GHB 13.0002-EN
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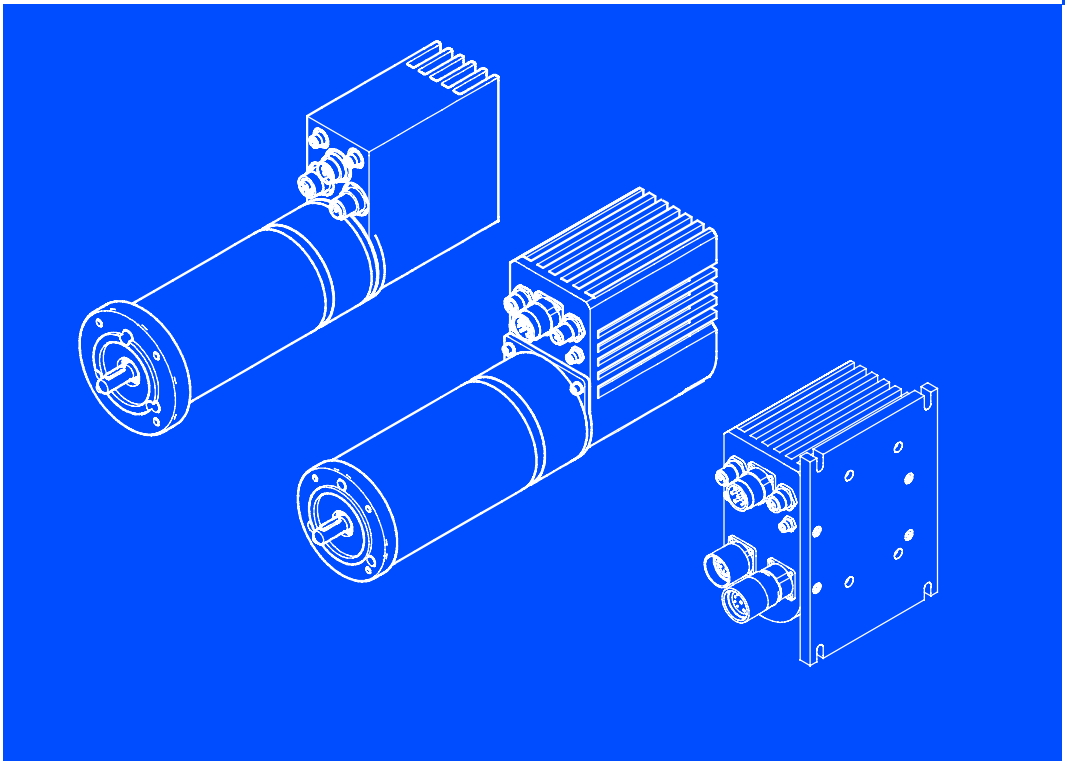
Hardware Manual

L-force | *Servo Drives 930 fluxxtorque*



931M/W

Servo inverter

Lenze

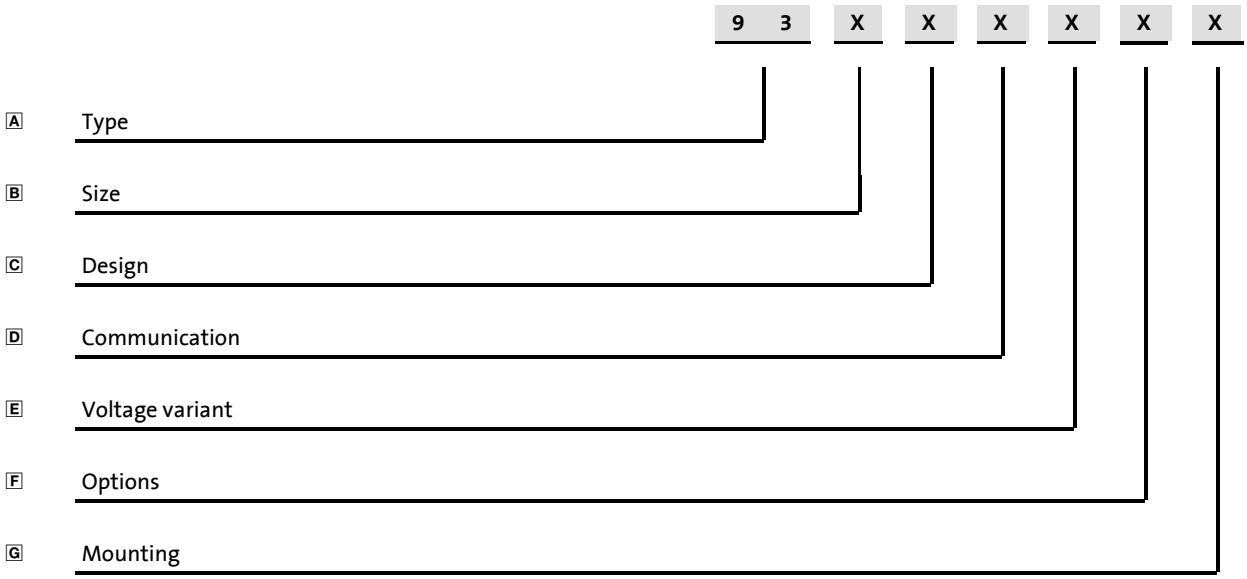
Please read these Instructions before you start working!
Follow the enclosed safety instructions.

This documentation is valid for 931M/W servo inverters using the following type code:

The devices of the 931 M/W series use two type codes. The type code for the 931M/W servo inverters describes the electronic characteristics of the drive system and specifies the power features.

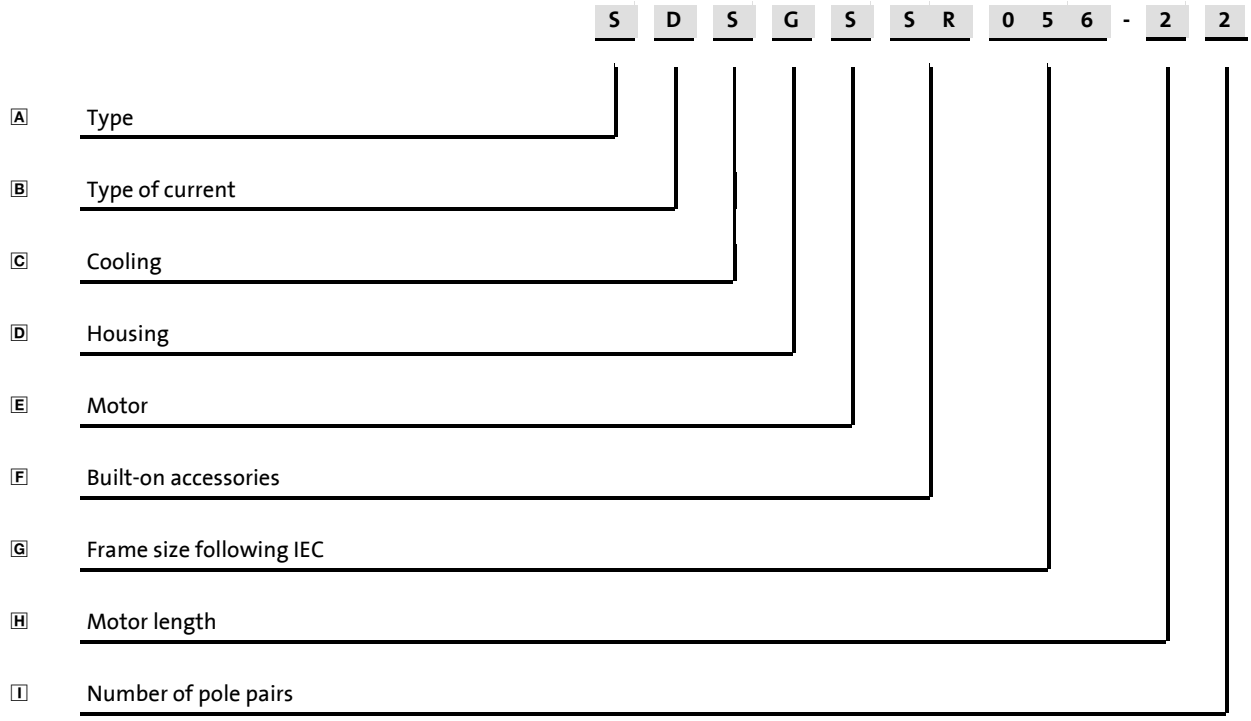
The type code for the 931M servo inverters (integrated servo inverters) describes the electronic characteristics of the drive system and the motor with feedback system and brake.

Type code for the 931M/W servo inverter



Legend for the 931M/W servo inverter type code		
A	93	Servo inverter
B	1	up to 600 W
	2	over 600 W
C	M	Integrated servo inverter
	W	IP54 built-in unit for local installation
D	C	CAN bus
	P	Profibus
E	K	Extra-low voltage
	N	Low voltage
F	1	Inputs and outputs
	2	Local CAN interface for I/O modules
G	0	Distributed mounting
	1	Axial mounting
	2	Radial mounting

Type code for 931Mservo drives



Legend for the 931M servo drive type code (931M servo inverter and SDSmotor)		
A	S	Lenze small drives
B	D	Three-phase AC current
C	S	Naturally ventilated
D	G	Smooth housing
E	S	Synchronous motor
F	SR SB SK	Servo inverter with resolver Servo inverter with resolver and brake Servo inverter with SinCos encoder
G	035 047 056	Frame size
H	2 3	Medium Long
I	2 3	2 pole pairs 3 pole pairs

What is new, what has changed ?

Material No.	Version			Description
-	1.0	07/2004	LKA	Preliminary version
13040582	2.0	02/2005	TD09	Complete revision for the series
-	3.0	10/2005	TD09	Revision of diverse chapters
13123471	3.1	12/2005	TD09	Revision of the table referring to rated data in S3 operation Supplemented by the chapter ”Internal brake resistor”

Tip!

Current documentation and software updates for Lenze products can be found on the Internet in the ”Downloads” area under

http://www.Lenze.com

1 Preface and general information

1.1 About this Manual

Target group

This Manual addresses to all persons designing, mounting, commissioning and setting the servo inverters of the 931 series.

Together with the catalogue, it presents the project documents for the mechanical engineer and the system engineer.

Contents

The System Manual supplements the Mounting Instructions contained in the scope of supply:

- The features and functions are described in detail.
- It provides detailed information on the possible applications.
- The parameter setting is clarified by examples.
- In case of doubt, the supplied Mounting Instructions always apply.

Finding information

- Via the contents and index, you quickly find the information regarding a specific problem.
- Descriptions and data with regard to other Lenze products can be gathered from the respective catalogues, Operating Instructions and Manuals. (📖 49)
- You can request Lenze documentation from your responsible Lenze sales partner, or download it from the Internet as a PDF file.

1.2 Terminology used

Term	In the following text used for
931M/W	931M or 931W servo inverter
Controller	931M/W servo inverter
Drive	931M servo inverter or 931W servo inverter with motor

1.3 Scope of supply

- ► 931M/W servo inverter
- ► Short description

After receipt of the delivery, check immediately whether the items delivered match the accompanying papers. Lenze does not accept any liability for deficiencies claimed subsequently.

Claim

- ► visible transport damage immediately to the forwarder.
- ► visible deficiencies/incompleteness immediately to your Lenze representative.

1.4 Legal regulations

Labelling	**Nameplate**	**CE identification**	**Manufacturer**
	Lenze drive controllers are definitely identified by the contents of the nameplate.	In compliance with the EC Low-Voltage Directive	Lenze GmbH & Co KG small drives Postfach 10 13 52 D-31763 Hameln
Application as directed	**931M/W servo inverters** ● must only be operated under the operating conditions prescribed in these instructions. ● are components – for the open and closed loop control of variable speed drives, – for installation in a machine, – for assembly with other components to form a machine. ● comply with the requirements of the Low-Voltage Directive. ● are not machines for the purpose of the Machinery Directive. ● are not to be used as domestic appliances, but only for industrial purposes. **Drive systems with 931M/W servo inverters** ● comply with the EMC Directive if they are installed according to the guidelines of CE-typical drive systems. ● can be used – for operation on public and non-public mains – for operation in industrial premises. ● The user is responsible for the compliance of his application with the EC directives. **Any other use shall be deemed inappropriate!**		
Liability	● The information, data, and notes in these instructions met the state of the art at the time of printing. Claims on modifications referring to controllers which have already been supplied cannot be derived from the information, illustrations, and descriptions. ● The specifications, processes, and circuitry described in these Instructions are for guidance only and must be adapted to your own specific application. Lenze does not take responsibility for the suitability of the process and circuit proposals. ● Lenze does not accept any liability for damage and operating interference caused by: – disregarding the Operating Instructions – unauthorised modifications to the controllers – operating errors – improper working on and with the drive controllers		
Warranty	● Terms of warranty: see Sales and Delivery Conditions of Lenze GmbH & Co KG Kleinantriebe. ● Warranty claims must be made to Lenze immediately after detecting the deficiency or fault. ● The warranty is void in all cases where liability claims cannot be made.		

2 Safety instructions

2.1 Personnel responsible for safety

Operator

- An operator is any natural or legal person who uses the drive system or on behalf of whom the drive system is used.
- The operator or his safety officer must ensure
  - that all relevant regulations, instructions and legislation are observed.
  - that only qualified personnel work with and on the drive system.
  - that the personnel have the Operating Instructions available for all corresponding operations.
  - that non-qualified personnel are prohibited from working with and on the drive system.

Skilled personnel

Skilled personnel are persons who - because of their education, experience, instructions, and knowledge about corresponding standards and regulations, rules for the prevention of accidents, and operating conditions - are authorised by the person responsible for the safety of the plant to perform the required actions and who are able to recognise potential hazards.
(See IEC 364, definition of skilled personnel)

2.2 General safety and application notes for Lenze controllers

(According to: Low-Voltage Directive 73/23/EEC)

General

Lenze controllers (frequency inverters, servo inverters, DC controllers) and the accessory components can include live and rotating parts - depending on their type of protection - during operation. Surfaces can be hot.

Non-authorised removal of the required cover, inappropriate use, incorrect installation or operation, create the risk of severe injury to persons or damage to material assets.

More information can be obtained from the documentation.

All operations concerning transport, installation, and commissioning as well as maintenance must be carried out by qualified, skilled personnel (IEC 364 and CENELEC HD 384 or DIN VDE 0100 and IEC report 664 or DIN VDE 0110 and national regulations for the prevention of accidents must be observed).

According to this basic safety information qualified, skilled personnel are persons who are familiar with the assembly, installation, commissioning, and operation of the product and who have the qualifications necessary for their occupation.

Application as directed

Drive controllers are components designed for installation into electrical systems or machines. They are not household appliances, but are only designed as components for industrial or professional purposes in terms of EN 61000-3-2.

When installing the controllers into machines, commissioning (i.e. starting of operation asdirected) is prohibited until it is proven that the machine complies with the regulations of the EC Directive 98/37/EC (Machinery Directive); EN 60204 must be observed.

Commissioning (i.e. starting of operation as directed) is only allowed when there is compliance with the EMC Directive (89/336/EEC).

The technical data and information on connection conditions can be obtained from the nameplate and the documentation. They must be observed in any case.

Warning: The availability of controllers is restricted according to EN 61800-3. These products can cause radio interferences in residential areas. In this case, special measures are required.

Transport, storage

Please observe the notes on transport, storage and appropriate handling.

Observe the climatic conditions in accordance with EN 50178.

Installation

The controllers must be installed and cooled according to the instructions given in the corresponding documentation.

Ensure proper handling and avoid mechanical stress. Do not bend any components and do not change any insulation distances during transport or handling. Do not touch any electroniccomponents and contacts.

Controllers contain electrostatically sensitive components, which can easily be damaged by inappropriate handling. Do not damage or destroy any electrical components since this might endanger your health!

Electrical connection

When working on live controllers, the valid national regulations for the prevention of accidents (e. g. VBG 4) must be observed.

The electrical installation must be carried out according to the appropriate regulations (e.g. cable cross-sections, fuses, PE connection). Additional information can be obtained from the documentation.

The documentation contains notes for the installation according to EMC (shielding, earthing and installation of cables). Also observe these notes with regard to CE-labelled drive contollers. The manufacturer of the system or the machine is responsible for the compliance with the limit values required in connection with EMC legislation. In order to observe the limit values for emitted radio interference which are effective at the installation location, you have to mount the controllers into housings (e. g. control cabinets). The housings have to enable an EMC-compliant installation. Observe in particular that, for instance, the doors of control cabinets are metallically connected to the housing in a circumferential manner. Reduce openings or apertures by the housing to a minimum.

Operation

If necessary, systems including controllers must be equipped with additional monitoring and protection devices according to the valid safety regulations (e.g. law on technical equipment, regulations for the prevention of accidents). The controller can be adapted to your application. Please observe the corresponding information given in the documentation.

After the drive controller has been disconnected from the voltage supply, all live components and power connections must not be touched immediately because capacitors can still be charged.

All protection covers and doors must be shut during operation.

Maintenance and servicing

The controllers do not require any maintenance if the prescribed conditions of operation are observed.

If the ambient air is polluted, the cooling surfaces of the controller may become dirty or the air vents of the controller may be obstructed. Therefore, clean the cooling surfaces and air vents periodically under these operating conditions. Do not use sharp or pointed tools for this purpose!

Disposal

Recycle metal and plastic materials. Ensure professional disposal of assembled PCBs.

The product-specific safety and application notes given in these Operating Instructions must be observed!

2.3 General safety information

- These safety information are not claimed to be complete. In case of questions and problems, please contact your Lenze representative.
- At the time of delivery the communication interfaces meet the state of the art and ensure basically safe operation.
- The information given in these Operating Instructions refer to the specified hardware and software versions of the modules.

2.4 Residual hazards

Protection of persons

After power-off, pins of the connection X2 (320 V DC, 230 V AC L1, N or 0 V DC), UL, BR and GND still carry hazardous voltages for at least 3 minutes!

- ► Before working on the controller, check that no voltage is applied to the power terminals.
- ► Always protect the power terminals against contact.

The discharge current to ground (PE) is > 3.5 mA, in accordance with EN 50178

- ► If a fixed installation is required, just design the PE conductor with a cable cross-section of at least 1.5 mm^2, or design the PE conductor double.

Observe appropriately installed cables, correct bolted connections, and correct plug connections.

Due to the high currents in applications with extra-low voltages, current-carrying parts can be strongly heated.

Device protection

- ► Connect or disconnect all pluggable terminals in a deenergised state only!
- ► A cyclic connection and disconnection of the supply voltage can overload and destroy the input current limitation of the drive controller:
  - – When effecting a cyclic switching of the supply voltage over a longer period, the period between two switch-on processes at least has to be one minute!

Motor protection

Drive systems can reach dangerous overspeeds (e.g. setting of high field frequencies for motors and machines which are not qualified for this purpose):

- ► The controllers do not offer any protection against these operating conditions. Use additional components for this.

Protection of the machine/system

A missing or incorrect resolver adjustment can bring about undefined control states. The perfect operation is no longer guaranteed.

2.5 Definition of notes used

The following signal words and symbols 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 trouble-free operation
 **Tip!**	Useful tip for simple handling
	Reference to another documentation

3 Technical data

3.1 Features

The 931M servo inverter is a synchronous motor with integrated busable servo inverter.

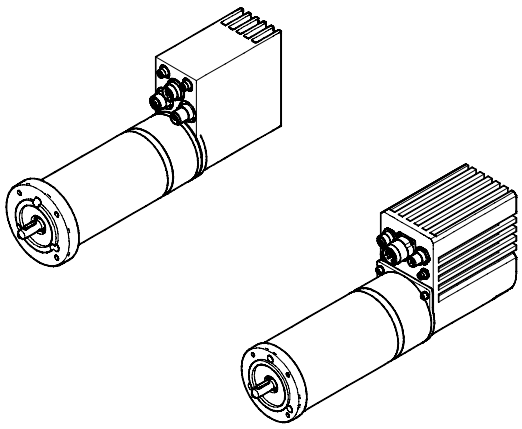
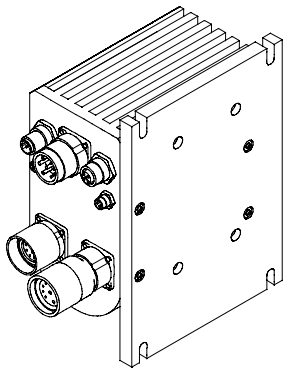
The difference between the 931W and the 931M servo inverters is the separate design of motor and servo inverter.

Type M and W have the same functionalities in both voltage variants 230 V AC/320 VDC and 24/42 V DC.

All servo inverters include 100 "driving programs" in which different operating modes such as speed mode, torque mode, positioning mode or following error mode can be entered with individual settings. The driving programs can be combined to form motion sequences (📖 fluxxtorque 931M/W Software Manual).

The servo inverters are equipped with different monitoring functions such as over and undervoltage monitoring, following error monitoring, temperature monitoring, etc.. Both motor or winding temperature and the temperature of the power electronics of the drive controllers are detected. Due to the temperature sensitivity of the power electronics, a power derating will be carried out from inverter temperatures of 70°C onwards. With inverter temperatures of 78°C or more, the servo inverters will be switched off.

Only synchronous motors with resolver will be used as motors. The technical data of the individual versions are listed in the following tables.

931Mservo inverter	931Wservo inverter
 M13.1020 M13.1006	 M13.1022

3.2 Design

Different controller variants are available. You can choose between different voltages, different bus systems and local CAN or I/O. With this option, the user can choose between a fixed input and output and a local CAN interface for the connection of additional modules. Possible combinations are listed in the following table:

Type	Supply voltage				Bus system/interface			Inputs/outputs	
	24V DC	42V DC	230V AC	320V DC	Profibus	CAN bus	Local CAN	IOs	RS232
931 MPN2_			•		•		•		•
931 MPN1_			•		•			•	•
931 MCN2_			•			•	•		•
931 MCN1_			•			•		•	•
931 MPN2_				•	•		•		•
931 MPN1_				•	•			•	•
931 MCN2_				•		•	•		•
931 MCN1_				•		•		•	•
931 WPN2_			•		•		•		•
931 WPN1_			•		•			•	•
931 WCN2_			•			•	•		•
931 WCN1_			•			•		•	•
931 WPN2_				•	•		•		•
931 WPN1_				•	•			•	•
931 WCN2_				•		•	•		•
931 WCN1_				•		•		•	•
931 MPK2_	•				•		•		•
931 MPK1_	•				•			•	•
931 MCK2_	•					•	•		•
931 MCK1_	•					•		•	•
931 MPK2_		•			•		•		•
931 MPK1_		•			•			•	•
931 MCK2_		•				•	•		•
931 MCK1_		•				•		•	•

3.3 Rated data

3.3.1 General data and operating conditions

The following standards and operating conditions are generally valid for 931M and 931W servo inverters:

Conformity	CE	Low-Voltage Directive 73/23/EEC
Regulations	Requirements in accordance with IEC/EN 61800-3 (category C3)	
Climatic conditions	Air humidity max. 90 % without condensation	
Cooling	Passively via housing surface and heatsink	
Permissible temperature ranges		
Transport	-25 °C... +70 °C	
Storage	-25 °C... +70 °C	
Operation	0 °C ... +40 °C	
Internal ambient temperature	$T_{electronics}$ > 70 °C: Power derating Disconnection at $T_{electronics}$ > 78 °C	
Permissible installation height	0 ... 1000 m amsl	above 1000 m amsl, reduce the rated output current by 5 %/1000 m
Mounting position	Every mounting position and mounting arrangement is permissible (see restriction)	
Mounting clearances		
above/below	≥ 50 mm	
sidewise	≥ 50 mm	
Type of protection	IP 54	
DC bus system	Possible with restrictions	

Explanation: Restrictions for DC bus systems

- ► When supplying several 931M or 931W devices with DC voltage from a DC bus system, ensure that the permissible voltage limits for the DC bus are observed when power is consumed or fed back by the inverters.
- ► We recommend to use slow-blowing DC fuses to fuse inverters in larger DC bus systems.

Explanation: restrictions concerning the mounting position

- ► In principle, every mounting position is permissible. The manufacturer recommends a vertical arrangement of the cooling ribs of the heatsink. For mounting positions with a non-vertical arrangement of the cooling ribs, the free convection is negatively influenced. In this case, a power derating of the drive due to the decreased cooling power may be required.

0 V (low) and 24 V (high) are used for the digital inputs and outputs. Here, the local CAN communication is an exception, using a lower voltage level (5 V). The digital inputs and outputs are short-circuit-proof, whereas the local CAN interface is not resistant to short-circuits.

The functions of the digital I/Os are listed in the below table. For more information, please see the Software Manual.

Inputs and outputs and bus systems of type 931M	
Digital inputs - standard I/O	1 input, 1 output All inputs and outputs can be freely configured as active HIGH or active LOW!
Digital inputs - local CAN, optional	In connection with a function module only (projected; 📖 61). More details can be obtained on request from Lenze GmbH & Co KG, Kleinantriebe.
Cycle time of digital I/Os	Adjustable via the scanning time (min. 500 µs). When using the local CAN option, the cycle time < 5ms.
RS232	
CAN (optional)	CANopen in accordance with DS301 and DSP402standard
Profibus (optional)	Profibus (Profidrive)

The control data is listed in the table below. For more information, please see the Software Manual.

Control and regulation of type 931M	
Control method	Torque, speed, following error and position control
Cycle time (current controller)	≤ 100 µs
Cycle time (speed, following error and position controller)	Adjustable via scanning time (min. 500 µs)
Chopper frequency (PWM)	10 kHz
Max. output frequency	500Hz
Positioning range	+/- 2^{19} revolutions
Storable function data records	100
Encoder evaluation	Resolver (12 bit internal resolution)
Monitoring	Over/undervoltage, motor and power stage temperature

3.3.2 Internal brake resistor

The 931M servo inverter in the 230 V supply voltage variant is provided with an integrated brake chopper and an integrated brake resistor which is designed for a continuous power of 40 W_{el} or for a short-time peak power of 200 W_{el}. The extra-low voltage variants do not feature an integrated brake chopper. The voltage threshold for the activation of the internal brake chopper approx. is 375 V DC.

Internal brake resistor (230 V variant)	
Resistance R [Ω]	550
Continuous power $P_{brake, el.}$ [W]	40
Peak power $P_{peak, el.}$ [W]	200
Mech. continuous braking torque * (n=3000 U/min.) [Nm]	0,2
Mech. peak torque * (n=3000 U/min.) [Nm]	0,8

* The information refers to the torque indicated on the motor shaft. In these values, the friction torque of the motor is also considered!

3.3.3 Rated data of the extra-low voltage version (24 or 42 V DC)

The extra-low voltage version of the drives has been designed for operation on 24/42 V DC. For a simple servo inverter operation, a 24 V or 42 V supply is sufficient. With an additional 24 V auxiliary supply, the control continues to be supplied if an error occurs and the supply voltage is disconnected. Important data (rotor position, information on faults, etc.) will thus continue to be recorded and transferred to the control.

Note!

The residual ripple component of the supply voltage must be under 5%.

The 24 V auxiliary supply is also required if the digital interface (digital I/O) or the local CAN interface is used.

3.3.4 Rated data of the low-voltage version (230 V AC / 320 V DC)

Inverters with 230 V AC mains supply have an additional 24 V auxiliary supply. The control is also supplied by the mains voltage. With an additional 24 V auxiliary supply, the control continues to be supplied if an error occurs and the supply voltage is disconnected. Important data (rotor position, information on faults, etc.) will thus continue to be recorded and transferred to the control.

The 24 V auxiliary supply is also required if the digital interface (digital I/O) or the local CAN interface is used.

3.3.5 Rated data of the drive systems

Type	SDSGSSR35			SDSGSSR47		SDSGSSR56	
Input data							
Power supply							
Voltage (all details +/- 10%)	24 V_{DC}	42 V_{DC}	42 V_{DC}	230 V_{AC}	320 V_{DC}	230 V_{AC}	320 V_{DC}
Frequency [Hz]	---	---	---	50	---	50	---
Rated current I_{in}	9.6 A_{DC}	5.0 A_{DC}	5.7 A_{DC}	2.6 A_{eff}	1.08 A_{DC}	4.3 A_{eff}	1.82 A_{DC}
Rated power P_{in} [W]	227	203	237	321	332	540	540
Apparent rated power S_{in} [VA]	---	---	---	580	---	980	---
Max. current $I_{max.}$	15 A_{DC}			10 A_{eff}	8 A_{DC}	10 A_{eff}	8 A_{DC}
Control supply							
Voltage (all details +/- 10%)	24 V_{DC}						
Current [A_{DC}]	0.2						
Brake supply							
Voltage (all details +/- 10%)	24 (fault concerning bei U < 20 V or U > 28 V)						
Current [A_{DC}]	Approx. 1						
Output data							
Output currents							
Output voltage [V_{AC}]	0 ... 16	0 ... 28		0 ... 210			
Rated current of fundamental oscillation I_{Out} [Aeff]	8.4	4.5	4.7	1.1		1.78	
Power factor of fundamental oscillation cos φ_1	0.99			0.98		0.99	
Max. current I_{max} [Aeff]	13.5			4.5			
Rated frequency [Hz]	100						
Electr. rated real power P [W]	186	187	217	305		500	
Electr. rated apparent power S [VA]	275	267	277	477	483	773	759
Mech. output data							
Rated operating mode	s1						
Rated power [W]	140		170	250		440	
Rated torque [Nm]	0.45			0.8		1.4	
Max. starting torque [3]	0.78	1.1	2.4	3.5		3.6	
Max. torque [4]	0.65	0.80	1.0	1.5	1.8	2.7	2.8
Rated speed [min^{-1}]	3000		2000	3000			
Idle speed [min^{-1}] [2]	5000	4500	2700	4300		4000	
Rated efficiency							
Inverter	0.82	0.92		0.87		0.93	
Motor	0.75		0.77	0.82		0.88	
Complete system	0.62	0.69	0.70	0.71		0.81	
Motor data							
Winding							
Speed constant [$V/1000min^{-1}$]	3.7	6.54	10.5	49.6		54.4	
Torque constant [Nm/A]	0.058	0.104	0.169	0.796		0.901	
R_{UV} [Ω]	0.26	0.77	0.94	18.7		6.8	
L_{line} [mH]	0.18	0.59	1.23	27.4		11.8	
Insulation material class	F						
Mechanics							
Moment of inertia [$kgcm^2$]	0.293			0.444		1.466	

Type	SDSGSSR35	SDSGSSR47	SDSGSSR56
Motor data			
Flange to IEC	C80		C90
Shaft end to IEC 72	9 x 20		11 x 23
Locating bearing at the output end	6000		6302
Floating bearing	6000		6201
Max. radial force at the beginning of the shaft journal 1) [N]	250		570
Max. radial force in the middle of the shaft journal 1) [N]	260		620
Max. axial force 1) [N]	200		490
Total weight (inverter and motor			
Geometry			
Inverter	📖 52		
Motor			

1) Forces for a bearing life of 20000 h
2) The idling speed indicates the max. possible speed of the drive system under no-load condition depending on the supply voltage of the inverter.
3) Maximum torque at a speed of 0 $min.^{-1}$ to 500 $min.^{-1}$
4) Maximum torque at rated speed

3.3.6 Rated data for S3 operation/overload capacity

For the dimensioning of a drive system which is operated in S3 operation, the effective motor torque is to be calculated. The effective torque results from the kinematics (travel profile) and the time-dependent load profile in consideration of the gearbox ratio, efficiency, friction lossses, etc.. It can be calculated in a simplified manner according to the following equation, where T represents the period of a cycle and Mi the motor torque to be reached in the time t_i. Furthermore, a dynamic factor k_{dyn} is to be considered, which - depending on the dynamic of the load profile - can reach values between 1 (low dynamic) to 1.2 (high dynamic / strong stabilisation processes). For calculating the effective torque, or for dimensioning drive systems, the "Drive Solution Designer" program can be used.

$$M_{eff} = \sqrt{\frac{\sum t_i \cdot M_i^2}{T}} \cdot k_{dyn} \leq M_{rated}$$

The drives of the 930 fluxxtorque product range are checked with regard to the S3 operating mode according to the load profile represented in diagram 1. The load profile travelled at rated speed (cycle time: 5 s) is composed of a peak load of 0.5 s (150 % M_{rated}) and a recovery time of 4.5 s (75% M_{rated}).

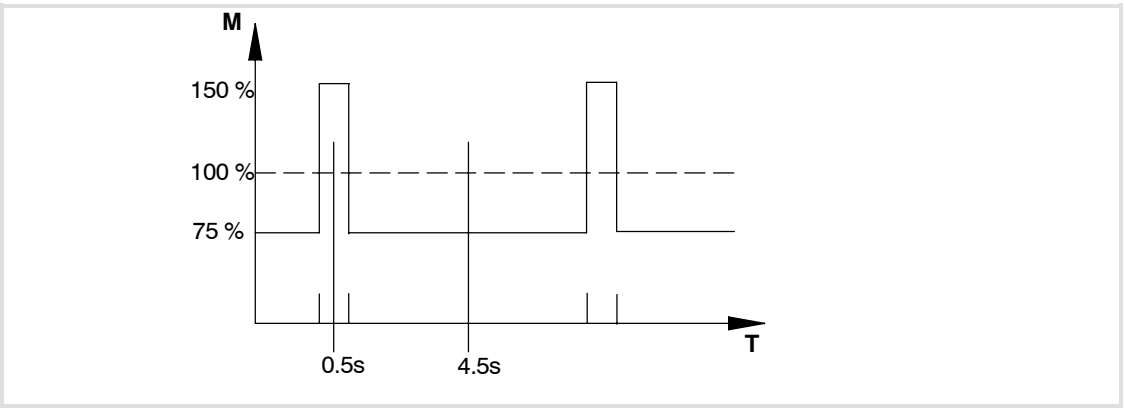


Fig. 1 Overload capacity of the drive at 40°C

Type	SDSGSSR35		SDSGSSR47			SDSGSSR56	
S3 operation							
Supply voltage [V]	24 *	42	42 *	230	320	230	320
Rated torque [Nm]	0.45	0.45	0.80	0.80	0.80	1.40	1.40
Max. load torque (15%) [Nm]	0.68	0.68	1.20	1.20	1.20	2.10	2.10
Recovery torque (75%) [Nm]	0.34	0.34	0.60	0.60	0.60	1.05	1.05

* The information is based on a reduced speed (1000 U/min).

3.4 Connection cables

3.4.1 System cable for 931M/W voltage supply

In general, the cable length for the connection, motor and resolver cables should not be longer than 5 m; in exceptional cases, however, the maximum cable length may be 10 m.

Different plugs are used to ensure that extra-low voltage and low-voltage devices cannot be connected to incorrect voltage potentials.

For more information on the connection cables, please see chapter 10.

3.4.1.1 System cable for 931M 24 V or 42 V voltage supply

Motor connection side	Length [m]	Voltage supply end	Designation
Binder M16/0.75 socket; 8-pole	3	without plug	491 629
	5		491 725

3.4.1.2 System cable for 931M/W 230 V or 320 V voltage supply

Motor connection side	Length [m]	Voltage supply end	Designation
M23 socket; 8-pole	3	without plug	491 726
	5		491 727

3.4.1.3 System cable for motor - 931W servo inverter

Inverter end X3	Length [m]	Motor connection side	Designation
M23 socket; 4+4-pole	2.5	M26 plug; 6-pole	Connection motor - servo inverter 13009633

3.4.1.4 System cable for servo inverter feedback

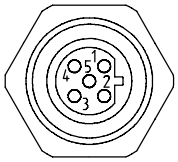
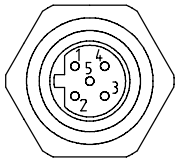
Inverter end X7	Length [m]	Motor connection side	Designation
M23 socket; 12-pole	2.5	M23 plug; 12-pole	13009634

3.4.2 Connection cables for bus systems

For more information on the connection cables, please see chapter 10.

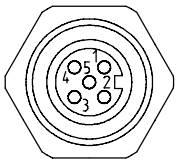
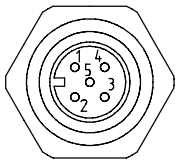
3.4.2.1 Connection cables for Profibus

The connection cables for CAN and Profibus have individual codes and cannot be interchanged. This prevents incorrect plugging and ensures that different bus systems cannot be crossed.

Profibus socket	Profibus plug
	

Profibus input X4.1	Length [m]	Profibus output X4.2	Designation
M12 socket; 5-pole	3	M12 plug; 5-pole	491 767
	5		491 768
Control connection	**Length [m]**	**Profibus output X4.2**	**Designation**
Without	3	M12 socket; 5-pole	491 769
	5		491 790

3.4.2.2 Connection cables for CAN bus

CAN bus socket	CAN bus plug
	

CAN input X4.1	Length [m]	CAN output X4.2	Designation
M12 socket; 5-pole	3	M12 plug; 5-pole	491 761
	5		491 762
Control connection	**Length [m]**	**CAN output X4.2**	**Designation**
Without	3	M12 socket; 15-pole	491 763
	5		491 764

3.4.3 Connecting cables

3.4.3.1 Connecting cables for RS232

Controller end X1	Length [m]	PC end	Designation
M8 socket; 3-pole	3	Sub D; 9-pole	491 791

3.4.3.2 Connecting cable for local CAN and I/O

Controller end X5	Length [m]	Additional module end	Designation
M8 socket; 4-pole	3	-----	491 996

4 Mechanical installation

Stop!

Ensure that the 931M/W servo inverters are securely connected using the screw connections provided and prevent excessive mechanical stress on the screw connections.

4.1 Important notes

- For polluted cooling air (dust, lints, greases, aggressive gases):
  - Implement adequate counter measures, e. g. separate routing of ait flow, regular cleaning, etc.
- Mounting clearances!
  - Observe unobstructed influx of the cooling air and emission of the exhaust air!
  - Observe a free space of 50 mm above and below as well as to the sides.
  - In case of high load and bad heat dissipation, the controller lowers the drive power, or possibly switches off.
- Do not exceed the range of the ambient operation temperature.
- For permanent vibrations or vibrancies:
  - Check the use of vibration dampers.

4.2 Mechanical installation of 931M

Note!

The 931 M servo inverters are directly mounted on the motor. Small installation spaces can thus be ideally used.

The axial servo inverter connection leads to a mean integrated design. For more details, please see the technical drawings in chapter 10.1.

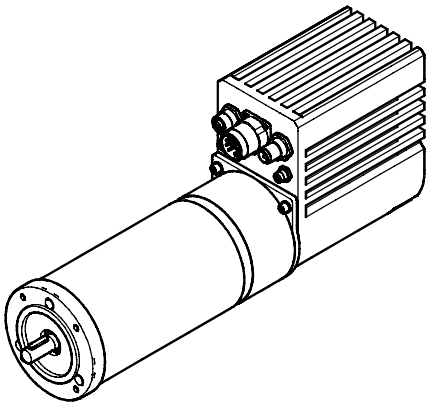
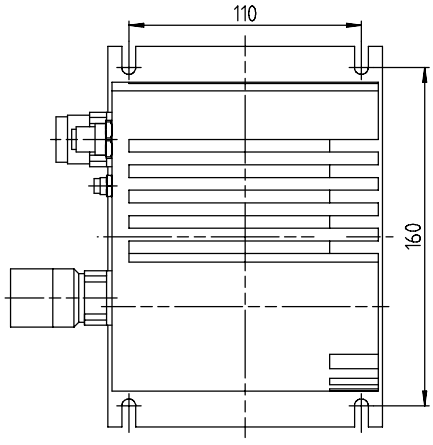


Fig. 2 Axial connection of the 931M servo inverter

4.3 Mechanical installation of 931W

The 931W servo inverters are assembled with a mounting plate using the elongated holes. The screw connections of the mounting plate can be turned by 90° each. This makes it possible to mount the inverters in different positions (turned by 90° each) onto the object.

Mounting plate for 931W



Inverter wit 931W mounting plate

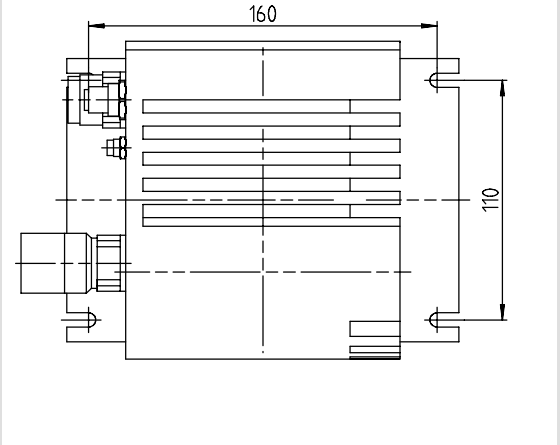


Fig. 3 Assembly: 931W inverter

4.4 Mounting plate for 931W

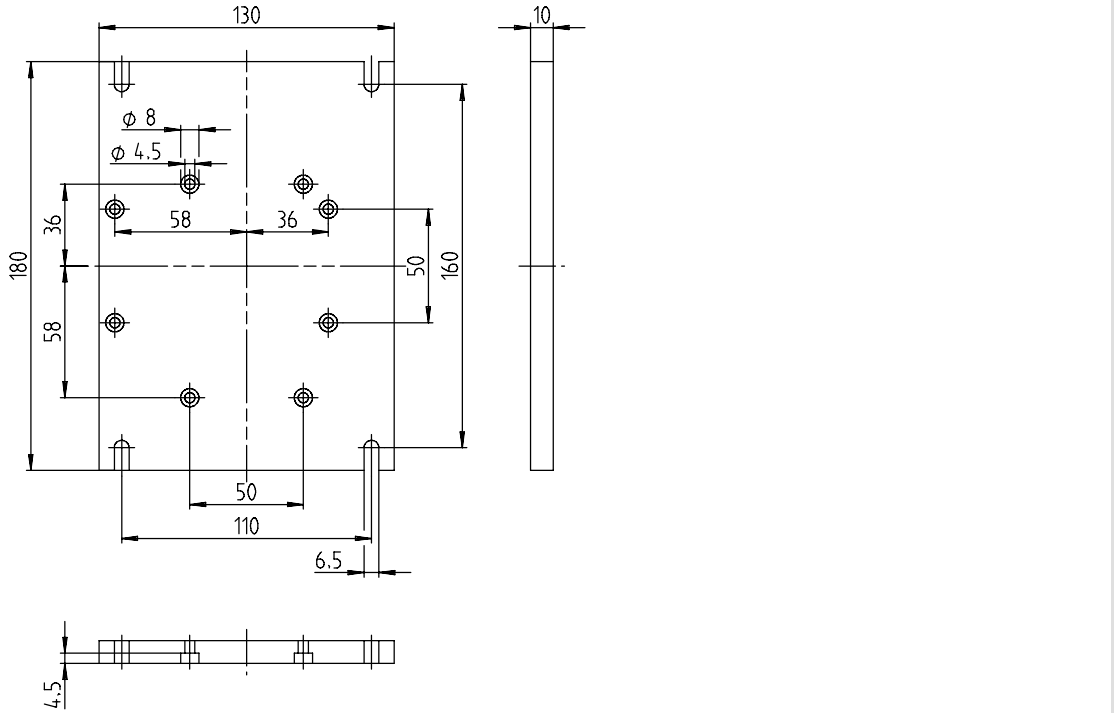


Fig. 4 Dimensions in mm

5 Electrical installation

5.1 Important notes

Stop!

The drive controller contains electrostatically sensitive components.

The personnel must be free of electrostatic charge prior to 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 intermediate circuit capacitor may cause traces of burning on the wrap 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 shield of the motor cable has to be connected to PE potential as extensively as possible to prevent effects due to interference.
- The resolver cable, encoder cable, and the motor cable may have a length of 10 m at a maximum!
- 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.

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

Important notes

The electromagnetic compatibility of a machine depends on the type of installation and on the care that is taken. Special attention should be paid to:

- Assembly
- Shielding
- Grounding

For diverging installations, the conformity to the EMC Directive requires a check of the machine or system regarding the EMC limit values. This, for instance, applies to the use of unshielded cables.

The compliance of the machine application with the EMC Directive is in the responsibility of the user.

- If you observe the following measures, you can assume that the machine will operate without any EMC problems caused by the drive system, and that compliance with the EMC Directive and the EMC law is achieved.
- If devices which do not comply with the CE requirements concerning noise immunity EN 50082-2 are operated close to the controller, these devices may be electromagnetically disturbed by the controllers.

Shielding

- Connect the shield of the motor cable on the 931W drive controller to the shield connection of the drive controller.
- Extensively connect the shield in the terminal box on the motor or on the motor housing to PE:
  – Metal glands at the motor terminal box ensure a connection of the shield and the motor housing.

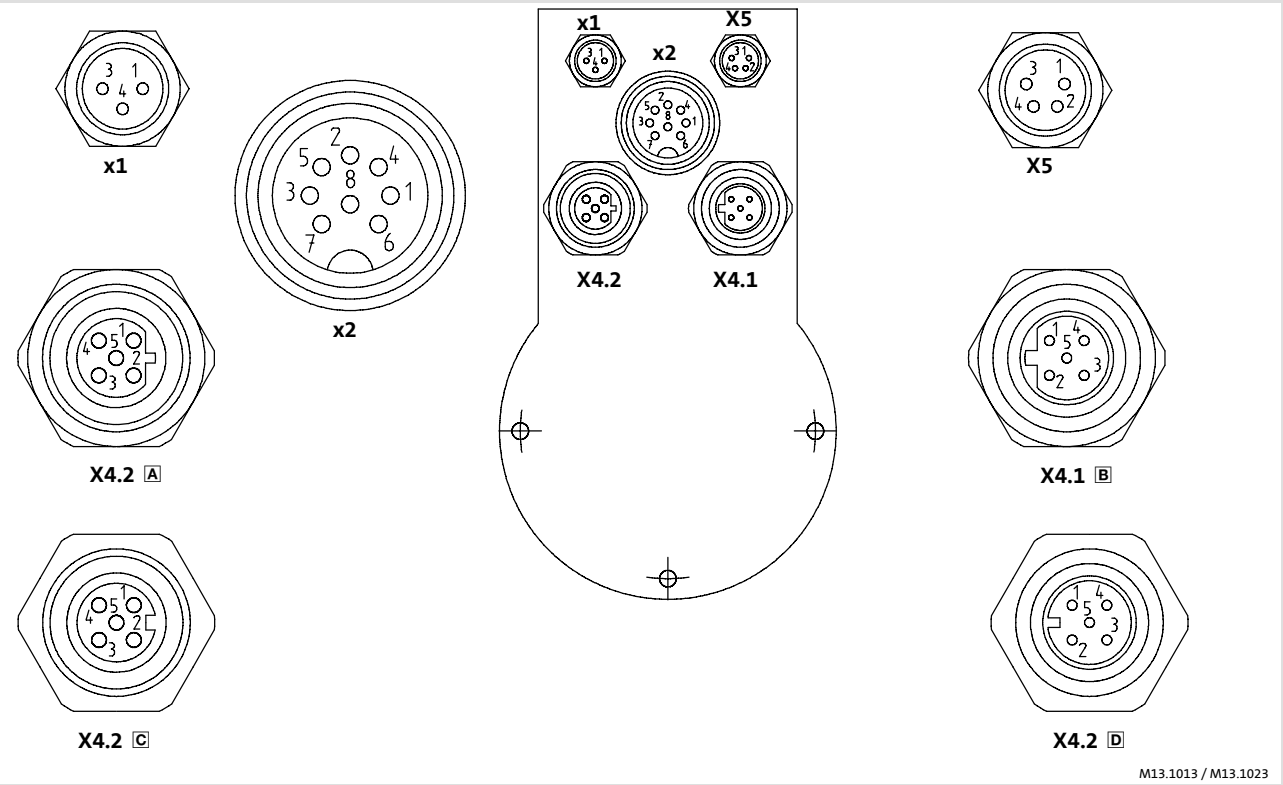
Earthing

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.

5.3 Electrical connections of 931M, 24 V DC / 42 V DC



A Profibus - socket (female)
B Profibus - plug (male)
C CAN - socket
D CAN - plug

X4.1 option Profibus (input)		
Pin No.	**Description**	
1	NC	
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 or PE	

X4.1 option CAN (input)	
Pin No.	**Description**
1	(CAN_SHLD) optional CAN Shield
2	NC/optional/(CAN_V+) for supply optoc.if qalv. isolation
3	CAN_GND Ground/OV/V-
4	CAN_H bus line (dominant high)
5	CAN_L bus line (dominant low)

X4.2 option Profibus (output)		
Pin No.	**Description**	
1	VP Power supply plus (P5V)	
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 or PE	

X4.2 option CAN (output)

Pin No.	Description
1	(CAN_SHLD) optional CAN Shield
2	NC/optional/(CAN_V+) for supply optoc. if galv. isolation
3	CAN_GND Ground/OV/V-
4	CAN_H bus line (dominant high)
5	CAN_L bus line (dominant low)

X2 voltage supply

Pin No.	Description	Pin No.	Description
1	GND	5	+24V / +42V supply
2	PE	6	24V electronic supply
3	+24V / +42V supply	7	+24V brake
4	GND	8	Brake enable

X1 RS232

Pin No.	Description
1	TxD
2	GND
3	RxD

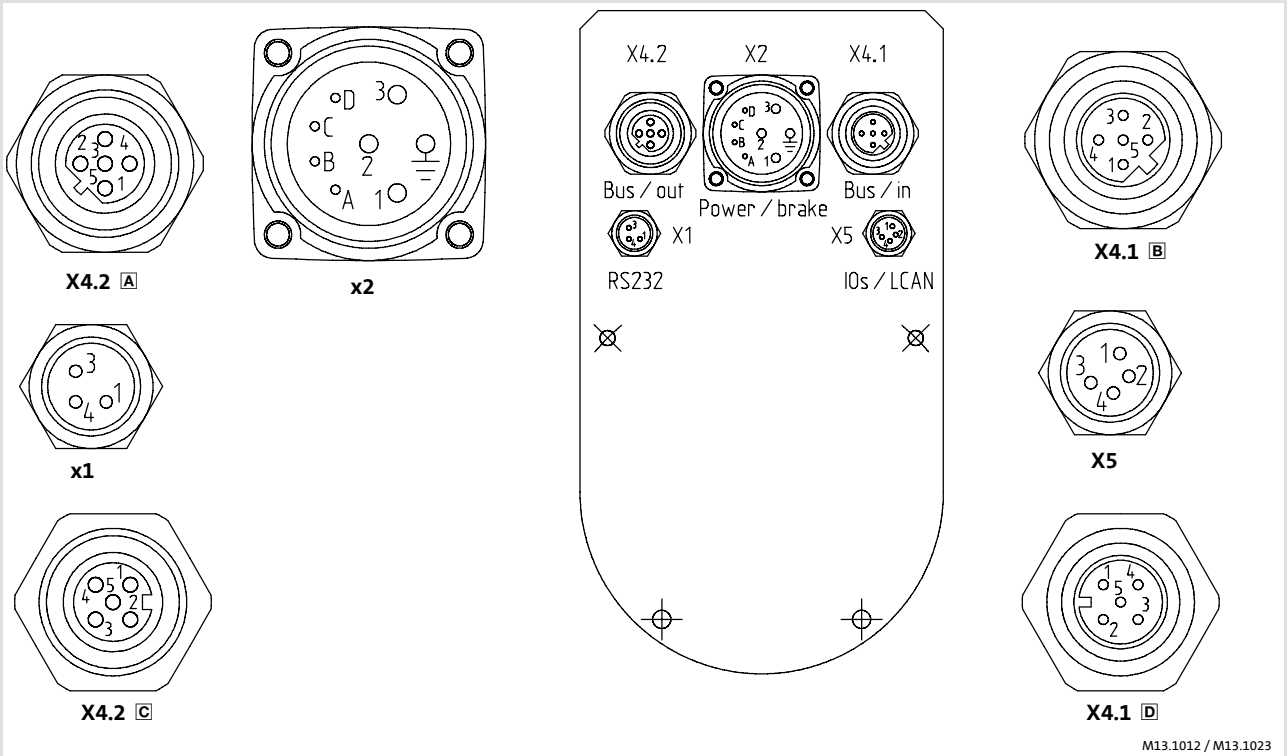
X5 option I/O

Pin No.	Description
1	+24 V
2	iN
3	GND
4	OUT

X5 option local CAN

Pin No.	Description
1	+24 V
2	Local CAN/H
3	GND
4	Local CAN/L

5.4 Electrical connections of 931M, 230 V AC / 320 V DC



A Profibus - socket (female)
B Profibus - plug (male)
C CAN - socket
D CAN - plug

X4.1 option Profibus (input)		
Pin No.	**Description**	
1	NC	
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 or PE	

X4.1 option CAN (input)	
Pin No.	**Description**
1	(CAN_SHLD) optional CAN Shield
2	NC/optional/(CAN_V+) for supply optoc.if qalv. isolation
3	CAN_GND Ground/OV/V-
4	CAN_H bus line (dominant high)
5	CAN_L bus line (dominant low)

X4.2 option Profibus (output)	
Pin No.	**Description**
1	VP Power supply plus (P5V)
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 or PE

X4.2 option CAN (output)	
Pin No.	**Description**
1	(CAN_SHLD) optional CAN Shield
2	NC/optional/(CAN_V+) for supply optoc. if galv. isolation
3	CAN_GND Ground/OV/V-
4	CAN_H bus line (dominant high)
5	CAN_L bus line (dominant low)

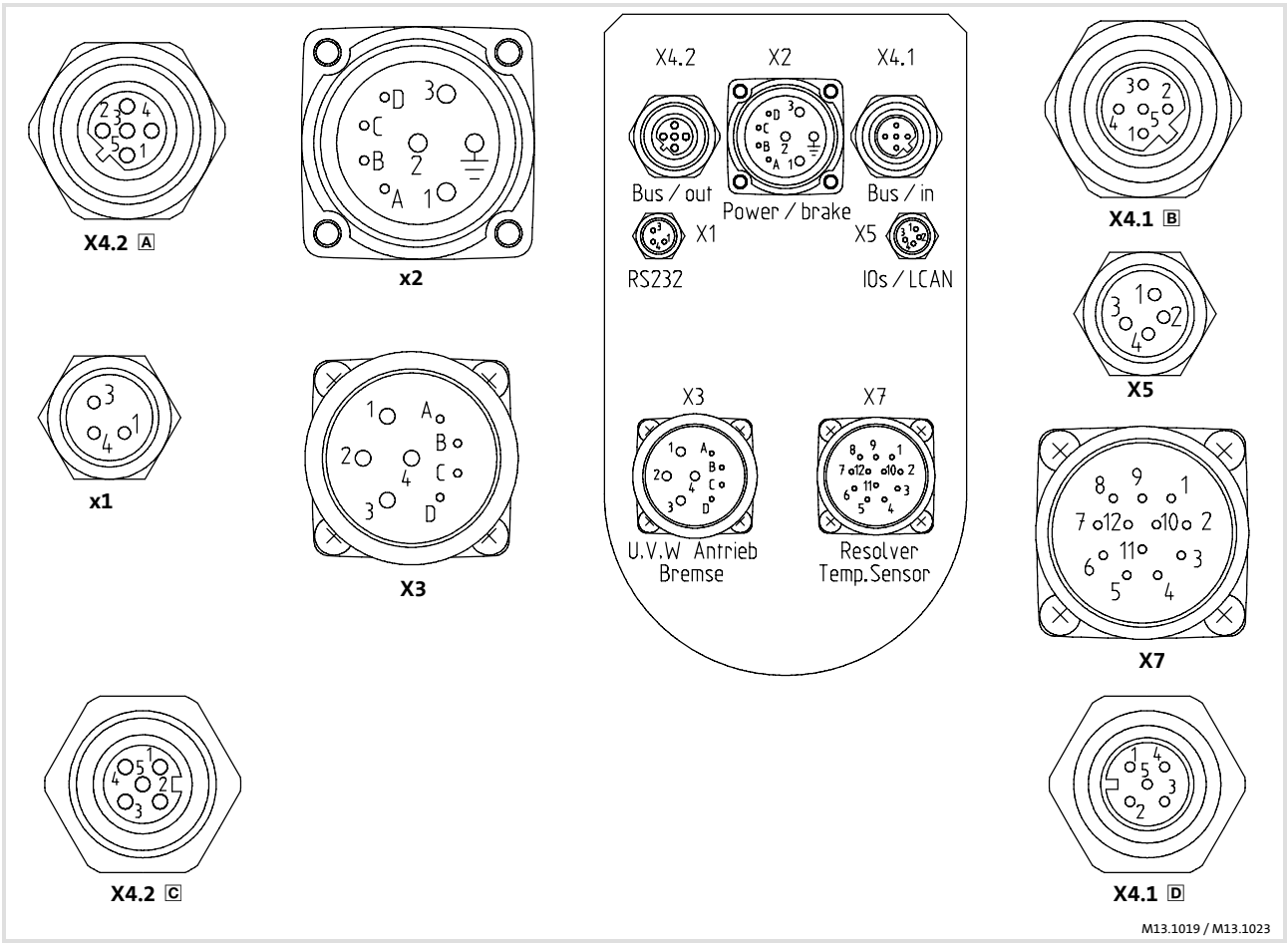
X2 voltage supply	
Pin No.	**Description**
1	N (with AC supply) or 0V DC
2	+320V DC
3	230V AC L1
PE	PE & shield
A	+24V brake
b	GND 24V auxiliary supply & brake
c	Brake enable (LOW active)
D	+24V auxiliary supply

X1 RS232	
Pin No.	**Description**
1	TxD
2	GND
3	RxD

X5 option I/O	
Pin No.	**Description**
1	+24 V
2	iN
3	GND
4	OUT

X5 option local CAN	
Pin No.	**Description**
1	+24 V
2	Local CAN/H
3	GND
4	Local CAN/L

5.5 Electrical connections of 931W, 230V AC / 320V DC



A Profibus - socket (female)
B Profibus - plug (male)
C CAN - socket
D CAN - plug

X4.1 option Profibus (input)		
Pin No.	**Description**	
1	NC	
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 or PE	

X4.1 option CAN (input)	
Pin No.	**Description**
1	(CAN_SHLD) optional CAN Shield
2	NC/optional/(CAN_V+) for supply optoc.if qalv. isolation
3	CAN_GND Ground/OV/V-
4	CAN_H bus line (dominant high)
5	CAN_L bus line (dominant low)

X4.2 option Profibus (output)	
Pin No.	**Description**
1	VP Power supply plus (P5V)

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 or PE	

X4.2 option CAN (output)

Pin No.	Description
1	(CAN_SHLD) optional CAN Shield
2	NC/optional/(CAN_V+) for supply optoc. if galv. isolation
3	CAN_GND Ground/OV/V-
4	CAN_H bus line (dominant high)
5	CAN_L bus line (dominant low)

X2 voltage supply

Pin No.	Description
1	N (with AC supply) or 0V DC
2	N (with AC supply) or +320V DC
3	230V AC L1
PE	PE & shield
A	+24V brake
b	GND 24V auxiliary supply & brake
c	Brake enable (low active)
D	+24V auxiliary supply

X1 RS232

Pin No.	Description
1	TxD
2	GND
3	RxD

X5 option I/O

Pin No.	Description
1	+24 V
2	iN
3	GND
4	OUT

X5 option local CAN

Pin No.	Description
1	+24 V
2	Local CAN/H
3	GND
4	Local CAN/L

X3 U, V, W drive and brake

Pin No.	Description
1	Motor phase U
2	PE
3	Motor phase V
4	Motor phase W
A	+ 24 V brake
b	GND brake
c	NC
D	Shield

X7 resolver, temperature sensor

Pin No.	Description
1	REF +
2	REF -
3	NC

4	COS +
5	COS -
6	SIN +
7	SIN -
8	NC
9	NC
10	NC
11	KTY +
12	KTY -

6 Commissioning

6.1 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. (📖 45)

Checking of electrical connections

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

- ► the electrical connection with regard to completeness, short circuit and earth fault.
- ► All plugs on the controller must be securely connected using the screw and plug connections provided.
- ► The screw connections on the motor must be securely connected.
- ► Carefully check the connections to the supply system and ensure that the current-carrying connections are correct.
- ► 24 V and 42 V controllers require correspondingly high currents to reach their maximum performance.

6.1.1 Voltage supply connection

- ► Ensure correct pole connections (extra-low voltage or mains voltage) for feeding the voltage supply (extra-low voltage)!
- ► Ensure that auxiliary supply (24 V for control) and supply voltage (24 V or 42 V DC-bus supply) are separately connected. When the supply is mixed up, the servo inverter may be destroyed.

6.1.2 Motor connection

- ► For trouble-free operation, we recommend to use Lenze standard cables.
- ► Ensure a proper shielding of the motor and feedback cable to avoid interferences.

6.1.3 External inputs and outputs / connection with local CAN devices

- ► For trouble-free operation, ensure that the additional modules are correctly connected.
- ► The connection cables for switches must be shielded.
- ► In general, the cables should not be longer than 5 m. In exceptional cases, the maximum cable length may be 10 m.

6.1.4 Bus cable connections

- ► Use Lenze standard cables (see chapter 5).
- ► Bus cables should always be shielded.
- ► Check the screw connections of the bus cables.

6.1.5 Connection of the connecting cable between PC and servo inverter

Servo inverter and PC are connected via an RS 232 interface using the 9-pole Sub-D interface of the PC and the 3-pole M8 connection of the servo inverter.

- ► Securely connect the connecting cable with the PC and the servo inverter.

6.1.6 Covers for the power connections

- ► Put on and fix cover(s).

7 Application example

7.1 Preconditions

Stop!

Before the first commissioning, the motor of the drive system or the integrated servo inverter should be placed on a level surface. The motor shaft should be freely movable and protected against contact. Ensure that the key is secured (if accessible).

Install the ”fluxx” software on your PC. For this, copy the program provided to your computer and start it with a double-click from the directory to which you have copied the program.

7.2 General information

The ”fluxx” user software has been developed for the commissioning, test purposes and easy monitoring of the drive. Use the software to easily start the servo inverter.

The ”fluxx” functions are explained in the ”fluxxtorque servo inverter” Software Manual.

Note!

Operation of the software requires the Microsoft operating system Windows NT 4.0, Windows 95/98, Windows 2000 or Windows XP.

7.3 Menu pages

For this example, you only need the menu pages Setup, Status and Driving program. The following sections describe the functions of the individual menu pages.

7.3.1 Setup menu page

Use the Setup menu page to define the access permissions, operating mode and the parameters of the RS232 interface. The other menu pages can only be used when communication with the motor has been built-up via the Setup menu page.

The selected operating mode automatically determines the scope of utilization and the access permissions.

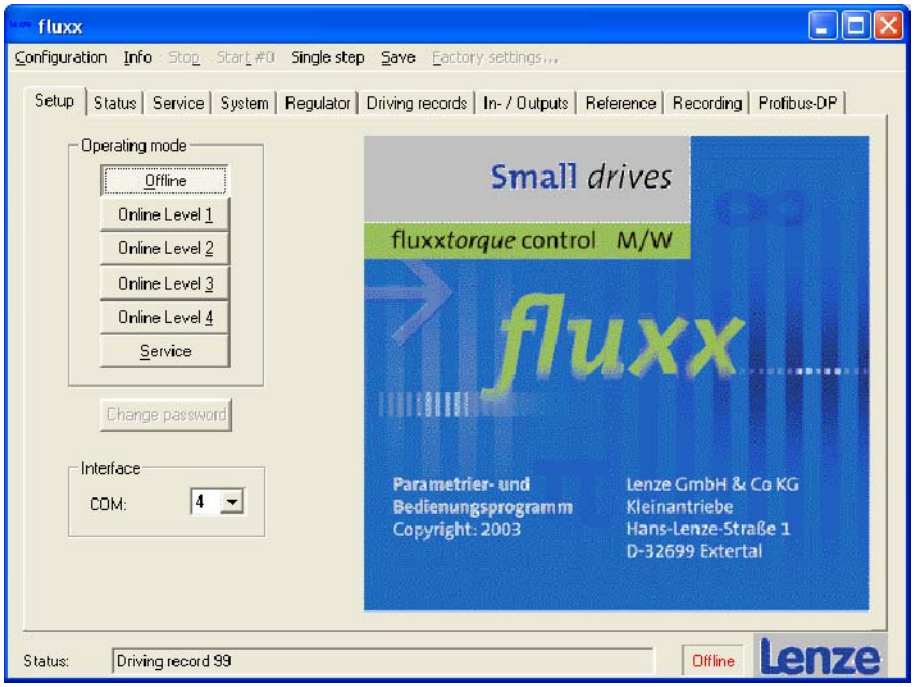


Fig. 5 Representation of the "Setup" tab

Note!

Enter the interface parameters first (bottom left on the first menu page).

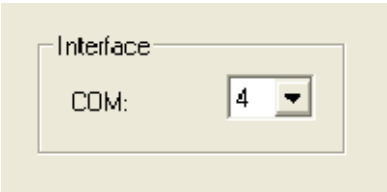


Fig. 6 Serial interface settings

The baud rate is set to 38400 baud by default. For the COM port, please see the hardware description for your PC.

Note!

In the default setting, the individual operating levels are not password-protected. If you want to use a password, please consider that the servo inverter must be returned to Lenze for password deactivation when the password gets lost!

In this example, log in under ”Online Level 3”. In this operating level, you can select speed and torque for a trial operation and start the driving program. You will be asked for a password. Do not enter anything and confirm with ”OK”.

If the power supply and the PC have been properly connected, the individual driving programs will be written to the PC when changing from ”Offline” to ”Online Level 3”. This can be seen in the status bar where the program counts from driving program 0 to 99. Now, you have an online connection with the drive.

On the lower edge of the operating program on the left next to the Lenze icon, the connection status is also displayed. If you have established the connection to the drive, the message ”Online” is displayed there in green font. If you are not able to establish a connection, an error is indicated.

7.3.2 Status menu page

This menu page shows:

- **Warnings** not leading to the disconnection of the amplifier power stage;
- **Fault messages** leading to the disconnection of the amplifier power stage;
- **Status messages** visualizing the response and general operating status activated by a warning or fault message;
- **Actual values** and units of the operating program reflecting the current physical and electrical operating states.

With a proper connection, you can see the current status of the drive, e.g.

- motor temperature,
- DC-bus voltage,
- drive status in the ”Status” bar.

To start the drive, switch to the ”Driving program” menu page.

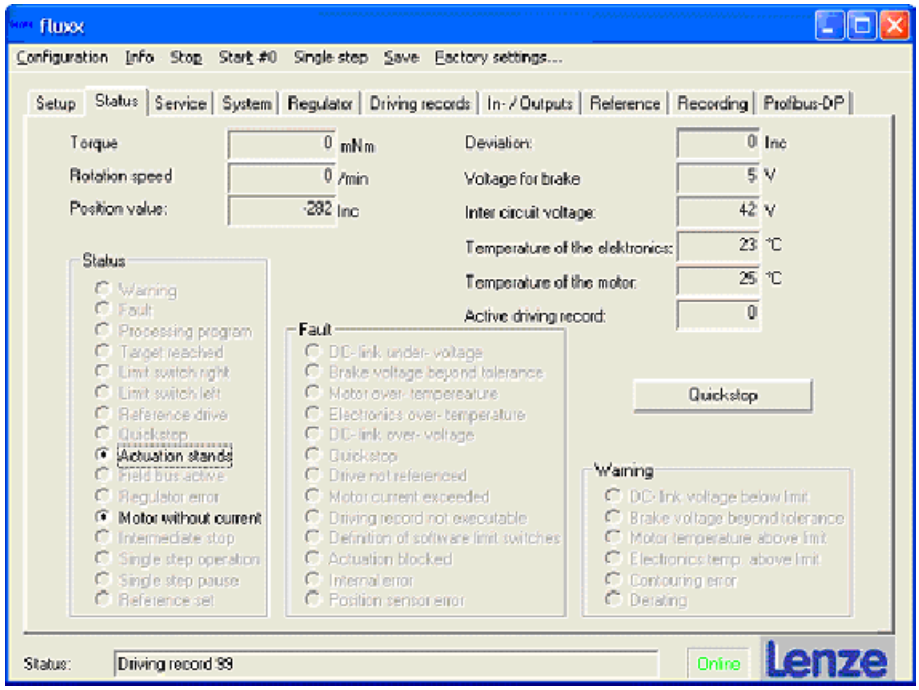


Fig. 7 Representation of the ”Status” tab

7.3.3 Driving program menu page

On this menu page, you can edit the ”driving programs”. Each ”driving program” contains the control mode (contouring error, speed, torque or position control), setpoint, different ramps, acceleration values and specific waiting times.

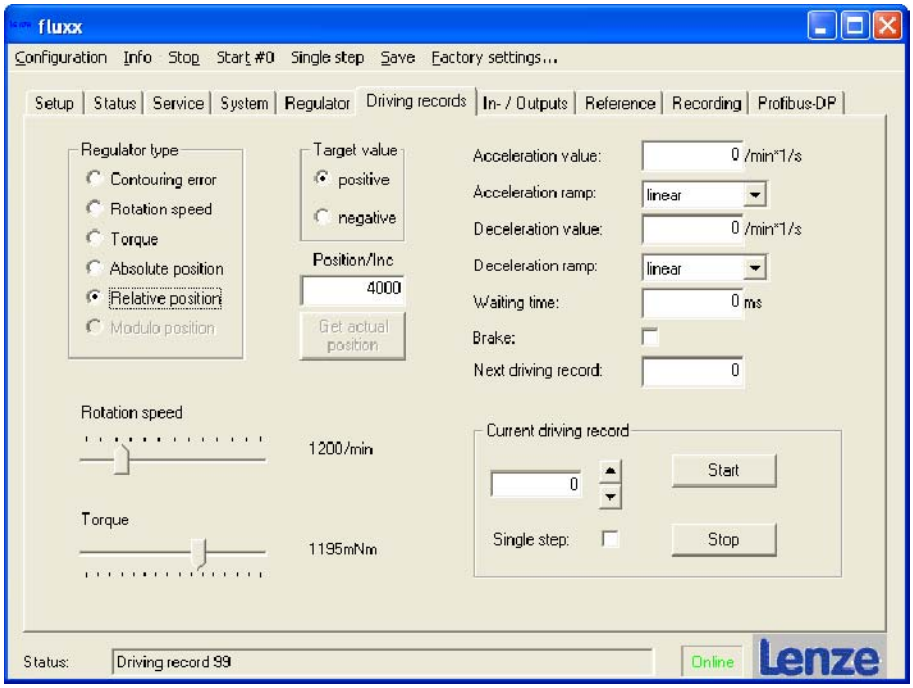


Fig. 8 Representation of the ”Driving program” tab

During the first commissioning, the drive traverses in the ”Following error” mode. Select driving program ”1” in the ”Current driving program” field. Driving program ”0” has special properties which will not be described in detail here (📖 Software Manual).

Select ”Following error” as control mode and ”positive” setpoint processing. The time selected under the menu item ”Set value positive/negative” indicates the following error mode time. Do not change the entry ”0”. With this setting, the drive will continue operation until a ”stop” command will be sent.

Select 100 min^{-1}/s as acceleration and deceleration value. Do not change the entry ”linear” for the acceleration and deceleration ramp.

Use the ”Speed” scrollbar to select 500 min^{-1}, the ”Torque” scrollbar should be positioned in the centre. This setting is used to prevent jerky movements.

Send a start command via the upper menu bar or by a click on the ”Start” field in the ”Current driving program” dialog.

After this, you will be asked if you want to save the changes made in the selected driving program.

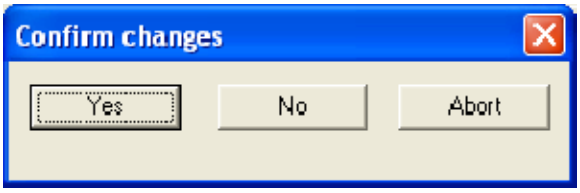


Fig. 9 Saving the settings

Click ”Yes” to confirm the settings. After this, the settings will be saved in the flash memory and can be converted into motion.

Sending another start command slowly starts operation of the drive. To stop the motion process, send a ”Stop” command via the upper menu bar or the ”Current driving program” dialog. After this, the drive will slowly decelerate.

8 Troubleshooting and fault elimination

8.1 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

8.2 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 interrrupted.
Electronic temperature exceeded	Temperature of the electronics too high, cooling not sufficient, utilisation of the electronics too high	Check ambient conditions of the electronics ($T_{ambient}$ <40°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

8.3 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

9 Accessories

9.1 Technical documentation

Accessories	Designation		Order No.
Profibus		German	On request
		English	
		French	
CAN		German	
		English	
		French	

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

9.2 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	3 AC 320 V - 0 % ... 575 V + 0 % 45 Hz - 0 % ... 65 Hz + 0 %	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

9.3 Function modules for 930 series (M/W)

For the servo inverters of the 930 series, function modules are provided to increase the number of the digital inputs and outputs of the servo inverter. Further function modules - e.g. for evaluating analog signals or for master frequency coupling - are projected. Further details on this can be received from your Lenze sales department.

For using function modules with a greater number of digital inputs and outputs, servo inverters are to be used with a local CAN interface. The function modules are to be connected to the servo inverters by means of a cable.

Stop!

The function modules are specifically designed for the L-force Servo Drives 930 fluxxtorque drive series. They are not compatible to the function modules (FIF or AIF modules). FIF or AIF modules therefore cannot be used.

The type code of the function modules is as follows:

Type code of the function modules					
930	-	-	- -	- -	- -
Series	Type: F: function module	Interface: C: local CAN I: IO	Number of digital inputs	Number of digital outputs	Special function

Technical data of the function modules which can be connected to a servo inverter via a local CAN interface:

Technical data of the 930FC140400function module	
Digital inputs	14 (24 V)
Digital outputs	4 (24 V, max. 0.5 A output current)
Type of protection	IP20
Special function	None
General	36-pole screw terminal
Recommended cable for local CAN connection	491996

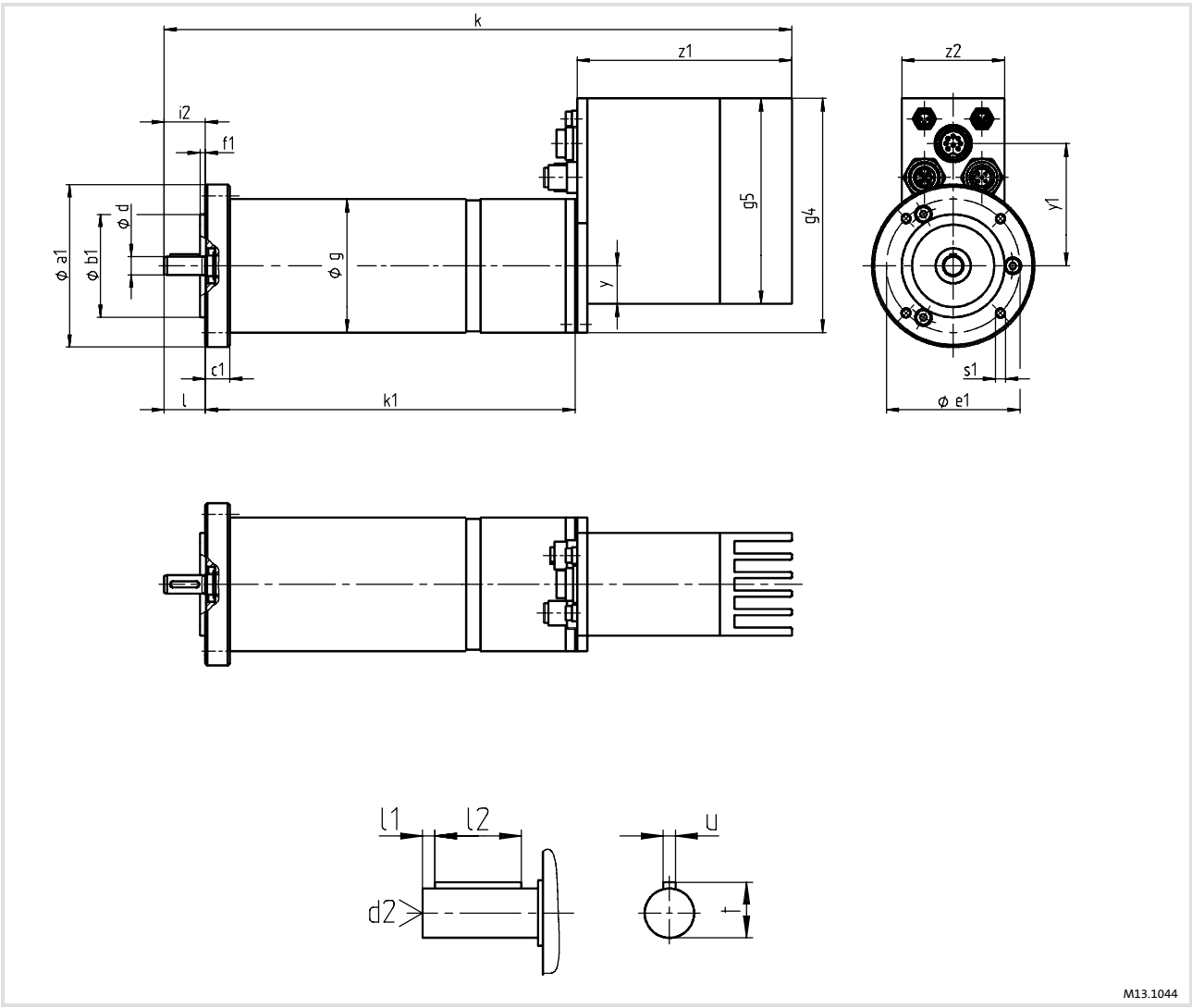
Technical data of 930FC030200application box	
Digital inputs	3 (24 V)
Digital outputs	2 (24 V, max. 0.5 A output current)
Type of protection	IP64
Special function	None
General	Each IO signal is lead out on a 3-pole M8 plug (digital input: male, digital output: female).
Recommended cable for local CAN connection	491996

For servo inverters with a digital IO interface, a function module is provided to transform the digital output into a digital input. Therefore, two inputs instead of one input and one output are provided.

Technical data of the 930FI020000 Y-distributor	
Digital inputs	2 (24 V)
Digital outputs	0
Type of protection	IP64
Special function	None
General	2 3-pole M8 sockets for sensors
Recommended cable for local CAN connection	Direct mounting
Restriction	Sampling frequency of the digital input is halved

10 Appendix

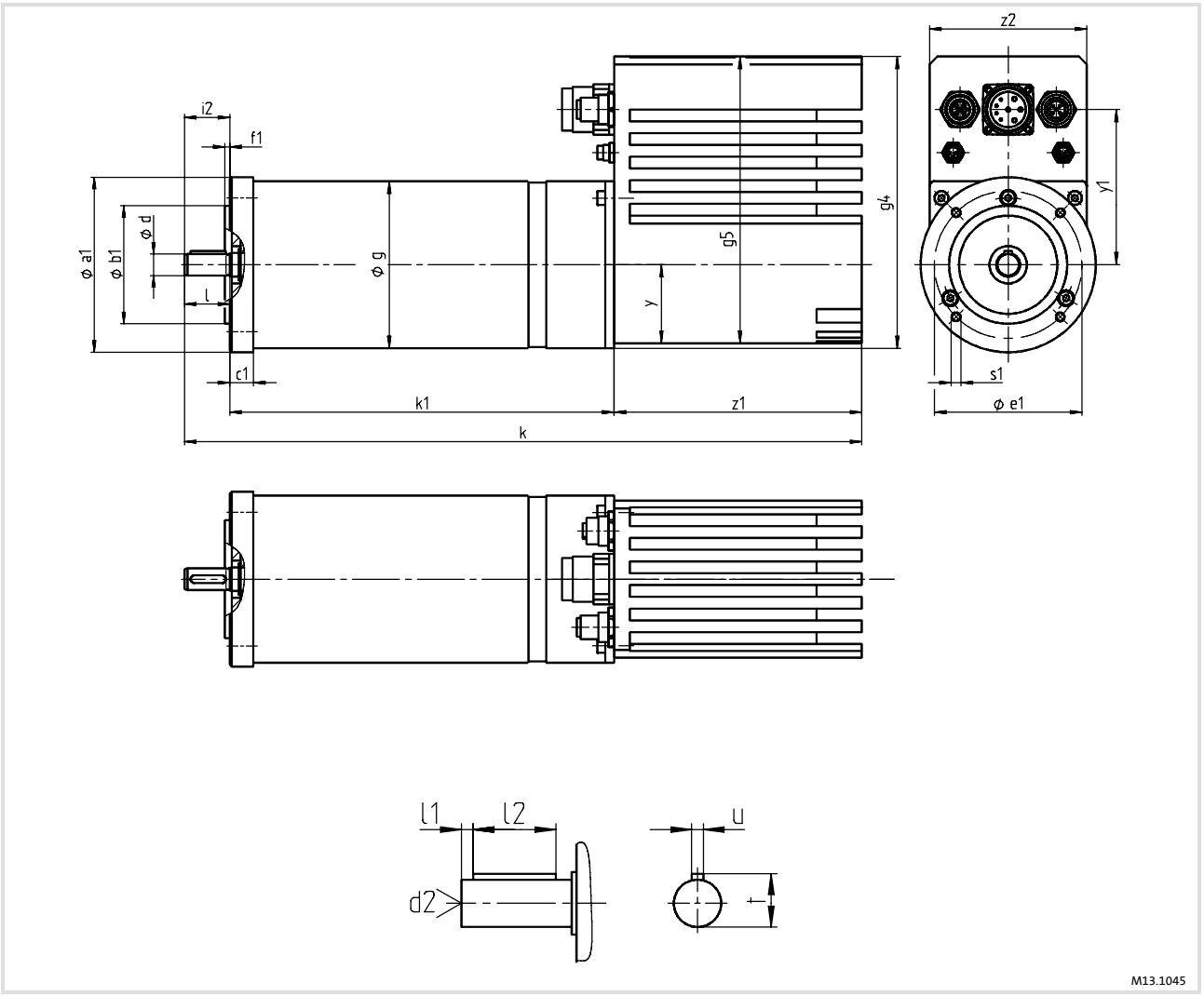
10.1 Dimensions of 931M 24 V or 42 V DC, simple mounting (resolver)



Motor frame size	Frame size	a1	b1 $_{j7}$	c1	d $_{k6}$	d2	e1	f1	g	g4	g5	i2	k	k1
SDSGSSR035-22	IEC56C80	79	50	12	9	M3	65	2.5	65	114	100	20	305.5	181
SDSGSSR047-22	IEC63C80	89	50	12	9	M3	65	2.5	75	124	100	20	325.5	201

Motor frame size	Frame size	l	l1	l2	s1	t	u	y	y1	z1	z2	Weight
SDSGSSR035-22	IEC56C80	20	3	14	M5	10.2	3	18.5	59.5	104.5	50	2.8
SDSGSSR047-22	IEC63C80	20	3	14	M5	10.2	3	13.5	64.5	104.5	50	3.7

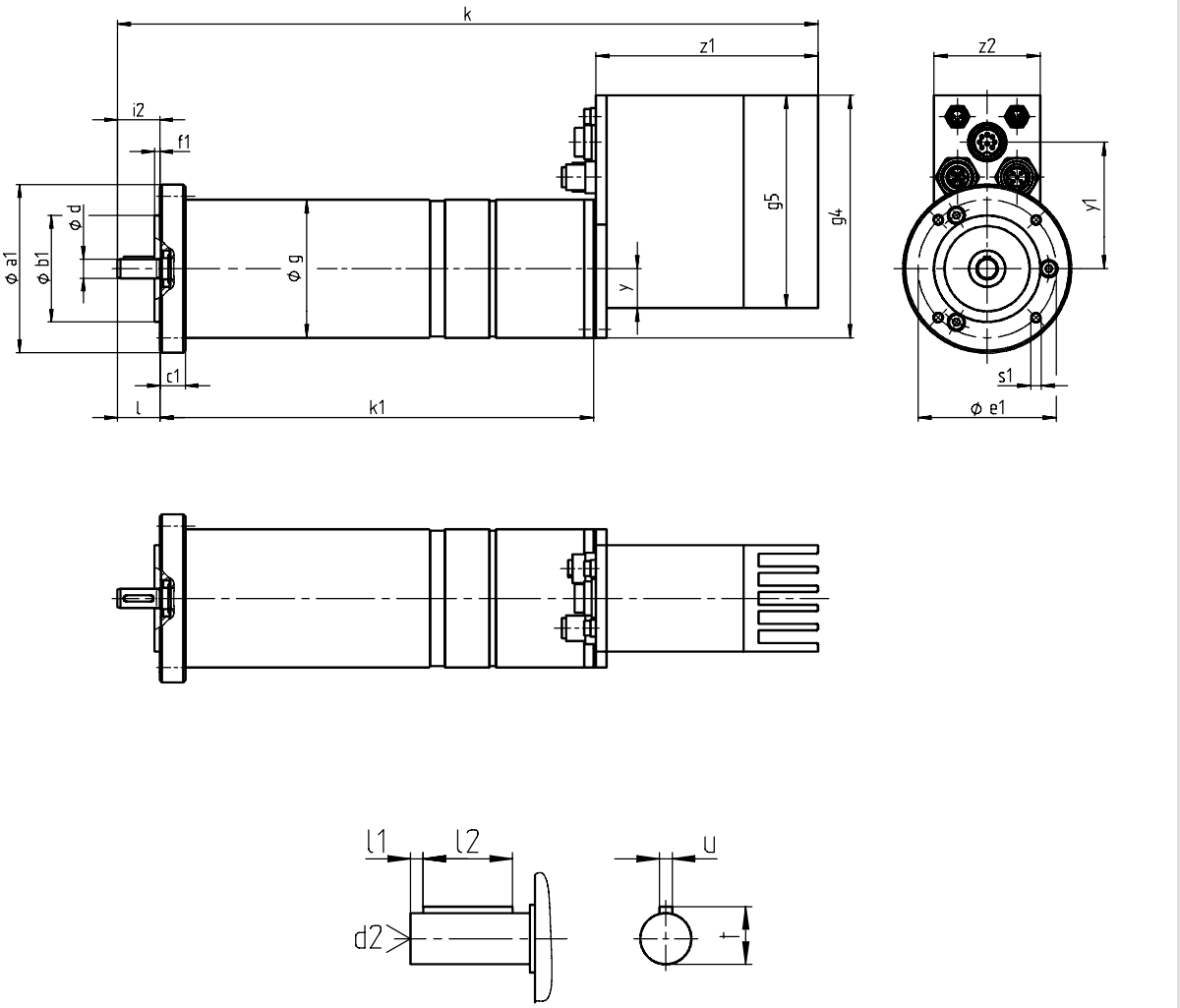
10.2 Dimensions of 931M 230 V AC or 320 V DC, simple mounting (resolver)



Motor frame size	Frame size	a1	b1 j7	c1	d k6	d2	e1	f1	g	g4	g5	i2	k	k1
SDSGSSR047-22	IEC56C80	79	50	12	9	M3	65	2.5	75	146	146	20	335	189.5
SDSGSSR056-22	IEC63C90	89	60	12	11	M4	75	2.5	85	148.5	146	23	345	196.5

Motor frame size	Frame size	l	l1	l2	s1	t	u	y	y1	z1	z2	Weight
SDSGSSR047-22	IEC56C80	20	3	14	M5	10.2	3	40	79	125.5	80	5.1
SDSGSSR056-22	IEC63C90	23	3	18	M5	12.5	4	40	79	125.5	80	6.3

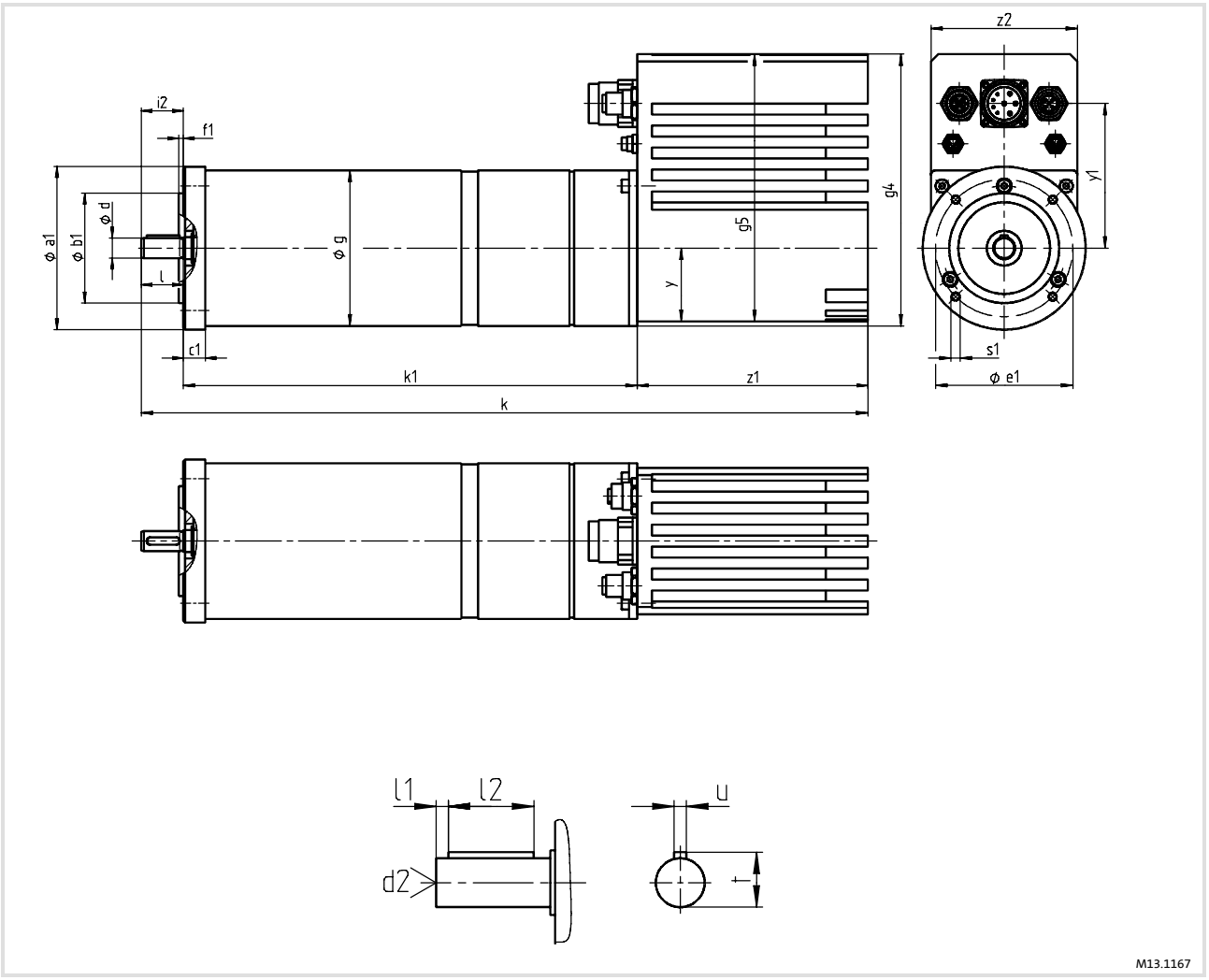
10.3 Dimensions of 931M 24 V or 42 V DC, double mounting (resolver + brake)



Motor frame size	Frame size	a1	b1 $_{j7}$	c1	d $_{k6}$	d2	e1	f1	g	g4	g5	i2	k	k1
SDSGSSR035-22	IEC58C80	79	50	12	9	M3	65	2.5	65	114	100	20	329.5	205
SDSGSSR047-22	IEC56C80	79	50	12	9	M3	65	2.5	75	124	100	20	358	233.5

Motor frame size	Frame size	l	l1	l2	s1	t	u	y	y1	z1	z2	Weight
SDSGSSR035-22	IEC58C80	20	3	14	M5	10.2	3	18.5	59.5	104.5	50	3.3
SDSGSSR047-22	IEC57C80	20	3	14	M5	10.2	3	18.5	64.5	104.5	50	4.3

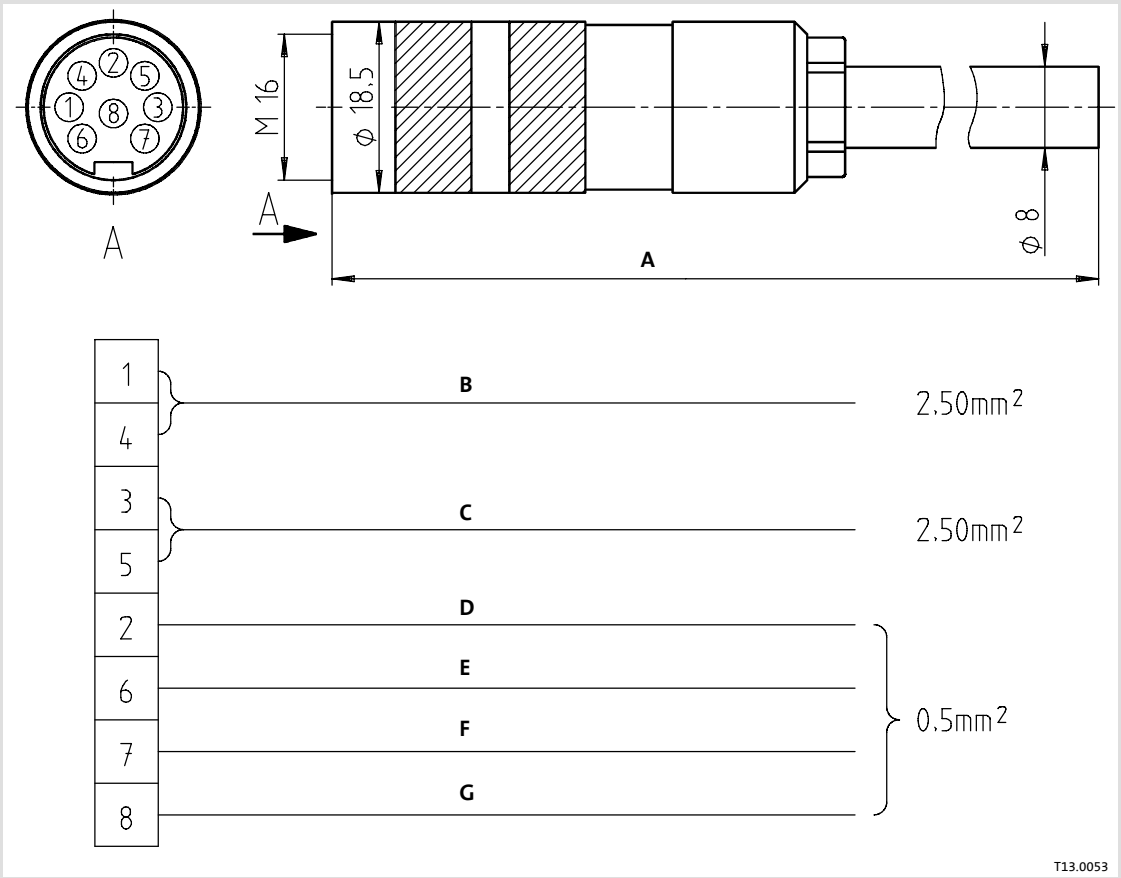
10.4 Dimensions of 931M 230 V AC or 320 V DC, double mounting (resolver + brake)



Motor frame size	Frame size	a1	b1 j7	c1	d k6	d2	e1	f1	g	g4	g5	i2	k	k1
SDSGSSR047-22	IEC58C80	79	50	12	9	M3	65	2.5	75	146	146	20	379	233.5
SDSGSSR056-22	IEC56C90	89	60	12	11	M4	75	2.5	85	148.5	146	23	397.5	249

Motor frame size	Frame size	l	l1	l2	s1	t	u	y	y1	z1	z2	Weight
SDSGSSR047-22	IEC58C80	20	3	14	M5	10.2	3	40	79	125.5	80	5.7
SDSGSSR056-22	IEC57C90	23	3	18	M5	12.5	4	40	79	125.5	80	7.0

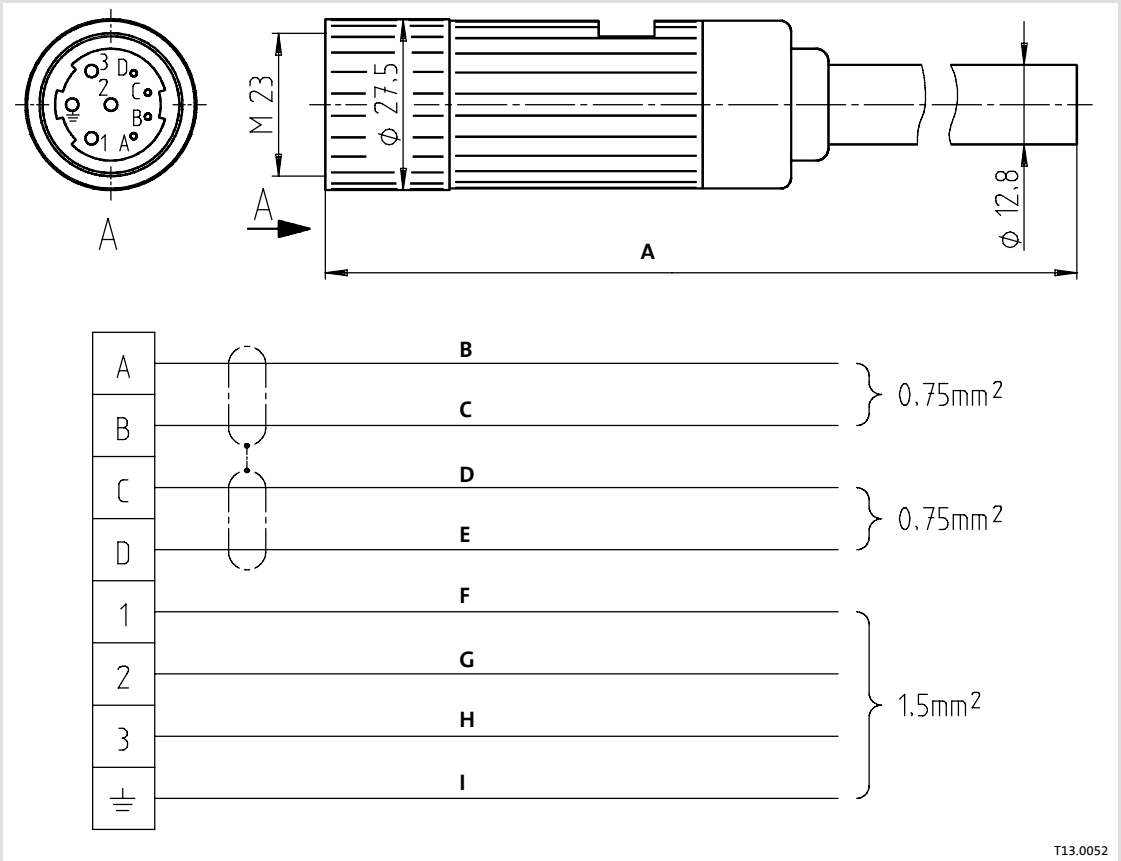
10.5 Voltage supply for type 931M 24 V or 42 V



A length x
B blue
C red
D green-yellow
E red + black
F red + white
G white

8-pole motor connection cable			
Pin assignment	**Conductor cross section**	**Core identification**	**Signal designation**
1	2.50 mm²	bl	GND
4			
3	2.50 mm²	rt	+ 42 V supply
5			
2	0.50 mm²	gnge	PE
6	0.50 mm²	rt + sw	+ 24 V auxiliary supply
7	0.50 mm²	rt + ws	+ 24 V brake
8	0.50 mm²	ws	Brake enable

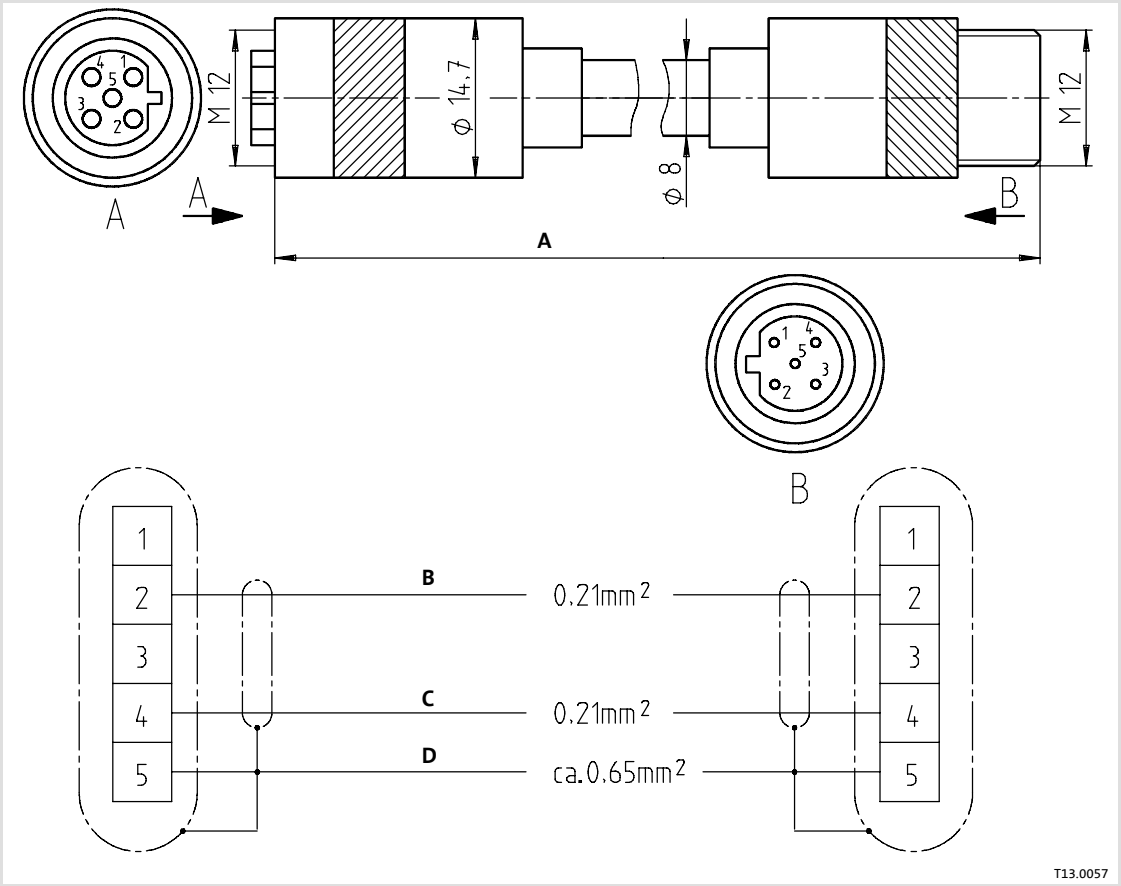
10.6 Voltage supply for type 931M 230 V or 320 V



A length x
B black 5
C black 6
D black 7
E black 8
F black 1
G black 2
H black 3
I green-yellow

8-pole motor connection cable			
Pin assignment	**Conductor cross section**	**Core identification**	**Signal designation**
A	0.75 mm²	5	+ 24 V brake
b	0.75 mm²	6	GND
c	0.75 mm²	7	Brake enable
D	0.75 mm²	8	+ 24 V auxiliary supply
1	1.50 mm²	1	230 V AC/0 V DC
2	1.50 mm²	2	Option +320 V DC
3	1.50 mm²	3	230 V AC/L1
⏚	1.50 mm²	gnge	PE

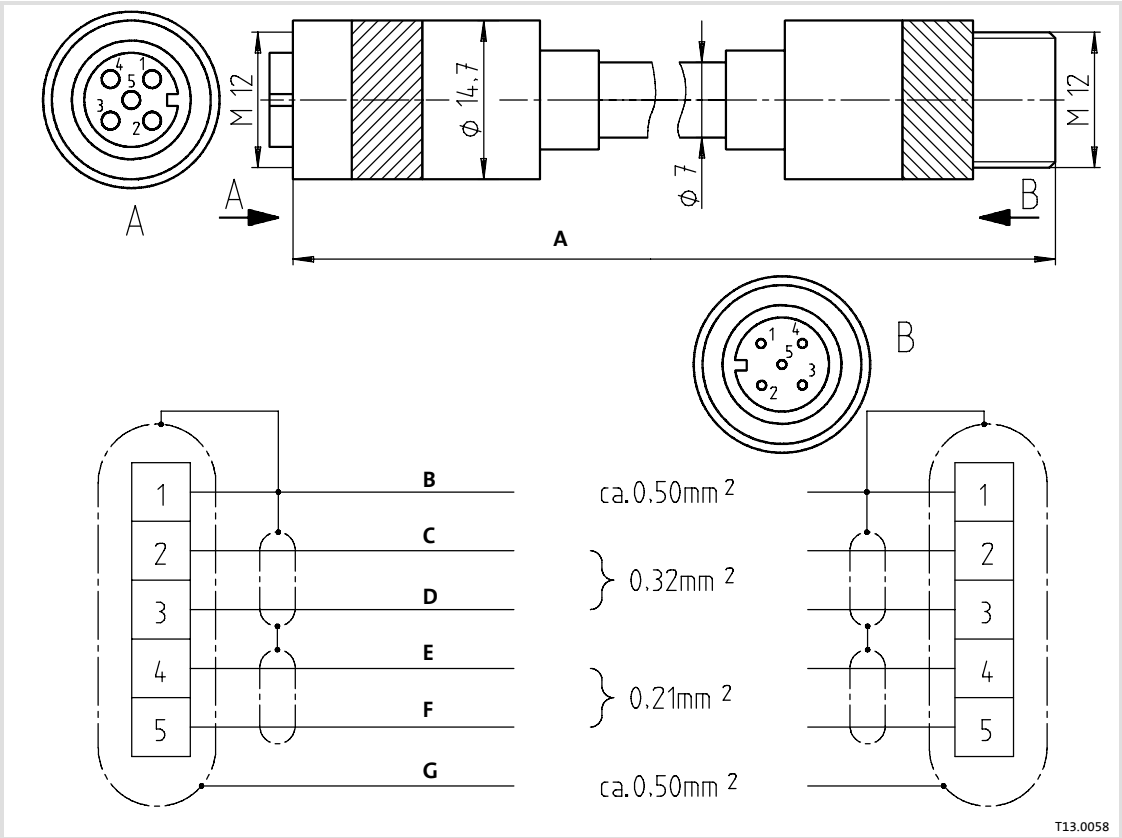
10.7 Profibus connection



A length x
B green
C red
D shield

5-pole Profibus connection cable			
Pin assignment	**Conductor cross section**	**Core identification**	**Signal designation**
1			
2	0.21 mm² / AWG24	gn	A-cable
3			
4	0.21 mm² / AWG24	rt	B-cable
5	0.65 mm² / AWG19	shield	shield

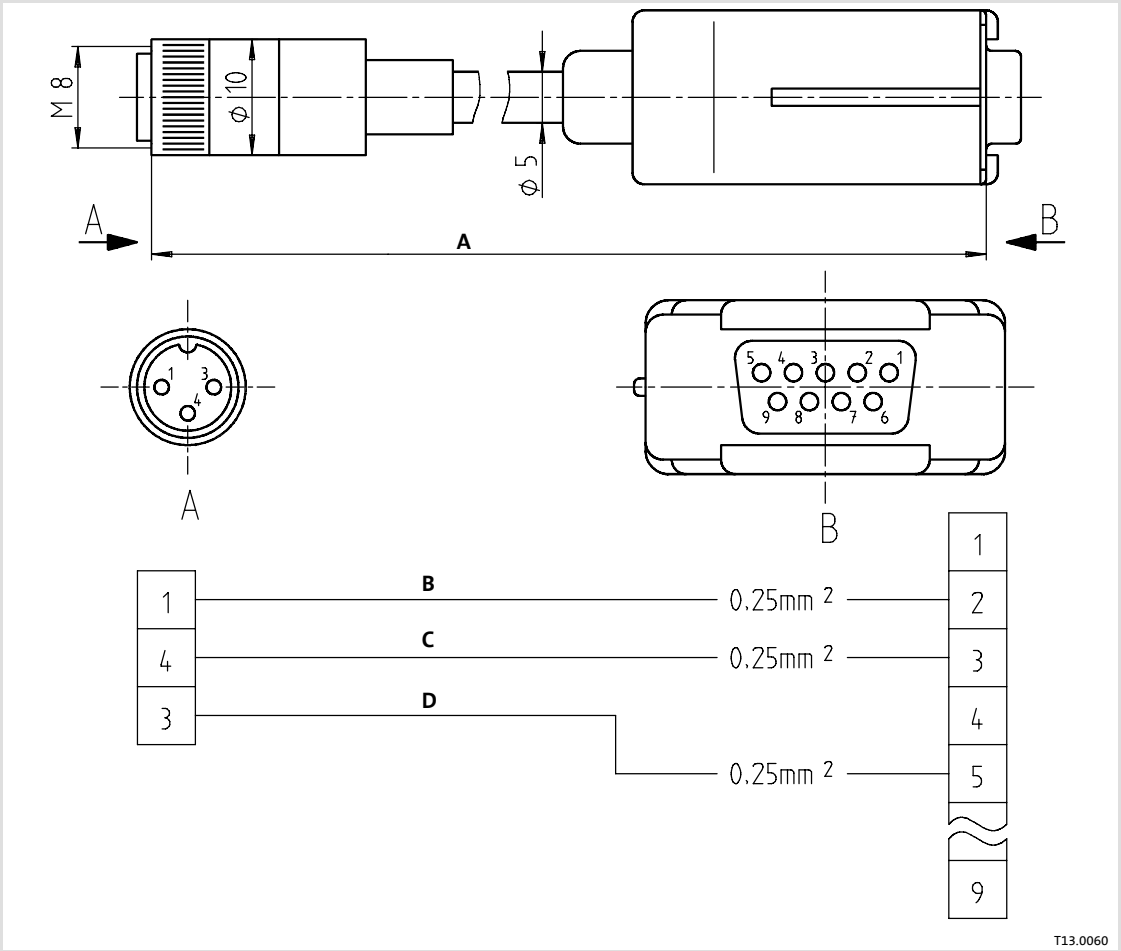
10.8 CAN connection



A length x
B shield
C red
D black
E white
F blue
G shield

5-pole CAN connection cable			
Pin assignment	**Conductor cross section**	**Core identification**	**Signal designation**
1	0.50 mm²	shield	shield
2	0.32 mm² / AWG22	rt	+ supply
3	0.32 mm² / AWG22	sw	- supply
4	0.21 mm² / AWG24	ws	CAN H
5	0.21 mm² / AWG24	bl	CAN L
	0.50 mm²	shield	shield

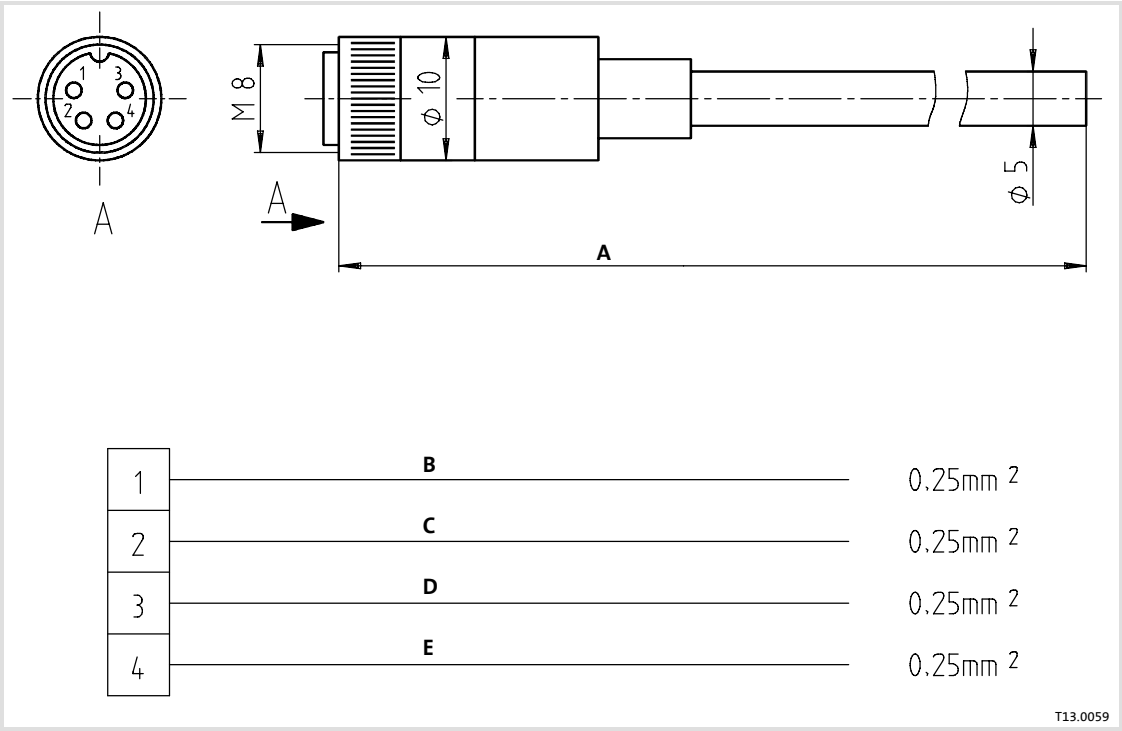
10.9 RS232 connection



A length x
B brown
C black
D blue

RS232 connection cable				
3-pole socket assignment	**9-pole socket assignment**	**Conductor cross section**	**Core identification**	**Signal designation**
1	2	0.25 mm² / AWG23	br	TxD
4	3	0.25 mm² / AWG23	sw	RxD
3	5	0.25 mm² / AWG23	bl	ground

10.10 Local CAN or digital I/O connection



A length x
B brown
C white
D blue
E black

4-pole local CAN or digital I/O connection cable				
Pin assignment	**Conductor cross section**	**Core identification**	**Signal designation local CAN**	**Signal designation digital I/O**
1	0.25 mm² / AWG23	br	+ 24 V	+ 24 V
2	0.25 mm² / AWG23	ws	CAN H	IN +
3	0.25 mm² / AWG23	bl	ground	ground
4	0.25 mm² / AWG23	sw	CAN L	OUT -

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Notes

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