STÖBER ANTRIEBSTECHNIK

POSIDRIVE® MDS 5000

Mounting Instructions

CONNECTION

MOUNTING

V 5.3

01/2008 GB

TABLE OF CONTENTS

1 NOTES ON SAFETY

This manual contains information which must be adhered to in order to prevent personal injury and property damage. This information is graduated by degree of damage as shown below.

ATTENTION

Means that an undesired result or undesired state may occur if this note is not heeded.

CAUTION

Without warning triangle: Means that property damage may occur if appropriate precautions are not taken.

CAUTION

With warning triangle: Means that minor personal injury and property damage may occur if appropriate precautions are not taken.

WARNING

Means that major danger of death and substantial property damage **may** occur if appropriate precautions are not taken.

DANGER

Means that great danger to life and substantial property damage **will** occur if appropriate precautions are not taken.

NOTE

Indicates an important piece of information on the product or the drawing of attention to a part of the documentation requiring special attention.

ACTION

Means the description of an action which is particularly important for handling the product.

1.1 Hardware

WARNING

To ensure that avoidable problems do not occur during commissioning and/or operation, be sure to read these installation and commissioning instructions before installation and commissioning.

In the sense of DIN EN 50178 (formerly VDE 0160), the FDS and MDS model series of POSIDRIVE® are electrical components of power electronics for the regulation of energy flow in high-voltage systems. They are exclusively designed to power servo (MDS) and asynchronous (FDS, MDS) machines. Utilization, installation, operation and maintenance are only permitted under observation and adherence to valid regulations and/or legal requirements, applicable standards and this technical documentation.
This is a product of the restricted sales class in accordance with IEC 61800-3. In a residential zone, this product may cause high-frequency interference in which case the user may be requested to take suitable measures.

Strict adherence to all rules and regulations must be ensured by the user.

The safety notes contained in further sections (items) and specifications must be adhered to by the user.

WARNING

Caution! High touch voltage! Danger of shock! Danger to life!

When network voltage is applied, never under any circumstances open the housing or disconnect the connections. When installing or removing option boards, you may only open the inverter in the dead state (all power plugs disconnected) and only after a waiting period of at least 5 minutes after the network voltage is switched off. Prerequisite for the correct functioning of the inverter is the correct configuration and installation of the inverter drive. Transport, installation, commissioning and handling of the device may only be performed by qualified personnel who have been especially trained for these tasks.

Pay particular attention to the following:

- Permissible protection class: Protective ground. Operation is only permitted when the protective conductor is connected in accordance with regulations. Direct operation of the devices on IT networks is not possible.
- Installation work may only be performed in the dead state. For work on the drive, lock enable and disconnect the complete drive from the power. (Observe the 5 safety rules.)
- Leave the plug for the DC link coupling connected even when the DC link coupling is not being used (BG0-BG2: X22)!
- Discharge time of the DC link capacitors > 5 minutes.
- Do not penetrate the device's interior with any kind of object.
- During installation or any other work in the switching cabinet, protect the device against falling parts (pieces of wire, stranded wire, pieces of metal, and so on). Parts with conductive properties may cause a short circuit within the inverter or device failure.
- Before commissioning, remove extra coverings so that the device cannot overheat.

The inverter must be installed in a switching cabinet in which the maximum ambient temperature (see technical data) is not exceeded. Only copper lines may be used. The line cross sections to be used are contained in table 310-16 of the NEC standard at 60 °C or 75 °C.

The company STÖBER ANTRIEBSTECHNIK GmbH + Co. KG accepts no liability for damages resulting from non-adherence to the instructions or the particular regulations.

The motor must have an integral temperature monitor with basis insulation as per EN 61800-5-1 or external motor overload protection must be used.

Only suitable for use on supply current networks which cannot deliver more than a maximum symmetric, nominal, short-circuit current of 5000 A at 480 Volt.

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes", or the equivalent. Suitable for use on a circuit capable of delivering not more than 10 kA rms. Symmetrical Amperes, 480 Volts Maximum" when Protected by RK1 Class Fuses as specified in the chapter technical data.

Subject to technical changes without prior notification which changes serve to improve the devices. This documentation is purely a product description. It does not represent promised properties in the sense of warranty law.

1.2 Software

Use of the POSITool software

The POSITool software package can be used to select an application, adjust parameters and signal monitoring of the 5th generation of STÖBER inverters. The functionality is specified by the selection of an application and the transmission of these data to an inverter.

The program is the property of STÖBER ANTRIEBSTECHNIK GmbH + Co. KG and is protected by copyright. The program is licensed for the user.
The software is provided exclusively in machine-readable format.
The customer receives from STÖBER ANTRIEBSTECHNIK GmbH + Co. KG a non-exclusive right to use the program (license) if the program was obtained legally.
The customer has the right to utilize the program for the above stated activities and functions and to make and install copies of the program, including one backup copy, for support of said utilization.

The conditions of this license apply to all copies. The customer is obligated to place the copyright note and all other ownership notes on every copy of the program.
The customer is not authorized to use, copy, change or pass on/transmit the program for reasons other than those covered by these conditions; the customer is also not authorized to convert the program (reverse assembly, reverse compilation) or compile the program in any other manner, or to sublicense, rent or lease the program.

Product maintenance

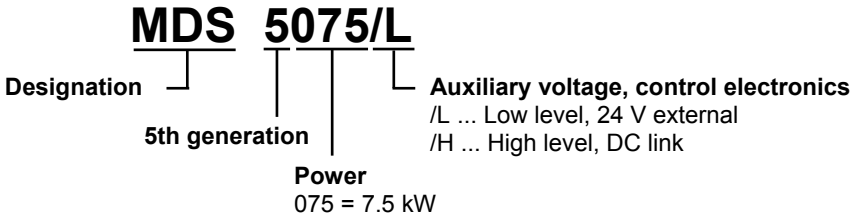
The obligation to perform maintenance applies to the two last current program versions prepared and released for use by STÖBER ANTRIEBSTECHNIK GmbH + Co. KG. STÖBER ANTRIEBSTECHNIK GmbH + Co. KG can either correct program errors or provide a new program version. The choice is up to STÖBER ANTRIEBSTECHNIK GmbH + Co. KG. If, in individual cases, the error cannot be corrected immediately, STÖBER ANTRIEBSTECHNIK GmbH + Co. KG will provide an intermediate solution which, if necessary, requires adherence by the user to special operating regulations.

The claim to error correction only exists when reported errors are reproducible or can be recorded by machine-made outputs. Errors must be reported in reconstructable form giving useful information for error correction.

The obligation to correct errors is invalidated for such programs which the customer changes or manipulates unless the customer can prove when reporting the error that the manipulation is not the cause of the error.
STÖBER ANTRIEBSTECHNIK GmbH + Co. KG is obligated to keep the currently valid program versions in a specially protected place (fire-resistant data safe, safety deposit box at a bank).

2 TECHNICAL DATA

Model key



2.1 Electrical

General (for all sizes)

Output voltage	3 x 0 V up to connection voltage
Output frequency	0 – 400 Hz
Radio interference suppression	EN 61800-3, interference emission, class C3
International certifications	UL and cUL
Storage/transportation temperature	-20 °C to +70 °C, max. of change: 20 K / h
Max. surrounding air temperature	0 to 45 °C with rated data, up to 55 °C with power reduction of 2.5% / °C
Relative humidity during operation	Relative humidity 85%, no condensation
Altitude of installation	Up to 1000 m above sea level without restriction 1000 to 2000 m above sea level with power reduction of 1.5% / 100 m
High voltage category	III in accordance with EN 61800-5-1
Degree of soil	Degree of soil 2 in accordance with EN 60204 / EN 50178
Protection rating	IP 20
Installation position	Generally vertical
Ventilation	Built in fan
Upper voltage limit	830 V
Brake chopper on level	780 V / 800 V
Brake chopper disable voltage	740 V / 760 V

Size 0 / BG 0

Device Type	MDS 5007	MDS 5004 *Under preparation*	MDS 5008	MDS 5015
ID no.	44556	44555	44557	44558
Recommended motor power	0.75 kW	0.37 kW	0.75 kW	1.5 kW
Connection voltage	(L1-N) 1 x 230 V +20%/-40%, 50/60Hz	(L1-L3) 3 x 400 V +32%/-50% 50 Hz (L1-L3) 3 x 480 V +10%/-58% 60 Hz		
Power fuses[1]	1 x 10 AT	3 x 6 AT	3 x 6 AT	3 x 10 AT

Operation with servo motor (control mode servo control)

Rated current I_N	3 x 3.0 A	3 x 1.0 A	3 x 1.5 A	3 x 3.0 A
I_{max}	250% / 2 sec., 200% / 5 sec.			
Clock pulse frequency	8 kHz			

Operation with three-phase current motor (control mode V/f, VC, SLVC)

Rated current I_N	3 x 4.0 A	3 x 1.3 A	3 x 2.1 A	3 x 4.0 A
I_{max}	180% / 5 sec., 150% / 30 sec.			
Clock pulse frequency	4 kHz (adjustable up to 16 kHz with derating)			

Brake resistor (accessories), cf. chap. 7.2	100 Ω: Max. of 1.6 kW	200 Ω: Max. of 3.2 kW	
Perm. motor cable length, shielded	50 m Output derating is required for distances of 50 m to 100 m (see chapter 7.2.4).		
Power loss at Ia = I_N	80 W	50 W	65 W	90 W
Power loss at Ia = 0A[2]	Max. of 30 W[2]		
Conductor cross section	Max. of 2.5 mm^2		
Dimensions (H x B x T) [mm]	300 x 70 x 175 (193)[3]		
Weight [kg] without packaging	2.2		
Weight [kg] with packaging	3.2		
Upper voltage limit	440 V	830 V	
Brake chopper on level	400 V / 420 V	780 V / 800 V	
Brake chopper disable voltage	360 V / 380 V	740 V / 760 V	

An external brake resistor may be required during generator operation.
A temperature-monitored brake resistor is required for UL/cUL-conform operation.

[1] Line circuit breaker, tripping characteristic C, EN 60 898
Use class RK1 fuses for UL adherence: Class RK1 (e.g., Bussmann KTS-R-xxA / 600 V)
[2] Depends on the option boards and sensors connected (e.g., encoder)
[3] Depth including braking resistor RB 5000

Size 1 / BG 1

Device Type	MDS 5040	MDS 5075
ID no.	44560	44561
Recommended motor capacity	4.0 kW	7.5 kW
Connection voltage	(L1-L3) 3 x 400 V +32%/-50% 50 Hz (L1-L3) 3 x 480 V +10%/-58% 60 Hz	
Power fuses[1]	3 x 16 AT	3 x 20 AT

Operation with servo motor (control mode servo control)

Rated current I_N	3 x 6.0 A	3 x 10 A
I_{max}	250% / 2 sec., 200% / 5 sec.	
Clock pulse frequency	8 kHz	

Operation with three-phase current motor (control mode V/f, VC, SLVC)

Rated current I_N	3 x 10 A	3 x 16 A
I_{max}	180% / 5 sec., 150% / 30 sec.	
Clock pulse frequency	4 kHz (adjustable up to 16 kHz with derating)	

Brake resistor (accessories), cf. chap. 7.2		100 Ω: Max. of 6.4 kW	47 Ω: Max. of 13.6 kW
Perm. motor cable length, shielded		50 m Output derating is required for distances of 50 m to 100 m (see chapter 7.2.4).	
Power loss at Ia = I_N		170 W	200 W
Power loss at Ia = 0A[2]		Max. of 30 W[2]	
Conductor cross section		Max. of 4 mm^2	
Dimensions (H x B x T) [mm]		300 x 70 x 260 (278)[3]	
Weight [kg]	without packaging	3.8	
	with packaging	5.1	
Upper voltage limit		830 V	
Brake chopper on level		780 V / 800 V	
Brake chopper disable voltage		740 V / 760 V	

An external brake resistor may be required during generator operation.
A temperature-monitored brake resistor is required for UL/cUL-conform operation.

[1] Line circuit breaker, tripping characteristic C, EN 60 898
Use class RK1 fuses for UL adherence: Class RK1 (e.g., Bussmann KTS-R-xxA / 600 V)
[2] Depends on the option boards and sensors connected (e.g., encoder)
[3] Depth including braking resistor RB 5000

Size 2 / BG 2

Device Type	MDS 5110	MDS 5150
ID no.	44562	44563
Recommended motor capacity	11 kW	15 kW
Connection voltage	(L1-L3) 3 x 400 V +32%/-50% 50 Hz (L1-L3) 3 x 480 V +10%/-58% 60 Hz	
Power fuses[1]	3 x 35 AT	3 x 50 AT

Operation with servo motor (control mode servo control)

Rated current I_N	3 x 14 A	3 x 20 A
I_{max}	250% / 2 sec., 200% / 5 sec.	
Clock pulse frequency	8 kHz	

Operation with three-phase current motor (control mode V/f, VC, SLVC)

Rated current I_N	3 x 22 A	3 x 32 A
I_{max}	180% / 5 sec., 150% / 30 sec.	
Clock pulse frequency	4 kHz (adjustable up to 16 kHz with derating)	

Brake resistor (accessories), cf. chap. 7.2		22 Ω: Max. of 29 kW	
Perm. motor cable length, shielded		50 m Output derating is required for distances of 50 m to 100 m (see chapter 7.2.4).	
Power loss at Ia = I_N		220 W	280 W
Power loss at Ia = 0A[2]		Max. of 30 W[2]	
Conductor cross section		Max. of 6 mm²	
Dimensions (H x B x T) [mm]		300 x 105 x 260 (278)[3]	
Weight [kg]	without packaging	5.0	
	with packaging	6.1	
Upper voltage limit		830 V	
Brake chopper on level		780 V / 800 V	
Brake chopper disable voltage		740 V / 760 V	

An external brake resistor may be required during generator operation.
A temperature-monitored brake resistor is required for UL/cUL-conform operation.

[1] Line circuit breaker, tripping characteristic C, EN 60 898
Use class RK1 fuses for UL adherence: Class RK1 (e.g., Bussmann KTS-R-xxA / 600 V)
[2] Depends on the option boards and sensors connected (e.g., encoder)
[3] Depth including braking resistor RB 5000

Size 3 / BG 3

Device Type	MDS 5220	MDS 5370	MDS 5450
ID no.	44564	44566	44567
Recommended motor capacity	22 kW	37 kW	45 kW
Connection voltage	(L1-L3) 3 x 400 V +32%/-50% 50 Hz (L1-L3) 3 x 480 V +10%/-58% 60 Hz		
Power fuses[1]	3 x 50 A gG[2]	3 x 80 A gG[2]	

Operation with servo motor (control mode servo control)

Rated current I_N	3 x 30 A	3 x 50 A	3 x 60 A
I_{max}	250% / 2 sec., 200% / 5 sec.[3]		
Clock pulse frequency	8 kHz		

Operation with three-phase current motor (control mode V/f, VC, *under preparation: SLVC***)**

Rated current I_N	3 x 44 A		3 x 70 A	3 x 85 A
I_{max}	180% / 5 sec., 150% / 30 sec.[3]			
Clock pulse frequency	4 kHz (adjustable up to 16 kHz with derating)			

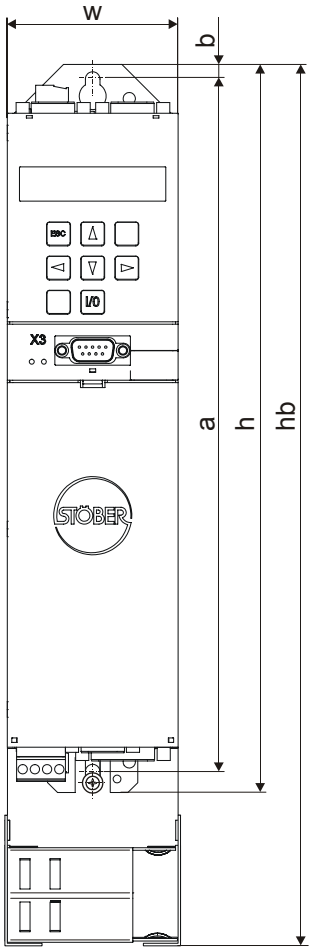
Brake resistor *internal*	30 Ω: 100 W / max. of 21 kW			
Brake resistor *external* (accessories), cf. chap. 7.2	15 Ω: max. of 42 kW			
Perm. motor cable length, shielded	100 m			
Power loss at Ia = I_N	Approx. 350 W		Approx. 600 W	Approx. 1000 W
Power loss at Ia = 0A[4]	max. of 55 W[4]			
Conductor cross section	Max. of 35 mm² without core end sleeve			
Dimensions (H x B x T) [mm]	382.5 x 190 x 276			
Weight [kg] without packaging	11.8		13.2	13.2
Weight [kg] with packaging	13.6		15.0	15.0
Upper voltage limit	830 V			
Brake chopper on level	780 V / 800 V			
Brake chopper disable voltage	740 V / 760 V			

An external brake resistor may be required during generator operation.
A temperature-monitored brake resistor is required for UL/cUL-conform operation.

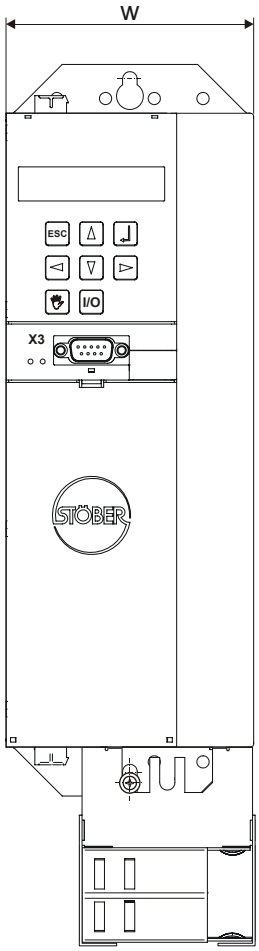
[1] Line circuit breaker, tripping characteristic C, EN 60 898
Use class RK1 fuses for UL adherence: Class RK1 (e.g., Bussmann KTS-R-xxA / 600 V)
[2] Operation with network commutating inductors and power fuses for operation class gG (full range fuses for cable and line protection in accordance with IEC 60269-2-1 / DIN VDE 0636, part 201 NH fuses).
[3] The effective current must be ≤ the rated current, averaged over 10 minutes.
[4] Depends on the option boards and sensors connected (e.g., encoder)

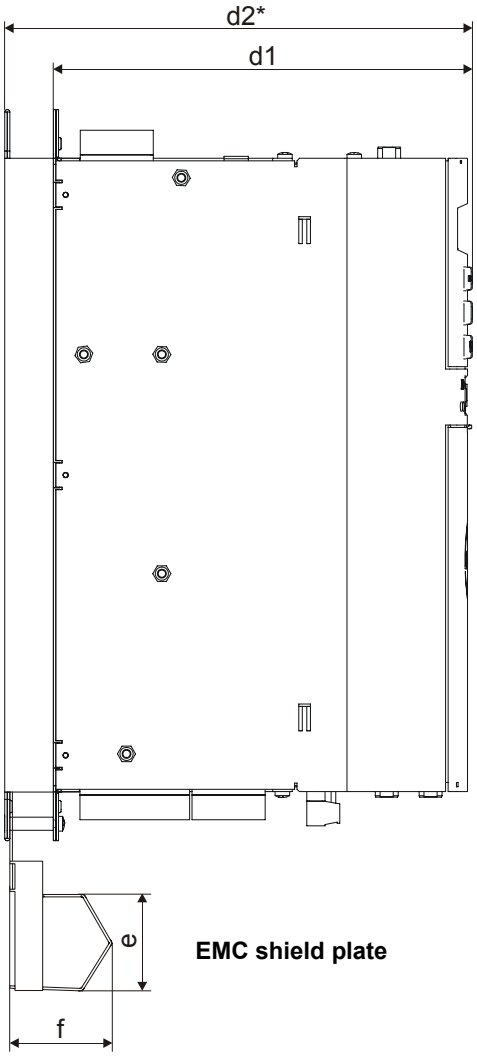
2.2 Mechanical

BG 0 / BG 1



BG 2





EMC shield plate

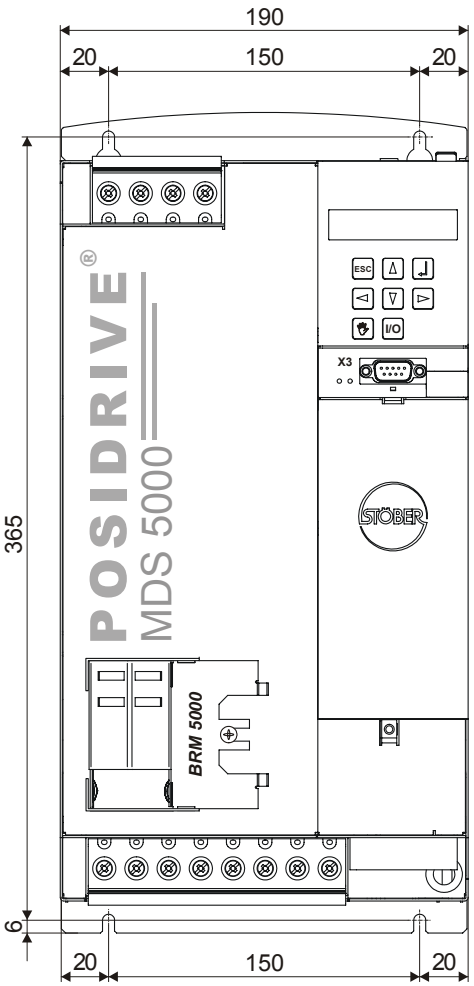
For position, designation and allocation of the terminals, see chap. 5.

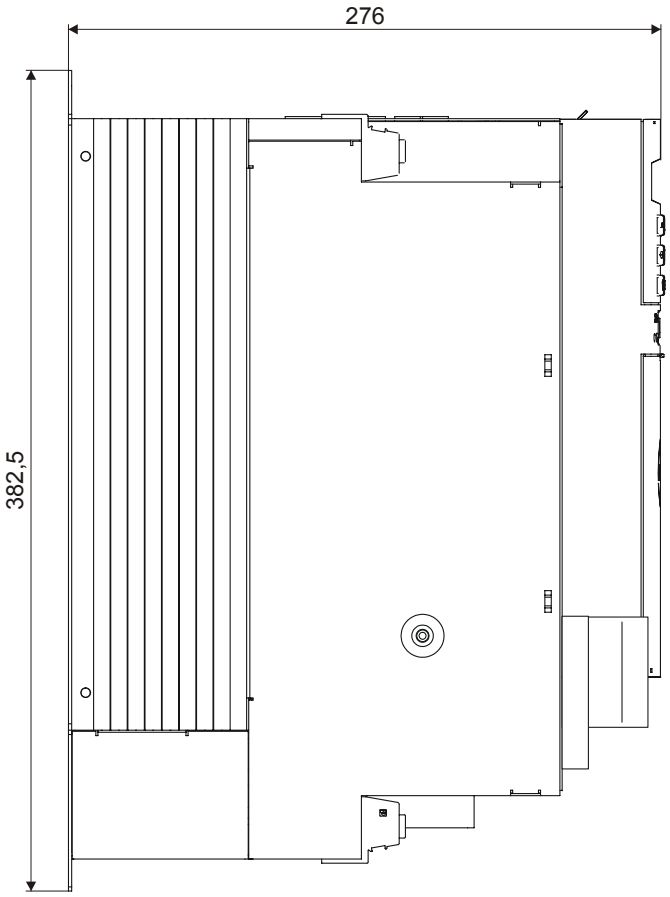
Dimensions in mm			**BG 0**	**BG 1**	**BG 2**
Inverter base plate	Height	h	300		
	Height (incl. EMC shield plate)	hb	360		
	Width	w	70		105
	Depth	d1	175	260	260
		d2*	193	278	278
EMC shield plate	Height	e	37.5		
	Depth	f	40		
Mounting holes	Distance	a	283		
	Vertical position on the base plate	b	6		
Weight [kg]	Without packaging		2.2	3.8	5.0
	With packaging		3.2	5.1	6.1

* d2 = Depth incl. brake resistor RB 5000

Min. Free Space [Dimensions in mm]	**Up**	**Down**	**To Right**	**To Left**	**Screws**
Without EMC shield plate	100	100	5	5	M5
With EMC shield plate	100	120	5	5	

Size 3 / BG 3





Dimensions in mm		BG 3		
		MDS 5220	MDS 5370	MDS 5450
Inverter base plate	Height	382.5		
	Width	190		
	Depth	276		
Mounting holes	Vertical (distance)	365		
	Vertical position on the base plate	6		
	Horizontal (distance)	150		
Weight [kg]	Without packaging	11.8	13.2	13.2
	With packaging	13.6	15.0	15.0

Dimensions in mm	Up	Down	To Right	To Left	Screws
Min. free space	100	100	5	5	M5

3 MECHANICAL INSTALLATION

This chapter gives you complete information on the subject of mechanical installation.
Only specialized personnel who are qualified for this task may install, commission and operate the device.

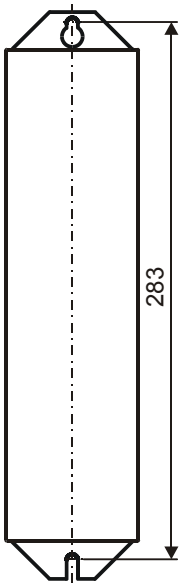
3.1 Installation Location

- Operate only in closed switching cabinet (adhere to protection rating IP 20).
- Install inverter only in vertical position.
- Avoid installation above heat-generating devices.
- Ensure sufficient air circulation in the switching cabinet
  (Adhere to minimum free spaces as per table in chap. 3.2.).
- Installation site free of dust, corrosive fumes and all liquids
  (in accordance with soiling degree 2 in accordance with EN 60204 / EN 50178)
- Avoid atmospheric humidity.
- Avoid condensation (e.g., due to anti-condensation heating elements).
- To meet EMC requirements, use mounting plates with conductive surface (e.g., unpainted).

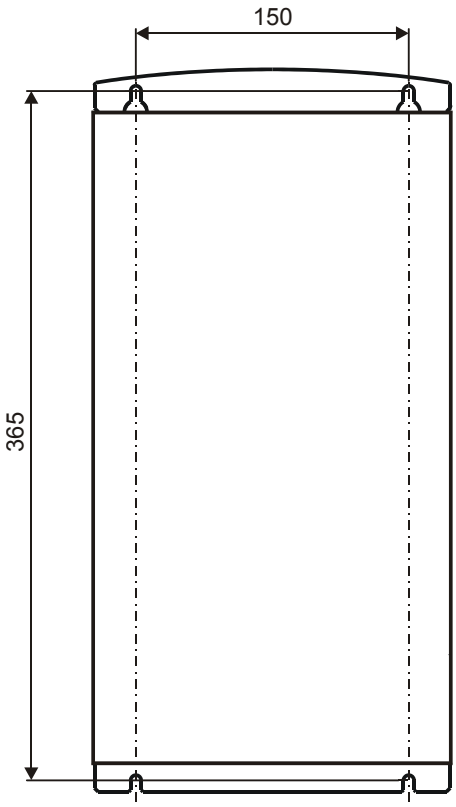
3.2 Mounting/Mounting Dimensions

3.2.1 Without Bottom

Drilling jigs

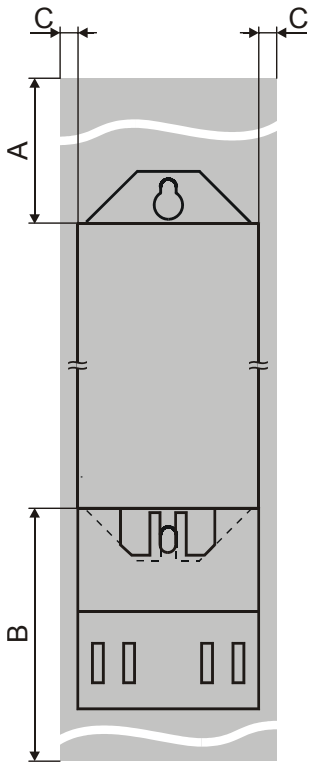


BG 0 – BG 2



BG 3

Free space



Min. Free Space [Dimensions in mm]	**A** Up	**B** Down	**C** To Right / Left	**Screws**
BG 0 – BG 2 Without EMC shielding plate	100	100	5	M5
BG 0 – BG 2 With EMC shielding plate	100	120	5	M5
BG 3	100	100	5	M5

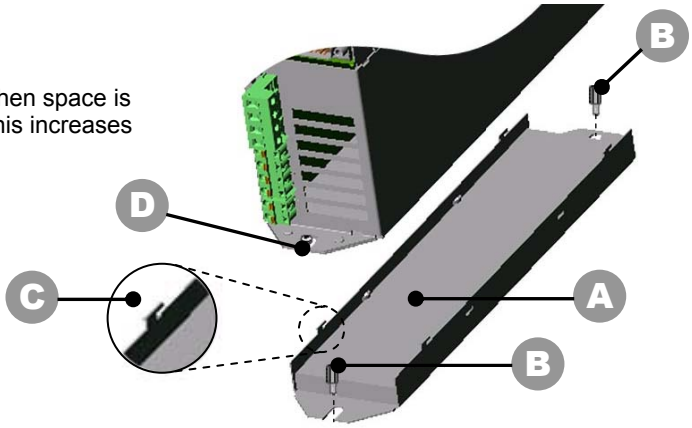
3.2.2 With Bottom Brake Resistor

Available for BG 0 to BG 2.

The "brake resistor RB 5000" substructure is the ideal solution when space is limited. It is placed between mounting surface and MDS 5000. This increases the mounting depth by approx. 20 mm.

Mounting

- Secure the bottom brake resistor (A) on the mounting surface with the included threaded bolts and spring rings (same drilling diagram as MDS 5000) (B).
- Hook the MDS 5000 in on the four guides (C).
- Secure the MDS 5000 to the threaded bolts with the two included screws (D).



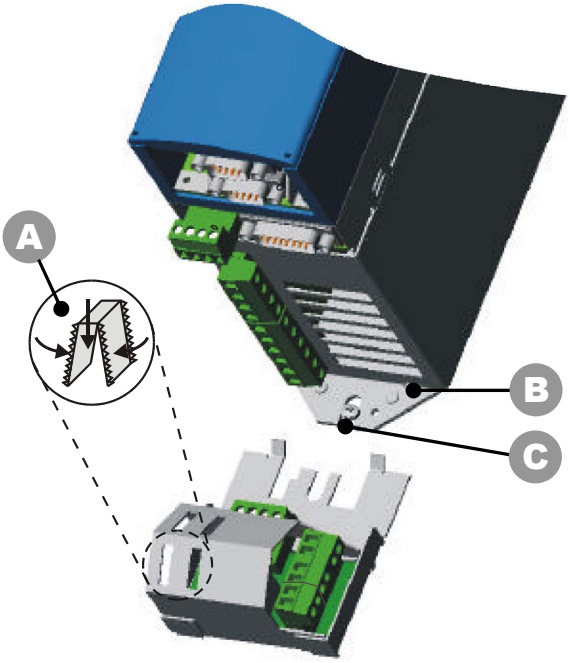
3.2.3 EMC Shield Plate and Brake Module for 24 V Brake

The EMC shield plate (EM 5000) and the *brake module for 24 V brake* (BRM 5000) are physically identical units (cf. accessories, chap. 7.1).

If necessary, the EMC shield plate can be replaced by the *brake module for 24 V brake*. See also chap. 4.4.

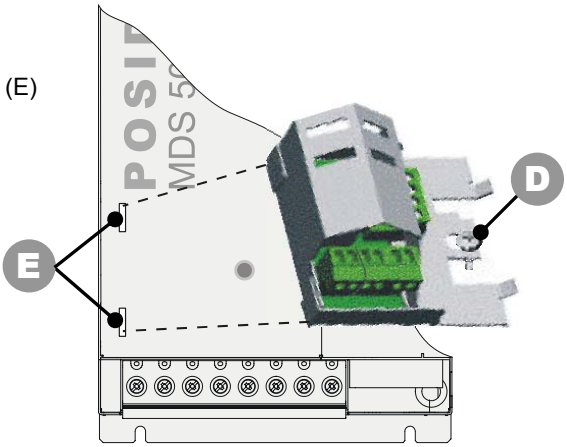
BG 0 – BG 2

- Position the EMC shield plate at a slight angle and insert the two brackets in the provided openings (B).
- Hook in the EMC shield plate.
- Secure the device and the EMC shield plate with the mounting screw (C).
- If already installed, secure the motor cable with the EMC clamp (A).
- Check to make sure that the shield of motor cable is positioned flat on the EMC shield plate with the EMC clamp. See also chap. 4.7.



BG 3

- Unscrew the screw (D) on the lower portion of the housing front.
- Place the *brake module for 24 V brake* with the two tabs in the two cutouts (E) in the housing front.
- Secure the *brake module for 24 V brake* with the screw (D).



part of BG 3

3.3 Installation of Accessories

Only specialized personnel who are qualified for this task may install accessories (cf. chap. 7). Suitable measures must be provided against damage by electrostatic discharging (in accordance with DIN EN 50082-2). Before installation, the device must be disconnected from the power and, with the MDS 5xxx/L series, the 24 V power must be turned off. Remember the discharge times (≥ 5 min.) for the DC link.

CAUTION

Immediately after the power is turned off, the DC link is still charged. Wait ≥ 5 min. for the DC link to discharge after turning off the power voltage. To prevent damage to device and accessory parts, install the accessory afterwards.

CAUTION

Danger of electrostatic charges damaging the PCB!
Perform potential equalization before you touch a PCB (option module 1 and 2).

3.3.1 Option module 1 (fieldbus)

3.3.1.1 CANopen DS-301 (CAN5000) / PROFIBUS DP-V1 (DP5000)

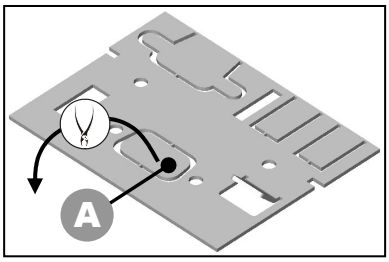
Installation is the same for both modules.

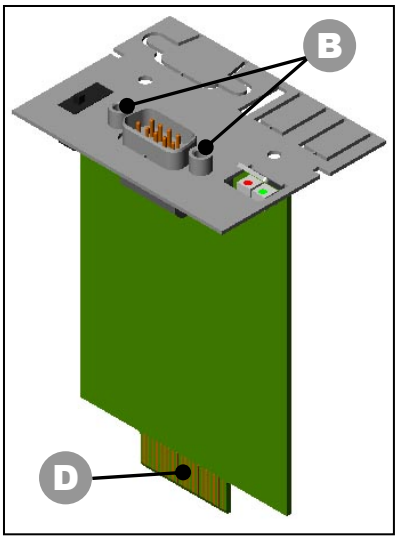
- Make sure that the device is without power. Wait ≥ 5 min. for the DC link capacitors to discharge after turning off the power supply voltage.
- Disconnect the cover plate by removing the two screws (E).
- Remove the prepunched area (A) for the sub D plug connector on the plate.
- Mount the plate on the board with the included UNC bolts (B).
- Slide the fieldbus board (C) with the gold-contacted terminal surfaces (D) into the black terminal block.

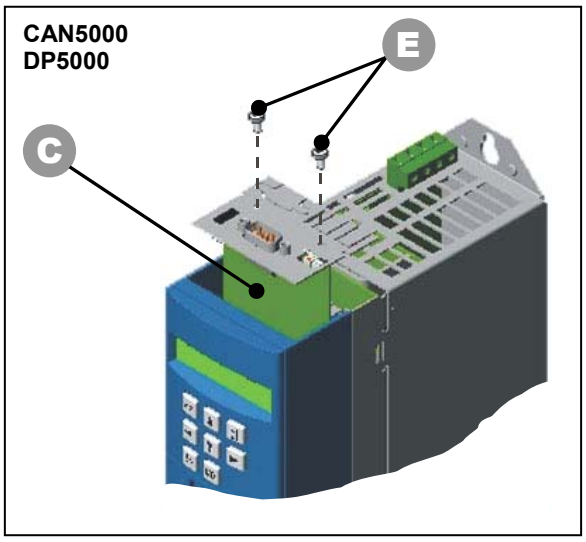
CAUTION

Be sure not to touch the gold contact surface with your fingers (danger of fouling and corrosion).

- Check correct position of the board.
- Secure the board with the two included screws (E).
- Then apply included labels (nameplate and adhesive label for switch setting (CAN)) to the cover plate.







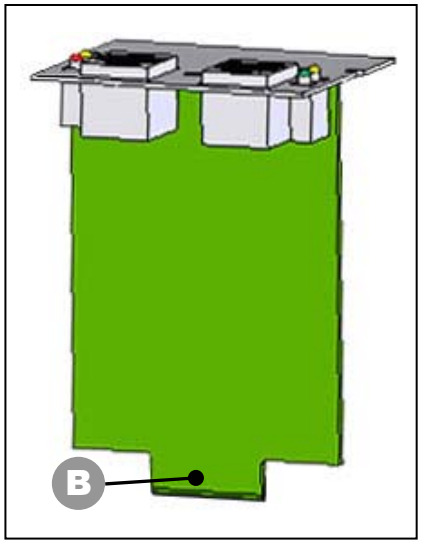
3.3.1.2 EtherCAT (ECS 5000)

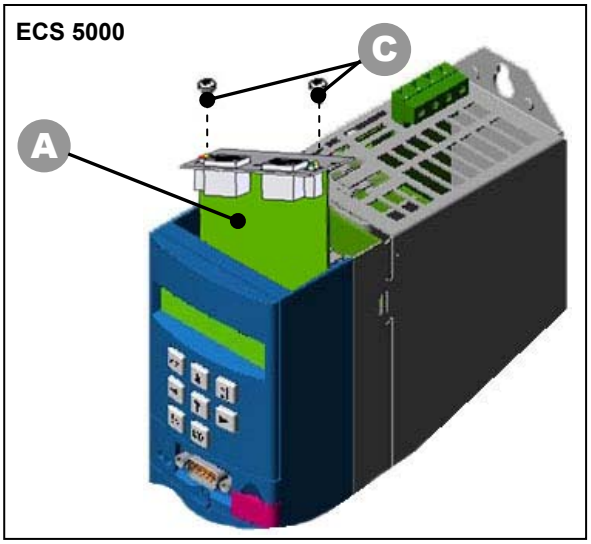
- Make sure that the device is without power. Wait ≥ 5 min. for the DC link capacitors to discharge after turning off the power supply voltage.
- Disconnect the cover plate by removing the two screws (C).
- Slide the EtherCAT board (A) with the gold-contacted terminal surfaces (B) into the black terminal block.

CAUTION

Be sure not to touch the gold contact surface with your fingers (danger of fouling and corrosion).

- Check correct position of the board.
- Secure the board with the two included screws (C).
- Then apply included labels (nameplate) to the cover plate.





3.3.2 Option module 2 (terminals)

- **Standard (SEA 5000, SEA 5001)**
- **Expanded (XEA 5001)**
- **Resolver (REA 5000)**

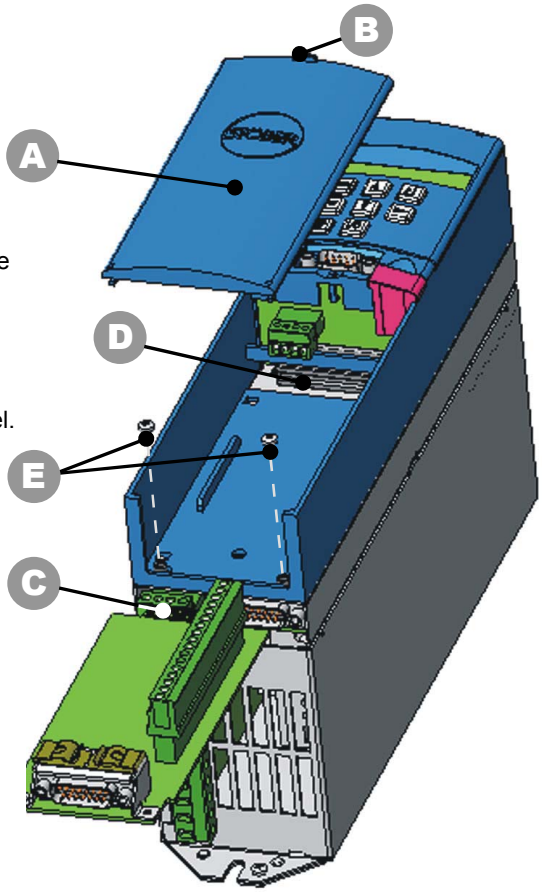
Installation is the same for all modules.

- Make sure that the device is without power.
- Before installation, remove the blue plastic cover (A) below the serial interface (terminal X3).
- Make sure that the device is without power.
- Unlock the snap-on lock (B) directly below terminal X3 and, on the snap-on lock, pull the cover towards the front.
- To completely unhook the cover, pull this in the direction of the operator panel.
- Push the I/O terminal module with the gold-contacted terminal surface (C) into the black terminal block (D).

CAUTION

Be sure not to touch the gold contact surface with your fingers (danger of fouling and corrosion).

- Check correct position of the board.
- Secure the board with the two included screws (E).
- Now hook the plastic cover (A) with the two catches into the plastic housing.
- Press the plastic cover (A) against the plastic housing until the snap-on lock (B) snaps in.



4 ELECTRICAL INSTALLATION

This chapter gives you complete information on the subject of electrical installation.
Only specialized personnel who are qualified for this task may install, commission and control the device.

4.1 EMC

This chapter contains general information on EMC-suitable installation. These are only recommendations. Depending on the application, the ambient conditions and the legal requirements, measures in addition to the following recommendations may be required.

- Mount device or Bottom Brake Resistor on conductive surface (unpainted).
- Install the power cables in spatially separately from the signal lines (encoder, analog/digital signal lines).
- Use only shielded cable for motor lines (corresponding cabels can be ordered from STÖBER ANTRIEBSTECHNIK.).
- Apply shield of the motor cable over a large surface in the immediate vicinity of the MDS 5000. The EMC shield plate (EM 5000) for mounting on the bottom of the device is available as an accessory (see chap. 3.2.3 and chap. 7.1).
- With asynchronous machines, apply the shield to the terminal block over a large surface (e.g. PG shield screw connection).
- Use output deraters for motor lines > 50 m.
- When an additional transfer plug connector is to be installed in the motor cable, the cable shield may not be interrupted.
- When the brake line is installed in the motor cable, the brake line must be shielded separately.
- When the length of the cable for connection of a brake resistor is longer than 30 cm, this must be shielded and the shield must be applied over a large surface in the immediate vicinity of the MDS 5000.
- Connect the shield of the control lines on one side with reference ground of the reference value source (e.g., PLC or CNC).
- Shield, and, if necessary, twist reference value lines before installing.

4.2 RCD (Residual Current Protective Devices)

Network phases and neutral conductors are connected with the protective conductor via Y capacitors. When network voltage is applied, a leakage current flows over these capacitors to the protective conductor. The greatest leakage current occurs during a malfunction (asymmetric feedin via only one phase) and during power-on (sudden change in voltage). The maximum leakage current due to asymmetric power feedin is 40 mA (network voltage of 400 V) for MDS inverters.
If RCD circuit breakers are necessary, the problem of power-on and off can be alleviated by using selective RCD circuit breakers (switch-off delay) or RCD circuit breakers with increased tripping current (e.g., 300 or 500 mA). Only all-current sensitive RCD circuit breakers may be used. Operation of several devices on one RCD circuit breaker is not recommended.

4.3 Power Connection

Protection via line circuit breakers in accordance with the values listed in chap. 2 (tripping characteristic C, in accordance with EN 60 898) or suitable, delayed safety fuse.

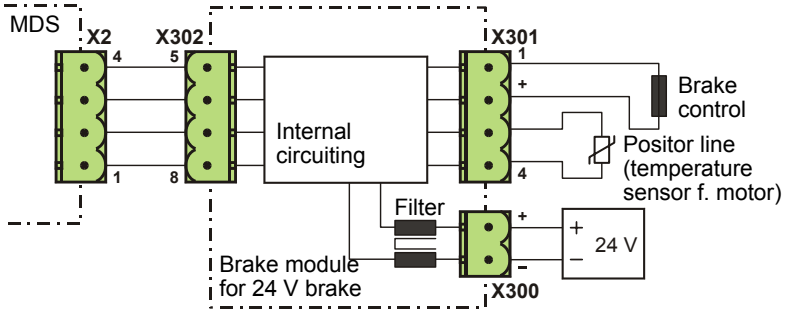
Use class RK1 fuses for UL conformance: Class RK1 (e.g., Bussmann KTS-R-xxA / 600 V)

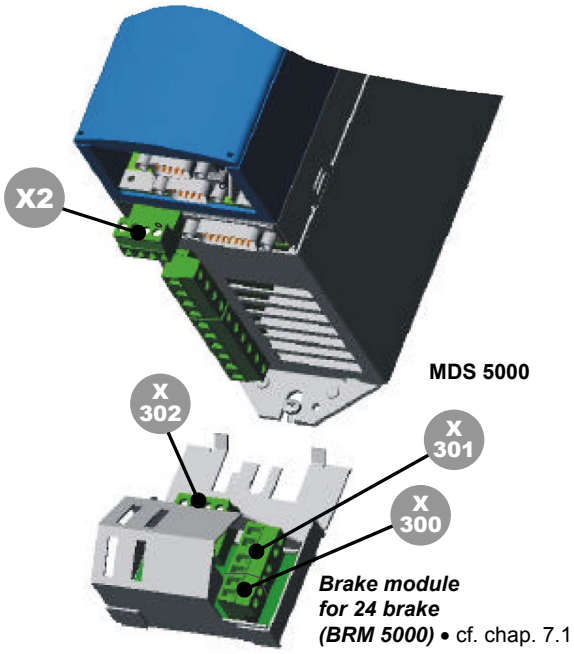
4.4 Brake Module for 24 V Brake

The relay in the basic device for brake control is equipped with hardgold contacts. This relay is designed for control of an electro-magnetic brake. The *brake module for 24 V brake* is required for control of a 24 V brake (BRM 5000). A thermally monitored and short-circuit-proof, electronic semi-conductor switch is available for switching the brake. When *Brake module for 24 V brake* is placed between relay and brake, the integrated filter suppresses the switch-off reactions. This also increases the lifespan of the relay contacts.
For a 230 VAC brake we also recommend control via a coupling relay and not directly via the existing relay.

Installation

- Connect terminal X302 with terminal X2 (for connection cable, see chap. 4.7.2).
- Connect the external 24 V to the power supply of the brake on X300 an (for pin allocation, see chap. 5.3).
- The brake and thermal contact lines installed in the motor cable are connected to X301 (for pin allocation, see chap. 5.3).





• cf. chap. 7.1

4.5 DC Link Coupling

If you are using axes in a plant which operate in a network of generators and motors, the DC link coupling (DC coupling) can be advantageous. When the DC-coupling is used, the excess energy of other axes is made available as drive power instead of converting this excess power into heat with a brake resistor. Remember that you will need a brake resistor which can absorb the power peaks when all drives in the DC-link network brake at the same time.

DANGER

Danger of damage to devices! When single-phase and three-phase devices are coupled, the single-phase devices will be destroyed. Use only three-phase devices for the DC link coupling!

CAUTION

Danger of damage to devices! When one device within the DC-link coupling network fails, the complete DC-link coupling network must be disconnected from the power network since other devices in the DC-link coupling network may be damaged. Be sure to adhere to the wiring of the ready-for-operation relay shown in chapter 4.5.1 (X1.1 and X1.2). When a failure occurs, replace all devices of one group.

NOTE

Please note that the parameter **A38** DC power-input must be set before the DC link coupling will function correctly.
Group 1: **A38** = *0: inactive*
Group 2 and 3: **A38** = *1: active*
For more details, also see the description of the parameter.

4.5.1 Basic Circuit Diagram

The following diagram shows the basic circuiting of the DC-link coupling. The inverters can be coupled together in up to three groups. The table in chapter 4.5.2 shows the possible combinations. The combination determines the types of power fuse and DC-link fuse.

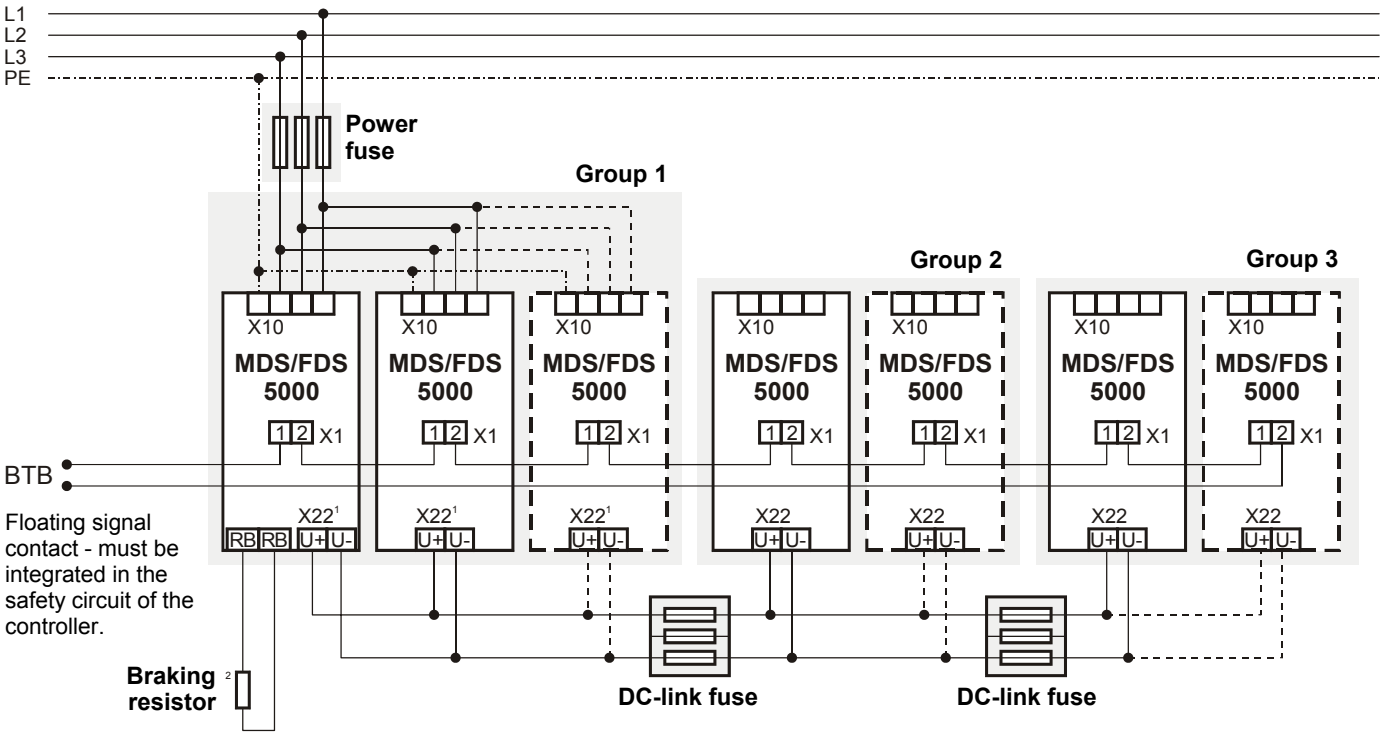


Figure 4-1 Basic circuit diagram for the DC link coupling

[1] For MDS 5000 devices of size BG3: X20, terminals DC-link +, DC-link -
[2] Dimension the brake resistor to fit the braking power of the DC-link network and the technical data of the device.

4.5.2 Combinations

The following table shows the possible combinations for the DC-link coupling. A total of 15 combinations are available.
Example: Combination no. 7
This combination lets you combine one size-1 inverter in group 1 with two size-0 devices in group 2. There is no group 3. The power fuse must have a nominal current of 20 A. The groups are separated from each other with the type-1 DC-link fuse (see chapter 4.5.3). Wait three minutes before turning on the devices of the DC-link coupling again.

	Group 1				DC-Link Fuse	Group 2		DC-Link Fuse	Group 3	Switchon Wait Time [min]
Type	MDS/FDS 5000		MDS 5000			MDS/FDS 5000			MDS/FDS	
Size	BG0	BG1	BG2	BG3		BG0	BG1		BG0	
Power fuse[1]	10 A	20 A	50 A	80 A		–	–		–	
Max. P-IN	4 kW	10 kW	20 kW	45 kW		–	–		–	
Combinationno.										
1	max. 4				–			–		1
2		max. 4			–			–		5
3		3			Type 1	2		–		5
4		3			Type 1	1		–		3
5		2			Type 1	2		–		3
6		2			Type 1	1		–		4
7		1			Type 1	2		–		3
8			max.3		–			–		2
9			3		Type 2		1	Typ 1	2	2
10			3		Type 1	2		–		2
11			3		Type 2		1	–		2
12			2		Type 2		1	–		2
13			2		Type 2		1	Typ 1	1	2
14			1		Type 1	1		–		2
15				max. 3				–		1

Instead of delaying the process by the switchon wait time, you can determine the switchon point in time by evaluating parameter **E14**. The parameter must indicate in all-network connected devices that the charging relays are open before the voltage can be switched through again. You can query the parameter via fieldbus or binary output.

4.5.3 Fuses

CAUTION

Danger of machine standstill! When one fuse element fails, the second fuse element is damaged. Always replace the elements of a fuse in pairs.

Use the following fuses to protect the DC-link coupling:

	Type 1	Type 2
Manufacturer	SIBA Sicherungs-Bau GmbH Borker Straße 22 D-44534 Lünen www.siba.de	
Size	10 x 38	
Rated voltage	AC 500 V	
Rated current	10 A	20 A
Power loss per element	1.6 W	3,5 W
Art. no. of fuse	60 034 34.10	60 034 34.20
Art. no. of fuse holder	51 063 04.3	

Keep the following points in mind during installation and operation:

- Use shielding for DC-link coupling connections longer than 20 cm. This will prevent EMC problems.
- Use the two outer elements of the fuse holder.

[1] For use conforming to UL, see specifications in the technical data.

4.6 Safety function „safe torque off“

NOTE

The certified version of the safety function is available for designs BG 0 to BG 2 as per EN 954-1 category 3. You will find the certificate under www.stoeber.de
The ASP 5001 may only be installed and repaired by STÖBER ANTRIEBSTECHNIK. This is why you should include installation in the inverter with your order of the ASP 5001.

NOTE

When certified use is required, the inverter must be installed in a switching cabinet with a protection rating of IP54.

4.6.1 Description

On the MDS 5000 inverter the safety function "safe torque off" can be implemented with option ASP 5001. When the safety function is used the inverter must be able to be switched off in two different ways. The first way to switch off the inverter uses the enable function. Diagnosis is performed via a binary output of the options SEA 5000, REA 5000, XEA 5001 or a fieldbus system.
The second way to switch off the inverter uses the ASP 5001 option in addition. When the ASP 5001 option is activated, control of the end stage is switched off with the positively-driven switch elements of a safety relay. The reference value input is disabled, and the signal contact is switched to an external safety circuit (break contact). The motor cannot start up even when there are defects in the end stage or the control circuit since the necessary phase sequence is no longer generated.

Advantages of the ASP 5001 option:

- No switching of the network voltage necessary and the DC link remains charged. This permits a faster restart.
- Less contact wear since only low voltage is switched.
- Less additional wiring work.

4.6.2 Use

WARNING

The starting lockout option only switches off the end stage. Dangerous voltages may still be present on the motor terminals!
This means that the starting lockout option does not provide galvanic isolation from the power network. The function does not provide protection against "electrical shock."
During maintenance or repair work an appropriate voltage-free circuit and system protection are required.

The regulations for emergency off situations must be adhered to.

WARNING

Since the safety function ensures that the motor torque is switched off, axes that are moving vertically must be protected against crashing down.

WARNING

Since the motor may run down in an undefined state when the starting lockout is activated during operation, it is essential to adhere to the switchoff sequences which will be described in the following section (1st and 2nd ways to switch off).

1st way to switch off: Enable

WARNING

1. Switchoff distance may not take effect. If you deviate from a standard configuration, you must ensure that the 1st switchoff distance (i.e., the enable) always takes effect.

WARNING

1. Switchoff distance did not take effect. Set **A55** = 0:inactive since the 1st switchoff distance can be made ineffective by the operator panel if you allow local mode (**A55** = 1:active).

The power end stage is activated on the inverter by applying a 24 V signal to terminals X1.3 and X1.4.
The following sequence must be adhered to when turning off the inverter.

1. The output power must be shut down (reference value = 0 Rpm).
2. When the motor speed is 0 Rpm the enable must be switched off.

When the application contains an integrated brake control, a motor speed at which the brake is to be applied can be specified in the parameter **F02** brake set.

Enable switchoff must be reported back to the safety circuit of the controller. One of the options SEA 5000, REA 5000 or XEA 5001 must be integrated on the inverter for the response message via a binary output (BA1 or BA2). The parameter **A900** sysEnableOut supplies the response message signal. Its coordinate **A900** is entered in parameter **F61** (for output to BA1) or **F62** (for output to BA2).
If the response message is sent via a fieldbus system, proceed as shown below:

1. Activate the Watchdog functionality of the bus system. See the fieldbus documentation:
   CAN-Bus: Pupl.-no. 441686
   PROFIBUS: Publ.-no. 441687
   EtherCAT: Publ.-no. 441896
2. Read the parameter **E200** Device Status Byte via fieldbus. The response message signal is supplied with bit 0 enabled.

2nd way to switch off: Use the ASP 5001 option

The second way to switch off is implemented with the ASP 5001 option. When the ASP 5001 option is installed the safety relay must be addressed with a 24 V signal (terminals X12.3 and X12.4) to deactivate the starting lockout and permit the inverter to begin operation. In this case the response message contact is opened (terminals X12.1 and X12.2).

When the safety relay is not addressed the starting lockout remains active. The inverter reports the device state "switchon disable" (see chap. 3 of the application manual for device states). The response message contact is closed.
The status of the ASP 5001 option can be monitored via the parameter **E67** starting lockout.

The following sequence must be adhered to (see Figure 4-2) for the 2nd way of switching off.

❶ Set the reference value to 0 Upm.
   ⇨ The drive stops.

❷ When the speed is 0 Upm, turn the enable off.
   ⇨ If the application contains an activation of the halting brake, it is disabled.
   ⇨ The inverter replies with a high signal indicating that the enable is turned off (e.g., via BA1).

❸ After the inverter has responded that the enable has been turned off, activate the starting lockout by turning off the 24 V signal on terminals X12.3 and X12.4.

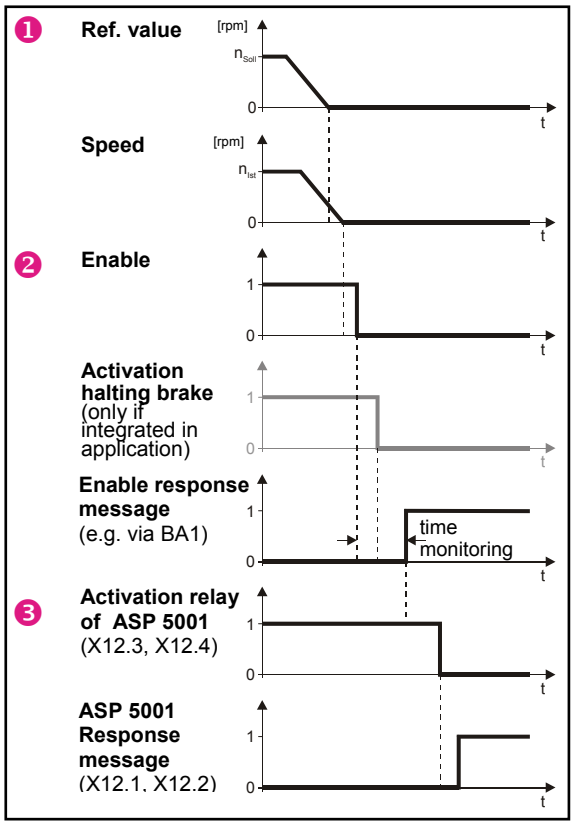


Figure 4-2 Timing diagram

Remember that you must monitor the time between the enable switchoff and the high signal of the enable response message. The maximum time for this step is:
t_{max} = 1s + regular time between enable switchoff and the high signal of the enable response message.
When this time is exceeded without receiving a response message from the inverter, you must always activate starting lockout! The external safety circuit must monitor the addressing of the enable and the relay coil as well as the resulting signals of the enable response message and the response message contact of the ASP 5001. When the ASP 5001 option is used with a host controller it must be ensured that the output of the controller is monitored for erroneous behavior.

WARNING

When signal and ground lines are looped through during wiring there is a danger of additional lines being interrupted if a wire break occurs.
This is why looping through is not permitted. Wire each line separately.

Figure 4-3 shows the wiring of the safety function "safe torque off." In our example the enable response message uses binary output BA1.

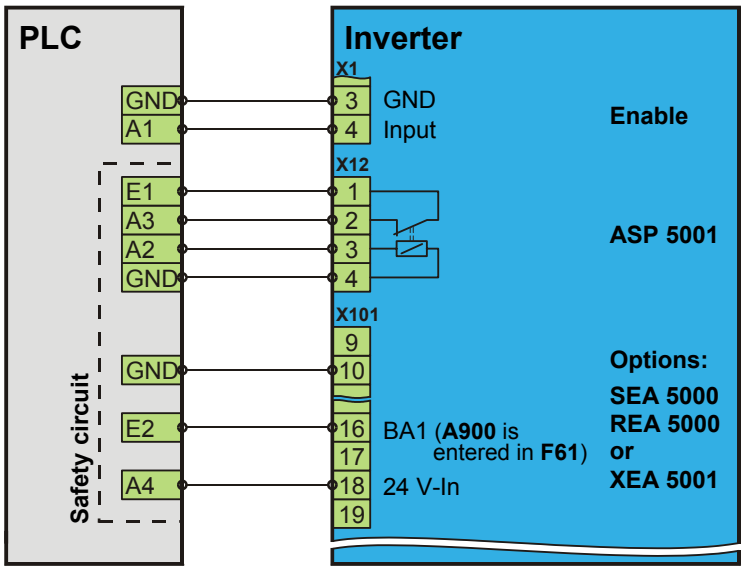


Figure 4-3 Wiring of the safety function

Table 1 lists the states of the input and output signals during normal operation together with the related device states. When the states of the signals on E1 and E2 are different from those indicated in the table, a malfunction has occurred. In such cases the system must be put into a defined state.

A1	A2	E1	E2	Device State
0	0	1	1	Switchon disable
1	0	1	1	Switchon disable
0	1	0	1	Ready for switchon
1	1	0	0	Enabled

Table 1

A1: Address enable

A2: Address ASP 5001

E1: Response message ASP 5001

E2: Response message enable (**A900**)

Switching on the inverter with the option "ASP 5001 starting lockout"
Proceed as follows (Figure 4-4 Timing diagram):

❶ Deactivate the starting lockout by turning on the 24 V signal on terminals X12.3 and X12.4.
⇨ The response message of the ASP 5001 contains a low signal.

❷ Turn on the enable.
⇨ The inverter replies with a low signal indicating that the enable is turned on (e.g., via BA1).
⇨ If the application contains an activation of the halting brake, it is enabled.

❸ When the brake has released, set the reference value to the reference speed.
⇨ The drive accelerates to reference speed.

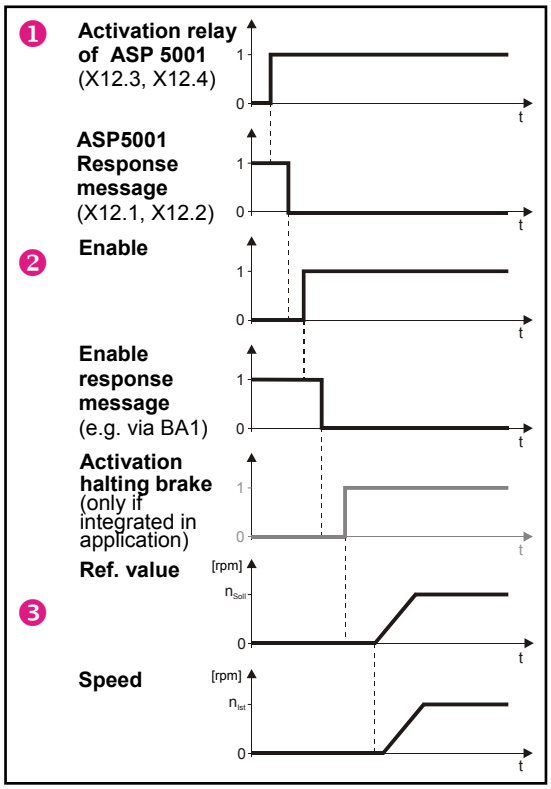


Figure 4-4 Timing diagram

4.6.3 Function Test

You must perform a function test for:

- First commissioning
- Re-commissioning with a change in circuiting of a plant and use of option ASP 5001
- At least once a month during maintenance

The integration in the external safety circuit must also be checked. Proceed as described below.

Test of the safety function

1. Shut down all drives. Secure the hanging loads against crashing.
2. Address the ASP 5001 option by applying a 24 V signal to terminals X12.3 and X12.4.
3. Turn off the enable.
   ⇨ The enable response message must then be active as a result.
4. Disconnect plug X12 from an inverter.
   ⇨ This should trigger the safety circuit.
5. Connect plug X12 again. Check the safety circuit.
6. Repeat steps 2 to 5 for each inverter.
7. Document the function test in your documentation.

4.6.4 Remaining Dangers

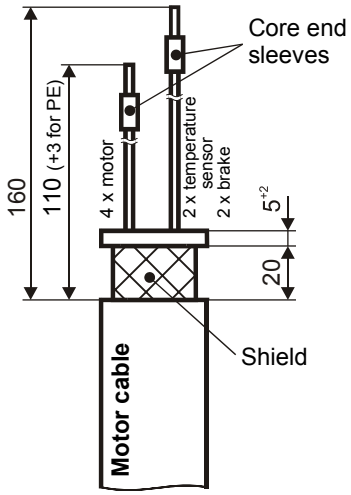
After a short circuit of two power transistors a remaining motion of up to 180°/pole pair can occur on the motor!
(Example: 4-pole motor ⇨ remaining motion is a maximum of 180°/2 = 90°)
Include this remaining motion is your risk analysis (e.g., with the safety function "safe standstill" for main spindle drives).

4.7 Cable Fabrication

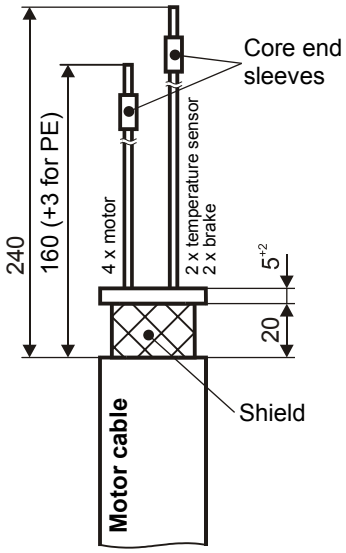
4.7.1 Motor Cables

Ready-to-use motor cables can be ordered from STÖBER ANTRIEBSTECHNIK.
The following modifications must be made for connection to the different model sizes.

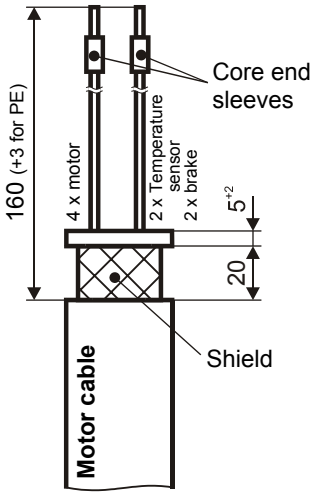
BG 0 without / with brake module



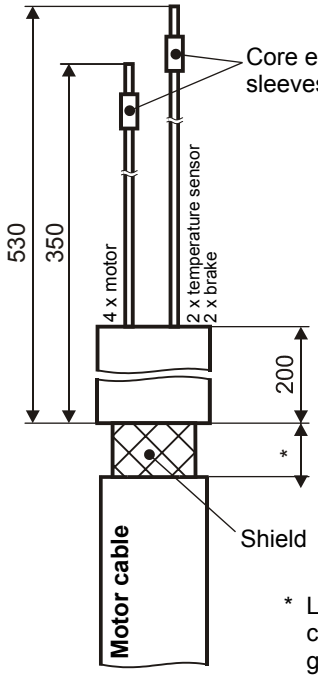
BG 1 / BG 2 without brake module



BG 1 / BG 2 with brake module



BG 3 without / with brake module

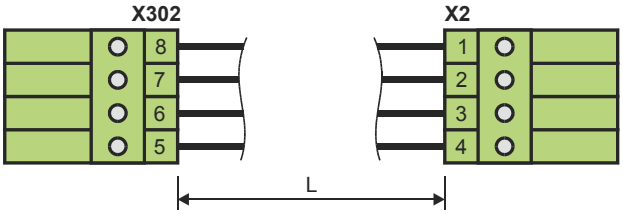


* Length corresponding to the grounding clip used.

All dimensions are recommended lengths which may vary depending on the installation site. [Dimensions in mm]

4.7.2 Connection Cable

Between the *brake module for 24 V brake* and the MDS 5000. This connection cable is not available from STÖBER ANTRIEBSTECHNIK !



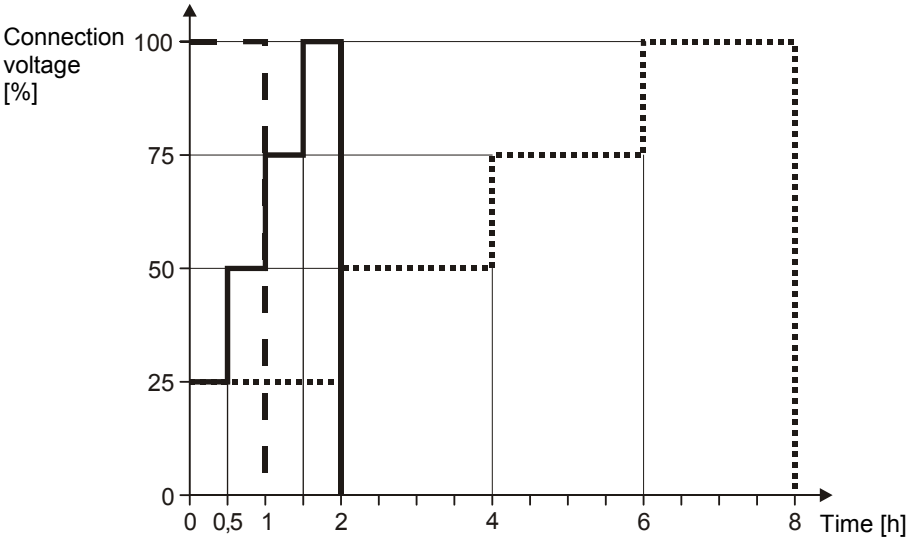
Dimensions in mm	BG 0	BG 1	BG 2	BG 3
L	140	225	225	140

4.8 Installation after storage period

WARNING

Capacitors are installed in the inverter. After storage times of one year and longer, the capacitors must be formed. If no forming is performed, substantial property damage may occur when the inverter is turned on.

Following a longer storage period, the capacitors of the inverter must be reformed. For the requirements, see the diagram below.

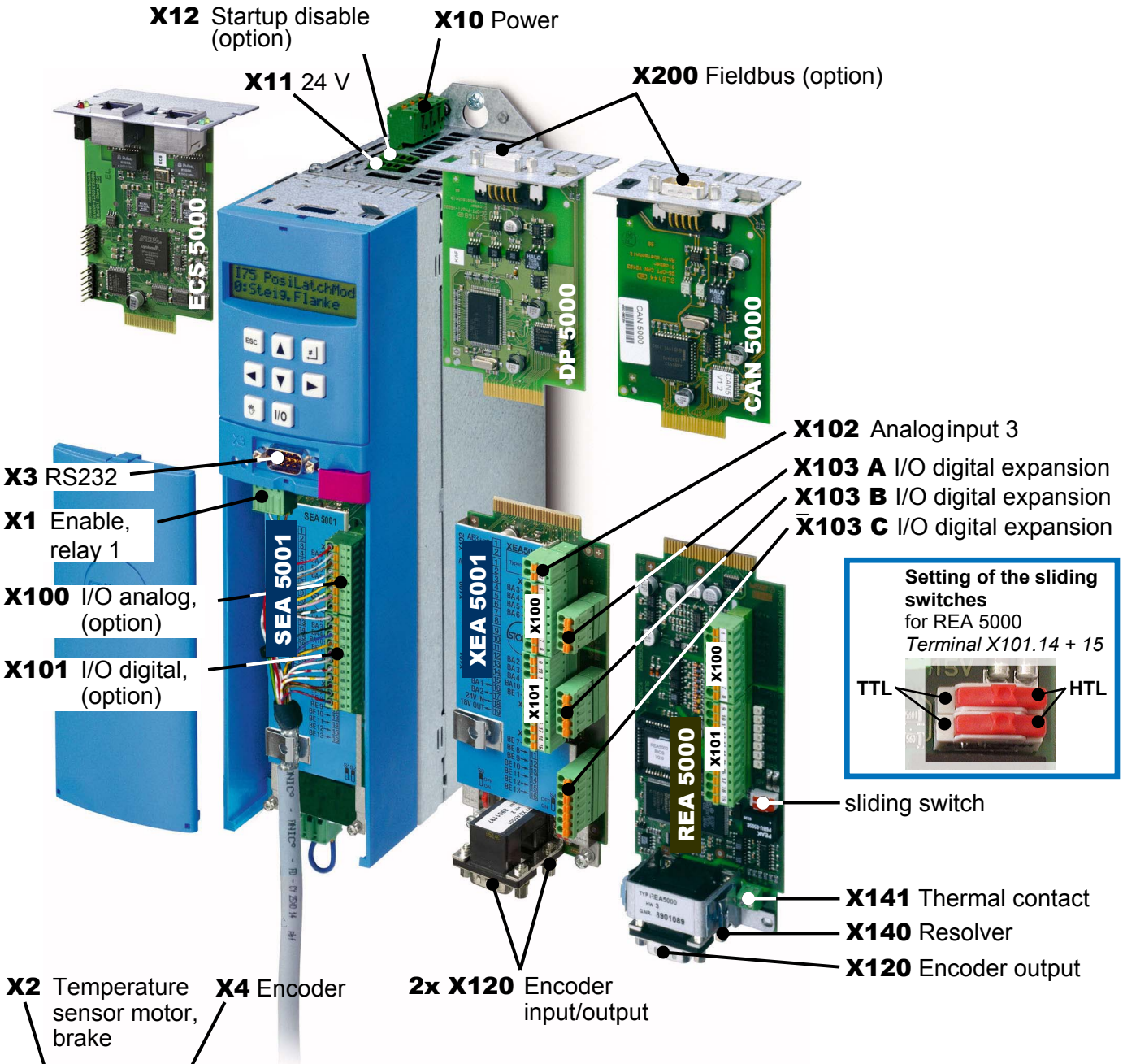


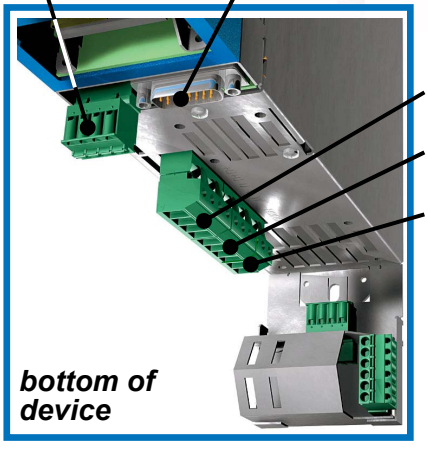
– –	Storage time, 1 – 2 years:	Before release, apply to voltage for one hour.
———	Storage time, 2 – 3 years:	Before release, form as per curve.
·····	Storage time, ≥ 3 years:	Before release, form as per curve.
	Storage time less than 1 year:	No measures required

5 CONNECTION ALLOCATION

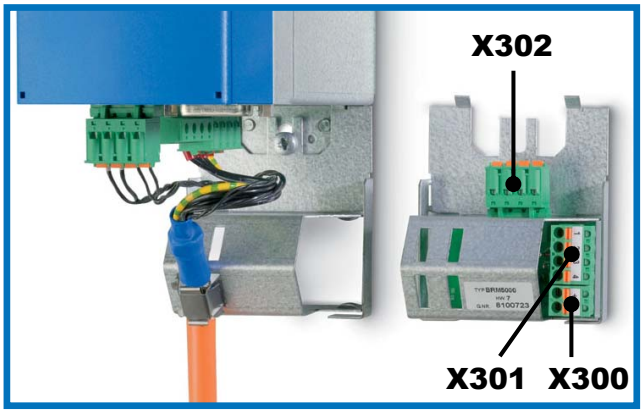
This section discusses the position, designation and allocation of the terminals.

5.1 Terminal Overview BG 0 to BG 2

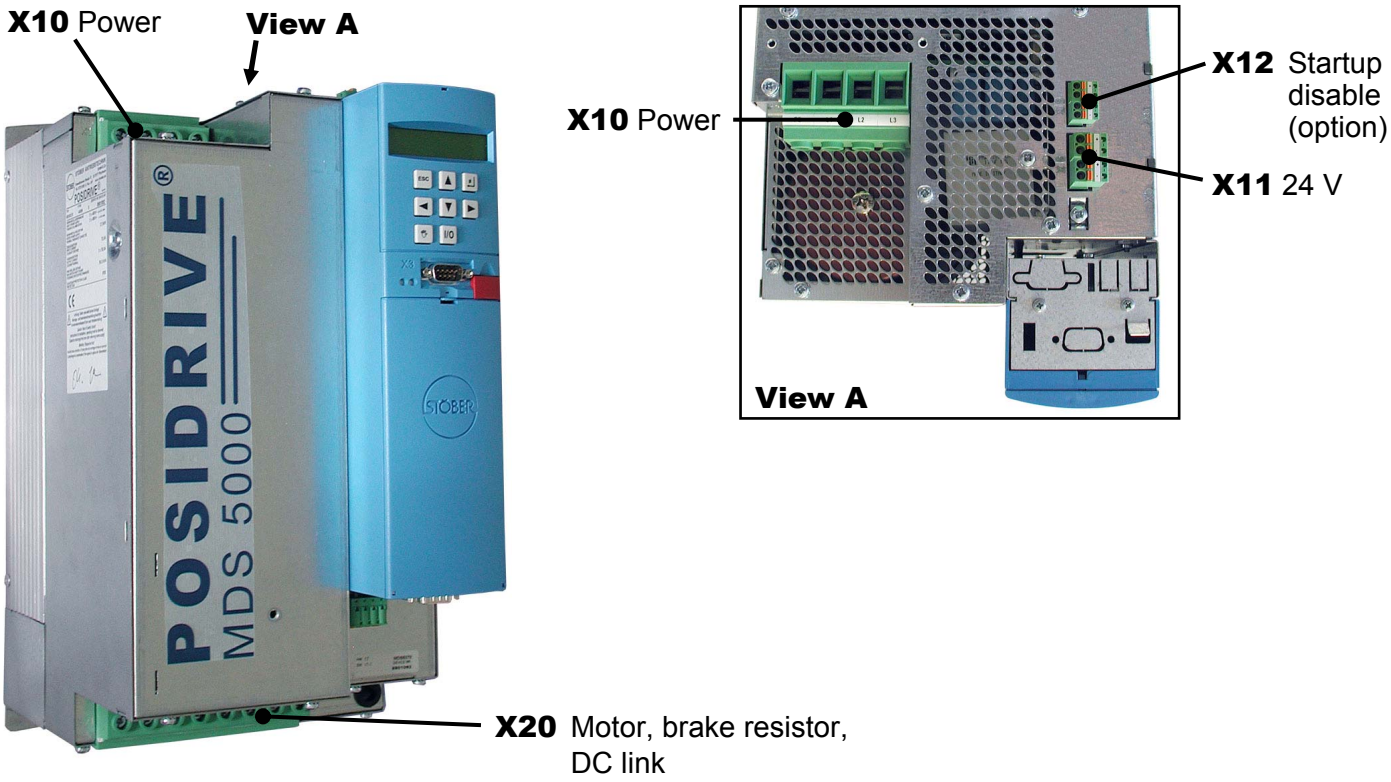




Brake module for 24 V brake (option)



5.2 Terminal Overview BG 3



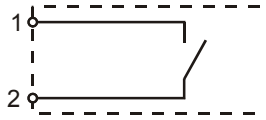
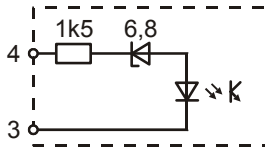
NOTE

Further connections at the control unit cp. chap. 5.1 (BG 0 to BG 2)!

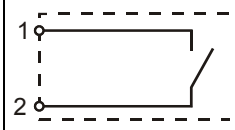
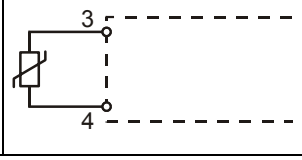
5.3 Terminal Allocation

This section presents and describes all interfaces. The exact position is shown in chap. 5.1.

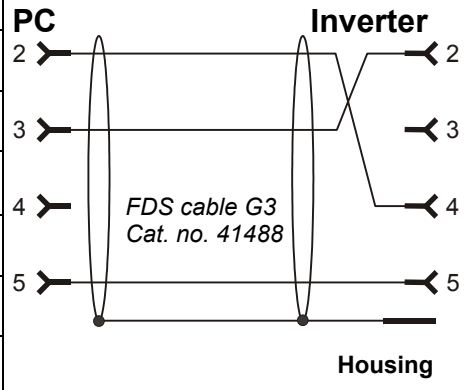
X1 – enable, relay 1

PIN[1]		Signal / Function	Description	Circuiting
	1	Contact 1	**Ready to run relay**: Show readiness for operation of the control electronics. No faults (contact closed) U_{max}=30 V, I_{max}= 1.0 A Life expectancy (number of switches): Mechanical: min. of 5,000,000 x 300,000 x at 24 V / 1A (ohmic load)	
	2	Contact 2		
	3	Reference potential for PIN 4	**Enable powerpack** L level <8 V H level ≥12 V $I_{in\ max}$ = 16 mA U_{Emax} = 30 V	
	4	+ Input		

X2 – temperature sensor motor, brake

PIN[1]		Signal / Function	Description	Circuiting
	1	Contact 1	**Brake activation:** Max. 250 V~/5 A 30 V/5 A = ohm. load, 30 V/0.3 A = ind. load, UL: 30 V/3 A = ohm. load Switching time 15 msec, T_A = 1 msec Life expectancy (number of switch operations): Mechanical: min. of 30,000,000 x 100,000 x at 250 V~ 0.6 A (ohm. load) 300,000 x at 30 V= 0.3 A (ohm. load)	 Use the optional *brake module for 24 V brake* (BRM 5000) for a 24 V brake. Cf. chap. 3.2.3 and 4.4.
	2	Contact 2		
	3	Temperature sensor f. input	**Temperature sensor, motor:** connection for one to six positor lines (thermal motor protection). Lines can be installed up to 50 m in motor cable. If operation without temperature sensor is permitted, pin 3 must be jumpered with pin 4.	
	4	Temperature sensor f. reference potential		

X3 – serial interface (RS232)

PIN[1]		Signal / Function	Description	Circuiting
	1	+10 V	Power for Controlbox; $I_{A\ max}$ = 30 mA	
	2	Rx	PC communication	
	3	Used internally	Do not use.	
	4	Tx	PC communication	
	5	SG (signal ground)	Reference potential for PIN 2 and PIN 4	
	6	Used internally	Do not use.	
	7	Used internally	Do not use.	
	8	Used internally	Do not use.	
	9	Used internally	Do not use.	

NOTE

A connection cable for connection of a PC (notebook) to the MDS via the serial interface is available from STÖBER (cat. no. 41488). Use of a conventional serial connection cable is only possible with an adapter (cat. no. 41489).

[1] View of terminal/sub D

X4 – encoder

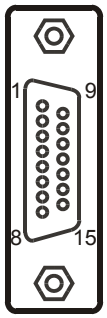
For evaluation of EnDat®, HTL, TTL and SSI encoders

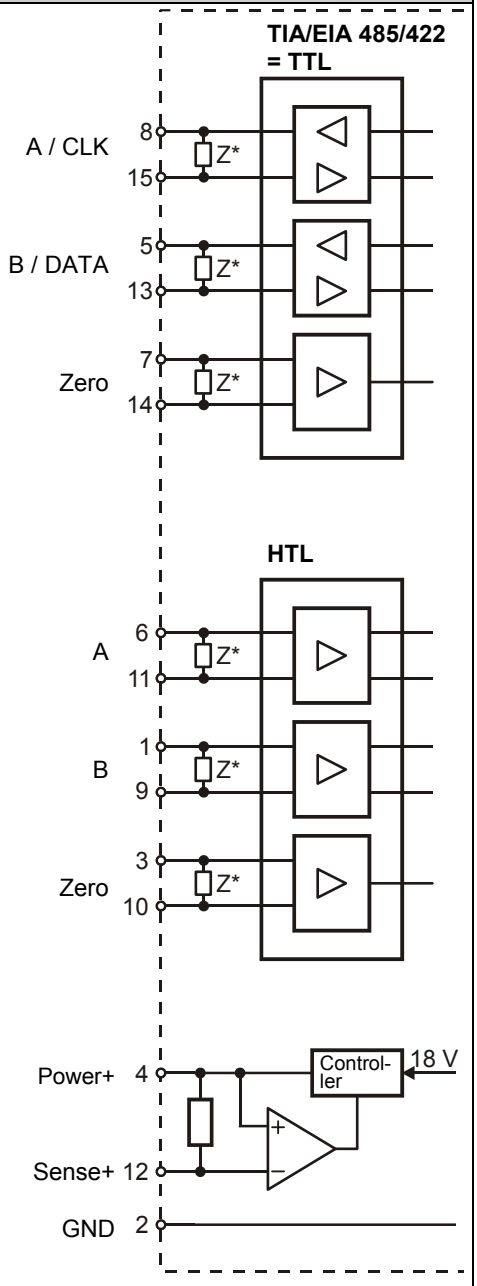
CAUTION

X4 may not be plugged in or disconnected when the device is on!
Otherwise the encoder may be destroyed!

To ensure correct function of the motors and inverters, we recommend the use of on the system coordinated cables from STÖBER ANTRIEBSTECHNIK.
We reserve the right to cancel the warranty if unsuitable cables are used.

PIN[1]	Signal / Function	Description
1	B (HTL)	**Differential input** For B track / HTL level
2	GND	**Reference potential** For auxiliary voltage / PIN 4
3	N (HTL)	**Differential input** For N track / HTL level
4	Power+ (U_A)	**Auxiliary voltage** For powering a shaft encoder 15-18 V, $I_{A\,max}$ = 300 mA, can be switched to 5 V with pin 12
5	B / DATA (TTL)	**Differential input** For B track / TTL level or + DATA input/output for SSI and EnDat® (function depends on parameterization)
6	A (HTL)	**Differential input** For A track / HTL level
7	N (TTL)	**Differential input** For N track / TTL level
8	A / CLK (TTL)	**Differential input** For A track / TTL level or + clock output for SSI and EnDat® (function depends on parameterization)
9	/B (HTL)	**Differential input** (inverse) For B track / HTL level
10	/N (HTL)	**Differential input** (inverse) For N track / HTL level
11	/A (HTL)	**Differential input** (inverse) For A track / HTL level
12	Sense+	**Sensor line for auxiliary voltage** For adjustment of encoder power -> see also Heidenhain's EnDat® encoder. Uncircuited: U_A on PIN 4, approx. 5.3 V On PIN 2: U_A on PIN 4, approx. 15–18 V On PIN 4: U_A on PIN 4, 5 V (settling of line losses)
13	/B /DATA (TTL)	**Differential input** (inverse) For B track / TTL level or - DATA input/output for SSI and EnDat® (function depends on parameterization)
14	/N (TTL)	**Differential input** (inverse) For N track / TTL level
15	/A /CLK (TTL)	**Differential input** (inverse) For A track / TTL level or - clock output for SSI and EnDat® (function depends on parameterization)





Z* = 150 Ω in series with 1nF

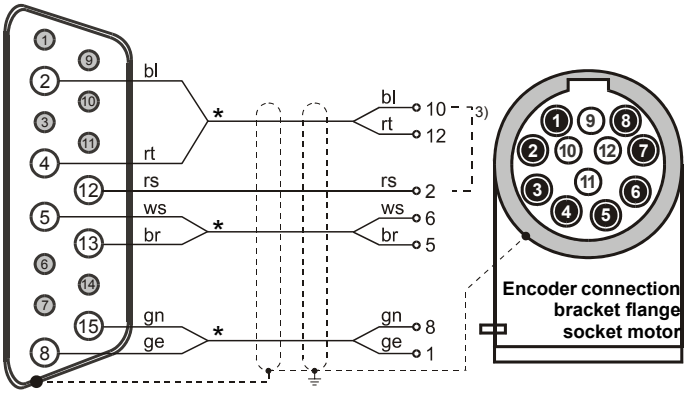
Frequencies:
EnDat® = 592 kHz / 2 MHz
SSI = 250 kHz / 592 kHz

Limit frequency:
Incremental encoder ≤1 MHz

[1] View of terminal/sub D

X4 – encoder – connection

EnDat®-absolute value encoder, digital / SSI (10 – 30 V)



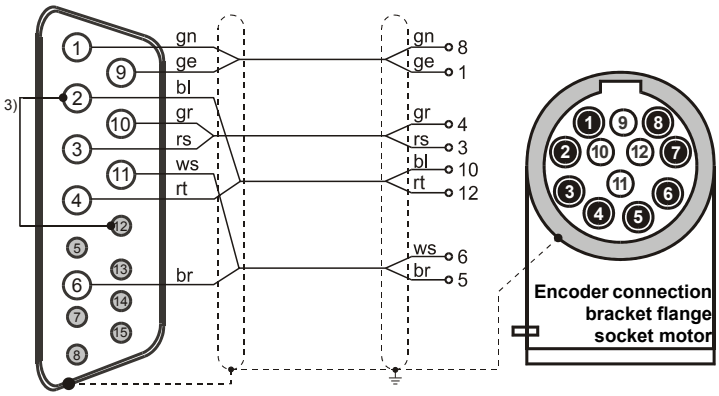
Signal	Clock+	Sense	DATA-	DATA+	Clock-	UB+	DGND
PIN X4	8	12	13	5	15	4	2
Motor[1]	1	2	5	6	8	12	10
Cable[2]	yellow	pink	brown	white	green	red	blue

1) PIN number of 12-pin encoder plug with STÖBER ED-/EK motor or MGS system motor
2) Color when STÖBER encoder cable is used
3) Jumper for UB+ = 18 V in the bracket flange socket when STÖBER system motors are used

* Cables twisted in pairs

EnDat® absolute value encoder may only be installed when the MDS is in a dead state. The non-observance of these notice can cause temporary malfunctions or destroy the encoder.

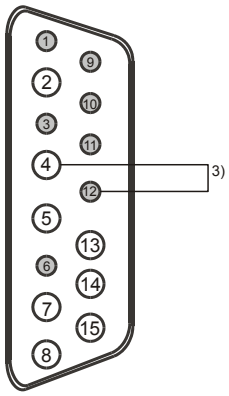
HTL (standard with STÖBER system motors)



Signal	A	/A	B	/B	N	/N	UB+	0V
PIN X4	6	11	1	9	3	10	4	2
Motor[1]	5	6	8	1	3	4	12	10
Cable[2]	brown	white	green	yellow	pink	gray	red	blue

1) PIN number of 12-pin encoder plug with MGS system motor
2) Color when STÖBER encoder cable is used
3) Jumper for UB+ = 18 V

TTL (for customer-specific solutions)

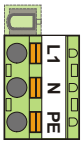


Signal	A	/A	B	/B	N	/N	UB+	0V
PIN X4	8	15	5	13	7	14	4	2

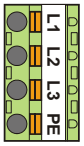
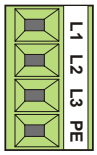
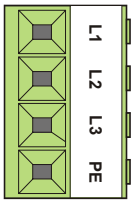
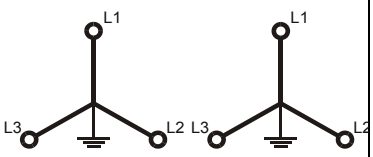
3) 5 V encoder, jumper between pin 12 (Sense) and pin 4 (UB+)

The cable is not included in delivery!

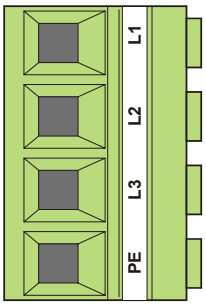
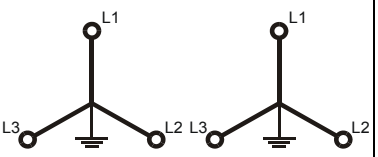
X10 – power (single-phase), MDS 5007

PIN[1]		Signal / Function	Description	Circuiting
		nc	Plastic dummy plug	
	L1	L1	Input voltage 230 V +20% / -55% 50/60 Hz	
	N	N	Neutral conductor	
	PE	PE	Protective conductor	

X10 – power (three-phase), BG 0 to BG 2

PIN[1]				Signal / Function	Description	Circuiting
BG 0	BG 1	BG 2				
			L1	L1	Input voltage (L1-L3): 3 x 400 V +32%/-50% 50 Hz or 3 x 480 V +10%/-42% 60 Hz	 400 V +32%/-50% 50 Hz 480 V +10%/-58% 60 Hz
			L2	L2		
			L3	L3		
			PE	PE	Protective conductor	

X10 – power (three-phase), BG 3

PIN[1]		Signal / Function	Description	Circuiting
	L1	L1	Input voltage (L1-L3): 3 x 400 V +32%/-50% 50 Hz or 3 x 480 V +10%/-42% 60 Hz	 400 V +32%/-50% 50 Hz 480 V +10%/-58% 60 Hz
	L2	L2		
	L3	L3		
	PE	PE	Protective conductor	

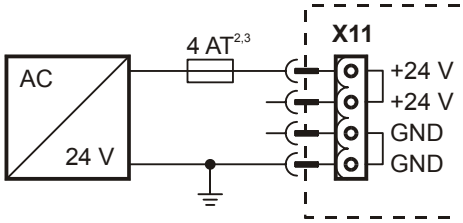
		Min. stud torque screw terminal:			
Size		**BG 0**	**BG 1**	**BG 2**	**BG 3**
Unit		*Nm/lb-in*	*Nm/lb-in*	*Nm/lb-in*	*Nm/lb-in*
Terminal	**X10**		0.5 / 4.4	1.2 / 11	2.5 / 22
	X11				0.5 / 4.4
	X20		0.5 / 4.4	1.2 / 11	2.5 / 22
	X21		0.5 / 4.4	1.2 / 11	
	X22	0.5 / 4.4	0.5 / 4.4	1.2 / 11	

1 Nm = 8.8 lb-in

[1] View of terminal/sub D

X11 – 24 V, BG 0 to BG 2

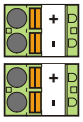
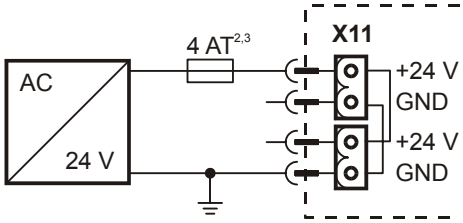
Only for devices of the MDS 5xxx/L series

PIN[1]		Signal / Function	Description	Circuiting
	+	+ 24 V	**Auxiliary voltage**[2] (PELV) For powering the control electronics U_E = 20.4 - 28.8 V $I_{E\ max}$ = 1.5 A	
	+	+ 24 V		
	-	GND	**Reference potential** for +24 V	
	-	GND		

If the 24 V power is looped through, a max. of four devices may be powered on one line.

X11 – 24 V, BG 3

Only for devices of the MDS 5xxx/L series

PIN[1]		Signal / Function	Description	Circuiting
	+	+ 24 V	**Auxiliary voltage**[2] (PELV) For powering the control electronics U_E = 20.4 - 28.8 V, $I_{E\ max}$ = 1.5 A	
	-	GND	**Reference potential** for +24 V	
	+	+ 24 V	**Auxiliary voltage**[2] (PELV) For powering the control electronics U_E = 20.4 - 28.8 V, $I_{E\ max}$ = 1.5 A	
	-	GND	**Reference potential** for +24 V	

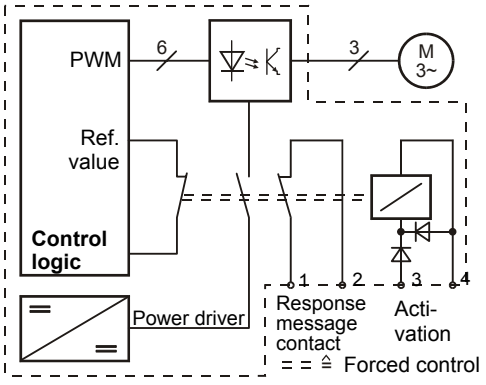
If the 24 V power is looped through, a max. of four devices may be powered on one line.

X12 – startup disable ASP 5001

BG 0 and BG 1 = optional. BG 2 and BG 3 = standard.

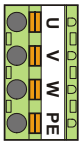
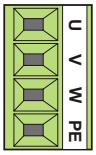
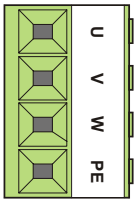
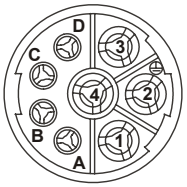
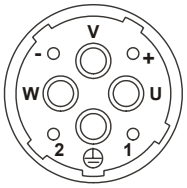
ATTENTION

Please remember that the following description only applies to the ASP 5001. Go to applications@stoeber.de for the description of the ASP 5001.

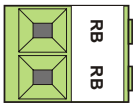
PIN[1]		Signal / Function	Description	Circuiting
	1	Contact 1	**Response message** Must be integrated in the safety circuit of the controller! 30 Vdc / 2 A = ohm. Last, 30 Vdc / 0,5 A = ind. Last Min. 10 V / 10 mA Life expectancy (number of switch operations): 1 000 000 x	
	2	Contact 2		
	3	Relay coil 1 (+)	**Activation**[2] (PELV) U_E = 20.4 V_{DC} fo 28.8 V_{DC} I_{ETyp} = 50 mA I_{Emax} = 70 mA	
	4	Relay coil 2 (-)		

[1] View of terminal/sub D
[2] To conform with UL, a 4 A delayed fuse must be used in the 24 V feeder line. The fuse must be approved in accordance with UL 248.
[3] When several devices are used, the fuse value must be adjusted accordingly. Pay attention to footnote „2"!

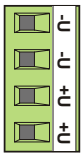
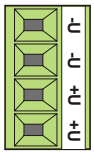
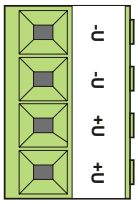
X20 – motor, BG 0 to BG 2

PIN[1]				Signal/Function	Description	Circuiting	
BG 0	BG 1	BG 2				**Motor plug 1**	**Motor plug 1,5**
			U	U	Motor connection, phase U		
			V	V	Motor connection, phase V	**Plug** **Cable** 1 = U .....**1** 2 = PE .....**gn/ge** 3 = V .....**2** 4 = W .....**3** A = Brake +24 V ... **5** B = Brake 0 V ..... **6** C = PTC .....**7** D = PTC **8**	**Plug** **Cable** U = U .....**1** V = V .....**2** W = W .....**3** ⏚ = PE .....**gn/ge** + = Brake +24 V... **5** - = Brake 0 V ..... **6** 1 = PTC .....**7** 2 = PTC **8**
			W	W	Motor connection, phase W	For fabrication of the motor cable, see chap. 4.7.	
			PE	PE	Protective conductor		

X21 – brake resistor, BG 0 to BG 2

PIN[1]				Signal / Function	Description	Circuiting
BG 0	BG 1	BG 2				
			RB	RB	Connection, brake resistor	With cables longer than 30 cm between brake resistor and device, shielded cables must be used.
			RB	RB	Connection, brake resistor	

X22 – DC link, BG 0 to BG 2

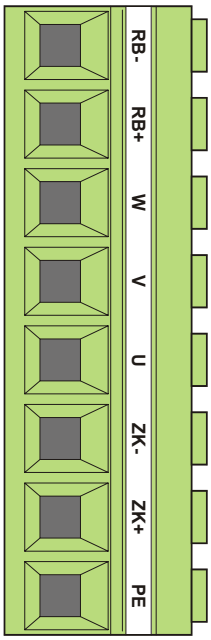
PIN[1]				Signal / Function	Description	Circuiting
BG 0	BG 1	BG 2				
			-U	-U	**Reference potential** for DC link	See chap. 4.5.
			-U	-U		
			+U	+U	**+ Potential** of DC link	
			+U	+U		

		Min. stud torque screw terminal:			
Size		**BG 0**	**BG 1**	**BG 2**	**BG 3**
Unit		*Nm/lb-in*	*Nm/lb-in*	*Nm/lb-in*	*Nm/lb-in*
Terminal	**X10**		0.5 / 4.4	1.2 / 11	2.5 / 22
	X11				0.5 / 4.4
	X20		0.5 / 4.4	1.2 / 11	2.5 / 22
	X21		0.5 / 4.4	1.2 / 11	
	X22	0.5 / 4.4	0.5 / 4.4	1.2 / 11	

1 Nm = 8.8 lb-in

[1] View of terminal/sub D

X20 – Motor, brake resistor, DC link, BG 3

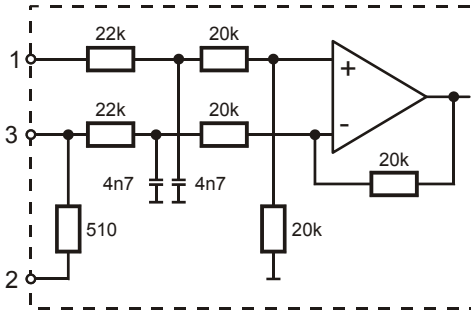
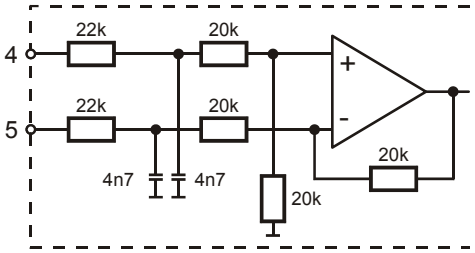
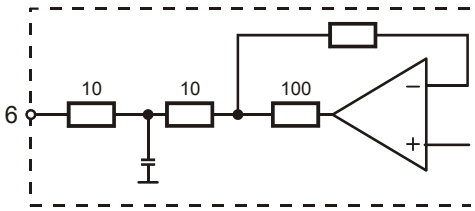
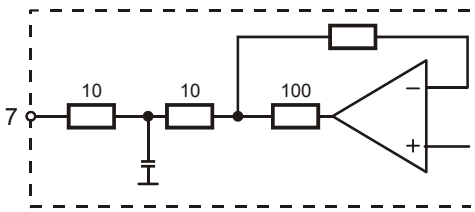
PIN[1]		Signal / Function	Description	Circuiting
	RB-	RB-	Connection, brake resistor	With cables longer than 30 cm between brake resistor and device, shielded cables must be used.
	RB+	RB+		
	W	W	**Motor connection, phase** W	see X20, BG 0 to BG 2
	V	V	Motor connection, phase V	
	U	U	Motor connection, phase U	
	ZK-	ZK-	**Reference potential** for DC link	See chap. 4.5.
	ZK+	ZK+	**+ Potential** of DC link	
	PE	PE	Protective conductor	

		Min. stud torque screw terminal:			
Size		**BG 0**	**BG 1**	**BG 2**	**BG 3**
Unit		*Nm/lb-in*	*Nm/lb-in*	*Nm/lb-in*	*Nm/lb-in*
Terminal	**X10**		0.5 / 4.4	1.2 / 11	2.5 / 22
	X11				0.5 / 4.4
	X20		0.5 / 4.4	1.2 / 11	2.5 / 22
	X21		0.5 / 4.4	1.2 / 11	
	X22	0.5 / 4.4	0.5 / 4.4	1.2 / 11	

1 Nm = 8.8 lb-in

[1] View of terminal/sub D

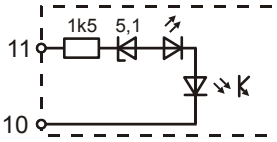
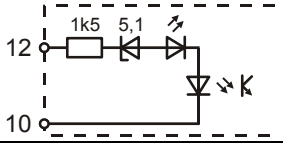
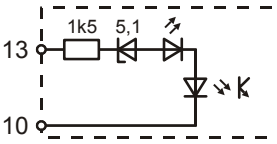
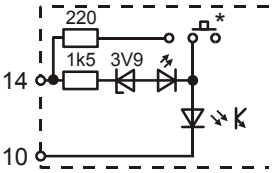
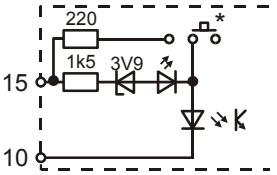
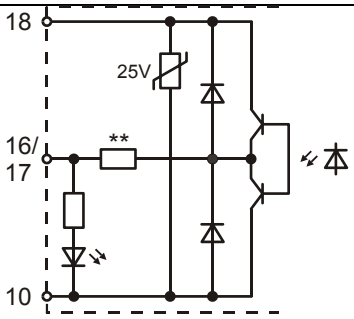
X100 – I/O analog
(only in combination with I/O terminal module, standard (SEA 5000, SEA 5001), expanded (XEA 5001) or resolver (REA 5000))

PIN[1]	Signal / Function	Description	Circuiting
1	AE1+	**+ Input of analog input AE1** Difference input voltage in relation to PIN 3; 0 ±10 V, Ri = 40 kΩ; Scanning time*: $T_{A\,min}$ = 1 msec; Resolution SEA 5000/5001: 11 bits + sign; Resolution REA/XEA 5001: 15 bits + sign; $U_{E\,max}$ against PIN 3 = 30 V; $U_{E\,max}$ against protective conductor = 15 V $U_{E\,max}$ against AGND = 30 V	
2	AE1 shunt	Shunt connection pin 2 must be jumpered with pin 1. Current input in relation to PIN 3; 0 ±20 mA; Ri=510 Ω; Scanning time*: $T_{A\,min}$ = 1 msec;	
3	AE1-	**Inverted input** of analog input AE1 $U_{E\,max}$ against PIN 1 = 30 V; $U_{E\,max}$ against protective conductor = 15 V $U_{E\,max}$ against AGND = 30 V	For circuiting examples, see chap. 6.
4	AE2+	**+ Input of analog input AE2** Difference input voltage in relation to PIN 5; 0 ±10 V; Ri = 40 kΩ; Scanning time*: $T_{A\,min}$ = 1 msec; Resolution: 11 bits + sign $U_{E\,max}$ against PIN 5 = 30 V; $U_{E\,max}$ against protective conductor = 15 V $U_{E\,max}$ against AGND = 30 V	
5	AE2-	**Inverted input** of analog input AE2 $U_{E\,max}$ against PIN 4 = 30 V; $U_{E\,max}$ against protective conductor = 15 V $U_{E\,max}$ against AGND = 30 V	
6	AA1	**Analog output 1** $I_{A\,max}$ = 10 mA; update rate*: 1 msec; Resolution: 10 bits + sign; Ri= 20 Ω; Reference ground = PIN 8	
7	AA2	**Analog output 2** $I_{A\,max}$ = 10 mA; update rate*: 1 msec; Resolution: 10 bits + sign; Ri= 20 Ω; Reference ground = PIN 8	
8	AGND	**Reference ground** for analog signals	

* The scanning time and the update rate T_A vary with the complexity of the user program in the POSIDRIVE® MDS 5000. Both times assume the values 1, 2, 4, 8, 16 or 32 msec depending on the scope of the user program.

[1] View of terminal/sub D

X101 – I/O digital
(only in combination with I/O terminal module, standard (SEA 5000, SEA 5001), expanded (XEA 5001) or resolver (REA 5000))

PIN[1]	Signal / Function	Description	Circuiting
9	GND 18 V	**Reference ground** For 18 V Auxiliary voltage (PIN 19)	
10	DGND (BE, BA, 24 V)	**Reference ground** For digital inputs and outputs (PIN 11 – 18)	
11	BE1	**Binary input BE1** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10. $U_{E\ max}$=30 V; $T_{A\ min}$*=1 msec (with timestamp); $I_{E\ max}$ = 16 mA with $U_{E\ max}$	
12	BE2	**Binary input BE2** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10. $U_{E\ max}$=30 V; $T_{A\ min}$*=1 msec (with timestamp); $I_{E\ max}$ = 16 mA with U_{Emax}	
13	BE3	**Binary input BE3** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10. $U_{E\ max}$=30 V; $T_{A\ min}$*=1 msec (with timestamp); $I_{E\ max}$ = 16 mA with $U_{E\ max}$ See supplement BE3 to BE5.	
14	BE4	**Binary input BE4** H level: 12 – 30 V / >3 mA; L level: 0 – 8 V / 0 mA; Reference ground is PIN 10. $U_{E\ max}$=30 V; $T_{A\ min}$*=1 msec (with timestamp); f_{grenz} = 100 kHz; $I_{E\ max}$= 16 mA with $U_{E\ max}$ Can be parameterized as input for incremental encoder and stepper motor. See supplement BE3 to BE5.	 * TTL/HTL changeover switch only with REA 5000
15	BE5	**Binary input BE5** H level: 12 – 30 V / >3 mA; L level: 0 – 8 V / 0 mA; Reference ground is PIN 10. $U_{E\ max}$=30 V; $T_{A\ min}$*=1 msec (with timestamp); f_{grenz} = 100 kHz; $I_{E\ max}$= 16 mA with $U_{E\ max}$ Can be parameterized as input for incremental encoder and stepper motor. See supplement BE3 to BE5.	 * TTL/HTL changeover switch only with REA 5000
16	BA1	**Binary output BA1** $I_{A\ max}$ = 20 mA; $T_{A\ min}$* = 1 msec. The output can simulate an impulse encoder depending on the parameterization. f_{grenz} = 100 kHz	 ** SEA 5000 / REA 5000: 13 Ω SEA 5001 / XEA 5001: 50 mA
17	BA2	**Binary output BA2** $I_{A\ max}$ = 20 mA; $T_{A\ min}$* = 1 msec. The output can simulate an impulse encoder depending on the parameterization. f_{grenz} = 100 kHz	
18	24 V-In (BA)	**24 V power** for XEA 5001 and for binary outputs with SEA 5000 and REA 5000 Reference ground PIN 10 Input range: 18 – 28.8 V	
19	18 V-Out	**Auxiliary voltage 18 V** U_A = 16 – 18 V; $I_{A\ max}$ = 50 mA Reference ground PIN 9	

* The scanning time and the update rate T_A vary with the complexity of the user program in the POSIDRIVE® MDS 5000. Both times assume the values 1, 2, 4, 8, 16 or 32 msec depending on the scope of the user program.

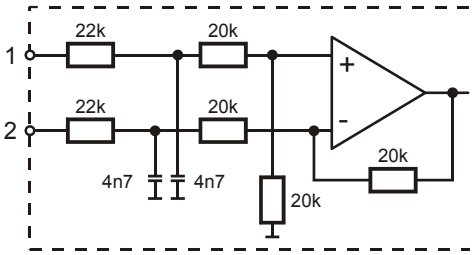
[1] View of terminal/sub D

Supplement for BE3 to BE5

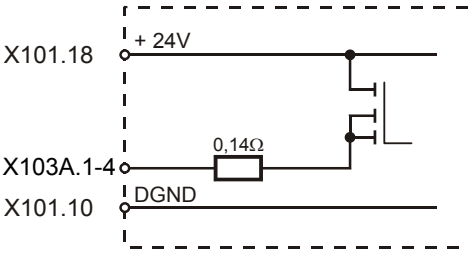
Connection of incremental and stepper motor signals to BE3, BE4 and BE5
(**Caution!** Function must be parameterized on the inverter!)

	Incremental encoder	Step motor signals
BE3	Zero track	-
BE4	Track A+	(Increments) freq.+
BE5	Track B+	(Direction of rotation) sign+

X102 – analog input no. 3 (only in combination with I/O terminal module "extended" (XEA 5001))

PIN[1]		Signal / Function	Description	Circuiting
	1	AE3+	**+ Input of the analog input AE3** Difference input voltage in relation to PIN 2; 0 ±10 V, Ri = 40 kΩ; Scanning time*: $T_{A\,min}$ = 1 msec; Scanning time: 11 bits + sign; $U_{E\,max}$ against PIN 2 = 30 V; $U_{E\,max}$ against protective conductor = 15 V $U_{E\,max}$ against AGND = 30 V	
	2	AE3-	**Inverted input** Of analog input AE3 $U_{E\,max}$ against PIN 1 = 30 V; $U_{E\,max}$ against protective conductor = 15 V $U_{E\,max}$ against AGND = 30 V	

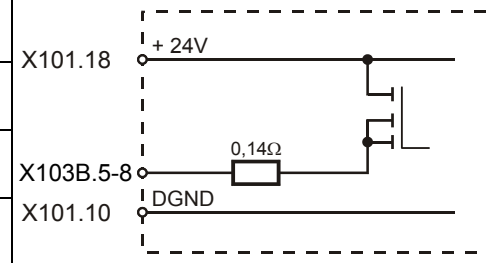
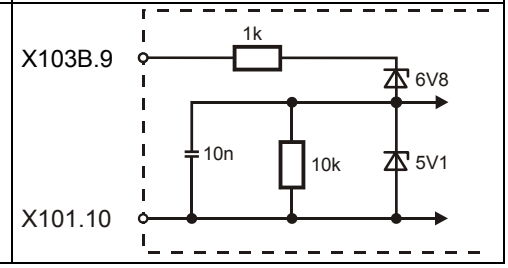
X103 A – I/O digital expansion (only in combination with I/O terminal module "expanded" (XEA 5001))

PIN[1]		Signal / Function	Description	Circuiting
	1	BA3	**Binary output BA3** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
	2	BA4	**Binary output BA4** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
	3	BA5	**Binary output BA5** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
	4	BA6	**Binary output BA6** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	

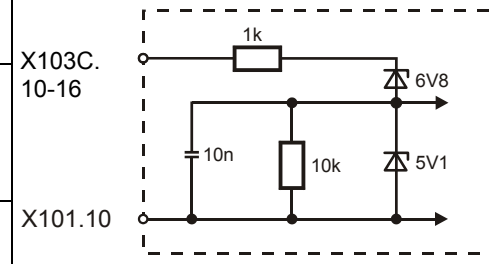
* The scanning time and the update rate T_A vary with the complexity of the user program in the POSIDRIVE® MDS 5000. Both times assume the values 1, 2, 4, 8, 16 or 32 msec depending on the scope of the user program.

[1] View of terminal/sub D

X103 B – I/O digital expansion (only in combination with I/O terminal module "expanded" (XEA 5001))

PIN[1]	Signal / Function	Description	Circuiting
5	BA7	**Binary output BA7** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
6	BA8	**Binary output BA8** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
7	BA9	**Binary output BA9** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
8	BA10	**Binary output BA10** $I_{A\,max}$ = 50 mA; $T_{A\,min}$* = 1 msec	
9	BE6	**Binary input BE6** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	

X103 C – I/O digital expansion (only in combination with I/O terminal module "expanded" (XEA 5001))

PIN[1]	Signal / Function	Description	Circuiting
10	BE7	**Binary input BE7** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	
11	BE8	**Binary input BE8** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	
12	BE9	**Binary input BE9** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	
13	BE10	**Binary input BE10** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	
14	BE11	**Binary input BE11** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	
15	BE12	**Binary input BE12** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101. $U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	
16	BE13	**Binary input BE13** H level: 12 – 30 V; L level: 0 – 8 V; Reference ground is PIN 10 of terminal X101.$U_{E\,max}$ = 30 V; $T_{A\,min}$* = 1 msec; $I_{E\,max}$ = 3 mA with $U_{E\,max}$	

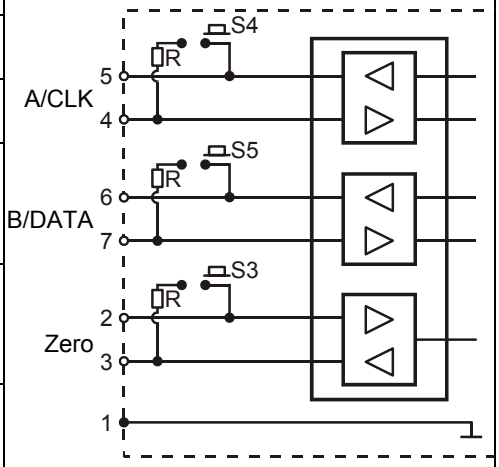
* The scanning time and the update rate T_A vary with the complexity of the user program in the POSIDRIVE® MDS 5000. Both times assume the values 1, 2, 4, 8, 16 or 32 msec depending on the scope of the user program.

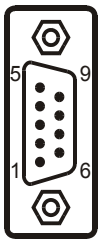
NOTE

When the 24 V power supply (X101.18) fails, the binary inputs BE6 to BE13 have the signal state 0 (regardless of the physical signal state).

X120 – encoder input/output (only in combination with I/O terminal module "expanded" (XEA 5001))

For evaluation and simulation of TTL or SSI encoders

PIN[1]	Signal / Function	Description	Circuiting
1	GND - ENC	**Reference potential** For PIN 2 - 7	
2	N	**Differential input / output** (inverse) For N track / TTL level	
3	/N	**Differential input / output** For N track / TTL level	
4	/A /CLK	**Differential input / output** (inverse) For A track / TTL level or - clock output for SSI (function depends on parameterization).	
5	A / CLK	**Differential input / output** For A track / TTL level or + clock output for SSI (function depends on parameterization).	
6	B / DATA	**Differential input / output** For B track / TTL level or + DATA input/output for SSI (function depends on parameterization).	
7	/B /DATA	**Differential input / output** (inverse) For B track / TTL level or - DATA input/output for SSI (function depends on parameterization).	
8	Power + (U_A)	**Auxiliary voltage** 15 V, $I_{A\,max}$ = 250 mA	
9	GND	**Reference potential** For encoder power / PIN 8	



R = 120 Ω

Z* = 150 Ω in series with 1nF

Frequencies:
SSI = 250 kHz / 592 kHz

Limit frequency:
Incremental encoder ≤1 MHz

Max. cable length: 50 m

Maximum number of stations which can be connected:
1 Master and 31 Slaves

NOTE

The interface X120 on option board XEA 5001 is designed as a double interface. The double interface is used to distribute encoder signals to other inverters without a lot of extra wiring work. This is why both sub D connections have the same allocation.

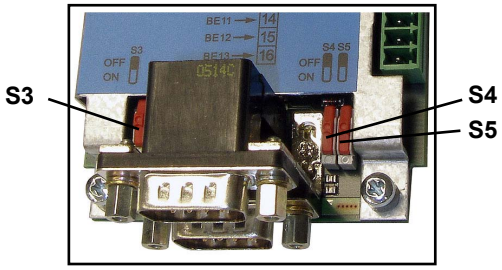
ATTENTION

When the internal power supply (PIN 8, PIN 9) is used, GND (PIN 9) must be connected with GND-ENC (PIN 1).

ATTENTION

Please remember that all SSI slaves must be switched on or off at the same time (24 V on X11 and X101.18). Switching individual stations during operation will cause malfunctions on the other stations.

Switch	TTL-Encoder	SSI-Encoder
S3	Zero	-
S4	A	CLK
S5	B	DATA



Topology

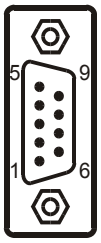
When two or more stations are coupled via the X120 interface only linear topologies may be used. The signal lines must be terminated with resistors for stations on both ends of the coupling. The terminating resistors can be switched on with switches S3, S4 and S5 on the XEA 5001 board.

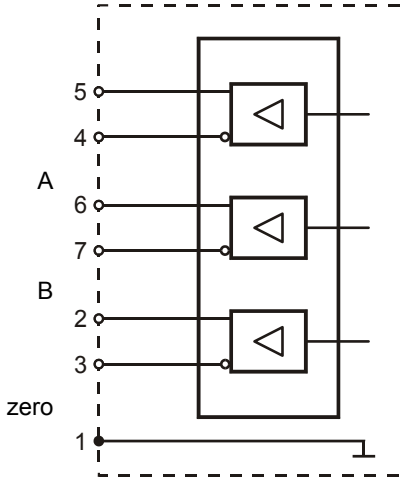
[1] View of terminal/sub D

X120 – encoder output (only in combination with I/O terminal module "resolver" (REA 5000))

For simulation of TTL encoder signals in reference to a resolver connected to X140

PIN[1]	Signal / Function	Description
1	GND	**Reference potential** For PIN 2 - 7
2	N (TTL)	**Differential output** für N track / TTL level
3	/N (TTL)	**Differential output** (inverse) For N track / TTL level
4	/A (TTL)	**Differential output** (inverse) For A track / TTL level
5	A (TTL)	**Differential output** For A track / TTL level
6	B (TTL)	**Differential output** For B track / TTL level
7	/B (TTL)	**Differential output** (inverse) For B track / TTL level
8	NC	Not connected
9	NC	Not connected

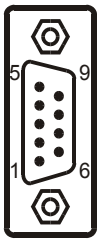


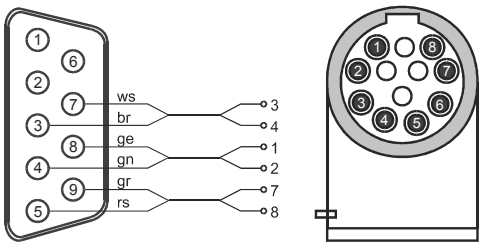


Limit frequency:
Incremental encoder ≤1 MHz

X140 – resolver (only in combination with I/O terminal module "resolver" (REA 5000))

PIN[1]	Signal / Function	Description
1	NC	Not connected
2	Temperature sensor f. input	**Temperature sensor, motor**[2] Connection for one to six positor lines.
3	-Sin (S2)	Negative input of the sine coil
4	-Cos (1)	Negative input of the cosine coil
5	-Erreg (R1)	Negative output of the exciter coil
6	Temperature sensor f. reference potential	**Temperature sensor, motor**[2] Connection for one to six positor lines.
7	+Sin (S4)	Positive input of the sine coil
8	+Cos (S3)	Positive input of the cosine coil
9	+Erreg (R2)	Positive output of the exciter coil



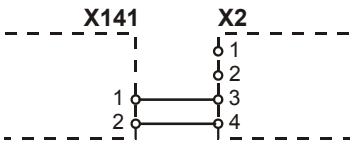


Suitable for resolver with:

Input voltage:	5-10 V
Input frequency:	7-9 kHz
Transfer behavior	0.5 ±0.5%
Number of poles	2
Phase displacement:	± 20 el.°
Maximum power consumption	0.8 W

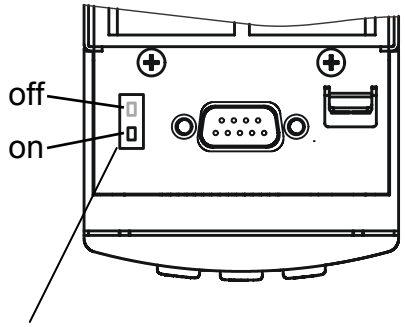
X141 – thermal contact (only in combination with I/O terminal module "resolver" (REA 5000))[2]

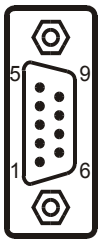
PIN[1]	Signal / Function	Description
1	Temperature sensor f. output	**Temperature sensor motor:** With STÖBER resolver cabling, contacts must be jumpered on terminal X2.
2	Temperature sensor f. reference potential	



[1] View of terminal/sub D
[2] For ED/EK-motors for SDS (e.g., ED403 UROS 110) when changing to MDS 5000.

X200 – fieldbus CANopen (only in combination with fieldbus module CAN5000)

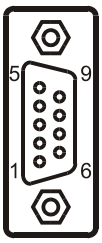
PIN[1]	Signal / Function	Description	Circuiting
1	NC	Not connected	 Internal terminal resistance: 120 Ω (can be switched through) Baud rate and bus address for generation of the COB-ID are set via software and stored non-volatilely in Paramodule.
2	CAN-low	CAN-low line	
3	GND	Signal ground	
4	NC	Not connected	
5	NC	Not connected	
6	CAN-low	CAN-low line Connected internally with PIN 2	
7	CAN-high	CAN-high line	
8	NC	Not connected	
9	CAN-high	CAN-high line Connected internally with PIN 7	



Comply with supplementary documentation CANopen (publ. no. 441694)!

X200 – fieldbus PROFIBUS DP (only in combination with fieldbus module DP5000)

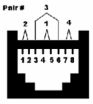
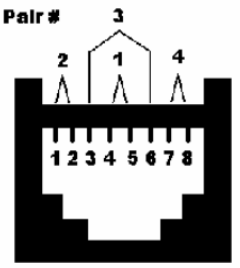
PIN[1]	Signal / Function	Description	Circuiting
1	NC	Not connected	PIN allocation in accordance with PROFIBUS standard (also for plug connectors with connectable terminating resistors)
2	NC	Not connected	
3	B	RxD / TxD-P (send/receive data, plus)	
4	RTS	Direction control for repeater (plus)	
5	GND	Ground to + 5 V	
6	+5 V	Power for terminal resistors	
7	NC	Not connected	
8	A	RxD / TxD-N (send/receive data, minus)	
9	NC	Not connected	



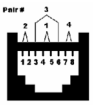
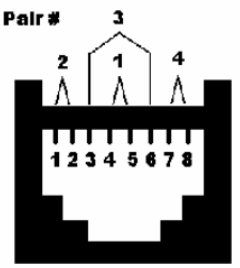
Comply with supplementary documentation PROFIBUS DP (publ. no. 441695)!

[1] View of terminal/sub D

X200 – IN EtherCAT (only in combination with fieldbus module ECS5000)

PIN[1]		Signal / Function	Description	Circuiting
	1	TxData +	EtherCAT communication	Suitable connection cables are Ethernet patch cables or crossover cables in **CAT5e** quality. 
	2	TxData -		
	3	RecvData +		
	4	NC	Not connected	
	5	NC		
	6	RecvData -	EtherCAT communication	
	7	NC	Not connected	
	8	NC		

X201 – OUT EtherCAT (only in combination with fieldbus module ECS5000)

PIN[1]		Signal / Function	Description	Circuiting
	1	TxData +	EtherCAT communication	Suitable connection cables are Ethernet patch cables or crossover cables in **CAT5e** quality. 
	2	TxData -		
	3	RecvData +		
	4	NC	Not connected	
	5	NC		
	6	RecvData -	EtherCAT communication	
	7	NC	Not connected	
	8	NC		

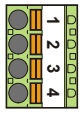
Comply with supplementary documentation EtherCAT (publ. no. 441896)!

[1] View of terminal/sub D

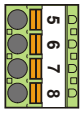
X300 – brake module for 24 V brake (optional)

PIN[1]		Signal / Function	Description	Circuiting
	+	+24 V	24 V power for brake activation $I_{E\ max}$ = 2 A	Voltage range: 24 V -0% to 24 V +5%
	-	GND	Reference potential for 24 V power	

X301 – brake module for 24 V brake (optional)

PIN[1]		Signal / Function	Description	Circuiting
	1	-Brake	- Connection for 24 V brake	
	2	+Brake	+ Connection for 24 V brake, $I_{A\ max}$ = 2 A	
	3	Thermal contact, input	**Temperature sensor:** Connection for one to six positor lines (thermal motor protection). Lines up to 50 m can be installed in motor cable. If operation without temperature sensor is permitted, pin 3 must be jumpered with pin 4.	Connected with PIN 6 of X302 Is looped through to PIN 3 of X2
	4	Thermal contact, reference potential		Connected with PIN 5 of X302 Is looped through to PIN 4 of X2

X302 – brake module for 24 V brake (optional)

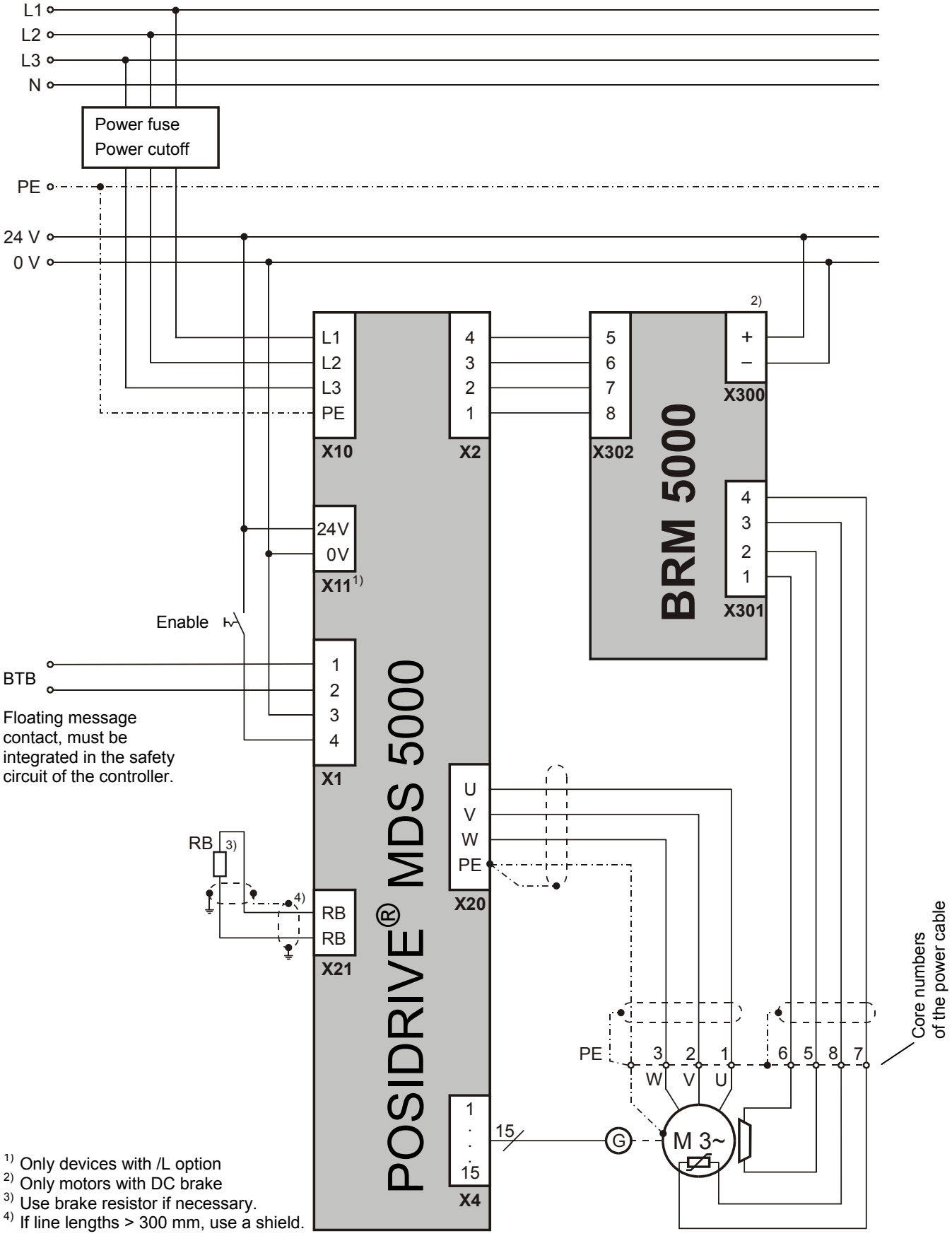
PIN[1]		Signal / Function	Description	Circuiting
	5	Thermal contact	**Temperature sensor, motor:** Must be connected with PIN 4 of X2	For fabrication of connection cable, see chap. 4.7.2.
	6	Thermal contact	**Temperature sensor, motor:** Must be connected with PIN 3 of X2	
	7	Brake contact	**Brake activation:** Must be connected with PIN 2 of X2	
	8	Brake contact	**Brake activation:** Must be connected with PIN 1 of X2	

[1] View of terminal/sub D

6 EXAMPLES OF CONNECTIONS

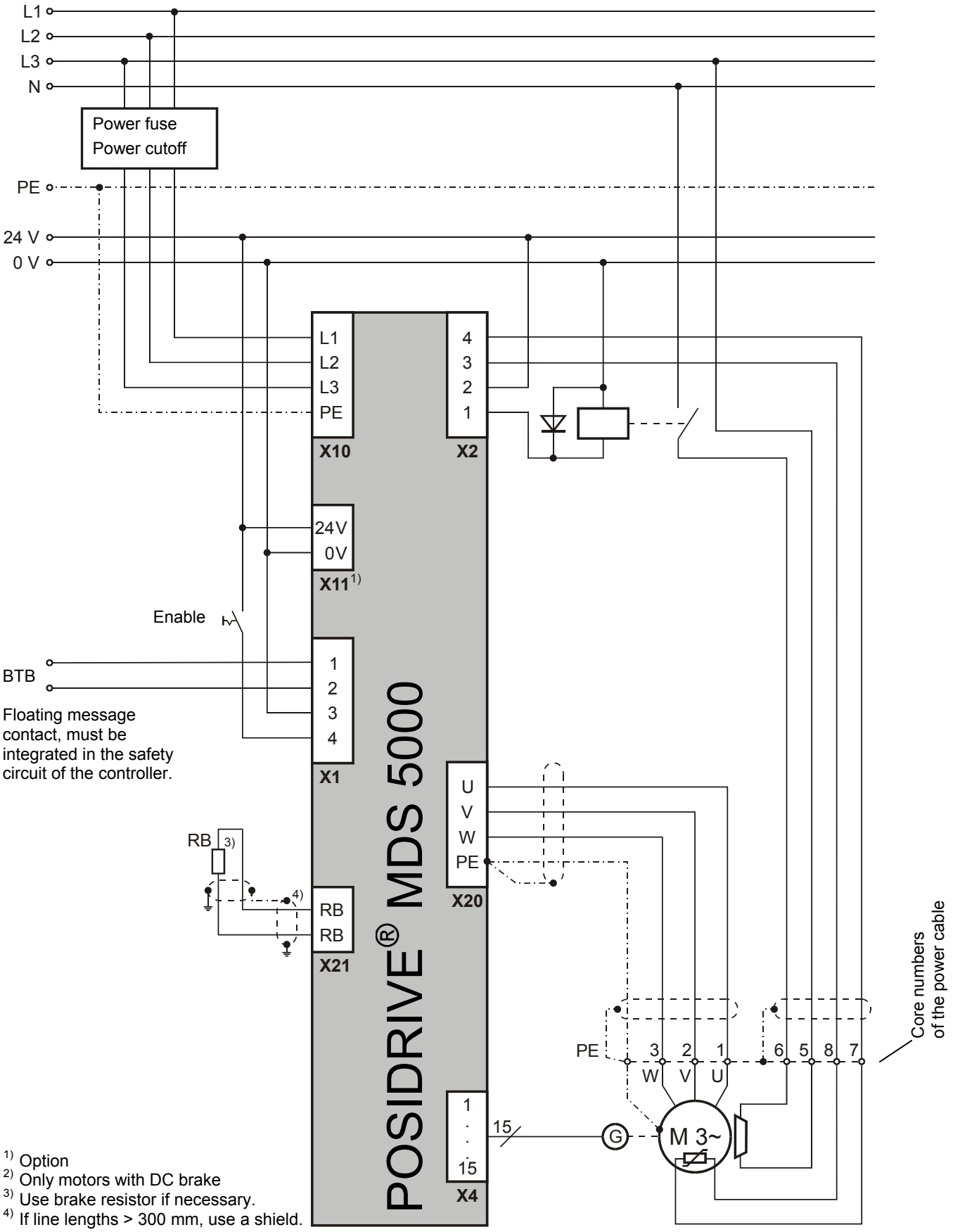
6.1 General

6.1.1 Brake connection with BRM 5000 for 24 V DC brakes



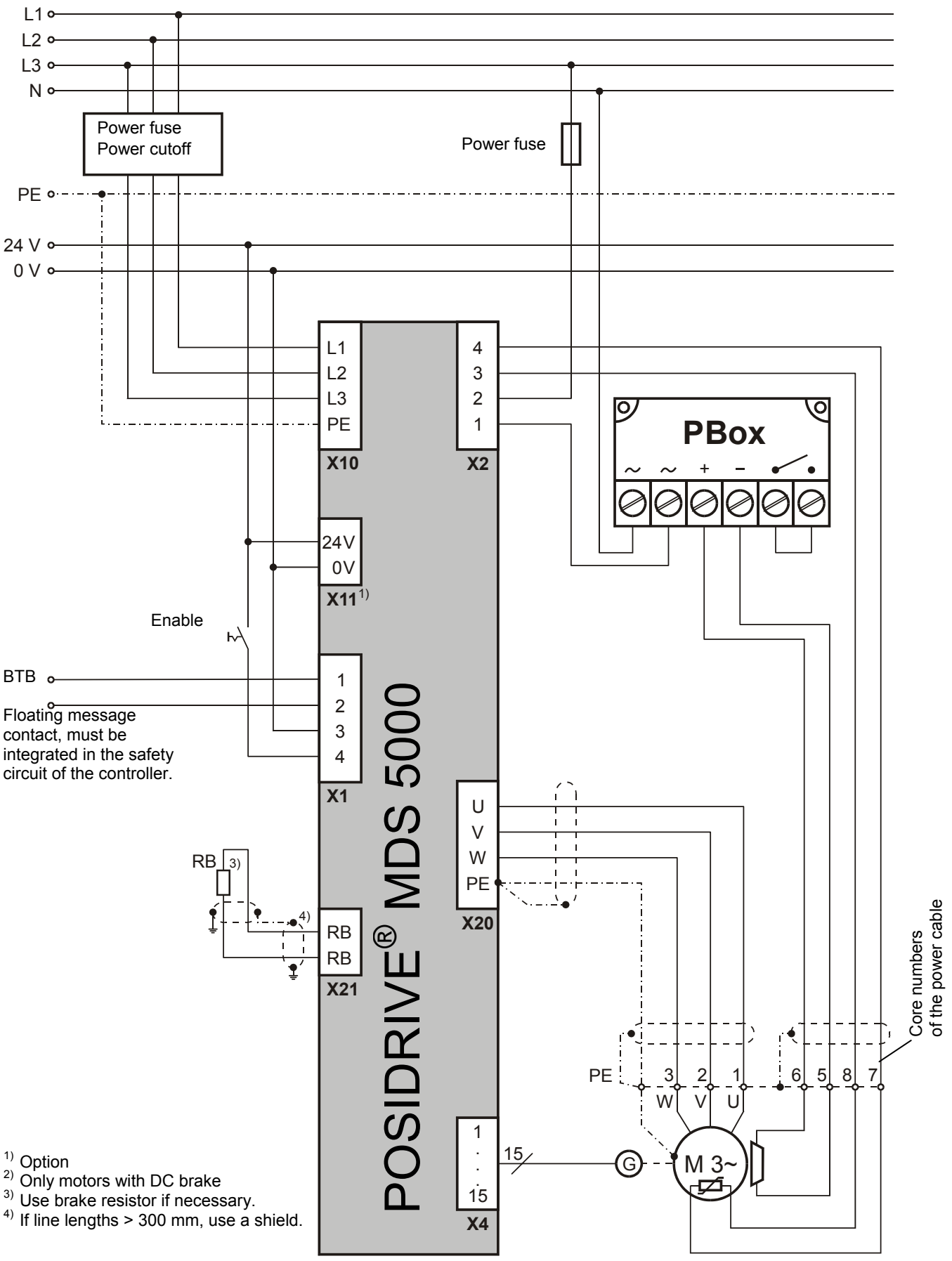
1) Only devices with /L option
2) Only motors with DC brake
3) Use brake resistor if necessary.
4) If line lengths > 300 mm, use a shield.

6.1.2 Brake connection with interface relay for 230 V AC brakes



1) Option
2) Only motors with DC brake
3) Use brake resistor if necessary.
4) If line lengths > 300 mm, use a shield.

6.1.3 Brake connection with Powerbox

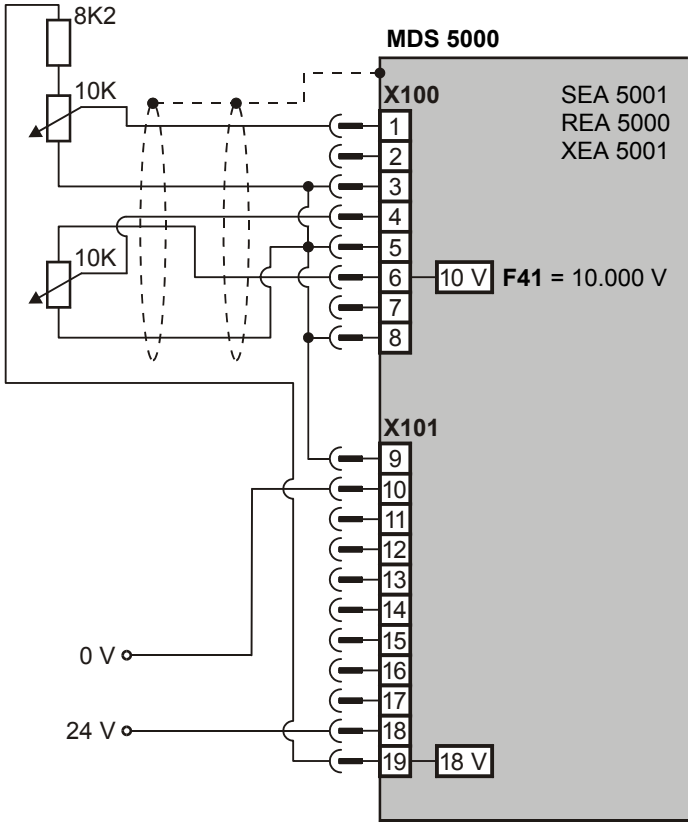


1) Option
2) Only motors with DC brake
3) Use brake resistor if necessary.
4) If line lengths > 300 mm, use a shield.

6.2 Terminals

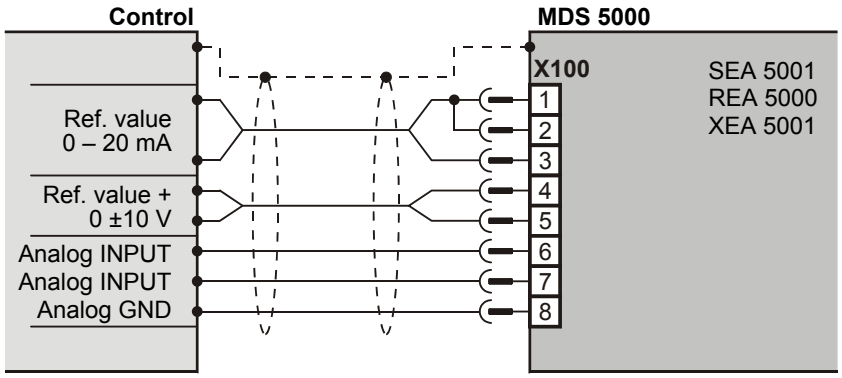
6.2.1 Example 1

- Potentiometer on AE1 (terminals X100.1, X100.3, X100.8) with voltage supply 18 V (terminal X100.19) and voltage divider.
- Potentiometer on AE2 (terminals X100.4 and X100.5, X100.8) with voltage supply 10 V via AA1 with **F41** analog output. Offset = 10 V (terminal X100.6).
- 24 V for option board (BA).



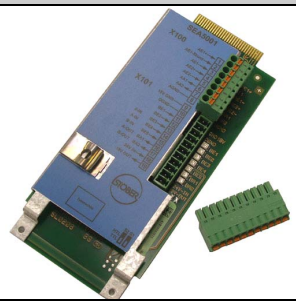
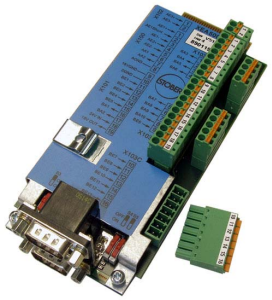
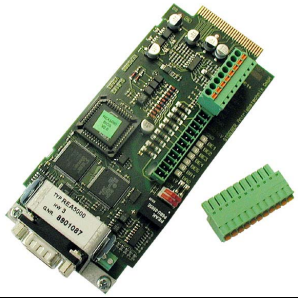
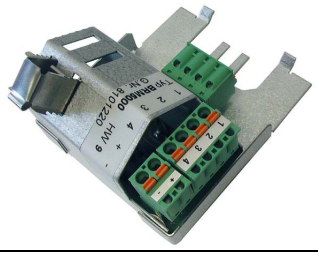
6.2.2 Example 2

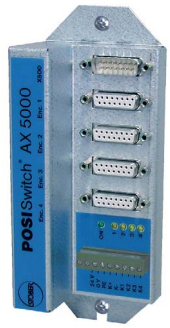
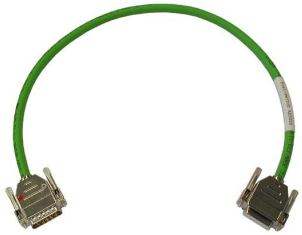
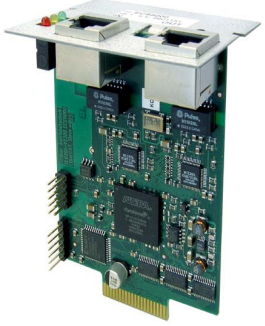
- Current-stabilized analog input AE1 (terminals X100.1-3).
- Voltage-controlled analog input AE2 (terminals X100.4 and X100.5).
- Connection of the analog outputs to PLC (terminals X100.6-8).

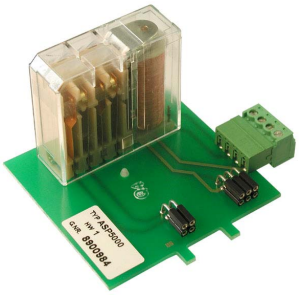


7 ACCESSORIES

7.1 Accessory Overview

	ID No.	Designation	Remarks
	49576	**I/O terminal module, standard (SEA 5001)** 2 analog inputs (11 bits + sign) 2 analog outputs (±10 bits) 5 binary inputs 2 binary outputs	Chap. 3.3.2 in this instruction
	49015	**I/O terminal module, expanded (XEA 5001)** 3 analog inputs (1 x 15 bits + sign, 2 x 11 bits + sign resolution) 2 analog outputs (±10 bits) 13 binary inputs 10 binary outputs 2 x D-SUB 9: Incremental encoder (TTL) or SSI input/output interface (X20 – SDS 4000 compatible) (2 x D-SUB 9 with same function to simplify signal transmission)	Chap. 3.3.2 in this instruction
No image available	49482	**SSI connection cable X120** For connecting the SSI interface X120 to the XEA 5001	Chap. 5.3
	44570	**I/O terminal module, resolver (REA 5000)** 2 analog inputs (1 x 15 bits + sign, 1 x 11 bits + sign resolution) 2 analog outputs (±10 bits) 5 binary inputs 2 binary outputs 1 x D-SUB 9: Resolver connection (16 bits) 1 x D-SUB 9: Incremental encoder simulation (TTL)	Chap. 3.3.2 in this instruction
	44959	**EMC shield plate (EM 5000)** Module for shield connection of motor line. Can be added to the basic housing.	Chap. 2.2 and 3.2.3 in this instruction
	44571	**Brake module for 24 V brake (BRM 5000)** For activation of a 24 V motor holding brake. Module is delivered in conjunction with EMC shield plate. Can be added to the basic housing.	Chap. 3.2.3 and 4.4 in this instruction

	ID No.	Designation	Remarks
	44573	**4-fold axis switch,** POSISwitch® **AX 5000** Permits operation of up to four servo motors on one POSIDRIVE® MDS 5000	POSISwitch® documentation: Publ. no. 441669 (D) Publ. no. 441689 (GB)
	45405	**POSISwitch® - connection cable (0.5 m)** Connection cable POSISwitch® AX 5000 to POSIDRIVE® MDS 5000 Length = 0.5 m (fabricated)	
	45386	**POSISwitch® - connection cable (2.5 m)** Connection cable POSISwitch® AX 5000 to POSIDRIVE® MDS 5000 Length = 2.5 m (fabricated)	
	44574	**Fieldbus module CANopen DS-301 (CAN5000)** (DSP402 under preparation) CAN bus coupling	Supplemental documentation: Fieldbus / CANopen Publ. no. 441684 (D) Publ. no. 441686 (GB) – – – – – – – – – – – – – – – – Chap. 3.3.1 in this instruction
	44575	**Fieldbus module PROFIBUS DP-V1 (DP5000)** PROFIBUS DP-V1 coupling	Supplemental documentation: Fieldbus / PROFIBUS Publ. no. 441685 (D) Publ. no. 441687 (GB) – – – – – – – – – – – – – – – – Chap. 3.3.1 in this instruction
	49014	**Option module EtherCAT (ECS5000)** Realtime Ethernet link EtherCATwith CANopen via EtherCAT	Supplemental documentation: Fieldbus / EtherCAT Publ. no. 441895 (D) Publ. no. 441896 (GB) Chap. 3.3.1 in this instruction

	ID No.	Designation	Remarks
No image available	49313	**EtherCAT cable (0.21 m)** EtherNet patch cable CAT5e, yellow	Chap. 5.3
	49314	**EtherCAT cable (0.38 m)** EtherNet patch cable CAT5e, yellow	Chap. 5.3
	-	**Starting lockout ASP 5001** The startup disable option may only be installed by STÖBER ANTRIEBSTECHNIK. Selection of startup disable ASP 5001 should take place parallel to the order.	Chap. 4.6
	44989	**Product CD " STÖBER ELECTRONICS 5000"** This CD-ROM contains: • POSITool (PC program for programming, operator control and monitoring of the inverter) • Documentation • Fieldbus files	Download POSITool Also via: *http://www.stoeber.de*
	41488	**Connection cable G3** Connection cable PC <-> MDS with sub D plug, 9-pin, socket / socket	Chap. 5 (X3 - serial interface)
	45616	**USB adapter** on RS232.	
	42224	**External operator, CONTROLBOX** Operating unit for parameterisation and operation of the inverters. Connecting lead (1.5 m) is included in the scope of supply.	**Supported from SV 5.1 on.** Controlbox documentation: Publ. no. 441445 (german) Publ. no. 441479 (englisch) Publ. no. 441651 (french) Additional cables: 5 m = Id.-no. 43216 10 m = Id.-no. 43217
	42225	**External operator,** **in a built-in DIN housing 96x96 mm** see above Protection rating IP54	

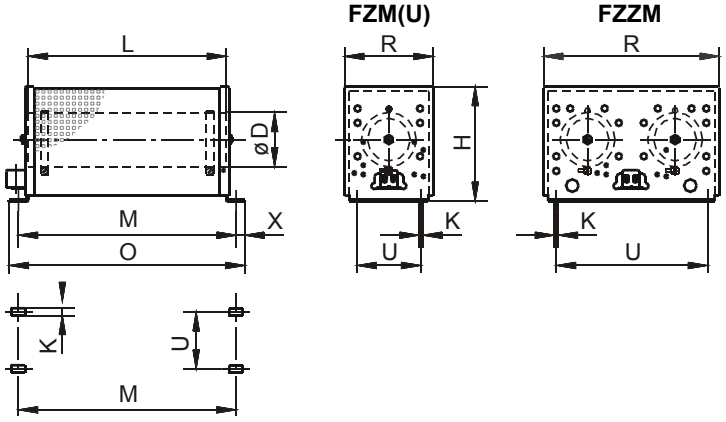
7.2 Brake Resistor

7.2.1 Brake resistor FZM(U), FZZM and VHPR

Allocation to MDS 5000

Type		FZM	FZMU c UL us		FZZM		VHPR c UL us			VHPR
		330x35 250 W 300 Ω	400x65 600 W 100 Ω	400x65 600 W 30 Ω	400x65 1200 W 30 Ω	400x65 1200 W 20 Ω	VHPR150V 150 W 300 Ω	VHPR150V 150 W 100 Ω	VHPR500V 400 W 47 Ω	VHPR600V 600 W 100 Ω
	ID no.	**40376**	**49010**	**49011**	**41642**	**41650**	**45972**	**45973**	**45974**	**44316**
	Thermal time constant τ [s]	40.0	40.0	40.0	40.0	40.0	46.6	80.1	65.0	40,0
MDS 5007	**44556**	-	X	-	-	-	-	X	-	X
MDS 5008	**44557**	X	-	-	-	-	X	-	-	-
MDS 5015	**44558**	X	-	-	-	-	X	-	-	-
MDS 5040	**44560**	-	X	-	-	-	-	X	-	X
MDS 5075	**44561**	-	X	-	-	-	-	X	X	X
MDS 5110	**44562**	-	-	X	X	-	-	-	X	-
MDS 5150	**44563**	-	-	X	X	-	-	-	X	-
MDS 5220	**44564**	-	-	X	-	X	-	-	X	-
MDS 5370	**44566**	-	-	X	-	X	-	-	X	-
MDS 5450	**44567**	-	-	X	-	X	-	-	X	-

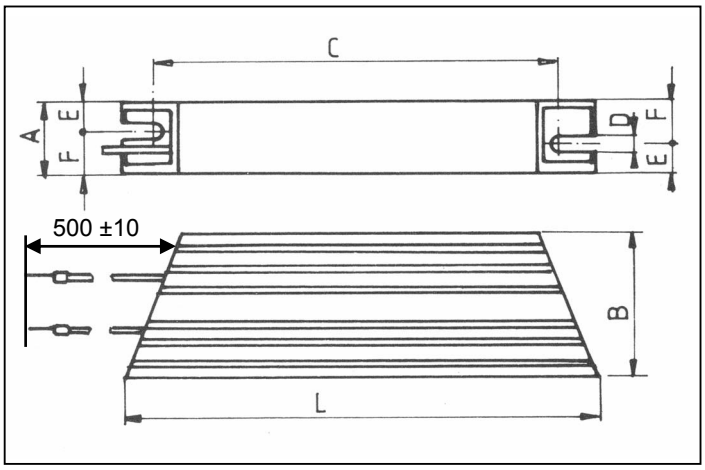
Dimensions - Brake Resistor FZM(U) / FZZM, Protection Rating IP20



Type	FZM 330x35	FZMU 400x65	FZZM 400x65
L x D	330 x 35	400 x 65	400 x 65
H	77	120	120
K	4.5 x 9	6.5 x 12	6.5 x 12
M	352	430	426
O	367	485	446
R	66	92	185
U	44	64	150
X	7	10	10
Weight [kg]	approx. 1.1	approx. 2.2	approx. 4.2

Dimensions - Brake Resistor VHPR, Protection Rating IP 54

Type	VHPR150V 150 W 300 Ω	VHPR150V 150 W 100 Ω	VHPR500V 400 W 47 Ω	VHPR600V 600 W 100 Ω
L	212	212	337	420
C	193±2	193±2	317±2	400±2
B	40	40	60	60
A	21	21	31	31
D	4.3	4.3	5.3	5.3
E	8	8	11.5	11.5
F	13	13	19.5	19.5
Thermal time constant τ [s]	46.6	80.1	65.0	40.0
Weight [g]	approx. 310	approx. 310	approx. 1020	approx. 1300



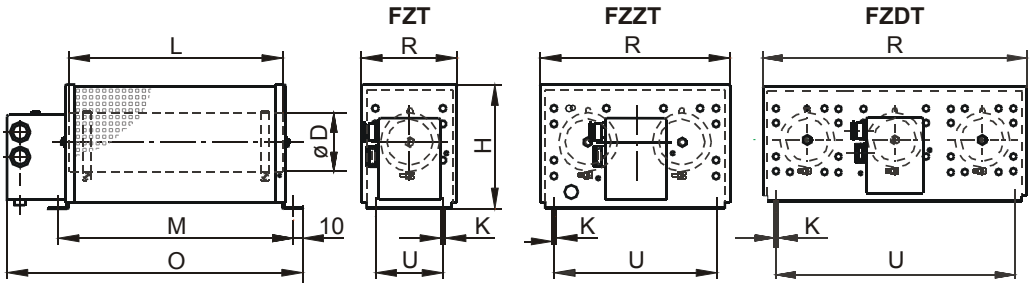
[Specifications in mm]

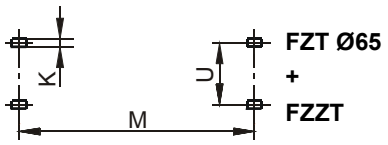
7.2.2 Brake resistor FZT, FZZT, FZDT and FGFT

Allocation to MDS 5000

Type		FZT	FZZT	FZDT	FGFT
		400x65 600 W 22 Ω	**400x65 1200 W 20 Ω**	**500x65 2500 W 20 Ω**	**3111202 6000 W 20 Ω**
	ID no.	**41649**	**41651**	**41653**	**41655**
	Thermal time constant τ [s]	30	30	30	20
MDS 5220	**44564**	**X**	**X**	**X**	**X**
MDS 5370	**44566**	**X**	**X**	**X**	**X**
MDS 5450	**44567**	**X**	**X**	**X**	**X**

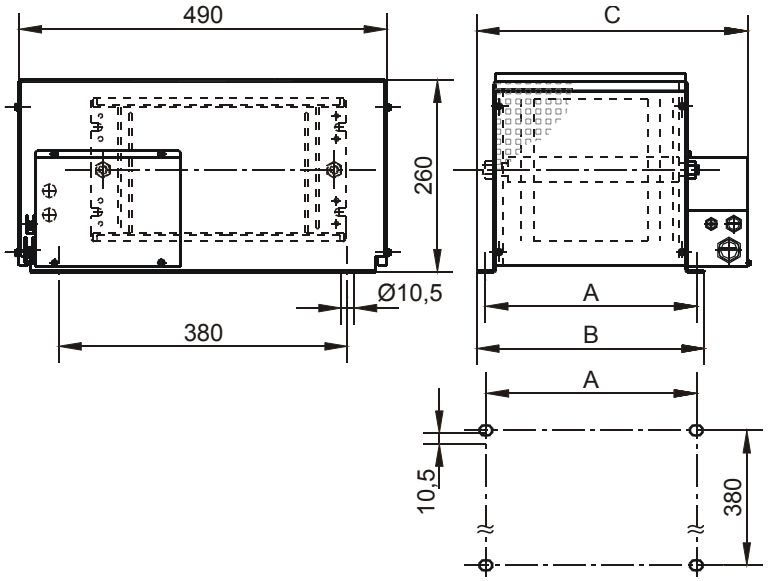
Dimensions - Brake Resistor FZT / FZZT / FZDT





Type	FZT 400x65	FZZT 400x65	FZDT 500x65
L x D	400 x 65	400 x 65	500 x 65
H	120	120	120
K	6.5 x 12	6.5 x 12	6.5 x 12
M	426	426	526
O	506	506	606
R	92	185	275
U	64	150	240
Weight [kg]	approx. 2.6	approx. 4.6	approx. 7.8

Dimensions - Brake Resistor FGFT



Type	FGFT 311-1202
A	370
B	395
C	455
Weight [kg]	approx. 13

[all Specifications in mm]

7.2.3 Bottom brake resistor RB 5000

Allocation to MDS 5000

Type		RB 5022 100 W 22 Ω	RB 5047 60 W 47 Ω	RB 5100 60 W 100 Ω	RB 5200 40 W 200 Ω
	ID no.	**45618**	**44966**	**44965**	**44964**
	Thermal time constant τ [s]	8	8	8	6
MDS 5008	**44557**	-	**-**	**-**	**X**
MDS 5015	**44558**	-	**-**	**-**	**X**
MDS 5040	**44560**	**-**	-	**X**	**-**
MDS 5075	**44561**	**-**	**X**	**-**	**-**
MDS 5110	**44562**	**X**	-	-	**-**
MDS 5150	**44563**	**X**	**-**	-	-

Dimensions - Bottom Brake Resistor RB 5000, Protection Rating IP54

Cf. dimensioned drawing chap. 2.2 and mechanical installation chap. 3.2.2.

Type	RB 5022 100 W 22 Ω	RB 5047 60 W 47 Ω	RB 5100 60 W 100 Ω	RB 5200 40 W 200 Ω
ID no.	**45618**	**44966**	**44965**	**44964**
Thermal time constant τ [s]	8	8	8	6
Height x width x depth (h x w x d) [mm]	300 x 94 x 18	300 x 62 x 18	300 x 62 x 18	300 x 62 x 18
Drilling jig (identical with MDS 5000)	BG2	BG0/1	BG0/1	BG0/1
Weight [g]	approx. 640	approx. 460	approx. 440	approx. 440
Length of the power leads [mm]	250	250	250	250

7.3 Output Deraters

Technical Data

WARNING

Danger of fire! When the output deraters are used outside the nominal data (cable length, current, frequency, and so on), the output deraters may overheat. Always operate the output deraters within their nominal data.

CAUTION

Danger of machine standstill! The evaluation of motor temperature sensor malfunctions due to cable capacities. If you have a cable length of more than 50 m and do not use cables from STÖBER ANTRIEBSTECHNIK GmbH & Co. KG, the cores for the motor temperature sensor and the brake must be separate (maximum length: 100 m).

Type	MDB-G0 3x4-3000	MDB-G1 3x16-900	MDB-G2 3x32-500
KT no.	**49582**	**49583**	**49584**
Size	BG0	BG1	BG2
Voltage range	3 x 0 to 500 V		
Frequency range	0 to 150 Hz		

Operation with servo motor (control mode servo control)

Rated current: 8 kHz	3 A	10 A	20 A
Max. overload: 8 kHz	250 % / 2 sec. 200 %/ 5 sec.		
Max. motor voltage	1.0 kV		
Max. dU/dt	3.5 kV/µsec		

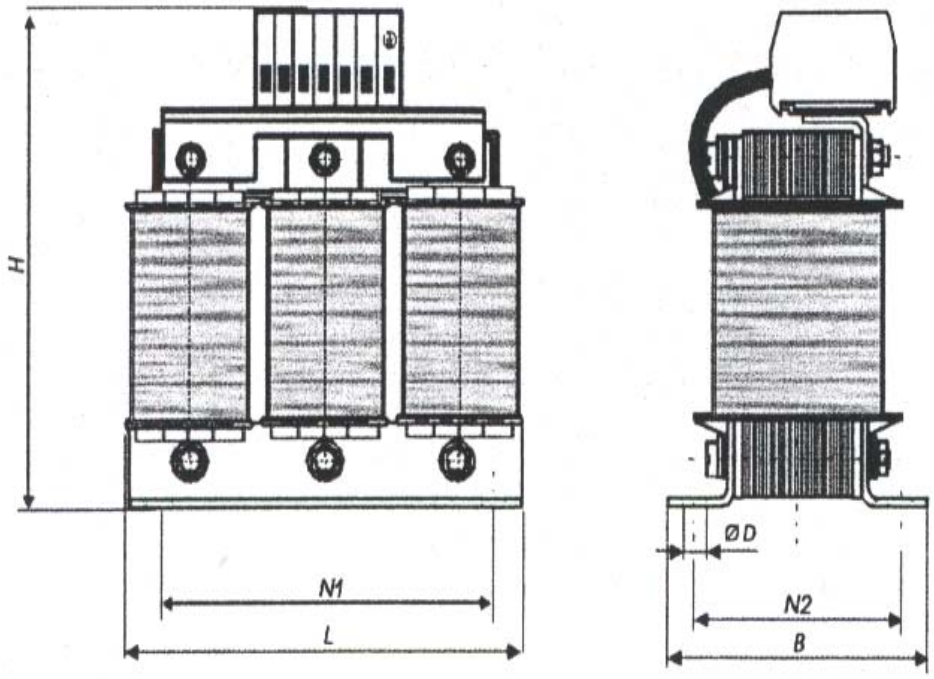
Operation with three-phase current motor (control mode V/f, VC, SLVC)

Rated current: 4 kHz	4 A	16 A	32 A
Max. overload: 4 kHz	180% / 5 sec. 150%/ 30 sec.		
Max. motor voltage	1.4 kV		
Max. dU/dt	3.0 kV/µsec		

Max. perm. cable length	100 m		
Output Derating	45 °C		
Design	open		
Power loss	15 W	40 W	80 W
Connections	Screw terminals		
Max. output Derating /mm²	4.0	4.0	6.0
Certifications	c UL us (under preparation)		

Dimensions

Type	L (mm)	H (mm)	B (mm)	N1 (mm)	N2 (mm)	Ø D (mm)	Screwed Glands	Connection (mm²)	Weight [kg]
MDB-G0 3x4-3000	95	110	66	62.5	40	5.8	M5	4	2
MDB-G1 3x16-900	125	160	71	100	55	5	M4	4	3
MDB-G2 3x32-500	155	185	91	130	71	8	M7	16	6



Global Presence

STÖBER ANTRIEBSTECHNIK

Address registers

Always up to date on the internet: *www.stoeber.de*

→ welcome → information

- **Technical Offices (TB) for advice and marketing in Germany**
- **Global presence for advice and marketing in about 25 countries**
- **Service Network Germany**
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STÖBER ANTRIEBSTECHNIK

STÖBER PRODUCT RANGE

Geared Motors	**MGS Geared Motors**
	MGS C Helical Geared Motors
	MGS F Shaft-Mounted Helical Geared Motors
	MGS K Helical Bevel Geared Motors
	MGS S Helical Worm Geared Motors
	SMS Geared Motors
	SMS P Planetary Geared Motors
	SMS PA Planetary Geared Motors
	SMS PH Planetary Geared Motors
	SMS PHA Planetary Geared Motors
	SMS PHK Right Angle Planetary Geared Motors
	SMS PHKX Right Angle Planetary Geared Motors
	SMS PK Right Angle Planetary Geared Motors
	SMS PKX Right Angle Planetary Geared Motors
	SMS KS Right Angle Servo Geared Motors
	SMS C Helical Geared Motors
	SMS F Shaft-Mounted Helical Geared Motors
	SMS K Helical Bevel Geared Motors
	SMS S Helical Worm Geared Motors
Electronics	**Inverters**
	POSIDRIVE® MDS 5000 Servo Inverters
	POSIDYN® SDS 4000 Servo Inverters
	POSIDRIVE® MDS 5000 Frequency Inverters
	POSIDRIVE® FDS 5000 Frequency Inverters
	POSIDRIVE® FAS 4000 Frequency Inverters
Gear Units	**MGS Gear Units**
	MGS C Helical Gear Units
	MGS F Shaft-Mounted Helical Gear Units
	MGS K Helical Bevel Gear Units
	MGS S Helical Worm Gear Units
	SMS Gear Units
	SMS C Helical Gear Units
	SMS F Shaft-Mounted Helical Gear Units
	SMS K Helical Bevel Gear Units
	SMS S Helical Worm Gear Units
	ServoFit® Planetary Gear Units
	ServoFit® P Planetary Gear Units
	ServoFit® PA Planetary Gear Units
	ServoFit® PH Planetary Gear Units
	ServoFit® PHA Planetary Gear Units
	Gear Unit Combinations
	PKX Right Angle Planetary Gear Units
	PK Right Angle Planetary Gear Units
	PHKX Right Angle Planetary Gear Units
	PHK Right Angle Planetary Gear Units
Motors	**AC Motors**
	MGS System Motors
	Servo Motors
	EK Servo Motors
	ED Servo Motors

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