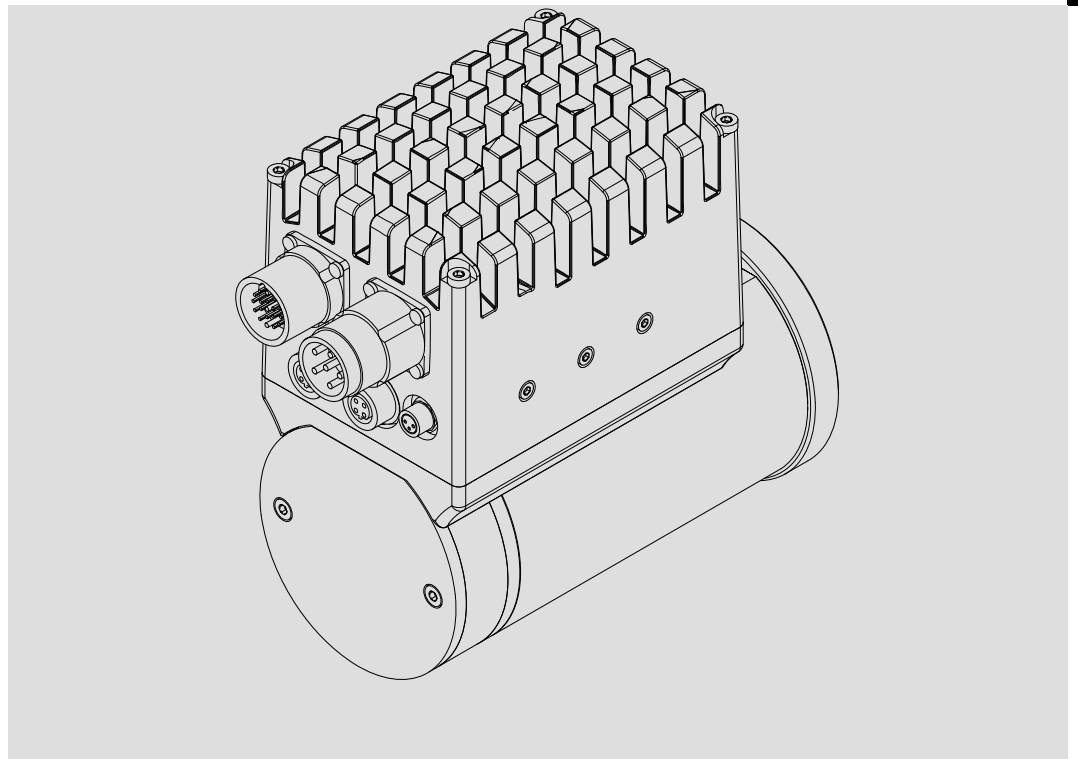




Servo Drives 930 *140 ... 600 W*



931K

Servo inverter



Please read these instructions before you start working!

Follow the enclosed safety instructions.

Detailed information is given in the corresponding operating instructions.

1	About this documentation	5
1.1	Document history	5
1.2	Conventions used	6
1.3	Abbreviations used	7
1.4	Terminology used	7
1.5	Notes used	8
2	Safety instructions	9
2.1	General safety instructions for drive components	9
2.2	Application as directed	10
2.3	Improper use	11
2.4	Residual hazards	11
3	Product description	12
3.1	Identification	12
3.1.1	Nameplate	12
3.1.2	Product key	14
4	Technical data	15
4.1	General data and operating conditions	15
4.2	Rated data	17
4.2.1	Inputs and outputs, 931K bus systems	18
4.3	Performance data of the complete devices	18
4.3.1	Mains voltage class 24 V DC	18
4.3.2	Mains voltage class 48 V DC	19
4.3.3	Mains voltage class 230 V AC	19
5	Mechanical installation	20
5.1	Dimensions	20
6	Electrical installation	22
6.1	Important notes	22
6.2	Installation according to EMC (installation of a CE-typical drive system)	23
6.2.1	Important notes	23
6.2.2	Connection plan	24
6.3	Voltage supply	25
6.4	Power connections 931KLN	26
6.5	Communication connections	27
6.6	Control terminals	28
6.6.1	Plug M12, 8-pole	28
6.6.2	Plug M23, 19-pole	29

6.7	Anschluss STO	30
6.7.1	Stecker M12, 5-polig, A-codiert	30
7	Safety engineering	31
7.1	Application as directed	31
7.2	Integrated "Safe Torque Off (STO)" function	32
7.2.1	General information regarding the STO function	32
8	Commissioning	34
8.1	Before switching on	34
8.2	Initial switch-on	35
9	Troubleshooting and fault elimination	40
9.1	Fault elimination for general errors	40
9.2	Error message	41
9.3	Fault elimination for known error message (see Fluxx, "Status" tab)	44
9.4	Fault elimination for errors / problems with regard to the handling of bus systems	46
10	Accessories	47
10.1	Technical documentation	47
10.2	Power supply units	47
11	Appendix	48
11.1	Voltage supply - device type 931K 24...48 V DC (X2)	48
11.2	Voltage supply - device type 931K 230 V AC (X2)	49
11.3	I/O connection for 931KL42 version (I/O via 1*M23, 19-pole) (X5)	50
11.4	I/O connection for 931KL52 version (I/O via 2*M12, 8-pole) (X5.1-X5.2)	51
11.5	I/O connection for 931KL52 version (I/O via 2*M12, 8-pole) (X5.1)	52
11.6	Profibus (X4) connection	53
11.7	CAN bus (X4) connection	54
11.8	EtherCAT (X5) connection	55
11.9	RS232 (X1) connection	56

1 About this documentation

Contents

- ▶ The present documentation serves to safely work on and with the drives. It includes safety instructions which must be observed.
- ▶ All persons working on and with the drives must have the documentation available and must observe the information and notes relevant for their work.
- ▶ The documentation must always be in a complete and perfectly readable state.

If the information provided in this documentation is not sufficient in your case, please refer to the controller or gearbox documentation.

Validity

This documentation applies to servo inverters:

Type	Designation
931K□K	Extra-low voltage servo inverter
931K□N	Mains voltage servo inverter

Target group

This documentation is directed at qualified skilled personnel according to IEC 60364.

Qualified skilled personnel are persons who have the required qualifications to carry out all activities involved in installing, mounting, commissioning, and operating the product.

1.1 Document history

Material number	Version			Description
13347015	1.0	06/2010	TD36	First edition
13399016	2.0	12/2011	TD36	RS232 (X1) connection has been corrected Corrections in the tables: Plug M12, 8-pole and Plug M23, 19-pole Product key has been completed in the fields of Options and Built-on accessories
13399016	2.1	07/2012	TD09	Correctio of value in the tablee "X2 voltage supply 230 V AC"
13466427	3.0	03/2013	TD09	The following has been updated: nameplate, product key, and technical data Newly added: STO connection (x61) and the chapter about safety engineering
13466427	3.1	08/2017	TD09	The following table has been changed: X2 voltage supply 230V AC

**Tip!**

Information and auxiliary devices related to the Lenze products can be found in the download area at

<http://www.Lenze.com>

Your opinion is important to us!

These instructions have been created to the best of our knowledge and belief to give you the best possible support for handling our product.

If you have suggestions for improvement, please e-mail us to:

feedback-docu@Lenze.de

Thank you for your support.

Your documentation team

1.2**Conventions used**

This documentation uses the following conventions to distinguish different types of information:

Type of information	Identification	Examples/notes
Spelling of numbers		
Decimal separator	Point	In general, the decimal point is used. For instance: 1234.56
Warnings		
UL warnings	Ⓐ	Are only given in English.
UR warnings	Ⓡ	
Icons		
Page reference	📖	Reference to another page with additional information For instance: 📖 16 = see page 16
Documentation reference	📄	Reference to another documentation with additional information For example: 📄 EDKxxx = see documentation EDKxxx
Document reference	📄	Reference to another documentation providing additional information E.g.: 📄 Software manual ...
Wildcard	□	Wildcard for options, selection data

1.3 Abbreviations used

Abbreviation			
P_r	Rated power	F_{r1}/F_{r2}	Permissible radial load
M_R	Rated torque	F_a	Permissible axial load
I_r	Rated current	n_r	Rated speed
U	Rated voltage	m_{Mot}	Motor weight (mass)
f	Rated frequency	n	Max. speed
J	Moment of inertia	M	Max. torque
ω	Angular velocity	M_K	Characteristic torque
I_{tot}	Total moment of inertia	M_L	Load torque
Q	Friction energy	W	Energy
U	Resulting supply voltage	l	Cable length
U_B	Rated brake voltage	I_B	Rated brake current
L_{line}	Phase inductance	R_{UV}	Stator resistance

1.4 Terminology used

Term	In the following text used for
Inverter	Servo inverter 931K□K, 931K□N
Drive system	Drive systems including servo motors and other Lenze drive components

1.5

Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:

**Danger!**

(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
Note!	Important note to ensure troublefree operation
Tip!	Useful tip for simple handling
Reference to another documentation	Reference to another documentation

2 Safety instructions

2.1 General safety instructions for drive components

(in accordance with Low-Voltage Directive 2006/95/EC)

At the time of dispatch, the drive components are in line with the latest state of the art and can be regarded as operationally safe.

Scope

The following general safety instructions apply to all Lenze drive and automation components.

The product-specific safety and application notes given in this documentation must be observed!

General hazards



Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

- ▶ Lenze drive and automation components ...
 - ... must only be used for the intended purpose.
 - ... must never be operated if damaged.
 - ... must never be subjected to technical modifications.
 - ... must never be operated unless completely assembled.
 - ... must never be operated without the covers/guards.
 - ... can - depending on their degree of protection - have live, movable or rotating parts during or after operation. Surfaces can be hot.
- ▶ For Lenze drive and automation components ...
 - ... only use approved accessories.
 - ... only use original manufacturer spare parts.
- ▶ All specifications of the corresponding enclosed documentation must be observed.
This is vital for safe and trouble-free operation and for achieving the specified product features.

- ▶ Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.
According to IEC 60364 or CENELEC HD 384, these are persons ...
... who are familiar with the installation, assembly, commissioning and operation of the product,
... possess the appropriate qualifications for their work,
... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.

Commissioning

- ▶ If required, you have to equip the system with additional monitoring and protective devices in accordance with the respective valid safety regulations (e. g. law on technical equipment, regulations for the prevention of accidents).
- ▶ Before commissioning remove transport locking devices and keep them for later transports.

2.2**Application as directed**

Low-voltage machines are no household appliances, they are designed as components for industrial or professional use in terms of IEC/EN 61000-3-2 only.

They comply with the harmonised standards of the series IEC/EN 60034.

Low-voltage machines are components for installation into machines as defined in the Machinery Directive 2006/42/EC. Commissioning is prohibited until the conformity of the end product with this directive has been established (follow i. a. IEC/EN 60204-1).

It is only permissible to use low-voltage machines with IP23 protection or less outdoors if special protective measures are taken.

The integrated brakes must not be used as safety brakes. It cannot be ruled out that interference factors which cannot be influenced cause a brake torque reduction.

- ▶ Drives
 - ... must only be operated under the operating conditions and power limits specified in this documentation.
 - ... comply with the protection requirements of the EC Low-Voltage Directive.

Any other use shall be deemed inappropriate!

2.3 Improper use

- ▶ Do not use an inverter
 - ... in explosion-protected areas
 - ... in aggressive environments (acids, gases, steams, dusts, oils)
 - ... under water
 - ... when it is exposed to radiation

2.4 Residual hazards

Protection of persons

- ▶ Do not use the integrated brakes as fail-safe brakes. It cannot be ruled out that certain disruptive factors that cannot be influenced such as oil ingress due to a defective shaft sealing ring at the drive end may reduce the braking torque.

Motor protection

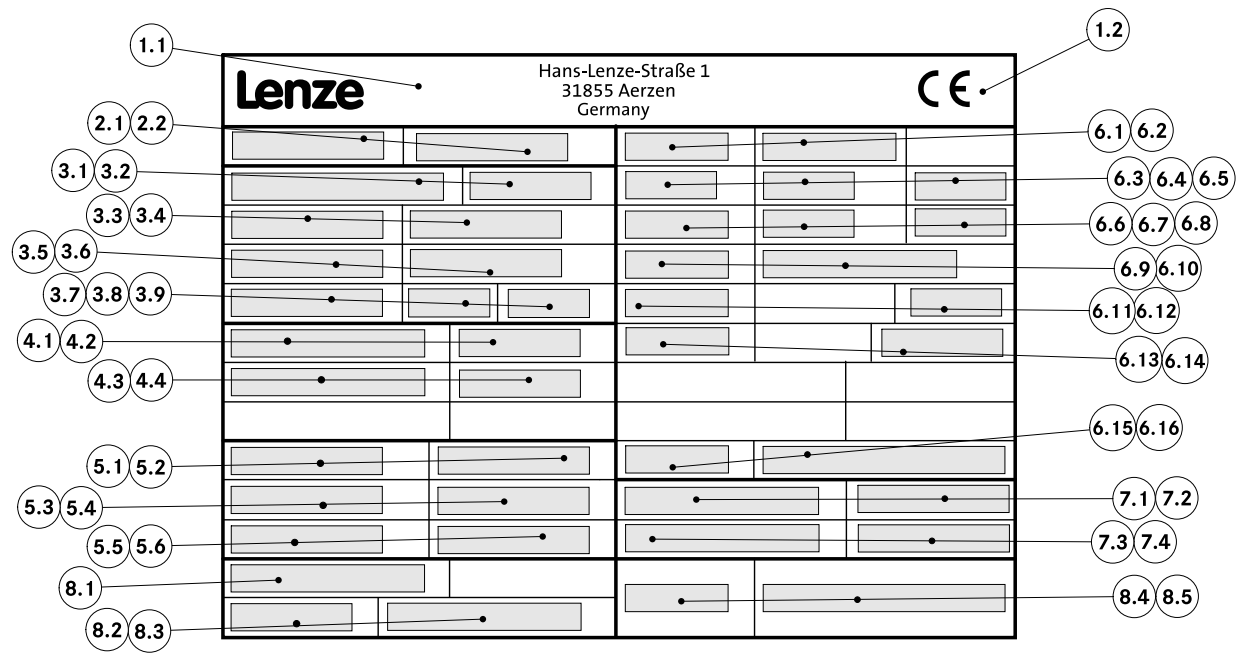
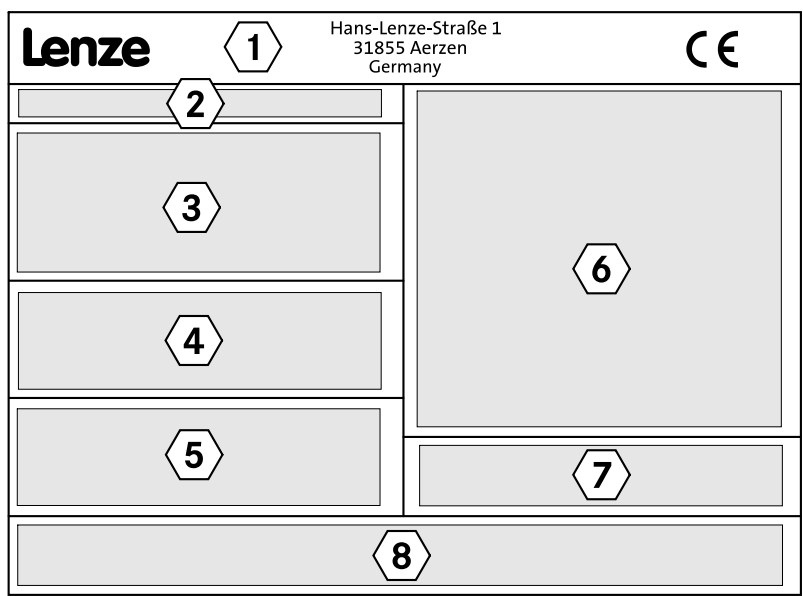
- ▶ Integrated temperature sensors do not provide full protection for the machine. If necessary, limit the maximum current. Parameterise the controller so that the motor will be switched off with $I > I_r$ after a few seconds of operation, especially if there is a risk of blocking.
- ▶ If deviations from normal operation occur, e.g. increased temperature, noise, vibration, determine the cause and, if necessary, contact the manufacturer. If in doubt, switch off the low-voltage machine.
- ▶ Overload protection does not protect against overloading under all conditions.

3 Product description
Identification
Nameplate

3 Product description

3.1 Identification

3.1.1 Nameplate

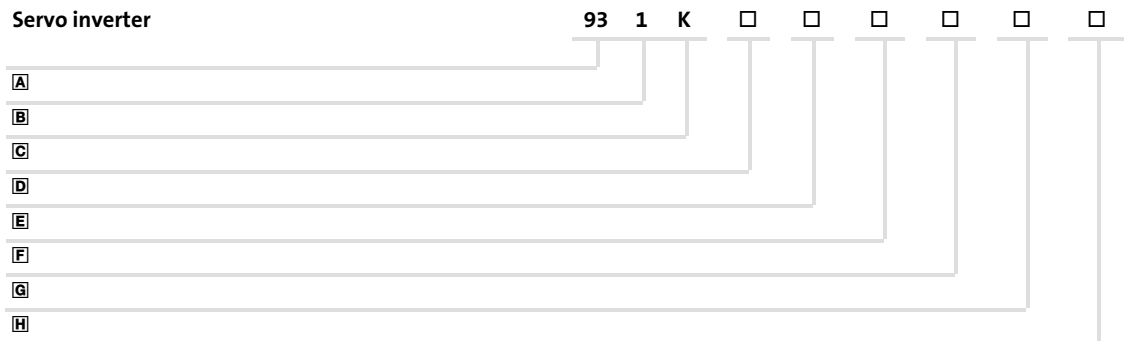


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1	General data		
1.1	Manufacturer		1.2 Valid conformities and approvals
2	Data on the complete drive system		
2.1	Drives		2.2 Type of drive
3	Inverter data		
3.1	Inverter/converter		3.6 Voltage / $I=I_{\max}$
3.2	Type of inverter		3.7 Bus system
3.3	FW		3.8 RS232
3.4	HW		3.9 I/O
3.5	Input		
4	Encoder data		
4.1	Encoder/feedback		4.3 Encoder voltage
4.2	Type of encoder		4.4 Indication of voltage
5	Gearbox data		
5.1	Gearbox		5.4 Ratio
5.2	Gearbox type		5.5 Lubricant
5.3	Torque M_2 [Nm]		5.6 Type of lubricant
6	Motor data		
6.1	Motor		6.9 $n_{\max}$ (mechanical)
6.2	Motor type		6.10 C86 code
6.3	Motor type		6.11 Circuit, rated voltage
6.4	Rated power [kW]		6.12 Rated frequency
6.5	Type of protection		6.13 Rated current
6.6	Rated torque		6.14 Rated speed
6.7	Operating mode		6.15 Winding insulation class
6.8	Cos φ		6.16 Temperature sensor
7	Brake data		
7.1	Brake		7.3 Voltage, current, braking torque
7.2	Type of brake		7.4 Material number
8	Production data		
8.1	Customer order number		8.4 Serial no.
8.2	Year of manufacture		8.5 Bar code
8.3	Ident no. of the drive		

3.1.2

Product key



Legend for the product key

A	Type	93	
B	Power range	1	Up to 600 W
C	Design	K	Compact drive
D	Communication	P C E	Profibus CAN bus EtherCAT
E	Voltage class	K N	Extra-low voltage Low voltage
F	Options	4 5 6	Analog and digital inputs and outputs, 1xM23 19-pole Analog and digital inputs and outputs, 2xM12 8-pole Special "Profibus" application, 1xM23 19-pole
H	Built-on accessories	2 3 4 5	Radial Radial, UL-certified Radial, UL-certified and STO "safe torque off" Radial, STO "safe torque off"

4 Technical data

4.1 General data and operating conditions

General data

Conformity and approval			
Conformity			
CE	2006/95/EC	Low-Voltage Directive	
Approval			
cUL	in process / devices according to UL 1004, UL 508C		
Protection of persons and device protection			
Type of protection	EN 60529	IP54 / IP55	All connectors that are not used have to be closed by means of a protective cap or blanking plugs.
Earth leakage current	EN 61800-5-1	> 3.5 mA	Observe regulations and safety instructions!
Insulation of control circuits	EN 61800-5-1	Safe mains isolation. Reinforced double insulation for digital inputs and digital outputs.	
Cyclic mains switching	Cyclic mains switching of five times in five minutes is fully permissible.		
EMC			
Noise emission	EN 61800-3	Cable-guided, up to 10 m motor cable length: category C2. Radiation: category C3	
Noise immunity	EN 61800-3	Category C3	

Operating conditions

Mounting conditions		
Mounting place		Machine-oriented mounting
Mounting position		No restrictions
Free space		
above/below		≥ 50 mm
to the sides		≥ 50 mm
Vibration resistance (9.81 m/s ² = 1 g)		
Transport	IEC/EN 60721-3-2	2M2
	EN 61800-5-1	2 ... 9 Hz: amplitude 3.5 mm
		10 ... 200 Hz: acceleration resistant up to 10 m/s ² 200 ... 500 Hz: acceleration resistant up to 15 m/s ²
Operation	Germanischer Lloyd	5 ... 13.2 Hz: amplitude 1.0 mm
		13.2 ... 100 Hz: acceleration resistant up to 0.7 g
	IEC/EN 60068-2-6	10 ... 57 Hz: amplitude 0.075 mm 57 ... 150 Hz: acceleration resistant up to 10 m/s ²

Ambient conditions**Climate**

Storage	IEC/EN 60721-3-1	1K3 (deviation: -25 ... +70 °C)
Transport	IEC/EN 60721-3-2	2K3 (deviation: -25 ... +60 °C)
Operation	IEC/EN 60721-3-3	3K3 (deviation: 0 ... +40 °C) > +40 °C: output power is reduced by 2.5%/°C
Cooling		Passively via housing surface and heatsink
Pollution	EN 61800-5-1	Degree of pollution 2
Site altitude		< 1000 m amsl > 1000 m amsl: current derating 5 %/1000 m

4.2

Rated data

... for CE version

Type		931K□K□2		931K□N□2
		24 ... 48 V DC		230 V AC
Input data		Without mains filter		
Supply				
Voltage range	U [V]	19.2 V DC -10 % ...57.6 V DC +0 %		180 ... 264 V AC 50 / 60 Hz
Rated voltage	U [V]	24 V DC	48 V DC	230 V AC
Residual ripple	%	< 5	< 5	< 5
Rated current	I [A]	10	10	2
Maximum current for 2 s	I _{DCmax} [A]	15	15	6
Rated power	P [W]	---	---	500
Rated apparent power	S [VA]	500	500	---
Control supply				
Control current	0.2 A ... 1.0 A			
Control voltage	24 V DC (+/- 10 %)			

... for UL version

Type		931K□K□2	931K□N□2
Control method		Speed, position, torque	
Cycle times	[ms]	1.6	
Current controller	t [μs]	100	
Speed controller		200	
Position controller		400	
Savable positions		64	

Motor

Motor type	Rated voltage [V]	Power [W]	Torque [Nm]	Moment of inertia [kgcm ²]
MRS 08C30	24 DC	120	0.38	0.144
	48 DC	120	0.38	
	230 AC	120	0.38	
MRS 08E30	24 DC	120	0.45	0.216
	48 DC	180	0.55	
	230 AC	180	0.55	
MRS 09E30	48 DC	250	0.80	0.286
	230 AC	250	0.80	
MRS 09G30	48 DC	370	1.20	0.400
	230 AC	370	1.20	
MRS 10F30	230 AC	440	1.40	1.287

4.2.1 Inputs and outputs, 931K bus systems

Interfaces	931K□□□2	931K□N□2
Rated voltage	24 ... 48 V DC	230 V AC
Digital inputs	10	
Digital outputs	4	
Analog inputs	2	
Analog outputs	1	
CAN bus	125, 250, 500 kbaud	
Profibus	9.6 kbaud ... 12 MB	
EtherCAT	COE (CAN over EtherCAT)	

4.3 Performance data of the complete devices

4.3.1 Mains voltage class 24 V DC

Servo inverter	931K□□□2	
Operating mode	s1	
Mechanical output data		
Motor frame size	MRS 08C30K	MRS 08E30K
Motor frame size (old product key)	SDSCS□□ 038-12	SDSCS□□ 038-22
Rated power	[W]	
	120	180
Rated torque	[Nm]	
	0.38	0.45
Maximum starting torque	[Nm]	
	1.5	1.5
Rated frequency	[Hz]	
	100	100
Rated speed	[rpm]	
	3000	3000
Brake	PMB02	
Voltage	[V DC]	
	24 (± 10 %)	24 (± 10 %)
Current	[A]	
	approx. 0.5	approx. 0.5
Holding torque	[Nm]	
	1	1

4.3.2 Mains voltage class 48 V DC

Servo inverter		931K□□□2			
Operating mode		S1			
Mechanical output data					
Motor frame size		MRS 08C30M	MRS 08E30M	MRS 09E30M	MRS 09G30M
Motor frame size (old product key)		SDSCS□□ 038-12	SDSCS□□ 038-22	SDSCS□□ 048-12	SDSCS□□ 048-22
Rated power	[W]	120	180	250	370
Rated torque	[Nm]	0.38	0.55	0.8	1.18
Maximum starting torque	[Nm]	1.5	3.0	4.0	4.0
Rated frequency	[Hz]	100	100	100	100
Rated speed	[rpm]	3000	3000	3000	3000
Brake		PMB02		PMB03	
Voltage	[V DC]	24 (± 10 %)	24 (± 10 %)	24 (± 10 %)	24 (± 10 %)
Current	[A]	approx. 0.5	approx. 0.5	approx. 0.5	approx. 0.5
Holding torque	[Nm]	1	1	2	2

4.3.3 Mains voltage class 230 V AC

Servo inverter		931K□□□2				
Operating mode		S1				
Mechanical output data						
Motor frame size		MRS 08C30L	MRS 08E30L	MRS 09E30L	MRS 09G30L	MRS 10F30L
Motor frame size (old product key)		SDSCS□□ 038-12	SDSCS□□ 038-22	SDSCS□□ 048-22	SDSCS□□ 048-32	SDSCS□□ 058-22
Rated power	[W]	120	180	250	370	440
Rated torque	[Nm]	0.38	0.55	0.8	1.18	1.4
Maximum starting torque	[Nm]	1.5	3.0	4.0	4.0	4.5
Rated frequency	[Hz]	100	100	100	100	100
Rated speed	[rpm]	3000	3000	3000	3000	3000
Brake		PMB02		PMB03		
Voltage	[V AC]	24 (± 10 %)	24 (± 10 %)	24 (± 10 %)	24 (± 10 %)	24 (± 10 %)
Current	[A]	approx. 1	approx. 1	approx. 1	approx. 1	approx. 1
Holding torque	[Nm]	1	1	2	2	4.5

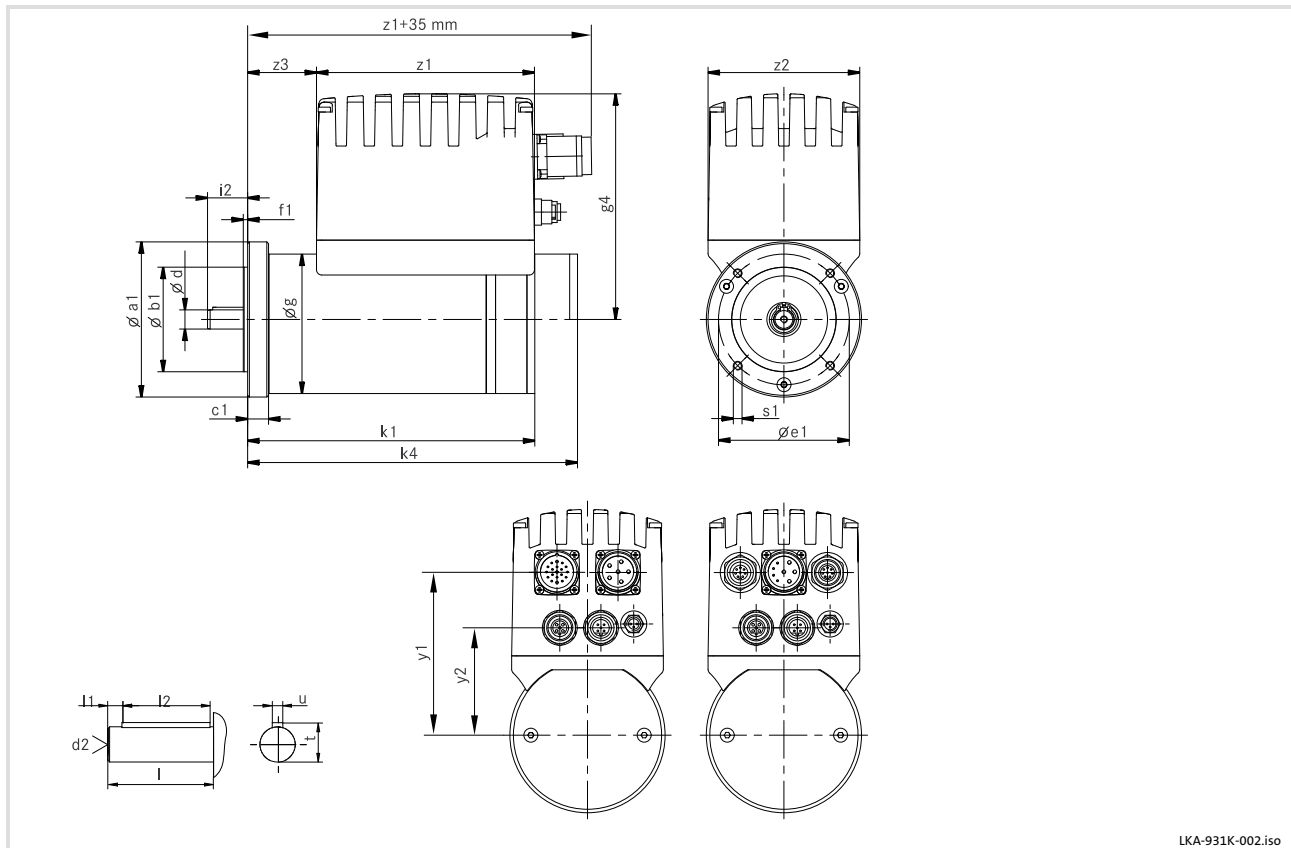
5 Mechanical installation

Dimensions

5 Mechanical installation

5.1 Dimensions

Built-on accessories: absolute value encoder, brake, and permanent magnetic brake



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931K□□ with motor type	Frame size	a1	b1 j7	c1	d k6	d2	e1	f1	g	g4	k1	k1	k4	k4
											RS0B0	SRMB0	RSOP1	SRMP1
MRS 08C30_	IEC56C80	79	50	10	9	M3	65	2.5	75	124.5	123	145	165	188
MRS 08E30_		79	50	10	9	M3	65	2.5	75	124.5	138	160	180	203
MRS 09E30_	IEC63C90	89	60	12	11	M4	75	2.5	85	129.5	145	167	187	210
MRS 09G30_		89	60	12	11	M4	75	2.5	85	129.5	165	187	207	230
MRS 10F30_		94.5	60	12	11	M4	75	2.5	85	137.5	160	182	202	235

931K□□ with motor type	Frame size	i2	l	l1	l2	s1	t	u	y1	y2	z1	z2	z3
MRS 08C30_	IEC56C80	20	20	3	14	M5	10.2	3	88.3	56.6	125	87	26
MRS 08E30_		20	20	3	14	M5	10.2	3	88.3	56.6	125	87	13
MRS 09E30_	IEC63C90	23	23	3	18	M5	12.5	4	93.3	61.6	125	87	20
MRS 09G30_		23	23	3	18	M5	12.5	4	93.3	61.6	125	87	40
MRS 10F30_		23	23	3	18	M5	12.5	4	101.3	69.6	125	87	35

Tab. 1 Dimensions, specified in mm; Observe additional space for bend radii and counter plugs

RS0B0	Resolver without brake
SRMB0	Absolute value encoder without brake
RS0P1	Resolver with permanent magnet brake
SRMP1	Absolute value encoder with permanent magnet brake

**Stop!**

The drive controller contains electrostatically sensitive components.

The personnel must be free of electrostatic charge when carrying out assembly and service operations.

**Danger!**

- ▶ The connection of all pluggable terminals has to be effected in a deenergised state.
- ▶ Connecting and disconnecting the voltage supply (X2) due to the charging processes of the DC bus capacitor may cause traces of burning on the plug-in connection, and may result in a destruction of the internal electronic circuit.
- ▶ A false polarity of the DC supply can bring about the destruction of the drive. Before switching the drive on, ensure that the polarity of the DC supply is correct.

**Note!**

For trouble-free operation, the following conditions are required:

- ▶ An installation according to EMC.
- ▶ The feeding power supply units have to be sufficiently dimensioned. The power supply units have to be protected against overcurrent by means of appropriate input fuses.

6.2 Installation according to EMC (installation of a CE-typical drive system)

6.2.1 Important notes

The drives comply with the EC Directive on "electromagnetic compatibility" if they are installed according to the specifications of a CE-typical drive system. The user is responsible for the compliance of their application with the EC Directive.

The electromagnetic compatibility of a machine depends on the type of installation and the care taken. Please observe:

- ▶ Assembly
- ▶ Shielding
- ▶ Grounding

Shielding

- ▶ Only use shielded cables with braids of tin-plated or nickel-plated copper. Shields of steel braid are not suitable.
 - The overlap rate of the shield braid has to be at least 70 % at an overlap angle of 90 °.
- ▶ Applying the shield correctly:
 - The shield connection is established via the connection plug.
 - Always apply the shield of the cable double sided - on the controller and on the motor.
- ▶ From a length of 200 mm, only use shielded cables for the control cables. Below a length of 200 mm, unshielded but twisted cables can be used.
- ▶ Applying the shield correctly:
 - The shield connection is established via the connecting plugs.
 - For cables for the digital inputs and outputs, apply the shield double sided.

Earthing

Ground all metallically conductive components (controller, motor filter) using suitable cables connected to a central earthing point (PE bar).

Maintain the minimum cross-sections prescribed in the safety regulations:

- ▶ With regard to EMC, however, not the cable cross-section is important, but the surface of the cable and the contact with a cross-section as large as possible, i.e. large surface.

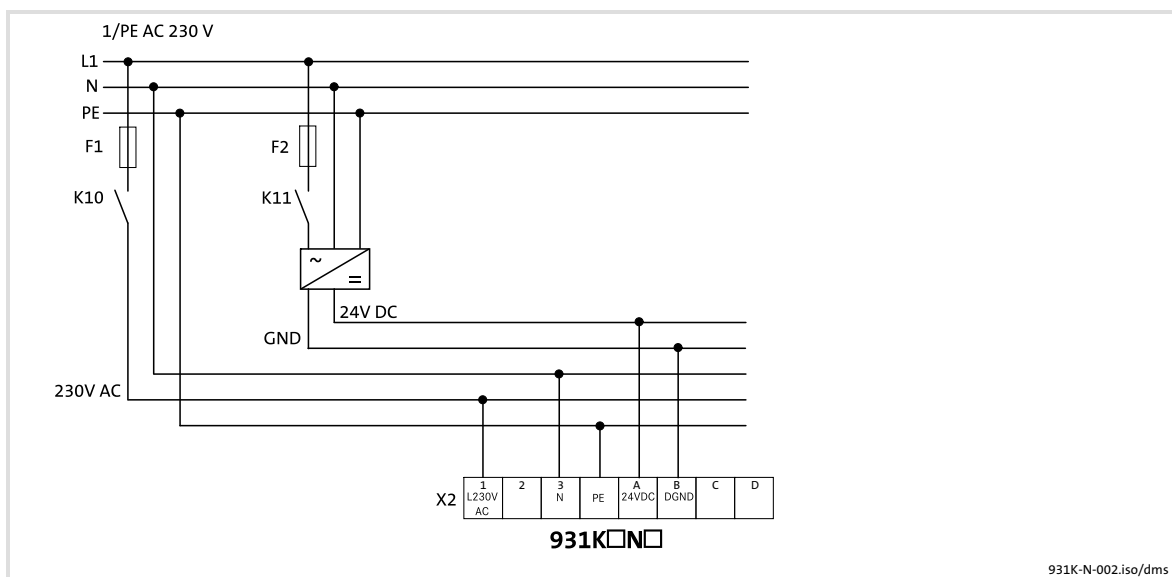
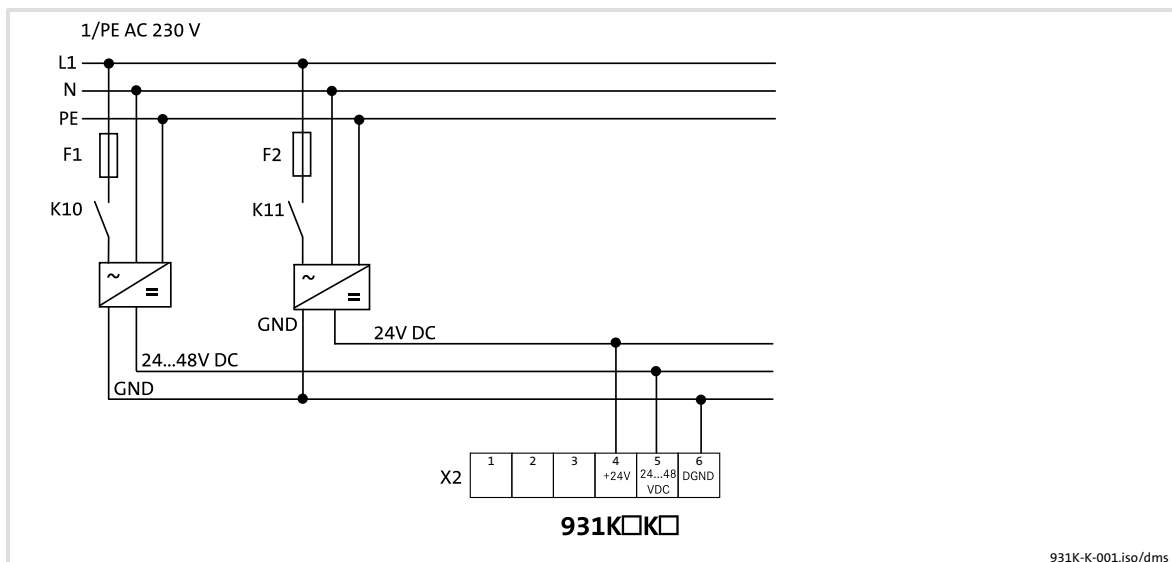


Note!

In order to ensure a perfect operation, we recommend the use of Lenze system cables.

6.2.2**Connection plan**

The following structure is required for compliance with the EMC directives (IEC 61800-3):



6.3 Voltage supply

The drive controller requires two voltage supplies on X2 for the operation:

- ▶ the control voltage (24 V DC) for the supply of the internal processors as well as of the digital outputs, and - if available - the holding brake.
- ▶ the supply voltage of the power unit with 24 V or 48 V DC

Both voltages have the same reference potential in the drive controller. They are not isolated. The connections for the control voltage and the supply voltage of the power unit are equipped with polarity protection and are additionally secured by means of a fuse or by a polyswitch in the drive.



Danger!

Für die Steuerspannung (24 V DC) und die Versorgungsspannung (24 V DC ... 48 V DC) müssen 2 separate DC-Netzteile verwendet werden.



Note!

Wird das Leistungsteil ebenfalls mit 24 V DC betrieben, können Sie unter folgenden Bedingungen ein gemeinsames 24 V DC-Netzteil verwenden:

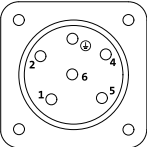
- ▶ Das 24 V DC-Netzteil muss hochdynamisch und stabil sein und auch bei schnellen Stromänderungen (z. B. 30 A in 0.5 ms) ohne Spannungseinbruch den geforderten Strom bereitstellen. Berücksichtigen Sie hierbei ist auch das Verhalten weiterer Lasten, die im DC-Versorgungsnetz integriert sind (z. B. ein weiterer Antriebsregler). Ferner muss das Netzteil bezüglich des maximalen Stroms ausreichend dimensioniert sein.
- ▶ Bei längeren DC-Versorgungsleitungen müssen Sie Stützkondensatoren zwischen UL und GND schalten, um die Versorgungsspannung zu stabilisieren. Sie können die Stabilität der Versorgungsspannung mit dem in der Parametriersoftware integrierten Oszilloskop leicht überprüfen.

6.4 Power connections 931K□N

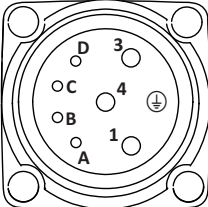
X1 RS232

Contact pattern	Pin no.	Signal
	1	TxD
	2	GND (ground)
	3	RxD

X2 voltage supply 24 / 48 V DC

Contact pattern	Pin no.	Value	Specification
	1	DOUT0	DOUT0 [0 / 24 V DC, max. 20 mA]
	2	DIN9: controller enable	Controller enable [0 ... 24 V]
	3	PE	Earth and shielding
	4	+ 24 V DC	Control voltage
	5	+ 24 ... + 48 V DC	DC-bus voltage
	6	DGND	DGND

X2 voltage supply 230 V AC

Contact pattern	Pin No.	Value	Specification
	1	N / 230 V AC	Mains phase
	4	-----	-----
	3	L / 230 V AC	Mains neutral conductor
	⊕	PE	Earth and shielding
	A	+ 24 V DC	Control voltage
	B	DGND	Reference potential for digital inputs
	C	DIN9: controller enable	Controller enable [0 ... 24 V]
	D	DOUT0	DOUT0 [0 / 24 V DC, max. 20 mA]

6.5 Communication connections

X4.1 / X4.2 PROFIBUS

Input contact pattern	Pin no.	Signal	Specification
	1	VP	Power supply plus (5 V)
	2	RxD/TxD-N	Receive / Transmit data -N (A line)
	3	DGND	Data Ground (reference potential to VP)
	4	RxD/TxD-P	Receive / Transmit data -plus (B line)
	5	Shield	Shield
Output contact pattern	Pin no.	Signal	Specification
	1	VP	Power supply plus (5V)
	2	RxD/TxD-N	Receive / Transmit data -N (A line)
	3	DGND	Data Ground (reference potential to VP)
	4	RxD/TxD-P	Receive / Transmit data -plus (B line)
	5	Shield	Shield

X4.1 / X4.2 CAN bus

Input contact pattern	Pin no.	Signal	Specification
	1	CAN_SHLD	CAN_Shield
	2	-----	Reserved
	3	CAN_GND	CAN_Ground
	4	CAN_H	CAN_HIGH (high is dominant)
	5	CAN_L	CAN_LOW (low is dominant)

X4.1 / X4.2 EtherCAT

Contact pattern	Pin no.	Signal	Specification
	1	Tx+	Transmission data +
	2	Rx+	Receive data +
	3	Tx-	Transmission data -
	4	RX-	Receive data -

6 Electrical installation

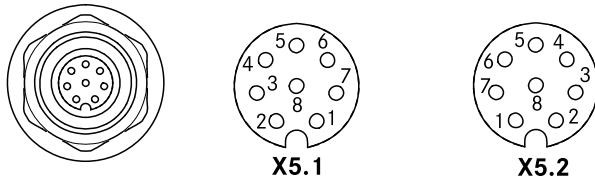
Control terminals

Plug M12, 8-pole

6.6 Control terminals

6.6.1 Plug M12, 8-pole

X5.1/X5.2 inputs and outputs ¹⁾



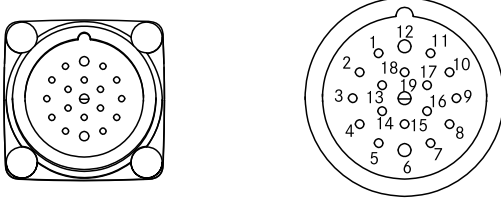
1) Only in conjunction with EtherCAT and 230 V AC

X5.1 input			
8-pole plug	Signal	Function	Technical data
1	DIN 4	Digital frequency In A-Line[0...24 V]	24V (8V...30V) active high according to EN 1131-2 $f_{\text{Limit}} = 5 \text{ kHz}$, $R_{\text{input}} = 13.3 \text{ k}\Omega$ and $C_{\text{input}} = 4.7 \text{ nF}$
2	DIN 5	Digital frequency In B-Line[0...24 V]	
3	DOUT 0	Operating status	24 V DC, max. 20 mA
4	DIN 1 / AIN0"-"	[0...24 V]	$\pm 10 \text{ V}$ voltage range, 12-bit resolution (differential), <250 μs delay max. 30 V DC
5	DIN 2 / AIN1	[0...24 V]	
6	DIN 3 / AIN1"-"	Controller enable (identical to X2 PIN C)	
7	DGND	Reference potential for digital inputs	
8	+24 V DC	Control voltage	24 V DC ($\pm 20 \%$) / 0.20 A

X5.2 output			
8-pole socket	Signal	Function	Technical data
1	DOUT 1	Digital frequency OUT A-Line [24 V DC, max. 20 mA]	24V DC, max. 20 mA > 100 kHz, $R_{\text{Load}} = 1 \text{ k}\Omega$, $C_{\text{Load}} = 1 \text{ nF}$
2	DOUT 2	Digital frequency OUT B-Line [24 V DC, max. 20 mA]	
3	DIN 6	[0...24 V]	24V (8V...30V) active high according to EN 1131-2
4	DIN 7		
5	DIN 8		
6	AMON 0	Analog output [0...10 V; 2 mA]	0 V ... 10 V, 8-bit resolution, $f_{\text{Limit}} \approx 1 \text{ kHz}$
7	DGND	Reference potential for digital inputs	
8	+24 V DC	Control voltage	24 V DC ($\pm 20 \%$) / 0.20 A

6.6.2 Plug M23, 19-pole

X5.1 inputs and outputs



19-pole plug	Signal	Function Operating modes			Technical data
		Speed	Torque	Position	
1	AIN 0"-"/ DIN 1	Jog setpoint 2 / AIN 0 -		Selection of position / path program	± 10 V voltage range, 12-bit resolution (differential), <250 µs delay max. 30 V DC
2	AIN 1 / DIN 2	Reversal of rotation direction / AIN 1 -			
3	"-"AIN 1 / DIN 3	Jog setpoint 2 / "-"AIN 1			
4	DIN 4	Incremental encoder input A			
5	DIN 5	Incremental encoder input B		Selection of position / path program	24V (8V...30V) active high according to EN 1131-2 Incremental encoder input limit frequency fLimit = 50 kHz
6	Profibus B (for 931KP□□□) / on request				
7	DIN 7	Negative limit switch			24V (8V...30V) active high according to EN 1131-2
8	DIN 8	Positive limit switch			
9	DIN 9	Controller enable / acknowledgement			
10	DGND	Reference potential for digital inputs			
11	+24 V	Control voltage			24 V DC (± 20%) / 0.2 A
12	A (for 931KP□□□) / on request				
13	AIN 0 / DIN 0	Delete error / AIN 0+		Selection of position / path program	± 10 V voltage range, 12-bit resolution (differential), <250 µs delay max. 30 V DC
14	DOUT 0	Readiness for operation			24 V DC, max. 20 mA > 100 kHz, RLoad = 1 kΩ CLoad = 1 nF
15	DIN 6	Quick stop		Start position	
16	AMON 0	Freely parameterisable			± 10 V voltage range, 12-bit resolution (differential), <250 µs delay max. 30 V DC
17	DOUT 1	Freely parameterisable			24 V DC, max. 20 mA > 100 kHz, RLoad = 1 kΩ CLoad = 1 nF
18	DOUT 2				
19					

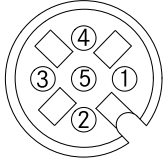
6 Electrical installation

Anschluss STO
Stecker M12, 5-polig, A-codiert

6.7 Anschluss STO

6.7.1 Stecker M12, 5-polig, A-codiert

X61 Ein- und Ausgänge



Pin	Anschluss	Beschreibung
1	STO1	Steuereingang 1 (SIA Sicherer Eingang, Kanal A) für die Funktion STO
2	STO2	Steuereingang 2 (SIA Sicherer Eingang, Kanal B) für die Funktion STO
3	REL1	Schließerkontakt für Rückmeldung STO an externe Steuerung
4	REL2	Schließerkontakt für Rückmeldung STO an externe Steuerung
5	frei	Optional für GND

7 Safety engineering

7.1 Application as directed

The servo positioning controllers of the 931K series support the implemented „safe torque off (STO)“ safety function in accordance with the requirements of the DIN EN ISO 13849-1 standard. Furthermore the „Additional requirements for electrical drive systems according to DIN EN 61800-5-2“ testing principle has been taken into consideration.

Safety performance indicators

- ▶ Category / performance level :
 - Category 3, / performance level e
- ▶ PFH value; probability of hazardous failure per hour
 - $PFH = 4.45 \cdot 10^{-8} / h$



Note!

- ▶ The values given are only achieved under the following condition:
 - Regular testing of the STO function, at least once a week, by the master control, if this is not carried out anyway for process-related reasons, every time the machine / system is switched on.



Stop!

Uncontrolled movement

Shutdown of the machine must be effected and ensured via the machine control. This applies in particular to vertical axes without self-locking mechanics or counter weight. For vertical axes, generally further safety measures must be implemented.

According to a hazard analysis / an assessment of risk carried out in accordance with the Machinery Directive 2006/42/EC or the corresponding standards, the machine manufacturer must project the safety system for the entire machine by taking into account all components implemented. These also include the electrical drives. The requirements with regard to control systems, i.e. the performance level to be selected, results from the magnitude of risk.

The „Safe Torque Off (STO)“ function does not provide electrical isolation. Thus it is not a protective function against electric shock. Therefore, in a normative sense, an emergency switching off device cannot be implemented with „Safe Torque Off (STO)“, since this requires switch-off of the whole system via the system disconnecting device (main switch or mains contactor).

For the shutdown, the EN 60204-1 standard describes three stop categories which can be used depending on a risk analysis.

- ▶ Stop category 0
 - Uncontrolled shutdown by immediately switching off the power. Emergency off or emergency stop
- ▶ Stop category 1
 - Controlled shutdown and switching off of the power when standstill has been reached, emergency stop
- ▶ Stop category 2
 - Controlled shutdown without switching off the power at standstill. Not suitable for emergency off or emergency stop.

7.2 Integrated "Safe Torque Off (STO)" function



Danger!

The „Safe Torque Off“ function does not offer protection against electric shock but only against hazardous rotary motions!

7.2.1 General information regarding the STO function

Performance features:

- ▶ Achieving the „Safe Torque Off“ (STO) function.
- ▶ Potential-free feedback contact for the operating status and diagnostics.
- ▶ The STO function is implemented on the standard device.
- ▶ With a suitable external safety switching device and suitable wiring of the 931K standard device, the "Safe stop 1" function (SS1) can be implemented.

There are 3 practical measures for implementing "STO":

- ▶ Contactor between the mains and drive system (mains contactor).
- ▶ Contactor between the power section and drive motor (motor contactor).
- ▶ Safe pulse inhibit (inhibit of the power semiconductor pulses, implemented in the 931K inverter).

The use of the integrated solution (safe pulse inhibit) produces several advantages:

- ▶ Less external components, e.g. contactors,
- ▶ Less wiring complexity and space requirement in the control cabinet,
- ▶ Lower costs,
- ▶ An improved availability of the machine / system.

Detailed features of the control inputs X61 (STO1, STO2)					
Pin	Specification	[Unit]	Min.	Typ.	Max.
STO1	Low signal	V	-3	0	+3
	High signal	V	17.2	24	28.8
	Tolerated test pulse, max.	ms	2.5	4	4
	Switch-off time	ms	5	---	10
	Running time	ms	5	---	10
	Input current	mA	0.5	---	1
STO2	Low signal	V			
	High signal	V			
	Tolerated test pulse	ms	2.5	4	4
	Switch-off time	ms	55	---	60
	Running time	ms	10	---	15
	Input current	mA	25	---	30
GND	Ground for STO1/STO2				
	Supply voltage by a safely separated power supply unit (SELV/PELV)	V	19.2	24	28.8
Input voltage threshold	Switch-on	V			17
	Switch-off	V			15.5

Detailed features of the feedback contacts X61 (REL1, REL2)					
Pin	Specification	[Unit]	Min.	Typ.	Max.
REL1, REL2 Potential-free relay contact, NO contact	Feedback contact				
	Contact voltage range (DC)	V	< 30		60
	Rated current (not short-circuit-proof)	mA	< 200		
	Voltage drop	mV	< 200		
	Operating time, closing	ms	< 1		
	Operating time, opening	ms	< 0.5		
	Residual current (contact open)	A			1

8 Commissioning

8.1 Before switching on



Stop!

Avoid injury to persons and damage to material assets during commissioning!

- Necessarily observe the switch-on sequence.
- During the resolver adjustment, the drive has to be able to rotate freely without load!



Tip!

For faults during commissioning, see chapter Troubleshooting and fault elimination. (📖 40)

Before the first commissioning and before commissioning after longer downtimes, check:

Check	Checked
Have all necessary electrical connections been established?	
Are there no short circuits and earth faults?	
Are all plug connections fixed?	
Are all plugs secured with the bolted connections specified for this purpose?	
Are all bolted connections tightened?	
Are control voltage and power supply connected with the right polarity?	
Are the output voltages of the power supply units set correctly? +24 V DC for the control	
+24V DC or +48 V DC for the power supply	
Is the shield of the motor cable and that of the feedback cable correctly applied?	
Are the correct signals assigned to the digital inputs and outputs? Are at least DIN9 (controller enable), DIN6 (start positioning) assigned?	
If limit switches are connected, are they connected to DIN7 and DIN8?	
If you use the analog inputs for the setpoint selection or for torque limitation Are the correct signals assigned to the analog inputs?	
Is the voltage for the analog inputs settled in the permissible range 0 ... 10 V?	

8.2

Initial switch-on



Note!

The described terminal assignment complies with the delivery status. You can alter the terminal assignment via the operating software.

(🔗 software manual 931 E/K)



Tip!

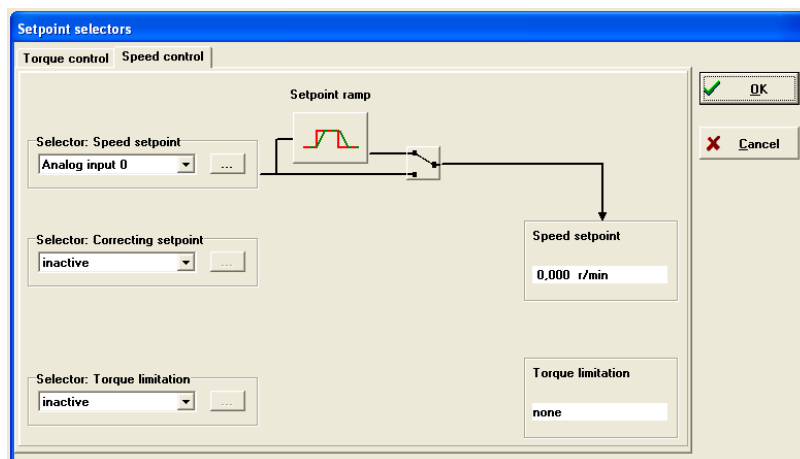
The windows to the individual menu items in the »Small Drive Control (SDC)« parameterisation software remain open after you have entered and adopted changes.

Close the windows when you have edited a menu item, so that the monitor operations remain clearly visible.

Before the drive is started, a couple of basic settings are required during initial commissioning.

Basic settings:

1. Use a null modem cable to connect the serial interfaces on the controller and on the PC.
2. Switch on the control voltage **but not the power supply** yet!
3. Start the »Small Drive Control (SDC)« parameterisation software.
 - If you cannot establish a connection between the PC and the controller, check the settings of the serial interface on the PC (📖 software manual).
 - If the communication is troubled, a message will be displayed.
4. Select the "Speed control" operating mode in the "Communication" window.
5. Assign the setpoint sources in the "Operating mode → Setpoint selectors..." menu:
 - Analog speed setpoint (± 10 V DC) via AIN0



931E_013

6. Parameterise the analog terminals in the "Parameter → I/Os... → Analog inputs" menu:
 - Here, the setpoint value is assigned to the voltage level.
 - Use the offset to adjust the potentiometer.
 - Use the "Safe zero" slider to define a range in which it is safe for the motor to stand still.

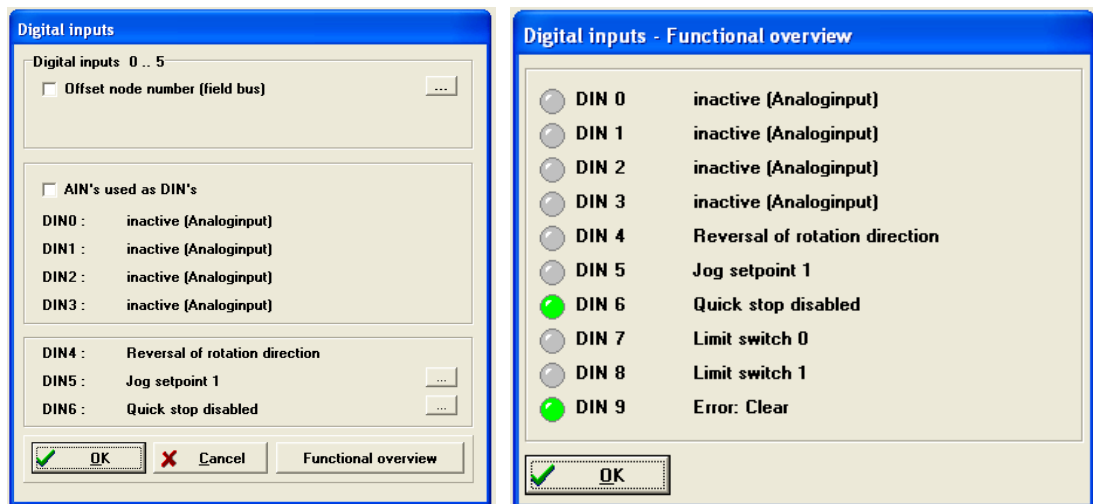
The screenshot shows the 'Analog inputs' configuration window for AIN1. The window has a title bar 'Analog inputs' and two tabs: 'AIN0' and 'AIN1'. The 'AIN1' tab is selected. Below the tabs is the 'AIN0 - Scaling' section. It contains the following parameters:

- An input voltage of +10 V corresponds to ...**
 - Torque setpoint / Torque limitation: 7,07 A
 - Speed setpoint / Correcting setpoint: 3000,000 r/min
- Offset:** 0,00 V
- Safe Zero:** 0,00 V

Each parameter has a text input field and a corresponding green display box. The 'OK' button is at the top right, and the 'Cancel' button is below it.

931E_012

7. Parameterise the digital terminals in the "Parameter → I/Os... → Digital inputs" menu.
 - See terminals from page 48 for terminal assignment
 - The analog inputs must not be configured as digital inputs. Therefore, ensure that "AINs used as DINs" has not been selected in the "Parameter → I/Os → Digital inputs" menu! Otherwise, the analog setpoint cannot be evaluated.
 - The "Functional overview" menu item displays the function of the digital inputs. Check the correct function here.
 - Software manual 931E/K provides information on how to configure analog inputs as digital inputs.



931E_011

8. Set the threshold for undervoltage detection in the "Parameter → Device parameter → DC-bus monitoring..." menu.
 - Set the threshold depending on the application and the supply voltage (e.g. 16 V with a 24 V DC power supply).
 - DIN9 = LOW
9. Switch on the power supply.
10. Check the system for pending error messages.
 - Remedy and acknowledge the errors first or change the error management.
11. Ensure that the drive is able to rotate unloaded!



Note!

If you select a Lenze servo motor from the motor database, the current control parameters are already optimised.
If required, minor changes must be made to the parameters to adjust them to your application.

12. Click the "Save Parameter" icon in the menu bar to save the settings to the EEPROM of the controller with mains failure protection.

The settings are complete.

You can now start the drive.

How to start the drive:

13. Specify a speed setpoint at AIN0.
14. Enable the controller.
 - DIN9 = HIGH
15. The drive is now working in speed-controlled operation.



Detailed information is provided in software manual 931E/K.

9

Troubleshooting and fault elimination

9.1

Fault elimination for general errors

Error	Cause	Remedy
No communication with drive possible	Supply voltage error	Check connections and supply of the control and power voltage.
	Communication error or defective RS232 communication cable	Check setting of the COM port in Fluxx operating software Check connection of the serial RS232 cable Replace RS232 cable (cable defect)
Digital IOs do not function	24 V control voltage not connected	Connect 24V control voltage / check control voltage
Local CAN interface or function module does not function	24 V control voltage not connected (LED on application box/function module is not blinking)	Connect 24V control voltage / check control voltage Check 4-pole communication cable between drive and application box
	Communication error or defective communication cable	Replace 4-pole communication cable between drive and application box
	Wiring error	Check of the connection of the digital IOs
Drive travels with maximum speed only	Resolver error or connection error in the motor cable	Carry out resolver position adjustment Select the option "Resolver direction inversion" in the "Service" tab Exchange of 2 phases of the connection (e. g. "V/U/W" instead of "U/V/W")
Fieldbus has parameter change rights	A higher-level control (e. g. Profibus S7) has the access authorisations to the drive	Return parameter change rights to the drive Separation of the guiding from the bus by means of the "Quick stop" button in the Fluxx on the "Status" tab (caution: drive stops, bus system is deprived of control change rights)
Communication loss when travel tasks are started	Power supply (specifically for DC drives) is dimensioned too low.	Use voltage supply with higher output power Check mains supply with regard to voltage dips

9.2 Error message

Various monitoring functions protect the drive against impermissible operating conditions. If a monitoring function responds, a corresponding response for protection of the drive is triggered. The following is monitored:

- ▶ Output stage temperature
- ▶ Motor temperature
- ▶ I2t-monitoring of the motor
- ▶ Overcurrent / short circuit of the output stage
- ▶ DC-bus voltage (undervoltage and overvoltage)
- ▶ Following error in the position control
- ▶ Homing errors
- ▶ Errors in the angle sensor system
- ▶ Communication errors
- ▶ Initialisation errors
- ▶ Checksum errors of the parameters
- ▶ STO functionality (plausibility check and discrepancy time monitoring)

Some responses to failures can be set in the SDC parameterisation software. Possible responses are:

Reaction	Meaning	Reaction of the drive
A	Immediate disconnection of the output stage	The motor coasts.
H	Emergency stop	The motor is braked to zero speed at the current limit. If there is a motor holding brake, it is applied. The output stage switches off.
W	Warning	The controller keeps operating, the output stage remains switched on. The warning signal can be read out via the CAN bus or via the serial RS232 interface.
O	Off	The warning signal is inhibited - no response.

Used symbols:

Symbol	Meaning
☑	Default setting
☐	Response parameterisable in SDC
-	Selection not possible

Response				Cause	Remedy
A	H	W	O		
☒	-	-	-	Inconsistent parameter set	Use the parameterisation software to check the parameter set of the drive (🔗 software manual 931E).
☒	☐	☐	☐	I ² t error	- Adapt the i²t time of the motor. (🔗 software manual 931K) - Perform resolver position adjustment. (🔗 software manual 931K) - Check set motor data. (🔗 software manual 931K) - Optimise controller settings. (🔗 software manual 931K) - Adapt travel profile (e.g. adapt acceleration ramps). - Reduce load torque of the motor.
☒	☐	☐	☐	Position control - following error	- Optimise controller settings for better running smoothness. (🔗 software manual 931K) - Adapt travel profile (e.g. reduce acceleration/deceleration ramps). (🔗 software manual 931K) - Increase following error window / switch-in delay. (🔗 software manual 931K)
☒	-	-	-	Resolver or sin/cos encoder error, certain detection not possible until approx. ½ motor revolution has been performed	- Check resolver plug for correct position. - Check resolver cable for cable break and short circuit. - Check the pin assignment of the plug of the resolver cable. - Ensure correct parameterisation of the encoder. (🔗 software manual 931K)
☒	-	-	-	Overvoltage in the DC bus > 70 V	- Check the power supply unit for correct functioning and if the supply voltage of the power section is in the permissible range (19.2 V DC ... 57.6 V DC). - Reduce the slope of the deceleration ramp. (🔗 software manual 931K) - Connect the external brake resistor to X2. - Check if other devices connected to the DC supply of the power section have caused this overvoltage.
☒	-	-	-	Overcurrent / short circuit	Check the motor cable and motor phases for phase leakage and short circuit
☒	-	-	-	System error	Switch off the control voltage and then switch it on again. If the error occurs again, send the device in.
☒	☐	-	-	Controller overtemperature	- Check the correct mounting in the control cabinet: - Position the heatsink over a large surface on the housing of the control cabinet. - Are there more installed heat sources in the proximity of the controller which result in an increased ambient inverter temperature? - Check if the ventilation slots of the controller are contaminated or blocked. Clean if necessary. - Optimise controller settings (unfavourable settings result in unnecessary heating). (🔗 software manual 931K) - Check resolver position adjustment. (🔗 software manual 931K) - Reduce load torque of the motor.

A	Response			Cause	Remedy
	H	W	O		
☒	☐	☐	☐	Motor overtemperature	• Check if the cooling of the motor via the motor housing is impeded due to deposits etc. (clean the motor if necessary). • Are there more heat sources in the proximity of the motor that result in an increased local ambient temperature and thus contribute to reduced heat dissipation? • Check controller settings, unfavourable settings result in unnecessary heating. (🔗 software manual 931K) • Reduce load torque of the motor. • Check thermal sensor settings. • Check resolver/encoder cable for open circuit. • Check resolver position adjustment (🔗 software manual 931K).
☒	☐	☐	☐	DC-bus undervoltage	• Check DC-bus voltage, adapt undervoltage trigger threshold if necessary. (🔗 software manual 931K)
☐	☐	☒	☐	MMC not plugged-in	• Check MMC (Multi Media Card) settings. • Plug-in MMC. • Use the parameterisation software to change the error management settings.

9.3

Fault elimination for known error message (see Fluxx, "Status" tab)

Error message	Cause	Remedy
DC-bus voltage under-run	DC-bus voltage too low	Check supply voltage. For DC supply voltages where the DC source features a dynamic that is too high, or where it is too limited due to the maximum current, the maximum torque and the accelerations have to be reduced
Brake voltage beyond the tolerance range	Supply voltage of the brake beyond the tolerance range	The brake voltage is displayed in the "Status" tab under "Brake voltage" Check setting in the "Service" "Brake/voltage range" tab (setting range 18...32V). Observe the correct polarity of the supply voltage!
Motor temperature exceeded	Evaluation of thermal detector has actuated	Motor temperature too high Incorrect or no thermal detector (931W) Incorrect values in the "Motor temperature, speed and position value" field: feedback connection between motor and inverter interrupted.
Electronic temperature exceeded	Temperature of the electronics too high, cooling not sufficient, utilisation of the electronics too high	Check ambient conditions of the electronics ($T_{\text{ambient}} < 40^{\circ}\text{C}$?) Clean heatsink Check mounting clearances (50 mm to all sides) Remove further heat sources near the drive Reduce load of the drive (reduce accelerations, reduce max. torque) Carry out resolver position adjustment
DC-bus voltage exceeded	DC-bus voltage exceeded, braking energy too high	Check braking accelerations and slowing-down process, and, if required, reduce braking accelerations At 24 V/42 V DC-power supply: use feedback-supplying power supply unit
Quick stop	A quick stop has been effected	Check cause (digital input, bus system control,...) Eliminate error cause, acknowledge error
Drive not referenced	Drive not referenced / reference run has to be carried out	For positioning: carry out reference run Select the following setting for speed, following error or torque control in the "Referencing" tab to avoid reference run: – Reference type "none" – Reference start: power up – Absolute resolver position: -1
Motor current exceeded	Motor is defective (earth fault or phase leakage), output stage is short-circuited	Output stage and / or motor of the drive is defective, return drive to manufacturer
Travel data set not executable	Settings in travel data set not conflict-free	Check of the settings in the "Travel data set" tab Check of the software limit switch ("System" tab, use software limit switch for positioning only! Check on whether the positioning target is beyond the software limit switches

Error message	Cause	Remedy
Definition of software limit switch	Error concerning the definition of the software limit switch	Check on whether left software limit switch < right software limit switch Consider positive direction ("System" tab) as well as possible gearbox direction inversion ("Service" tab) Check settings of the software limit switches
Drive inhibited	Mechanical load too high (output shaft inhibited)	Check mechanical load Check and, if required, increase maximum torque in the "Service", "Controller" and "Travel data set" tabs
	Brake in the "Service" tab is not selected/not released	Check setting of the mechanical brake (recommendation: 150 ms for disengagement and engagement time) Check function of the brake (releasing and disengaging of the brake has to be audible). In case of faulty behaviour, address the manufacturer
	Connection error in the motor cable	Select the option "Resolver direction inversion" in the "Service" tab Exchange of 2 phases of the connection (e. g. "V/U/W" instead of "U/V/W")
	No resolver position adjustment	Carry out resolver position adjustment ("Service" tab)
Internal error	Internal error	Output stage of the drive is defective, return drive to the manufacturer
Position encoder	The feedback system indicates an error	Return the drive to your sales partner

9.4

Fault elimination for errors / problems with regard to the handling of bus systems

In order to be able to search for and eliminate errors and faults with regard to installation and commissioning more easily, the display window "Display fieldbus" under the "Service" tab of the operating program is provided to you. If you observe the drive in the "Online level 1", you can at the same time observe the control and status word of the drive and read and communication objects and write to them (see Profibus, CAN bus Manual). Please observe the access authorisations. If the operating program accesses to the drive within a higher level (e.g. level service), the bus system is inhibited.

Error	Cause	Remedy
Communication faults	Bus plug not properly attached by snap mechanism or incorrectly connected	Ensure faultless mounting of the bus plugs
	Missing bus terminating resistors	Check the terminating resistors of your system
	Bus address incorrectly set	Check the bus addresses of the nodes by using the software (see Manual)
	Baud rate of one or several nodes incorrectly set	Check the baud rate of the nodes by using the software (see Manual)
Last node does not log on on the bus system.	Input and output interchanged. In addition, terminating resistor activated. The terminating resistor interrupts the bus system to the output (X4.2)	Use input (X 4.1) for connecting the bus system (see Manual)
Nodes after a drive do not log on on the bus system	Terminating resistor activated in the wrong place. The terminating resistor interrupts the bus system to the output (X4.2)	Deactivate terminating resistor of the interrupting drive
Voltage error when connecting the supply voltage	First the control voltage (24V), and afterwards the power voltage (24, 42, 230 or 320 V) has been connected	Observe switch-on sequence. First power (the control is supplied automatically at the same time). Afterwards connect the control voltage
Travel data set not executable	Settings in transmitted travel data set not conflict-free	Check of the settings in the travel data set Check of the software limit switch ("System" tab) (use software limit switch for positioning only)! Check on whether the positioning target is beyond the software limit switches
Drive cannot be activated via the bus	Access error. Bus system has no access to the node	Check access of the "Fluxx" operating software to the drive (access max. online level 1 for bus access!!!)
Drive can be started via the control word, but does not accept any setpoints	Bus system does not have parameter change rights (see "Bus system" Manual)	Request parameter change rights via bus system
	Quick stop has been actuated via "Fluxx" software	The parameter change rights have to be dispensed by the "Fluxx". Request parameter change rights via bus system again afterwards

10 Accessories

10.1 Technical documentation

Accessories	Name	Order number
Profibus	German	On request
	English	
CAN	German	
	English	
EtherCAT	German	
	English	



Further information on motors and gearboxes can be gathered from the respective catalogue.

10.2 Power supply units

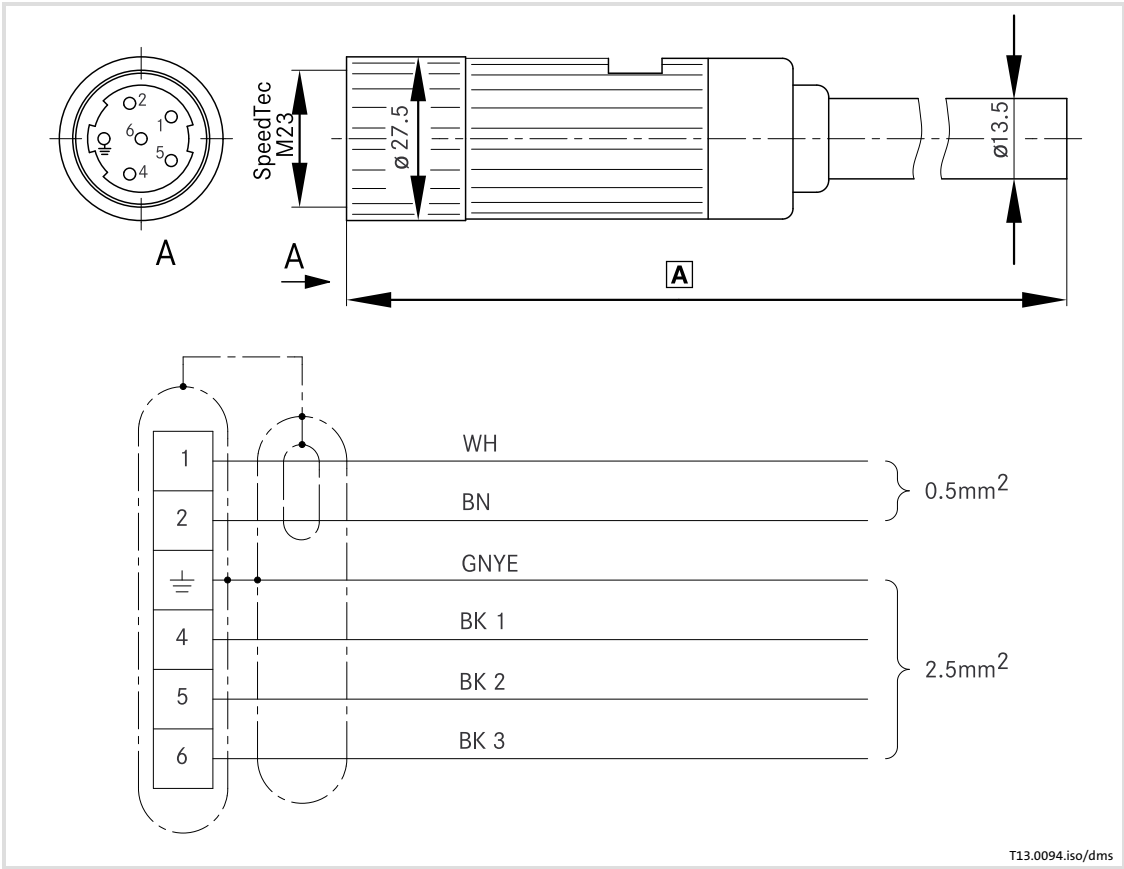
Technical data of the power supply units				
Secondary side		Primary side		Order number
DC 24 V (DC 2.5 ... 28.5 V)	5A	AC 85 V - 0 % ... 264 V + 0 % 45 Hz - 0 % ... 65 Hz + 0 %	Approx. 1.6 A (AC 120 V) Approx. 0.84 A (AC 230 V)	EZV1200-000
	10 A		Approx. 2.34 A (AC 120 V) Approx. 1.2 A (AC 230 V)	EZV2400-000
	20 A		Approx. 4.76 A (AC 120 V) Approx. 2.3 A (AC 230 V)	EZV4800-000
DC 24 V (DC 2.5 ... 28.5 V)	5A	3 AC 320 V - 0 % ... 575 V + 0 % 45 Hz - 0 % ... 65 Hz + 0 %	Approx. 3 × 0.36 A (AC 400 V) Approx. 3 × 0.34 A (AC 480 V)	EZV1200-001
	10 A		Approx. 3 × 0.63 A (AC 400 V) Approx. 3 × 0.57 A (AC 480 V)	EZV2400-001
	20 A		Approx. 3 × 1.1 A (AC 400 V) Approx. 3 × 1.0 A (AC 480 V)	EZV4800-001
DC 48 V (DC 40 ... 56 V)	5A	AC 85 V - 0 % ... 264 V + 0 % 45 Hz - 0 % ... 65 Hz + 0 %	Approx. 2.2 A (AC 120 V) Approx. 1.2 A (AC 230 V)	EZV2400-002
	10 A		Approx. 3 × 1.2 A (AC 400 V) Approx. 3 × 1.0 A (AC 480 V)	EZV4800-002
	20 A		Approx. 3 × 2.3 A (AC 400 V) Approx. 3 × 1.9 A (AC 480 V)	EZV9600-000

11

Appendix

11.1

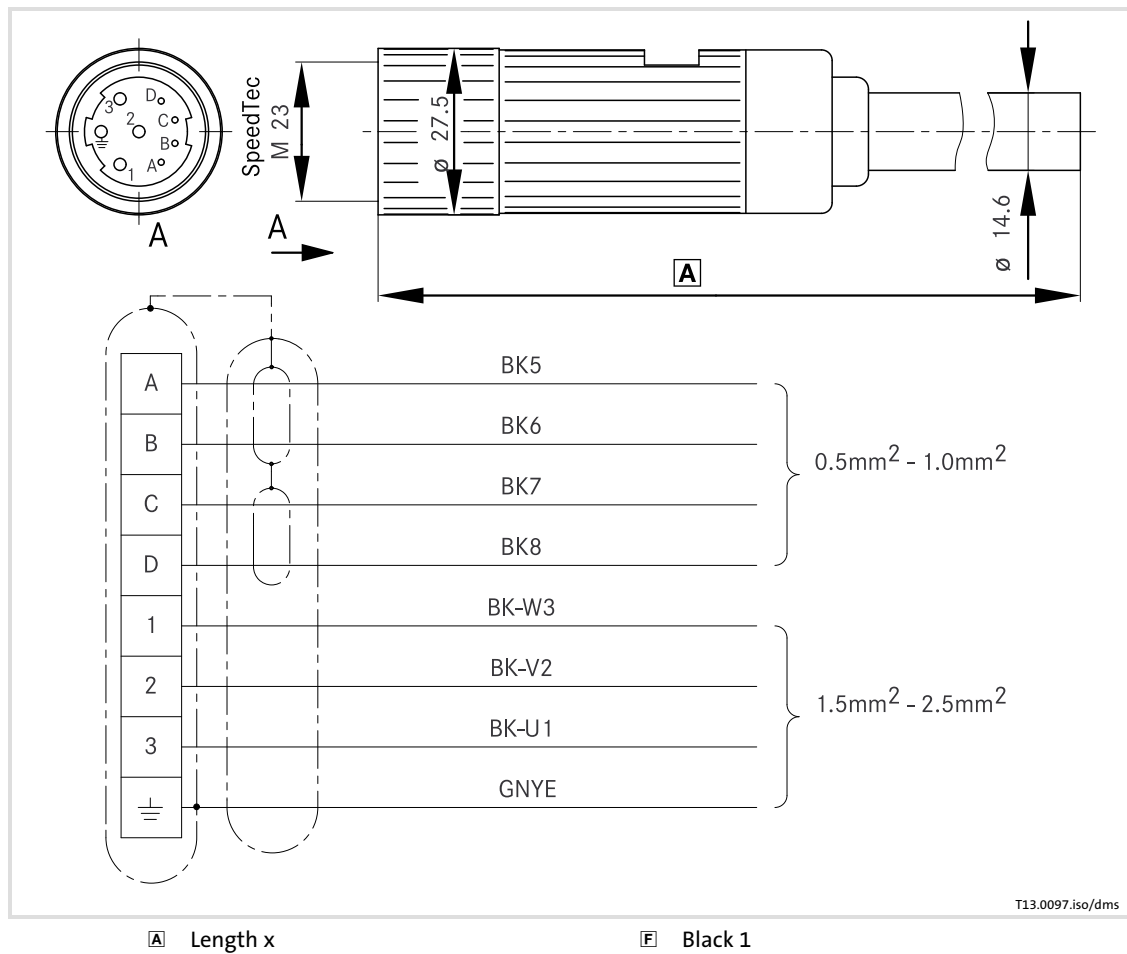
Voltage supply - device type 931K 24...48 V DC (X2)



A Length x

Connection cable 24 ... 48 V DC, 6-pole (X2)			
Assignment in plug	Connection cross-section	Core identification	Signal designation
1	0.50 mm²	WH	DOUT 0
2	0.50 mm²	BN	DIN 9
⊕	2.50 mm²	GNYE	PE conductor
4	2.50 mm²	BK1	+ 24 V DC
5	2.50 mm²	BK2	+ U _{ZK}
6	2.50 mm²	BK3	GND

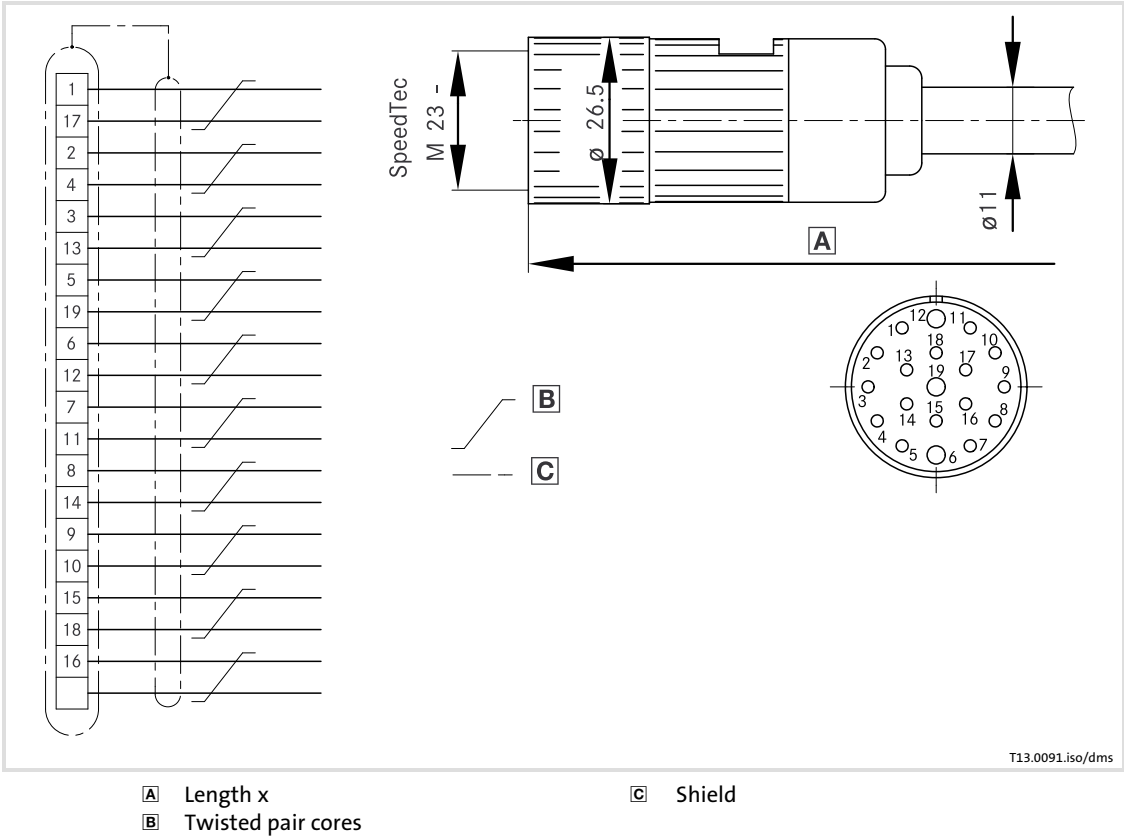
11.2 Voltage supply - device type 931K 230 V AC (X2)



Connection cable 230 V DC, 8-pole (X2)

Assignment in plug	Connection cross-section	Core identification	Signal designation
A	min. 0.50 mm ²	BK5	+ 24 V DC
B		BK6	GND
C		BK7	DIN 9
D		BK8	DOUT 0
1	min. 1.50 mm ²	BK-W3	Neutral conductor
2		BK-V2	free
3		BK-U1	230 V AC/L1
⊕		GNYE	PE conductor

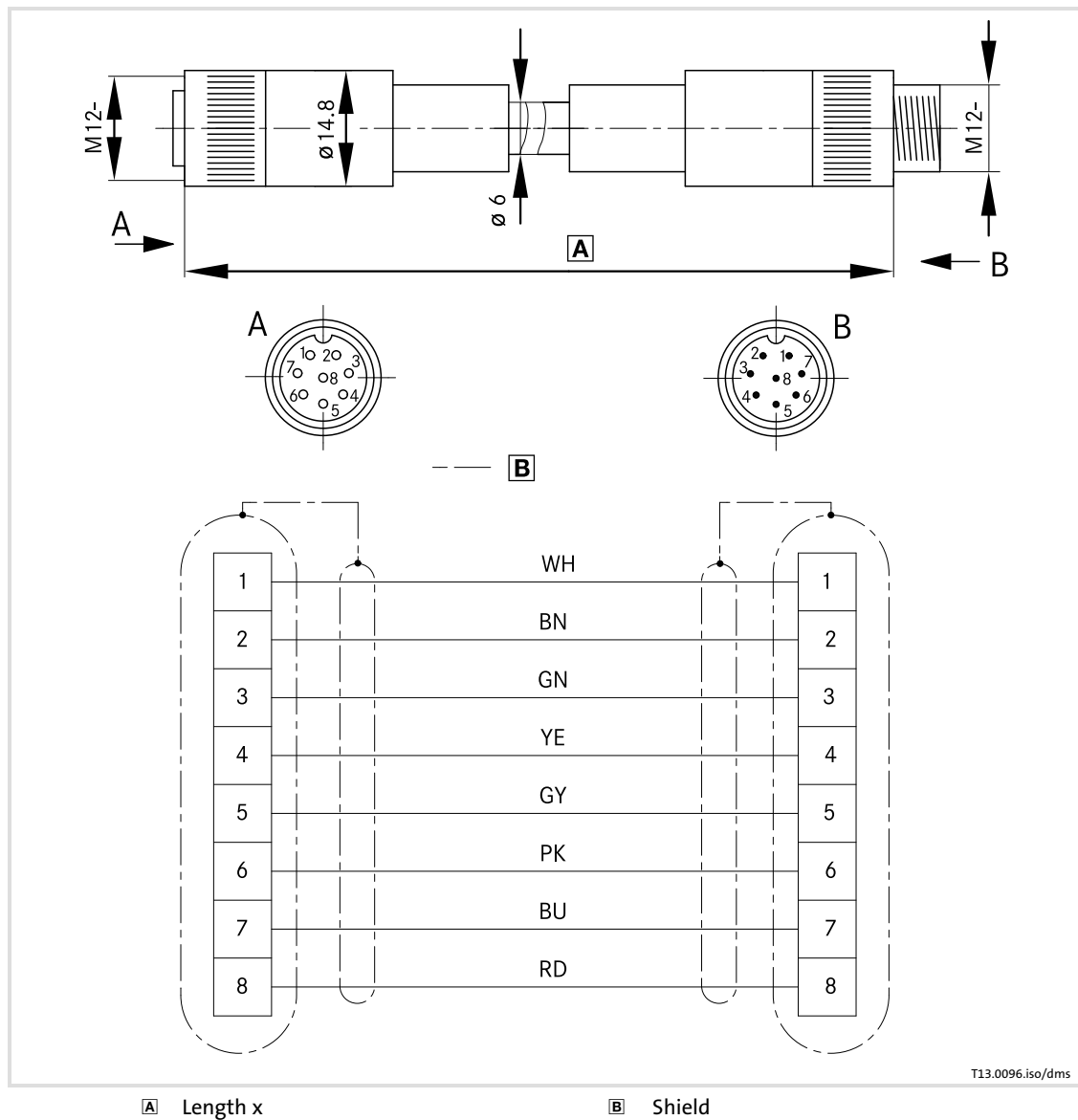
11.3 I/O connection for 931K□42 version (I/O via 1*M23, 19-pole) (X5)



I/O connection cable, 19-pole (X5)				
Assignment in plug	Pair number	Connection cross-section	Core identification - A	Core identification - B
13	a7	0.25 mm ² / AWG 24	WH-GN	
1	b6			RD-BU
2	b2			YE
3	b7			BN-GN
4	a2		GN	
5	b3			PK
15	a8		WH-YE	
7	a4		BU	
8	a1		WH	
9	b5			VT
10	a5		BK	
11	b4			RD
16	a9		GY-BN	
14	b1			BN
17	a6		GY-PK	
18	b8			YE-BN
-----	b9			GY-BN
12	b10			PK-BN
6	a10		WH-PK	
19	a3		GY	

11.4

I/O connection for 931K□52 version (I/O via 2*M12, 8-pole) (X5.1-X5.2)

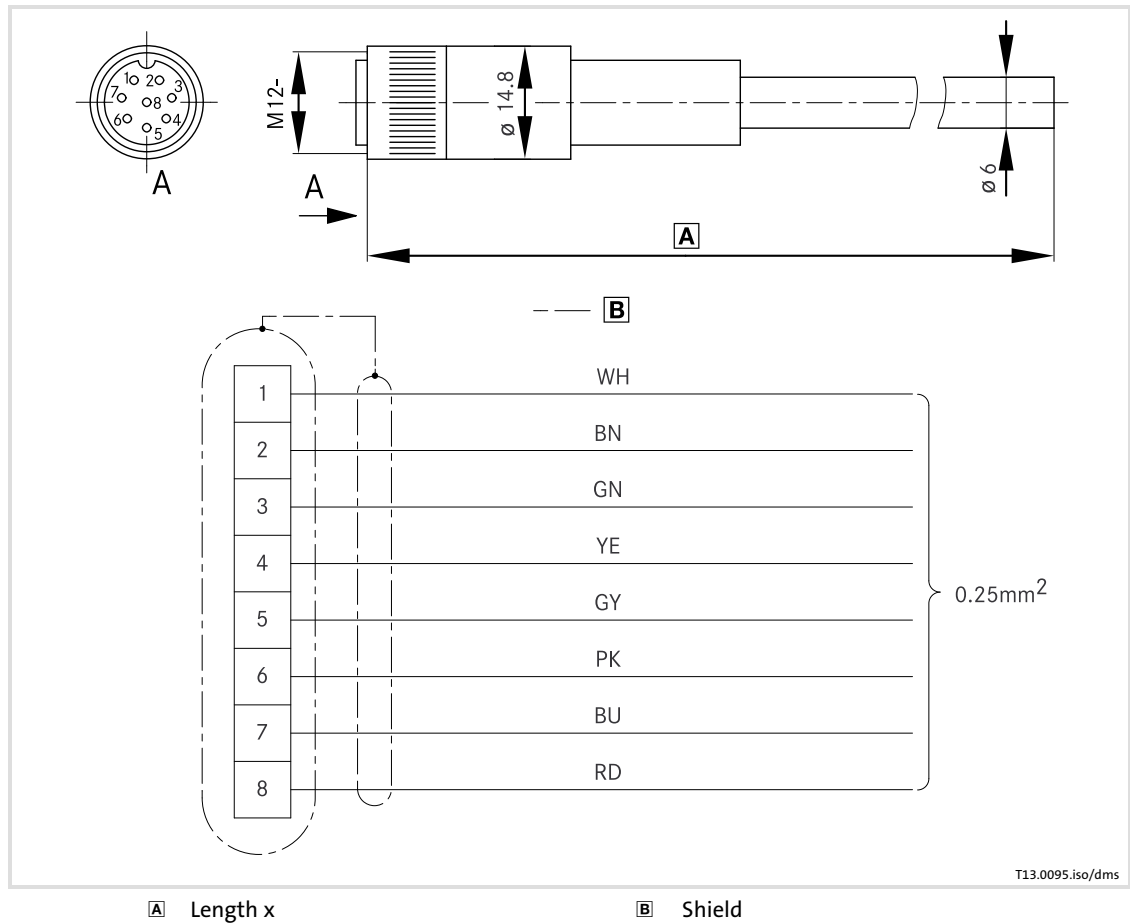


I/O connection cable, 8-pole (X5.1-X5.2)

Assignment in plug	Assignment in socket	Connection cross-section	Core identification
1	1	min. 0.25 mm ² / AWG 24	WH
2	2		BN
3	3		GN
4	4		YE
5	5		GY
6	6		PK
7	7		BU
8	8		RD

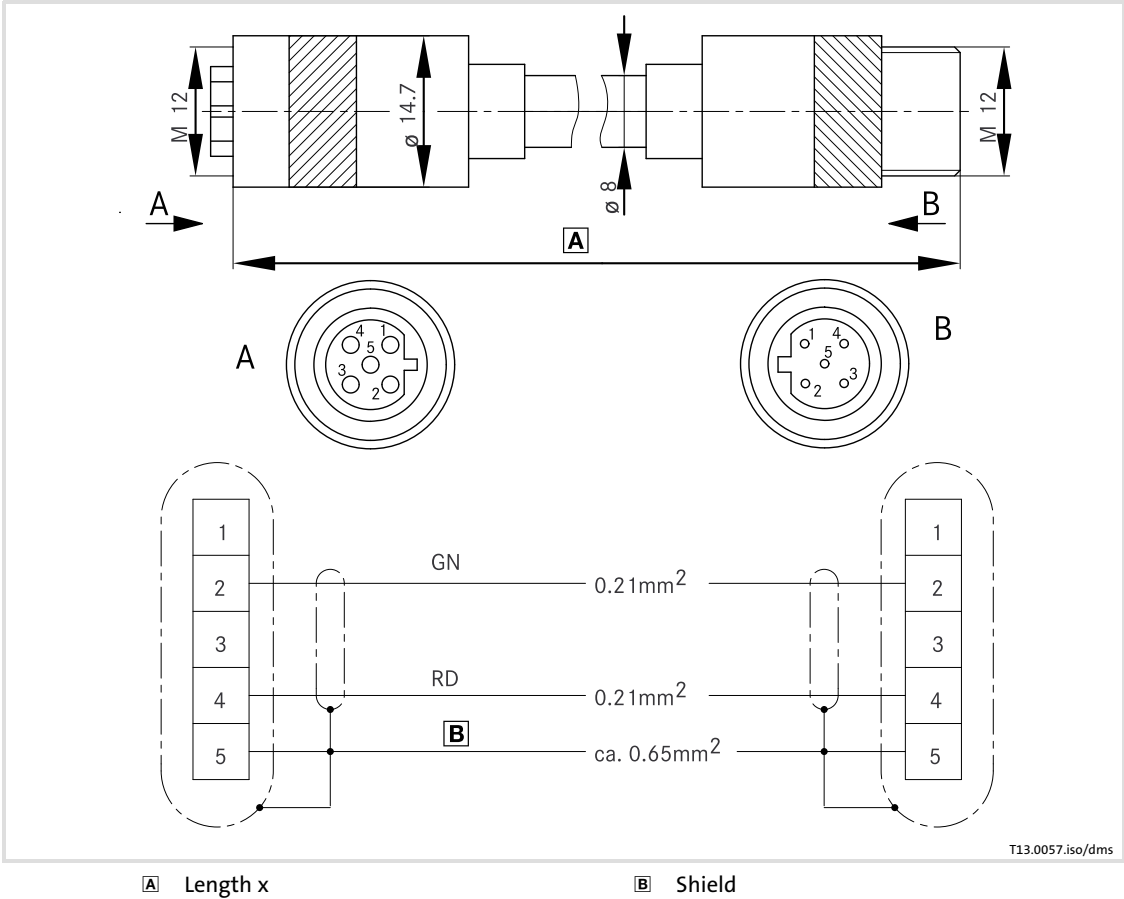
11.5

I/O connection for 931K□52 version (I/O via 2*M12, 8-pole) (X5.1)



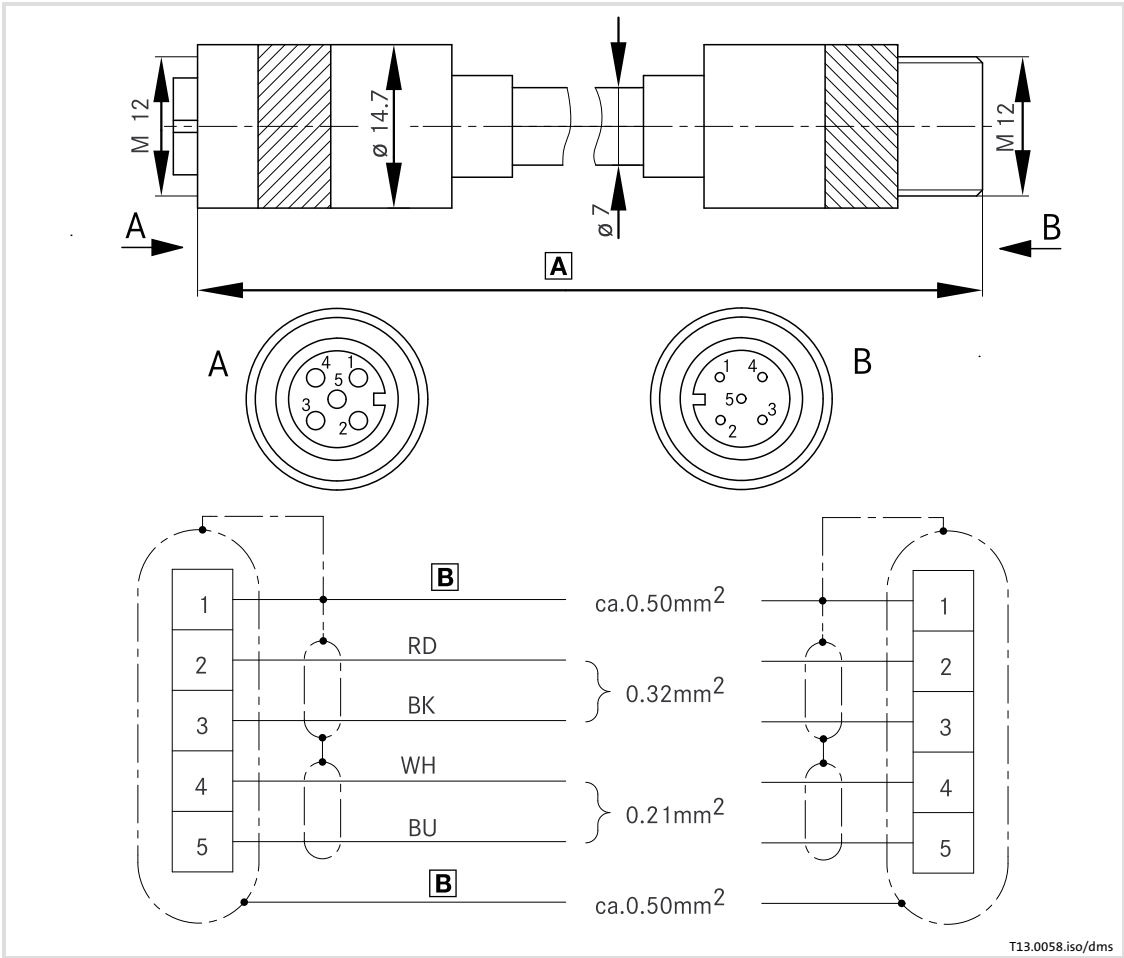
I/O connection cable, 8-pole (X5.1)		
Assignment in socket	Connection cross-section	Core identification
1	min. 0.25 mm² / AWG 24	WH
2		BN
3		GN
4		YE
5		GY
6		PK
7		BU
8		RD

11.6 Profibus (X4) connection



Profibus (X4) connection			
Assignment in plug	Connection cross-section	Core identification	Signal designation
1			
2	0.21 mm ² / AWG24	GN	Cable A
3			
4	0.21 mm ² / AWG24	RD	Cable B
5	0.65 mm ² / AWG19	Shield	Shield

11.7 CAN bus (X4) connection

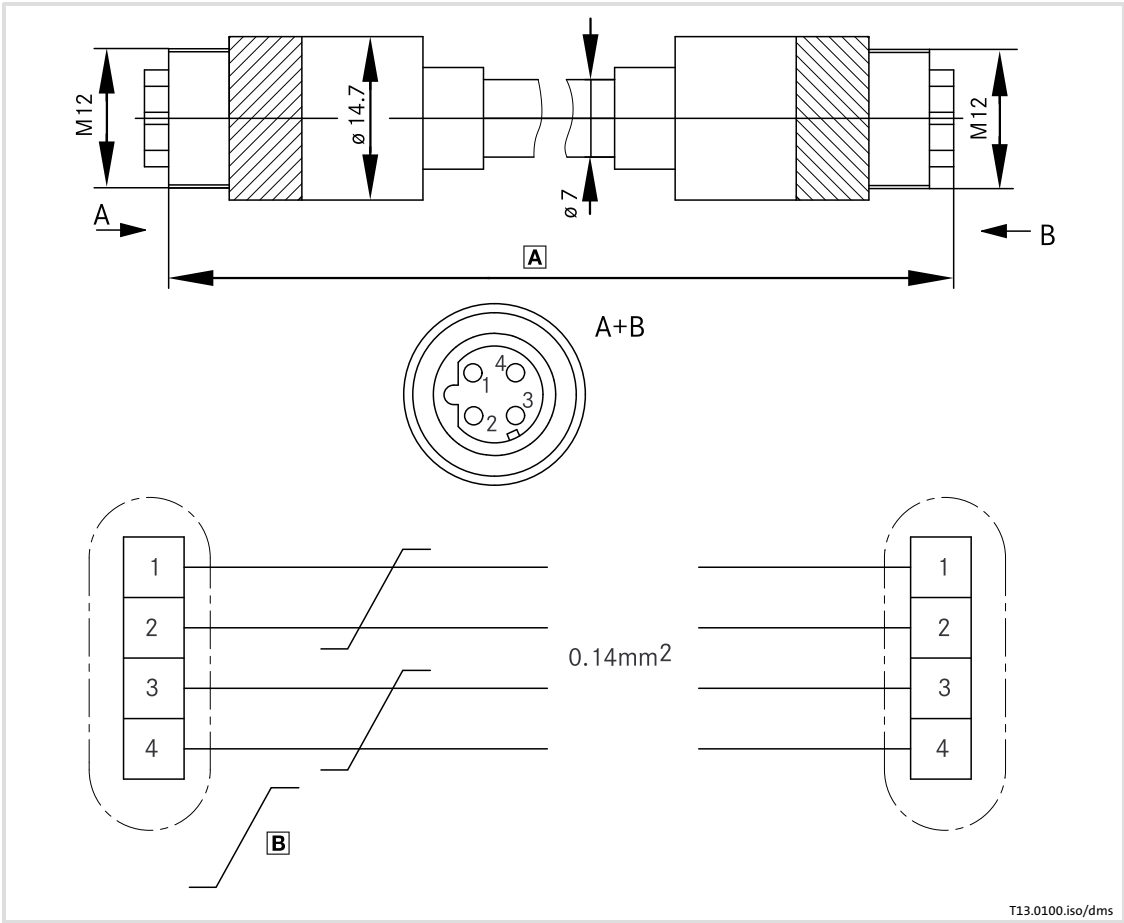


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- A** Length x
B Shield

CAN bus (X4) connection			
Assignment in plug	Connection cross-section	Core identification	Signal designation
1	0.50 mm ²	Shield	Shield
2	0.32 mm ² / AWG22	RD	+ supply
3	0.32 mm ² / AWG22	BK	- supply
4	0.21 mm ² / AWG24	WH	CAN H
5	0.21 mm ² / AWG24	BU	CAN L
	0.50 mm ²	Shield	Shield

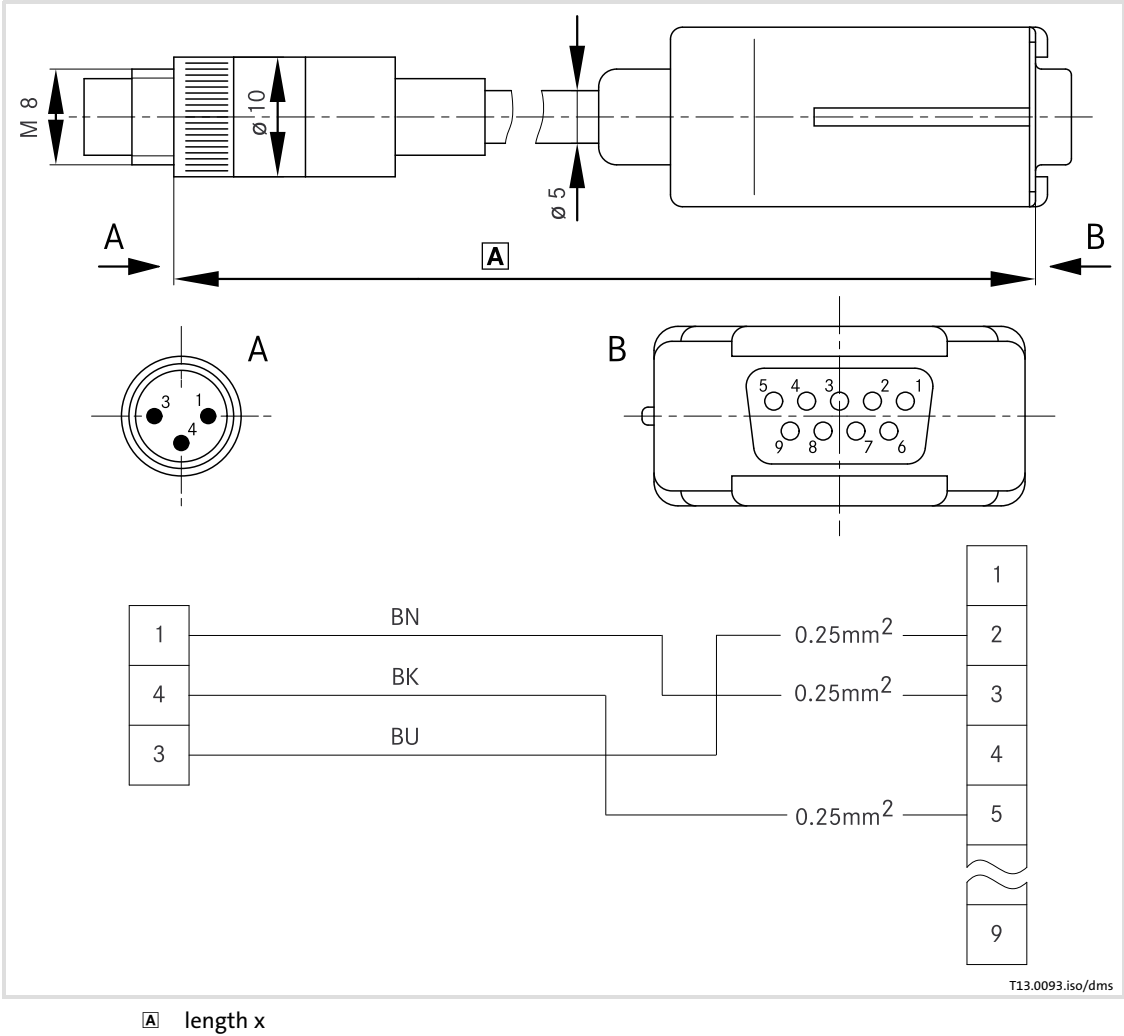
11.8 EtherCAT (X5) connection



- A** Length x
B Twisted pair cores

EtherCAT (X5) connection			
Assignment in plug	Connection cross-section	Built-in part, socket	Signal designation
1	0.14 mm ² / AWG26	1 mm	Transmission data +
2	0.14 mm ² / AWG26	1 mm	Receive data +
3	0.14 mm ² / AWG26	1 mm	Transmission data -
4	0.14 mm ² / AWG26	1 mm	Receive data -

11.9 RS232 (X1) connection



RS232 (X1) connection				
Pin assignment	Socket assignment	Conductor cross section	Core identification	Signal designation
1	3	0.25 mm ² / AWG 23	BN	RxD
4	5		BK	GND
3	2		BU	TxD





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