protection: black polycarbonate, 20% fibreglass

References



XUS ZC●●●●

Fixing bases

Description	For use with			Height protected	Reference	Weight
	Light curtains Height	Mirrors Height	IP 67 tube Height			
	mm	mm	mm	mm		kg
Fixing base XUS ZC●●●●	150…900	182…894	434…956	1200	**XUS ZC1200**	11.340
	870…1500	995…1503	1042…1477	1800	**XUS ZC1800**	15.880
	1570…1800	1605…1706	1565…1917	2100	**XUS ZC2100**	20.410
	1920…2095	1910	2091	2400	**XUS ZC2400**	27.220
	–	2240	2266	3100	**XUS ZC3100**	29.940

Accessories

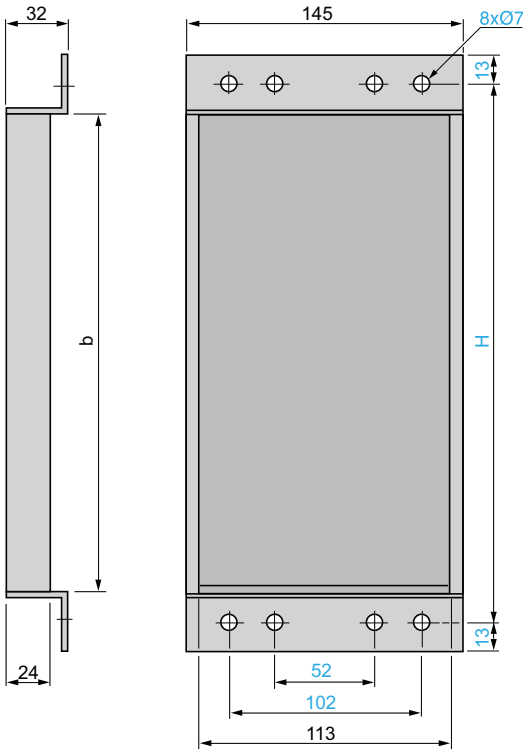
Description	For use with	Reference	Weight kg
Fixing kit (sold in lots of 2)	Fixing base XUS ZC●●●●	**XUS ZCA**	0.450
Floor fixing kit comprising: 4 bolts, 4 rawplugs, 12 washers, 8 standard nuts, 4 lock nuts, 4 rubber insulators, 4 spacers (tube)	Fixing base XUS ZC●●●●	**XUS ZCB**	0.450

Dimensions:
page 3/130

Safety detection solutions
Accessories for safety light curtains types 2 and 4

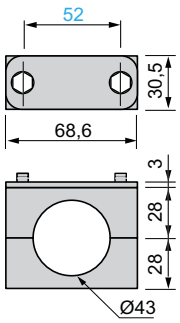
90° mirror adaptors + fixing clamps

XUS ZM●●●●/XUS ZA●●●●



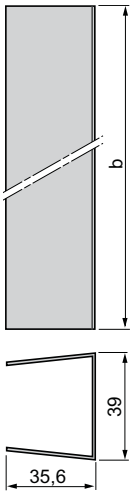
XUS			
Glass	Stainless steel	b	H
ZM0102	ZA102	140	182
ZM0152	ZA152	191	233
ZM0305	ZA0305	343	386
ZM0457	ZA0457	495	538
ZM0508	ZA0508	546	589
ZM0610	ZA0610	648	690
ZM0711	ZA0711	749	792
ZM0762	ZA0762	800	843
ZM0813	ZA0813	851	894
ZM0914	ZA0914	953	995
ZM1016	ZA1016	1054	1097
ZM1067	ZA1067	1105	1148
ZM1219	ZA1219	1257	1300
ZM1321	ZA1321	1359	1402
ZM1372	ZA1372	1410	1452
ZM1422	ZA1422	1461	1503
ZM1524	ZA1524	1562	1605
ZM1626	ZA1626	1664	1706
ZM1830	ZA1830	1867	1910
ZM2134	ZA2134	2172	2214

Fixing clamp (quantity 2)



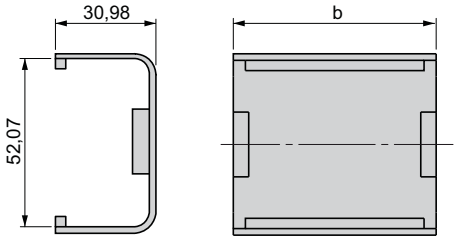
Protective cover

XUS ZWS●●●● for XUL T



XUS	b
ZWS0260	293
ZWS0350	380
ZWS0435	467
ZWS0520	554
ZWS0610	641
ZWS0700	728
ZWS0785	815
ZWS0870	902
ZWS0955	989
ZWS1045	1075
ZWS1130	1163
ZWS1215	1249
ZWS1305	1336
ZWS1390	1423
ZWS1570	1597
ZWS1745	1771
ZWS1920	1945
ZWS2095	2120

XUS ZWSP for XUS LP

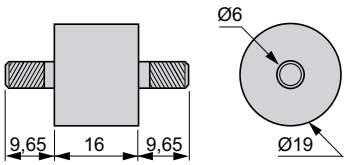


XUS	b
ZWSP	62.48

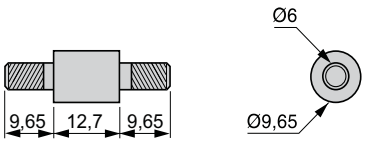
References:
pages 3/124 and 3/125

Anti-vibration kits *(1)*

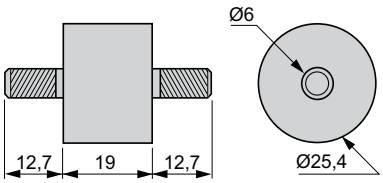
XSZ SMK



XSZ SMK1



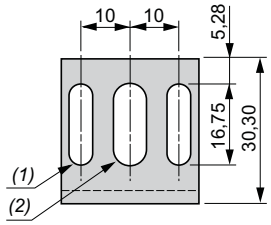
XSZ SMK2

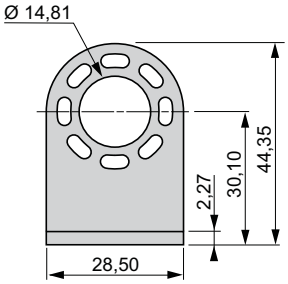


(1) The anti-vibration kit comprises 8 shock absorbers, 16 washers and 16 nuts.

Fixing brackets for anti-vibration kit

XUS LZ227 for XUS LN



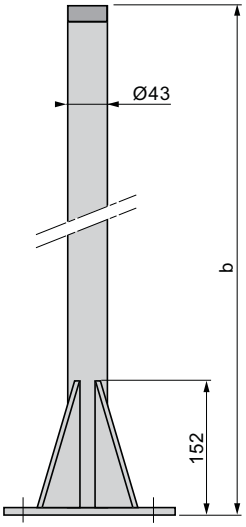


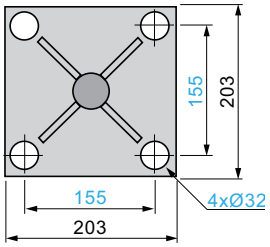
(1) 2 elongated holes Ø 5.10 x 16.75 mm.
(2) 1 elongated hole Ø 6.75 x 16.75 mm.

References:
page 3/134

3

Fixing base
XUS ZC●●●●

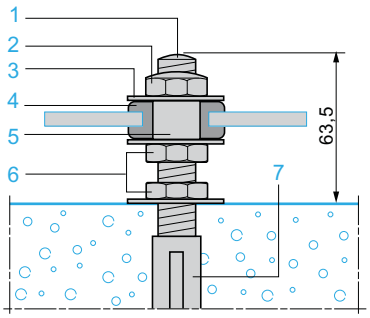




XUS	b
XUS ZC1200	1200
XUS ZC1800	1800
XUS ZC2100	2100
XUS ZC2400	2400
XUS ZC3100	3100

Floor fixing kit (quantity 4) for fixing base XUS ZC●●●●
XUS ZCB

Scale: 2.5



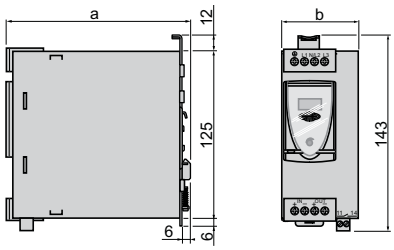
1 Bolt,
2 1 lock nut,
3 3 washers,
4 Rubber insulator,
5 Spacer (tube),
6 2 standard nuts,
7 Rawplug.

Characteristics:
page 3/127

References:
page 3/127

Dimensions

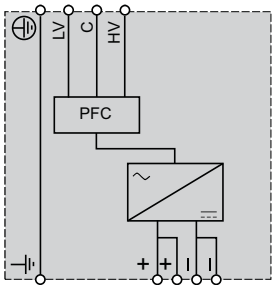
ABL 8RPS24●●●
Common side view



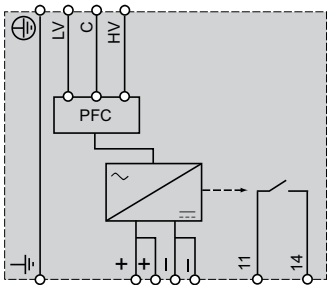
ABL 8	a	b
RPS24030	120	44
RPS24050	120	56
RPS24100	140	85

Internal schemes

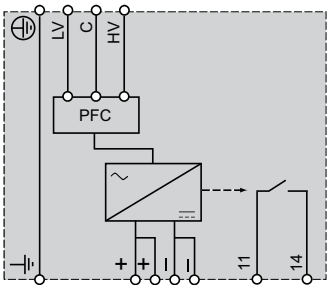
ABL 8RPS24030



ABL 8RPS24050



ABL 8RPS24100



Safety detection solutions

Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

Operating principle

XPS CM safety modules form, with XU2 S single-beam photo-electric sensors (periodically tested), a category 2 light curtain conforming to standards IEC/EN 61496 parts 1 and 2 and EN 60825-1.
The connection of 1 to 4 pairs of XU2 S photo-electric sensors makes it possible to create a protected space up to 1200 mm high conforming to EN 999/ISO 13855 and 8 m long.

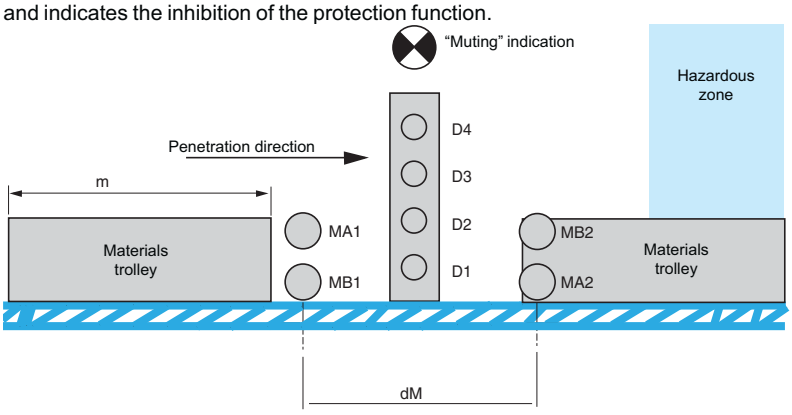
The built-in “muting” function allows for the automatic passage of parts to be machined or loaded pallets without interrupting the transportation movement.
When the system is engaged by the operating control (in series with the main circuit feedback loop) and the light protection is not interrupted, the main circuit is closed by the two safety relays of the XPS CM module.

An interruption of the protection field causes the safety outputs to open instantaneously, and the process PLC receives a stop command. The LED on the XPS CM front panel changes from green to red. The “open” state is maintained until the module is restarted using the start button.

The “muting” function allows the light protection to be inhibited. This possibility allows a trolley transporting materials to pass through without triggering the main circuit. The “muting” function cannot be activated by supplying the inhibition devices unless the safety outputs have been switched on beforehand.

To trigger the “muting” function, the inhibition devices must be activated within the 3-second time interval. This synchronisation time for the two inhibition inputs can be deactivated by connecting two configuration terminals. The “muting” cycle has a maximum duration of 60 seconds. During this period, materials can be transported through the protection field without deactivating the safety outputs. The 60 second limit value of the “muting” cycle may be made infinite by connecting two configuration terminals.

During the “muting” operation process, a light indicating the “muting” state is controlled by the XPS CM module. An error at the level of the indicator light (short-circuit, open-circuit) will be recognized straight away, and will deactivate the “muting” function. The indicator light comes on when a “muting” signal is generated and indicates the inhibition of the protection function.



D1, D2, D3, D4: monitoring photo-electric sensors.
MA1, MB1, MA2, MB2: “Muting” photo-electric sensors.
m = trolley length
dM = distance between MA1, MB1 and MA2, MB2.

Conditions to be observed for the “muting” function

- “Muting” sensors must be of the XU2 M18PP340 thru-beam or XU9 M18PP340 polarised reflex type or mechanical limit switches with contacts.
- dM ≤ m to obtain continuous validation of the “muting” function.
- Avoid the intrusion of persons during the “muting” phase. This phase is indicated by an indicator light on the “muting” indicator output of the XPS CM module.
- A materials transportation trolley must generate the “muting” signal before it enters the protection field and interrupt the signal when it is once again released from all the sensors of the protection field.

Characteristics: page 3/141 | References: page 3/134 | Functional diagrams: page 3/136 | Connections: page 3/137

Safety detection solutions

Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

Characteristics of safety modules

Module type			XPS CM1144	XPS CM1144P
Products designed for max. use in safety related parts of control systems conforming to EN 954-1			Category 2 (type 2) conforming to IEC/EN 61496-1	
Ambient air temperature		**°C**	Operation: -10...+ 55 °C. Storage: - 25…+ 85	
Degree of protection conforming to IEC 529			Terminals: IP 20, enclosure: IP 40	
Supply	Voltage	**V**	⎓ 24, voltage limits: - 20…+ 20 %	
Maximum consumption		**W**	< 15, with thru-beam photoelectric sensors and “muting” signalling	
Module fuse protection			Internal, electronic	
Rated insulation voltage (Ui)		**V**	300 (degree of pollution 2 conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)	
Rated impulse withstand voltage (Uimp)		**kV**	4 (overvoltage category 3, conforming to EN/IEC 60947-5-1, DIN VDE 0110 parts 1 and 2)	
Inputs for sensors	Number of inputs to be monitored		4 (terminals Z1, Z2, Z3, Z4)	
	Input voltage	**V**	⎓ 24	
	Supply voltage of sensors	**V**	⎓ 24 (terminal U+/U-)	
	Supply current of sensors	**mA**	< 200	
Inputs for the “muting” function	Number of “muting” inputs		2 (terminals MA, MB)	
	Input voltage	**V**	⎓ 24 (terminal U+/U-)	
	Maximum current	**mA**	< 200	
	Synchronisation time for the activation of the MA/MB “muting” signal	**s**	3 (+/- 20 %)	
	“Muting” maximum duration	**s**	60 (- 10…+ 30 %)	
Single-beam thru-beam photo-electric sensors for input monitoring Z1-Z2-Z3-Z4 - sensors authorised for the protection field (max. 4)			XU2 S18PP340●●● (infrared)	
- “muting” sensors			XU2 M18PP340●●● or XU9 M18PP340●●● photo-electric sensors or XC limit switches	
- Sensor supply resistivity		Ω	10 max.	
Safety outputs				
- number and type			2 N/O (terminals 13-14, 23-24), volt-free	
- solid-state output breaking capacity			4 N/O 24 V/20 mA, (Y33-Y34, Y33-Y44, Y33-Y54, Y33-Y64)	
- breaking capacity in AC-15		**VA**	C300: inrush 1800, maintained 180	
- breaking capacity in DC-13			24 V/1.5 A, L/R = 50 ms	
- maximum thermal current (Ithe)		**A**	5.6	
- sum of maximum thermal current		**A**	11	
- minimum current (volt-free contact)		**mA**	10	
- minimum voltage (volt-free contact)		**V**	17	
- short-circuit protection		**A**	4 gG or 6 fast-acting fuse cartridge, conforming to EN/IEC 60947-5-1 and DIN VDE 0660 part 200	
“Muting” signalling sensors for incandescent lamp			Number 1 (terminal H1), maximum power: 6.5 W/⎓ 24 V, maximum power: 4 W/⎓ 24 V	
Response time on input change of state		**ms**	< 25	
Electrical durability			See page 38610/6	
Display			4 LEDs	
Connection	Type		Captive screw clamp terminals	Captive screw clamp terminals, separate removable terminal block
- 1-wire connection	Without cable ends		Solid or flexible cable: 0.14…2.5 mm^2	Solid or flexible cable: 0.2…2.5 mm^2
	With cable ends		Without bezel, flexible cable: 0.25…2.5	Without bezel, flexible cable: 0.25…2.5
	With cable ends		With bezel, flexible cable: 0.25…1.5 mm^2	With bezel, flexible cable: 0.25…2.5 mm^2
- 2-wire connection	Without cable ends		Solid or flexible cable: 0.14…0.75 mm^2	Solid cable: 0.2…1 mm^2, flexible cable: 0.2…1.5 mm^2
	With cable ends		Without bezel, flexible cable: 0.25…1 mm^2	Without bezel, flexible cable: 0.25…1 mm^2
	With cable ends		Double with bezel, flexible cable: 0.5…1.5 mm^2	Double with bezel, flexible cable: 0.5…1.5 mm^2

Characteristics of photo-electric sensors

Product certification			CE, conforming to EN/IEC 61496-1/-2 and EN/IEC 60825-1
Ambient air temperature		**°C**	Operation: - 25…+ 55 (infrared transmission sensors), Storage: - 40…+ 70
Vibration resistance			7 gn (f = 10…55 Hz), conforming to EN/IEC 60068-2-6
Shock resistance			30 gn, 3 axes: 3 times, conforming to EN/IEC 60068-2-27
Degree of protection			IP 67 conforming to EN/IEC 60529
Connection	Pre-cabled		PVC cable, diameter 5 mm, length 5 m, wire c.s.a.: 4 x 0.34 mm2 (3 x 0.34 mm2 for thru-beam transmitter)
	Connector		M12 male connector, 4-pin (suitable jumper cables and female connectors M12, 4-contact, see our catalogue “Global detection”)
Materials			Case: nickel-plated brass (infrared transmission sensors). Lenses: PMMA
Nominal sensing distance		**m**	8 (infrared transmission sensors)
Rated supply voltage		**V**	⎓ 12…24 (with protection against reverse polarity)
Voltage limits		**V**	⎓ 10…30 V (including ripple)
Switching capacity (sealed)		**mA**	≤ 100 mA (with overload and short-circuit protection)
Voltage drop, closed state		**V**	≤ 1.5
Current consumption, no-load		**mA**	≤ 35
Maximum switching frequency		**Hz**	500
Delays		**ms**	Response: ≤ 1; recovery: ≤ 1

Principle: page 3/132 References: page 3/134 Functional diagrams: page 3/136 Connections: page 3/137

Safety detection solutions

Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function



XPS CM1144●

3

Safety modules

Description	Type of terminal block connection	Number of safety circuits	Additional outputs	Supply	Reference	Weight kg
Safety modules for the monitoring of single-beam photo-electric sensors with a test input associated with a built-in “muting” function	Integrated in module	2	4	⎓ 24 V	**XPS CM1144**	0.350
	Separate, can be removed from module	2	4	⎓ 24 V	**XPS CM1144P**	0.350

Principle: page 3/132 | Characteristics: page 3/133 | Functional diagrams: page 3/136 | Connections: page 3/137

Safety detection solutions

Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function


811176


811175

XU2 S18●P340L5


811180


811181

XU2 S18●P340WL5


811176

XU2 S18KP340L5T


811180

XU2 S18KP340WL5T


811178

XU2 S18PP340DR


811181

XU2 S18PP340WL5R

Single-beam photo-electric sensors with a test input

Description	Transmission type	Line of sight	Connection	Reference	Weight kg
PNP thru-beam pair (transmitter + receiver) Light or dark programmable switching	Infrared Sensing distance: 8 m	Along case axis	Pre-cabled L = 5 m	**XU2 S18PP340L5**	0.485
			M12 connector	**XU2 S18PP340D**	0.155
		90° to case axis	Pre-cabled L = 5 m	**XU2 S18PP340WL5**	0.485
			M12 connector	**XU2 S18PP340WD**	0.155
Thru-beam transmitter alone (for XPS CM1144●)	Infrared	Along case axis	Pre-cabled L = 5 m	**XU2 S18KP340L5T**	0.235
			M12 connector	**XU2 S18KP340DT**	0.075
		90° to case axis	Pre-cabled L = 5 m	**XU2 S18KP340WL5T**	0.235
			M12 connector	**XU2 S18KP340WDT**	0.155
PNP thru-beam receiver alone (for XPS CM1144●)	Infrared	Along case axis	Pre-cabled L = 5 m	**XU2 S18PP340L5R**	0.250
			M12 connector	**XU2 S18PP340DR**	0.080
		90° to case axis	Pre-cabled L = 5 m	**XU2 S18PP340WL5R**	0.250
			M12 connector	**XU2 S18PP340WDR**	0.080

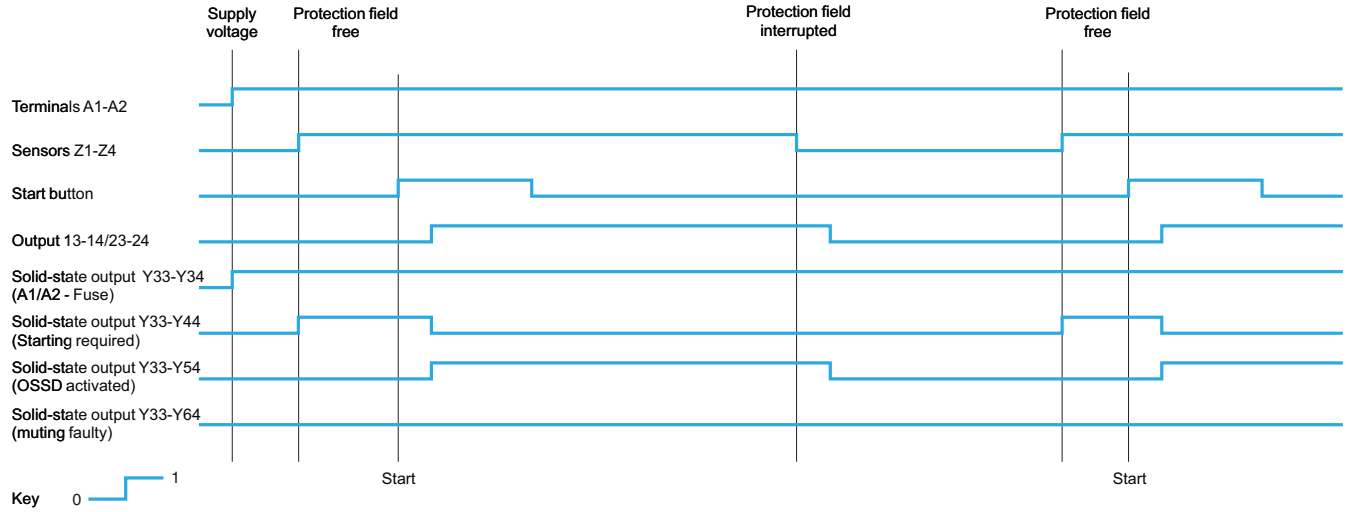
Other products Sensors available pre-cabled with other cable lengths. Please consult your Regional Sales Office.

Safety detection solutions

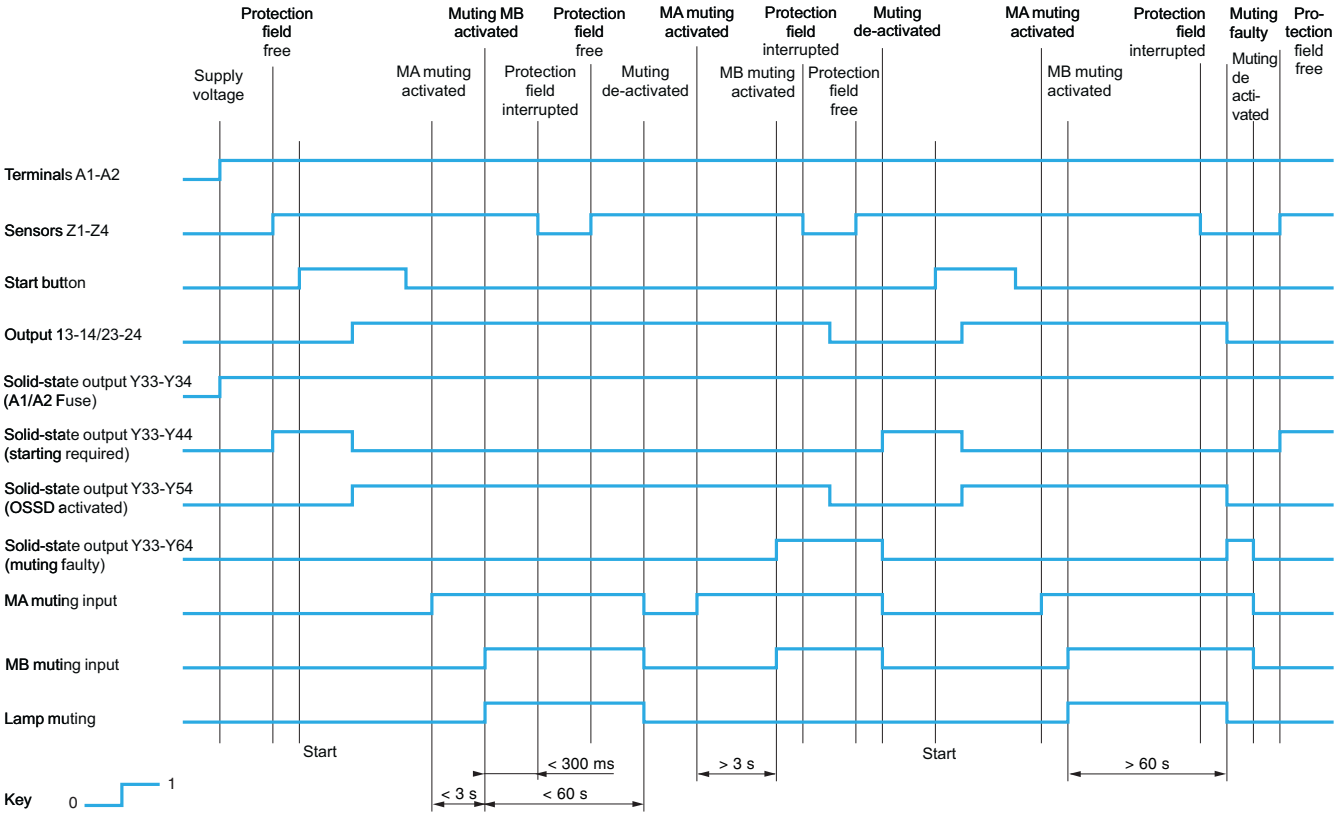
Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

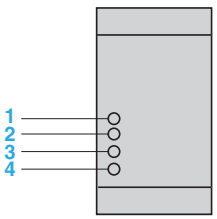
Functional diagram of XPS CM module



Functional diagram of the XPS CM module with “muting” function



Key to LEDs



1 A1-A2 supply voltage, electronic internal fuse status
2 Signalling for restarting
3 Safety output closed
4 Safety output open

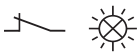
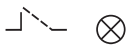
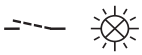
Principle: page 3/140
Characteristics: page 3/141
References: page 3/142
Connections: page 3/145

Safety detection solutions

Preventa safety modules and single-beam photo-electric sensors

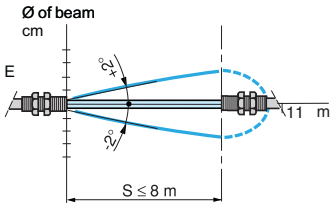
With a test input associated with a built-in “muting” function

Operation

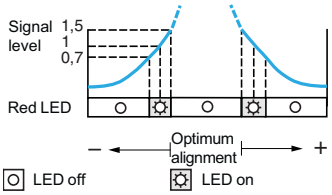
	Light switching		Dark switching	
	No object in beam	Object in beam	No object in beam	Object in beam
Output state (PNP) indicator, yellow LED (illuminated when sensor output is on)				

Curves

Infrared detection curve

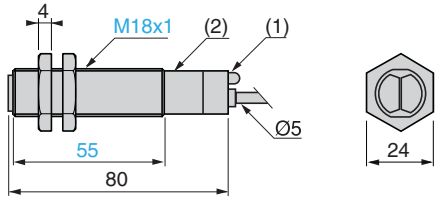


Functional check



Dimensions

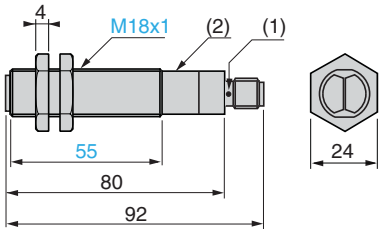
XU2 S18PP340L5, XU2 S18PP340L5L



(1) LED

(2) Potentiometer

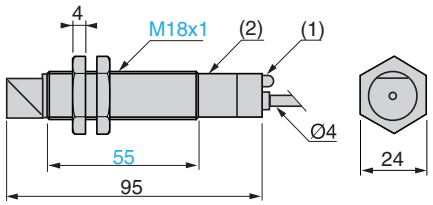
XU2 S18PP340D



Fixing nut tightening torque: 24 N.m

Connector tightening torque: 2 N.m

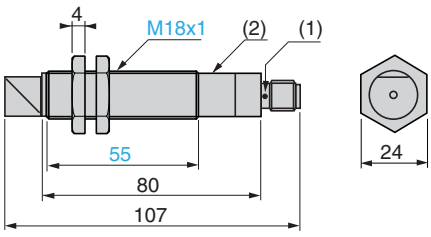
XU2 S18PP340WL5



(1) LED

(2) Potentiometer

XU2 S18PP340WD



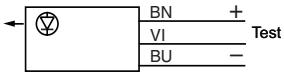
Fixing nut tightening torque: 24 N.m

Connector tightening torque: 2 N.m

Wiring schemes (3-wire ⎓)

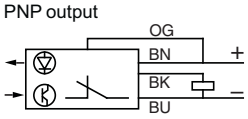
Cable connection

Transmitter



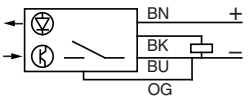
Receiver

Light switching (no object present). PNP output



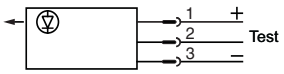
Receiver

Dark switching (no object present). PNP output



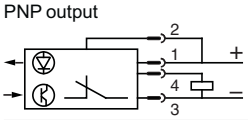
Plug-in connector

Transmitter



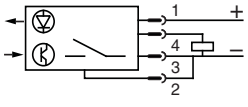
Receiver

Light switching (no object present). PNP output



Receiver

Dark switching (no object present). PNP output



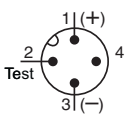
Cable connections

(–)	BU	(Blue)
(+)	BN	(Brown)
(OUT)	BK	(Black) (receiver)
(Prog.)	OG	(Orange) (receiver)
(Test)	VI	(Violet) (transmitter)

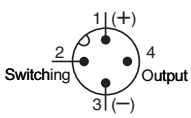
Connector schemes

Sensor connector pin view

Transmitter

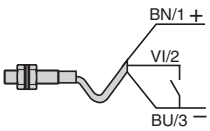


Receiver

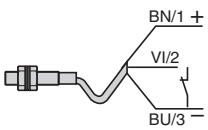


Beam break test (for transmitter only)

Beam made



Beam broken



Principle: page 3/140 | Characteristics: page 3/141 | References: page 3/142 | Functional diagrams: page 3/144

Safety detection solutions

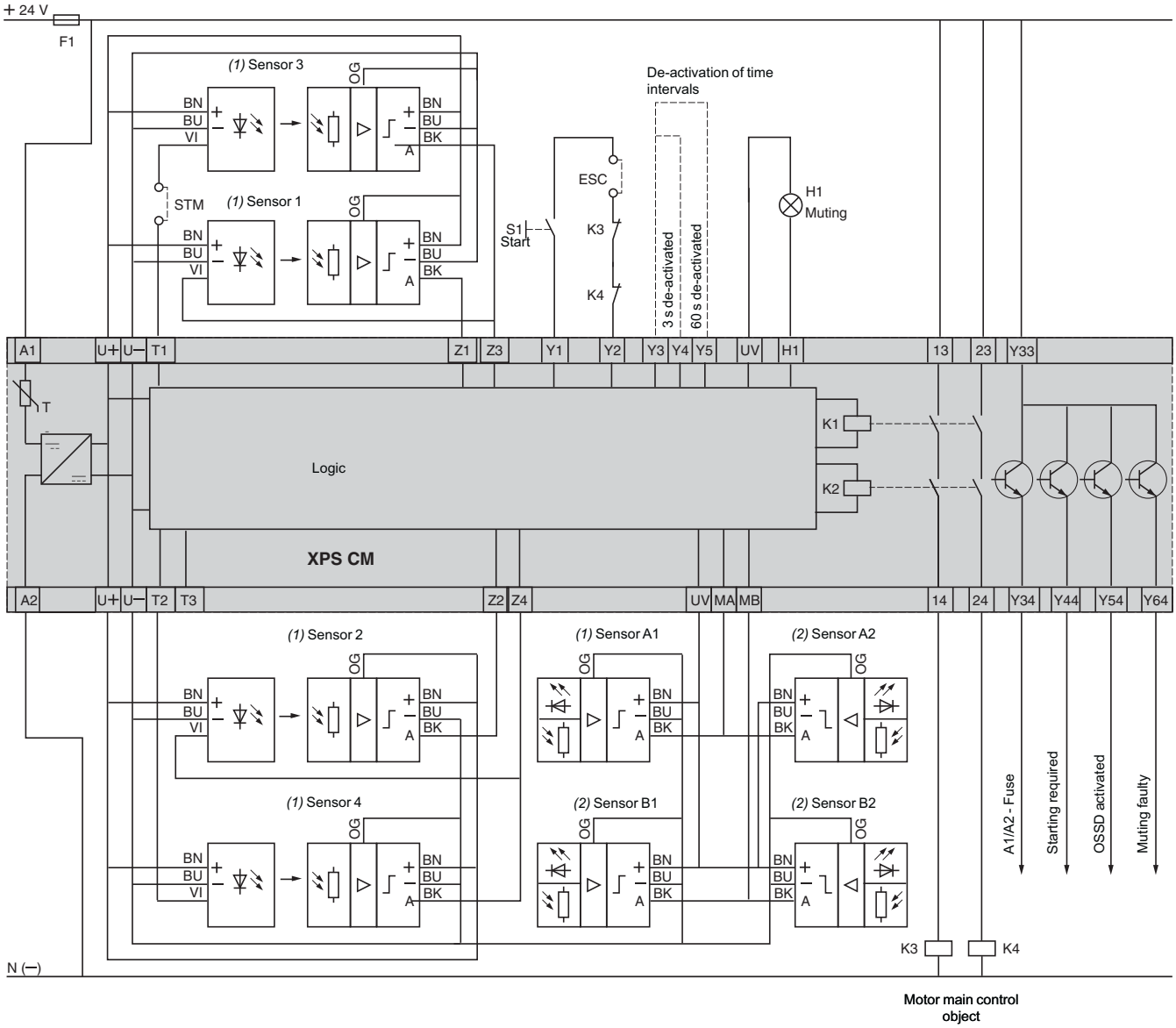
Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

ConnectionS

Connection of XPS CM module with 4 pairs of XU2 S single-beam sensors

(Connection of 1 to 4 pairs of XU2 S sensors to XPS CM, see page 3/147)



XU2 S sensors can be programmed for light switching or dark switching (dark switching with sensors 1 and 3 and light switching with sensors 2 and 4, for example).
ESC: external start conditions
Y1-Y2: return loop.
STM: for stopping time measurement.
(1) Protection field sensors
(2) Muting sensors

Safety detection solutions

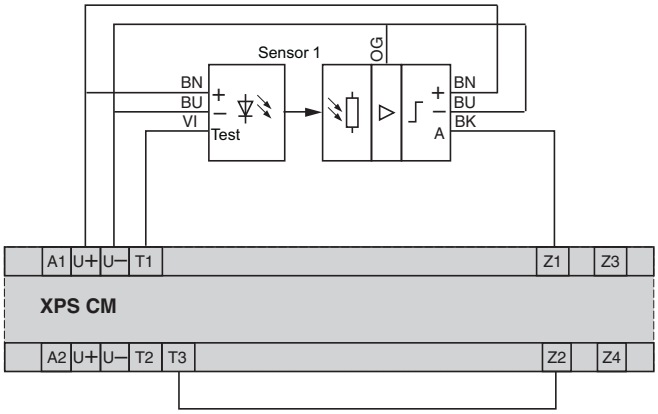
Preventa safety modules and single-beam photo-electric sensors

With a test input associated with a built-in “muting” function

Connections (continued)

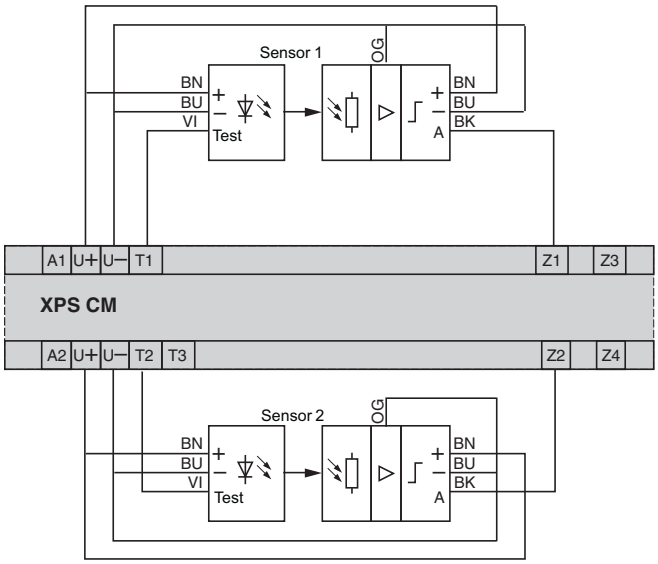
Connection of XPS CM module with 1 pair of XU2 S sensors

(dark switching)



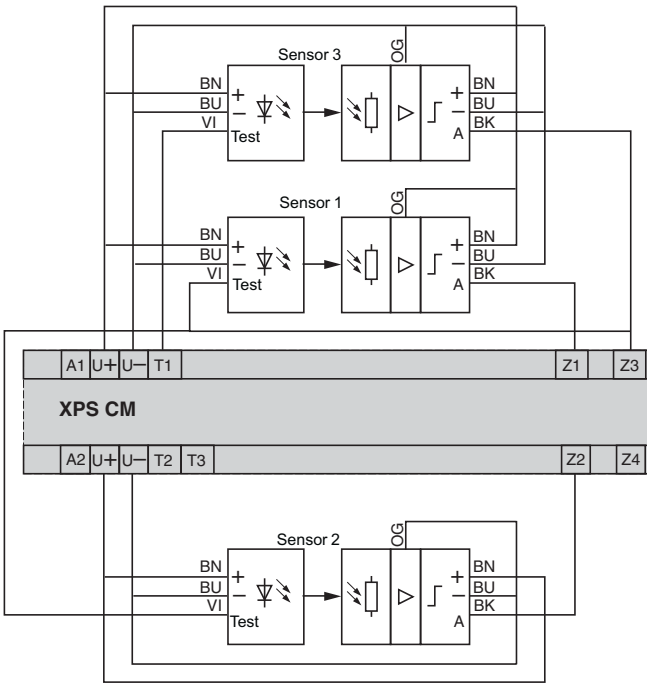
Connection of XPS CM module with 2 pairs of XU2 S sensors

(dark switching)



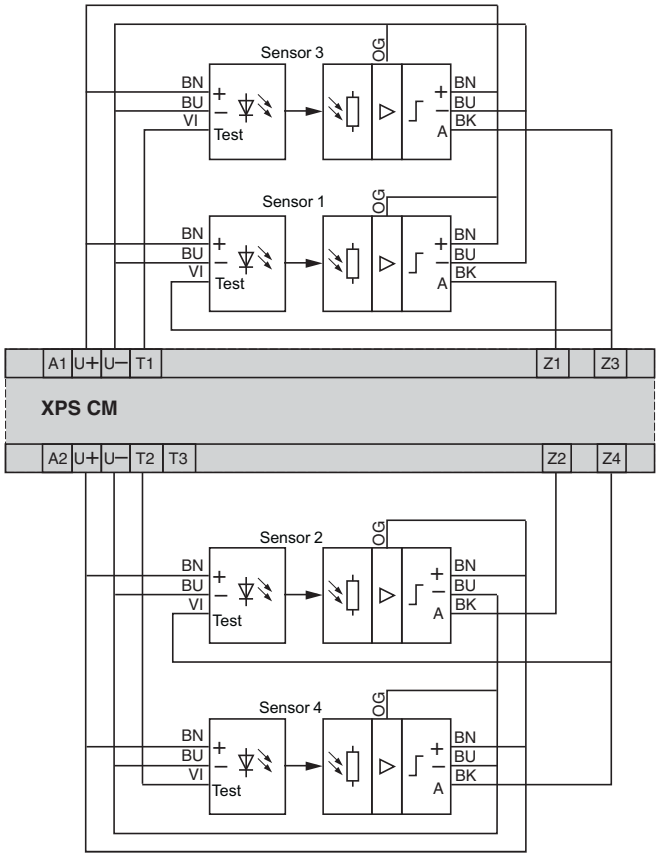
Connection of XPS CM module with 3 pairs of XU2 S sensors

(2 for dark switching, 1 for light switching)



Connection of XPS CM module with 4 pairs of XU2 S sensors

(2 for dark switching, 2 for light switching)



Safety dialogue solutions

Selection guide: Dialogue components *4/2*

Emergency stop trip wire switches type XY2 C *4/4*

Foot switches, Harmony type XPE. *4/14*

- Metal foot switches, Universal, Harmony types XPE M/R. *4/18*
- Plastic foot switches, Harmony types XPE A/B/G/Y *4/22*

Enabling switches for safety circuits. *4/26*

Two-hand ergonomic control stations with Harmony XB4 control units. *4/28*

Emergency Stop pushbuttons Ø 22

- Chromium plated metal bezel , XB4 . . . . . *4/34*
- Plastic bezel, XB5 . . . . . *4/38*

XAL control stations for emergency Stop pushbuttons Ø 22 . . . . . *4/42*

- Complete stations (screw clamp terminal connections). *4/43*
- Separate components for user assembly *4/44*

Beacons and indicator banks Ø 70 mm Universal, Harmony type XVB *4/46*

Complete Beacons

- For incandescent bulbs or LEDs (BA 15d base fitting). *4/50*
- With LED light source *4/51*
- With “flash” discharge tube *4/52*

Indicator banks Ø 70 mm (customer assembly)

- Illuminated units for incandescent bulbs or LEDs (BA 15d base fitting) *4/53*
- Illuminated units with integral LED. *4/54*
- Illuminated units with integral “flash” discharge tube *4/55*
- Audible units, base units, cover, accessories *4/56*

Accessories for beacons and indicator banks *4/57*

Rotating mirror beacons, type XVR *4/60*

Sirens, type XVS *4/62*

Safety dialogue solutions
Dialogue components

Applications	**Trip wire switches for:** - conveyor systems, - materials handling, machine tools, - electrical testing stations	**Foot switches for:** - bending machines, dosing machines, assembly stations, packaging machines, cutting presses, stamping presses, - machine tools (numerical control, lathes, milling machines, grinders, machining centres), - guillotines, cutters, folders, saws, - forging machines, rolling machines, cold metal forming machines		**Enabling grip switch for:** - robots, - machine tools, - labellers	**Ergonomic two-hand control stations for machine tool control**
	 813638_1	 561251	 521352	 530146	 825932_1
Features	Length of protected zone: 15 to 100 metres. Can be tripped by the operator at any point in the work zone	Metal, with or without protective cover. Single or double pedal	Plastic, with or without protective cover. Single pedal	Plastic enclosure	2 control pushbuttons and 1 Emergency stop pushbutton
Conformity to standards	**XY2 CH**, **XY2 CE**: EN/IEC 60947-5-1, EN/ISO 13850:2006, UL 508 and CSA C22-2 n° 14 (when specified H7) **XY2 CB**: EN/IEC 60947-5-1, EN/ISO 13850:2006, CSA C22-2 n° 14 (when specified H2)	Without protective cover: EN/IEC 60947-5-1, CSA C22-2 n° 14 With protective cover: NF E 09-031	**XPE B, G**: EN/IEC 60947-5-1, UL 508, CSA C22-2 n°14 **XPE A, Y**: EN/IEC 60947-5-1	EN/IEC 60947-1, EN/IEC 60947-5-1, EN/IEC 60204-1, cUL us 508, CSA C22-2 n° 14	EN/IEC 60947-5-1, EN 574/ISO 13851
Protective treatment	Special version, “TH”			Standard version, “TC”	
Ambient temperature					
For operation	- 25…+ 70 °C		**XPE B, G**: - 25…+ 70 °C **XPE A, Y**: - 25…+ 55 °C	- 10…+ 60 °C	- 25…+ 70 °C
For storage	- 40…+ 70 °C				
Electric shock protection conforming to EN/IEC 61140	Class I			Class II	Class I
Degree of protection conforming to EN/IEC 60529	**XY2 CH**, **XY2 CE**: IP 65 **XY2 CB**: enclosure IP 22, contact housing IP 65	IP 66, IP 669 (with protective cover)	**XPE B**, **G** : IP 66 **XPE Y** : IP 55 **XPE A** : IP 43	IP 66 IP 65 with pushbutton	IP 65
Positive operation conforming to EN/IEC 60947-5-1 Appendix K	N/C contacts with positive opening operation ⊖			2-contact, 3-position with positive opening operation	N/C contacts with positive opening operation
Rated insulation voltage	**XY2 CH**, **XY2 CE**: Ui = 400 V degree of pollution 3 conforming to EN/IEC 60947-1, Ui = 300 V conforming to UL 508, CSA C22-2 n° 14 **XY2 CB**: Ui = 500 V degree of pollution 3 conforming to EN/IEC 60947-1, Ui = 600 V conforming to CSA C22-2 n° 14	Ui = 500 V, degree of pollution 3 conforming to EN/IEC 60947-1, group C conforming to NF C 20-040 and VDE 0110 Ui = 300 V conforming to UL 508, CSA C22-2 n° 14		Ui = 250 V Ui = 125 V for pushbutton conforming to EN/IEC 60947-1	Ui = 600 V, degree of pollution 3 conforming to EN/IEC 60947-1
Rated impulse withstand voltage conforming to EN/IEC 60947-1	**XY2 CH**, **XY2 CE**: Uimp = 4 kV **XY2 CB:** Uimp = 6 kV	Uimp = 6 kV		Uimp = 2.5 kV	Uimp = 6 kV
Type references	**XY2 C**	**XPE M, XPE R**	**XPE A, XPE B, XPE G, XPE Y**	**XY2 AU**	**XY2 SB**
Pages	4/7	4/19	4/23	4/27	4/31

Emergency Stop pushbuttons for: - machine tools, - foundries, presses, - automobile industry	**Emergency Stop pushbuttons for:** - assembly and packaging machines, - paper, cardboard and woodworking machines, - food/beverage processing and chemical industries	**Control stations for:** - assembly and packaging machines, - paper, cardboard and woodworking machines, - food/beverage processing, chemical and automobile industries, mechanical presses	**Beacons and indicator banks**	**Rotating mirror beacons** for long distance signalling applications	**Sirens** for long distance signalling applications
					
Metal bezel and fixing collar	Plastic bezel and fixing collar	Plastic enclosure	Direct fixing or on support tube	Light source included: - halogen bulb 70 W or - incandescent bulb 25 W	Power - 106 db, single tone - 106 db, 2 tone
EN/IEC 60947-1, EN/IEC 60947-5-1, EN/IEC 60947-5-4, EN/IEC 60947-5-5, EN/ISO 13850:2006 and EN/IEC 60204-1 (trigger action and mechanical latching mushroom head pushbuttons), JIS C 4520, CSA C22-2 n° 14, UL 508			EN/IEC 60947-5-1, UL 508, CSA C22-2 n°14	EN/IEC 60947-1, EN/IEC 60947-5-1, UL 508, CSA C22-2-14	EN/IEC 60947-1, EN/IEC 60947-5-1
Standard version, “TH”			Standard version, “TC”		
- 25…+ 70 °C			See page 4/48	- 20…+ 50 °C	- 40…+ 50 °C
- 40…+ 70 °C					
Classe I	Classe II		Class I: mounted on support tube Class II: mounted directly	Class I	Class II: ∿ 120/230 V Class III: ⎓ 24 V
IP 66, IP 69K (head fitted with bellows ZBZ ●8) Nema type 4X and 12, 13			IP 65 (mounted on fixing base XVB Z0●) IP 66 (mounted directly on base unit)	IP 65	IP 40
N/C contacts with positive opening operation ⊖			–		
Standard single and double blocks with screw clamp terminals: Ui = 600 V, degree of pollution 3 Blocks for plug-in connector or Faston connectors: Ui = 250 V, degree of pollution 3 Standard blocks for printed circuit board connection: Ui = 250 V, degree of pollution 3 conforming to EN/IEC 60947-1			Ui = 250 V conforming to EN/IEC 60947-1		
Standard single and double blocks with screw clamp terminals: Uimp = 6 kV Blocks for plug-in connector: Uimp = 4 kV Standard blocks for printed circuit board connection: Uimp = 4 kV			Uimp = 4 kV		Uimp = 1.5 kV (⎓ 24 V), Uimp = 4 kV (∿ 120/230 V)

XB4 B	XB5 A	XAL K	XVB L, XVB C	XVR	XVS
4/35	4/39	4/43	4/50	4/61	4/63

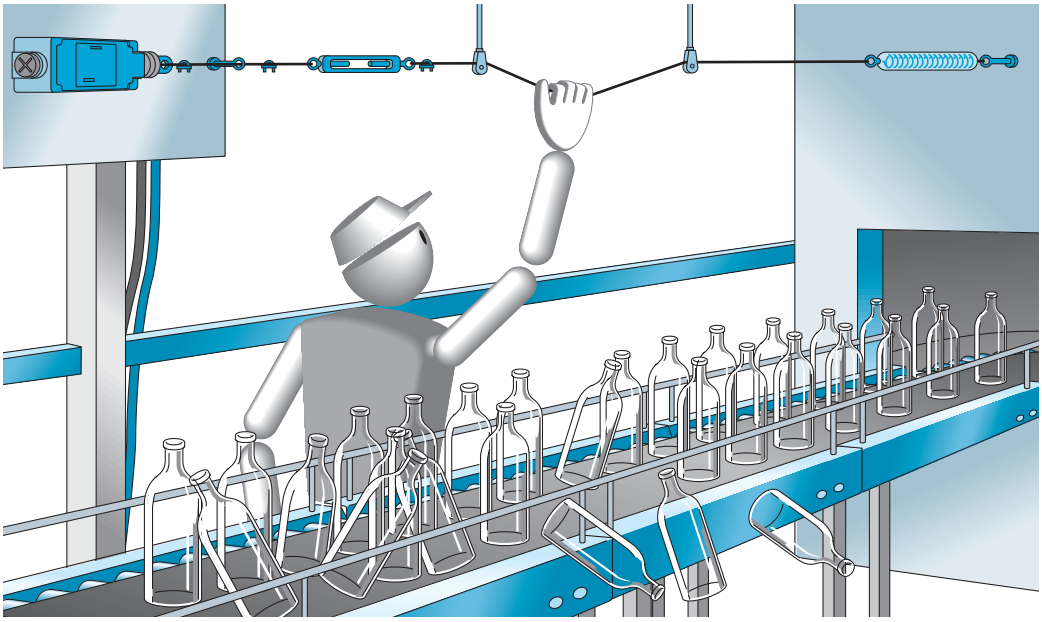
Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C

Presentation

Emergency stop trip wire switches

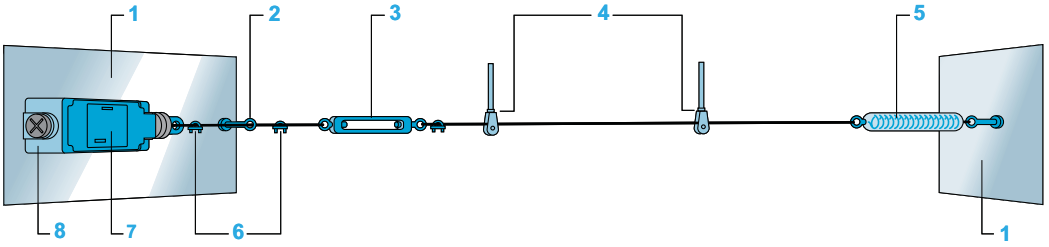
Emergency stop trip wire switches are designed to:
- avert hazards (dangerous phenomena) at the earliest possible moment, or to reduce risks which could cause injury to persons or damage either to machines or work in progress,
- be tripped by a single human action when a normal Emergency stop function is not available,
- trip in the event of the trip wire breaking.

Emergency stop trip wire switches are essential in premises and on machines that are potentially dangerous when in operation. The operator must be able to trigger the stop instruction at any point within their working area.
Application examples: woodworking machines, shears, conveyor systems, transfer machines, printing machines, textile machines, rolling mills, test laboratories, paint shops, surface treatment works.



Installation

Typical installation



1 Fixing support
2 First cable support
3 Turnbuckle
4 Pulley supports and pulleys
5 End spring
6 Cable grips
7 Switch adjustment
8 Emergency stop

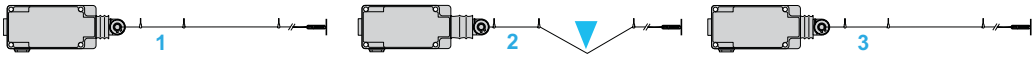
Notes regarding installation

- All XY2 CH/CE/CB trip wire switches can be fitted with a pilot light to indicate their tripped condition.
- Cable tension adjustment can be performed using:
  - a turnbuckle (to be ordered separately, see page 4/11),
  - a tensioner (integrated in certain XY2 CH models, see page 4/11),
  - a tensioner (to be ordered separately, see page 4/11) for mounting on XY2 CE models.
- This adjustment is simplified by:
  - a cable tension indicator that is available on all models XY2 CH,
  - the availability of versions with a “cable tension indicator” window by stating its reference on the order form (see page 4/10). Example: reference XY2 CE1A250 becomes XY2 CE1**D**250.
- The use of an end spring is strongly advised for conveyor system applications to ensure operation of the Emergency stop in the event of the cable being pulled towards the switch.
- It is essential that pulleys be used with trip wires that deviate from a straight run, i.e. angled to form a protected zone.
- Important: switches XY2 CB must not be used if the installation requires that the trip wire be angled. Switches XY2 CH and XY2 CE can be used if the installation requires that the trip wire be angled. In this case, the total sum of the angles through which the trip wire bends must not exceed 180° (For further information on instructions to be adhered to, please refer to the installation manual).

Characteristics: page 4/6
References: page 4/7
Dimensions: page 4/13

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C

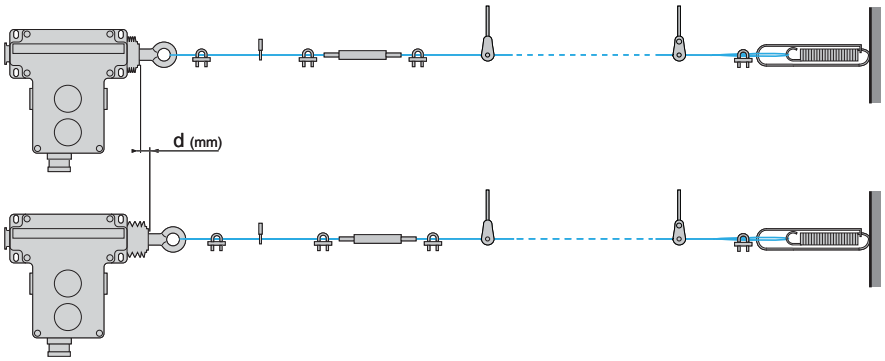
Main features



Positive operation: running condition	1	The switches incorporate positive opening operation contacts, the tripping of the switch being made with positive action.
Latching: stop instruction given (tripped)	2	The switch latches in the tripped position (N/C safety contact(s) open). The function of the N/O contact is purely for signalling.
Resetting: stop condition (awaiting reset/restart)	3	The switches incorporate a reset button, which re-closes the safety contact(s). Restarting of the machine must only be achieved by manual operation of a control device within the machine start circuit, remote to the trip wire switch.

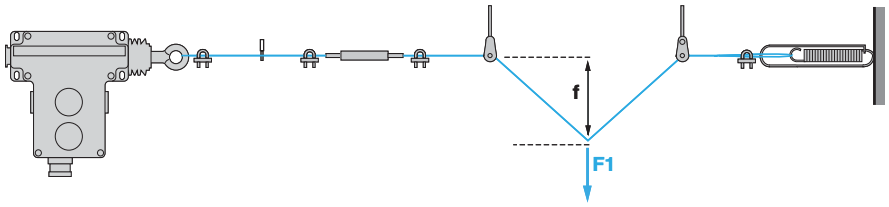
Trip wire expansion and contraction: d

Temperature variations likely to be encountered in the protected zone will obviously cause the trip wire to expand or contract.
To enable instant verification that the trip wire is at its correct tension (and for making any necessary adjustments), trip wire switches XY2 CH and XY2 CE incorporate a trip wire tension indicator.



Tripping force: F1
Tripping deflection: f

The tripping force F1 is the force necessary on the trip wire to cause the switch to trip.
The tripping deflection **f** is the distance that the trip wire has to be deflected from its taut position to the point at which the switch trips.



Adjustment values (with end spring)

For Emergency stop trip wire switches type XY2 CE: the adjustment values depend on the positions of the cam located inside the switch. Adjustment is made by rotating the cam after the switch has been installed.
Each notched position of the cam is referenced by the letters A to F, and the selected letter is visible through a viewing port.
Temperature range: < 25 °C.

Type	Position of cam	Max. length of cable	End spring	Average tripping deflection values f and tripping forces F1 for a distance of 5 m between cable supports and cable used							
				Force F1 (daN)				Deflection f (mm) for:			
				Standard		Light		Standard force		Light force	
				Cable Ø 3.2 mm	Cable Ø 5 mm	Cable Ø 3.2 mm	Cable Ø 5 mm	Cable Ø 3.2 mm	Cable Ø 5 mm	Cable Ø 3.2 mm	Cable Ø 5 mm
XY2 CH	–	15 m	XY2 CZ703	2.4	3	–	–	190	230	–	–
XY2 CE	A	50 m	XY2 CZ702	7	7	4	4.4	270	260	240	250
	B			8.6	8.4	4.4	4.8	300	280	250	270
	C			10.1	9.6	4.8	5.1	320	300	270	270
	D			11	10.2	4.6	5.3	330	320	280	280
	E			12.5	12.3	5.8	6	360	340	310	290
	F			14.4	13.3	6.4	6.6	390	360	330	320
XY2 CB	–	100 m	XY2 CZ702	4.5	–	–	–	325	–	–	–

Standards

Trip wire switches XY2 CH, XY2 CE and XY2 CB meet all the requirements of the harmonised European standard **EN/ISO 13850:2006**, relating to Emergency stop devices.
All the trip wire switches are CE marked and supplied with an EC declaration of conformity.

Characteristics: page 4/6
References: page 4/7
Dimensions: page 4/13

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C

Environment

Conformity to standards	Products	**XY2 CH**, **XY2 CE**: EN/IEC 60947-5-1, EN/ISO 13850:2006, UL 508 and CSA C 22-2 n° 14 (with suffix H7) **XY2 CB**: EN/IEC 60947-5-1, EN/ISO 13850:2006, CSA C 22-2 n° 14 (with suffix H2)
	Machine assemblies	**XY2 CH**, **XY2 CE**, **XY2 CB**: EN/IEC 60204-1, Machinery directive: 98/37/EC and 91/368/EEC, Work equipment directive: 89/655/EEC
Product certifications		**XY2 CH**: UL-CSA (with suffix H7), CCC *(1)* **XY2 CE**: UL-CSA A300-Q300 (with suffix H7), CCC *(1)* **XY2 CB**: CSA A600-Q600 (with suffix H2)
Protective treatment	Standard version	"TC"
	Special version	"TH"
Ambient air temperature	For operation	- 25…+ 70 °C
	For storage	- 40…+ 70 °C
Vibration resistance		**XY2 CH**: 10 gn (10…150 Hz) **XY2 CE**: 10 gn (10…300 Hz) conforming to EN/IEC 60068-2-6
Shock resistance		**XY2 CH, XY2 CE**: 50 gn (duration 11 ms) conforming to EN/IEC 60068-2-27
Electric shock protection		Class I conforming to EN/IEC 61140 and NF C 20-030
Degree of protection		**XY2 CH, XY2 CE**: IP 65 **XY2 CB**: enclosure IP 22, contact housing IP 65, conforming to EN/IEC 60529 and NF C 20-010
Mechanical life		**XY2 CH**, **XY2 CE** (Emergency stop), **XY2 CB**: 10 000 operating cycles
Length of protected zone (trip wire)		**XY2 CH**: ≤ 15 metres, **XY2 CE**: ≤ 50 metres, **XY2 CB**: ≤ 100 metres and ≤ 2 x 100 metres
Distance between cable supports		5 m
Cable entries		See dimensions, page 4/13.

Contact block characteristics

Rated operational characteristics	**XY2 CH**, **XY2 CE**: AC-15: A300 or Ue = 240 V, Ie = 3 A DC-13: Q600 or Ue = 250 V, Ie = 0.27 A conforming to EN/IEC 60947-5-1 Appendix A **XY2 CB**: AC-15: A600 or Ue = 600 V, Ie = 1.2 A DC-13: Q600 or Ue = 600 V, Ie = 0.1 A conforming to EN/IEC 60947-5-1 Appendix A
Nominal thermal current	10 A
Rated insulation voltage	**XY2 CH**, **XY2 CE**: Ui = 400 V degree of pollution 3 conforming to EN/IEC 60947-1, Ui = 300 V conforming to UL 508, CSA C22-2 n° 14 **XY2 CB**: Ui = 500 V degree of pollution 3 conforming to EN/IEC 60947-1, Ui = 600 V to CSA C22-2 n° 14
Rated impulse withstand voltage	**XY2 CH**, **XY2 CE**: Uimp = 4 kV, **XY2 CB**: Uimp = 6 kV conforming to EN/IEC 60947-1
Positive operation	N/C contact with positive opening operation conforming to EN/IEC 60947-5-1 Section 3
Contact operation	**XY2 CH**, **XY2 CE** (Emergency stop), **XY2 CB**: N/C + N/C or N/C + N/O slow break
Resistance across terminals	≤ 25 mΩ conforming to NF C 93-050 method A or EN/IEC 60255-7 category 3
Terminal referencing	Conforming to CENELEC EN 50013
Short-circuit protection	**XY2 CH, XY2 CE, XY2 CB**: 10 A cartridge fuse type gG (gl) conforming to EN/IEC 60269

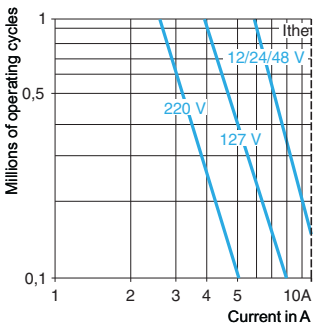
Rated operational power
(Electrical durability)

Operating rate: 3600 operating cycles/hour
Load factor: 0.5

XY2 CH, XY2 CE
Conforming to EN/IEC 60947-5-1 Appendix C
Utilisation categories AC-15 and DC-13

a.c. supply ∼ 50…60 Hz

Inductive circuit



Voltage	V	**24**	**48**	**120**
	W	15	23	30

XY2 CB
Conforming to EN/IEC 60947-5-1 Appendix C
Utilisation categories AC-15 and DC-13

a.c. supply ∼ 50…60 Hz

Power broken in VA *(1)*

Inductive circuit

Voltage	V	**24**	**48**	**127**	**220**
	VA	250	250	500	500

d.c. supply ⎓

Power broken in W *(1)*

Inductive circuit

Voltage	V	**24**	**48**	**120**
	W	50	100	100

(1) For 1 million operating cycles.

Contact connection	Screw clamp terminals Clamping capacity: min. 1 x 0.5 mm², max. 2 x 1.5 mm² Minimum tightening torque: 0.8 N.m Maximum tightening torque: 1.2 N.m

(1) Only products XY2 CH without pilot light and XY2 CE without pilot light or with 24, 48 or 130 V pilot light are CCC and UL-CSA approved.

General: page 4/4 References: page 4/7 Dimensions: page 4/13

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C


8030I5

XY2 CH13250

Latching Emergency stops
(integrated turnbuckle, cable and end spring to be ordered separately) *(1)*

Without pilot light

Length of cable	Colour of enclosure	Reset		Type of contact			Cable anchor point	Reference	Weight kg
⩽ **15 m**	Grey RAL 7032	By booted pushbutton	–	1	1	N/C + N/O slow break	RH side or LH side	**XY2 CH13250** *(3)*	0.865
		By mushroom head pushbutton	–	1	1			**XY2 CH13350** *(3)*	0.900
		By key operated pushbutton (key n° 421) *(2)*	–	1	1			**XY2 CH13450** *(3)*	0.910
		By flush pushbutton	–	2	–	N/C + N/C slow break	RH side or LH side	**XY2 CH13170** *(3)*	0.865
		By booted pushbutton	–	2	–			**XY2 CH13270** *(3)*	0.865
		By mushroom head pushbutton	–	2	–			**XY2 CH13370** *(3)*	0.865
		By key operated pushbutton (key n° 421) *(2)*	–	2	–			**XY2 CH13470** *(3)*	0.910
	Grey RAL 3000 *(4)*	By booted pushbutton	–	1	1	N/C + N/O slow break	RH side or LH side	**XY2 CH13258** *(3)*	0.865
				2	–	N/C + N/C slow break	RH side or LH side	**XY2 CH13278** *(3)*	0.865
With pilot light (direct supply)									
⩽ **15 m**	Grey RAL 7032	By booted pushbutton	24 V	1	1	N/C + N/O slow break	RH side or LH side	**XY2 CH13253**	0.900
				2	–	N/C + N/C slow break	RH side or LH side	**XY2 CH13273**	0.900


807506

XY2 CE1A250

Latching Emergency stops
(turnbuckle, cable and end spring to be ordered separately) *(1)*

Without pilot light

⩽ **50 m** *(5)*	Grey RAL 7032	By booted pushbutton	–	1	1	N/C + N/O slow break	RH side	**XY2 CE1A250** *(6)*	1.450
							LH side	**XY2 CE2A250** *(6)*	1.450
				2	–	N/C + N/C slow break	RH side	**XY2 CE1A270** *(6)*	1.450
							LH side	**XY2 CE2A270** *(6)*	1.450
		By key operated pushbutton (key n° 421) *(2)*	–	1	1	N/C + N/O slow break	RH side	**XY2 CE1A450** *(6)*	1.465
							LH side	**XY2 CE2A450** *(6)*	1.465
				2	–	N/C + N/C slow break	RH side	**XY2 CE1A470** *(6)*	1.470
							LH side	**XY2 CE2A470** *(6)*	1.470
With pilot light (direct supply)									
⩽ **50 m** *(5)*	Grey RAL 7032	By booted pushbutton	24 V, 48 V, 130 V (bulb not included)	2	2	N/C + N/O slow break	RH side	**XY2 CE1A296**	1.470
							LH side	**XY2 CE2A296**	1.470
			230 V (bulb not included)	2	2	N/C + N/O slow break	RH side	**XY2 CE1A297**	1.470
							LH side	**XY2 CE2A297**	1.470

Other versions

See order forms on pages 4/8 and 4/9.
XY2 CE with reset by Ø 40 mm mushroom head pushbutton or with integral cable tensioner and support.
Please consult your Regional Sales Office.

(1) See separate components, page 4/11.
(2) Ø 30 spring return, mushroom head, key operated pushbutton. Locking and key withdrawal in the rest (unactuated) position.
*(3) For ISO M20 threaded cable entry version, add H29 to the end of the reference selected. Example: **XY2 CH13250** becomes **XY2 CH13250H29**.*
(4) Only available on Emergency stop enclosures type XY2 CH1325● and XY2 CH1327● for standard, H29 and TK versions.
(5) Available with window for viewing cable tension indicator, for adjustment whilst the cover is closed (see versions XY2 CE●D●●● and XY2 CE●E●●● on the order form, page 4/10.
*(6) ATEX version available (products for explosive atmospheres). To order, add **EX** to the end of the reference. Example: **XY2 CE1A250** becomes **XY2 CE1A250EX**.*

4

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C



XY2 CB30

Latching Emergency stops
(end spring included, turnbuckle and cable to be ordered separately) *(1)*

Without pilot light

Length of cable	Colour of enclosure	Reset	Type of contact			Cable anchor point	Reference	Weight kg
⩽ **100 m**	Blue	From inside enclosure	1	1	N/C + N/O slow break	LH side	**XY2 CB10**	18.750
						RH side	**XY2 CB20**	18.750
			2	–	N/C + N/C slow break	LH side	**XY2 CB104**	18.750
						RH side	**XY2 CB204**	18.750
⩽ **2 x 100 m**	Blue	From inside enclosure	1	1	N/C + N/O slow break	RH and LH sides	**XY2 CB30**	29.250
			2	–	N/C + N/C slow break	RH and LH sides	**XY2 CB304**	29.250

With pilot light

Length of cable	Colour of enclosure	Reset	Supply voltage	Type of contact			Cable anchor point	Reference	Weight kg
■ **Direct supply**									
⩽ **100 m**	Blue	From inside enclosure	24 V	1	1	N/C + N/O slow break	LH side	**XY2 CB11**	19.550
							RH side	**XY2 CB21**	19.550
			48 V	1	1	N/C + N/O slow break	LH side	**XY2 CB12**	19.550
							RH side	**XY2 CB22**	19.550
⩽ **2 x 100 m**	Blue	From inside enclosure	24 V	1	1	N/C + N/O slow break	RH and LH sides	**XY2 CB31**	25.600
			48 V	1	1	N/C + N/O slow break	RH and LH sides	**XY2 CB32**	30.050
■ **Supply via integral transformer** *(2)*									
⩽ **100 m**	Blue	From inside enclosure	127 V/6 V	1	1	N/C + **N/O** slow break	LH side	**XY2 CB13**	15.600
							RH side	**XY2 CB23**	15.600
			220 V/6 V	1	1	N/C + N/O slow break	LH side	**XY2 CB14**	15.600
							RH side	**XY2 CB24**	15.600
⩽ **2 x 100 m**	Blue	From inside enclosure	127 V/6 V	1	1	N/C + N/O slow break	RH and LH sides	**XY2 CB33**	25.600
			220 V/6 V	1	1	N/C + N/O slow break	RH and LH sides	**XY2 CB34**	25.600

(1) See separate components, page 4/11. End spring XY2 CZ702 included.
(2) Bulb DL1 CB006 included.

General: page 4/4 Characteristics: page 4/6 Dimensions: page 4/13

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C

Complete units, pre-assembled

Customer			Schneider Electric Industries SA	
Company	Order N°	Delivery date	Sales office - Subsidiary Co.	Order N°

How to use this form:
- indicate the number of Emergency stop switches required,
- complete the basic reference.

Reference

Number of identical Emergency stops ☐ **XY2 CH** ☐☐☐☐☐☐☐

Model		
Emergency stop (latching)		**1**
Degree of protection		
IP 65 (standard bellows) without tensioner		**1**
IP 65 (silicone bellows) without tensioner		**2**
IP 65 (standard bellows) with integral tensioner		**3**
IP 65 (silicone bellows) with integral tensioner		**4**
Type of reset		
Emergency stop *(1)* Reset by spring return pushbutton	Flush	**1**
	Booted	**2**
	Mushroom head, Ø 30	**3**
	Key operated mushroom head, Ø 30 (key n° 421)	**4**
	Key operated mushroom head, Ø 30 (key n° 455)	**5**
	Key operated mushroom head, Ø 30 *(2)*	**9**
Contact block for Emergency stop function *(3)*		
Slow break	1 N/C + N/O (N/O staggered)	**5**
	1 N/C + N/C	**7**
Pilot light		
Without pilot light		**0**
With 24 V direct supply pilot light		**3**
With 48 V direct supply pilot light		**4**
With 130 V direct supply pilot light		**5**
With 230 V direct supply pilot light		**7**
1/2" NPT tapped cable entries		**H7** *(4)*
ISO M20 tapped cable entries		**H29**
Increased protective treatment against corrosion		**TK** *(5)*

(1) Opening of a circuit + mechanical latching in the open position.
(2) Other key numbers:

458A	520E	1242A	1243E	1344A	1422A	1431E
2123E	2132E					

(3) Emergency stop trip wire switches can only be fitted with slow break contact blocks.
(4) Only for versions without pilot light. For versions with pilot light, order an H4 version.
*(5) Protective treatment TK is only possible for switches with silicone bellows (**XY2 CH12●●●TK**, **XY2 CH14●●●H29TK**...).*

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C

Complete units, pre-assembled

Customer			Schneider Electric Industries SA	
Company	Order N°	Delivery date	Sales office - Subsidiary Co.	Order N°

How to use this form:
- indicate the number of Emergency stop switches required,
- complete the basic reference.

Reference

Number of identical Emergency stops: ☐ **XY2 CE** ☐ ☐ ☐ ☐ ☐ ☐ ☐

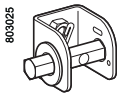
Model								
Emergency stop (latching)	Anchor point on RH side, standard force	**1**						
	Anchor point on LH side, standard force	**2**						
	Anchor point on RH side, light force	**5**						
	Anchor point on LH side, light force	**6**						
Degree of protection and "cable tension indicator" window								
IP 65 (standard bellows) without "cable tension indicator" window			**A**					
IP 65 (silicone bellows) without "cable tension indicator" window			**C**					
IP 65 (standard bellows) with "cable tension indicator" window			**D**					
IP 65 (silicone bellows) with "cable tension indicator" window			**E**					
Type of reset								
Emergency stop *(1)* Reset by spring return pushbutton	Flush			**1**				
	Booted			**2**				
	Mushroom head, Ø 30			**3**				
	Key operated mushroom head, Ø 30 (n° 421)			**4**				
	Key operated mushroom head, Ø 30 (n° 455)			**5**				
	Key operated mushroom head, Ø 30 *(2)*			**9**				
Contact block for Emergency stop function *(3)*								
Slow break	1 N/C + N/O				**5**			
	1 N/C + N/C				**7**			
	2 N/C + N/O (compulsory with pilot light) *(4)*				**9**			
Pilot light								
Without pilot light						**0**		
With 24-48-130 V direct supply pilot light. Bulb not included (provide for 2 contact blocks)						**6**		
With 230 V direct supply, via integral resistor, pilot light. Bulb included (provide for 2 contact blocks) *(5)*						**7**		
1/2" NPT tapped cable entries							**H7** *(6)*	
Increased protective treatment against corrosion								**TK** *(7)*

(1) Opening of N/C contact + mechanical latching in the open position.
(2) Other key numbers:

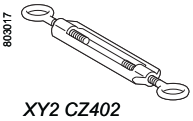
458A	520E	1242A	1243E	1344A	1422A	1431E
2123E	2132E					

(3) Emergency stop trip wire switches can only be fitted with slow break contact blocks.
(4) The use of a pilot light means selecting a switch fitted with 2 N/C + N/O contacts: XY2 CE●●●9.
(5) Replacement bulb: DL1 CE130.
(6) For versions with pilot light, order an H4 version.
*(7) Protective treatment TK is only possible for switches with silicone bellows (**XY2 CE●C●●●TK, XY2 CE●E●●●H7TK**...).*

Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C



XY2 CZ203



XY2 CZ402



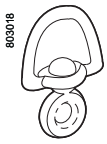
XY2 CZ503



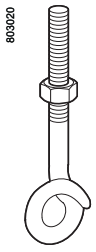
XY2 CZ524



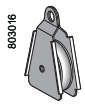
XY2 CZ601



XY2 CZ602



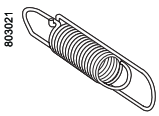
XY2 CZ705



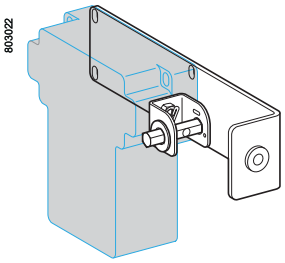
XY2 CZ708



XY2 CZ701



XY2 CZ702



XY2 CZ917

Separate components

Description	For use with	Diameter mm	Length m	Reference	Weight kg
Galvanised cables with red sheath	XY2 CH, XY2 CE and XY2 CB	3.2	10.5	**XY2 CZ301**	0.280
			15.5	**XY2 CZ3015**	0.410
			25.5	**XY2 CZ302**	0.690
			50.5	**XY2 CZ305**	1.360
			100.5	**XY2 CZ310**	2.700
	XY2 CH and XY2 CE	5	15.5	**XY2 CZ1015**	0.850
			25.5	**XY2 CZ102**	1.400
			50.5	**XY2 CZ105**	2.750
			100.5	**XY2 CZ110**	5.500

Description	Type	For use with	Sold in lots of	Unit reference	Weight kg
Tensioner	–	XY2 CE only	1	**XY2 CZ203**	0.09
Turnbuckles	M6 x 60 + locknut	All models *(1)*	1	**XY2 CZ402**	0.060
	M8 x 70 + locknut	All models *(1)*	1	**XY2 CZ404**	0.100
Cable grips	Single	Cable Ø 3 to 5 mm	10	**XY2 CZ503**	0.007
	Double	Cable Ø 3 to 5 mm	10	**XY2 CZ513**	0.016
	Clamp	Cable Ø 3.2 mm	10	**XY2 CZ523**	0.050
		Cable Ø 5 mm	10	**XY2 CZ524**	0.080
Cable supports	Fixed	All models	10	**XY2 CZ601**	0.030
	Swivelling	All models	1	**XY2 CZ602**	0.130
	Pulley support	XY2 CH and XY2 CE	1	**XY2 CZ705**	0.060
Pulley	Cable Ø 5 mm max.	XY2 CH and XY2 CE	1	**XY2 CZ708**	0.002
Cable end protectors		Cable Ø 3.2 mm	10	**XY2 CZ701**	0.002
		Cable Ø 5 mm	10	**XY2 CZ704**	0.010
End springs		XY2 CH	1	**XY2 CZ703**	0.035
		XY2 CE and XY2 CB	1	**XY2 CZ702**	0.080

Mounting kits

Contents	For use with	Cable diameter mm	Length of cable m	Reference	Weight kg
1 tensioner **XY2 CZ203** + 1 bracket	XY2 CE	–	–	**XY2 CZ917**	0.612
1 galvanised cable + 1 cable grip **XY2 CZ523** + 1 end spring **XY2 CZ703**	XY2 CH	3.2	10	**XY2 CZ9310**	0.415
			15	**XY2 CZ9315**	0.535
1 galvanised cable + 4 cable grips **XY2 CZ523** + 1 turnbuckle **XY2 CZ404** + 1 cable support **XY2 CZ601** + 3 cable end protectors **XY2 CZ701** + 1 end spring **XY2 CZ702**	XY2 CE	3.2	25	**XY2 CZ9325**	10
	XY2 CE and XY2 CB	3.2	50	**XY2 CZ9350**	1.980
1 galvanised cable + 4 cable grips **XY2 CZ524** + 1 turnbuckle **XY2 CZ404** + 1 cable support **XY2 CZ601** + 3 cable end protectors **XY2 CZ704** + 1 end spring **XY2 CZ702**	XY2 CE	5	25	**XY2 CZ9525**	1.905
			50	**XY2 CZ9550**	3.280

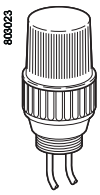
Documentation

Description	For use with	Reference	Weight kg
Installation manual	XY2 CH and XY2 CE	**XCOM2512**	0.200

(1) Emergency stop trip wire switches XY2 CH13●●● and XY2 CH14●●● incorporate a cable tensioner as standard. Therefore, there is no need to order a turnbuckle.

General: page 4/4 Characteristics: page 4/6 Dimensions: page 4/13

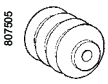
Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C



XY2 CZ●●●●



9001 KP3●R9



XY2 CZ901



XY2 CZ902

Replacement parts

Description	Type		Reference	Weight kg
Reset pushbutton (blue), spring return for XY2 CH and XY2 CE	Flush with “R” marked on push		**ZA2 BA639**	0.030
	Booted		**ZA2 BP6**	0.025
	Mushroom head, Ø 30		**ZA2 BC64**	0.045
	Key operated mushroom head, Ø 30 (key n° 421)		**ZA2 BS06212**	0.090
	Key operated mushroom head, Ø 30 (key n° 455)		**ZA2 BS062**	0.090
Keys for reset button	N° 421		**Q99900911**	0.006
	N° 455		**Q99900901**	0.006
Pilot light head assembly	Orange, for XY2 CH and XY2 CE		**ZA2 BV05**	0.015
Pilot light lens	Orange, for XY2 CH and XY2 CE		**ZB2 BV015**	0.003
Fixing nut	Black plastic nut for head ZA2 B		**ZA2 BZ901**	0.002
Fixing nut tightening tool	Black plastic socket wrench for fixing nut ZA2 BZ901		**ZA2 BZ901**	0.060
Pilot lights With bulb DL1 AA●●● included	Orange, for XY2 CH	24 V	**XY2 CZ0024** *(1)*	0.035
		48 V	**XY2 CZ0048** *(1)*	0.035
		130 V	**XY2 CZ0130** *(1)*	0.035
		230 V	**XY2 CZ0230** *(1)*	0.035
	Red, for XY2 CB	24 V	**9001 KP35R9**	0.134
		48 V	**9001 KP36R9**	0.134
		120 V	**9001 KP1R9**	0.210
		230 V	**9001 KP7R9**	0.210

Description	Type		Sold in lots of	Unit reference	Weight kg
Incandescent bulbs	Screw base fitting for XY2 CH	24 V - 6 W	10	**DL1 AA024**	0.004
		48 V - 6 W	10	**DL1 AA048**	0.004
		130 V - 6 W	10	**DL1 AA127**	0.004
		230 V - 6 W	10	**DL1 AA220**	0.004
	BA 9s base fitting for XY2 CE and XY2 CB	24 V - 2.6 W	10	**DL1 CE024**	0.002
		48 V - 2.6 W	10	**DL1 CE048**	0.002
	BA 9s base fitting for XY2 CE	130 V - 2.6 W	10	**DL1 CE130**	0.002
	BA 9s base fitting for XY2 CB 120 V and 230 V	6 V - 1.2 W	10	**DL1 CB006**	0.002
Packet of 5 collars	For mounting DL1 AA127 and DL1 AA220 bulbs in pilot lights XY2 CZ●●●		5	**XY2 CZ908**	0.018
Dust and damp protecting bellows	For XY2 CE	Polychloroprene	1	**XY2 CZ901**	0.017
		Silicone	1	**XY2 CZ904**	0.005
	For XY2 CH	Polychloroprene	1	**XY2 CZ902**	0.017
		Silicone	1	**XY2 CZ903**	0.005
Adaptor	For XY2 CB	ISO M20	5	**DE9 RP13520**	0.050

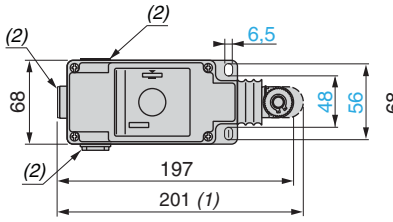
(1) Only for use as replacement parts for switches pre-fitted with pilot lights. CCC and UL-CSA approvals no longer apply if a pilot light XY2 CZ●●● is mounted on Emergency stops XY2 CH.

General: page 4/4 Characteristics: page 4/6 Dimensions: page 4/13

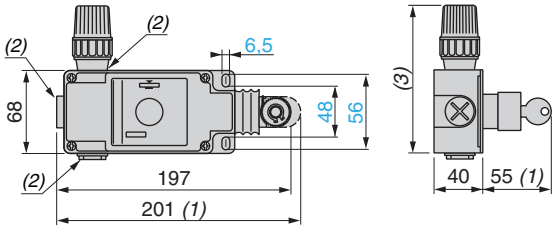
Safety dialogue solutions
Emergency stop trip wire switches, type XY2 C

XY2 CH

Without pilot light



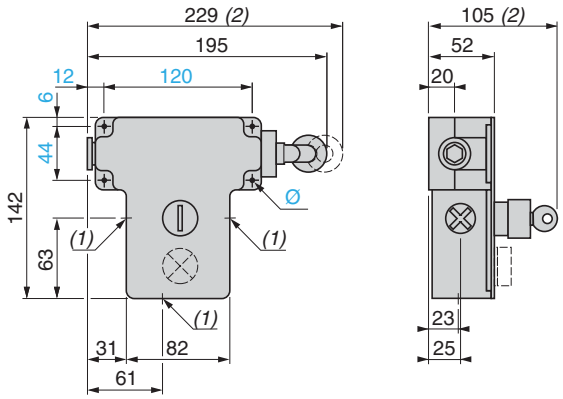
With pilot light



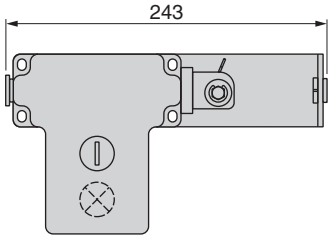
(1) Maximum extension.
*(2) Tapped entries for n° 13 (Pg 13.5) cable gland. For ISO M20 the reference becomes **XY2 CH●●●●●H29**.*
(3) 121 mm: 24 V and 48 V versions. 131 mm: 130 V and 230 V versions.

XY2 CE

XY2 CE●A●●●, XY2 CE●C●●●



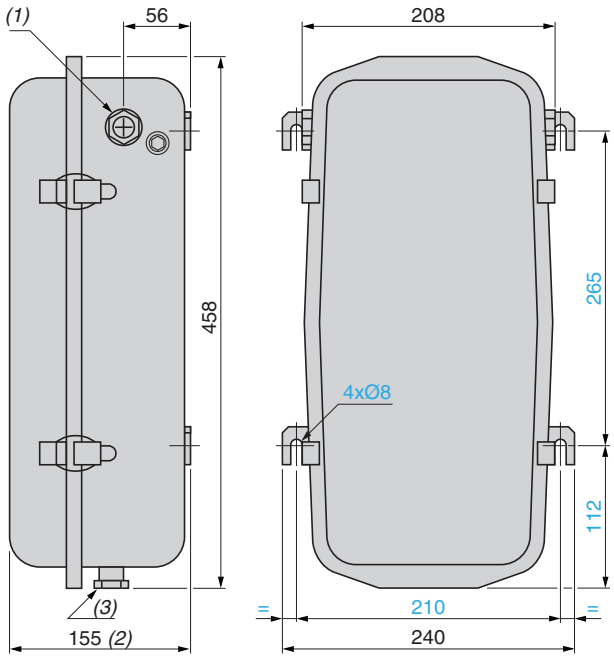
XY2 CE●A●●● + XY2 CZ917 (tensioner + bracket)



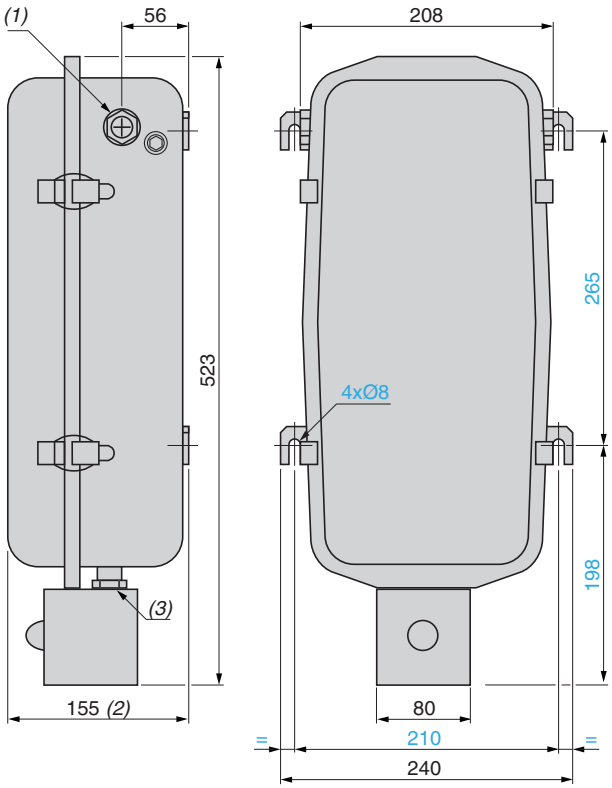
(1) 3 plain holes for n° 13 (Pg 13.5) or ISO M20 cable gland.
(2) Maximum extension.
Ø: 4 elongated holes Ø 6 mm.

XY2 CB

Without pilot light



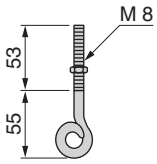
With pilot light



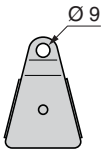
(1) 2 access points for operating cable.
(2) + 125 for opening cover.
(3) 1 tapped entry for n° 13 (Pg 13.5) cable gland. For ISO M20 use adaptor DE9 RP13520.

Accessories

XY2 CZ705



XY2 CZ708



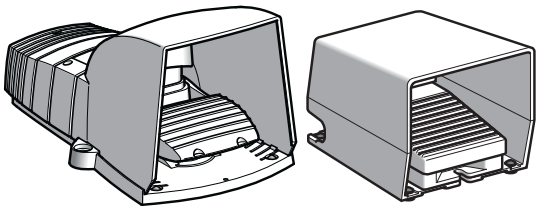
4

Safety dialogue solutions
Foot switches, Harmony type XPE

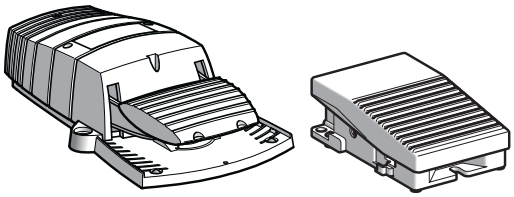
Presentation

Foot switches type XPE are an ideal solution for providing start and stop instructions for many types of industrial machines, running in various operating modes: normal (pulsed) start, inching, hold to run.

The range comprises metal case foot switches (heavy duty, high risk) complying to very strict regulations, and plastic case foot switches (light duty, low risk).



Fitted with a protective cover, the foot switches are for applications where, for each issuing of the start instruction, a high level of danger exists **(high risk)**.



Foot switches **without a protective cover** are suitable for applications where the issuing of the start instruction presents a **reduced level of danger**.

Contact

Switches incorporate snap action contacts with positive opening operation

The foot switches can incorporate **one or two N/C + N/O contact blocks**.

Positive opening operation on release of pedal: the hold down or return to the rest position of the pedal (machine stop) is positive acting.

Terminology

Positive opening operation

A switch meets this requirement when all its N/C contacts can be switched to the open position with certainty, i.e. there are no flexible links between the moving contacts and the actuator to which the operating force is applied.

All pedal operated foot switches incorporate a snap action N/C + N/O contact block with positive opening operation, and conform fully to standard IEC 60947-5-1 Section 3.

Snap action contact (quick break)

The displacement speed of the moving contacts is not related to the speed at which the contact actuator is operated. This feature gives consistent electrical performance, even when the contact actuator device is operated at low speeds.

Characteristics:
pages 4/18 and 4/22

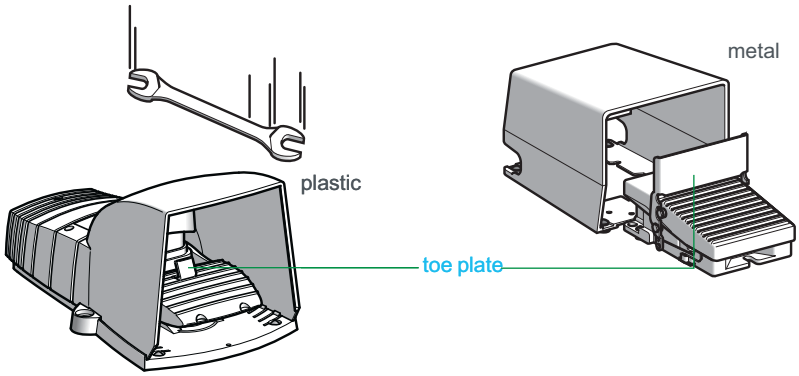
References:
pages 4/19 and 4/23

Dimensions:
pages 4/21 and 4/24

Safety dialogue solutions
Foot switches, Harmony type XPE

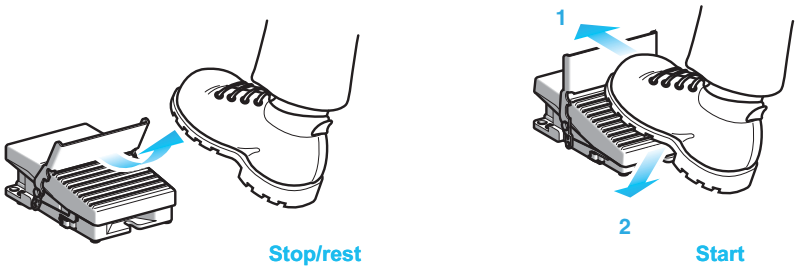
Start instructions

Foot switches XPE with protective cover are ideally suited for issuing a safety "Start" instruction for potentially dangerous machines.



The protective cover over the operating pedal avoids the risk of accidental operation, either by human action or by falling objects, which could result in unintentional starting of the machine.

A trigger mechanism **(toe plate)** enables locking of the pedal in the rest (released) position.

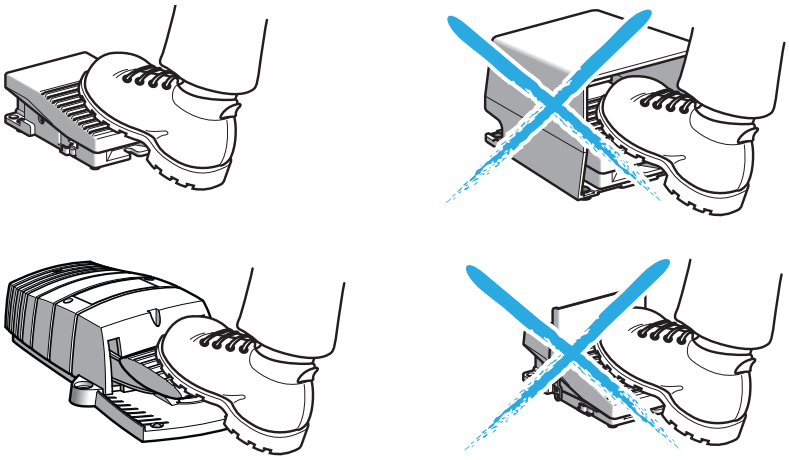


Positive action is required on the toe plate 1 before the pedal 2 can be depressed to start the machine.

On releasing the pedal to stop the machine, the trigger mechanism re-engages and locks the pedal in the rest position.

Normal stop instructions

All foot switches of the XPE range can be used for issuing a normal stop instruction to a machine.



Never use the protective cover nor the trigger mechanism for this type of application. Access to the stop control must be as unrestricted as possible and without any constraints.

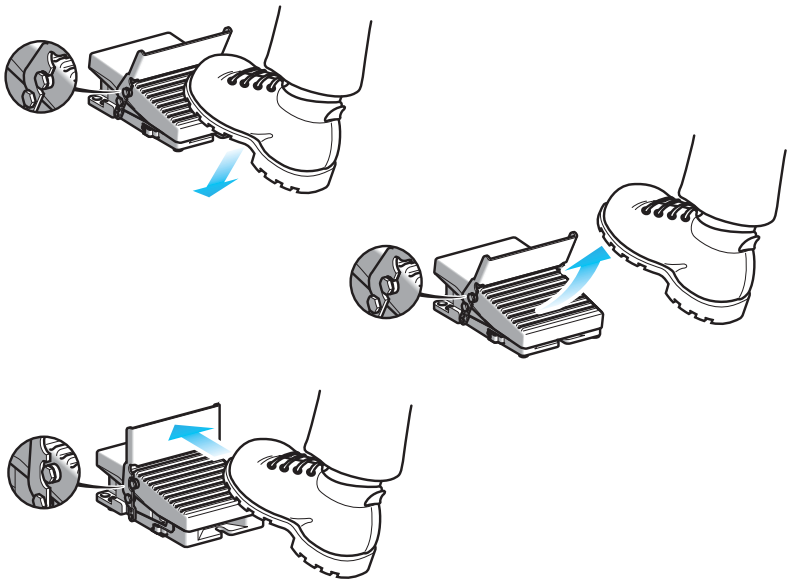
For machine stop instructions, use the N/C contact(s).

Characteristics: pages 4/18 and 4/22
References: pages 4/19 and 4/23
Dimensions: pages 4/21 and 4/24

Safety dialogue solutions
Foot switches, Harmony type XPE

Pedal latching device when depressed

Foot switches with pedal latching device are particularly suited for the control of “hold to run” machines and also, for adjustment operations.



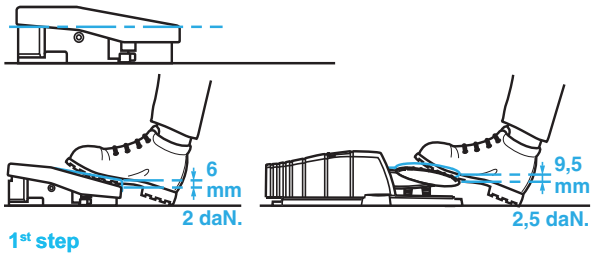
Pressing the pedal issues the machine start instruction and, when the pedal reaches its stop, it latches in the operated position.

Removing the foot from the pedal will not stop the “machine” cycle **(hold to run)**, the pedal remains latched.

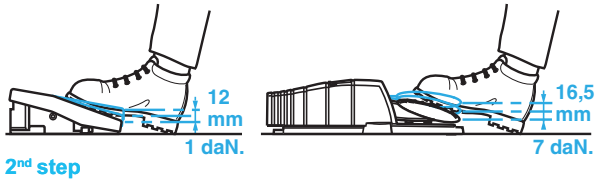
For issuing a normal stop instruction, the foot is replaced on the pedal and the toe plate operated: this returns the pedal to the rest position.

Switches with 2 step contact operation

Foot switches featuring 2 step contact operation are ideal for applications involving 2-speed machines.
Examples:
- **First speed: low (used for setting-up, adjustment or tool maintenance).**
- **Second speed: fast (normal machine operating speed).**



The first step, at 6 mm pedal travel and light foot pressure (2 daN), actuates a N/C + N/O contact block.



The second step, at maximum pedal travel (12 mm) and required foot pressure (9 daN), actuates a second N/C + N/O contact block.

Applications

Many types of machines are fitted with foot switches

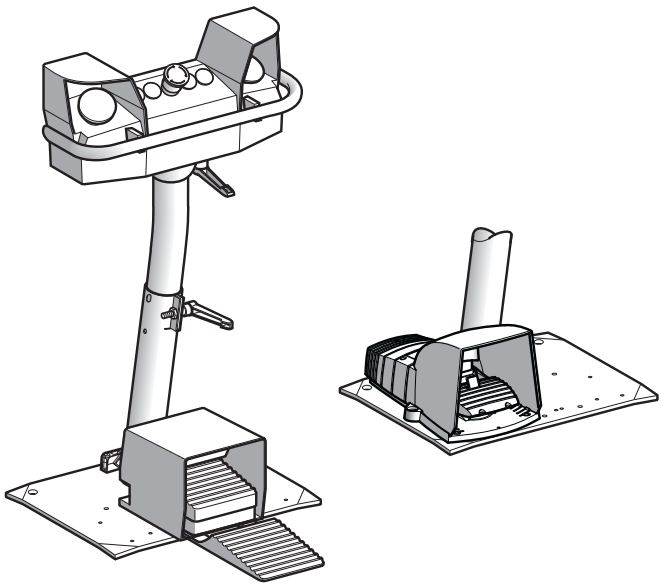
- Bending machine
- Dosing machine
- Assembly station
- Packaging machines
- Cutting presses, stamping presses
- Machine tools (numerical control, lathes, milling machines, grinders, machining centres)
- Guillotines, cutters, folders, saws
- Forging machines, rolling machines, cold metal forming machines

Characteristics: pages 4/18 and 4/22
References: pages 4/19 and 4/23
Dimensions: pages 4/21 and 4/24

Safety dialogue solutions
Foot switches, Harmony type XPE

Foot switches used in conjunction with two-hand control stations

Foot switches XPE can be mounted directly on the baseplate (without drilling additional fixing holes) of the pedestal XY2 SB90 for two-hand control stations XY2 SB7●.

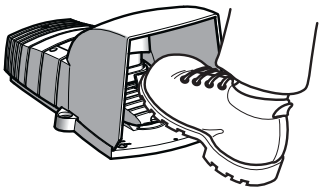


The baseplate of the two-hand control station pedestal XY2 SB90 is pre-drilled with fixing holes to suit the mounting of either:

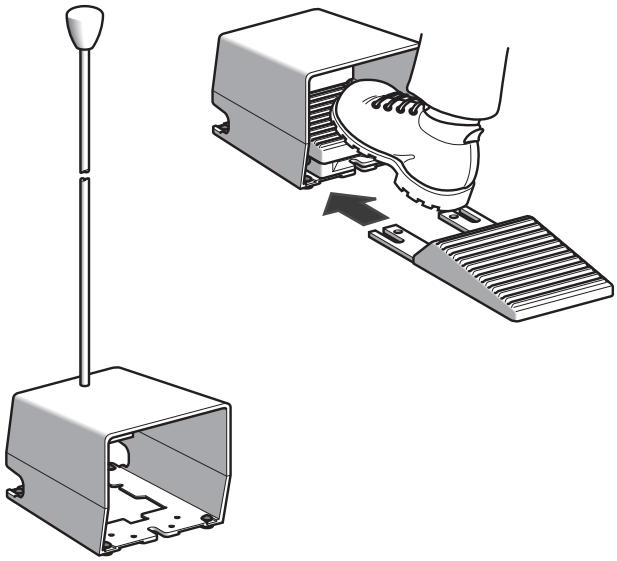
- One XPE foot switch, with or without protective cover.
- Two XPE R foot switches, each with its own protective cover or fitted with a common (double) cover.

Ergonomic

The protective cover is very strong and is sufficiently dimensioned to accommodate all types of footwear (large size, safety boots, etc.).



The foot switch is designed such that the operating pedal is close to the ground and at a comfortable angle.



Various accessories improve the working comfort for machine operators and help to avoid discomfort in the base of the spine due to unbalanced positioning of the pelvis:

- Heel rest (metal XPE).
- Hand grip for mounting on protective cover.

4

Characteristics: pages 4/18 and 4/22
References: pages 4/19 and 4/23
Dimensions: pages 4/21 and 4/24

Safety dialogue solutions
Metal foot switches, Universal, Harmony types XPE M/R

Environment

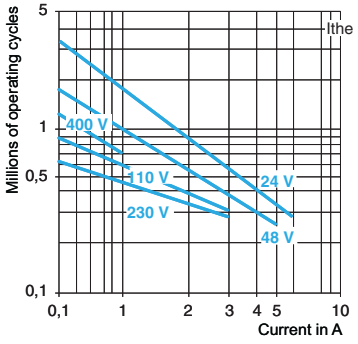
Conformity to standards	Without protective cover		EN/IEC 60947-5-1, CSA C22 2 n° 14 (if H2 specified)
	With protective cover		NF E 09-031
Product certifications	Standard version		FI, CSA A300 - Q300 with tapped entries for cable gland
	Special version		CSA A300 - Q300 with 1/2" NPT adaptor
Protective treatment	Standard version		"TC"
	Special version		"TH"
Ambient air temperature	For operation	**°C**	- 25…+ 70
	For storage	**°C**	- 40…+ 70
Vibration resistance			15 gn (10…500 Hz) conforming to IEC 60068-2-6
Shock resistance			20 gn conforming to IEC 60068-2-27 (150 gn conforming to NF E 09-031)
Electric shock protection			Class I conforming to EN/IEC 61140 and NF C 20-030
Mechanical life			15 million operating cycles
Degree of protection			IP 66 conforming to IEC 60529 and IP 669 conforming to NF C 20-010 (with protective cover)
Cable entries			See dimensions, page 4/21

Contact block characteristics

Rated operational characteristics	∼ AC-15		A300 or Ue = 240 V, Ie = 3 A
	⎓ DC-13		Q300 or Ue = 250 V, Ie = 0.27 A conforming to EN/IEC 60947-5-1 Appendix A
Rated insulation voltage		**V**	Ui = 500, degree of pollution 3 conforming to EN/IEC 60947-1, group C conforming to NF C 20-040 and VDE 0110
			Ui = 300 conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage		**kV**	Uimp = 6 conforming to EN/IEC 60947-1
Positive operation			N/C contact with positive opening operation conforming to EN/IEC 60947-5-1 Appendix K
Resistance across terminals		**mΩ**	≤ 25 conforming to NF C 93-050 method A or IEC 60255-7 category 3
Short-circuit protection			10 A cartridge fuse type gG (gI) conforming to EN/IEC 60947-5-1, VDE 0660-200
Foot switches with snap action contacts	Operational power		Conforming to EN/IEC 60947-5-1 Appendix C
	Utilisation categories		AC-15 and DC-13
	Operating rate		3600 operating cycles/hour. Load factor: 0.5

a.c. supply ∼ 50-60 Hz

⎓⎓ Inductive circuit



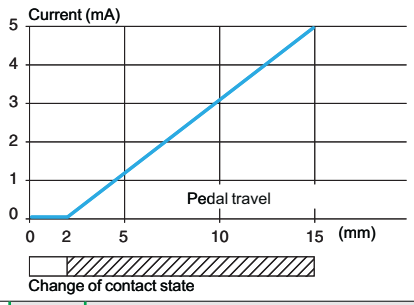
d.c. supply ⎓

Power broken in W for 5 million operating cycles

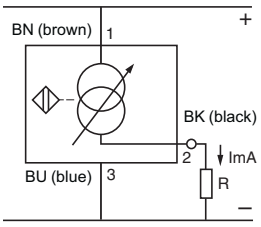
Voltage	V	24	48	120
⎓⎓	W	10	7	4

Foot switches with analogue output	Nominal supply voltage	**V**	⎓ 24…48
	Voltage limits	**V**	⎓ 19…58
	Current consumption, no-load	**mA**	4
	Output current drift (IS) in relation to temperature		0…+ 50 °C: + 2…- 6%
			- 25…+ 70 °C: + 2…- 12%

Output current curve



Wiring scheme



Connection	Screw clamp terminals		Maximum clamping capacity: 1 x 2.5 mm² or 2 x 1.5 mm² with or without cable end

General: page 4/14 References: page 4/19 Dimensions: page 4/21

Safety dialogue solutions
Metal foot switches, Universal, Harmony types XPE M/R



XPE M510



XPE R5100D



XPE M310



XPE R3100D

Single and double pedal foot switches with protective cover

Description	Pedal	Contact operation		Colour	Reference	Weight kg
Metal With trigger mechanism requiring positive action to allow pedal operation	Single	1 step	1 N/C + N/O	Blue	**XPE M510**	2.570
	Double	1 step	2 x 1 N/C + N/O	Blue	**XPE M5100D**	6.070
	Single	1 step	1 N/C + N/O	Orange	**XPE R510**	2.570
	Double	1 step	2 x 1 N/C + N/O	Orange	**XPE R5100D**	6.070
	Single	1 step	2 N/C + N/O	Blue	**XPE M511**	2.590
	Double	1 step	2 x 2 N/C + N/O	Blue	**XPE M5110D**	6.090
	Single	1 step	2 N/C + N/O	Orange	**XPE R511**	2.590
	Double	1 step	2 x 2 N/C + N/O	Orange	**XPE R5110D**	6.090
	Single	2 step	2 N/C + N/O	Blue	**XPE M711**	2.590
				Orange	**XPE R711**	2.590
	Single	1 step with analogue output	2 N/C + N/O	Blue	**XPE M529**	2.600
				Orange	**XPE R529**	2.600
Metal Without trigger mechanism	Single	1 step	1 N/C + N/O	Blue	**XPE M310**	2.400
	Double	1 step	2 x 1 N/C + N/O	Blue	**XPE M3100D**	5.900
	Single	1 step	1 N/C + N/O	Orange	**XPE R310**	2.400
	Double	1 step	2 x 1 N/C + N/O	Orange	**XPE R3100D**	5.900
	Single	1 step	2 N/C + N/O	Blue	**XPE M311**	2.420
	Double	1 step	2 x 2 N/C + N/O	Blue	**XPE M3110D**	5.920
	Single	1 step	2 N/C + N/O	Orange	**XPE R311**	2.420
	Double	1 step	2 x 2 N/C + N/O	Orange	**XPE R3110D**	5.920
	Single	1 step latching	1 N/C + N/O	Blue	**XPE M410**	2.400
				Orange	**XPE R410**	2.420
	Single	2 step	2 N/C + N/O	Blue	**XPE M611**	2.420
				Orange	**XPE R611**	2.420
	Single	1 step with analogue output	2 N/C + N/O	Blue	**XPE M329**	2.420
	Double	2 step + 1 step	2 x 1 N/C + N/O + 1 N/C + N/O	Blue	**XPE M6210D**	5.900

General: page 4/14 Characteristics: page 4/18 Dimensions: page 4/21

Safety dialogue solutions
Metal foot switches, Universal, Harmony types XPE M/R



XPE R810



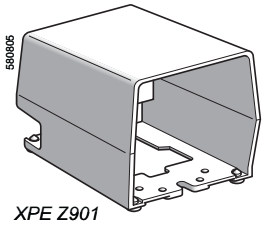
XPE M110

Foot switches without protective cover

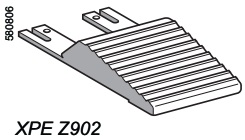
Description	Contact operation		Colour	Reference	Weight kg
Metal With trigger mechanism requiring positive action to allow pedal operation	1 step	1 N/C + N/O	Blue	**XPE M810**	1.200
			Orange	**XPE R810**	1.200
		2 N/C + N/O	Blue	**XPE M811**	1.220
			Orange	**XPE R811**	1.220
	2 step	2 N/C + N/O	Blue	**XPE M911**	1.220
			Orange	**XPE R911**	1.220
	Analogue output	2 N/C + N/O	Blue	**XPE M929**	1.220
			Orange	**XPE R929**	1.220
Metal Without trigger mechanism	1 step	1 N/C + N/O	Blue	**XPE M110** *(1)*	1.200
			Orange	**XPE R110** *(1)*	1.200
		2 N/C + N/O	Blue	**XPE M111** *(1)*	1.220
			Orange	**XPE R111** *(1)*	1.220
	2 step	2 N/C + N/O	Blue	**XPE M211** *(1)*	1.220
			Orange	**XPE R211** *(1)*	1.220
	Analogue output	2 N/C + N/O	Orange	**XPE R229**	1.220

Accessories

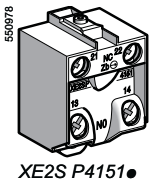
Description	For use with	Unit reference	Weight kg
Single protective cover	XPE M	**XPE Z901**	1.200
	XPE R	**XPE Z911**	1.200
Double protective cover	XPE M	**XPE Z921**	1.200
	XPE R	**XPE Z931**	1.200
Hand grip for protective cover	XPE Z901 or XPE Z911	**XPE Z913**	0.450
Heel rest	XPE M	**XPE Z902**	0.240
	XPE R	**XPE Z912**	0.240
Trigger mechanism	XPE M or XPE R	**XPE Z903**	0.170
Latching device (replacement for foot switches with this feature)	XPE M or XPE R	**XPE Z904**	0.170
Cable clamp	XPE M or XPE R	**XPE Z905**	0.010
Contact blocks Snap action	1 step switches: 1st or 2nd N/C + N/O 2 step switches: 1st N/C + N/O	**XE2S P4151**	0.020
	2 step switches: 2nd N/C + N/O	**XE2S P4151B**	0.020
ISO M20 adaptor (Sold in lots of 5)	XPE M or XPE R	**DE9 RA1620**	0.050



XPE Z901



XPE Z902



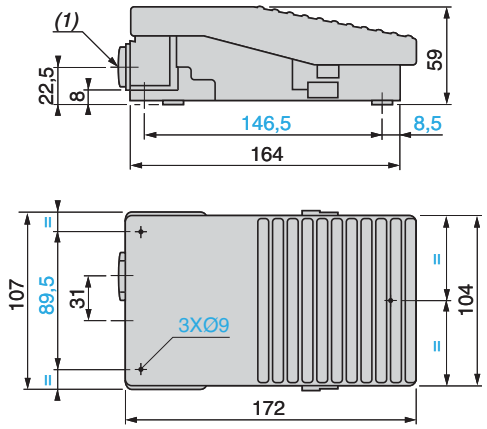
XE2S P4151●

*(1) To order an ATEX D version of the product (protection against dust), add **EX** to the end of the reference. Example: **XPE M110EX**.*

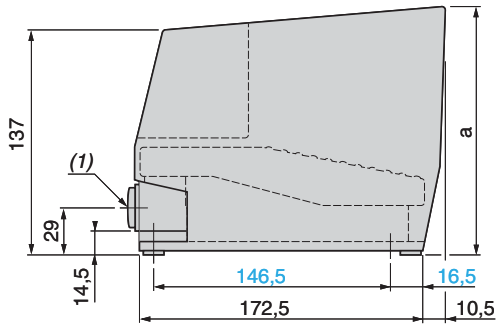
General: page 4/14 Characteristics: page 4/18 Dimensions: page 4/21

Safety dialogue solutions
Metal foot switches, Universal, Harmony types XPE M/R

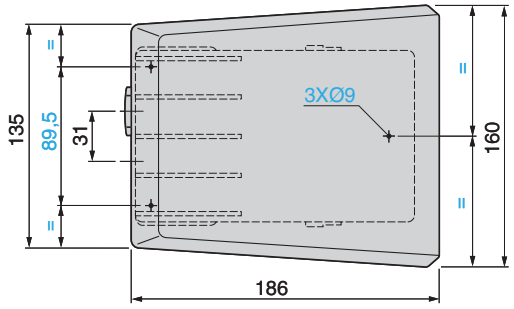
XPE M, XPE R without protective cover



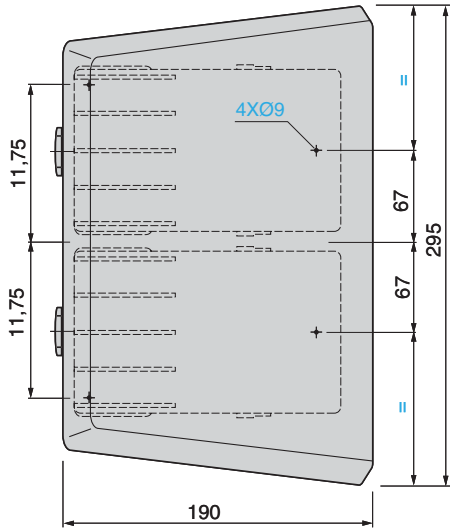
XPE M, XPE R with protective cover



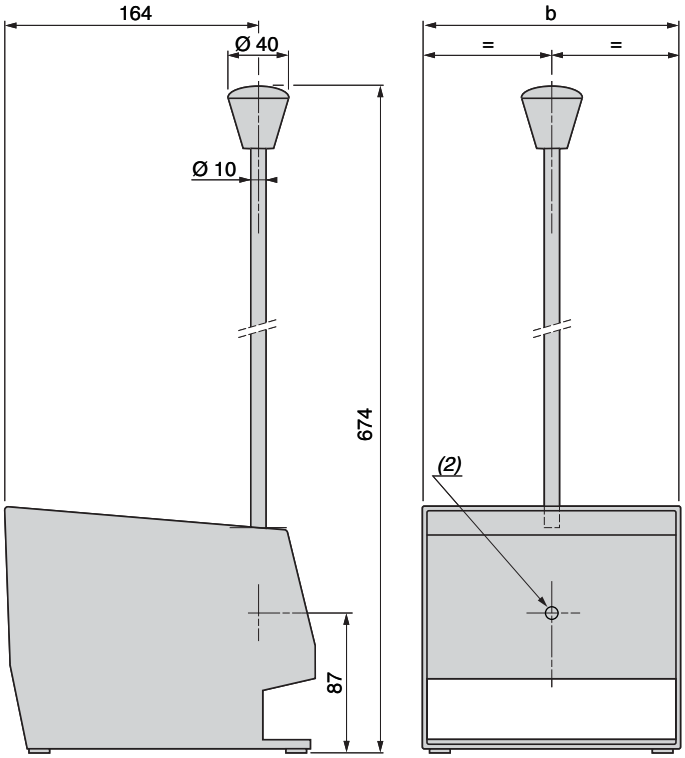
Single



Double



XPE Z913



	a	b
Single pedal	152	160
Double pedal	155	295

(1) 2 tapped entries for n° 16 (Pg 16) cable gland. For ISO M20, use adaptor DE9 RA1620.
(2) 1 Ø 6 plain hole.

Safety dialogue solutions
Plastic foot switches, Harmony types XPE A/B/G/Y

Environment

Conformity to standards			**XPE A, XPE B, XPE G, XPE Y** without protective cover: IEC/EN 60947-5-1 **XPE B, XPE G**: UL 508, CSA C22-2 n° 14
			XPE B, XPE G with protective cover: NF E 09-031
Product certifications	Standard version		**XPE B, XPE G**: UL, CSA A300 - Q300 with knock-out entries for ISO M20 cable gland
Protective treatment	Standard version		"TH"
Ambient air temperature	For operation	**°C**	**XPE B, XPE G**: - 25…+ 70 **XPE A, XPE Y**: - 25…+ 55
	For storage	**°C**	- 40…+ 70
Vibration resistance	Conforming to IEC 60068-2-6		5 gn (10…500 Hz)
Shock resistance	Conforming to IEC 60068-2-27		**XPE A**: 25 gn, **XPE B, XPE G, XPE Y**: 30 gn
Electric shock protection	Conforming to IEC/EN 61140 and NF C 20-030		Class II
Mechanical life			**XPE A**: 2 million operating cycles **XPE Y**: 5 million operating cycles **XPE B, XPE G**: 10 million operating cycles
Degree of protection			**XPE A**: IP 43 conforming to IEC 60529 **XPE Y**: IP 55 conforming to IEC 60529
			XPE B, XPE G: IP 66 conforming to IEC 60529
Cable entries			See dimensions, pages 4/24 and 4/25

Contact block characteristics

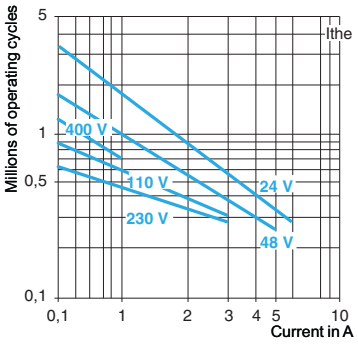
Rated operational characteristics			∼ AC-15; A 300 or Ue = 240 V, Ie = 3 A
			⎓ DC-13; Q 300 or Ue = 250 V, Ie = 0.27 A conforming to IEC/EN 60947-5-1 Appendix A
Rated insulation voltage			Ui = 500 V degree of pollution 3 conforming to IEC/EN 60947-1, group C conforming to NF C 20-040 and VDE 0110
			Ui = 300 V conforming to UL 508, CSA C22-2 n° 14
Rated impulse withstand voltage			Uimp = 6 kV conforming to IEC/EN 60947-1
Positive operation			N/C contact with positive opening operation conforming to IEC/EN 60947-5-1 Appendix K
Resistance across terminals			≤ 25 mΩ conforming to NF C 93-050 method A or IEC 60255-7 category 3
Short-circuit protection			10 A cartridge fuse type gG (gI) conforming to IEC/EN 60947-5-1, VDE 0660-200

Operational power
conforming to IEC/EN 60947-5-1 Appendix C

Foot switches with snap action contacts

Utilisation categories AC-15 and DC-13
Operating rate: 3600 operating cycles/hour
Load factor: 0.5

a.c. supply ∼ 50-60 Hz
⎓ Inductive circuit



d.c. supply ⎓

Power broken in W for 5 million operating cycles				
Voltage	V	24	48	120
⎓	W	10	7	4

Connection			Screw clamp terminals
			Maximum clamping capacity: 1 x 2.5 mm² or 2 x 1.5 mm² with or without cable end

General: page 4/14 References: page 4/23 Dimensions: page 4/24

Safety dialogue solutions
Plastic foot switches, Harmony types XPE A/B/G/Y



XPE ●510



XPE ●310



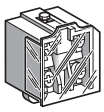
XPE G810



XPE ●110



XPE A110



XE2S P4151

Single pedal foot switches with protective cover

Description	Contact operation		Housing colour	Reference	Weight kg
With trigger mechanism requiring positive action to allow pedal operation	1 step	1 N/C + N/O	Yellow	**XPE Y510** *(1)*	0.700
			Blue	**XPE B510**	0.700
			Grey	**XPE G510**	0.700
		2 N/C + N/O	Yellow	**XPE Y511** *(1)*	0.700
			Blue	**XPE B511**	0.700
			Grey	**XPE G511**	0.700
	2 step	2 N/C + N/O	Yellow	**XPE Y711** *(1)*	0.700
			Blue	**XPE B711**	0.700
			Grey	**XPE G711**	0.700
Without trigger mechanism	1 step	1 N/C + N/O	Yellow	**XPE Y310**	0.690
			Blue	**XPE B310**	0.690
			Grey	**XPE G310**	0.690
		2 N/C + N/O	Yellow	**XPE Y311** *(1)*	0.690
			Blue	**XPE B311**	0.690
			Grey	**XPE G311**	0.690
	2 step	2 N/C + N/O	Yellow	**XPE Y611** *(1)*	0.690
			Blue	**XPE B611**	0.690
			Grey	**XPE G611**	0.690

Foot switches without protective cover

Description	Contact operation		Housing colour	Reference	Weight kg
With trigger mechanism requiring positive action to allow pedal operation	1 step	1 N/C + N/O	Grey	**XPE G810**	0.580
	2 step	2 N/C + N/O	Grey	**XPE G911**	0.580
Without trigger mechanism	1 step	1 N/C + N/O	Yellow	**XPE Y110** *(1)*	0.570
			Blue	**XPE B110**	0.570
			Grey	**XPE G110**	0.570
			Black	**XPE A110**	0.275
		2 N/C + N/O	Blue	**XPE B111**	0.570
			Grey	**XPE G111**	0.570
			Black	**XPE A111**	0.295
	2 step	2 N/C + N/O	Yellow	**XPE Y211** *(1)*	0.570
			Blue	**XPE B211**	0.570
			Grey	**XPE G211**	0.570

Accessories for foot switches, with or without protective cover

Description	For use with	Sold in lots of	Unit reference	Weight kg
M20 x 1.5 cable gland	Cable Ø 5…10 mm	5	**DE9RA200612**	0.014
	Cable Ø 7…13 mm	5	**DE9RA201014**	0.014
Contact blocks, snap action	1 or 2 step switches	1	**XE2S P4151**	0.020

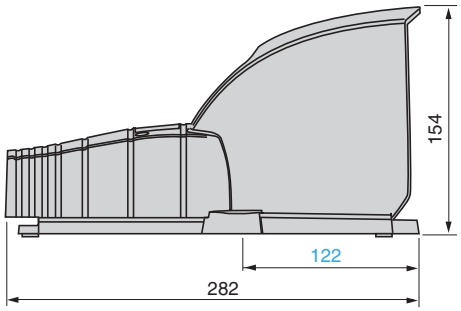
(1) IP 55, not UL, CSA approved.

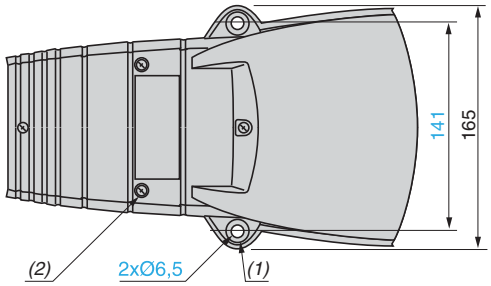
General: page 4/14 Characteristics: page 4/22 Dimensions: page 4/24

Safety dialogue solutions
Plastic foot switches,
Harmony types XPE B/G/Y

XPE B, XPE G, XPE Y

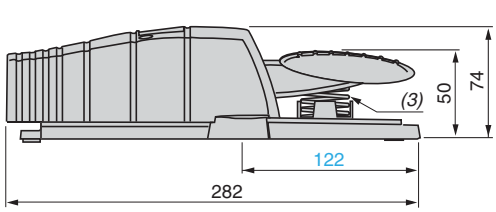
With protective cover

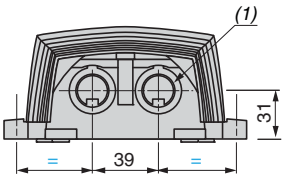


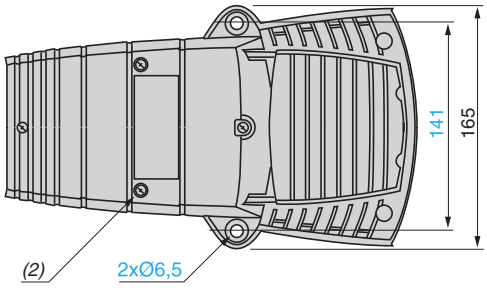


(1) Ø 16 x 4 counterbored hole.
(2) 4 cover fixing screws: stainless steel. Tightening torque: 1 N.m.

Without protective cover



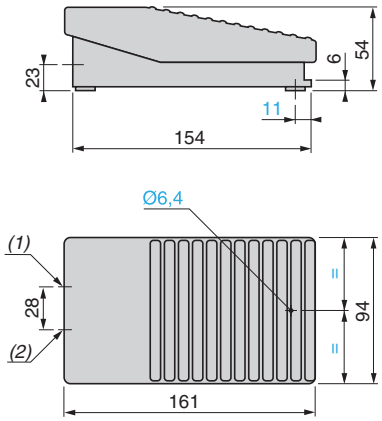




(1) 2 plain holes for ISO M20 or n° 13 (Pg 13.5) cable gland.
(2) 4 cover fixing screws: stainless steel. Tightening torque: 1 N.m.
(3) Return spring: stainless steel.

Safety dialogue solutions
Plastic foot switches, Harmony type XPE A

XPE A



(1) 1 plain hole for ISO M20 or n° 13 (Pg 13.5) cable gland.
(2) 1 plain hole for ISO M20 or n° 9 (Pg 11) cable gland.

4

Operating principle

Enabling switches, comprising an XY2 AU grip and an XPS VC monitoring module, allow authorised personnel to undertake adjustment, programming or maintenance operations near machine equipment hazardous zones, providing certain conditions are met.

In effect, to gain access, these operations, often performed at reduced speed, must be selected by authorised personnel using selectors, with or without keys. Once selection is made, the enabling switch temporarily assumes control of the hazardous zone's usual protection measures. Important note: the enabling switch alone must not lead to the actuation of any dangerous movements associated with the machine; a secondary, intentional control action is required from the operator. In addition, each person in the hazardous zone must be provided with an enabling switch to ensure their own safety.

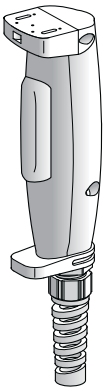
Environment

Conforming to standards	Products		IEC/EN 60947-1 , IEC/EN 60947-5-1, cUL us 508 and CSA C22-2 n° 14
	Machine assemblies		IEC/EN 60204-1
Protective treatment			Standard version: "TC"
Ambient air temperature	Operation	**°C**	- 10…+ 60
	Storage	**°C**	- 40…+70
Vibration resistance			6 gn (5…55 Hz) conforming to IEC 60068-2-6
Shock resistance			10 gn (11 ms) conforming to IEC 60068-2-27
Electric shock protection			Class II conforming to IEC/EN 61140
Degree of protection			IP 66 conforming to IEC 60529, IP 65 with a pushbutton, IK 06 conforming to EN 50102
Mechanical durability		**Op. cycle**	1 million
Enclosure			Double insulated enclosure made of PA66
Cable diameter		**mm**	7…13

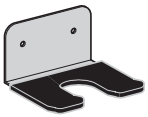
Contact block characteristics

Rated operational characteristics		∼ AC-15 : C300 or Ue = 250 V, Ie = 1.5 A or Ue = 125 V, Ie = 0.75 A ⎓ DC-13 : R300 or Ue = 250 V, Ie = 0.1 A or Ue = 125 V, Ie = 0.22 A conforming to IEC 60947-5-1 Appendix A
Thermal current (Ithe)	**A**	5
Rated insulation voltage (Ui)	**V**	250, degree of pollution III (II inside) conforming to IEC 60947-1 125, contact 7-8
Rated impulse withstand voltage (Uimp)	**kV**	2.5 conforming to EN 60947-1
Positive operation		2 3-position contacts with positive opening operation conforming to IEC 60947-5-1 appendix K
Contact operation		Slow break
Resistance across terminals	**mΩ**	≤ 50
Actuation force		1…2: 12 N 2…3: 50 N
Terminal referencing		Numbered conforming to CENELEC EN 50013
Short-circuit protection		4 A cartridge fuse type gG (gl)
Connection	**mm²**	Terminal block, 1 x 0.34…1 x 1.5

Safety dialogue solutions
Enabling switches
For safety circuits



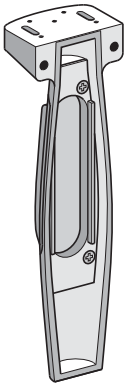
XY2 AU●



XY2 AZ1

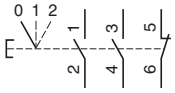
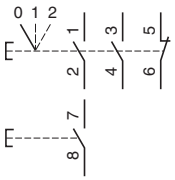


XY2 AZ2



XY2 AZ3

References

Number of contacts	Contact type	Contact blocks and scheme	Reference	Weight kg
3	2 enabling 3 positions + 1 N/C		**XY2 AU1**	0.310
	2 enabling 3 positions + 1 N/C + 1 N/O supplementary contact		**XY2 AU2**	0.320

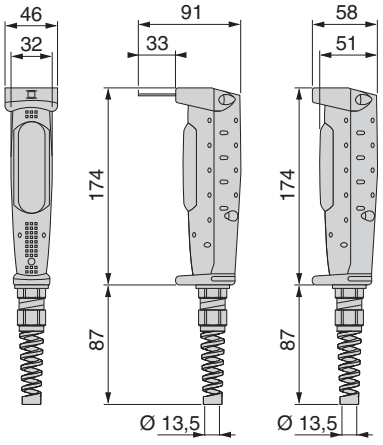
Separate components and spare parts

Description	Reference	Weight kg
Grip support	**XY2 AZ1**	0.215
Cover kit for key actuator XCS Z01 or XCS Z11 only applicable to XY2 AU1	**XY2 AZ2**	0.015
Cover	**XY2 AZ3**	0.060

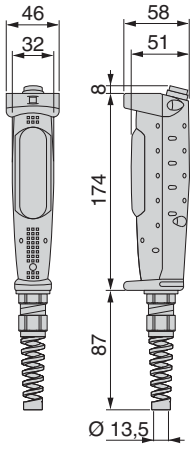
4

Dimensions

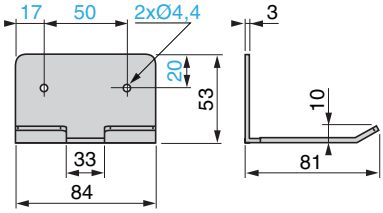
XY2 AU1



XY2 AU2

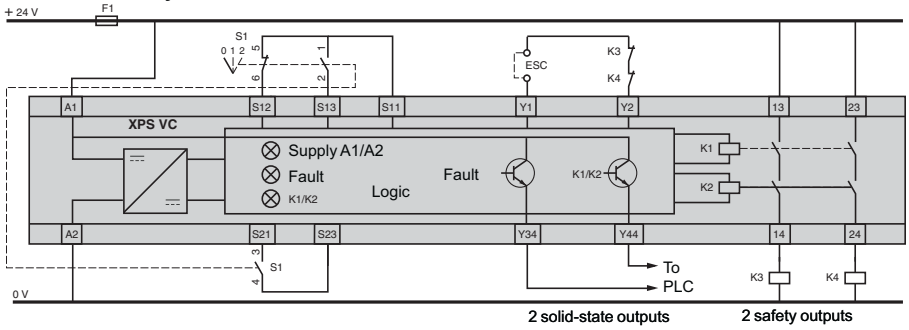


XY2 AZ1



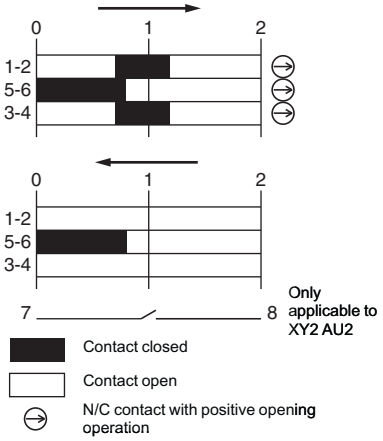
Connection example

With XPS VC safety module

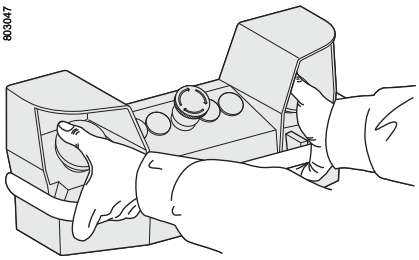


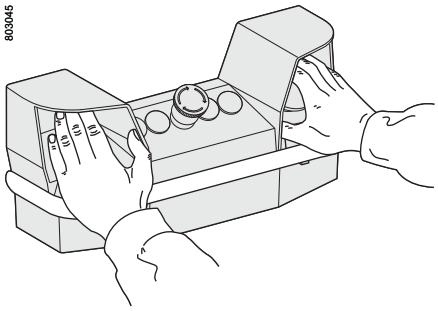
ESC : external start conditions

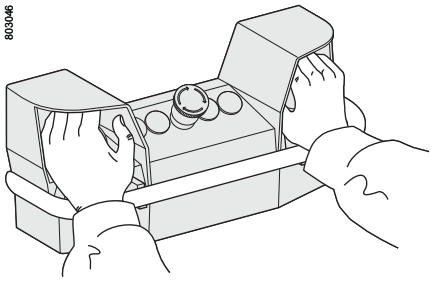
State of XY2 AU● contacts

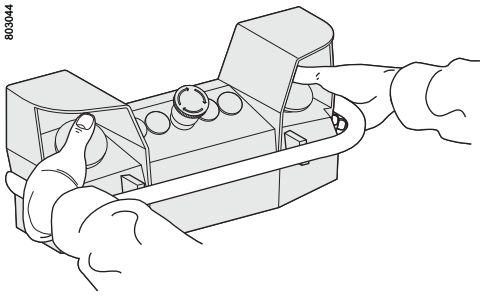


Safety dialogue solutions
Two-hand ergonomic control stations
With Harmony XB4 B control units









Presentation

The design of the control station incorporates features to significantly reduce occupational illnesses associated with repetitive movements of the hands, particularly “carpal tunnel syndrome”.

The health and comfort of the machine operator is assured by:
- the numerous alternative hand positions for operating the 2 pushbutton actuators, see diagrams to left,
- a hand rail,
- simple and fast adjustments of control station position.

This two-hand control station protects machine operators against both industrial accidents and illnesses related to their occupation.

It conforms to the following European safety standards:
- EN 574 (two-hand control),
- EN 999 (approach speeds of parts of the human body and positioning of safety devices).

The control station can be mounted:
- directly on the machine housing,
- on a pedestal, enabling 3 directional adjustment:
  - height,
  - rake,
  - skew.

The use of a two-hand control station in conjunction with a safety module type XPS BC or XPS BF provides type IIIC two-hand control conforming to EN 574, i.e. category 4 conforming to EN 954.

The two-hand control station + safety module XPS BC combination has an EC examination of type certificate issued by BERUFSGENOSSENSCHAFT of Germany (1996), n° 007052001181295.

The range comprises:
- two-hand control stations with or without pre-wired terminal blocks,
- kits (control station + pedestal), with or without pre-wired terminal blocks.

The products are supplied with an installation manual, which is also available as a separate item.

Description: page 4/29 | Characteristics: page 4/30 | References: page 4/31 | Dimensions: page 4/33

Safety dialogue solutions
Two-hand ergonomic control stations
With Harmony XB4 B control units

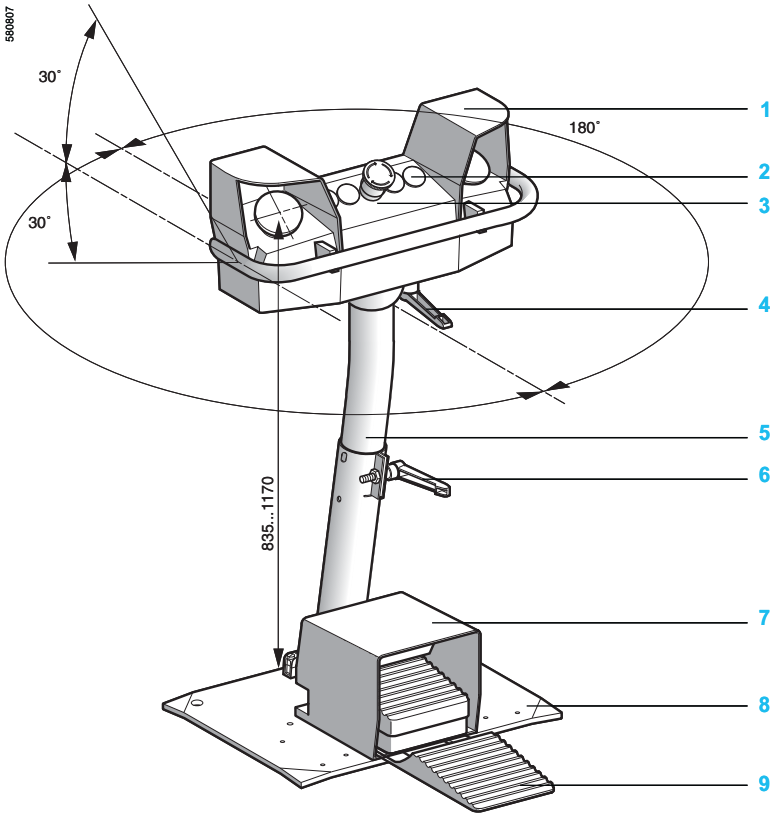
Description

The control station 1 has five cut-outs (Ø 22 mm) 2 as standard. Five additional cut-outs are possible 3.

Its pedestal 5 enables the following quick and simple adjustments:

- Control station rake (± 30°) using handle 4.
- Control station skew (± 180°) using handle 6.
- Control station height (835 to 1170 mm) using handle 6.
-

The baseplate 8 can be fitted with safety foot switches XPE R 9, together with their protective covers 7. See page 4/19.



Characteristics

Environment

Conformity to standards			EN/IEC 60947-5-1, EN 574 ISO 13851		
Colour			Orange RAL 2008		
Protective treatment	Standard version		"TC"		
Ambient air temperature	For operation	**°C**	- 25…+ 70		
	For storage	**°C**	- 40…+ 70		
Vibration resistance	Conforming to EN/IEC 60068-2-6		5 gn (2…500 Hz)		
Shock resistance	Conforming to EN/IEC 60068-2-27		10 gn (duration 11 ms)		
Electric shock protection	Conforming to EN/IEC 61140		Class I		
Degree of protection	Conforming to EN/IEC 60529		IP 65		
Mechanical life	Number of operating cycles		1 million		
Cable entries			See dimensions, page 4/33		

Contact block characteristics

Rated operational characteristics	~ AC-15		A600 or Ue = 240 V and Ie = 3 A		
	⎓ DC-13		Q600 or Ue = 250 V and Ie = 0.27 A conforming to EN/IEC 60947-5-1 Appendix A		
Rated insulation voltage	Conforming to EN/IEC 60947-1	**V**	Ui = 600, degree of pollution 3		
	Conforming to UL 508 and CSA C22-2 n° 14	**V**	Ui = 600		
Rated impulse withstand voltage	Conforming to EN/IEC 60947-1	**kV**	Uimp = 6		
Contact operation	Slow break, with positive opening operation		N/C + N/O break before make on each black actuator pushbutton N/C + N/C simultaneous on Emergency stop pushbutton N/C + N/O break before make on Lock out pushbutton		
Positive operation	Conforming to EN/IEC 60947-5-1 Appendix K		N/C contact with positive opening operation		
Terminal referencing			Conforming to CENELEC EN 50013		
Short-circuit protection	Conforming to EN/IEC 269		10 A cartridge fuse type gG (gI)		
Connection	Screw clamp terminals	**mm²**	Minimum clamping capacity: 1 x 0.22 or 1 x 0.22 + 1 x 0.34 Maximum clamping capacity: 1 x 2.5 or 2 x 1.5		
Electrical durability Conforming to EN/IEC 60947-5-1 Appendix C Operating rate: 3600 operating cycles/hour. Load factor: 0.5	a.c. supply for 1 million operating cycles utilisation category AC-15	**V**	24	120	230
		A	4	3	2
	d.c. supply for 1 million operating cycles utilisation category DC-13	**V**	24	110	
		A	0.5	0.2	
Electrical reliability	Failure rate According to EN/IEC 60947-5-4		At 17 V and 5 mA, $\lambda < 10^{-8}$ At 5 V and 1 mA, $\lambda < 10^{-6}$		

Safety dialogue solutions
Two-hand ergonomic control stations
With Harmony XB4 B control units

803051

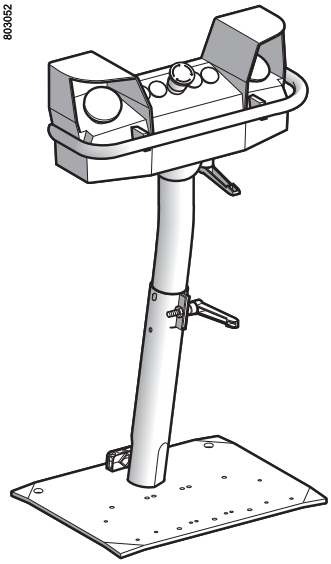


XY2 SB7●

Two-hand control stations - painted

Description	Mushroom head		Reference	Weight kg
	Function and colour	Contacts		
2 control pushbuttons with N/C + N/O break before make contacts and 1 mushroom head pushbutton	Emergency stop Red	N/C + N/C slow break	**XY2 SB71**	4.000
	Lock out (Schaltsperre) Yellow	N/C + N/O break before make	**XY2 SB75**	4.000
2 control pushbuttons with N/C + N/O break before make contacts and 1 mushroom head pushbutton, with pre-wired terminal block	Emergency stop Red	N/C + N/C slow break	**XY2 SB72**	4.000
	Lock out (Schaltsperre) Yellow	N/C + N/O break before make	**XY2 SB76**	4.000

803052



XY2 SB7●4

Kits (control station + pedestal)

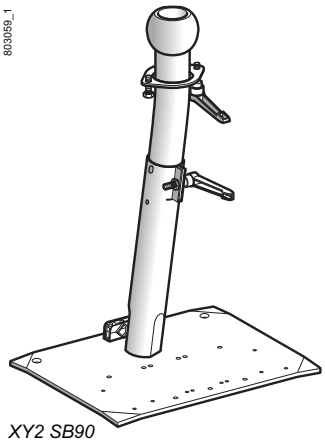
Description	Mushroom head		Reference	Weight kg
	Function and colour	Contacts		
2 control pushbuttons and 1 mushroom head Emergency stop pushbutton + pedestal XY2 SB90	Emergency stop Red	N/C + N/C slow break	**XY2 SB714**	17.000
2 control pushbuttons and 1 mushroom head Emergency stop pushbutton, with pre-wired terminal block + pedestal XY2 SB90	Emergency stop Red	N/C + N/C slow break	**XY2 SB724**	17.000

Documentation

Description	For use with	Reference	Weight kg
Installation manual	All control stations XY2 SB7●●	**XCO M2514**	0.200

Safety dialogue solutions
Two-hand ergonomic control stations
With Harmony XB4 B control units

803059_1



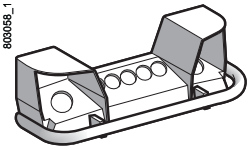
XY2 SB90

803057_1



XY2 SB98

803058_1



XY2 SB511

522964



XY2 SB99

803054_1



ZB4 BR216

803055_1



ZB4 BS844

503745



ZB4 BS845S

Separate components and spare parts

Various accessories

Description	For use with	Colour	Unit reference	Weight kg
Metal pedestal adjustable height	XY2 SB●●	Orange	**XY2 SB90**	13.000
Collar for guard rail (welded fixing)	XY2 SB90	Orange	**XY2 SB98**	0.800
Control station top without control devices	–	Orange	**XY2 SB511**	2.500
Control station base	–	Orange	**XY2 SB531**	1.200
Double protective metal cover	Metal pedestal XY2SB90 and foot switches type XPE R	Orange	**XY2 SB96**	4.370
Replacement handle (sold in lots of 5)	Metal pedestal XY2SB90	Black	**XY2 SB93**	0.155
Replacement seals	–	–	**XY2 SB99**	0.300
Adaptor (sold in lots of 5)	ISO M25	–	**DE9 RA2125**	0.010
Fixing nut (Sold in lots of 5)	Adaptor	–	**DE9 EC21**	0.005

Control units *(1)*

Description	Component part	Colour	Reference	Weight kg
Pushbutton actuator	Ø 60 mm mushroom head	Black	**ZB4 BR216**	0.095
	N/C + N/O body/contact assembly	–	**ZB4 BZ105**	0.055
Emergency stop pushbutton	Ø 40 mm mushroom head	Red	**ZB4 BS844**	0.060
	N/C + N/C body/contact assembly	–	**ZB4 BZ104**	0.055
Lock out pushbutton	Ø 40 mm mushroom head	Yellow, marked “Schaltsperre”	**ZB4 BS845S**	0.060
	N/C + N/O body/contact assembly	–	**ZB4 BZ105**	0.055

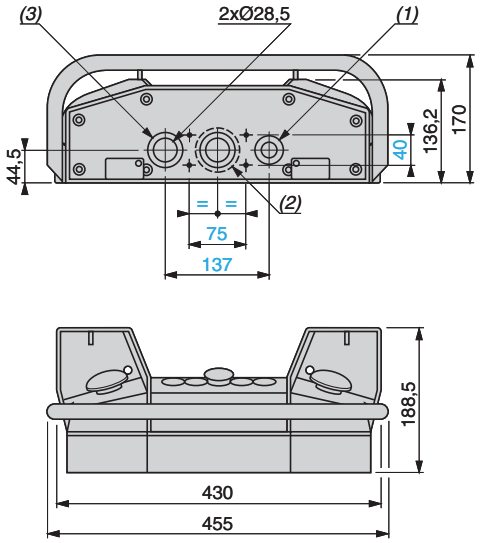
(1) Other XB4 B control and signalling units are suitable for use on the control stations. Please refer to our “Human Machine Interface” catalogue.

Presentation: page 4/28 | Description: page 4/29 | Characteristics: page 4/30 | Dimensions: page 4/33

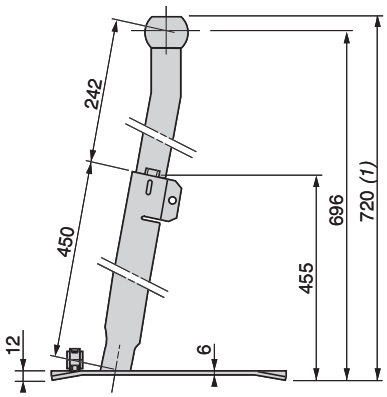
Safety dialogue solutions
Two-hand ergonomic control stations
With Harmony XB4 B control units

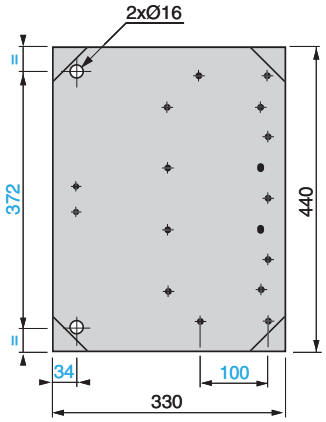
Dimensions

Control station
XY2 SB7●

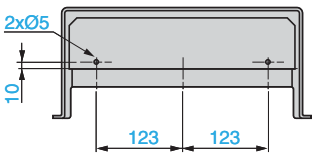


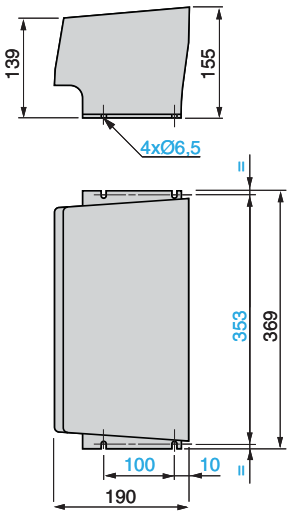
Pedestal
XY2 SB90





Double protective cover
XY2 SB96





(1) 2 plain holes for n° 13 (Pg 13.5) or ISO M20 cable gland.
(2) Ø 56 mm knock-out specifically for mounting on pedestal.
(3) 1 plain hole for n° 21 (Pg 21) cable gland. For ISO M25, use adaptor DE9 RA2125 and fixing nut DE9 EC21.

(1) Adjustable height of pedestal 720 to 1060 mm.

Presentation: page 4/28
Description: page 4/29
Characteristics: page 4/30
References: page 4/31

Safety dialogue solutions

Harmony® XB4, metal

Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Chromium plated metal bezel

Environment

Protective treatment	Standard version		"TH"
Ambient air temperature around the device	For storage	**°C**	- 40…+ 70
	For operation	**°C**	- 25…+ 70 unless otherwise stated
Electric shock protection	Conforming to IEC/EN 61140		Class I
Degree of protection	Conforming to IEC 60529		IP 66 unless otherwise stated
	Conforming to NEMA		NEMA 4X and 13, unless otherwise stated
Mechanical shock protection	Conforming to EN 50102		IK 03
Conformity to standards			IEC/EN 60947-1, IEC/EN 60947-5-1, IEC/EN 60947-5-4, IEC/EN 60947-5-5, EN/ISO 13850:2006 and IEC/EN 60204-1(trigger action and mechanical latching) JIS C 4520 UL 508, CSA C22-2 n° 14
Product certifications	UL Listed, CSA		Standard contact with screw clamp terminals: A600; Q600
	BV, RINA, LROS, DNV, GL		Standard contact with screw clamp terminals
Terminal referencing			Conforming to EN 50005 and EN 50013

Contact function and complete unit characteristics

Mechanical characteristics

Contact operation	N/C or N/O		Slow break
Positive operation	Conforming to IEC/EN 60947-5-1 Appendix K		All functions incorporating a N/C contact are positive opening operation
Operating force		**N**	Emergency stop with N/C + N/O: ■ Push-Pull: trigger action: 50 ■ Turn to release (with and without key unlocking): trigger action: 44
		N	Additional contact (extra to change state) ■ N/C contact: 2 ■ N/O contact: 2.3
Mechanical durability (in millions of operating cycles)	Emergency stop pushbutton		0.3
	Standard block only		5
Vibration resistance	Conforming to IEC 60068-2-6		Frequency: 2…500 Hz: 5 gn
Shock resistance	Conforming to IEC 60068-2-27		Half sine wave acceleration 11 ms: 10 gn

Electrical characteristics

Cabling capacity	Conforming to IEC 60947-1	**mm²**	Screw clamp terminals; cross head screws (Pozidriv type) Min.: 1 x 0.22 without cable end (1 x 0.34 for linking) Max.: 2 x 1.5 with cable end		
Contact material	Silver alloy (Ag/Ni)		Standard block with screw clamp terminals		
Short-circuit protection	Conforming to IEC/EN 60947-5-1	**A**	Standard block with screw clamp terminals: 10 (gG cartridge fuse conforming to IEC 60269-1)		
Rated insulation voltage	Conforming to IEC/EN 60947-1	**V**	Standard block with screw clamp terminals: Ui = 600, degree of pollution 3		
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1	**kV**	Standard block with screw clamp terminals: Uimp = 6		
Rated operational characteristics Conforming to IEC/EN 60947-5-1	a.c. supply: utilisation category AC-15		Standard block with screw clamp terminals: A600: Ue = 600 V and Ie = 1.2 A or Ue = 240 V and Ie = 3 A or Ue = 120 V and Ie = 6 A		
	d.c. supply: utilisation category DC-13		Standard block with screw clamp terminals: Q600: Ue = 600 V and Ie = 0.1 A or Ue = 250 V and Ie = 0.27 A or Ue = 125 V and Ie = 0.55 A		
Electrical durability Conforming to IEC/EN 60947-5-1 Appendix C Operating rate: 3600 operating cycles/hour Load factor: 0.5	a.c. supply for 1 million operating cycles utilisation category AC-15		Standard block with screw clamp terminals:		
		V	24	120	230
		A	4	3	2
	d.c. supply for 1 million operating cycles utilisation category DC-13		Standard block with screw clamp terminals:		
		V	24	110	
		A	0.5	0.2	
Electrical reliability	Failure rate (according to IEC/EN 60947-5-4)		Standard block in clean environment: ■ At 17 V and 5 mA, $\lambda < 10^{-8}$ ■ At 5 V and 1 mA, $\lambda < 10^{-6}$		

References: page 4/35
Dimensions: page4/37

Safety dialogue solutions

Harmony® XB4, metal

Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Chromium plated metal bezel



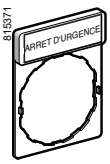
XB4 BT845



XB4 BS8445



XB4 BS9445



ZBY 2130



ZBY ●330

Emergency stop mushroom head pushbuttons (colour: red)

Screw clamp terminal connections

Shape of head	Type of push	Type of contact N/O	Type of contact N/C	Reference	Weight kg
	Trigger action Push-pull Ø 40	1	1	**XB4 BT845** (ZB4 BZ105 + ZB4 BT84)	0.136
	Trigger action Turn to release Ø 40	1	1	**XB4 BS8445** (ZB4 BZ105 + ZB4 BS844)	0.130
	Trigger action Key release (n° 455) Ø 40	1	1	**XB4 BS9445** (ZB4 BZ105 + ZB4 BS944)	0.170

Legend holder, 30 x 40 mm

Description	White marking on red background	Reference	Weight kg
With 8 x 27 mm legend	EMERGENCY STOP	**ZBY 2330**	0.002
	ARRET D'URGENCE	**ZBY 2130**	0.002
	NOT-AUS	**ZBY 2230**	0.002

Circular legends

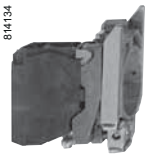
Diameter mm	Marking, on yellow background	Reference	Weight kg
60	EMERGENCY STOP	**ZBY 9330**	0.004
	ARRET D'URGENCE	**ZBY 9130**	0.004
	NOT-AUS	**ZBY 9230**	0.004
90	EMERGENCY STOP	**ZBY 8330**	0.008
	ARRET D'URGENCE	**ZBY 8130**	0.008
	NOT-AUS	**ZBY 8230**	0.008

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Dimensions: page 4/37

Safety dialogue solutions

Harmony® XB4, metal

Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Chromium plated metal bezel


814134

ZB4 BZ102


550279

ZB4 BT84


550278

ZB4 BS834


815383

ZB4 BS934

ZB4 B sub-assemblies for user assembly: bodies + heads

Complete bodies (fixing collar + single contact block)

Description	Type of contact N/O	Type of contact N/C	Reference	Weight kg
Screw clamp terminal connections	–	1	**ZB4 BZ102**	0.053
	–	2	**ZB4 BZ104**	0.062
	1	1	**ZB4 BZ105**	0.062
	1	2	**ZB4 BZ141**	0.072

Mushroom heads for latching pushbuttons (Emergency stop: red)

Shape of head	Type of push	Push Ø mm	Colour	Reference		Weight kg
	Trigger action Push-pull *(2)*	40	Red	**ZB4 BT84**		0.077
	Trigger action Turn to release *(2)*	30	Red	**ZB4 BS834**		0.068
		40	Red	**ZB4 BS844**		0.073
	Trigger action Key release (n° 455) *(2)*	30	Red	**ZB4 BS934**		0.094
		40	Red	**ZB4 BS944**	*(1)*	0.098
		60	Red	**ZB4 BS964**		0.118

(1) Other key numbers:
*Key n° 421E: add the suffix **12** to the reference.*
*Key n° 458A: add the suffix **10** to the reference.*
*Key n° 520E: add the suffix **14** to the reference.*
*Key n° 3131A: add the suffix **20** to the reference.*
*Example: the reference for a Ø 40 red mushroom head for a trigger action latching pushbutton with release by key n° 421E becomes: **ZB4 BS94412**.*
(2) Maximum number of contact blocks fitted to associated body: 4.

Characteristics: page 4/34
Dimensions: page4/37

Schneider Electric

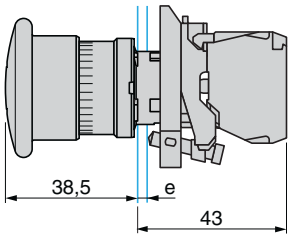
Safety dialogue solutions

Harmony® XB4, metal

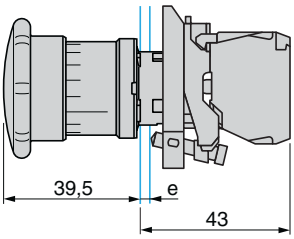
Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Chromium plated metal bezel

Emergency stop mushroom head pushbuttons (complete units)

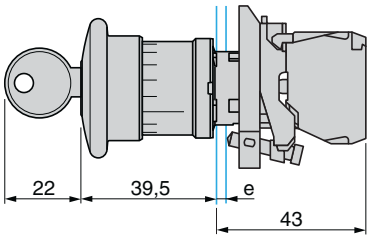
XB4 BT845



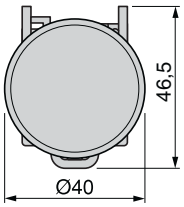
XB4 BS8445



XB4 BS9445



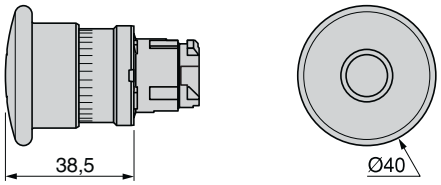
Common face view



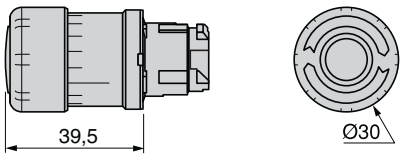
e: support panel thickness 1 to 6 mm.

Heads for latching mushroom head pushbuttons

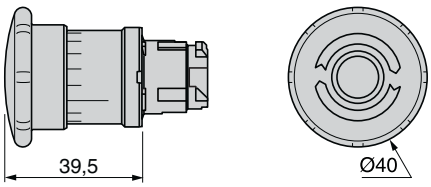
Push-pull
ZB4 BT84



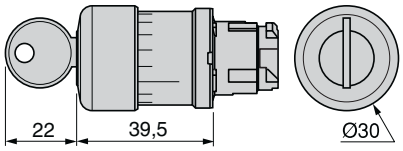
Turn to release
ZB4 BS834



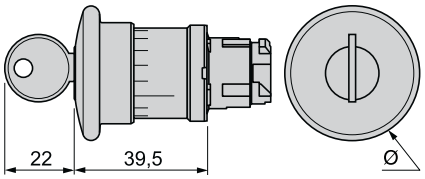
ZB4 BS844



Key release
ZB4 BS934



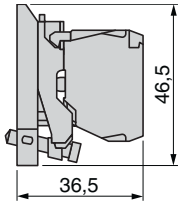
ZB4 BS944, BS964



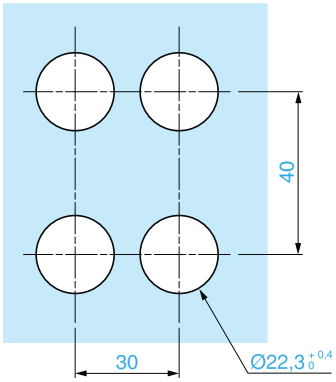
ZB4	Ø
BS944	40
BS964	60

Bodies for pushbuttons, screw clamp terminal connections

ZB4 BZ10●, BZ141



Panel cut-out and mounting centres



Characteristics: page 4/34
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Safety dialogue solutions

Harmony® XB5, plastic
Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Plastic bezel

Environment

Protective treatment	Standard version		"TH"
Ambient air temperature around the device	For storage	**°C**	- 40…+ 70
	For operation	**°C**	- 25…+ 70 unless otherwise stated
Electric shock protection	Conforming to IEC/EN 61140		Class II
Degree of protection	Conforming to IEC 60529		IP 66
	Conforming to NEMA		NEMA 4X and 13, unless otherwise stated
Mechanical shock protection	Conforming to EN 50102		IK 03
Conformity to standards			IEC/EN 60947-1, IEC/EN 60947-5-1, IEC/EN 60947-5-4, IEC/EN 60947-5-5, EN/ISO 13850:2006 and IEC/EN 60204-1(trigger action and mechanical latching) JIS C 4520 UL 508, CSA C22-2 n° 14
Product certifications	UL Listed, CSA		Standard contact with screw clamp terminals: A600; Q600
	BV, RINA, LROS, DNV, GL		Standard contact with screw clamp terminals
Terminal referencing			Conforming to EN 50005 and EN 50013

Contact function and complete unit characteristics

Mechanical characteristics

Contact operation	N/C or N/O		Slow break
Positive operation	Conforming to IEC/EN 60947-5-1 Appendix K		All functions incorporating a N/C contact are positive opening operation
Operating force		**N**	Emergency stop with N/C + N/O: ■ Push-Pull: trigger action: 50 ■ Turn to release (with and without key unlocking): trigger action: 44
		N	Additional contact (extra to change state) ■ N/C contact: 2 ■ N/O contact: 2.3
Mechanical durability (in millions of operating cycles)	Emergency stop pushbutton		0.3
	Standard block only		5
Vibration resistance	Conforming to IEC 60068-2-6		Frequency: 2…500 Hz: 5 gn
Shock resistance	Conforming to IEC 60068-2-27		Half sine wave acceleration 11 ms: 10 gn

Electrical characteristics

Cabling capacity	Conforming to IEC 60947-1	**mm²**	Screw clamp terminals; cross head screws (Pozidriv type) Min.: 1 x 0.22 without cable end (1 x 0.34 for linking) Max.: 2 x 1.5 with cable end
Contact material	Silver alloy (Ag/Ni)		Standard block with screw clamp terminals
Short-circuit protection	Conforming to IEC/EN 60947-5-1	**A**	Standard block with screw clamp terminals: 10 (gG cartridge fuse conforming to IEC 60269-1)
Rated insulation voltage	Conforming to IEC/EN 60947-1	**V**	Standard block with screw clamp terminals: Ui = 600, degree of pollution 3
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1	**kV**	Standard block with screw clamp terminals: Uimp = 6
Rated operational characteristics Conforming to IEC/EN 60947-5-1	a.c. supply: utilisation category AC-15		Standard block with screw clamp terminals: A600: Ue = 600 V and Ie = 1.2 A or Ue = 240 V and Ie = 3 A or Ue = 120 V and Ie = 6 A
	d.c. supply: utilisation category DC-13		Standard block with screw clamp terminals: Q600: Ue = 600 V and Ie = 0.1 A or Ue = 250 V and Ie = 0.27 A or Ue = 125 V and Ie = 0.55 A
Electrical durability Conforming to IEC/EN 60947-5-1 Appendix C Operating rate: 3600 operating cycles/hour Load factor: 0.5	a.c. supply for 1 million operating cycles utilisation category AC-15		Standard block with screw clamp terminals:
		V	24 / 120 / 230
		A	4 / 3 / 2
	d.c. supply for 1 million operating cycles utilisation category DC-13		Standard block with screw clamp terminals:
		V	24 / 110
		A	0.5 / 0.2
Electrical reliability	Failure rate (according to IEC/EN 60947-5-4)		Standard block in clean environment: ■ At 17 V and 5 mA, $\lambda < 10^{-8}$ ■ At 5 V and 1 mA, $\lambda < 10^{-6}$

References: page 4/39
Dimensions: page 4/41

Safety dialogue solutions

Harmony® XB5, plastic

Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Plastic bezel



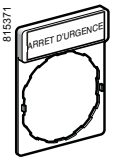
XB5 AT845



XB5 AS8445



XB5 AS9445



ZBY 2130



ZBY ●330

Emergency stop mushroom head pushbuttons (colour: red)

Screw clamp terminal connections

Shape of head	Type of push	Type of contact N/O	Type of contact N/C	Reference	Weight kg
	Trigger action Push-pull Ø 40	1	1	**XB5 AT845** (ZB5 AZ105 + ZB5 AT84)	0.076
	Trigger action Turn to release Ø 40	1	1	**XB5 AS8445** (ZB5 AZ105 + ZB5 AS844)	0.072
	Trigger action Key release (n° 455) Ø 40	1	1	**XB5 AS9445** (ZB5 AZ105 + ZB5 AS944)	0.112

Legend holder, 30 x 40 mm

Description	White marking on red background	Reference	Weight kg
With 8 x 27 mm legend	EMERGENCY STOP	**ZBY 2330**	0.002
	ARRET D'URGENCE	**ZBY 2130**	0.002
	NOT-AUS	**ZBY 2230**	0.002

Circular legends

Diameter	Marking, on yellow background	Reference	Weight
mm			**kg**
60	EMERGENCY STOP	**ZBY 9330**	0.004
	ARRET D'URGENCE	**ZBY 9130**	0.004
	NOT-AUS	**ZBY 9230**	0.004
90	EMERGENCY STOP	**ZBY 8330**	0.008
	ARRET D'URGENCE	**ZBY 8130**	0.008
	NOT-AUS	**ZBY 8230**	0.008

4

Characteristics: page 4/38
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Safety dialogue solutions

Harmony® XB5, plastic

Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Plastic bezel


814409

ZB5 AZ102


550287

ZB5 AT84


550285

ZB5 AS844


530708

ZB5 AS934

4

ZB5 B sub-assemblies for user assembly: bodies + heads

Complete bodies (fixing collar + single contact block)

Description	Type of contact N/O	Type of contact N/C	Reference	Weight kg
Screw clamp terminal connections	–	1	**ZB5 AZ102**	0.021
	–	2	**ZB5 AZ104**	0.030
	1	1	**ZB5 AZ105**	0.030
	1	2	**ZB5 AZ141**	0.040

Mushroom heads for latching pushbuttons (Emergency stop: red)

Shape of head	Type of push	Push Ø mm	Push Colour	Reference		Weight kg
	Trigger action Push-pull *(2)*	40	Red	**ZB5 AT84**		0.050
	Trigger action Turn to release *(2)*	30	Red	**ZB5 AS834**		0.042
		40	Red	**ZB5 AS844**		0.046
	Trigger action Key release (n° 455) *(2)*	30	Red	**ZB5 AS934**		0.068
		40	Red	**ZB5 AS944**	*(1)*	0.071
		60	Red	**ZB5 AS964**		0.092
	Trigger action Key release (n° 4A185) *(2)*	40	Red	**ZB5 AS944D**		0.071

(1) Other key numbers:
*Key n° 421E: add the suffix **12** to the reference.*
*Key n° 458A: add the suffix **10** to the reference.*
*Key n° 520E: add the suffix **14** to the reference.*
*Key n° 3131A: add the suffix **20** to the reference.*
*Example: the reference for a Ø 40 red mushroom head for a trigger action latching pushbutton with release by key n° 421E becomes: **ZB5 AS94412**.*
(2) Maximum number of contact blocks fitted to associated body: 4.

Characteristics: page 4/38
Dimensions: page 4/41

Schneider Electric

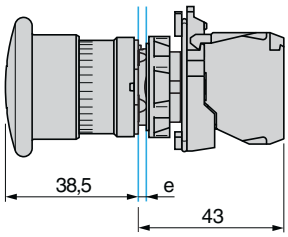
Safety dialogue solutions

Harmony® XB5, plastic

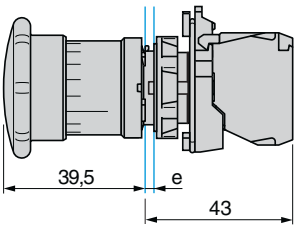
Emergency stop mushroom head pushbuttons
Ø 22 trigger action
Plastic bezel

Emergency stop mushroom head pushbuttons (complete units)

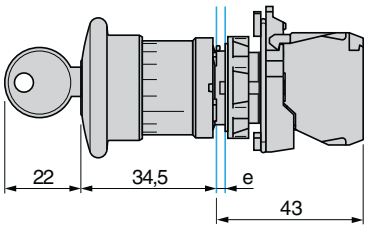
XB5 AT845



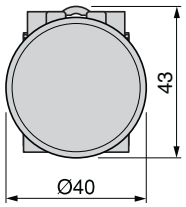
XB5 AS8445



XB5 AS9445



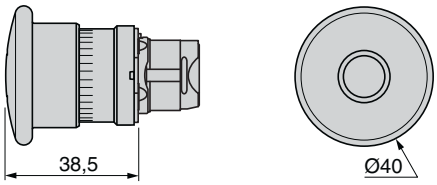
Common face view



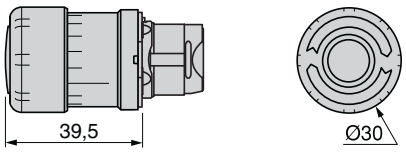
e: support panel thickness 1 to 6 mm.

Heads for latching mushroom head pushbuttons

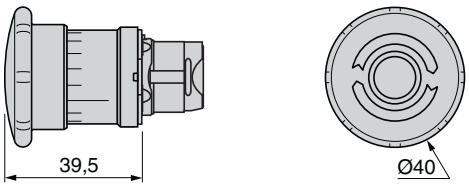
Push-Pull
ZB5 AT84



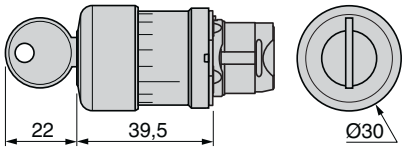
Turn to release
ZB5 AS834



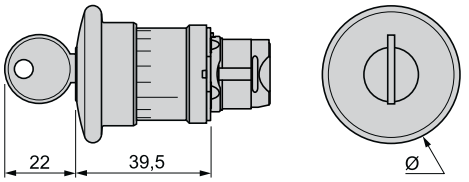
ZB5 AS844



Key release
ZB5 AS934

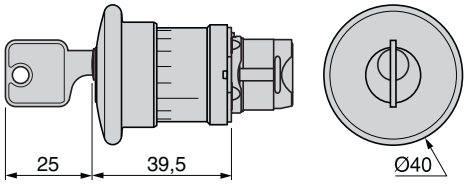


ZB5 AS944, AS964

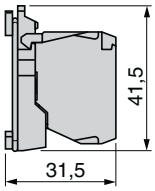


ZB5	Ø
AS944	40
AS964	60

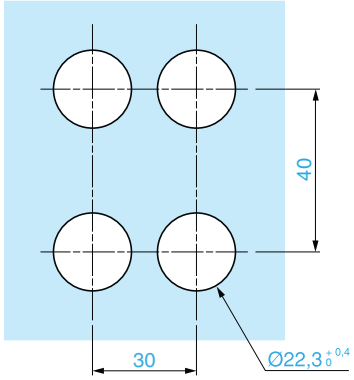
ZB5 AS944D



Bodies for pushbuttons, screw clamp terminal connections
ZB5 AZ10●, AZ141



Panel cut-out and mounting centres



Characteristics: page 4/38
References: page 4/39

Safety dialogue solutions
XAL control stations for Ø 22 trigger action
Emergency stop mushroom head pushbuttons

Environment

Protective treatment	Standard version		"TH"
Ambient air temperature around the device	For storage	**°C**	- 40…+ 70
	For operation	**°C**	- 25…+ 70 unless otherwise stated
Electric shock protection	Conforming to IEC/EN 61140		Class II
Degree of protection	Conforming to IEC 60529		IP 66
	Conforming to NEMA		NEMA 4X and 13
Mechanical shock protection	Conforming to EN 50102		IK 03
Conformity to standards			IEC/EN 60947-1, IEC/EN 60947-5-1, IEC/EN 60947-5-4, IEC/EN 60947-5-5, EN/ISO 13850:2006 and IEC/EN 60204-1(trigger action and mechanical latching) JIS C 4520 UL 508, CSA C22-2 n° 14
Product certifications	UL Listed, CSA		Standard contact with screw clamp terminals: A600; Q600
Terminal referencing			Conforming to EN 50005 and EN 50013
Material and colours			Polycarbonate, yellow RAL 1012 lid and light grey RAL 7035 base
Cable entries			Knock-out entries for n° 13 (CM12, Pg 13.5) cable gland and tapped ISO 20

Contact function characteristics

Mechanical characteristics

Contact operation	N/C or N/O		Slow break
Positive operation	Conforming to IEC/EN 60947-5-1 Appendix K		All functions incorporating a N/C contact are positive opening operation
Operating force		**N**	Emergency stop with N/C + N/O: ■ Push-Pull: trigger action: 50 ■ Turn to release (with and without key unlocking): trigger action: 44
		N	Additional contact (extra to change state) ■ N/C contact: 2 ■ N/O contact: 2.3
Mechanical durability (in millions of operating cycles)			0.1
Vibration resistance	Conforming to IEC 60068-2-6		Frequency: 2…500 Hz: 5 gn
Shock resistance	Conforming to IEC 60068-2-27		Half sine wave acceleration 11 ms: 10 gn

Electrical characteristics

Cabling capacity	Conforming to IEC 60947-1	**mm²**	Screw clamp terminals; cross head screws (Pozidriv type) Min.: 1 x 0.22 without cable end (1 x 0.34 for linking) Max.: 2 x 1.5 with cable end		
Contact material	Silver alloy (Ag/Ni)		Standard block with screw clamp terminals		
Short-circuit protection	Conforming to IEC/EN 60947-5-1	**A**	Standard block with screw clamp terminals: 10 (gG cartridge fuse conforming to IEC 269-1)		
Rated insulation voltage	Conforming to IEC/EN 60947-1	**V**	Standard block with screw clamp terminals: Ui = 600, degree of pollution 3		
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1	**kV**	Standard block with screw clamp terminals: Uimp = 6		
Rated operational characteristics Conforming to IEC/EN 60947-5-1	a.c. supply: utilisation category AC-15		A600: Ue = 600 V and Ie = 1.2 A or Ue = 240 V and Ie = 3 A or Ue = 120 V and Ie = 6 A		
	d.c. supply: utilisation category DC-13		Q600: Ue = 600 V and Ie = 0.1 A or Ue = 250 V and Ie = 0.27 A or Ue = 125 V and Ie = 0.55 A		
Electrical durability Conforming to IEC/EN 60947-5-1 Appendix C Operating rate: 3600 operating cycles/hour Load factor: 0.5	a.c. supply for 1 million operating cycles utilisation category AC-15		Standard block with screw clamp terminals:		
		V	24	120	230
		A	4	3	2
	d.c. supply for 1 million operating cycles utilisation category DC-13		Standard block with screw clamp terminals:		
		V	24	110	
		A	0.4	0.15	
Electrical reliability	Failure rate (according to IEC/EN 60947-5-4)		Standard block in clean environment: ■ At 17 V and 5 mA, $\lambda < 10^{-8}$ ■ At 5 V and 1 mA, $\lambda < 10^{-6}$		

References: page 4/43
Dimensions: page 4/45

Safety dialogue solutions

XAL control stations for Ø 22 trigger action
Emergency stop mushroom head pushbuttons
Complete stations (screw clamp terminal connections)



XAL K178●



XAL K188●

Emergency stop function
(yellow lid "RAL 1012", light grey base "RAL 7035")

Description	Type	Type of contact N/O	Type of contact N/C	Reference	Weight kg
Without marking					
1 mushroom head pushbutton Ø 40 mm, red Turn to release	Trigger action	–	2	**XAL K178F**	0.194
		1	1	**XAL K178E**	0.194
		1	2	**XAL K178G**	0.194
1 mushroom head pushbutton Ø 40 mm, red Key release (n° 455)	Trigger action	–	2	**XAL K188F**	0.188
		1	1	**XAL K188E**	0.188
		1	2	**XAL K188G**	0.188

4

Characteristics: page 4/42
Dimensions: page 4/45

Safety dialogue solutions

XAL control stations for Ø 22 trigger action
Emergency stop mushroom head pushbuttons
Separate components for user assembly


815446

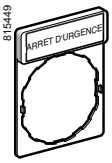
ZEN L1111


550285

ZB5 AS844


530708

ZB5 AS934



815449

ZBY 2130

Empty enclosures

Description	Number of cut-outs	Reference	Weight kg
For normal environments (with stainless steel lid fixing screws)			
Yellow lid "RAL 1012" Light grey base "RAL 7035"	1	**XAL K01**	0.136
For normal environments, CSA + UL certifications *(1)* (with stainless steel lid fixing screws)			
Yellow lid "RAL 1012" Light grey base "RAL 7035"	1	**XAL K01H7**	0.136

Electrical blocks (for mounting on metal plate at back of enclosure)

Description	Type	Sold in lots of	Unit reference	Weight kg
Electrical blocks with screw clamp terminal connections				
Standard contact blocks *(2)*	N/O contact	5	**ZEN L1111**	0.015
	N/C contact	5	**ZEN L1121**	0.015

Mushroom heads for Emergency stop pushbuttons

Shape of head	Type of push	Push Ø mm	Push Colour	Reference		Weight kg
Trigger action latching mushroom heads						
	Push-pull	40	Red	**ZB5 AT84**		0.050
	Turn to release	30	Red	**ZB5 AS834**		0.042
		40	Red	**ZB5 AS844**		0.046
	Key release (n° 455)	30	Red	**ZB5 AS934**		0.068
		40	Red	**ZB5 AS944**	*(3)*	0.071
		60	Red	**ZB5 AS964**		0.092
	Key release (n° 4A185)	40	Red	**ZB5 AS944D**		0.071

Legend holder

Description	White marking on red background	Reference	Weight kg
Legend holder 30 x 40 mm with 8 x 27 mm legend	EMERGENCY STOP	**ZBY 2130**	0.002
	ARRET D'URGENCE	**ZBY 2113**	0.002
	NOT-AUS	**ZBY 2230**	0.002

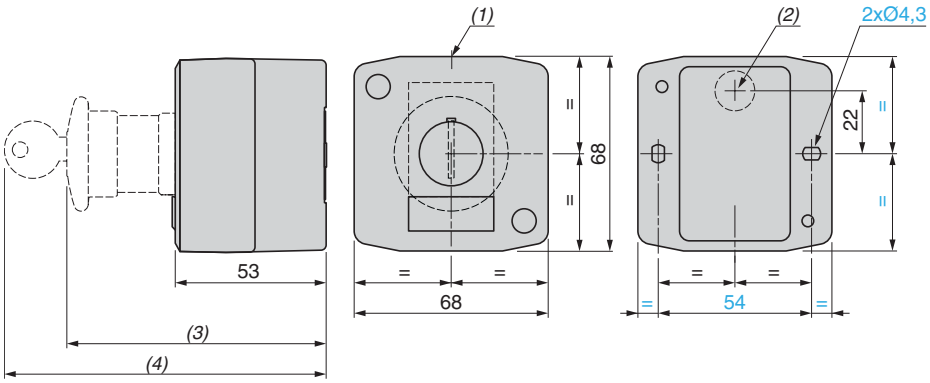
(1) Volt-free commoning/earth terminal included.
(2) A maximum of 3 electrical blocks can be fitted per associated head.
(3) Other key numbers:
*Key n° 421E: add the suffix **12** to the reference.*
*Key n° 458A: add the suffix **10** to the reference.*
*Key n° 520E: add the suffix **14** to the reference.*
*Key n° 3131A: add the suffix **20** to the reference.*
*Example: the reference for a Ø 40 red mushroom head for a trigger action latching pushbutton with release by key n° 421E becomes: **ZB5 AS94412**.*

Characteristics: page 4/42
Dimensions: page 4/45

Safety dialogue solutions

XAL control stations for Ø 22 trigger action
Emergency stop mushroom head pushbuttons
Separate components for user assembly

Single-way control stations XAL K

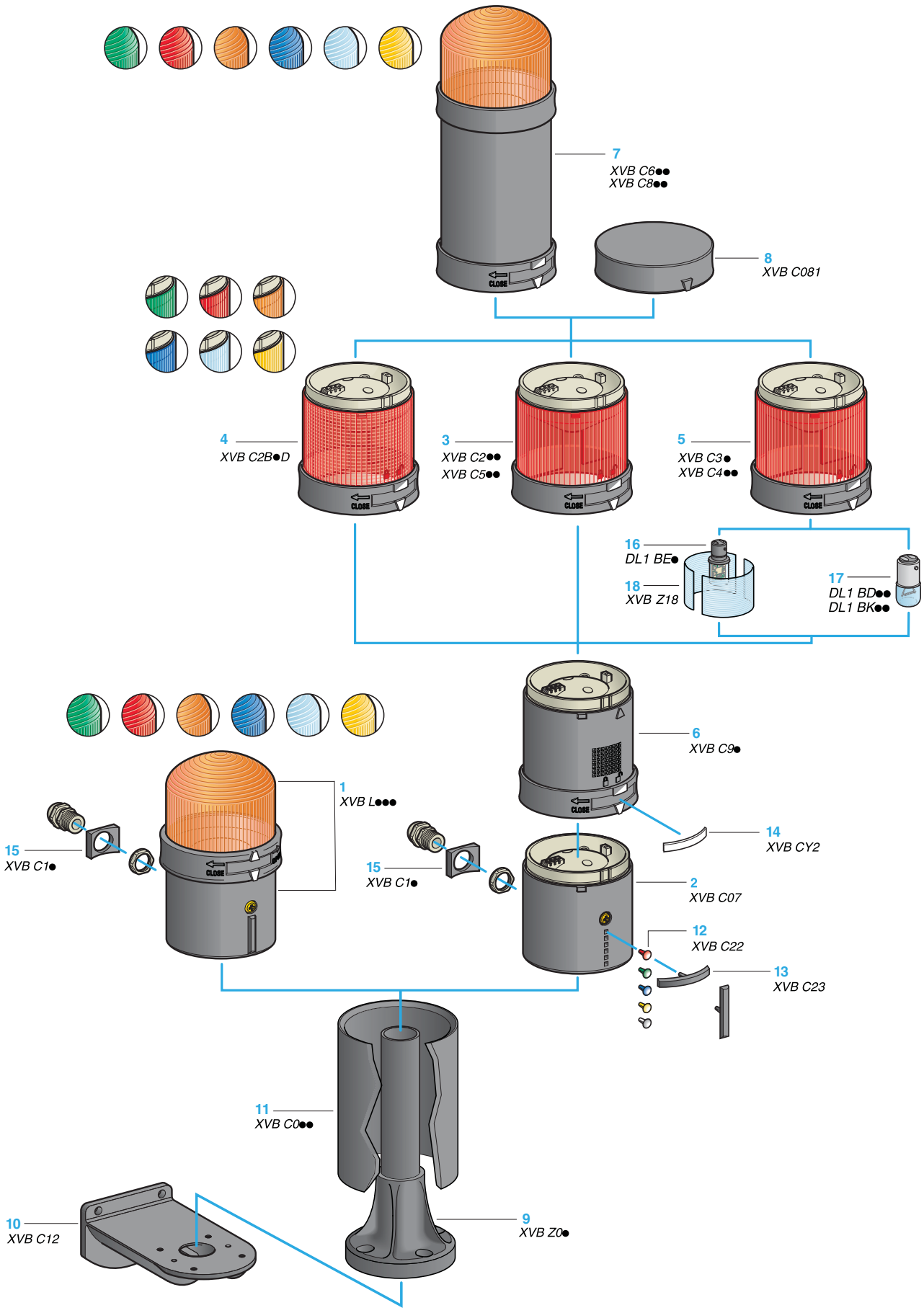


(1) Knock-out entry for n° 13 cable gland.
(2) 2 knock-outs for cable entry.
(3) 91 mm for latching mushroom head pushbuttons.
(4) 113 mm for latching mushroom head pushbuttons with key release.

Characteristics:
page 4/42

Safety dialogue solutions

Beacons and indicator banks Ø 70 mm
Harmony type XVB Universal



Safety dialogue solutions
Beacons and indicator banks Ø 70 mm
Harmony type XVB Universal

Beacons and indicator banks type XVB are visual or audible signalling units used for indicating, throughout 360° and at a distance, the various states or operation sequences of a machine or installation. Examples: start, stop machine, no material, call technical staff, fault signalling, etc.

Illuminated beacon

Complete product XVB L

Ready assembled 1 with a single illuminated signalling unit:
- ◻ steady light (with incandescent bulb or LED),
- ◻ flashing light (with incandescent bulb or LED),
- ◻ or “flash” (with discharge tube).

The **XVB L** beacon comprises:
- ■ A base unit with a removable terminal block and bottom or side cable entry.
- ■ One coloured illuminated unit (green, red, orange, blue, clear or yellow).

Indicator bank

Customer assembled product XVB C

Variable composition assembly of 1 to 5 illuminated or audible units which are supplied as separate items (assembly by user). Maximum configuration: 5 units or 4 units + 1 “flash” unit.

The indicator bank **XVB C** comprises:
- ■ A base unit with a removable terminal block and bottom or side cable entry 2.
- ■ 1 to 5 coloured illuminated units (green, red, orange, blue, clear or yellow):
- ◻ with integral LED 3,
- ◻ with integral LED and diffuser 4 *(1)*,
- ◻ for incandescent bulbs or base mounted LEDs 5.
- ■ 1 or 2 audible units 6.
- ■ A maximum of 1 “flash” discharge unit (5 Joule or 10 Joule) 7, for mounting on top of the bank.
- ■ A top cover 8 (except when using a “flash” discharge tube).

- ■ The illuminated or audible units stack vertically and are easily locked and unlocked using an integral clamping ring. Electrical connections between each unit are made automatically.
- ■ A light diffuser, pre-fitted in illuminated units XVB C2B●D with a base mounted LED, distributes the light evenly over the lens surface. When using the indicator banks in bright ambient light conditions, remove the diffuser to improve contrast.
- ■ Connection on the AS-Interface cabling system is possible by ordering a dedicated base unit. Please refer to our “Industrial communication in machines and installations” catalogue.

Accessories

For beacons XVB L and indicator banks XVB C

- ■ Fixing base comprising a support tube glued into a plastic fixing plate, for a height beneath the base unit of 80, 380 or 780 mm 9.
- ■ Fixing plate for mounting on vertical support 10.
- ■ Support tube concealment cover, height 100, 400 or 800 mm 11.
- ■ Coloured markers 12 (2).
- ■ Legend holder with legend 13 (2).
- ■ Legends that attach to locking ring of each signalling unit for identification 14.
- ■ Adaptor and 13P cable gland 15.
- ■ Base mounted LED 16 or incandescent bulb 17.
- ■ Diffuser 18 *(1)*.

Installation

Mounting

- ■ Base unit fixed directly onto panel using 2 screws.
- ■ Fixed using a fixing base comprising an aluminium support tube glued into a plastic fixing plate.

Cabling

By means of removable terminal block incorporated in base unit (simplified wiring). The screw and captive cable clamp terminals are protected to prevent any accidental contact with live parts.

(1) The diffuser can only be used with LED illuminated units. Not compatible with units fitted with an incandescent bulb or “flash” discharge tube.
(2) These enable the position of the various units (illuminated or audible) to be identified in the event of dismantling the bank.

Characteristics: page 4/48 References: page 4/50 Dimensions: page 4/58

Safety dialogue solutions
Beacons and indicator banks Ø 70 mm
Harmony type XVB Universal

Environment characteristics

Product certifications	Standard version		CSA C22-2 n°14, UL 508, CCC, GOST
Conformity to standards			EN/IEC 60947-5-1
Protective treatment	Standard version		"TC"
Ambient air temperature	For storage	**°C**	- 40…+ 70
	For operation *(1)*	**°C**	**Illuminated units with steady light signalling:** - 25…+ 70, with 7 W incandescent bulb - 25…+ 50, with LED
		°C	**Illuminated units with flashing light signalling:** - 25…+ 50, with 7 W incandescent bulb - 25…+ 50, with LED
		°C	**Illuminated units with "flash" discharge tube:** - 25…+ 50
		°C	**Audible units:** - 25…+ 50, with buzzer
Electric shock protection Conforming to IEC 61140	Mounted on support tube		Class I
	Mounted on base unit		Class II
Degree of protection	Conforming to IEC 60529		IP 65 (mounted on fixing base XVB Z0●) IP 66 (mounted directly on base unit)
	Conforming to UL 508		Type 4X NEMA "Indoor"
Material	Illuminated units		Polycarbonate
	Base unit and cover		Glass-reinforced polyamide and polycarbonate
	Support tube		Painted aluminium
	Fixing plate for use on vertical support		Zamak
	Fixing plate for use on horizontal support		Polyamide 66
	Support tube concealment cover		ABS

(1) Warning: illuminated units with incandescent bulbs must not be combined with LED illuminated units, due to the risk of overheating.
Also, when different units (e.g. steady, flashing…) are combined, the maximum temperature is limited to that of the weaker unit.

4

General: page 4/46 References: page 4/50 Dimensions: page 4/58

Electrical characteristics

Rated insulation voltage (Ui)	Conforming to IEC 60947-1	**V**	250
Voltage limits	Conforming to IEC 60947-5-1	**V**	0.85 to 1.10 Un (Un: nominal voltage)
Consumption	LED units	**mA**	**Steady light signalling:** ⎓ 24 V: < 47 ∼ 120 V: < 17 ∼ 230 V: < 17
		mA	**Flashing light signalling:** ⎓ 24 V: < 47 ∼ 120 V: < 17 ∼ 230 V: < 17
	Units with discharge tube *(1)*	**mA**	**Flashing light signalling:** ∼ 24 V: 5 J unit: < 550; 10 J unit: < 1 300 ⎓ 24 V: 5 J unit: < 350; 10 J unit: < 850 ∼ 48 V: 10 J unit: < 650 ⎓ 48 V: 10 J unit: < 400 ∼ 120 V: 5 J unit: < 140; 10 J unit: < 290 ∼ 230 V: 5 J unit: < 105; 10 J unit: < 280
	Audible units	**mA**	⎓ 12…48 V: < 15 ∼ 120…230 V: < 25
Rated impulse withstand voltage	Conforming to IEC 60947-1	**kV**	U imp = 4
Light source	Illuminated units with steady or flashing light signalling		LEDs: degree of pollution 2 Bulbs with BA 15d base fitting, maximum power 7 W
Illuminating power	Units with discharge tube	**cds**	13 (integral high intensity tube) with clear lens unit: 5 J tube 26 (integral high intensity tube) with clear lens unit: 10 J tube
Audible unit	Continuous or intermittent tone	**dB**	90 at 1 m
	Fundamental frequency	**kHz**	2.8
Terminal referencing			1 terminal referenced “C” common to all 5 units
			1 or 5 terminals referenced 1 to 5, depending on number of units
Connection	Maximum clamping capacity on protected, ready-to-tighten, screw and captive cable clamp terminals	**mm²**	1 x 1.5 with cable end
Frequency of illuminated units	Illuminated units with flashing light signalling	**Hz**	1
	Illuminated units with discharge tube	**Hz**	1

(1) ***Warning****: illuminated units with a “flash” discharge tube are not suitable for steady light signalling due to the heat generated.*

General: page 4/46 References: page 4/50 Dimensions: page 4/58

Safety dialogue solutions

Illuminated beacons Ø 70 mm
Harmony type XVB L Universal
Complete beacons for incandescent bulbs or LEDs (BA 15d base fitting)



XVB L3●



XVB L4B●

Beacons with steady light signalling

Description	Light source, to be ordered separately *(1)*	Colour	Reference	Weight kg
Complete unit comprising: - 1 illuminated unit - 1 base unit (direct or tube fixing)	Incandescent bulb 7 W max. 250 V max.	Green	**XVB L33**	0.260
		Red	**XVB L34**	0.260
		Orange	**XVB L35**	0.260
		Blue	**XVB L36**	0.260
		Clear	**XVB L37**	0.260
		Yellow	**XVB L38**	0.260

Beacons with integral flashing light signalling

Description	Light source, to be ordered separately *(1)*	Colour	Reference	Weight kg
Complete unit comprising: - 1 illuminated unit - 1 base unit (direct or tube fixing)	Incandescent bulb 7 W max. ~ 24 V ⎓ 24…48 V	Green	**XVB L4B3**	0.280
		Red	**XVB L4B4**	0.280
		Orange	**XVB L4B5**	0.280
		Blue	**XVB L4B6**	0.280
		Clear	**XVB L4B7**	0.280
		Yellow	**XVB L4B8**	0.280
	Incandescent bulb 7 W max. ~ 48…230 V	Green	**XVB L4M3**	0.280
		Red	**XVB L4M4**	0.280
		Orange	**XVB L4M5**	0.280
		Blue	**XVB L4M6**	0.280
		Clear	**XVB L4M7**	0.280
		Yellow	**XVB L4M8**	0.280

(1) Incandescent bulbs and LEDs, see page 4/57.

General: page 4/46 Characteristics: page 4/48 Dimensions: page 4/58

Safety dialogue solutions
Illuminated beacons Ø 70 mm
Harmony type XVB L Universal
Complete beacons with LED light source



XVB L0B●

Beacons with steady light signalling

Description	Light source	Colour	Reference	Weight kg
Complete unit comprising: - 1 illuminated unit - 1 base unit (direct or tube fixing) -	LED, included ⎓ 24 V	Green	**XVB L0B3**	0.270
		Red	**XVB L0B4**	0.270
		Orange	**XVB L0B5**	0.270
		Blue	**XVB L0B6**	0.270
		Clear	**XVB L0B7**	0.270
		Yellow	**XVB L0B8**	0.270
	LED, included ∼ 120 V	Green	**XVB L0G3**	0.270
		Red	**XVB L0G4**	0.270
		Orange	**XVB L0G5**	0.270
		Blue	**XVB L0G6**	0.270
		Clear	**XVB L0G7**	0.270
		Yellow	**XVB L0G8**	0.270
	LED, included ∼ 230 V	Green	**XVB L0M3**	0.270
		Red	**XVB L0M4**	0.270
		Orange	**XVB L0M5**	0.270
		Blue	**XVB L0M6**	0.270
		Clear	**XVB L0M7**	0.270
		Yellow	**XVB L0M8**	0.270



XVB L1B●

Beacons with integral flashing light signalling

Description	Light source	Colour	Reference	Weight kg
Complete unit comprising: - 1 illuminated unit - 1 base unit (direct or tube fixing) -	LED, included ⎓ 24 V	Green	**XVB L1B3**	0.280
		Red	**XVB L1B4**	0.280
		Orange	**XVB L1B5**	0.280
		Blue	**XVB L1B6**	0.280
		Clear	**XVB L1B7**	0.280
		Yellow	**XVB L1B8**	0.280
	LED, included ∼ 120 V	Green	**XVB L1G3**	0.280
		Red	**XVB L1G4**	0.280
		Orange	**XVB L1G5**	0.280
		Blue	**XVB L1G6**	0.280
		Clear	**XVB L1G7**	0.280
		Yellow	**XVB L1G8**	0.280
	LED, included ∼ 230 V	Green	**XVB L1M3**	0.280
		Red	**XVB L1M4**	0.280
		Orange	**XVB L1M5**	0.280
		Blue	**XVB L1M6**	0.280
		Clear	**XVB L1M7**	0.280
		Yellow	**XVB L1M8**	0.280

General: page 4/46 | Characteristics: page 4/48 | Dimensions: page 4/58

Safety dialogue solutions

Illuminated beacons Ø 70 mm
Harmony type XVB L Universal
Complete beacons with “flash” discharge tube



XVB L6B●



XVB L8B●

Beacons with 5 Joule “flash” discharge tube

Description	Light source	Colour	Reference	Weight kg
Complete unit comprising: - 1 illuminated unit - 1 base unit (direct or tube fixing)	Integral “flash” discharge tube ⎓ 24 V	Green	**XVB L6B3**	0.440
		Red	**XVB L6B4**	0.440
		Orange	**XVB L6B5**	0.440
		Blue	**XVB L6B6**	0.440
		Clear	**XVB L6B7**	0.440
		Yellow	**XVB L6B8**	0.440
	Integral “flash” discharge tube ∿ 120 V	Green	**XVB L6G3**	0.425
		Red	**XVB L6G4**	0.425
		Orange	**XVB L6G5**	0.425
		Blue	**XVB L6G6**	0.425
		Clear	**XVB L6G7**	0.425
		Yellow	**XVB L6G8**	0.425
	Integral “flash” discharge tube ∿ 230 V	Green	**XVB L6M3**	0.435
		Red	**XVB L6M4**	0.435
		Orange	**XVB L6M5**	0.435
		Blue	**XVB L6M6**	0.435
		Clear	**XVB L6M7**	0.435
		Yellow	**XVB L6M8**	0.435

Beacons with 10 Joule “flash” discharge tube

Description	Light source	Colour	Reference	Weight kg
Complete unit comprising: - 1 illuminated unit - 1 base unit (direct or tube fixing)	Integral “flash” discharge tube ⎓ 24 V	Green	**XVB L8B3**	0.450
		Red	**XVB L8B4**	0.450
		Orange	**XVB L8B5**	0.450
		Blue	**XVB L8B6**	0.450
		Clear	**XVB L8B7**	0.450
		Yellow	**XVB L8B8**	0.450
	Integral “flash” discharge tube ∿ 120 V	Green	**XVB L8G3**	0.460
		Red	**XVB L8G4**	0.460
		Orange	**XVB L8G5**	0.460
		Blue	**XVB L8G6**	0.460
		Clear	**XVB L8G7**	0.460
		Yellow	**XVB L8G8**	0.460
	Integral “flash” discharge tube ∿ 230 V	Green	**XVB L8M3**	0.460
		Red	**XVB L8M4**	0.460
		Orange	**XVB L8M5**	0.460
		Blue	**XVB L8M6**	0.460
		Clear	**XVB L8M7**	0.460
		Yellow	**XVB L8M8**	0.460

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General: page 4/46 | Characteristics: page 4/48 | Dimensions: page 4/58

Safety dialogue solutions

Indicator banks Ø 70 mm
Harmony type XVB C Universal (customer assembly, up to 5 units)
Illuminated units for incandescent bulbs or LEDs (BA 15d base fitting)

For use with base unit XVB C●●: see page 4/56



XVB C3●



XVB C4●●

Illuminated units with steady light signalling

Description	Light source, to be ordered separately *(1)*	Colour	Reference	Weight kg
Illuminated units	Incandescent bulb 7 W max. 250 V max. or LED	Green	**XVB C33**	0.140
		Red	**XVB C34**	0.140
		Orange	**XVB C35**	0.140
		Blue	**XVB C36**	0.140
		Clear	**XVB C37**	0.140
		Yellow	**XVB C38**	0.140

Illuminated units with integral flashing light signalling

Description	Light source, to be ordered separately *(1)*	Colour	Reference	Weight kg
Illuminated units	Incandescent bulb 7 W max. ∼ 24 V ⎓ 24…48 V or LED	Green	**XVB C4B3**	0.160
		Red	**XVB C4B4**	0.160
		Orange	**XVB C4B5**	0.160
		Blue	**XVB C4B6**	0.160
		Clear	**XVB C4B7**	0.160
		Yellow	**XVB C4B8**	0.160
	Incandescent bulb 7 W max. ∼ 48…230 V or LED	Green	**XVB C4M3**	0.160
		Red	**XVB C4M4**	0.160
		Orange	**XVB C4M5**	0.160
		Blue	**XVB C4M6**	0.160
		Clear	**XVB C4M7**	0.160
		Yellow	**XVB C4M8**	0.160

(1) Incandescent bulbs and LEDs, see page 4/57.

Safety dialogue solutions

Indicator banks Ø 70 mm
Harmony type XVB C Universal (customer assembly, up to 5 units)
Illuminated units with integral LED

For use with base unit XVB C●●: see page 4/56



XVB C2●●

Illuminated units with steady light signalling

Description	Voltage	Colour	Reference	Weight kg
Illuminated units with integral LED Protected LED	⎓ 24 V	Green	**XVB C2B3** *(1)*	0.150
		Red	**XVB C2B4** *(1)*	0.150
		Orange	**XVB C2B5** *(1)*	0.150
		Blue	**XVB C2B6** *(1)*	0.150
		Clear	**XVB C2B7** *(1)*	0.150
		Yellow	**XVB C2B8** *(1)*	0.150
	∿ 120 V	Green	**XVB C2G3**	0.150
		Red	**XVB C2G4**	0.150
		Orange	**XVB C2G5**	0.150
		Blue	**XVB C2G6**	0.150
		Clear	**XVB C2G7**	0.150
		Yellow	**XVB C2G8**	0.150
	∿ 230 V	Green	**XVB C2M3**	0.150
		Red	**XVB C2M4**	0.150
		Orange	**XVB C2M5**	0.150
		Blue	**XVB C2M6**	0.150
		Clear	**XVB C2M7**	0.150
		Yellow	**XVB C2M8**	0.150



XVB C5●●

Illuminated units with integral flashing light signalling

Description	Voltage	Colour	Reference	Weight kg
Illuminated units with integral LED Protected LED	⎓ 24 V	Green	**XVB C5B3**	0.170
		Red	**XVB C5B4**	0.170
		Orange	**XVB C5B5**	0.170
		Blue	**XVB C5B6**	0.170
		Clear	**XVB C5B7**	0.170
		Yellow	**XVB C5B8**	0.170
	∿ 120 V	Green	**XVB C5G3**	0.170
		Red	**XVB C5G4**	0.170
		Orange	**XVB C5G5**	0.170
		Blue	**XVB C5G6**	0.170
		Clear	**XVB C5G7**	0.170
		Yellow	**XVB C5G8**	0.170
	∿ 230 V	Green	**XVB C5M3**	0.170
		Red	**XVB C5M4**	0.170
		Orange	**XVB C5M5**	0.170
		Blue	**XVB C5M6**	0.170
		Clear	**XVB C5M7**	0.170
		Yellow	**XVB C5M8**	0.170

(1) To order an illuminated unit with integral LED pre-fitted with light diffuser XVB Z18, add the letter "D" to the end of the reference. Example: XVB C2B3D.

Safety dialogue solutions

Indicator banks Ø 70 mm

Harmony type XVB C Universal (customer assembly, up to 5 units)

Illuminated units with integral “flash” discharge tube

For use with base unit XVB C●●: see page 4/56



XVB C6●●

Illuminated units with 5 Joule “flash” discharge tube

Description	Light source	Colour	Reference	Weight kg
Illuminated units	Integral “flash” discharge tube ⎓ 24 V	Green	**XVB C6B3**	0.295
		Red	**XVB C6B4**	0.295
		Orange	**XVB C6B5**	0.295
		Blue	**XVB C6B6**	0.295
		Clear	**XVB C6B7**	0.295
		Yellow	**XVB C6B8**	0.295
	Integral “flash” discharge tube ~ 120 V	Green	**XVB C6G3**	0.280
		Red	**XVB C6G4**	0.280
		Orange	**XVB C6G5**	0.280
		Blue	**XVB C6G6**	0.280
		Clear	**XVB C6G7**	0.280
		Yellow	**XVB C6G8**	0.280
	Integral “flash” discharge tube ~ 230 V	Green	**XVB C6M3**	0.290
		Red	**XVB C6M4**	0.290
		Orange	**XVB C6M5**	0.290
		Blue	**XVB C6M6**	0.290
		Clear	**XVB C6M7**	0.290
		Yellow	**XVB C6M8**	0.290



XVB C8●●

Illuminated units with 10 Joule “flash” discharge tube

Description	Light source	Colour	Reference	Weight kg
Illuminated units	Integral “flash” discharge tube ⎓ 24 V	Green	**XVB C8B3**	0.305
		Red	**XVB C8B4**	0.305
		Orange	**XVB C8B5**	0.305
		Blue	**XVB C8B6**	0.305
		Clear	**XVB C8B7**	0.305
		Yellow	**XVB C8B8**	0.305
	Integral “flash” discharge tube ⎓ 48 V	Orange	**XVB C8E5**	0.315
	Integral “flash” discharge tube ~ 120 V	Green	**XVB C8G3**	0.315
		Red	**XVB C8G4**	0.315
		Orange	**XVB C8G5**	0.315
		Blue	**XVB C8G6**	0.315
		Clear	**XVB C8G7**	0.315
		Yellow	**XVB C8G8**	0.315
	Integral “flash” discharge tube ~ 230 V	Green	**XVB C8M3**	0.315
		Red	**XVB C8M4**	0.315
		Orange	**XVB C8M5**	0.315
		Blue	**XVB C8M6**	0.315
		Clear	**XVB C8M7**	0.315
		Yellow	**XVB C8M8**	0.315

Safety dialogue solutions
Indicator banks Ø 70 mm
Harmony type XVB C Universal (customer assembly, up to 5 units)
Audible units, base units, cover, accessories


XVB C9●

Audible units

Description	Characteristics	Reference	Weight kg
Buzzer, 90 dB at 1 m Adjustable: - 70 or 90 dB - continuous or intermittent tone using microswitch	⎓ 12…48 V	**XVB C9B**	0.170
	∿ 120…230 V	**XVB C9M**	0.180

Base units (for direct or tube fixing)

Description	For use with	Type	Reference	Weight kg
Base unit + cover with bottom or side cable entry	Banks without "flash" discharge tube unit	Standard	**XVB C21**	0.190
Base unit only with bottom or side cable entry	Banks with "flash" discharge tube unit	Standard	**XVB C07**	0.160
Base unit + cover with side cable entry	All types of bank	AS-Interface *(1)*	**XVB C21A**	–
Base unit + cover with bottom entry, pre-cabled (length 1 metre) and fitted with M12 end connector	All types of bank	AS-Interface *(1)*	**XVB C21B**	–

(1) For further information on AS-Interface connections, refer to our "Industrial communication in machines and installations" catalogue.


XVB C07

Accessories specific to indicator banks XVB C

Description	Application	Unit reference	Weight kg
Cover only	For use with XVB C2, XVB C3, XVB C4, XVB C5 and XVB C9	**XVB C081**	0.030
Set of 6 coloured markers	For identification of the position of units in the event of dismantling the bank	**XVB C22**	0.001
Set of 5 legend holders	For identification of stacked units on base unit	**XVB C23**	0.002
Sheet of 85 legends	For use with base unit legend holder XVB C23	**XVB CY1**	0.005
Sheet of 52 legends	For identification of stacked units, used on locking ring	**XVB CY2**	0.005
Adaptor for side entry through base unit	With 13P cable gland	**XVB C14**	0.015
SIS labelling software (in English, French, German, Italian and Spanish)	For creating legends	**XBY 2U**	0.100
Light diffuser, clear plastic (Sold in boxes)	Only for use with LED illuminated units (all colours) One box allows to equip 5 illuminated units.	**XVB Z18**	0.080


XVB Z18

General: page 4/46 Characteristics: page 4/48 Dimensions: page 4/58

Safety dialogue solutions
Beacons and indicator banks Ø 70 mm
Harmony type XVB Universal
Accessories



XVB Z02 XVB Z03/Z04

Accessories common to beacons XVB L and indicator banks XVB C

Description	Height under base unit (mm)	Colour	Reference	Weight kg
Fixing bases comprising Ø 25 mm aluminium support tube glued into a black plastic fixing plate	80	Black aluminium	**XVB Z02**	0.110
		Aluminium	**XVB Z02A**	0.110
	380	Black aluminium	**XVB Z03**	0.200
		Aluminium	**XVB Z03A**	0.200
	780	Black aluminium	**XVB Z04**	0.325
		Aluminium	**XVB Z04A**	0.325

Description	For use with	Material	Reference	Weight kg
Support tube concealment cover	Support tubes **XVB Z02, XVB Z02A**	ABS	**XVB C020**	0.080
	Support tubes **XVB Z03, XVB Z03A**	ABS	**XVB C030**	0.305
	Support tubes **XVB Z04, XVB Z04A**	ABS	**XVB C040**	0.610
Ø 25 mm aluminium support tube Height under base unit 780 mm	Fixing plate XVB Z01 (to be glued into the plastic fixing plate)	Plastic	**XVB Z14**	0.690
Fixing plate for use on horizontal support	Ø 25 mm aluminium support tube	Plastic	**XVB Z01**	0.050
Fixing plate for use on vertical support	Base unit (direct mounting), fixing plate XVB Z01 or fixing bases XVB Z0●	Zamak	**XVB C12**	0.380



XVB C020



XVB Z01



XVB C12



DL1 B●●



DL1 BD●●/DL1 BK●●

Description	Characteristics		Sold in lots of	Unit reference	Weight kg
Incandescent bulbs BA 15d base fitting	12 V	7 W	10	**DL1 BEJ**	0.090
	24 V	6.5 W	10	**DL1 BEB**	0.090
	48 V	6 W	10	**DL1 BEE**	0.090
	120 V	7 W	10	**DL1 BEG**	0.090
	230 V	7 W	10	**DL1 BEM**	0.090
LEDs BA 15d base fitting Protected LED	⎓ 24 V	White	1	**DL1 BDB1**	0.015
		Green	1	**DL1 BDB3**	0.015
		Red	1	**DL1 BDB4**	0.015
		Orange	1	**DL1 BDB5**	0.015
		Blue	1	**DL1 BDB6**	0.015
		Yellow	1	**DL1 BDB8**	0.015
	∼ 120 V	White	1	**DL1 BDG1**	0.015
		Green	1	**DL1 BDG3**	0.015
		Red	1	**DL1 BDG4**	0.015
		Orange	1	**DL1 BDG5**	0.015
		Blue	1	**DL1 BDG6**	0.015
		Yellow	1	**DL1 BDG8**	0.015
	∼ 230 V	White	1	**DL1 BDM1**	0.015
		Green	1	**DL1 BDM3**	0.015
		Red	1	**DL1 BDM4**	0.015
		Orange	1	**DL1 BDM5**	0.015
		Blue	1	**DL1 BDM6**	0.015
		Yellow	1	**DL1 BDM8**	0.015
Flashing LEDs BA 15d base fitting Protected LED	⎓ 24 V	White	1	**DL1 BKB1**	0.015
		Green	1	**DL1 BKB3**	0.015
		Red	1	**DL1 BKB4**	0.015
		Orange	1	**DL1 BKB5**	0.015
		Blue	1	**DL1 BKB6**	0.015
		Yellow	1	**DL1 BKB8**	0.015
	∼ 120 V	White	1	**DL1 BKG1**	0.015
		Green	1	**DL1 BKG3**	0.015
		Red	1	**DL1 BKG4**	0.015
		Orange	1	**DL1 BKG5**	0.015
		Blue	1	**DL1 BKG6**	0.015
		Yellow	1	**DL1 BKG8**	0.015
	∼ 230 V	White	1	**DL1 BKM1**	0.015
		Green	1	**DL1 BKM3**	0.015
		Red	1	**DL1 BKM4**	0.015
		Orange	1	**DL1 BKM5**	0.015
		Blue	1	**DL1 BKM6**	0.015
		Yellow	1	**DL1 BKM8**	0.015

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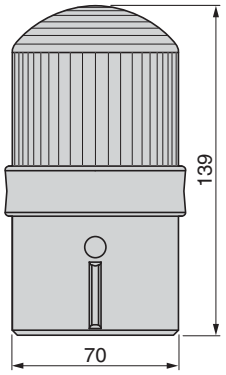
General: page 4/46 Characteristics: page 4/48 Dimensions: page 4/58

Safety dialogue solutions
Beacons and indicator banks Ø 70 mm
Universal, Harmony type XVB

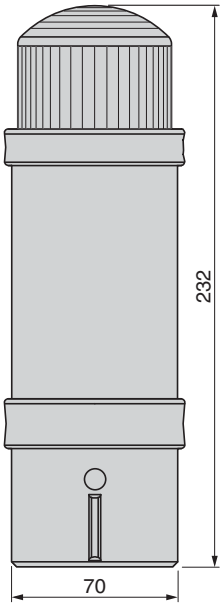
Dimensions

Illuminated beacons XVB L●●●

For BA 15d bulb or LED

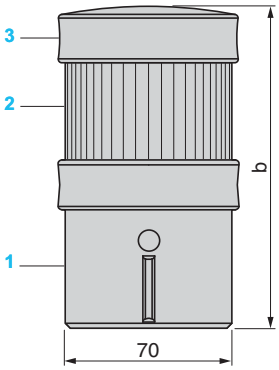


With "flash" discharge tube unit



Indicator banks XVB C●●●

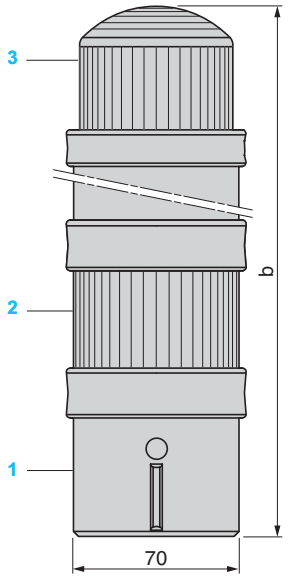
Without "flash" discharge tube unit



1 + 3 = Base unit + cover XVB C21
2 Illuminated or audible signalling unit XVB C●●●

Number of illuminated or audible signalling units (no "flash")	b
1	138
2	201
3	264
4	327
5	390

With "flash" discharge tube unit

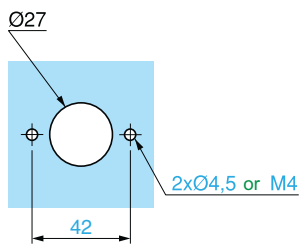


1 Base unit XVB C07
2 Illuminated or audible signalling unit XVB C●●●
3 "Flash" unit XVB C●●●

Number of illuminated or audible signalling units other than "flash" tube	b
1	295
2	358
3	421
4	484

Panel cut-out for direct fixing

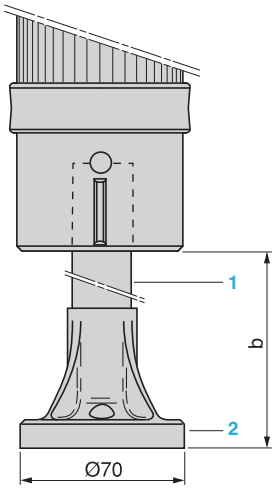
On base unit XVB C21, XVB C07, XVB C21A or XVB C21B



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References: page 4/50

Dimensions

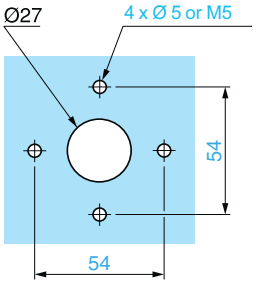
With fixing bases comprising XVB Z0● (aluminium support tube glued into black plastic fixing plate)



Fixing base comprising XVB Z0● (Ø 25 mm support tube 1 glued into plastic fixing plate 2)

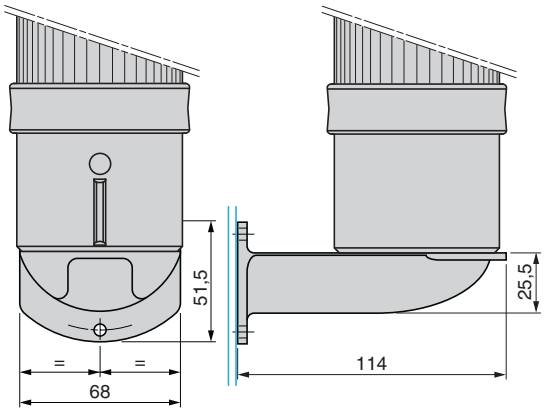
XVB	b
Z02/Z02A	80
Z03/Z03A	380
Z04/Z04A	780

Horizontal support panel cut-out for mounting on fixing plate

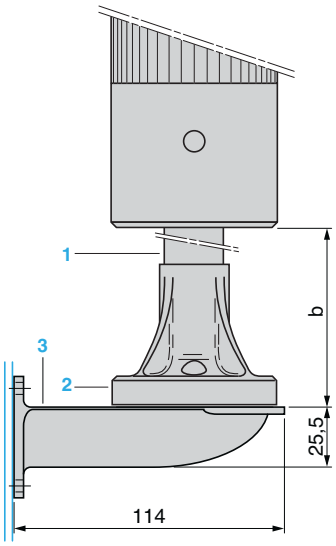


With fixing plate XVB C12 for use on vertical support

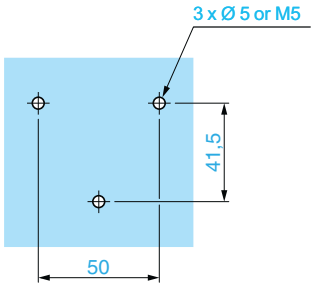
Direct mounting on base unit



Mounting using fixing base XVB Z0● (aluminium support tube glued into black plastic fixing plate)



Vertical support panel drillings for mounting fixing plate XVB C12



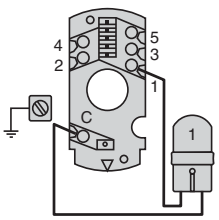
Fixing base comprising XVB Z0● (Ø 25 mm support tube 1 glued into plastic fixing plate 2) mounted on fixing plate XVB C12 for vertical support 3

XVB	b
Z02/Z02A	80
Z03/Z03A	380
Z04/Z04A	780

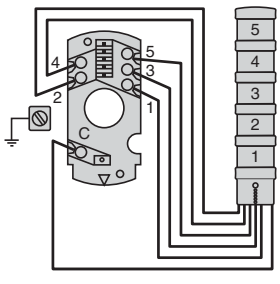
Installation

Connections

XVB L

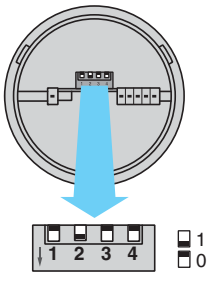


XVB C



Adjustment of audible signal for buzzers type XVB C9●

By means of 4 microswitches located in the base of the buzzer:
- 2 switches marked **1** and **2** for selecting continuous or intermittent **mode** (Hz).
- 2 switches marked **3** and **4** for selecting the **power** (dB) of the audible signal.



Position of microswitches		Setting
1	**2**	**Mode**
1	1	▬ 2.8 kHz
1	0	▬ 2.8 kHz
0	1	⊓⊓ 5 Hz *(1)*
0	0	⊔ 1 Hz
3	**4**	**Power**
1	1	90 dB *(1)*
0	1	85 dB
1	0	80 dB
0	0	70 dB

(1) Factory setting.

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Characteristics: page 4/48
References: page 4/50

Safety dialogue solutions
Rotating mirror beacons, type XVR

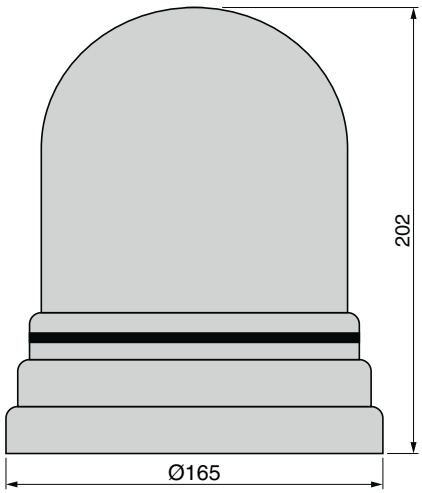
General

These rotating beacons are designed for long distance signalling applications.

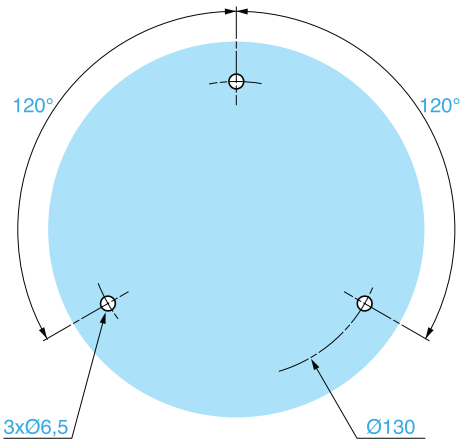
Characteristics

Conformity to standards			IEC/EN 60947-1, IEC/EN 60947-5-1, UL 508, CSA C22-2-14
Protective treatment	Standard version		"TC"
Ambient air temperature	For storage	**°C**	- 40…+ 70
	For operation	**°C**	- 20…+ 50
Electric shock protection	Conforming to IEC/EN 61140 and NF C 20-030		Class I
Degree of protection	Conforming to IEC 60529 and NF C 20-010		IP 65
	Conforming to UL 508 and CSA 22		Type 4X Nema "INDOOR"
Material	Base unit		Glass-reinforced polyamide 6
	Domed lens unit		Polycarbonate
Rated insulation voltage (Ui)	Conforming to IEC/EN 60947-1	**V**	250
Consumption	Halogen bulbs	**mA**	⎓ 24 V: < 3100
	Incandescent bulbs	**mA**	⎓ 24 V: < 1050
			∿ 120 V: < 210
			∿ 230 V: < 110
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1	**kV**	U imp = 4
Light source	Halogen bulbs		Bulbs with H1 base fitting: maximum power 70 W
	Incandescent bulbs		Bulbs with BA 15d base fitting: maximum power 25 W
Service life of motor		**H**	> 2000
Mounting position			Horizontal
Flash frequency		**Hz**	3
Connection	Maximum clamping capacity	**mm²**	1 x 1.5 mm²
Cable entry			For ISO M20 x 1.5 cable gland (included)

Dimensions



Panel cut-out



M20 x 1.5 cable gland included

Safety dialogue solutions
Rotating mirror beacons, type XVR



XVR 1●●●

Rotating mirror beacons

Light source	Supply voltage	Colour	Reference	Weight kg
Halogen bulb included 70 W	≂ 24 V	Green	**XVR 1B93**	1.165
		Red	**XVR 1B94**	1.165
		Orange	**XVR 1B95**	1.165
		Blue	**XVR 1B96**	1.165
		Yellow	**XVR 1B98**	1.165
Incandescent bulb included 25 W	≂ 24 V	Green	**XVR 1B03**	1.165
		Red	**XVR 1B04**	1.165
		Orange	**XVR 1B05**	1.165
		Blue	**XVR 1B06**	1.165
		Yellow	**XVR 1B08**	1.165
	∿ 120 V	Green	**XVR 1G03**	1.235
		Red	**XVR 1G04**	1.235
		Orange	**XVR 1G05**	1.235
		Blue	**XVR 1G06**	1.235
		Yellow	**XVR 1G08**	1.235
	∿ 230 V	Green	**XVR 1M03**	1.235
		Red	**XVR 1M04**	1.235
		Orange	**XVR 1M05**	1.235
		Blue	**XVR 1M06**	1.235
		Yellow	**XVR 1M08**	1.235

Accessories and spare parts

Description	Characteristics	Unit reference	Weight kg
Domed lens unit	Green	**XVR 0153**	0.335
	Red	**XVR 0154**	0.335
	Orange	**XVR 0155**	0.335
	Blue	**XVR 0156**	0.335
	Yellow	**XVR 0158**	0.335
Protective grill for domed lens unit	–	**XVR 016** *(1)*	–
Fixing plate for use on vertical support	–	**XVR 012**	–
Fixing plate for support tube (1/2 NPT)	–	**XVR 013**	–
Halogen bulbs H1 base fitting, 70 W	24 V	**DL1 BRBH**	–
Incandescent bulbs BA 15d base fitting, 25 W (sold in lots of 10)	24 V	**DL1 BRB**	0.100
	120 V	**DL1 BRG**	0.100
	230 V	**DL1 BRM**	0.100

(1) This protective grill is only suitable for use with the XVR 1●●● rotating mirror beacon, without cable gland fitted.

General

These sirens are designed for long distance signalling applications.

Characteristics

Conformity to standards			IEC/EN 60947-1, IEC/EN 60947-5-1
Protective treatment	Standard version		"TC"
Ambient air temperature	For storage	**°C**	- 40…+ 70
	For operation	**°C**	- 40…+ 50
Electric shock protection	Conforming to IEC/EN 61140 and NF C 20-030	**kV**	∼ 120 V and ∼ 230 V: class II
		kV	⎓ 24 V: class III
Degree of protection	Conforming to IEC 60529 and NF C 20-010		IP 40
Material	Body		Glass-reinforced polyamide 6
	Cone		Butadiene-styrene acrylic
Rated insulation voltage (Ui)	Conforming to IEC/EN 60947-1	**V**	250
Consumption		**mA**	⎓ 24: 440
		mA	∼ 120: 110
		mA	∼ 230: 55
Frequency	1-tone	**Hz**	1000 ± 10%
	2-tone	**Hz**	700 and 800 ± 15%
Rated impulse withstand voltage	Conforming to IEC/EN 60947-1	**kV**	∼ 120 V and ∼ 230 V: U imp = 4
		kV	⎓ 24 V: U imp = 1.5
Mounting position			All positions
Connection	Maximum clamping capacity	**mm²**	1 x 1.5 with cable end

References

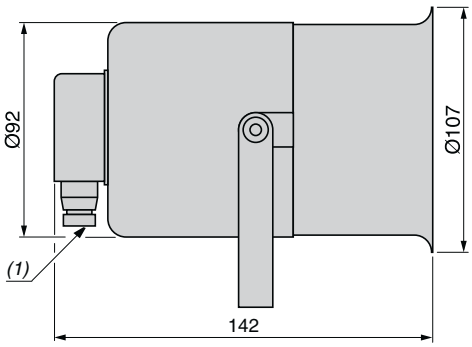


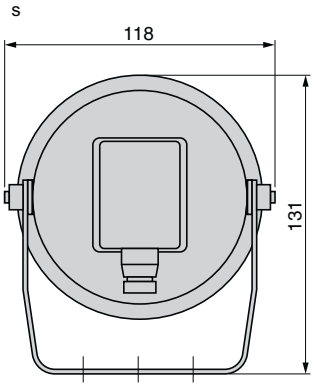
XVS B●

Sirens

Description	Supply voltage	Number of tones	Reference	Weight kg
Sirens 106 db	⎓ 24 V	1	**XVS B1**	0.860
		2	**XVS B2**	0.860
	∿ 120 V	1	**XVS G1**	0.860
		2	**XVS G2**	0.860
	∿ 230 V	1	**XVS M1**	0.860
		2	**XVS M2**	0.860

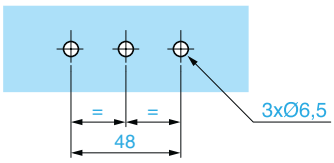
Dimensions





(1) Cable gland n° 7 (DIN Pg 7), included.

Panel cut-out



5

Safety control and protection solutions

Mini-VARIO and VARIO switch disconnectors

Selection guide: Mini-VARIO and VARIO switch disconnectors 5/2

Mini-VARIO switch disconnectors

For standard applications

- Complete units *5/8*
- For customer assembly *5/9*

For high performance applications

- Complete units *5/10*

Mini-VARIO and VARIO switch disconnectors

- Operators, handles and front plates for customer assembly. *5/13*
- Accessories. *5/14*

VARIO enclosed switch disconnectors

- Pre-assembled *5/16*
- Assembled by the user *5/17*
- Add-on modules *5/18*

Direct starters for safety applications

Selection guide: Direct starters for safety applications. 5/26

Thermal-magnetic motor circuit breakers TeSys GV2 ME *5/28*

Enclosed thermal-magnetic motor circuit breakers TeSys GV2 ME and accessories, assembled by customer. *5/30*

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE

Non reversing starters

- LG7 K, with pushbutton control of isolation *5/34*
- LG1 K, with rotary operator for control of isolation *5/35*
- LJ7 K, with integral transformer *5/40*

Reversing starters

- LG8 K, with pushbutton control of isolation *5/36*
- Variants *5/37*
- LJ8 K, with integral transformer *5/41*

Contactors

Selection guide: Contactors 5/44

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors

Applications	**Mini-Vario and Vario rotary switch disconnectors from 12 to 175 A are suitable for on-load making and breaking of resistive or mixed resistive and inductive circuits where frequent operation is required. They can also be used for direct switching of motors in utilisation categories AC-3 and DC-3 specific to motors. Vario switch disconnectors are suitable for isolator applications with fully visible breaking (since the handle cannot indicate the "open" position unless all the contacts are actually open and separated by the appropriate isolating distance) and it is possible to padlock the handles in the open position.**







Application	Standard applications				
Presentation	Bare switches			Enclosed switches	
Assembly	Pre-assembled		For customer assembly	Pre-assembled	For customer assembly
Thermal current	12 and 20 A			10…32 A	10 and 16 A
Operational current AC-23 at 400 V	8.1 and 11 A			8.1…29 A	8.1…11 A
Number of poles	3		3…5	3	3…5
Number of auxiliary contacts	–		1 or 2	–	1 or 2
Reversible terminal blocks	Yes				
Mounting	On door	At back of enclosure	On door or at back of enclosure	–	
Operator	Direct	Offset with door interlock mechanism	Direct or offset with door interlock mechanism	Direct	
Switch type	**VCDN 12 VCDN 20**	**VCCDN 12 VCCDN 20**	**VN 12 VN 20**	**VCFN 12GE to VCFN 40GE**	**VN 12, VN 20 + VCFX GE1**
Pages	5/8		5/9	5/16	5/17 to 5/19

Mini-Vario and Vario rotary switch disconnectors from 12 to 175 A are suitable for on-load making and breaking of resistive or mixed resistive and inductive circuits where frequent operation is required.
They can also be used for direct switching of motors in utilisation categories AC-3 and DC-3 specific to motors.
Vario switch disconnectors are suitable for isolator applications with fully visible breaking (since the handle cannot indicate the "open" position unless all the contacts are actually open and separated by the appropriate isolating distance) and it is possible to padlock the handles in the open position.






High performance applications					
Bare switches				Enclosed switches	
Pre-assembled			For customer assembly	Pre-assembled	For customer assembly
12…175 A				10…140 A	10…63 A
8.1…83 A					8.1…41 A
3			3…6 (up to 80 A) 3 (for 125 and 175 A ratings)	3	3… 6
–			1 or 2	–	2
Yes					
On door	At back of enclosure	In enclosure or modular distribution boards	On door, at back of enclosure, in enclosure or modular distribution boards	–	
Direct	Indirect with door interlock mechanism	Direct	Direct or indirect with door interlock mechanism	Direct	
VC● 02 to VC● 6	**VCC● 02 to VCC● 6**	**VVE 0 to VVE 4**	**V02 to V6**	**VCF 02GE to VCF 6GE**	**V02 to V4 + VCFX GE1 to VCFX GDXE**
5/10			5/11 to 5/15	5/16	5/17

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors

Characteristics

Environment

Switch type (bare type)				VN 12 VZN 12	V02 VZ 02	VN 20 VZN 20	V01 VZ 01	V0 VZ 0	VVD 0 VVE 0	V1 VZ 1	VVD 1 VVE 1
Conforming to standards				IEC 60947-3							
Product certifications				UL, CSA, GL							
Protective treatment				"TC"							
Degree of protection with protection shroud				IP 20 conforming to IEC 60529							
Ambient air temperature			**° C**	- 20…+ 50							
Flame resistance			**° C**	960 conforming to IEC 60695-2-1							
Shock resistance 1/2 sine wave = 11ms conforming to IEC60068-2-27			**gn**	15	30	15	30				
Vibration resistance 10…150 Hz conforming to IEC 60068-2-6			**gn**	5	1						

Electrical characteristics, a.c. operation

Switch type (bare type)				VN 12 VZN 12	V02 VZ 02	VN 20 VZN 20	V01 VZ 01	V0 VZ 0	VVD 0 VVE 0	V1 VZ 1	VVD 1 VVE 1
Rated operational voltage (Ue)			**V**	690							
Rated impulse withstand voltage (Uimp)			**kV**	6	8	6	8				
Conventional thermal currents in free air (Ith) **and rated uninterrupted** (Iu)			**A**	12		20		25		32	
Conventional thermal current in enclosure (Ithe)			**A**	10		16		20		25	
Rated operational power and current	AC-21A/22A	230…690 V	**A**	12		20		25		32	
	AC-23A	230 V	**A/kW**	10.6/3		14/4		19.7/5.5			
		240 V	**A/kW**	10.6/3		14/4		19.9/5.5		18.9/5.5	
		400 V	**A/kW**	8.1/4		11/5.5		14.5/7.5		21.8/11	
		415 V	**A/kW**	8.1/4		11/5.5		14/7.5		21/11	
		500 V	**A/kW**	8.9/5.5		11.9/7.5		16.7/11			
		690 V	**A/kW**	8.6/7.5		12.3/11		17.5/15			
Rated operational power	AC -3	230/240 V	**kW**	1.5		3		4			
		400/415 V	**kW**	3		4		5.5		7.5	
		500 V	**kW**	4		5.5		7.5			
		690 V	**kW**	4	5.5		7.5	11			
Intermittent duty class				30							
Characteristics in normal operating conditions	Rated making capacity AC-21A/22A/23A (I rms)		**A/** 400 V	120		200		250		320	
	Rated breaking capacity AC-21A/22A/23A (I rms)		**A/** 400 V	120		200				250	
Short-circuit characteristics	Permissible rms short time rating (Icw)		**A/** 400 V/1s	140	300	140	300			384	
	Rated making capacity under short-circuit conditions (Icm) I peak		**kA/** 400 V	0.5	1	0.5	1				
	Rated conditional short-circuit current (I rms) with aM/gG fuses		**kA/** 400 V	6	10	6	10				
			A	12		20		25		35	

5

Environment

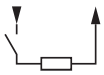
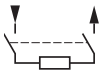
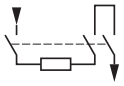
V2 VZ 2	VVD 2 VVE 2	V3 VZ 3	VVD 3 VVE 3	V4 VZ 4	VVD 4 VVE 4	V5	V6	VZ7 VZ2 0	VZN 05 VZN 06
IEC 60947-3								IEC 60947-5	
UL, CSA, GL									
“TC”									
IP 20 conforming to IEC 60529									
- 20…+ 50									
960 conforming to IEC 60695-2-1									
30								–	
1								–	

V2 VZ 2	VVD 2 VVE 2	V3 VZ 3	VVD 3 VVE 3	V4 VZ 4	VVD 4 VVE 4	V5	V6	VZ7 VZ2 0	VZN 05 VZN 06
690									
8									6
40		63		80		125	175	12	6
32		50		63		100	140	10	4
40		63		80		125	160	Ie/AC-15	
25.8/7.5		50.3/15		61.2/18.5		71.9/22	96.6/30	6 A	
24.8/7.5		48.2/15		58.5/18.5		68/22	92.7/30	6 A	
29/15		41.5/22		57/30		68.5/37	83/45	4 A	
28/15		40/22		55/30		66/37	80/45	4 A	
28.5/18.5		44/30		54/37		64.5/45	79/55	2 A	
17.5/15		25/22		33/30		42/37	49/45	1 A	
5.5		11		15		22	30	–	
11		18.5		22		30	37	–	
15		22		30		37	45	–	
11		18.5				30	37	–	
30								–	
400		630		800		1250	1750	–	
320		500		640		1000	1400	–	
480		756		960		1500	2100	–	
1		2.1				2.8		–	
10								1	
50		63		80		125	200	16	1.6

5

Characteristics

Electrical characteristics, d.c. operation

Switch type (bare type)				VN 12 VZN 12	V02 VZ 02	VN 20 VZN 20	V01 VZ 01	V0 VZ 0	VVD 0 VVE 0	V1 VZ 1	VVD 1 VVE 1
Rated operational current DC-1 (L/R = 1ms)	24 V	1 contact	**A**	12		20		25		32	
		2 contacts	**A**	12		20		25		32	
		3 contacts	**A**	12		20		25		32	
	48 V	1 contact	**A**	12		20		25		32	
		2 contacts	**A**	12		20		25		32	
		3 contacts	**A**	12		20		25		32	
	60 V	1 contact	**A**	12		20		25		32	
		2 contacts	**A**	12		20		25		32	
		3 contacts	**A**	12		20		25		32	
	110 V	1 contact	**A**	1.5		2		9		10	
		2 contacts	**A**	8		10		12		16	
		3 contacts	**A**	12		20		25		32	
	220 V	1 contact	**A**	1.5		2		2.5		3	
		2 contacts	**A**	7		8		10		12	
		3 contacts	**A**	10		14		16		20	
	250 V	1 contact	**A**	0.6		0.7		0.8		1	
		2 contacts	**A**	3		4		6		8	
		3 contacts	**A**	8		10		12		16	
Rated operational current DC-2 to DC-5 (L/R = 1ms)	24 V	1 contact	**A**	12		20		25		32	
		2 contacts	**A**	12		20		25		32	
		3 contacts	**A**	12		20		25		32	
	48 V	1 contact	**A**	12		20		25		32	
		2 contacts	**A**	12		20		25		32	
		3 contacts	**A**	12		20		25		32	
	60 V	1 contact	**A**	10		14		16		20	
		2 contacts	**A**	12		20		25		32	
		3 contacts	**A**	12		20		25		32	
	110 V	1 contact	**A**	1.5		2		2.5		3	
		2 contacts	**A**	3		4		5		6	
		3 contacts	**A**	12		20		25		32	
	220 V	1 contact	**A**	0.4		0.5		0.5		0.8	
		2 contacts	**A**	1.4		1.5		1.5		2	
		3 contacts	**A**	1		2		3		4	
	250 V	1 contact	**A**	0.3		0.4		0.5		0.8	
		2 contacts	**A**	0.4		0.6		0.8		1	
		3 contacts	**A**	1.2		2.4		1.6		2	

Other characteristics

Switch type (bare type)			VN 12 VZN 12	V02 VZ 02	VN 20 VZN 20	V01 VZ 01	V0 VZ 0	VVD 0 VVE 0	V1 VZ 1	VVD 1 VVE 1
Mechanical durability (millions of operating cycles)			0.05	0.1	0.05	0.1				
Electrical durability in cat. AC-21 (millions of operating cycles)			0.05	0.1	0.05	0.1				
Electrical durability in cat. DC-1 to 5 (operating cycles)			30 000							
Suitable for isolation			Yes							
Cabling	Flexible cable + cable end	**mm²**	4	6	4	6				
	Solid cable	**mm²**	4	10	4	10				
Tightening torque		**N.m**	0.7	2.1	0.7	2.1				

V2 VZ 2	VVD 2 VVE 2	V3 VZ 3	VVD 3 VVE 3	V4 VZ 4	VVD 4 VVE 4	V5	V6	VZ7 VZ2 0	VZN 05 VZN 06
40		63		80		125	175	8 (Ie/DC-11)	
40		63		80		125	175	–	
40		63		80		125	175	–	
40		63		80		125	175	8 (Ie/DC-11)	
40		63		80		125	175	–	
40		63		80		125	175	–	
35		40		50		60	70	4 (Ie/DC-11)	
40		63		80		125	175	–	
40		63		80		125	175	–	
12		20		25		30	12	2 (Ie/DC-11)	
20		63		80		125	175	–	
40		63		80		125	175	–	
4		6		8		12	15	1 (Ie/DC-11)	
14		25		30		40	50	–	
25		30		40		80	100	–	
2		4		5		3	10	0.8 (Ie/DC-11)	
12		20		25		30	40	–	
20		30		40		50	61	–	
40		63		80		125	175	–	
40		63		80		125	175	–	
40		63		80		125	175	–	
40		63		80		125	175	–	
40		63		80		125	175	–	
40		63		80		125	175	–	
25		40		50		60	70	–	
40		63		80		125	175	–	
40		63		80		125	175	–	
5		6		8		10	12	–	
8		10		20		22	24	–	
40		50		63		70	80	–	
1		1.5		2		2.2	2.4	–	
3		4		6		7	8	–	
7		10		15		16	13	–	
1		1.2		1.5		1.6	1.8	–	
2		3		6		7	8	–	
6		8		10		12	14	–	

V2 VZ 2	VVD 2 VVE 2	V3 VZ 3	VVD 3 VVE 3	V4 VZ 4	VVD 4 VVE 4	V5	V6	VZ7 VZ2 0	VZN 05 VZN 06
0.1		0.03						0.1	0.05
0.1		0.03						0.1 (AC-15)	0.05
30 000								30 000 (DC-11)	
Yes								–	
6		16				70		2 x 0.75…1.5	
10		25				95		2 x 1…2.5	
2.1		4				22.6		0.7	

Safety control and protection solutions

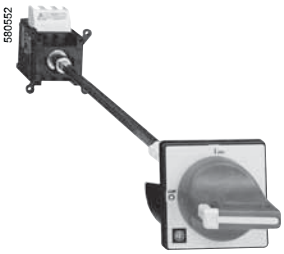
Mini-VARIO switch disconnectors for standard applications

Complete units

- 3-pole rotary switch disconnectors, 12 to 20 A
- Padlockable operating handle (padlocks not supplied).
- Degree of protection IP 65.
- Marking on operator O I.



VCDN 20



VCCDN 20

Main and Emergency stop switch disconnectors

For door mounting

Operator			Ith	Reference	Weight
Handle	Front plate	Fixing			
	mm	mm	A		kg
Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 60 x 60	Ø 22.5	12	**VCDN 12**	0.177
			20	**VCDN 20**	0.177

Main and Emergency stop switch disconnectors

For mounting at back of an enclosure *(1)*

Operator			Ith	Reference	Weight
Handle	Front plate	Fixing			
	mm	mm	A		kg
Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 60 x 60	Ø 22.5	12	**VCCDN 12**	0.334
			20	**VCCDN 20**	0.334

(1) Switches supplied with a shaft extension VZN 17 and a door interlock plate KZ 32.

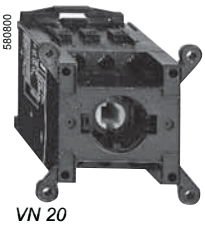
5

Characteristics : page 5/4
Dimensions : pages 5/20 and 5/21
Schemes : page 5/21

Safety control and protection solutions

Mini-VARIO switch disconnectors for standard applications

For customer assembly



VN 20



VZN 11



VZN 14



VZN 05

Switch bodies

Description	Rating A	Reference	Weight kg
3-pole switch disconnectors	12	**VN 12**	0.110
	20	**VN 20**	0.110

Add-on modules

Description	Rating A	Reference	Weight kg
Main pole modules	12	**VZN 12**	0.020
	20	**VZN 20**	0.020
Neutral pole module with early make and late break contacts	12 and 20	**VZN 11**	0.020
Earthing module	12 and 20	**VZN 14**	0.016
Auxiliary contact block modules	1 N/O late make contact	**VZN 05**	0.020
	1 N/C early break contact	**VZN 06**	0.020
Input terminal protection shrouds	For add-on pole modules or auxiliary contact block modules (single-pole shroud)	**VZN 26**	0.004
	For switch bodies (3-pole shroud)	**VZN 08**	0.007

Maximum number of add-on modules that can be fitted on a switch body

VZN 12 or VZN 20	+	**VN 12**	+	VZN 12 or VZN 20
or		**or**		VZN 11 + VZN 14
VZN 05 or VZN 06		**VN 20**	or	VZN 05 or VZN 06

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Characteristics : page 5/4
Dimensions : pages 5/20 and 5/21
Schemes : page 5/21

Safety control and protection solutions

VARIO switch disconnectors for high performance applications

Complete units



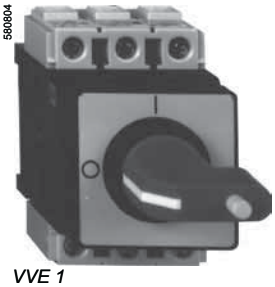
VCF 0



VCF 5



VCCF 0



VVE 1

- 3-pole rotary switch disconnectors, 12 to 175 A
- Marking on operator O I.
- Padlockable operating handle (padlocks not supplied).

Degree of protection IP 65.

Main and Emergency stop switch disconnectors

For door mounting

Handle	Front plate mm	Fixing	Rating A	Reference	Weight kg
Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 60 x 60	Ø 22.5	12	**VCD 02**	0.215
			20	**VCD 01**	0.215
			25	**VCD 0**	0.215
			32	**VCD 1**	0.215
			40	**VCD 2**	0.215
		4 screws	12	**VCF 02**	0.250
			20	**VCF 01**	0.250
			25	**VCF 0**	0.250
			32	**VCF 1**	0.250
			40	**VCF 2**	0.250
			63	**VCF 3**	0.560
			80	**VCF 4**	0.560
Red, long, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 90 x 90	4 screws	125	**VCF 5**	1.200
			175	**VCF 6**	1.200

For mounting at back of an enclosure *(1)*

Handle	Front plate mm	Fixing	Rating A	Reference	Weight kg
Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 60 x 60	Ø 22.5	12	**VCCD 02**	0.392
			20	**VCCD 01**	0.392
			25	**VCCD 0**	0.392
			32	**VCCD 1**	0.392
			40	**VCCD 2**	0.392
		4 screws	12	**VCCF 02**	0.527
			20	**VCCF 01**	0.527
			25	**VCCF 0**	0.527
			32	**VCCF 1**	0.527
			40	**VCCF 2**	0.527
			63	**VCCF 3**	0.440
			80	**VCCF 4**	0.680
Red, long, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 90 x 90	4 screws	125	**VCCF 5**	1.320
			175	**VCCF 6**	1.320

For mounting in an enclosure or for modular distribution boards

Handle	Front plate mm	Fixing	Rating A	Reference	Weight kg
Red, padlockable with 1 padlock (Ø 4 to Ø 6)	Yellow 45 x 45		25	**VVE 0**	0.250
			32	**VVE 1**	0.250
			40	**VVE 2**	0.250
			63	**VVE 3**	0.530
			80	**VVE 4**	0.530

(1) Switches supplied with a shaft extension VZN 17 and a door interlock plate KZ 32 or KZ 74 (see page 5/14).

Characteristics : page 5/4
Dimensions : page 5/22
Schemes : page 5/23

Safety control and protection solutions

VARIO switch disconnectors for high performance applications

Complete units



V0



V5



VZ 0



VZ 11



VZ 15



VZ 20

Switch bodies

Description	Rating A	Reference	Weight kg
3-pole switch disconnectors *(1)*	12	**V02**	0.200
	20	**V01**	0.200
	25	**V0**	0.200
	32	**V1**	0.200
	40	**V2**	0.200
	63	**V3**	0.500
	80	**V4**	0.500
	125	**V5**	0.900
	175	**V6**	0.900

Add-on modules

Description	Rating A	Reference	Weight kg
Main pole modules	12	**VZ 02**	0.050
	20	**VZ 01**	0.050
	25	**VZ 0**	0.050
	32	**VZ 1**	0.050
	40	**VZ 2**	0.050
	63	**VZ 3**	0.100
	80	**VZ 4**	0.100
Neutral pole modules with early make and late break contacts (1)	12 to 40	**VZ 11**	0.050
	63 to 80	**VZ 12**	0.100
	125 and 175	**VZ 13**	0.250
Earthing modules	12 to 40	**VZ 14**	0.050
	63 and 80	**VZ 15**	0.100
	125 and 175	**VZ 16**	0.250

Auxiliary contact block modules

Auxiliary contact block modules with 2 auxil. contacts	N/O + N/C *(2)*	**VZ 7**	0.050
	N/O + N/O	**VZ 20**	0.050

Maximum no. of add-on modules that can be fitted on a switch body

1 add-on module on each side of the switch body

VZ 7 or VZ 20	+	**V0●**	+	VZ 7 or VZ 20	VZ 7	+	**V5**	+ VZ 7
or				or	or			or
VZ 11 or VZ 12	+	**V0**	+	VZ 11 or VZ 12	VZ 20	+		+ VZ 20
or				or	or		**or**	or
VZ 14 or VZ 15	+	**to**	+	VZ 14 or VZ 15	VZ 13	+		+ VZ 13
or				or	or		**V6**	or
VZ 0●/VZ 0 to VZ 4	+	**V4**	+	VZ 0●/VZ 0 to VZ 4	VZ 16	+		+ VZ 16

2 add-on modules on each side of the switch body

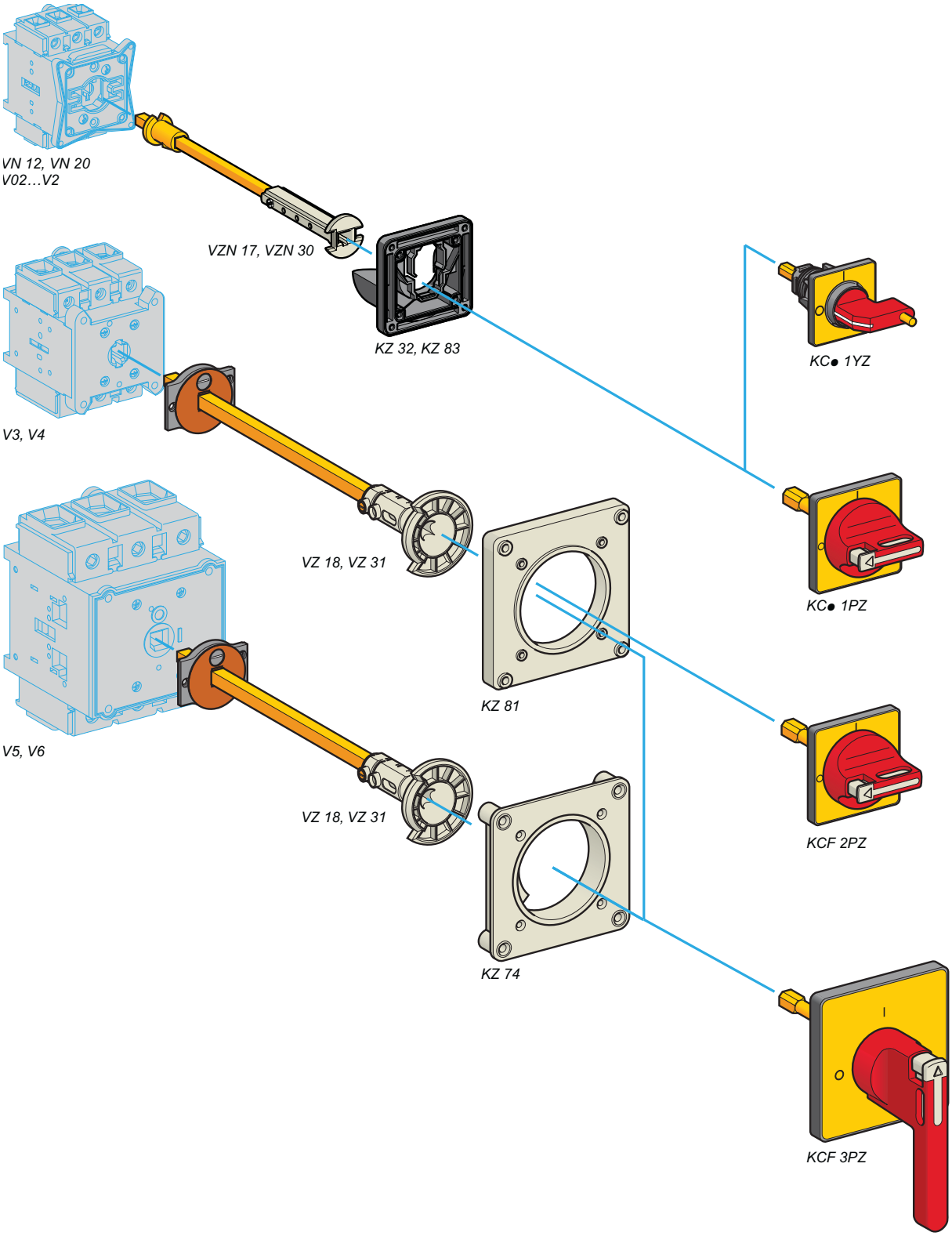
VZ 0●	+ VZ 0●	+	**V0●**	+ VZ 0●	+ VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 0	+ VZ 0	+	**V0**	+ VZ 0	+ VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 1	+ VZ 1	+	**V1**	+ VZ 1	+ VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 2	+ VZ 2	+	**V2**	+ VZ 2	+ VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 3	+ VZ 3	+	**V3**	+ VZ 3	+ VZ 7	or	VZ 20	or	VZ 12	or	VZ 15
VZ 4	+ VZ 4	+	**V4**	+ VZ 4	+ VZ 7	or	VZ 20	or	VZ 12	or	VZ 15

Note : *The add-on modules mounted next to the switch body are main poles. Maximum of 3 main pole modules per switch body.*

(1) Protection shrouds are available if required: see page 5/14.
(2) Late make N/O, early break N/C contacts

Characteristics : page 5/4
Dimensions : page 5/22
Schemes : page 5/23

Safety control and protection solutions
Mini-VARIO and VARIO switch disconnectors



Safety control and protection solutions

Mini-VARIO and VARIO switch disconnectors
Operators, handles and front plates
(for customer assembly)

- Padlockable operating handle (padlocks not supplied).
- Degree of protection IP 65.
- Marking on operator ○┘.

Handles and front plates for main and Emergency stop switch disconnectors

For switch body	Operator			Reference	Weight
	Handle	Front plate			
		Dimensions	Fixing		
		mm			kg
VN 12, VN 20 V02…V2	Red, padlockable with up to 1 padlock (Ø 4 to Ø 6)	Yellow 45 x 45	Ø 22.5	**KCC 1YZ**	0.050
			4 screws	**KCE 1YZ**	0.040
	Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 60 x 60	Ø 22.5	**KCD 1PZ**	0.082
			4 screws	**KCF 1PZ**	0.075
V3 and V4	Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 60 x 60	4 screws	**KCF 2PZ**	0.070
V5 and V6	Red, long, padlockable with up to 3 padlocks (Ø 4 to Ø 8)	Yellow 90 x 90	4 screws	**KCF 3PZ** *(1)*	0.160

(1) For door mounting of 63 and 80 A switch disconnectors, adapter plate KZ 106 must be ordered separately (see page 5/14).

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Safety control and protection solutions

Mini-VARIO and VARIO switch disconnectors

Accessories



VZ 8



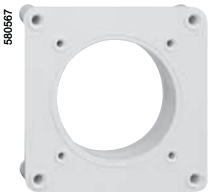
VZ 26



VZ 18



KZ 32



KZ 81

Input terminal protection shrouds

Description	For use on	Reference	Weight kg
For switch bodies (3-pole shroud)	V02…V2	**VZ 8**	0.015
	V3 and V4	**VZ 9**	0.020
	V5 and V6	**VZ 10**	0.060
For add-on pole modules (single-pole shroud)	VZ 02…VZ 2, VZ 11, VZ 14	**VZ 26**	0.005
	VZ 3, VZ 4, VZ 12, VZ 15	**VZ 27**	0.007
	VZ 13, VZ 16	**VZ 28**	0.020
For contact blocks with 2 auxiliary contacts	–	**VZ 29**	0.005

Components for door interlocking

For rear fixing switch disconnectors mounted at the back of an enclosure, in addition to a direct operator

Description	For use on	Distance enc.back/door	Sold in lots of	Unit reference	Weight
		mm			kg
Shaft extensions	VN 12, VN 20 V02…V2	300…330	1	**VZN 17** *(1)*	0.100
		400…430	1	**VZN 30** *(1)*	0.130
	V02…V2	300…330	1	**VZ 17**	0.075
		400…430	1	**VZ 30**	0.125
	V3 and V4	300…320	1	**VZ 18**	0.170
		400…420	1	**VZ 31**	0.215
	V5 and V6	330…350	1	**VZ 18**	0.170
		430…450	1	**VZ 31**	0.215
Door interlock plates	VN 12, VN 20 V02…V2	–	5	**KZ 32**	0.177
	V3…V6	–	5	**KZ 74**	0.020

Description	For use on	Front plate dimensions	Sold in lots of	Unit reference	Weight
		mm			kg
Plates for door mounting of handles with 4 screw fixing	VN 12, VN 20 V02…V2	45 x 45 or 60 x 60	5	**KZ 83**	0.205
	V3…V6	60 x 60 or 90 x 90	5	**KZ 81**	0.010
Adapter plate for switch disconnectors	V3 and V4	90 x 90	5	**KZ 106**	0.075

(1) Can be used with V02 to V2 switches.

Characteristics : page 5/4
Dimensions : pages 5/20 to 5/23
Schemes : pages 5/21 and 5/23

Safety control and protection solutions

Mini-VARIO and VARIO switch disconnectors

Accessories


580568

KZ 15


580569

KZ 67


580570

Z01

Accessories for operators

Description	For use on	Front plate dimensions	Sold in lots of	Unit reference	Weight
		mm			kg
Legend holder with silver coloured blank legend plate	Front plate	45 x 45	5	**KZ 13**	0,060
		60 x 60	5	**KZ 15**	0,065
		90 x 90	5	**KZ 103**	0,070
Legend holders without legend plate	Front plate	45 x 45	20	**KZ 14**	0,060
		60 x 60	10	**KZ 16**	0,065
		90 x 90	5	**KZ 101**	0,070
Silver coloured blank legend plates for engraving by customer	KZ 14	–	20	**KZ 76**	0,020
	KZ 16	–	10	**KZ 77**	0,010
	KZ 101	–	5	**KZ 100**	0,005
Seals	VN 12, VN 20	45 x 45	5	**KZ 65**	0,037
	V02…V2	60 x 60	5	**KZ 66**	0,033
	V3 and V4	60 x 60	5	**KZ 62**	0,033
	V3…V6	90 x 90	5	**KZ 67**	0,064
Tightening tool	For operators with Ø 22.5 fixing	–	5	**Z01**	0,050

5

Characteristics : page 5/4
Dimensions : pages 5/20 to 5/23
Schemes : pages 5/21 and 5/23

Safety control and protection solutions

VARIO enclosed switch disconnectors (pre-assembled)

Enclosed switch disconnectors for high performance applications



VCF 0GE

- Marking on operator ○ ⏽.
- 3-pole rotary switch disconnectors from 10 to 140 A
- Padlockable operating handle (padlock not included).
- IP 65 degree of protection enclosures, sealable and lockable.
- Cover lockable in position “I” (ON) up to 63 A rating.

3-pole main and Emergency stop switch disconnectors *(1)*

Operator		Ithe	Power AC-23 at 400 V	Incorporated switch body	Possible attachments *(2)*	Reference	Weight
Handle	Front plate Dimensions						
	mm	A	kW				kg
Red, padlockable with up to 3 padlocks (Ø 4 to Ø 8 shank)	Yellow 60 x 60	10	4	V02	2	**VCF 02GE**	0.500
		16	5.5	V01	2	**VCF 01GE**	0.500
		20	7.5	V0	2	**VCF 0GE**	0.500
		25	11	V1	2	**VCF 1GE**	0.500
		32	15	V2	2	**VCF 2GE**	0.500
		50	22	V3	3	**VCF 3GE**	0.930
		63	30	V4	3	**VCF 4GE**	0.930
Red, long padlockable with up to 3 padlocks (Ø 4 to Ø 8 shanks)	Yellow 90 x 90	100	37	V5	1	**VCF 5GE**	2.190
		140	45	V6	1	**VCF 6GE**	2.190



VCF 3GE

Enclosed switch disconnectors for standard applications

- 3-pole rotary switch disconnectors from 10 to 32 A
- Degree of protection IP 55.

3-pole main and Emergency stop switch disconnectors *(1)*

Operator		Ithe	Power AC-23 at 400 V	Incorporated switch body	Possible attachments *(2)*	Reference	Weight
Handle	Front plate Dimensions						
	mm	A	kW				kg
Red, padlockable with 1 padlock (Ø 8 shank) **or up to 3 padlocks** (Ø 6 shank)	Yellow 60 x 60	10	4	VN 12	2	**VCFN 12GE** *(2)*	0.422
		16	5.5	VN 20	2	**VCFN 20GE** *(2)*	0.422
		20	7.5	V0	0	**VCFN 25GE**	0.512
		25	11	V1	0	**VCFN 32GE**	0.512
		32	15	V2	0	**VCFN 40GE**	0.512

(1) Switch disconnector characteristics, see pages 5/4 to 5/6.
(2) For enclosures VCF and VCFN, see page 5/18



VCFN 12GE

Dimensions : page 5/24
Schemes : page 5/25

Safety control and protection solutions

VARIO enclosed switch disconnectors (assembled by the user)

580574



VCFX GE2

Empty enclosures

IP 65 enclosure with red padlockable handle operator and yellow front plate
(for mounting a main or Emergency stop switch disconnector)

For switch body type	Ithe	Possible attachments *(1)*	Reference	Weight
	A			kg
VN 12, VN 20 V02…V2	10…32	2	**VCFX GE1**	0.340
V02…V2	10…32	4	**VCFX GE4**	0.660
V3 and V4	50…63	3	**VCFX GE2**	0.660
		4	**VCFX GDXE**	0.660

Switch bodies for standard applications *(2)*

Description	Rating	Reference	Weight
	A		kg
3-pole switch disconnectors	10	**VN 12**	0.110
	16	**VN 20**	0.110

Switch bodies for high performance applications *(2)*

Description	Rating	Reference	Weight
	A		kg
3-pole switch disconnectors	10	**V02**	0.200
	16	**V01**	0.200
	20	**V0**	0.200
	25	**V1**	0.200
	32	**V2**	0.200
	50	**V3**	0.200
	63	**V4**	0.200

580575



V0

(1) See page 5/18.
(2) Switch disconnector characteristics, see pages 5/4 to 5/6.

5

Dimensions :
pages 5/24 and 5/17

Schemes :
page 5/25

Safety control and protection solutions
VARIO enclosed switch disconnectors
Add-on modules



VZ 0



VZ 11



VZ 15



VZ 20

Add-on modules for enclosure VCF

Description	Rating	Reference	Weight
	A		kg
Main pole modules (mounted in enclosure)	10	**VZ 02**	0.050
	16	**VZ 01**	0.050
	20	**VZ 0**	0.050
	25	**VZ 1**	0.050
	32	**VZ 2**	0.050
	50	**VZ 3**	0.100
	63	**VZ 4**	0.100
Neutral pole modules with early make and late break contacts	10 to 32	**VZ 11**	0.050
	50 and 63	**VZ 12**	0.100
	100 and 140	**VZ 13**	0.250
Earthing modules	10 to 32	**VZ 14**	0.050
	50 and 63	**VZ 15**	0.100
	100 and 140	**VZ 16**	0.250
Auxiliary contact block modules with 2 auxiliary contacts	N/O + N/C *(1)*	**VZ 7**	0.050
	N/O + N/O	**VZ 20**	0.050

Maximum number of add-on modules that can be fitted on a switch body

1 add-on module on each side of the switch body

VZ 7 or VZ 20	+	**V0●**	+	VZ 7 or VZ 20
or				or
VZ 11 or VZ 12	+	**V0**	+	VZ 11 or VZ 12
or				or
VZ 14 or VZ 15	+	**to**	+	VZ 14 or VZ 15
or				or
VZ 0●/VZ 0 to VZ 4	+	**V4**	+	VZ 0●/VZ 0 to VZ 4

2 add-on modules on each side of the switch body

VZ 0●	+	VZ 0●	+	**V0●**	+	VZ 0●	+	VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 0	+	VZ 0	+	**V0**	+	VZ 0	+	VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 1	+	VZ 1	+	**V1**	+	VZ 1	+	VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 2	+	VZ 2	+	**V2**	+	VZ 2	+	VZ 7	or	VZ 20	or	VZ 11	or	VZ 14
VZ 3	+	VZ 3	+	**V3**	+	VZ 3	+	VZ 7	or	VZ 20	or	VZ 12	or	VZ 15
VZ 4	+	VZ 4	+	**V4**	+	VZ 4	+	VZ 7	or	VZ 20	or	VZ 12	or	VZ 15

Note : *The add-on modules mounted next to the switch body are main pole modules. Maximum of 3 main pole modules per switch body.*

(1) Late make N/O, early break N/C contacts

Schemes : page 5/25

Safety control and protection solutions

Mini-VARIO enclosed switch disconnectors

Add-on modules



VZN 11



VZN 14



VZN 05

Add-on modules for enclosures VCFN 12GE and 20 GE

Description	Rating	Reference	Weight
	A		kg
Main pole modules	10	**VZN 12**	0.020
	16	**VZN 20**	0.020
Neutral pole module with early make and late break contacts	10 and 16	**VZN 11**	0.020
Earthing module	10 and 16	**VZN 14**	0.016
Auxiliary contact block modules	1 late make N/O contact	**VZN 05**	0.020
	1 early break N/C contact	**VZN 06**	0.020

Maximum number of add-on modules that can be fitted on a switch body

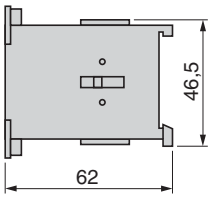
VZN 12 or VZN 20	+	**VN 12**	+	VZN 12 or VZN 20
				or
				VZN 11
		or		
or				or
		VN 20		VZN 05 or VZN 06
				or
VZN 05 or VZN 06				VZN 14

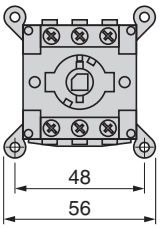
Schemes :
page 5/25

Dimensions

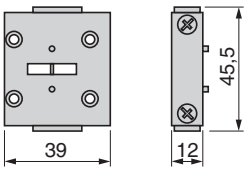
Switch disconnectors

Switch bodies VN 12, VN 20

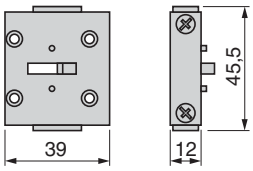




Add-on modules VZN 12, VZN 20



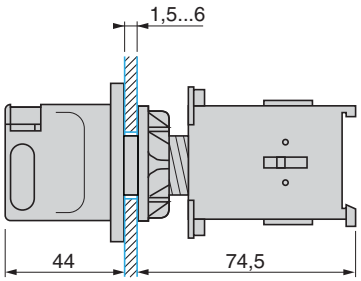
Add-on modules VZN 11, VZN 14 VZN 05 and VZN 06

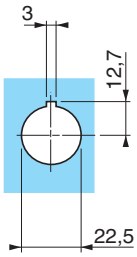


Mounting

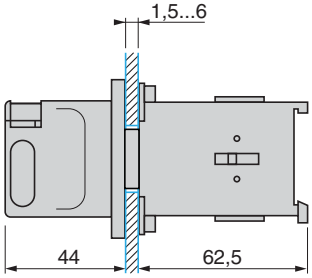
Switch disconnector mounted on enclosure door

VN 12, VN 20
Single hole fixing

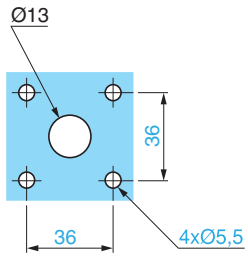




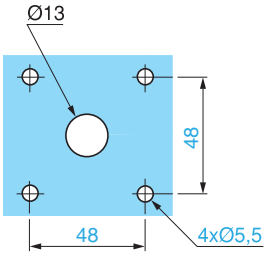
VN 12, VN 20
4 screw fixing



45 x 45 front plate



60 x 60 front plate



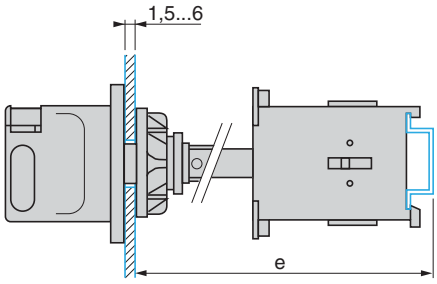
Characteristics : page 5/4
References : page 5/8
Schemes : page 5/20

Mounting (continued)

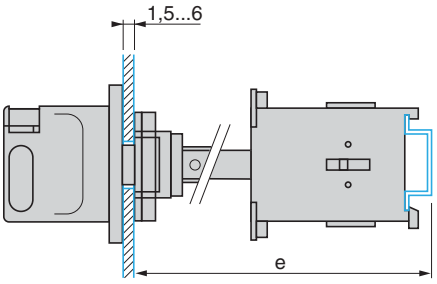
Switch disconnector mounted at back of enclosure with shaft extension VZN 17 or VZN 30 (clip-on mounting on ⊔ rail)

VN 12, VN 20

Single hole fixing



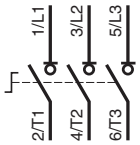
4 screw fixing



	Shaft extension	Distance (e) enclosure back/door
		mm
VN 12, VN 20	VZN 17	300…330
	VZN 30	400…430

Schemes

Switch body VN 12, VN 20	Main pole module VZN 12, VZN 20	Neutral pole module VZN 11	Auxiliary contact blocks VZN 05	Auxiliary contact blocks VZN 06











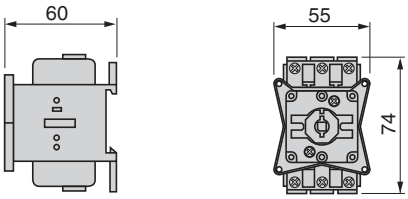
5

Characteristics : page 5/4
References : page 5/8

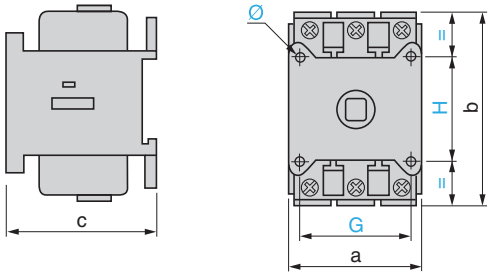
Dimensions

Switch disconnectors

Switch bodies V0●, V0 to V2



Switch bodies V3 to V6



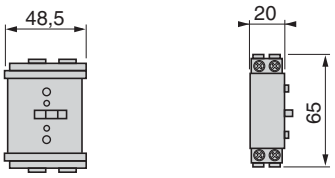
	a	b	c	G	H	Ø
V3, V4	60	83	65	48	48	5.5
V5, V6	90	125	90	68	68	5.5

Add-on modules VZ 02 to VZ 4 and VZ 11 to VZ 16



	a	b	c
VZ 02 and VZ 01, VZ 0 to VZ 2, VZ 11, VZ 14	16	74	35
VZ 3, VZ 4, VZ 12, VZ 15	20	83	46
VZ 13, VZ 16	30	125	63

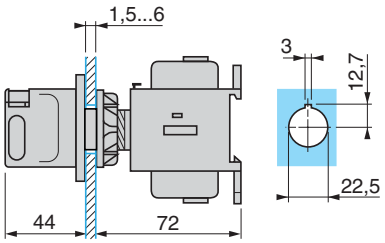
Add-on modules VZ 7, VZ 20



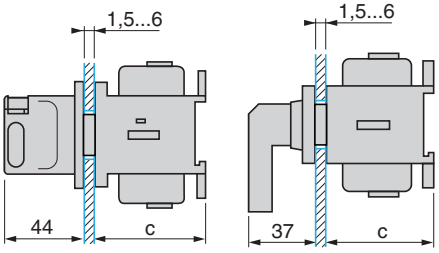
Mounting

Switch disconnector mounted on enclosure door

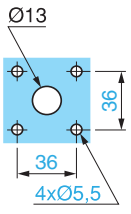
Single hole fixing V0●, V0 to V4



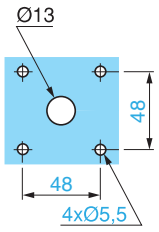
4 screw fixing V0●, V0 to V4



4 screw fixing 45 x 45 front plate V0●, V0 to V2

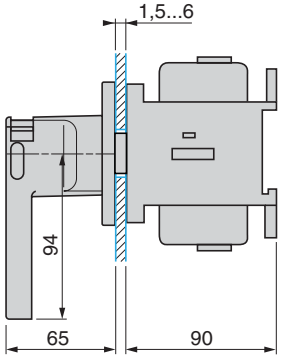


4 screw fixing 60 x 60 front plate V0●, V0 to V4

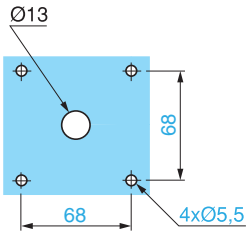


	c
V0●, V0 to V2	60
V3, V4	65

V5 and V6. 4 screw fixing



90 x 90 front plate

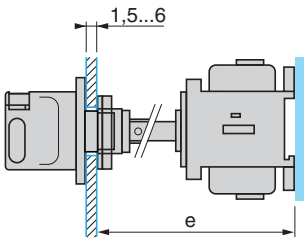


Characteristics : page 5/4
References : pages 5/10
Schemes : page 5/23

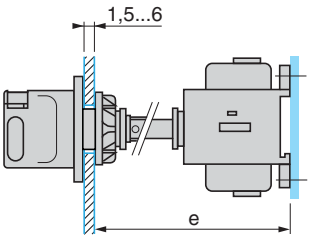
Mounting (continued)

Switch disconnector mounted at back of enclosure

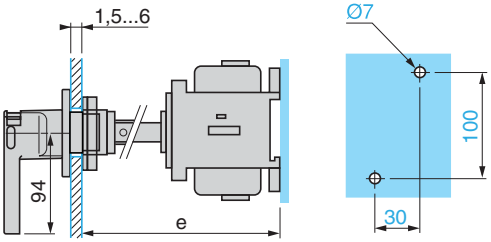
4 screw fixing
V0●, V0 to V2 with shaft extension VZ 17 or VZ 30 (clip-on mounting on ⊥Γ rail possible for V0● to V2)



Single hole fixing
V3 to V4 with shaft extension VZ 18 or VZ 31



V5 and V6 with shaft extension VZ 18 or VZ 31

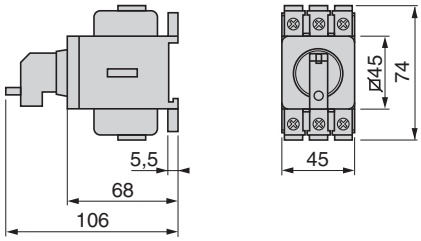


	Shaft extension	Distance (e) enc.back/door	Ø	G
		mm		
V02 and V01 V0 to V2	VZ 17	300…330	2 x 4.2	15
	VZ 30	400…430	2 x 4.2	15
V3 and V4	VZ 18	300…320	2 x 5	20
	VZ 31	400…420	2 x 5	20

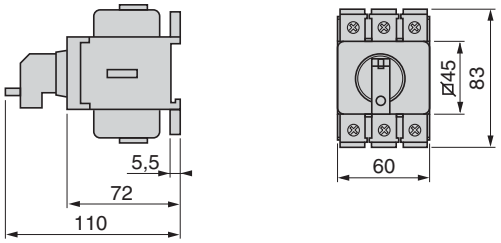
	Shaft extension	Distance (e) enc. back/door
		mm
V5 and V6	VZ 18	300…350
	VZ 31	430…450

Switch disconnectors for modular distribution boards

VV● 0 to VV● 2



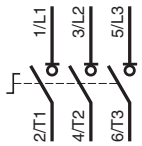
VV● 3 to VV● 4



Schemes

Switch body

V02 and V01
V0 to V6



Main pole module

VZ 02 and VZ 01
VZ 0 to VZ 4



Neutral pole module

VZ 11 to VZ 13



Auxiliary contact blocks

VZ 7



VZ 20

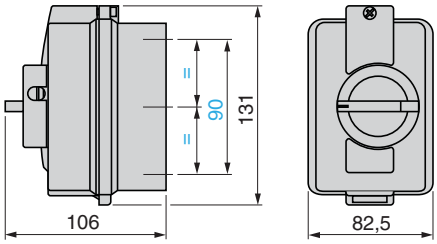


Characteristics : page 5/4
References : pages 5/10
Schemes : page 5/23

Safety control and protection solutions
VARIO enclosed switch disconnectors

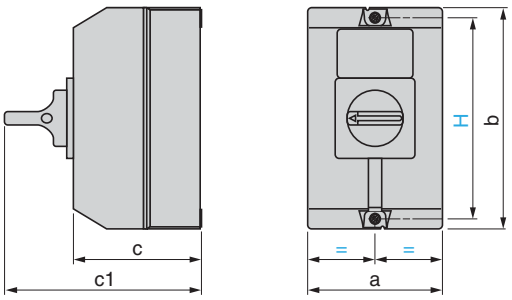
Dimensions

VCFN 12GE to VCFN 40GE



Cable glands: 2 x 16 P top and bottom

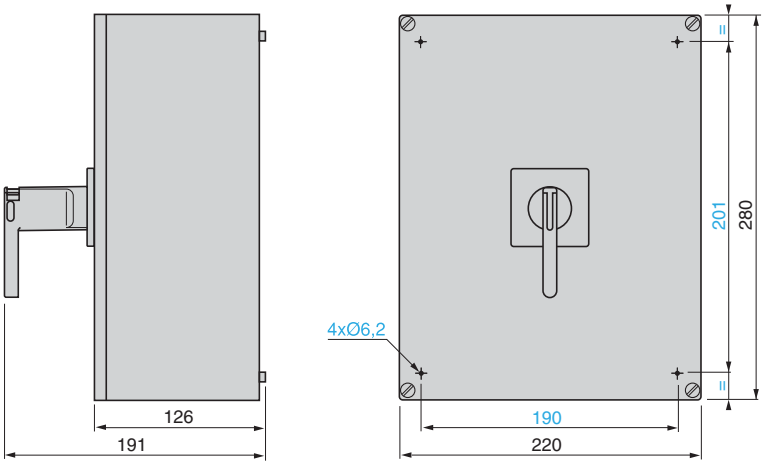
VCF 02GE to 4GE, VCFX GE1 to GE4



	a	b	c	c1	H
VCF 02GE to VCF 2GE, VCFX GE1 *(1)*	90	146	85	131	130
VCF 3GE and VCF 4GE *(2)*	150	170	106	152	164
VCFX GE2 and VCFX GE4 *(2)*	150	170	106	152	164

(1) Cable glands: 2 x 16 P top and bottom
(2) Cable glands: 2 x 16/21/29 P top and bottom

VCF 5GE and 6GE



References : page 5/16
Schemes : page 5/25

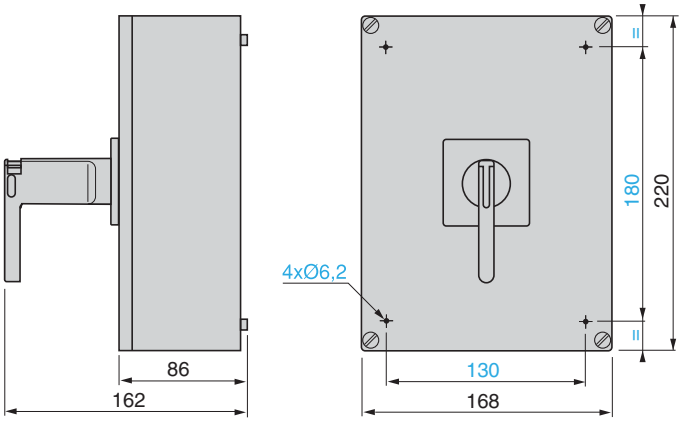
Safety control and protection solutions

VARIO enclosed switch disconnectors
(assembled by the user)

Dimensions *(continued)*

Empty enclosures

VCFX GDXE



Schemes

Switch disconnectors

Enclosed switch disconnectors or switch bodies	Main pole module	Neutral pole module



Auxiliary contact blocks

VZ 7	VZ 20	VZN 05	VZN 06



References :
pages 5/17 to 5/19

Safety control and protection solutions

Direct starters for safety applications

Applications	**Industrial and service industries** **Use in a machine subject to the enforcement of Machinery Directive 98/37/CE and Work equipment directive 89/655/CEE.**		
			
Starter type	For customer assembly	Pre-assembled	
Operation	1 direction of movement		
Standardised powers of 3-phase motors in AC-3 supplied with 400/415 V	0.06…11 kW	0.06…9 kW	
Components	Thermal-magnetic motor circuit-breaker + voltage minimum circuit-breaker	Thermal-magnetic motor circuit-breaker + switch	Rotary-control selector switch + thermal-magnetic motor circuit-breaker + switch
Unit type	**GV2 ME + GV AX + GV2 MC + GV2 K**	**LG7 K LG7 D**	**LG1 K LG1 D**
Pages	5/28 to 5/31	5/34	5/35







	2 directions of movement	
0.06…4 kW	0.06…5.5 kW	0.06…4 kW
Thermal-magnetic motor circuit-breaker + switch + control transformer	Thermal-magnetic motor circuit-breaker + reversing switch	Thermal-magnetic motor circuit-breaker + reversing switch + control transformer
LJ7 K	**LG8 K**	**LJ8 K**
5/40	5/36	5/41

5

Safety control and protection solutions

Thermal-magnetic motor circuit breakers TeSys GV2 ME



GV2 ME

Thermal-magnetic motor circuit breakers GV2 ME with screw terminals

GV2 ME: pushbutton control

Standard power ratings of 3-phase motors 50/60 Hz in category AC-3									Setting range of thermal trips *(2)*	Magnetic tripping current Id ± 20 %	Reference	Weight
400/415 V			500 V			690 V						
P	Icu	Ics *(1)*	P	Icu	Ics *(1)*	P	Icu	Ics *(1)*				
kW	kA		kW	kA		kW	kA		A	A		kg
–	–	–	–	–	–	–	–	–	0.1…0.16	1.5	**GV2 ME01**	0.260
0.06	★	★	–	–	–	–	–	–	0.16…0.25	2.4	**GV2 ME02**	0.260
0.09	★	★	–	–	–	–	–	–	0.25…0.40	5	**GV2 ME03**	0.260
0.12	★	★	–	–	–	**0.37**	★	★	0.40…0.63	8	**GV2 ME04**	0.260
0.18	★	★	–	–	–	–	–	–	0.40…0.63	8	**GV2 ME04**	0.260
0.25	★	★	–	–	–	**0.55**	★	★	0.63…1	13	**GV2 ME05**	0.260
0.37	★	★	**0.37**	★	★	–	–	–	1…1.6	22.5	**GV2 ME06**	0.260
0.55	★	★	**0.55**	★	★	**0.75**	★	★	1…1.6	22.5	**GV2 ME06**	0.260
–	–	–	**0.75**	★	★	**1.1**	★	★	1…1.6	22.5	**GV2 ME06**	0.260
0.75	★	★	**1.1**	★	★	**1.5**	3	75	1.6…2.5	33.5	**GV2 ME07**	0.260
1.1	★	★	**1.5**	★	★	**2.2**	3	75	2.5…4	51	**GV2 ME08**	0.260
1.5	★	★	**2.2**	★	★	**3**	3	75	2.5…4	51	**GV2 ME08**	0.260
2.2	★	★	**3**	50	100	**4**	3	75	4…6.3	78	**GV2 ME10**	0.260
3	★	★	**4**	10	100	**5.5**	3	75	6…10	138	**GV2 ME14**	0.260
4	★	★	**5.5**	10	100	**7.5**	3	75	6…10	138	**GV2 ME14**	0.260
5.5	15	50	**7.5**	6	75	**9**	3	75	9…14	170	**GV2 ME16**	0.260
–	–	–	–	–	–	**11**	3	75	9…14	170	**GV2 ME16**	0.260
7.5	15	50	**9**	6	75	**15**	3	75	13…18	223	**GV2 ME20**	0.260
9	15	40	**11**	4	75	**18.5**	3	75	17…23	327	**GV2 ME21**	0.260
11	15	40	**15**	4	75	–	–	–	20…25	327	**GV2 ME22** *(3)*	0.260
15	10	50	**18.5**	4	75	**22**	3	75	24…32	416	**GV2 ME32**	0.260

Thermal-magnetic motor circuit breakers GV2 ME with built-in auxiliary contact block

With instantaneous auxiliary contact block:

- **GV AE1**, add suffix **AE1TQ** to the motor circuit breaker reference selected above. Example: **GV2 ME01AE1TQ**.
- **GV AE11**, add suffix **AE11TQ** to the motor circuit breaker reference selected above. Example: **GV2 ME01AE11TQ**.
- **GV AN11**, add suffix **AN11TQ** to the motor circuit breaker reference selected above. Example: **GV2 ME01AN11TQ**.

These motor circuit breakers with built-in contact block are sold in lots of 20 parts in a single pack.

(1) As a % of Icu.
*(2) To use **GV2 ME** in enclosures, please consult your Regional Sales Office.*
*(3) For the maximum rating which can be installed in **GV2 MC** or **MP** enclosures, please consult your Regional Sales Office.*
★ > 100 kA.

Safety control and protection solutions

Thermal-magnetic motor circuit breakers TeSys GV2 ME - Accessories

Contact blocks

Description	Mounting	Max. number	Contact types		Sold in lots of.	Unit reference	Weight kg
Instantaneous auxiliary contacts	Front	1	N/O or N/C *(1)*		10	**GV AE1**	0.015
			N/O + N/C		10	**GV AE11**	0.020
			N/O + N/O		10	**GV AE20**	0.020
	Side LH	2	N/O + N/C		1	**GV AN11**	0.050
			N/O + N/O		1	**GV AN20**	0.050
Fault signalling contact + instantaneous auxiliary contact	Side *(2)* LH	1	N/O (fault)	+ N/O	1	**GV AD1010**	0.055
				+ N/C	1	**GV AD1001**	0.055
			N/C (fault)	+ N/O	1	**GV AD0110**	0.055
				+ N/C	1	**GV AD0101**	0.055
Short-circuit signalling contact	Side LH	1	C/O common point		1	**GV AM11**	0.045

Electric trips

Undervoltage or shunt trip *(3)*

Mounting	Voltage		Reference	Weight kg
Side (1 block on RH side of breaker)	24 V	50 Hz	**GV A●025**	0.105
		60 Hz	**GV A●026**	0.105
	48 V	50 Hz	**GV A●055**	0.105
		60 Hz	**GV A●056**	0.105
	100 V	50 Hz	**GV A●107**	0.105
	100…110 V	60 Hz	**GV A●107**	0.105
	110…115 V	50 Hz	**GV A●115**	0.105
		60 Hz	**GV A●116**	0.105
	120…127 V	50 Hz	**GV A●125**	0.105
	127 V	60 Hz	**GV A●115**	0.105
	200 V	50 Hz	**GV A●207**	0.105
	200 V…220 V	60 Hz	**GV A●207**	0.105
	220 V…240 V	50 Hz	**GV A●225**	0.105
		60 Hz	**GV A●226**	0.105
	380 V…400 V	50 Hz	**GV A●385**	0.105
		60 Hz	**GV A●386**	0.105
	415 V…440 V	50 Hz	**GV A●415**	0.105
	415 V	60 Hz	**GV A●416**	0.105
	440 V	60 Hz	**GV A●385**	0.105
	480 V	60 Hz	**GV A●415**	0.105
	500 V	50 Hz	**GV A●505**	0.105
	600 V	60 Hz	**GV A●505**	0.105

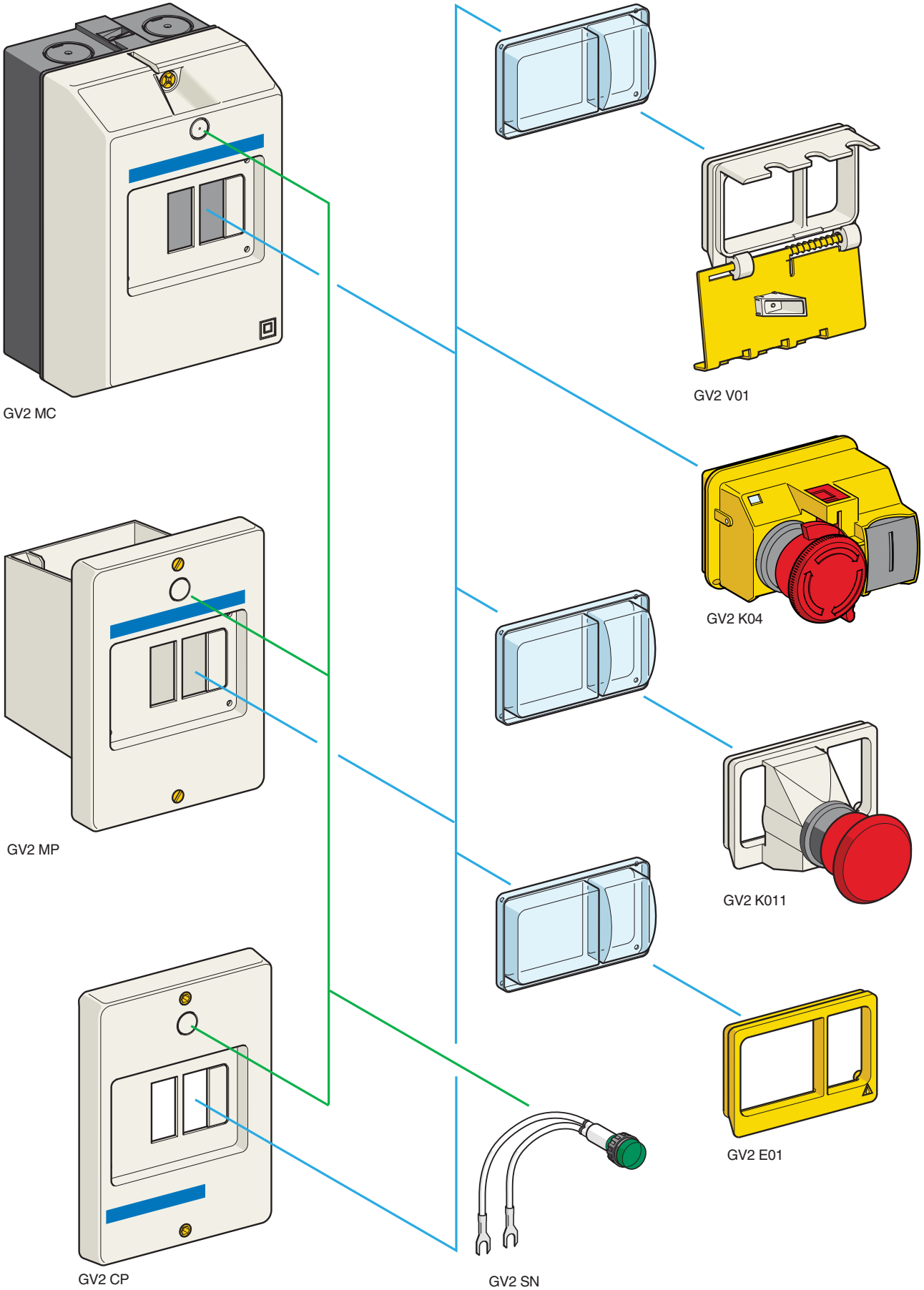
INRS voltage minimum (only installed on GV2 ME)
Safety device for dangerous machines conforming to INRS and VDE 0113

Side (1 block on RH side of breaker GV2 ME)	110…115 V	50 Hz	**GV AX115**	0.110
		60 Hz	**GV AX116**	0.110
	127 V	60 Hz	**GV AX115**	0.110
	220…240 V	50 Hz	**GV AX225**	0.110
		60 Hz	**GV AX226**	0.110
	380…400 V	50 Hz	**GV AX385**	0.110
		60 Hz	**GV AX386**	0.110
	415…440 V	50 Hz	**GV AX415**	0.110
	440 V	60 Hz	**GV AX385**	0.110

(1) Choice of N/C or N/O contact operation depending on which way round the reversible block is mounted.
*(2) The **GV AD** is always mounted next to the circuit breaker*
*(3) To order an undervoltage trip: replace the dot in the reference with a **U**, example: **GV2 AU025**.*
*To order a shunt trip: replace the dot in the reference with an **S**, example: **GV2 AS025**.*

Safety control and protection solutions

Enclosed thermal-magnetic motor circuit breakers TeSys GV2 ME and accessories, assembled by customer



Safety control and protection solutions

Enclosed thermal-magnetic motor circuit breakers TeSys GV2 ME and accessories, assembled by customer

Thermal-magnetic motor circuit breakers GV2 ME

Motor-circuit breakers and accessories: see pages 5/28 and 5/29. The starter consisting of an enclosed motor circuit-breaker GV2 ME conforms to IEC 60947-4-1.

GV2	ME01	ME02	ME03	ME04	ME05	ME06	ME07	ME08	ME10	ME14	ME16	ME20	ME21	ME22
Ithe enclosed (A)	0.16	0.25	0.4	0.63	1	1.6	2.5	4	6.3	9	13	17	21	23

Enclosures for thermal-magnetic motor circuit breakers GV2 ME

Type	Degree of protection	Possible attachments on side of GV2 ME		Reference	Weight kg
		Left	Right		
Surface mounting Double, insulated with protective conductor. Sealable cover	IP 41	1	1	**GV2 MC01**	0.290
	IP 55	1	1	**GV2 MC02**	0.300
				or **GV2 MCK04** *(1)*	0.420
	IP 55 for temperature < + 5 °C	1	1	**GV2 MC03**	0.300
Flush mounting with protective conductor	IP 41 (front face)	1	1	**GV2 MP01**	0.115
	IP 41 (reduced flush mounting)	–	1	**GV2 MP03**	0.115
	IP 55 (front face)	1	1	**GV2 MP02**	0.130
	IP 55 (reduced flush mounting)	–	1	**GV2 MP04**	0.130

Front plate

Description			Sold in lots of	Unit reference	Weight kg
For direct control, through a panel of a chassis-mounted GV2 ME	IP 55		1	**GV2 CP21**	0.800

Accessories common to all enclosures (to be ordered separately)

Padlocking device *(2)* for GV2 ME operator (padlocking is only possible in "O" position)	1 to 3 padlocks Ø 4 to 8 mm		1	**GV2 V01**	0.075
Mushroom head "Stop" pushbutton Ø 40 mm, red	Spring return *(2)*		1	**GV2 K011**	0.052
	Latching *(2)* IP 55	Key release key n° 455	1	**GV2 K021**	0.160
		Turn to release	1	**GV2 K031**	0.115
			1	**GV2 K04** *(3)*	0.120
Sealing kit	For enclosures and front plate	IP 55	10	**GV2 E01**	0.012
		IP 55 for θ < + 5 °C	10	**GV2 E02**	0.012
Neutral terminal			100	**AB1 VV635UBL**	0.015
Partition			50	**AB1 AC6BL**	0.003

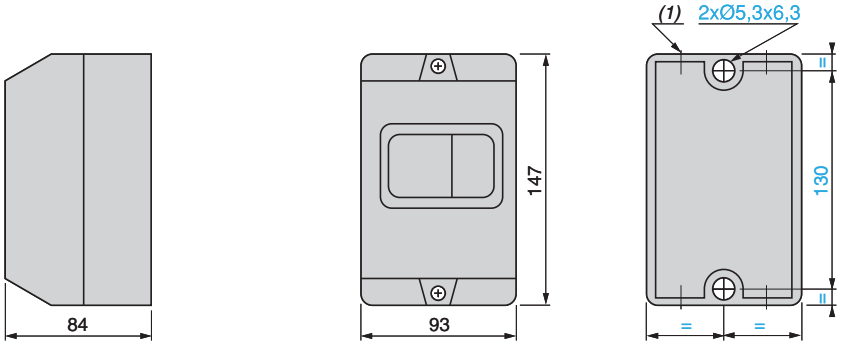
Description	Voltage V	Colour	Sold in lots of	Unit reference	Weight kg
Neon indicator light	110	Green	10	**GV2 SN13**	0.019
		Red	10	**GV2 SN14**	0.019
		Orange	10	**GV2 SN15**	0.019
		Clear	10	**GV2 SN17**	0.019
	220/240	Green	10	**GV2 SN23**	0.019
		Red	10	**GV2 SN24**	0.019
		Orange	10	**GV2 SN25**	0.019
		Clear	10	**GV2 SN27**	0.019
	380/440	Green	10	**GV2 SN33**	0.019
		Red	10	**GV2 SN34**	0.019
		Orange	10	**GV2 SN35**	0.019
		Clear	10	**GV2 SN37**	0.019

*(1) The **GV2 MCK04** enclosure has a **GV2 K04** mushroom head Stop pushbutton fitted as standard.*
*(2) Supplied with IP 55 sealing kit. For use with **GV2 M●01**.*
(3) Padlockable in "Off" position using Ø 4 to 8 mm shank padlocks.

Dimensions: page 5/32
Schemes: page 5/33

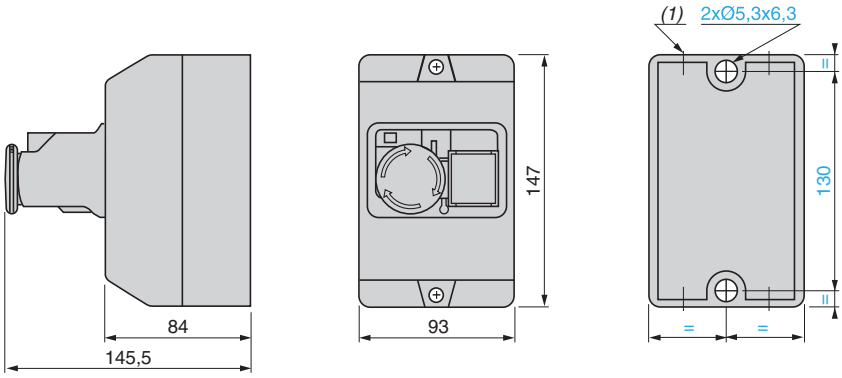
Dimensions

Surface mounting enclosure GV2 MC0●



(1) 4 knock-outs for 16 mm plastic cable gland or 16 mm conduit.

Surface mounting enclosure GV2 MCK04

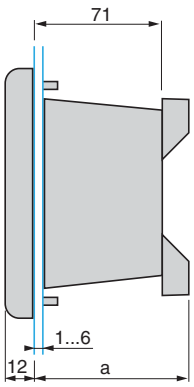


(1) 4 knock-outs for 16 mm plastic cable gland or 16 mm conduit.

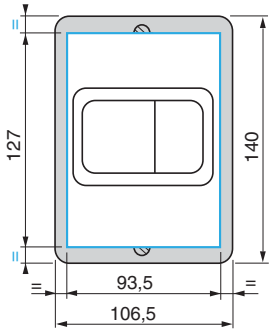
Mounting

Flush mounting enclosures GV2 MP0● (panel cut-out)

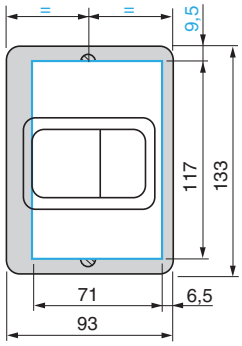
GV2 MP0●



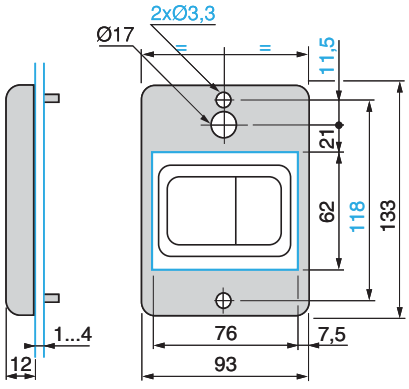
GV2 MP01, MP02



GV2 MP03, MP04



Front plate GV2 CP21

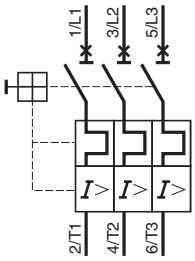


GV2	a
MP01, MP02	–
MP03, MP04	86

Safety control and protection solutions
TeSys enclosed starters
Enclosed thermal-magnetic motor circuit-breakers
GV2 ME

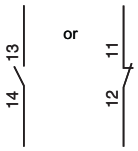
Schemes

GV2 ME●●

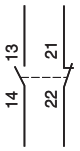


Instantaneous auxiliary contacts

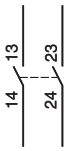
GV AE1



GV AE11

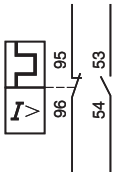


GV AE20

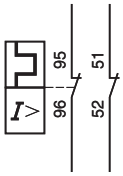


Instantaneous auxiliary contacts and fault signalling contacts

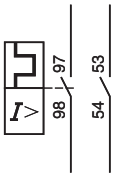
GV AD0110



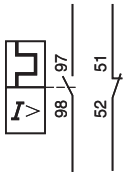
GV AD0101



GV AD1010

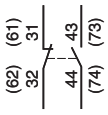


GV AD1001

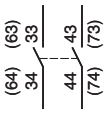


Instantaneous auxiliary contacts

GV AN11

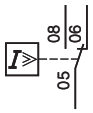


GV AN20



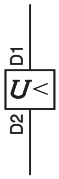
Short-circuit signalling contacts

GV AM11

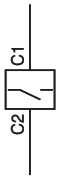


Voltage trips

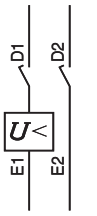
GV AU●●●



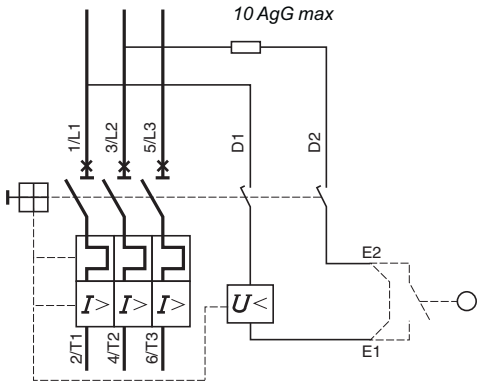
GV AS●●●



GV AX●●●



Wiring diagram for undervoltage trip used on potentially dangerous machines, conforming to INRS



5

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE *(1)*

533963



LG7 K06

533964



LG7 D12 with padlocking facility fitted as standard

Non-reversing starters (with pushbutton control of isolation)

Standard power ratings of 3-phase motors 50-60 Hz in category AC-3			Circuit-breaker	Dust & damp protected starter	Weight
220/ 230 V	400/ 415 V	440 V	Setting range of thermal trips	Basic reference, to be completed by adding the voltage code *(2) (3)*	
kW	kW	kW	A		kg
–	0.06	0.06	0.16…0.25	**LG7 K06●●02**	1.300
0.06	0.09	0.12	0.25…0.40	**LG7 K06●●03**	1.300
–	0.18	0.18	0.40…0.63	**LG7 K06●●04**	1.300
0.12	0.25	0.37	0.63…1	**LG7 K06●●05**	1.300
0.25	0.55	0.55	1…1.6	**LG7 K06●●06**	1.300
0.37	0.75	1.1	1.6…2.5	**LG7 K06●●07**	1.300
0.75	1.5	1.5	2.5…4	**LG7 K06●●08**	1.300
1.1	2.2	3	4…6.3	**LG7 K06●●10**	1.300
1.5	4	4	6…10	**LG7 K09●●14**	1.450
3	5.5	5.5	9…14	**LG7 D12●●16**	1.600
4	7.5	9	13…18	**LG7 D18●●20**	1.630
4	9	9	17…23	**LG7 D18●●21**	1.630

Specifications

Functions performed by the starter:
- isolation,
- locking of isolation fitted as standard as from LG7 K09,
- lockable Emergency Stop (1/4 turn) *(3)*,
- short-circuit protection,
- overload protection,
- pushbutton control: 1 white Start button “I” and 1 black Stop button “O”,
- degree of protection of enclosure: IP 657, double insulated.

Switching back on of power supply after tripping must be by a deliberate action.
A GV2 SN●● indicator light may be added (to be assembled by customer), please consult your Regional Sales Office.
For supply voltages between 380 and 415 V (codes Q7, V7 or N7) the control circuit is pre-wired between phases.
For other supply voltages, the control circuit must be wired by the customer.

Variants (pre-assembled)

See page 5/37.

(1) Compliance with a harmonised European standard assumes conformity with the corresponding directive, provided that installation, building in and/or assembly of the starter is carried out correctly by the machine manufacturer.
Harmonised European standards: EN 60947 and EN 60439.
Conformity to international standards: IEC 60947 and IEC 60439.
(2) Standard control circuit voltages (for other voltages, please consult your Regional Sales Office):

LG7 K

Volts ~ 50/60 Hz	12	24	36	42	48	110	127	220/ 230	230	230/ 240	380/ 400	400	400/ 415	440	500	660/ 690
Code	J7	B7	C7	D7	E7	F7	FC7	M7	P7	U7	Q7	V7	N7	R7	S7	Y7

LG7 D

Volts ~ 50/60 Hz	24	42	48	110	220/ 230	230	240	380/ 400	400	415	440
Code	B7	D7	E7	F7	M7	P7	U7	Q7	V7	N7	R7

*(3) **LG7 K06**: the mushroom head type Emergency Stop acts mechanically on the circuit-breaker.*
***LG7 K09**, **D12**, **D18**: the Emergency Stop function is performed by an undervoltage trip, acting on the circuit-breaker. This circuit-breaker is always supplied pre-wired for use on 380/415 V 50 Hz. For a 60 Hz supply, please consult your Regional Sales Office.*

Other versions Starters for voltages other than those indicated above. Please consult your Regional Sales Office.

Dimensions : page 5/38
Schemes : page 5/39

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE (1)

533965



LG1 K

Non-reversing starters (with rotary operator for control of isolation)

Enclosure cannot be opened when energised in position "I".

Standard power ratings of 3-phase motors 50-60 Hz in category AC-3			Circuit-breaker	Dust & damp protected starter	Weight
			Setting range of thermal trips	Basic reference, to be completed by adding the voltage code (2)	
220/230 V	400/415 V	440 V			
kW	kW	kW	A		kg
–	0.06	0.06	0.16…0.25	**LG1 K065●●02**	0.970
0.06	0.09	0.12	0.25…0.40	**LG1 K065●●03**	0.970
–	0.18	0.18	0.40…0.63	**LG1 K065●●04**	0.970
0.12	0.25	0.25	0.63…1	**LG1 K065●●05**	0.970
0.25	0.55	0.55	1…1.6	**LG1 K065●●06**	0.970
0.37	0.75	1.1	1.6…2.5	**LG1 K065●●07**	0.970
0.75	1.5	1.5	2.5…4	**LG1 K065●●08**	0.970
1.1	2.2	3	4…6.3	**LG1 K065●●10**	0.970
1.5	4	4	6…10	**LG1 K095●●14**	1.120
3	5.5	5.5	9…14	**LG1 D122●●16**	1.270
4	7.5	9	13…18	**LG1 D182●●20**	1.290
4	9	9	17…23	**LG1 D182●●21**	1.290

Specifications

Functions performed by the starter:
- isolation,
- locking of isolation,
- lockable Emergency Stop (red/yellow switch disconnector),
- short-circuit protection,
- overload protection,
- pushbutton control: 1 white Start button "I" and 1 black Stop button "O",
- degree of protection of enclosure: IP 657, double insulated.

Switching back on of power supply after tripping must be by a deliberate action.
A GV2 SN●● indicator light may be added (to be assembled by customer), please consult your Regional Sales Office.
For supply voltages between 380 and 415 V (codes Q7, V7 or N7) the control circuit is pre-wired between phases.
For other supply voltages, the control circuit must be wired by the customer.

Variants (pre-assembled)

See page 5/37.

(1) Compliance with a harmonised European standard assumes conformity with the corresponding directive, provided that installation, building in and/or assembly of the starter is carried out correctly by the machine manufacturer.
Harmonised European standards: EN 60947 and EN 60439.
Conformity to international standards: IEC 60947 and IEC 60439.
(2) Standard control circuit voltages (for other voltages, please consult your Regional Sales Office):

LG1 K

Volts ~ 50/60 Hz	12	24	36	42	48	110	127	220/230	230	230/240	380/400	400	400/415	440	500	660/690
Code	J7	B7	C7	D7	E7	F7	FC7	M7	P7	U7	Q7	V7	N7	R7	S7	Y7

LG1 D

Volts ~ 50/60 Hz	24	42	48	110	220/230	230	240	380/400	400	415	440
Code	B7	D7	E7	F7	M7	P7	U7	Q7	V7	N7	R7

Other versions — Starters for voltages other than those indicated above. Please consult your Regional Sales Office.

Dimensions : page 5/38
Schemes : page 5/39

5

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE (1)

533966



LG8 K06

Reversing starters (with pushbutton control of isolation)

Standard power ratings of 3-phase motors 50-60 Hz in category AC-3			Circuit-breaker	Dust & damp protected starter	Weight
220/ 230 V	400/ 415 V	440 V	Setting range of thermal trips	Basic reference, to be completed by adding the voltage code (2) (3)	
kW	kW	kW	A		kg
–	0.06	0.06	0.16…0.25	**LG8 K06●●02**	1.640
0.06	0.09	0.12	0.25…0.40	**LG8 K06●●03**	1.640
–	0.18	0.18	0.40…0.63	**LG8 K06●●04**	1.640
0.12	0.25	0.25	0.63…1	**LG8 K06●●05**	1.640
0.25	0.55	0.55	1…1.6	**LG8 K06●●06**	1.640
0.37	0.75	1.1	1.6…2.5	**LG8 K06●●07**	1.640
0.75	1.5	1.5	2.5…4	**LG8 K06●●08**	1.640
1.1	2.2	3	4…6.3	**LG8 K06●●10**	1.640
1.5	4	4	6…10	**LG8 K09●●14**	1.640
3	5.5	5.5	9…14	**LG8 K12●●16**	1.640

533967



LG8 K09 with padlocking facility fitted as standard

5

Specifications of reversing starters

Functions performed by the starter:
- isolation,
- locking of isolation fitted as standard as from LG8 K09,
- Emergency stop *(3)*,
- short-circuit protection,
- overload protection,
- control by selector switch “1-2”, position non maintained,
- degree of protection of enclosure: IP 657, double insulated.

Switching back on of power supply after tripping must be by a deliberate action.
A GV2 SN●● indicator light may be added (to be assembled by customer), please consult your Regional Sales Office.
For supply voltages between 380 and 415 V (codes Q7, V7 or N7) the control circuit is pre-wired between phases.
For other supply voltages, the control circuit must be wired by the customer.

Variants (pre-assembled)

See page 5/37.

(1) Compliance with a harmonised European standard assumes conformity with the corresponding directive, provided that installation, building in and/or assembly of the starter is carried out correctly by the machine manufacturer.
Harmonised European standards: EN 60947 and EN 60439.
Conformity to international standards: IEC 60947 and IEC 60439.

(2) Standard control circuit voltages (for other voltages, please consult your Regional Sales Office):

Volts ~ 50/60 Hz	12	24	36	42	48	110	127	220/ 230	230	230/ 240	380/ 400	400	400/ 415	440	500	660/ 690
Code	J7	B7	C7	D7	E7	F7	FC7	M7	P7	U7	Q7	V7	N7	R7	S7	Y7

*(3) **LG8 K06**: the mushroom head type Emergency Stop acts mechanically on the circuit-breaker.*
***LG8 K09**: the Emergency Stop function is performed by an undervoltage trip, acting on the circuit-breaker. This circuit-breaker is always supplied pre-wired for use on 380/415 V 50 Hz. For a 60 Hz supply, please consult your Regional Sales Office.*

Other versions

Starters for higher power ratings.
Please consult your Regional Sales Office.

Dimensions : page 5/38
Schemes : page 5/39

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE (1)

Variants

Description	Application	Suffix to be added to the starter reference (2)
With Emergency Stop **No control pushbuttons**	LG1, LG7, LG8	**A04**
With Emergency Stop **2 pushbuttons with arrows "↑" and "↓"** (latching) 1 Stop button "O"	LG8 K06	**A10**
Without Emergency Stop **2 pushbuttons with arrows "↑" and "↓"** (non latching) Without Emergency Stop	LG8	**A14**
With Emergency Stop, mushroom head	LG1	**A37**
Without Emergency Stop (when the Emergency Stop is on the machine)	LG7, LG8	**A39**
With padlocking facility (fitted as standard as from LG1 K09 or LG7 K09)	LG1 K06, LG7 K06	**A29**
1 neutral terminal Fitted as standard on starters ordered for use on 240 V (U7) supply	LG1, LG7, LG8	**A59**
Short-circuit signalling block	LG7	**A12**
Vacuum valve for compressor	LG7 D	**A40**
Without circuit-breaker	LG1, LG7, LG8	*(3)*

Possible combinations of variants for the selected starter type (4)

Starter type	A04	A10	A12	A14	A29	A37	A39	A40	A59
LG1 K	■				■	(5)			■
LG7 K06	■		■		■		■		■
LG7 K09	■		■				■		■
LG7 D12	■		■				■	■	■
LG8 K06	■				■		■		■
		■			■		■		■
				■	■		■		■
LG8 K09	■						■		■
				■			■		■

■ Combination possible Combination not possible

(1) *Compliance with a harmonised European standard assumes conformity with the corresponding directive, provided that installation, building in and/or assembly of the starter is carried out correctly by the machine manufacturer.*
Harmonised European standards: EN 60947 and EN 60439.
Conformity to international standards: IEC 60947 and IEC 60439.

(2) *Example: **LG7 D12M716A04**.*

(3) *Delete the last 2 digits of the selected starter reference. Example: **LG1 K065●●08** becomes **LG1 K065●●**.*

(4) *Example: **LG8 K095●●A04A39A59**.*

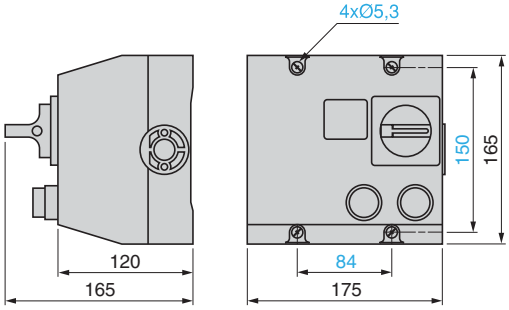
(5) ***LG1 K06**: the mushroom head type Emergency Stop acts mechanically on the circuit-breaker.*
***LG1 K09**, **D12**, **D18**: the Emergency Stop function is performed by an undervoltage trip, acting on the circuit-breaker. This circuit-breaker is always supplied pre-wired for use on 380/415 V 50 Hz. For a 60 Hz supply, please consult your Regional Sales Office.*

Safety control and protection solutions

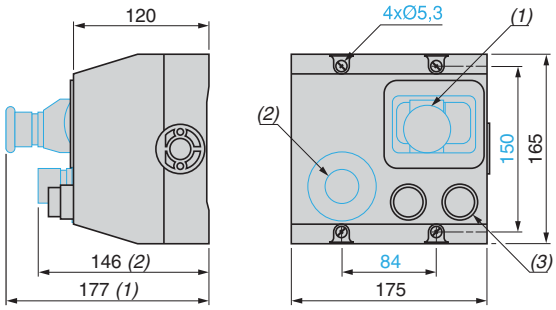
Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE

Starters without isolator

LG1 K06, K09
LG1 D12, D18



LG7 K06, K09, D12, D18
LG8 K06, K09, K12



(1) Emergency Stop for starters < 3 kW
(2) Emergency Stop for starters ≥ 3 kW
(3) Only for LG7

Knock-outs or blanking plugs for cable glands

Type of enclosure	At top	At bottom
LG1 K and LG1 D	2 x 13 P and 2 x 16 P	2 x 13 P and 2 x 16 P
LG7 K and LG7 D	2 x 13 P and 2 x 16 P	2 x 13 P and 2 x 16 P
LG8 K	2 x 13 P and 2 x 16 P	2 x 13 P and 2 x 16 P

5

References :
pages 5/34 to 5/37

Schemes :
page 5/39

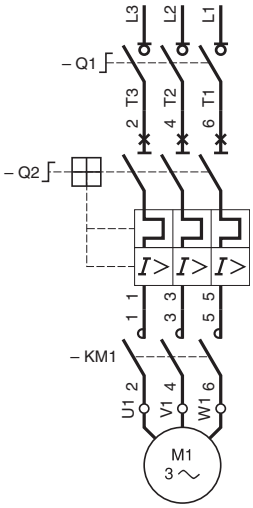
Schneider Electric

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE

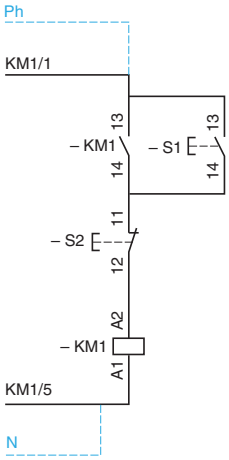
D.O.L. starters

LG1 K06, K09, D12, D18

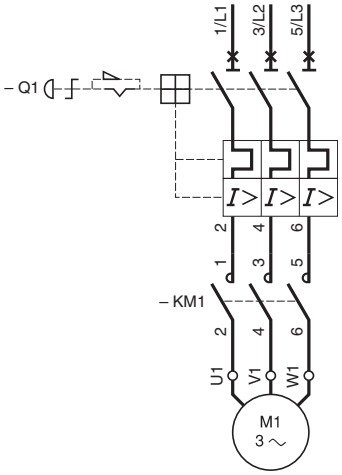


LG1 K06, K09, D12, D18

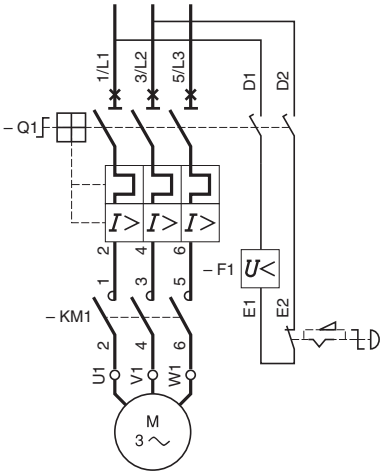
380/400 V, code Q7 or 400/415 V, code N7
220/230 V, code M7



LG7 K06

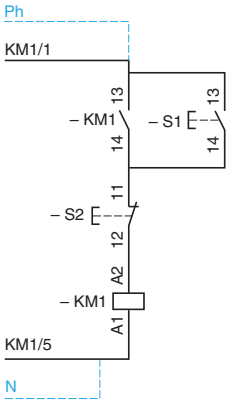


LG7 K09, D12, D18



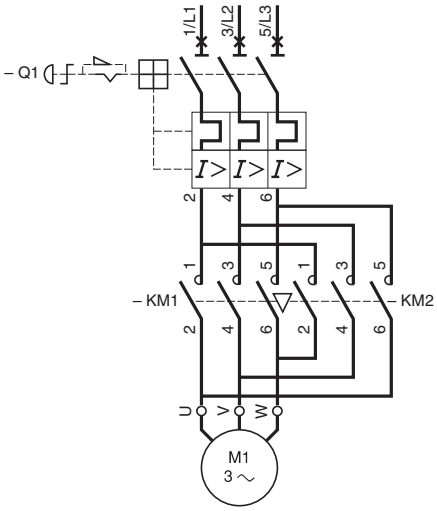
LG7 K06, K09, D12, D18

380/400 V, code Q7 or 400/415 V, code N7
220/230 V, code M7

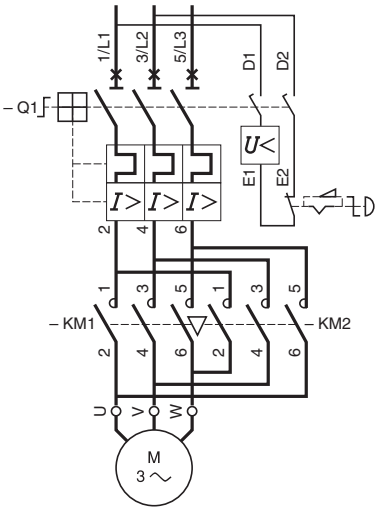


Reversing starters

LG8 K06

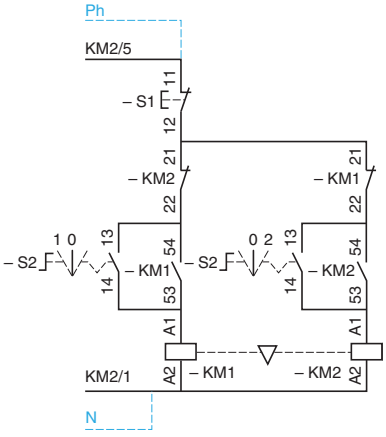


LG8 K09, K12



LG8 K06, K09, K12

380/400 V, code Q7 or 400/415 V, code N7
220/230 V, code M7



References : pages 5/34 to 5/37

Schemes : page 5/39

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE

533981



LJ7 K

Non-reversing starters with integral transformer

Compliance with a harmonised European standard assumes conformity with the corresponding directive, provided that installation, building in and/or assembly of the starter is carried out correctly by the machine manufacturer.
Harmonised European standards: EN 60947 and EN 60439.
Conformity to international standards: IEC 60947 and IEC 60439.

Starters pre-wired for operation on a 3-phase 380 to 400 V 50 Hz supply (with pushbutton control of isolator function)

Standard power ratings of 3-phase motors 50 Hz in category AC-3	Circuit-breaker	Dust and damp protected starter	Weight
380/400 V	Setting range of thermal trips	Reference *(1)*	
kW	A		kg
0.06	0.16…0.25	**LJ7 K06Q702**	2.270
0.09	0.25…0.40	**LJ7 K06Q703**	2.270
0.18	0.40…0.63	**LJ7 K06Q704**	2.270
0.25	0.63…1	**LJ7 K06Q705**	2.270
0.55	1…1.6	**LJ7 K06Q706**	2.270
0.75	1.6…2.5	**LJ7 K06Q707**	2.270
1.5	2.5…4	**LJ7 K06Q708**	2.270
2.2	4…6.3	**LJ7 K06Q710**	2.270
4	6…10	**LJ7 K09Q714**	2.270

Specifications

Functions performed by the starter:
- isolation,
- locking of isolation fitted as standard on LJ7 K09,
- lockable Emergency Stop (1/4 turn) *(2)*,
- short-circuit protection,
- overload protection,
- pushbutton control: 1 white Start button “I” and 1 black Stop button “O”,
- terminal allowing connection of a volt-free contact, if required, in the control circuit,
- degree of protection of enclosure: IP 657, double insulated.

Switching back on of power supply after tripping must be by a deliberate action.
A GV2 SN●● indicator light may be added (to be assembled by customer), please consult your Regional Sales Office.
Integral transformer: 400/24 V, 25 VA.

Variants *(3)*

Description	For use on	Suffix to be added to the starter reference *(4)*
With Emergency Stop No control pushbuttons	LJ7	**A04**
Without Emergency Stop (when the Emergency Stop is on the machine)	LJ7	**A39**
With padlocking facility (fitted as standard on LJ7 K09)	LJ7 K06	**A29**
Without circuit-breaker	LJ7	*(5)*

*(1) In the reference, the voltage code **Q7 (380/400 V) indicates the power supply voltage** to which the starter will be connected, it being assumed that the contactor has a ∼ 24 V coil (see control circuit scheme).*
*(2) **LJ7 K06** (P ⩽ 3 kW at 400 V): the mushroom head type Emergency Stop acts mechanically on the circuit-breaker.*
*__LJ7 K09__ (P > 3 kW at 400 V): the Emergency Stop function is performed by an undervoltage trip **GV AX385**, acting on the circuit-breaker. This circuit-breaker is always supplied pre-wired for use on 380/400 V 50 Hz.*
*(3) Possible combination of variants A04, A29 and A39 on starters LJ7 K06. Example: **LJ7 K06Q702A04A29A39**.*
*Possible combination of variants A04 and A39 on starters **LJ7 K09Q714A04A39**.*
*(4) Example: **LJ7 K06Q702A04**.*
*(5) Delete the last 2 digits of the selected starter reference. Example: **LJ7 K06Q702** becomes **LJ7 K06Q7**.*

Other versions

Starters for voltages other than those indicated above.
Please consult your Regional Sales Office.

Dimensions : page 5/42
Schemes : page 5/43

Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE

533982



LJ8 K

Reversing starters with integral transformer

Compliance with a harmonised European standard assumes conformity with the corresponding directive, provided that installation, building in and/or assembly of the starter is carried out correctly by the machine manufacturer.
Harmonised European standards: EN 60947 and EN 60439.
Conformity to international standards: IEC 60947 and IEC 60439.

Starters pre-wired for operation on a 3-phase 380 to 400 V 50 Hz supply (with pushbutton control of isolator function)

Standard power ratings of 3-phase motors 50 Hz in category AC-3	Circuit-breaker	Dust and damp protected starter	Weight
380/400 V	Setting range of thermal trips	Reference *(1)*	
kW	A		kg
0.06	0.16…0.25	**LJ8 K06Q702**	2.650
0.09	0.25…0.40	**LJ8 K06Q703**	2.650
0.18	0.40…0.63	**LJ8 K06Q704**	2.650
0.25	0.63…1	**LJ8 K06Q705**	2.650
0.55	1…1.6	**LJ8 K06Q706**	2.650
0.75	1.6…2.5	**LJ8 K06Q707**	2.650
1.5	2.5…4	**LJ8 K06Q708**	2.650
2.2	4…6.3	**LJ8 K06Q710**	2.650
4	6…10	**LJ8 K09Q714**	2.650

Specifications

Functions performed by the starter:
- isolation,
- locking of isolation fitted as standard on LJ8 K09,
- lockable Emergency Stop (1/4 turn) *(2)*,
- short-circuit protection,
- overload protection,
- pushbutton control: 1 white Start button “I” and 1 black Stop button “O”,
- terminal allowing connection of a volt-free contact, if required, in the control circuit,
- degree of protection of enclosure: IP 657, double insulated.

Switching back on of power supply after tripping must be by a deliberate action.
A GV2 SN●● indicator light may be added (to be assembled by customer), please consult your Regional Sales Office.
Integral transformer: 400/24 V, 25 VA.

Variants *(3)*

Description	For use on	Suffix to be added to the starter reference *(4)*
With Emergency Stop No control pushbuttons	LJ8	**A04**
Without Emergency Stop (when the Emergency Stop is on the	LJ8	**A39**
With padlocking facility (fitted as standard on LJ8 K09)	LJ8 K06	**A29**
Without circuit-breaker	LJ8	*(5)*

*(1) In the reference, the voltage code **Q7 (380/400 V) indicates the power supply voltage** to which the starter will be connected, it being assumed that the contactor has a ∼ 24 V coil (see control circuit scheme).*
*(2) **LJ8 K06** (P ≤ 3 kW at 400 V): the mushroom head type Emergency Stop acts mechanically on the circuit-breaker.*
*__LJ8 K09__ (P > 3 kW at 400 V): the Emergency Stop function is performed by an undervoltage trip **GV AX385**, acting on the circuit-breaker. This circuit-breaker is always supplied pre-wired for use on 380/400 V 50 Hz.*
*(3) Possible combination of variants A04, A29 and A39 on starters LJ8 K06. Example: **LJ8 K06Q702A04A29A39**.*
*Possible combination of variants A04 and A39 on starters LJ8 K09. Example : **LJ8 K09Q714A04A39**.*
*(4) Example: **LJ8 K06Q702A04**.*
*(5) Delete the last 2 digits of the selected starter reference. Example: **LJ8 K06Q702** becomes **LJ8 K06Q7**.*

Other versions

Starters for voltages other than those indicated above.
Please consult your Regional Sales Office.

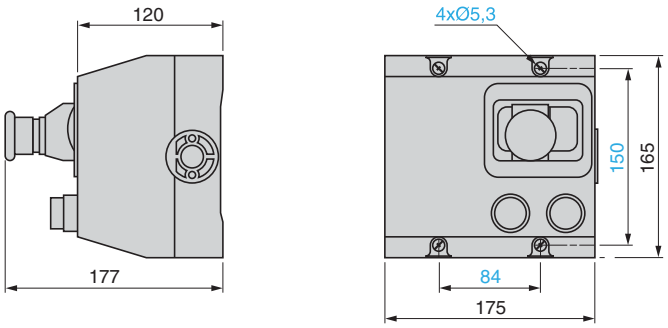
Dimensions : page 5/42
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Safety control and protection solutions

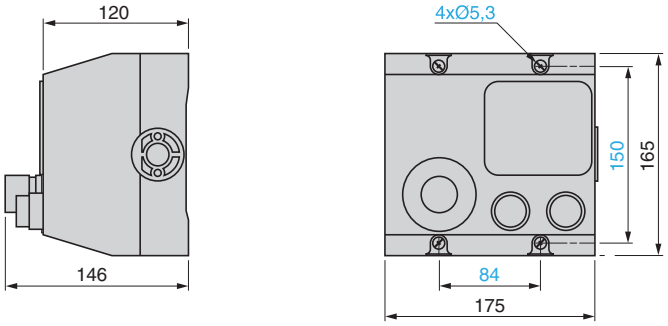
Enclosed D.O.L. starters for motor control
for use on a machine subject to the application
of Machinery Directive 98/37/CE

Dimensions

LJ7 K06, LJ8 K06



LJ7 K09, LJ8 K09



Cut-outs or blanking plugs for cable glands at the top and at the bottom 2 x 13 P and 2 x 16 P.

References :
pages 5/40 and 5/41

Schneider Electric

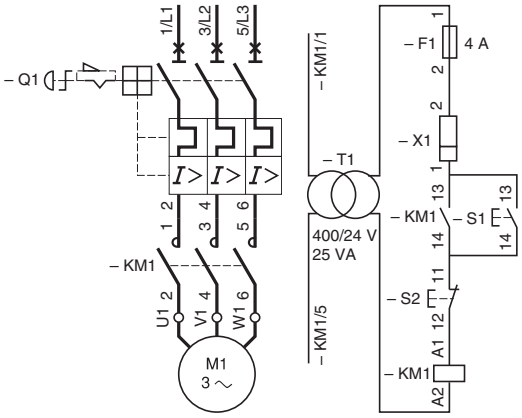
Safety control and protection solutions

Enclosed D.O.L. starters for motor control for use on a machine subject to the application of Machinery Directive 98/37/CE

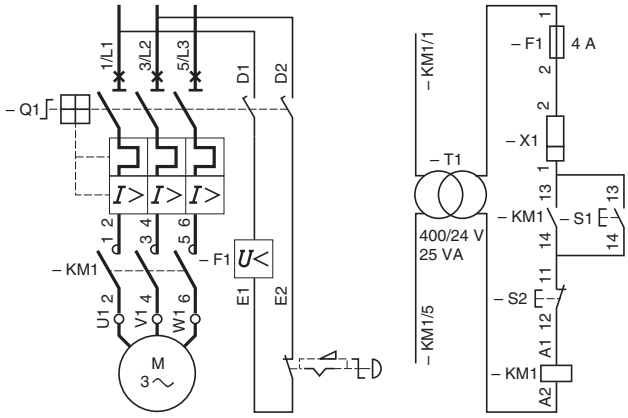
Schemes

Non-reversing starters

LJ7 K06

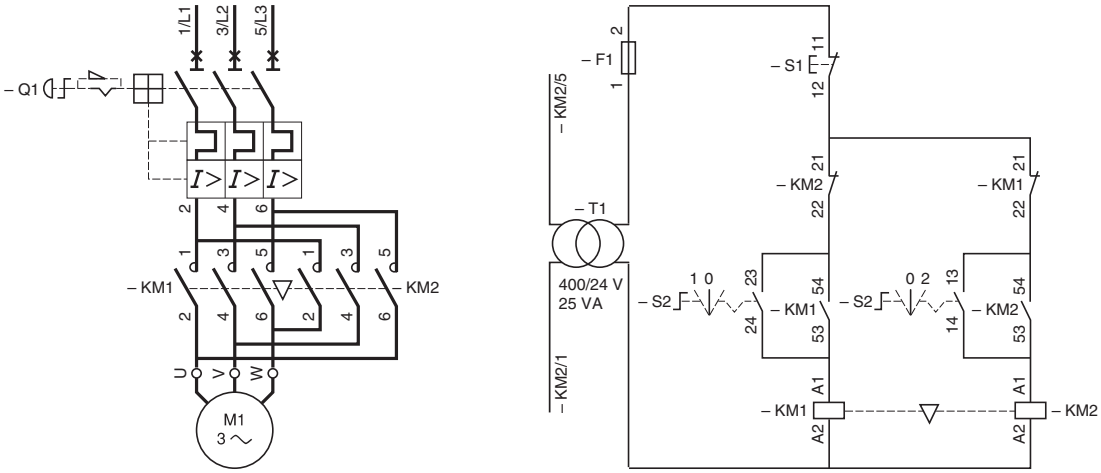


LJ7 K09

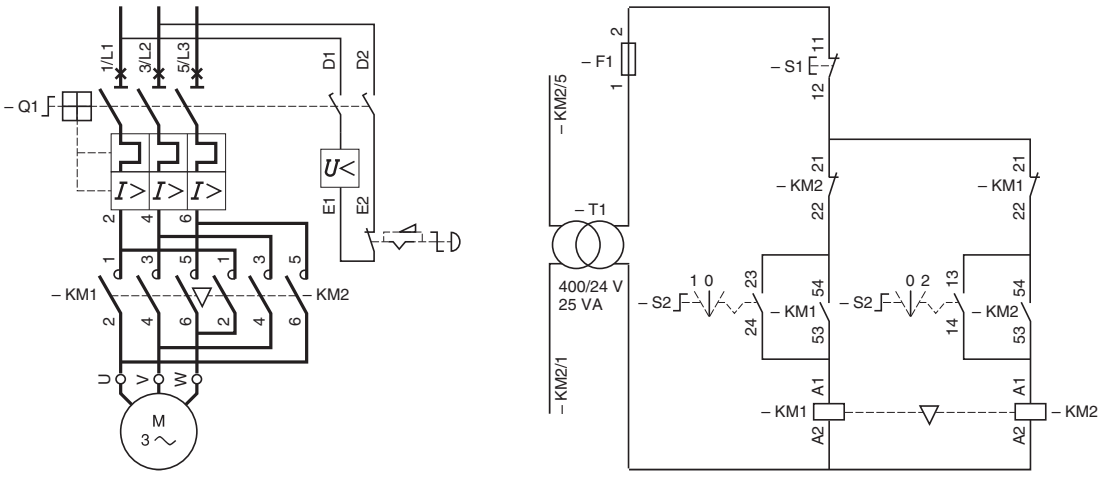


Reversing starters

LJ8 K06



LJ8 K09



5

References :
pages 5/40 and 5/41

Safety control and protection solutions
TeSys contactors

Applications		Equipment based on standard contactors						Equipment requiring low consumption contactors which can be switched directly from solid state outputs
								
								
Rated operational current	AC-3	6 A	6...16 A	9…150 A	115…800 A	750…1800 A	6...12 A	9…25 A
	AC-1	12 A	20 A	25…200 A	200…1600 A	800…2750 A	20 A	20…40 A
Rated operational voltage		690 V	690 V	690 V	1000 V	1000 V	690 V	690 V
Number of poles		2 or 3	3 or 4	3 or 4	2, 3 or 4	1…4	3 or 4	3
Contactor type references		**LC1 SK LP1 SK**	**LC1 K LC7 K LP1 K**	**LC1 D**	**LC1 F**	**LC1 B**	**LP4 K**	**LC1 D**
Pages		Consult our catalogue “Motor starters solutions - Control and protection components”						

5

Equipment requiring magnetic latching contactors	Motors, resistive circuits, rotor short-circuiting devices, electro lifting magnets, hoisting, mines, ⎓ motors, high operating rates. Variable composition bar mounted contactors.	Induction heating, heating of metal or of a metal part in a channel or crucible furnace by induction of a.c. currents. Contactors for induction heating applications	Applications conforming to "NATO" specifications and references. Shockproof contactors	Protection of reversing variable speed controllers for d.c. motors. Fast acting contactors.
				
150…1800 A	80...1800 A	–	12…630 A	–
250…2750 A	80…2750 A	80…16 300 A	25…850 A	–
1000 V	∿ 1000 V ⎓ 440 or 1500 V	3000 V	690 V or 1000 V	∿ 1000 V ⎓ 1050 V
1…4	1…6	1…8	3 or 4	2 or 4
CR1 F **CR1 B**	**CV●**	**CE●** **CS●**	**LC1 D●G** **LP1 D●G** **LC1 FG●●●**	**CR3 ●B**
Consult our catalogue "Motor starters solutions - Control and protection components"	Consult our catalogue "TeSys contactors - Variable composition contactors"	Consult our catalogue "Motor starters solutions - Control and protection components"		

Safety of personnel and equipment

Introduction - European legislation *6/2*

Industrial accidents *6/3*

European legislation and the standards *6/4*

Standards to be applied *6/6*

Assessment of machinery related risk *6/8*

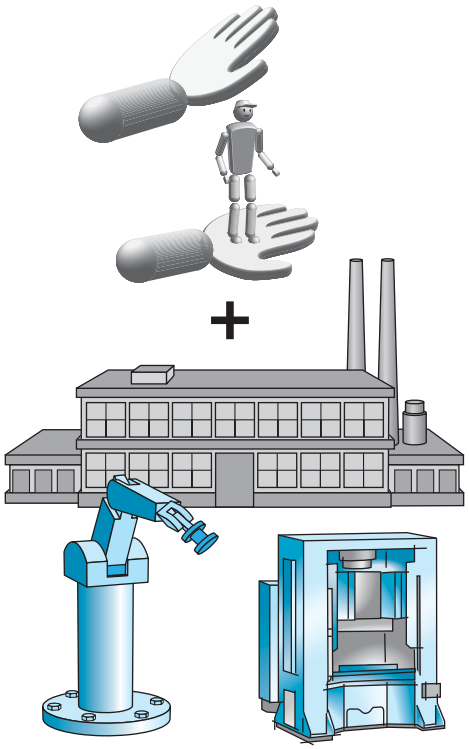
Standard to be applied according to the design selected for the machine control system *6/10*

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *6/12*

Standard EN/IEC 62061
Machinery safety - Safety-related electrical control systems (SRECS) *6/16*

Certification and CE marking *6/20*

Safety of personnel and equipment
Introduction - European legislation



Safety and process reliability

Introduction

Safety has become a key issue for businesses.
Social developments in association with technological progress have had a profound impact on legislation and on regulations for the use of building electrical automation equipment.

Social issues

The safety-conscious nature of our western societies has led the legislature to increase the number of requirements and establish stricter rules, while the high cost of accidents has prompted companies to make efforts in the same direction.

Technological issues

■ Increasing levels of automation have led to new restrictions. In some case it is difficult, if not dangerous, to stop a machine suddenly and it is necessary to perform a safe shut down sequence before allowing personnel to enter into a production cell.

■ The increasingly widespread use of electronics and software has required a different approach to the solutions adopted; empirical rules are no longer enough. Selection includes a reliability calculation to determine the behaviour of the system.

In this context, the specification and design phase are crucial. Studies show that more than 2/3rds of incidents are due to bad design and inadequate specifications. At this stage it is therefore necessary to estimate potential risks and select the most appropriate solutions to reduce their consequences. Standards are available to assist and guide the designer.
Manufacturers of components and solutions help their customers by offering complete, ready-to-use functions which, when combined in accordance with the regulations, satisfy the customer's needs and meet legislative requirements.

In this chapter, we will present a simplified process. To make a choice, the customer will then be able to refer to the safety functions chapter and to the safety products chapters.

European legislation

European legislation requires that preventive action be taken to preserve and protect the quality of the environment and human health. To achieve these objectives, European Directives have been prepared which must be applied by plant operators and by manufacturers of equipment and machines. It also assigns responsibility for possible accidents.

■ Notwithstanding the constraints, machine safety has the following positive repercussions:
- prevention of industrial accidents,
- protection of workers and personnel by means of suitable safety measures that take into account the machine's application and the local environment.

■ This makes it possible to reduce direct and indirect related costs:
- by reducing physical harm,
- by reducing insurance premiums,
- by reducing production losses and possible delay penalties,
- by limiting damages and costs for maintenance.

■ Safe operation involves two principles: safety and reliability of the process:
- safety is the ability of a device to keep the risk incurred by persons within acceptable limits,
- reliability of operation is the ability of a system or device to perform its function at any moment in time and for a specified duration.

■ Safety must be taken into account right from the beginning of the design stage and kept in place throughout all stages of a machine's life cycle: transport, installation, commissioning, maintenance, dismantling.

Safety of personnel and equipment
Industrial accidents

Industrial accidents

An industrial accident occurs through work or in the workplace and causes minor to serious injury to a person using a machine, feeding it or carrying out special work on it (fitter, operator, maintenance personnel, etc.).

Causes of accidents in the workplace

■ Human-related factors (designers, users):
- poor grasp of machine design,
- over-familiarity with danger through habit and failure to take dangerous situations seriously,
- underestimation of hazards, causing people to ignore safe working procedure,
- loss of concentration on tasks to be performed (e.g. fatigue),
- failure to comply with procedures,
- stressful working conditions (noise, work rates, etc.),
- uncertainty of employment which can lead to inadequate training,
- inadequate or bad maintenance, generating unsuspected hazards.

■ Machine-related factors:
- inadequate guards,
- inherent machine hazards (e.g. reciprocal motion of a machine, unexpected starting or stopping),
- machines not suited to the application or environment (e.g. sound alarms deadened by the noise of surrounding machinery).

■ Plant-related factors:
- movement of personnel from machine to machine (automated production line),
- machinery from different manufacturers and using different technologies,
- flow of materials or products between machines.

Consequences

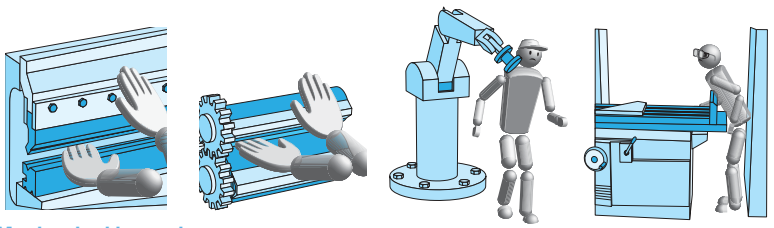
- Risk of varying degrees of physical injury to the user,
- stoppage of the machine involved,
- stoppage of similar machine installations for inspection, for example by health and safety inspectors,
- if necessary, modifications to make machinery safe,
- change of personnel and training new personnel for the job,
- damage to the company brand image.

Conclusion

Damages for physical injuries are equivalent to about 20 thousand million euro paid out each year in the European Union. Decisive action is required to reduce the number of accidents in the workplace. The first essentials are adequate company policies and efficient organisation.
Reducing the number of industrial accidents and injuries depends on the safety of machines and equipment.

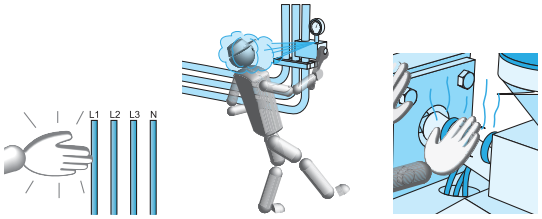
Types of potential hazard

The potential hazards of a machine can be classified into three main groups, as illustrated below:



Mechanical hazards

Puncturing, cutting, shearing, fractures, severing	*Catching, entanglement, drawing in, trapping*	*Impact*	*Crushing*



Electrical hazards **Physical and chemical hazards**

Electric shock, electrocution, burns	*Discharge of dangerous substances*	*Burns*

Safety of personnel and equipment
European legislation and the standards

European legislation and the standards

The main purpose of the Machinery Directive 98/37/EC is to compel manufacturers to guarantee a minimum safety level for machinery and equipment sold within the European Union. A new version of the Machinery Directive 2006/42/EC will be effective at the end of 2009.

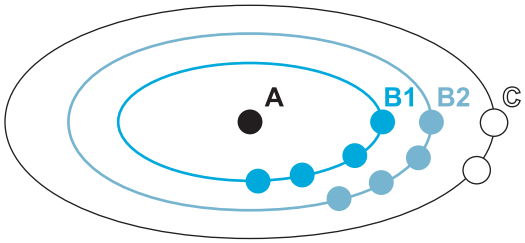
To allow free circulation of machinery within the European Union, the CE marking must be applied to the machine and an EC declaration of conformity is issued to the purchaser. This directive came into effect in January 1995 and has been enforced since January 1997 for all machines.

The user has obligations defined by the Use of Work Equipment directive 89/655/EEC which can in most cases be met by using machinery compliant with relevant standards.
These standards are complex. After a brief presentation of the structure of the standards system, we will provide the reader with a practical guide to the typical standards to be applied according to the selected control system design.

Standards

The harmonised European safety standards establish technical specifications which comply with the minimum safety requirements defined in the related directives. Compliance with all applicable harmonised European standards **can be assumed to ensure** compliance with the related directives. The main purpose is to guarantee a minimum safety level for machinery and equipment sold within the EU market and allow the free circulation of machinery within the European Union.

The 3 groups of European standards



■ Type **A** standards
Basic safety standards which specify the basic concepts, design principles and general aspects valid for all types of machine: e.g. EN/ISO 12100.

■ Type B standards
Standards relating to specific aspects of safety or to a particular device that can be used on a wide range of machines.

□ Type B1 standards
Standards relating to specific safety aspects of machines: e.g. EN/IEC 60204-1 Electrical equipment of machines.

□ Type B2 standards
Standards relating to specific products such as two-hand control stations (EN 574), guard switches (EN 1088), emergency stops (EN/ISO 13850), etc.

■ Type C standards
Standards relating to various families or groups of machines (e.g.: hydraulic presses EN 693, robots, ...) and giving detailed applicable requirements.

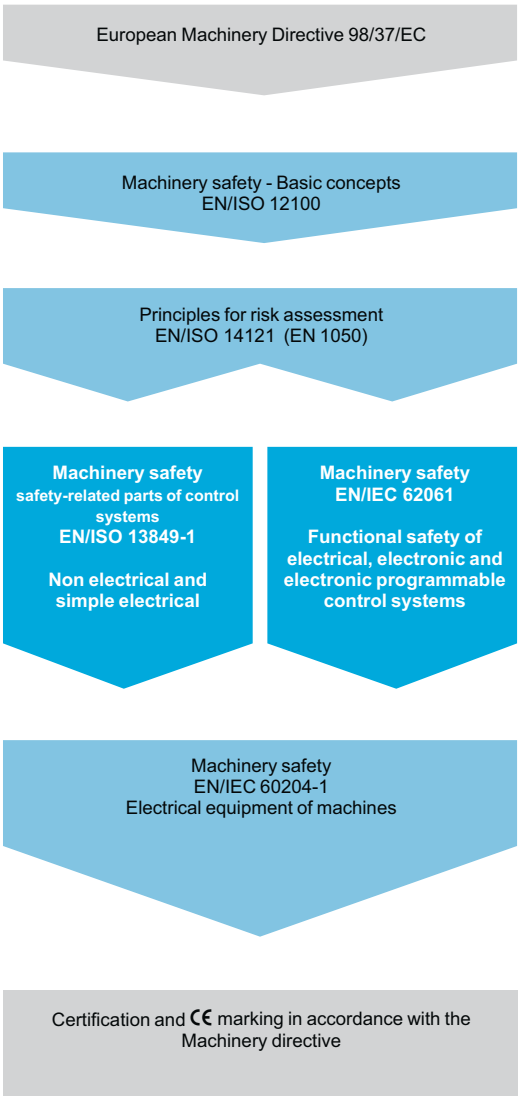
Safety of personnel and equipment
European legislation and the standards
(continued)

European legislation and the standards *(continued)*

A selection of standards

Standards	Type	Subject
EN/ISO 12100-1 EN/ISO 12100-2	A	Machinery safety - Basic concepts - Part 1: Terminology, methodology, - Part 2: Technical principles
EN/ISO 14121-1 (EN 1050)	A	Machinery safety - Principles for risk assessment
EN 574	B	Two-hand control devices - Functional aspects and design principles
EN/ISO 13850	B	Emergency stop - Principles for design
EN/IEC 62061	B	Functional safety of safety-related electrical, electronic and electronic programmable control systems
EN/ISO 13849-1 (EN 954-1)	B	Machinery safety - Safety-related parts of control systems - Part 1 general principles for design
EN 349	B	Minimum gaps to avoid crushing parts of the human body
EN 294	B	Safety distances to prevent hazardous zones being reached by upper limbs
EN 811	B	Safety distances to prevent hazardous zones being reached by lower limbs
EN 60204-1	B	Machinery safety - Electrical equipment of machines - Part 1: general requirements
EN 999	B	Positioning of protective equipment in respect of approach speeds of body parts
EN 1088	B	Interlocking devices associated with guards - Principles for design and selection
EN/IEC 61496-1	B	Electro-sensitive protective equipment
EN/IEC 60947-5-1	B	Electromechanical control circuit devices
EN 842	B	Visual danger signals - General requirements, design and testing
EN 1037	B	Prevention of unexpected start-up
EN 953	B	General requirements for the design and construction of fixed and movable guards
EN 201	C	Machinery for plastics and rubber - Injection moulding machines - Safety requirements
EN 692	C	Mechanical presses - Safety requirements
EN 693	C	Hydraulic presses - Safety requirements
EN 289	C	Machinery for plastics and rubber - Presses - Safety requirements
EN 422	C	Blow moulding machines for producing hollow parts - Design and construction requirements
EN/ISO 10218-1	C	Manipulating industrial robots - Safety requirements
EN 415-4	C	Safety of packaging machines - Part 4: palletisers and depalletisers
EN 619	C	Safety and EMC requirements for equipment for mechanical handling of unit loads
EN 620	C	Safety and EMC requirements for fixed belt conveyors for bulk material
EN 746-3	C	Industrial thermo processing equipment - Part 3: safety requirements for the generation and use of atmosphere gases

Safety of personnel and equipment
Standards to be applied



Standards to be applied for the design of machines

Standards to be applied

The process

European Machinery Directive 98/37/EC
Compliance with the following standards ensure compliance with the Machinery Directive (a new version of the Machinery Directive 2006/42/EC will be effective in November 2009).

EN/ISO 12100: Basic concept, General principles for design.
See page 6/7.
The purpose of this standard is to provide designers with an overall framework and guidance to enable them to produce machines that are safe for their intended use.

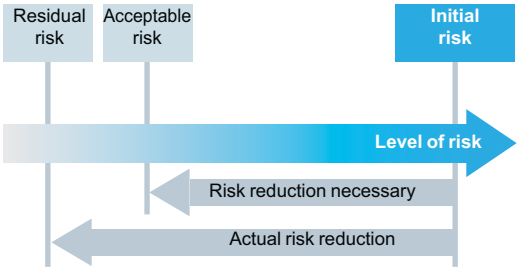
EN/ISO 14121: Principles for risk assessment.
See page 6/8.

Standards to be apply according to the design selected for the Machine control system.
See page 6/10.

EN/IEC 60204-1: Electrical equipment of machines
Standard EN/IEC 60204-1 completes the safety standards by giving setting-up rules for each component of a machine's electrical functions.
It specifies, amongst other things:
- the type of connection terminals and disconnection and breaking devices,
- the type of electric shock protection,
- the type of control circuits,
- the type of conductors and wiring rules,
- the type of motor protection.

See page 6/21.

Safety of personnel and equipment
Standards to be applied *(continued)*



Reduction of risk to an acceptable level

Standards to be applied (continued)

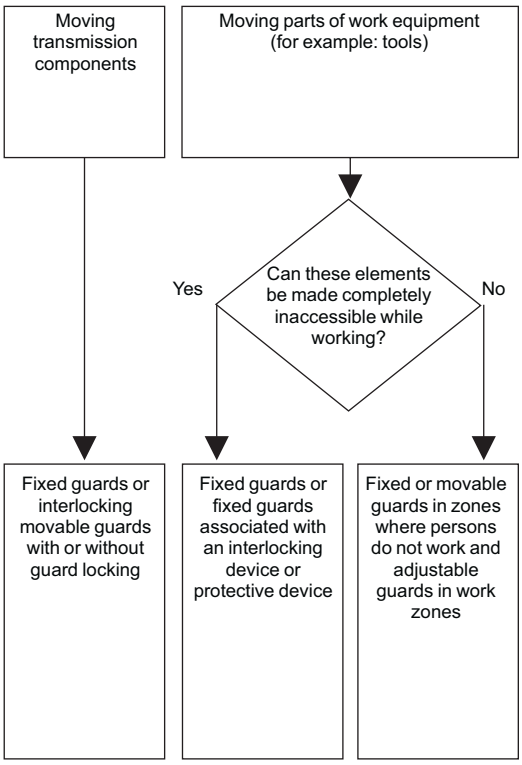
Risk and safety

Safety is the absence of risks which could cause injury to or damage the health of persons. Functional safety is a part of safety that depends on the correct operation of safety functions.

According to the requirements of standard EN/ISO 12100-1, the machine designer's job is to reduce all risks to a value lower than the acceptable risk.
For more details concerning the sources of accidents and risk prevention, the reader is referred on page 6/3.

This standard recognises two sources of hazardous phenomena:
- moving parts of machines,
- moving tools and/or workpieces.

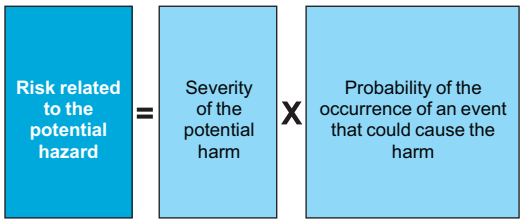
It gives guidelines for the selection and installation of devices which can be used to protect persons and identifies those measures that are implemented by the machine designer and those dependent on its user.



Selection of the protection system (EN/ISO 12100-2)

The measures taken by the machine designer may be:
- inherent in the design,
- selection of guards and additional measures, including control systems,
- information for the user.

The measures taken by the user may be (non-exhaustive list):
- organisation, procedures, etc.,
- personal protective equipment,
- training.



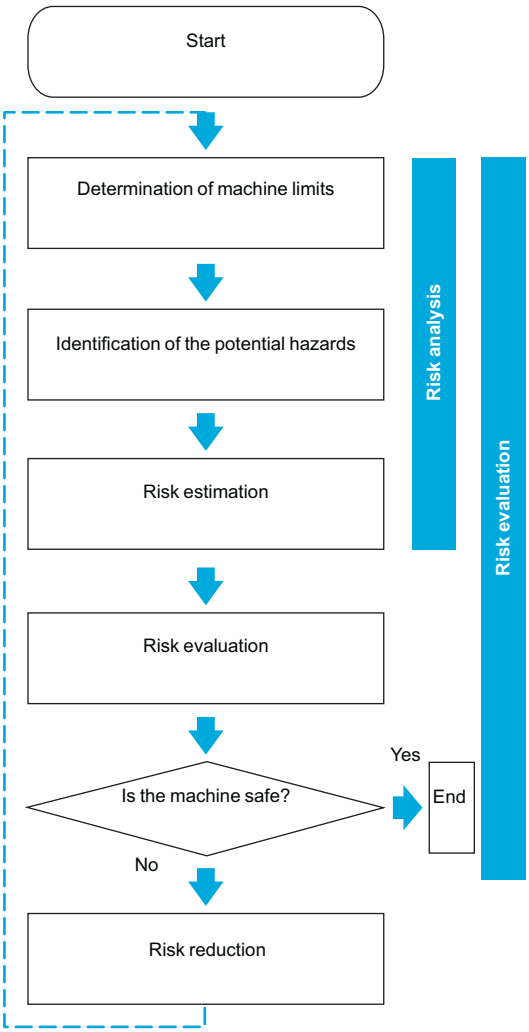
Definition of risk

Assessment of machinery related risk

European legislation

■ Machines are sources of potential risk and the Machinery Directive requires a risk assessment to ensure that any potential risk is reduced to less than the acceptable risk.

Standard EN/ISO 14121 defines risk as follows: risk is the severity multiplied by the possibility of occurrence. It defines an iterative process for achieving machine safety, which states that the risks for each potential hazard can be determined in four stages. This method provides the basis for the requisite risk reduction.



Logic steps for risk analysis

Risk assessment

Risk assessment consists of a series of logic steps which make it possible to systematically analyse and evaluate machinery-related risks.

Risk assessment is followed, whenever necessary, by a reduction of the risk.
This definition taken from standard EN/ISO 14121-1 is based on an iterative process represented in the diagram opposite.

Determination of machine limits

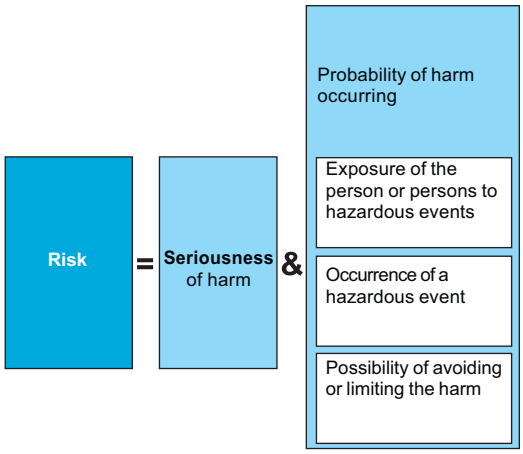
Risk assessment starts by determining the limits of the machine at all stages of its life cycle:
- transport, assembly, installation,
- commissioning,
- use,
- de-commissioning, dismantling.

The use limitations must then be specified:
- operating modes,
- level of training required,
- space limits (amplitude, movement...),
- time limits (life cycle, frequency of maintenance...).

Identification of the potential hazard

If a potential hazard exists, a hazardous phenomenon will cause harm if measures are not taken. All the tasks associated with the machine's life cycle must be identified, such as:
- assembly, transport and installation,
- adjustment, testing,
- learning, programming,
- tool changing,
- feeding, removal of product from the machine,
- starting, stopping,
- emergency stops, restarting after an unexpected stop,
- maintenance, cleaning, etc.

Safety of personnel and equipment
Assessment of machinery related risk *(continued)*



Elements of the risk

Assessment of machinery related risk (continued)

Risk assessment (continued)

Risk estimation

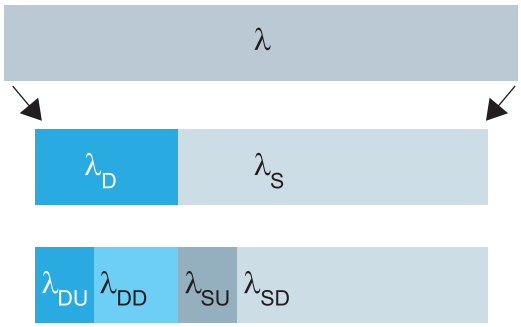
The risk is a function of the severity of the harm and the probability that this harm will occur.

■ The severity of the harm takes into account:
- the severity of injuries (slight, serious, death),
- the extent of the harm (number of persons).

■ The probability of the harm occurring takes into account:
- exposure to the hazard (nature of access, time spent in the hazardous zone, number of persons exposed, frequency of access...),
- the occurrence of a hazardous event (accident history, comparison of risks, ...),
- the possibility of avoiding or limiting the harm (experience, awareness of the risk, ...).

Risk evaluation

On the basis of the risk assessment, the designer has to define the safety related control system. To achieve that, the designer will chose one of the two standards appropriate to the application:
- either standard EN/ISO 13849-1, which defines performance levels (**PL**),
- or standard EN/IEC 62061, which defines safety integrity levelS (**SIL**).



λ rate of control system failures
λ_D rate of dangerous failures
λ_{DU} rate of undetected dangerous failures
λ_{DD} rate of detected dangerous failures
λ_S rate of safe failures
λ_S rate of undetected safe failures
λ_S rate of detected safe failures

Breakdown of the probability of failures

Risk reduction

The process of risk reduction for dangerous events starts by:
- intrinsic prevention (inherently safe design),
- definition of the appropriate protective means (guards, cover, fix fences, ...),
- personal training.

If the selected preventive measure depends on a safety related control system, the designer has to perform an iterative process for the design of the safety relative control system.

■ The first stage is to define the necessary safety-related control functions:
- either through the choice of components,
- or by adapting the control system architecture. Redundancy (double circuit components), for example, significantly increases the reliability of the solution.

■ Once the limits of available technologies have been reached, it will not be possible to further reduce the rate of dangerous failures. To achieve the required level of safety, it will be necessary to use a diagnostic system that allows dangerous failures to be detected.

Safety of personnel and equipment
Standard to be applied according to the design selected for the machine control system

Standard to be applied according to the design selected for the machine control system

Safety standards to be applied according to type of architecture selected

Based on the generic definition of the risk the standards classify levels of risk reduction using different calculation methods, which we will explain in the paragraphs specific to each of these standards.

Two definitions coexist:
- standard EN/ISO 13849-1: PL (Performance Level),
- standard EN/IEC 62061: SIL (Safety Integrity Level).

The table below gives **relations** between these two definitions.

Standard	Definition	Relations				
EN/ISO 13849-1	PL	a	b	c	d	e
EN/IEC 62061	SIL	x	1	1	2	3

In order to be able to select the applicable standard, a common table in both standards gives indications which are summarised in the table below:

Technology used	EN/ISO 13849-1 max. PL	EN/IEC 62061 max. SIL
Non electric only, for example hydraulic	e	Not covered
Including some electromechanical, for example relays and/or non complex electronics	e *(1)*	3
Including complex electronics, for example programmable	e	3

(1) For designated architectures only.

For building specific complex sub-systems or for higher level requirements including software, standard EN/IEC 61508 relating to systems must be used.

Safety of personnel and equipment

Standard to be applied according to the design selected for the machine control system *(continued)*

Standard to be applied according to the design selected for the machine control system *(continued)*

Designing a control system taking into account the requirements of safety standards may seem rather complex. We will guide the reader through this process by presenting:

- the basis and development of the standards,
- the safety standards to be applied according to the type of architecture selected,
- machine equipment and wiring.

Basis and development of the standards

In a complex system, such as a refinery, it is no longer sufficient to consider only the sub-systems to ensure protection; failure of a sub-system could be catastrophic for persons and the environment.
The approach is therefore more global.Taking into account the whole safety life cycle standard EN/IEC 61508 deals with control systems, and includes safety rules, technical specifications, management and training of personnel.

The use of more complex control systems based on electronics and software highlights the weaknesses of standard EN 954-1:

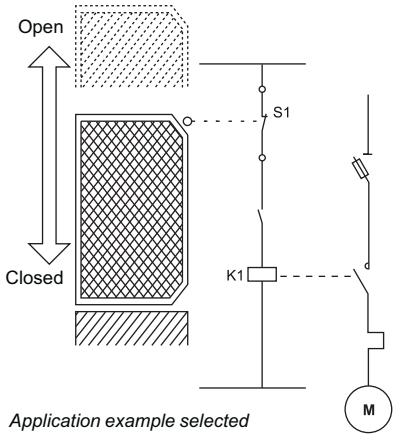
- the reliability of components is not taken into account,
- insufficient requirements for programmable products,
- combining components with a category certification is not enough to “guarantee” the required level of risk reduction.

Based on experience gained with systems, the standards body has, in line with standard EN/IEC 61508, developed standard EN/IEC 62061 which applies the principles of functional safety to the design of control systems for machinery.
This standard offers two important advantages:

- it incorporates the new electronic and electronic programmable technologies to provide the safety functions,
- it is consistent with the basic standard EN/IEC 61508 and is therefore being specified more and more for machines by users.

At the same time, standard EN/ISO 13849-1 will totally replace the standard EN 954-1 in November 2009, which brings several improvements and, above all, is consistent with safety standards in general.

Safety of personnel and equipment
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS)



Application example selected

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems

Standard EN/ISO 13849-1 is a development of standard EN 954-1. For clarity, only a simplified analysis of this new version will be presented here.

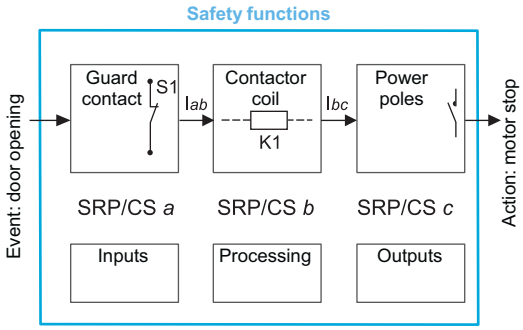
Field of application of the standard

This standard gives safety requirements and advice relating to principles for the design and integration of safety-related parts of control systems (SRP/CS), including software design. For these parts, it specifies the characteristics, including the performance level, needed to achieve these safety functions. It applies to the SRP/CS of all types of machine, regardless of the technology and type of energy used (electric, hydraulic, pneumatic, mechanical, etc.).

Process

Risk assessment as defined in standard EN/ISO 14121 (see page 6/6) leads to decisions on risk reduction measures. If these measures depend on a control system, then EN/ISO 13849-1 can apply. It defines a 6-stage design process.
1 - Selection of the essential safety functions that SRP/CS must perform. For each safety function, specify the required characteristics.
2 - Determine the required performance level (PLr).
3 - Design and technical creation of safety functions: identify the parts that perform the safety function.
Determine the performance level (PL) for all safety-related parts, taking into account all the other criteria.
4 - Evaluate the performance level PL for each safety-related part.
5 - Check that the performance level PL achieved is greater than or equal to the required level (PLr).
6 - Validate to ensure that all requirements are satisfied.

We will now illustrate these stages, taking as an example a safety function that stops operation of a machine motor when a safety guard is opened. The machine is potentially dangerous, there is a risk of the operator's arm being amputated if there is no guard.



Representation of the safety function

Stage 1 - Selection of safety functions
The diagram opposite shows a safety function which consists of several parts:
- the input actuated by opening of the guard (SRP/CS*a*),
- the control logic, limited in this example to opening or closing of a contactor coil (SRP/CS*b*),
- the power output that controls the motor (SRP/CS*c*),
- the connections (I*ab*, I*bc*).

Stage 2 - Estimation of required performance level (PLr)
For our safety function, this is estimated using the risk graph.

The parameters to be considered are:
□ **S** severity of the injury
- **S1** slight injury, normally reversible,
- **S2** Serious, normally irreversible, including death.

□ **F** frequency and/or duration of exposure to the hazardous phenomenon.
- **F1** rare to fairly frequent and/or short duration of exposure,
- **F2** frequent to permanent and/or long duration of exposure.

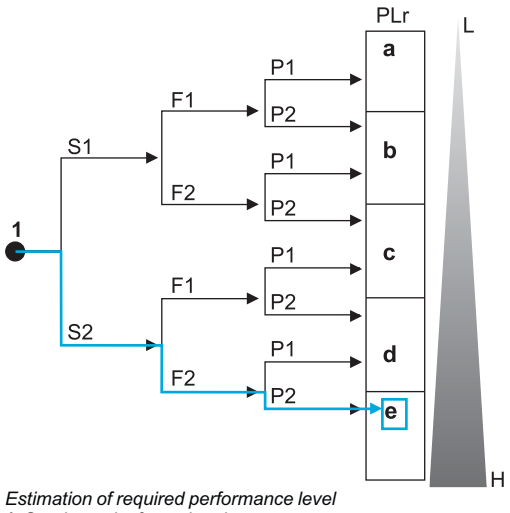
□ **P** possibility of avoiding the hazardous phenomena or limiting the harm.
- **P1** possible under certain circumstances,
- **P2** virtually impossible.

As a failure of the safety function could result in a serious injury, the estimate (in blue on the drawing on the next page) gives a required performance level PLr = e.

Risk related to the potential hazard	=	Severity of the potential harm	X	Probability of occurrence - frequency and duration of exposure - possibility of avoiding or limiting the probability of the occurrence of an event that could cause the harm

Risk analysis

Safety of personnel and equipment
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *(continued)*



Estimation of required performance level
1: Starting point for estimation
L: Low contribution to risk reduction
PLr: Required Performance Level
H: High contribution to risk reduction
→ : Estimation

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems *(continued)*

Process ***(continued)***

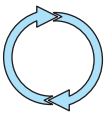
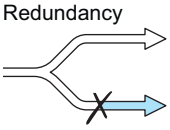
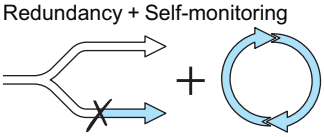
Stage 3

Design and creation of the safety functions
At this point, we need to describe the PL calculation method.
The PL is defined in terms of the probability of a dangerous failure per hour:

PL	Probability of a dangerous failure per hour
a	$\geq 10^{-5} \ldots < 10^{-4}$
b	$\geq 3 \times 10^{-6} \ldots < 10^{-5}$
c	$\geq 10^{-6} \ldots < 3 \times 10^{-6}$
d	$\geq 10^{-7} \ldots < 10^{-6}$
e	$\geq 10^{-8} \ldots < 10^{-7}$

It comprises the following main elements:
- the category of the components used,
- the reliability of the components ($MTTF_d$: mean time to dangerous failure),
- the diagnostic capability DC.

■ Category of components used
The table below summarises system behaviour in the event of a failure, for the 5 categories defined:

	System behaviour	Principles to achieve safety
B	A fault can lead to loss of the safety function	Selection of appropriate component
1	As for category B but greater reliability of the safety function required.	Selection of appropriate component
2	A fault can lead to loss of the safety function between two periodic inspections and loss of the safety function is detected by the control system at the next test.	Self-monitoring 
3	For a single fault, the safety function is always ensured. Only some faults will be detected. The accumulation of undetected faults can lead to loss of the safety function.	Redundancy 
4	When faults occur, the safety function is always ensured. Faults will be detected in time to prevent loss of the safety function	Redundancy + Self-monitoring 

■ Reliability of the components
The $MTTF_d$ is the Mean Time To dangerous Failure of the component.
Without going into the suggested calculation methods, we can decide to use the three ranges suggested below:

Reliability levels of components	
Index	**Range**
Low	3 years ≤ $MTTF_d$ < 10 years
Medium	10 years ≤ $MTTF_d$ < 30 years
High	30 years ≤ $MTTF_d$ < 100 years

A $MTTF_d$ of less than 3 years should never be found, because this would mean that after one year in operation, 30% of all those components in use would have failed to a dangerous state. The maximum value is limited to 100 years because devices dealing with a significant risk should not depend on the reliability of a single component. Additional measures such as redundancy and tests are required.

Safety of personnel and equipment
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *(continued)*

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems *(continued)*

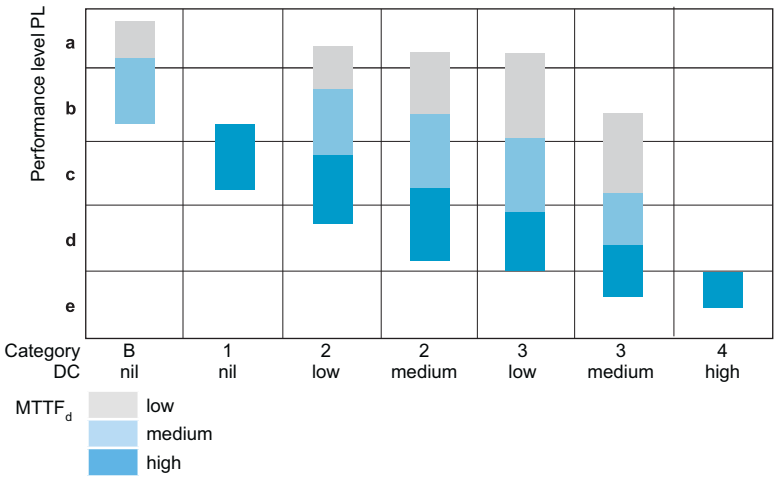
Process ***continued)***

Stage 3- ***(continued)***

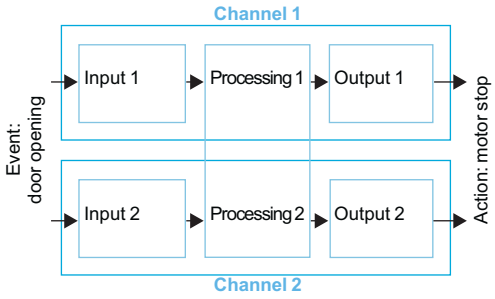
■ Diagnostic capability: this term is expressed as a percentage and quantifies the ability to diagnose a dangerous failure.
For example, in the event of welding of a N/C contact in a relay, the state of the N/O contact could incorrectly indicate the opening of the circuit, unless the relay has mechanically linked N/O and N/C contacts, when the fault can be detected.
The standard recognises four ranges:

Diagnostic capability categories	
Index	**Range**
Nil	DC < 60%
Low	60% ⩽ DC < 90%
Medium	90% ⩽ DC < 99%
High	99% ⩽ DC

■ Summary table for the designer: to help the designer make their choice, the following table summarises the elements of the **PL**.

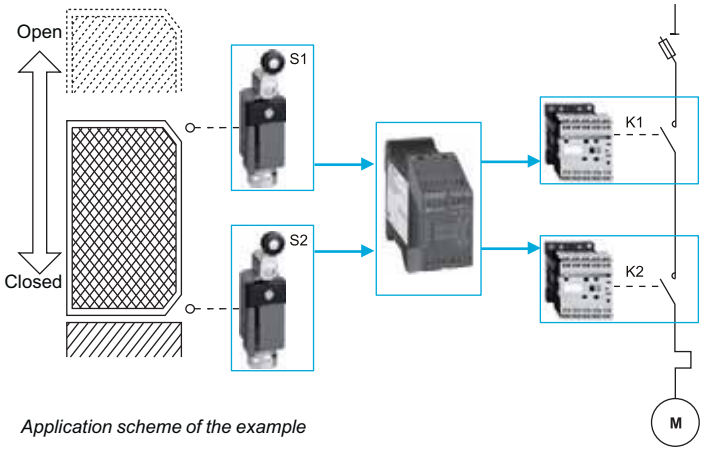


□ In our example, to reach the PL = e, the solution will therefore have to correspond to category 4 with redundant circuit; the function scheme is shown opposite with two channels in parallel,
□ a high diagnostic capability,
□ a high $MTTF_d$.



Functional diagram of the example

For our application, we could suggest a redundant relay scheme but it is nowadays easier to use safety function blocks.
The solution is illustrated below.



Application scheme of the example

The process suggested by the standard is iterative and a few estimations are therefore necessary in order to obtain the expected result. In view of the required performance level, we have chosen a solution with redundant circuit.

Safety of personnel and equipment
Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems (SRP/CS) *(continued)*

Standard EN/ISO 13849-1
Machinery safety - Safety-related parts of control systems
(continued)

Process *(continued)*

Stage 4 - Evaluate the performance level PL for each safety-related part
Based on the information in the supplier's catalogue and Annex E of the standard, we obtain the following values:

Example	B_{10} (number of operations) / % dangerous failure	$MTTF_d$	DC
SRP/CS_a: Safety limit switches	10.000.000 / 20% dangerous failure	7102	99%
SRP/CS_b: XPS AK safety module	-	191.5	99%
SRP/CS_c: LCK contactor	1.000.000 / 73% dangerous failure	194	99%

For electromechanical products,
the $MTTF_d$ is calculated on the basis of the total number of operations that the product can perform, using $\mathbf{B_{10d}}$ values:
In our case, the machine operates for 220 days per year, 8 hours per day with a cycle of 90 s.
N = 220 x 8 x (3600 / 90) = 70 400 operations/year
$MTTF_d = B_{10d} / (0.1 \times N)$ and $B_{10d} = B_{10} / \%$ dangerous failure.

For the safety switches,
the $MTTF_d$= (1 / 0.20 x 10 000 000) / (0.1) x 70 400 = 284 years
For the contactors,
the $MTTF_d$ = (1 / 0.73 x 1 000 000) / (0.1) x 70 400 = 194 years
The $MTTF_d$ for each channel will then be calculated using the formula:

$$\frac{1}{MTTF_d} = \frac{1}{MTTF_{da}} + \frac{1}{MTTF_{db}} + \frac{1}{MTTF_{dc}}$$

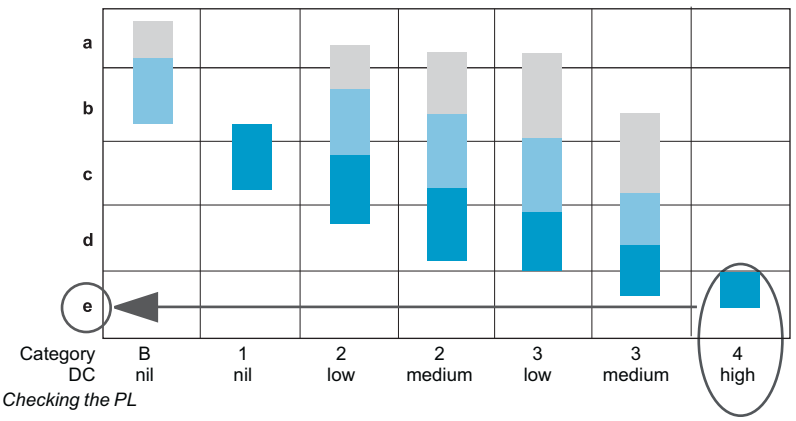
i.e. 95.2 years for each channel.
A similar formula is used to calculate the diagnostic capability

$$DC_{avg} = \frac{\frac{DC_a}{MTTF_{da}} + \frac{DC_b}{MTTF_{db}} + \frac{DC_c}{MTTF_{dc}}}{\frac{1}{MTTF_{da}} + \frac{1}{MTTF_{db}} + \frac{1}{MTTF_{dc}}}$$

The result of the calculation in our example gives a value of 99%

Stage 5 - Checking that required performance level is achieved
The result of the above calculations is summarised below:
- a redundant architecture: category 4,
- a mean time to failure > 30 years: high $MTTF_d$,
- a diagnostic capability of 99%: high DC.

Looking at this table, we confirm that **PL** level **e** is achieved:



Checking the PL

Stage 6 - Validation of the required performance level
The design of SRP/CS must be validated and must show that the combination of SRP/CS performing each safety function satisfies all the applicable requirements of EN/ISO 13849.

Safety of personnel and equipment
Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS)

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS)

Functional Safety of safety-related electrical, electronic and electronic programmable control systems

Field of application of the standard

Safety-related electrical control systems in machines (**SRECS**) are playing an increasing role in ensuring the overall safety of machines and are more and more frequently using complex electronic technology.

This standard is specific to the machine sector within the framework of EN/IEC 61508. It gives rules for the integration of sub-systems designed in accordance with EN/ISO 13849. It does not specify the operating requirements of non-electrical control components in machines (for example: hydraulic, pneumatic).

Functional approach to safety

As with EN/ISO 13849-1, the process starts with analysis of the risks (EN/ISO 14121) in order to be able to determine the safety requirements. **A particular feature of this standard is that it prompts the user to make a functional analysis of the architecture, then split it into sub-functions and analyse their interactions before deciding on a hardware solution for them (the SRECS)**.

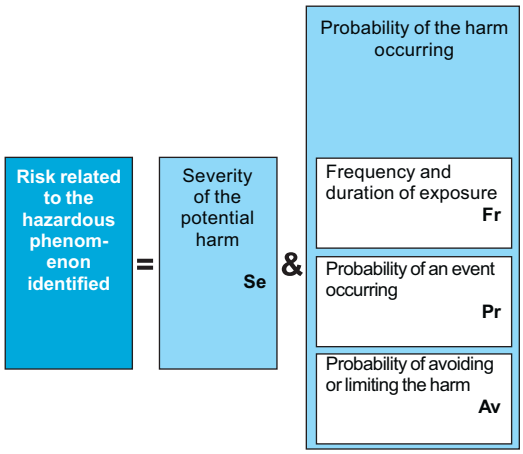
■ A functional safety plan must be drawn up and documented for each design project. It must include:
□ a specification of the safety requirements for the safety functions (**SRCF**) that is in two parts:
- a description of the functions and interfaces, operating modes, function priorities, frequency of operation, etc.
- specification of the safety integrity requirements for each function, expressed in terms of **SIL** (Safety Integrity Level).
The table below gives the target maximum failure values for each level.

SIL	Probability of a dangerous failure per hour (PFHd)
3	$\geqslant 10^{-8} ... < 10^{-7}$
2	$\geqslant 10^{-7} ... < 10^{-6}$
1	$\geqslant 10^{-6} ... < 10^{-5}$

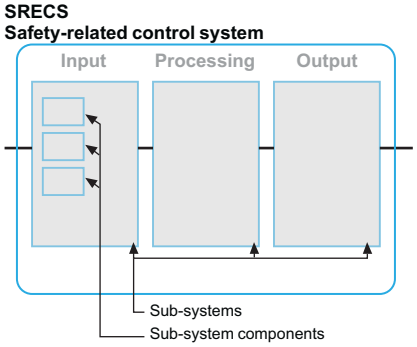
□ The structured and documented design process for electrical control systems (**SRECS**),
□ the procedures and resources for recording and maintaining appropriate information,
□ the process for management and modification of the configuration, taking into account organisation and authorised personnel,
□ the verification and validation plan.

■ Functional safety
The decisive advantage of this approach is that of being able to offer a failure calculation method that incorporates all the parameters that can affect the reliability of electrical systems, whatever the technology used.
The method consists of assigning a SIL to each function, taking into account the following parameters:
- the probability of a dangerous failure of the components (**PFH**d),
- the type of architecture; with or without redundancy, with or without diagnostic device making it possible to avoid some of the dangerous failures,
- common cause failures (power cuts, overvoltage, loss of communication network, etc.) (**CCF**),
- the probability of a dangerous transmission error where digital communication is used,
- electromagnetic interference (**EMC**).

Safety of personnel and equipment
Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*



Risk assessment parameters



***Stage 1**: Basic structure of the electrical control system*

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Process

Designing a system is split into 5 stages after having drawn up the functional safety plan:
1 - based on the safety requirements specification (**SRS**), assign a safety level (**SIL**) and identify the basic structure of the electrical control system (**SRECS**), describe each related function (**SRCF**),
2 - break down each function into a function block structure (**FB**),
3 - list the safety requirements for each function block and assign the function blocks to the sub-systems within the architecture,
4 - select the components for each sub-system,
5 - design the diagnostic function and check that the specified safety level (**SIL**) is achieved.
We will retain the previous example which consists of stopping the operation of a motor when the safety guard is opened. In the event of an incident, there is a risk of an harm being amputated or fracture of a limb.

■ **Stage 1** - Assign a safety integrity level (**SIL**) and identify the structure of the **SRECS**
Based on the risk assessment performed in accordance with standard EN/ISO 14121, estimation of the required **SIL** is performed for each hazardous phenomenon and is broken down into parameters, see illustration opposite.

□ Severity **Se**
The severity of injuries or damage to health can be estimated by taking into account reversible injuries, irreversible injuries and death.
The classification is shown in the table below.

Consequence	Severity Se
Irreversible: death, loss of an eye or an arm	4
Irreversible: shattered limb, loss of a finger	3
Reversible: requires the attention of a medical practitioner	2
Reversible: requires first aid	1

□ Probability of the harm occurring
Each of the three parameters **Fr**, **Pr**, **Av** must be estimated separately using the most unfavourable case. It is strongly recommended that a task analysis model be used in order to ensure that estimation of the probability of the harm occurring is correctly taken into account.
- Frequency and duration of exposure **Fr**

The level of exposure is linked to the need to access the hazardous zone (normal operation, maintenance, ...) and the type of access (manual feeding, adjustment, ...). It must then be possible to estimate the average frequency of exposure and its duration.
The classification is shown in the table below:

Frequency of dangerous exposure	Fr
≤ 1 hour	5
>1 hour... ≤ 1 day	5
> 1 day... ≤ 2 weeks	4
2 weeks... ≤ 1 year	3
> 1 year	2

- Probability of occurrence of a hazardous event **Pr**.

Two basic concepts must be taken into account:
- the predictability of the dangerous components in the various parts of the machine in its various operating modes (normal, maintenance, troubleshooting), paying particular attention to unexpected restarting,
- behaviour of the persons interacting with the machine, such as stress, fatigue, inexperience, etc.

Probability of occurrence of a dangerous event	Pr
Very high	5
Probable	4
Possible	3
Almost impossible	2
Negligible	1

Safety of personnel and equipment
Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Process *(continued)*

■ **Stage 1** -*(continued)*

- Probability of avoiding or limiting the harm **Av**.

This parameter is linked to the design of the machine. It takes into account the suddenness of the occurrence of the hazardous event, the nature of the dangerous component (cutting, temperature, electrical) and the possibility for a person to identify a hazardous phenomenon.

Probability of avoiding or limiting the harm	Av
Impossible	5
Almost impossible	3
Probable	1

□ Assignment of the **SIL**

Estimation is made with the help of the table below.
In our example, the degree of severity is 3 because there is a risk of a finger being amputated; this value is shown in the first column of the table.
All the other parameters must be added together in order to select one of the classes (vertical columns in the table below), which gives us:
Fr = 5 accessed several times a day
Pr = 4 hazardous event probable
Av = 3 probability of avoiding almost impossible
Therefore a class Cl = 5 + 4 + 3 = 12
A level of SIL 2 must be achieved by the safety-related electrical control system(s) (**SRECS**) on the machine.

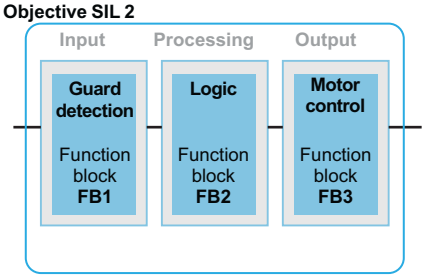
Estimation of the SIL

Se	Class Cl				
	3-4	5-7	8-10	11-13	14-15
4	SIL 2	SIL 2	SIL 2	SIL 3	SIL 3
3	-	-	SIL 1	SIL 2	SIL 3
2	-	-	-	SIL 1	SIL 2
1	-	-	-	-	SIL 1

□ Basic structure of the **SRECS**

Without going into detail about the hardware components to be used, the system is broken down into sub-systems. In our case, we find the 3 sub-systems that will perform the input, processing and output functions. The figure opposite illustrates this stage, using the terminology given in the standard.

SRECS
Objective SIL 2



***Stage 2**: Break down into function blocks*

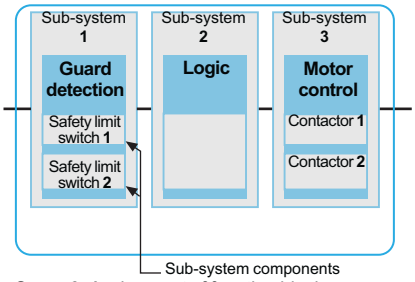
■ **Stage 2** - Break down each function into a function block structure (**FB**)

A function block (**FB**) is the result of a detailed break down of a safety-related function.
The function block structure gives an initial concept of the SRECS architecture. The safety requirements of each block are deduced from the specification of the safety requirements of the system's function.

■ **Stage 3** - List the safety requirements for each function block and assign the function blocks to the sub-systems within the architecture

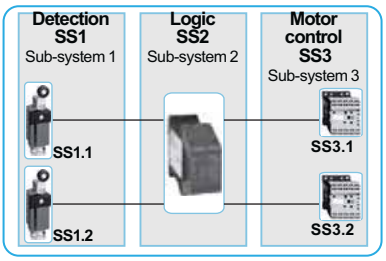
Each function block is assigned to a sub-system in the SRECS architecture. A failure of any sub-system will lead to the failure of the safety-related control function. More than one function block may be assigned to each sub-system. Each sub-system may include sub-system elements and, if necessary, diagnostic functions in order to ensure that anomalies can be detected and the appropriate action taken.
These diagnostic functions (D) are considered as separate functions; they may be performed within the sub-system, by another internal or external sub-system.

SRECS

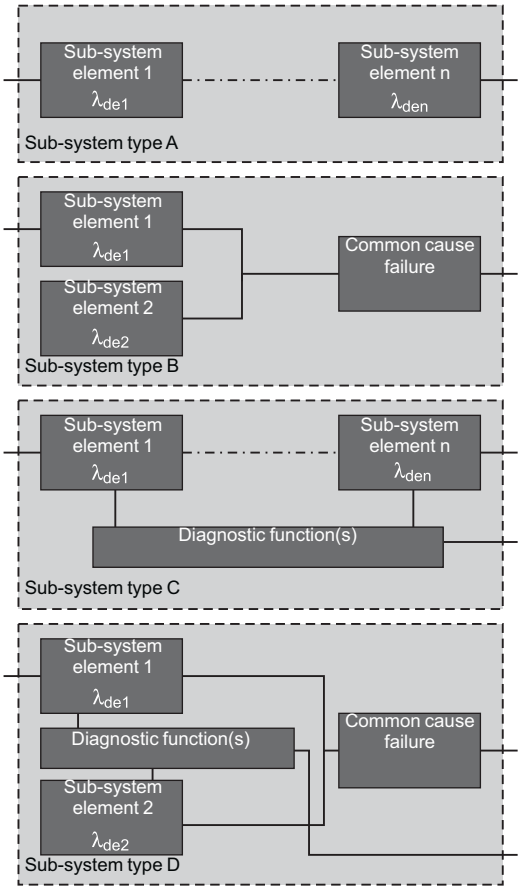


***Stage 3**: Assignment of function blocks*

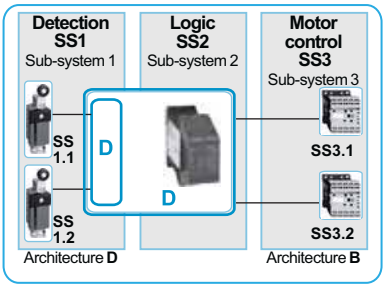
Safety of personnel and equipment
Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*



***Stage 4**: Component selection*



Types of sub-system architecture



***Stage 5**: Design of the diagnostic function*

Standard EN/IEC 62061
Machinery safety - Safety-Related Electrical Control systems (SRECS) *(continued)*

Process *(continued)*

■ **Stage 4** - Select the components for each sub-system

The products shown in the illustration opposite are selected. If the sensors and contactors are the same as in the previous example, a safety module XPS AK will be chosen. The cycle in this example is 450s which means the duty cycle **C** is 8 operations per hour.

As the safety integrity level required for the entire system is SIL 2, each of the components must achieve this level.
The manufacturer's catalogue gives the following values:
Safety limit switches 1 and 2: B_{10} = 10 000 000 operations, the proportion of dangerous failures is 20%, lifetime is 10 years.
- Safety module: $PFH_d = 5.96\ 10^{-9}$
- Contactors 1 and 2: B_{10} = 1 000 000 operations, the proportion of dangerous failures = 73%, lifetime is 20 years.

■ **Stage 5** - Design the diagnostic function

The SIL of the sub-system depends not only on the components, but also on the architecture selected. For our example, we will choose architectures B and D of the standard.
In our architecture, the safety module performs diagnostics not only on itself, but also on the safety limit switches.

We have three sub-systems for which the safety levels must be determined:
□ SS1: two redundant safety limit switches in a sub-system with a type D architecture,
□ SS2: a SIL 3 safety module (obtained on the basis of the PFH provided by the manufacturer),
□ SS3: two redundant contactors built in accordance with a type B architecture.

The calculation method is quite complex, so we will only give the final result. This method takes into account the following parameters:
- **B_{10}**: number of operations at which 10% of the population fail
- **C**: Duty cycle (number of operations per hour)
- λ_D: rate of dangerous failures ($\lambda_D = \lambda$ x portion of dangerous failures in %)
- β: common cause failure coefficient, which is 10 % here and 10% is the worst case: see Annex F.
- **T1**: Proof Test Interval or life time whichever is smaller, as provided by the supplier
- **T2**: diagnostic test interval
- **DC**: Diagnostic coverage rate = λ_{DD}/λ_D, ratio between the rate of detected failures and the rate of dangerous failures.

We obtain:
- for SS1 $PFH_d = 1.6\ E^{-9}$
- for SS3 $PFH_d = 1.07\ E^{-7}$

The total probability of dangerous failures per hour is:
- $\mathbf{PFH_{DSRECS}} = \mathbf{PFH_{DSS1}} + \mathbf{PFH_{DSS2}} + \mathbf{PFH_{DSS3}}$
- $\mathbf{PFH_{DSRECS}} = 1.6\ E^{-9} + 5.96\ 10^{-9} + 1.07\ E^{-7} = 1.14\ E^{-7}$

Which corresponds to the expected result (table below) of a SIL = 2 .
Comment: A level of SIL 3 could have been achieved by using mirror contacts to create a feedback loop on the contactors, i.e. a sub-system architecture type D.

Checking the required SIL	
SIL	**Probability of dangerous failures per hour (PFHd)**
3	$\geq 10^{-8} \ldots < 10^{-7}$
2	**$\geq 10^{-7} \ldots < 10^{-6}$**
1	$\geq 10^{-6} \ldots < 10^{-5}$

6

Safety of personnel and equipment
Certification and CE marking

Certification and CE marking

There are 6 stages in the process for certification and affixing of the CE marking on machines:
1 - apply all the relevant directives,
2 - conform to the essential health and safety requirements,
3 - draw up the technical documentation,
4 - if applicable proceed with the conformity examination,
5 - draw up the Declaration of Conformity,
6- affix the CE marking.

The Machinery Directive

The Machinery Directive is an example of the “New approach” for the harmonisation of products in terms of technical specifications and standards. It is based on:
- essential health and safety requirements which must be complied with before the machine is put on the market,
- a voluntary harmonisation process of standards undertaken by the European Standards Committee (CEN) and the European committee for electro-technical standardisation (CENELEC).
- conformity of evaluation procedures adapted to the types of risk and associated with machine types,
- the CE marking, affixed by the manufacturer to indicate that the machine conforms to the applicable directives; machines bearing this marking can circulate freely within the European Union.

The directive has considerably simplified the multiple national legislations which were in force and has therefore removed many barriers which made trading difficult in the European Union. This has also made it possible to reduce the social cost of accidents. The directives do not apply to pre-existing machines within the EU unless they are substantially modified.
A list of the machines requiring special attestation procedures can be found in the Machinery Directive Annex 4.

The essential requirements

Annexe I of the Machinery Directive groups together the essential health and safety requirements, for putting machines and safety components on the market and into service in Europe.
It follows that:
- if all the requirements of the directive are complied with, no member state of the European Union can oppose circulation of this product.
- if the requirements of the directive are not complied with, putting the product on the market may be prohibited or withdrawal of the product from the market may be required.

In the European Union, this concerns not only manufacturers or their distributors, but also importers and resellers who import these machines or put them into service. Second-hand machines within the EU are not covered, but used machines that have been modified or refurbished can be considered to be new machines.

The harmonised standards

The simplest way to demonstrate conformity with the directives is to conform to the European Harmonised Standards. When, for a product listed in Annex 4 of the Machinery Directive, there is no harmonised standard, or the existing standards are not relevant to cover the essential health and safety requirements, or if the manufacturer considers that these standards are not applicable to their product, they can apply for approval by an outside Notified Body.

These bodies are approved by the Member States after having shown that they have the recognised expertise to give such an opinion (TÜV, BGIA, INRS, BSI Product Services, etc.).

Although the Notified Body has a certain number of responsibilities under the Directive, it is always the manufacturer or their representative who remain responsible for conformity of the product.

Safety of personnel and equipment
Certification and CE marking *(continued)*

Certification and CE marking *(continued)*

Declaration of conformity

In accordance with Article 1 of the Machinery Directive, the manufacturer or their authorised representative established in the European Union must draw up a European Declaration of Conformity for each machine (or safety component). This is in order to certify that the machine or safety component conforms to the Directive.
Before putting a product on the market, the manufacturer or their representative must be able to prepare a technical file.

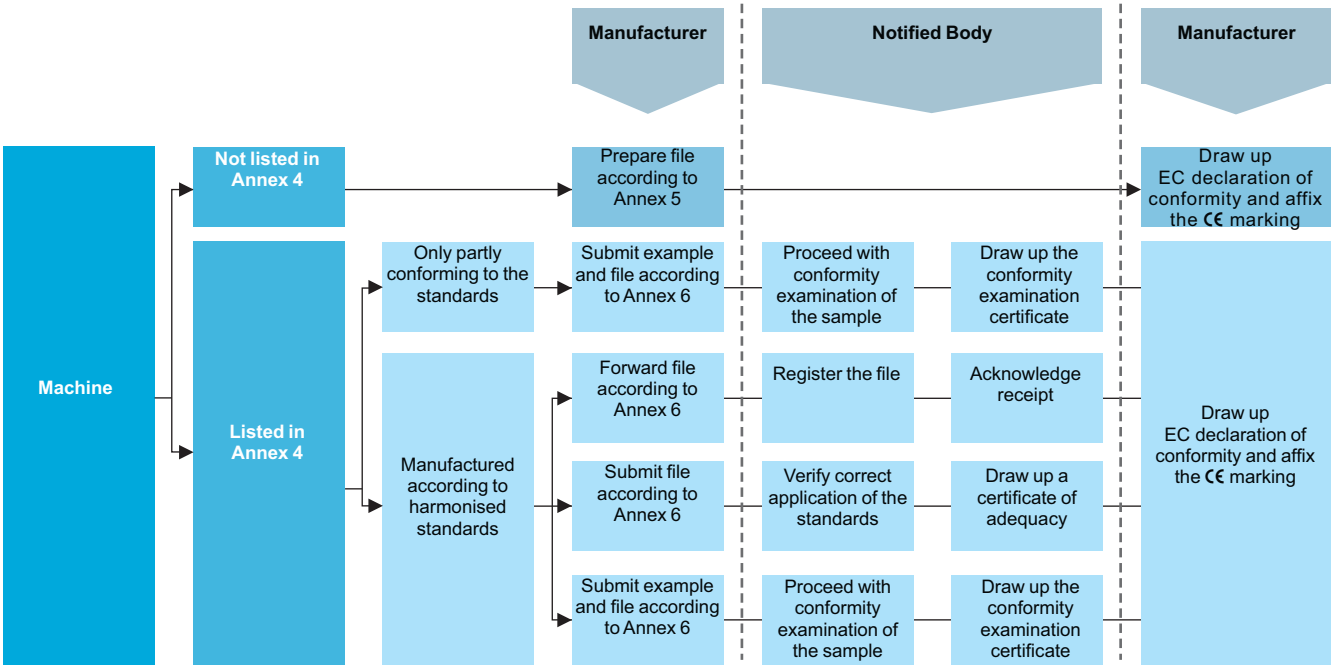
CE marking

Finally, the CE mark must be affixed to the machine by the manufacturer or their authorised representative in the European Union. This marking has been obligatory since 1st January 1995 and can only be affixed if the machine conforms to all the applicable directives, such as:
- the Machinery Directive 98/37/EC,
- the Electromagnetic Compatibility (EMC) directive 2004/108/EC,
- the Low Voltage Directive 2006/95/EC.

There are other directives such as the protection of persons, lifts, medical equipment, etc., which may also be applicable.

The CE marking is the machine's passport in the European Union, which allows it to be marketed in all countries within the Union without taking into account regulations in each individual country.

CE marking procedure



Technical information

Protective treatment of equipment according to climatic environment 7/2

Product standards and certifications 7/4

Degrees of protection provided by enclosures 7/6

IP code 7/6

IK code 7/7

Product reference index 7/8

Technical information
Protective treatment of equipment according to climatic environment

Depending on the climatic and environmental conditions in which the equipment is placed, Schneider Electric can offer specially adapted products to meet your requirements.

In order to make the correct choice of protective finish, two points should be remembered:
- the prevailing climate of the country is never the only criterion,
- only the atmosphere in the immediate vicinity of the equipment need be considered.

All climates treatment “TC”

This is the standard treatment for Telemecanique brand equipment and is suitable for the vast majority of applications. It is the equivalent of treatments described as “Klimafest”, “Climateproof”.
In particular, it meets the requirements specified in the following publications:
- Publication UTE C 63-100 (method I), successive cycles of humid heat at:
+ 40 °C and 95 % relative humidity.
- DIN 50016 - Variations of ambient conditions within a climatic chamber:
+ 23 °C and 83 % relative humidity,
+ 40 °C and 92 % relative humidity.

It also meets the requirements of the following marine classification societies: BV-LR-GL-DNV-RINA.

Characteristics

- Steel components are usually treated with zinc. When they have a mechanical function, they may also be painted.
- Insulating materials are selected for their high electrical, dielectric and mechanical characteristics.
- Metal enclosures have a stoved paint finish, applied over a primary phosphate protective coat, or are galvanised (e.g. some prefabricated busbar trunking components).

Limits for use of “TC” (All climates) treatment

- “TC” treatment is suitable for the following temperatures and humidity:

Temperature (°C)	**Relative humidity** (%)
20	95
40	80
50	50

“TC” treatment is therefore suitable for all latitudes and in particular tropical and equatorial regions where the equipment is mounted in normally ventilated industrial premises. Being sheltered from external climatic conditions, temperature variations are small, the risk of condensation is minimised and the risk of dripping water is virtually non-existent.

Extension of use of “TC” (All climates) treatment

In cases where the humidity around the equipment exceeds the conditions described above, or in equatorial regions if the equipment is mounted outdoors, or if it is placed in a very humid location (laundries, sugar refineries, steam rooms, etc.), “TC” treatment can still be used if the following precautions are taken:
- The enclosure in which the equipment is mounted must be protected with a “TH” finish (see next page) and must be well ventilated to avoid condensation and dripping water (e.g. enclosure base plate mounted on spacers).
- Components mounted inside the enclosure must have a “TC” finish.
- If the equipment is to be switched off for long periods, a heater must be provided (0.2 to 0.5 kW per square decimetre of enclosure), that switches on automatically when the equipment is turned off. This heater keeps the inside of the enclosure at a temperature slightly higher than the outside surrounding temperature, thereby avoiding any risk of condensation and dripping water (the heat produced by the equipment itself during normal running is sufficient to provide this temperature difference).
- Special considerations for “Operator dialog” and “Detection” products:
for certain pilot devices, the use of “TC” treatment can be extended to outdoor use provided their enclosure is made of light alloys, zinc alloys or plastic material. In this case, it is also essential to ensure that the degree of protection against penetration of liquids and solid objects is suitable for the applications involved.

Technical information
Protective treatment of equipment according to climatic environment

"TH" treatment for hot and humid environments

This treatment is suitable for hot and humid atmospheres where installations are regularly subject to condensation, dripping water and the risk of fungi.

In addition, plastic insulating components are resistant to attacks from insects such as termites and cockroaches. These properties have often led to this treatment being described as "Tropical Finish", but this does not mean that all equipment installed in tropical and equatorial regions must systematically have undergone "TH" treatment. On the other hand, certain operating conditions in temperate climates may well require the use of "TH" treated equipment (see limitations for use of "TC" treatment).

Special characteristics of "TH" treatment

■ All insulating components are made of materials which are either resistant to fungi or treated with a fungicide, and which have increased resistance to creepage (Standards IEC 60112, NF C 26-220, DIN 5348).

■ Metal enclosures receive a top-coat of stoved, fungicidal paint, applied over a rust inhibiting undercoat. Components with "TH" treatment may be subject to a surcharge *(1)*. Please consult your Regional Sales Office.

Protective treatment selection guide

Surrounding environment	Duty cycle	Internal heating of enclosure when not in use	Type of climate	Protective treatment of equipment	Protective treatment of enclosure
Indoors					
No dripping water or condensation	Unimportant	Not necessary	Unimportant	"TC"	"TC"
Presence of dripping water or condensation	Frequent switching off for periods of more than 1 day	No	Temperate	"TC"	"TH"
			Equatorial	"TH"	"TH"
		Yes	Unimportant	"TC"	"TH"
	Continuous	Not necessary	Unimportant	"TC"	"TH"
Outdoors (sheltered)					
No dripping water or dew	Unimportant	Not necessary	Temperate	"TC"	"TC"
			Equatorial	"TH"	"TH"
Exposed outdoors or near the sea					
Frequent and regular presence of dripping water or dew	Frequent switching off for periods of more than 1 day	No	Temperate	"TC"	"TH"
			Equatorial	"TH"	"TH"
		Yes	Unimportant	"TC"	"TH"
	Continuous	Not necessary	Unimportant	"TC"	"TH"

These treatments cover, in particular, the applications defined by methods I and II of guide UTE C 63-100.

Special precautions for electronic equipment

Electronic products always meet the requirements of "TC" treatment. A number of them are "TH" treated as standard.

Some electronic products (for example: programmable controllers, flush mountable controllers CCX and flush mountable operator terminals XBT) require the use of an enclosure providing a degree of protection to at least IP 54, as defined by standards IEC 60664 and NF C 20 040, for use in industrial applications or in environmental conditions requiring "TH" treatment.

These electronic products, including flush mountable products, must have a degree of protection to at least IP 20 (provided either by their own enclosure or by their installation method) for restricted access locations where the degree of pollution does not exceed 2 (a test booth not containing machinery or other dust producing activities, for example).

Special treatments

For particularly harsh industrial environments, Schneider Electric is able to offer special protective treatments. Please consult your Regional Sales Office.

(1) A large number of the Telemecanique brand products are "TH" treated as standard and are, therefore, not subject to a surcharge.

Technical information
Product standards and certifications

Standardisation

Conformity to standards

Telemecanique brand products satisfy, in the majority of cases, national (for example: BS in Great Britain, NF in France, DIN in Germany), European (for example: CENELEC) or international (IEC) standards. These product standards precisely define the performance of the designated products (such as IEC 60947 for low voltage equipment).
When used correctly, as designated by the manufacturer and in accordance with regulations and correct practices, these products will allow users to build equipment, machine systems or installations that conform to their appropriate standards (for example: IEC 60204-1, relating to electrical equipment used on industrial machines).
Schneider Electric is able to provide proof of conformity of its production to the standards it has chosen to comply with, through its quality assurance system.
On request, and depending on the situation, Schneider Electric can provide the following:
- a declaration of conformity,
- a certificate of conformity (ASEFA/LOVAG),
- a homologation certificate or approval, in the countries where this procedure is required or for particular specifications, such as those existing in the merchant navy.

Code	Certification authority		Country
	Name	Abbreviation	
ANSI	American National Standards Institute	ANSI	USA
BS	British Standards Institution	BSI	Great Britain
CEI	Comitato Elettrotecnico Italiano	CEI	Italy
DIN/VDE	Verband Deutscher Electrotechniker	VDE	Germany
EN	Comité Européen de Normalisation Electrotechnique	CENELEC	Europe
GOST	Gosudarstvenne Komitet Standartov	GOST	Russia
IEC	International Electrotechnical Commission	IEC	Worldwide
JIS	Japanese Industrial Standard	JISC	Japan
NBN	Institut Belge de Normalisation	IBN	Belgium
NEN	Nederlands Normalisatie Institut	NNI	Netherlands
NF	Union Technique de l'Electricité	UTE	France
SAA	Standards Association of Australia	SAA	Australia
UNE	Asociacion Española de Normalizacion y Certificacion	AENOR	Spain

European EN standards

These are technical specifications established in conjunction with, and with approval of, the relative bodies within the various CENELEC member countries (European Union, European Free Trade Association and many central and eastern European countries having «member» or «affiliated» status). Prepared in accordance with the principle of consensus, the European standards are the result of a weighted majority vote. Such adopted standards are then integrated into the national collection of standards, and contradictory national standards are withdrawn.
European standards incorporated within the French collection of standards carry the prefix NF EN. At the 'Union Technique de l'Electricité' *(Technical Union of Electricity)* (UTE), the French version of a corresponding European standard carries a dual number: European reference (NF EN …) and classification index (C …).
Therefore, the standard NF EN 60947-4-1 relating to motor contactors and starters, effectively constitutes the French version of the European standard EN 60947-4-1 and carries the UTE classification C 63-110.
This standard is identical to the British standard BS EN 60947-4-1 or the German standard DIN EN 60947-4-1.
Whenever reasonably practical, European standards reflect the international standards (IEC).
With regard to automation system components and distribution equipment, in addition to complying with the requirements of French NF standards, Telemecanique brand components conform to the standards of all other major industrial countries.

Regulations

European Directives

Opening up of European markets assumes harmonisation of the regulations pertaining to each of the member countries of the European Union.
The purpose of the European Directive is to eliminate obstacles hindering the free circulation of goods within the European Union, and it must be applied in all member countries. Member countries are obliged to transcribe each Directive into their national legislation and to simultaneously withdraw any contradictory regulations. The Directives, in particular those of a technical nature which concern us, only establish the objectives to be achieved, referred to as "essential requirements".
The manufacturer must take all the necessary measures to ensure that his products conform to the requirements of each Directive applicable to his production.
As a general rule, the manufacturer certifies conformity to the essential requirements of the Directive(s) for his product by affixing the CE mark.
The CE mark is affixed to Telemecanique brand products concerned, in order to comply with French and European regulations.

Significance of the CE mark
- The CE mark affixed to a product signifies that the manufacturer certifies that the product conforms to the relevant European Directive(s) which concern it; this condition must be met to allow free distribution and circulation within the countries of the European Union of any product subject to one or more of the E.U. Directives.
- The CE mark is intended solely for national market control authorities.
- The CE mark must not be confused with a conformity marking.

Technical information
Product standards and certifications

European Directives (continued)

For electrical equipment, only conformity to standards signifies that the product is suitable for its designated function, and only the guarantee of an established manufacturer can provide a high level of quality assurance.
For Telemecanique brand products, one or several Directives are likely to be applicable, depending on the product, and in particular:

- the Low Voltage Directive 73/23/EEC amended by Directive 93/68/EEC: the CE mark relating to this Directive has been compulsory since 1st January 1997.
- the Electromagnetic Compatibility Directive 89/336/EEC, amended by Directives 92/31/EEC and 93/68/EEC: the CE mark on products covered by this Directive has been compulsory since 1st January 1996

ASEFA-LOVAG certification

The function of ASEFA (Association des Stations d'Essais Française d'Appareils électriques - *Association of French Testing Stations for Low Voltage Industrial Electrical Equipment)* is to carry out tests of conformity to standards and to issue certificates of conformity and test reports.
ASEFA laboratories are authorised by the French authorisation committee (COFRAC).
ASEFA is now a member of the European agreement group LOVAG (Low Voltage Agreement Group). This means that any certificates issued by LOVAG/ASEFA are recognised by all the authorities which are members of the group and carry the same validity as those issued by any of the member authorities.

Quality labels

When components can be used in domestic and similar applications, it is sometimes recommended that a "Quality label" be obtained, which is a form of certification of conformity.

Code	Quality label	Country
CEBEC	Comité Electrotechnique Belge	Belgium
KEMA-KEUR	Keuring van Electrotechnische Materialen	Netherlands
NF	Union Technique de l'Electricité	France
ÖVE	Österreichischer Verband für Electrotechnik	Austria
SEMKO	Svenska Electriska Materiel Kontrollanatalten	Sweden

Product certifications

In some countries, the certification of certain electrical components is a legal requirement. In this case, a certificate of conformity to the standard is issued by the official test authority.
Each certified device must bear the relevant certification symbols when these are mandatory:

Code	Certification authority	Country
CSA	Canadian Standards Association	Canada
UL	Underwriters Laboratories	USA
CCC	China Compulsory Certification	China

Note on certifications issued by the Underwriters Laboratories (UL). There are two levels of approval:

"Recognized" ( ) The component is fully approved for inclusion in equipment built in a workshop, where the operating limits are known by the equipment manufacturer and where its use within such limits is acceptable by the Underwriters Laboratories.
The component is not approved as a "Product for general use" because its manufacturing characteristics are incomplete or its application possibilities are limited.
A "Recognized" component does not necessarily carry the certification symbol.

"Listed" (UL) The component conforms to all the requirements of the classification applicable to it and may therefore be used both as a "Product for general use" and as a component in assembled equipment. A "Listed" component must carry the certification symbol.

Marine classification societies

Prior approval (= certification) by certain marine classification societies is generally required for electrical equipment which is intended for use on board merchant vessels.

Code	Classification authority	Country
BV	Bureau Veritas	France
DNV	Det Norske Veritas	Norway
GL	Germanischer Lloyd	Germany
LR	Lloyd's Register	Great Britain
NKK	Nippon Kaiji Kyokaï	Japan
RINA	Registro Italiano Navale	Italy
RRS	Register of Shipping	Russia

Note

For further details on a specific product, please refer to the "Characteristics" pages in this catalogue or consult your Regional Sales Office.

Technical information
Degrees of protection provided by enclosures
IP code

Degrees of protection against the penetration of solid bodies, water and personnel access to live parts

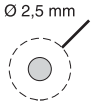
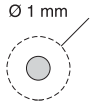
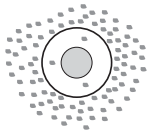
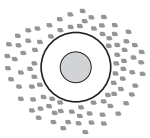
The European standard EN 60529 dated October 1991, IEC publication 529 (2nd edition - November 1989), defines a coding system (IP code) for indicating the degree of protection provided by electrical equipment enclosures against accidental direct contact with live parts and against the ingress of solid foreign objects or water.
This standard does not apply to protection against the risk of explosion or conditions such as humidity, corrosive gasses, fungi or vermin.
Certain equipment is designed to be mounted on an enclosure which will contribute towards achieving the required degree of protection (example : control devices mounted on an enclosure).
Different parts of an equipment can have different degrees of protection (example : enclosure with an opening in the base).
Standard NF C 15-100 (December 2002 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

IP ●●● code

The IP code comprises **2 characteristic numerals** (e.g. **IP 55**) and may include **an additional letter** when the actual protection of personnel against direct contact with live parts is better than that indicated by the first numeral (e.g. IP 20C).
Any characteristic numeral which is unspecified is replaced by an X (e.g. IP XXB).

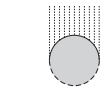
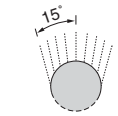
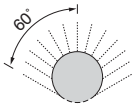
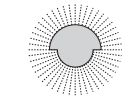
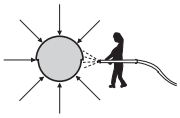
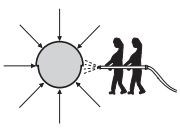
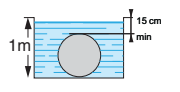
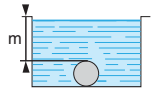
1st characteristic numeral:

corresponds to protection of the equipment against penetration of solid objects and protection of personnel against direct contact with live parts.

	Protection of the equipment		Protection of personnel
0	Non-protected		Non-protected
1		Protected against the penetration of solid objects having a diameter greater than or equal to 50 mm	Protected against direct contact with the back of the hand (accidental contacts).
2		Protected against the penetration of solid objects having a diameter greater than or equal to 12.5 mm.	Protected against direct finger contact.
3		Protected against the penetration of solid objects having a diameter greater than or equal to 2.5 mm.	Protected against direct contact with a Ø 2.5 mm tool.
4		Protected against the penetration of solid objects having a diameter > 1 mm.	Protected against direct contact with a Ø 1 mm wire.
5		Dust protected (no harmful deposits).	Protected against direct contact with a Ø 1 mm wire.
6		Dust tight.	Protected against direct contact with a Ø 1 mm wire.

2nd characteristic numeral:

corresponds to protection of the equipment against penetration of water with harmful effects.

0	Non-protected	
1		Protected against vertical dripping water, (condensation).
2		Protected against dripping water at an angle of up to 15°.
3		Protected against rain at an angle of up to 60°.
4		Protected against splashing water in all directions.
5		Protected against water jets in all directions.
6		Protected against powerful jets of water and waves.
7		Protected against the effects of temporary immersion.
8		Protected against the effects of prolonged immersion under specified conditions.

Additional letter:

corresponds to protection of personnel against direct contact with live parts.

A	With the back of the hand.
B	With the finger.
C	With a Ø 2.5 mm tool.
D	With a Ø 1 mm wire.

Technical information
Degrees of protection provided by enclosures
IK code

Degrees of protection against mechanical impact

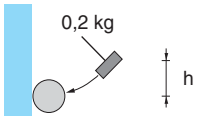
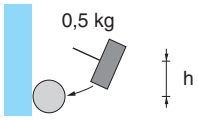
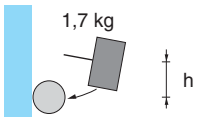
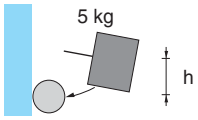
The European standard EN 62262 dated February 2002 defines a coding system (IK code) for indicating the degree of protection provided by electrical equipment enclosures against external mechanical impact.
Standard NF C 15-100 (December 2002 edition), section 512, table 51 A, provides a cross-reference between the various degrees of protection and the environmental conditions classification, relating to the selection of equipment according to external factors.
Practical guide UTE C 15-103 shows, in the form of tables, the characteristics required for electrical equipment (including minimum degrees of protection), according to the locations in which they are installed.

IK ●● code

The IK code comprises **2 characteristic numerals** (e.g. **IK 05**).

2 characteristic numerals:

corresponding to a value of impact energy.

		h (cm)	Energy (J)
00	Non-protected		
01		7.5	0.15
02		10	0.2
03		17.5	0.35
04		25	0.5
05		35	0.7
06		20	1
07		40	2
08		30	5
09		20	10
10		40	20

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