STÖBER

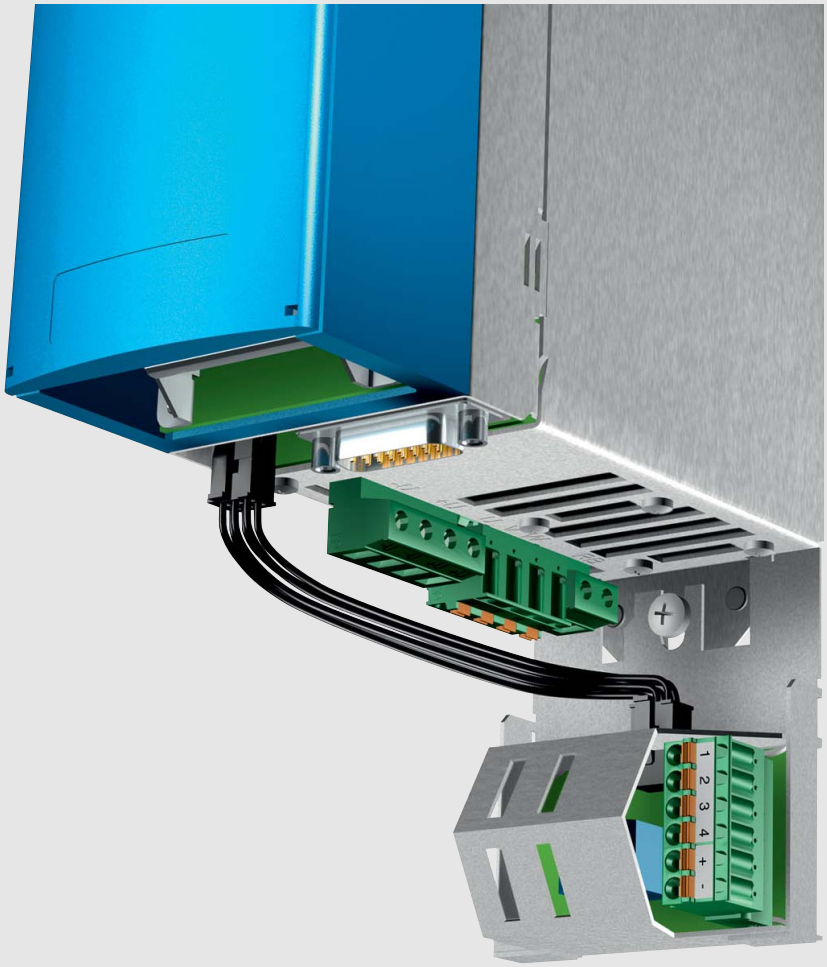
EMC shrouds and brake modules

Commissioning Instructions

Installation

Connecting

Diagnosis



V 5.6-R or later

03/2018 en

Table of contents

1 Introduction

1.1 Purpose of the manual

This document contains all relevant information regarding information and connection of EMC shrouds and brake modules for 5th generation STOBER inverters.

Original version
The original version of this manual is in German.

Information about brake module BRS 5001
The BRS 5001 is the follow-up model to the BRS 5000. The BRS 5001 requires firmware V 5.6-N or higher. The new version is equipped with separate terminals for connecting a motor holding brake and 24 vdc power supply as well as a screwable shield connection terminal and a second fastening clip for optional use.
Other differences in comparison to the previous model BRS 5000:

- Power semiconductors replaced
- Heat sink for the power semiconductors optimized
- Performance optimized
- X300 terminal strip divided:
  - X300 for 24 vdc power supply
  - X301 for connecting one to two brakes
- Time between failures in undervoltage detection increased
- Device firmware adapted (starting with V 5.6-N)

1.2 Abbreviations, formula symbols and indices

Abbreviations	
DC	Direct Current
EMC	Electromagnetic Compatibility
PTC	Positive Temperature Coefficient

Formula symbols	Unit	Explanation
I	**A**	**Current**
I_1	A	Input current
I_{1max}	A	Maximum input current
I_2	A	Output current
I_{2max}	A	Maximum output current
R	**V**	**Voltage**
U_1	V	Input voltage

1.3 Further support

If you have questions or problems please contact our Service department:
- 24 h Service hotline +49 180 5 786 323

If you have technical questions that are not answered by this document, please contact:
- Phone: +49 7231 582-3060
- E-mail: applications@stoeber.de

If you have questions about the documentation, please contact:
- E-mail: electronics@stoeber.de

If you have questions about training sessions, please contact:
- E-mail: training@stoeber.de

2 Overview

Assignment of shrouds/brake modules to inverters

Type	EM 5000	EM6A03	BRM 5000	BRS 5001
ID no.	44959	135120	44571	56518
FDS 5000	Size 0 – 1	—	Size 0 – 1	—
MDS 5000	Size 0 – 2	Size 3	Size 0 – 3	—
SDS 5000	Size 0 – 2	Size 3	—	Size 0 – 3

EMC shroud EM 5000

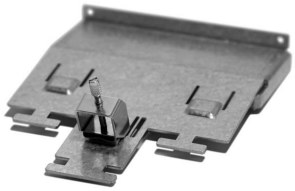
ID no. 44959

EMC shroud for sizes 0 to 2.
Accessory part for shield connection of the motor line.
Attachable on the basic housing.
Including shield connection terminal.

Technical Data	
Power cable cross-section	1 to 4 mm²
Max. shield diameter	12 mm
Min. shield contact surface (isolated part of the power cable)	15 mm

EMC shroud EM6A3

ID no. 135120

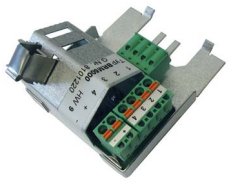


EMC shroud for size 3.
Accessory part for shield connection of the motor line.
Attachable on the basic housing.
Including shield connection terminal.
If necessary you can also connect the cable shield of the braking resistor and DC link connection on the shroud. Additional shield connection terminals are available as accessories for this purpose (ID No. 56521).

Technical Data	
Power cable cross-section	2.5 to 35 mm²
Max. shield diameter	35 mm
Min. shield contact surface (isolated part of the power cable)	20 mm
Tightening torque	1.5 – 1.8 Nm

Brake module BRM 5000

ID no. 44571

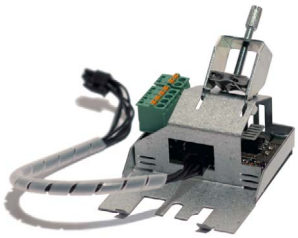


Brake module for inverters of series FDS 5000 and MDS 5000.
Accessory part for control of a motor holding brake (24 VDC) and (for inverters up to size 2) for connecting to the shield of the power cable.
Attachable on the basic housing.
Including shield connection terminal.

Technical Data	
Power cable cross-section	1 to 4 mm²
Max. shield diameter	12 mm
Min. shield contact surface (isolated part of the power cable)	15 mm

Brake module BRS 5001

ID no. 56518



Brake module for inverters of series SDS 5000.
Accessory part for direct control of up to two motor holding brakes (24 VDC) and (for inverters up to size 2) for connecting to the shield of the power cable.
Attachable on the basic housing.
Including connection cable for basic device and shield connection terminal.

Technical Data	
Power cable cross-section	1 to 10 mm²
Max. shield diameter	20 mm
Min. shield contact surface (isolated part of the power cable)	20 mm
Tightening torque	0.8 Nm

3 Notes on safety

The devices can represent a source of danger. Therefore observe
- the safety guidelines, technical rules and regulations given in the following sections and the
- Generally applicable technical rules and regulations.

Always read the corresponding documentation as well. STÖBER ANTRIEBSTECHNIK GmbH & Co. KG shall assume no liability for damage resulting from failure to comply with the instruction manual or relevant regulations. This documentation is purely a production description. It does not include any guaranteed features in terms of a warranty right. We reserve the right to make technical changes for the purpose of improving the devices.

3.1 Component part of the product

The technical documentation is a component part of a product.
- Since the technical documentation contains important information, always keep it handy in the vicinity of the device until the machine is disposed of.
- If the product is sold, disposed of, or rented out, always include the technical documentation with the product.

3.2 Operation in accordance with its intended use

Accessory part EM 5000 is used exclusively for the shield contact of the power cable for inverters sizes 0 to 2.

Accessory part EM6A3 is used exclusively for the shield contact of the power cable, braking resistor and DC link connection for size 3 inverters.

Accessory part BRM 5000 may only be used to control motor holding brakes on the POSIDRIVE MDS 5000 and POSIDRIVE FDS 5000, and also as shielding for sizes 0 to 2 in the following cases:
- direct brake control with a rated voltage of 24 V
- indirect brake control via a switching device with a rated voltage of 24 V

Also note the technical data of the brake module during configuration.

Non-designated use includes especially connecting motor holding brakes and loads with a different rated voltage.

Accessory part BRS 5001 may only be used to control motor holding brakes on the POSIDYN SDS 5000 and also as shielding for sizes 0 to 2 in the following cases:
- direct brake control with a rated voltage of 24 V
- indirect brake control via a switching device with a rated voltage of 24 V

Also note the technical data of the brake module during configuration.

Non-designated use includes especially connecting motor holding brakes and loads with a different rated voltage.

3.3 Qualified personnel

Since the devices may harbor residual risks, all configuration, transportation, installation and commissioning tasks including operation and disposal may only be performed by trained personnel who are aware of the possible risks.
Personnel must have the qualifications required for the job. The following table lists examples of occupational qualifications for the jobs:

Activity	Possible occupational qualifications
Transportation and storage	Worker skilled in storage logistics or comparable training
Configuration	- Graduate engineer (electro-technology or electrical power technology) - Technician (m/f) (electro-technology)
Installation and connection	Electronics technician (m/f)
Commissioning (of a standard application)	- Technician (m/f) (electro-technology) - Master electro technician (m/f)
Programming	Graduate engineer (electro-technology or electrical power technology)
Operation	- Technician (m/f) (electro-technology) - Master electro technician (m/f)
Disposal	Electronics technician (m/f)

In addition, the valid regulations, the legal requirements, the reference books, this technical documentation and, in particular, the safety information contained therein must be carefully

- read,
- understood and
- complied with.

3.4 Installation and connection

Installation and connection work are only permitted after the device has been isolated from the power!
The accessory installation instructions allow the following actions during the installation of accessories:

- The housing in the upper slot can be opened
- The housing in the bottom slot can be opened.

Opening the housing in another place or for other purposes is not permitted.

Use only copper conductors. For the line cross sections to be used, refer to DIN VDE 0298-4 or DIN EN 60204-1 Appendix D and Appendix G.

The permissible protection class is protective ground. Operation is not permitted unless the protective ground is connected in accordance with the regulations. Comply with the applicable instructions for installation and commissioning of motor and brakes.

Main equipment grounding markings: The main ground connections are marked "PE" or with the international ground symbol (IEC 60417, Symbol 5019 ⏚).

The motor must have an integrated temperature monitor with basic isolation in acc. with EN 61800-5-1 or external motor overload protection must be used.

Protect the device from falling parts (pieces of wire, leads, metal parts, and so on) during installation or other tasks in the switching cabinet. Parts with conductive properties inside the inverter can cause short circuits or device failure.

3.5 Commissioning, operation and service

Remove the additional covers before commissioning so that the device will not overheat. Note the minimum open areas specified in the projecting manuals during installation to prevent the inverter and its accessories from overheating.

The drive controller housing must be closed before you turn on the power supply voltage. When the power supply voltage is turned on, hazardous voltages may be present on the connection terminals and the cables and motor terminals connected to them. Note that the device is not reliably free of voltage simply because all the displays are blank.

The following actions are prohibited while the supply voltage is applied
- Opening the housing
- Connecting or disconnecting connection clamps and
- Installing/removing or attaching/detaching accessories.

Apply the 5 safety rules in the order stated before performing any work on the machine:
1. Disconnect.
   Also ensure that the auxiliary circuits are disconnected.
2. Protect against being turned on again.
3. Check that voltage is not present.
4. Ground and short circuit.
5. Cover adjacent live parts.

Information
Note that the discharge time of the DC link capacitors is up to 5 minutes. You can only determine the absence of voltage after this time period.

You can carry out work on the drive controller later. Repairs may only be performed by STOBER.

Send faulty devices with a fault description to:
STÖBER ANTRIEBSTECHNIK GmbH & Co. KG
Department VS-EL
Kieselbronner Str.12
75177 Pforzheim
GERMANY

3.6 Disposal

Please observe the current national and regional regulations! Dispose of the individual parts separately depending on the quality and currently applicable regulations, e.g. as

- Electronic waste (circuit boards)
- Plastic
- Sheet metal
- Copper
- Aluminum
- Battery

3.7 Presentation of notes on safety

NOTICE

Notice

means that property damage may occur

▶ if the stated precautionary measures are not taken.

⚠ CAUTION!

Caution

with warning triangle means that minor injury may occur

▶ if the stated precautionary measures are not taken.

⚠ WARNING!

Warning

means that there may be a serious danger of death

▶ if the stated precautionary measures are not taken.

⚠ DANGER!

Danger

means that serious danger of death exists

▶ if the stated precautionary measures are not taken.

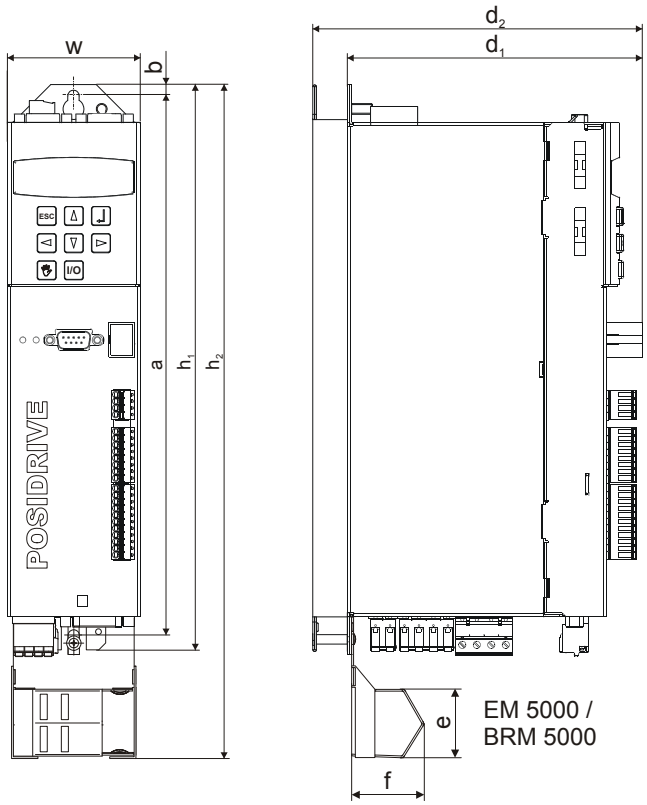
Information

refers to important information about the product or serves to emphasize a section in the documentation to which the reader should pay special attention.

4 Attachment

4.1 Dimensions

4.1.1 FDS 5000: sizes 0 to 1

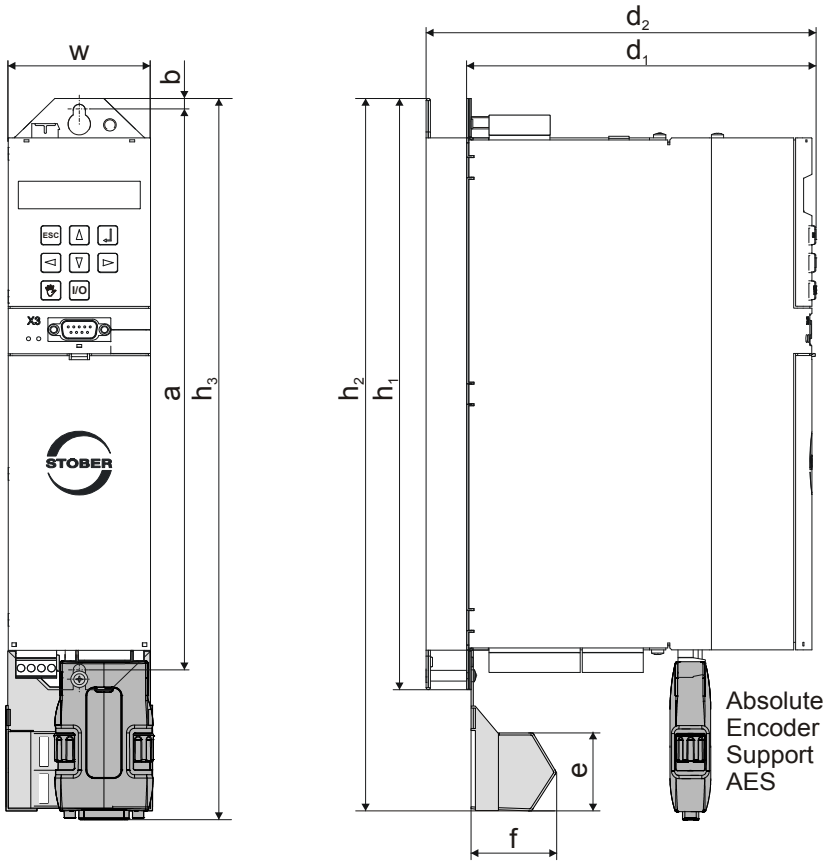


Dimensions [mm]			Size 0	Size 1
Inverter	Height	h_1	300	
		h_2 a)	360	
	Width	w	70	
	Depth	d_1	157	242
		d_2 b)	175	260
EMC shroud	Height	e	37,5	
	Depth	f	40	
Fastening holes	Vertical distance	a	283	
	Vertical distance to upper edge	b	6	

a) h_2 = Height incl. EMC shroud EM 5000 or brake module BRM 5000

b) d_2 = Depth incl. brake resistor RB 5000

4.1.2 MDS 5000: sizes 0 to 2



EM 5000 / BRM 5000

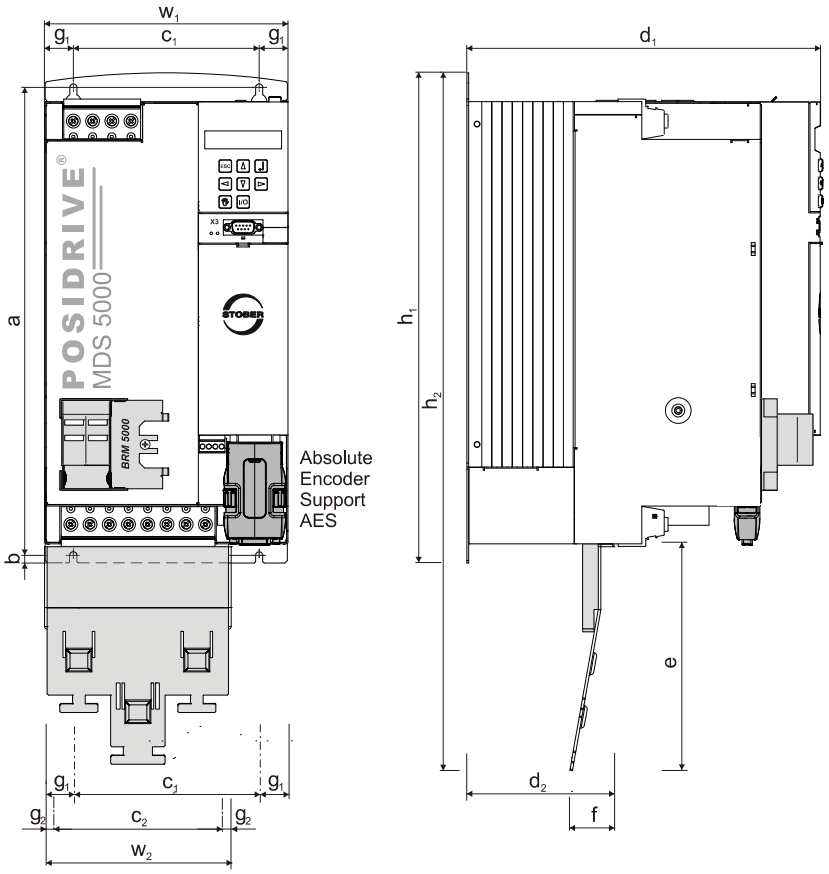
Dimensions [mm]			Size 0	Size 1	Size 2
Inverter	Height	h_1	300		
		h_2 a)	360		
		h_3 b)	365		
	Width	w	70		105
	Depth	d_1	175	260	260
		d_2 c)	193	278	278
EMC shroud	Height	e	37.5		
	Depth	f	40		
Fastening holes	Vertical distance	a	283		
	Vertical distance to upper edge	b	6		

a) h_2 = Height incl. EMC shroud EM 5000 or brake module BRM 5000

b) h_3 = Height incl. AES

c) d_2 = Depth incl. brake resistor RB 5000

4.1.3 MDS 5000: size 3



Dimensions [mm]			Size 3
Inverter	Height	h_1	382.5
	Height	h_2 a)	540
	Width	w_1	190
	Depth	d_1	276
EMC shroud	Height	e	174
	Width	w_2	147
	Width	f	34
	Depth	d_2	113
Fastening holes	Vertical distance	a	365+2
	Vertical distance to bottom edge	b	6
	Horizontal distance	c_1 b)	150+0.2/-0.2
	Horizontal distance from the side edge	g_1 c)	20
	Horizontal distance	c_2 d)	132
	Horizontal distance from the side edge	g_2 e)	7.5

a) h_2 = Height incl. EMC shroud EM6A3

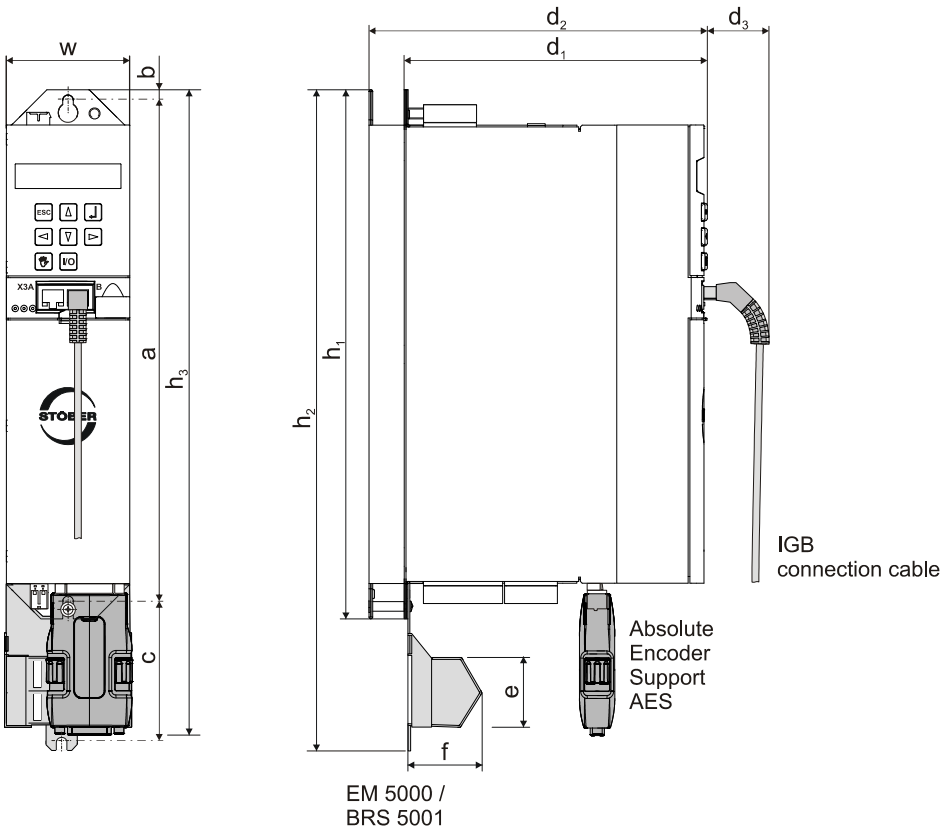
b) c_1 = Horizontal distance from the fastening holes of the inverter

c) g_1 = Horizontal distance from the side edge of the inverter

d) c_2 = Horizontal distance from the fastening holes of the EMC shroud EM6A3

e) g_2 = Horizontal distance from the side edge of the EMC shroud EM6A3

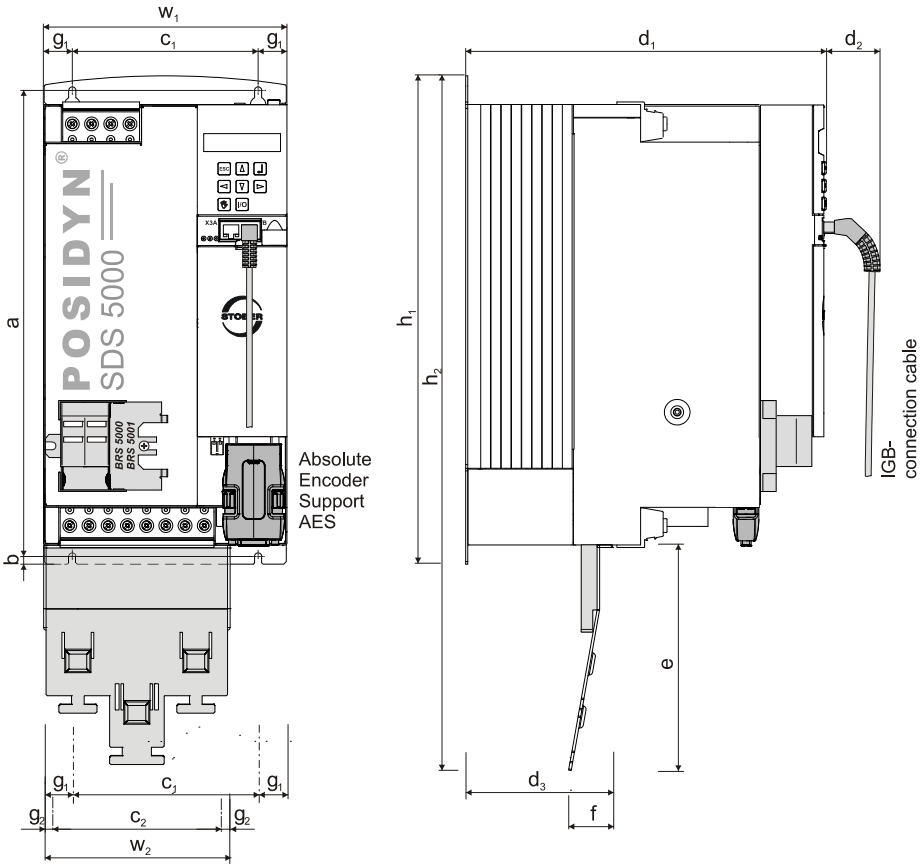
4.1.4 SDS 5000: sizes 0 to 2



Dimensions [mm]			Size 0	Size 1	Size 2
Inverter	Height	h_1	300		
		h_2	360[a] / 373[b]		
		h_3 [c]	365		
	Width	w	70		105
	Depth	d_1	175	260	260
		d_2 [d]	193	278	278
		d_3	40		
EMC shroud	Height	e	37.5[e] / 44[f]		
	Depth	f	40		
Fastening holes	Vertical distance to upper edge	b	6		
	Vertical distance	a	283+2		
	Vertical distance	c[g]	79		

a) h_2 = Height incl. EMC shroud EM 5000
b) h_2 = Height incl. brake module BRS 5001
c) h_3 = Height incl. AES
d) d_2 = Depth incl. brake resistor RB 5000
e) e = Height of the EMC shroud EM 5000
f) e = Height of the brake module BRS 5001
g) c = Vertical distance at brake module BRS 5001

4.1.5 SDS 5000: size 3



Dimensions [mm]			Size 3
Inverter	Height	h_1	382.5
		h_2 a)	540
	Width	w_1	190
	Depth	d_1	276
		d_2	40
EMC shroud	Height	e	174
	Width	w_2	147
	Depth	f	34
	Depth	d_3	113
Fastening holes	Vertical distance	a	365+2
	Vertical distance to bottom edge	b	6
	Horizontal distance	c_1 b)	150+0.2/-0.2
	Horizontal distance from the side edge	g_1 c)	20
	Horizontal distance	c_2 d)	132
	Horizontal distance from the side edge	g_2 e)	7.5

a) h_2 = Height incl. EMC shroud EM6A3
b) c_1 = Horizontal distance from the fastening holes of the inverter
c) g_1 = Horizontal distance from the side edge of the inverter
d) c_2 = Horizontal distance from the fastening holes of the EMC shroud EM6A3
e) g_2 = Horizontal distance from the side edge of the EMC shroud EM6A3

4.2 Minimum clearances

The specified minimum clearances refer to the outside edges of the inverter.

Min. clearance [mm]	Up	Down	On the side
Size 0 – Size 2	100	100	5
... with EMC shroud or brake module	100	120	5
Size 3	100	100	5
... with EMC shroud	100	220	5

4.3 Attaching EMC shroud EM 5000

For inverters sizes 0 to 2.

You can use the EM 5000 EMC shroud to connect the cable shield of the power cable. The EMC shroud EM 5000 and the brake module BRM 5000 are identical in terms of mechanics. The attachment for both accessory parts is therefore the same, see section 4.5 Attaching brake module BRM 5000.

4.4 Attaching EMC shroud EM6A3

The larger EMC shroud EM6A3 is available for size 3 inverters for connecting the shield of the motor line.

⚠ WARNING!

Danger of personal injury and material damage due to electric shock!

▶ Always switch off all power supply voltage before working on the inverter! Note that the discharge time of the DC link capacitors is up to 5 minutes. You can only determine the absence of voltage after this time period.

For attachment you will need:

- A Phillips screwdriver
- The two enclosed screws and washers (combination screws with toothed lock washer, M4x8)

Attaching the EMC shroud EM6A3 to an inverter (size 3)

1. Fasten the part onto the bottom of the inverter with the enclosed fastening screws in the tapped holes provided for that purpose (maximum tightening torque: 2.4 Nm).

4.5 Attaching brake module BRM 5000

You can use the BRM 5000 brake module to connect the cable shield of the power cable. The module also includes power electronics for the optional brake controller for a 24-V brake.

⚠ WARNING!

Danger of personal injury and material damage due to electric shock!

▶ Always switch off all power supply voltage before working on the inverter! Note that the discharge time of the DC link capacitors is up to 5 minutes. You can only determine the absence of voltage after this time period.

Attaching the brake module BRM 5000 to inverters sizes 0 to 2 is different than the attaching it to size 3 inverters.

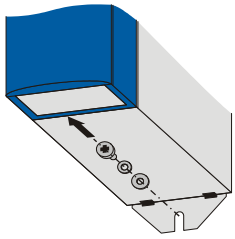
4.5.1 Attaching to sizes 0 to 2

Requirements:
- You have already installed the inverter in the control cabinet.

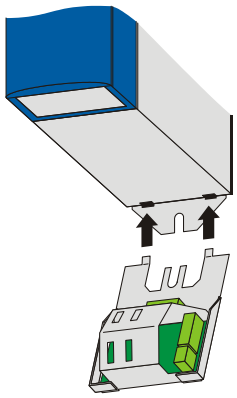
You need:
- A Phillips screwdriver for loosening the fastening screw.

Attaching brake module BRM 5000

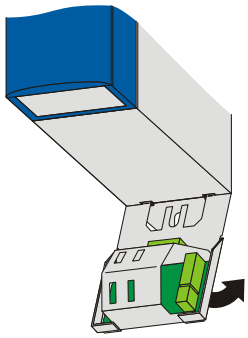
1. Undo the lower fastening screw and washers of the inverter:



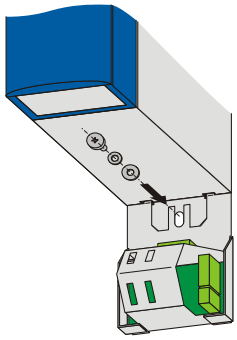
2. Insert the module into the openings of the inverter at a slight angle:



3. Align the component vertically:



4. Fasten the component onto the inverter with the fastening screw and washers:



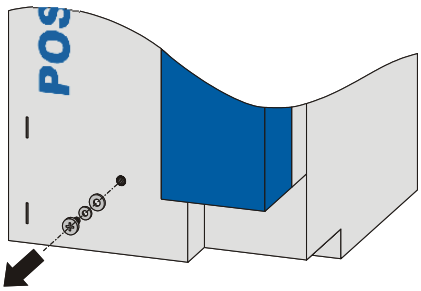
⇨ You have now attached the accessory.

4.5.2 Attaching to size 3

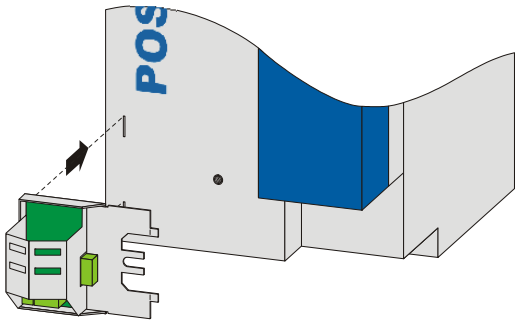
For attachment you will need:
- A Phillips screwdriver

Installation of brake module BRM 5000

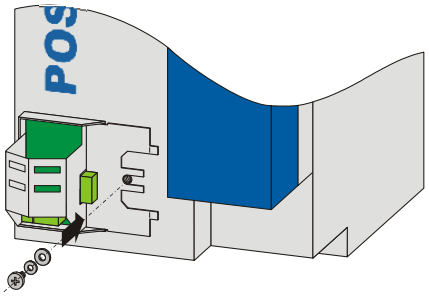
1. Remove the mounting screw and washers from the front of the inverter:



2. Place the component on the device so that the guide rails are in the openings:



3. Secure the component to the device with the mounting screw and the washers:



⇨ You have now installed the accessory.

4.6 Attaching brake module BRS 5001

⚠ WARNING!

Danger of personal injury and material damage due to electric shock!

▶ Always switch off all power supply voltage before working on the inverter! Note that the discharge time of the DC link capacitors is up to 5 minutes. You can only determine the absence of voltage after this time period.

You can use the BRS 5001 brake module to connect the cable shield of the power cable. The module also includes power electronics for the optional brake controller for one or two 24-V brakes.

The module includes monitoring for short circuit and broken cable to the connected brake and also for module overload and undervoltage.

The attachment of brake module BRS 5001 to inverters of size 3 is different to the attachment to inverters of size 0 to 2.

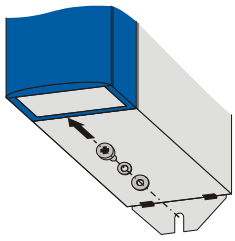
4.6.1 Attaching to sizes 0 to 2

Requirements:
- You have already installed the inverter in the control cabinet.

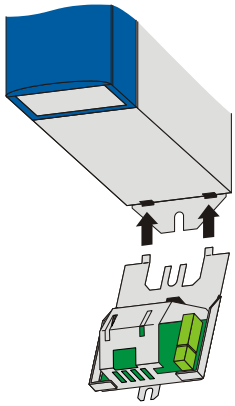
You need:
- A Phillips screwdriver for loosening the fastening screw.

Attaching brake module BRS 5001

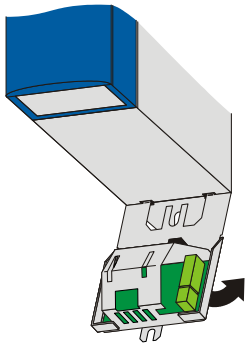
1. Undo the lower fastening screw and washers of the inverter:



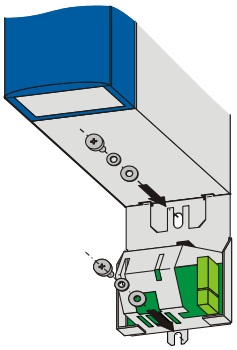
2. Insert the module into the openings of the inverter at a slight angle:



3. Align the component vertically:



4. Fasten the component onto the inverter with the fastening screw and washers. You can optionally secure the component below in addition with another fastening screw on the mounting plate:



⇨ You have now attached the accessory.

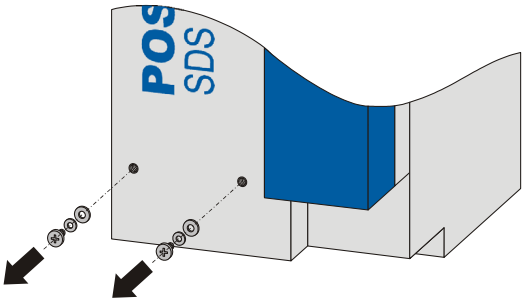
4.6.2 Attaching to size 3

You need:

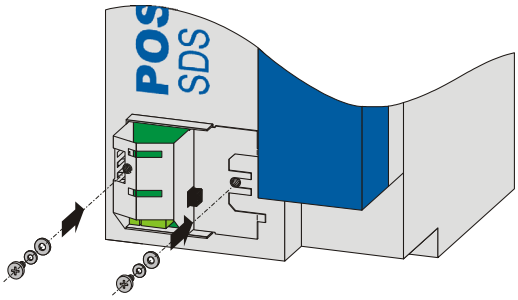
- A Phillips screwdriver for loosening the fastening screw.

Attaching brake module BRS 5001

1. Undo the fastening screws and washers on the front of the inverter:



2. Place the component on the device and fasten it in place with the fastening screws and washers:



⇨ You have now attached the accessory.

5 Connection

5.1 Connecting brake module BRM 5000

⚠ WARNING!

Danger of personal injury and material damage due to electric shock!

▶ Ensure sufficient strain relief for the power cable! Note that the option module does not provide the function of strain relief.

Information

Shield connection of the power cable using shield connection terminal:

Use the upper brake module mounting position for power cables with a cable diameter up to 11 mm.

You can also fasten power cables with a cable diameter of 12 mm or larger to the lower brake module mounting position.

Terminal description X300 on BRM 5000

Connect the 24 vdc power supply of the brake module to terminal X300.

Pin		Designation	Function	Data
	+	24 V	Power input for brake controller	U_1 = 24 – 30 V I_{1max} = 2.5 A Fuse: up to max. 6 AT according to brake used
	–	GND	Reference potential for 24 V	—

Maximum conductor cross-section

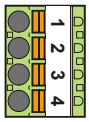
Connection type	Maximum conductor cross-section [mm²]
Rigid	2,5
Flexible	2,5
Flexible with cable end, without plastic sleeve	2,5
Flexible with cable end, with plastic sleeve	2,5
2 leads with the same cross-section with double cable end	1,5

Other cable requirements

Technical Data	
Insulation stripping length	10 mm

Terminal description – X301 on BRM 5000

Connect the motor halting brake and the motor temperature sensor to terminal X301.

Pin		Designation	Function	Data
	1	1BD2	Reference potential for Pin 2	—
	2	1BD1	Control brake	I_{2max} ≤ 2.5 A: max. of 10 switching cycles per minute
	3	1TP1/1K1+	Temperature sensor	Max. 6 PTC or one KTY84-130, max. cable length: 50 m
	4	1TP2/1K2-		

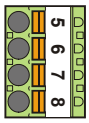
Maximum conductor cross-section

Connection type	Maximum conductor cross-section [mm^2]
Rigid	2,5
Flexible	2,5
Flexible with cable end, without plastic sleeve	2,5
Flexible with cable end, with plastic sleeve	2,5
2 leads with the same cross-section with double cable end	1,5

Other cable requirements

Technical Data	
Insulation stripping length	10 mm

Terminal description – X302 on BRM 5000
Connect terminal X302 to terminal X2 on the inverter.

Pin		Designation	Function
	5	1TP2/1K2-	Temperature sensor, connect with pin 4 on X2
	6	1TP1/1K1+	Temperature sensor, connect with pin 3 on X2
	7	1BD2	Control brake, connect with pin 2 on X2
	8	1BD1	Control brake, connect with pin 1 an X2

Maximum conductor cross-section

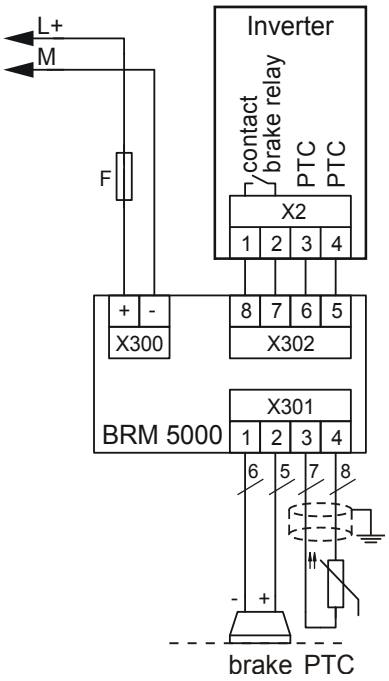
Connection type	Maximum conductor cross-section [mm^2]
Rigid	2,5
Flexible	2,5
Flexible with cable end, without plastic sleeve	2,5
Flexible with cable end, with plastic sleeve	2,5
2 leads with the same cross-section with double cable end	1,5

Other cable requirements

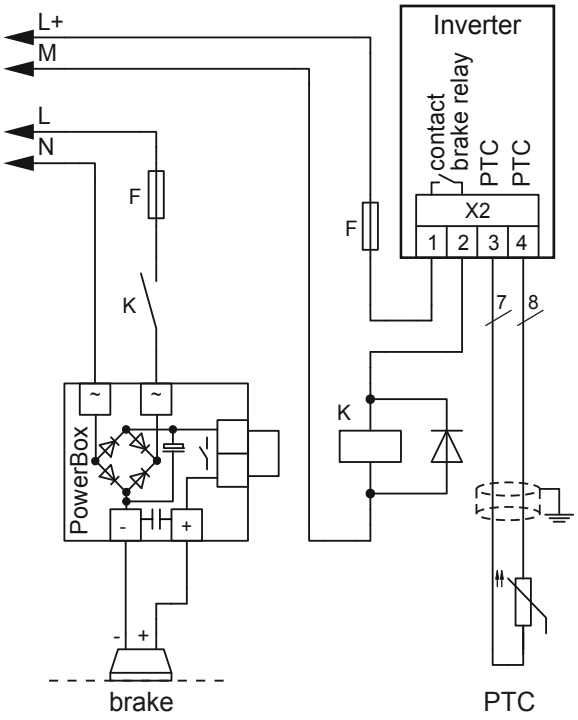
Technical Data	
Insulation stripping length	10 mm

Information
Remember that one LED is installed on the brake module. These LED indicate the status of the brake control:
- LED on: brake output, energized (active)
- LED off: brake output, not energized (inactive)

Brake connection with BRM 5000 for 24 V DC brake



Indirect brake control



5.2 Connecting brake module BRS 5001

The inverter SDS 5000 can control one or two motor holding brakes. Usually brake 1 is the motor-internal brake and brake 2 the one in the motor adapter ServoStop. STÖBER ANTRIEBSTECHNIK GmbH & Co. KG offers the mtor adapter ServoStop as an option for servo geared motors.

Requirement for the connection of motor holding brakes on the SDS 5000:
- Accessory part BRS 5001 (firmware V 5.6-N or later)
- Connection cable (X5, X302) included with the BRS 5001

Information
Remember that motor halting brakes of other manufacturers may not be connected to the BRS 5001 without first consulting STOBER.

⚠ WARNING!

Danger of personal injury and material damage due to electric shock!

▶ Ensure sufficient strain relief for the power cable! Note that the option module does not provide the function of strain relief.

Information
Remember that you may only make the connection between X5 and X302 with the connection cable included with the BRS 5001.

Information
Remember that two LEDs are installed on the brake module. These LEDs indicate the status of the brake control:
- LED on: brake output, energized (active)
- LED off: brake output, not energized (inactive)

Terminal description X5 (inverter) and X302 (BRS 5001)

Pin		Designation	Function
6 5 4 3 2 1	1	1BD1	Controller Brake 1
	2	1BD2	Reference potential at pin 1, 2, 5 and 6
	3	Status1	Brake 1 feedback
	4	Status2	Brake 2 feedback
	5	2BD2	Reference potential at pin 1, 2, 5 and 6
	6	2BD1	Controller Brake 2

Terminal description X300 (BRS 5001)

Pin		Designation	Function	Data
	+	24 V	Power input for brake controller	U_1 = 24 – 30 V I_{1max} = 7.5 A Fuse: up to max. 10 AT according to brakes used
	–	GND	Reference potential for 24 V	—

Information
Note that the 24-V power supply on X300 Pin + must always be at least 24 V. If the voltage falls below 24 V, a malfunction is triggered in the inverter.
Connect a controlled 24-V power supply to X300 Pin +.

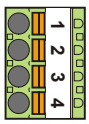
Maximum conductor cross-section

Connection type	Maximum conductor cross-section [mm²]
Rigid	2,5
Flexible	2,5
Flexible with cable end, without plastic sleeve	2,5
Flexible with cable end, with plastic sleeve	2,5
2 leads with the same cross-section with double cable end	1,5

Other cable requirements

Technical Data	
Insulation stripping length	10 mm

Terminal description X301 (BRS 5001)

Pin		Designation	Function	Data
	1	1BD1	Controller Brake 1	$I_2 \leq 3.6$ A: max. 15 operating cycles per min. I_{2max} = 3.6 A
	2	1BD2	Brake 1 reference potential	—
	3	2BD1	Controller Brake 2	$I_2 \leq 3.6$ A: max. 15 operating cycles per min. I_{2max} = 3.6 A
	4	2BD2	Brake 2 reference potential	—

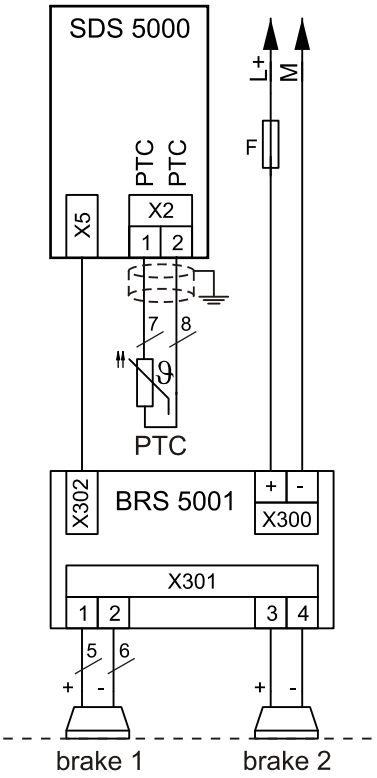
Maximum conductor cross-section

Connection type	Maximum conductor cross-section [mm²]
Rigid	2,5
Flexible	2,5
Flexible with cable end, without plastic sleeve	2,5
Flexible with cable end, with plastic sleeve	2,5
2 leads with the same cross-section with double cable end	1,5

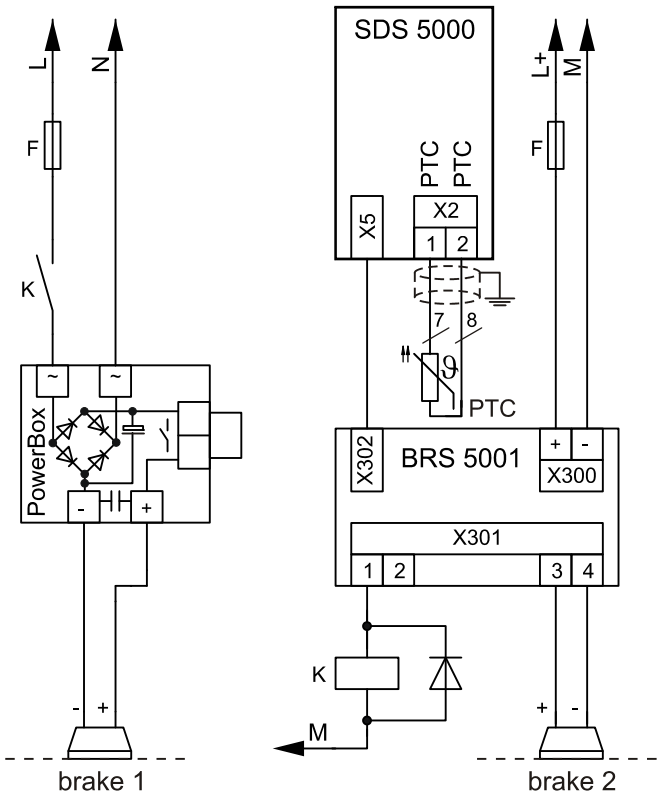
Other cable requirements

Technical Data	
Insulation stripping length	10 mm

Brake connection with BRS 5001 for 24 V DC brakes



Indirect brake control



6 Diagnosis

The event displays in the inverter display give you information about the current status of the device and allow for initial diagnostics without any additional aids. The relevant events for the brake modules are:

6.1 34:Hardw.fault

Resolution	Level	Response	Counter
There is a hardware fault.	Malfunction	The inverter can no longer be enabled.	*Z34*

Cause	Description	Measure	Acknowledgement
1:FPGA	Fault when loading the FPGA	Please contact our service department, see section 1.3 Further support	can not be acknowledged
2:NOV-ST	Faulty power stage memory (EEPROM)		
3:NOV-ST	Faulty control part memory (EEPROM)		
4:Brake1	The controller of the brake 1 is faulty or the 24 V supply is missing at the brake module.	Check the wiring and correct it if necessary.	
5:Brake2	The controller of the brake 2 is faulty or the 24 V supply is missing at the brake module.	Check the wiring and correct it if necessary.	
11:CurrentMeas	The current offset measurement for the device start-up indicates a deviation that is too large.	Please contact our service department, see section 1.3 Further support	

6.2 72:Brake test

Triggering	Level	Response	Counter
The time set in *B311 timeout for brake test B300* has elapsed while brake management is active without the *B300 brake test* action having been performed. If *B310 = 2: axis-specific* is set, the event only applies to axis 1. If a setting other than *B310* is active, the event applies to all axes.	Causes 1 and 2: Fault Cause 3: Message	The power board remains switched off and the drive is torque-free/force-free. If the air override is inactive, a possibly existing brake will be controlled to close.	*Z72*

Cause	Description	Measure	Confirmable
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action having been performed.	Perform the *B300 brake test* action.	Yes For a duration of 5 minutes, to be able to perform action *B300 brake test*.
2:brakeDefective	When performing the brake test action, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • The motor must be sent in for repair. Please contact our Service department.	
3:Brake test required	The time entered in *B311 Timeout for brake test B300* has elapsed once without the *B300 brake test* action having been performed.	Perform the *B300 brake test* action.	

6.3 73:Ax2braketest

Triggering	Level	Response	Counter
The time set in *B311 timeout for brake test B300* has elapsed while brake management is active without the *B300 brake test* action having been performed. If *B310 = 2: axis-specific* is set, the event only applies to axis 2.	Causes 1 and 2: Fault Cause 3: Message	The power board remains switched off and the drive is torque-free/force-free. If the air override is inactive, a possibly existing brake will be controlled to close.	*Z73*

Cause	Description	Measure	Confirmable
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action having been performed.	Perform the *B300 brake test* action.	Yes For a duration of 5 minutes, to be able to perform action *B300 brake test*.
2:brakeDefective	When performing the brake test action, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • The motor must be sent in for repair. Please contact our Service department.	
3:Brake test required	The time entered in *B311 Timeout for brake test B300* has elapsed once without the *B300 brake test* action having been performed.	Perform the *B300 brake test* action.	

6.4 74:Ax3braketest

Triggering	Level	Response	Counter
The time set in *B311 timeout for brake test B300* has elapsed while brake management is active without the *B300 brake test* action having been performed. If *B310 = 2: axis-specific* is set, the event only applies to axis 3.	Causes 1 and 2: Fault Cause 3: Message	The power board remains switched off and the drive is torque-free/force-free. If the air override is inactive, a possibly existing brake will be controlled to close.	*Z74*

Cause	Description	Measure	Confirmable
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action having been performed.	Perform the *B300 brake test* action.	Yes For a duration of 5 minutes, to be able to perform action *B300 brake test*.
2:brakeDefective	When performing the brake test action, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • The motor must be sent in for repair. Please contact our Service department.	
3:Brake test required	The time entered in *B311 Timeout for brake test B300* has elapsed once without the *B300 brake test* action having been performed.	Perform the *B300 brake test* action.	

6.5 75:Ax4braketest

Triggering	Level	Response	Counter
The time set in *B311 timeout for brake test B300* has elapsed while brake management is active without the *B300 brake test* action having been performed. If *B310 = 2: axis-specific* is set, the event only applies to axis 4.	Causes 1 and 2: Fault Cause 3: Message	The power board remains switched off and the drive is torque-free/force-free. If the air override is inactive, a possibly existing brake will be controlled to close.	*Z72*

Cause	Description	Measure	Confirmable
1:B311Timeout	The time entered in *B311 Timeout for brake test B300* has elapsed twice without the *B300 Brake test* action having been performed.	Perform the *B300 brake test* action.	Yes For a duration of 5 minutes, to be able to perform action *B300 brake test*.
2:brakeDefective	When performing the brake test action, the holding torque entered in *B304* or *B305* could not be applied or the encoder test run included in the brake test was completed with errors.	• Perform the brake grinding function and then the brake test. • The motor must be sent in for repair. Please contact our Service department.	
3:Brake test required	The time entered in *B311 Timeout for brake test B300* has elapsed once without the *B300 brake test* action having been performed.	Perform the *B300 brake test* action.	

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