



safety integrated



Safety Technology
for
Factory Automation

SIEMENS

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Components for Automation

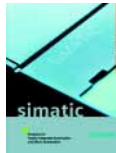
Order No.:
CD-ROM: E86060-D4001-A110-C5-7600
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SIMATIC ST 70

Products for Totally Integrated Automation and Micro Automation

Order No.:
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Safety Technology for Factory Automation

Short catalog 2007



Void:
Short Catalog Safety Integrated 2006

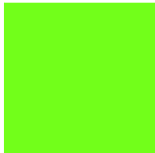
The products described in this catalog
are also included in the
electronic catalog CA 01
Order No.:
CD: E86060-D4001-A100-C5-7600
DVD: E86060-D4001-A510-C5-7600

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The products and systems described in this catalog are manufactured/distributed under application of a certified quality management system in accordance with DIN EN ISO 9001. The certificate is recognized by all IQNet countries.



SIEMENS

Detecting

Switch strips,
light barriers/light
curtains, Laser scanners
Position-, hinge-,
magnetic switches
pushbuttons, indicators,
cable-operated switches,
operation consoles, foot
switches, gas analyzers,
pressure, flow, level mea-
suring devices,
positioners

1

Evaluating, Communication

CPUs for factory
and process automation
Fail-safe I/O devices for
ET 200S, ET 200M
SIMATIC ET 200pro
SIMATIC ET 200eco
ASIsafe
Network transitions
3TK28 safety relays

2

Reacting

ET 200S and ET200pro
motor starters and
frequency converters
SINAMICS G120
SINAMICS G120D
SINAMICS S120
SIMODRIVE
SIMOVERT
MASTERDRIVES

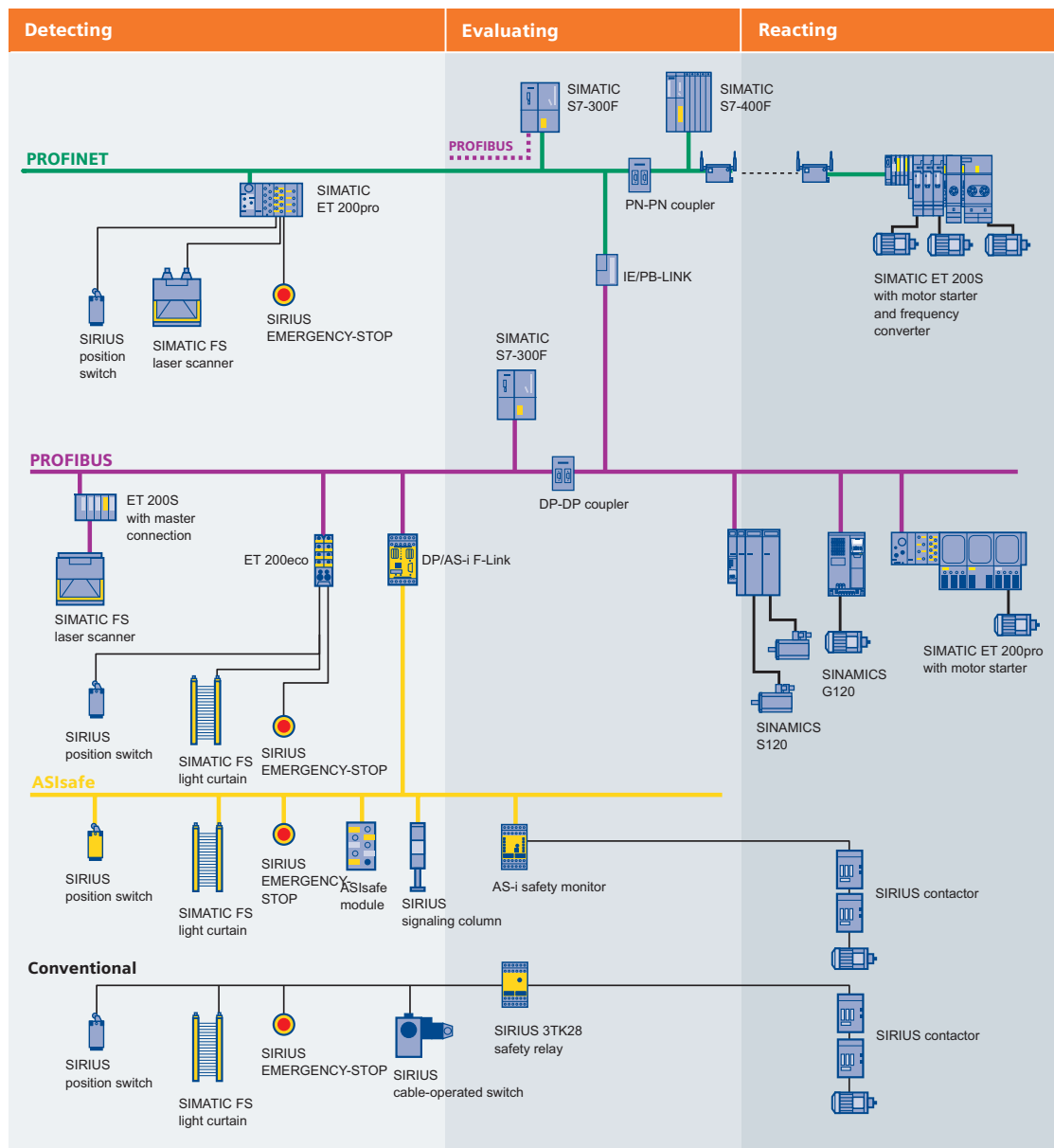
3

Appendix

4



Safety Integrated - Safety technology from Siemens



It's in your hands - to protect humans, machines and the environment against possible danger. The solution we are offering you is the Safety Integrated concept that leaves nothing out, is fully integrated in the standard automation system and offers a range of products from a single source for dealing with all eventualities.

www.siemens.com/safety

Here you will find everything you need to know about our extensive product range as well as useful links to documentation and services on all aspects of safety.

The following is a must for machine builders and operators: there can be absolutely no gaps in providing safety for humans and machines. The solution: our Safety Integrated concept based on Totally Integrated Automation. Whether for simple safety functions or highly complex tasks - our program offers you maximum safety.

Safety Integrated is a unique, complete and integrated safety concept and covers all tasks encountered in safety engineering from acquisition, evaluation and reaction to sensors and actuators and the PLC and drives.

Our products meet the current safety standards in industry including TÜV, NFPA and UL.

All Safety Integrated products or systems can be fully integrated in the standard automation system. They are particularly flexible and economical, accelerate engineering, increase the availability of the plant and enable machines to be operated in accordance with standard practices. And thanks to the extensive range of products and services including support - you are always on the safe side with Safety Integrated.

Detecting



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Fail-safe sensors

Introduction

Fail-safe sensors – For all-round protection of persons and machines

For the protection of persons and machines in the industrial environment, maximum process reliability is paramount. Not simply to prevent adverse events but also to achieve the greatest possible plant availability for maximum efficiency. A clear case for our optical safety sensors. They ensure safe and reliable protection for persons, machines and systems. They are, of course, integrated into our uniform safety concept Safety Integrated.

Highlights

- Laser scanners, light barriers, light curtains and light arrays for contact-free guarding of danger areas
- Safe all-round protection for persons and systems in stationary and mobile applications
- Wear-free and maintenance-free technology for maximum availability
- Freedom in machine design, without the need for mechanical safety gates
- Component of the complete Siemens Safety Integrated product range

Requirements for categories according to EN 954-1

Category ¹⁾	Summary of requirements	System response ²⁾	Principles for achieving safety
B	The safety-relevant components of controls and/or their protective equipment and components must be designed, constructed, selected, assembled and combined in compliance with all applicable standards such as to be capable of withstanding all potentially hazardous influences.	The occurrence of a fault can result in loss of the safety function.	Mainly characterized by the selection of components.
1	The requirements of Category B must be met. Well-proven components and well-proven safety principles must be implemented.	The occurrence of a fault can result in loss of the safety function but the probability of it occurring is less than for Category B.	
2	The requirements of Category B must be met and well-proven safety principles must be implemented. The safety functions must be tested at regular intervals by the machine control.	The occurrence of a fault can result in loss of the safety function between tests. The loss of the safety function will be detected by the test.	Mainly characterized by the structure.
3	The requirements of Category B must be met and well-proven safety principles must be implemented. Parts with relevance for safety must be implemented such that: • A single fault in any of these components does not result in loss of the safety function. • If it can be implemented in an appropriate way, individual faults/errors can be detected.	When the single fault occurs, the safety function is always maintained. • Some but not all faults are detected. • An accumulation of undetected faults may lead to loss of the safety function.	
4	The requirements of Category B must be met and well-proven safety principles must be implemented. Parts with relevance for safety must be implemented such that: • A single fault in any of these components does not result in loss of the safety function. • The individual fault is detected during or before the next activation of the safety function or, if this is not possible, an accumulation of faults will not result in loss of the safety function.	• When faults occur, the safety function is always maintained. • Faults are detected early to prevent loss of the safety function.	

1) The categories are not intended to be applied in a specific sequence or hierarchy with reference to the safety requirements.

2) The risk assessment will establish whether complete or partial loss of the safety function(s) due to faults is acceptable.

SIMATIC FS100 safety strips

Finger-traps are a danger on many machines and other technical installations. In these situations, the simplest protection is implemented with rubber switching strips that on the one hand halt the dangerous motion in a failsafe state and on the other hand act as a buffer to prevent injury.

The edge of the rubber strip (signal encoder) is monitored optically by means of a fail-safe send/receive sensor that is inserted into the strip from the outside. This means that any length can be used, cut to length as required by the customer.



SIMATIC FS200 light barriers

When space is at a premium, contact-free light barriers are the ideal solution for access protection to danger zones, danger points or entry points. Designed to the IP65 degree of protection, they have a range of up to 150 m in category 2. The light barriers of category 4 with a range of up to 60 m feature frequency modulated infrared light and integral pollution monitoring. Additional evaluation units support start/restart inhibiting, contactor control and muting functions



SIMATIC FS400 light curtains and light arrays

The contact-free, active optoelectronic light curtains and light arrays for category 2 and 4 according to EN 954-1 protect operating personnel at running machines or plants or in their vicinity. Thanks to specially developed integrated circuits (ASICs) and a patented, intelligent evaluation technique, they are extremely fault-tolerant and highly available. A wide range of different functions including start/restart inhibiting, contactor control, muting, sequence control and blanking support a wide range of different applications such as finger and hand protection, horizontal danger zone protection or access protection to large areas. Versions for connection to ASIsafe and PROFIsafe are available.

A light curtain or light array comprises an emitter and a receiver, which must be mounted opposite each other. Depending on the resolution and the length, a certain number of transmit and receive diodes are arranged on top of each other. The infrared LEDs of the emitter emit short light pulses that are detected by the receive diodes.



SIMATIC FS600 laser scanners

The laser scanner is an optical distance sensor for flexible guarding of danger zones. By emitting harmless laser pulses and subsequently evaluating the reflections, the scanner detects persons and objects and responds in accordance to the programmed protected fields.



Switch strips SIMATIC FS100

Switch strips category 4

Overview



The safety switch strips for machine construction consist of „sensitive edges“ and protect persons or objects from being crushed or becoming stuck. If the safety strip is moved or if a fault occurs in the safety strip or the cable connections, the output circuits trip and the drive is halted or reversed.

The safety strips are approved with the corresponding evaluation unit for Category 4 to EN 954-1.

Application

Typical application examples in machine and plant construction are protective covers of machines, driverless transport systems, lifting tables, washing portals, lifting platforms and automatic handling devices.

Safety strips can also be used for limiting the force applied to an obstruction in door and gate areas as well as for automatically closing doors and windows in vehicle construction.

Design

The monitoring system consists of a 3RG78 55 safety strip and a 3RG78 57 evaluation unit.

Technical Specifications

Evaluation unit

Type	3RG78 57
Approvals	Category 4 to EN 954-1
Overvoltage category (to DIN VDE 0110)	3 (4 kV)
Operating voltage	24 V DC (+20 %/-10 %)
Power consumption	< 4 W
Protection of the supply voltage	1 A (slow)
Output contacts	2 NO (safety) / 1 NC (semicond., switching to N potential)
Response time	Approx. 32 ms
Continuous thermal current	4 A
Switching current	max. 4 A
Switching voltage	max. AC 250 V, 50/60 Hz
Switching power (AC)	max. 1250 VA
Status indication	
• Power	Green LED
• Channel	Green LED
Mechanical endurance	30 x 10 ⁶ operations
Degree of protection to IEC 60529	IP20 terminal casing

The safety strip comprises the mounting strip (aluminum rail), the sensitive edge (rubber strip) and an infrared sensor. The sensor, consisting of a transmitter and receiver, has a sensing range of 0.5 ... 10 m.

The signal evaluator is fitted in a narrow housing (width 22.5 mm) for mounting onto standard rails. A separate signal evaluator is required for each switch strip, i.e. the combination of transmitter and receiver.

A three-core cable connects the transmitter and receiver to the evaluation unit.

Installation

The mounting strip is cut to size and fitted to the edge to be protected. The rubber strip is cut to size and inserted in the mounting strip. The transmitter and receiver are inserted into the hollow space of the rubber strip on the left and right.

The brown, green and white cores must be connected to the signal evaluator, ensuring the colors are connected correctly.

The infrared light beam between the transmitter and the receiver is routed along the rubber strip. It is reflected from the smooth inner surface of the strip. This allows the rubber strip to be curved to a certain extent without switch-off occurring.

Function

Due to the dynamic nature of the circuit, every fault is detected. In the event of a fault or when the strip is operated, the monitoring unit switches to the safe state. The restart must be acknowledged via an external circuit (e.g. by a Ready/On button).

The status of the unit is indicated via two LEDs (supply voltage, enable) on the front plate.

Outputs

The signal evaluator has:

- Two positively opening relay outputs that are used as enabling circuits
- A semiconductor output (signaling output, with no relevance for safety) for reporting the fault to the controller (npn open collector).

Type	3RG78 57
Ambient temperature	+5 ... +55 °C
Mounting of housing	Snap mounting on 35 mm DIN rail
Mounting position	Any

Switch strip (rubber sensitive edge)

Type	3RG78 55
Material	EPDM, 60 Shore
Dimensions (W × H)	25 mm × 30 mm
Temperature resistance	
• temporarily	–50 ... +120 °C
• continuously	–30 ... +100 °C
Substance resistance	Ozone; oil limited extent, fuels, solvents, acids

Switch strips SIMATIC FS100

Switch strips category 4

Selection and ordering data

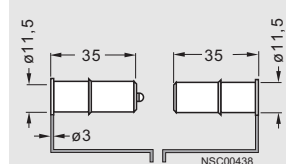
Version	Range m	Length m	Order No.
Optical safety switch strips			
 3RG78 55-1RG  3RG78 55-.BB	Transmitter-/Receiver sensors	0,5 ... 10	3RG78 55-1RG
	receiver cable length 3 m, transmitter cable length 10,5 m		
	Sensor strip (rubber sensitive edge)	1	3RG78 55-2BB
		2.5	3RG78 55-2BD
		5	3RG78 55-2BF
		10	3RG78 55-2BG
	Sensor strip (rubber sensitive edge), oil-resistant	1	3RG78 55-4BB
		2.5	3RG78 55-4BD
		5	3RG78 55-4BF
	Mounting strip (made of aluminum)	1	3RG78 55-3BB
		2.5	3RG78 55-3BD

A: Subject to export regulation AL = N and ECCN = EAR99H

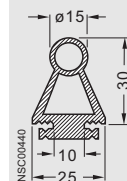
Application	Control	Attainable category to EN 954-1	Order No.
Evaluation unit 24 V DC			
	Monitoring of safety switch strips	Dynamic signal	3RG78 57-1BD
		4	

Dimension drawings

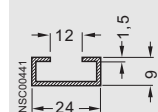
3RG78 55-1R. send/receive sensors



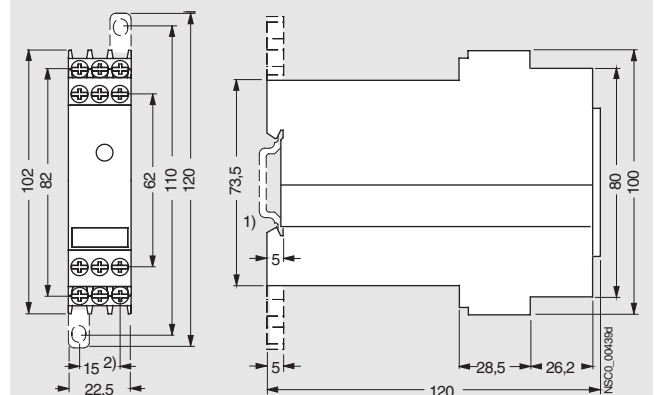
3RG78 55-2B. sensor strip



3RG78 55-3B. mounting strip



3RG78 57-1BD evaluation unit



Light barriers SIMATIC FS200

Light barriers category 2 with evaluation unit, light barriers category 4

Overview



The light barriers are non-contact protective devices for access protection for hazardous areas, hazardous locations and entry points. They are the optimum solution in many cases especially when security is necessary but must not have a disruptive effect or reduce productivity.

Whenever a light beam is interrupted, a signal is output for reliable interruption of a dangerous movement of a machine, installation or other motorized equipment.

A complete system comprises at least one thru-beam sensor with separate transmitter and receiver. Two different systems are available which are authorized as a complete unit for Safety Category 2 or 4 in accordance with EN 954-1 by a German trade association.

- Category 2 with an external evaluation unit,
- Category 4, operation without an evaluation unit is possible.

The 3RG78 23 light barriers (Category 2) only operate as non-contact safety devices in conjunction with the 3RG78 25 or 3RG78 47 evaluation units. The 3RG78 24 light barriers (Category 4) can also be operated with the 3RG78 47 evaluation units.

[For evaluation units 3RG78 47 see page 3/55.](#)

Application

Typical applications for light barriers include access protection for:

- Power-operated windows, doors and gates
- Warehouse equipment and devices
- Packaging machines
- Palette loading systems
- Stacking systems
- Winding and unwinding machines
- Textile machines
- Food machines
- Printing and paper processing machines
- Processing machines in the chemicals, plastics and rubber industries
- Recirculating buffers
- Lifting platforms
- Butcher's machines

and many more applications.

Light barriers category 2 with evaluation unit,
light barriers category 4

Technical Specifications

Light barriers

Type	3RG78 23	3RG78 24
Category according to EN 954-1	Category 2	Category 4
Operating voltage	24 V DC	24 V DC
Operating range	0 ... 120 m	0 ... 60 m
Typical range limit ¹⁾	0 ... 150 m	–
Light type	infrared (880 nm)	
Opening angle	max. 4°	max. 2°
Object size	min. 9 mm Ø	min. 13 mm Ø
Operating temperature	–25 ... +60 °C	
Degree of protection	IP65	
Conductor	circular connector M 12	Pg cable gland

Evaluation units

Type	3RG78 25	–
Category according to EN 954-1	Category 2	
Operating voltage	24 V DC, ± 15 %	
Response time	max. 20 ms	
Current	ca. 200 mA	
Safety output	2 floating NO contacts	
Current-carrying capacity	max. 4 A	
Signaling outputs	separate pnp transistor outputs	
Operating temperature	–20 ... +60 °C	
Type of protection ²⁾	IP40	

1) The range limit is the maximum achievable range without surplus light emission.

2) Only suitable for use in electrical equipment areas, e.g. control cabinet to the IP54 degree of protection.

Selection and ordering data

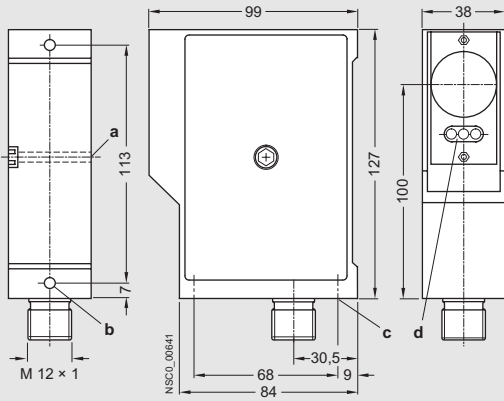
Version	Connection	Order No.
Safety light barriers		
Category 2 according to EN 954-1		
Transmitter	M12 circular connector	3RG78 23-3BG00
Receiver, Range 0...150 m	M12 circular connector	3RG78 23-3KB00
Category 4 according to EN 954-1		
Transmitter	Pg 11 cable gland	3RG78 24-6BG00
Receiver, Range 0...60 m	Pg 11 cable gland	3RG78 24-6JB00
Evaluation unit		
Kategorie 2 nach EN 954-1		
Evaluation unit, geeignet für Lichtvorhänge 3RG78 41 und Lichtschranken 3RG78 23	Up to 6 light barrier pairs can be connected	3RG78 25-1CB1
Accessories		
M12 cable plug, 4-pole, with black PUR cable		
Cable length 5 m		3RX80 00-0CB42-1AF0
Cable length 10 m		3RX80 00-0CB42-1AL0

Light barriers SIMATIC FS200

Light barriers category 2 with evaluation unit,
light barriers category 4

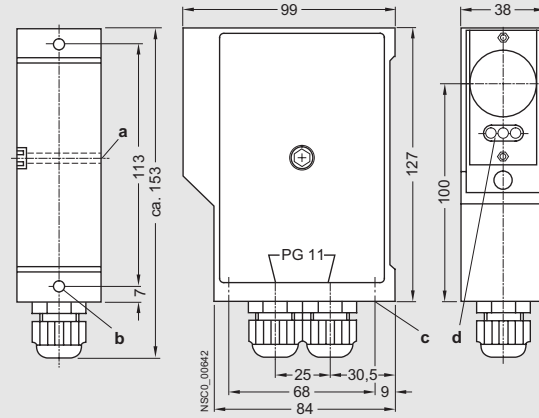
Dimension drawings

3RG78 23 light barrier



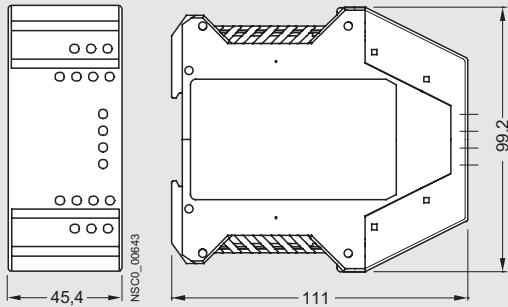
- a = Device mounting M 6 × 12
- b = Device mounting M 6 × 9
- c = Device mounting M 6 × 9
- d = LED

3RG78 24 light barrier



- a = Device mounting M 6 × 12
- b = Device mounting M 6 × 9
- c = Device mounting M 6 × 12
- d = LED

3RG78 25 evaluation device



Overview



Light curtains and light arrays 3RG78 4 and 3SF78 4 (for AS-Interface and PROFIBUS)

- Active opto-solid-state protective devices (AOPD)
- Type 2 or type 4 to IEC/EN 61496-1, -2
- SIL 2 and 3 to IEC/EN 61508
- EU type tested
- Protect operating personnel working on or near dangerous machines
- Non-contact operation
- Wear-resistant in comparison with mechanical systems (e.g. safety mats)

For further details, see the "Safety Integrated" manual and the operating instructions for the applicable devices.

Tests/service

The devices are EU type tested (TÜV (German Technical Inspectorate) Product Service in cooperation with the BIA).

If required, tests can be performed before initial start-up, as well as the annual inspection (such as that required by law for presses). Please ask your Siemens contact person for further information.

Benefits

Integrated functions

- Start-up/restart inhibit
- Contactor control
- "Blanking" function package with
 - Fixed blanking
 - Floating blanking
 - Reduced resolution
- "Muting" function package
- Multi-scan function
- Sequence control (optional)

Configuration

- By teach-in key and opto-magnetic key
- Transmission of the configuration data through a plug-in configuration card
- 2 transmission channels
- Cascading of host and guest devices
- Expanded display (2 × 7 segments)

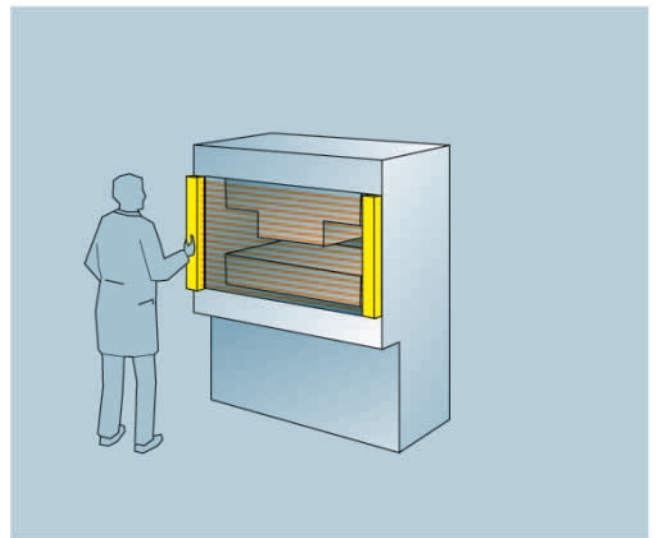
Outputs/connections:

- Local interface
- M12 connections
- Hirschmann-type connection
- Brad-Harrison-type connection (often required for NAFTA-Market (North American Free Trade Agreement))
- Transistor outputs
- Relay outputs
- Connection to AS-Interface
- Connection to PROFIBUS

Application

Light curtains for finger and hand protection in danger zones

Protection against touching danger zones where light curtains are mounted close to dangerous machine parts (finger and hand protection).



Light curtains and arrays SIMATIC FS400

Introduction

Device selection

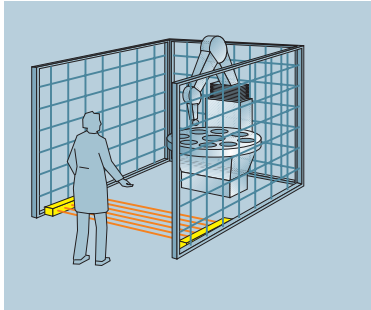
Light curtains for category 2 or 4, with 14 and 30 mm resolution

Applications

e.g. presses, punches, filter presses, cutting machines

Light curtains for horizontal danger zone protection at floor level

Reliable detection of persons in danger zones when the light curtain is mounted close to the floor (crawling underneath is not possible)



Device selection

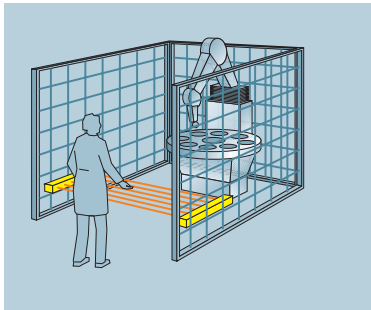
Light curtains for category 2 or 4, with 50 mm or 55 mm resolution

Applications

e.g. welding and assembly lines/robots in the automotive industry.

Light curtains for horizontal danger zone protection

Reliable detection of persons in danger zones when the light curtain is mounted at a height of between 0.6 to 1 m



Device selection

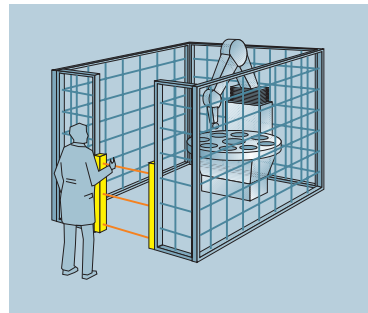
Light curtains for category 2 or 4, with 80 or 90 mm resolution

Applications

e.g. welding and assembly lines/robots in the automotive industry

Light arrays for access protection

Reliable detection of persons entering danger zones.



Device selection

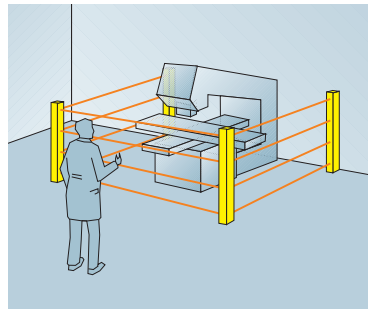
2, 3, or 4-beam light array, for category 4 with 18 m range.

Applications

Access control, e.g. at robots and handling devices.

Light arrays for access control in large areas

Safely detects personnel entering danger zones.



Protecting large danger zones with a high 60 m / 70 m range

Device selection

2, 3, or 4-beam light arrays for category 4 with a 60 to 70 m range.

Applications

Access protection (e.g. on automatic machining centers or palletizing machines).

Safety categories

Depending on the safety category to EN 954-1 required in accordance with the C standard or on the basis of a risk analysis carried out for the machine or plant, type 2 (up to type 2) or type 4 (up to type 4) light curtains or arrays can be used (Definitions of safety categories: See page 1/2).

Design

A light curtain or light array comprises a transmitter and a receiver, which must be mounted opposite each other. Depending on the resolution and the length, a certain number of transmit and receive diodes are arranged vertically. The infrared LEDs of the transmitter emit short light pulses that are detected by the receive diodes.

- 3RG78 44 and 3SF78 44 light curtains and arrays with integrated evaluation unit for type 4 to IEC/EN 61496
 - Resolution: 14, 30, 50 and 90 mm
 - Protective field height: 150 mm to 3000 mm
 - 2, 3, or 4-beam light arrays
 - transceiver, 2-beam with reflecting mirror
 - Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)

- 3RG78 45 light curtains and arrays with integrated evaluation unit for type 4 to IEC/EN 61496
 - Resolution: 14, 30, 50 and 90 mm
 - Protective field height: 150 mm to 3000 mm
 - 2, 3, or 4-beam light arrays
 - transceivers, 2-beam, with reflecting mirror
 - Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)
- 3RG78 41 light curtains for external evaluation, for type 2 to IEC/EN 61496
 - Resolution: 30, 55, and 80 mm
 - Protective field height: 150 mm to 1800 mm
 - Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)
- 3RG78 43 light curtains with integrated evaluation unit, for type 2 according to IEC/EN 61496, developed to EN 61508 (SIL 2), suitable for risk assessment according to pr EN ISO 13489
 - Resolution 20, 30, 40 and 90 mm
 - Protective field heights from 150 mm to 1800 mm
- 3RG78 46 light curtains with integrated evaluation for type 4 to EN 954-1
 - resolution 20, 30, 40 and 90 mm.
 - protective field heights from 150 mm to 1800 mm
- 3SF78 42 ASIsafe light curtains and arrays for external evaluation, for type 4 to EN 954-1
 - Resolution: 14, 30, 50 and 90 mm
 - Protective field height: from 150 to 3000 mm
 - transceiver, 2-beam, with reflecting mirror
 - 2, 3, or 4-beam light arrays
 - Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)

Standards

- EN 61496-1, -2, IEC 61496-1, -2 (requirements for non-contact protection systems)
- EN 999 (including calculation of safety clearances)
- EN 954-1 (machine safety, safety-related parts of control systems)
- EN 61508: Functional safety of safety-related electrical/electronic/programmable electronic systems

Function

Blanking function package

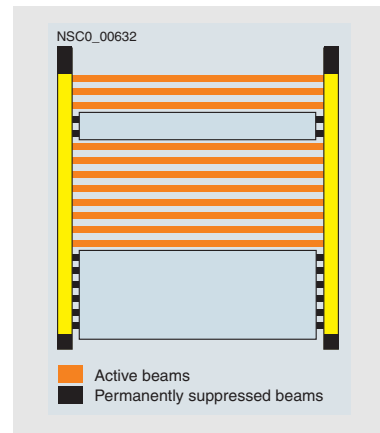
The light curtains can also be supplied with an optional blanking function.

Fixed blanking

If an object is permanently located in the light path, the corresponding zone can be suppressed. This is achieved by suppressing the required number of beams.

The suppressed objects must be permanently located in the protective zone, otherwise safety cannot be guaranteed. The light curtain switches the equipment off.

Configuration is carried out using a teach-in function by means of the safety key or using the programming and diagnostics software SafetyLab.

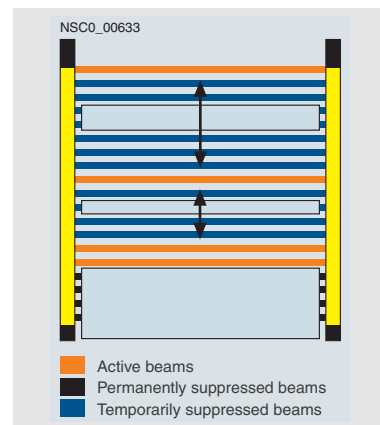


Floating blanking

If moving objects are located in the light path, any number of beams can be suppressed. The objects can move within the suppressed beams without the light curtain switching off.

If the moving objects are removed from the zone, the light curtain will interrupt the hazardous movement, otherwise safety can no longer be guaranteed.

Configuration is carried out using a teach-in function by means of the safety key or using the programming and diagnostics software SafetyLab.



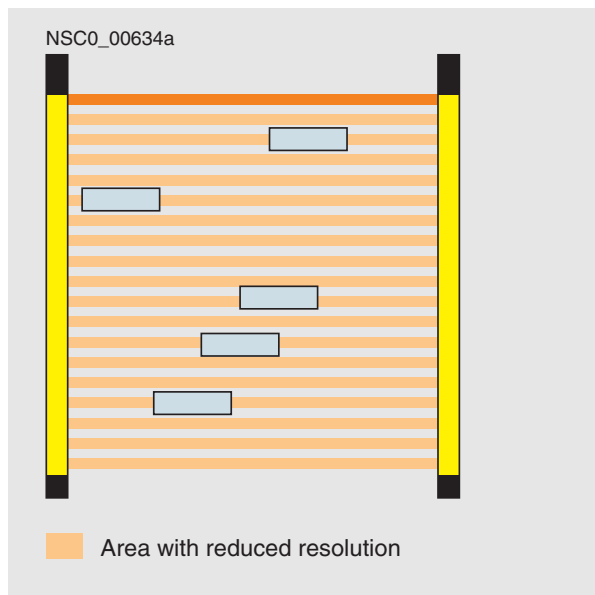
Reduced Resolution

If an object is located in the light path, two or three beams can be suppressed. The difference between reduced resolution and floating blanking is that continuous monitoring does not take place.

A DIP switch is used for configuration or the programming and diagnostics software SafetyLab.

Light curtains and arrays SIMATIC FS400

Introduction



"Muting" function package

When arranged vertically, light curtains, light arrays, and Transmitters are often used for protecting access points. With additional sensor signals, the protective function can be suppressed to allow materials to be transported in or out of hazardous areas, for example. The protective field is temporarily suppressed and, once the goods have passed through, reactivated. Personnel must not be allowed to enter the hazardous area while muting is active.

Using the number of connected sensors or the sequence of the muting signals, the devices automatically recognize the "sequential muting" mode when inputs M1 to M4 are assigned and "2-sensor parallel muting" when the signals M2 and M3 are assigned. A DIP switch can be used to set "4-sensor parallel muting".

Muting restart

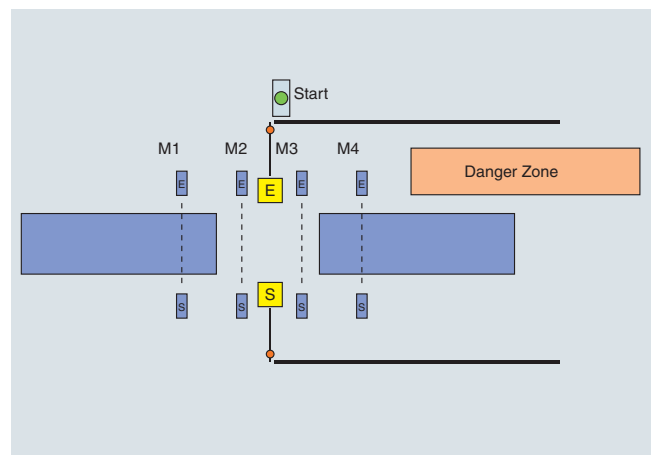
If the power fails while goods are passing the muting sensors, for example, the valid muting sequence is interrupted. When the power supply has been restored, muting is not automatically resumed because the muting sequence is not as expected.

To remove the goods from the area covered by the muting sensors, an integrated retraction mode can be activated using the start key. The light curtain attempts to find a valid muting sequence from the muting sensors. If successful, the muting indicator lamp stops flashing and is lit continuously. If unsuccessful, the start key must be kept depressed until the muting path is completely free.

4-sensor sequential muting

If the material that is to be transported in the danger zone always has the same dimensions and there is no lack of space, the use of sequential muting is preferred. With sequential muting, four muting sensors are connected. These must be activated in a predefined sequence to trigger muting. They can be activated in either of the following sequences: M1, M2, M3, M4 or M4, M3, M2, M1. The transported goods must be of sufficient length to briefly activate all 4 sensors simultaneously. Sequential muting is successfully completed when the third muting sensor to be activated is not activated any longer.

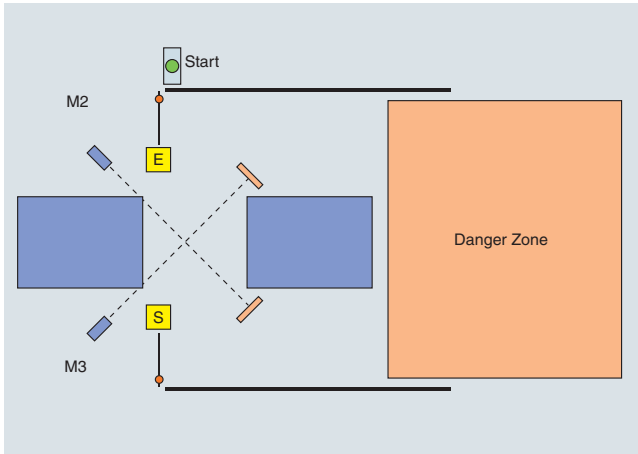
The SafetyLab software can be used to select a muting variant in which the second muting sequence is triggered before the first has finished (sequential muting with two objects). This variant saves time and, in turn, production costs for the user.



2-sensor parallel muting

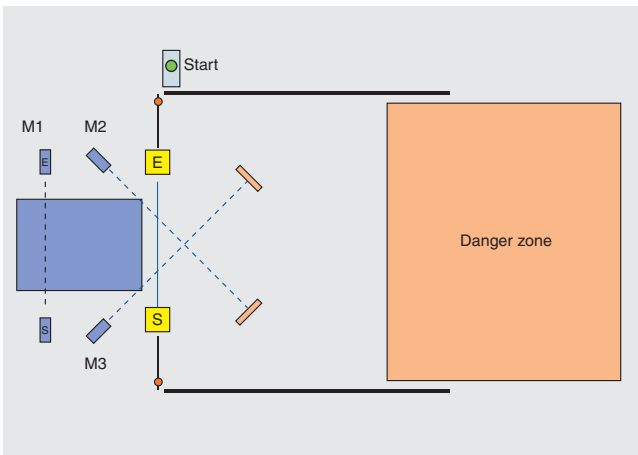
Parallel muting is ideal in plants in which the dimensions of the goods are not constant or space requirements must be kept to a minimum. Two muting sensors can be used, whose beams intersect behind the protective field in the danger zone.

Parallel muting is used when signals M2 and M3 are switched simultaneously without M1 and M4 having been activated or connected beforehand or simultaneously. Two-sensor parallel muting is straightforward because only two muting sensors are required. Goods can also be moved forwards and backwards within the muting area.



3-sensor direction muting

Three-sensor direction muting is configured in a similar way to 2-sensor parallel muting. Material can only be transported through the light curtain in one direction. To trigger the muting function, muting sensor M1 must first be activated, followed by muting sensors M2 and M3. If the paths for muting sensors M2 and M3 are interrupted, sensor M1 does not need to be activated.

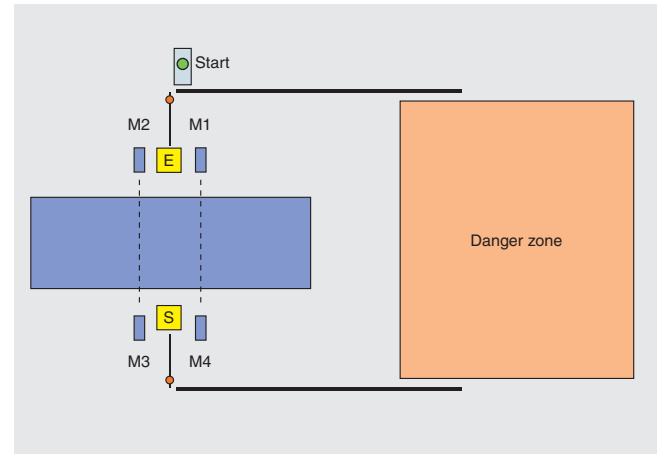


Parallel muting with 4 sensors

4-sensor parallel muting can be used advantageously wherever

- the transported material is too small to be acquired simultaneously by 4 sensors arranged sequentially,
- the available space is too small even for the crossover light beams of 2-sensor parallel muting.

The function of 4-sensor parallel muting corresponds to that of 2-sensor parallel muting with the additional characteristic of the muting activation signal being obtained from two sensor pairs. Muting is triggered when within a 2.5 s interval, M2 is activated with M3 or M1 is activated with M4.



PC software

PC software can be used to visualize and record the function of the light curtains.

SafetyLab is the diagnostic and parameterization software for 3RG78 44 / 3SF78 44 light curtains, light arrays and Transmitters. SafetyLab can be used for all available function packages of the light curtains and light arrays from firmware Version 3.10:

- Blanking function package
- Muting function package
- Sequence control system function package

The firmware version of the receiver is indicated on the 7-segment display during start-up.

Mounting sets

To facilitate installation, alignment, commissioning, and troubleshooting, a practical accessories package containing mounting columns, reflecting mirror columns, reflecting mirrors, mounting supports, and laser alignment tools is available.

Light curtains and arrays SIMATIC FS400

Program overview

Overview

Device type	Evaluation	Category Type	Function package	Output	Connection type	LED	Page
Type series 3RG78 44							
Light curtains 	internal	4	Blanking	Transistor	M12 connector	–	1/18
Light curtains	internal	4	Blanking	Transistor	Cable gland	–	1/19
Light curtains	internal	4	Blanking	Transistor	Brad-Harrison (MIN)	–	1/21
Light curtains 	internal	4	Blanking	Transistor	Hirschmann	–	1/23
Light curtains	internal	4	Blanking	Relay	Hirschmann	–	1/25
Light curtains 	internal	4	Muting	Transistor	M12 connector	–	1/26
Light curtains	internal	4	Muting	Transistor	Cable gland	–	1/26
Light arrays	internal	4	Muting	Transistor	Cable gland	–	1/27
Transceiver	internal	4	Muting	Transistor	Cable gland	with and without	1/27
Light curtains	internal	4	Muting	Transistor	Brad-Harrison (MIN)	–	1/28
Light arrays	internal	4	Muting	Transistor	Brad-Harrison (MIN)	–	1/28
Light arrays 	internal	4	Muting	Transistor	Hirschmann	–	1/28
Light curtains	internal	4	Muting	Relay	Hirschmann	–	1/29
Light curtains	internal	4	Muting	Relay	Hirschmann	with	1/29
Light arrays 	internal	4	Muting	Relay	M12 connector	–	1/30
Light arrays	internal	4	Muting	Relay	Hirschmann	–	1/30
Light arrays	internal	4	Muting	Relay	Hirschmann	with	1/30
Transceiver 	internal	4	Muting	Relay	M12 connector	with and without	1/30
Transceiver	internal	4	Muting	Relay	Hirschmann	with and without	1/31
Light curtains 	internal	4	Sequence control	Transistor	M12 connector	–	1/32
Light curtains	internal	4	Sequence control	Relay	Hirschmann	–	1/33
Type series 3RG78 45							
Light curtains 	internal	4	Standard	Transistor	M12 connector	–	1/36
Light arrays 	internal	4	Standard	Transistor	M12 connector	–	1/38
Transceiver 	internal	4	Standard	Transistor	M12 connector	–	1/38
Light curtains 	internal	4	Standard	Transistor	Hirschmann	–	1/39
Light arrays 	internal	4	Standard	Transistor	Hirschmann	–	1/40
Transceiver 	internal	4	Standard	Transistor	Hirschmann	–	1/40
Light curtains 	internal	4	Standard	Transistor	Brad-Harrison (MIN)	–	1/41
Light arrays 	internal	4	Standard	Transistor	Brad-Harrison (MIN)	–	1/43
Transceiver 	internal	4	Standard	Transistor	Brad-Harrison (MIN)	–	1/43
Light curtains 	internal	4	Standard	Transistor	Cable gland	–	1/44
Light arrays 	internal	4	Standard	Transistor	Cable gland	–	1/46
Transceiver 	internal	4	Standard	Transistor	Cable gland	–	1/46
Type series 3SF78 44 ASIsafe							
Light curtains	internal	4	Blanking	ASIsafe	ASIsafe	–	1/50
Light curtains	internal	4	Muting	ASIsafe	ASIsafe	–	1/51
Light curtains	internal	4	Muting	ASIsafe	ASIsafe	with	1/52
Light arrays	internal	4	Muting	ASIsafe	ASIsafe	–	1/52
Light arrays	internal	4	Muting	ASIsafe	ASIsafe	with	1/52
Transceiver	internal	4	Muting	ASIsafe	ASIsafe	with and without	1/53
Light curtains	internal	4	Sequence control	ASIsafe	ASIsafe	–	1/54

Light curtains and arrays SIMATIC FS400

Program overview

Device type	Evaluation	Category Type	Function package	Output	Connection type	LED	Page
Type series 3SF78 44 PROFIsafe							
Light curtains 	internal	4	Blanking	PROFIsafe	PROFIsafe	–	1/57
Light curtains 	internal	4	Muting	PROFIsafe	PROFIsafe	–	1/58
Light arrays 	internal	4	Muting	PROFIsafe	PROFIsafe	–	1/58
Transceiver 	internal	4	Muting	PROFIsafe	PROFIsafe	with and without	1/58
Light curtains 	internal	4	Sequence control	PROFIsafe	PROFIsafe	–	1/59
Type series 3SF78 42 ASIsafe							
Light curtains	external	4	–	ASIsafe	ASIsafe	–	1/60
Light arrays	external	4	–	ASIsafe	ASIsafe	–	1/63
Transceiver 	external	4	–	ASIsafe	ASIsafe	–	1/63
Type series 3SF78 46 FS420I							
Light curtains	internal	4	Standard	Transistor	M12 connector	–	1/66
Type series 3RG78 43 FS420I							
Light curtains	internal	2 (SIL 2)	Standard	Transistor	M12 connector	–	1/70
Type series 3RG78 41							
Light curtains	external	2	–	Transistor	M12 connector	–	1/74

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Integrated evaluation

Overview



3RG78 44 light curtains and arrays with integrated evaluation unit for category 4 to EN 954-1

- with function packages "Blanking", "Muting" and "Sequence control",
- Resolution: 14, 30 and 50 mm
- Protective field height: 150 mm to 3000 mm
- 2, 3, or 4-beam light arrays
- Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)

Two standard mounting brackets (3RG78 48-0AB) are supplied with all devices also available as accessories, see page 1/83.

Technical Specifications

Type	3RG78 44
Safety category to EN, IEC 61496-1, 2	Type 4
Protective field height	• 14 and 30 mm resolution: 150 ... 1800 mm • 50 mm resolution: 450 ... 3000 mm
Protective field width, range	• 14 mm resolution: 0 ... 6 m • 30 and 50 mm resolution: 0 ... 18 m
Detection capability (resolution)	14 mm, 30 mm, 50 mm
Supply voltage (transmitter and receiver)	24 V DC $\pm$ 20% (external power pack with safe isolation and bridging of 20 ms voltage dip is necessary)
Residual ripple	< 5 %
Current consumption	• Transmitter: 75 mA • Receiver: 160 mA (without external load)
General value for external fuse in the transmitter and receiver leads	4 A
Wavelength	880 nm (infrared)
Synchronization	Optical between transmitter and receiver
Vibration resistance	5 g, 10 ... 55 Hz to IEC/EN 60068-2-6
Shock resistance	10 g, 16 ms to IEC/EN 60068-2-29
Ambient temperature	• Operation: 0 ... +50 °C • Storage: -25 ... +70 °C
Relative humidity	15 ... 95 %
Degree of protection	IP65
Safety class to DIN VDE 0106	III

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Integrated evaluation

Program overview 3RG78 44

Device type	Function package	Output	Connection type	for Light curtains: Resolution for Light arrays: Range			LED	Page
				14 mm	30 mm	50 mm		
Light curtains 	Blanking	Transistor	M12 connector	✓	✓	–	–	1/18
Light curtains	Blanking	Transistor	Cable gland	✓	✓	✓	–	1/19
Light curtains	Blanking	Transistor	Brad Harrison connection ¹⁾	✓	✓	✓	–	1/21
Light curtains 	Blanking	Transistor	Hirschmann	✓	✓	✓	–	1/23
Light curtains	Blanking	Relay	Hirschmann	✓	✓	–	–	1/25
Light curtains 	Muting	Transistor	M12 connector	–	✓	–	–	1/26
Light curtains	Muting	Transistor	Cable gland	–	✓	–	–	1/26
Light arrays	Muting	Transistor	Cable gland	0.8 m ... 18 m; 6 ... 70 m			–	1/27
Transceiver	Muting	Transistor	Cable gland	6.5 m			with and without	1/27
Light curtains	Muting	Transistor	Brad Harrison connection ¹⁾	–	✓	–	–	1/28
Light arrays	Muting	Transistor	Brad Harrison connection ¹⁾	0.8 m ... 18 m			–	1/28
Light arrays 	Muting	Transistor	Hirschmann	6 ... 70 m			–	1/28
Light curtains	Muting	Relay	Hirschmann	–	✓	–	–	1/29
Light curtains	Muting	Relay	Hirschmann	–	✓	–	with	1/29
Light arrays 	Muting	Relay	M12 connector	0.8 m ... 18 m			–	1/30
Light arrays	Muting	Relay	Hirschmann connection	0.8 m ... 18 m; 6 ... 70 m			–	1/30
Light arrays	Muting	Relay	Hirschmann connection	0.8 m ... 18 m			with	1/30
Transceiver 	Muting	Relay	M12 connector	6.5 m			with and without	1/30
Transceiver	Muting	Relay	Hirschmann connection	6.5 m			with and without	1/31
Light curtains 	Sequence control	Transistor	M12 connector	✓	–	–	–	1/32
Light curtains	Sequence control	Relay	Hirschmann connection	✓	✓	–	–	1/33

1) Often required for applications in NAFTA market.

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation

Function package Blanking, transistor output

Selection and ordering data

Light curtains with M12 connectors 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
300	Receiver	3RG78 44-3BB04-0SS1	3RG78 44-3BB04-1SS1	3RG78 42-6BD21
300	Transmitter	3RG78 44-3SB04-0SS0	3RG78 44-3SB04-1SS0	3RG78 42-6BD20
450	Receiver	3RG78 44-3BB06-0SS1	3RG78 44-3BB06-1SS1	3RG78 42-6BE21
450	Transmitter	3RG78 44-3SB06-0SS0	3RG78 44-3SB06-1SS0	3RG78 42-6BE20
600	Receiver	3RG78 44-3BB08-0SS1	3RG78 44-3BB08-1SS1	3RG78 42-6BF21
600	Transmitter	3RG78 44-3SB08-0SS0	3RG78 44-3SB08-1SS0	3RG78 42-6BF20
750	Receiver	3RG78 44-3BB11-0SS1	3RG78 44-3BB11-1SS1	3RG78 42-6BG21
750	Transmitter	3RG78 44-3SB11-0SS0	3RG78 44-3SB11-1SS0	3RG78 42-6BG20
900	Receiver	3RG78 44-3BB13-0SS1	3RG78 44-3BB13-1SS1	3RG78 42-6BH21
900	Transmitter	3RG78 44-3SB13-0SS0	3RG78 44-3SB13-1SS0	3RG78 42-6BH20
1050	Receiver	3RG78 44-3BB15-0SS1	3RG78 44-3BB15-1SS1	3RG78 42-6BJ21
1050	Transmitter	3RG78 44-3SB15-0SS0	3RG78 44-3SB15-1SS0	3RG78 42-6BJ20
1200	Receiver	3RG78 44-3BB17-0SS1	3RG78 44-3BB17-1SS1	3RG78 42-6BK21
1200	Transmitter	3RG78 44-3SB17-0SS0	3RG78 44-3SB17-1SS0	3RG78 42-6BK20
1350	Receiver	3RG78 44-3BB20-0SS1	3RG78 44-3BB20-1SS1	3RG78 42-6BL21
1350	Transmitter	3RG78 44-3SB20-0SS0	3RG78 44-3SB20-1SS0	3RG78 42-6BL20
1500	Receiver	3RG78 44-3BB22-0SS1	3RG78 44-3BB22-1SS1	3RG78 42-6BM21
1500	Transmitter	3RG78 44-3SB22-0SS0	3RG78 44-3SB22-1SS0	3RG78 42-6BM20
1650	Receiver	3RG78 44-3BB24-0SS1	3RG78 44-3BB24-1SS1	3RG78 42-6BN21
1650	Transmitter	3RG78 44-3SB24-0SS0	3RG78 44-3SB24-1SS0	3RG78 42-6BN20
1800	Receiver	3RG78 44-3BB26-0SS1	3RG78 44-3BB26-1SS1	3RG78 42-6BP21
1800	Transmitter	3RG78 44-3SB26-0SS0	3RG78 44-3SB26-1SS0	3RG78 42-6BP20
Resolution 30 mm				
300	Receiver	3RG78 44-3BD04-0SS1	3RG78 44-3BD04-1SS1	3RG78 42-6DD21
300	Transmitter	3RG78 44-3SD04-0SS0	3RG78 44-3SD04-1SS0	3RG78 42-6DD20
450	Receiver	3RG78 44-3BD06-0SS1	3RG78 44-3BD06-1SS1	3RG78 42-6DE21
450	Transmitter	3RG78 44-3SD06-0SS0	3RG78 44-3SD06-1SS0	3RG78 42-6DE20
600	Receiver	3RG78 44-3BD08-0SS1	3RG78 44-3BD08-1SS1	3RG78 42-6DF21
600	Transmitter	3RG78 44-3SD08-0SS0	3RG78 44-3SD08-1SS0	3RG78 42-6DF20
750	Receiver	3RG78 44-3BD11-0SS1	3RG78 44-3BD11-1SS1	3RG78 42-6DG21
750	Transmitter	3RG78 44-3SD11-0SS0	3RG78 44-3SD11-1SS0	3RG78 42-6DG20
900	Receiver	3RG78 44-3BD13-0SS1	3RG78 44-3BD13-1SS1	3RG78 42-6DH21
900	Transmitter	3RG78 44-3SD13-0SS0	3RG78 44-3SD13-1SS0	3RG78 42-6DH20
1050	Receiver	3RG78 44-3BD15-0SS1	3RG78 44-3BD15-1SS1	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-3SD15-0SS0	3RG78 44-3SD15-1SS0	3RG78 42-6DJ20
1200	Receiver	3RG78 44-3BD17-0SS1	3RG78 44-3BD17-1SS1	3RG78 42-6DK21
1200	Transmitter	3RG78 44-3SD17-0SS0	3RG78 44-3SD17-1SS0	3RG78 42-6DK20
1350	Receiver	3RG78 44-3BD20-0SS1	3RG78 44-3BD20-1SS1	3RG78 42-6DL21
1350	Transmitter	3RG78 44-3SD20-0SS0	3RG78 44-3SD20-1SS0	3RG78 42-6DL20
1500	Receiver	3RG78 44-3BD22-0SS1	3RG78 44-3BD22-1SS1	3RG78 42-6DM21
1500	Transmitter	3RG78 44-3SD22-0SS0	3RG78 44-3SD22-1SS0	3RG78 42-6DM20
1650	Receiver	3RG78 44-3BD24-0SS1	3RG78 44-3BD24-1SS1	3RG78 42-6DN21
1650	Transmitter	3RG78 44-3SD24-0SS0	3RG78 44-3SD24-1SS0	3RG78 42-6DN20
1800	Receiver	3RG78 44-3BD26-0SS1	3RG78 44-3BD26-1SS1	3RG78 42-6DP21
1800	Transmitter	3RG78 44-3SD26-0SS0	3RG78 44-3SD26-1SS0	3RG78 42-6DP20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Blanking, transistor output

Light curtains with cable gland

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3RG78 44-6BB02-0SS1	–	3RG78 42-6BB21
150	Transmitter	3RG78 44-6SB02-0SS0	–	3RG78 42-6BB20
225	Receiver	3RG78 44-6BB03-0SS1	3RG78 44-6BB03-1SS1	3RG78 42-6BC21
225	Transmitter	3RG78 44-6SB03-0SS0	3RG78 44-6SB03-1SS0	3RG78 42-6BC20
300	Receiver	3RG78 44-6BB04-0SS1	3RG78 44-6BB04-1SS1	3RG78 42-6BD21
300	Transmitter	3RG78 44-6SB04-0SS0	3RG78 44-6SB04-1SS0	3RG78 42-6BD20
450	Receiver	3RG78 44-6BB06-0SS1	3RG78 44-6BB06-1SS1	3RG78 42-6BE21
450	Transmitter	3RG78 44-6SB06-0SS0	3RG78 44-6SB06-1SS0	3RG78 42-6BE20
600	Receiver	3RG78 44-6BB08-0SS1	3RG78 44-6BB08-1SS1	3RG78 42-6BF21
600	Transmitter	3RG78 44-6SB08-0SS0	3RG78 44-6SB08-1SS0	3RG78 42-6BF20
750	Receiver	3RG78 44-6BB11-0SS1	3RG78 44-6BB11-1SS1	3RG78 42-6BG21
750	Transmitter	3RG78 44-6SB11-0SS0	3RG78 44-6SB11-1SS0	3RG78 42-6BG20
900	Receiver	3RG78 44-6BB13-0SS1	3RG78 44-6BB13-1SS1	3RG78 42-6BH21
900	Transmitter	3RG78 44-6SB13-0SS0	3RG78 44-6SB13-1SS0	3RG78 42-6BH20
1050	Receiver	3RG78 44-6BB15-0SS1	3RG78 44-6BB15-1SS1	3RG78 42-6BJ21
1050	Transmitter	3RG78 44-6SB15-0SS0	3RG78 44-6SB15-1SS0	3RG78 42-6BJ20
1200	Receiver	3RG78 44-6BB17-0SS1	3RG78 44-6BB17-1SS1	3RG78 42-6BK21
1200	Transmitter	3RG78 44-6SB17-0SS0	3RG78 44-6SB17-1SS0	3RG78 42-6BK20
1350	Receiver	3RG78 44-6BB20-0SS1	3RG78 44-6BB20-1SS1	3RG78 42-6BL21
1350	Transmitter	3RG78 44-6SB20-0SS0	3RG78 44-6SB20-1SS0	3RG78 42-6BL20
1500	Receiver	3RG78 44-6BB22-0SS1	3RG78 44-6BB22-1SS1	3RG78 42-6BM21
1500	Transmitter	3RG78 44-6SB22-0SS0	3RG78 44-6SB22-1SS0	3RG78 42-6BM20
1650	Receiver	3RG78 44-6BB24-0SS1	3RG78 44-6BB24-1SS1	3RG78 42-6BN21
1650	Transmitter	3RG78 44-6SB24-0SS0	3RG78 44-6SB24-1SS0	3RG78 42-6BN20
1800	Receiver	3RG78 44-6BB26-0SS1	3RG78 44-6BB26-1SS1	3RG78 42-6BP21
1800	Transmitter	3RG78 44-6SB26-0SS0	3RG78 44-6SB26-1SS0	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 44-6BD02-0SS1	3RG78 44-6BD02-1SS1	3RG78 42-6DB21
150	Transmitter	3RG78 44-6SD02-0SS0	3RG78 44-6SD02-1SS0	3RG78 42-6DB20
225	Receiver	3RG78 44-6BD03-0SS1	3RG78 44-6BD03-1SS1	3RG78 42-6DC21
225	Transmitter	3RG78 44-6SD03-0SS0	3RG78 44-6SD03-1SS0	3RG78 42-6DC20
300	Receiver	3RG78 44-6BD04-0SS1	3RG78 44-6BD04-1SS1	3RG78 42-6DD21
300	Transmitter	3RG78 44-6SD04-0SS0	3RG78 44-6SD04-1SS0	3RG78 42-6DD20
450	Receiver	3RG78 44-6BD06-0SS1	3RG78 44-6BD06-1SS1	3RG78 42-6DE21
450	Transmitter	3RG78 44-6SD06-0SS0	3RG78 44-6SD06-1SS0	3RG78 42-6DE20
600	Receiver	3RG78 44-6BD08-0SS1	3RG78 44-6BD08-1SS1	3RG78 42-6DF21
600	Transmitter	3RG78 44-6SD08-0SS0	3RG78 44-6SD08-1SS0	3RG78 42-6DF20
750	Receiver	3RG78 44-6BD11-0SS1	3RG78 44-6BD11-1SS1	3RG78 42-6DG21
750	Transmitter	3RG78 44-6SD11-0SS0	3RG78 44-6SD11-1SS0	3RG78 42-6DG20
900	Receiver	3RG78 44-6BD13-0SS1	3RG78 44-6BD13-1SS1	3RG78 42-6DH21
900	Transmitter	3RG78 44-6SD13-0SS0	3RG78 44-6SD13-1SS0	3RG78 42-6DH20
1050	Receiver	3RG78 44-6BD15-0SS1	3RG78 44-6BD15-1SS1	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-6SD15-0SS0	3RG78 44-6SD15-1SS0	3RG78 42-6DJ20
1200	Receiver	3RG78 44-6BD17-0SS1	3RG78 44-6BD17-1SS1	3RG78 42-6DK21
1200	Transmitter	3RG78 44-6SD17-0SS0	3RG78 44-6SD17-1SS0	3RG78 42-6DK20
1350	Receiver	3RG78 44-6BD20-0SS1	3RG78 44-6BD20-1SS1	3RG78 42-6DL21
1350	Transmitter	3RG78 44-6SD20-0SS0	3RG78 44-6SD20-1SS0	3RG78 42-6DL20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation

Function package Blanking, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1500	Receiver	3RG78 44-6BD22-0SS1	3RG78 44-6BD22-1SS1	3RG78 42-6DM21
1500	Transmitter	3RG78 44-6SD22-0SS0	3RG78 44-6SD22-1SS0	3RG78 42-6DM20
1650	Receiver	3RG78 44-6BD24-0SS1	3RG78 44-6BD24-1SS1	3RG78 42-6DN21
1650	Transmitter	3RG78 44-6SD24-0SS0	3RG78 44-6SD24-1SS0	3RG78 42-6DN20
1800	Receiver	3RG78 44-6BD26-0SS1	3RG78 44-6BD26-1SS1	3RG78 42-6DP21
1800	Transmitter	3RG78 44-6SD26-0SS0	3RG78 44-6SD26-1SS0	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3RG78 44-6BE06-0SS1	3RG78 44-6BE06-1SS1	3RG78 42-6EE21
450	Transmitter	3RG78 44-6SE06-0SS0	3RG78 44-6SE06-1SS0	3RG78 42-6EE20
600	Receiver	3RG78 44-6BE08-0SS1	3RG78 44-6BE08-1SS1	3RG78 42-6EF21
600	Transmitter	3RG78 44-6SE08-0SS0	3RG78 44-6SE08-1SS0	3RG78 42-6EF20
750	Receiver	3RG78 44-6BE11-0SS1	3RG78 44-6BE11-1SS1	3RG78 42-6EG21
750	Transmitter	3RG78 44-6SE11-0SS0	3RG78 44-6SE11-1SS0	3RG78 42-6EG20
900	Receiver	3RG78 44-6BE13-0SS1	3RG78 44-6BE13-1SS1	3RG78 42-6EH21
900	Transmitter	3RG78 44-6SE13-0SS0	3RG78 44-6SE13-1SS0	3RG78 42-6EH20
1050	Receiver	3RG78 44-6BE15-0SS1	3RG78 44-6BE15-1SS1	3RG78 42-6EJ21
1050	Transmitter	3RG78 44-6SE15-0SS0	3RG78 44-6SE15-1SS0	3RG78 42-6EJ20
1200	Receiver	3RG78 44-6BE17-0SS1	3RG78 44-6BE17-1SS1	3RG78 42-6EK21
1200	Transmitter	3RG78 44-6SE17-0SS0	3RG78 44-6SE17-1SS0	3RG78 42-6EK20
1350	Receiver	3RG78 44-6BE20-0SS1	3RG78 44-6BE20-1SS1	3RG78 42-6EL21
1350	Transmitter	3RG78 44-6SE20-0SS0	3RG78 44-6SE20-1SS0	3RG78 42-6EL20
1500	Receiver	3RG78 44-6BE22-0SS1	3RG78 44-6BE22-1SS1	3RG78 42-6EM21
1500	Transmitter	3RG78 44-6SE22-0SS0	3RG78 44-6SE22-1SS0	3RG78 42-6EM20
1650	Receiver	3RG78 44-6BE24-0SS1	3RG78 44-6BE24-1SS1	3RG78 42-6EN21
1650	Transmitter	3RG78 44-6SE24-0SS0	3RG78 44-6SE24-1SS0	3RG78 42-6EN20
1800	Receiver	3RG78 44-6BE26-0SS1	3RG78 44-6BE26-1SS1	3RG78 42-6EP21
1800	Transmitter	3RG78 44-6SE26-0SS0	3RG78 44-6SE26-1SS0	3RG78 42-6EP20
2100	Receiver	3RG78 44-6BE28-0SS1	3RG78 44-6BE28-1SS1	3RG78 42-6ER21
2100	Transmitter	3RG78 44-6SE28-0SS0	3RG78 44-6SE28-1SS0	3RG78 42-6ER20
2400	Receiver	3RG78 44-6BE31-0SS1	3RG78 44-6BE31-1SS1	3RG78 42-6ES21
2400	Transmitter	3RG78 44-6SE31-0SS0	3RG78 44-6SE31-1SS0	3RG78 42-6ES20
2700	Receiver	3RG78 44-6BE33-0SS1	3RG78 44-6BE33-1SS1	3RG78 42-6ET21
2700	Transmitter	3RG78 44-6SE33-0SS0	3RG78 44-6SE33-1SS0	3RG78 42-6ET20
3000	Receiver	3RG78 44-6BE35-0SS1	3RG78 44-6BE35-1SS1	3RG78 42-6EU21
3000	Transmitter	3RG78 44-6SE35-0SS0	3RG78 44-6SE35-1SS0	3RG78 42-6EU20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Blanking, transistor output

Light curtains with Brad Harrison connection (MIN-Series)¹⁾

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
225	Receiver	3RG78 44-4BB03-0SS1	3RG78 44-4BB03-1SS1	3RG78 42-6BC21
225	Transmitter	3RG78 44-4SB03-0SS0	3RG78 44-4SB03-1SS0	3RG78 42-6BC20
300	Receiver	3RG78 44-4BB04-0SS1	3RG78 44-4BB04-1SS1	3RG78 42-6BD21
300	Transmitter	3RG78 44-4SB04-0SS0	3RG78 44-4SB04-1SS0	3RG78 42-6BD20
450	Receiver	3RG78 44-4BB06-0SS1	3RG78 44-4BB06-1SS1	3RG78 42-6BE21
450	Transmitter	3RG78 44-4SB06-0SS0	3RG78 44-4SB06-1SS0	3RG78 42-6BE20
600	Receiver	3RG78 44-4BB08-0SS1	3RG78 44-4BB08-1SS1	3RG78 42-6BF21
600	Transmitter	3RG78 44-4SB08-0SS0	3RG78 44-4SB08-1SS0	3RG78 42-6BF20
750	Receiver	3RG78 44-4BB11-0SS1	3RG78 44-4BB11-1SS1	3RG78 42-6BG21
750	Transmitter	3RG78 44-4SB11-0SS0	3RG78 44-4SB11-1SS0	3RG78 42-6BG20
900	Receiver	3RG78 44-4BB13-0SS1	3RG78 44-4BB13-1SS1	3RG78 42-6BH21
900	Transmitter	3RG78 44-4SB13-0SS0	3RG78 44-4SB13-1SS0	3RG78 42-6BH20
1050	Receiver	3RG78 44-4BB15-0SS1	3RG78 44-4BB15-1SS1	3RG78 42-6BJ21
1050	Transmitter	3RG78 44-4SB15-0SS0	3RG78 44-4SB15-1SS0	3RG78 42-6BJ20
1200	Receiver	3RG78 44-4BB17-0SS1	3RG78 44-4BB17-1SS1	3RG78 42-6BK21
1200	Transmitter	3RG78 44-4SB17-0SS0	3RG78 44-4SB17-1SS0	3RG78 42-6BK20
1350	Receiver	3RG78 44-4BB20-0SS1	3RG78 44-4BB20-1SS1	3RG78 42-6BL21
1350	Transmitter	3RG78 44-4SB20-0SS0	3RG78 44-4SB20-1SS0	3RG78 42-6BL20
1500	Receiver	3RG78 44-4BB22-0SS1	3RG78 44-4BB22-1SS1	3RG78 42-6BM21
1500	Transmitter	3RG78 44-4SB22-0SS0	3RG78 44-4SB22-1SS0	3RG78 42-6BM20
1650	Receiver	3RG78 44-4BB24-0SS1	3RG78 44-4BB24-1SS1	3RG78 42-6BN21
1650	Transmitter	3RG78 44-4SB24-0SS0	3RG78 44-4SB24-1SS0	3RG78 42-6BN20
1800	Receiver	3RG78 44-4BB26-0SS1	3RG78 44-4BB26-1SS1	3RG78 42-6BP21
1800	Transmitter	3RG78 44-4SB26-0SS0	3RG78 44-4SB26-1SS0	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 44-4BD02-0SS1	3RG78 44-4BD02-1SS1	3RG78 42-6DB21
150	Transmitter	3RG78 44-4SD02-0SS0	3RG78 44-4SD02-1SS0	3RG78 42-6DB20
225	Receiver	3RG78 44-4BD03-0SS1	3RG78 44-4BD03-1SS1	3RG78 42-6DC21
225	Transmitter	3RG78 44-4SD03-0SS0	3RG78 44-4SD03-1SS0	3RG78 42-6DC20
300	Receiver	3RG78 44-4BD04-0SS1	3RG78 44-4BD04-1SS1	3RG78 42-6DD21
300	Transmitter	3RG78 44-4SD04-0SS0	3RG78 44-4SD04-1SS0	3RG78 42-6DD20
450	Receiver	3RG78 44-4BD06-0SS1	3RG78 44-4BD06-1SS1	3RG78 42-6DE21
450	Transmitter	3RG78 44-4SD06-0SS0	3RG78 44-4SD06-1SS0	3RG78 42-6DE20
600	Receiver	3RG78 44-4BD08-0SS1	3RG78 44-4BD08-1SS1	3RG78 42-6DF21
600	Transmitter	3RG78 44-4SD08-0SS0	3RG78 44-4SD08-1SS0	3RG78 42-6DF20
750	Receiver	3RG78 44-4BD11-0SS1	3RG78 44-4BD11-1SS1	3RG78 42-6DG21
750	Transmitter	3RG78 44-4SD11-0SS0	3RG78 44-4SD11-1SS0	3RG78 42-6DG20
900	Receiver	3RG78 44-4BD13-0SS1	3RG78 44-4BD13-1SS1	3RG78 42-6DH21
900	Transmitter	3RG78 44-4SD13-0SS0	3RG78 44-4SD13-1SS0	3RG78 42-6DH20
1050	Receiver	3RG78 44-4BD15-0SS1	3RG78 44-4BD15-1SS1	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-4SD15-0SS0	3RG78 44-4SD15-1SS0	3RG78 42-6DJ20
1200	Receiver	3RG78 44-4BD17-0SS1	3RG78 44-4BD17-1SS1	3RG78 42-6DK21
1200	Transmitter	3RG78 44-4SD17-0SS0	3RG78 44-4SD17-1SS0	3RG78 42-6DK20
1350	Receiver	3RG78 44-4BD20-0SS1	3RG78 44-4BD20-1SS1	3RG78 42-6DL21
1350	Transmitter	3RG78 44-4SD20-0SS0	3RG78 44-4SD20-1SS0	3RG78 42-6DL20
1500	Receiver	3RG78 44-4BD22-0SS1	3RG78 44-4BD22-1SS1	3RG78 42-6DM21
1500	Transmitter	3RG78 44-4SD22-0SS0	3RG78 44-4SD22-1SS0	3RG78 42-6DM20

1) Often required for applications in NAFTA market.

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation

Function package Blanking, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1650	Receiver	3RG78 44-4BD24-0SS1	3RG78 44-4BD24-1SS1	3RG7842-6DN21
1650	Transmitter	3RG78 44-4SD24-0SS0	3RG78 44-4SD24-1SS0	3RG78 42-6DN20
1800	Receiver	3RG78 44-4BD26-0SS1	3RG78 44-4BD26-1SS1	3RG78 42-6DP21
1800	Transmitter	3RG78 44-4SD26-0SS0	3RG78 44-4SD26-1SS0	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3RG78 44-4BE06-0SS1	3RG78 44-4BE06-1SS1	3RG78 42-6EE21
450	Transmitter	3RG78 44-4SE06-0SS0	3RG78 44-4SE06-1SS0	3RG78 42-6EE20
600	Receiver	3RG78 44-4BE08-0SS1	3RG78 44-4BE08-1SS1	3RG78 42-6EF21
600	Transmitter	3RG78 44-4SE08-0SS0	3RG78 44-4SE08-1SS0	3RG78 42-6EF20
750	Receiver	3RG78 44-4BE11-0SS1	3RG78 44-4BE11-1SS1	3RG78 42-6EG21
750	Transmitter	3RG78 44-4SE11-0SS0	3RG78 44-4SE11-1SS0	3RG78 42-6EG20
900	Receiver	3RG78 44-4BE13-0SS1	3RG78 44-4BE13-1SS1	3RG78 42-6EH21
900	Transmitter	3RG78 44-4SE13-0SS0	3RG78 44-4SE13-1SS0	3RG78 42-6EH20
1050	Receiver	3RG78 44-4BE15-0SS1	3RG78 44-4BE15-1SS1	3RG78 42-6EJ21
1050	Transmitter	3RG78 44-4SE15-0SS0	3RG78 44-4SE15-1SS0	3RG78 42-6EJ20
1200	Receiver	3RG78 44-4BE17-0SS1	3RG78 44-4BE17-1SS1	3RG78 42-6EK21
1200	Transmitter	3RG78 44-4SE17-0SS0	3RG78 44-4SE17-1SS0	3RG78 42-6EK20
1350	Receiver	3RG78 44-4BE20-0SS1	3RG78 44-4BE20-1SS1	3RG78 42-6EL21
1350	Transmitter	3RG78 44-4SE20-0SS0	3RG78 44-4SE20-1SS0	3RG78 42-6EL20
1500	Receiver	3RG78 44-4BE22-0SS1	3RG78 44-4BE22-1SS1	3RG78 42-6EM21
1500	Transmitter	3RG78 44-4SE22-0SS0	3RG78 44-4SE22-1SS0	3RG78 42-6EM20
1650	Receiver	3RG78 44-4BE24-0SS1	3RG78 44-4BE24-1SS1	3RG78 42-6EN21
1650	Transmitter	3RG78 44-4SE24-0SS0	3RG78 44-4SE24-1SS0	3RG78 42-6EN20
1800	Receiver	3RG78 44-4BE26-0SS1	3RG78 44-4BE26-1SS1	3RG78 42-6EP21
1800	Transmitter	3RG78 44-4SE26-0SS0	3RG78 44-4SB26-1SS0	3RG78 42-6EP20
2100	Receiver	3RG78 44-4BE28-0SS1	3RG78 44-4BE28-1SS1	3RG78 42-6ER21
2100	Transmitter	3RG78 44-4SE28-0SS0	3RG78 44-4SE28-1SS0	3RG78 42-6ER20
2400	Receiver	3RG78 44-4BE31-0SS1	3RG78 44-4BE31-1SS1	3RG78 42-6ES21
2400	Transmitter	3RG78 44-4SE31-0SS0	3RG78 44-4SE31-1SS0	3RG78 42-6ES20
2700	Receiver	3RG78 44-4BE33-0SS1	3RG78 44-4BE33-1SS1	3RG78 42-6ET21
2700	Transmitter	3RG78 44-4SE33-0SS0	3RG78 44-4SE33-1SS0	3RG78 42-6ET20
3000	Receiver	3RG78 44-4BE35-0SS1	3RG78 44-4BE35-1SS1	3RG78 42-6EU21
3000	Transmitter	3RG78 44-4SE35-0SS0	3RG78 44-4SE35-1SS0	3RG78 42-6EU20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Blanking, transistor output

Light curtains with Hirschmann connection 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3RG78 44-2BB02-0SS1	–	3RG78 42-6BB21
150	Transmitter	3RG78 44-2SB02-0SS0	–	3RG78 42-6BB20
225	Receiver	3RG78 44-2BB03-0SS1	3RG78 44-2BB03-1SS1	3RG78 42-6BC21
225	Transmitter	3RG78 44-2SB03-0SS0	3RG78 44-2SB03-1SS0	3RG78 42-6BC20
300	Receiver	3RG78 44-2BB04-0SS1	3RG78 44-2BB04-1SS1	3RG78 42-6BD21
300	Transmitter	3RG78 44-2SB04-0SS0	3RG78 44-2SB04-1SS0	3RG78 42-6BD20
450	Receiver	3RG78 44-2BB06-0SS1	3RG78 44-2BB06-1SS1	3RG78 42-6BE21
450	Transmitter	3RG78 44-2SB06-0SS0	3RG78 44-2SB06-1SS0	3RG78 42-6BE20
600	Receiver	3RG78 44-2BB08-0SS1	3RG78 44-2BB08-1SS1	3RG78 42-6BF21
600	Transmitter	3RG78 44-2SB08-0SS0	3RG78 44-2SB08-1SS0	3RG78 42-6BF20
750	Receiver	3RG78 44-2BB11-0SS1	3RG78 44-2BB11-1SS1	3RG78 42-6BG21
750	Transmitter	3RG78 44-2SB11-0SS0	3RG78 44-2SB11-1SS0	3RG78 42-6BG20
900	Receiver	3RG78 44-2BB13-0SS1	3RG78 44-2BB13-1SS1	3RG78 42-6BH21
900	Transmitter	3RG78 44-2SB13-0SS0	3RG78 44-2SB13-1SS0	3RG78 42-6BH20
1050	Receiver	3RG78 44-2BB15-0SS1	3RG78 44-2BB15-1SS1	3RG78 42-6BJ21
1050	Transmitter	3RG78 44-2SB15-0SS0	3RG78 44-2SB15-1SS0	3RG78 42-6BJ20
1200	Receiver	3RG78 44-2BB17-0SS1	3RG78 44-2BB17-1SS1	3RG78 42-6BK21
1200	Transmitter	3RG78 44-2SB17-0SS0	3RG78 44-2SB17-1SS0	3RG78 42-6BK20
1350	Receiver	3RG78 44-2BB20-0SS1	3RG78 44-2BB20-1SS1	3RG78 42-6BL21
1350	Transmitter	3RG78 44-2SB20-0SS0	3RG78 44-2SB20-1SS0	3RG78 42-6BL20
1500	Receiver	3RG78 44-2BB22-0SS1	3RG78 44-2BB22-1SS1	3RG78 42-6BM21
1500	Transmitter	3RG78 44-2SB22-0SS0	3RG78 44-2SB22-1SS0	3RG78 42-6BM20
1650	Receiver	3RG78 44-2BB24-0SS1	3RG78 44-2BB24-1SS1	3RG78 42-6BN21
1650	Transmitter	3RG78 44-2SB24-0SS0	3RG78 44-2SB24-1SS0	3RG78 42-6BN20
1800	Receiver	3RG78 44-2BB26-0SS1	3RG78 44-2BB26-1SS1	3RG78 42-6BP21
1800	Transmitter	3RG78 44-2SB26-0SS0	3RG78 44-2SB26-1SS0	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 44-2BD02-0SS1	-	3RG78 42-6DB21
150	Transmitter	3RG78 44-2SD02-0SS0	-	3RG78 42-6DB20
225	Receiver	3RG78 44-2BD03-0SS1	3RG78 44-2BD03-1SS1	3RG78 42-6DC21
225	Transmitter	3RG78 44-2SD03-0SS0	3RG78 44-2SD03-1SS0	3RG78 42-6DC20
300	Receiver	3RG78 44-2BD04-0SS1	3RG78 44-2BD04-1SS1	3RG78 42-6DD21
300	Transmitter	3RG78 44-2SD04-0SS0	3RG78 44-2SD04-1SS0	3RG78 42-6DD20
450	Receiver	3RG78 44-2BD06-0SS1	3RG78 44-2BD06-1SS1	3RG78 42-6DE21
450	Transmitter	3RG78 44-2SD06-0SS0	3RG78 44-2SD06-1SS0	3RG78 42-6DE20
600	Receiver	3RG78 44-2BD08-0SS1	3RG78 44-2BD08-1SS1	3RG78 42-6DF21
600	Transmitter	3RG78 44-2SD08-0SS0	3RG78 44-2SD08-1SS0	3RG78 42-6DF20
750	Receiver	3RG78 44-2BD11-0SS1	3RG78 44-2BD11-1SS1	3RG78 42-6DG21
750	Transmitter	3RG78 44-2SD11-0SS0	3RG78 44-2SD11-1SS0	3RG78 42-6DG20
900	Receiver	3RG78 44-2BD13-0SS1	3RG78 44-2BD13-1SS1	3RG78 42-6DH21
900	Transmitter	3RG78 44-2SD13-0SS0	3RG78 44-2SD13-1SS0	3RG78 42-6DH20
1050	Receiver	3RG78 44-2BD15-0SS1	3RG78 44-2BD15-1SS1	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-2SD15-0SS0	3RG78 44-2SD15-1SS0	3RG78 42-6DJ20
1200	Receiver	3RG78 44-2BD17-0SS1	3RG78 44-2BD17-1SS1	3RG78 42-6DK21
1200	Transmitter	3RG78 44-2SD17-0SS0	3RG78 44-2SD17-1SS0	3RG78 42-6DK20
1350	Receiver	3RG78 44-2BD20-0SS1	3RG78 44-2BD20-1SS1	3RG78 42-6DL21
1350	Transmitter	3RG78 44-2SD20-0SS0	3RG78 44-2SD20-1SS0	3RG78 42-6DL20
1500	Receiver	3RG78 44-2BD22-0SS1	3RG78 44-2BD22-1SS1	3RG78 42-6DM21

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation

Function package Blanking, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1500	Transmitter	3RG78 44-2SD22-0SS0	3RG78 44-2SD22-1SS0	3RG78 42-6DM20
1650	Receiver	3RG78 44-2BD24-0SS1	3RG78 44-2BD24-1SS1	3RG78 42-6DN21
1650	Transmitter	3RG78 44-2SD24-0SS0	3RG78 44-2SD24-1SS0	3RG78 42-6DN20
1800	Receiver	3RG78 44-2BD26-0SS1	3RG78 44-2BD26-1SS1	3RG78 42-6DP21
1800	Transmitter	3RG78 44-2SD26-0SS0	3RG78 44-2SD26-1SS0	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3RG78 44-2BE06-0SS1	3RG78 44-2BE06-1SS1	3RG78 42-6EE21
450	Transmitter	3RG78 44-2SE06-0SS0	3RG78 44-2SE06-1SS0	3RG78 42-6EE20
600	Receiver	3RG78 44-2BE08-0SS1	3RG78 44-2BE08-1SS1	3RG78 42-6EF21
600	Transmitter	3RG78 44-2SE08-0SS0	3RG78 44-2SE08-1SS0	3RG78 42-6EF20
750	Receiver	3RG78 44-2BE11-0SS1	3RG78 44-2BE11-1SS1	3RG78 42-6EG21
750	Transmitter	3RG78 44-2SE11-0SS0	3RG78 44-2SE11-1SS0	3RG78 42-6EG20
900	Receiver	3RG78 44-2BE13-0SS1	3RG78 44-2BE13-1SS1	3RG78 42-6EH21
900	Transmitter	3RG78 44-2SE13-0SS0	3RG78 44-2SE13-1SS0	3RG78 42-6EH20
1050	Receiver	3RG78 44-2BE15-0SS1	3RG78 44-2BE15-1SS1	3RG78 42-6EJ21
1050	Transmitter	3RG78 44-2SE15-0SS0	3RG78 44-2SE15-1SS0	3RG78 42-6EJ20
1200	Receiver	3RG78 44-2BE17-0SS1	3RG78 44-2BE17-1SS1	3RG78 42-6EK21
1200	Transmitter	3RG78 44-2SE17-0SS0	3RG78 44-2SE17-1SS0	3RG78 42-6EK20
1350	Receiver	3RG78 44-2BE20-0SS1	3RG78 44-2BE20-1SS1	3RG78 42-6EL21
1350	Transmitter	3RG78 44-2SE20-0SS0	3RG78 44-2SE20-1SS0	3RG78 42-6EL20
1500	Receiver	3RG78 44-2BE22-0SS1	3RG78 44-2BE22-1SS1	3RG78 42-6EM21
1500	Transmitter	3RG78 44-2SE22-0SS0	3RG78 44-2SE22-1SS0	3RG78 42-6EM20
1650	Receiver	3RG78 44-2BE24-0SS1	3RG78 44-2BE24-1SS1	3RG78 42-6EN21
1650	Transmitter	3RG78 44-2SE24-0SS0	3RG78 44-2SE24-1SS0	3RG78 42-6EN20
1800	Receiver	3RG78 44-2BE26-0SS1	3RG78 44-2BE26-1SS1	3RG78 42-6EP21
1800	Transmitter	3RG78 44-2SE26-0SS0	3RG78 44-2SE26-1SS0	3RG78 42-6EP20
2100	Receiver	3RG78 44-2BE28-0SS1	3RG78 44-2BE28-1SS1	3RG78 42-6ER21
2100	Transmitter	3RG78 44-2SE28-0SS0	3RG78 44-2SE28-1SS0	3RG78 42-6ER20
2400	Receiver	3RG78 44-2BE31-0SS1	3RG78 44-2BE31-1SS1	3RG78 42-6ES21
2400	Transmitter	3RG78 44-2SE31-0SS0	3RG78 44-2SE31-1SS0	3RG78 42-6ES20
2700	Receiver	3RG78 44-2BE33-0SS1	3RG78 44-2BE33-1SS1	3RG78 42-6ET21
2700	Transmitter	3RG78 44-2SE33-0SS0	3RG78 44-2SE33-1SS0	3RG78 42-6ET20
3000	Receiver	3RG78 44-2BE35-0SS1	3RG78 44-2BE35-1SS1	3RG78 42-6EU21
3000	Transmitter	3RG78 44-2SE35-0SS0	3RG78 44-2SE35-1SS0	3RG78 42-6EU20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Blanking, relay output

Light curtains with Hirschmann connection

Protective field height	Version	Standard device 14 mm Resolution	Standard device 30 mm Resolution
mm		Order No.	Order No.
Resolution 14 mm and 30 mm			
300	Receiver	3RG78 44-8BB04-0SS1	3RG78 44-8BD04-0SS1
300	Transmitter	3RG78 44-2SB04-0SS0	3RG78 44-2SD04-0SS0
450	Receiver	3RG78 44-8BB06-0SS1	3RG78 44-8BD06-0SS1
450	Transmitter	3RG78 44-2SB06-0SS0	3RG78 44-2SD06-0SS0
600	Receiver	3RG78 44-8BB08-0SS1	3RG78 44-8BD08-0SS1
600	Transmitter	3RG78 44-2SB08-0SS0	3RG78 44-2SD08-0SS0
750	Receiver	3RG78 44-8BB11-0SS1	3RG78 44-8BD11-0SS1
750	Transmitter	3RG78 44-2SB11-0SS0	3RG78 44-2SD11-0SS0
900	Receiver	3RG78 44-8BB13-0SS1	3RG78 44-8BD13-0SS1
900	Transmitter	3RG78 44-2SB13-0SS0	3RG78 44-2SD13-0SS0
1050	Receiver	3RG78 44-8BB15-0SS1	3RG78 44-8BD15-0SS1
1050	Transmitter	3RG78 44-2SB15-0SS0	3RG78 44-2SD15-0SS0
1200	Receiver	3RG78 44-8BB17-0SS1	3RG78 44-8BD17-0SS1
1200	Transmitter	3RG78 44-2SB17-0SS0	3RG78 44-2SD17-0SS0
1350	Receiver	on request	3RG78 44-8BD20-0SS1
1350	Transmitter	on request	3RG78 44-2SD20-0SS0
1500	Receiver	on request	3RG78 44-8BD22-0SS1
1500	Transmitter	on request	3RG78 44-2SD22-0SS0
1650	Receiver	on request	3RG78 44-8BD24-0SS1
1650	Transmitter	on request	3RG78 44-2SD24-0SS0
1800	Receiver	on request	3RG78 44-8BD26-0SS1
1800	Transmitter	on request	3RG78 44-2SD26-0SS0

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Muting, transistor output

Light curtains with M12 connector 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3RG78 44-3MD04-0SS1	on request	3RG78 42-6DD21
300	Transmitter	3RG78 44-3SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3RG78 44-3MD06-0SS1	on request	3RG78 42-6DE21
450	Transmitter	3RG78 44-3SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3RG78 44-3MD08-0SS1	on request	3RG78 42-6DF21
600	Transmitter	3RG78 44-3SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3RG78 44-3MD11-0SS1	on request	3RG78 42-6DG21
750	Transmitter	3RG78 44-3SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3RG78 44-3MD13-0SS1	on request	3RG78 42-6DH21
900	Transmitter	3RG78 44-3SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3RG78 44-3MD15-0SS1	on request	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-3SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3RG78 44-3MD17-0SS1	on request	3RG78 42-6DK21
1200	Transmitter	3RG78 44-3SD17-0SS0	on request	3RG78 42-6DK20
1350	Receiver	3RG78 44-3MD20-0SS1	on request	3RG78 42-6DL21
1350	Transmitter	3RG78 44-3SD20-0SS0	on request	3RG78 42-6DL20
1500	Receiver	3RG78 44-3MD22-0SS1	on request	3RG78 42-6DM21
1500	Transmitter	3RG78 44-3SD22-0SS0	on request	3RG78 42-6DM20
1650	Receiver	3RG78 44-3MD24-0SS1	on request	3RG78 42-6DN21
1650	Transmitter	3RG78 44-3SD24-0SS0	on request	3RG78 42-6DN20
1800	Receiver	3RG78 44-3MD26-0SS1	on request	3RG78 42-6DP21
1800	Transmitter	3RG78 44-3SD26-0SS0	on request	3RG78 42-6DP20

Light curtains with cable gland

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3RG78 44-6MD04-0SS1	on request	3RG78 42-6DD21
300	Transmitter	3RG78 44-6SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3RG78 44-6MD06-0SS1	on request	3RG78 42-6DE21
450	Transmitter	3RG78 44-6SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3RG78 44-6MD08-0SS1	on request	3RG78 42-6DF21
600	Transmitter	3RG78 44-6SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3RG78 44-6MD11-0SS1	on request	3RG78 42-6DG21
750	Transmitter	3RG78 44-6SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3RG78 44-6MD13-0SS1	on request	3RG78 42-6DH21
900	Transmitter	3RG78 44-6SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3RG78 44-6MD15-0SS1	on request	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-6SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3RG78 44-6MD17-0SS1	on request	3RG78 42-6DK21
1200	Transmitter	3RG78 44-6SD17-0SS0	on request	3RG78 42-6DK20
1350	Receiver	3RG78 44-6MD20-0SS1	on request	3RG78 42-6DL21
1350	Transmitter	3RG78 44-6SD20-0SS0	on request	3RG78 42-6DL20
1500	Receiver	3RG78 44-6MD22-0SS1	on request	3RG78 42-6DM21
1500	Transmitter	3RG78 44-6SD22-0SS0	on request	3RG78 42-6DM20
1650	Receiver	3RG78 44-6MD24-0SS1	on request	3RG78 42-6DN21
1650	Transmitter	3RG78 44-6SD24-0SS0	on request	3RG78 42-6DN20
1800	Receiver	3RG78 44-6MD26-0SS1	on request	3RG78 42-6DP21
1800	Transmitter	3RG78 44-6SD26-0SS0	on request	3RG78 42-6DP20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Muting, transistor output

Light arrays with cable gland

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 44-6MM50-0SS1
4 beams	300	Transmitter	3RG78 44-6SM50-0SS0
3 beams	400	Receiver	3RG78 44-6MP50-0SS1
3 beams	400	Transmitter	3RG78 44-6SP50-0SS0
2 beams	500	Receiver	3RG78 44-6MS50-0SS1
2 beams	500	Transmitter	3RG78 44-6SS50-0SS0
Range 6 to 70 m			
4 beams	300	Receiver	3RG78 44-6MM51-0SS1
4 beams	300	Transmitter	3RG78 44-6SM51-0SS0
3 beams	400	Receiver	3RG78 44-6MP51-0SS1
3 beams	400	Transmitter	3RG78 44-6SP51-0SS0
2 beams	500	Receiver	3RG78 44-6MS51-0SS1
2 beams	500	Transmitter	3RG78 44-6SS51-0SS0

Transceiver with cable gland

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG78 44-6MS50-0ST0
2 beams	500	Transceiver with integrated LED indicator light	3RG78 44-6MS50-0MT0
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Muting, transistor output

Light curtains with Brad Harrison connection (MIN-Series)¹⁾

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3RG78 44-4MD04-0SS1	on request	3RG78 42-6DD21
300	Transmitter	3RG78 44-4SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3RG78 44-4MD06-0SS1	on request	3RG78 42-6DE21
450	Transmitter	3RG78 44-4SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3RG78 44-4MD08-0SS1	on request	3RG78 42-6DF21
600	Transmitter	3RG78 44-4SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3RG78 44-4MD11-0SS1	on request	3RG78 42-6DG21
750	Transmitter	3RG78 44-4SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3RG78 44-4MD13-0SS1	on request	3RG78 42-6DH21
900	Transmitter	3RG78 44-4SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3RG78 44-4MD15-0SS1	on request	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-4SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3RG78 44-4MD17-0SS1	on request	3RG78 42-6DK21
1200	Transmitter	3RG78 44-4SD17-0SS0	on request	3RG78 42-6DK20
1350	Receiver	3RG78 44-4MD20-0SS1	on request	3RG78 42-6DL21
1350	Transmitter	3RG78 44-4SD20-0SS0	on request	3RG78 42-6DL20
1500	Receiver	3RG78 44-4MD22-0SS1	on request	3RG78 42-6DM21
1500	Transmitter	3RG78 44-4SD22-0SS0	on request	3RG78 42-6DM20
1650	Receiver	3RG78 44-4MD24-0SS1	on request	3RG78 42-6DN21
1650	Transmitter	3RG78 44-4SD24-0SS0	on request	3RG78 42-6DN20
1800	Receiver	3RG78 44-4MD26-0SS1	on request	3RG78 42-6DP21
1800	Transmitter	3RG78 44-4SD26-0SS0	on request	3RG78 42-6DP20

Light arrays with Brad Harrison connection (MIN-Series)¹⁾

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 44-4MM50-0SS1
4 beams	300	Transmitter	3RG78 44-4SM50-0SS0
3 beams	400	Receiver	3RG78 44-4MP50-0SS1
3 beams	400	Transmitter	3RG78 44-4SP50-0SS0
2 beams	500	Receiver	3RG78 44-4MS50-0SS1
2 beams	500	Transmitter	3RG78 44-4SS50-0SS0

Light arrays with Hirschmann connection

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6 to 70 m			
4 beams	300	Receiver	3RG78 44-2MM51-0SS1
4 beams	300	Transmitter	3RG78 44-2SM51-0SS0
3 beams	400	Receiver	3RG78 44-2MP51-0SS1
3 beams	400	Transmitter	3RG78 44-2SP51-0SS0
2 beams	500	Receiver	3RG78 44-2MS51-0SS1
2 beams	500	Transmitter	3RG78 44-2SS51-0SS0

1) Often required for applications in NAFTA market.

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Muting, relay output

Light curtains with Hirschmann connection

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3RG78 44-8MD04-0SS1	on request	3RG78 42-6DD21
300	Transmitter	3RG78 44-2SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3RG78 44-8MD06-0SS1	on request	3RG78 42-6DE21
450	Transmitter	3RG78 44-2SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3RG78 44-8MD08-0SS1	on request	3RG78 42-6DF21
600	Transmitter	3RG78 44-2SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3RG78 44-8MD11-0SS1	on request	3RG78 42-6DG21
750	Transmitter	3RG78 44-2SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3RG78 44-8MD13-0SS1	on request	3RG78 42-6DH21
900	Transmitter	3RG78 44-2SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3RG78 44-8MD15-0SS1	on request	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-2SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3RG78 44-8MD17-0SS1	on request	3RG78 42-6DK21
1200	Transmitter	3RG78 44-2SD17-0SS0	on request	3RG78 42-6DK20
1350	Receiver	3RG78 44-8MD20-0SS1	on request	3RG78 42-6DL21
1350	Transmitter	3RG78 44-2SD20-0SS0	on request	3RG78 42-6DL20
1500	Receiver	3RG78 44-8MD22-0SS1	on request	3RG78 42-6DM21
1500	Transmitter	3RG78 44-2SD22-0SS0	on request	3RG78 42-6DM20
1650	Receiver	3RG78 44-8MD24-0SS1	on request	3RG78 42-6DN21
1650	Transmitter	3RG78 44-2SD24-0SS0	on request	3RG78 42-6DN20
1800	Receiver	3RG78 44-8MD26-0SS1	on request	3RG78 42-6DP21
1800	Transmitter	3RG78 44-2SD26-0SS0	on request	3RG78 42-6DP20

Light curtains with Hirschmann connection, integrated LED indicator light

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3RG78 44-8MD04-0KS1	on request	3RG78 42-6DD21
300	Transmitter	3RG78 44-2SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3RG78 44-8MD06-0KS1	on request	3RG78 42-6DE21
450	Transmitter	3RG78 44-2SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3RG78 44-8MD08-0KS1	on request	3RG78 42-6DF21
600	Transmitter	3RG78 44-2SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3RG78 44-8MD11-0KS1	on request	3RG78 42-6DG21
750	Transmitter	3RG78 44-2SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3RG78 44-8MD13-0KS1	on request	3RG78 42-6DH21
900	Transmitter	3RG78 44-2SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3RG78 44-8MD15-0KS1	on request	3RG78 42-6DJ21
1050	Transmitter	3RG78 44-2SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3RG78 44-8MD17-0KS1	on request	3RG78 42-6DK21
1200	Transmitter	3RG78 44-2SD17-0SS0	on request	3RG78 42-6DK20

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Muting, relay output

Light arrays with M12 connector

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 44-3MM50-0SS1
4 beams	300	Transmitter	3RG78 44-3SM50-0SS0
3 beams	400	Receiver	3RG78 44-3MP50-0SS1
3 beams	400	Transmitter	3RG78 44-3SP50-0SS0
2 beams	500	Receiver	3RG78 44-3MS50-0SS1
2 beams	500	Transmitter	3RG78 44-3SS50-0SS0

Light arrays with Hirschmann connection

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 44-8MM50-0SS1
4 beams	300	Transmitter	3RG78 44-2SM50-0SS0
3 beams	400	Receiver	3RG78 44-8MP50-0SS1
3 beams	400	Transmitter	3RG78 44-2SP50-0SS0
2 beams	500	Receiver	3RG78 44-8MS50-0SS1
2 beams	500	Transmitter	3RG78 44-2SS50-0SS0
Range 6 to 70 m			
4 beams	300	Receiver	3RG78 44-8MM51-0SS1
4 beams	300	Transmitter	3RG78 44-2SM51-0SS0
3 beams	400	Receiver	3RG78 44-8MP51-0SS1
3 beams	400	Transmitter	3RG78 44-2SP51-0SS0
2 beams	500	Receiver	3RG78 44-8MS51-0SS1
2 beams	500	Transmitter	3RG78 44-2SS51-0SS0

Light arrays with Hirschmann connection, integrated LED indicator light

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 44-8MM50-0KS1
4 beams	300	Transmitter	3RG78 44-2SM50-0SS0
3 beams	400	Receiver	3RG78 44-8MP50-0KS1
3 beams	400	Transmitter	3RG78 44-2SP50-0SS0
2 beams	500	Receiver	3RG78 44-8MS50-0KS1
2 beams	500	Transmitter	3RG78 44-2SS50-0SS0

Transceiver with M12 connector

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG78 44-3MS50-0ST0
2 beams	500	Transceiver with integrated LED indicator light	3RG78 44-3MS50-0MT0
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Muting, relay output

Transceiver with Hirschmann connection

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG78 44-8MS50-0ST0
2 beams	500	Transceiver with integrated LED indicator light	3RG78 44-8MS50-0MT0
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation

Function package Sequence ctrl, trans. output

Light curtains with M12 connector 

Protective field height	Version	Standard device 14 mm Resolution	Host device 14 mm Resolution
mm		Order No.	Order No.
Resolution 14 mm			
300	Receiver	3RG78 44-3TB04-0SS1	3RG78 44-3TB04-1SS1
300	Transmitter	3RG78 44-3SB04-0SS0	3RG78 44-3SB04-1SS0
450	Receiver	3RG78 44-3TB06-0SS1	3RG78 44-3TB06-1SS1
450	Transmitter	3RG78 44-3SB06-0SS0	3RG78 44-3SB06-1SS0
600	Receiver	3RG78 44-3TB08-0SS1	3RG78 44-3TB08-1SS1
600	Transmitter	3RG78 44-3SB08-0SS0	3RG78 44-3SB08-1SS0
750	Receiver	3RG78 44-3TB11-0SS1	3RG78 44-3TB11-1SS1
750	Transmitter	3RG78 44-3SB11-0SS0	3RG78 44-3SB11-1SS0
900	Receiver	3RG78 44-3TB13-0SS1	3RG78 44-3TB13-1SS1
900	Transmitter	3RG78 44-3SB13-0SS0	3RG78 44-3SB13-1SS0

Additional products on request

Light curtains and arrays SIMATIC FS400

Series 3RG78 44, Type 4

Internal evaluation
Function package Sequence ctrl, relay output

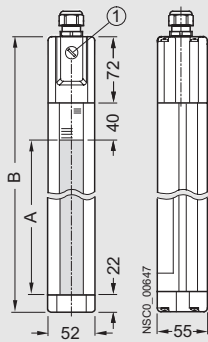
Light curtains with Hirschmann connection

Protective field height	Version	Standard device 14 mm Resolution	Standard device 30 mm Resolution
mm		Order No.	Order No.
Resolution 14 mm and 30 mm			
300	Receiver	3RG78 44-8TB04-0SS1	3RG78 44-8TD04-0SS1
300	Transmitter	3RG78 44-2SB04-0SS0	3RG78 44-2SD04-0SS0
450	Receiver	3RG78 44-8TB06-0SS1	3RG78 44-8TD06-0SS1
450	Transmitter	3RG78 44-2SB06-0SS0	3RG78 44-2SD06-0SS0
600	Receiver	3RG78 44-8TB08-0SS1	3RG78 44-8TD08-0SS1
600	Transmitter	3RG78 44-2SB08-0SS0	3RG78 44-2SD08-0SS0
750	Receiver	3RG78 44-8TB11-0SS1	3RG78 44-8TD11-0SS1
750	Transmitter	3RG78 44-2SB11-0SS0	3RG78 44-2SD11-0SS0
900	Receiver	3RG78 44-8TB13-0SS1	3RG78 44-8TD13-0SS1
900	Transmitter	3RG78 44-2SB13-0SS0	3RG78 44-2SD13-0SS0

Additional products on request

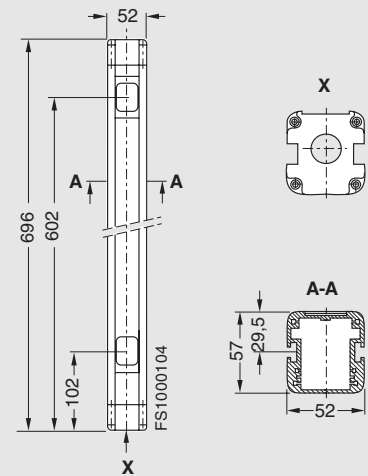
Dimension drawings

3RG78 44 standard light curtains and 3RG78 44 light arrays

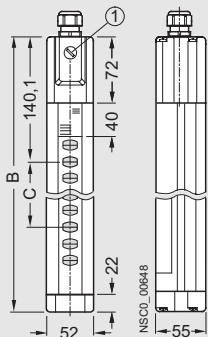


- ① Screw cap Pg 9 (only Receiver, for local interface)
A Protective field height (see selection and ordering data)
B Total length = protective field height A + 134 mm

Mirror 3RG78 48-1TL



3RG78 44 light arrays, additional dimensions



Additional dimensions for light arrays only:

Type	B	C	Beams
3RG78 44-..M	1184	300	4
3RG78 44-..P	1034	400	3
3RG78 44-..S	734	500	2

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation

Overview



Light curtains and arrays 3RG78 45 with integrated evaluation for type 4 to IEC/EN 61496

- with function package "Standard",
- Resolution 14, 30 and 50 mm
- Protective field heights from 150 mm to 3000 mm,
- 2, 3 or 4 beam light arrays,
- Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)

Two standard mounting brackets (3RG78 48-0AB) are supplied with all devices also available as accessories, see page 1/83).

Program overview 3RG78 45

Device type	Function package	Output	Connection type	for light curtains: Resolution for light arrays and transceivers: Range				Page
				14 mm	30 mm	50 mm	90 mm	
Light curtains	Standard	Transistor	M12 connector	✓	✓	✓	✓	1/36
Light arrays	Standard	Transistor	M12 connector	0.8 m ... 18 m; 6 ... 60 m				1/38
Transceiver	Standard	Transistor	M12 connector	6.5 m				1/38
Light curtains	Standard	Transistor	Hirschmann connection	✓	✓	–	–	1/39
Light arrays	Standard	Transistor	Hirschmann connection	0.8 m ... 18 m; 6 ... 60 m				1/40
Transceiver	Standard	Transistor	Hirschmann connection	6.5 m				1/40
Light curtains	Standard	Transistor	Brad Harrison connection ¹⁾	✓	✓	✓	✓	1/41
Light arrays	Standard	Transistor	Brad Harrison connection ¹⁾	0.8 m ... 18 m; 6 ... 60 m				1/43
Transceiver	Standard	Transistor	Brad-Harrison connection ¹⁾	6.5 m				1/43
Light curtains	Standard	Transistor	Cable gland	✓	✓	✓	✓	1/44
Light arrays	Standard	Transistor	Cable gland	0.8 m ... 18 m; 6 ... 60 m				1/46
Transceiver	Standard	Transistor	Cable gland	6.5 m				1/46

1) Often required for applications in NAFTA market.

Technical data

Type	3RG78 45
Safety category EN IEC 61496	Type 4 (self-monitoring)
Detection capability (resolution)	14 mm, 30 mm, 50 mm, 90 mm or whole person covered by 2, 3 or 4 rays
Protective field width, range	
• for resolutions 14 and 30 mm	150 ... 1800 mm
• for resolution 50 mm	450 ... 3000 mm
• for resolution 90 mm	750 ... 3000 mm
Width of protective field, detection range	
• for resolution 14 mm	0,3 ... 6 m
• for resolution 30, 50 and 90 mm	0,8 ... 18 m
• for light curtains 18 m	0,8 ... 18 m
• for Light arrays 60 m	6 ... 60 m

Type	3RG78 45
Supply voltage U_S (transmitter and receiver)	24 V DC $\pm$ 20 % (external power pack is required with reliable mains isolation and compensation of voltage dips of 20 ms)
Current consumption	
• Transmitter	75 mA
• Receiver	180 mA (without external load)
Vibration resistance	5 g, 10 ... 55 Hz to IEC/EN 60068-2-6
Shock resistance	10 g, 16 ms to IEC/EN 60068-2-29

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation

Type	3RG78 45
Infrared light interference suppression	2 techniques selectable
• Standard • d-scan	High suppression Very high suppression (increased response time for devices with more than 15 beams)
Synchronization between transmitter and receiver	Optically; 2 selectable transfer channels
Ambient temperature	
• Operation • Storage	0 ... +55 °C -25 ... +70 °C
Permissible relative humidity	15 ... 95%
Degree of protection	IP65
Electrical connection	With Pg 13 screw terminals and plug-in connection
Connection cable	
• Transmitter • Receiver	7-pin, 0.5 ... 1.0 mm ² 7-pin, 0.5 ... 1.0 mm ² (shielded if required)
Cable length with 1.0 mm ²	100 m

Inputs

Transmitter test input	Closed-circuit principle
Minimum opening time	50 ms

Outputs

Safety outputs	2 fail-safe pnp outputs with cross-over monitoring (short-circuit proof)
Output voltage $U_{a \min}$	$U_{\text{vers}} - 2.7 \text{ V}$
Output current $I_{a \max}$	0.3 A
Peak current	0.4 A
Continuous thermal current at 35 °C / at 55 °C	0.3 A / 0.22 A
Max. load capacitance per output	300 nF (100 nF for channel 2)
Response time from interruption of protective field to until safety outputs switch off	Increases with the number of beams
• for resolution 14 mm • for resolution 30 mm • for resolution 50 mm • for resolution 90 mm • for 2, 3, 4 beam light arrays	7 ... 39 ms (d-scan 10 ... 78 ms) 7 ... 20 ms (d-scan 10 ... 39 ms) 17 ms (d-scan 33 ms) 13 ms (d-scan 20 ms) 5 ms (d-scan 8 ms)
Response time from interruption of protective field to until safety outputs switch off	
• for all resolutions • after very short interruptions of the protective field	0.5 ms 100 ms
Pollution output and fault signaling output	pnp output (short-circuit proof)
Output current, max.	70 mA
Safety and diagnostic interface	RS 485, 57.6 kBaud

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Selection and ordering data

Light curtains with M12 connector 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3RG78 45-3BB01	–	3RG78 42-6BB21
150	Transmitter	3RG78 45-3BB00	–	3RG78 42-6BB20
225	Receiver	3RG78 45-3BC01	3RG78 45-3BC11	3RG78 42-6BC21
225	Transmitter	3RG78 45-3BC00	3RG78 45-3BC10	3RG78 42-6BC20
300	Receiver	3RG78 45-3BD01	3RG78 45-3BD11	3RG78 42-6BD21
300	Transmitter	3RG78 45-3BD00	3RG78 45-3BD10	3RG78 42-6BD20
450	Receiver	3RG78 45-3BE01	3RG78 45-3BE11	3RG78 42-6BE21
450	Transmitter	3RG78 45-3BE00	3RG78 45-3BE10	3RG78 42-6BE20
600	Receiver	3RG78 45-3BF01	3RG78 45-3BF11	3RG78 42-6BF21
600	Transmitter	3RG78 45-3BF00	3RG78 45-3BF10	3RG78 42-6BF20
750	Receiver	3RG78 45-3BG01	3RG78 45-3BG11	3RG78 42-6BG21
750	Transmitter	3RG78 45-3BG00	3RG78 45-3BG10	3RG78 42-6BG20
900	Receiver	3RG78 45-3BH01	3RG78 45-3BH11	3RG78 42-6BH21
900	Transmitter	3RG78 45-3BH00	3RG78 45-3BH10	3RG78 42-6BH20
1050	Receiver	3RG78 45-3BJ01	3RG78 45-3BJ11	3RG78 42-6BJ21
1050	Transmitter	3RG78 45-3BJ00	3RG78 45-3BJ10	3RG78 42-6BJ20
1200	Receiver	3RG78 45-3BK01	3RG78 45-3BK11	3RG78 42-6BK21
1200	Transmitter	3RG78 45-3BK00	3RG78 45-3BK10	3RG78 42-6BK20
1350	Receiver	3RG78 45-3BL01	3RG78 45-3BL11	3RG78 42-6BL21
1350	Transmitter	3RG78 45-3BL00	3RG78 45-3BL10	3RG78 42-6BL20
1500	Receiver	3RG78 45-3BM01	3RG78 45-3BM11	3RG78 42-6BM21
1500	Transmitter	3RG78 45-3BM00	3RG78 45-3BM10	3RG78 42-6BM20
1650	Receiver	3RG78 45-3BN01	3RG78 45-3BN11	3RG78 42-6BN21
1650	Transmitter	3RG78 45-3BN00	3RG78 45-3BN10	3RG78 42-6BN20
1800	Receiver	3RG78 45-3BP01	3RG78 45-3BP11	3RG78 42-6BP21
1800	Transmitter	3RG78 45-3BP00	3RG78 45-3BP10	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 45-3DB01	–	3RG78 42-6DB21
150	Transmitter	3RG78 45-3DB00	–	3RG78 42-6DB20
225	Receiver	3RG78 45-3DC01	3RG78 45-3DC11	3RG78 42-6DC21
225	Transmitter	3RG78 45-3DC00	3RG78 45-3DC10	3RG78 42-6DC20
300	Receiver	3RG78 45-3DD01	3RG78 45-3DD11	3RG78 42-6DD21
300	Transmitter	3RG78 45-3DD00	3RG78 45-3DD10	3RG78 42-6DD20
450	Receiver	3RG78 45-3DE01	3RG78 45-3DE11	3RG78 42-6DE21
450	Transmitter	3RG78 45-3DE00	3RG78 45-3DE10	3RG78 42-6DE20
600	Receiver	3RG78 45-3DF01	3RG78 45-3DF11	3RG78 42-6DF21
600	Transmitter	3RG78 45-3DF00	3RG78 45-3DF10	3RG78 42-6DF20
750	Receiver	3RG78 45-3DG01	3RG78 45-3DG11	3RG78 42-6DG21
750	Transmitter	3RG78 45-3DG00	3RG78 45-3DG10	3RG78 42-6DG20
900	Receiver	3RG78 45-3DH01	3RG78 45-3DH11	3RG78 42-6DH21
900	Transmitter	3RG78 45-3DH00	3RG78 45-3DH10	3RG78 42-6DH20
1050	Receiver	3RG78 45-3DJ01	3RG78 45-3DJ11	3RG78 42-6DJ21
1050	Transmitter	3RG78 45-3DJ00	3RG78 45-3DJ10	3RG78 42-6DJ20
1200	Receiver	3RG78 45-3DK01	3RG78 45-3DK11	3RG78 42-6DK21
1200	Transmitter	3RG78 45-3DK00	3RG78 45-3DK10	3RG78 42-6DK20
1350	Receiver	3RG78 45-3DL01	3RG78 45-3DL11	3RG78 42-6DL21
1350	Transmitter	3RG78 45-3DL00	3RG78 45-3DL10	3RG78 42-6DL20

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1500	Receiver	3RG78 45-3DM01	3RG78 45-3DM11	3RG78 42-6DM21
1500	Transmitter	3RG78 45-3DM00	3RG78 45-3DM10	3RG78 42-6DM20
1650	Receiver	3RG78 45-3DN01	3RG78 45-3DN11	3RG78 42-6DN21
1650	Transmitter	3RG78 45-3DN00	3RG78 45-3DN10	3RG78 42-6DN20
1800	Receiver	3RG78 45-3DP01	3RG78 45-3DP11	3RG78 42-6DP21
1800	Transmitter	3RG78 45-3DP00	3RG78 45-3DP10	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3RG78 45-3EE01	3RG78 45-3EE11	3RG78 42-6EE21
450	Transmitter	3RG78 45-3EE00	3RG78 45-3EE10	3RG78 42-6EE20
600	Receiver	3RG78 45-3EF01	3RG78 45-3EF11	3RG78 42-6EF21
600	Transmitter	3RG78 45-3EF00	3RG78 45-3EF10	3RG78 42-6EF20
750	Receiver	3RG78 45-3EG01	3RG78 45-3EG11	3RG78 42-6EG21
750	Transmitter	3RG78 45-3EG00	3RG78 45-3EG10	3RG78 42-6EG20
900	Receiver	3RG78 45-3EH01	3RG78 45-3EH11	3RG78 42-6EH21
900	Transmitter	3RG78 45-3EH00	3RG78 45-3EH10	3RG78 42-6EH20
1050	Receiver	3RG78 45-3EJ01	3RG78 45-3EJ11	3RG78 42-6EJ21
1050	Transmitter	3RG78 45-3EJ00	3RG78 45-3EJ10	3RG78 42-6EJ20
1200	Receiver	3RG78 45-3EK01	3RG78 45-3EK11	3RG78 42-6EK21
1200	Transmitter	3RG78 45-3EK00	3RG78 45-3EK10	3RG78 42-6EK20
1350	Receiver	3RG78 45-3EL01	3RG78 45-3EL11	3RG78 42-6EL21
1350	Transmitter	3RG78 45-3EL00	3RG78 45-3EL10	3RG78 42-6EL20
1500	Receiver	3RG78 45-3EM01	3RG78 45-3EM11	3RG78 42-6EM21
1500	Transmitter	3RG78 45-3EM00	3RG78 45-3EM10	3RG78 42-6EM20
1650	Receiver	3RG78 45-3EN01	3RG78 45-3EN11	3RG78 42-6EN21
1650	Transmitter	3RG78 45-3EN00	3RG78 45-3EN10	3RG78 42-6EN20
1800	Receiver	3RG78 45-3EP01	3RG78 45-3EP11	3RG78 42-6EP21
1800	Transmitter	3RG78 45-3EP00	3RG78 45-3EP10	3RG78 42-6EP20
2100	Receiver	3RG78 45-3ER01	3RG78 45-3ER11	3RG78 42-6ER21
2100	Transmitter	3RG78 45-3ER00	3RG78 45-3ER10	3RG78 42-6ER20
2400	Receiver	3RG78 45-3ES01	3RG78 45-3ES11	3RG78 42-6ES21
2400	Transmitter	3RG78 45-3ES00	3RG78 45-3ES10	3RG78 42-6ES20
2700	Receiver	3RG78 45-3ET01	3RG78 45-3ET11	3RG78 42-6ET21
2700	Transmitter	3RG78 45-3ET00	3RG78 45-3ET10	3RG78 42-6ET20
3000	Receiver	3RG78 45-3EU01	3RG78 45-3EU11	3RG78 42-6EU21
3000	Transmitter	3RG78 45-3EU00	3RG78 45-3EU10	3RG78 42-6EU20
Resolution 90 mm				
750	Receiver	3RG78 45-3JG01	3RG78 45-3JG11	3RG78 42-6JG21
750	Transmitter	3RG78 45-3JG00	3RG78 45-3JG10	3RG78 42-6JG20
900	Receiver	3RG78 45-3JH01	3RG78 45-3JH11	3RG78 42-6JH21
900	Transmitter	3RG78 45-3JH00	3RG78 45-3JH10	3RG78 42-6JH20
1050	Receiver	3RG78 45-3JJ01	3RG78 45-3JJ11	3RG78 42-6JJ21
1050	Transmitter	3RG78 45-3JJ00	3RG78 45-3JJ10	3RG78 42-6JJ20
1200	Receiver	3RG78 45-3JK01	3RG78 45-3JK11	3RG78 42-6JK21
1200	Transmitter	3RG78 45-3JK00	3RG78 45-3JK10	3RG78 42-6JK20
1350	Receiver	3RG78 45-3JL01	3RG78 45-3JL11	3RG78 42-6JL21
1350	Transmitter	3RG78 45-3JL00	3RG78 45-3JL10	3RG78 42-6JL20
1500	Receiver	3RG78 45-3JM01	3RG78 45-3JM11	3RG78 42-6JM21
1500	Transmitter	3RG78 45-3JM00	3RG78 45-3JM10	3RG78 42-6JM20
1650	Receiver	3RG78 45-3JN01	3RG78 45-3JN11	3RG78 42-6JN21
1650	Transmitter	3RG78 45-3JN00	3RG78 45-3JN10	3RG78 42-6JN20

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation

Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1800	Receiver	3RG78 45-3JP01	3RG78 45-3JP11	3RG78 42-6JP21
1800	Transmitter	3RG78 45-3JP00	3RG78 45-3JP10	3RG78 42-6JP20
2100	Receiver	3RG78 45-3JR01	3RG78 45-3JR11	3RG78 42-6JR21
2100	Transmitter	3RG78 45-3JR00	3RG78 45-3JR10	3RG78 42-6JR20
2400	Receiver	3RG78 45-3JS01	3RG78 45-3JS11	3RG78 42-6JS21
2400	Transmitter	3RG78 45-3JS00	3RG78 45-3JS10	3RG78 42-6JS20
2700	Receiver	3RG78 45-3JT01	3RG78 45-3JT11	3RG78 42-6JT21
2700	Transmitter	3RG78 45-3JT00	3RG78 45-3JT10	3RG78 42-6JT20
3000	Receiver	3RG78 45-3JU01	3RG78 45-3JU11	3RG78 42-6JU21
3000	Transmitter	3RG78 45-3JU00	3RG78 45-3JU10	3RG78 42-6JU20

Light arrays with M12 connector

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
1 beams	300	Receiver	3RG78 45-3MH01
4 beams	300	Transmitter	3RG78 45-3MH00
3 beams	400	Receiver	3RG78 45-3PG01
3 beams	400	Transmitter	3RG78 45-3PG00
2 beams	500	Receiver	3RG78 45-3SE01
2 beams	500	Transmitter	3RG78 45-3SE00
Range 6 to 60 m			
4 beams	300	Receiver	3RG78 45-3MH51
4 beams	300	Transmitter	3RG78 45-3MH50
3 beams	400	Receiver	3RG78 45-3PG51
3 beams	400	Transmitter	3RG78 45-3PG50
2 beams	500	Receiver	3RG78 45-3SE51
2 beams	500	Transmitter	3RG78 45-3SE50

Transceiver with M12 connector

Number of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG7845-3TE01
Mirror for transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Light curtains with Hirschmann connection 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3RG78 45-2BB01	-	3RG78 42-6BB21
150	Transmitter	3RG78 45-2BB00	-	3RG78 42-6BB20
225	Receiver	3RG78 45-2BC01	on request	3RG78 42-6BC21
225	Transmitter	3RG78 45-2BC00	on request	3RG78 42-6BC20
300	Receiver	3RG78 45-2BD01	on request	3RG78 42-6BD21
300	Transmitter	3RG78 45-2BD00	on request	3RG78 42-6BD20
450	Receiver	3RG78 45-2BE01	on request	3RG78 42-6BE21
450	Transmitter	3RG78 45-2BE00	on request	3RG78 42-6BE20
600	Receiver	3RG78 45-2BF01	on request	3RG78 42-6BF21
600	Transmitter	3RG78 45-2BF00	on request	3RG78 42-6BF20
750	Receiver	3RG78 45-2BG01	on request	3RG78 42-6BG21
750	Transmitter	3RG78 45-2BG00	on request	3RG78 42-6BG20
900	Receiver	3RG78 45-2BH01	on request	3RG78 42-6BH21
900	Transmitter	3RG78 45-2BH00	on request	3RG78 42-6BH20
1050	Receiver	3RG78 45-2BJ01	on request	3RG78 42-6BJ21
1050	Transmitter	3RG78 45-2BJ00	on request	3RG78 42-6BJ20
1200	Receiver	3RG78 45-2BK01	on request	3RG78 42-6BK21
1200	Transmitter	3RG78 45-2BK00	on request	3RG78 42-6BK20
1350	Receiver	3RG78 45-2BL01	on request	3RG78 42-6BL21
1350	Transmitter	3RG78 45-2BL00	on request	3RG78 42-6BL20
1500	Receiver	3RG78 45-2BM01	on request	3RG78 42-6BM21
1500	Transmitter	3RG78 45-2BM00	on request	3RG78 42-6BM20
1650	Receiver	3RG78 45-2BN01	on request	3RG78 42-6BN21
1650	Transmitter	3RG78 45-2BN00	on request	3RG78 42-6BN20
1800	Receiver	3RG78 45-2BP01	on request	3RG78 42-6BP21
1800	Transmitter	3RG78 45-2BP00	on request	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 45-2DB01	-	3RG78 42-6DB21
150	Transmitter	3RG78 45-2DB00	-	3RG78 42-6DB20
225	Receiver	3RG78 45-2DC01	on request	3RG78 42-6DC21
225	Transmitter	3RG78 45-2DC00	on request	3RG78 42-6DC20
300	Receiver	3RG78 45-2DD01	on request	3RG78 42-6DD21
300	Transmitter	3RG78 45-2DD00	on request	3RG78 42-6DD20
450	Receiver	3RG78 45-2DE01	on request	3RG78 42-6DE21
450	Transmitter	3RG78 45-2DE00	on request	3RG78 42-6DE20
600	Receiver	3RG78 45-2DF01	on request	3RG78 42-6DF21
600	Transmitter	3RG78 45-2DF00	on request	3RG78 42-6DF20
750	Receiver	3RG78 45-2DG01	on request	3RG78 42-6DG21
750	Transmitter	3RG78 45-2DG00	on request	3RG78 42-6DG20
900	Receiver	3RG78 45-2DH01	on request	3RG78 42-6DH21
900	Transmitter	3RG78 45-2DH00	on request	3RG78 42-6DH20
1050	Receiver	3RG78 45-2DJ01	on request1	3RG78 42-6DJ21
1050	Transmitter	3RG78 45-2DJ00	on request0	3RG78 42-6DJ20
1200	Receiver	3RG78 45-2DK01	on request	3RG78 42-6DK21
1200	Transmitter	3RG78 45-2DK00	on request	3RG78 42-6DK20
1350	Receiver	3RG78 45-2DL01	on request	3RG78 42-6DL21
1350	Transmitter	3RG78 45-2DL00	on request	3RG78 42-6DL20
1500	Receiver	3RG78 45-2DM01	on request	3RG78 42-6DM21
1500	Transmitter	3RG78 45-2DM00	on request	3RG78 42-6DM20

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1650	Receiver	3RG78 45-2DN01	on request	3RG78 42-6DN21
1650	Transmitter	3RG78 45-2DN00	on request	3RG78 42-6DN20
1800	Receiver	3RG78 45-2DP01	on request	3RG78 42-6DP21
1800	Transmitter	3RG78 45-2DP00	on request	3RG78 42-6DP20

Light arrays with Hirschmann connection

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 45-2MH01
4 beams	300	Transmitter	3RG78 45-2MH00
3 beams	400	Receiver	3RG78 45-2PG01
3 beams	400	Transmitter	3RG78 45-2PG00
2 beams	500	Receiver	3RG78 45-2SE01
2 beams	500	Transmitter	3RG78 45-2SE00
Range 6 to 60 m			
4 beams	300	Receiver	3RG78 45-2MH51
4 beams	300	Transmitter	3RG78 45-2MH50
3 beams	400	Receiver	3RG78 45-2PG51
3 beams	400	Transmitter	3RG78 45-2PG50
2 beams	500	Receiver	3RG78 45-2SE51
2 beams	500	Transmitter	3RG78 45-2SE50

Transceiver with Hirschmann connection

Number of beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG7845-2TE01
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Light curtains with Brad Harrison connection (MIN series)¹⁾ 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3RG78 45-4BB01	-	3RG78 42-6BB21
150	Transmitter	3RG78 45-4BB00	-	3RG78 42-6BB20
225	Receiver	3RG78 45-4BC01	3RG78 45-4BC11	3RG78 42-6BC21
225	Transmitter	3RG78 45-4BC00	3RG78 45-4BC10	3RG78 42-6BC20
300	Receiver	3RG78 45-4BD01	3RG78 45-4BD11	3RG78 42-6BD21
300	Transmitter	3RG78 45-4BD00	3RG78 45-4BD10	3RG78 42-6BD20
450	Receiver	3RG78 45-4BE01	3RG78 45-4BE11	3RG78 42-6BE21
450	Transmitter	3RG78 45-4BE00	3RG78 45-4BE10	3RG78 42-6BE20
600	Receiver	3RG78 45-4BF01	3RG78 45-4BF11	3RG78 42-6BF21
600	Transmitter	3RG78 45-4BF00	3RG78 45-4BF10	3RG78 42-6BF20
750	Receiver	3RG78 45-4BG01	3RG78 45-4BG11	3RG78 42-6BG21
750	Transmitter	3RG78 45-4BG00	3RG78 45-4BG10	3RG78 42-6BG20
900	Receiver	3RG78 45-4BH01	3RG78 45-4BH11	3RG78 42-6BH21
900	Transmitter	3RG78 45-4BH00	3RG78 45-4BH10	3RG78 42-6BH20
1050	Receiver	3RG78 45-4BJ01	3RG78 45-4BJ11	3RG78 42-6BJ21
1050	Transmitter	3RG78 45-4BJ00	3RG78 45-4BJ10	3RG78 42-6BJ20
1200	Receiver	3RG78 45-4BK01	3RG78 45-4BK11	3RG78 42-6BK21
1200	Transmitter	3RG78 45-4BK00	3RG78 45-4BK10	3RG78 42-6BK20
1350	Receiver	3RG78 45-4BL01	3RG78 45-4BL11	3RG78 42-6BL21
1350	Transmitter	3RG78 45-4BL00	3RG78 45-4BL10	3RG78 42-6BL20
1500	Receiver	3RG78 45-4BM01	3RG78 45-4BM11	3RG78 42-6BM21
1500	Transmitter	3RG78 45-4BM00	3RG78 45-4BM10	3RG78 42-6BM20
1650	Receiver	3RG78 45-4BN01	3RG78 45-4BN11	3RG78 42-6BN21
1650	Transmitter	3RG78 45-4BN00	3RG78 45-4BN10	3RG78 42-6BN20
1800	Receiver	3RG78 45-4BP01	3RG78 45-4BP11	3RG78 42-6BP21
1800	Transmitter	3RG78 45-4BP00	3RG78 45-4BP10	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 45-4DB01	-	3RG78 42-6DB21
150	Transmitter	3RG78 45-4DB00	-	3RG78 42-6DB20
225	Receiver	3RG78 45-4DC01	3RG78 45-4DC11	3RG78 42-6DC21
225	Transmitter	3RG78 45-4DC00	3RG78 45-4DC10	3RG78 42-6DC20
300	Receiver	3RG78 45-4DD01	3RG78 45-4DD11	3RG78 42-6DD21
300	Transmitter	3RG78 45-4DD00	3RG78 45-4DD10	3RG78 42-6DD20
450	Receiver	3RG78 45-4DE01	3RG78 45-4DE11	3RG78 42-6DE21
450	Transmitter	3RG78 45-4DE00	3RG78 45-4DE10	3RG78 42-6DE20
600	Receiver	3RG78 45-4DF01	3RG78 45-4DF11	3RG78 42-6DF21
600	Transmitter	3RG78 45-4DF00	3RG78 45-4DF10	3RG78 42-6DF20
750	Receiver	3RG78 45-4DG01	3RG78 45-4DG11	3RG78 42-6DG21
750	Transmitter	3RG78 45-4DG00	3RG78 45-4DG10	3RG78 42-6DG20
900	Receiver	3RG78 45-4DH01	3RG78 45-4DH11	3RG78 42-6DH21
900	Transmitter	3RG78 45-4DH00	3RG78 45-4DH10	3RG78 42-6DH20
1050	Receiver	3RG78 45-4DJ01	3RG78 45-4DJ11	3RG78 42-6DJ21
1050	Transmitter	3RG78 45-4DJ00	3RG78 45-4DJ10	3RG78 42-6DJ20
1200	Receiver	3RG78 45-4DK01	3RG78 45-4DK11	3RG78 42-6DK21
1200	Transmitter	3RG78 45-4DK00	3RG78 45-4DK10	3RG78 42-6DK20
1350	Receiver	3RG78 45-4DL01	3RG78 45-4DL11	3RG78 42-6DL21
1350	Transmitter	3RG78 45-4DL00	3RG78 45-4DL10	3RG78 42-6DL20

1) Often required for applications in NAFTA market.

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation

Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1500	Receiver	3RG78 45-4DM01	3RG78 45-4DM11	3RG78 42-6DM21
1500	Transmitter	3RG78 45-4DM00	3RG78 45-4DM10	3RG78 42-6DM20
1650	Receiver	3RG78 45-4DN01	3RG78 45-4DN11	3RG78 42-6DN21
1650	Transmitter	3RG78 45-4DN00	3RG78 45-4DN10	3RG78 42-6DN20
1800	Receiver	3RG78 45-4DP01	3RG78 45-4DP11	3RG78 42-6DP21
1800	Transmitter	3RG78 45-4DP00	3RG78 45-4DP10	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3RG78 45-4EE01	3RG78 45-4EE11	3RG78 42-6EE21
450	Transmitter	3RG78 45-4EE00	3RG78 45-4EE10	3RG78 42-6EE20
600	Receiver	3RG78 45-4EF01	3RG78 45-4EF11	3RG78 42-6EF21
600	Transmitter	3RG78 45-4EF00	3RG78 45-4EF10	3RG78 42-6EF20
750	Receiver	3RG78 45-4EG01	3RG78 45-4EG11	3RG78 42-6EG21
750	Transmitter	3RG78 45-4EG00	3RG78 45-4EG10	3RG78 42-6EG20
900	Receiver	3RG78 45-4EH01	3RG78 45-4EH11	3RG78 42-6EH21
900	Transmitter	3RG78 45-4EH00	3RG78 45-4EH10	3RG78 42-6EH20
1050	Receiver	3RG78 45-4EJ01	3RG78 45-4EJ11	3RG78 42-6EJ21
1050	Transmitter	3RG78 45-4EJ00	3RG78 45-4EJ10	3RG78 42-6EJ20
1200	Receiver	3RG78 45-4EK01	3RG78 45-4EK11	3RG78 42-6EK21
1200	Transmitter	3RG78 45-4EK00	3RG78 45-4EK10	3RG78 42-6EK20
1350	Receiver	3RG78 45-4EL01	3RG78 45-4EL11	3RG78 42-6EL21
1350	Transmitter	3RG78 45-4EL00	3RG78 45-4EL10	3RG78 42-6EL20
1500	Receiver	3RG78 45-4EM01	3RG78 45-4EM11	3RG78 42-6EM21
1500	Transmitter	3RG78 45-4EM00	3RG78 45-4EM10	3RG78 42-6EM20
1650	Receiver	3RG78 45-4EN01	3RG78 45-4EN11	3RG78 42-6EN21
1650	Transmitter	3RG78 45-4EN00	3RG78 45-4EN10	3RG78 42-6EN20
1800	Receiver	3RG78 45-4EP01	3RG78 45-4EP11	3RG78 42-6EP21
1800	Transmitter	3RG78 45-4EP00	3RG78 45-4EP10	3RG78 42-6EP20
2100	Receiver	3RG78 45-4ER01	3RG78 45-4ER11	3RG78 42-6ER21
2100	Transmitter	3RG78 45-4ER00	3RG78 45-4ER10	3RG78 42-6ER20
2400	Receiver	3RG78 45-4ES01	3RG78 45-4ES11	3RG78 42-6ES21
2400	Transmitter	3RG78 45-4ES00	3RG78 45-4ES10	3RG78 42-6ES20
2700	Receiver	3RG78 45-4ET01	3RG78 45-4ET11	3RG78 42-6ET21
2700	Transmitter	3RG78 45-4ET00	3RG78 45-4ET10	3RG78 42-6ET20
3000	Receiver	3RG78 45-4EU01	3RG78 45-4EU11	3RG78 42-6EU21
3000	Transmitter	3RG78 45-4EU00	3RG78 45-4EU10	3RG78 42-6EU20
Resolution 90 mm				
750	Receiver	3RG78 45-4JG01	3RG78 45-4JG11	3RG78 42-6JG21
750	Transmitter	3RG78 45-4JG00	3RG78 45-4JG10	3RG78 42-6JG20
900	Receiver	3RG78 45-4JH01	3RG78 45-4JH11	3RG78 42-6JH21
900	Transmitter	3RG78 45-4JH00	3RG78 45-4JH10	3RG78 42-6JH20
1050	Receiver	3RG78 45-4JJ01	3RG78 45-4JJ11	3RG78 42-6JJ21
1050	Transmitter	3RG78 45-4JJ00	3RG78 45-4JJ10	3RG78 42-6JJ20
1200	Receiver	3RG78 45-4JK01	3RG78 45-4JK11	3RG78 42-6JK21
1200	Transmitter	3RG78 45-4JK00	3RG78 45-4JK10	3RG78 42-6JK20
1350	Receiver	3RG78 45-4JL01	3RG78 45-4JL11	3RG78 42-6JL21
1350	Transmitter	3RG78 45-4JL00	3RG78 45-4JL10	3RG78 42-6JL20
1500	Receiver	3RG78 45-4JM01	3RG78 45-4JM11	3RG78 42-6JM21
1500	Transmitter	3RG78 45-4JM00	3RG78 45-4JM10	3RG78 42-6JM20
1650	Receiver	3RG78 45-4JN01	3RG78 45-4JN11	3RG78 42-6JN21
1650	Transmitter	3RG78 45-4JN00	3RG78 45-4JN10	3RG78 42-6JN20

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1800	Receiver	3RG78 45-4JP01	3RG78 45-4JP11	3RG78 42-6JP21
1800	Transmitter	3RG78 45-4JP00	3RG78 45-4JP10	3RG78 42-6JP20
2100	Receiver	3RG78 45-4JR01	3RG78 45-4JR11	3RG78 42-6JR21
2100	Transmitter	3RG78 45-4JR00	3RG78 45-4JR10	3RG78 42-6JR20
2400	Receiver	3RG78 45-4JS01	3RG78 45-4JS11	3RG78 42-6JS21
2400	Transmitter	3RG78 45-4JS00	3RG78 45-4JS10	3RG78 42-6JS20
2700	Receiver	3RG78 45-4JT01	3RG78 45-4JT11	3RG78 42-6JT21
2700	Transmitter	3RG78 45-4JT00	3RG78 45-4JT10	3RG78 42-6JT20
3000	Receiver	3RG78 45-4JU01	3RG78 45-4JU11	3RG78 42-6JU21
3000	Transmitter	3RG78 45-4JU00	3RG78 45-4JU10	3RG78 42-6JU20

Light arrays with Brad Harrison connection

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 45-4MH01
4 beams	300	Transmitter	3RG78 45-4MH00
3 beams	400	Receiver	3RG78 45-4PG01
3 beams	400	Transmitter	3RG78 45-4PG00
2 beams	500	Receiver	3RG78 45-4SE01
2 beams	500	Transmitter	3RG78 45-4SE00
Range 6 to 60 m			
4 beams	300	Receiver	3RG78 45-4MH51
4 beams	300	Transmitter	3RG78 45-4MH50
3 beams	400	Receiver	3RG78 45-4PG51
3 beams	400	Transmitter	3RG78 45-4PG50
2 beams	500	Receiver	3RG78 45-4SE51
2 beams	500	Transmitter	3RG78 45-4SE50

Transceiver with Brad-Harrison connection

Number of beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG7845-4TE01
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Light curtains with cable glands 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3RG78 45-6BB01	-	3RG78 42-6BB21
150	Transmitter	3RG78 45-6BB00	-	3RG78 42-6BB20
225	Receiver	3RG78 45-6BC01	3RG78 45-6BC11	3RG78 42-6BC21
225	Transmitter	3RG78 45-6BC00	3RG78 45-6BC10	3RG78 42-6BC20
300	Receiver	3RG78 45-6BD01	3RG78 45-6BD11	3RG78 42-6BD21
300	Transmitter	3RG78 45-6BD00	3RG78 45-6BD10	3RG78 42-6BD20
450	Receiver	3RG78 45-6BE01	3RG78 45-6BE11	3RG78 42-6BE21
450	Transmitter	3RG78 45-6BE00	3RG78 45-6BE10	3RG78 42-6BE20
600	Receiver	3RG78 45-6BF01	3RG78 45-6BF11	3RG78 42-6BF21
600	Transmitter	3RG78 45-6BF00	3RG78 45-6BF10	3RG78 42-6BF20
750	Receiver	3RG78 45-6BG01	3RG78 45-6BG11	3RG78 42-6BG21
750	Transmitter	3RG78 45-6BG00	3RG78 45-6BG10	3RG78 42-6BG20
900	Receiver	3RG78 45-6BH01	3RG78 45-6BH11	3RG78 42-6BH21
900	Transmitter	3RG78 45-6BH00	3RG78 45-6BH10	3RG78 42-6BH20
1050	Receiver	3RG78 45-6BJ01	3RG78 45-6BJ11	3RG78 42-6BJ21
1050	Transmitter	3RG78 45-6BJ00	3RG78 45-6BJ10	3RG78 42-6BJ20
1200	Receiver	3RG78 45-6BK01	3RG78 45-6BK11	3RG78 42-6BK21
1200	Transmitter	3RG78 45-6BK00	3RG78 45-6BK10	3RG78 42-6BK20
1350	Receiver	3RG78 45-6BL01	3RG78 45-6BL11	3RG78 42-6BL21
1350	Transmitter	3RG78 45-6BL00	3RG78 45-6BL10	3RG78 42-6BL20
1500	Receiver	3RG78 45-6BM01	3RG78 45-6BM11	3RG78 42-6BM21
1500	Transmitter	3RG78 45-6BM00	3RG78 45-6BM10	3RG78 42-6BM20
1650	Receiver	3RG78 45-6BN01	3RG78 45-6BN11	3RG78 42-6BN21
1650	Transmitter	3RG78 45-6BN00	3RG78 45-6BN10	3RG78 42-6BN20
1800	Receiver	3RG78 45-6BP01	3RG78 45-6BP11	3RG78 42-6BP21
1800	Transmitter	3RG78 45-6BP00	3RG78 45-6BP10	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3RG78 45-6DB01	-	3RG78 42-6DB21
150	Transmitter	3RG78 45-6DB00	-	3RG78 42-6DB20
225	Receiver	3RG78 45-6DC01	3RG78 45-6DC11	3RG78 42-6DC21
225	Transmitter	3RG78 45-6DC00	3RG78 45-6DC10	3RG78 42-6DC20
300	Receiver	3RG78 45-6DD01	3RG78 45-6DD11	3RG78 42-6DD21
300	Transmitter	3RG78 45-6DD00	3RG78 45-6DD10	3RG78 42-6DD20
450	Receiver	3RG78 45-6DE01	3RG78 45-6DE11	3RG78 42-6DE21
450	Transmitter	3RG78 45-6DE00	3RG78 45-6DE10	3RG78 42-6DE20
600	Receiver	3RG78 45-6DF01	3RG78 45-6DF11	3RG78 42-6DF21
600	Transmitter	3RG78 45-6DF00	3RG78 45-6DF10	3RG78 42-6DF20
750	Receiver	3RG78 45-6DG01	3RG78 45-6DG11	3RG78 42-6DG21
750	Transmitter	3RG78 45-6DG00	3RG78 45-6DG10	3RG78 42-6DG20
900	Receiver	3RG78 45-6DH01	3RG78 45-6DH11	3RG78 42-6DH21
900	Transmitter	3RG78 45-6DH00	3RG78 45-6DH10	3RG78 42-6DH20
1050	Receiver	3RG78 45-6DJ01	3RG78 45-6DJ11	3RG78 42-6DJ21
1050	Transmitter	3RG78 45-6DJ00	3RG78 45-6DJ10	3RG78 42-6DJ20
1200	Receiver	3RG78 45-6DK01	3RG78 45-6DK11	3RG78 42-6DK21
1200	Transmitter	3RG78 45-6DK00	3RG78 45-6DK10	3RG78 42-6DK20
1350	Receiver	3RG78 45-6DL01	3RG78 45-6DL11	3RG78 42-6DL21
1350	Transmitter	3RG78 45-6DL00	3RG78 45-6DL10	3RG78 42-6DL20

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1500	Receiver	3RG78 45-6DM01	3RG78 45-6DM11	3RG78 42-6DM21
1500	Transmitter	3RG78 45-6DM00	3RG78 45-6DM10	3RG78 42-6DM20
1650	Receiver	3RG78 45-6DN01	3RG78 45-6DN11	3RG78 42-6DN21
1650	Transmitter	3RG78 45-6DN00	3RG78 45-6DN10	3RG78 42-6DN20
1800	Receiver	3RG78 45-6DP01	3RG78 45-6DP11	3RG78 42-6DP21
1800	Transmitter	3RG78 45-6DP00	3RG78 45-6DP10	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3RG78 45-6EE01	3RG78 45-6EE11	3RG78 42-6EE21
450	Transmitter	3RG78 45-6EE00	3RG78 45-6EE10	3RG78 42-6EE20
600	Receiver	3RG78 45-6EF01	3RG78 45-6EF11	3RG78 42-6EF21
600	Transmitter	3RG78 45-6EF00	3RG78 45-6EF10	3RG78 42-6EF20
750	Receiver	3RG78 45-6EG01	3RG78 45-6EG11	3RG78 42-6EG21
750	Transmitter	3RG78 45-6EG00	3RG78 45-6EG10	3RG78 42-6EG20
900	Receiver	3RG78 45-6EH01	3RG78 45-6EH11	3RG78 42-6EH21
900	Transmitter	3RG78 45-6EH00	3RG78 45-6EH10	3RG78 42-6EH20
1050	Receiver	3RG78 45-6EJ01	3RG78 45-6EJ11	3RG78 42-6EJ21
1050	Transmitter	3RG78 45-6EJ00	3RG78 45-6EJ10	3RG78 42-6EJ20
1200	Receiver	3RG78 45-6EK01	3RG78 45-6EK11	3RG78 42-6EK21
1200	Transmitter	3RG78 45-6EK00	3RG78 45-6EK10	3RG78 42-6EK20
1350	Receiver	3RG78 45-6EL01	3RG78 45-6EL11	3RG78 42-6EL21
1350	Transmitter	3RG78 45-6EL00	3RG78 45-6EL10	3RG78 42-6EL20
1500	Receiver	3RG78 45-6EM01	3RG78 45-6EM11	3RG78 42-6EM21
1500	Transmitter	3RG78 45-6EM00	3RG78 45-6EM10	3RG78 42-6EM20
1650	Receiver	3RG78 45-6EN01	3RG78 45-6EN11	3RG78 42-6EN21
1650	Transmitter	3RG78 45-6EN00	3RG78 45-6EN10	3RG78 42-6EN20
1800	Receiver	3RG78 45-6EP01	3RG78 45-6EP11	3RG78 42-6EP21
1800	Transmitter	3RG78 45-6EP00	3RG78 45-6EP10	3RG78 42-6EP20
2100	Receiver	3RG78 45-6ER01	3RG78 45-6ER11	3RG78 42-6ER21
2100	Transmitter	3RG78 45-6ER00	3RG78 45-6ER10	3RG78 42-6ER20
2400	Receiver	3RG78 45-6ES01	3RG78 45-6ES11	3RG78 42-6ES21
2400	Transmitter	3RG78 45-6ES00	3RG78 45-6ES10	3RG78 42-6ES20
2700	Receiver	3RG78 45-6ET01	3RG78 45-6ET11	3RG78 42-6ET21
2700	Transmitter	3RG78 45-6ET00	3RG78 45-6ET10	3RG78 42-6ET20
3000	Receiver	3RG78 45-6EU01	3RG78 45-6EU11	3RG78 42-6EU21
3000	Transmitter	3RG78 45-6EU00	3RG78 45-6EU10	3RG78 42-6EU20
Resolution 90 mm				
750	Receiver	3RG78 45-6JG01	3RG78 45-6JG11	3RG78 42-6JG21
750	Transmitter	3RG78 45-6JG00	3RG78 45-6JG10	3RG78 42-6JG20
900	Receiver	3RG78 45-6JH01	3RG78 45-6JH11	3RG78 42-6JH21
900	Transmitter	3RG78 45-6JH00	3RG78 45-6JH10	3RG78 42-6JH20
1050	Receiver	3RG78 45-6JJ01	3RG78 45-6JJ11	3RG78 42-6JJ21
1050	Transmitter	3RG78 45-6JJ00	3RG78 45-6JJ10	3RG78 42-6JJ20
1200	Receiver	3RG78 45-6JK01	3RG78 45-6JK11	3RG78 42-6JK21
1200	Transmitter	3RG78 45-6JK00	3RG78 45-6JK10	3RG78 42-6JK20
1350	Receiver	3RG78 45-6JL01	3RG78 45-6JL11	3RG78 42-6JL21
1350	Transmitter	3RG78 45-6JL00	3RG78 45-6JL10	3RG78 42-6JL20
1500	Receiver	3RG78 45-6JM01	3RG78 45-6JM11	3RG78 42-6JM21
1500	Transmitter	3RG78 45-6JM00	3RG78 45-6JM10	3RG78 42-6JM20
1650	Receiver	3RG78 45-6JN01	3RG78 45-6JN11	3RG78 42-6JN21
1650	Transmitter	3RG78 45-6JN00	3RG78 45-6JN10	3RG78 42-6JN20

Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation Function package Standard, transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1800	Receiver	3RG78 45-6JP01	3RG78 45-6JP11	3RG78 42-6JP21
1800	Transmitter	3RG78 45-6JP00	3RG78 45-6JP10	3RG78 42-6JP20
2100	Receiver	3RG78 45-6JR01	3RG78 45-6JR11	3RG78 42-6JR21
2100	Transmitter	3RG78 45-6JR00	3RG78 45-6JR10	3RG78 42-6JR20
2400	Receiver	3RG78 45-6JS01	3RG78 45-6JS11	3RG78 42-6JS21
2400	Transmitter	3RG78 45-6JS00	3RG78 45-6JS10	3RG78 42-6JS20
2700	Receiver	3RG78 45-6JT01	3RG78 45-6JT11	3RG78 42-6JT21
2700	Transmitter	3RG78 45-6JT00	3RG78 45-6JT10	3RG78 42-6JT20
3000	Receiver	3RG78 45-6JU01	3RG78 45-6JU11	3RG78 42-6JU21
3000	Transmitter	3RG78 45-6JU00	3RG78 45-6JU10	3RG78 42-6JU20

Light arrays, transistor output with cable gland

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3RG78 45-6MH01
4 beams	300	Transmitter	3RG78 45-6MH00
3 beams	400	Receiver	3RG78 45-6PG01
3 beams	400	Transmitter	3RG78 45-6PG00
2 beams	500	Receiver	3RG78 45-6SE01
2 beams	500	Transmitter	3RG78 45-6SE00
Range 6 to 60 m			
4 beams	300	Receiver	3RG78 45-6MH51
4 beams	300	Transmitter	3RG78 45-6MH50
3 beams	400	Receiver	3RG78 45-6PG51
3 beams	400	Transmitter	3RG78 45-6PG50
2 beams	500	Receiver	3RG78 45-6SE51
2 beams	500	Transmitter	3RG78 45-6SE50

Transceiver with cable gland

Number of beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3RG7845-6TE01
Mirror for Transceiver			3RG78 48-1TL

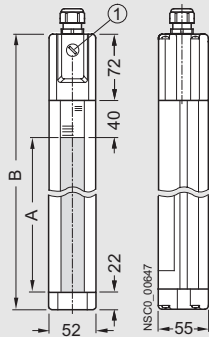
Light curtains and arrays SIMATIC FS400

Series 3RG78 45, Type 4

Internal evaluation
Function package Standard, transistor output

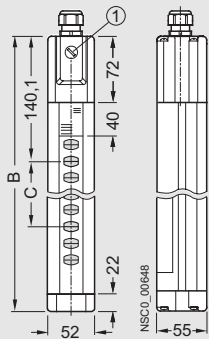
Dimension drawings

3RG78 45 standard light curtains, 3RG78 45 light arrays



- ① Screw cap Pg 9 (only Receiver, for local interface)
- A Protective field height
(see „Selection and ordering data“ tables)
- B Total length = protective field height
A + 134 mm

3RG78 45 light arrays, additional dimensions Additional dimensions for light arrays only:



Type	B	C	Beams
3RG78 45-..M	1184	300	4
3RG78 45-..P	1034	400	3
3RG78 45-..S	734	500	2

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation, ASIsafe

Overview



Light curtains and light arrays 3SF78 44 for ASIsafe with integrated evaluation for Type 4 to IEC/EN 61496-1, -2

- with function packages "Blanking", "Muting" and "Sequence control",
- Resolution 14, 30 and 50 mm,
- Protective field heights from 150 to 3000 mm,
- 2, 3 or 4 beam light arrays,
- Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)

Two standard mounting brackets (3RG78 48-0AB) are supplied with all devices also available as accessories, see page 1/83).

Program overview 3SF78 44 (ASIsafe)

Device type	Function package	Output	Connection type	for light curtains: Resolution for light arrays: Range		LED indicator light	Page
				14 mm	30 mm		
Light curtains	Blanking	ASIsafe	ASIsafe	✓	✓	–	1/50
Light curtains	Muting	ASIsafe	ASIsafe	–	✓	–	1/51
Light curtains	Muting	ASIsafe	ASIsafe	–	✓	with	1/52
Light arrays	Muting	ASIsafe	ASIsafe	0.8 m ... 18 m; 6 ... 70 m		–	1/52
Light arrays	Muting	ASIsafe	ASIsafe	0.8 m ... 18 m		with	1/52
Transceiver	Muting	ASIsafe	ASIsafe	6.5 m		with and without	1/53
Light curtains	Sequence control	ASIsafe	ASIsafe	✓	✓	–	1/54

More ASIsafe light curtains and arrays for external evaluation: see pages 1/60 and 1/63.

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation, ASIsafe

Technical Specifications

Type	3SF78 44
Safety category to IEC/EN 61496-1, -2	Type 4
Protective field height	
• 14 and 30 mm resolutions	150 ... 1800 mm
• 50 mm resolution	450 ... 3000 mm
Protective field width, sensing field	
• 14 mm resolution	0 ... 6 m
• 30 and 50 mm resolutions	0 ... 18 m
Detection capability (resolution)	14 mm, 30 mm, 50 mm
Supply voltage (transmitter and receiver)	24 V DC $\pm$ 20 % (external power pack is required with reliable mains isolation and compensation of voltage dips of 20 ms, min. 1 A current reserve)
Residual ripple of supply voltage	< 5%
Current consumption	
• Transmitter	75 mA
• Receiver	160 mA (without external load)
Common value for external fuse in the supply line for emitter and receiver	4 A
Wave length	880 nm (infrared)
Synchronization	Optical between transmitter and receiver
Ambient temperature	
• Operation	0 ... +50 °C
• Storage	-25 ... +70 °C
Air humidity	15 ... 95%
Degree of protection	IP65
Safety class to DIN VDE 0106	III
Vibration resistance	5 g, 10 ... 55 Hz to IEC/EN 60068-2-6
Shock resistance	10 g, 16 ms to IEC/EN 60068-2-29

Signal inputs and outputs (local socket, optional)

Signal inputs	
• Restart inhibit unlocking	1 button with 1 NO contact (floating)
- min. operating time	300 ms
- max. operating time	4 s
• Teach-in	2-pin key-operated switch (selector switch) floating
- Simultaneity	< 500 ms
Voltage output (for command devices or safety sensors only)	24 V DC $\pm$ 20 %, max 0.5 A

Receiver/Transmitter machine interface, ASIsafe

OSSDs safety switching outputs	4 bit AS-i data		
	Minimum	Typical	Maximum
Permissible cable length	-	-	100 m
Restart time after beam interruption	-	140 ms	-
Slave address area	1	-	31
Slave address area (WE)	0 (ex works)		
ID code / IO code transmitter	-		
ID code receiver	B		
IO code receiver	0		
AS-i profile	Secure slave		
Cycle time in accordance with AS-I specification	5 ms		
OSSD response time	Depends on number of beams, see operating instructions		
Additional response time of the AS-i system	40 ms		

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Blanking, ASIsafe

Selection and ordering data

Light curtains

Protective field height	Version	Standard device 14 mm Resolution	Standard device 30 mm Resolution
mm		Order No.	Order No.
Resolution 14 mm and 30 mm			
300	Receiver	3SF78 44-6BB04-0SS1	3SF78 44-6BD04-0SS1
300	Transmitter	3SF78 44-6SB04-0SS0	3SF78 44-6SD04-0SS0
450	Receiver	3SF78 44-6BB06-0SS1	3SF78 44-6BD06-0SS1
450	Transmitter	3SF78 44-6SB06-0SS0	3SF78 44-6SD06-0SS0
600	Receiver	3SF78 44-6BB08-0SS1	3SF78 44-6BD08-0SS1
600	Transmitter	3SF78 44-6SB08-0SS0	3SF78 44-6SD08-0SS0
750	Receiver	3SF78 44-6BB11-0SS1	3SF78 44-6BD11-0SS1
750	Transmitter	3SF78 44-6SB11-0SS0	3SF78 44-6SD11-0SS0
900	Receiver	3SF78 44-6BB13-0SS1	3SF78 44-6BD13-0SS1
900	Transmitter	3SF78 44-6SB13-0SS0	3SF78 44-6SD13-0SS0
1050	Receiver	3SF78 44-6BB15-0SS1	3SF78 44-6BD15-0SS1
1050	Transmitter	3SF78 44-6SB15-0SS0	3SF78 44-6SD15-0SS0
1200	Receiver	3SF78 44-6BB17-0SS1	3SF78 44-6BD17-0SS1
1200	Transmitter	3SF78 44-6SB17-0SS0	3SF78 44-6SD17-0SS0
1350	Receiver	on request	3SF78 44-6BD20-0SS1
1350	Transmitter	on request	3SF78 44-6SD20-0SS0
1500	Receiver	on request	3SF78 44-6BD22-0SS1
1500	Transmitter	on request	3SF78 44-6SD22-0SS0
1650	Receiver	on request	3SF78 44-6BD24-0SS1
1650	Transmitter	on request	3SF78 44-6SD24-0SS0
1800	Receiver	on request	3SF78 44-6BD26-0SS1
1800	Transmitter	on request	3SF78 44-6SD26-0SS0

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Muting, ASIsafe

Light curtains

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3SF78 44-6MD04-0SS1	on request	3RG78 42-6DD21
300	Transmitter	3SF78 44-6SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3SF78 44-6MD06-0SS1	on request	3RG78 42-6DE21
450	Transmitter	3SF78 44-6SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3SF78 44-6MD08-0SS1	on request	3RG78 42-6DF21
600	Transmitter	3SF78 44-6SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3SF78 44-6MD11-0SS1	on request	3RG78 42-6DG21
750	Transmitter	3SF78 44-6SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3SF78 44-6MD13-0SS1	on request	3RG78 42-6DH21
900	Transmitter	3SF78 44-6SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3SF78 44-6MD15-0SS1	on request	3RG78 42-6DJ21
1050	Transmitter	3SF78 44-6SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3SF78 44-6MD17-0SS1	on request	3RG78 42-6DK21
1200	Transmitter	3SF78 44-6SD17-0SS0	on request	3RG78 42-6DK20
1350	Receiver	3SF78 44-6MD20-0SS1	on request	3RG78 42-6DL21
1350	Transmitter	3SF78 44-6SD20-0SS0	on request	3RG78 42-6DL20
1500	Receiver	3SF78 44-6MD22-0SS1	on request	3RG78 42-6DM21
1500	Transmitter	3SF78 44-6SD22-0SS0	on request	3RG78 42-6DM20
1650	Receiver	3SF78 44-6MD24-0SS1	on request	3RG78 42-6DN21
1650	Transmitter	3SF78 44-6SD24-0SS0	on request	3RG78 42-6DN20
1800	Receiver	3SF78 44-6MD26-0SS1	on request	3RG78 42-6DP21
1800	Transmitter	3SF78 44-6SD26-0SS0	on request	3RG78 42-6DP20

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Muting, ASIsafe

Light curtains, integrated LED indicator light

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3SF78 44-6MD04-0KS1	on request	3RG78 42-6DD21
300	Transmitter	3SF78 44-6SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3SF78 44-6MD06-0KS1	on request	3RG78 42-6DE21
450	Transmitter	3SF78 44-6SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3SF78 44-6MD08-0KS1	on request	3RG78 42-6DF21
600	Transmitter	3SF78 44-6SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3SF78 44-6MD11-0KS1	on request	3RG78 42-6DG21
750	Transmitter	3SF78 44-6SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3SF78 44-6MD13-0KS1	on request	3RG78 42-6DH21
900	Transmitter	3SF78 44-6SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3SF78 44-6MD15-0KS1	on request	3RG78 42-6DJ21
1050	Transmitter	3SF78 44-6SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3SF78 44-6MD17-0KS1	on request	3RG78 42-6DK21
1200	Transmitter	3SF78 44-6SD17-0SS0	on request	3RG78 42-6DK20

Light arrays

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3SF78 44-6MM50-0SS1
4 beams	300	Transmitter	3SF78 44-6SM50-0SS0
3 beams	400	Receiver	3SF78 44-6MP50-0SS1
3 beams	400	Transmitter	3SF78 44-6SP50-0SS0
2 beams	500	Receiver	3SF78 44-6MS50-0SS1
2 beams	500	Transmitter	3SF78 44-6SS50-0SS0
Range 6 to 70 m			
4 beams	300	Receiver	3SF78 44-6MM51-0SS1
4 beams	300	Transmitter	3SF78 44-6SM51-0SS0
3 beams	400	Receiver	3SF78 44-6MP51-0SS1
3 beams	400	Transmitter	3SF78 44-6SP51-0SS0
2 beams	500	Receiver	3SF78 44-6MS51-0SS1
2 beams	500	Transmitter	3SF78 44-6SS51-0SS0

Light arrays, integrated LED indicator light

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 to 18 m			
4 beams	300	Receiver	3SF78 44-6MM50-0KS1
4 beams	300	Transmitter	3SF78 44-6SM50-0SS0
3 beams	400	Receiver	3SF78 44-6MP50-0KS1
3 beams	400	Transmitter	3SF78 44-6SP50-0SS0
2 beams	500	Receiver	3SF78 44-6MS50-0KS1
2 beams	500	Transmitter	3SF78 44-6SS50-0SS0

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Muting, ASIsafe**Transceiver**

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3SF78 44-6MS50-0ST0
2 beams	500	Transceiver with integrated LED indicator light	3SF78 44-6MS50-0MT0
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Sequence control, ASIsafe

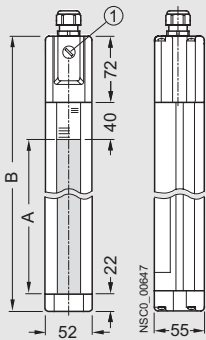
Light curtains

Protective field height	Version	Standard device 14 mm Resolution	Standard device 30 mm Resolution
mm		Order No.	Order No.
Resolution 14 mm and 30 mm			
300	Receiver	3SF78 44-6TB04-0SS1	3SF78 44-6TD04-0SS1
300	Transmitter	3SF78 44-6SB04-0SS0	3SF78 44-6SD04-0SS0
450	Receiver	3SF78 44-6TB06-0SS1	3SF78 44-6TD06-0SS1
450	Transmitter	3SF78 44-6SB06-0SS0	3SF78 44-6SD06-0SS0
600	Receiver	3SF78 44-6TB08-0SS1	3SF78 44-6TD08-0SS1
600	Transmitter	3SF78 44-6SB08-0SS0	3SF78 44-6SD08-0SS0
750	Receiver	3SF78 44-6TB11-0SS1	3SF78 44-6TD11-0SS1
750	Transmitter	3SF78 44-6SB11-0SS0	3SF78 44-6SD11-0SS0
900	Receiver	3SF78 44-6TB13-0SS1	3SF78 44-6TD13-0SS1
900	Transmitter	3SF78 44-6SB13-0SS0	3SF78 44-6SD13-0SS0

Additional products on request

Dimension drawings

3SF78 44 light curtains and light arrays 3SF78 44 Standard

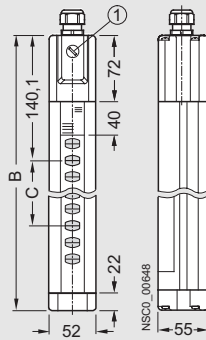


① Screw cap Pg 9 (only Receiver, for local interface)

A Protective field height
(see „Selection and ordering data“ tables)

B Total length = protective field height
A + 134 mm

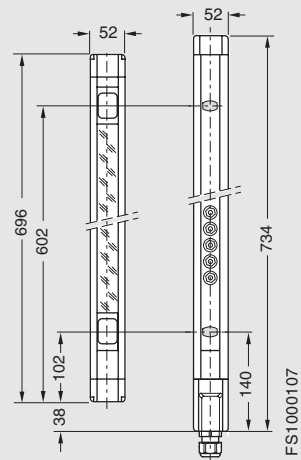
Light arrays 3SF78 44, additional dimensions



Additional dimensions for light arrays only:

Type	B	C	Beams
3SF78 44-...M	1184	300	4
3SF78 44-...P	1034	400	3
3SF78 44-...S	734	500	2

Mirror 3RG78 48-1TL (left) and Muting Transceiver (right)



FS1000107

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation, PROFIsafe

Overview



Light curtains and arrays 3SF78 44 for PROFIsafe with integrated evaluation for type 4 to IEC/EN 61496-1, -2

- with function packages "Blanking", "Muting" and "Sequence control",
- Resolution 14, 30 and 50 mm,
- Protective field heights from 150 mm to 3000 mm,
- 2, 3 or 4 beam light arrays,
- Cascading of host and guest devices for greater protective field heights and lengths or for an angular arrangement as an option.

Two standard mounting brackets (3RG78 48-0AB) are supplied with all devices also available as accessories, see page 1/83).

Other versions, which are not included in the ordering data, are available on request.

Program overview 3SF78 44 (PROFIsafe)

Device type	Function package	Output	Connection type	for light curtains: Resolution for light arrays and transceivers: Range			LED indicator light	Page
				14 mm	30 mm	50 mm		
Light curtains	Blanking	PROFIsafe	PROFIsafe	✓	✓	–	–	1/57
Light curtains	Muting	PROFIsafe	PROFIsafe	–	–	✓	–	1/58
Light arrays	Muting	PROFIsafe	PROFIsafe	0.8 m ... 18 m			–	1/58
Transceiver	Muting	PROFIsafe	PROFIsafe	6.5 m			with or without	1/58
Light curtains	Sequence control	PROFIsafe	PROFIsafe	✓	–	–	–	1/59

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation, PROFIsafe

Technical data

Type	3SF78 44
Safety category to IEC/EN 61496-1, -2	Type 4
Protective field height	
• for resolution 14 and 30 mm	150 ... 1800 mm
• for resolution 50 mm	450 ... 3000 mm
Protective field width, range	
• for resolution 14 mm	0 ... 6 m
• for resolution 30 and 50 mm	0 ... 18 m
Resolutions	14 mm, 30 mm, 50 mm
Supply voltage (transmitter and receiver)	24 V DC $\pm$ 20 %
Wavelength	880 nm (infrared)
Synchronization	optical between transmitter and receiver
Ambient temperature	
• Operation	0 ... +50 °C
• Storage	-20 ... +60 °C
Relative air humidity	15 ... 95%, without condensation
Degree of protection	IP65
Safety class to DIN VDE 0106	III
Vibration resistance	5 g, 10 ... 55 Hz to IEC/EN 60068-2-6
Shock resistance	10 g, 16 ms to IEC/EN 60068-2-29

Signal inputs and outputs (local socket, optional)

Signal inputs	
• Restart inhibit unlocking	1 button with 1 NO contact (floating)
- min. operating time	300 ms
- max. operating time	4 s
• Teach-in	2-pin key-operated switch (selector switch) floating
- Simultaneity	< 500 ms
Voltage output (for command devices or safety sensors only)	24 V DC $\pm$ 20 %, max 0.5 A

General system data of PROFIsafe receiver

Safety category	• Type 4 to IEC/EN 61496-1, -2 • SIL 3 to IEC 61508
Supply voltage U_V	DC 24 V $\pm$ 20 %
Residual ripple of supply voltage U_V	$\pm$ 5% within limits of U_V , w/ external power supply and secure isolation from mains
Current consumption at	
• $U_V = 28.8$ V DC, +20%	150 mA
• $U_V = 24$ V DC	160 mA
• $U_V = 19.2$ V DC, -20%	170 mA
PROFIBUS	
• Data rate	9.6 kBd ... 12 MBd
• Port	M12 plug, b-coded
Additional response time of the PROFIsafe system (receiver)	20 ms
Cable length	
• PROFIBUS output	0.2 m
• PROFIBUS input	0.4 m
• Power supply	0.6 m
Length of supply cable, max.	< 100 m

Type 3SF78 44

PROFIsafe services

Version of PROFIsafe driver	V2, supports PROFIsafe profiles V1 and V2
Cyclic data	4 user data bytes input data 4 user data bytes output data
Acyclic data	To read the switching status of the individual beams
Parameter backup in F-CPU through Proxy function block for	• S7-315F • S7-317F • S7-416F
Number of parameter sets, toggle with safe program in F-CPU	max. 255, depends on available memory on F-CPU
Restart delay is the larger of the following values	• Watchdog time in F-CPU +20 ms • Restart delay of receiver

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Blanking, PROFIsafe

Selection and ordering data

Light curtains 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
300	Receiver	3SF78 44-8BB04-0SS1	3SF78 44-8BB04-1SS1	3RG78 42-6BD21
300	Transmitter	3SF78 44-6SB04-0SS0	3SF78 44-6SB04-1SS0	3RG78 42-6BD20
450	Receiver	3SF78 44-8BB06-0SS1	3SF78 44-8BB06-1SS1	3RG78 42-6BE21
450	Transmitter	3SF78 44-6SB06-0SS0	3SF78 44-6SB06-1SS0	3RG78 42-6BE20
600	Receiver	3SF78 44-8BB08-0SS1	3SF78 44-8BB08-1SS1	3RG78 42-6BF21
600	Transmitter	3SF78 44-6SB08-0SS0	3SF78 44-6SB08-1SS0	3RG78 42-6BF20
750	Receiver	3SF78 44-8BB11-0SS1	3SF78 44-8BB11-1SS1	3RG78 42-6BG21
750	Transmitter	3SF78 44-6SB11-0SS0	3SF78 44-6SB11-1SS0	3RG78 42-6BG20
900	Receiver	3SF78 44-8BB13-0SS1	3SF78 44-8BB13-1SS1	3RG78 42-6BH21
900	Transmitter	3SF78 44-6SB13-0SS0	3SF78 44-6SB13-1SS0	3RG78 42-6BH20
1050	Receiver	3SF78 44-8BB15-0SS1	3SF78 44-8BB15-1SS1	3RG78 42-6BJ21
1050	Transmitter	3SF78 44-6SB15-0SS0	3SF78 44-6SB15-1SS0	3RG78 42-6BJ20
1200	Receiver	3SF78 44-8BB17-0SS1	3SF78 44-8BB17-1SS1	3RG78 42-6BK21
1200	Transmitter	3SF78 44-6SB17-0SS0	3SF78 44-6SB17-1SS0	3RG78 42-6BK20
1350	Receiver	3SF78 44-8BB20-0SS1	3SF78 44-8BB20-1SS1	3RG78 42-6BL21
1350	Transmitter	3SF78 44-6SB20-0SS0	3SF78 44-6SB20-1SS0	3RG78 42-6BL20
1500	Receiver	3SF78 44-8BB22-0SS1	3SF78 44-8BB22-1SS1	3RG78 42-6BM21
1500	Transmitter	3SF78 44-6SB22-0SS0	3SF78 44-6SB22-1SS0	3RG78 42-6BM20
1650	Receiver	3SF78 44-8BB24-0SS1	3SF78 44-8BB24-1SS1	3RG78 42-6BN21
1650	Transmitter	3SF78 44-6SB24-0SS0	3SF78 44-6SB24-1SS0	3RG78 42-6BN20
1800	Receiver	3SF78 44-8BB26-0SS1	3SF78 44-8BB26-1SS1	3RG78 42-6BP21
1800	Transmitter	3SF78 44-6SB26-0SS0	3SF78 44-6SB26-1SS0	3RG78 42-6BP20
Resolution 30 mm				
300	Receiver	3SF78 44-8BD04-0SS1	3SF78 44-8BD04-1SS1	3RG78 42-6DD21
300	Transmitter	3SF78 44-6SD04-0SS0	3SF78 44-6SD04-1SS0	3RG78 42-6DD20
450	Receiver	3SF78 44-8BD06-0SS1	3SF78 44-8BD06-1SS1	3RG78 42-6DE21
450	Transmitter	3SF78 44-6SD06-0SS0	3SF78 44-6SD06-1SS0	3RG78 42-6DE20
600	Receiver	3SF78 44-8BD08-0SS1	3SF78 44-8BD08-1SS1	3RG78 42-6DF21
600	Transmitter	3SF78 44-6SD08-0SS0	3SF78 44-6SD08-1SS0	3RG78 42-6DF20
750	Receiver	3SF78 44-8BD11-0SS1	3SF78 44-8BD11-1SS1	3RG78 42-6DG21
750	Transmitter	3SF78 44-6SD11-0SS0	3SF78 44-6SD11-1SS0	3RG78 42-6DG20
900	Receiver	3SF78 44-8BD13-0SS1	3SF78 44-8BD13-1SS1	3RG78 42-6DH21
900	Transmitter	3SF78 44-6SD13-0SS0	3SF78 44-6SD13-1SS0	3RG78 42-6DH20
1050	Receiver	3SF78 44-8BD15-0SS1	3SF78 44-8BD15-1SS1	3RG78 42-6DJ21
1050	Transmitter	3SF78 44-6SD15-0SS0	3SF78 44-6SD15-1SS0	3RG78 42-6DJ20
1200	Receiver	3SF78 44-8BD17-0SS1	3SF78 44-8BD17-1SS1	3RG78 42-6DK21
1200	Transmitter	3SF78 44-6SD17-0SS0	3SF78 44-6SD17-1SS0	3RG78 42-6DK20
1350	Receiver	3SF78 44-8BD20-0SS1	3SF78 44-8BD20-1SS1	3RG78 42-6DL21
1350	Transmitter	3SF78 44-6SD20-0SS0	3SF78 44-6SD20-1SS0	3RG78 42-6DL20
1500	Receiver	3SF78 44-8BD22-0SS1	3SF78 44-8BD22-1SS1	3RG78 42-6DM21
1500	Transmitter	3SF78 44-6SD22-0SS0	3SF78 44-6SD22-1SS0	3RG78 42-6DM20
1650	Receiver	3SF78 44-8BD24-0SS1	3SF78 44-8BD24-1SS1	3RG78 42-6DN21
1650	Transmitter	3SF78 44-6SD24-0SS0	3SF78 44-6SD24-1SS0	3RG78 42-6DN20
1800	Receiver	3SF78 44-8BD26-0SS1	3SF78 44-8BD26-1SS1	3RG78 42-6DP21
1800	Transmitter	3SF78 44-6SD26-0SS0	3SF78 44-6SD26-1SS0	3RG78 42-6DP20

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

Internal evaluation
Function package Muting, PROFIsafe

Light curtains

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
300	Receiver	3SF78 44-8MD04-0SS1	on request	3RG78 42-6DD21
300	Transmitter	3SF78 44-6SD04-0SS0	on request	3RG78 42-6DD20
450	Receiver	3SF78 44-8MD06-0SS1	on request	3RG78 42-6DE21
450	Transmitter	3SF78 44-6SD06-0SS0	on request	3RG78 42-6DE20
600	Receiver	3SF78 44-8MD08-0SS1	on request	3RG78 42-6DF21
600	Transmitter	3SF78 44-6SD08-0SS0	on request	3RG78 42-6DF20
750	Receiver	3SF78 44-8MD11-0SS1	on request	3RG78 42-6DG21
750	Transmitter	3SF78 44-6SD11-0SS0	on request	3RG78 42-6DG20
900	Receiver	3SF78 44-8MD13-0SS1	on request	3RG78 42-6DH21
900	Transmitter	3SF78 44-6SD13-0SS0	on request	3RG78 42-6DH20
1050	Receiver	3SF78 44-8MD15-0SS1	on request	3RG78 42-6DJ21
1050	Transmitter	3SF78 44-6SD15-0SS0	on request	3RG78 42-6DJ20
1200	Receiver	3SF78 44-8MD17-0SS1	on request	3RG78 42-6DK21
1200	Transmitter	3SF78 44-6SD17-0SS0	on request	3RG78 42-6DK20
1350	Receiver	3SF78 44-8MD20-0SS1	on request	3RG78 42-6DL21
1350	Transmitter	3SF78 44-6SD20-0SS0	on request	3RG78 42-6DL20
1500	Receiver	3SF78 44-8MD22-0SS1	on request	3RG78 42-6DM21
1500	Transmitter	3SF78 44-6SD22-0SS0	on request	3RG78 42-6DM20
1650	Receiver	3SF78 44-8MD24-0SS1	on request	3RG78 42-6DN21
1650	Transmitter	3SF78 44-6SD24-0SS0	on request	3RG78 42-6DN20
1800	Receiver	3SF78 44-8MD26-0SS1	on request	3RG78 42-6DP21
1800	Transmitter	3SF78 44-6SD26-0SS0	on request	3RG78 42-6DP20

Light arrays

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 0.8 m to 18 m			
4 beams	300	Receiver	3SF78 44-8MM50-0SS1
4 beams	300	Transmitter	3SF78 44-6SM50-0SS0
3 beams	400	Receiver	3SF78 44-8MP50-0SS1
3 beams	400	Transmitter	3SF78 44-6SP50-0SS0
2 beams	500	Receiver	3SF78 44-8MS50-0SS1
2 beams	500	Transmitter	3SF78 44-6SS50-0SS0

Transceiver PROFIsafe

No. of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3SF78 44-8MS50-0ST0
2 beams	500	Transceiver with integrated LED indicator light	3SF78 44-8MS50-0MT0
Mirror for Transceiver			3RG78 48-1TL

Light curtains and arrays SIMATIC FS400

Series 3SF78 44, Type 4

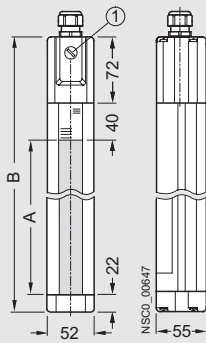
Internal evaluation
Function package Sequence Control, PROFIsafe

Light curtains 

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	
Resolution 14 mm				
300	Receiver	3SF78 44-8TB04-0SS1	3SF78 44-8TB04-1SS1	3RG78 42-6BD21
300	Transmitter	3SF78 44-6SB04-0SS0	3SF78 44-6SB04-1SS0	3RG78 42-6BD20
450	Receiver	3SF78 44-8TB06-0SS1	3SF78 44-8TB06-1SS1	3RG78 42-6BE21
450	Transmitter	3SF78 44-6SB06-0SS0	3SF78 44-6SB06-1SS0	3RG78 42-6BE20
600	Receiver	3SF78 44-8TB08-0SS1	3SF78 44-8TB08-1SS1	3RG78 42-6BF21
600	Transmitter	3SF78 44-6SB08-0SS0	3SF78 44-6SB08-1SS0	3RG78 42-6BF20
750	Receiver	3SF78 44-8TB11-0SS1	3SF78 44-8TB11-1SS1	3RG78 42-6BG21
750	Transmitter	3SF78 44-6SB11-0SS0	3SF78 44-6SB11-1SS0	3RG78 42-6BG20
900	Receiver	3SF78 44-8TB13-0SS1	3SF78 44-8TB13-1SS1	3RG78 42-6BH21
900	Transmitter	3SF78 44-6SB13-0SS0	3SF78 44-6SB13-1SS0	3RG78 42-6BH20

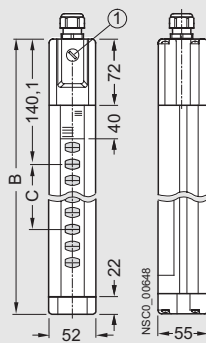
Dimension drawings

3SF78 44 standard light curtains and light arrays



- ① Screw cap Pg 9
(receiver only, for local interface)
- A Protective field height
(see selection and ordering data)
- B Total length= protective field height
A + 134 mm

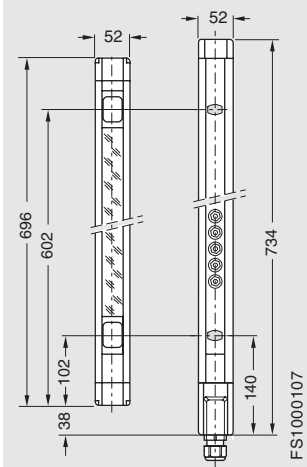
3SF78 44 light arrays, additional dimensions



Additional dimensions for light arrays only:

Type	B	C	Beams
3SF78 44-..M	1184	300	4
3SF78 44-..P	1034	400	3
3SF78 44-..S	734	500	2

Mirror 3RG78 48-1TL (left) and muting Transmitter (right)

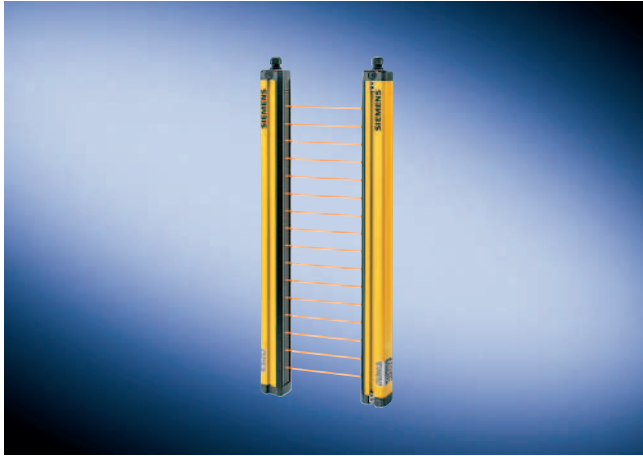


Light curtains and arrays SIMATIC FS400

Series 3SF78 42, Type 4

External evaluation
ASIsafe

Overview



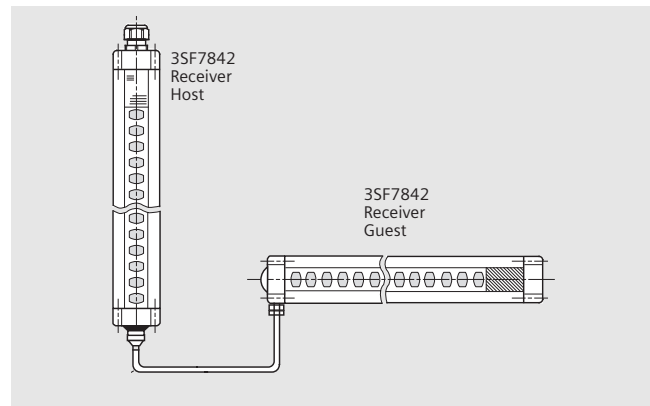
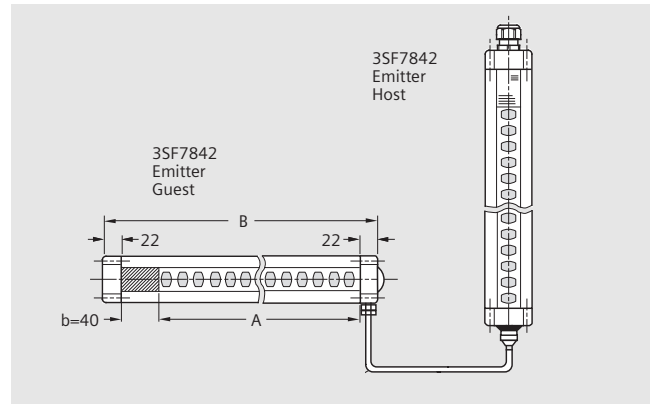
Light curtains and light arrays 3SF78 42 for Category 4 according to EN 954-1

- Resolution 14, 30, 50 and 90 mm,
- Protective field heights from 150 to 3000 mm,
- 2, 3 or 4 beam light arrays,
- Connection to AS-Interface.

Cascading of host and guest devices for greater protective field heights and lengths or for an angular arrangement as an option.

Two standard mounting brackets (3RG78 48-0AB) are supplied with all devices 3SF78 42 (also available as accessories, see page 1/83).

Design



Host/Guest: cascading of basic device/follow-up device

Program overview 3SF78 42 (ASIsafe)

Device type	Function package	Output	Connection type	for light curtains: Resolution for light arrays and transceivers: Range				Page
				14 mm	30 mm	50 mm	90 mm	
Light curtains	–	ASIsafe	ASIsafe	✓	✓	✓	✓	1/60
Light arrays	–	ASIsafe	ASIsafe	0.8 m ... 18 m; 6 m ... 60 m				1/63
Transceiver	–	ASIsafe	ASIsafe	6.5 m				1/63

Selection and ordering data

Light curtains

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 14 mm				
150	Receiver	3SF78 42-6BB01	-	3RG78 42-6BB21
150	Transmitter	3SF78 42-6BB00	-	3RG78 42-6BB20
225	Receiver	3SF78 42-6BC01	3SF78 42-6BC11	3RG78 42-6BC21
225	Transmitter	3SF78 42-6BC00	3SF78 42-6BC10	3RG78 42-6BC20
300	Receiver	3SF78 42-6BD01	3SF78 42-6BD11	3RG78 42-6BD21
300	Transmitter	3SF78 42-6BD00	3SF78 42-6BD10	3RG78 42-6BD20
450	Receiver	3SF78 42-6BE01	3SF78 42-6BE11	3RG78 42-6BE21
450	Transmitter	3SF78 42-6BE00	3SF78 42-6BE10	3RG78 42-6BE20
600	Receiver	3SF78 42-6BF01	3SF78 42-6BF11	3RG78 42-6BF21
600	Transmitter	3SF78 42-6BF00	3SF78 42-6BF10	3RG78 42-6BF20
750	Receiver	3SF78 42-6BG01	3SF78 42-6BG11	3RG78 42-6BG21

Light curtains and arrays SIMATIC FS400

Series 3SF78 42, Type 4

External evaluation
ASIsafe

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
750	Transmitter	3SF78 42-6BG00	3SF78 42-6BG10	3RG78 42-6BG20
900	Receiver	3SF78 42-6BH01	3SF78 42-6BH11	3RG78 42-6BH21
900	Transmitter	3SF78 42-6BH00	3SF78 42-6BH10	3RG78 42-6BH20
1050	Receiver	3SF78 42-6BJ01	3SF78 42-6BJ11	3RG78 42-6BJ21
1050	Transmitter	3SF78 42-6BJ00	3SF78 42-6BJ10	3RG78 42-6BJ20
1200	Receiver	3SF78 42-6BK01	3SF78 42-6BK11	3RG78 42-6BK21
1200	Transmitter	3SF78 42-6BK00	3SF78 42-6BK10	3RG78 42-6BK20
1350	Receiver	3SF78 42-6BL01	3SF78 42-6BL11	3RG78 42-6BL21
1350	Transmitter	3SF78 42-6BL00	3SF78 42-6BL10	3RG78 42-6BL20
1500	Receiver	3SF78 42-6BM01	3SF78 42-6BM11	3RG78 42-6BM21
1500	Transmitter	3SF78 42-6BM00	3SF78 42-6BM10	3RG78 42-6BM20
1650	Receiver	3SF78 42-6BN01	3SF78 42-6BN11	3RG78 42-6BN21
1650	Transmitter	3SF78 42-6BN00	3SF78 42-6BN10	3RG78 42-6BN20
1800	Receiver	3SF78 42-6BP01	3SF78 42-6BP11	3RG78 42-6BP21
1800	Transmitter	3SF78 42-6BP00	3SF78 42-6BP10	3RG78 42-6BP20
Resolution 30 mm				
150	Receiver	3SF78 42-6DB01	–	3RG78 42-6DB21
150	Transmitter	3SF78 42-6DB00	–	3RG78 42-6DB20
225	Receiver	3SF78 42-6DC01	3SF78 42-6DC11	3RG78 42-6DC21
225	Transmitter	3SF78 42-6DC00	3SF78 42-6DC10	3RG78 42-6DC20
300	Receiver	3SF78 42-6DD01	3SF78 42-6DD11	3RG78 42-6DD21
300	Transmitter	3SF78 42-6DD00	3SF78 42-6DD10	3RG78 42-6DD20
450	Receiver	3SF78 42-6DE01	3SF78 42-6DE11	3RG78 42-6DE21
450	Transmitter	3SF78 42-6DE00	3SF78 42-6DE10	3RG78 42-6DE20
600	Receiver	3SF78 42-6DF01	3SF78 42-6DF11	3RG78 42-6DF21
600	Transmitter	3SF78 42-6DF00	3SF78 42-6DF10	3RG78 42-6DF20
750	Receiver	3SF78 42-6DG01	3SF78 42-6DG11	3RG78 42-6DG21
750	Transmitter	3SF78 42-6DG00	3SF78 42-6DG10	3RG78 42-6DG20
900	Receiver	3SF78 42-6DH01	3SF78 42-6DH11	3RG78 42-6DH21
900	Transmitter	3SF78 42-6DH00	3SF78 42-6DH10	3RG78 42-6DH20
1050	Receiver	3SF78 42-6DJ01	3SF78 42-6DJ11	3RG78 42-6DJ21
1050	Transmitter	3SF78 42-6DJ00	3SF78 42-6DJ10	3RG78 42-6DJ20
1200	Receiver	3SF78 42-6DK01	3SF78 42-6DK11	3RG78 42-6DK21
1200	Transmitter	3SF78 42-6DK00	3SF78 42-6DK10	3RG78 42-6DK20
1350	Receiver	3SF78 42-6DL01	3SF78 42-6DL11	3RG78 42-6DL21
1350	Transmitter	3SF78 42-6DL00	3SF78 42-6DL10	3RG78 42-6DL20
1500	Receiver	3SF78 42-6DM01	3SF78 42-6DM11	3RG78 42-6DM21
1500	Transmitter	3SF78 42-6DM00	3SF78 42-6DM10	3RG78 42-6DM20
1650	Receiver	3SF78 42-6DN01	3SF78 42-6DN11	3RG78 42-6DN21
1650	Transmitter	3SF78 42-6DN00	3SF78 42-6DN10	3RG78 42-6DN20
1800	Receiver	3SF78 42-6DP01	3SF78 42-6DP11	3RG78 42-6DP21
1800	Transmitter	3SF78 42-6DP00	3SF78 42-6DP10	3RG78 42-6DP20
Resolution 50 mm				
450	Receiver	3SF78 42-6EE01	3SF78 42-6EE11	3RG78 42-6EE21
450	Transmitter	3SF78 42-6EE00	3SF78 42-6EE10	3RG78 42-6EE20
600	Receiver	3SF78 42-6EF01	3SF78 42-6EF11	3RG78 42-6EF21
600	Transmitter	3SF78 42-6EF00	3SF78 42-6EF10	3RG78 42-6EF20
750	Receiver	3SF78 42-6EG01	3SF78 42-6EG11	3RG78 42-6EG21
750	Transmitter	3SF78 42-6EG00	3SF78 42-6EG10	3RG78 42-6EG20
900	Receiver	3SF78 42-6EH01	3SF78 42-6EH11	3RG78 42-6EH21
900	Transmitter	3SF78 42-6EH00	3SF78 42-6EH10	3RG78 42-6EH20

Light curtains and arrays SIMATIC FS400

Series 3SF78 42, Type 4

External evaluation ASIsafe

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1050	Receiver	3SF78 42-6EJ01	3SF78 42-6EJ11	3RG78 42-6EJ21
1050	Transmitter	3SF78 42-6EJ00	3SF78 42-6EJ10	3RG78 42-6EJ20
1200	Receiver	3SF78 42-6EK01	3SF78 42-6EK11	3RG78 42-6EK21
1200	Transmitter	3SF78 42-6EK00	3SF78 42-6EK10	3RG78 42-6EK20
1350	Receiver	3SF78 42-6EL01	3SF78 42-6EL11	3RG78 42-6EL21
1350	Transmitter	3SF78 42-6EL00	3SF78 42-6EL10	3RG78 42-6EL20
1500	Receiver	3SF78 42-6EM01	3SF78 42-6EM11	3RG78 42-6EM21
1500	Transmitter	3SF78 42-6EM00	3SF78 42-6EM10	3RG78 42-6EM20
1650	Receiver	3SF78 42-6EN01	3SF78 42-6EN11	3RG78 42-6EN21
1650	Transmitter	3SF78 42-6EN00	3SF78 42-6EN10	3RG78 42-6EN20
1800	Receiver	3SF78 42-6EP01	3SF78 42-6EP11	3RG78 42-6EP21
1800	Transmitter	3SF78 42-6EP00	3SF78 42-6EP10	3RG78 42-6EP20
2100	Receiver	3SF78 42-6ER01	3SF78 42-6ER11	3RG78 42-6ER21
2100	Transmitter	3SF78 42-6ER00	3SF78 42-6ER10	3RG78 42-6ER20
2400	Receiver	3SF78 42-6ES01	3SF78 42-6ES11	3RG78 42-6ES21
2400	Transmitter	3SF78 42-6ES00	3SF78 42-6ES10	3RG78 42-6ES20
2700	Receiver	3SF78 42-6ET01	3SF78 42-6ET11	3RG78 42-6ET21
2700	Transmitter	3SF78 42-6ET00	3SF78 42-6ET10	3RG78 42-6ET20
3000	Receiver	3SF78 42-6EU01	3SF78 42-6EU11	3RG78 42-6EU21
3000	Transmitter	3SF78 42-6EU00	3SF78 42-6EU10	3RG78 42-6EU20
Resolution 90 mm				
750	Receiver	3SF78 42-6JG01	3SF78 42-6JG11	3RG78 42-6JG21
750	Transmitter	3SF78 42-6JG00	3SF78 42-6JG10	3RG78 42-6JG20
900	Receiver	3SF78 42-6JH01	3SF78 42-6JH11	3RG78 42-6JH21
900	Transmitter	3SF78 42-6JH00	3SF78 42-6JH10	3RG78 42-6JH20
1050	Receiver	3SF78 42-6JJ01	3SF78 42-6JJ11	3RG78 42-6JJ21
1050	Transmitter	3SF78 42-6JJ00	3SF78 42-6JJ10	3RG78 42-6JJ20
1200	Receiver	3SF78 42-6JK01	3SF78 42-6JK11	3RG78 42-6JK21
1200	Transmitter	3SF78 42-6JK00	3SF78 42-6JK10	3RG78 42-6JK20
1350	Receiver	3SF78 42-6JL01	3SF78 42-6JL11	3RG78 42-6JL21
1350	Transmitter	3SF78 42-6JL00	3SF78 42-6JL10	3RG78 42-6JL20
1500	Receiver	3SF78 42-6JM01	3SF78 42-6JM11	3RG78 42-6JM21
1500	Transmitter	3SF78 42-6JM00	3SF78 42-6JM10	3RG78 42-6JM20
1650	Receiver	3SF78 42-6JN01	3SF78 42-6JN11	3RG78 42-6JN21
1650	Transmitter	3SF78 42-6JN00	3SF78 42-6JN10	3RG78 42-6JN20
1800	Receiver	3SF78 42-6JP01	3SF78 42-6JP11	3RG78 42-6JP21
1800	Transmitter	3SF78 42-6JP00	3SF78 42-6JP10	3RG78 42-6JP20
2100	Receiver	3SF78 42-6JR01	3SF78 42-6JR11	3RG78 42-6JR21
2100	Transmitter	3SF78 42-6JR00	3SF78 42-6JR10	3RG78 42-6JR20
2400	Receiver	3SF78 42-6JS01	3SF78 42-6JS11	3RG78 42-6JS21
2400	Transmitter	3SF78 42-6JS00	3SF78 42-6JS10	3RG78 42-6JS20
2700	Receiver	3SF78 42-6JT01	3SF78 42-6JT11	3RG78 42-6JT21
2700	Transmitter	3SF78 42-6JT00	3SF78 42-6JT10	3RG78 42-6JT20
3000	Receiver	3SF78 42-6JU01	3SF78 42-6JU11	3RG78 42-6JU21
3000	Transmitter	3SF78 42-6JU00	3SF78 42-6JU10	3RG78 42-6JU20

Light curtains and arrays SIMATIC FS400

Series 3SF78 42, Type 4

External evaluation
ASIsafe

Light arrays

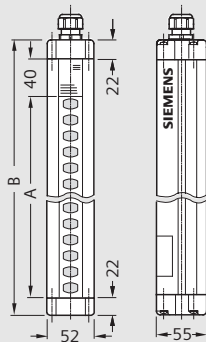
No. of light beams	Beam distance	Version	Range 0.8 m to 18 m	Range 6 m to 60 m
	mm		Order No.	Order No.
4 beams	300	Transmitter	3SF78 42-6MH00	3SF78 42-6MH50
4 beams	300	Receiver	3SF78 42-6MH01	3SF78 42-6MH51
3 beams	400	Transmitter	3SF78 42-6PG00	3SF78 42-6PG50
3 beams	400	Receiver	3SF78 42-6PG01	3SF78 42-6PG51
2 beams	500	Transmitter	3SF78 42-6SE00	3SF78 42-6SE50
2 beams	500	Receiver	3SF78 42-6SE01	3SF78 42-6SE51

Transceiver with ASIsafe^{NEW}

Number of light beams	Beam distance	Version	Standard device
	mm		Order No.
Range 6.5 m			
2 beams	500	Transceiver	3SF7842-6TE01
Mirror for Transceiver			3RG78 48-1TL

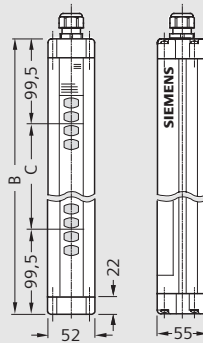
Dimension drawings

3SF78 42 light curtains and light arrays 3SF78 42 Standard, host and guest devices



- A Protective field height
(see „Selection and ordering data“ tables)
- B Total length = protective field height
A + 84 mm

Light arrays 3SF78 42, additional dimensions



Additional dimensions for light arrays only:

Type	B (mm)	C (mm)	Beams
3SF78 42-6M...	499	300	4
3SF78 42-6P...	599	400	3
3SF78 42-6S...	699	500	2

Light curtains and arrays SIMATIC FS400

Series 3RG78 46, Type 4

Internal evaluation

Function package Standard, transistor output

Overview



3RG78 46 light curtains with integrated evaluation for Type 4 according to EN IEC 61496-1 and prEN IEC 61496-2

- Resolution 14, 20, 30, 40 and 90 mm
- Protective field heights from 150 mm to 1800 mm
- Two 360° mounting brackets 3RG78 48-2BA each are enclosed with all devices (can also be ordered as accessories, see page 1/83)

Program overview 3RG78 46 (FS420I)

Device type	Function package	Output	Connection type	Resolution					Page
				14 mm	20 mm	30 mm	40 mm	90 mm	
Light curtains	Standard	Transistor	M12 connector	✓	✓	✓	✓	✓	1/66

Light curtains and arrays SIMATIC FS400

Series 3RG78 46, Type 4

Internal evaluation
Function package Standard, transistor output

Technical specifications

Type	3RG78 46
Safety category EN IEC 61496	Type 4
Detection capability (resolution)	14 mm, 20 mm, 30 mm, 40 mm, 90 mm
Protective field width, range	
• for Resolution 14 mm	0.5 ... 5 m
• for Resolution 20 mm	0.7 ... 14 m
• for Resolution 30 mm	0.5 ... 9 m
• for Resolution 40 mm	0.9 ... 20 m
• for Resolution 90 mm	0.9 ... 20 m
Supply voltage U_S (transmitter and receiver)	24 V DC $\pm$ 20 % (external power pack is required with reliable mains isolation and compensation of voltage dips of 20 ms, min. 250 mA (plus OSSD load))
Residual ripple of supply voltage	$\pm$ 5% within the limits of U_S
Current consumption	
• Transmitter	75 mA
• Receiver	110 mA (without external load)
General value for external fuse in the emitter and receiver supply leads	1 A medium time lag
Permissible cable cross section	
• Transmitter	0.25 mm ²
• Receiver	0.14 mm ²
Transmitter	Light-emitting diodes according to EN 60825-1:1994+ A1:2002+A:2001
• Class	1
• Wavelength	950 nm
• Power	< 50 μ W

Type	3RG78 46
Synchronization	Optically between emitter and receiver
Safety class (VDE 106) ¹⁾	III
Ambient temperature	
• Operation	0 ... +55 °C
• Storage	-25 ... +70 °C
Permissible relative humidity	15 ... 95%
Degree of protection	IP65
Signal inputs	
• Transmitter pin 4 - test input	- Input: Contact or transistor connected to +24 V DC 0 V or spare = Test - Current load: 20 mA max.
• Receiver pin 1 - Start/restart key - error/pollution group alarm	Input: Contact (NO) connected to 24 V DC, current load: 15 mA max. Outlet: pnp: Connected to 24 V DC, 80 mA max.
• Receiver Pin 3 - EDM (contactor control) - without EDM	- Input: Contact (NC) connected to 0 V - Current load: 15 mA max. 24 V DC connection
• Receiver pin 4 - with RES - without RES	Input: DC 24 V Jumper to Pin 1

¹⁾ The circuits connected to the inputs and outputs must comply with the air gaps and creepage distances specified in the applicable standards for safe isolation.

OSSDs transistor outputs	2 pnp safety-related transistor outputs, cross-connection monitored, short-circuit-proof		
	Minimum	Typical	Maximum
Operational voltage active high (U_S - 1.6 V) For resistive load $I_{rated} = 250$ mA	–	+22 V	–
Operational voltage, low	-80 V ¹⁾	0 V	+ 2.8 V
Switch current	–	250 mA	–
Leakage current	–	< 5 μ A	< 20 μ A
Load capacitance	–	–	< 220 nF
Load inductance	–	–	< 2,0 H
Permissible line resistance to load	–	–	< 300 Ω ²⁾
Permissible line length between receiver and load (for 0.25 mm ²)	–	–	100 m
Test pulse width	30 μ s	–	100 μ s
Test pulse interval	–	–	22 μ s
OSSD restart time after beam interruption	40 ms	100 ms	–
OSSD response time	Depending on the number of beams, see operating instructions		

¹⁾ Fast recovery voltage for contactors, otherwise 0 V.

²⁾ Please note further constraints due to cable lengths and load current.

Light curtains and arrays SIMATIC FS400

Series 3RG78 46, Type 4

Internal evaluation
Function package Standard, transistor output

Selection and ordering data

Light curtains with M12 connector

Protective field height	Version	Resolution 14 mm 	Resolution 20 mm	Resolution 30 mm
mm		Order No.	Order No.	Order No.
SIMATIC FS420I				
150	Receiver	-	3RG78 46-3SC02-0SS1	3RG78 46-3SD02-0SS1
150	Transmitter	-	3RG78 46-3SC02-0SS0	3RG78 46-3SD02-0SS0
225	Receiver	-	3RG78 46-3SC03-0SS1	3RG78 46-3SD03-0SS1
225	Transmitter	-	3RG78 46-3SC03-0SS0	3RG78 46-3SD03-0SS0
300	Receiver	3RG7846-3SB04-0SS1	3RG78 46-3SC04-0SS1	3RG78 46-3SD04-0SS1
300	Transmitter	3RG7846-3SB04-0SS0	3RG78 46-3SC04-0SS0	3RG78 46-3SD04-0SS0
450	Receiver	3RG78 46-3SB06-0SS1	3RG78 46-3SC06-0SS1	3RG78 46-3SD06-0SS1
450	Transmitter	3RG78 46-3SB06-0SS0	3RG78 46-3SC06-0SS0	3RG78 46-3SD06-0SS0
600	Receiver	3RG78 46-3SB08-0SS1	3RG78 46-3SC08-0SS1	3RG78 46-3SD08-0SS1
600	Transmitter	3RG78 46-3SB08-0SS0	3RG78 46-3SC08-0SS0	3RG78 46-3SD08-0SS0
750	Receiver	3RG78 46-3SB11-0SS1	3RG78 46-3SC11-0SS1	3RG78 46-3SD11-0SS1
750	Transmitter	3RG78 46-3SB11-0SS0	3RG78 46-3SC11-0SS0	3RG78 46-3SD11-0SS0
900	Receiver	3RG78 46-3SB13-0SS1	3RG78 46-3SC13-0SS1	3RG78 46-3SD13-0SS1
900	Transmitter	3RG78 46-3SB13-0SS0	3RG78 46-3SC13-0SS0	3RG78 46-3SD13-0SS0
1050	Receiver	3RG78 46-3SB15-0SS1	3RG78 46-3SC15-0SS1	3RG78 46-3SD15-0SS1
1050	Transmitter	3RG78 46-3SB15-0SS0	3RG78 46-3SC15-0SS0	3RG78 46-3SD15-0SS0
1200	Receiver	3RG78 46-3SB17-0SS1	3RG78 46-3SC17-0SS1	3RG78 46-3SD17-0SS1
1200	Transmitter	3RG78 46-3SB17-0SS0	3RG78 46-3SC17-0SS0	3RG78 46-3SD17-0SS0
1350	Receiver	3RG78 46-3SB20-0SS1	3RG78 46-3SC20-0SS1	3RG78 46-3SD20-0SS1
1350	Transmitter	3RG78 46-3SB20-0SS0	3RG78 46-3SC20-0SS0	3RG78 46-3SD20-0SS0
1500	Receiver	3RG78 46-3SB22-0SS1	3RG78 46-3SC22-0SS1	3RG78 46-3SD22-0SS1
1500	Transmitter	3RG78 46-3SB22-0SS0	3RG78 46-3SC22-0SS0	3RG78 46-3SD22-0SS0
1650	Receiver	3RG78 46-3SB24-0SS1	3RG78 46-3SC24-0SS1	3RG78 46-3SD24-0SS1
1650	Transmitter	3RG78 46-3SB24-0SS0	3RG78 46-3SC24-0SS0	3RG78 46-3SD24-0SS0
1800	Receiver	3RG78 46-3SB26-0SS1	3RG78 46-3SC26-0SS1	3RG78 46-3SD26-0SS1
1800	Transmitter	3RG78 46-3SB26-0SS0	3RG78 46-3SC26-0SS0	3RG78 46-3SD26-0SS0

Light curtains and arrays SIMATIC FS400

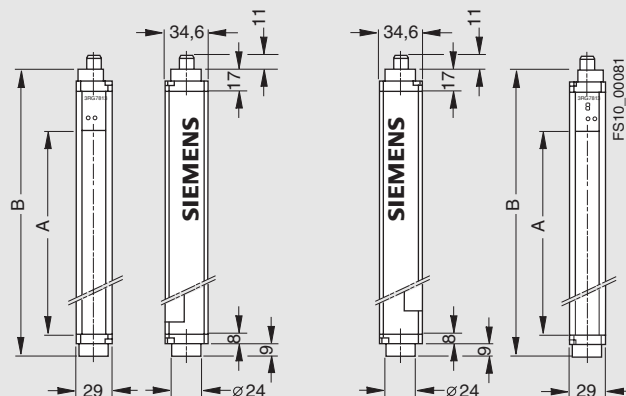
Series 3RG78 46, Type 4

Internal evaluation
Function package Standard, transistor output

Protective field height	Version	Resolution 40 mm	Resolution 90 mm
mm		Order No.	Order No.
SIMATIC FS420I			
150	Receiver	3RG78 46-3SF02-0SS1	—
150	Transmitter	3RG78 46-3SF02-0SS0	—
225	Receiver	3RG78 46-3SF03-0SS1	—
225	Transmitter	3RG78 46-3SF03-0SS0	—
300	Receiver	3RG78 46-3SF04-0SS1	—
300	Transmitter	3RG78 46-3SF04-0SS0	—
450	Receiver	3RG78 46-3SF06-0SS1	—
450	Transmitter	3RG78 46-3SF06-0SS0	—
600	Transmitter	3RG78 46-3SF08-0SS0	3RG78 46-3SJ08-0SS0
600	Receiver	3RG78 46-3SF08-0SS1	3RG78 46-3SJ08-0SS1
750	Receiver	3RG78 46-3SF11-0SS1	3RG78 46-3SJ11-0SS1
750	Transmitter	3RG78 46-3SF11-0SS0	3RG78 46-3SJ11-0SS0
900	Receiver	3RG78 46-3SF13-0SS1	3RG78 46-3SJ13-0SS1
900	Transmitter	3RG78 46-3SF13-0SS0	3RG78 46-3SJ13-0SS0
1050	Receiver	3RG78 46-3SF15-0SS1	3RG78 46-3SJ15-0SS1
1050	Transmitter	3RG78 46-3SF15-0SS0	3RG78 46-3SJ15-0SS0
1200	Receiver	3RG78 46-3SF17-0SS1	3RG78 46-3SJ17-0SS1
1200	Transmitter	3RG78 46-3SF17-0SS0	3RG78 46-3SJ17-0SS0
1350	Receiver	3RG78 46-3SF20-0SS1	3RG78 46-3SJ20-0SS1
1350	Transmitter	3RG78 46-3SF20-0SS0	3RG78 46-3SJ20-0SS0
1500	Receiver	3RG78 46-3SF22-0SS1	3RG78 46-3SJ22-0SS1
1500	Transmitter	3RG78 46-3SF22-0SS0	3RG78 46-3SJ22-0SS0
1650	Receiver	3RG78 46-3SF24-0SS1	3RG78 46-3SJ24-0SS1
1650	Transmitter	3RG78 46-3SF24-0SS0	3RG78 46-3SJ24-0SS0
1800	Receiver	3RG78 46-3SF26-0SS1	3RG78 46-3SJ26-0SS1
1800	Transmitter	3RG78 46-3SF26-0SS0	3RG78 46-3SJ26-0SS0

Dimension drawings

Light curtains 3RG78 46 with integrated evaluation, Type 4



Transmitter

Receiver

A Protective field height
(See Selection and ordering data)

B Overall dimension without connector = Height of protective field A + 75.5 mm

Light curtains and arrays SIMATIC FS400

Series 3RG78 43, Type 2

Internal evaluation, Function package Standard,
Transistor output, to IEC/EN 61508 (SIL 2)

Overview



3RG7843 light curtains with integrated processing for Category 2 according to EN 954-1

- Developed according to EN 61508 (SIL 2)
- Risk assessment, suitable according to pr EN ISO 13489
- Resolution 20, 30, 40 and 90 mm
- Protective field heights from 150 mm to 1800 mm

Two 360° mounting brackets 3RG78 48-2BA each are enclosed with all devices (can also be ordered as accessories, see page 1/87)

Program overview 3RG78 43 (FS420I)

Device type	Function package	Output	Connection type	Resolution				See Page
				20 mm	30 mm	40 mm	90 mm	
Light curtains	Standard	Transistor	M12 connector	✓	✓	✓	✓	1/70

Light curtains and arrays SIMATIC FS400

Series 3RG78 43, Type 2

Internal evaluation, Function package Standard,
Transistor output, to IEC/EN 61508 (SIL 2)

Technical specifications

Type	3RG78 43
Safety category EN IEC 61496; SIL2 according to IEC 61508	Type 2
Detection capability (resolution)	20 mm, 30 mm, 40 mm, 90 mm
Protective field width, range	
for 20 mm resolution	0.5 ... 15 m
for 30 mm resolution	0 ... 8 m
for 40 mm resolution	0.8 ... 20 m
for 90 mm resolution	0.8 ... 20 m
Supply voltage U_S (emitter and receiver)	24 V DC $\pm$ 20 % (external power pack is required with reliable mains isolation and compensation of voltage dips of 20 ms, min. 1 A current reserve)
Residual ripple of supply voltage	$\pm$ 5% within the limits of U_{Supply}
Current consumption	
• Transmitter	45 mA
• Receiver	140 mA (without external load)
Common value for external fuse in the supply line for emitter and receiver	1 A
Permissible conductor cross-section	
• Transmitter	0.25 mm ²
• Receiver	0.14 mm ²
Transmitter	Light-emitting diodes according to EN 60825-1: 1994+ A1: 2002+A: 2001
• Class	1

Type	3RG78 43
• Wave length	950 nm
• Pulse duration	7 μ s
• Pulse pause	3.1 ms
• Output	< 10 μ W
Synchronization	Optically between emitter and receiver
Test cycle time for integrated periodic test	100 ms
Safety class (VDE 106)	III ¹⁾
Ambient temperature	
• Operation	0 ... +50 °C
• Storage	-25 ... +70 °C
Relative humidity	15 ... 95 %
Degree of protection	IP65
Signal inputs	
• Emitter test input	Input: Contact or transistor connected to +24 V DC, current load: 20 mA max.
• Receiver signal input BA1	Input: Contact or transistor connected to +24 V DC or to GND, current load: 10 mA max.
• Receiver signal input BA2	Input: Contact or transistor connected to +24 V DC or to GND, current load: 10 mA max.

¹⁾ The circuits connected to the inputs and outputs must comply with the air gaps and creepage distances specified in the applicable standards for safe isolation.

Transistor outputs receiver

OSSD transistor outputs	2 pnp safety-related transistor outputs, short-circuit-proof		
	Minimum	Typical	Maximum
Operational voltage, active high	$U_V - 1.9$ V	$U_V - 1$ V	$U_V - 0.8$ V
Operational voltage, low	–	200 mV	+ 1 V
Operational current	–	–	250 mA
Leakage current	–	< 2 μ A ¹⁾	–
Load capacitance	–	–	< 2.2 μ F
Load inductance	–	–	2.0 H
Permissible line resistance to load	–	–	< 50 Ω ²⁾
Permissible conductor cross-section: Receiver	–	–	0.14 mm ²
Permissible cable length between receiver and load	–	–	100 m
Auxiliary pulse width	20 μ s	–	230 μ s
Auxiliary pulse spacing	3.7 ms	–	46 ms
OSSD reactivation time after interruption of the beam without RES	–	100 ms	–
OSSD response time	depends on no. of light beams, see operating instructions		

¹⁾ In the event of a fault (when the GND cable is interrupted), the output behaves like a 120 k Ω resistance to U_S . A series-connected failsafe PLC must not recognize this as a logical "1".

²⁾ Please note further constraints due to cable length and load current.

Light curtains and arrays SIMATIC FS400

Series 3RG78 43, Type 2

Internal evaluation, Function package Standard,
Transistor output, to IEC/EN 61508 (SIL 2)

Selection and ordering data

Light curtains with M12 connector

Protective field height	Version	Resolution 20 mm	Resolution 30 mm
mm		Order No.	Order No.
SIMATIC FS420I			
150	Receiver	3RG78 43-3SC02-0SS1	3RG78 43-3SD02-0SS1
150	Transmitter	3RG78 43-3SC02-0SS0	3RG78 43-3SD02-0SS0
225	Receiver	3RG78 43-3SC03-0SS1	3RG78 43-3SD03-0SS1
225	Transmitter	3RG78 43-3SC03-0SS0	3RG78 43-3SD03-0SS0
300	Receiver	3RG78 43-3SC04-0SS1	3RG78 43-3SD04-0SS1
300	Transmitter	3RG78 43-3SC04-0SS0	3RG78 43-3SD04-0SS0
450	Receiver	3RG78 43-3SC06-0SS1	3RG78 43-3SD06-0SS1
450	Transmitter	3RG78 43-3SC06-0SS0	3RG78 43-3SD06-0SS0
600	Receiver	3RG78 43-3SC08-0SS1	3RG78 43-3SD08-0SS1
600	Transmitter	3RG78 43-3SC08-0SS0	3RG78 43-3SD08-0SS0
750	Receiver	3RG78 43-3SC11-0SS1	3RG78 43-3SD11-0SS1
750	Transmitter	3RG78 43-3SC11-0SS0	3RG78 43-3SD11-0SS0
900	Receiver	3RG78 43-3SC13-0SS1	3RG78 43-3SD13-0SS1
900	Transmitter	3RG78 43-3SC13-0SS0	3RG78 43-3SD13-0SS0
1050	Receiver	3RG78 43-3SC15-0SS1	3RG78 43-3SD15-0SS1
1050	Transmitter	3RG78 43-3SC15-0SS0	3RG78 43-3SD15-0SS0
1200	Receiver	3RG78 43-3SC17-0SS1	3RG78 43-3SD17-0SS1
1200	Transmitter	3RG78 43-3SC17-0SS0	3RG78 43-3SD17-0SS0
1350	Receiver	3RG78 43-3SC20-0SS1	3RG78 43-3SD20-0SS1
1350	Transmitter	3RG78 43-3SC20-0SS0	3RG78 43-3SD20-0SS0
1500	Receiver	3RG78 43-3SC22-0SS1	3RG78 43-3SD22-0SS1
1500	Transmitter	3RG78 43-3SC22-0SS0	3RG78 43-3SD22-0SS0
1650	Receiver	3RG78 43-3SC24-0SS1	3RG78 43-3SD24-0SS1
1650	Transmitter	3RG78 43-3SC24-0SS0	3RG78 43-3SD24-0SS0
1800	Receiver	3RG78 43-3SC26-0SS1	3RG78 43-3SD26-0SS1
1800	Transmitter	3RG78 43-3SC26-0SS0	3RG78 43-3SD26-0SS0

Protective field height	Version	Resolution 40 mm	Resolution 90 mm
mm		Order No.	Order No.
SIMATIC FS420I			
150	Receiver	3RG78 43-3SF02-0SS1	—
150	Transmitter	3RG78 43-3SF02-0SS0	—
225	Receiver	3RG78 43-3SF03-0SS1	—
225	Transmitter	3RG78 43-3SF03-0SS0	—
300	Receiver	3RG78 43-3SF04-0SS1	—
300	Transmitter	3RG78 43-3SF04-0SS0	—
450	Receiver	3RG78 43-3SF06-0SS1	—
450	Transmitter	3RG78 43-3SF06-0SS0	—
600	Transmitter	3RG78 43-3SF08-0SS0	3RG78 43-3SJ08-0SS0
600	Receiver	3RG78 43-3SF08-0SS1	3RG78 43-3SJ08-0SS1
750	Receiver	3RG78 43-3SF11-0SS1	3RG78 43-3SJ11-0SS1
750	Transmitter	3RG78 43-3SF11-0SS0	3RG78 43-3SJ11-0SS0
900	Receiver	3RG78 43-3SF13-0SS1	3RG78 43-3SJ13-0SS1
900	Transmitter	3RG78 43-3SF13-0SS0	3RG78 43-3SJ13-0SS0
1050	Receiver	3RG78 43-3SF15-0SS1	3RG78 43-3SJ15-0SS1
1050	Transmitter	3RG78 43-3SF15-0SS0	3RG78 43-3SJ15-0SS0
1200	Receiver	3RG78 43-3SF17-0SS1	3RG78 43-3SJ17-0SS1
1200	Transmitter	3RG78 43-3SF17-0SS0	3RG78 43-3SJ17-0SS0

Light curtains and arrays SIMATIC FS400

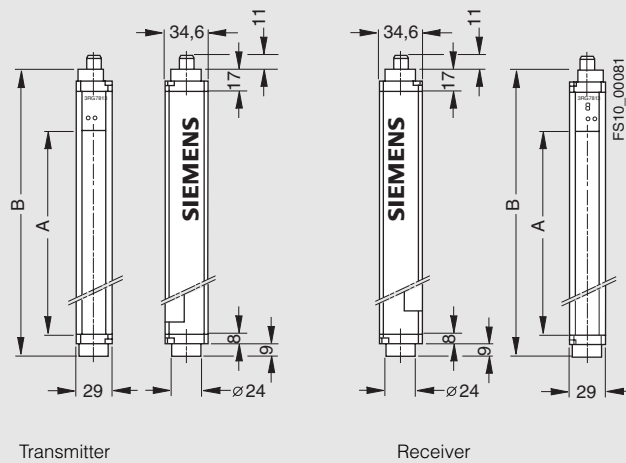
Series 3RG78 43, Type 2

Internal evaluation, Function package Standard,
Transistor output, to IEC/EN 61508 (SIL 2)

Protective field height	Version	Resolution 40 mm	Resolution 90 mm
mm		Order No.	Order No.
1350	Receiver	3RG78 43-3SF20-0SS1	3RG78 43-3SJ20-0SS1
1350	Transmitter	3RG78 43-3SF20-0SS0	3RG78 43-3SJ20-0SS0
1500	Receiver	3RG78 43-3SF22-0SS1	3RG78 43-3SJ22-0SS1
1500	Transmitter	3RG78 43-3SF22-0SS0	3RG78 43-3SJ22-0SS0
1650	Receiver	3RG78 43-3SF24-0SS1	3RG78 43-3SJ24-0SS1
1650	Transmitter	3RG78 43-3SF24-0SS0	3RG78 43-3SJ24-0SS0
1800	Receiver	3RG78 43-3SF26-0SS1	3RG78 43-3SJ26-0SS1
1800	Transmitter	3RG78 43-3SF26-0SS0	3RG78 43-3SJ26-0SS0

Dimension drawings

Light curtains 3RG78 43-3S...-0SS.



A Protective field height
(See Selection and ordering data)

B Total length = Protective field height A + 75.5 mm

Light curtains and arrays SIMATIC FS400

Series 3RG78 41, Type 2

External evaluation
transistor output

Overview



Light curtains 3RG78 41 for category 2 according to IEC/EN 61496-1, -2

- Resolution 30, 55 and 80 mm,
- Protective field heights from 150 to 1800 mm,
- Cascading of host and guest devices for higher or longer protective fields or for angular arrangement (optional)

Program overview 3RG78 41

Device type	Function package	Output	Connection type	Resolution			See Page
				30 mm	55 mm	80 mm	
Light curtains	–	Transistor	M12 connector	✓	✓	✓	1/70

Light curtains and arrays SIMATIC FS400

Series 3RG78 41, Type 2

External evaluation
transistor output

Technical specifications

Type	3RG78 41
Safety category EN IEC 61496-1, -2	Type 2 (can be tested) in conjunction with an external monitoring unit (type 2)
Detection capability (resolution)	30 mm, 55 mm, 80 mm
Protective field height	
• for resolution 30 mm	150 ... 1800 mm
• for resolution 55 mm	300 ... 1800 mm
• for resolution 80 mm	450 ... 1800 mm
Protective field width, sensing field	0.3 ... 6 m
Protection class	I
Supply voltage (Transmitter and Receiver)	24 V DC $\pm$ 20 % (external power pack with safe line separation and 20 ms power loss ride-through)
Current consumption	
• Transmitter	75 mA
• Receiver	75 mA (without external load)
Synchronization between transmitter and receiver	optical; 2 selectable transfer channels
Ambient temperature	
• Operation	0 ... +55 °C
• Storage	-25 ... +75 °C
Air humidity	15 ... 95 % (non-condensing)
Degree of protection	IP65
Electrical connection	Round connector M12 (8-pin)
Connection cable	7-pin, 0.25 mm ² (shielded, with molded-on plug), 5 or 15 m long
Vibration resistance	5 g, 10 ... 55 Hz to IEC/EN 60068-2-6
Shock resistance	10 g, 16 ms to IEC/EN 60068-2-29

Inputs

Transmitter test input	Via floating NC contact or pnp output
• No test	+24 V
• Test	0 V or high resistance
Min. signal duration for triggering test	20 ms
Test execution time	10 ms

Outputs

OSSD safety outputs	pnp output (short-circuit proof)
Output current $I_{a \text{ max}}$	100 mA
Response time from interruption of protective field to until safety outputs switch off	Increases with the number of beams (for exact values, see operating instructions)
• at resolution 30 mm	8 ... 29 ms
• at resolution 55 mm	8 ... 19 ms
• at resolution 80 mm	8 ... 15 ms
Reactivation time from enabling the protective field until safety outputs switch on	
• All resolutions	0.5 ms
• After momentary protective field interruptions	min. 100 ms
Pollution output and fault signaling output	pnp output (short-circuit proof)
Output current, max.	70 mA
Diagnostics interface, receiver	RS485

Light curtains and arrays SIMATIC FS400

Series 3RG78 41, Type 2

External evaluation
transistor output

Selection and ordering data

Light curtains, M12 connector

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
Resolution 30 mm				
150	Receiver	3RG78 41-3DB01	3RG78 41-3DB11	3RG78 41-3DB21
150	Transmitter	3RG78 41-3DB00	3RG78 41-3DB10	3RG78 41-3DB20
225	Receiver	3RG78 41-3DC01	3RG78 41-3DC11	3RG78 41-3DC21
225	Transmitter	3RG78 41-3DC00	3RG78 41-3DC10	3RG78 41-3DC20
300	Receiver	3RG78 41-3DD01	3RG78 41-3DD11	3RG78 41-3DD21
300	Transmitter	3RG78 41-3DD00	3RG78 41-3DD10	3RG78 41-3DD20
450	Receiver	3RG78 41-3DE01	3RG78 41-3DE11	3RG78 41-3DE21
450	Transmitter	3RG78 41-3DE00	3RG78 41-3DE10	3RG78 41-3DE20
600	Receiver	3RG78 41-3DF01	3RG78 41-3DF11	3RG78 41-3DF21
600	Transmitter	3RG78 41-3DF00	3RG78 41-3DF10	3RG78 41-3DF20
750	Receiver	3RG78 41-3DG01	3RG78 41-3DG11	3RG78 41-3DG21
750	Transmitter	3RG78 41-3DG00	3RG78 41-3DG10	3RG78 41-3DG20
900	Receiver	3RG78 41-3DH01	3RG78 41-3DH11	3RG78 41-3DH21
900	Transmitter	3RG78 41-3DH00	3RG78 41-3DH10	3RG78 41-3DH20
1050	Receiver	3RG78 41-3DJ01	3RG78 41-3DJ11	3RG78 41-3DJ21
1050	Transmitter	3RG78 41-3DJ00	3RG78 41-3DJ10	3RG78 41-3DJ20
1200	Receiver	3RG78 41-3DK01	3RG78 41-3DK11	3RG78 41-3DK21
1200	Transmitter	3RG78 41-3DK00	3RG78 41-3DK10	3RG78 41-3DK20
1350	Receiver	3RG78 41-3DL01	3RG78 41-3DL11	3RG78 41-3DL21
1350	Transmitter	3RG78 41-3DL00	3RG78 41-3DL10	3RG78 41-3DL20
1500	Receiver	3RG78 41-3DM01	3RG78 41-3DM11	3RG78 41-3DM21
1500	Transmitter	3RG78 41-3DM00	3RG78 41-3DM10	3RG78 41-3DM20
1650	Receiver	3RG78 41-3DN01	3RG78 41-3DN11	3RG78 41-3DN21
1650	Transmitter	3RG78 41-3DN00	3RG78 41-3DN10	3RG78 41-3DN20
1800	Receiver	3RG78 41-3DP01	3RG78 41-3DP11	3RG78 41-3DP21
1800	Transmitter	3RG78 41-3DP00	3RG78 41-3DP10	3RG78 41-3DP20
Resolution 55 mm				
300	Receiver	3RG78 41-3FD01	3RG78 41-3FD11	3RG78 41-3FD21
300	Transmitter	3RG78 41-3FD00	3RG78 41-3FD10	3RG78 41-3FD20
450	Receiver	3RG78 41-3FE01	3RG78 41-3FE11	3RG78 41-3FE21
450	Transmitter	3RG78 41-3FE00	3RG78 41-3FE10	3RG78 41-3FE20
600	Receiver	3RG78 41-3FF01	3RG78 41-3FF11	3RG78 41-3FF21
600	Transmitter	3RG78 41-3FF00	3RG78 41-3FF10	3RG78 41-3FF20
750	Receiver	3RG78 41-3FG01	3RG78 41-3FG11	3RG78 41-3FG21
750	Transmitter	3RG78 41-3FG00	3RG78 41-3FG10	3RG78 41-3FG20
900	Receiver	3RG78 41-3FH01	3RG78 41-3FH11	3RG78 41-3FH21
900	Transmitter	3RG78 41-3FH00	3RG78 41-3FH10	3RG78 41-3FH20
1050	Receiver	3RG78 41-3FJ01	3RG78 41-3FJ11	3RG78 41-3FJ21
1050	Transmitter	3RG78 41-3FJ00	3RG78 41-3FJ10	3RG78 41-3FJ20
1200	Receiver	3RG78 41-3FK01	3RG78 41-3FK11	3RG78 41-3FK21
1200	Transmitter	3RG78 41-3FK00	3RG78 41-3FK10	3RG78 41-3FK20
1350	Receiver	3RG78 41-3FL01	3RG78 41-3FL11	3RG78 41-3FL21
1350	Transmitter	3RG78 41-3FL00	3RG78 41-3FL10	3RG78 41-3FL20
1500	Receiver	3RG78 41-3FM01	3RG78 41-3FM11	3RG78 41-3FM21
1500	Transmitter	3RG78 41-3FM00	3RG78 41-3FM10	3RG78 41-3FM20
1650	Receiver	3RG78 41-3FN01	3RG78 41-3FN11	3RG78 41-3FN21
1650	Transmitter	3RG78 41-3FN00	3RG78 41-3FN10	3RG78 41-3FN20

Light curtains and arrays SIMATIC FS400

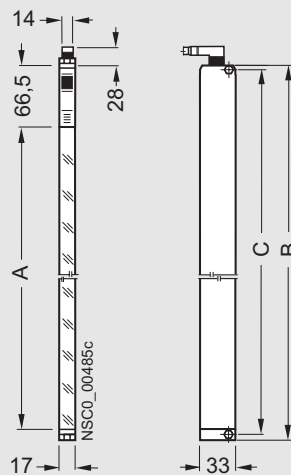
Series 3RG78 41, Type 2

External evaluation
transistor output

Protective field height	Version	Standard device	Host device	Guest device
mm		Order No.	Order No.	Order No.
1800	Receiver	3RG78 41-3FP01	3RG78 41-3FP11	3RG78 41-3FP21
1800	Transmitter	3RG78 41-3FP00	3RG78 41-3FP10	3RG78 41-3FP20
Resolution 80 mm				
450	Receiver	3RG78 41-3HE01	3RG78 41-3HE11	3RG78 41-3HE21
450	Transmitter	3RG78 41-3HE00	3RG78 41-3HE10	3RG78 41-3HE20
600	Receiver	3RG78 41-3HF01	3RG78 41-3HF11	3RG78 41-3HF21
600	Transmitter	3RG78 41-3HF00	3RG78 41-3HF10	3RG78 41-3HF20
900	Receiver	3RG78 41-3HH01	3RG78 41-3HH11	3RG78 41-3HH21
900	Transmitter	3RG78 41-3HH00	3RG78 41-3HH10	3RG78 41-3HH20
1200	Receiver	3RG78 41-3HK01	3RG78 41-3HK11	3RG78 41-3HK21
1200	Transmitter	3RG78 41-3HK00	3RG78 41-3HK10	3RG78 41-3HK20
1500	Receiver	3RG78 41-3HM01	3RG78 41-3HM11	3RG78 41-3HM21
1500	Transmitter	3RG78 41-3HM00	3RG78 41-3HM10	3RG78 41-3HM20
1800	Receiver	3RG78 41-3HP01	3RG78 41-3HP11	3RG78 41-3HP21
1800	Transmitter	3RG78 41-3HP00	3RG78 41-3HP10	3RG78 41-3HP20

Dimension drawings

Standard light curtains 3RG78 41-3..0.



Type	A	B	C
3RG78 41-3.B..	170.5	248.5	238.5
3RG78 41-3.C..	245.5	323.5	313.5
3RG78 41-3.D..	320.5	398.5	388.5
3RG78 41-3.E..	470.5	548.5	538.5
3RG78 41-3.F..	620.5	698.5	688.5
3RG78 41-3.G..	770.5	848.5	838.5
3RG78 41-3.H..	920.5	998.5	988.5
3RG78 41-3.J..	1 070.5	1 148.5	1 138.5
3RG78 41-3.K..	1 220.5	1 298.5	1 288.5
3RG78 41-3.L..	1 370.5	1 448.5	1 438.5
3RG78 41-3.M..	1 520.5	1 598.5	1 588.5
3RG78 41-3.N..	1 670.5	1 748.5	1 738.5
3RG78 41-3.P..	1 820.5	1 898.5	1 888.5

Light curtains and arrays SIMATIC FS400

Evaluation units

Evaluation units

Overview



The 3RG78 47 evaluation units form a flexible product family of interface modules for the light curtains and light arrays. The modular product series can be implemented up to Category 4 to IEC/EN 61496-1, -2.

The evaluation units enhance the functional scope of the light curtains and arrays to include start-up/restart inhibiting, contactor control and, depending on the device variant, sequence control and muting.

The device type also offers a comprehensive range of additional functions, such as a pre-trip warning for the relay contacts, a PC-based diagnostics function, and numerous signaling outputs to a higher-level PLC.

Outputs

OSSD safety outputs

Switching voltage/current

- only for expanded variants

OSSD external protection

OSSD response time of evaluation unit (without light curtain)

- for light curtain, type 4, with semiconductor output
- for light curtain, type 2
- for safety switches

OSSD reactivation time

OSSD-approved spark extinguishing

Relay outputs

2 safety-related NO contacts

60 V DC, 250 V AC, max. 6 A

1 safety-related NC contact,
DC 60 V, AC 250 V, max. 6 A,
minimum switching current 20 mA

6 A

22 ms

64 ms

64 ms

100 ms

required

Technical specifications

Standard evaluation units

Type	3RG78 47-4BA
Safety category according to EN 954-1	up to 4 (depending on type of upstream protective device)
Supply voltage	24 V AC/DC, $\pm 20\%$
Power consumption	1.5 W supply over AOPD)
OSSD external protection	2 relay outputs (switchover contacts)
Monitoring output	Relay output (NC contacts)
Max. cont. current per current path	3 A
Response time	10 ms
Recovery time	20 ms

Current consumption (Inputs B1 and B3)	32 mA each
Permissible input lead resistance	50 Ω
Permissible ambient temperatures	• in operation • during storage
Degree of protection	II
Type of protection	IP20
Terminals	Screw-type
Dimensions (W x H x D)	17.5 mm x 99 mm x 113.6 mm
Mounting	on 35 mm DIN rail

Light curtains and arrays SIMATIC FS400

Evaluation units

Evaluation units

Type	3RG78 47-4BB
Safety category acc. to EN 954-1	Category 4
STOP category to EN 60204-1 (11/98)	STOP category 0
Supply voltage	24 V AC/DC, -15 % ... +10 %
Residual ripple (for DC)	2.4 Vpp
Frequency (for AC)	50 ... 60 Hz
Power consumption	2.1 W (for AC)/1.7 W (for DC)
External protection for supply circuit	1 A slow
Output contacts	2 NO, 1 NC AgSnO ₂ , gold plated
Breaking capacity acc. to EN 60947-5-1	
• AC-15, 230 V	6 A
• DC-13, 24 V (360 operating cycles/h)	6 A
• DC-13, 24 V (3600 operating cycles/h)	3 A
Max. cont. current per cond. path	6 A
Contact protection per cond. path	6.3 A quick or 4 A slow
Max. total current for all cond. paths	12 A
Mechanical endurance	10 x 10 ⁶ operating cycles
Operating frequency	3600 operating cycles
Pick-up delay	
• Manual start	70 ms
• Automatic start	230 ms
Release delay, response time	20 ms
Minimum on-time S34, S35	80 ms
Solid-state backup	
• Response time	2 s
• Recovery time	2 s
Control voltage/current on S11, S22, S31	24 V DC/20 mA
Permissible input lead resistance	< 70 Ω
Emitted interference	EN 50081-1, -2
Interference immunity	EN 50082-2
Clearance and creepage distances to EN 60064	4 kV
Operating temperature	-25 ... +55 °C
Degree of protection	
• Housing	IP40
• Terminals	IP20
Conductor cross-sections	
• Finely stranded	2 x 0.14 ... 0.75 mm ²
• Finely stranded with end sleeve	2 x 0.25 ... 0.5 mm ²
• Finely stranded with twin end sleeve	2 x 1.5 mm ²
• Solid	1 x 0.14 ... 2.5 mm ²
• Finely stranded with end sleeve	2 x 0.25 ... 2.5 mm ²

Intelligent evaluation units

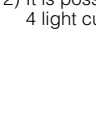
Type	3RG78 47
Protection acc. to EN, IEC 61496-1	Type 4
Safety category acc. to EN 954-1	Category 4
STOP category acc. to EN 60204-1 (11/98)	STOP category 0
Supply voltage	24 V DC, ± 20%, external power section with safe isolation from the supply and bridging of 20 ms voltage drop is necessary
Current consumption	Approx. 200 mA without external load
External protection (power supply)	2.5 A medium slow
Safety sensors that can be connected (expanded versions)	1 light curtain, Type 4, or up to 2 light curtains of Type 2 (all acc. to IEC 61496) up to 2 light curtains of Type 4, or up to 4 light curtains of Type 2 (all acc. to IEC 61496)
Test outputs T1 and T2, test interval	200 ms
Available functions	
• All versions	Start/restart inhibit, contactor control, diagnosis
• Versions with sequence control	Protection, single-pulse and two-pulse mode
• Versions with muting function	Sequential muting, parallel muting, parallel double muting (only 3RG78 47-4.G)
Control inputs	
• Contactor control (EDM)	Feedback of positively-driven contacts of downstream contactors
• Start/restart inhibit (Reset)	Floating NO (button or key-switch)
Conductor	
• Muting sensors that cannot be tested	Signal level in damped state: active high, +24 V
• Muting sensors that can be tested	active high, +24 V, plus test pulses T1 or T2
Outputs	
• Muting displays for lamps 24 V, max. 5 W	pnp switching outputs muting function On, active high, +24 V, 200 mA max.
• Signal outputs (acc. to variants)	Light curtain free/interrupted; switching state relay/transistor output; restart inhibit locked/unlocked; status of muting function; muting error; warning muting lamp defective; internal errors, etc.
Operating temperature	0 ... +55 °C
Degree of protection	IP20; must be installed in switch-gear cabinet or housing to IP 54 degree of protection upwards
Installation	Mounting on 35 mm standard mounting rail
Connection	Plug-in coded screw terminals up to 2.5 mm ²

Light curtains and arrays SIMATIC FS400

Evaluation units

Evaluation units

Selection and ordering data

Evaluation units	Version	Relay output
		Order No.
 3RG78 25-1CB1	Type 2 and 4 according to EN 954-1	
	Relay module, two channels, for AOPDs with 2 OSSDs and contactor control	3RG7847-4BA
	Type 2 according to EN 954-1	
 3RG78 25-1CB1	Standard, restart inhibit, contactor control (suitable for light curtains 3RG78 41 and light barriers 3RG78 23)	3RG78 25-1CB1
	Type 4 according to EN 954-1¹⁾	
 3RG78 47-4BB	Standard, restart inhibit, contactor control (no diagnostics or test functions, only suitable for light curtains and arrays of category 4 and for light curtains 3RG78 43 of category 2)	3RG78 47-4BB
 3RG78 47-4BD	Standard, restart inhibit, contactor control	3RG78 47-4BD
	Standard, restart inhibit, contactor control, extended version ²⁾	3RG78 47-4BE
 3RG78 47-4BF	Muting function, restart inhibit, contactor control	3RG78 47-4BF
	Muting function, restart inhibit, contactor control, extended version ²⁾	3RG78 47-4BG
 3RG78 47-4BF	Muting function, two channels, with UL approbation, CSA approbation pending	3RG78 47-5BF
	Muting function, with UL approbation, CSA approbation pending, extended version ²⁾	3RG78 47-5BG
 3RG78 47-4BH	Sequence control, restart inhibit, contactor control,	3RG78 47-4BH
	Sequence control, restart inhibit, contactor control, extended version ²⁾	3RG78 47-4BJ
 3RG78 47-4BK	Muting function and sequence control, restart inhibit, contactor control,	3RG78 47-4BK
	Muting function and sequence control, restart inhibit, contactor control, extended version ²⁾	3RG78 47-4BL

1) For Light curtains and arrays of category 4 it is also possible to use the electronic safety combination 3TK28 41.

2) It is possible to connect up to two light curtains type 4, or up to 4 light curtains type 2, or 2 safety switches (e.g. EMER OFF).

Light curtains and arrays SIMATIC FS400

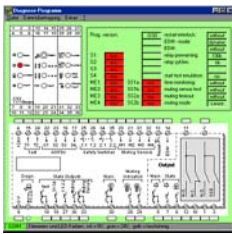
Evaluation units

Evaluation units

Version

Order No.

Diagnostics software for evaluation units

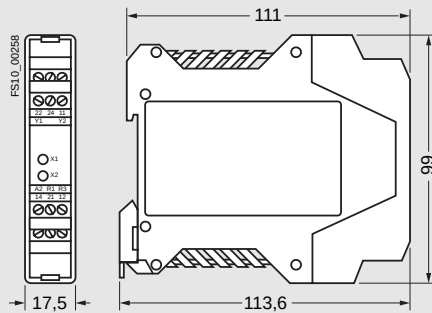


Diagnostics software for evaluation units,
with PC cable

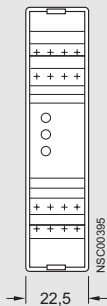
3RG78 48-4AC

Dimension drawings

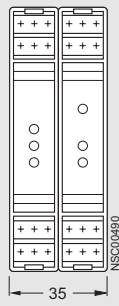
3RG78 47-4BA



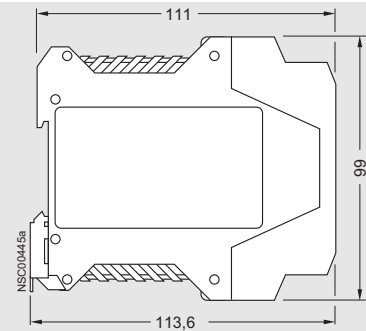
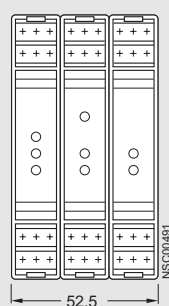
3RG78 47-4BB



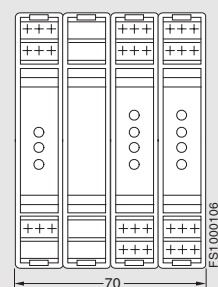
3RG78 47-4.D/E/H/J



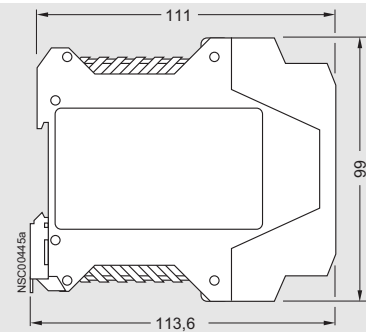
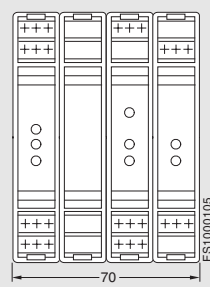
3RG78 47-4.F/G/K/L



3RG78 47-5BG/DG



3RG78 47-5BF/DF



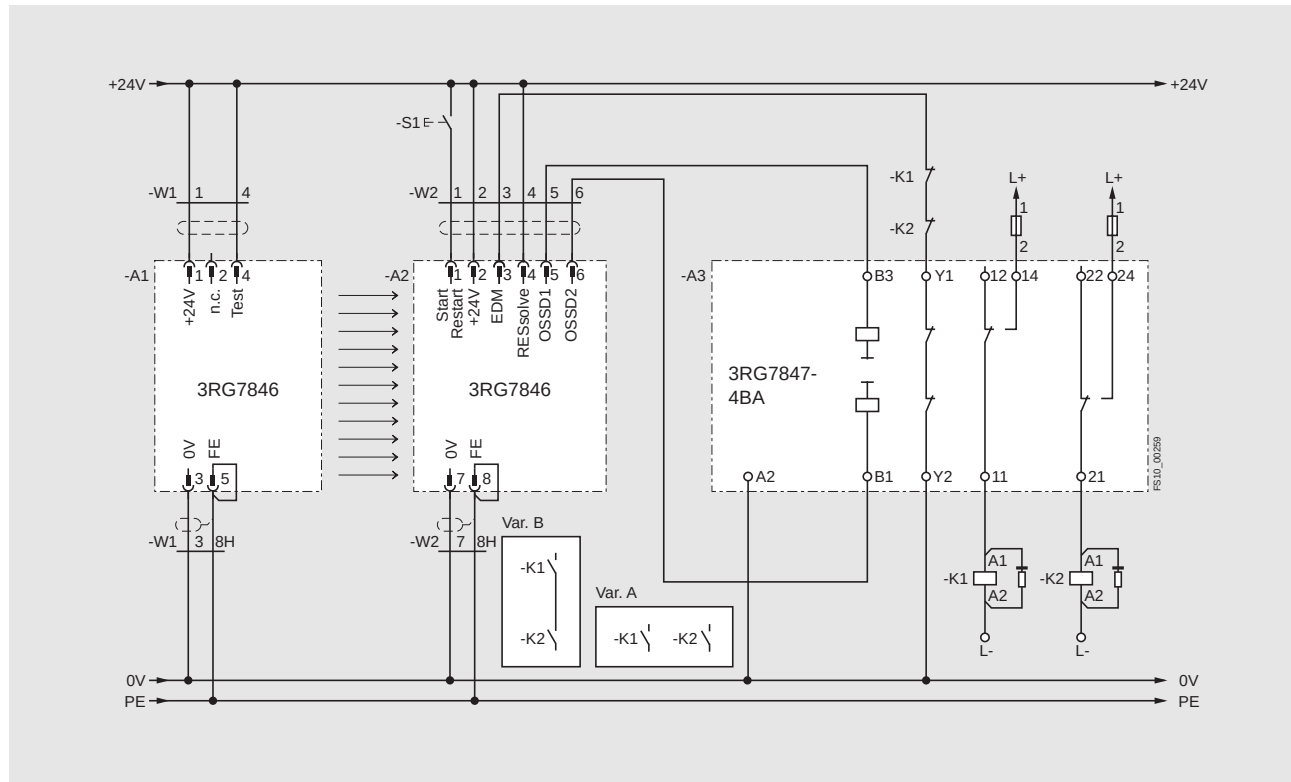
Light curtains and arrays SIMATIC FS400

Evaluation units

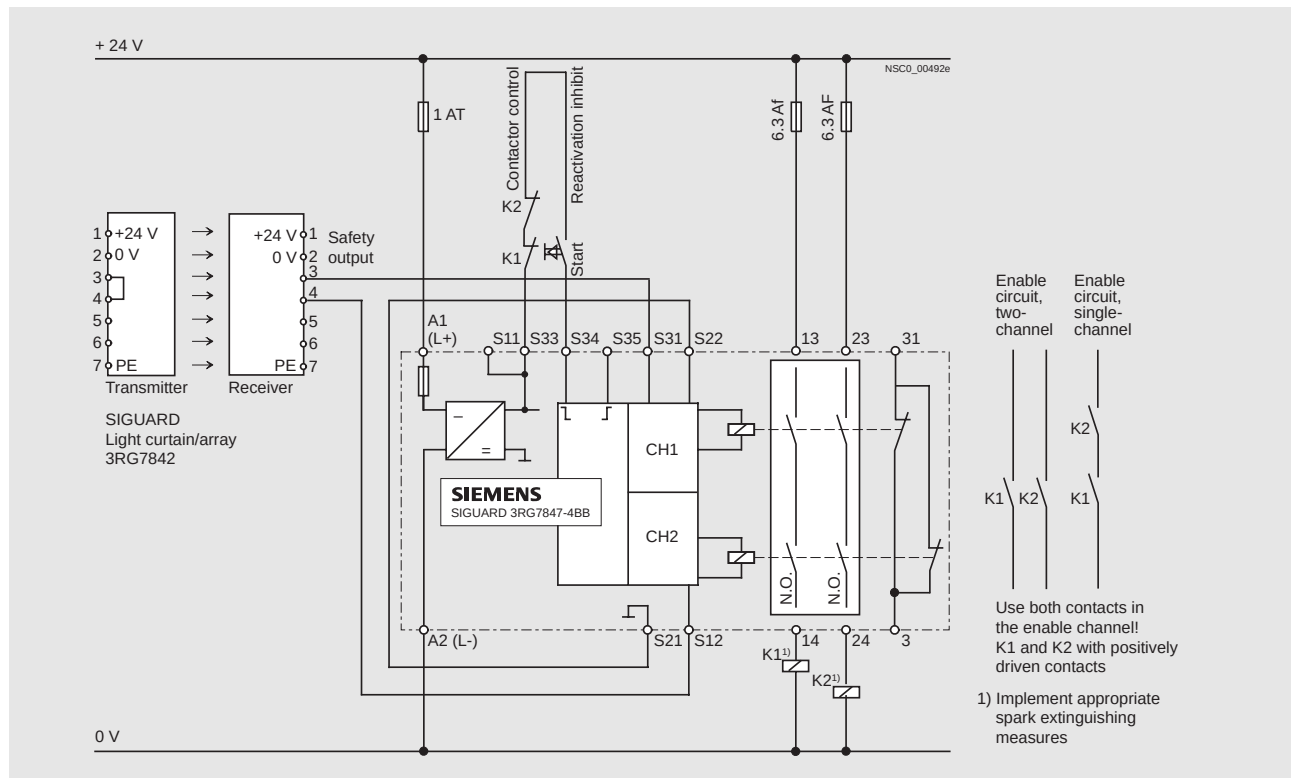
Evaluation units

Circuit diagrams

Standard evaluation unit 3RG78 47-4BA



Standard evaluation unit 3RG78 47-4BB

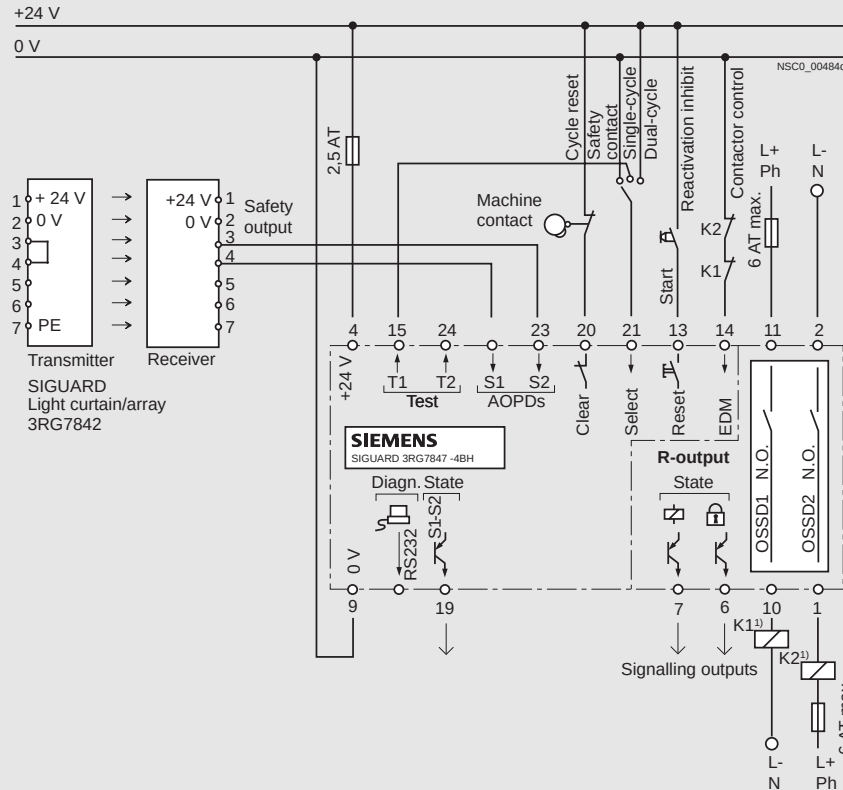


Light curtains and arrays SIMATIC FS400

Evaluation units

Evaluation units

Evaluation unit with sequence control 3RG78 47-4BH



Light curtains and arrays SIMATIC FS400

Assembly material

Overview

Installation, calibration, start-up and fault localization are aided by a wide range of practical accessories which include fixing columns, mirror columns, reflective mirrors, brackets and laser alignment aids.

Furthermore, the function of the light curtain as well as that of the evaluation units can be visualized and recorded using PC software.

Selection and ordering data

	Length mm	Order No.
Fixing columns		
	1060	3RG78 48-0CL
	1360	3RG78 48-0CP
	1660	3RG78 48-0CR
	1960	3RG78 48-0CU
Mirrors for light curtains		
	for series 3RG78 43, 3RG78 44, 3RG78 45, 3RG78 46, 3SF78 42 and 3SF78 44	
	Mirror	
	210	3RG78 48-1DC
	285	3RG78 48-1DD
	360	3RG78 48-1DL
	510	3RG78 48-1DM
	660	3RG78 48-1DN
	810	3RG78 48-1DP
	960	3RG78 48-1DR
	1110	3RG78 48-1DU
	1260	3RG78 48-1DE
	1410	3RG78 48-1DF
	1560	3RG78 48-1DG
	1710	3RG78 48-1DH
	1860	3RG78 48-1DK
	Mirror columns	
	1060	3RG78 48-0DL
	1360	3RG78 48-0DP
	1660	3RG78 48-0DR
	1960	3RG78 48-0DU
Mirror columns for light arrays		
	for series 3RG78 44, 3RG78 45, 3SF78 42 and 3SF78 44	
	Adjustable individual mirrors	
	1060, 2 beams	3RG78 48-0FL
	1360, 3 beams	3RG78 48-0FP
	1360, 4 beams	3RG78 48-0FR
Mounting materials		
	Bracket, hinged, with vibration damping (including 2 screws and 2 keyway slides)	3RG78 48-0BB
	Standard holding bracket set (1 set = 2 pcs., incl. screws)	3RG78 48-0AB

Light curtains and arrays SIMATIC FS400

Assembly material

Version	Order No.
Keyway blocks (1 set = 2 pcs.), M6	3RG78 48-0AC
Muting mounting system Total length 1000 mm with 2 rods 12 mm, for fixing columns (see page 1/83)	3RG78 48-2AF
Muting mounting system Total length 1000 mm with 2 reflectors	3RG78 48-2LF
Muting mounting system for sequential muting Total length 1000 mm with 4 rods 12 mm for fixing columns (see page 1/83)	3RG784 8-2DF
Muting mounting system for sequential muting Total length 1000 mm with 4 reflectors	3RG78 48-2KF
Muting mounting system Total length 350 mm with 2 rods 12 mm for fixing columns (see page 1/83)	3RG78 48-2GF
Muting mounting system, for mounting directly to device with slot/key fixture for 2 sensors, with angled rods, for fixing columns (see page 1/83)	3RG78 48-2HF
Rod for mounting to muting mounting system Diameter 12 mm, length 200 mm	3RX7 315
Rod for mounting to muting mounting system Diameter 12 mm, length 300 mm	3RX7 316
Mounting plate for sensors Affix to 12 mm rod, for sensor assembly system	3RX7 326
Mounting base with 12 mm hole for assembly system	3RX7 322

Keys



Safety key for teach-in mode
Magnetic key for alignment indicator

3RG78 48-2AH
3RG78 48-2BH

Laser alignment device



Standard version (to be used with light curtain type 4 only)
for mounting in conjunction with fixing columns
for light barriers and Laser scanners

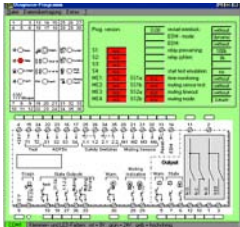
3RG78 48-1AB
3RG78 48-1AG
3RG7848-1AP

Test rods

for 3RG78 41 and 3RG78 42, resolution 14 mm and 30 mm
Set for light curtains 3RG78 44

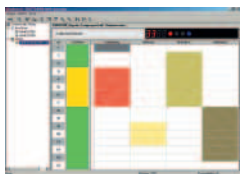
3RG78 48-0AH
3RG78 48-0FH

Diagnostics software



for evaluation units, incl. PC cable

3RG78 48-4AC



Diagnostics and parameter assignment software SafetyLab, with PC cable

3RG78 48-2SL

PC cable, including connector, 9-pole, with optical interface

3RG78 38-1DC

Light curtains and arrays SIMATIC FS400

Assembly material

Version		Length	Pole	Order No.
		m		
ASIsafe				
K45F 2F-DI LS Type 2 to be connected to light curtains type 2 3RG78 43				3RK1205-0CQ21-0AA3
K45F 2F-DI LS Type 4 to be connected to light curtains type 4 3RG78 46				3RK1205-0CQ24-0AA3
ASIsafe adapter for receiver 3SF78 44 for bus connection and 24 V power supply				3RG78 38-1DG
ASIsafe adapter for transmitter 3SF78 4 and receiver M12 bus terminal for AS-i duct				3RX98 01-0AA00
Cable M12 - ASIsafe-Adapter for Receiver 3SF78 44 M12		1	5-pin	3RG78 38-1EA
Connecting cable M12 - AS-i adapter for receiver 3SF78 44 M12		2	5-pin	3RG78 38-1EB
ASIsafe module for light curtains 3RG78 43, type 2				3RK1205-0BQ21-0AA3
ASIsafe module for light curtains 3RG78 46, type 4				3RK1205-0BQ24-0AA3
Cables and cable plugs, Hirschmann-type				
Cable plug			12-pin	3RG78 48-2DA
Angled cable plug			12-pin	3RG78 48-2DB
Cable for machine interface, straight plug		10		3RG78 48-2CK
Cable for machine interface, straight plug		25		3RG78 48-2DK
Cable for machine interface, straight plug		50		3RG78 48-2EK
Cables, Brad-Harrison-type (MIN-Series) for light curtains and arrays 3RG78 42 and 3RG78 44				
Note: Predominantly for NAFTA-Market	Connecting cable	4	7-pin	3RG78 48-0DB01
	Connecting cable	4	5-pin	3RG78 48-0DB00
	Connecting cable	4	3-pin	3RG78 48-0DB02
	Connecting cable	12	7-pin	3RG78 48-0KB01
	Connecting cable	12	5-pin	3RG78 48-0KB00
	Connecting cable	12	3-pin	3RG78 48-0KB02
	Connecting cable	20	7-pin	3RG78 48-0LB01
	Connecting cable	20	5-pin	3RG78 48-0LB00
	Connecting cable	20	3-pin	3RG78 48-0LB02
Cable and cable plugs for series 3RG78 44 and 3SF78 44				
Cable for local connection, with angled connector M12, 8-pin		3		3RG78 48-2AK
Cable for local connection, with angled connector M12, 8-pin		10		3RG78 48-2BK
Junction box, external, with six M12 sockets and cable		0.5		3RG78 48-2AB

Light curtains and arrays SIMATIC FS400

Assembly material

	Version	Rated voltage	Order No.
Muting light and accessories			
    	Light element clear	24 ... 230 V AC/DC	8WD42 00-1AE
	Connection element, with end cover for pipe mounting, floor mounting and angled mounting		8WD42 08-0AA
	Pipe (one piece), length 100 mm		8WD42 08-0EF
	Base (one piece) Plastic, for mounting on a surface		8WD42 08-0DE
	Angle for wall mounting		8WD42 08-0CA
	Incandescent light bulb, 5 Watts base BA 15d	24 V AC/DC	8WD43 28-1XX

	Length	Version	Order No.
Protective profiles and mounting profiles for light curtains 3RG78 41			
	150 mm		3RG78 48-0GB
	225 mm		3RG78 48-0GC
	300 mm		3RG78 48-0GD
	450 mm		3RG78 48-0GE
	600 mm		3RG78 48-0GF
	750 mm		3RG78 48-0GG
	900 mm		3RG78 48-0GH
	1050 mm		3RG78 48-0GJ
	1200 mm		3RG78 48-0GK
	1350 mm		3RG78 48-0GL
	1500 mm		3RG78 48-0GM
	1650 mm		3RG78 48-0GN
	1800 mm		3RG78 48-0GP

Cable with sockets M12 for light curtains 3RG78 41			
	5 m	straight	3RG78 48-1BA
	5 m	angled	3RG78 48-1BC
	15 m	straight	3RG78 48-1BD
	15 m	angled	3RG78 48-1BE

Cables with plugs M12 for light curtain transmitter 3RG78 43 and 3RG78 46			
5-pin, shielded	5 m	straight	3RG78 48-2EA
5-pin, shielded	5 m	angled	3RG78 48-2EB
5-pin, shielded	10 m	straight	3RG78 48-2EC
5-pin, shielded	10 m	angled	3RG78 48-2ED
5-pin, shielded	15 m	straight	3RG78 48-2EE
5-pin, shielded	15 m	angled	3RG78 48-2EF

Cables with plugs M12 for light curtain transmitter 3RG78 43 and 3RG78 46			
8-pin, shielded	5 m	straight	3RG78 48-2CA
8-pin, shielded	5 m	angled	3RG78 48-2CB
8-pin, shielded	10 m	straight	3RG78 48-2CC
8-pin, shielded	10 m	angled	3RG78 48-2CD
8-pin, shielded	15 m	straight	3RG78 48-2CE
8-pin, shielded	15 m	angled	3RG78 48-2CF

Light curtains and arrays SIMATIC FS400

Assembly material

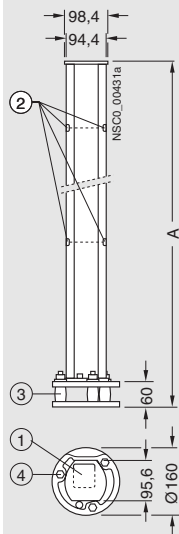
M12 socket	Cable	Length	Order No.
Connecting cables for ASIsafe with straight plugs and straight or angled socket M12, for light curtain transmitter 3RG78 43 and 3RG78 46			
straight	5-pin, shielded	5 m	3RG78 48-3EA
angled	5-pin, shielded	5 m	3RG78 48-3EB
straight	5-pin, shielded	10 m	3RG78 48-3EC
angled	5-pin, shielded	10 m	3RG78 48-3ED
straight	5-pin, shielded	15 m	3RG78 48-3EE
angled	5-pin, shielded	15 m	3RG78 48-3EF
Connecting cables for ASIsafe with straight plugs and straight or angled socket M12, for light curtain transmitter 3RG78 43 and 3RG78 46			
straight	8-pin, shielded	5 m	3RG78 48-3CA
angled	8-pin, shielded	5 m	3RG78 48-3CB
straight	8-pin, shielded	10 m	3RG78 48-3CC
angled	8-pin, shielded	10 m	3RG78 48-3CD
straight	8-pin, shielded	15 m	3RG78 48-3CE
angled	8-pin, shielded	15 m	3RG78 48-3CF
Designation			Order No.
Mounting material for light curtains 3RG78 43 and 3RG78 46			
  	Support 360 °		3RG7848-2BA
	Support L-angle		3RG7848-2BB
	Support Z-angle		3RG7848-2BC
	Support set 360°		3RG7848-2BD
	L-angle set and support set		3RG7848-2BE
	Z-angle set and support set		3RG7848-2BF
	Swivel-type support with oscillation damping		3RG7848-0BB
Test rods			
	Test rod 20 mm		3RG78 48-1CH
	Test rod 30 mm		3RG78 48-0AH
	Test rod 40 mm		3RG78 48-1BH

Light curtains and arrays SIMATIC FS400

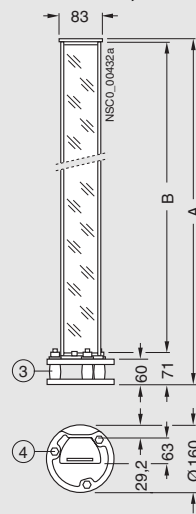
Assembly material

Dimension drawings

Fixing column 3RG78 48-0C.



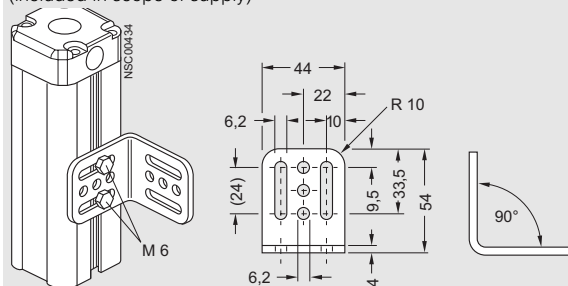
Mirror column 3RG78 48-0D., 3RG78 48-0F.



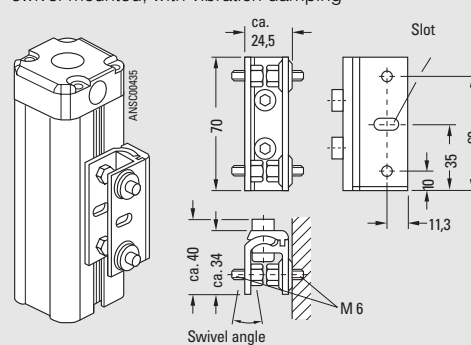
Type	A	B
3RG78 48-0.L	1060	974
3RG78 48-0.P	1360	1274
3RG78 48-0.R	1660	1574
3RG78 48-0.U	1960	1874

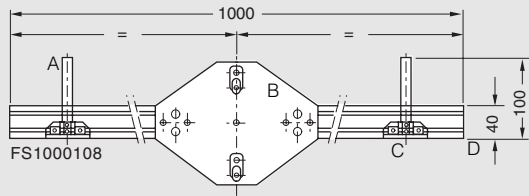
- ① Light curtain
- ② 8 holes, Ø 16 mm
- ③ Plastic springs, with automatic return function
- ④ 3 holes in floor for dowels, Ø 10 mm, 80 mm deep

Standard mounting bracket 3RG78 48-0AB (included in scope of supply)

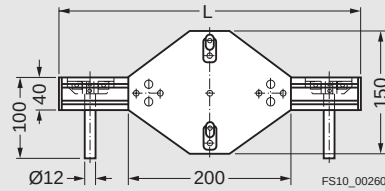
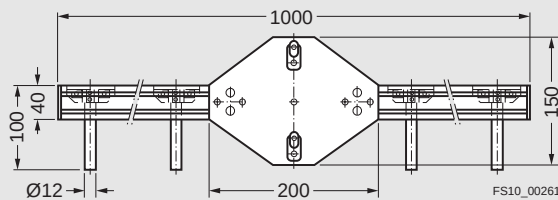
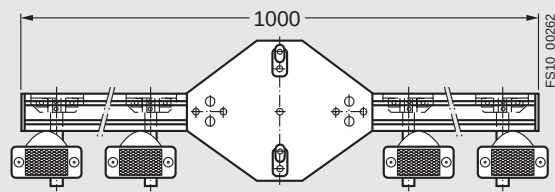
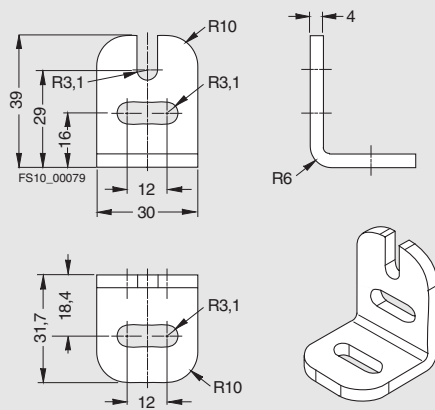
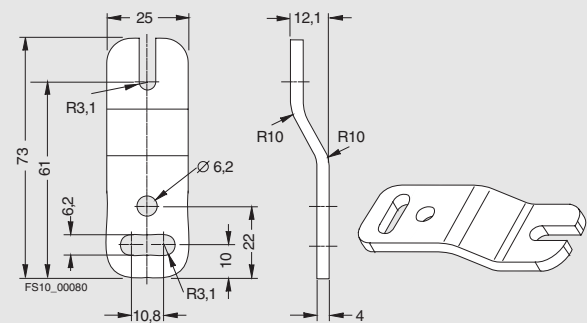


Support 3RG78 48-0BB, swivel-mounted, with vibration damping



Muting mounting system

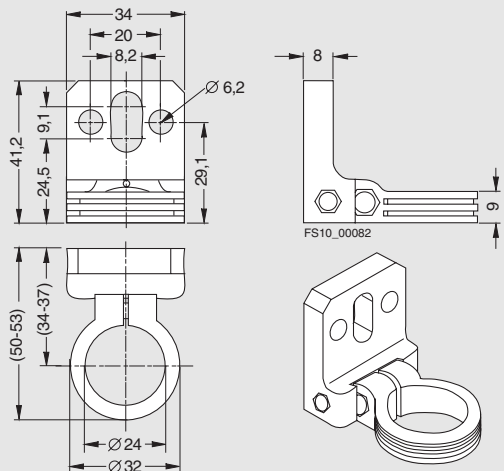
- A V2A rod 12 x 100 mm
- B mounting plate
- C Aluminium profile
- D Cover

Muting mounting system 3RG7848-2GF, length 350 mm with 2 rods**Muting mounting system 3RG7848-2DF for sequential muting, total length 1000 mm with 4 rods 12 mm****Muting mounting system for sequential muting 3RG7848-2KF, length 1000 mm with 4 reflectors****L-angle 3RG7848-2BB****Z-angle 3RG7848-2BC**

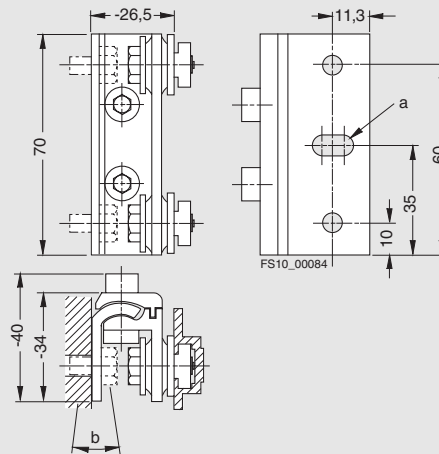
Light curtains and arrays SIMATIC FS400

Assembly material

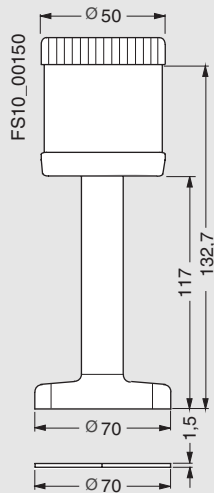
Support 360° 3RG7848-2BA



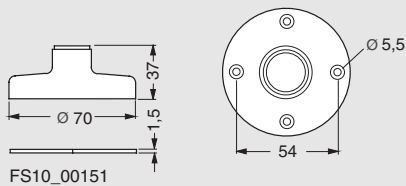
Swivel-type support with oscillation damping 3RG7848-0BB



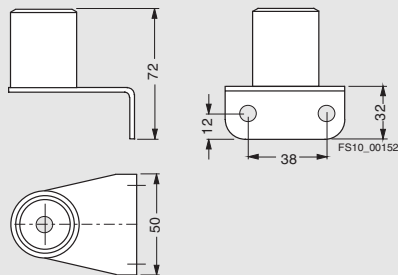
Signal column with light element 8WD42 00-1AE, pipe 8WD42 08-0EF and base 8WD42 08-0DE



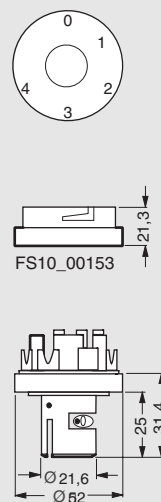
Base 8WD42 08-0DE



Angle for wall mounting 8WD42 08-0CA



Connection element 8WD42 08-0AA



Introduction

Overview

Our optical distance sensors provide perfect all-round protection to Category 3 according to EN 954-1.

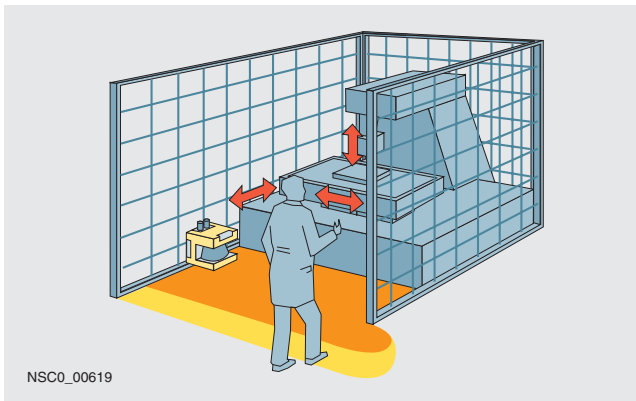
In an operating field of 190° and over a distance of up to 4.0 m (up to 15 m in non safety-related applications), the laser scanner reliably senses every object and every person. And it works so simply: The distance sensor emits light pulses at regular intervals.

If they hit an obstruction, the sensor receives the reflected light and evaluates it. If this is evaluated as the predefined area to be protected, a Stop function is triggered.

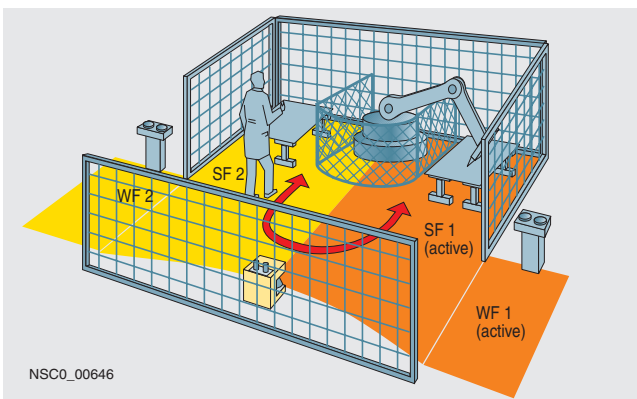
With up to four programmable protective field pairs that can be selected during operation, our laser scanners can be optimally adapted to any application - on machines, production robots, conveyor systems or vehicles.

Different variants support optimal integration in the automation system: Whether conventionally in the safety circuit, over PROFIBUS with PROFIsafe or over AS-Interface with ASIsafe.

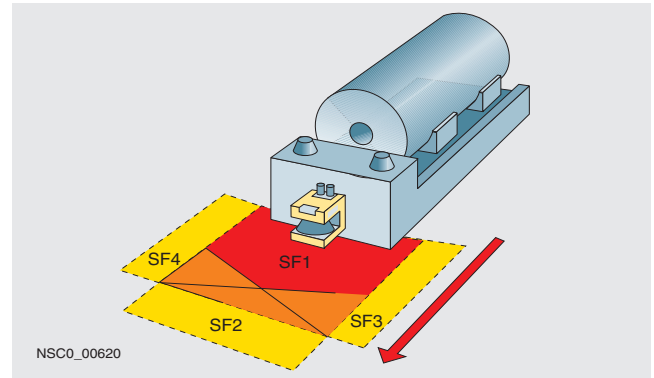
Application

Horizontal danger zone protection

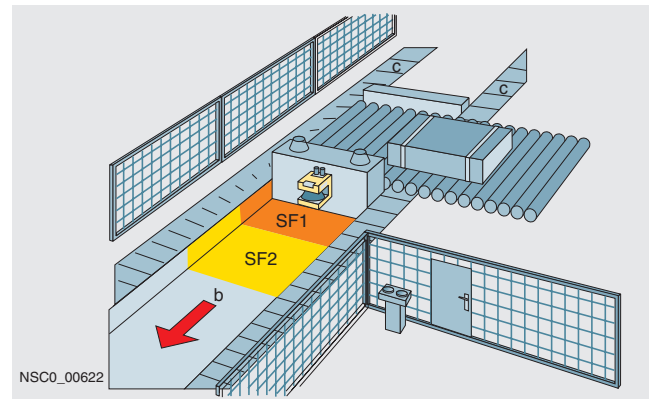
- Reliable detection of persons and objects in danger zones around machines and plants.
- Flexible programming of almost any protection and warning zones.

Horizontal danger zone protection with more than one protective field

- Reliable detection of persons in different danger zones by switching between protective fields.
- Increased availability due to accurate protection of just the fields that are currently active.

Route monitoring for automatic guided vehicle systems

- Reliable detection of persons and objects approaching the vehicle.
- The laser scanner offers a greater protection range than bumpers and, therefore, permits higher speeds.

Collision protection for shifting units

- Reliable protection of persons in the path of the vehicle.
- Objects in the path of the vehicle are detected in good time and damage to the vehicle or its load is prevented.

Other applications

- Many different types of hazardous area protection
- Protection for rooms and entrances
- Projecting object monitoring to protect machines and personnel
- Non-safety-relevant measuring or detection tasks (e.g. determining distances, positions, or contours)

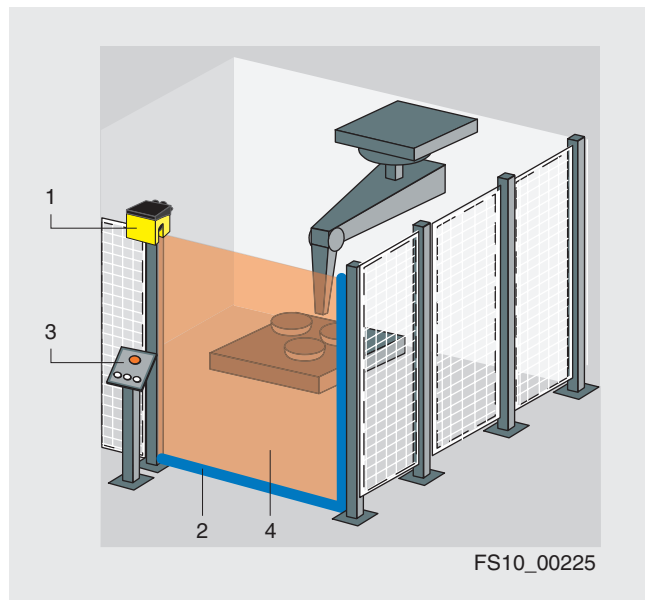
Laser scanners SIMATIC FS600

Introduction

Access protection by means of entry control

Access protection by means of entry control can be used when the entry location to a machine or to a danger zone can be precisely defined and when no other unsecured access to this area exists.

The laser scanner is preferably mounted above the entry point, aligned vertically. To protect the protective devices, laser scanners and fence from inadvertent adjustment and malicious manipulation, the protective fields of the laser scanners must be defined using reference contours. In this operating mode, the scanner uses the sampled environment as a reference and can therefore monitor changes to the structure of the protective equipment as well as each individual measurement to detect an entering person.



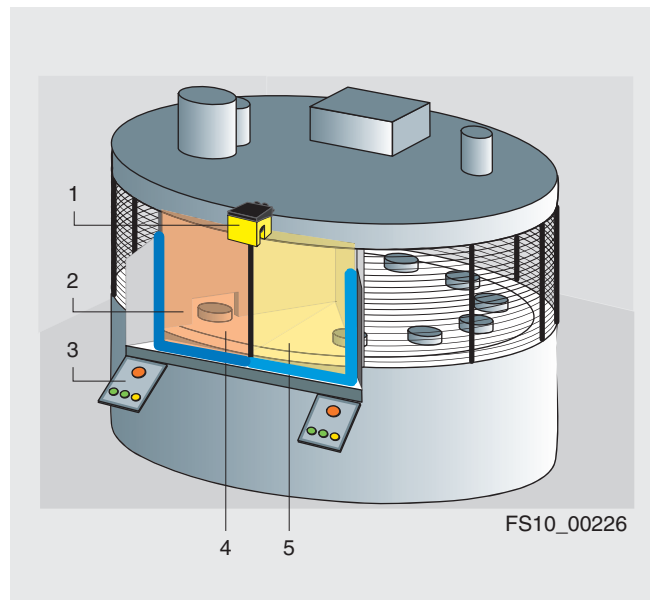
Access through entry control

- 1 Laser scanners
- 2 Reference contour
- 3 Emergency stop
- 4 Protective field

Securing danger zones by means of hand and arm guards

If a machine operator has to be close to the dangerous movement or if the operator coordinates the positioning and removal of workpieces at the machine, danger zone protection must be implemented at the machine.

A protective device must be used to guard these danger zones. The laser scanner is approved for securing danger zones by means of hand and arm guards and can, also in combination with protective field changeover, ensure flexible work safety. To protect the protective devices, laser scanners and the screens (attached to the sides as a reference and as additional access protection) from inadvertent adjustment and malicious manipulation, the protective fields of the laser scanners must be defined using reference contours.

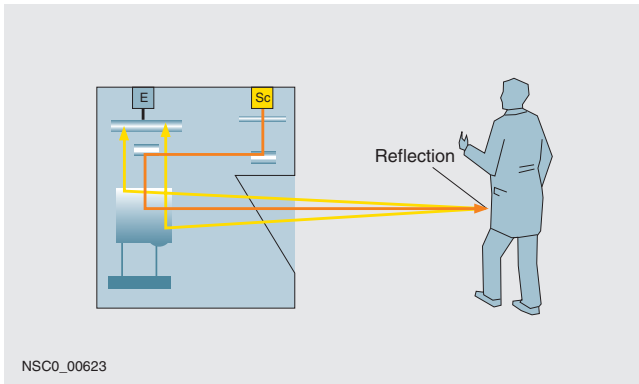


Application example for a circular table

- 1 Laser scanners
- 2 Reference contour
- 3 Emergency stop
- 4, 5 Protective fields with reference classes

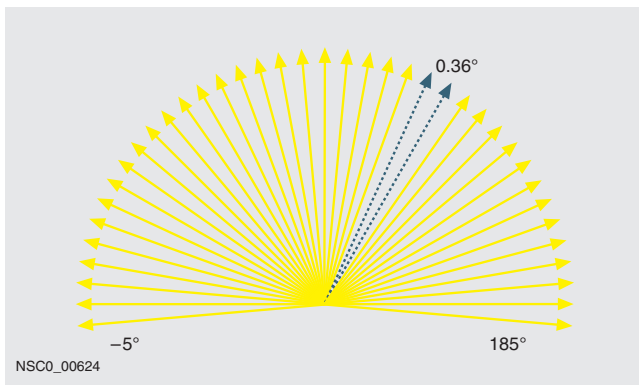
Function

The LS4 laser scanner is an optical, contact-free surface scanner – designed primarily for protection of persons.



Using a laser diode with transmission optics, the laser scanner continuously generates bundled light pulses that are scattered throughout the operating range by an integrated rotating mirror. If objects or persons enter the field, it evaluates the reflected light pulses and continuously calculates the exact position coordinates on the basis of the light propagation time. If the defined personnel protective field is penetrated, the laser scanner stops the machine immediately (within the system response time). The Stop function is reset when the protective field is free again, either automatically or following acknowledgement (depending on the operating mode).

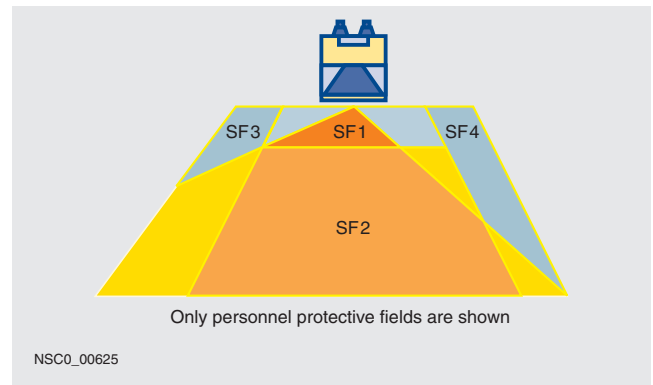
The operating range of the LS4 laser scanner spans 190° and is subdivided into angle segments of 0.36°.



The scan rate is 25 scans/second, i.e. one light pulse every 40 ms in each segment. A special algorithm ensures that objects larger than 70 mm (this corresponds to the scanner resolution) can be reliably detected and that contamination (e.g. dust) does not reduce system availability. The LS4 laser scanner detects people (even if they are wearing dark clothing) at a distance of up to 4 m (failsafe). People or objects can, however, be detected at a distance of up to 15 m so that a warning can be issued (not safety relevant).

Four protective field/warning field pairs

Four variable protective field pairs for the personnel protective field and warning field, which can be easily set on the PC, ensure that the LS4 laser scanner can be adapted to suit any requirement.



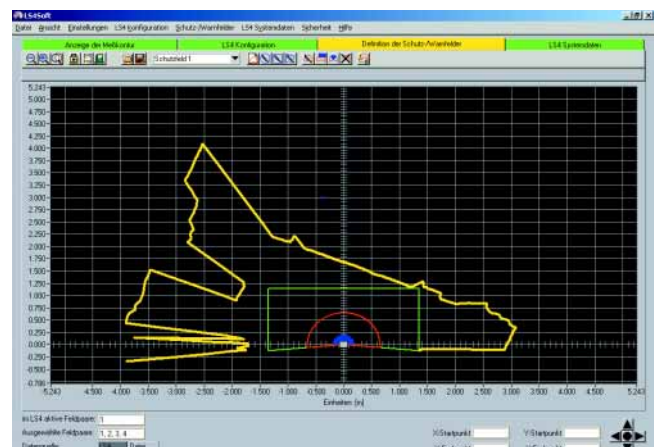
It can be implemented in stationary applications (machines and installations) or mobile applications (vehicles, automatic guided vehicle systems, or shifting units). In the case of a robot, for example, different operating ranges can be protected, whereby the laser scanner operates in succession with regard to time and space. In the case of automatic guided vehicle systems, four programmable protective fields can be protected, e.g. rapid travel, slow travel, turning left, turning right.

LS4soft operator software

Thanks to the PC operator software LS4soft, it could not be easier to optimize the laser scanner settings. The following functions have been integrated

- User-friendly configuration of the protective field using a PC or laptop
- Configuration of additional functions, such as protective field selection, restart inhibit, etc., by means of a software wizard
- Comprehensive range of displays, e.g. defined protective fields, current scan contours, system settings, etc., reliable, password-protected access with different authorization levels
- Executable under Microsoft Windows 95/98/NT/2000/XP

The operator software is supplied with the laser scanner.



Laser scanners SIMATIC FS600

Standard laser scanner

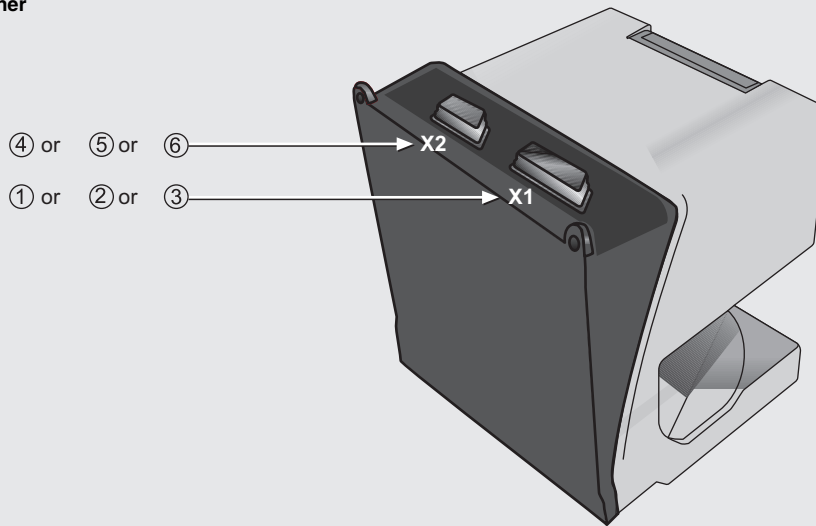
Overview



Standard laser scanner with port covers

Integration

Standard laser scanner



FS10_00138

Contact assignment

Port	Description	Position	Connectable accessories	Order No.
X1	15-pin. Sub-D-Connector for control interface	①	Socket, complete, 15-pin	3RG78 38-1BA
		②	Socket, complete, 15-pin with cable guide	3RG78 38-1BB
		③	Cable, incl. socket, 15-pin	3RG78 38-1BD (5 m)
				3RG78 38-1BE (10 m)
				3RG78 38-1BF (20 m)
3RG78 38-1BG (35 m)				
X2	9-pin. Sub-D-socket for RS232/RS422 PC interface	④	Connector, complete, 9-pin	3RG78 38-1BH (50 m)
				3RG78 38-1CA
				3RG78 38-1CB
				3RG78 38-1CC (3 m)
		⑥	Cable, incl. connector, 9-pin	3RG78 38-1CD (5 m)
3RG78 38-1CE (10 m)				

Technical Specifications

Type	Standard laser scanner
Personnel protective field	
Detection range	0 ... 4 m
Luminance factor	Min. 1.8 %
Object size/diameter	70 mm (cylindrical test object)
Response time	
• Dual evaluation (2 scans)	80 ms
• Adjustable up to 16 scans	640 ms
No. of protective fields	4 (can be selected over switching inputs)
Output	2 fail-safe pnp transistor outputs (24 V, 250 mA)
Safety category	
• To DIN V 19250	Requirements class 4
• To EN 954-1	Category 3 (single-fault-proof)
• To IEC 61496-1, EN 61496-3	Type 3
Start	Start-up testing and start-up inhibit can be set separately.
Restart	160 ms ... 10 s (can be set or is manual)
Supplement with deactivated dust suppression	83 mm
Supplement with activated dust suppression	
• Protective field size < 3.5 m	83 mm
• Protective field size > 3.5 m	100 mm
Additional supplement in the case of retro-reflectors or highly reflective surfaces (e.g. certain metals or ceramics) in the scan plane	
• Over 1.2 m behind the protective field line	0 mm
• In protective field or up to 1.2 m behind the protective field line	110 mm
Warning field	
Detection range	0 ... 15 m
Luminance factor, min.	20 %
Object size	150 mm × 150 mm
Response time	
• Dual evaluation (2 scans)	80 ms
• Adjustable up to 16 scans	640 ms
No. of warning fields	4 (can be selected over switching inputs)
Output	pnp transistor output (max. 100 mA)
Contour measurement	
Detection range	0 ... 50 m
Luminance factor	Min. 20 %
Object size	–
Output	RS 232 serial interface (10 m), RS 422 (50 m)
Radial resolution	5 mm
Lateral resolution	0.36°
Power supply	
Operating voltage	Supply (to IEC 60742) with safety isolating transformer or similar for DC/DC transducers

Type	Standard laser scanner
• External supply	24 V DC, –30 ... +20 %
Current consumption, approx.	300 mA (use power pack with 2.5 A)
Power consumption with 24 V	8 W plus output load
Overcurrent protection	1.25 A fuse, medium time lag, in control cabinet
Overvoltage protection	With safe final shutdown
Voltage dips	According to EN 61496-1
Protective conductor	Must not be connected
Inputs	
Restart/reset	Connection of a command unit for operating mode with restart inhibit and/or device reset, dynamically monitored, 24 V DC optically decoupled
Field pair changeover	Selection from 4 field pairs through 4 control leads with internal monitoring (1 field pair = 1 protective field and 1 warning field), 24 V DC optically decoupled
Signal definition	
• High (logical 1)	16 ... 30 V
• Low (logical 0)	< 3 V
Parameter assignment	
Operating software	Communication and parameter assignment software under Windows 95/98/NT/2000/XP with safe programming protocol
Interfaces	
For device parameterization field definition	RS 232, RS 422
Outputs	
Protective field	2 × safe semiconductor output, pnp, max. 250 mA short-circuit monitored, overcurrent protected
Warning field/pollution/fault	pnp transistor output (max. 100 mA)
Load characteristics, max. values	Low-pass response
• Limit frequency f_g	< 1 kHz
• Capacitance C_{load}	< 100 nF
Level	
• High (OSSD)	$U_b - 3.2 V$
• Low (OSSD)	< 2 V
• High (alarm active)	$U_b - 4 V$
• Low (alarm inactive)	< 2 V
Environment and materials	
Degree of protection to IEC 60529	IP65
Shock-hazard protection	Total insulation, safety class 2
Ambient temperature	
• Operation	0 ... +50 °C
• Storage	–20 ... +60 °C
Humidity to DIN 40040	Table 10, code E (fairly dry)
Housing material	Cast aluminum, plastic
Weight, approx.	2 kg

Laser scanners SIMATIC FS600

Standard laser scanner

Type	Standard laser scanner
Dimensions (W × H × D) in mm	140 × 155 × 135
Distance from center of scan plane to lower edge of housing	48.75 mm
Distance from rear edge of housing to rotating mirror axis	68 mm
Vibratory load over 3 axes to IEC 60068, part 2-6	10 ... 150 Hz, max. 5 g
Continuous shock over 3 axes to IEC 60068, part 2-29	10 g, 16 ms
Interference immunity	
• To EN 61496-1	In accordance with requirements for type 4
• To DIN 40839-1, 3	Test pulses 1, 2, 3a, 3b, 5 (do not use in vehicles with internal-combustion engines)
Rotating mirror drive	Brushless DC motor
Rotating mirror bearing	Maintenance-free ball bearing
Connections	
Cable lengths	2 connectors (plugged in from above, soldered connection)
• Control cable X1, max.	50 m (for conductor cross-section of 0.5 mm ² , shielded)
• Data cable X2, RS 232, max.	10 m
• Data cable X2, RS 422, max.	50 m (twisted pair)
Optical characteristics	
Rotation angle, max.	190°
Angle resolution	0.36°
Lateral tolerance	
• Without assembly system (for rear of housing)	± 0.18°
• With assembly system (for mounting surface)	± 0.22°
Scan rate	25 scans/s or 40 ms/scan
Laser protection class to EN 60825-1	Class 1 (eye safe)
• Wavelength	905 nm (infrared)
• Beam divergence	2 mrad
• Time base	100 s

Selection and ordering data

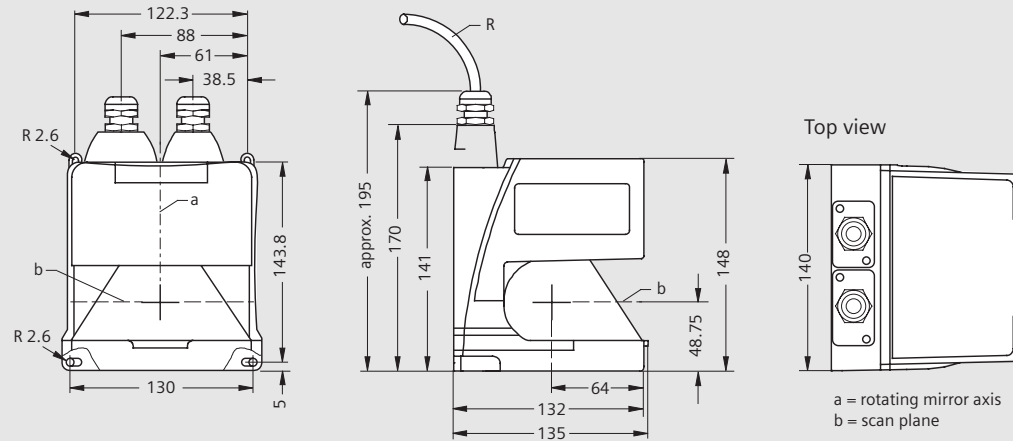
	Order No.
SIMATIC FS620I standard laser scanner Including LS4soft software, for securing danger zones	3RG78 34-6DD00
SIMATIC FS660I standard laser scanner with vertical protection Including LS4soft software, for securing danger zones, danger points and access protection	A 3RG78 34-6DE00
	
Accessories Assembly system, hinged, for easy adjustment	3RG78 38-1AA
	
Adapter plate for PLS mounting support	3RG78 38-1AB
Cleaning set Includes cleaning fluid (1000 ml), cloths (100 pcs.)	3RG78 38-7RS
Connectors and cables	
• Socket, complete, 15-pin (X1)	3RG78 38-1BA
• Plug, complete, 9-pin (X2)	3RG78 38-1CA
• Socket, complete, 15-pin (X1) with lateral cable routing	3RG78 38-1BB
• Plug, complete, 9-pin (X2) with lateral cable routing	3RG78 38-1CB
Connecting cable incl. socket, 15-pin (X1)	
• 5 m	3RG78 38-1BD
• 10 m	3RG78 38-1BE
• 20 m	3RG78 38-1BF
• 35 m	3RG78 38-1BG
• 50 m	3RG78 38-1BH
Connecting cable incl. plug, 9-pin (X2)	
• 3 m	3RG78 38-1CC
• 5 m	3RG78 38-1CD
• 10 m	3RG78 38-1CE

For suitable evaluation units, see "Evaluation units", from page 3/55.

A: Subject to export regulation AL = N and ECCN = EAR99H

Dimension drawings

Standard laser scanner with switching output

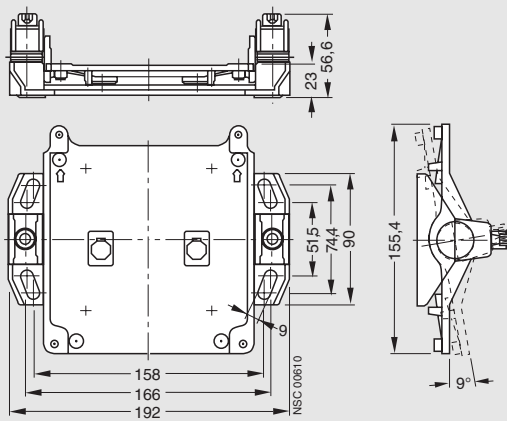


R = smallest bending radius: 50 mm (original accessories)

a = rotating mirror axis

b = scan plane

3RG78 38-1AA assembly system



Laser scanners SIMATIC FS600

ASIsafe laser scanner

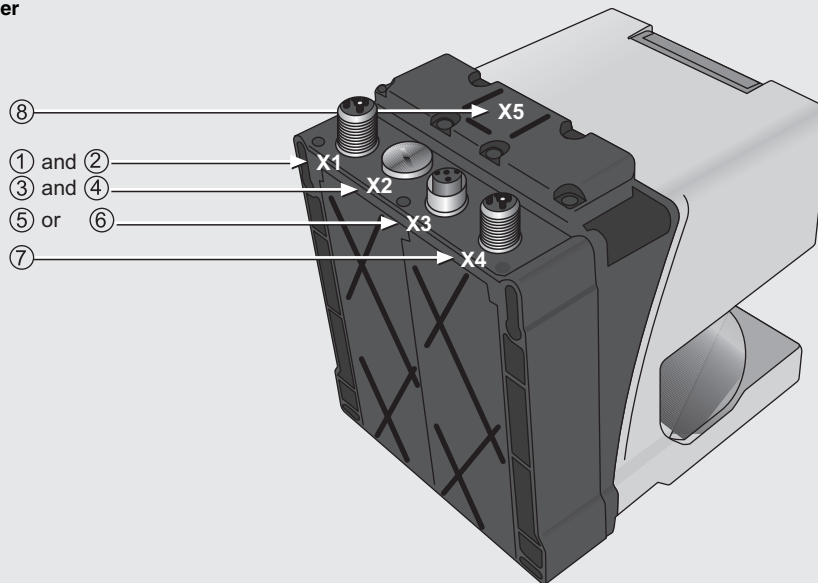
Overview



ASIsafe laser scanner

Integration

ASIsafe laser scanner



FS10_00136

Contact assignment

Port	Description	Position	Connectable accessories	Order No.
X1	M12 connector for AS-Interface (Bus connection and 24 V DC power supply)	①	LS4 connecting cable to M12 AS-Interface adapter	3RG78 38-1EA (1 m) 3RG78 38-1EB (2 m)
		②	M12 AS-Interface adapter	3RG78 38-1DG
X2	Port for AS-Interface addressing and diagnostics unit	③	AS-Interface addressing and diagnostics unit	3RK1 904-2AB01
		④	Connecting cable with M12 socket and M12 plug (3-core)	3RX8 000-0GF32-1AB5 (1.5 m)
X3	M12 socket for connecting the changeover for the protective fields	⑤	M12 jumper plug (suitable for fixed protection field 1)	3RG78 38-1DF
		⑥	M12 connector with terminal housing, 5-pin	3RX8 000-0CD55
X4	M12 connector for connecting a restart button (optional)	⑦	M12 cable socket with terminal housing, 5-pin	3RX8 000-0CB55
X5	Optical PC interface	⑧	PC connecting cable for LS4 with optical interface, 9-pin	3RG78 38-1DC

Technical Specifications

Type	ASIsafe laser scanner
Personnel protective field	
Detection range	0 ... 4 m
Luminance factor, min.	1.8 %
Object size/diameter	70 mm (cylindrical test object)
Response time	
• Dual evaluation (2 scans)	85 ms (laser scanner only, without AS-Interface system times)
• Adjustable up to 16 scans	645 ms (laser scanner only, without AS-Interface system times)
No. of protective fields	4 (selectable over switching inputs)
Safety category	Category 3 to EN 954-1, type 3 to IEC 61496-1 or EN 61496-3
Output	Secure AS-Interface
Start	Start test and start inhibit can be set separately
Restart	160 ms ... 10 s (can be set or is manual)
Protective field supplement	
• For deactivated dust suppression	83 mm
• For activated dust suppression	
- protective field size < 3.5 mm	83 mm
- protective field size > 3.5 mm	100 mm
• Additional supplement in the case of retro-reflectors or highly reflective surfaces (e.g. certain metals or ceramics) in the scan plane	
- over 1.2 m behind the protective field line	0 mm
- in protective field or up to 1.2 m behind the protective field line	110 mm
Warning field	
Detection range	0 ... 15 m
Luminance factor, min.	20 %
Object size	150 × 150 mm
Response time	
• dual evaluation (2 scans)	85 ms (laser scanner only, without AS-Interface system times)
• adjustable up to 16 scans	645 ms (laser scanner only, without AS-Interface system times)
No. of warning fields	4 (selectable over switching inputs)
Output	AS-Interface
Contour measurement	
Detection range	0 ... 50 m
Luminance factor	min. 20 %
Output	RS 232 serial interface, through infrared interface
Radial resolution	5 mm
Lateral resolution	0.36 °
Supply voltage	
• through AS-Interface network	29.5 ... 31.6 V (according to AS-Interface specification)
• through external supply	24 V DC (±20 %)

Type	ASIsafe laser scanner
• Note	The power pack for the external power supply and the AS-Interface power pack for supplying the AS-Interface components must have a safe isolation to IEC 60742 and must bridge brief power failures of up to 20 ms (e.g. AS-Interface power pack 3RX9 307-0AA00).
Overcurrent protection	Fuse 1.25 A (medium slow)
Typical current consumption from supply circuit	400 mA
Typical current consumption from AS-Interface circuit	50 mA
Inputs	
Restart/Reset	Connection of a command unit for operating mode with restart inhibit and/or device reset, dynamically monitored, 24 V DC optically decoupled
Field pair changeover	Selection from four field pairs over 4 control leads with internal monitoring (1 field pair = 1 protective field and 1 warning field), 24 V optically decoupled
Signal definition	
• High (logical 1)	16 ... 30 V
• Low (logical 0)	< 3 V
Control cable	
• Length, max.	50 m (cable cross-section: 0.5 mm ² , shielded)
AS-Interface address programming	Connection of a standard AS-Interface address programming device
RS 232 interfaces over infrared interface	For device parameter assignment and field definition
Optics	
Angular range	190 °
Angle resolution	0.36 °
Lateral tolerance	
• without assembly system (for rear of housing)	± 0.18 °
• with assembly system (for mounting surface)	± 0.22 °
• Scan rate	25 scans/s or 40 ms/scan
Laser protection class	
• to standard	EN 60825-1, class 1 (eye-safe)
• wavelength	905 nm
• beam divergence	2 mrad
• time base	100 s

Laser scanners SIMATIC FS600

ASIsafe laser scanner

Type	ASIsafe laser scanner
Environment and material	
Degree of protection	IP65
Ambient temperature	
• Operation	0 ... +50 °C
• Storage	-20 ... +60 °C
Housing insulation class	Protection class 2
Humidity	To DIN 40040, table 10, code E (fairly dry)
Dimensions (W × H × D) in mm	141 × 167 × 168
Weight	2.25 kg
Transmitter	Infrared laser diode (λ = 905 nm)
Housing	Cast aluminum, plastic, steel connection plate
Vibrations over 3 axes to IEC 60068, part 2-6	10 ... 150 Hz, max. 5 g
Continuous shock over 3 axes to IEC 60068, part 2-29	10 g, 16 ms
Drive for rotating mirror	Brushless DC motor
Bearing for rotating mirror	Maintenance-free ball bearing
AS-Interface	
• ID code	B
• I/O code	0 (four data bits as outputs)
• Slave address	Programmed by user in the range 1 ... 31 (on delivery = 0)
• Cycle time in accordance with AS-Interface specification	5 ms
• Profile	Reliable slave

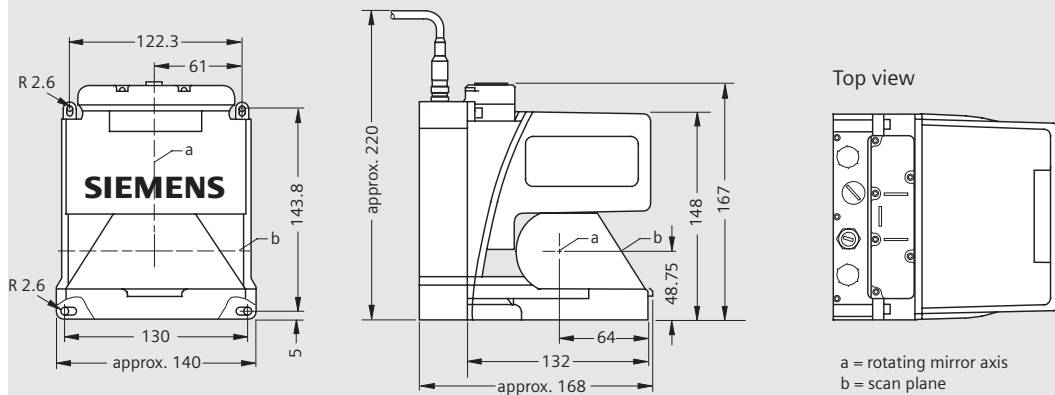
Selection and ordering data

Order No.	
SIMATIC FS620I ASIsafe laser scanner	3SF78 34-6DD00
Including LS4soft software, for securing danger zones	
SIMATIC FS660I ASIsafe laser scanner with vertical protection	3SF78 34-6DE00
Including LS4soft software, for securing danger zones, danger points and access protection	
	
Accessories	
Assembly system , hinged, for easy adjustment	3RG78 38-1AA
	
Adapter plate for PLS mounting support	3RG78 38-1AB
Cleaning set	3RG78 38-7RS
Includes cleaning fluid (1000 ml), cloths (100 pcs.)	
Connectors and cables	
PC connecting cable for laser scanners AS-Interface and PROFIBUS	3RG78 38-1DC
Includes plug (9-pin) and optical interface	
M12 jumper plug (suitable for protection field)	3RG78 38-1DF
M12 adapter	3RG78 38-1DG
For AS-Interface and power supply	
LS4 M12 – M12 adapter connection cable	
• 5-pin, 1 m long	3RG78 38-1EA
• 5-pin, 2 m long	3RG78 38-1EB

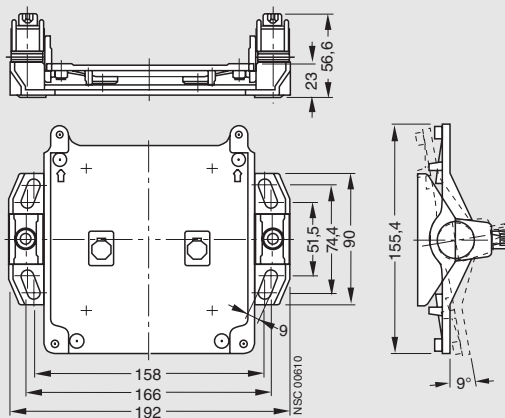
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Dimension drawings

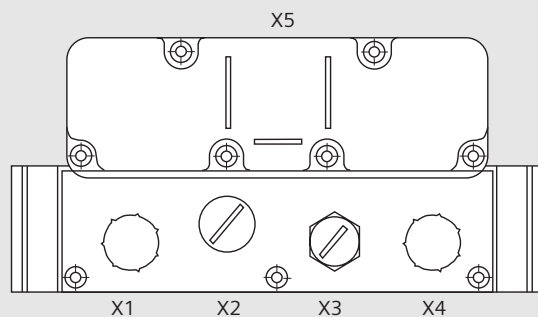
ASIsafe laser scanner



3RG78 38-1AA assembly system



Circuit diagrams



- X1 AS-Interface connection (Bus connection and 24 Volt power supply)
- X2 AS-Interface connection for address programming device
- X3 Connection protective fields switchover
- X4 Connection restart button
- X5 Optical PC Interface

Laser scanners SIMATIC FS600

PROFIsafe laser scanner

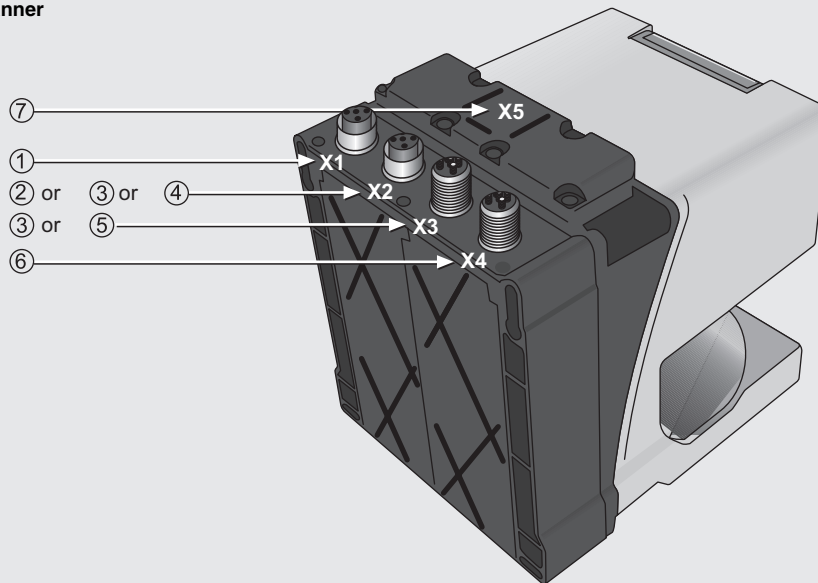
Overview



PROFIsafe laser scanner

Integration

PROFIsafe laser scanner



FS10_00137

Contact assignment

Port	Description	Position	Connectable accessories	Order No.
X1	M12 connector for connecting a restart button (optional)	①	M12 connector with terminal housing, 5-pin	3RX8 000-0CD55
X2	M12 socket for PROFIBUS output cable	②	Terminating resistor for PROFIBUS DP	6GK1 905-0EC00
		③	PROFIBUS M12 connecting cable, with plug and socket, 2-pin	6XV1 830-3DE50 (0.5 m) 6XV1 830-3DH15 (1.5 m) 6XV1 830-3DH30 (3 m) 6XV1 830-3DH50 (5 m) 6XV1 830-3DN10 (10 m) 6XV1 830-3DN15 (15 m)
		④	PROFIBUS M12 connecting plug with male insert	6GK1 905-0EA00
X3	M12 plug for PROFIBUS input cable	③	PROFIBUS M12 connecting cable, with plug and socket, 2-pin	6XV1 830-3DE50 (0.5 m) 6XV1 830-3DH15 (1.5 m) 6XV1 830-3DH30 (3 m) 6XV1 830-3DH50 (5 m) 6XV1 830-3DN10 (10 m) 6XV1 830-3DN15 (15 m)
		⑤	PROFIBUS M12 connecting plug with female insert	6GK1 905-0EB00
X4	M12 plug for 24 V DC power supply	⑥	M12 cable socket with terminal housing, 5-pin	3RX8 000-0CB55
X5	Optical PC interface	⑦	PC connecting cable for LS4 with optical interface, 9-pin	3RG78 38-1DC

Technical Specifications

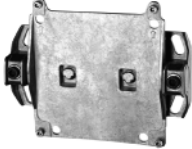
Type	PROFIsafe laser scanner
Personnel protective field	
Detection range	0 ... 4 m
Luminance factor, min.	1.8 %
Object size/diameter	70 mm (cylindrical test object)
Response time	
• Dual evaluation (2 scans)	80 ms (laser scanner only, without PROFIBUS system times)
• Adjustable up to 16 scans	640 ms (laser scanner only, without PROFIBUS system times)
No. of protective fields	4 (selectable over PROFIBUS)
Safety category	Category 3 to EN 954-1, type 3 to IEC 61496-1 or EN 61496-3
Output	PROFIBUS (PROFIsafe profile)
Start	Start test and start inhibit can be set separately
Restart	160 ms ... 10 s (can be set or is manual)
Protective field supplement	
• For deactivated dust suppression	83 mm
• For activated dust suppression	
- protective field size < 3.5 mm	83 mm
- protective field size > 3.5 mm	100 mm
• Additional supplement in the case of retro-reflectors or highly reflective surfaces (e.g. certain metals or ceramics) in the scan plane	
- over 1.2 m behind the protective field line	0 mm
- in protective field or up to 1.2 m behind the protective field line	110 mm
Warning field	
Detection range	0 ... 15 m
Luminance factor, min.	20 %
Object size	150 mm × 150 mm
Response time	
• dual evaluation (2 scans)	80 ms (laser scanner only, without PROFIBUS system times)
• adjustable up to 16 scans	640 ms (laser scanner only, without PROFIBUS system times)
No. of warning fields	4 (selectable over PROFIBUS)
Output	PROFIBUS
Contour measurement	
Detection range	0 ... 50 m
Luminance factor	min. 20 %
Output	RS 232 serial interface, through infrared interface
Radial resolution	5 mm
Lateral resolution	0.36 °
Supply voltage	
• through external supply	24 V DC (+20 %, -30 %)
• Note	The power pack of the external power supply must have a safe isolation to IEC 60742 and must bridge brief power failures of up to 20 ms.
Overcurrent protection	Fuse 1.25 A (medium slow)

Type	PROFIsafe laser scanner
Typical current consumption from supply circuit	350 mA
Inputs	
Restart/Reset	Connection of a command device for "with restart inhibit" mode and/or device resets, monitored dynamically
Field pair changeover	Field pair switchover over PROFIBUS (PROFIsafe profile)
Signal definition	
• High (logical 1)	16 ... 30 V
• Low (logical 0)	< 3 V
Control cable	
• Length, max.	50 m (cable cross-section: 0.5 mm ² , shielded)
RS 232 interfaces over infrared interface	For device parameter assignment and field definition
Optics	
Angular range	190 °
Angle resolution	0.36 °
Lateral tolerance	
• without assembly system (for rear of housing)	± 0.18 °
• with assembly system (for mounting surface)	± 0.22 °
• Scan rate	25 scans/s or 40 ms/scan
Laser protection class	
• to standard	EN 60825-1, class 1 (eye safe)
• wavelength	905 nm
• beam divergence	2 mrad
• time base	100 s
Environment and material	
Degree of protection	IP65
Ambient temperature	
• Operation	0 ... +50 °C
• Storage	-20 ... +60 °C
Housing insulation class	Protection class 2
Humidity	To DIN 40040, table 10, code E (fairly dry)
Dimensions (W × H × D) in mm	141 × 167 × 168
Transmitter	Infrared laser diode (λ = 905 nm)
Housing	Cast aluminum, plastic, steel connection plate
Vibrations over 3 axes to IEC 60068, part 2-6	10 ... 150 Hz, max. 5 g
Continuous shock over 3 axes to IEC 60068, part 2-29	10 g, 16 ms
Drive for rotating mirror	Brushless DC motor
Bearing for rotating mirror	Maintenance-free ball bearing

Laser scanners SIMATIC FS600

PROFIsafe laser scanner

Selection and ordering data

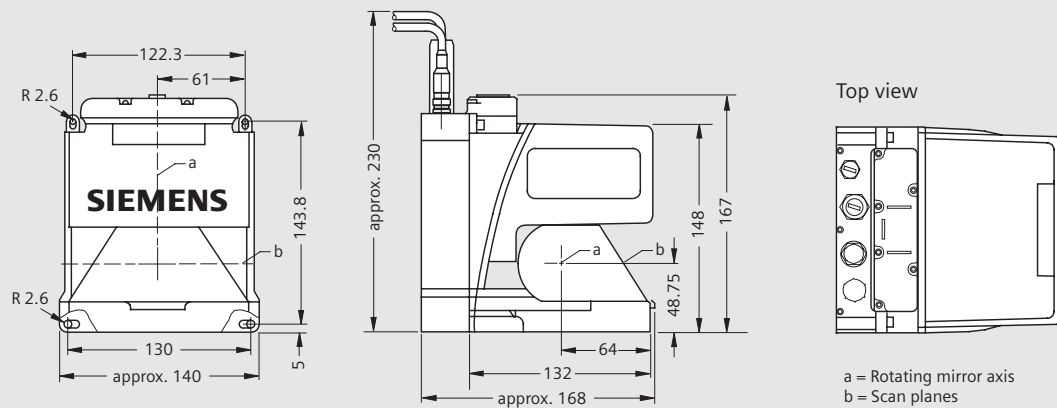
	Order No.
SIMATIC FS620I PROFIsafe laser scanner Including LS4soft software, for securing danger zones	3SF78 34-6PB00
SIMATIC FS660I PROFIsafe laser scanner with vertical protection Including LS4soft software, for securing danger zones, danger points and access protection	A 3SF78 34-6PE00
	
Accessories Assembly system , hinged, for easy adjustment	3RG78 38-1AA
	
Adapter plate for PLS mounting support	3RG78 38-1AB
Cleaning set Includes cleaning fluid (1000 ml), cloths (100 pcs.)	3RG78 38-7RS

	Order No.
Connectors and cables PC connecting cable for laser scanners AS-Interface and PROFIBUS Includes plug (9-pin) and optical interface	3RG78 38-1DC
PROFIBUS M12 terminating connector For PROFIBUS DP 1 package = 5 pieces	6GK1 905-0EC00
PROFIBUS M12 terminating connector 1 package = 5 pieces	
• Pin insert • Socket insert	6GK1 905-0EA00 6GK1 905-0EB00
PROFIBUS M12 plug-in cables 2-core (inverted coding) preassembled, with M12 connectors, in different lengths:	
• 0.5 m • 1.5 m • 3.0 m • 5.0 m • 10.0 m • 15.0 m	6XV1 830-3DE50 6XV1 830-3DH15 6XV1 830-3DH30 6XV1 830-3DH50 6XV1 830-3DN10 6XV1 830-3DN15

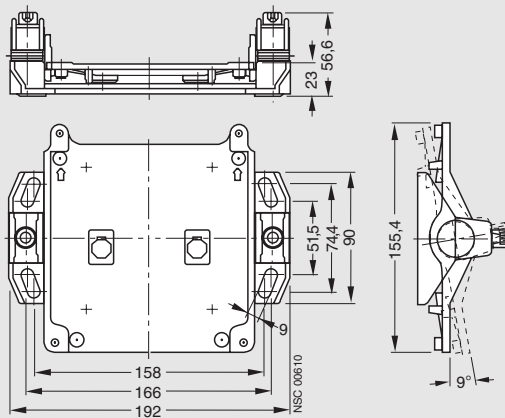
A: Subject to export regulation AL = N and ECCN = EAR99H

Dimension drawings

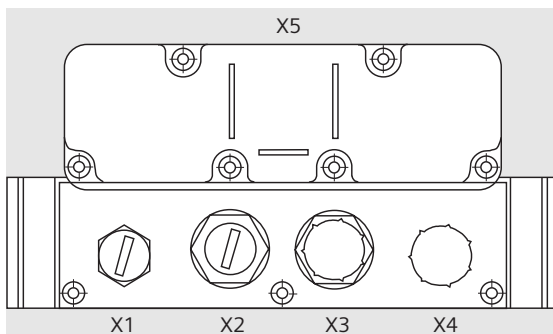
PROFIsafe laser scanner



Mounting system 3RG78 38-1AA



Circuit diagrams



- X1 Connection restart button
- X2 PROFIBUS output wire link
- X3 PROFIBUS input wire link
- X4 Connection supply voltage
- X5 Optical PC Interface

Detecting

Introduction

Overview



	Position switches, standard				Hinge switches		Unenclosed
Enclosures							
Plastic	✓	✓	--	--	✓	--	✓
Metal	--	--	✓	✓	--	✓	--
Dimensions (W x H x D) in mm	31 x 68 x 33	50 x 53 x 33	40 x 78 x 38	56 x 78 x 38	31 x 68 x 33	40 x 78 x 38	30 x 48,5 x 20
Degree of protection	IP65	IP66/IP67	IP66/IP67	IP66/IP67	IP65	IP66/IP67	IP10 or IP20
Standards							
IEC 60947-5-1	Mounting and operating points according to EN 50047	Operating points according to EN 50047	Mounting and operating points according to EN 50041	Operating points according to EN 50041	Mounting and operating points according to EN 50047	Mounting and operating points according to EN 50041	Mounting and operating points according to EN 50047
Approvals	CE, UL, CSA, CCC ¹⁾		CE, UL ²⁾ , CSA, CCC ¹⁾		CE, UL ²⁾ , CSA, CCC ¹⁾		
Contact blocks							
2 slow-action contacts	1 NO + 1 NC		1 NO + 1 NC		--		1 NO + 1 NC
2 snap-action contacts	1 NO + 1 NC		1 NO + 1 NC		1 NO + 1 NC		1 NO + 1 NC
2 snap-action contacts, short stroke	1 NO + 1 NC		✓		✓		✓
2 snap-action contacts with 2 x 2 mm contact gap	1 NO + 1 NC		✓		✓		✓
3 slow-action contacts	1 NO + 2 NC		1 NO + 2 NC		✓		1 NO + 2 NC
3 snap-action contacts	1 NO + 2 NC		1 NO + 2 NC		1 NO + 2 NC		1 NO + 2 NC
Special features							
LED status display	✓		✓		✓		--
Increased corrosion protection	✓		✓		✓		--
Explosion protection (ATEX)	--		✓		--	✓	--
ASIsafe integrated	✓		✓		✓		--
Electrical specifications							
Insulation voltage U_i	400 V		400 V		400 V		400 V
Continuous thermal current I_{the}	6 A		6 A		6 A		6 A
Terminals							
Cable entry	1 x M20 x 1.5	2 x M20 x 1.5	1 x M20 x 1.5	3 x M20 x 1.5	1 x M20 x 1.5	1 x M20 x 1.5	--
M12 plug, 4 or 5-pole	✓	✓	✓	✓	✓	✓	--
Plug, 6-pole + PE	--	--	✓	✓	--	--	--
Actuators							
Rounded plungers and roller plungers	✓		✓		--		✓
Roller and angular roller levers	✓		✓		--		--
Spring rods	✓		✓		--		--
Twist levers and rod actuators	✓		✓		--		--
Fork levers	--		✓		--		--
Hinges for mounting	--		--		✓		--
Page							
Complete units	1/112	1/116	1/120	1/124	1/141	1/142	1/128
Modular system	1/114	1/118	1/122	1/126	--	--	--
ASIsafe	1/148	1/148	1/150	1/150	1/158	1/159	--
ATEX	--	--	1/143	1/143	--	1/146	--

✓ Available

-- Not available

1) Submitted.

2) UL approved. Exception:
Metal enclosures with 2-pole contact block submitted.

Overview



3SE5 232,
3SE5 242,
3SF1 2.4



3SE5 112,
3SE5 122,
3SF1 1.4



3SE5 322,
3SE5 312,
3SF1 3.4



3SE6

	Position switches with separate actuator		Position switches with tumbler	Magnetically operated switches
Enclosures				
Plastic	✓	--	✓	✓
Metal	--	✓	✓	--
Dimensions (W x H x D) in mm	31 × 68 × 33, 50 × 53 × 33	40 × 78 × 38, 56 × 78 × 38	54 × 185 × 44	M30 × 44, 19 × 33 × 13, 25 × 88 × 13
Degree of protection	IP65, IP66/IP67	IP66/IP67	IP66/IP67	IP67
Standards				
IEC 60947-5-1	Mounting according to EN 50047	Mounting according to EN 50041	EN 1088, GS-ET 19	Category 3 according to EN 954-1
Approvals	CE, TÜV, UL ²⁾ , CSA, CCC ¹⁾		CE, TÜV, UL, CSA, CCC ¹⁾	CE, UL, CSA
Switch blocks				
2 slow-action contacts	1 NO + 1 NC	--	--	--
2 snap-action contacts	--	--	--	--
3 slow-action contacts	1 NO + 2 NC	--	--	--
3 snap-action contacts	--	--	--	--
6 slow-action contacts	--	--	2 × (1 NO + 2 NC)	--
Reed contacts	--	--	--	1 NO + 1 NC, 2 NC
Special features				
LED status display	✓	--	✓	--
Increased corrosion protection	✓	--	✓	--
Explosion protection (ATEX)	✓	--	--	--
ASIsafe integrated	✓	--	✓	--
Electrical specifications				
Insulation voltage U_i	400 V	--	400 V	--
Continuous thermal current I_{the}	6 A	--	6 A	--
Terminals				
Cable entry	1 × M20 × 1.5, 2 × M20 × 1.5	1 × M20 × 1.5, 3 × M20 × 1.5	3 × M20 × 1.5	--
M12 plug, 4 or 5-pole	✓	✓	✓	✓
Molded cable	--	--	--	✓
AS-Interface	✓	✓	✓	✓ (through I/O module)
Actuators				
Separate actuator	✓	--	✓	--
Page				
Complete units	1/132	1/133	1/137, 1/138	1/160
Modular system	--	--	--	--
ASIsafe	1/153	1/154	1/156, 1/157	LV 1 · 2007
ATEX	--	1/146	--	LV 1 · 2007

Available

-- Not available

¹⁾ Submitted.

²⁾ UL approved. Exception:
Metal enclosures with 2-pole contact block submitted.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

General data

Overview

Position switches in the innovative SIRIUS 3SE5 series are modern in design, compact, modular and simple to connect.

Complete units

Popular variants of the position switches in standard enclosures are available as complete units.



Position switches with plastic and metal enclosures

Modular system

The 3SE5 series features a new modular system comprising different sizes of the basic switch and an actuator which must be ordered separately. Thanks to the modular design of the switch the user can select the right solution for his application from numerous variants and install it himself in a very short time. The short delivery times of the modules enable fast replacement and thus ensure high plant availability.



Examples of selection options in the modular system

Design

Enclosure sizes

The 3SE5 switches are available in various enclosure sizes:

- Encapsulated position switch IP20 or IP10
- Plastic enclosures according to EN 50047 (31 mm wide), 1 cable entry
- Plastic enclosures (50 mm wide), 2 cable entries
- Metal enclosures according to EN 50041 (40 mm wide), 1 cable entry
- Metal enclosures (56 mm wide), 3 cable entries

Enclosure versions

Various basic switches can be selected for the enclosures:

- Available with two or three-pole switch blocks (screw terminal) designed as slow-action or snap-action contacts.
- Optional LED status display
- With mounted four or five-pole M12 connector socket (available for the wide enclosures as an accessory for self-assembly)
- With 6-pole connector socket + PE on the metal enclosures
- With increased corrosion protection
- Metal enclosures for explosion protection (ATEX) (see page 1/143)
- AS-Interface version with integrated ASIsafe electronics for all enclosure designs (see page 1/147)

Actuator variants

The following actuator variants are available:

- Rounded plunger
- Roller plunger
- Roller lever
- Angular roller lever
- Spring rod
- Twist levers and fork lever
- Rod actuator

The actuator rollers are available with various materials and diameters.

Positive opening

The NC contacts of the switch are forced open mechanically, positively-driven and reliably by the plunger. This is referred to as "positive opening".

Contact reliability

The new switch blocks ensure an extremely high contact stability. This applies even when the devices are switching low voltages and currents, e.g. 1 mA at 5 V DC

3SE5, 3SF1 Position Switches

3SE5 Position Switches

General data

Benefits

The 3SE5 position switch differ from the previous series through the following new characteristics:

- The modular structure of the product range allows a number of versions with a smaller number of bearing types for enclosures and operating mechanisms.
- All actuators around the axis in increments of 22.5° (see picture on page 1/110).
- All enclosure sizes – now also including the small enclosure 31 mm wide – are optionally available with an LED signaling indicator (see the picture on page 1/110).
- The new three-pole switching element 1 NO + 2 NC is available for all enclosure sizes (see picture on page 1/110).
- The short-stroke switching element 1 NO + 1 NC improves the precision of the switching operation through a reduced actuation path.
- The 1 NO + 1 NC snap-action contact with 2 x 2 mm contact opening is suitable for simultaneous disconnect and signaling particularly in the elevator industry.
- Rounded plunger according to EN 50041 with 3 mm over-travel (total travel 9 mm) for greater tolerance when switching.
- The plastic enclosure with a width of 31 mm has simple and fast wiring equipment which makes it possible to save from approx. 20 to 25 % of the time when connecting (see picture on page 1/110).
- The ASIsafe electric component is integrated for the versions with the AS-Interface connection (see page 1/147); an additional adapter is not required.

Application

With the standard position switches, mechanical positions of moved machine parts are converted into electrical signals. Through their modular and uniform design and large number of variants, the devices can meet practically all requirements in industry.

Devices are available with enclosure versions to suit the particular ambient conditions. Different control tasks can be performed with the best contact blocks suited for the particular purpose. And many different actuator variants are available to match the mechanical configuration of the moved machined parts. Dimensions, fixing points and characteristics are largely in accordance with the EN 50041 or EN 50047 standards.

The devices are suitable for use in any climate.

Standards

IEC 60947-5-1 or EN 60947-5-1.

The protective measure of "total insulation" by the molded-plastic enclosure is guaranteed by the use of molded-plastic screw-glands.

Safety position switches

For controls according to IEC 60204-1 or EN 60204-1 the devices can be used as a safety position switch. To secure position switches against changes in their position, keyed techniques must be employed on installation.

Safety circuits

The standards IEC 60947-5-1 and EN 60947-5-1 require positive opening of the NC contacts. Hence for the purposes of personal safety, the assured opening of NC contacts is expressly stipulated for the electrical equipment of machines in all safety circuits and marked according to IEC 60947-5-1 with the symbol ☞.

Category 4 according to EN 954-1 can be attained with the 3SE5 position switches with ☞ if the corresponding failsafe evaluation units are selected and correctly installed, e.g. the 3TK28 safety relays or matching devices from the ASIsafe, SIMATIC or SINUMERIK product ranges. The operating mechanisms (actuators) must also be connected to the enclosure as positively-driven. The corresponding operating mechanisms are marked in the catalog with ☞.

Contacts for each application

- **Snap-action contacts:** NC contacts and NO contacts switch at the same time – regardless of the actuating speed ($v_{\min} = 0.01$ m/s).
- **Slow-action contacts:** Difference in travel between "NC contact opens" and "NO contact closes"; the switching speed is the same as or proportional to the actuating speed ($v_{\min} = 0.4$ m/s).

Operating mechanisms for each application

Rounded plungers and roller plungers

- Operation in direction of the plunger axis or with bar at right angles to the plunger axis
- The roller plunger is recommended for lateral actuation and relatively long overtravel.

Roller and angular roller levers

- Depending on the direction of starting (left or right), various approach angles ($\alpha = 30^\circ$) and trailing angles ($\gamma = 45^\circ$) are possible
- For actuators made of finely ground steel in the form of cams, straight-edges or cam disks

Spring rods

- Can be used for undefined actuations and changing starting conditions
- Starting from any direction is possible

Twist levers and rod actuators

- For a high starting speed ($v = 1.5$ m/s)
- Variety of starting options
- Insensitive to oil, grinding dust, ice and coarse-grained material
- With the twist lever the maximum approach angle is always equal to the maximum trailing angle
- Rod actuator – when no actuator with approach and trailing angle is possible
- Adjustment of the twist lever in increments of 10°. Can be set with left or right switching

Fork levers

- Switchable in two directions
- Latching actuator
- For reciprocating movements

3SE5, 3SF1 Position Switches

3SE5 Position Switches

General data

Design

Additional contacts

Exchangeable two and three-pole switch blocks for all enclosure sizes



The new three-pole switch block (2 NC, 1 NO) in snap-action and slow-action is regularly available for all enclosure forms. It offers more switching through redundant shutdowns (2 NC contacts) with simultaneous signaling (1 NO contact). The same installation space is required as for a two-pole switch block.

Optional LED indicators

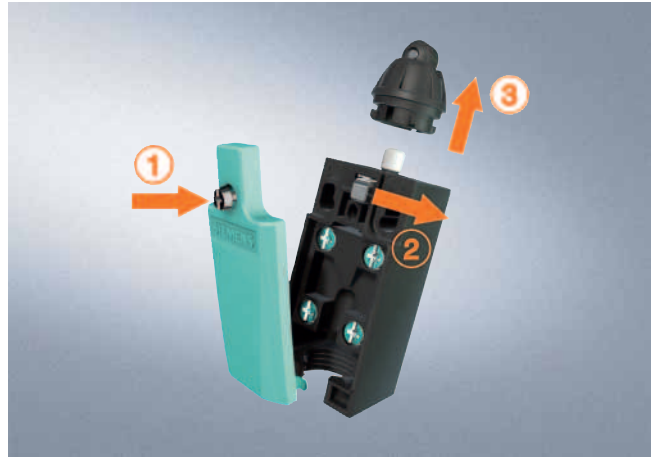
Available for all enclosure sizes



The enclosure versions can be supplied with an LED signaling indicator (1 × green + 1 × yellow). This is the first time that optical status monitoring is also available for small standard enclosures according to EN 50047. The LED signal displays are available in all common voltages (24 V DC and 230 V AC)

Mounting

Easy plug-in method – for fast replacement of the actuator heads



- (1) Open cover
- (2) Actuate locking lever
- (3) Replace the head (turnable by 16 x 22.5°)
- (4) Lock and close the cover

Quick-connect technology

For plastic enclosure with a width of 31 mm.



These position switches can be wired quickly and easily as an added customer benefit. The connecting cable is first connected to the terminals of the contact block and then guided through a slit into the cable gland opening. The time saved through this new connection method is approx. 20 to 25 %.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

General data

Options

On the following pages you will find selection tables for complete units as well as components of the modular system.

The complete units are indicated in the selection and ordering data by green backgrounds (in PDF only).

The modular system is indicated in the selection and ordering data by orange backgrounds (in PDF only).

Using the modular system you can assemble switch variants which are not available as complete units. Each complete unit can also be supplied as a module.

A basic switch for the modular system comprises an enclosure with a switch block and a cover. Among the basic switches the following versions, for example, can be selected:

- Basic enclosure with teflon plunger
- Version with increased corrosion protection
- Version with 2 LEDs
- Version with M12 plug or 6-pole + PE
- Version with M12 connector socket and with 2 LEDs

For the plastic enclosures with a width of 31 and 50 mm the basic switches are designed as complete units with rounded plunger (according to standard).

Complete units

Ordering example

Required:

- Position switch according to EN 50047 in a plastic enclosure
- Switch block with slow-action contacts 1 NO + 1 NC
- Angular roller lever, metal lever and plastic roller

To be ordered:

Version	Order No.
Complete units • Enclosure width 31 mm	
 Angular roller lever with metal lever and plastic roller 13 mm Slow-action contacts 1 NO + 1 NC	3SE5 232-0BF10

Modular system

Ordering example 1

Required:

- Position switch according to EN 50047 in a plastic enclosure
- Switch block with slow-action contacts 1 NO + 1 NC
- Angular roller lever, metal lever and plastic roller

To be ordered separately:

Version	Order No.
Basic switches • Enclosure width 31 mm	
 with teflon plunger Slow-action contacts 1 NO + 1 NC	3SE5 232-0BC05
+	
Actuators	
 Angular roller lever Metal lever, plastic roller	3SE5 000-0AF10

Ordering example 2

Required:

- Position switch according to EN 50047 in a plastic enclosure
- Switch block with slow-action contacts 1 NO + 1 NC
- Twist lever, high-grade steel lever and plastic roller

To be ordered separately:

Version	Order No.
Basic switches • Enclosure width 31 mm	
 with teflon plunger Slow-action contacts 1 NO + 1 NC	3SE5 232-0BC05
+	
Part-turn actuators	
 Actuator heads	3SE5 000-0AK00
 Twist lever High-grade steel lever, plastic roller	3SE5 000-0AA31

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 31 mm according to EN 50047

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP65 · Cable entry M20 × 1.5

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Complete units¹⁾ • Enclosure width 31 mm				
 Rounded plunger	Rounded plungers, type B according to EN 50047			
	With teflon plunger			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BC05	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0CC05	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HC05	0.065
	• Integrated ²⁾			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0FC05	0.065
	• Short-stroke, integrated ²⁾			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0GC05	0.065
	• 2 × 2 mm contact gap			
 With 2 LEDs	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KC05	0.075
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LC05	0.075
	With increased corrosion protection			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BC05-1CA0	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0CC05-1CA0	0.065
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KC05-1CA0	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LC05-1CA0	0.065
	With M12 connector socket, 4-pole			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 234-0BC05-1AC4	0.070
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 234-0HC05-1AC4	0.070
 Roller plunger	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 232-1KC05	0.060
	Snap-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 232-1LC05	0.060
	Slow-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 232-3KC05	0.060
	Snap-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 232-3LC05	0.060
	With M12 connector socket, 5-pole, and 2 LEDs			
	Slow-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 234-1BC05-1AF3	0.070
	Snap-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 234-1CC05-1AF3	0.070
	Roller plungers, type C according to EN 50047			
	With plastic roller 10 mm			
 Roller plungers with central fixing	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BD03	0.060
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HD03	0.060
	• Integrated ²⁾			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KD03	0.060
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LD03	0.060
	With M12 connector socket, 4-pole			
	Snap-action contacts, integrated ¹⁾	1 NO + 1 NC --	➔ 3SE5 234-0HD03-1AC4	0.070
	Roller plungers with central fixing			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HD10	0.090
	• Integrated ²⁾			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KD10	0.090

➔ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Popular variants.

²⁾ Subsequent replacement of switching elements is not possible.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 31 mm according to EN 50047

2 or 3 contacts · Degree of protection IP65 · Cable entry M20 × 1.5

Version	Contacts	LEDs	Complete units	Weight per PU approx.
			Order No.	kg
Complete units¹⁾ · Enclosure width 31 mm				
 Roller lever	Roller levers, type E according to EN 50047			
	With metal lever and plastic roller 13 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BE10	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HE10	0.065
	• Integrated ²⁾			
 Angular roller lever	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KE10	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LE10	0.065
	With M12 connector socket, 4-pole			
	Snap-action contacts, integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 234-0HE10-1AC4	0.075
	Angular roller levers			
 Spring rod	With metal lever and plastic roller 13 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BF10	0.070
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HF10	0.070
	• Integrated ²⁾			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KF10	0.070
 Twist lever	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LF10	0.070
	Spring rods			
	Length 142.5 mm, with plastic plunger 50 mm			
	Snap-action contacts	1 NO + 1 NC --	3SE5 232-0HR01	0.090
	• Integrated ²⁾			
 Twist lever, adjustable length	Twist levers, type A according to EN 50047			
	With metal lever 21 mm and plastic roller 19 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BK21	0.085
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HK21	0.085
	• Integrated ²⁾			
 Rod actuator	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KK21	0.085
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LK21	0.085
	With M12 connector socket, 4-pole			
	Snap-action contacts, integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 234-0HK21-1AC4	0.095
	Twist levers, adjustable length			
	With metal lever with grid hole and plastic roller 19 mm			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0HK60	0.100
	• Integrated ²⁾			
	With metal lever and plastic roller 19 mm			
	Slow-action contacts	1 NO + 1 NC --	3SE5 232-0BK50	0.100
	Snap-action contacts	1 NO + 1 NC --	3SE5 232-0HK50	0.100
	• Integrated ²⁾			
	Snap-action contacts	1 NO + 2 NC --	3SE5 232-0LK50	0.100
	Rod actuators			
	With aluminium rod, length 200 mm			
	Snap-action contacts	1 NO + 1 NC --	3SE5 232-0HK80	0.090
	• Integrated ²⁾			
	With spring rod, length 200 mm			
	Snap-action contacts	1 NO + 1 NC --	3SE5 232-0HK82	0.080
	• Integrated ²⁾			

➔ Positive opening according to IEC 60947-5-1, Appendix K.

1) Popular variants.

2) Subsequent replacement of switching elements is not possible.

Note: If the device you require is not available as a complete unit, see "Modular System" on the next page.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 31 mm according to EN 50047

Modular system

2 or 3 contacts · Degree of protection IP65 · Cable entry M20 × 1.5

Version	Contacts	LEDs	Modular system	Weight approx.
			Order No.	kg
Basic switches • Enclosure width 31 mm (with rounded plunger¹⁾)				
 Basic switches	With teflon plunger			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BC05	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0CC05	0.065
	Snap-action contacts • Integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 232-0HC05	0.065
	Snap-action contacts • Short-stroke, integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 232-0FC05	0.065
	Snap-action contacts • 2 × 2 mm contact gap	1 NO + 1 NC --	➔ 3SE5 232-0GC05	0.065
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KC05	0.075
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LC05	0.075
 With increased corrosion protection	With increased corrosion protection³⁾			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0BC05-1CA0	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0CC05-1CA0	0.065
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0KC05-1CA0	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0LC05-1CA0	0.065
 With M12 plug	With M12 connector socket, 4-pole			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 234-0BC05-1AC4	0.070
	Snap-action contacts • Integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 234-0HC05-1AC4	0.070
	Slow-action contacts	2 NC --	➔ 3SE5 234-0KC05-1AE0	0.070
	Snap-action contacts	2 NC --	➔ 3SE5 234-0LC05-1AE0	0.070
 With 2 LEDs	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 232-1KC05	0.060
	Snap-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 232-1LC05	0.060
	Slow-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 232-3KC05	0.060
	Snap-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 232-3LC05	0.060
 With M12 plug and 2 LEDs	With M12 connector socket, 5-pole, and 2 LEDs			
	Slow-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 234-1BC05-1AF3	0.070
	Snap-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 234-1CC05-1AF3	0.070

➔ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, necessary in safety circuits.

¹⁾ On the plastic version the basic switch is a complete unit with rounded plunger.

²⁾ Subsequent replacement of switching elements is not possible.

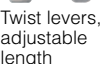
³⁾ Use corresponding high-grade steel lever.

Note: For selection aid, see page 1/111.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 31 mm according to EN 50047

Version		Diameter	Modular system	Weight approx.
			Order No.	kg
Actuators				
 Roller plunger	Roller plungers, type C according to EN 50047			
	Plastic rollers	10	➞ 3SE5 000-0AD03	0.005
	High-grade steel rollers	10	➞ 3SE5 000-0AD04	0.010
 With central fixing	Roller plungers with central fixing			
	Plastic rollers	10	➞ 3SE5 000-0AD10	0.025
	High-grade steel rollers	10	➞ 3SE5 000-0AD11	0.030
 Roller lever	Roller levers, type E according to EN 50047			
	Metal lever, plastic roller	13	➞ 3SE5 000-0AE10	0.045
	Metal lever, high-grade steel roller	13	➞ 3SE5 000-0AE11	0.050
	High-grade steel lever, plastic roller	13	➞ 3SE5 000-0AE12	0.050
	High-grade steel lever, high-grade steel roller	13	➞ 3SE5 000-0AE13	0.055
 Angular roller lever	Angular roller levers			
	Metal lever, plastic roller	13	➞ 3SE5 000-0AF10	0.010
	Metal lever, high-grade steel roller	13	➞ 3SE5 000-0AF11	0.013
	High-grade steel lever, plastic roller	13	➞ 3SE5 000-0AF12	0.013
	High-grade steel lever, high-grade steel roller	13	➞ 3SE5 000-0AF13	0.013
 Spring rod	Spring rods			
	Plastic plunger:			
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR01	0.025
	• Length 76 mm (spring 23.5 mm, plunger 10 mm)		3SE5 000-0AR03	0.020
	• Length 242.5 mm (spring 150 mm, plunger 50 mm)		3SE5 000-0AR04	0.040
 Spring rod	High-grade steel plunger:			
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR02	0.040
Part-turn actuators				
 Part-turn actuators	Part-turn actuators, plastic (without lever)			
	Switching right and/or left, adjustable		➞ 3SE5 000-0AK00	0.020
 Twist lever	Levers for part-turn actuators			
	Twist levers, type A according to EN 50047			
 Twist levers, adjustable length	Metal lever, plastic roller	19	➞ 3SE5 000-0AA21	0.010
	Metal lever, high-grade steel roller	19	➞ 3SE5 000-0AA22	0.020
 Twist levers, adjustable length	Metal lever, roller with ball bearing	19	➞ 3SE5 000-0AA23	0.020
	Metal lever, plastic roller	30	➞ 3SE5 000-0AA25	0.010
 Twist levers, adjustable length	High-grade steel lever, plastic roller	19	➞ 3SE5 000-0AA31	0.022
	High-grade steel lever, high-grade steel roller	19	➞ 3SE5 000-0AA32	0.022
 Twist levers, adjustable length	Twist levers, adjustable length, with grid hole			
	Metal lever, plastic roller	19	➞ 3SE5 000-0AA60	0.025
 Twist levers, adjustable length	Metal lever, high-grade steel roller	19	➞ 3SE5 000-0AA61	0.040
	Metal lever, rubber roller	50	➞ 3SE5 000-0AA68	0.045
 Twist levers, adjustable length	High-grade steel lever, plastic roller	19	➞ 3SE5 000-0AA62	0.025
	High-grade steel lever, high-grade steel roller	19	➞ 3SE5 000-0AA63	0.040
 Rod actuator	Twist levers, adjustable length			
	Metal lever, plastic roller	19	3SE5 000-0AA50	0.025
 Rod actuator	Metal lever, high-grade steel roller	19	3SE5 000-0AA51	0.035
	Metal lever, plastic roller	30	3SE5 000-0AA55	0.025
 Rod actuator	Metal lever, rubber roller	50	3SE5 000-0AA58	0.040
	High-grade steel lever, plastic roller	19	3SE5 000-0AA52	0.025
 Rod actuator	High-grade steel lever, high-grade steel roller	19	3SE5 000-0AA53	0.035
	Rod actuators			
 Rod actuator	Aluminium rod, length 200 mm	6	3SE5 000-0AA80	0.025
	Spring rod, length 200 mm	6	3SE5 000-0AA81	0.030
 Rod actuator	Plastic rod, length 200 mm	6	3SE5 000-0AA82	0.015

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 50 mm

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry 2 × (M20 × 1.5)

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Complete units¹⁾ • Enclosure width 50 mm				
 Rounded plunger	Rounded plungers			
	With teflon plunger			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0BC05	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0CC05	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0HC05	0.065
	• Integrated ²⁾			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0FC05	0.065
	• Short-stroke, integrated ²⁾			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0GC05	0.065
	• 2 × 2 mm contact gap			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0KC05	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0LC05	0.065
	With increased corrosion protection			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0BC05-1CA0	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0HC05-1CA0	0.065
	• Integrated ²⁾			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0KC05-1CA0	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0LC05-1CA0	0.065
 With 2 LEDs	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 242-1KC05	0.070
	Snap-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 242-1LC05	0.070
	Slow-action contacts	1 NO + 2 NC 115 ... 230 V	➔ 3SE5 242-3KC05	0.080
	Snap-action contacts	1 NO + 2 NC 115 ... 230 V	➔ 3SE5 242-3LC05	0.080
 Roller plunger	Roller plungers			
	With plastic roller 10 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0BD03	0.075
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0HD03	0.075
	• Integrated ²⁾			
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0LD03	0.080

➔ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Popular variants.

²⁾ Subsequent replacement of switching elements is not possible.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 50 mm

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry 2 × (M20 × 1.5)

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Complete units¹⁾ · Enclosure width 50 mm				
	Roller levers			
	With metal lever and plastic roller 13 mm			
	Slow-action contacts	1 NO + 1 NC --	➞ 3SE5 242-0BE10	0.080
	Snap-action contacts	1 NO + 1 NC --	➞ 3SE5 242-0HE10	0.080
				
	• Integrated ²⁾			
	Snap-action contacts	1 NO + 2 NC --	➞ 3SE5 242-0LE10	0.090
	Twist levers			
	With metal lever 21 mm and plastic roller 19 mm			
	Slow-action contacts	1 NO + 1 NC --	➞ 3SE5 242-0BK21	0.095
	Snap-action contacts	1 NO + 1 NC --	➞ 3SE5 242-0HK21	0.095
	• Integrated ²⁾			
	Snap-action contacts	1 NO + 2 NC --	➞ 3SE5 242-0LK21	0.105
	Twist levers, adjustable length			
	With metal lever and plastic roller 19 mm			
	Snap-action contacts	1 NO + 1 NC --	3SE5 242-0HK50	0.110
	• Integrated ²⁾			

➞ Positive opening according to IEC 60947-5-1, Appendix K.

1) Popular variants.

2) Subsequent replacement of switching elements is not possible.

Note: If the device you require is not available as a complete unit, see "Modular System" on the next page.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 50 mm

Modular system

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry 2 × (M20 × 1.5)

Version	Contacts	LEDs	Modular system	Weight approx.
			Order No.	kg
Basic switches • Enclosure width 50 mm (with rounded plunger¹⁾)				
 Basic switches	With teflon plunger			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0BC05	0.065
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0CC05	0.065
	Snap-action contacts • Integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 242-0HC05	0.065
	Snap-action contacts • Short-stroke, integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 242-0FC05	0.065
	Snap-action contacts • 2 × 2 mm contact gap	1 NO + 1 NC --	➔ 3SE5 242-0GC05	0.065
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0KC05	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0LC05	0.065
 With increased corrosion protection	With increased corrosion protection³⁾			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 242-0BC05-1CA0	0.065
	Snap-action contacts • Integrated ²⁾	1 NO + 1 NC --	➔ 3SE5 242-0HC05-1CA0	0.065
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0KC05-1CA0	0.065
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0LC05-1CA0	0.065
 With 2 LEDs	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 242-1KC05	0.070
	Snap-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 242-1LC05	0.070
	Slow-action contacts	1 NO + 2 NC 115 ... 230 V	➔ 3SE5 242-3KC05	0.080
	Snap-action contacts	1 NO + 2 NC 115 ... 230 V	➔ 3SE5 242-3LC05	0.080

➔ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, necessary in safety circuits.

¹⁾ On the plastic version the basic switch is a complete unit with rounded plunger.

²⁾ Subsequent replacement of switching elements is not possible.

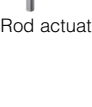
³⁾ Use corresponding high-grade steel lever.

Note: For selection aid, see page 1/111.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Plastic enclosures
Enclosure width 50 mm

Version		Diameter	Modular system	Weight approx.
		mm	Order No.	kg
Actuators				
 Roller plunger	Roller plungers, type C according to EN 50047			
	Plastic rollers	10	➞ 3SE5 000-0AD03	0.005
	High-grade steel rollers	10	➞ 3SE5 000-0AD04	0.010
 With central fixing	Roller plungers with central fixing			
	Plastic rollers	10	➞ 3SE5 000-0AD10	0.025
	High-grade steel rollers	10	➞ 3SE5 000-0AD11	0.030
 Roller lever	Roller levers, type E according to EN 50047			
	Metal lever, plastic roller	13	➞ 3SE5 000-0AE10	0.045
	Metal lever, high-grade steel roller	13	➞ 3SE5 000-0AE11	0.050
	High-grade steel lever, plastic roller	13	➞ 3SE5 000-0AE12	0.050
	High-grade steel lever, high-grade steel roller	13	➞ 3SE5 000-0AE13	0.055
 Angular roller lever	Angular roller levers			
	Metal lever, plastic roller	13	➞ 3SE5 000-0AF10	0.010
	Metal lever, high-grade steel roller	13	➞ 3SE5 000-0AF11	0.013
	High-grade steel lever, plastic roller	13	➞ 3SE5 000-0AF12	0.013
	High-grade steel lever, high-grade steel roller	13	➞ 3SE5 000-0AF13	0.013
 Spring rod	Spring rods			
	Plastic plunger:			
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR01	0.025
	• Length 76 mm (spring 23.5 mm, plunger 10 mm)		3SE5 000-0AR03	0.020
	• Length 242.5 mm (spring 150 mm, plunger 50 mm)		3SE5 000-0AR04	0.040
 Spring rod	High-grade steel plunger:			
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR02	0.040
Part-turn actuators				
 Part-turn actuators	Part-turn actuators, plastic (without lever)			
	Switching right and/or left, adjustable		➞ 3SE5 000-0AK00	0.020
 Twist lever	Levers for part-turn actuators			
	Twist levers			
 Twist levers, adjustable length	Metal lever, plastic roller	19	➞ 3SE5 000-0AA21	0.010
	Metal lever, high-grade steel roller	19	➞ 3SE5 000-0AA22	0.020
 Twist levers, adjustable length	Metal lever, roller with ball bearing	19	➞ 3SE5 000-0AA23	0.020
	Metal lever, plastic roller	30	➞ 3SE5 000-0AA25	0.010
 Twist levers, adjustable length	High-grade steel lever, plastic roller	19	➞ 3SE5 000-0AA31	0.022
	High-grade steel lever, high-grade steel roller	19	➞ 3SE5 000-0AA32	0.022
 Twist levers, adjustable length	Twist levers, adjustable length, with grid hole			
	Metal lever, plastic roller	19	➞ 3SE5 000-0AA60	0.025
 Twist levers, adjustable length	Metal lever, high-grade steel roller	19	➞ 3SE5 000-0AA61	0.040
	Metal lever, rubber roller	50	➞ 3SE5 000-0AA68	0.045
 Twist levers, adjustable length	High-grade steel lever, plastic roller	19	➞ 3SE5 000-0AA62	0.025
	High-grade steel lever, high-grade steel roller	19	➞ 3SE5 000-0AA63	0.040
 Twist levers, adjustable length	Twist levers, adjustable length			
	Metal lever, plastic roller	19	3SE5 000-0AA50	0.025
 Twist levers, adjustable length	Metal lever, high-grade steel roller	19	3SE5 000-0AA51	0.035
	Metal lever, plastic roller	30	3SE5 000-0AA55	0.025
 Twist levers, adjustable length	Metal lever, rubber roller	50	3SE5 000-0AA58	0.040
	High-grade steel lever, plastic roller	19	3SE5 000-0AA52	0.025
 Twist levers, adjustable length	High-grade steel lever, high-grade steel roller	19	3SE5 000-0AA53	0.035
	Rod actuators			
 Rod actuator	Aluminium rod, length 200 mm	6	3SE5 000-0AA80	0.025
	Spring rod, length 200 mm	6	3SE5 000-0AA81	0.030
	Plastic rod, length 200 mm	6	3SE5 000-0AA82	0.015

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 40 mm according to EN 50041

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Complete units¹⁾ • Enclosure width 40 mm				
	Rounded plungers with 3 mm overtravel			
	With high-grade steel plungers			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0BC02	0.290
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0CC02	0.290
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0KC02	0.300
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0LC02	0.300
	Roller plungers			
	With high-grade steel roller 13 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0BD02	0.310
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0CD02	0.310
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0KD02	0.320
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0LD02	0.320
	Roller levers			
	With metal lever and plastic roller 22 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0BE01	0.300
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0CE01	0.300
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0KE01	0.310
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0LE01	0.310
	Angular roller levers			
	With metal lever and plastic roller 22 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0BF01	0.310
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 112-0CF01	0.310
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0LF01	0.320
	Spring rods			
	Length 142.5 mm, with plastic plunger 50 mm			
	Snap-action contacts	1 NO + 1 NC --	3SE5 112-0CR01	0.315

➔ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Popular variants.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 40 mm according to EN 50041

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg

Complete units¹⁾ · Enclosure width 40 mm

Twist lever

Twist levers**With metal lever 27 mm and plastic roller 19 mm**

Slow-action contacts	1 NO + 1 NC --	➞	3SE5 112-0BH01	0.345
Snap-action contacts	1 NO + 1 NC --	➞	3SE5 112-0CH01	0.345
Slow-action contacts	1 NO + 2 NC --	➞	3SE5 112-0KH01	0.355
Snap-action contacts	1 NO + 2 NC --	➞	3SE5 112-0LH01	0.355

With M12 connector socket, 5-pole

Snap-action contacts	1 NO + 1 NC --	➞	3SE5 114-0CH01-1AC5	0.350

With M12 plug, 5-pole, and 2 LEDs

Snap-action contacts	1 NO + 1 NC 24 V DC	➞	3SE5 114-1CH01-1AF3	0.355

With metal lever 27 mm and high-grade steel roller 19 mm

Slow-action contacts	1 NO + 1 NC --	➞	3SE5 112-0BH02	0.355
Snap-action contacts	1 NO + 1 NC --	➞	3SE5 112-0CH02	0.355

Twist levers, adjustable length**With metal lever with grid hole and plastic roller 19 mm**

Slow-action contacts	1 NO + 1 NC --	➞	3SE5 112-0BH60	0.360
Snap-action contacts	1 NO + 1 NC --	➞	3SE5 112-0CH60	0.360
Snap-action contacts	1 NO + 2 NC --	➞	3SE5 112-0LH60	0.370



Twist levers, adjustable length, with grid hole

With metal lever and plastic roller 19 mm

Slow-action contacts	1 NO + 1 NC --		3SE5 112-0BH50	0.360
Snap-action contacts	1 NO + 1 NC --		3SE5 112-0CH50	0.360
Snap-action contacts	1 NO + 2 NC --		3SE5 112-0LH50	0.370

With metal lever and high-grade steel roller 19 mm

Snap-action contacts	1 NO + 1 NC --		3SE5 112-0CH51	0.370



Twist levers, adjustable length

Fork levers**With metal lever and 2 plastic rollers 19 mm**

Snap-action contacts	1 NO + 1 NC --	➞	3SE5 112-0CT11	0.360



Fork lever

Rod actuators**With aluminium rod, length 200 mm**

Snap-action contacts	1 NO + 1 NC --		3SE5 112-0CH80	0.300

With plastic rod, length 200 mm

Snap-action contacts	1 NO + 1 NC --		3SE5 112-0CH82	0.300



Rod actuator

➞ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Popular variants.

Note: If the device you require is not available as a complete unit, see "Modular System" on the next page.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 40 mm according to EN 50041

Modular system

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version	Contacts	LEDs	Modular system		Weight approx.
			Order No.	kg	
Basic switches • Enclosure width 40 mm					
	With M20 x 1.5 connecting thread				
	Slow-action contacts	1 NO + 1 NC --	➞	3SE5 112-0BA00	0.260
	Snap-action contacts	1 NO + 1 NC --	➞	3SE5 112-0CA00	0.260
	Slow-action contacts	1 NO + 2 NC --	➞	3SE5 112-0KA00	0.270
	Snap-action contacts	1 NO + 2 NC --	➞	3SE5 112-0LA00	0.270
Basic switches					
	With increased corrosion protection ¹⁾				
	Slow-action contacts	1 NO + 1 NC --	➞	3SE5 112-0BA00-1CA0	0.260
	Snap-action contacts	1 NO + 1 NC --	➞	3SE5 112-0CA00-1CA0	0.260
	Slow-action contacts	1 NO + 2 NC --	➞	3SE5 112-0KA00-1CA0	0.270
	Snap-action contacts	1 NO + 2 NC --	➞	3SE5 112-0LA00-1CA0	0.270
With increased corrosion protection					
	With M12 connector socket, 5-pole				
	Slow-action contacts	1 NO + 1 NC --	➞	3SE5 114-0BA00-1AC5	0.270
	Snap-action contacts	1 NO + 1 NC --	➞	3SE5 114-0CA00-1AC5	0.270
	Slow-action contacts	2 NC --	➞	3SE5 114-0KA00-1AE1	0.280
	Snap-action contacts	2 NC --	➞	3SE5 114-0LA00-1AE1	0.280
With M12 plug					
	With plug, 6-pole + PE				
	Slow-action contacts	1 NO + 2 NC --	➞	3SE5 115-0KA00-1AD1	0.280
	Snap-action contacts	1 NO + 2 NC --	➞	3SE5 115-0LA00-1AD1	0.280
	With plug, 6-pole + PE and quick-release device				
	Snap-action contacts	1 NO + 1 NC --	➞	3SE5 115-0CA00-1AD0	0.350
With plug, 6-pole					
	With 2 LEDs, yellow/green				
	Slow-action contacts	1 NO + 2 NC 24 V DC	➞	3SE5 112-1KA00	0.280
	Snap-action contacts	1 NO + 2 NC 24 V DC	➞	3SE5 112-1LA00	0.280
	Slow-action contacts	1 NO + 2 NC 230 V AC	➞	3SE5 112-3KA00	0.280
	Snap-action contacts	1 NO + 2 NC 230 V AC	➞	3SE5 112-3LA00	0.280
With 2 LEDs					
	With M12 connector socket, 5-pole, and 2 LEDs				
	Slow-action contacts	1 NO + 1 NC 24 V DC	➞	3SE5 114-1BA00-1AF3	0.280
	Snap-action contacts	1 NO + 1 NC 24 V DC	➞	3SE5 114-1CA00-1AF3	0.280
With M12 plug and 2 LEDs					
	With plug, 6-pole + PE, and 2 LEDs				
	Slow-action contacts	1 NO + 1 NC 24 V DC	➞	3SE5 115-1BA00-1AF2	0.290
	Snap-action contacts	1 NO + 1 NC 24 V DC	➞	3SE5 115-1CA00-1AF2	0.290
	Snap-action contacts	2 NC 24 V DC	➞	3SE5 115-1LA00-1AD2	0.300
With plug, 6-pole, and 2 LEDs					

➔ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, necessary in safety circuits.

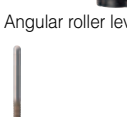
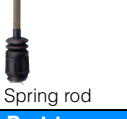
¹⁾ Use corresponding high-grade steel lever.

Note: For selection aid, see page 1/111.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 40 mm according to EN 50041

Version		Diameter	Modular system		Weight approx.
		mm	Order No.		kg
Actuators					
	Rounded plungers, type B according to EN 50041				
	High-grade steel plungers, with 3 mm overtravel		➞ 3SE5 000-0AC02		0.030
	Roller plungers, type C according to EN 50041				
	High-grade steel rollers	13	➞ 3SE5 000-0AD02		0.050
	Roller levers				
	Metal lever, plastic roller	22	➞ 3SE5 000-0AE01		0.040
	Metal lever, high-grade steel roller	22	➞ 3SE5 000-0AE02		0.065
	High-grade steel lever, plastic roller	22	➞ 3SE5 000-0AE03		0.040
	High-grade steel lever, high-grade steel roller	22	➞ 3SE5 000-0AE04		0.065
	Angular roller levers				
	Metal lever, plastic roller	22	➞ 3SE5 000-0AF01		0.050
	Metal lever, high-grade steel roller	22	➞ 3SE5 000-0AF02		0.075
	High-grade steel lever, plastic roller	22	➞ 3SE5 000-0AF03		0.050
	High-grade steel lever, high-grade steel roller	22	➞ 3SE5 000-0AF04		0.075
	Spring rods				
	Plastic plunger:				
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR01		0.025
	• Length 76 mm (spring 23.5 mm, plunger 10 mm)		3SE5 000-0AR03		0.020
	• Length 242.5 mm (spring 150 mm, plunger 50 mm)		3SE5 000-0AR04		0.040
	High-grade steel plunger:				
Spring rod	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR02		0.040
	Part-turn actuators				
	Part-turn actuators, metal (without lever)				
	• For twist levers and rod actuators, switching right and/or left, adjustable		➞ 3SE5 000-0AH00		0.070
Part-turn actuators	• For fork lever		➞ 3SE5 000-0AT10		0.050
	Levers for part-turn actuators				
	Twist levers, type A according to EN 50041				
	Metal lever, plastic roller	19	➞ 3SE5 000-0AA01		0.015
Twist lever	Metal lever, high-grade steel roller	19	➞ 3SE5 000-0AA02		0.025
	Metal lever, roller with ball bearing	19	➞ 3SE5 000-0AA03		0.020
	Metal lever, 2 plastic roller	19	➞ 3SE5 000-0AA04		0.015
	Metal lever, plastic roller	30	➞ 3SE5 000-0AA05		0.015
Twist levers, adjustable length	Metal lever, rubber roller	50	➞ 3SE5 000-0AA08		0.030
	High-grade steel lever, plastic roller	19	➞ 3SE5 000-0AA11		0.015
	High-grade steel lever, high-grade steel roller	19	➞ 3SE5 000-0AA12		0.025
	Twist levers, adjustable length, with grid hole				
Twist levers, adjustable length	Metal lever, plastic roller	19	➞ 3SE5 000-0AA60		0.025
	Metal lever, high-grade steel roller	19	➞ 3SE5 000-0AA61		0.040
	Metal lever, rubber roller	50	➞ 3SE5 000-0AA68		0.045
	High-grade steel lever, plastic roller	19	➞ 3SE5 000-0AA62		0.025
Fork levers	High-grade steel lever, high-grade steel roller	19	➞ 3SE5 000-0AA63		0.040
	Twist levers, adjustable length				
	Metal lever, plastic roller	19	3SE5 000-0AA50		0.025
	Metal lever, high-grade steel roller	19	3SE5 000-0AA51		0.035
Fork levers	Metal lever, plastic roller	30	3SE5 000-0AA55		0.025
	Metal lever, rubber roller	50	3SE5 000-0AA58		0.040
	High-grade steel lever, plastic roller	19	3SE5 000-0AA52		0.025
	High-grade steel lever, high-grade steel roller	19	3SE5 000-0AA53		0.035
Fork levers	Fork levers				
	Metal lever, 2 plastic roller	19	➞ 3SE5 000-0AT01		0.050
Rod actuator	Metal lever, 2 high-grade steel rollers	19	➞ 3SE5 000-0AT02		0.050
	High-grade steel lever, 2 plastic rollers	19	➞ 3SE5 000-0AT03		0.050
Rod actuator	High-grade steel lever, 2 high-grade steel rollers	19	➞ 3SE5 000-0AT04		0.050
	Rod actuators, type D, according to EN 50041				
Rod actuator	Aluminium rod, length 200 mm	6	3SE5 000-0AA80		0.025
	Spring rod, length 200 mm	6	3SE5 000-0AA81		0.030
	Plastic rod, length 200 mm	6	3SE5 000-0AA82		0.015

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 56 mm

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry 3 × (M20 × 1.5)

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Complete units¹⁾ • Enclosure width 56 mm				
	Rounded plungers with 3 mm overtravel			
	With high-grade steel plungers			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0BC02	0.355
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0CC02	0.355
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 122-0KC02	0.365
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 122-0LC02	0.365
	Roller plungers			
	With high-grade steel roller 13 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0BD02	0.375
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0CD02	0.250
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 122-0KD02	0.250
	Snap-action contacts	1 NO + 2 NC --	➔ 3SE5 122-0LD02	0.250
	Roller levers			
	With metal lever and plastic roller 22 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0BE01	0.365
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0CE01	0.365
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 122-0KE01	0.375
	With metal lever and high-grade steel roller 22 mm			
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0CE02	0.250
	Angular roller levers			
	With metal lever and plastic roller 22 mm			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0BF01	0.380
	Snap-action contacts	1 NO + 1 NC --	➔ 3SE5 122-0CF01	0.380
Spring rods				
Length 142.5 mm, with plastic plunger 50 mm				
	Snap-action contacts	1 NO + 1 NC --	3SE5 122-0CR01	0.250

➔ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Popular variants.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 56 mm

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry 3 × (M20 × 1.5)

Version	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg

Complete units¹⁾ · Enclosure width 56 mm

Twist lever

Twist levers**With metal lever 27 mm and plastic roller 19 mm**

Slow-action contacts	1 NO + 1 NC --	➞	3SE5 122-0BH01	0.410
Snap-action contacts	1 NO + 1 NC --	➞	3SE5 122-0CH01	0.410
Slow-action contacts	1 NO + 2 NC --	➞	3SE5 122-0KH01	0.420
Snap-action contacts	1 NO + 2 NC --	➞	3SE5 122-0LH01	0.420

With metal lever 27 mm and high-grade steel roller 19 mm

Snap-action contacts	1 NO + 1 NC --	➞	3SE5 122-0CH02	0.250
Snap-action contacts	1 NO + 2 NC --	➞	3SE5 122-0LH02	0.250

Twist levers, adjustable length**With metal lever with grid hole and plastic roller 19 mm**

Slow-action contacts	1 NO + 1 NC --	➞	3SE5 122-0BH60	0.250
Snap-action contacts	1 NO + 1 NC --	➞	3SE5 122-0CH60	0.250
Snap-action contacts	1 NO + 2 NC --	➞	3SE5 122-0LH60	0.250

With metal lever and plastic roller 19 mm

Slow-action contacts	1 NO + 1 NC --		3SE5 122-0BH50	0.420
Snap-action contacts	1 NO + 1 NC --		3SE5 122-0CH50	0.420
Snap-action contacts	1 NO + 2 NC --		3SE5 122-0LH50	0.430

Twist levers,
adjustable
length**Fork levers****With metal lever and 2 plastic rollers 19 mm**

Snap-action contacts	1 NO + 1 NC --	➞	3SE5 122-0CT11	0.250



Fork lever

Rod actuators**With aluminium rod, length 200 mm**

Snap-action contacts	1 NO + 1 NC --		3SE5 122-0CH80	0.250

With plastic rod, length 200 mm

Snap-action contacts	1 NO + 1 NC --		3SE5 122-0CH82	0.250



Rod actuator

➞ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Popular variants.

Note: If the device you require is not available as a complete unit, see "Modular System" on the next page.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 56 mm

Modular system

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry 3 × (M20 × 1.5)

Version	Contacts	LEDs	Modular system	Weight approx.
			Order No.	kg
Basic switches • Enclosure width 56 mm				
	With three M20 × 1.5 connecting threads			
	Slow-action contacts	1 NO + 1 NC --	➡ 3SE5 122-0BA00	0.315
	Snap-action contacts	1 NO + 1 NC --	➡ 3SE5 122-0CA00	0.315
	Slow-action contacts	1 NO + 2 NC --	➡ 3SE5 122-0KA00	0.325
	Snap-action contacts	1 NO + 2 NC --	➡ 3SE5 122-0LA00	0.325
Basic switches				
	With increased corrosion protection¹⁾			
	Slow-action contacts	1 NO + 1 NC --	➡ 3SE5 122-0BA00-1CA0	0.315
	Snap-action contacts	1 NO + 1 NC --	➡ 3SE5 122-0CA00-1CA0	0.315
	Slow-action contacts	1 NO + 2 NC --	➡ 3SE5 122-0KA00-1CA0	0.325
	Snap-action contacts	1 NO + 2 NC --	➡ 3SE5 122-0LA00-1CA0	0.325
With increased corrosion protection				
	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➡ 3SE5 122-1KA00	0.330
	Snap-action contacts	1 NO + 2 NC 24 V DC	➡ 3SE5 122-1LA00	0.330
	Slow-action contacts	1 NO + 2 NC 230 V AC	➡ 3SE5 122-3KA00	0.330
	Snap-action contacts	1 NO + 2 NC 230 V AC	➡ 3SE5 122-3LA00	0.330
With 2 LEDs				

➡ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, necessary in safety circuits.

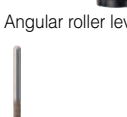
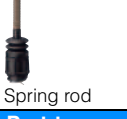
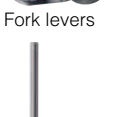
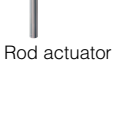
¹⁾ Use corresponding high-grade steel lever.

Note: For selection aid, see page 1/111.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Metal enclosures
Enclosure width 56 mm

Version		Diameter	Modular system		Weight approx.
		mm	Order No.		kg
Actuators					
	Rounded plungers, type B according to EN 50041				
	High-grade steel plungers, with 3 mm overtravel		➔ 3SE5 000-0AC02		0.030
	Roller plungers, type C according to EN 50041				
	High-grade steel rollers	13	➔ 3SE5 000-0AD02		0.050
	Roller levers				
	Metal lever, plastic roller	22	➔ 3SE5 000-0AE01		0.040
	Metal lever, high-grade steel roller	22	➔ 3SE5 000-0AE02		0.065
	High-grade steel lever, plastic roller	22	➔ 3SE5 000-0AE03		0.040
	High-grade steel lever, high-grade steel roller	22	➔ 3SE5 000-0AE04		0.065
	Angular roller levers				
	Metal lever, plastic roller	22	➔ 3SE5 000-0AF01		0.050
	Metal lever, high-grade steel roller	22	➔ 3SE5 000-0AF02		0.075
	High-grade steel lever, plastic roller	22	➔ 3SE5 000-0AF03		0.050
	High-grade steel lever, high-grade steel roller	22	➔ 3SE5 000-0AF04		0.075
	Spring rods				
	Plastic plunger:				
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR01		0.025
	• Length 76 mm (spring 23.5 mm, plunger 10 mm)		3SE5 000-0AR03		0.020
	• Length 242.5 mm (spring 150 mm, plunger 50 mm)		3SE5 000-0AR04		0.040
	High-grade steel plunger:				
	• Length 142.5 mm (spring 50 mm, plunger 50 mm)		3SE5 000-0AR02		0.040
	Part-turn actuators				
	Part-turn actuators, metal (without lever)				
	• For twist levers and rod actuators, switching right and/or left, adjustable		➔ 3SE5 000-0AH00		0.070
	• For fork lever		➔ 3SE5 000-0AT10		0.050
	Levers for part-turn actuators				
	Twist levers, type A according to EN 50041				
	Metal lever, plastic roller	19	➔ 3SE5 000-0AA01		0.015
	Metal lever, high-grade steel roller	19	➔ 3SE5 000-0AA02		0.025
	Metal lever, roller with ball bearing	19	➔ 3SE5 000-0AA03		0.020
	Metal lever, 2 plastic roller	19	➔ 3SE5 000-0AA04		0.015
	Metal lever, plastic roller	30	➔ 3SE5 000-0AA05		0.015
	Metal lever, rubber roller	50	➔ 3SE5 000-0AA08		0.030
	High-grade steel lever, plastic roller	19	➔ 3SE5 000-0AA11		0.015
	High-grade steel lever, high-grade steel roller	19	➔ 3SE5 000-0AA12		0.025
	Twist levers, adjustable length, with grid hole				
	Metal lever, plastic roller	19	➔ 3SE5 000-0AA60		0.025
	Metal lever, high-grade steel roller	19	➔ 3SE5 000-0AA61		0.040
	Metal lever, rubber roller	50	➔ 3SE5 000-0AA68		0.045
	High-grade steel lever, plastic roller	19	➔ 3SE5 000-0AA62		0.025
	High-grade steel lever, high-grade steel roller	19	➔ 3SE5 000-0AA63		0.040
	Twist levers, adjustable length				
	Metal lever, plastic roller	19	3SE5 000-0AA50		0.025
	Metal lever, high-grade steel roller	19	3SE5 000-0AA51		0.035
	Metal lever, plastic roller	30	3SE5 000-0AA55		0.025
	Metal lever, rubber roller	50	3SE5 000-0AA58		0.040
	High-grade steel lever, plastic roller	19	3SE5 000-0AA52		0.025
	High-grade steel lever, high-grade steel roller	19	3SE5 000-0AA53		0.035
	Fork levers				
	Metal lever, 2 plastic roller	19	➔ 3SE5 000-0AT01		0.050
	Metal lever, 2 high-grade steel rollers	19	➔ 3SE5 000-0AT02		0.050
	High-grade steel lever, 2 plastic rollers	19	➔ 3SE5 000-0AT03		0.050
	High-grade steel lever, 2 high-grade steel rollers	19	➔ 3SE5 000-0AT04		0.050
	Rod actuators, type D, according to EN 50041				
	Aluminium rod, length 200 mm	6	3SE5 000-0AA80		0.025
	Spring rod, length 200 mm	6	3SE5 000-0AA81		0.030
	Plastic rod, length 200 mm	6	3SE5 000-0AA82		0.015

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Open-type position switches

Overview



Their compact design makes these switches particularly suitable for use in confined conditions. The fixing dimensions and operating points are according to EN 50047.

The switches are equipped with two or three contacts in slow-action or snap-action versions. The stroke is 6 mm.

The empty enclosure can be equipped with all switching element variants ([see page 1/130](#)).

Selection and ordering data

2 or 3 contacts · Degree of protection IP20 (2 contacts), IP10 (3 contacts)

Version		Contacts	Order No.	Weight approx. kg
Plastic enclosures • Enclosure width 30 mm				
With teflon plunger, Ø 6 mm				
	Slow-action contacts	1 NO + 1 NC	➔ 3SE5 250-0BC05	0.025
	Snap-action contacts	1 NO + 1 NC	➔ 3SE5 250-0CC05	0.025
2 contacts				
	Slow-action contacts	1 NO + 2 NC	➔ 3SE5 250-0KC05	0.035
	Snap-action contacts	1 NO + 2 NC	➔ 3SE5 250-0LC05	0.035
3 contacts				
	Empty enclosures without switch block	--	➔ 3SE5 250-0AC05	0.015
Empty enclosures				

➔ Positive opening according to IEC 60947-5-1, Appendix K.

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Accessories and spare parts

Selection and ordering data

The quick-release devices and plug-in connections are used for fast installation and replacement of position switches.

Version		Order No.	Weight approx. kg
Quick-release devices for position switches • Enclosure width 40 mm			
	Adapter plates with screws Base plates with locking lever	3SY3 110 3SY3 027	0.055 0.080
Plug-in connections for M20 × 1.5 connecting thread			
	Connector sockets (6-pole + PE), for M20 × 1.5 for max. 250 V, 10 A with 0.75 mm ² connecting cable, plastic, degree of protection IP65, ambient temperature –40 to +90 °C Cable boxes¹⁾ with terminal compartment, can be pre-assembled, plastic, degree of protection IP65	3SY3 131 3SY3 123	0.030 0.065
	Connector sockets (4-pole), M12 for M20 × 1.5, fixed for max. 250 V, 4 A with 0.25 mm ² connecting cable, plastic, degree of protection IP67, ambient temperature –40 to +85 °C Coupling boxes (4-pole), M12 with terminal compartment, can be pre-assembled ²⁾	3SY3 127 3RX8 000-0CB45	0.010 0.016
	Connector sockets (5-pole), M12 for M20 × 1.5, fixed for max. 125 V, 4 A with 0.25 mm ² connecting cable, plastic, degree of protection IP67, ambient temperature –40 to +85 °C Coupling boxes (5-pole), M12 with terminal compartment, can be pre-assembled ²⁾	3SY3 128 3RX8 000-0CB55	0.010 0.016
Adapters and cable glands for M20 × 1.5 connecting thread			
	Adapters according to and for cable entry from M20 × 1.5 to NPT 1/2 • Metal • Plastic	3SX9 917 3SX9 918	0.035 0.015
	Cable glands M20 × 1.5 Plastic	3SX9 926	0.010

¹⁾ For wiring, a crimping tool is necessary,

max. conductor cross-section 1 mm².

3SE5, 3SF1 Position Switches

3SE5 Position Switches

Accessories and spare parts

Version	Contacts	Order No.	Weight approx. kg
3SE5 spare parts for position switches			
 2 contacts	Switch blocks with 2 contacts		
	• Slow-action contacts	1 NO + 1 NC	3SE5 000-0BA00 0.050
	• Snap-action contacts	1 NO + 1 NC	3SE5 000-0CA00 0.050
	- Standard		3SE5 000-0GA00 0.050
	- 2 × 2 mm switching interval		3SE5 000-0NA00 0.050
 3 contacts	Switch blocks with 3 contacts		
	• Slow-action contacts	1 NO + 2 NC	3SE5 000-0KA00 0.060
	• Snap-action contacts	1 NO + 2 NC	3SE5 000-0LA00 0.060

Version	Rated voltage LED V	Order No.	Weight approx. kg
3SE5 spare parts for position switches			
 31 mm, turquoise with LED	Covers for plastic enclosure, width 31 mm		
	• Turquoise with LED	24 DC	3SE5 230-1AA00 0.012
		230 AC	3SE5 230-3AA00 0.012
	• Yellow	--	3SE5 230-0AA00-1AG0 0.010
	• Yellow with LED	24 DC	3SE5 230-1AA00-1AG0 0.012
 50 mm, turquoise with LED	Covers for plastic enclosure, width 50 mm		
	• Turquoise with LED	24 DC	3SE5 240-1AA00 0.015
		230 AC	3SE5 240-3AA00 0.015
	• Yellow	--	3SE5 240-0AA00-1AG0 0.012
	• Yellow with LED	24 DC	3SE5 240-1AA00-1AG0 0.015
 40 mm, yellow with LED	Covers for metal enclosure, width 40 mm		
	• Turquoise with LED	24 DC	3SE5 110-1AA00 0.060
		230 AC	3SE5 110-3AA00 0.060
	• Yellow	--	3SE5 110-0AA00-1AG0 0.055
	• Yellow with LED	24 DC	3SE5 110-1AA00-1AG0 0.060
 56 mm, yellow with LED	Covers for metal enclosure, width 56 mm		
	• Turquoise with LED	24 DC	3SE5 120-1AA00 0.085
		230 AC	3SE5 120-3AA00 0.085
	• Yellow	--	3SE5 120-0AA00-1AG0 0.080
	• Yellow with LED	24 DC	3SE5 120-1AA00-1AG0 0.085
		230 AC	3SE5 120-3AA00-1AG0 0.085

3SE5 Position Switches

3SE5 Position Switches with Separate Actuator

General data

Overview

3SE5 position switches with separate actuator have the same enclosures as the standard switches (modular system).



Design

Enclosure sizes

The 3SE5 switches are available in various enclosure sizes:

- Plastic enclosures according to EN 50047 (31 mm wide), 1 cable entry
- Plastic enclosures (50 mm wide), 2 cable entries
- Metal enclosures according to EN 50041 (40 mm wide), 1 cable entry
- Metal enclosures (56 mm wide), 3 cable entries

Enclosure versions

Various basic variants can be selected for the enclosures:

- Available with two or three-pole switching elements designed as slow-action contacts
- Optional LED status display
- With mounted four or five-pole M12 connector socket (available for the wide enclosures as an accessory for self-assembly)
- With 6-pole connector socket + PE on the metal enclosures
- Similarly with a combination of connector socket and LED indicators
- With increased corrosion protection
- Metal enclosures for explosion protection (ATEX) ([see page 1/146](#))
- AS-Interface version with integrated ASIsafe electronics for all enclosure designs

Actuation

The actuator head is included in the scope of supply. For actuation from four directions it can be adjusted through 4 x 90°. The switches can also be approached from above.

The actuators are not included in the scope of supply of the position switch and must be ordered separately from a choice of six variants to suit the application.

The actuator is encoded. Simple overruling by hand or auxiliary devices is impossible.

Benefits

The 3SE5 position switches with separate actuator differ from the previous series through the following new characteristics:

- All housing sizes are optionally available with a LED signaling indicator.
- The new three-pole switching element 1 NO + 2 NC is available for all enclosure sizes.
- The plastic enclosure has simple and fast wiring equipment which makes it possible to save from approx. 20 to 25 % of the time when connecting.
- The ASIsafe electric component is integrated for the versions with the AS-Interface connection; an adapter is not required.

Application

Position switches with separate actuator are used where the position of doors, covers or protective grills must be monitored for safety reasons.

The position switch can only be operated with the matching coded actuator. Simple overruling by hand or auxiliary devices is impossible.

Devices are available with enclosure versions to suit the particular ambient conditions. Different control tasks can be performed with the best contact blocks suited for the particular purpose. Dimensions, fixing points of the enclosure are in accordance with EN 50041 or EN 50047 standards.

The devices are suitable for use in any climate.

Standards

IEC 60947-5-1 or EN 60947-5-1.

The protective measure of "total insulation" by the molded-plastic enclosure is guaranteed by the use of molded-plastic screw-glands.

Safety position switches

For controls according to IEC 60204-1 or EN 60204-1 the devices can be used as a safety position switch. To secure position switches against changes in their position, keyed techniques must be employed on installation.

Safety circuits

The standards IEC 60947-5-1 and EN 60947-5-1 require positive opening of the NC contacts. Hence for the purposes of personal safety, the assured opening of NC contacts is expressly stipulated for the electrical equipment of machines in all safety circuits and marked according to IEC 60947-5-1 with the symbol ☞.

Category 4 according to EN 954-1 can be attained with the position switches with separate actuator if the corresponding failsafe evaluation units are selected and correctly installed, e.g. the 3TK28 safety relays or matching units from the ASIsafe, SIMATIC or SINUMERIK product ranges.

3SE5 Position Switches

3SE5 Position Switches with Separate Actuator

Plastic enclosures

Enclosure width 31 mm acc. to EN 50047 / 50 mm

Selection and ordering data

Complete units

5 directions of approach · 2 or 3 contacts · Degree of protection IP65 or IP66/IP67 · Cable entry M20 × 1.5

Version ¹⁾	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Enclosure width 31 mm according to EN 50047				
	5 directions of approach			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 232-0RV40	0.100
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 232-0QV40	0.110
	With M12 connector socket, 4-pole			
	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 234-0RV40-1AC4	0.110
	Slow-action contacts	2 NC --	➔ 3SE5 234-0QV40-1AE0	0.120
	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 232-1RV40	0.110
	Slow-action contacts	1 NO + 1 NC 230 V AC	➔ 3SE5 232-3RV40	0.110
	With M12 connector socket, 5-pole, and 2 LEDs			
	Slow-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 234-1RV40-1AF3	0.130
Enclosure width 50 mm				
	5 directions of approach			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 242-0QV40	0.110
	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 242-1QV40	0.120
	Slow-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 242-3QV40	0.120

➔ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately; see page 1/134.

3SE5 Position Switches

3SE5 Position Switches with Separate Actuator

Metal enclosures
Enclosure width 40 mm acc. to EN 50041 / 56 mm

Selection and ordering data

Complete units

5 directions of approach · 2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version ¹⁾	Contacts	LEDs	Complete units	Weight approx.
			Order No.	kg
Enclosure width 40 mm according to EN 50041				
 With separate actuator	5 directions of approach			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 112-0QV10	0.360
	With M12 connector socket, 5-pole			
 With M12 plug	Slow-action contacts	1 NO + 1 NC --	➔ 3SE5 114-0RV10-1AC5	0.360
	Slow-action contacts	2 NC --	➔ 3SE5 114-0QV10-1AE1	0.360
	With plug, 6-pole + PE			
 With 2 LEDs	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 115-0QV10-1AD1	0.380
	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 112-1QV10	0.370
 With 2 LEDs	Slow-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 112-3QV10	0.370
	With M12 connector socket, 5-pole, and 2 LEDs			
	Slow-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 114-1RV10-1AF3	0.360
 With 2 LEDs	With plug, 6-pole + PE, and 2 LEDs			
	Slow-action contacts	1 NO + 1 NC 24 V DC	➔ 3SE5 115-1RV10-1AF2	0.380
Enclosure width 56 mm				
 With separate actuator	5 directions of approach			
	Slow-action contacts	1 NO + 2 NC --	➔ 3SE5 122-0QV10	0.360
 With 2 LEDs	With 2 LEDs, yellow/green			
	Slow-action contacts	1 NO + 2 NC 24 V DC	➔ 3SE5 122-1QV10	0.370
	Slow-action contacts	1 NO + 2 NC 230 V AC	➔ 3SE5 122-3QV10	0.370

➔ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately; see page 1/134.

3SE5 Position Switches

3SE5 Position Switches with Separate Actuator

Accessories

Selection and ordering data

Version		Order No.	Weight approx. kg
Actuators			
	standard actuator, length 75.6 mm	3SE5 000-0AV01	0.035
	with vertical fixing, length 53 mm	3SE5 000-0AV02	0.035
	with transverse fixing, length 47 mm	3SE5 000-0AV03	0.035
	radius actuator, left, length 44.5 mm	3SE5 000-0AV04	0.040
	radius actuator, right, length 44.5 mm	3SE5 000-0AV06	0.040
	universal actuator, length 69 mm	3SE5 000-0AV05	0.070
Connections			
	Connector sockets (4-pole), M12 for M20 × 1.5, fixed for max. 250 V, 4 A with 0.25 mm ² connecting cable, plastic, degree of protection IP67, ambient temperature –40 to +85 °C	3SY3 127	0.010
	Coupling boxes (4-pole), M12 with terminal compartment, can be pre-assembled	3RX8 000-0CB45	0.016
	Connector sockets (5-pole), M12 for M20 × 1.5, fixed for max. 125 V, 4 A with 0.25 mm ² connecting cable, plastic, degree of protection IP67, ambient temperature –40 to +85 °C	3SY3 128	0.010
	Coupling boxes (5-pole), M12 with terminal compartment, can be pre-assembled	3RX8 000-0CB55	0.016
	Cable glands M20 × 1.5 Plastic	3SX9 926	0.010

3SE5 Position Switches

3SE5 Position Switches with Tumbler

General data

Overview

SIRIUS 3SE5 safety position switches with tumbler are comprised of a switch part with electromechanical tumbler and a mechanical actuator which has to be ordered separately.

They are rugged protective devices that enable the greatest possible safety for man and machine.

The position switches with tumbler are offered in plastic or metal enclosures.

Dimensions (W × H × D): 54 × 185 × 43.5 mm.



Actuation

The actuator head is included in the scope of supply. For actuation from four directions it can be adjusted through $4 \times 90^\circ$. The switches can also be approached from above.

The actuators are not included in the scope of supply of the position switch and must be ordered separately from a choice of six variants to suit the application.

Actuation data:

- Maximum actuating speed $v_{\max} = 1.5 \text{ m/s}$
- Minimum actuating speed $v_{\min} = 0.4 \text{ mm/s}$
- Minimum force in the direction of actuation $F_{\min} = 30 \text{ N}$

Tumbler

There are two versions for locking the actuator:

- Spring-actuated lock (closed-circuit principle) with various release mechanisms
- Magnet field lock (open-circuit principle)

Benefits

The new generation of 3SE5 3 position switches offers:

- More safety through higher locking forces:
 - 1300 N with a plastic enclosure
 - 2600 N with a metal enclosure
- Various release mechanisms: lock release, escape release and emergency release
- Two contact blocks each with three contacts as standard equipment, hence fewer versions needed
- Same dimensions for all enclosure versions: Plastic, metal or with integrated ASIsafe
- An extensive range of actuators
- An optional LED status display 24 V DC, 115 V AC or 230 V AC for all switch variants
- Device with ASIsafe electronics integrated in the enclosure ([see page 1/155](#)).

Application

The position switches with tumbler are exceptional, technically safe devices which restrict and prevent an unforeseen or intentional opening of protective doors, protective grilles or other covers as long as a dangerous situation is present (i.e. follow-on motion of the shutdown machine).

The safety position switches with tumbler have the following functions:

- Enabling the machine or process with closed and locked protective system
- Locking the machine or process with opened protective system
- Position monitoring of the protective system and tumbler

Standards

The switches comply with the standards IEC 60947-1 (Low-Voltage Controlgear, General) and IEC 60947-5-1 (Electromechanical Control Devices).

The mechanical design of the switch corresponds to the requirements of the failsafe principle according to EN 1088.

Approvals

The switches are approved for use with locking devices according to EN 1088 and EN 292, Parts 1 and 2.

3SE5 3 position switches with tumbler bear the VDE test mark for tested according to GS-ET19 (Test Principles of the German Trade Association for Locking Devices with Electromagnetic Tumblers).

They are approved according to UL 508, UL 50 and UL 746-C.

3SE5 Position Switches

3SE5 Position Switches with Tumbler

General data

Function

Tumblers

The separate actuator operates in a similar way to the coding of a key and protects against manipulation. It transmits the locking force to the protection system and helps to monitor its position.

There are two versions of locking:

Spring-actuated lock (closed-circuit principle)

- In the standard version, the position switch locks by means of spring force and releases by means of electromagnetic force. In the case of voltage failure, it reliably prevents the protective device from opening when machine parts are still moving.
- The switch is equipped with an auxiliary release for emergency situations or setup mode.
- An auxiliary release which can be secured with a lock to prevent misuse is available as a variant.



Auxiliary release



Auxiliary release with lock

The new 3SE5 3 position switches are also available with an escape release or an emergency release.

- Personnel working inside the hazard zone can use the escape release feature to manually release the tumbler so that they can exit the hazard area. An intentional act (in this case pulling the gray actuator) is required to release the locking mechanism and restore the normal operating state.
- The emergency release enables someone in an emergency situation to manually release the tumbler without tools from the access side (outside the hazardous area). Releasing the lock and restoring the normal operating statue must require effort which is comparable to repair activity, in this case disassembly of the red actuator and resetting the mechanical lock.



Escape release from the front



Emergency release from the back

Magnet field lock (open-circuit principle)

- The second version offers locking by means of electromagnetic force and release by means of spring force. This version has an advantage when it is necessary to quickly access the machine after a power failure occurs, or in the case of very short overtravel times.

Switch blocks

The position switches with tumbler have one switch block each for:

- Monitoring the actuator or the position of the protective door
- Monitoring the position of the magnet

The mechanical design of the switch corresponds to the requirements of the failsafe principle according to EN 1088.

Optical signaling devices

The position switches with tumbler are available with an optional optical signaling device.

The signaling device indicates the switch position of the lock and the protective device optically by means of 2 LEDs on the enclosure surface.

Protective device	Tumbler	Display	Meaning
Closed	Released	Yellow + green	Actuator free to be pulled
Closed	Closed	Green	Actuator locked
Open	Open	Yellow	Actuator pulled

Note:

The voltage of the LEDs at the monitored contacts must be the same as the operational voltage of the magnet (same potential).

3SE5 Position Switches

3SE5 Position Switches with Tumbler

Plastic enclosures
With locking force greater than 1200 N

Selection and ordering data

6 contacts · 5 directions of approach · Locking force 1300 N (1000 N according to GS-ET 19) · Degree of protection IP66/IP67

Tumbler ¹⁾	LEDs	Magnet, rated operational voltage	Complete units	Weight approx.
		V	Order No.	kg
1300 N locking force · Enclosure width 54 mm				
 3SE5 312-0SD2.	Spring-actuated locks			
	• With auxiliary release	-- 24 DC	➞ 3SE5 322-0SD21	0.480
		-- 115 AC	➞ 3SE5 322-0SD22	0.480
		-- 230 AC	➞ 3SE5 322-0SD23	0.480
		Yellow/green 24 DC	➞ 3SE5 322-1SD21	0.480
		Yellow/green 115 AC	➞ 3SE5 322-2SD22	0.480
		Yellow/green 230 AC	➞ 3SE5 322-3SD23	0.480
 3SE5 312-0SE2.	• With auxiliary release with lock	-- 24 DC	➞ 3SE5 322-0SE21	0.495
		-- 115 AC	➞ 3SE5 322-0SE22	0.495
		-- 230 AC	➞ 3SE5 322-0SE23	0.495
		Yellow/green 24 DC	➞ 3SE5 322-1SE21	0.495
		Yellow/green 115 AC	➞ 3SE5 322-2SE22	0.495
		Yellow/green 230 AC	➞ 3SE5 322-3SE23	0.495
 3SE5 312-0SF2.	• With escape release from the front	-- 24 DC	➞ 3SE5 322-0SF21	0.495
		-- 115 AC	➞ 3SE5 322-0SF22	0.495
		-- 230 AC	➞ 3SE5 322-0SF23	0.495
		Yellow/green 24 DC	➞ 3SE5 322-1SF21	0.495
		Yellow/green 115 AC	➞ 3SE5 322-2SF22	0.495
		Yellow/green 230 AC	➞ 3SE5 322-3SF23	0.495
 3SE5 312-0SG2.	• With escape release from the back and auxiliary release from the front	-- 24 DC	➞ 3SE5 322-0SG21	0.480
		-- 115 AC	➞ 3SE5 322-0SG22	0.480
		-- 230 AC	➞ 3SE5 322-0SG23	0.480
		Yellow/green 24 DC	➞ 3SE5 322-1SG21	0.480
		Yellow/green 115 AC	➞ 3SE5 322-2SG22	0.480
		Yellow/green 230 AC	➞ 3SE5 322-3SG23	0.480
 3SE5 312-0SJ2.	• With emergency release from the back and auxiliary release from the front	-- 24 DC	➞ 3SE5 322-0SJ21	0.480
		-- 115 AC	➞ 3SE5 322-0SJ22	0.480
		-- 230 AC	➞ 3SE5 322-0SJ23	0.480
		Yellow/green 24 DC	➞ 3SE5 322-1SJ21	0.480
		Yellow/green 115 AC	➞ 3SE5 322-2SJ22	0.480
		Yellow/green 230 AC	➞ 3SE5 322-3SJ23	0.480
 3SE5 312-0SB2.	Magnetic field locks			
		-- 24 DC	➞ 3SE5 322-0SB21	0.480
		-- 115 AC	➞ 3SE5 322-0SB22	0.480
		-- 230 AC	➞ 3SE5 322-0SB23	0.480
		Yellow/green 24 DC	➞ 3SE5 322-1SB21	0.480
		Yellow/green 115 AC	➞ 3SE5 322-2SB22	0.480
		Yellow/green 230 AC	➞ 3SE5 322-3SB23	0.480

➞ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately; see page 1/139.

3SE5 Position Switches

3SE5 Position Switches with Tumbler

Metal enclosures
With locking force greater than 2000 N

Selection and ordering data

6 contacts · 5 directions of approach · Locking force 2600 N (2000 N according to GS-ET 19) · Degree of protection IP66/IP67

Tumbler ¹⁾	LEDs	Magnet, rated operational voltage	Complete units	Weight approx.
		V	Order No.	kg
2600 N locking force · Enclosure width 54 mm				
	Spring-actuated locks			
	• With auxiliary release	-- 24 DC	➡ 3SE5 312-0SD11	0.925
		-- 115 AC	➡ 3SE5 312-0SD12	0.925
		-- 230 AC	➡ 3SE5 312-0SD13	0.925
	Yellow/green	24 DC	➡ 3SE5 312-1SD11	0.925
		115 AC	➡ 3SE5 312-2SD12	0.925
		230 AC	➡ 3SE5 312-3SD13	0.925
	• With auxiliary release with lock	-- 24 DC	➡ 3SE5 312-0SE11	0.940
		-- 115 AC	➡ 3SE5 312-0SE12	0.940
		-- 230 AC	➡ 3SE5 312-0SE13	0.940
	Yellow/green	24 DC	➡ 3SE5 312-1SE11	0.940
		115 AC	➡ 3SE5 312-2SE12	0.940
		230 AC	➡ 3SE5 312-3SE13	0.940
	• With escape release from the front	-- 24 DC	➡ 3SE5 312-0SF11	0.940
		-- 115 AC	➡ 3SE5 312-0SF12	0.940
		-- 230 AC	➡ 3SE5 312-0SF13	0.940
	Yellow/green	24 DC	➡ 3SE5 312-1SF11	0.940
		115 AC	➡ 3SE5 312-2SF12	0.940
		230 AC	➡ 3SE5 312-3SF13	0.940
	• With escape release from the back and auxiliary release from the front	-- 24 DC	➡ 3SE5 312-0SG11	0.925
		-- 115 AC	➡ 3SE5 312-0SG12	0.925
		-- 230 AC	➡ 3SE5 312-0SG13	0.925
	Yellow/green	24 DC	➡ 3SE5 312-1SG11	0.925
		115 AC	➡ 3SE5 312-2SG12	0.925
		230 AC	➡ 3SE5 312-3SG13	0.925
	• With emergency release from the back and auxiliary release from the front	-- 24 DC	➡ 3SE5 312-0SJ11	0.925
		-- 115 AC	➡ 3SE5 312-0SJ12	0.925
		-- 230 AC	➡ 3SE5 312-0SJ13	0.925
	Yellow/green	24 DC	➡ 3SE5 312-1SJ11	0.925
		115 AC	➡ 3SE5 312-2SJ12	0.925
		230 AC	➡ 3SE5 312-3SJ13	0.925
	Magnetic field locks			
	--	24 DC	➡ 3SE5 312-0SB11	0.925
		115 AC	➡ 3SE5 312-0SB12	0.925
		230 AC	➡ 3SE5 312-0SB13	0.925
	Yellow/green	24 DC	➡ 3SE5 312-1SB11	0.925
		115 AC	➡ 3SE5 312-2SB12	0.925
		230 AC	➡ 3SE5 312-3SB13	0.925

➡ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately; see page 1/139.

3SE5 Position Switches

3SE5 Position Switches with Tumbler

Accessories

Selection and ordering data

Version		Order No.	Weight approx. kg
Actuators			
	standard actuator, length 75.6 mm	3SE5 000-0AV01	0.035
	with vertical fixing, length 53 mm	3SE5 000-0AV02	0.035
	with transverse fixing, length 47 mm	3SE5 000-0AV03	0.035
	radius actuator, left, length 44.5 mm	3SE5 000-0AV04	0.040
	radius actuator, right, length 44.5 mm	3SE5 000-0AV06	0.040
	universal actuator, length 69 mm	3SE5 000-0AV05	0.070
Connections			
	Connector sockets (4-pole), M12 for M20 × 1.5, fixed for max. 250 V, 4 A with 0.25 mm ² connecting cable, plastic, degree of protection IP67, ambient temperature –40 to +85 °C	3SY3 127	0.010
	Coupling boxes (4-pole), M12 with terminal compartment, can be pre-assembled	3RX8 000-0CB45	0.016
	Connector sockets (5-pole), M12 for M20 × 1.5, fixed for max. 125 V, 4 A with 0.25 mm ² connecting cable, plastic, degree of protection IP67, ambient temperature –40 to +85 °C	3SY3 128	0.010
	Coupling boxes (5-pole), M12 with terminal compartment, can be pre-assembled	3RX8 000-0CB55	0.016
	Cable glands M20 × 1.5 Plastic	3SX9 926	0.010

3SE5 Position Switches

3SE5 Hinge Switches

General data

Overview

3SE5 hinge switches have the same enclosures as the standard switches (modular system).



Hinge switches

Design

Enclosure sizes

The 3SE5 switches are available as complete units in two enclosure sizes:

- Plastic enclosures according to EN 50047 (31 mm wide), 1 cable entry
- Metal enclosures according to EN 50041 (40 mm wide), 1 cable entry

Enclosure versions

Various basic variants can be selected for the enclosures:

- Available with two or three-pole switching elements designed as snap-action contacts
- Metal enclosures for explosion protection (ATEX) ([see page 1/146](#))
- AS-Interface version with integrated ASIsafe electronics for all enclosure designs

Operating mechanism

The hinge switches are provided for mounting on hinges. The actuator head is included in the scope of supply. There are two versions:

- Operating mechanism with hollow shaft, diameter inside 8 mm, outside 12 mm
- Operating mechanism with solid shaft, diameter 10 mm

Benefits

The 3SE5 hinge switches differ from the previous series through the following new characteristics:

- All actuators around the axis in increments of 22.5° ([see picture on page 1/110](#)).
- The new three-pole switching element 1 NO + 2 NC is available for all enclosure sizes.
- The plastic enclosure with a width of 31 mm has simple and fast wiring equipment which makes it possible to save from approx. 20 to 25 % of the time when connecting ([see picture on page 1/110](#)).
- The ASIsafe electric component is integrated for the versions with the AS-Interface connection; an additional adapter is not required ([see page 1/147](#)).

Application

The hinge switches are used in those areas where the position of swivelable protective devices such as doors or flaps must be monitored. The position of the doors and flaps is converted into electric signals with the switches. The switches allow shutdown and signaling without delay in the event of a smaller opening angle through the snap-action contacts with an operating angle of 5° or 15°.

Devices are available with enclosure versions to suit the particular ambient conditions. Different control tasks can be performed with the best contact blocks suited for the particular purpose. Dimensions and fixing points of the enclosures are in accordance with EN 50041 or EN 50047 standards.

The devices are suitable for use in any climate.

Standards

IEC 60947-5-1 or EN 60947-5-1.

The protective measure of "total insulation" by the molded-plastic enclosure is guaranteed by the use of molded-plastic screw-glands.

Safety position switches

For controls according to IEC 60204-1 or EN 60204-1 the devices can be used as a safety position switch. To secure position switches against changes in their position, keyed techniques must be employed on installation.

Safety circuits

The standards IEC 60947-5-1 and EN 60947-5-1 require positive opening of the NC contacts. Hence for the purposes of personal safety, the assured opening of NC contacts is expressly stipulated for the electrical equipment of machines in all safety circuits and marked according to IEC 60947-5-1 with the symbol .

Category 4 according to EN 954-1 can be attained with the 3SE5 hinge switches with  if the corresponding failsafe evaluation units are selected and correctly installed, e.g. the 3TK28 safety relays or matching devices from the ASIsafe, SIMATIC or SINUMERIK product ranges.

3SE5 Position Switches

3SE5 Hinge Switches

Plastic enclosures
Enclosure width 31 mm according to EN 50047

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP65 or IP66/IP67 · Cable entry M20 × 1.5

Version	Snap-action contacts	Complete units	Weight, approx.
		Order No.	kg
Plastic enclosures • Enclosure width 31 mm according to EN 50047			
	With hollow shaft		
	Operating angle 5°	1 NO + 2 NC ➡ 3SE5 232-0LU11	0.090
	Operating angle 15°	1 NO + 1 NC ➡ 3SE5 232-0HU21	0.080
	Operating angle 15°	1 NO + 2 NC ➡ 3SE5 232-0LU21	0.080
	With solid shaft		
	Operating angle 5°	1 NO + 2 NC ➡ 3SE5 232-0LU12	0.120
	Operating angle 15°	1 NO + 1 NC ➡ 3SE5 232-0HU22	0.110
	Operating angle 15°	1 NO + 2 NC ➡ 3SE5 232-0LU22	0.120

➡ Positive opening according to IEC 60947-5-1, Appendix K.

Accessories

Version	Order No.	Weight approx.
		kg
Actuator heads		
	With hollow shaft	
	Operating angle 5°	3SE5 000-0AU11 0.030
	Operating angle 15°	3SE5 000-0AU21 0.030
	With solid shaft	
	Operating angle 5°	3SE5 000-0AU12 0.052
	Operating angle 15°	3SE5 000-0AU22 0.052

Note: The respective actuator heads are included in the scope of supply for the complete units.

3SE5 Position Switches

3SE5 Hinge Switches

Metal enclosures
Enclosure width 40 mm according to EN 50041

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP65 or IP66/IP67 · Cable entry M20 × 1.5

Version	Snap-action contacts	Complete units	Weight approx.
		Order No.	kg
Metal enclosures • Enclosure width 40 mm according to EN 50041			
	With hollow shaft		
	Operating angle 5°	1 NO + 2 NC ➡ 3SE5 112-0LU11	0.295
	Operating angle 15°	1 NO + 2 NC ➡ 3SE5 112-0LU21	0.295
	With solid shaft		
	Operating angle 5°	1 NO + 2 NC ➡ 3SE5 112-0LU12	0.315
	Operating angle 15°	1 NO + 2 NC ➡ 3SE5 112-0LU22	0.315

With hollow shaft

With solid shaft

➡ Positive opening according to IEC 60947-5-1, Appendix K.

Accessories

Version	Order No.	Weight approx.
		kg
Actuator heads		
	With hollow shaft	
	Operating angle 5°	3SE5 000-0AU11
	Operating angle 15°	3SE5 000-0AU21
	With solid shaft	
	Operating angle 5°	3SE5 000-0AU12
	Operating angle 15°	3SE5 000-0AU22

Actuator head with hollow shaft

Actuator head with solid shaft

Note: The respective actuator heads are included in the scope of supply for the complete units.

3SE5 Position Switches

3SE5 Explosion-Proof Position Switches (ATEX)

Metal enclosures
Enclosure width 40 mm acc. to EN 50041 / 56 mm

Overview



The position switch in the metal enclosure including the hinge switch and the switch with a disconnected actuator are also available in versions for operation in areas with a gas explosion hazard and in areas with combustible dust.

To achieve the maximum possible safety in these areas, the legislators of most countries have drawn up requirements in the form of laws, regulations and standards which these switches comply with to the letter.

These switches comply with Directive 94/4/EC (ATEX 95) of the European Union and are approved for Zone 22.

They have a grounding screw on the outside of the enclosure but are otherwise identical with the standard enclosures. The connection openings are closed with protective caps upon delivery.

Selection and ordering data

Complete units

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version	Contacts	Complete units	Weight per PU approx.
		Order No.	kg

Enclosure width 40 mm according to EN 50041

With M20 × 1.5 connecting thread			
	Snap-action contacts	1 NO + 1 NC	
	Rounded plunger, high-grade steel, with overtravel	➔ 3SE5 112-0CC02-1DA0	0.290
	Roller plunger, high-grade steel	➔ 3SE5 112-0CD02-1DA0	0.310
	Roller lever, high-grade steel lever, plastic roller	➔ 3SE5 112-0CE03-1DA0	0.300
	Angular roller lever, high-grade steel lever, plastic roller	➔ 3SE5 112-0CF03-1DA0	0.320
	Spring rod, length 142.5 mm	3SE5 112-0CR01-1DA0	0.315
	Plastic plunger	➔ 3SE5 112-0CH11-1DA0	0.360
	Twist lever, high-grade steel lever, plastic roller	3SE5 112-0CH52-1DA0	0.360
	Twist lever, adjustable length	➔ 3SE5 112-0CT13-1DA0	0.360
	High-grade steel lever, plastic roller	3SE5 112-0CH80-1DA0	0.300
	Fork lever, high-grade steel lever, plastic roller	3SE5 112-0CH82-1DA0	0.300
	Rod actuator, aluminium rod, length 200 mm		
	Rod actuator, plastic rod, length 200 mm		

Enclosure width 56 mm

With three M20 × 1.5 connecting threads			
	Snap-action contacts	1 NO + 1 NC	
	Rounded plunger, high-grade steel, with overtravel	➔ 3SE5 122-0CC02-1DA0	0.355
	Roller plunger, high-grade steel	➔ 3SE5 122-0CD02-1DA0	0.380
	Roller lever, high-grade steel lever, plastic roller	➔ 3SE5 122-0CE03-1DA0	0.375
	Angular roller lever, high-grade steel lever, plastic roller	➔ 3SE5 122-0CF03-1DA0	0.390
	Spring rod, length 142.5 mm	3SE5 122-0CR01-1DA0	0.390
	Plastic plunger	➔ 3SE5 122-0CH11-1DA0	0.410
	Twist lever, high-grade steel lever, plastic roller		

➔ Positive opening according to IEC 60947-5-1, Appendix K.

Note: If the device you require is not available as a complete unit, see "Modular System" on the next page.

3SE5 Position Switches

3SE5 Explosion-Proof Position Switches (ATEX)

Metal enclosures

Enclosure width 40 mm acc. to EN 50041 / 56 mm

Modular system

2 or 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version	Contacts	Modular system	Weight approx.
		Order No.	kg

Basic switches • Enclosure width 40 mm according to EN 50041



Basic switches

With M20 × 1.5 connecting thread

Slow-action contacts	1 NO + 1 NC	↻	3SE5 112-0BA00-1DA0	0.260
Snap-action contacts	1 NO + 1 NC	↻	3SE5 112-0CA00-1DA0	0.260
Slow-action contacts	1 NO + 2 NC	↻	3SE5 112-0KA00-1DA0	0.270
Snap-action contacts	1 NO + 2 NC	↻	3SE5 112-0LA00-1DA0	0.270

Basic switches • Enclosure width 56 mm



Basic switches

With three M20 × 1.5 connecting threads

Slow-action contacts	1 NO + 1 NC	↻	3SE5 122-0BA00-1DA0	0.325
Snap-action contacts	1 NO + 1 NC	↻	3SE5 122-0CA00-1DA0	0.325
Slow-action contacts	1 NO + 2 NC	↻	3SE5 122-0KA00-1DA0	0.335
Snap-action contacts	1 NO + 2 NC	↻	3SE5 122-0LA00-1DA0	0.335

↻ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, necessary in safety circuits.

Version	Diameter	Modular system	Weight approx.
	mm	Order No.	kg

Actuators



Rounded plunger

Rounded plungers, type B according to EN 50041

High-grade steel plungers, with 3 mm overtravel	↻	3SE5 000-0AC02	0.030



Roller plunger

Roller plungers, type C according to EN 50041

High-grade steel rollers	13	↻	3SE5 000-0AD02	0.050



Roller lever

Roller levers

Metal lever, plastic roller	22	↻	3SE5 000-0AE01	0.040
Metal lever, high-grade steel roller	22	↻	3SE5 000-0AE02	0.065
High-grade steel lever, plastic roller	22	↻	3SE5 000-0AE03	0.040
High-grade steel lever, high-grade steel roller	22	↻	3SE5 000-0AE04	0.065



Angular roller lever

Angular roller levers

Metal lever, plastic roller	22	↻	3SE5 000-0AF01	0.050
Metal lever, high-grade steel roller	22	↻	3SE5 000-0AF02	0.075
High-grade steel lever, plastic roller	22	↻	3SE5 000-0AF03	0.050
High-grade steel lever, high-grade steel roller	22	↻	3SE5 000-0AF04	0.075



Spring rod

Spring rods

Plastic plunger:

- Length 142.5 mm (spring 50 mm, plunger 50 mm)
- Length 76 mm (spring 23.5 mm, plunger 10 mm)
- Length 242.5 mm (spring 150 mm, plunger 50 mm)

High-grade steel plunger:

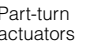
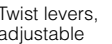
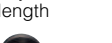
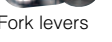
- Length 142.5 mm (spring 50 mm, plunger 50 mm)

3SE5 000-0AR01	0.025
3SE5 000-0AR03	0.020
3SE5 000-0AR04	0.040
3SE5 000-0AR02	0.040

3SE5 Position Switches

3SE5 Explosion-Proof Position Switches (ATEX)

Metal enclosures
Enclosure width 40 mm acc. to EN 50041 / 56 mm

Version	Diameter	Modular system	Weight approx.
	mm	Order No.	kg
Part-turn actuators			
	Part-turn actuators, metal (without lever)		
	• For twist levers and rod actuators, switching right and/or left, adjustable	➞ 3SE5 000-0AH00	0.070
	• For fork lever	➞ 3SE5 000-0AT10	0.050
Levers for part-turn actuators			
Twist levers, type A according to EN 50041			
	Metal lever, plastic roller	19 ➞ 3SE5 000-0AA01	0.015
	Metal lever, high-grade steel roller	19 ➞ 3SE5 000-0AA02	0.025
	Metal lever, roller with ball bearing	19 ➞ 3SE5 000-0AA03	0.020
	Metal lever, 2 plastic roller	19 ➞ 3SE5 000-0AA04	0.015
	Metal lever, plastic roller	30 ➞ 3SE5 000-0AA05	0.015
	Metal lever, rubber roller	50 ➞ 3SE5 000-0AA08	0.030
	High-grade steel lever, plastic roller	19 ➞ 3SE5 000-0AA11	0.015
	High-grade steel lever, high-grade steel roller	19 ➞ 3SE5 000-0AA12	0.025
Twist levers, adjustable length, with grid hole			
	Metal lever, plastic roller	19 ➞ 3SE5 000-0AA60	0.025
	Metal lever, high-grade steel roller	19 ➞ 3SE5 000-0AA61	0.040
	Metal lever, rubber roller	50 ➞ 3SE5 000-0AA68	0.045
	High-grade steel lever, plastic roller	19 ➞ 3SE5 000-0AA62	0.025
	High-grade steel lever, high-grade steel roller	19 ➞ 3SE5 000-0AA63	0.040
Twist levers, adjustable length			
	Metal lever, plastic roller	19 3SE5 000-0AA50	0.025
	Metal lever, high-grade steel roller	19 3SE5 000-0AA51	0.035
	Metal lever, plastic roller	30 3SE5 000-0AA55	0.025
	Metal lever, rubber roller	50 3SE5 000-0AA58	0.040
	High-grade steel lever, plastic roller	19 3SE5 000-0AA52	0.025
	High-grade steel lever, high-grade steel roller	19 3SE5 000-0AA53	0.035
Fork levers			
	Metal lever, 2 plastic roller	19 ➞ 3SE5 000-0AT01	0.050
	Metal lever, 2 high-grade steel rollers	19 ➞ 3SE5 000-0AT02	0.050
	High-grade steel lever, 2 plastic rollers	19 ➞ 3SE5 000-0AT03	0.050
	High-grade steel lever, 2 high-grade steel rollers	19 ➞ 3SE5 000-0AT04	0.050
Rod actuators, type D, according to EN 50041			
	Aluminium rod, length 200 mm	6 3SE5 000-0AA80	0.025
	Spring rod, length 200 mm	6 3SE5 000-0AA81	0.030
	Plastic rod, length 200 mm	6 3SE5 000-0AA82	0.015

➞ Positively driven actuator, necessary in safety circuits.

3SE5 Position Switches

3SE5 Explosion-Proof Position Switches (ATEX)

Metal enclosures

Enclosure width 40 mm acc. to EN 50041 / 56 mm

Position switches with separate actuator · Complete units

5 directions of approach · 3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version ¹⁾	Contacts	Complete units	Weight approx.
		Order No.	kg
Enclosure width 40 mm according to EN 50041			
 With separate actuator	With M20 × 1.5 connecting thread Slow-action contacts 1 NO + 2 NC ➞	3SE5 112-0QV10-1DA0	0.250
Enclosure width 56 mm			
 With separate actuator	With three M20 × 1.5 connecting threads Slow-action contacts 1 NO + 2 NC ➞	3SE5 122-0QV10-1DA0	0.250

➞ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately.

Hinge switches · Complete units

3 contacts · Degree of protection IP66/IP67 · Cable entry M20 × 1.5

Version	Snap-action contacts	Complete units	Weight approx.
		Order No.	kg
Enclosure width 40 mm according to EN 50041			
 With hollow shaft	With hollow shaft Operating angle 5° 1 NO + 2 NC ➞ Operating angle 15° 1 NO + 2 NC ➞	3SE5 112-0LU11-1DA0 3SE5 112-0LU21-1DA0	0.295 0.295
 With solid shaft	With solid shaft, Ø = 10 mm Operating angle 5° 1 NO + 2 NC ➞ Operating angle 15° 1 NO + 2 NC ➞	3SE5 112-0LU12-1DA0 3SE5 112-0LU22-1DA0	0.315 0.315

➞ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, usable in safety circuits.

Overview

The 3SF1 position switches with safety-oriented communication can be directly connected using the AS-Interface bus system. The safety functions no longer have to be conventionally wired up.

With the new 3SF1 position switches the ASIsafe electronics are integrated in the switch enclosure.



Examples of selection options in the modular system

Modular system

The position switches of the 3SF1 1.4 and 3SF1 2.4 series are constructed from a modular system comprising different variants of the basic enclosure and an actuator which must be ordered separately. Thanks to the modular design of the switch the end user can select the right solution for his application from numerous variants and install it himself in a very short time.

Display

The switches have a status display with three LEDs:

- LED 1 (yellow): F-IN1
- LED 2 (yellow): F-IN2
- LED 3 (green/red): AS-i/FAULT

Connections

Connection to the AS-Interface is by means of a 4-pole M12 connector socket (plastic version) connected to the yellow AS-Interface bus cable.

The wide enclosures (50 or 56 mm) have a second M12 connector socket for connecting a second position switch. Category 4 according to EN 954-1 is thus achieved.

Benefits

The new generation of 3SF1 position switches offers:

- ASIsafe Electronics integrated in the enclosure, with low power consumption < 60 mA
- An extensive range of actuators
- Status display with three LEDs

Application

With the standard position switches, mechanical positions of moved machine parts are converted into electrical signals. Through their modular and uniform design and large number of variants, the devices can meet practically all requirements in industry.

Devices are available with enclosure versions to suit the particular ambient conditions. Different control tasks can be performed with the best contact blocks suited for the particular purpose. And many different actuator variants are available to match the mechanical configuration of the moved machined parts. Dimensions, fixing points and characteristics are largely in accordance with the EN 50041 or EN 50047 standards.

The devices are suitable for use in any climate.

Standards

The switches comply with the standards IEC 60947-1 (Low-Voltage Controlgear, General) and IEC 60947-5-1 (Electromechanical Control Devices).

The mechanical design of the switch corresponds to the requirements of the failsafe principle according to EN 1088.

Approvals

The ASIsafe versions 3SF1 1 and 3SF1 2 can be used according to IEC 61508 in loops up to SIL 3. They can be identified with the certificate logo and the certification certificate, approval number 73301.

They are approved according to UL 508, UL 50 and UL 746-C.

Category 3 according to EN 954-1 is achieved with the 3SF1 1 and 3SF1 2 position switches with two-channel scanning in corresponding operation. Category 4 can be achieved through combination of the 3SF1 position switch with a 3SE5 position switch.

3SF1 AS-Interface Position Switches

Plastic enclosures

Enclosure width 31 mm acc. to EN 50047 / 50 mm

Selection and ordering data

Modular system

For the ASIsafe version of the position switch, the basic switch and actuator must be ordered separately.

1 or 2 contacts · 3 LEDs · Degree of protection IP65 or IP66/IP67 · M12 connector socket

Version	Contacts	LEDs	Modular system	Weight approx.
Order No.				kg
Basic switches (with rounded plunger¹⁾) · Enclosure width 31 mm according to EN 50047				
	With teflon plunger, with M12 connector socket , 4-pole; channel 1 on NC contact, channel 2 on NC contact			
	Slow-action contacts	2 NC	24 V DC	➡ 3SF1 234-1KC05-1BA1 0.070
	Snap-action contacts	2 NC	24 V DC	➡ 3SF1 234-1LC05-1BA1 0.070
ASIsafe basic switches				
Basic switches (with rounded plunger¹⁾) · Enclosure width 50 mm				
	With teflon plunger, with M12 connector socket , 4-pole; channel 1 on NC contact, channel 2 on M12 socket, right			
	Slow-action contacts	1 NC	24 V DC	➡ 3SF1 244-1KC05-1BA2 0.080
	Snap-action contacts	1 NC	24 V DC	➡ 3SF1 244-1LC05-1BA2 0.080
ASIsafe basic switches				

ASIsafe basic switches

ASIsafe basic switches

→ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, usable in safety circuits.

¹⁾ On the plastic version the basic switch is a complete unit with rounded plunger.

For selection aid, see page 1/111

3SF1 AS-Interface Position Switches

Plastic enclosures
Enclosure width 31 mm acc. to EN 50047 / 50 mm

Version		Diameter	Modular system		Weight approx.
		mm	Order No.		kg
Actuators					
	Roller plungers, type C according to EN 50047				
	Plastic rollers	10	➞	3SE5 000-0AD03	0.005
	High-grade steel rollers	10	➞	3SE5 000-0AD04	0.010
	Roller plungers with central fixing				
	Plastic rollers	10	➞	3SE5 000-0AD10	0.025
	High-grade steel rollers	10	➞	3SE5 000-0AD11	0.030
	Roller levers, type E according to EN 50047				
	Metal lever, plastic roller	13	➞	3SE5 000-0AE10	0.045
	Metal lever, high-grade steel roller	13	➞	3SE5 000-0AE11	0.050
	High-grade steel lever, plastic roller	13	➞	3SE5 000-0AE12	0.050
	High-grade steel lever, high-grade steel roller	13	➞	3SE5 000-0AE13	0.055
	Angular roller levers				
	Metal lever, plastic roller	13	➞	3SE5 000-0AF10	0.010
	Metal lever, high-grade steel roller	13	➞	3SE5 000-0AF11	0.013
	High-grade steel lever, plastic roller	13	➞	3SE5 000-0AF12	0.013
	High-grade steel lever, high-grade steel roller	13	➞	3SE5 000-0AF13	0.013
Part-turn actuators with levers					
	Part-turn actuators, plastic (without lever)				
	switching right or left, adjustable		➞	3SE5 000-0AK00	0.020
Levers for part-turn actuators					
	Twist levers, type A according to EN 50047				
	Metal lever, plastic roller	19	➞	3SE5 000-0AA21	0.010
	Metal lever, high-grade steel roller	19	➞	3SE5 000-0AA22	0.020
	Metal lever, roller with ball bearing	19	➞	3SE5 000-0AA23	0.020
	Metal lever, plastic roller	30	➞	3SE5 000-0AA25	0.010
	High-grade steel lever, plastic roller	19	➞	3SE5 000-0AA31	0.022
	High-grade steel lever, high-grade steel roller	19	➞	3SE5 000-0AA32	0.022
	Twist levers, adjustable length, with grid hole				
	Metal lever, plastic roller	19	➞	3SE5 000-0AA60	0.025
	Metal lever, high-grade steel roller	19	➞	3SE5 000-0AA61	0.040
	Metal lever, plastic roller	50	➞	3SE5 000-0AA67	0.025
	Metal lever, rubber roller	50	➞	3SE5 000-0AA68	0.045
	High-grade steel lever, plastic roller	19	➞	3SE5 000-0AA62	0.025
	High-grade steel lever, high-grade steel roller	19	➞	3SE5 000-0AA63	0.040

➞ Positively driven actuator, usable in safety circuits.

3SF1 AS-Interface Position Switches

Metal enclosures

Enclosure width 40 mm acc. to EN 50041 / 56 mm

Selection and ordering data

Modular system

For the ASIsafe version of the position switch, the basic switch and actuator must be ordered separately.

1 or 2 contacts · 3 LEDs · Degree of protection IP66/IP67 · M12 connector socket

Version	Contacts	LEDs	Modular system	Weight approx.	
Order No.				kg	
Basic switches · Enclosure width 40 mm according to EN 50041					
	With M12 connector socket, 4-pole; channel 1 on NC contact, channel 2 on NC contact				
	Slow-action contacts	2 NC	24 V DC ➞	3SF1 114-1KA00-1BA1	0.285
	Snap-action contacts	2 NC	24 V DC ➞	3SF1 114-1LA00-1BA1	0.285
ASIsafe basic switches					
Basic switches · Enclosure width 56 mm					
	With M12 connector socket, 4-pole; channel 1 on NC contact, channel 2 on M12 socket, right				
	Slow-action contacts	1 NC	24 V DC ➞	3SF1 124-1KA00-1BA2	0.360
	Snap-action contacts	1 NC	24 V DC ➞	3SF1 124-1LA00-1BA2	0.360
ASIsafe basic switches					
➞ Positive opening according to IEC 60947-5-1, Appendix K, or positively driven actuator, usable in safety circuits.			Note: For selection aid, see page 1/111.		

3SF1 AS-Interface Position Switches

Metal enclosures
Enclosure width 40 mm acc. to EN 50041 / 56 mm

Version		Diameter	Modular system		Weight approx.		
		mm	Order No.		kg		
Actuators							
 Rounded plunger	Rounded plungers, type B according to EN 50041		↻	3SE5 000-0AC02	0.030		
	High-grade steel plungers						
 Roller plunger	Roller plungers, type C according to EN 50041		↻	3SE5 000-0AD02	0.050		
	High-grade steel rollers 13						
 Roller lever	Roller levers		↻				
	Metal lever, plastic roller	22				3SE5 000-0AE01	0.040
	Metal lever, high-grade steel roller	22				3SE5 000-0AE02	0.065
	High-grade steel lever, plastic roller	22				3SE5 000-0AE03	0.040
	High-grade steel lever, high-grade steel roller	22				3SE5 000-0AE04	0.065
 Angular roller lever	Angular roller levers		↻				
	Metal lever, plastic roller	22				3SE5 000-0AF01	0.050
	Metal lever, high-grade steel roller	22				3SE5 000-0AF02	0.075
	High-grade steel lever, plastic roller	22				3SE5 000-0AF03	0.050
	High-grade steel lever, high-grade steel roller	22				3SE5 000-0AF04	0.075
Part-turn actuators with levers							
 Part-turn actuators	Part-turn actuators, metal (without lever)		↻	3SE5 000-0AH00	0.070		
	switching right or left, adjustable						
 Twist lever	Levers for part-turn actuators		↻				
	Twist levers, type A according to EN 50041						
	Metal lever, plastic roller	19				3SE5 000-0AA01	0.015
	Metal lever, high-grade steel roller	19				3SE5 000-0AA02	0.025
	Metal lever, roller with ball bearing	19				3SE5 000-0AA03	0.020
	Metal lever, 2 plastic roller	19				3SE5 000-0AA04	0.015
	Metal lever, plastic roller	30				3SE5 000-0AA05	0.015
	Metal lever, plastic roller	50				3SE5 000-0AA07	0.020
	Metal levers, rubber roller	50				3SE5 000-0AA08	0.030
	High-grade steel lever, plastic roller	19				3SE5 000-0AA11	0.015
	High-grade steel lever, high-grade steel roller	19				3SE5 000-0AA12	0.025
	Twist levers, adjustable length, with grid hole						
	Metal lever, plastic roller	19				3SE5 000-0AA60	0.025
	Metal lever, high-grade steel roller	19				3SE5 000-0AA61	0.040
 Twist levers, adjustable length	Metal lever, plastic roller	50	3SE5 000-0AA67	0.025			
	Metal lever, rubber roller	50	3SE5 000-0AA68	0.045			
	High-grade steel lever, plastic roller	19	3SE5 000-0AA62	0.025			
	High-grade steel lever, high-grade steel roller	19	3SE5 000-0AA63	0.040			
	Fork levers						
	Metal lever, 2 plastic roller	19	3SE5 000-0AT01	0.050			
 Fork levers	Metal lever, 2 high-grade steel rollers	19	3SE5 000-0AT02	0.050			
	High-grade steel lever, 2 plastic rollers	19	3SE5 000-0AT03	0.050			
	High-grade steel lever, 2 high-grade steel rollers	19	3SE5 000-0AT04	0.050			

⊕ Positively driven actuator, usable in safety circuits.

3SF1 AS-Interface Position Switches

3SF1 Position Switches with Separate Actuator

General data

Overview

The 3SF1 position switches with safety-oriented communication can be directly connected using the AS-Interface bus system. The safety functions no longer have to be conventionally wired up.

With the new 3SF1 position switches the ASIsafe electronics are integrated in the switch enclosure.



3SF1 position switches with separate actuator and with integrated ASIsafe Electronics

3SF1 position switches with separate actuator have the same enclosures as the standard switches.

Actuation

The actuator head is included in the scope of supply. For actuation from four directions it can be adjusted through $4 \times 90^\circ$. The switches can also be approached from above.

The actuators are not included in the scope of supply of the position switch and must be ordered separately from a choice of six variants to suit the application.

Display

The switches have a status display with three LEDs:

- LED 1 (yellow): F-IN1
- LED 2 (yellow): F-IN2
- LED 3 (green/red): AS-i/FAULT

Connections

Connection to the AS-Interface is by means of a 4-pole M12 connector socket (plastic version) connected to the yellow AS-Interface bus cable.

The wide enclosures (50 or 56 mm) have a second M12 connector socket for connecting a second position switch. Category 4 according to EN 954-1 is thus achieved.

Benefits

The new generation of 3SF1 position switches with separate actuator offers:

- ASIsafe Electronics integrated in the enclosure, with low power consumption $< 60 \text{ mA}$
- An extensive range of actuators
- Status display with three LEDs

Application

Position switches with separate actuator are used where the position of doors, covers or protective grills must be monitored for safety reasons.

The position switch can only be operated with the matching coded actuator. Simple overruling by hand or auxiliary devices is impossible.

Devices are available with enclosure versions to suit the particular ambient conditions. Different control tasks can be performed with the best contact blocks suited for the particular purpose. Dimensions, fixing points of the enclosure are in accordance with EN 50041 or EN 50047 standards.

The devices are suitable for use in any climate.

Standards

The switches comply with the standards IEC 60947-1 (low-voltage controlgear, general) and IEC 60947-5-1 (electromechanical control devices).

The mechanical design of the switch corresponds to the requirements of the failsafe principle according to EN 1088.

Approvals

The ASIsafe versions 3SF1 1 and 3SF1 2 can be used according to IEC 61508 in loops up to SIL 3. They can be identified with the certificate logo and the certification certificate, approval number 73301.

They are approved according to UL 508, UL 50 and UL 746-C.

Category 3 according to EN 954-1 is achieved with the 3SF1 1 and 3SF1 2 position switches with two-channel scanning in corresponding operation. Category 4 can be achieved through combination of the 3SF1 position switch with a 3SE5 position switch.

3SF1 AS-Interface Position Switches

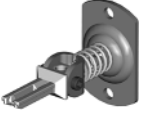
3SF1 Position Switches with Separate Actuator

Plastic enclosures
Enclosure width 31 mm acc. to EN 50047 / 50 mm

Overview

- Contacts: 1 or 2 slow-action contacts
- Status display with 3 LEDs 24 V DC;
1: F-IN1, 2: F-IN2, 3: AS-i/FAULT
- Degree of protection IP65 or IP66/IP67

Selection and ordering data

Version ¹⁾	Slow-action contacts	Complete units	Weight approx.
		Order No.	kg
Enclosure width 31 mm according to EN 50047			
	5 directions of approach M12 connector socket, 4-pole; channel 1 on NC contact, channel 2 on NC contact	2 NC → 3SF1 234-1QV40-1BA1	0.095
Enclosure width 50 mm			
	5 directions of approach M12 connector socket, 4-pole; channel 1 on NC, channel 2 on M12 socket, right	1 NC → 3SF1 244-1QV40-1BA2	0.110
Actuators			
	Actuators • Standard actuator, length 75.6 mm	3SE5 000-0AV01	0.035
	• With vertical fixing, length 53 mm	3SE5 000-0AV02	0.035
	• With transverse fixing, length 47 mm	3SE5 000-0AV03	0.035
	• Radius actuator, left, length 44.5 mm	3SE5 000-0AV04	0.040
	• Radius actuator, right, length 44.5 mm	3SE5 000-0AV06	0.040
	• Universal actuator, length 69 mm	3SE5 000-0AV05	0.070

→ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately.

3SF1 AS-Interface Position Switches

3SF1 Position Switches with Separate Actuator

Metal enclosures

Enclosure width 40 mm acc. to EN 50041 / 56 mm

Overview

- Contacts: 1 or 2 slow-action contacts
- Status display with 3 LEDs 24 V DC;
1: F-IN1, 2: F-IN2, 3: AS-i/FAULT
- Degree of protection IP66/IP67

Selection and ordering data

Version ¹⁾		Slow-action contacts	Complete units		Weight approx.
			Order No.	kg	
Enclosure width 40 mm according to EN 50041					
	5 directions of approach M12 connector socket, 4-pole; channel 1 on NC contact, channel 2 on NC contact	2 NC	↻	3SF1 114-1QV10-1BA1	0.430
ASIsafe					
Enclosure width 56 mm					
	5 directions of approach M12 connector socket, 4-pole; channel 1 on NC, channel 2 on M12 socket, right	1 NC	↻	3SF1 124-1QV10-1BA2	0.500
ASIsafe					
Actuators					
	Actuators • Standard actuator, length 75.6 mm			3SE5 000-0AV01	0.035
	• With vertical fixing, length 53 mm			3SE5 000-0AV02	0.035
	• With transverse fixing, length 47 mm			3SE5 000-0AV03	0.035
	• Radius actuator, left, length 44.5 mm			3SE5 000-0AV04	0.040
	• Radius actuator, right, length 44.5 mm			3SE5 000-0AV06	0.040
	• Universal actuator, length 69 mm			3SE5 000-0AV05	0.070

⤵ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately.

3SF1 AS-Interface Position Switches

3SF1 Position Switches with Tumbler

General data

Overview

The 3SF1 position switches with safety-oriented communication can be directly connected using the AS-Interface bus system. The safety functions no longer have to be conventionally wired up.

With the new 3SF1 position switches the ASIsafe electronics are integrated in the switch enclosure.



3SF1 position switches with tumbler and with integrated ASIsafe electronics

Actuation

The actuator head is included in the scope of supply. For actuation from four directions it can be adjusted through $4 \times 90^\circ$. The switches can also be approached from above.

The actuators are not included in the scope of supply of the position switch and must be ordered separately from a choice of six variants to suit the application.

Tumblers

There are two versions for locking the actuator:

- Spring-actuated lock (closed-circuit principle) with various release mechanisms
- Magnet field lock (open-circuit principle)

Display

The switches have a status display with four LEDs:

- LED 1 (yellow): F-IN1
- LED 2 (yellow): F-IN2
- LED 3 (green): AS-i
- LED 4 (red): FAULT

Connections

Connection to the AS-Interface is by means of a 4-pole M12 connector socket (plastic version) connected to the yellow AS-Interface bus cable (no additional supply of auxiliary power is required thanks to the low current consumption of the magnet of max. 170 mA).

Benefits

The new generation of 3SF1 3 position switches with tumbler offers:

- More safety through higher locking forces:
 - 1300 N for plastic version
 - 2600 N for metal version
- Various release mechanisms: lock release, escape release and emergency release
- ASIsafe Electronics integrated in the enclosure; connected through 4-pole M12 connector socket
- Current consumption of the magnet max. 170 mA
- Two switch blocks as standard equipment, hence fewer variants needed
- Same dimensions for all enclosure versions: Plastic, metal
- An extensive range of actuators
- Status display with four LEDs

Application

The position switches with tumbler are exceptional, technically safe devices which restrict and prevent an unforeseen or intentional opening of protective doors, protective grilles or other covers as long as a dangerous situation is present (i.e. follow-on motion of the shutdown machine).

The safety position switches with tumbler have the following functions:

- Enabling the machine or process with closed and locked protective system
- Locking the machine or process with opened protective system
- Position monitoring of the protective system and tumbler

Standards

The switches comply with the standards IEC 60947-1 (Low-Voltage Controlgear, General) and IEC 60947-5-1 (Electromechanical Control Devices).

The mechanical design of the switch corresponds to the requirements of the failsafe principle according to EN 1088.

Approvals

The switches are approved for use with locking devices according to EN 1088 and EN 292, Parts 1 and 2.

3SE5 3 position switches with tumbler bear the VDE test mark for tested according to GS-ET19 (Test Principles of the German Trade Association for Locking Devices with Electromagnetic Tumblers).

The ASIsafe versions 3SF1 3 can be used according to IEC 61508 in loops up to SIL 3. They can be identified with the certificate logo and the certification certificate, approval number 73201.

They are approved according to UL 508, UL 50 and UL 746-C.

Category 3 according to EN 954-1 is achieved with the 3SF1 3 position switch with two-channel scanning in corresponding operation. Category 4 can be achieved through combination of the 3SF1 3 position switch with a 3SE5 position switch.

3SF1 AS-Interface Position Switches

3SF1 Position Switches with Tumbler

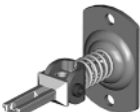
Plastic enclosures
With locking force greater than 1200 N

Overview

5 directions of approach · Degree of protection IP66/IP67

- Contacts
 - Variant -1BA1:
ASIsafe Channel 1 and 2: One NC contact each from the actuator and magnet
 - Variant -1BA3:
ASIsafe Channel 1 and 2: Two NC contacts each from the actuator
- Magnet: rated operational voltage 24 V DC
- Locking force 1300 N (1000 N according to GS-ET 19)
- Status display with 4 LEDs 24 V DC;
1: F-IN1, 2: F-IN2, 3: AS-i, 4: FAULT

Selection and ordering data

Tumblers ¹⁾		Enclosure width	Complete units		Weight approx.
		mm	Order No.		kg
1300 N locking force · Enclosure width 54 mm					
	Spring-actuated locks				
	• With auxiliary release	54	➡	3SF1 324-1SD21-1BA1	0.495
	• With auxiliary release	54	➡	3SF1 324-1SD21-1BA3	0.495
	• With auxiliary release with lock	54	➡	3SF1 324-1SE21-1BA1	0.495
3SF1 324-1SD21-...					
	• With escape release from the front	54	➡	3SF1 324-1SF21-1BA1	0.495
	• With escape release from the back and auxiliary release from the front	54	➡	3SF1 324-1SG21-1BA1	0.495
	• With emergency release from the back and auxiliary release from the front	54	➡	3SF1 324-1SJ21-1BA1	0.495
3SF1 324-1SF21-...					
	Magnetic field locks	54	➡	3SF1 324-1SB21-1BA1	0.495
3SF1 324-1SB21-...					
Actuators					
	Actuators				
	• Standard actuator, length 75.6 mm		3SE5 000-0AV01		0.035
	• With vertical fixing, length 53 mm		3SE5 000-0AV02		0.035
					
	• With transverse fixing, length 47 mm		3SE5 000-0AV03		0.035
	• Radius actuator, left, length 44.5 mm		3SE5 000-0AV04		0.040
	• Radius actuator, right, length 44.5 mm		3SE5 000-0AV06		0.040
					
	• Universal actuator, length 69 mm		3SE5 000-0AV05		0.070

➡ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately.

3SF1 AS-Interface Position Switches

3SF1 Position Switches with Tumbler

Metal enclosures
With locking force greater than 2000 N

Overview

5 directions of approach · Degree of protection IP66/IP67

- Contacts:
ASIsafe Channel 1 and 2: One NC contact each from the actuator and magnet
- Magnet: rated operational voltage 24 V DC
- Locking force 2600 N (2000 N according to GS-ET 19)
- Status display with 4 LEDs 24 V DC;
1: F-IN1, 2: F-IN2, 3: AS-i, 4: FAULT

Selection and ordering data

Tumblers ¹⁾		Enclosure width	Complete units		Weight approx.
		mm	Order No.		kg
2600 N locking force · Enclosure width 54 mm					
	Spring-actuated locks				
	• With auxiliary release	54	➞	3SF1 314-1SD11-1BA1	0.940
	• With auxiliary release with lock	54	➞	3SF1 314-1SE11-1BA1	0.940
	• With escape release from the front	54	➞	3SF1 314-1SF11-1BA1	0.940
	• With escape release from the back and auxiliary release from the front	54	➞	3SF1 314-1SG11-1BA1	0.940
3SF1 314-1SD21-...	• With emergency release from the back and auxiliary release from the front	54	➞	3SF1 314-1SJ11-1BA1	0.940
3SF1 314-1SF21-...					
	Magnetic field locks	54	➞	3SF1 314-1SB11-1BA1	0.940
3SF1 314-1BF21-...					
Actuators					
	Actuators				
	• Standard actuator, length 75.6 mm			3SE5 000-0AV01	0.035
	• With vertical fixing, length 53 mm			3SE5 000-0AV02	0.035
	• With transverse fixing, length 47 mm			3SE5 000-0AV03	0.035
	• Radius actuator, left, length 44.5 mm			3SE5 000-0AV04	0.040
	• Radius actuator, right, length 44.5 mm			3SE5 000-0AV06	0.040
	• Universal actuator, length 69 mm			3SE5 000-0AV05	0.070

➞ Positive opening according to IEC 60947-5-1, Appendix K.

¹⁾ Supplied without actuator. Please order separately.

3SF1 AS-Interface Position Switches

3SF1 Hinge Switches

Plastic enclosures

Enclosure width 31 mm acc. to EN 50047 / 50 mm

Overview

Hinge switches for mounting on hinges:

- Hollow shaft, diameter inside 8 mm, outside 12 mm
- Solid shaft, diameter 10 mm

For the ASIsafe version of the hinge switch, the basic switch and actuator head must be ordered separately.

The standards and approvals are the same as for the 3SF1 standard switches.

Selection and ordering data

Modular system

1 or 2 contacts · 3 LEDs · Degree of protection IP65 or IP66/IP67 · M12 connector socket

Version	Contacts	LEDs	Modular system	Weight per PU approx.
			Order No.	kg

Basic switches · Enclosure width 31 mm according to EN 50047



With teflon plunger, with M12 connector socket, 4-pole;
channel 1 on NC contact,
channel 2 on NC contact

Snap-action contacts

2 NC

24 V DC →

3SF1 234-1LC05-1BA1

0.070

ASIsafe basic switches

Basic switches · Enclosure width 50 mm



With teflon plunger, with M12 connector socket, 4-pole;
channel 1 on NC contact,
channel 2 on M12 socket, right

Snap-action contacts

1 NC

24 V DC →

3SF1 244-1LC05-1BA2

0.080

ASIsafe basic switches

Actuator heads



Actuator head with hollow shaft

With hollow shaft

Operating angle 5°

Operating angle 15°

3SE5 000-0AU11

0.030

3SE5 000-0AU21

0.030



Actuator head with solid shaft

With solid shaft

Operating angle 5°

Operating angle 15°

3SE5 000-0AU12

0.052

3SE5 000-0AU22

0.052

→ Positive opening according to IEC 60947-5-1, Appendix K.

3SF1 AS-Interface Position Switches

3SF1 Hinge Switches

Metal enclosures
Enclosure width 40 mm acc. to EN 50041 / 56 mm

Overview

Hinge switches for mounting on hinges:

- Hollow shaft, diameter inside 8 mm, outside 12 mm
- Solid shaft, diameter 10 mm

For the ASIsafe version of the hinge switch, the basic switch and actuator head must be ordered separately.

The standards and approvals are the same as for the 3SF1 standard switches.

Selection and ordering data

Modular system

1 or 2 contacts · 3 LEDs · Degree of protection IP66/IP67 · M12 connector socket

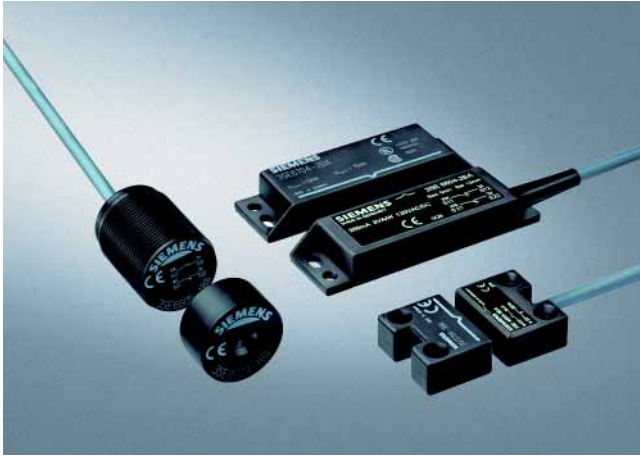
Version	Contacts	LEDs	Modular system	Weight approx.
			Order No.	kg
Basic switches · Enclosure width 40 mm according to EN 50041				
	With M12 connector socket , 4-pole; channel 1 on NC contact, channel 2 on NC contact Snap-action contacts		2 NC 24 V DC ➞ 3SF1 114-1LA00-1BA1	0.285
ASIsafe basic switches				
Basic switches · Enclosure width 56 mm				
	With M12 connector socket , 4-pole; channel 1 on NC contact, channel 2 on M12 socket, right Snap-action contacts		1 NC 24 V DC ➞ 3SF1 124-1LA00-1BA2	0.360
ASIsafe basic switches				
Actuator heads				
	With hollow shaft Operating angle 5° Operating angle 15°		3SE5 000-0AU11 3SE5 000-0AU21	0.030 0.030
Actuator head with hollow shaft				
	With solid shaft Operating angle 5° Operating angle 15°		3SE5 000-0AU12 3SE5 000-0AU22	0.052 0.052
Actuator head with solid shaft				

➞ Positive opening according to IEC 60947-5-1, Appendix K.

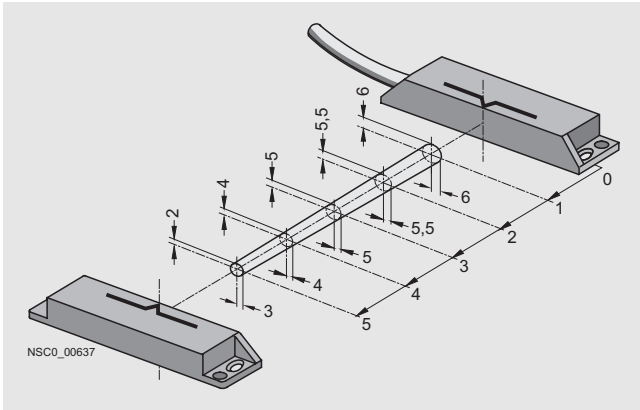
3SE6 Magnetically Operated Switches

Magnetic monitoring systems

Overview



A magnetically operated switch is comprised of a coded switching magnet and a contact block (sensor unit). Evaluation requires a safety relay or connection to a bus system.



Enabling range (example)

3SE6 806 safety relay

The 3SE6 806 safety relay has two floating enabling circuits (safe circuits) as NO contact circuits and one floating signaling circuit as a NC circuit. The number of enabling circuits can be increased by adding one or more 3TK28 30 expansion modules.

Up to six protective devices (sensors) can be connected to the safety relay. The device has six current-sourcing semiconductor outputs (Y1 ... Y6), which report the state of the connected protective devices.

Application

SIRIUS 3SE6 magnetically operated switches are designed for mounting on movable protective guards (covers, hinge switches, doors, etc.). Evaluation can be performed by means of a safety relay or through connection to a bus system.

The 3SE6 6 non-contact, magnetically operated safety switches stand out due to their enclosed design with degree of protection IP67. They are particularly suitable therefore for areas exposed to contamination, cleaning or disinfecting.

A magnetic monitoring system comprises one or more magnetically operated switches and an evaluation unit, e.g. a safety relay. When contact blocks 1 NO + 1 NC are used, the 3SE6 806 safety relay provides a high degree of protection against manipulation and can be installed in safety circuits up to Category 3 according to EN 954-1.

Combination of monitoring unit and magnetically operated switch

Monitoring units	Magnetically operated switch (contact block)			
	1 NC + 1 NO 3SE6 605 -1BA	3SE6 605 -2BA	3SE6 605 -3BA	2 NC 3SE6 604 -2BA
Relay outputs¹⁾				
SIRIUS 3SE6 806 safety relay	✓	✓	✓	--
Solid-state outputs²⁾				
3TK28 4. SIRIUS safety relay	--	--	--	✓
3TK28 5. SIRIUS safety relay with contactor relay	--	--	--	✓
3RA7 SIRIUS safe load feeder	--	--	--	✓
3RK1 ASIsafe module	--	--	--	✓
SIMATIC ET200 S, PROFIsafe 4/8 F-DI 24 V DC	✓	✓	✓	✓
SIMATIC ET 200M: SM 326, 24 DI, 24 V DC, SM 326, 8 DI, NAMUR; SIMATIC S7-31xF-2 DP: SM 326, 24 DI, 24 V DC	✓	✓	✓	✓

✓ Combination possible.

-- Combination not possible.

1) Up to Category 3 according to EN 954-1.

2) Up to Category 4 according to EN 954-1.

3SE6 Magnetically Operated Switches

Magnetic monitoring systems

Selection and ordering data

	Version	Size	Contacts	Order No.	Weight approx.
		mm			kg
Round sensor units					
	Switching magnets (coded)	M30		3SE6 704-1BA	0.035
	Contact blocks				
	• With 3 m cable	M30	1 NO + 1 NC	3SE6 605-1BA	0.165
	• With M12 plug, 4-pole	M30	1 NO + 1 NC	3SE6 605-1BA02	0.040
Rectangular sensor units					
	Switching magnets (coded)	25 × 88		3SE6 704-2BA	0.027
	Contact blocks				
	• With 3 m cable	25 × 88	1 NO + 1 NC 2 NC	3SE6 605-2BA 3SE6 604-2BA	0.165 0.165
	• With M8 plug, 4-pole	25 × 88	1 NO + 1 NC 2 NC	3SE6 605-2BA01 3SE6 604-2BA01	0.040 0.130
	Switching magnets (coded)	25 × 33		3SE6 704-3BA	0.014
	Contact blocks with 3 m cable	25 × 33	1 NO + 1 NC	3SE6 605-3BA	0.150
Accessories					
	Spacers	25 × 88		3SX3 260	0.015
	Spacers	25 × 33		3SX3 261	0.010
	Version	Number of sensors	Enabling/signaling circuits	Order No.	Weight approx.
					kg
Monitoring units					
	Safety relays with relay output, 6-fold	6	2 NO / 1 NC	3SE6 806-2CD00	0.200
	Rated control supply voltage 24 V DC				

For more monitoring units, see catalog LV 1, chapters 6 and 7, and catalog IK PI.

Commanding and Signaling Devices

Introduction

Overview



Pushbutton units and indicator lights				
Designs				
Nominal diameter	16 mm	22 mm	22 mm	22 mm
Version	Plastic, round	Plastic, round	Plastic, square	Metal, round
Actuators				
Pushbuttons and switches	✓ ¹⁾	✓	✓	✓
Illuminated pushbuttons and switches	✓ ¹⁾	✓	✓	✓
Mushroom pushbuttons	--	✓	--	✓
Push-pull buttons	--	✓	--	✓
EMERGENCY-STOP mushroom pushbuttons	✓	✓	✓	✓
Selector switches	✓	✓	✓	✓
Locks	✓	✓	✓	✓
Special actuators				
Joystick switches	--	✓	--	--
Twin pushbuttons	--	✓	--	--
Potentiometer operating mechanisms	--	✓	--	--
Indicators				
Indicator lights	✓	✓	✓	✓
Acoustic signaling devices	--	✓	--	--
Contact blocks				
Single-pole	✓	✓	✓	✓
Two-pole	✓	✓	✓	✓
Lampholders				
Wedge bases	✓	✓ (with solder connections)	✓ (with solder connections)	✓ (with solder connections)
BA 9s base	--	✓	✓	✓
With integrated LEDs	--	✓	✓	✓
Connections				
Plug-in connections	✓	--	--	--
Screw terminals	--	✓	✓	✓
Spring-loaded terminals	--	✓	✓	✓
Solder pins	✓	✓	✓	✓
AS-Interface	--	✓	✓	✓

AS-Interface solutions

Commanding and signaling devices of the SIRIUS 3SB3 series can be connected to the AS-Interface communication system quickly and easily with the help of various solutions.

For AS-Interface solutions, see catalog IK PI "Industrial Communication for Automation & Drives".

AS-Interface EMERGENCY STOP according to ISO 13850 (EN 418)

Using a special F adapter, EMERGENCY-STOP devices according to ISO 13850 (EN 418) can be directly connected through the standard AS-Interface with safety-oriented communication.

AS-Interface enclosures and front panel modules

For customized enclosures with connection to AS-Interface, see Catalog IK PI.

For front panel modules with one 4I/4O slave for connection of four 3SB3 control devices, see catalog IK PI.

✓ Standard

-- Not available

□ Optional

¹⁾ Only pushbuttons, no pushbutton switches.



3SB38



3SB38 6



3SE7, 3SF2



3SE29

	Enclosures	Two-hand operation consoles	Cable-operated switches	Foot switches
Enclosures				
Molded plastic	✓	✓	--	✓
Metal	✓	✓	✓	✓
Actuators				
Pushbuttons and switches	✓	✓	--	✓
Illuminated pushbuttons & switches	✓	✓	--	--
Mushroom pushbuttons	✓	✓	--	--
Push-pull buttons	✓	--	--	--
EMERGENCY-STOP mushroom pushbuttons	✓	✓	✓	--
Selector switches	✓	--	--	--
Locks	✓	--	--	--
Bowden wires	--	--	✓	--
Indicators				
Indicator Lights	✓	--	✓	--
Acoustic signaling devices	✓	--	--	--
Contact blocks				
Single-pole	✓	✓	--	--
Two-pole	--	✓	✓	✓
Three-pole	--	--	--	✓
Four-pole	--	--	✓	✓
Terminals				
Screw terminals	✓	✓	✓	✓
Spring-loaded terminals	✓	□	--	--
Molded cables	--	--	--	✓
Plug-in connection	--	□	□	□
AS-Interface	✓	□	--	--



8WD42, 8WD44



8WD53

	Signaling columns	Integrated signal lamps
Enclosures		
Molded plastic	✓	✓
Metal	--	--
Lightings		
Incandescent lamps	✓	✓
LEDs	✓	✓
Flashlights	✓	✓
Terminals		
Screw terminals	✓	✓
Spring-loaded terminals	✓	--
AS-Interface	✓	--

3SB2 Pushbutton Units and Indicator Lights, 16 mm

General data

Overview

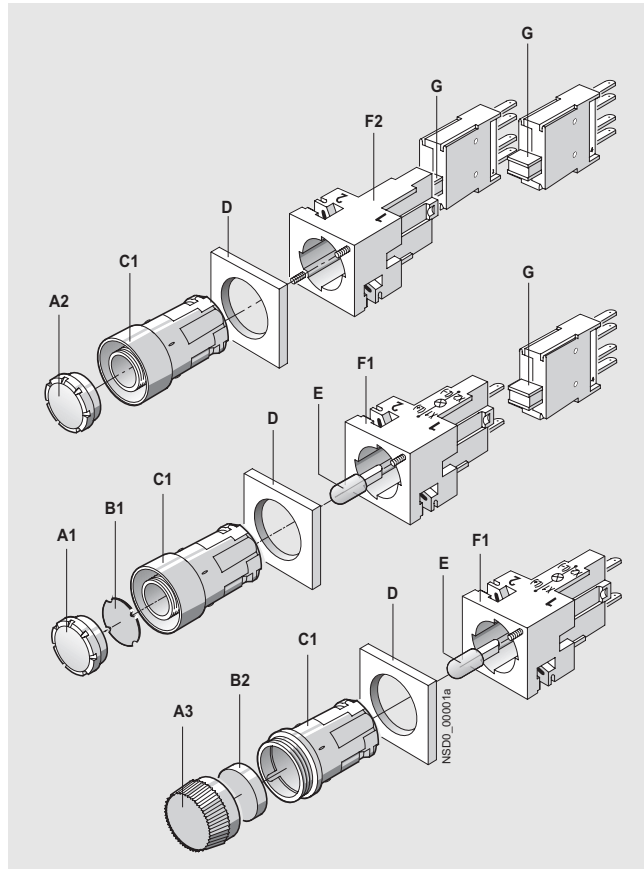
The 3SB2 pushbutton units and indicator lights are provided for front plate mounting and rear connection with flat connectors. For use on printed circuit boards, contact blocks and lampholders with solder pins are also available.

Standards

IEC 60947-5-1, EN 60947-5-5 (VDE 0660 Part 200),

IEC 60947-5-5, EN 60947-5-5 (VDE 0660 Part 210) for EMERGENCY-STOP mushroom pushbuttons.

Version



- A1 Illuminated pushbutton, flat
- A2 Pushbutton, flat
- A3 Screw lens for indicator light
- B1 Insert label for inscription
- B2 Insert cap for inscription
- C1 Collar with extruded front ring
- C2 Collar for indicator light
- D Frame for rectangular design
- E Wedge base lamp W2 x 4.6 d
- F1 Lampholder with holder
- F2 Holder
- G Contact blocks (1 NO or 1 NC) for snapping onto holder or lampholder

Application

The devices are climate-proof and suitable for marine applications.

Safety EMERGENCY-STOP pushbuttons according to ISO 13850/EN 418

For controls that comply with IEC 60204-1 or EN 60204-1 (VDE 0113 Part 1), the mushroom pushbuttons of the 3SB2 series are suitable for use as safety EMERGENCY-STOP pushbuttons.

Safety circuits

The standards IEC 60947-5-1 and EN 60947-5-1 require positive opening. Hence for the purposes of personal safety, the assured opening of NC contacts is expressly stipulated for the electrical equipment of machines in all safety circuits and marked according to IEC 60947-5-1 with the symbol .

Category 4 according to EN 954-1 can be attained with the EMERGENCY-STOP mushroom pushbuttons if the corresponding failsafe evaluation units are selected and correctly installed, e.g. the 3TK28 safety relays or matching units from the ASIsafe, SIMATIC or SINUMERIK product ranges.

3SB2 Pushbutton Units and Indicator Lights, 16 mm

Complete units
Selection and ordering data


EMERGENCY-STOP
mushroom pushbutton

Version	Color of actuator	Contact blocks	Flat connectors	Weight approx.
			Order No.	kg
EMERGENCY-STOP mushroom pushbuttons according to ISO 13850 or EN 418, latching Latches automatically when pressed; unlatches by turning the mushroom head anticlockwise, with yellow name plate, with inscription "EMERGENCY STOP"			3SB22 03-1AC01	0.032

Red 1 NC → ¹⁾

³⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SB2 Pushbutton Units and Indicator Lights, 16 mm

Actuators and indicators

Selection and ordering data



EMERGENCY-STOP
mushroom pushbutton

¹⁾ The mushroom pushbutton cannot be combined with 3SB29 02-0AB name plate or 3SB29 02-0AA single frame.

Version	Color of actuator	Order No.	Weight approx.
			kg
EMERGENCY-STOP mushroom pushbuttons acc. to ISO 13850 or EN 418, latching¹⁾	Red	3SB20 00-1AC01	0.015
Latches automatically when pressed; unlatches by turning the mushroom head anticlockwise			

3SB2 Pushbutton Units and Indicator Lights, 16 mm

Contact blocks and lampholders

Selection and ordering data

Version	Symbols	Operating travel	Order No.	Weight approx.
		☐ Contact closed ☐ Contact open		kg

Contact blocks and lampholders with flat connectors $2 \times 2.8 - 0.8$ mm according to IEC 60760

Holders for fixing the actuator and the contact blocks



Holder

Holders for 2 contact blocks
Inscription with identification number 1-2

3SB29 08-0AA

0.008

LAMPOLDERS WITH HOLDER FOR FIXING THE ACTUATOR AND THE CONTACT BLOCKS

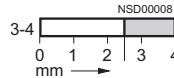
Contact blocks for fixing in the holder or lampholder



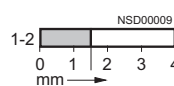
Contact block

Contact blocks with one contact²⁾

1 NO


3SB24 04-0B

0.004

1 NC ³⁾
3SB24 04-0C

0.004

¹⁾ For plug-in and insulating sleeves, see Accessories.

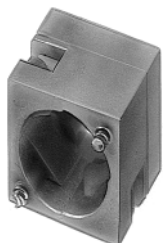
²⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SB2 Pushbutton Units and Indicator Lights, 16 mm

Contact blocks and lampholders

Version	Symbols	Operating travel	DT	Order No.	Weight approx.
		☐ Contact closed ☐ Contact open			kg

Contact blocks and lampholders with solder pins



Holder

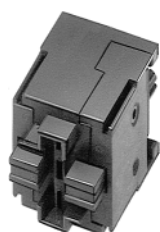
Holders for contact blocks with solder pins
for fixing the actuators in the front panel

Lampholders
Wedge base
W2 x 4.6 d



B **3SB29 08-0AB** 0.006

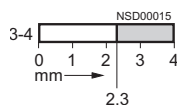
B **3SB24 55-2A** 0.008



Contact block with solder pin

Contact blocks

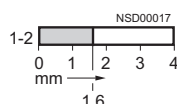
1 NO



B **3SB24 55-0B** 0.008

1 NC

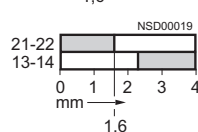
→ ¹⁾



B **3SB24 55-0C** 0.008

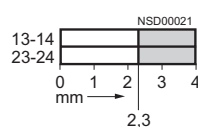
1 NO + 1 NC

→ ¹⁾



B **3SB24 55-0J** 0.010

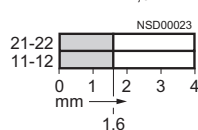
1 NO + 1 NO



B **3SB24 55-0E** 0.009

1 NC + 1 NC

→ ¹⁾



B **3SB24 55-0F** 0.009

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SB2 Pushbutton Units and Indicator Lights, 16 mm

Accessories and spare parts

Mounting parts and accessories

Version		Order No.	Weight approx. kg
Various accessories			
	Name plates, yellow, Ø 50 mm as backing plate for EMERGENCY STOP, self-adhesive		
	• Blank • With German inscription "NOT-AUS"	3SB29 08-2AF 3SB29 08-2AG	0.001 0.001
Flat connectors			
	Plug-in sleeves for flat connectors 2.8 × 0.8 mm, cross-section 0.5 ... 1.5 mm ²	3SB29 08-8AA	0.290
	Insulation sleeves for flat connectors, connection from the front	3SB29 08-8AB	0.100
	Complete connectors ¹⁾ for connecting contact blocks and lampholders (up to 10 connections). Guaranteed finger-safe according to IEC 61140 and VBG 4	3SB29 08-8AD	0.005
	Plug-in sleeves for flat connectors 2.8 × 0.8 mm, with locating spring for latching in complete connector	3SB29 08-8AE	0.100

¹⁾ Required 3SB29 08-8AE plug-in sleeves for flat connectors 2.8 × 0.8 mm must be ordered separately.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

General data

Overview



The 3SB3 series is a range of plastic and metal commanding devices for front panel mounting and rear conductor connection.

3SB3 is of modern industrial design with a very flat construction and can be mounted rapidly by a single person. A metal version with a high degree of protection according to IP67 and NEMA 4 is available in addition for the world market.

Standards

IEC 60947-1, EN 60947-1 (VDE 0660 Part 100).

IEC 60947-5-1, EN 60947-5-1 (VDE 0660 Part 200),

IEC 60947-5-5, EN 60947-5-5 (VDE 0660 Part 210) for EMERGENCY-STOP mushroom pushbuttons.

Design

The 3SB3 series is available:

- Made of molded plastic in flat, round and square design
- Made of metal in round design

The operating surfaces of the pushbuttons and illuminated pushbuttons are concave. The lenses of the indicator lights are convex. The flat design makes cleaning easy.

Application

The devices are climate-proof (KTW 24) and suitable for standard industrial applications. For operation in oily atmospheres (organic oils/lubricants) we recommend actuators of polyamide type (-0PA0 variants).

AS-Interface solutions

The 3SB3 commanding and signaling devices can be connected to the AS-Interface communication system quickly and safely with the help of various solutions.

The following solutions are available:

- ASIsafe EMERGENCY-STOP pushbuttons
- AS-Interface enclosures (with 1 to 6 command positions)
- AS-Interface front panel modules (for 4 command positions)

Safety EMERGENCY-STOP pushbuttons according to ISO 13850/EN 418

For controls that comply with IEC 60204-1 or EN 60204-1 (VDE 0113 Part 1), the mushroom pushbuttons of the 3SB3 series are suitable for use as safety EMERGENCY-STOP pushbuttons.

Safety circuits

The standards IEC 60947-5-1 and EN 60947-5-1 require positive opening. Hence for the purposes of personal safety, the assured opening of NC contacts is expressly stipulated for the electrical equipment of machines in all safety circuits and marked according to IEC 60947-5-1 with the symbol ➔.

Category 4 according to EN 954-1 can be attained with the EMERGENCY-STOP mushroom pushbuttons if the corresponding failsafe evaluation units are selected and correctly installed, e.g. the 3TK28 safety relays or matching units from the ASIsafe, SIMATIC or SINUMERIK product ranges.

A complete representation of pushbuttons and indicator lights is provided in Catalog LV 1.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Actuators and indicators, plastic, round

General data

Version	Color of actuator	Contacts for front plate mounting	Screw terminals	Weight approx.

EMERGENCY-STOP control devices according to ISO 13850/EN 418,
with yellow name plate, Ø 80 mm, labeled.
Can also be used with 3TK28 safety relays



EMERGENCY-STOP
mushroom pushbutton

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching function

German inscription "NOT-AUS"

Rotate-to-unlatch mechanism

Red 1 NC



3SB32 03-1HA20

0.072

1 NO + 1 NC



3SB32 01-1HA20

0.078

Pull-to-unlatch mechanism



1 NC



3SB32 03-1TA20

0.050

1 NO + 1 NC



3SB32 01-1TA20

0.050

English inscription "EMERGENCY STOP"

Rotate-to-unlatch mechanism

Red 1 NC



3SB32 03-1HR20

0.071

1 NO + 1 NC



3SB32 01-1HR20

0.050

With pull-to-unlatch mechanism



1 NC



3SB32 03-1TR20

0.050

1 NO + 1 NC



3SB32 01-1TR20

0.050

Version	Color of handle	Contacts for front plate mounting	Spring-loaded terminals	Weight approx.
			Order No.	kg

EMERGENCY-STOP control devices according to ISO 13850/EN 418,
with yellow name plate, Ø 80 mm, labeled.
Can also be used with 3TK28 safety relays



EMERGENCY-STOP
mushroom pushbutton

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching function

German inscription "NOT-AUS"

Rotate-to-unlatch mechanism

Red 1 NC



3SB32 03-1HA20-0CC0

0.072

1 NO + 1 NC



3SB32 01-1HA20-0CC0

0.078

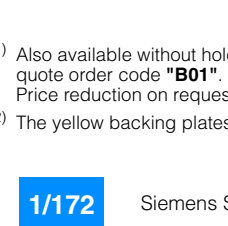


1) Positive opening according to IEC 60947-5-1, Appendix K.
2)

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Actuators and indicators, plastic, round

General data

Version		Color of actuator	Approval	Order No.	Weight approx. kg
EMERGENCY-STOP control devices according to ISO 13850/EN 418 and IEC 60947-5-5 with holder¹⁾²⁾ Can also be used with 3TK28 safety relays					
	EMERGENCY-STOP mushroom pushbuttons, Ø 32 mm, with positive latching according to EN 418, with rotate-to-unlatch mechanism	Red		3SB30 00-1FA20	0.048
Mushroom diameter 32 mm					
	EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching according to EN 418, with rotate-to-unlatch mechanism	Red		3SB30 00-1HA20	0.055
Mushroom diameter 40 mm, with rotate-to-unlatch mechanism					
	EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching according to EN 418, with pull-to-unlatch mechanism	Red		3SB30 00-1TA20	0.058
Mushroom diameter 40 mm, pull-to-unlatch mechanism					
	EMERGENCY-STOP mushroom pushbuttons, Ø 60 mm, with positive latching acc. to EN 418, with rotate-to-unlatch mechanism	Red		3SB30 00-1AA20	0.081
Mushroom diameter 40 mm, pull-to-unlatch mechanism					
	EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with RONIS key-operated switch, lock No. SB 30, with positive latching acc. to EN 418, unlocking only possible using key	Red		3SB30 00-1BA20	0.086
Mushroom diameter 60 mm					
	EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with CES key-operated switch, lock No. SSG 10, with positive latching acc. to EN 418, unlocking only possible using key	Red		3SB30 00-1KA20	0.114
Mushroom diameter 40 mm, with key-operated switch					
	EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with BKS key-operated switch, lock No. S1, with positive latching acc. to EN 418, unlocking only possible using key	Red		3SB30 00-1LA20	0.112
Mushroom diameter 40 mm, with key-operated switch					
	EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with O.M.R. key-operated switch, lock No. 73037, with positive latching according to EN 418, unlocking only possible using key	Red		3SB30 00-1MA20	0.120
Mushroom diameter 40 mm, with key-operated switch					

¹⁾ Also available without holder. Supplement Order No. with "-Z" and quote order code "B01".
Price reduction on request.

²⁾ The yellow backing plates must be ordered separately, see Accessories.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Actuators and indicators, plastic, round

Complete units

Version	Color of actuator	Contacts for front plate mounting	Screw terminals	Weight approx.
			Order No.	kg

EMERGENCY-STOP control devices acc. to ISO 13850/EN 418, with yellow name plate, Ø 80 mm, labeled¹⁾. Can also be used with 3TK28 safety relays



EMERGENCY-STOP mushroom pushbutton

¹⁾ German inscription "NOT-AUS"

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching function, with rotate-to-unlatch mechanism

Red

1 NC
1 NO + 1 NC



3SB33 03-1HA20

3SB33 01-1HA20

0.072

0.080

²⁾ Positive opening according to IEC 60947-5-1, Appendix K.

Version	Color of actuator	Approval	Order No.	Weight approx.
				kg

EMERGENCY-STOP control devices according to ISO 13850/EN 418 and IEC 60947-5-5 with holder¹⁾²⁾. Can also be used with 3TK28 safety relays



EMERGENCY-STOP mushroom pushbutton

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching according to EN 418, rotate-to-unlatch mechanism

Red



3SB31 10-1HA20

0.056

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with RONIS key-operated switch (with 2 keys), lock No. SB 30, with positive latching according to EN 418, unlocking only possible using key

Red



3SB31 10-1BA20

0.114



EMERGENCY-STOP mushroom pushbutton with key-operated switch

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with CWS key-operated switch (with 2 keys), lock No. SSG 10, with positive latching according to EN 418, unlocking only possible using key

Red



3SB31 10-1KA20

0.118

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with BKS key-operated switch (with 2 keys), lock No. S1, with positive latching according to EN 418, unlocking only possible using key

Red



3SB31 10-1LA20

0.118

EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with O.M.R. key-operated switch (with 2 keys), lock No. 73037 with positive latching according to EN 418, unlocking using key

Red



3SB31 10-1MA20

0.125

¹⁾ Also available without holder. Supplement Order No. with "-Z" and quote order code "B01". Price reduction on request.

²⁾ The yellow backing plates must be ordered separately, see Accessories.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Actuators and indicators, plastic, round

Complete units

Version	Color of actuator	Contacts for front plate mounting	Screw terminals	Weight approx.
			Order No.	kg

EMERGENCY-STOP control devices according to ISO 13850/EN 418, with yellow name plate, Ø 80 mm, labeled. Can also be used with 3TK28 safety relays



EMERGENCY-STOP mushroom pushbutton
Rotate-to-unlatch mechanism

Mushroom pushbuttons, Ø 40 mm with positive latching

German inscription "NOT-AUS"

Rotate-to-unlatch mechanism	Red	1 NC	→ ¹⁾	3SB36 03-1HA20	0.131
		1 NO + 1 NC	→ ¹⁾	3SB36 01-1HA20	0.137
With pull-to-unlatch mechanism	Red	1 NC	→ ¹⁾	3SB36 03-1TA20	0.131
		1 NO + 1 NC	→ ¹⁾	3SB36 01-1TA20	0.137

English inscription "EMERGENCY STOP"

Rotate-to-unlatch mechanism	Red	1 NC	→ ¹⁾	3SB36 03-1HR20	0.130
		1 NO + 1 NC	→ ¹⁾	3SB36 01-1HR20	0.140
With pull-to-unlatch mechanism	Red	1 NC	→ ¹⁾	3SB36 03-1TR20	0.140
		1 NO + 1 NC	→ ¹⁾	3SB36 01-1TR20	0.140

Version	Color of actuator	Contacts for front plate mounting	Spring-loaded terminals	Weight approx.
			Order No.	kg

EMERGENCY-STOP control devices according to ISO 13850/EN 418, with yellow name plate, Ø 80 mm, labeled. Can also be used with 3TK28 safety relays



EMERGENCY-STOP mushroom pushbutton
Pull-to-unlatch mechanism

Mushroom pushbuttons, Ø 40mm with positive latching

German inscription "NOT-AUS"

Rotate-to-unlatch mechanism	Red	1 NC	→ ¹⁾	3SB36 03-1HA20-0CC0	0.131
		1 NO + 1 NC	→ ¹⁾	3SB36 01-1HA20-0CC0	0.137
With pull-to-unlatch mechanism	Red	1 NC	→ ¹⁾	3SB36 03-1TA20-0CC0	0.131
		1 NO + 1 NC	→ ¹⁾	3SB36 01-1TA20-0CC0	0.137
		1 NC + 1 NC	→ ¹⁾	3SB36 11-1TA20-0CC0	0.131

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

²⁾

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Actuators and indicators, plastic, round

Actuators and Indicators

Version	Color of actuator	Order No.	Weight approx. kg
EMERGENCY-STOP control devices according to ISO 13850/EN 418 and IEC 60947-5-5 with holder¹⁾²⁾ Can also be used with 3TK28 safety relays			
	Red	3SB35 00-1FA20	0.107
Mushroom diameter 32 mm			
	Red	3SB35 00-1HA20	0.114
Mushroom diameter 40 mm, with rotate-to-unlatch mechanism			
	Red	3SB35 00-1TA20	0.113
	Red	3SB35 00-1AA20	0.139
Mushroom diameter 60 mm			
	Red	3SB35 00-1BA20	0.145
Mushroom diameter 40 mm, pull-to-unlatch mechanism			
	Red	3SB35 00-1KA20	0.173
	Red	3SB35 00-1UA20	0.173
Mushroom diameter 60 mm			
	Red	3SB35 00-1LA20	0.171
	Red	3SB35 00-1MA20	0.179
Mushroom diameter 40 mm, with key-operated switch			

1) Also available without holder. Supplement Order No. with "-Z" and quote order code "B01".
Price reduction on request.

2) The yellow backing plates must be ordered separately, see Accessories.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Components for Actuators and Indicators

Contact blocks and lampholders

Selection and ordering data

Version	Symbols	Color/ operating travel	Screw terminals	Weight approx.
		☐ Contact closed ☐ Contact open	Order No.	kg
Contact blocks for front plate mounting				
	Contact blocks with one contact Mounting depth 50 mm			
	1 NO		NSD00006	
	1 NO with gold-plated contacts		NSD00015	3SB34 00-0B 3SB34 00-0BA
	1 NC		NSD00017	3SB34 00-0C 3SB34 00-0CA
	Contact blocks with 2 contacts Mounting depth 65 mm (including unit labeling plate)			
	1 NO + 1 NC		NSD00038	3SB34 00-0A 3SB34 00-0AA
	1 NO + 1 NC with gold-plated contacts		NSD00039	
	1 NO leading + 1 NC delayed		NSD00037b	3SB34 00-0H 3SB34 00-0HA
	1 NO leading + 1 NC delayed with gold-plated contacts		NSD00039	
	2 NO		NSD00040	3SB34 00-0D 3SB34 00-0DA
	2 NO with gold-plated contacts		NSD00040	
	2 NC		NSD00036	3SB34 00-0E 3SB34 00-0EA
	2 NC with gold-plated contacts		NSD00036	

¹⁾ Positive opening to IEC 60947-5-1, Appendix K.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Components for Actuators and Indicators

Contact blocks and lampholders

Selection and ordering data

2)

Version	Rated voltage of lamp/ Symbols	Color/ operating travel	Spring-loaded terminals	Weight approx.
	V	 Contact closed  Contact open	Order No.	kg

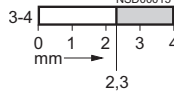
Contact blocks for front plate mounting



Contact blocks with one contact

Mounting depth 50 mm, grid 30 mm x 30 mm

1 NO

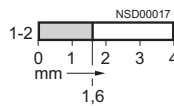
1 NO with
gold-plated
contacts**3SB34 03-0B**

0.008

3SB34 03-0BA

0.008

1 NC

1 NC with
gold-plated
contacts**3SB34 03-0C**

0.008

3SB34 03-0CA

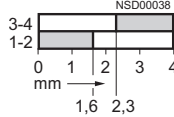
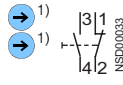
0.008



Contact blocks with 2 contacts

Mounting depth 65 mm

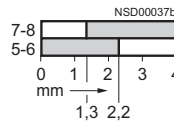
1 NO + 1 NC

1 NO + 1 NC
with gold-
plated
contacts**3SB34 03-0A**

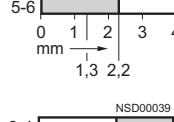
0.018

3SB34 03-0AA

0.018

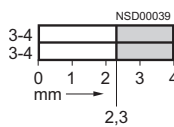
1 NO leading +
1 NC delayed**3SB34 03-0H**

0.018

1 NO leading +
1 NC delayed
with gold-
plated
contacts**3SB34 03-0HA**

0.018

2 NO

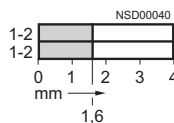
2 NO with
gold-plated
contacts**3SB34 03-0D**

0.017

3SB34 03-0DA

0.017

2 NC

2 NC with
gold-plated
contacts**3SB34 03-0E**

0.018

3SB34 03-0EA

0.018

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Components for Actuators and Indicators

Contact blocks and lampholders

Version	Symbols	Operating travel	Solder pin connections	Weight approx.
		☐ Contact closed ☐ Contact open		
			Order No.	kg

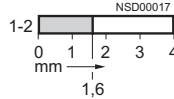
Contact blocks for use on printed circuit boards



Contact blocks with one contact

Mounting depth 44 mm

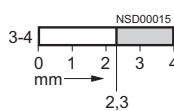
1 NO



3SB34 11-0B

0.003

1 NC



3SB34 11-0C

0.003

Version	Order No.	Weight approx.
		kg

Holders for 3 contact blocks, for front panel mounting



Holders for pushbuttons and switches²⁾
for snapping on 3 blocks

3SB39 01-0AB

0.100

Accessories for printed circuit boards



Holders for printed circuit boards
for mounting the command devices
on the printed circuit board
(screw supplied)

3SB39 01-0AA

0.200

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

²⁾ Holder also for mushroom pushbutton and push-pull button.

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Components for Actuators and Indicators

AS-Interface F adapters for EMERGENCY-STOP control devices

Overview



The AS-Interface F adapter is used to connect an EMERGENCY-STOP control device according to ISO 13850 or EN 418 from the 3SB3 series to the AS-Interface bus system.

The F adapter has a safe AS-Interface slave and is snapped from behind onto the EMERGENCY-STOP control device (only actuator).

Depending on the version used, connection is made using screw terminals or spring-loaded terminals. In the expanded version, an output is also available for actuating an indicator light with LED.

Addressing is performed using the AS-Interface connections or the integrated addressing socket.

Safety category 4 (SIL 3) is achieved with the adapter.

Selection and ordering data



3SF5 402-1AA03

Version	Screw terminals	Weight approx.
AS-Interface F adapters for SIRIUS 3SB3 EMERGENCY-STOP control devices for mounting on front plate • 2I • 2I/1O, output for LED control	Order No.	kg
	3SF5 402-1AA03 3SF5 402-1AB03	0.066 0.066
Version	Spring-loaded terminals	Weight approx.
AS-Interface F adapters for SIRIUS 3SB3 EMERGENCY-STOP control devices for mounting on front plate • 2I • 2I/1O, output for LED control	Order No.	kg
	3SF5 402-1AA04 3SF5 402-1AB04	0.066 0.066

3SB3 Pushbutton Units and Indicator Lights, 22 mm

Accessories and Spare Parts

Protective covers

Selection and ordering data

Version	Use	Color	Order No.	Weight approx. kg	
Protective caps, silicone, degree of protection IP67					
	Protective caps, clear for round version ¹⁾	Mushroom push-pull switches, Ø 40 mm	Transparent	3SB19 02-2BH	0.006
		EMERGENCY-STOP mushroom push- buttons, Ø 40 mm	Transparent	3SB39 21-0BU	0.013

¹⁾ Not to be used with label holder.

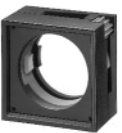
Selection and ordering data

	Version	Use	Color	Order No.	Weight approx. kg
	Protective collars				
	Protective collars for EMERGENCY STOP¹⁾ for round version for front plate mounting	E-STOP mushroom pushbuttons with- out key-operated switch	Yellow	3SB39 21-0AK	0.044
		E-STOP mushroom pushbuttons with key-operated switch	Yellow	3SB39 21-0AX	0.053
	Protective collars for EMERGENCY STOP for 5 padlocks¹⁾ for round version for front plate mounting	3SB3...1AA20 E-STOP mushroom pushbuttons	Yellow	3SB39 21-0CG	0.044

¹⁾ The protective collar must only be used to protect against inadvertent actuating and must be fitted to allow unimpeded access to the EMERGENCY-STOP mushroom pushbutton.

Version	Use	Inscription	Order No.	Weight approx. kg
Yellow name plates, as backing plate for EMERGENCY STOP				
	Name plates, round, self-adhesive, external dia. 80 mm, drilled hole 23 mm	Blank	3SB39 21-0AB	0.002
		4 languages: G, En, It, Sp	3SB39 21-0BW	0.001
		NOT-AUS	3SB39 21-0AC	0.001
		NOT-HALT	3SB39 41-0AK	0.001
		EMERGENCY STOP	3SB39 21-0AD	0.001
		ARRET D'URGENCE	3SB39 21-0AG	0.002
		EMERGENZA	3SB39 21-0AN	0.002
	Yellow name plate, illuminated provides signal for emergency stop	Blank	3SB39 21-0DA	
		EMERGENCY STOP	3SB39 21-0DD	
		NOT-HALT	3SB39 21-0DK	
	Name plates, round, self-adhesive, external dia. 80 mm, cut-out 26 mm x 26 mm	Blank	3SB39 41-0AB	0.001
		NOT-AUS	3SB39 41-0AC	0.001
		EMERGENCY STOP	3SB39 41-0AD	0.002
	Name plates, round, 1 mm thick, external dia. 75 mm, drilled hole 22.5 mm	Blank	3SB19 02-2BA	0.006
		NOT-AUS	3SB19 02-2BB	0.006

Miscellaneous accessories

Version	Use	Order No.	Weight approx. kg
Holders and pressure plates			
	Holders for pushbuttons and switches for snapping on 3 blocks	Pushbuttons, push-pull buttons, mushroom push-buttons with front plate mounting	3SB39 01-0AB 0.100
Holders			
	Holders for plastic version, round		3SB39 31-0AA 0.014
	Holders for plastic version, square		3SB39 51-0AA 0.013
	Holders for metal version, round		3SB39 31-0AC 0.044
	Grounding screws for grounding metal actuators for fitting in front plates made of non-conducting materials		3SB39 21-0BD 0.200

3SB3 Pushbutton Units and Indicator Lights, 22 mm Enclosures

General data

Overview



Enclosed pushbutton units and indicator lights are used as hand operated control devices for separately allocated control units and cabinets. The devices are suitable for use in any climate.

Enclosures with handle are available for suspension (e.g. for crane control units).

The enclosed pushbutton units and indicator lights are available with conventional controls as well as for connection to the AS-Interface bus system.

The following versions are available:

- Enclosure with standard fittings with 1 to 3 command positions
- Enclosure with customized equipment with 1 to 6 command positions
- Empty enclosures (individual parts must be ordered separately)

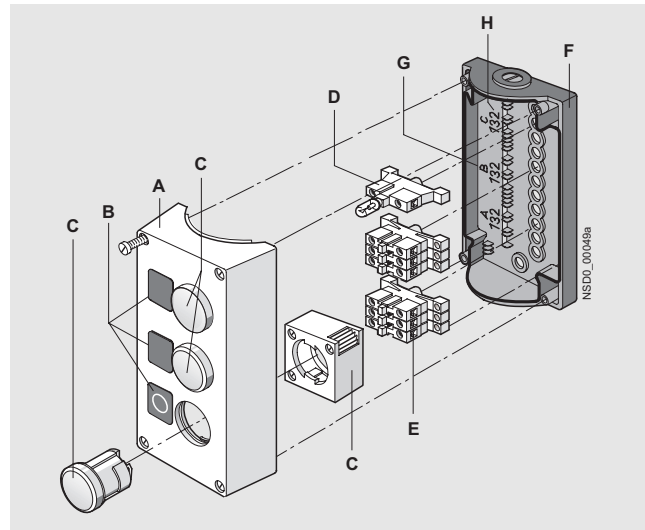
Customer-specific enclosures

Enclosures with more than 6 command positions can also be supplied with AS-Interface connection.

For fully equipped AS-Interface enclosures, see catalog IK PI.

Standards

IEC 60947-5-1 (VDE 0660 Part 200).



- A Top part of enclosure
- B Labeling plates
- C Actuator with holder
- D Function digit
- E Contact blocks, lampholders for floor mounting
- F Bottom part of enclosure
- G Identification letters for the command positions
- H Identification number

3SB3 Pushbutton Units and Indicator Lights, 22 mm Enclosures

Enclosures with standard fittings, empty enclosures

Overview

Enclosures with standard fittings are available with:

- 1 to 3 command positions
- Operational voltage up to 400 V
- Vertical mounting type

The actuator/indicator is fixed with an enclosure nut. If required it can be disassembled with a 27 mm socket wrench or with a 3SX17 07 ring nut wrench.

Contact blocks for floor mounting are snapped into the base of the enclosure.

Molded-plastic enclosures are equipped with actuators and indicators made of plastic, metal enclosures are equipped with actuators and indicators made of metal.

Colors of enclosure cover:

- Gray, RAL 7035, or
- Yellow, RAL 1004

Color of the base of the enclosure:

- Black, RAL 9005

Selection and ordering data

Equipment	Contact block function	Number of command positions	Order No.	Weight approx. kg

Molded-plastic enclosures with standard fittings

Cable entry top and bottom each 1 x M20

A = Pushbutton green, label "I"	1 NO	1	3SB38 01-0DA3	0.210
A = Pushbutton red, label "O"	1 NC	1	3SB38 01-0DB3	0.209
A = Pushbutton white, label "I"	1 NO	1	3SB38 01-0DD3	0.205
A = Pushbutton black, label "O"	1 NC	1	3SB38 01-0DE3	0.205
A = EMERGENCY-STOP mushroom pushbuttons, Ø 40 mm, with positive latching according to EN 418				
• With yellow top part, without protective collar • With yellow top part, with protective collar¹⁾	1 NC	→ ²⁾ 1	3SB38 01-0DG3	0.242
	2 NC	→ ²⁾ 1	3SB38 01-0EG3	0.250
	1 NC	→ ²⁾ 1	3SB38 01-0DF3	0.270
	2 NC	→ ²⁾ 1	3SB38 01-0EF3	0.270



¹⁾ The protective collar must only be used to protect against inadvertent actuating and must be fitted to allow unimpeded access to the EMERGENCY-STOP mushroom pushbutton.

²⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SB3 Pushbutton Units and Indicator Lights, 22 mm Enclosures

Enclosures with standard fittings, empty enclosures

Equipment	Contact block function	Number of command positions	Order No.	Weight per PU approx. kg
Metal enclosures with standard fittings				
	A = EMERGENCY-STOP mushroom pushbutton, Ø 40 mm, with positive latching acc. to EN 418			
	• With yellow top part, without protective collar	1 NC → ²⁾ 1	3SB38 01-2DG3	0.591
		2 NC → ²⁾ 1	3SB38 01-2EG3	0.590
	• With yellow top part, with protective collar ¹⁾	1 NC → ²⁾ 1	3SB38 01-2DF3	0.684
		2 NC → ²⁾ 1	3SB38 01-2EF3	0.680
	A = EMERGENCY-STOP mushroom pushbutton, Ø 60 mm, with positive latching acc. to EN 418			
	• With yellow top part, with protective collar for 5 padlocks	2 NC 1	3SB38 01-2EA30-0CC0	0.591
	A = mushroom pushbutton, Ø 60 mm, black, with positive latching			
	• With gray top part, with protective collar for 5 padlocks	2 NC 1	3SB38 01-2EB30-0CC0	0.591

¹⁾ The protective collar must only be used to protect against inadvertent actuating and must be fitted to allow unimpeded access to the EMERGENCY-STOP mushroom pushbutton.

²⁾ Positive opening according to IEC 60947-5-1, Appendix K.

Version	Number of command positions	Order No.	Weight approx. kg

Empty enclosures, molded plastic

Cable entry top and bottom, each 1 x M20 for 1 to 3 command positions, each 1 x M25 for 4 and 6 command positions

	For EMERGENCY STOP, for contact blocks, lampholders and accessories with snap-on floor mounting, also single-pole front plate blocks can be used (switching state is maintained upon opening)			
	• With yellow top part, without protective collar	1	3SB38 01-0AB3	0.185
	• With yellow top part, with protective collar ¹⁾	1	3SB38 01-0AD3	0.213

Empty enclosures, metal

Cable entry top and bottom, each 1 x M20 for 1 to 3 command positions, each 1 x M25 for 4 and 6 command positions

Picture see above  	Description see above			
	• With yellow top part, without protective collar	1	3SB38 01-2AB3	0.447
	• With yellow top part, with protective collar ¹⁾	1	3SB38 01-2AD3	0.551
	• With yellow top part, with protective collar for 3 padlocks, for mushroom Ø 40 mm, can be locked (BKS, CES, O.M.R.)	1	3SB38 01-2EC3	0.551

¹⁾ The protective collar must only be used to protect against inadvertent actuating and must be fitted to allow unimpeded access to the EMERGENCY-STOP mushroom pushbutton.

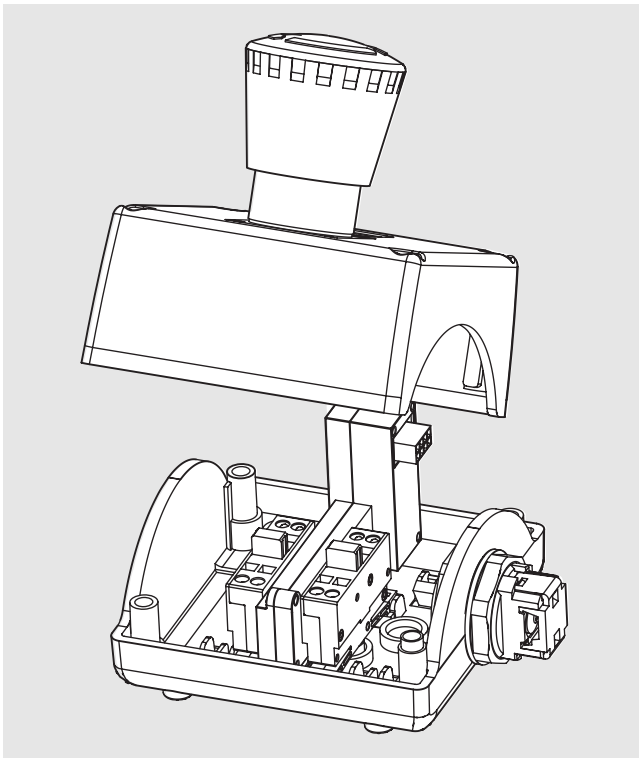
3SB3 Pushbutton Units and Indicator Lights, 22 mm AS-Interface Enclosures

General data

Overview



Distributed command devices of the 3SB3 series can be quickly connected to the AS-Interface using AS-Interface enclosures. Using suitable components you can make your own enclosures with integrated AS-Interface or flexibly modify existing enclosures.



Enclosure

Color of enclosure cover:

- Gray, RAL 7035, or
- Yellow, RAL 1004, for EMERGENCY STOP.

Color of enclosure base:

- Black, RAL 9005

For customized enclosures and for front panel modules with one 4I/4O slave for connection of four 3SB3 commanding and signaling devices, see catalog IK PI.

Installation of AS-Interface slaves

The following slave types are available for connecting the command positions:

- Slave in A/B technology with 4 inputs and 3 outputs
- Slave with 4 inputs and 4 outputs
- F slave with 2 safe inputs for EMERGENCY STOP

The following table shows the maximum number of equipable slaves:

Enclosure for	Number of slaves for enclosures without EMERGENCY STOP	Number of slaves for enclosures with EMERGENCY STOP
1 command position	not available	1x F slave
2 command positions	1 x slave 4I/4O or 4I/3O	not available
3 command positions	1 x slave 4I/4O or 4I/3O	1 x slave 4I/4O or 4I/3O + 1 x F slave
4 command positions	2 x slave 4I/4O or 4I/3O ¹⁾	2 x slave 4I/4O or 4I/3O + 1 x F slave ¹⁾
6 command positions	2 x slave 4I/4O or 4I/3O	2 x slave 4I/4O or 4I/3O + 1 x F slave

¹⁾ For metal enclosures with 4 command positions, only 1 x slave 4I/4O or 4I/3O is possible.

Connection

One set of links is required in each case to connect a slave to contact blocks, to lampholders and to the connection element.

The connection elements are mounted in the front-end cable glands and are used for connection of the AS-Interface or for bringing unused inputs or outputs out of the enclosure.

For connection to the AS-Interface bus there is a choice of the following options:

- Terminal for shaped AS-Interface cable. The cable is contacted by the insulation piercing method and routed past the enclosure on the outside (possible only with plastic enclosure).
- Cable gland for the shaped AS-Interface cable or round cable. The cable is routed into the enclosure (preferable for metal enclosure).
- Connection using M12 plug

If less than all inputs/outputs of the installed slaves in an enclosure are used for connecting the command devices, free inputs and outputs can be routed on request to the outside through an M12 socket on the top or bottom side of the enclosure.

To supply inputs with power, the S+ connection of the must be assigned to the socket, for outputs the OUT- connection must be assigned.

Addressing is performed using the AS-Interface connections or the integrated addressing socket. An external power supply is not required.

3SB3 Pushbutton Units and Indicator Lights, 22 mm AS-Interface Enclosures

AS-Interface enclosures with standard fittings

Overview

Enclosures with standard fittings are available with:

- 1 to 3 command positions
- Operational voltage through AS-Interface (approx. 30 V),
- Vertical mounting type
- Molded-plastic enclosures are equipped with actuators and indicators made of plastic, metal enclosures are equipped with actuators and indicators made of metal.

The actuator/indicator is fixed with an enclosure nut. If required it can be disassembled with a 27 mm socket wrench or with a 3SX17 07 ring nut wrench.

The enclosures without EMERGENCY STOP each have one user module with 4I/3O; the enclosures with EMERGENCY STOP have a safe AS-Interface slave integrated in the enclosure.

EMERGENCY-STOP enclosures are fitted with two NC contact blocks, which are wired to the safe slave. The contact blocks and lampholders (with spring-loaded terminals) of the control device, and the AS-Interface slaves, are mounted in the base of the enclosure and are cable-connected.

The molded-plastic versions of the enclosures have a connection for the AS-Interface flat cable (the cable is routed past the enclosure on the outside); in the case of the metal versions the AS-Interface cable is routed into the enclosure.

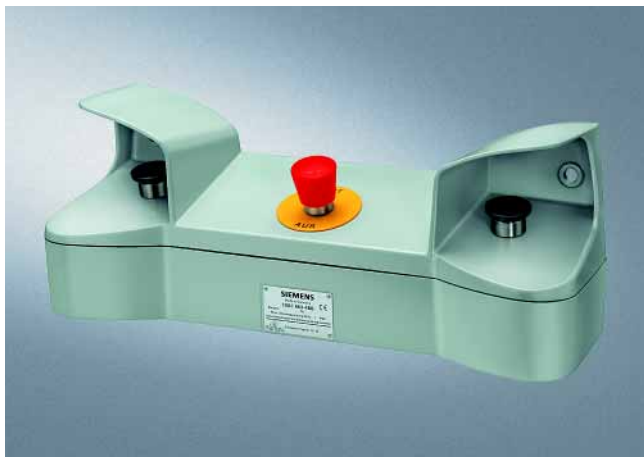
Selection and ordering data

Equipping options (A, B, C = identification letters of the command positions)	Number of command positions	Order No.	Weight approx.
			kg
AS-Interface enclosures, molded plastic			
A = EMERGENCY-STOP mushroom pushbutton through AS-Interface adapter, top part of enclosure in yellow	1	3SF5 811-0AA08	0.415
A = EMERGENCY-STOP mushroom pushbutton through AS-Interface adapter, top part of enclosure in yellow, with protective collar	1	3SF5 811-0AB08	0.415
AS-Interface enclosures, metal			
A = EMERGENCY-STOP mushroom pushbutton through AS-Interface adapter, top part of enclosure in yellow	1	3SF5 811-2AA08	0.415
A = EMERGENCY-STOP mushroom pushbutton through AS-Interface adapter, top part of enclosure in yellow, with protective collar	1	3SF5 811-2AB08	0.415
A = EMERGENCY-STOP mushroom pushbutton, M12 plug, enclosure top in yellow		3SF5 811-2AA10	0.415
A = EMERGENCY-STOP mushroom pushbutton über M1 plug, enclosure in yellow, with protective collar		3SF5 811-2AB10	0.415

3SB3 Two-Hand Operation Consoles

Molded-plastic and metal enclosures

Overview



Two-hand operation console with metal enclosure

Equipment

The two-hand operation consoles are pre-equipped with 3SB3 command devices. The standard equipment comprises:

- 2 black mushroom pushbuttons, Ø 40 mm, 1 NO + 1 NC, Order No. 3SB30 00-1GA11
- 1 red EMERGENCY-STOP mushroom pushbutton acc. to EN 418 (ISO 13850), Ø 40 mm, with positive latching, 2 NC, Order No. 3SB30 00-1HA20

The molded-plastic version can be retrofitted with up to 8 customized command positions. The surface of the console has premachined breaking points for this purpose.

Application

The two-hand operation consoles are required for use with machines and systems that have hazardous areas, in order to direct both hands of the operator to one position.

Operation consoles are primarily used on presses, stamping machines, printing presses and paper converting machines, in the chemical industry and in the rubber and plastics industries.

For the further processing of control commands, suitable evaluation units are used, e.g. 3TK28 3 safety relays (see [Safety Relays in LV 1, chapter 7](#)).

Standards

The two-hand operation consoles comply with the requirements of EN 574.

Selection and ordering data

Version	Order No.	Weight approx. kg
Metal enclosures, degree of protection IP65		
 Two-hand operation consoles, metal enclosure Degree of protection IP65 acc. to EN 574 • With standard fittings • With standard fittings and 4 additional holes for 22.5 mm command devices¹⁾ • Empty enclosure, unequipped	3SB38 63-4BB	2.650
	3SB38 63-4BA	4.800
	3SB38 63-4BC	4.800
Molded-plastic enclosures, degree of protection IP65		
 Two-hand operation consoles, molded-plastic enclosure with standard fittings and preset breaking points for 8 additional 22.5 mm¹⁾ command devices, with holes for metric cable glands	3SB38 63-1BB3	2.264
Accessories		
 Stands for two-hand operation console with holes for metric cable glands	3SB39 01-0AQ3	16.000

3SB39 01-0AQ

¹⁾ See 3SB3 Pushbutton Units and Indicator Lights.

3SE7, 3SF2 Cable-Operated Switches

3SE7 metal enclosures

Overview



Application

SIRIUS cable-operated switches are used for monitoring or for EMERGENCY-STOP devices on particularly endangered system sections.

As the effective range of a cable-operated switch is only limited by the length of the pull-rope, large systems can also be protected. Cable-operated switches (requiring pulling at both ends) and conveyor belt unbalance trackers are used primarily for monitoring very long belt systems.

Standards

The switches are equipped with positive latching and positive NC contacts and are thus suitable for operation in EMERGENCY-STOP devices in accordance with ISO 13850 and EN 418.

Selection and ordering data

	Version	Rope length	Contacts	Order No.	Weight approx.
		m			kg
Cable-operated switches					
 3SE7 150-1BD00	Metal enclosures (cover made of molded plastic)	10			
	• Without latching, only cable pull monitoring		1 NO + 1 NC → ¹⁾	3SE7 120-2DD01	0.395
	• With latching and latching reset		2 NC → ¹⁾	3SE7 120-1BF00	0.410
	Metal enclosures (cover made of molded plastic), with dust protection and alignment window	25			
	• Without latching		1 NO + 1 NC → ¹⁾	3SE7 150-2DD00	0.425
	• With latching and latching reset		1 NO + 1 NC → ¹⁾	3SE7 150-1BD00	0.445
			2 NC → ¹⁾	3SE7 150-1BF00	0.440
	• With latching and key unlatching		1 NO + 1 NC → ¹⁾	3SE7 150-1CD00	0.510
	Metal enclosures (cover made of molded plastic), with dust protection and alignment window, with LED, red, 24 V DC	25			
	• Without latching		1 NO + 1 NC → ¹⁾	3SE7 150-2DD04	0.425
 3SE7 150-1BD04	• With latching and latching reset		1 NO + 1 NC → ¹⁾	3SE7 150-1BD04	0.450

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SE7, 3SF2 Cable-Operated Switches

3SE7 metal enclosures

Version	Rope length	Contacts	Order No.	Weight approx.	
	m			kg	
Cable-operated switches					
 3SE7 140-1B.00	Metal enclosures (cover made of molded plastic), with dust protection	50			
	• With latching and latching reset	1 NO + 1 NC → ¹⁾	3SE7 140-1BD00	0.790	
		2 NC → ¹⁾	3SE7 140-1BF00	0.790	
	• In addition with LED, red, 24 V DC	1 NO + 1 NC → ¹⁾	3SE7 140-1BD04	0.820	
	• With latching and key unlatching	1 NO + 1 NC → ¹⁾	3SE7 140-1CD00	0.835	
 3SE7 141-1EG10	Metal enclosures (cover made of molded plastic), with EMERGENCY STOP, rotate-to-unlatch mechanism	75	1 NO + 3 NC → ¹⁾	3SE7 141-1EG10	0.790
 3SE7 160-1AE00	Metal enclosures with actuation on both sides	2 × 75			
	• With latching and latching reset	2 NO + 2 NC → ¹⁾	3SE7 160-1AE00	1.270	
		1 NO + 1 NC → ¹⁾	3SE7 160-1BD00	0.300	
	• In addition with LED, red, 24 V DC	2 NO + 2 NC → ¹⁾	3SE7 160-1AE04	1.200	
Conveyor belt unbalance protection devices					
 3SE7 310-1AE00	Metal enclosures				
	• With latching and latching reset	2 NO + 2 NC → ¹⁾	3SE7 310-1AE00	1.805	
	• In addition with LED, red, 24 V DC	2 NO + 2 NC → ¹⁾	3SE7 310-1AE04	1.815	
Accessories					
	LED lamps, red 24 V DC • 25 mm diameter; for M20 x 1.5 connection		3SX3 235	0.015	

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SE7, 3SF2 Cable-Operated Switches

3SE7 metal enclosures

Accessories

	Version ¹⁾	Length/ diameter	Order No.	Weight approx. kg
	Steel ropes with red plastic sheath, Ø 4 mm ²⁾	10 m	3SE7 910-3AA	0.420
		15 m	3SE7 910-3AB	0.665
		20 m	3SE7 910-3AC	0.865
		50 m	3SE7 910-3AH	2.065
	Rope clamps galvanized white	• Oval Ø 4 mm	3SE7 941-1AC	0.040
			3SE7 943-1AC	0.010
		• Duplex (1 set = 4 units) Ø 4 mm	3SE7 944-1AC	0.020
		• Single (1 set = 4 units) Ø 5 mm	3SE7 942-1AA	0.025
	Tension springs (zinc-plated) to maintain the counter tension		3SE7 931-1AB	0.150
			3SE7 931-1AD	0.340
			3SE7 931-1AE	
	Rope rollers for changing the direction of the rope, rotatable	Ø 4 mm	3SE7 921-1AC	0.045
	Fixtures for the rope rollers (including fixing nuts)		3SE7 921-1AA	0.015
	Rope eyes for changes in rope direction and improved power transmission at the fixing points (1 set = 4 units)	Ø 4 mm	3SE7 930-1AD	0.005
	Eyebolts for fixing the rope		3SE7 920-1AB	0.035
			3SE7 920-1AC	0.060
	Turnbuckles for precise adjustment of the pretension		3SE7 950-1AB	0.055
			3SE7 950-1AD	0.075

¹⁾ For mounting and fixing the cables, see Technical Information LV 1 T.

²⁾ Diameter including casing; the diameter of the steel wire is 3.2 mm.

3SF2 AS-Interface cable-operated switches

Overview



AS-Interface cable-operated switches can now be directly connected via the standard AS-Interface with safety-oriented communication.

The safety functions no longer have to be conventionally wired up.

Application

SIRIUS cable-operated switches are used for monitoring or for EMERGENCY-STOP devices on particularly endangered system sections.

As the effective range of a cable-operated switch is only limited by the length of the pull-rope, large systems can also be protected.

Standards

The switches with positive latching are suitable for operation in EMERGENCY-STOP devices in accordance with ISO 13850 and EN 418. They are usable up to Category 4 according to EN 954-1.

Selection and ordering data

Version	Basic switch ¹⁾	Order No.	Weight approx. kg
AS-Interface cable-operated switches AS/safe with direct connection to AS-Interface, metal enclosure with dust protection, IP65, latching according to EN 418, with button reset, 2 NC contacts ²⁾			
 For rope lengths up to 10 m, 3SE7 120-1BF00 with alignment window	→	3SF2 120-1BF00-0BA1	0.620
 For rope lengths up to 25 m, 3SE7 150-1BF00 with alignment window	→	3SF2 150-1BF00-0BA1	0.630
 For rope lengths up to 50 m 3SE7 140-1BF00	→	3SF2 140-1BF00-0BA1	0.917

→ Positive opening according to IEC 60947-5-1, Appendix K.

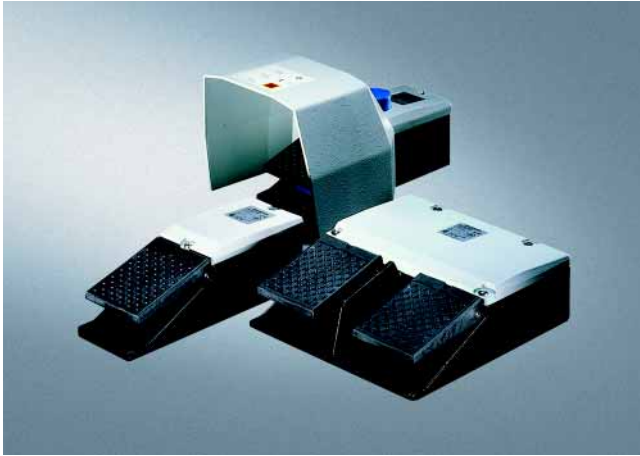
¹⁾ For accessories, see 3SE7 Basic Switches. For technical specifications, contact travel, circuit diagrams and dimensional drawings, see Technical Information LV 1 T.

²⁾ Positive opening according to IEC 60947-5-1, Appendix K.

3SE2, 3SE3 Foot Switches

Molded-plastic and metal enclosures

Overview



Foot switches with metal enclosures

The 3SE2 9 and 3SE3 9 foot switch range encompasses versions in a metal enclosure for rugged applications as well as versions with molded-plastic enclosure. The units can be supplied with or without a cover and have fixing holes for them to be screwed to the floor.

Depending on the particular application, the switches can be ordered in latching or momentary-contact versions.

Safety foot switches

The single-pedal safety foot switches according to EN 418 lock on actuation. After eliminating the hazard, the machine can only be restarted after manually releasing the switch. A pushbutton on the top of the enclosure is used for this purpose. The devices are supplied with a cover.

Version with molded-plastic enclosures

For operation in less harsh environments, momentary-contact pedal switches with molded-plastic enclosures are available. They are supplied in single-pedal and two-pedal versions, the single-pedal version is also available with a cover. The momentary-contact pedal switch has one microswitch (changeover contact) per actuating pedal.

3SE2, 3SE3 Foot Switches

Molded-plastic and metal enclosures

Selection and ordering data

	Version	Slow-action contacts for each pedal	Order No.	Weight approx. kg
Metal enclosures, degree of protection IP65				
 3SE2 90.-.AA20 3SE2 91.-.AA20	Momentary-contact foot switches, single pedal M20 x 1.5 cable entry			
	• Without cover	1 NO + 1 NC → ¹⁾ 2 NO + 2 NC → ¹⁾	3SE2 902-0AB20 3SE2 903-1AB20	0.655 0.665
	• With cover	1 NO + 1 NC → ¹⁾ 2 NO + 2 NC → ¹⁾	3SE2 902-0AA20 3SE2 903-1AA20	1.375 1.370
	Foot switches, single pedal M20 x 1.5 cable entry			
	• Without cover	1 NO + 1 NC → ¹⁾	3SE2 912-2AB20	0.665
 3SE2 912-2AB20 3SE2 912-2AA20	• With cover	1 NO + 1 NC → ¹⁾	3SE2 912-2AA20	1.350
	Momentary-contact foot switches, two pedals M25 x 1.5 cable entry			
	• Without cover	1 NO + 1 NC → ¹⁾ 2 NO + 2 NC → ¹⁾	3SE2 932-0AB20 3SE2 932-1AB20	1.680 1.870
	• With cover	1 NO + 1 NC → ¹⁾ 2 NO + 2 NC → ¹⁾	3SE2 932-0AA20 3SE2 932-1AA20	2.550 2.570
		Safety foot switches, single pedal with cover, M20 x 1.5 cable entry, with interlock according to EN 418, NO closes as momentary contact type, NC opens with latching		2 NO + 2 NC → ¹⁾ 3SE2 924-3AA20
Molded-plastic enclosures, degree of protection IP65				
 3SE3 902-4CA20 3SE3 934-5CB20	Momentary-contact pedal switches 3 m cable Microswitch			
	• Single pedal			
	- without cover	1 CO contact	3SE3 902-4CB20	0.355
	- with cover	1 CO contact	3SE3 902-4CA20	1.100
	• Two pedals, without cover	2 x 1 CO	3SE3 934-5CB20	0.800

¹⁾ Positive opening according to IEC 60947-5-1, Appendix K.

Process Analytical Instruments

Continuous gas analyzers, extractive

ULTRAMAT, OXYMAT, CALOMAT

Overview

For additional information on Process Analytics see the Internet under:

www.siemens.de/prozessinstrumentierung (toggle to English)

www.siemens.de/prozessanalytik (toggle to English)

www.siemens.com/piaselector

or in catalog PA01 „Process Analytical Instruments“

ULTRAMAT 23

The ULTRAMAT 23 gas analyzer can measure up to 4 gas components at once: A maximum of three infrared sensitive gases such as CO, CO₂, NO, SO₂, CH₄ plus O₂ with an electrochemical oxygen measuring cell.

ULTRAMAT 23 basic versions for:

- 1 infrared gas component with/without oxygen measurement
- 2 infrared gas components with/without oxygen measurement
- 3 infrared gas components with/without oxygen measurement.



ULTRAMAT 23

ULTRAMAT 6

The ULTRAMAT 6 single-channel or dual-channel gas analyzers operate according to the NDIR two-beam alternating light principle and measure gases highly selectively whose absorption bands lie in the infrared wavelength range from 2 to 9 µm, such as CO, CO₂, NO, SO₂, NH₃, H₂O, CH₄ and other hydrocarbons.

Single-channel analyzers measure up to 2 gas components, dual-channel analyzers up to 4 gas components simultaneously.



19" unit and field unit

OXYMAT 6

The OXYMAT 6 gas analyzers are based on the paramagnetic alternating pressure method and are used to measure oxygen in gases.



19" unit and field unit

Process Analytical Instruments

Continuous gas analyzers, extractive

ULTRAMAT, OXYMAT, CALOMAT

OXYMAT 61

The measuring principle of the OXYMAT 61 gas analyzer is based on the paramagnetic alternating pressure method and is used to measure oxygen in gases in standard applications.



CALOMAT 6

The CALOMAT 6 gas analyzer is primarily used for quantitative determination of H_2 or He in binary or quasi-binary non-corrosive gas mixtures.

Concentrations of other gases can also be measured if their thermal conductivities differ significantly from the residual gases like Ar, CO_2 , CH_4 , NH_3 .



19" unit and field unit

Additional information is available in catalog PA 01 „Process Analytical Instruments“

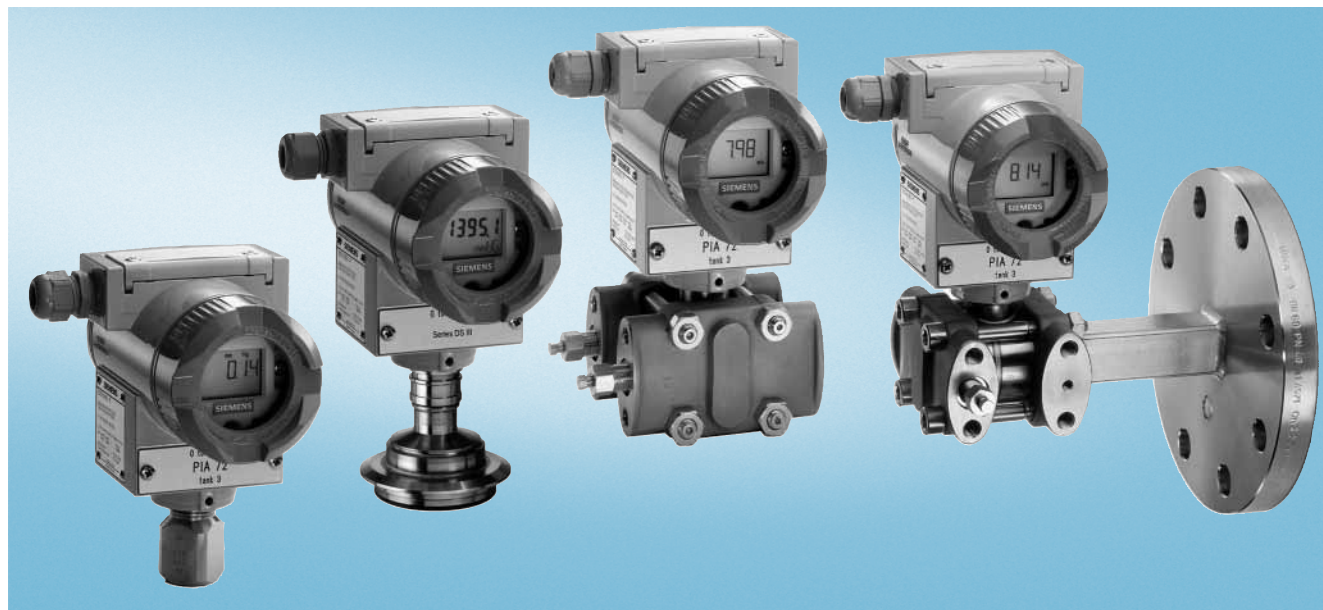
Process Analytical Instruments

SITRANS P measuring instruments for pressure

Transmitters for gage, absolute and differential pressure, flow and level

Overview

Series DS III



For additional information on SITRANS P see in the Internet under: www.siemens.com/sitransp

SITRANS P pressure transmitters, DS III series, are digital pressure transmitters featuring extensive user-friendliness and high accuracy. The parameterization is performed using control keys, over HART communication, PROFIBUS-PA or Foundation Fieldbus interface.

Extensive functionality enables the pressure transmitter to be precisely adapted to the plant's requirements. Operation is very simple in spite of the numerous setting options.

Transmitters with type of protection "Intrinsic safety" and "Explosion-proof" may be installed within potentially explosive atmospheres (zone 1) or in zone 0. The transmitters are provided with an EC type examination certificate and comply with the corresponding harmonized European standards (ATEX).

The transmitters can be equipped with various designs of remote seals for special applications such as the measurement of highly viscous substances.

Various versions of the DS III pressure transmitters are available for measuring:

- Gage pressure, absolute pressure, for differential pressure transmitters
- Filling level, mass level, volume level
- Volume flow, mass flow

Benefits

- High quality and long life
- High reliability even under extreme chemical and mechanical loads
- For aggressive and non-aggressive gases, vapors and liquids
- Extensive diagnosis and simulation functions
- Separate replacement of measuring cell and electronics without recalibration
- Minimum conformity error
- Small long-term drift

- Wetted parts made of high-grade materials (e.g. stainless steel, Hastelloy, gold, Monel, tantalum)
- Infinitely adjustable span from 0.01 mbar to 400 mbar for DS III with HART communication
- Nominal measuring range from 1 to 400 bar for DS III PA (PROFIBUS PA) and FF (Foundation Fieldbus)
- High measuring accuracy
- Parameterization over control keys and HART communication, PROFIBUS PA communication or Foundation Fieldbus interface.

Applications

The pressure transmitters of the DS III series, can be used in industrial areas with extreme chemical and mechanical loads. Electromagnetic compatibility in the range 10 kHz to 1 GHz makes the DS III pressure transmitters suitable for locations with high electromagnetic emissions.

Pressure transmitters with type of protection "Intrinsic safety" and "Explosion-proof" may be installed within potentially explosive atmospheres (zone 1) or in zone 0. The pressure transmitters are provided with an EC type examination certificate and comply with the corresponding harmonized European standards (ATEX).

Pressure transmitters with the type of protection "Intrinsic safety" for use in zone 0 may be operated with power supply units of category "ia" and "ib".

The transmitters can be equipped with various designs of remote seals for special applications such as the measurement of highly viscous substances.

The pressure transmitter can be operated locally over 3 control keys or programmed externally over HART communication or over PROFIBUS PA or Foundation Fieldbus interface.

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

SITRANS T temperature measuring devices

SITRANS TW universal transmitter

Overview

For additional information on SITRANS T see in the Internet under: www.siemens.com/sitranst

Four wire system for rail mounting



The user-friendly transmitters for the control room

The SITRANS TW universal transmitter is a further development of the service-proven SITRANS T for the 4-wire system in a mounting rail housing. With numerous new functions it sets new standards for temperature transmitters.

With its diagnostics and simulation functions the SITRANS TW provides the necessary insight during commissioning and operation. And using its HART interface the SITRANS TW can be conveniently adapted with SIMATIC PDM to every measurement task.

All SITRANS TW control room devices are available in a non-intrinsically safe version as well as in an intrinsically safe version for use with the most stringent requirements.

Applications

The SITRANS TW transmitter is a four-wire rail-mounted device with a universal input circuit for connection to the following sensors and signal sources:

- Resistance thermometers
- Thermocouple elements
- Resistance-based sensors/potentiometers
- mV sensors
- As special version: V sources, current sources

The 4-wire rail-mounted SITRANS TW transmitter wire is designed for control room installation. It must not be mounted in potentially explosive atmospheres.

All SITRANS TW control room devices are available in a non-intrinsically safe version as well as in an intrinsically safe version for use with the most stringent requirements.

Function

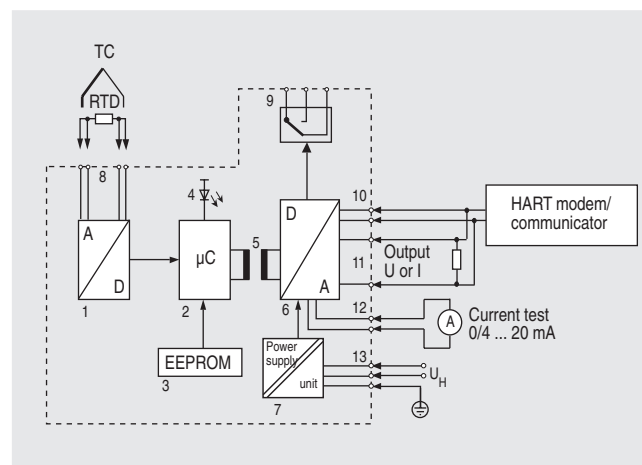
Features

- Transmitter in four-wire system with HART interface
- Housing can be mounted on 35 mm rail or 32 mm G rail
- Screw plug connector
- All circuits electrically isolated
- Output signal: 0/4 to 20 mA or 0/2 to 10 V
- Power supplies: 115/230 V AC/DC or 24 V AC/DC

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

- Explosion protection [EEx ia] or [EEx ib] for measurements with sensors in the hazardous area
- Temperature-linear characteristic for all temperature sensors
- Temperature-linear characteristic can be selected for all temperature sensors
- Automatic correction of zero and span
- Monitoring of sensor and cable for open-circuit and short-circuit
- Sensor fault and/or limit can be output via an optional sensor fault/limit monitor
- Hardware write protection for HART communication
- Diagnostic functions
- Slave pointer functions

Mode of operation



The signal output by a resistance-based sensor (two-wire, three-wire, four-wire system), voltage source, current source or thermocouple is converted by the analog-to-digital converter (1, function diagram) into a digital signal. This is evaluated in the micro controller (2), corrected according to the sensor characteristic, and converted by the digital-to-analog converter (6) into an output current (0/4 to 20 mA) or output voltage (0/2 to 10 V). The sensor characteristics as well as the electronics data and the data for the transmitter parameters are stored in the non-volatile memory (3). AC or DC voltages can be used as the power supply (13). Any terminal connections are possible for the power supply as a result of the bridge rectifier in the power supply unit. The PE conductor is required for safety reasons.

A HART modem or a HART communicator permit parameterization of the transmitter using a protocol according to the HART specification. The transmitter can be directly parameterized at the point of measurement via the HART output terminals (10).

The operation indicator (4) identifies a fault-free or faulty operating state of the transmitter. The limit monitor (9) enables the signaling of sensor faults and/or limit violations. In the case of a current output, the current can be checked on a meter connected to test socket (12).

Diagnosis and simulation functions

The SITRANS TW comes with extensive diagnosis and simulation functions.

Physical values can be defined with the simulation function. It is thus possible to check the complete signal path from the sensor input to inside the control system without additional equipment. The slave pointer functions are used to record the minimum and maximum of the plant's process variable.

Process Analytical Instruments

SITRANS F M flow meters

Transmitter

MAGFLO MAG 6000 I/6000 I Ex d

Overview

For additional information on SITRANS F see in the Internet under: www.siemens.com/sitransf



The SITRANS F M MAGFLO MAG 6000 I / I Ex d transmitter is designed for the demands in the process industry. The robust die cast aluminium housing provides superb protection, even in the most harsh industrial environments. Full input and output functionality is given even in the Ex version.

Benefits

- Full range of ATEX rated flow meters with intrinsically safe rated input and outputs
- For compact or remote installation
- HART, PROFIBUS PA/DP, MODBUS RTU/RS485 add-on communication modules available
- Superior signal resolution for optimum turn down ratio
- Digital signal processing with many possibilities
- Automatic reading of SENSORPROM data for easy commissioning
- User configurable operation menu with password protection
 - 3 lines, 20 characters display in 11 languages
 - Flow rate in various units
 - Totalizer for forward, reverse and net flow as well as much more information available.
- Multiple functional outputs for process control, minimum configuration with analogue, pulse/frequency and relay output (status, flow direction, limits)
- Comprehensive self-diagnostic for error indication and error logging
- Batch control

Design

The transmitter is designed for either compact or remote installation in non-hazardous or hazardous areas.

Function

The following functions are available:

- Flow rate
- 2 measuring ranges, 2 totalizers
- Low flow cut-off
- Flow direction
- Error system, operating time
- Uni-/bidirectional flow
- Limit switches and pulse output
- Batch control

The MAG 6000 I/6000 I Ex d is a microprocessor-based transmitter with a build-in alphanumeric display in several languages. The transmitters evaluate the signals from the associated electromagnetic sensors and also fulfil the task of a power supply unit which provides the magnet coils with a constant current.

Further information on connection, mode of operation and installation can be found in the data sheets for the sensors.

Displays and keypads

Operation of the transmitter can be carried out using:

- Keypad and display unit
- HART communicator
- PC/laptop and SIMATIC PDM software via HART communication
- PC/laptop and SIMATIC PDM software using PROFIBUS communication

Technical specifications

Mode of operation and design	
Measuring principle	Electromagnetic with pulsed constant field
Empty pipe	Detection of empty pipe (special cable required in separate mounted installation)
Excitation frequency	Sensor size dependent pulsating DC current
Electrode input impedance	$> 1 \times 10^{14} \Omega$
Input	
Digital input	DC 11 ... 30 V, $R_i = 4.4 \text{ k}\Omega$
• Activation time	50 ms
• Current	$I_{DC 11 \text{ V}} = 2.5 \text{ mA}$, $I_{DC 30 \text{ V}} = 7 \text{ mA}$
Output	
Current output	
• Signal range	0 ... 20 mA or 4 ... 20 mA (Active/passive)
• Load	$< 560 \Omega$
• Time constant	0.1 ... 30 s, adjustable
Digital output	
• Frequency	0 ... 10 kHz, 50% duty cycle (uni-/bidirectional)
• Time constant	0.1 ... 30 s, adjustable
• Pulse (passive)	3 ... 30 V DC, max 110 mA (30 mA Ex version), $200 \Omega \leq R_i \leq 10 \text{ k}\Omega$ (powered from connected equipment)
• Time constant	0.1 ... 30 s, adjustable
Relay output	
• Time constant	Changeover relay, same as current output
• Load	42 V AC/2 A, 24 V DC/1 A
Low flow cut off	
	0 ... 9.9% of maximum flow
Galvanic isolation	
	All inputs and outputs are galvanic isolated
Max. measuring error	
• MAG 6000 I	0.25% of rate

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

SITRANS F C flow meters

MASSFLO MASS 6000
IP67 NEMA 4X compact/remote

Overview



MASS 6000 is based on the latest developments within digital signal processing technology – engineered for high performance, fast flow step response, fast batching applications, high immunity against process noise, easy to install, commission and maintain. The MASS 6000 transmitter delivers true multiparameter measurements i.e. mass flow, volume flow, density, temperature and fraction. The MASS 6000 IP67 transmitter can be compact mounted on all sensors of type MASS 2100 DI 3 to DI 40, and can be used in remote version for all types of MASS 2100/MC1 and FC300 sensors.

Benefits

- Dedicated mass flow chip with the latest ASIC technology
- Fast batching and flow step response with an update rate of true 30 Hz
- Superior noise immunity due to a patented DFT (Discrete Fourier Transformation) algorithm
- Front end resolution better than 0.35 ns improves zero point stability and enhances dynamic turn down ratio on flow and density accuracy
- Advanced diagnosis and service menu enhances trouble shooting and meter verification
- Built-in batch controller with compensation and monitoring comprising 2 built in totalizers
- Multi parameter outputs, individual configurable for mass flow, volume flow, density, temperature or fraction flow such as °BRIX or °PLATO
- Digital input for batch-control, remote zero adjust or forced output mode
- All outputs can be forced to preset value for simulation, verification or calibration purposes
- User configurable operation menu with password protection
 - 3 lines, 20 characters display in 11 languages
 - Self explaining error handling/log in text format
 - Keypad can be used for controlling batch as start/stop/hold/reset
- SENSORPROM technology automatically configures transmitter at start up providing:
 - Factory pre-programming with calibration data, pipe size, sensor type, output settings
 - Any values or settings changed by users are stored automatically
 - Automatically re-programming any new transmitter without loss of accuracy
 - Transmitter replacement in less than 5 minutes. True plug & play

- 4-wire Pt1000 temperature measurement ensures optimum accuracy on mass flow, density and fraction flow
- Fraction flow computation based on 5 order algorithm matching all applications
- USM II platform enables fitting of add-on bus modules without loss of functionality.
 - All modules can be fitted as true "plug & play"
 - Module and transmitter are automatically configured through the SENSORPROM
- Installation of the transmitter to the sensor is simple plug & play via the sensor pedestal

Applications

SITRANS F C MASSFLO mass flow meters are suitable for all applications within the entire process industry, where there is a demand for accurate flow measurement. The meter is capable of measuring both liquid and gas flow.

The main applications for the MASS 6000 IP67 transmitter can be found in:

- Food and beverage industries
- Pharmaceutical industries
- Automotive industry
- Oil and gas industry
- Power generation and utility industry
- Water and waste water industry

Design

The transmitter is designed in an IP67/NEMA 4X compact polyamide enclosure which can be compact mounted on the MASS 2100 sensor range DI 3 to DI 40 (1/8" to 1½") and remote mounted for the entire sensor series.

The MASS 6000 IP67 is available as standard with 1 current-, 1 frequency/pulse- and 1 relay output and can be fitted with add-on modules for bus communication.

Function

The following functions are available:

- Mass flow rate, volume flow rate, density, temperature, fraction flow
- 1 current output, 1 frequency/pulse output, 1 relay output, 1 digital input
- All outputs can be individually configured with mass, volume, density etc.
- 2 built in totalizers which can count positive, negative or net
- Low flow cut-off
- Density cut-off or empty pipe cut-off, adjustable
- Flow direction adjustable
- Error system consisting of error-log, error pending menu
- Display of operating time
- Uni/bidirectional flow measurement
- Limit switches with 1 or 2 limits, programmable for flow, density or temperature
- Noise filter setting for optimization of measurement performance under non ideal application conditions
- Full batch controller
- Automatic zero adjustment menu, with zero point evaluation feed back
- Full service menu for effective and straight forward application and meter trouble shooting

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

SITRANS F C flow meters

MASSFLO MASS 6000 for 19" rack/19" wall mounting

Overview



MASS 6000 is based on the latest developments within digital signal processing technology – engineered for high performance, fast flow step response, fast batching applications, high immunity against process noise, easy to install, commission and maintain.

The MASS 6000 transmitter delivers true multi parameter measurements i.e.: Mass flow, volume flow, density, temperature and fraction.

The MASS 6000 19" transmitter can be connected to all sensors of types MASS 2100/MC1/FC300 and are available in different versions depending of number of output facilities, Ex protection and grade of enclosure.

Benefits

- Dedicated mass flow chip with the latest ASIC technology
- Fast batching and flow step response with an update rate of true 30 Hz
- Superior noise immunity due to a patented DFT (Discrete Fourier Transformation) algorithm
- Front end resolution better than 0.35 ns improves zero point stability and enhances dynamic turn down ratio on flow and density accuracy
- Advanced diagnosis and service menu enhances trouble shooting and meter verification
- Built in batch controller with compensation and monitoring comprising 2 built in totalizers
- Multi parameter outputs, individual configurable for mass flow, volume flow, density, temperature or fraction flow such as °BRIX or °PLATO
- Many output capacities, up to 3 current outputs, 2 frequency/pulse and 2 relay (excludes the possibility of an add-on module)
- Digital input for batch-control, remote zero adjust or forced output mode
- All outputs can be forced to preset value for simulation, verification or calibration purposes
- User configurable operation menu with password protection
 - 3 lines, 20 characters display in 11 languages
 - Self explaining error handling/log in text format
 - Keypad can be used for controlling batch as start/stop/hold/reset

- SENSORPROM technology automatically configures transmitter at start up providing:
 - Factory pre-programming with calibration data, pipe size, sensor type, output settings
 - Any values or settings changed by users are stored automatically
 - Automatically re-programming any new transmitter without loss of accuracy
 - Transmitter replacement in less than 5 minutes. True plug & play
- 4-wire Pt1000 temperature measurement ensures optimum accuracy on mass flow, density and fraction flow
- Fraction flow computation based on 5 order algorithm matching all applications
- USM II platform enables fitting of add-on bus modules without loss of functionality.
 - All modules can be fitted as true "plug & play"
 - Module and transmitter automatically configured through the SENSORPROM
- Transmitter available with ATEX and UL approval
- All electrical connections are easy accessible on the large back plane PCB

Applications

SITRANS F C MASSFLO coriolis mass flow meters are suitable for all applications within the entire process industry, where there is a demand for accurate flow measurement. The meter can measure both liquids and gases.

The main applications for the MASS 6000 19" transmitter can be found in:

- Chemical and pharmaceutical industries
- Food and beverage industries
- Automotive industry
- Oil and gas industry
- Power generation and utility industry
- Water and waste water industry

Design

The transmitter is designed as a 19" insert as base to be used in:

- 19" rack system
- Panel mounting IP66/NEMA 4
- Back of panel mounting IP20/NEMA 1
- Wall mounting IP66/NEMA 4

The MASS 6000 19" is available as standard or as ATEX approved transmitter which is to be mounted in the safe area.

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

SITRANS F C flow meters

MASSFLO MASS 6000 Ex compact-/remote

Overview



MASS 6000 is based on the latest developments within digital signal processing technology – engineered for high performance, fast flow step response, fast batching applications, high immunity against process noise, easy to install, commission and maintain.

The MASS 6000 transmitter delivers true multiparameter measurements i.e.: Mass flow, volume flow, density, temperature and fraction flow.

The MASS 6000 Ex-d transmitter is manufactured in stainless steel (AISI 316L) and able to withstand harsh installation conditions in hazardous applications within the process and chemical industry. The conservative choice of material guarantees the user a low cost of ownership and a long trouble-free lifetime. The Ex-d can be compact mounted on all sensors of type MASS 2100 DI 3 to DI 40, and can be used in remote version for all types of MASS 2100.

Benefits

- Fully stainless steel flameproof EEx-d enclosure, ensuring optimum cost of ownership
- Intrinsically safe keypad and display directly programmable in hazardous area
- ATEX approved transmitter which can be mounted in hazardous area Zone 1 or Zone 2
- Sensor and transmitter interface intrinsically safe EEx ia IIC
- Exchange of transmitter directly in hazardous area without shut down of process pipe line due to ia IIC sensor/transmitter interface
- Dedicated mass flow chip with the latest ASIC technology
- Fast batching and flow step response with an update rate of true 30 Hz
- Superior noise immunity due to a patented DFT (Discrete Fourier Transformation) algorithm
- Front end resolution better than 0.35 ns improves zero point stability and enhances dynamic turn down ratio on flow and density accuracy
- Advanced diagnosis and service menu enhances trouble shooting and meter verification
- Built in batch controller with compensation and monitoring comprising 2 built in totalizers
- Multi parameter outputs, individual configurable for mass flow, volume flow, density, temperature or fraction flow such as °BRIX or °PLATO
- 1 current output, 1 frequency/pulse and 1 relay as standard output

- Current output can be selected as passive or active output
- Digital input for batch-control, remote zero adjust or forced output mode
- All outputs can be forced to preset value for simulation, verification or calibration purposes
- User configurable operation menu with password protection
 - 3 lines, 20 characters display in 11 languages
 - Self explaining error handling/log in text format
 - Keypad can be used for controlling batch as start/stop/hold/reset
- SENSORPROM technology automatically configures transmitter at start up providing:
 - Factory pre-programming with calibration data, pipe size, sensor type, output settings
 - Any values or settings changed by users are stored automatically
 - Automatically re-programming any new transmitter without loss of accuracy
 - Transmitter replacement in less than 5 minutes. True plug & play
- 4-wire Pt1000 temperature measurement ensures optimum accuracy on mass flow, density and fraction flow
- Fraction flow computation based on 5 order algorithm matching all applications
- USM II platform enables fitting of add-on bus modules without loss of functionality
 - All modules can be fitted as true "plug & play"
 - Module and transmitter automatically configured through the SENSORPROM
- Installation of the transmitter to the sensor is simple plug & play via the sensor pedestal

Application

SITRANS F C MASSFLO mass flow meters are suitable for all applications within the entire process industry where there is a demand for accurate flow measurement in hazardous area. The meter can measure both liquids and gases.

The main applications for the MASS 6000 Ex-d transmitter can be found in:

- Chemical process industry
- Pharmaceutical industries
- Automotive industry
- Oil and gas industry
- Power generation and utility industry

Design

The transmitter is designed in an Ex-d compact stainless steel enclosure which can be compact mounted on the MASS 2100 sensor range DI 3 to DI 40, and remote mounted for the entire sensor series.

The MASS 6000 Ex-d is available as standard with 1 current-, 1 frequency/pulse- and 1 relay output and can be fitted with add-on modules for bus communication

- Flameproof „d“ enclosure
- Enclosure stainless steel, IP67/NEMA 4X as compact and IP66/NEMA 4 as remote
- Supply voltage 24 V AC/DC.
- MASS 6000 Ex-d is ATEX approved together with all MASS 2100 sensors

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

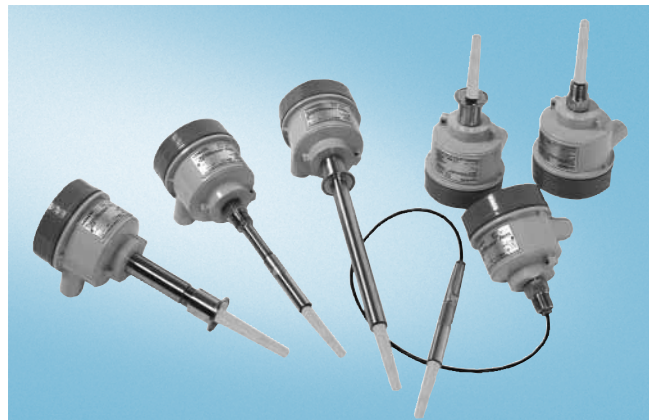
SITRANS L level instruments

Point level measurement - capacitance switches

Pointek CLS 200

Overview

For additional information on SITRANS L see in the Internet under: www.siemens.com/sitransl



Pointek CLS 200 is a versatile inverse frequency shift capacitance level switch with optional rod/cable choices and configurable output, ideal for detection of liquids, solids, slurries, foam and interfaces. The digital version (with optional PROFIBUS PA) includes a display and provides additional diagnostic features.

Benefits

- Potted construction protects signal circuit from shock, vibration, humidity and/or condensation
- High chemical resistance
- Level detection independent of tank or pipe earth reference
- Insensitive to product buildup due to high frequency oscillation (5.5 MHz)
- High sensitivity allows installation in a wide range of liquids, solids or slurry applications
- Integral LCD display allows for easy setup of CLS 200 when you can configure switching threshold, even under the most demanding process conditions.
- Extended rod, cable and sanitary versions available
- Standard version: 3 LED indicators for adjustment control, output status and power
- Digital version: integral LCD display, and optional PROFIBUS PA communication

Applications

The Pointek CLS 200 is offered in standard and digital versions. The standard version has 3 LED indicators with basic relay and solid-state switch alarms.

The digital version provides an integral LCD display for stand-alone use, and provides PROFIBUS PA communication (profile version 3.0, Class B) when required.

The power supply is galvanically isolated and accepts a wide range of voltages (12 to 250 V AC/DC for standard version and 9 to 32 V DC for digital version). The stainless steel and PPS (PVDF optional) materials used in the probe construction provides a temperature rating up to +125 °C (+257 °F) on the process wetted portion of the probe. The switch responds to any material with a dielectric constant of 1.5 or more by detecting a change in oscillating frequency, and it can be set to detect before contact or on contact with the probe. The CLS 200 operates independently of the tank wall or pipe so it does not require an external reference electrode for level detection in a non-conductive vessel such as concrete or plastic.

Modular design and construction provide a wide choice of configurations, including rod, cable and sanitary versions. When used with a SensGuard protection cover, the CLS 200 is protected from shearing, impact and abrasion in tough primary processes.

- Key Applications: liquids, slurries, powders, granules, pressurized applications, hazardous areas

Configuration



Pointek CLS 200, installation

Process Analytical Instruments

SITRANS L level instruments

Point level measurement - capacitance switches Pointek CLS 300

Overview



Pointek CLS 300 is an inverse frequency shift capacitance level switch with optional rod/cable choices and configurable output. It is ideal for detecting liquids, solids, slurries, foam and interfaces in demanding conditions where high pressure and temperatures are present. The Digital version (with optional PROFIBUS PA) includes a display and provides additional diagnostic features.

Benefits

- Patented Active-Shield technology so measurement is unaffected by material buildup in active shield section
- Performs in extremely abrasive conditions because of solid rod construction
- Standard version: 3 LED indicators for adjustment control, output status and power
- Digital version: integral LCD display, and optional PROFIBUS PA communication
- Push-button calibration, full-function diagnostics
- Multiple output options

Application

The Pointek CLS 300 is offered in standard and digital versions. The standard version has 3 LED indicators with basic relay or solid-state switch alarms.

The digital version provides an integral LCD display for stand-alone use, with PROFIBUS PA communication (Profile version 3.0, Class B) when required. Solid-state switch alarm is standard.

The robust design of CLS 300 makes it specifically applicable for heavy solids applications where abrasive materials occur like the mining industry.

The fully potted electronics are unaffected by condensation, dust or vibration.

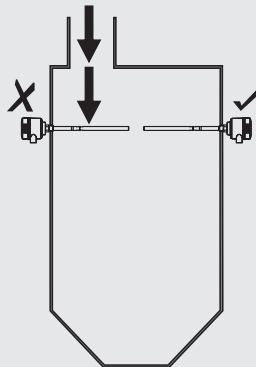
Wetted parts are made of stainless steel with a PFA shield for high chemical resistance. Ceramic inserts are supplied with high temperature CLS 300 devices. Materials with low or high dielectric constants can be accurately detected. The unique active shield suppresses interference from material buildup.

The unique modular design of the Pointek CLS 300 provides a wide range of configurations, process connections, extensions and approvals to meet the temperature and pressure requirements of specific applications. The modular design makes ordering easier and reduces stocking requirements. A wide range of probe configurations is available, including rod and cable versions.

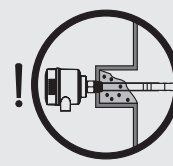
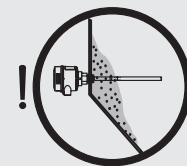
- Key Applications: liquids, slurries, bulk solids, relatively high pressure and temperature, hazardous areas, milling and mining applications

Configuration

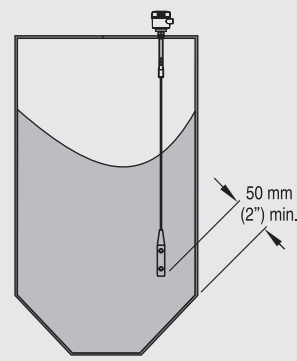
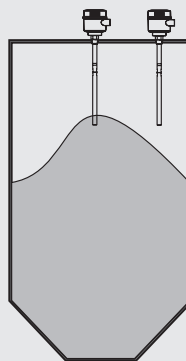
Installation



Keep unit out of path of falling material, or protect probe from falling material.



Build up of material in active shield area does not affect switch operation.



Install probe at least 50 mm (2") from tank wall.

Pointek CLS 300 installation

Process Analytical Instruments

SITRANS L level instruments

Point level measurement - capacitance switches Pointek CLS 500

Overview



Pointek CLS 500 is an inverse frequency shift capacitance level switch for detecting interfaces, solids, liquids, toxic and aggressive chemicals in critical conditions of high temperature and pressure.

Benefits

- Patented Active-Shield technology so measurement is unaffected by material buildup in active shield section
- 2-wire loop powered with solid-state switch or 4 to 20/20 to 4 mA output
- Simple push-button calibration and integrated local display
- Full function diagnostics
- HART communications for remote commissioning and inspection

Application

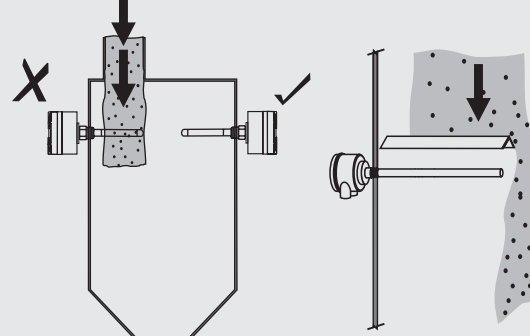
Patented Active-Shield technology ensures that measurement is unaffected by vapors, product deposits, dust and condensation. The unique mechanical probe design coupled with a high performance transmitter gives superior performance in a wide range of level detection applications.

Pointek CLS 500's microprocessor-based electronics provide one-point calibration, making setup possible without shutting down your production process.

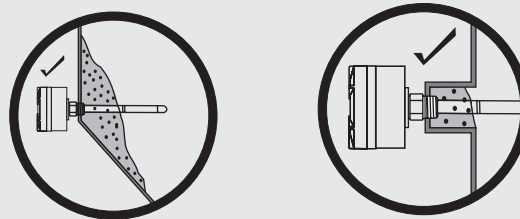
- Key Applications: foam or liquid/foam level, glycol regenerators, high-pressure coalescers, LNG applications

Configuration

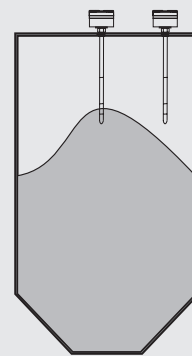
Installation



Keep unit out of path of falling material, or protect probe from falling material.



Build up of material in active shield area does not affect switch operation.



Install probe at least 50 mm (2") from tank wall.

Pointek CLS 500 installation

Process Analytical Instruments

SITRANS L level instruments

Point level measurement - ultrasonic switch Pointek ULS 200

Overview



The Pointek ULS 200 is an ultrasonic non-contacting switch with two switch points for level detection of bulk solids, liquids and slurries in a wide variety of industries; ideal for sticky materials.

Benefits

- 2 switch outputs for high-high, high, low and low-low level alarms or pump up/pump down control
- Integral temperature compensation
- AC or DC power supply
- Electronics provided with fail-safe function
- Threaded and 3A approved sanitary fitting clamp process connections
- Polycarbonate or aluminum enclosures, Type 6/NEMA 6/IP67
- Easy, two-button programming

Application

The measuring range for bulk solids is max. 3 m (9.8 ft) and 5 m (16.4 ft) for liquids and slurries. Unlike invasive contacting devices, there is no material buildup on the sensor.

The level switch has a rugged design, combining the transducer and electronics in one durable device. It has no moving parts and is virtually maintenance-free.

The transducer, available in ETFE or PVDF copolymer, is inert to most chemicals. This means the device can be used in the chemical, petrochemical, water and wastewater industries. A sanitary version of the ULS 200, with an industry standard flange option, is easy to remove from the application for cleaning. It thus satisfies the prerequisites for use in the food, beverage and pharmaceutical industries. The Pointek ULS 200 delivers superior performance while reducing maintenance, downtime and equipment replacement costs.

- Key Applications: liquids, slurries, fluid materials, plugged chute detection, chemical industry

Design

Installation

The Pointek ULS 200 should be mounted in an area that is within the temperature range specified and that is suitable to the enclosure rating and materials of construction. The cover should be accessible to allow programming, wiring and display viewing.

It is advisable to keep the Pointek ULS 200 away from high voltage or current runs, contactors and SCR control drives.

Locate the Pointek ULS 200 so that it has a clear sound path perpendicular to the material surface. The sound path should not intersect the fill path, rough walls, seams, rungs etc.

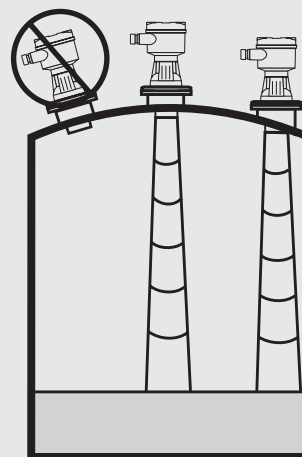
Mounting and Interconnection

The Pointek ULS 200 is available in three thread types: 2" NPT, 2" BSPT or PF2 and can be fitted with the optional 75 mm (3") flange adapter for mating to 3" ASME, DN 65, PN 10 and JIS 10K 3B sized flanges.

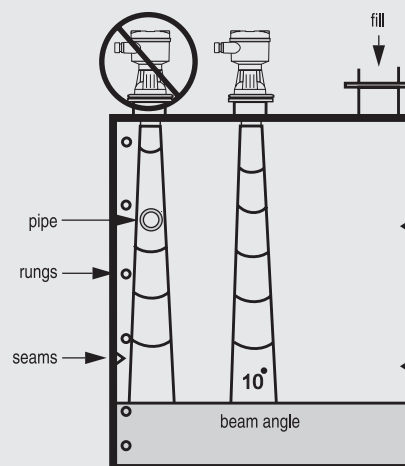
Separate cables and conduit may be required to conform to standard instrumentation wiring or electrical codes.

Configuration

Parabolic Mounting



Flat Mounting and Beam Angle



Pointek ULS 200 Mounting

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

SITRANS L level instruments

Continuous measurement - Radar transmitter SITRANS LR 200

Overview



SITRANS LR 200 is a 2-wire loop powered pulse radar level transmitter for liquid bulk storage or simple process vessels.

Benefits

- Uni-Construction polypropylene rod antenna standard, other antenna options available
- Easy installation and simple start-up
- Programming using infrared Intrinsically Safe handheld programmer or SIMATIC PDM
- Communication using HART® or PROFIBUS PA
- Patented Sonic Intelligence® signal processing
- Extremely high signal-to-noise ratio
- Auto False-Echo Suppression of fixed obstructions
- Various flanges, horn and waveguide antenna options available

Application

SITRANS LR 200's unique design allows safe and simple programming using the Intrinsically Safe handheld programmer without having to open the instrument's lid. It also features a built-in alphanumeric display in four languages.

The SITRANS LR 200 has a standard Uni-Construction polypropylene rod antenna that offers excellent chemical resistance and is hermetically sealed. With other instruments, you may need to consider compatibility of multiple materials including the seal between the materials. The Uni-Construction antenna features an internal, integrated shield that eliminates vessel nozzle interference.

Start-up is easy with as few as two parameters for basic operation. Installation is simplified as the electronics are mounted on a rotating head that swivels, allowing the instrument to line up with conduit or wiring connections or simply to adjust the position for easy viewing. SITRANS LR 200 features patented Sonic Intelligence signal-processing technology for superior reliability.

Key Applications: liquid bulk storage tanks, process vessels with agitators, vaporous liquids, high temperatures.

Additional information is available in catalog FI 01 „Field Instruments for Process Automation“

Process Analytical Instruments

SITRANS L level instruments

Continuous measurement -
Capacitance transmitters SITRANS LC 500

Overview



SITRANS LC 500 is an inverse frequency shift capacitance level or interface transmitter for extreme and critical process conditions, such as oil and liquefied natural gas (LNG) as well as toxic and aggressive chemicals and vapors.

Benefits

- Patented Active-Shield technology so measurement is unaffected by material buildup in active shield section
- Simple push-button calibration and integrated local display
- Inverse frequency approach provides high resolution
- 2-wire loop powered 4 to 20/20 to 4 mA measurement signal
- Pre-detection alarm and full function diagnostics
- High temperature and pressure resistant (optional)
- Full-function diagnostics comply with NAMUR NE 43
- Easy calibration locally or via HART (using SIMATIC PDM software)

Application

SITRANS LC 500's advanced electronics provide one-step, push-button calibration and local display for easy on-site installation and setup.

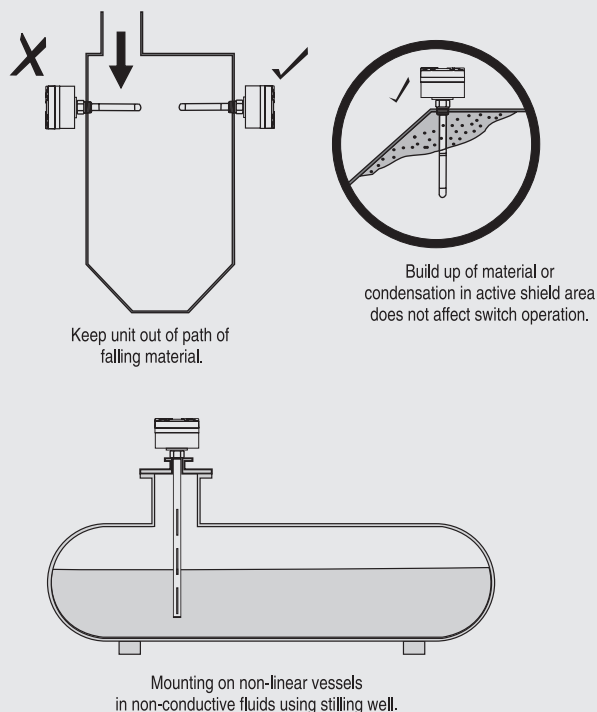
The unique mechanical probe design coupled with a high performance transmitter gives superior performance in toxic and aggressive chemicals, acids, caustics, adhesives and in viscous conductive and non-conductive materials.

The SMART 2-wire transmitter has HART® communications for remote commissioning and inspection.

- Key Applications: Oil/water or foam/liquid interface measurement in separators or coalescers, cryogenic applications including CO₂ and liquefied natural gas (LNG), distillation/regeneration tanks with high temperatures

Configuration

Installation



SITRANS LC 500, installation

Process Analytical Instruments

Electropneumatic positioners SIPART PS2

SIPART PS2, PS2 PA, PS2 FF,
PS2 EEx d, PS2 EEx d PA and PS2 EEx d FF

Overview

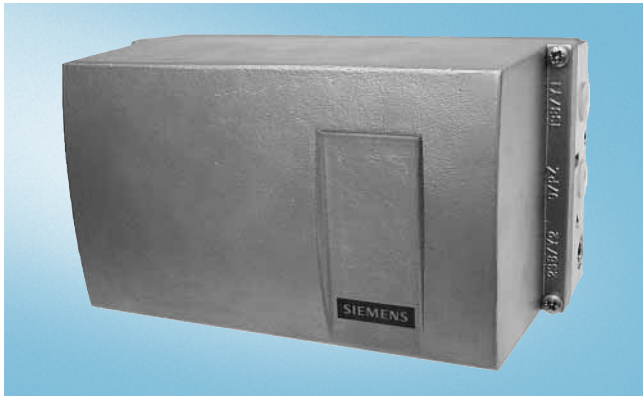
For additional information on SIPART PS2 see in the Internet under: www.siemens.com/sipartps2



SIPART PS2 electropneumatic positioner



SIPART PS2 EEx d electropneumatic positioner in pressure-proof casing



SIPART PS2 in stainless steel casing

The SIPART PS2 electropneumatic positioner is used to control the final control element of pneumatic linear or part-turn actuators. The electropneumatic positioner moves the actuator to a valve position corresponding to the setpoint. Additional function inputs can be used to block the valve or to set a safety position. A binary input is present as standard in the basic device for this purpose.

Benefits

SIPART PS2 positioners offer decisive advantages:

- Simple installation and automatic commissioning (self-adjustment of zero and span)
- Simple operation with
 - Local operation and configuration of the device using three input keys and a user-friendly two-line LCD
 - Programming through SIMATIC PDM
- Very high-quality control thanks to an online adaptation procedure
- Negligible air consumption in stationary operation
- "Tight shut-off" function (ensures maximum positioning pressure on the valve seat)
- Numerous functions can be activated by simple configuring (e.g. characteristics and limits)
- Extensive diagnosis functions for valve and actuator
- Only one device version for linear and part-turn actuators
- Few moving parts, hence insensitive to vibrations
- External non-contacting position sensor as option for extreme ambient conditions

Application

The SIPART PS2 positioner is used, for example, in the following industries:

- Chemical/petrochemical, power stations
- Paper and glass
- Water, waste water
- Food and pharmaceuticals
- Offshore plants

The SIPART PS2 positioner is available:

- For single-action actuators: in plastic, stainless steel or aluminum casings, as well as flameproof aluminium casing (EEx d)
- For double-action actuators: in plastic and stainless steel casing, as well as flameproof aluminum casing (EEx d)
- For non-hazardous applications
- For hazardous applications in the designs
 - as intrinsically-safe device (EEx ia/ib) or
 - in flameproof aluminum casing (EEx d) or
 - in Ex n design (non sparking)

and in the versions:

- With 0/4 to 20 mA control communication through HART signal (as option)
- With PROFIBUS PA communication interface
- With Foundation Fieldbus (FF) communications interface.

Explosion-proof versions

The basic version of the device is available in an intrinsically-safe design with degree of protection EEx ia/ib or in a non-intrinsically-safe design for zone 2 (see Technical data for intrinsically-safe versions).

A non-intrinsically-safe application is permissible in zone 1 for the SIPART PS2 EEx d flameproof version (see "Technical Data"). It is then permissible to use all option modules (except external actuator travel detection systems, SIA module and NCS).

Stainless steel casing for extreme ambient conditions

The SIPART PS2 is available in a stainless steel casing for use in particularly aggressive environments (e.g. offshore operation, chlorine plants etc.). The device functions are the same as those of the basic versions.

Evaluating / Communication



2/2 Communication over PROFIBUS

2/2 CPUs for factory automation

2/2 CPU 315F-2 DP
2/7 CPU 315F-2 PN/DP
2/13 CPU 317F-2 DP
2/19 CPU 317F-2 PN/DP
2/25 CPU 319F-3 PN/DP
2/32 CPU 416F-2 and CPU 416F-3 PN/DP

2/44 CPUs for process automation

2/44 CPU 414-4H for S7-400H/F/FH
2/49 CPU 417-4H for S7-400H/F/FH
2/54 Sync module for coupling to CPU 41xH

2/55 Configuring

2/55 Engineering Factory Safety/
Distributed Safety
2/56 Engineering Process Safety
2/57 S7 F-Systems
2/58 SIMATIC Safety Matrix

2/60 Fail-safe I/O devices ET 200S

2/61 Interface module
IM 151-7 F-CPU
2/66 F-Power module
PM-E F PROFIsafe
2/67 F electronics modules
2/70 F electronics modules RELAY
2/72 F electronics modules SIPLUS
2/74 F terminal modules

2/76 Fail-safe I/O devices ET 200M

2/76 F digital/analog modules
2/77 SM 326 F digital input module -
Safety Integrated
2/80 SM 326 F digital output module
- Safety Integrated
2/83 F digital input module
SIPLUS SM 326-Safety
Integrated
2/85 F digital output module
SIPLUS SM 326-Safety
Integrated
2/90 SM 336 F analog input module
- Safety Integrated
2/90 Isolation module
2/91 SIPLUS S7-300 isolating
module (extended
temperature range)

2/92 SIMATIC ET 200pro

2/93 IM 154-2 High Feature interface
module
2/97 Interface Module IM 154-4 PN
2/99 Interface module IM 154-8 PN/DP
2/105 Fail-safe expansion modules
2/106 Fail-safe digital expansion modules

2/107 SIMATIC ET200eco

2/113 Communication over AS-interface

2/113 ASIsafe

2/115 AS-Interface safety monitors
2/117 AS-Interface safety modules
2/119 CP 243-2
2/121 CP 343-2 P

For ASIsafe also see in Chapter 1:
1/14 ASIsafe light curtains and
arrays(see overview)
1/91 ASIsafe Laser scanner
1/147 Positions switched 3SF1 for
AS-Interface
1/158 Hinge switches 3SF1 for
AS-Interface
1/179 AS-Interface F-Adapter
1/185 Pushbuttons and indicators
Enclosures for AS-Interface
1/191 AS-Interface cable operated
switches

2/123 Transition fromPROFIBUS DP to AS-Interface

2/123 DP/AS-i LINK Advanced
2/127 DP/AS-Interface Link 20E
2/129 DP/AS-i F-Link

2/132 Conventional design

2/133 3TK28 safety relays

2/134 with electronic enabling circuits
3TK28 4
2/136 with relay enabling circuits
3TK28 2, 3TK28 3
2/141 with auxiliary contactor enabling
circuits 3TK28 5

Evaluating / Communication

CPUs for factory automation

CPU 315F-2 DP

Overview



- For design of a fail-safe automation system for plants with increased safety requirements
- Based on the SIMATIC CPU 315-2 DP
- Complies with safety requirements up to SIL 3 to IEC 61508 and up to Cat. 4 according to EN 954-1
- Distributed fail-safe I/O modules can be connected through the integral PROFIBUS DP interface (PROFIsafe).
- Fail-safe I/O modules of the ET 200M range can also be centrally connected
- Central and distributed use of standard modules for non-safety-relevant applications

Micro Memory Card required for operation of CPU.

Application

The CPU 315F-2 DP permits the design of a fail-safe automation system for plants with increased safety requirements, especially for production engineering.

Distributed I/O stations containing fail-safe I/O modules can be connected through the integrated PROFIBUS DP interface. The fail-safe I/O modules of ET 200M can also be centrally implemented safety-related.

Safety-related communication between the F CPU and the fail-safe I/O modules is performed on the basis of the PROFIsafe profile.

Design

The CPU 315F-2 DP is equipped with the following:

- Microprocessor:
The processor achieves a processing time of 100 ns per binary instruction.
- Memory:
192 KB high-speed RAM for safety-relevant and standard program sections; increased memory space requirements must be expected (5 times larger) in the case of safety-relevant program sections. Of the 192 KB RAM, 128 KB data memory can be used for standard applications. Micro memory cards (max. 8 MB) as load memory for programs additionally permit storage of the project (including symbols and comments) in the CPU.
- Flexible expansion capability;
max. 31 modules, (4-tier installation)
- MPI multi-point interface;
The integrated MPI interface can build as many as 16 connections simultaneously to S7-300/400 or to PG, PC, OP. Among these connections, one is always reserved for PG and another for OP. The MPI makes it possible to set up a simple network with a maximum of 16 CPUs via "global data communication".

- PROFIBUS DP interface:
The CPU 315F-2 DP with PROFIBUS DP master/slave interface allows a distributed automation configuration offering high speed and ease of use. The distributed I/O is handled from the user's viewpoint in the same way as central I/O (configuring, addressing and programming are identical). Distributed I/O stations complete with fail-safe I/O modules can be connected through the integral PROFIBUS DP interface. The fail-safe I/O modules of ET200M can also be centrally implemented safety-related.
Safety-related communication between the F CPU and the fail-safe I/O modules is performed on the basis of the PROFIsafe profile.

Function

- Password protection;
A password concept also protects the user program from unauthorized access.
- Diagnostics buffer;
The last 100 errors and interrupt events are saved in a buffer for diagnostics purposes.
- Maintenance-free data back-up;
All standard data are automatically written onto the Micro Memory Card by the CPU if there is a power interruption, and are available unchanged following voltage recovery

Configurable attributes

STEP 7 can be used to parameterize both S7 configurations and the properties and responses of the CPUs:

- MPI multipoint interface;
Determination of node addresses.
- Restart/cycle time behavior;
Stipulation of maximum cycle time and loading as well as self-test functions
- Clock bit memory;
Address setting
- Protection level;
Definition of access rights to program and data.
- System diagnostics;
Definition of the handling and scope of diagnostics messages.
- Watchdog interrupts;
Setting of periodicity
- Time-of-day interrupts;
Setting of date and time of start and periodicity
- PROFIBUS DP master/slave interface;
User-oriented address allocation for distributed I/O

Indication and information functions

- Status and error indications;
LEDs indicate e.g. hardware, programming, time or I/O errors, as well as operating states such as RUN, STOP and restart
- Test functions;
The PG can be used to display signal states in program execution, modify process variables independently of the user program, and read out the contents of stack memories.
- Information functions;
You can use the PG to obtain information about the storage capacity and operating mode of the CPU as well as the current loading of the main and load memories as well as current cycle times and diagnostic buffer contents in plain text.

Integrated communication functions

- PG/OP communication
- Global data communication
- S7 basic communication
- S7 communication (server only)

Evaluating / Communication

CPU for factory automation

CPU 315F-2 DP

Communication

The safety-related communication and standard communication between the central controller and the distributed stations is conducted over PROFIBUS DP. The specially developed PROFIBUS profile *PROFIsafe* allows the transmission of user data associated with the safety function within the standard data telegram. Additional hardware components, e.g. special safety buses, are unnecessary. The required software is either integrated in the hardware components as an extension of the operating system, or must be loaded into the CPU as a certified software component.

Mode of operation

The safety functions of the F CPU are contained in the CPU's F program and in the fail-safe signal modules.

The signal modules monitor the output and input signals by means of discrepancy analyses and test signal injections.

The CPU monitors proper operation of the PLC by performing regular self-tests, instruction tests and logic and sequential program flow control. In addition, the I/O is checked by requesting signs of life.

If an error is diagnosed on the system, the latter is moved to a safe state.

An F runtime license is not required for operation of the S7-300F-2 DP.

Programming

The S7-300F is programmed in exactly the same way as the other SIMATIC S7 systems. The user program for non fail-safe plant sections is created with the proven programming tools such as STEP 7.

SIMATIC S7 Distributed Safety option package

The STEP 7 option package "S7 F Distributed Safety" is required to program the safety-relevant parts of the program. The package contains all the functions and blocks required to create the F program.

The F program with the safety functions is linked in F-FBD or F-LAD or using special function blocks from the F library. Use of F-FBD or F-LAD simplifies plant planning and programming and, because of the uniform and cross-vendor presentation, the acceptance test too. Programmers can concentrate completely on configuration of the safety-relevant application without having to use additional tools.

Technical specifications

6ES7 315-6FF01-0AB0	
Product status	
associated programming package	STEP 7 V5.2 SP1 or higher with HSP 0126
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Voltages and currents	
external protection for supply cables (recommendation)	min. 2 A
Current consumption	
Inrush current, typ.	2.5 A
I ² t	0.5 A ² s
Current consumption (in no-load operation), typ.	60 mA
Power loss, typ.	2.5 W

Memory	
Type of storage	
• RAM	
- integrated	192 KByte; The number of F-instructions compared to a standard program is limited due to the F-specific overheads; depending on the type of programming, about 36 K F-instructions are possible.
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
Backup	
• present	Yes; Guaranteed by MMC (maintenance-free)
CPU/blocks	
DB	
• Number, max.	1,023; DB 0 reserved
• Size, max.	16 KByte
FB	
• Number, max.	2,048; See Operation List
• Size, max.	16 KByte
FC	
• Number, max.	2,048; See Operation List
• Size, max.	16 KByte
OB	
• Size, max.	16 KByte
Nesting depth	
• per priority class	8
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.1 µs
for word operations, min.	0.2 µs
for fixed point arithmetic, min.	2 µs
for floating point arithmetic, min.	6 µs
Times/counters and their remanence	
S7 counter	
• Number	256
• of which remanent without battery	
- adjustable	Yes
• Counting range	
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	256
• Remanence	
- adjustable	Yes
- preset	No retentivity
• Time range	
- lower limit	10 ms

Evaluating / Communication

CPUs for factory automation

CPU 315F-2 DP

- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	2,048 Byte
• Remanence available	Yes; MB 0 to MB 2047
• Number of clock memories	8; 1 memory byte
Data blocks	
• Number, max.	1,023; DB 0 reserved
• Size, max.	16 KByte
Local data	
• per priority class, max.	1,024 Byte
Address area	
I/O address area	
• Inputs	2 KByte
• Outputs	2 KByte
• of which, distributed	
- Inputs	2 KByte
- Outputs	2 KByte
Process image	
• Inputs	384 Byte
• Outputs	384 Byte
Digital channels	
• Inputs	16,384
• Outputs	16,384
• Inputs, of which central	1,024
• Outputs, of which central	1,024
Analog channels	
• Inputs	1,024
• Outputs	1,024
• Inputs, of which central	256
• Outputs, of which central	256
Hardware config.	
Racks, max.	4
Modules per rack, max.	8
Number of DP masters	
• integrated	1
• via CP	1
Number of operable FMs and CPs (recommended)	
• FM	8
• CP, point-to-point	8
• CP, LAN	10
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Deviation per day, max.	10 s
Operating hours counter	
• Number	1
• Number/Number range	0

• Range of values	0 to 2 ³¹ hours (when using SFC 101)
• Granularity	1 hour
• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• in AS, Master	Yes
S7 message functions	
Number of login stations for message functions, max.	16; depending on the configured connections for PG/OP and S7 basic communication
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	40
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30
• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	Inputs, outputs
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	100
• adjustable	No
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
S5-compatible communication	
• supported	Yes; via CP and loadable FC
Number of connections	
• overall	16
• usable for PG communication	15
• usable for OP communication	15
• usable for S7 basic communication	12
1st interface	
Type of interface	Integral RS 485 interface

Evaluating / Communication CPUs for factory automation

CPU 315F-2 DP

Physics	RS 485
isolated	No
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	Yes
• DP master	No
• DP slave	No
• Point-to-point coupling	No
MPI	
• Number of connections	16
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	Yes; via CP and loadable FB
- S7 communication, as server	Yes
• Transmission speeds, max.	187.5 kBit/s
2nd interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	No
• DP master	Yes
• DP slave	Yes
• Point-to-point coupling	No
DP master	
• Number of connections, max.	16
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	No
- S7 communication	No
- equidistance support	Yes
- SYNC/FREEZE	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	125
• Address area	
- Inputs, max.	244 KByte
- Outputs, max.	244 KByte
DP slave	
• Number of connections	16
• Services	
- PG/OP communication	Yes
- Routing	Yes; with interface active
- Global data communication	No

- S7 basic communication	No
- S7 communication, as client	No
- S7 communication, as server	No
- direct data exchange (cross traffic)	Yes
- DPV1	No
• GSD file	http://www.ad.siemens.de/csi_e/gsd
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; V5.1 SP6 or higher
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
Software libraries	
Operational stacks	see instruction list
Nesting levels	8
User program protection/password protection	Yes
System functions (SFC)	see instruction list
System function blocks (SFB)	see instruction list
Dimensions	
Width	40 mm
Height	125 mm
Depth	130 mm
Weights	
Weight, approx.	290 g

Selection and Ordering Data

	Order No.
CPU 315F-2 DP	6ES7 315-6FF01-0AB0
CPU for SIMATIC S7-300F; main memory 192 KB, power supply 24 V DC, MPI/PROFIBUS DP master/slave interface, incl. single location number labels and 2 keys	
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Micro Memory Card	
64 KB	6ES7 953-8LF20-0AA0

Evaluating / Communication

CPUs for factory automation

CPU 315F-2 DP

	Order No.
128 KB	6ES7 953-8LG11-0AA0
512 KB	6ES7 953-8LJ20-0AA0
2 MB	6ES7 953-8LL20-0AA0
4 MB	6ES7 953-8LM20-0AA0
8 MB	6ES7 953-8LP20-0AA0
MPI cable For connecting SIMATIC S7 and the PG through MPI; 5 m in length	6ES7 901-0BF00-0AA0
Slot number plates	6ES7 912-0AA00-0AA0
S7-300 manual Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection Electronic manuals on DVD, multilingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	6ES7 998-8XC01-8YE0
SIMATIC Manual Collection update service for 1 year Current "Manual Collection" DVD and the three subsequent updates	6ES7 998-8XC01-8YE2
Power supply connector 10 units, spare part	6ES7 391-1AA00-0AA0
Labeling strips 10 units, spare part	6ES7 392-2XX00-0AA0
Label cover 10 units, spare part	6ES7 392-2XY00-0AA0
S7 SmartLabel Software for automatic labeling of modules based on data of the STEP 7 project	2XV9 450-1SL01-0YX0
Labeling sheets for machine inscription For 16-channel signal modules, DIN A4, for printing with laser printer; 10 units Petrol Light-beige Yellow Red For 32-channel signal modules, DIN A4, for printing with laser printer; 10 units Petrol Light-beige Yellow Red	 6ES7 392-2AX00-0AA0 6ES7 392-2BX00-0AA0 6ES7 392-2CX00-0AA0 6ES7 392-2DX00-0AA0 6ES7 392-2AX10-0AA0 6ES7 392-2BX10-0AA0 6ES7 392-2CX10-0AA0 6ES7 392-2DX10-0AA0

	Order No.
Manual "Communication for SIMATIC S7-300/-400" German English French Spanish Italian	6ES7 398-8EA00-8AA0 6ES7 398-8EA00-8BA0 6ES7 398-8EA00-8CA0 6ES7 398-8EA00-8DA0 6ES7 398-8EA00-8EA0
PROFIBUS DP bus connector RS 485 • With 90° cable outlet, max. transmission rate 12 Mbit/s - Without PG interface - With PG interface • With 90° cable outlet for Fast-Connect connection system, max. transmission rate 12 Mbit/s - Without PG interface - With PG interface • With axial cable outlet for SIMATIC OP, for connecting to PPI, MPI, PROFIBUS	 6ES7 972-0BA12-0XA0 6ES7 972-0BB12-0XA0 6ES7 972-0BA50-0XA0 6ES7 972-0BB50-0XA0 6GK1 500-0EA02
PROFIBUS Fast Connect bus cable Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	6XV1 830-0EH10
RS 485 repeater for PROFIBUS Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	6ES7 972-0AA01-0XA0
PROFIBUS bus components For establishing MPI/PROFIBUS communication	See Catalogs IK PI, CA 01

Evaluating / Communication CPUs for factory automation

CPU 315F-2 PN/DP

Overview



- For design of a fail-safe automation system for plants with increased safety requirements
- Complies with safety requirements up to SIL 3 to IEC 61508 and up to Cat. 4 according to EN 954-1
- Fail-safe I/O modules in distributed stations can be connected through the integrated PROFINET interface (PROFIsafe) and/or through the integrated PROFIBUS DP interface (PROFIsafe);
- Fail-safe I/O modules of the ET 200M range can also be centrally connected
- Central and distributed use of standard modules for non safety-relevant applications
- Component based Automation (CBA) on PROFINET
- PROFINET proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)

Micro Memory Card required for operation of CPU.

Application

The CPU 315F-2 PN/DP permits the design of a fail-safe automation system for plants with increased safety requirements, especially for production engineering.

It can be used as a PROFINET IO Controller and as a standard PROFIBUS DP master in SIMATIC S7-300. The CPU 315F-2 PN/DP can also be implemented as distributed intelligence (DP slave).

Distributed I/O stations containing fail-safe I/O modules can be connected through the two integrated interfaces. The fail-safe I/O modules of ET200M can also be centrally implemented safety-related.

Safety-related communication between the F CPU and the fail-safe I/O modules is performed on the basis of the PROFIsafe profile.

A Micro Memory Card is required for operation of the CPU.

Design

The CPU 315F-2 PN/DP is equipped with the following:

- Microprocessor:
the processor can handle an execution time of approximately 100 ns per binary instruction and 3 µs per floating-point operation.

- Memory:
256 KB high-speed RAM for safety-relevant and standard program sections; increased memory space requirements must be expected (5 times larger) if safety-relevant program sections are implemented. Micro memory cards (max. 8 MB) as load memories for programs additionally permit storage of the project (including symbols and comments) in the CPU.
- Flexible expansion capability;
max. 31 modules, (4-tier configuration)
- Combined MPI/DP interface;
the first MPI/DP integrated interface can establish as many as 16 connections simultaneously to S7-300/400 or connections to PG, PC, OP. Among these connections, one is always reserved for programming devices and another for OPs. A simple network with up to 32 CPUs can be configured with the MPI interfaces and "global data communication". The MPI interface can be reconfigured from an MPI to a DP interface. The DP interface can be used as a DP master or as a DP slave.
PROFIBUS DP interface:
The PROFIBUS DP V1 standard is fully supported. This increases the scope of DP V1 standard slaves in terms of diagnostics and parameterization capability.
- Ethernet interface;
the second integral interface of the CPU 315-2 PN/DP is a PROFINET interface based on Ethernet TCP/IP.
It supports the following protocols:
 - S7 communication for data communication between SIMATIC controllers;
 - PG/OP communication for programming, startup and diagnostics through STEP 7;
 - PG/OP communication for interfacing to HMI and SCADA;
 - Open TCP/IP communication over PROFINET and SIMATIC NET OPC server for communication with other controllers and I/O devices with a separate CPU.

Function

- Password protection;
A password concept also protects the user program from unauthorized access.
- Diagnostics buffer;
The last 100 errors and interrupt events are saved in a buffer for diagnostics purposes.
- Maintenance-free data backup;
The CPU automatically saves all data in case of power failure so that the data are available again unchanged when the power returns

Configurable attributes

STEP 7 can be used to parameterize both S7 configurations and the properties and responses of the CPUs:

- MPI multipoint interface;
Determination of node addresses.
- Restart/cycle time behavior;
Stipulation of maximum cycle time and loading.
- Clock bit memory;
Address setting.
- Protection level;
Definition of access rights to program and data.
- System diagnostics;
Definition of the handling and scope of diagnostics messages.
- Watchdog interrupts;
Setting of periodicity.
- Time-of-day interrupts;
Setting of date and time of start and periodicity.
- PROFIBUS DP master/slave interface;
User-oriented address allocation for distributed I/O.

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CPU 315F-2 PN/DP

Indication and information functions

- Status and error indications;
LEDs indicate e.g. hardware, programming, time, I/O or bus errors, as well as operating states such as RUN, STOP and re-start
- Test functions;
The PG can be used to display signal states in program execution, modify process variables independently of the user program, and read out the contents of stack memories.
- Information functions;
You can use the PG to obtain information about the storage capacity and operating mode of the CPU as well as the current loading of the main and load memories, current cycle times and diagnostic buffer contents in plain text.

Integrated communication functions

- PG/OP communication
- Global data communication
- S7 basic communication
- S7 communication
- Open communication by means of TCP/IP
- PROFINET CBA

Communication

The safety-related communication and standard communication between the central controller and the distributed stations is conducted over PROFIBUS DP and/or PROFINET. The specially developed profile PROFIsafe allows the transmission of user data associated with the safety function within the standard data telegram. Additional hardware components, e.g. special safety buses, are unnecessary. The required software is either integrated in the hardware components as an extension of the operating system, or must be loaded into the CPU as a certified software component.

Mode of operation

The safety functions of the F CPU are contained in the CPU's F program and in the fail-safe signal modules. The signal modules monitor the output and input signals by means of discrepancy analyses and test signal injections. The CPU checks proper operation of the PLC by performing regular self-tests, instruction tests and logic and sequential program flow control. In addition, the I/O is checked by requesting signs of life. If an error is diagnosed on the system, the latter is moved to a safe state. An F runtime license is not required for operation of the CPU 315F-2 PN/DP.

Programming

The CPU 315F-2 PN/DP is programmed in the same manner as other SIMATIC S7 systems. The user program for non fail-safe plant sections is created with the proven programming tools such as STEP 7.

SIMATIC S7 Distributed Safety option package

The STEP 7 option package "S7 F Distributed Safety" is required to program the safety-relevant parts of the program. The package contains all the functions and blocks required to create the F program.

The F program with the safety functions is linked in F-FBD or F-LAD or using special function blocks from the F library. Use of F-FBD or F-LAD simplifies plant planning and programming and, because of the uniform and cross-vendor presentation, the acceptance test too. Programmers can concentrate completely on configuration of the safety-relevant application without having to use additional tools.

Technical specifications

6ES7 315-2FH13-0AB0	
Product status	
associated programming package	STEP 7 V5.4 SP2 or higher S7 Distributed Safety V5.4 or higher
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Voltages and currents	
external protection for supply cables (recommendation)	min. 2 A
Current consumption	
Inrush current, typ.	2.5 A
I ² t	1 A ² s
Current consumption (in no-load operation), typ.	100 mA
Current consumption (rated value)	650 mA
Power loss, typ.	3.5 W
Memory	
Type of storage	
• RAM	
- integrated	256 KByte; For program and data
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
- expandable FEPRM	can be plugged in as MMC
Backup	
• present	Yes; Guaranteed by MMC (maintenance-free)
• without battery	Yes; Program and data
CPU/blocks	
DB	
• Number, max.	1,023; Number band: 1 to 1023
• Size, max.	16 KByte
FB	
• Number, max.	1,024; Sequence of numbers: 0 to 2047
• Size, max.	16 KByte
FC	
• Number, max.	1,024; Sequence of numbers: 0 to 2047
• Size, max.	16 KByte
OB	
• Size, max.	16 KByte
Nesting depth	
• per priority class	8
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.1 µs
for word operations, min.	0.2 µs
for fixed point arithmetic, min.	2 µs
for floating point arithmetic, min.	3 µs

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Times/counters and their remanence	
S7 counter	
• Number	256
• of which remanent without battery	
- adjustable	Yes
- lower limit	0
- upper limit	255
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	255
• Counting range	
- adjustable	Yes
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	256
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	255
- preset	No retentivity
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	2,048 Byte
• Remanence available	Yes; MB 0 to MB 2047
• Number of clock memories	8; 1 memory byte
Data blocks	
• Number, max.	1,023; From DB 1 to DB 1023
• Size, max.	16 KByte
• Remanence adjustable	Yes; via non-retain property on DB
• Remanence preset	yes
Local data	
• per priority class, max.	1,024 Byte; per block max. 510
Address area	
I/O address area	
• Inputs	2 KByte
• Outputs	2 KByte
• of which, distributed	
- Inputs	2 KByte
- Outputs	2 KByte
Process image	
• Inputs	384 Byte

• Outputs	384 Byte
Digital channels	
• Inputs	16,384
• Outputs	16,384
• Inputs, of which central	1,024; max.
• Outputs, of which central	1,024; max.
Analog channels	
• Inputs	1,024
• Outputs	1,024
• Inputs, of which central	256; max.
• Outputs, of which central	256; max.
Hardware config.	
Central devices, max.	1
Expansion devices, max.	3
Racks, max.	4
Modules per rack, max.	8
Number of DP masters	
• integrated	1
• via CP	4
Number of operable FMs and CPs (recommended)	
• FM	8
• CP, point-to-point	8
• CP, LAN	10
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Deviation per day, max.	10 s
Operating hours counter	
• Number	1
• Number/Number range	0
• Range of values	2 ³¹ hours (when using the SFC 101)
• Granularity	1 hour
• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• in AS, Master	Yes
• in AS, Slave	Yes
S7 message functions	
Number of login stations for message functions, max.	16; (depending on the configured connections for PG/OP and S7 basic communication)
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	40
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30

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• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	Inputs, outputs
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	100
• adjustable	No
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
S5-compatible communication	
• supported	Yes; via CP and loadable FC
Open IE communication	
• TCP/IP	Yes; via integrated PROFINET interface and loadable FBs
- Number of connections, max.	8
- Data length, max.	1,460 Byte
Number of connections	
• overall	16
• usable for PG communication	15; max.
• usable for OP communication	15
• usable for S7 basic communication	14
• usable for routing	X1 as MPI: max. 10; X1 as DP master: max. 24; X1 as DP slave (active): max. 14; X2 as PROFINET: max. 24
PROFINET CBA (at set setpoint communication load)	
• Setpoint for the CPU communication load	50%
• Number of remote interconnection partners	32
• Number of functions, master/slave	17
• Total of all master/slave connections	1,000
• Data length of all incoming connections master/slave, max.	4,000 Byte
• Data length of all outgoing connections master/slave, max.	4,000 Byte
• Number of device-internal and PROFIBUS interconnections	500
• Data length of device-internal and PROFIBUS interconnections, max.	4,000 Byte
• Data length per connection, max.	1,400 Byte
• Remote interconnections with acyclic transmission	

- Sampling frequency: sampling interval, min.	500 ms
- Number of incoming interconnections	100
- Number of outgoing interconnections	100
- Data length of all incoming interconnections, max.	2,000 Byte
- Data length of all outgoing interconnections, max.	2,000 Byte
- Data length per connection, max.	1,400 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	10 ms
- Number of incoming interconnections	200
- Number of outgoing interconnections	200
- Data length of all incoming interconnections, max.	2,000 Byte
- Data length of all outgoing interconnections, max.	2,000 Byte
- Data length per connection, max.	450 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	3; 2x PN OPC/1x iMap
- HMI variable updating	500 ms
- Number of HMI variables	200
- Data length of all HMI variables, max.	2,000 Byte
• PROFIBUS proxy functionality	
- supported	Yes
- Number of linked PROFIBUS devices	16
- Data length per connection, max.	240 Byte; Slave-dependent
PROFINET CBA (at 50 % communication load)	
• Data length for arrays and structures (local interconnection), max.	Slave-dependent
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	2 * PN OPC / 1 * iMap
1st interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes
• Point-to-point coupling	No
MPI	
• Number of connections	16

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CPU 315F-2 PN/DP

• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- SYNC/FREEZE	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
DP slave	
• Services	
- Routing	Yes; only with active interface
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32; with max. 32 bytes each
2nd interface	
Type of interface	PROFINET
Physics	Ethernet
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	0 mA
automatic detection of transmission speed	Yes; (10/100 Mbit/s)
Functionality	
• MPI	No
• DP master	No
• DP slave	No
• PROFINET IO controller	Yes
• PROFINET CBA	Yes

• Point-to-point coupling	No
PROFINET CBA	
• Acyclic transmission	Yes
• cyclic transmission	Yes
PROFINET IO controller	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- S7 communication	Yes; with loadable FBs, max. configurable connections: 14, max. number of instances: 32
- open IE communication	Yes; via TCP/IP
• Transmission speed, max.	100 Mbit/s
• Number of connectable IO-devices, max.	128
• Updating time	1 to 512 ms (minimum value depends on communication share set for PROFINET I/O, on the number of I/O devices and on the number of configured net data items)
• Address area	
- Inputs, max.	2 KByte
- Outputs, max.	2 KByte
• Useful data consistency, max.	256 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; V5.3 SP3 or higher with hardware update
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Software libraries	
Operational stocks	see instruction list
Nesting levels	8
User program protection/password protection	Yes
System functions (SFC)	see instruction list
System function blocks (SFB)	see instruction list
Dimensions	
Width	80 mm
Height	125 mm
Depth	130 mm
Weights	
Weight, approx.	460 g

Selection and Ordering Data

	Order No.
CPU 315F-2 PN/DP	6ES7 315-2EH13-0AB0

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CPU 315F-2 PN/DP

Order No.	
CPU for SIMATIC S7-300F; main memory 256 KB, power supply 24 V DC, MPI/PROFIBUS DP master/slave interface, Industrial Ethernet/PROFINET interface; incl. slot number labels	
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Micro Memory Card	
64 KB	6ES7 953-8LF20-0AA0
128 KB	6ES7 953-8LG11-0AA0
512 KB	6ES7 953-8LJ20-0AA0
2 MB	6ES7 953-8LL20-0AA0
4 MB	6ES7 953-8LM20-0AA0
8 MB	6ES7 953-8LP20-0AA0
MPI cable	6ES7 901-0BF00-0AA0
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	
Slot number plates	6ES7 912-0AA00-0AA0
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multilingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current "Manual Collection" DVD and the three subsequent updates	
Power supply connector	6ES7 391-1AA00-0AA0
10 units, spare part	
Labeling strips	6ES7 392-2XX00-0AA0
10 units, spare part	
Label cover	6ES7 392-2XY00-0AA0
10 units, spare part	
S7 SmartLabel	2XV9 450-1SL01-0YX0
Software for automatic labeling of modules based on data of the STEP 7 project	

Order No.	
Labeling sheets for machine inscription	
For 16-channel signal modules, DIN A4, for printing with laser printer;	
10 units	
petrol	6ES7 392-2AX00-0AA0
light-beige	6ES7 392-2BX00-0AA0
yellow	6ES7 392-2CX00-0AA0
red	6ES7 392-2DX00-0AA0
For 32-channel signal modules, DIN A4, for printing with laser printer;	
10 units	
petrol	6ES7 392-2AX10-0AA0
light-beige	6ES7 392-2BX10-0AA0
yellow	6ES7 392-2CX10-0AA0
red	6ES7 392-2DX10-0AA0
Manual "Communication for SIMATIC S7-300/-400"	
German	6ES7 398-8EA00-8AA0
English	6ES7 398-8EA00-8BA0
French	6ES7 398-8EA00-8CA0
Spanish	6ES7 398-8EA00-8DA0
Italian	6ES7 398-8EA00-8EA0
PROFIBUS DP bus connector RS 485	
• With 90° cable outlet, max. transmission rate 12 Mbit/s	
- Without PG interface	6ES7 972-0BA12-0XA0
- With PG interface	6ES7 972-0BB12-0XA0
• With 90° cable outlet for Fast-Connect connection system, max. transmission rate 12 Mbit/s	
- Without PG interface	6ES7 972-0BA50-0XA0
- With PG interface	6ES7 972-0BB50-0XA0
• With axial cable outlet for SIMATIC OP, for connecting to PPI, MPI, PROFIBUS	6GK1 500-0EA02
PROFIBUS Fast Connect bus cable	6XV1 830-0EH10
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	
RS 485 repeater for PROFIBUS	6ES7 972-0AA01-0XA0
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	
PROFIBUS bus components	See Catalogs IK PI, CA 01
For establishing MPI/PROFIBUS communication	

Evaluating / Communication CPUs for factory automation

CPU 317F-2 DP

Overview



- The fail-safe CPU with a large program memory and quantity framework for demanding applications
- For design of a fail-safe automation system for plants with increased safety requirements
- Complies with safety requirements up to SIL 3 to IEC 61508 and up to Cat. 4 according to EN 954-1
- Distributed fail-safe I/O modules can be connected through the two integral PROFIBUS DP interfaces (PROFIsafe).
- Fail-safe I/O modules of the ET 200M range can also be centrally connected
- Central and distributed use of standard modules for non safety-relevant applications

Micro Memory Card required for operation of CPU.

Application

The CPU 317F-2 DP permits the design of a fail-safe automation system for plants with increased safety requirements, especially for production engineering.

Distributed I/O stations containing fail-safe I/O modules can be connected through the two integrated PROFIBUS DP interfaces. The fail-safe I/O modules of ET 200M can also be centrally implemented safety-related.

Safety-related communication between the F CPU and the fail-safe I/O modules is performed on the basis of the PROFIsafe profile.

A Micro Memory Card is required for operation of the CPU.

Design

The CPU 317F-2 DP is equipped with the following:

- Microprocessor;
the processor achieves an execution time of approximately 100 ns per binary instruction and 2 µs per floating-point operation. The CPU 317F-2 DP is clearly superior in terms of processing speed, particularly where word or double-word commands and 32 bit fixed-point commands are concerned.
- Memory;
1024 KB high-speed RAM for safety-relevant and standard program sections; increased memory space requirements must be expected (5 times larger) if safety-relevant program sections are implemented. Micro Memory Cards (8 MB max.) as load memory for the program also allow the project to be stored in the CPU (complete with symbols and comments) and can be used for data archiving and recipe management.
- Flexible expansion;
up to 32 modules (four-tier configuration)

- Combined MPI/DP interface;
the first MPI/DP integrated interface can establish as many as 32 connections simultaneously to S7-300/400 or connections to programming device, PC, OP. Among these connections, one is always reserved for programming devices and another for OPs. A simple network with up to 32 CPUs can be configured with the MPI interfaces and "global data communication".
- The MPI interface can be reconfigured from an MPI to a DP interface. The DP interface can be used as a DP master or as a DP slave.
- PROFIBUS DP interface;
the second integrated interface of the CPU 317F-2 DP is a pure PROFIBUS DP interface that can be used as a DP master or as a DP slave. It allows a distributed automation configuration with high speeds and simple handling. From the user's point of view, the distributed I/Os are treated the same as central I/Os (identical configuration, addressing and programming).
The PROFIBUS DP V1 standard is supported in full. This increases the scope of DP V1 standard slaves in terms of diagnostics and parameterization capability.
Limitation: It is impossible to operate both interfaces simultaneously as slaves.

Distributed I/O stations containing fail-safe I/O modules can be connected through the two integrated PROFIBUS DP interfaces. The fail-safe I/O modules of ET 200M can also be installed in central and safety-related configurations. The fail-safe I/O modules of ET 200M can also be centrally implemented. Safety-related communication is performed over PROFIBUS DP with the PROFIsafe profile.

Function

- Password protection;
A password concept protects the user program from unauthorized access.
- Diagnostics buffer;
The last 100 errors and interrupt events are saved in a buffer for diagnostics purposes.
- Maintenance-free data backup;
The CPU automatically saves all data in case of power failure so that the data are available again unchanged when the power returns

Configurable attributes

STEP 7 can be used to parameterize both S7 configurations and the properties and responses of the CPUs:

- MPI multipoint interface;
Determination of node addresses.
- Restart/cycle time behavior;
Stipulation of maximum cycle time and loading.
- Clock bit memory;
Address setting
- Protection level;
Definition of access rights to program and data.
- System diagnostics;
Definition of the handling and scope of diagnostics messages.
- Watchdog interrupts;
Setting of periodicity
- Time-of-day interrupts;
Setting of date and time of start and periodicity
- PROFIBUS DP master/slave interface;
User-oriented address allocation for distributed I/O.

Indication and information functions

- Status and error indications;
LEDs indicate e.g. hardware, programming, time, I/O or bus errors, as well as operating states such as RUN, STOP and restart

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CPU 317F-2 DP

- Test functions;
The PG can be used to display signal states in program execution, modify process variables independently of the user program, and read out the contents of stack memories.
- Information functions;
You can use the PG to obtain information about the storage capacity and operating mode of the CPU as well as the current loading of the main and load memories, current cycle times and diagnostic buffer contents in plain text.

Integrated communication functions

- PG/OP communication
- Global data communication
- S7 basic communication
- S7 communication (server only)

Sequential function chart

The CPU provides many extensive system functions for diagnostics, parameterization, synchronization, alerting, time measurement, etc.

Details can be found in the manual.

Communication

The safety-related communication and standard communication between the central controller and the distributed stations is conducted over PROFIBUS DP. The specially developed PROFIBUS profile PROFIsafe allows the transmission of user data associated with the safety function within the standard data telegram. Additional hardware components, e.g. special safety buses, are unnecessary. The required software is either integrated in the hardware components as an extension of the operating system, or must be loaded into the CPU as a certified software component.

Mode of operation

The safety functions of the F CPU are contained in the CPU's F program and in the fail-safe signal modules. The signal modules monitor the output and input signals by means of discrepancy analyses and test signal injections. The CPU monitors proper operation of the PLC by performing regular self-tests, instruction tests and logic and sequential program flow control. In addition, the I/O is checked by requesting signs of life. If an error is diagnosed on the system, the latter is moved to a safe state. An F runtime license is not required for operation of the CPU 317F-2 DP.

Programming

The CPU 317F-2 DP is programmed in the same manner as other SIMATIC S7 systems. The user program for non fail-safe plant sections is created with the proven programming tools such as STEP 7.

SIMATIC S7 Distributed Safety option package

The "S7 F Distributed Safety" option package is required to program the safety-relevant parts of the program. The package contains all the functions and blocks required to create the F program. The F program with the safety functions is linked in F-FBD or F-LAD or using special function blocks from the F library. Use of F-FBD or F-LAD simplifies plant planning and programming and, because of the uniform and cross-vendor presentation, the acceptance test too. Programmers can concentrate completely on configuration of the safety-relevant application without having to use additional tools.

Technical specifications

6ES7 317-6FF03-0AB0	
Product status	
associated programming package	STEP 7 V5.2 SP1 with hardware update or higher; S7 Distributed Safety 5.2 SP1 or higher
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Voltages and currents	
external protection for supply cables (recommendation)	min. 2 A
Current consumption	
Inrush current, typ.	2.5 A
I ² t	1 A ² s
Current consumption (in no-load operation), typ.	100 mA
Power loss, typ.	4 W
Memory	
Type of storage	
• RAM	
- integrated	1,024 KByte
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
Backup	
• present	Yes; Guaranteed by MMC (maintenance-free)
• without battery	Yes; Program and data
CPU/blocks	
DB	
• Number, max.	2,047; Number band: 1 to 2047
• Size, max.	64 KByte
FB	
• Number, max.	2,048; Sequence of numbers: 0 to 2047
• Size, max.	64 KByte
FC	
• Number, max.	2,048; Sequence of numbers: 0 to 2047
• Size, max.	64 KByte
OB	
• Size, max.	64 KByte
Nesting depth	
• per priority class	16
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.05 µs
for word operations, min.	0.2 µs
for fixed point arithmetic, min.	0.2 µs
for floating point arithmetic, min.	1 µs

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 DP

Times/counters and their remanence	
S7 counter	
• Number	512
• of which remanent without battery	
- adjustable	Yes
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	511
• Counting range	
- adjustable	Yes
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	512
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	511
- preset	No retentivity
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	4,096 Byte
• Remanence available	Yes; MB 0 to MB 4095
• Number of clock memories	8; 1 memory byte
Data blocks	
• Number, max.	2,047; from DB 1 to DB 2047
• Size, max.	64 KByte
• Remanence adjustable	Yes; via non-retain property on DB
• Remanence preset	yes
Local data	
• per priority class, max.	1,024 Byte
Address area	
I/O address area	
• Inputs	8 KByte
• Outputs	8 KByte
• of which, distributed	
- Inputs	8 KByte
- Outputs	8 KByte
Process image	
• Inputs	1,024 Byte
• Outputs	1,024 Byte

Digital channels	
• Inputs	65,536
• Outputs	65,536
• Inputs, of which central	1,024
• Outputs, of which central	1,024
Analog channels	
• Inputs	4,096
• Outputs	4,096
• Inputs, of which central	256
• Outputs, of which central	256
Hardware config.	
Central devices, max.	1
Expansion devices, max.	3
Racks, max.	4
Modules per rack, max.	8
Number of DP masters	
• integrated	2
• via CP	4
Number of operable FMs and CPs (recommended)	
• FM	8
• CP, point-to-point	8
• CP, LAN	10
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Deviation per day, max.	10 s
Operating hours counter	
• Number	4
• Number/Number range	0 to 3
• Range of values	0 to 2 ³¹ hours (when using SFC 101)
• Granularity	1 hour
• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• in AS, Master	Yes
• in AS, Slave	Yes
S7 message functions	
Number of login stations for message functions, max.	32; depending on the configured connections for PG/OP and S7 basic communication
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	60
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30
• of which status variable, max.	30

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 DP

• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	Inputs, outputs
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	100
• adjustable	No
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
S5-compatible communication	
• supported	Yes; via CP and loadable FC
Number of connections	
• overall	32
• usable for PG communication	31
• usable for OP communication	31
• usable for S7 basic communication	30
• usable for routing	8
1st interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes
• Point-to-point coupling	No
MPI	
• Number of connections	32
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
• Transmission speeds, max.	12 Mbit/s

DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- SYNC/FREEZE	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
• Address area	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
DP slave	
• Services	
- Routing	Yes; only with active interface
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
2nd interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	No
• DP master	Yes
• DP slave	Yes
• Point-to-point coupling	No
DP master	
• Number of connections, max.	32
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes

Evaluating / Communication CPUs for factory automation

CPU 317F-2 DP

- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- SYNC/FREEZE	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
• Address area	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
DP slave	
• Number of connections	32
• Services	
- PG/OP communication	Yes
- Routing	Yes; with interface active
- Global data communication	No
- S7 basic communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• GSD file	http://www.ad.siemens.de/support in Product Support area
• Transmission speeds, max.	12 Mbit/s
• automatic baud rate search	Yes; only with passive interface
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; V5.2 SP1 or higher
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Software libraries	
Operational stocks	see instruction list
Nesting levels	8
User program protection/password protection	Yes
System functions (SFC)	see instruction list
System function blocks (SFB)	see instruction list
Dimensions	
Width	80 mm
Height	125 mm
Depth	130 mm
Weights	

Weight, approx. 460 g

Selection and Ordering Data

	Order No.
CPU 317F-2 DP	6ES7 317-6FF03-0AB0
Main memory 1024 KB, power supply 24 V DC, MPI/PROFIBUS DP master/slave interface, MMC required	
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Micro Memory Card	
64 KB	6ES7 953-8LF20-0AA0
128 KB	6ES7 953-8LG11-0AA0
512 KB	6ES7 953-8LJ20-0AA0
2 MB	6ES7 953-8LL20-0AA0
4 MB	6ES7 953-8LM20-0AA0
8 MB	6ES7 953-8LP20-0AA0
MPI cable	6ES7 901-0BF00-0AA0
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	
Slot number plates	6ES7 912-0AA00-0AA0
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multilingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current "Manual Collection" DVD and the three subsequent updates	
Power supply connector	6ES7 391-1AA00-0AA0
10 units, spare part	
Labeling strips	6ES7 392-2XX00-0AA0
10 units, spare part	
Label cover	6ES7 392-2XY00-0AA0

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 DP

Order No.	
10 units, spare part	
S7 SmartLabel	2XV9 450-1SL01-0YX0
Software for automatic labeling of modules based on data of the STEP 7 project	
Labeling sheets for machine inscription	
For 16-channel signal modules, DIN A4, for printing with laser printer;	
10 units	
petrol	6ES7 392-2AX00-0AA0
light-beige	6ES7 392-2BX00-0AA0
yellow	6ES7 392-2CX00-0AA0
red	6ES7 392-2DX00-0AA0
For 32-channel signal modules, DIN A4, for printing with laser printer;	
10 units	
petrol	6ES7 392-2AX10-0AA0
light-beige	6ES7 392-2BX10-0AA0
yellow	6ES7 392-2CX10-0AA0
red	6ES7 392-2DX10-0AA0
Manual "Communication for SIMATIC S7-300/-400"	
German	6ES7 398-8EA00-8AA0
English	6ES7 398-8EA00-8BA0
French	6ES7 398-8EA00-8CA0
Spanish	6ES7 398-8EA00-8DA0
Italian	6ES7 398-8EA00-8EA0
PROFIBUS DP bus connector RS 485	
- With 90° cable outlet, max. transmission rate 12 Mbit/s - Without PG interface 6ES7 972-0BA12-0XA0 - With PG interface 6ES7 972-0BB12-0XA0 - With 90° cable outlet for Fast-Connect connection system, max. transmission rate 12 Mbit/s - Without PG interface 6ES7 972-0BA50-0XA0 - With PG interface 6ES7 972-0BB50-0XA0 - With axial cable outlet for SIMATIC OP, for connecting to PPI, MPI, PROFIBUS 6GK1 500-0EA02	
PROFIBUS Fast Connect bus cable	6XV1 830-0EH10
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	
RS 485 repeater for PROFIBUS	6ES7 972-0AA01-0XA0
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	
PROFIBUS bus components	See Catalogs IK PI, CA 01
For establishing MPI/PROFIBUS communication	

Evaluating / Communication CPUs for factory automation

CPU 317F-2 PN/DP

Overview



- The fail-safe CPU with a large program memory and quantity framework for demanding applications
- For design of a fail-safe automation system for plants with increased safety requirements
- Complies with safety requirements up to SIL 3 to IEC 61508 and up to Cat. 4 according to EN 954-1
- Fail-safe I/O modules in distributed stations can be connected through the integrated PROFINET interface (PROFIsafe) and/or through the integrated PROFIBUS DP interface (PROFIsafe)
- Fail-safe I/O modules of the ET 200M range can also be centrally connected
- Central and distributed use of standard modules for non safety-relevant applications
- Component Based Automation (CBA) on PROFINET
- PROFINET proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)

Micro Memory Card required for operation of CPU.

Application

The CPU 317F-2 PN/DP permits the design of a more extensive fail-safe automation system for plants with increased safety requirements, especially for production engineering.

It can be used as a PROFINET IO Controller and as a standard PROFIBUS DP master in SIMATIC S7-300. The CPU 317F-2 PN/DP can also be implemented as distributed intelligence (DP slave).

Distributed I/O stations containing fail-safe I/O modules can be connected through the two integrated interfaces. The fail-safe I/O modules of ET200M can also be centrally implemented safety-related.

Safety-related communication between the F CPU and the fail-safe I/O modules is performed on the basis of the PROFIsafe profile.

A Micro Memory Card is required for operation of the CPU.

Design

The CPU 317F-2 PN/DP is equipped with the following:

- Microprocessor:
the processor achieves an execution time of approximately 100 ns per binary instruction and 3 µs per floating-point operation.

- Memory:
1024 KB high-speed RAM for safety-relevant and standard program sections; increased memory space requirements must be expected (5 times larger) if safety-relevant program sections are implemented. Micro memory cards (max. 8 MB) as load memories for programs additionally permit storage of the project (including symbols and comments) in the CPU.
- Flexible expansion capability;
max. 32 modules, (4-tier configuration)
- Combined MPI/DP interface;
the first MPI/DP integrated interface can establish as many as 16 connections simultaneously to S7-300/400 or connections to PG, PC, OP. Of the connections, one is permanently reserved for programming devices and one for OPs. The MPI supports simple networking of up to 32 CPUs over "Global data communication".
This interface can be reconfigured from MPI interface to DP interface. The DP interface can be used as a DP master or as a DP slave.
PROFIBUS DP interface:
The PROFIBUS DP V1 standard is fully supported. This increases the scope of DP V1 standard slaves in terms of diagnostics and parameterization capability.
- Ethernet interface;
the second integrated interface of the CPU 317F-2 PN/DP is a PROFINET interface based on Ethernet TCP/IP. It supports the following protocols:
 - S7 communication for data communication between SIMATIC controllers;
 - PG/OP communication for programming, startup and diagnostics through STEP 7;
 - PG/OP communication for interfacing to HMI and SCADA;
 - Open TCP/IP communication over PROFINET and SIMATIC NET OPC server for communication with other controllers and I/O devices with a separate CPU.

Function

- Password protection;
A password concept also protects the user program from unauthorized access.
- Diagnostics buffer;
The last 100 errors and interrupt events are saved in a buffer for diagnostics purposes.
- Maintenance-free data backup;
The CPU automatically saves all data in case of power failure so that the data are available again unchanged when the power returns

Configurable attributes

STEP 7 can be used to parameterize both S7 configurations and the properties and responses of the CPUs:

- MPI multipoint interface;
Determination of node addresses.
- Restart/cycle time behavior;
Stipulation of maximum cycle time and loading.
- Clock bit memory;
Address setting.
- Protection level;
Definition of access rights to program and data.
- System diagnostics;
Definition of the handling and scope of diagnostics messages.
- Watchdog interrupts;
Setting of periodicity.
- Time-of-day interrupts;
Setting of date and time of start and periodicity.
- PROFIBUS DP master/slave interface;
User-oriented address allocation for distributed I/O.

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 PN/DP

Indication and information functions

- Status and error indications;
LEDs indicate e.g. hardware, programming, time, I/O or bus errors, as well as operating states such as RUN, STOP and re-start
- Test functions;
The PG can be used to display signal states in program execution, modify process variables independently of the user program, and read out the contents of stack memories.
- Information functions;
You can use the PG to obtain information about the storage capacity and operating mode of the CPU as well as the current loading of the main and load memories, current cycle times and diagnostic buffer contents in plain text.

Integrated communication functions

- PG/OP communication
- Global data communication
- S7 basic communication
- S7 communication
- Open communication by means of TCP/IP
- PROFINET CBA

Communication

The safety-related communication and standard communication between the central controller and the distributed stations is conducted over PROFIBUS DP and/or PROFINET. The specially developed profile PROFIsafe allows the transmission of user data associated with the safety function within the standard data telegram. Additional hardware components, e.g. special safety buses, are unnecessary. The required software is either integrated in the hardware components as an extension of the operating system, or must be loaded into the CPU as a certified software component.

Mode of operation

The safety functions of the F CPU are contained in the CPU's F program and in the fail-safe signal modules. The signal modules monitor the output and input signals by means of discrepancy analyses and test signal injections.

The CPU checks proper operation of the PLC by performing regular self-tests, instruction tests and logic and sequential program flow control. In addition, the I/O is checked by requesting signs of life.

If an error is diagnosed on the system, the latter is moved to a safe state.

An F runtime license is not required for operation of the CPU 317F-2 PN/DP.

Programming

The CPU 317F-2 PN/DP is programmed in the same manner as other SIMATIC S7 systems. The user program for non fail-safe plant sections is created with the proven programming tools such as STEP 7.

SIMATIC S7 Distributed Safety option package

The STEP 7 option package "S7 F Distributed Safety" is required to program the safety-relevant parts of the program. The package contains all the functions and blocks required to create the F program.

The F program with the safety functions is linked in F-FBD or F-LAD or using special function blocks from the F library. Use of F-FBD or F-LAD simplifies plant planning and programming and, because of the uniform and cross-vendor presentation, the acceptance test too. Programmers can concentrate completely on configuration of the safety-relevant application without having to use additional tools.

Technical specifications

6ES7 317-2FK13-0AB0	
Product status	
associated programming package	STEP 7 V5.4 SP2 or higher, S7 Distributed Safety V5.4 or higher
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Voltages and currents	
external protection for supply cables (recommendation)	min. 2 A
Current consumption	
Inrush current, typ.	2.5 A
I ² t	1 A ² s
Current consumption (in no-load operation), typ.	100 mA
Current consumption (rated value)	650 mA
Power loss, typ.	3.5 W
Memory	
Type of storage	
• RAM	
- integrated	1 MByte; For program and data
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
Backup	
• present	Yes; Guaranteed by MMC (maintenance-free)
• without battery	Yes; Program and data
CPU/blocks	
DB	
• Number, max.	2,047; Number band: 1 to 2047
• Size, max.	64 KByte
FB	
• Number, max.	2,048; Sequence of numbers: 0 to 2047
• Size, max.	64 KByte
FC	
• Number, max.	2,048; Sequence of numbers: 0 to 2047
• Size, max.	64 KByte
OB	
• Size, max.	64 KByte
Nesting depth	
• per priority class	16
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.05 µs
for word operations, min.	0.2 µs
for fixed point arithmetic, min.	0.2 µs
for floating point arithmetic, min.	1 µs

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 PN/DP

Times/counters and their remanence	
S7 counter	
• Number	512
• of which remanent without battery	
- adjustable	Yes
- lower limit	0
- upper limit	511
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	511
• Counting range	
- adjustable	Yes
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	512
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	511
- preset	No retentivity
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	4,096 Byte
• Remanence available	Yes; MB 0 to MB 4095
• Number of clock memories	8; 1 memory byte
Data blocks	
• Number, max.	2,047; from DB 1 to DB 2047
• Size, max.	64 KByte
• Remanence adjustable	Yes; via non-retain property on DB
• Remanence preset	yes
Local data	
• per priority class, max.	1,024 Byte
Address area	
I/O address area	
• Inputs	8 KByte
• Outputs	8 KByte
• of which, distributed	
- Inputs	8 KByte
- Outputs	8 KByte
Process image	
• Inputs	2,048 Byte

• Outputs	2,048 Byte
• Inputs, adjustable	2,048 Byte
• Outputs, adjustable	2,048 Byte
• Inputs, preset	1,024 Byte
• Outputs, preset	1,024 Byte
Digital channels	
• Inputs	65,536
• Outputs	65,536
• Inputs, of which central	1,024
• Outputs, of which central	1,024
Analog channels	
• Inputs	4,096
• Outputs	4,096
• Inputs, of which central	256
• Outputs, of which central	256
Hardware config.	
Central devices, max.	1
Expansion devices, max.	3
Racks, max.	4
Modules per rack, max.	8
Number of DP masters	
• integrated	1
• via CP	4
Number of operable FMs and CPs (recommended)	
• FM	8
• CP, point-to-point	8
• CP, LAN	10
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Deviation per day, max.	10 s
Operating hours counter	
• Number	4
• Number/Number range	0 to 3
• Range of values	0 to 2 ³¹ hours (when using SFC 101)
• Granularity	1 hour
• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• in AS, Master	Yes
• in AS, Slave	Yes
S7 message functions	
Number of login stations for message functions, max.	32; depending on the configured connections for PG/OP and S7 basic communication
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	60

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 PN/DP

Test commissioning functions

Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30
• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	Inputs, outputs
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	100
• adjustable	No
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
S5-compatible communication	
• supported	Yes; via CP and loadable FC
Open IE communication	
• TCP/IP	Yes; via integrated PROFINET interface and loadable FBs
- Number of connections, max.	8
- Data length, max.	1,460 Byte
Number of connections	
• overall	32
• usable for PG communication	31
• usable for OP communication	31
• usable for S7 basic communication	30
PROFINET CBA (at set setpoint communication load)	
• Setpoint for the CPU communication load	50%
• Number of remote interconnection partners	32
• Number of functions, master/slave	17
• Total of all master/slave connections	1,000
• Data length of all incoming connections master/slave, max.	4,000 Byte
• Data length of all outgoing connections master/slave, max.	4,000 Byte
• Number of device-internal and PROFIBUS interconnections	500

• Data length of device-internal and PROFIBUS interconnections, max.	4,000 Byte
• Data length per connection, max.	1,400 Byte
• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	500 ms
- Number of incoming interconnections	100
- Number of outgoing interconnections	100
- Data length of all incoming interconnections, max.	2,000 Byte
- Data length of all outgoing interconnections, max.	2,000 Byte
- Data length per connection, max.	1,400 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	10 ms
- Number of incoming interconnections	200
- Number of outgoing interconnections	200
- Data length of all incoming interconnections, max.	2,000 Byte
- Data length of all outgoing interconnections, max.	2,000 Byte
- Data length per connection, max.	450 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	3; 2x PN OPC/1x iMap
- HMI variable updating	500 ms
- Number of HMI variables	200
- Data length of all HMI variables, max.	2,000 Byte
• PROFIBUS proxy functionality	
- supported	Yes
- Number of linked PROFIBUS devices	16
- Data length per connection, max.	240 Byte; Slave-dependent
PROFINET CBA (at 50 % communication load)	
• Data length for arrays and structures (local interconnection), max.	Slave-dependent
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	2 * PN OPC / 1 * iMap
1st interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	Yes
• DP master	Yes

Evaluating / Communication CPUs for factory automation

CPU 317F-2 PN/DP

• DP slave	Yes
• Point-to-point coupling	No
MPI	
• Number of connections	16
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- SYNC/FREEZE	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
DP slave	
• Services	
- Routing	Yes; with interface active
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
2nd interface	
Type of interface	PROFINET
Physics	Ethernet
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	0 mA
automatic detection of transmission speed	Yes; (10/100 Mbit/s)
Functionality	

• MPI	No
• DP master	No
• DP slave	No
• PROFINET IO controller	Yes; Firmware Status V2.3 or higher
• PROFINET CBA	Yes
• Point-to-point coupling	No
PROFINET CBA	
• Acyclic transmission	Yes
• cyclic transmission	Yes
PROFINET IO controller	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- S7 communication	Yes; with loadable FBs, max. configurable connections: 16, max. number of instances: 32
- open IE communication	Yes; via TCP/IP
• Transmission speed, max.	100 Mbit/s
• Number of connectable IO-devices, max.	128
• Updating time	1 to 512 ms (minimum value depends on communication share set for PROFINET I/O, on the number of I/O devices and on the number of configured net data items)
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data consistency, max.	256 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; V5.3 SP3 or higher with hardware update
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Software libraries	
Operational stocks	see instruction list
Nesting levels	8
User program protection/password protection	Yes
System functions (SFC)	see instruction list
System function blocks (SFB)	see instruction list
Dimensions	
Width	80 mm
Height	125 mm
Depth	130 mm
Weights	
Weight, approx.	460 g

Evaluating / Communication

CPUs for factory automation

CPU 317F-2 PN/DP

Selection and Ordering Data

	Order No.
CPU 317F-2 PN/DP	6ES7 317-2EH13-0AB0
Main memory 1024 KB, 24 V DC supply voltage, MPI/PROFIBUS DP master/slave interface, Industrial Ethernet/PROFINET interface; MMC required	
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Micro Memory Card	
64 KB	6ES7 953-8LF20-0AA0
128 KB	6ES7 953-8LG11-0AA0
512 KB	6ES7 953-8LJ20-0AA0
2 MB	6ES7 953-8LL20-0AA0
4 MB	6ES7 953-8LM20-0AA0
8 MB	6ES7 953-8LP20-0AA0
MPI cable	6ES7 901-0BF00-0AA0
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	
Slot number plates	6ES7 912-0AA00-0AA0
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multilingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current "Manual Collection" DVD and the three subsequent updates	
Power supply connector	6ES7 391-1AA00-0AA0
10 units, spare part	
Labeling strips	6ES7 392-2XX00-0AA0
10 units, spare part	
Label cover	6ES7 392-2XY00-0AA0
10 units, spare part	
S7 SmartLabel	2XV9 450-1SL01-0YX0

	Order No.
Software for automatic labeling of modules based on data of the STEP 7 project	
Labeling sheets for machine inscription	
For 16-channel signal modules, DIN A4, for printing with laser printer;	
10 units	
petrol	6ES7 392-2AX00-0AA0
light-beige	6ES7 392-2BX00-0AA0
yellow	6ES7 392-2CX00-0AA0
red	6ES7 392-2DX00-0AA0
For 32-channel signal modules, DIN A4, for printing with laser printer;	
10 units	
petrol	6ES7 392-2AX10-0AA0
light-beige	6ES7 392-2BX10-0AA0
yellow	6ES7 392-2CX10-0AA0
red	6ES7 392-2DX10-0AA0
Manual "Communication for SIMATIC S7-300/-400"	
German	6ES7 398-8EA00-8AA0
English	6ES7 398-8EA00-8BA0
French	6ES7 398-8EA00-8CA0
Spanish	6ES7 398-8EA00-8DA0
Italian	6ES7 398-8EA00-8EA0
PROFIBUS DP bus connector RS 485	
- With 90° cable outlet, max. transmission rate 12 Mbit/s - Without PG interface - With PG interface - With 90° cable outlet for Fast-Connect connection system, max. transmission rate 12 Mbit/s - Without PG interface - With PG interface - With axial cable outlet for SIMATIC OP, for connecting to PPI, MPI, PROFIBUS	6ES7 972-0BA12-0XA0 6ES7 972-0BB12-0XA0 6ES7 972-0BA50-0XA0 6ES7 972-0BB50-0XA0 6GK1 500-0EA02
PROFIBUS Fast Connect bus cable	6XV1 830-0EH10
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	
RS 485 repeater for PROFIBUS	6ES7 972-0AA01-0XA0
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	
PROFIBUS bus components	See Catalogs IK PI, CA 01
For establishing MPI/PROFIBUS communication	

Evaluating / Communication CPUs for factory automation

CPU 319F-3 PN/DP

Overview



- The fail-safe CPU with high-performance command processing, large program memory and large quantity structure for demanding applications
- For constructing a fail-safe automation system for plants with increased safety requirements
- Satisfies safety requirements up to SIL 3 acc. to IEC 61508 and up to Cat. 4 acc. to EN 954-1
- Fail-safe I/O modules can be connected decentralized over the integrated PROFINET interface (PROFIsafe) and/or over the integrated PROFIBUS DP interface (PROFIsafe)
- Fail-safe I/O modules of ET200M can also be connected centrally
- Standard modules for non-safety-related applications can be operated centrally and decentralized
- Distributed intelligence in Component Based Automation (CBA) on PROFINET
- Isochronous mode on PROFIBUS
- PROFINET proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)

For operation of the CPU, a micro memory card is required.

Application

The CPU 319F-3 PN/DP is the fastest S7-300 CPU with a large program memory. It is ideally suited to plants with extensive automation tasks and stringent safety requirements.

It can be used as a PROFINET IO controller and as a standard PROFIBUS DP master in the SIMATIC S7-300. The CPU 319F-3 PN/DP can also be used as distributed intelligence (DP slave).

Distributed I/O devices with fail-safe I/O modules can be connected over the three integrated interfaces. The fail-safe I/O modules of the ET200M can also be used centrally for safety-related applications.

The integrated communication options of the CPU support networked automation solutions (also fail-safe) without the need for additional components.

Design

The CPU 319F-3 PN/DP features:

- High command processing and communication performance

- 1.4 MB working memory; the extensive working memory for runtime-relevant program sections offers sufficient space for user programs. In the case of safety-related program sections, increased memory requirements (5 times larger) must be expected. Micro memory cards (8 MB max.) as load memory for the program also allow the project to be stored in the CPU (complete with symbols and comments) and can be used for data archiving and recipe management.
- Flexible expansion capability; max. 32 modules (4-tier configuration)
- Combined MPI/DP interface; the first integrated MPI/DP interface can establish up to 32 connections simultaneously to the S7-300/400 or connections to PGs, PCs and OPs. One of the connections is permanently reserved for the PG and one for the OP. With MPI, a simple network can be constructed with up to 32 CPUs using "global data communication". This interface can be reconfigured from an MPI to a DP interface. The DP interface can be used as a DP master or as a DP slave. PROFIBUS DP interface: The PROFIBUS DP V1 standard is supported in full. This enhances the diagnostics and parameterization capability of DP V1 standard slaves.
- DP interface; the second integrated DP interface can establish up to 32 connections simultaneously to the S7-300/400 or connections to PGs, PCs and OPs. One of the connections is permanently reserved for the PG and one for the OP. The DP interface can also be used as a DP master or as a DP slave. PROFIBUS DP slaves can be operated isochronously on this interface. The PROFIBUS DP V1 standard is supported in full. This enhances the diagnostics and parameterization capability of DP V1 standard slaves.
- Ethernet interface; the third integrated interface of the CPU 319F-3 PN/DP is a PROFINET interface based on Ethernet TCP/IP. It supports the following protocols:
 - S7 communication for the exchange of data between SIMATIC controllers
 - PG/OP communication for programming, start-up and diagnostics through STEP 7
 - PG/OP communication for connection to HMI and SCADA
 - Open TCP/IP, UDP and ISO-on-TCP (RFC1006) communication over PROFINET
 - SIMATIC NET OPC server for communication with other controllers and I/O devices with an integrated CPU

Function

- Password protection; a password concept protects the user program from unauthorized access.
- Diagnostics buffer; the last 100 error and interrupt events are stored in a buffer for diagnostic purposes.
- Maintenance-free data back-up; all data (up to 700 KB) are automatically backed up by the CPU if the voltage is interrupted and are available unchanged after the voltage has been reconnected.

Parameterizable properties

The S7 configuration as well as the properties and response of the CPUs can be parameterized using STEP 7:

- MPI multipoint interface; determining station addresses
- Start-up/cyclic response; determining maximum cycle time and loading
- Isochronous interrupts; setting of DP master system, partial process image number and delay time

Evaluating / Communication

CPUs for factory automation

CPU 319F-3 PN/DP

- Clock bit memory; setting of addresses
- Retentivity; setting of retentive areas
- Clock interrupts; setting of start date, start time and periodicity
- Watchdog interrupts; setting of periodicity
- System diagnostics; determining handling and scope of the diagnostic alarms
- Clock; setting the type of synchronization in the AS or on the MPI
- Protection level; specifying the access rights to program and data
- Operation; selection of either test operation or process operation
- Communication; reserving the connection resources
- PROFIBUS DP master/slave interfaces; user-oriented address assignment for distributed I/O
- PROFINET interface; parameterization of time synchronization with NTP procedure

Information and display functions

- Status and error indications; LEDs indicate hardware, programming, time, I/O and bus errors and operating statuses such as RUN, STOP and starting.
- Test functions; the PG is used to indicate signal status during program execution, to modify process variables independently of the user program and to output the contents of stack memories.
- Information functions; the PG can be used to obtain information about the memory capacity and operating mode of the CPU, the current loading of the work and load memory, current cycle times and diagnostics buffer content in plain text.

Integrated communication functions

- PG/OP communication
- Global data communication
- S7 basic communication
- S7 communication
- S5-compatible communication
- Routing
- PROFIBUS DP master/slave
- Open communication over TCP/IP, UDP and ISO-on-TCP (RFC1006)
- PROFINET IO controller
- PROFINET CBA
- System functions; the CPU offers a number of comprehensive system functions for diagnosis, parameterization, synchronization, interrupts, time measurement, etc. Further details can be found in the manual.

Communication

The safety related and standard communication between the central controller and the distributed stations takes place over PROFIBUS DP and/or PROFINET. The specially developed PROFIsafe profile supports the transfer of user data for the safety functions within the standard data message frame. Additional hardware components, e.g. special safety buses are not required. The necessary software is either integrated in the hardware components as an expansion of the operating system or loaded into the CPU later as a certified software block.

Mode of operation

The safety functions of the F-CPU are included in the F program of the CPU and in the fail-safe signal modules. The signal modules monitor the output and input signals by means of discrepancy analysis and the injection of test signals.

The CPU checks the proper operation of the controller by means of periodic self-tests, command tests and logic-based and time-based program execution checks. Furthermore, the I/O is checked using requests for signs of life.

If an error is diagnosed in the system, the system will be placed in a safe state.

An F runtime license is not required to operate the CPU 319F-3 PN/DP.

Programming

The CPU 319F-3 PN/DP is programmed in the same manner as the other SIMATIC S7 systems. The user program for non-fail-safe plant sections is created using familiar programming tools, e.g. STEP 7.

SIMATIC S7 Distributed Safety option package

The STEP 7 option package "SIMATIC S7 Distributed Safety" is required for programming the safety-related program components. The package contains all the functions and blocks required to create an F program.

The F program with the safety functions is connected in F FBD or F LAD or using special functions from the F library. Use of F FBD or F LAD simplifies configuration and programming of the plant and also acceptance testing thanks to the non-plant-specific uniform presentation form. The programmer can concentrate on configuration of the safety-related application without the need to use additional tools.

Technical specifications

6ES7 318-3FL00-0AB0	
Product status	
associated programming package	STEP 7 V5.4 or higher, Service Pack 2 with HSP 143
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Voltages and currents	
external protection for supply cables (recommendation)	min. 2 A
Current consumption	
Inrush current, typ.	4 A
I ² t	1.2 A²s
Current consumption (in no-load operation), typ.	400 mA
Current consumption (rated value)	1,050 mA
Power loss, typ.	14 W
Memory	
Type of storage	
• RAM	
- integrated	1,400 KByte
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte

Evaluating / Communication CPUs for factory automation

CPU 319F-3 PN/DP

Backup	
• present	Yes; up to 700 KB, maintenance-free
• without battery	Yes; Program and data
CPU/blocks	
DB	
• Number, max.	4,095; DB 0 reserved
• Size, max.	64 KByte
FB	
• Number, max.	2,048; from FB 0 to FB 2047
• Size, max.	64 KByte
FC	
• Number, max.	2,048; from FC 0 to FC 2047
• Size, max.	64 KByte
OB	
• Size, max.	64 KByte
Nesting depth	
• per priority class	16
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.01 µs
for word operations, min.	0.02 µs
for fixed point arithmetic, min.	0.02 µs
for floating point arithmetic, min.	0.1 µs
Times/counters and their remanence	
S7 counter	
• Number	2,048
• Remanence	
- adjustable	Yes
• Counting range	
- adjustable	Yes
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	2,048
• Remanence	
- adjustable	Yes
- preset	No retentivity
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	8 KByte
• Remanence available	Yes; MB 0 to MB 8191
• Number of clock memories	8; 1 memory byte

Data blocks	
• Number, max.	4,095; from DB 1 to DB 4095
• Size, max.	64 KByte
• Remanence adjustable	Yes; via non-retain property on DB
• Remanence preset	yes
Local data	
• per priority class, max.	1,024 Byte
Address area	
I/O address area	
• Inputs	8 KByte
• Outputs	8 KByte
• of which, distributed	
- Inputs	8 KByte
- Outputs	8 KByte
Process image	
• Inputs, adjustable	2 KByte
• Outputs, adjustable	2 KByte
• Inputs, preset	1,024 Byte
• Outputs, preset	1,024 Byte
Subprocess images	
• Number of subprocess images, max.	1
Digital channels	
• Inputs	65,536
• Outputs	65,536
• Inputs, of which central	1,024
• Outputs, of which central	1,024
Analog channels	
• Inputs	4,096
• Outputs	4,096
• Inputs, of which central	256
• Outputs, of which central	256
Hardware config.	
Racks, max.	4
Modules per rack, max.	8
Number of DP masters	
• integrated	2
• via CP	4
Number of operable FMs and CPs (recommended)	
• FM	8
• CP, point-to-point	8
• CP, LAN	10
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Deviation per day, max.	10 s
Operating hours counter	
• Number	4
• Number/Number range	0 to 3
• Range of values	0 to 2 ³¹ hours (when using SFC 101)
• Granularity	1 hour

Evaluating / Communication

CPUs for factory automation

CPU 319F-3 PN/DP

• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• to DP, Master	Yes
• to DP, Slave	Yes; on DP slave only time-of-day slave
• in AS, Master	Yes
• in AS, Slave	Yes
• on Ethernet via NTP	Yes; as client
S7 message functions	
Number of login stations for message functions, max.	32; depending on the configured connections for PG/OP and S7 basic communication
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	60
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30
• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	Inputs, outputs
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	500
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
S5-compatible communication	
• supported	Yes; via CP and loadable FC
Open IE communication	
• TCP/IP	Yes; via integrated PROFINET interface and loadable FBs
- Number of connections, max.	8
- Data length, max.	1,460 Byte
• ISO-on-TCP (RFC1006)	Yes; via integrated PROFINET interface and loadable FBs

- Number of connections, max.	8
- Data length, max.	8,192 Byte
• UDP	Yes; via integrated PROFINET interface and loadable FBs
- Number of connections, max.	8
- Data length, max.	1,472 Byte
Number of connections	
• overall	32
• usable for PG communication	31
• usable for OP communication	31
• usable for S7 basic communication	30
PROFINET CBA (at set setpoint communication load)	
• Setpoint for the CPU communication load	20%
• Number of remote interconnection partners	32
• Number of functions, master/slave	50
• Total of all master/slave connections	3,000
• Data length of all incoming connections master/slave, max.	24,000 Byte
• Data length of all outgoing connections master/slave, max.	24,000 Byte
• Number of device-internal and PROFIBUS interconnections	1,000
• Data length of device-internal and PROFIBUS interconnections, max.	8,000 Byte
• Data length per connection, max.	1,400 Byte
• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	200 ms
- Number of incoming interconnections	100
- Number of outgoing interconnections	100
- Data length of all incoming interconnections, max.	3,200 Byte
- Data length of all outgoing interconnections, max.	3,200 Byte
- Data length per connection, max.	1,400 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	1 ms
- Number of incoming interconnections	300
- Number of outgoing interconnections	300
- Data length of all incoming interconnections, max.	4,800 Byte
- Data length of all outgoing interconnections, max.	4,800 Byte
- Data length per connection, max.	250 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	3; 2x PN OPC/1x iMap
- HMI variable updating	500 ms

Evaluating / Communication CPUs for factory automation

CPU 319F-3 PN/DP

- Number of HMI variables	600
- Data length of all HMI variables, max.	9,600 Byte
• PROFIBUS proxy functionality	
- supported	Yes
- Number of linked PROFIBUS devices	32
- Data length per connection, max.	240 Byte; Slave-dependent
1st interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	150 mA
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes
• Point-to-point coupling	No
MPI	
• Number of connections	32
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes; possible via CP and loadable FB
• Transmission speeds, max.	12 Mbit/s
DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes; with I blocks
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- Isochronous mode	No
- SYNC/FREEZE	Yes
- Activation/deactivation of DP slaves	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte

DP slave	
• Services	
- Routing	Yes; with interface active
- Global data communication	No
- S7 basic communication	No
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
2nd interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
• MPI	No
• DP master	Yes
• DP slave	Yes
• PROFINET IO controller	No
• PROFINET CBA	No
• Point-to-point coupling	No
DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes; with I blocks
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- Isochronous mode	Yes; OB 61
- SYNC/FREEZE	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
DP slave	
• Services	

Evaluating / Communication

CPUs for factory automation

CPU 319F-3 PN/DP

- PG/OP communication	Yes
- Routing	Yes; with interface active
- Global data communication	No
- S7 basic communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• GSD file	The current GSD file can be obtained from: http://www.siemens.de/profinet-bus-gsd
• Transmission speeds, max.	12 Mbit/s
• automatic baud rate search	Yes; only with passive interface
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
3rd interface	
Type of interfaces	PROFINET
Physics	RJ45
isolated	Yes
automatic detection of transmission speed	Yes; (10/100 Mbit/s)
Functionality	
• MPI	No
• PROFINET IO controller	Yes
• PROFINET IO device	No
• PROFINET CBA	Yes
• Point-to-point coupling	No
Open IE communication	
• Number of connections, max.	8
PROFINET CBA (at 50 % communication load)	
• Acyclic transmission	Yes
• cyclic transmission	Yes
CPU/programming	
Programming language	
• STEP 7	Yes; 5.4 or higher, Service Pack 1 with HSP
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Software libraries	
Operational stocks	see instruction list
Nesting levels	8
User program protection/password protection	Yes
System functions (SFC)	see instruction list
System function blocks (SFB)	see instruction list

Dimensions	
Width	120 mm
Height	125 mm
Depth	130 mm
Weights	
Weight, approx.	1,250 g

Selection and Ordering Data

	Order No.
CPU 319F-3 PN/DP	6ES7 318-3FL00-0AB0
Main memory 1.4 MB, power supply 24 V DC, combined MPI/PROFIBUS DP master/slave interface, PROFIBUS DP master/slave interface, Ethernet/PROFINET interface; MMC required	
Distributed Safety V5.4 programming tool	
<i>Task:</i> Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S <i>Requirement:</i> STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	6ES7 833-1FC02-0YE5
From V5.x to V5.4; floating license for 1 user	
Micro Memory Card	
64 KB	6ES7 953-8LF20-0AA0
128 KB	6ES7 953-8LG11-0AA0
512 KB	6ES7 953-8LJ20-0AA0
2 MB	6ES7 953-8LL20-0AA0
4 MB	6ES7 953-8LM20-0AA0
8 MB	6ES7 953-8LP20-0AA0
MPI cable	6ES7 901-0BF00-0AA0
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	
Slot number plates	6ES7 912-0AA00-0AA0
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multilingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (distributed I/O), SIMATIC PC, SIMATIC PG (programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	

Evaluating / Communication

CPUs for factory automation

CPU 319F-3 PN/DP

	Order No.
SIMATIC Manual Collection update service for 1 year Current "Manual Collection" DVD and the three subsequent updates	6ES7 998-8XC01-8YE2
Power supply connector 10 units, spare part	6ES7 391-1AA00-0AA0
Labeling strips 10 units, spare part	6ES7 392-2XX00-0AA0
Label cover 10 units, spare part	6ES7 392-2XY00-0AA0
S7 SmartLabel Software for automatic labeling of modules based on data of the STEP 7 project	2XV9 450-1SL01-0YX0
Labeling sheets for machine inscription For 16-channel signal modules, DIN A4, for printing with laser printer; 10 units petrol light-beige yellow red For 32-channel signal modules, DIN A4, for printing with laser printer; 10 units petrol light-beige yellow red	6ES7 392-2AX00-0AA0 6ES7 392-2BX00-0AA0 6ES7 392-2CX00-0AA0 6ES7 392-2DX00-0AA0 6ES7 392-2AX10-0AA0 6ES7 392-2BX10-0AA0 6ES7 392-2CX10-0AA0 6ES7 392-2DX10-0AA0
Manual "Communication for SIMATIC S7-300/-400" German English French Spanish Italian	6ES7 398-8EA00-8AA0 6ES7 398-8EA00-8BA0 6ES7 398-8EA00-8CA0 6ES7 398-8EA00-8DA0 6ES7 398-8EA00-8EA0
SIMATIC S7 demo case With mounting components for mounting S7-200 and S7-300	6ES7 910-3AA00-0XA0
PROFIBUS bus components	
PROFIBUS DP bus connector RS 485 • With 90° cable outlet, max. transmission rate 12 Mbit/s - Without PG interface - With PG interface • With 90° cable outlet for Fast-Connect connection system, max. transmission rate 12 Mbit/s - Without PG interface - With PG interface • With axial cable outlet for SIMATIC OP, for connecting to PPI, MPI, PROFIBUS	6ES7 972-0BA12-0XA0 6ES7 972-0BB12-0XA0 6ES7 972-0BA50-0XA0 6ES7 972-0BB50-0XA0 6GK1 500-0EA02
PROFIBUS Fast Connect bus cable	6XV1 830-0EH10

	Order No.
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	
RS 485 repeater for PROFIBUS Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	6ES7 972-0AA01-0XA0
PROFINET bus components	
IE FC TP standard cable GP 2x2 4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; Sold by the meter	6XV1 840-2AH10
FO Standard Cable GP (50/125) Standard cable, splittable, UL approval, sold by the meter	6XV1 873-2A
SCALANCE X204-2 Industrial Ethernet switch Industrial Ethernet switches with integral SNMP access, Web diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	6GK5 204-2BB00-2AA3
IE FC RJ45 plugs RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
IE FC RJ45 plug 145 145° cable outlet 1 unit 10 units 50 units	6GK1 901-1BB30-0AA0 6GK1 901-1BB30-0AB0 6GK1 901-1BB30-0AE0
IE FC RJ45 plug 180 180° cable outlet 1 unit 10 units 50 units	6GK1 901-1BB10-2AA0 6GK1 901-1BB10-2AB0 6GK1 901-1BB10-2AE0
PROFIBUS/PROFINET bus components For establishing MPI/PROFIBUS/PROFINET communication	See Catalogs IK PI, CA 01

Evaluating / Communication CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Overview



- For constructing a fail-safe automation system for plants with increased safety requirements
- High-performance CPU in the top-end performance range
- Satisfies safety requirements up to SIL 3 acc. to IEC 61508 and Cat. 4 acc. to EN 954-1
- Standard and safety-related tasks can be performed with a single CPU
- Multi-processor mode is possible
- Safety-related communication with distributed I/O devices over PROFIBUS DP with the *PROFIsafe* profile
- Fail-safe I/O modules can be connected decentralized over the integrated interfaces (DP and PN with CPU416F-3 PN/DP) and/or through communication modules (CP443-5 Ext. and CP443-1 Adv.)
- Standard modules for non-safety-related applications can be operated centrally and decentralized

Application

The CPU 416F-2 and the CPU 416F-3 PN/DP are high-performance CPUs of the SIMATIC S7-400. They allow a fail-safe automation system to be constructed for plants with increased safety requirements.

The integrated PROFIBUS DP interfaces of CPU 416F-2 support direct connection to the PROFIBUS DP fieldbus as a master or as a slave.

Another DP master system can be connected in the case of the CPU 416F-3 PN/DP through the IF 964-DP interface module.

The integrated PROFINET interface of the CPU 416F-3 PN/DP implements switch functionality by using the ERTEC 400 ASIC. This forms the basis for provision of 2 externally accessible PROFINET ports. This means that apart from hierarchic network topologies, line structures can also be implemented with the new S7-400 controllers.

Note:

Only interface module 6ES7 964-2AA04-0AB0 can be used.

Fail-safe I/O modules can be connected to all integrated interfaces, to IF 964-DP and/or through communication modules (CP443-5 Ext. and CP443-1 Advanced). Safety-related communication is performed over PROFIBUS DP with the *PROFIsafe* profile.

Design

Both CPUs feature:

- High-performance processor:
The CPUs achieve command runtimes down to 0.03 µs per binary instruction.

- **CPU 416F-2:** 5.6 MB working memory (of which 2.8 MB each for program and data);
CPU 416F-3 PN/DP: 11.2 MB working memory (of which 5.6 MB each for program and data);
faster working memory for sections of the user program that are significant for execution.
- Flexible expansion possibilities:
Max. 262144 digital, 16384 analog inputs/outputs.
- MPI multi-point interface:
The MPI allows a simple network to be established with up to 32 stations and a data transmission rate of up to 12 Mbit/s. The CPUs can establish up to 44 connections to stations of the communications bus (C bus) and MPI.
- Mode selector:
Implemented as a toggle switch.
- Diagnostics buffer:
The last 120 error and interrupt events are stored in a ring buffer for diagnostic purposes. The number of entries can be parameterized.
- Real-time clock:
Diagnostic alarms of the CPU are tagged with the date and time.
- Memory card:
To expand the integrated load memory. RAM and FEPROM cards (FEPROM for saving even at zero voltage).
- Combined MPI/DP interface and integrated PROFIBUS DP interface (with CPU 416F-2):
The PROFIBUS DP master interface allows a distributed automation configuration offering high speed and ease of use. The distributed I/O is treated like a central I/O from the point of view of the user (same configuring, addressing and programming).
Mixed installation: SIMATIC S5 and SIMATIC S7 as PROFIBUS master acc. to EN 50170.

CPU 416F-3 PN/DP also features:

- Submodule socket:
Using the IF 964-DP interface module, an additional PROFIBUS DP master system can be connected.
- PROFINET interface with 2 ports (switch)
 - PROFINET I/O, 256 IO devices can be connected
 - PROFINET CBA

Fail-safe I/O modules can be connected to all integrated interfaces, to IF 964-DP and/or through communication modules (CP443-5 Ext. and CP443-1 Advanced). Safety-related communication is performed over PROFIBUS DP with the *PROFIsafe* profile.

Function

- Block protection:
A password concept protects the user program from unauthorized access.
- Integrated HMI services:
For HMI devices, the user only has to specify the source and destination for the data. They are then cyclically transported by the system automatically.
- Integrated communication functions:
 - PG/OP communication
 - Global data communication
 - S7 basic communication
 - S7 communication
- Firmware update over the network

CPU 416-3 PN/DP additionally:

- Open communication over TCP/IP, UDP and ISO-on-TCP (RFC1006)
- Distributed intelligence in Component Based Automation (CBA) on PROFINET
- Additional diagnostic option with integrated web server

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Parameterizable properties

Using the STEP 7 hardware configuration tool, properties and responses of the S7-400 including the CPUs can be parameterized, e.g.:

- MPI multi-point interface:
 - determining station addresses.
 - start-up/cyclic response.
 - determining the maximum cycle time and communication load.
- Address assignment:
 - Addressing the I/O modules.
- Retentive areas:
 - Determining the number of retentive bit memories, counters, timers, data blocks and clock bit memories
- Size of the process image, local data.
- Length of the diagnostic buffer.
- Protection level:
 - Specifying the access rights to program and data.
- System diagnostics:
 - Determining handling and scope of the diagnostic alarms.
- Cyclic interrupts:
 - Setting of periodicity

CPU 416F-3 PN/DP additionally:

- PROFINET interface
- Parameterization of time synchronization with NTP procedure

Information and display functions

- Status and error LEDs:
 - LEDs indicate, for example, internal and external errors and operating states such as RUN, STOP, start-up and test functions.
- Test functions:
 - The PG is used to indicate signal states during program execution, to modify process variables independently of the user program, to output the contents of stack memories, to execute individual program steps, and to block program sections.
- Information functions:
 - The PG can be used to obtain information about the memory capacity and operating mode of the CPU and the current loading of the work and load memory.

Communication

The safety related and standard communication between the central controller and the fail-safe ET 200 modules takes place over PROFIBUS DP and/or PROFINET. The specially developed PROFIBUS profile *PROFIsafe* supports the transfer of user data for the safety functions within the standard data message frame. Additional hardware components, e.g. special safety buses are not required. The necessary software is either integrated in the hardware components as an expansion of the operating system or loaded into the CPU later as a certified software block.

Mode of operation

The safety functions of the F-CPU are included in the F program of the CPU and in the fail-safe signal modules.

The signal modules monitor the output and input signals by means of discrepancy analysis and the injection of test signals.

The CPU checks the proper operation of the controller by means of periodic self-tests, command tests and logic-based and time-based program execution checks. Furthermore, the I/O is checked using requests for signs of life.

If an error is diagnosed in the system, the system will be placed in a safe state.

An F runtime license is not required to operate the CPU 416F-2 and CPU416F-3 PN/DP.

Programming

The CPU 416F-2 and the CPU416F-3 PN/DP are programmed in the same manner as the other SIMATIC S7 systems. The user program for non-fail-safe plant sections is created using familiar programming tools, e.g. STEP 7.

SIMATIC S7 Distributed Safety option package

The STEP 7 option package "SIMATIC S7 Distributed Safety" is required for programming the safety-related program components. The package contains all the functions and blocks required to create an F program.

The F program with the safety functions is connected in F FBD or F LAD or using special functions from the F library. Use of F FBD or F LAD simplifies configuration and programming of the plant and also acceptance testing thanks to the non-plant-specific uniform presentation form. The programmer can concentrate on configuration of the safety-related application without the need to use additional tools.

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Technical specifications

	6ES7 416-2FN05-0AB0	6ES7 416-3FR05-0AB0
Product status		
Firmware version	V 5.0	V 5.0
associated programming package	From STEP7 V 5.3 SP2 or higher with HW update	From STEP7 V 5.4 SP1 or higher
Voltages and currents		
Feeding of external buffer voltage to CPU	5 to 15 V DC	5 to 15 V DC
Current consumption		
from backplane bus DC 5 V, max.	1.1 A	1.4 A
from interface DC 5 V, max.	90 mA; At each DP interface	90 mA; At each DP interface
Power loss, typ.	4 W	5.5 W
Backup battery		
• Buffer current, typ.	125 µA; Valid up to 40 C	125 µA; Valid up to 40 C
• Buffer current, max.	550 µA	550 µA
Memory		
Type of storage		
• RAM		
- integrated (for program)	2.8 MByte	5.6 MByte
- integrated (for data)	2.8 MByte	5.6 MByte
- expandable	No	No
• Load memory		
- expandable FEPR0M	Yes	Yes; With Memory Card (FLASH)
- expandable FEPR0M, max.	64 MByte	64 MByte
- integrated RAM, max.	1 MByte	1 MByte
- expandable RAM	Yes	Yes; With Memory Card (RAM)
- expandable RAM, max.	64 MByte	64 MByte
Backup		
• present	Yes	Yes
• with battery	Yes	Yes
• without battery	No	No
CPU/blocks		
DB		
• Number, max.	10,000; Number range: 1 to 16,000	10,000; Number range: 1 to 16,000
• Size, max.	64 KByte	64 KByte
FB		
• Number, max.	5,000; Number range: 0 to 7,999	5,000; Number range: 0 to 7,999
• Size, max.	64 KByte	64 KByte
FC		
• Number, max.	5,000; Number range: 0 to 7,999	5,000; Number range: 0 to 7,999
• Size, max.	64 KByte	64 KByte
OB		
• Number, max.	See OP list	See Instruction List
• Size, max.	64 KByte	64 KByte
• Number of isochronous mode Obs	4	4
Nesting depth		
• per priority class	24	24
• additional within an error OB	2	2
CPU/processing times		
for bit operations, min.	30 ns	30 ns
for word operations, min.	30 ns	30 ns
for fixed point arithmetic, min.	30 ns	30 ns
for floating point arithmetic, min.	90 ns	90 ns

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Times/counters and their remanence		
S7 counter		
• Number	2,048	2,048
• Remanence		
- adjustable	Yes	Yes
- lower limit	0	0
- upper limit	2,047	2,047
- preset	From Z 0 to Z 7	From Z 0 to Z 7
• Counting range		
- lower limit	0	0
- upper limit	999	999
IEC counter		
• present	Yes	Yes
• Type	SFB	SFB
S7 times		
• Number	2,048	2,048
• Remanence		
- adjustable	Yes	Yes
- lower limit	0	0
- upper limit	2,047	2,047
- preset	No timers retentive	No timers retentive
• Time range		
- lower limit	10 ms	10 ms
- upper limit	9,990 s	9,990 s
IEC timer		
• present	Yes	Yes
• Type	SFB	SFB
Data areas and their remanence		
remanent data area, total	Total working and load memory (with backup battery)	Total working and load memory (with backup battery)
Flag		
• Number, max.	16 KByte	16 KByte; Size of bit memory address area
• Remanence available	Yes	Yes
• Number of clock memories	8; (in 1 memory byte)	8; (in 1 memory byte)
Address area		
I/O address area		
• Inputs	16 KByte	16 KByte
• Outputs	16 KByte	16 KByte
• of which, distributed		
- MPI/DP interface, inputs	2 KByte	2 KByte
- MPI/DP interface, outputs	2 KByte	2 KByte
- DP interface, inputs	8 KByte	8 KByte
- DP interface, outputs	8 KByte	8 KByte
- PN interface, inputs		8 KByte
- PN interface, outputs		8 KByte
Process image		
• Inputs, adjustable	16 KByte	16 KByte
• Outputs, adjustable	16 KByte	16 KByte
• Inputs, preset	512 Byte	512 Byte
• Outputs, preset	512 Byte	512 Byte
• consistent data, max.	244 Byte	244 Byte
• Access to consistent data in process image	Yes	Yes
Subprocess images		

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

• Number of subprocess images, max.	15	15
Digital channels		
• Inputs	131,072	131,072
• Outputs	131,072	131,072
• Inputs, of which central	131,072	131,072
• Outputs, of which central	131,072	131,072
Analog channels		
• Inputs	8,192	8,192
• Outputs	8,192	8,192
• Inputs, of which central	8,192	8,192
• Outputs, of which central	8,192	8,192
Hardware config.		
connectable OPs	63	63
Central devices, max.	1	1
Expansion devices, max.	21	21
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)	Yes; 4 CPUs max. (with UR1 or UR2)
IM		
• Number of connectable IMs (total), max.	6	6
• Number of connectable IM 460s, max.	6	6
• Number of connectable IM 463s, max.	4; IM 463-2	4; IM 463-2
Number of DP masters		
• integrated	2	1
• via IM 467	4	4
• via CP	10; CP 443-5 Ext.	10; CP 443-5 Ext.
• Mixed mode IM + CP permitted	No; IM 467 not suitable for use with CP 443-5 Ext. and CP443-1 EX4x (in PNIO mode)	No; IM 467 not suitable for use with CP 443-5 Ext. and CP443-1 EX4x (in PNIO mode)
• via interface module	0	1; IF 964-DP
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6	6
Number of IO controllers		
• integrated		1
• via CP	4; Via CP 443-1 EX 41 in PN operation Max. 4 in central controller	4; Via CP 443-1 EX41 in PN operation: 4 max. in central unit
Number of operable FMs and CPs (recommended)		
• FM	Limited due to number of slots and number of connections	Limited due to number of slots and number of connections
• CP, point-to-point	Limited due to number of slots and number of connections	Limited due to number of slots and number of connections
• PROFIBUS and Ethernet CPs	14; Of which max. 10 CP o. IM as DP master and PN controller	14; Of which 10 CP/IM max. as DP master and PN - controller
Time		
Clock		
• Hardware clock (real-time clock)	Yes	Yes
• buffered and synchronizable	Yes	Yes
• Resolution	1 ms	1 ms
Operating hours counter		
• Number	8	8
Clock synchronization		
• supports	Yes	Yes
• to MPI, Master	Yes	Yes
• to MPI, Slave	Yes	Yes
• to DP, Master	Yes	Yes
• to DP, Slave	Yes	Yes
• in AS, Master	Yes	Yes
• in AS, Slave	Yes	Yes

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

- on Ethernet via NTP - to IF 964 DP	Via CP	Yes; As client Yes
S7 message functions		
Number of login stations for message functions, max.	63; Max. 63 with alarm_S and alarm_D (OP's); 12 max. with alarm_8 and alarm_P (e.g. WinCC)	63; Max. 63 with alarm_S and alarm_D (OP's); max. 12 with alarm_8 and alarm_P (e.g. WinCC)
Symbol-related messages	Yes	Yes
Number of messages		
overall, max.	1,024	1,024
Block related messages	Yes	Yes
Alarm 8-blocks	Yes	Yes
Instrumentation & control messages	Yes	Yes
Test commissioning functions		
Status/control		
Status/control variable	Yes	Yes
Forcing		
Forcing	Yes	Yes
Status block	Yes	Yes
Single step	Yes	Yes
Number of breakpoints	4	4
Diagnostic buffer		
present	Yes	Yes
Number of entries, max.	3,200	3,200
adjustable	Yes	Yes
preset	120	120
Communication functions		
PG/OP communication	Yes	Yes
Routing	Yes	Yes
Global data communication		
supported	Yes	Yes
Size of GD packets, max.	54 Byte	54 Byte
S7 basic communication		
supported	Yes	Yes
Useful data per job, max.	76 Byte	76 Byte
S7 communication		
supported	Yes	Yes
Useful data per job, max.	64 KByte	64 KByte
S5-compatible communication		
supported	Yes; (via CP -max. 10- and FC AG_SEND and FC AG_RECV)	Yes; (via CP -max. 10- and FC AG_SEND and FC AG_RECV)
Useful data per job, max.	8 KByte	8 KByte
Standard communication (FMS)		
supported	Yes; Via CP and loadable FB	Yes; Via CP and loadable FB
Web server	No; Via CP	Yes; Read-only function
Open IE communication		
TCP/IP		Yes
- Number of connections, max.		64
- Data length, max.		32 KByte
ISO-on-TCP (RFC1006)	Via CP 443-1 Adv and loadable FB	Yes
- Number of connections, max.		64
- Data length, max.	1452	32 KByte; 1452 bytes via CP 443-1 Adv.
UDP		Yes
- Number of connections, max.		64
- Data length, max.		1,472 Byte

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Number of connections		
• overall	64	64
PROFINET CBA (at set setpoint communication load)		
• Number of remote interconnection partners		32
• Number of functions, master/slave		150
• Total of all master/slave connections		6,000
• Data length of all incoming connections master/slave, max.		65,000 Byte
• Data length of all outgoing connections master/slave, max.		65,000 Byte
• Number of device-internal and PROFIBUS interconnections		1,000
• Data length of device-internal and PROFIBUS interconnections, max.		16,000 Byte
• Data length per connection, max.		2,000 Byte
• Remote interconnections with acyclic transmission		
- Sampling frequency: sampling interval, min.		200 ms; Depending on preset communication load, number of interconnections and data length used
- Number of incoming interconnections		500
- Number of outgoing interconnections		500
- Data length of all incoming interconnections, max.		16,000 Byte
- Data length of all outgoing interconnections, max.		16,000 Byte
- Data length per connection, max.		2,000 Byte
• Remote interconnections with cyclic transmission		
- Transmission frequency: transmission interval, min.		1 ms; Depending on preset communication load, number of interconnections and data length used
- Number of incoming interconnections		300
- Number of outgoing interconnections		300
- Data length of all incoming interconnections, max.		4,800 Byte
- Data length of all outgoing interconnections, max.		4,800 Byte
- Data length per connection, max.		250 Byte
• HMI variables via PROFINET (acyclic)		
- Number of log-in stations for HMI variables (PN OPC/iMap)		2x PN OPC/1x iMap
- HMI variable updating		500 ms
- Number of HMI variables		1,500
- Data length of all HMI variables, max.		48,000 Byte
• PROFIBUS proxy functionality		
- supported		Yes; 32 PROFIBUS slaves max. connectable
- Data length per connection, max.		240 Byte; Slave-dependent
1st interface		
Physics	RS 485 / PROFIBUS	RS 485 / PROFIBUS + MPI
isolated	Yes	Yes
Functionality		
• MPI	Yes	Yes
• DP master	Yes	Yes
• DP slave	Yes	Yes
MPI		
• Number of connections	44	44
• Services		
- PG/OP communication	Yes	Yes
- Routing	Yes	Yes

Evaluating / Communication CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

- Global data communication	Yes	Yes
- S7 basic communication	Yes	Yes
- S7 communication	Yes	Yes
• Transmission speeds, max.	12 Mbit/s	12 Mbit/s
DP master		
• Number of connections, max.	32	32; If a diagnostic repeater is used on the line, the number of connection resources on the line is reduced by 1
• Services		
- PG/OP communication	Yes	Yes
- Routing	Yes	Yes
- S7 basic communication	Yes	Yes
- S7 communication	Yes	Yes
- equidistance support	Yes	Yes
- Activation/deactivation of DP slaves	Yes	Yes
- direct data exchange (cross traffic)	Yes	Yes
• Transmission speeds, max.	12 Mbit/s	12 Mbit/s
• Number of DP slaves, max.	32	32
• Address area		
- Inputs, max.	2 KByte	2 KByte
- Outputs, max.	2 KByte	2 KByte
• Useful data per DP slave		
- Inputs, max.	244 Byte	244 Byte
- Outputs, max.	244 Byte	244 Byte
DP slave		
• Number of connections	32	32
• Services		
- Routing	Yes	Yes; When interface active
- Status/control	Yes	Yes; When interface active
- Programming	Yes	Yes; When interface active
• Transmission speeds, max.	12 Mbit/s	12 Mbit/s
• Transfer memory		
- Inputs	244 Byte	244 Byte
- Outputs	244 Byte	244 Byte
• Address area, max.	32	32; Virtual slots
• Useful data per address area, max.	32 Byte	32 Byte
• Useful data per address area, of which consistent, max.	32 Byte	32 Byte
2nd interface		
Physics	RS 485 / PROFIBUS	Ethernet
isolated	Yes	Yes
Functionality		
• DP master	Yes	No
• DP slave	Yes	No
• PROFINET IO controller		Yes
• PROFINET CBA		Yes
• Point-to-point coupling		No
DP master		
• Number of connections, max.	32	
• Services		
- PG/OP communication	Yes	
- Routing	Yes	
- S7 basic communication	Yes	

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

- S7 communication	Yes	
- equidistance support	Yes	
- Activation/deactivation of DP slaves	Yes	
- direct data exchange (cross traffic)	Yes	
• Transmission speeds, max.	12 Mbit/s	
• Number of DP slaves, max.	125	
• Address area		
- Inputs, max.	8 KByte	
- Outputs, max.	8 KByte	
• Useful data per DP slave		
- Inputs, max.	244 Byte	
- Outputs, max.	244 Byte	
DP slave		
• Number of connections	32	
• Services		
- Routing	Yes	
- Status/control	Yes	
- Programming	Yes	
• Transmission speeds, max.	12 Mbit/s	
• Transfer memory		
- Inputs	244 Byte	
- Outputs	244 Byte	
• Address area, max.	32	
• Useful data per address area, max.	32 Byte	
• Useful data per address area, of which consistent, max.	32 Byte	
PROFINET CBA		
• Acyclic transmission		Yes
• cyclic transmission		Yes
PROFINET IO controller		
• Services		
- PG/OP communication		Yes
- Routing		Yes; Routing of PG functions
- S7 communication		Yes
- open IE communication		Yes
• Transmission rate, min.		10 Mbit/s
• Transmission speed, max.		100 Mbit/s
• Number of connectable IO-devices, max.		256
• Updating time		250 µs to 512 ms; minimum value dependent on preset communication share for PROFINET I/O, of number of I/O devices and number of configured user data
• Address area		
- Inputs, max.		8 KByte
- Outputs, max.		8 KByte
• Useful data consistency, max.		255 Byte; Including user data attendant
3rd interface		
Type of interfaces		Pluggable interface module (IF), technical specifications as for 2nd interface
pluggable interface module		IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)
Physics		RS 485/Profibus
isolated		Yes
power supply to interface (15 to 30 V DC), max.		150 mA
Number of connection resources		32

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Functionality		
• MPI		No
• DP slave		Yes
• DP master		Yes
DP master		
• Number of connections, max.		32
• Services		
- PG/OP communication		Yes
- Routing		Yes
- Global data communication		No
- S7 basic communication		Yes
- S7 communication		Yes
- Equidistance support		Yes
- SYNC/FREEZE		Yes
- Activation/deactivation of DP slaves		Yes
- Direct data exchange		Yes
• Transmission rate, max.		12 Mbit/s
• Number of DP slaves, max.		125
• Address area		
- Inputs, max.		8 KByte
- Outputs, max.		8 KByte
• Useful data per DP slave		
- Useful data per DP slave, max.		244 Byte
- Inputs, max.		244 Byte
- Outputs, max.		244 Byte
- Slots, max.		244
- per slot, max.		128 Byte
DP slave		
• Number of connections		32
• Services		
- Routing		Yes; When interface active
- Programming		Yes; When interface active
- Status/control		Yes; When interface active
• GSD file		http://support.automation.siemens.com/WW/view/de/113652
• Transmission rate, max.		12 Mbit/s
• Transfer memory		
- Inputs		244 Byte
- Outputs		244 Byte
• Address range, max.		32
• Useful data per address area, max.		32 Byte
• Useful data per address area, of which consistent, max.		32 Byte
Isochronous mode		
Useful data per isochronous slave, max.	244 Byte	244 Byte
equidistance	Yes	Yes
shortest clock pulse	1 ms; 0.5 ms without use of SFC 126, 127	1 ms; Without use of SFC 126 and 127 up to 0.5 ms
CiR configuration in RUN		
CiR synchronization time, basic load	100 ms	100 ms
CiR synchronization time, time per I/O slave	40 µs	40 µs
CPU/programming		
Configuration software		
• STEP 7	Yes	Yes

Evaluating / Communication

CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Programming language		
• STEP 7		Yes
• LAD	Yes	Yes
• FUP	Yes	Yes
• AWL	Yes	Yes
• SCL	Yes	Yes
• CFC	Yes	Yes
• GRAPH	Yes	Yes
• HiGraph®	Yes	Yes
Nesting levels	7	7
User program protection/password protection	Yes	Yes
Dimensions		
Width	25 mm	50 mm
Height	290 mm	290 mm
Depth	219 mm	219 mm
Dimensions		
Required slots	1	2
Weights		
Weight, approx.	720 g	900 g

Selection and Ordering Data

Ordering data	Order No.
CPU 416F-2	6ES7 416-2FN05-0AB0
For configuring safety-related automation systems; main memory 5.6 MB, 24 V DC power supply, MPI/PROFIBUS DP master interface, PROFIBUS DP master interface, slot for memory card, incl. slot number labels	
CPU 416F-3 PN/DP	6ES7 416-3FR05-0AB0
For configuring safety-related automation systems; main memory 11.2 MB, 24 V DC power supply, MPI/PROFIBUS DP master interface, PROFINET interface, PROFIBUS DP master interface, receptacle for 1 IF submodule, slot for memory card, incl. slot number labels	
Option package S7 F Distributed Safety V5.4	
for generating fail-safe programs for the S7-300F	
Floating license	6ES7 833-1FC02-0YA5
Upgrade from V5.x to V5.4	6ES7 833-1FC02-0YE5
Software Update Service	6ES7 833-1FC00-0YX2
Memory Card RAM	
64 KB	6ES7 952-0AF00-0AA0
256 KB	6ES7 952-1AH00-0AA0
1 MB	6ES7 952-1AK00-0AA0
2 MB	6ES7 952-1AL00-0AA0
4 MB	6ES7 952-1AM00-0AA0
8 MB	6ES7 952-1AP00-0AA0
16 MB	6ES7 952-1AS00-0AA0
64 MB	6ES7 952-1AY00-0AA0
FEPRM memory card	
64 KB	6ES7952-0KF00-0AA0

Ordering data	Order No.
256 KB	6ES7952-0KH00-0AA0
1 MB	6ES7 952-1KK00-0AA0
2 MB	6ES7 952-1KL00-0AA0
4 MB	6ES7 952-1KM00-0AA0
8 MB	6ES7 952-1KP00-0AA0
16 MB	6ES7 952-1KS00-0AA0
32 MB	6ES7 952-1KT00-0AA0
64 MB	6ES7 952-1KY00-0AA0
MPI cable	6ES7 901-0BF00-0AA0
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	
IF 964-DP interface module	6ES7 964-2AA04-0AB0
For connecting an additional DP line	
Slot number plates	6ES7 912-0AA00-0AA0
1 set (spare part)	
Manual "SIMATIC S7-400 programmable controller"	
incl. instruction list	
German	6ES7 498-8AA05-8AA0
English	6ES7 498-8AA05-8BA0
French	6ES7 498-8AA05-8CA0
Spanish	6ES7 498-8AA05-8DA0
Italian	6ES7 498-8AA05-8EA0
S7-400 operation list	
German	6ES7 498-8AA05-8AN0
English	6ES7 498-8AA05-8BN0
French	6ES7 498-8AA05-8CN0
Spanish	6ES7 498-8AA05-8DN0
Italian	6ES7 498-8AA05-8EN0

Evaluating / Communication CPUs for factory automation

CPU 416F-2 and CPU 416F-3 PN/DP

Ordering data	Order No.
Manual "Communication for SIMATIC S7-300/-400"	
German	6ES7 398-8EA00-8AA0
English	6ES7 398-8EA00-8BA0
French	6ES7 398-8EA00-8CA0
Spanish	6ES7 398-8EA00-8DA0
Italian	6ES7 398-8EA00-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current "Manual Collection" DVD and the three subsequent updates	
Brochure "SIMATIC S7-400 programmable controller - Design and application"	
German	6ES7 498-8AA00-8AB0
English	6ES7 498-8AA00-8BB0
PROFIBUS bus components	
RS 485 bus connector with 90° cable outlet	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA12-0XA0
With PG interface	6ES7 972-0BB12-0XA0
RS 485 bus connector with angled cable outlet	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA41-0XA0
With PG interface	6ES7 972-0BB41-0XA0
RS 485 bus connector with 90° cable outlet for Fast Connect system	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA50-0XA0
With PG interface	6ES7 972-0BB50-0XA0
RS 485 bus connector with axial cable outlet	
For SIMATIC OP, for connection to PPI, MPI, PROFIBUS	6GK1 500-0EA02
PROFIBUS FastConnect bus cable	
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	6XV1 830-0EH10
RS 485 repeater for PROFIBUS	6ES7 972-0AA01-0XA0
Data transfer rate up to 12 Mbit/s; 24 V DC; IP 20 housing	
PROFINET bus components	
IE FC TP standard cable GP 2x2	6XV1 840-2AH10
4-core, shielded TP installation cable for connection to IE FC Outlet RJ45/ IE FC RJ45 Plug; PROFINET-compatible; with UL approval; Sold by the meter	

Ordering data	Order No.
FO Standard Cable GP (50/125)	6XV1 873-2A
Standard cable, splittable, UL approval, sold by the meter	
SCALANCE X204-2 Industrial Ethernet switch	6GK5 204-2BB00-2AA3
Industrial Ethernet switches with integral SNMP access, Web diagnostics, copper cable diagnostics and PROFINET diagnostics for configuring line, star and ring topologies; four 10/100 Mbit/s RJ45 ports and two FO ports	
IE FC RJ45 plugs	
RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables	
IE FC RJ45 plug 180	
180° cable outlet	
1 unit	6GK1 901-1BB10-2AA0
10 units	6GK1 901-1BB10-2AB0
50 units	6GK1 901-1BB10-2AE0
PROFIBUS/PROFINET bus components	See Catalogs IK PI, CA 01
For establishing MPI/PROFIBUS/PROFINET communication	

Evaluating / Communication

CPUs for process automation

CPU 414-4H for S7-400H/F/FH

Overview



- CPU for SIMATIC S7-400H and S7-400F/FH.
- Can be used in high availability S7-400H systems
- Can be used with F-runtime license and F-compatible CPU in failsafe S7-400F/FH systems
- With integrated PROFIBUS DP master interface
- With 2 slots for sync modules

Application

The CPU 414-4H is compatible with the SIMATIC S7-400H and S7-400F/FH. It allows a fault-tolerant S7-400H system to be configured. It can also be used for the failsafe S7-400F/FH automation system in conjunction with an F-runtime license. The integrated PROFIBUS DP interface supports direct connection to the PROFIBUS DP fieldbus as master.

Design

The CPU 414-4H includes:

- High-performance processor: The CPU achieves instruction execution times as low as 60 ns per binary instruction
- 1.4 MB RAM (700 KB for program, 700 KB for data); load memory for user programs and parameter assignment data of the S7-400H F/FH automation system; high-speed RAM for user program components applicable to execution
- Memory card: for expansion of the integrated load memory. In addition to the program, the information contained in the load memory includes parameter assignment data for the S7-400H F/FH and therefore requires approximately twice as much space. The result is:
 - Integrated load memory is not adequate for large programs so that a memory card is often required.
 RAM and FEPRAM cards (FEPRAM for retentive storage) are available.
- Flexible expansion capability: Max. 65K digital, 4K analog I/Os
- Multipoint interface MPI: The integrated MPI makes it possible to establish a simple network with up to 32 nodes, at a data transmission rate of up to 187.5 kbps. The CPU can establish up to 64 connections to nodes on the communication bus (C-bus) and the MPI.

Note:

When PROFIBUS DP and MPI interfaces are operated simultaneously, only the following bus connector can be connected to the MPI:

- With a socket: 6ES7 972-0BB41-0XA0
- Without a socket: 6ES7 972-0BA41-0XA0

- Mode selector: Designed as a key-operated switch. Access authorizations can be restricted by means of the removable mode selector.
- Diagnostics buffer: The last 120 fault and interrupt events are retained in a FIFO buffer for diagnostics purposes
- Real-time clock: CPU diagnostics messages are date-stamped and time-stamped.
- PROFIBUS DP interface: The CPU 414-4H with PROFIBUS DP master interface supports a distributed automation configuration with high speed and simple handling. From the user's point of view, the distributed I/O is treated as central I/O (same configuring, addressing and programming).

Note:

When PROFIBUS DP and MPI interfaces are operated simultaneously, only the following bus connector can be connected to the MPI:

- With a socket: 6ES7 972-0BB41-0XA0
- Without a socket: 6ES7 972-0BA41-0XA0

Function

- Block protection: A password concept also protects the user program from unauthorized access as well as the keys witch.
- Integrated HMI services: The user only has to specify the source and destination of the data with HMI devices. The data are then transported cyclically and automatically by the system.
- Integrated communication functions:
 - PG/OP communication
 - Expanded communication (simple and high-availability)

Configurable Attributes

The STEP 7 "hardware configuration" tool and the installed S7-400H options package are used to configure the features and response of the S7-400H, including the CPUs, for example:

- Multipoint interface MPI:
 - Definition of node addresses
 - Startup/cycle behavior
 - Stipulation of the maximum cycle time and communication load
- Address allocation: Addressing of I/O modules
- Retentive area: Definition of the number of retentive bit memories, counters, timers, data blocks, and clock memories
- Protection level: Definition of access authorizations to program and data
- System diagnostics: Definition of the handling and scope of diagnostics messages
- Timed interrupts: Setting of periods
- Configuration of H stations

Safety-related functions

The F-runtime license can be used to compile the failsafe F user program and run it on the CPU. A license is required for each S7-400F/FH system. 2 TÜV stickers are included.

Reporting functions

- Status and fault indicators: LEDs indicate internal and external errors and operating modes such as RUN, STOP, Startup, "Master" mode, redundancy error, test function, etc.

Evaluating / Communication

CPU for process automation

CPU 414-4H for S7-400H/F/FH

- Test functions:
The PG can be used to display signal states in program execution, modify process tags irrespective of the user program, read out the contents of stack memories, run separate program steps and inhibit program components.
- Information functions:
The PG can be used to provide the user with information about the memory capacity and operating mode of the CPU, and the current utilization of the working and load memories.

Technical specifications

6ES7 414-4HJ04-0AB0	
Supply voltages	
Rated value	
• DC 24 V	Yes
Voltages and currents	
Feeding of external buffer voltage to CPU	5 to 15 VDC
Current consumption	
from backplane bus DC 5 V, max.	2 A
Power loss, typ.	4.5 W
Backup battery	
• Buffer current, typ.	550 µA
• Buffer current, max.	1,530 µA
Memory	
Type of storage	
• RAM	
- integrated (for program)	700 KByte
- integrated (for data)	700 KByte
- expandable	No
• Load memory	
- expandable FEPRM	Yes; with Memory Card (FLASH)
- expandable FEPRM, max.	64 MByte
- integrated RAM, max.	256 KByte
- expandable RAM	Yes; With Memory Card (RAM)
- expandable RAM, max.	16 MByte
Backup	
• present	Yes
• with battery	Yes; All data
• without battery	No
CPU/blocks	
DB	
• Number, max.	4,095; DB 0 reserved
• Size, max.	64 KByte
FB	
• Number, max.	2,048
• Size, max.	64 KByte
FC	
• Number, max.	2,048
• Size, max.	64 KByte
OB	
• Size, max.	64 KByte
Nesting depth	
• per priority class	24

CPU/processing times	
for bit operations, min.	0.06 µs
for word operations, min.	0.06 µs
for fixed point arithmetic, min.	0.06 µs
for floating point arithmetic, min.	0.18 µs
Times/counters and their remanence	
S7 counter	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	From Z 0 to Z 7
• Counting range	
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	2,048
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	8 KByte
• Remanence available	Yes; MB 0 to MB 8191
Address area	
I/O address area	
• Inputs	8 KByte
• Outputs	8 KByte
• of which, distributed	
- MPI/DP interface, inputs	2 KByte
- MPI/DP interface, outputs	2 KByte
- DP interface, inputs	6 KByte
- DP interface, outputs	6 KByte
Process image	
• Inputs, adjustable	8 KByte
• Outputs, adjustable	8 KByte
• Inputs, preset	1,024 Byte
• Outputs, preset	1,024 Byte
Subprocess images	
• Number of subprocess images, max.	8
Digital channels	
• Inputs	65,536
• Outputs	65,536
• Inputs, of which central	65,536

Evaluating / Communication

CPUs for process automation

CPU 414-4H for S7-400H/F/FH

• Outputs, of which central	65,536
Analog channels	
• Inputs	4,096
• Outputs	4,096
• Inputs, of which central	4,096
• Outputs, of which central	4,096
Hardware config.	
Central devices, max.	1
Expansion devices, max.	21
Multicomputing	No
IM	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	6; IM 463-2
Number of DP masters	
• integrated	2
• via IM 467	0
• via CP	10
• Mixed mode IM + CP permitted	No; IM 467 cannot be used jointly with CP 443-5 Ext.
• via interface module	0
Number of operable FMs and CPs (recommended)	
• FM	32; Limited due to number of slots and number of connections
• CP, point-to-point	32; Limited due to number of slots and number of connections
• CP, LAN	32; limited due to number of slots and number of connections
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
Operating hours counter	
• Number	8
Clock synchronization	
• supports	Yes
S7 message functions	
Number of login stations for message functions, max.	8
Test commissioning functions	
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3,200
• adjustable	Yes
• preset	120
Communication functions	
PG/OP communication	Yes
Global data communication	
• supported	No
S7 basic communication	
• supported	No
S7 communication	
• supported	Yes

• as server	Yes
• as client	Yes
• Useful data per job, max.	64 KByte
S5-compatible communication	
• supported	Yes; via CP and loadable FC
• Useful data per job, max.	8 KByte
Standard communication (FMS)	
• supported	Yes; Via CP and loadable FB
Number of connections	
• overall	32
1st interface	
Physics	RS 485 / PROFIBUS
isolated	Yes
Functionality	
• MPI	Yes; Default setting
• DP master	Yes
• DP slave	No
MPI	
• Number of connections	32
• Services	
- PG/OP communication	Yes
- Global data communication	No
- S7 basic communication	No
- S7 communication	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Number of connections, max.	32
• Services	
- PG/OP communication	Yes
- S7 basic communication	No
- S7 communication	No
- S7 communication, as client	No
- S7 communication, as server	No
- equidistance support	No
- Activation/deactivation of DP slaves	Yes
- direct data exchange (cross traffic)	No
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	32; Number of slots, max. 512
• Address area	
- Inputs, max.	2 KByte
- Outputs, max.	2 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
2nd interface	
Physics	RS 485 / PROFIBUS
isolated	Yes
Functionality	
• DP master	Yes; Default setting
• DP slave	No
• Point-to-point coupling	No

Evaluating / Communication CPUs for process automation

CPU 414-4H for S7-400H/F/FH

DP master	
• Number of connections, max.	16
• Number of connections (of which reserved), max.	1 for PG, 1 for OP
• Services	
- PG/OP communication	Yes
- S7 basic communication	No
- S7 communication	No
- S7 communication, as client	No
- S7 communication, as server	No
- equidistance support	No
- Activation/deactivation of DP slaves	No
- direct data exchange (cross traffic)	No
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	96
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; V5.0 SP2
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
User program protection/password protection	Yes
Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm
Dimensions	
Required slots	2
Weights	
Weight, approx.	1,070 g

Selection and Ordering Data

Ordering data	Order No.
CPU 414-4H	
For S7-400H and S7-400F/FH; MPI/PROFIBUS DP master interface, 2 slots for Sync modules, slot for memory card, incl. slot number labels, 2 keys	
Main memory 1,4 MB	6ES7 414-4HJ04-0AB0
Memory Card RAM	
1 MB	6ES7 952-1AK00-0AA0

Ordering data	Order No.
2 MB	6ES7 952-1AL00-0AA0
4 MB	6ES7 952-1AM00-0AA0
8 MB	6ES7 952-1AP00-0AA0
16 MB	6ES7 952-1AS00-0AA0
64 MB	6ES7 952-1AY00-0AA0
FEPR0M memory card	
1 MB	6ES7 952-1KK00-0AA0
2 MB	6ES7 952-1KL00-0AA0
4 MB	6ES7 952-1KM00-0AA0
8 MB	6ES7 952-1KP00-0AA0
16 MB	6ES7 952-1KS00-0AA0
32 MB	6ES7 952-1KT00-0AA0
64 MB	6ES7 952-1KY00-0AA0
MPI cable	
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	6ES7 901-0BF00-0AA0
Slot number plates	
1 set (spare part)	6ES7 912-0AA00-0AA0
S7 F Systems option pack	
For programming fail-safe user programs, with F block library	6ES7 833-1CC00-0YX0
F runtime license	
For using fail-safe programs in CPU 417-4H;	6ES7 833-1CC00-6YX0
one license required for each S7-400F/FH system	
Manual "SIMATIC S7-400H programmable controller"	
German	6ES7 988-8HA11-8AA0
English	6ES7 988-8HA11-8BA0
French	6ES7 988-8HA11-8CA0
Spanish	6ES7 988-8HA11-8DA0
Italian	6ES7 988-8HA11-8EA0
Manual "Communication for SIMATIC S7-300/-400"	
German	6ES7 398-8EA00-8AA0
English	6ES7 398-8EA00-8BA0
French	6ES7 398-8EA00-8CA0
Spanish	6ES7 398-8EA00-8DA0
Italian	6ES7 398-8EA00-8EA0
SIMATIC Manual Collection	
Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	6ES7 998-8XC01-8YE0
SIMATIC Manual Collection update service for 1 year	
Current "Manual Collection" DVD and the three subsequent updates	6ES7 998-8XC01-8YE2
Brochure "SIMATIC S7-400 programmable controller - Design and application"	
German	6ES7 498-8AA00-8AB0
English	6ES7 498-8AA00-8BB0

Evaluating / Communication

CPUs for process automation

CPU 414-4H for S7-400H/F/FH

Ordering data	Order No.
RS 485 bus connector with 90° cable outlet	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA12-0XA0
With PG interface	6ES7 972-0BB12-0XA0
RS 485 bus connector with angled cable outlet	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA41-0XA0
With PG interface	6ES7 972-0BB41-0XA0
Max. transmission rate 1.5 Mbit/s	
Without PG interface	6ES7 972-0BA30-0XA0
RS 485 bus connector with 90° cable outlet for Fast Connect system	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA50-0XA0
With PG interface	6ES7 972-0BB50-0XA0
RS 485 bus connector with axial cable outlet	
For SIMATIC OP, for connection to PPI, MPI, PROFIBUS	6GK1 500-0EA02
PROFIBUS FastConnect bus cable	
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	6XV1 830-0EH10

Evaluating / Communication

CPUs for process automation

CPU 417-4H for S7-400H/F/FH

Overview



- CPU for SIMATIC S7-400H and S7-400F/FH.
- Can be used in high availability S7-400H systems
- Can be used with F-runtime license and F-compatible CPU in failsafe S7-400F/FH systems
- With integrated PROFIBUS DP master interface
- With 2 slots for sync modules

Applications

The CPU 417-4H is the most powerful CPU for the SIMATIC S7-400H and S7-400F/FH. It allows a fault-tolerant S7-400H system to be configured. It can also be used for the failsafe S7-400F/FH automation system in conjunction with an F-runtime license.

The integrated PROFIBUS DP interface supports direct connection to the PROFIBUS DP fieldbus as master.

Design

The CPU 417-4H includes:

- Powerful processor:
The CPU achieves command execution times of as low as 30 ns per binary command.
- 20 MB working memory (10 MB for program, 10 MB for data):
Load memory for user programs and parameterization data of the S7-400H programmable controller; high-speed memory for critical parts of the user program.
- Memory card:
For expanding the integral load memory. The information stored in the load memory includes S7-400H parameterization data in addition to the program and therefore requires twice as much memory space. The result is:
- Integral load memory is not sufficient for large programs, so a memory card is frequently necessary.

RAM and FEPRM cards are available (FEPRM can also be used for storage in the de-energized state).

Note:

The RAM memory cards 6ES7 955-... can only be used in combination with the CPU 6ES7 417-4HL01-...

- Flexible expansion capability:
Max. 128 K digital, 8 K analog inputs/outputs.
- Multipoint interface MPI:
The MPI can be used to set up a simple network with up to 32 stations and a data transmission rate of 187.5 Kbit/s. The CPU can establish up to 64 connections to stations on the communications bus (C bus) and the MPI.

Note:

If PROFIBUS DP and the MPI interface are used simultaneously,

the following bus connectors must be plugged into the MPI interface:

- With a socket: 6ES7 972-0BB41-0XA0
- Without a socket: 6ES7 972-0BA41-0XA0
- Mode selector:

Designed as key switch. Access rights to user data can be limited with the removable mode selector.

- Diagnostics buffer:
The last 120 fault and interrupt events are saved in a ring buffer for diagnostic purposes.
- Real-time clock:
Diagnostics messages from the CPU are tagged with the date and time.
- PROFIBUS DP interface:
The CPU 417-4H with PROFIBUS DP master interface supports a high-speed, distributed automation configuration with easy handling. From the user's point of view, the distributed I/O is treated as central I/O (same configuring, addressing and programming).

Note:

If PROFIBUS DP and the MPI interface are used simultaneously, the following bus connectors must be plugged into the MPI interface:

- With a socket: 6ES7 972-0BB41-0XA0
- Without a socket: 6ES7 972-0BA41-0XA0

Function

- Block protection:
A password concept also protects the user program from unauthorized access as well as the key switch.
- Integrated HMI services:
The user only has to specify the source and destination of the data with HMI devices. The data are then transported cyclically and automatically by the system.
- Integrated communication functions:
 - PG/OP communication
 - Expanded communication (simple and high-availability)

Configurable Attributes

The STEP 7 "hardware configuration" tool and the installed S7-400H options package are used to configure the features and response of the S7-400H, including the CPUs, for example:

- Multipoint interface MPI:
 - Definition of node addresses
 - Startup/cycle behavior
 - Stipulation of the maximum cycle time and communication load
- Address allocation:
Addressing of I/O modules
- Retentive area:
Definition of the number of retentive bit memories, counters, timers, data blocks, and clock memories
- Protection level:
Definition of access authorizations to program and data
- System diagnostics:
Definition of the handling and scope of diagnostics messages
Timed interrupts:
- Setting of periods
Configuration of H stations

Safety-related functions

The F-runtime license can be used to compile the failsafe F user program and run it on the CPU. A license is required for each S7-400F/FH system. 2 TÜV stickers are included.

Evaluating / Communication

CPUs for process automation

CPU 417-4H for S7-400H/F/FH

Reporting functions

- Status and fault indicators:
LEDs indicate internal and external errors and operating modes such as RUN, STOP, Startup, "Master" mode, redundancy error, test function, etc.
- Test functions:
The PG can be used to display signal states in program execution, modify process tags irrespective of the user program, read out the contents of stack memories, run separate program steps and inhibit program components.
- Information functions:
The PG can be used to provide the user with information about the memory capacity and operating mode of the CPU, and the current utilization of the working and load memories.

Technical specifications

6ES7 417-4HL04-0AB0	
Supply voltages	
Rated value	
• DC 24 V	Yes
Voltages and currents	
Feeding of external buffer voltage to CPU	5 to 15 VDC
Current consumption	
from backplane bus DC 5 V, max.	1.7 A
Power loss, typ.	6 W
Backup battery	
• Buffer current, typ.	600 µA
• Buffer current, max.	1,810 µA
Memory	
Type of storage	
• RAM	
- expandable	No
• Load memory	
- expandable FEPRM	Yes; with Memory Card (FLASH)
- expandable FEPRM, max.	64 MByte
- integrated RAM, max.	256 KByte
- expandable RAM	Yes; With Memory Card (RAM)
- expandable RAM, max.	16 MByte
Backup	
• present	Yes
• with battery	Yes; All data
• without battery	No
CPU/blocks	
DB	
• Number, max.	8,192; DB 0 reserved
FB	
• Number, max.	6,144
• Size, max.	64 KByte
FC	
• Number, max.	6,144
• Size, max.	64 KByte
OB	
• Size, max.	64 KByte
Nesting depth	
• per priority class	24
• additional within an error OB	2

CPU/processing times	
for bit operations, min.	0.03 µs
for word operations, min.	0.03 µs
for fixed point arithmetic, min.	0.03 µs
for floating point arithmetic, min.	0.09 µs
Times/counters and their remanence	
S7 counter	
• Number	2,048
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	2,047
- preset	From Z 0 to Z 7
• Counting range	
- lower limit	1
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	2,048
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	16 KByte
• Remanence available	Yes; MB 0 to MB 16383
Address area	
I/O address area	
• Inputs	16 KByte
• Outputs	16 KByte
• of which, distributed	
- MPI/DP interface, inputs	2 KByte
- MPI/DP interface, outputs	2 KByte
- DP interface, inputs	8 KByte
- DP interface, outputs	8 KByte
Process image	
• Inputs, adjustable	16 KByte
• Outputs, adjustable	16 KByte
• Inputs, preset	1,024 Byte
• Outputs, preset	1,024 Byte
Subprocess images	
• Number of subprocess images, max.	8
Digital channels	
• Inputs	131,072
• Outputs	131,072
• Inputs, of which central	131,072

Evaluating / Communication CPUs for process automation

CPU 417-4H for S7-400H/F/FH

• Outputs, of which central	131,072
Analog channels	
• Inputs	8,192
• Outputs	8,192
• Inputs, of which central	8,192
• Outputs, of which central	8,192
Hardware config.	
Central devices, max.	1
Expansion devices, max.	21
Multicomputing	No
IM	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	6; IM 463-2
Number of DP masters	
• integrated	2
• via IM 467	0
• via CP	10
• Mixed mode IM + CP permitted	No; IM 467 cannot be used jointly with CP 443-5 Ext.
• via interface module	0
Number of operable FMs and CPs (recommended)	
• FM	64; Limited due to number of slots and number of connections
• CP, point-to-point	64; Limited due to number of slots and number of connections
• CP, LAN	64; limited due to number of slots and number of connections
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
Operating hours counter	
• Number	8
Clock synchronization	
• supports	Yes
S7 message functions	
Number of login stations for message functions, max.	16
Communication functions	
PG/OP communication	Yes
Global data communication	
• supported	No
S7 basic communication	
• supported	No
S7 communication	
• supported	Yes
• as server	Yes
• as client	Yes
• Useful data per job, max.	64 KByte
S5-compatible communication	
• supported	Yes; via CP and loadable FC
• Useful data per job, max.	8 KByte

Standard communication (FMS)	
• supported	Yes; Via CP and loadable FB
Number of connections	
• overall	64
1st interface	
Physics	RS 485 / PROFIBUS
isolated	Yes
Functionality	
• MPI	Yes; Default setting
• DP master	Yes
• DP slave	No
MPI	
• Number of connections	44
• Services	
- PG/OP communication	Yes
- Global data communication	No
- S7 basic communication	No
- S7 communication	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Number of connections, max.	32
• Services	
- PG/OP communication	Yes
- S7 basic communication	No
- S7 communication	No
- S7 communication, as client	No
- S7 communication, as server	No
- equidistance support	No
- Activation/deactivation of DP slaves	No
- direct data exchange (cross traffic)	No
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	32; Number of slots, max. 512
• Address area	
- Inputs, max.	2 KByte
- Outputs, max.	2 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
2nd interface	
Physics	RS 485 / PROFIBUS
isolated	Yes
Functionality	
• DP master	Yes
• DP slave	No
• Point-to-point coupling	No
DP master	
• Number of connections, max.	32
• Number of connections (of which reserved), max.	1 for PG, 1 for OP
• Services	
- PG/OP communication	Yes

Evaluating / Communication

CPUs for process automation

CPU 417-4H for S7-400H/F/FH

- S7 basic communication	No
- S7 communication	No
- S7 communication, as client	No
- S7 communication, as server	No
- equidistance support	No
- Activation/deactivation of DP slaves	No
- direct data exchange (cross traffic)	No
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	125; Number of slots, max. 2048
• Address area	
- Inputs, max.	8 KByte
- Outputs, max.	8 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; V5.0 SP2
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
User program protection/pass-word protection	Yes
Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm
Dimensions	
Required slots	2
Weights	
Weight, approx.	1,070 g

Selection and Ordering Data

Ordering data	Order No.
CPU 417-4H	
For S7-400H and S7-400F/FH; MPI/PROFIBUS DP master interface, 2 slots for Sync modules, slot for memory card, incl. slot number labels, 2 keys	
Main memory 20 MB	6ES7 417-4HL04-0AB0
Memory Card RAM	
1 MB	6ES7 952-1AK00-0AA0
2 MB	6ES7 952-1AL00-0AA0
4 MB	6ES7 952-1AM00-0AA0
8 MB	6ES7 952-1AP00-0AA0
16 MB	6ES7 952-1AS00-0AA0
64 MB	6ES7 952-1AY00-0AA0

Ordering data	Order No.
FEPROM memory card	
1 MB	6ES7 952-1KK00-0AA0
2 MB	6ES7 952-1KL00-0AA0
4 MB	6ES7 952-1KM00-0AA0
8 MB	6ES7 952-1KP00-0AA0
16 MB	6ES7 952-1KS00-0AA0
32 MB	6ES7 952-1KT00-0AA0
64 MB	6ES7 952-1KY00-0AA0
MPI cable	6ES7 901-0BF00-0AA0
For connecting SIMATIC S7 and the PG through MPI; 5 m in length	
Slot number plates	6ES7 912-0AA00-0AA0
1 set (spare part)	
S7 F Systems option pack	6ES7 833-1CC00-0YX0
For programming fail-safe user programs, with F block library	
F runtime license	6ES7 833-1CC00-6YX0
For using fail-safe programs in CPU 417-4H; 1 license required for each S7-400F/FH system	
Manual "SIMATIC S7-400H programmable controller"	
German	6ES7 988-8HA11-8AA0
English	6ES7 988-8HA11-8BA0
French	6ES7 988-8HA11-8CA0
Spanish	6ES7 988-8HA11-8DA0
Italian	6ES7 988-8HA11-8EA0
Manual "Communication for SIMATIC S7-300/-400"	
German	6ES7 398-8EA00-8AA0
English	6ES7 398-8EA00-8BA0
French	6ES7 398-8EA00-8CA0
Spanish	6ES7 398-8EA00-8DA0
Italian	6ES7 398-8EA00-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current "Manual Collection" DVD and the three subsequent updates	
Brochure "SIMATIC S7-400 programmable controller - Design and application"	
German	6ES7 498-8AA00-8AB0
English	6ES7 498-8AA00-8BB0
RS 485 bus connector with 90° cable outlet	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA12-0XA0
With PG interface	6ES7 972-0BB12-0XA0
RS 485 bus connector with angled cable outlet	
Max. transmission rate 12 Mbit/s	

Evaluating / Communication

CPUs for process automation

CPU 417-4H for S7-400H/F/FH

Ordering data	Order No.
Without PG interface	6ES7 972-0BA41-0XA0
With PG interface	6ES7 972-0BB41-0XA0
Max. transmission rate 1.5 Mbit/s	
Without PG interface	6ES7 972-0BA30-0XA0
RS 485 bus connector with 90° cable outlet for Fast Connect system	
Max. transmission rate 12 Mbit/s	
Without PG interface	6ES7 972-0BA50-0XA0
With PG interface	6ES7 972-0BB50-0XA0
RS 485 bus connector with axial cable outlet	
For SIMATIC OP, for connection to PPI, MPI, PROFIBUS	6GK1 500-0EA02
PROFIBUS FastConnect bus cable	
Standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	6XV1 830-0EH10

Evaluating / Communication

CPUs for process automation

Sync module for coupling two CPU 41xH

Overview



- For connecting the two 414-4H/417-4H CPUs in the S7-400H subunits
- Can be plugged directly into the CPU

Application

The Sync module is required for connecting the two 414-4H or 417-4H CPUs in the S7-400H subunits.

Design

The Sync module is plugged into the slot reserved for it on the CPU 414-4H/417-4H. Two Sync modules are required for each CPU. Modules in the subunits are connected by means of fiber-optic connecting cables.

With CPU 414-4H (6ES7 414-4HJ04-0AA0) and CPU 417-4H (6ES7 417-4HL04-0AA0) only the following Sync modules and fiber-optic Sync cables can be used:

- Sync module 6ES7 960-1AA04-0XA0 for fiber-optic cables up to 10 m in length (patch cable).
- Sync module 6ES7 960-1AB04-0XA0 for fiber-optic cables up to 10 km in length (patch cable or installation cable).

Technical specifications

	6ES7 960-1AA04-0XA0	6ES7 960-1AB04-0XA0
Current consumption		
from CPU, max.	210 mA	250 mA
Power loss, typ.	1.1 mW	1.3 mW
Dimensions		
Width	25 mm	25 mm
Height	53 mm	53 mm
Depth	140 mm	140 mm
Weights		
Weight, approx.	65 g	65 g

Selection and Ordering Data

Ordering data

Order No.

Sync module

For linking the two CPUs 414-4H/417-4H with S7-400H/F/FH; two modules required per CPU;

For 6ES7 414-4HJ04-0AA0 and 6ES7 417-4HL04-0AA0; for patch cable, can be used with fiber-optic cables of max. 10 m

6ES7 960-1AA04-0XA0

For 6ES7 414-4HJ04-0AA0 and 6ES7 417-4HL04-0AA0; for patch cable and installation cable, can be used with fiber-optic cables of max. 10 km

6ES7 960-1AB04-0XA0

Fiber-optic connecting cable

For Sync module 6ES7 960-1Ax04-0XA0

- 1 m
- 2 m
- 10 m

6ES7 960-1AA04-5AA0

6ES7 960-1AA04-5BA0

6ES7 960-1AA04-5KA0

On request

For Sync module 6ES7 960-1AB04-0XA0; Fiber-optic monomode LC/LC duplex crossed 9/125 μ (max. 10 km)

Distributed safety software

Overview

- For creating safety-oriented automation applications with SIMATIC S7 in LAD or FBD (STEP 7 required)
- Implementation of safety functions by making simple connections between function blocks
- With preconfigured function block library
- User-defined blocks can be created
- Optimum embedding in the automation world due to guaranteed integration with STEP 7 tools
- Scope of supply:
 - Distributed Safety editor
 - Code generator
 - Debugger
 - Libraries of standard blocks

Benefits

Technological requirements can be quickly and easily converted into finished executable process automation programs. The outlay for creating programs in LAD or FBD only changes slightly:

- The automation problem can already be solved by configuring. Implementation of the configuring data is made automatically.
- Safety functions are programmed by interconnecting function blocks (AND, OR, etc.). Time-consuming programming is no longer necessary. Of course, FBs created with other STEP 7 programming languages can also be integrated.
- Optimal embedding into the world of automation through guaranteed continuity with the STEP 7 tools (also to the HMI tools), automatic expansion of STEP 7 project management, sharing of signal data with STEP 7, and integration with classical programming languages, e.g. through the import of standard function blocks and FCs written in LAD.
- An executable code is generated virtually at the push of a button and transmitted online into the automation system. To generate codes, STEP 7 needs to be installed on the programming device.

Application

The Distributed Safety engineering tool can be used to generate safety-related automation applications with SIMATIC S7 in LAD or FBD. A library of prefabricated blocks is available for this purpose. Users can also program their own blocks and add them to the library.

Design

The scope of supply of Distributed Safety includes:

- Distributed Safety editor
- Code generator
- Debugger
- Standard function block libraries

Function

- Catalog containing an extensive set of standard blocks, including:
 - Logic blocks
 - Pulse blocks
 - Counter
 - Timers
- Facilitation of test and startup through integral online monitoring and debugging.
- The CPU status is displayed in test mode. The display encompasses the statements online/offline and RUN and STOP online.
- Added documentation options:
 - Linking to project-wide documentation system DOCPRO.

- Message configuring for WinCC.

Expandable libraries:

The standard libraries can be expanded by means of separate application/technology-oriented blocks in the STL, LAD, FBD, S7-GRAPH and S7-HiGraph programming languages (for SIMATIC S7 in each case). Blocks can have as many as 160 inputs/outputs.

The F standard libraries can be expanded in the F-LAD and F-FBD programming languages by means of separate application-specific or technology-related blocks. The F blocks are called up and processed in a dedicated F runtime group using the F call function. The maximum interval between two calls can be parameterized in this case.

- Syntax check:
 - To detect program errors already when creating blocks.
- Display and operation attributes optimize the handling of the blocks.

Test and debug functions

In test and debug mode, all STEP 7 test functions are available.

Password protection

Distributed Safety V5.1 and higher completely supports password protection of the CPU.

Software requirements

- Distributed Safety V5.2 executes with STEP 7 V5.1 SP6 and higher.
- Distributed Safety V5.4 executes with STEP 7 V5.3 SP3 and higher.

Selection and Ordering Data

Ordering data	Order No.
Distributed Safety V5.4 programming tool <i>Task:</i> Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S <i>Requirement:</i> STEP 7 V5.3 SP3 and higher Floating license Software Update Service	6ES7 833-1FC02-0YA5 6ES7 833-1FC00-0YX2
Distributed Safety Upgrade From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Engineering License for the fail-safe library "Function blocks for burner management systems" FFB-V 1.2 License for one controller	9AL3 100-1AD12

Evaluating / Communication Configuring

Engineering Process Safety

Overview

The process industry frequently features complex technological sequences with high safety demands, and faults and failures in the process automation could have fatal consequences for personnel, machines, plants and the environment. Therefore process safety is of particular significance. The safety technology used must reliably detect errors in the process and also its own internal errors, and automatically set the plant/application to a safe state if an error is detected.

Safety Integrated for Process Automation is the comprehensive range of products and services from Siemens for safe, fault-tolerant applications in the process industry. This is characterized by:

- AS 414F/FH and AS 417F/FH safety-related automation systems
- Failsafe PROFIBUS communication using the PROFIsafe profile
- Failsafe transmitters (SITRANS P DS III) on the PROFIBUS PA with PROFIsafe
- ET 200M and ET 200S distributed I/O systems with safety-related I/O modules
- User-friendly process visualization, including safety-relevant fault messages, via the operator system
- Engineering system with S7 F Systems software package, CFC and SIMATIC Safety Matrix
- Safety lifecycle management with support of highly qualified solution partners: services for all phases of the lifecycle of a safety instrumented system (analysis, implementation and operation)

Benefits

Safety Integrated for Process Automation permits complete integration of safety engineering into the SIMATIC PCS 7 process control system. The Basic Process Control System (BPCS) and Safety Instrumented System (SIS) melt together into a uniform and innovative complete system. The advantages of this fusion are quite clear:

- One common controller platform
- One common engineering system
- No separate safety bus - standard and safety-related communication take place on the same fieldbus (PROFIBUS with PROFIsafe)
- Mixed operation of standard and safety-related I/O modules in ET 200M and ET 200S remote I/O stations
- Uniform data management - no complex data exchange between BPCS and safety system
- Integration of safety-related applications into process visualization on the operator station
- Automatic integration of safety-related fault messages with time tagging into the process control system
- Integration of safety-related hardware into the SIMATIC PCS 7 asset management for diagnostics and preventive maintenance

The SIMATIC PCS 7 engineering system is a universal tool equally suitable for BPCS and safety applications.

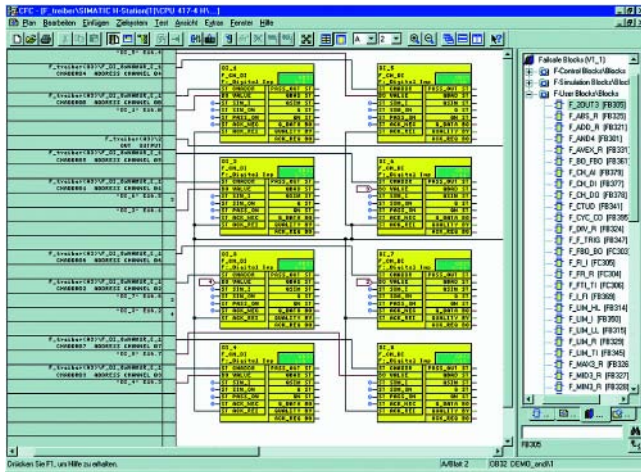
Using the S7 F Systems engineering tool, you can parameterize the AS 414F/FH and AS 417F/FH automation systems as well as the safety-related F-modules of the ET 200M and ET 200S I/O systems.

Using Continuous Function Chart (CFC) and predefined function blocks from the F-block library of S7 F Systems, you can configure safety-related applications simply, efficiently and without weary acquaintance.

However, this is even simpler, more convenient and faster using the SIMATIC Safety Matrix based on CFC. The configuration tool

functioning according to the principle of a Cause&Effect matrix automatically creates complex safety programs once you have assigned the events (causes) occurring during a process to exactly defined reactions (effects).

Overview



Evaluating / Communication Configuring

SIMATIC Safety Matrix

Overview

The SIMATIC Safety Matrix which can be used in addition to the CFC is an innovative safety lifecycle tool from Siemens that can be used not only for user-friendly configuration of safety applications, but also for their operation and service. The tool, which is based on the proven principle of a cause & effect matrix, is ideally suited to processes where defined statuses require specific safety reactions.

The SIMATIC Safety Matrix not only means that programming of the safety logic is significantly simpler and more convenient, but also much faster than in the conventional manner. During the risk analysis of a plant, the configuration engineer can assign exactly defined reactions (effects) to events (causes) which may occur during a process.

Benefits

The advantages of the SIMATIC Safety Matrix in the implementation phase:

- Simple programming using Cause&Effect method
- No programming knowledge required
- Automatic generation of CFCs including driver blocks
- Automatic version tracking
- integrated change tracking
- 1-to-1 printout of Cause&Effect matrix

Design

In the context of SIMATIC PCS 7, the following individual products are offered for the SIMATIC Safety Matrix:

- **SIMATIC Safety Matrix Tool** for configuration of safety functions on the SIMATIC PCS 7 engineering system
- **SIMATIC Safety Matrix Editor** for creating and debugging the Safety Matrix logic in an external computer, independent of the engineering system (can be optionally used additive to the SIMATIC Safety Matrix Tool)
- **SIMATIC Safety Matrix Viewer for SIMATIC PCS 7** for operation and monitoring of the SIMATIC Safety Matrix using the SIMATIC PCS 7 operator system (for ordering data, refer to Section "OS software" in Chapter "Operator system")

System requirements

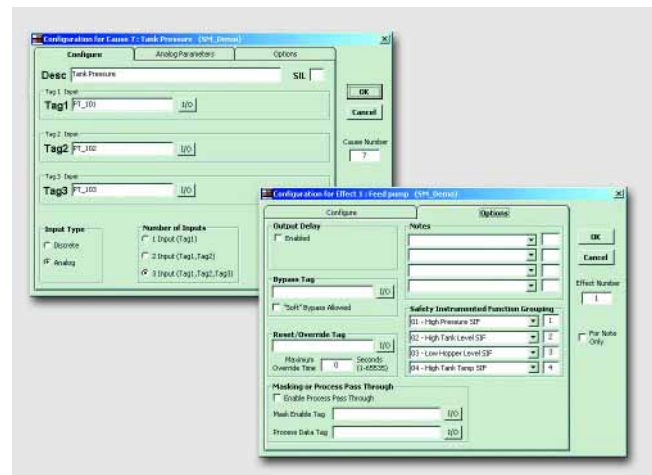
	Hardware requirement	Software requirement
SIMATIC Safety Matrix Tool	SIMATIC PCS 7 AS 414H or AS 417H	SIMATIC PCS 7 V6.0 SP2 or higher, S7 F Systems V5.2 HF 2 or higher with S7 F-Lib V1.2
SIMATIC Safety Matrix Editor		Windows 2000 Professional SP2 or higher or Windows XP Professional
SIMATIC Safety Matrix Viewer	SIMATIC PCS 7 AS 414H or AS 417H	SIMATIC PCS 7-OS V6.0 SP2 or higher

The SIMATIC Safety Matrix Editor offers the advantage that the Safety Matrix can also be created, processed further and debugged outside the SIMATIC PCS 7 engineering system. The SIMATIC Safety Matrix Editor can be used on a computer with Windows 2000 Professional SP2 or higher or Windows XP Professional. However, generation of the safety-related CFC program as well as compilation and downloading to the automation system are only possible by means of the SIMATIC engineering system with the SIMATIC Safety Matrix Tool.

Function

The screenshot shows the SIMATIC SAFETY MATRIX interface. It features a grid where causes (rows) are linked to effects (columns). The grid is divided into sections for different process parameters like Tank Pressure, Tank Level, and Tank Temperature. The interface includes buttons for 'View', 'Edit', 'Delete', and 'Add', as well as a 'Cause Description' column on the right.

Safety Matrix: intersections define the linking of causes and effects"



Configuration of analog or digital causes and their digital effects"

The matrix table is comparable with a spreadsheet program, and the configuration engineer first enters the possible process events (inputs) in the horizontal lines, and then configures their type and number, logical links, possible delays and interlocks, and any tolerable faults. In the vertical columns, he subsequently defines the reactions (outputs) to a particular event.

Events and reactions are linked simply by clicking the cell at the intersection of the row and column. Using these data, the SIMATIC Safety Matrix automatically generates complex, safety-related CFC programs. No special programming knowledge is required of the configuration engineer, and he can completely concentrate on the safety requirements of the plant.

Selection and Ordering Data

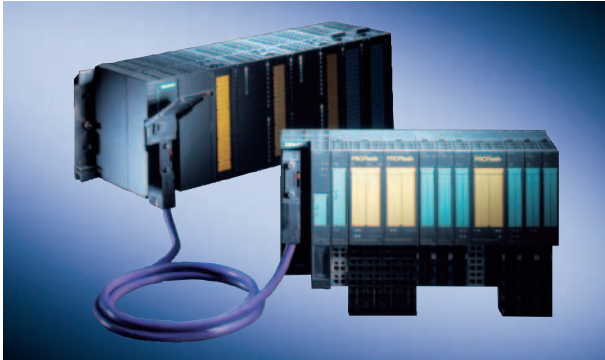
Order No.	
SIMATIC Safety Matrix Tool Creation, configuration, compilation, loading and online monitoring of the Safety Matrix in a SIMATIC PCS 7 environment Including SIMATIC Safety Matrix Viewer for SIMATIC PCS 7, for operation and monitoring of the Safety Matrix in a SIMATIC PCS 7 environment with several operator control levels 1 language (English), executes with Windows XP Professional, single license for 1 installation Type of delivery: Certificate of license and authorization diskette for Safety Matrix Tool and Safety Matrix Viewer; software and electronic documentation on CD	6ES7 833-1SM00-0YA5
SIMATIC Safety Matrix Editor Creation and checking of the Safety Matrix logic on an external computer without a SIMATIC PCS 7/ STEP 7 environment 1 language (English), executes with Windows 2000 Professional or Windows XP Professional, single license for 1 installation Type of delivery: Certificate of license and authorization diskette; software and electronic documentation on CD	6ES7 833-1SM40-0YA5

Evaluating / Communication

Fail-safe I/O devices ET 200S

Fail-safe modules

Overview



The fail-safe SIMATIC S7 CPUs, plus the fail-safe signal modules of SIMATIC ET 200S / ET200 / 200pro/ ET200eco and ET200M have been specially developed for distributed applications in manufacturing systems. Thanks to the discrete structure of the F I/Os, safety technology is only applied where actually required. The new system replaces conventional electromechanical components, such as:

- Freely programmable safe linking of sensors to actuators;
- Selective safe shutdown of actuators;
- Hybrid configurations of F modules (F stands for fail-safe) and standard modules in a station;
- Single-bus concept, F signals and standard signals are transferred over one bus medium (PROFIBUS DP, PROFINET).

Totally Integrated Automation (TIA)

Safety technology (Safety Integrated) is a component of Totally Integrated Automation resulting in the total integration of safety and standard automation (SIMATIC S7).

Whereas today, standard automation (conventional PLCs) and safety automation (electromechanics) are still separate, these two worlds are growing closer together to form one uniform, integrated overall system.

Siemens can therefore present itself as a complete supplier for automation engineering for which safety technology is part of the standard automation and uniformity exists throughout the complete system.

Evaluating / Communication

Fail-safe I/O devices ET 200S

IM 151-7 F-CPU interface module

Overview



- Interface module with integrated fail-safe CPU for SIMATIC ET 200S
- With DP/MPI interface
- For design of a fail-safe automation system for plants with increased safety requirements
- Complies with safety requirements up to SIL 3 according to IEC 61508 and Cat. 4 according to EN 954-1
- Fail-safe I/O modules can be connected in a distributed configuration through DP master modules (PROFIsafe)
- The fail-safe I/O modules of ET200S PROFIsafe can be connected in a centralized configuration
- Standard modules can be used for non-safety-relevant applications

Note:
Micro Memory Card required for operation of CPU.

Application

- The IM 151-7 F-CPU supports setting up a fail-safe automation system for plant with stringent safety requirements, particularly in production engineering.
- The intelligent ET 200S station can also be implemented standalone.
- As a PROFIBUS DP slave they can be used for distributed, fail-safe expansion of both the fail-safe and the standard versions of PROFIBUS DP masters.

Design

The IM 151-7 F-CPU includes:

- Microprocessor; Processing time of 100 ns per binary instruction
- 64 KB main memory
- Highly modular expansion for maximum flexibility; up to 63 I/O modules (power, electronics, technology and motor starter modules) mixed as required
- Integral multipoint interface PG, OP/DP, in RS 485 (Cu, 9-pin sub-D female connector) configurable as DP slave or MPI
- Password concept for protecting the application program against unauthorized access
- Diagnostic buffer; for the 100 preceding fault and interruption events
- SIMATIC MMC
 - For maintenance-free data backup without battery
 - Program back-up (load memory)
 - Firmware update through MMC
 - External load memory on MMC
- Update via MMC

- Hardware clock; Diagnostic message frames of the CPU can be provided with date/time stamp
- Integrated communication functions:
 - PG/OP communication
 - PROFIBUS DP slave/MPI
- Basic communication as server (S7-CPU's access data from the IM 151-7 F-CPU through PROFIBUS using I-Put/I-Get)
- TeleService

Function

Function

Configurable and parameterizable attributes

- I/O configuration: Type and scope
- Startup and scan cycle response: Definition of maximum scan time and loading, in addition to self-test functions
- Definition of the number of retentive bit memories, counters, timers and data blocks
- Clock memory flag: Address settings
- Protective stage: Definition of access authorizations to programs and data
- Definition of the handling and scope of diagnostic messages
- Timed interrupts: Setting of periodic occurrence
- Schedulers: Start date, start time and periodicity settings

Mode of operation

The safety functions of the IM 151-7 F-CPU are present in the F program of the CPU and in the fail-safe signal modules. The signal modules monitor the output and input signals by means of discrepancy analyses and test signal injections.

The CPU checks proper operation of the PLC by performing regular self-tests, instruction tests and logic and sequential program flow control. In addition, the I/O is checked by requesting signals of life.

If an error is diagnosed on the system, the latter is moved to a safe state.

An F runtime license is not required for operation of the IM 151-7 F-CPU.

Display and information functions

- Status and error functions; LEDs indicate, for example, hardware, programming, time or I/O errors and the modes RUN, STOP, restart, etc.
- Test functions; the PG can be used to display signal states in program execution, modify process tags irrespective of the user program, and read out the contents of stack memories
- Information functions; you can use the PG to obtain information about the storage capacity and operating mode of the CPU as well as the current loading of work and load memories, current scan times and diagnostic buffer contents in plaintext

Programming

The IM 151-7 F-CPU is programmed in the same manner as the other SIMATIC S7 systems. The user program for non-fail-safe plant sections is created with the proven programming tools such as STEP 7.

SIMATIC S7 Distributed Safety option package

The STEP 7 option package "SIMATIC S7 Distributed Safety" is required to program the safety-relevant parts of the program. The package contains all the functions and blocks required to create the F program.

The F program with the safety functions is linked in the F-FBD or F-LAD or using special function blocks from the F library. Use of F-FBD or F-LAD simplifies plant planning and programming and, because of the uniform and cross-vendor presentation, the acceptance test. Programmers can concentrate completely on

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Fail-safe I/O devices ET 200S

IM 151-7 F-CPU interface module

configuration of the safety-relevant application without having to use additional tools.

Technical specifications

6ES7 151-7FA20-0AB0	
Voltages and currents	
Mains/voltage failure jumpering, min.	5 ms
Load voltage L+	
• Rated value (DC)	24 V
• Short-circuit protection	Yes
• reverse polarity protection	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Current consumption	
from supply voltage 1L+, max.	250 mA
Power loss, typ.	3.3 W
Current output to backplane bus (DC 5 V), max.	700 mA
Memory	
Type of storage	
• RAM	
- integrated	128 KByte
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
CPU/blocks	
Number of blocks (total)	1,024; (DBs, FCs, FBs); the maximum number of loadable blocks can be reduced by the MMC used.
DB	
• Number, max.	511
• Size, max.	16 KByte
FB	
• Number, max.	1,024
• Size, max.	16 KByte
FC	
• Number, max.	1,024
• Size, max.	16 KByte
OB	
• Size, max.	16 KByte
Nesting depth	
• per priority class	8
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.1 µs
for word operations, min.	0.2 µs
for fixed point arithmetic, min.	2 µs
for floating point arithmetic, min.	3 µs
Times/counters and their remanence	
S7 counter	
• Number	256
• Remanence	
- adjustable	Yes

- lower limit	0
- upper limit	255
• Counting range	
- adjustable	Yes
- lower limit	0
- upper limit	999
IEC counter	
• Type	SFB
• Number	Unlimited (limited only by RAM capacity)
S7 times	
• Number	256
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	255
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• Type	SFB
Data areas and their remanence	
Retentive data area in total (incl. times, counters, flags), max.	64 KByte
Flag	
• Number, max.	256 Byte
• Remanence available	Yes
• Remanence preset	MB 0 to MB 15
• Number of clock memories	8; 1 memory byte
Data blocks	
• Number, max.	511
• Size, max.	16 KByte
Local data	
• per priority class, max.	510 Byte
Address area	
I/O address area	
• Inputs	2,048 Byte
• Outputs	2,048 Byte
Process image	
• Inputs	128 Byte
• Outputs	128 Byte
Digital channels	
• Inputs	16,336
• Outputs	16,336
• Inputs, of which central	248
• Outputs, of which central	248
Analog channels	
• Inputs	1,021
• Outputs	1,021
• Inputs, of which central	124
• Outputs, of which central	124
Hardware config.	
Number of modules per system, max.	63

Evaluating / Communication

Fail-safe I/O devices ET 200S

IM 151-7 F-CPU interface module

Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes
• Backup time	6 w
• Deviation per day, max.	10 s
Operating hours counter	
• Number	1
• Range of values	0 to 2 ³¹ hours (when using SFC 101)
• Granularity	1 hour
• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• in AS, Master	No
• in AS, Slave	No
S7 message functions	
Number of login stations for message functions, max.	12
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	40
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30
• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	Inputs, outputs
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	100
• adjustable	No
Communication functions	
PG/OP communication	Yes
Global data communication	
• supported	Yes
• Number of GD packets, max.	4
• Number of GD packets, transmitter, max.	4
• Number of GD packets, receiver, max.	4
• Size of GD packets, max.	22 Byte
• Size of GD packet (of which consistent), max.	22 Byte

S7 basic communication	
• supported	Yes
• Useful data per job, max.	76 Byte
• Useful data per job (of which consistent) max.	76 Byte
S7 communication	
• supported	Yes
• as server	Yes
• as client	No
• Useful data per job, max.	180 Byte
• Useful data per job, of which consistent, max.	64 Byte
S5-compatible communication	
• supported	No
Standard communication (FMS)	
• supported	No
Number of connections	
• overall	12
• usable for PG communication	11
• reserved for PG communication	1
• usable for OP communication	11
• reserved for OP communication	1
• usable for S7 basic communication	10
• reserved for S7-Basic communication	0
• usable for routing	4
1st interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Power supply to interface (15 to 30 V DC), max.	80 mA
Functionality	
• MPI	Yes
• DP master	No
• DP slave	Yes
• Point-to-point coupling	No
MPI	
• Number of connections	12
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
• Transmission speeds, max.	12 Mbit/s
DP slave	
• Number of connections	12
• Services	
- PG/OP communication	Yes
- Routing	Yes

Evaluating / Communication

Fail-safe I/O devices ET 200S

IM 151-7 F-CPU interface module

- direct data exchange (cross traffic)	Yes
- DPV1	No
• Transmission speeds, max.	12 Mbit/s
• automatic baud rate search	Yes; only with passive interface
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
• Useful data per address area, max.	32 Byte
2nd interface	
Physics	RS 485
isolated	Yes
Functionality	
• MPI	No
• DP master	Yes
• Point-to-point coupling	No
DP master	
• Number of connections, max.	12
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes; 1 blocks only
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- SYNC/FREEZE	Yes
- Activation/deactivation of DP slaves	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	32
• Address area	
- Inputs, max.	2 KByte
- Outputs, max.	2 KByte
• Useful data per DP slave	
- Inputs, max.	244 Byte
- Outputs, max.	244 Byte
Isochronous mode	
Isochronous mode	No
CPU/programming	
Programming language	
• STEP 7	Yes
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• GRAPH	Yes
Nesting levels	8

User program protection/pass-word protection	Yes
Isolation	
Isolation checked with	500 V DC
Isolation	
between load voltage and all other switching components	Yes
between PROFIBUS DP and all other circuits	Yes
Permissible potential difference	
between different circuits	75 V DC / 60 V AC
Dimensions	
Width	60 mm
Height	119.5 mm
Depth	75 mm
Weights	
Weight, approx.	200 g

Selection and Ordering Data

	Order No.
IM151-7 F-CPU interface module	6ES7 151-7FA01-0AB0
For configuring a fail-safe automation system	
Accessories	
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	6ES7 833-1FC02-0YE5
From V5.x to V5.3; Floating license for 1 user	
MMC 64 kByte	6ES7 953-8LF20-0AA0
for program backup	
MMC 128 kByte	6ES7 953-8LG11-0AA0
for program backup	
MMC 512 kByte	6ES7 953-8LJ20-0AA0
for program backup	
MMC 2 MByte	6ES7 953-8LL20-0AA0
For program backup and/or firmware update	
MMC 4 MByte	6ES7 953-8LM20-0AA0
for program backup	
External prommer	6ES7 792-0AA00-0XA0
for MMC with USB interface	
Terminating module	6ES7 193-4JA00-0AA0
as spare part for ET 200S	
SIMATIC S5, 35 mm DIN rail	
• Length: 483 mm for 19" cabinets	6ES5 710-8MA11
• Length: 530 mm for 600 mm cabinets	6ES5 710-8MA21

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Fail-safe I/O devices ET 200S

IM 151-7 F-CPU interface module

	Order No.
• Length: 830 mm for 900 mm cabinets	6ES5 710-8MA31
• Length: 2 m	6ES5 710-8MA41

Evaluating / Communication

Fail-safe I/O devices ET 200S

PM-E F PROFIsafe F-power module

Overview

Fail-safe PM-E F PROFIsafe power modules for safety shutdown of standard digital output modules.

- Up to 2 fail-safe digital outputs onboard (source/sink outputs, up to 2A, up to SIL3/Cat. 4)
- The standard digital output modules can be shut down up to Cat.3 (EN 954) and SIL 2 (IEC61508) up to 10 A. The following modules can be used down-circuit of the power modules.
 - 2 DO / 0.5 A ST 6ES7 132-4BB01-0AA0
 - 2 DO / 2 A ST 6ES7 132-4BB31-0AA0
 - 2 DO / 0.5 A HF 6ES7 132-4BB01-0AB0
 - 2 DO / 2 A HF 6ES7 132-4BB31-0AB0
 - 4 DO / 0.5 A ST 6ES7 132-4BD01-0AA0
 - 4 DO / 2 A ST 6ES7 132-4BD31-0AA0

The modules support PROFIsafe, both in PROFIBUS, and in PROFINET configurations. They can be used with all fail-safe SIMATIC S7-CPU's.

Application

Fail-safe PM-E F PROFIsafe power modules for safety shutdown of standard digital output modules.

The standard digital output modules are supplied over PM-E PROFIsafe and can be shut down with fail-safety using relay contacts according to Cat. 3/ SIL2.

The PM-E F pm PROFIsafe power module can be used for loads configured without a ground connection and has 2 additional fail-safe digital outputs onboard. These are source/sink outputs and can be used for safety circuits up to Cat. 4/ SIL 3.

The PM-E F pp PROFIsafe power modules can be used for loads that are connected to ground, e.g. for actuators that have to be connected to a central mass.

The modules can be operated both down-circuit of the IM151-7 F-CPU in a central configuration and down-circuit of the IM 151 High Feature and IM151-3 PROFINET High Feature in a distributed configuration.

Design

PM-E F PROFIsafe power modules are plugged into the TM-P terminal modules provided.

The first module after the IM 151 must be a power module.

Selection and Ordering Data

	Order No.
Power module PM-E F pm PROFIsafe, 24 V DC	6ES7 138-4CF02-0AB0
For safe shutdown of digital output modules	
Power module PM-E F pp PROFIsafe, 24 V DC	6ES7 138-4CF41-0AB0
For safe shutdown of digital output modules	
Accessories	
IM 151-1 HIGH FEATURE interface module	6ES7151-1BA01-0AB0
For ET 200S; data transmission rate up to 12 Mbit/s; data volumes 244 bytes each for I/O, up to 63 modules can be connected; connection of PROFIsafe modules, isochronous mode; bus connection via 9-pin Sub-D incl. terminating module	

	Order No.
Terminal modules for power modules	
TM-P30S44-A0	6ES7 193-4CK20-0AA0
Ordering unit 1 item 7 x 2 terminals, terminal access to AUX1 bus, AUX1 interrupted to the left, screw-type terminals for PM-E F PROFIsafe	
TM-P30C44-A0	6ES7 193-4CK30-0AA0
Ordering unit 1 item 7 x 2 terminals, terminal access to AUX1 bus, AUX1 interrupted to the left, spring-loaded terminals for PM-E F PROFIsafe	
Distributed Safety V5.4 programming tool	
<i>Task:</i> Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S <i>Requirement:</i> STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	6ES7 833-1FC02-0YE5
From V5.x to V5.3; Floating license for 1 user	
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2

Evaluating / Communication

Fail-safe I/O devices ET 200S

F electronics modules

Overview



Digital inputs/outputs for the fail-safe SIMATIC S7 systems

Fail-safe digital input module

- For fail-safe reading of sensor information (1 or 2 channels)
- Provides integral discrepancy evaluation for 2-out-of-2 signals
- 2 internal sensor supplies (incl. test function) onboard

Fail-safe digital output module

- Fail-safe 2-channel activation (sink/source output) by actuators
- Actuators can be driven by up to 2 A

All modules are certified up to Cat. 4 (EN954-1) and up to SIL 3 (IEC 61508).

The modules support PROFIsafe, both in PROFIBUS, and in PROFINET configurations.

They can be used with all fail-safe SIMATIC S7 CPUs.

Application

The fail-safe modules of ET 200S can be used to implement the safety-related application requirements as an integral part of the overall automation. The safety functions required for fail-safe operation are integrated in the modules. The modules can be used for safety circuits up to Cat. 4/ SIL 3.

Communication to fail-safe SIMATIC S7 CPUs is performed by means of PROFIsafe.

The modules can be operated both down-circuit of the IM151-7 F-CPU in a central configuration and down-circuit of the IM 151 High Feature and IM151-3 PROFINET High Feature in a distributed configuration.

A standard power module is required to supply the modules.

Design

Digital input/output modules have the following features:

Compact design

The rugged plastic casing contains

- Green LEDs to display the signal states at the inputs/outputs
- Plug option for the front connector, protected behind the front door
- Labeling strip on the front door (yellow for fail-safe modules).

Simple connection

The modules are mounted on the standard rail and connected to neighboring modules via the bus connector. There are no slot rules and the addresses of the inputs are assigned via the slot.

By using them in the distributed I/O station ET 200M in combination with active bus modules, the modules can be replaced during operation with the equipment live. The remaining modules continue to operate.

User-friendly wiring

The modules are wired up via a front connector. When it is plugged in for the first time, a coding device latches in the connector so that the connector will only fit onto modules of this type. When the module is replaced, the fully wired front connector can be plugged into the new module of the same type.

In the case of fail-safe input modules, the necessary encoder power supply (test outputs) are provided. These test outputs can be activated via parameterization.

Technical specifications

6ES7 138-4FA03-0AB0	
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
• Reverse polarity protection	No
Current consumption	
Power loss, typ.	4 W
Address area	
Occupied address area	
• Outputs	4 Byte
• Inputs	6 Byte
Digital inputs	
Number of digital inputs	8; 8 single-channel, 4 two-channel
Number of simultaneously controllable inputs	8
Cable length	
• cable length, shielded, max.	200 m
• Cable length unshielded, max.	200 m
Input characteristic curve to IEC 1131, Typ 1	Yes
Input voltage	
• Rated value, DC	24 V
• for signal "0"	-30 to +5 V
• for signal "1"	15 to 30 V
Input current	
• for signal "1", typ.	3.7 mA
Input delay (for rated value of input voltage)	
• for standard inputs	
- programmable	Yes
- at "0" to "1", min.	0.3 ms
- at "0" to "1", max.	17 ms
- at "1" to "0", min.	0.3 ms
- at "1" to "0", max.	17 ms
Encoder supply	
Number of outputs	2
Output voltage	min. L+ (-1.5 V)
Output current, rated value	300 mA
Output current, permissible range	0 to 300 mA

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Fail-safe I/O devices ET 200S

F electronics modules

Short-circuit protection	Yes; electronic (response threshold 0.7 A to 1.8 A)
Encoder	
Connectable encoders	
• 2-wire BEROs	No
Status information/alarms/diagnostics	
Diagnostics	
• Diagnostic functions	Yes
Diagnostics indication LED	
• Collective error SF (red)	Yes
• Status indicator digital input (green)	Yes
Isolation	
Galvanic isolation, digital inputs	
• between the channels	No
• between the channels and the backplane bus	Yes
• between the channels and the load voltage L+	No
Standards, approvals, certificates	
Highest safety class achievable in safety mode	
• to EN 954	Cat. 3 (single-channel), Cat. 4 (two-channel)
• to IEC 61508	SIL 2 (single-channel), SIL 3 (two-channel)
Dimensions	
Width	30 mm
Height	81 mm
Depth	52 mm
Weights	
Weight, approx.	78 g

6ES7 138-4FB02-0AB0

Voltages and currents	
Load voltage L+	
• Rated value (DC)	24 V
• reverse polarity protection	No
Current consumption	
from load voltage L+ (without load), max.	typ. 100 mA
from backplane bus 3.3 V DC, max.	28 mA
Power loss, typ.	3.5 W
Digital outputs	
Number of digital outputs	4
cable length, shielded, max.	200 m
Cable length unshielded, max.	200 m
Short-circuit protection of the output	Yes; Electronic
Limitation of inductive shutdown voltage to	typ. (L+) -47 V
Lamp load, max.	10 W
Controlling a digital input	No
Output voltage	

• for signal "1", min.	L+ (-2,0 V), current sourcing switch: L+ (-1,5 V), voltage drop on current sinking switch: max. 0.5 V
Output current	
• for signal "1" rated value	2 A
• for signal "1" permissible range for 0 to 60 °C, min.	20 mA
• for signal "1" permissible range for 0 to 60 °C, max.	2.4 A
• for signal "0" residual current, max.	0.5 mA; Current sourcing switch: max. 0.5 mA; current sinking switch: max. 4 mA
Parallel switching of 2 outputs	
• for increased power	No
• for redundant control of a load	No
Switching frequency	
• with resistive load, max.	30 Hz
• with inductive load, max.	0.1 Hz
• on lamp load, max.	10 Hz
Aggregate current of the outputs (per group)	
• vertical installation	
- up to 40 °C, max.	4 mA
• horizontal installation	
- up to 40 °C, max.	6 A
- up to 55 °C, max.	5 A
• up to 60 °C, max.	4 mA
Load impedance range	
• lower limit	12 Ω
• upper limit	1 kΩ
Status information/alarms/diagnostics	
Diagnostics	
• Diagnostic functions	Yes
• Wire break	Yes
• Short circuit	Yes
Diagnostics indication LED	
• Collective error SF (red)	Yes
• Status indicator digital output (green)	Yes
Isolation	
Isolation, digital outputs	
• between the channels	No
• between the channels and the backplane bus	Yes
• between the channels and the load voltage L+	No
Standards, approvals, certificates	
Highest safety class achievable in safety mode	
• to EN 954	Cat. 4
• to IEC 61508	SIL 3
Dimensions	
Width	30 mm
Height	81 mm
Depth	52 mm

Evaluating / Communication

Fail-safe I/O devices ET 200S

F electronics modules

Weights	
Weight, approx.	85 g

Selection and Ordering Data

	Order No.
Electronic module 4/8 F-DI PROFIsafe 24 V DC 30 mm construction width, up to Category 4 (EN954-1)	6ES7 138-4FA03-0AB0
Electronic module 4 F-DO PROFIsafe 24 V DC/2A 30 mm construction width, up to Category 4 (EN954-1)	6ES7 138-4FB02-0AB0
Electronic module 4 F-DI / 3 F-DO PROFIsafe 24 V DC/2A 30 mm construction width, up to Category 3 (EN954-1) / SIL 2 (IEC 62061)	6ES7 138-4FC00-0AB0

Accessories

Terminal modules for electronic modules	See F terminal modules
IM151-1 High Feature interface module For ET200S; transmission rate up to 12 Mbit/s; max. 63 modules can be connected, with isochronous mode, bus connection via 9-pin Sub-D connector incl. terminating module	6ES7 151-1BA01-0AB0
Distributed Safety V5.4 programming tool <i>Task:</i> Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S <i>Requirement:</i> STEP 7 V5.3 SP3 and higher Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade From V5.x to V5.3; Floating license for 1 user	6ES7 833-1FC02-0YE5
SIMATIC Manual Collection Electronic manuals on DVD, multi-language: S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)	6ES7 998-8XC01-8YE0
SIMATIC Manual Collection – Update service for 1 year Scope of delivery: Current DVD "S7 Manual Collection" and the three subsequent updates	6ES7 998-8XC01-8YE2

Evaluating / Communication

Fail-safe I/O devices ET 200S

F electronics module RELAY

Overview



The digital electronics module 1 F-RO 24 V DC/5A 24 to 230 V AC/5A has the following characteristics

- 1 relay output (2 NO contacts)
- Output current 5 A.
- Rated load voltage 24 V DC and 24 to 230 V AC
- The control circuit of the two safety relays must be routed from the outside to the respective terminals.

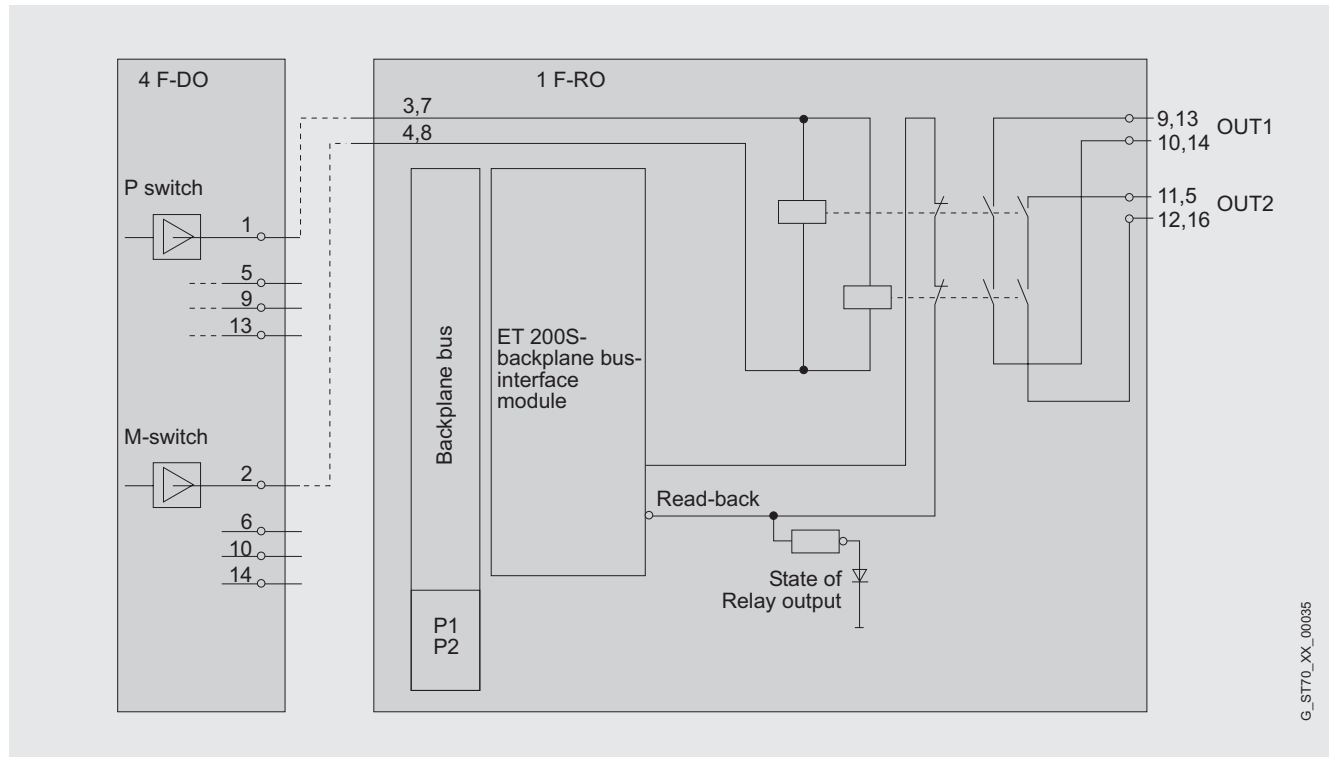
The attainable safety integrity level is SIL3 (IEC61508), when the control of the F-RO module is implemented via a fail-safe output (e.g. EM 4F-DO 24 V DC/2A PROFIsafe).

Application

The 1 F-RO module can be used in multiple ways, e.g.

- for switching of external voltages
- when floating signals are needed
- e.g. for controller enables
- when higher switching capacities (> 2A) are needed

Design



The block diagram shows the control via 4F-DO 24 V DC/2A PROFIsafe (6ES7138-4FB02-0AB0). The control circuit must be routed to the terminals 3, 4 or 7, 8. One channel of the F-DO can also be used for control of multiple F-RO modules (group shut-down).

Technical specifications

6ES7 138-4FR00-0AA0	
Voltages and currents	
Load voltage L+	
• Rated value (DC)	24 V; Supply via fail-safe output, e.g. of an F-DO
Current consumption	
from load voltage L+ (without load), max.	100 mA; from control voltage

from backplane bus 3.3 V DC, max.	10 mA
Power loss, typ.	2.1 W
Address area	
Address space per module	
• with packing	2 Bit
• without packing	1 Byte
Digital inputs	
Cable length	
• Cable length unshielded, max.	10 m; control cable
Digital outputs	
Number of digital outputs	1
cable length, shielded, max.	200 m

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Evaluating / Communication

Fail-safe I/O devices ET 200S

F electronics module RELAY

Cable length unshielded, max.	200 m
Short-circuit protection of the output	No; 6 A external fuse of duty category gL/gG
Controlling a digital input	Yes
Output current	
• for signal "1" rated value	5 A
• for signal "1" minimum load current	5 mA
Switching frequency	
• with resistive load, max.	2 Hz
• with inductive load, max.	0.1 Hz
Aggregate current of the outputs (per group)	
• vertical installation	
- up to 40 °C, max.	6 A
• horizontal installation	
- up to 40 °C, max.	8 A
- up to 55 °C, max.	6 A; at 50°C
- up to 60 °C, max.	5 A; up to max. 24.8 V
Relay outputs	
Switching capacity of the contacts	
• Thermal continuous current, max.	5 A
Status information/alarms/diagnostics	
Diagnostics indication LED	
• Status indicator digital output (green)	Yes
Isolation	
Isolation, digital outputs	
• between the channels	Yes
• between the channels and the backplane bus	Yes
• between the channels and the load voltage L+	Yes; between channels and control voltage
Standards, approvals, certificates	
Highest safety class achievable in safety mode	
• to EN 954	to Cat. 4
• to IEC 61508	up to SIL 3
Dimensions	
Width	30 mm
Height	81 mm
Depth	52 mm
Weights	
Weight, approx.	90 g

Selection and Ordering Data

	Order No.
Electronics module 1 F-RO 24 V DC/5A 24 to 230 V AC/5A	6ES7 138-4FR00-0AA0
Accessories	
Labelling strip	
Distributed Safety V5.4 programming tool Floating License	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	6ES7 833-1FC02-0YE5
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
SIMATIC Manual Collection – Update service for 1 year	6ES7 998-8XC01-8YE2

Evaluating / Communication

Fail-safe I/O devices ET 200S

F electronics module SIPLUS (extended temperature range)

Overview



Digital inputs/outputs for the fail-safe SIMATIC S7 systems

Fail-safe digital input module

- For fail-safe reading of sensor information (1 or 2 channels)
- Provides integral discrepancy evaluation for 2-out-of-2 signals
- 2 internal sensor supplies (incl. test function) onboard

Fail-safe digital output module

- Fail-safe 2-channel activation (sink/source output) by actuators
- Actuators can be driven by up to 2 A

All modules are certified up to Cat. 4 (EN954-1) and up to SIL 3 (IEC 61508).

The modules support PROFIsafe, both in PROFIBUS, and in PROFINET configurations.

They can be used with all fail-safe SIMATIC S7 CPUs.

4/8 F-DI, PROFIsafe 24 VDC	
Order No.	6AG1 138-4FA02-2AB0
Order No. based on	6ES7 138-4FA02-0AB0
Ambient temperature range	-25 to +60 °C; condensation permissible
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).
Technical data	The technical data are identical with those of the based-on modules.

4 F-DO, PROFIsafe 24 VDC/2 A	
Order No.	6AG1 138-4FB02-2AB0
Order No. based on	6ES7 138-4FB02-0AB0
Ambient temperature range	-25 to +60 °C; condensation permissible
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).
Technical data	The technical data are identical with those of the based-on modules.

Application

The fail-safe modules of ET 200S can be used to implement the safety-related application requirements as an integral part of the overall automation. The safety functions required for fail-safe operation are integrated in the modules. The modules can be used for safety circuits up to Cat. 4/ SIL 3.

Communication to fail-safe SIMATIC S7 CPUs is performed by means of PROFIsafe.

The modules can be operated both down-circuit of the IM151-7 F-CPU in a central configuration and down-circuit of the IM 151 High Feature and IM151-3 PROFINET High Feature in a distributed configuration.

A standard power module is required to supply the modules.

Design

Digital input/output modules feature the following mechanical characteristics:

Compact design

The rugged plastic housing contains:

- Green LEDs for indicating the signal states on the inputs/outputs
- Socket for the front connector, protected behind the front door
- Labeling field on the front door (yellow for fail-safe modules).

Easy installation

The modules are mounted on the DIN rail, and connected to the adjacent modules by means of bus connectors. There are no slot rules, the addresses of the inputs are determined by the slot.

When used in the ET 200M distributed I/O system together with active bus modules, hot swapping of the digital input/output modules is possible. The remaining modules continue to operate.

User-friendly wiring

The modules are wired via a front connector. When the module is connected for the first time, a coding latches in the connector so that the connector now only fits onto modules of the same type. When a module is replaced, the front connector can be used for the new module of the same type with the complete wiring.

The required sensor power supplies (test outputs) are made available in the case of the fail-safe input modules. These test outputs can be activated by setting parameters.

Evaluating / Communication

Fail-safe I/O devices ET 200S

**F electronics module SIPLUS
(extended temperature range)**

Selection and Ordering Data

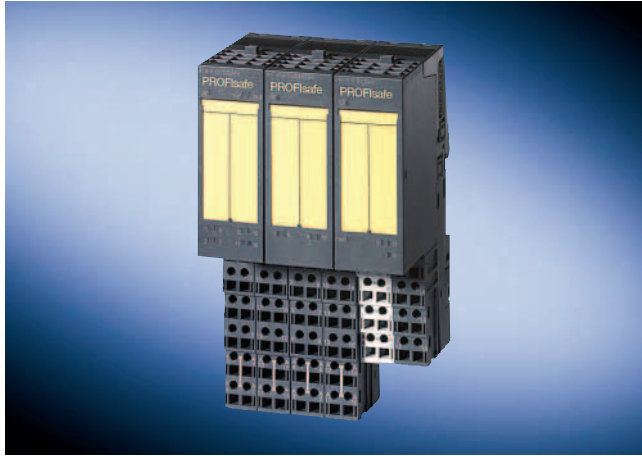
Ordering data	Order No.
F electronics modules SIPLUS	
(Extended temperature range and medium load)	
4/8 F-DI PROFIsafe 24 VDC electronics module	6AG1 138-4FA02-2AB0
30 mm construction width, up to Category 4 (EN954-1)	
Electronics module 4 F-DO PROFIsafe 24 VDC/2 A	6AG1 138-4FB02-2AB0
30 mm construction width, up to Category 4 (EN954-1)	
Accessories	
Terminal modules for electronic modules	See F terminal modules
IM151-1 High Feature interface module	6ES7 151-1BA01-0AB0
For ET 200S; transmission rate up to 12 Mbit/s; max. 63 modules can be connected, with isochronous mode, bus connection via 9-pin Sub-D connector incl. terminating module	
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	6ES7 833-1FC02-0YE5
From V5.x to V5.3; floating license for 1 user	
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on CD, multilingual: S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)	
SIMATIC Manual Collection – Update service for 1 year	6ES7 998-8XC01-8YE2
Scope of delivery: Current CD "S7 Manual Collection" and the three subsequent updates	

Evaluating / Communication

Fail-safe I/O devices ET 200S

F terminal modules

Overview



- Mechanical modules as receptacles for the electronic modules
- For setting up permanent wiring through self-configuring voltage buses
- Keyed connection technology to ensure an enhanced vibration resistance of up to 5 g
- Different versions to accommodate power modules and electronic modules
- Replaceable terminal box (even within the station network)
- Automatic coding of the electronic modules
- Self-shielding of the backplane bus for high data security
- Color coding facility for the terminals and for identifying the slot numbers
- Alternatively available with screw-type or spring-loaded terminals
- For up to 60 % faster process wiring also with FastConnect connection method (av. soon)

Application

Terminal modules are purely mechanical components for configuring the ET 200S. They accommodate the electronic modules and motor starter. The modules are automatically coded.

In the terminal modules, integral, self-configuring voltage buses, communications-capable motor starter and its self-configuring 40 A power bus considerably reduce wiring and control cabinet space requirements. The self-assembling shielding of the backplane bus increases data security.

Rugged construction and molded connections support use in a harsh industrial environment (e.g. vibration resistance up to 5 g).

Terminal modules are available in different versions:

- Terminal modules for power modules TM-P:
To supply load/encoder voltage on two self-configuring potential buses. A third potential bus (AUX1, max. 230 V) can be used user-specifically, e.g. for continuous supply of light barriers or protective conductors. Power modules are plugged onto TP-M modules for the purpose of voltage monitoring and fusing. Power modules are plugged onto TP-M modules for the purpose of voltage monitoring and fusing. TM-P modules can be used as often as required at any location in the ET 200S. This means that the size of a voltage group can be determined individually. The first module behind the IM151 is always a TM-P with a connected power module

- Terminal modules for electronic modules (TM-E);
TM-E modules accept electronic modules (inputs/outputs, technology modules). The unused signal lines of exclusive OR sensors can also be connected. Dedicated double-width terminal modules accept safety-related PROFIsafe electronic modules (F-DI, F-DO and PM E-F).

Design

TM-P

- Connection through screw-type or spring-loaded terminals
- With or without terminal access to AUX1 rail
- With or without interruption of the AUX1 rail
- Light casing color to allow better differentiation

TM-E

- Connection through screw-type or spring-loaded terminals
- With or without terminal access to AUX1 rail
- Connection in 2, 3 or 4-wire technology
- Direct connection of non-equivalent sensors without additional terminal blocks

Selection and Ordering Data

	Order No.
Terminal modules for power modules	
TM-P15S23-A1 Ordering unit 1 piece 2 x 3 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, screw-type terminals	6ES7 193-4CC20-0AA0
TM-P15C23-A1 Ordering unit 1 piece 2 x 3 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, spring-loaded terminals	6ES7 193-4CC30-0AA0
TM-P15S23-A0 Ordering unit 1 piece 2 x 3 terminals, terminal access to AUX1 bus, AUX1 interrupted to the left, screw-type terminals	6ES7 193-4CD20-0AA0
TM-P15C23-A0 Ordering unit 1 piece 2 x 3 terminals, terminal access to AUX1 bus, AUX1 interrupted to the left, spring-loaded terminals	6ES7 193-4CD30-0AA0
TM-P15S22-01 Ordering unit 1 piece 2 x 2 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, screw-type terminals	6ES7 193-4CE00-0AA0
TM-P15C22-01 Ordering unit 1 piece 2 x 2 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, spring-loaded terminals	6ES7 193-4CE10-0AA0
TM-P30S44-A0 Ordering unit 1 piece 7 x 2 terminals, terminal access to AUX1 bus, AUX1 interrupted to the left, screw-type terminals for PM-E F PROFIsafe	6ES7 193-4CK20-0AA0
TM-P30C44-A0	6ES7 193-4CK30-0AA0

Evaluating / Communication

Fail-safe I/O devices ET 200S

F terminal modules

Order No.	
Ordering unit 1 piece 7 x 2 terminals, terminal access to AUX1 bus, AUX1 interrupted to the left, spring-loaded terminals for PM-E F PROFIsafe	
Terminal modules for electronic modules	
TM-E30S44-01 Ordering unit 1 piece 4 x 4 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, screw-type terminals	6ES7 193-4CG20-0AA0
TM-E30C44-01 Ordering unit 1 piece 4 x 4 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, spring-loaded terminals	6ES7 193-4CG30-0AA0
TM-E30S46-A1 Ordering unit 1 piece 4 x 6 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, screw-type terminals	6ES7 193-4CF40-0AA0
TM-E30C46-A1 Ordering unit 1 piece 4 x 6 terminals, terminal access to AUX1 bus, AUX1 interconnected to the left, spring-loaded terminals	6ES7 193-4CF50-0AA0
Accessories	
Color coding plates Ordering unit 200 pieces for TM-P, TM-E • white • yellow • yellow/green • red • blue • brown • turquoise Ordering unit 1200 pieces, for terminal modules of SIMATIC ET 200S; contains 60 strips with 20 pieces each • yellow • yellow/green	6ES7 193-4LA20-0AA0 6ES7 193-4LB20-0AA0 6ES7 193-4LC20-0AA0 6ES7 193-4LD20-0AA0 6ES7 193-4LF20-0AA0 6ES7 193-4LG20-0AA0 6ES7 193-4LH20-0AA0 6ES7 193-4LB10-0AA0 6ES7 193-4LC10-0AA0
Grounding terminal Ordering unit 1 piece For cable cross-sections up to 25 mm ²	8WA2 868
3 x 10 mm busbars Ordering unit 1 piece	8WA2 842
Labels, inscribed Ordering unit 1 set • 200 items for slot numbering (1 to 20) 10 x • 200 items for slot numbering (1 to 40) 5 x • 200 items for slot numbering (1 to 64) 1 x, (1 to 68) 2 x	8WA8 861-0AB 8WA8 861-0AC 8WA8 861-0DA
Labels, blank 200 pieces for slot numbering	8WA8 848-2AY

Evaluating / Communication

Fail-safe I/O devices ET 200M

F digital/analog modules

Overview

The fail-safe CPUs of SIMATIC S7 and the fail-safe signal modules of SIMATIC ET 200S, ET 200pro, ET 200eco and ET 200M have been specially developed for distributed safety-related applications in production engineering. Thanks to the discreetly modular structure of the fail-safe I/OS, safety technology is only applied where actually required. The new system replaces conventional electromechanical components, such as:

- Freely programmable, safe linking of sensors to actuators
- Selective safe shutdown of actuators
- Mixed configuration of fail-safe modules and standard modules in a station
- Single-bus concept;
fail-safe signals and standard signals are transferred over a single bus medium (PROFIBUS DP, PROFINET)

Totally Integrated Automation (TIA)

Safety technology (Safety Integrated) is a component of Totally Integrated Automation which provides total integration of safety automation and standard automation (SIMATIC S7).

Where standard automation (classical PLC) and safety automation (electro-mechanics) are still separate today, these two worlds are growing together into a uniform, integrated overall system.

Siemens can therefore present itself as a complete supplier for automation technology in which safety engineering is part of the standard automation and system-wide integration exists.

Evaluating / Communication

Fail-safe I/O devices ET 200M

SM 326 F digital input module - Safety Integrated

Overview



- Digital inputs for the fail-safe SIMATIC S7 systems
- They are suitable for connecting:
 - switches and 2-wire proximity switches (BEROs)
 - Sensors according to NAMUR and mechanical contacts, also for signals from hazardous areas
- With integral safety functions for fail-safe operation
- Can be used in fail-safe mode
 - Centrally: With S7-31xF-2 DP
 - Distributed in ET 200M: With SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH
- Can be used in standard mode as an S7-300 module

Application

Fail-safe digital input modules are suitable for connecting

- switches and 2-wire proximity switches (BEROs)
- Sensors according to NAMUR and mechanical contacts, also for signals from hazardous areas

The modules are implemented centrally with SIMATIC S7-31xF-2 DP and in the ET 200M distributed I/O station in combination with SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH. They can also be used in non-safety-relevant standard mode and then respond like standard S7-300 modules.

Design

Fail-safe digital input modules have the following mechanical features:

- Compact configuration:
 - The rugged plastic housing contains
 - green input signal status LEDs
 - green LED for indicating safety mode
 - red group fault LED
 - slot for front connector protected by the front cover
 - labeling area on the front cover
- Easy installation:
 - Installed in the same way as the other ET 200M I/O modules
- User-friendly wiring via front connector

Note:

Cable guide 6ES7 393-4AA10-0AA0 is required in order to operate 6ES7 326-1RF00-0AB0 failsafe digital input modules in hazardous areas.

Function

Fail-safe digital input modules convert the levels of the external digital signals from the process into the internal signal level of the fail-safe SIMATIC S7 CPUs.

The safety functions required for failsafe operation are integrated in the modules.

Technical specifications

	6ES7 326-1RF00-0AB0	6ES7 326-1BK00-0AB0
Supply voltages		
Supply voltage of electronics and encoders 1L+/2L+		
• Rated value (DC)	24 V	24 V
Current consumption		
from load voltage L+ (without load), max.	160 mA	450 mA
from backplane bus DC 5 V, max.	90 mA	100 mA
Power loss, typ.	4.5 W	10 W
Connection point		
required front connectors	40-pin	40-pin
Digital inputs		
Number of digital inputs	8; 8 (one-channel); 4 (two-channel)	24
Number of simultaneously controllable inputs		
• Number of simultaneously controllable inputs, up to 40 °C	8; vertical setup	24
• Number of simultaneously controllable inputs, up to 60 °C	8; horizontal set up	24; (at 24 V) or 18 (at 28.8 V)
Cable length		
• cable length, shielded, max.	200 m	200 m
• Cable length unshielded, max.	100 m	100 m
Input voltage		
• Rated value, DC		24 V
• for signal "0"		-30 to +5 V
• for signal "1"		11 to 30 V
Input current		
• for signal "0", max. (permissible quiescent current)		2 mA
• for signal "1", typ.	2.1 to 7 mA	10 mA
Input delay (for rated value of input voltage)		
• for standard inputs		
- at "0" to "1", max.		3.4 ms
- at "1" to "0", max.		3.4 ms
Encoder supply		
Number of outputs	8	4; isolated
Output voltage	8.2 V DC	
Output current, rated value		400 mA
Encoder		
Connectable encoders		
• 2-wire BEROs		Yes; if short-circuit test is deactivated
• permissible quiescent current (2-wire BEROs), max.		2 mA

Evaluating / Communication

Fail-safe I/O devices ET 200M

SM 326 F digital input module - Safety Integrated

Ex(i) characteristics		
Module for Ex(i) protection	Yes	
Max. values of input circuits (per channel)		
• Co (permissible external capacity), max.	3 µF	
• Io (short-circuit current), max.	13.9 mA	
• Lo (permissible external inductivity), max.	80 mH	
• Po (power of load), max.	33.1 mW	
• Uo (output no-load voltage), max.	10 V	
• Ta (permissible ambient temperature), max.	60 °C	60 °C
Status information/alarms/diagnostics		
Alarms		
• Diagnostic alarm	Yes	Yes
Diagnoses		
• Diagnostic information readable	Yes	Yes
Isolation		
Isolation checked with	500 VDC	500 V DC / 350 V AC
Isolation		
Galvanic isolation, digital inputs		
• between the channels	Yes	Yes
• between the channels, in groups of		12
• between the channels and the backplane bus	Yes	Yes
Standards, approvals, certificates		
Type of protection to EN 50020 (CENELEC)	II(2)G [Ex ib] IIC to EN 50020	
Test number KEMA	99 ATEX 2671 X	
Highest safety class achievable in safety mode		
• to DIN VDE 0801	AK 4 (one channel), AK 5 and 6 (two channel)	AK 6
• to EN 954	Cat. 3 (single-channel), Cat. 4 (two-channel)	Cat. 4
• to IEC 61508	SIL 2 (single-channel), SIL 3 (two-channel)	SIL 3
Dimensions		
Width	80 mm	80 mm
Height	125 mm	125 mm
Depth	120 mm	120 mm
Weights		
Weight, approx.	482 g	442 g

Evaluating / Communication

Fail-safe I/O devices ET 200M

SM 326 F digital input module - Safety Integrated

Selection and Ordering Data

Ordering data	Order No.
F digital input module SM 326	
24 inputs, 24 V DC	6ES7 326-1BK01-0AB0
8 inputs, 24 V DC, NAMUR	6ES7 326-1RF00-0AB0
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Labeling sheet with strips for 10 electronic blocks	
• For 16-channel electronic blocks incl. add-on terminals	6ES7 193-1BH00-0XA0
• For 32-channel electronic blocks incl. add-on terminals	6ES7 193-1BL00-0XA0
Connecting cable for PROFI-BUS	6ES7 901-4BD00-0XA0
12 Mbit/s, for connecting PG to PROFIBUS DP, pre-assembled with 2 x 9-pin Sub-D connector, 3 m	
PROFIBUS bus connector	
• 90° cable outlet, terminating resistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BA12-0XA0
• 90° cable outlet, terminating resistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BB12-0XA0
• Angular outgoing cable, insulation displacement terminals, without bus terminating resistor, without PG connection socket, up to 1.5 Mbit/s	6ES7 972-0BA30-0XA0
• 90° cable outlet, terminating resistor with isolating function, insulation displacement technology, Fast Connect, without PG socket, up to 12 Mbit/s	6ES7 972-0BA50-0XA0
• 90° cable outlet, terminating resistor with isolating function, insulation displacement technology, Fast Connect, with PG socket, up to 12 Mbit/s	6ES7 972-0BB50-0XA0
DIN rail for active bus modules	
for max. 5 active bus modules for hot swapping function	
• 483 mm long	6ES7 195-1GA00-0XA0
• 530 mm long	6ES7 195-1GF30-0XA0
• 620 mm long	6ES7 195-1GG30-0XA0
• 2000 mm long	6ES7 195-1GC00-0XA0
Active bus module	6ES7 195-7HC00-0XA0
BM 1 x 80 for 1 module with 80 mm width	
SITOP power supply module	6ES7 307-1EA00-0AA0

Ordering data	Order No.
for ET 200M; 120/230 V AC, 24 V DC, 5 A; Type PS 307-1E	
Front connectors	
40-pin, with screw contacts	
• 1 unit	6ES7 392-1AM00-0AA0
• 100 units	6ES7 392-1AM00-1AB0
40-pin with cage clamp contacts	
• 1 unit	6ES7 392-1BM01-0AA0
• 100 units	6ES7 392-1BM01-1AB0
Labeling strips	6ES7 392-2XX20-0AA0
For fail-safe modules (spare part); 10 units	
Label cover	6ES7 392-2XY20-0AA0
For fail-safe modules (spare part); 10 units	
LK 393 cable guide	6ES7 393-4AA10-0AA0
For F modules; L+ and M connections; 5 units	
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multi-lingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current S7 Manual Collection DVD and the three subsequent updates	

Evaluating / Communication

Fail-safe I/O devices ET 200M

SM 326 F digital output module - Safety Integrated

Overview



- Digital outputs for the fail-safe SIMATIC S7 systems
- Two variants (1 x source/source output, 1 x source/sink output)
- For connection of solenoid valves, DC contactors and signaling lamps
- With integral safety functions for fail-safe operation
- Can be used in fail-safe mode
 - Centrally: With S7-31xF-2 DP
 - Distributed in ET 200M: With SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH
- Can be used in standard mode as an S7-300 module (only applies to 6ES7326-2BF01-0AB0)

Application

Fail-safe digital output modules are implemented centrally with SIMATIC S7-31xF-2 DP and in the ET 200M distributed I/O station in combination with SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH. They can also be used in non-safety-relevant standard mode and then respond like standard S7-300 modules.

They are suitable e.g. for connecting solenoid valves, DC contactors and signaling lamps.

Design

Failsafe digital output modules are characterized by the following mechanical features:

- Compact configuration:
 - 2 connections per output for single-channel or redundant actuator control
 - green LEDs for indicating the signal statuses at the outputs
 - a green LED for indicating safety mode
 - a red group fault LED
 - plug-in facilities for the front connector, protected by the front cover
 - labeling area on the front cover
- Easy installation:
 - Installed in the same way as the other ET 200M I/O modules
- User-friendly wiring via front connector

Function

Failsafe digital output modules convert the internal signal level of the failsafe SIMATIC S7 CPUs into the external signal levels required for the process. The safety functions required for failsafe operation are integrated in the modules.

Technical specifications

	6ES7 326-2BF01-0AB0	6ES7 326-2BF40-0AB0
Voltagess and currents		
Load voltage L+		
• Rated value (DC)	24 V; 1L+, 2L+, 3L+	24 V; 1L+, 2L+, 3L+
Current consumption		
from load voltage 1L+, max.	70 mA; from supply voltage	75 mA; from supply voltage
from load voltage 2L+ (without load), max.	100 mA	100 mA
from load voltage 3L+ (without load), max.	100 mA	100 mA
from backplane bus DC 5 V, max.	100 mA	100 mA
Power loss, typ.	12 W	12 W
Connection point		
required front connectors	40-pin	40-pin
Digital outputs		
Number of digital outputs	10	8
cable length, shielded, max.	1,000 m; 200 m for SIL3, AK 6, Cat 4	30 m
Cable length unshielded, max.	600 m	50 m
Short-circuit protection of the output	Yes; Electronic	Yes; Electronic
Limitation of inductive shutdown voltage to	L+ (-53 V) without series diode, L+ (-33 V) with series diode	L+ (-33 V)
Lamp load, max.	5 W	5 W
Output voltage		
• for signal "1" with series diode, min.	L+ (-1.8 V)	
• for signal "1" without series diode, min.	L+ (-1 V)	L+ (-1 V)
Output current		
• for signal "1" rated value	2 A	2 A
• for signal "1" permissible range for 0 to 40 °C, min.	7 mA	7 mA
• for signal "1" permissible range for 0 to 40 °C, max.	2 A; 2 A for horizontal installation, 1 A for vertical installation	2 A; ??? A for horizontal installation, 1 A for vertical installation
• for signal "1" permissible range for 40 to 60 °C, min.	7 mA	7 mA
• for signal "1" permissible range for 40 to 60 °C, max.	1 A; for horizontal installation	1 A; for horizontal installation
• for signal "0" residual current, max.	0.5 mA	0.5 mA
Switching frequency		
• with resistive load, max.	10 Hz	30 Hz
• with inductive load, max.	2 Hz	2 Hz
• on lamp load, max.	10 Hz	10 Hz
Aggregate current of the outputs (per group)		

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Fail-safe I/O devices ET 200M

SM 326 F digital output module - Safety Integrated

- vertical installation - up to 40 °C, max. - horizontal installation - up to 40 °C, max. - up to 60 °C, max.	5 A; without series diode, 4 A with series diode 7.5 A; without series diode, 5 A with series diode 5 A; without series diode, 4 A with series diode	5 A 7.5 A 5 A
Status information/alarms/diagnostics		
Alarms		
• Diagnostic alarm	Yes	Yes; Parameterizable
Diagnoses		
• Diagnostic information readable	Yes	Yes
Isolation		
Isolation checked with	500 V DC / 350 V AC	500 V DC / 350 V AC
Isolation		
Isolation, digital outputs		
• between the channels	Yes	Yes
• between the channels, in groups of	5	4
• between the channels and the backplane bus	Yes	Yes
• between the channels and the voltage supply to the electronics	Yes	Yes
Standards, approvals, certificates		
Highest safety class achievable in safety mode		
• to DIN VDE 0801	AK 5 and 6	
• to EN 954	Cat. 4	Cat. 4
• to IEC 61508	SIL 3	SIL 3
Dimensions		
Width	80 mm	80 mm
Height	125 mm	125 mm
Depth	120 mm	120 mm
Weights		
Weight, approx.	465 g	465 g

Selection and Ordering Data

Ordering data	Order No.
F digital output module SM 326	
10 outputs, 24 V DC, 2 A	6ES7 326-2BF01-0AB0
8 outputs, 24 V DC, 2 A	6ES7 326-2BF40-0AB0
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Labeling sheet with strips for 10 electronic blocks	
• For 16-channel electronic blocks incl. add-on terminals	6ES7 193-1BH00-0XA0
• For 32-channel electronic blocks incl. add-on terminals	6ES7 193-1BL00-0XA0
Connecting cable for PROFIBUS	
12 Mbit/s, for connecting PG to PROFIBUS DP, pre-assembled with 2 x 9-pin Sub-D connector, 3 m	
PROFIBUS bus connector	
• 90° cable outlet, terminating resistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BA12-0XA0
• 90° cable outlet, terminating resistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BB12-0XA0
• Angular outgoing cable, insulation displacement terminals, without bus terminating resistor, without PG connection socket, up to 1.5 Mbit/s	6ES7 972-0BA30-0XA0
• 90° cable outlet, terminating resistor with isolating function, insulation displacement technology, Fast Connect, without PG socket, up to 12 Mbit/s	6ES7 972-0BA50-0XA0
• 90° cable outlet, terminating resistor with isolating function, insulation displacement technology, Fast Connect, with PG socket, up to 12 Mbit/s	6ES7 972-0BB50-0XA0
DIN rail for active bus modules	
for max. 5 active bus modules, for function "Insertion and removal"	
• 483 mm long	6ES7 195-1GA00-0XA0
• 530 mm long	6ES7 195-1GF30-0XA0
• 620 mm long	6ES7 195-1GG30-0XA0
• 2000 mm long	6ES7 195-1GC00-0XA0
Active bus module	
BM 1 x 80 for 1 module with 80 mm width	6ES7 195-7HC00-0XA0

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Fail-safe I/O devices ET 200M

SM 326 F digital output module - Safety Integrated

Ordering data	Order No.
SITOP power supply module for ET 200M; 120/230 V AC, 24 V DC, 5 A; Type PS 307-1E	6ES7 307-1EA00-0AA0
Front connectors 40-pin, with screw contacts • 1 unit • 100 units 40-pin with cage clamp contacts • 1 unit • 100 units	6ES7 392-1AM00-0AA0 6ES7 392-1AM00-1AB0 6ES7 392-1BM01-0AA0 6ES7 392-1BM01-1AB0
Labeling strips For fail-safe modules (spare part), 10 units	6ES7 392-2XX20-0AA0
Label cover For fail-safe modules (spare part), 10 units	6ES7 392-2XY20-0AA0
LK 393 cable guide For F modules; L+ and M connections, 5 units	6ES7 393-4AA10-0AA0
S7-300 manual Design, CPU data, module data, instruction list German English French Spanish Italian	6ES7 398-8FA10-8AA0 6ES7 398-8FA10-8BA0 6ES7 398-8FA10-8CA0 6ES7 398-8FA10-8DA0 6ES7 398-8FA10-8EA0
SIMATIC Manual Collection Electronic manuals on DVD, multi-lingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	6ES7 998-8XC01-8YE0
SIMATIC Manual Collection update service for 1 year Current S7 Manual Collection DVD and the three subsequent updates	6ES7 998-8XC01-8YE2

Evaluating / Communication

Fail-safe I/O devices ET 200M

F digital input module SIPLUS SM 326 - Safety Integrated

Overview



- Digital inputs for the fail-safe SIMATIC S7 systems
- They are suitable for connecting:
 - switches and 2-wire proximity switches (BEROs)
 - Sensors according to NAMUR and mechanical contacts, also for signals from hazardous areas
- With integral safety functions for fail-safe operation
- Can be used in fail-safe mode
 - Centrally: With S7-31xF-2 DP
 - Distributed in ET 200M: With SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH
- Can be used in standard mode as an S7-300 module

SIPLUS SM 326 fail-safe digital input module

Order No.	6AG1 326-1BK01-2AB0
Order No. based on	6ES7 326-1BK01-0AB0
Ambient temperature range	-25 °C to +60 °C, condensation permissible
Ambient conditions	Suitable for extraordinary medial exposure (e.g. by chloride and sulfuric atmospheres).
Technical data	The technical data are identical with the technical data of the based on modules.

Application

Fail-safe digital input modules are suitable for connecting

- switches and 2-wire proximity switches (BEROs)
- Sensors according to NAMUR and mechanical contacts, also for signals from hazardous areas

The modules are implemented centrally with SIMATIC S7-31xF-2 DP and in the ET 200M distributed I/O station in combination with SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH. They can also be used in non-safety-relevant standard mode and then respond like standard S7-300 modules.

Design

Fail-safe digital input modules have the following mechanical features:

- Compact configuration:
 - The rugged plastic housing contains
 - green input signal status LEDs
 - green LED for indicating safety mode
 - red group fault LED
 - slot for front connector protected by the front cover
 - labeling area on the front cover

- Easy installation:
Installed in the same way as the other ET 200M I/O modules
- User-friendly wiring via front connector

Note:

Cable guide 6ES7 393-4AA10-0AA0 is required in order to operate 6ES7 326-1RF00-0AB0 failsafe digital input modules in hazardous areas.

Function

Failsafe digital input modules convert the levels of the external digital signals from the process into the internal signal level of the failsafe SIMATIC S7 CPUs.

The safety functions required for failsafe operation are integrated in the modules.

Technical specifications

The technical data are identical with the technical data of the 6ES7 326-1BK01-0AB0 modules

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Fail-safe I/O devices ET 200M

F digital input module SIPLUS SM 326 - Safety Integrated

Selection and Ordering Data

Ordering data	Order No.
SIPLUS SM 326 F digital input module	
24 inputs, 24 V DC extended temperature range and medial load	6AG1 326-1BK01-0AB0
Distributed Safety V5.4 pro- gramming tool	
Task: Software for configuring fail- safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Labeling sheet with strips for 10 electronic blocks	
• For 16-channel electronic blocks incl. add-on terminals	6ES7 193-1BH00-0XA0
• For 32-channel electronic blocks incl. add-on terminals	6ES7 193-1BL00-0XA0
Connecting cable for PROFIBUS	6ES7 901-4BD00-0XA0
12 Mbit/s, for connecting PG to PROFIBUS DP, pre-assembled with 2 x 9-pin Sub-D connector, 3 m	
PROFIBUS bus connector	
• 90° cable outlet, terminating re- sistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BA12-0XA0
• 90° cable outlet, terminating re- sistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BB12-0XA0
• Angular outgoing cable, insula- tion displacement terminals, without bus terminating resistor, without PG connection socket, up to 1.5 Mbit/s	6ES7 972-0BA30-0XA0
• 90° cable outlet, terminating re- sistor with isolating function, in- sulation displacement technology, Fast Connect, with- out PG socket, up to 12 Mbit/s	6ES7 972-0BA50-0XA0
• 90° cable outlet, terminating re- sistor with isolating function, in- sulation displacement technology, Fast Connect, with PG socket, up to 12 Mbit/s	6ES7 972-0BB50-0XA0
DIN rail for active bus modules	
for max. 5 active bus modules for hot swapping function	
• 483 mm long	6ES7 195-1GA00-0XA0
• 530 mm long	6ES7 195-1GF30-0XA0
• 620 mm long	6ES7 195-1GG30-0XA0
• 2000 mm long	6ES7 195-1GC00-0XA0
Active bus module	6ES7 195-7HC00-0XA0
BM 1 x 80 for 1 module with 80 mm width	
SITOP power supply module	6ES7 307-1EA00-0AA0

Ordering data	Order No.
for ET 200M; 120/230 V AC, 24 V DC, 5 A; Type PS 307-1E	
Front connectors	
40-pin, with screw contacts	
• 1 unit	6ES7 392-1AM00-0AA0
• 100 units	6ES7 392-1AM00-1AB0
40-pin with cage clamp contacts	
• 1 unit	6ES7 392-1BM01-0AA0
• 100 units	6ES7 392-1BM01-1AB0
Labeling strips	6ES7 392-2XX20-0AA0
For fail-safe modules (spare part); 10 units	
Label cover	6ES7 392-2XY20-0AA0
For fail-safe modules (spare part); 10 units	
LK 393 cable guide	6ES7 393-4AA10-0AA0
For F modules; L+ and M connec- tions; 5 units	
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multi- lingual: S7-200, S7-300, C7, S7- 400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Soft- ware, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Commu- nication), SIMATIC Machine Vision, SIMATIC Sensors	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current S7 Manual Collection DVD and the three subsequent updates	

Evaluating / Communication

Fail-safe I/O devices ET 200M

F digital output module SIPLUS SM 326 - Safety Integrated

Overview



- Digital outputs for the fail-safe SIMATIC S7 systems
- Two variants (1 x source/source output, 1 x source/sink output)
- For connection of solenoid valves, DC contactors and signaling lamps
- With integral safety functions for fail-safe operation
- Can be used in fail-safe mode
 - Centrally: With S7-31xF-2 DP
 - Distributed in ET 200M: With SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH
- Can be used in standard mode as an S7-300 module (only applies to 6ES7326-2BF01-0AB0)

SIPLUS SM 326 fail-safe digital output module

Order No.	6AG1 326-2BF01-2AB0
Order No. based on	6ES7 326-2BF01-0AB0
Ambient temperature range	-25 °C to +60 °C, condensation permissible
Ambient conditions	Suitable for extraordinary medial exposure (e.g. by chloride and sulfuric atmospheres).
Conformity with standard for electronic devices on rail vehicles (EN 50155, temperature T1, category 1).	Yes
Technical data	The technical data are identical with the technical data of the based on modules.

Application

Fail-safe digital output modules are implemented centrally with SIMATIC S7-31xF-2 DP and in the ET 200M distributed I/O station in combination with SIMATIC IM 151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH. They can also be used in non-safety-relevant standard mode and then respond like standard S7-300 modules.

They are suitable e.g. for connecting solenoid valves, DC contactors and signaling lamps.

Design

Failsafe digital output modules are characterized by the following mechanical features:

- Compact configuration:
 - 2 connections per output for single-channel or redundant actuator control
 - green LEDs for indicating the signal statuses at the outputs

- a green LED for indicating safety mode
- a red group fault LED
- plug-in facilities for the front connector, protected by the front cover
- labeling area on the front cover
- Easy installation:
 - Installed in the same way as the other ET 200M I/O modules
- User-friendly wiring via front connector

Function

Failsafe digital output modules convert the internal signal level of the failsafe SIMATIC S7 CPUs into the external signal levels required for the process. The safety functions required for failsafe operation are integrated in the modules.

Technical specifications

The technical data are identical with the technical data of the 6ES7 326-2BF01-0AB0 modules

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Fail-safe I/O devices ET 200M

F digital output module SIPLUS SM 326 - Safety Integrated

Selection and Ordering Data

Ordering data	Order No.
SIPLUS SM 326 F digital output module	
10 outputs, 24 V DC, 2 A extended temperature range and medial load	6AG1 326-1BK01-0AB0
Distributed Safety V5.4 pro- gramming tool	
Task: Software for configuring fail- safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Labeling sheet with strips for 10 electronic blocks	
• For 16-channel electronic blocks incl. add-on terminals	6ES7 193-1BH00-0XA0
• For 32-channel electronic blocks incl. add-on terminals	6ES7 193-1BL00-0XA0
Connecting cable for PROFI- BUS	6ES7 901-4BD00-0XA0
12 Mbit/s, for connecting PG to PROFIBUS DP, pre-assembled with 2 x 9-pin Sub-D connector, 3 m	
PROFIBUS bus connector	
• 90° cable outlet, terminating re- sistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BA12-0XA0
• 90° cable outlet, terminating re- sistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BB12-0XA0
• Angular outgoing cable, insula- tion displacement terminals, without bus terminating resistor, without PG connection socket, up to 1.5 Mbit/s	6ES7 972-0BA30-0XA0
• 90° cable outlet, terminating re- sistor with isolating function, in- sulation displacement technology, Fast Connect, with- out PG socket, up to 12 Mbit/s	6ES7 972-0BA50-0XA0
• 90° cable outlet, terminating re- sistor with isolating function, in- sulation displacement technology, Fast Connect, with PG socket, up to 12 Mbit/s	6ES7 972-0BB50-0XA0
DIN rail for active bus modules	
for max. 5 active bus modules, for function "Insertion and removal"	
• 483 mm long	6ES7 195-1GA00-0XA0
• 530 mm long	6ES7 195-1GF30-0XA0
• 620 mm long	6ES7 195-1GG30-0XA0
• 2000 mm long	6ES7 195-1GC00-0XA0
Active bus module	6ES7 195-7HC00-0XA0
BM 1 x 80 for 1 module with 80 mm width	
SITOP power supply module	6ES7 307-1EA00-0AA0

Ordering data	Order No.
for ET 200M; 120/230 V AC, 24 V DC, 5 A; Type PS 307-1E	
Front connectors	
40-pin, with screw contacts	
• 1 unit	6ES7 392-1AM00-0AA0
• 100 units	6ES7 392-1AM00-1AB0
40-pin with cage clamp contacts	
• 1 unit	6ES7 392-1BM01-0AA0
• 100 units	6ES7 392-1BM01-1AB0
Labeling strips	6ES7 392-2XX20-0AA0
For fail-safe modules (spare part), 10 units	
Label cover	6ES7 392-2XY20-0AA0
For fail-safe modules (spare part), 10 units	
LK 393 cable guide	6ES7 393-4AA10-0AA0
For F modules; L+ and M connec- tions, 5 units	
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multi- lingual: S7-200, S7-300, C7, S7- 400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Soft- ware, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Commu- nication), SIMATIC Machine Vision, SIMATIC Sensors	
SIMATIC Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Current S7 Manual Collection DVD and the three subsequent updates	

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Fail-safe I/O devices ET 200M

SM 336 F analog input module - Safety Integrated

Overview



- Analog inputs for the fail-safe SIMATIC S7 systems
- For connection of analog voltage and current sensors
- With integral safety functions for fail-safe operation
- For use in the ET 200M distributed I/O station with SIMATIC IM151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH
- Can be used in standard mode as an S7-300 module

Application

The modules are implemented centrally with SIMATIC S7-31xF-2 DP and in the ET 200M distributed I/O station in combination with SIMATIC IM151-7 F-CPU, S7-31xF-2 DP, S7-416F-2 and S7-400F/FH. They can also be used in non-safety-relevant standard mode and then respond like standard S7-300 modules.

Encoders with voltage and current signals can be connected.

Design

The module has the following features:

- 6 inputs:
 - Standard operation: 6 inputs, of which 6 are for current measurement or up to 4 for voltage measurement
 - Safety operation: 6 inputs for current measurement
- Compact configuration:
 - Green LED for indicating safety mode
 - Red group fault LED
 - Slots for the front connector, protected by the front cover
 - Labeling area on the front cover.
- Easy installation
Installed in the same way as the other ET 200M I/O modules
- User-friendly wiring via front connector

Function

The analog input module converts analog signals from the process to digital signals for internal processing by the fail-safe SIMATIC S7 CPUs.

The safety functions required for fail-safe operation are integrated in the module.

The following functions are available:

- Resolution 13 bits + sign.
- Measuring ranges:
 - 0 to 20 mA or 4 to 20 mA, 0 to 10 V in standard mode
 - 4 to 20 mA in safety mode.
- Interrupt capability
The module sends diagnostic interrupts to the CPU of the controller.

- Diagnostics
The module sends extensive diagnostic information to the CPU.

Technical specifications

6ES7 336-1HE00-0AB0	
Voltages and currents	
Load voltage L+	
• Rated value (DC)	24 V
• reverse polarity protection	Yes
Current consumption	
from backplane bus DC 5 V, max.	90 mA
from supply voltage L+, max.	160 mA; typically
Power loss, typ.	4.25 W
Connection point	
required front connectors	40-pin
Analog inputs	
Number of analog inputs	6
Number of analog inputs for voltage measurement	4
cable length, shielded, max.	200 m
permissible input frequency for voltage input (destruction limit), max.	30 V
permissible input current for current input (destruction limit), max.	40 mA
Input ranges (rated values), voltages	
• 0 to +10 V	Yes
Input ranges (rated values), currents	
• 0 to 20 mA	Yes
• 4 to 20 mA	Yes
Analog value creation	
Integration and conversion time/resolution per channel	
• Resolution with overload area (bit including sign), max.	14 Bit
• Integration time, ms	20 ms (at 50 Hz); 16.66 ms (at 60 Hz)
• Interference voltage suppression for interference frequency f1 in Hz	38 dB
Encoder	
Connection of signal encoders	
• for current measurement as 2-wire transducer	Yes
• for current measurement as 4-wire transducer	Yes
Errors/accuracies	
Operational limit in overall temperature range	
• Voltage, relative to input area	+/- 0.48 %
• Current, relative to input area	+/- 0.48 %
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input area	+/- 0.4 %
• Current, relative to input area	+/- 0.4 %

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Fail-safe I/O devices ET 200M

SM 336 F analog input module - Safety Integrated

Status information/alarms/diagnostics	
Alarms	
• Diagnostic alarm	Yes; Parameterizable
Diagnoses	
• Diagnostic information readable	Yes
Isolation	
Isolation checked with	500 V DC / 350 V AC
Isolation	
Isolation, analog inputs	
• between the channels	No
• between the channels and the backplane bus	Yes
• between the channels and the voltage supply to the electronics	Yes; only if sensors are externally supplied
Standards, approvals, certificates	
Highest safety class achievable in safety mode	
• to DIN V 19250	AK 6
• to EN 954	Cat. 4
• to IEC 61508	SIL 3
Dimensions	
Width	80 mm
Height	125 mm
Depth	120 mm
Weights	
Weight, approx.	480 g

Selection and Ordering Data

Ordering data	Order No.
F analog input module SM 336	
6 inputs, 14 bit	6ES7 336-1HE00-0AB0
Distributed Safety V5.4 programming tool	
Task: Software for configuring fail-safe user programs for SIMATIC S7-300F, S7-400F, ET 200S Requirement: STEP 7 V5.3 SP3 and higher	
Floating license	6ES7 833-1FC02-0YA5
Software Update Service	6ES7 833-1FC00-0YX2
Distributed Safety Upgrade	
From V5.x to V5.4; Floating license for 1 user	6ES7 833-1FC02-0YE5
Labeling sheet with strips for 10 electronic blocks	
• For 16-channel electronic blocks incl. add-on terminals	6ES7 193-1BH00-0XA0
• For 32-channel electronic blocks incl. add-on terminals	6ES7 193-1BL00-0XA0
Connecting cable for PROFIBUS	6ES7 901-4BD00-0XA0
12 Mbit/s, for connecting PG to PROFIBUS DP, pre-assembled with 2 x 9-pin Sub-D connector, 3 m	
PROFIBUS bus connector	

Ordering data	Order No.
• 90° cable outlet, terminating resistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BA12-0XA0
• 90° cable outlet, terminating resistor with isolating function, without PG socket, up to 12 Mbit/s	6ES7 972-0BB12-0XA0
• Angular outgoing cable, insulation displacement terminals, without bus terminating resistor, without PG connection socket, up to 1.5 Mbit/s	6ES7 972-0BA30-0XA0
• 90° cable outlet, terminating resistor with isolating function, insulation displacement technology, Fast Connect, without PG socket, up to 12 Mbit/s	6ES7 972-0BA50-0XA0
• 90° cable outlet, terminating resistor with isolating function, insulation displacement technology, Fast Connect, with PG socket, up to 12 Mbit/s	6ES7 972-0BB50-0XA0
DIN rail for active bus modules	
for max. 5 active bus modules for hot swapping function	
• 483 mm long	6ES7 195-1GA00-0XA0
• 530 mm long	6ES7 195-1GF30-0XA0
• 620 mm long	6ES7 195-1GG30-0XA0
• 2000 mm long	6ES7 195-1GC00-0XA0
Active bus module	6ES7 195-7HC00-0XA0
BM 1 x 80 for 1 module with 80 mm width	
SITOP power supply module	6ES7 307-1EA00-0AA0
for ET 200M; 120/230 V AC, 24 V DC, 5 A; Type PS 307-1E	
Front connectors	
40-pin, with screw contacts	
• 1 unit	6ES7 392-1AM00-0AA0
• 100 units	6ES7 392-1AM00-1AB0
40-pin with cage clamp contacts	
• 1 unit	6ES7 392-1BM01-0AA0
• 100 units	6ES7 392-1BM01-1AB0
Labeling strips	6ES7 392-2XX20-0AA0
For fail-safe modules (spare part), 10 units	
Label cover	6ES7 392-2XY20-0AA0
For fail-safe modules (spare part), 10 units	
LK 393 cable guide	6ES7 393-4AA10-0AA0
For F modules; L+ and M connections, 5 units	
S7-300 manual	
Design, CPU data, module data, instruction list	
German	6ES7 398-8FA10-8AA0
English	6ES7 398-8FA10-8BA0
French	6ES7 398-8FA10-8CA0
Spanish	6ES7 398-8FA10-8DA0
Italian	6ES7 398-8FA10-8EA0

Evaluating / Communication

Fail-safe I/O devices ET 200M

SM 336 F analog input module - Safety Integrated

Ordering data	Order No.
SIMATIC Manual Collection Electronic manuals on DVD, multi-lingual: S7-200, S7-300, C7, S7-400, SIMATIC DP (Distributed I/O), SIMATIC PC, SIMATIC PG (Programming device), STEP 7, Engineering Tools, Runtime Software, SIMATIC PCS 7, SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication), SIMATIC Machine Vision, SIMATIC Sensors	6ES7 998-8XC01-8YE0
SIMATIC Manual Collection update service for 1 year Current S7 Manual Collection DVD and the three subsequent updates	6ES7 998-8XC01-8YE2

Evaluating / Communication

Fail-safe I/O devices ET 200M

Isolation module

Overview

- Supports mixed operation of fail-safe signal modules in safety mode and S7-300 standard modules in an ET 200M when Cat. 4 or SIL 3 has to be achieved.
- The isolation module is not required if the safety class or safety category to be achieved is less than SIL 3 or Cat. 4, respectively.

When Cat. 4/SIL 3 is required, the isolation module must be implemented in the following situations:

Application	Isolation module must be used
Central use after CPU 31xF-2 DP or CPU 31xF-2 PN/DP • Only fail-safe modules in the tier • Standard and fail-safe modules in the tier	Yes, behind the CPU Yes, after the last standard module and before the first fail-safe module
Central use after CPU 31xF-2 DP or CPU 31xF-2 PN/DP in an expansion rack • Only fail-safe modules in the tier • Standard and fail-safe modules in the tier	Yes, after the IM 36x Yes, after the last standard module and before the first fail-safe module
Distributed behind the IM 153-2 with copper connection • Only fail-safe modules in the station • Standard and fail-safe modules in the station	Yes, after the IM 153-2 Yes, after the last standard module and before the first fail-safe module
Distributed behind the IM 153-2 with fiber-optic connection • Only fail-safe modules in the station • Standard and fail-safe modules in the station	No Yes, after the last standard module and before the first fail-safe module

Technical specifications

	6ES7 195-7KF00-0XA0
Weight, approx.	10 g

Selection and Ordering Data

Ordering data	Order No.
Isolation module for simultaneous operation of fail-safe and standard modules in an ET 200M	6ES7 195-7KF00-0XA0
Isolation bus module for accommodating the isolating module in an ET 200M	6ES7 195-7HG00-0XA0

Evaluating / Communication

Fail-safe I/O devices ET 200M

SIPLUS S7-300 isolating module (extended temperature range)

Overview

- Hybrid operation of failsafe signal modules in safety operation and S7-300 standard modules in an ET 200M
- Configuration of PROFIBUS-DP lines with Cu bus cables; fiber-optic cables are not necessary
- Any IM 153-x can be used

The isolating module is not required if safety class SIL 2 has to be achieved.

	SIPLUS S7-300 isolating module
Order No.	6AG1 195-7KF00-2XA0
Order No. based on	6ES7 195-7KF00-0XA0
Ambient temperature range	-25 °C to +60 °C, condensation permissible
Ambient conditions	Suitable for extraordinary medial exposure (e.g. by chloride and sulfuric atmospheres).
Conformity with standard for electronic devices on rail vehicles (EN 50155, temperature T1, category 1).	Yes
Technical data	The technical data are identical with the technical data of the based on modules.

Technical specifications

Isolating module

Dimensions and weight

- Weight, approx. 0.280 kg

Accessories

- Part of product ET 200M

Technical specifications

	6AG1 195-7KF00-0XA0
Dimensions and Weight	
• Weight, ca.	10 g
Accessory	
• belongs to product	ET 200M

Selection and Ordering Data

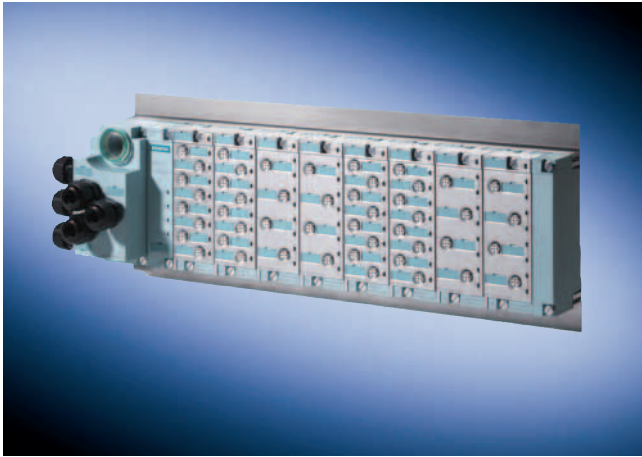
Ordering data	Order No.
SIPLUS Isolating module for simultaneous operation of fail-safe and standard modules in an ET 200M	6AG1 195-7KF00-0XA0
Isolating bus module for accommodating the isolating module in an ET 200M	6ES7 195-7HG00-0XA0

Evaluating / Communication

SIMATIC ET 200pro

ET 200pro

Overview



- Distributed I/O system with degree of protection IP65/67 for cabinet-free use at the machine.
- Small, multifunctional complete solution: Digital inputs/outputs, failsafe modules, motor starters up to 5.5 kW, etc.
- Communication over PROFIBUS or PROFINET
- Mixed arrangement of failsafe and standard modules in the same station
- Freely selectable connection technique: Direct, ECOFAST or M12 7/8"
- Power module for easy implementation of load groups
- Module replacement during operation (hot swapping)
- Easy installation as well as permanent wiring
- Data transmission rates of up to 12 Mbit/s
- Extensive diagnostics: Module-specific or channel-specific
- Intelligent motor starters for starting and protection of motors and loads up to 5.5 kW
 - Versions: Direct and reversing starters - Standard and High-Feature
- Failsafe modules with safety-related signal processing according to PROFIsafe

Application

SSIMATIC ET 200pro is the new modular I/O system with high degree of protection IP65/66/67 for local, cabinetless applications. ET 200pro distinguishes itself through a small frame size and an innovative installation concept. ET 200pro can be optimized and very flexibly adapted to the requirements of the corresponding automation task with respect to the connection method, required I/Os and fieldbus connection. New features such as the integrated PROFIsafe safety technology, the PROFINET interface and the ability to hotswap modules permit it to be used for a wide range of applications.

With the integrated motor starters, conveyor applications can be implemented optimally, or drives of up to 5.5 kW can be controlled without control cabinet.

Design



The tried and tested separation of module and bus/power connection technology, which has already been used for the ET 200eco, is now also used for the digital and analog expansion modules of the ET 200pro. For the interface module this allows use of the T-functionality for the bus and 24 V power supply, and for the expansion modules it permits pre-wiring of sensor/actuator connections. This permanent wiring allows exactly one electronics module to be hot-swapped in the event of a fault without having to switch off the whole station. It can continue to operate fault-free while the module is being replaced. This ensures very high plant availability. When an electronics component is replaced, the whole I/O wiring can remain on the connecting module and does not have to be marked or removed.

Evaluating / Communication

SIMATIC ET 200pro

IM 154-2 High Feature interface module

Overview



Interface module for handling communication between the ET 200pro and the higher-level master over PROFIBUS DP.

Application

The interface module IM 154-2 DP High Feature handles the communication between the ET 200pro and higher-level masters over PROFIBUS DP.

Design

Connecting modules for DP interface modules (must be ordered separately):

- CM IM DP direct
- CM IM DP ECOFAST Cu
- CM IM DP M12 7/8"

All connecting modules contain a PROFIBUS address adjuster that is visible and adjustable from the outside as well as a selectable, segmenting terminating resistor.

The IM 154-2 DP High Feature interface module must be implemented in PROFIsafe applications.

Function

The IM 154-2 DP High Feature interface modules are configured using STEP 7 V5.3 SP3. A hardware support package is available for STEP 7 V5.3 SP2 and higher.

Integration into older versions is possible via GSD.

Technical specifications

	6ES7 154-2AA00-0AB0
Supply voltages	
Supply voltage of electronics 1L+	
• Rated value (DC)	24 V
• Short-circuit protection	Yes; over exchangeable fuses
• reverse polarity protection	Yes; against destruction
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Current consumption	
from supply voltage 1L+, max.	200 mA
Address area	
Addressing volume	
• Outputs	244 Byte
• Inputs	244 Byte
PROFIBUS DP	
automatic detection of transmission speed	Yes
1st interface	
Type of interface	PROFIBUS DP
Physics	RS 485
Functionality	
• DP slave	Yes
DP slave	
• Services	
- SYNC/FREEZE	Yes
- direct data exchange (cross traffic)	Yes
• Transmission speeds, min.	9.6 kBit/s
• Transmission speeds, max.	12 Mbit/s
Parameter	
DPV1 operation	possible
Diagnostic alarm	parameterizable
Process alarm	parameterizable
Swapping interrupt	parameterizable
Hot swapping of modules	possible
Status information/alarms/diagnostics	
Diagnostics indication LED	
• Bus error BF (red)	Yes
• Collective error SF (red)	Yes
• Monitoring 24 V voltage supply ON (green)	Yes
• Load voltage monitoring DC 24 V (green)	Yes
Isolation	
Isolation checked with	500 V DC
Isolation	
between backplane bus and electronics	No
between supply voltage and electronics	Yes

Evaluating / Communication

SIMATIC ET 200pro

IM 154-2 High Feature interface module

Environmental requirements	
Operating temperature	
• min.	-25 °C
• max.	55 °C
Storage/transport temperature	
• min.	-40 °C
• max.	70 °C
Degree and class of protection	
• IP 65	Yes
• IP 66	Yes
• IP 67	Yes
Dimensions	
Width	90 mm
Height	130 mm
Depth	59.3 mm
Weights	
Weight, approx.	415 g

Selection and Ordering Data

	Order No.
IM 154-2 High Feature interface module For ET 200pro; for communication between ET 200pro and higher-level masters over PROFIBUS DP; support of PROFI-safe	6ES7 154-2AA00-0AB0
Accessories	
CM IM DP ECOFAST connection module For connecting PROFIBUS DP and the 24 V power supply to PROFIBUS interface modules, 2 ECOFAST Cu connections	6ES7 194-4AA00-0AA0
CM IM DP direct connection module For connecting PROFIBUS DP and the 24 V power supply directly to the PROFIBUS interface modules, up to six M20 screwed cable glands	6ES7 194-4AC00-0AA0
CM IM DP M12, 7/8" connection module For connecting PROFIBUS DP and the 24 V power supply to PROFIBUS interface modules, 2 x M12 and 2 x 7/8"	6ES7 194-4AD00-0AA0
Accessories for CM IM DP ECOFAST	
PROFIBUS ECOFAST hybrid cable, pre-assembled With 2 ECOFAST connectors, trailing-type cable 2 x CU 0.64 mm ² and 4 x Cu 1.5 mm ²	
• 1.5 m long	6XV1 830-7BH15
• 3.0 m long	6XV1 830-7BH30
• 5.0 m long	6XV1 830-7BH50
• 10 m long	6XV1 830-7BN10
• 15 m long	6XV1 830-7BN15
• 20 m long	6XV1 830-7BN20
• 25 m long	6XV1 830-7BN25

	Order No.
• 30 m long • 35 m long • 40 m long • 45 m long • 50 m long	6XV1 830-7BN30 6XV1 830-7BN35 6XV1 830-7BN40 6XV1 830-7BN45 6XV1 830-7BN50
PROFIBUS ECOFAST hybrid cable GP, pre-assembled With 2 ECOFAST connectors, trailing-type cable 2 x CU 0.64 mm ² and 4 x Cu 1.5 mm ²	
• 1.5 m long • 3.0 m long • 5.0 m long • 10 m long • 15 m long • 20 m long • 25 m long • 30 m long • 35 m long • 40 m long • 45 m long • 50 m long	6XV1 860-3PH15 6XV1 860-3PH30 6XV1 860-3PH50 6XV1 860-3PN10 6XV1 860-3PN15 6XV1 860-3PN20 6XV1 860-3PN25 6XV1 860-3PN30 6XV1 860-3PN35 6XV1 860-3PN40 6XV1 860-3PN45 6XV1 860-3PN50
PROFIBUS ECOFAST hybrid cable, non-assembled Trailing-type cable 2 x CU 0.64 mm ² and 4 x Cu 1.5 mm ²	
• 50 m long • 100 m long	6XV1 830-7AN50 6XV1 830-7AT10
PROFIBUS ECOFAST hybrid cable GP, non-assembled Trailing-type cable 2 x CU 0.64 mm ² and 4 x Cu 1.5 mm ²	
• 50 m long • 100 m long	6XV1 860-4PN50 6XV1 860-4PT10

Evaluating / Communication

SIMATIC ET 200pro

IM 154-2 High Feature interface module

	Order No.
PROFIBUS ECOFAST hybrid connector 180 ECOFAST Cu, 2 x Cu, 4 x 1.5 mm ² , HANBRID connector • with male insert, 5 per pack • with female insert, 5 per pack	6GK1 905-0CA00 6GK1 905-0CB00
PROFIBUS ECOFAST hybrid connector angular ECOFAST Cu, 2 x Cu, 4 x 1.5 mm ² , HANBRID connector • with male insert, 5 per pack • with female insert, 5 per pack	6GK1 905-0CC00 6GK1 905-0CD00
ECOFAST sealing cap For protecting unused bus connections for ET 200pro; 10 items per pack <i>Accessories for CM IM DP direct</i>	6ES7 194-1JB10-0XA0
PROFIBUS trailing cable Max. acceleration 4 m/s ² , at least 3,000,000 bending cycles, bending radius 60 mm, 2-core shielded, sold by the meter, minimum order quantity 20 m, maximum order quantity 1000 m	6XV1 830-3EH10
PROFIBUS FC Food bus cable With PE sheath for use in the food and beverages industry, 2-core, shielded, sold by the meter, minimum order quantity 20 m, maximum order quantity 1000 m	6XV1 830-0GH10
PROFIBUS FC Robust bus cable With PUR sheath for use under conditions of extreme mechanical stress and aggressive chemicals, 2-core, shielded, sold by the meter, minimum order quantity 20 m, maximum order quantity 1000 m	6XV1 830-0JH10
Power line 5-core, 5 x 1.5 mm ² , trailing type, sold by the meter, minimum order quantity 20 m, maximum order quantity 1000 m <i>Accessories for CM IM DP M12, 7/8"</i>	6XV1 830-8AH10
PROFIBUS M12 connecting cable Pre-assembled with two M12 connectors, 5-pin • 1.5 m long • 2.0 m long • 3.0 m long • 5.0 m long • 10 m long • 15 m long	6XV1 830-3DH15 6XV1 830-3DH20 6XV1 830-3DH30 6XV1 830-3DH50 6XV1 830-3DN10 6XV1 830-3DN15
7/8" connecting cable to power supply 5-core, 5 x 1.5 mm ² , trailing type, pre-assembled with two 7/8" connectors, 5-pin • 1.5 m long • 2.0 m long • 3.0 m long	6XV1 822-5BH15 6XV1 822-5BH20 6XV1 822-5BH30

	Order No.
• 5.0 m long • 10 m long • 15 m long	6XV1 822-5BH50 6XV1 822-5BN10 6XV1 822-5BN15
M12 cable connector For ET 200eco, with axial cable outlet • with male insert, 5 per pack • with female insert, 5 per pack	6GK1 905-0EA00 6GK1 905-0EB00
7/8" cable connector For ET 200eco, with axial cable outlet • with male insert, 5 per pack • with female insert, 5 per pack	6GK1 905-0FA00 6GK1 905-0FB00
M12 sealing cap For protection of unused M12 connections with ET 200pro	3RX9 802-0AA00
Sealing cap 7/8" For protecting unused 7/8" connections for ET 200pro; 10 items per pack <i>General accessories</i>	6ES7 194-3JA00-0AA0
ET 200pro rack • Narrow, for interface, electronics and power modules - 500 mm - 1000 mm - 2000 mm, can be cut to length • Compact, for interface, electronics and power modules - 500 mm - 1000 mm - 2000 mm, can be cut to length • Wide, for interface, electronics, power modules and motor starters - 500 mm - 1000 mm - 2000 mm, can be cut to length • Wide, for I/O modules and motor starters - 500 mm - 1000 mm - 2000 mm	6ES7 194-4GA00-0AA0 6ES7 194-4GA60-0AA0 6ES7 194-4GA20-0AA0 6ES7 194-4GC70-0AA0 6ES7 194-4GC60-0AA0 6ES7 194-4GC20-0AA0 6ES7 194-4GB00-0AA0 6ES7 194-4GB60-0AA0 6ES7 194-4GB20-0AA0 6ES7 194-4GD00-0AA0 6ES7 194-4GD10-0AA0 6ES7 194-4GD20-0AA0
Spare fuse 12.5 A quick-response, for interface and power modules, 10 items per package unit	6ES7 194-4HB00-0AA0
Technical product data For CAX applications, one-off license	6ES7 991-0CD01-0YX0
Technical product data For CAX applications, one-off license, update service	6ES7 991-0CC00-0YX2
SIMATIC Manual Collection	6ES7 998-8XC01-8YE0

Evaluating / Communication

SIMATIC ET 200pro

IM 154-2 High Feature interface module

Order No.

Electronic manuals on DVD, multi-language:
S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)

SIMATIC Manual Collection – Update service for 1 year

Scope of delivery: Current DVD "S7 Manual Collection" and the three subsequent updates

6ES7 998-8XC01-8YE2

Evaluating / Communication

SIMATIC ET 200pro

Overview



Interface module for processing the communication between ET 200pro and a higher-level controller over PROFINET IO.

Application

The IM 154-4 PN High Feature interface module handles the communication between ET 200pro and the higher-level PLC over PROFINET IO.

Design

The interface module is equipped with a 2-port switch for line-type network topologies and two M12 sockets for communication, as well as a 7/8" socket for the 24 V supply. PROFIsafe applications are also possible in combination with this module.

A Micro Memory Card is necessary for operation of IM 154-4 PN High Feature. This must be ordered separately.

Function

The IM 154-4 PN High Feature interface modules are configured using STEP 7 V5.4. A hardware support package is available for STEP 7 V5.3 SP3 and higher. A GSD file allows it to be integrated into older versions of STEP 7 from V5.3 SP2 and above.

Technical specifications

	6ES7 154-4AB00-0AB0
Supply voltages	
Supply voltage of electronics 1L+	
• Rated value (DC)	24 V
• Short-circuit protection	Yes; over exchangeable fuses
• reverse polarity protection	Yes; against destruction
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Current consumption	
from supply voltage 1L+, max.	250 mA
Power loss, typ.	4.5 W
Memory	
Type of storage	
• Micro Memory Card	Yes
Address area	
Addressing volume	

Interface Module IM 154-4 PN

• Outputs	256 Byte
• Inputs	256 Byte
Protocols	
PROFINET IO	Yes
PROFINET IO	
Transmission speed, max.	100 Mbit/s; full duplex
automatic detection of transmission speed	Yes
Services	Network management functions, network diagnostics (SNMP), ping, arp
Status information/alarms/diagnostics	
Diagnostics indication LED	
• Bus error BF (red)	Yes
• Collective error SF (red)	Yes
• Monitoring 24 V voltage supply ON (green)	Yes
• Load voltage monitoring DC 24 V (green)	Yes
Isolation	
Isolation checked with	500 V DC
Isolation	
between backplane bus and electronics	Yes
between supply voltage and electronics	Yes
Environmental requirements	
Operating temperature	
• min.	-25 °C
• max.	55 °C
Storage/transport temperature	
• min.	-40 °C
• max.	70 °C
Degree and class of protection	
• IP 65	Yes
• IP 66	Yes
• IP 67	Yes
Dimensions	
Width	90 mm
Height	130 mm
Depth	71 mm
Weights	
Weight, approx.	480 g

Evaluating / Communication

SIMATIC ET 200pro

Interface Module IM 154-4 PN

Selection and Ordering Data

	Order No.
IM 154-4 PN High Feature interface module For communication between ET 200pro and higher-level controllers over PROFINET IO; support of PROFIsafe	6ES7 154-4AB00-0AB0
Accessories	
M12 sealing cap For protection of unused M12 connections with ET 200pro	3RX9 802-0AA00
Micro Memory Card, 3.3 V, NFLASH • 64 KB • 128 KB • 512 KB • 2 MB • 4 MB • 8 MB	6ES7 953-8LF20-0AA0 6ES7 953-8LG11-0AA0 6ES7 953-8LJ20-0AA0 6ES7 953-8LL20-0AA0 6ES7 953-8LM20-0AA0 6ES7 953-8LP20-0AA0
IE M12 connecting cables Pre-assembled with two M12 connectors • 0.3 m long • 0.5 m long • 1.0 m long • 1.5 m long • 2.0 m long • 3.0 m long • 5.0 m long • 10 m long • 15 m long	6XV1 870-8AE30 6XV1 870-8AE50 6XV1 870-8AH10 6XV1 870-8AH15 6XV1 870-8AH20 6XV1 870-8AH30 6XV1 870-8AH50 6XV1 870-8AN10 6XV1 870-8AN15
7/8" connecting cable to power supply 5-core, 5 x 1.5 mm ² , trailing type, pre-assembled with two 7/8" connectors, 5-pin • 1.5 m long • 2.0 m long • 3.0 m long • 5.0 m long • 10 m long • 15 m long	6XV1 822-5BH15 6XV1 822-5BH20 6XV1 822-5BH30 6XV1 822-5BH50 6XV1 822-5BN10 6XV1 822-5BN15
Power line 5-core, 5 x 1.5 mm ² , trailing type, sold by the meter, minimum order quantity 20 m, maximum order quantity 1000 m	6XV1 830-8AH10
7/8" cable connector For ET 200eco, with axial cable outlet • with male insert, 5 per pack • with female insert, 5 per pack	6GK1 905-0FA00 6GK1 905-0FB00
7/8" Power T-Tap Power T-piece with two 7/8" female inserts and one 7/8" male insert, 5 per pack	6GK1 905-0FC00

Order No.

General accessories

ET 200pro rack

- Narrow, for interface, electronics and power modules
 - 500 mm
 - 1000 mm
 - 2000 mm, can be cut to length
- Compact, for interface, electronics and power modules
 - 500 mm
 - 1000 mm
 - 2000 mm, can be cut to length
- Wide, for interface, electronics, power modules and motor starters
 - 500 mm
 - 1000 mm
 - 2000 mm, can be cut to length
- Wide, for I/O modules and motor starters
 - 500 mm
 - 1000 mm
 - 2000 mm

6ES7 194-4GA00-0AA0
6ES7 194-4GA60-0AA0
6ES7 194-4GA20-0AA0

6ES7 194-4GC70-0AA0
6ES7 194-4GC60-0AA0
6ES7 194-4GC20-0AA0

6ES7 194-4GB00-0AA0
6ES7 194-4GB60-0AA0
6ES7 194-4GB20-0AA0

6ES7 194-4GD00-0AA0
6ES7 194-4GD10-0AA0
6ES7 194-4GD20-0AA0

Spare fuse

12.5 A quick-response, for interface and power modules, 10 items per package unit

6ES7 194-4HB00-0AA0

SIMATIC Manual Collection

Electronic manuals on DVD, multi-language:
 S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)

6ES7 998-8XC01-8YE0

SIMATIC Manual Collection – Update service for 1 year

Scope of delivery: Current DVD "S7 Manual Collection" and the three subsequent updates

6ES7 998-8XC01-8YE2

Evaluating / Communication

SIMATIC ET 200pro

Overview



- PROFINET IO Controller to operate distributed I/Os on PROFINET
- Component Based Automation (CBA) on PROFINET
- PROFINET proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)
- CPU with PLC functionality equivalent to S7-315-2 PN/DP, provides distributed intelligence for preprocessing
- Interface module to exchange preprocessed I/O data from ET 200pro with a higher-level master through PROFIBUS DP
- Fast, simple and end-to-end programming of a system with modular programs via STEP 7

Micro Memory Card required for operation of CPU.

Application

The IM 154-8 CPU can be used as an IO Controller on PROFINET through the integrated PROFINET interface. The intelligent 154-8 CPU interface module has integrated PLC functionality. The included functions are equivalent to S7-315-2 PN/DP CPU.

The ET 200pro can use these PLC functions to control autonomous technological functional units, e.g.,

- Conveyor systems, switches
- Lifting stations
- Positioning tasks

Because of the available PROFIBUS interface in addition to the PROFINET interface, the IM 154-8 interface module also includes the option to operate other decentralized I/Os through PROFIBUS. The IM 154-8 CPU can be used on PROFIBUS not only as a master but also as a slave. The CPU's potential applications are therefore extended manufacturing cells with preprocessing, whereby stand-alone operation is also an option. Cabinet-free installations are possible due to the high IP67 rating.

Design

The intelligent IM154-8 CPU interface module consists of two components:

- IM154-8 PN/DP CPU (6ES7154-8AB00-0AB0) and
- CM IM PN DP M12 7/8" connection module (6ES7194-4AN00-0AA0)

Both components are sold separately.

The IM154-8 CPU interface module includes the following:

- 3 PROFINET ports (2 x M12, 1 x RJ45)
- 2 MPI/PROFIBUS connections (input and output, M12)
- Integrated CPU with the power of an S7-315-2 PN/DP CPU

Interface module IM 154-8 PN/DP CPU

- RUN/STOP switch and RJ45 PROFINET port behind a sealed cover
- Micro Memory Card below the connection module

Function

- Diagnostics buffer; the last 500 errors and interrupt events are saved in a buffer for diagnostics purposes.
- Maintenance-free data backup; the CPU automatically saves all data (up to 128 KB) in case of power failure so that the data are available again unchanged when the power returns.

Parameterizable attributes

STEP 7 can be used to parameterize both S7 configurations and the properties and responses of the CPUs:

- Restart/cycle time behavior: Stipulation of maximum cycle time and loading.
- Clock bit memory: Address setting.
- Protection level: Definition of access rights to program and data.
- System diagnostics: Definition of the handling and scope of diagnostics messages.
- Watchdog interrupts: Setting of periodicity.
- Time-of-day interrupts: Setting of date and time of start and periodicity.
- PROFIBUS DP master/slave interface: User-oriented address allocation for distributed I/O.
- PROFINET interface: parameterization of time synchronization using NTP procedure
- MPI multipoint interface: Determination of node addresses.

Indication and information functions

- Status and error indications: LEDs indicate, e.g., hardware, programming, time, I/O or bus errors, as well as operating states such as RUN, STOP and restart. Maintenance alarm and PROFINET link/activity.
- Test functions: the programming device can be used to display signal states in program execution, modify process variables independently of the user program, and read out the contents of stack memories.
- Information functions: you can use the programming device to obtain information about the storage capacity and operating mode of the CPU as well as the current utilization of the main and load memories, current cycle times and diagnostic buffer contents in plain text.

Integrated communication functions

- PG/OP communication
- Shared data communication
- S7 basic communication
- S7 communication
- S5-compatible communication
- Routing
- PROFIBUS DP master/slave
- Open communication over TCP/IP, UDP and ISO-on-TCP (RFC1006)
- PROFINET IO Controller
- PROFINET CBA

Evaluating / Communication

SIMATIC ET 200pro

Interface module IM 154-8 PN/DP CPU

System functions

The CPU provides many extensive system functions for diagnostics, parameterization, synchronization, alerting, time measurement, etc. For detailed information, refer to the manual

Technical specifications

	6ES7 154-8AB00-0AB0
Product status	
associated programming package	STEP 7 V5.4 SP1 with HW update
Supply voltages	
Rated value	
• DC 24 V	Yes
• permissible range, lower limit (DC)	20.4 V
• permissible range, upper limit (DC)	28.8 V
Voltages and currents	
external protection for supply cables (recommendation)	MCB 24V DC / 16A with tripping characteristic Type B and C (see ET 200pro manual)
Current consumption	
Inrush current, typ.	2 A; Typical
I ² t	0.04 A²s; Typical
Current consumption (rated value)	350 mA; Typical
Power loss, typ.	8.5 W; Typical
Memory	
Type of storage	
• RAM	
- integrated	256 KByte
- expandable	No
• Load memory	
- pluggable (MMC)	Yes
- pluggable (MMC), max.	8 MByte
Backup	
• present	Yes
• without battery	Yes
CPU/blocks	
DB	
• Number, max.	1,023; Number band: 1 to 1023
• Size, max.	16 KByte
FB	
• Number, max.	1,024; Sequence of numbers: 0 to 2047
• Size, max.	16 KByte
FC	
• Number, max.	1,024; Sequence of numbers: 0 to 2047
• Size, max.	16 KByte
OB	
• Size, max.	16 KByte
Nesting depth	
• per priority class	8
• additional within an error OB	4
CPU/processing times	
for bit operations, min.	0.1 µs
for word operations, min.	0.2 µs

for fixed point arithmetic, min.	2 µs
for floating point arithmetic, min.	3 µs
Times/counters and their remanence	
S7 counter	
• Number	256
• of which remanent without battery	
- adjustable	Yes
- lower limit	0
- upper limit	255
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	255
• Counting range	
- adjustable	Yes
- lower limit	0
- upper limit	999
IEC counter	
• present	Yes
• Type	SFB
S7 times	
• Number	256
• Remanence	
- adjustable	Yes
- lower limit	0
- upper limit	128
- preset	No retentivity
• Time range	
- lower limit	10 ms
- upper limit	9,990 s
IEC timer	
• present	Yes
• Type	SFB
Data areas and their remanence	
Flag	
• Number, max.	2,048 Byte
• Remanence available	Yes; MB 0 to MB 2047
• Number of clock memories	8
Data blocks	
• Number, max.	1,023; From DB 1 to DB 1023
• Size, max.	16 KByte
• Remanence adjustable	Yes; From DB 1 to DB 1023
• Remanence preset	yes
Local data	
• per priority class, max.	1,024 Byte; per block max. 510
Address area	
I/O address area	
• Inputs	2,048 Byte
• Outputs	2,048 Byte
• of which, distributed	
- Inputs	2,048 Byte
- Outputs	2,048 Byte

Evaluating / Communication

SIMATIC ET 200pro

Interface module IM 154-8 PN/DP CPU

Process image	
• Inputs, adjustable	2,048 Byte
• Outputs, adjustable	2,048 Byte
• Inputs, preset	128 Byte
• Outputs, preset	128 Byte
Subprocess images	
• Number of subprocess images, max.	1
Digital channels	
• Inputs	16,384
• Outputs	16,384
• Inputs, of which central	128
• Outputs, of which central	64
Analog channels	
• Inputs	1,024
• Outputs	1,024
• Inputs, of which central	64
• Outputs, of which central	64
Hardware config.	
Racks, max.	1
Modules per rack, max.	16; Expansion width max. 1m
Number of DP masters	
• integrated	1
Time	
Clock	
• Hardware clock (real-time clock)	Yes
• buffered and synchronizable	Yes; On MPI: master/slave; to DP: when operated as DP master: master/slave; to PROFINET: Via NTP (client only)
• Deviation per day, max.	10 s
Operating hours counter	
• Number	1
• Range of values	2 to the power of 31 hours (when using the SFC 101)
• Granularity	1 h
• remanent	Yes; must be restarted at each warm restart
Clock synchronization	
• supports	Yes
• to MPI, Master	Yes
• to MPI, Slave	Yes
• in AS, Master	No
• in AS, Slave	No
• on Ethernet via NTP	Yes; As client
S7 message functions	
Number of login stations for message functions, max.	16
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	40
Test commissioning functions	
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	30

• of which status variable, max.	30
• of which control variable, max.	14
Forcing	
• Forcing	Yes
• Force, variables	I/O
• Number of variables, max.	10
Status block	Yes
Single step	Yes
Number of breakpoints	2
Diagnostic buffer	
• present	Yes
• Number of entries, max.	500
• adjustable	No
Communication functions	
PG/OP communication	Yes
Routing	Yes
Global data communication	
• supported	Yes
• Size of GD packets, max.	22 Byte
S7 basic communication	
• supported	Yes
S7 communication	
• supported	Yes
Open IE communication	
• TCP/IP	Yes
- Number of connections, max.	8
- Data length, max.	8 KByte
• ISO-on-TCP (RFC1006)	Yes
- Number of connections, max.	8
- Data length, max.	8 KByte
• UDP	Yes
- Number of connections, max.	8
- Data length, max.	1,472 KByte
Number of connections	
• overall	16
• usable for PG communication	15
• usable for OP communication	15
• usable for S7 basic communication	14
PROFINET CBA (at set setpoint communication load)	
• Setpoint for the CPU communication load	50%
• Number of remote interconnection partners	32
• Number of functions, master/slave	30
• Total of all master/slave connections	1,000
• Data length of all incoming connections master/slave, max.	4,000 Byte
• Data length of all outgoing connections master/slave, max.	4,000 Byte
• Number of device-internal and PROFIBUS interconnections	500
• Data length of device-internal and PROFIBUS interconnections, max.	4,000 Byte
• Data length per connection, max.	1,400 Byte

Evaluating / Communication

SIMATIC ET 200pro

Interface module IM 154-8 PN/DP CPU

• Remote interconnections with acyclic transmission	
- Sampling frequency: sampling interval, min.	500 ms
- Number of incoming interconnections	100
- Number of outgoing interconnections	100
- Data length of all incoming interconnections, max.	2,000 Byte
- Data length of all outgoing interconnections, max.	2,000 Byte
- Data length per connection, max.	1,400 Byte
• Remote interconnections with cyclic transmission	
- Transmission frequency: transmission interval, min.	1 ms
- Number of incoming interconnections	200
- Number of outgoing interconnections	200
- Data length of all incoming interconnections, max.	2,000 Byte
- Data length of all outgoing interconnections, max.	2,000 Byte
- Data length per connection, max.	250 Byte
• HMI variables via PROFINET (acyclic)	
- Number of log-in stations for HMI variables (PN OPC/iMap)	3; 2 * PN OPC / 1 * iMap
- HMI variable updating	500 ms
- Number of HMI variables	200
- Data length of all HMI variables, max.	2,000 Byte
• PROFIBUS proxy functionality	
- supported	Yes
- Number of linked PROFIBUS devices	16
- Data length per connection, max.	240 Byte
1st interface	
Type of interface	Integral RS 485 interface
Physics	RS 485
isolated	Yes
Functionality	
• MPI	Yes
• DP master	Yes
• DP slave	Yes
• Point-to-point coupling	No
MPI	
• Number of connections	16
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	Yes
- S7 basic communication	Yes
- S7 communication	Yes

- S7 communication, as client	No
- S7 communication, as server	Yes
• Transmission speeds, max.	12 Mbit/s
DP master	
• Services	
- PG/OP communication	Yes
- Routing	Yes
- Global data communication	No
- S7 basic communication	Yes
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- equidistance support	Yes
- SYNC/FREEZE	Yes
- Activation/deactivation of DP slaves	Yes
- DPV1	Yes
• Transmission speeds, max.	12 Mbit/s
• Number of DP slaves, max.	124
DP slave	
• Services	
- Routing	Yes
- Global data communication	No
- S7 basic communication	No
- S7 communication	Yes
- S7 communication, as client	No
- S7 communication, as server	Yes
- direct data exchange (cross traffic)	Yes
- DPV1	No
• Transmission speeds, max.	12 Mbit/s
• Transfer memory	
- Inputs	244 Byte
- Outputs	244 Byte
• Address area, max.	32
2nd interface	
Type of interface	PROFINET
Physics	Ethernet
isolated	Yes
automatic detection of transmission speed	Yes
Functionality	
• MPI	No
• DP master	No
• DP slave	No
• PROFINET IO controller	Yes
• PROFINET CBA	Yes
• Point-to-point coupling	No
PROFINET CBA	
• Acyclic transmission	Yes
• cyclic transmission	Yes
PROFINET IO controller	
• Services	

- PG/OP communication	Yes
- Routing	Yes
- S7 communication	Yes
- open IE communication	Yes
• Transmission speed, max.	100 Mbit/s
• Number of connectable IO-devices, max.	128
• Address area	
- Inputs, max.	2,048 Byte
- Outputs, max.	2,048 Byte
• Useful data consistency, max.	256 Byte
CPU/programming	
Programming language	
• STEP 7	Yes; From V 5.3 SP1 + HW-Support Package
• LAD	Yes
• FUP	Yes
• AWL	Yes
• SCL	Yes
• CFC	Yes
• GRAPH	Yes
• HiGraph®	Yes
Software libraries	
Operational stocks	see instruction list
Nesting levels	8
User program protection/pass-word protection	Yes
System functions (SFC)	see instruction list
System function blocks (SFB)	see instruction list
Isolation	
between backplane bus and all other circuit parts	Yes
between backplane bus and electronics	No
between supply and all other circuit parts	Yes
Degree of protection	
IP20 rear	Yes
Dimensions	
Width	135 mm
Height	130 mm
Depth	65 mm
Weights	
Weight, approx.	555 g

Evaluating / Communication

SIMATIC ET 200pro

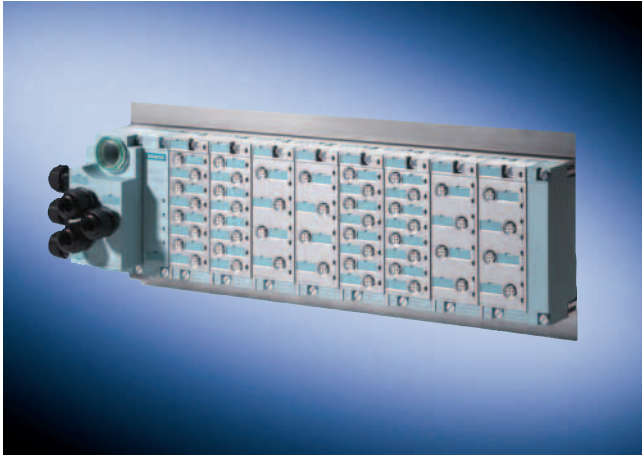
Interface module IM 154-8 PN/DP CPU

Selection and Ordering Data

	Order No.
IM 154-8 PN/DP CPU interface module PROFINET IO Controller to operate distributed I/Os on PROFINET, with integrated PLC functionality	6ES7 154-8AB00-0AB0
Accessories	
Connection module For CPU IM154-8 PN/DP, with 4 x M12 and 2 x 7/8", to connect PROFINET and PROFIBUS DP	6ES7 194-4AN00-0AA0
SCALANCE X-200 Industrial Ethernet Switches With integral SNMP access, Web diagnosis, copper cable diagnosis and PROFINET diagnosis, for setting up linear, star and ring structures SCALANCE X208PRO, in degree of protection IP65, with eight 10/100 Mbit/s M12 ports, incl. eleven M12 dust caps	6GK5 208-0HA00-2AA6
Industrial Ethernet FC RJ45 Plug 180 RJ45 plug connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 180° cable outlet	
1 unit	6GK1 901-1BB10-2AA0
10 units	6GK1 901-1BB10-2AB0
50 units	6GK1 901-1BB20-2AE0
Industrial Ethernet Fast Connect installation cables • Fast Connect standard cable • Fast Connect trailing cable • Fast Connect marine cable	6XV1 840-2AH10 6XV1 840-3AH10 6XV1 840-4AH10
Industrial Ethernet Fast Connect Stripping Tool	6GK1 901-1GA00
IE Connecting Cable M12-180/M12-180 Preassembled IE FC TP Trailing Cable GP 2 x 2 (PROFINET Type C) with two 4-pin M12 plugs (4-pin, D-coded), degree of protection IP65/IP67, length:	
0.3 m	6XV1 870-8AE30
0.5 m	6XV1 870-8AE50
1.0 m	6XV1 870-8AH10
1,5 m	6XV1 870-8AH15
2,0 m	6XV1 870-8AH20
3,0 m	6XV1 870-8AH30
5,0 m	6XV1 870-8AH50
10 m	6XV1 870-8AN10
15 m	6XV1 870-8AN15
IE M12 Plug PRO M12 plug-in connector suitable for on-site assembly (D-coded), metal enclosure, fast connection, for SCALANCE X208PRO and IM 154-4 PN	

	Order No.
1 units	6GK1 901-0DB10-6AA0
8 units	6GK1 901-0DB10-6AA8
IE panel feedthrough Cabinet feedthrough for converting from the M12 connection system (D-coded, IP65/IP67) to the RJ45 connection system (IP20), 1 pack = 5 units	6GK1 901-0DM20-2AA5

Overview



The fail-safe SIMATIC S7 CPUs, plus the fail-safe signal modules of SIMATIC ET 200S / ET200 / 200pro/ ET200eco and ET200M have been specially developed for distributed applications in manufacturing systems. Thanks to the discrete structure of the F I/Os, safety technology is only applied where actually required. The new system replaces conventional electromechanical components, such as:

- Freely programmable safe linking of sensors to actuators;
- Selective safe shutdown of actuators;
- Hybrid configurations of F modules (F stands for fail-safe) and standard modules in a station;
- Single-bus concept, F signals and standard signals are transferred over one bus medium (PROFIBUS DP, PROFINET).

Totally Integrated Automation (TIA)

Safety technology (Safety Integrated) is a component of Totally Integrated Automation resulting in the total integration of safety and standard automation (SIMATIC S7).

Whereas today, standard automation (conventional PLCs) and safety automation (electromechanics) are still separate, these two worlds are growing closer together to form one uniform, integrated overall system.

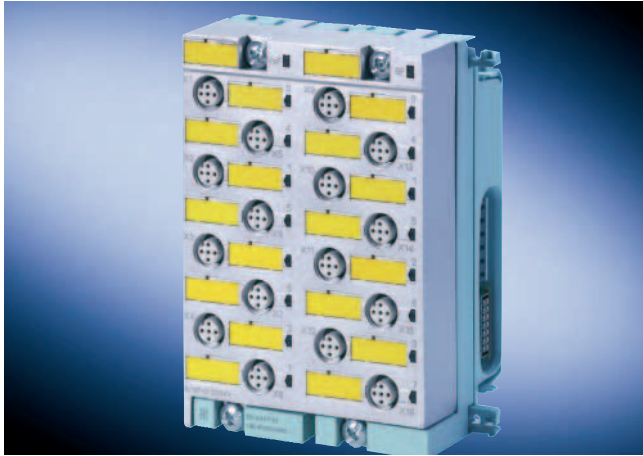
Siemens can therefore present itself as a complete supplier for automation engineering for which safety technology is part of the standard automation and uniformity exists throughout the complete system.

Evaluating / Communication

SIMATIC ET 200pro

Fail-safe digital expansion modules

Overview



Fail-safe digital inputs/outputs with degree of protection IP65/66/67 for application on the machine level without control cabinet

Fail-safe digital inputs

- For fail-safe reading of sensor information (1 or 2 channels)
- Provide integral discrepancy evaluation for 2-out-of-2 signals
- Internal sensor supplies (incl. test function) available

Fail-safe digital outputs

- Fail-safe 2-channel activation (sink/source output) by actuators
- Actuators can be driven by up to 2 A

All modules are certified up to Cat. 4 (EN954-1) and up to SIL 3 (IEC 61508) and feature detailed diagnostics.

The modules support PROFIsafe, both in PROFIBUS, and in PROFINET configurations. They can be used with IM 151-7 F-CPU, CPU31xF-2 DP, CPU31xF-2 PN/DP and CPU416F-2.

Application

The fail-safe modules of ET200pro can be used to implement the safety-related application requirements as an integral part of the overall automation. The safety functions required for fail-safe operation are integrated in the modules. The modules can be used for safety circuits up to Cat. 4/ SIL 3.

Communication to fail-safe SIMATIC S7 CPUs is performed by means of PROFIsafe.

The modules can be operated in a distributed configuration down-circuit of the IM 154-2 High Feature and IM154-4 PROFINET High Feature interface modules.

A standard power module is required to supply the modules.

Selection and Ordering Data

	Order No.
Fail-safe digital input module 8/16 F-DI PROFIsafe 24 V DC, including bus module Connecting module must be ordered separately	6ES7 148-4FA00-0AB0
Fail-safe digital input/output module 4/8 F-DI, 4 F-DO 2 A 24 V DC, including bus module Connecting module must be ordered separately	6ES7 148-4FC00-0AB0
Accessories	
Connection module For the fail-safe electronic module 4/8 F-DI/4 F-DO, 24 V DC/2 A	6ES7 194-4DC00-0AA0
Connection module For the fail-safe electronic module 8/16 F-DI, 24 V DC/2 A	6ES7 194-4DD00-0AA0
IM154-2 High Feature interface module For ET 200pro, incl. termination module	6ES7 154-2AA00-0AB0
PROFINET interface module IM154-4 PN Including termination module	6ES7 154-4AB00-0AB0
M12 covering cap For protection of unused M12 connections with ET 200pro	3RX9 802-0AA00
M12 connector, can be assembled in the field 5-pin, for connecting digital sensors and actuators, 1 unit	3RX8 000-0CD55
M12 connecting cable With PUR sheath, for connecting digital sensors and actuators, pre-assembled, with connector and socket at each end	
• 3 x 0.34 mm², fixed lengths, 1 unit - 0.6 m - 1 m - 1.5 m • 4 x 0.34 mm², fixed lengths, 1 unit - 0.6 m - 1 m - 1.5 m	3RX1 633 3RX1 634 3RX8 000-0GF32-1AB5 3RX8 000-0GF42-1AB0 3RX8 000-0CC44-1AF0 3RX8 000-0GF42-1AB5

Evaluating / Communication

SIMATIC ET200eco

SIMATIC ET 200eco

Overview



- Compact, cost-effective I/O devices for processing digital signals
- Design without control cabinet with degree of protection IP65/67 with flexible and fast connections
- Comprises a basic module and various connection blocks for application-specific implementation options:
 - ECOFAST: 2 x RS 485 hybrid fieldbus connection with identification plug for setting the PROFIBUS address
 - M12: 2 x M12 and 2 x 7/8" with 2 rotary coding switches for assigning the PROFIBUS address
- Connection block contains T-functionality for bus and power supply so that during commissioning and service, the modules can be disconnected from and reconnected to the PROFIBUS without interruption
- Module variance: 8DI, 16DI, 8DI/8DO (1.3 A), 8DI/8DO (2.0 A), 8DO (2.0 A), 16DO (0.5 A)
- Transmission rates up to 12 Mbit/s
- Failsafe DI modules 4/8 F-DI with safety-related signal processing according to PROFIsafe

Application

ET 200eco is a distributed I/O device to the degree of protection IP65/67. ET 200eco stands for easy handling and installation.

ET 200eco offers the user the option of low-cost processing of digital signals (also failsafe) on PROFIBUS DP.

Its high degree of protection and its ruggedness make it particularly suitable for implementation in the machine environment.

The flexible connection blocks can be used to connect to PROFIBUS DP through M12 or through a standardized hybrid fieldbus interface (ECOFAST).

The compact ET 200eco block I/O offers a compatible extension for applications to a high degree of protection alongside the modular I/O product range ET 200X.

Design

ET 200eco comprises a basic module and terminal block.

For implementing and integrating PROFIBUS applications, a compact perfectly interacting module spectrum is available for digital I/Os:

Number of channels	Type of connection
8 DI	8 single channels via 8x M12 screwed glands for 8 digital input signals

Number of channels	Type of connection
16 DI	16 channels via 8x M12 screwed glands with dual assignment for 16 digital input signals
8 DO	8 single channels via 8x M12 screwed glands for 8 digital output signals (2A)
16 DO	16 channels via 8x M12 screwed glands with dual assignment for 16 digital output signals (0.5 A)
8 DI / 8 DO (1.3 A)	16 channels via 8x M12 screwed glands with dual assignment for 8 digital inputs and 8 digital output signals (1.3 A)
8 DI / 8 DO (2.0 A)	16 channels via 8x M12 screwed glands with dual assignment for 8 digital inputs and 8 digital output signals (2.0 A)
4/8F-DI	Up to 4 channels (Cat. 4, SIL 3) or up to 8 channels (Cat. 3, SIL 2)

Via the variable and flexible terminal blocks, PROFIBUS DP can be connected as required via 2x M12, 2x7/8" or 2x hybrid fieldbus interfaces (ECOFAST).

The T functions for PROFIBUS DP and the power supply are integrated in the terminal block which means that installations can be operated without interruption and without the need for additional components during the commissioning and maintenance of bus lines.

The pin assignment for the actuators and sensors are adapted to the degree of protection IP65/67 standardization trend.

Depending on the type of terminal block, the PROFIBUS address is set either visually or using plug-in jumpers.

In ECOFAST interfaces, the well-proven identification connector is implemented; in M12, 7/8" interfaces, two rotary coding switches visible from the outside are used to set the PROFIBUS address.

Function

Operating mode

Communication takes place exclusively via PROFIBUS DP.

There are diagnostics functions to monitor the functionality of the ET 200eco:

- BF (bus fault)
- SF (system fault)
- Power supply, encoder and load

The diagnostics data are indicated by LEDs on the module and can be evaluated via software on the programming device or PC or by the PLC

A short-circuit in the encoder supply or a missing load voltage is diagnosed module by module.

The connection block can be removed from the basic module and screwed on again with the equipment live, so PROFIBUS and the power supply remain permanently active in the application.

Configuration

A GSD file is available for parameterizing when connecting modules to master modules that are not parameterized with STEP 7. This can be loaded into the configuration tool of the master and provides all the information in plain text for parameterizing the ET 200eco.

For the 4/8F-DI, the F configuration tool that runs under STEP 7 is required for parameterization. This is a component part of S7 Distributed Safety and S7 F systems.

Evaluating / Communication

SIMATIC ET200eco

SIMATIC ET 200eco

Technical specifications

	6ES7 141-3BF00-0XA0	6ES7 141-3BH00-0XA0	6ES7 148-3FA00-0XB0
Supply voltages			
Supply voltage of electronics 1L+			
• Rated value (DC)	24 V	24 V	24 V
• reverse polarity protection	Yes	Yes	No
Current consumption			
from supply voltage 1L+, max.	70 mA; typically	70 mA; typically	100 mA
Power loss, typ.	2.4 W	3.6 W	3 W
FH technology			
Module for fail-safe applications			Yes
Protocols			
PROFIBUS DP protocol	Yes	Yes	Yes
PROFIBUS DP			
Transmission speed, max.	12 Mbit/s; 9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 kBaud 1.5 / 3 / 6 / 12 Mbaud	12 Mbit/s; 9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 kBaud 1.5 / 3 / 6 / 12 Mbaud	12 Mbit/s
Digital inputs			
Number of digital inputs	8	16	8; 8 single-channel, 4 two-channel
Number of simultaneously controllable inputs	8; All mounting positions up to 55 °C	16; All mounting positions up to 55 °C	8; 8 single channel, 4 two-channel
Cable length			
• Cable length unshielded, max.	30 m	30 m	30 m
Input characteristic curve to IEC 1131, Typ 1	Yes	Yes	Yes
Input voltage			
• Rated value, DC	24 V	24 V	24 V
• for signal "0"	-3 to 5 V	-3 to 5 V	-30V to 5 V
• for signal "1"	13 to 30 V	13 to 30 V	15 to 30 V
Input current			
• for signal "1", typ.	7 mA	7 mA	3.7 mA
Input delay (for rated value of input voltage)			
• for standard inputs			
- at "0" to "1", max.	3 ms; Typ.	3 ms; Typ.	
- at "1" to "0", max.	3 ms; typically	3 ms; typically	
Encoder supply			
Number of outputs	8	8	2
Output voltage	24 V DC	24 V DC	Min. L+ (-1.5V)

Output current, rated value	1 A; Aggregate current up to 55 °C	1 A; Aggregate current up to 55 °C	300 mA
Short-circuit protection	Yes; electronic	Yes; electronic	Yes
Encoder			
Connectable encoders			
• 2-wire BEROs	Yes	Yes	No
• permissible quiescent current (2-wire BEROs), max.	1.5 mA	1.5 mA	
Status information/alarms/diagnostics			
Status indicator	Yes	Yes	
Alarms			
• Alarms	No	No	
Diagnostics			
• Diagnostics	Yes; Diagnostic information readable	Yes; Diagnostic information readable	
Diagnostics indication LED			
• Collective error SF (red)	Yes	Yes	Yes
• Status indicator digital input (green)	Yes	Yes	Yes
• Channel error indicator F (red)	No	No	No
Isolation			
Isolation checked with	500 V DC	500 V DC	350 V AC/ 1min
Isolation			
between PROFIBUS DP and all other circuits	Yes	Yes	Yes
Galvanic isolation, digital inputs			
• between the channels	No	No	No
Permissible potential difference			
between different circuits	75 V DC/ 60 V AC	75 V DC/ 60 V AC	75 V DC/ 60 V AC
Standards, approvals, certificates			
Highest safety class achievable in safety mode			
• to EN 954			Cat.3 (one-channel), Cat.4 (two-channel)
• to IEC 61508			SIL 2 (one channel), SIL 3 (two channel)
General information			
Vendor identification (Vendor ID)	80DBh	80DAh	
Dimensions			

Evaluating / Communication

SIMATIC ET200eco

SIMATIC ET 200eco

Width	60 mm	60 mm	60 mm
Height	210 mm	210 mm	210 mm
Depth	28 mm	28 mm	28 mm
Weights			
Weight, approx.	210 g	210 g	220 g

	6ES7 142-3BF00-0XA0	6ES7 142-3BH00-0XA0
Supply voltages		
Supply voltage of electronics 1L+		
• Rated value (DC)	24 V	24 V
• reverse polarity protection	Yes	Yes
Voltages and currents		
Load voltage 2L+		
• Rated value (DC)	24 V	24 V
• Reverse polarity protection	Yes	Yes
Current consumption		
from load voltage 2L+ (without load), max.	60 mA; typically	80 mA; typically
from supply voltage 1L+, max.	70 mA; typically	70 mA; typically
Power loss, typ.	4 W	4 W
Protocols		
PROFIBUS DP protocol	Yes	Yes
PROFIBUS DP		
Transmission speed, max.	12 Mbit/s; 9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 kBaud 1.5 / 3 / 6 / 12 Mbaud	12 Mbit/s; 9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 kBaud 1.5 / 3 / 6 / 12 Mbaud
Digital outputs		
Number of digital outputs	8	16
Cable length unshielded, max.	30 m	30 m
Short-circuit protection of the output	Yes; Electronic	Yes; Electronic
• Response threshold, typ.	4 A (per channel)	1.4 A (per channel)
Limitation of inductive shutdown voltage to	2L+ (-44 V)	2L+ (-47 V)
Lamp load, max.	10 W	5 W
Controlling a digital input	Yes	Yes
Output voltage		
• for signal "1", min.	2L+ (- 0.8 V)	2L+ (- 0.8 V)
Output current		
• for signal "1" rated value	2 A	0.5 A
• for signal "1" permissible range for 0 to 55 °C, min.	5 mA	5 mA
• for signal "1" permissible range for 0 to 55 °C, max.	2.4 A	1 A
• for signal "0" residual current, max.	0.5 mA	0.1 mA

Parallel switching of 2 outputs		
• for increased power	No	No
• for redundant control of a load	Yes	Yes
Switching frequency		
• with resistive load, max.	100 Hz	100 Hz
• with inductive load, max.	0.5 Hz; to IEC 947-5-1, DC13	0.5 Hz; to IEC 947-5-1, DC13
• on lamp load, max.	1 Hz	1 Hz
Aggregate current of the outputs (per group)		
• up to 55 °C, max.	4 A; 4 A each for sockets X1, X3, X5, X7, 4 A each for X2, X4, X6, X8; note the current carrying capacity of the cable	4 A; Please note the current carrying capacity of the cable.
Load impedance range		
• lower limit	12 Ω	12 Ω
• upper limit	4 kΩ	4 kΩ
Status information/alarms/diagnostics		
Status indicator	Yes	Yes
Alarms		
• Alarms	No	No
Diagnoses		
• Diagnostics	Yes; Diagnostic information readable	Yes; Diagnostic information readable
Diagnostics indication LED		
• Collective error SF (red)	Yes	Yes
• Status indicator digital output (green)	Yes	Yes
• Channel error indicator F (red)	No	No
Isolation		
Isolation checked with	500 V DC	500 V DC
Isolation		
between PROFIBUS DP and all other circuits	Yes	Yes
Isolation, digital outputs		
• between the channels	No	No
Permissible potential difference		
between different circuits	75 V DC/ 60 V AC	75 V DC/ 60 V AC
General information		
Vendor identification (Vendor ID)	80DDh	80FBh
Dimensions		
Width	60 mm	60 mm
Height	210 mm	210 mm
Depth	28 mm	28 mm
Weights		
Weight, approx.	210 g	210 g

Evaluating / Communication

SIMATIC ET200eco

SIMATIC ET 200eco

	6ES7 143-3BH00-0XA0	6ES7 143-3BH10-0XA0
Supply voltages		
Supply voltage of electronics 1L+		
• Rated value (DC)	24 V	24 V
• reverse polarity protection	No	Yes
Voltages and currents		
Load voltage 2L+		
• Rated value (DC)	24 V	24 V
• Reverse polarity protection	No	Yes
Current consumption		
from load voltage 2L+ (without load), max.	60 mA; typically	60 mA; typically
from supply voltage 1L+, max.	70 mA; typically	70 mA; typically
Power loss, typ.	5 W	5 W
Protocols		
PROFIBUS DP protocol	Yes	Yes
PROFIBUS DP		
Transmission speed, max.	12 Mbit/s; 9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 kBaud 1.5 / 3 / 6 / 12 Mbaud	12 Mbit/s; 9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 kBaud 1.5 / 3 / 6 / 12 Mbaud
Digital inputs		
Number of digital inputs	8	8
Number of simultaneously controllable inputs	8; All mounting positions up to 55 °C	8; All mounting positions up to 55 °C
Input characteristic curve to IEC 1131, Typ 1	Yes	Yes
Input voltage		
• Rated value, DC	24 V	24 V
• for signal "0"	-3 to 5 V	-3 to 5 V
• for signal "1"	13 to 30 V	13 to 30 V
Input current		
• for signal "1", typ.	7 mA	7 mA
Input delay (for rated value of input voltage)		
• for standard inputs		
- at "0" to "1", max.	3 ms; Typ.	3 ms; Typ.
- at "1" to "0", max.	3 ms; typically	3 ms; typically
Digital outputs		
Number of digital outputs	8	8
Cable length unshielded, max.	30 m	30 m
Short-circuit protection of the output	Yes; Electronic	Yes; Electronic
• Response threshold, typ.	4 A per channel	4 A per channel
Limitation of inductive shutdown voltage to	2L+ (-44 V)	2L+ (-44 V)
Lamp load, max.	10 W	10 W
Controlling a digital input	Yes	Yes
Output voltage		
• for signal "1", min.	2L+ (- 0.8 V)	2L+ (-1.2 V)

Output current

• for signal "1" rated value	2 A	1.3 A
• for signal "1" permissible range for 0 to 55 °C, min.	5 mA	5 mA
• for signal "1" permissible range for 0 to 55 °C, max.	2.4 A	1.8 A
• for signal "0" residual current, max.	0.5 mA	0.5 mA

Parallel switching of 2 outputs

• for increased power	No	No
• for redundant control of a load	Yes	Yes

Switching frequency

• with resistive load, max.	100 Hz	100 Hz
• with inductive load, max.	0.5 Hz; to IEC 947-5-1, DC13	0.5 Hz; to IEC 947-5-1, DC13
• on lamp load, max.	1 Hz	1 Hz

Aggregate current of the outputs (per group)

• up to 55 °C, max.	4 A; 4 A each for sockets X1, X3, X5, X7 and 4 A each for sockets X2, X4, X6, X8; note the current carrying capacity of the cable	5.2 A; Please note the current carrying capacity of the cable.

Load impedance range

• lower limit	12 Ω	12 Ω
• upper limit	4 kΩ	4 kΩ

Encoder supply

Number of outputs	8	8
Output voltage	24 V DC	
Output current, rated value	0.75 A; up to 55°C max. 0.75 A (summation current)	1 A; Up to 55°C max. 1 A (summation current)
Short-circuit protection	Yes; electronic	Yes; electronic

Encoder

Connectable encoders		
• 2-wire BEROs	Yes	Yes
• permissible quiescent current (2-wire BEROs), max.	1.5 mA	1.5 mA

Status information/alarms/diagnostics

Status indicator	Yes	Yes
Alarms		
• Alarms	No	No
Diagnostics		
• Diagnostics	Yes; Diagnostic information readable	Yes; Diagnostic information readable
Diagnostics indication LED		
• Collective error SF (red)	Yes	Yes
• Status indicator digital output (green)	Yes	Yes

Evaluating / Communication

SIMATIC ET200eco

SIMATIC ET 200eco

• Status indicator digital input (green)	Yes	Yes
• Channel error indicator F (red)	No	No
Isolation		
Isolation checked with	500 V DC	500 V DC
Isolation		
between PROFIBUS DP and all other circuits	Yes	Yes
Galvanic isolation, digital inputs		
• between the channels	No	No
Isolation, digital outputs		
• between the channels	No	No
Permissible potential difference		
between different circuits	75 V DC/ 60 V AC	75 V DC/ 60 V AC
General information		
Vendor identification (Vendor ID)	80DCh	80FCh
Dimensions		
Width	60 mm	60 mm
Height	210 mm	210 mm
Depth	28 mm	28 mm
Weights		
Weight, approx.	210 g	210 g

	6ES7 194-3AA00-0AA0	6ES7 194-3AA00-0BA0
Current consumption		
Power loss, typ.	2 W; The power loss depends on the current that you loop through via the connection block.	2 W; The power loss depends on the current that you loop through via the connection block.
Dimensions		
Width	79 mm	79 mm
Height	60 mm	60 mm
Depth	30 mm	29 mm
Weights		
Weight, approx.	313 g	392 g

Selection and Ordering Data

	Order No.
ET 200eco basic modules BM 141	
• 8 DI DC 24 V 8 x M12, individual assignment, IP65/67 connection block 6ES7 194-3AA00-0.A0 to be ordered separately	6ES7 141-3BF00-0XA0
• 16 DI DC 24 V 8 x M12, double assignment, IP65/67 connection block 6ES7 194-3AA00-0.A0 to be ordered separately	6ES7 141-3BH00-0XA0

	Order No.
ET 200eco basic module BM 142	6ES7 142-3BF00-0XA0
• 8 DO DC 24 V/1.2 A 8 x M12, individual assignment, IP65/67 connection block 6ES7 194-3AA00-0.A0 to be ordered separately	
• 16 DO DC 24 V/0.5 A 8 x M12, double assignment, IP65/67; connection block 6ES7 194-3AA00-0.A0 to be ordered separately	6ES7 142-3BH00-0XA0
ET 200eco basic module BM 143	
• 8 DI/8 DO, 2 A 8 x M12, IP65/67 connection block 6ES7 194-3AA00-0.A0 to be ordered separately	6ES7 143-3BH00-0XA0
• 8 DI/8 DO, 1.3 A 8 x M12, double assignment, IP65/67 connection block 6ES7 194-3AA00-0.A0 to be ordered separately	6ES7 143-3BH10-0XA0
ET 200eco basic module BM 148	
• 4/8 F-DI, 8 x M12, connection block 6ES7 194-3AA00-0.A0 to be ordered separately	6ES7 148-3FA00-0XB0
ECOFASST connection block	6ES7 194-3AA00-0AA0
for ET 200eco, 2 x ECOFAST connection RS485 identification connector for PROFIBUS DP, address setting	
M12 connection block, 7/8"	6ES7 194-3AA00-0BA0
for ET 200eco, 2 x M12 and 2 x 7/8" 2 rotary coding switch for PROFIBUS DP, address setting	

Accessories

"Distributed Safety" V5.4 F programming tool	6ES7 833-1FC02-0YA5
Floating License for 1 user, with documentation, 3 languages (German, English, French), on CD, runs on STEP 7 V5.3 SP3 or higher	
"Distributed Safety" F programming tool Upgrade from V5.x to V5.4	6ES7 833-1FC02-0YE5
"Distributed Safety" F programming tool	6ES7 833-1FC00-0YX2
Software update service for 1 year, with automatic extension; latest current software version.	
Labels	3RT1 900-1SB20
Module description "Distributed I/O device ET 200eco" excluding F-DI	
• Paper copy	
• German	6ES7 198-8GA00-8AA0
• English	6ES7 198-8GA00-8BA0
• French	6ES7 198-8GA00-8CA0
PROFIBUS ECOFAST Hybrid Cable – Cu	See ECOFAST bus cables
PROFIBUS ECOFAST terminating plug	
ECOFASST terminating resistor for PROFIBUS DP	
• 1 package = 1 unit	6GK1 905-0DA10

Evaluating / Communication

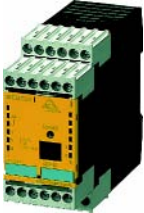
SIMATIC ET200eco

SIMATIC ET 200eco

	Order No.
• 1 package = 5 units	6GK1 905-0DA00
M12 covering caps	3RX9 802-0AA00
for sealing of unused I/O sockets	
M12 connection block, 7/8" accessories	
PROFIBUS M12 connecting cable	
Pre-assembled 2-wire (inverse coded) with M12 connectors at various lengths:	
• 0.3 m	6XV1 830-3DE30
• 0.5 m	6XV1 830-3DE50
• 1.0 m	6XV1 830-3DH10
• 1.5 m	6XV1 830-3DH15
• 2.0 m	6XV1 830-3DH20
• 3.0 m	6XV1 830-3DH30
• 5.0 m	6XV1 830-3DH50
• 10.0 m	6XV1 830-3DN10
• 15.0 m	6XV1 830-3DN15
SIMATIC NET energy cable	
5-wire energy cable, stranded 5 x 1.5 mm ² , trailing-type	
• Sold by the meter, minimum order quantity = 20 m	6XV1 830-8AH10
PROFIBUS M12 connecting cable	
for PROFIBUS DP, 1 package = 5 units	
• Male insert	6GK1 905-0EC00
• Socket insert	6GK1 905-0ED00
7/8" connecting cable to power supply	
Pre-assembled 5-wire with 7/8" connectors at various lengths:	
• 0.3 m	6XV1 822-5BE30
• 0.5 m	6XV1 822-5BE50
• 1.0 m	6XV1 822-5BH10
• 1.5 m	6XV1 822-5BH15
• 2.0 m	6XV1 822-5BH20
• 3.0 m	6XV1 822-5BH30
• 5.0 m	6XV1 822-5BH50
• 10.0 m	6XV1 822-5BN10
• 15.0 m	6XV1 822-5BN15
PROFIBUS M12 cable connector	
1 package = 5 units	
• Male insert	6GK1 905-0EA00
• Socket insert	6GK1 905-0EB00
7/8" connector	
1 package = 5 units	
• Male insert	6GK1 905-0FA00
• Socket insert	6GK1 905-0FB00
7/8" covering caps	6ES7 194-3JA00-0AA0
1 package = 10 units	
M12 Y-shaped coupler plug	6ES7 194-1KA01-0XA0
For double connection of sensors using single cable, 5-pin; not applicable for F-DI4/8	

	Order No.
M12 coupler plug	3RX1 667
for connecting actuators or sensors, 5-pole	
M12 angular coupler plug	3RX1 668
for connecting actuators or sensors, 5-pole	
S7 Manual Collection	6ES7 998-8XC01-8YE0
Electronic manuals on DVD, multi-language: S7-200, TD 200, S7-300, M7-300, C7, S7-400, M7-400, STEP 7, Engineering Tools, Runtime Software, SIMATIC DP (Distributed I/O), SIMATIC HMI (Human Machine Interface), SIMATIC NET (Industrial Communication)	
S7 Manual Collection update service for 1 year	6ES7 998-8XC01-8YE2
Scope of delivery: Current DVD "S7 Manual Collection" and the three subsequent updates	

Overview

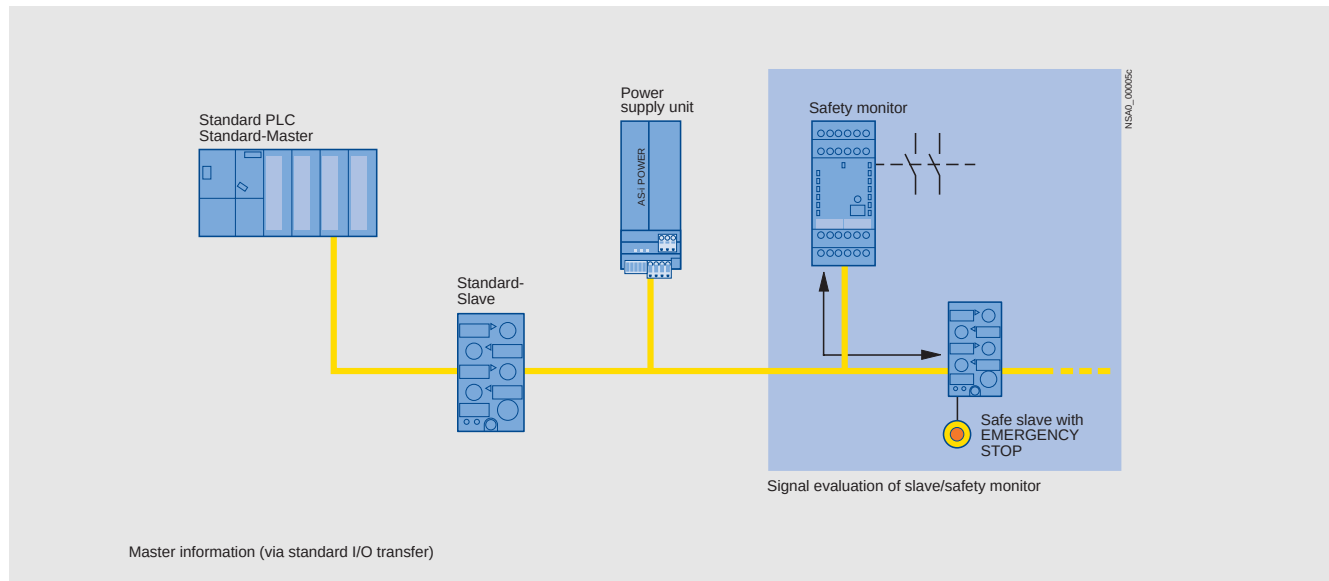
AS-Interface / ASIsafe		Order No.	See
ASIsafe enables the integration of safety-oriented components in an AS-Interface network, for example: • EMERGENCY-STOP pushbuttons • Protective door switches • Safety light arrays The simple wiring of AS-Interface, which is a major advantage, is maintained.			
 Safety monitor  K45F  S22.5F (SlimLine)  Position switches  Position switches with tumbler  Light curtains and arrays  EMER-OFF for front plates	AS-Interface safety monitors • Key element of ASIsafe • Monitors safe participants and links safety inputs • Ensures safe disconnection • Modular construction according to individual requirements • Available with one or two release circuits with 2-channel configuration • New version of "Expanded safety monitor" with expanded RAM and integrated ON- and OFF-delay and pulse functions Your advantage: Easy to configure safety functions up to Category 4	3RK1	2/115
	AS-Interface safety modules • Complete portfolio of ASIsafe modules • Degree of protection IP65/IP67 or IP20 • Very compact, starting with 20 mm width • 2 or 4 inputs in category 2 or 1 or 2 inputs in category 4 / SIL 3 • 4 fail-safe inputs or 2 standard outputs are available on the module in addition Your advantage: Easy integration of safe signals, be it in the cabinet or in the field	3RK1	2/117
	Position switches and cable-operated switches • Degree of protection IP65 • Direct connection of position switches or cable-operated switches for detection of safe signals • Available with separate actuator and tumbler • Molded-plastic or metal enclosures Your advantage: No more conventional wiring of safety functions required	3SF1 3SF2	Chap. 1 Chap. 1
	Light curtains/arrays and laser scanners • Degree of protection IP65 • Direct and safe connection to AS-Interface • Up to Category 3 (laser scanners) or Category 4 (light arrays/curtains) Your advantage: Direct connection of active and optical protection for persons to ASIsafe	3SF7 3RG7 84...	Chap. 1
	NAS-Interface EMERGENCY-STOP pushbuttons • Degree of protection IP65/IP67 • EMERGENCY-STOP directly on AS-Interface using integrated modules • Metal or plastic version Your advantage: Easy direct connection of service-proven operator controls to ASIsafe	3SF5	Chap.1

Evaluating / Communication

ASIsafe

Introduction

Overview



Master information (through regular I/O transfer)

Safety is included

The ASIsafe concept supports the direct integration of safety-related components, such as emergency stop switches, protective door switches or safety light arrays, in the AS-Interface network. These are fully compatible with the familiar AS-Interface components (masters, slaves, power supplies, repeaters, etc.) according to IEC 62062/EN 50295 and are operated in conjunction with them on the yellow AS-Interface cable.

The signals of the safety sensors are evaluated by a safety monitor which not only monitors the switching signals of the safety sensors but also continuously checks that the data transmission works correctly. The safety monitor has one or two enabling circuits which are configured with two channels and are used to switch the machine or plant to the safe state. Sensors and monitors can be connected to any points of the AS-Interface network. Also, several monitors can be used on one network.

A failsafe controller or a special master is not required. The master regards safety slaves like all other slaves and receives the safety data solely for information purposes. Hence it is also possible to expand all existing AS-Interface networks.

ASIsafe ensures a maximum response time of 40 ms. This is the time between the signal being applied to the input of the safe slave and the output on the safety monitor being switched off.

Tested safety

The system was tested and approved by TÜV (Germany), NRTL (USA) and INRS (France). The transmission method for safety-oriented signals is designed so that applications up to Category 4 according to EN 954-1 and SIL 3 according to IEC 61508 can be realized.

Software

The safety-oriented applications can be compiled and transferred into the monitor using the configuration software. The software also enables online diagnostics.

Benefits

- No failsafe PLC or special master is required
- Simple system structure thanks to standardized AS-Interface technique
- Safety-related and standard data on the same bus
- Existing systems can be expanded quickly and easily
- Optimum integration in TIA (Safety Diagnostics) and Safety Integrated
- Safe signals can be combined in groups
- Inclusion of the safety signals in the plant diagnostics, also on existing HMI panels
- Approved up to Category 4 according to EN 954-1 or SIL 3 according to IEC 61508
- ASIsafe is certified by TÜV (Germany), NRTL (USA) and INRS (France)

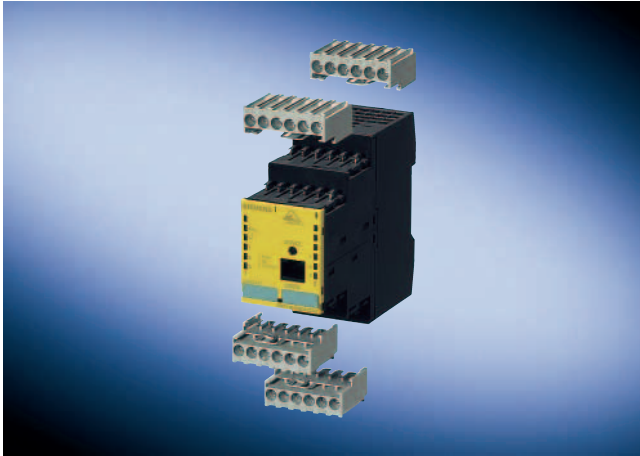
Application

Integrated safety technology in the AS-Interface system is used wherever EMERGENCY-STOP pushbuttons, protective door interlocks, stop Category 0 and 1, two-hand operator controls and light arrays are now installed

Note:

For ASIsafe position switches and cable operated switches see chapter 1.

Overview



The safety monitor is the centerpiece of ASIsafe. A safe application is configured using a PC and the safety monitor. Various application-specific operating modes can be selected for this. They include, for example, an EMERGENCY-STOP function, tumbler and selection of stop Category 0 or Category 1.

To be able to make full use of the AS-Interface diagnostics options, the monitor can also be operated with an AS-Interface address if required. With the help of the diagnostics block for STEP7, which is included on the ASIsafe CD, the full diagnostics spectrum can be processed further in the higher-level PLC.

The monitor comes in two expansion levels:

- **Basic safety monitor** with starter set of modules and basic functionality
- **Expanded safety monitor** with expanded features and functionality

Both expansion levels are available with one or two enabling circuits with two-channel configuration.

The safety monitor is used in an AS-Interface bus system to monitor protective devices, e.g. EMERGENCY-STOP switches. It is classified in Safety Category 4 according to EN 954-1.

According to IEC 61508 the safety monitor can be used in loops up to SIL3. The user must calculate the PFD value of the total loop.

ON period in months	Total operating time in years	PFD
3	10	$\leq 4 \times 10^{-5}$
6	10	$\leq 6 \times 10^{-5}$
9	10	$\leq 9 \times 10^{-5}$

Note: Depending on the choice of safety components used, the complete safety system may also be classified in a lower safety category.

Application

The monitor comes in two expansion levels:

- Basic safety monitor with starter set of blocks and basic functionality
- Expanded safety monitor with expanded features and functionality

Basic Safety Monitor versus Expanded Safety Monitor

	Basic safety monitors	Expanded safety monitors
Number of monitoring modules	32	48
Number of OR gates (inputs)	2	6
Number of AND gates (inputs)	--	6
Wildcards for monitoring modules	✓	✓
Deactivating of monitoring modules	✓	✓
Fault release	✓	✓
Diagnostics hold	✓	✓
A/B slaves for acknowledgment	✓	✓
Safe time functions	--	✓
"Button" function	--	✓
Debouncing of contacts	--	✓

Number of monitoring modules

The number of devices which the safety monitor can process is increased with the *expanded safety monitor* from 32 to 48. Applications of greater complexity and size can thus be simulated in the safety monitor.

Logic OR operation

At the logic operation level two elements can be linked by OR operations in the basic version and up to six in the expanded version.

Logic AND operation

In addition to the standard AND operation in the main path of an enabling circuit, an AND operation can also be inserted in an OR operation on the *expanded safety monitor*. More than two elements can be linked in this AND.

Functions of the basic safety monitor

- Wildcards and deactivating of monitoring modules
Wildcards are available for the configuration. These wildcards are integrated in the configuration and diagnostics and can be activated very easily if required. User-friendly and easy configuring is thus possible even when system configurations change.
- Fault release
If a module detects a fault, the AS-Interface safety monitor goes into fault status. A differentiated fault release (reset) is now possible for this scenario. The fault release can be activated by an AS-Interface standard slave, e.g. a pushbutton, and is effective only on module level. The great advantage of this is that the entire safety monitor is no longer reset but only the module which is locked in the fault.
- Buffer storage and "Diagnostics hold"
Momentary disconnections are saved in a buffer storage for diagnostics. Disconnections can also be "frozen" until an acknowledgment comes through a standard slave (function "Diagnostics hold").

Additional functions of the expanded safety monitor

The following additional features are provided by only the *expanded safety monitor*:

- Safe time functions
Timers with the following functions are available:
 - ON-delay
 - OFF-delay
 - pulse

Evaluating / Communication

ASIsafe

AS-Interface safety monitors

- "Button" function
Additional acknowledgment option for restarting the system using an additional button. In addition to the Service button on the safety monitor its function (restarting the system) can be placed on any button of a commanding and signaling device through configuration in the asimon software.
- Debouncing of contacts
For debouncing the contacts it is possible to set a bounce time after which a system restart takes place.

Compatibility

Already created configurations can be adopted in the "new" safety monitor without change.

All functions are designed for Category 4 according to EN954-1. Safety monitor, monitoring and evaluation unit and slaves were certified by T·V according to IEC61508, NRTL (USA) and INRS (France).

Selection and ordering data

	Version	Order No.	Weight kg
 3RK1 105-1BE04-0CA0	Basic safety monitors with screw-type terminals • One enabling circuit • Two enabling circuits	3RK1 105-1AE04-0CA0 3RK1 105-1BE04-0CA0	0.336 0.408
	Expanded safety monitors with screw-type terminals • One enabling circuit • Two enabling circuits	3RK1 105-1AE04-2CA0 3RK1 105-1BE04-2CA0	0.336 0.408
	Basic safety monitors with spring-type terminals • One enabling circuit • Two enabling circuits	3RK1 105-1AG04-0CA0 3RK1 105-1BG04-0CA0	0.336 0.408
	Expanded safety monitors with spring-type terminals • One enabling circuit • Two enabling circuits	3RK1 105-1AG04-2CA0 3RK1 105-1BG04-2CA0	0.336 0.408
	Accessories		
	ASIsafe CD included in scope of delivery • Configurations software asimon V2, plus • Diagnostics package for STEP7 (FB102) including ready-to-use HMI templates for WinCCflex (OP / TP 177 - 277)	3RK1 802-2FB06-0GA0	0.212
 3RK1 901-5AA00	Cable set included in scope of delivery • PC configuration cable • Transfer cable between two monitors	3RK1 901-5AA00	0.054
	Adapter from USB to RS232 (optional)	2SX5100-3PC07	0.004
	Sealable covers	3RP1 902	0.004

Overview



Safety modules for AS-Interface (ASIsafe modules) are available for field use in degree of protection IP67 (K20F and K45F compact modules) and for the control cabinet (S22.5F SlimLine modules) in degree of protection IP20:

K45F compact safety modules for operation in the field

The platform of the K45F modules covers the following variations:

- K45F 2F-DI: Two safety-oriented inputs in operation up to Category 2 according to EN 954-1. If Category 4 is required, a two-channel input is available on the module.
- K45F 2F-DI/2DO: There are also two standard outputs in addition to the safe inputs. Supplied from the yellow AS-i cable
- K45F 2F-DI/2DO U_{aux} : Same as K45F 2F-DI/2DO, but supplied from the black 24 V DC cable
- K45F 4F-DI: Four safety-oriented inputs in operation up to Category 2, two for Category 4. Extremely compact double slave (uses two full AS-i addresses).

A very compact module with an optimum price /performance ratio is thus available for very application.

K20F compact safety modules for operation in the field

Being only 20 mm wide, the K20F module is particularly well suited for applications where modules need to be arranged in the most confined space. The K20F modules are connected to the AS-Interface with a round cable with M12 cable box instead of with the AS-Interface flat cable. This enables extremely compact installation. The flexibility of the round cable means that it can also be used on moving machine parts without any problems. The K20 modules are also ideal for such applications as their non-encapsulated design makes them particularly light in weight.

S22.5F SlimLine safety modules for operation in control gear cabinets and local control cabinets

The S22.5F SlimLine safety module has two safety inputs. The safe connection of signals to ASIsafe networks in the control cabinet is also possible therefore. For operation up to Category 2, both inputs can be separately assigned; if Category 4 is required, a two-channel input is available on the module.

In addition there are two S22.5F module versions which have two standard outputs in addition to the two safety inputs; power is supplied either from only the yellow AS-Interface cable or as auxiliary voltage from the black 24 V DC cable.

Evaluating / Communication

ASIsafe

AS-Interface safety modules

Selection and ordering data

Version			Order No.	Weight approx. kg	
	K20F compact safety modules				
	I/O type	U_{aux} 24 V			
	2 F-DI	--	3RK1 205-0BQ30-0AA3	0.075	
3RK1 205-0BQ30-0AA3					
	K45F compact safety modules¹⁾				
	I/O type	U_{aux} 24 V			
	2 F-DI	--	3RK1 205-0BQ00-0AA3	0.103	
	4 F-DI	--	3RK1 205-0CQ00-0AA3	0.110	
	2 F-DI / 2 DO	--	3RK1 405-0BQ20-0AA3	0.110	
2 F-DI / 2 DO	✓	3RK1 405-1BQ20-0AA3	0.110		
3RK1 205-0BQ00-0AA3					
	K45 mounting plates				
	• For wall mounting • For standard rail mounting			3RK1 901-2EA00 3RK1 901-2DA00	0.027 0.036
3RK1 901-2EA00					
	K60F compact safety modules¹⁾				
	I/O type	U_{aux} 24 V			
	2 F-DI / 2 DO	--	3RK1 405-0BQ00-0AA3	0.207	
	2 F-DI / 2 DO	✓	3RK1 405-1BQ00-0AA3	0.208	
3RK1 405-1BQ00-0AA3					
	S22.5F SlimLine safety modules				
	Connections	I/O type	U_{aux} 24 V		
	Screw	2 F-DI	--	3RK1 205-0BE00-0AA2	0.132
	Screw	2 F-DI / 2 DO	--	3RK1 405-0BE00-0AA2	0.180
	Screw	2 F-DI / 2 DO	✓	3RK1 405-1BE00-0AA2	0.180
	Spring	2 F-DI	--	3RK1 205-0BG00-0AA2	0.102
	Spring	2 F-DI / 2 DO	--	3RK1 405-0BG00-0AA2	0.170
	Spring	2 F-DI / 2 DO	✓	3RK1 405-1BG00-0AA2	0.170
3RK1 205-0BE00-0AA2					
	K60 mounting plates				
	• For wall mounting • For standard rail mounting			3RK1 901-0CA00 3RK1 901-0CB01	0.065 0.095
3RK1 901-0CA00					
	Input bridges for K45/K60F				
	• Black version • Red version			3RK1 901-1AA00 3RK1 901-1AA01	0.012 0.013
3RK1 901-1AA00					
	AS-Interface sealing caps M12, tamper-proof for free M12 sockets				
				3RK1 901-1KA01	0.100
3RK1 901-1KA01					

¹⁾ Modules are supplied without mounting plate.

Overview



The CP 243-2 is the AS-Interface master for the innovated generation of SIMATIC S7-200. The communications processor (6GK1 243-2AX01-0AX0) supports the extended AS-Interface specification V2.1 and has the following functions:

- Up to 62 AS-Interface slaves can be connected and integrated analog value transfer (according to the extended AS-Interface specification V2.1)
- Supports all AS-Interface master functions in accordance with the extended AS-Interface specification V2.1
- Status displays for operating states and display of the functional readiness of connected slaves with LEDs in the front panel
- Indication of errors (incl. AS-Interface voltage errors, configuration errors) with LEDs in the front panel
- Compact enclosure designed to match the new generation of SIMATIC S7-200.

Benefits



- More flexible and extended application options of the SIMATIC S7-200 due to the considerable increase in the available digital and analog inputs/outputs
- Shorter startup times due to easy configuration at the press of a button
- In the event of a fault, shorter standstill and service times due to LED indication of:
- Status of the CPs
 - connected slaves and their operational readiness
 - monitoring of the AS-Interface voltage level

Application

The CP 243-2 is the AS-Interface master connection exclusively for the CPUs 22x of the innovated SIMATIC S7-200 generation. By connecting to AS-Interface, the available digital inputs and outputs for S7-200 are significantly increased (max. 248 DI / 186 DO on AS-Interface per CP).

In addition, the integrated analog value processing also makes analog values (per CP max. 31 analog slaves, each with up to 4 channels) available to the S7-200 at the AS-Interface. Up to two CP 243-2s can be operated simultaneously on the S7-200.

Design

The CP 243-2 is connected to the S7-200 like an expansion module. It features:

- Two terminals for direct connection of the AS-Interface cable
- LEDs in the front panel for displaying the operating status and the operational readiness of all connected and activated slaves
- Two pushbuttons for displaying the status information of the slaves, for switching the operating status and entering the existing ACTUAL configuration as the SETPOINT configuration

Function

The CP 243-2 supports all functions specified by the extended AS-Interface specification V2.1. With this specification it is possible to operate up to 62 digital or 31 analog slaves on the AS-Interface by means of double address assignment (A-B).

The integrated analog value processing permits the analog values to be accessed as easily as the digital values.

The CP 243-2 occupies a digital input byte (status byte), a digital output byte (control byte) as well as 8 analog input and 8 analog output words in the process image of the S7-200. The CP 243-2 therefore requires two slots. Application programs use the status and control byte to set the operating mode of the CP 243-2.

Depending on the operating mode, the CP 243-2 either uses the analog address space of the S7-200 to store the I/O data of the AS-Interface slaves or diagnostics values or enables master calls (e.g. re-addressing of slaves).

Configuring

All connected AS-Interface slaves are configured at the press of a button. More comprehensive configuration of the CPs is not necessary.

Evaluating / Communication

ASIsafe

CP 243-2

Technical specifications

AS-Interface specification	V 2.1
Bus cycle time	5 ms with 31 slaves 10 ms with 62 slaves
Interfaces	
• Allocation of analog address space in the PLC	corresponding to two I/O modules (8 DI/8 DO and 8 AI/ 8 AO)
• AS-Interface connection	terminal connection
Current consumption	
• through backplane bus	type. 220 mA for 5 V DC
• via AS-Interface from the AS-Interface shaped cables	max. 100 mA
Power loss	approx. 2 W
Perm. ambient conditions	
• Operating temperature	
- horizontal installation	0 °C ... +55 °C
- vertical mounting	0 °C ... +45 °C
• Transport/storage temperature	- 40 °C ... +70 °C
• Relative humidity	max. 95% at +25 °C
Construction	
• Module format	S7-22x expansion module
• Dimensions (W x H x D) in mm	71.2 x 80 x 62 (H+16 mm with holes for wall mounting)
• Weight	approx. 250 g
• Space requirements	1 slot

Ordering data

CP 243-2 communications processor
For connection of SIMATIC S7-200 (2nd generation) to AS-Interface with bus connector

Manual for CP 243-2
Including AS-Interface fundamentals and diskette with program examples
paper version

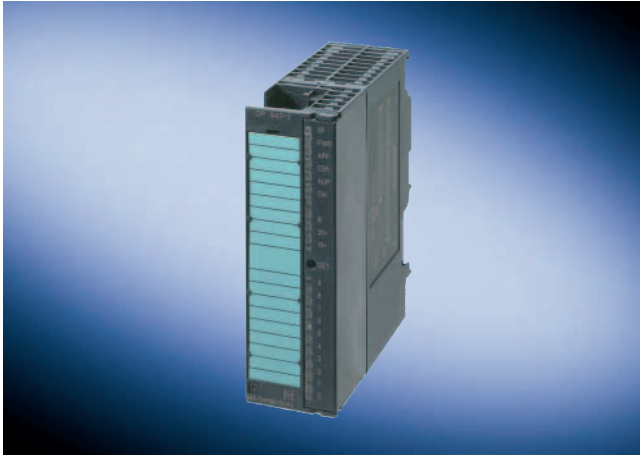
- German
- English
- French
- Spanish
- Italian

Order No.

6GK7 243-2AX01-0XA0

6GK7 243-2AX00-8AA0
6GK7 243-2AX00-8BA0
6GK7 243-2AX00-8CA0
6GK7 243-2AX00-8DA0
6GK7 243-2AX00-8EA0

Overview



The CP 343-2 is the AS-Interface master for the SIMATIC S7-300 programmable controller and the ET 200 M distributed I/O station. The functions of the communications processor are as follows:

- **It supports configuration of the AS-Interface network with STEP 7 V5.2 and higher**
- Up to 62 AS-Interface slaves can be connected and integrated analog value transfer (according to the extended AS-Interface specification V2.1)
- Supports all AS-Interface master functions in accordance with the extended AS-Interface specification V2.1
- Status displays for operating states and display of the functional readiness of connected slaves with LEDs in the front panel
- Indication of errors (incl. AS-Interface voltage errors, configuration errors) with LEDs in the front panel
- Compact enclosure designed to match the SIMATIC S7-300

Benefits



- Shorter startup times due to easy configuration at the press of a button
- Flexible decentralized topologies can be constructed by using this communications processor in the ET 200M DP slave.
- Reduction of standstill or service times in the event of a fault through LED displays:
 - status of the AS-Interface network
 - connected slaves and their operational readiness
 - monitoring of the AS-Interface voltage level
- Reduced costs for spare parts inventories because the CP can be used in both the SIMATIC S7-300 and in ET 200M.
- Ideal for complex applications through the connection option of 62 slaves and integrated analog value processing

Application

The CP 343-2 is the AS-Interface master connection for SIMATIC S7-300 and ET 200M. Connection to the AS-Interface allows access to max. 248 DI/186 DO per CP.

The integrated analog value processing also supports evaluation of very simple analog signals (per CP at max. 31 analog slaves, each with four channels).

Design

The CP 343-2 is connected to the S7-300 like an expansion module. It features:

- Two terminals for direct connection of the AS-Interface cable
- LEDs in the frontplate for displaying the operating status and the operational readiness of all connected and activated slaves
- Pushbuttons for displaying the status information of the slaves, for switching the operating status and entering the existing ACTUAL configuration as the SETPOINT configuration

Function

In I/O mode, the CP 343-2 P reserves 16 bytes in the analog address space of the SIMATIC S7-300. The I/O data of the standard slaves or A slaves is stored here. The I/O data of the B slaves can be accessed using the "read/ write data record " function.

A and B slaves are slaves in accordance with the extended AS-Interface Specification V2.1. For the AS-Interface master calls (e.g. Write parameter, read diagnostic values), a Function Call (FC) is provided on the diskette that accompanies the manual.

All connected AS-Interface slaves are configured at the press of a button. No further configuration of the CP is necessary.

The CP 343-2 P supports all functions specified by the extended AS-Interface specification V2.1. With this specification it is possible to operate up to 62 digital or 31 analog slaves on the AS-Interface by means of double address assignment. The integrated analog value processing permits easy access to the analog values.

Configuring

All connected AS-Interface slaves are configured at the press of a button. More comprehensive configuration of the CPs is not necessary.

The CP 343-2 P also supports configuration of the AS-Interface network with STEP 7 (V5.2 and higher).

Evaluating / Communication

ASIsafe

CP 343-2 P

Technical specifications

AS-Interface Specification	V 2.1
Bus cycle time	5 ms for 31 slaves 10 ms for 62 slaves
Interfaces	
• Assignment of analog address space in the PLC	16 byte I/O and P-bus S7-300
• AS-Interface connection	S7-300 front connector with terminal
Supply voltage	+5 V DC through backplane bus
Current consumption	
• Through backplane bus	typ. 200 mA at 5 V DC
• Through AS-Interface from the AS-Interface shaped cables	max. 100 mA
Power loss	2 W
Perm. environmental conditions	
• Operating temperature	0°C to +60°C
• Transport/storage temperature	-40 °C to +70 °C
• Relative humidity, max.	95% at +25 °C
Design	
• Module format	S7-300 design
• Dimensions (W x H x D) in mm	40 x 125 x 120
• Weight	approx. 190 g
• Space required	1 slot

Ordering data

Ordering data	Order No.
CP 343-2 communications processor For connection of SIMATIC S7-300 and ET 200M to the AS-Interface; without front connector	6GK7 343-2AH10-0XA0
Front connector 20-pin, with screw contacts	6ES7 392-1AJ00-0AA0
CP 343-2 and CP 343-2 P manual including software (FC) and examples paper version	
• German	6GK7 343-2AH00-8AA0
• English	6GK7 343-2AH00-8BA0
• French	6GK7 343-2AH00-8CA0
• Spanish	6GK7 343-2AH00-8DA0
• Italian	6GK7 343-2AH00-8EA0
Electronic manuals Communication systems, logs, products on CD-ROM German/English	6GK1 975-1AA00-3AA0

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i LINK Advanced

Overview



PN	DP-M	DP-S	ASi-M
		■	■

- Compact network transition between PROFIBUS (DP slave) and AS-Interface
- Single and dual AS-Interface master (according to AS-Interface specification V3.0) for connecting 62 AS-Interface slaves
- High-performance, integrated analog value transmission
- High-performance, integral earth-fault monitoring for the AS-Interface cable
- Simple diagnostics and startup on site using a pixel-graphics display and operator keys or Web interface with standard browser
- Optimum TIA integration through STEP 7, integration into engineering tools of other vendors through PROFIBUS type file (GSD)
- Vertical integration (standard Web interface) through Industrial Ethernet
- Power supply from the AS-Interface cable or alternatively with 24 V DC (optional)
- Module replacement without PG by using C-PLUG (optional)

Benefits



- Short startup time through simple configuration by pressing a button and testing the AS-Interface segment via display or Web interface
- Reduction in downtimes and servicing times on failure of slave through convenient diagnostics on display or Web interface and by simple replacement of module with the C-PLUG swap medium
- Reduction of installation costs because the power can be supplied entirely from the AS-Interface cable, so an additional power supply is not required
- Reduced engineering overhead through convenient configuration of Siemens slaves per slave catalog in HW-Config (STEP 7)
- Lower costs for high quantity frameworks as result of the dual AS-Interface master

Application

The DP/AS-i LINK Advanced is PROFIBUS DPV1 slave (according to EN 50 170) and AS-Interface master (according to AS-Interface specification V3.0 to EN 50 295) and enables transparent data access to the AS-Interface from PROFIBUS DP.

PROFIBUS DP masters can exchange I/O data cyclically with the AS-Interface; DP masters with acyclic services can additionally carry out AS-Interface master calls. The DP/AS-i LINK Advanced is thus particularly suitable for distributed configuration and for linking a subordinate AS-Interface network.

The DP/AS-i LINK Advanced in the version as AS-Interface single master is sufficient for applications with typical quantity frameworks.

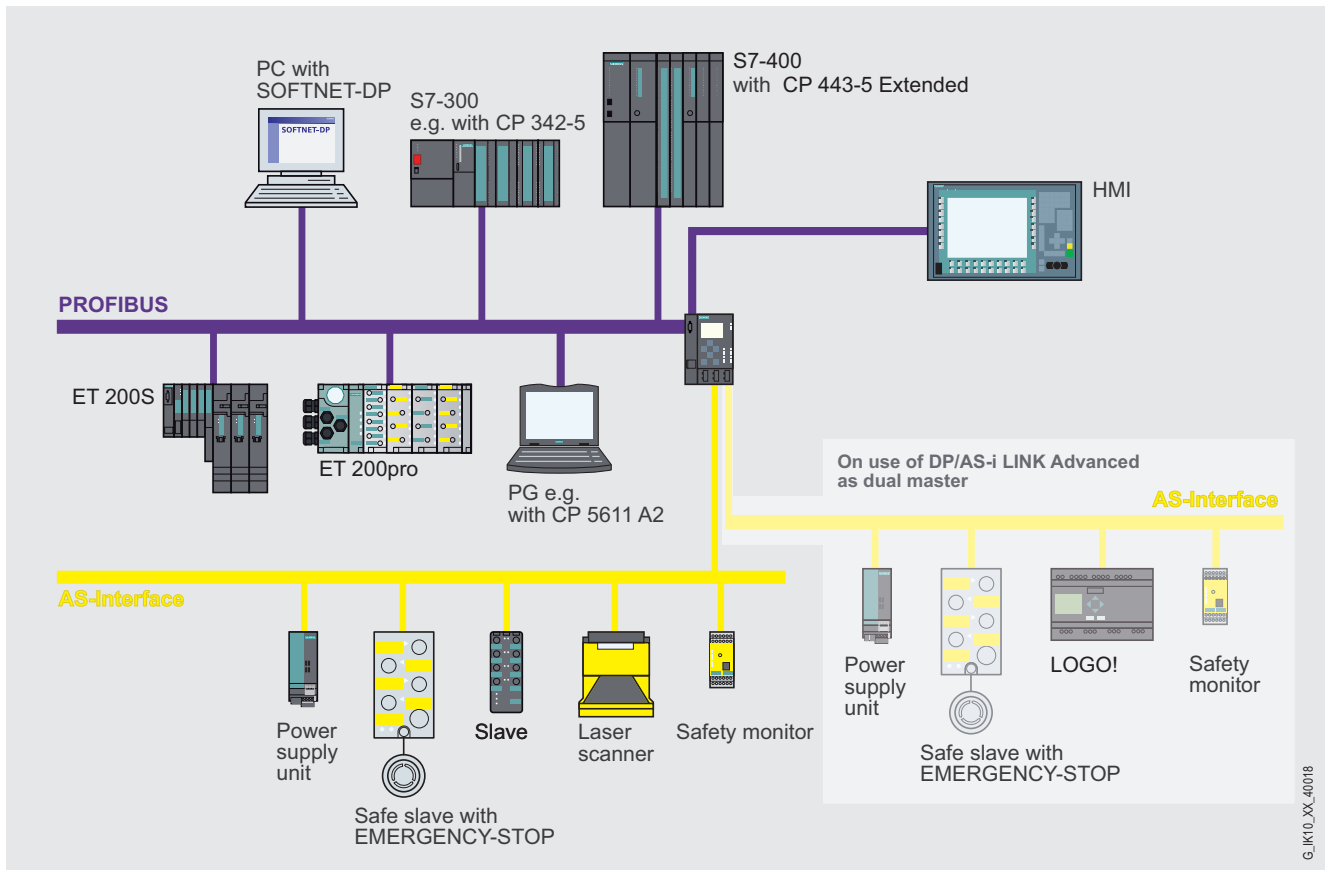
The DP/AS-i LINK Advanced in the AS-Interface dual master version is used for applications with high quantity frameworks. In this case, twice the quantity frameworks can be used on two AS-Interface segments running independently of each other.

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i LINK Advanced

Application (Fortsetzung)



Linking of AS-Interface to PROFIBUS via DP/AS-i LINK Advanced as single/dual master

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i LINK Advanced

Design

- Stable plastic enclosure with degree of protection IP20 for DIN rail mounting
- Compact design;
 - display in front panel for exactly detailed indication of operating state and functional readiness of all connected and activated AS-Interface slaves
 - 6 keys for startup and testing of the AS-Interface segment directly on the DP/AS-i LINK Advanced
 - LED display of operating state of PROFIBUS DP and AS-Interface
 - integral Ethernet port (RJ45 socket) for convenient startup, diagnostics and testing of DP/AS-i LINK Advanced through a Web interface with standard browser
 - power supply from the AS-Interface shaped cable or alternatively with 24 V DC
 - low mounting depth due to recessed connector assembly
- Simple assembly on standard DIN rail
- Operation without fans or batteries
- Fast device replacement in the event of a fault by using the optional C-PLUG swap medium (not included in scope of supply)

Function

The DP/AS-i LINK Advanced allows a PROFIBUS DP master to cyclically access the I/O data of all slaves of a subordinate AS-Interface segment. In line with the enhanced AS-Interface specification (V3.0), a maximum of 62 slaves – each with 4 inputs and 4 outputs – as well as analog slaves can be connected per AS-Interface segment.

The DP/AS-i LINK Advanced occupies 62 input byte and 62 output byte in the DP master as standard, in which the I/O data of the connected digital AS-Interface slaves are saved. The input/output buffer can be compressed so that only the I/O memory space actually required is occupied in the system of the DP master. Integral evaluation of analog signals is just as simple as the access to digital values; it is unnecessary to call communications blocks.

PROFIBUS DP V1 masters are also able to trigger AS-Interface master calls (e.g. write parameters, modify addresses, read diagnostics values) by means of the acyclic PROFIBUS services.

The subordinate AS-Interface segment can be completely started up using an input display in the AS-i link. The DP/AS-i LINK Advanced is equipped with an additional Ethernet port which permits use of the integral Web server and therefore additionally increases the convenience of the input display already described. Firmware updates are also available free of charge.

The optional C-PLUG supports module replacement without a programming device, ensuring that downtimes in the event of a fault are reduced to a minimum.

Diagnostics data

Extensive diagnostics options are available via LEDs, the display and input keys, Web interface or STEP 7, including

- Operating status of the link
- Status of the link as PROFIBUS DP slave
- Diagnostics of the AS-Interface network
- Frame statistics
- Standard diagnostics sites for rapid diagnostics access using standard browser

Configuration

The DP/AS-i LINK Advanced can be configured using STEP 7 from Version V5.4 or simply by importing the actual configuration on the display.

Alternatively, the DP/AS-i LINK Advanced can be integrated in the engineering tool by means of the PROFIBUS type file (GSD):

- COM PROFIBUS
- Older STEP 7 versions lower than V5.4
- Engineering tools from other vendors

With STEP 7 configuring, uploading of the AS-Interface configuration is possible in STEP 7 from V5.4 onwards. In addition, AS-Interface Slaves from Siemens can be conveniently configured in HW-Config (slave catalog).

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i LINK Advanced

Technical specifications

Data transmission rates per AS-Interface segment	
• AS-Interface bus cycle time	5 ms for 31 slaves; 10 ms for 62 slaves
• PROFIBUS data transmission rate	Up to 12 Mbit/s
• Ethernet data transmission rate	10/100 Mbit/s, autosensing
Interfaces	
• AS-Interface connection	1 x 4-pin terminal block (plug-in)
- with single master	1 x 4-pin terminal block (plug-in)
- with dual master (2 AS-i segments)	2 x 4-pin terminal block (plug-in)
• Connection to PROFIBUS	1 x 9-pin Sub-D socket
• Connection to Ethernet	1 x RJ45 socket
• Optional: 24 V DC supply voltage	3-pole terminal contacts (plug-in) incl. functional ground for integral ground fault monitoring
• Slot for the swap medium	C-PLUG
Display	128 x 64 pixels with backlighting
Keys	Membrane keyboard (6 keys)
Supply voltage	
• From the AS-Interface shaped cable (segment 1)	According to AS-Interface specification EN 50 295
• Optional: 24 V DC	24 V DC, PE conductor
Current consumption	
• From the AS-Interface shaped cable	max. 250 mA
Loading capacity	
• 5 V DC on PROFIBUS connection	max. 70 mA
• Power loss	7.5 W
Degree of protection	IP20
Perm. ambient conditions	
• Operating temperature	
- horizontal mounting	0 °C ... +60 °C
- vertical mounting	0 °C ... +45 °C
• Transport/storage temperature	-30 °C ... +70 °C
• Relative humidity	max. 95% at +25 °C
• Operating altitude	3000 m above mean sea level
Construction	
• Assembly	On standard DIN rail
• Dimensions (W x H x D) in mm	90 x 132 x 88.5
• Weight	approx. 380 g
Supported AS-Interface master profiles	M1, M2, M3, M4 (corresponding to complete AS-Interface specification V3.0)
Configuration of AS-Interface	by means of keys on front panel, with STEP 7 Version V5.4 and later, through Web interface

Ordering data

Order No.

DP/AS-i LINK Advanced

Network transition between PROFIBUS DP and AS-Interface; master profiles M3 and M4, enhanced AS-Interface specification V3.0; degree of protection IP20; manual on CD-ROM, German, English, French, Spanish, Italian

- Single master with display
- Dual master with display

6GK1 415-2BA10

6GK1 415-2BA20

Accessories

C-PLUG

Swap medium for simple replacement of devices in the event of a fault; for storing configuration or engineering and application data; can be used for SIMATIC NET products with C-PLUG slot

6GK1 900-0AB00

IE FC RJ45 Plug 90

RJ45 plug-in connector for Industrial Ethernet with a rugged metal housing and integrated insulation displacement contacts for connecting Industrial Ethernet FC installation cables; with 90° cable outlet; e.g. for ET 200S

- 1 pack = 1 item
- 1 pack = 10 items
- 1 pack = 50 items

6GK1 901-1BB20-2AA0

6GK1 901-1BB20-2AB0

6GK1 901-1BB20-2AE0

Bus connector RS 485 with angled cable outlet (35°)

With screw-type terminals, max. data transmission rate 12 Mbit/s

- Without PG interface

6ES7 972-0BA60-0XA0

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-Interface Link 20E

Overview



PN	DP-M	DP-S	ASi-M

The DP/AS-Interface link 20E connects PROFIBUS DP with AS-Interface. It provides the following functions:

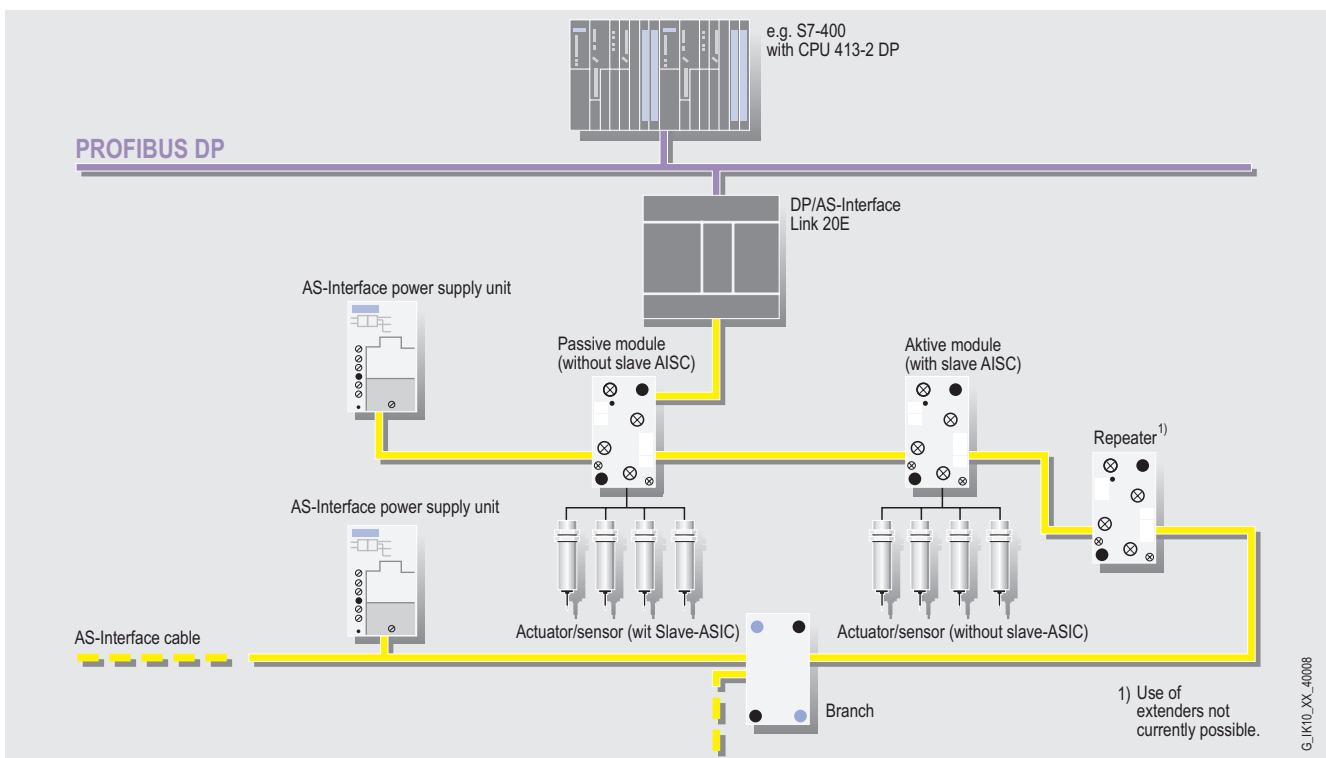
- PROFIBUS DP slave and AS-Interface master
- Up to 62 AS-Interface slaves can be connected and integrated analog value transfer (according to the extended AS-Interface specification V2.1).
- Supports all AS-Interface master functions in accordance with the extended AS-Interface specification V2.1, i.e. Master Class M3.
- Supplied from the AS-Interface cable, so no additional power supply is necessary.
- Supports uploading of the AS-Interface configuration in STEP 7 from V5.2.

Benefits



- Reduction of installation costs because the power is supplied entirely from the AS-Interface cable, so an additional power supply is not required.

- Shorter start-up time thanks to easy configuration at the press of a button
- Reduction of downtimes or service times due to failure of a slave thanks to the LEDs
- Quick and easy start-up thanks to readout of the AS-Interface configuration (ES03 and higher)



Transition from PROFIBUS DP to AS-Interface over DP/AS-Interface Link 20E

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-Interface Link 20E

Application

The DP/AS-Interface Link 20E is a PROFIBUS DP slave (according to EN 50 170) and AS-Interface master (according to EN 50 295) and enables the AS-Interface to be operated on PROFIBUS DP.

Simple PROFIBUS masters can exchange I/O data cyclically with AS-Interface; masters with acyclic services can exchange I/O data and perform master calls. DP/AS-Interface Link 20E cannot be used in conjunction with the extender.

Design

- Compact housing with degree of protection IP20 for DIN rail mounting
- LEDs in the frontplate for displaying the operating status and operational readiness of all connected and activated slaves
- The PROFIBUS DP address can be set by the simple push of a button
- LED display of PROFIBUS DP slave address, DP bus fault and diagnostics
- Two pushbuttons for switching the operating mode and for setting the existing ACTUAL configuration as SETPOINT configuration
- Power is supplied from the AS-Interface shaped cable

Function

The DP/AS-Interface Link 20E allows a DP master to access all slaves of an AS-Interface segment. According to the expanded specifications (V2.1) a maximum of 62 slaves each with 4 inputs and 3 outputs can now be connected.

By default, the DP/AS-Interface Link 20E occupies 32 byte input and 32 byte output data in the DP master in which the I/O data of the AS-Interface slaves connected are stored. The size of the input/output buffer can be compressed, so that only the memory space of the DP master actually required is occupied.

PROFIBUS DP masters are also able to invoke the AS-Interface master calls through the acyclic PROFIBUS utilities menu (e.g. parametric control, change addresses, read diagnostic values).

Configuration

The DP/AS-Interface Link 20E can be configured at the PROFIBUS with STEP 7 or COM PROFIBUS.

Enclosed with the manual are also the type and GSD files, so that it is also possible to carry out configuration with versions that do not yet contain the DP/AS-Interface Link 20E as standard.

Configuration of the AS-Interface segment can be preset either by means of STEP 7 or simply by adopting the ACTUAL configuration. Startup is also possible without PROFIBUS.

For STEP 7 configuration, uploading of the AS-Interface configuration is possible in STEP 7 V5.2 and newer.

Technical specifications

AS-Interface bus cycle time	5 ms for 31 slaves 10 ms for 62 slaves
PROFIBUS transmission rate	max. 12 Mbit
Supported AS-Interface master profile	M3 (corresponding to Complete AS-Interface Specification V2.1)
Configuring AS-Interface	by means of pushbutton on the frontplate or with STEP 7 V5.1 SP2
Interfaces	
• AS-Interface connection	Clip contacts
• Connection to PROFIBUS	9-pin Sub-D socket
Supply voltage	
• From the AS-Interface cable	According to AS-Interface specification EN 50 295
Current consumption	
• From the AS-Interface cable	max. 200 mA
Loading capacity	
5 V DC on PROFIBUS connection	max. 90 mA
Power loss	3.7 W
Mounting	DIN rail or direct mounting
Degree of protection	IP20
Perm. ambient conditions	
• Operating temperature	
- horizontal mounting	0 °C ... +60 °C
- vertical mounting	0 °C ... +45 °C
• Transport/storage temperature	-40 °C ... +70 °C
• Relative humidity	max. 95% at +25 °C
Construction	
• Module format	S7-200 construction
• Dimensions (W x H x D) in mm	90 x 80 x 60
• Weight	approx. 200 g

Ordering data

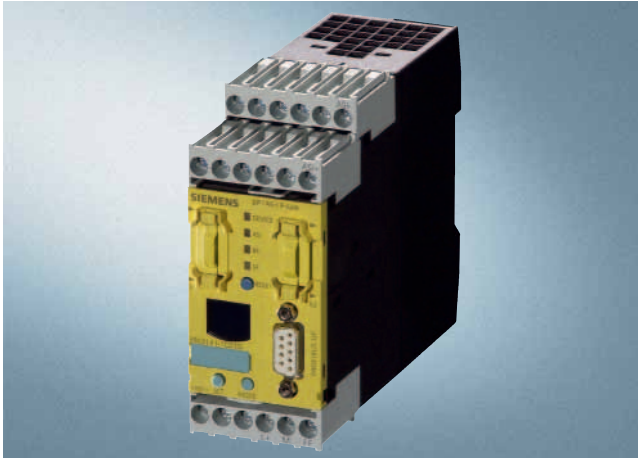
Ordering data	Order No.
DP/AS-Interface Link 20E	6GK1 415-2AA01
Network transition between PROFIBUS DP and AS-Interface in degree of protection IP20	
DP/AS-Interface Link 20E manual	
Paper version including type and GSD files	
• German	6GK1 971-2DS01-0AA0
• English	6GK1 971-2DS01-0AA1
• French	6GK1 971-2DS01-0AA2
• Spanish	6GK1 971-2DS01-0AA3
• Italian	6GK1 971-2DS01-0AA4

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i F-Link

Overview



PN	DP-M	DP-S	ASi-M
		■	■

- Compact, safety-oriented router between PROFIBUS (DP Slave) and AS-Interface
- Monitoring the inputs of safety-oriented binary AS-i slaves (ASIsafe slaves) and forwarding of data through PROFIsafe. No additional safety-oriented components required for the AS-Interface (e.g. safety monitor)
- AS-i master according to AS-Interface Specification V3.0, master profile M4, for connection of up to 62 AS-i slaves with integrated analog value transmission
- Direct integration in PROFIBUS networks. Integration in PROFINET environments through PROFINET/PROFIBUS gateway (IE/PB Link) or through SIMATIC S7-315 F PN/DP, S7-317 F PN/DP or S7-416F-3 PN/DP
- Optimum TIA integration in STEP 7 using Object Manager, integration in non-Siemens engineering tools using PROFIBUS type file (GSD)
- Local diagnostics using LEDs and display with control keys
- Module exchange without a PG, because starting data are sent through the PROFIBUS DP master

Benefits



- Gaps in (bus-based) safety technology closed: safety-oriented signals (EMERGENCY-STOP, door tumbler, light curtains etc.) collected with AS-i and transferred to higher-level F PLC. This enables:
 - Quick installation, easy commissioning: use of AS-i virtues in the field now fully consistent for Safety Integrated
 - Cost-effective solution as ASIsafe is ideally suited for the collection of "fewer but more distributed failsafe bits".
- Price advantage: as a fully fledged AS-i master according to Specification V3.0, larger volumes of project data can be used on the AS-i network (496 inputs and an equal number of outputs, up to 62 analog slaves)
- Investment protection:
 - Connection to PROFIBUS networks, such as DP/AS-i Link Advanced or DP/AS-i Link 20E
 - Downward compatibility to AS-Interface specification V2
 - Open for modern automation concepts with AS-i
- Short start-up through simple configuration at the press of a button
- Teaching the code sequences of ASIsafe slaves is possible at the press of a button
- Reduced amount of engineering work thanks to user-friendly configuration of all AS-i slaves from Siemens using the slave catalog in HW-Config (STEP 7), for the first time also as ASIsafe slaves modeled on PROFIsafe slaves
- Cost-savings thanks to programming of the safety logic with the familiar, powerful commands of the distributed safety packages from the failsafe SIMATIC PLC in F-FUP or F-FOP, incl. TUV-certified function blocks for typical safety applications
- Use in machine-tools under SINUMERIK 840 D (pl/sl) possible (available soon)
- Reduction of standstill and servicing times in the event of a slave failure thanks to user-friendly diagnostics using the display and through simple module exchange (only a few settings by control keys are required, without use of the configuring tool)

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i F-Link

Application

Link between PROFI-safe and ASIsafe

The DP/AS-i F-Link is a PROFIBUS DP-V1 slave (according to EN 50170) and an AS-Interface master (based on AS-Interface Specification V3.0 according to EN 50296). It enables transparent data access to AS-Interface from PROFIBUS DP. The DP/AS-i F-Link is also the only AS-i master with which safety-oriented input data can be passed from ASIsafe slaves via the PROFI-safe protocol to a failsafe CPU with PROFIBUS DP master. No additional safety cabling or monitoring is required (in particular no AS-Interface safety monitor). The transmission of binary values or analog values is possible depending on the slave type. All slaves according to AS-Interface Specification V3.0 can be used as AS-i slaves.

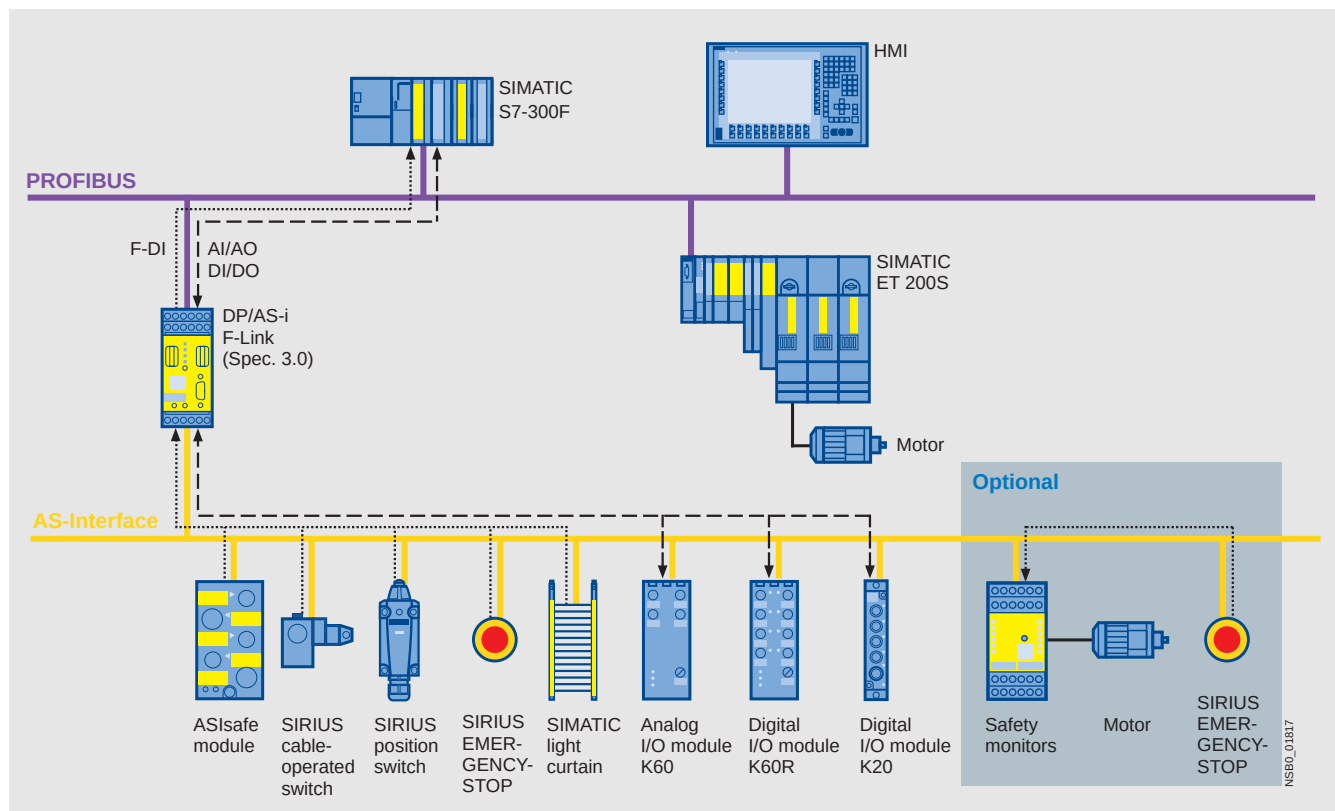
PROFIBUS DP masters according to DP-V0 or DP-V1 can exchange I/O data with lower-level AS-i slaves in cyclic mode. PROFIBUS DP masters with acyclic services according to DP-V1 are able in addition to initiate AS-i command calls (e.g. reconfiguring during normal operation). In addition to digital I/O data, analog data can also be saved permanently in the cyclic periphery of a failsafe S7-300/S7-416 F-CPU.

Network connectivity

The DP/AS-i F-Link can be used in a variety of constellations.

In configuring mode the DP/AS-i F-Link reads in the configuration data of the peripherals on the AS-Interface. Slave addresses can be set using the display and the control keys, and the code sequences of safe AS-i slaves can be taught.

During operation, four display LEDs and the display provide detailed diagnostics information, which directly localizes the fault if required. Using the PLC user program it is possible to read out diagnostics data records and make them available to a higher-level operating and monitoring system (e.g. WinCC).

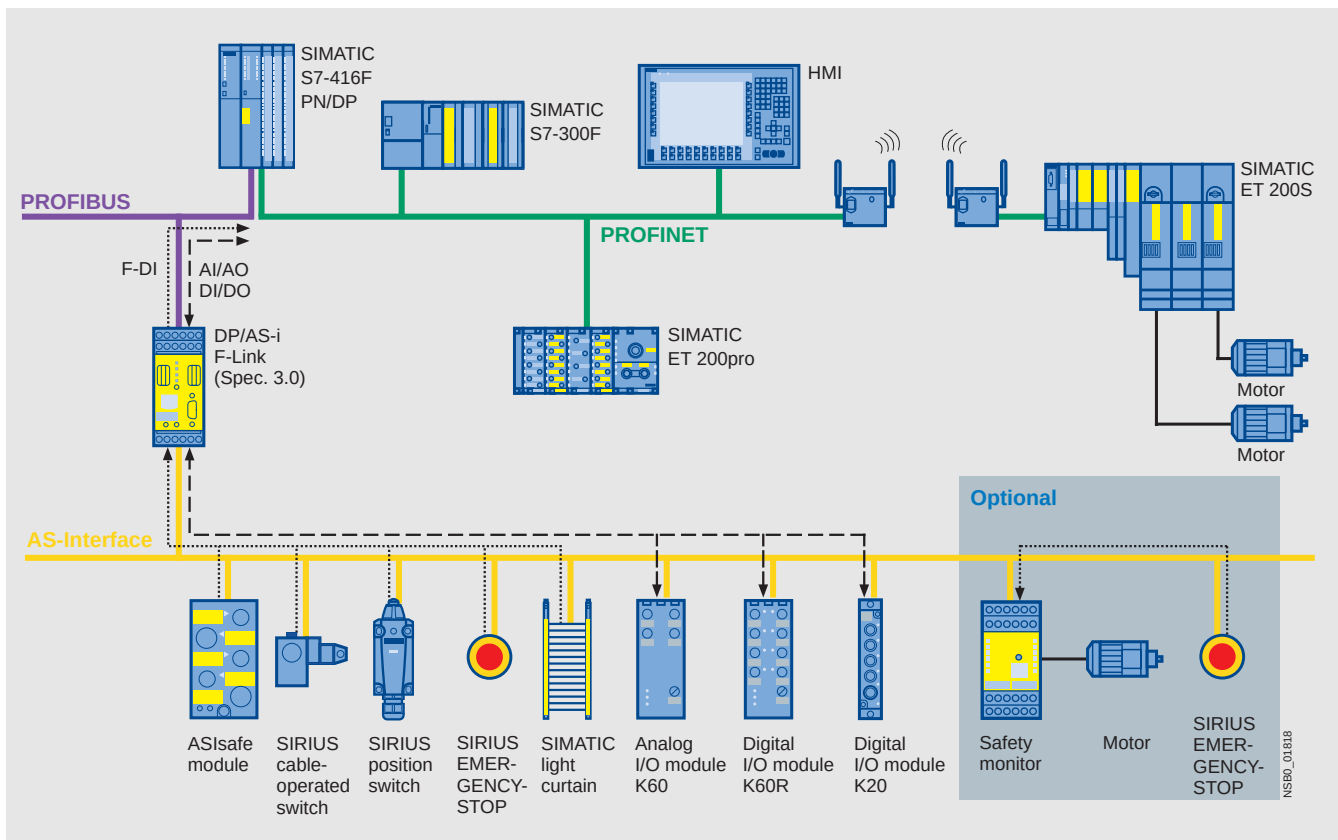


Constellation 1: Integration in PROFIBUS networks under SIMATIC F PLC

NSB0_01817

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

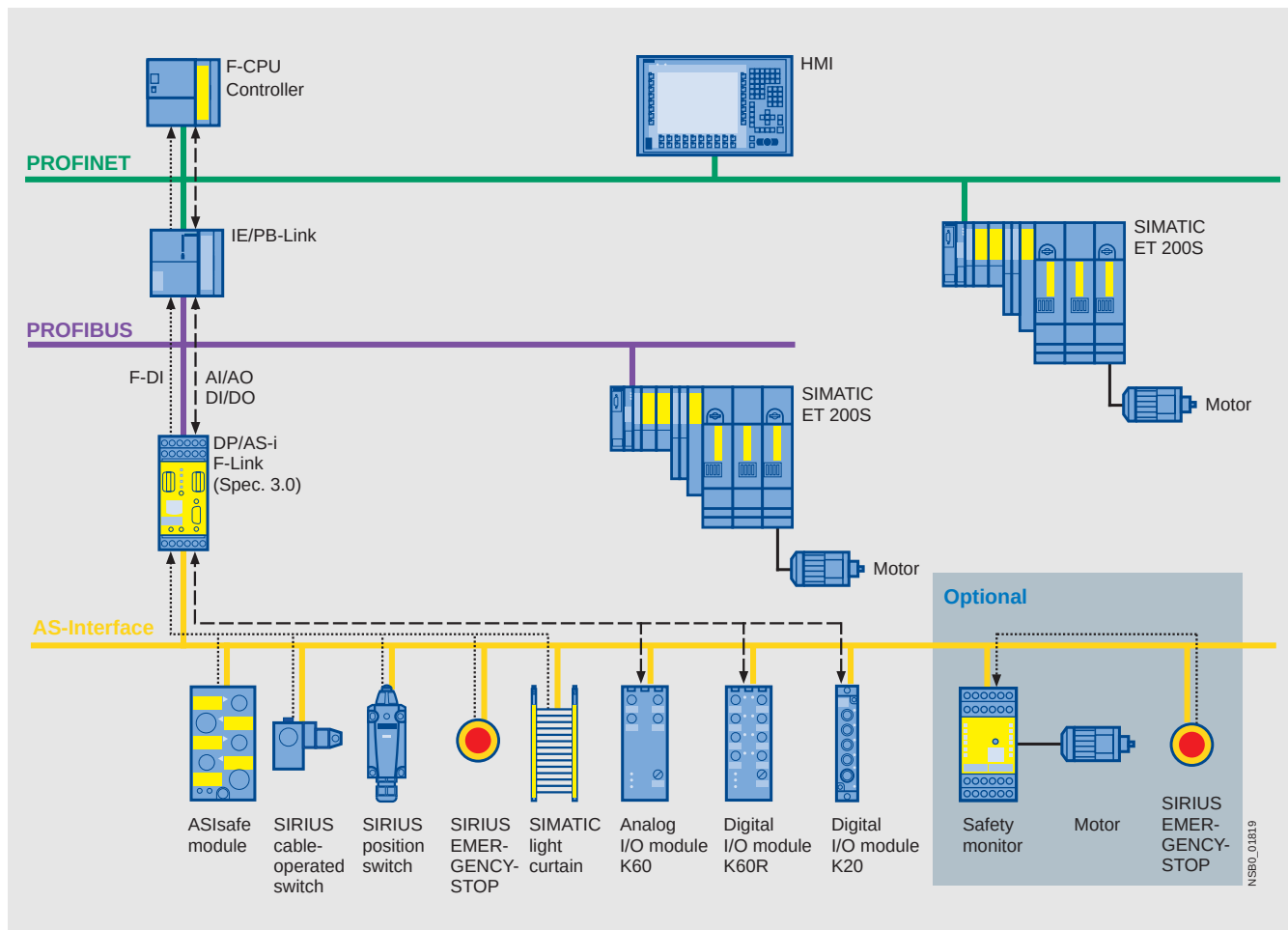
DP/AS-i F-Link


Constellation 2: Integration in PROFINET networks under SIMATIC F-PLC (SIMATIC S7-315 F PN/DP, S7-317 F PN/DP or S7-416F-3 PN/DP)

Evaluating / Communication

Transition from PROFIBUS DP to AS-Interface

DP/AS-i F-Link



Constellation 3: Alternatively integration in PROFINET networks under SIMATIC F PLC through IE/PB Link

Further network connectivity options:

- Integration in SINUMERIK Power Line and Solution Line (available soon)
- Integration under non-Siemens failsafe control systems using PROFIBUS type file (GSD)

Selection and ordering data

Version	Order No.	Weight approx. kg
 DP/AS-i F-Link Router between PROFIBUS DP and AS-Interface for safety-oriented data transmission from ASIsafe to PROFIBUS DP – PROFIsafe. Master profile M3.M4 according to extended AS-i Specification 3.0, degree of protection IP20 • Screw terminals • Spring-loaded terminals	3RK3 141-1CD10 3RK3 141-2CD10	0.300 0.300

Additional Info

The manual DP/AS-i F-Link can be downloaded free of charge from the Internet at <http://support.automation.siemens.com/WW/view/en/24063754>.

More presales information can be found at <http://www.siemens.com/as-interface/master>.

Evaluating / Communication

3TK28 safety relays

General data

Overview



SIRIUS safety relays are the key elements of a consistent and cost-effective safety chain. Be it EMERGENCY-STOP disconnection, protective door monitoring or the protection of presses or punches – with SIRIUS safety relays every safety application can be implemented to optimum effect in terms of engineering and price.

SIRIUS safety relays provide numerous safety-related functions:

- Monitoring the safety functions of sensors
- Monitoring the sensor cables
- Monitoring the correct operation of the safety relay
- Monitoring the actuators (contactors) in the shutdown circuit
- Safety-oriented disconnection when dangers arise

SIRIUS safety relays meet the highest requirements (Category 4) according to EN 954-1 and achieve the highest safety integrity level (SIL 3) according to IEC 61508.

Benefits

General

- Can be used for all safety applications thanks to compliance with the highest safety requirements (Category 4 according to EN 954-1 or SIL 3 according to IEC 61508)
- Suitable for use all over the world through compliance with all globally established certifications
- Compact, service-proven SIRIUS design creates more space in the control cabinet
- Flexible connectability and expendability make subsequent changes easy
- Removable terminals for greater plant availability
- Yellow front plate clearly identifies the device as an item of safety equipment
- Sensor cable up to 2000 m long enables use in large-scale plants

Relay outputs

- Different voltages can be switched through the floating contacts
- Higher currents can be switched with relay contacts

Solid-state outputs

- Wear-free
- Suitable for operation in fast switching applications
- Insensitive to vibrations and dirt
- Good electrical endurance

Microprocessor systems

- Flexible use thanks to many different integrated functions
- Easy parameterization using DIP switches on the front
- High functional reliability based on extensive monitoring functions
- Operated by the machine control
- Also connection of non-contact sensors (light arrays, light barriers etc.)

Application

SIRIUS safety relays are used mainly in autonomous safety applications which are not connected to a safety-oriented bus system. Their function here is to evaluate the sensors and the safety-oriented shutdown of hazards. Also they check and monitor the sensors, actuators and safety-oriented functions of the safety relay.

Evaluating / Communication

3TK28 safety relays

with electronic enabling circuits

Selection and ordering data



Type	3TK28 40 Basic units	3TK28 41 Basic units	3TK28 42 Basic units	3TK28 45 Multi function unit „Automatic and monitored start“	Multi function unit t_v „Automatic and monitored start“	Multi function unit „Monitored start“	Multi function unit t_v „Monitored start“	Multi function unit „OK push-button“	Multi function unit t_v „OK push-button“	Multi function unit t_v „spring-powered tumbler“	Multi function unit t_v „magnetic tumbler“
Sensors											
• Inputs	1	1	1	2	2	2	2	2	2	2	2
• Solid-state	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
• With contacts	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Safety mats	--	✓	✓	✓	✓	✓	✓	--	--	--	--
Start											
• Auto	✓	✓	✓	1	1	--	--	1	1	--	--
• Monitored	✓	✓	✓	1	1	2	2	1	1	2	2
Cascading input 24 V DC	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Key-operated switches	--	--	--	✓	✓	✓	✓	✓	✓	--	--
Enabling circuit, floating											
• Stop category 0	--	--	--	2 NO	1 NO	2 NO	1 NO	2 NO	1 NO	1 NO	1 S
• Stop category 1	--	--	--	--	1 NO	--	1 NO	--	1 NO	1 NO	1 S
Enabling circuit, solid-state											
• Stop category 0	2	2	1	2	1	2	1	2	1	1	1
• Stop category 1	--	--	1	--	1	--	1	--	1	1	1
Signaling outputs											
• Floating	--	--	--	--	--	--	--	--	--	--	--
• solid-state	--	--	--	1	1	1	1	1	1	1	1
Category according to EN 954-1 max	3	4	4	4	4	4	4	4	4	4	4
SIL level max.	2	3	3	3	3	3	3	3	3	3	3
Rated control supply voltage DC 24 V	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

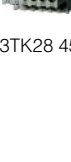
✓ = available

-- = not available

Evaluating / Communication

3TK28 safety relays

with electronic enabling circuits

Rated control supply voltage U_s		OFF-delay t_v	DT	Screw terminals	Weight
V		s		Order No.	kg
Rated control supply voltage U_s 24 V DC					
	3TK28 40 basic units				
	24 DC	--		3TK28 40-1BB40	0.180
	3TK28 41 basic units				
	24 DC	--		3TK28 41-1BB40	0.166
	3TK28 42 basic units t_v				
	24 DC	0.05 ... 3		3TK28 42-1BB41	0.168
		0.5 ... 30		3TK28 42-1BB42	0.166
		5 ... 300		3TK28 42-1BB44	0.166
	3TK28 45 Multi function unit „Automatic and monitored start“				
	24 DC	--		3TK28 45-1HB40	0.415
	3TK28 45 Multi function unit „Automatic and monitored start“				
	24 DC	0.05 ... 3		3TK28 45-1HB41	0.400
		0.5 ... 30		3TK28 45-1HB42	0.400
		5 ... 300		3TK28 45-1HB44	0.415
	3TK28 45 Multi function unit „Monitored start“				
	24 DC	--		3TK28 45-1DB40	0.168
	3TK28 45 Multi function unit t_v „Monitored start“				
	24 DC	0.05 ... 3		3TK28 45-1DB41	0.400
		0.5 ... 30		3TK28 45-1DB42	0.400
		5 ... 300		3TK28 45-1DB44	0.415
	3TK28 45 Multi function unit „OK pushbutton“				
	24 DC	--		3TK28 45-1EB40	0.400
	3TK28 45 Multi function unit t_v „OK pushbutton“				
	24 DC	0.05 ... 3		3TK28 45-1EB41	0.400
		0.5 ... 30		3TK28 45-1EB42	0.400
		5 ... 300		3TK28 45-1EB44	0.400
	3TK28 45 Multi function unit t_v „Spring-powered tumbler“				
	24 DC	0.05 ... 3		3TK28 45-1FB41	0.400
		0.5 ... 30		3TK28 45-1FB42	0.400
		5 ... 300		3TK28 45-1FB44	0.400
	3TK28 45 Multi function unit t_v „Magnetic tumbler“				
	DC 24	0.05 ... 3		3TK28 45-1GB41	0.400
		0.5 ... 30		3TK28 45-1GB42	0.400
		5 ... 300		3TK28 45-1GB44	0.400

Evaluating / Communication

3TK28 safety relays

with electronic enabling circuits

	Rated control supply voltage U_s	OFF-delay t_v	Spring-loaded terminals	Weight pro PE approx.
	V	s	Order No.	kg
Rated control supply voltage U_s DC 24 V				
 3TK28 45-2DB40	3TK28 40 basic units			
	DC 24	--	3TK28 40-2BB40	0.150
	3TK28 41 basic units			
	DC 24	--	3TK28 41-2BB40	0.143
	3TK28 42 basic units t_v			
	DC 24	0.05 ... 3	3TK28 42-2BB41	0.143
		0.5 ... 30	3TK28 42-2BB42	0.146
		5 ... 300	3TK28 42-2BB44	0.149
	3TK28 45 Multi function unit „Automatic and monitored start“			
	DC 24	--	3TK28 45-2HB40	0.415
 3TK28 45-2DB41	3TK28 45 Multi function unit „Automatic and monitored start“			
	DC 24	0.05 ... 3	3TK28 45-2HB41	0.400
		0.5 ... 30	3TK28 45-2HB42	0.400
		5 ... 300	3TK28 45-2HB44	0.415
	3TK28 45 Multi function unit „Monitored start“			
	DC 24	--	3TK28 45-2DB40	0.168
	3TK28 45 Multi function unit t_v „Monitored start“			
	DC 24	0.05 ... 3	3TK28 45-2DB41	0.400
		0.5 ... 30	3TK28 45-2DB42	0.400
		5 ... 300	3TK28 45-2DB44	0.415
	3TK28 45 Multifunktionsgerät „OK pushbutton“			
	DC 24	--	3TK28 45-2EB40	0.400
	3TK28 45 Multi function unit t_v „OK pushbutton“			
	DC 24	0.05 ... 3	3TK28 45-2EB41	0.400
		0.5 ... 30	3TK28 45-2EB42	0.400
		5 ... 300	3TK28 45-2EB44	0.400
	3TK28 45 Multi function unit t_v „Spring-powered tumbler“			
	DC 24	0.05 ... 3	3TK28 45-2FB41	0.400
		0.5 ... 30	3TK28 45-2FB42	0.400
		5 ... 300	3TK28 45-2FB44	0.400
	3TK28 45 Multi function unit t_v „Magnetic tumbler“			
	DC 24	0.05 ... 3	3TK28 45-2GB41	0.400
		0.5 ... 30	3TK28 45-2GB42	0.400
		5 ... 300	3TK28 45-2GB44	0.400

Accessories

	Version	Order No.	Weight approx.
			kg
Push-in lugs and covers			
 3RP19 03	Push-in lugs for screw mounting, 2 units are required for each device	3RP19 03	0.002
	Sealable covers for securing against unauthorized adjustment of setting knobs	3RP19 02	0.004
 3RP19 02			

Evaluating / Communication

3TK28 safety relays

with relay enabling circuits

Selection and ordering data



Type	3TK28 21 Basic units	3TK28 22 Basic units	3TK28 23 Basic units	3TK28 24 Basic units	3TK28 25 Basic units	3TK28 27 Basic units <i>t_v</i>	3TK28 28 Basic units <i>t_v</i>	3TK28 30 Expansion units	3TK28 34 Two-hand control units	3TK28 35 Slowing down test apparatus
Sensors										
• Input	1	1	1	1	1	1	1	--	1	--
• Solid-state	--	--	--	--	--	--	--	--	--	--
• With contacts	✓	✓ ¹⁾	✓	✓	✓	✓	✓	--	✓	--
Safety mats	--	--	--	--	--	--	--	--	--	--
Start										
• Auto	✓	✓	--	✓	✓	--	✓	--	--	--
• Monitored	--	--	✓	--	✓	✓	--	--	--	--
Cascading input 24 V DC	--	--	--	--	--	--	--	--	--	--
Key-operated switches	--	--	--	--	--	--	--	--	--	--
Enabling circuit, floating										
• Stop category 0	3 NO	2 NO	2 NO	2 NO	3 NO	2 NO	2 NO	4 NO	2 NO+2 NC	3 NO+2 NC
• Stop category 1	--	--	--	--	--	2 NO	2 NO	--	--	--
Enabling circuit, solid-state										
• Stop category 0	--	--	--	--	--	--	--	--	--	--
• Stop category 1	--	--	--	--	--	--	--	--	--	--
Signaling outputs										
• Floating	1 NC	--	--	--	2 NC	1 NC	1 NC	--	--	--
• Solid-state	--	--	--	--	--	--	--	--	--	--
Category according to EN 954-1 max	3 ²⁾	4	4	3 ²⁾	4	4 ³⁾	4 ³⁾	Corresponds to basic unit	4	4
SIL level max.	--	--	--	--	--	--	--	Corresponds to basic unit	--	--
Rated control supply voltage										
• 24 V DC	--	--	--	✓	✓	✓	✓	--	✓	✓
• 24 V AC/DC	✓	✓	✓	✓	--	--	--	✓	--	--
• 24 V AC	--	--	--	--	✓	✓	✓	--	✓	✓
• 115 V AC	--	--	--	✓	✓	✓	✓	✓	✓	✓
• 230 V AC	--	--	--	✓	✓	✓	✓	✓	✓	✓
• 24 ... 240 V AC/DC	--	--	--	--	--	--	--	--	--	--

✓ = Available

-- = Not available

¹⁾ The ON button is not monitored.

²⁾ Depending on the hazard assessment, additional measures may be necessary in the sensor circuit (e.g. protected laying).

³⁾ Only possible for instantaneous enabling contacts, otherwise Category 3.

⁴⁾ For expansion of Siemens safety products.

Evaluating / Communication

3TK28 safety relays

with relay enabling circuits

Rated control supply voltage U_s		OFF-delay t_v	Screw terminals	Weight approx.
V		s	Order No.	kg
				
3TK28 21-1CB30				
				
3TK28 25-1CB30				
				
3TK28 26-1BB40				
				
3TK28 27-1CB31				
				
3TK28 30-1CB40				
				
3TK28 26-1CW30				
Rated control supply voltages U_s DC 24 V and AC 50/60 Hz, 24, 115, 230 V				
3TK28 21 basic units				
AC/DC 24	--		3TK28 21-1CB30	0.276
3TK28 22 basic units				
AC/DC 24	--		3TK28 22-1CB30	0.271
3TK28 23 basic units				
AC/DC 24	--		3TK28 23-1CB30	0.271
3TK28 24 basic units				
AC/DC 24	--		3TK28 24-1CB30	0.254
DC 24	--		3TK28 24-1BB40	0.249
AC 115	--		3TK28 24-1AJ20	0.294
AC 230	--		3TK28 24-1AL20	0.288
3TK28 25 basic units				
DC 24	--		3TK28 25-1BB40	0.423
AC 24	--		3TK28 25-1AB20	0.421
AC 115	--		3TK28 25-1AJ20	0.519
AC 230	--		3TK28 25-1AL20	0.516
3TK28 26 basic units				
DC 24	--		3TK28 26-1BB40	0.423
AC/DC 24 ... 240	--		3TK28 26-1CW30	0.421
3TK28 27 basic units t_v				
DC 24	0.05 ... 3		3TK28 27-1BB41	0.495
AC 24			3TK28 27-1AB21	0.499
AC 115			3TK28 27-1AJ21	0.650
AC 230			3TK28 27-1AL21	0.650
DC 24	0.5 ... 30		3TK28 27-1BB40	0.497
AC 24			3TK28 27-1AB20	0.496
AC 115			3TK28 27-1AJ20	0.650
AC 230			3TK28 27-1AL20	0.650
3TK28 28 basic units t_v				
DC 24	0.05 ... 3		3TK28 28-1BB41	0.499
AC 24			3TK28 28-1AB21	0.501
AC 115			3TK28 28-1AJ21	0.657
AC 230			3TK28 28-1AL21	0.650
DC 24	0.5 ... 30		3TK28 28-1BB40	0.496
AC 24			3TK28 28-1AB20	0.500
AC 115			3TK28 28-1AJ20	0.650
AC 230			3TK28 28-1AL20	0.650
3TK28 30 expansion unit				
AC/DC 24	--		3TK28 30-1CB30	0.267
AC 115			3TK28 30-1AJ20	0.306
AC 230			3TK28 30-1AL20	0.306
3TK28 34 two-hand control units				
DC 24	--		3TK28 34-1BB40	0.432
AC 24			3TK28 34-1AB20	0.424
AC 115			3TK28 34-1AJ20	0.519
AC 230			3TK28 34-1AL20	0.519
3TK28 35 slowing down test apparatus				
DC 24	--		3TK28 35-1BB40	0.495
AC 115	--		3TK28 35-1AJ20	0.572
AC 230	--		3TK28 35-1AL20	0.574

Evaluating / Communication

3TK28 safety relays

with relay enabling circuits



3TK28 26-2BB40

Rated control supply voltage U_s	OFF-delay t_v	Spring-loaded terminals	Weight approx.
V	s	Order No.	kg
Rated control supply voltages U_s DC 24 V and AC 50/60 Hz, 24, 115, 230 V			
3TK28 21 basic units			
AC/DC 24	--	3TK28 21-2CB30	0.246
3TK28 22 basic units			
AC/DC 24	--	3TK28 22-2CB30	0.250
3TK28 23 basic units			
AC/DC 24	--	3TK28 23-2CB30	0.247
3TK28 24 basic units			
AC/DC 24	--	3TK28 24-2CB30	0.230
DC 24	--	3TK28 24-2BB40	0.228
AC 115	--	3TK28 24-2AJ20	0.265
AC 230	--	3TK28 24-2AL20	0.270
3TK28 25 basic units			
DC 24	--	3TK28 25-2BB40	0.374
AC 24	--	3TK28 25-2AB20	0.375
AC 115	--	3TK28 25-2AJ20	0.472
AC 230	--	3TK28 25-2AL20	0.475
3TK28 26 basic units			
DC 24	--	3TK28 26-2BB40	0.423
AC/DC 24 ... 240	--	3TK28 26-2CW30	0.421
3TK28 27 basic units t_v			
DC 24	0.05 ... 3	3TK28 27-2BB41	0.454
AC 24		3TK28 27-2AB21	0.454
AC 115		3TK28 27-2AJ21	0.240
AC 230		3TK28 27-2AL21	0.605
DC 24	0.5 ... 30	3TK28 27-2BB40	0.455
AC 24		3TK28 27-2AB20	0.454
AC 115		3TK28 27-2AJ20	0.606
AC 230		3TK28 27-2AL20	0.604
3TK28 28 basic units t_v			
DC 24	0.05 ... 3	3TK28 28-2BB41	0.450
AC 24		3TK28 28-2AB21	0.454
AC 115		3TK28 28-2AJ21	0.240
AC 230		3TK28 28-2AL21	0.608
DC 24	0.5 ... 30	3TK28 28-2BB40	0.457
AC 24		3TK28 28-2AB20	0.468
AC 115		3TK28 28-2AJ20	0.609
AC 230		3TK28 28-2AL20	0.612
3TK28 30 expansion unit			
AC/DC 24	--	3TK28 30-2CB30	0.244
AC 115		3TK28 30-2AJ20	0.276
AC 230		3TK28 30-2AL20	0.276
3TK28 34 two-hand control units			
DC 24	--	3TK28 34-2BB40	0.383
AC 24		3TK28 34-2AB20	0.376
AC 115		3TK28 34-2AJ20	0.472
AC 230		3TK28 34-2AL20	0.472
3TK28 35 slowing down test apparatus			
AC 115	--	3TK28 35-2AJ20	0.551
AC 230	--	3TK28 35-2AL20	0.552

Evaluating / Communication

3TK28 safety relays

with relay enabling circuits

Accessories

Version	DT	Order No.	Weight. kg
Push-in lugs and covers			
 3RP19 03  3RP19 02	Push-in lugs for screw mounting, 2 units are required for each device	▶ 3RP19 03	0.002
	Sealable covers for securing against unauthorized adjustment of setting knobs	▶ 3RP19 02	0.004

Evaluating / Communication

3TK28 safety relays

with auxiliary contactor enabling circuits

Selection and ordering data



Typ	3TK28 50 Basic units	3TK28 51 Basic units	3TK28 52 Basic units	3TK28 53 Basic units	3TK28 56 Expansion units ¹⁾	3TK28 57 Expansion units ¹⁾ <i>t_v</i>
Sensors						
• Input	1	1	1	1	--	--
• Solid-state	--	--	--	✓	--	--
• With contacts	✓	✓	✓	✓	--	--
Safety mats	✓	✓	✓	✓	--	--
Start						
• Auto	✓	✓	✓	✓	--	--
• Monitored	✓	✓	✓	✓	--	--
Cascading input 24 V DC	--	--	--	✓	✓	✓
Key-operated switches	--	--	--	--	--	--
Enabling circuit, floating						
• Stop category 0	3 NO	2 NO	6 NO	3 NO	6 NO	--
• Stop category 1	--	--	--	--	--	3 NO
Enabling circuit, solid-state						
• Stop category 0	--	--	--	1	1	1
• Stop category 1	--	--	--	--	--	--
Signaling outputs						
• Floating	--	1 NC	1 NC	--	1 NC	--
• Solid-state	--	--	--	--	--	--
Category according to EN 954-1 max	3	3	3	4	Corresponds to basic unit	Corresponds to basic unit
SIL level max.	2	2	2	3	--	--
Rated control supply voltage						
• 24 V DC	✓	✓	✓	✓	✓	✓
• 24 V AC/DC	--	--	--	--	--	--
• 24 V AC	✓	✓	--	--	--	--
• 115 V AC	✓	✓	--	--	--	--
• 230 V AC	✓	✓	✓	--	--	--
• 24 ... 240 V AC/DC	--	--	--	--	--	--
Rated operational voltage						
• 24 V DC	✓	✓	✓	✓	✓	✓
• 230 V AC	✓	✓	✓	✓	✓	✓
• 600 V AC	✓	✓	✓	✓	✓	✓
Switching capacity						
• AC-15 at <i>U</i> = 230 V	✓	✓	✓	✓	✓	✓
• DC-13 at <i>U</i> = 24 V	✓	✓	✓	✓	✓	✓

✓ = Available

-- = Not available

¹⁾ For expansion of Siemens safety products.

Evaluating / Communication

3TK28 safety relays

with auxiliary contactor enabling circuits

Rated control supply voltage U_s	OFF-delay t_v	Screw terminals	Weight
V	s	Order No.	kg
Rated control supply voltages U_s DC 24 V and AC 50/60 Hz, 115, 230 V			
3TK28 50 basic units			
DC 24	--	3TK28 50-1BB40	0.819
AC 115		3TK28 50-1AJ20	0.765
AC 230		3TK28 50-1AL20	0.770
3TK28 51 basic units			
DC 24	--	3TK28 51-1BB40	0.821
AC 115		3TK28 51-1AJ20	0.770
AC 230		3TK28 51-1AL20	0.767
3TK28 52 basic units			
DC 24	--	3TK28 52-1BB40	0.919
AC 230		3TK28 52-1AL20	0.870
3TK28 53 basic units			
DC 24	--	3TK28 53-1BB40	0.714
3TK28 56 expansion unit			
DC 24	--	3TK28 56-1BB40	0.785
3TK28 57 expansion unit t_v			
DC 24	0.05 ... 3	3TK28 57-1BB41	0.682
DC 24	0.5 ... 30	3TK28 57-1BB42	0.679
DC 24	5 ... 300	3TK28 57-1BB44	0.650

Rated control supply voltage U_s	OFF-delay t_v	Spring-loaded terminals	Weight
V	s	Order No.	kg
Rated control supply voltages U_s DC 24 V and AC 50/60 Hz, 115, 230 V			
3TK28 50 basic units			
DC 24	--	3TK28 50-2BB40	0.820
AC 115		3TK28 50-2AJ20	0.650
AC 230		3TK28 50-2AL20	0.761
3TK28 51 basic units			
DC 24	--	3TK28 51-2BB40	0.650
AC 115		3TK28 51-2AJ20	0.650
AC 230		3TK28 51-2AL20	0.768
3TK28 52 basic units			
DC 24	--	3TK28 52-2BB40	0.935
AC 230		3TK28 52-2AL20	0.878
3TK28 53 basic units			
DC 24 V	--	3TK28 53-2BB40	0.705
3TK28 56 expansion unit			
DC 24 V	--	3TK28 56-2BB40	0.750
3TK28 57 expansion unit t_v			
DC 24 V	0.05 ... 3	3TK28 57-2BB41	0.650
	0.5 ... 30	3TK28 57-2BB42	0.677
	5 ... 300	3TK28 57-2BB44	0.650



3TK28 50-2BB40



3TK28 51-2BB40



3TK28 52-2BB40

Reacting



3/2	ET 200S motor starters and frequency converters
3/3	Fail-safe motor starter
3/5	ET 200S FC fail-safe frequency converter
3/13	Safety module local
3/17	PROFIsafe safety module
3/20	ET 200pro motor starters and frequency converters
3/20	Motor starter standard and high feature
3/25	ET 200pro FC frequency converter
3/29	ET 200pro isolator modules
3/31	Safety local module
3/34	Accessories for motor starters
3/35	SINAMICS G120 - Inverter chassis units
3/35	SINAMICS G120 chassis units 0.37 kW to 90 kW
3/39	Control unit CU240
3/41	Basic Operator Panel BOP
3/42	Memory card for control units
3/43	Power modules
3/44	Power modules PM240
3/46	Power modules PM250
3/48	Power modules PM260
3/50	Safe brake relay
3/51	SINAMICS G120D - Distributed frequency converters
3/51	SINAMICS G120D 0.75 kW to 7.5 kW
3/53	Control units CU240D
3/54	Power modules PM250D
3/55	SINAMICS S120
3/55	Converter system for Motion control applications
3/59	SIMOVERT MASTERDRIVES
3/59	CNC automation systems SINUMERIK

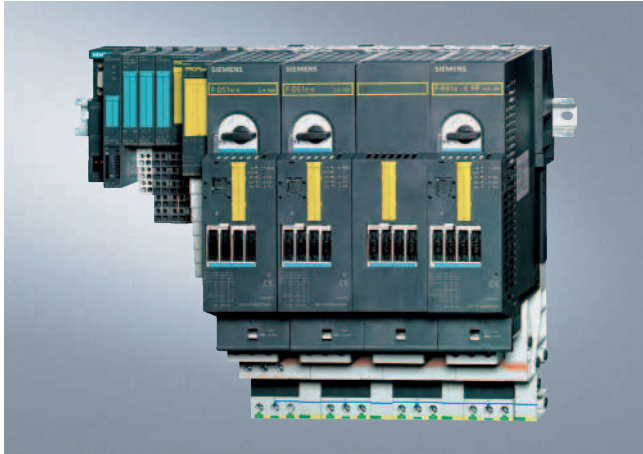


Reacting

ET 200S motor starters and frequency converters

Overview

Safety motor starter ET 200S solutions



The ET 200S Safety motor starter solutions comprise:

- Safety modules
- Standard motor starters
- High Feature motor starters
- Failsafe motor starters

With the ET 200S Safety motor starter Solutions there is no complicated and hence cost-intensive configuring and wiring outlay compared to the conventional safety technology. The ET 200S Safety motor starter Solutions are designed for Category 4 according to EN 954-1 or SIL 3 IEC 61508.

They enable the use of safety-oriented direct-on-line starters or reversing starters in the SIMATIC ET 200S distributed peripherals system on PROFINET or PROFIBUS. The fine modular architecture of the system enables optimum imaging of machine or plant applications.

Within an ET 200S station the Safety motor starter Solutions can also be combined with Standard motor starters or High Feature motor starters without safety functions or the SIMATIC ET 200S FC frequency converter up to max. 4 kW up to Category 3 according to EN 954-1 or SIL 2 according to IEC 61508.

Standard and High Feature ET 200S motor starters can be found on page 5/78 onwards.

The "SIMATIC ET 200 Configurator" software can be found in Catalog CA 01 on CD or DVD. You can also download the "SIMATIC ET 200 Configurator" software from the Internet:

<http://www.siemens.com/sirius-starting>

<http://www.siemens.com/ET200S>

ET 200S FC failsafe frequency converter



For a detailed description see page 3/5.

New to the world market: Failsafe frequency converters

- For stepless speed control of asynchronous motors
- Consisting of the modules for control module ICU24F and power section IPM25 up to 4.0 kW
- Hot swapping of control module and power supply permitted
- Only small effect on line network
- Operation without line commutating reactor
- Active braking with line-commutated energy recovery
- Can be combined with Brake Control Module for controlling an electromechanical holding brake
- With self-establishing 50 A energy bus, i.e. load voltage is fed into a group of frequency converters
- For achieving EMC Class A (acc. to EN 55011)
Connection of an EMC filter before the power bus

The failsafe ET 200S FC is fail-safe and offers comprehensive integrated safety functions (certified acc. to EN 954-1, Category 3 or IEC 61508, SIL 2)

Safely Terminated Torque (STO):

Torque is safely turned off.

Safely Limited Speed (SLS):

A specified motor speed is monitored to make sure it is not exceeded. Can be used without motor encoder.s, provided standard asynchronous motors are used.

Safe Stop1 (SS1):

Braking to standstill is monitored. Can be used without motor encoder, provided standard asynchronous motors are used.

Application

The ET 200S Safety motor starter Solutions are preferred in all production and process automation fields in which the enhancement of plant availability and flexibility plays a key role.

- **Safety motor starters Solutions local** are preferred from the safety technology point of view for locally restricted safety applications. These motor starters are not dependent on a safe control system.
- **Safety motor starters Solutions PROFIsafe** are often found by contrast in safety applications of the more complex type that are interlinked. In this case a safe control system is used with the bus systems PROFINET or PROFIBUS with the PROFIsafe profile.

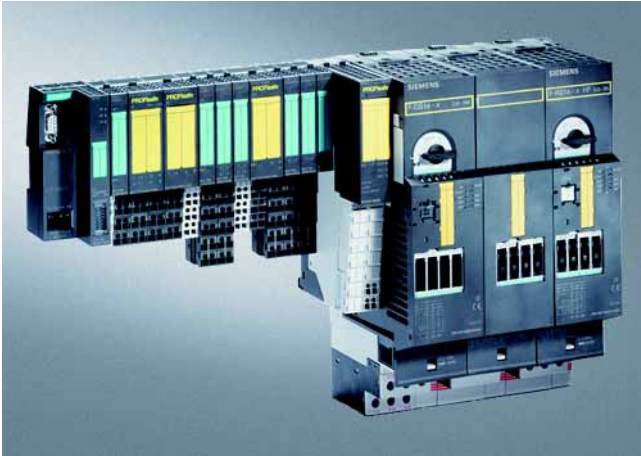
Note:

The complete Safety Motor Starter program is included in catalog 1K PI, chapter 5.

ET 200S motor starters and frequency converters

Fail-safe motor starter

Overview



The Fail-safe motor starter has been developed on the basis of the High Feature motor starter. It differs in that, in addition to a circuit-breaker/contactor assembly, a safe solid-state evaluation circuit is installed for error detection purposes which makes the motor starter Fail-safe.

If the contactor to be switched fails in an EMERGENCY STOP case, the evaluation solid-states detects a fault and opens the circuit-breaker in the motor starter through a shunt release in a fail-safe manner. The second redundant shutdown components is therefore no longer a main contactor, as is generally the case, but the circuit-breaker installed in the motor.

All functions of the High Feature starter are already integrated

The new Fail-safe motor starters are characterized by easy, space-saving assembly as well as minimal wiring outlay. Like the High Feature starters, the Fail-safe motor starters have a switching capacity of up to 7.5 kW (16 A) which is achieved with just two motor starter versions. Another important feature is the high availability due to the high short-circuit withstand capability (type of coordination 2).

Benefits

Advantages over conventional safety systems:

- Significant savings in components (less hardware)
- Less mounting and installation work
- Motor starters are fail-safe and offer high availability

Application

Application

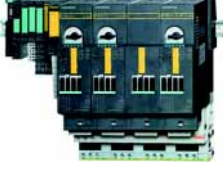
The Fail-safe motor starter is predestined for use in combination with PROFIsafe (see Figure *Fail-safe motor starter with ET 200S PROFIsafe*, page 3/18). Another field of application is in combination with ASIsafe or safety relays (see Safety Module local, Overview, Example 2 on page 3/14 *Motorstarter Fail-safe with ASIsafe and 3TK28*).

Reacting

ET 200S motor starters and frequency converters

Fail-safe motor starter

Selection and Ordering data

	Version	Order No.
ET 200S fail-safe motor starters		
 F-DS1e-x direct starter	F-DS1e-x direct on-line starter Fail-safe direct on-line starter for up to 7.5 kW Mechanical switching Electronic overload protection	
	• 0.3 to 3 A	3RK1 301-0AB13-0AA4
	• 2.4 to 8 A	3RK1 301-0BB13-0AA4
	• 2.4 to 16 A	3RK1 301-0CB13-0AA4
	F-DS1e-x reversing starter Fail-safe reversing starter for up to 7.5 kW Mechanical switching Electronic overload protection Fuseless	
	• 0.3 to 3 A	3RK1 301-0AB13-1AA4
	• 2.4 to 8 A	3RK1 301-0BB13-1AA4
	• 2.4 to 16 A	3RK1 301-0CB13-1AA4
Components for fail-safe motor starters		
	TM-FDS65-S32/S31-01 terminal module for F-DS1e-x direct on-line starter with coding	
	• With supply terminals for power bus (TM-FDS65-S32-01)	3RK1 903-3AC00
	• Without supply terminals for power bus (TM-FDS65-S31-01)	3RK1 903-3AC10
	TM-FRS130-S32/S31-01 terminal module for F-RS1e-x reversing starter with coding	
	• With supply terminals for power bus (TM-FRS130-S32-01)	3RK1 903-3AD00
	• Without supply terminals for power bus (TM-FRS130-S31-01)	3RK1 903-3AD10
	M65-PEN-F PE/N terminal block with supply terminals, with covers	3RK1 903-2AC00
	M65-PEN-S terminal block without supply terminals	3RK1 903-2AC10

ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

Overview



Components of the ET 200S FC fail-safe frequency converter

Benefits

- The frequency converter is completely integrated into the ET 200S system and offers all system advantages, such as high availability thanks to the hot swapping function, modular expansion, or reduction of the wiring overhead resulting from the self-assembling terminal module wiring.
- With self-assembling 50 A power bus, i.e. the load voltage is only supplied once for a group of frequency converters
- Comprehensive diagnostics facilities for high availability
- Input for motor encoder for precise speed control
- Input for PTC/KTY encoder for comprehensive motor protection
- Slot for optional memory card (MMC) to save the parameter settings for fast replacement of modules without tools
- All common control modes are available: Frequency control, sensor-less vector control or torque control, closed-loop control with motor encoder
- Parameterization takes place using STARTER, the graphical parameterization tool for Siemens drives
- Active braking is possible without additional overhead. The line-commutated energy recovery of the frequency converter for the power supply network means that brake chopper modules or pulsed resistors are superfluous.
- The "torque safely turned OFF" is completely electronic and therefore without contacts. This provides reliable and extremely short response times.
- Unique is that the "safe reduced speed" and the "safe stop 1" do not require a motor encoder or other encoder. These functions can therefore be implemented with minimum overhead.

Application

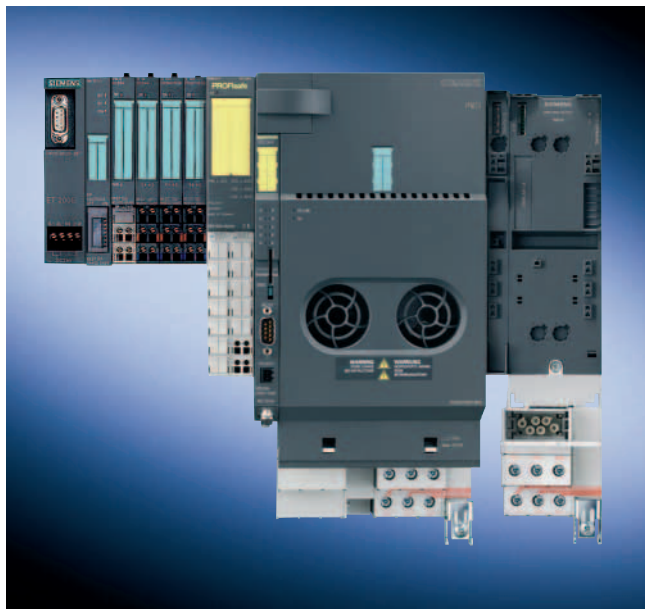
- New application possibilities are opened up for the ET 200S system where continuous control of the speed of asynchronous motors is required.
- The frequency converter handles frequency control and vector control for more complex drive tasks. In addition, the converter also supports torque control for conveyor applications, winding and unwinding drives, as well as hoisting gear. Together with a motor encoder, the range extends up to closed-loop controls for exact control of speeds and torques.
- The advantages of line-commutated power regeneration are primarily evident in continuous regenerative operation. Examples include unwinding units, lowering of loads with hoisting gear, or electric braking of large centrifugal masses.
- Together with an intelligent header module (IM 151 CPU) and the ET 200S FC frequency converter, the I/O station is expanded to become a complete automation solution for machine modules and plant sections.
- The integral safety functions significantly reduce the overhead for drive solutions in plant sections where there is a hazard potential. Monitoring of the safely reduced speed in sensor-less standard asynchronous motors is unique in drive engineering.

Reacting

ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

Design



Design of an ET 200S station with two ET 200S FC fail-safe frequency converters (only terminal modules on the right)

The ET 200S FC consists of the following components:

- ICU24F control unit (F = with integral safety technology)
- IPM25 converter power module
- Terminal modules to accommodate control unit and converter power module

Following insertion of the modules, the control unit and the converter power module of the frequency converter are interconnected.

The PM-D F PROFIsafe or PM-D F X1 power modules provide the power supply for one or more control units.

Accessories

The following accessories are available:

- The labeling strips and color coding labels of the ET 200S system can also be used for the frequency converter.
- **Jumper block L1/L2/L3**
The jumper blocks L1/L2/L3 are used to bridge a gap in the power bus. 15 mm wide jumper blocks are used to bridge the control unit of the subsequent frequency converter. If a brake control module is connected, a 30mm wide jumper block is required in order to pass on the power bus via the brake control module and ICU24 to the subsequent IPM25 converter power module.
- **Jumper block PE/N**
The Jumper blocks PE/N are used to bridge a gap in the PE/N bus, e.g. caused by use of a brake control module, a PM-D(F) power module or the control unit of the frequency converter.

• EMC filter

An EMC filter must be externally connected to the supply of the power bus in order to achieve EMC Class A (according to EN 55011). Shielded motor cables must be used in addition. It must be ensured that the shield is connected correctly. The terminal modules for the converter power module of the frequency converter are equipped with an integral shield connection element.

Within the ET 200S system, several frequency converters can be supplied over a common power bus with 400 V. The EMC filter is connected up-circuit of the power bus. The filters are designed for a maximum effective length of 350 m shielded cable. The effective cable length is the combined length of all motor cables of the frequency converter on the common 400 V power bus.

The two EMC filters of the ET 200S FC are designed as group filters for more than one frequency converter and have the following properties:

EMC filter	Rated current	Maximum cable length	Conductor cross-section
Type			
6SL3203-0BE22-5AA0	25 A	350 m	4 mm ²
6SL3203-0BE25-0AA0	50 A	350 m	10 mm ²

The use of output reactors or LC filters on the converter output does not affect the maximum cable length for the EMC filter.

• Output reactors and LC filters for longer cable lengths

Without additional components on the converter output, the maximum length of motor cables on the SIMATIC ET 200S FC frequency converter is 50 m (shielded cable) or 100 m (unshielded). Longer cables are possible when output reactors or LC filters are used:

To reduce the capacitive equalizing currents and du/dt for motor cables, output reactors are provided. Consequently when output reactors are used, the maximum permissible cable lengths between the motor and converter are:

IPM25 converter power module	Output choke Type	Max. permissible motor cable lengths (shielded/unshielded) for a line voltage of	
		380 V -15% to 400 V	401 V to 480 V+10%
0.75 kW	6SE6400-3TC00-4AD2	150 m/ 225 m	100 m/ 150 m
2.2 kW and 4.0 kW	6SE6400-3TC01-0BD3	150 m/ 225 m	100 m/ 150 m

ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

Design (continued)

The LC filter limits the rate of rise of voltage and the capacitive charge/discharge currents which occur with converter operation. This means that considerably longer motor cables can be used for operation with LC filters. The service life of the motor is as long as for direct mains operation. It is therefore not necessary to use an output reactor. When LC filters are used, the maximum permissible cable lengths between the motor and converter are:

IPM25 converter power module	LC filter Type	Max. permissible motor cable lengths (shielded/unshielded) for a line voltage of 380 V to 480 V -15% +10%
0.75 kW	6SE6400-3TD00-4AD0	200 m/300 m
2.2 kW and 4.0 kW	6SE6400-3TD01-0BD0	200 m/300 m

When an output reactor or LC filter is used, it is important to note the following during assembly and start-up:
The output reactors and LC filters must be mounted alongside or below the ET 200S station. Vertical alignment is important to ensure adequate cooling. The connecting cable to the converter must be pre-assembled for all components and shortened to a length of approximately 30 cm – the shield of the motor cable must be attached to the output reactor or the LC filter.

The pulse frequency of the converter must be reduced to 4 kHz (the factory setting is 8 kHz). In addition, when an LC filter is used, the converter must be operated in V/f mode.

- **Shield clamps**
To connect the shield of motor cables
- **Grounding terminal**
To ground the 3 x 10 mm busbar for the shield connection
- **Busbar 3 x 10 mm**
To accommodate the shield clamps and the grounding terminal
- **Brake control module**
xB1 or xB2 to control an external electromechanical brake

Function

The ET 200S FC is capable of dynamic control procedures such as sensorless vector control or torque control. Where particular speed accuracy and dynamic response requirements exist, a motor encoder can be connected to the control module.

The ET 200S FC is operated without a line reactor.

A PTC or KTY encoder in the motor can be evaluated by the control module to evaluate the motor temperature.

Integral safety functions are selected via the switch-off modules of a series-connected PM-D F:

- Safely turned off torque (STO). The drive is prevented from starting up)
- Safely reduced speed (the preset motor speed is monitored for correct speed)
- Safe stop 1 (monitoring of braking to standstill or safe reduced speed)

The safety functions of the ET 200S FC are certified according to Category 3 of EN 954-1 and to SIL 2 of IEC 61508.

Accessories

The following accessories are available:

- **MMC parameter memory**
If required, the complete parameter settings of the frequency converter can be saved on a memory card (MMC). When servicing, the plant is immediately ready for use again after replacing the frequency converter and inserting the memory card.

Reacting

ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

Technical specifications

	Control unit	Converter power modules	
	ICU24	IPM25, FS A Frame size A	IPM25, FS B Frame size B
Selection features			
• Integral safety functions according to Category 3 of EN 954-1 or according to SIL 2 of IEC 61508	• Safe stop • Safely-reduced speed ¹⁾ • Safe brake ramp ¹⁾	-	-
• Output	-	0.75 kW	2.2 kW 4.0 kW
• Rated input current (at 50 °C ambient temperature)	-	1.9 A	5.7 A 9.6 A
• Rated output current (at 50 °C ambient temperature)	-	2.1 A	5.9 A 10.2 A
• Mounting dimensions (W x H x D) in mm (including terminal module)	15 x 220 x 156	65 x 290 x 156	130 x 290 x 156
Electrical data			
Line voltage	3 AC 380 V to 480 V +10%/-15%		
Line frequency	47 Hz to 63 Hz		
Overload capability	• Overload current 1.5 x rated output current (i.e. 150% overload capability) for 60s, cycle time 300s • Overload current 2 x rated output current (i.e. 200% overload capability) for 3s, cycle time 300s		
Output frequency	0 Hz to 650 Hz		
Pulse frequency	8 kHz (standard), 2 kHz to 16 kHz (in 2 kHz increments)		
System perturbation	Low loading of power supply network by network harmonics (guide values: 5: 20%, 7: 14%, 11: 9%, 13: 8%)		
Skipped frequency range	1, programmable		
Converter efficiency	≥96 %		
Interfaces	• Connection to PROFIBUS or PROFINET over the ET 200S backplane bus • RS232 interface with USS protocol for commissioning on the PC using the STARTER commissioning software • Activation of the integrated safety functions via PROFIsafe (PM-D PROFIsafe) or terminals (PM-DFX1) • Slot for an optional memory card (MMC) for uploading or downloading parameter settings • PTC/KTY84 interface (Sub-D connector) for motor temperature monitoring • Speed sensor interface (Sub-D connector) for unipolar HTL incremental position encoder		
Functions			
Open-loop/closed-loop control procedure	• V/f control – linear ($M \sim n$) with/without flux current control (FCC), quadratic ($M \sim n^2$) or parameterizable • Vector control – with or without encoder • Torque control		
Operating functions	Jogging mode, free function blocks (FFB), positioning deceleration ramp, automatic restart following interruption due to power failure, bumpless connection of converter to rotating motor		
Braking functions	• Regenerative braking operation without brake chopper and pulsed resistor • Control of an electromechanical holding brake via an optional brake control module		
Protective functions	Undervoltage, overvoltage, ground faults, short circuits, stall prevention, motor thermal protection (I^2t , or sensor) inverter overtemperature, motor blocking protection		
Connectable motors	• Low-voltage asynchronous motors • Motor cable lengths: max. 50 m (shielded) max. 100 m (unshielded) If an output reactor or an LC filter is used, longer cable lengths are possible		
Mechanical data			
Degree of protection	IP20		
Operating temperature	• With vertical design of station • With horizontal design of station	-10 °C to +40 °C -10 °C to +50 °C/to +60 °C with derating	
Standards			
Compliance with standards	UL, cUL ,CE, c-tick, low-voltage directive 73/23/EEC, EMC directive 89/336/EEC		

1) The safety functions "Safely reduced speed" and "Safe braking ramp" are certified for asynchronous motors without encoders - these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

Reacting

ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

Technical specifications (continued)

Derating data – Pulse frequency

Output kW	Rated output current in A at a pulse frequency of							
	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.75	2.1	2.1	2.1	2.1	1.05	1.05	1.05	1.05
2.2	5.9	5.9	5.9	5.9	5.3	5.3	5.3	5.3
4.0	10.2	10.2	10.2	10.2	5.1	5.1	5.1	5.1

The current data apply to an ambient temperature of 50°C unless specified otherwise.

Ordering data

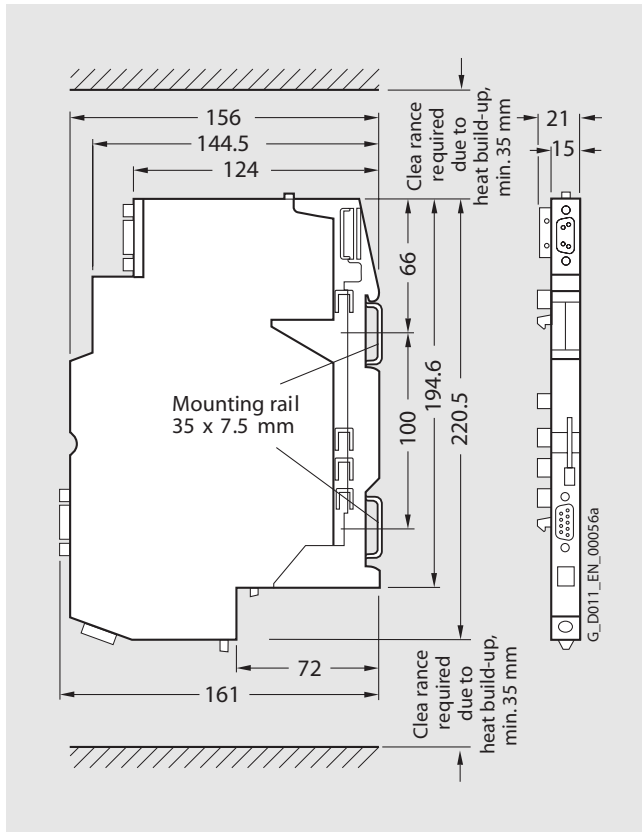
	Version	Order No.
	ICU24F control unit - Control modes: V/f, FCC, SLVC, VC with encoder, torque control - Motor encoder input: HTL unipolar - Motor temperature input: PTC/KTY - Integrated safety functions	6SL3244-0SA01-1AA1
	IPM25 converter power module 380 V – 480 V 3 AC +10/-15% 47 Hz – 63 Hz Overload: 150% 60 s 200% 3 s Power: 0.75 kW	6SL3225-0SE17-5UA1
	IPM25 converter power module 380 V – 480 V 3 AC +10/-15% 47 Hz – 63 Hz Overload: 150% 60 s 200% 3 s Power: 2.2 kW 4.0 kW	6SL3225-0SE22-2UA1 6SL3225-0SE24-0UA1

Reacting

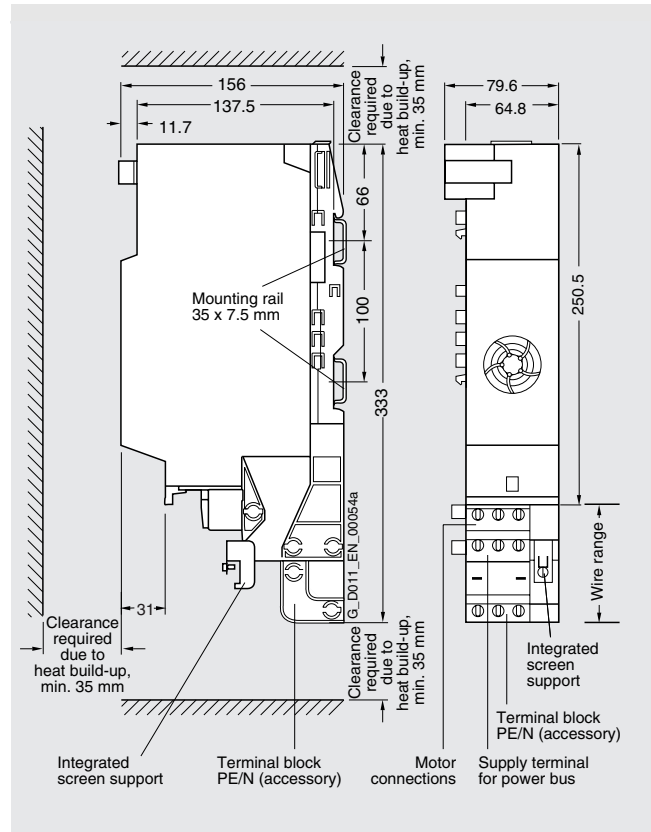
ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

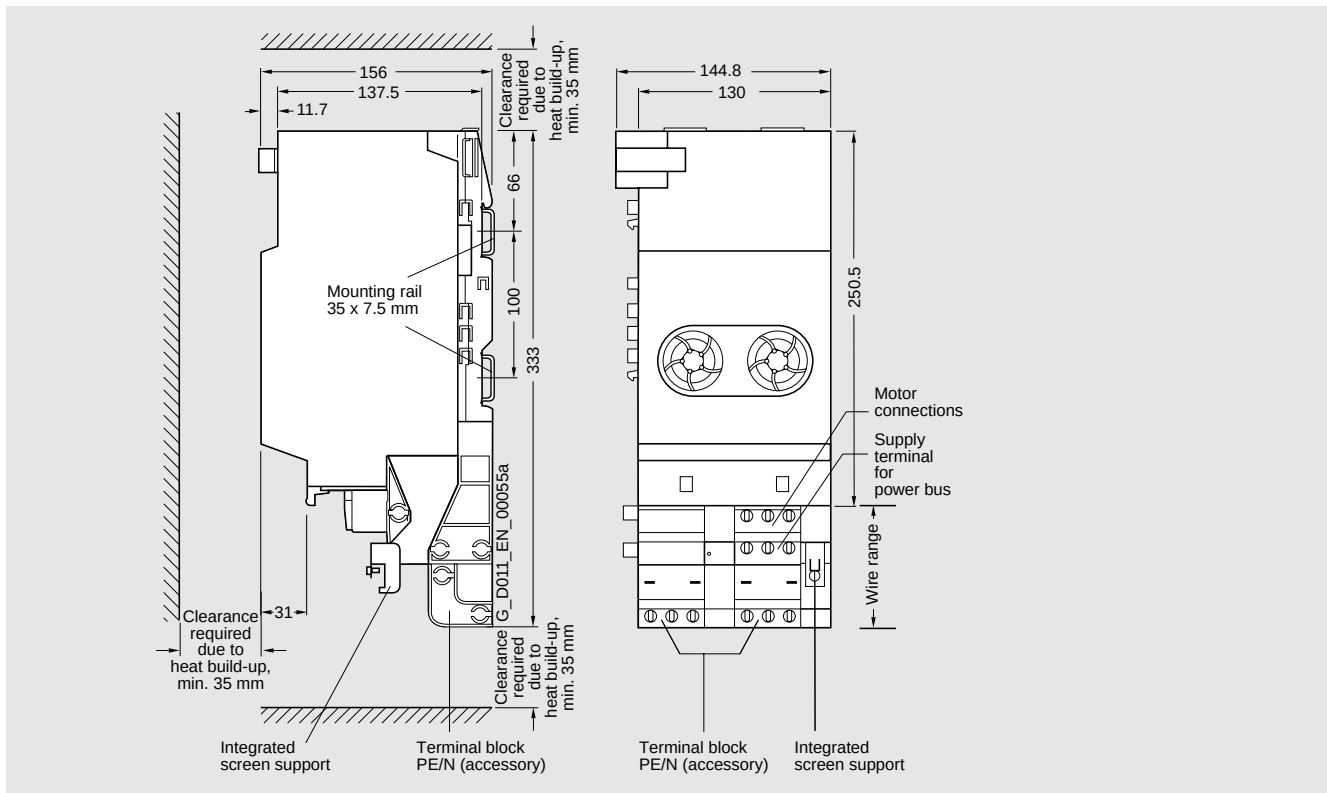
Dimension drawings



ICU24F control unit

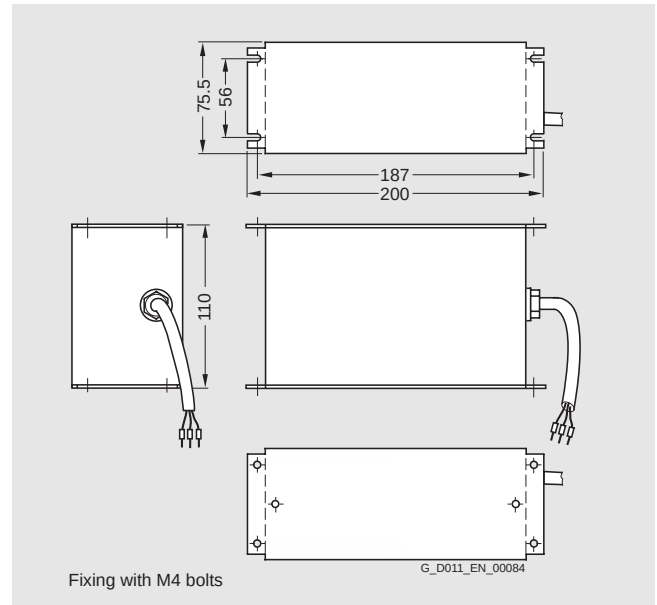
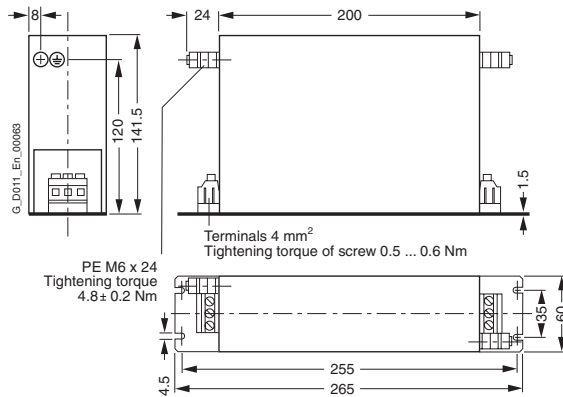
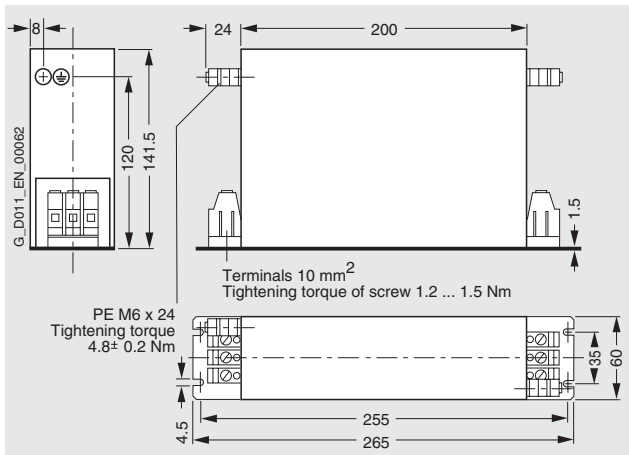


IPM25 converter power module, 0.75 kW

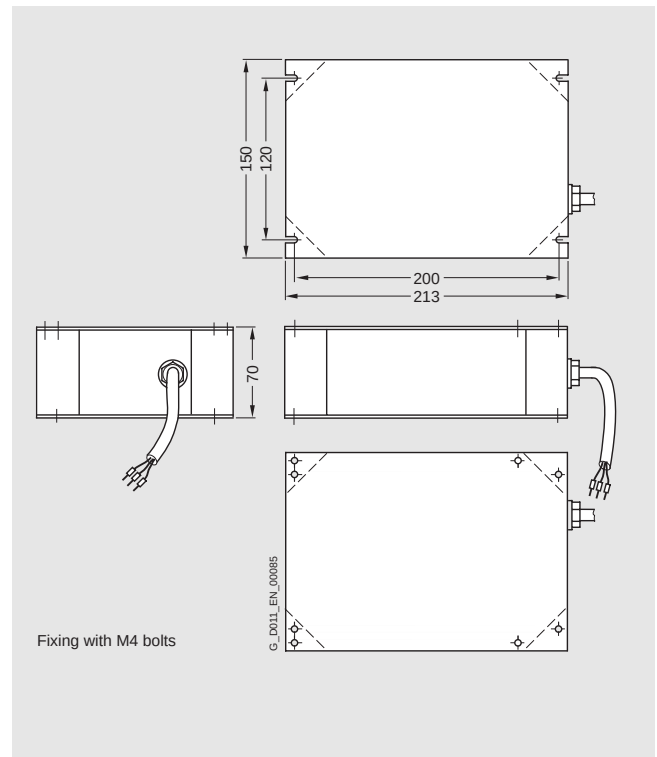


IPM25 converter power module, 2.2 kW and 4.0 kW

Dimension drawings (continued)



Output choke for IPM25 FS A



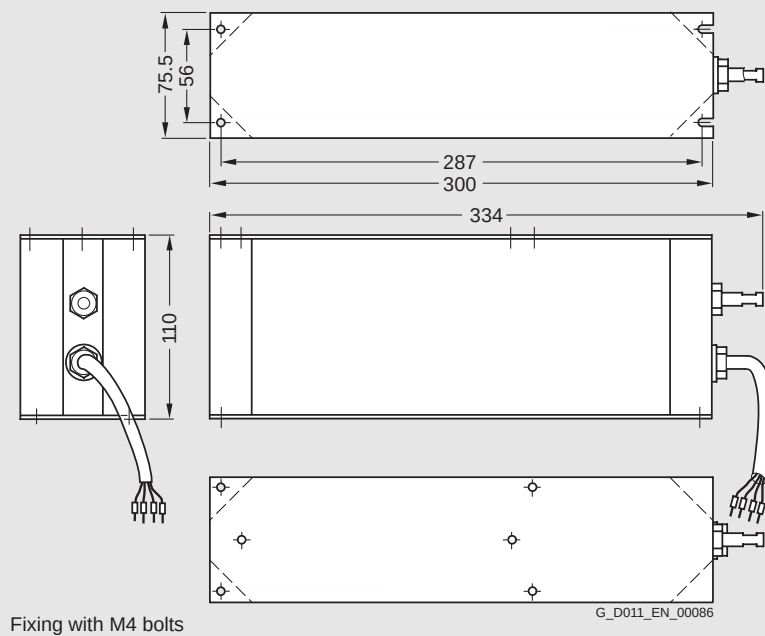
Output choke for IPM25 FS B

Reacting

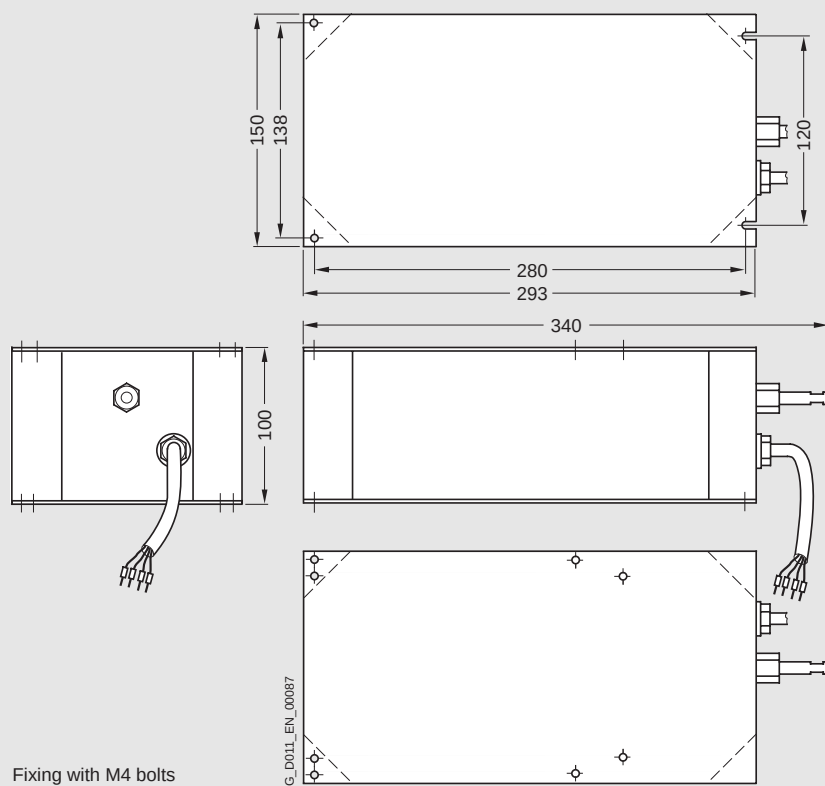
ET 200S motor starters and frequency converters

ET 200S FC fail-safe frequency converter

Dimension drawings (continued)



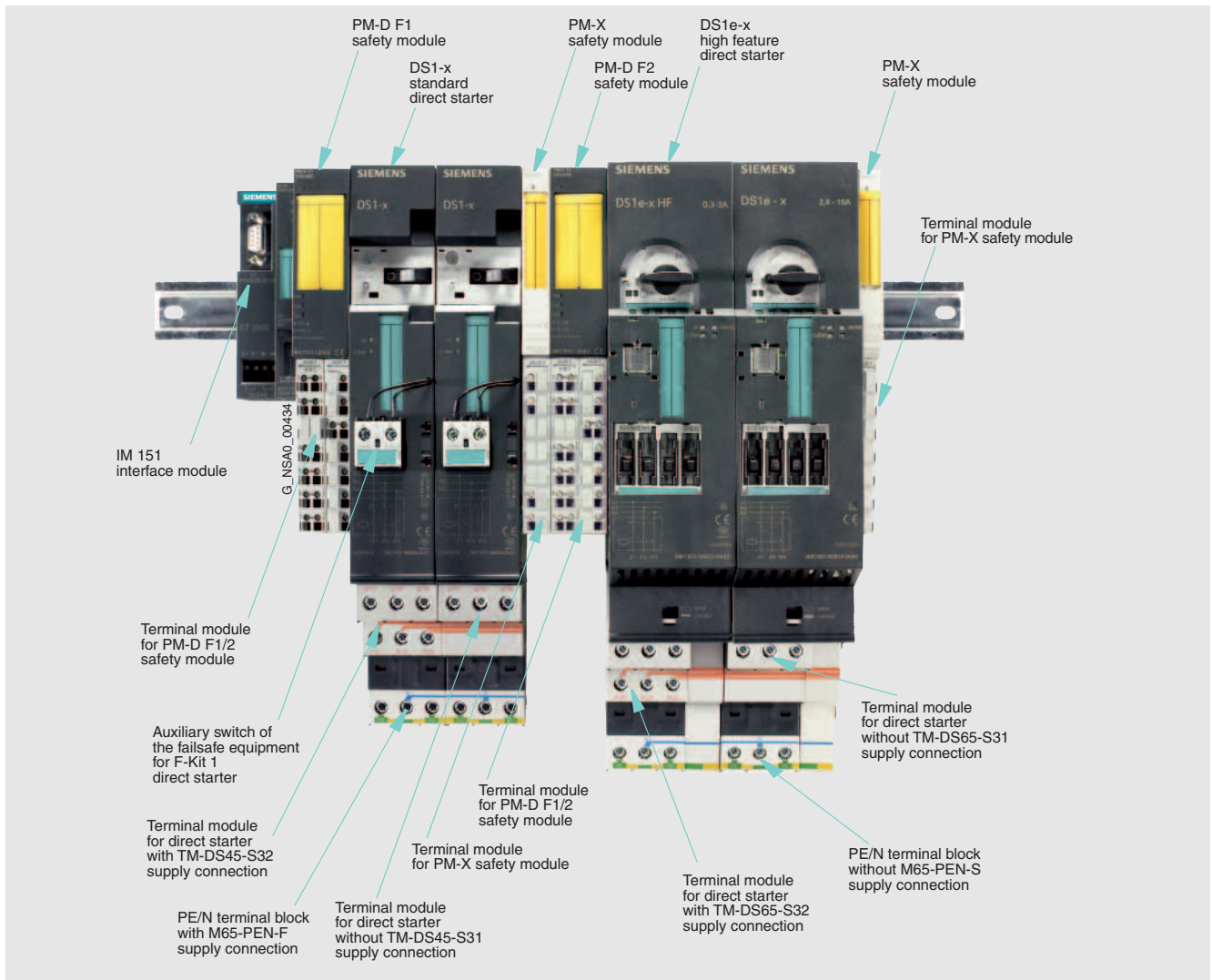
LC filter for IPM25 FS A



LC filter for IPM25 FS B

Reacting

ET 200S motor starters and frequency converters

Safety module local
Overview


Interplay of ET 200S safety motor starters Solutions local components



Safety Module PM-D F1

Safety Motor Starter Solutions local

- For use of Standard, High-feature or Fail-safe motor starters in systems with safety categories 2 to 4 (acc. to EN 954-1)
- No complex wiring for conventional safety systems
- Can also be used in combination with external safety relays
- Can also be used to activate external safety systems
- Safety module available for function-monitored and automatic starting
- Safety module available for Stop category 0 and 1
- Safety module for monitoring the auxiliary voltages for motor starters
- Safety modules can be plugged into the TM-PF30 terminal modules.

PM-D F1/F2/F3/F4/F5 safety modules

- PM-D F1/F2/F3/F4 safety modules monitor auxiliary voltages and contain the complete functionality of a safety relay:
 - PM-D F1
 For evaluation of EMERGENCY STOP circuits with the function "monitored start".

Reacting

ET 200S motor starters and frequency converters

Safety module local

- PM-D F2
For evaluation of protective doors with the function "auto-matic start".
- PM-D F3
Expansion to PM-D F1/F2 for time-delayed shutdown.
- PM-D F4
For expansion of safety circuits with other ET 200S motor starters, e.g. in a different line.
- PM-D F5
Transmits the status from PM-D F1 ... 4 through four floating enabling circuits to external safety equipment (contact multipliers)
- The PM-D F1 and PM-D F2 modules can be combined with the PM-D F3 or PM-D F4 modules.
- A PM-D F5 can be positioned at any point between a PM-D F1 ... 4 and a PM-X.
- Safety modules monitor the U1 and U2 auxiliary voltages. A voltage failure is relayed as a diagnostics signal over the bus.
 - No additional PM-D safety module is required when the safety modules are used.
 - Each safety circuit, beginning with a PM-D F1 ... 4, must be terminated with one PM-X each.

Fail-safe Kit

The Fail-safe Kit (F-Kit) must be added to each Standard motor starter in a safety segment in order to monitor the switching function.

F-Kit 1 supplements the DS1-x direct-on-line starter, F-Kit 2 the RS1-x reversing starter.

The F-Kits are comprised of:

- Contact supports for the terminal modules
- One or two auxiliary switch blocks for the contactor/contactors of the motor starter
- Connecting leads

High Feature motor starters and their terminal modules come as standard with the functionality of the F-Kits integrated.

Examples

The diverse possible uses of the safety motor starter Solutions local are presented in the manual SIMATIC ET 200S Motor Starters in the context of typical sample applications.

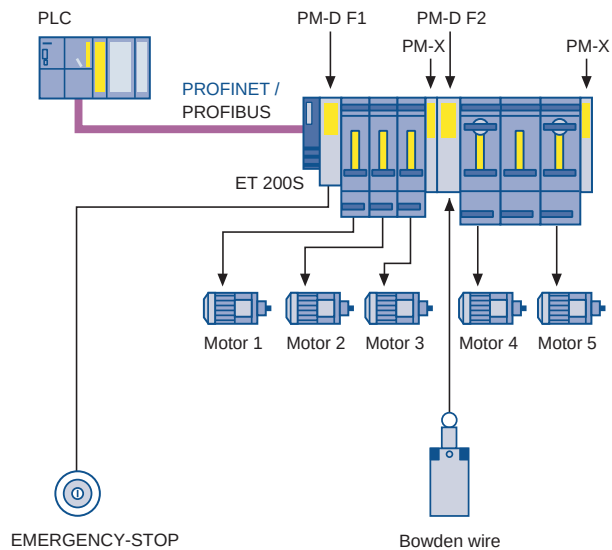
Safety functional examples for easy, quick and low-cost implementations of applications with safety motor starters Solutions local are available in the Internet:

You can find more information in the Internet at:

<http://www.siemens.com/sirius-starting>

<http://www.siemens.com/ET200S>

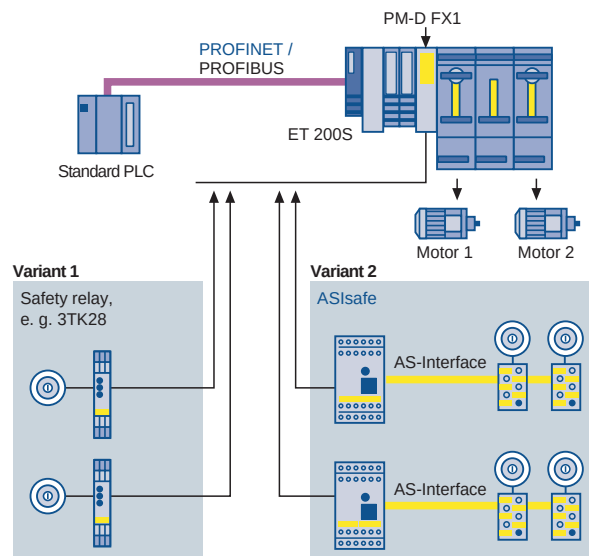
Example 1:



NSA0_00433

ET 200S safety motor starter Solutions local with 2 safety circuits (= shutdown groups), Standard motor starters and High Feature motor starters

Example 2:



NSA0_00431

ET 200S safety motor starter Solutions local with 2 external safety assemblies (= safety relays or ASIsafe monitors) and with Fail-safe motor starters (PM-DFX-1 application). 2 of the 6 available safe shutdown groups are used.

Signals with relevance for safety can be input to ET 200S through a PM-DFX1 infeed terminal module through the release circuits of the ASIsafe monitor or the safety relay to control the Fail-safe motor starters which then selectively switch off the downstream motors.

ET 200S motor starters and frequency converters

Safety module local

Application

With the Safety Motor Starter Solutions local it is easy to configure several safety circuits. The safety sensors are connected directly and locally to the safety modules. These safety modules perform the work of the otherwise obligatory safety relays and safely shut down the downstream motor starters in accordance with the function selected. The crosslinks required for this are already integrated in the system and need no additional wiring. All signals from the safety modules are automatically relayed as diagnostics signals, e.g. in the event of crossover in the EMERGENCY STOP circuit.

The highest safety category 4 acc. to EN 954-1 can be obtained with safety motor starters Solutions local. They can thus be used for evaluation of EMERGENCY STOP circuits or for monitoring protective doors and also for time-delayed shutdowns. With the contact multiplier the safety-relevant signals can also be made available to external systems.

All standard safety applications can be covered through combination of different TM-PF30 terminal modules. Needless to say, ET 200S motor starters can also be used in conjunction with external safety relays or with ASIsafe.

Use of the PM-DFX1 safety module: The PM-DFX1 safety module is used for feeding in 1 to 6 shutdown groups. The infeed voltage can be switched using 1 to 6 external safety shutdown devices (either ASIsafe monitors or 3TK28 safety relays). This safety module is used in applications with external safety shutdown devices where there is a need for the fully selective safety shutdown of Fail-safe motor starters/frequency converters.

With the Safety Motor Starter Solutions local, up to 80 % of wiring is saved compared to conventional safety systems with local safety applications.

Local actuation of the fail-safe frequency converter

The PM-DFX1 safety module is used for feeding in 1 to 6 shutdown groups. The infeed voltage can be switched using 1 to 6 external safety shutdown devices (either ASIsafe monitors or 3TK28 safety relays).

This safety module is used in applications with external safety shutdown devices where there is a need for actuating the fail-safe functions of the ET200S FC fail-safe frequency converter. The safety functions of the ET 200S FC frequency converter are compliant with Category 3 according to EN 954-1 and with SIL2 according to IEC 61508.

Terminal modules for (TM-PF30) Safety Module

For supplying load and sensor voltage to the potential bars of the motor starters, and for connection of the 2-channel sensor circuit (e.g. EMERGENCY STOP button) and a reset button. Different terminal modules are available for the configuring of separate safety circuits or for the cascading of safety circuits, and for applications with time-delayed shutdown.

Terminal module for (TM-X) Safety Module

For connection of an external infeed contactors (2nd shutdown possibility). With terminals for contactor coil and feedback contact. Is always required to terminate a group of safety-oriented motor starters.

Reacting

ET 200S motor starters and frequency converters

Safety module local

Selection and Ordering data

	Version	Order No.	Weight kg
Safety Module			
 3RK1 903-1BA00	PM-D F1 with diagnostics; power module for emergency-off application Monitored start	3RK1 903-1BA00	0.216
	PM-D F2 with diagnostics; power module for protective door monitoring Automatic start	3RK1 903-1BB00	0.218
	PM-D F3 with diagnostics Power module for the expansion of PM-D F1/2 for an additional voltage group; Time-delayed (0 to 15 s)	3RK1 903-1BD00	0.209
 3RK1 903-3DA00	PM-D F4 SIGUARD with diagnostics; power module for the expansion of PM-D F1/2 for an add. voltage group	3RK1 903-1BC00	0.225
	PM-D F5 SIGUARD with diagnostics Power module for the expansion of PM-D F1 ... 4 with four floating release circuit; contact multipliers	3RK1 903-1BE00	0.222
	PM-D FX1 With diagnostics; infeed terminal module for feeding in 1 to 6 shutdown groups	3RK1 903-3DA00	0.123
	F-CM contact multipliers With 4 safe floating contacts	3RK1 903-3CA00	0.223
Accessories			
 3RK1 903-1CA00 3RK1 903-1CA01	PM-X SIGUARD connection module with diagnostics Module for connecting a safety group and for connecting an external infeed contactor or for connecting to an external safety circuit	3RK1 903-1CB00	0.068
	F Kit 1 Fail-safe equipment for DS1-x Standard motor starter ¹⁾	3RK1 903-1CA00	0.030
	F Kit 2 Fail-safe equipment for RS1-x standard motor starter ¹⁾	3RK1 903-1CA01	0.056
Components for safety modules			
 3RK1 903-1AA00	Terminal modules		
	TM-PF30 S47-B1 For PM-D F1/2 Safety Modules; with infeed U_1/U_2 and sensor connection	3RK1 903-1AA00	0.408
	TM-PF30 S47-B0 For PM-D F1/2 Safety Modules; with sensor connection	3RK1 903-1AA10	0.393
	TM-PF30 S47-C1 For PM-D F3/4 Safety Modules; with infeed U_1/U_2 and actuation input IN+/IN-	3RK1 903-1AC00	0.399
	TM-PF30 S47-C0 For PM-D F3/4 Safety Modules; with infeed U_2	3RK1 903-1AC10	0.378
	TM-PF30 S47-D0 With PM-D F5 safety module	3RK1 903-1AD10	0.400
	TM-X15 S27-01 For PM-X safety module	3RK1 903-1AB00	0.201
	TM-P15-S27-01 terminal module For PM-D power module	3RK1 903-0AA00	0.224
	TM-PFX30 S47-G0/G1 terminal module For PM-D FX1 safety module (infeed terminal module)		
	• Infeed left (TM-PFX30 S47-G0)	3RK1 903-3AE10	0.408
	• Infeed center (TM-PFX30 S47-G1)	3RK1 903-3AE00	0.405
	TM-FCM30 S47-F01 terminal module For F-CM contact multiplier	3RK1 903-3AB10	0.410

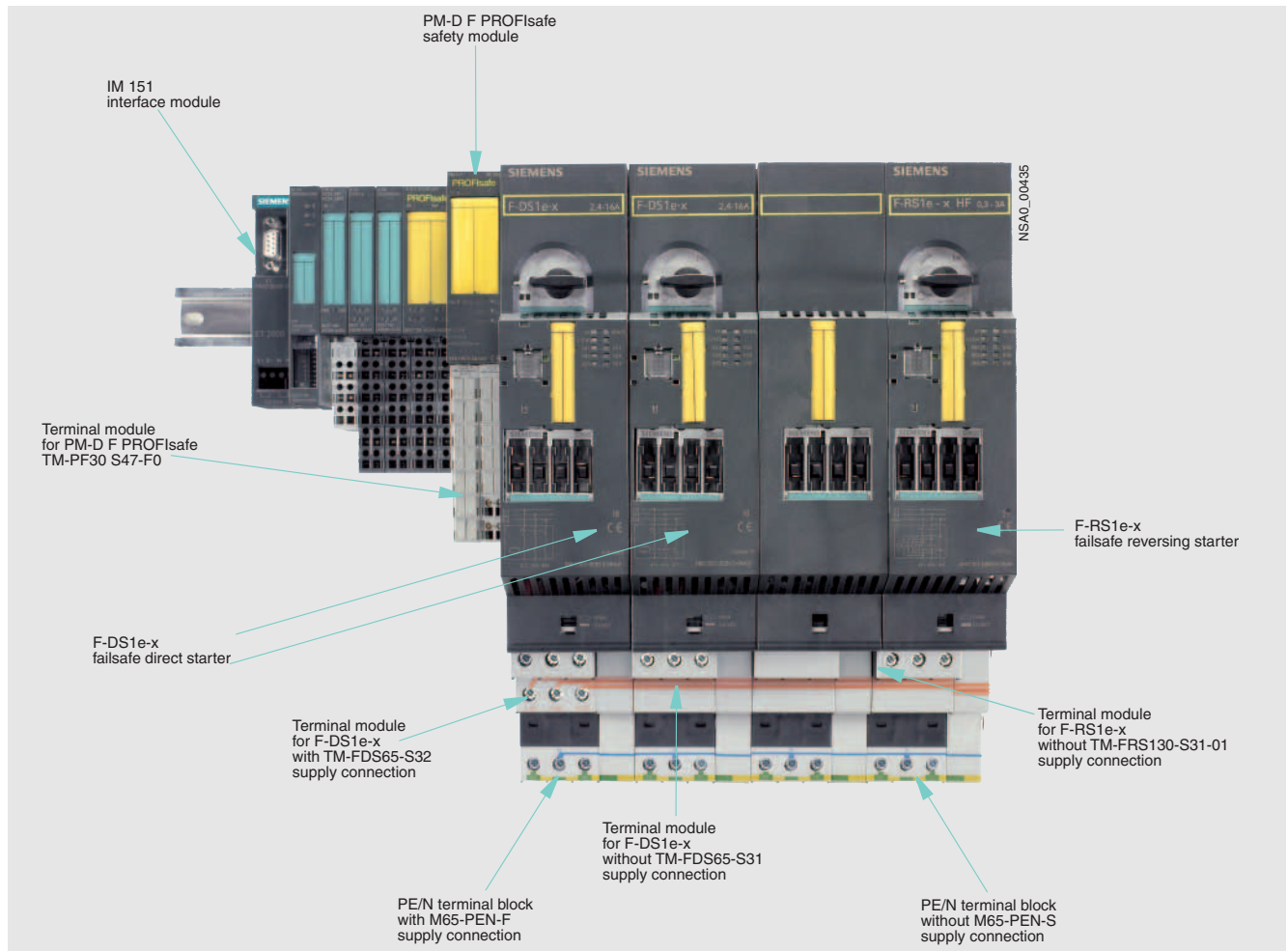
¹⁾ The function of the fail-safe kit is already integrated into High Feature motor starters.

Reacting

ET 200S motor starters and frequency converters

PROFIsafe safety module

Overview



Interplay of ET 200S safety motor starter Solutions PROFIsafe components

Safety Motorstarter Solution PROFIsafe



PM-D F PROFIsafe and Terminal module

Sensor and actuator assignment are freely configurable within the framework of the distributed safety concept:

The logic of the safety functions is implemented by software. Safety-oriented PROFIsafe communication and the use of a safety-oriented control system are required.

Integration of the safety system in the standard automation is realized through a single bus system (see Advantages of PROFIsafe), using PROFIBUS as well as PROFINET.

- For the use of Fail-safe motor starters in plants with safety category 2 to 4 acc. to EN 954-1 and SIL 2 and 3 acc. to IEC 61508. The use of Standard or High Feature motor starters is also possible with certain assemblies
- High flexibility (any assignment of sensors to motor starters using the PLC)
- Full selectivity of disconnection of the Fail-safe motor starters
- No complex wiring for conventional safety systems, e.g. no infeed contactors even in the highest safety category
- Can also be used in combination with external safety relays
- Can also be used to activate external safety systems
- Safety module available for any safety function
- Safety module available for Stop category 0 and 1
- Safety module for monitoring the auxiliary voltages for motor starters
- Safety modules can be plugged into the TM-PF30 terminal modules

Reacting

ET 200S motor starters and frequency converters

PROFIsafe safety module

High degree of flexibility with safety engineering Fail-safe motor starter for PROFIsafe:

In EMERGENCY STOP applications, the Fail-safe motor starters are selectively switched off through the upstream safety module PM-D F PROFIsafe. For each safety module, six switch-off groups can be formed. In the first delivery stage, the Fail-safe freely-programmable logic of the SIMATIC controller is used to interface with the relevant Fail-safe sensors. The interface between PROFIsafe and installations that use conventional safety systems is implemented through the Fail-safe Contact Multiplier F-CM with four floating contacts.

Example:

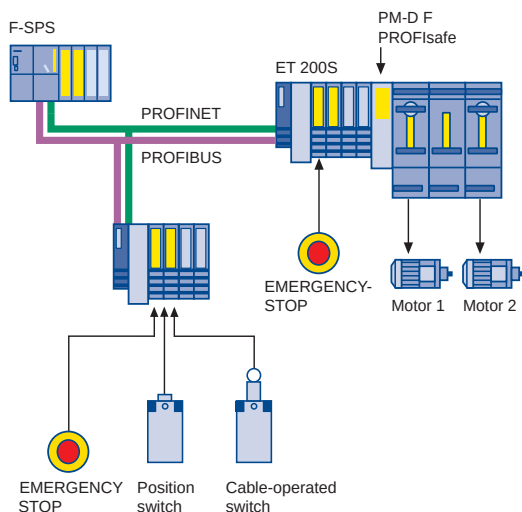
The diverse possible uses of the safety motor starter Solutions PROFIsafe are presented in the manual SIMATIC ET 200S Motor Starters in the context of typical sample applications.

Safety functional examples for easy, quick and low-cost implementations of applications with safety motor starters Solutions local are available on the Internet:

Additional information is available in the Internet under:

<http://www.siemens.com/sirius-starting>

<http://www.siemens.com/ET200S>



NSA0_00432a

ET 200S safety motor starter Solutions PROFIsafe with Fail-safe motor starters and fully selective shutdown (PM-DF PROFIsafe application)

Within an ET 200S station the Fail-safe motor starters are assigned to one of 6 safety segments. For plants with distributed configuration the shutdown signals of these safety segments are preferably issued by a higher level, safety-oriented control system through PROFIsafe. This permits the greatest flexibility for assigning the motor starters to different safety circuits.

Alternatively, an ET 200S F-CPU can also be used for control purposes

Applications

Solution PROFIsafe safety motor starters

If a safety-oriented SIMATIC CPU is used, the ET 200S is available as a safety-oriented peripheral. Nevertheless, in such a station it is possible to configure conventional motor starters and input/output modules mixed with modules with safety functions.

Thanks to the PROFIsafe profile the safety functions are available in the complete network, which means that the Solution PROFIsafe safety motor starters enable the selective shutdown of a group of Standard, High Feature or Fail-safe motor starters regardless of where and on which peripheral station the safe control devices were connected. As such this solution provides an unprecedented level of flexibility and reduction of wiring for applications in wide-spread plants or with a sporadic demand for changes in the assignment of safety segments.

The Solution PROFIsafe safety motor starters are ideally suited for safety concepts with Cat. 2 to 4 acc. to EN 954-1- or up to SIL 3 acc. to IEC 61508.

Each safety module switches up to 6 shutdown groups for Fail-safe motor starters/frequency converters.

PM-D F safety module PROFIsafe

The PM-D F PROFIsafe safety module receives the shutdown signal from the interface module of the ET 200S and safely switches off 1 to 6 shutdown groups. This safety module is used in PROFIsafe applications where there is a need for the selective safety shutdown of Fail-safe motor starters/frequency converters.

Reacting

ET 200S motor starters and frequency converters

PROFIsafe safety module

Selection and Ordering data

Version	Order No.	Weight kg
PM-D F PROFIsafe safety modules For PROFIBUS and PROFINET For fail-safe motor starters For fail-safe contact multipliers Six switch-off groups (SG1 to SG6)	3RK1 903-3BA01	0.139
F-CM contact multipliers With 4 safe floating contacts	3RK1 903-3CA00	0.223
Components for safety module PROFIsafe		
TM-PF30 S47-F0 terminal module For PM-D F PROFIsafe safety module	3RK1 903-3AA00	0.360
TM-FCM30 S47-F01 terminal module For F-CM contact multiplier	3RK1 903-3AB10	0.410
Components for frequency converters and fail-safe frequency converters		
TM-ICU15 terminal modules For ICU24 / ICU24F control module of the frequency converter	3RK1 903-3EA10	0.097
TM-IPM65 terminal modules For IPM25 power section 0.75 kW, of the frequency converter		
• With incoming energy bus connection (TM-IPM65-S32)	3RK1 903-3EC00	0.020
• Without incoming energy bus connection (TM-IPM65-S31)	3RK1 903-3EC10	0.020
TM-IPM130 terminal modules For IPM25 power section 2.2 kW and 4.0 kW of the frequency converter		
• With incoming energy bus connection (TM-IPM130-S32)	3RK1 903-3ED00	0.020
• Without incoming energy bus connection (TM-IPM130-S31)	3RK1 903-3ED10	0.020
PE/N terminal blocks M65-PEN-F With supply terminals With caps	3RK1 903-2AC00	0.093
Terminal block M65-PEN-S Without incoming energy connection	3RK1 903-2AC10	0.099

Reacting

ET 200pro motor starters and frequency converters

Motor starter standard and high feature

Overview



Motor starters

- Only two variants up to 5.5 kW
- All settings can be parameterized by bus
- Comprehensive diagnostics signals
- Overload can be acknowledged by remote reset
- Current unbalance monitoring
- Stall protection
- Emergency start function in the event of overload
- Current value transmission by bus
- Current limit monitoring
- Direct-on-line or reversing starters
- Power bus can be plugged in using the new HAN Q4/2 plug-in connectors
- Conductor cross-sections up to 6 x 4 mm²
- 25 A per segment (power looped through using jumper plug)
- In the Standard and High-Feature versions (with 4 DI onBoard)
- Electromechanical switching and electronic switching
- Electronic starter for direct activation or with integrated smooth starter function
- Supplied with 400 V AC brake contact as an option

Isolator modules

The isolator module with switch disconnecter function is used for safe disconnection of the 400 V operational voltage during repair work in the plant and provides an integrated group fusing function (i.e. additional group short-circuit protection for all subsequently supplied motor starters).

Depending on the power distribution concept, all stations can be equipped with an isolator module as an option.

Safety applications

Safety local isolator module

With the Safety local modules

- Safety local isolator module and
- 400 V disconnecting module

it is possible to achieve safety category 4/SIL 3 with an appropriate connection.

Safety Solution PROFIsafe

With the Safety PROFIsafe modules

- F-Switch and
- 400 V disconnecting module

it is likewise possible to achieve safety category 4/SIL 3 with an appropriate connection.

Benefits

ET 200pro motor starters provide the following advantages:

- High flexibility thanks to a modular and compact design
- Little variance among all motor starter versions (2 units up to 5.5 kW)
- Extensive parameterization using STEP 7 HW-Config
- Increase of plant availability through fast replacement of units (easy mounting and plug-in technology)
- Extensive diagnostics and information for preventive maintenance
- Parameterizable inputs for local control functions (High-Feature)
- Cabinet-free construction thanks to high degree of protection IP65.

Application

With the ET 200pro motor starters, any three-phase loads can be protected and switched. They are an integral part of ET 200pro and have the high degree of protection IP65. This makes them ideal for operation in modular, distributed peripherals without control cabinets or control enclosures.

The ET 200pro motor starters are available both with mechanical as well as electronic contacts.

The ET 200pro electromechanical starters are offered as direct (DSe/DSe) and reversing starters (RSe/RSe) in the High-Feature version with the following features:

- 4 digital inputs
- Device versions with or without control for externally fed brakes with 400 V AC
- With expanded parameterization capabilities.

The ET 200pro electronic starters are offered as direct (DSe/DSe) and reversing starters (RSe/RSe) in the High-Feature version with the following features:

- 4 digital inputs
- With soft-starting and soft ramp-down function
- With deactivated smooth start function as an electronic starter for applications with a high level of switching frequency
- Device versions with or without control for externally fed brakes with 400 V AC
- With expanded parameterization capabilities

As the result of the protection concept with solid-state overload evaluation and the use of SIRIUS controls size S00, additional advantages are realized on the standard and High-Feature motor starters – advantages which soon make themselves positively felt particularly in manufacturing processes with high plant stoppage costs:

- Configuration is made easier by the fine modular structure. When using the ET 200pro motor starters, the list of parts per load feeder is reduced to two main units: the bus module and the motor starter. This makes the ET 200pro ideal for modular machine concepts or solutions for conveying systems and in machine-tool building.
- Expansions are easily possible through the subsequent adding of modules. The innovative plug-in technology also does away with the wiring needed up to now. Through the hot swapping function (disconnection and connection during operation) a motor starter can be replaced within seconds if necessary, without having to shut down the ET 200pro station and with it the process in the plant. The motor starters are therefore recommendable in particular for applications with special demands on availability. Storage costs are optimized in addition by the low level of variance (2 units up to 5.5 kW).

The ordering option for motor starters with a 400 V AC brake output provides the possibility of controlling motors with 400 V AC brakes. With four locally acting inputs available on the

ET 200pro motor starters and frequency converters

Motor starter standard and high feature

High-Feature motor starter it is possible to realize autonomous special functions which work independently of the bus and the higher-level control system, e.g. as a quick stop on gate valve controls or limit position disconnectors. In parallel with this, the states of these inputs are signaled to the control system.

When using the optional isolator module with switch disconnect and group fusing function for the ET 200pro, the 400 V supply of the motor starters can be switched on and off directly in the field, i.e. locally.

Reacting

ET 200pro motor starters and frequency converters

Motor starter standard and high feature

Technical specifications

	Motor starters, High-Feature	
	Motor starters, Standard DSe, RSe	DSe, RSe sDSSSte, sDSte, sRSSSte, sRSte
General data		
Motor starters that can be connected to ET 200pro or modules with a width of 110 mm	Max. 8	
Mounting dimensions (W x H x D) in mm		
• Direct-on-line starter and reversing starter	110 x 230 x 150	110 x 230 x 160
Permissible ambient temperature		
• During operation	-25 ... +55 °C, from +40 °C with derating	
• During storage	-40 ... +70 °C	
Permissible mounting positions	Vertical, horizontal	
Vibration resistance according to IEC 60068, Part 2-6	2 g	
Shock resistance according to IEC 60068, Part 2-27	Half-sine 15 g/11 ms	
Power consumption	DC 24 V	
• From auxiliary circuit L+/M (U1)	Approx. 40 mA	
• From auxiliary circuit A1/A2 (U2)	Approx. 200 mA	
Rated operational current for power bus I_e	25	
Rated operational voltage U_e	400 V AC	
• Approval according to EN 60947-1, Appendix N	Up to 200 V AC	Up to 400 V AC
• Approval according to CSA and UL	Up to 600 V AC	Up to 480 V AC
Approval according to DIN VDE 0106, Part 101	Up to 500 V AC	Up to 480 V AC
CSA and UL approval	Up to 600 V AC	Up to 480 V AC
Conductor cross-sections		
• Incoming energy supply	max. 6 x 4 mm ²	
Degree of protection	IP65	
Touch protection	Touch protection	
Degree of pollution	3, IEC 60664 (IEC 61131)	
Rated impulse withstand voltage U_{imp}	6 kV	
Rated insulation voltage U_i	400 V	
Rated operational current for starters I_e		
• AC-1/2/3 at 40 °C		
- At 400 V	0.15 ... 2.0 A/1.5 ... 12.0 A	0.15 ... 2.0 A/1.5 ... 12.0 A ¹⁾
- At 500 V	0.15 ... 2.0 A/1.5 ... 9.0 A	
• AC-4 at 40 °C		
- At 400 V	0.15 ... 2.0 A/1.5 ... 4.0 A	
Rated short-circuit breaking capacity	100 kA at 400 V	
Type of coordination according to IEC 60947-4-1	1	
Power of induction motors at 400 V	Max. 5.5 kW	Max. 5.5/4 kW ²⁾
Utilization categories	AC-1, AC-2, AC-3, AC-4	AC-53a ³⁾ (max. 9 A with deactivated soft starter function up to CLASS 10)
Safe isolation between main and auxiliary circuits	400 V, according to EN 60947-1, Appendix N	
Service life of contactor		
• Mechanical	30 million operating cycles	--
• Electrical	Up to 10 million operating cycles; dependent on the current loading (see Manual)	--
Reliable switching frequency	Dependent on the current loading, motor starting time and relative ON period (see Manual)	
Operating times at 0.85 ... 1.1 x U_e		
• Closing delay	11 ... 50 ms	--
• Opening delay	5 ... 45 ms	--

1) Caution!

With deactivated soft starter control function the permissible rated operational current is reduced to 9 A up to CLASS 10.

2) With parameterization as electronic starter max. 4 kW.

3) 8-hour operation.

Reacting

ET 200pro motor starters and frequency converters

Motor starter standard and high feature

Technical specifications (continued)

	Motor starters, Standard DSe, RSe	Motor starters, High-Feature DSe, RSe	sDSSSte, sDSte, sRS- Ste, sRSte
Device functions			
Parameterizable rated operational current	Yes		
Parameterizable current limit values	No	Yes, 2 limit values	
Parameterizable response in case of current limit violation	No	Yes	
Zero current monitoring	Yes		
Parameterizable response in case of zero current violation	Yes		
Parameterizable current unbalance limit	No, fixed limit value (30 % $\times I_e$)	Yes, 30 % ... 60 % $\times I_e$	
Parameterizable response in case of unbalance limit violation	Yes		
Motor blocking monitoring	No	Yes	
Parameterizable blocking current limit value	No	Yes, 150 % ... 1000 % $\times I_e$	
Parameterizable blocking time limit value	No	Yes, 1 ... 5 s	
Current value transmission	Yes		
Group warning diagnostics	No	Yes, parameterizable	
Group diagnostics	Yes, parameterizable		
Emergency start	Yes		
Digital inputs	No	Yes, 4 inputs	
• Parameterizable input signal	No	Yes, latching/ non-latching	
• Parameterizable input level	No	Yes, NC contacts/NO contacts	
• Parameterizable input signal delay	No	Yes, 10 ... 80 ms	
• Parameterizable input signal extension	No	Yes, 0 ... 200 ms	
• Parameterizable input control actions	No	Yes, 12 different actions	
400 V brake output	Yes, ordering option		
Parameterizable brake enabling delay	Yes, -2.5 ... 2.5 s		
Parameterizable holding time of the brake during stopping	Yes, 0 ... 25 s		
Parameterizable start-up type	No		Yes
Parameterizable ramp-down time	No		Yes
Parameterizable starting voltage	No		Yes
Parameterizable stop voltage	No		Yes
Local device interface	Yes		
Firmware update	Yes, by trained personnel		
Thermal motor model	Yes		
Parameterizable trip class	No, CLASS 10 fixed	Yes, CLASS 5, 10, 15, 20	
Parameterizable response in case of overload of thermal motor model	No	Yes, 3 possible states	
Advance warning limit for motor heating	No	Yes, parameterizable 0 ... 95 %	
Advance warning limit time-related trip reserve	No	Yes, parameterizable 0 ... 500 s	
Parameterizable recovery time	No	Yes, 1 ... 30 min	
Parameterizable zero voltage safety	No, permanently inte- grated	Yes	
Reversing start function	Yes, ordering option		
Parameterizable interlock time for reversing starters	No, 150 ms fixed	Yes, 0 ... 60 s	
Integrated logbook functions	Yes, 3 device logbooks		
Integrated statistics data memory	Yes		
Parameterizable response in case of CPU / master stop	Yes		
Device indications			
• Group fault	SF LED (red)		
• Switching state	STATE LED (red, yellow, green)		
• Device status	DEVICE LED (red, yellow, green)		
• Digital inputs	No	IN 1 ... IN 4, LED	

Reacting

ET 200pro motor starters and frequency converters

Motor starter standard and high feature

Selection and ordering data

Version		Order No.
Standard motor starters, mechanical¹⁾		
Motor protection: thermal model		
	DSe direct-on-line starters	
	• Without brake output	3RK1 304-5 S40-4AA0
	• With brake output 400 V AC	3RK1 304-5 S40-4AA3
	RSe reversing starters	
	• Without brake output	3RK1 304-5 S40-5AA0
	• With brake output 400 V AC	3RK1 304-5 S40-5AA3
High-Feature motor starters, mechanical¹⁾		
Motor protection: thermal model		
	DSe direct-on-line starters	
	• Without brake output and with 4 inputs	3RK1 304-5 S40-2AA0
	• With brake output 400 V AC and 4 inputs	3RK1 304-5 S40-2AA3
	RSe reversing starters	
	• Without brake output and with 4 inputs	3RK1 304-5 S40-3AA0
	• With brake output 400 V AC and 4 inputs	3RK1 304-5 S40-3AA3
	Setting range of rated operational current	
	• 0.15 ... 2.0 A	K
	• 1.5 ... 12.0 A	L
High-Feature motor starters, electronic^{1) 2)} 		
Full motor protection, comprising thermal motor protection and thermistor motor protection		
	sDSSSte/sDSSte direct-on-line starters	
	• Without brake output and with 4 inputs	3RK1 304-5 S70-2AA0
	• With brake output 400 V AC and 4 inputs	3RK1 304-5 S70-2AA3
	sRSSSte/sRSSte reversing starters	
	• Without brake output and with 4 inputs	3RK1 304-5 S70-3AA0
	• With brake output 400 V AC and 4 inputs	3RK1 304-5 S70-3AA3
	Setting range of rated operational current	
	• 0.15 ... 2.0 A	K
	• 1.5 ... 12.0 A	L

1) Only functions when used together with the backplane bus module and the wide module rack.

The backplane bus module and the wide module rack must be ordered separately (see Accessories for ET 200pro motor starters).

2) The solid-state motor starters can be used not only as solid-state motors starters with a high level of switching frequency but also as fully fledged soft starters for soft starting and smooth ramp-down. The changeover from motor starter to soft starter takes place through reparameterization in HW Config. Depending on the settings, this results in the following current ranges:

- Parameterization as solid-state starter: 0.15 ... 2 A and 1.5 ... 9 A (4 kW)
- Parameterization as soft starter: 0.15 ... 2 A and 1.5 ... 12 A (5.5 kW).

ET 200pro motor starters and frequency converters

ET 200pro FC frequency converter

Overview



ET 200pro FC Standard frequency converter and converter with integral safety functions

- Two versions with and without integral safety functions
- 1.1 kW output (1.5 kW at max. 45 °C ambient temperature)
- Sensor-free vector control, frequency control or torque control
- Integral brake control 180 V DC
- Regenerative feedback
- Power is looped through using jumpers with 25 A per segment
- Easy parameterization over the bus
- Extensive diagnostics

Benefits

- The frequency converter is completely integrated into the ET 200pro system and offers all the system advantages such as cabinet-free installation, easy mounting on the module carrier, reduction of the wiring overhead due to self-assembling communication and supply rails in the backplane bus, comprehensive diagnostic mechanisms and high availability thanks to replaceability without affecting other modules in the ET 200pro station.
- The load voltage is routed to downstream frequency converters or motor starters with minimal installation costs through pre-assembled jumper plugs. The maximum current carrying capacity of the jumper plugs is 25 A.
- Easy combination and expansion of converter functionality using I/O modules or RSM isolator modules within the distributed station.
- Input for PTC/KTY encoder for comprehensive motor protection
- The integral 180 V DC brake control makes the rectifier in the motor terminal box superfluous
- Slot for optional memory card (MMC) to save the parameter settings for fast replacement of modules with automatic reparameterization
- Available control modes: Frequency control, sensorless vector control or torque control

- STARTER, the graphical parameterization tool for Siemens drives, is used to set the parameters either over the connected fieldbus or over a point-to-point connection
Note: Access to the frequency converter over the bus is not possible using STARTER when a CPU is located between the PC and a frequency converter. This also applies to the IM154-8 CPU.
- Active and dynamic braking of the motor is possible without incurring any additional costs. The generated braking energy is fed back into the power supply, so there is no need for braking choppers and pulse resistors.
- The fail-safe version of the frequency converter offers autonomous, certified safety functions that ensure that persons and machines are protected from the dangerous movement of machines. Integration of the safety system into the drive also simplifies the machine architecture and supports system-wide diagnostics.
- Minimum reaction time of the fail-safe frequency converter to signals of safe sensors thanks to local activation through the Safety Local Isolator Module F-RSM or via field bus with the PROFIsafe F-Switch module.

Reacting

ET 200pro motor starters and frequency converters

ET 200pro FC frequency converter

Application

- The frequency converter controls the speed of asynchronous motors steplessly
- The modular, service-friendly concept of the frequency converter is ideally suited to manufacturing processes with high plant standstill costs
- Optimal solutions can be created using several frequency converters combined in one distributed station when drives are operated in the same area or for the same purposes.
- The frequency converter handles frequency control for simple applications as well as vector control for more complex drive tasks. It also handles the optimal control of a motor brake, if used.
- The converter also supports torque control, for example, for applications with mechanically coupled drives
- The advantages of line-commutated power regeneration are primarily evident in continuous regenerative operation. Examples include unwinding units, lowering of loads, or dynamic braking of large centrifugal masses.
- The integral safety functions significantly reduce the overhead for drive solutions in plant sections where there is a hazard potential. Additional savings can be made thanks to sensorless speed monitoring of standard asynchronous motors.

Design



Installation of an ET 200pro station with 2 ET 200pro FC frequency converters with integral safety functions

The ET 200pro FC consists of the following components:

- ET 200pro FC Standard frequency converter or converter with integral safety functions
- Special backplane bus module to hold the frequency converter

Accessories

The following accessories are available:

Description	Order No.
Connector set for power supply, HanQ4/2 • 2.5 mm² • 4.0 mm² • 6.0 mm²	3RK1911-2BE50 3RK1911-2BE10 3RK1911-2BE30
Pre-assembled motor cable with connector on one end, shielded, HanQ8 • Length 1.5 m • Length 3 m • Length 5 m • Length 10 m	6ES7194-1LA01-0AA0 6ES7194-1LB01-0AA0 6ES7194-1LC01-0AA0 6ES7194-1LD01-0AA0
Frequency converter connector for motor cable, shielded, HanQ8	6ES7194-1AB01-0XA0
Power jumper plug for 400 V power transmission to following 400 V modules	3RK1922-2BQ00
RS232 interface cable for parameterizing the converter with the STARTER tool via a direct point-to-point connection	3RK1922-2BP00
Memory card (MMC) for parameter settings of the ET 200S FC and ET 200pro FC	6SL3254-0AM00-0AA0

If required, the complete parameter settings of the frequency converter can be saved on a memory card (MMC). When servicing, the plant is immediately ready for use again after replacing the frequency converter and inserting the memory card.

ET 200pro motor starters and frequency converters

ET 200pro FC frequency converter

Technical specifications

ET 200pro frequency converter with integral safety functions	
Selection features	
Integral safety functions according to Category 3 of EN 954-1 and according to SIL 2 of IEC 61508	• Safe Torque Off (STO) • Safely Limited Speed (SLS)¹⁾ • Safe Stop 1 (SS1)¹⁾ • Activation of the integral safety functions through Safety Local Isolator Module F-RSM or through PROFIsafe F-Switch
Electrical data	
Line voltage	3 AC 380 V to 480 V +10% / -10%
Output (at 0 °C to 55 °C ambient temperature)	1.1 kW
Rated input current (at 0 °C to 55 °C ambient temperature)	2.0 A
Rated output current (at 0 °C to 55 °C ambient temperature)	3.5 A
Output (at 0 °C to 45 °C ambient temperature)	1.5 kW
Rated input current (at 0 °C to 45 °C ambient temperature)	2.5 A
Rated output current (at 0 °C to 45 °C ambient temperature)	3.9 A
Line frequency	47 Hz to 63 Hz
Overload capability	• Overload current 1.5 x rated output current (i.e. 150% overload) for 60 s, cycle time 300 s • Overload current 2 x rated output current (i.e. 200% overload) for 3 s, cycle time 300 s
Output frequency	0 Hz to 650 Hz
Pulse frequency	4 kHz (standard), 2 kHz to 16 kHz (in 2 kHz steps)
SCCR (Short Circuit Current Rating) ²⁾	10 kA
Skipped frequency range	1, programmable
Converter efficiency	≥96%
Interfaces	• Connection to PROFIBUS (PROFINET available soon) over the ET 200pro backplane bus • Optical interface with USS protocol for optical RS232 connecting cable • Slot for an optional memory card (MMC) for uploading or downloading parameter settings • PTC/KTY84 interface for motor temperature monitoring

ET 200pro frequency converter with integral safety functions	
Functions	
Open-loop/closed-loop control procedure	• V/f control – linear ($M \sim n$) with/without flux current control (FCC), quadratic ($M \sim n^2$) or parameterizable • Vector closed-loop control without encoder • Closed-loop torque control
Operating functions	Jogging mode, free function blocks (FFB), positioning deceleration ramp, automatic restart following interruption due to power failure, bumpless connection of converter to rotating motor
Braking functions	• Regenerative braking operation without brake chopper and pulse resistor • Control of an electromagnetic holding brake
Protective functions	Undervoltage, overvoltage, ground faults, short circuits, stall prevention, thermal motor protection I^2t , or sensor), converter overtemperature, motor blocking protection
Connectable motors	• Low-voltage asynchronous motors • Motor cable lengths: max. 15 m (shielded)
Mechanical data	
Degree of protection	IP65
Operating temperature	0 °C to +55 °C Increased output at 0 °C to +45 °C
Mounting position	Vertical wall mounting (vertical alignment of the cooling fins)
Mounting dimensions (W x H x D) in mm (including terminal module)	155 x 230 x 213
Weight	2.5 kg
Standards	
Compliance with standards	UL, cUL, CE, c-tick, Low Voltage Directive 73/23/EEC, EMC Directive 89/336/EEC

1) The safety functions "Safely limited speed" and "Safe stop 1" are certified for asynchronous motors without encoders - these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

2) Valid for industrial control cabinet installation according to NEC Article 409 / UL 508A. Additional information is available in the Internet under: <http://support.automation.siemens.com/ww/view/en/23995621>

Reacting

ET 200pro motor starters and frequency converters

ET 200pro FC frequency converter

Technical specifications (continued)

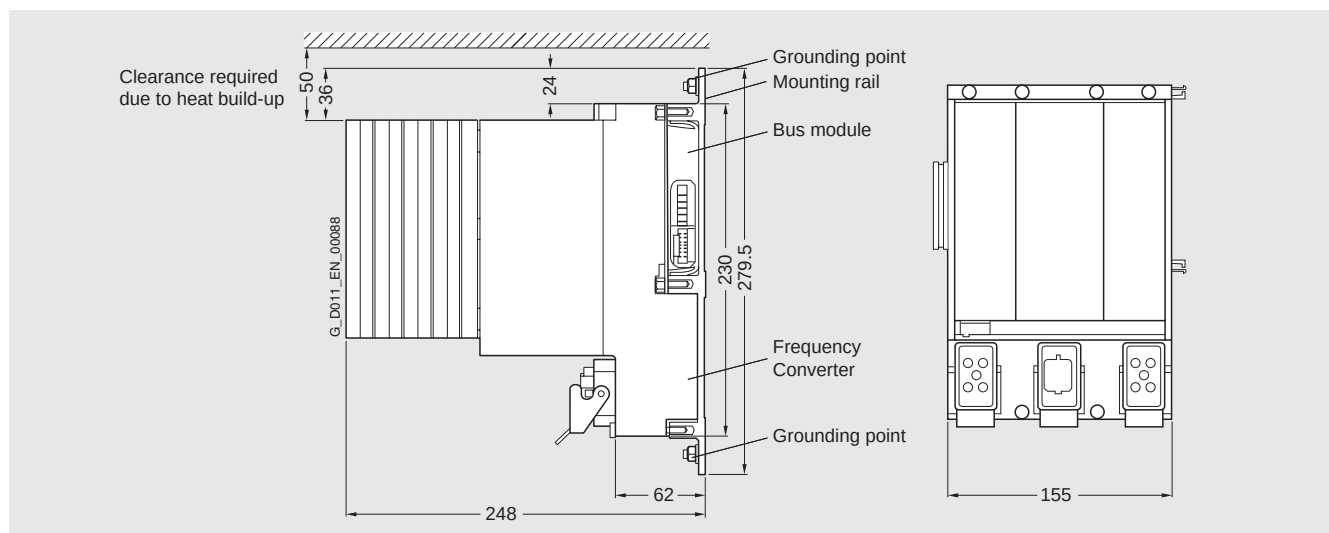
Derating data – Pulse frequency

Ambient temperature °C	Rated output current in A at a pulse frequency of							
	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0 ... 55 (1.1 kW)	3.5	3.5	2.8	2.2	1.6	1.1	0.5	-
0 ... 45 (1.5 kW)	3.9	3.9	3.9	3.9	3.4	3.0	2.6	2.2

Ordering data

		Order No.
	ET 200pro FC frequency converter with integral safety functions 380 V – 480 V 3 AC +10/-10% 47 Hz – 63 Hz Overload: 150% 60 s 200% 3 s Output: 1.1 kW (0 ° ... 55 °C) 1.5 kW (0 ° ... 45 °C)	6SL3235-0TE21-1SB0
		6SL3235-0TE21-1RB0
Backplane bus module to hold the frequency converter		6SL3260-2TA00-0AA0

Dimensional drawings



ET 200pro FC frequency converter with backplane bus module and mounting rail

ET 200pro motor starters and frequency converters

ET 200pro isolator modules

Overview

The isolator module with integrated group fusing function (i.e. additional group short-circuit protection for all subsequently supplied motor starters) and switch disconnecter function is used for safe disconnection of the 400 V operational voltage in the plant.

Depending on the power distribution concept, all stations can be equipped with an isolator module as an option.

The isolator module is available in addition in a safety version (see Safety local Isolator Modules).

Benefits

The following properties apply to the isolator module:

- Increase of plant availability through fast replacement of units (easy mounting and plug-in technology)
- Cabinet-free construction thanks to high degree of protection IP65.

Technical specifications

	Isolator module
General data	
Mounting dimensions (W x H x D) in mm	110 x 230 x 170
• Direct-on-line starter and reversing starter	
Permissible ambient temperature	
• During operation • During storage	-25 ... +55 °C -40 ... +70 °C
Permissible mounting positions	Any
Vibration resistance according to IEC 60068, Part 2-6	2 g
Shock resistance according to IEC 60068, Part 2-27	Half-sine 15 g/11 ms
Power consumption	
• From auxiliary circuit L+/M (U1) • From auxiliary circuit A1/A2 (U2)	Approx. 20 mA --
Rated operational current for power bus I_e	25 A
Rated operational voltage U_e	400 V
Approvals according to	
• DIN VDE 0106, Part 101 • CSA and UL	Up to 500 V Up to 600 V
Conductor cross-sections	
• Incoming energy supply	Max. 6 x 4 mm ²
Degree of protection	IP65
Touch protection	Touch protection
Degree of pollution	3, IEC 60664 (IEC 61131)
Rated impulse withstand voltage U_{imp}	6 kV
Rated insulation voltage U_i	400 V
Rated operational current for starters I_e	
• AC-1/2/3 at 40 °C - At 400 V - At 500 V	25 A 25 A
Rated short-circuit breaking capacity	50 kA at 400 V
Type of coordination according to IEC 60947-4-1	2
Safe isolation between main and auxiliary circuits	400 V, according to DIN VDE 0106, Part 101
Device functions	
• Group diagnostics	Yes, parameterizable
Device indications	
• Group fault	SF LED (red)

Reacting

ET 200pro motor starters and frequency converters

ET 200pro isolator modules

Selection and ordering data

Version		Order No.
ET 200pro isolator modules, mechanical		
 3RK1 304-0HS00-6AA0	Isolator modules¹⁾ Rated operational current 25 A	3RK1 304-0HS00-6AA0
 3RK1 304-0HS00-7AA0	Safety local isolator modules^{2) 3)} Rated operational current 16 A	3RK1 304-0HS00-7AA0

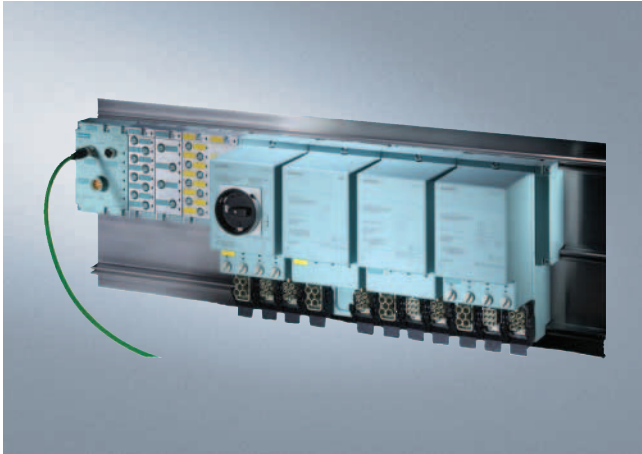
- 1) Only functions when used together with the corresponding backplane bus module 110 mm and the wide module rack. The backplane bus module and the wide module rack must be ordered separately (see Accessories for ET 200pro motor starters).
- 2) The Safety local isolator module only functions when used together with the 400 V disconnecting module.
- 3) Only in combination with the special backplane bus module for the Safety local isolator module (see Accessories for ET 200pro motor starter).

Reacting

ET 200pro motor starters and frequency converters

Safety local module

Overview



Safety local isolator modules

The Safety local isolator module is a maintenance switch with integrated safety evaluation functions that can be parameterized using DIP switches.

It is used for:

- Connection of a 1 or 2-channel EMERGENCY-STOP circuit up to category 3-4/SIL 3 (protective door or EMERGENCY-STOP pushbuttons) and parameterizable start behavior
- Control of the 400 V disconnecting module by means of a safety rail signal.

400 V disconnecting modules

The 400 V disconnecting module enables the safe disconnection of the operational voltage of 400 V up to category 3-4/SIL 3. For operation in a Safety Solution local application it functions only in combination with the safety local isolator module.

For operation in a Safety PROFIsafe application it functions only in combination with the F-Switch.

F-Switch

Failsafe digital inputs/outputs in degree of protection IP65/66/67 for near-machine, cabinet-free use.

Failsafe digital inputs

- For the failsafe reading in of sensor information (1-/2-channel)
- Including integrated evaluation for 2v2 signals
- Internal sensor supplies (incl. testing) available

Failsafe digital outputs

- 3 failsafe PP-switching outputs for safe switching of the backplane bus bars

The F-Switch is certified up to Cat. 4 (EN 954-1) and up to SIL 3 (IEC 61508) and has detailed diagnostics.

It supports PROFIsafe in PROFIBUS configurations as well as in PROFINET configurations.

Application

Safety local isolator modules

The Safety local isolator module features the same functions as a standard isolator module with an additional local safety function.

The Safety local isolator module contains a 3TK28 41 module and is equipped with M12 terminals for the connection of external safety components.

Terminals 1 and 2 can be used to connect either 1-channel or 2-channel EMERGENCY-STOP circuits or protective door circuits (IN 1, IN 2).

For monitored starts, an external START switch can be connected to terminal 3.

The required safety functions can be set using 2 slide switches located under the left M12 opening.

In the event of an EMERGENCY-STOP, the Safety local isolator module trips the downstream 400 V disconnecting module. This safely isolates the 400 V circuit up to Cat. 4/SIL 3.

In combination with the 400 V disconnecting module, the Safety local isolator module can be used for safety applications up to Cat. 4/SIL 3.

400 V disconnecting modules

The 400 V disconnecting module can be used together with the Safety local isolator module for local safety applications and together with the F-Switch for PROFIsafe safety applications.

It contains two contactors connected in series for safety-oriented disconnection of the main circuit.

The auxiliary circuit supply of the device is over a safety power rail in the backplane bus module.

The 400 V disconnecting module can be used together with the Safety local isolator module or with the F-Switch for safety applications up to Cat. 4/SIL 3.

F-Switch

The F-Switch is a failsafe solid-state module for PROFIsafe safety applications. It has two failsafe inputs and outputs for safe switching of the 24 V supply over backplane bus bars. In combination with the 400 V disconnecting module it can be used in PROFIsafe applications for the failsafe disconnection of ET 200pro motor starters up to Cat. 4/SIL 3.

Reacting

ET 200pro motor starters and frequency converters

Safety local module

Technical specifications

	Safety local isolator modules	400 V disconnecting modules
General data		
Mounting dimensions (W x H x D) in mm		
• Direct-on-line starter and reversing starter	110 x 230 x 170 mm	110 x 230 x 150 mm
Permissible ambient temperature		
• During operation	-25 ... +55 °C	
• During storage	-40 ... +70 °C	
Permissible mounting positions	Any	
Vibration resistance according to IEC 60068, Part 2-6	2 g	
Shock resistance according to IEC 60068, Part 2-27	Half-sine 15 g/11 ms	
Power consumption		
• From auxiliary circuit L+/M (U1)	Approx. 20 mA	
• From auxiliary circuit A1/A2 (U2)	--	
Rated operational current for power bus I_e	25 A	
Rated operational voltage U_e	400 V	
Approval according to DIN VDE 0106, Part 101	Up to 500 V	
CSA and UL approval	Up to 600 V	
Conductor cross-sections		
Incoming energy supply	max. 6 x 4 mm ²	
Degree of protection	IP65	
Touch protection	Touch protection	
Degree of pollution	3, IEC 60664 (IEC 61131)	
Rated impulse withstand voltage U_{imp}	6 kV	
Rated insulation voltage U_i	400 V	
Rated operational current for starters I_e		
• AC-1/2/3 at 40 °C		
- At 400 V	16 A	25 A
- At 500 V	16 A	25 A
Rated short-circuit breaking capacity	50 at 400 V	
Type of coordination according to IEC 60947-4-1	2	
Safe isolation between main and auxiliary circuits	400 V, according to DIN VDE 0106, Part 101	
Operating times at 0.85 ... 1.1 x U_e		
• Closing delay	--	25 ... 100 ms
• Opening delay	--	7 ... 10 ms
Device functions		
• Group diagnostics	Yes, parameterizable	
Device indications		
• Group fault	SF LED (red)	

Reacting

ET 200pro motor starters and frequency converters

Safety local module

Selection and ordering data

	Version	Order No.
ET 200pro safety modules		
 3RK1 304-0HS00-7AA0	Safety local isolator modules Rated operational current 16 A • The Safety local isolator module only functions when used together with the 400 V disconnecting module. • Only in combination with the special backplane bus module for the Safety local isolator module (see Accessories for ET 200pro motor starters).	3RK1 304-0HS00-7AA0
	400 V disconnecting modules Rated operational current 25 A • The 400 V disconnecting module only functions when used together with the Safety local isolator module. • Only functions when used together with the backplane bus module and the wide module rack. The backplane bus module and the wide module rack must be ordered separately (see Accessories for ET 200pro motor starter).	3RK1 304-0HS00-8AA0
 6ES7 148-1FS00-0AB0	F-Switch PROFIsafe  24 V DC, incl. bus module Connection module to be ordered separately	6ES7 148-4FS00-0AB0
	Connection modules for F-Switch  24 V DC	6ES7 194-4DA00-0AA0

Reacting

ET 200pro motor starters and frequency converters

Accessories for motor starters

Selection and ordering data

Version	Order No.
Wide module racks¹⁾	
• Length 500 mm	6ES7 194-4GB00-0AA0
• Length 1000 mm	6ES7 194-4GB10-0AA0
• Length 2000 mm	6ES7 194-4GB20-0AA0
Module racks, wide, compact¹⁾	
• Length 500 mm	6ES7 194-4GD00-0AA0
• Length 1000 mm	6ES7 194-4GD10-0AA0
• Length 2000 mm	6ES7 194-4GD20-0AA0
Backplane bus modules 110 mm²⁾	3RK1 922-2BA00
Backplane bus module for Safety local isolator module	3RK1 922-2BA01
RS 232 interface cables	3RK1 922-2BP00
Hand-held devices For ET 200pro motor starters, (also for ET 200S High-Feature and ECOFAST), for local operation. A serial interface cable must be ordered separately.	3RK1 922-3BA00
Sealing caps (for power supply) (1 pack contains 10 units)	3RK1 902-0CJ00
Dismantling tools for HAN Q4/2 	3RK1 902-0AB00
Crimping tools for pins/sockets 4 mm² and 6 mm² 	3RK1 902-0CW00
Crimping tools for male contacts and sockets up to 4.0 mm² (HAN Q8/0)	3RK1 902-0CT00
Dismantling tools for male contacts and sockets (HAN Q8/0)	3RK1 902-0AJ00
M12 sealing caps  For sealing unused input and output sockets (one set contains ten sealing caps)	3RX9 802-0AA00



3RK1 922-3BA00

1) The module rack can accommodate all ET 200pro motor starters and any optional modules (isolator module, Safety local isolator module and 400 V disconnecting module).

2) The backplane bus module is a prerequisite for operation of the ET 200pro motor starter and the optional module.

Reacting

SINAMICS G120 - Inverter chassis units

SINAMICS G120 chassis units
0.37 kW to 90 kW

Overview

The new SINAMICS G120 series of frequency inverters is designed to provide precise and cost-effective speed/torque control of AC motors.

With different device versions (frame sizes FSA to FSF) in the power range of 0.37 kW to 90 kW, it is suitable for a wide variety of drive solutions.



Examples of SINAMICS G120, frame sizes FSA, FSB and FSC; each with Power Module, Control Unit and Basic Operator Panel



Examples of SINAMICS G120, frame sizes FSD, FSE and FSF; each with Power Module, Control Unit and Basic Operator Panel

Note:

Look up catalog D11.1 2007 for the complete SINAMICS G120 program.

Reacting

SINAMICS G120 - Inverter chassis units

SINAMICS G120 chassis units
0.37 kW to 90 kW

Overview

Modularity

SINAMICS G120 is a modular converter system comprising a variety of functional units. The two main units are

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor in several different modes. It supports communication with a local or central control and with monitoring equipment or input/output terminals for a direct control function.

The Power Module supplies the motor in the power range 0.37 kW to 90 kW. The Power Module is controlled by a micro-processor in the Control Unit. State-of-the-art IGBT technology with pulse-width-modulated motor voltage and selectable pulse frequency is applied to achieve extremely reliable, flexible motor operation. An extensive range of protective functions afford a high degree of motor protection.

Furthermore, a large number of additional components are available, such as:

- Basic Operator Panel (BOP) for parameterization, diagnostics, control and copying of drive parameters
- Line filter classes A and B
- Line reactors
- Braking resistors
- Output reactors

Safety Integrated

The SINAMICS G120 inverter chassis units include versions for safety-oriented applications. All Power Modules are designed as intrinsically failsafe. A Safety Integrated Drive can be created by combining a Power Module with the relevant Failsafe Control Unit.

The SINAMICS G120 fail-safe frequency inverter provides four safety functions, certified in accordance with EN 954-1, Cat. 3 and IEC 61508 SIL 2:

- Safe stop 1 (SS1)
- Safely limited speed (SLS)
- Safe brake control (SBC)
- Safe torque off (STO)

Innovative cooling concept and paint finish of electronic modules

Significant increase in service life or useful life is achieved by the innovative cooling system and paint finish of the electronic modules. These features are based on the following principles:

- Disposal of all heat losses via an external heat sink
- Electronic modules not located in air duct
- Standardized convection cooling of Control Unit
- All cooling air is directed through the heat sink

STARTER drive/commissioning software

The STARTER drive/commissioning software supports the commissioning and maintenance of SINAMICS G120 inverters. It provides operator guidance designed to simplify and speed up commissioning, combined with comprehensive, user-friendly functions for the relevant drive solution.

Benefits

- Modularity ensures flexibility for an advanced drive concept
 - Each innovative step of a component can improve the existing drive system
 - Tailored to the customer, selectable and scalable
 - Only the required functions are purchased
 - Module replacement under voltage possible (hot swap)
 - Pluggable terminals
 - The modules can be easily replaced, which makes the system extremely service-friendly
- The safety functions make it easier to integrate drives into safety-oriented machines or plants
- Communication capability via PROFIBUS with PROFIdrive Profile 4.0
 - Reduced number of interfaces
 - Plant-wide engineering
 - Easy to handle
- Increased ruggedness due to innovative cooling concept and paint finish of the electronic modules
- Simple device replacement and time-saving parameter cloning with optional Basic Operator Panel or optional MMC memory card
- Low-noise motor operation due to high pulse frequency
- Compact, space-saving design
- Software parameters for easy adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- 2/3-wire method (static/pulsed signals) for universal control via digital inputs
- Engineering and commissioning with standard engineering tools such as SIZER, STARTER and Drive ES: ensures fast configuration and easy commissioning – with Drive ES Basic STARTER is integrated into STEP 7 resulting in centralized data storage and continuous communication
- Worldwide certification in accordance with CE, UL, cUL, c-tick and Safety Integrated in accordance with IEC 61508 SIL 2

Application

SINAMICS G120 is ideal

- as a universal drive in all industrial and commercial applications
- in the automotive, textiles, printing and chemical industries
- for end-to-end applications, e.g. in conveyor systems

Design

The SINAMICS G120 inverter chassis units are modular frequency inverters for standard drives. Each SINAMICS G120 comprises two operative units – the Power Module and Control Unit.

Power Modules

The following Power Modules are available for SINAMICS G120 inverter chassis units:

PM240 Power Modules

PM240 Power Modules feature an integrated brake chopper and are designed for drives without energy recovery. Generator energy produced during braking is converted to heat via externally connected braking resistors.

PM250 Power Modules (available soon)

PM250 Power Modules use an innovative circuit design which allows line-commutated energy recovery to the supply. This innovative circuit permits generator energy to be fed back into the supply system and therefore saves energy.

Reacting

SINAMICS G120 - Inverter chassis units

SINAMICS G120 chassis units
0.37 kW to 90 kW

Design (continued)

Control Units

The following Control Units and an MMC memory card are available as accessories for SINAMICS G120 inverter chassis units:

CU240 Control Units

The Control Unit performs closed-loop control functions for the inverter. In addition to control functions, the Control Unit can also perform other tasks which can be adapted to the relevant application by parameterization. Several versions of Control Units are available:

- CU240S DP
- CU240S DP-F
- CU240S PN
- CU240S PN-F (available soon)

MMC memory card

The parameter settings for a converter are stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data. The respective slot is located at the top of the Control Unit.

There is also a large number of components available for expanding the system, e.g. line-side power components, DC link components, load-side power components and supplementary system components.

Line-side power components

The following line-side power components are available for SINAMICS G120 inverter chassis units:

Line filters

The PM240 Power Module complies with a higher radio interference class with one of the additional line filters.

Line reactors

A line reactor is needed for high system fault levels, partly to protect the actual inverter against excessive harmonic currents, and thus against overload, and partly to limit the line harmonic distortions to the permitted values.

Recommended line components

This is a recommendation for further line-side components, such as fuses and circuit-breakers (line-side components must be dimensioned in accordance with IEC standards). Further information on the listed fuses and circuit-breakers can be found in Catalogs LV 1 and LV 1 T.

DC link components

The following DC link components are available for SINAMICS G120 inverter chassis units:

Braking resistors

Excess power in the DC link is dissipated via the braking resistor. The braking resistors are designed for use with PM240 Power Modules. These feature an integrated brake chopper (electronic switch).

Load-side power components

The following load-side power components are available for SINAMICS G120 inverter chassis units. During operation with an output reactor or a LC filter or sinusoidal filter, shielded motor cable lengths are possible and the motor service life is increased:

Output reactors

Output reactors reduce the voltage loading on the motor windings. At the same time, the capacitive charge/discharge currents, which place an additional load on the power section when long motor cables are used, are reduced.

LC filter and sinusoidal filter (available soon)

The LC filter/sinusoidal filter limits the rate of rise of voltage and the capacitive charge/discharge currents which usually occur with inverter operation. It is therefore not necessary to use an output reactor.

Availability as base components

The following line-side power components, DC link components and load-side power components are designed as base components in the corresponding frame sizes:

	Size					
	FSA	FSB	FSC	FSD	FSE	FSF
Line-side power components						
Line filter class A	✓					
Line filter class B	✓	✓	✓			
Line reactors	✓	✓	✓	✓	✓	
DC link components						
Braking resistors	✓	✓				
Load-side power components						
Output reactors	✓	✓	✓			

Supplementary system components

The following supplementary system components are available for SINAMICS G120 inverter chassis units:

BOP Basic Operator Panel

The BOP Basic Operator Panel can be plugged onto the Control Unit and can be used to commission drives, monitor drives in operation and input individual parameter settings. The BOP also provides a function for quick copying of parameters.

PC-inverter connection kit

For controlling and commissioning a converter directly from a PC if the appropriate software (STARTER) has been installed. The STARTER commissioning tool is supplied on CD-ROM in the scope of supply of the PC-inverter connection kit.

Brake Relay

The Brake Relay allows the Power Module to be connected to an electromechanical motor brake, thereby allowing the motor brake to be driven directly by the Control Unit.

Safe Brake Relay

The Safe Brake Relay allows the Power Module to be connected to an electromechanical motor brake, allowing the brake to be directly and safely controlled by the Control Unit in accordance with EN 954-1, safety category 3 and IEC 61508 SIL 2.

Reacting

SINAMICS G120 - Inverter chassis units

SINAMICS G120 chassis units
0.37 kW to 90 kW

Design (continued)

Adapter for mounting on DIN rail

The adapter for DIN rail mounting can be used to mount inverters of frame size A and B on DIN rails (2 units with a center-to-center distance of 100 mm).

Screen termination kit

The screen termination kit makes it easier to bond the shields of supply and control cables, offers mechanical strain relief and thus ensures optimum EMC performance.

NEMA1 kit (available soon)

The SINAMICS G120 inverter chassis units are designed to comply with type "UL OPEN". The NEMA1 kit is required to obtain a type 1 NEMA housing compliant with NEMA1 directives (NEMA 250-2003).

Configuration

The following electronic configuration and engineering tools are available for SINAMICS G120 inverter chassis units:

SD configurator selection aid within the CA 01

The interactive catalog CA 01 – the offline mall of Siemens Automation and Drives (A&D) – contains over 100000 products with approximately 5 million potential drive system product variants. The SD configurator has been developed to facilitate selection of the correct motor and/or inverter from the wide spectrum of A&D SD products. The configurator is integrated in this catalog with the selection and configuration tools as a "selection aid" on CD 2 "Configuring".

SIZER configuration tool

The SIZER PC tool provides an easy-to-use means of configuring the SINAMICS and MICROMASTER 4 drive family. It provides support when setting up the technologies involved in the hardware and firmware components required for a drive task. SIZER supports the complete configuration of the drive system, from simple single drives to complex multi-axis applications.

STARTER drive/commissioning software

The STARTER drive/commissioning software provides menu-guided assistance with commissioning, optimization and diagnostics. STARTER is not only designed for use on SINAMICS drives but also for MICROMASTER4 units and SIMATIC ET 200S FC frequency inverter for distributed I/Os.

Drive ES engineering system

Drive ES is the engineering system used to integrate Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively in terms of communication, configuration and data management. The STEP 7 Manager user interface provides the basis for this procedure. A variety of software packages, i.e. Drive ES Basic, Drive ES SIMATIC and Drive ES PCS 7, is available for SINAMICS.

Technical data

Unless explicitly specified otherwise, the following technical data are valid for all the following components of the SINAMICS G120 inverter chassis unit.

Mechanical data

Vibratory load

• Transport ¹⁾	Class 2M3 in acc. with EN 60068-2-6
• Operation	Class 3M4 in acc. with EN 60068-2-6 10 Hz to 58 Hz: constant deflection 0.075 mm 58 Hz to 200 Hz: constant acceleration = 9.81 m/s ² (1 g)

Shock load

• Transport ¹⁾	Class 2M2 in acc. with EN 60068-2-27
• Operation	Class 3M4 in acc. with EN 60068-2-27 49 m/s ² (5 g)/30 ms

Ambient conditions

Protection class	Class I (with protective conductor system) and class III (PELV) in acc. with EN 61800-5-1
Shock protection	in acc. with EN 61800-5-1 when used properly
Permissible ambient and coolant temperature (air) during operation for line-side power components and Power Modules	0 °C to +40 °C without derating, > 40 °C to +55 °C see derating characteristics
Permissible ambient and coolant temperature (air) during operation for Control Units, supplementary system components and DC link components	0 °C to +50 °C with CU240S DP-F: 0 °C to +45 °C up to 2000 m above sea level

Standards

Compliance with standards	UL, cUL, CE, c-tick
CE mark	in accordance with Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EC

EMC directive

• Frame sizes FSB to FSF with integrated line filter class A	Category C2 ²⁾ in acc. with EN 61800-3 or class A in acc. with EN 55011
• Frame size FSA without integrated line filter and with additional line filter class A	Category C2 ²⁾ in acc. with EN 61800-3 or class A in acc. with EN 55011
• Frame size FSA with additional line filter class A and with additional line filter class B	Category C2 ²⁾ in acc. with EN 61800-3 or class B in acc. with EN 55011
• Frame sizes FSB and FSC with integrated line filter class A and with additional line filter class B	Category C2 ²⁾ in acc. with EN 61800-3 or class B in acc. with EN 55011

Note:

The EMC product standard EN 61800-3 does not directly refer to a frequency inverter, but to a PDS (Power Drive System), that covers beside the inverter the whole circuiting as well as the motor and cables. The inverters themselves are in general not subject to marking in accordance with the EMC directive.

1) In transport packaging.

With shielded motor cable up to 25 m.

Reacting

SINAMICS G120 - Inverter chassis units

Control unit CU240

Technical data

	CU240S DP Control Unit 6SL3244-0BA20-1PA0	CU240S DP-F Control Unit 6SL3244-0BA21-1PA0
Electrical data		
Operating voltage	24 V DC via the Power Module or an external 24 V DC supply	24 V DC via the Power Module or an external 24 V DC supply
Interfaces		
Digital inputs – standard	9	6
Digital inputs – failsafe	–	2
Digital outputs	3	3
Analog inputs	2	2
	Both analog inputs can be configured as supplementary digital inputs if an additional function is required. Switching thresholds: 0 → 1: Rated voltage 2 V 1 → 0: Rated voltage 0.8 V Analog inputs are protected against inputs in a voltage range of ± 30 V and have a common-mode voltage in the ± 15 V range.	
Analog outputs	2	2
	Analog outputs have short-circuit protection, but are not isolated. Maximum output voltage = 10 V in current mode, maximum output current = 20 mA in voltage mode. The reaction time should equal approximately 1 ms with a load of maximum 10 k Ω in voltage mode.	
Bus interface	PROFIBUS DP	PROFIBUS DP, PROFIsafe
Encoder interfaces	1	1
PTC/KTY interface	✓	✓
Brake Relay interface or Safe Brake Relay interface (connection via Power Module)	✓	✓
MMC memory card slot	✓	✓
RS232/USS interface (connection via PC-inverter connection kit)	✓	✓
Safety functions		
Integrated safety functions in accordance with Category 3 of EN 954-1 or in accordance with SIL2 of IEC 61508	–	• Safe Stop 1 – SS1 • Safely limited speed – SLS • Safe brake control – SBC • Safe torque off – STO
Open-loop and closed-loop control functions		
V/f linear/quadratic/parameterizable	✓	✓
V/f with flux current control (FCC)	✓	✓
Vector Control, without encoder	✓	✓
Vector Control with encoder	✓	✓
Torque control, without encoder	✓	✓
Torque control with encoder	✓	✓

Reacting

SINAMICS G120 - Inverter chassis units

Control unit CU240

Technical data (continued)

	CU240S DP Control Unit 6SL3244-0BA20-1PA0	CU240S DP-F Control Unit 6SL3244-0BA21-1PA0
Software functions		
Fixed frequencies	16, parameterizable	16, parameterizable
Signal interconnection with BICO technology	✓	✓
Automatic restart after line failure or operation fault	✓	✓
Positioning deceleration ramp	✓	✓
Slip compensation	✓	✓
Free function blocks for logical and arithmetic operations	✓	✓
Kinetic buffering	✓	✓
Ramp smoothing	✓	✓
3 switchable drive data sets	✓	✓
3 switchable command data sets (CDS) (manual/automatic)	✓	✓
Flying restart	✓	✓
JOG	✓	✓
Controller (PID)	✓	✓
Thermal motor protection	✓	✓
Thermal inverter protection	✓	✓
V _{dmax} controller	✓	✓
Setpoint input	✓	✓
Motor identification	✓	✓
Motor holding brake	✓	✓
Braking functions • DC injection braking • compound braking • dynamic braking with integrated brake chopper	✓	✓
Mechanical data		
Degree of protection	IP20	IP20
Operating temperature	-10 °C to +50 °C (14 °F to 122 °F)	0 °C to +45 °C (32 °F to 113 °F)
Relative humidity	< 95% RH, condensation not permissible	< 95% RH, condensation not permissible
Dimensions (W × H × D), mm	73 × 177 × 63	73 × 177 × 63
Weight, approx. kg	0.52	0.52

Selection and ordering data

Communication	Digital inputs Standard	Digital inputs Failsafe	Digital outputs	Encoder interfaces	Designation	Control Unit Order No.
Standard						
PROFIBUS DP	9	–	3	1	CU240S DP	6SL3244-0BA20-1PA0
Failsafe for Safety Integrated						
PROFIBUS DP	6	2	3	1	CU240S DP-F	6SL3244-0BA21-1PA0

Reacting

SINAMICS G120 - Inverter chassis units

Basic Operator Panel BOP

Overview



The BOP Basic Operator Panel can be used to commission drives, monitor drives in operation and input individual parameter settings.

Values and units are displayed via a 5-digit display.

One BOP can be used for several inverters. It is plugged directly onto the Control Unit.

The BOP provides a function for time-saving copying of parameters. A parameter set of one inverter can be saved and then loaded to another inverter.

Integration



Control Unit with plugged in BOP Basic Operator Panel

Selection and ordering data

BOP Basic Operator Panel

Order No.

6SL3255-0AA00-4BA1

Reacting SINAMICS G120 - Inverter chassis units

Memory card for control units

Overview



The parameter settings for an inverter are stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data.

- All parameter settings can be written from the MMC memory card to the inverter or saved from the inverter to the MMC memory card.
- Up to 100 parameter sets can be stored.
- Supports serial commissioning without using further commissioning tools such as BOP and STARTER.
- How the MMC memory card is commissioned can be defined by the user (parameter p8458):
 - 0 = parameter set 0 is never automatically downloaded from the MMC ("never")
 - 1 = parameter set 0 is downloaded once after Power On ("once")
 - 2 = parameter set 0 is always downloaded once after Power On ("always")

Note:

The MMC memory card is not necessary for the running operation and need not remain inserted.

Integration



Inserting the MMC memory card into the Control Unit



Control Unit with inserted MMC memory card

Selection and ordering data

MMC memory card	Order No.
	6SL3254-0AM00-0AA0

Overview



The SINAMICS G120 converter chassis units are modular frequency converters for standard drives. Each SINAMICS G120 comprises two operative units – the Power Module and the Control Unit.

Power Modules

The following Power Modules are available for SINAMICS G120 converter chassis units:

PM240 Power Modules

PM240 Power Modules feature an integrated brake chopper and are designed for drives without energy recovery capability. Generator energy produced during braking is converted to heat via externally connected braking resistors.

PM250 Power Modules

PM250 Power Modules use an innovative circuit design which allows line-commutated energy recovery to the supply. This innovative circuit permits generator energy to be fed back into the supply system and therefore to save energy.

PM260 Power Modules

PM260 Power Modules also use an innovative circuit design which allows line-commutated energy recovery to the supply. This innovative circuit permits generator energy to be fed back into the supply system and therefore to save energy. The PM260 Power Modules also have an integrated sinusoidal filter that limits the voltage rate-of-rise and the capacitive charge/discharge currents which usually occur with converter operation.

Reacting

SINAMICS G120 - Inverter chassis units

Power modules PM240

Technical data

General technical data

Power Modules PM240	
Line operating voltage	380 V to 480 V 3 AC $\pm 10\%$
Input frequency	47 Hz to 63 Hz
Output frequency	
• Control type V/f	0 Hz to 650 Hz
• Control type Vector	0 Hz to 200 Hz
Pulse frequency	4 kHz, (standard), for higher pulse frequencies see derating data in catalog D11.1
Power factor	0.95
Converter efficiency	95% to 97%
Control factor	93 %
Overload capability	
• High overload (HO)	1.5 x rated output current (i.e. 150% overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200% overload) for 3 s with a cycle time of 300 s
• Light overload (LO)	1.1 x rated output current (i.e. 110% overload) for 57 s with a cycle time of 300 s 1.5 x rated output current (i.e. 150% overload) for 3 s with a cycle time of 300 s
Electromagnetic compatibility	Optional line filter class A or B in accordance with EN 55011 is available
Possible braking methods	• DC injection braking • Compound braking • Dynamic braking with integrated brake chopper
Degree of protection	IP20
Ambient temperature	0 °C to +40 °C without derating, > 40 °C to +55 °C see derating characteristics in catalog D11.1.
Operating temperature	
• High overload (HO)	0 °C to +50 °C (32 °F to 122 °F)
• Light overload (LO)	0 °C to +40 °C (32 °F to 104 °F)
Storage temperature	–40 °C to +70 °C (–40 °F to +158 °F)
Relative humidity	< 95% RH, condensation not permissible
Cooling	Internal air cooling, power sections with increased air cooling by in-built fans
Installation altitude	Up to 1000 m above sea level without power reduction, > 1000 m see derating characteristic in catalog D11.1.
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter interlock
Compliance with standards	UL, cUL, CE, c-tick
CE mark	In accordance with Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EC

Reacting

SINAMICS G120 - Inverter chassis units

Power modules PM240

Selection and ordering data

Rated output ¹⁾		Rated output current ²⁾ I_{rated}	Output based on base load current ³⁾		Base load current ⁴⁾ I_H	Frame size	SINAMICS G120 PM240 Power Module without integrated line filter Order No.	SINAMICS G120 PM240 Power Module with integrated line filter Order No.
kW	hp	A	kW	hp	A			
3 AC 380 V to 480 V								
0.37	0.50	1.3	0.37	0.50	1.3	FSA	6SL3224-0BE13-7UA0	–
0.55	0.75	1.7	0.55	0.75	1.7	FSA	6SL3224-0BE15-5UA0	–
0.75	1.0	2.2	0.75	1.0	2.2	FSA	6SL3224-0BE17-5UA0	–
1.1	1.5	3.1	1.1	1.5	3.1	FSA	6SL3224-0BE21-1UA0	–
1.5	2.0	4.1	1.5	2.0	4.1	FSA	6SL3224-0BE21-5UA0	–
2.2	3.0	5.9	2.2	3.0	5.9	FSB	6SL3224-0BE22-2UA0	6SL3224-0BE22-2AA0
3.0	4.0	7.7	3.0	4.0	7.7	FSB	6SL3224-0BE23-0UA0	6SL3224-0BE23-0AA0
4.0	5.0	10.2	4.0	5.0	10.2	FSB	6SL3224-0BE24-0UA0	6SL3224-0BE24-0AA0
7.5	10	18	5.5	7.5	13.2	FSC	6SL3224-0BE25-5UA0	6SL3224-0BE25-5AA0
11.0	15	25	7.5	10	19	FSC	6SL3224-0BE27-5UA0	6SL3224-0BE27-5AA0
15.0	20	32	11.0	15	26	FSC	6SL3224-0BE31-1UA0	6SL3224-0BE31-1AA0
18.5	25	38	15.0	20	32	FSD	6SL3224-0BE31-5UA0	6SL3224-0BE31-5AA0
22	30	45	18.5	25	38	FSD	6SL3224-0BE31-8UA0	6SL3224-0BE31-8AA0
30	40	60	22	30	45	FSD	6SL3224-0BE32-2UA0	6SL3224-0BE32-2AA0
37	50	75	30	40	60	FSE	6SL3224-0BE33-0UA0	6SL3224-0BE33-0AA0
45	60	90	37	50	75	FSE	6SL3224-0BE33-7UA0	6SL3224-0BE33-7AA0
55	75	110	45	60	90	FSF	6SL3224-0BE34-5UA0	6SL3224-0BE34-5AA0
75	100	145	55	75	110	FSF	6SL3224-0BE35-5UA0	6SL3224-0BE35-5AA0
90	125	178	75	100	145	FSF	6SL3224-0BE37-5UA0	6SL3224-0BE37-5AA0

1) Rated output based on rated output current I_{rated} : The rated output current I_{rated} is based on the load cycle for light overload (LO).

2) The rated output current I_{rated} is based on the load cycle for light overload (LO). This current values are placed on the rating plate of the Power Module.

3) These output values are placed on the rating plate of the Power Module. The base load current I_H is based on the load cycle for high overload (HO).

4) The base load current I_H is based on the load cycle for high overload (HO).

Reacting

SINAMICS G120 - Inverter chassis units

Power modules PM250

Technical data

General technical data

Power Modules PM250	
Line operating voltage	380 V to 480 V 3 AC $\pm 10\%$
Input frequency	47 Hz to 63 Hz
Output frequency	
• Control type V/f	0 Hz to 650 Hz
• Control type Vector	0 Hz to 200 Hz
Pulse frequency	4 kHz, (standard), for higher pulse frequencies see derating data in catalog D11.1.
Power factor	0.95
Converter efficiency	95% to 97%
Control factor	88 %
Overload capability	
• High overload (HO)	1.5 x rated output current (i.e. 150% overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200% overload) for 3 s with a cycle time of 300 s
• Light overload (LO)	1.1 x rated output current (i.e. 110% overload) for 57 s with a cycle time of 300 s 1.5 x rated output current (i.e. 150% overload) for 3 s with a cycle time of 300 s
Electromagnetic compatibility	Optional line filter class A or B in accordance with EN 55011 is available
Possible braking methods	Regenerative feedback in generating mode
Degree of protection	IP20
Ambient temperature	0 °C to +40 °C without derating, > 40 °C to +55 °C see derating characteristics in catalog D11.1.
Operating temperature	
• High overload (HO)	0 °C to +50 °C (32 °F to 122 °F)
• Light overload (LO)	0 °C to +40 °C (32 °F to 104 °F)
Storage temperature	-40 °C to +70 °C (-40 °F to +158 °F)
Relative humidity	< 95% RH, condensation not permissible
Cooling	Internal air cooling, power sections with increased air cooling by in-built fans
Installation altitude	Up to 1000 m above sea level without power reduction, > 1000 m see derating characteristic in catalog D11.1.
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Inverter overtemperature • Parameter interlock
Compliance with standards	UL, cUL, CE, c-tick
CE mark	In accordance with Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EC

Reacting

SINAMICS G120 - Inverter chassis units

Power modules PM250

Selection and ordering data

Rated output ¹⁾		Rated out- put current ²⁾	Output based on base load current ³⁾		Base load current ³⁾	Frame Size	SINAMICS G120 Power Module PM250 with integrated line filter class A Order No.
kW	hp	A	kW	hp	A		
3 AC 380 ... 480 V							
7.5	10	18	5.5	7.5	13.2	FSC	6SL3225-0BE25-5AA0
11.0	15	25	7.5	10	19	FSC	6SL3225-0BE27-5AA0
15.0	20	32	11.0	15	26	FSC	6SL3225-0BE31-1AA0
18.5	25	38	15.0	20	32	FSD	6SL3225-0BE31-5AA0
22	30	45	18.5	25	38	FSD	6SL3225-0BE31-8AA0
30	40	60	22	30	45	FSD	6SL3225-0BE32-2AA0
37	50	75	30	40	60	FSE	6SL3225-0BE33-0AA0
45	60	90	37	50	75	FSE	6SL3225-0BE33-7AA0
55	75	110	45	60	90	FSF	6SL3225-0BE34-5AA0
75	100	145	55	75	110	FSF	6SL3225-0BE35-5AA0
90	125	178	75	100	145	FSF	6SL3225-0BE37-5AA0

¹⁾ Rated output based on the rated output current I_{rated} . The rated output current I_{rated} is based on the loading for light overload (light overload LO).

²⁾ The rated output current I_{rated} is based on the loading for light overload (light overload LO).

³⁾ The basic load current I_H is based on the loading for high overload (high overload HO).

Reacting

SINAMICS G120 - Inverter chassis units

Power modules PM260

Technical data

General technical data

Power Modules PM260	
Line operating voltage	660 V to 690 V 3 AC $\pm 10\%$ The power units can also be operated with a minimal voltage of 500 V. In this case, the power is reduced linearly - see derating characteristics in catalog D11.1.
Input frequency	47 Hz to 63 Hz
Output frequency	
• Control type V/f	0 Hz to 200 Hz
• Control type Vector	0 Hz to 200 Hz
Pulse frequency	16 kHz, (standard)
Power factor	0.95
Converter efficiency	95% to 97%
Control factor	88 %
Overload capability	
• High overload (HO)	1.5 x rated output current (i.e. 150% overload) for 57 s with a cycle time of 300 s 2 x rated output current (i.e. 200% overload) for 3 s with a cycle time of 300 s
• Light overload (LO)	1.1 x rated output current (i.e. 110% overload) for 57 s with a cycle time of 300 s 1.4 x rated output current (i.e. 140% overload) for 3 s with a cycle time of 300 s
Electromagnetic compatibility	Optional line filter class A or B in accordance with EN 55011 is available
Possible braking methods	Regenerative feedback in generating mode
Degree of protection	IP20
Ambient temperature	0 °C to +40 °C without derating, > 40 °C to +55 °C see derating characteristics in catalog D11.1.
Operating temperature	
• High overload (HO)	– 10 °C to + 50 °C (14 °F to 122 °F) without derating, > 50 °C to + 60 °C (122 °F to 140 °F) see derating characteristics in catalog D11.1.
• Light overload (LO)	– 10 °C to + 40 °C (14 °F to 104 °F) without derating, > 40 °C to + 60 °C (104 °F to 140 °F) see derating characteristics in catalog D11.1.
Storage temperature	–40 °C to +70 °C (–40 °F to +158 °F)
Relative humidity	< 95% RH, condensation not permissible
Cooling	Internal ventilator, power units with increased air cooling by built-in fans
Installation altitude	Up to 1000 m above sea level without power reduction, > 1000 m see derating characteristic
Protective functions	• Undervoltage • Overvoltage • Overload • Ground fault • Short-circuit • Stall prevention • Motor blocking protection • Motor overtemperature • Converter overtemperature • Parameter interlock
Compliance with standards	CE
CE mark	In accordance with Low-Voltage Directive 73/23/EEC and Machinery Directive 98/37/EC

1) Valid for industrial cabinet installations according to NEC Article 409/UL 508A. Additional information is available in the Internet under:
<http://support.automation.siemens.com/WW/view/en/23995621>

Reacting

SINAMICS G120 - Inverter chassis units

Power modules PM260

Selection and ordering data

Rated output ¹⁾			Rated out- put current ²⁾ <i>I_n</i>	Output based on base load current ³⁾		Base load current ³⁾ <i>I_H</i>	Frame Size	SINAMICS G120 Power Mod- ule PM260 without inte- grated line filter	SINAMICS G120 Power Module PM260 with integrated line filter class A
									Order No.
kW	hp	A	kW	hp	A				
11.0	15	14	7.5	10	10	FSD	6SL3225-0BH27-5UA0	6SL3225-0BH27-5AA0	
15.0	20	19	11.0	15	14	FSD	6SL3225-0BH31-1UA0	6SL3225-0BH31-1AA0	
18.5	25	23	15.0	20	19	FSD	6SL3225-0BH31-5UA0	6SL3225-0BH31-5AA0	
30	40	35	22	30	26	FSF	6SL3225-0BH32-2UA0	6SL3225-0BH32-2AA0	
37	50	42	30	40	35	FSF	6SL3225-0BH33-0UA0	6SL3225-0BH33-0AA0	
55	75	62	37	50	42	FSF	6SL3225-0BH33-7UA0	6SL3225-0BH33-7AA0	

¹⁾ Rated output based on the rated output current I_{rated} . The rated output current I_{rated} is based on the loading for light overload (light overload LO).

²⁾ The rated output current I_{rated} is based on the loading for light overload (light overload LO).

³⁾ The basic load current I_H is based on the loading for high overload (high overload HO).

Reacting SINAMICS G120 - Inverter chassis units

Safe brake relay

Overview



The Safe Brake Relay allows the Power Module to be safely connected to an electromechanical motor brake, allowing the brake to be directly and safely controlled by the Control Unit in accordance with EN 954-1, safety category 3, and IEC 61508 SIL 2.

Ordering data

	Order No.
Safe Brake Relay including cable harness for connection to the Power Module	6SL3252-0BB01-0AA0

Integration

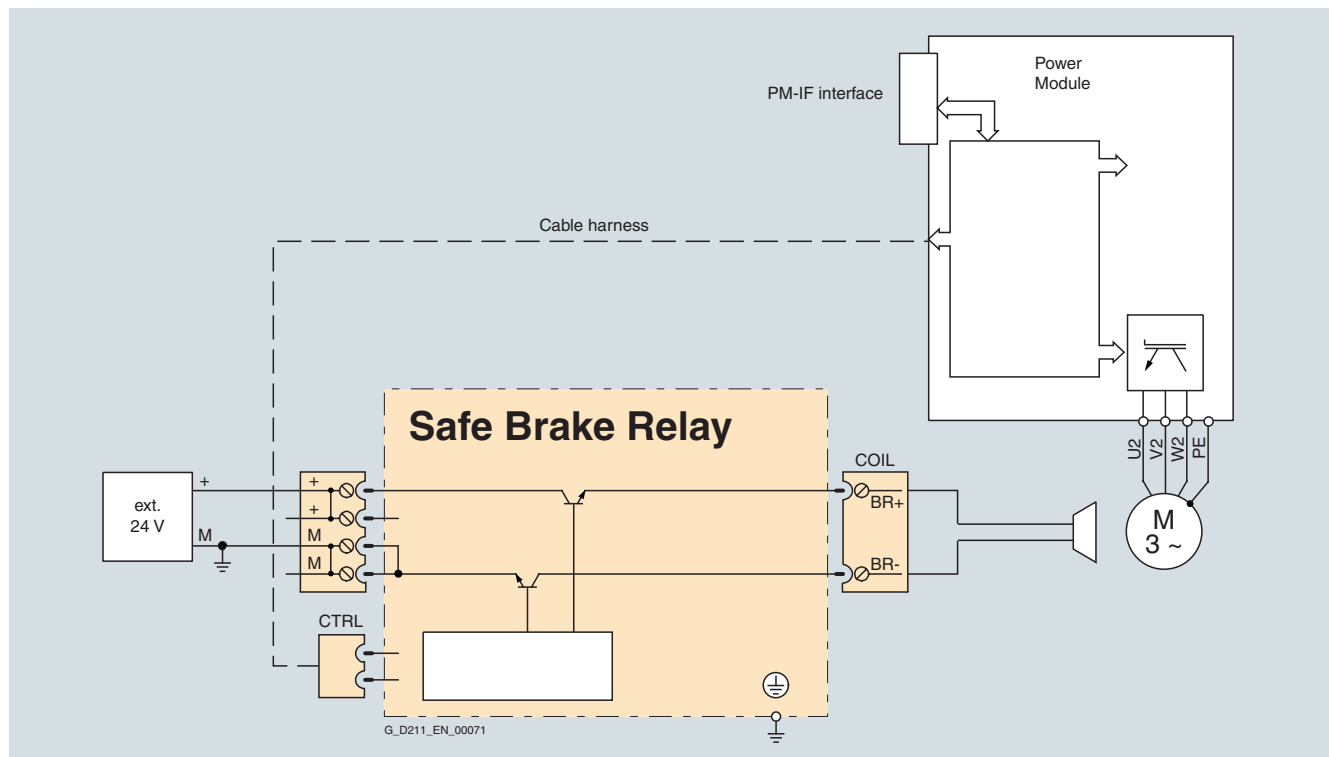
The Safe Brake Relay has the following interfaces:

- A two-channel transistor output stage to control the motor brake solenoid
- A connection for a 24 V DC power supply
- A connection for the cable harness (CTRL) for connection to the Power Module

The Safe Brake Relay can be mounted on the shield bonding plate near the power terminals of the Power Module.

The supplied safe brake relay includes the cable harness for connection with the power module.

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.



Typical connection of Safe Brake Relay

Technical data

	Safe Brake Relay
Supply voltage	20.4 V DC to 28.8 V DC Recommended rated value of the supply voltage 26 V DC (to equalize and compensate for the voltage drop along the feeder cable to the 24 V DC solenoid of the motor brake)
Permissible current drain of the motor brake, max.	2 A
Current requirements at 24 V DC, max.	0.005 A + current consumption of brake

	Safe Brake Relay
Connector cross-section, max.	2.5 mm ²
Type of protection	IP20
Dimensions	
• Width	68 mm
• Height	63 mm
• Depth	33 mm
Weight, approx.	0.17 kg

SINAMICS G120D - Distributed frequency converters

SINAMICS G120D
0.75 kW to 7.5 kW

Overview

The new SINAMICS G120D distributed frequency inverter series is the solution for demanding drive tasks especially in the field of conveyor systems. SINAMICS G120D supports bump-free, closed-loop speed control of three-phase asynchronous motors and fulfills all the requirements of conveyor system applications from simple frequency control through to demanding vector control. With its well-thought-out modular type of construction to the IP65 degree of protection, it is seamlessly integrated into the plant and supports a high plant availability and minimized spare parts inventories. The innovative power module concept with regenerative feedback capability helps to save energy. Safety functions that are unique worldwide support enhanced plant concepts with increased productivity. This drive can be optimally integrated into the Siemens TIA world of automation via PROFIBUS.

With different device versions (frame sizes FSA to FSC) in an output range of 0.75 kW to 7.5 kW, it is suitable for a wide variety of drive solutions.



Example for SINAMICS G120D, frame size FSA, comprising Power Module PM250D and fail-safe Control Unit CU240D DP-F

Reasons for using distributed drive systems

- Modular drive solutions providing standardized mechatronic elements that can be individually tested
- No need for a control cabinet, resulting in a smaller space requirement and less air-conditioning
- Long cables between the converter and motor can be avoided (which means lower output losses, reduced interference emission and lower costs for shielded cables and additional filters)
- Distributed configurations offer considerable benefits for conveyor systems with their extensive coverage (e.g. in the automotive and logistics sectors)

Modularity

SINAMICS G120D is a modular inverter system to IP65 degree of protection comprising a variety of functional units. The two main units are

- Control Unit (CU)
- Power Module (PM)

The Control Unit controls and monitors the Power Module and the connected motor in several different control modes. The digital inputs and digital outputs on the device support the simple wiring of sensors and actuators directly on the drive. The input signals can either be directly linked within the Control Unit and trigger local responses automatically or they can be transferred to the central controller via PROFIBUS for processing within the context of the overall plant.

The Power Module supplies the motor in the power range 0.75 kW to 7.5 kW. The Power Module is controlled by a microprocessor in the Control Unit. State-of-the-art IGBT technology with

pulse-width-modulation is used for highly reliable and flexible motor operation. It also features a range of functions offering a high degree of protection for the Power Module and motor. The unusual slimline type of construction is optimized for use directly in the plant. The Power Module also has the same drilling template for all outputs (constant footprint).

Safety integrated

The SINAMICS G120D distributed frequency inverters are available in a number of different variants for safety-oriented applications. All Power Modules are already designed for Safety Integrated. A Safety Integrated Drive can be created by combining a Power Module with the relevant Failsafe Control Unit.

The SINAMICS G120D fail-safe frequency inverter provides three safety functions, certified in accordance with EN 954-1, Cat. 3 and IEC 61508 SIL 2:

- Safe torque off (STO) to protect against active movement of the drive
- Safe Stop 1 (SS1) for continuous monitoring of a safe braking ramp
- Safely limited speed (SLS) for protection against dangerous movements on exceeding a speed limit

The functions "Safe Stop 1" and "Safely limited speed" can both be implemented without a motor sensor or encoder; the implementation cost is minimal. Existing plants can also be updated with safety technology without the need to change the motor or mechanical system.

The safety functions "Safely limited speed" and "Safe stop 1" are certified for asynchronous motors without encoders - these safety functions are not permitted for pull-through loads as in the case of lifting gear and winders.

STARTER drive/commissioning software

The STARTER (STARTER Version 4.1, SP1 and higher) drive/commissioning software supports the commissioning and maintenance of SINAMICS G120D inverters. The operator guidance combined with comprehensive, user-friendly functions for the relevant drive solution allow you to commission the device quickly and easily. The commissioning tool STARTER is included in the scope of supply of the Control Unit on CD-ROM.

Reacting

SINAMICS G120D - Distributed frequency converters

0.75 kW to 7.5 kW

Benefits

- Compact and space-saving design with slimline type of construction and identical drilling template for all outputs
- Wide output range from 0.75 to 7.5 kW.
- The safety functions make it easier to integrate drives into safety-oriented machines or plants
- The innovative circuit design (bidirectional input rectifier with "pared-down" DC link) allows the kinetic energy of a load to be fed back into the supply system. This feedback capability provides enormous potential for savings because generated energy no longer has to be converted into heat in a braking resistor. Braking resistors and reactors are not necessary - this is a particular advantage in terms of the space requirement and installation costs for the high IP65 degree of protection.
- Enhanced ruggedness and longer service life due to coating of the electronic modules
- Flexibility due to modularity for a future-oriented distributed drive concept to the high IP65 degree of protection
 - Every development stage of a component can improve the existing drive system
 - Module replacement when system is running (hot swapping)
 - The modules can be easily replaced, which makes the system extremely service friendly.
- Capable of communicating via PROFIBUS with PROFIdrive Profile 4.0
 - Reduced number of interfaces
 - Plant-wide engineering
 - Easy to handle
- The ability to connect up to six sensors and up to two actuators directly to the Control Unit means that almost all drive information can be directly managed; local preprocessing of the signals takes the load off the fieldbus.
- Integrated EMC filter of class A (according to EN 55011), integrated braking control (400 V 1 AC rectified, corresponds to 180 V DC) and integrated motor protection due to thermal motor model and evaluation of PTC or KTY 84 temperature sensors
- Software parameters for easy adaptation to 50 Hz or 60 Hz motors (IEC or NEMA motors)
- Easy replacement of devices and time-saving copying of parameters with the optional MMC memory card
- Engineering and commissioning with uniform engineering tools such as SIZER (Version 2.9 and higher), STARTER (Version 4.1, SP1 and higher) and Drive ES: Ensure rapid engineering and easy commissioning – STARTER is integrated in STEP 7 with Drive ES Basic with all the advantages of central data storage and totally integrated communication
- Certified worldwide for compliance with CE, UL, cUL, C-tick and Safety Integrated according to EN 954-1, Cat. 3 and IEC 61508 SIL 2

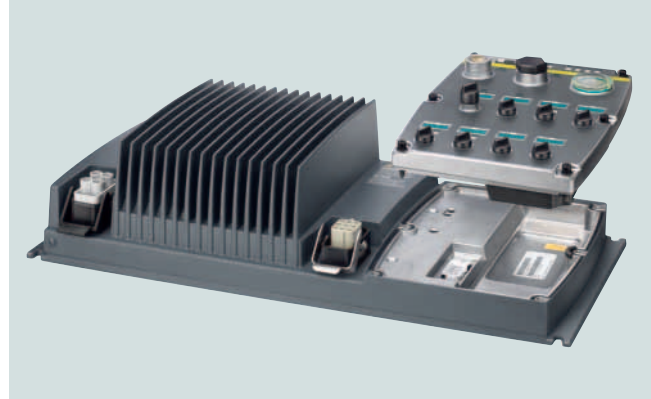
Application

SINAMICS G120D is ideally suited for demanding conveyor system applications in the industrial environment for which a distributed drive with communications capability is required. This applies in particular to the automotive sector, e.g. assembly lines.

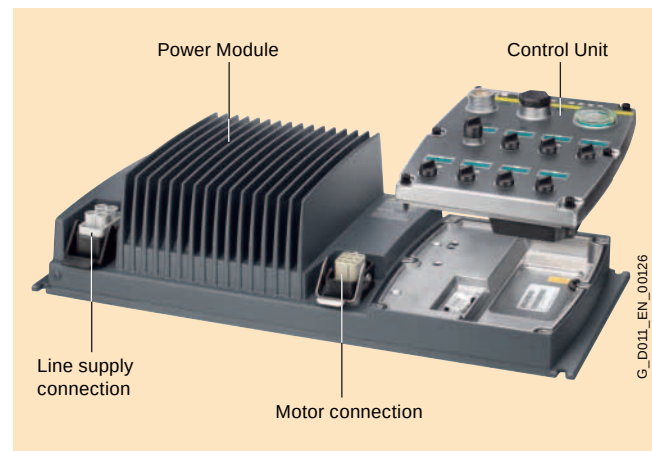
SINAMICS G120D is also suitable for further high-performance applications, e.g. in the airport sector, food and beverages industry (dry areas) and in distribution logistics (e.g. monorail overhead conveyors).

Design

The SINAMICS G120D distributed frequency inverters are modular frequency inverters for standard drives. Each SINAMICS G120D comprises two operative units – the Power Module and Control Unit.



Power Module PM250D and Control Unit CU240D



Power Module PM250D with line and motor connections and Control Unit CU240D

Reacting

SINAMICS G120D - Distributed frequency converters

Control units CU240D

Selection and Ordering Data

Communication	Digital inputs	Digital outputs	Encoder interfaces	Designation	Control unit Order No.
Standard					
PROFIBUS DP	6	2	1	CU240D DP	6SL3544-0FA20-1PA0
Fail-safe for Safety Integrated					
PROFIBUS DP	6	2	1	CU240D DP-F	6SL3544-0FA21-1PA0

Accessories

MMC memory card

The parameter settings for an inverter can be stored on the MMC memory card. When the plant is serviced, it is immediately ready for use again after, for example, replacement of the frequency inverter and transfer of the memory card data. The associated slot is located on the rear of the Control Unit.

	Order No.
MMC memory card	6SL3254-0AM00-0AA0

RS232 interface cable for communication with a PC

For controlling and commissioning an inverter directly from a PC over a point-to-point link if the appropriate software (STARTER Version 4.1, SP1 and higher) has been installed. The start-up tool STARTER is included in the scope of supply of every Control Unit on CD-ROM.

	Order No.
RS232 interface cable for communication with a PC	3RK1922-2BP00

Spare parts kit

A spare parts kit can be ordered which comprises small parts such as replacement seals, cover caps, PROFIBUS address windows and screws.

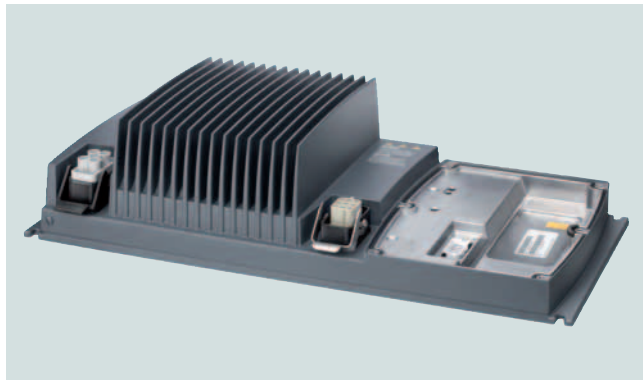
	Order No.
Spare parts kit for SINAMICS G120D Control Units	6SL3500-0SK01-0AA0
comprising replacement seals, cover caps, PROFIBUS address windows and screws	

Reacting

SINAMICS G120D - Distributed frequency converters

Power modules PM250D

Overview



Example of Power Module PM250D FSD

The regenerative feedback capability of the PM250D Power Module in generating mode (electronic braking) means that energy is returned to the supply system and not destroyed in a braking resistor. This saves space, time-consuming dimensioning of the braking resistor as well as its wiring. Generated heat is also reduced.

An innovative circuit design reduces supply harmonics. A line reactor is not required. This saves space and costs for engineering and procurement.

The PM250D Power Module is also designed for safety-sensitive applications. In conjunction with a Safety Control Unit, the drive can be turned into a Safety Integrated Drive (see Control Units).

Selection and Ordering Data

Rated output ¹⁾		Rated output current ²⁾	Input current	Size	SINAMICS G120D Power Module PM250D <u>with</u> integrated line filter class A Order No.
kW	hp	A	A		
3 AC 380 to 480 V					
0.75	1	2.2	2.1	FSA	6SL3525-0PE17-5AA0
1.5	2	4.1	3.8	FSA	6SL3525-0PE21-5AA0
3	4	7.7	7.2	FSB	6SL3525-0PE23-0AA0
4	5	10.2	9.5	FSC	6SL3525-0PE24-0AA0
5.5	7.5	13.2	12.2	FSC	6SL3525-0PE25-5AA0
7.5	10	19.0	17.7	FSC	6SL3525-0PE27-5AA0

Accessories

Connector sets for the line supply

	Order No.
Connector set for Han Q4/2 power supply	
• 2.5 mm ²	3RK1911-2BE50
• 4 mm ²	3RK1911-2BE10
• 6 mm ²	3RK1911-2BE30

Pre-assembled motor cables and connector set for the connection between the Power Module and the motor

	Order No.
Pre-assembled motor cable, with HAN Q8 connector on one end, shielded	
• 1.5 m long	6ES7194-1LA01-0AA0
• 3 m long	6ES7194-1LB01-0AA0
• 5 m long	6ES7194-1LC01-0AA0
• 10 m long	6ES7194-1LD01-0AA0
Connector set for motor cable, shielded, HAN Q8	6ES7194-1AB01-0XA0

¹⁾ Rated power based on rated current I_n .
Rated current based on I_n high overload cycles (high overload HO).

²⁾ Rated current based on I_n high overload cycles (high overload HO).

Overview



The flexible, modular drive system for demanding drive tasks

SINAMICS S120 is a modular drive system with servo and vector control that is ideal for sophisticated drive tasks in mechanical and plant engineering.

Versions are available for both single-axis and multi-axis applications. Covering power ranges of between 0.12 kW (0.16 HP) and 4500 kW (6000 HP) and featuring a variety of control modules classified according to function, the SINAMICS S120 modular system can be quickly and easily designed to meet the exact requirements of almost any high-performance drive configuration.

Even in their basic versions, the SINAMICS S120 Control Units feature extensive drive intelligence: servo and vector control, Vif control, positioning and safety functions, as well as numerous other useful functions required for ensuring reliable operation. The closed-loop control methods offered support synchronous and induction motors.

Integrated PROFIBUS DP interfaces ensure that SINAMICS S120 can be easily integrated in complete automation solutions. PROFINET, among others, is another additional field bus interface that is supported. In conjunction with the SIMATIC industry automation system, SINAMICS S120 can be used as a basis for creating conventional end-to-end automation and drive solutions.

Together with SIMOTION D or SINUMERIK 840D solution line control units, SINAMICS S120 can also be used as a basis for implementing complete drive-integrated motion control and machine tool solutions.

SINAMICS S120 is also available as cabinet modules specially designed for use in plant engineering applications that can be

combined to create a row of drive cabinets with a total power of up to 4500 kW (6000 HP). Standardized interfaces enable the modules to be easily linked to a ready-to-connect drive solution for multi-motor applications.

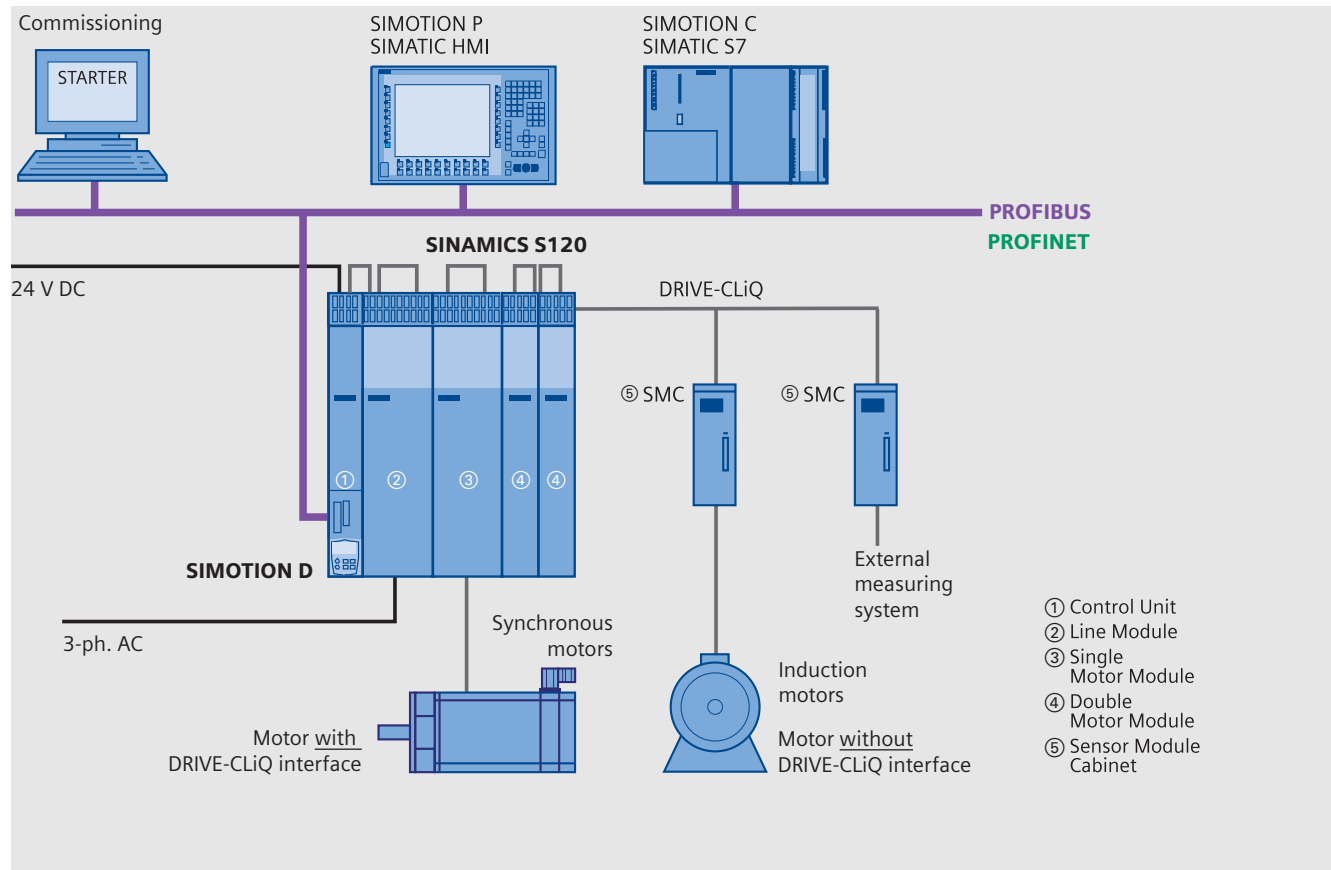
*Cabinet Modules -
the modular system for
outputs of up to 4500 kW
(6000 HP)*



Reacting SINAMICS S120

Converter system for
Motion Control applications

Integration



Applications

Regardless of whether the application involves continuous material webs or cyclic, highly dynamic processes – SINAMICS S120 means increased machine performance in many sectors:

- Packaging machines
- Plastics processing machines
- Textile machines
- Printing machines
- Paper machines
- Hoisting equipment
- Handling and assembly systems
- Machine tools
- Rolling mills
- Test stands

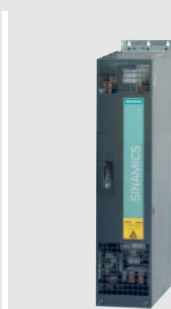
Benefits

SINAMICS S120 offers the following benefits:

- Universal application in high-performance single and multi-axis applications
- Can be combined as required to create customized solutions
- Broad power range
- Wide range of functions
- SINAMICS Safety Integrated functions
- Can support different cooling methods
- Can support different supply concepts
- Easy integration in higher-level automation and IT structure
- User friendliness
- Easy installation
- Practical connection system

Design

AC/AC units for single-axis applications



DC/AC units for multi-axis applications



Blocksize	Chassis	Booksize	Chassis	Cabinet Modules
IP20	IP20	IP20	IP00/IP20	IP20 (IP21/IP23/IP54)
0.12 kW to 90 kW	110 kW to 250 kW	1.6 kW to 107 kW	75 kW to 1200 kW	1.6 kW to 4500 kW

SINAMICS S120 devices are available as single drives or as multi-axis drive systems

SINAMICS S120 AC drives for high-performance single drives

SINAMICS S120 AC drives were developed especially for single drives. They have a modular structure and comprise the following components: Power Module in which the power supply and power unit are integrated. Power Modules are available for outputs of 0.12 kW (0.16 HP) to 250 kW (340 HP). Connected to the Power Module is the Control Unit, which contains all the intelligent control functions as well as the drive interfaces for communication purposes and for connecting additional components.

SINAMICS S120 DC/AC units for multi-axis applications

Optimized for use in multi-axis applications, SINAMICS S120 multi-axis units feature a central power supply and DC link. They also have a modular structure and comprise the following components:

Control Unit

The Control Unit contains the control intelligence for all the drive axes integrated in the multi-axis line-up. It also contains drive-related I/Os and interfaces for communicating with higher-level controllers. Control Units are available with different ranges of functions and with different performance levels

Line Module

The Line Module contains the central power supply for the DC link. Different Line Modules are available for different applications, including an unregulated infeed unit for motor mode and a regulated feed1feedback unit that provides a constant DC link voltage even if line voltage fluctuations occur and supplies excess energy back to the network. Line Modules are available for outputs of 5 kW (6.7 HP) to 6000 kW (8000 HP)..

Motor Modules

One or more Motor Modules can be supplied with power for the motors via the DC link. Synchronous and induction motors can be operated. Motor Modules are available for rated outputs from 1.6 kW (2 HP) to 1200 kW (1600 HP)

Other modules and components

A wide range of additional modules and components are available for connecting different position measuring and encoder systems and for extending the drive system to include drive-related I/Os:

- Terminal Modules, Terminal Boards: for extending the drive system to include drive-related I/Os.
- Sensor Modules: for connecting position encoders to the drive system.
- Communication Boards: provide Control Units with an additional communication interface.

DRIVE-CLiQ system interface

All SINAMICS S120 components are connected easily via the high-performance DRIVE-CLiQ system interface. *Line and Motor Modules are connected to the Control Unit via DRIVE-CLiQ. Terminal and Sensor Modules are connected to the drive system. Motors with a DRIVE-CLiQ interface can be connected directly to the drive system

SINAMICS S120 with its different types and their combination.

SINAMICS S120 is available in different types.

- SINAMICS S120 AC drives are available for power ratings from 0.12 kW to 90 kW (0.16 HP to 120 HP) in the compact blocksize format and for power ratings from 110 kW to 250 kW (150 HP to 340 HP) in the chassis format.
- SINAMICS S120 multi-axis drives are available for power ratings from 1.6 kW to 107 kW (2 HP to 145 HP) in the booksize format, for power ratings from 75 kW to 1200 kW (100 HP to 1600 HP) in the chassis format, and up to 4500 kW (6000 HP) in the Cabinet Modules. All SINAMICS S120 types support internal air cooling. The multi-axis devices in chassis format are also available in versions that support liquid cooling (e.g. for applications in dusty, corrosive, or salty environments or if insufficient space is available). Booksize units are also available with external air cooling and in the Cold Plate version.

All SINAMICS S120 types can be combined with each other as required. Even SINAMICS S120 AC drives can be combined to handle multi-axis applications via the DRIVE-CLiQ interface.

Reacting SINAMICS S120

Converter system for Motion Control applications

Auto-configuration with electronic type plate

All SINAMICS S120 components feature a digital type plate that stores all the relevant data about that particular component. For motors, this data includes the parameters of the electric equivalent circuit diagram and characteristic values of the built-in motor encoder. The Control Unit records this data automatically via DRIVE-CLiQ so that it does not need to be entered during commissioning or when the equipment is replaced.

In addition to the technical data, the digital rating plate stores logistical data (manufacturer ID, order number, and globally unique identification number). Since this data can be called up electronically on-site or remotely, all the components used in a machine can always be individually identified, which simplifies servicing.

Technical data

Electrical data	
Line voltages	1 AC 200 ... 240 V, $\pm 10\%$ 3 AC 380 ... 480 V, $\pm 10\%$ 3 AC 660 ... 690 V, $\pm 10\%$
Power range	0.12 ... 1200 kW
Supported network types	IT, TN, TT
Line frequency	50 Hz, 60 Hz
Control methods	U/f closed loop Vector control Servo control Dynamic servo control (DSC)
Digital inputs and outputs	yes, scalable number
Analog inputs and outputs	yes, scalable number
Communication interfaces	Digital in/outputs, DC 24 V, Analog in/outputs, PROFIBUS DP, PROFINET, CANopen.
Functions	
Technological functions	• Several command/drive data set • freely interconnectable through BICO technology, • flying measurement, flying restart, kinetic buffering, • Motion Control in conjunction with SIMOTION D, • numeric control in conjunction with SINUMERIK840solution line, • technology controller (PID), • integrated positioning functions
Safety functions (Safety Integrated, depends on type)	• Safe Torque Off (STO), • Safe Stop 1, Safe Stop 1 (SS1, SS2), • Safely Limited Speed (SLS), • Safe Speed Monitor (SSM), • Safe Brake Control (SBC).
Limits	• Torque limit/current limit, • Power limit, • Speed limit.
Protective functions (excerpt)	• Temperature monitoring of motor and power sections • Overcurrents, overvoltages, undervoltages, • Blocking protection • Overspeed, Standstill, • Short circuit proof and ground fault proof.

Electrical data	
Setpoint processing	• Direction of rotation reversal, • 4 skip bandwidths, • Basic ramp-function generator without rounding-off, with a special fast stopping ramp • Expanded ramp-function generator with rounding-off and setting functions Speed setpoint filter
Connectable motors	• Asynchronous motors, • Induction motors, • Synchronous motors, • Torque motors, • Linear motors.
Supported encoders	• Resolver, • Absolute encoders, • Incremental encoder sin/cos 1 V_{pp}, • Incremental encoder TTL-Signal, RS422, • Incremental encoder HTL.
Mechanical data	
Degree of protection	IP00 / IP20, optional up to IP54
Cooling methods	• Internal or external air cooling, • liquid cooling, • Cold Plate cooling
Standards	
Compliance with standards	CE, ®, cUL, Safety Integrated IEC 61508 / SIL 2

Additional information:

www.siemens.com/sinamics-s120

Catalog: D21.1, Order No.: E86060-K5521-A111-A2

SIMOVERT MASTERDRIVES

Overview



- Fully digital frequency converters with IGBT power modules.
- Can be used for single-motor and sectional drives.
- Types of construction:
Compact PLUS, compact, rack-mounting, and cabinet units.

- Device versions:
 - Vector Control for demanding continuous processes in all sectors of industry and for all applications. Supply voltages from 380 V to 690 V, 50/60 Hz; power ratings from 0.55 kW to 2300 kW; higher power ratings available as application.
 - Motion Control for all servo applications, even those with the most demanding technological requirements. Voltages from 380 V to 480 V; 50/60 Hz; power ratings from 0.55 kW to 250 kW.
- Version with Active Front End for jerk-free and stable drive technology possible.
- Connection to PROFIBUS DP via communication modules possible.
- Extensive range of accessories and system components.

Drive ES engineering system: See Catalog ST 70, Section 7, Engineering Tools

Further information:

- Catalogs DA 65.10/DA 65.11
- Internet:
<http://www.siemens.com/drivesolutions>

CNC Automation System SINUMERIK

Overview

**SINUMERIK 840D solution line,
SINUMERIK 840D powerline**

- The digital system for the most complex requirements.
- Can be used in mold and tool making, in complex mass production in job-shop production and for almost any type of technology.
- With up to 10 CNC channels and 31 axes per NCU module, making it suitable for use in the rotary transfer machines and "cyclic machines" (e.g., presses, packaging and printing machines) sector.
- Scalable NCU software with 2/6/12/31 axes for a number of different NCU modules and correspondingly advanced CNC functionality.
- Up to 8 NCUs with up to 248 axes can be connected via NC link.

- Special technology functions (e.g., laser machining, handling) available via compile cycles that can be reloaded in order to support optimum adaptation to the machines and the equipment of integrated machine series.
- All NCUs with optional PROFIBUS DP interface (master/slave).

Further information:

- SINUMERIK 840D powerline: Catalog NC 60
SINUMERIK 840D solution line: Catalog NC 61
- Internet:
<http://www.siemens.com/sinumerik>

Reacting



Notes

Appendix



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4/4	Siemens solution partners
4/5	Siemens contacts worldwide
4/6	Information and ordering in the Internet and on CD/DVD
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Appendix

Machine safety

Normal B10 values of electromechanical components

Overview

Recommendation for normal B10-values when applying standard IEC 62061:2005 and ISO 13849-1:2006

In order to comply with IEC 62061:2005 and ISO 13849-1:2006 it is required to define failure rates for electromechanical components (failures per hour).

With these rates it is possible to calculate the failure probability (PFH_D, defined as the probability of dangerous failures per hour) of a safety-relevant operation.

The failure rate of electromechanical components is described with the B10 value.

The B10 value of devices subjected to wear is expressed as the number of switching operations:

The B10 value is the number of switching operations, obtained in a life cycle test, which can be performed until 10 % of the tested devices have failed (or: number of actuations after which 10 % of the devices have failed). Using a simplified equation, it is possible to use the B10 value to calculate the overall failure rate of an electromechanical component:

Overall failure rate $\lambda = 0.1 \times C / B10$

with C = number of duty cycles per hour (specified by end user)

The failure rate consists of non-dangerous (λ_S) and dangerous (λ_D) failures:

$$\lambda = \lambda_S + \lambda_D$$

or

$$\lambda_D = [\text{Ratio of dangerous failures in \%}] \times \lambda$$

$$\lambda_S = [\text{Ratio of non-dangerous failures in \%}] \times \lambda$$

The rate of dangerous failures D of the component is needed for further calculations.

Note:

ISO 13849-1:2006 calculates the dangerous failure rate MTTF_d, where MTTF = 1/λ.

This is where the B10_d value is used:

$$B10_d = B10 / (\text{ratio of dangerous failures}).$$

For ISO 13849-1:2006 it is recommended to assume that a machine is in constant operation (24 hours per day and 365 days per year). The calculation of the failure rate of an electromechanical component is identical in both standards.

Because of the large number of electromechanical components it is advantageous, from the user's point of view, to combine these components in product groups.

SIRIUS normal B10 values of electromechanical components

Siemens SIRIUS product group (electromechanical components)	B10 values (duty cycles)	Ratio of dangerous values
EMERGENCY STOP control devices (with positive opening contacts)		
• turn-to-release	100000	20%
• pull-to-release	30000	20%
Cable operated switches for EMERGENCY STOP function (with positive opening contacts)	1000000	20%
Position switches		
• Standard position switches (with positive opening contacts)	10000000	20%
• Position switches with separate actuator (with positive opening contacts)	1000000	20%
• Position switches with solenoid interlocking (with positive opening contacts)	1000000	20%
Hinge switches (with positive opening contacts)	1000000	20%
Pushbuttons (non-latching) (with positive opening contacts)	10000000	20%
Contactors / Motor starters (with mirror contacts or so-called "positively driven contacts")	1000000	75%

Example calculation:

A protective door is monitored by a position switch with separate actuator. This door is opened 4 times an hour.

The overall failure rate of the position switch is calculated as

$$\lambda = 0.1 \times C / B10$$

$$\lambda = 0.1 \times 4 / 1000000 = 4 \times 10^{-7} \text{ (failures per hour).}$$

The dangerous failure rate is therefore

$$\lambda_D = 0.2 \times 4 \times 10^{-7} = 8 \times 10^{-8} \text{ 1/h}$$

or

$$MTTF_d = 1 \text{ h} / 8 \times 10^{-8} \text{ (about 1427 years)}$$

Siemens Standard SN 31920 provides detailed explanations.

**Faster and more applicable know-how:
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SITRAIN® – the Siemens Training for Automation and Industrial Solutions – provides you with comprehensive support in solving your tasks.

Training by the market leader in automation and plant engineering enables you to make independent decisions with confidence. Especially where the optimum and efficient use of products and plants are concerned. You can eliminate deficiencies in existing plants, and exclude expensive faulty planning right from the beginning.



First-class know-how directly pays for itself: In shorter start-up times, high-quality end products, faster troubleshooting and reduced downtimes. In other words, increased profits and lower costs.

Achieve more with SITRAIN

- Shorter times for startup, maintenance and servicing
- Optimized production operations
- Reliable configuration and startup
- Minimization of plant downtimes
- Flexible plant adaptation to market requirements
- Compliance with quality standards in production
- Increased employee satisfaction and motivation
- Shorter familiarization times following changes in technology and staff

Contact

Visit our site on the Internet at:

www.siemens.com/sitrain

or let us advise you personally. You can request our latest training catalog from:

SITRAIN Customer Support Germany:

Phone: +49 (0)1805 / 23 56 11
(0.14 €/min from the German landline network)

Fax: +49 (0)1805 / 23 56 12

SITRAIN highlights**Top trainers**

Our trainers are skilled teachers with direct practical experience. Course developers have close contact with product development, and directly pass on their knowledge to the trainers.

Practical experience

The practical experience of our trainers enables them to teach theory effectively. But since theory can be pretty drab, we attach great importance to practical exercises which can comprise up to half of the course time. You can therefore immediately implement your new knowledge in practice. We train you on state-of-the-art methodically/didactically designed training equipment. This training approach will give you all the confidence you need.

Wide variety

With a total of about 300 local attendance courses, we train the complete range of A&D products as well as interaction of the products in systems. Telecourses, teach-yourself software and seminars with a presenter on the Web supplement our classic range of courses.

Proprietary training

We are only a short distance away. You can find us at more than 50 locations in Germany, and in 62 countries worldwide. You wish to have individual training instead of one of our 300 courses? Our solution: We will provide a program that matches your personal requirements. Training can be carried out in our Training Centers or at your company.

The right mixture: Blended learning

"Blended learning" means a combination of various training media and sequences. For example, a local attendance course in a Training Center can be optimally supplemented by a teach-yourself program as preparation or follow-up. Additional effect: Reduced traveling costs and periods of absence.

Courses on "Safety Integrated"

	Course designation
Manufacturing Automation	
Standards and Regulations	
• Current standards for developing safe machines	ST-NSST
• Safety Integrated overview over manufacturing automation	ST-SIUEBF
Products	
• Configuring and programming fail-safe SIMATIC S7-300 control systems with PROFIsafe	ST-PPDS
• Testing, Usage and Handling of contactless protective equipment	SE-FSZERT
• Actuator-Sensor-Interface system course	IK-ASISYS
• SINAMICS G120 service and commissioning	DR-G120-EXP
• SINUMERIK 840D, Safety Integrated configuring and commissioning	NC-84DSIW
• SINUMERIK 840D, Safety Integrated refresher course	NC-84DSIR
• SINUMERIK 840D, Safety Integrated maintenance	NC-84DSIS
Process Automation	
Standards and Regulations	
• Safety Integrated in process automation / process engineering	ST-SIUEBPV
Products	
• Configuring and programming with F-Systems in STEP 7 / PCS 7	ST-PPFS
• SIMATIC S7, S7-400 H System course	ST-7H400H

Appendix

Services

Siemens solution partners

Overview

Solution Partner	SIEMENS
Automation	
Solution Partner	SIEMENS
Power Distribution	

Products and systems from Siemens Automation and Drives provide the ideal platform for all automation tasks.

Siemens Solution Partners offer customized future-proof solutions with products and systems from Siemens Automation and Drives. The basis: qualified product and system knowledge coupled with a high degree of solutions and industry-related expertise.

In the Siemens Solution Partner Program you are certain to find the optimum partner for your specific requirements. Since more than 400 companies worldwide belong to the program, you can be sure to get expert support at your location.

The Solution Partner Finder, available to you on the Internet, is a comprehensive database in which all Solution Partners, together with their performance profiles, present themselves.

In addition to the search criteria Technology, Sector and Country, you can also search by Company and ZIP Code. From there it is only a small step to making the first contact.

Call up the Solution Partner Finder as follows:

- CA 01 on CD-ROM:
On the start page via "Contacts & Partners; Siemens Solution Partner Automation and Power Distribution"
- CA 01 online:
Go directly to the Solution Partner Finder:
www.siemens.com/automation/partnerfinder

Additional information about the Siemens Solution Partner Program is available in the Internet at:

www.siemens.com/automation/solutionpartner

Partners for safety

Die Solution Partners Safety offer a wide variety of solutions and assistance, based on their know-how in functional safety technology.

The presales and after sales assistance comprise safety-relevant counseling, analysis and evaluation of risks, and also the development of comprehensive safety concepts, planning and commissioning of projects and running maintenance.

Overview

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Contacts by country sector product Reporting **en** Go

Local Partners Worldwide Germany

Are you looking for a local contact to help you with questions regarding **Siemens Automation and Drives** products, solutions and services?

O.K. First, please select the city nearest to your location:

→ (or to select a different country click here)

Berlin

Now select the appropriate team who you would like to deal with your enquiry:

Sales

Next >

Contact

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At

<http://www.siemens.com/automation/partner>

you can find details of Siemens contact partners worldwide responsible for particular technologies.

You can obtain in most cases a contact partner for

- Technical Support,
- Spare parts/repairs,
- Service,
- Training,
- Sales or
- Consultation/engineering.

You start by selecting a

- Country,
- Product or
- Sector.

By further specifying the remaining criteria you will find exactly the right contact partner with his/her respective expertise.

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Contacts by country sector product Reporting **en** Go

Local Partners Worldwide Please select a sector

Select area/sector Select city Your contact(s)

Sectors Search a Sector

Which sector* is your question regarding?

A&D Sectors

- ☒ Video Systems, Visualization Systems
- ☐ Electrical Wireline
- ☐ Material Flow Controlling, Distribution and Logistics
- ☐ Assembly Control
- ☐ Paper Machines
- ☐ Production Automation in the Automotive Industry and Suppliers
- ☐ Production Logistics and Control Systems
- ☐ Production Machines, Textiles, Plastics, Metal Forming, Wood, Glass, Ceramic processing, Stone processing, Packaging, Printing, Cranes
- ☐ Process Control Systems
- ☐ Testing/Final Assembly

* This list contains industry sectors covered by Siemens Automation and Drives products and solutions.

Please select the team who you would like to deal with your enquiry:

Sales

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Contact

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Contacts by country sector product Reporting **en** Go

Local Partners Worldwide Please select a Siemens product group

Select area/product Select city Your contact(s)

Product Catalog Search a Product

Which product* does your question refer to?

A&D Product Groups

- ☒ Drive Technology
- ☐ Automation systems
- ☐ Communication networks
- ☐ Low Voltage Controls
- ☐ Electrical Installation Technology
- ☐ Process automation
- ☐ Sensor, measuring and testing technology
- ☐ Power supplies
- ☐ Safety systems - Safety Integrated
- ☐ Systems solutions and products for switches

* This list contains products and solutions provided by Siemens Automation and Drives.

Please select the team who you would like to deal with your enquiry:

Sales

Next >

Contact

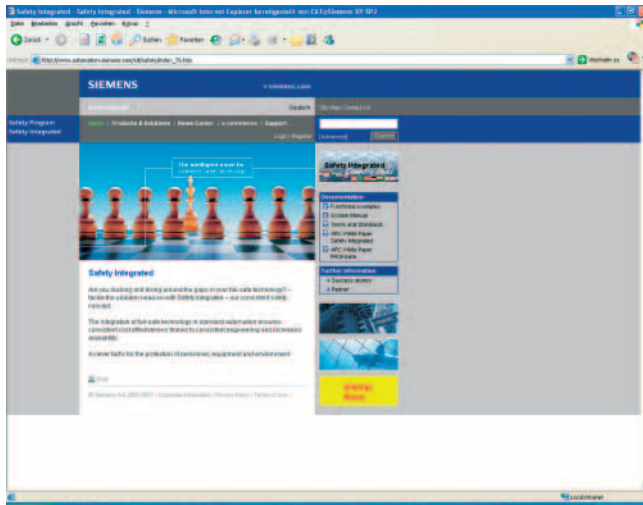
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Appendix

A&D online services

Information and ordering in the Internet and on CD/DVD

Safety Integrated in the WWW



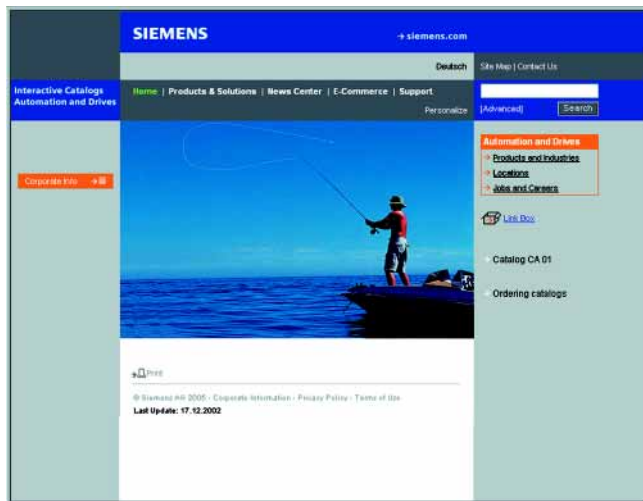
Safety Integrated offers comprehensive and integrated solutions for projects in the manufacturing and process industry. These solutions are accompanied by excellent services in all phases of a safety-critical plant or machine. The website provides crucial information on products, solutions and support, for example manuals, references and function examples.

Under the address

www.siemens.com/safety

you will find all you need to know about products, systems and services.

Product Selection Using the Offline Mall of Automation and Drives



Detailed information together with convenient interactive functions:

The Offline Mall CA 01 covers more than 80,000 products and thus provides a full summary of the Siemens Automation and Drives product base.

Here you will find everything that you need to solve tasks in the fields of automation, switchgear, installation and drives. All information is linked into a user interface which is easy to work with and intuitive.

After selecting the product of your choice you can order at the press of a button, by fax or by online link.

Information on the Offline Mall CA 01 can be found in the Internet under

<http://www.siemens.com/automation/ca01>

or on CD-ROM or DVD.

Easy Shopping with the A&D Mall



The A&D Mall is the virtual department store of Siemens AG in the Internet. Here you have access to a huge range of products presented in electronic catalogs in an informative and attractive way.

Data transfer via EDIFACT allows the whole procedure from selection through ordering to tracking of the order to be carried out online via the Internet.

Numerous functions are available to support you.

For example, powerful search functions make it easy to find the required products, which can be immediately checked for availability. Customer-specific discounts and preparation of quotes can be carried out online as well as order tracking and tracing.

Please visit the A&D Mall on the Internet under:

<http://www.siemens.com/automation/mall>

Our services in every phase of your project



In the face of harsh competition you need optimum conditions to keep ahead all the time:

A strong starting position. A sophisticated strategy and team for the necessary support - in every phase.

Service & Support from Siemens provides this support with a complete range of different services for automation and drives.

In every phase: from planning and startup to maintenance and upgrading.

Our specialists know when and where to act to keep the productivity and cost-effectiveness of your system running in top form.

Online Support



The comprehensive information system available round the clock via Internet ranging from Product Support and Service & Support services to Support Tools in the Shop.

<http://www.siemens.com/automation/service&support>

Technical Support



Competent consulting in technical questions covering a wide range of customer-oriented services for all our products and systems.

Tel.: +49 (0)180 50 50 222
Fax: +49 (0)180 50 50 223

www.siemens.com/automation/support-request

Technical Consulting



Support in the planning and designing of your project from detailed actual-state analysis, target definition and consulting on product and system questions right to the creation of the automation solution.¹⁾

Configuration and Software Engineering



Support in configuring and developing with customer-oriented services from actual configuration to implementation of the automation project.¹⁾

Service On Site



With Service On Site we offer services for startup and maintenance, essential for ensuring system availability.

In Germany
0180 50 50 444¹⁾

Repairs and Spare Parts



In the operating phase of a machine or automation system we provide a comprehensive repair and spare parts service ensuring the highest degree of operating safety and reliability.

In Germany
0180 50 50 446¹⁾

Optimization and Upgrading



To enhance productivity and save costs in your project we offer high-quality services in optimization and upgrading.¹⁾

¹⁾ Country-specific telephone numbers are shown on our Internet site
<http://www.siemens.com/automation/service&support>

Appendix

Customer Support

Knowledge Base on CD-ROM



For locations without online connections to the Internet there are excerpts of the free part of the information sources available on CD-ROM (Service & Support Knowledge Base). This CD-ROM contains all the latest product information at the time of production (FAQs, Downloads, Tips and Tricks, Updates) as well as general information on Service and Technical Support.

The CD-ROM also includes a full-text search and our Knowl-

edge Manager for targeted searches for solutions. The CD-ROM will be updated every 4 months.

Just the same as our online offer in the Internet, the Service & Support Knowledge Base on CD comes complete in 5 languages (German, English, French, Italian, Spanish).

You can order the **Service & Support Knowledge Base** CD from your Siemens contact.

Order no. **6ZB5310-0EP30-0BA2**

Orders via the Internet
(with Automation Value Card or credit card) at:

<http://www.siemens.com/automation/service&support>

in the Shop domain.

Automation Value Card



Small card - great support

The Automation Value Card is an integral component of the comprehensive service concept with which Siemens Automation and Drives will accompany you in each phase of your automation project.

It doesn't matter whether you want just specific services from our Technical Support or want to purchase high-quality Support Tools in our Online Shop, you can always pay with your Automation Value Card. No invoicing, transparent and safe. With your personal card number and associated PIN you can view the state of your account and all transactions at any time.

Services on card. This is how it's done.

Card number and PIN are on the back of the Automation Value Card. When delivered, the PIN is covered by a scratch field, guaranteeing that the full credit is on the card.

By entering the card number and PIN you have full access to the Service & Support services being offered. The charge for the services procured is debited from the credits on your Automation Value Card.

All the services offered are marked in currency-neutral credits, so you can use the Automation Value Card worldwide.

Automation Value Card order numbers

Credits	Order no.
200	6ES7 997-0BA00-0XA0
500	6ES7 997-0BB00-0XA0
1000	6ES7 997-0BC00-0XA0
10000	6ES7 997-0BG00-0XA0

Detailed information on the services offered is available on our Internet site at:

<http://www.siemens.com/automation/service&support>

Service & Support à la Card: Examples

Technical Support

"Priority"	Priority processing for urgent cases
"24 h"	Availability round the clock
"Extended"	Technical consulting for complex questions

Support Tools in the Support Shop

"System Utilities"	Tools that can be used directly for configuration, analysis and testing
"Applications"	Complete topic solutions including ready-tested software
"Functions & Samples"	Adaptable blocks for accelerating your developments



Notes



Appendix

Customer Support



Notes

Overview

Software types

Software requiring a license is categorized into types. The following software types have been defined:

- Engineering software
- Runtime software

Engineering software

This includes all software products for creating (engineering) user software, e.g. for configuring, programming, parameterizing, testing, commissioning or servicing.

Data generated with engineering software and executable programs can be duplicated for your own use or for use by third-parties free-of-charge.

Runtime software

This includes all software products required for plant/machine operation, e.g. operating system, basic system, system expansions, drivers, etc.

The duplication of the runtime software and executable programs created with the runtime software for your own use or for use by third-parties is subject to a charge.

You can find information about license fees according to use in the ordering data (e.g. in the catalog). Examples of categories of use include per CPU, per installation, per channel, per instance, per axis, per control loop, per variable, etc.

Information about extended rights of use for parameterization/configuration tools supplied as integral components of the scope of delivery can be found in the readme file supplied with the relevant product(s).

License types

Siemens Automation & Drives offers various types of software license:

- Floating license
- Single license
- Rental license
- Trial license

Floating license

The software may be installed for internal use on any number of devices by the licensee. Only the concurrent user is licensed. The concurrent user is the person using the program. Use begins when the software is started.

A license is required for each concurrent user.

Single license

Unlike the floating license, a single license permits only one installation of the software.

The type of use licensed is specified in the ordering data and in the Certificate of License (CoL). Types of use include for example per device, per axis, per channel, etc.

One single license is required for each type of use defined.

Rental license

A rental license supports the "sporadic use" of engineering software. Once the license key has been installed, the software can be used for a specific number of hours (the operating hours do not have to be consecutive).

One license is required for each installation of the software.

Trial license

A trial license supports "short-term use" of the software in a non-productive context, e.g. for testing and evaluation purposes. It can be transferred to another license.

Factory license

With the Factory License the user has the right to install and use the software at one permanent establishment only. The permanent establishment is defined by one address only. The number of hardware devices on which the software may be installed results from the order data or the Certificate of License (CoL).

Certificate of license

The Certificate of License (CoL) is the licensee's proof that the use of the software has been licensed by Siemens. A CoL is required for every type of use and must be kept in a safe place.

Downgrading

The licensee is permitted to use the software or an earlier version/release of the software, provided that the licensee owns such a version/release and its use is technically feasible.

Delivery versions

Software is constantly being updated. The following delivery versions

- PowerPack
- Upgrade

can be used to access updates.

Existing bug fixes are supplied with the ServicePack version.

PowerPack

PowerPacks can be used to upgrade to more powerful software. The licensee receives a new license agreement and CoL (Certificate of License) with the PowerPack. This CoL, together with the CoL for the original product, proves that the new software is licensed.

A separate PowerPack must be purchased for each original license of the software to be replaced.

Upgrade

An upgrade permits the use of a new version of the software on the condition that a license for a previous version of the product is already held.

The licensee receives a new license agreement and CoL with the upgrade. This CoL, together with the CoL for the previous product, proves that the new version is licensed.

A separate upgrade must be purchased for each original license of the software to be upgraded.

ServicePack

ServicePacks are used to debug existing products.

ServicePacks may be duplicated for use as prescribed according to the number of existing original licenses.

License key

Siemens Automation & Drives supplies software products with and without license keys.

The license key serves as an electronic license stamp and is also the "switch" for activating the software (floating license, rental license, etc.).

The complete installation of software products requiring license keys includes the program to be licensed (the software) and the license key (which represents the license).



Detailed explanations concerning license conditions can be found in the "Terms and Conditions of Siemens AG" or under <http://www.siemens.com/automation/mall> (A&D Mall Online-Help System)

Appendix

Customer Support

Conditions of sale and delivery

Export regulations

Terms and Conditions of Sale and Delivery

By using this catalog you can acquire hardware and software products described therein from Siemens AG subject to the following terms. Please note! The scope, the quality and the conditions for supplies and services, including software products, by any Siemens entity having a registered office outside of Germany, shall be subject exclusively to the General Terms and Conditions of the respective Siemens entity. The following terms apply exclusively for orders placed with Siemens AG.

For customers with a seat or registered office in Germany

The "General Terms of Payment" as well as the "General Conditions for the Supply of Products and Services of the Electrical and Electronics Industry" shall apply.

For software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office in Germany" shall apply.

For customers with a seat or registered office outside of Germany

The "General Terms of Payment" as well as the "General Conditions for Supplies of Siemens. Automation and Drives for Customers with a Seat or registered Office outside of Germany" shall apply.

For software products, the "General License Conditions for Software Products for Automation and Drives for Customers with a Seat or registered Office outside of Germany" shall apply.

General

The dimensions are in mm. In Germany, according to the German law on units in measuring technology, data in inches only apply to devices for export.

Illustrations are not binding.

Insofar as there are no remarks on the corresponding pages, - especially with regard to data, dimensions and weights given - these are subject to change without prior notice.

The prices are in € (Euro) ex works, exclusive packaging.

The sales tax (value added tax) is not included in the prices. It shall be debited separately at the respective rate according to the applicable legal regulations.

Prices are subject to change without prior notice. We will debit the prices valid at the time of delivery.

Surcharges will be added to the prices of products that contain silver, copper, aluminum, lead and/or gold if the respective basic official prices for these metals are exceeded. These surcharges will be determined based on the official price and the metal factor of the respective product.

The surcharge will be calculated on the basis of the official price on the day prior to receipt of the order or prior to the release order.

The metal factor determines the official price as of which the metal surcharges are charged and the calculation method used. The metal factor, provided it is relevant, is included with the price information of the respective products.

An exact explanation of the metal factor and the text of the Comprehensive Terms and Conditions of Sale and Delivery are available free of charge from your local Siemens business office under the following Order Nos.:

- 6ZB5310-0KR30-0BA1
(for customers based in Germany)
- 6ZB5310-0KS53-0BA1
(for customers based outside Germany)

or download them from the Internet

<http://www.siemens.com/automation/mall>

(Germany: A&D Mall Online-Help System)

Export regulations

The products listed in this catalog / price list may be subject to European / German and/or US export regulations.

Therefore, any export requiring a license is subject to approval by the competent authorities.

According to current provisions, the following export regulations must be observed with respect to the products featured in this catalog / price list:

AL	Number of the <u>German Export List</u> Products marked other than "N" require an export license. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "<u>AL</u>" <u>not equal to</u> "<u>N</u>" are subject to a European or German export authorization when being exported out of the EU.
ECCN	<u>Export Control Classification Number</u> Products marked other than "N" are subject to a reexport license to specific countries. In the case of software products, the export designations of the relevant data medium must also be generally adhered to. Goods labeled with an "<u>ECCN</u>" <u>not equal to</u> "<u>N</u>" are subject to a US re-export authorization.

Even without a label or with an "AL: N" or "ECCN: N", authorization may be required due to the final destination and purpose for which the goods are to be used.

The deciding factors are the AL or ECCN export authorization indicated on order confirmations, delivery notes and invoices.

Errors excepted and subject to change without prior notice.

A&D/VuL_ohne MZ/En 05.09.06

Automation and Drives Interactive catalog on CD-ROM and on DVD • The Offline Mall of Automation and Drives	<i>Catalog</i> CA 01	Industrial Communication for Automation and Drives	<i>Catalog</i> IK PI
Automation Systems for Machine Tools SINUMERIK & SIMODRIVE SINUMERIK & SINAMICS	NC 60 NC 61	Low-Voltage Controls and Distribution – SIRIUS, SENTRON, SIVACON Controls and Distribution – Technical Information SIRIUS, SENTRON, SIVACON SIDAC Reactors and Filters SIVENT Fans SIVACON 8PS Busbar Trunking Systems	LV 1 LV 1 T LV 60 LV 65 LV 70
Drive Systems <u>Variable-Speed Drives</u> SINAMICS G110/SINAMICS G120 Inverter Chassis Units SINAMICS G120D Distributed Frequency Inverters SINAMICS G130 Drive Converter Chassis Units, SINAMICS G150 Drive Converter Cabinet Units SINAMICS GM150/SINAMICS SM150 Medium-Voltage Converters SINAMICS S120 Drive Converter Systems SINAMICS S150 Drive Converter Cabinet Units Asynchronous Motors Standardline Synchronous Motors with Permanent-Magnet Technology, HT-direct DC Motors SIMOREG DC MASTER 6RA70 Digital Chassis Converters SIMOREG K 6RA22 Analog Chassis Converters SIMOREG DC MASTER 6RM70 Digital Converter Cabinet Units SIMOVERT PM Modular Converter Systems SIEMOSYN Motors MICROMASTER 410/420/430/440 Inverters MICROMASTER 411/COMBIMASTER 411 SIMOVERT MASTERDRIVES Vector Control SIMOVERT MASTERDRIVES Motion Control Synchronous and asynchronous servomotors for SIMOVERT MASTERDRIVES SIMODRIVE 611 universal and POSMO <u>Low-Voltage Three-Phase-Motors</u> IEC Squirrel-Cage Motors <u>Automation Systems for Machine Tools SIMODRIVE</u> • Main Spindle/Feed Motors • Converter Systems SIMODRIVE 611/POSMO <u>Automation Systems for Machine Tools SINAMICS</u> • Main Spindle/Feed Motors • Drive System SINAMICS S120 <u>Drive and Control Components for Hoisting Equipment</u>	D 11.1 D 11 D 12 D 21.1 D 21.3 D 86.1 D 86.2 DA 12 DA 21.1 DA 21.2 DA 22 DA 45 DA 48 DA 51.2 DA 51.3 DA 65.10 DA 65.11 DA 65.3 DA 65.4 D 81.1 NC 60 NC 61 HE 1	Motion Control System SIMOTION Process Instrumentation and Analytics Field Instruments for Process Automation Measuring Instruments for Pressure, Differential Pressure, Flow, Level and Temperature, Positioners and Liquid Meters <i>PDF: Indicators for panel mounting</i> SIREC Recorders and Accessories SIPART, Controllers and Software SIWAREX Weighing Systems Continuous Weighing and Process Protection Process Analytical Instruments <i>PDF: Process Analytics, Components for the System Integration</i> SIMATIC Industrial Automation Systems SIMATIC PCS Process Control System Products for Totally Integrated Automation and Micro Automation SIMATIC PCS 7 Process Control System Add-ons for the SIMATIC PCS 7 Process Control System Migration solutions with the SIMATIC PCS 7 Process Control System pc-based Automation SIMATIC Control Systems SIMATIC Sensors Sensors for Factory Automation Systems Engineering Power supplies SITOP power System cabling SIMATIC TOP connect System Solutions Applications and Products for Industry are part of the interactive catalog CA 01 TELEPERM M Process Control System <i>PDF: AS 488/TM automation systems</i>	PM 10 FI 01 MP 12 MP 20 MP 31 WT 01 WT 02 PA 01 PA 11 ST 45 ST 70 ST PCS 7 ST PCS 7.1 ST PCS 7.2 ST PC ST DA FS 10 KT 10.1 KT 10.2 PLT 112
Electrical Installation Technology <i>PDF: ALPHA Small Distribution Boards and Distribution Boards, Terminal Blocks</i> <i>PDF: ALPHA 8HP Molded-Plastic Distribution System</i> <i>PDF: BETA Low-Voltage Circuit Protection</i> <i>PDF: DELTA Switches and Socket Outlets</i> GAMMA Building Controls	ET A1 ET A3 ET B1 ET D1 ET G1		
Human Machine Interface Systems SIMATIC HMI	ST 80		

www.siemens.com/safety

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Automation and Drives
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