BERGER LAHR

Catalogue

Intelligent Compact Drives IclA I••

a company of Schneider Electric

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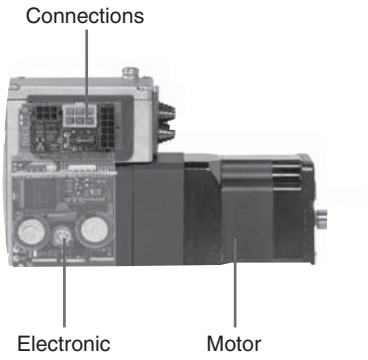
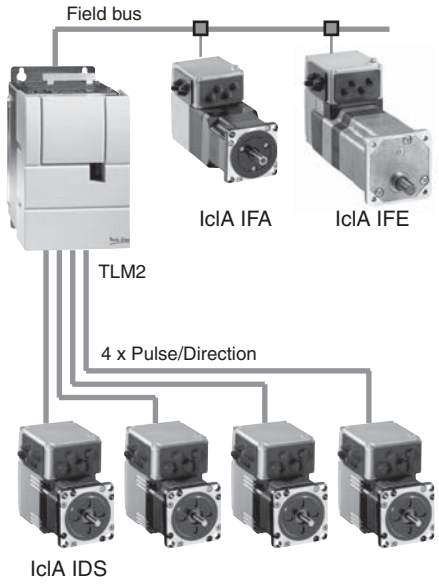
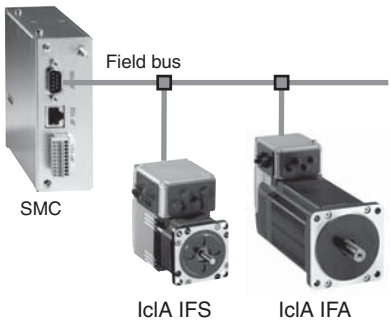






Product offering

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, e.g. the TLM2 from Berger Lahr or a programmable logic controller complex automation task, can be solved simply and economically. The following finished function modules are available for simple motion programming with a Berger Lahr motion controller . The IclA compact drives from Berger Lahr are characterised due 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 control cabinet and the space requirements in the machine are low.

Simplicity

Integration of the motor and electronics reduces the installation costs and simplifies the electromagnetic compatibility concept. Also the simple to operate PC software IclA Easy allows rapid commissioning.

Openness

The compact drives are fitted with a fieldbus interface which allows communication via 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

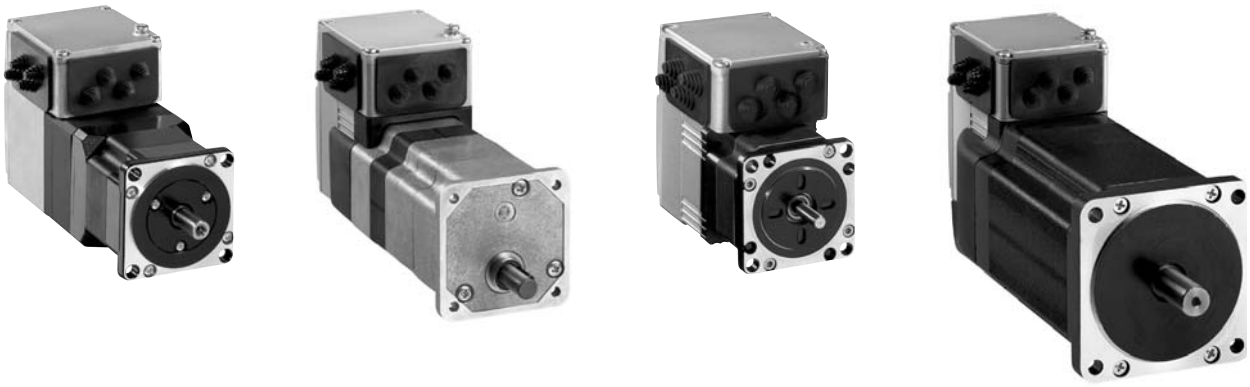
IclA compact drives can be equipped with various motor types: AC synchronous servo motor, brushless DC motor or stepper motor. Every motor type offers certain advantages whereby a multitude of possibilities for using them arise.

Safety

The integrated "Power Removal" safety function enables a stop of category 0 or 1 as per EN60204-1 without external power contactors. This reduces the system costs and response times. The drive system fulfils the requirements of the IEC61508 SIL2 as well as of EN954-1 category 3.

Product quotation IclA intelligent compact drives

IclA IFA6•	IclA IFE71	IclA I•S6•	IclA I•S9•



IclA with fieldbus interface

IclA IFA with AC synchronous servomotor	IFA6•	
Torque range	0.26 ... 0.45 Nm; peak torque 0.4 ... 0.72 Nm	
Speed range	up to 7500 1/min (without gearing)	
Positioning resolution	0.02° (singleturn encoder, optional: multiturn encoder with positioning range of 4096 revolutions)	
Interfaces	Fieldbus interface: Profibus DP, CANopen, RS485 24 V signal interface with 4 freely programmable I/O signals; interface for safety function "Power Removal"	
Operating modes	homing, jog, profile position, profile velocity, electronic gear [1)]	
Configuration	via fieldbus or parameter switch: baud rate, network address and terminating resistor	
IclA IFE with brushless DC motor	**IFE71**	
Torque range	0.17 Nm; 3.1 ... 11 Nm (with spur wheel gear)	
Speed range	up to 4800 1/min (without gearing)	
Detent torque	0.08 Nm (without gearing); 1 ... 8 Nm (with spur wheel gear)	
Positioning resolution	0.26° ... 1.67° (with spur wheel gear)	
Interfaces	Fieldbus interface: Profibus DP, CANopen, RS485 24 V signal interface with 4 freely programmable I/O signals; interface for safety function " Power Removal"	
Operating modes	Homing, jogging, profile position, profile velocity	
Configuration	via fieldbus or parameter switch: baud rate, network address and terminating resistor	
IclA IFS with three-phase stepper motor	**IFS6•**	**IFS9•**
Torque range	0.45 ... 1.5 Nm (without gearing)	2 ... 6 Nm (without gearing)
Speed range	up to 2000 1/min (without gearing)	up to 1000 1/min (without gearing)
Positioning resolution	0.018°	
Interfaces	Fieldbus interface: Profibus DP, CANopen, RS485 24 V signal interface with 4 freely programmable I/O signals; interface for safety function "Power Removal"	
Operating modes	Homing, jogging, profile position, profile velocity	
Configuration	via fieldbus or parameter switch: baud rate, network address and terminating resistor	

[1)] operating mode “electronic gear” not for IFA6• with multiturn encoder

IclA with pulse/direction interface

IclA IDS with three-phase stepper motor	IDS6•	IDS9•
Torque range	0.45 ... 1.5 Nm (without gearing)	2 ... 6 Nm (without gearing)
Speed range	up to 2000 1/min (without gearing)	up to 1000 1/min(without gearing)
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, blocking detection, I/O signal assignment	
Configuration	via parameter switch: motor phase current, step count, phase current lowering, blocking detection, RS485 terminating resistor, I/O signal assignment	

Product description

The IclA IF• Intelligent Compact Drives comprise motor, control electronics and a fieldbus interface (CANopen, Profibus DP or RS485).
The IclA IF• group of products includes the:

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

IclA IFA – the compact drive for dynamic processes
The IclA IFA has an AC synchronous servomotor This motor is characterised by high dynamics, because it can take a short-term overcurrent during acceleration.

IclA IFE – the compact drive for automatic format change
The IclA IFE is fitted with a brushless DC motor. The brushless DC motors have high detent torque at zero-current. This makes a holding brake unnecessary in most applications. In combination with the electronics the IclA IFE has the characteristics of an absolute value encoder.

IclA IFS – the compact drive for short distance positioning
The IclA IFS with its 3-phase stepper motor offers high torques at low speeds of rotation. The IclA IFS compact drive is ideally suited as a speed drive with constant velocity characteristics, and can also be used for high-resolution positioning. Commissioning the stepper motor drive is simple because it is not necessary to adjust the controller.

Special features

IclA IFA

- High dynamics and high peak torque
- High-resolution Singleturn encoder with a resolution of 16384 increments/revolution
- Optionally with Multiturn encoder with a resolution of 16384 increments/revolution with a positioning range of 4096 revolutions
- Optionally with integrated holding brake
- Optionally with planetary gear

IclA IFE

- High zero-current detent torque
- Quasi-absolute value sensor, therefore homing not required after switching off and on
- Optionally with spur wheel gear or planetary gear

IclA IFS

- High continuous standstill torque
- Good constant velocity characteristics
- High positioning resolution (0.018°)
- Optionally with holding brake (IFS9• only)
- Optionally with planetary gear

Electronics

The electronic system comprises control electronics and power amplifier. They have a common power supply and are not galvanically isolated.
The compact drive can be configured and actuated via the fieldbus interface.
There are also four different 24 V signals available. They can be used as input or output.

Connections

The IclA IF• 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 safety function "Power Removal"

Fieldbus interface

The following fieldbuses can be connected to the fieldbus interface depending on the device version:

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

The fieldbus interface is used for parameterisation and actuation of the compact drive. In addition, the compact drive can be commissioned with a PC connected to the fieldbus interface and the PC software "IclA Easy". This requires a compatible fieldbus converter, such as USB-CAN, USB-RS485, RS232-RS485 or CP551 from Siemens for Profibus.

24V signal interface

Four 24 V signals are available, any one of which can be used either as an input or an output.
The 24 V signals are available to the master controller via the fieldbus. They can also be used for predefined functions, such as for connection of limit switches 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 safety function "Power Removal"

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).

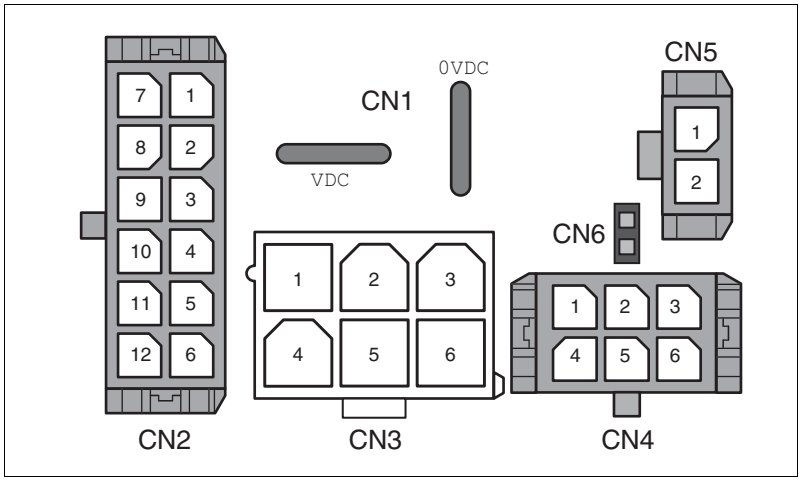
Connection technologies

Circuit board plug connector

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

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

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

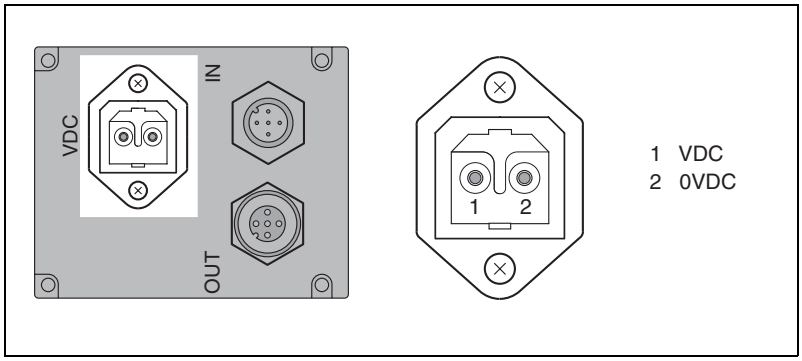


Circuit board plug connector, overview of all connections

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

Industrial connectors (optional)

Compact drives with industrial connectors are preferably used in special machines and small production runs.
The device version with industrial connectors has a connector housing with two M12 circular plug-in connectors (5-pin) for the fieldbus connection and a Hirschmann STASEI 200 connector for connection of the power supply.

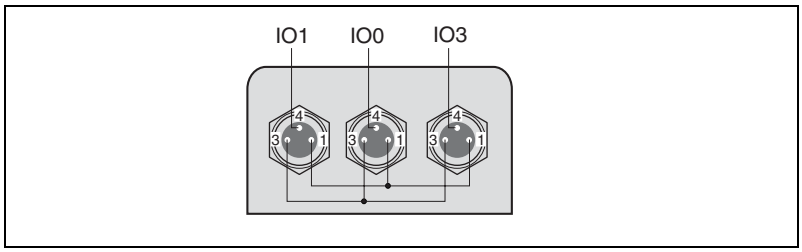


Industrial connectors, overview of connections

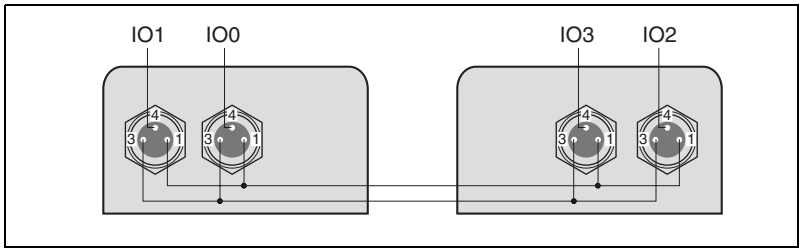
I/O signal plug-in units

One or two I/O signal plug-in units with industrial 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). Different I/O signal plug-in units are available for this purpose.

I/O signal plug-in units for internal 24 V signal power supply

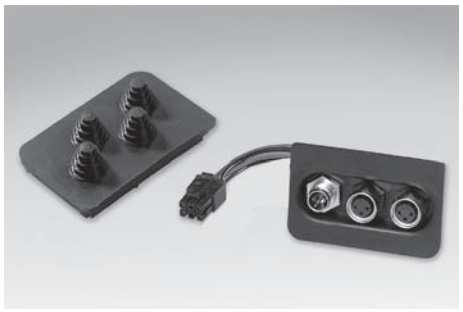


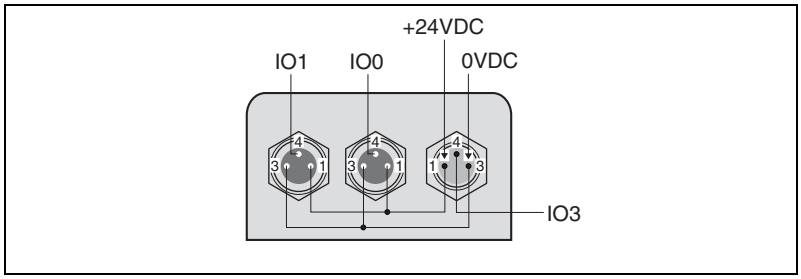
Plug-in unit for three I/O signals



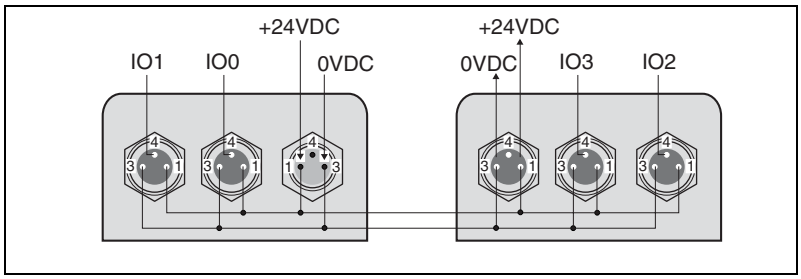
Plug-in units for four I/O signals

I/O signal plug-in units for external 24 V signal power supply



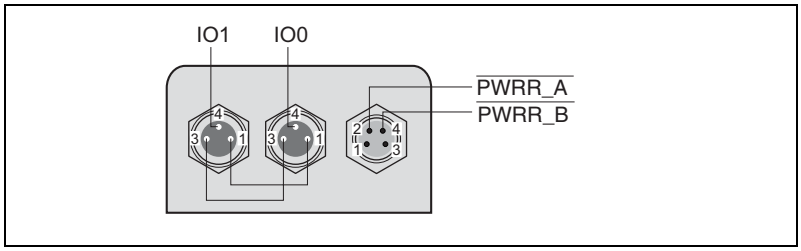


Plug-in unit for three I/O signals

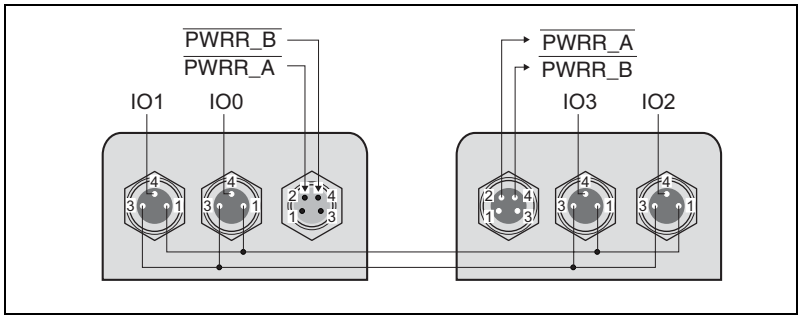


Plug-in units for four I/O signals

I/O signal plug-in units with "Power Removal" safety function and internal 24 V signal power supply



Plug-in unit for two I/O signals and signals for safety function



Plug-in units 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) only with IclA IFA with singleturn encoder

Operating modes

Overview

The following operating modes can be set via fieldbus:

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

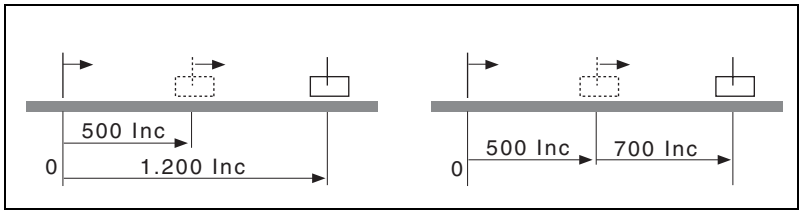
Profile position

In the operating mode "profile position" 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



Operating mode "profile position", absolute and relative

Reference value default

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

Application example

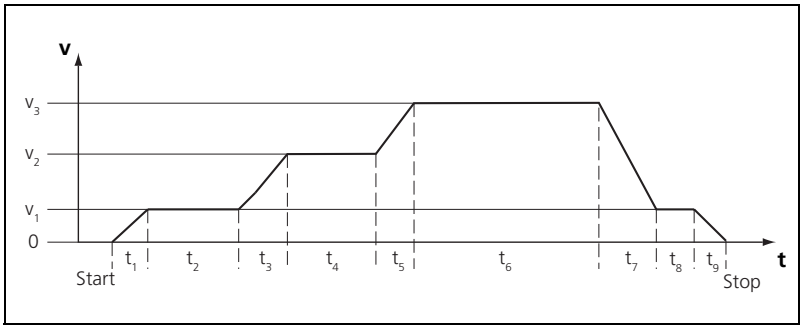
Pick-and-place with a linear robot

Profile velocity

In operating mode "profile velocity", a reference speed for the motor is set and a movement without a target position is started. This speed is maintained until a different reference 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
t7, t9	= braking

Referencing

There are two types of homing:

- Reference movementSpecifying the dimension reference by approach to a limit or reference switch
- Position settingSpecifying the position reference relative to the current motor position

Note: In the case of IclA IFA with multiturn encoders, a valid actual position of the motor is available immediately on starting. This is why no homing to external limit switches is required.

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

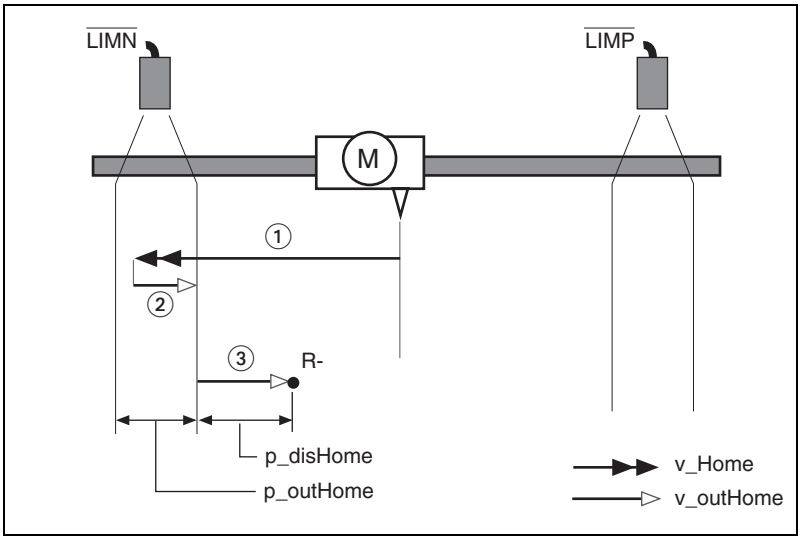
- Limit switchLIMx
- Reference switchREF

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.

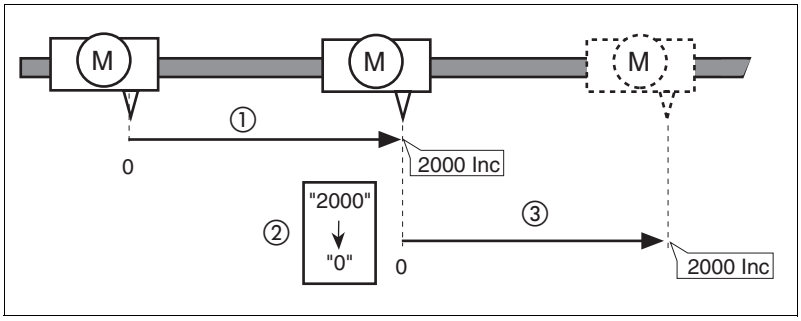
Example 1: Reference movement towards limit switch



"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 "IclA Easy".

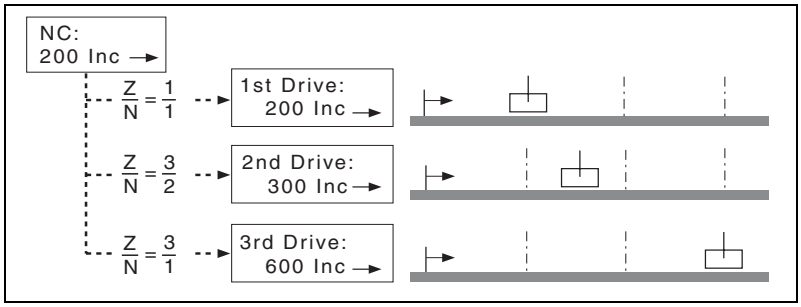
Example of application
Before absolute positioning in point-to-point mode.

Electronic gear (only IclA IFA with singleturn encoder)

In "electronic gear" operating mode with the singleturn encoder, the reference signals from an encoder (A/B signals) or a controller (pulse/direction signals) are fed in and a new position preset 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 IclA 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.



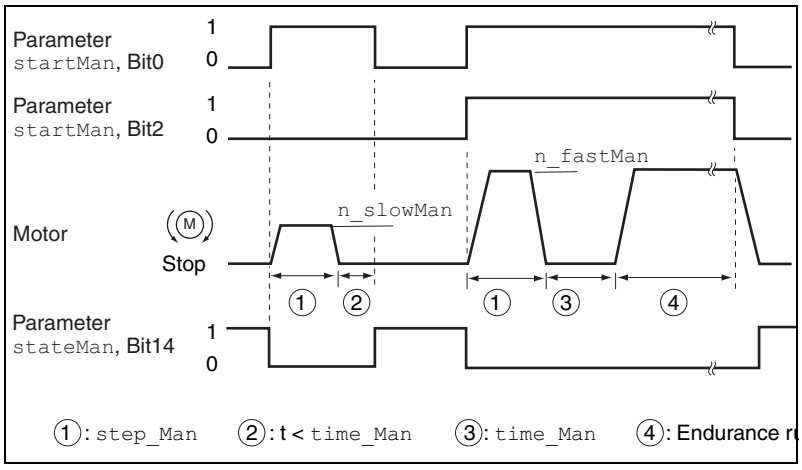
"Electronic gear" operating mode

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 "IclA Easy".

Example of application
Setting up the machine during commissioning



Jog, slow and fast

Safety function

Definition

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

Category 0 stop (EN60204-1)
Standstill by immediate power shutdown to the machine drive elements (i.e. an uncontrolled stop).

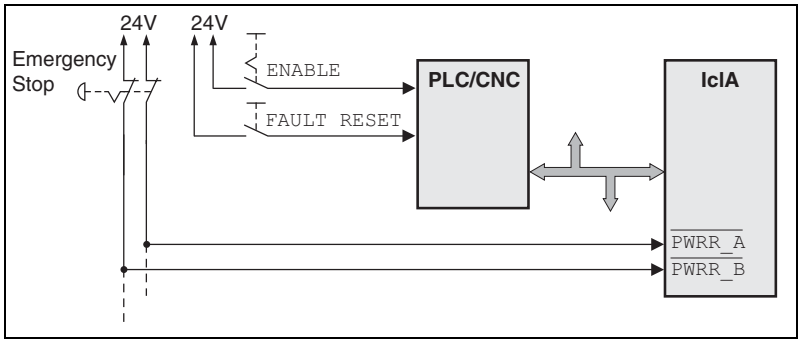
Category 1 stop (EN60204-1)
A controlled stop in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

Description

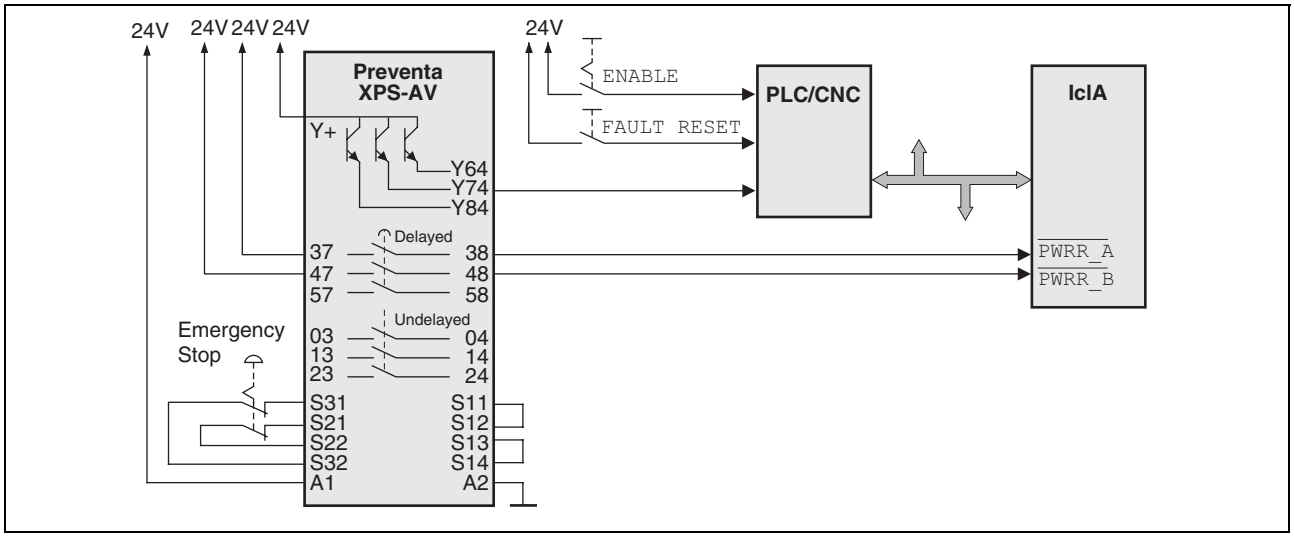
The " Power Removal "safety function integrated into the product can be used to implement the "emergency stop " control function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508; SIL 2: Functional safety of electrical/electronic/programmable electronic safety-related systems.
- IEC 62061; SIL 2: Safety of machines - functional safety of safety-related electrical, electronic and programmable electronic control systems
- EN 954-1, category 3: Machine safety, safety-related parts of controls, Part 1: General principles of design
- EN 13849-1, category 3: Machine safety, safety-related parts of controls, Part 1: General principles of design

Examples of applications for the safety function



Example category 0 stop



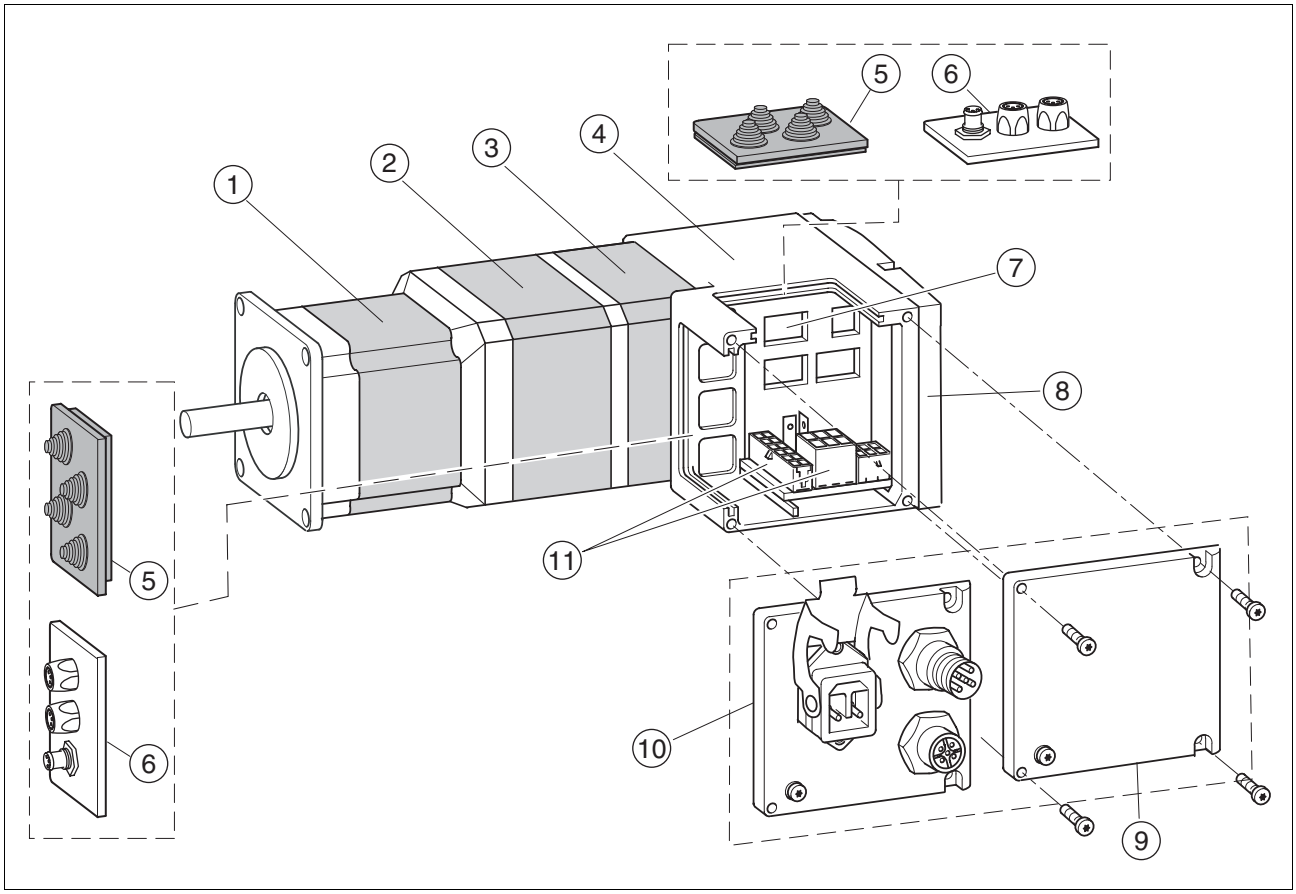
Example category 1 stop

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

IclA IFA
Product overview



Components of the IclA IFA compact drive

(1) Synchronous AC-servomotor
(2) Holding brake (optional)
(3) Encoders
(4) Electronics housing
(5) Plug-in unit cable entry (accessory)
(6) I/O plug-in unit with industrial connectors (accessory)
(7) Switches for making settings
(8) Electronics cover, must not be removed
(9) Plug cover, to be removed on installation
(10) Cover with industrial connectors for VDC supply voltage and IN/OUT fieldbus terminal (optional)
(11) Electrical interfaces

Technical data

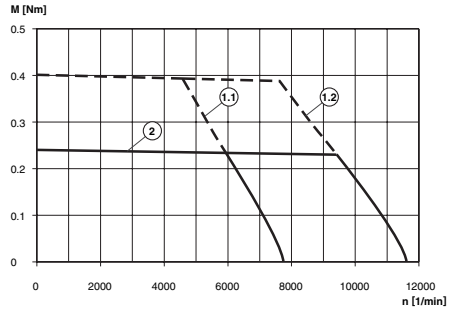
Mechanical data IFA6•

		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 per revolution	Inc.	16384				16384			
Positioning sensor precision	°	±0.05				±0.05			
Rotor inertia J_R	kg·cm²	0.1				0.18			
Weight m	kg	1.4				1.7			
Shaft load									
• Max. radial force [3]	N	89				107			
• Max. axial tensile force	N	104				104			
• Max. axial force pressure	N	104				104			
• Nominal bearing life L_{10h} [4]	h	20000				20000			
Holding brake (Option) [5]									
Holding torque M_H	Nm	1.2							
Electrical pick-up power	W	10							
Energise time (release brake)	ms	14							
De-energise time (lock brake)	ms	13							
Moment of inertia	kg·cm²	0.07							
Multiturn encoder (Option) [5]									
Measuring range absolute		4096 revolutions							
Positioning resolution per revolution	Inc.	16384							
Positioning sensor precision	°	±0.05							

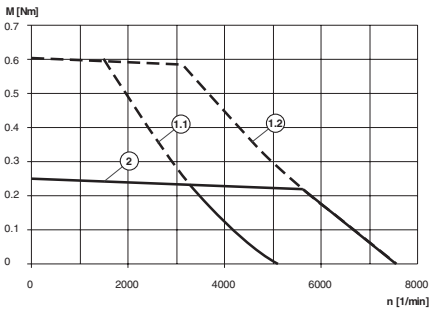
1) Max. 2.5 s
2) At 20 1/min; at 0 1/min the continuous torque is reduced to 89% of the input value
3) Reference point of radial force: 10 mm distance from flange
4) Operating hours with 10% probability of failure; conditions for shaft load: speed 4000 1/min, 100% ED at nominal torque, ambient temperature 40 °C
5) Holding brake and multiturn encoder can not be used at the same time.

Characteristic curves

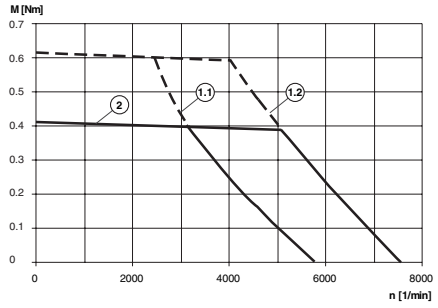
IFA61 torque characteristic with 3D winding



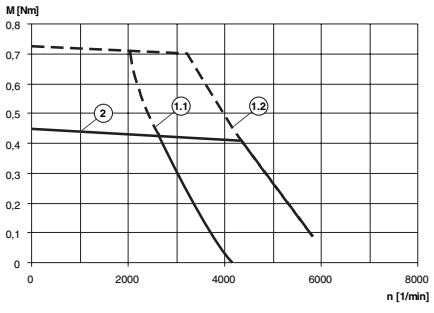
IFA61 torque characteristic with 5D winding



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		Corresponds to PELV as per DIN 19240, not reverse-polarity-protected	
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 levelIO0..IO3	V / mA	≤ 4.5 / ≤ 0.7	
High levelIO0..IO3	V / mA	≥ 15 / ≥ 2	
Admissible voltage range	V	0 ... 30	
Debouncing time IO0 to I03	ms	0.1	
Debounce time I02, IO3 at capture function	ms	0.01	
24V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)	
		with external supply	**with internal supply**
Voltage supply range	VDC_{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply unit is protected against: • Short circuit of the output voltage • Overload of output voltage (limited to 6 W output power)
Fieldbus interfaces			
CAN			
Signal inputs/outputs		according to ISO 11898, no galvanic isolation	
Transmission rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000	
Transmission protocol		CANopen according to DS301	
RS485			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transmission rate	kBaud	9.6 / 19.2 / 38.4	
Transmission protocol		Berger Lahr protocol, compatible to Twin Line	
Profibus DP			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transmission rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000	
Transmission protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Type 2	

Ambient conditions

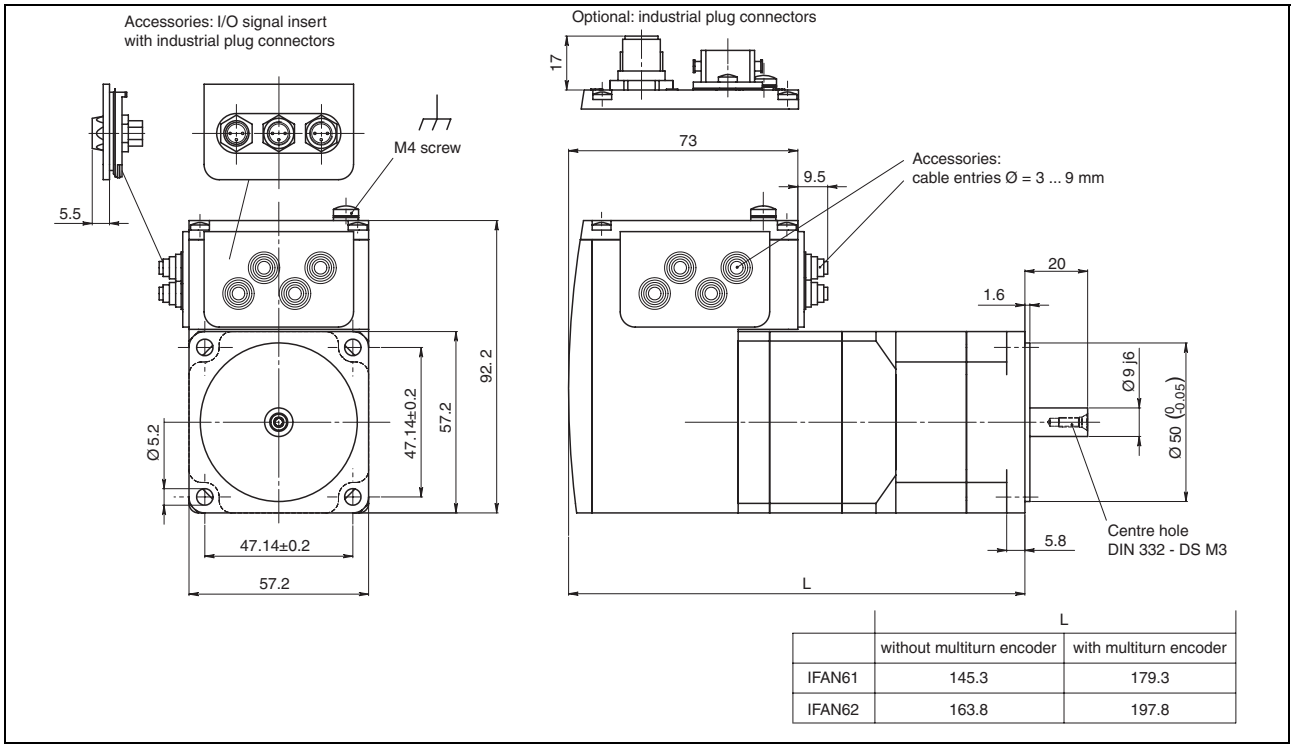
Ambient temperature [1)]	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85 (non-condensing)
Vibration strain as per DIN EN 60068-2-6	m/s^2	20
Heat 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)

Safety functions

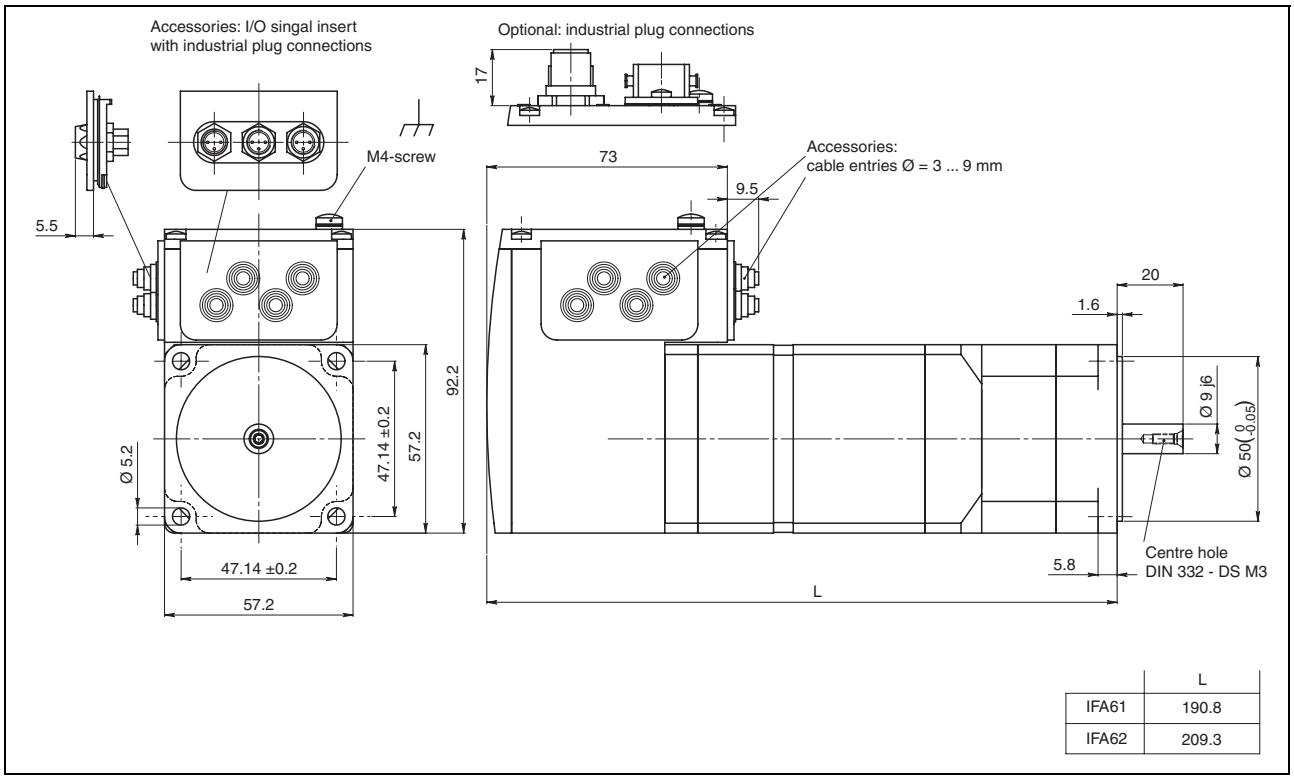
Service life corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings



	L	
	without multiturn encoder	with multiturn encoder
IFAN61	145.3	179.3
IFAN62	163.8	197.8

Intelligent compact drive IclA IFA6 •, dimensions in mm



	L
IFA61	190.8
IFA62	209.3

Intelligent compact drive IclA IFA6 • with holding brake, dimensions in mm

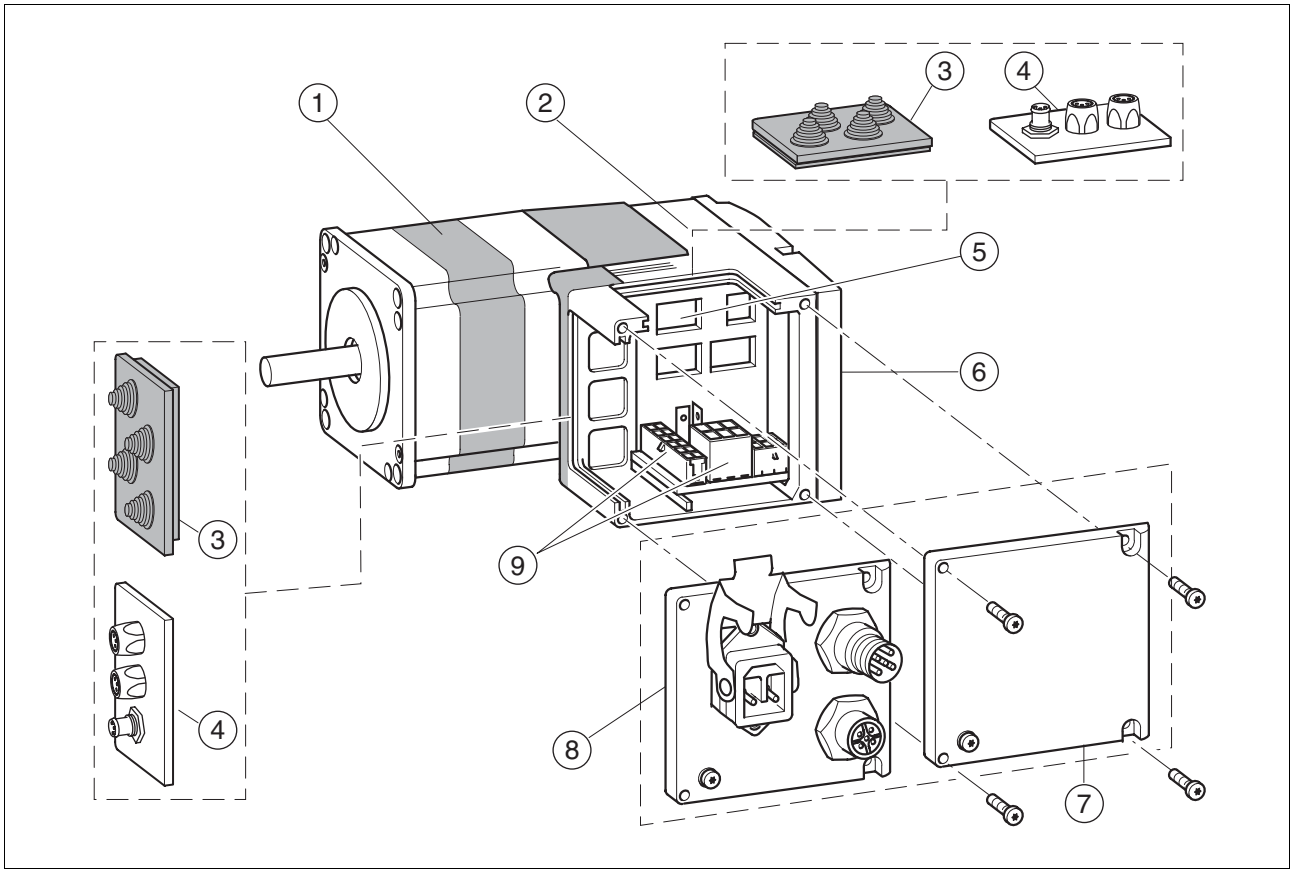
Type code

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 = IclA 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 = index motor length	I	F	A	**6**	**1**	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	41
Supply voltage nominal 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
Supply signal interface – = no (external power supply unit required) IS = internal 24 V 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 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, 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
Measurement system C = Singleturn encoder M = Multiturn encoder [1]	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 [1]	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	**–**	B	54	O-001	R	P	P	41
Connection model B = printed circuit board plug connector I = industrial connector	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	**B**	54	O-001	R	P	P	41
Degree of protection overall (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
Gearing O-001 = no gearing planetary gear PLE 60, 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 gearing) K = parallel key (with gearing 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
Degree of protection shaft bushing 41 = IP41 - no gearing 54 = IP54 - with gearing	I	F	A	6	1	/	2	CAN	IS	D	S	/	3 D	C	–	B	54	O-001	R	P	P	**41**

[1] Holding brake and multiturn encoder can not be operated together.

IclA IFE

Product overview



Components of the IclA IFE compact drive

(1) Brushless DC 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 gearing

Nominal 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	kg·cm^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 pull	N	30	
• Max. axial force push	N	30	
• Nominale Lagerlebensdauer L_{10h} [2]	h	20000	

[1] Point of attack of radial force: 12.5 mm distance from flange
[2] Betriebsstunden bei 10% Ausfallwahrscheinlichkeit

IFE71 mechanical data with spur wheel gear

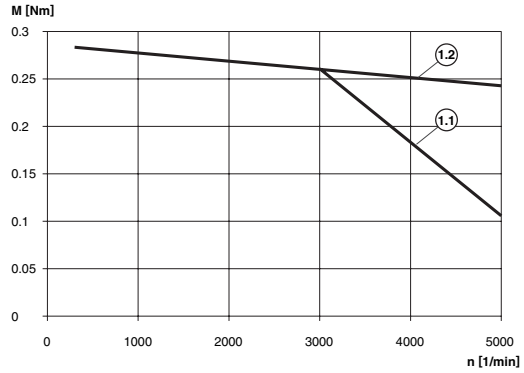
		V-018		**V-038**		**V-054**		**V-115**	
Gear speeds		3		3		4		4	
Ratio		160:9		75:2		490:9		3675:32	
Nominal voltage	V_{DC}	24	36	24	36	24	36	24	36
Nominal current	A	4.5	4	4	3.4	4.3	3.5	2.6	2.1
Rated motor speed of rotation	1/min	4000	4800	4000	4800	4000	4800	4000	4800
Nominal output speed	1/min	225	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	kg·cm^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		44	
Torsional backlash	°	≤ 1							
Weight m	kg	1.85							
Shaft load (short-time operation)									
• Max. radial force [1]	N	200							
• Max. axial force	N	80							
• Nominale Lagerlebensdauer 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] Point of attack of radial shaft load: 12.5 mm distance to flange
[2] Betriebsstunden bei 10% Ausfallwahrscheinlichkeit
[3] With reduced nominal output torque M_N = 6 Nm; 2500 h at maximum torque
[4] With reduced nominal output torque M_N = 8 Nm; 2500 h at maximum torque

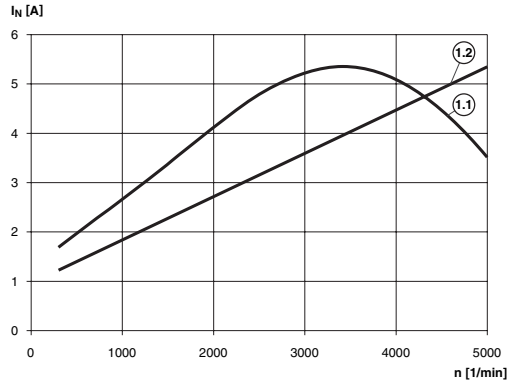
Characteristic curves

IFE71 torque characteristic

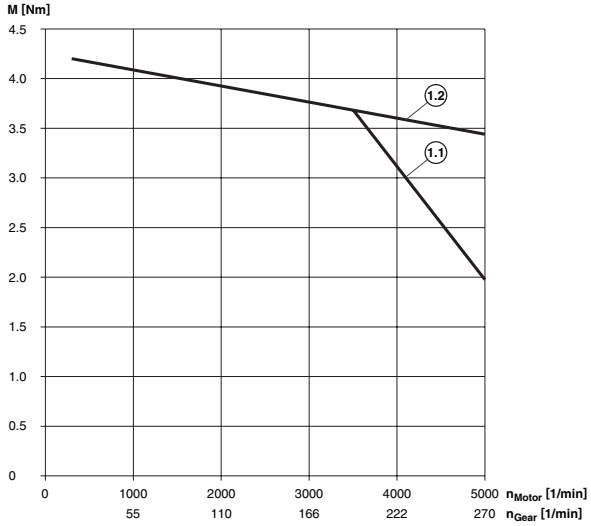
without gearing

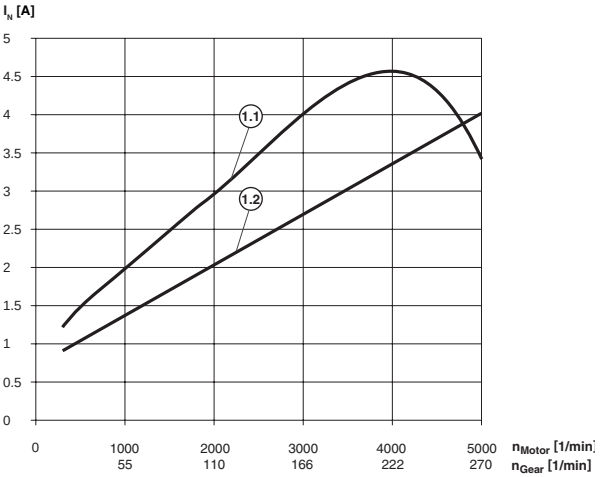


IFE71 current characteristic

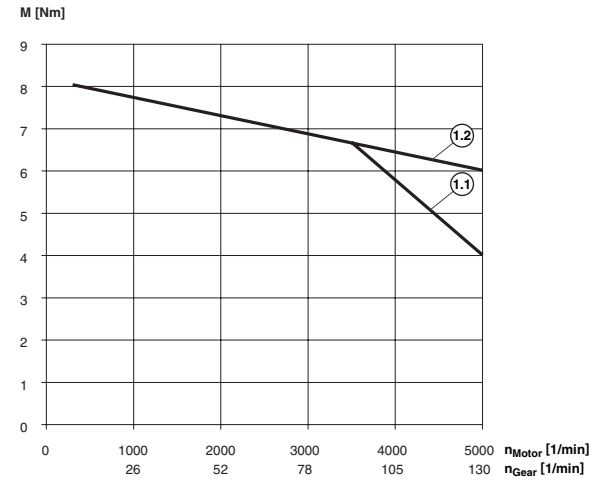


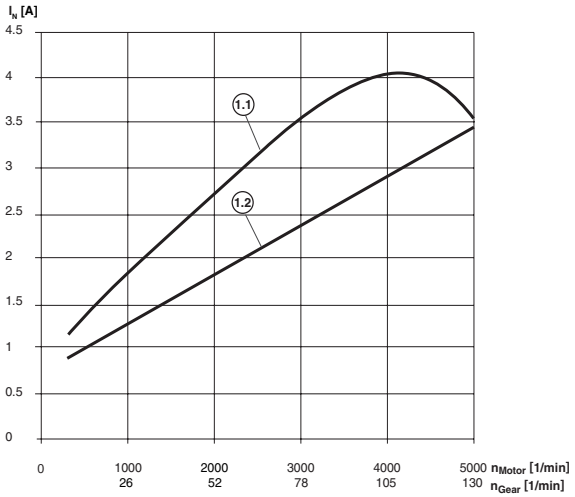
with spur wheel gear V-018





with spur wheel gear V-038

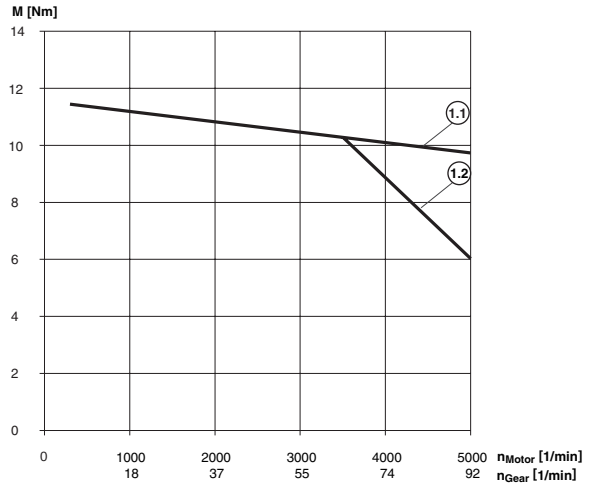




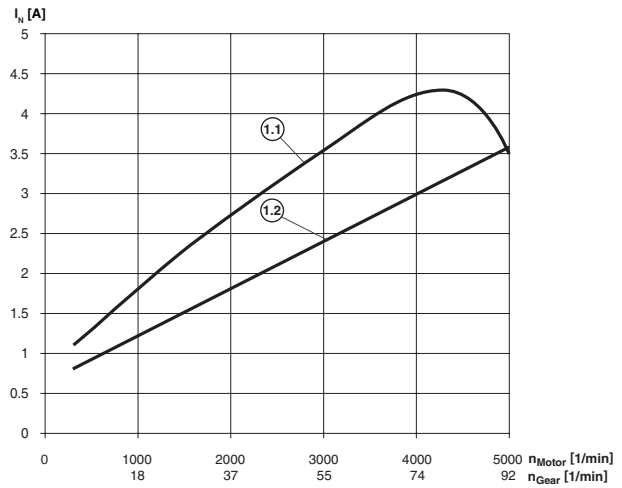
(1.1) Max. torque or Current at 24 V

(1.2) Max. torque or Current at 36 V

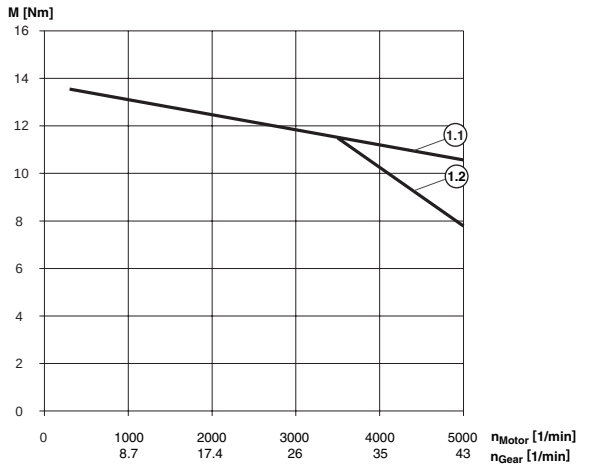
IFE71 torque characteristic with spur wheel gear V-054

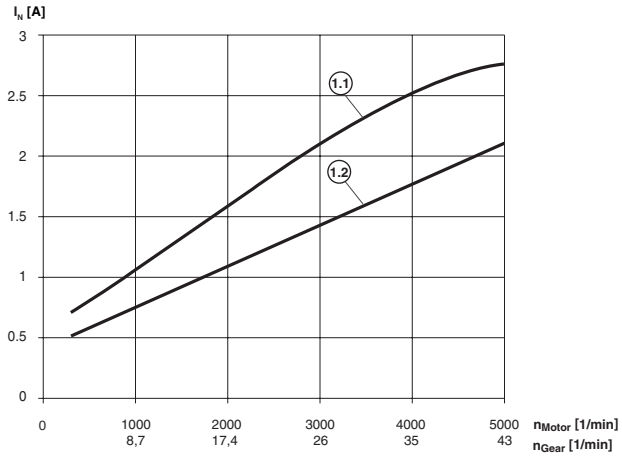


IFE71 current characteristic



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		Corresponds to PELV as per DIN 19240, not reverse-polarity-protected	
Supply voltage	V_{DC}	18 ... 40 (absolute limit values)	
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=1500µF	
External backup fuse	A	10, characteristic: slow-blow	
24V signal interface		4 signals, each can be used as input or output GND galvanic connection with GND supply voltage, not polarised	
24V signal inputs			
Low levelIO0..IO3	V / mA	≤4.5 / ≤0.7	
High levelIO0..IO3	V / mA	≥15 / ≥2	
Admissible voltage range	V	0 ... 30	
Debouncing time IO0 to I03	ms	0.1	
24V signal outputs		switching to positive, short-circuit protected, inductively chargeable (1000 mH / 100mA)	
		with external supply	**with internal supply**
Voltage supply range	V_{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply unit is protected against: • Short circuit of the output voltage • Overload of output voltage (limited to 6 W output power)
Fieldbus interfaces			
CAN			
Signal inputs/outputs		according to ISO 11898, no galvanic isolation	
Transmission rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000	
Transmission protocol		CANopen according to DS301	
RS485			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transmission rate	kBaud	9.6 / 19.2 / 38.4	
Transmission protocol		Berger Lahr protocol, compatible to Twin Line	
Profibus DP			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transmission rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000	
Transmission protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Type 2	

Ambient conditions

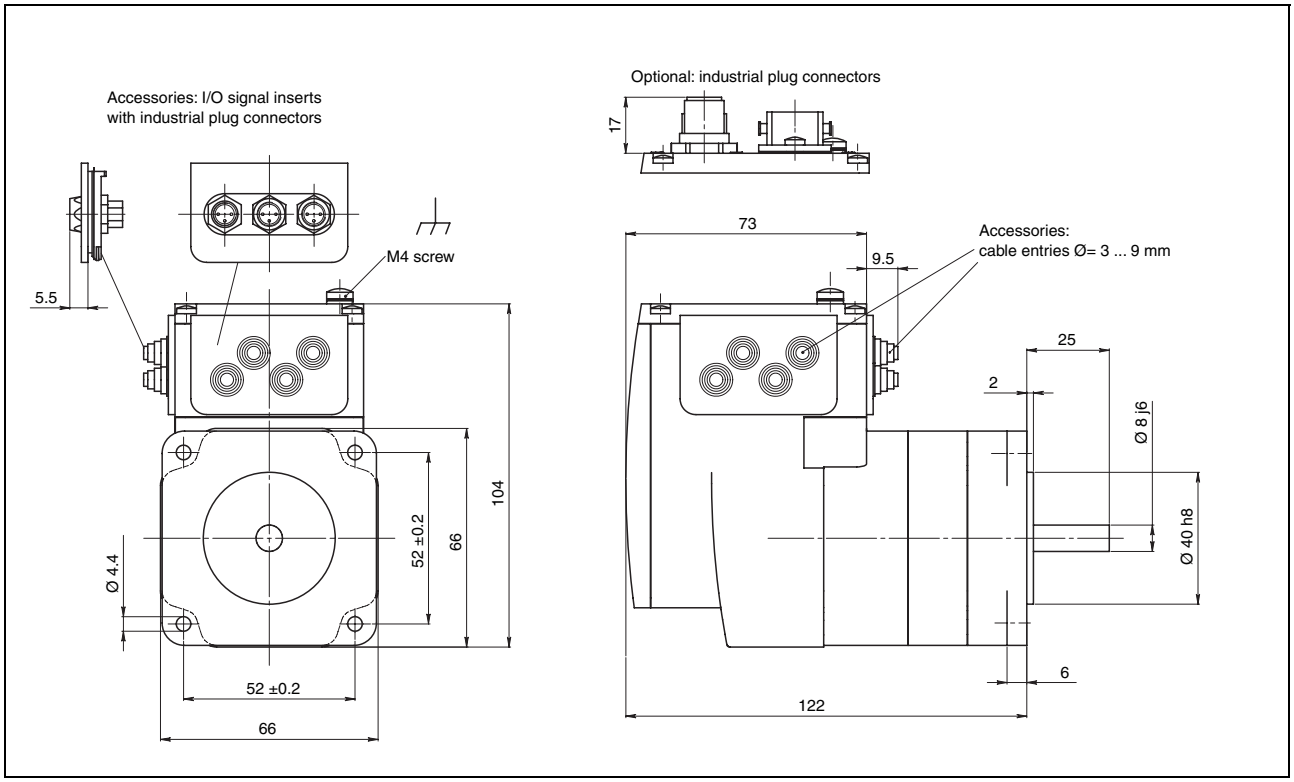
Ambient temperature [1)]	°C	0 ... 65; 50 ... 65: reduced power rating: 2%/K
Max. admissible motor temperature	°C	110
Installation height without reduced power rating	m	< 1000 m above sea level
Temperature for transportation and storage	°C	-25 ... +70
Relative humidity	%	15 ... 85 (non-condensing)
Vibration strain as per DIN EN 60068-2-6	m/s^2	20
Heat 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)

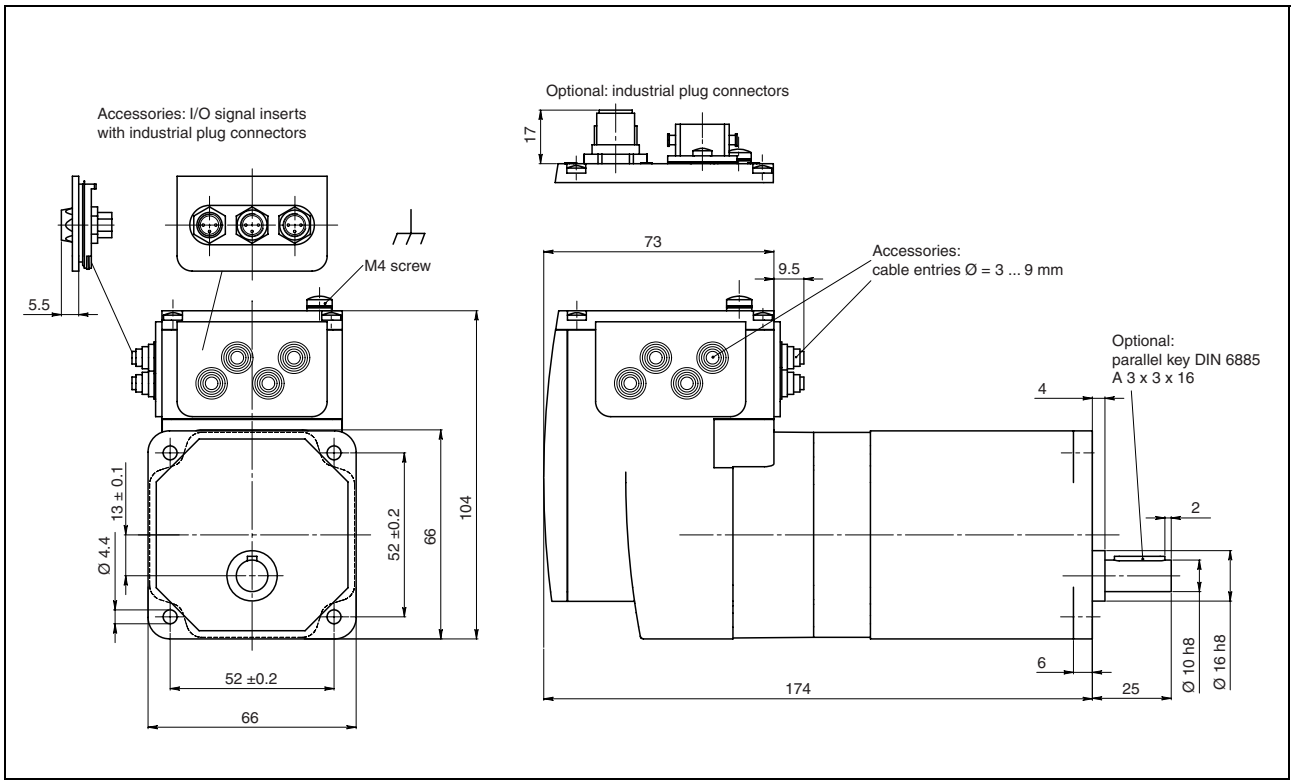
Safety functions

Service life corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
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 gearing, dimensions in mm



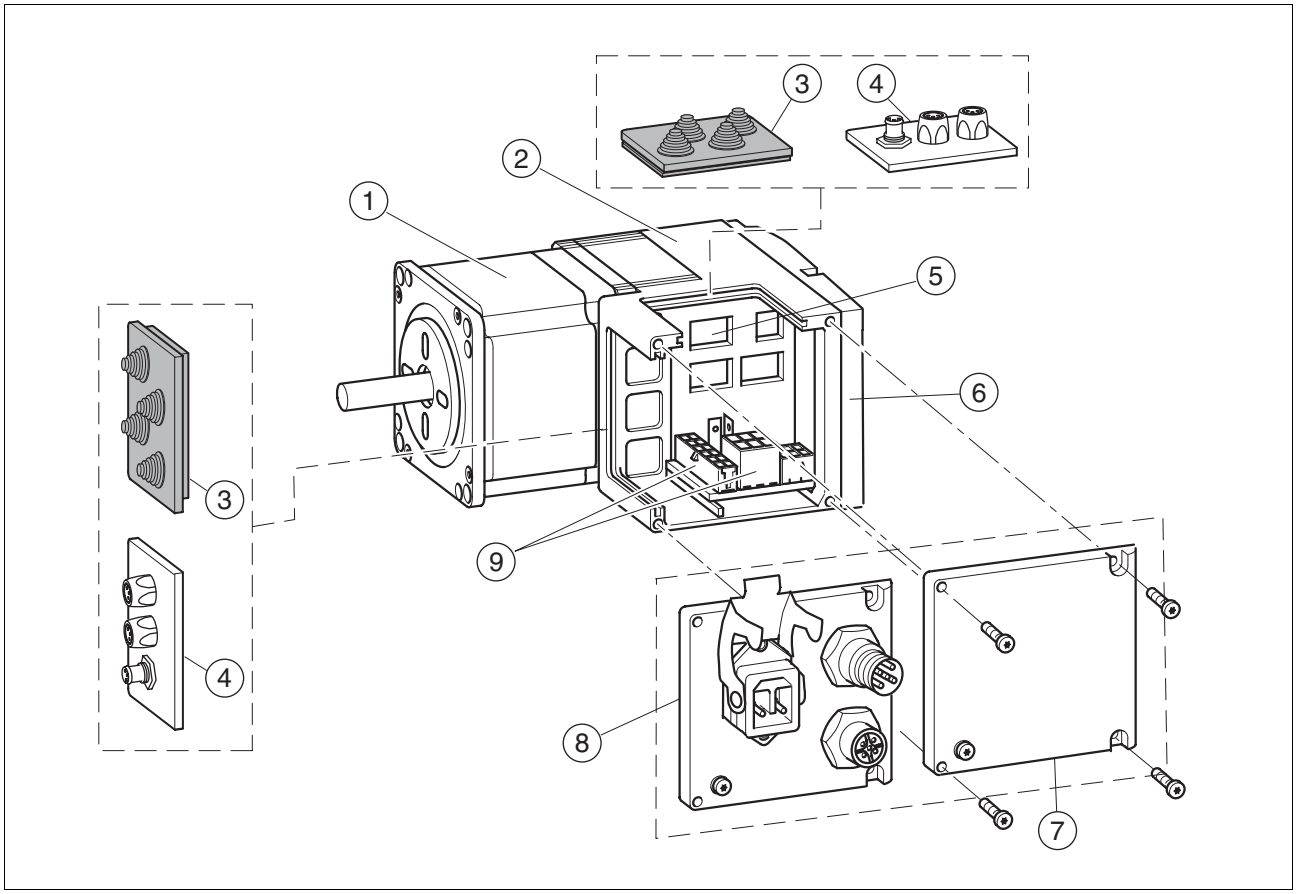
Intelligent compact drive IclA IFE71 with spur wheel gear, dimensions in mm

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 = IclA 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 = brushless DC 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 VDC	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 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 value sensor	I	F	E	7	1	/	2	DP0	–	D	S	/	–	**Q**	D	B	54	/	V-018	K	P	P	54
Holding brake D = none 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 connector	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	**B**	54	/	V-018	K	P	P	54
Degree of protection in total (apart from shaft bushing) 54 = IP54	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	**54**	/	V-018	K	P	P	54
Gearing O-001 = no gearing 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 gearing or with spur wheel gear) K = parallel key (only with gearing)	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 41 = IP41 (without gearing) 54 = IP54 (with gearing)	I	F	E	7	1	/	2	DP0	–	D	S	/	–	Q	D	B	54	/	V-018	K	P	P	**54**

IclA IFS

Product overview



Components of the IclA 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

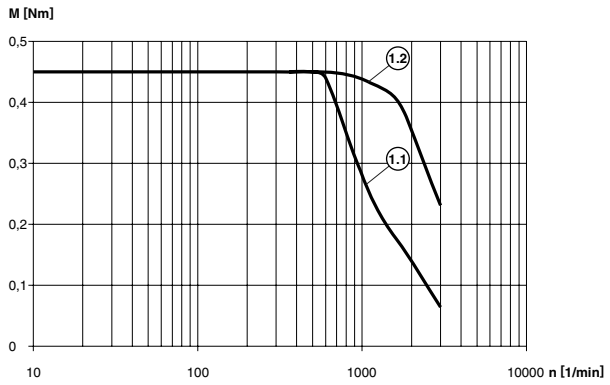
Mechanical data IFS6•

		IFS61	IFS62	IFS63
Max. torque M_{max}	Nm	0.45	0.9	1.5
Holding torque M_H	Nm	0.51	1.02	1.70
Moment of inertia	kg·cm^2	0.1	0.22	0.38
Positioning resolution	Incr.	20000		
Systematic angular tolerance per step [1]	‘	±6		
Mass 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		
• Nominale Lagerlebensdauer L_{10h} [4]	h	20000		

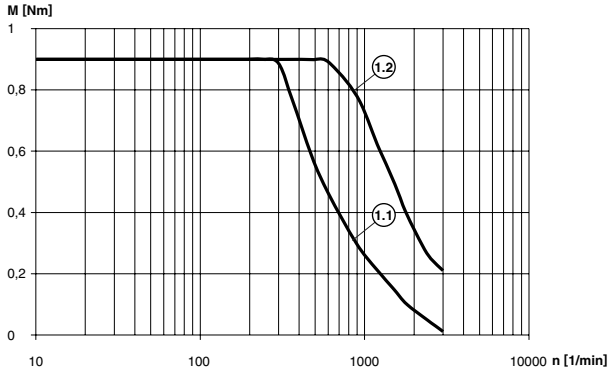
1) Measured at 1000 steps/revolution
2) Conditions for the shaft load: speed of rotation 60 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C
3) Point of attack of radial force: 10.5 mm distance from flange
4) Betriebsstunden bei 10% Ausfallwahrscheinlichkeit

Characteristic curve IFS6•

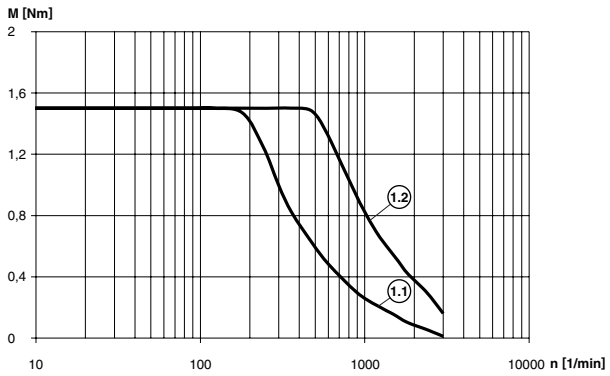
IFS61 torque characteristic



IFS62 torque characteristic



IFS63 torque characteristic



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

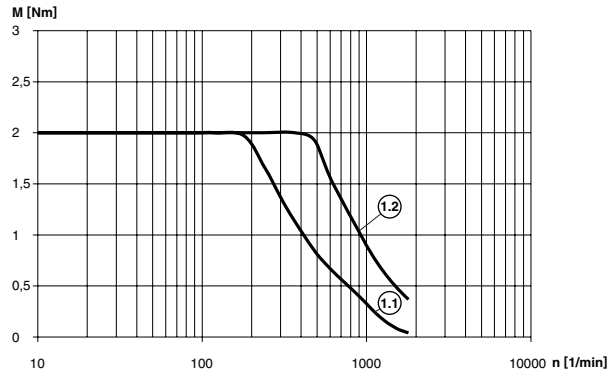
Mechanical data IFS9•

		IFS91	IFS92	IFS93	
Winding type				**Standard**	**3 D**
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	kg·cm^2	1.1	2.2	3.3	
Positioning resolution	Incr.	20000			
Systematic angular 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	20000			
Holding brake					
Holding torque M_H	Nm	6			
Electrical pull-in power	W	22			
Energise time (release brake)	ms	40			
De-energise time (apply brake)	ms	20			
Moment of inertia	kgcm²	0.2			
Mass m	kg	1.8			

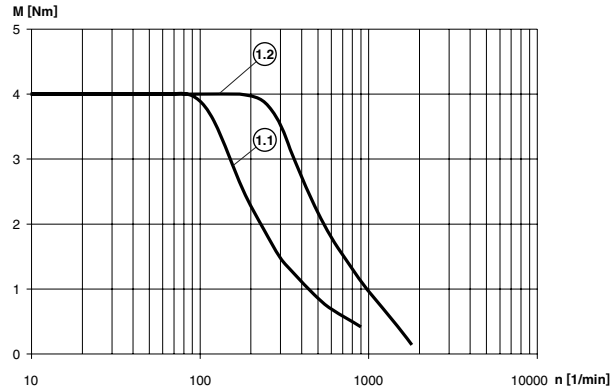
1) Measured at 1000 steps/revolution
2) Conditions for the shaft load: speed of rotation 60 1/min, 100% duty cycle at rated torque, ambient temperature 40 °C
3) Point of attack of radial force: 10.5 mm distance from flange
4) Operating hours at a probability of failure of 10%

Characteristic curve IFS 9•

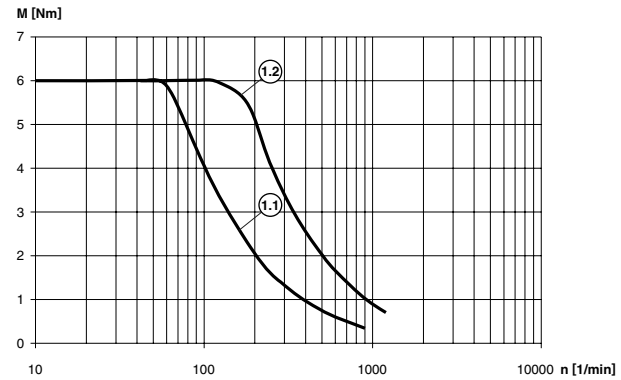
IFS91 torque characteristic



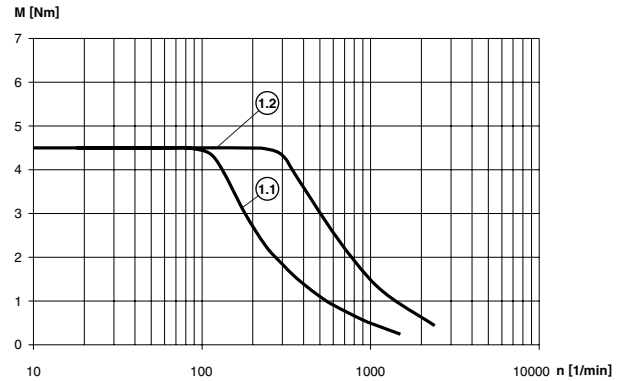
IFS92 torque characteristic



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, not reverse-polarity-protected	
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			
• IFS6•	A	3.5	
• IFS9•	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 levelIO0..IO3	V / mA	≤ 4.5 / ≤ 0.7	
High levelIO0..IO3	V / mA	≥ 15 / ≥ 2	
Admissible voltage range	V	0 ... 30	
Debouncing time IO0 to I03	ms	0.1	
Debounce time IO2, IO3 at capture function	ms	0.01	
24V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)	
		with external supply	**with internal supply**
Voltage supply range	VDC_{DC}	10 ... 30	23 ... 25
Switching current	mA	≤ 100 (per output)	≤ 200 (total)
			The internal power supply unit is protected against: • Short circuit of the output voltage • Overload of output voltage (limited to 6 W output power)
Fieldbus interfaces			
CAN			
Signal inputs/outputs		according to ISO 11898, no galvanic isolation	
Transmission rate	kBaud	50 / 100 / 125 / 250 / 500 / 800 / 1000	
Transmission protocol		CANopen according to DS301	
RS485			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transmission rate	kBaud	9.6 / 19.2 / 38.4	
Transmission protocol		Berger Lahr protocol, compatible to Twin Line	
Profibus DP			
Signal inputs/outputs		according to RS485, no galvanic isolation, 2-wire	
Transmission rate	kBaud	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 / 1500 / 3000 / 6000 / 12000	
Transmission protocol		Profibus DP-V0, data format according to Profidrive V2.0 PPO Type 2	

Ambient 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 (non-condensing)
Vibration strain as per DIN EN 60068-2-6	m/s^2	20
Heat class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

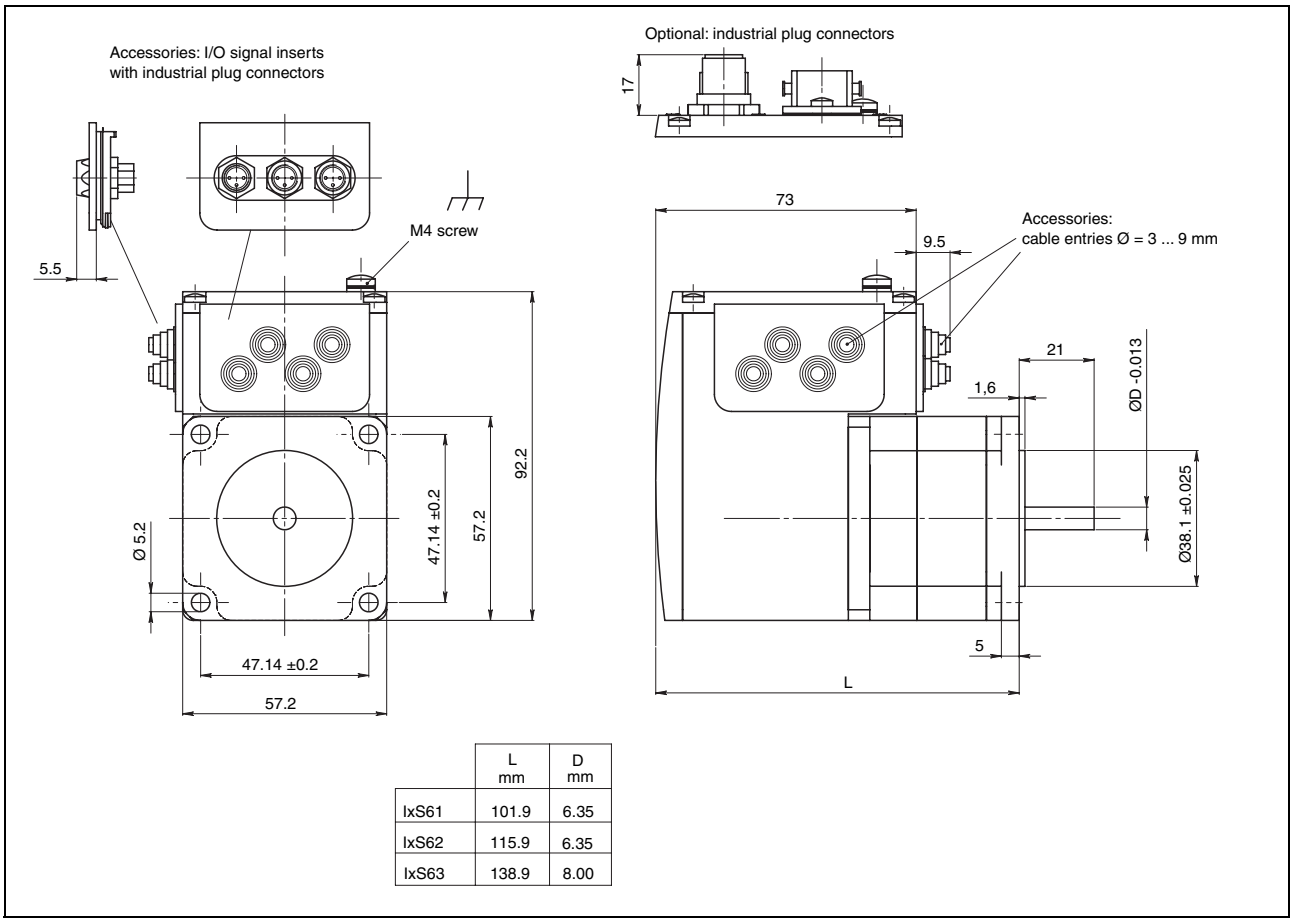
1) Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

Safety functions

Service life corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings

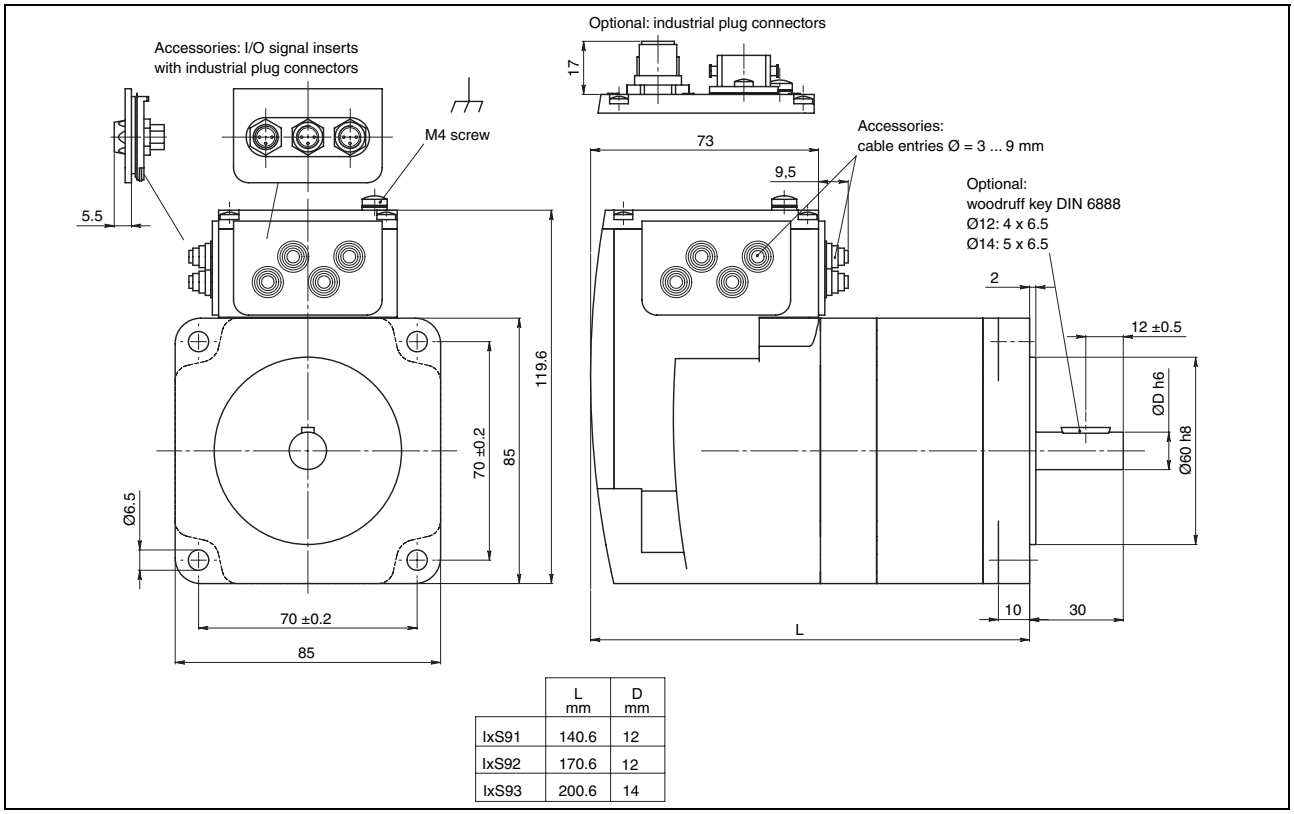
Dimensional drawings IFS6•



	L mm	D mm
IxS61	101.9	6.35
IxS62	115.9	6.35
IxS63	138.9	8.00

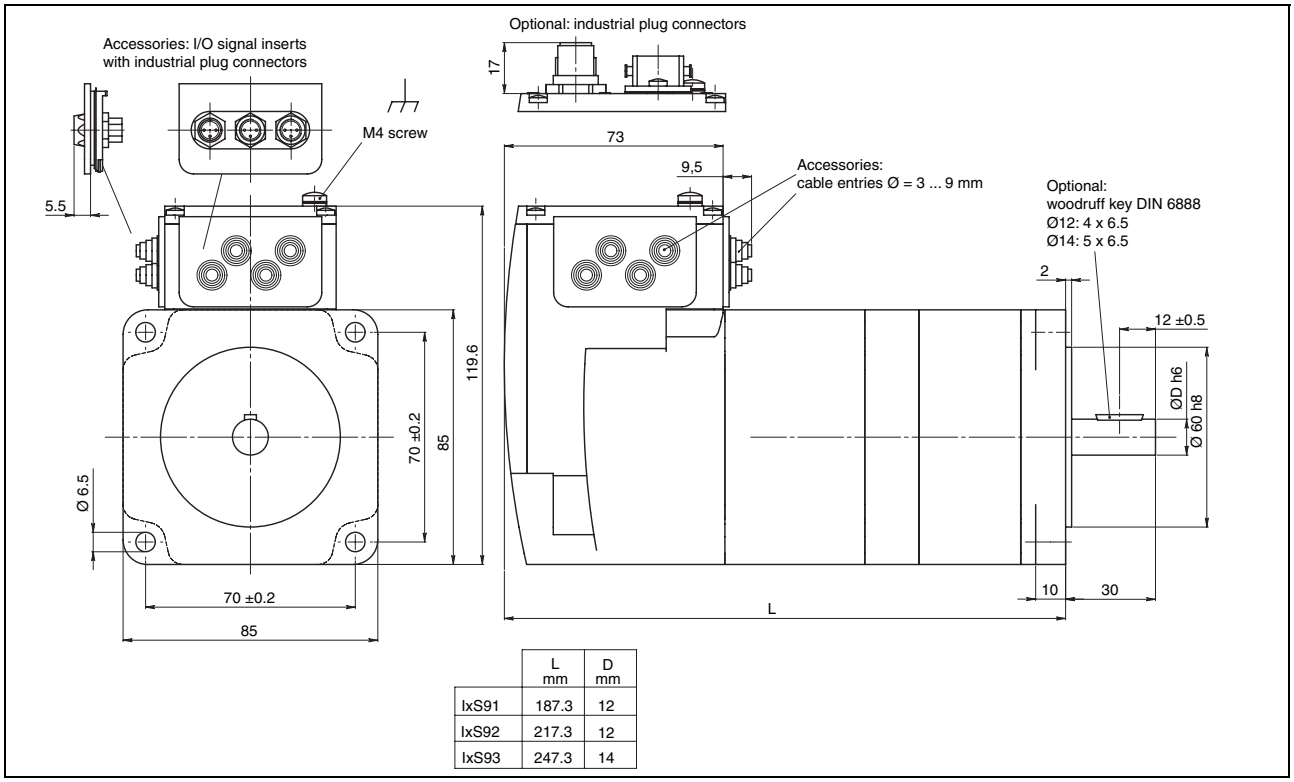
Intelligent compact drive IclA IFS6•, dimensions in mm

Dimensional drawings IFS9•



	L mm	D mm
IxS91	140.6	12
IxS92	170.6	12
IxS93	200.6	14

Intelligent compact drive IclA IFS9 •, dimensions in mm



	L mm	D mm
IxS91	187.3	12
IxS92	217.3	12
IxS93	247.3	14

Intelligent compact drive IclA IFS9 • with holding brake, dimensions in mm

Type code

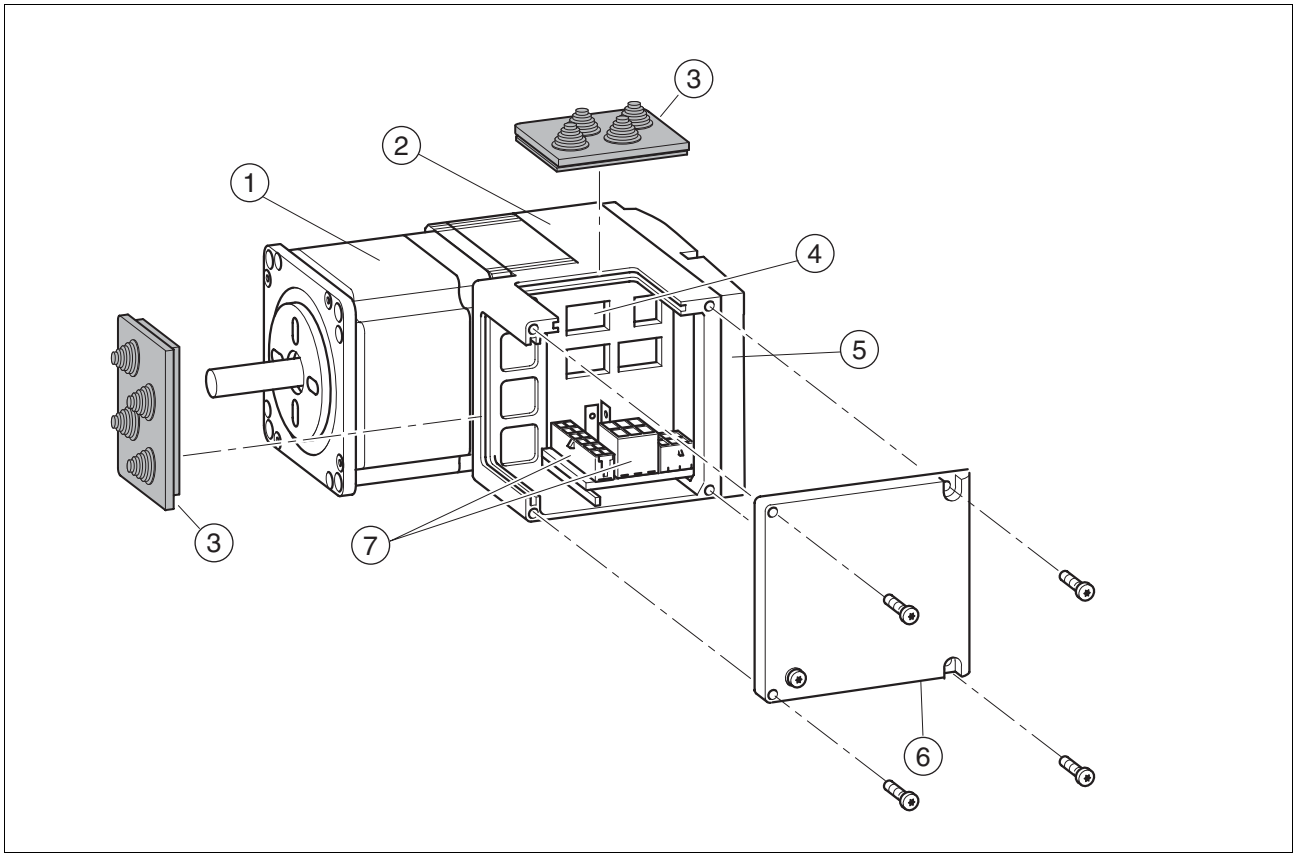
Type code IFS6•

Example:	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Product family I = IclA 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 = index motor length	I	F	S	**6**	**1**	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Supply voltage nominal 2 = 24 ... 36 V_{DC}	I	F	S	6	1	/	**2**	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communication 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
Supply signal interface – = no (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 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
Measurement system – = no measurement 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 model B = printed circuit board plug connector I = industrial connector	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Degree of protection overall (except for shaft bushing) 54 = IP54	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gearing O-001 = no gearing planetary gear PLE 60, 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 gearing) K = parallel key (with gearing 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
Degree of protection shaft bushing 41 = IP41 - no gearing 54 = IP54 - with gearing	I	F	S	6	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

Type code IFS9•																						
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 = index motor length	I	F	S	**9**	**1**	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Supply voltage nominal 2 = 24 ... 36 V_{DC}	I	F	S	9	1	/	**2**	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communication 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
Supply signal interface – = no (external power supply unit required) IS = internal 24 V power supply unit	I	F	S	9	1	/	2	CAN	**IS**	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Hardware option 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 torque (with IFS93)	I	F	S	9	1	/	2	CAN	IS	D	S	/	**–**	–	–	B	54	O-001	R	P	P	41
Measurement system – = no measurement 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 model B = printed circuit board plug connector I = industrial connector	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Degree of protection overall (except for shaft bushing) 54 = IP54	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gearing O-001 = no gearing planetary gear PLE 80, 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 gearing) W = woodruff key according to DIN 6888 (without gearing) K = parallel key (only with gearing)	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
Degree of protection shaft bushing 41 = IP41 - no gearing 54 = IP54 - with gearing	I	F	S	9	1	/	2	CAN	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

IclA IDS

Product overview



Components of the IclA 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
- Constant velocity characteristics
- High positioning resolution (0.018°)
- Optionally with planetary gear (IDS9• also with holding brake)

Control

The IclA IDS moves the stepper motor 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) is 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.
There are also four different 24V signals available. The assignment of the inputs and outputs can be specified via parameter switches.
The electronics are thermally decoupled from the motor by a plastic component.

Connections

The IclA IDS intelligent compact drives have the following connections:

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

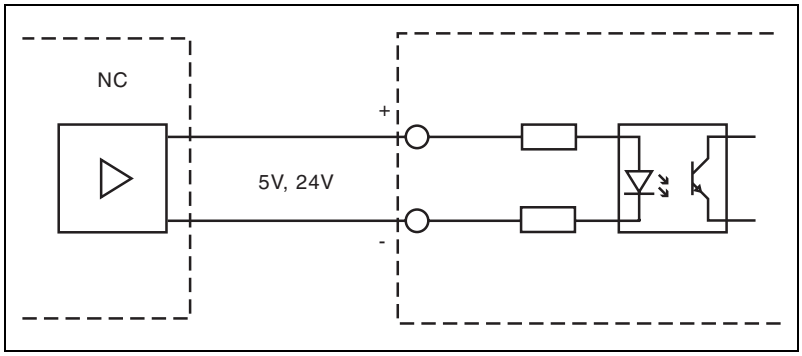
The cabling is connected with printed circuit board plug connectors.

Multifunction interface

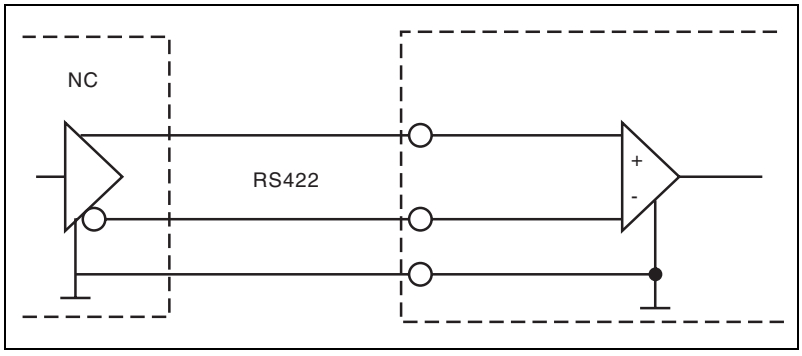
The multifunction interface operates at one of the following signal levels depending on the device model:

- 24 V signals opto-isolated (PD1)
- 5V signals opto-isolated (PD2)
- 5 V differential signals without galvanic 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 "IclA 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 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 safety function "Power Removal"

The integrated safety function "Power Removal" enables a stop of category 0 or 1 as per EN60204-1 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).

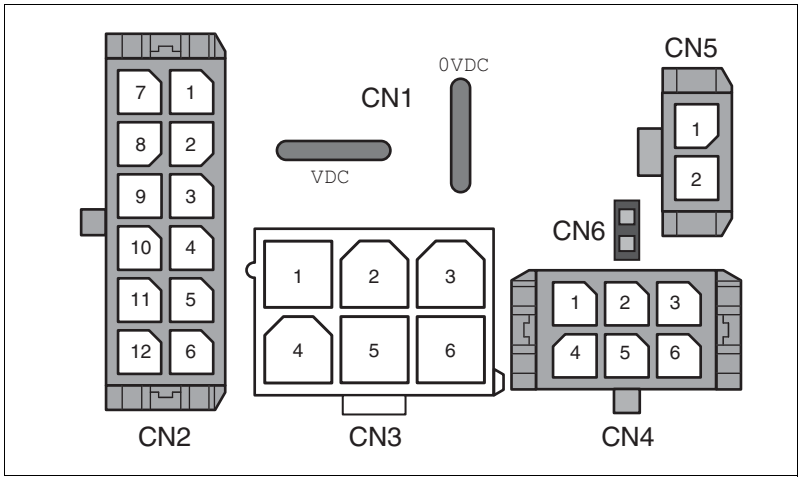
Connection technology

Circuit board plug connector

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

- Fieldbus and I/O signal connection with plug connector" Molex Micro Fit"
- 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

Connection	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 IclA 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 steps per revolution

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

Example:
At a number of steps of 1000 and at 1000 pulses, the compact drive turns the motor exactly one complete revolution. At a pulse frequency of 1 kHz this yields a speed of 1 1/s = 60 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

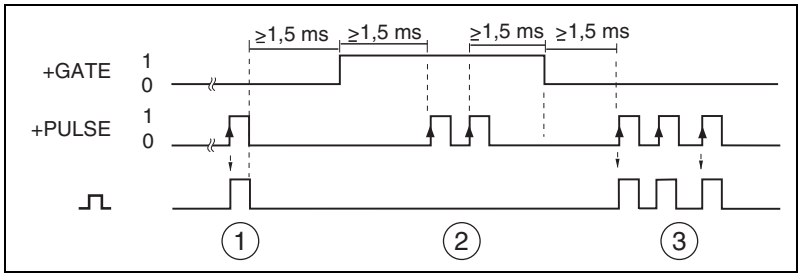
The ENABLE/GATE signal is available at the following interfaces:

- 24 V 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

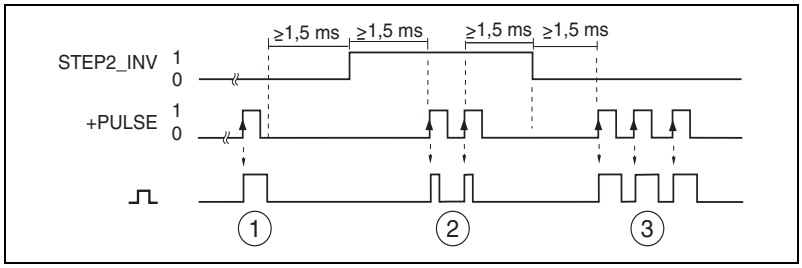
The STEP2_INV/PWM signal is available at the following interfaces:

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

The STEP2_INV/PWM 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/INDEX PULSE" signal output

For compact drives with an index pulse, the index pulse signal can be switched to the "FAULT / INDEX PULSE" signal output (only possible with compact drives with index pulse encoder).
The FAULT/INDEX PULSE signal is available at the following interfaces:

- 24 V signal interface

The FAULT/INDEX PULSE 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.

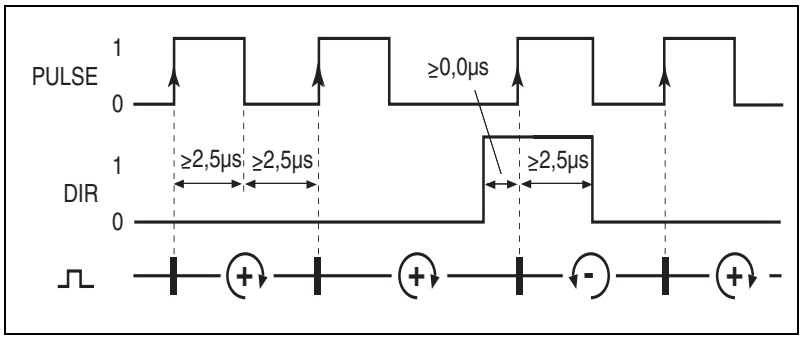
Setting options via parameter switches
Activating/Deactivating blocking detection

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:

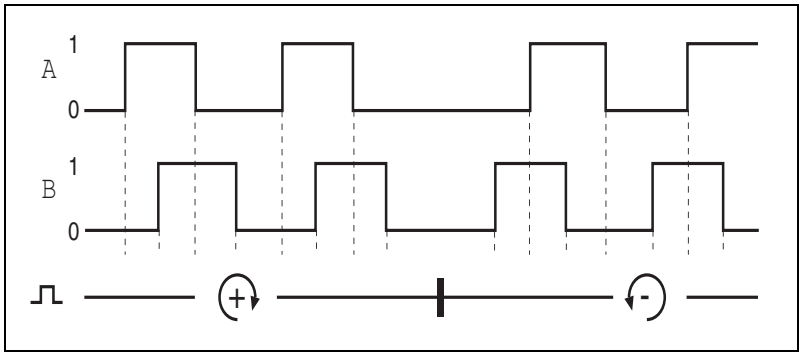
- PULSE/DIR
- A/B

"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" interface 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 shuts off the motor torque safely. The supply voltage must not be interrupted. There is no monitoring at standstill.

Category 0 stop (EN60204-1)
Standstill by immediate power shutdown to the machine drive elements (i. e. an uncontrolled stop).

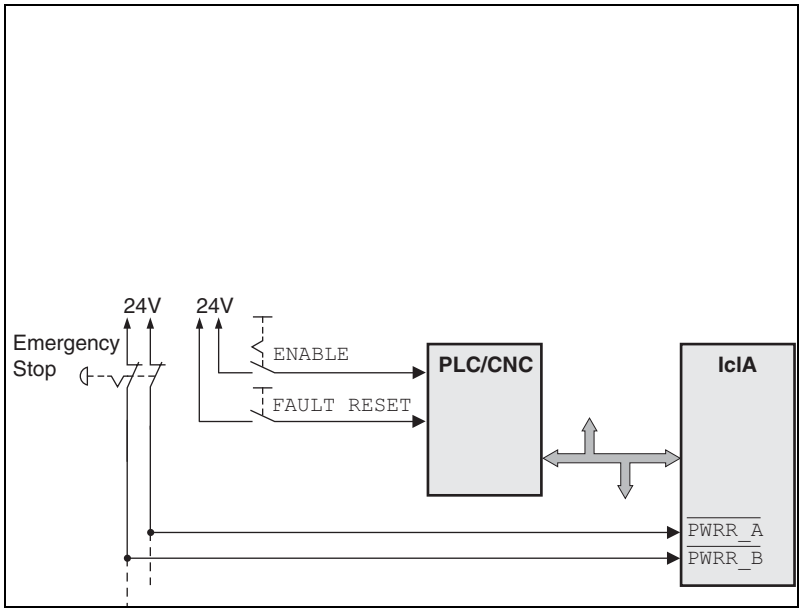
Category 1 stop (EN60204-1)
A controlled stop in which the machine drive elements are retained to effect the standstill. Power feed is only interrupted when everything has come to a standstill.

Description

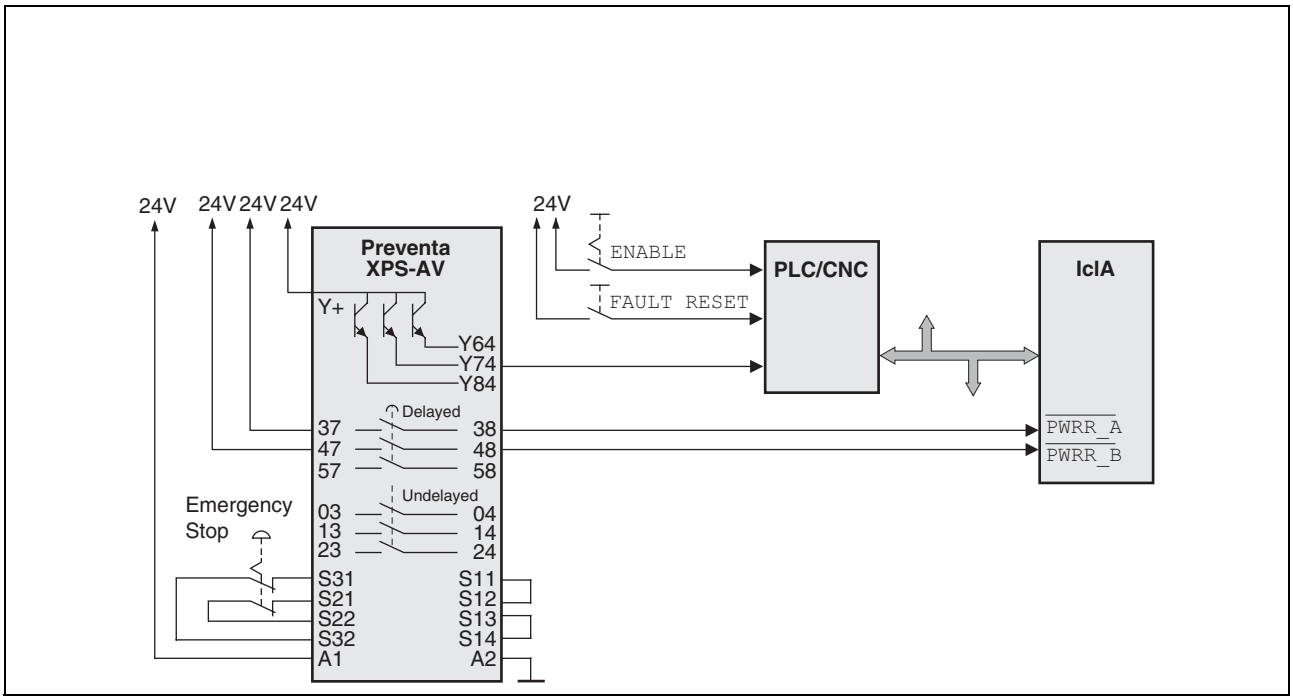
The "Power Removal"safety function integrated into the product can be used to implement the "Emergency Stop control " function (EN 60204-1) for Category 0 Stop and Category 1 Stop. This safety function also prevents the compact drive from unexpected restart.
The following safety levels are implemented in accordance with the standards for functional safety:

- IEC 61508; SIL 2; Functional safety of electrical/electronic/programmable electronic safety-related systems.
- IEC 62061; SIL 2; Safety of Machines - Functional safety of electrical, electronic and programmable controllers of machines
- EN 954-1, category 3: Machine safety, safety-related parts of controls, Part 1: General principles of design
- EN 13849-1, category 3: Machine safety, safety-related parts of controls, Part 1: General principles of design

Examples of applications for the safety function



Example category 0 stop



Example category 1 stop

Technical data

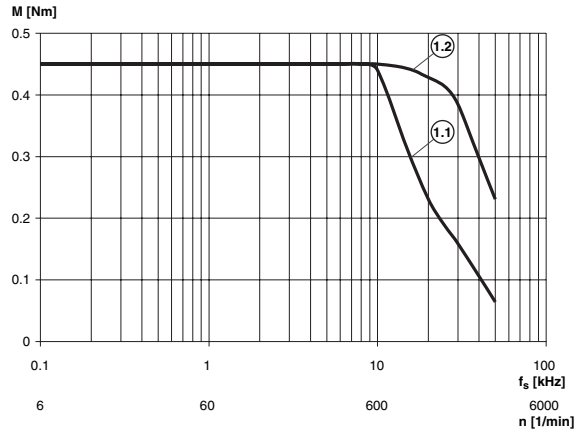
Mechanical data IDS6•

		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
Rotor inertia JR	kgcm²	0.1	0.22	0.38
Steps per revolution		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
Mass 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 pressure	N	8.4		
• Nominal bearing service life L_{10h} [4]	h	20000		

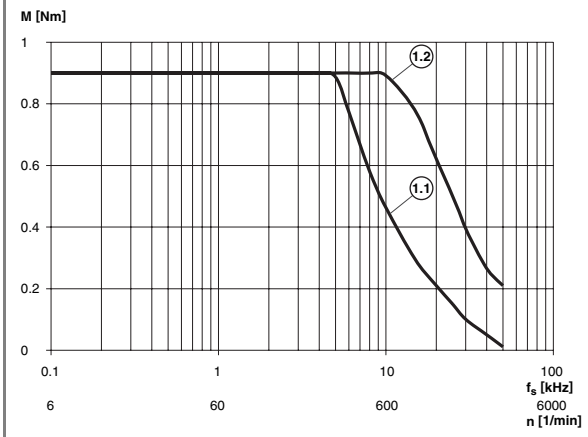
1) Measured at 1000 steps/revolution, unit in minutes of arc
2) Conditions for shaft load: speed 60 1/min, ED at torque, ambient temperature 40 °C
3) Point of attack of radial force: 10.5 mm distance to flange
4) operating hours at a probability of failure of 10%

Characteristic curves IDS6•

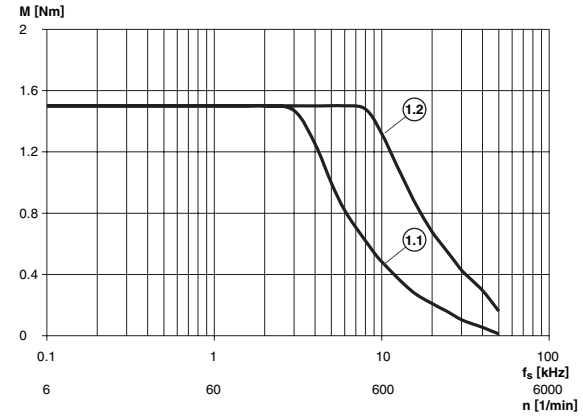
IDS61 torque characteristic



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

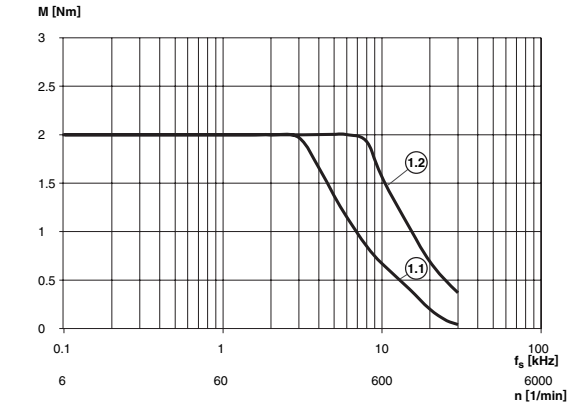
Mechanical data IDS9•

		IDS91	IDS92	IDS93	IDS93
Winding type				**Standard**	**3 D**
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
Rotor inertia JR	kgcm²	1.1	2.2	3.3	
Steps per revolution		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			
Mass 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 pressure	N	30			
• Nominal bearing service life L_{10h} [4]	h	20000			
Holding brake					
Holding torque M_H	Nm	6			
Electrical pull-in power	W	22			
Energise time (release brake)	ms	40			
De-energise time (apply brake)	ms	20			
Moment of inertia	kgcm²	0.2			
Mass m	kg	1.8			

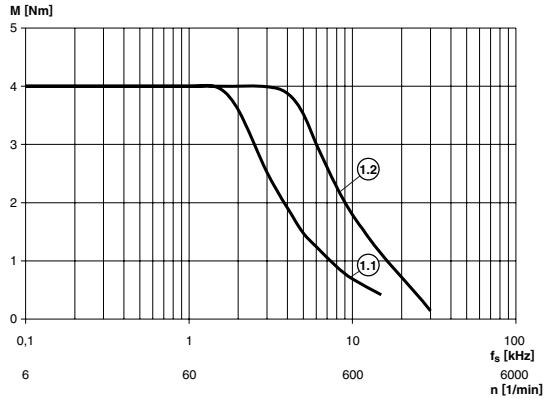
1) Measured at 1000 steps/revolution, unit in minutes of arc
2) Conditions for shaft load: speed 60 1/min, ED at torque, ambient temperature 40 °C
3) Point of attack of radial force: 10.5 mm distance to flange
4) operating hours at a probability of failure of 10%

Characteristic curves IDS9•

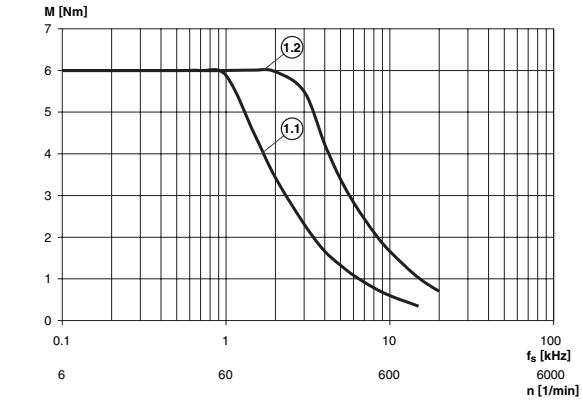
IDS91 torque characteristic



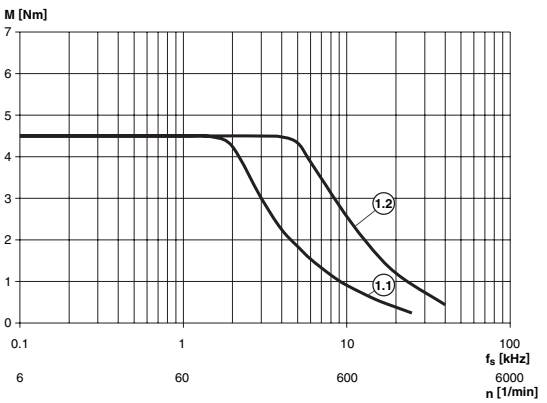
IDS92 torque characteristic



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		Corresponding to PELV / DIN 19240, no inverse-polarity protection !		
Voltage supply range	V_{DC}	18 ... 40		
Rated supply voltage	V_{DC}	24 / 36		
Ripple at nominal voltage	V_{SS}	≤ 3.6		
Max. current consumption				
• IDS6•	A	3.5		
• IDS9•	A	5		
Inrush current		charging current of capacitor C = 1500 µF		
External 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		
Debounce time IO0 ... IO3	ms	0.1		
Debounce time IO2, IO3 at capture function	ms	0.01		
24V signal outputs		Switching to Plus, short-circuit proof, inductively chargeable (1000 mH / 100 mA)		
		with external supply	**with internal supply**	
Voltage supply range	V_{DC}	10 ... 30	23 ... 25	
Switching current	mA	≤ 100 (per output)	≤ 200 (total)	
			The internal power supply unit is protected against: • Short circuit of the output voltage • Overload of output voltage, limited to 6 W output power	
Multifunction interface		PD1 (24V)	PD2 (5V)	PD3
Inputs				
Electrically isolated		yes	yes	no
Low level	V / mA	≤ 3 / ≤ 0.2	≤ 0.4 / ≤ 0.2	RS422
High level	V / mA	≤ 20 / ≤ 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 protected, reverse-polarity-protected 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

Ambient 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 (non-condensing)
Vibration strain as per DIN EN 60068-2-6	m/s^2	20
Heat class according to DIN EN 60034-1		155 (F)
Shaft eccentricity and axial precision		as per EN 50347 (IEC 60072-1)

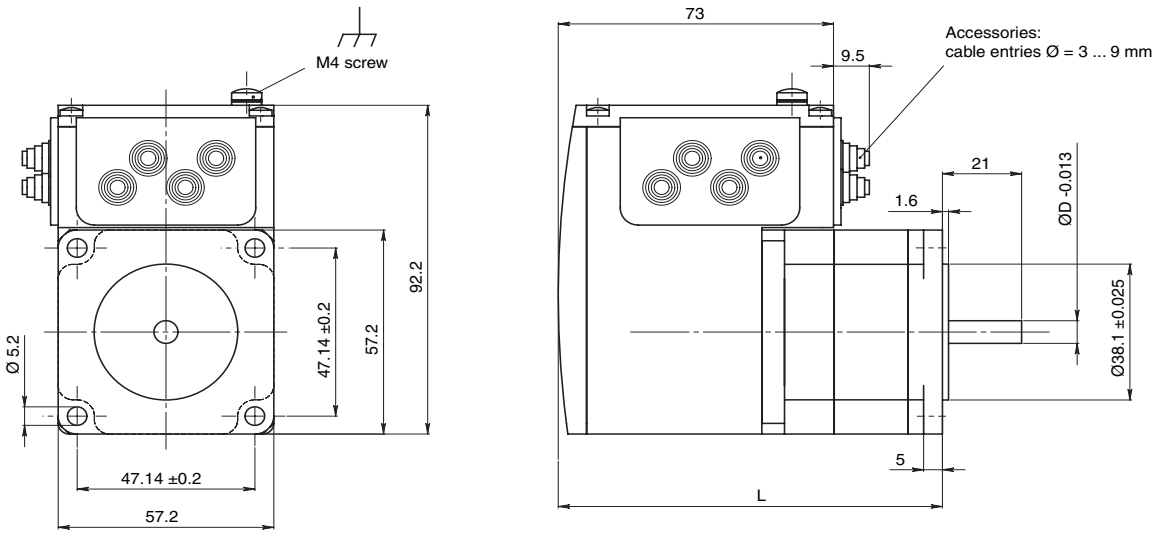
[1] Limit values with flanged motor (e.g. steel plate 300x300x10 mm)

Safety functions

Service life corresponding to safety life cycle (IEC 61508)	years	20
SFF (Safe Failure Function) (IEC 61508)	%	67
Probability of failure (PFH) (IEC 61508	1/h	$1.84 \cdot 10^{-9}$
Response time (until shutdown of power amplifier)	ms	< 50
Permitted test pulse width of upstream devices	ms	≤ 1

Dimensional drawings

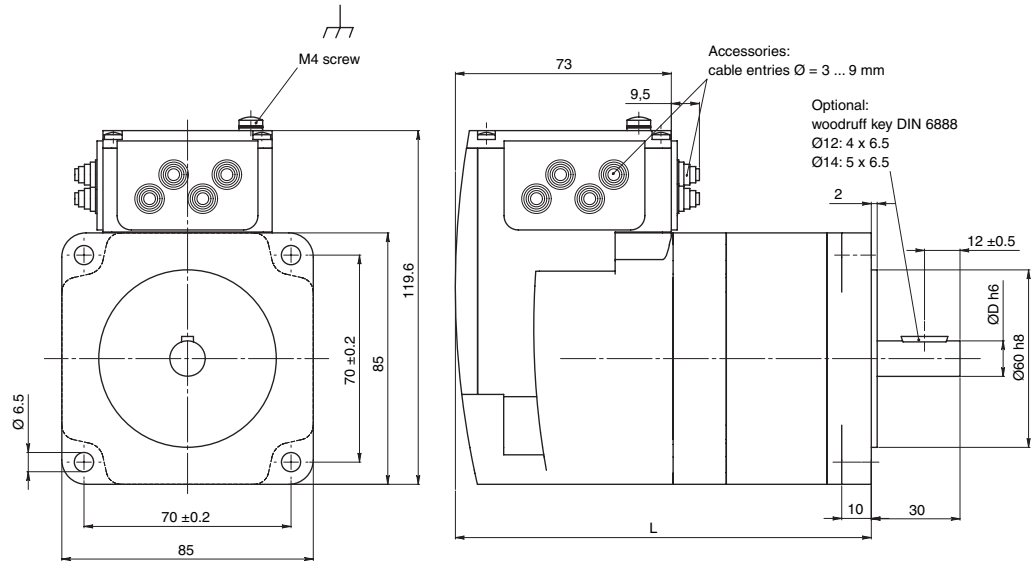
Dimensional drawings IDS6•



	L mm	D mm
IxS61	101.9	6.35
IxS62	115.9	6.35
IxS63	138.9	8.00

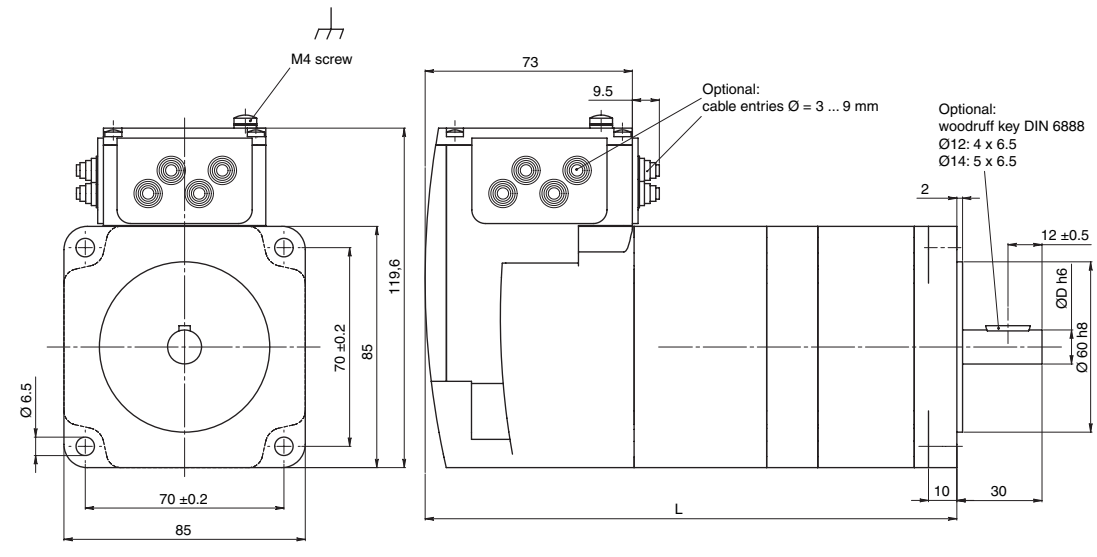
Intelligent compact drive IclA IDS6 •, dimensions in mm

Dimensional drawings IDS9•



	L mm	D mm
IxS91	140.6	12
IxS92	170.6	12
IxS93	200.6	14

Intelligent compact drive IclA IDS9•, dimensions in mm



	L mm	D mm
IxS91	187.3	12
IxS92	217.3	12
IxS93	247.3	14

Intelligent compact drive IclA IDS9• with holding brake, dimensions in mm

Type code

Type code IDS6•

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 = index motor length	I	D	S	6	**1**	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Supply voltage nominal 2 = 24 ... 36 V_{DC}	I	D	S	6	1	/	**2**	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communication interface PD1 = 24 V signals, opto-isolated PD2 = 5 V signal, opto-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
Supply signal interface – = no (external power supply unit required) IS = internal 24 V 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
Measurement system – = no measurement 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
Degree of protection overall (except for shaft bushing) 54 = IP54	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gearing O-001 = no gearing planetary gear PLE 60, 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 gearing) K = parallel key (with gearing 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
Degree of protection of shaft bushing 41 = IP41 (without gearing) 54 = IP54 (with gearing)	I	D	S	6	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

Type code IDS9•																					
Example:	**I**	**D**	**S**	**9**	**1**	**/**	**2**	**PD3**	**IS**	**D**	**S**	**/**	**–**	**–**	**–**	**B**	**54**	**O-001**	**R**	**P**	**P**	**41**
Product family I = IclA intelligent compact drive	**I**	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Controller type D = power electronics	I	**D**	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor type S = stepper motor	I	D	**S**	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Motor size 9 = motor flange [cm] 1, 2, 3 = index motor length	I	D	S	**9**	**1**	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Supply voltage nominal 2 = 24 ... 36 V_{DC}	I	D	S	9	1	/	**2**	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Communication interface PD1 = 24 V signals, opto-isolated PD2 = 5 V signal, opto-isolated PD3 = 5 V signals, push-pull (RS422)	I	D	S	9	1	/	2	**PD3**	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Supply signal interface – = no (external power supply unit required) IS = internal 24 V power supply unit	I	D	S	9	1	/	2	PD3	**IS**	D	S	/	–	–	–	B	54	O-001	R	P	P	41
Hardware option D = parameter switch for configuration	I	D	S	9	1	/	2	PD3	IS	**D**	S	/	–	–	–	B	54	O-001	R	P	P	41
Software version S = Standard	I	D	S	9	1	/	2	PD3	IS	D	**S**	/	–	–	–	B	54	O-001	R	P	P	41
Winding type – = Standard 3D = higher speed (with IDS93)	I	D	S	9	1	/	2	PD3	IS	D	S	/	**–**	–	–	B	54	O-001	R	P	P	41
Measurement system – = no measurement system I = index pulse encoder	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	**–**	–	B	54	O-001	R	P	P	41
Holding brake – = no holding brake B = with holding brake	I	D	S	9	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	9	1	/	2	PD3	IS	D	S	/	–	–	–	**B**	54	O-001	R	P	P	41
Degree of protection overall (except for shaft bushing) 54 = IP54	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	**54**	O-001	R	P	P	41
Gearing O-001 = no gearing planetary gear PLE 80, gear ratio: 3-003 = 3 : 1 3-005 = 5 : 1 3-008 = 8 : 1	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	**O-001**	R	P	P	41
Shaft type R = round, smooth shaft (without gearing) W = woodruff key according to DIN 6888 (without gearing) K = parallel key (only with gearing)	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	**R**	P	P	41
Centring collar diameter P = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	**P**	P	41
Shaft diameter P = Standard	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	**P**	41
Degree of protection of shaft bushing 41 = IP41 (without gearing) 54 = IP54 (with gearing)	I	D	S	9	1	/	2	PD3	IS	D	S	/	–	–	–	B	54	O-001	R	P	P	**41**

Planetary gear

Description

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

IclA compact drive	Planetary gear	
	Diameter	Step-up gearing
IDS6•, IFS6•	60	3:1
		5:1
		8:1
IDS9•, IFS9•	80	3:1
		5:1
		8:1
IFA6•	60	3:1
		5:1
		8:1
IFE71	40	16 : 1
		40 : 1
		60 : 1
		120 : 1

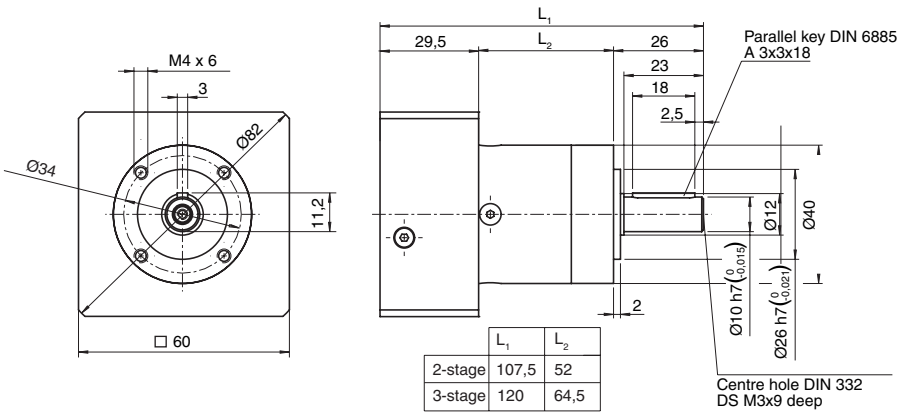
Technical data

Gearing		PLE 40				PLE 60			PLE 80		
Gear ratio		**16**	**40**	**60**	**120**	**3**	**5**	**8**	**3**	**5**	**8**
Torsional play	arcmin	<30				< 20			< 12		
Torsional stiffness	Nm/arcmin	1.1	1.1	1.0	1.0	2.3			6		
Nominal 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		
Mass	kg	0.45	0.45	0.55	0.55	0.9			2.1		
Gear stages		2		3		1			1		
Max. drive speed	1/min	18000				13000			7000		
Recommended drive speed	1/min	4500				4000			4000		
Efficiency	%	94	94	90	90	96			96		
min. Operating temperature	°C	-25				-25			-25		
Max. Operating temperature	°C	+90				-90			-90		
Max. operating temperature (briefly)	°C	+120				+120			+120		
Storage		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		
Service life	h	10000				20000			20000		

[1] The actual output torque is calculated from the motor torque x gear ratio x efficiency of the gearing.

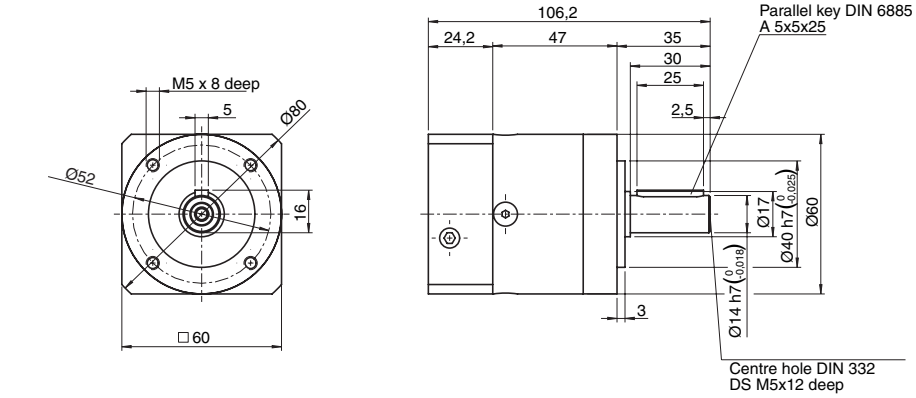
Attention: the actual output torque must be less than the nominal output torque of the gearing, otherwise the gearing may be destroyed.

Dimensional drawings

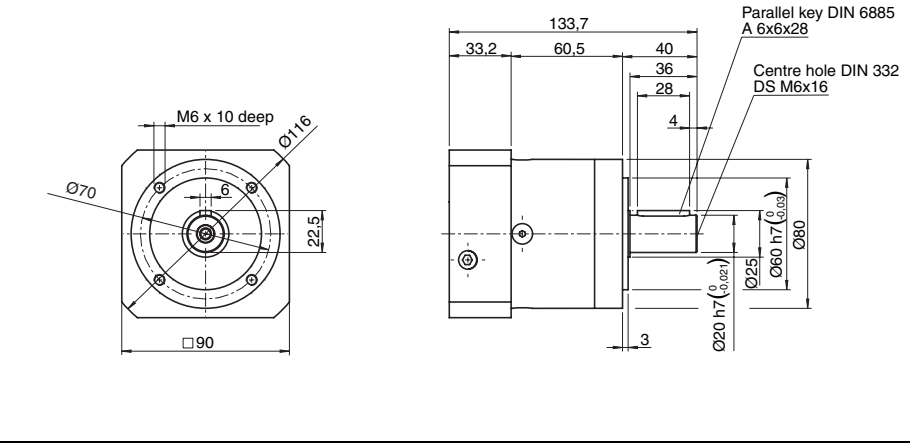


	L_1	L_2
2-stage	107,5	52
3-stage	120	64,5

Gearing PLE 40, 2 step or 3 step, dimensions in mm



Gearing PLE 60, 1 step, dimensions in mm



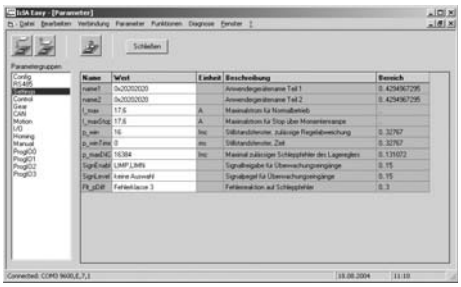
Gearing PLE 80, 1 step, dimensions in mm

Accessories

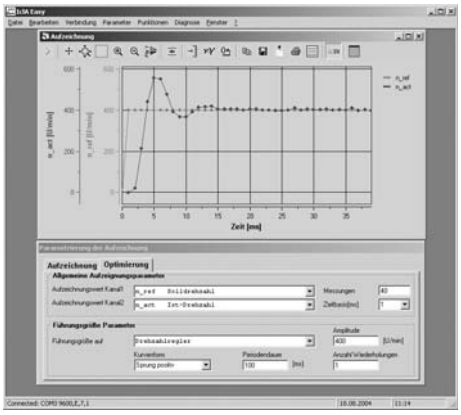
Software and documentation

The IclA documentation and the commissioning software “IclA Easy” are available in the download area of the Berger Lahr website, refer to www.berger-lahr.com/download.

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 2000/XP. The program communicates with the compact drives via RS485, CAN or Profibus DP with the aid of a fieldbus converter.

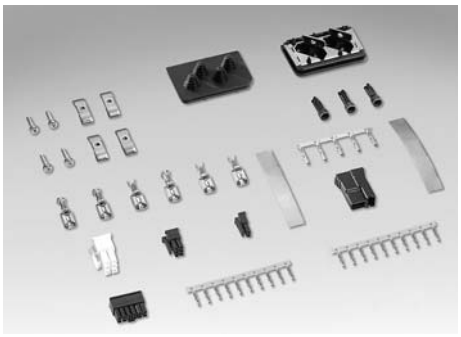
Supported fieldbus converters

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

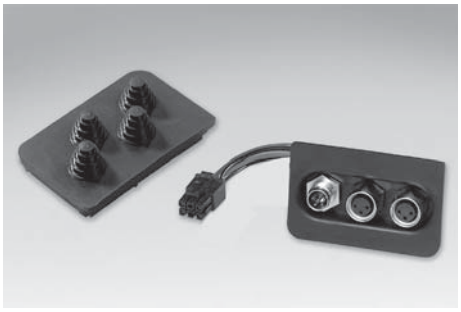
The latest version of the commissioning software "IclA Easy" is available for download at http://www.berger-lahr.com/download.

For IclA with printed circuit board plug connectors

Designation	Description		Order number
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 wire diameter of 3 ... 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			
	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 supply, 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**

For IclA with industrial connectors

I/O signal plug-in units

Designation	Description	Order number
IclA IFx plug-in unit 3 I/O		
	Plug-in unit for three I/O signals	**0062501533001**
	Contents: • 1 plug-in unit with 3 M8 female connectors (3-pin) for connection of 3 I/O signals • 1 blind plug-in unit	
	Matching connector set: IclA IFx connector set 3 I/O	**0062501534002**
IclA IFx plug-in unit 4 I/O		
	Plug-in unit for four I/O signals	**0062501533002**
	Contents: • 2 plug-in units with 2 M8 female connectors (3-pin) each for connection of 4 I/O signals	
	Matching connector set: IclA IFx connector set 2 I/O (2x)	**0062501534001**
IclA IFx plug-in unit 3 I/O 24V		
	Plug-in unit for 3 I/O signals and external 24 V signal power supply	**0062501524001**
	Contents: • 1 plug-in unit with 2 M8 female connectors and 1 M8 connector for connection of 3 I/O signals and 24 V signal power supply • 1 blind plug-in unit	
	Matching connector set: IclA IFx connector set 3 I/O 24 V	**0062501523001**
IclA IFx plug-in unit 4 I/O 24V		
	Plug-in units for 4 I/O signals and external 24 V signal power supply	**0062501527001**
	Contents: • 1 plug-in unit – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (3-pin) for connection of 24V signal power supply (IN) • 1 plug-in unit – 2 M8 female connectors (3-pin) for connection of 2 I/O signals – 1 M8 connector (3-pin) for connection of 24V signal power supply (out)	
	Matching connector set: IclA IFx connector set 4 I/O 24 V	**0062501523002**

I/O signal plug-in units

Designation	Description	Order number
IclA IFx plug-in unit 2 I/O 1PWRR		
	Plug-in units for 2 I/O signals and signals for Power Removal safety function Contents: • 1 plug-in unit – 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 plug-in unit Matching connector set:	**0062501533003**
	IclA IFx connector set 2 I/O	**0062501534001**
	IclA Ixx cable (PWRR M8x4)	**00625014850xx**
IclA IFx plug-in unit 4 I/O 2PWRR		
	Plug-in units for 4 I/O signals and signals for Power Removal safety function Contents: • 1 plug-in unit – 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 plug-in unit – 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 Matching connector set:	**0062501533004**
	IclA IFx connector set 2 I/O (2x)	**0062501534001**
	IclA IFx connector set PWRR	**0062501534005**
	IclA Ixx cable (PWRR M8x4)	**00625014850xx**

Connector sets for I/O signal plug-in units

Designation	Description	Order number
IclA IFx connector set 2 I/O		
	Connector set for fitting to cables for 2 I/O signals Contents: • 2 M8 circular plug-in connector (3-pin) **Note: 2 connector sets are required for IclA IFx connector units with 4 I/O signals.**	**0062501534001**
IclA IFx connector set 3 I/O		
	Connector set for fitting to cables for 3 I/O signals Contents: • 3 M8 circular plug-in connector (3-pin)	**0062501534002**
IclA IFx connector set 3 I/O 24 V		
	Connector set for fitting to cables for 3 I/O signals and 1 power supply cable Contents: • 2 M8 circular plug-in connector (3-pin) • 1 M8 circular plug-in connector socket (3-pin)	**0062501523001**
IclA IFx connector set 4 I/O 24 V		
	Connector set for fitting to cables for 4 I/O signals and 2 power supply cables Contents: • 5 M8 circular plug-in connectors (3-pin) • 1 M8 circular plug-in connector socket (3-pin)	**0062501523002**

Connector sets for I/O signal plug-in units

Designation	Description	Order number
IclA IFx connector set 1 PWRR output		
	Connector set for fitting to cables for forwarding signals for safety function Power Removal Contents: • 1 M8 circular plug-in connector (4-pin)	**0062501534005**

Connector sets for fieldbus

Designation	Description	Order number
IclA IFx connector set Profibus M12		
	For fabrication of Profibus cables; Contents: • 1 M12 circular plug-in connector (B-coded) • 1 M12 circular plug-in connector socket (B-coded) • 1 M12 protective cap	**0062501525001**
IclA IFx connector set CAN / RS485 M12		
	For fabrication of CAN cables or RS485 cables; Contents: • 1 M12 circular plug-in connector # (A-coded) • 1 M12 circular plug-in connector socke (A-coded) • 1 M12 protective cap	**0062501526001**

Cable

Designation	Description		Order number
IclA IFx cable (power supply, 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 Ixx cable (supply: STAK)			
	For connection of power supply; cUL-approved; for trailing cable applications; complies with DESINA standard (IclA Ixx cable not suitable for IDS)	3 m	**0062501470030**
		5 m	**0062501470050**
		10 m	**0062501470100**
		15 m	**0062501470150**
		20 m	**0062501470200**
IclA Ixx 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**

Rheostatic braking controller UBC60

Designation	Description	Order number
IclA Ixx rheostatic braking controller UBC60		
	To assimilate and convert the braking energy into heat energy in an internal braking resistor. An external braking resistor is required if the excess braking energy cannot be dissipated via the internal braking resistor. In this case the internal braking resistor is disabled. Description and technical data, refer to documentation UBC60. The documentation is available in the download area of the Berger Lahr website, refer to www.berger-lahr.com/download.	**ACC3EA001**

Conversion tables

Rotor inertia

	lb·in²	lb·ft²	lb·in·s²	lb·ft·s² slug·ft²	kg·cm²	kg·cm·s²	g·cm²	g·cm·s²	oz·in²	oz·in·s²
lb·in²	–	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 103	2.984	16	4.14 x 10^{-2}
lb·ft²	144	–	0.3729	3.10 x 10^{-2}	421.40	0.4297	4.21 x 10^{5}	429.71	2304	5.967
lb·in·s²	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·s² slug·ft²	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·cm²	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·s²	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·cm²	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·s²	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·in²	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·s²	24.3	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
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	–

Speed

	1/min (rpm)	rad/sec	deg./sec
1/min (rpm)	–	0.105	6.0
rad/sec	9.55	–	57.30
deg./sec	0.167	1.745 x 10^{-2}	–

Mass

	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	–

Temperature

	°F	°C
°F	–	$(\vartheta$ - 32) x $^{5}/_{9}$
°C	ϑ ¾ $^{9}/_{5}$ + 32	–

Force

	lb	oz	gf	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
gf	2.205 x 10^{-3}	0.03527	–	980.665	N.A.
dyne	2.248 x 10^{-6}	3.59 x 10^{-6}	1.02 x 10^{-3}	–	0.0001
N	0.22481	3.5967	N.A.	100,000	–

Example for conversion:
Conversion of 10 inches to metres. Search for "in" (inches) in the left column of the "length" table and "m" (metres) in the header row. The box at the intersection of column and row gives you the conversion factor: "0.0254". Multiply 10 inches by 0.0254, and you have the value in metres: 10 in x 0.0254 = 0.254 m.

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