

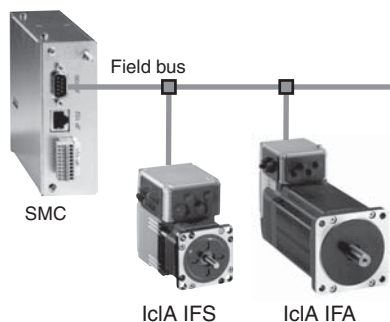
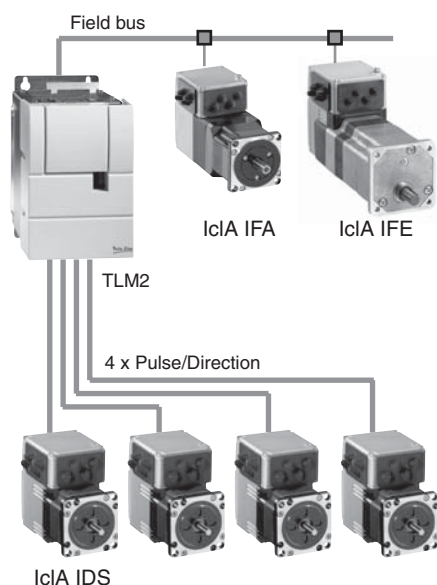
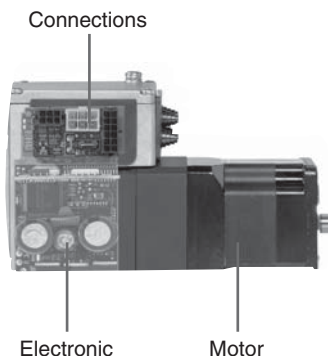
BERGER LAHR

Catalogue

Intelligent Compact Drives IclA Ixx



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Product overview

IclA intelligent compact drives consist of a motor and control electronics. Control takes place over a fieldbus or pulse interface. IclA are used as a decentralised drive in machine building and automation technology. This is how the connection with a motion controller, such as the TLM2 from Berger Lahr or a programmable logic controller can perform a complex automation task, simply and economically. Function modules are available for simple motion programming with a Berger Lahr motion controller. The IclA compact drives from Berger Lahr have the following characteristics:

Compactness

The motor and electronics create a compact unit with small dimensions. Thus no space is needed for the control electronics in the switching cabinet and the space requirements in the machine are low.

Simplicity

Integration of the motor and electronics reduces the installations costs and simplifies electromagnetic compatibility. Also, the simple to operate PC software for the IclA allows for easy commissioning.

Openness

The compact drives are fitted with a fieldbus interface which allows communication over CANopen, Profibus DP or RS485. Compact drives with a stepper motor can also be alternatively obtained with a pulse/direction interface. This open communication concept allows integration into existing system environments.

Flexibility

IclA compact drives are available in several type of motor designs, including AC-synchronous, servomotor, EC motor and stepper motor. Each design offers a unique advantage depending on specification.

Safety

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN 60204-1 without external power contactors. This reduces the system costs and the response times. The drive meets the requirements of the IEC 61508 SIL 2 as well as EN 954-1 category 3.

Product overview IclA intelligent compact drives

IclA IFA6x



IclA IFE71



IclA IxS6x



IclA IxS9x



IclA with fieldbus interface

IclA IFA with AC synchronous servomotor

IFA6x

Torque range	0.26 ... 0.45 Nm; peak torque: 0.4 ... 0.72 Nm
Speed range	up to 7,500 1/min (without transmission)
Positioning resolution	0.02°

Interfaces	Fieldbus interface: Profibus DP, CANopen or RS485 24 V signal interface with 4 free programmable input/output signals; interface for safety function "Power removal"
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Operating modes	Homing, jog, profile position, profile velocity, electronic gear
------------------------	--

Configuration	over fieldbus or parameter switch: Baud rate, network addresses and terminating resistor
----------------------	--

IclA IFE with EC motor

IFE71

Torque range	0.17 Nm; 3.1 ... 11 Nm (with spur wheel gear)
Speed range	up to 4,800 1/min (without transmission)
Detent torque	0.08 Nm (without transmission); 1 ... 8 Nm (with spur wheel gear)
Positioning resolution	0.26° ... 1.67° (with spur wheel gear)

Interfaces	Fieldbus interface: Profibus DP, CANopen or RS485 24 V signal interface with 4 free programmable input/output signals; interface for safety function "Power removal"
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Operating modes	Homing, jog, profile position, profile velocity
------------------------	---

Configuration	over fieldbus or parameter switch: Baud rate, network addresses and terminating resistor
----------------------	--

IclA IFS with three-phase stepper motor

IFS6x

IFS9x

Torque range	0.45 ... 1.5 Nm (without transmission)	2 ... 6 Nm (without transmission)
Speed range	up to 2,000 1/min (without transmission)	up to 1,000 1/min (without transmission)
Positioning resolution	0.018°	

Interfaces	Fieldbus interface: Profibus DP, CANopen or RS485 24 V signal interface with 4 free programmable input/output signals; interface for safety function "Power removal"
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Operating modes	Homing, jog, profile position, profile velocity
------------------------	---

Configuration	over fieldbus or parameter switch: Baud rate, network addresses and terminating resistor
----------------------	--

IclA with pulse/direction interface

IclA IDS with three-phase stepper motor

IDS6x

IDS9x

Torque range	0.45 ... 1.5 Nm (without transmission)	2 ... 6 Nm (without transmission)
Speed range	up to 2,000 1/min (without transmission)	up to 1,000 1/min (without transmission)
Positioning resolution	0.036°	

Interfaces	Multifunctional interface for pulse/direction or AB signals (encoder); Service interface RS485; 24 V signal interface; interface for safety function "Power Removal"
-------------------	--

Functions	Current reduction, stall detection, input/output signal assignment
------------------	--

Configuration	over the parameter switch: Motor phase current, step count, phase current lowering, stall detection, RS485 terminating resistor, input/output signal assignment
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Product description

The lclA IFx intelligent compact drives consist of the motor, control electronics and a field bus interface (CANopen, Profibus DP or RS485).

The lclA IFx product group includes:

- IFA with AC synchronous servomotor
- IFE with EC motor (brushless DC motor)
- IFS with three-phase stepper motor

lclA IFA – the compact drive for dynamic processes

The lclA IFA has an AC synchronous servomotor. This motor has a high dynamic response, because it can be subjected to short-term overcurrent during acceleration.

lclA IFE – the compact drive for automatic format changes

The lclA IFE is fitted with an EC motor (brushless DC motor). The EC motors installed in the drive have a high holding torque when without power. A holding brake is generally unnecessary. Due to electronic processing with the lclA IFE, the positioning characteristics are similar to an absolute value encoder.

lclA IFS – the compact drive for short-line positioning

The lclA IFS with its three-phase stepper motor provides high torque at low speeds. The lclA compact drive with its synchronous characteristics is ideally suited for high resolution positioning operations. Commissioning of the stepper motor drive is easy because controller setting is not required.

Special features

lclA IFA

- High dynamics and high peak torque
- High resolution single-turn absolute value encoder with a resolution of 16384 increments
- Optionally with integrated holding brake
- Optionally with planetary gear

lclA IFE

- High holding torque without power
- Quasi-absolute value sensor, therefore homing not required after switching off and on
- Optionally with spur wheel gear or planetary gear

lclA IFS

- High continuous standstill torque
- Good synchronous characteristics
- High positioning resolution (0.018°)
- Optionally with holding brake (IFS9x only)
- Optionally with planetary gear

Electronics

The electronic system is comprised of control electronics and a power amplifier. They have a common power supply and are not electrically isolated.

The compact drive can be configured and actuated via the fieldbus interface.

There are also four 24 V I/O points available. Each can be configured as an input or output.

Connections

The IclA IFx intelligent compact drives have the following connections:

- supply voltage V_{DC}
- Fieldbus interface: Profibus DP, CANopen or RS485
- 24 V signal interface for four inputs/outputs
- Signal interface for "Power Removal" safety function

Fieldbus interface

Depending on the device version, the following fieldbuses can be connected to the fieldbus interface:

- PROFIBUS DP-V0 (data format according to Profidrive V2.0 PPO Type 2)
- CANopen (DS301 protocol)
- RS485 (Berger Lahr protocol, compatible to TwinLine)

The fieldbus interface is used for setting parameters and control of the compact drive. The compact drive can also be operated with a PC and the "IclA Easy" PC software via the fieldbus interface. A fieldbus converter is required for this, e.g. USB-CAN, RS232-RS485 or CP551 from Siemens for Profibus.

24 V I/O signal interface

Four 24 V signals are available, which can be used as both input and output.

The 24 V signals are freely accessible to the master controller over the fieldbus. They can also be used for predefined functions, such as for connection of limit and reference switches.

The 24 V power supply to the outputs is internal via the supply voltage of the compact drive (standard). Alternatively, the outputs and the sensors can be powered by a separate power supply unit (optional).

Signal interface for "Power Removal" safety function

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN 60204-1 without external power contactors. The supply voltage must not be interrupted. This reduces the system costs and response times.

The safety function is activated via two redundant 24 V input signals (low active).

Connection technologies

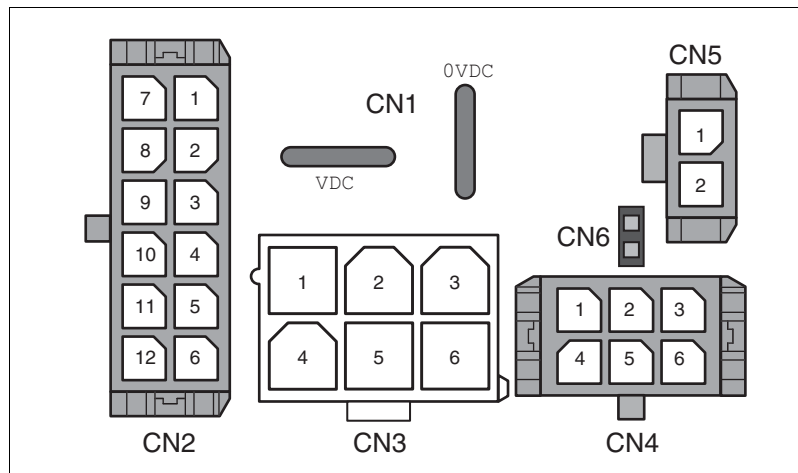
Circuit board plug connector



Circuit board plug connectors are used for cabling series machines with cable harnesses.

- Fieldbus and I/O signal connection with "Molex Micro Fit" plug connector
- Power supply connection with "AMP Positive Lock" crimp contacts

Two cable entries are required for cabling the compact drive (see accessories).



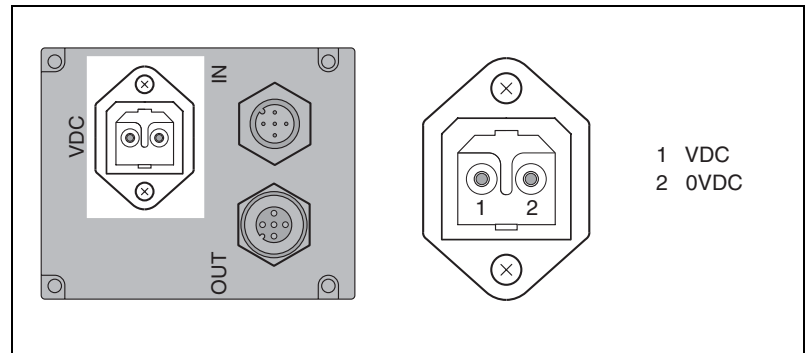
Printed circuit board plug connectors, overview of all connections

Terminal	Assignments
CN1	Supply voltage VDC
CN2	For all IFx: Interface for Profibus DP For IFA only: interface for Profibus DP and electronic gear operating mode (reference signal)
CN3	Interface for CAN or RS485
CN4	24 V interface
CN5	Interface for "Power Removal" safety function
CN6	Jumper for disabling "Power Removal" safety function

Industrial plug connectors

Compact drives with industrial plug connectors are generally used in specialised machines and small production runs.

The device version with industrial plug connectors has a connector housing cover with two M12 circular connectors (5-pin) for the fieldbus terminal and a Hirschmann STASEI 200 connector for connection of the power supply.

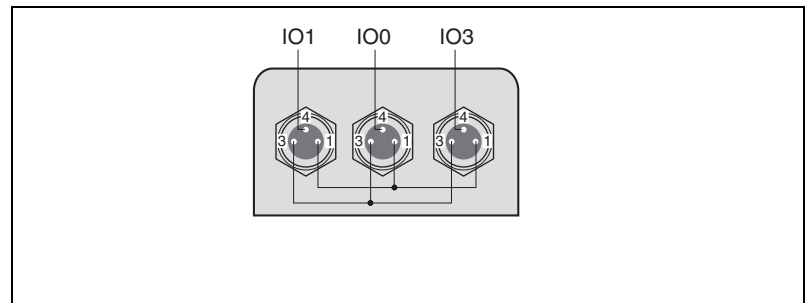


Industrial plug connectors, overview of connections

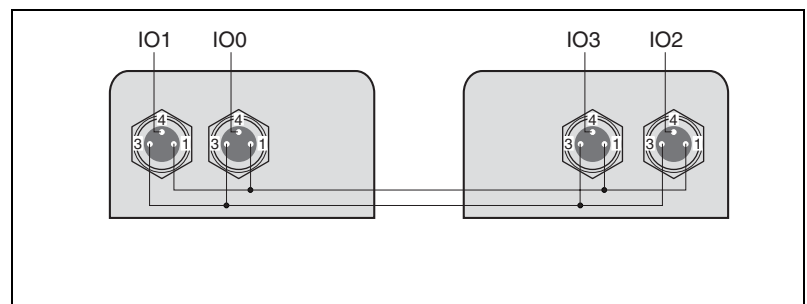
I/O signal inserts

One or two I/O signal inserts with industrial plug connectors can be ordered for connection of the I/O signals (see accessories).

The 24 V power supply to the outputs is internal via the power supply or an external power supply unit (optional). Various I/O signal inserts are available for this.

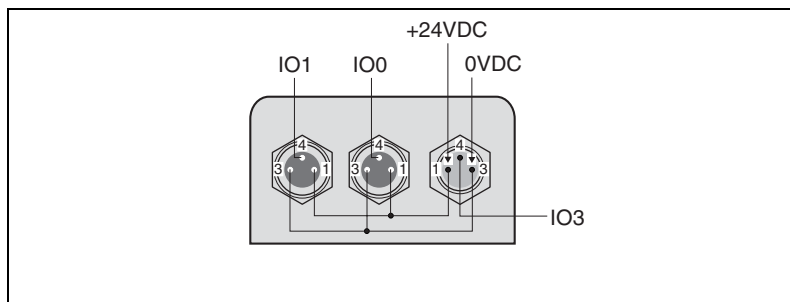
I/O signal inserts with internal 24 V signal power supply

Insert for three I/O signals

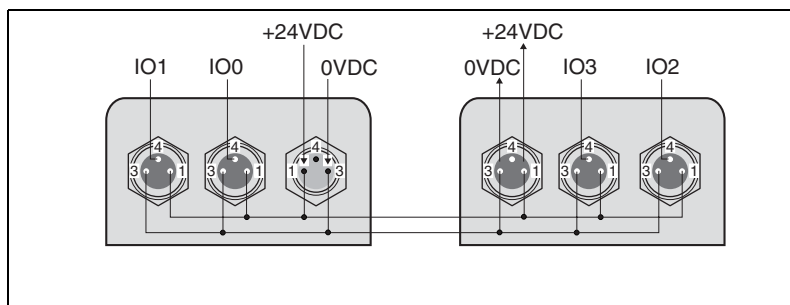


Inserts for four I/O signals

I/O signal inserts with external 24 V signal power supply

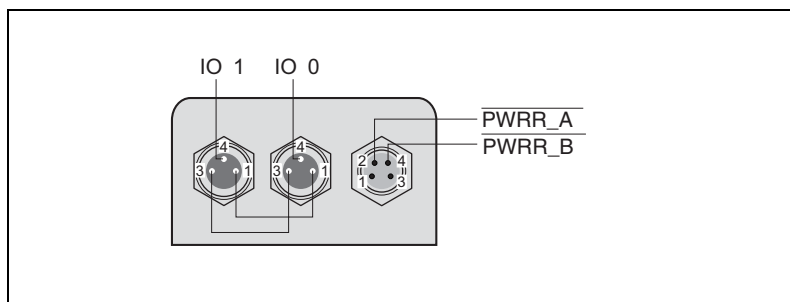


Insert for three I/O signals

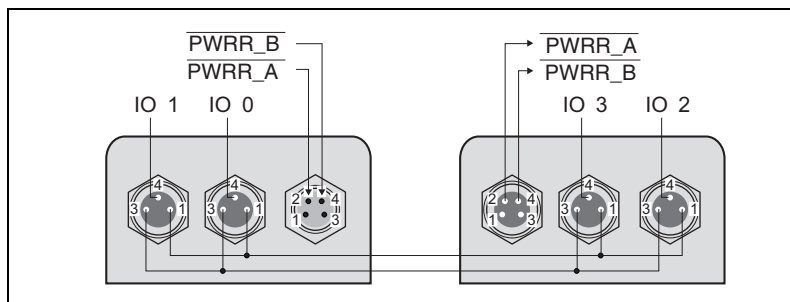


Inserts for four I/O signals

I/O signal inserts with "Power Removal" safety function and internal 24 V signal power supply



Insert for two I/O signals and signals for safety function



Inserts for four I/O signals and signals for safety function

Functions

Configuration via parameter switches

The following settings can be made on the compact drive via parameter switches:

Profibus DP

- Setting fieldbus address
- Activating terminating resistor

CAN and RS485

- Setting fieldbus address
- Setting baud rate
- Activating terminating resistor
- Setting pulse input for electronic gear operating mode (pulse/direction or A/B signals, with IclA IFA only)

Operating modes

Overview

The following operating modes can be set via fieldbus:

- Profile position
- Profile velocity
- Homing
- Electronic gear (IclA IFA only)
- Jog

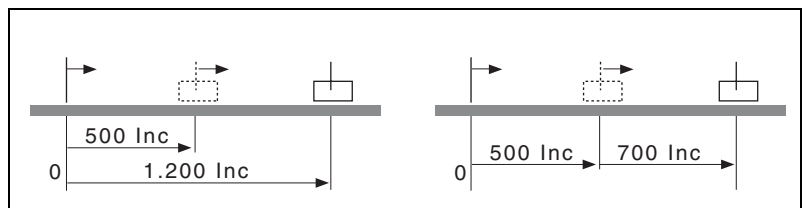
Profile position

In "profile position" operating mode the motor is positioned from a point A to a point B with a positioning command.

Setting options

The positioning path can be input in two ways:

- Absolute positioning, reference point is the zero point of the axis
- Relative positioning, reference point is the current position of the motor



"Profile position" operating mode, absolute and relative

Reference value default

The reference value is set via fieldbus or with the PC software "IclA Easy".

Example of application

Pick-and-place with a linear robot

Profile velocity

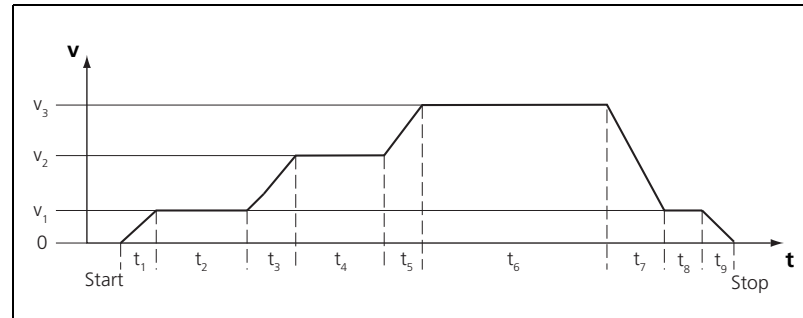
In the "profile velocity" operating mode a setpoint speed for the motor is set and a movement without a target position is started. This speed is maintained until a different setpoint speed is input or the operating mode is changed.

Reference value default

The reference value is set via fieldbus or with the PC software "IclA Easy".

Example of application

Coating application in CD manufacture



Profile velocity

- | | |
|----------------------|---------------------|
| t_1, t_3, t_5 | = acceleration |
| t_2, t_4, t_6, t_8 | = constant movement |
| t_7, t_9 | = braking |

Homing

There are two types of "homing":

- Reference movement
Specifying the dimension reference by approaching a limit or reference switch
- Dimension setting
Specifying the dimension reference relative to the current motor position

Reference movement

In the reference movement a defined position on the axis is approached. The defined position is specified by a mechanical switch:

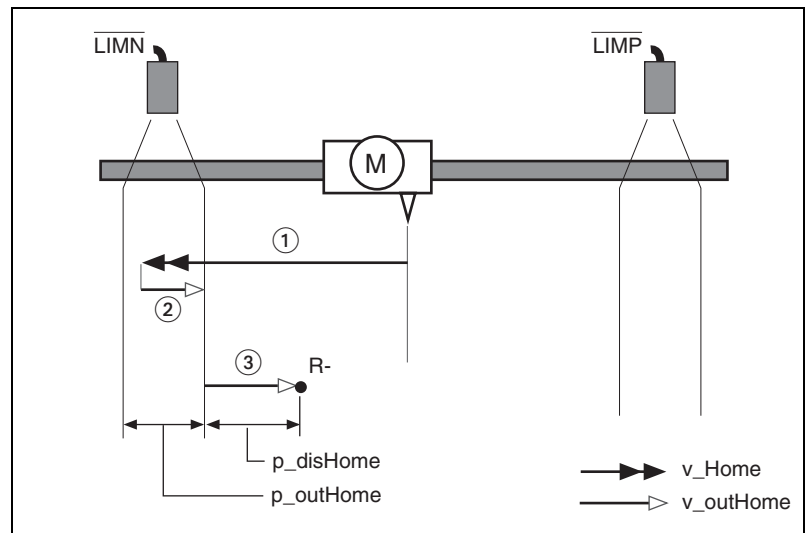
- Limit switch
- Reference switch REF

Types of reference movements

There are six standard reference movements:

- Movement to negative limit switch LIMN
- Movement to positive limit switch LIMP
- Movement to reference switch REF with first movement in counter-clockwise direction of rotation
- Movement to reference switch REF with first movement in clockwise direction of rotation
- Reference movement to index pulse in clockwise or counter-clockwise direction of rotation (IFA and IFS with index pulse encoder only)
- Reference movement to block = mechanical stop (IFE only)

The standard reference movements can be conducted with and without index pulse.

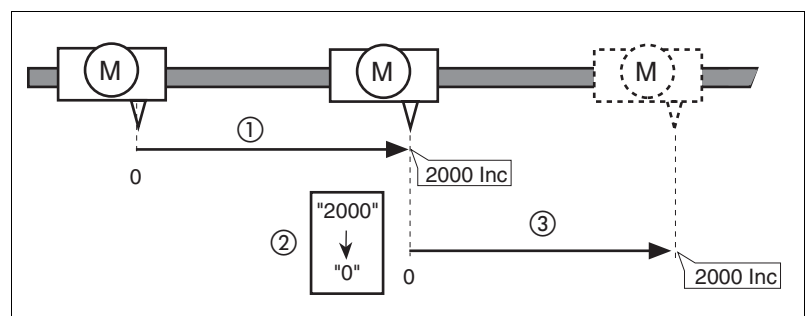
Example 1: Reference movement towards limit switch

"Homing" operating mode, reference movement to limit switch

- (1) Movement to limit switch at search speed
- (2) Movement to switching edge at clearance speed
- (3) Movement to distance to switching edge at clearance speed

Example 2: Dimension setting

Dimension setting can be used to carry out a continuous motor movement without exceeding positioning limits.



Positioning by 4000 increments with set dimensions

- (1) The motor is positioned by 2000 Inc.
- (2) By setting dimensions to 0 the current motor position is set to position value 0 and the new zero point is simultaneously defined.
- (3) After triggering a new travel command by 2000 Inc the new target position is 2000 Inc.

This method avoids crossing absolute position limits during a positioning operation because the zero point is continuously tracked.

Reference value default

The reference value is set via fieldbus or with the PC software "IcIA Easy".

Example of application

Before absolute positioning in "profile position" operating mode.

Electronic gear (possible with lclA IFA only)

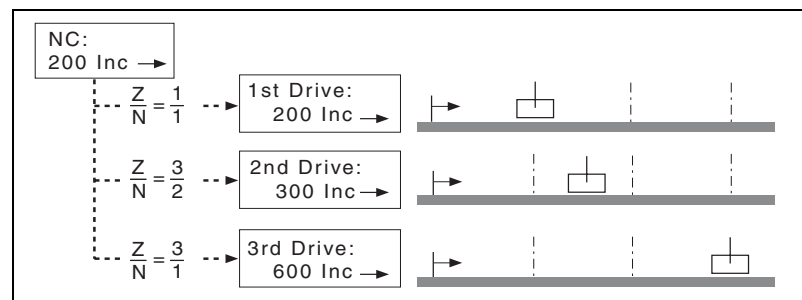
In the "electronic gear" operating mode the reference signal from an encoder (A/B signals) or a controller (pulse/direction signals) are fed in and a new position setpoint is calculated with an adjustable gear ratio.

Reference value default

The reference value is set with pulse/direction or A/B encoder signals (adjustable with parameter switch). The reference value for lclA IFA with Profibus can only be set with pulse/direction signals.

Example of application

Synchronisation of motion sequences, e.g. cutting material on a conveyor.



"Electronic gear" operating mode

Jog

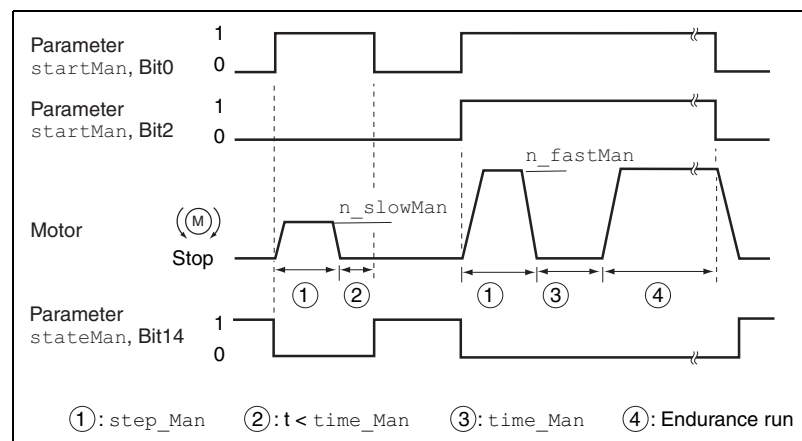
The motor traverses by one traverse unit or at constant speed in continuous running. The length of the path unit, the speed steps and the switching time in continuous operation can be set by manual actuation.

Reference value default

The reference value is set via fieldbus or with the PC software "lclA Easy".

Example of application

Setting up the machine during commissioning



Jog, slow and fast

Safety function**Definition****Power Removal**

The "Power Removal" safety function switches off the motor torque safely. The supply voltage must not be interrupted. There is no monitoring at standstill.

Category 0 stop (EN 60204-1)

Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).

Category 1 stop (EN 60204-1)

A controlled stop in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

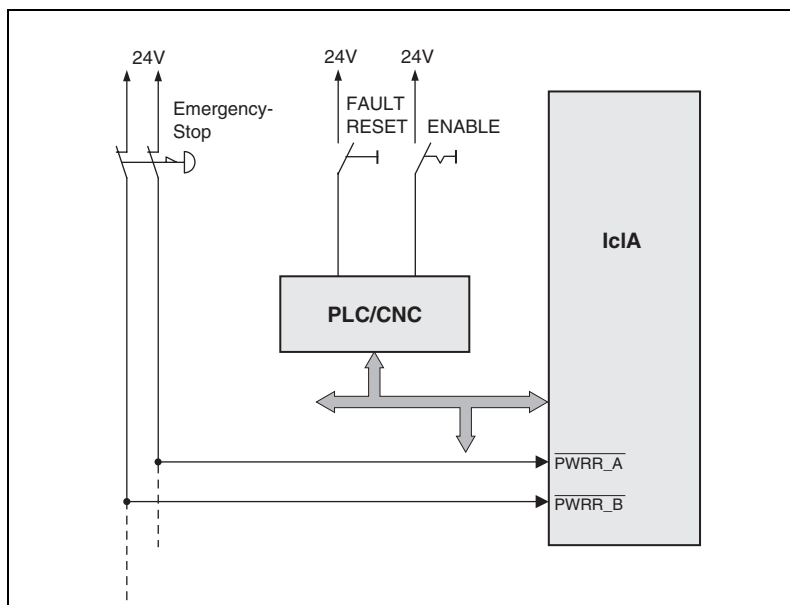
Description

The "Power Removal" safety function integrated into the product can be used to implement the Emergency Stop control function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.

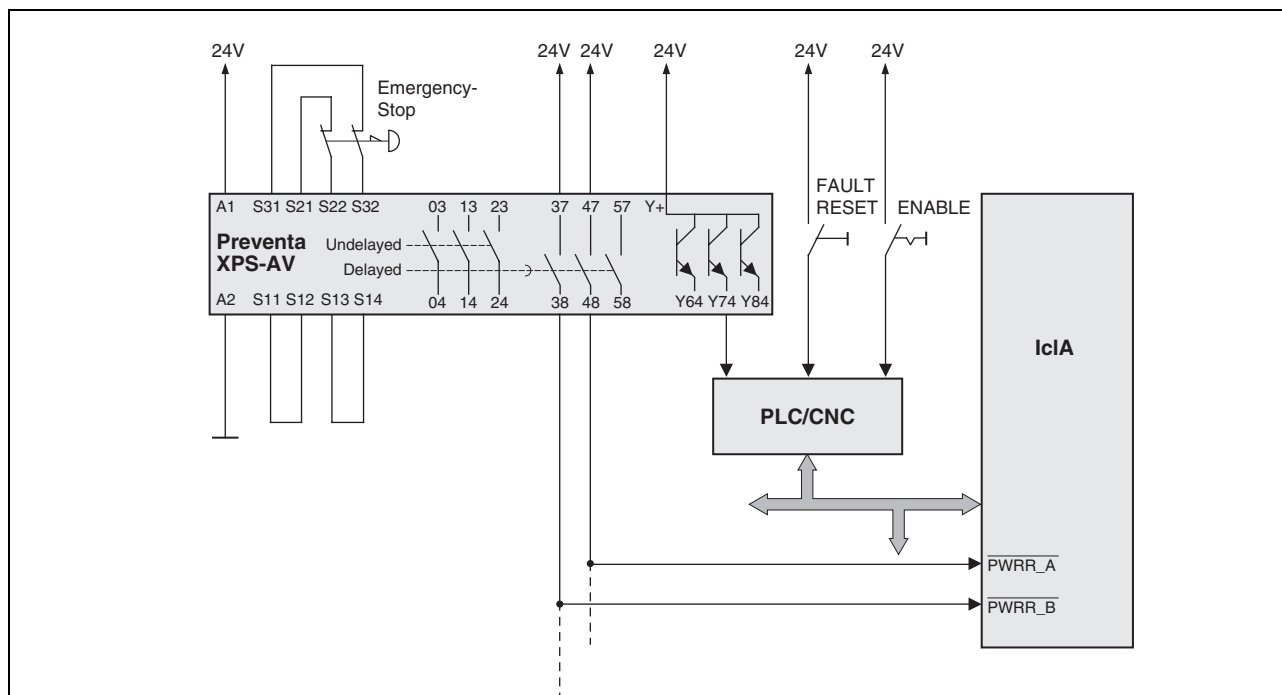
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508; SIL 2; Functional safety of electrical/electronic/programmable electronic safety-related systems.
- pr IEC 62061; SIL 2; Safety of Machines - Functional safety of electrical, electronic and programmable controllers of machines
- EN 954-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements
- pr EN 13849-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements

Examples of applications for the safety function



Example category 0 stop

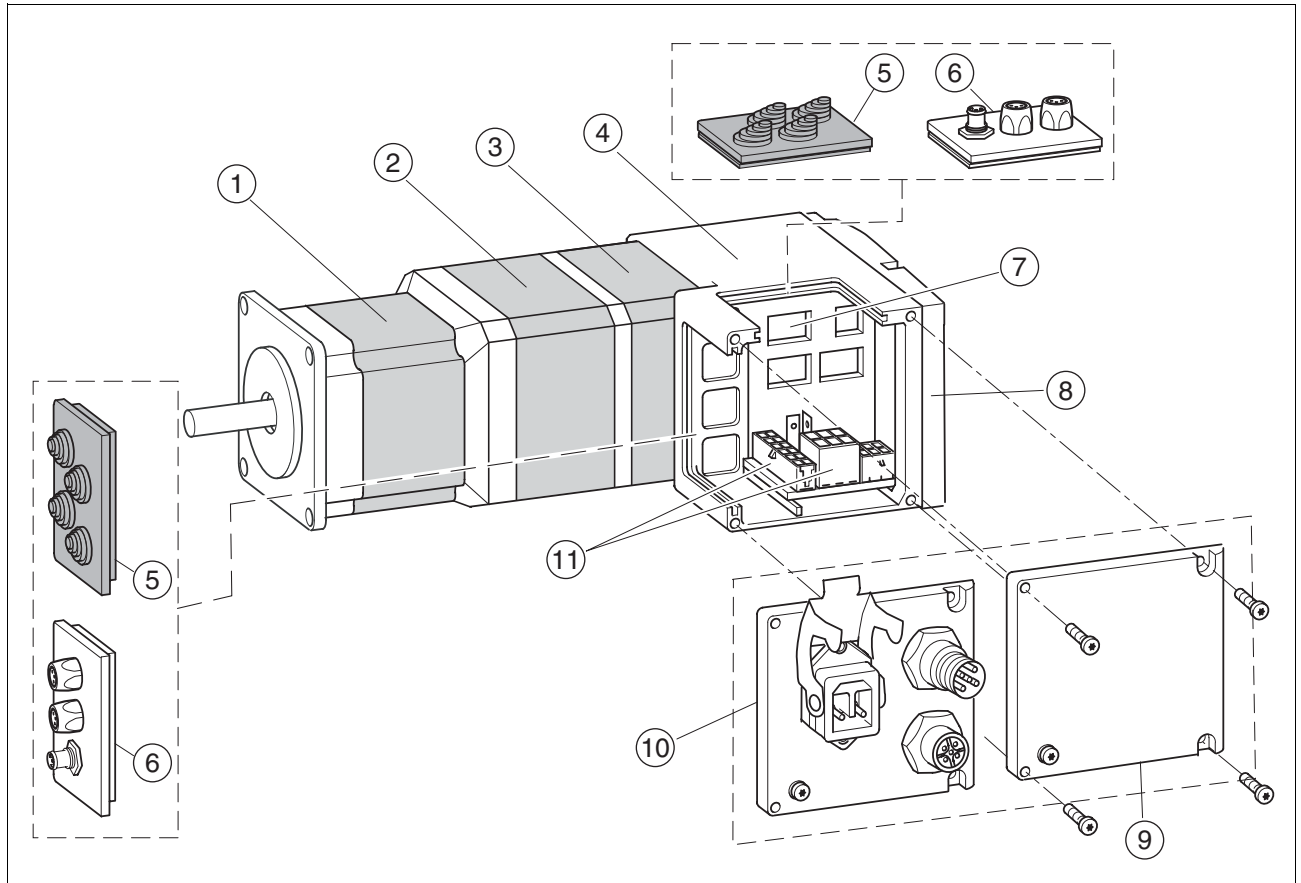


Example category 1 stop

Additional operating functions

Additional operating functions can be activated over the fieldbus or by PC.

- Reverse the direction of rotation of the motor
- Setting travel profile via profile generator
- Trigger Quick Stop function
- Fast position capture via signal input (Capture)
- Programming inputs/outputs

IcIA IFA**Product overview**

Components of the IcIA IFA compact drive

- (1) Synchronous AC-servomotor
- (2) Brake (optional)
- (3) Encoder
- (4) Electronics housing
- (5) Plug-in unit cable entry (accessory)
- (6) I/O plug-in unit with industrial plug connector (accessory)
- (7) Parameter switches
- (8) Electronics cover, must not be removed
- (9) Plug cover, to be removed on installation
- (10) Cover with industrial plug connector for VDC supply voltage and IN/OUT fieldbus terminal (optional)
- (11) Electrical terminals

Technical data

IFA6x mechanical data

		IFA61/./3D		IFA61/./5D		IFA62/./3D		IFA62/./5D	
Nominal voltage	V _{DC}	24	36	24	36	24	36	24	36
Nominal speed	1/min	5100	7500	3200	5500	3100	5000	2600	4300
Max. torque M _{max} ¹⁾	Nm	0.43		0.6		0.61		0.72	
Continuous torque M _{d0} ²⁾	Nm	0.26		0.26		0.41		0.45	
Positioning resolution	Incr.	16384				16384			
Accuracy of positioning sensor	°	±0.05				±0.05			
Moment of inertia J _R	kgcm ²	0.1				0.18			
Weight m	kg	1.4				1.7			
Shaft load									
• Max. radial force ³⁾	N	89				107			
• Max. axial force tension	N	104				104			
• Max. axial force compression	N	104				104			
• Nominal bearing life L _{10h} ⁴⁾	h	20000				20000			

Holding brake

Holding torque M _H	Nm	1.2
Electrical pick-up power	W	10
Turn on time (release brake)	ms	14
Break time (close brake)	ms	13
Moment of inertia	kgcm ²	0.07
Weight m	kg	0.400

¹⁾ Max. 2.5 s

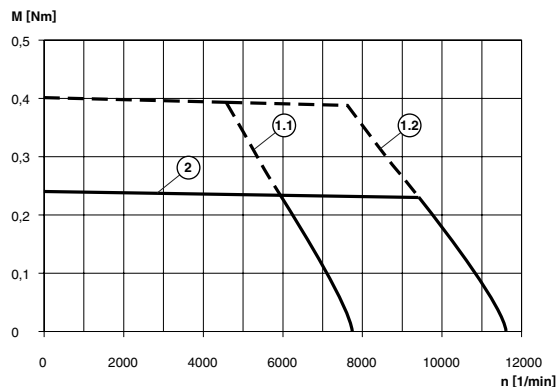
²⁾ At 20 1/min; at 0 1/min the continuous torque is reduced to 89% of the input value

³⁾ Reference point of radial force: 10 mm distance from flange

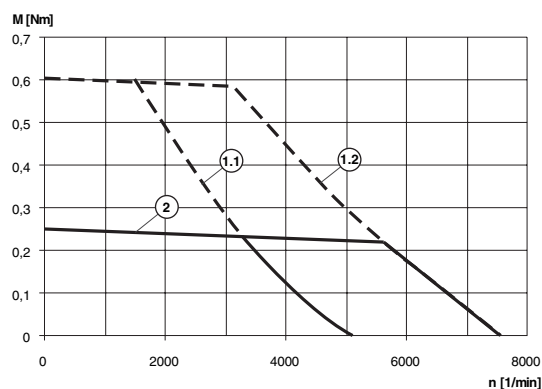
⁴⁾ Operating hours at 10% failure probability; conditions for shaft load: speed of rotation 4000 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C

Characteristic curves

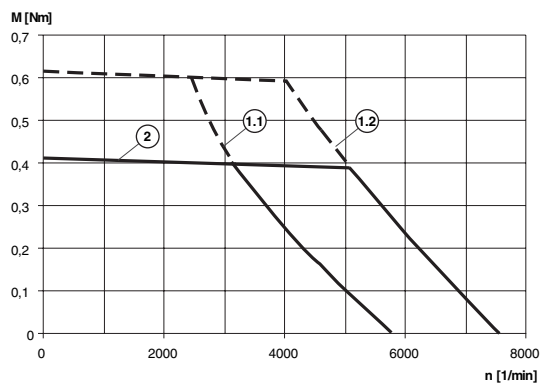
IFA61 torque characteristic with 3D winding



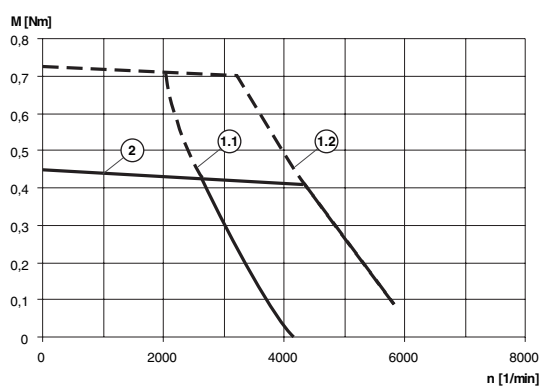
IFA61 torque characteristic with 5D winding



IFA62 torque characteristic with 3D winding



IFA62 torque characteristic with 5D winding



(1.1) Max. torque at 24 V
(1.2) Max. torque at 36 V

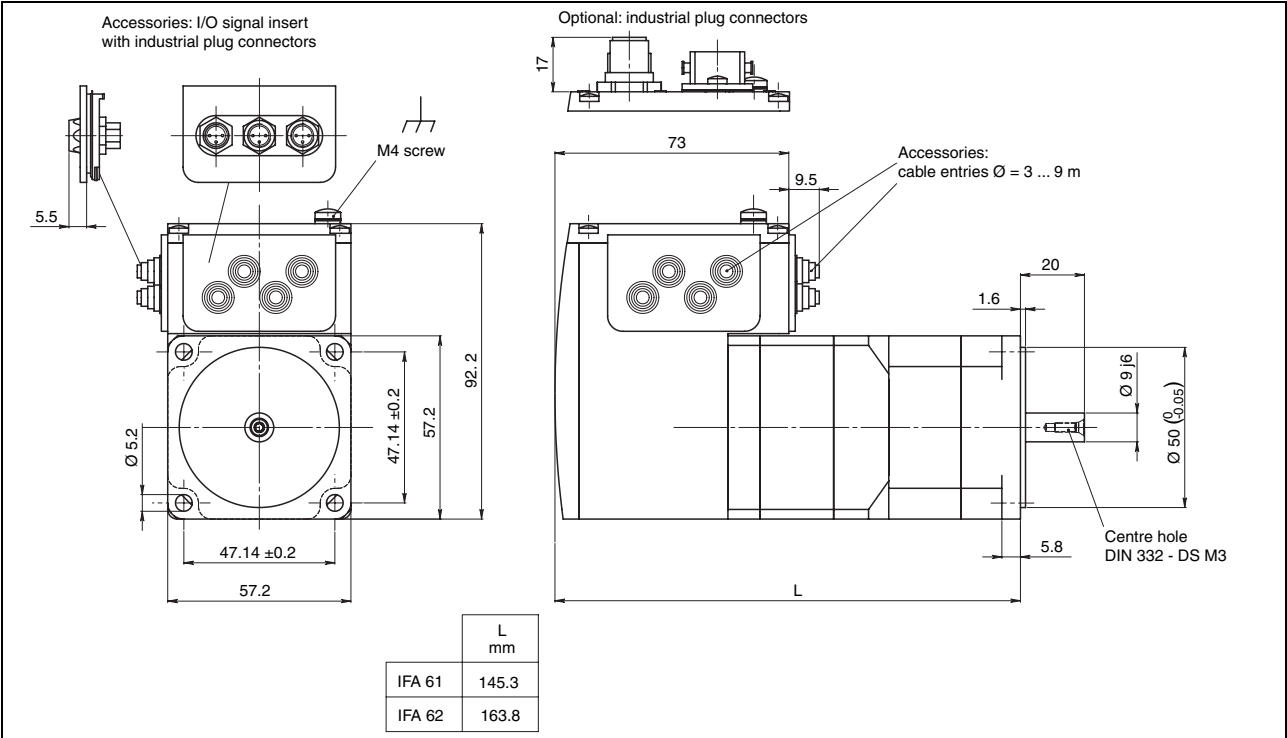
(2) Continuous torque

Electrical Data		
Supply voltage		
Supply voltage (absolute limit values)	V _{DC}	18 ... 40
Nominal voltage	V _{DC}	24 / 36
Ripple at nominal voltage	V _{SS}	≤ 3.6
Max. current consumption	A	5
Inrush current		charging current of capacitor C = 1500 µF
External backup fuse	A	10, characteristic: slow-acting fuse
24V signal interface		
4 signals, each can be used as input or output		
GND galvanically connected with power supply GND, no inverse-polarity protection !		
24V signal inputs		
Low level IO0..IO3	V / mA	≤ 4.5 / ≤ 0.7
High level IO0..IO3	V / mA	≥ 15 / ≥ 2
Admissible voltage range	V	0 ... 30
Debouncing time IO0 to IO3	ms	0.1
Debouncing time IO2,IO3 with capture	ms	0.01
24V signal outputs		
Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)		
		with external power supply
Supply	V _{DC}	10 ... 30
Switching current	mA	≤ 100 (per output)
		with internal power supply
		23 ... 25
		≤ 200 (total)
		The internal power supply is protected against:
		• short-circuiting of the output voltage
		• overloading of the output voltage (limit set at 6 W output power)
Fieldbus interfaces		
CAN		
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transfer rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000
Transfer protocol		CANopen according to DS301
RS485		
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire
Transfer rate	kBaud	9.6 / 19.2 / 38.4
Transfer protocol		Berger Lahr protocol, compatible to Twin Line
Profibus DP		
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire
Transfer rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000
Transfer protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Typ 2
Environmental conditions		
Ambient temperature ¹⁾	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s ²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks ²⁾		1000
• Peak acceleration	m/s ²	150
Heat class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Insulation material class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)
Safety functions		
Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508)	1/h	1.84·10 ⁻⁹
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

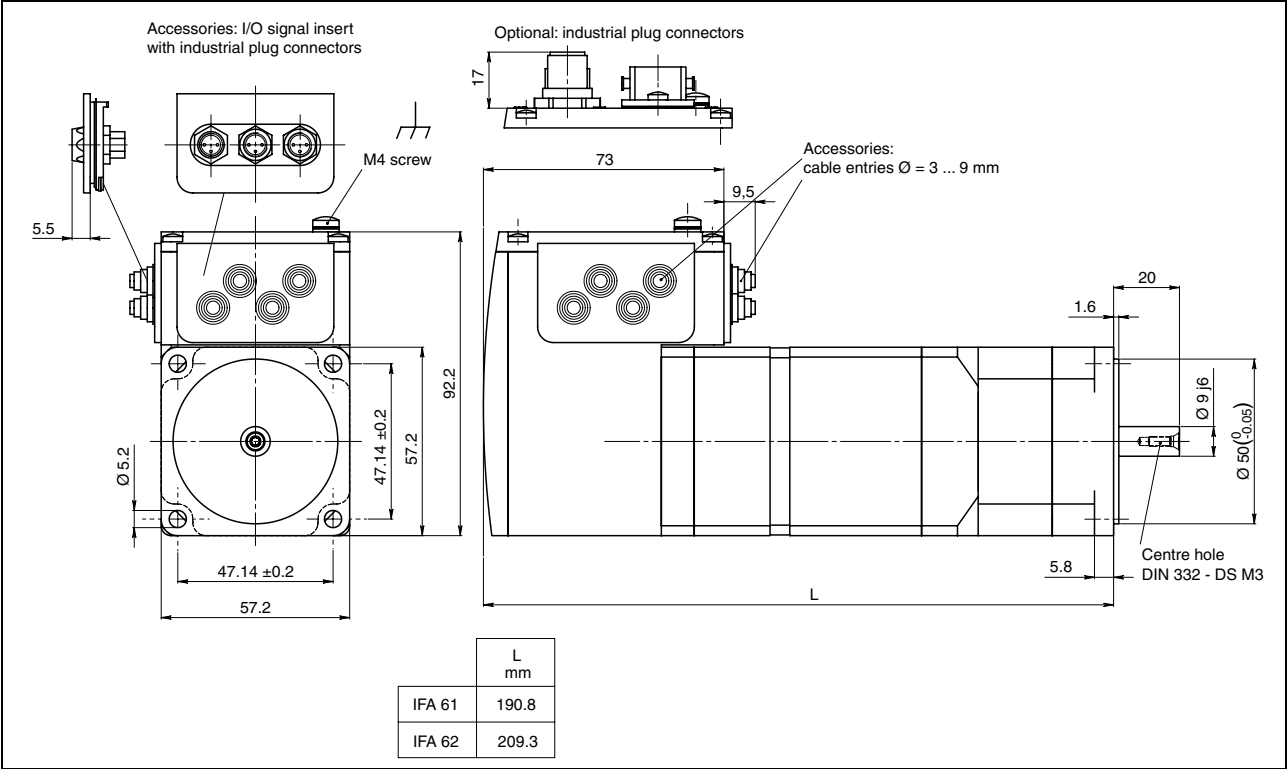
¹⁾ Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

²⁾ In each case in positive and negative direction per axis (X, Y, Z)

Dimensional drawings



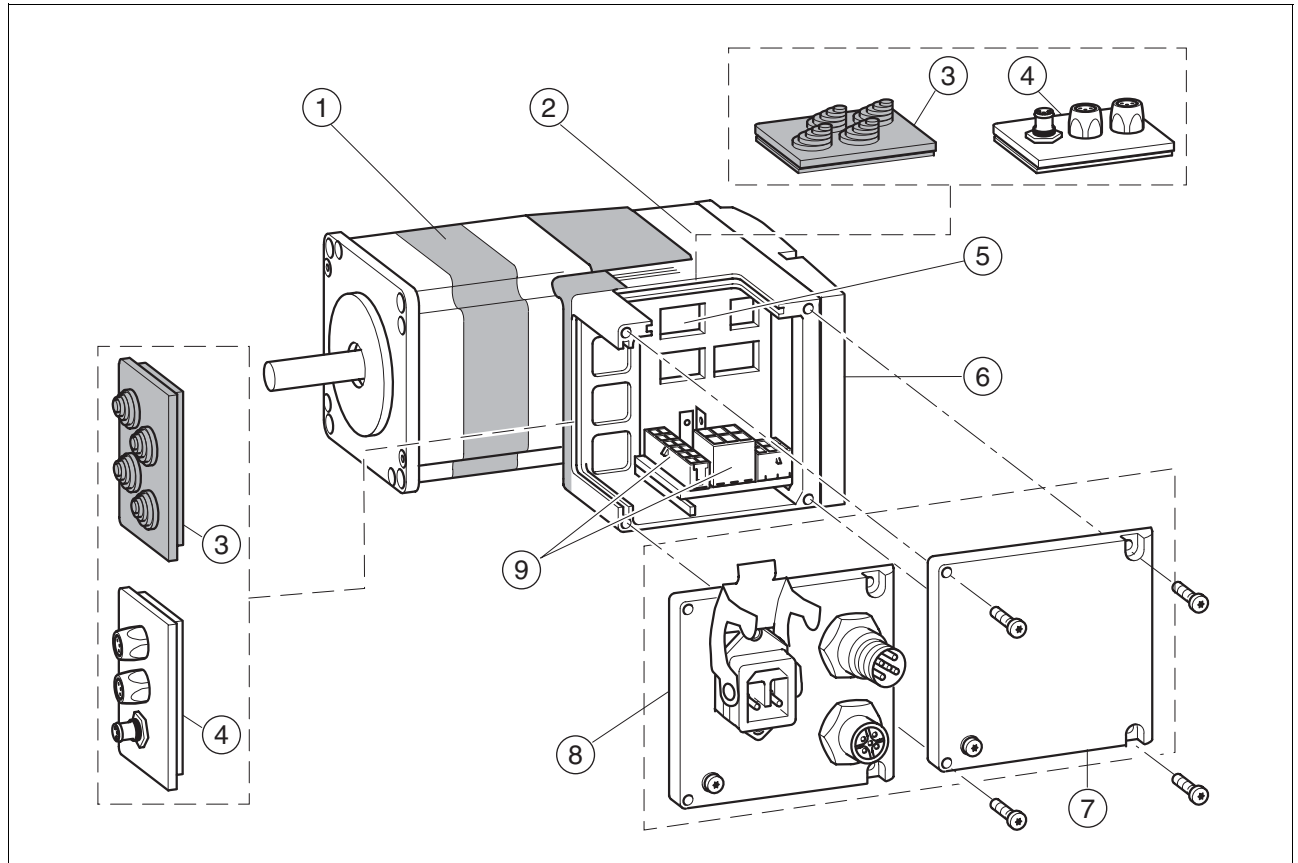
Intelligent Compact Drive IcIA IFA6x



Intelligent Compact Drive IcIA IFA6x with holding brake

Type code																	
Example:		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Product family I = IcIA intelligent compact drive		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Controller type F = positioning controller with fieldbus		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Motor type A = servomotor		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Motor size 6 = motor flange [cm] 1, 2 = motor length index		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Nominal supply voltage 2 = 24 / 36 V _{DC}		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Fieldbus interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Signal interface power supply – = none (external power supply unit required) IS = internal 24V power supply unit		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Hardware option – = none (electronic gear not possible) D = parameter switch for configuration		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Software version S = Standard		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Winding type 3D = high speed of rotation, delta connection 5D = high torque, delta connection		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Measuring system C = Singleturn encoder		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Holding brake – = no holding brake B = with holding brake		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Connection technology B = printed circuit board plug connector I = industrial plug connector		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Overall degree of protection (except for shaft bushing) 54 = IP54		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Gear O-001 = no gearbox PLE 60 planetary gear, gear ratio: 2-003 = 3 : 1 2-005 = 5 : 1 2-008 = 8 : 1		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Centring collar diameter: P = Standard		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Shaft diameter P = Standard		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41
Shaft bushing degree of protection 41 = IP41		I	F	A	6	1	/	2	CAN	IS	D	S	/	3	D	C	– B 54 O-001 R P P 41

IcIA IFE Product overview



Components of the IcIA IFE compact drive

- (1) EC motor
- (2) Electronics housing
- (3) Plug-in unit cable entry (accessory)
- (4) I/O plug-in unit with industrial plug connector (accessory)
- (5) Parameter switches
- (6) Electronics cover, must not be removed
- (7) Plug cover, to be removed on installation
- (8) Cover with industrial plug connector for VDC supply voltage and IN/OUT fieldbus terminal (optional)
- (9) Electrical terminals

Technical data

IFE71 mechanical data without gearbox

Rated supply voltage	V _{DC}	24	36
Nominal current	A	4.7	5.1
Rated speed	1/min	4000	4800
Nominal output	W	74	117
Nominal torque M _N	Nm	0.175	0.24
Max. torque M _{max}	Nm	0.26	0.36
Max. idle current	A	1	0.6
Max. ready current	A	0.1	0.06
Detent torque (without current)	Nm	0.08	
Moment of inertia	kgcm ²	0.149	
Max. speed	1/min	5000	
Positioning resolution	Incr.	12	
Accuracy of positioning sensor	Incr.	±1	
Weight m	kg	1.4	
Shaft load			
• Max. radial force ¹⁾	N	80	
• Max. axial force tension	N	30	
• Max. axial force compression	N	30	
• Nominal bearing life L _{10h} ²⁾	h	20000	

¹⁾ Reference point of radial force: 12.5 mm distance from flange

²⁾ Operating hours at a failure probability of 10%

IFE71 mechanical data with spur wheel gear

		V-018		V-038		V-054		V-115	
Gear speeds		3		3		4		4	
Step-up gearing		160:9		75:2		490:9		3675:32	
Rated supply voltage	V _{DC}	24	36	24	36	24	36	24	36
Nominal current	A	4.5	4	4	3.4	4.3	3.5	2.6	2.1
Rated motor speed of rotation	1/min	4000	4800	4000	4800	4000	4800	4000	4800
Nominal output speed	1/min	225	270	107	128	73	88	35	42
Nominal output torque M _N	Nm	3.1	3.5	5.8	6.0	9.5	10.0	10.0	11.0
Nominal output	W	74	98	65	81	73	88	38	48
Max. idle current	A	1	0.6	1	0.6	1	0.6	1	0.6
Max. ready current	A	0.1	0.06	0.1	0.06	0.1	0.06	0.1	0.06
Detent torque (without current)	Nm	1.1		3.0		3.3		8.0	
Moment of inertia output	kgcm ²	48		211		441		1962	
Max. speed	1/min	281		133		92		44	
Positioning resolution motor	Incr.	12							
Positioning accuracy motor	Incr.	±1							
Positioning resolution output	°	1.667		0.8		0.55		0.26	
Torsional backlash	°	≤ 1							
Weight m	kg	1.85							
Shaft load (short-time operation)									
• Max. radial force ¹⁾	N	200							
• Max. axial force	N	80							
• Nominal bearing life L _{10h} ²⁾	h	2500							
Shaft load (long-term operation)									
• Max. radial force	N	200							
• Max. axial force	N	10							
• Nominal bearing lifetime L _{10h} ²⁾	h	15000		15000		15000 ³⁾		15000 ⁴⁾	

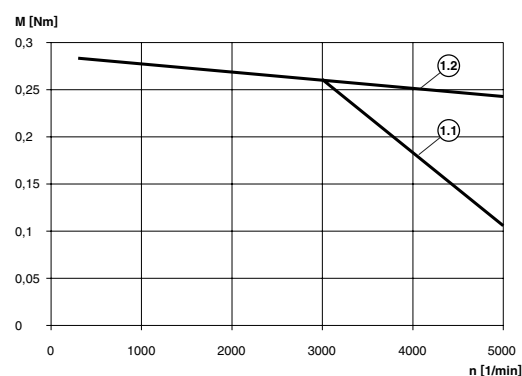
¹⁾ Reference point of radial shaft load: 12.5 mm distance from flange

²⁾ Operating hours at a failure probability of 10%

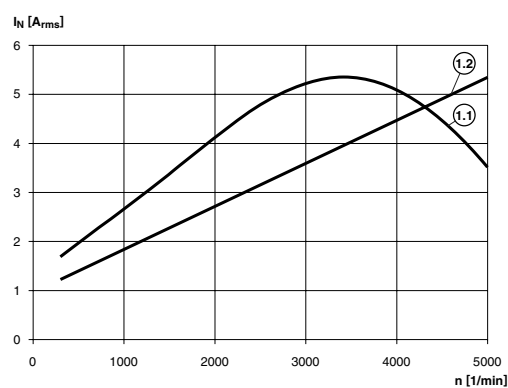
³⁾ At reduced rated drive torque M_N = 6 Nm; 2500 h at maximum torque

⁴⁾ At reduced rated drive torque M_N = 8 Nm; 2500 h at maximum torque

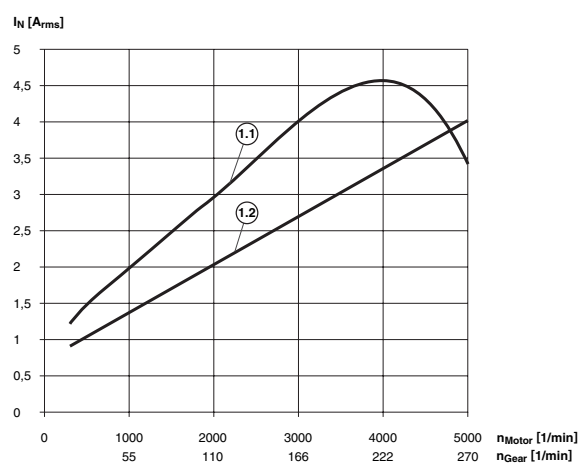
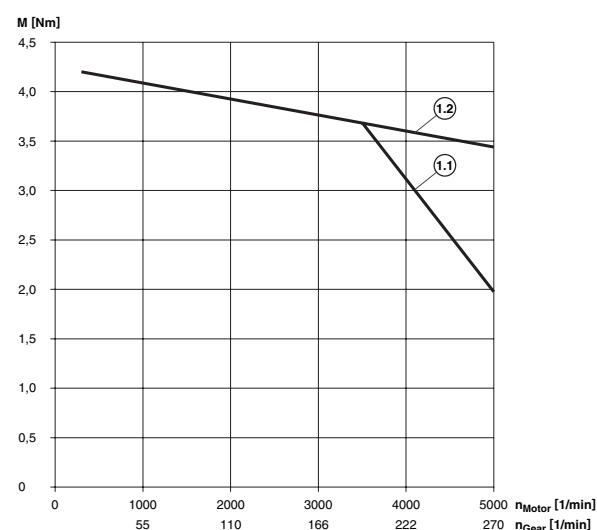
Characteristic curves

IFE71 torque characteristic
without gearbox

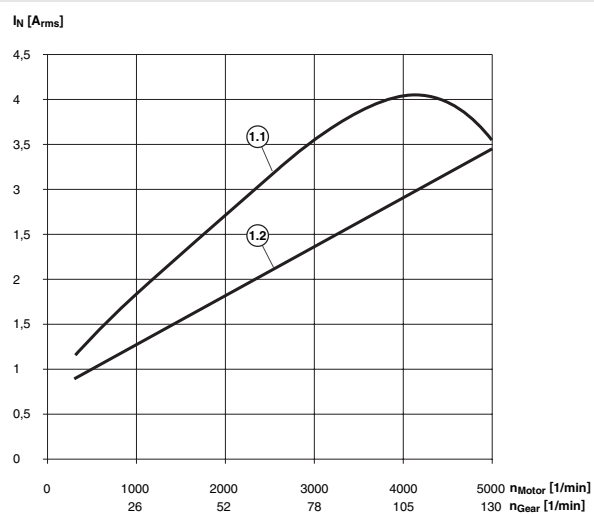
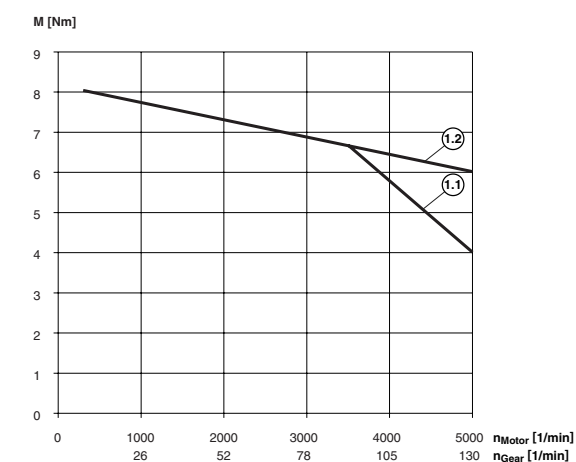
IFE71 current characteristic



with spur wheel gear V-018



with spur wheel gear V-038

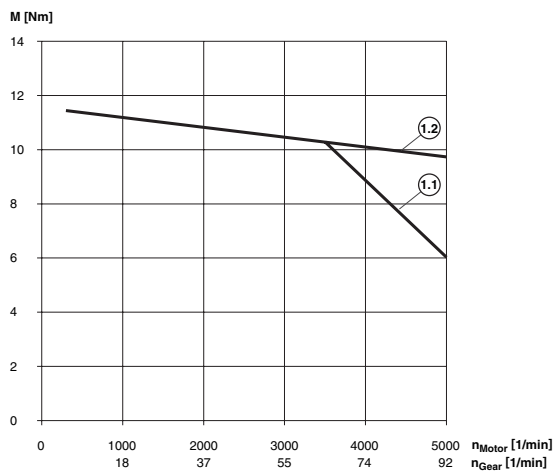


(1.1) Max. torque or current at 24 V

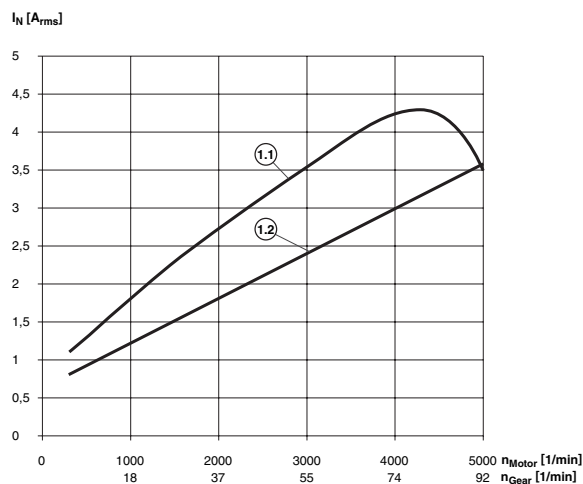
(1.2) Max. torque or current at 36 V

Characteristic curves

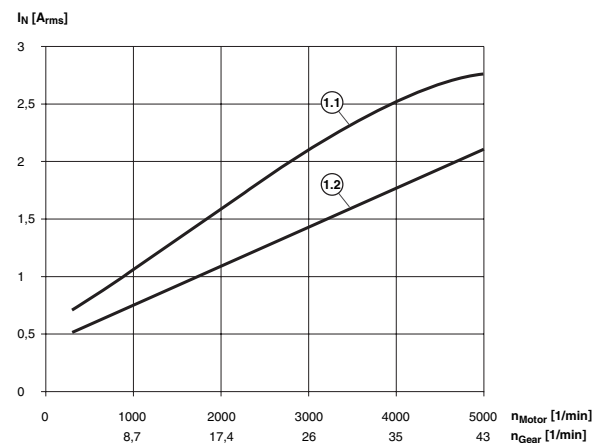
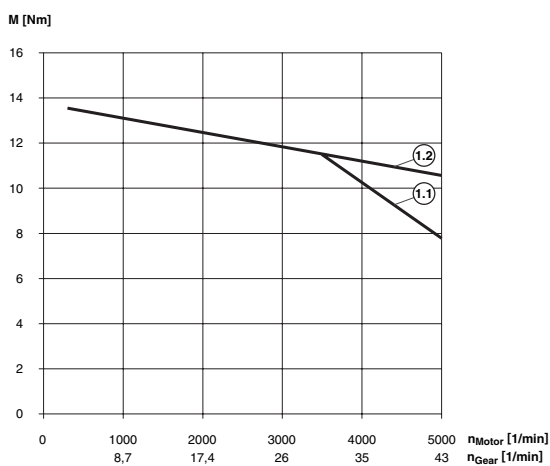
IFE71 torque characteristic with spur wheel gear V-054



IFE71 current characteristic



with spur wheel gear V-115

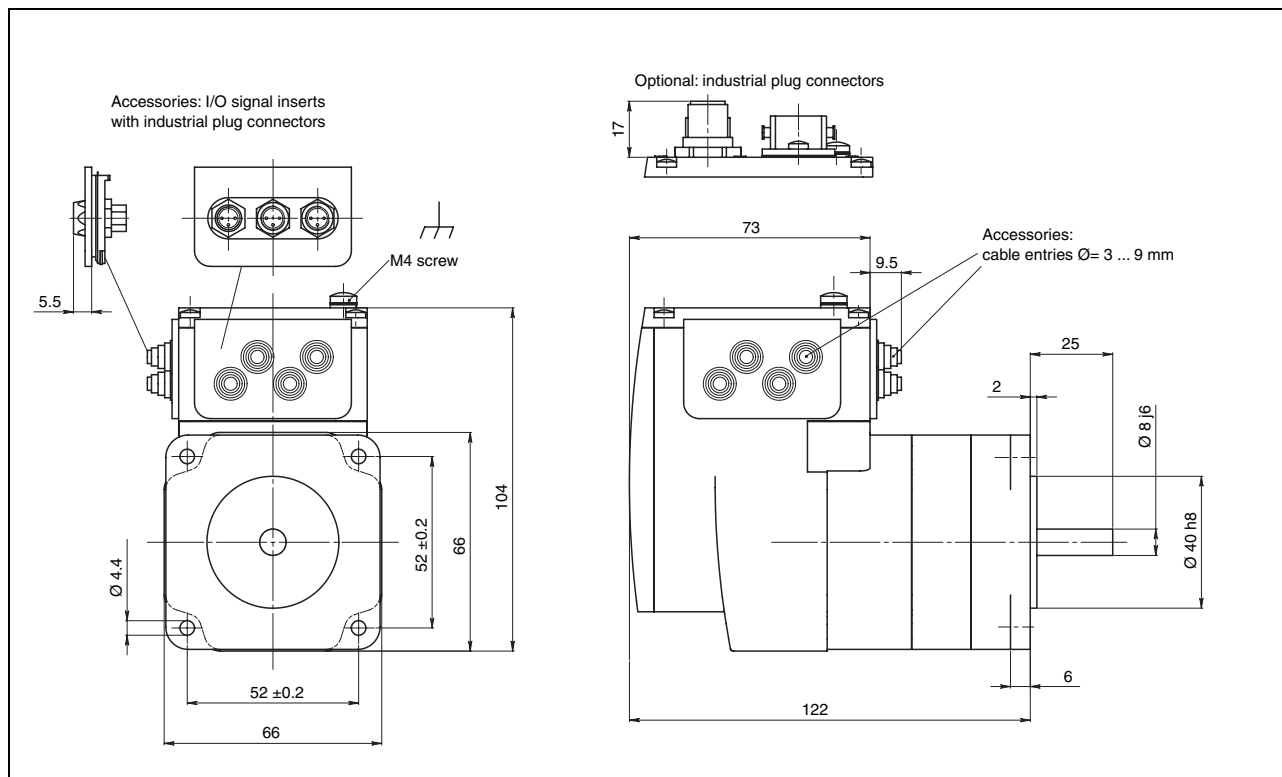


(1.1) Max. torque or current at 24 V

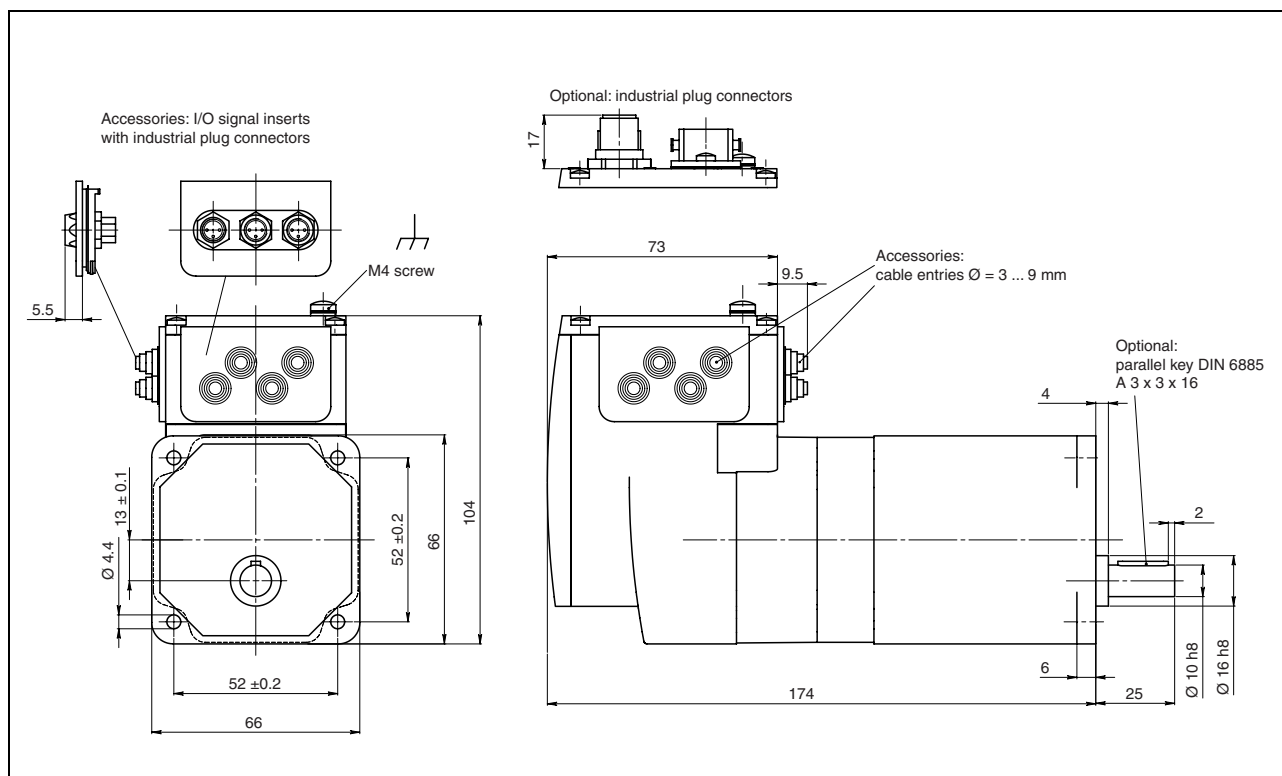
(1.2) Max. torque or current at 36 V

Electrical Data		
Supply voltage		
Supply voltage (absolute limit values)	V _{DC}	18 ... 40
Nominal voltage	V _{DC}	24 / 36
Ripple at nominal voltage	V _{SS}	≤ 3.6
Max. current consumption	A	6
Inrush current		charging current of capacitor C = 1500 µF
External backup fuse	A	10, characteristic: slow-acting fuse
24V signal interface		
4 signals, each can be used as input or output		
GND galvanically connected with power supply GND, no inverse-polarity protection !		
24V signal inputs		
Low level IO0..IO3	V / mA	≤ 4.5 / ≤ 0.7
High level IO0..IO3	V / mA	≥ 15 / ≥ 2
Admissible voltage range	V	0 ... 30
Debouncing time IO0 to IO3	ms	0.1
24V signal outputs		
Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100mA)		
		with external power supply
Supply voltage	V _{DC}	10 ... 30
Switching current	mA	≤ 100 (per output)
		with internal power supply
		23 ... 25
		The internal power supply is protected against:
		<ul style="list-style-type: none"> • short-circuiting of the output voltage • overloading of the output voltage (limit set at 6 W output power)
Fieldbus interfaces		
CAN		
Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transfer rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000
Transfer protocol		CANopen according to DS301
RS485		
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire
Transfer rate	kBaud	9.6 / 19.2 / 38.4
Transfer protocol		Berger Lahr protocol, compatible to Twin Line
Profibus DP		
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire
Transfer rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000
Transfer protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Typ 2
Environmental conditions		
Ambient temperature ¹⁾	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s ²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks ²⁾		1000
• Peak acceleration	m/s ²	150
Heat class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Insulation material class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)
¹⁾ Limit values with flanged motor (e.g. steel plate 300x300x10 mm)		
²⁾ In each case in positive and negative direction per axis (X, Y, Z)		
Safety functions		
Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508)	1/h	1.84·10 ⁻⁹
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings



Intelligent Compact Drive IclA IFE71 without gear box

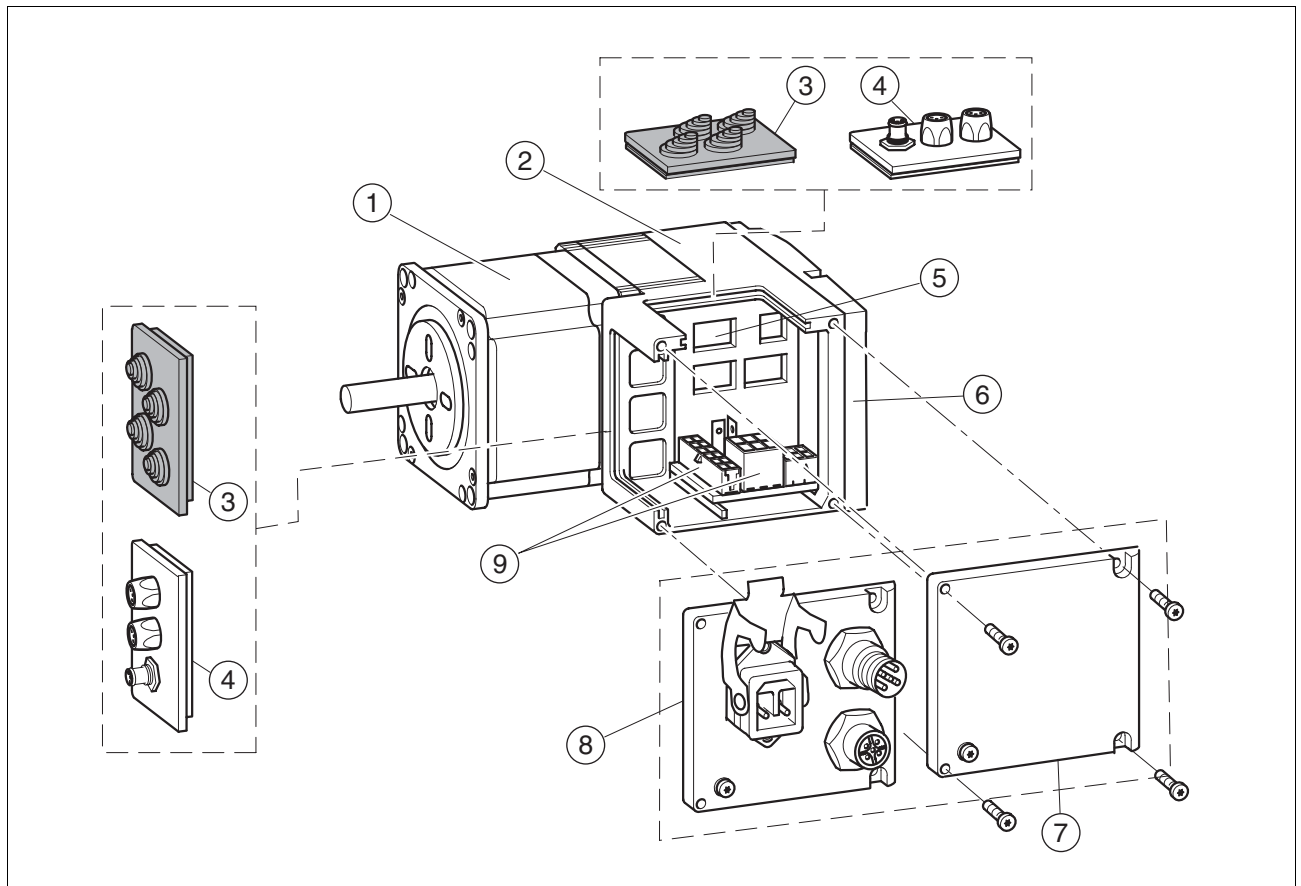


Intelligent Compact Drive IclA IFE71 with spur wheel gear

Type code	
Example:	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Product family I = IcIA intelligent compact drive	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Controller type F = positioning controller with fieldbus	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Motor type E = EC motor	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Motor size 7 = motor flange [cm] 1 = index motor length	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Nominal supply voltage 2 = 24 / 36 V _{DC}	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Fieldbus interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Signal interface power supply – = none (external power supply unit required) IS = internal 24 V power supply unit	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Hardware option – = none (electronic gear not possible) D = parameter switch for configuration	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Software version S = Standard	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Winding type – = Standard	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Measuring system Q = quasi absolute encoder	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Holding brake D = no holding brake (detent torque without power)	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Connection technology B = printed circuit board plug connector I = industrial plug connector	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Overall degree of protection (except for shaft bushing) 54 = IP54	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Gear O-001 = no gearbox Spur wheel gear, gear ratio: V-018 = 160 : 9 V-038 = 75 : 2 V-054 = 490 : 9 V-115 = 3675 : 32 PLE 40 planetary gear, gear ratio: 1-016 = 16 : 1 1-040 = 40 : 1 1-060 = 60 : 1 1-120 = 120 : 1	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Centring collar diameter: P = Standard	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Shaft diameter P = Standard	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54
Shaft bushing degree of protection 54 = IP54	I F E 7 1 / 2 DP0 – D S / – Q D B 54 / V-018 K P P 54

IcIA IFS

Product overview



Components of the IcIA IFS compact drive

- (1) Three-phase stepper motor
- (2) Electronics housing
- (3) Plug-in unit cable entry (accessory)
- (4) I/O plug-in unit with industrial plug connector (accessory)
- (5) Parameter switches
- (6) Electronics cover, must not be removed
- (7) Plug cover, to be removed on installation
- (8) Cover with industrial plug connector for VDC supply voltage and IN/OUT fieldbus terminal (optional)
- (9) Electrical terminals

Technical data

IFS6x mechanical data

		IFS61	IFS62	IFS63
Max. torque M_{\max}	Nm	0.45	0.9	1.5
Holding torque M_H	Nm	0.51	1.02	1.7
Moment of inertia	kgcm ²	0.1	0.22	0.38
Positioning resolution	Incr.	20.000		
Systematic angular tolerance per step ¹⁾	'	±6		
Weight m	kg	1.3	1.6	2.0
Shaft load ²⁾				
• Max. radial force ³⁾	N	24	24	50
• Max. axial force pull	N	100		
• Max. axial force push	N	8.4		
• Nominal bearing life L_{10h} ⁴⁾	h	20.000		

¹⁾ Measured at 1000 steps/revolution

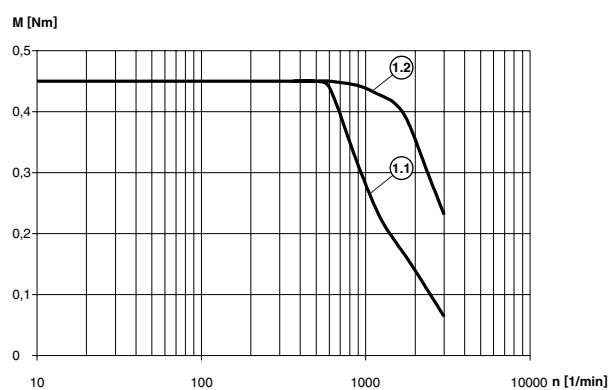
²⁾ Conditions for the shaft load: speed of rotation 60 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C

³⁾ Reference point of radial force: 10.5 mm distance from flange

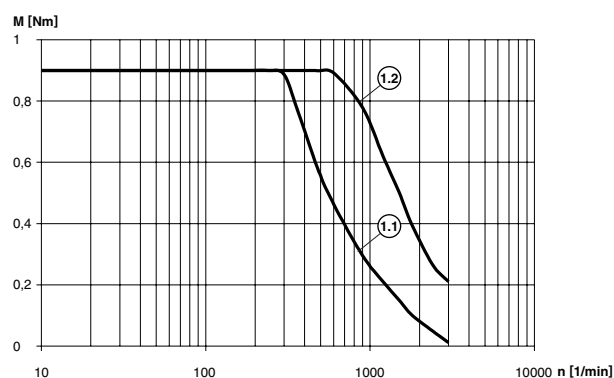
⁴⁾ Operating hours at a failure probability of 10%

Characteristic curves

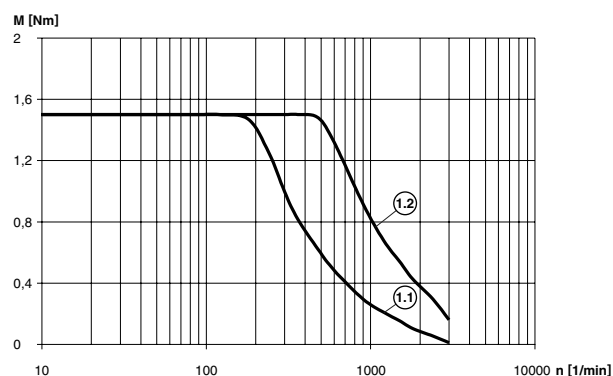
IFS61 torque characteristic



IFS62 torque characteristic



IFS63 torque characteristic



(1.1) Max. torque at 24 V

(1.2) Max. torque at 36 V

IFS9x mechanical data

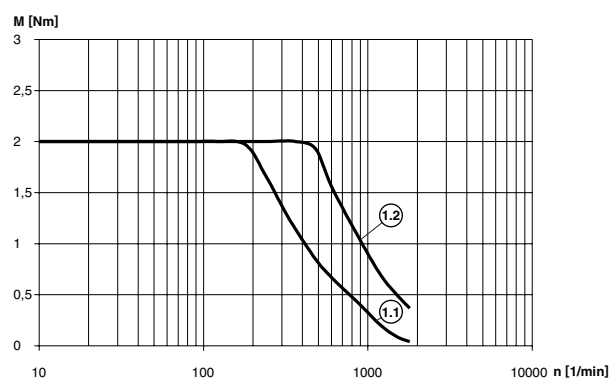
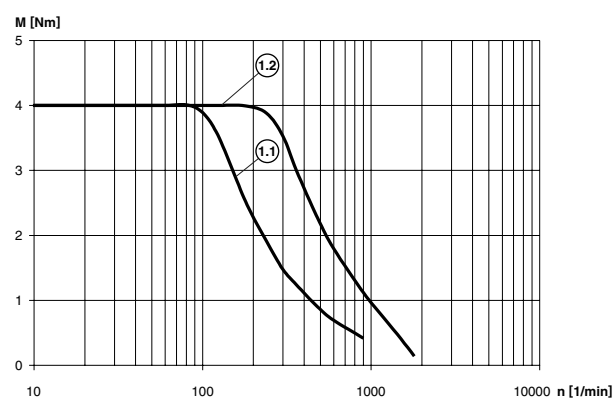
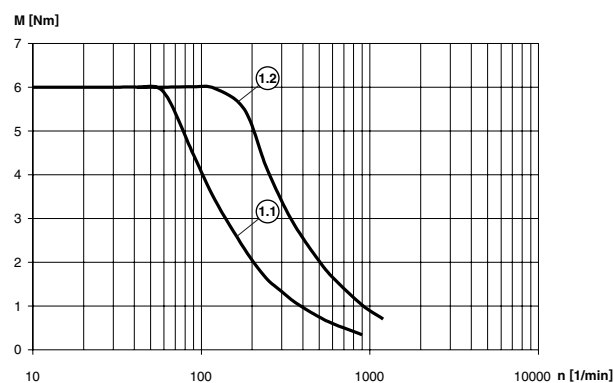
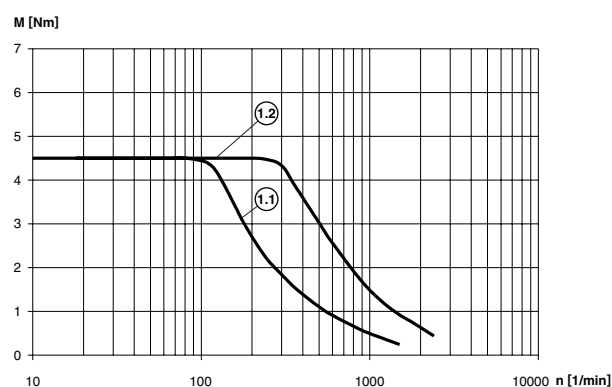
		IFS91	IFS92	IFS93	
Winding type				Standard	3D
Max. torque M_{\max}	Nm	2.0	4.0	6.0	4.5
Holding torque M_H	Nm	2.0	4.0	6.0	4.5
Moment of inertia	kgcm ²	1.1	2.2	3.3	
Positioning resolution	Incr.	20.000			
Systematic angle tolerance per step ¹⁾	'	±6			
Weight m	kg	2.6	3.6	4.7	
Shaft load ²⁾					
• Max. radial force ³⁾	N	100	100	110	
• Max. axial force pull	N	170			
• Max. axial force push	N	30			
• Nominal bearing life L_{10h} ⁴⁾	h	20.000			
Holding brake					
Holding torque M_H	Nm	6			
Electrical pick-up power	W	22			
Energise time (release brake)	ms	40			
De-energise time (close brake)	ms	20			
Moment of inertia	kgcm ²	0.2			
Weight m	kg	1.8			

¹⁾ Measured at 1000 steps/revolution, unit in minutes of arc

²⁾ Conditions for the shaft load: speed of rotation 60 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C

³⁾ Reference point of radial force: 10.5 mm distance from flange

⁴⁾ Operating hours at a failure probability of 10%

Characteristic curves**IFS91 torque characteristic****IFS92 torque characteristic****IFS93 torque characteristic****IFS93 torque characteristic with 3D winding**

(1.1) Max. torque at 24 V

(1.2) Max. torque at 36 V

Electrical Data

Supply voltage			Corresponds to PELV as per DIN 19240, no inverse-polarity protection
Supply voltage (absolute limit values)	V _{DC}	18 ... 40	
Nominal voltage	V _{DC}	24 / 36	
Ripple at nominal voltage	V _{SS}	≤ 3.6	
Max. current consumption			
• IFS6x	A	3.5	
• IFS9x	A	5	
Inrush current		charging current of capacitor C = 1500 µF	
External backup fuse	A	10, characteristic: slow-acting fuse	

24V signal interface

4 signals, each can be used as input or output
GND galvanically connected with power supply GND, no inverse-polarity protection !

24V signal inputs

Low level IO0..IO3	V / mA	≤ 4.5 / ≤ 0.7
High level IO0..IO3	V / mA	≥ 15 / ≥ 2
Admissible voltage range	V	0 ... 30
Debouncing time IO0 to IO3	ms	0.1
Debouncing time IO2,IO3 with capture	ms	0.01

24V signal outputs

Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)

		with external power supply	with internal power supply
Supply	V _{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply is protected against: • short-circuiting of the output voltage • overloading of the output voltage (limit set at 6 W output power)

Fieldbus interfaces

CAN

Signal inputs/outputs		according to ISO 11898, no galvanic isolation
Transfer rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000
Transfer protocol		CANopen according to DS301

RS485

Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire
Transfer rate	kBaud	9.6 / 19.2 / 38.4
Transfer protocol		Berger Lahr protocol, compatible to Twin Line

Profibus DP

Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire
Transfer rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000
Transfer protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Typ 2

Environmental conditions

Ambient temperature ¹⁾	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s ²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks ²⁾		1000
• Peak acceleration	m/s ²	150
Protection class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Insulation material class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

¹⁾ Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

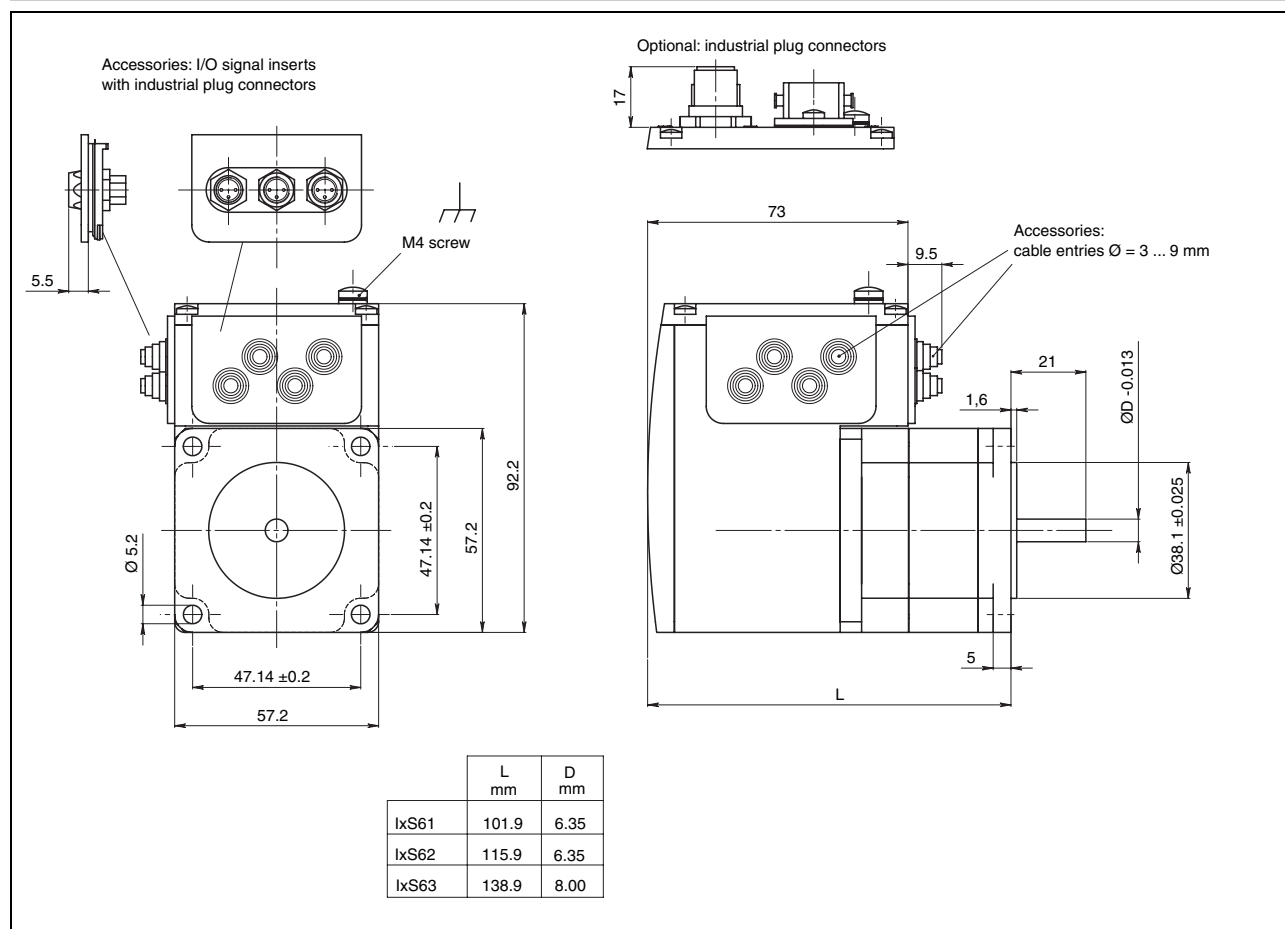
²⁾ In each case in positive and negative direction per axis (X, Y, Z)

Safety functions

Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508)	1/h	1.84·10 ⁻⁹
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

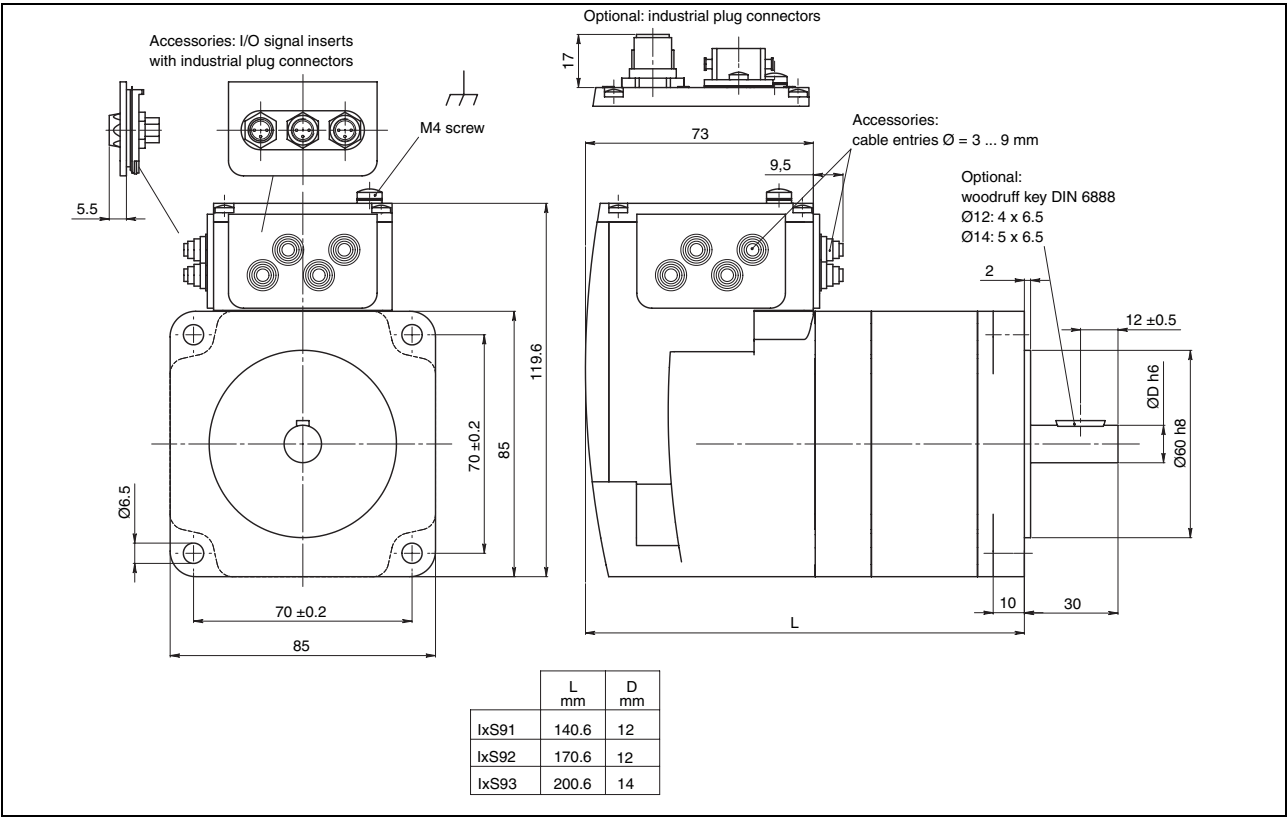
Dimensional drawings

Dimensional drawings IFS6x

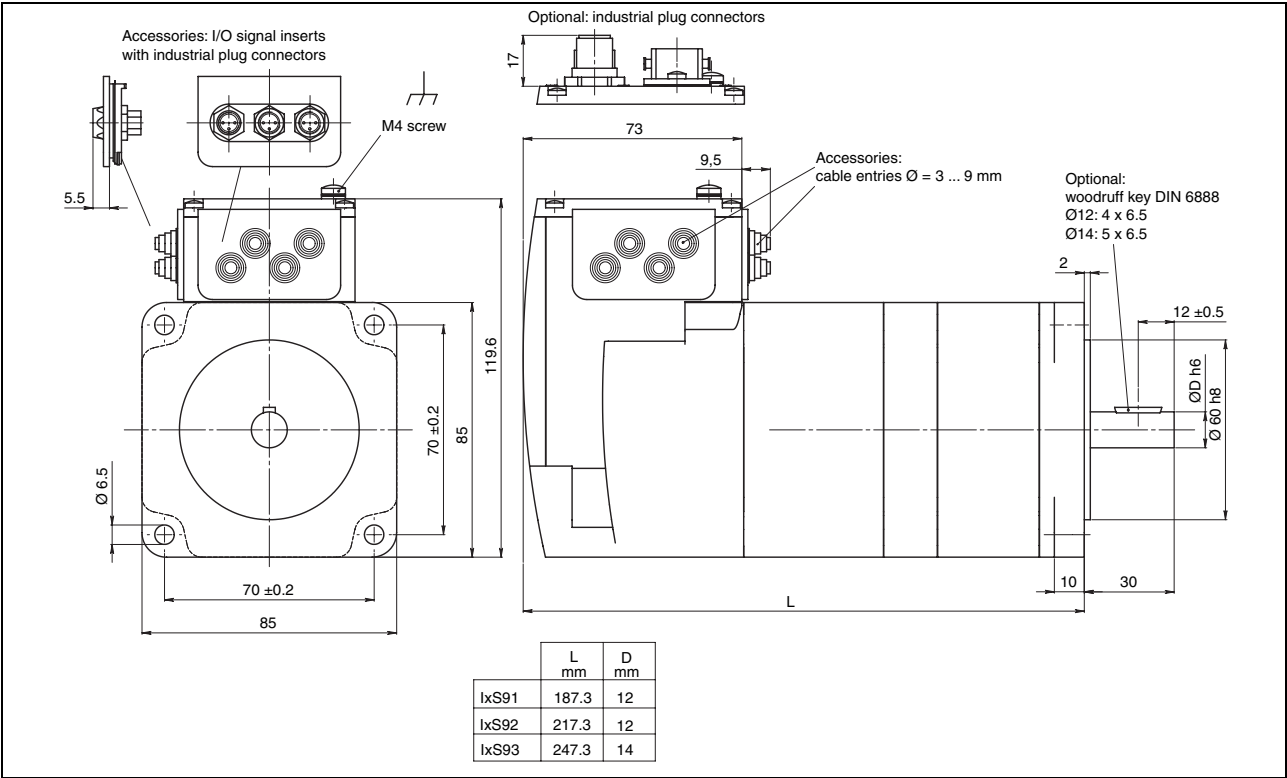


Intelligent Compact Drive IcIA IFS6x

Dimensional drawings IFS9x



Intelligent compact drive IclA IFS9x



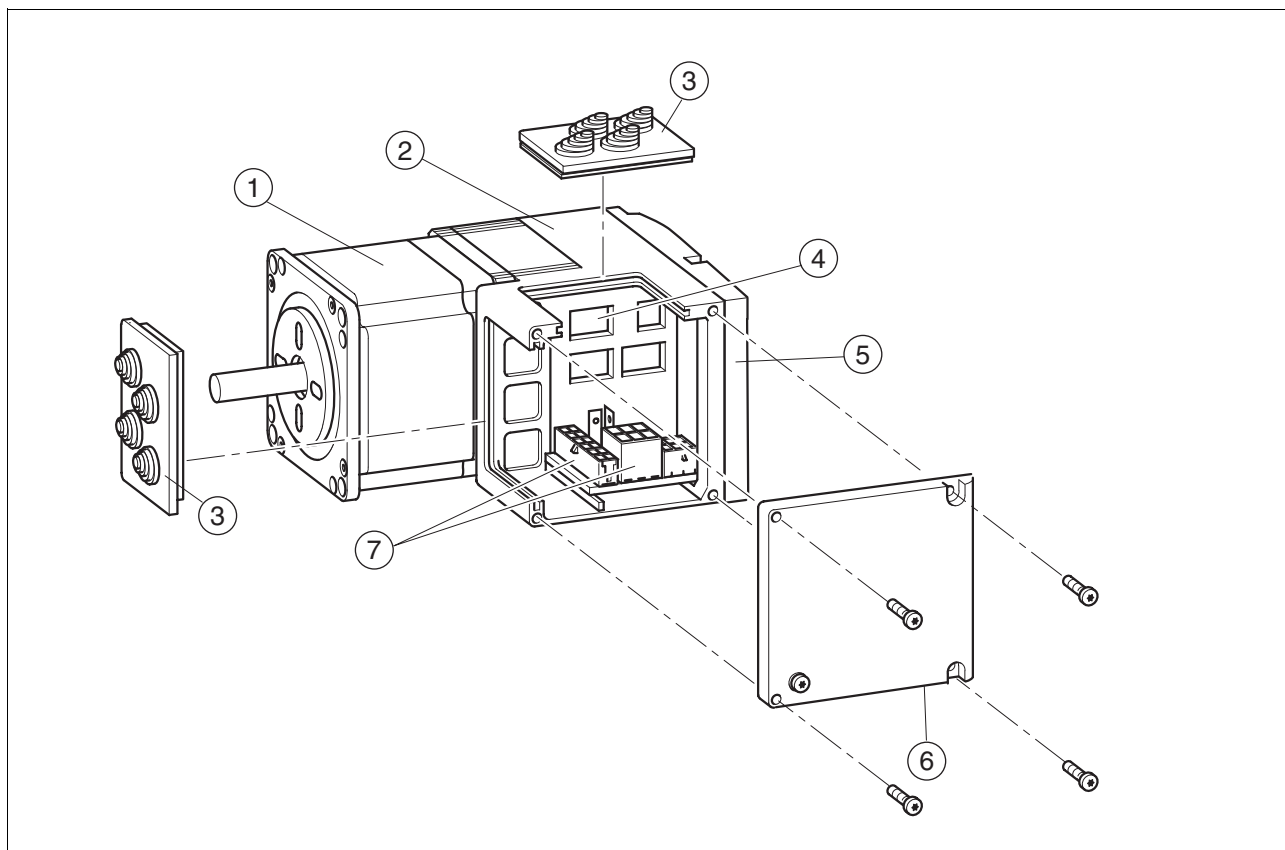
Intelligent Compact Drive IclA IFS9x with holding brake

Type code	
Type code IFS6x	
Example:	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Product family I = IcIA intelligent compact drive	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Controller type F = positioning controller with fieldbus	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Motor type S = stepper motor	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Motor size 6 = motor flange [cm] 1, 2, 3 = motor length index	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Nominal supply voltage 2 = 24 to 36 V _{DC}	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Communications interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Signal interface power supply - = none (external power supply unit required) IS = internal 24 V power supply unit	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Hardware option - = none D = parameter switch for configuration	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Software version S = Standard	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Winding type - = Standard	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Measuring system - = no measuring system I = index pulse encoder	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Holding brake - = no holding brake	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Connection technology B = printed circuit board plug connector I = industrial plug connector	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Overall degree of protection (except for shaft bushing) 54 = IP54	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Gear O-001 = no gearbox PLE 60 planetary gear, gear ratio: 2-003 = 3 : 1 2-005 = 5 : 1 2-008 = 8 : 1	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Centring collar diameter: P = Standard	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Shaft diameter P = Standard	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41
Shaft bushing degree of protection 41 = IP41	I F S 6 1 / 2 CAN IS D S / - - - B 54 O-001 R P P 41

Type code IFS9x		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Example:		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Product family I = IclA intelligent compact drive		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Controller type F = positioning controller with fieldbus		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Motor type S = stepper motor		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Motor size 9 = motor flange [cm] 1, 2, 3 = motor length index		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Nominal supply voltage 2 = 24 to 36 V _{DC}		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Communications interface DP0 = Profibus DP V0 CAN = CANopen DS301 485 = RS485		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Signal interface power supply - = none (external power supply unit required) IS = internal 24V power supply unit		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Hardware option - = none D = parameter switch for configuration		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Software version S = Standard		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Winding type - = Standard 3D = higher speed (with IFS93)		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Measuring system - = no measuring system I = index pulse encoder		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Holding brake - = no holding brake B = with holding brake		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Connection technology B = printed circuit board plug connector I = industrial plug connector		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Overall degree of protection (except for shaft bushing) 54 = IP54		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Gear O-001 = no gearbox PLE 80 planetary gear, gear ratio: 3-003 = 3 : 1 3-005 = 5 : 1 3-008 = 8 : 1		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Shaft type R = round, smooth shaft (without gearbox) W = woodruff key as per DIN 6888 (without gearbox) K = parallel key (with gearbox only)		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Centring collar diameter: P = Standard		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Shaft diameter P = Standard		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41
Shaft bushing degree of protection 41 = IP41		I	F	S	9	1	/	2	CAN	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41

IcIA IDS

Product overview



Components of the IcIA IDS compact drive

- (1) Three-phase stepper motor
- (2) Electronics housing
- (3) Plug-in unit cable entry (accessory)
- (4) Parameter switches
- (5) Electronics cover, must not be removed
- (6) Plug cover, to be removed on installation
- (7) Electrical terminals



Product description

The IDS intelligent compact drives consist of a three-phase stepper motor and control electronics with pulse/direction interface.

Application options

The IclA IDS contains a three-phase stepper motor and control electronics with pulse interface. Pulse/direction signals of a master controller, e.g. multi-axis motion controller or AB signals of an encoder, are converted directly into a movement.

Special features

- High continuous standstill torque
- Good synchronous characteristics
- High positioning resolution (0.018°)
- Optionally with planetary gear (IDS9x also with holding brake)

Control

The IclA IDS rotates the shaft as specified by a reference value. The reference value signal is generated by a controller or an encoder and is sent to the multifunction interface as a pulse signal.

The step count (steps per revolution) can be set with a parameter switch.

Electronics

The electronic system comprises control and power electronics. They have a common power supply and are not electrically isolated.

It is controlled via the multifunction interface. The 24 V signal interface also has four inputs/outputs. The assignment of the inputs and outputs can be specified via parameter switches.

The electronics are thermally isolated from the motor by a plastic component.

Connections

The IcIA IDS intelligent compact drives have the following connections:

- Power supply
- Multifunction interface
- Service interface, for commissioning
- 24 V signal interface for four inputs/outputs
- Signal interface for "Power Removal" safety function

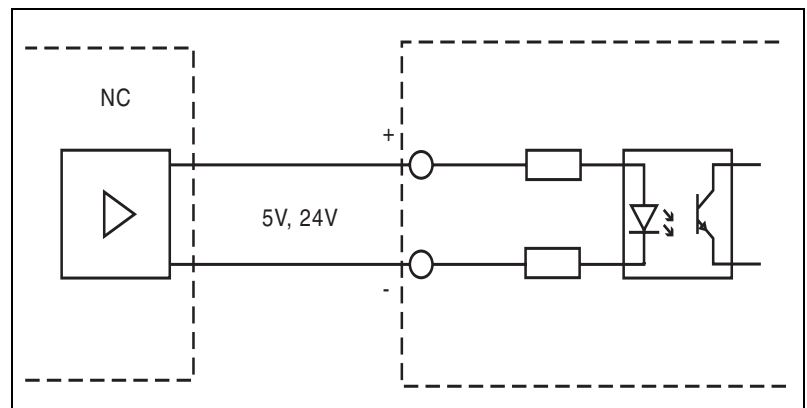
The cabling is connected with printed circuit board plug connectors.

Multifunction interface

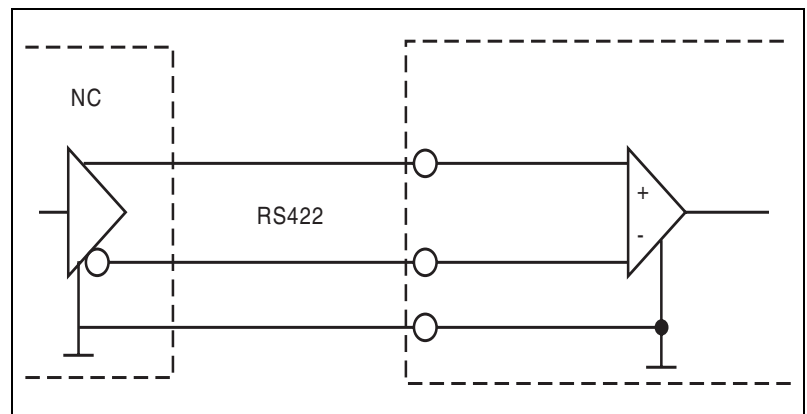
The multifunction interface operates at one of the following signal levels depending on the device model:

- 24 V signals optically isolated (PD1)
- 5 V signals optically isolated (PD2)
- 5 V differential signals without electrical isolation (PD3)

The reference pulses are fed in through two of the inputs, either as pulse/direction signals or as AB signals. The other inputs have the functions "power amplifier enable / pulse blocking" and "step size switching / PWM motor current control".



Circuits of signal inputs in PD1 and PD2



Circuits of signal inputs with PD3

Service interface

The service interface is a RS485 bus interface for service purposes. A PC can be connected to the service interface using an RS485-RS232 converter. The "lclA Easy" PC commissioning software can be used for items such as reading out the error memory or monitoring the temperature.

24 V signal interface

Two inputs and two outputs are available. The inputs are used for "step size adjustment" and "power amplifier activation / pulse blocking". The outputs have the functions "power amplifier standby" and "fault output / index pulse". The 24-V-supply of the outputs is internal via the supply voltage of the compact drive (standard). Alternatively, the outputs and the sensor mechanism can be supplied with power via a separate power supply (optional).

Signal interface for "Power Removal" safety function

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN 60204-1 without external power contactors. The supply voltage must not be interrupted. This reduces the system costs and response times. The safety function is activated via two redundant 24 V input signals (low active).

Connection technology

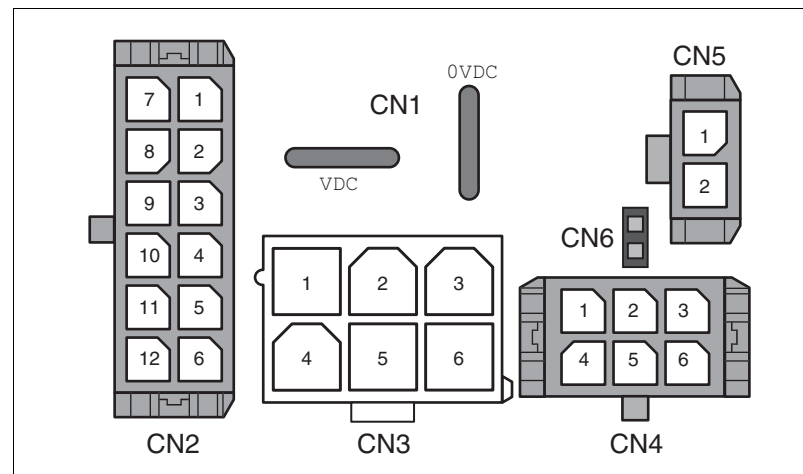
Circuit board plug connector



Circuit board plug connectors are used for cabling series machines with cable harnesses.

- Fieldbus and I/O signal connection with "Molex Micro Fit" plug connector
- Power supply connection with "AMP Positive Lock" crimp contacts

Two cable entries are required for cabling the compact drive (see accessories).



Overview of all connections

Terminal	Assignments
CN1	Supply voltage VDC
CN2	Multifunction interface
CN3	Service interface
CN4	24 V signal interface
CN5	Interface for "Power Removal" safety function
CN6	Jumper for disabling "Power Removal" safety function

Functions

Overview

The following functions can be set on the IcIA IDS compact drive via the parameter switches:

- Step count: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000
- Motor phase current (25% ... 100% of nominal current)
- Current reduction to 70% of specified motor phase current at standstill
- Functions of the signal inputs
 - Reference pulses fed as pulse/direction or AB signals ("PULSE/DIR / A/B" signal input)
 - Release or block power amplifier ("ENABLE / GATE" signal input)
 - Release or block reference pulse ("ENABLE / GATE" signal input)
 - Control motor phase current with PWM signal ("PWM / STEP2_INV" signal input)
 - Increase or reduce step count by a factor of 10, e.g. 200/2000 ("PWM / STEP2_INV" signal input)
- Functions of the signal outputs
 - Output error signal ("FAULT / INDEXPULSE" signal output)
 - Output index pulse signal ("FAULT / INDEXPULSE" signal output), possible only with compact drives with index pulse encoder
 - The operating readiness is signalled via the "ACTIVE" signal output.
- Activating blocking detection. If the actual position deviates from the setpoint position by more than one revolution, an error is reported and the power to the compact drive is switched off. In this operating status the motor has no torque. Possible only with compact drives with index pulse encoder.
- Switching on RS485 terminating resistor
- Switch on and off "Power Removal" safety function

Setting number of steps

The number of steps per axis revolution can be set via the step count.

Example:

At a step count of 1000 the compact drive runs exactly one complete motor revolution at 1000 pulses. At a pulse frequency of 1 kHz this yields a speed of $1 \frac{1}{s} = 60 \frac{1}{min}$. The "STEP2_INV" setting at the parameter switch can be inverted via the input signal STEP2_INV of the multifunction interface or the 24 V signal interface.

Setting options via parameter switches

Step count: 200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000 per revolution

Setting motor phase current

The motor phase current is set with a rotary switch. A high motor phase current generates a high motor torque.

Setting options via rotary switches

Motor phase current: 25% ... 100% (in 5% steps) of nominal current

Activating motor phase current reduction

If the full holding torque is not required, the "motor phase current reduction" function can be used to reduce the holding torque.

Advantage: Motor and electrics heat up less and the efficiency is improved.

The motor phase current is reduced to approximately 70% of the set motor phase current 100 ms after receiving the last pulse edge.

The motor phase current is set with a rotary switch. A high motor phase current generates a high motor torque.

Setting options via parameter switches

Enable/disable motor phase current reduction

Setting function of the "ENABLE / GATE" signal input

The ENABLE/GATE signal is available at the following interfaces:

- 24V signal interface
- Multifunction interface

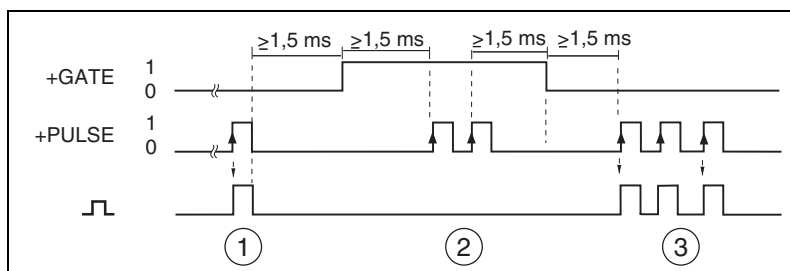
The ENABLE/GATE signal can have two functions:

"ENABLE" function: release/enable power amplifier

The "ENABLE" function releases the power amplifier to allow control of the motor.

"GATE" function: release/enable pulse input

The "GATE" function blocks the pulses at the reference value input without switching off the operating readiness. In a multi-axis system single axes can be selected with the "GATE" function.



Signal sequences when switching on the compact drive with the GATE function

- (1) Motor step
- (2) No motor steps
- (3) Motor steps

The diagram shows the motor movement with the "GATE" function activated. There must be no pulse pending for 1.5 ms before and after switching the GATE signal to ensure that the compact drive can follow the pulse preset step by step. If the time period is not met, the LED signals a warning. The warning does not affect the operating readiness of the compact drive.

Setting options via parameter switches

Setting function of the "ENABLE / GATE" signal input

Setting function of the "STEP2_INV / PWM" signal input

The STEP2_INV / PWM signal is available at the following interfaces:

- Multifunction interface
- 24 V signal interface (STEP2_INV only)

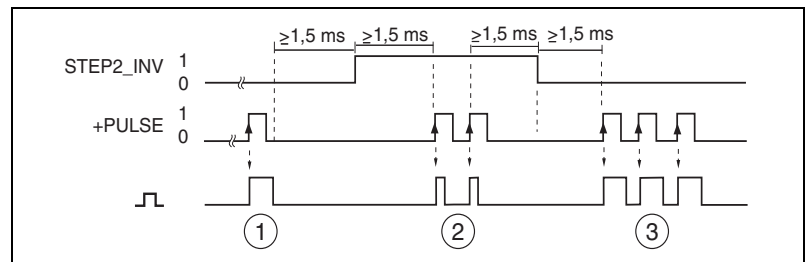
The STEP2_INV / PWM signal can have two functions:

"STEP2_INV" function

This function can be used if high-accuracy positioning is required but the output frequency of the master controller is limited.

The number of steps can be increased or reduced by a factor of 10 with the signal input.

If the "STEP2_INV" function is activated, the setting of the parameter switch 1.1 is inverted.



Signal sequences when switching the STEP2_INV signal

- (1) Large motor step
- (2) Motor steps lower by a factor of 10
- (3) Large motor steps

"PWM" function

The "PWM" function (pulse width modulation) can be used to reduce the motor phase current and as a result the torque by 0% to 100% of the motor phase current that is set at the "HEX" rotary switch.

At constant HIGH level no motor phase current flows (current reset to zero). At constant LOW level the motor operates at the specified maximum motor phase current. If a rectangular-pulse signal is fed, the motor phase current can be set with the pulse-pause ratio.

Setting options via parameter switches

Setting function of the "STEP2_INV / PWM" signal input

Setting function of the "FAULT / INDEXPULSE" signal output

For compact drives with index pulse the index pulse signal can be switched to the "FAULT / INDEXPULSE" signal output (possible with compact drives with index pulse encoder only).

The FAULT / INDEXPULSE signal is available at the following interfaces:

- 24 V signal interface

The FAULT / INDEXPULSE signal can have two functions:

"FAULT" function

The "FAULT" function shows an error status. An error can be reset by locking and enabling the power amplifier (ENABLE signal): LOW --> HIGH).

"INDEXPULSE" function

If the compact drive has the optional internal Hall sensor on the motor shaft, the Hall sensor sends the INDEXPULSE signal once per revolution.

Setting options via parameter switches

Setting function of the "FAULT / INDEXPULSE" signal output

Activating blocking detection

The compact drive is fitted with stall detection as an option. The stall detection responds if the actual position of the axis deviates from the setpoint position by more than one revolution. The function is only available on compact drives with index pulse. If the stall detection responds, the power to the compact drive is disconnected and the "FAULT" signal output is set.

Stall detection is only possible with a compact drive with index pulse encoder.

Setting options via parameter switches

Activating/Deactivating blocking detection

Setting function of the "DIR / A and PULSE / B" signal inputs

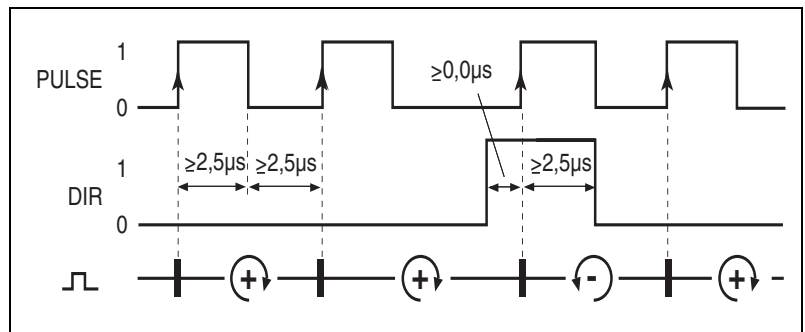
The values of the setpoint position can be fed in at the multifunction interface as pulse/direction signals or A/B encoder signals. The compact drive converts the input signals to a motor movement.

Two interface modes are available:

- PULSE/DIR
- A/B

"PULSE/DIR" interface mode

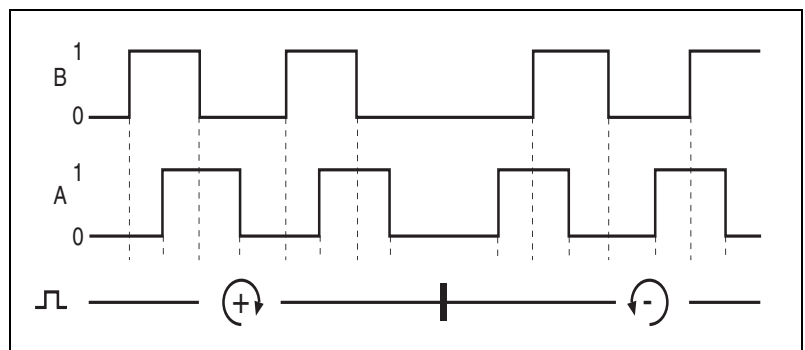
The motor executes an angular increment with the rising edge of the PULSE signal. The direction of rotation is controlled by the DIR signal.



Pulse/direction signals

"A / B" interface mode

A/B encoder signals can be fed as a reference value selection via the "A / B" operating mode.



A/B encoder signals

Setting options via parameter switches

Setting function of the "DIR / A and PULSE / B" signal inputs

Safety function

Definition

Power Removal

The "Power Removal" safety function switches off the motor torque safely. The supply voltage must not be interrupted. There is no monitoring at standstill.

Category 0 stop (EN 60204-1)

Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).

Category 1 stop (EN 60204-1)

A controlled stop, in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

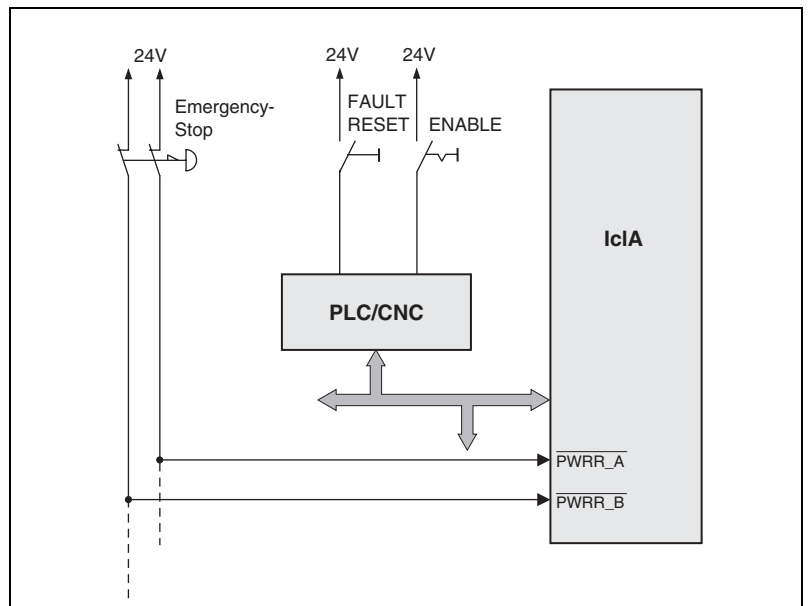
Description

The "Power Removal" safety function integrated into the product can be used to implement the Emergency Stop control function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.

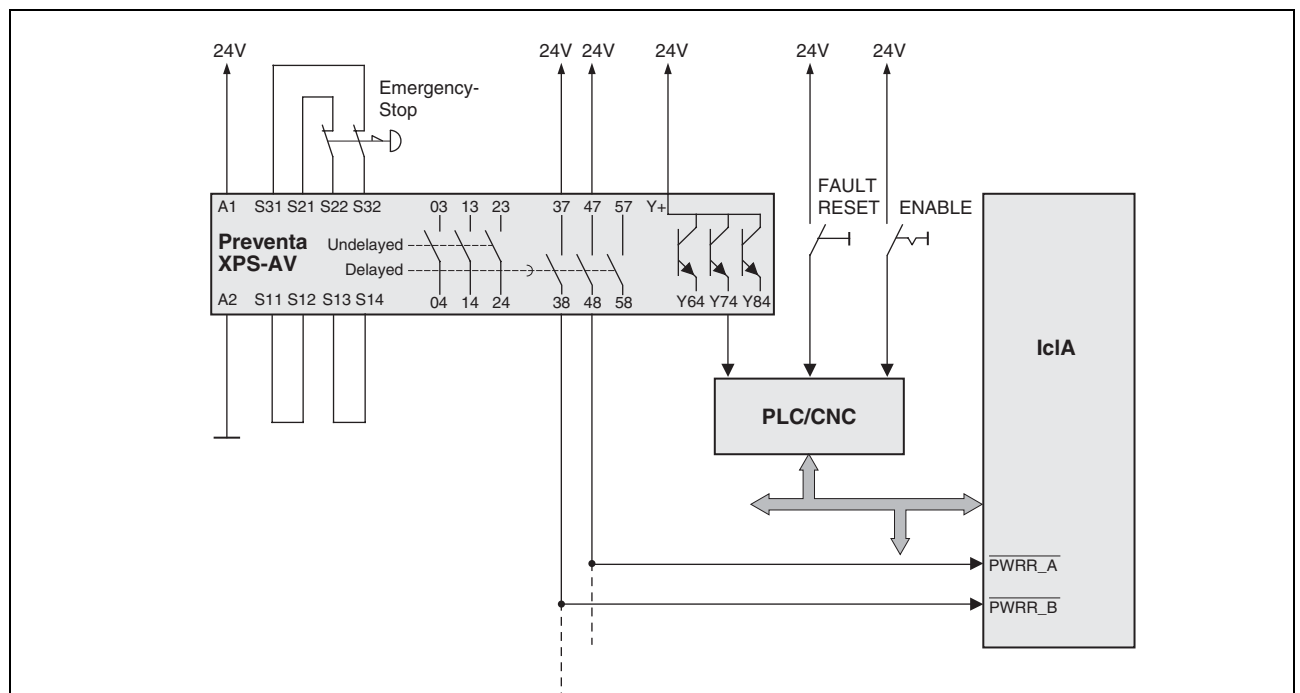
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508, SIL 2: Functional safety of electrical/electronic/programmable electronic safety-related systems
- pr IEC 62061, SIL 2: Safety of machinery, Functional safety of electrical, electronic and programmable controllers of machines
- EN 954-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements
- pr EN 13849-1, Category 3: Safety of machinery, Safety of components of control devices, Part 1: General design requirements

Examples of applications for the safety function



Example category 0 stop



Example category 1 stop

Technical data

IDS6x mechanical data

		IDS61	IDS62	IDS63
Max. torque M_{\max}	Nm	0.45	0.90	1.50
Holding torque M_H	Nm	0.51	1.02	1.70
Moment of inertia	kgcm ²	0.1	0.22	0.38
Number of steps		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000		
Step angle	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036		
Systematic angle tolerance per step ¹⁾	'	±6	±6	±6
Weight	kg	1.3	1.6	2.0
Shaft load ²⁾				
• Max. radial force ³⁾	N	24	24	50
• Max. axial force tension	N	100		
• Max. axial force compression	N	8.4		
• Nominal bearing life L_{10h} ⁴⁾	h	20000		

¹⁾ Measured at 1000 steps/revolution, unit in minutes of arc

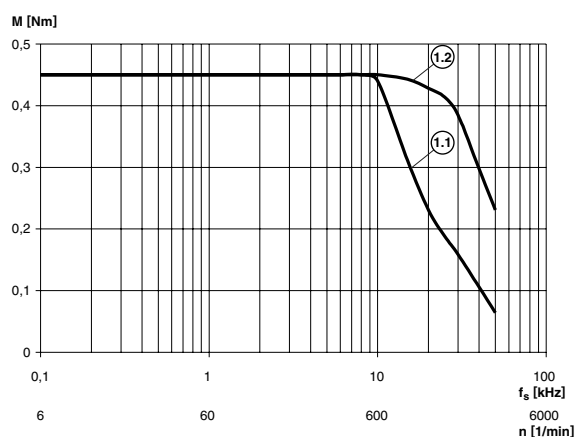
²⁾ Conditions for the shaft load: speed of rotation 60 1/min, duty cycle at torque, ambient temperature 40 °C

³⁾ Reference point of radial force: 10.5 mm distance from flange

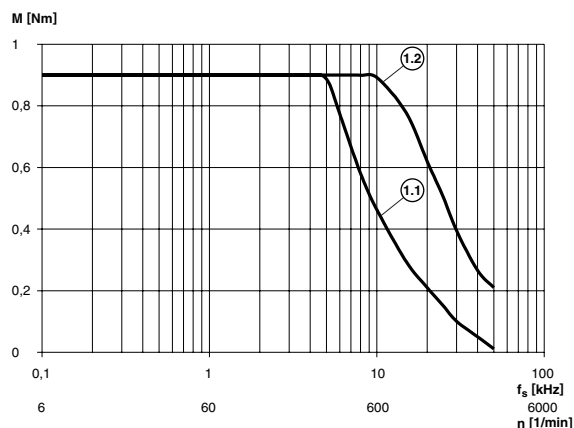
⁴⁾ Operating hours at a failure probability of 10%

Characteristic curves

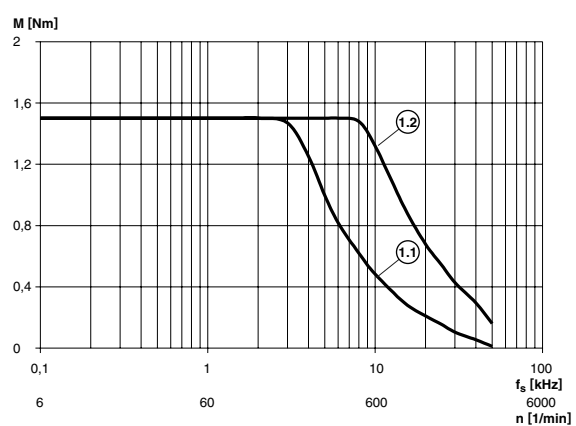
IDS61 torque characteristic



IDS62 torque characteristic



IDS63 torque characteristic



(1.1) Max. torque at 24 V

(1.2) Max. torque at 36 V

measured at 1000 steps/revolution

IDS9x mechanical data

		IDS91	IDS92	IDS93 Standard	IDS93 3 D
Winding type					
Max. torque M_{\max}	Nm	2.0	4.0	6.0	4.5
Holding torque M_H	Nm	2.0	4.0	6.0	4.5
Moment of inertia	kgcm ²	1.1	2.2	3.3	
Number of steps		200 / 400 / 500 / 1000 / 2000 / 4000 / 5000 / 10000			
Step angle	°	1.8 / 0.9 / 0.72 / 0.36 / 0.18 / 0.09 / 0.072 / 0.036			
Systematic angle tolerance per step ¹⁾	'	±6			
Weight m	kg	2.6	3.6	4.7	
Shaft load ²⁾					
• Max. radial force ³⁾	N	100	100	110	
• Max. axial force tension	N	170			
• Max. axial force compression	N	30			
• Nominal bearing life L_{10h} ⁴⁾	h	20000			

Holding brake

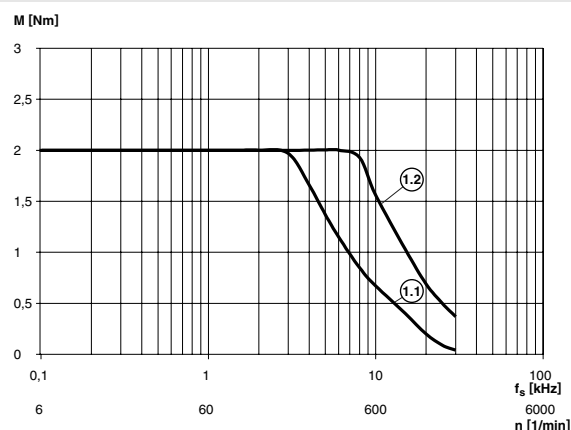
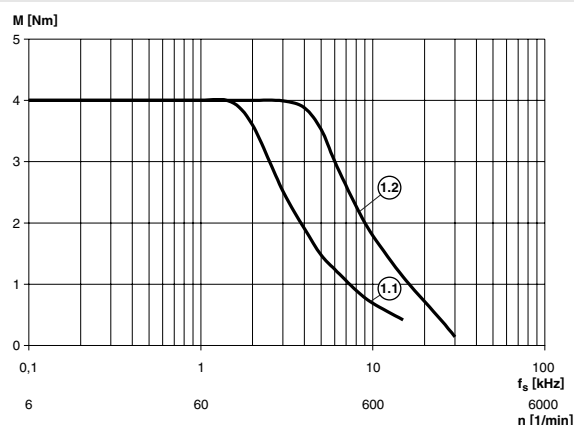
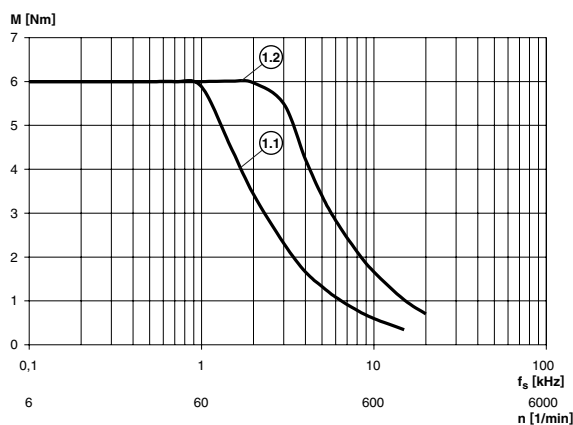
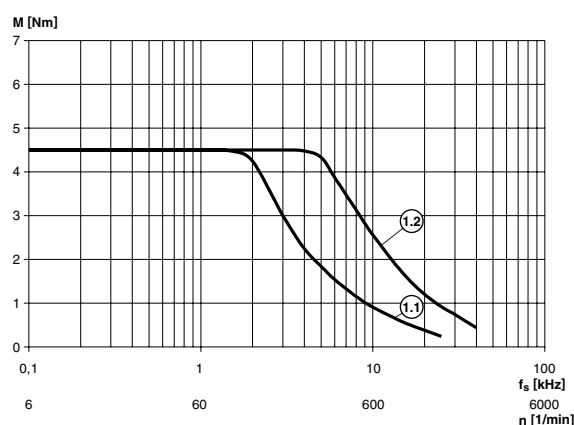
Holding torque M_H	Nm	6			
Electrical pick-up power	W	22			
Energise time (release brake)	ms	40			
De-energise time (close brake)	ms	20			
Moment of inertia	kgcm ²	0.2			
Weight m	kg	1.8			

¹⁾ Measured at 1000 steps/revolution, unit in minutes of arc

²⁾ Conditions for the shaft load: speed of rotation 60 1/min, duty cycle at torque, ambient temperature 40 °C

³⁾ Reference point of radial force: 10.5 mm distance from flange

⁴⁾ Operating hours at a failure probability of 10%

Characteristic curves**IDS91 torque characteristic****IDS92 torque characteristic****IDS93 torque characteristic****IDS93 torque characteristic with 3D winding**

(1.1) Max. torque at 24 V

(1.2) Max. torque at 36 V

measured at 1000 steps/revolution

Electrical data				
Power supply		Corresponds to PELV as per DIN 19240, no inverse-polarity protection		
Supply voltage	VDC	18 ... 40		
Rated supply voltage	VDC	24 / 36		
Ripple at nominal voltage	V _{SS}	≤ 3.6		
Max. power consumption				
• IDS6x	A	3.6		
• IDS9x	A	5		
Starting current		charging current of capacitor C = 1500 µF		
External fuse	A	10, characteristic: slow-acting fuse		
24 V signal interface		4 signals, each can be used as input or output, GND galvanically connected with power supply GND, no inverse-polarity protection !		
24 V signal inputs				
Low level IO0..IO3	V/mA	≤ 4.5 / ≤ 0.7		
High level IO0..IO3	V/mA	≥ 15 / ≥ 2		
Admissible voltage range	V	0 ... 30		
Debounce time IO0 to IO3	ms	0.1		
Debounce time IO2, IO3 at capture function	ms	0.01		
24 V signal outputs		switching to positive, short-circuit resistant, inductively chargeable (1000 mH / 100mA)		
		with external power supply	with internal power supply	
Supply voltage	V _{DC}	10 ... 30	23 ... 25	
Switching current	mA	≤ 100 (per output)	≤ 200 (total)	
			The internal power supply is protected against: <ul style="list-style-type: none">• short-circuiting of the ouput voltage• overloading of the output voltage (limit set at 6 W output power)	
Multifunction interface		PD1 (24V)	PD2 (5V)	PD3
Inputs				
Electrically isolated		yes	yes	no
Low level	V / mA	≤ 0.3 / ≤ 0.2	≤ 0.4 / ≤ 0.2	RS422
High level	V / mA	≥ 2.5 / ≥ 7	≥ 2.5 / ≥ 7 ¹⁾	RS422
Admissible voltage range	V	-3...30	-5.25 ... +5.25	-2 ... +26 ²⁾
Input resistance	Ω	2000	140	5000
PULSE/DIR frequency input	kHz	≤ 200	≤ 200	≤ 200
PWM frequency input current reduction	kHz	6...25	6 ... 25	6 ... 25
Output		short-circuit resistant, , no inverse-polarity protection to 100 mA, inductively chargeable (1000 mH / 100 mA)		
Electrically isolated		yes	yes	no
Max. switching voltage	V	30	30	30
Max. switching current	mA	100	100	100
Internal voltage drop at 10 mA / 100 mA	V	≤1.6 / 1.9	≤1.6 / 1.9	≤0.2 / 0.2

1) From pulse frequency 50 kHz: high level ≥ 3.5 V

2) Voltage related to GND

Environmental conditions		
Ambient temperature ¹⁾	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85
Vibration strain		as per DIN EN 60068-2-6
• Acceleration amplitude	m/s ²	20
• Frequency range	Hz	10 ... 500
• Number of cycles		10
Continuous shock		as per DIN EN 60068-2-29
• Number of shocks ²⁾		1000
• Peak acceleration	m/s ²	150
Heat class according to EN 60529		IP54 complete device except for shaft bushing; IP41 shaft bushing
Insulation material class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

1) Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

2) In each case in positive and negative direction per axis (X, Y, Z)

Safety functions		
Life time corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508)	1/h	1.84·10 ⁻⁹
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

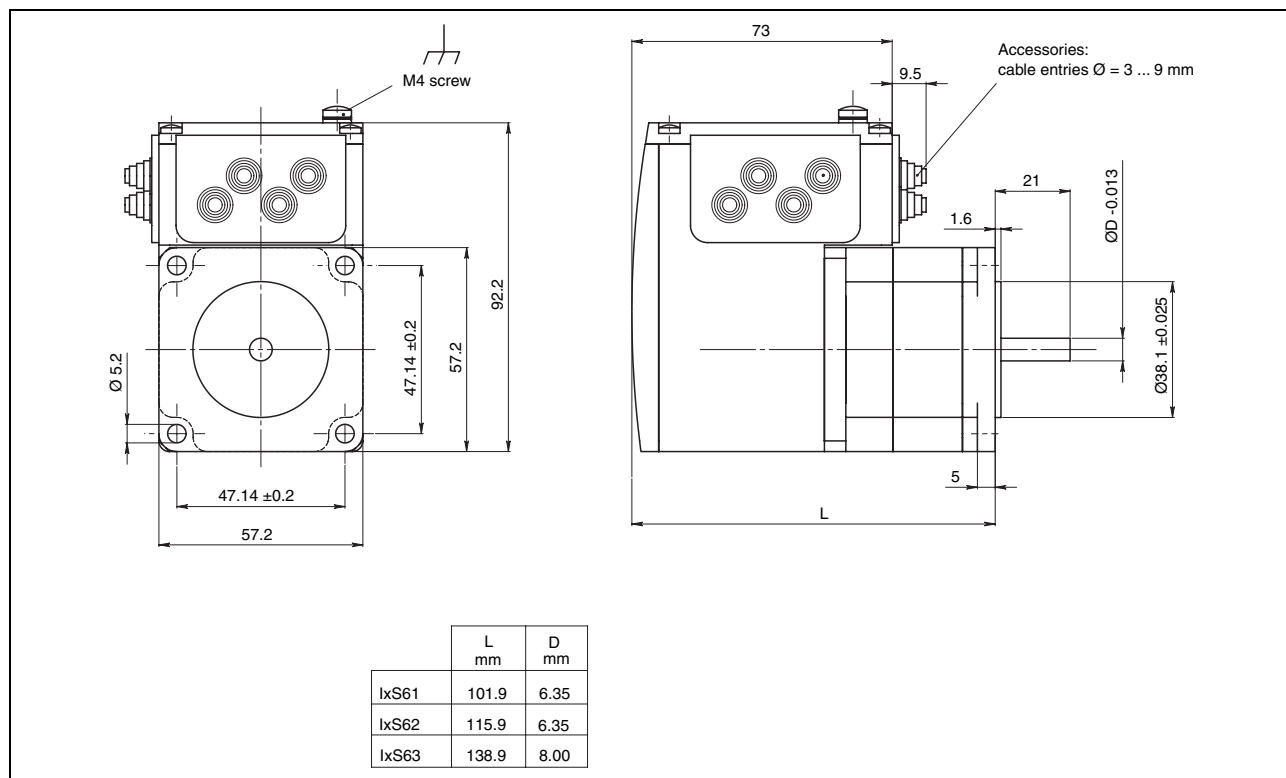
¹⁾ From pulse frequency 50 kHz: high level ≥ 3.5 V

²⁾ Voltage related to GND

¹⁾ Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

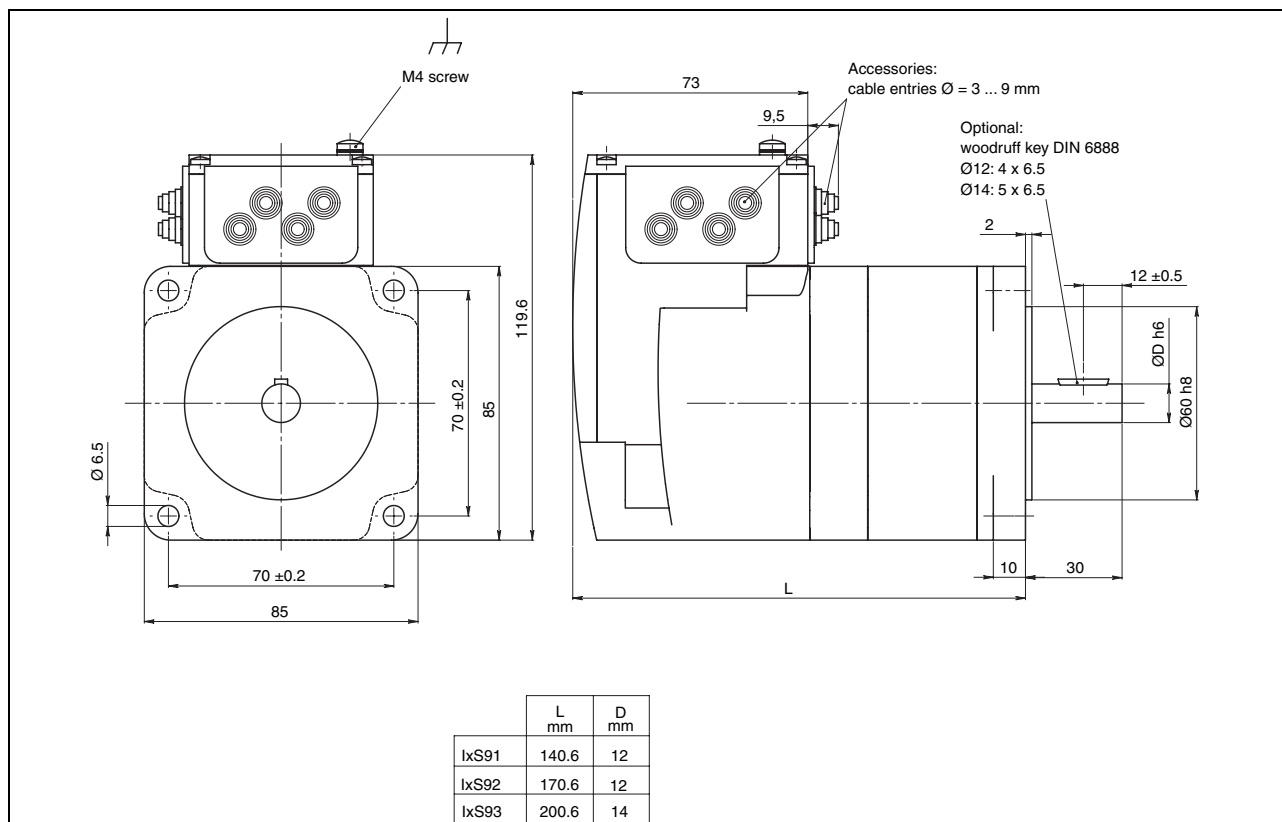
²⁾ In each case in positive and negative direction per axis (X, Y, Z)

Dimensional drawings Dimensional drawings IDS6x

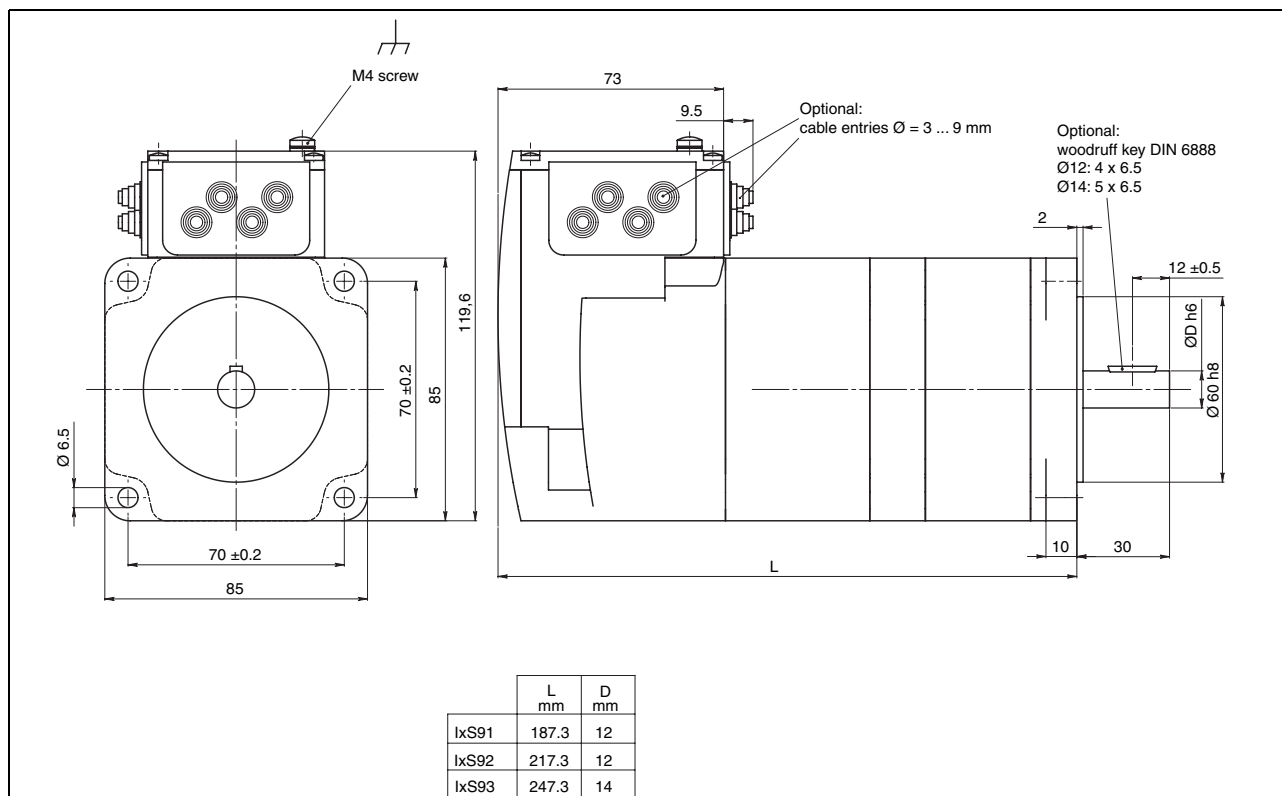


Intelligent Compact Drive IcIA IDS6x

Dimensional drawings IDS9x



Intelligent Compact Drive IcIA IDS9x



Intelligent Compact Drive IcIA IDS9x with holding brake

Type code																							
Type code IDS6x																							
Example:	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Product family I = IclA intelligent compact drive	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Controller type D = power electronics	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Motor type S = stepper motor	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Motor size 6 = motor flange [cm] 1, 2, 3 = motor length index	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Nominal supply voltage 2 = 24 to 36 V _{DC}	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Communications interface PD1 = 24 V signals, optically isolated PD2 = 5 V signals, optically isolated PD3 = 5 V signals, push-pull (RS422)	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Signal interface power supply - = none (external power supply unit required) IS = internal 24V power supply unit	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Hardware option D = parameter switch for configuration	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Software version S = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Winding type - = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Measuring system - = no measuring system I = index pulse encoder	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Holding brake - = no holding brake	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Connection technology B = printed circuit board plug connector	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Overall degree of protection (except for shaft bushing) 54 = IP54	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
gear O-001 = no gearbox PLE 60 planetary gear, gear ratio: 2-003 = 3 : 1 2-005 = 5 : 1 2-008 = 8 : 1	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Shaft type R = round, smooth shaft (without gearbox) K = parallel key (with gearbox only)	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Centring collar diameter: P = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Shaft diameter P = Standard	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	
Shaft bushing degree of protection 41 = IP41	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	B	54	O-001	R	P	P	41	

Type code IDS9x																
Example:	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Product family I = IclA intelligent compact drive	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Controller type D = power electronics	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Motor type S = stepper motor	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Motor size 9 = motor flange [cm] 1, 2, 3 = motor length index	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Nominal supply voltage 2 = 24 to 36 V _{DC}	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Communications interface PD1 = 24 V signals, optically isolated PD2 = 5 V signals, optically isolated PD3 = 5 V signals, push-pull (RS422)	I	D	S	6	1	/	2	PD3	IS	D	S	/	-	-	-	41
Signal interface power supply - = none (external power supply unit required) IS = internal 24V power supply unit	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Hardware option D = parameter switch for configuration	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Software version S = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Winding type - = Standard 3D = higher speed of rotation (with IFS93)	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Measuring system - = no measuring system I = index pulse encoder	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Holding brake - = no holding brake B = with holding brake	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Connection technology B = printed circuit board plug connector	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Overall degree of protection (except for shaft bushing) 54 = IP54	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Gear O-001 = no gearbox PLE 80 planetary gear, gear ratio: 3-003 = 3 : 1 3-005 = 5 : 1 3-008 = 8 : 1	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Shaft type R = round, smooth shaft (without gearbox) W = disc spring as per DIN 6888 (without gearbox) K = parallel key (with gearbox only)	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Centring collar diameter: P = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Shaft diameter P = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41
Shaft bushing degree of protection 41 = IP41	I	D	S	9	1	/	2	PD3	IS	D	S	/	-	-	-	41

Planetary gear

Description



The IcIA intelligent compact drives can be supplied with a planetary gear as an option. Different planetary gears are available depending on the motor. The following table shows the available planetary gears.

IcIA compact drive	Planetary gear Diameter	Reduction ratio
IDS6x, IFS6x	60	3: 1
		5: 1
		8: 1
IDS9x, IFS9x	80	3: 1
		5: 1
		8: 1
IFA6x	60	3: 1
		5: 1
		8: 1
IFE71	40	16: 1
		40: 1
		60: 1
		120: 1

Technical data

Gear		PLE 40				PLE 60			PLE 80		
Reduction ratio		16	40	60	120	3	5	8	3	5	8
Torsional play	arcmin	<30				< 20			< 12		
Torsion rigidity	Nm/arcmin	1.1	1.1	1.0	1.0	2.3			6		
Rated output torque ¹⁾	Nm	20	18	20	18	12	16	15	40	50	50
Moment of inertia	kgcm²	0.022	0.016	0.029	0.029	0.135	0.078	0.065	0.77	0.45	0.39
Max. radial force	N	200				500			950		
Max. axial force	N	200				600			1200		
Weight	kg	0.45	0.45	0.55	0.55	0.9			2.1		
Gear stages		2		3		1			1		
Max. drive speed	1/min	18.000				13.000			7.000		
Rec. drive speed	1/min	4.500				4.000			4.000		
Efficiency	%	94	94	90	90	96			96		
Min. operating temperature	°C	-25				-25			-25		
Max. operating temperature	°C	+90				-90			-90		
Max. operating temperature (short-term)	°C	+120				+120			+120		
Bearings		Deep-groove ball bearing				Deep-groove ball bearing			Deep-groove ball bearing		
Degree of protection		IP 54				IP 54			IP 54		
Lubrication		life lubrication				life lubrication			life lubrication		
Life time	h	10.000				20.000			20.000		

¹⁾ The actual output torque is calculated from the motor torque x reduction ratio x efficiency of the gearbox.

CAUTION: the actual output torque must be less than the rated output torque of the gearbox, otherwise the gearbox may be damaged.

Technical drawing of a 2-stage and 3-stage centrifugal pump assembly. The drawing includes a front view (left) and a side view (right).

Front View (Left):

- Outer square dimension: $\square 60$
- Central hole diameter: $\varnothing 34$
- Distance from center to screw center: 3
- Screw specification: M4 x 6 deep
- Inner circle diameter: $\varnothing 2$
- Flange thickness: 11.2

Side View (Right):

- Overall length: L_1
- Distance from center to first stage: 29.5
- Distance from center to second stage: L_2
- Distance between stages: 26
- Keyway width: 23
- Keyway depth: 18
- Keyway height: 2.5
- Key specification: Parallel key DIN 6885 A 3x3x18
- Keyway diameter: $\varnothing 12$
- Shaft diameter: $\varnothing 26$ h7(0,015)
- Shaft tolerance: h7(0,027)
- Centre hole specification: Centre hole DIN 332 DS M3x9 deep
- Flange outer diameter: $\varnothing 40$
- Flange thickness: 2

	L_1	L_2
2-stage	107,5	52
3-stage	120	64,5

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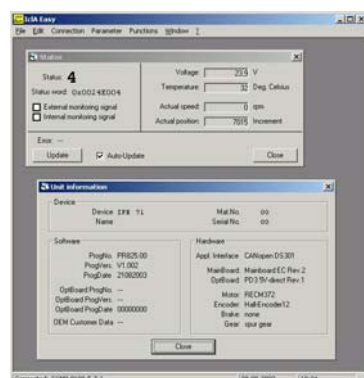
Berger Lahr

Accessories

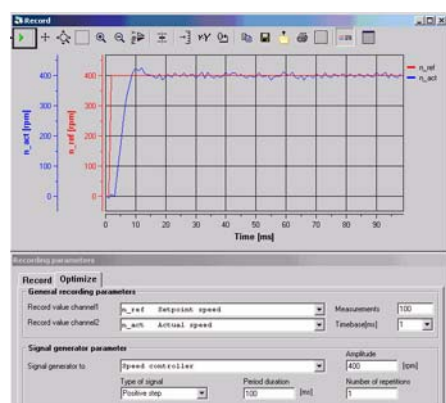
Software and documentation

Designation	Description	Order no.
IclA CD-ROM	Contents: • Catalogue, German and English • Documentation, German and English • IclA Easy commissioning software • EDS file for IclA IFx with CAN bus • GSD file for IclA IFx with Profibus	0098441113207
IclA IFA documentation	DIN A4, bound	German 0098441113227
		English 0098441113228
IclA IFE documentation	DIN A4, bound	German 0098441113211
		English 0098441113212
IclA IFS documentation	DIN A4, bound	German 0098441113188
		English 0098441113189
IclA IDS documentation	DIN A4, bound	German 0098441113190
		English 0098441113191
IclA IFx CANopen documentation	DIN A4, bound	German 0098441113184
		English 0098441113185
IclA IFx RS485 documentation	DIN A4, bound	German 0098441113186
		English 0098441113187
IclA IFx Profibus documentation	DIN A4, bound	German 0098441113192
		English 0098441113193

"IclA Easy" commissioning software



Display of status and device information



Optimising the controller with IclA IFA

The "IclA Easy" commissioning software offers the following functions:

- Input and display of device parameters
- Archiving and duplication of device parameters
- Display of status and device information
- Positioning the motor with the PC
- Triggering reference movements
- Access to all documented parameters
- Diagnostics of breakdown
- Optimising the controller (IclA IFA only)

Requirements and interfaces

"IclA Easy" runs on a PC with Microsoft Windows 98/ME/NT/2000/XP. The program communicates with the compact drives via RS485, CAN or Profibus DP with the aid of a fieldbus converter.

Supported fieldbus converters

Compact drive interface	PC interface	Required fieldbus converter	Reference source
RS485	USB	NuDAM ND-6530	www.acceed.com
	RS232	NuDAM ND-6520	www.acceed.com
CAN	USB	PCAN-USB, Peak	www.peak-system.com
	parallel	PCAN dongle, Peak	www.peak-system.com
Profibus DP	PCMCIA	Siemens CP5511/12	www.ad.siemens.com
	PCI	Siemens CP5611/13	www.ad.siemens.com

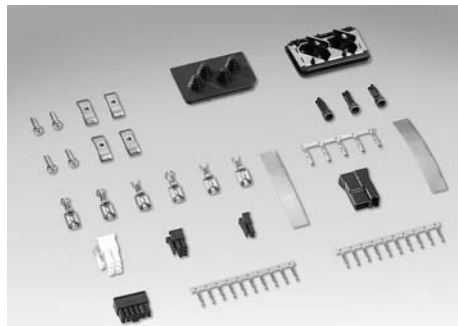
Reference source

The "IclA Easy" commissioning software is included on the IclA CD-ROM. The latest version is available for download at <http://www.berger-lahr.com>.

Accessories for IclA IDS and IclA IFx compact drives with printed circuit board plug connectors

Designation	Description	Order no.
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IclA Ixx Installation set



Contents:

- Connector shell
- Shielding foil
- Crimp contacts
- 2 cable entries
- 3 crimp end connector
- Connector shell (Power Removal)
- Crimp contacts (Power Removal)

0062501521001

IclA Ixx Cable Entries



For max. 4 cables with a cable cross section of 3 to 9 mm. Two cable entries per compact drive are required. The cable entries are for sealing, strain relief and shield connection.

2 units	0062501520002
10 units	0062501520001

IclA IDx Cable (power, P/D)



For connection of pulse/direction interface with a master controller and power supply; cUL-approved; suitable for trailing cable applications; meets DESINA standard; incl. second cable entry

3 m	0062501464030
5 m	0062501464050
10 m	0062501464100
15 m	0062501464150
20 m	0062501464200

IclA IFx Cable (power, CAN, RS485, Profibus)



Cable for connection to the fieldbus and power supply. The cable can be used for initial commissioning of the compact drive. A second cable entry is supplied.

• CAN	3 m	0062501462030
• RS485	3 m	0062501463030
• Profibus	3 m	0062501484030



Accessories for IclA IFx compact drives with industrial plug connectors

I/O signal inserts

Designation	Description	Order no.
IclA IFx Insert 3/I/O	<p>Insert for three I/O signals</p> <p>Contents:</p> <ul style="list-style-type: none"> 1 insert with 3 M8 female connectors (3-pin) for connection of 3 I/O signals 1 blind insert <p>Matching connector set:</p> <p>IclA IFx connector set 3 I/O</p>	<p>0062501533001</p> <p>0062501534002</p>
IclA IFx Insert 4/I/O	<p>Insert for four I/O signals</p> <p>Contents:</p> <ul style="list-style-type: none"> 2 inserts with 2 M8 female connectors (3-pin) each for connection of 4 I/O signals <p>Matching connector set:</p> <p>IclA IFx connector set 2 I/O (2x)</p>	<p>0062501533002</p> <p>0062501534001</p>
IclA IFx Insert 3/I/O 24V	<p>Insert for 3 I/O signals and external 24 V signal power supply</p> <p>Contents:</p> <ul style="list-style-type: none"> 1 insert with 2 M8 female connectors and 1 M8 connector for connection of 3 I/O signals and 24 V signal power supply 1 blind insert <p>Matching connector set:</p> <p>IclA IFx connector set 3 I/O 24V</p>	<p>0062501524001</p> <p>0062501523001</p>
IclA IFx Insert 4/I/O 24V	<p>Inserts for 4 I/O signals and external 24V signal power supply</p> <p>Contents:</p> <ul style="list-style-type: none"> 1 insert <ul style="list-style-type: none"> 2 M8 female connectors (3-pin) for connection of 2 I/O signals 1 M8 connector (3-pin) for connection of 24 V signal power supply (IN) 1 insert <ul style="list-style-type: none"> 2 M8 female connectors (3-pin) for connection of 2 I/O signals 1 M8 connector (3-pin) for connection of 24 V signal power supply (out) <p>Matching connector set:</p> <p>IclA IFx connector set 4 I/O 24V</p>	<p>0062501527001</p> <p>0062501523002</p>

Accessories for IclA IFx compact drives with industrial plug connectors

I/O signal inserts

Designation	Description	Order no.
IclA IFx Insert 2 I/O 1PWRR		
	<p>Inserts for 2 I/O signals and signals for Power Removal safety function</p> <p>Contents:</p> <ul style="list-style-type: none"> • 1 insert <ul style="list-style-type: none"> – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (4-pin) for connection of signal for Power Removal • 1 blind insert <p>Matching connector set:</p> <p>IclA IFx connector set 2 I/O</p> <p>IclA Ixx cable (PWRR M8x4)</p>	<p>0062501533003</p> <p>0062501534001</p> <p>00625014850xx</p>
IclA IFx Insert 4 I/O 2PWRR		
	<p>Inserts for 4 I/O signals and signals for Power Removal safety function</p> <p>Contents:</p> <ul style="list-style-type: none"> • 1 insert <ul style="list-style-type: none"> – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (4-pin) for connection of signals for Power Removal • 1 insert <ul style="list-style-type: none"> – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 female connector (4-pin) for forwarding signals for Power Removal <p>Matching connector set:</p> <p>IclA IFx connector set 2 I/O (2x)</p> <p>IclA IFx connector set 1 PWRR-Exit</p> <p>IclA Ixx cable (PWRR M8x4)</p>	<p>00 62501533004</p> <p>0062501534001</p> <p>0062501534005</p> <p>00625014850xx</p>


Accessories for IclA IFx compact drives with industrial plug connectors

Connector sets for I/O signal inserts


Designation	Description	Order no.
IclA IFx Connector 2 I/O	<p>Connector set for fitting to cables for 2 I/O signals</p> <p>Contents:</p> <ul style="list-style-type: none"> • 2 M8 circular connector plug (3-pin) <p>Note: two connector sets are required for IclA IFx inserts with 4 I/O signals.</p>	0062501534001
IclA IFx Connector 3 I/O	<p>Connector set for fitting to cables for 3 I/O signals</p> <p>Contents:</p> <ul style="list-style-type: none"> • 3 M8 circular connector plug (3-pin) 	0062501534002
IclA IFx Connector 3 I/O 24V	<p>Connector set for fitting to cables for 3 I/O signals and 1 power supply cable</p> <p>Contents:</p> <ul style="list-style-type: none"> • 2 M8 circular connector plug (3-pin) • 1 M8 circular connector socket (3-pin) 	0062501523001
IclA IFx Connector 4 I/O 24V	<p>Connector set for fitting to cables for 4 I/O signals and 2 power supply cables</p> <p>Contents:</p> <ul style="list-style-type: none"> • 5 M8 circular connector plug (3-pin) • 1 M8 circular connector socket (3-pin) 	0062501523002

Accessories for IclA IFx compact drives with industrial plug connectors


Connector sets for I/O signal inserts

Designation	Description	Order no.
IclA IFx Connector 1PWRR output	Connector set for fitting to cables for forwarding signals for safety function Power Removal	0062501534005
		
Contents: • 1 M8 circular connector plug (4-pin)		

Connector sets for fieldbus


Designation	Description	Order no.
IclA IFx Connector Profibus M12	For fabrication of Profibus cables	0062501525001
		
Contents: • 1 M12 circular connector plug (B-coded) • 1 M12 circular connector socket (B-coded) • 1 M12 protective cap		

IclA IFx Connector CAN / RS485 M12

		
	For fabrication of CAN cables or RS485 cables	0062501526001
Contents: • 1 M12 circular connector plug (A-coded) • 1 M12 circular connector socket (A-coded) • 1 M12 protective cap		

Accessories for IclA IFx compact drives with industrial plug connectors

Cable

Designation	Description	Order no.
IclA IFx Cable (power, CAN, RS485, Profibus)		
	Cable for connection to the fieldbus and power supply. The cable can be used for initial commissioning of the compact drive. A second cable entry is supplied.	
	• CAN	3 m 0062501462030
	• RS485	3 m 0062501463030
	• Profibus	3 m 0062501484030

IclA lxx Cable (power: STAK)



For connection of power supply; cUL-approved; for trailing cable applications; complies with DESINA standard

3 m	0062501470030
5 m	0062501470050
10 m	0062501470100
15 m	0062501470150
20 m	0062501470200

(IclA lxx cable not suitable for IDS)

IclA lxx Cable (PWRR M8x4) xx m



Cable with M8 female connector (4-pin) for connection of signals for Power Removal safety function

3 m	0062501485030
5 m	0062501485050
10 m	0062501485100
15 m	0062501485150
20 m	0062501485200

Conversion tables

Rotor inertia

	lb-in ²	lb-ft ²	lb-in-s ²	lb-ft-s ² slug-ft ²	kg-cm ²	kg-cm-s ²	g-cm ²	g-cm-s ²	oz-in ²	oz-in-s ²
lb-in ²	–	6.94 x 10 ⁻³	2.59 x 10 ⁻³	2.15 x 10 ⁻⁴	2.926	2.98 x 10 ³	2.92 x 10 ³	2.984	16	4.14 x 10 ⁻²
lb-ft ²	144	–	0.3729	3.10 x 10 ⁻²	421.40	0.4297	4.21 x 10 ⁵	429.71	2304	5.967
lb-in-s ²	386.08	2.681	–	8.33 x 10 ⁻²	1.129 x 10 ³	1.152	1.129 x 10 ⁶	1.152 x 10 ³	6.177 x 10 ³	16
lb-ft-s ² slug-ft ²	4.63 x 10 ³	32.17	12	–	1.35 x 10 ⁴	13.825	1.355 x 10 ⁷	1.38 x 10 ⁴	7.41 x 10 ⁴	192
kg-cm ²	0.3417	2.37 x 10 ⁻³	8.85 x 10 ⁻⁴	7.37 x 10 ⁻⁶	–	1.019 x 10 ⁻³	1000	1.019	5.46	1.41 x 10 ⁻²
kg-cm-s ²	335.1	2.327	0.8679	7.23 x 10 ⁻²	980.66	–	9.8 x 10 ⁵	1000	5.36 x 10 ³	13.887
g-cm ²	3.417 x 10 ⁻⁴	2.37 x 10 ⁻⁶	8.85 x 10 ⁻⁷	7.37 x 10 ⁻⁸	1 x 10 ⁻³	1.01 x 10 ⁻⁶	–	1.01 x 10 ⁻³	5.46 x 10 ⁻³	1.41 x 10 ⁻⁶
g-cm-s ²	0.335	2.32 x 10 ⁻³	8.67 x 10 ⁻⁴	7.23 x 10 ⁻⁵	0.9806	1 x 10 ⁻³	980.6	–	5.36	1.38 x 10 ⁻²
oz-in ²	0.0625	4.3 x 10 ⁻⁴	1.61 x 10 ⁻⁶	1.34 x 10 ⁻⁶	0.182	1.86 x 10 ⁻⁴	182.9	0.186	–	2.59 x 10 ⁻³
oz-in-s ²	24.13	0.1675	6.25 x 10 ⁻²	5.20 x 10 ⁻³	70.615	7.20 x 10 ⁻²	7.06 x 10 ⁴	72	386.08	–

Torque

	lb-in	lb-ft	oz-in	Nm	kg-m	kg-cm	g-cm	dyne-cm
lb-in	–	8.333 x 10 ⁻²	16	0.113	1.152 x 10 ⁻²	1.152	1.152 x 10 ³	1.129 x 10 ⁶
lb-ft	12	–	192	1.355	0.138	13.825	1.382 x 10 ⁴	1.355 x 10 ⁷
oz-in	6.25 x 10 ⁻²	5.208 x 10 ⁻³	–	7.061 x 10 ⁻³	7.200 x 10 ⁻⁴	7.200 x 10 ⁻²	72.007	7.061 x 10 ⁴
Nm	8.850	0.737	141.612	–	0.102	10.197	1.019 x 10 ⁴	1 x 10 ⁷
kg-m	86.796	7.233	1.388 x 10 ³	9.806	–	100	1 x 10 ⁵	9.806 x 10 ⁷
kg-cm	0.8679	7.233 x 10 ⁻²	13.877	9.806 x 10 ⁻²	10 ⁻²	–	1000	9.806 x 10 ⁵
g-cm	8.679 x 10 ⁻⁴	7.233 x 10 ⁻⁶	1.388 x 10 ⁻²	9.806 x 10 ⁻⁶	1 x 10 ⁻⁵	1 x 10 ⁻³	–	980.665
dyne-cm	8.850 x 10 ⁻⁷	7.375 x 10 ⁻⁸	1.416 x 10 ⁻⁵	10 ⁻⁷	1.019 x 10 ⁻⁸	1.0197 x 10 ⁻⁶	1.019 x 10 ⁻⁶	–

Power

	H.P.	W
H.P.	–	745.7
(lb-in)(deg./sec)	2.645 x 10 ⁻⁶	1.972 x 10 ⁻³
(lb-in)(RPM)	1.587 x 10 ⁻⁶	1.183 x 10 ⁻²
(lb-ft)(deg./sec)	3.173 x 10 ⁻⁵	2.366 x 10 ⁻²
(lb-ft)(RPM)	1.904 x 10 ⁻⁴	0.1420
W	1.31 x 10 ⁻³	–

Length

	in	ft	yd	m	cm	mm
in	–	0.0833	0.028	0.0254	2.54	25.4
ft	12	–	0.333	0.3048	30.48	304.8
yd	36	3	–	0.914	91.44	914.4
m	39.37	3.281	1.09	–	100	1000
cm	0.3937	0.03281	1.09 x 10 ⁻²	0.01	–	10
mm	0.03937	0.00328	1.09 x 10 ⁻³	0.001	0.1	–

Rotation

	RPM	rad/sec	deg./sec	1/min
RPM	–	0.105	6.0	1
rad/sec	9.55	–	57.30	9.55
deg./sec	0.167	1.745 x 10 ⁻²	–	0.167
1/min	1	0.105	6.0	–

Weight

	lb	oz	slug	kg	g
lb	–	16	0.0311	0.453592	453.592
oz	6.35 x 10 ⁻²	–	1.93 x 10 ⁻³	0.028349	28.35
slug	32.17	514.8	–	14.5939	1.459 x 10 ⁴
kg	2.20462	35.274	0.0685218	–	1000
g	2.205 x 10 ⁻³	3.527 x 10 ⁻³	6.852 x 10 ⁻⁵	0.001	–

Force

	lb	oz	g	dyne	N
lb	–	16	453.592	4.448 x 10 ⁵	4.4482
oz	0.0625	–	28.35	2.780 x 10 ⁴	0.27801
g	2.205 x 10 ⁻³	0.03527	–	1.02 x 10 ⁻³	N.A.
dyne	2.248 x 10 ⁻⁶	3.59 x 10 ⁻⁶	980.7	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Temperature

	°F	°C
°F	–	Subtract 32 and multiply by ⁵ / ₉ .
°C	Multiply by ⁹ / ₅ and add 32.	–



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