

# Rexroth IndraDrive Additional Components and Accessories

R911306140  
Edition 03

## Project Planning Manual



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Additional Components and  
Accessories

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DOK-INDRV*-ADDCOMP****-PR03-EN	2008-02	See chapter "Introduction" → "Documentation" → "Changes"

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# 1 Introduction

## 1.1 Documentation

### 1.1.1 General Information

<b>This Documentation</b>	<p>This documentation describes the following additional components and accessories for Rexroth IndraDrive systems:</p> <ul style="list-style-type: none"> <li>• Transformers (DST)</li> <li>• Mains filters (HNF, HNK, HNS, NFE, NFD)</li> <li>• Mains chokes (HNL)</li> <li>• DC bus chokes (HLL)</li> <li>• DC bus capacitor units (HLC)</li> <li>• DC bus resistor units (HLB)</li> <li>• Braking resistors (HLR)</li> <li>• Motor filters (HMF)</li> <li>• Housing for control sections (HAC)</li> <li>• Control module for holding brake (HAT)</li> <li>• Accessories (HAS)</li> </ul>
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#### WARNING

#### Personal injury and property damage caused by incorrect project planning for applications, machines and installations!

Take the content of the following Project Planning Manual into account: "Rexroth IndraDrive, Drive System" (DOK-INDRV\*-SYSTEM\*\*\*\*-PRxx-EN-P; part no: R911309636).

#### Documentation for Project Planning of System



For complete project planning of a Rexroth IndraDrive system you need, in any case, the documentation "Rexroth IndraDrive, Drive System" (Project Planning Manual; DOK-INDRV\*-SYSTEM\*\*\*\*-PRxx-EN-P; part no.: R911309636). This documentation, among other things, contains:

- General specifications for the components of the drive system
- Configuration of the drive system components
- Arrangement of the components in the control cabinet
- Electromagnetic compatibility (EMC)
- Types of mains connection
- Requirements on the mains connection
- Control circuits for the mains connection
- Connections of the components in the drive system
- Fusing and selection of the mains contactor
- Calculations (determining appropriate drive controller; mains connection; leakage capacitance; operating data of mains filters; selecting the 24V supply; braking behavior when using a DC bus resistor unit)

## Introduction

## 1.1.2 Changes

## Changes in Comparison to Previous Edition

Chapter	Changes
Introduction	Reference documentations updated
DC Bus Choke	DC bus choke HLL included
Motor Filter	Motor filter for HCS02 included: <ul style="list-style-type: none"> <li>HMF01.1A-N0K2-M0012-A-500-NNNN</li> <li>HMF01.1A-N0K2-M0028-A-500-NNNN</li> </ul> Type code updated
Mains Filter	Data updated HNS02.1 (mains filter, with switch-disconnector): Description of connection points updated
DC Bus Resistor Unit	HLB01.1D, interface X32: Pin assignment updated
Accessories	New chapter

Fig. 1-1: Changes

## 1.1.3 Reference Documentations

## Drive Systems, System Components

Title Rexroth IndraDrive ...	Kind of documentation	Document typecode <sup>1)</sup> DOK-INDRV*-...	Part number R911...
Drive System	Project Planning Manual	SYSTEM*****-PRxx-EN-P	309636
Mi Drive Systems	Project Planning Manual	KCU+KSM*****-PRxx-EN-P	320924
Supply Units and Power Sections	Project Planning Manual	HMV-S-D+HCS-PRxx-EN-P	318790
Drive Controllers Control Sections	Project Planning Manual	CSH*****-PRxx-EN-P	295012
Additional Components and Accessories	Project Planning Manual	ADDCOMP*****-PRxx-EN-P	306140
C Drive Controllers HCS02.1, HCS03.1	Operating Instructions	FU*****-IBxx-EN-P	314905

1) In the document typecodes, "xx" is a wild card for the current edition of the documentation (example: PR01 is the first edition of a Project Planning Manual)

Fig. 1-2: Documentations – overview

## Motors

Title Rexroth IndraDyn ...	Kind of documentation	Document typecode <sup>1)</sup> DOK-MOTOR*-...	Part number R911...
A Series Asynchronous Motors	Project Planning Manual	MAD/MAF*****-PRxx-EN-P	295781
H Frameless Synchronous Spindle Motors	Project Planning Manual	MBS-H*****-PRxx-EN-P	297895
L Synchronous Linear Motors	Project Planning Manual	MLF*****-PRxx-EN-P	293635

Title	Kind of documentation	Document typecode <sup>1)</sup>	Part number
Rexroth IndraDyn ...		DOK-MOTOR*-...	R911...
S Synchronous Motors	Project Planning Manual	MSK*****-PRxx-EN-P	296289
T Synchronous Torque Motors	Project Planning Manual	MBT*****-PRxx-EN-P	298798

1) In the document typecodes, "xx" is a wild card for the current edition of the documentation (example: PR01 is the first edition of a Project Planning Manual)

*Fig. 1-3: Documentations – overview*

## Cables

Title	Kind of documentation	Document typecode <sup>1)</sup>	Part number
Rexroth Connection Cables	Selection Data	DOK-...	R911...
		CONNEX-CABLE*STAND-AUxx-EN-P	282688

1) In the document typecodes, "xx" is a wild card for the current edition of the documentation (example: AU03 is the third edition of the documentation "Selection Data")

*Fig. 1-4: Documentations – overview*

## Firmware

Title	Kind of documentation	Document typecode <sup>1)</sup>	Part number
Rexroth IndraDrive ...		DOK-INDRV*-...	R911...
Firmware for Drive Controllers	Functional Description	MP*-05VRS**-FKxx-EN-P	320182
Firmware for Drive Controllers	Functional Description	MP*-04VRS**-FKxx-EN-P	315485
Firmware for Drive Controllers	Functional Description	MP*-03VRS**-FKxx-EN-P	308329
Firmware for Drive Controllers	Functional Description	MP*-02VRS**-FKxx-EN-P	299223
Firmware for Drive Controllers	Parameter Description	GEN-**VRS**-PAxx-EN-P	297317
Firmware for Drive Controllers	Troubleshooting Guide	GEN-**VRS**-WAxx-EN-P	297319
Integrated Safety Technology	Functional and Application Description	SI**VRS**-FKxx-EN-P	297838
Rexroth IndraMotion MLD	Application Manual	MLD-**VRS**-AWxx-EN-P	306084
Rexroth IndraMotion MLD Library	Library Description	MLD-SYSLIB*-FKxx-EN-P	309224

1) In the document typecodes, "xx" is a wild card for the current edition of the documentation (example: PA02 is the second edition of a Parameter Description)

*Fig. 1-5: Documentations – overview*



## 2 Important Directions for Use

### 2.1 Appropriate Use

#### 2.1.1 Introduction

Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.



#### **Personal injury and property damage caused by incorrect use of the products!**

The products have been designed for use in the industrial environment and may only be used in the appropriate way. If they are not used in the appropriate way, situations resulting in property damage and personal injury can occur.



Rexroth as manufacturer is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Rexroth products, make sure that all the pre-requisites for an appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the products take the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

#### 2.1.2 Areas of Use and Application

Drive controllers made by Rexroth are designed to control electrical motors and monitor their operation.

Control and monitoring of the Drive controllers may require additional sensors and actors.



The drive controllers may only used with the accessories and parts specified in this documentation. If a component has not been specifically named, then it may neither be mounted nor connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant Functional Descriptions.

Drive controllers have to be programmed before commissioning, making it possible for the motor to execute the specific functions of an application.

Drive controllers of the Rexroth IndraDrive line have been developed for use in single- and multi-axis drive and control tasks.

To ensure application-specific use of Drive controllers, device types of different drive power and different interfaces are available.

Typical applications include:

## Important Directions for Use

- handling and mounting systems,
- packaging and food machines,
- printing and paper processing machines and
- machine tools.

Drive controllers may only be operated under the assembly and installation conditions described in this documentation, in the specified position of normal use and under the ambient conditions as described (temperature, degree of protection, humidity, EMC, etc.).

## 2.2 Inappropriate Use

Using the Drive controllers outside of the operating conditions described in this documentation and outside of the indicated technical data and specifications is defined as "inappropriate use".

Drive controllers must not be used, if ...

- they are subject to operating conditions that do not meet the specified ambient conditions. This includes, for example, operation under water, under extreme temperature fluctuations or extremely high maximum temperatures.
- Furthermore, Drive controllers must not be used in applications which have not been expressly authorized by Rexroth. Please carefully follow the specifications outlined in the general Safety Instructions!

## 3 Safety Instructions for Electric Drives and Controls

### 3.1 Safety Instructions - General Information

#### 3.1.1 Using the Safety Instructions and Passing them on to Others

Do not attempt to install or commission this device without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with the device. If you do not have the user documentation for the device, contact your responsible Bosch Rexroth sales representative. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the device.

If the device is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the device in the official language of the user's country.



**Improper use of these devices, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!**

Observe the safety instructions!

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#### 3.1.2 How to Employ the Safety Instructions

Read these instructions before initial commissioning of the equipment in order to eliminate the risk of bodily harm and/or material damage. Follow these safety instructions at all times.

- Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before commissioning the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of this device.
- Only assign trained and qualified persons to work with electrical installations:
  - Only persons who are trained and qualified for the use and operation of the device may work on this device or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the product, as well as an understanding of all warnings and precautionary measures noted in these instructions.
  - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and devices on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.

## Safety Instructions for Electric Drives and Controls

- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The devices have been designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Only use safety-relevant applications that are clearly and explicitly approved in the Project Planning Manual. If this is not the case, they are excluded. Safety-relevant are all such applications which can cause danger to persons and material damage.
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturer must

- make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
- make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Commissioning of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only permitted if the national EMC regulations for the application are met.
- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective documentation (Project Planning Manuals of components and system).  
The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connection and installation conditions are specified in the product documentation and must be followed at all times.

*National regulations which the user must take into account*

- European countries: according to European EN standards
- United States of America (USA):
  - National Electrical Code (NEC)
  - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
  - regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
  - International Organization for Standardization (ISO)
  - International Electrotechnical Commission (IEC)

### 3.1.3 Explanation of Warning Symbols and Degrees of Hazard Seriousness

The safety instructions describe the following degrees of hazard seriousness. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions:

## Safety Instructions for Electric Drives and Controls

Warning symbol	Signal word	Degree of hazard seriousness acc. to ANSI Z 535.4-2002
	Danger	Death or severe bodily harm will occur.
	Warning	Death or severe bodily harm may occur.
	Caution	Minor or moderate bodily harm or material damage may occur.

Fig.3-1: Hazard classification (according to ANSI Z 535)

## 3.1.4 Hazards by Improper Use

**DANGER****High electric voltage and high working current! Risk of death or severe bodily injury by electric shock!**

Observe the safety instructions!

**DANGER****Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!**

Observe the safety instructions!

**WARNING****High electric voltage because of incorrect connection! Risk of death or bodily injury by electric shock!**

Observe the safety instructions!

**WARNING****Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!**

Observe the safety instructions!

**CAUTION****Hot surfaces on device housing! Danger of injury! Danger of burns!**

Observe the safety instructions!

**CAUTION****Risk of injury by improper handling! Risk of bodily injury by bruising, shearing, cutting, hitting or improper handling of pressurized lines!**

Observe the safety instructions!

**CAUTION****Risk of injury by improper handling of batteries!**

Observe the safety instructions!

## 3.2 Instructions with Regard to Specific Dangers

### 3.2.1 Protection Against Contact with Electrical Parts and Housings



This section concerns devices and drive components with voltages of **more than 50 Volt**.

Contact with parts conducting voltages above 50 Volts can cause personal danger and electric shock. When operating electrical equipment, it is unavoidable that some parts of the devices conduct dangerous voltage.

**DANGER****High electrical voltage! Danger to life, electric shock and severe bodily injury!**

- Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and repair this equipment.
- Follow general construction and safety regulations when working on power installations.
- Before switching on the device, the equipment grounding conductor must have been non-detachably connected to all electrical equipment in accordance with the connection diagram.
- Do not operate electrical equipment at any time, even for brief measurements or tests, if the equipment grounding conductor is not permanently connected to the mounting points of the components provided for this purpose.
- Before working with electrical parts with voltage potentials higher than 50 V, the device must be disconnected from the mains voltage or power supply unit. Provide a safeguard to prevent reconnection.
- With electrical drive and filter components, observe the following:  
Wait **30 minutes** after switching off power to allow capacitors to discharge before beginning to work. Measure the electric voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
- Never touch the electrical connection points of a component while power is turned on. Do not remove or plug in connectors when the component has been powered.
- Install the covers and guards provided with the equipment properly before switching the device on. Before switching the equipment on, cover and safeguard live parts safely to prevent contact with those parts.
- A residual-current-operated circuit-breaker or r.c.d. cannot be used for electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device according to the relevant standards.
- Secure built-in devices from direct touching of electrical parts by providing an external housing, for example a control cabinet.



For electrical drive and filter components with voltages of **more than 50 volts**, observe the following additional safety instructions.

**DANGER**

### High housing voltage and high leakage current! Risk of death or bodily injury by electric shock!

- Before switching on, the housings of all electrical equipment and motors must be connected or grounded with the equipment grounding conductor to the grounding points. This is also applicable before short tests.
- The equipment grounding conductor of the electrical equipment and the devices must be non-detachably and permanently connected to the power supply unit at all times. The leakage current is greater than 3.5 mA.
- Over the total length, use copper wire of a cross section of a minimum of 10 mm<sup>2</sup> for this equipment grounding connection!
- Before commissioning, also in trial runs, always attach the equipment grounding conductor or connect to the ground wire. Otherwise, high voltages may occur at the housing causing electric shock.

## 3.2.2 Protection Against Electric Shock by Protective Extra-Low Voltage

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

All connections and terminals with voltages between 5 and 50 volts at Rexroth products are PELV systems. <sup>1)</sup> It is therefore allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections and terminals.

**WARNING**

### High electric voltage by incorrect connection! Risk of death or bodily injury by electric shock!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g. the mains connection) are connected to Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV. <sup>2)</sup>

## 3.2.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

<sup>1)</sup> "Protective Extra-Low Voltage"

<sup>2)</sup> "Protective Extra-Low Voltage"

## Safety Instructions for Electric Drives and Controls

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily harm and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.



### **Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!**

- Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation.

These measures have to be provided for by the user according to the specific conditions within the installation and a hazard and fault analysis. The safety regulations applicable for the installation have to be taken into consideration. Unintended machine motion or other malfunction is possible if safety devices are disabled, bypassed or not activated.

#### **To avoid accidents, bodily harm and/or material damage:**

- Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:
  - use safety fences
  - use safety guards
  - use protective coverings
  - install light curtains or light barriers
- Fences and coverings must be strong enough to resist maximum possible momentum.
- Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the device if the emergency stop is not working.
- Isolate the drive power connection by means of an emergency stop circuit or use a safety related starting lockout to prevent unintentional start.
- Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone.
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example:
  - mechanically securing the vertical axes,
  - adding an external braking/ arrester/ clamping mechanism or
  - ensuring sufficient equilibration of the vertical axes.
- The standard equipment motor brake or an external brake controlled directly by the drive controller are **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
  - maintenance and repair work
  - cleaning of equipment
  - long periods of discontinued equipment use
- Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such devices cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

### 3.2.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors and permanent magnets in motors represent a serious personal danger to those with heart pacemakers, metal implants and hearing aids.



WARNING

#### Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

- Persons with heart pacemakers and metal implants are not permitted to enter following areas:
  - Areas in which electrical equipment and parts are mounted, being operated or commissioned.
  - Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.
- If it is necessary for somebody with a pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of present or future implanted heart pacemakers differs greatly so that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above. Otherwise health hazards may occur.

### 3.2.5 Protection Against Contact with Hot Parts



CAUTION

#### Hot surfaces at motor housings, on drive controllers or chokes! Danger of injury! Danger of burns!

- Do not touch surfaces of device housings and chokes in the proximity of heat sources! Danger of burns!
- Do not touch housing surfaces of motors! Danger of burns!
- According to the operating conditions, temperatures can be **higher than 60 °C, 140°F** during or after operation.
- Before accessing motors after having switched them off, let them cool down for a sufficiently long time. Cooling down can require **up to 140 minutes!** Roughly estimated, the time required for cooling down is five times the thermal time constant specified in the Technical Data.
- After switching drive controllers or chokes off, wait 15 minutes to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, the manufacturer of the end product, machine or installation, according to the respective safety regulations, has to take measures to avoid injuries caused by burns in the end application. These measures can be, for example: warnings, guards (shielding or barrier), technical documentation.

### 3.2.6 Protection During Handling and Mounting

In unfavorable conditions, handling and mounting certain parts and components in an improper way can cause injuries.



CAUTION

**Risk of injury by improper handling! Bodily injury by bruising, shearing, cutting, hitting!**

- Observe the general construction and safety regulations on handling and mounting.
- Use suitable devices for mounting and transport.
- Avoid jamming and bruising by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- If necessary, use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids because of the danger of skidding.

### 3.2.7 Battery Safety

Batteries consist of active chemicals enclosed in a solid housing. Therefore, improper handling can cause injury or material damage.



CAUTION

**Risk of injury by improper handling!**

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries do not damage electrical parts installed in the devices.
- Only use the battery types specified by the manufacturer.



Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separate from other waste. Observe the local regulations in the country of assembly.

### 3.2.8 Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors cooled with liquid and compressed air, as well as drive controllers, can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricating agents. Improper handling of the connected supply systems, supply lines or connections can cause injuries or material damage.

Safety Instructions for Electric Drives and Controls

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**CAUTION**

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**Risk of injury by improper handling of pressurized lines!**

- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
  - Observe the respective manufacturer's operating instructions.
  - Before dismounting lines, relieve pressure and empty medium.
  - Use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
  - Immediately clean up any spilled liquids from the floor.
- 



Environmental protection and disposal! The agents used to operate the product might not be economically friendly. Dispose of ecologically harmful agents separately from other waste. Observe the local regulations in the country of assembly.

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## 4 Brief Description, Usage

### 4.1 General Information

In terms of "Appropriate Use", cases of operation and applications not mentioned in this chapter are not allowed.

### 4.2 Applications of the Drive System Rexroth IndraDrive

The digital, intelligent drive system Rexroth IndraDrive is the cost-efficient solution with a high degree of functionality for single-axis and multi-axis drive and control tasks.

The drive system Rexroth IndraDrive fulfills a large number of drive tasks in the most varied applications.

Typical applications are the industrial sectors:

- printing and paper converting
- packaging and food
- mounting and handling
- wood machining
- machine tools
- metal forming
- general automation

For these applications there are different device types of graduated performance.

### 4.3 Mains Transformers DST and DLT

**DST and DLT** transformers are used to transform mains voltages to the allowed nominal voltages of the devices.

**DLT** transformers are used to

- prevent overvoltage between outer conductor and ground
- protect other loads against leakage currents

Type	Usage
DST autotransformer	Adjusting voltage range in <b>grounded</b> mains
DLT isolating transformer	Adjusting voltage range in <b>ungrounded</b> mains

Fig.4-1: Usage of transformers



As a matter of principle, DLT isolating transformers have to be used at ungrounded mains.

### 4.4 Mains Filters HNF, HNK, NFE, HNS02 and NFD

Mains filters reduce radio interference and mains pollution.



When using mains filters HNF01, NFD03, HNS02 and HNK01 at **mains grounded via outer conductor**, use an isolating transformer between mains and mains filter.

Brief Description, Usage

Type	Usage
NFE01.1	Interference suppression of power supply units up to 230 V
NFE02.1	Interference suppression of single-phase drive controllers up to 230 V
NFD03.1	Interference suppression of three-phase drive controllers up to 480 V for 1–6 axes and motor cable lengths up to max. 75 m single-axis / 120 m multi-axis (HCS02.1E)
HNF01.1	Interference suppression of three-phase drive controllers up to 480 V for drive systems with a high number of axes and long motor cables
HNK01.1	Interference suppression of three-phase drive controllers HCS03.1E up to 500 V
HNS02	Interference suppression of three-phase drive controllers up to 480 V for drive systems with a maximum of 12 axes and a maximum of 200 m motor cable length Integrated switch-disconnector

Fig.4-2: Usage of mains filters



Only operate expressly allowed components at the mentioned mains filters. Operating, for example, blowers, pumps etc. at HNF mains filters is not allowed.

## 4.5 Mains Chokes HNL01 and HNL02

(Standard) mains chokes HNL01.1E, HNL01.1R and HNL02.1R

- reduce harmonics in the mains current
- increase the allowed DC bus continuous power of certain converters
- allow operating regenerative supply units at the mains

**Current-compensated** mains chokes HNL01.1E-\*\*\*\*-S and HNL01.1R-\*\*\*\*-S reduce asymmetric currents (leakage currents) in the mains connection phase of the drive system.

The different types may be used **exclusively** as follows:

Type	Usage
HNL01.1R	For connection to components with regeneration to the supply mains (HNV01.1R)
HNL01.1E	For connection to components without regeneration to the supply mains (HNV01.1E, HCS02.1E, HCS03.1E)
HNL01.1*-****-S	Current-compensated chokes for use with HNL01.1 mains chokes to reduce asymmetric currents (leakage currents) in the mains connection phase of the drive system (HNV01.1E, HNV01.1R, HCS02.1E, HCS03.1E)
HNL02.1R	Mains chokes in housing for control cabinet mounting for connection to components with regeneration to the supply mains (HNV02.1R)

Fig.4-3: Usage of mains chokes

## 4.6 DC Bus Resistor Unit HLB01

DC bus resistor units HLB01

- convert generated kinetic energy into thermal energy
- increase the continuous regenerative power in the drive system
- increase the peak regenerative power in the drive system
- allow the DC bus short circuit function ("ZKS") in the drive system

Type	Usage
HLB01.1C	In drive systems of the Rexroth IndraDrive C product range with a device mounting depth of 265 mm. See also Project Planning Manual "Rexroth IndraDrive, Drive System" → "Configuration of the Drive System" → "Additional Components".
HLB01.1D	In drive systems of the Rexroth IndraDrive M product range with a device mounting depth of 322 mm. See also Project Planning Manual "Rexroth IndraDrive, Drive System" → "Configuration of the Drive System" → "Additional Components".

Fig.4-4: DC bus resistor units HLB

## 4.7 Braking Resistor HLR01

HLR01.1N-xxxx-Nxxx-A-007-NNNN braking resistors convert generated kinetic energy into thermal energy. For this purpose, the line covers a wide range of continuous power and energy absorption capacity.

Type	Usage
HLR01.1A	<b>Type of construction A</b> (version for device mounting): To be mounted to drive controllers of the Rexroth IndraDrive C product range. For this purpose, the drive controllers must be equipped with a brake chopper.
HLR01.1N	<b>Type of construction N</b> (version for free assembly): For free assembly in the installation, operated by drive controller of the Rexroth IndraDrive C product range. For this purpose, the drive controllers must be equipped with a brake chopper.

Fig.4-5: Braking resistors HLR

Designs of type of construction N:

- Fixed resistor IP 20 **type A**  
Cement-coated, wire-wound, tube-type fixed resistors; screwed on side walls; perforated cover; connections in terminal box with PG gland
- Steel-grid fixed resistor IP 20 **type B**  
Fixed resistor in steel-grid design; connection depending on type
- Steel-grid fixed Resistor IP 20 **type C**  
Fixed resistor in steel-grid design; connection depending on type

## 4.8 DC Bus Capacitor Unit HLC01

DC bus capacitor units HLC01 store energy in the DC bus of the drive system.

## Brief Description, Usage

Type	Usage
HLC01.1C	In drive systems of the product ranges Rexroth IndraDrive C and Rexroth IndraDrive M
HLC01.1D	In drive systems of the product ranges Rexroth IndraDrive C and Rexroth IndraDrive M

Fig.4-6: DC bus capacitor units HLC

## 4.9 Motor Filters HMF01

HMF01 motor filters

- reduce the rise of the output voltage of drive controllers
- reduce leakage currents of the motor lines
- reduce interference voltage on the motor lines

Type	Usage
HMF01.1	At the motor output of HCS drive controllers

Fig.4-7: HMF01 motor filters

## 4.10 Housing for Control Sections HAC01

Additional components HAC01 are used to

- insert control sections in them
- supply control sections with 24V control voltage

Type	Usage
HAC01.1-002-NNN-NN	To insert CDB01 control sections in it

Fig.4-8: HAC01 type

# 5 General Specifications of the Components

## 5.1 Certifications

**Declaration of Conformity** For the components, there are declarations of conformity available which confirm that the components have been designed according to the valid EN standards and EC directives. If required, our sales representative can provide you with the declarations of conformity.

Description	Standard
CE conformity regarding Low-Voltage Directive	EN61800-5-1 (IEC 61800-5-1:2003)
CE conformity regarding EMC product standard	EN61800-3 (IEC 61800-3:2004)

Fig.5-1: Applied standards

CE Label

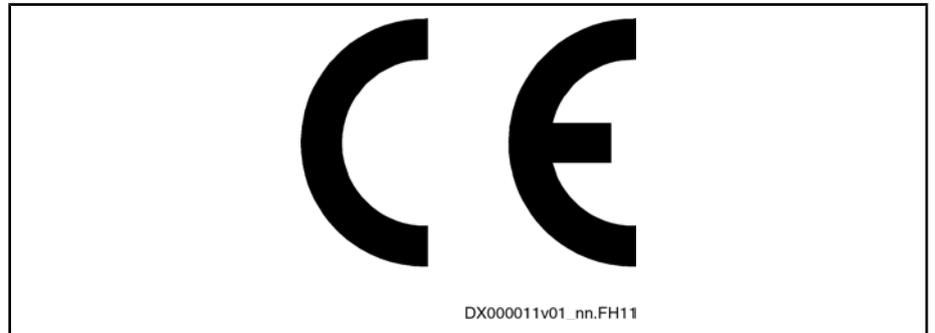


Fig.5-2: CE label

C-UL-US Listing

The components are labeled:

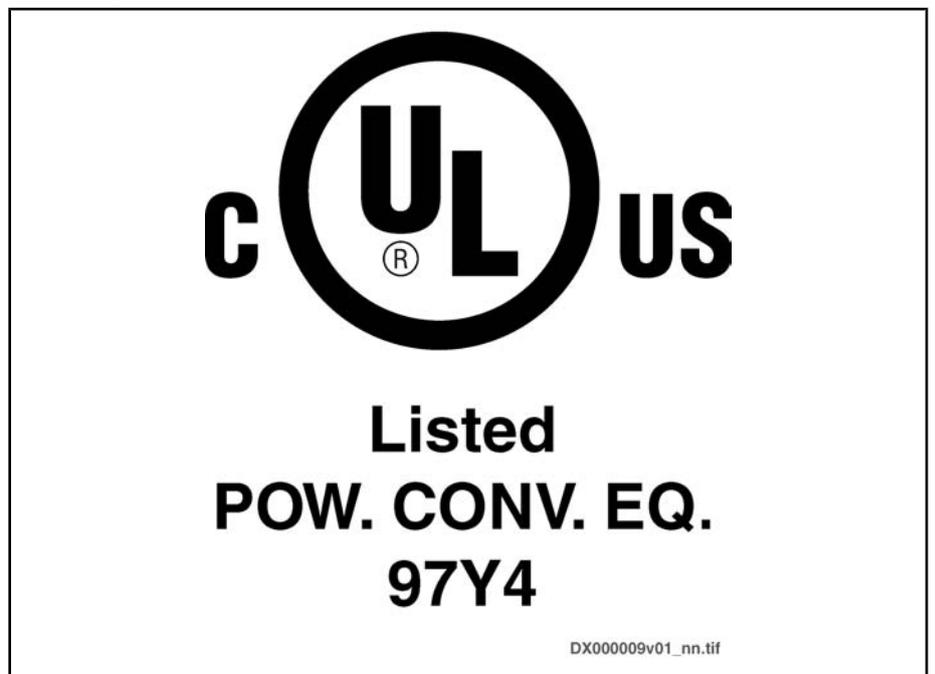


Fig.5-3: C-UL-US label

## General Specifications of the Components

Description	Standard
Listing according to UL standard (UL)	UL 508 C
Listing according to CSA standard	Canadian National Standard C22.2 No. 14-05
UL files (UL)	Company Name: BOSCH REXROTH ELECTRIC DRIVES & CONTROLS GMBH Category Name: Power Conversion Equipment

Fig. 5-4: Applied standards

**UL ratings**

For using the component in the scope of CSA / UL, take the UL ratings of the individual components into account.



See documentation of the respective component.

In the scope of CSA / UL, it is exclusively the following components which have been approved to supply the IndraDrive components HMS, HMD, KCU, KSM:

- HMV01.1E
- HMV01.1R
- HMV02.1R
- HCS02.1E
- HCS03.1E

Make sure that the indicated **short circuit current rating SCCR** is not exceeded, e.g. by appropriate fuses in the mains supply of the supply unit.

**Wiring material UL**

In the scope of CSA / UL, use copper 60/75 °C only; class 1 or equivalent only.

**Allowed pollution degree**

Comply with the allowed pollution degree of the components (see chapter "Ambient and Operating Conditions").

**UL file number**

The components are listed by **UL** ("Underwriters Laboratories Inc.®"). You can find the evidence of certification on the internet under <http://www.ul.com> under "Certifications" by entering the file number or the "Company Name: Rexroth".

File numbers of the IndraDrive components:

- E134201
- E227957

The **control sections** are part of the listed components.

**CCC (China Compulsory Certification)**

The CCC test symbol comprises a compulsory certification of safety and quality for certain products mentioned in the product catalog "First Catalogue of Products Subject to Compulsory Certification" and in the CNCA document "Application Scope for Compulsory Certification of Products acc. first Catalogue" and put in circulation in China. This compulsory certification has been existing since 2003.

CNCA is the Chinese authority responsible for certification directives. When a product is imported in China, the certification will be checked at the customs by means of entries in a database. For the requirement of certification three criteria are normally relevant:

1. Customs tariff number (HS code) according to CNCA document "Application Scope for Compulsory Certification of Products acc. first Catalogue".
2. Scope of application according to CNCA document "Application Scope for Compulsory Certification of Products acc. first Catalogue".
3. For the IEC product standard used, the corresponding Chinese GB standard must exist.

For the Rexroth drive components described in this documentation, **certification is not required at present**, thus they are not CCC certified. Negative certifications will not be issued.

## 5.2 Transport and Storage

### 5.2.1 Transport of the Components

#### Ambient and operating conditions - Transport

Description	Symbol	Unit	Value
Temperature range	$T_{a\_tran}$	°C	-25 ... 70
Relative humidity		%	5 ... 95
Absolute humidity		g/m <sup>3</sup>	1 ... 60
Climatic category (IEC721)			2K3
Moisture condensation			Not allowed
Icing			Not allowed

Fig.5-5: Ambient and operating conditions - Transport

### 5.2.2 Storage of the Components



#### Damage to the component caused by long storage periods!

Some components contain electrolytic capacitors which may deteriorate during storage.

When storing these components for a longer period of time, operate them **once a year for at least 1 hour**:

- HCS and HMV: Operation with mains voltage  $U_{LN}$
- HMS, HMD, HLC: Operation with DC bus voltage  $U_{DC}$

General Specifications of the Components

**Ambient and operating conditions - Storage**

Description	Symbol	Unit	Value
Temperature range	$T_{a\_store}$	°C	-25 ... 55
Relative humidity		%	5 ... 95
Absolute humidity		g/m <sup>3</sup>	1 ... 29
Climatic category (IEC721)			1K3
Moisture condensation			Not allowed
Icing			Not allowed

Fig.5-6: Ambient and operating conditions - Storage

## 5.3 Installation Conditions

### 5.3.1 Ambient and Operating Conditions

The **supply units and drive controllers**, as well as their additional components, are designed for control cabinet mounting.



Check that the ambient conditions, in particular the control cabinet temperature, are complied with by calculating the heat levels in the control cabinet. Afterwards, make the corresponding measurements to find out that the ambient conditions have actually been complied with.

In the Technical Data of the individual components, the power dissipation is indicated as an important input value for calculating the heat levels.

**Distributed servo drives KSM** are designed for use near to the machines and are not installed in control cabinets.

**Ambient and operating conditions**

Description	Symbol	Unit	Value (supply units, drive controllers)	Value (distributed servo drives KSM)
Degree of protection (IEC529)			IP20	IP65
Use in the scope of CSA / UL			For use in NFPA-79 Applications only.	
Temperature during storage			See chapter "Storage of the Components"	
Temperature during transport			See chapter "Transport of the Components"	
Allowed mounting position Definition of mounting positions: See chapter <a href="#">5.3.2 Mounting Position, page 25</a>			G1	IM B5 IM V1 IM V3
Allowed ambient temperature range	$T_{a\_work}$	°C	0 ... 40	
Allowed ambient temperature range during operation with reduced nominal data <sup>1)</sup>	$T_{a\_work\_red}$	°C	0 ... 55 See figure "Capacity utilization at higher ambient temperature" in chapter "Capacity Utilization"	
Derating at $T_{a\_work} < T_a < T_{a\_work\_red}$ <sup>2)</sup>	$f_{Ta}$	%/K	See Technical Data of the individual components	

## General Specifications of the Components

Description	Symbol	Unit	Value (supply units, drive controllers)	Value (distributed servo drives KSM)
Nominal data up to installation altitude	$h_{nenn}$	m	1000	
Maximum installation altitude without additional overvoltage limiter	$h_{max\_ohne}$	m	2000	
Maximum installation altitude <sup>3)</sup>	$h_{max}$	m	4000 See figure "Capacity utilization at higher installation altitude" in chapter "Capacity Utilization"	
Reduced power data above installation altitude at $T_a < T_{a\_work\_red}$ <sup>4)</sup>	$h_{red}$	m	1000	
Relative humidity		%	5 ... 95	
Absolute humidity		g/m <sup>3</sup>	1 ... 29	
Climatic category (IEC721)			3K4	
Allowed pollution degree (EN50178)			2	3 (only with connectors plugged in)
Allowed dust, steam			EN50178 tab. A.2	According to degree of protection
Vibration sine: amplitude (peak-peak) at 10 ... 57 Hz <sup>5)</sup>		mm	0,15 ±15 %	-
Vibration sine: acceleration at 57 ... 150 Hz <sup>5)</sup>		g	1 ±15 %	-
Vibration noise (random) frequency <sup>5)</sup>		Hz	20 ... 150	-
Vibration noise (random) spectral acceleration density, amplitude <sup>5)</sup>		g <sup>2</sup> /Hz	0,005 ±3 dB	-
Vibration noise (random) rms value of total acceleration <sup>5)</sup>		g	1	-
Shock test out of operation (EN60068-2-27), 11 ms		g	10	-
Shock test half sine: out of operation (6 ms) <sup>7)</sup>		g	-	15
Vibration sine: acceleration at 10 ... 2000 Hz <sup>6)</sup> , axial		g	-	1
Vibration sine: acceleration at 10 ... 2000 Hz <sup>6)</sup> , radial		g	-	1

- 1) Observe derating  
2) Data to be derated: PDC\_cont; PBD; lout\_cont  
3) In the installation, install overvoltage limiter for transient overvoltages to limit the voltage to 1 kV between the outer conductors and to 2.5 kV between conductor-ground  
4) See following characteristic; observe derating  
5) According to EN 60068-2-36  
6) According to EN 60068-2-6  
7) According to EN 60068-2-27  
*Fig. 5-7: Ambient and operating conditions*

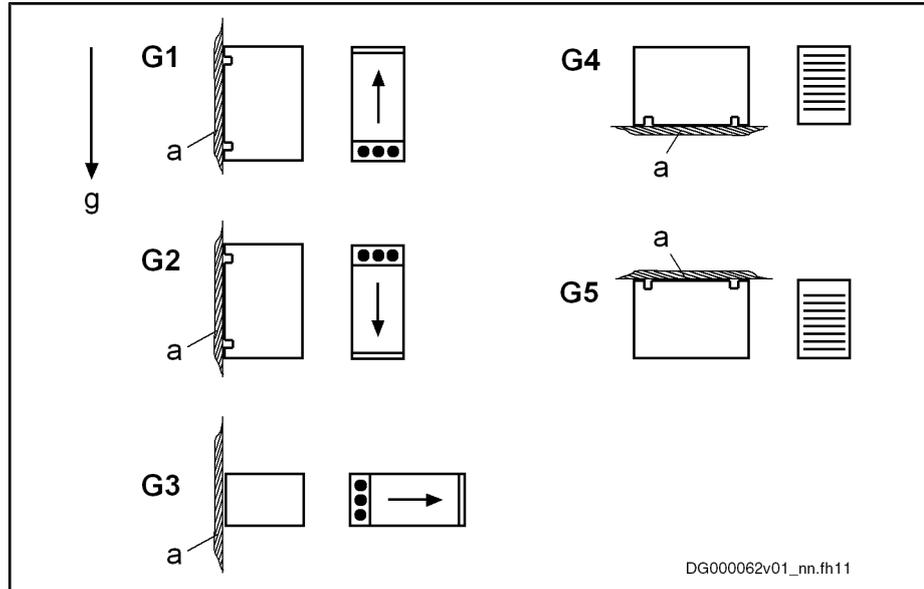
### 5.3.2 Mounting Position

Only operate the components in allowed mounting positions.

General Specifications of the Components

**Definition of Mounting Positions for Drive Controllers**

As a matter of principle, only the mounting position G1 is allowed for drive controllers.



- a Mounting surface
  - g Direction of gravitational force
  - G1 Normal mounting position. The natural convection supports the forced cooling air current. This avoids the generation of pockets of heat in the component.
  - G2 180° to normal mounting position
  - G3 Turned by 90° from vertical to horizontal mounting position
  - G4 Bottom mounting; mounting surface on bottom of control cabinet
  - G5 Top mounting; mounting surface at top of control cabinet
- Fig.5-8: Definition of mounting positions*

**Definition of Mounting Positions KSM**

Distributed servo drives KSM can be supplied in type of construction B05. The allowed types of installation according to EN 60034-7:1993 are contained in the following table.

General Specifications of the Components

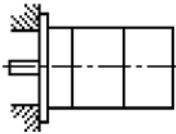
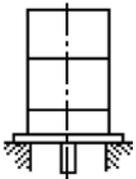
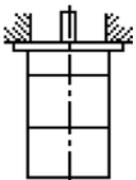
Type of construction of motor	Allowed types of installation		
	Description	Drawing	Installation
B05	IM B5		Flange mounting on drive side of flange
	IM V1		Flange mounting on drive side of flange, drive side bottom
	IM V3		Flange mounting on drive side of flange, drive side top

Fig. 5-9: Mounting positions



**CAUTION**

**Motor damage caused by penetration of fluids!**

If motors are attached according to IM V3, fluid present at the output shaft over a prolonged time may enter into and cause damage to the motors.

→ Ensure that fluid cannot be present at the output shaft.

### 5.3.3 Compatibility With Foreign Matters

All Rexroth controls and drives are developed and tested according to the state-of-the-art technology.

As it is impossible to follow the continuing development of all materials (e.g. lubricants in machine tools) which may interact with our controls and drives, it cannot be completely ruled out that any reactions with the materials used by Bosch Rexroth might occur.

For this reason, before using the respective material a compatibility test has to be carried out for new lubricants, cleaning agents etc. and our housings/our materials.

### 5.3.4 Prime Coat and Housing Varnish

The housing varnish of the KSM01 consists of black (RAL9005) 2K epoxy resin coating on the basis of epoxy polyamide resin in water.

Chemically resistant to	In restricted form resistant to	Nonresistant to
<ul style="list-style-type: none"> <li>Diluted acids/lyes</li> <li>Water, sea water, waste water</li> <li>Common mineral oils</li> </ul>	<ul style="list-style-type: none"> <li>Organic solvents</li> <li>Hydraulic oil</li> </ul>	<ul style="list-style-type: none"> <li>Concentrated acids/lyes</li> </ul>

Fig. 5-10: Varnish resistance

General Specifications of the Components

It is permitted to provide the housing with additional varnish with a maximum coat thickness of 40 µm. Before varnishing, verify the adhesion and resistance of the new varnish.

## 5.4 Capacity Utilization

Where installation conditions differ, the following performance data are reduced in accordance with the diagrams:

**Drive controller:**

- Allowed DC bus continuous power  $P_{DC\_cont}$
- Braking resistor continuous power  $P_{BD}$
- Continuous current  $I_{out\_cont}$

**Motor:**

- Power
- Continuous torque at standstill
- S1 continuous torques
- Short-time service torque MKB

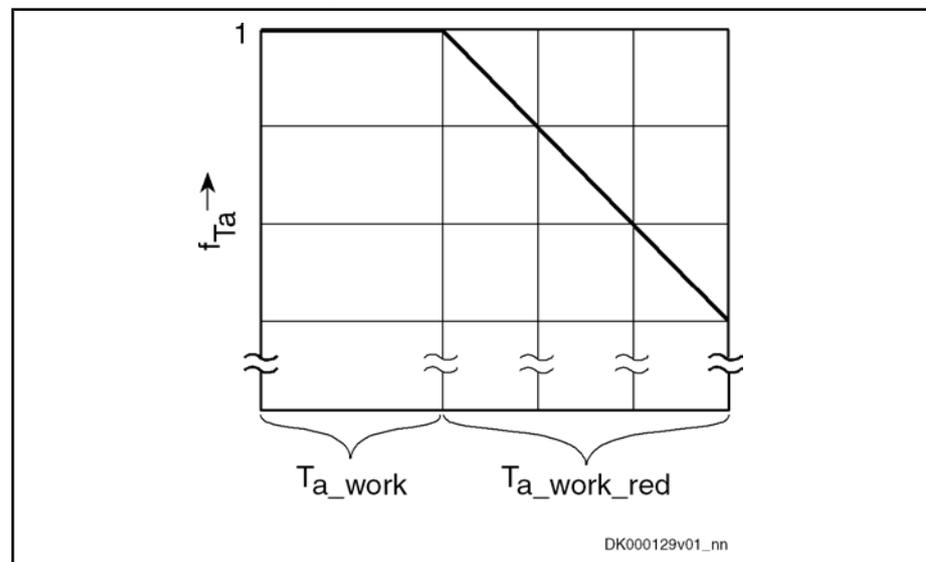
If differing ambient temperatures and higher installation altitudes occur simultaneously, both capacity utilization factors must be multiplied. The installation altitude must only be taken into account once, deviating ambient temperatures must be taken into account separately for motor and drive controller.



Use outside of the indicated installation conditions is not allowed, even if the performance data are additionally reduced.

### Capacity Utilization vs. Ambient Temperature

As the ambient temperature increases, the capacity utilization of the devices is reduced according to the figure below.



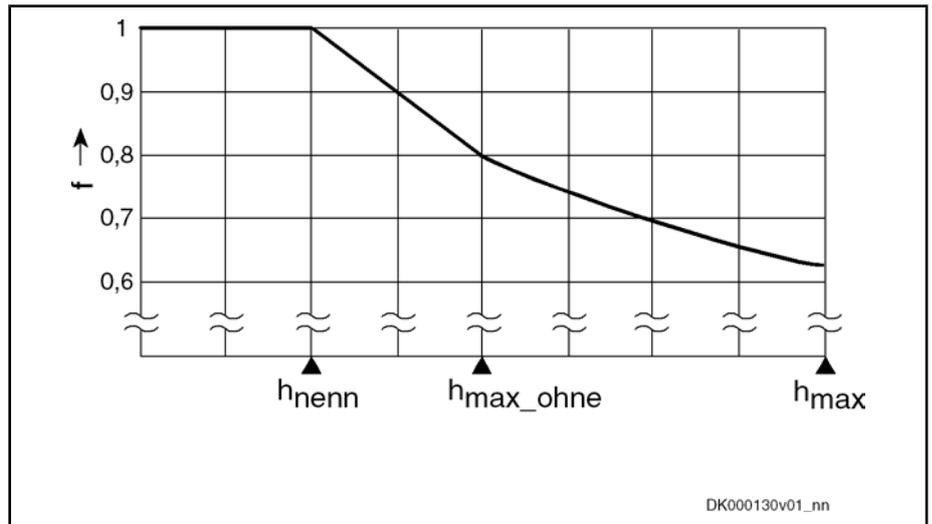
$f_{Ta}$  Capacity utilization factor  
 $T_{a\_work}$  Ambient temperature range for operation with nominal data  
 $T_{a\_work\_red}$  Ambient temperature range for operation with reduced nominal data

Fig.5-11: Capacity utilization at higher ambient temperature

### Capacity Utilization vs. Installation Altitude

As the installation altitude increases, the capacity utilization of the devices is reduced according to the figure below.

General Specifications of the Components



- f Capacity utilization factor
- $h_{nenn}$  Maximum installation altitude for operation with nominal data
- $h_{max\_ohne}$  Maximum installation altitude for operation with reduced nominal data without using an overvoltage limiter
- $h_{max}$  Maximum installation altitude for operation with reduced nominal data when using an overvoltage limiter

Fig. 5-12: Capacity utilization at higher installation altitude

## 5.5 Voltage Test and Insulation Resistance Test

According to standard, the **components** of the Rexroth IndraDrive range are tested with voltage.

Test	Test rate
Voltage test	100% (EN61800-5-1)
Insulation resistance test	100% (EN50178)

Fig. 5-13: Applied standards



### Voltage test of the installation

Disconnect all connections to the components or disconnect the plug-in connections to protect the electronic components, before making

- a **voltage test** or
- an **insulation resistance test** for the **installation** in which the components are used.

## General Specifications of the Components

## 5.6 Control Voltage Specification (24V Supply)



### PELV for 24V power supply unit

For the 24V supply of the devices of the Rexroth IndraDrive range, use a power supply unit or a control-power transformer with protection by PELV <sup>1)</sup> according to IEC 60204-1 (section 6.4).

In the scope of CSA/UL, the data of the control-power transformer are limited to:

- Max. output voltage: 42.4 V<sub>peak</sub> or 30 V<sub>ac</sub>
- Max. output power: 10000 VA

The data in the table below generally apply to the 24V supply of the devices of the Rexroth IndraDrive range. For other data, such as power consumption and inrush currents, see the technical data of the respective device.

The specified values apply at the connections (+24V, 0V) to the "24V supply" of the devices!

Description	Symbol	Unit	Value
Control voltage for drive systems <b>without</b> operation of <b>motor holding brakes</b> in Rexroth motors	U <sub>N3</sub>	V	<b>19,2 ... 28,8</b> (24 ±20%) When using supply units HMV01.1E, HMV01.1R, HMV02.1R, HLB01.1D: <b>22,8 ... 27,3</b> (24 -5%, 26 +5%)
Control voltage for drive systems <b>with</b> operation of <b>motor holding brakes</b> in Rexroth motors	U <sub>N3</sub>	V	Depending on the motor cable length, the control voltage must be within the following voltage ranges: <ul style="list-style-type: none"> <li>• Motor cable length &lt; 50 m: <b>22,8 ... 25,2</b> (24 ±5%)</li> <li>• Motor cable length &gt; 50 m: <b>24,7 ... 27,3</b> (26 ±5%)</li> </ul> Take the data of the corresponding motor holding brake into account.
External control voltage at devices of design "NNNV" (see type code HCS02, HCS03; other design: DC 24 V power supply from the DC bus and external)	U <sub>N3</sub>	V	<b>26 ... 28,8</b> The output voltage of the internal switching power supply unit is 24 ±10% (see control voltage block diagram "int. SMPS").
Max. ripple content	w	-	The amplitudes of the alternating component on U <sub>N3</sub> must be within the specified voltage range.
Maximum allowed overvoltage	U <sub>N3max</sub>	V	33 (max. 1 ms)

Fig.5-14: Control voltage

<sup>1)</sup> Protective Extra-Low Voltage



**Overvoltage**

Overvoltage greater than 33 V has to be discharged by means of the appropriate electrical equipment of the machine or installation.

This includes:

- 24V power supply units that reduce incoming overvoltage to the allowed value.
- Overvoltage limiters at the control cabinet input that limit existing overvoltage to the allowed value. This, too, applies to long 24V lines that have been run in parallel to power cables and mains cables and can absorb overvoltage by inductive or capacitive coupling.



**Power supply units with buffer (UPS)**

For HMV supply units, use 24 V supplies with buffer times of at least 100 ms (e.g. UPS), if commutation drops and short-time interruptions in the application exceed the specified values.

For the 24V supply, also take the following chapter into account: "Project Planning of Mains Connection" in the Project Planning Manual "Rexroth IndraDrive, Drive System".

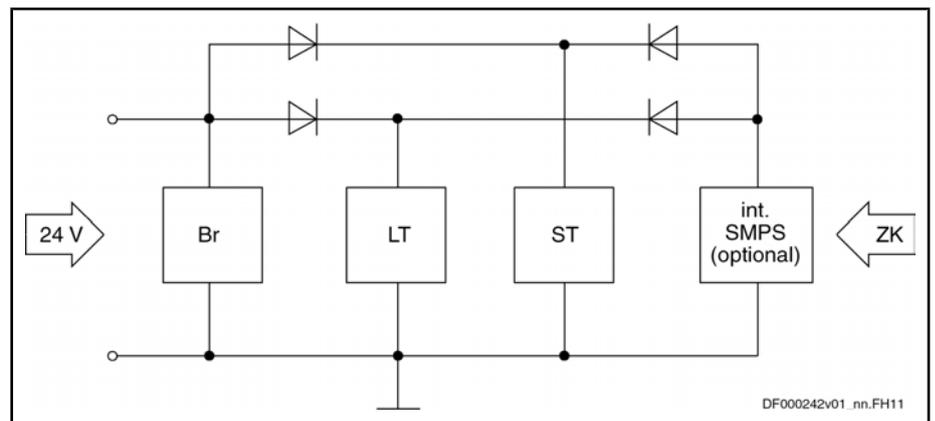


**Insulation monitoring impossible**

The input 0 V is connected in conductive form with the housing potential. Insulation monitoring at +24 V and 0 V against housing is impossible.

**Control Voltage Block Diagram  
HCS, HMS, HMD**

The control voltage, which is supplied via the connection for 24V supply, takes effect according to the following block diagram.



- |           |   |
|-----------|---|
| BR        | circuit for brake control   |
| LT        | power section, e.g. HCS02   |
| ST        | control section, e.g. CSB01   |
| ZK        | DC bus  |
| int. SMPS | internal switching power supply unit, for types HCS0x.1E-Wxxxx-NxxV |
- Fig.5-15: Block diagram of internal control voltage*



## 6 Transformers

### 6.1 General Information

Transformers are only needed if the mains voltage is outside of the allowed nominal voltage of the drive controller.

**Grounded Mains** For grounded mains, the mains voltage is adjusted to the nominal voltage of the device by means of **autotransformers** which have been dimensioned for a **specific output voltage range**.

**Ungrounded Mains** For voltage adjustment of ungrounded mains, always connect **isolating transformers** to prevent overvoltages between outer conductor and ground.



## 6.2.2 Selection

Select the autotransformer according to the mains voltage and the power requirements of the installation. For the selection, proceed as follows:

1. By means of the required nominal mains voltage range from the diagram "Classification of the three-phase current autotransformers in type groups", determine the type group and read the transformation ratio "i".
2. Calculate the actual transformer output voltage by means of the given nominal mains voltage and the transformation ratio "i".
3. Check the drive data. The output voltage of the transformer has an effect on the drive data.
4. Select the three-phase current autotransformer for the determined mains connected load  $S_{LN}$ .

Determining the mains connected load: See Project Planning Manual "Rexroth IndraDrive, Drive System" → "Calculations" → "Calculations for the Mains Connection" → "Calculating the Mains-Side Phase Current"

The nominal power of the transformer must at least equal the mains connected load  $S_{LN}$ .

For DST transformers, the nominal power is identical to the throughput rating.

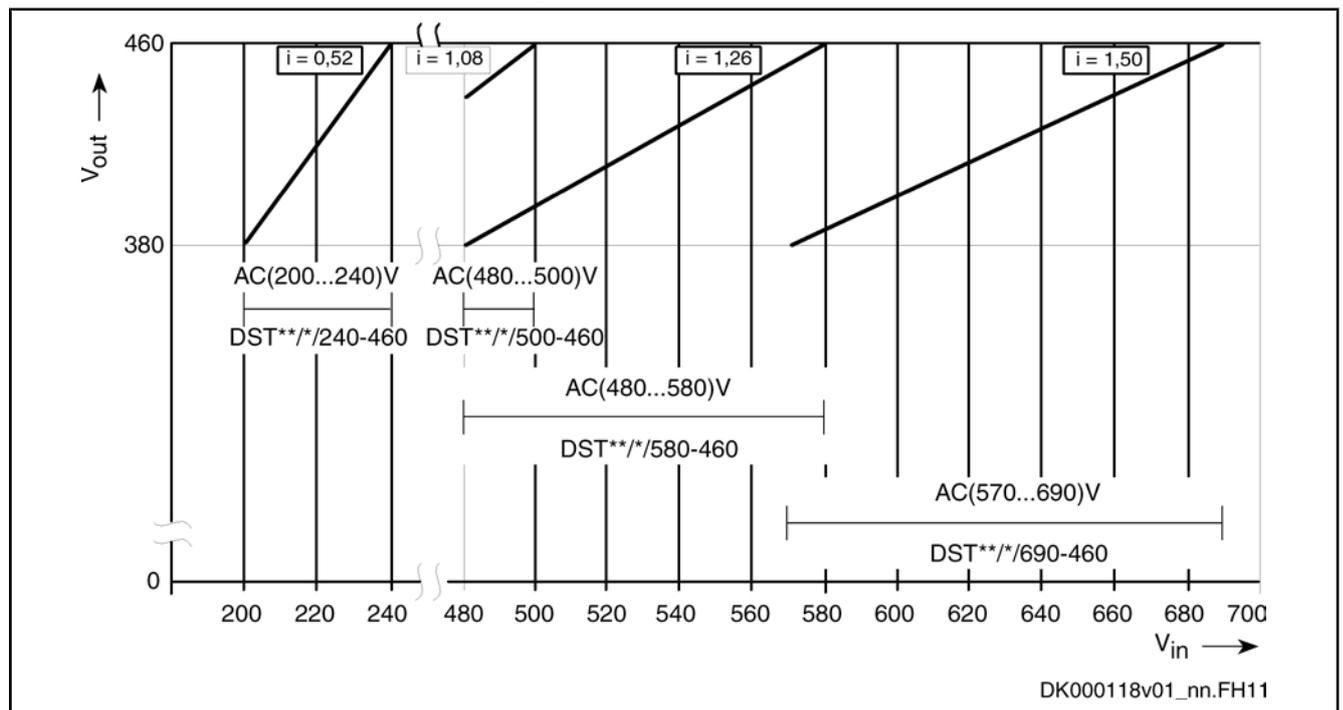


Fig. 6-2: Classification of the three-phase current autotransformers in type groups

Transformers

### 6.2.3 Technical Data

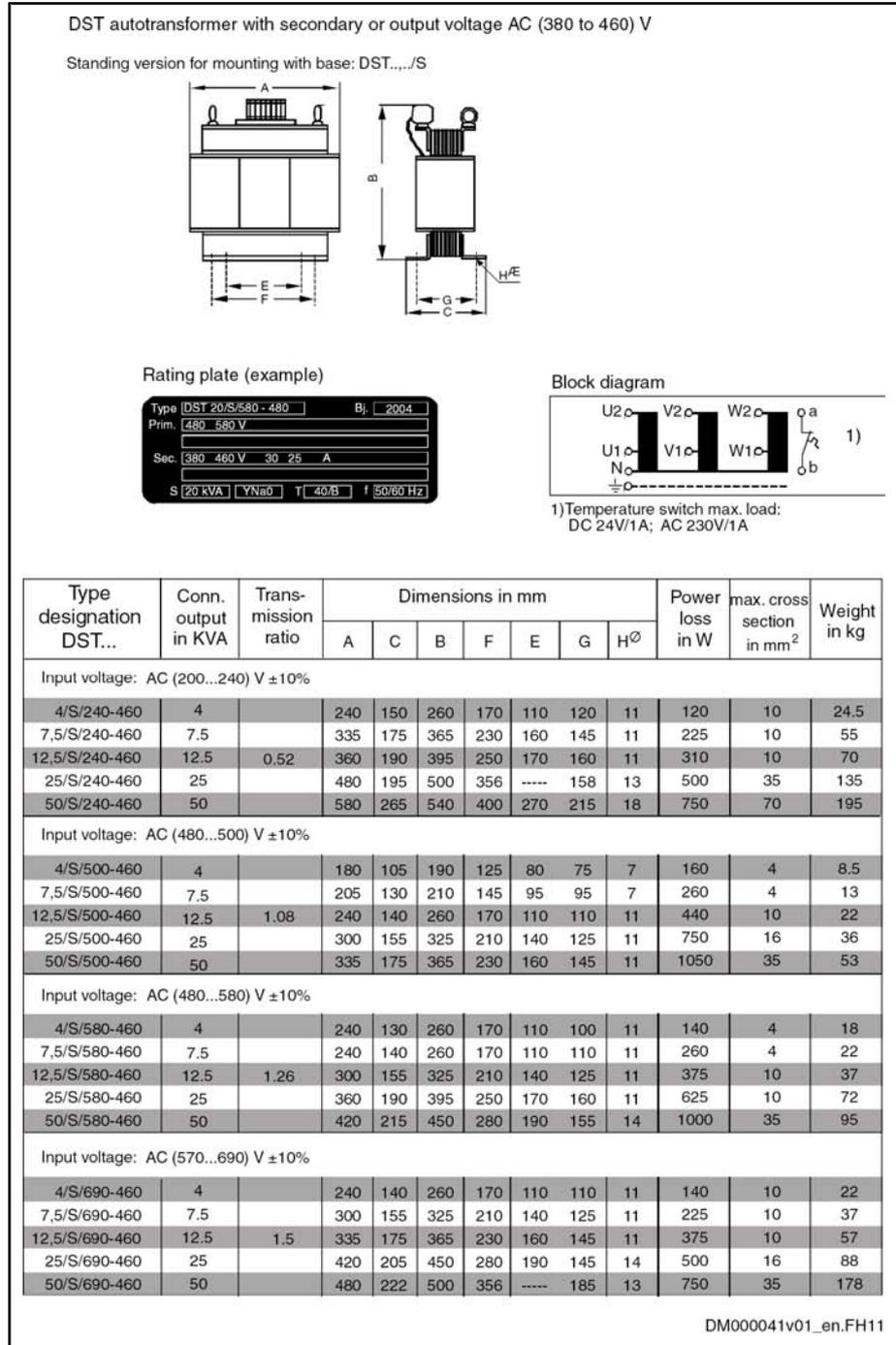


Fig.6-3: DST autotransformers for drive controllers for mains voltage adjustment



Mains Filter

NFE02.1 - Mains Filter, Single-Phase

Abbrev. Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	2	1	2	3	4	5	6	7	8	9	0	3	0	1	2	3	4	5	6	7	8	9	0	4							
Example:	N	F	E	0	2	.	1	-	2	3	0	-	0	0	8																																				

1. **Product group**  
1.1 NFE ..... = NFE
2. **Line**  
2.1 2 ..... = 02
3. **Design**  
3.1 1 ..... = 1
4. **Nominal voltage**  
4.1 AC 230 V ..... = 230
5. **Nominal current**  
5.1 8,0 A ..... = 008

**Illustration example: NFE02.1**

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Fig. 7-2: Type code NFE02.1

### NFD03.1 - Mains Filter, 3-Phase

Abbrev.	Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0			
Example:		N	F	D	0	3	.	1	-	4	8	0	-	0	0	7																		

1. **Product group**
- 1.1 NFD..... = NFD
  
2. **Line**
- 2.1 3..... = 03
  
3. **Design**
- 3.1 1..... = 1
  
4. **Nominal voltage**
- 4.1 AC 115 to 480 V ..... = 480
  
5. **Rated current**
- 5.1 7 A ..... = 007
- 5.2 16 A ..... = 016
- 5.3 30 A ..... = 030
- 5.4 55 A ..... = 055
- 5.5 75 A ..... = 075
- 5.6 130 A ..... = 130
- 5.7 180 A ..... = 180

Illustration example: NFD03.1

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Fig.7-3: Type code NFD03.1

Mains Filter

### 7.1.2 Mechanical Data NFE / NFD

#### NFE01.1

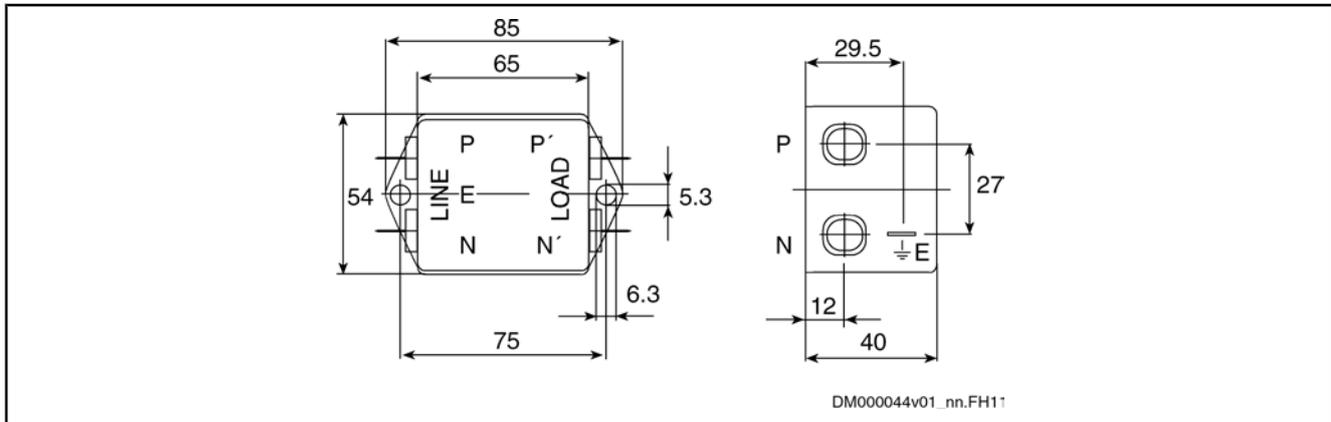
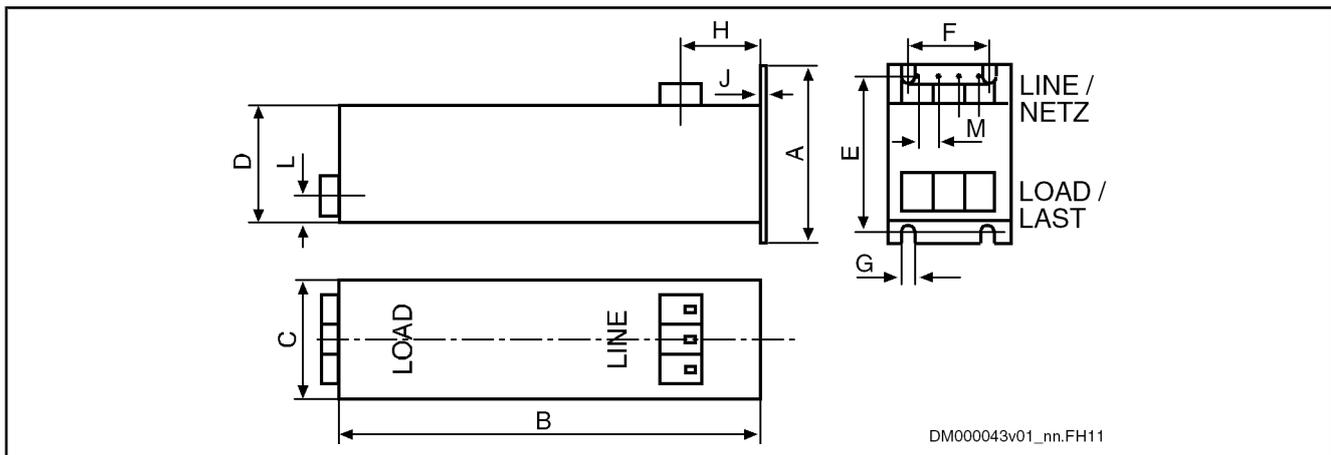


Fig.7-4: Single-phase filter NFE01.1-250-006 for interference suppression of the power supply unit NTM



The mains filter is connected by means of tab receptacles (b = 6.3 mm, d = 1 mm).

#### NFE02.1



Type NFE02.1-230-008 (with 3 terminal connectors)  
 Fig.7-5: Single-phase filter NFE02.1 for drives

NFD03.1

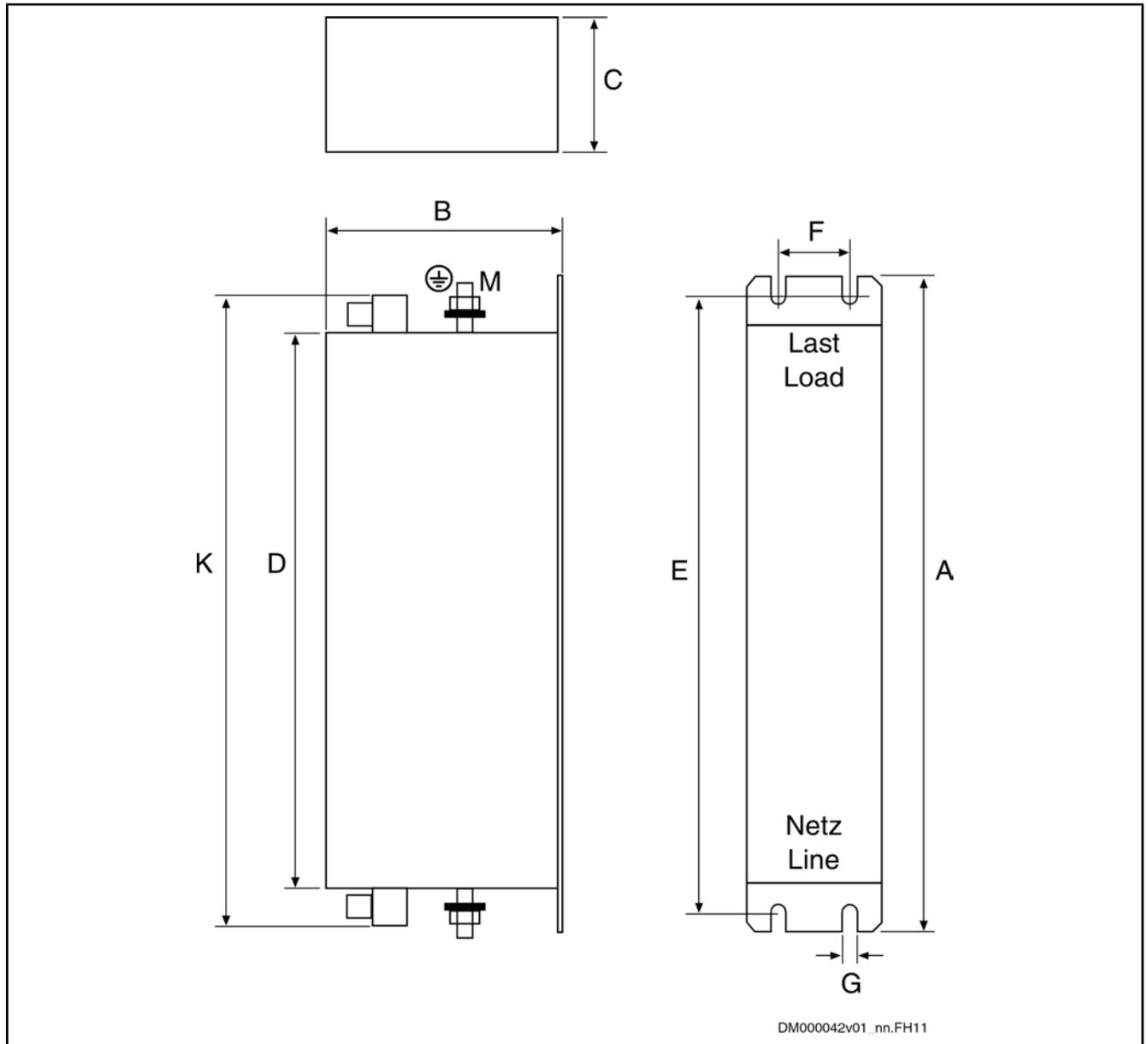


Fig.7-6: Three-phase current filter NFD03.1 for drives

Tolerance limits for NFD03.1:

- The dimensions B, C, D, K are maximum values. They can be reduced up to 15 mm.
- The ground studs M can also be arranged horizontally (protruding from the mounting flange), instead of vertically (as illustrated above).

Mains filter type	A	B	C	D	E	F	G	H	J	K	L	M	M <sub>AE</sub>	M <sub>AKI</sub>
NFD 03.1-480-007	190	90	50	160	180	20	5,4	-	-	190	-	M5	2,2	0,8
NFD 03.1-480-016	250	90	55	220	235	25	5,4	-	-	250	-	M5	2,2	0,8
NFD 03.1-480-030	270	100	60	240	255	30	5,4	-	-	270	-	M5	2,2	2
NFD 03.1-480-055	250	105	90	220	235	60	5,4	-	-	260	-	M6	4	2,2

Mains Filter

Mains filter type	A	B	C	D	E	F	G	H	J	K	L	M	M <sub>AE</sub>	M <sub>AKI</sub>
NFD 03.1-480-075	270	145	90	240	255	60	6,5	–	–	280	–	M6	4	4,5
NFD 03.1-480-130	270	160	100	240	255	65	6,5	–	–	330	–	M10	18	8
NFD 03.1-480-180	380	180	130	350	365	102	6,5	–	–	455	–	M10	18	20
NFE 02.1-230-008	90	210	60	60	80	40	5,3	40	0,75	–	15	10	0,8	0,8
NFE 01.1-250-006	See drawing													

M<sub>AE</sub> Maximum tightening torque of the ground stud in Nm

M<sub>AKI</sub> Maximum tightening torque of the terminal in Nm

Fig.7-7: Dimensions of the mains filters NFD/NFE

### 7.1.3 Electrical Data NFE / NFD



**Using mains filters in mains grounded via outer conductor**

When using mains filters NFD03 in mains grounded via outer conductor, use an isolating transformer between mains and mains filter.

Maximum mains connection voltage of mains 50 ... 60 Hz U <sub>N</sub>	Nominal mains current I <sub>henn</sub> (1)	Number of phases	Mains filter type	Terminal connectors (3)			Power dissipation approx. W	Weight kg	Type of construction
				Flexible [mm <sup>2</sup> ]	Rigid [mm <sup>2</sup> ]	AWG			
AC 480V +10%	7	3	NFD 03.1-480-007	4 (3)	6 (3)	AWG 12	3,9	0,7	Vertical
AC 480V +10%	16	3	NFD 03.1-480-016	4 (3)	6 (3)	AWG 12	6,4	1,0	Vertical
AC 480V +10%	30	3	NFD 03.1-480-030	10	16	AWG 6	11,9	1,4	Vertical
AC 480V +10%	55	3	NFD 03.1-480-055	16	25	AWG 4	25,9	2,0	Vertical
AC 480V +10%	75	3	NFD 03.1-480-075	25	35	AWG 3	30,4	3,5	Vertical
AC 480V +10%	130	3	NFD 03.1-480-130	50	50	AWG 1/0	38	4,7	Vertical
AC 480V +10%	180	3	NFD 03.1-480-180	95	95	AWG 4/0	61	10	Vertical
AC 230V +10%	7,5	1	NFE 02.1-230-008	4 (3)	6 (3)	AWG 10	7,2	1,1	Vertical
AC 230 V +10%	4,7	1	NFE 01.1-250-006 (2)	Tab connectors 6.3 × 0.8 mm			4	0,245	Horizontal

NFD Three-phase filter

NFE Single-phase filter

(1) Mains-side maximum continuous current at 45 °C ambient temperature

(2) Only use for interference suppression of the power supply unit NTM

(3) For the equipment grounding conductor, connect a conductor cross section of 10 mm<sup>2</sup> by means of terminal pin or ring cable lug

Fig.7-8: Technical data

<b>Operating frequency</b>	From 0–60 Hz at 45 °C
<b>Power dissipation</b>	Measured $2$ or $3 \times R I_{Nenn DC}^2$
<b>Temperature range</b>	-25 ... +85 °C
<b>Overload</b>	$1.5 \times I_{Nenn}$ 1 minute per hour or $4 \times I_{Nenn}$ for 10 s
<b>Effective attenuation</b>	Frequency range 0.15–30 MHz
<b>Saturation behavior</b>	Reduction of filter attenuation by 6 dB at 2.5-fold to 3-fold nominal current
<b>Test voltage</b>	L/N → PE or L → PE: DC 2700 V, 2 s at 25 °C L/ N → L: DC 2100 V, 2 s at 25 °C
<b>Current reduction in the case of overtemperature</b>	See formula for reduction in chapter "Calculations"
<b>Leakage current at 50 Hz</b>	Symmetrical three-phase operation: Typ. 30 mA Single-phase operation or in the case of tripped fuses of a phase: Typ. 175 ... 190 mA
<b>Degree of protection</b>	IP 20, except for NFE01.1-250-006: IP 10

Fig.7-9: Technical data

Mains Filter

## 7.2 HNF01.1 - Mains Filter, 3-Phase

### 7.2.1 Type Code HNF01.1

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	2	1	2	3	4	5	6	7	8	9	3	0	1	2	3	4	5	6	7	8	9	4	0
Example:	H	N	F	0	1	.	1	A	-	F	2	4	0	-	R	0	0	9	4	-	A	-	4	8	0	-	N	N	N	N											

- 1. Product**
- 1.1 HNF..... = HNF
  
- 2. Line**
- 2.1 1..... = 01
  
- 3. Design**
- 3.1 1..... = 1
  
- 4. EMC area per DIN EN 61800-3**
- 4.1 industrial area ..... = A
- 4.2 residential area ..... = B
  
- 5. Applications**
- 5.1 6 axes, cable length max. 240 m = F240
- 5.2 15 axes, cable length max. 750 m = M750
- 5.3 15 axes, cable length max. 900 m = M900
- 5.4 22 axes, cable length max. 1000 m = N1K0
- 5.5 45 axes, cable length max. 2000 m = P2K0
  
- 6. Supply system**
- 6.1 only for feeding units ..... = E
- 6.2 only for regenerative units ..... = R
  
- 7. Nominal current**
- 7.1 e.g., 94 A..... = 0094
  
- 8. Degree of protection**
- 8.1 IP20..... = A
  
- 9. Mains connecting voltage**
- 9.1 3 AC 400 to 480V -15+10%, 50/60 Hz ..... = 480
- 9.2 3 AC 400 to 500V -15+10%, 50/60 Hz ..... = 500
  
- 10. Other design**
- 10.1 none ..... = NNNN
  
- 11. Standard reference**

Standard	Title	Edition
DIN EN 60529	Degrees of protection provided by enclosures (IP-Code)	2000-09
DIN EN 61800-3	Adjustable speed electrical power drive systems - Part 3: EMC product standard including specific test methods (IEC 61800-3:1996); German version EN 61800:1996 + A11:2000	2001-02

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Fig.7-10: Type code

## 7.2.2 Mechanical Data HNF01.1

### Dimensions



#### Mounting position and distances

Mount HNF01 in the control cabinet in normal mounting position G1 and allow cooling by natural convection. For this purpose, keep at least 80 mm at the top side and bottom side of HNF free from mounted parts.

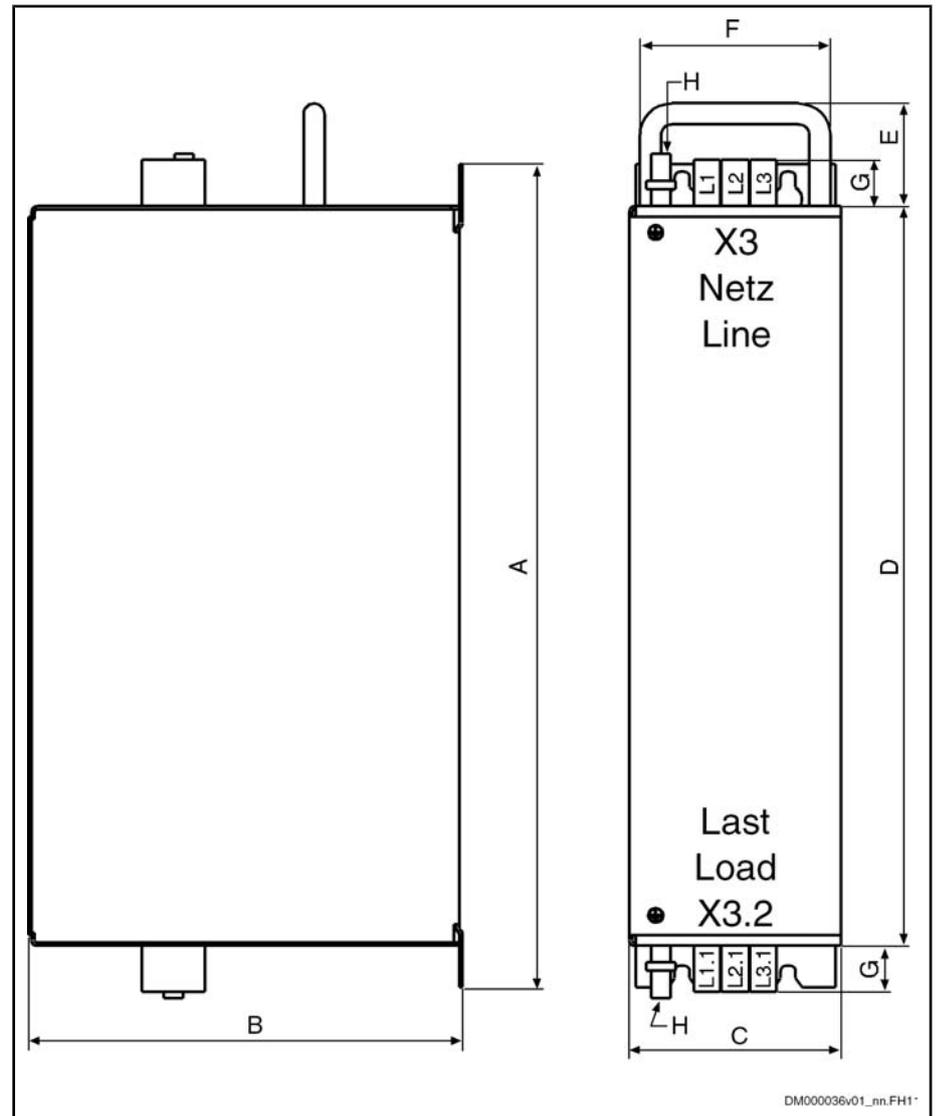


Fig.7-11: Dimensions

Mains Filter

Mains filter	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	Max. allowed tightening torque [Nm]
HNFF01.1A-F240-R0026-A-480-NNNN	480	262	100	440	-	-	26	M6×20	8.6
HNFF01.1A-F240-E0051-A-480-NNNN HNFF01.1A-M900-E0051-A-480-NNNN	480	262	100	440	-	-	33	M6×16	2.3
HNFF01.1A-M900-R0026-A-480-NNNN	480	262	150	440	-	-	26	M6×20	8.6
HNFF01.1A-F240-R0065-A-480-NNNN HNFF01.1A-M900-R0065-A-480-NNNN	480	262	150	440	40	110	40	M6×16	4.8
HNFF01.1A-F240-R0094-A-480-NNNN HNFF01.1A-M900-R0094-A-480-NNNN	480	262	150	440	40	110	45	M10×30	25
HNFF01.1A-F240-E0125-A-480-NNNN HNFF01.1A-M900-E0125-A-480-NNNN	480	262	150	440	40	110	45	M10×30	25
HNFF01.1A-F240-E0202-A-480-NNNN	480	262	150	440	40	110	63.5	M10×30	25
HNFF01.1A-M900-E0202-A-480-NNNN	480	262	250	440	40	110	63.5	M10×30	25
HNFF01.1A-H350-R0180-A-480-NNNN	480	262	250	440	40	110	67	M10×30	25

Fig. 7-12: Dimensions

### Drilling Pattern

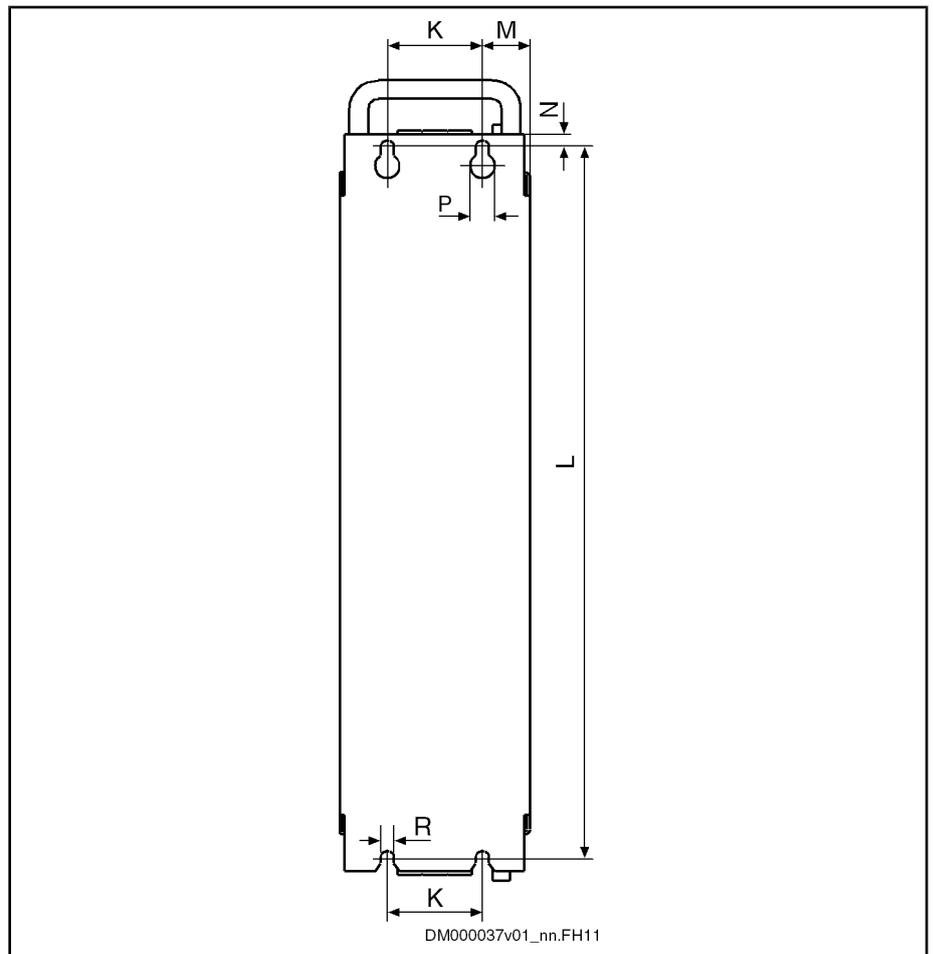


Fig.7-13: Drilling pattern

Mains filter	K [mm]	L [mm]	M [mm]	N [mm]	P [mm]	R [mm]
HNF01.1A-F240-E0051-A-480-NNNN HNF01.1A-M900-E0051-A-480-NNNN	50	466	25	7	13	6,5
HNF01.1A-F240-E0125-A-480-NNNN HNF01.1A-M900-E0125-A-480-NNNN	125	466	12,5	7	13	6,5
HNF01.1A-F240-E0202-A-480-NNNN	125	466	12,5	7	13	6,5
HNF01.1A-M900-E0202-A-480-NNNN HNF01.1A-H350-R0180-A-480-NNNN	150	466	50	7	13	6,5
HNF01.1A-F240-R0026-A-480-NNNN	50	466	25	7	13	6,5
HNF01.1A-M900-R0026-A-480-NNNN	100	466	25	7	13	6,5
HNF01.1A-F240-R0065-A-480-NNNN HNF01.1A-M900-R0065-A-480-NNNN	100	466	25	7	13	6,5
HNF01.1A-F240-R0094-A-480-NNNN HNF01.1A-M900-R0094-A-480-NNNN	125	466	12,5	7	13	6,5

Fig.7-14: Drilling pattern

Mains Filter

## 7.2.3 Electrical Data HNF01.1

### Data HNF01.1A-xxxx-Rxxxx-A-480-NNNN for Infeeding Supply Systems



Using mains filters in mains grounded via outer conductor

When using mains filters HNF01 in mains grounded via outer conductor, use an isolating transformer between mains and mains filter.

#### Technical data - Currents, voltages, power

Description	Symbol	Unit	HNF01.1 A-F240- E0051- A-480- NNNN	HNF01.1 A-F240- E0125- A-480- NNNN	HNF01.1 A-F240- E0202- A-480- NNNN	HNF01.1 A-M900- E0051- A-480- NNNN	HNF01.1 A-M900- E0125- A-480- NNNN	HNF01.1 A-M900- E0202- A-480- NNNN
Degree of protection according to IEC60529			IP20					
Listing according to UL standard (UL)			UL1283					
Listing according to CSA standard (UL)			C22.2 No. 8					
Mass (weight)	m	kg	15,00	18,00	29,00	15,00	30,00	37,00
Mains voltage three-phase at TN-S, TN-C, TT mains	$U_{LN}$	V	380...480					
Mains voltage three-phase at Corner-grounded-Delta mains <sup>1)</sup>	$U_{LN}$	V	Not allowed					
Mains voltage three-phase at IT mains <sup>2)</sup>	$U_{LN}$	V	Not allowed					
Tolerance $U_{LN}$ (UL)		%	±10					
Input frequency (UL)	$f_{LN}$	Hz	50...60					
Tolerance input frequency (UL)		Hz	±2					
Nominal current	$I_{L\_cont}$	A	51,00	125,00	202,00	51,00	125,00	202,00
Maximum allowed peak current <sup>3)</sup>	$I_{L\_max}$	A	77,00	188,00	303,00	77,00	188,00	303,00
Power dissipation at continuous current and continuous DC bus power respectively (UL) <sup>4)</sup>	$P_{Diss\_cont}$	W	<89	<127	<373	<91	<174	<373
Insulation resistance at DC 500 V	$R_{is}$	Mohm	1,18					

Description	Symbol	Unit	HNF01.1 A-F240- E0051- A-480- NNNN	HNF01.1 A-F240- E0125- A-480- NNNN	HNF01.1 A-F240- E0202- A-480- NNNN	HNF01.1 A-M900- E0051- A-480- NNNN	HNF01.1 A-M900- E0125- A-480- NNNN	HNF01.1 A-M900- E0202- A-480- NNNN
Required wire size according to IEC 60364-5-52; at $I_{L\_cont}$ <sup>5)</sup>	$A_{LN}$	mm <sup>2</sup>	16	70	185	16	70	185
Required wire size according to UL 508 A (internal wiring); at $I_{L\_cont}$ (UL) <sup>6)</sup>	$A_{LN}$	AWG	6	1	4/0	6	1	4/0

- 1) 2) Mains voltage >  $U_{LN}$ : Use a transformer with grounded neutral point, don't use autotransformers!
- 3) With R-types:  $t = 0,3$  s;  $T = 1,42$  s;  $K = 2,5$ ; with E-types:  $t = 0,3$  s;  $T = 0,67$  s;  $K = 2,5$
- 4) HMV, HCS: Plus dissipation of braking resistor, control section
- 5) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °C
- 6) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C

Fig.7-15: HNF - Technical data - Currents, voltages, power

### Data HNF01.1A-xxxx-Rxxxx-A-480-NNNN for Regenerative Supply Systems



#### Using mains filters in mains grounded via outer conductor

When using mains filters HNF01 in **mains grounded via outer conductor**, use an isolating transformer between mains and mains filter.

#### Technical data - Currents, voltages, power

Description	Symbol	Unit	HNF01.1 1A- F240- R0026- A-480- NNNN	HNF01.1 1A- F240- R0065- A-480- NNNN	HNF01.1 1A- F240- R0094- A-480- NNNN	HNF01.1 1A- H350- R0180- A-480- NNNN	HNF01.1 1A- M900- R0026- A-480- NNNN	HNF01.1 1A- M900- R0065- A-480- NNNN	HNF01.1 1A- M900- R0094- A-480- NNNN
Degree of protection according to IEC60529			IP20						
Listing according to UL standard (UL)			UL1283			-	UL1283		
Listing according to CSA standard (UL)			C22.2 No. 8			-	C22.2 No. 8		
Mass (weight)	m	kg	14,00	25,00	28,00	45,00	17,00	26,00	29,00
Mains voltage three-phase at TN-S, TN-C, TT mains	$U_{LN}$	V	380...480						
Mains voltage three-phase at Corner-grounded-Delta mains <sup>1)</sup>	$U_{LN}$	V	Not allowed						
Mains voltage three-phase at IT mains <sup>2)</sup>	$U_{LN}$	V	Not allowed						
Tolerance $U_{LN}$ (UL)		%	±10						
Input frequency (UL)	$f_{LN}$	Hz	50...60						
Tolerance input frequency (UL)		Hz	±2						

## Mains Filter

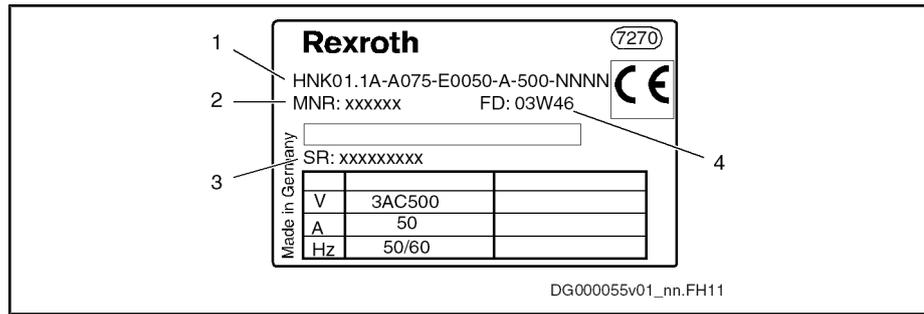
Description	Symbol	Unit	HNF01.1A-F240-R0026-A-480-NNNN	HNF01.1A-F240-R0065-A-480-NNNN	HNF01.1A-F240-R0094-A-480-NNNN	HNF01.1A-H350-R0180-A-480-NNNN	HNF01.1A-M900-R0026-A-480-NNNN	HNF01.1A-M900-R0065-A-480-NNNN	HNF01.1A-M900-R0094-A-480-NNNN
Nominal current	$I_{L\_cont}$	A	26,00	65,00	94,00	180,00	26,00	65,00	94,00
Maximum allowed peak current <sup>3)</sup>	$I_{L\_max}$	A	65,00	163,00	235,00	270,00	65,00	163,00	235,00
Power dissipation at continuous current and continuous DC bus power respectively (UL) <sup>4)</sup>	$P_{Diss\_cont}$	W	<73	<163	<135	305,00	77,00	157,00	146,00
Insulation resistance at DC 500 V	$R_{is}$	Mohm	0,17		1,18	1,33	0,17		
Required wire size according to IEC 60364-5-52; at $I_{L\_cont}$ <sup>5)</sup>	$A_{LN}$	mm <sup>2</sup>	6	25	50	120	6	25	50
Required wire size according to UL 508 A (internal wiring); at $I_{L\_cont}$ (UL) <sup>6)</sup>	$A_{LN}$	AWG	10	6	3	4/0	10	6	3

- 1) 2) Mains voltage > ULN: Use a transformer with grounded neutral point, don't use autotransformers!
- 3) With R-types:  $t = 0,3$  s;  $T = 1,42$  s;  $K = 2,5$ ; with E-types:  $t = 0,3$  s;  $T = 0,67$  s;  $K = 2,5$
- 4) HMV, HCS: Plus dissipation of braking resistor, control section
- 5) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °C
- 6) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C

Fig. 7-16: HNF - Technical data - Currents, voltages, power



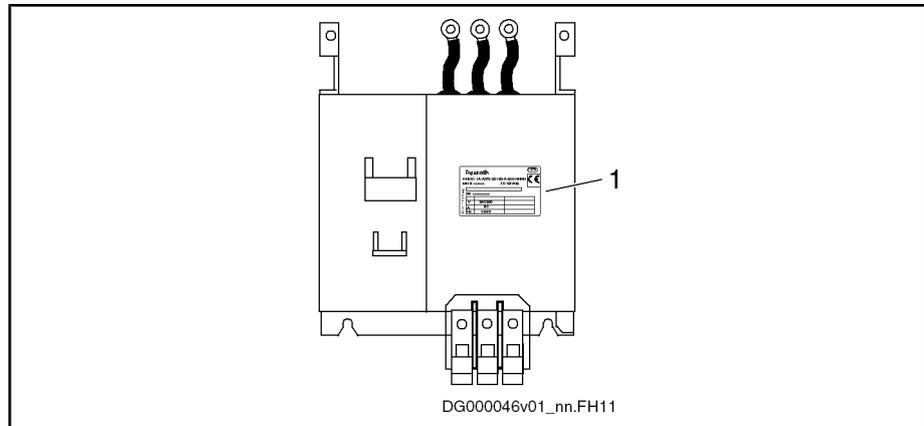
Mains Filter



- 1 Type designation
- 2 Part number
- 3 Serial number
- 4 Production date

Fig. 7-18: Example of type plate HNK01.1

Position of type plate:



- 1) Type plate

Fig. 7-19: Type plate arrangement

### 7.3.3 Mechanical Data HNK01.1

#### Dimensions

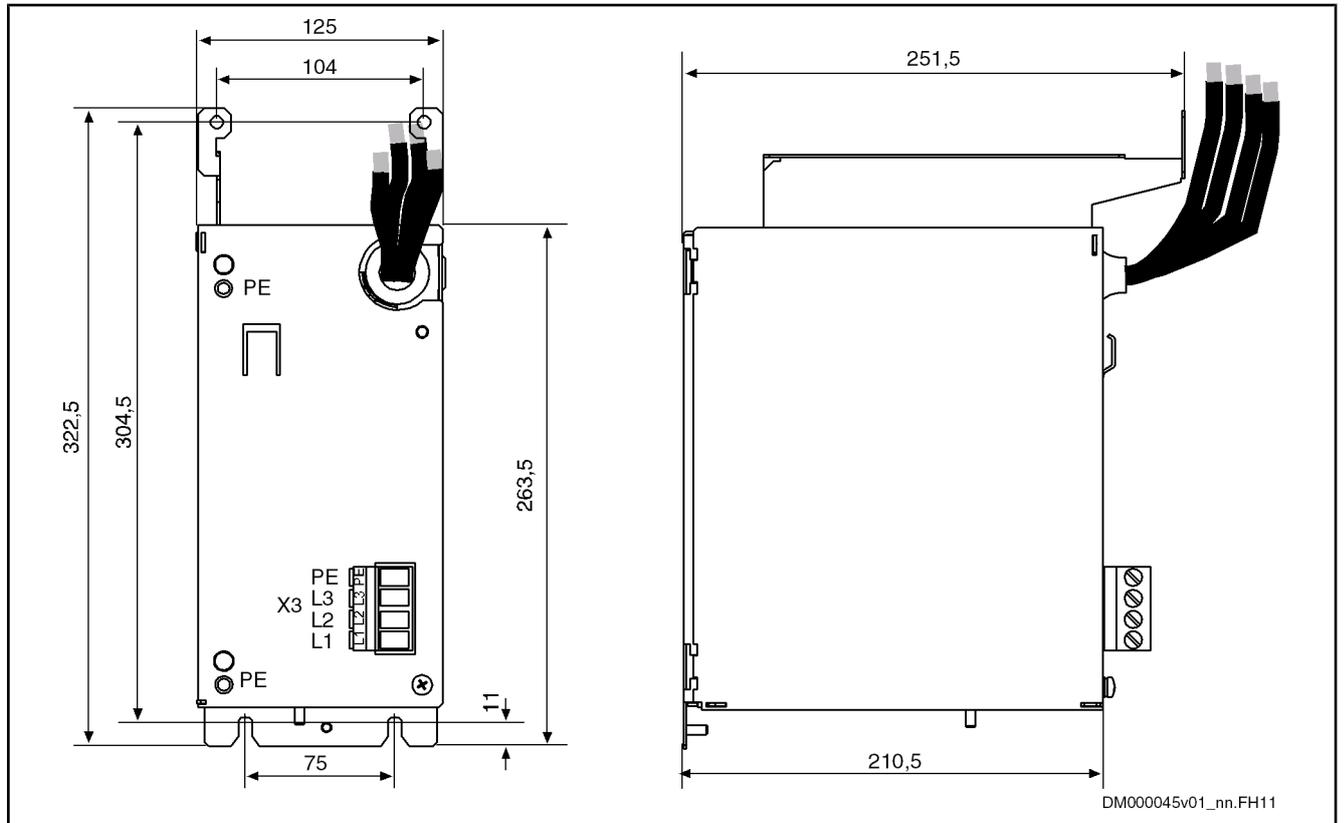


Fig.7-20: Dimensions mains filter HNK01.1A-A075-E0050

Mains Filter

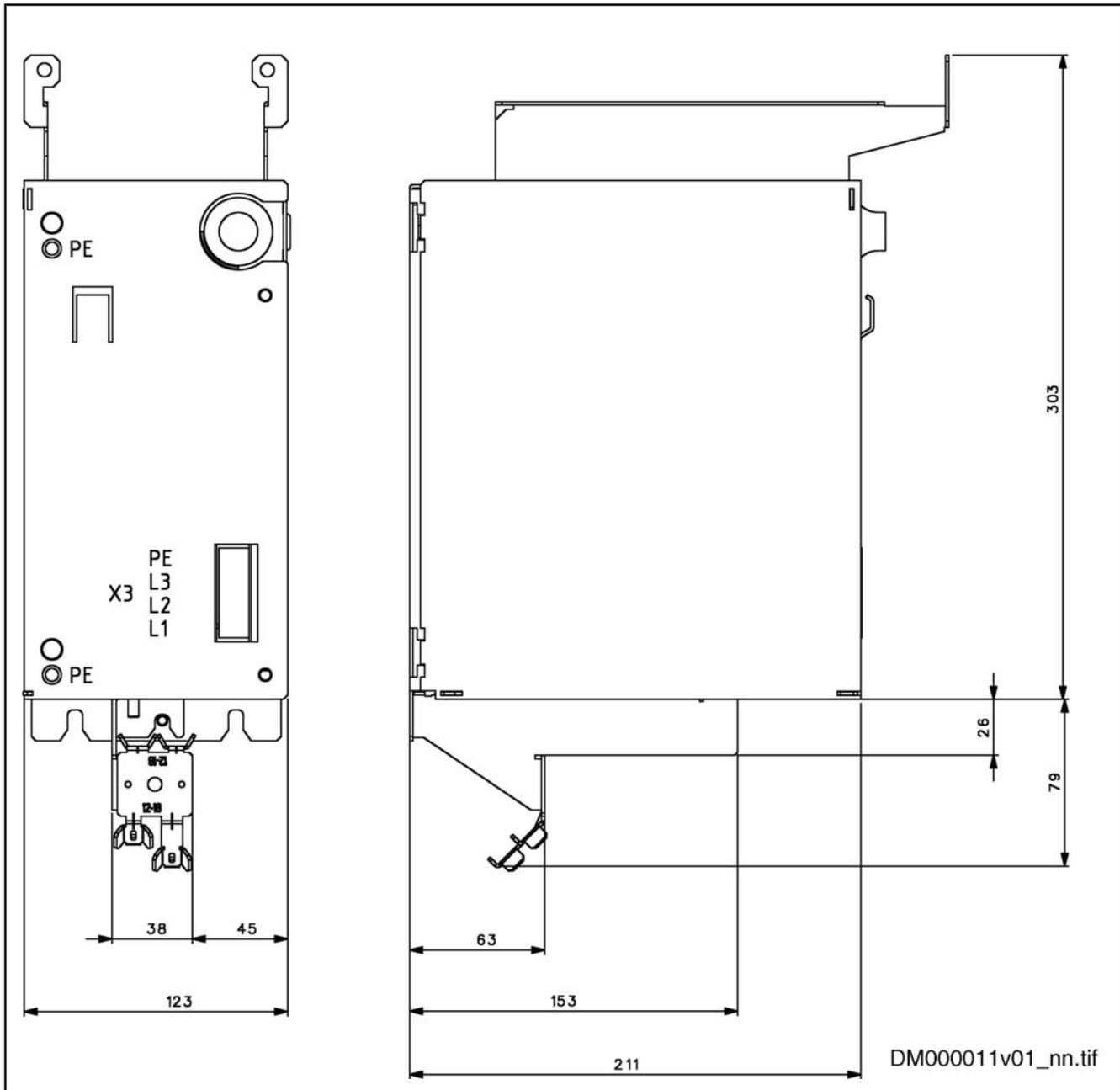


Fig.7-21: Dimensions mains filter HNK01.1A-A075-E0050 with HAS02

Mains Filter

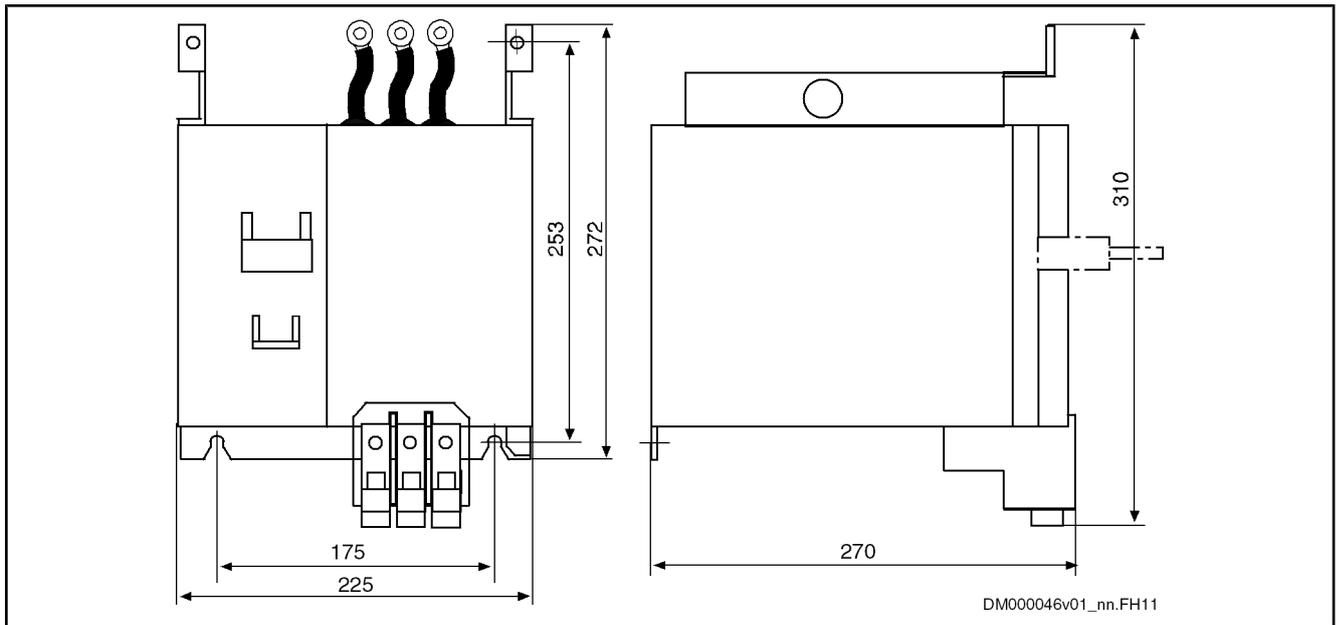


Fig.7-22: Dimensions mains filter HNK01.1A-A075-E0080/0106

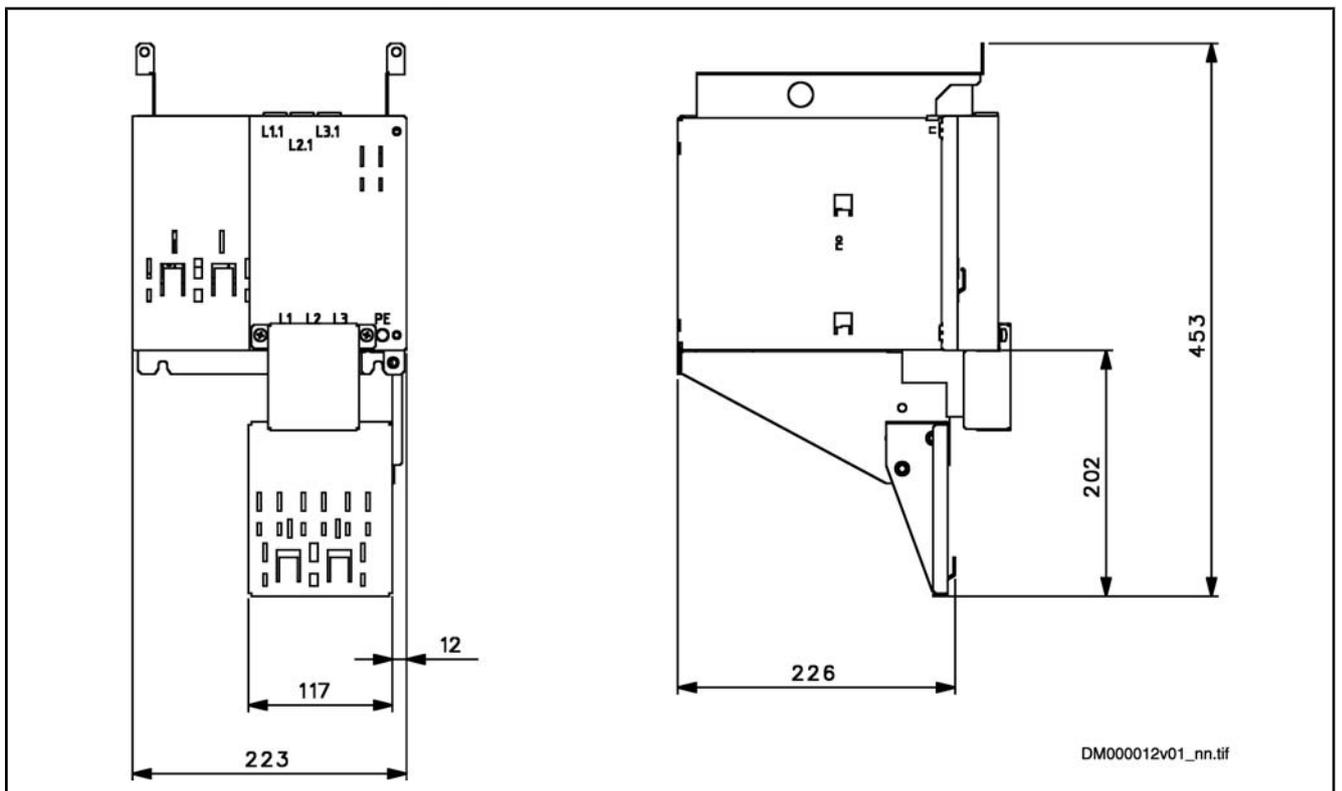


Fig.7-23: Dimensions mains filter HNK01.1A-A075-E0080/0106 with HAS02

Mains Filter

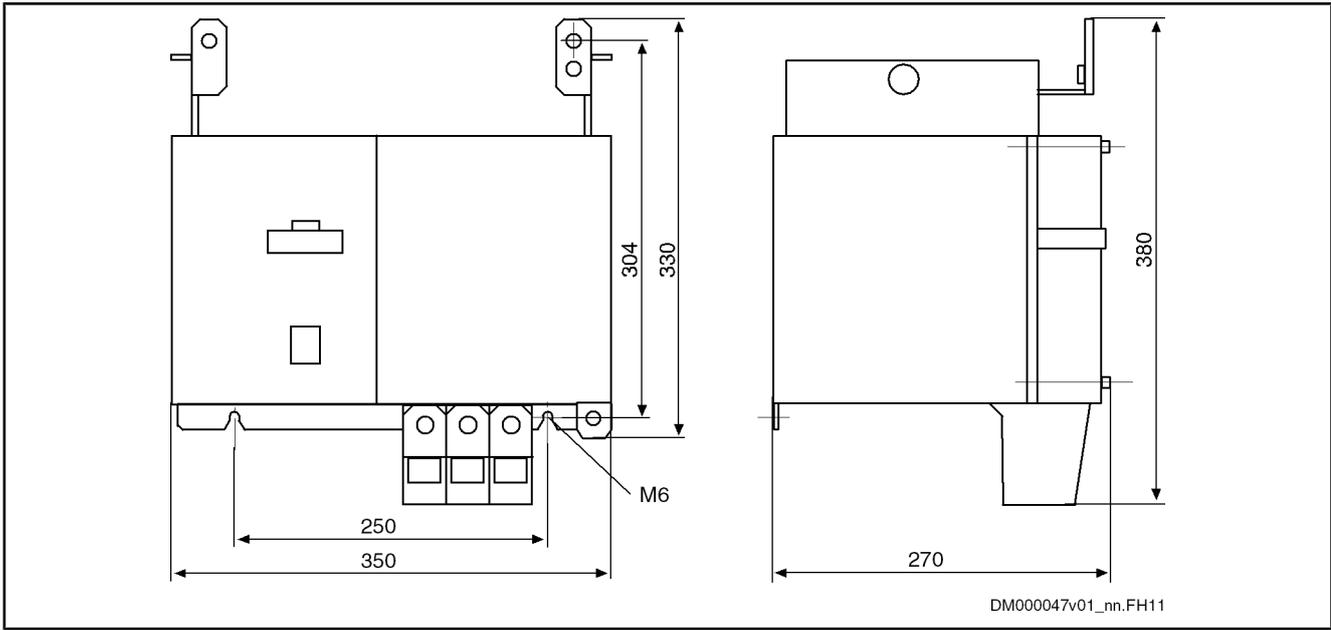


Fig.7-24: Dimensions mains filter HNK01.1A-A075-E0146

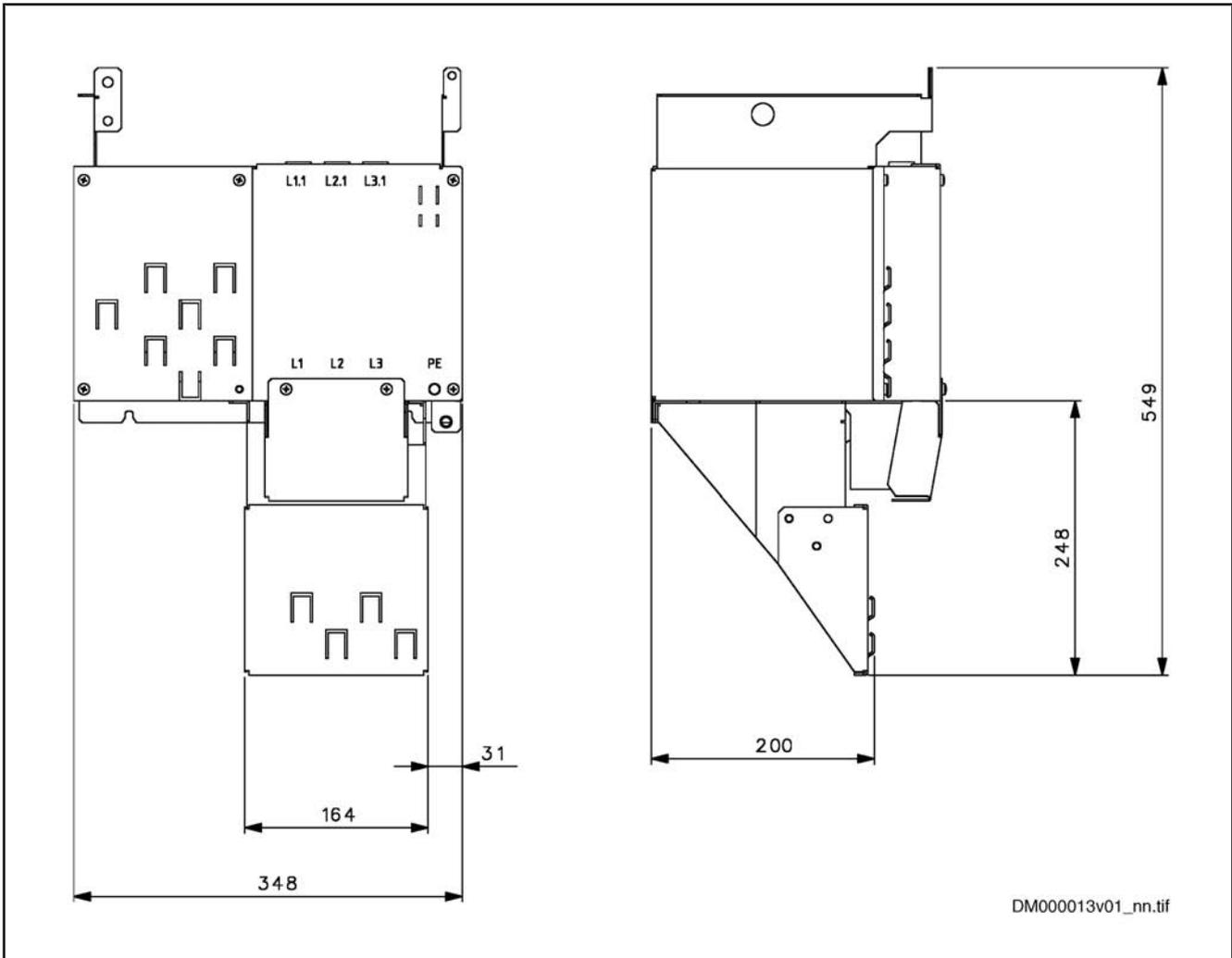


Fig.7-25: Dimensions mains filter HNK01.1A-A075-E0146 with HAS02

## 7.3.4 Electrical Data HNK01.1

Circuit Diagram

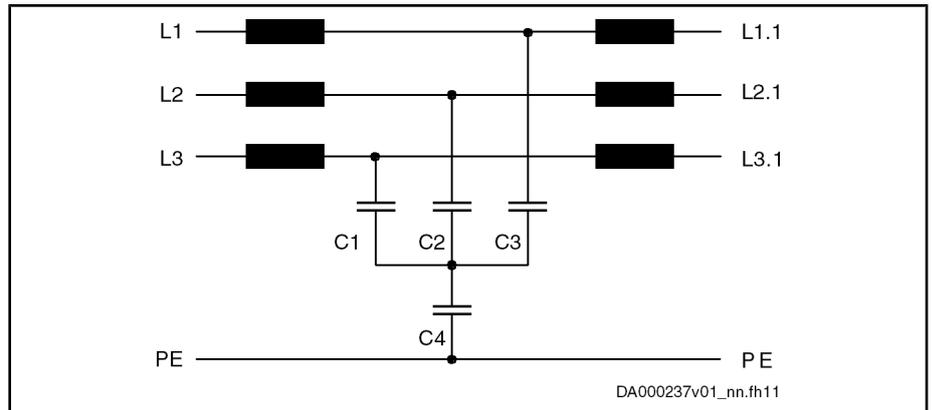
C1, C2, C3    Approx. 3.3  $\mu$ FC4            Approx. 0.5  $\mu$ F

Fig. 7-26:    Block diagram HNK01

### Technical data - Currents, voltages, power

Description	Symbol	Unit	HNK01.1A-	HNK01.1A-	HNK01.1A-	HNK01.1A-
			A075-E0050-	A075-E0080-	A075-E0106-	A075-E0146-
			A-500-NNNN	A-500-NNNN	A-500-NNNN	A-500-NNNN
Degree of protection according to IEC60529			IP20			
Listing according to UL standard (UL)			Listed as optional part of HCS03			
Listing according to CSA standard (UL)			-			
Minimum distance on the bottom of the device <sup>1)</sup>	$d_{bot}$	mm	100			
Minimum distance on the top of the device <sup>2)</sup>	$d_{top}$	mm	Mounted to HCS03			
Mass (weight)	m	kg	15,00	20,00	28,00	
Mains voltage three-phase at TN-S, TN-C, TT mains	$U_{LN}$	V	380...480			
Mains voltage three-phase at Corner-grounded-Delta mains <sup>3)</sup>	$U_{LN}$	V	380...480			
Mains voltage three-phase at IT mains <sup>4)</sup>	$U_{LN}$	V	380...480			
Tolerance $U_{LN}$ (UL)		%	$\pm 10$			
Input frequency (UL)	$f_{LN}$	Hz	50...60			
Tolerance input frequency (UL)		Hz	$\pm 2$			
Continuous current	$I_{Lcont}$	A	50	80	106	146
Typical inductance per winding at $I_{cont}$	$L_{typ}$	$\mu$ H	571	362	240	170

## Mains Filter

Description	Symbol	Unit	HNK01.1A-A075-E0050-A-500-NNNN	HNK01.1A-A075-E0080-A-500-NNNN	HNK01.1A-A075-E0106-A-500-NNNN	HNK01.1A-A075-E0146-A-500-NNNN
Power dissipation at continuous current and continuous DC bus power respectively (UL) <sup>5)</sup>	$P_{Diss\_cont}$	W	55	90	120	140
Insulation resistance at DC 500 V	$R_{is}$	Mohm	>15			
Required wire size according to IEC 60364-5-52; at $I_{L\_cont}$ <sup>6)</sup>	$A_{LN}$	mm <sup>2</sup>	16	35	50	95
Required wire size according to UL 508 A (internal wiring); at $I_{L\_cont}$ (UL) <sup>7)</sup>	$A_{LN}$	AWG	8	4	2	1/0

- 1) 2) See fig. "Air intake and air outlet at drive controller"  
 3) 4) Mains voltage > ULN: Use a transformer with grounded neutral point, don't use autotransformers!  
 5) HMV, HCS: Plus dissipation of braking resistor, control section  
 6) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °C  
 7) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C

Fig.7-27: HNK - Technical data - Currents, voltages, power

### 7.3.5 Arrangement of the Components Drive Controller HCS03 and Mains Filter HNK01



**DANGER**

**Lethal electric shock caused by live parts with more than 50 V!**

Establish equipment grounding connection between mains filter HNK01 and drive controller HCS03. Screw joint bars to guide bar.

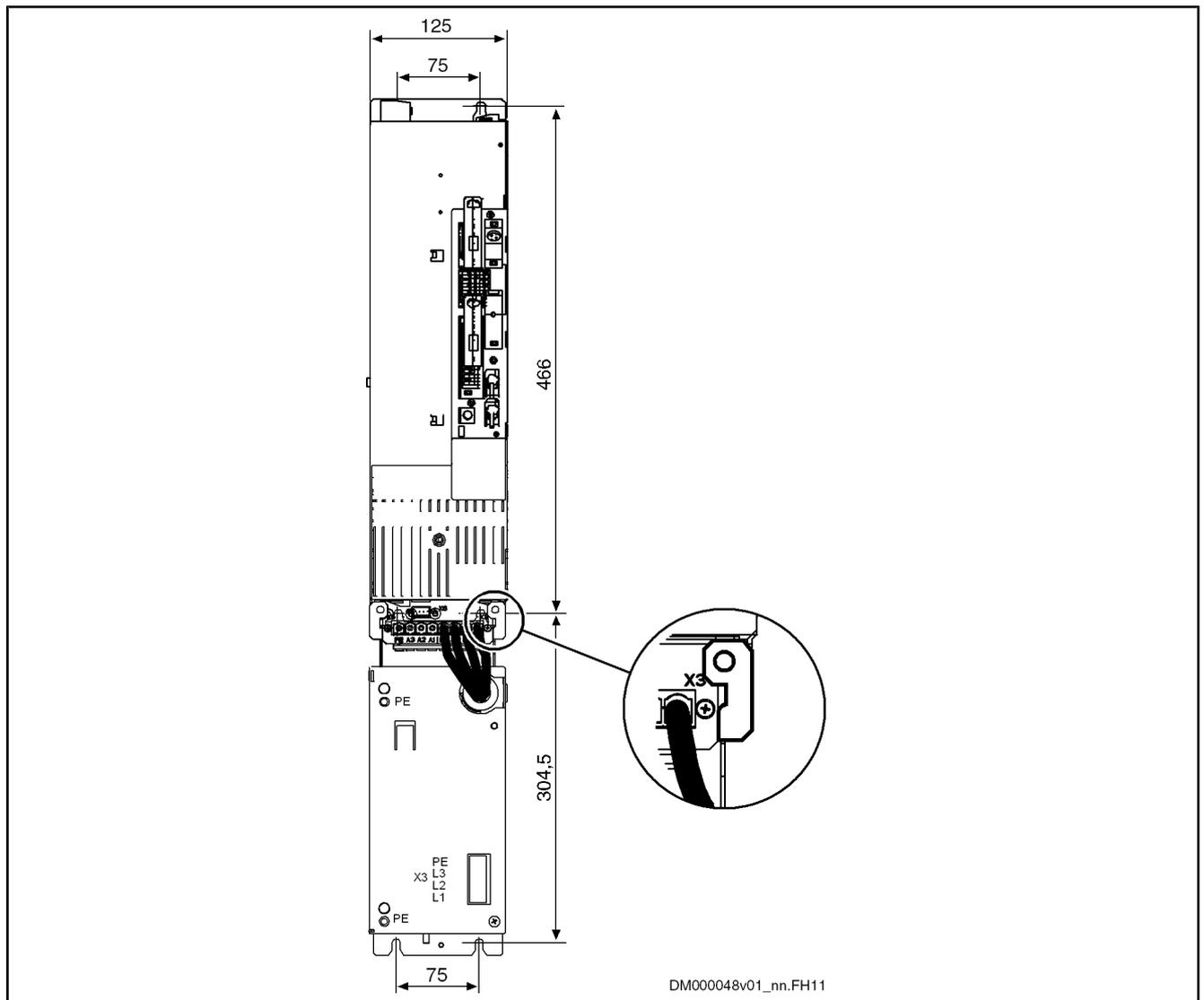
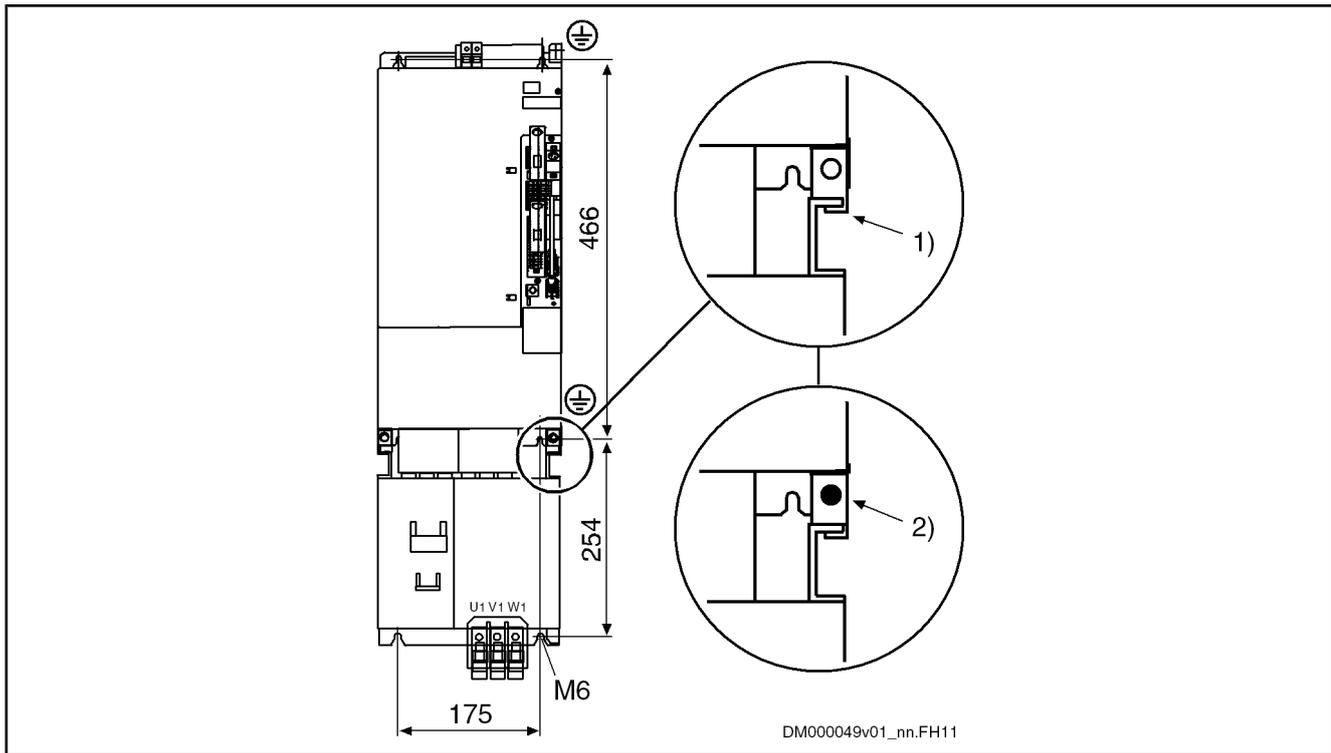


Fig.7-28:

Put mains filter on guide bar. Ensure equipment grounding connection by screwing the mounting link.

Arrangement of device HCS03.1E-...-W0070 and mains filter HNK01.-  
\*\*\*-E0050

Mains Filter



- 1) Put mains filter on guide bar
  - 2) Ensure equipment grounding connection by screwing the mounting link
- Fig. 7-29: Arrangement of device HCS03.1E-...-W0100 / ...-W0150 and mains filter HNK01.-\*\*\*-E0080 / ...-E0106*

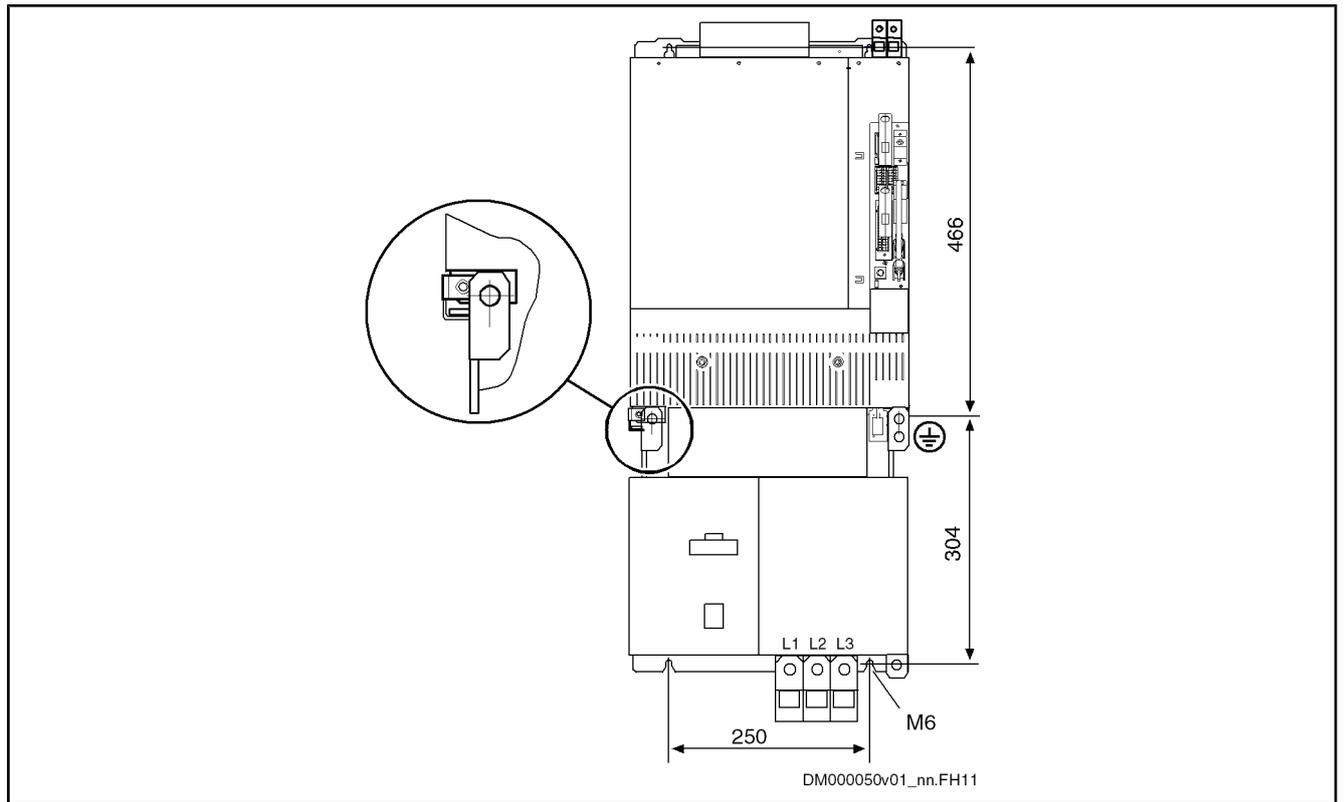


Fig.7-30:

Put mains filter on guide bar. Ensure equipment grounding connection by screwing the mounting link.  
Arrangement of device HCS03.1E-...-W0210 and mains filter HNK01.-\*\*\*-E0146



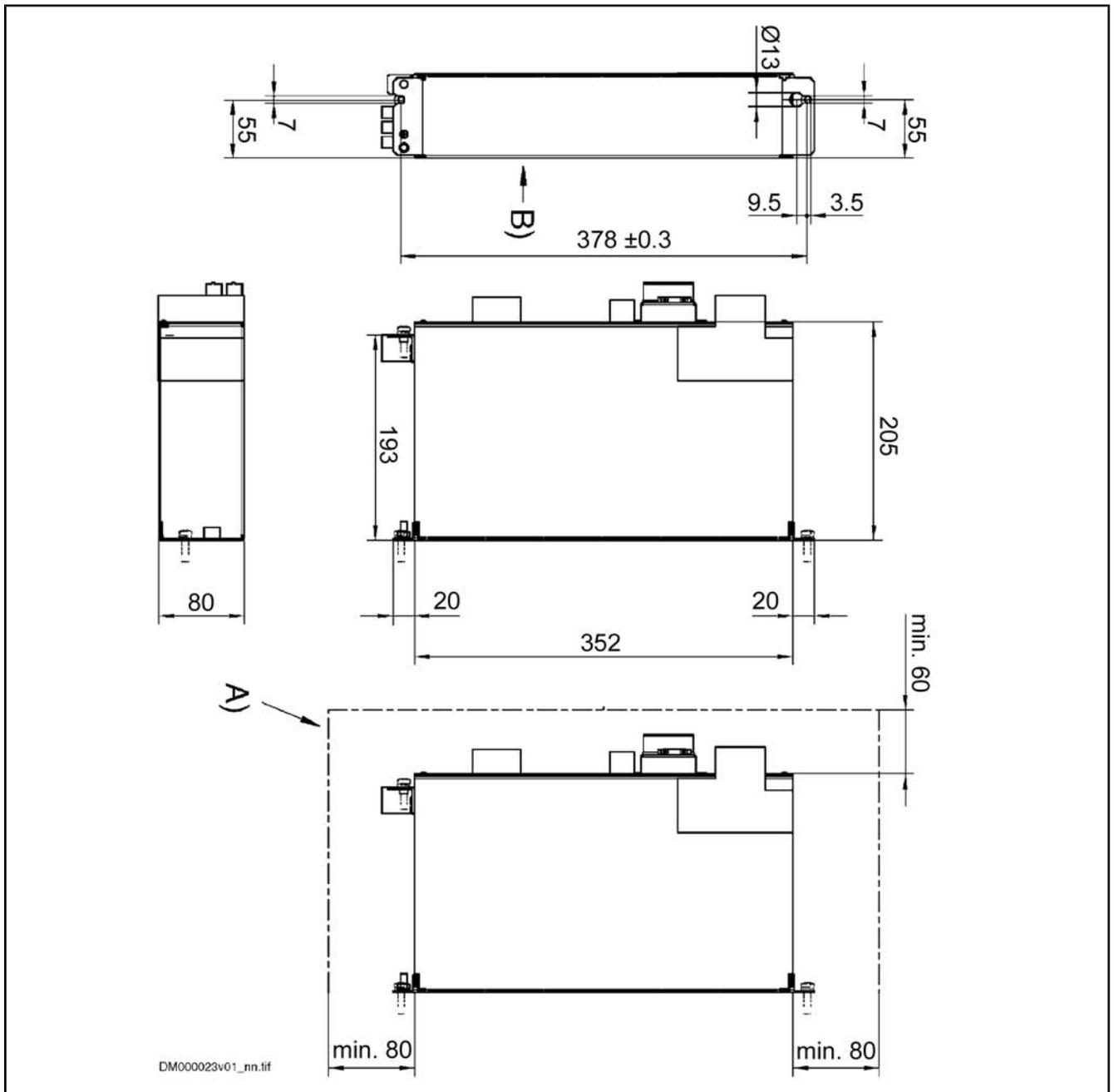
## 7.4.2 Mechanical Data HNS02.1

### Dimensions



#### Mounting position and distances

Mount HNS02.1 in the control cabinet in normal mounting position G1 and allow cooling by natural convection. Observe the minimum mounting clearance of the device.



A) Data in mm  
Minimum mounting clearance  
B) Rear view!  
Fig.7-32: Dimensions HNS02.1

## Mains Filter

## 7.4.3 Electrical Data HNS02.1

Description	Symbol	Value
Power dissipation	W	75
Phase current (continuous current)	A	23
Phase current (peak current <sup>1)</sup> )	A	55
Maximum leakage current at filter input (mains side) with 12 drive controllers and 200 m motor cable	A	0,57
Leakage current at filter output (load side) with 12 drive controllers and 200 m motor cable	A	0,7

Fig. 7-33: Data

Description	Symbol	Value
Allowed THD (Total Harmonic Distortion)	%	 See Project Planning Manual "Rexroth IndraDrive, Drive System"
Reduction of allowed operating data due to harmonics component	-	
Connecting voltage	V	3 × AC 380 ... 480 ±10%, 50/60 Hz ±2%
Sum of leakage currents at filter input with supply unit switched off:		
1 phase failed	A	< 0,8
2 phases failed	A	< 2,0
Insulation resistance (phase – ground) (discharging resistances of Y-capacitors)	kOhm	> 730
Degree of protection	-	IP20
Weight	kg	14,9
Materials	-	Free of asbestos and silicone

- 1) Duration: 300 ms  
 Duty cycle for infeeding devices: 0.67 s  
 Duty cycle for regenerative devices: 1.42 s  
 Basic load: 60% continuous current

Fig. 7-34: Data

## 7.4.4 Connection Points

**WARNING**

**Lethal electric shock caused by live parts with more than 50 V!**

**Before** working on the wiring at filter, mains choke or supply unit:

1. Disconnect the device from the mains voltage
2. Discharge the device-internal capacitors (short-circuit the power connections at filter output or choke input)

View	Description	Significance
	L1, L2, L3	Input for supply with mains voltage
	F1, F2, F3	Fuses between mains input (L1, L2, L3) and mains output (L1.1, L2.1, L3.1)
	X41.1, X41.2	Converter (D-Sub ↔ terminal block)
	X14 (L1.2, L2.2, L3.2)	Output to load HMV02 (X14, mains voltage synchronization)
	F4	Fuses before output X14
		Equipment grounding conductor
	L1.1, L2.1, L3.1	Output to load HMV02 (X3, mains connection)

Fig.7-35: Connection points and fuses

L1, L2, L3	Unit	Min.	Max.
Connection cable flexible	mm <sup>2</sup>	4	25
	AWG	10	4
Connection cable rigid	mm <sup>2</sup>	4	35
Tightening torque	Nm	-	4,5

Fig.7-36: Data - connection point L1, L2, L3

L1.1, L2.1, L3.1	Unit	Min.	Max.
Connection cable flexible	mm <sup>2</sup>	4	10
	AWG	10	6
Connection cable rigid	mm <sup>2</sup>	4	16
Tightening torque	Nm	-	1,8

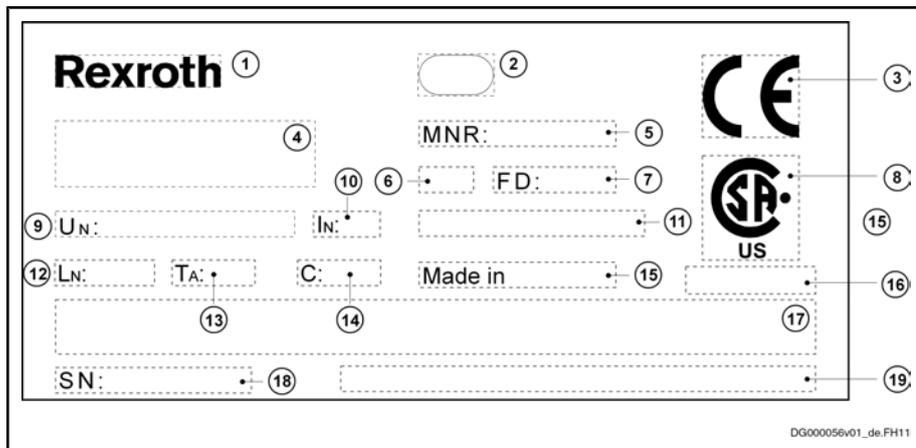
Fig.7-37: Data - connection point L1.1, L2.1, L3.1





HNL - Mains Chokes for Supply Units and Converters

8.1.2 Type Plate



- 1 Word mark
- 2 Business facility number
- 3 CE label
- 4 Type designation (two lines, 20 characters each)
- 5 Part number
- 6 Change release
- 7 Production date (YYWww)
- 8 Certification label
- 9 Nominal voltage / frequency
- 10 Nominal current
- 11 Number of design specification
- 12 Nominal inductance
- 13 Temperature
- 14 Number and value of additional capacitors
- 15 Designation of origin
- 16 Approval number
- 17 Bar code (39 or 93)
- 18 Serial number
- 19 Company address

Fig. 8-2: Type plate

## 8.2 HNL01.1E - Mains Chokes, Infeeding

### 8.2.1 Technical Data

#### Mechanical System and Mounting

Dimensions Type 1:

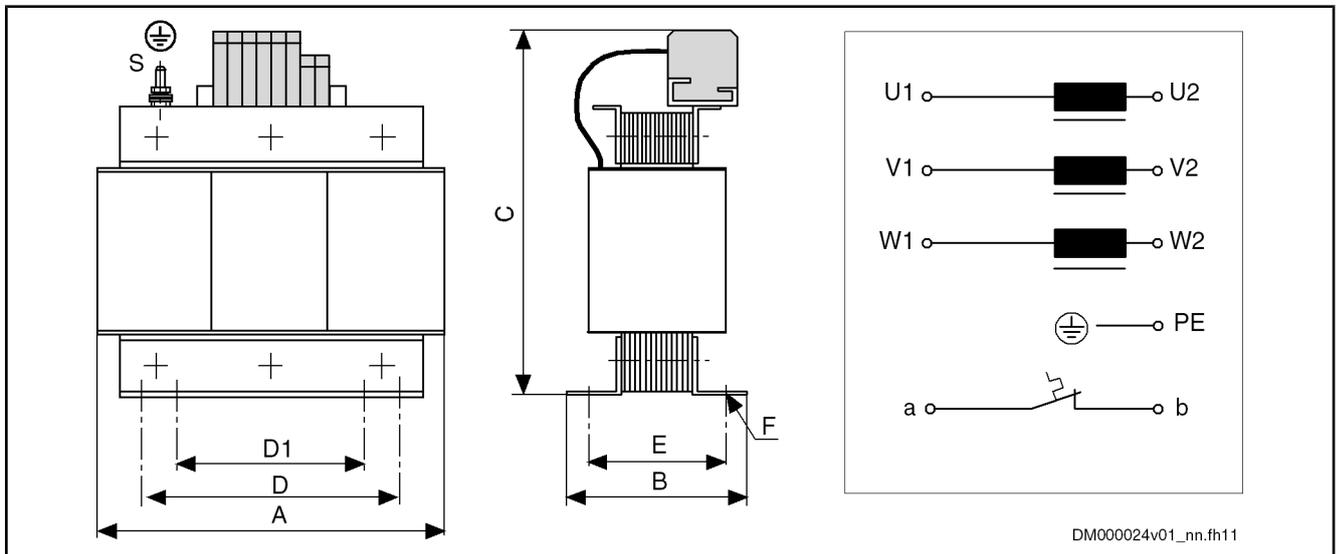


Fig.8-3: Dimensions type 1

Dimensions Type 2:

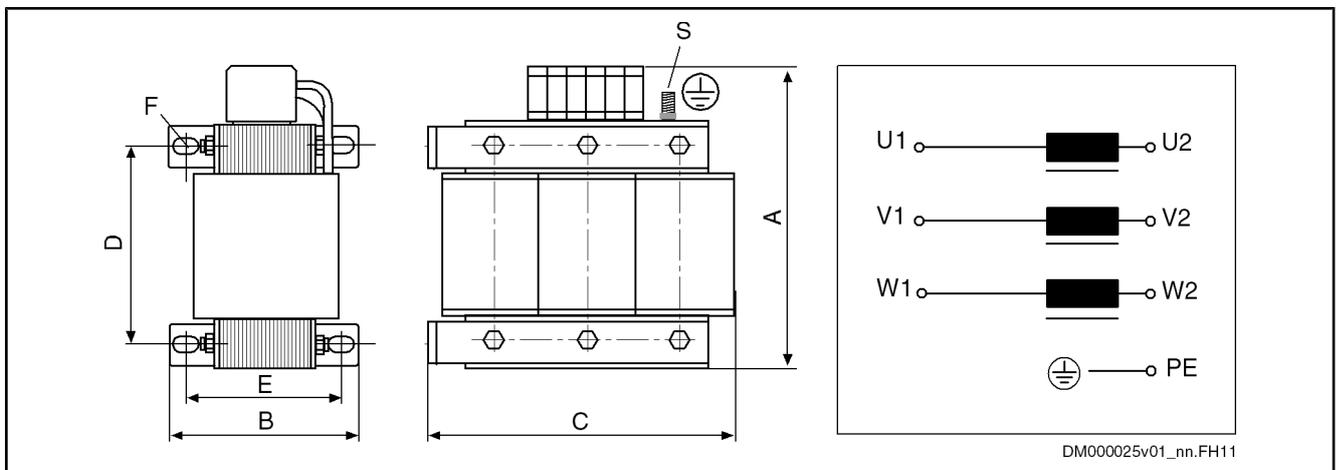


Fig.8-4: Dimensions type 2

HNL - Mains Chokes for Supply Units and Converters

Dimensions Type 3:

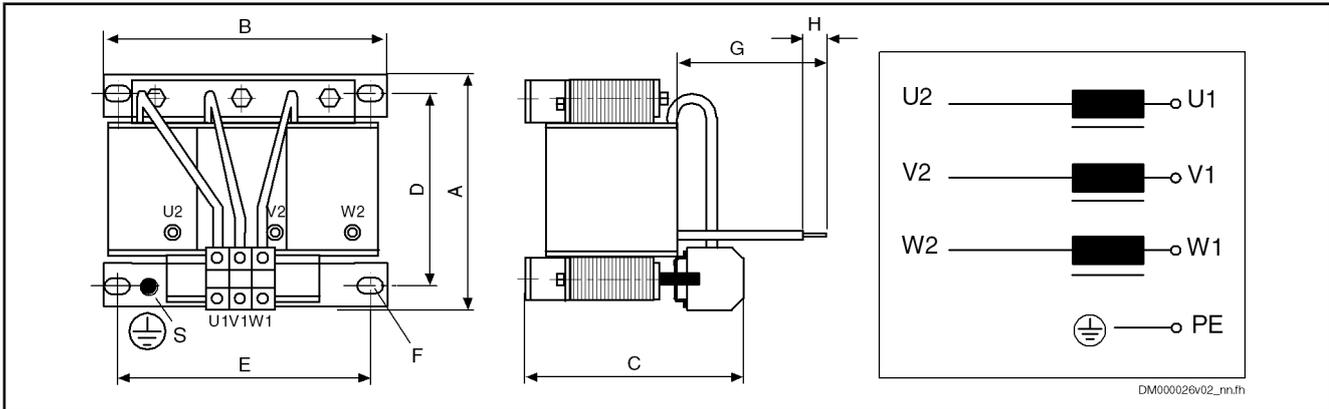


Fig.8-5: Dimensions type 3

Dimensions Type 4:

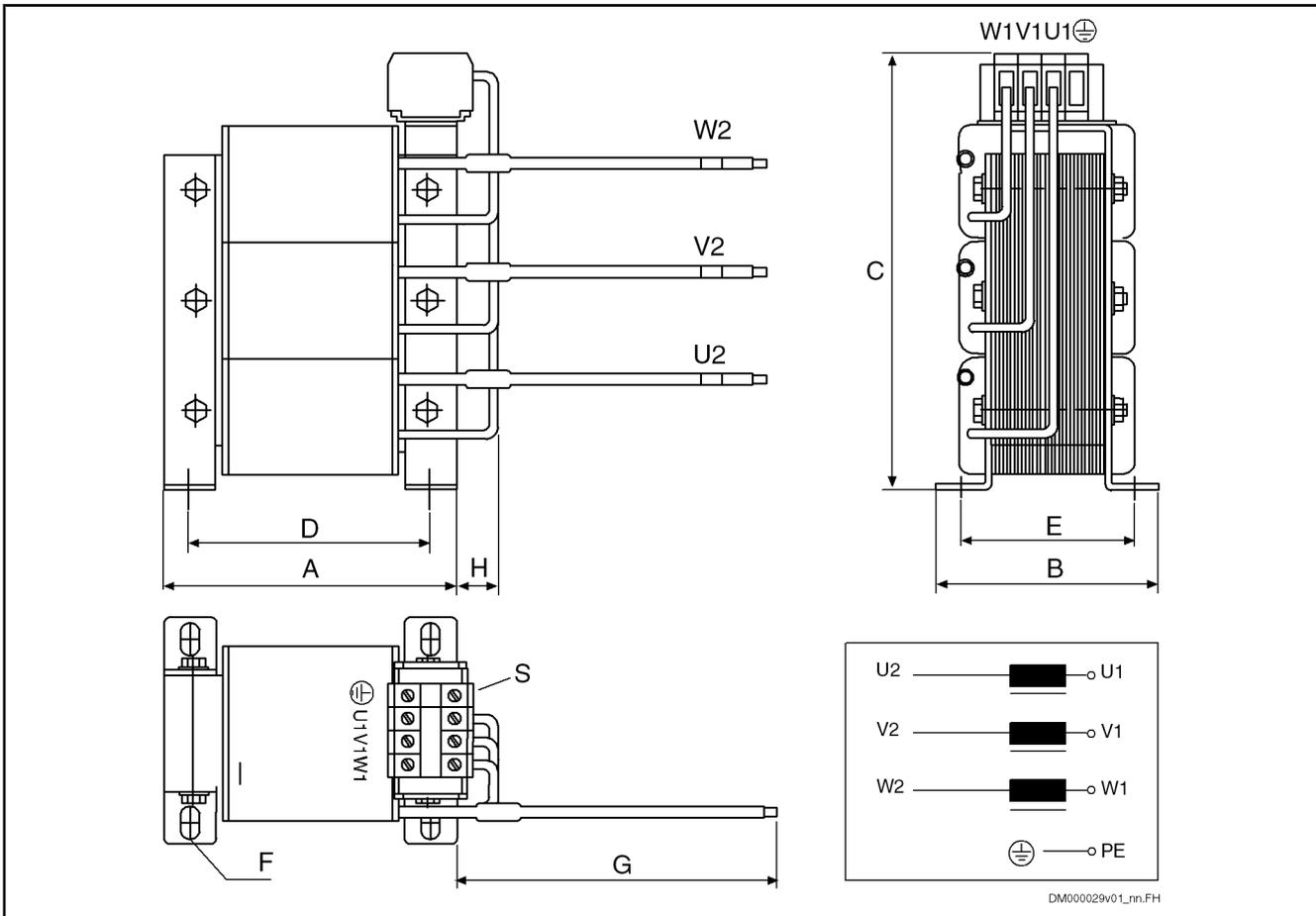


Fig.8-6: Dimensions type 4

Mains choke	Type	Dimensions [mm]										Weight [kg]
		A	B	C	D	D1	E	F 1)	G	H	S	
HNL01.1E-1000-N0012-A-500-NNNN	1	120	61	164	81	-	44	6,4 × 11	-	-	M5	2,7
HNL01.1E-1000-N0020-A-500-NNNN	1	150	66,5	184	113	-	49,5	6,4 × 11	-	-	M5	3,9

## HNL - Mains Chokes for Supply Units and Converters

Mains choke	Type	Dimensions [mm]										Weight [kg]
		A	B	C	D	D1	E	F <sup>1)</sup>	G	H	S	
HNL01.1E-0600-N0032-A-500-NNNN	1	150	66,5	185	113	-	49,5	6,4 × 11	-	-	M5	4,5
HNL01.1E-0571-N0050-A-500-NNNN	4	153	100	238	127	-	80	8,5 × 12	400	30	-	13
HNL01.1E-0400-N0051-A-480-NNNN	1	180	112	225	125	80	87	7 × 15	-	-	M6	13,5
HNL01.1E-0362-N0080-A-500-NNNN	3	175	205	180	145	-	185	8,5 × 12	350	Ap- prox. 12	M6	13
HNL01.1E-0240-N0106-A-500-NNNN	3	193	205	210	145	-	185	8,5 × 12	380	Ap- prox. 12	M6	15
HNL01.1E-0200-N0125-A-480-NNNN	1	230	148	295	180	-	122	8 × 12	-	-	M8	24
HNL01.1E-0170-N0146-A-500-NNNN	3	205	250	230	152	-	230	8,5 × 12	400	Ap- prox. 12	M8	22
HNL01.1E-0100-N0202-A-480-NNNN	1	265	152	350	215	-	126	15 × 11	-	-	M8	33

1) Long hole in "B" direction  
Fig. 8-7: Dimensions, weight

Mains choke	Connection cross section mm <sup>2</sup> / AWG		Tightening torque Nm	
	U1, V1, W1 U2, V2, W2	a, b	U1, V1, W1 U2, V2, W2	a, b
HNL01.1E-1000-N0012-A-500-NNNN	4	4	Observe the data imprinted on the component.	
HNL01.1E-1000-N0020-A-500-NNNN	6	4		
HNL01.1E-0600-N0032-A-500-NNNN	10	4		
HNL01.1E-0571-N0050-A-500-NNNN	16 / AWG 8	-		
HNL01.1E-0400-N0051-A-480-NNNN	16	2,5		
HNL01.1E-0362-N0080-A-500-NNNN	35 / AWG 6	-		
HNL01.1E-0240-N0106-A-500-NNNN	35 / AWG 1/0	-		
HNL01.1E-0200-N0125-A-480-NNNN	70	2,5		
HNL01.1E-0170-N0146-A-500-NNNN	50 / AWG 1/0	-		
HNL01.1E-0100-N0202-A-480-NNNN	150	2,5		

Fig. 8-8: Connection cross section, tightening torque

## Basic Data

Mains choke	U <sub>N</sub> [V]	I <sub>N</sub> [A]	L <sub>N</sub> [μH]	P <sub>V</sub> [W]	I <sub>max</sub> [A]	L <sub>min</sub> At I <sub>max</sub>
HNL01.1E-1000-N0012-A-500-NNNN	500	12	3 × 1000	40	25	50% of L <sub>N</sub>
HNL01.1E-1000-N0020-A-500-NNNN	500	20	3 × 1000	60	50	50% of L <sub>N</sub>
HNL01.1E-0600-N0032-A-500-NNNN	500	32	3 × 600	75	80	50% of L <sub>N</sub>

## HNL - Mains Chokes for Supply Units and Converters

Mains choke	$U_N$ [V]	$I_N$ [A]	$L_N$ [μH]	$P_V$ [W]	$I_{max}$ [A]	$L_{min}$ At $I_{max}$
HNL01.1E-0571-N0050-A-500-NNNN	500	50	3 × 571	50	100	50% of $L_N$
HNL01.1E-0400-N0051-A-480-NNNN	480	51	3 × 400	165	77	50% of $L_N$
HNL01.1E-0362-N0080-A-500-NNNN	500	80	3 × 362	80	160	50% of $L_N$
HNL01.1E-0240-N0106-A-500-NNNN	500	106	3 × 240	100	212	50% of $L_N$
HNL01.1E-0200-N0125-A-480-NNNN	480	125	3 × 200	170	188	50% of $L_N$
HNL01.1E-0170-N0146-A-500-NNNN	500	146	3 × 170	130	292	50% of $L_N$
HNL01.1E-0100-N0202-A-480-NNNN	480	202	3 × 100	200	303	50% of $L_N$

Fig.8-9: Electrical data

## Temperature Contact a, b

Switching capacity	Switching temperature
1 A / AC 250 V DC 24 V	125 °C HNL01.1E mains chokes of type 1 are equipped with a temperature contact (a, b), types 2, 3 and 4 are not.

Fig.8-10: Temperature contact

## 8.3 HNL01.1R - Mains Chokes, Regenerative

## 8.3.1 Safety Instruction

**WARNING****High electrical voltage! Danger to life, electric shock and severe bodily injury!**

- After switch-off, the capacitors in the choke will remain charged for a longer time which can cause electric shock.
- Only operate the choke with connected discharging device or with connection to "X14, Mains voltage synchronization" at a regenerative HMV supply unit (HMV01.1R).
- Unless you use a supply unit with connection "X14, Mains voltage synchronization", operation is only allowed with a connected discharging device, e.g. with HNF mains filter or additional discharging resistors.
- Before accessing the choke, wait up to 30 minutes after switching off power to allow the choke to discharge.
- Verify isolation from supply of energized connections before touching the connections.
- Before switching on, read and observe the notes on project planning.

### 8.3.2 Technical Data

#### Mechanical System and Mounting

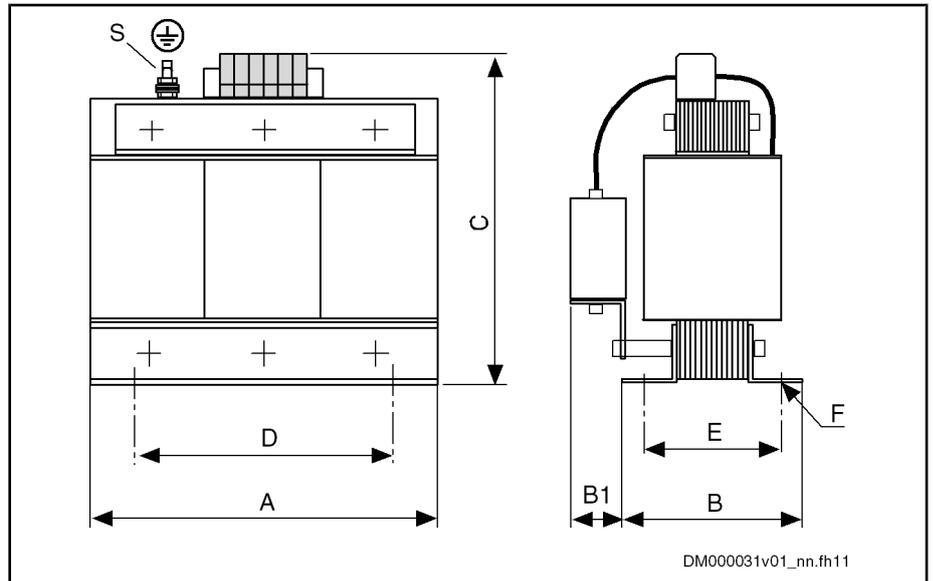


Fig. 8-11: Dimensions

Mains choke	Dimensions [mm]								Weight [kg]
	A	B	B1	C	D	E	F 1)	S	
HNL01.1R-0980-C0026-A-480-NNNN	210	108	64	245	175	85	8 × 12	M6	16
HNL01.1R-0590-C0065-A-480-NNNN	300	155	50	360	240	123	11 × 15	M8	45
HNL01.1R-0540-C0094-A-480-NNNN	340	174	55	385	290	132	11 × 15	M8	65
HNL01.1R-0300-C0180-A-480-NNNN	340	191	70	400	290	147	11 × 15	M8	73

1) Long hole in "B" direction

Fig. 8-12: Dimensions, weight

#### Basic Data

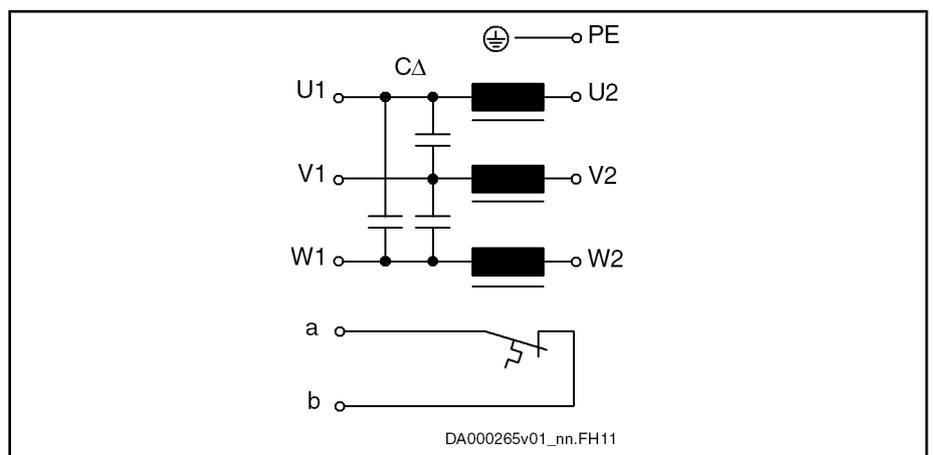


Fig. 8-13: Circuit diagram HNL01.1R

Connect the choke inputs U1, V1, W1 to the **supply mains** and the choke outputs U2, V2, W2 to the input of the **supply unit**.

## HNL - Mains Chokes for Supply Units and Converters

Mains choke	Connection cross section mm <sup>2</sup> / AWG		Tightening torque Nm	
	U1, V1, W1 U2, V2, W2	a, b	U1, V1, W1 U2, V2, W2	a, b
HNL01.1R-0980-C0026-A-480-NNNN	16	2,5	Observe the data imprinted on the component.	
HNL01.1R-0590-C0065-A-480-NNNN	50	2,5		
HNL01.1R-0540-C0094-A-480-NNNN	70	2,5		
HNL01.1R-0300-C0180-A-480-NNNN	95	2,5		

Fig.8-14: Connection cross section, tightening torque

## Temperature Contact a, b

Switching capacity	Switching temperature
1 A / AC 250 V	125 °C
DC 24 V	150 °C (HNL01.1R-0300-C0180-A-480-NNNN)

Fig.8-15: Temperature contact a, b

## Electrical data

Mains choke	U <sub>N</sub> [V]	I <sub>N</sub> [A]	P <sub>V</sub> [W]	L <sub>N</sub> [μH]	I <sub>max</sub> <sup>1)</sup> [A]	L <sub>min</sub> At I <sub>max</sub>	CΔ [μF]
HNL01.1R-0980-C0026-A-480-NNNN	480	26	225	3 × 980	65	80% of L <sub>N</sub>	3 × 10
HNL01.1R-0590-C0065-A-480-NNNN	480	65	310	3 × 590	163	80% of L <sub>N</sub>	3 × 20
HNL01.1R-0540-C0094-A-480-NNNN	480	94	420	3 × 540	235	80% of L <sub>N</sub>	3 × 20
HNL01.1R-0300-C0180-A-480-NNNN	480	180	800	3 × 300	360	80% of L <sub>N</sub>	3 × 30

1) For 300 ms at 1.42 s duty cycle time and 60 % basic load

Fig.8-16: Electrical data

## 8.4 HNL01.1\*-\*\*\*\*-S - Mains Chokes, Current-Compensated

## 8.4.1 Function

Current-compensated mains chokes

- reduce asymmetric currents (leakage currents) in the mains connection phase of the drive system by high asymmetric inductance values
- do not replace the function of conventional mains chokes

### 8.4.2 Technical Data

#### Mechanical System and Mounting

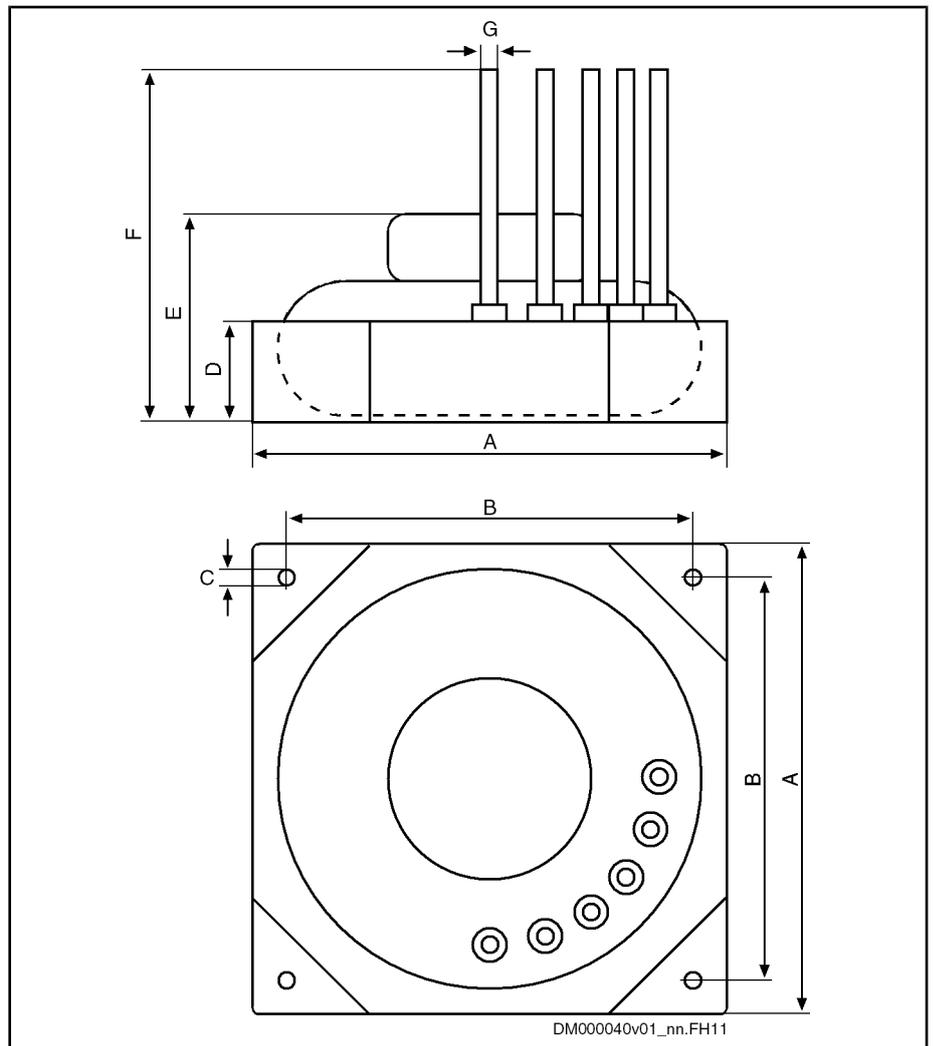


Fig.8-17: Dimensions

Mains choke	Dimensions [mm <sup>2</sup> ]							Weight [kg]
	A	B	C	D	E	F	G	
HNL01.1E-5700-S0051-A-480-NNNN	230	200	6.5	30	105	600	25 <sup>1)</sup>	11
HNL01.1E-2800-S0125-A-480-NNNN	340	280	8.4	83	150	600	1/0 <sup>2)</sup>	26
HNL01.1E-3400-S0202-A-480-NNNN	340	280	8.4	83	185	600	5/0 <sup>2)</sup>	30
HNL01.1R-4200-S0026-A-480-NNNN	230	200	6.5	30	125	600	16 <sup>1)</sup>	12
HNL01.1R-6300-S0065-A-480-NNNN	250	200	6.5	55	155	600	25 <sup>1)</sup>	14
HNL01.1R-3000-S0094-A-480-NNNN	340	280	8.4	83	170	600	50 <sup>1)</sup>	24

1)

mm<sup>2</sup>

2)

AWG

Fig.8-18: Dimensions, weight

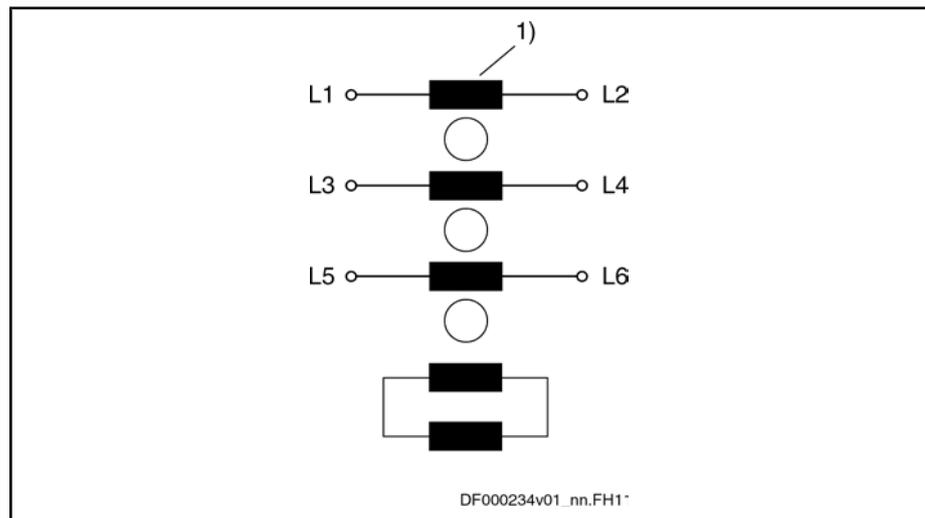
HNL - Mains Chokes for Supply Units and Converters

Basic Data

	Unit	E-5700-S0051	E-2800-S0125	E-3400-S0202	R-4200-S0026	R-6300-S0065	R-3000-S0094
Degree of protection		IP20					
Materials		Free of asbestos and silicone					
Certification		Acc. to UL 508 and CSA C22.2 No. 14-M91					
Connecting voltage	V	3 × AC 380 ... 480 ±10%, 50/60 Hz ±2%					
Inductance L <sub>N</sub>	mH	3 × 5,7	3 × 2,8	3 × 3,4	3 × 4,2	3 × 6,3	3 × 3,0
Minimum inductance, L <sub>min</sub>		0.8 × L <sub>N</sub> at I <sub>max</sub>					
Nominal current	A	51	125	202	26	65	94
Peak current <sup>1)</sup>	A	77	188	303	65	163	235
Total leakage current at power connection	A	< 2	< 2,2	< 2,2	< 2	< 2	< 2
Allowed power dissipation at nominal current and maximum leakage current	W	83	179	320	80	138	142

1) Duration: 300 ms; duty cycle: for infeeding devices: 0.67 s; for regenerative devices: 1.42 s; basic load: 60%

Fig.8-19: Basic data



1) 3 × 6.3 mH

Fig.8-20: Circuit diagram HNL...S (example HNL01.1R-6300-S0065-A-480-NNNN)

As a matter of principle, the current-compensated mains choke is connected between the conventional mains choke and the mains input of the supply unit.

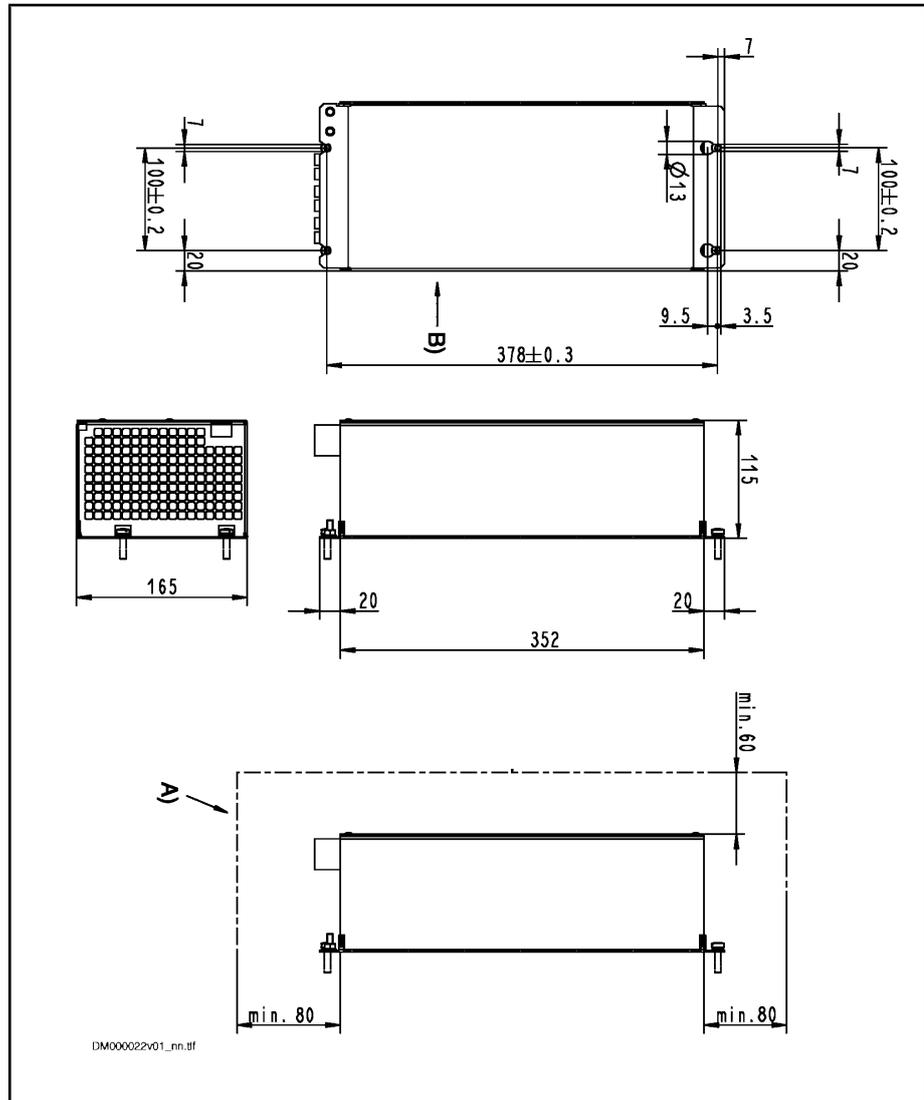


HNL - Mains Chokes for Supply Units and Converters

### 8.5.2 Technical Data

#### Mechanical System and Mounting

Dimensions



DM000022v01\_nn.tif

Data in mm

A) Minimum mounting clearance

B) Rear view!

Fig.8-22: Dimensions HNL02.1

Weight

HNL02.1R-0980-N0023-A-480-NNNN	HNL02.1R-0980-C0023-A-480-NNNN
12.5 kg	13 kg

Fig.8-23: Weight

#### Basic Data

	Unit	HNL02.1R-0980-N0023-A-480-NNNN	HNL02.1R-0980-C0023-A-480-NNNN
Degree of protection		IP20	
Operation temperature	°C	0 ... 55	

## HNL - Mains Chokes for Supply Units and Converters

	Unit	HNL02.1R-0980-N0023-A-480-NNNN	HNL02.1R-0980-C0023-A-480-NNNN
Nominal operating temperature	°C	40	
Certification		UL 506 and CAN/CSA C22.2 No. 66	Acc. to UL 508 C and CSA C22.2 No. 14-M91
Materials		Free of asbestos and silicone	
Rated voltage $U_{LN}$	V	3 AC 380 ... 480 $\pm$ 10%	
Nominal frequency $f_{LN}$	Hz	50/60 Hz $\pm$ 2%	
Inductance $L_N$	mH	3 $\times$ 0,98	
Minimum inductance, $L_{min}$		0.8 $\times$ $L_N$ at $I_{max}$	
Capacitors at mains input	$C_x$	-	3 $\times$ 10 $\mu$ F
Nominal current	A	23	
Peak current $I_{max}$ <sup>1)</sup>	A	55	
Total leakage current at power connection with 12 drive controllers and 200 m motor cable	A	< 0,7	
Power dissipation at nominal current and maximum leakage current	W	95	
Maximum allowed fusing of blower or temperature contact connection	A	4	
Switching capacity temperature contact (N/C)	V	AC 30 <sup>2)</sup>	AC 30 DC 24
	A	3	
Trigger temperature	°C	130	

1) Duration: 300 ms  
Duty cycle for infeeding devices: 0.67 s  
Duty cycle for regenerative devices: 1.42 s  
Basic load: 60%

2) In the scope of UL, operation with direct voltage is not allowed  
*Fig. 8-24: Specific data*

## Connection Points



**WARNING**

### Lethal electric shock caused by live parts with more than 50 V!

If wiring work is to be carried out at filter, mains choke or supply unit, discharge the device-internal capacitors after disconnecting the mains voltage. (Short-circuit the power connections at filter output or choke input)

HNL - Mains Chokes for Supply Units and Converters

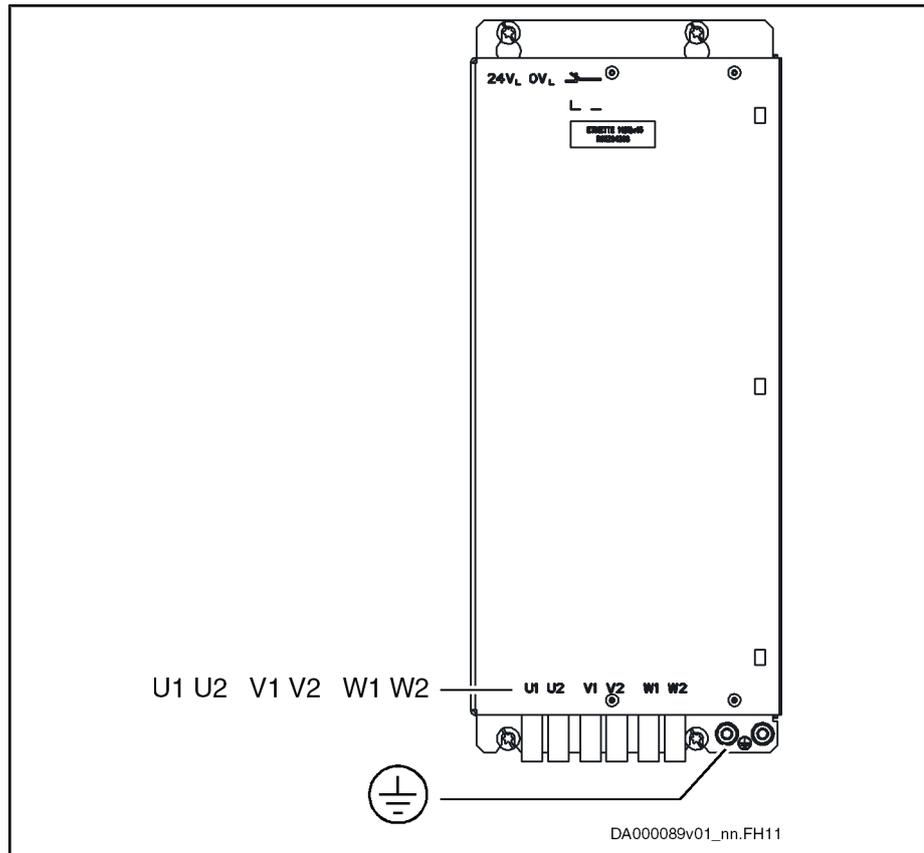


Fig.8-25: Connection points

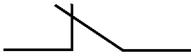
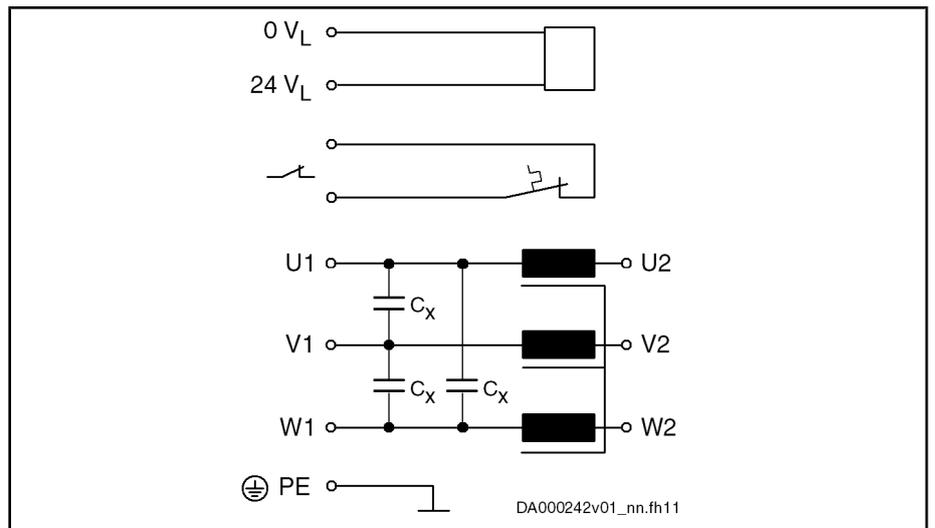
Connection	Significance
U1, V1, W1	Input from supply mains
U2, V2, W2	Output to supply unit HMV02
	Equipment grounding conductor
24V <sub>L</sub>	Supply voltage internal blower
0V <sub>L</sub>	
 DA000241v01_nn.fh11	Temperature contact

Fig.8-26: Connection points

HNL - Mains Chokes for Supply Units and Converters



$C_x$  Capacitors in design HNL02.1E-0980-C0023-A-480-NNNN  
 Fig. 8-27: Circuit diagram



## HLL01 - DC Bus Choke, Current-Compensated (Preliminary)

## 9 HLL01 - DC Bus Choke, Current-Compensated (Preliminary)

### 9.1 Brief Description, Usage and Commissioning

#### 9.1.1 Brief Description

HLL01 DC bus chokes connect Rexroth IndraDrive systems to supply units. The DC bus choke connects the DC bus of the supply unit to the DC bus of the drive system.

### 9.2 Type Code and Identification

#### 9.2.1 Type code



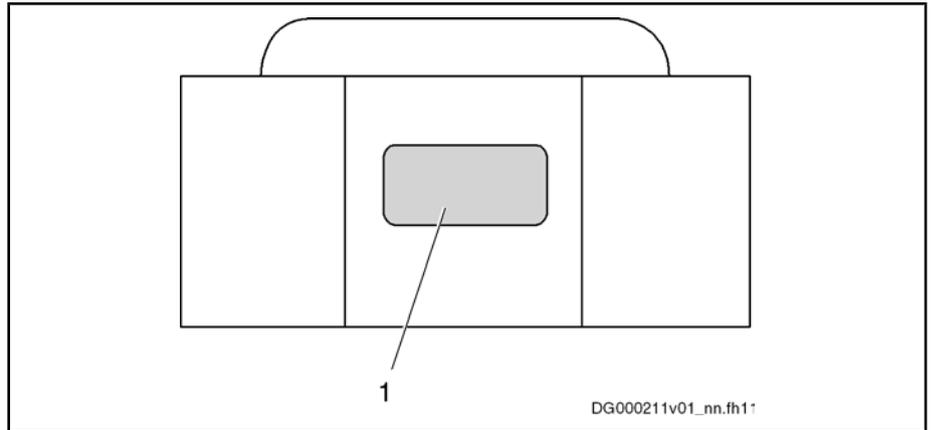
The following figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

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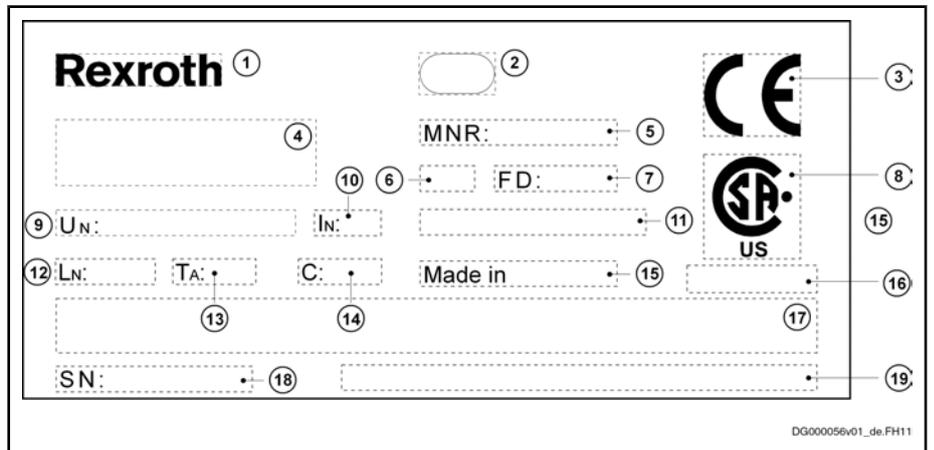
HLL01 - DC Bus Choke, Current-Compensated (Preliminary)

Type Plate Arrangement



1 Type plate  
Fig. 9-2: Position of type plate

Type Plate



- 1 Word mark
- 2 Business facility number
- 3 CE label
- 4 Type designation (two lines, 20 characters each)
- 5 Part number
- 6 Change release
- 7 Production date (YYWww)
- 8 Certification label
- 9 Nominal voltage / frequency
- 10 Nominal current
- 11 Number of design specification
- 12 Nominal inductance
- 13 Temperature
- 14 Number and value of additional capacitors
- 15 Designation of origin
- 16 Approval number
- 17 Bar code (39 or 93)
- 18 Serial number
- 19 Company address

Fig. 9-3: Type plate

## 9.3 Scope of Supply

DC bus choke HLL01

HLL01 - DC Bus Choke, Current-Compensated (Preliminary)

## 9.4 Installation and Mounting

### 9.4.1 General Information

---



**DANGER**

#### **Lethal electric shock caused by live parts with more than 50 V!**

Connect the DC bus choke to the equipment grounding system of the control cabinet.

Check the continuity of the equipment grounding conductors from the mains connection to the connected motors.

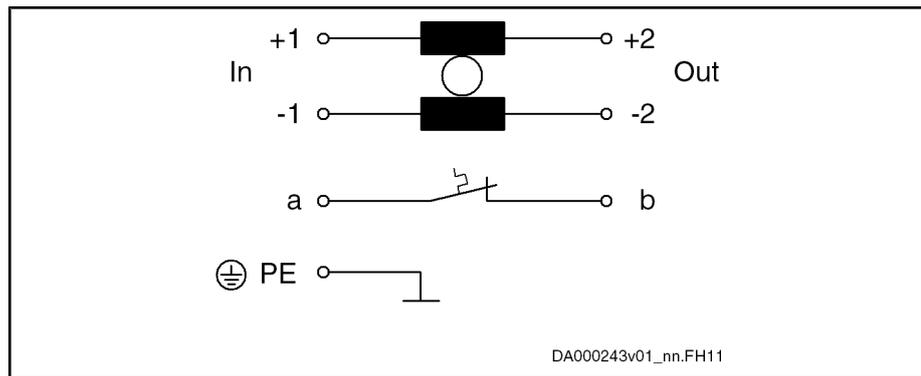
For the equipment grounding conductor, run stationary lines with the cross section of the lines of the DC bus choke power connections, but at least 10 mm<sup>2</sup>.

---

Mount HLL01 to a bare metal mounting plate which has been connected to the equipment grounding system of the control cabinet.



HLL01 - DC Bus Choke, Current-Compensated (Preliminary)



In +1, -1 Input (from supply unit)  
 Out +2, -2 Output (to drive system)  
 a, b Temperature contact  
 PE Equipment grounding conductor  
 Fig. 9-5: Circuit diagram HLL01.1

## 9.5 Technical Data

### Technical data - Currents, voltages, power

Description	Symbol	Unit	HLL01.1N-10M0-S0100-A-007-05A0-NNNN
Degree of protection according to IEC529			IP20
Allowed ambient temperature range	$T_{a\_work}$	°C	0 ... 40
Allowed ambient temperature range during operation with reduced nominal data	$T_{a\_work\_red}$	°C	0 ... 55
Reduced nominal current at $T_{a\_work} < T_a < T_{a\_work\_red}$	$f_{Ta}$	%/K	2,0
Allowed mounting position			Horizontally or vertically on mounting surface
Minimum distance on the bottom of the device	$d_{bot}$	mm	All around 80; allow free convection
Minimum distance on the top of the device	$d_{top}$	mm	
Horizontal spacing on the device	$d_{hor}$	mm	
Mass (weight)	m	kg	35
Nominal inductance	$L_{nenn}$	mH	10
Nominal voltage	$U_{LN}$	V	DC 540 ... 750
Tolerance $U_{LN}$			±10%
Nominal current	$I_{L\_cont}$		100
Maximum allowed peak current <sup>6)</sup>	$I_{L\_max}$	A	250
Maximum allowed leakage current	$I_{ab}$	A	5 at 70% × $I_{L\_cont}$ 2 at 100% × $I_{L\_cont}$
Power dissipation at continuous current and continuous DC bus power respectively	$P_{Diss\_cont}$	W	300
Required wire size according to IEC 60364-5-52; at $I_{L\_cont}$ <sup>9)</sup>	$A_{LN}$	mm <sup>2</sup>	50

## HLL01 - DC Bus Choke, Current-Compensated (Preliminary)

Description	Symbol	Unit	HLL01.1N-10M0-S0100-A-007-05A0-NNNN
Required wire size according to UL 508 A (internal wiring); at $I_{L\_cont}$ (UL) <sup>10)</sup>	$A_{LN}$		AWG 2
Recommended fuse at operation under rated conditions		A	125; gL
Allowed range tightening torque	M	Nm	6,0 ... 6,5
<b>Temperature contact</b>			
Typical switching temperature of temperature contact	$T_{schalt}$	°C	150
Switching capacity of temperature contact			1 A / 250V AC; 24 V DC
Cross section of connection cable	A	mm <sup>2</sup>	1 ... 2,5
Cross section of connection cable	A		AWG 18 ... 14
Allowed range tightening torque	M	Nm	0,5 ... 0,6

6)  $t = 0.3$  s;  $T = 1.42$  s;  $K = 2.5$ 9) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °C10) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C*Fig.9-6: HLL - Technical data - Currents, voltages, power*



## 10 HLC01.1 - DC Bus Capacitor Unit

### 10.1 Application Instructions

---



#### Damage to the drive controller!

In operating cycles of more than 30 cycles per minute, the DC bus capacitors **in the drive controller** can be overloaded when the mains connection voltage decreases.

Additionally use DC bus capacitor units.

---

Using a DC bus capacitor unit you can increase the storable energy in the DC bus. This makes sense

- for applications with short cycle times (> approx. 30 cycles per minute). The continuous power of a braking resistor will be reduced and with it the dissipation heat generated in the control cabinet.
- for applications which need a certain amount of energy, also in case of mains failure (e.g. for return motions)
- to back up the DC bus for systems with DC bus connections > 2 m between the drive controllers

HLC01.1 - DC Bus Capacitor Unit

## 10.2 Identification

Abbrev. Column	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	2	1	2	3	4	5	6	7	8	9	3	1	2
Example:	H	L	C	0	1	.	1	D	-	0	5	M	0	-	A	-	0	0	7	-	N	N	N	N							

1. **Product**
  - 1.1 HLC ..... = HLC
2. **Line**
  - 2.1 1 ..... = 01
3. **Design**
  - 3.1 1 ..... = 1
4. **Mounting depth** ❶
  - 4.1 300 mm. .... = C
  - 4.2 400 mm. .... = D
5. **Nominal capacitance**
  - 5.1 5,0 mF ..... = 05M0
  - 5.2 2,4 mF ..... = 02M4
  - 5.3 1,0 mF ..... = 01M0
6. **Degree of protection**
  - 6.1 IP 20 ..... = A
7. **DC bus nominal voltage**
  - 7.1 DC 700 V ..... = 007
8. **Other design**
  - 8.1 none ..... = NNNN
9. **Standard reference**

Standard	Title	Edition
DIN EN 60529	Degrees of protection provided by enclosures (IP-Code)	2000-09

**Note:**

❶ Mounting depth "C" is only available with nominal capacitance "02M4" or "01M0"  
 Mounting depth "D" is only available with nominal capacitance "05M0"

DT000001v01\_en.FHS

Fig.10-1: Type code

## 10.3 Mounting

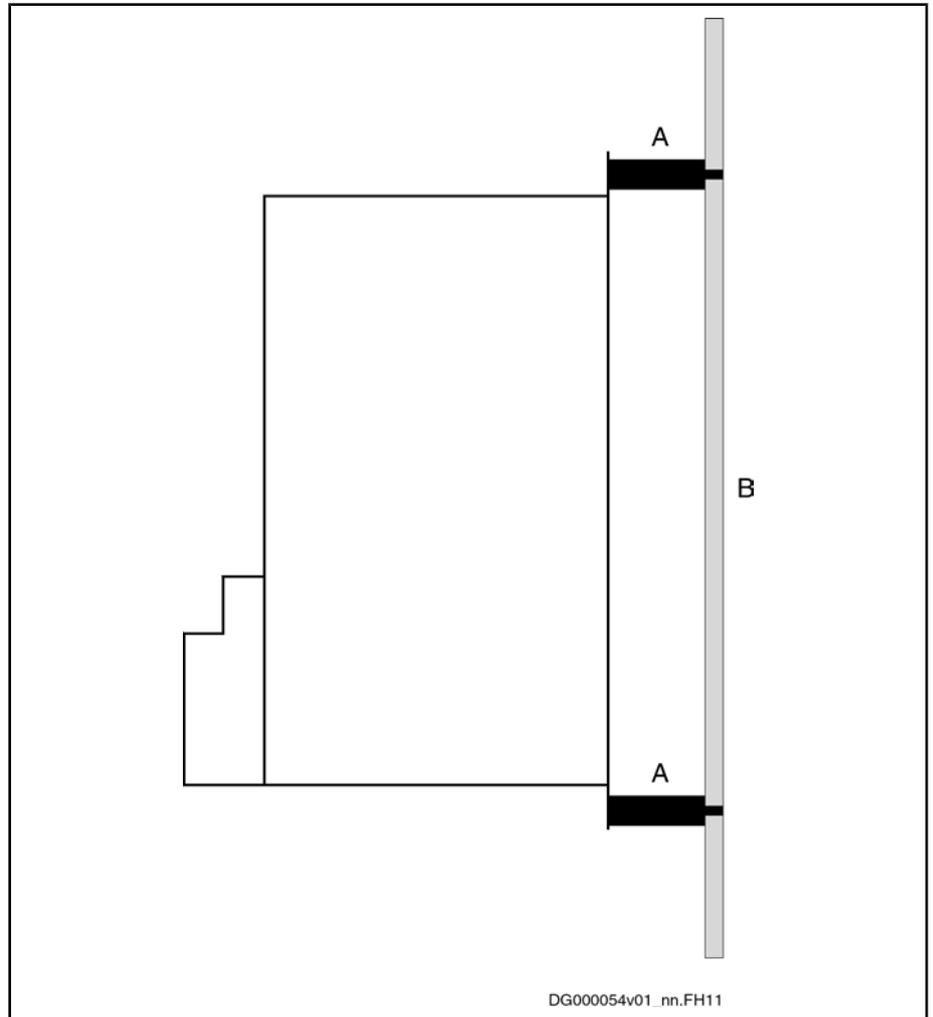
### 10.3.1 Notes

- Always mount the DC bus capacitor unit directly next to the drive controller with the highest DC bus continuous power.
- To compensate the different mounting depths of a DC bus capacitor unit **HLC01.1C** and **IndraDrive M drive controllers**, there are suitable distance bolts (accessory HAS03.1-002-NNN-NN; contains 2 distance bolts). You

## HLC01.1 - DC Bus Capacitor Unit

are only allowed to use the distance bolts when the DC bus capacitor unit is mounted directly next to the drive controller. In this case you also have to connect the contact bars for DC bus and control voltage connection to the DC bus capacitor unit.

- Mount the distance bolts to the bare metal mounting surface of the control cabinet.



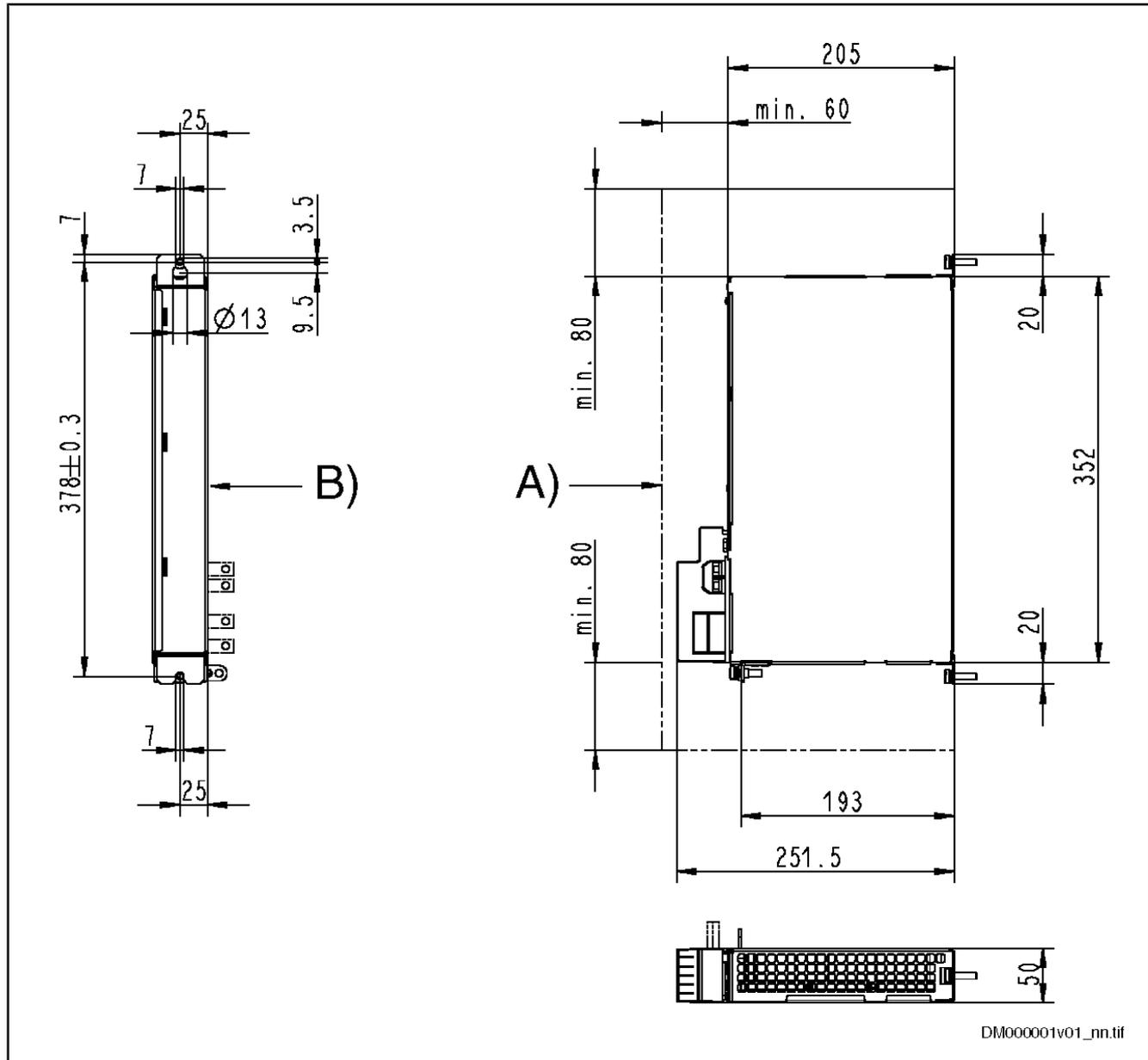
A Distance bolts  
B Mounting surface in control cabinet

*Fig. 10-2: How to use the distance bolts*

HLC01.1 - DC Bus Capacitor Unit

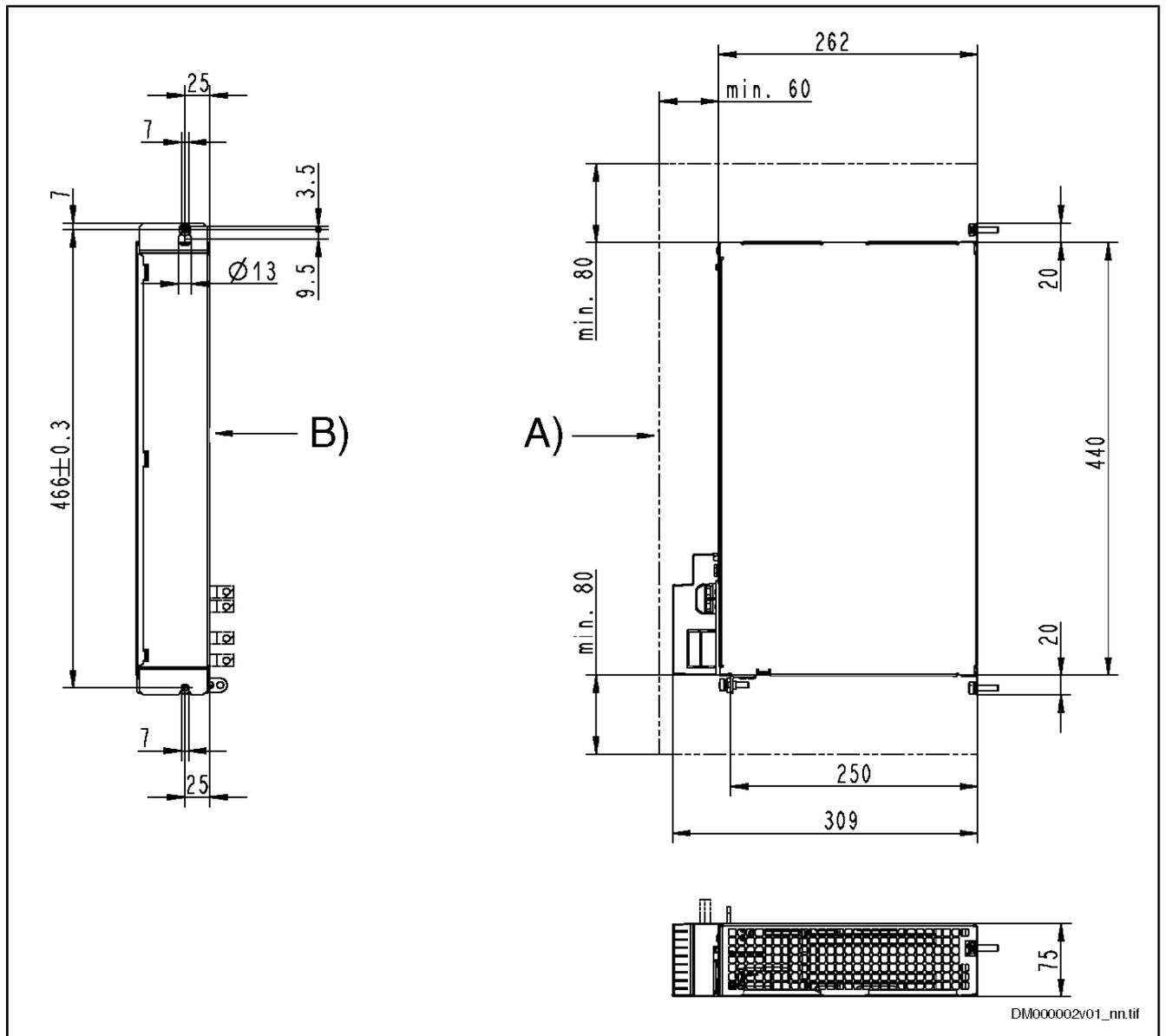
### 10.3.2 Mechanical Data

#### Dimensions HLC01.1C



A) Minimum mounting clearance  
B) Rear view  
Fig.10-3: Dimensions HLC01.1C

Dimensions HLC01.1D



A) Minimum mounting clearance

B) Rear view

Fig.10-4: Dimensions HLC01.1D

Weight

Type	Weight [kg]
HLC01.1C-01M0-A-007-NNNN	3,2
HLC01.1C-02M4-A-007-NNNN	4,3
HLC01.1D-05M0-A-007-NNNN	8,6

Fig.10-5: Weight

HLC01.1 - DC Bus Capacitor Unit

## 10.4 Installation

### 10.4.1 Electrical Data

Description	Symbol	Unit	Type		
			HLC01.1C-01M0	HLC01.1 C-02M4	HLC01.1D-05M0
Allowed input voltage	$U_{DC}$	V	DC 254 ... 750 V		
Nominal DC bus capacitance	$C_{DC}$	mF	1	2,4	5
Maximum discharging time from 820 V to 50 V	T	s	250	280	760
Power dissipation (at 750 V DC bus voltage)	$P_v$	W	12	24	13
Insulation resistance	$R_{is}$	Mohm	> 25		
Maximum current (at 55 °C ambient temperature)	$I_{Ceff}$	A	20	50	60
Cooling			Natural convection		

Fig. 10-6: Electrical data



As the mains connection voltage increases, the storable energy in the DC bus decreases, because the differential voltage between braking resistor threshold and DC bus voltage (crest value of connection voltage) is reduced.

### 10.4.2 Connection Points

#### General Information



**WARNING**

#### Lethal electric shock caused by live parts with more than 50 V!

Before working on live parts: De-energize the installation and secure the power switch against unintentional or unauthorized re-energization.

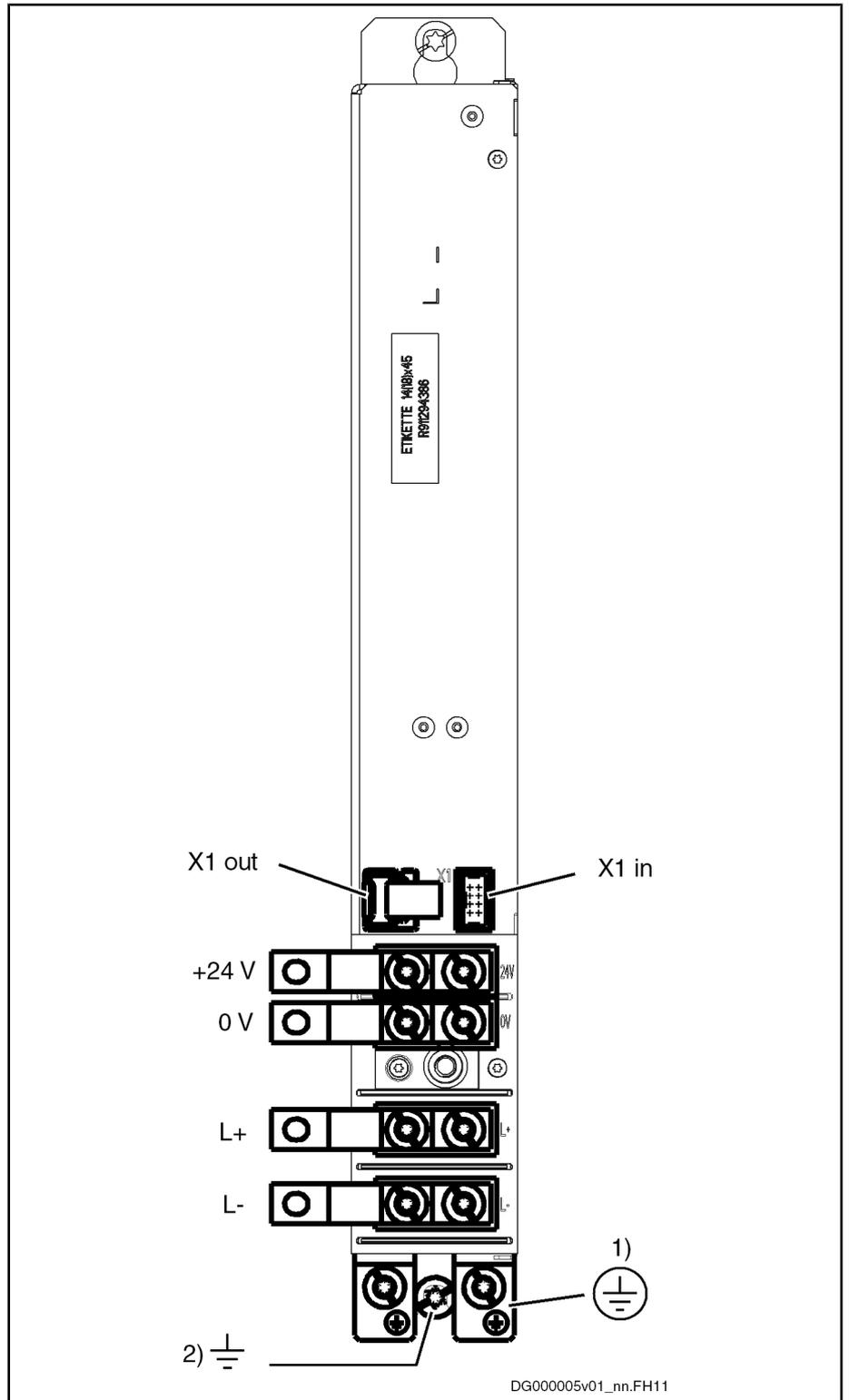
Wait at least **30 minutes** after switching off the supply voltages to allow discharging. To shorten the waiting time until voltage has fallen below 50 V, you can use a discharging device (see chapter "Appendix").

Check whether voltages have fallen below 50 V before touching live parts!



When using **HMV** supply units, the discharging time of the DC bus capacitors can be reduced by activating the function "ZKS".

Overview



- |               |                               |
|---------------|-------------------------------|
| X1 in, X1 out | Module bus                    |
| 24V, 0V       | Control voltage               |
| L+, L-        | DC bus                        |
| 1)            | Equipment grounding conductor |
| 2)            | Ground connection             |

Fig.10-7: Connections - overview

DG000005v01\_nn.FH11

HLC01.1 - DC Bus Capacitor Unit

**X1, Module Bus**

**Function, Pin Assignment**

The module bus is an **internal system connection** and is used to exchange data between the devices.

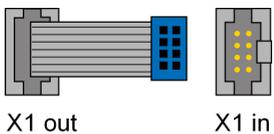
View	Identification	Function
 <p>X1 out                      X1 in</p> <p>DG000057v01_nn.FH11</p>	X1 in	To plug in module bus connector
	X1 out	Passes module bus connection to neighboring device

Fig.10-8: X1, Module bus

**Notes on Installation**

Keep ribbon cable in parking position, when not connected to neighboring device.



When using DC bus capacitor units: Do not establish this connection at the DC bus capacitor unit, if the DC bus capacitor unit is the last device in the drive system.

**Control Voltage (+24 V, 0 V)**



When using DC bus capacitor units: Do not establish this connection at the DC bus capacitor unit, if the DC bus capacitor unit is the last device in the drive system.

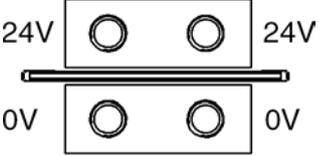
View	Identification	Function	
 <p>24V                      24V</p> <p>0V                        0V</p> <p>DA000175v01_nn.FH11</p>	+24V	power supply connection to neighboring devices with contact bars from accessory HAS01.1	
	0V	reference potential for power supply connection to neighboring devices with contact bars from accessory HAS01.1	
<b>Screw connection</b>	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>
M6 thread at device (terminal block)			
tightening torque	Nm	5,5	6,5
power consumption	W	P <sub>N3</sub> (see technical data)	
voltage load capacity	V	U <sub>N3</sub> (see technical data)	
polarity reversal protection		within the allowed voltage range by internal protective diode	
<b>Current carrying capacity "looping through" from 24V to 24V, 0V to 0V</b> (contact bars in scope of supply of accessory HAS01)			
with contact bars -072	A	220	

Fig.10-9: Function, pin assignment, properties

## L+ L-, DC Bus Connection



**WARNING**

### Lethal electric shock caused by live parts with more than 50 V!

Before working on live parts: De-energize the installation and secure the power switch against unintentional or unauthorized re-energization.

Wait at least **30 minutes** after switching off the supply voltages to allow discharging. To shorten the waiting time until voltage has fallen below 50 V, you can use a discharging device (see chapter "Appendix").

Check whether voltages have fallen below 50 V before touching live parts!

#### Function, Pin Assignment

The DC bus connection connects

- several drive controllers to one another
- a drive controller to additional components



HCS02.1E-W0012 drive controllers do not have a DC bus connection.

View	Identification	Function	
<p>DA000176v01_nn.FH11</p>	L+	connection points for connecting DC bus connections	
	L-		
<b>Screw connection</b>	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>
M6 thread at device (terminal block)			
tightening torque	Nm	5,5	6,5
short circuit protection		via fusing elements connected in the incoming circuit to the mains connection	
overload protection		via fusing elements connected in the incoming circuit to the mains connection	
<b>Current carrying capacity "looping through" from L+ to L+, L- to L-</b> (contact bars in scope of supply of accessory HAS01)			
with contact bars -072	A		220
<b>additionally</b> with contact bars -042 and end piece	A		245

Fig. 10-10: Function, pin assignment, properties

#### Notes on Installation

If in special cases it is not possible to use the contact bars provided to establish the connection, the connection must be established using the shortest possible **twisted** wires.

HLC01.1 - DC Bus Capacitor Unit



**CAUTION**

**Risk of damage by reversing the polarity of the DC bus connections L+ and L-**

Make sure the polarity is correct.

Length of twisted wire	Max. 2 m
Line cross section	Min. 10 mm <sup>2</sup> , but not smaller than cross section of supply feeder
Line protection	By means of fuses in the mains connection
Dielectric strength of single strand against ground	≥ 750 V (e.g.: strand type – H07)

*Fig.10-11: DC bus line*

**Connection of Equipment Grounding Conductor**



**DANGER**

**Lethal electric shock caused by live parts with more than 50 V!**

Connect the drive controller to the equipment grounding system of the control cabinet.

Supplying device **with** connection for joint bar:

- Via the joint bar on the front connect the drive controller to the supplying device.

Supplying device **without** connection for joint bar:

- Via a separate connection line, connect the drive controller to the equipment grounding system of the control cabinet.

Via the joint bar on the front connect the drive controller to the neighboring drive controller.

Connect the equipment grounding conductor connection of the supplying unit to the equipment grounding system of the control cabinet.

Check the continuity of the equipment grounding conductors from the mains connection to the connected motors.

**Equipment grounding conductor: material and cross section**

For the equipment grounding conductor, use the same metal (e.g. copper) as for the outer conductors.

For the connections from the equipment grounding conductor connection of the device to the equipment grounding conductor system in the control cabinet, make sure the cross sections of the lines are sufficient.

Cross sections of the equipment grounding connections:

- for **HCS03.1E** drive controllers and **HMV01** supply units, **at least 10 mm<sup>2</sup>**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- for **HCS02.1E** drive controllers, **at least 4 mm<sup>2</sup>**, but not smaller than the cross sections of the outer conductors of the mains supply feeder

Additionally, mount the housing of HCS02.1E to a bare metal mounting plate. Connect the mounting plate, too, with at least the same cross section to the equipment grounding conductor system in the control cabinet.

For outer conductors with a cross section greater than 16 mm<sup>2</sup>, you can reduce the cross section of the equipment grounding connection according to the table "Cross section of equipment grounding conductor, excerpt from EN 61800-5-1:2003".

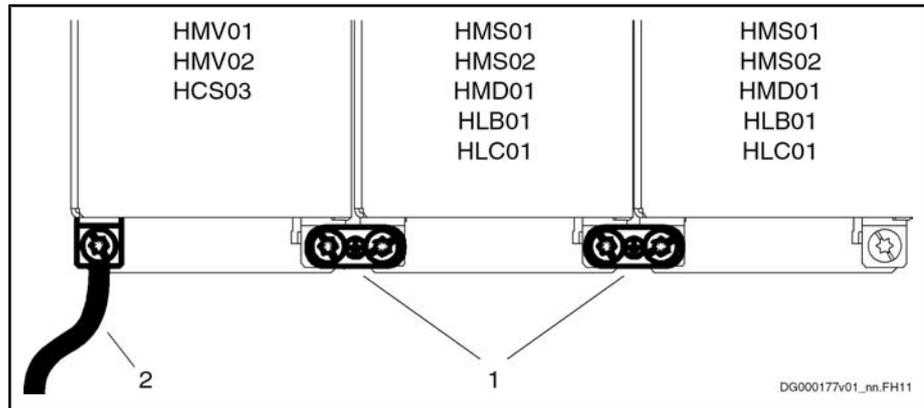
Cross-sectional area A of outer conductors	Minimum cross-sectional area A <sub>PE</sub> of equipment grounding connection
$A \leq 16 \text{ mm}^2$	A
$16 \text{ mm}^2 < A \leq 35 \text{ mm}^2$	16
$35 \text{ mm}^2 < A$	A / 2

Fig. 10-12: Equipment grounding conductor cross section, excerpt from EN 61800-5-1:2003, table 2



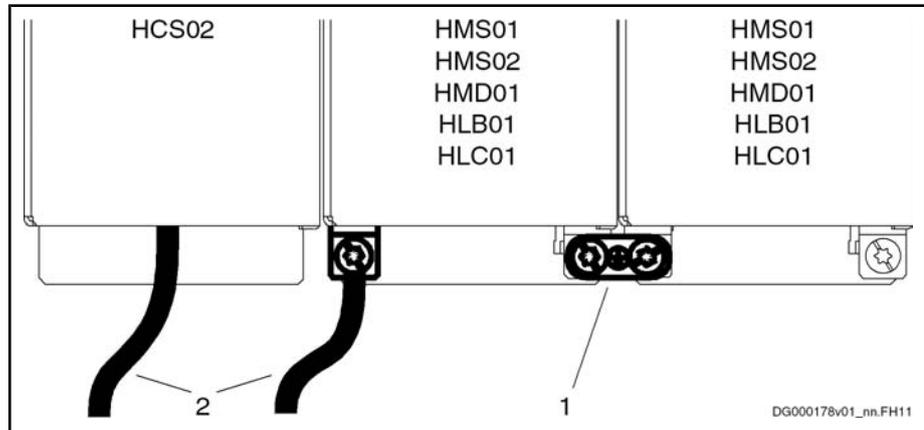
The line for the connection of the equipment grounding conductor must have at least the cross section of the mains supply feeder. With cross sections of the mains supply feeder smaller than 10 mm<sup>2</sup> (AWG 8), the equipment grounding conductor must have at least 10 mm<sup>2</sup> (AWG 8).

HLC01.1 - DC Bus Capacitor Unit



- 1 Joint bar
- 2 Connection to equipment grounding system

Fig.10-13: Equipment grounding conductor connection for supply via HMV01, HMV02, HCS03



- 1 Joint bar
- 2 Connection to equipment grounding system

Fig.10-14: Equipment grounding conductor connection for supply via HCS02

**Design, Tightening Torque**

The joint bars are connected by means of screws:

Design	Tightening torque
M6 × 25	6 Nm

Fig.10-15: Data of connection point

**Ground Connection**

The ground connection of the housing is used to provide functional safety of the drive controllers and protection against contact in conjunction with the equipment grounding conductor.

Ground the housings of the drive controllers:

1. Connect the bare metal back panel of the drive controller in conductive form to the mounting surface in the control cabinet. To do this, use the supplied mounting screws.
2. Connect the mounting surface of the control cabinet in conductive form to the equipment grounding system.
3. For the ground connection, observe the maximum allowed ground resistance.

See Project Planning Manual "Rexroth IndraDrive – Drive System" chapter "Dimensioning the Mains Connection"

### 10.4.3 Touch Guard at Devices

#### Cutouts



**WARNING**

#### Lethal electric shock caused by live parts with more than 50 V!

- The appropriate touch guard must be mounted for each device following connection work.
- Never mount a damaged touch guard.
- Immediately replace a damaged touch guard by an undamaged touch guard.
- Keep the cutouts at the touch guard as small as possible. Only remove the cutouts if necessary.

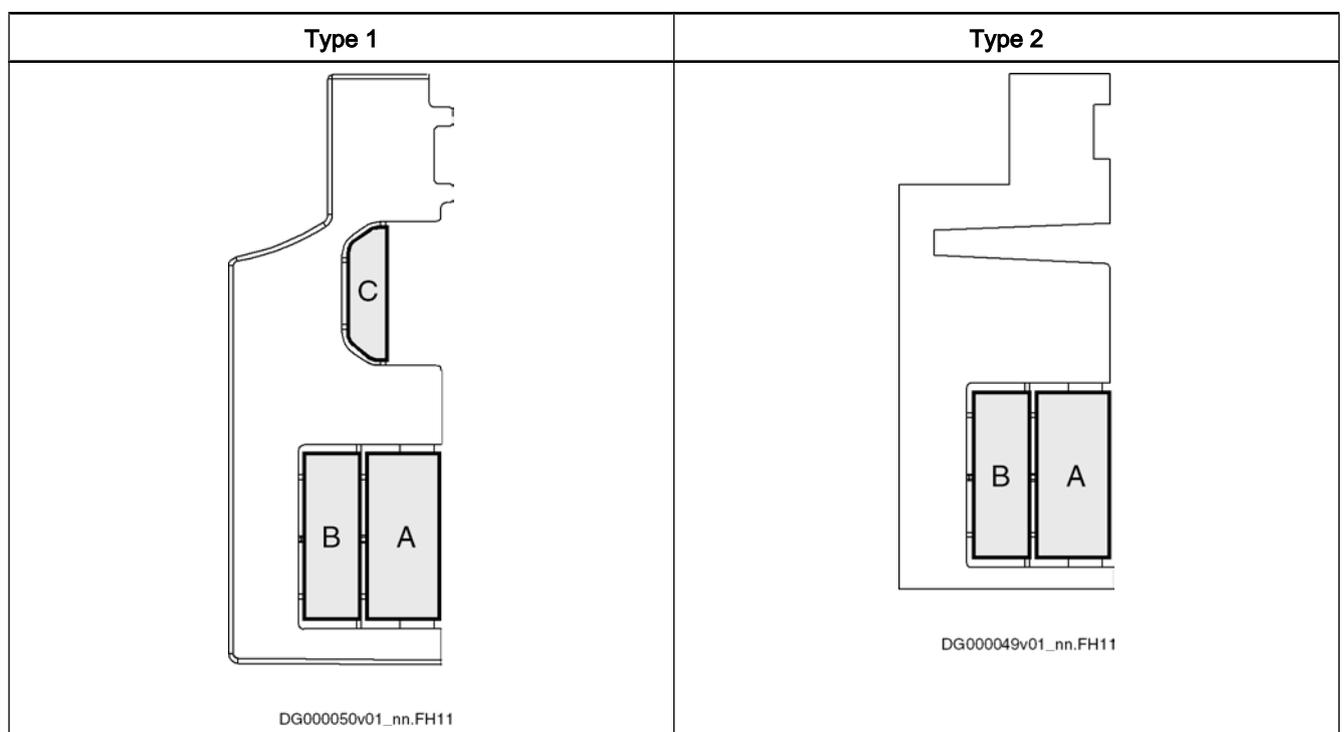
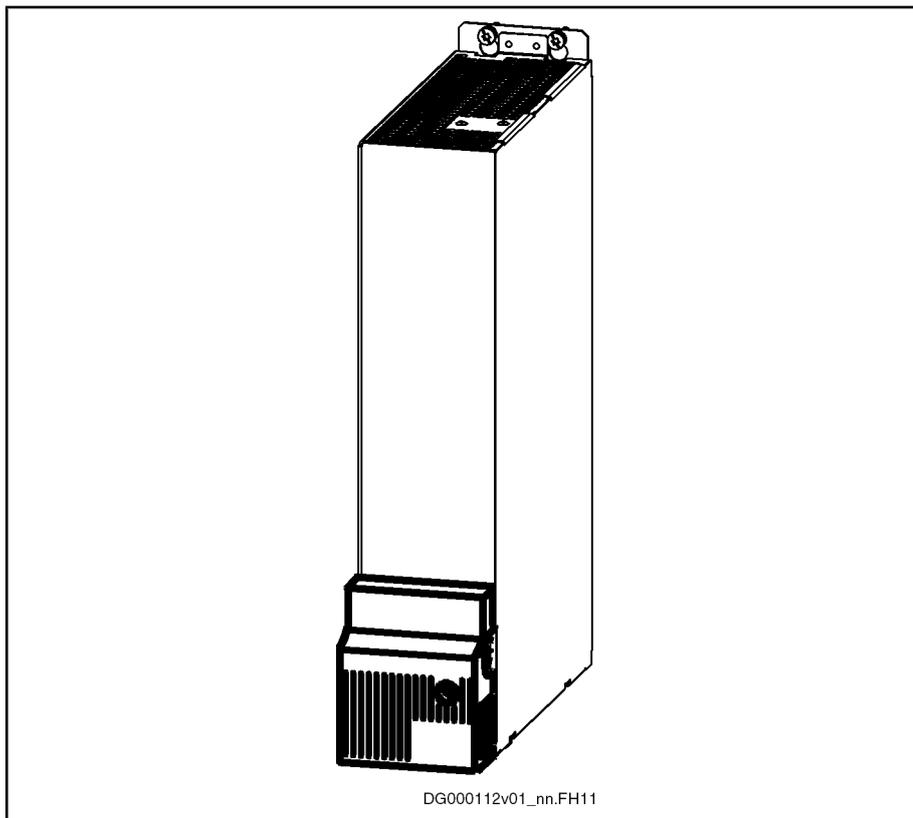


Fig. 10-16: Cutouts at the touch guard

- If the DC bus and the control voltage are connected by means of **contact bars**, only **cutout A** may be removed from the touch guard.
- If the DC bus and the control voltage are connected by means of **cables** (e.g. in the case of multiple-line arrangement), the **cutouts A, B and C** may be removed from the touch guard.
- At the first and last device in a line of interconnected devices, you must **not remove any** cutout at the outer side of the touch guard.

## HLC01.1 - DC Bus Capacitor Unit

### Mounting



*Fig.10-17: Touch guard at device*

The touch guard is fixed to the device with screws.

**Tightening Torque Max. 2.8 Nm**

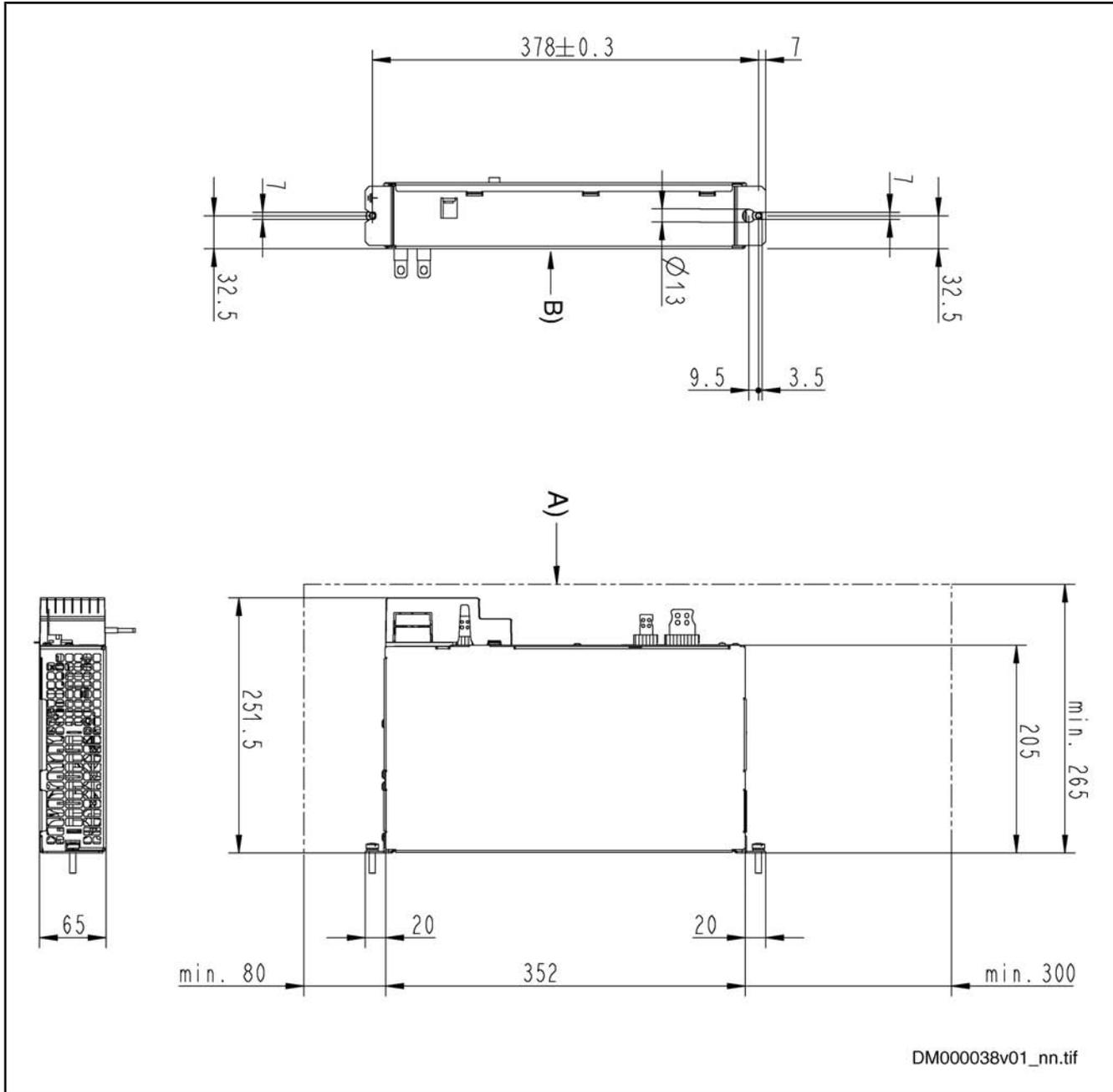


HLB01.1C and HLB01.1D - DC Bus Resistor Unit

## 11.3 Mounting HLB01.1

### 11.3.1 Mechanical Data HLB01.1

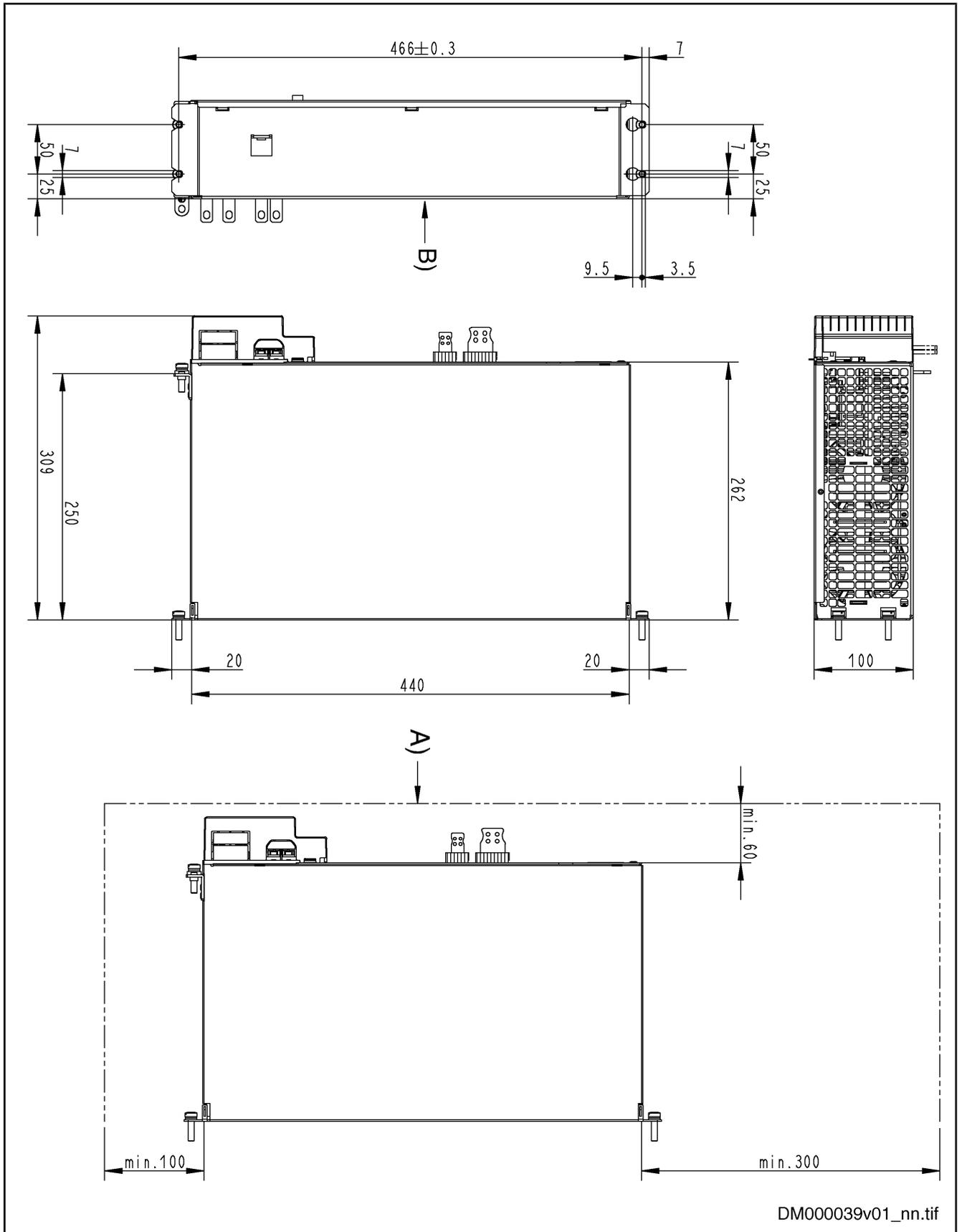
#### Dimensions HLB01.1C



A) Minimum mounting clearance  
 B) Rear view!  
 Fig.11-2: Dimensions HLB01.1C

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

Dimensions HLB01.1D



DM000039v01\_nn.tif

A) Minimum mounting clearance  
 B) Rear view!  
 Fig.11-3: Dimensions HLB01.1D

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

**Weight**

Type	Weight [kg]
HLB01.1C	5,8
HLB01.1D	12,2

Fig. 11-4: Weight

**11.4 Installation HLB01.1**

**11.4.1 Electrical Data HLB01.1**

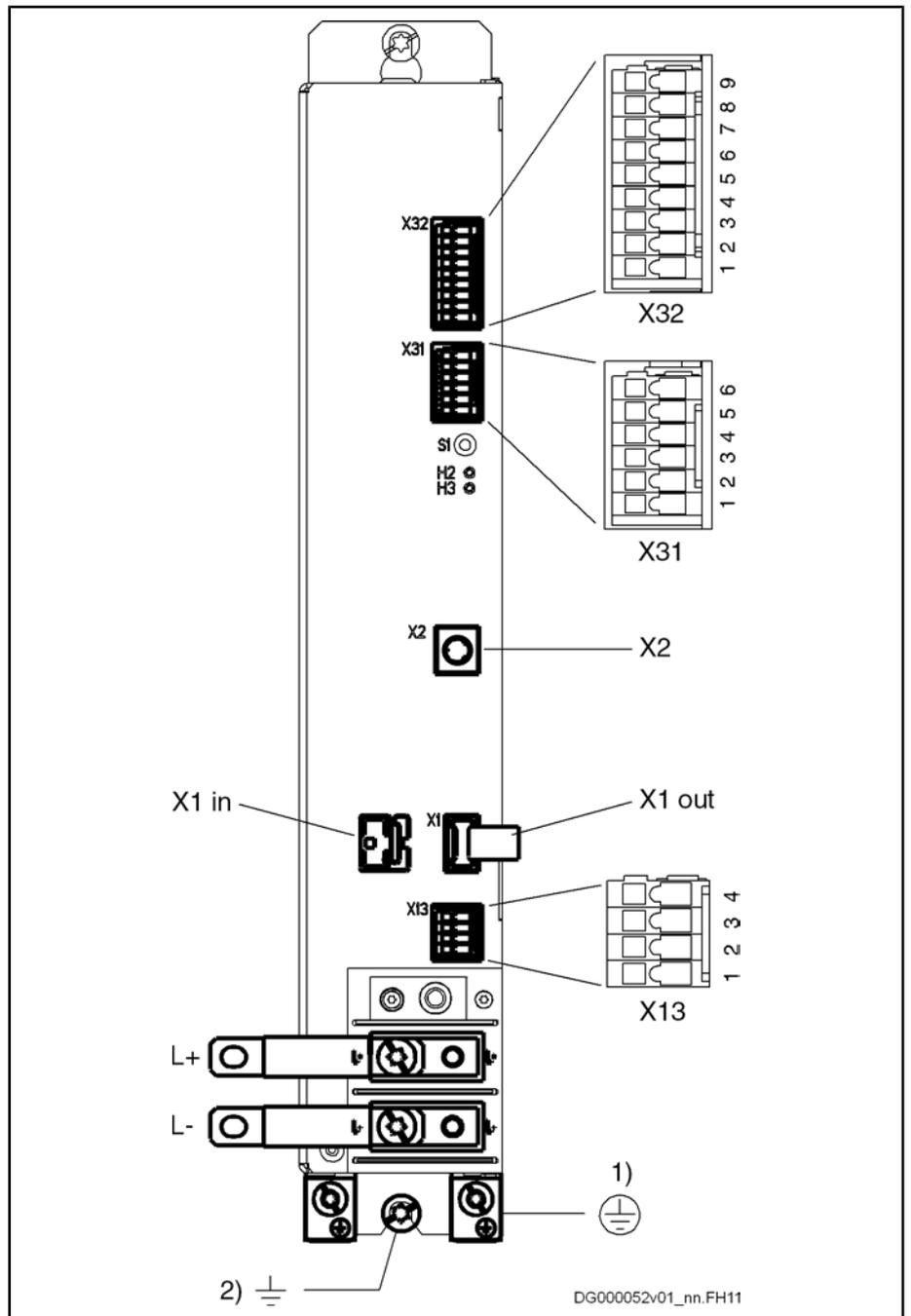
Description	Symbol	Unit	HLB01.1C	HLB01.1D
Allowed input voltage	$U_{LN}$	V	DC 254 ... 750	
Braking resistor threshold	$U_{R\_DC\_on\_f}$	V	820	820
Continuous power	$P_{cont}$	kW	1	2
Peak power	$P_{peak}$	kW	100	100
Max. regenerative power	$W_{R\_max}$	kWs	100	500
Derating if devices are connected in parallel <sup>1)</sup>			0,8	0,8
<b>Control voltage supply</b>				
Control voltage	$U_{N3}$	V	19,2 ... 28,8	22,8 ... 27,3
Power consumption	$P_{N3}$	W	14	14
Max. inrush current	$I_{EIN3}$	A	3 (for 50 ms)	3 (for 50 ms)

1) The factor of derating results from the balancing behavior. The balancing behavior is determined by tolerance-afflicted voltage measurements in the individual devices. Derating applies both to the continuous power and to the maximum allowed regenerative power.

Fig. 11-5: Electrical data

## 11.4.2 Connection Points

### Overview HLB01.1C



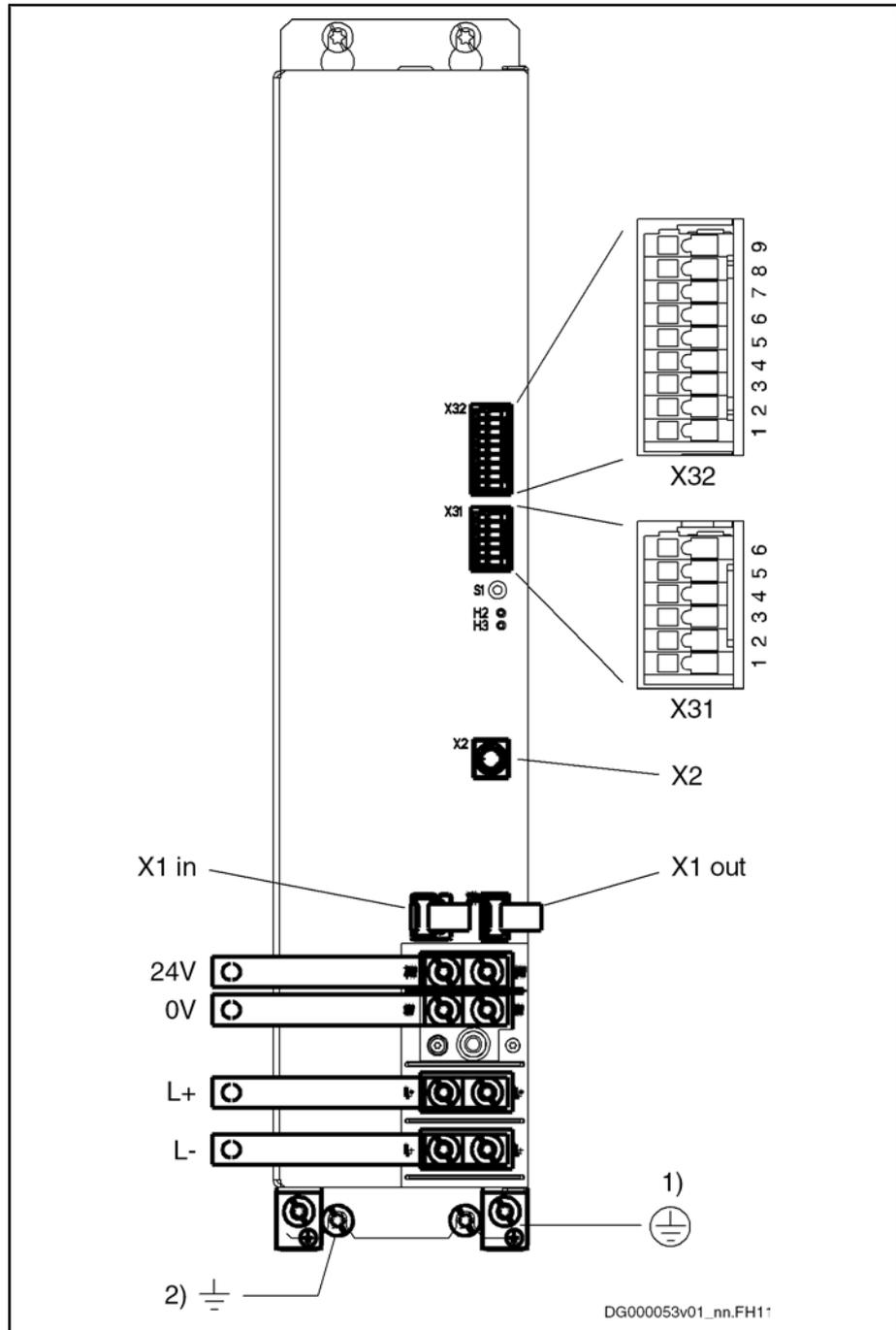
1) Equipment grounding conductor

2) Ground connection

Fig.11-6: Connections HLB01.1C

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

Overview HLB01.1D



- 1) Equipment grounding conductor
  - 2) Ground connection
- Fig.11-7: Connections HLB01.1D

### L+ L-, DC Bus Connection



**WARNING**

**Lethal electric shock caused by live parts with more than 50 V!**

Before working on live parts: De-energize the installation and secure the power switch against unintentional or unauthorized re-energization.

Wait at least **30 minutes** after switching off the supply voltages to allow discharging. To shorten the waiting time until voltage has fallen below 50 V, you can use a discharging device (see chapter "Appendix").

Check whether voltages have fallen below 50 V before touching live parts!

**Function, Pin Assignment**

The DC bus connection connects

- several drive controllers to one another
- a drive controller to additional components



HCS02.1E-W0012 drive controllers do not have a DC bus connection.

View	Identification	Function	
<p>DA000176v01_nn.FH11</p>	L+	connection points for connecting DC bus connections	
	L-		
<b>Screw connection</b>	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>
M6 thread at device (terminal block)			
tightening torque	Nm	5,5	6,5
short circuit protection		via fusing elements connected in the incoming circuit to the mains connection	
overload protection		via fusing elements connected in the incoming circuit to the mains connection	
<b>Current carrying capacity "looping through" from L+ to L+, L- to L-</b> (contact bars in scope of supply of accessory HAS01)			
with contact bars -072	A		220
<b>additionally</b> with contact bars -042 and end piece	A		245

Fig. 11-8: Function, pin assignment, properties

**Notes on Installation**

If in special cases it is not possible to use the contact bars provided to establish the connection, the connection must be established using the shortest possible **twisted** wires.

HLB01.1C and HLB01.1D - DC Bus Resistor Unit



**CAUTION**

**Risk of damage by reversing the polarity of the DC bus connections L+ and L-**

Make sure the polarity is correct.

Length of twisted wire	Max. 2 m
Line cross section	Min. 10 mm <sup>2</sup> , but not smaller than cross section of supply feeder
Line protection	By means of fuses in the mains connection
Dielectric strength of single strand against ground	≥ 750 V (e.g.: strand type – H07)

*Fig.11-9: DC bus line*

**Connection of Equipment Grounding Conductor**



**DANGER**

**Lethal electric shock caused by live parts with more than 50 V!**

Connect the drive controller to the equipment grounding system of the control cabinet.

Supplying device **with** connection for joint bar:

- Via the joint bar on the front connect the drive controller to the supplying device.

Supplying device **without** connection for joint bar:

- Via a separate connection line, connect the drive controller to the equipment grounding system of the control cabinet.

Via the joint bar on the front connect the drive controller to the neighboring drive controller.

Connect the equipment grounding conductor connection of the supplying unit to the equipment grounding system of the control cabinet.

Check the continuity of the equipment grounding conductors from the mains connection to the connected motors.

**Equipment grounding conductor: material and cross section**

For the equipment grounding conductor, use the same metal (e.g. copper) as for the outer conductors.

For the connections from the equipment grounding conductor connection of the device to the equipment grounding conductor system in the control cabinet, make sure the cross sections of the lines are sufficient.

Cross sections of the equipment grounding connections:

- for **HCS03.1E** drive controllers and **HMV01** supply units, **at least 10 mm<sup>2</sup>**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- for **HCS02.1E** drive controllers, **at least 4 mm<sup>2</sup>**, but not smaller than the cross sections of the outer conductors of the mains supply feeder

Additionally, mount the housing of HCS02.1E to a bare metal mounting plate. Connect the mounting plate, too, with at least the same cross section to the equipment grounding conductor system in the control cabinet.

For outer conductors with a cross section greater than 16 mm<sup>2</sup>, you can reduce the cross section of the equipment grounding connection according to the table "Cross section of equipment grounding conductor, excerpt from EN 61800-5-1:2003".

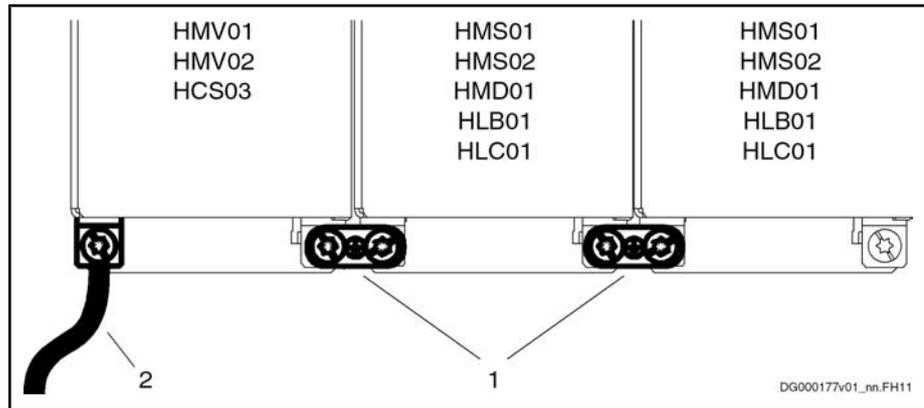
Cross-sectional area A of outer conductors	Minimum cross-sectional area A <sub>PE</sub> of equipment grounding connection
$A \leq 16 \text{ mm}^2$	A
$16 \text{ mm}^2 < A \leq 35 \text{ mm}^2$	16
$35 \text{ mm}^2 < A$	A / 2

Fig. 11-10: Equipment grounding conductor cross section, excerpt from EN 61800-5-1:2003, table 2



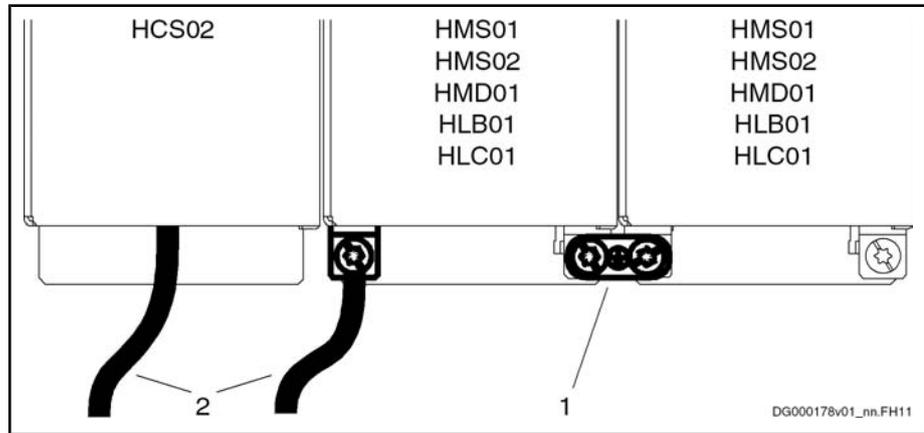
The line for the connection of the equipment grounding conductor must have at least the cross section of the mains supply feeder. With cross sections of the mains supply feeder smaller than 10 mm<sup>2</sup> (AWG 8), the equipment grounding conductor must have at least 10 mm<sup>2</sup> (AWG 8).

HLB01.1C and HLB01.1D - DC Bus Resistor Unit



- 1 Joint bar
- 2 Connection to equipment grounding system

Fig. 11-11: Equipment grounding conductor connection for supply via HMV01, HMV02, HCS03



- 1 Joint bar
- 2 Connection to equipment grounding system

Fig. 11-12: Equipment grounding conductor connection for supply via HCS02

**Design, Tightening Torque**

The joint bars are connected by means of screws:

Design	Tightening torque
M6 × 25	6 Nm

Fig. 11-13: Data of connection point

**Ground Connection**

The ground connection of the housing is used to provide functional safety of the drive controllers and protection against contact in conjunction with the equipment grounding conductor.

Ground the housings of the drive controllers:

1. Connect the bare metal back panel of the drive controller in conductive form to the mounting surface in the control cabinet. To do this, use the supplied mounting screws.
2. Connect the mounting surface of the control cabinet in conductive form to the equipment grounding system.
3. For the ground connection, observe the maximum allowed ground resistance.

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

See Project Planning Manual "Rexroth IndraDrive – Drive System" chapter "Dimensioning the Mains Connection"

X13 at HLB01, Control Voltage

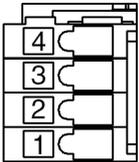
Assignment	Conne- ction	Signal name	Function																																				
 <p>DG000115v01_nn.FH11</p>	4	+24V	Power supply and "looping through"																																				
	3	+24V																																					
	2	0V	Reference potential for power supply and "looping through"																																				
	1	0V																																					
<table border="1"> <thead> <tr> <th>Spring terminal (connector)</th> <th>Unit</th> <th>Min.</th> <th>Max.</th> </tr> </thead> <tbody> <tr> <td>Connection cable solid wire</td> <td>mm<sup>2</sup></td> <td>1</td> <td>1,5</td> </tr> <tr> <td>Connection cable stranded wire</td> <td>mm<sup>2</sup></td> <td>1</td> <td>1,5</td> </tr> <tr> <td>Connection cable</td> <td>AWG</td> <td>18</td> <td>16</td> </tr> <tr> <td>Power consumption</td> <td>W</td> <td colspan="2">P<sub>N3</sub> (see technical data)</td> </tr> <tr> <td>Voltage load capacity</td> <td>V</td> <td colspan="2">U<sub>N3</sub> (see technical data)</td> </tr> <tr> <td>Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Continuous current P<sub>N3</sub>/U<sub>N3</sub></td> <td>A</td> <td></td> <td>6</td> </tr> <tr> <td>Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Inrush current I<sub>EIN3</sub></td> <td>A</td> <td></td> <td>12</td> </tr> <tr> <td>Polarity reversal protection</td> <td></td> <td colspan="2">Within the allowed voltage range by internal protective diode</td> </tr> </tbody> </table>				Spring terminal (connector)	Unit	Min.	Max.	Connection cable solid wire	mm <sup>2</sup>	1	1,5	Connection cable stranded wire	mm <sup>2</sup>	1	1,5	Connection cable	AWG	18	16	Power consumption	W	P <sub>N3</sub> (see technical data)		Voltage load capacity	V	U <sub>N3</sub> (see technical data)		Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Continuous current P <sub>N3</sub> /U <sub>N3</sub>	A		6	Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Inrush current I <sub>EIN3</sub>	A		12	Polarity reversal protection		Within the allowed voltage range by internal protective diode	
Spring terminal (connector)	Unit	Min.	Max.																																				
Connection cable solid wire	mm <sup>2</sup>	1	1,5																																				
Connection cable stranded wire	mm <sup>2</sup>	1	1,5																																				
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Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Continuous current P <sub>N3</sub> /U <sub>N3</sub>	A		6																																				
Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Inrush current I <sub>EIN3</sub>	A		12																																				
Polarity reversal protection		Within the allowed voltage range by internal protective diode																																					

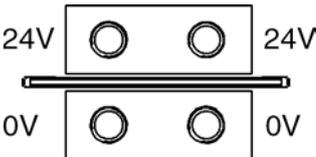
Fig. 11-14: Function, pin assignment, properties

Notes on Installation

Requirements on the connection to the 24V supply:

- Minimum cross section: 1 mm<sup>2</sup>
- Maximum allowed inductance: 100 µH (2 twisted single strands, 75 m long)
- Parallel line routing where possible

Control Voltage HLB01.1D

View	Identifica- tion	Function
 <p>DA000175v01_nn.FH11</p>	+24V	power supply connection to neighboring devices with contact bars from accessory HAS01.1
	0V	reference potential for power supply connection to neighboring devices with contact bars from accessory HAS01.1

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

Screw connection	Unit	Min.	Max.
M6 thread at device (terminal block)			
tightening torque	Nm	5,5	6,5
power consumption	W	P <sub>N3</sub> (see technical data)	
voltage load capacity	V	U <sub>N3</sub> (see technical data)	
polarity reversal protection		within the allowed voltage range by internal protective diode	
<b>Current carrying capacity "looping through" from 24V to 24V, 0V to 0V</b> (contact bars in scope of supply of accessory HAS01)			
with contact bars -072	A	220	

Fig. 11-15: Function, pin assignment, properties

X1, Module Bus

Function, Pin Assignment

The module bus is an **internal system connection** and is used to exchange data between the devices.

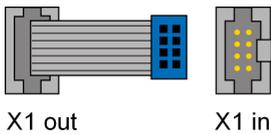
View	Identification	Function
 <p>X1 out                      X1 in</p> <p>DG000057v01_nn.FH11</p>	X1 in	To plug in module bus connector
	X1 out	Passes module bus connection to neighboring device

Fig. 11-16: X1, Module bus

Notes on Installation

Keep ribbon cable in parking position, when not connected to neighboring device.



When using DC bus capacitor units: Do not establish this connection at the DC bus capacitor unit, if the DC bus capacitor unit is the last device in the drive system.

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

X31 at HLB01, Ready for Operation and Prewarning Contact

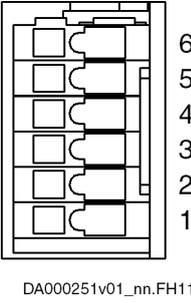
Assignment	Connection	Signal name/function	
 <p>DA000251v01_nn.FH11</p>	6	<b>Ready for operation contact:</b> <b>Closes</b> , when the following conditions have been fulfilled: <ul style="list-style-type: none"> <li>Control voltage available</li> <li>Heat sink temperature OK</li> <li>Load resistor temperature OK</li> <li>Continuous power is smaller than specified value (see technical data)</li> <li>Maximum regenerative power is smaller than specified value (see technical data)</li> </ul>	
	5		
		4	n. c.
		3	n. c.
		2	<b>Prewarning contact:</b> <b>Opens</b> , when one of the following conditions have been fulfilled: <ul style="list-style-type: none"> <li>Heat sink temperature too high</li> <li>Continuous power &gt; 90%</li> <li>Regenerative power &gt; 90%</li> </ul>
		1	
Shields of control lines	Connect to shield connection XS1 of neighboring drive controller		
Spring terminal (connector)	Unit	Min.	Max.
Connection cable solid wire	mm <sup>2</sup>	0,5	1,5
Connection cable stranded wire	mm <sup>2</sup>	0,5	1,5
	AWG	20	16
Max. switching voltage	V	DC 30	
Max. switching current	A	DC 1	
Max. continuous current	A	DC 1	
Minimum load of the contacts	mA	10	

Fig. 11-17: Function, pin assignment, properties

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

X32 at HLB01, DC Bus Short Circuit Control, Clear Errors, Braking Resistor Threshold



**Risk of fire caused by the "sacrificing behavior" of the ZKS stage!**

The "ZKS" input activates the function "DC bus short circuit", when there hasn't any voltage been applied and when there isn't any current flowing to the input. This status occurs both in the case of wire break and when the 24V supply fails.

When the 24V supply fails in applications in which energy does not only get to the DC bus via the mains connection, but also via regeneratively operated motors (e.g. following-on rollers), the ZKS stage converts this energy into heat until it is destroyed ("sacrificing behavior").

Counter measures with such applications:

- Do not use drive controllers with integrated ZKS stage or
- buffer the 24V supply (e.g. by means of a UPS) to evaluate the monitor and switch off the energy flow in the case of error.

Assignment	Connection	Signal name/function HLB01.1C	Signal name/function HLB01.1D	
<p>DA000252v01_nn.FH11</p>	9	n. c.		
	8	Input <b>ZKS1</b> Input circuit: See figure " <a href="#">HLB01.1C input circuit ZKS</a> "	Input <b>ZKS1</b> Input circuit: See figure " <a href="#">HLB01.1D input circuit ZKS</a> "	
	7	n. c.		
	6	n. c.		
	5	Input <b>clear errors</b> : A negative edge at the input against GND clears all present errors that can be cleared.	Input <b>clear errors</b> : A negative edge at the input against X32.4 clears all present errors that can be cleared.	
	4	GND	Reference potential for input <b>clear errors</b> : Applies to devices with hardware index $\geq$ A17 (see type plate)	
	3		n. c. Applies to devices with hardware index $\geq$ A17 (see type plate)	
	2	Input <b>braking resistor threshold</b> : High (n.c.): Load-dependent in the range of DC 820 ... 850 V Low (bridge with 0V): Reserved		
	1	n. c.	Connect <b>ZKS2</b> (reference potential for input ZKS1) to 0V	
Shields of control lines	Connect to shield connection XS1 of neighboring drive controller			
DC bus short circuit control	Unit	Min.	Max.	

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

High: ZKS stage not active, i.e. braking resistor <b>switched off</b> Voltage at input ZKS1 against ZKS2 (HLB01.1D) or against GND (HLB01.1C)	V	19,2	28,8
Low: ZKS stage active, i.e. braking resistor <b>switched on</b>	V	0	5
Delay $t_{d,on}$ until braking resistor <b>switches on</b>	ms	Approx. 160	
Delay $t_{d,off}$ until braking resistor <b>switches off</b>	ms	Approx. 1	
Input resistance	kOhm	2 ±10%	
Polarity reversal protection		Within the allowed input voltage range	
Electrical isolation		HLB01.1C: Not electrically isolated, input ZKS1 with reference to GND HLB01.1D: Inputs ZKS1, ZKS2 are electrically isolated, i.e. both inputs must be connected!	

Input circuit ZKS

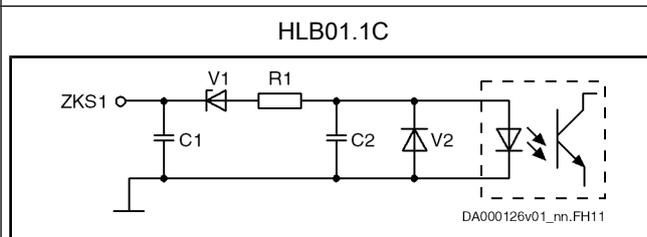


Fig.11-18: HLB01.1C input circuit ZKS

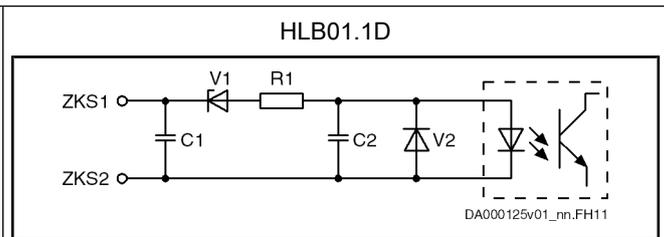


Fig.11-19: HLB01.1D input circuit ZKS

Spring terminal (connector)	Unit	Min.	Max.
Connection cross section solid wire	mm <sup>2</sup>	0,5	1,5
Connection cross section stranded wire	mm <sup>2</sup>	0,5	1,5
Connection cross section	AWG	28	14

Fig.11-20: Function, pin assignment, properties

## X2, Serial Interface (RS232)

### General Information

The serial interface (RS232) is required for programming, parameterization and diagnosis during commissioning and servicing.

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

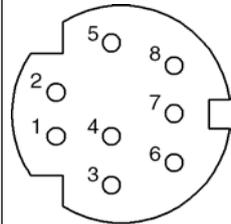
Conne- ction point	Type	No. of poles	Stranded wire [mm <sup>2</sup> ]	Description	Figure
X2	MiniDin, female (device)	8	0,25–0,5	serial interface	 <p>DA000049v01_nn.FH</p>

Fig.11-21: Connections

Pin Assignment

Pin	Signal	Function
1	RTS	request to send
2	CTS	clear to send
3	TxD	transmit data
4	GND	reference potential
5	RxD	receive data
6	V <sub>cc</sub>	supply voltage
7	n. c.	n. c.
8	n. c.	n. c.

n. c. not connected

Fig.11-22: Pin assignment of serial interface

Features

Feature	Unit	Min.	Typ.	Max.
number of nodes				1
allowed cable length	m			15
transmission rates	kBaud	9,6		115
connection		galvanically connected to control section supply		
allowed voltage difference between reference potentials of control section and data end device	V			1

Fig.11-23: Features



The accessory **HAS05.1-005** makes available a converter from RS232 to RS485 (see Project Planning Manual "Rexroth IndraDrive - Drive System", chapter "Accessories").

## Connection Diagrams Serial Interface to PC

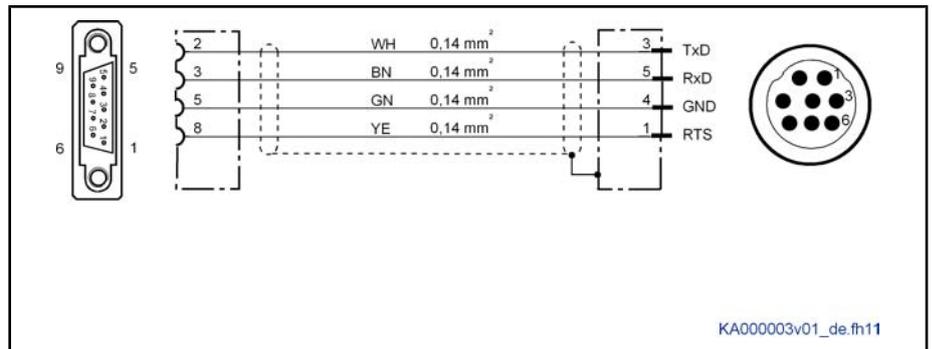
Serial Interface to PC With 9-Pin  
D-Sub

Fig. 11-24: Connection of serial interface to PC with 9-pin D-Sub



For **direct** connection to the serial interface, use our cable **IKB0041**.

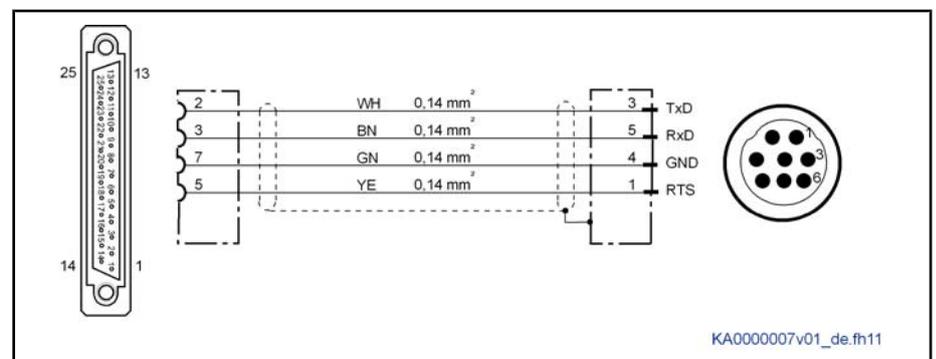
Serial Interface to PC With 25-Pin  
D-Sub

Fig. 11-25: Connection of serial interface to PC with 25-pin D-Sub

## X2, RS232 Interface



For internal use only.

## 11.4.3 Touch Guard at Devices

## Cutouts



**WARNING**

**Lethal electric shock caused by live parts with more than 50 V!**

- The appropriate touch guard must be mounted for each device following connection work.
- Never mount a damaged touch guard.
- Immediately replace a damaged touch guard by an undamaged touch guard.
- Keep the cutouts at the touch guard as small as possible. Only remove the cutouts if necessary.

HLB01.1C and HLB01.1D - DC Bus Resistor Unit

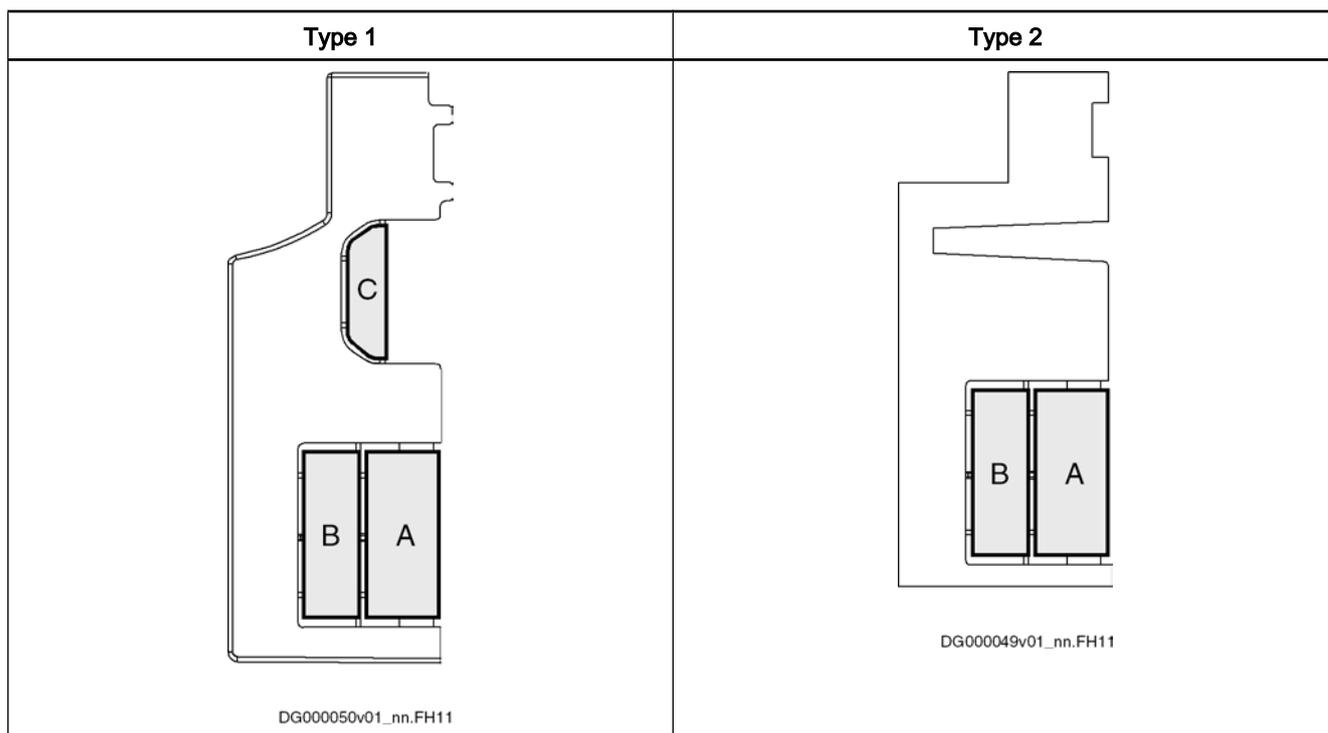


Fig. 11-26: Cutouts at the touch guard

- If the DC bus and the control voltage are connected by means of **contact bars**, only **cutout A** may be removed from the touch guard.
- If the DC bus and the control voltage are connected by means of **cables** (e.g. in the case of multiple-line arrangement), the **cutouts A, B and C** may be removed from the touch guard.
- At the first and last device in a line of interconnected devices, you must **not remove any** cutout at the outer side of the touch guard.

## Mounting

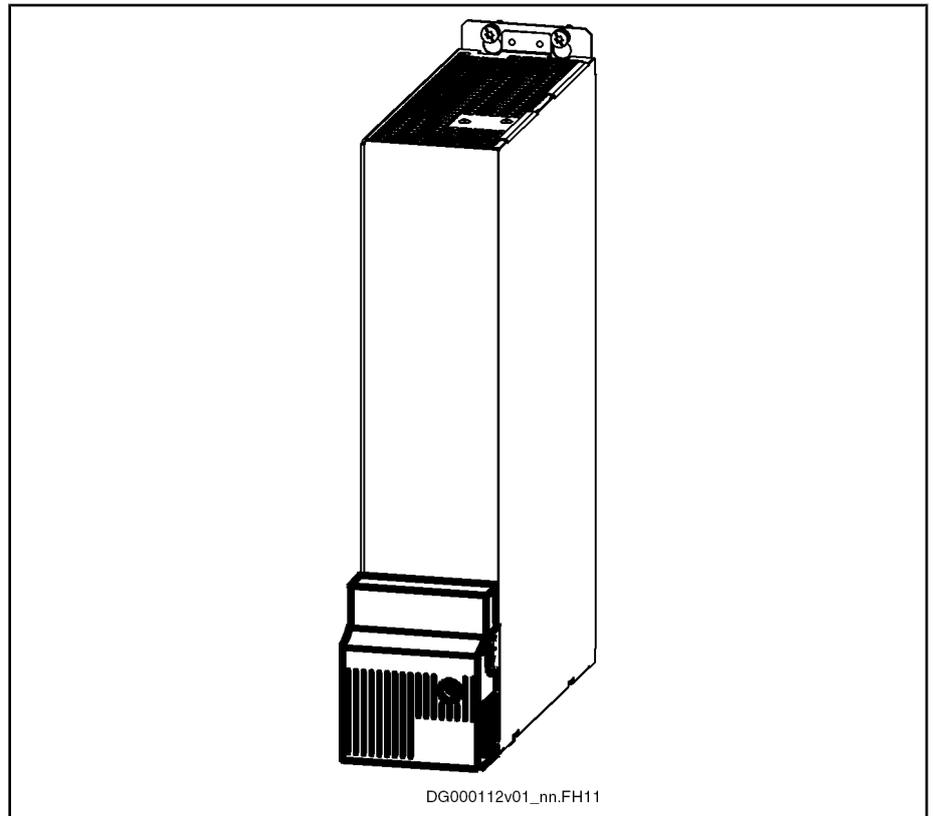


Fig. 11-27: Touch guard at device

The touch guard is fixed to the device with screws.

Tightening Torque **Max. 2.8 Nm**

## 11.5 Commissioning, Operation, Diagnoses



**CAUTION**

### Risk of fire caused by the "sacrificing behavior" of the ZKS stage!

The "ZKS" input activates the function "DC bus short circuit", when there hasn't any voltage been applied and when there isn't any current flowing to the input. This status occurs both in the case of wire break and when the 24V supply fails.

When the 24V supply fails in applications in which energy does not only get to the DC bus via the mains connection, but also via regeneratively operated motors (e.g. following-on rollers), the ZKS stage converts this energy into heat until it is destroyed ("sacrificing behavior").

Counter measures with such applications:

- Do not use drive controllers with integrated ZKS stage or
- buffer the 24V supply (e.g. by means of a UPS) to evaluate the monitor and switch off the energy flow in the case of error.

HLB01.1C and HLB01.1D - DC Bus Resistor Unit



At the common DC bus, other braking resistors take effect. For example, converters (HCS02, HCS03) and supply units (HMV) have integrated braking resistors or operate external HLR braking resistors.

For operating HLB01 at HCS and HMV, set the following parameters:

- P-0-0833, Braking resistor threshold
- P-0-0858, Data of external braking resistor
- P-0-0859, Data of internal braking resistor
- P-0-0860, Converter configuration

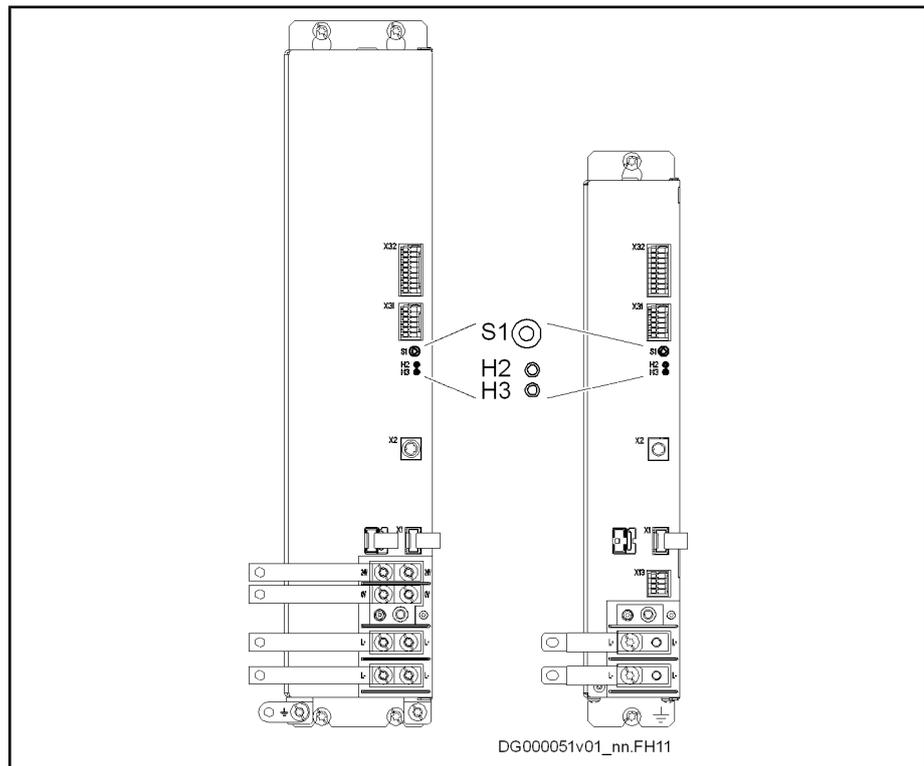


Fig.11-28: Diagnostic LEDs and reset key

**Reset Key S1**

**Diagnostic LED H2 (Green)**

Is used for resetting errors.

Status	Significance
 Flashing	Device is ready for operation and $U_{ZK} \leq 50 \text{ V}$
 Continuous light	Device is ready for operation and $U_{ZK} > 50 \text{ V}$

Fig.11-29: Diagnostic LED H2 (green)

## HLB01.1C and HLB01.1D - DC Bus Resistor Unit

## Diagnostic LED H3 (Red)

Status	Significance
 Flashing	<ul style="list-style-type: none"><li>• Overload prewarning at 90% load</li><li>• Overtemperature prewarning</li></ul>
 Continuous light	<ul style="list-style-type: none"><li>• Overload</li><li>• Overtemperature</li><li>• Internal error</li></ul>

Fig. 11-30: Diagnostic LED H3 (red)



## 12 HLR01 - Braking Resistors

### 12.1 Braking Resistor HLR01

HLR01.1N-xxxx-Nxxx-A-007-NNNN braking resistors convert generated kinetic energy into thermal energy. For this purpose, the line covers a wide range of continuous power and energy absorption capacity.

Type	Usage
HLR01.1A	<b>Type of construction A</b> (version for device mounting): To be mounted to drive controllers of the Rexroth IndraDrive C product range. For this purpose, the drive controllers must be equipped with a brake chopper.
HLR01.1N	<b>Type of construction N</b> (version for free assembly): For free assembly in the installation, operated by drive controller of the Rexroth IndraDrive C product range. For this purpose, the drive controllers must be equipped with a brake chopper.

Fig. 12-1: Usage of DC bus resistor units HLR

Versions of type of construction N:

- fixed resistor IP 20 **type A**  
cement-coated, wire-wound, tube-type fixed resistors; screwed on side walls; perforated cover; connections in terminal box with PG gland
- steel-grid fixed resistor IP 20 **type B**  
fixed resistor in steel-grid design; connection depending on type
- steel-grid fixed resistor IP 20 **type C**  
fixed resistor in steel-grid design; connection depending on type

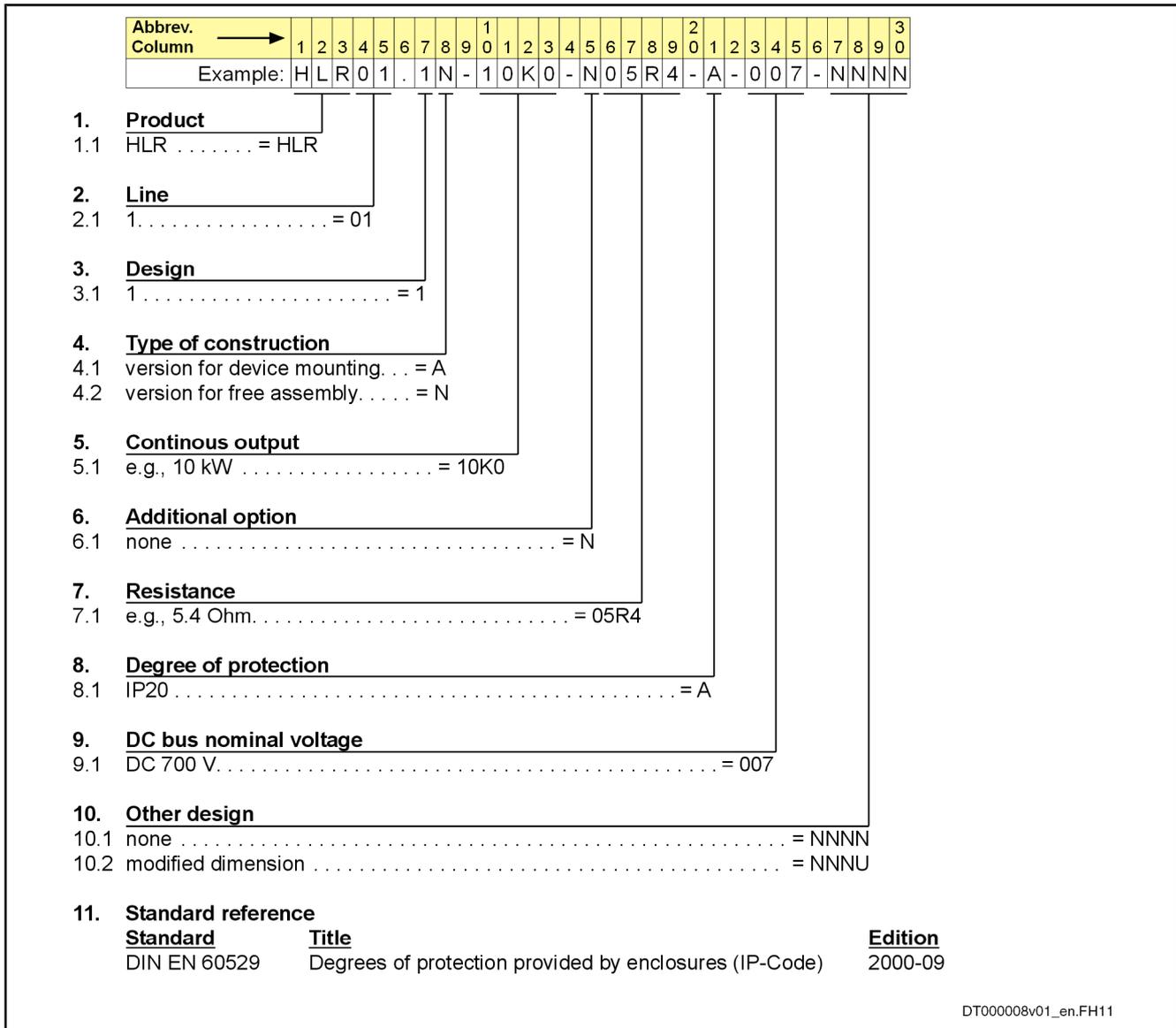
## 12.2 Type Code and Identification

### 12.2.1 Type Code



The following figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

HLR01 - Braking Resistors



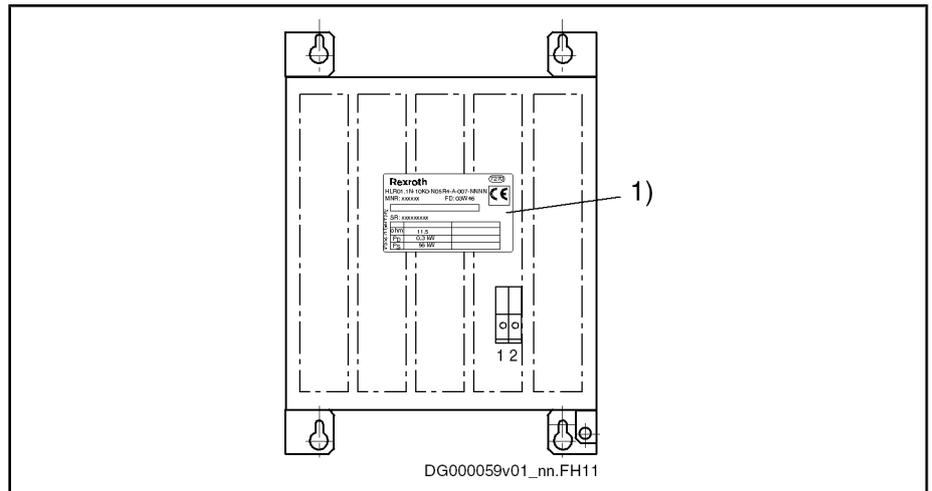
DT000008v01\_en.FH11

Fig. 12-2: Type code braking resistor HLR01.1

## 12.2.2 Identification

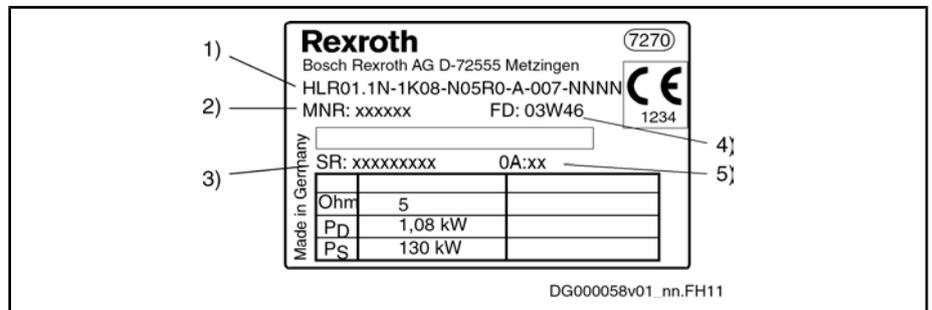
Each braking resistor is identified by a type designation. There is a type plate attached to all components.

Type Plate Arrangement



1) Type plate  
Fig. 12-3: Position of type plate

Type Plate



1) Type designation  
2) Part number  
3) Serial number  
4) Production date  
5) Revision index  
Fig. 12-4: Type plate HLR01.1

## 12.3 Scope of Supply

The scope of supply of HLR braking resistors provided for mounting to drive controllers includes the joint bar for the equipment grounding conductor connection.

## 12.4 Technical Data

### 12.4.1 Technical Data HLR01 for HCS02.1

#### Assignment HLR01 to HCS02.1E

Braking Resistors HLR01 for HCS02

Converter	Braking resistor type <sup>1)</sup>	Type of construction <sup>2)</sup>	Type Dimensions <sup>3)</sup>
HCS02.1E-W0054-A-03-xNNx	HLR01.1N-01K8-N40R0-...	Free assembly N	A7
HCS02.1E-W0054-A-03-xNNx	HLR01.1N-03K8-N40R0-...	Free assembly N	B1

HLR01 - Braking Resistors

Converter	Braking resistor type <sup>1)</sup>	Type of construction <sup>2)</sup>	Type Dimensions <sup>3)</sup>
HCS02.1E-W0070-A-03-xNNx	HLR01.1N-02K4-N28R0-...	Free assembly N	A8
HCS02.1E-W0070-A-03-xNNx	HLR01.1N-05K5-N28R0-...	Free assembly N	B2

- 1) Complete type with: A-007-NNNN
- 2) See Project Planning Manual "Rexroth IndraDrive Additional Components and Accessories", type code HLR
- 3) See Project Planning Manual "Rexroth IndraDrive Additional Components and Accessories", dimension tables HLR

Fig. 12-5: Assignment braking resistors HLR ↔ HCS02

HLR01 for HCS02.1E-W0054

Technical data - Currents, voltages, power

Description	Symbol	Unit	HLR01.1N-01K8-N40R0	HLR01.1N-03K8-N40R0
Degree of protection according to IEC60529			IP20	
Allowed ambient temperature range during operation with nominal data	T <sub>a_work</sub>	°C	0...40	
Mass (weight)	m	kg	6,60	9,50
Nominal braking resistance	R <sub>DC_Bleeder</sub>	ohm	40,00	
Braking resistor continuous power	P <sub>BD</sub>	kW	1,80	3,80
Braking resistor peak power at U <sub>DC</sub> = 850 V	P <sub>BS</sub>	kW	18,00	
Maximum regenerative power to be absorbed	W <sub>R_max</sub>	kWs	72,00	300,00
Maximum allowed on-time duty	t <sub>on_max</sub>	s	0,13	2,30
Minimum allowed cycle time	T <sub>cycl</sub>	s	4,00	16,67
Cooling type			n	
Volumetric capacity of forced cooling	V	m <sup>3</sup> /h	-	
Temperature rise with minimum distances d <sub>bot</sub> ; d <sub>top</sub> ; P <sub>BD</sub>	ΔT	K	65	
Minimum distance on the top of the device <sup>1)</sup>	d <sub>top</sub>	mm	300	600
Minimum distance on the bottom of the device <sup>2)</sup>	d <sub>bot</sub>	mm	200	
Horizontal spacing on the device <sup>3)</sup>	d <sub>hor</sub>	mm	200	
Allowed range tightening torque	M	Nm	1,80	2,00

## HLR01 - Braking Resistors

Description	Symbol	Unit	HLR01.1N-01K8-N40R0	HLR01.1N-03K8-N40R0
Required wire size according to IEC 60364-5-52; <sup>4)</sup>	$A_L$	mm <sup>2</sup>	4	4,0
Required wire size according to UL 508 A (internal wiring); (UL) <sup>5)</sup>	$A_L$	AWG	12	

1) 2) 3)

4)

5)

Fig. 12-6:

See fig. "Air intake and air outlet at drive controller"

Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °CCopper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C

HLR - Technical data - Currents, voltages, power

**CAUTION****Property damage due to temperatures higher than 105 °C!**

Observe the indicated minimum distances!

Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures

**HLR01 for HCS02.1E-W0070****Technical data - Currents, voltages, power**

Description	Symbol	Unit	HLR01.1N-02K4-N28R0	HLR01.1N-05K5-N28R0
Degree of protection according to IEC60529			IP20	
Allowed ambient temperature range during operation with nominal data	$T_{a\_work}$	°C	0...40	
Mass (weight)	$m$	kg	7,90	13,00
Nominal braking resistance	$R_{DC\_Bleeder}$	ohm	28,00	
Braking resistor continuous power	$P_{BD}$	kW	2,40	5,50
Braking resistor peak power at $U_{DC} = 850$ V	$P_{BS}$	kW	26,00	
Maximum regenerative power to be absorbed	$W_{R\_max}$	kWs	100,80	420,00
Maximum allowed on-time duty	$t_{on\_max}$	s	0,12	2,10
Minimum allowed cycle time	$T_{cycl}$	s	3,88	16,15
Cooling type			n	
Volumetric capacity of forced cooling	$V$	m <sup>3</sup> /h	-	
Temperature rise with minimum distances $d_{bot}$ ; $d_{top}$ ; $P_{BD}$	$\Delta T$	K	65	
Minimum distance on the top of the device <sup>1)</sup>	$d_{top}$	mm	300	600
Minimum distance on the bottom of the device <sup>2)</sup>	$d_{bot}$	mm	200	

HLR01 - Braking Resistors

Description	Symbol	Unit	HLR01.1N-02K4-N28R0	HLR01.1N-05K5-N28R0
Horizontal spacing on the device <sup>3)</sup>	d <sub>hor</sub>	mm	200	
Allowed range tightening torque	M	Nm	1,80	2,00
Required wire size according to IEC 60364-5-52; <sup>4)</sup>	A <sub>L</sub>	mm <sup>2</sup>	4	
Required wire size according to UL 508 A (internal wiring); (UL) <sup>5)</sup>	A <sub>L</sub>	AWG	12	

1) 2) 3) See fig. "Air intake and air outlet at drive controller"  
 4) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4; Ta ≤ 40 °C  
 5) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1; Ta ≤ 40 °C  
 Fig. 12-7: HLR - Technical data - Currents, voltages, power



**Property damage due to temperatures higher than 105 °C!**

Observe the indicated minimum distances!

Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures

**12.4.2 Technical Data HLR01 for HCS03.1E**

**Assignment HLR01 to HCS03.1E**

Braking Resistors HLR01 for HCS03

Converter	Braking resistor type <sup>1)</sup>	Type of construction <sup>2)</sup>	Type Dimensions <sup>3)</sup>
HCS03.1E-W0070-A-05-xNBV	HLR01.1A-0300-N17R5-...	Device mounting A	See corresponding dimensional drawing HLR01.1N-...
HCS03.1E-W0100-A-05-xNBV	HLR01.1A-0470-N11R7-...	Device mounting A	
HCS03.1E-W0150-A-05-xNBV	HLR01.1A-0780-N07R0-...	Device mounting A	
HCS03.1E-W0210-A-05-xNBV	HLR01.1A-1K08-N05R0-...	Device mounting A	
HCS03.1E-W0070-A-05-xNBV	HLR01.1N-01K6-N18R0-...	Free assembly N	A5
HCS03.1E-W0100-A-05-xNBV	HLR01.1N-02K0-N15R0-...	Free assembly N	A6
HCS03.1E-W0150-A-05-xNBV	HLR01.1N-04K5-N07R4-...	Free assembly N	B1
HCS03.1E-W0210-A-05-xNBV	HLR01.1N-06K5-N06R1-...	Free assembly N	B2
HCS03.1E-W0070-A-05-xNBV	HLR01.1N-03K5-N19R0-...	Free assembly N	B1
HCS03.1E-W0100-A-05-xNBV	HLR01.1N-05K0-N15R0-...	Free assembly N	B2

## HLR01 - Braking Resistors

Converter	Braking resistor type <sup>1)</sup>	Type of construction <sup>2)</sup>	Type Dimensions <sup>3)</sup>
HCS03.1E-W0150-A-05-xNBV	HLR01.1N-08K5-N08R0-...	Free assembly N	B3
HCS03.1E-W0210-A-05-xNBV	HLR01.1N-12K5-N05R5-...	Free assembly N	B4
HCS03.1E-W0070-A-05-xNBV	HLR01.1N-04K5-N18R0-...	Free assembly N	B2
HCS03.1E-W0100-A-05-xNBV	HLR01.1N-07K0-N14R0-...	Free assembly N	B3
HCS03.1E-W0150-A-05-xNBV	HLR01.1N-11K0-N07R3-...	Free assembly N	B3
HCS03.1E-W0210-A-05-xNBV	HLR01.1N-17K0-N05R1-...	Free assembly N	B5
HCS03.1E-W0070-A-05-xNBV	HLR01.1N-06K5-N18R0-...	Free assembly N	B2
HCS03.1E-W0100-A-05-xNBV	HLR01.1N-09K5-N13R0-...	Free assembly N	B3
HCS03.1E-W0150-A-05-xNBV	HLR01.1N-15K0-N08R1-...	Free assembly N	B4
HCS03.1E-W0210-A-05-xNBV	HLR01.1N-23K0-N05R5-...	Free assembly N	C2
HCS03.1E-W0070-A-05-xNBV	HLR01.1N-10K0-N18R0-...	Free assembly N	B3
HCS03.1E-W0100-A-05-xNBV	HLR01.1N-14K5-N13R0-...	Free assembly N	B4
HCS03.1E-W0150-A-05-xNBV	HLR01.1N-24K0-N07R2-...	Free assembly N	C3
HCS03.1E-W0210-A-05-xNBV	HLR01.1N-36K0-N05R4-...	Free assembly N	C4

1) Complete type with: A-007-NNNN

2) See Project Planning Manual "Rexroth IndraDrive Additional Components and Accessories", type code HLR

3) See Project Planning Manual "Rexroth IndraDrive Additional Components and Accessories", dimension tables HLR

Fig. 12-8: Assignment braking resistors HLR ↔ HCS03

## HLR01 for HCS03.1E-W0070

## Technical data - Currents, voltages, power

Description	Symbol	Unit	HLR01.1 N-01K6- N18R0	HLR01.1 N-0300- N17R5	HLR01.1 N-03K5- N19R0	HLR01.1 N-04K5- N18R0	HLR01.1 N-06K5- N18R0	HLR01.1 N-10K0- N18R0
Degree of protection according to IEC60529			IP20					
Allowed ambient temperature range during operation with nominal data	T <sub>a,work</sub>	°C	0...40					

HLR01 - Braking Resistors

Description	Symbol	Unit	HLR01.1 N-01K6- N18R0	HLR01.1 N-0300- N17R5	HLR01.1 N-03K5- N19R0	HLR01.1 N-04K5- N18R0	HLR01.1 N-06K5- N18R0	HLR01.1 N-10K0- N18R0
Mass (weight)	m	kg	5,20	3,00	9,50	13,00		22,00
Nominal braking resistance	$R_{DC\_Bleeder}$	ohm	18,00	17,50	19,00	18,00		
Braking resistor continuous power	$P_{BD}$	kW	1,60	0,30	3,50	4,50	6,50	10,00
Braking resistor peak power at $U_{DC} = 850 V$	$P_{BS}$	kW	34,00	37,00	31,00	33,00		
Maximum regenerative power to be absorbed	$W_{R\_max}$	kWs	109,00	37,00	252,00	432,00	686,00	1080,00
Maximum allowed on-time duty	$t_{on\_max}$	s	3,30	1,00	8,00	13,00	21,00	32,00
Minimum allowed cycle time	$T_{cycl}$	s	120,00					
Cooling type			n	f	n			
Volumetric capacity of forced cooling	V	m <sup>3</sup> /h	-	200,00	-			
Temperature rise with minimum distances $d_{bot}$ ; $d_{top}$ ; $P_{BD}$	$\Delta T$	K	>40	20	>65		>100	
Minimum distance on the top of the device <sup>1)</sup>	$d_{top}$	mm	1000	80	1000			
Minimum distance on the bottom of the device <sup>2)</sup>	$d_{bot}$	mm	200	80	300			
Horizontal spacing on the device <sup>3)</sup>	$d_{hor}$	mm	200	0	300			
Allowed range tightening torque	M	Nm	1,80	1,50	2,00			
Required wire size according to IEC 60364-5-52; <sup>4)</sup>	$A_L$	mm <sup>2</sup>	2,5		4,0	6,0	10,0	
Required wire size according to UL 508 A (internal wiring); (UL) <sup>5)</sup>	$A_L$	AWG	14		12	10	8	

1) 2) 3)

See fig. "Air intake and air outlet at drive controller"

4)

Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40 \text{ °C}$

5)

Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40 \text{ °C}$

Fig. 12-9:

HLR - Technical data - Currents, voltages, power



**Property damage due to temperatures higher than 105 °C!**

Observe the indicated minimum distances!

Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures

## HLR01 for HCS03.1E-W0100

## Technical data - Currents, voltages, power

Description	Symbol	Unit	HLR01.1 N-02K0- N15R0	HLR01.1 N-0470- N11R7	HLR01.1 N-05K0- N15R0	HLR01.1 N-07K0- N14R0	HLR01.1 N-09K5- N13R0	HLR01.1 N-14K5- N13R0
Degree of protection according to IEC60529			IP20					
Allowed ambient temperature range during operation with nominal data	$T_{a\_work}$	°C	0...40					
Mass (weight)	m	kg	6,20	4,50	13,00	22,00		33,00
Nominal braking resistance	$R_{DC\_Bleeder}$	ohm	15,00	11,70	15,00	14,00	13,00	
Braking resistor continuous power	$P_{BD}$	kW	2,00	0,47	5,00	7,00	9,50	14,50
Braking resistor peak power at $U_{DC} = 850$ V	$P_{BS}$	kW	40,00	56,00	40,00	43,00	46,00	4,00
Maximum regenerative power to be absorbed	$W_{R\_max}$	kWs	137,00	56,00	360,00	672,00	1003,00	1566,00
Maximum allowed on-time duty	$t_{on\_max}$	s	3,40	1,00	9,00	16,00	22,00	34,00
Minimum allowed cycle time	$T_{cycl}$	s	120,00					
Cooling type			n	f	n			
Volumetric capacity of forced cooling	V	m <sup>3</sup> /h	-	200,00	-			
Temperature rise with minimum distances $d_{bot}$ ; $d_{top}$ ; $P_{BD}$	$\Delta T$	K	>40	23	>65			
Minimum distance on the top of the device <sup>1)</sup>	$d_{top}$	mm	1000	80	1000			
Minimum distance on the bottom of the device <sup>2)</sup>	$d_{bot}$	mm	200	80	300			
Horizontal spacing on the device <sup>3)</sup>	$d_{hor}$	mm	200	0	300			
Allowed range tightening torque	M	Nm	0,50	4,00	2,00			3,00
Required wire size according to IEC 60364-5-52; <sup>4)</sup>	$A_L$	mm <sup>2</sup>	4,0		6,0	10,0		16,0
Required wire size according to UL 508 A (internal wiring); (UL) <sup>5)</sup>	$A_L$	AWG	12		10	8		6

1) 2) 3)

4)

5)

Fig. 12-10:

See fig. "Air intake and air outlet at drive controller"

Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °CCopper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C

HLR - Technical data - Currents, voltages, power

HLR01 - Braking Resistors



**Property damage due to temperatures higher than 105 °C!**

Observe the indicated minimum distances!

Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures

**HLR01 for HCS03.1E-W0150**

**Technical data - Currents, voltages, power**

Description	Symbol	Unit	HLR01.1 N-04K5- N07R4	HLR01.1 N-0780- N07R0	HLR01.1 N-08K5- N08R0	HLR01.1 N-11K0- N07R3	HLR01.1 N-15K0- N08R1	HLR01.1 N-24K0- N07R2
Degree of protection according to IEC60529			IP20					
Allowed ambient temperature range during operation with nominal data	$T_{a\_work}$	°C	0...40					
Mass (weight)	m	kg	9,50	5,50	22,00		33,00	80,00
Nominal braking resistance	$R_{DC\_Bleeder}$	ohm	7,40	7,00	8,00	7,30	8,10	7,20
Braking resistor continuous power	$P_{BD}$	kW	4,50	0,78	8,50	11,00	15,00	24,00
Braking resistor peak power at $U_{DC} = 850 V$	$P_{BS}$	kW	81,00	93,00	75,00	82,00	74,00	83,00
Maximum regenerative power to be absorbed	$W_{R\_max}$	kWs	246,00	93,00	612,00	1056,00	1584,00	2592,00
Maximum allowed on-time duty	$t_{on\_max}$	s	3,00	1,00	8,20	13,00	21,00	31,00
Minimum allowed cycle time	$T_{cycl}$	s	120,00					
Cooling type			n	f	n			
Volumetric capacity of forced cooling	V	m <sup>3</sup> /h	-	200,00	-			
Temperature rise with minimum distances $d_{bot}$ ; $d_{top}$ ; $P_{BD}$	$\Delta T$	K	>100	20	>65			>100
Minimum distance on the top of the device <sup>1)</sup>	$d_{top}$	mm	1000	80	1000			
Minimum distance on the bottom of the device <sup>2)</sup>	$d_{bot}$	mm	300	80	300			
Horizontal spacing on the device <sup>3)</sup>	$d_{hor}$	mm	300	0	300			
Allowed range tightening torque	M	Nm	3,00	4,00	3,00			6,00

## HLR01 - Braking Resistors

Description	Symbol	Unit	HLR01.1 N-04K5- N07R4	HLR01.1 N-0780- N07R0	HLR01.1 N-08K5- N08R0	HLR01.1 N-11K0- N07R3	HLR01.1 N-15K0- N08R1	HLR01.1 N-24K0- N07R2
Required wire size according to IEC 60364-5-52; <sup>4)</sup>	$A_L$	mm <sup>2</sup>	10,0		16,0	25,0		35,0
Required wire size according to UL 508 A (internal wiring); (UL) <sup>5)</sup>	$A_L$	AWG	8		6	3		2

1) 2) 3)

See fig. "Air intake and air outlet at drive controller"

4)

Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °C

5)

Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C*Fig. 12-11: HLR - Technical data - Currents, voltages, power***Property damage due to temperatures higher than 105 °C!**

Observe the indicated minimum distances!

Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures

**HLR01 for HCS03.1E-W0210****Technical data - Currents, voltages, power**

Description	Symbol	Unit	HLR01.1 N-06K5- N06R1	HLR01.1 N-12K5- N05R5	HLR01.1 N-17K0- N05R1	HLR01.1 N-1K08- N05R0	HLR01.1 N-23K0- N05R5	HLR01.1 N-36K0- N05R4
Degree of protection according to IEC60529			IP20					
Allowed ambient temperature range during operation with nominal data	$T_{a\_work}$	°C	0...40					
Mass (weight)	m	kg	13,00	33,00	43,00	8,00	56,00	93,00
Nominal braking resistance	$R_{DC\_Bleeder}$	ohm	6,10	5,50	5,10	5,00	5,50	5,40
Braking resistor continuous power	$P_{BD}$	kW	6,50	12,50	17,00	1,08	23,00	36,00
Braking resistor peak power at $U_{DC} = 850$ V	$P_{BS}$	kW	98,00	109,00	117,00	130,00	109,00	111,00
Maximum regenerative power to be absorbed	$W_{R\_max}$	kWs	356,00	900,00	1632,00	130,00	2429,00	3888,00
Maximum allowed on-time duty	$t_{on\_max}$	s	3,60	8,30	14,00	1,00	22,00	35,00
Minimum allowed cycle time	$T_{cycl}$	s	120,00					
Cooling type			n			f	n	
Volumetric capacity of forced cooling	V	m <sup>3</sup> /h	-			200,00	-	
Temperature rise with minimum distances $d_{bot}$ ; $d_{top}$ ; $P_{BD}$	$\Delta T$	K	>100			22	>200	

HLR01 - Braking Resistors

Description	Symbol	Unit	HLR01.1 N-06K5- N06R1	HLR01.1 N-12K5- N05R5	HLR01.1 N-17K0- N05R1	HLR01.1 N-1K08- N05R0	HLR01.1 N-23K0- N05R5	HLR01.1 N-36K0- N05R4
Minimum distance on the top of the device <sup>1)</sup>	d <sub>top</sub>	mm	1000			80	1000	
Minimum distance on the bottom of the device <sup>2)</sup>	d <sub>bot</sub>	mm	300			80	300	
Horizontal spacing on the device <sup>3)</sup>	d <sub>hor</sub>	mm	300			0	300	
Allowed range tightening torque	M	Nm	6,00					
Required wire size according to IEC 60364-5-52; <sup>4)</sup>	A <sub>L</sub>	mm <sup>2</sup>	16,0	35,0		16,0	50,0	
Required wire size according to UL 508 A (internal wiring); (UL) <sup>5)</sup>	A <sub>L</sub>	AWG	6	2		6	1/0	

1) 2) 3) See fig. "Air intake and air outlet at drive controller"  
 4) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4; Ta ≤ 40 °C  
 5) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1; Ta ≤ 40 °C  
 Fig.12-12: HLR - Technical data - Currents, voltages, power



**Property damage due to temperatures higher than 105 °C!**

Observe the indicated minimum distances!  
 Above the devices there may only be such materials which

- are not combustible
- are insensitive to the occurring high temperatures

## 12.5 Installation and Mounting

### 12.5.1 Notes on Installation and Mounting



**Lethal electric shock caused by live parts with more than 50 V!**

Connect the braking resistor to the equipment grounding system of the control cabinet.

- Braking resistors of **type of construction A**: For the equipment grounding connection, mount the joint bar on the front between braking resistor and drive controller.
- Braking resistors of **type of construction N**: Connect the equipment grounding conductor in stationary form to the equipment grounding system of the control cabinet.

Check the continuity of the equipment grounding conductors from the mains connection to the housings of the braking resistors.

**Equipment grounding conductor: material and cross section**

For the equipment grounding conductor, use the same metal (e.g. copper) as for the outer conductors.

For the connections from the equipment grounding conductor connection of the device to the equipment grounding conductor system in the control cabinet, make sure the cross sections of the lines are sufficient.

Cross sections of the equipment grounding connections:

- for **HCS03.1E** drive controllers and **HMV01** supply units, **at least 10 mm<sup>2</sup>**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- for **HCS02.1E** drive controllers, **at least 4 mm<sup>2</sup>**, but not smaller than the cross sections of the outer conductors of the mains supply feeder

Additionally, mount the housing of HCS02.1E to a bare metal mounting plate. Connect the mounting plate, too, with at least the same cross section to the equipment grounding conductor system in the control cabinet.

For outer conductors with a cross section greater than 16 mm<sup>2</sup>, you can reduce the cross section of the equipment grounding connection according to the table "Cross section of equipment grounding conductor, excerpt from EN 61800-5-1:2003".

Cross-sectional area A of outer conductors	Minimum cross-sectional area A <sub>PE</sub> of equipment grounding connection
$A \leq 16 \text{ mm}^2$	A
$16 \text{ mm}^2 < A \leq 35 \text{ mm}^2$	16
$35 \text{ mm}^2 < A$	A / 2

Fig. 12-13: Equipment grounding conductor cross section, excerpt from EN 61800-5-1:2003, table 2

**CAUTION****Hot surface!**

The surface and housing parts of the braking resistor can have a temperature of more than 250 °C in operation.

Do not stress and do not touch surfaces and housing parts of braking resistors.

Before touching the surfaces and housing parts of braking resistors, wait for an adequate time after switching off power to allow the braking resistors to cool down.

## HLR01 - Braking Resistors



**CAUTION**

---

### High temperatures in the proximity of braking resistors!

Mount the braking resistors to temperature-resistant mounting surfaces in such a way that the air can freely enter and escape and heat does not accumulate.

Take the minimum distances  $d_{top}$ ,  $d_{bot}$  and  $d_{hor}$  into account.

Take into account that the temperatures in the range of the indicated minimum distances can be above 250 °C.

Leave sufficient distance to combustible objects and take into account that braking resistors dissipate a lot of heat.

Make sure there is free cooling air supply at the bottom  $d_{bot}$  and cooling air discharge at the top  $d_{top}$ .

The space must be able to discharge the energy converted by the braking resistor.

---



### Observe degree of protection!

When mounted outdoor or at the outside of the control cabinet, observe the degree of protection IP20 of the braking resistor.

Protect the devices against intrusion of water.

---

## 12.5.2 Braking Resistors HLR01.1, Type of Construction A (Version for Device Mounting)

### General Information

Only HLR01 braking resistors of the **type of construction A** (see type code) are suited for mounting to HCS03 drive controllers.

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The braking resistors provided for mounting above the HCS03 drive controllers are cooled by the cooling air of the drive controller flowing off.

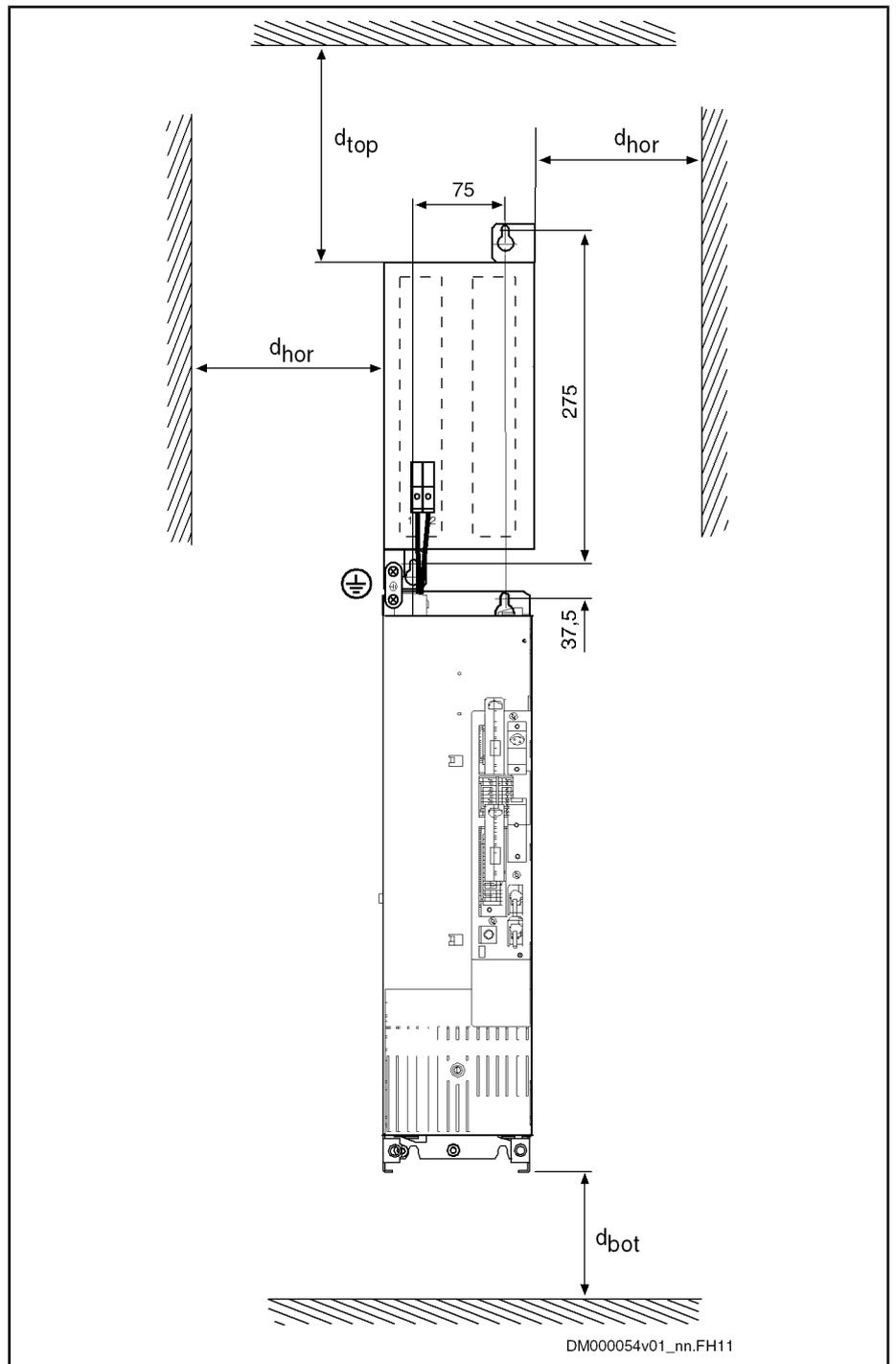
For other mounting situations, the HLR braking resistors must be separately cooled:

Cooling air current of at least 200 m<sup>3</sup>/h through the braking resistor

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HCS03.1E-W0070-xNBV With HLR01.1N-0300-N17R-A-007-NNNN

Dimensions for Mounting

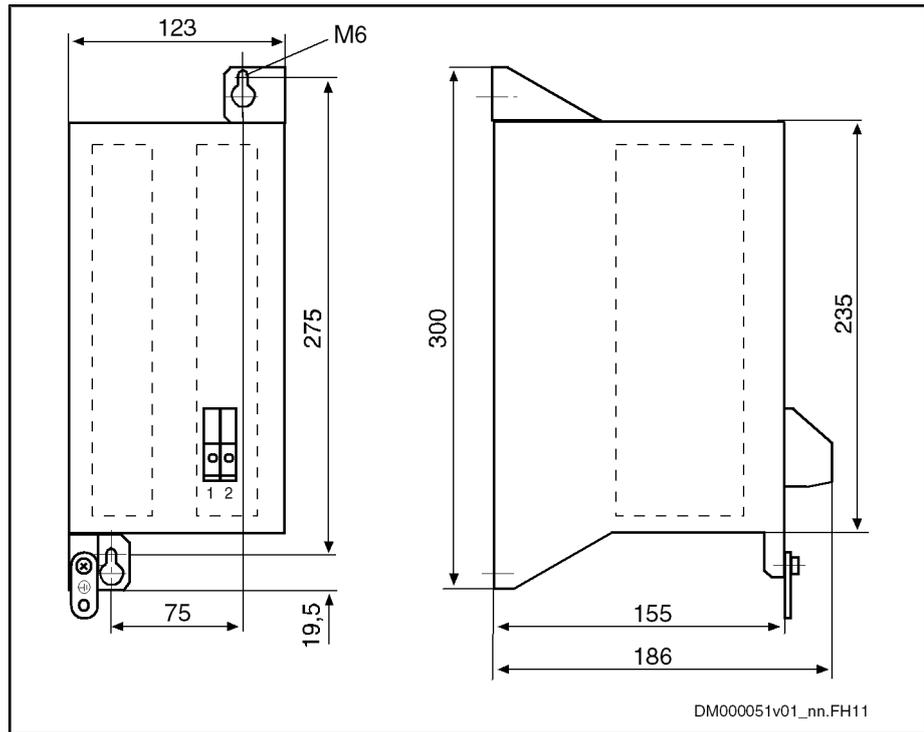


$d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Dimensions in mm  
Distances at top and bottom and on the sides, data see chapter "Technical Data"

Fig. 12-14: Mounting example device / braking resistor  
HLR01.1N-0300-N17R5-A-007-NNNN

HLR01 - Braking Resistors

Dimensional Drawing  
HLR01.1N-0300-N17R5-A-007-  
NNNN

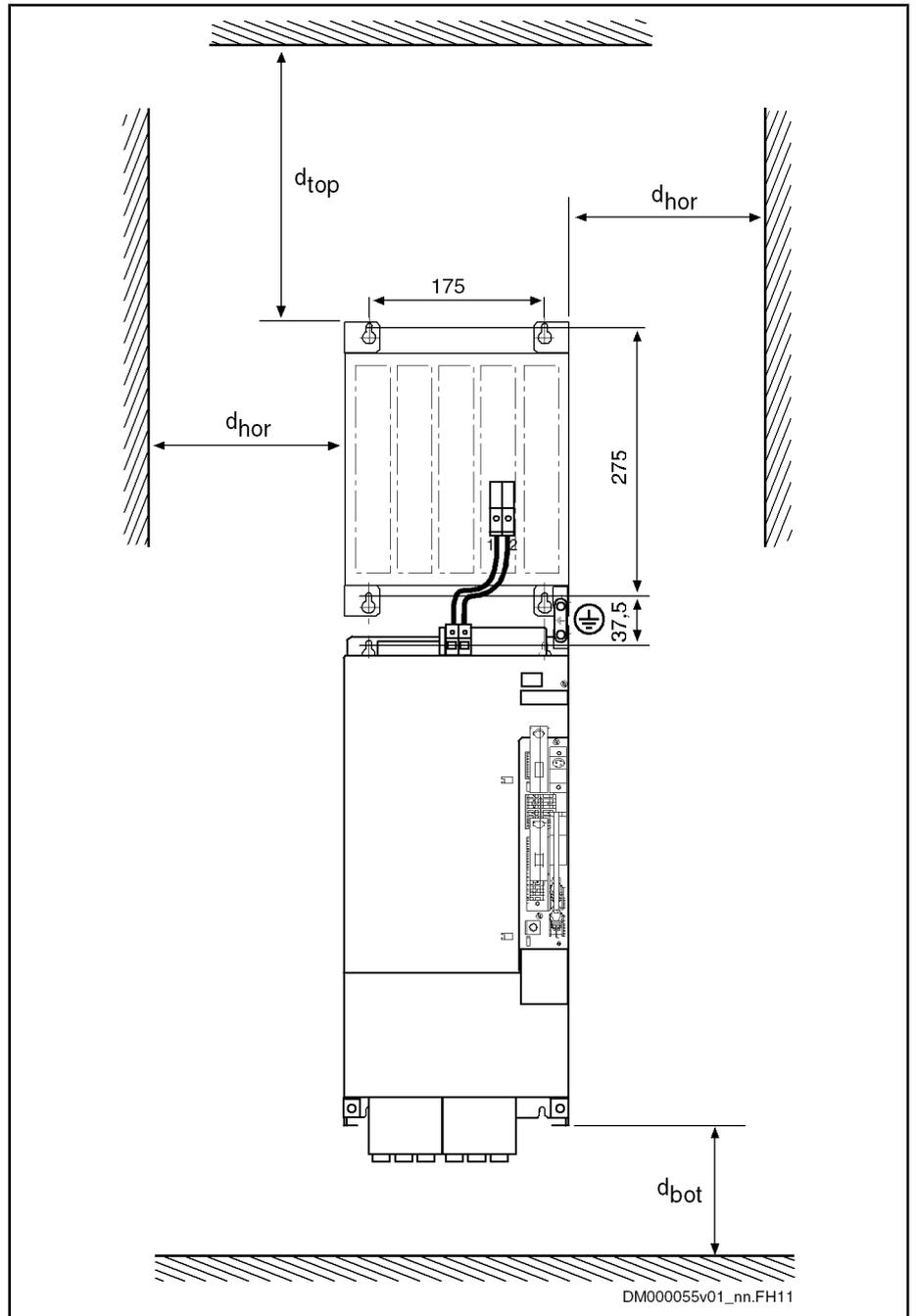


Dimensions in mm

Fig. 12-15: Dimensions braking resistor HLR01.1N-0300-N17R5-A-007-NNNN

HCS03.1E-W0100-xNBV With HLR01.1N-0470-N11R7-A-007-NNNN

Dimensions for Mounting

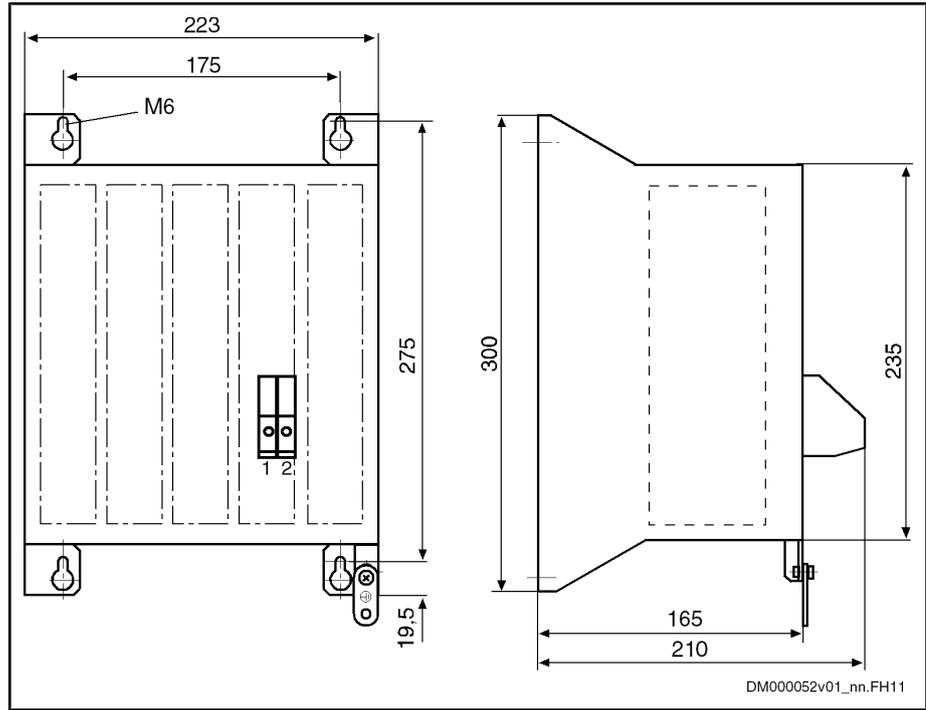


Dimensions in mm  
 $d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Distances at top and bottom and on the sides, data see chapter "Technical Data"

Fig. 12-16: Mounting example device / braking resistor  
 HLR01.1N-0470-N11R7-A-007-NNNN and  
 HLR01.1N-0780-N07R7-A-007-NNNN

HLR01 - Braking Resistors

Dimensional Drawing  
HLR01.1N-0470-N11R7-A-007-N  
NNN

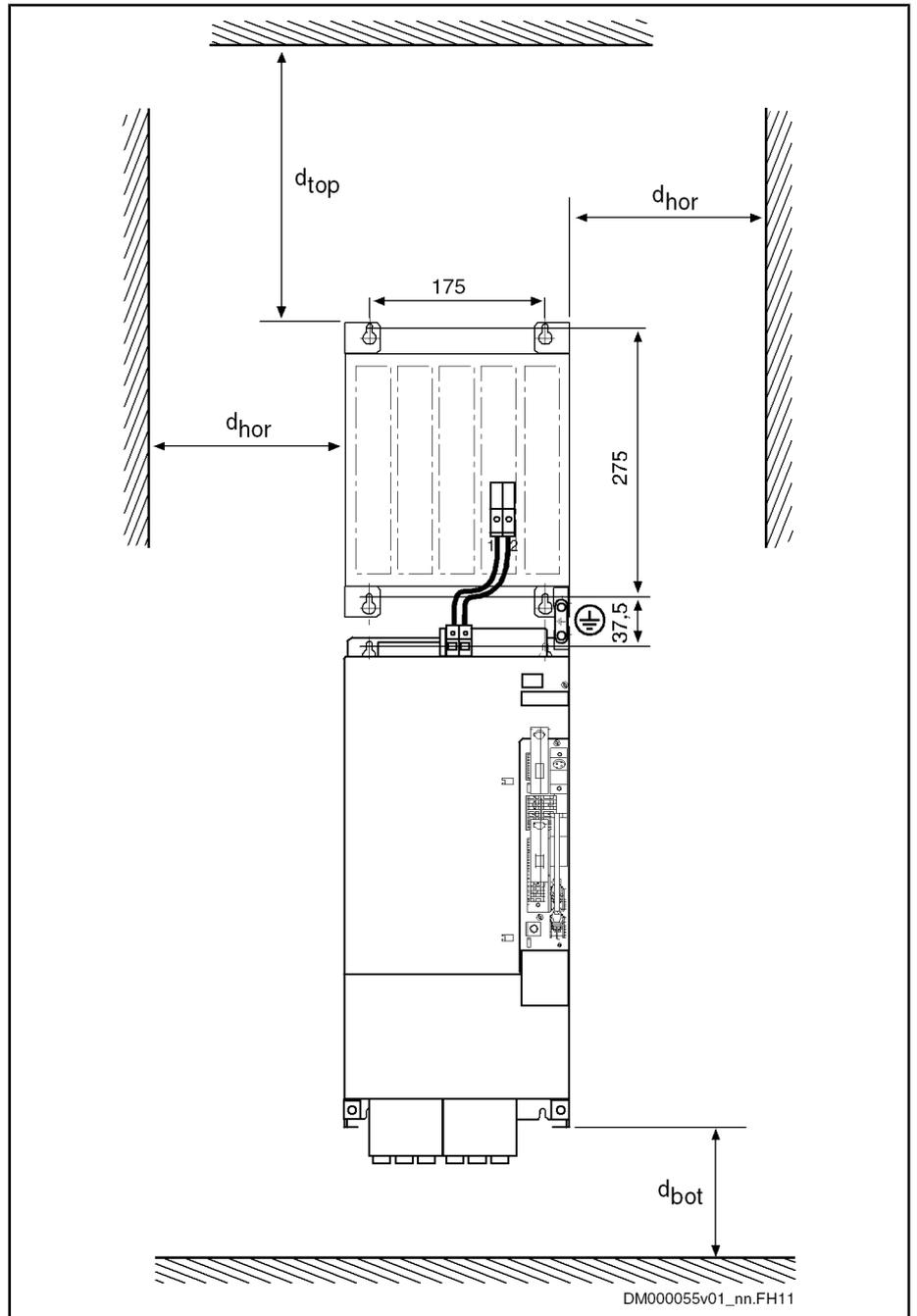


Dimensions in mm

Fig.12-17: Dimensions braking resistor HLR01.1N-0470-N11R7-A-007-NNNN

HCS03.1E-W0150-xNBV With HLR01.1N-0780-N07R7-A-007-NNNN

Dimensions for Mounting

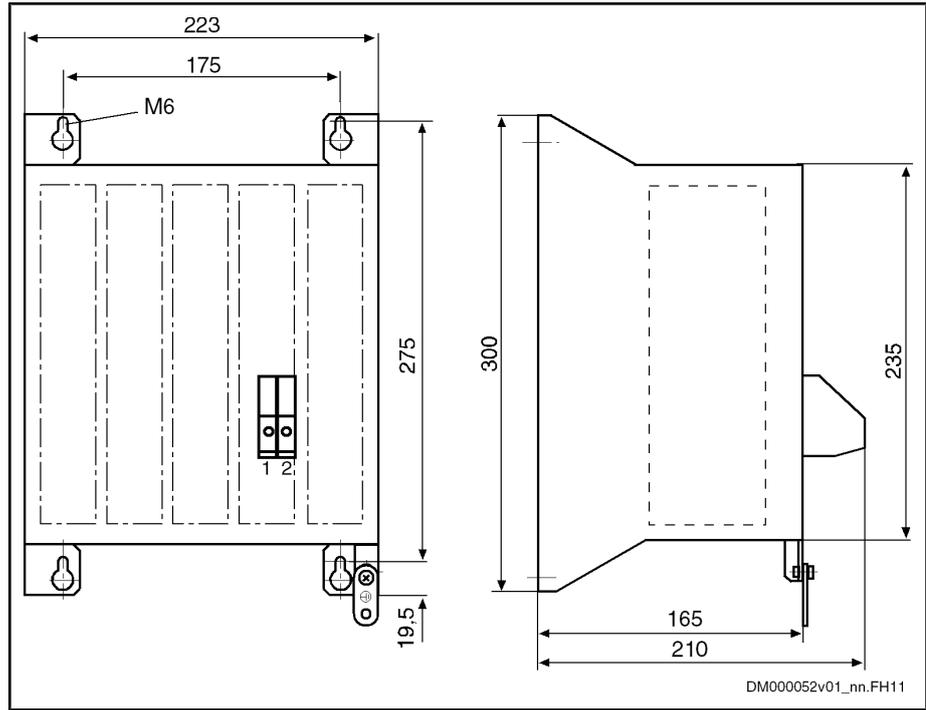


Dimensions in mm  
 $d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Distances at top and bottom and on the sides, data see chapter "Technical Data"

Fig. 12-18: Mounting example device / braking resistor  
 HLR01.1N-0780-N07R7-A-007-NNNN

HLR01 - Braking Resistors

Dimensional Drawing  
HLR01.1N-0780-N07R0-A-007-N  
NNN

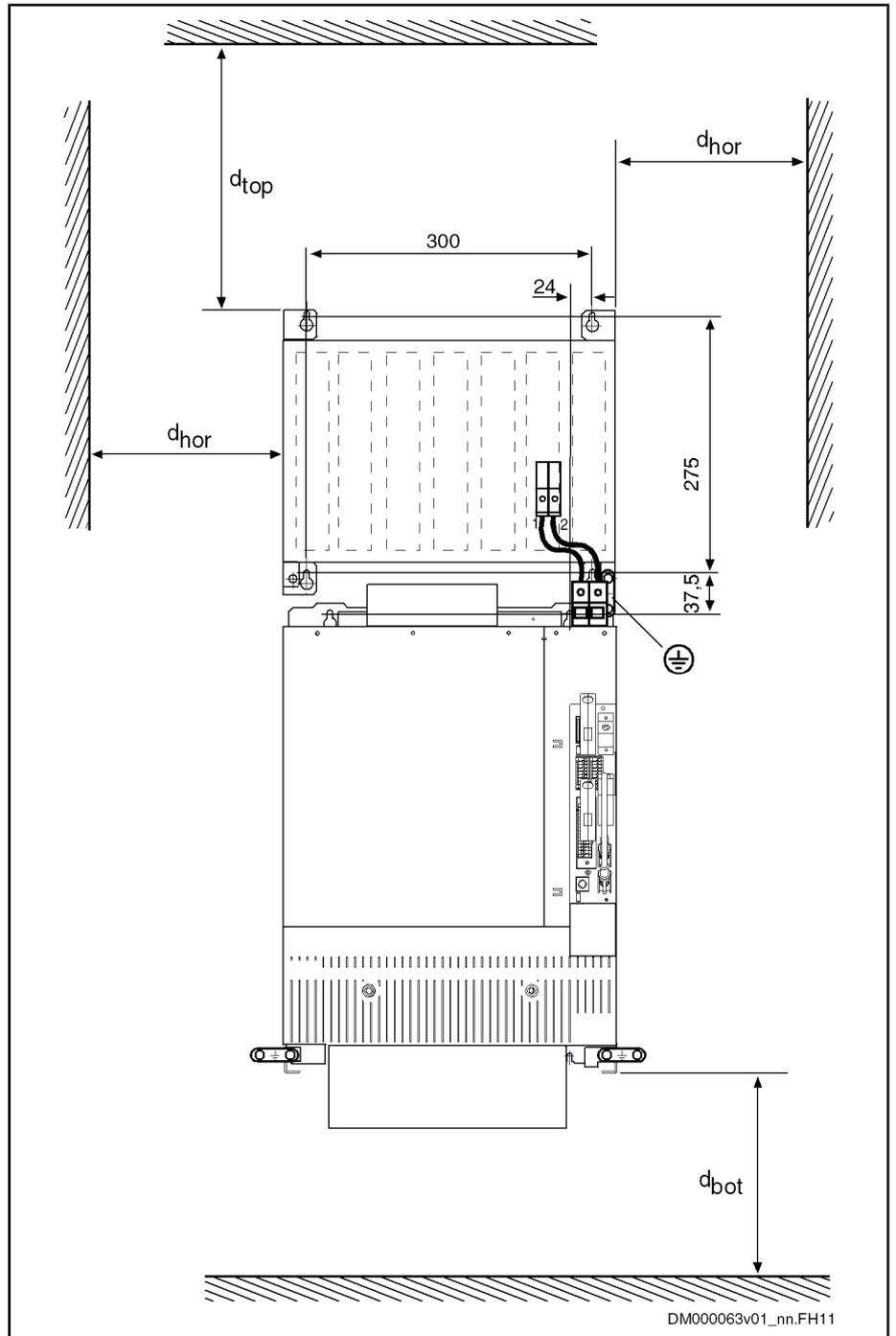


Dimensions in mm

Fig.12-19: Dimensions braking resistor HLR01.1N-0780-N07R0-A-007-NNNN

HCS03.1E-W0210-xNBV With HLR01.1N-1K08-N05R0-A-007-NNNN

Dimensions for Mounting

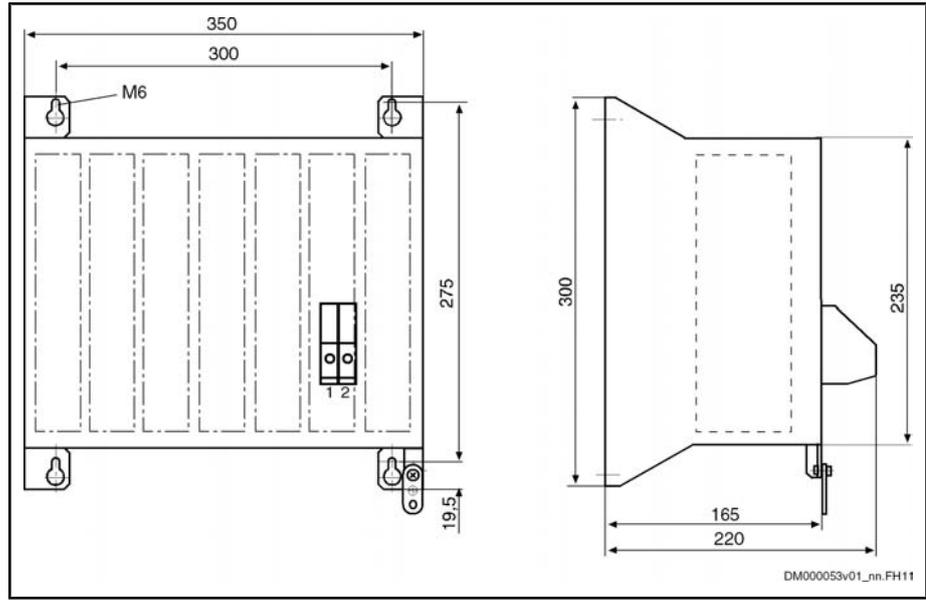


$d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Dimensions in mm  
Distances at top and bottom and on the sides, data see chapter "Technical Data"

Fig. 12-20: Mounting example device / braking resistor  
HLR01.1N-1K08-N05R0-A-007-NNNN

HLR01 - Braking Resistors

Dimensional Drawing  
HLR01.1N-1K08-N05R0-A-007-  
NNNN

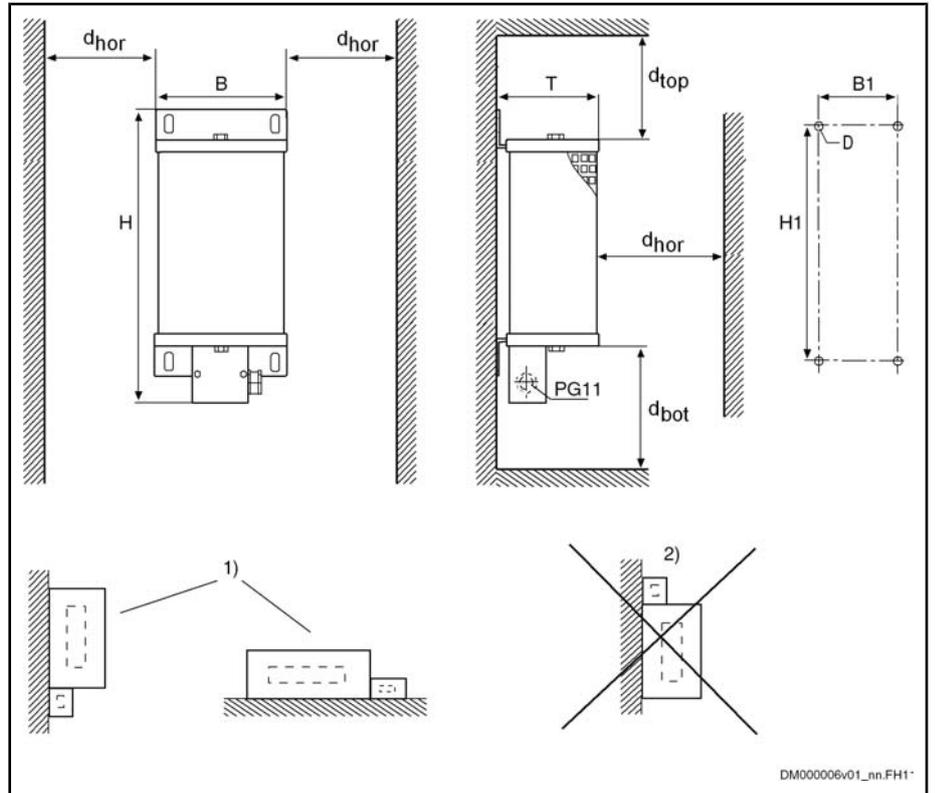


Dimensions in mm

Fig.12-21: Dimensions braking resistor HLR01.1N-1K08-N05R0-A-007-NNNN

### 12.5.3 Braking Resistors HLR01.1, Type of Construction N (Version for Free Assembly)

#### Fixed Resistor IP 20 Type A



$d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Distances at top and bottom and on the sides, data see chapter "Technical Data"

1) Allowed mounting position (terminals at the bottom; on horizontal surfaces)

2) Inadmissible mounting position (terminals at the top, to the right and to the left)

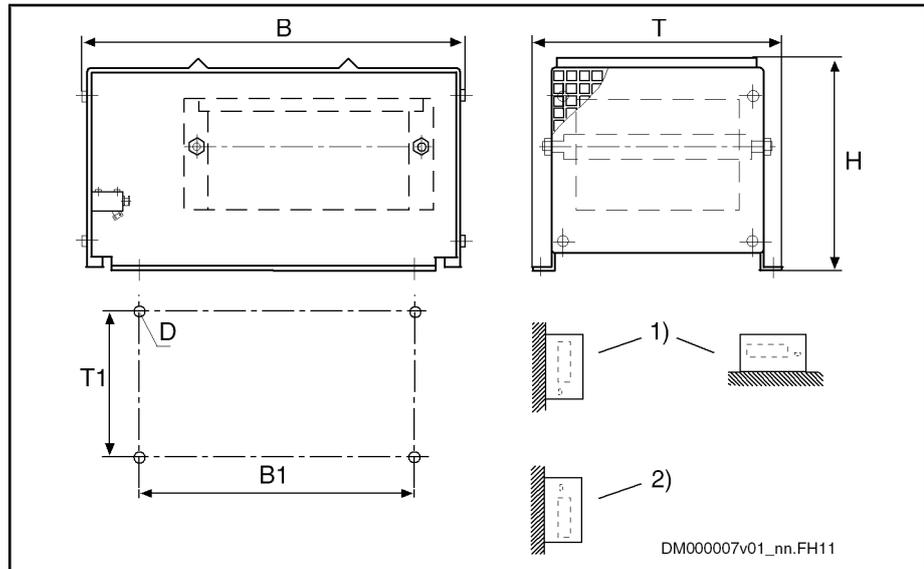
Fig. 12-22: Type A5 – A6

Type	Dimensions in mm						Weight in kg
	H	B	T	H1	B1	D	
A5	586	185	120	526	150	M6	5,2
A6	686	185	120	626	150	M6	6,2
A7	549	275	120	430	240	M6	6,6
A8	649	275	120	530	240	M6	7,9

Fig. 12-23: Dimension table braking resistor type A

HLR01 - Braking Resistors

Steel-Grid Fixed Resistor IP 20 Type B



$d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Distances at top and bottom and on the sides, data see chapter "Technical Data"

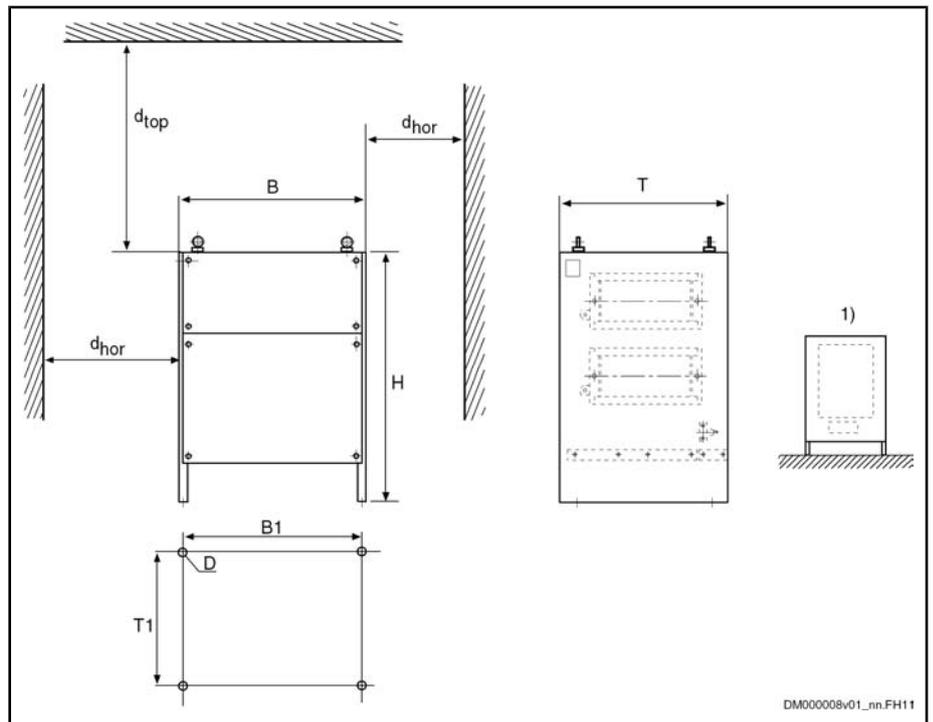
- 1) Allowed mounting position (terminals at the bottom; perforated sheet at the top and at the bottom; on horizontal surfaces)
- 2) Inadmissible mounting position (terminals at the top, to the right and to the left)

Fig. 12-24: Type B1 – B4

Type	Dimensions in mm						Weight in kg
	B	T	H	B1	T1	D	
B1	490	300	270	380	270	M10	9,5
B2	490	400	270	380	370	M10	13
B3	490	600	270	380	570	M10	22
B4	490	800	270	380	770	M10	33
B5	490	1000	270	380	970	M10	44

Fig. 12-25: Dimension table braking resistor type B

### Steel-Grid Fixed Resistor IP 20 Type C



$d_{top}$ ,  $d_{bot}$ ,  $d_{hor}$  Distances at top and bottom and on the sides, data see chapter "Technical Data"

1) Allowed mounting position (vertically on horizontal surfaces)

Fig. 12-26: Type C1 – C7

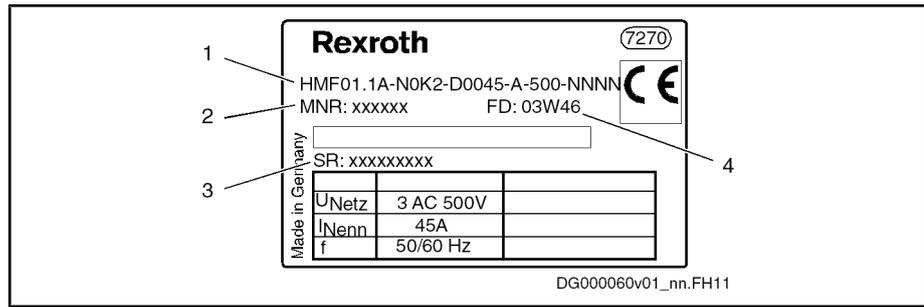
Type	Dimensions in mm						Weight in kg
	B	T	H	B1	T1	D	
C2	595	490	710	570	380	M10	56
C3	795	490	710	770	380	M10	80
C4	995	490	710	970	380	M10	93

Fig. 12-27: Dimension table braking resistor type C





HMF01.1 - Motor Filter



1 Type designation  
 2 Part number  
 3 Serial number  
 4 Production date  
 Fig.13-2: Type plate

### 13.3 Electrical Data

Technical data - Currents, voltages, power

Description	Symbol	Unit	HMF01.1 A-N0K2- D0045- A-500- NNNN	HMF01.1 A-N0K2- D0073- A-500- NNNN	HMF01.1 A-N0K2- D0095- A-500- NNNN	HMF01.1 A-N0K2- D0145- A-500- NNNN	HMF01.1 N-N0K2- M0012- A-500- NNNN	HMF01.1 N-N0K2- M0028- A-500- NNNN
Degree of protection according to IEC60529			IP20					
Listing according to UL standard (UL)			n.s.					
Listing according to CSA standard (UL)			n.s.					
Mass (weight)	m		15	15,00	20,00		5,10	11,20
Inductance		μH	3 × 160	3 × 100	3 × 78	3 × 50	3 × 900	3 × 450
Allowed switching frequencies	f <sub>s</sub>	kHz	4				4, 8, 12, 16	
Allowed continuous output current at f <sub>s</sub> = 4 kHz	I <sub>out_cont4</sub>	A	45,0000	73,0000	95,0000	145,0000	12,0000	28,0000
Maximum output current at f <sub>s</sub> = 4 kHz	I <sub>out_max4</sub>	A	n.s.				28,0000	70,0000
Rise of voltage at output with U <sub>LN_nenn</sub> and 15 m motor cable length phase-ground (10-90%)	dv/dt	kV/μs	1,00					
Rise of voltage at output with U <sub>LN_nenn</sub> and 15 m motor cable length phase-phase (10-90%)	dv/dt	kV/μs	1,00					
Power dissipation at continuous current and continuous DC bus power respectively (UL)	P <sub>Diss_cont</sub>	W	120,00	160,00	190,00	220,00	25,00	50,00
Insulation resistance at DC 500 V	R <sub>is</sub>	kOhm	n.s.				600,00	

Description	Symbol	Unit	HMF01.1 A-N0K2- D0045- A-500- NNNN	HMF01.1 A-N0K2- D0073- A-500- NNNN	HMF01.1 A-N0K2- D0095- A-500- NNNN	HMF01.1 A-N0K2- D0145- A-500- NNNN	HMF01.1 N-N0K2- M0012- A-500- NNNN	HMF01.1 N-N0K2- M0028- A-500- NNNN
Required wire size according to IEC 60364-5-52; at $I_{L\_cont}$ <sup>5)</sup>	$A_{LN}$	mm <sup>2</sup>	16	35	50	95	1,5	6
Required wire size according to UL 508 A (internal wiring); at $I_{L\_cont}$ (UL) <sup>6)</sup>	$A_{LN}$	AWG	6	2	0	4/0	14	10

n.s. Not specified  
 5) Copper wire; PVC-insulation (conductor temperature 70 °C); installation method B2; table B52-4;  $T_a \leq 40$  °C  
 6) Copper wire; PVC-insulation (conductor temperature 90 °C); table 13.5.1;  $T_a \leq 40$  °C

Fig. 13-3: HMF - Technical data - Currents, voltages, power

## 13.4 Mechanical Data

### 13.4.1 Dimensions, Mass

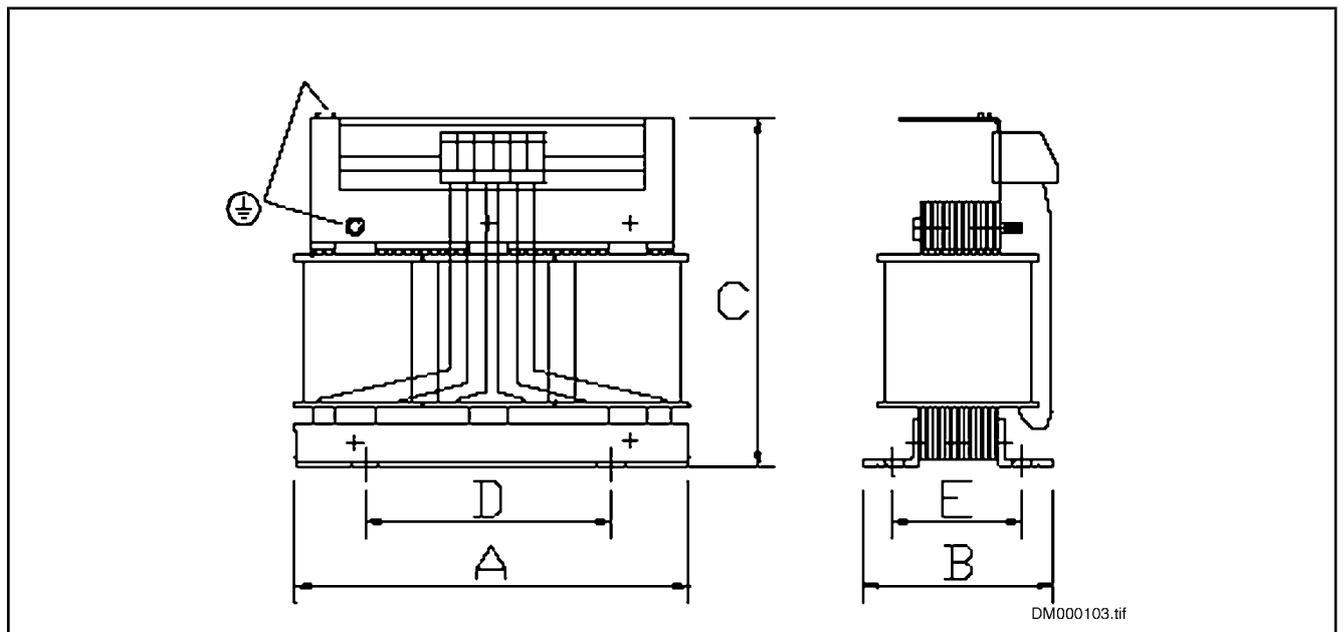


Fig. 13-4: Dimensions motor filter HMF01.1A-N0K2-M0012-A-500-NNNN

HMF01.1 - Motor Filter

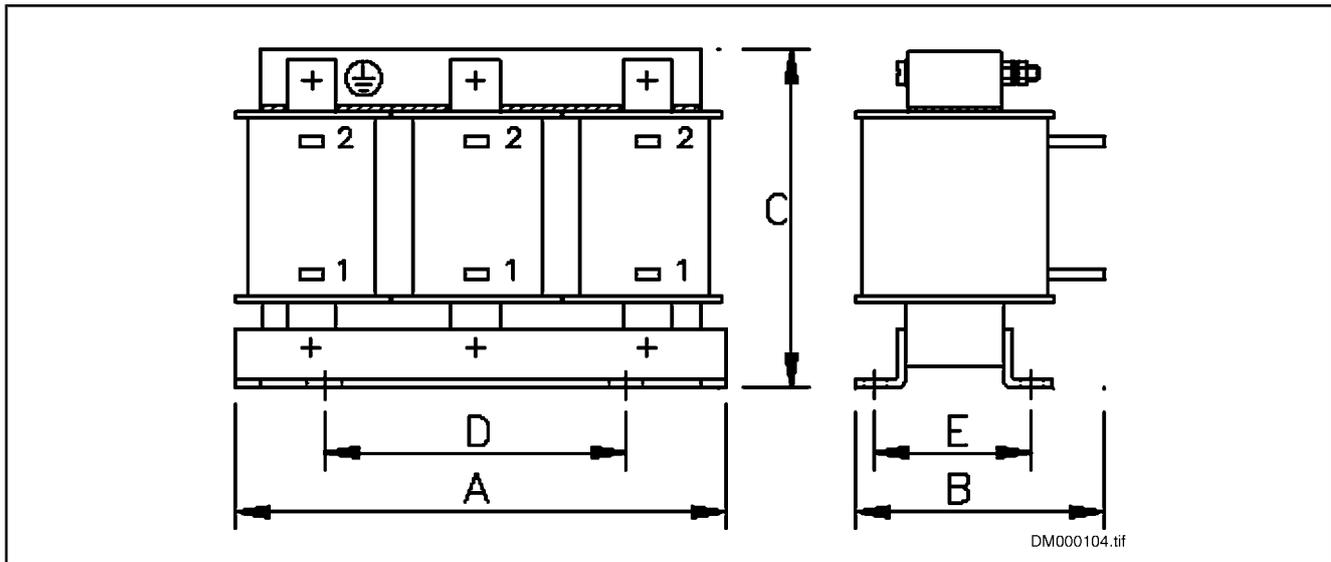
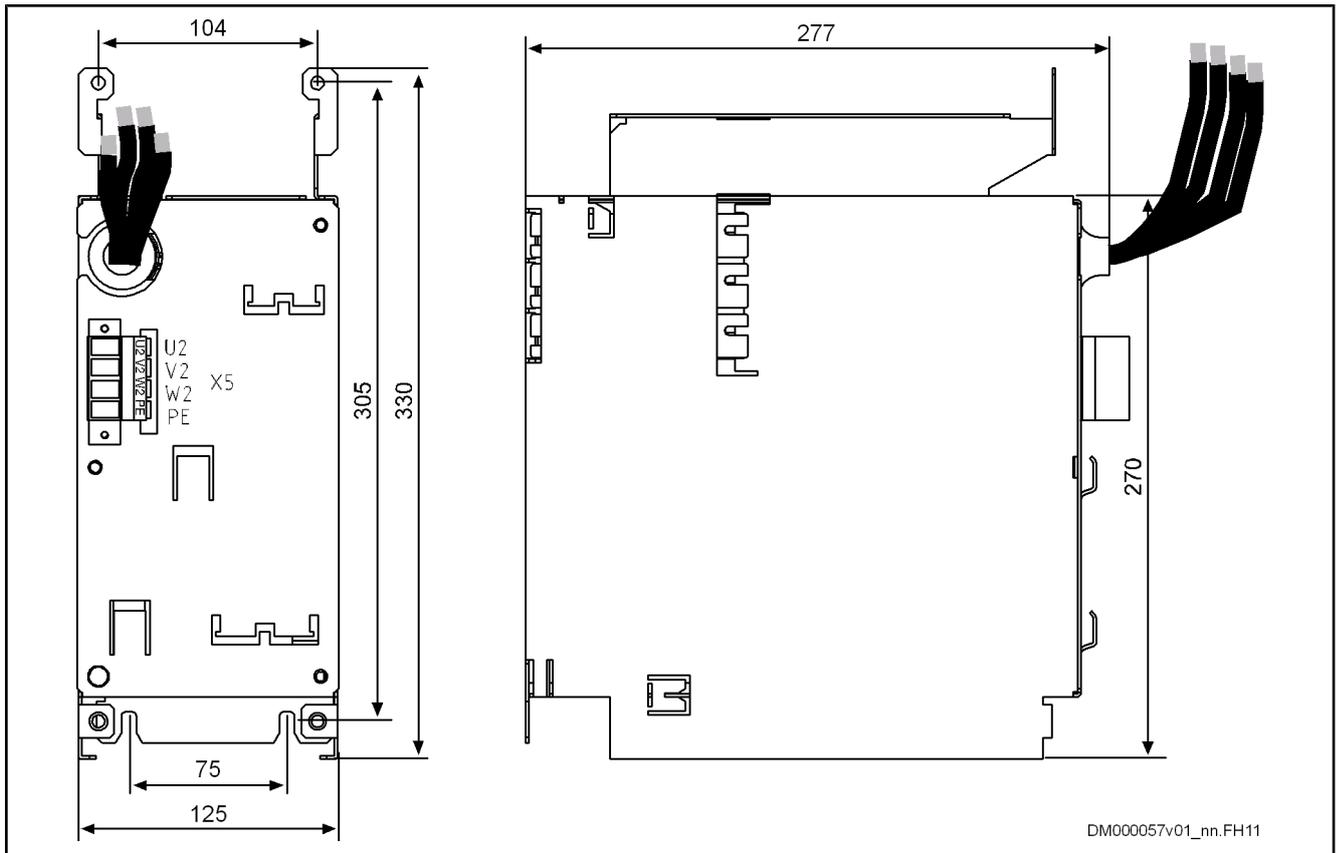


Fig.13-5: Dimensions motor filter HMF01.1A-N0K2-M0028-A-500-NNNN

Type	Dimensions [mm]					Weight [kg]	Tightening torque electrical connections [Nm]
	A	B	C	D	E		
0012	155	91,5	162	130	71,5	5,1	0,6-0,8
0028	210	130	182	175	95	11,2	12

Fig.13-6: Dimensions motor filter



Dimensions in mm  
Fig. 13-7: Dimensions motor filter HMF01.1A-N0K2-D0045-A-500-NNNN

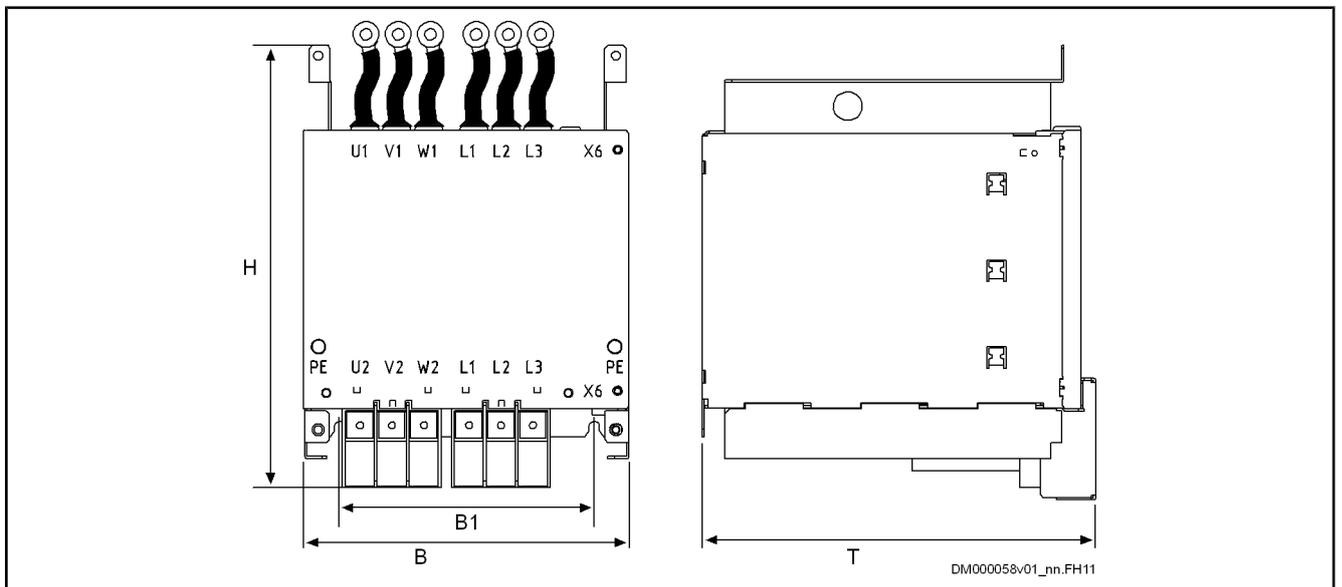


Fig. 13-8: Dimensions motor filters HMF01.1A-N0K2-D0073-A-500-NNNN, HMF01.1A-N0K2-D0095-A-500-NNNN and HMF01.1A-N0K2-D0145-A-500-NNNN

## HMF01.1 - Motor Filter

Type	Dimensions [mm]					Weight [kg]	Tightening torque electrical connections [Nm]
	B	H	T	B	H1		
0045	See above fig. "Dimensions motor filter HMF01.1A-N0K2- D0045-A-500-NNNN"					15	1,5
0073	225	315	270	175	257	15	6
0095	225	315	270	175	257	20	6
0145	350	400	260	250	310	20	25

*Fig. 13-9: Dimensions motor filter*

### 13.5 Arrangement of the Components HCS03.1 / Motor Filter HMF

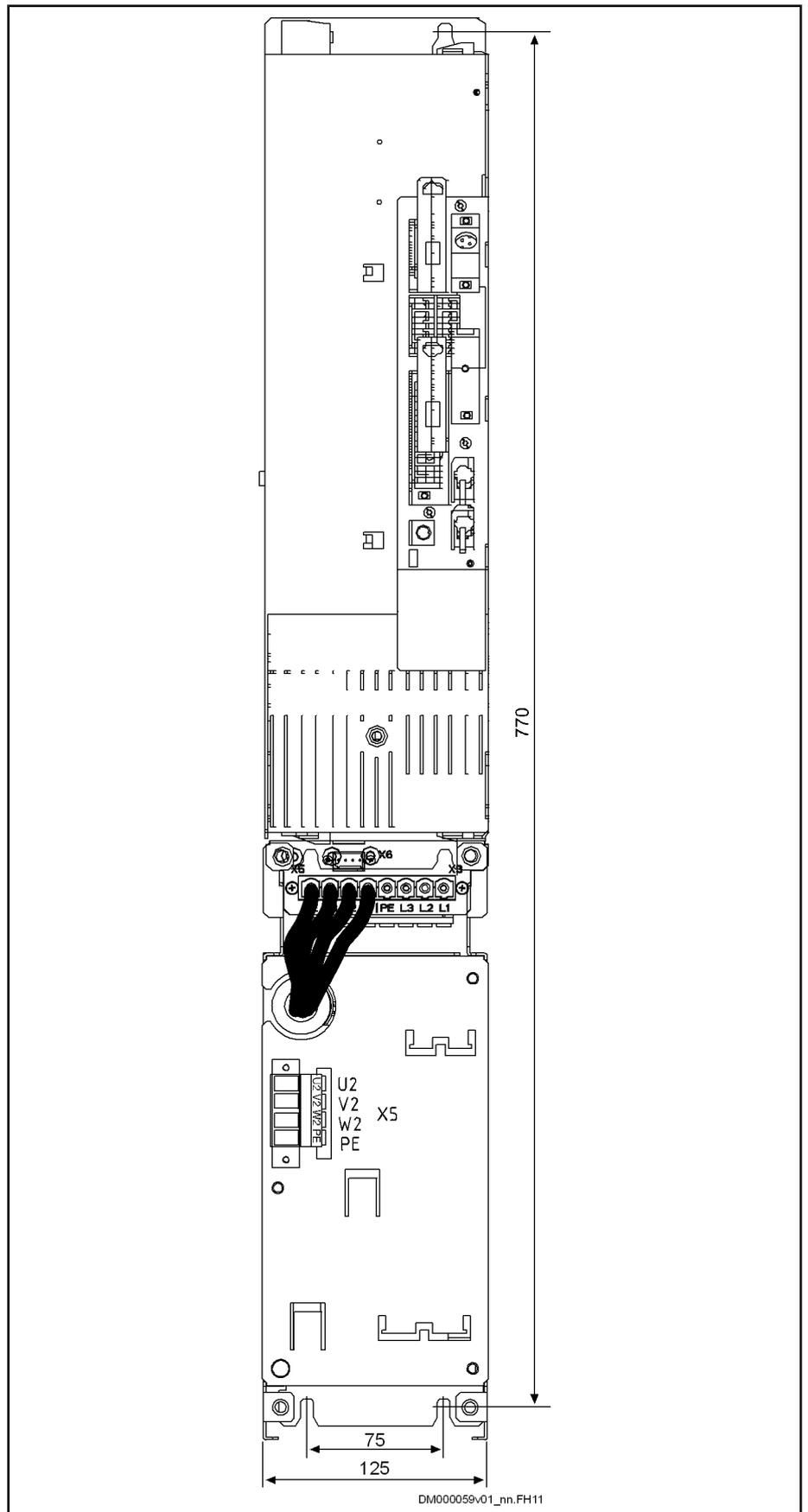


Fig. 13-10: Sample mounting HCS03.1E-W0070 / HMF01.1A-D0K2-D0045

HMF01.1 - Motor Filter

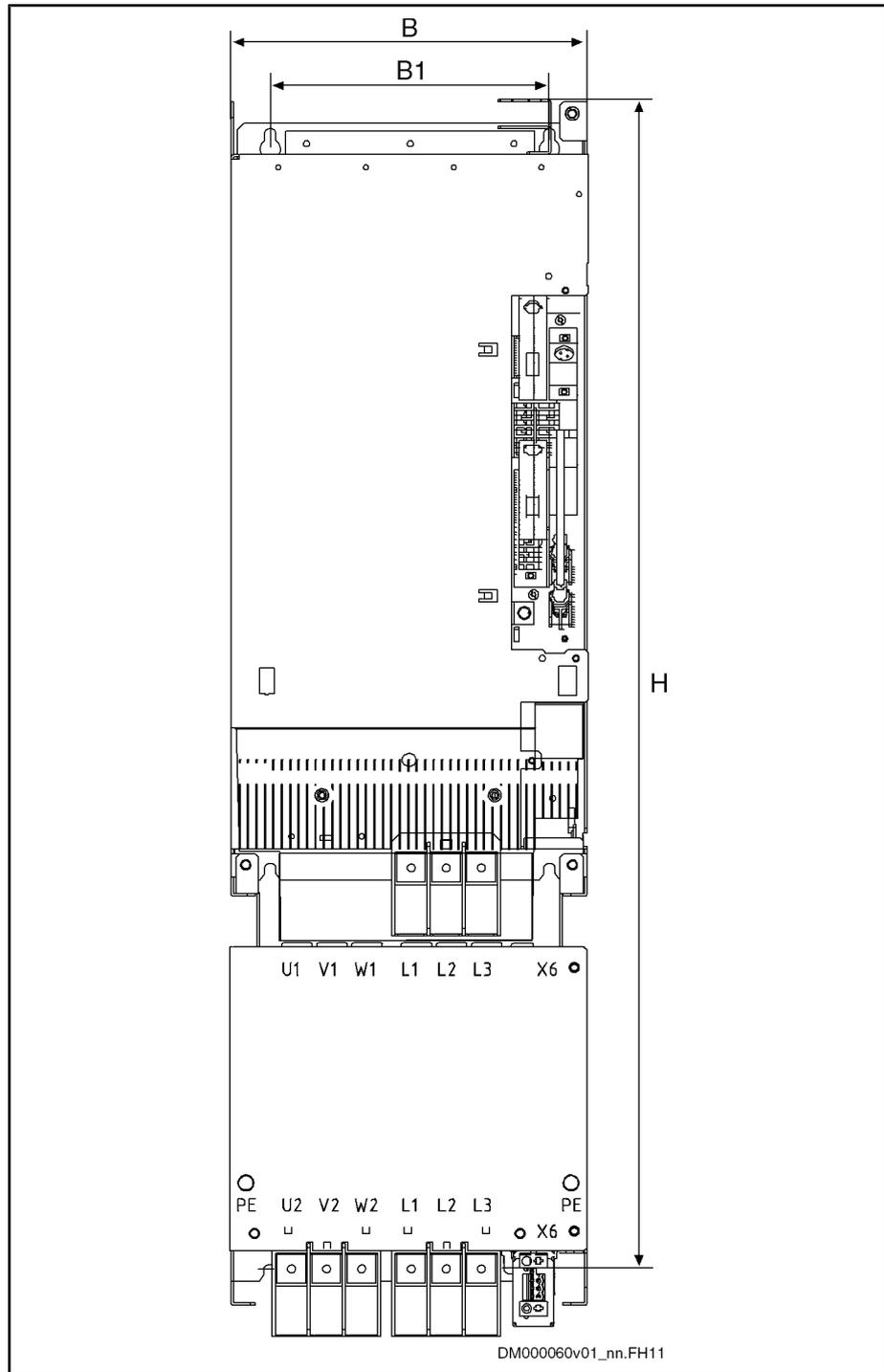


Fig.13-11: Sample mounting HCS03.1E-W0100, -0150, -0210 / motor filter

HCS03.1E-	H	B	B1
W0100	720	225	175
W0150	720	225	175
W0210	780	350	250

Fig.13-12: Dimension table for sample mounting HCS03.1E-... / motor filter HMF

### 13.6 Arrangement of the Components HCS03.1 / Motor Filter and Mains Filter

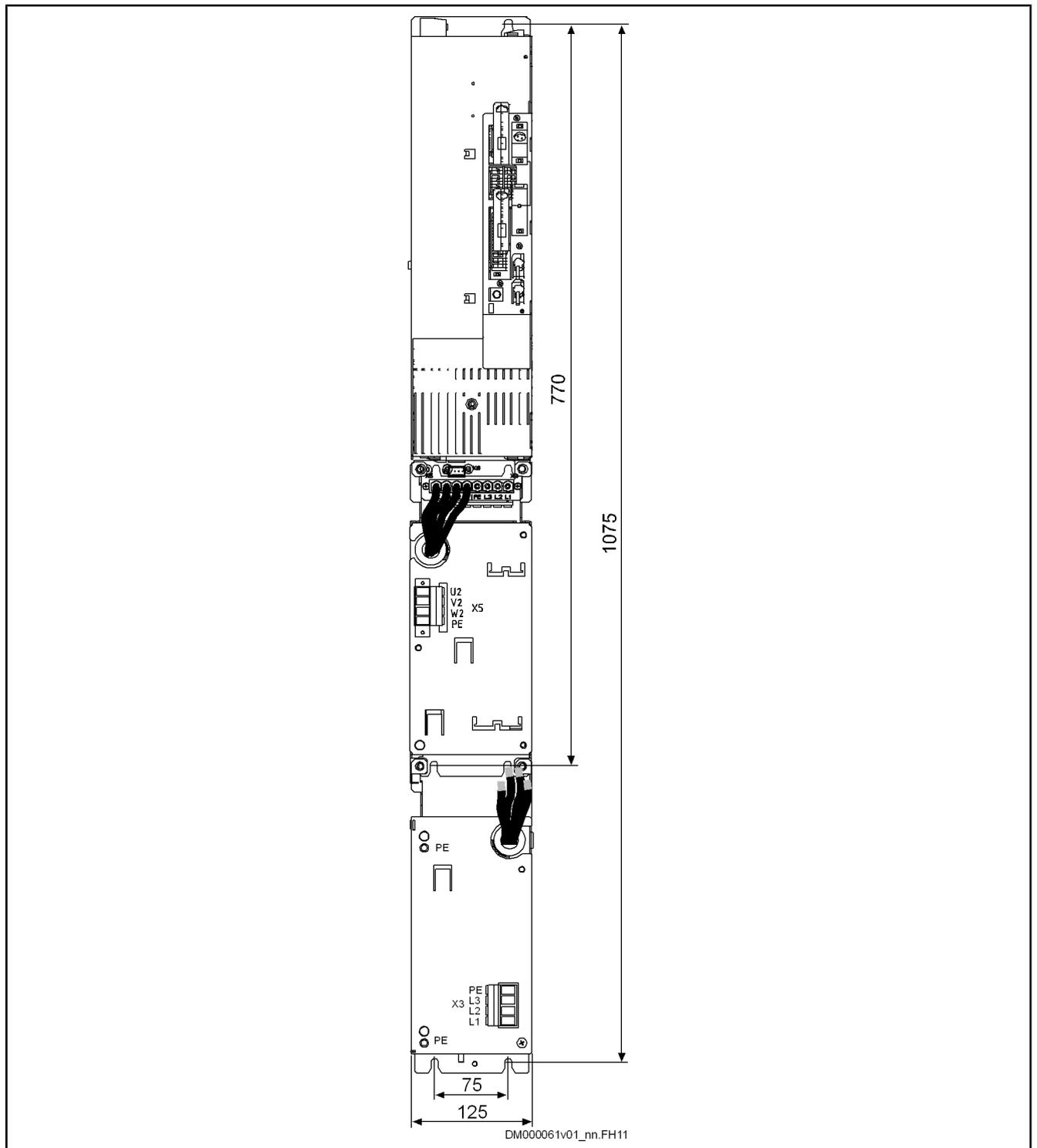


Fig. 13-13: Arrangement HCS03.1E-W0070 / motor filter and mains filter + HAS05.1-001 + HAS05.1-002



For information on the HAS accessories, see Project Planning Manual on the drive system Rexroth IndraDrive.

HMF01.1 - Motor Filter

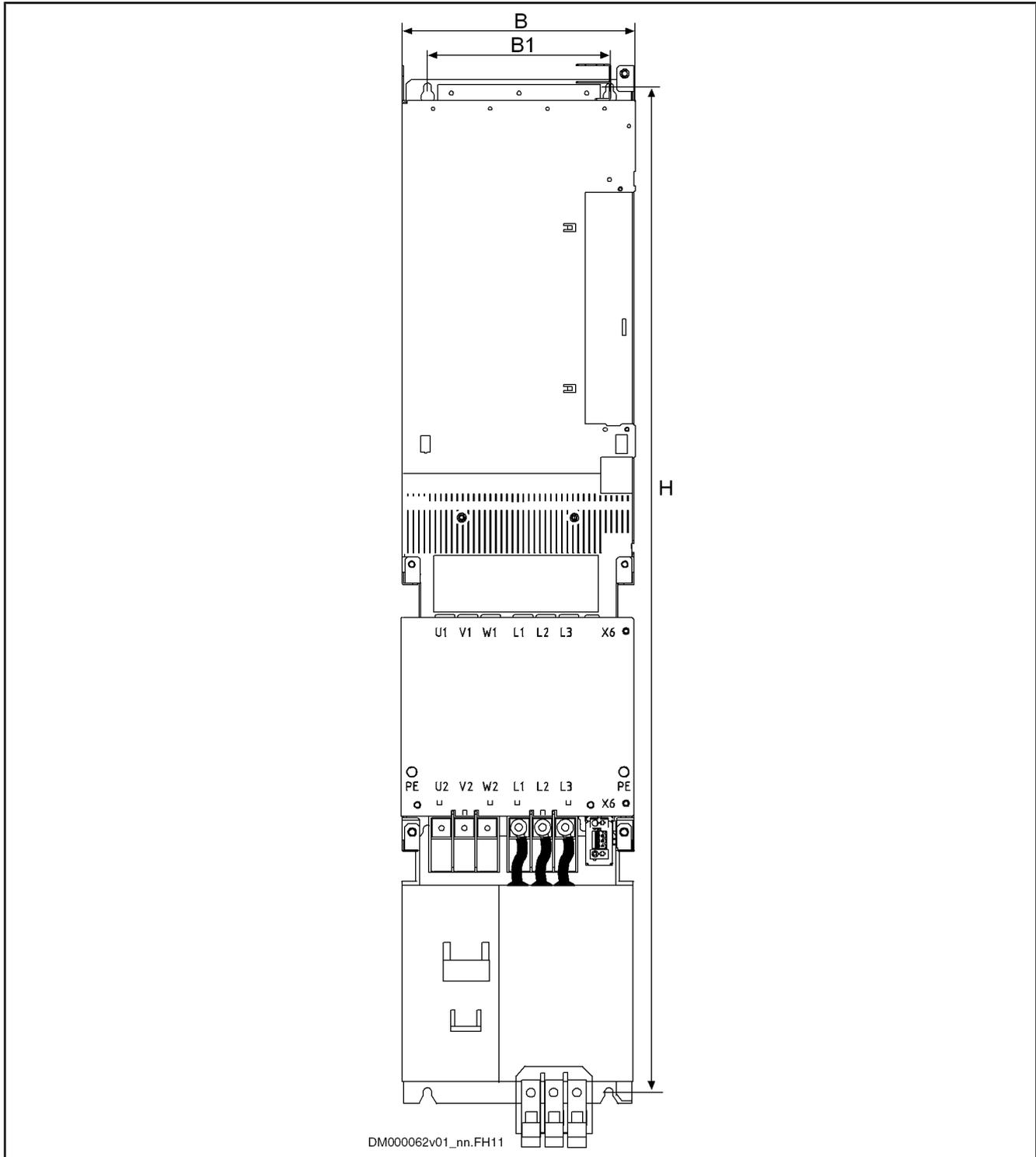


Fig.13-14: Arrangement of device 0100, 0150, 0210 / motor filter and mains filter

<b>HCS03.1E-</b>	<b>H</b>	<b>B1</b>	<b>B</b>
W0100	980	175	225
W0150	980	175	225
W0210	1090	250	350

*Fig. 13-15: Dimension table for sample mounting HCS03.1E-.. / mains filter / motor filter*





HAC01 - Housing for Control Sections

## 14.2 Usage

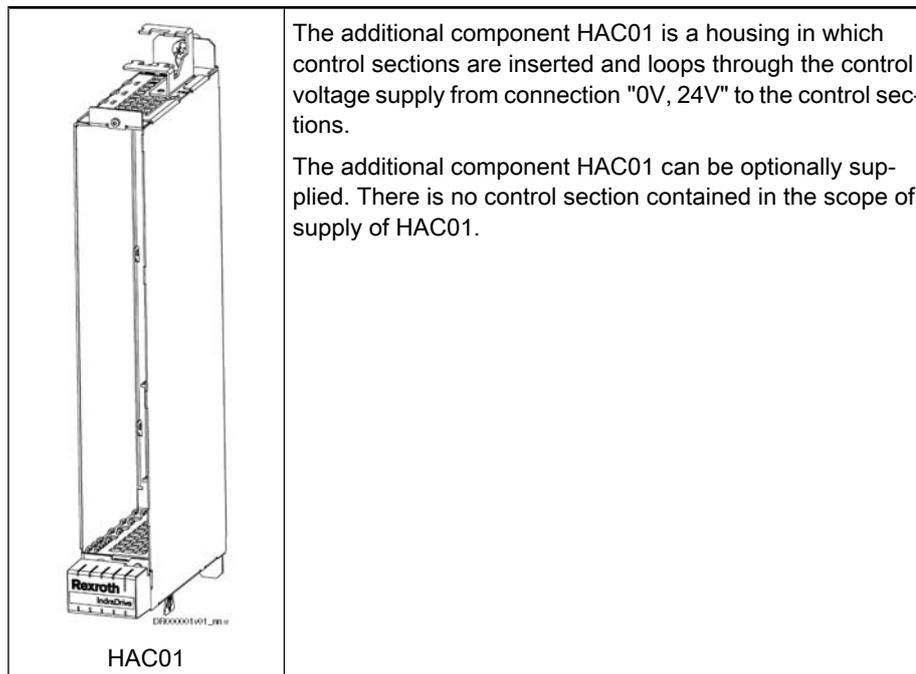
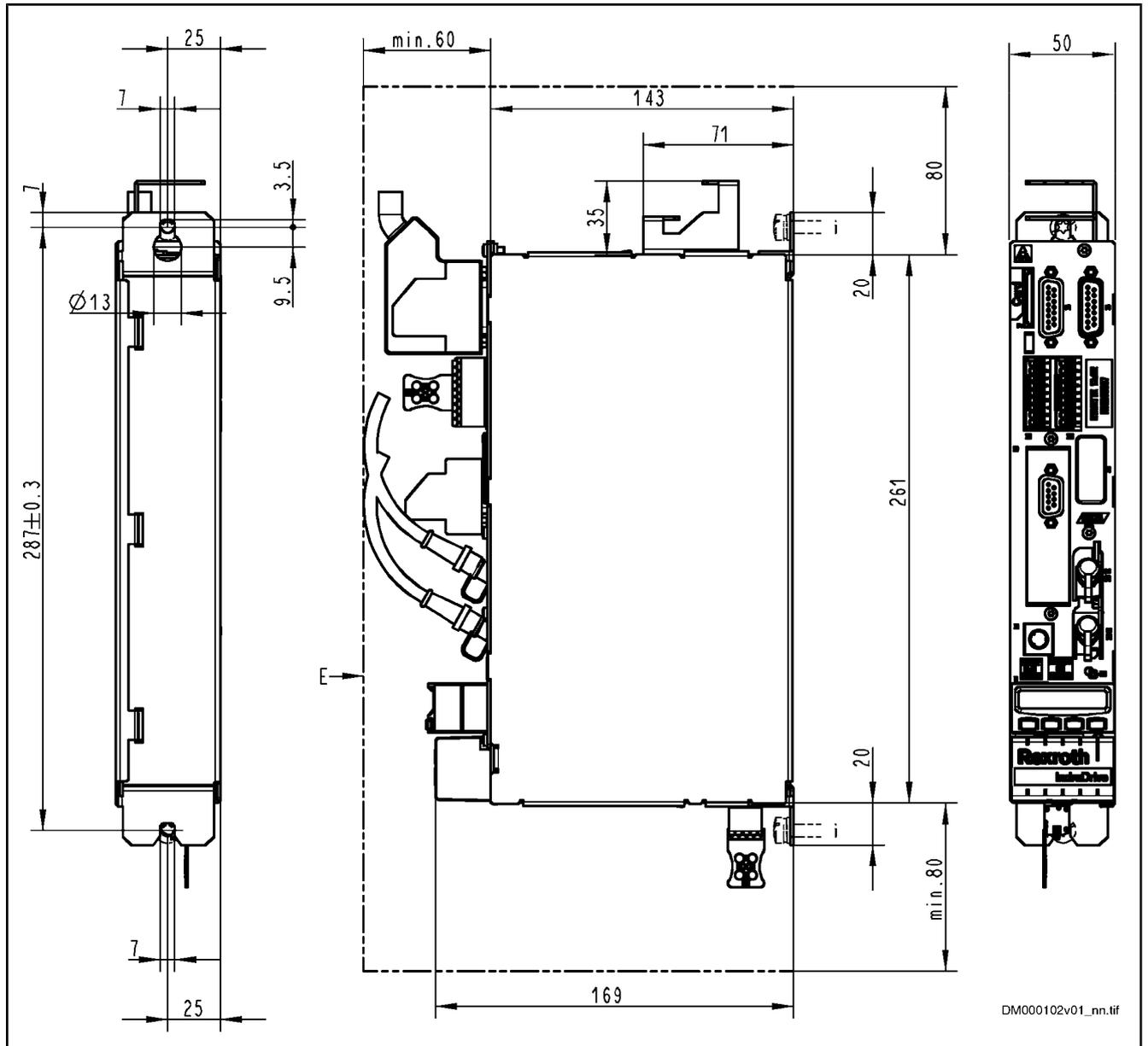


Fig.14-3: Usage

### 14.3 Mechanical and Electrical Data

#### 14.3.1 Dimensional Drawings HAC01.1

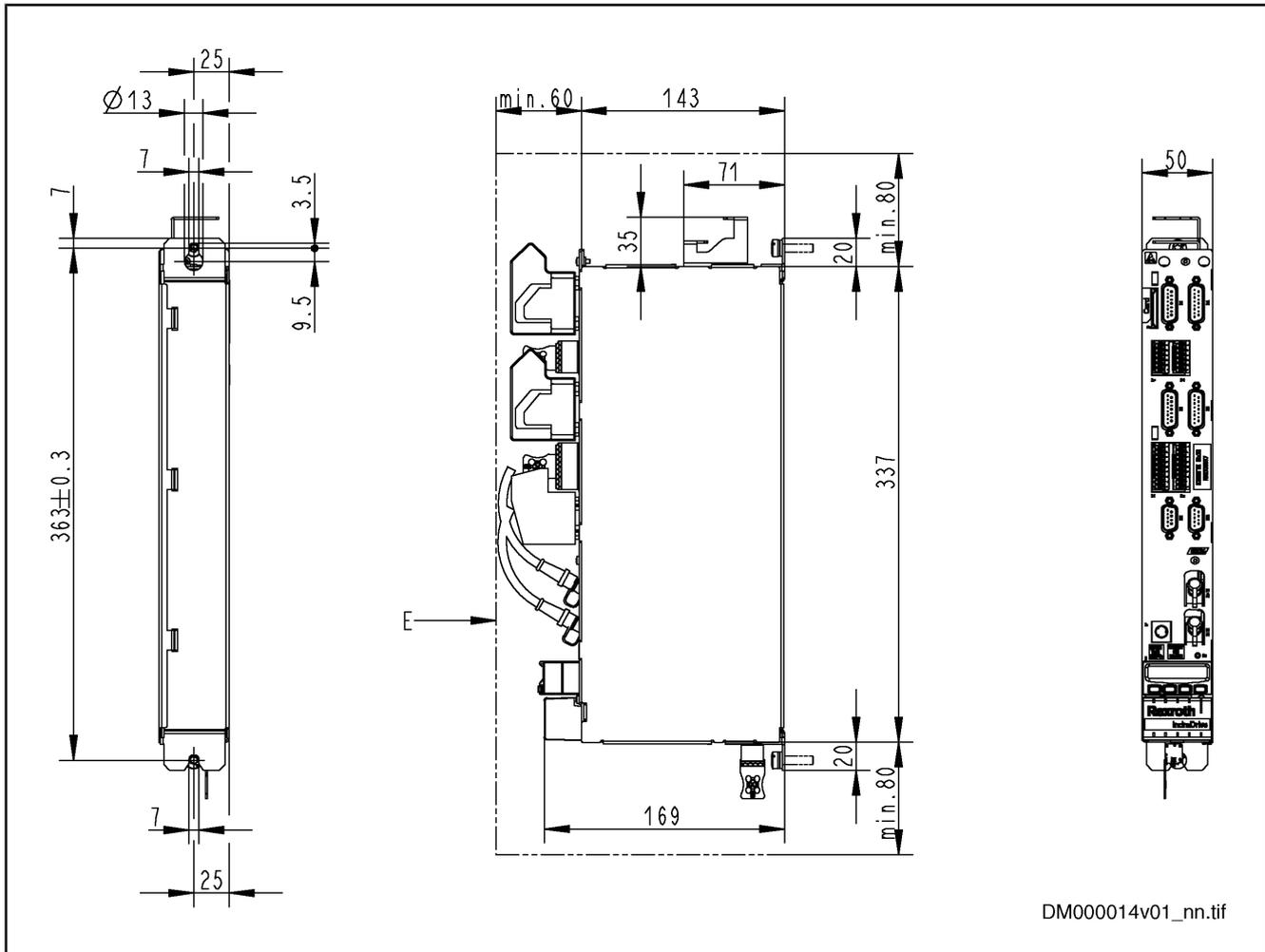
##### HAC01.1-001-NNN-NN



E All dimensions in mm  
Minimum mounting clearance  
Fig. 14-4: Dimensions HAC01.1-001-NNN-NN

HAC01 - Housing for Control Sections

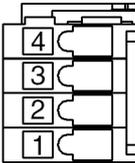
HAC01.1-002-NNN-NN



E All dimensions in mm  
Minimum mounting clearance  
Fig. 14-5: Dimensions HAC01.1-002-NNN-NN

14.3.2 Connections at HAC01

X13, Control Voltage

Assignment	Connection	Signal name	Function
 DG000115v01_nn.FH11	4	+24V	Power supply and "looping through"
	3	+24V	
	2	0V	Reference potential for power supply and "looping through"
	1	0V	
Spring terminal (connector)	Unit	Min.	Max.
Connection cross section solid wire	mm <sup>2</sup>	1,0	1,5
Connection cross section stranded wire	mm <sup>2</sup>	1,0	1,5

## HAC01 - Housing for Control Sections

Connection cross section	AWG	18	16
Power consumption	W	$P_{N3}$ (see technical data of the device)	
Voltage load capacity	V	$U_{N3}$ (see technical data of the device)	
Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Continuous current $P_{N3}/U_{N3}$	A		6
Current carrying capacity "looping through" from +24V to +24V, 0V to 0V Inrush current $I_{EIN3}$	A		12
Polarity reversal protection		Within the allowed voltage range by internal protective diode	

Fig. 14-6: Function, pin assignment, properties

**Power Consumption at X13**

The power consumption at X13 is determined by the **control section** and **optional modules** used.

**Overvoltage**

Overvoltage greater than 33 V has to be discharged by means of the appropriate electrical equipment of the machine or installation.

This includes:

- 24V power supply units that reduce incoming overvoltage to the allowed value.
- Overvoltage limiters at the control cabinet input that limit existing overvoltage to the allowed value. This, too, applies to long 24V lines that have been run in parallel to power cables and mains cables and can absorb overvoltage by inductive or capacitive coupling.

**Specification of Control Voltage**

See chapter [5.6 Control Voltage Specification \(24V Supply\)](#), page 30



# 15 HAT01 - Control Module for Holding Brake

## 15.1 Brief Description, Usage and Design

**Brief Description** The control module HAT01 belongs to the Rexroth IndraDrive product range and is used for the "safety related braking and holding system".

HAT01 control modules are mounted on a top-hat rail in the control cabinet.

**Usage** The types are used as follows:

Type	Usage
HAT01.1-002-NNN-NN	To control an electrically releasing, redundant holding brake.

Fig.15-1: Usage

## 15.2 Type Code and Identification

### 15.2.1 Type Code



The following figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.

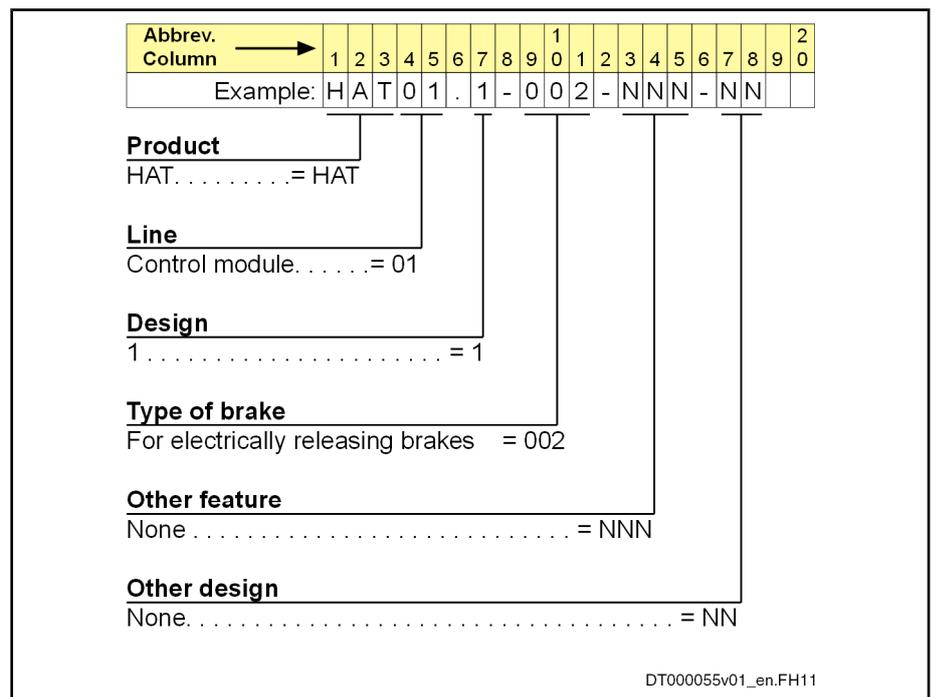
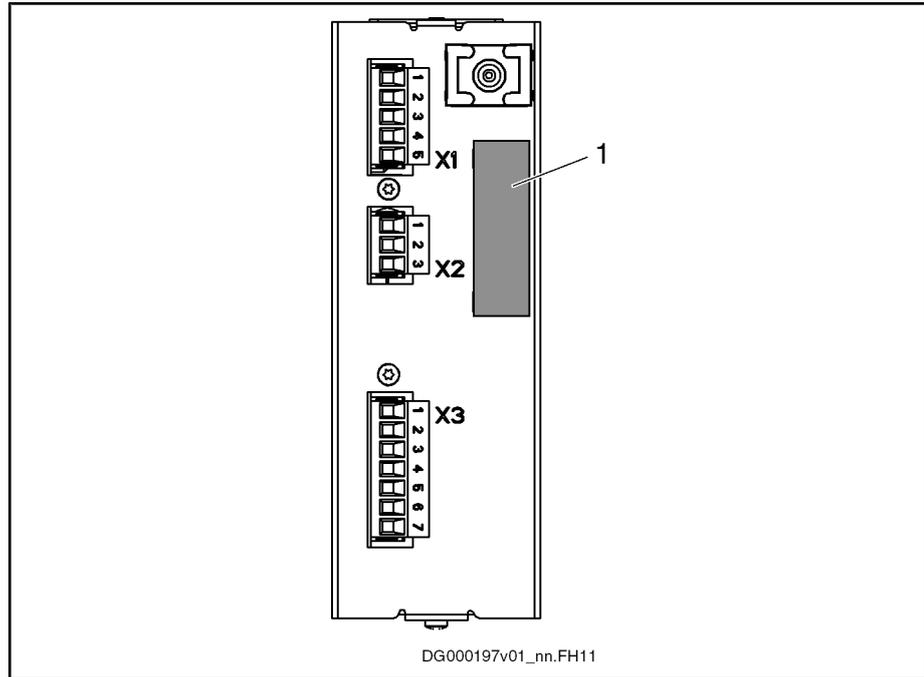


Fig.15-2: Type code

HAT01 - Control Module for Holding Brake

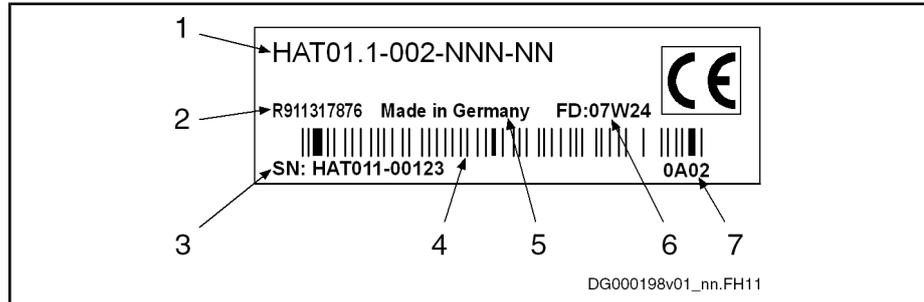
### 15.2.2 Identification

Type Plate Arrangement



1 Type plate  
 Fig. 15-3: Type plate arrangement

Type Plate



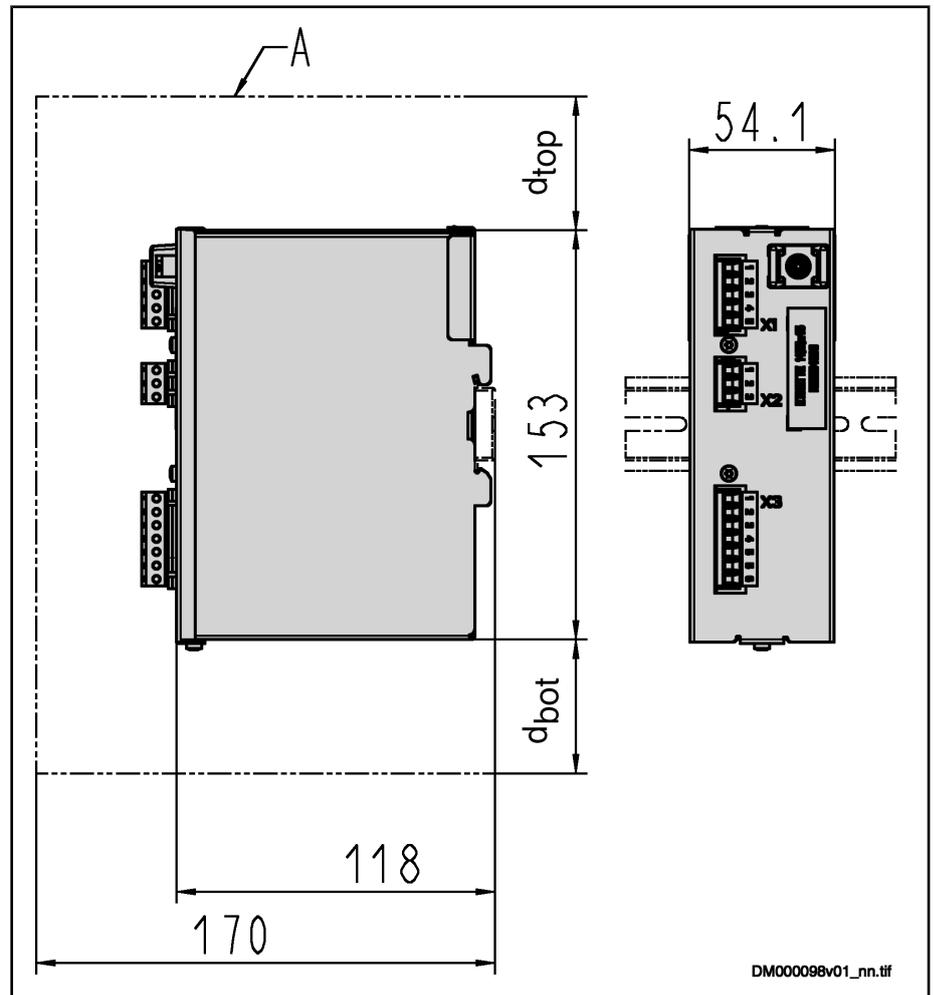
1 Device type  
 2 Part number  
 3 Serial number  
 4 Bar code  
 5 Country of manufacture  
 6 Production week, 07W24 meaning year 2007, week 24  
 7 Hardware index  
 Fig. 15-4: Type plate

### 15.3 Scope of Supply

The scope of supply of the control module HAT01 contains:

- Connectors X1, X2, X3

## 15.4 Dimensions



A Minimum mounting clearance  
 $d_{top}$ ,  $d_{bot}$  See table "Technical data"  
 Fig. 15-5: Dimensions

All dimensions in mm

Minimum mounting clearance

See table "Technical data"

Dimensions

## 15.5 Technical Data

### Technical data

Description	Symbol	Unit	HAT01.1-002-NNN-NN
Weight	m	kg	0,6
Degree of protection			IP20
Allowed mounting position			Vertical
Minimum distance from the top of the device <sup>5)</sup>	$d_{top}$	mm	50
Minimum distance from the bottom of the device <sup>6)</sup>	$d_{bot}$	mm	50
Minimum distance on the side of the device	$d_{hor}$	mm	-
Allowed ambient temperature range	$T_{a,work}$	°C	0 ... 55

HAT01 - Control Module for Holding Brake

Description	Symbol	Unit	HAT01.1-002-NNN-NN
Cooling type <sup>3)</sup>			n
Listing according to UL standard (UL)			In preparation
UL files (UL)			In preparation
<b>Control voltage supply</b>			
Rated control voltage input (UL) <sup>1)</sup>	$U_{N3}$	V	Brake cable length < 50 m: 24 ±5% Brake cable length > 50 m: 26 ±5%
Maximum allowed voltage for 1 ms <sup>2)</sup>	$U_{N3\_max}$	V	33
Rated power consumption control voltage input at $U_{N3}$ (UL)	$P_{N3}$	W	1,5
Inrush current at 24V supply	$I_{EIN3}$	A	35
Pulse width of $I_{EIN3}$	$t_{EIN3Lade}$	ms	4
Input capacitance	$C_{N3}$	mF	3,6
Power dissipation	$P_{Diss}$	W	Max. 7.5 (brake controlled)
Output current	$I_{Br}$	A	See "X2, Output to Brake"

- 1) Observe supply voltage for motor holding brakes  
 2) See following note regarding overvoltage  
 3) n: Natural convection; f: Forced cooling  
 5) 6) 7) See fig. "Air intake and air outlet at drive controller"  
 Fig. 15-6: HAT01 - Technical data



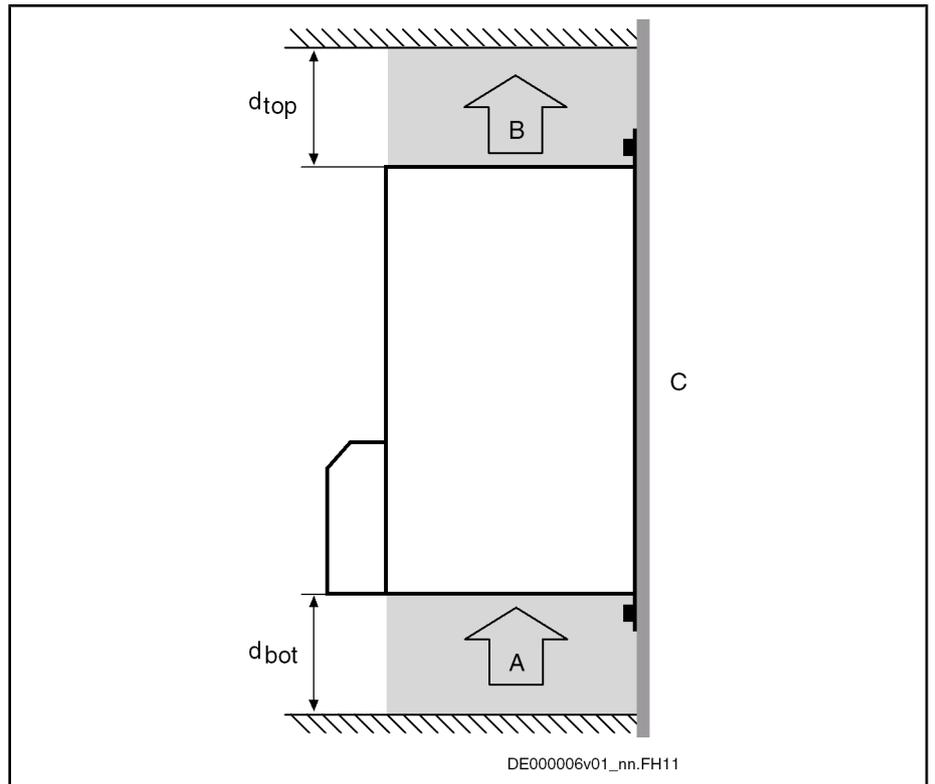
**Overvoltage** of more than 33V has to be discharged by means of the appropriate electrical equipment of the machine or installation.

This includes:

- 24V power supply units that reduce incoming overvoltages to the allowed value.
- Overvoltage limiters at the control cabinet input that limit existing overvoltage to the allowed value. This, too, applies to long 24V lines that have been run in parallel to power cables and mains cables and can absorb overvoltages by inductive or capacitive coupling.

HAT01 - Control Module for Holding Brake

Distances



- A Air intake
- B Air outlet
- C Mounting surface in control cabinet
- $d_{top}$  Distance top
- $d_{bot}$  Distance bottom

Fig. 15-7: Air intake and air outlet at drive controller

HAT01 - Control Module for Holding Brake

## 15.6 Connection Points

### 15.6.1 Front View

Front view	Connection point	Description
<p>DG000196v01_nn.FH11</p>	X1	24 V power supply (24V, 0V)
	X2	Output to brake
	X3	Signal exchange with control section; connection with ready-made cable <b>RKS0007</b>
	A	Strain relief: Fix connection cable with cable tie

Fig. 15-8: Connection points

### 15.6.2 X1, 24 V Power Supply

Assignment	Conne- ction	Signal name	Function
<p>DA000230v01_nn.FH11</p>	X1.1	+24V	Power supply and "looping through"
	X1.2	+24V	
	X1.3	0V	Reference potential for power supply and "looping through"
	X1.4	0V	
	X1.5	-	Housing potential

Screw connection at connector	Unit	Min.	Max.
Tightening torque	Nm	0,5	0,6
Connection cable stranded wire	mm <sup>2</sup>	1,0	2,5
Connection cable	AWG	18	14
Power consumption	W	See P <sub>N3</sub>	
Voltage load capacity	V	See U <sub>N3</sub>	

HAT01 - Control Module for Holding Brake

Current carrying capacity "looping through" from +24V to +24V, 0V to 0V	A		6; max. 1 other HAT01 for operation with HMD01
Polarity reversal protection	-	Within the allowed voltage range by internal protective diode	

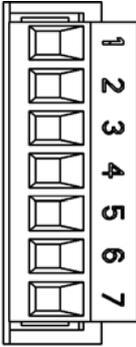
Fig. 15-9: Function, pin assignment, properties

### 15.6.3 X2, Output to Brake

Assignment	Connection	Signal name	Function
 DA000231v01_nn.FH11	X2.1	Br+	Connection to positive pole of holding brake
	X2.2	Br-	Connection to negative pole of holding brake
	X2.3	-	Housing potential HAT01 (connection for cable shield)
<b>Screw connection at connector</b>			
	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>
Tightening torque	Nm	0,5	0,6
Connection cable stranded wire	mm <sup>2</sup>	1,0	2,5
Connection cable	AWG	18	14
Output current $I_{Br\_cont}$	A		6
Output current $I_{Br\_max}; t \leq 1\text{ s}; I_{AV} \leq I_{Br\_cont}$	A		7,5
Output voltage $U_{Br}$	V	$U_{N3} - 0.5\text{ V}$	$U_{N3}$
Output protection	-	Short-circuit proof and overload-proof within the allowed voltage range	

Fig. 15-10: Function, pin assignment, properties

### 15.6.4 X3, Signal Exchange With Control Section

Assignment	Connection	Signal name	Function
 DA000234v01_nn.FH11	X3.1	+24V	Power supply of isolated inputs/ outputs X3.3 and X3.4 with 24 V / 0.1 A
	X3.2	+24V	
	X3.3	HAT-Steuer	Input for brake control via $U_{Br}$ (X2)
	X3.4	HAT-Diagnose	Output HAT-Diagnose
	X3.5	0V	Reference potential for power supply at X3.1
	X3.6	0V	
	X3.7	-	Connection for cable shield
<b>Screw connection at connector</b>			
	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>

HAT01 - Control Module for Holding Brake

Tightening torque	Nm	0,5	0,6
Connection cable stranded wire	mm <sup>2</sup>	1,0	2,5
Connection cable	AWG	18	14
Allowed cable length	m		3
Input X3.3 controls output Br+/Br- (X2) (dynamized input)		250 Hz ±20%, duty cycle ~50% → "H" level at output Br (X2)	
Output voltage at X3.4 shows status of controlled brake	V	Brake applied: 150 Hz ±20% Brake released: "H", (max. X3.1 - 0.5 V) Brake faulty: "L"	
Ready-made connection cable	-	RKS0007	

Fig. 15-11: Function, pin assignment, properties

RKS0007 at HAT01

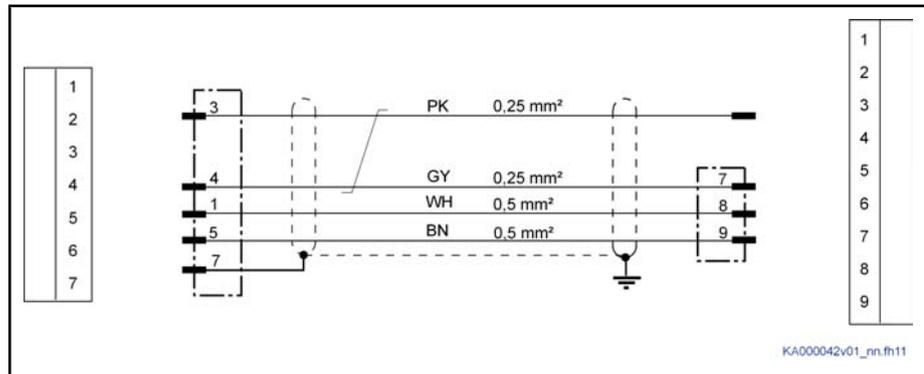


Fig. 15-12: Interconnection diagram RKS0007



Accessories

As adjusted to the device widths, we distinguish 3 types:

- HAS01 **without** contact bars, (-NNN)
- HAS01 **with** contact bars (-072-) to connect the DC buses
- HAS01 **with** contact bars (-072-) to connect the DC buses and joint bars to connect the equipment grounding conductors of the devices



Observe that the contact bars of the basic accessories HAS01 are used for connection to the drive controller on the **left-hand** side.

### 16.1.3 Usage

The HAS01 accessories are used to

- fix the drive controllers to a mounting surface
- connect the DC bus connections of drive controllers
- connect the 24V supply of drive controllers of the Rexroth IndraDrive M range
- connect the equipment grounding conductor from drive controller to drive controller or supply unit
- increase the current carrying capacity of the contact bars in the DC bus for high-performance devices (by means of the parts "end piece" and "bar" in HAS01; see chapter "Assignment")



**Use of the parts "end piece" and "bar"**

For high-performance devices, you have to mount the end pieces and bars contained in the HAS01 accessory (see chapter "Assignment").

See sections "DC Bus Connection (L+, L-)" and "Terminal Block, 24V - 0V (24V Supply)" in the Project Planning Manual "Rexroth IndraDrive, Supply Units and Power Sections".

### 16.1.4 Assignment

The accessories are assigned to the individual devices depending on the device width (see section "Type Code").

Device type		Width / mm	Accessory HAS01.1-	
				With "end piece"
HMS01.1N-	W0020	50	050	-
	W0036	50	050	-
	W0054	75	075	-
	W0070	100	100	-
	W0110	125	125	-
	W0150	150	150	-
	W0210	200	200	■
	W0350	350	350	■

Device type		Width / mm	Accessory HAS01.1-	
				With "end piece"
HMD01.1N-	W0012	50	050	-
	W0020	50	050	-
	W0036	75	075	-
HMS02.1N-	W0028	49.5	050	-
	W0054	74.5	075	-
	F0028			
	F0054			
	F0070			
	F0110			
	F0150			
	F0210			
HLB01.1	D	100	100	-
HLC01.1	D	100	100	-
HMV01.1E-	W0030	150	150	-
	W0075	250	250	■
	W0120	350	350	■
HMV01.1R-	W0018	175	175	-
	W0045	250	250	■
	W0065	350	350	■
	W0120	350	350	■
HMV02.1E-	F0025			
	F0075			
HMV02.1R-	W0015	150	150	-
	F0150			
HCS02.1N-	W0012	65	065	-
	W0028	65	065	-
	W0054	105	105	-
	W0070	105	105	-
HLB01.1	C	65	065	-
HLC01.1	C	50	050	-
HCS03.1N-	W0070	125	125	-
	W0100	225	225	-
	W0150	225	225	-
	W0210	350	350	■

Fig. 16-2: Device width

Accessories

## 16.1.5 Scope of Supply

Components of the accessory: see accompanying notes

Made in Germany  
109-1253-4801-05

**Rexroth  
Bosch Group**

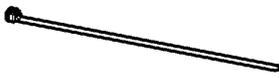
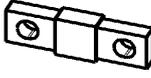
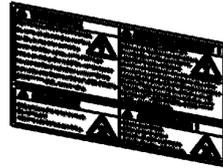
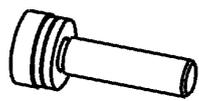
## HAS01.1-050-072-MN



R911306620

12	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-050-072 ISOL.	R911309945
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

**BEIPACKZETTEL HAS01.1-050-072-MN**

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
DB140835		1:4
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
DB139203		1:2
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
DB184465		1:2
4	SCHIENE-VERBINDUNG HAS01.1-050-072 ISOL.	R911309945
DB166230		1:2
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
DB175705		2:5
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
DB-40050		1:1
12	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
DB-54729		1:1

<b>Datum</b>	2004-02-20	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-050-072-MN	
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306606	<b>Zeich-Nr.</b> 109-1253-4201-06
<b>Datei</b>	DB166239	<b>Ers.durch</b>	..	<b>AEM-Nr.</b> 5-017509

Fig. 16-3: Accompanying note

Accessories

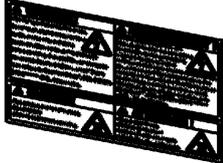
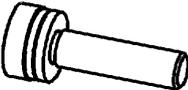
Made in Germany  
109-1253-4802-05

**Rexroth**  
**Bosch Group**

## HAS01.1-075-072-MN



R911306619

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
		
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1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
		
		1:2
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
		
		1:2
4	SCHIENE-VERBINDUNG HAS01.1-075-072 ISOL.	R911309946
		
		1:2
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
		
		2:5
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
		
		1:1
12	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
		
		1:1

Datum	2004-02-20	Benennung
Name	Hirt	BEIPACKZETTEL HAS01.1-075-072-MN
Material-Nr.	R911306607	Zeich-Nr. 109-1253-4202-06
Datei	DB166241	Ers.durch .. AEM-Nr. 5-017509

Fig.16-4: Accompanying note

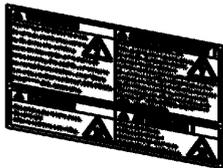
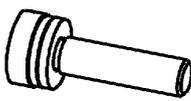
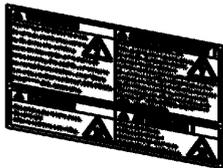
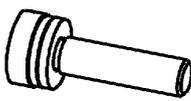
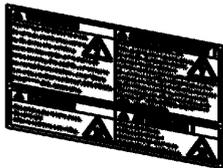
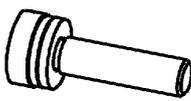
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2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165																																																																																			
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4	SCHIENE-VERBINDUNG HAS01.1-100-072 ISOL.	R911309947																																																																																			
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1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089																																																																																			
DB175705		2:5																																																																																			
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DB-54729		1:1																																																																																			
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Datei	DB166243	Ers.durch .. AEM-Nr. 5-017509																																																																																			

Fig. 16-5: Accompanying note

Accessories

Made in Germany  
109-1253-4845-00

**Rexroth  
Bosch Group**

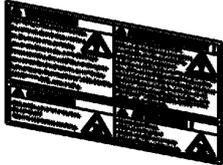
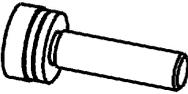
## HAS01.1-125-072-MN



R911315182

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2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

### BEIPACKZETTEL HAS01.1-125-072-MN

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DBT84465		1:2
4	SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.	R911309948
DBT66341		1:2
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
DBT75105		2:5
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Datei	DB193171	Ers.durch	..	AEM-Nr.	5-0

Fig.16-6: Accompanying note

Made in Germany  
109-1253-4804-05

**Rexroth**  
**Bosch Group**

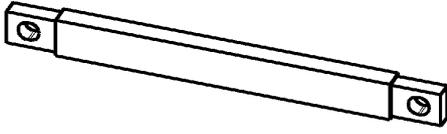
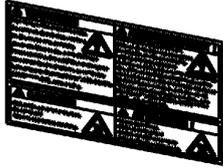
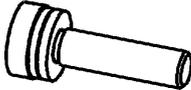
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R911306622

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1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-150-072 ISOL.	R911309949
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

**BEIPACKZETTEL HAS01.1-150-072-MN**

Stck	Benennung	MNR
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1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
DB139203		1:2
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
DB184765		1:2
4	SCHIENE-VERBINDUNG HAS01.1-150-072 ISOL.	R911309949
DB166233		1:2
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
DB175705		2:5
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
DB-40050		1:1
17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
DB-54729		1:1

<b>Datum</b>	2004-02-20	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-150-072-MN	
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306614	<b>Zeich-Nr.</b> 109-1253-4204-06
<b>Datei</b>	DB166245	<b>Ers.durch</b>	..	<b>AEM-Nr.</b> 5-017509

Fig.16-7: Accompanying note

Accessories

Made in Germany  
109-1253-4809-02



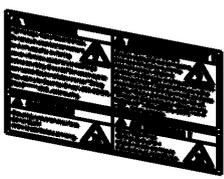
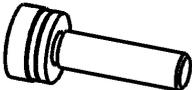
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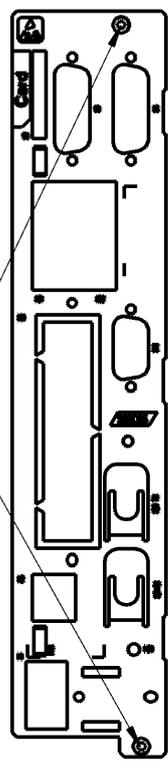
R911306629

2	WERKZ-BETAETIGUNG STECK-FK RM5,00	R911295969
13	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
<b>Stck</b>	<b>Benennung</b>	<b>MNR</b>

### BEIPACKZETTEL HAS01.1-150-NNN-MN

Stck	Benennung	MNR
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1	 <small>2:5</small>	R911309089
2	 <small>1:1</small>	R911294165
13	 <small>1:1</small>	R911276873
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Einbauposition  
der Schraube  
M3x8



1:2

Datum	2004-02-20	Benennung		
Name	Hirt	BEIPACKZETTEL HAS01.1-150-NNN-MN		
Material-Nr.	R911306635	Zeich-Nr.	109-1253-4217-02	
Datei	DB166332	Ers.durch	..	AEM-Nr. 5-010883

Fig.16-8: Accompanying note

Made in Germany  
109-1253-4805-05

**Rexroth**  
**Bosch Group**

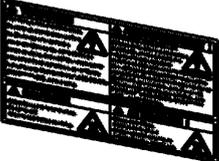
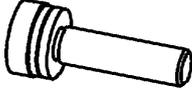
## HAS01.1-175-072-MN



R911306623

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1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-175-072 ISOL.	R911309950
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

**BEIPACKZETTEL HAS01.175-072-MN**

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
DB146855		1:4
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2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
DB184465		1:2
4	SCHIENE-VERBINDUNG HAS01.1-175-072 ISOL.	R911309950
DB166231		7:20
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
DB175705		2:5
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
DB-40050		1:1
17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
DB-54729		1:1

<b>Datum</b>	2004-02-20	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-175-072-MN	
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306615	<b>Zeich-Nr.</b>
<b>Material-Nr.</b>	R911306615	<b>Ers.durch</b>	..	<b>AEM-Nr.</b>
<b>Datei</b>	DB166274			5-017509

Fig. 16-9: Accompanying note

Accessories

Made in Germany  
109-1253-4810-02



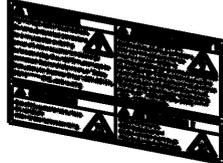
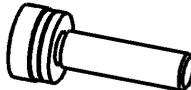
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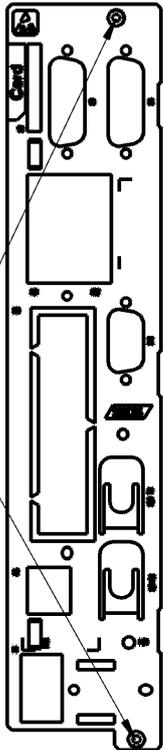


R911306630

2	WERKZ-BETAETIGUNG STECK-FK RM5,00	R911295969
13	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
<b>Stck</b>	<b>Benennung</b>	<b>MNR</b>

### BEIPACKZETTEL HAS01.1-175-NNN-MN

Stck	Benennung	MNR
5	 1:4	R911222614
1	 2:5	R911309089
2	 1:1	R911294165
13	 1:1	R911276873
2	 1:1	R911295969



Einbauposition  
der Schraube  
M3x8

1:2

Datum	2004-02-20	Benennung
Name	Hirt	BEIPACKZETTEL HAS01.1-175-NNN-MN
Material-Nr.	R911306636	Zeich-Nr. 109-1253-4218-02
Datei	DB166319	Ers.durch .. AEM-Nr. 5-010883

Fig.16-10: Accompanying note

Made in Germany  
109-1253-4806-05

**Rexroth  
Bosch Group**

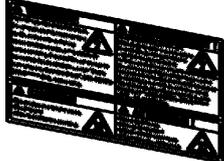
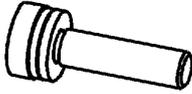
## HAS01.1-200-072-MN



R911306624

17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-200-072 ISOL.	R911309951
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
<b>Stck</b>	<b>Benennung</b>	<b>MNR</b>

### BEIPACKZETTEL HAS01.1-200-072-MN

Stck	Benennung	MNR
DB139203		R911294924 1:2
DB164405		R911311751 1:2
DB160235		R911309951 7:20
DB175105		R911309089 2:5
DB-40060		R911294165 1:1
DB-54729		R911276873 1:1

### BEIPACKZETTEL HAS01.1-200-072-MN

Stck	Benennung	MNR
DB131131		R911311982 1:2
DB146855		R911222614 1:4

<b>Datum</b>	2004-02-20	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-200-072-MN	
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306616	<b>Zeich-Nr.</b> 109-1253-4206-06
<b>Datei</b>	DB166247	<b>Ers.durch</b>	..	<b>AEM-Nr.</b> 5-017509

Fig.16-11: Accompanying note

Accessories

Made in Germany  
109-1253-4807-06

**Rexroth  
Bosch Group**

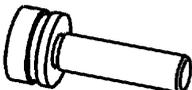
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R911306625

1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-250-072 ISOL.	R911309953
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
17	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
Stck	Benennung	MNR

**BEIPACKZETTEL HAS01.1-250-072-MN**

Stck	Benennung	MNR
DB181731	2 ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
		1:2
DB-40060	2 FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165
		1:1
DB146855	5 KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
		1:4
DB-51729	17 KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873
		1:1
DB139203	1 LASCHE HMD/HMS01.1 ERDUNG	R911294924
		1:2
DB181465	2 SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
		1:2
DB166236	4 SCHIENE-VERBINDUNG HAS01.1-250-072 ISOL.	R911309953
		1:4
DB175105	1 SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
		2:5

<b>Datum</b>	2004-02-20	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-250-072-MN
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306617
<b>Material-Nr.</b>	R911306617	<b>Zeich-Nr.</b>	109-1253-4207-07
<b>Datei</b>	DB166276	<b>Ers.durch</b>	..
		<b>AEM-Nr.</b>	5-036224

Fig.16-12: Accompanying note

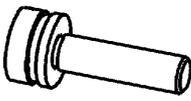
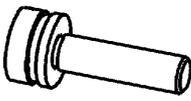
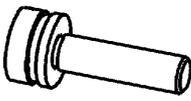
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1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089																																																																	
13	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873																																																																	
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614																																																																	
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165																																																																	
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982																																																																	
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Stck	Benennung	MNR																																																																	
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982																																																																	
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165																																																																	
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13	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873																																																																	
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089																																																																	
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DB-40060		1:1																																																																	
DB140835		1:4																																																																	
DB-34729		1:1																																																																	
DB15105		2:5																																																																	
Datum	2004-02-20	Benennung																																																																	
Name	Hirt	BEIPACKZETTEL HAS01.1-250-NNN-MN																																																																	
Material-Nr.	R911306637	Zeich-Nr. 109-1253-4219-04																																																																	
Datei	DB166334	Ers.durch .. AEM-Nr. 5-036224																																																																	

Fig.16-13: Accompanying note

Accessories

Made in Germany  
109-1253-4808-06

**Rexroth**  
**Bosch Group**

## HAS01.1-350-072-MN



R911306626

4	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050
17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL.	R911309954
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
4	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
4	FEDERRING DIN127-B10-FST &	R911213251
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>

**BEIPACKZETTEL HAS01.1-350-072-MN**

Stck	Benennung	MN
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
4	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
4	SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL.	R911309954
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
4	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050

Stck	Benennung	MN
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
4	FEDERRING DIN127-B10-FST &	R911213251
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

<b>Datum</b>	2004-02-23	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-350-072-MN
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306618
<b>Material-Nr.</b>	R911306618	<b>Zeich-Nr.</b>	109-1253-4208-07
<b>Datei</b>	DB166280	<b>Ers.durch</b>	..
		<b>AEM-Nr.</b>	5-017509

Fig.16-14: Accompanying note

Made in Germany  
109-1253-4812-05

**Rexroth  
Bosch Group**

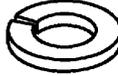
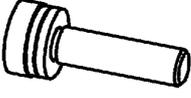
## HAS01.1-350-NNN-MN



R911306632

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2	SCHR-LIN-M	3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE	UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHEIBE	10,50X 20,00X 2,00 DIN 125 A	R911213277
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****		R911222614
4	FEDERRING	DIN127-B10-FST &	R911213251
2	ENDSTUECK	HAS01.1 SCHIENE-VERBINDUNG	R911311982
Stck	Benennung		MN

**BEIPACKZETTEL HAS01.1-350-NNN-MN**

Stck	Benennung	MN
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
		
1:2		
4	FEDERRING DIN127-B10-FST &	R911213251
		
1:1		
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
		
1:4		
4	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
		
1:1		
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
		
1:4		
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
		
1:1		
15	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
		
1:1		
4	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050
		
1:2		

<b>Datum</b>	2004-02-24	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-350-NNN-MN
<b>Name</b>	Hirt	<b>Material-Nr.</b>	R911306632
<b>Material-Nr.</b>	R911306632	<b>Zeich-Nr.</b>	109-1253-4220-05
<b>Datei</b>	DB166325	<b>Ers.durch</b>	..
		<b>AEM-Nr.</b>	5-017509

Fig.16-15: Accompanying note

Accessories

Made in Germany  
109-1253-4827-00

**Rexroth**  
**Bosch Group**

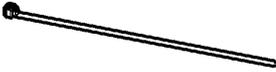
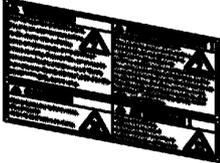
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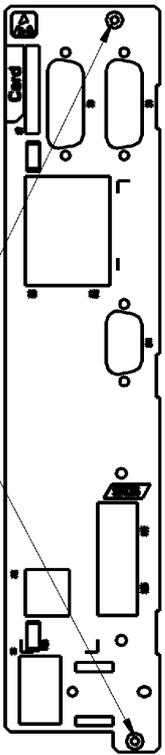
R911311807

6	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
2	SCHIENE-VERBINDUNG HAS01.1-065-072 ISOL.	R911311806
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

### BEIPACKZETTEL HAS01.1-065-072-CN

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
DBT-46835		1:4
2	SCHIENE-VERBINDUNG HAS01.1-065-072 ISOL.	R911311806
DBT67234		1:2
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
DBT15705		2:5
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
DB-10060		1:1
6	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
DB-51729		1:2

Datum	2005-06-01	Benennung
Name	rainhirt	BEIPACKZETTEL HAS01.1-065-072-CN
Material-Nr.	R911311810	Zeich-Nr. 109-1253-4265-00
Datei	DB187295	Ers.durch .. AEM-Nr. 5-017033



Einbauposition  
der Schraube  
M3x8

1:2

Fig.16-16: Accompanying note

Made in Germany  
109-1253-4828-00

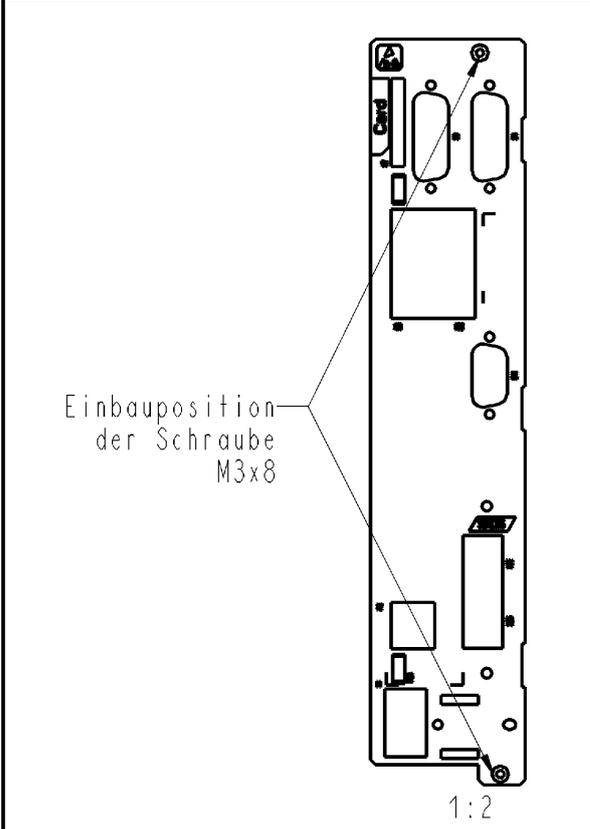
**Rexroth**  
**Bosch Group**

## HAS01.1-105-072-CN



R911311808

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2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
2	SCHIENE-VERBINDUNG HAS01.1-105-072 ISOL.	R911311805
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR



Einbauposition  
der Schraube  
M3x8

1:2

### BEIPACKZETTEL HAS01.1-105-072-CN

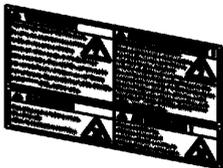
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1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
8	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873



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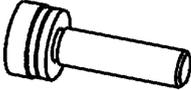
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2:5



1:1



1:1

Datum	2005-06-01	Benennung
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Material-Nr.	R911311812	Zeich-Nr. 109-1253-4266-00
Datei	DB187297	Ers.durch .. AEM-Nr. 5-017033

Fig.16-17: Accompanying note

Accessories

Made in Germany  
109-1228-4812-02



# HAS01.1-065-NNN-CN

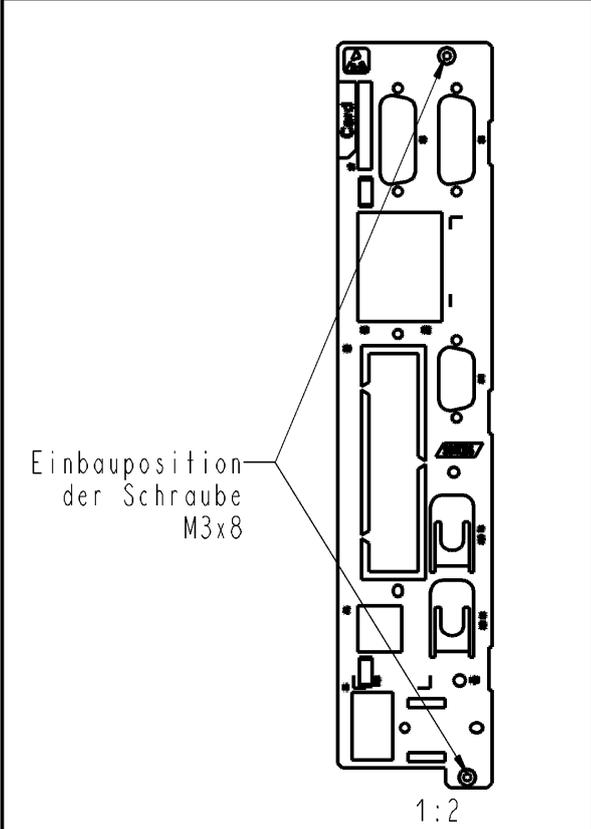


R911306007

2	WERKZ-BETAETIGUNG STECK-FK RM3,50	R911295970
2	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

### BEIPACKZETTEL HAS01.1-065-NNN-CN

Stck	Benennung	MNR
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1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
2	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	WERKZ-BETAETIGUNG STECK-FK RM3,50	R911295970



Einbauposition der Schraube M3x8

1:2

Datum	2004-01-29	Benennung
Name	Hirt	BEIPACKZETTEL HAS01.1-065-NNN-CN
Material-Nr.	R911306096	Zeich-Nr. 109-1228-4230-03
Datei	DB165225	Ers.durch .. AEM-Nr. 5-010883

Fig.16-18: Accompanying note

Made in Germany  
109-1229-4813-02

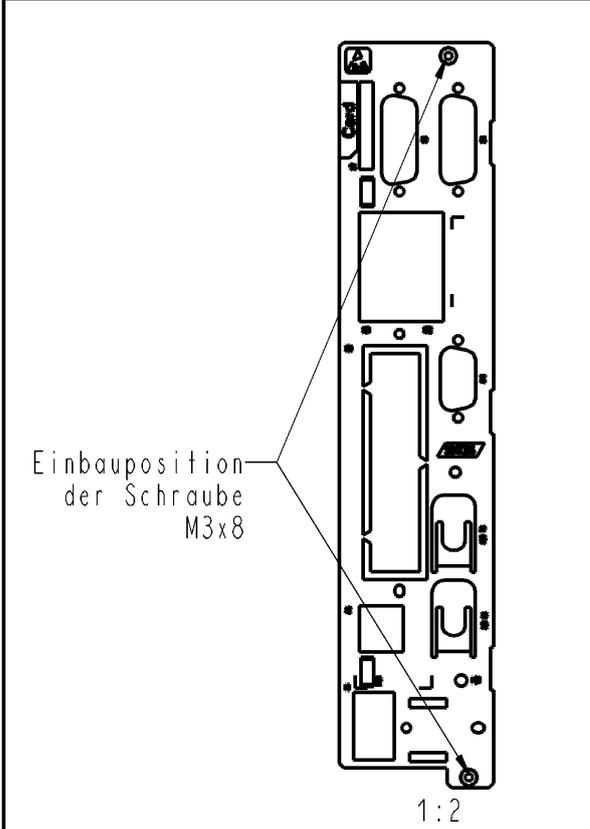


## HAS01.1-105-NNN-CN



R911306008

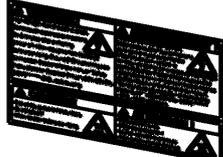
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4	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR



Einbauposition  
der Schraube  
M3x8

1:2

### BEIPACKZETTEL HAS01.1-105-NNN-CN

Stck	Benennung	MNR
5	 KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614  1:4
1	 SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089  2:5
2	 SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165  1:1
4	 SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873  1:2
2	 WERKZ-BETAETIGUNG STECK-FK RM3,50	R911295970  1:1

Datum	2004-01-29	Benennung	BEIPACKZETTEL HAS01.1-105-NNN-CN
Name	Hirt	Zeich-Nr.	109-1229-4224-03
Material-Nr.	R911306098	Ers.durch	..
Datei	DB165229	AEM-Nr.	5-010883

Fig. 16-19: Accompanying note

Accessories

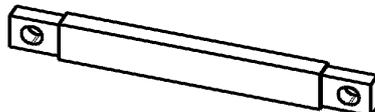
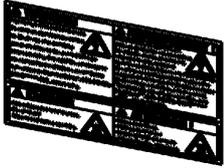
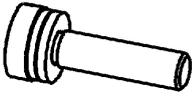
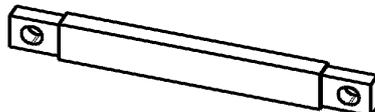
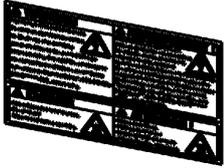
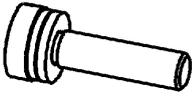
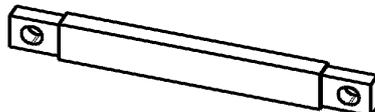
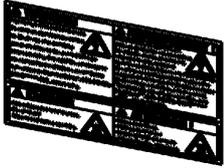
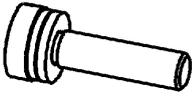
<p>Made in Germany 109-1253-4813-04</p> <p style="text-align: right;"><b>Rexroth</b> <b>Bosch Group</b></p> <h2 style="text-align: center;">HAS01.1-125-072-CN</h2>  <p style="text-align: center;">R911306664</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 5%;">Stck</th> <th style="width: 85%;">Benennung</th> <th style="width: 10%;">MNR</th> </tr> </thead> <tbody> <tr> <td>15</td> <td>SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41</td> <td>R911276873</td> </tr> <tr> <td>2</td> <td>SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*</td> <td>R911294165</td> </tr> <tr> <td>1</td> <td>SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30</td> <td>R911309089</td> </tr> <tr> <td>4</td> <td>SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.</td> <td>R911309948</td> </tr> <tr> <td>2</td> <td>SCHIENE-VERBINDUNG HAS01.1-032-042</td> <td>R911311751</td> </tr> <tr> <td>1</td> <td>LASCHE HMD/HMS01.1 ERDUNG</td> <td>R911294924</td> </tr> <tr> <td>5</td> <td>KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****</td> <td>R911222614</td> </tr> <tr> <th>Stck</th> <th>Benennung</th> <th>MNR</th> </tr> </tbody> </table>	Stck	Benennung	MNR	15	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873	2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165	1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089	4	SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.	R911309948	2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751	1	LASCHE HMD/HMS01.1 ERDUNG	R911294924	5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614	Stck	Benennung	MNR	<h3 style="text-align: center;">BEIPACKZETTEL HAS01.1-125-072-CN</h3> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Stck</th> <th style="width: 85%;">Benennung</th> <th style="width: 10%;">MNR</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****</td> <td>R911222614</td> </tr> <tr> <td style="text-align: center;">DB146855</td> <td style="text-align: center;"></td> <td style="text-align: right;">1:4</td> </tr> <tr> <td>1</td> <td>LASCHE HMD/HMS01.1 ERDUNG</td> <td>R911294924</td> </tr> <tr> <td style="text-align: center;">DB139203</td> <td style="text-align: center;"></td> <td style="text-align: right;">1:2</td> </tr> <tr> <td>2</td> <td>SCHIENE-VERBINDUNG HAS01.1-032-042</td> <td>R911311751</td> </tr> <tr> <td style="text-align: center;">DB184465</td> <td style="text-align: center;"></td> <td style="text-align: right;">1:2</td> </tr> <tr> <td>4</td> <td>SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.</td> <td>R911309948</td> </tr> <tr> <td style="text-align: center;">DB166341</td> <td style="text-align: center;"></td> <td style="text-align: right;">1:2</td> </tr> <tr> <td>1</td> <td>SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30</td> <td>R911309089</td> </tr> <tr> <td style="text-align: center;">DB175105</td> <td style="text-align: center;"></td> <td style="text-align: right;">2:5</td> </tr> <tr> <td>2</td> <td>SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*</td> <td>R911294165</td> </tr> <tr> <td style="text-align: center;">DB-40050</td> <td style="text-align: center;"></td> <td style="text-align: right;">1:1</td> </tr> <tr> <td>15</td> <td>SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41</td> <td>R911276873</td> </tr> <tr> <td style="text-align: center;">DB-54729</td> <td style="text-align: center;"></td> <td style="text-align: right;">1:1</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2004-02-26</td> <td style="width: 15%;">Benennung</td> <td colspan="2" rowspan="2">BEIPACKZETTEL HAS01.1-125-072-CN</td> </tr> <tr> <td>Name</td> <td>Hirt / Slevén</td> <td></td> </tr> <tr> <td>Material-Nr.</td> <td>R911306672</td> <td>Zeich-Nr.</td> <td colspan="2">109-1253-4223-05</td> </tr> <tr> <td>Datei</td> <td>DB166375</td> <td>Ers.durch</td> <td>..</td> <td>AEM-Nr. 5-017509</td> </tr> </table>	Stck	Benennung	MNR	5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614	DB146855		1:4	1	LASCHE HMD/HMS01.1 ERDUNG	R911294924	DB139203		1:2	2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751	DB184465		1:2	4	SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.	R911309948	DB166341		1:2	1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089	DB175105		2:5	2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165	DB-40050		1:1	15	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873	DB-54729		1:1	Datum	2004-02-26	Benennung	BEIPACKZETTEL HAS01.1-125-072-CN		Name	Hirt / Slevén		Material-Nr.	R911306672	Zeich-Nr.	109-1253-4223-05		Datei	DB166375	Ers.durch	..	AEM-Nr. 5-017509
Stck	Benennung	MNR																																																																																									
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2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165																																																																																									
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4	SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.	R911309948																																																																																									
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751																																																																																									
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924																																																																																									
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614																																																																																									
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DB139203		1:2																																																																																									
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751																																																																																									
DB184465		1:2																																																																																									
4	SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL.	R911309948																																																																																									
DB166341		1:2																																																																																									
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089																																																																																									
DB175105		2:5																																																																																									
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165																																																																																									
DB-40050		1:1																																																																																									
15	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873																																																																																									
DB-54729		1:1																																																																																									
Datum	2004-02-26	Benennung	BEIPACKZETTEL HAS01.1-125-072-CN																																																																																								
Name	Hirt / Slevén																																																																																										
Material-Nr.	R911306672	Zeich-Nr.	109-1253-4223-05																																																																																								
Datei	DB166375	Ers.durch	..	AEM-Nr. 5-017509																																																																																							

Fig.16-20: Accompanying note

Made in Germany  
109-1253-4814-01

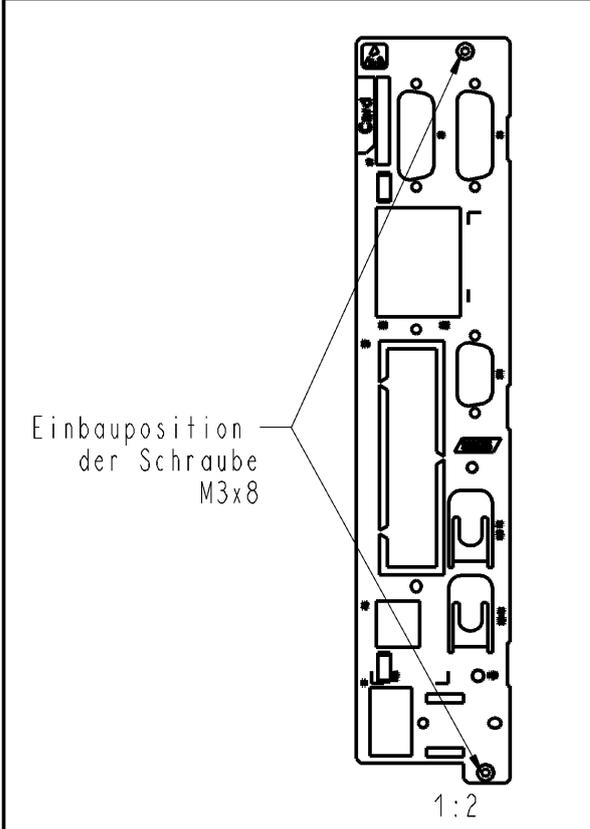


## HAS01.1-125-NNN-CN



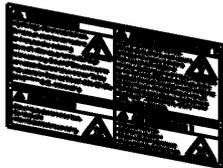
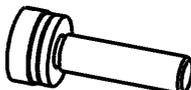
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2	WERKZ-BETAETIGUNG STECK-FK RM3,50	R911295970
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2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR	R911299476
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-****	R911222614
Stck	Benennung	MNR



1:2

### BEIPACKZETTEL HAS01.1-125-NNN-CN

Stck	Benennung	MNR
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1 DB163271		R911299476 2:5
2 DB_40060		R911294165 1:1
11 DB_54729		R911276873 1:1
2 DB144743		R911295970 1:1

Datum	2004-02-26	Benennung
Name	Hirt / Steven	BEIPACKZETTEL HAS01.1-125-NNN-CN
Material-Nr.	R911306674	Zeich-Nr. 109-1253-4224-01
Datei	DB166377	Ers.durch .. AEM-Nr. 5-07273

Fig.16-21: Accompanying note

Accessories

Made in Germany  
109-1253-4815-04

**Rexroth  
Bosch Group**

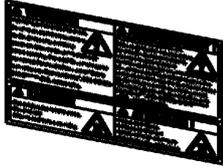
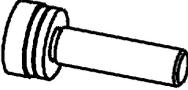
## HAS01.1-225-072-CN



R911306666

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2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-225-072 ISOL.	R911309952
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
Stck	Benennung	MNR

**BEIPACKZETTEL HAS01.1-225-072-CN**

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
DB146855		1:4
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
DB139203		1:2
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
DB184465		1:2
4	SCHIENE-VERBINDUNG HAS01.1-225-072 ISOL.	R911309952
DB166342		1:4
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
DB175105		2:5
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
DB-40050		1:1
21	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
DB-54729		1:1

<b>Datum</b>	2004-02-26	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-225-072-CN	
<b>Name</b>	Hirt / Slevén	<b>Material-Nr.</b>	R911306675	<b>Zeich-Nr.</b> 109-1253-4225-05
<b>Datei</b>	DB166379	<b>Ers.durch</b>	..	<b>AEM-Nr.</b> 5-017509

Fig.16-22: Accompanying note

Made in Germany  
109-1253-4816-01

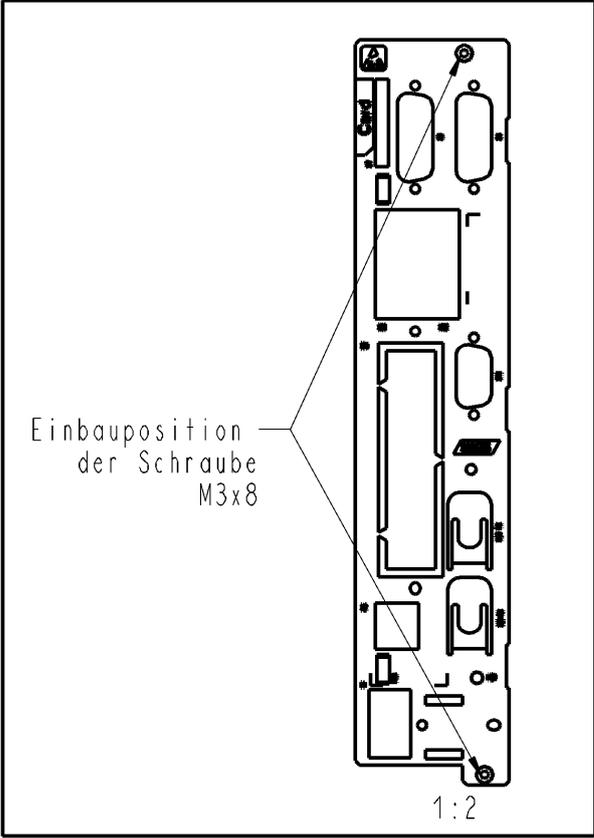


## HAS01.1-225-NNN-CN



R911306667

2	WERKZ-BETAETIGUNG STECK-FK RM3,50	R911295970
17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR	R911299476
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-****	R911222614
Stck	Benennung	MNR



1:2

### BEIPACKZETTEL HAS01.1-225-NNN-CN

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-****	R911222614
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR	R911299476
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
17	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z4I	R911276873
2	WERKZ-BETAETIGUNG STECK-FK RM3,50	R911295970

Datum	2004-02-26	Benennung
Name	Hirt / Steven	BEIPACKZETTEL HAS01.1-225-NNN-CN
Material-Nr.	R911306677	Zeich-Nr. 109-1253-4226-01
Datei	DB166381	Ers.durch .. AEM-Nr. 5-07273

Fig.16-23: Accompanying note

Accessories

Made in Germany  
109-1253-4817-06

**Rexroth  
Bosch Group**

## HAS01.1-350-072-CN

R911306668

1	SECHSKANTSCHRAUBE ISO4017-M8X25-8.8 &	R911292421
6	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050
15	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
4	SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL.	R911309954
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
6	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
1	LASCHE HCS03.1E-W0210 ERDUNG	R911025419
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
6	FEDERRING DIN127-B10-FST &	R911213251
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>

### BEIPACKZETTEL HAS01.1-350-072-CN

Stck	Benennung	MN
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
		1:2
6	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
		1:2
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
		1:2
4	SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL.	R911309954
		1:5
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
		1:4
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
		1:1
15	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
		1:1
6	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050
		1:2
1	SECHSKANTSCHRAUBE ISO4017-M8X25-8.8 &	R911292421
		1:2

### BEIPACKZETTEL HAS01.1-350-072-CN

Stck	Benennung	MN
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
		1:2
6	FEDERRING DIN127-B10-FST &	R911213251
		1:1
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
		1:4
1	LASCHE HCS03.1E-W0210 ERDUNG	R911025419
		1:4

<b>Datum</b>	2004-02-28	<b>Benennung</b>	BEIPACKZETTEL HAS01.1-350-072-CN	
<b>Name</b>	Hirt / Slevén	<b>Material-Nr.</b>	R911306678	<b>Zeich-Nr.</b> 109-1253-4227-07
<b>Datei</b>	DB166387	<b>Ers.durch</b>	..	<b>AEM-Nr.</b> 5-017509

Fig.16-24: Accompanying note

Made in Germany  
109-1253-4818-06

**Rexroth**  
**Bosch Group**

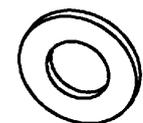
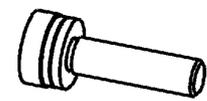
## HAS01.1-350-NNN-CN



R911306669

1	SECHSKANTSCHRAUBE	ISO4017-M8X25-8.8	&	R911292421
6	SECHSKANTSCHRAUBE	ISO4017-M10X30-8.8A1E		R913000050
13	SCHR-LIN-M	6,0X25,0-K-8.8-ISO7045-ZN-Z41		R911276873
2	SCHR-LIN-M	3,0X 8,0-T-8.8-ISO7045-ZN-ML*		R911294165
1	SCHILD-KLEBE	UL-CSA WARNHINWEIS EN/FR 30		R911309089
6	SCHEIBE	10,50X 20,00X 2,00 DIN 125 A		R911213277
1	LASCHE	HCS03.1E-W0210 ERDUNG		R911025419
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****			R911222614
6	FEDERRING	DIN127-B10-FST	&	R911213251
2	ENDSTUECK	HAS01.1 SCHIENE-VERBINDUNG		R911311982
Stck	Benennung			MN

**BEIPACKZETTEL HAS01.1-350-NNN-CN**

Stck	Benennung	MN																				
1	LASCHE HCS03.1E-W0210 ERDUNG	R911025419																				
																						
1:4																						
6	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277																				
																						
1:1																						
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089																				
																						
1:4																						
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165																				
																						
1:1																						
13	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873																				
																						
1:1																						
6	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050																				
																						
1:2																						
1	SECHSKANTSCHRAUBE ISO4017-M8X25-8.8	R911292421																				
																						
1:2																						
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Datum	2004-02-26	Benennung	BEIPACKZETTEL HAS01.1-350-NNN-CN																			
Name	Hirt / Steven	Zeich-Nr.	109-1253-4228-07																			
Material-Nr.	R911306669	Ers.durch	..																			
Datei	DB166390	AEM-Nr.	5-017509																			

**BEIPACKZETTEL HAS01.1-350-NNN-CN**

Stck	Benennung	MN
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
		
1:2		
6	FEDERRING DIN127-B10-FST	R911213251
		
1:1		
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
		
1:4		

Fig. 16-25: Accompanying note

Accessories

Made in Germany  
109-1253-4849-00

**Rexroth**  
**Bosch Group**

## HAS01.1-350-NNN-CA



R911315683

Stck	Benennung	MN
9	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050
9	SECHSKANTMUTTER ISO4032-M10-8-E0P	R911213275
16	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
9	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
9	FEDERRING DIN127-B10-FST &	R911213251
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982

### BEIPACKZETTEL HAS01.1-350-NNN-CA

Stck	Benennung	MN
9	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911309089
2	SCHR-LIN-M 3,0X 8,0-T-8.8-ISO7045-ZN-ML*	R911294165
16	SCHR-LIN-M 6,0X25,0-K-8.8-ISO7045-ZN-Z41	R911276873
9	SECHSKANTMUTTER ISO4032-M10-8-E0P	R911213275
9	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050

### BEIPACKZETTEL HAS01.1-350-NNN-CA

Stck	Benennung	MN
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982
9	FEDERRING DIN127-B10-FST &	R911213251
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

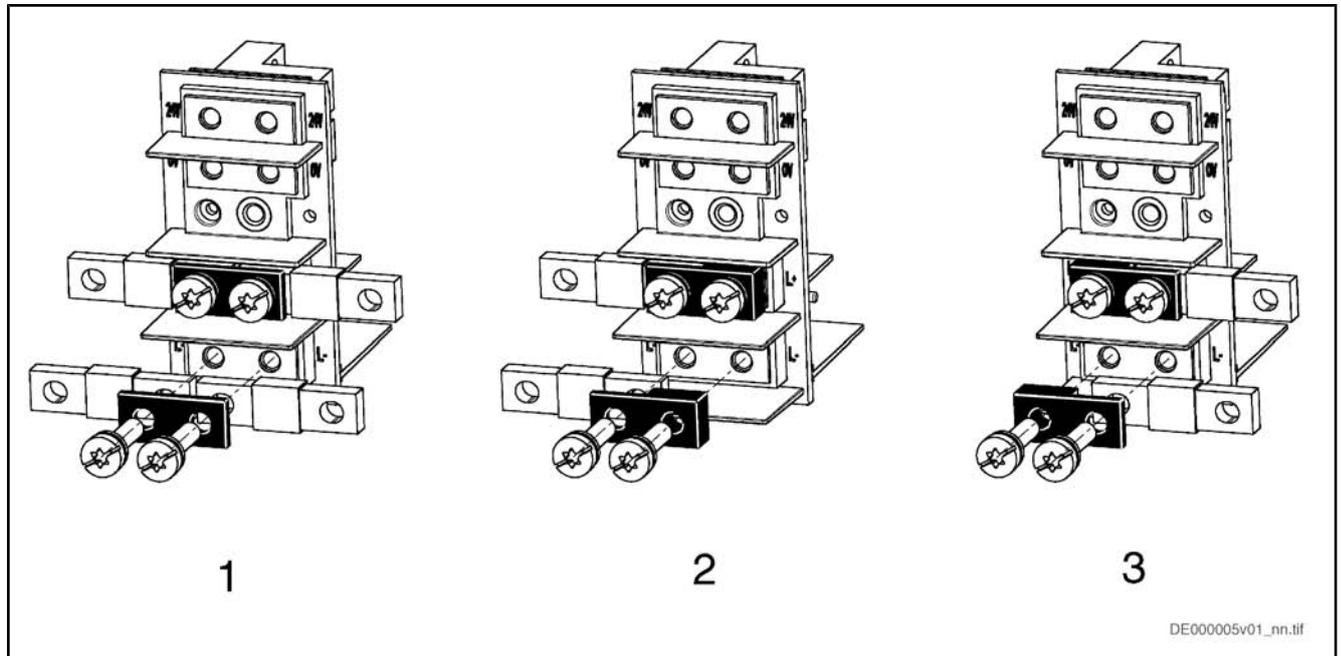
### BEIPACKZETTEL HAS01.1-350-NNN-CA

Datum	Benennung
2006-01-17	BEIPACKZETTEL HAS01.1-350-NNN-CA
Name	sonjrazz
Material-Nr.	R911315811
Datei	DB195173

Fig. 16-26: Accompanying note

## 16.1.6 Mounting the Parts "Bar" and "End Piece" of the Accessories HAS01

The parts "bar" and "end piece" increase the current carrying capacity of the DC bus connections by reducing the involved contact resistances.



- 1 Bar  
2 End piece (right end)  
3 End piece (left end)

Fig. 16-27: Mounting bar and end piece of HAS01

- **Ad 1:** Use the bars (-042) contained in all HAS01.1-\*\*\*-072-\*\* as shown in the figure at L+ and L-.
- **Ad 2 and 3:** Use the end pieces contained in all HAS01.1-350-\*\*\*-\*\* and HAS01.1-200-\*\*\*-\*\* at the right and left ends of the DC bus connections in the drive system.

## 16.2 HAS02, Shield Connection

### 16.2.1 General Information

Accessories for appropriate connection of the motor cable to the drive controller, especially the shield connection of the motor cable.

There are appropriate HAS02 accessories for the different drive controllers.



## 16.2.5 Scope of Supply

For the scope of supply and the components of HAS02, see the corresponding accompanying notes.

Accessories

Made in Germany  
109-1214-4805-02

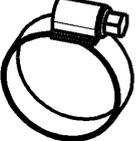


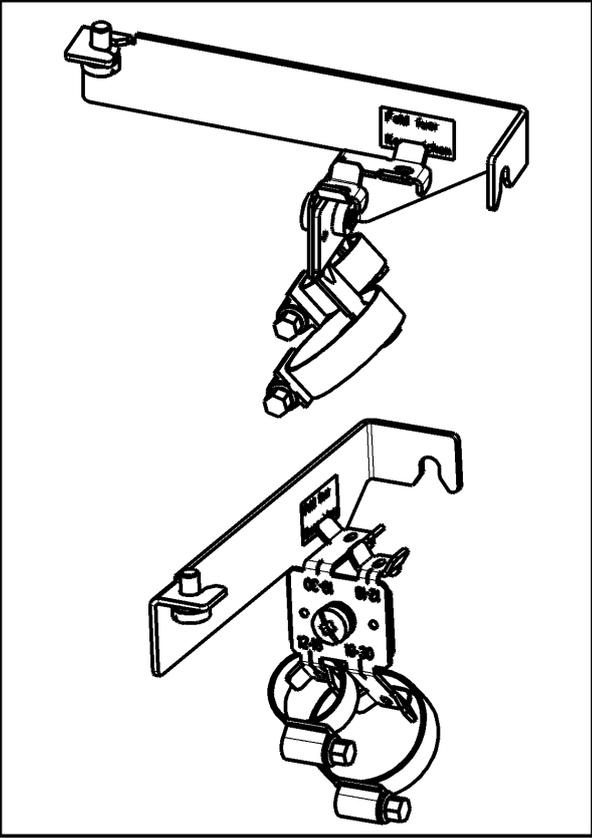
# HAS02.1-001-NNN-NN



R911306330

2	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
1	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
1	HALTERUNG HMS01.1 KABELD. 12-30	R911306336
1	BLECH HCS02.1 KABELBEFESTIGUNG	R911305851
Stck	Benennung	MN

BEIPACKZETTEL HAS02.1-001-NNN-NN		
Stck	Benennung	MN
DB163070	 BLECH HCS02.1 KABELBEFESTIGUNG	R911305851 1:5
DB164826	 HALTERUNG HMS01.1 KABELD. 12-30	R911306336 7:20
DB-46876	 SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471 1:2
DB-46888	 SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472 1:2
DB-38705	 SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551 1:1



Datum	2004-02-03	Benennung	BEIPACKZETTEL HAS02.1-001-NNN-NN	
Name	Hirt	Material-Nr.	R911306332	Zeich-Nr. 109-1214-4213-02
Datei	DB165406	Ers.durch	..	AEM-Nr. 5-07273

Fig.16-29: Accompanying note

Made in Germany  
109-1228-4815-02



# HAS02.1-002-NNN-NN

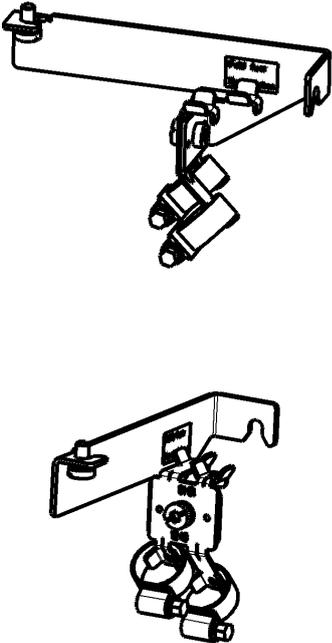


R911306106

2	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
2	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
1	HALTERUNG HCS02.1 KABELD. 12-18	R911305852
1	BLECH HCS02.1 KABELBEFESTIGUNG	R911305851
Stck	Benennung	MN

### BEIPACKZETTEL HAS02.1-002-NNN-NN

Stck	Benennung	MN
DB163070	 BLECH HCS02.1 KABELBEFESTIGUNG	R911305851 1:5
DB163246	 HALTERUNG HCS02.1 KABELD. 12-18	R911305852 7:20
DB-46879	 SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471 1:2
DB-38405	 SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551 1:1



Datum	2004-01-30	Benennung
Name	Born	BEIPACKZETTEL HAS02.1-002-NNN-NN
Material-Nr.	R911306107	Zeich-Nr. 109-1228-4231-02
Datei	DB165311	Ers.durch .. AEM-Nr. 5-07273

Fig. 16-30: Accompanying note

Accessories

Made in Germany  
109-1217-4816-02

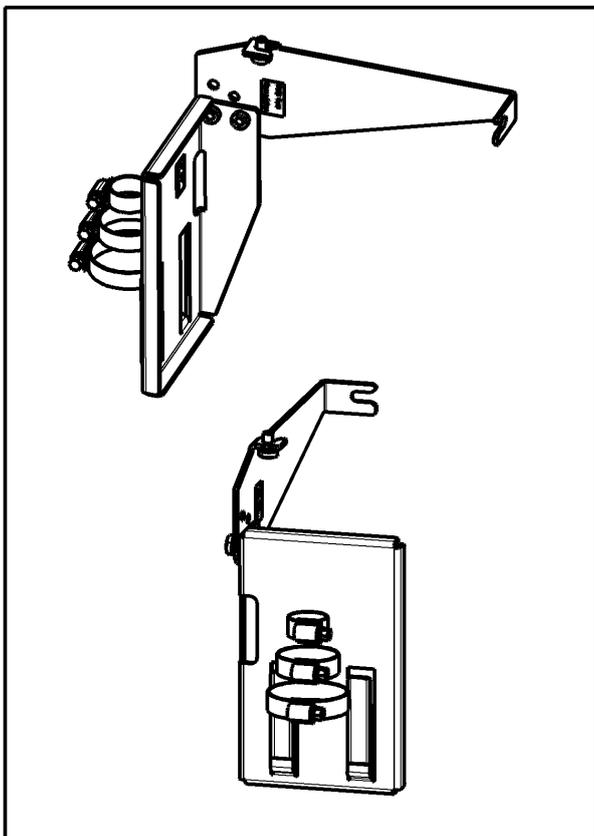


# HAS02.1-003-NNN-NN



R911306331

1	WINKEL HMS01.1-W0210 ABSCHIRMANSCHLUSS	R911305950
3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
1	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	SHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
1	BLECH HMS01.1-W0210 ABSCHIRMANSCHLUSS	R911305940
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>



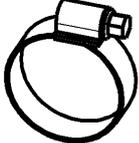
BEIPACKZETTEL HAS02.1-003-NNN-NN		
Stck	Benennung	MN
1	BLECH HMS01.1-W0210 ABSCHIRMANSCHLUSS	R911305940
DB164075		1:4
1	SHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
DB_46879		1:2
1	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
DB_46866		1:2
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
DB148073		2:5
3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
DB_38405		1:1
1	WINKEL HMS01.1-W0210 ABSCHIRMANSCHLUSS	R911305950
DB164151		1:5
<b>Datum</b>	2004-02-03	<b>Benennung</b>
<b>Name</b>	Koblinger	BEIPACKZETTEL HAS02.1-003-NNN-NN
<b>Material-Nr.</b>	R911306333	<b>Zeich-Nr.</b> 109-1217-4262-02
<b>Datei</b>	DB164151	<b>Ers.durch</b> .. <b>AEM-Nr.</b> 5-07273

Fig.16-31: Accompanying note

Made in Germany  
109-1253-4819-01

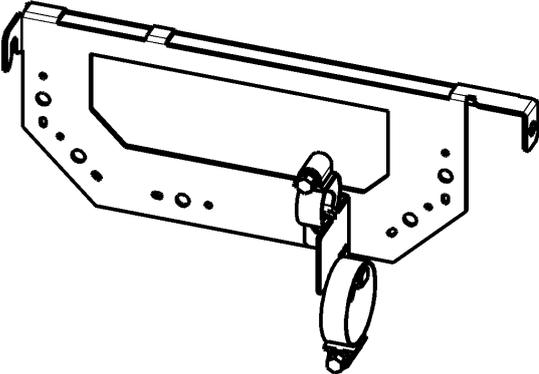


## HAS02.1-004-NNN-NN

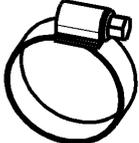
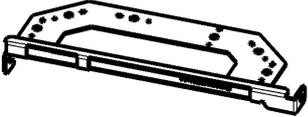


R911306720

1	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
1	SCHIRMWINKEL	R911024542
1	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	SHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
1	HALTERUNG HMS01.1 KABELD. 12-35	R911296081
Stck	Benennung	MN



### BEIPACKZETTEL HAS02.1-004-NNN-NN

Stck	Benennung	MN
1	HALTERUNG HMS01.1 KABELD. 12-35	R911296081
DB145411		7:20
1	SHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
DB_46879		1:2
1	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
DB_46868		1:2
1	SCHIRMWINKEL	R911024542
DB165569		1:5
1	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
DB_38705		1:1

Datum	2004-03-02	Benennung	BEIPACKZETTEL HAS02.1-004-NNN-NN
Name	Hirt / Steven	Material-Nr.	R911306724
		Zeich-Nr.	109-1253-4229-01
Datei	DB166622	Ers.durch	...
		AEM-Nr.	5-07273

Fig.16-32: Accompanying note

Accessories

Made in Germany  
109-1253-4820-01



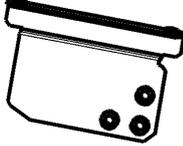
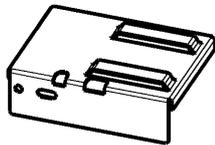
## HAS02.1-005-NNN-NN



R911306721

1	WINKEL HMS01.1-W0150 ABSCHIRMANSCHLUSS	R911296068
4	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z4I	R911252551
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
2	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	ABSCHIRMANSCHLUSS	R911024379
Stck	Benennung	MN

### BEIPACKZETTEL HAS02.1-005-NNN-NN

Stck	Benennung	MN
DB166623	 1:4	R911024379
DB166623	 1:2	R911274472
DB148073	 7:20	R911296565
DB30405	 1:1	R911252551
DB144563	 1:5	R911296068

Datum	2004-03-02	Benennung	BEIPACKZETTEL HAS02.1-005-NNN-NN
Name	Hirt / Sleven	Material-Nr.	R911306725
		Zeich-Nr.	109-1253-4230-01
Datei	DB166623	Ers.durch	..
		AEM-Nr.	5-07273

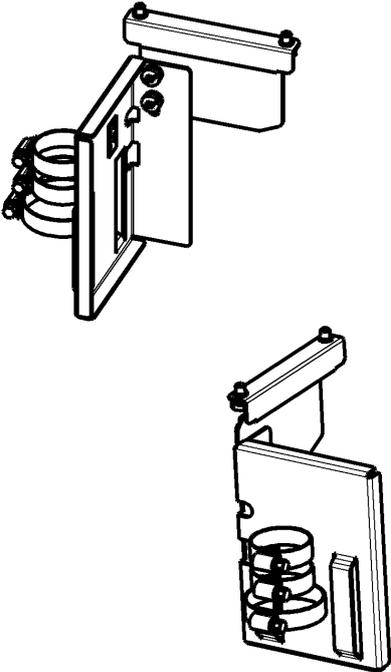


Fig.16-33: Accompanying note

Made in Germany  
109-1253-4821-01

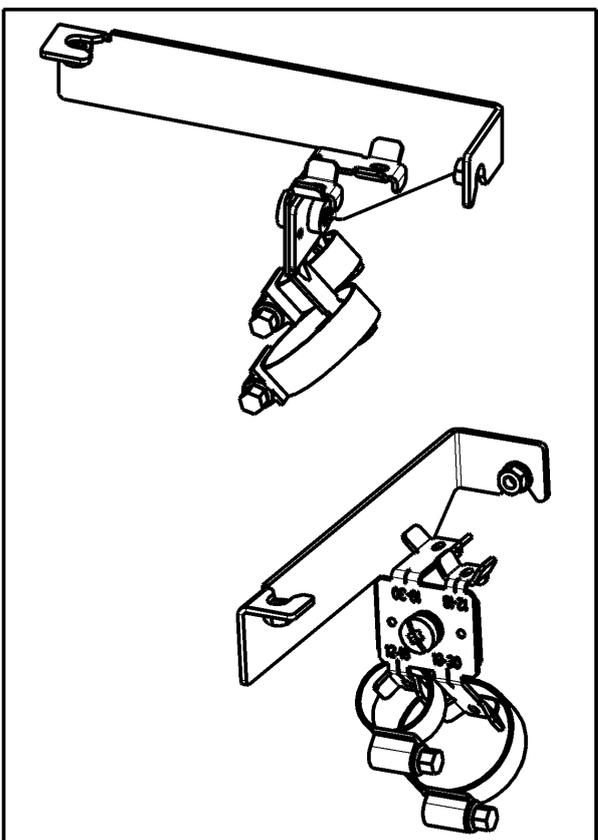


# HAS02.1-006-NNN-NN



R911306722

1	SCHR-LIN-M 6,0X12,0-K-8-ISO7045-ZN-Z41	R911252551
1	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
2	MUTTER-KOM-M 5,0-D10-H05,80 A2-B	R911210162
1	HALTERUNG HMS01.1 KABELD. 12-30	R911306336
1	BLECH HCS02.1 KABELBEFESTIGUNG	R911305851
Stck	Benennung	MN



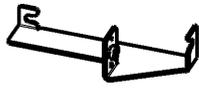
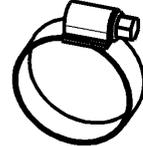
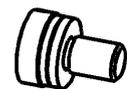
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Stck	Benennung	MN
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DB163070		1:5
1	HALTERUNG HMS01.1 KABELD. 12-30	R911306336
DB164826		7:20
2	MUTTER-KOM-M 5,0-D10-H05,80 A2-B	R911210162
DB-39161		1:1
1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
DB-46879		1:2
1	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
DB-46886		1:2
1	SCHR-LIN-M 6,0X12,0-K-8-ISO7045-ZN-Z41	R911252551
DB-38405		1:1
Datum	2004-03-02	Benennung
Name	Hirt / Steven	BEIPACKZETTEL HAS02.1-006-NNN-NN
Material-Nr.	R911306726	Zeich-Nr. 109-1253-4231-01
Datei	DB166624	Ers.durch .. AEM-Nr. 5-07273

Fig.16-34: Accompanying note

Accessories

Made in Germany  
109-1253-4822-01

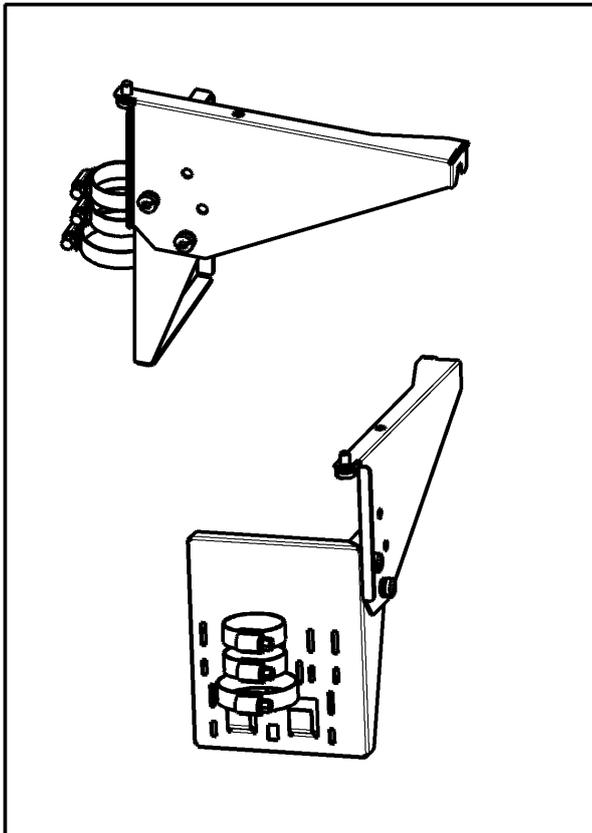


HAS02.1-007-NNN-NN



R911306723

3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
1	SCHIRMANBINDUNG	R911024565
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
2	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	HALTER SCHIRMANBINDUNG	R911024564
Stck	Benennung	MN



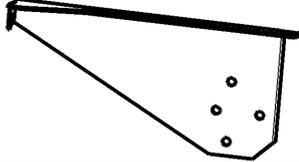
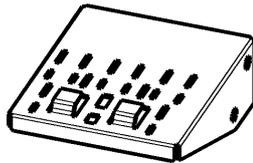
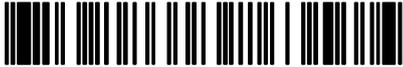
BEIPACKZETTEL HAS02.1-007-NNN-NN		
Stck	Benennung	MN
1	HALTER SCHIRMANBINDUNG	R911024564
DB166573		1:5
2	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
DB_16668		1:2
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
DB148073		7:20
1	SCHIRMANBINDUNG	R911024565
DB166572		1:4
3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
DB_38405		1:1
Datum	2004-03-02	Benennung
Name	Hirt / Slevén	BEIPACKZETTEL HAS02.1-007-NNN-NN
Material-Nr.	R911306723	Zeich-Nr. 109-1253-4232-01
Datei	DB166625	Ers.durch .. AEM-Nr. 5-07273

Fig.16-35: Accompanying note

Made in Germany



## HAS02.1-008-NNN-NN



R911309579

4	SECHSKANTSCHRAUBE ISO4017-M6X12-8-8-A2C	R900014492
4	SCHR-LIN-M 6,0X12,0-K-8-8-ISO7045-ZN-Z41	R911252551
1	SCHIRMAUFLAGE HCS210	0025285
4	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
4	SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427
2	HALTER SCHIRMAUFLAGE HCS210	0025286
4	FEDERRING B 6,0 DIN 127 ZN	R911213515
Stck	Benennung	MN

**BEIPACKZETTEL HAS02.1-008-NNN-NN**

Stck	Benennung	MN
4	FEDERRING B 6,0 DIN 127 ZN	R911213515
2	HALTER SCHIRMAUFLAGE HCS210	0025286
4	SCHLEIBE 6,40X 12,00X 1,60 DIN 125	R911212427
4	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	SCHIRMAUFLAGE HCS210	0025285
4	SCHR-LIN-M 6,0X12,0-K-8-8-ISO7045-ZN-Z41	R911252551
4	SECHSKANTSCHRAUBE ISO4017-M6X12-8-8-A2C	R900014492

<b>Datum</b>	2004-11-08	<b>Benennung</b>
<b>Name</b>	Sleven	BEIPACKZETTEL HAS02.1-008-NNN-NN
<b>Material-Nr.</b>		<b>Zeich-Nr.</b> 109-1253-4233-00
<b>Datei</b>	DB178779	<b>Ers.durch</b> ... <b>AEM-Nr.</b> ...

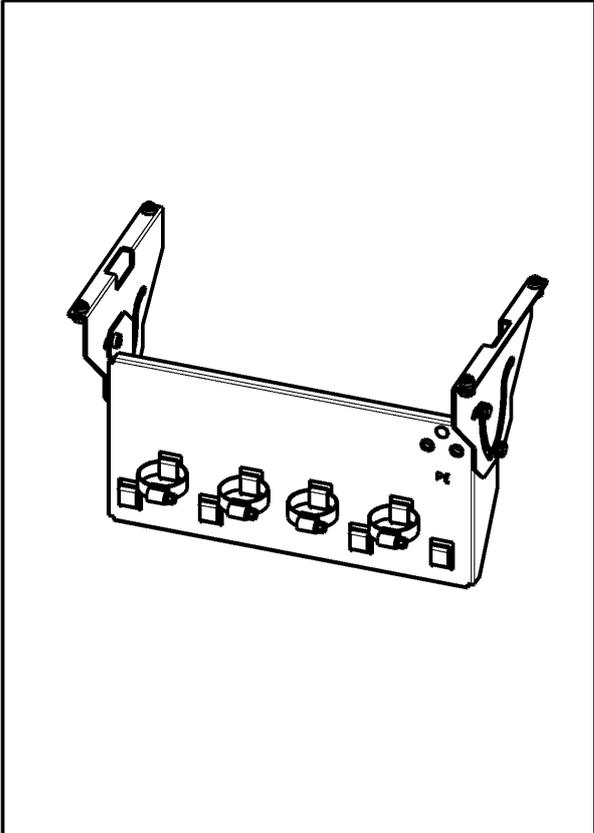


Fig. 16-36: Accompanying note

Accessories

Made in Germany  
109-1253-4824-00



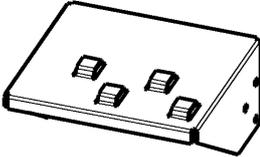
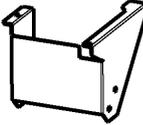
## HAS02.1-009-NNN-NN



R911308225

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1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
2	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	HALTER SCHIRMBLECH	R911025035
1	BLECH-SCHIRMAUFLAGE	R911025036

**BEIPACKZETTEL HAS02.1-009-NNN-NN**

Stck	Benennung	MN
DB11916	1 BLECH-SCHIRMAUFLAGE	R911025036
		1:5
DB11914	1 HALTER SCHIRMBLECH	R911025035
		1:10
DB-46868	2 SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
		1:4
DB14803	1 SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
		1:4
DB-38705	6 SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
		1:1

Datum	2004-07-06	Benennung
Name	Hirt	BEIPACKZETTEL HAS02.1-009-NNN-NN
Material-Nr.	R911308255	Zeich-Nr. 109-1253-4234-00
Datei	DB171948	Ers.durch .. AEM-Nr. ..

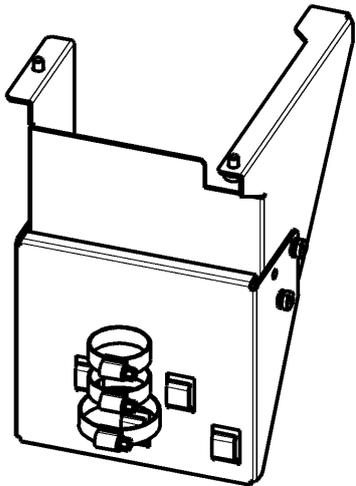


Fig.16-37: Accompanying note

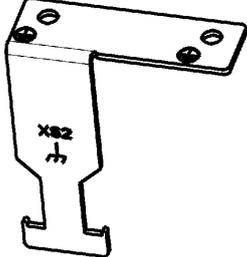
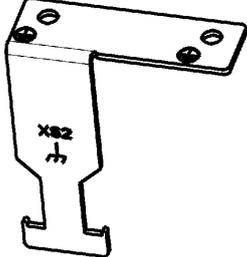
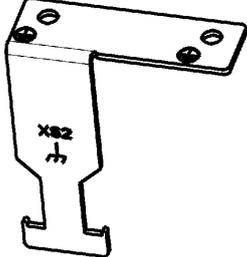
<p>Made in Germany 109-1253-4841-00</p> <p style="text-align: right;"><b>Rexroth</b> <b>Bosch Group</b></p> <h2 style="text-align: center;">HAS02.1-010-NNN-NN</h2> <div style="text-align: center;">                   R911306209             </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 20px;"> <tr> <td style="width: 5%;">1</td> <td style="width: 75%;">KLEMME SK 20</td> <td style="width: 20%;">R911313176</td> </tr> <tr> <td>1</td> <td>BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS</td> <td>R911311526</td> </tr> <tr> <td><b>Stck</b></td> <td><b>Benennung</b></td> <td><b>MN</b></td> </tr> </table>	1	KLEMME SK 20	R911313176	1	BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS	R911311526	<b>Stck</b>	<b>Benennung</b>	<b>MN</b>	<p style="text-align: center;"><b>BEIPACKZETTEL HAS02.1-010-NNN-NN</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;">Stck</th> <th style="width: 75%;">Benennung</th> <th style="width: 20%;">MN</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;">DB185832</td> <td>                     1 BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS   </td> <td style="vertical-align: top;">R911311526  1:2</td> </tr> <tr> <td style="vertical-align: top;">DB183313</td> <td>                     1 KLEMME SK 20   </td> <td style="vertical-align: top;">R911313176  1:2</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 20px;"> <tr> <td style="width: 15%;"><b>Datum</b></td> <td style="width: 30%;">2005-08-19</td> <td style="width: 15%;"><b>Benennung</b></td> <td style="width: 40%;">BEIPACKZETTEL HAS02.1-010-NNN-NN</td> </tr> <tr> <td><b>Name</b></td> <td>rainhirt</td> <td><b>Material-Nr.</b></td> <td>R911313050</td> </tr> <tr> <td><b>Material-Nr.</b></td> <td>R911313050</td> <td><b>Zeich-Nr.</b></td> <td>109-1253-4277-00</td> </tr> <tr> <td><b>Datei</b></td> <td>DB190746</td> <td><b>Ers.durch</b></td> <td>...</td> </tr> <tr> <td></td> <td></td> <td><b>AEM-Nr.</b></td> <td>...</td> </tr> </table>	Stck	Benennung	MN	DB185832	1 BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS 	R911311526  1:2	DB183313	1 KLEMME SK 20 	R911313176  1:2	<b>Datum</b>	2005-08-19	<b>Benennung</b>	BEIPACKZETTEL HAS02.1-010-NNN-NN	<b>Name</b>	rainhirt	<b>Material-Nr.</b>	R911313050	<b>Material-Nr.</b>	R911313050	<b>Zeich-Nr.</b>	109-1253-4277-00	<b>Datei</b>	DB190746	<b>Ers.durch</b>	...			<b>AEM-Nr.</b>	...
1	KLEMME SK 20	R911313176																																					
1	BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS	R911311526																																					
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>																																					
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DB185832	1 BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS 	R911311526  1:2																																					
DB183313	1 KLEMME SK 20 	R911313176  1:2																																					
<b>Datum</b>	2005-08-19	<b>Benennung</b>	BEIPACKZETTEL HAS02.1-010-NNN-NN																																				
<b>Name</b>	rainhirt	<b>Material-Nr.</b>	R911313050																																				
<b>Material-Nr.</b>	R911313050	<b>Zeich-Nr.</b>	109-1253-4277-00																																				
<b>Datei</b>	DB190746	<b>Ers.durch</b>	...																																				
		<b>AEM-Nr.</b>	...																																				

Fig.16-38: Accompanying note

Accessories

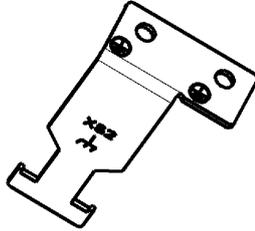
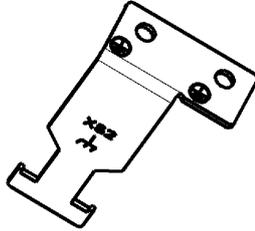
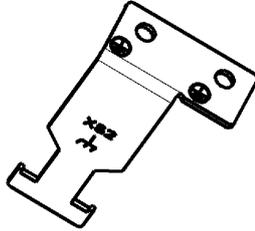
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1	KLEMME SK 20	R911313176																																									
1	BLECH HMS02.1 W0028 ABSCHIRMANSCHLUSS	R911311525																																									
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>																																									
BEIPACKZETTEL HAS02.1-011-NNN-NN																																											
Stck	Benennung	MN																																									
1	BLECH HMS02.1 W0028 ABSCHIRMANSCHLUSS	R911311525																																									
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DB186471		1:2																																									
<b>Datum</b>	2005-08-19	<b>Benennung</b>																																									
<b>Name</b>	rainhirt	BEIPACKZETTEL HAS02.1-011-NNN-NN																																									
<b>Material-Nr.</b>	R911306628	<b>Zeich-Nr.</b> 109-1253-4278-00																																									
<b>Datei</b>	DB190747	<b>Ers.durch</b> .. <b>AEM-Nr.</b> ..																																									

Fig.16-39: Accompanying note

Made in Germany  
109-1253-4850-00

**Rexroth**  
**Bosch Group**

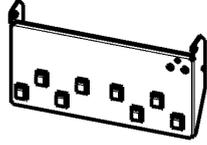
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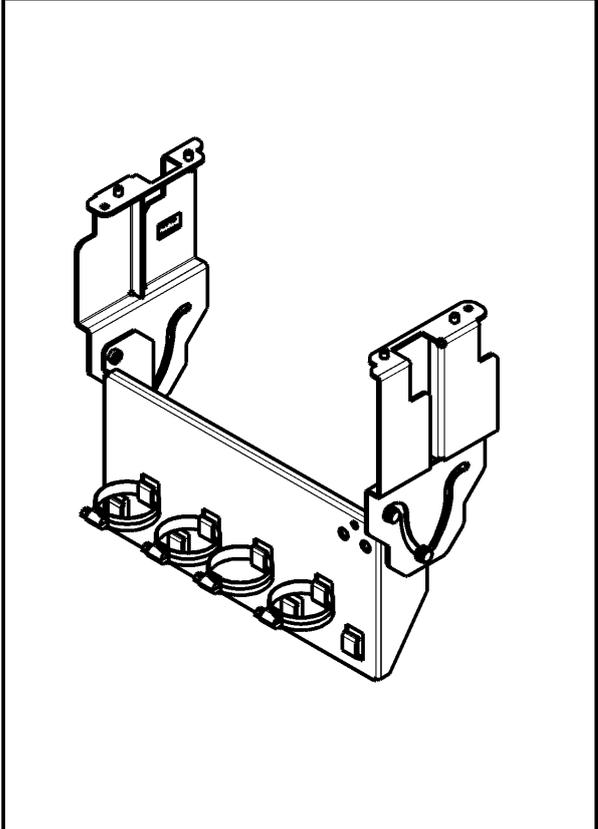


R911315682

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4	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
4	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
4	SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427
4	FEDERRING DIN127-B6-FST &	R911213515
2	BLECH HCS04.1E-W0500 ABSCHIRMANSCHLUSS	R911027316
Stck	Benennung	MN

**BEIPACKZETTEL HAS02.1-012-NNN-NN**

Stck	Benennung	MN
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		1:10
DB-5562	4 FEDERRING DIN127-B6-FST &	R911213515
		1:1
DB-42275	4 SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427
		1:1
DB748043	4 SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
		2:5
DB-38405	4 SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
		1:1
DB78750	4 SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C	R900014492
		1:1
DB186125	1 WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS	R911025285
		1:10



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		AEM-Nr.	...

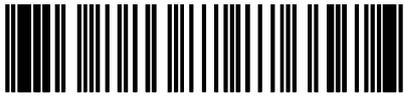
Fig. 16-40: Accompanying note

Accessories

Made in Germany  
109-1287-4820-00

**Rexroth  
Bosch Group**

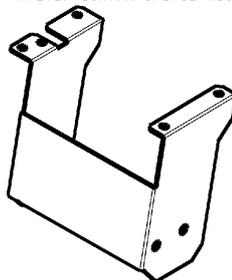
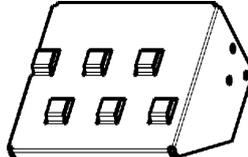
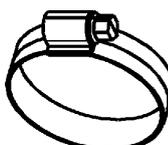
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R911318183

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1	0027843 SCHIRMAUFLAGE HCS0500	R911203470
1	0027842 HALTER SCHIRMAUFLAGE HCS0500	R911203471
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>

**BEIPACKZETTEL HAS02.1-013-NNN-NN**

Stck	Benennung	MN
DB20419T		R911203471 1:5
DB19933Z		R911203470 1:5
DB11608S		R911294530 1:1
DB11607S		R911296565 1:2

Datum	2006-08-21	Benennung	
Name	mat home1	BEIPACKZETTEL HAS02.1-013-NNN-NN	
Material-Nr.	R911318184	Zeich-Nr.	109-1287-4203-00
Datei	DB204202	Ers.durch	.. AEM-Nr. ..

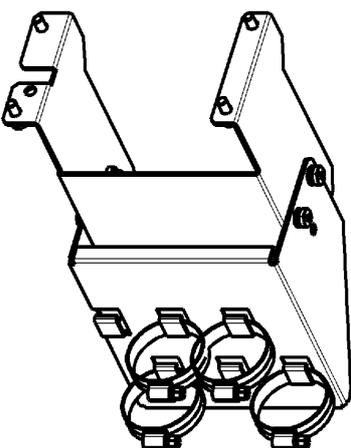


Fig.16-41: Accompanying note

Made in Germany  
109-1253-4857-00

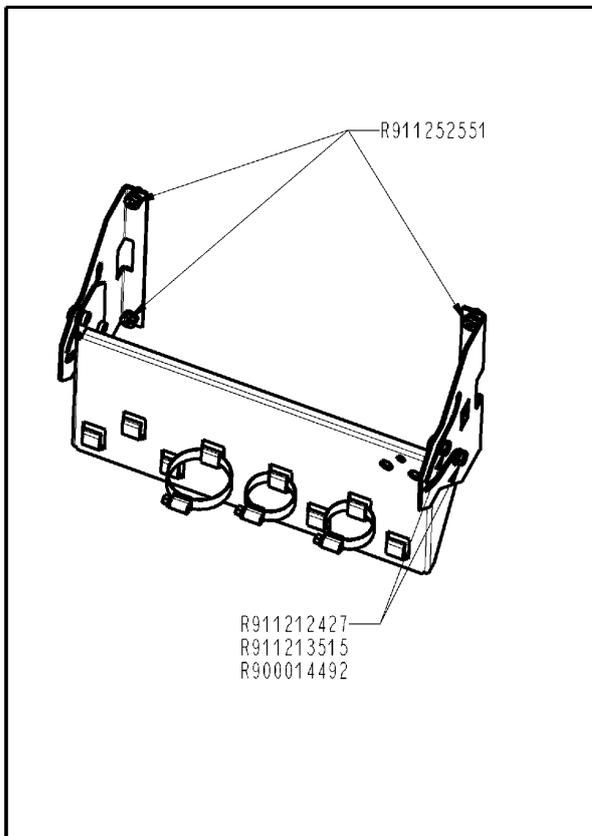
**Rexroth**  
**Bosch Group**

**HAS02.1-014-NNN-NN**



R911319050

1	WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS	R911025285
4	SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C	R900014492
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
2	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
4	SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427
4	KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &	R911252551
4	FEDERRING DIN127-B6-FST &	R911213515
2	BLECH HMS01.1-W0350 ABSCHIRMANSCHLUSS	R911318661
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>



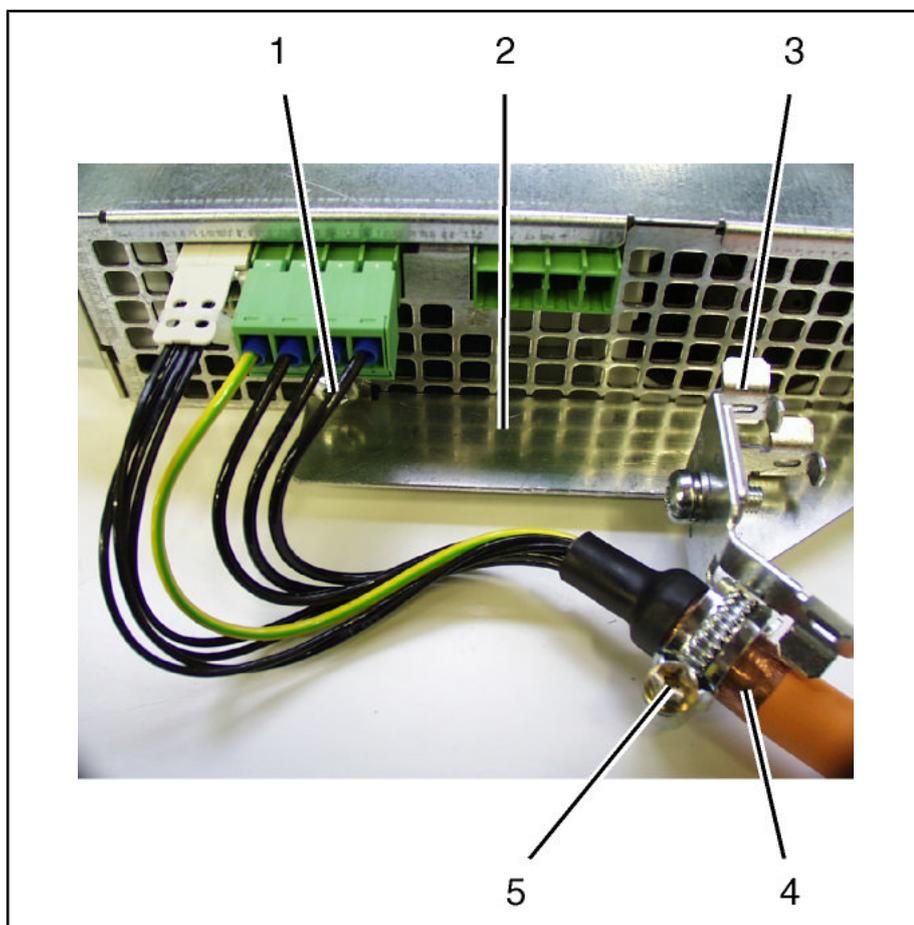
BEIPACKZETTEL HAS02.1-014-NNN-NN			
Stck	Benennung	MN	
2	BLECH HMS01.1-W0350 ABSCHIRMANSCHLUSS	R911318661	
DB204147		3:20	
4	FEDERRING DIN127-B6-FST &	R911213515	
DB-55762		1:1	
4	KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &	R911252551	
DB-38405		1:1	
4	SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427	
DB-72275		1:1	
2	SHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472	
DB-76868		2:5	
1	SHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565	
DB-76073		2:5	
4	SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C	R900014492	
DB178150		1:1	
1	WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS	R911025285	
DB186725		1:10	
<b>Datum</b>	2006-10-11	<b>Benennung</b>	BEIPACKZETTEL HAS02.1-014-NNN-NN
<b>Name</b>	siegfis0	<b>Material-Nr.</b>	R911319013
<b>Material-Nr.</b>	R911319013	<b>Zeich-Nr.</b>	109-1253-4298-00
<b>Datei</b>	DB205990	<b>Ers.durch</b>	...
		<b>AEM-Nr.</b>	...

Fig.16-42: Accompanying note

## Accessories

## 16.2.6 Mounting the HAS02 Accessories

## General Information



- |   |                                  |
|---|----------------------------------|
| 1 | Screw in thread XS2              |
| 2 | Fixing device of shielding plate |
| 3 | Shielding plate                  |
| 4 | Shield of motor cable            |
| 5 | Clip                             |

Fig. 16-43: Shield connection of motor cable

- Unscrew bottom or bottom left fixing screw of drive controller.
- Put fixing device of accessories to bottom of drive controller and screw down fixing screw of drive controller again.



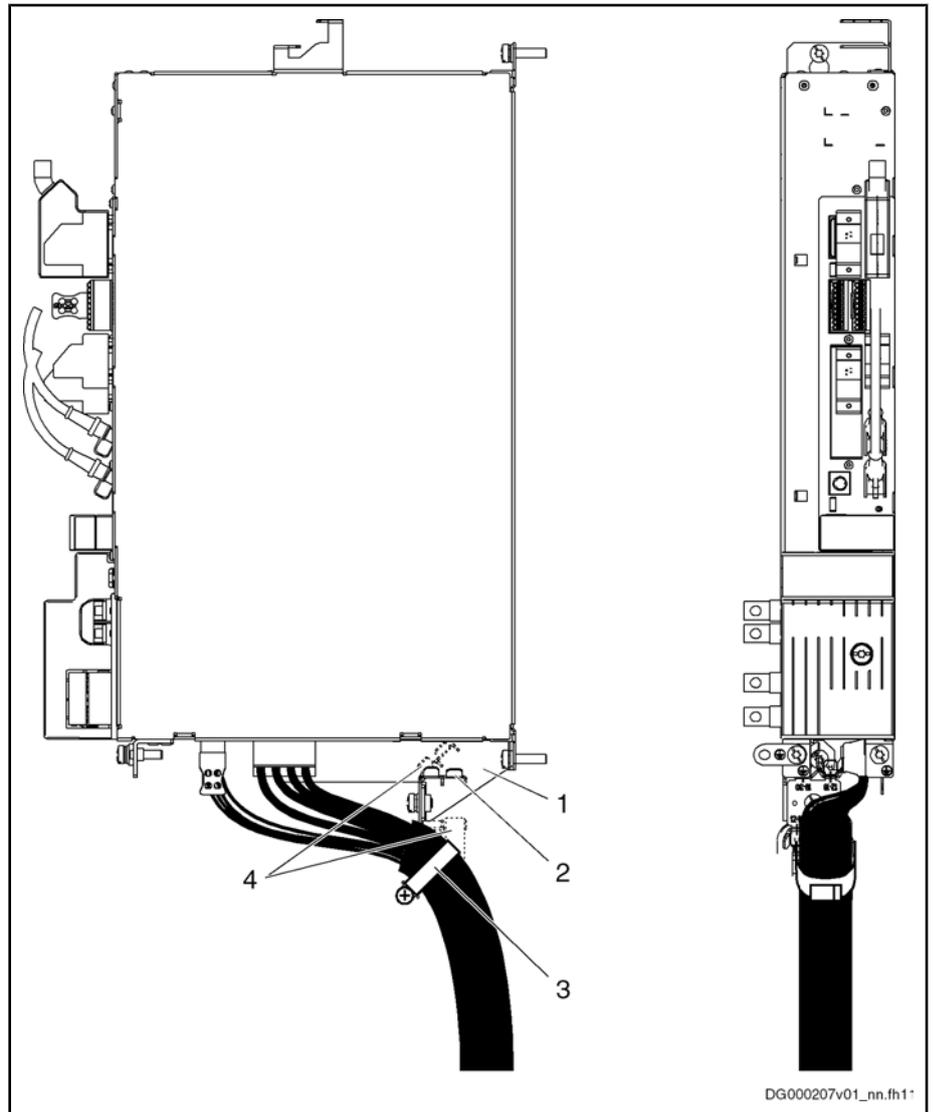
CAUTION

### Risk of damage to the drive controller caused by too long screws!

Exclusively use the supplied screws of a length of 12 mm for the thread of the shield connection XS2.

- Screw second screw (M6 × 12) in thread XS2 at bottom of drive controller.
- Screw shielding plate to sheet metal of accessories according to desired cable routing of motor cable (45° or horizontal). (The figure below illustrates cable routing with 45°.)
- According to diameter of motor cable, fix motor cable at corresponding point of shielding plate (12–18 mm or 19–30 mm) with a clip. Make sure that shield of motor cable has good contact with shielding plate (see figure below).

## HAS02.1-001 at HMS01.1N-W0054



- |   |   |
|---|---|
| 1 | Fixing device   |
| 2 | Shielding plate   |
| 3 | Clip  |
| 4 | Different possibilities of mounting the shielding plate, according to motor cable routing |

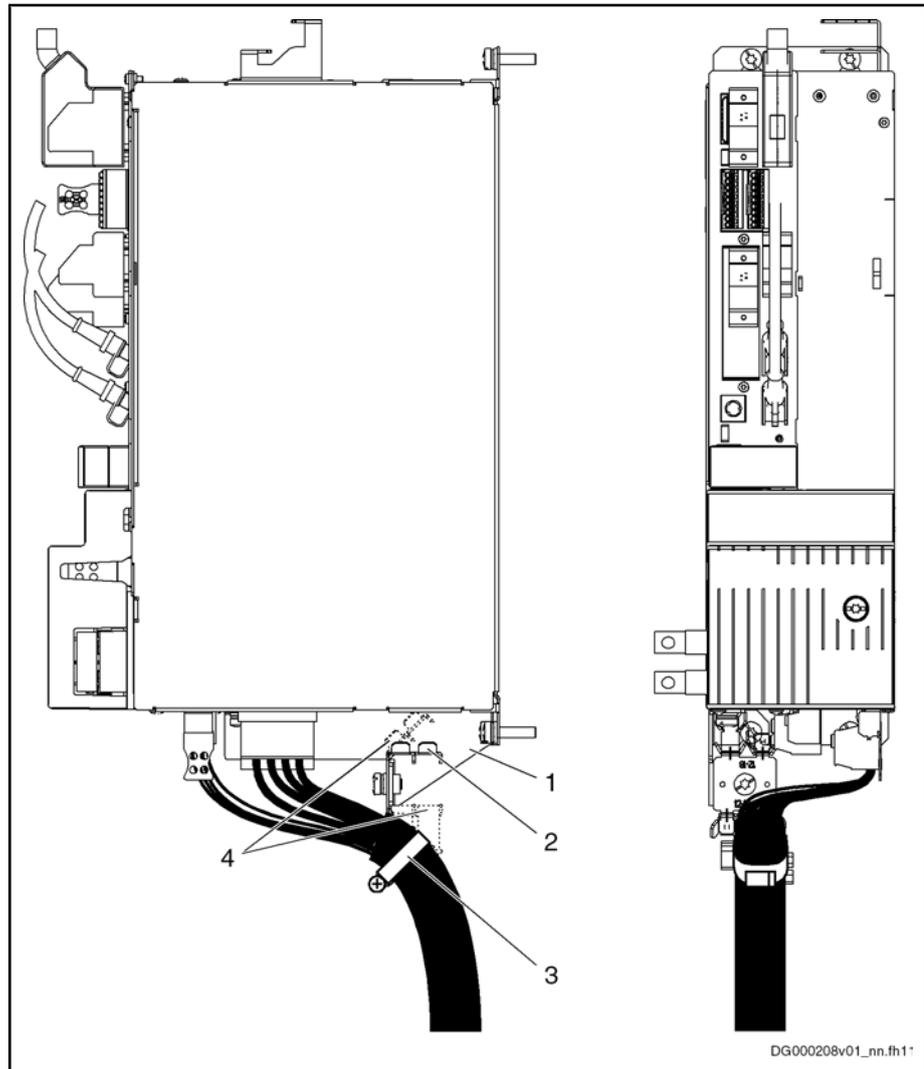
Fig. 16-44: HAS02.1-001 at bottom of drive controller HMS01.1N-W0054

**Mounting**

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

Accessories

HAS02.1-002 at HCS02.1E-W0054

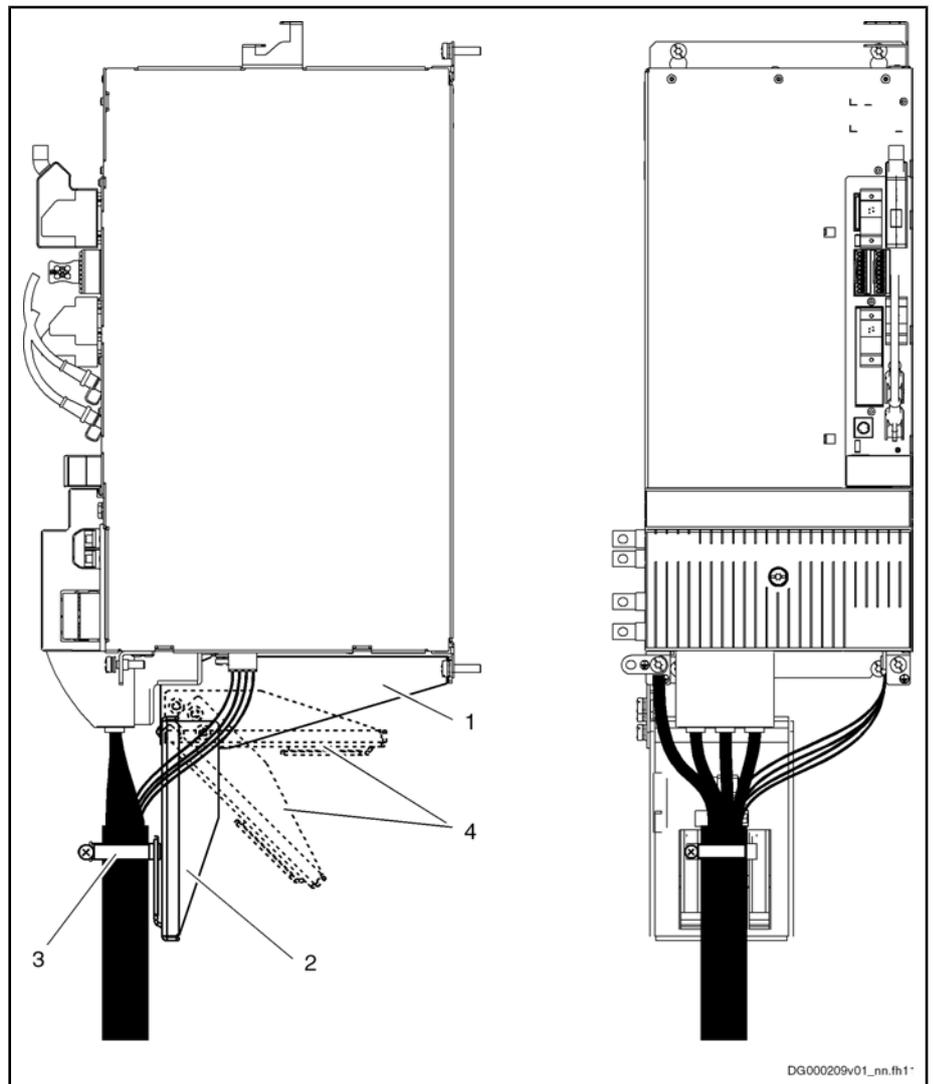


- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different possibilities of mounting the shielding plate, according to motor cable routing

Fig.16-45: HAS02.1-002 at bottom of drive controller HCS02.1E-W0054

- Mounting**
1. By means of supplied screws, fasten fixing device to bottom of drive controller.
  2. Fix shielding plate to fixing device according to desired motor cable routing.
  3. Fix shield of cable to shielding plate with appropriate clip.

## HAS02.1-003 at HMS01.1N-W0210



- |   |   |
|---|---|
| 1 | Fixing device   |
| 2 | Shielding plate   |
| 3 | Clip  |
| 4 | Different possibilities of mounting the shielding plate, according to motor cable routing |

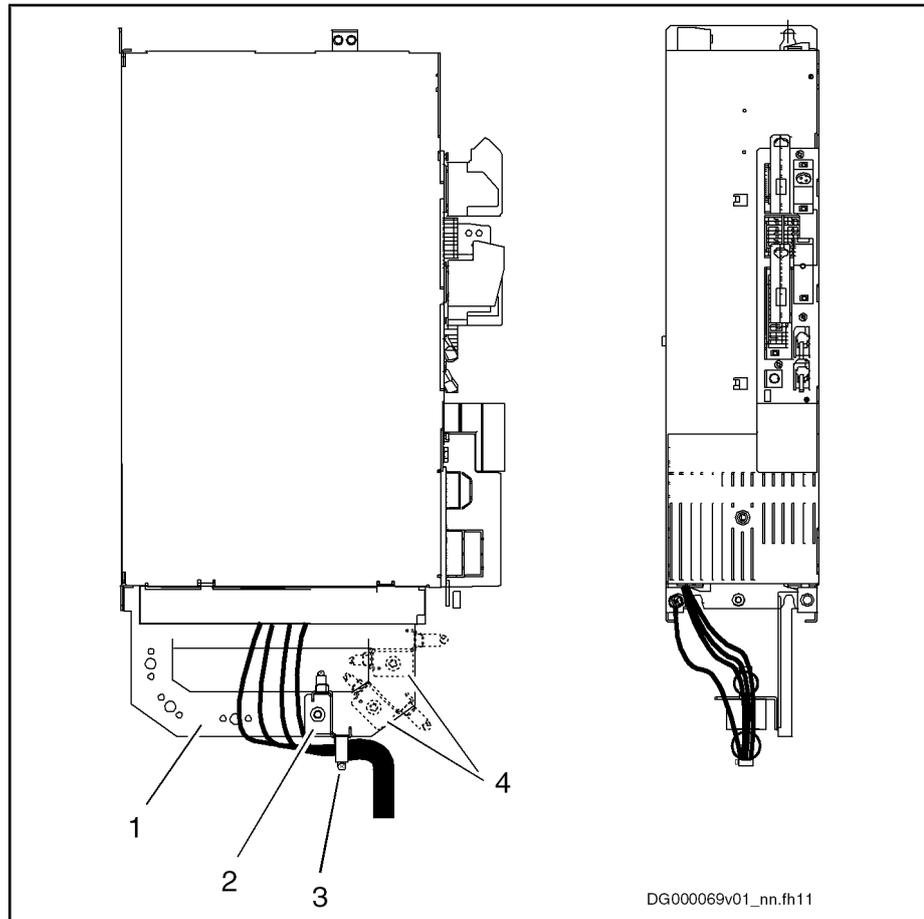
Fig. 16-46: HAS02.1-003 at bottom of drive controller HMS01.1N-W0210

**Mounting**

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

Accessories

HAS02.1-004 at HCS03.1E-W0070

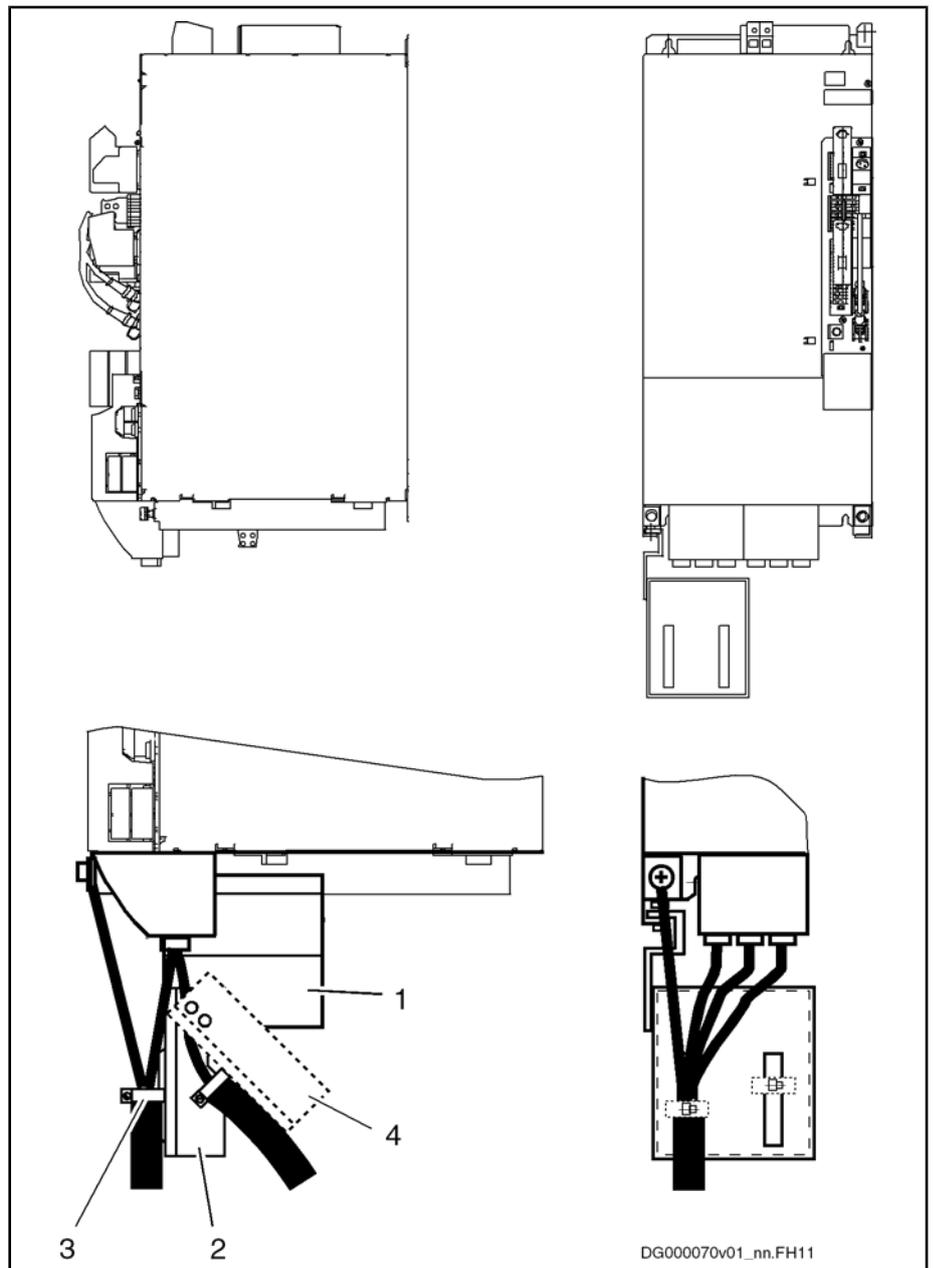


- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 16-47: HAS02.1-004 at bottom of drive controller HCS03.1E-W0070

- Mounting**
1. By means of supplied screws, fasten fixing device to bottom of drive controller.
  2. Fix shielding plate to fixing device according to desired motor cable routing.
  3. Fix shield of cable to shielding plate with appropriate clip.

## HAS02.1-005 at HCS03.1E-W0100 / 150



- |   |   |
|---|---|
| 1 | Fixing device   |
| 2 | Shielding plate   |
| 3 | Clip  |
| 4 | Different possibilities of mounting the shielding plate, according to motor cable routing |

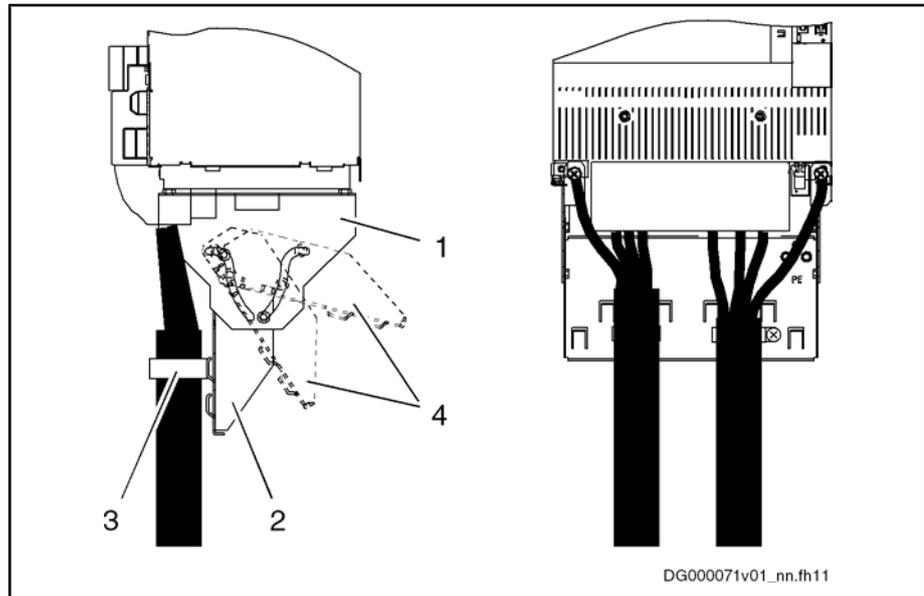
Fig. 16-48: HAS02.1-005 at bottom of drive controller HCS03.1E-W0100 / 0150

**Mounting**

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

Accessories

HAS02.1-008 at HCS03.1E-W0210

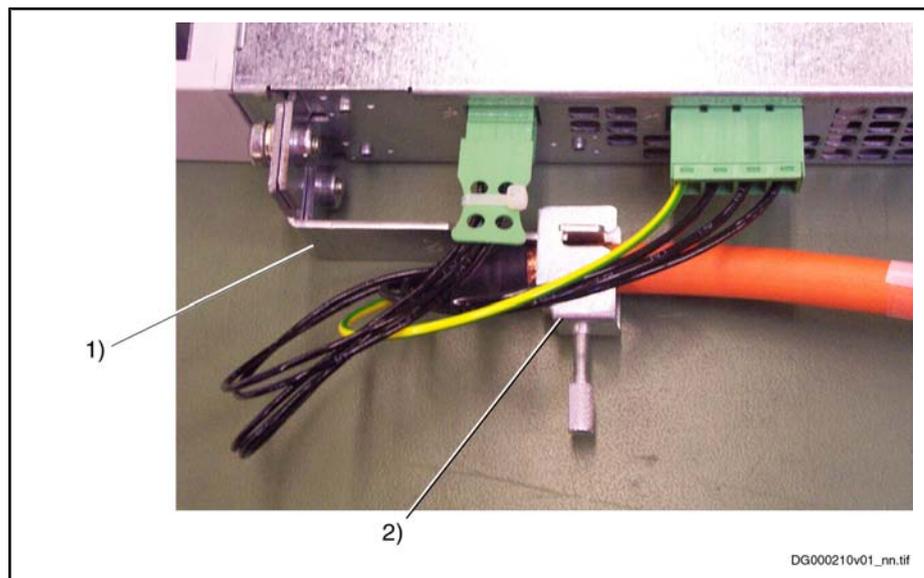


- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 16-49: HAS02.1-008 at bottom of drive controller HCS03.1E-W0210

- Mounting**
1. By means of supplied screws, fasten fixing device to bottom of drive controller.
  2. Fix shielding plate to fixing device according to desired motor cable routing.
  3. Fix shield of cable to shielding plate with appropriate clip.

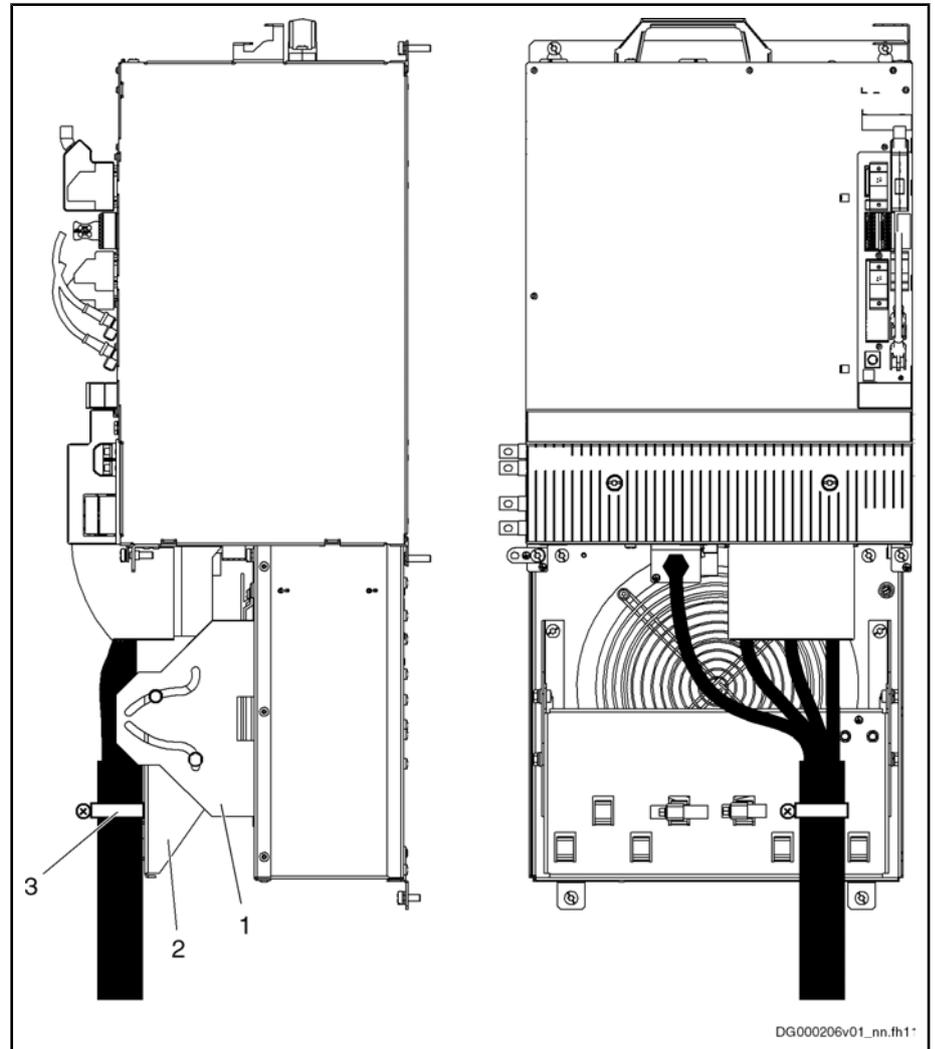
HAS02.1-010 at HMS02.1N-W0028 / 54



- 1 Fixing device
  - 2 Shielding plate
- Fig. 16-50: HAS02.1-010-NNN-NN at bottom of drive controller HMS02.1N-W0028 / 54

1. Screw fixing device to equipment grounding conductor connection of drive controller.
2. Fix shield of cable with shielding plate to fixing device.

### HAS02.1-014 at HMS01.1N-W0350



- |   |                 |
|---|-----------------|
| 1 | Fixing device   |
| 2 | Shielding plate |
| 3 | Clip            |

Fig.16-51: HAS02.1-014 at bottom of drive controller HMS01.1N-W0350

1. By means of supplied screws, fasten fixing device to front of blower unit.
2. Fix shielding plate to fixing device.
3. Fix shield of cable to shielding plate with appropriate clip.

## 16.2.7 Shield Connection of the Motor Cable via Mains Filter

### General Information

There is a special shielding plate for shield connection of the motor cable via the mains filter at the drive controller:

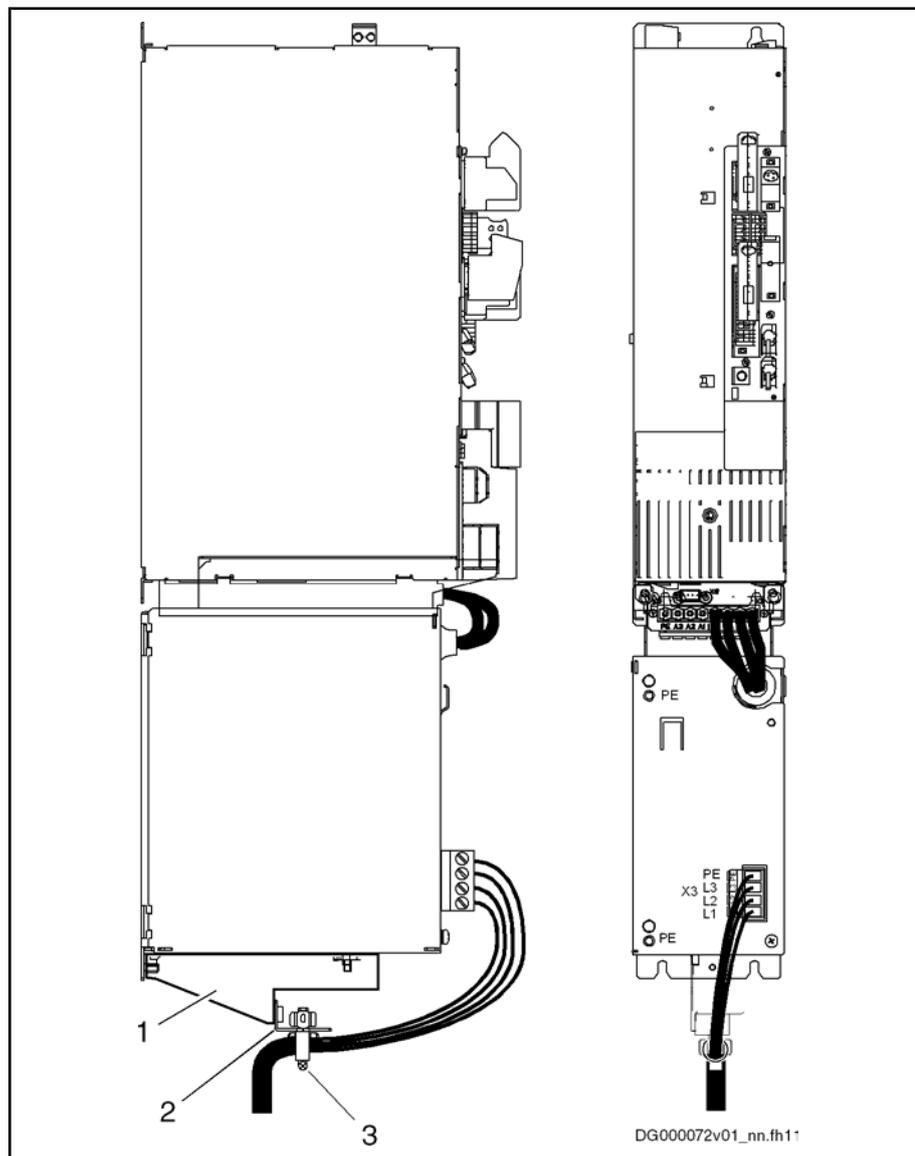
Accessories



Using the shielding plate guarantees optimum shield contact of the motor cable. You should therefore, **where possible, always** use the shielding plate.

The shielding plate is only available as an option.

HAS02.1-006 With Motor Cable and Mains Filter



- 1 Fixing device
- 2 Shielding plate
- 3 Clip

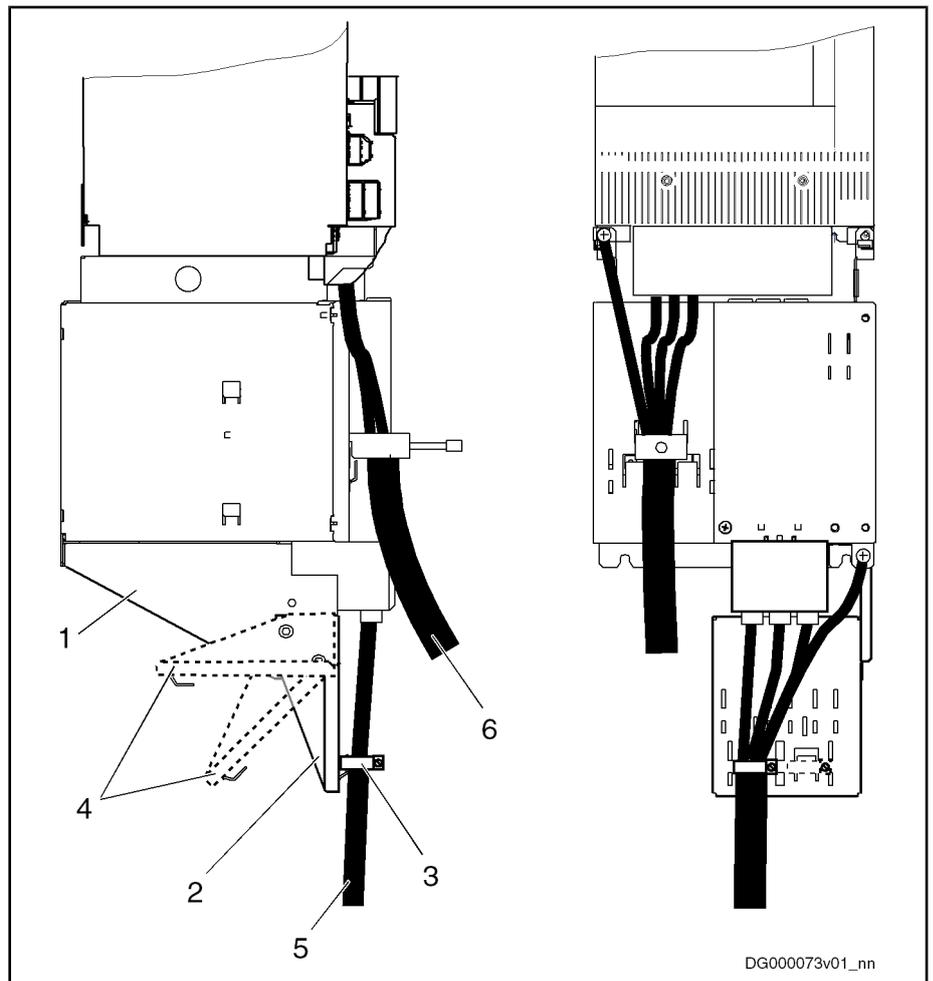
Fig.16-52: HAS02.1-006 at bottom of mains filter (rated current 50 A)

1. Hang up fixing device at bottom of mains filter at threaded bolts and fasten with supplied nuts.
2. Screw shielding plate to fixing device.
3. Fix shield of cable to shielding plate with appropriate clip.



The shield terminals must not be used to provide strain relief.

## HAS02.1-007 With Power Supply Cable and Mains Filter



- |   |   |
|---|---|
| 1 | Fixing device   |
| 2 | Shielding plate   |
| 3 | Clip  |
| 4 | Different possibilities of mounting the shielding plate, according to cable routing |
| 5 | Power supply cable  |
| 6 | Motor cable   |

Fig. 16-53: HAS02.1-007 at bottom of mains filter (rated current 80 A / 106 A)

**1.** Hang up fixing device at bottom of mains filter and fasten with supplied screws.

**2.** Screw shielding plate to fixing device.

According to desired cable routing, the shielding plate can be mounted in different positions.

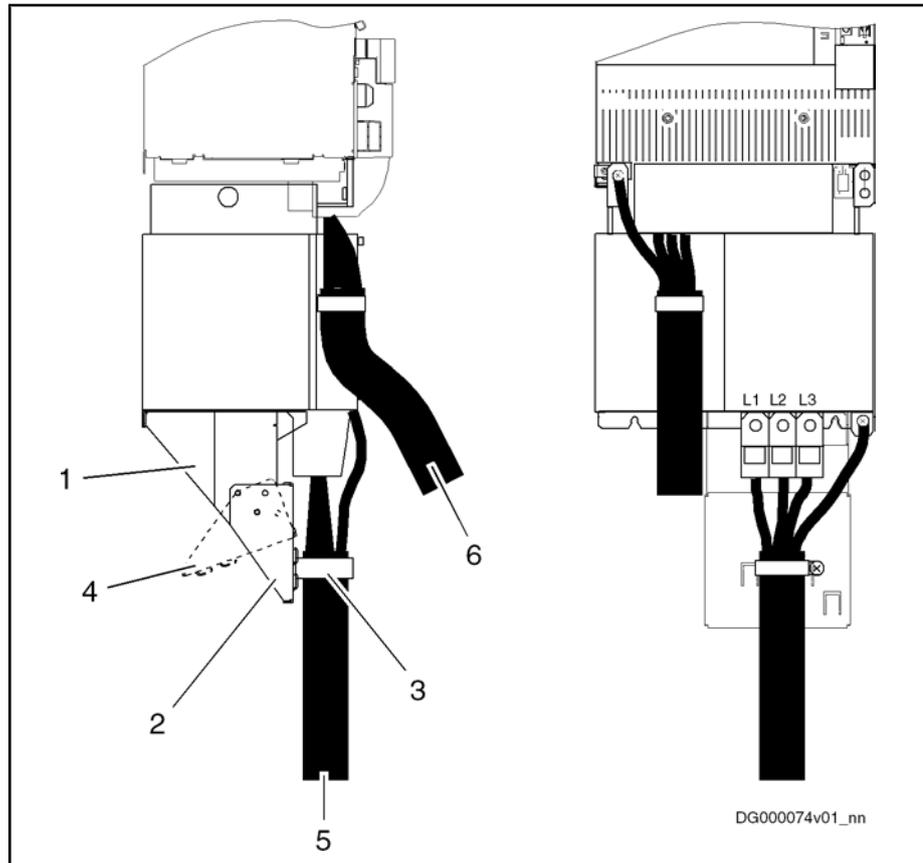
**3.** Fix shield of cable to shielding plate with clip.



The shield terminals must not be used to provide strain relief.

Accessories

HAS02.1-009 With Power Supply Cable and Mains Filter



- 1 Fixing device
  - 2 Shielding plate
  - 3 Clip
  - 4 Different possibilities of mounting the shielding plate, according to cable routing
  - 5 Power supply cable
  - 6 Motor cable
- Fig. 16-54: Shielding plate HAS02.1-009 at bottom of mains filter (rated current 146 A)

- Mounting**
1. By means of supplied screws, fasten fixing device to bottom of drive controller.
  2. Fix shielding plate to fixing device according to desired motor cable routing.
  3. Fix shield of cable to shielding plate with appropriate clip.



The shield terminals must not be used to provide strain relief.

## 16.3 HAS03, Control Cabinet Adapter

### 16.3.1 Type Code

Abbrev. Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Example:	H	A	S	0	3	.	1	-	0	0	2	-	N	N	N	-	N	N	

- 1. Product**
  - 1.1 Accessories  
IndraDrive . . . = HAS
- 2. Line**
  - 2.1 Control cabinet adapter = 03
- 3. Design**
  - 3.1 1 . . . . . = 1
- 4. Device assignment (Number of bolt)**
  - 4.1 HCS02.1E-W0012 . . . . . = 002
  - 4.2 HCS02.1E-W0028 . . . . . = 002
  - 4.3 HLB01.1C-01K0-N06R0-A-007-NNNN = 002
  - 4.4 HLC01.1C-01M0-A-007-NNNN = 002
  - 4.5 HLC01.1C-02M4-A-007-NNNN = 002
  - 4.6 HCS02.1E-W0054 . . . . . = 004
  - 4.7 HCS02.1E-W0070 . . . . . = 004
- 5. Other feature**
  - 5.1 none . . . . . = NNN
- 6. Other design**
  - 6.1 none . . . . . = NN

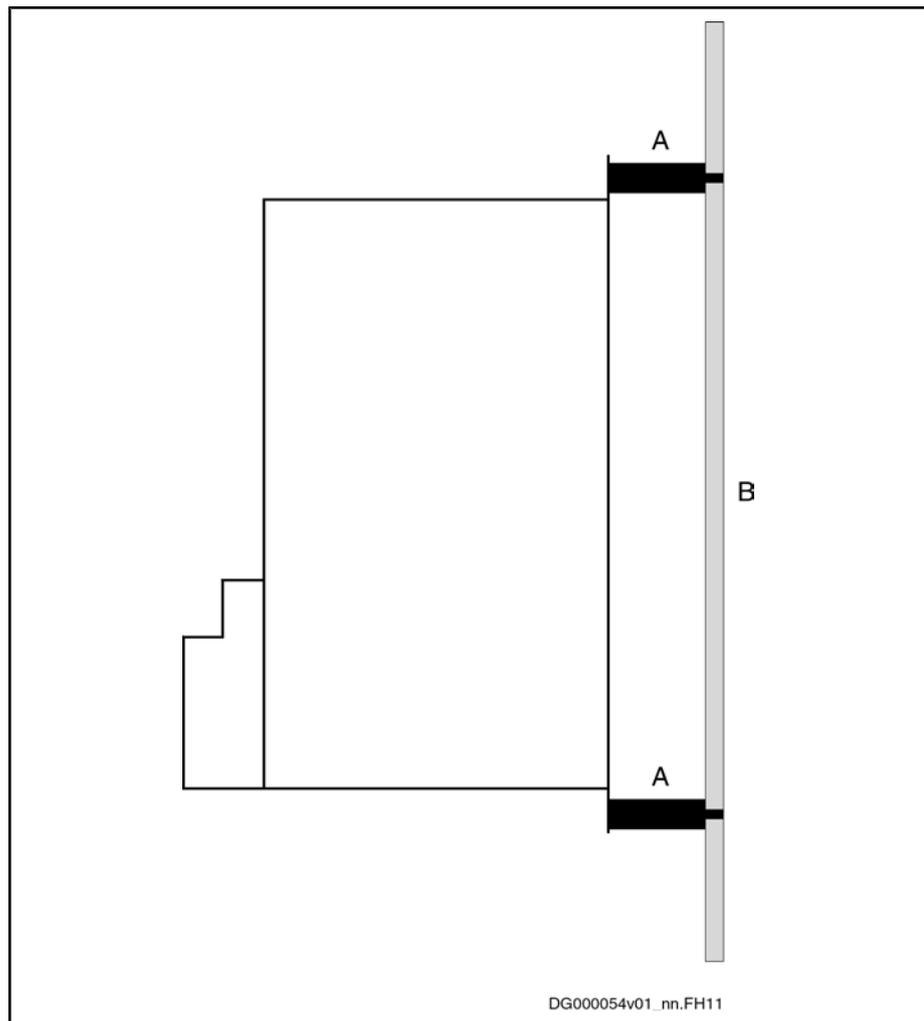
DT000005v01\_en.fh

Fig. 16-55: Type code HAS03.1

### 16.3.2 Usage

The control cabinet adapter is used to compensate different mounting depths of drive controllers HCS02.1E and HLC01.1C and HMS01 / HMD01 when mounted to a common mounting surface.

Accessories



A Control cabinet adapter  
 B Mounting surface in control cabinet

Fig. 16-56: How to use the control cabinet adapters

 Observe the maximum allowed **tightening torque of 6 Nm** at HAS03.

 Mechanical stability of the adapted device requires a rigid connection via DC bus rails to a neighboring device without adapter.

- Do not operate HAS03 without neighboring device.
- Mount HAS03 to bare metal mounting plate.

### 16.3.3 Assignment of Accessory HAS03

See section "Type Code (Device Assignment)".

### 16.3.4 Scope of Supply

**Scope of Supply** For the scope of supply and the parts of HAS03, see the corresponding accompanying note.

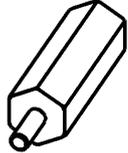
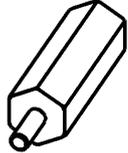
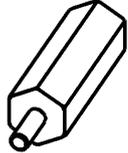
<p>Made in Germany 109-1253-4825-01</p> <div style="text-align: right; margin-top: 10px;">  </div> <h2 style="text-align: center; margin: 20px 0;">HAS03.1-002-NNN-NN</h2> <div style="text-align: center; margin: 10px 0;">                   R911308567             </div>		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">BEIPACKZETTEL HAS03.1-002-NNN-NN</th> </tr> <tr> <th style="width: 10%;">Stck</th> <th style="width: 70%;">Benennung</th> <th style="width: 20%;">MN</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">2</td> <td>ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN</td> <td style="text-align: center;">R911309313</td> </tr> <tr> <td colspan="3" style="text-align: center; height: 150px; vertical-align: middle;"> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">DB17219</div>  <div style="text-align: right; font-size: small;">1:2</div> </div> </td> </tr> <tr> <td colspan="3" style="height: 150px;"></td> </tr> <tr> <td colspan="3" style="text-align: center;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">2</td> <td style="width: 70%;">ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN</td> <td style="width: 20%; text-align: center;">R911309313</td> </tr> <tr> <td style="text-align: center;"><b>Stck</b></td> <td style="text-align: center;"><b>Benennung</b></td> <td style="text-align: center;"><b>MN</b></td> </tr> </table> </td> </tr> </tbody> </table>		BEIPACKZETTEL HAS03.1-002-NNN-NN			Stck	Benennung	MN	2	ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN	R911309313	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">DB17219</div>  <div style="text-align: right; font-size: small;">1:2</div> </div>						<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: center;">2</td> <td style="width: 70%;">ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN</td> <td style="width: 20%; text-align: center;">R911309313</td> </tr> <tr> <td style="text-align: center;"><b>Stck</b></td> <td style="text-align: center;"><b>Benennung</b></td> <td style="text-align: center;"><b>MN</b></td> </tr> </table>			2	ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN	R911309313	<b>Stck</b>	<b>Benennung</b>	<b>MN</b>
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Stck	Benennung	MN																									
2	ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN	R911309313																									
<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: small;">DB17219</div>  <div style="text-align: right; font-size: small;">1:2</div> </div>																											
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2	ABSTANDSBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN	R911309313																									
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>																									
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Datum	2004-08-04	Benennung	BEIPACKZETTEL HAS03.1-002-NNN-NN																								
Name	Hirt	Material-Nr.	R911308566																								
		Zeich-Nr.	109-1253-4235-01																								
Datei	DB173400	Ers.durch	..																								
		AEM-Nr.	5-011323																								

Fig. 16-57: Accompanying note

Accessories

Made in Germany 109-1253-4826-01			
<h1 style="margin: 0;">HAS03.1-004-NNN-NN</h1>			
			
R911308568			
4	ABSTANDBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN	R911309313	
<b>Stck</b>	<b>Benennung</b>	<b>MN</b>	

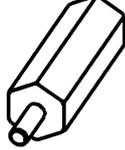
BEIPACKZETTEL HAS03.1-004-NNN-NN		
4	ABSTANDBOLZEN BM 6,0X 57,0 SW19,0 ST-ZN	R911309313
		
1:2		
Datum	2004-08-04	Benennung
Name	Hirt	BEIPACKZETTEL HAS03.1-004-NNN-NN
Material-Nr.	R911308568	Zeich-Nr.
		109-1253-4236-01
Datei	DB173398	Ers.durch
		AEM-Nr. 5-011323

Fig.16-58: Accompanying note

## 16.4 HAS04, Capacitor

### 16.4.1 General Information

Capacitors from the DC bus connections L+ and L- against housing.

### 16.4.2 Type Code

Abbrev. Column	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
Example:	H	A	S	0	4	.	1	-	0	0	1	-	N	N	N	-	N	N	

<b>1.</b>	<b>Product</b>																			
1.1	Accessories IndraDrive ... = HAS																			
<b>2.</b>	<b>Line</b>																			
2.1	Capacitor ..... = 04																			
<b>3.</b>	<b>Design</b>																			
3.1	1 ..... = 1																			
<b>4.</b>	<b>Capacitor</b>																			
4.1	2 x 470 nF (HCS02.x) ..... = 001																			
4.2	2 x 470 nF (HCS03.x) ..... = 002																			
<b>5.</b>	<b>Other feature</b>																			
5.1	none ..... = NNN																			
<b>6.</b>	<b>Other design</b>																			
6.1	none ..... = NN																			

DT000006v01\_en.fh

Fig. 16-59: Type code HAS04.1



Using the HAS04 accessories requires additional mounting clearance at the drive controller.

Observe the dimensions of HAS04.

### 16.4.3 Usage

The HAS04 accessories are used to

- operate HCS02 and HCS03 drive controllers at the HNF01.1 mains filter
- operate HMS01 drive controllers at HCS02 and HCS03 drive controllers

HAS04 type	Usage
HAS04.1-001-NNN-NN	At DC bus connections of HCS02 drive controllers
HAS04.1-002-NNN-NN	At DC bus connections of HCS03 drive controllers

Fig. 16-60: HAS04 type

Accessories

### 16.4.4 Assignment

Device	HAS04.1	
	-001	-002
HCS02.1E-W0028	■	-
HCS02.1E-W0054	■	-
HCS02.1E-W0070	■	-
HCS03.1E-W0070	-	■
HCS03.1E-W0100	-	■
HCS03.1E-W0150	-	■
HCS03.1E-W0210	-	■

Fig. 16-61: Assignment of accessory HAS04

### 16.4.5 Scope of Supply

The HAS04 accessories are available as an option, they are not part of the standard scope of supply.

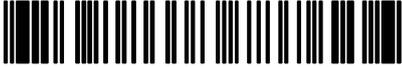
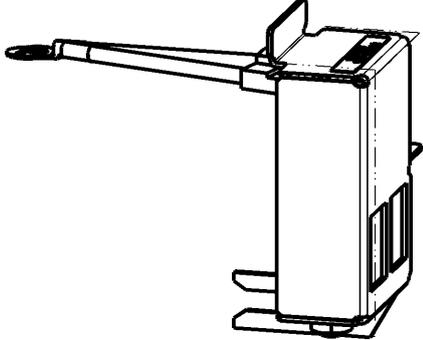
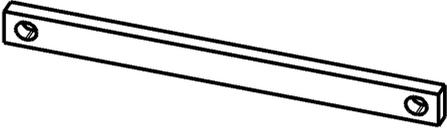
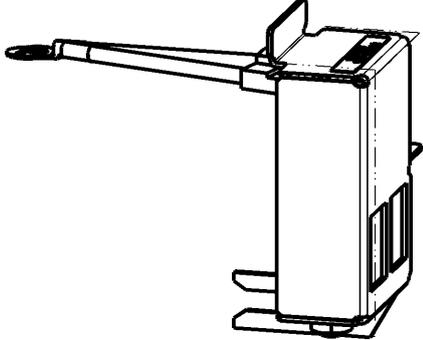
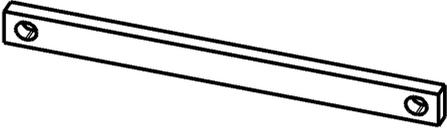
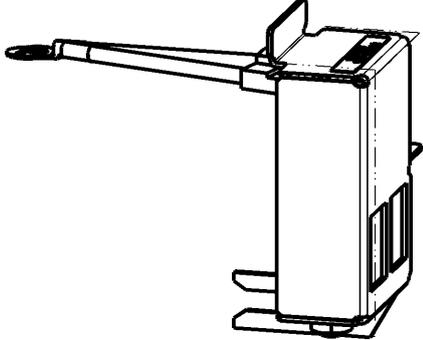
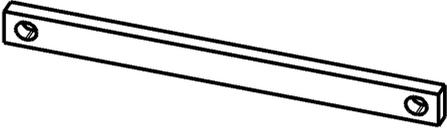
<p>Made in Germany 109-1228-4S05-00</p> <div style="text-align: right;">  </div> <h2 style="text-align: center; margin: 20px 0;">HAS04.1-001-NNN-NN</h2> <div style="text-align: center;">  <p>R911309268</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 20px;"> <tr> <td style="width: 5%; text-align: center;">3</td> <td style="width: 75%;">SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41</td> <td style="width: 20%; text-align: right;">R911252551</td> </tr> <tr> <td style="text-align: center;">1</td> <td>SCHIENE-VERBINDUNG HAS01.1-150-072</td> <td style="text-align: right;">R911306692</td> </tr> <tr> <td style="text-align: center;">1</td> <td>BGR HAS04.1-001-NNN-NN</td> <td style="text-align: right;">R911309270</td> </tr> <tr> <td style="text-align: center;"><b>Stck</b></td> <td style="text-align: center;"><b>Benennung</b></td> <td style="text-align: center;"><b>MN</b></td> </tr> </table>	3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551	1	SCHIENE-VERBINDUNG HAS01.1-150-072	R911306692	1	BGR HAS04.1-001-NNN-NN	R911309270	<b>Stck</b>	<b>Benennung</b>	<b>MN</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">BEIPACKZETTEL HAS04.1-001-NNN-NN</th> </tr> <tr> <th style="width: 5%;">Stck</th> <th style="width: 75%;">Benennung</th> <th style="width: 20%;">MN</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>BGR HAS04.1-001-NNN-NN</td> <td style="text-align: right;">R911309270</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DBT74737</td> <td style="text-align: center;">  </td> <td style="text-align: right; vertical-align: middle;">1:2</td> </tr> <tr> <td style="text-align: center;">1</td> <td>SCHIENE-VERBINDUNG HAS01.1-150-072</td> <td style="text-align: right;">R911306692</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DBT66233</td> <td style="text-align: center;">  </td> <td style="text-align: right; vertical-align: middle;">1:2</td> </tr> <tr> <td style="text-align: center;">3</td> <td>SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41</td> <td style="text-align: right;">R911252551</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB-38405</td> <td style="text-align: center;">  </td> <td style="text-align: right; vertical-align: middle;">1:1</td> </tr> <tr> <td colspan="3" style="padding: 5px;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2004-10-15</td> <td style="width: 60%;">Benennung</td> </tr> <tr> <td>Name</td> <td>Razzo</td> <td>BEIPACKZETTEL HAS04.1-001-NNN-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911309316</td> <td>Zeich-Nr. 109-1228-4236-01</td> </tr> <tr> <td>Datei</td> <td>DB177206</td> <td>Ers.durch 109-1228-4236-00 AEM-Nr. ohac</td> </tr> </table> </td> </tr> </tbody> </table>	BEIPACKZETTEL HAS04.1-001-NNN-NN			Stck	Benennung	MN	1	BGR HAS04.1-001-NNN-NN	R911309270	DBT74737		1:2	1	SCHIENE-VERBINDUNG HAS01.1-150-072	R911306692	DBT66233		1:2	3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551	DB-38405		1:1	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2004-10-15</td> <td style="width: 60%;">Benennung</td> </tr> <tr> <td>Name</td> <td>Razzo</td> <td>BEIPACKZETTEL HAS04.1-001-NNN-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911309316</td> <td>Zeich-Nr. 109-1228-4236-01</td> </tr> <tr> <td>Datei</td> <td>DB177206</td> <td>Ers.durch 109-1228-4236-00 AEM-Nr. ohac</td> </tr> </table>			Datum	2004-10-15	Benennung	Name	Razzo	BEIPACKZETTEL HAS04.1-001-NNN-NN	Material-Nr.	R911309316	Zeich-Nr. 109-1228-4236-01	Datei	DB177206	Ers.durch 109-1228-4236-00 AEM-Nr. ohac
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Fig. 16-62: Accompanying note HAS04.1-001

Accessories

Made in Germany

109-1253-4847-00

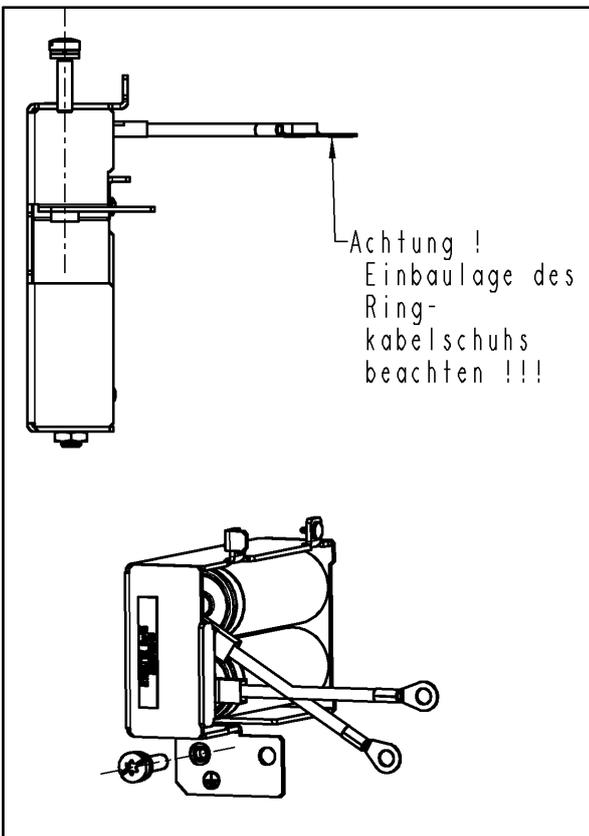
**Rexroth  
Bosch Group**

**HAS04.1-002-NNN-NN**



R911315348

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Stck	Benennung	MN



BEIPACKZETTEL HAS04.1-002-NNN-NN		
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Fig.16-63: Accompanying note HAS04.1-002

### 16.4.6 Capacitor

Connection HAS04

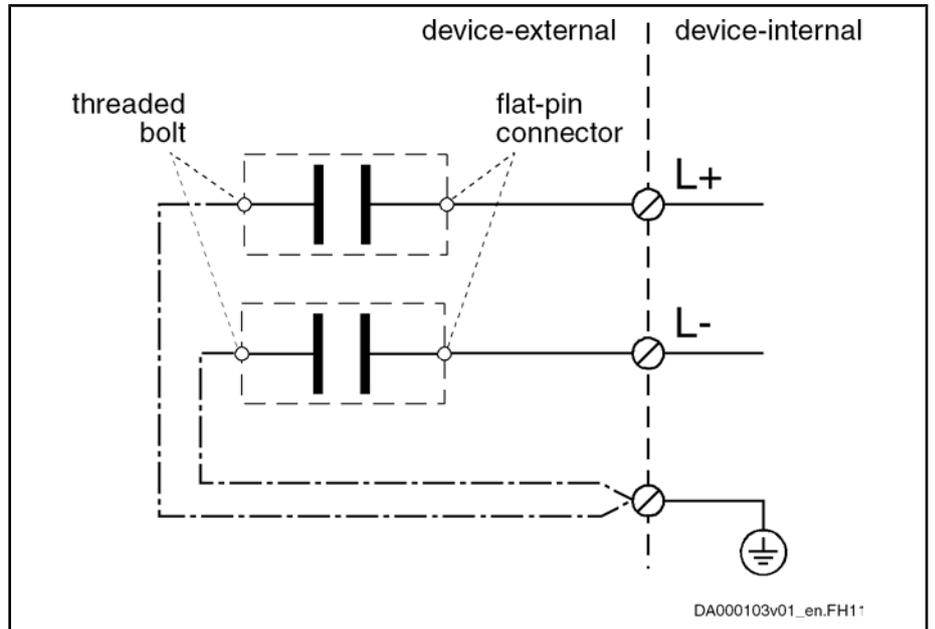


Fig. 16-64: Connection HAS04

### 16.4.7 Mounting Dimensions

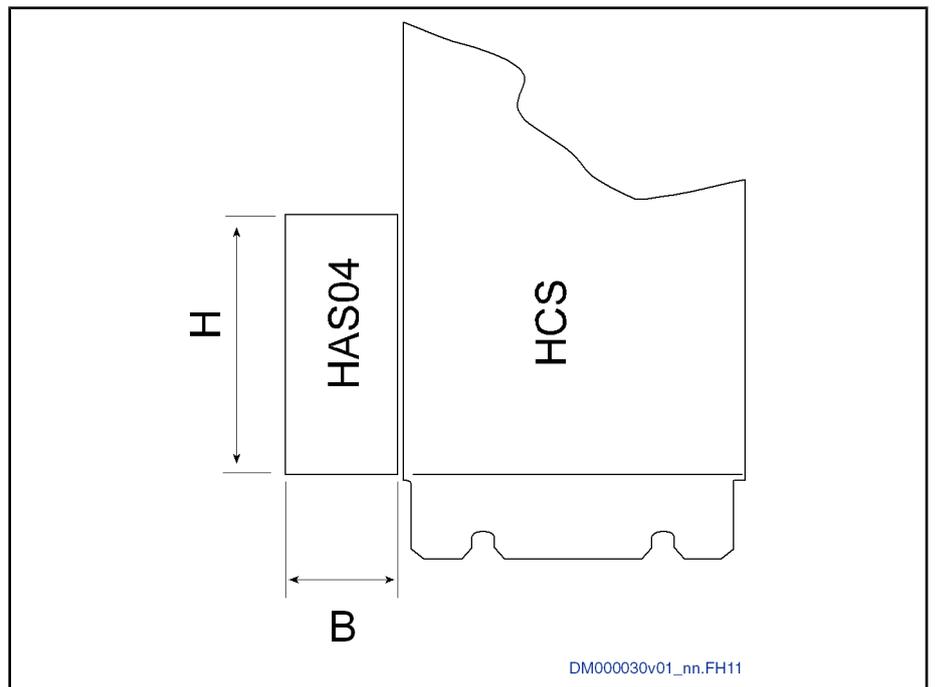


Fig. 16-65: Mounting dimensions HAS04

Device	Min. mounting width B [mm]	Device height H [mm]	Device depth [mm]
HAS04.1-001	30	75	< 150
HAS04.1-002	40	75	< 150

Fig. 16-66: Mounting dimensions

Accessories

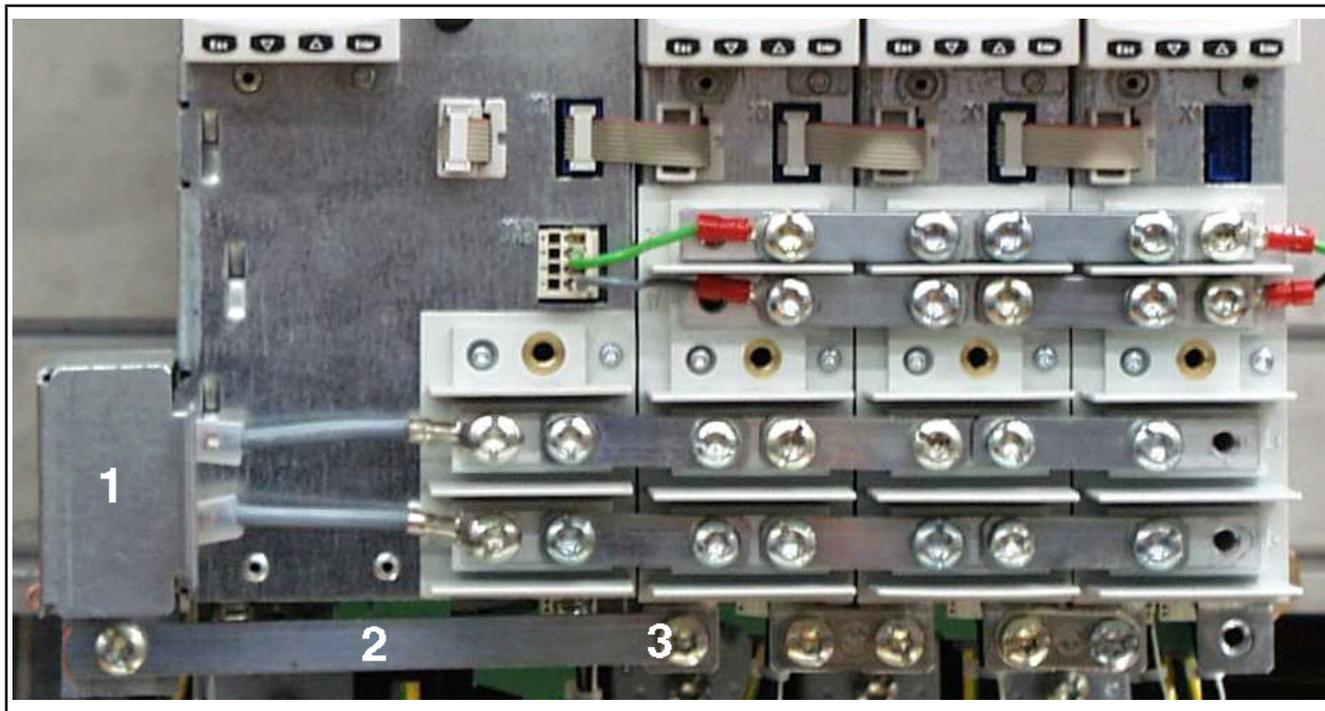
### 16.4.8 Mounting the HAS04.1-001 Accessories



**WARNING**

**Dangerous contact voltage at device housing! Lethal electric shock!**

Connect HMx01 drive controllers to the HCS02 drive controller by means of bus bar 2 (see figure below). Bus bar 2 replaces the equipment grounding connection 3 at HMx01 (see figure below) to the equipment grounding system.



- 1 Mounted HAS04.1-001 accessories with connection to L+ and L-
- 2 Mounted bus bar
- 3 Equipment grounding connection at HMx01

*Fig.16-67: HAS04.1-001 at drive system HCS02 with HMx01 without touch guard mounted*



- 1 Mounted HAS04.1-001 accessories  
2 Mounted bus bar

Fig. 16-68: HAS04.1-001 at drive system HCS02 with HMx01 with touch guard mounted

## 16.4.9 Mounting the HAS04.1-002 Accessories

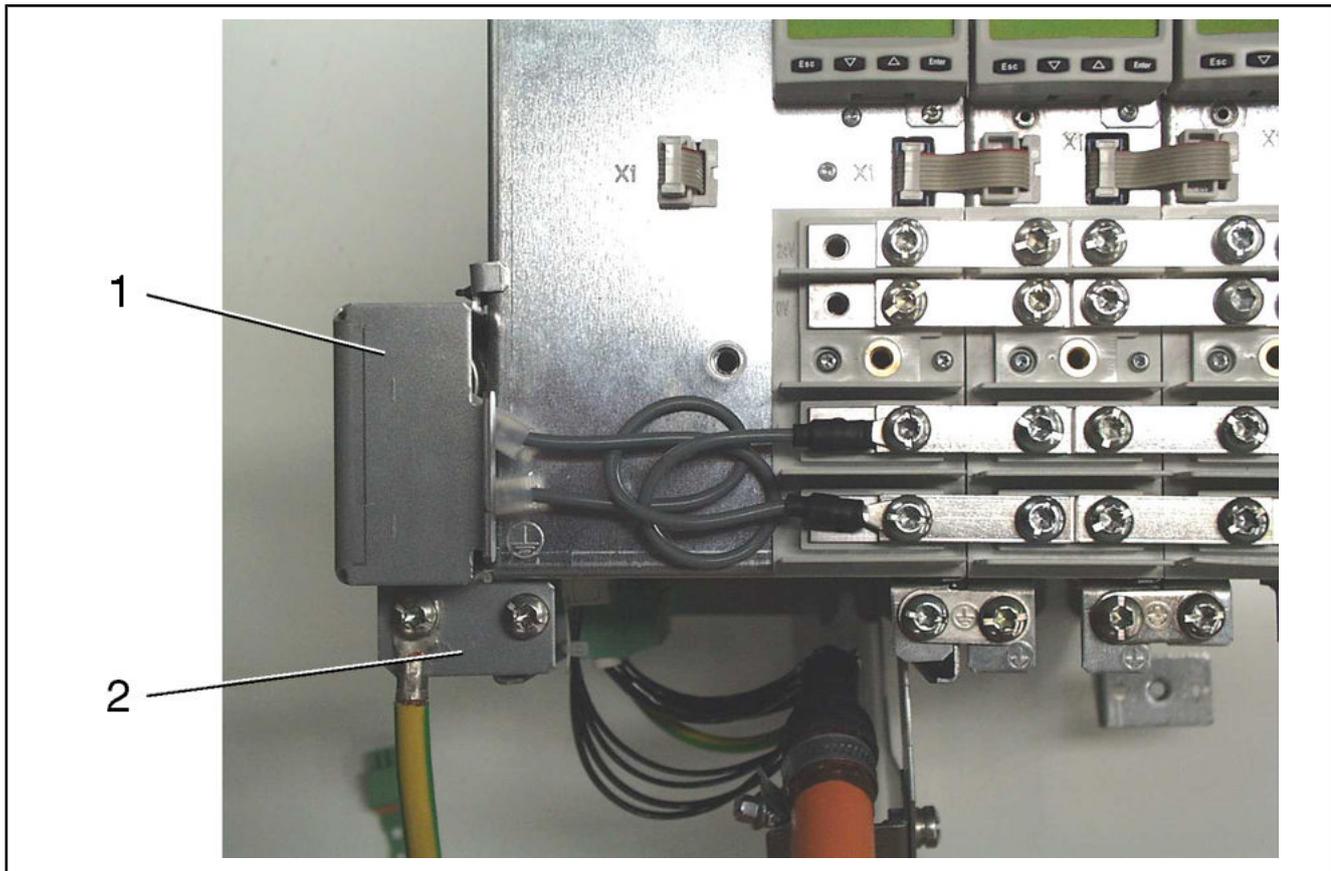


**WARNING**

**Dangerous contact voltage at device housing! Lethal electric shock!**

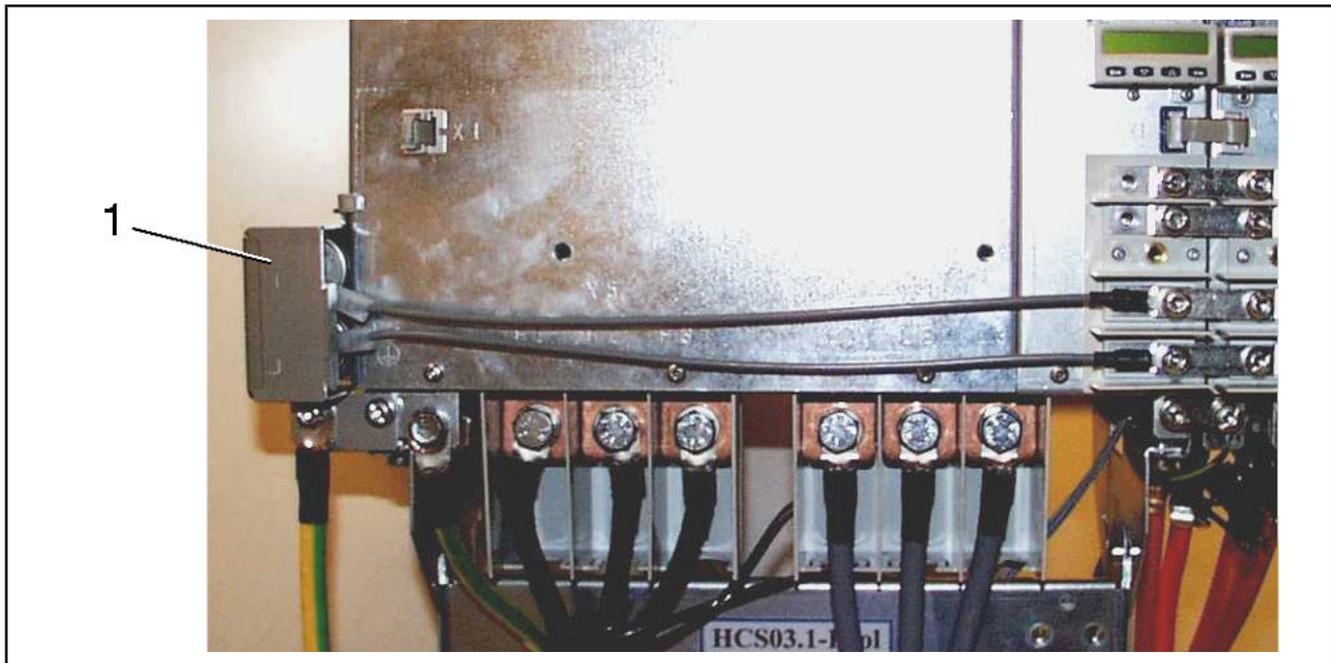
Connect the HAS04.1-002 accessories to drive controller HCS03 via the joint bar (see figure below).

Accessories



1 Mounted HAS04.1-002 accessories with connection to L+ and L-  
2 Joint bar

Fig. 16-69: HAS04.1-002 at drive system HCS03.1E-W0070, -W0100, -W0150 with HMx01 without touch guard mounted



1 Mounted HAS04.1-002 accessories with connection to L+ and L-  
HAS04.1-002 at drive system HCS03.1E-W0210 with HMx01 without touch guard mounted

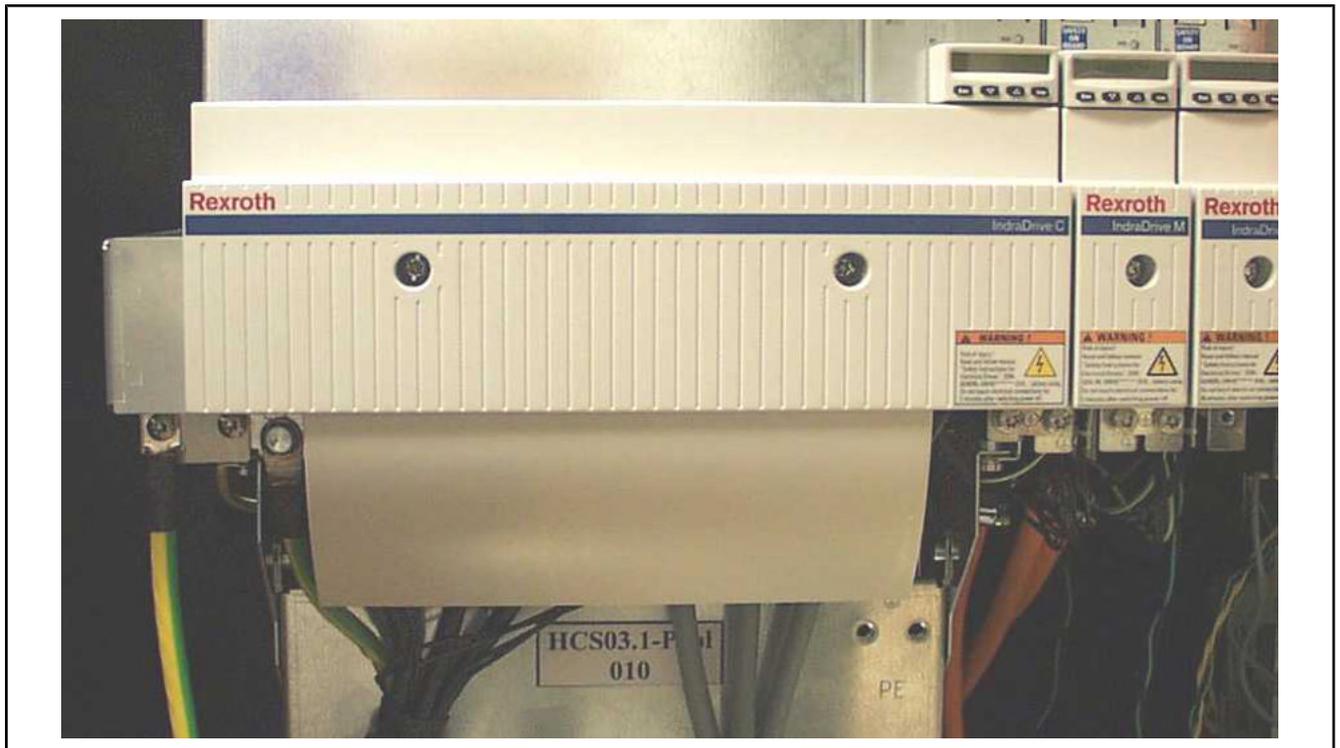


Fig. 16-71: HAS04.1-002 at drive system HCS03 with HMx01 with touch guard mounted

## 16.5 HAS05, Accessories for Connection Points

### 16.5.1 Overview of Types

The product line HAS05 includes:

- Cables
- Connectors
- Adapters

HAS05 type	Brief description / usage
HAS05.1-001-NNN-NN	Adapter for mains and motor connection Is used for electrical connection between output filter HMF01.1A-D0K2-D0045 and HCS03.1E-W0070, as well as between mains filter HNK01.1A-A075-E0050 and HCS03.1E-W0070
HAS05.1-002-NNN-NN	Extension Is used for electrical connection between mains filter HNK01.1A-A075-E0050 and HCS03.1E-W0070, if an output filter has been mounted between HCS03.1 and mains filter
HAS05.1-003-NNN-NN	Signal level converter encoder emulation Increases voltage level at output of optional module MEM (encoder emulation) to voltage range 5 ... 30 V

## Accessories

HAS05 type	Brief description / usage
HAS05.1-004-NNL-NN HAS05.1-004-NNR-NN	Adapter DC bus connection With this accessory, you can wire several systems of drive controllers with greater cross sections at DC bus connections L+ and L- NNL: Outgoing direction "left" NNR: Outgoing direction "right"
HAS05.1-005-NNN-NN	Signal level converter RS232/RS485 Converts the serial interface of control sections from RS232 standard to RS485 standard
HAS05.1-006-NNN-NN	Adapter for controlling motor holding brake
HAS05.1-007-NNL-NN HAS05.1-007-NNR-NN	Adapter from D-Sub to terminal connector Universal adapter for safety technology for easier X41 wiring of 2nd channel NNL: For mounting to double-axis control sections CDB01 at OP ST1 NNR: For mounting to double-axis control sections CDB01 at OP ST2
HAS05.1-008-NNN-NN	Adapter for connecting two cables With this accessory, you can connect 2 ring cable lugs each at connections A1, A2 and A3 of X5 (motor connection)

Fig.16-72: HAS05 types

## 16.5.2 Type Code



The following figure illustrates the basic structure of the type code. Our sales representative will help you with the current status of available versions.



Accessories

You need this adapter when additional components are mounted to HCS03.1E-W0070 in order to connect them to the mains and motor input.

**Assignment** HAS05.1-001 can be used at the following drive controllers:

Device	HAS05.1-001
HCS03.1E-W0070	■

Fig. 16-74: Assignment accessory HAS05.1-001

**Scope of Supply** Order this accessory as a separate item. It is not part of the scope of supply of the device.

Parts of the accessory: see accompanying note

**Parts of HAS05.1-001**

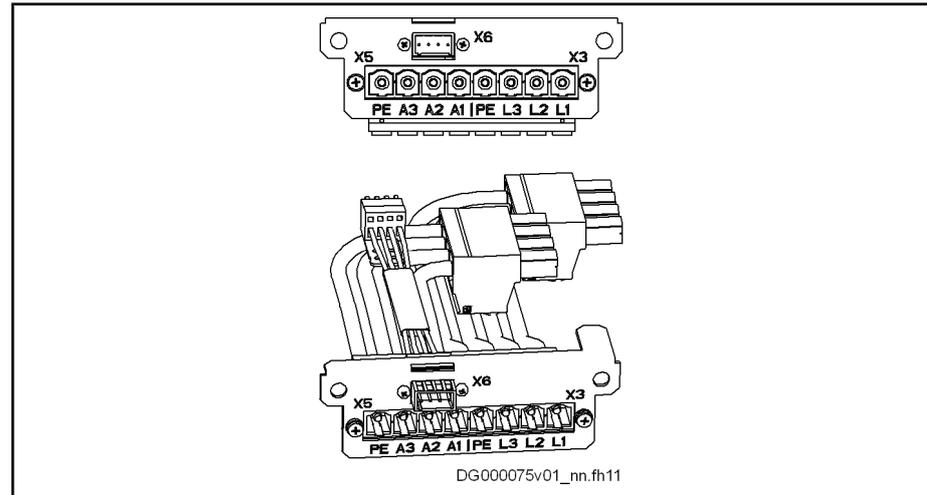


Fig. 16-75: Parts of HAS05.1-001

Technical Data

**Connection, Mounting Dimensions**

**Allowed Cross Sections** The accessory HAS05.1 has been dimensioned to insert lines with ferrules in it.

	Unit	HAS05.1-001
Allowed connection cross section stranded wire	mm <sup>2</sup>	16
Allowed connection cross section stranded wire	AWG	6

Fig. 16-76: Connection cross section HAS05.1-001

**Mounting Dimensions** The mounted adapter remains within the outer housing dimensions of the involved components HMF and HCS03.

- Connection**
- **HMF01**  
Connect input of output filter HMF01 to X5 at HAS05.1-001 (motor output of HCS03).
  - **HNK01**  
Connect output of mains filter HNK01 to X3 at HAS05.1-001 (mains input of HCS03).

**Examples of Installation** Mounted accessory

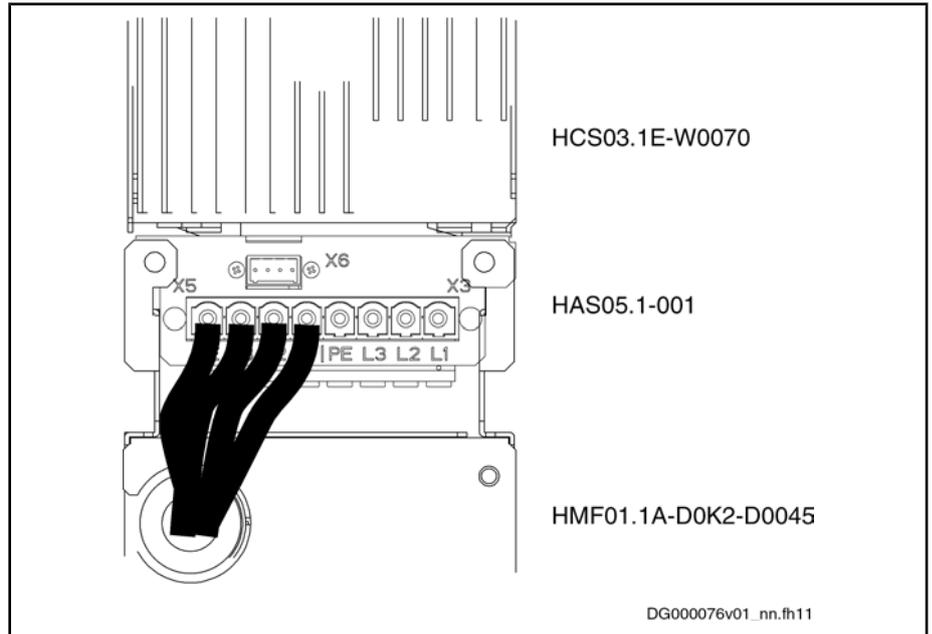


Fig. 16-77: Arrangement HCS03 / HAS05.1-001 / HMF01

## 16.5.4 HAS05.1-002, Extension

### Brief Description and Usage

**Brief Description** The accessory HAS05.1-002 is an extension which connects the output of the HNK01 mains filter to the mains input of HCS03 (X3).

This adapter is required when the additional components HNK01 **and** HMF01 are mounted to HCS03.1E-W0070. The adapter is not required without HMF01.

**Assignment** HAS05.1-002 can be used at the following drive controllers:

Device	HAS05.1-002
HCS03.1E-W0070 With HNK01 and HMF01	■

Fig. 16-78: Assignment accessory HAS05.1-002

**Scope of Supply** Order this accessory as a separate item. It is not part of the scope of supply of the device.

Parts of the accessory: see accompanying note

### Parts of HAS05.1-002

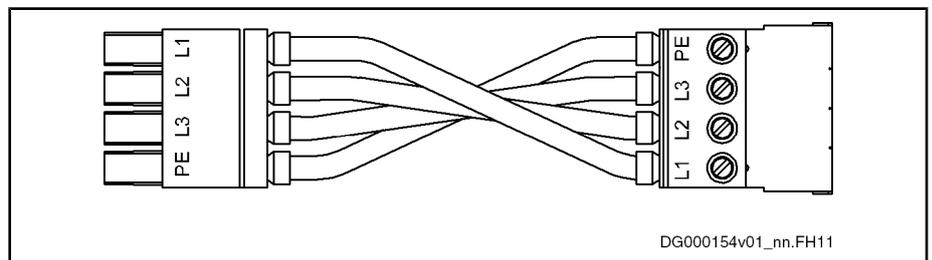


Fig. 16-79: Parts of HAS05.1-002

Accessories

### 16.5.5 HAS05.1-003, Signal Level Converter Encoder Emulation

#### Usage

Accessories	Usage
HAS05.1-003-NNN-NN	Adjusts voltage level at output of optional module MEM to voltage range 5–30 V

Fig.16-80: Usage

#### Scope of Supply

**Scope of Supply** Order this accessory as a separate item. It is not part of the scope of supply of the device.

Parts of the accessory: see accompanying note

#### Dimensions

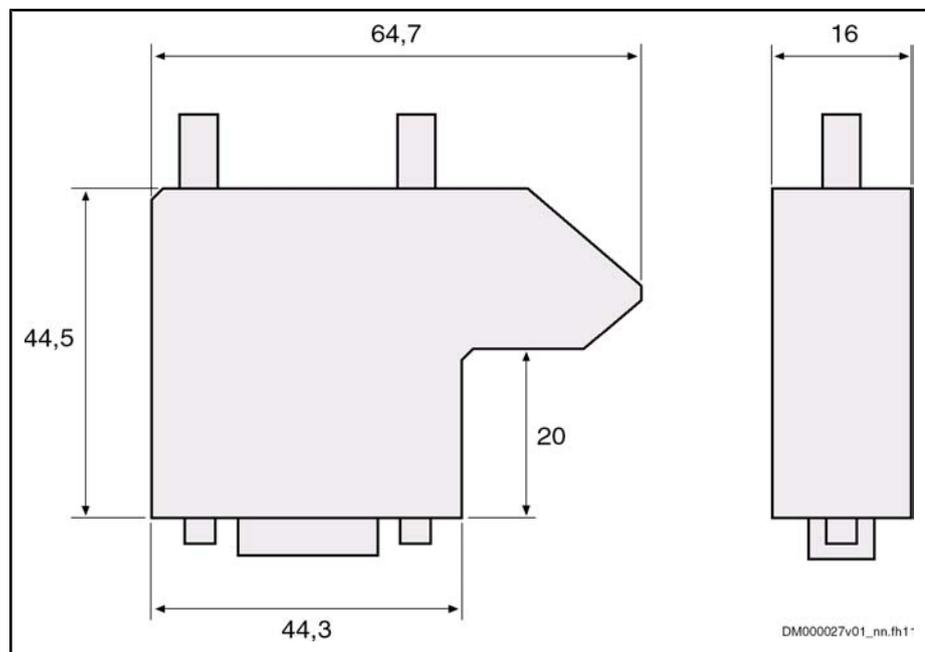
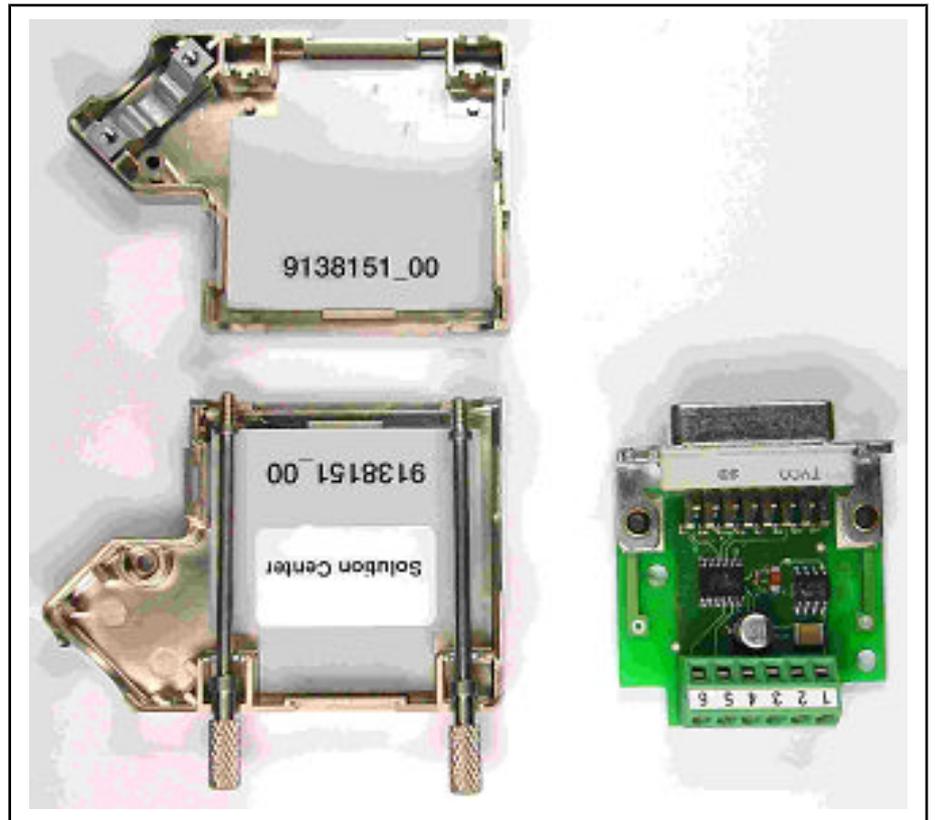


Fig.16-81: Dimensions HAS05.1-003

Parts



- 1 Top shell of connector housing
- 2 Bottom shell of connector housing
- 3 Electronics circuit board with internal connection point

Fig. 16-82: Parts

Accessories

Description

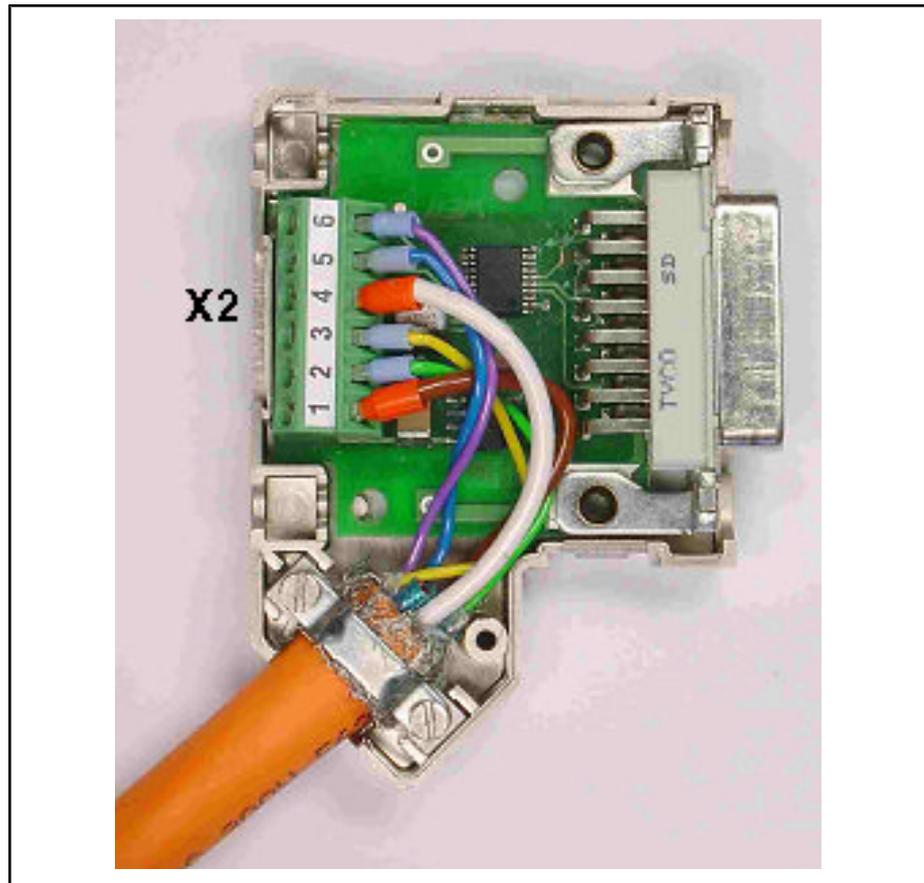


Fig.16-83: Accessory HAS05.1-003

Connection point	Type	No. of poles	Stranded wire [mm <sup>2</sup> ]
X2	Screw terminal block	6	0,14–1,5

Pin Assignment

Fig.16-84: Connection

Pin	Signal	Function
1	UB	Voltage supply for electronics
2	UL	Voltage supply for output driver
3	UA2+	Incremental encoder track A2
4	0Vext	Reference potential
5	UA1+	Incremental encoder track A1
6	UA0+	Incremental encoder reference track A0
	Shield	Connect cable shield to connector housing

Fig.16-85: Assignment



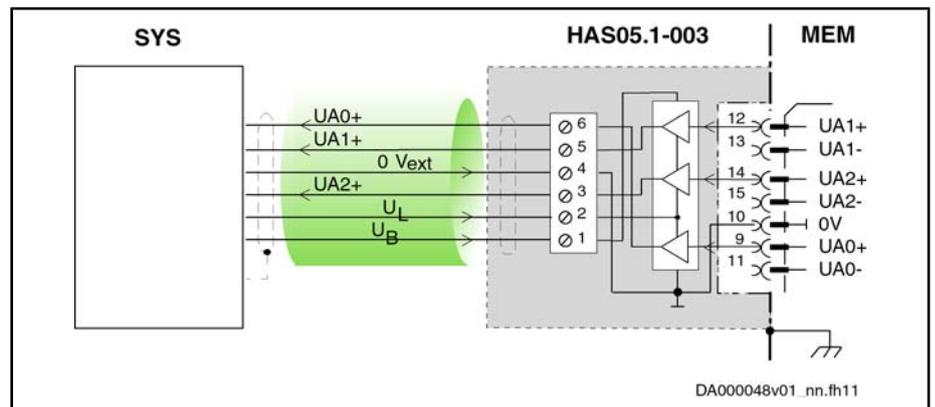
If the required output voltage UL is greater than 7V, it can be used to supply the electronics (UB), too.

Electrical Data

Data	Unit	Min.	Typ.	Max.
Supply voltage U <sub>L</sub> (output driver)	V	5		30
Supply current U <sub>L</sub> (output driver)	mA		16	
Supply voltage U <sub>B</sub> (electronics)	V	7		30
Supply current U <sub>B</sub> (electronics)	mA		17	
Output voltage UA0+, UA1+, UA2+	V			U <sub>L</sub>
Allowed output current per output UA0+, UA1+, UA2+	mA			40
Output resistance	kOhm			
Short circuit protection		Present		
Overload protection		Present, output voltage is reduced		

Fig.16-86: Supply and outputs

Example of Connection



SYS Target, e.g. PLC; incremental input, counter or trigger function

Fig.16-87: Example of connection

### 16.5.6 HAS05.1-004, Adapter DC Bus Connection

#### Brief Description and Usage

**Brief Description** The accessory HAS05.1-004-NNR and HAS05.1-004-NNL is an adapter which allows connecting lines with cross sections of up to  $2 \times 50 \text{ mm}^2$  to the DC bus connections.

It is typically used at the DC bus connections of high-performance supply units and inverters, when these devices have not been arranged directly side by side (e.g. with multiple-line arrangement or with decentralized supply concepts between several control cabinets).

The types "NNR" and "NNL" allow connections with outgoing directions to the right and left (view to front of drive controller).

**Assignment** The use of the HAS05.1-004 accessory is restricted by the width of the drive controllers:

- NNL: Device width is at least 125 mm
- NNR: Can be used independently of the device width

## Accessories

At devices with a width of 50 mm, the outgoing direction to the left can also be used with the type "NNR".

For devices up to a width of 125 mm and for the outgoing direction to the left, you can fix lines with a **maximum cross section of  $1 \times 35 \text{ mm}^2$**  (1 ring cable lug) without fixing device (01) and without bar (05) directly at the terminal block (see [picture 4](#)).

The accessory can be used at the following drive controllers:

Device	HAS05.1-004-	
	NNL	NNR
HMV01.1E-W0030, -W0075, -W0120	■	■
HMV01.1R-W0018, -W0065, -W0120	■	■
HMS01.1N: type current < W0110	-	■
HMS01.1N: type current $\geq$ W0110	■	■
HMD01.1N-W0012, -W0020, -W0036	-	■
HCS03.1E: type current $\geq$ W0070	■	■
HLB01.1D	-	■
HLC01.1D	-	■

Fig. 16-88: Assignment accessory HAS05.1-004

**Scope of Supply**

Order this accessory as a separate item. It is not part of the scope of supply of the device.

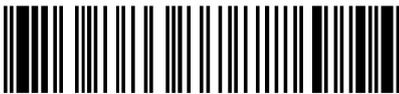
Parts of the accessory: see accompanying note

Accompanying note HAS05.1-004-NNR-NN

Made in Germany  
109-1253-4837-00

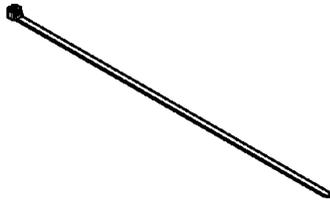
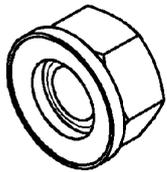
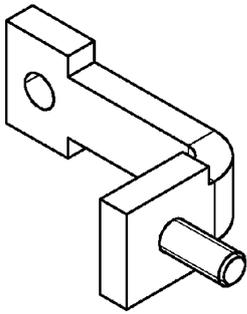
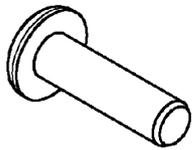
**Rexroth**  
**Bosch Group**

## HAS05.1-004-NNR-NN



R911312154

1	SCHR-EJO-P-KL 40X14      WN1452*-SN-***	R911268139
2	SCHIENE-STROM HAS05.1-004-NNR	R911315873
2	MUTTER-KOM-M 6,0-D12-H06,70    A2-B	R911221473
2	KAB-BIND-D078-B4,8-C085-N220-TR-PA-*****	R911269782
1	BERUEHRUNGSSCHUTZ WINKEL HAS05.1-004-NNR	R911315622
1	BERUEHRUNGSSCHUTZ DECKEL HAS05.1-004-NNR	R911315621
Stck	Benennung	MN

BEIPACKZETTEL HAS05.1-004-NNR-NN														
Stck	Benennung	MN												
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1:4														
2	MUTTER-KOM-M 6,0-D12-H06,70    A2-B	R911221473												
														
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1:1														
1	SCHR-EJO-P-KL 40X14      WN1452*-SN-***	R911268139												
														
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Datum</td> <td style="width: 30%;">2006-02-13</td> <td style="width: 50%;">Benennung</td> </tr> <tr> <td>Name</td> <td>sonjrazz</td> <td>BEIPACKZETTEL HAS05.1-004-NNR-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911312185</td> <td>Zeich-Nr. 109-1253-4275-00</td> </tr> <tr> <td>Datei</td> <td>DB196528</td> <td>Ers.durch ..      AEM-Nr. ..</td> </tr> </table>			Datum	2006-02-13	Benennung	Name	sonjrazz	BEIPACKZETTEL HAS05.1-004-NNR-NN	Material-Nr.	R911312185	Zeich-Nr. 109-1253-4275-00	Datei	DB196528	Ers.durch ..      AEM-Nr. ..
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Datei	DB196528	Ers.durch ..      AEM-Nr. ..												

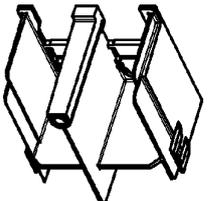
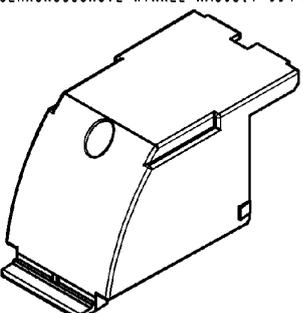
BEIPACKZETTEL HAS05.1-004-NNR-NN		
Stck	Benennung	MN
1	BERUEHRUNGSSCHUTZ DECKEL HAS05.1-004-NNR	R911315621
		
1:2		
1	BERUEHRUNGSSCHUTZ WINKEL HAS05.1-004-NNR	R911315622
		
1:2		

Fig. 16-89: Accompanying note HAS05.1-004-NNR-NN

Accessories

Accompanying note HAS05.1-004-NNL

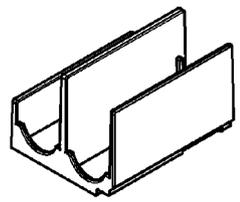
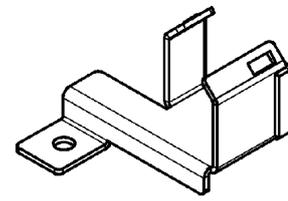
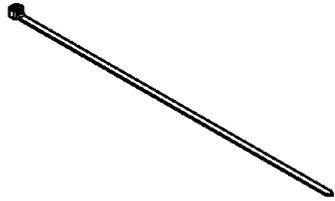
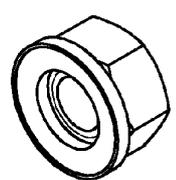
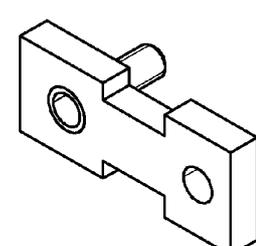
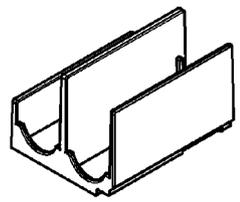
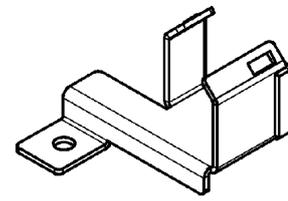
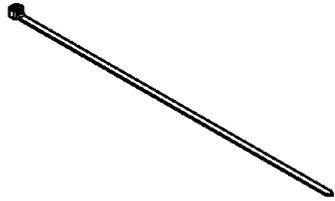
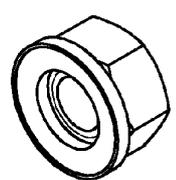
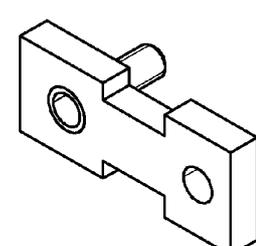
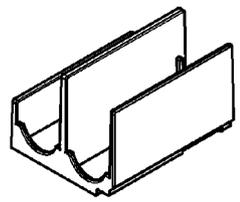
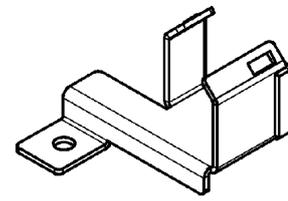
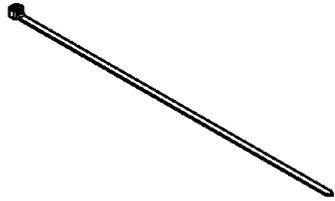
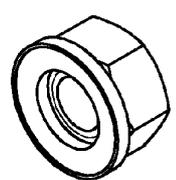
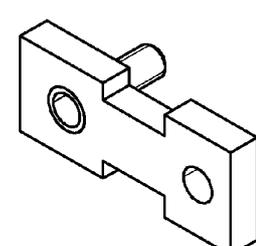
<p>Made in Germany 109-1253-4836-00</p> <p style="text-align: right;"><b>Rexroth Bosch Group</b></p> <h2 style="text-align: center;">HAS05.1-004-NNL-NN</h2>  <p style="text-align: center; font-size: 1.2em;">R911312153</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width: 5%;">Stck</th> <th style="width: 75%;">Benennung</th> <th style="width: 20%;">MN</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>SCHIENE-STROM HAS05.1-004-NNL</td> <td>R911315869</td> </tr> <tr> <td>2</td> <td>MUTTER-KOM-M 6,0-D12-H06,70 A2-B</td> <td>R911221473</td> </tr> <tr> <td>3</td> <td>KAB-BIND-D078-B4,8-C085-N220-TR-PA-*****</td> <td>R911269782</td> </tr> <tr> <td>1</td> <td>HALTERUNG KABEL HAS05.1-004-NNL/NNB</td> <td>R911315620</td> </tr> <tr> <td>1</td> <td>HALTERUNG HAS05.1-004 LINKS</td> <td>R911312216</td> </tr> <tr> <th>Stck</th> <th>Benennung</th> <th>MN</th> </tr> </tbody> </table>	Stck	Benennung	MN	2	SCHIENE-STROM HAS05.1-004-NNL	R911315869	2	MUTTER-KOM-M 6,0-D12-H06,70 A2-B	R911221473	3	KAB-BIND-D078-B4,8-C085-N220-TR-PA-*****	R911269782	1	HALTERUNG KABEL HAS05.1-004-NNL/NNB	R911315620	1	HALTERUNG HAS05.1-004 LINKS	R911312216	Stck	Benennung	MN	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3" style="text-align: center;">BEIPACKZETTEL HAS05.1-004-NNL-NN</th> </tr> <tr> <th style="width: 5%;">Stck</th> <th style="width: 75%;">Benennung</th> <th style="width: 20%;">MN</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">HALTERUNG HAS05.1-004 LINKS</td> <td style="text-align: center;">R911312216</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">HALTERUNG KABEL HAS05.1-004-NNL/NNB</td> <td style="text-align: center;">R911315620</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">KAB-BIND-D078-B4,8-C085-N220-TR-PA-*****</td> <td style="text-align: center;">R911269782</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">MUTTER-KOM-M 6,0-D12-H06,70 A2-B</td> <td style="text-align: center;">R911221473</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">SCHIENE-STROM HAS05.1-004-NNL</td> <td style="text-align: center;">R911315869</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center; vertical-align: middle;">DB196546</td> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: right; vertical-align: middle;">1:2</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB194342</td> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: right; vertical-align: middle;">1:2</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB194491</td> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: right; vertical-align: middle;">1:4</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB-39162</td> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: right; vertical-align: middle;">2:1</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB135396</td> <td style="text-align: center; vertical-align: middle;">  </td> <td style="text-align: right; vertical-align: middle;">1:1</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2006-02-10</td> <td style="width: 60%;">Benennung</td> </tr> <tr> <td>Name</td> <td>sonj r o z z</td> <td>BEIPACKZETTEL HAS05.1-004-NNL-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911312183</td> <td>Zeich-Nr. 109-1253-4274-00</td> </tr> <tr> <td>Datei</td> <td>DB196502</td> <td>Ers.durch .. AEM-Nr. ..</td> </tr> </table>	BEIPACKZETTEL HAS05.1-004-NNL-NN			Stck	Benennung	MN	1	HALTERUNG HAS05.1-004 LINKS	R911312216	1	HALTERUNG KABEL HAS05.1-004-NNL/NNB	R911315620	3	KAB-BIND-D078-B4,8-C085-N220-TR-PA-*****	R911269782	2	MUTTER-KOM-M 6,0-D12-H06,70 A2-B	R911221473	2	SCHIENE-STROM HAS05.1-004-NNL	R911315869	DB196546		1:2	DB194342		1:2	DB194491		1:4	DB-39162		2:1	DB135396		1:1	Datum	2006-02-10	Benennung	Name	sonj r o z z	BEIPACKZETTEL HAS05.1-004-NNL-NN	Material-Nr.	R911312183	Zeich-Nr. 109-1253-4274-00	Datei	DB196502	Ers.durch .. AEM-Nr. ..
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Fig. 16-90: Accompanying note HAS05.1-004-NNL-NN

## Technical Data

### Connection, Mounting Dimensions

#### Allowed Cross Sections, Lengths

The accessory HAS05.1-004 is used to connect lines with ring cable lugs. At each connection point, it is allowed to use 1 or 2 lines of the same cross section.

	Unit	HAS05.1-004- NNL	HAS05.1-004- NNR
Allowed connection cross section stranded wire; 1 ring cable lug mounted	mm <sup>2</sup>	35 50	35 50
	AWG	2 1/0	2 1/0
Allowed connection cross section stranded wire; 2 ring cable lugs mounted	mm <sup>2</sup>	35 50	35 50
	AWG	2 1/0	2 1/0
Maximum tightening torque	Nm	6,6	6,6
Minimum tightening torque	Nm	5,4	5,4
Allowed length, required lengths of lay etc.		See Project Planning Manual "Rexroth IndraDrive, Drive System" → "Connections of the Components in the Drive System" → "Connection of the DC Bus Connections"	
Fusing		Observe requirement on line protection!  See Project Planning Manual "Rexroth IndraDrive, Drive System" → "Connections of the Components in the Drive System" → "Connection of the DC Bus Connections"	

Fig. 16-91: Connection cross section HAS05.1-004

#### Mounting Dimensions

When mounted, the accessory requires the following mounting clearance to the left or to the right.

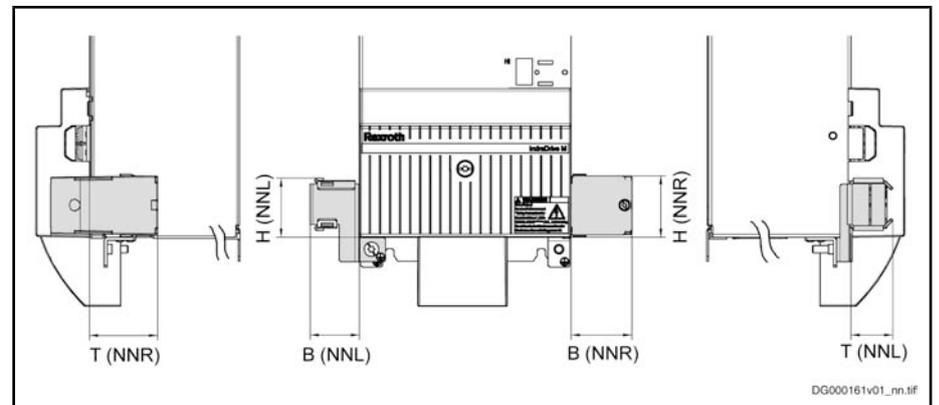


Fig. 16-92: Mounting dimensions HAS05.1-004-NNR, -NNL

## Accessories



Observe the minimum bending radiuses of the lines used. This requires additional mounting clearance, particularly on the left side.

Dimension	Unit	HAS05.1-004-NNL	HAS05.1-004-NNR
Mounting dimension B	mm	41	50
Mounting dimension H	mm	50	51
Mounting dimension T	mm	35	56

Fig. 16-93: Mounting dimensions HAS05.1-004

## How to Mount HAS05.1-004

### Cases to be Distinguished

- Outgoing direction of the lines to the right (HAS05.1-004-NNR)
- Outgoing direction of the lines to the left (HAS05.1-004-NNL)
- Outgoing direction of the lines to both sides (HAS05.1-004-NNR and HAS05.1-004-NNL)

### Outgoing Direction of the Lines to the Right (HAS05.1-004-NNR)

1. Mount bar

**Without** DC bus contact bars (see [picture 1](#)):

Screw bar (5) and end piece (12) to terminal block (tightening torque: 6 Nm)

**With** DC bus contact bars (see [picture 2](#)):

Screw bar (5), DC bus contact bar (11) and connection piece (13) to terminal block (tightening torque: 6 Nm)

2. Mount line:

(See [picture 1](#) and [picture 2](#))

Screw ring cable lug (10) to bar (5) (tightening torque: 6 Nm; with 2 ring cable lugs, observe inverse arrangement)

3. Mount touch guard:

(See [picture 3](#))

Mount touch guard of drive controller (tightening torque: max. 2.8 Nm)

Insert touch guard of bars (2) and touch guard cover (1) and screw them together (tightening torque: 1.6 Nm)

Picture 1

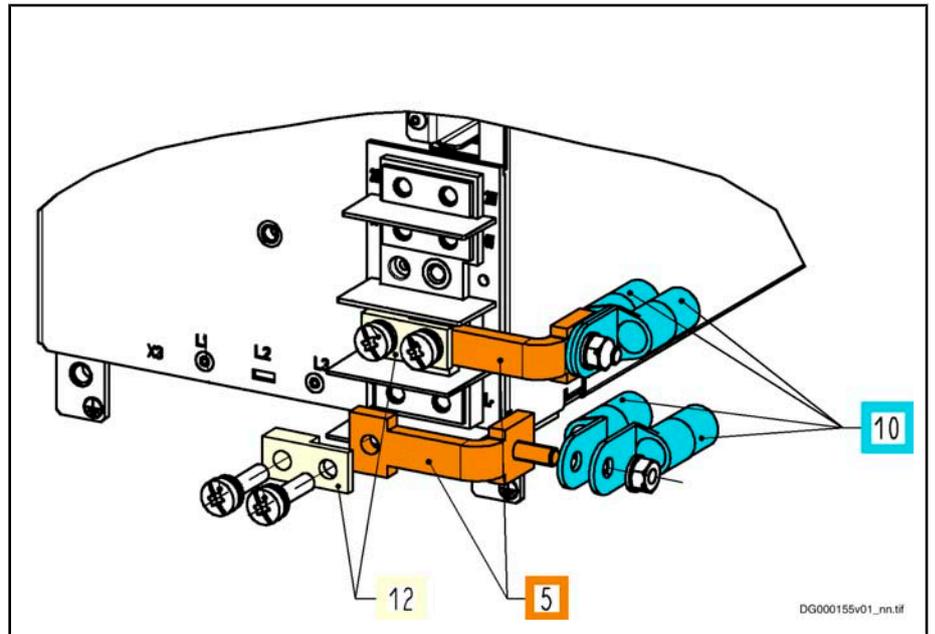


Fig. 16-94: HAS05.1-004-NNR; outgoing direction of the lines to the right; without DC bus contact bars

Picture 2

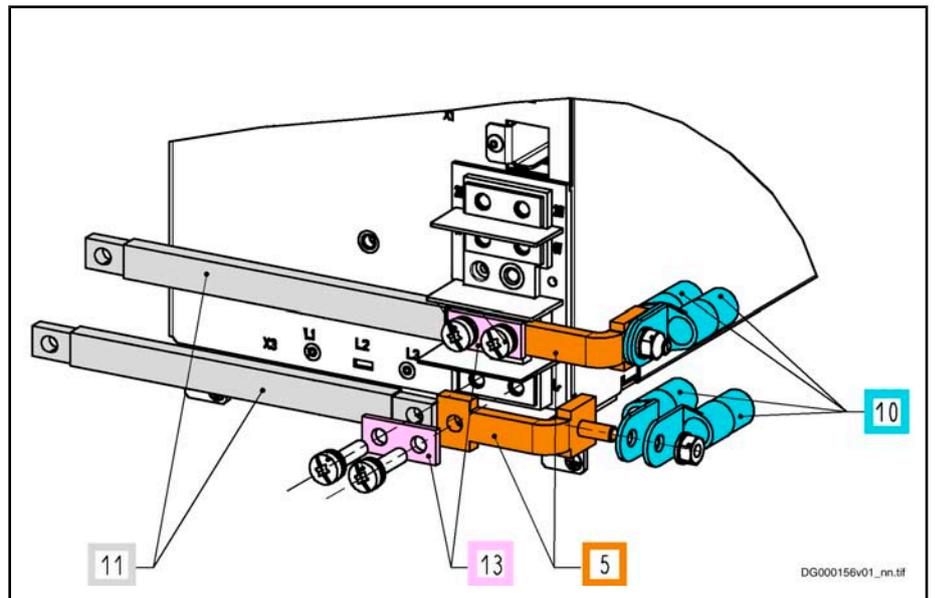


Fig. 16-95: HAS05.1-004-NNR; outgoing direction of the lines to the right; with DC bus contact bars

## Accessories

Picture 3

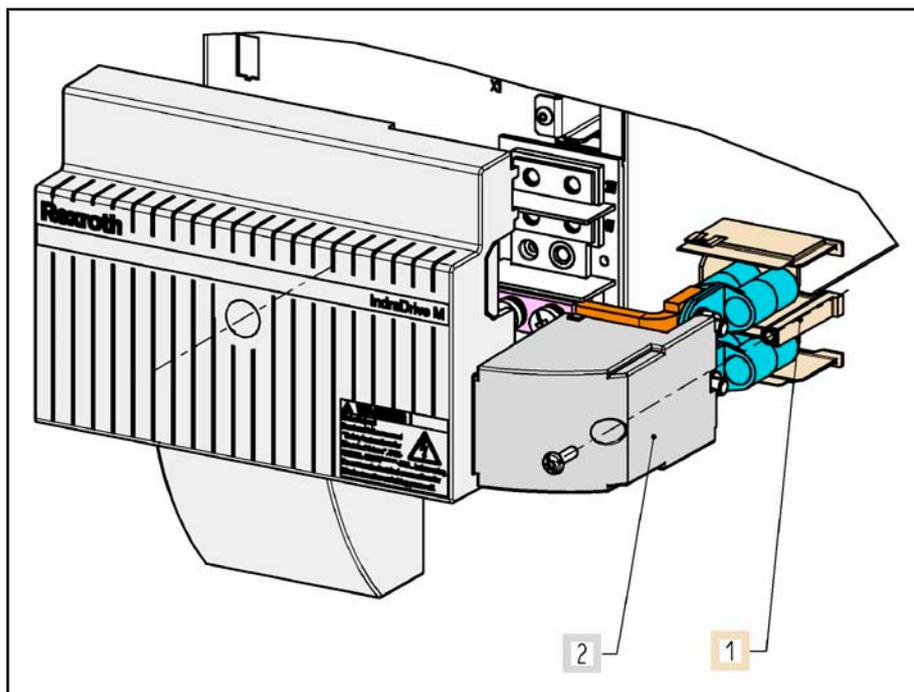


Fig. 16-96: HAS05.1-004-NNR; mounting the touch guard



Make sure there is strain relief for the lines outgoing backward.

#### Outgoing Direction of the Lines to the Left (HAS05.1-004-NNL)

1. Mount bar
  - Without** DC bus contact bars (see [picture 4](#)):  
Screw bar (05) and end piece (12) to terminal block (tightening torque: 6 Nm)
  - With** DC bus contact bars (see [picture 5](#)):  
Screw bar (05), DC bus contact bar (11) and connection piece (13) to terminal block (tightening torque: 6 Nm)
2. Put fixing device (01) on bar (05)
3. Screw cable holder (02) to left equipment grounding connection
4. Mount line:
  - (See [picture 4](#) and [picture 5](#))
  - Screw ring cable lug (10) to bar (05) (tightening torque: 6 Nm; with 2 ring cable lugs, observe inverse arrangement)
  - Fix lines with cable tie to cable holder (02)
5. Mount touch guard of drive controller (tightening torque: max. 2.8 Nm)

Picture 4

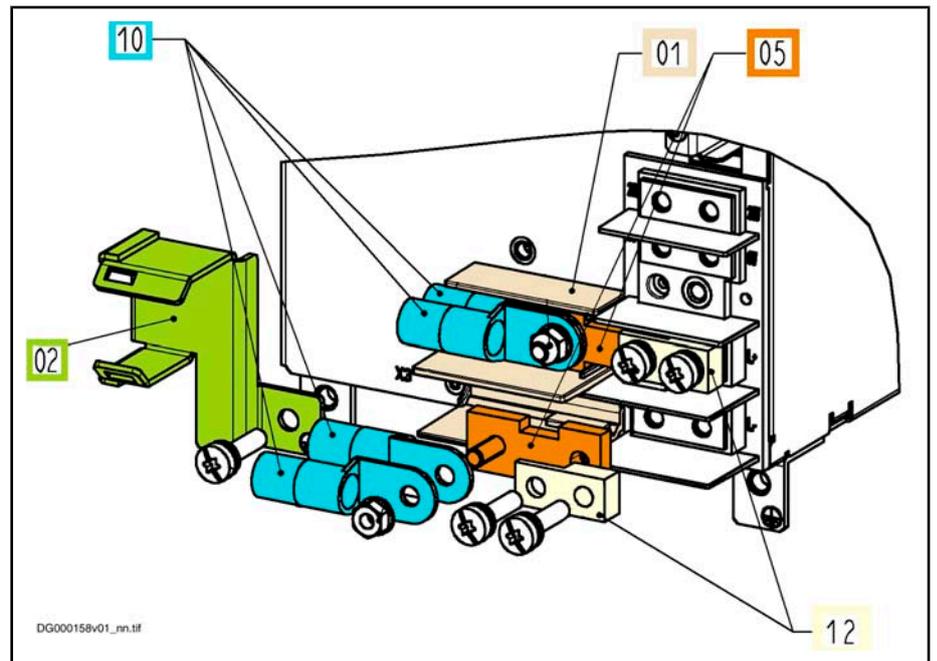


Fig. 16-97: HAS05.1-004-NNL; outgoing direction of the lines to the left; without DC bus contact bars

Picture 5

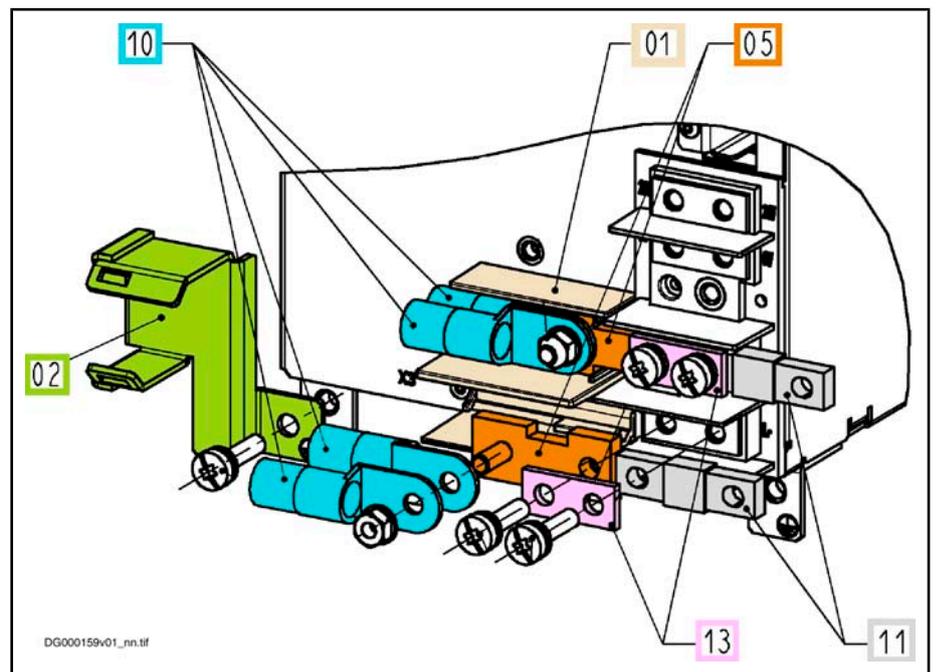


Fig. 16-98: HAS05.1-004-NNL; outgoing direction of the lines to the left; with DC bus contact bars

Accessories



Beneath the touch guard, run the non-twisted lines in parallel. Outside of the touch guard (after the strain relief), twist the line pairs. In the case of four lines at the connections L+ and L-, twist L+ and L- to form one pair. Keep the surface between the individual lines of a pair as small as possible. Run the line pairs with the smallest possible distance to each other.

**Outgoing Direction of the Lines to Both Sides (HAS05.1-004-NNR and HAS05.1-004-NNL)**

For mounting with outgoing direction to both sides, observe the descriptions on "Outgoing Direction of the Lines to the Left (HAS05.1-004-NNL)" and "Outgoing Direction of the Lines to the Right (HAS05.1-004-NNR)".

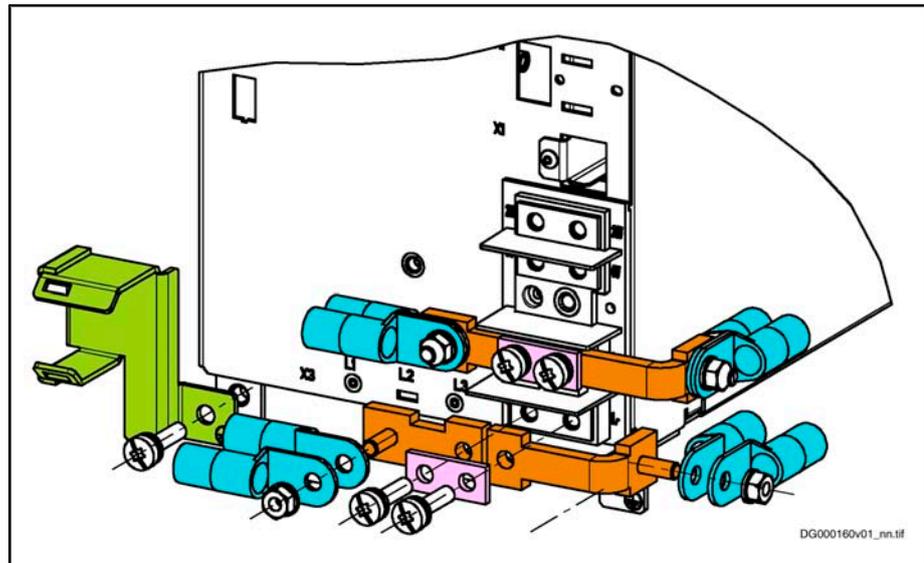


Fig. 16-99: Mounting HAS05.1-004-NNL and -NNR

**16.5.7 HAS05.1-005, Signal Level Converter RS232/RS485**

**Usage**

Accessory	Usage
HAS05.1-005-NNN-NN	Converts serial interface of Rexroth IndraDrive control sections from RS232 standard to RS485 standard

Fig. 16-100: Usage

**Scope of Supply**

**Scope of Supply**

Order this accessory as a separate item. It is not part of the scope of supply of the device.

Parts of the accessory: see accompanying note

*Scope of supply*

- Converter
- Connector at X2 and X3
- Cable tie
- Accompanying note

## Technical Data

## Dimensions

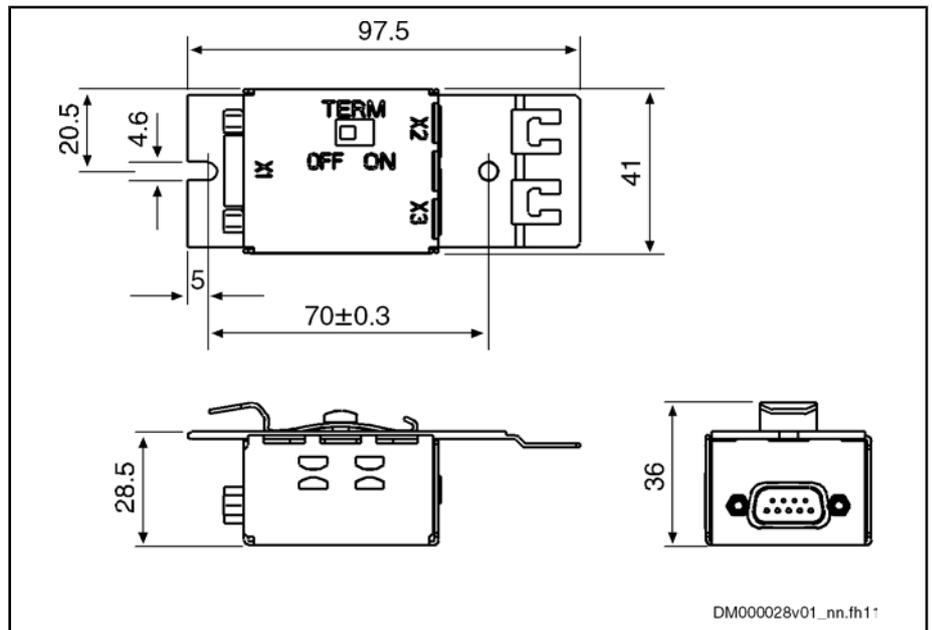


Fig.16-101: Dimensions



HAS05.1-005 can be mounted on a top-hat rail. For mounting it at a wall, remove the top-hat rail clip at the back of the housing.

You can also mount HAS05.1-005 on electrically insulating surfaces.

## Electrical Data

Characteristic	Unit	Min.	Typ.	Max.
Number of nodes				31
Allowed cable length <sup>1)</sup>	m			500
Transmission rates <sup>2)</sup>	kBaud	9,6		115
Mode of operation		Semi-duplex 2-wire line		
Connection between X1 and X2, X3		Galvanically connected		
Allowed voltage difference between the reference potentials of the drive controllers (housing)	V			20
Current consumption at X1.1	mA			50
Termination (TERM)		Switchable ON, OFF		
Short-circuit protection		Data+ against Data- Data+, Data- against GND		
Cable length at X1	m			5
Cable length at X2, X3	m	Comply with bus length; see allowed cable length		

Accessories

Characteristic	Unit	Min.	Typ.	Max.
Connections X2, X3		Spring terminal		
Connection cross section stranded wire	mm <sup>2</sup> / AWG	0.14–1.5 / 28–16; ferrule without insulating sleeve		

- 1) Bus length RS485, corresponds to total length of all connected cables
- 2) Is set via firmware used

Fig. 16-102: Technical characteristics

Position of Connections, Termination



Fig. 16-103: HAS05.1-005 with connection cables

Pin Assignment X1

Connection	Signal	Function
1	V <sub>cc</sub>	Supply voltage (+5V)
2	RxD	Receive Data
3	TxD	Transmit Data
4	n. c.	n. c.
5	GND	Reference potential
6	n. c.	n. c.
7	n. c.	n. c.
8	RTS	Request to send
9	n. c.	n. c.

Fig. 16-104: Pin assignment X1

Pin Assignment X2

Connection	Signal	Function
1	Data+	Data transmission +
2	Data-	Data transmission -
3	Shield	Connection overall shield

Fig. 16-105: Pin assignment X2

Pin Assignment X3

Connection	Signal	Function
1	Data+	Data transmission +
2	Data-	Data transmission -
3	Shield	Connection overall shield
4	GND	Connection internal shield (signal shield)

Fig. 16-106: Pin assignment X3

## Installation

### General Information

Three connections connect the accessory HAS05.1-005 to form an RS485 bus:

- Connection X1 to serial interface X2 at control section
- Connection X2 to connection X3 at next HAS05
- Connection X2 to bus master (e.g. RS232/485 converter controlled by a PC)



Terminate the RS485 bus line at the most remote bus ends.

To do this, switch on the termination at the bus master (converter at PC). At the last node, set the "TERM" switch to "ON".



See also Functional Description of firmware "Communication via RS485 Interface" and Parameter Description, e.g. "P-0-4050, Answer delay RS-232/485"

Accessories

Example of Connection

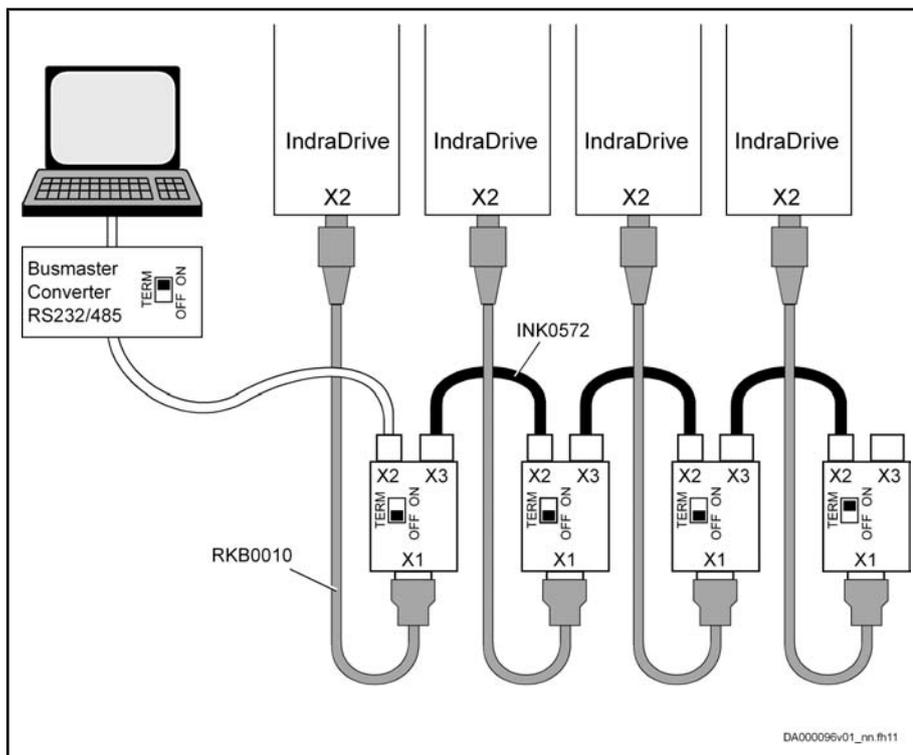


Fig. 16-107: Example of connection



Connect PC and RS485 bus to a so-called bus master converter; this RS232/485 converter automatically generates the RTS control signal.

The accessory HAS05.1-005 does not accomplish this function!

Connection at X1

Connection From X1 to Control Section (X2)

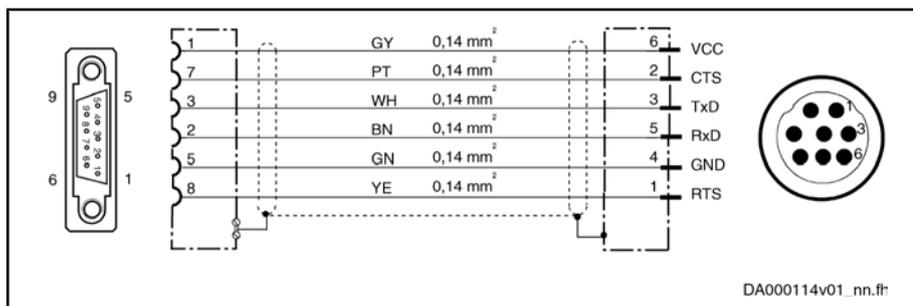


Fig. 16-108: Connection cable RKB0010



For **direct** connection from X1 to the control section, use our cable **RKB0010** and observe its maximum allowed length (see "Electrical Data" on page 265).

Connection at X2 and X3

Connect X2 and X3 with a cable according to the interconnection diagram below.

## Connection Between X2 and X3

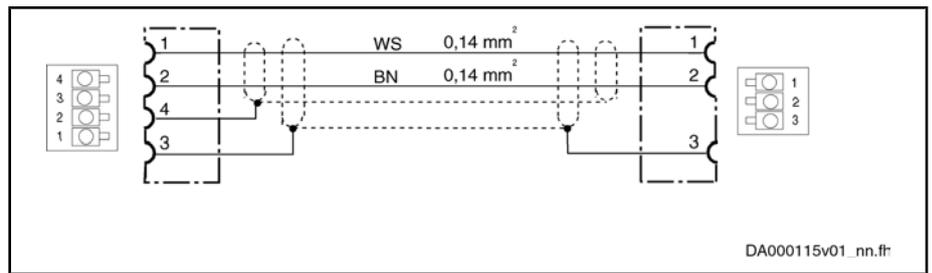


Fig. 16-109: Connection cable at X2 and X3



To assemble connection cables at X2 and X3, use our non-assembled cable **INK0572**.

## Strain Relief at Connection X2 and X3



Fig. 16-110: Strain relief at connection X2 and X3



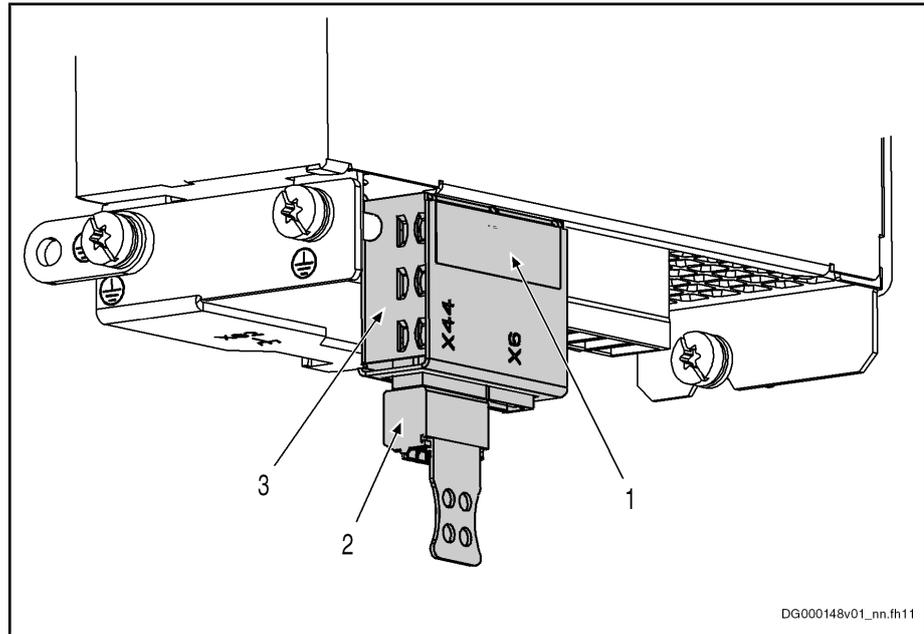
Provide sufficient strain relief for the connections at X2 and X3!  
Use the supplied cable ties.

## 16.5.8 HAS05.1-006, Adapter for Controlling Motor Holding Brake

### Usage

<b>Assignment</b>	The accessory HAS05.1-006 can be used at the following drive controllers: <ul style="list-style-type: none"> <li>• HMS02.1N-W0028</li> <li>• HMS02.1N-W0054</li> </ul>
<b>Function</b>	The accessory HAS05.1-006 switches the voltage supply of the motor holding brake (connection point X6, motor temperature monitoring and motor holding brake) and has a feedback contact to the switching action.
<b>Scope of Supply</b>	Connector at X44 (Connector at X6 is not part of the scope of supply. Use the connector of the power section.)
<b>Identification, Parts</b>	The accessory has a type plate for identification.

Accessories



DG000148v01\_nn.fh11

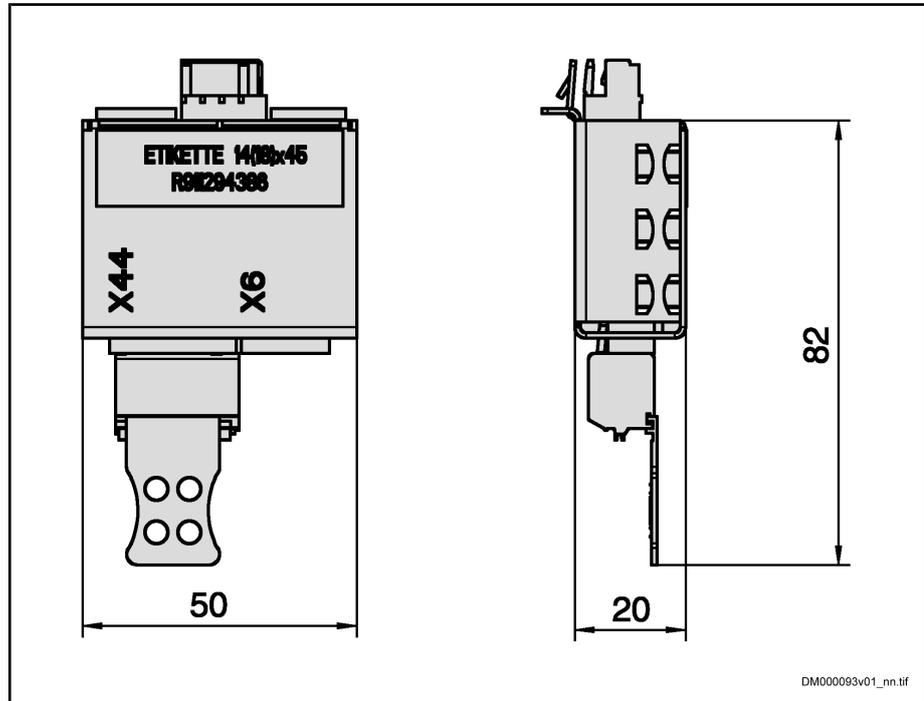
- 1 Type plate
- 2 Connector at connection point X44
- 3 HAS05.1-006

Fig.16-111: HAS05.1-006 at connection point X6 at drive controller

Technical Data

Mounting Dimensions

The accessory requires the following mounting clearance at the drive controller.



DM000093v01\_nn.tif

Data in mm

Fig.16-112: Mounting dimensions



Observe the minimum bending radiuses of the lines used. This requires additional mounting clearance at the drive controller, particularly downward.

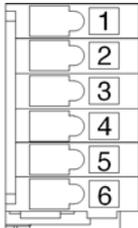
## Connection Points

### X6



The connection point is described in the Project Planning Manual "Rexroth IndraDrive Supply Units and Power Sections" → "Functions and Electrical Connection Points" → "X6, Motor Temperature Monitoring and Motor Holding Brake".

### X44

View	Connection	Signal name	Function
 DG000147v01_nn.FH1*	X44.1	+24V	Relay control
	X44.2		
	X44.3	0V	
	X44.4		
	X44.5	nc_Rel	Relay contact "N/C"
	X44.6	nc_Rel	
<b>Spring terminal (connector)</b>			
	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>
Connection cross section solid wire	mm <sup>2</sup>	0,14	1,5
Connection cross section stranded wire	mm <sup>2</sup>	0,14	1,5
Connection cross section	AWG	28	16
<b>Electrical data</b>			
Supply d1 (X44.1/2, X44.3/4)	V	19,2	28,8
	mA		50
Switching capacity K1 (X44.5, X44.6)	A	-	2
Switching capacity K2 (X6.3, X6.4)	V		28,8
Minimum load of the contacts	mA	10	
Contact resistance at minimum current	Ω		1
Pick up delay	ms		30
Drop out delay	ms		30
Time constant of load	ms	ohmic	
Number of switching actions at maximum time constant of load		1 × 10 <sup>6</sup>	
Number of mechanical switching cycles		1 × 10 <sup>6</sup>	

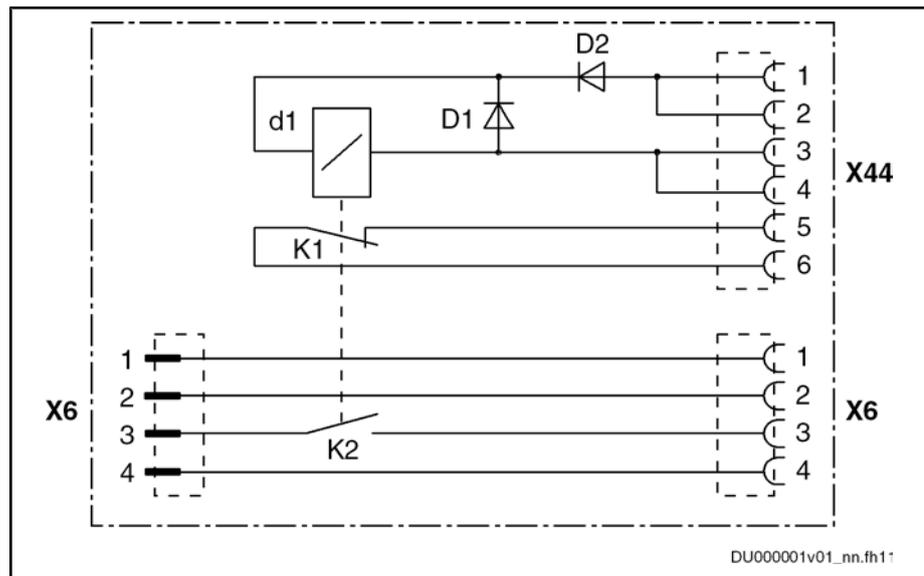
Accessories

Short circuit protection		See description of connection point "X6, Motor Temperature Monitoring and Motor Holding Brake" in the Project Planning Manual "Rexroth IndraDrive Supply Units and Power Sections"
Overload protection		

Fig.16-113: Function, pin assignment

Usage

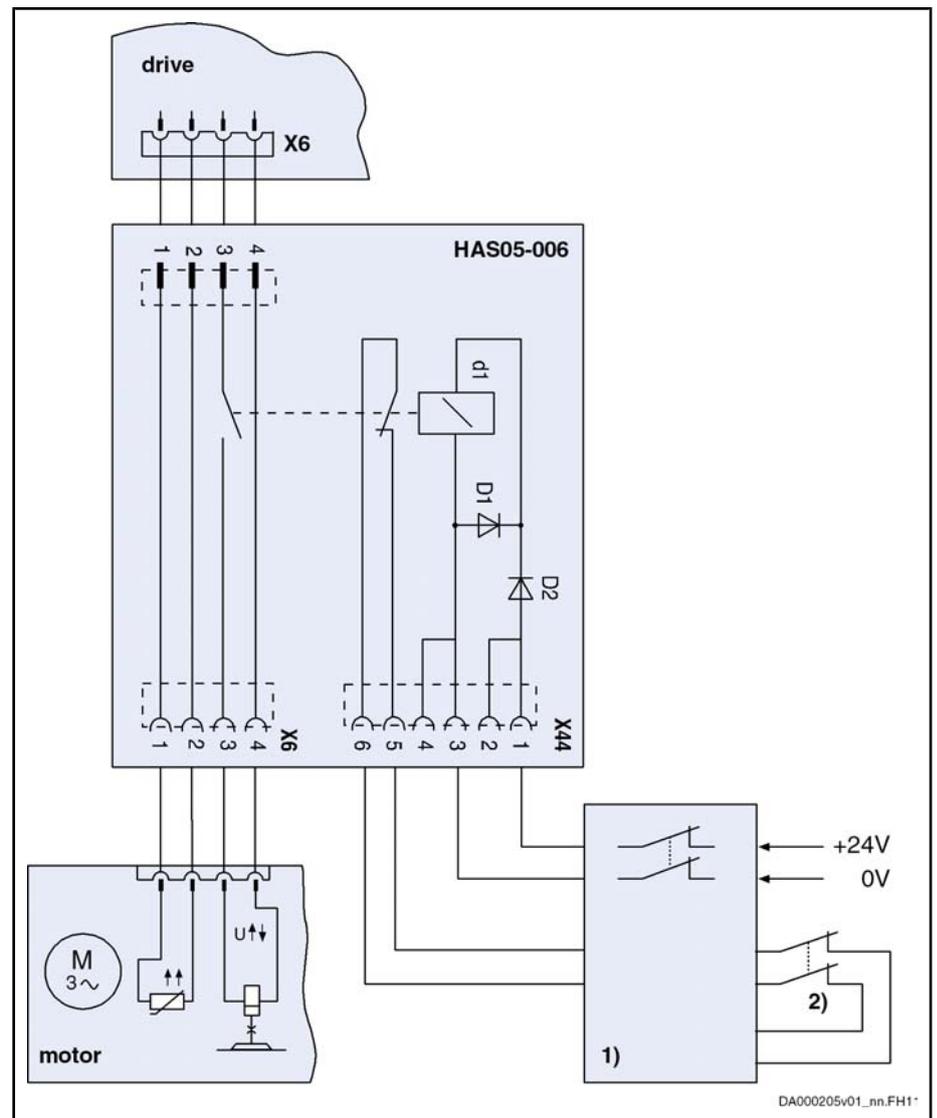
Block Diagram



- D1 Free-wheeling diode
- D2 Polarity reversal protection diode
- d1 Relay
- K1 N/C contact
- K2 N/O contact

Fig.16-114: Block diagram

## Example of Use



- 1) Safety door monitor  
 2) Safety door contacts  
 Fig. 16-115: Example of connection

## Mounting

## Mount HAS05.1-006

1. Plug HAS05.1-006 in connection point X6 at drive controller



Make sure that HAS05.1-006 snaps in at X6 at the drive controller.

2. Plug connectors X6 and X44 in HAS05.1-006



Make sure there is sufficient strain relief for the connectors.

## Dismount HAS05.1-006

1. Remove connection cable from HAS05.1-006

Accessories

2. Loosen snap-in connection with screwdriver and remove HAS05.1-006 from drive controller

## 16.5.9 HAS05.1-007, Adapter From D-Sub to Terminal Connector

### Usage

The adapter **HAS05.1-007** exists in the following types of design:

- **NNL**: Mounting direction left (outgoing direction spring terminal left)
- **NNR**: Mounting direction right (outgoing direction spring terminal right)

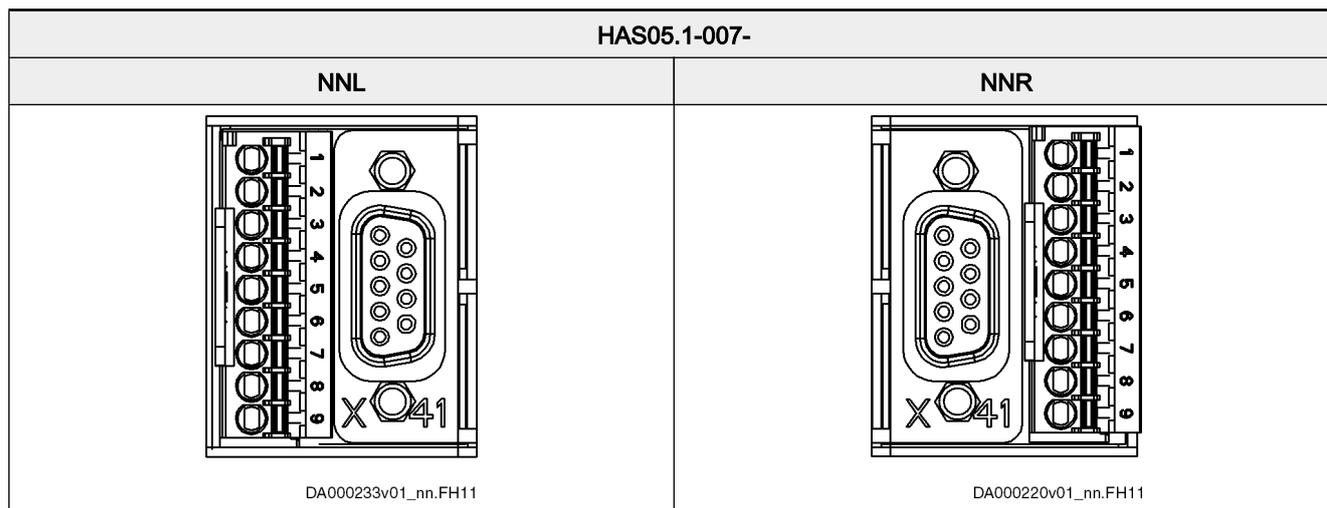


Fig.16-116: Types of design

**Assignment** The accessory HAS05.1-007 can be used at the following control sections:

HAS05.1-007-NNL	HAS05.1-007-NNR
CSH01.1C at X41 (Condition: option 3 not equipped)	CSH01.1C at X41
CDB01.1C at X41.1 (option ST1)	CSH01.2C at X41
	CDB01.1C at X41.2 (option ST2)

Fig.16-117: Assignment HAS05.1-007

At **CDB01** control sections, you can use both types of design together. However, there is the following restriction:

When using the type of design **NNL** at **HMD01.1N-W0012** or **HMD01.1N-W0020** drive controllers of a width of 50 mm, you cannot use the adapter of type of design **NNR** at the neighboring control section on the left-hand side.

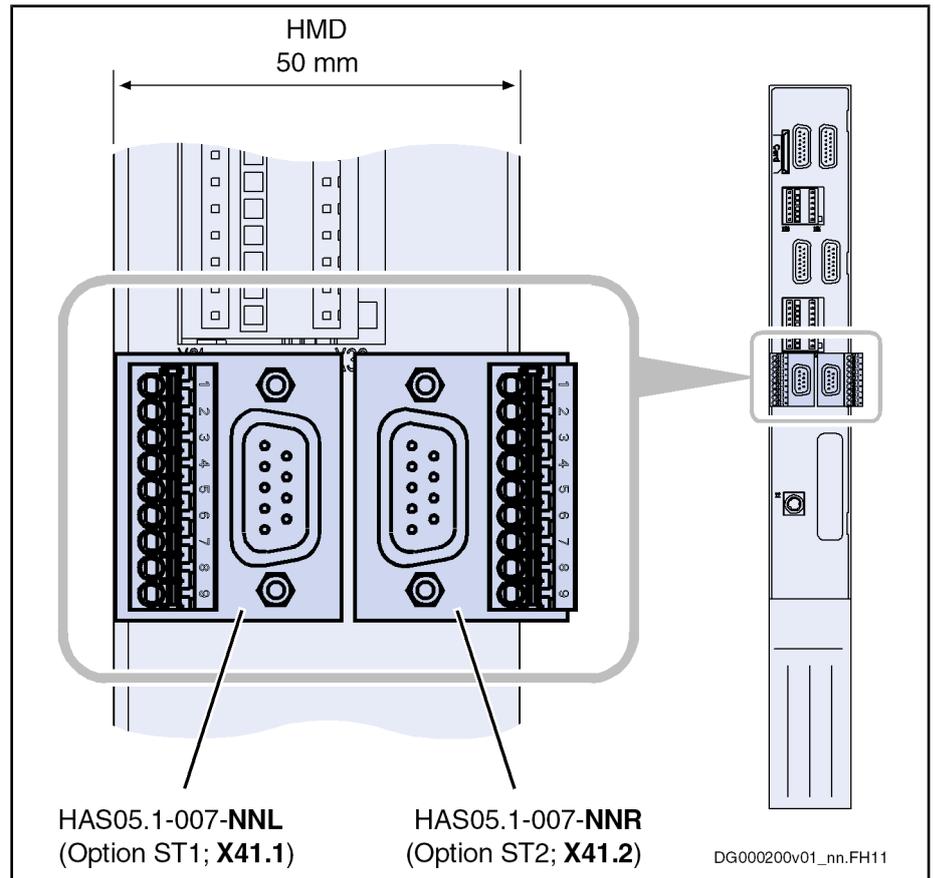


Fig.16-118: HAS05.1-007-NNL and -NNR at HMD drive controller of a width of 50 mm

**Function** Universal adapter for safety technology

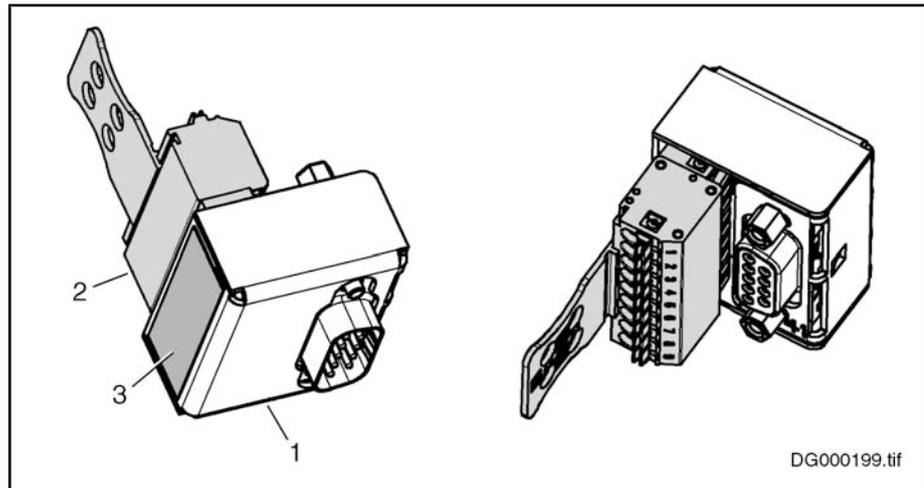
Usage:

1. Converter of D-Sub connection to terminal connection for an axis
2. Connection of additional component HAT01 to control section and optional module S1
3. Converter of D-Sub connection to terminal connection for bus connection of optional modules S1 of the axes of one zone (see figure "[Wiring Example With HAS05.1-007-NNR](#)" on page 279)

**Identification, Parts** The accessory has a type plate for identification.

Accessories

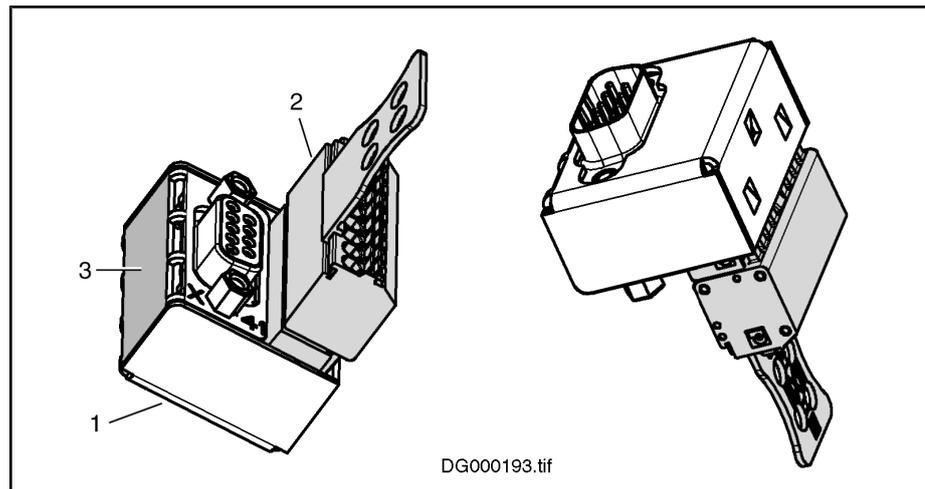
HAS05.1-007-NNL



- 1 Adapter
- 2 Connector (spring terminal)
- 3 Type plate

Fig. 16-119: HAS05.1-007-NNL

HAS05.1-007-NNR



- 1 Adapter
- 2 Connector (spring terminal)
- 3 Type plate

Fig. 16-120: HAS05.1-007-NNR

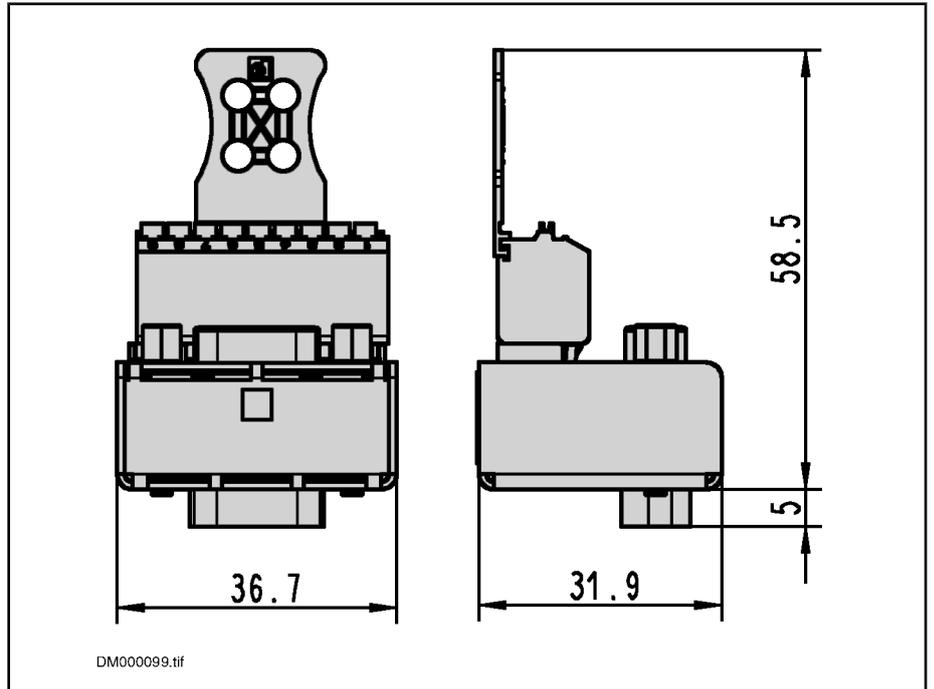
The adapter is plugged in the connection point X41 (resp. X41.1 or X41.2 for double-axis devices) of the control section and secured with screws.

Technical Data

Mounting Dimensions

The accessory requires the following mounting clearance at the drive controller.

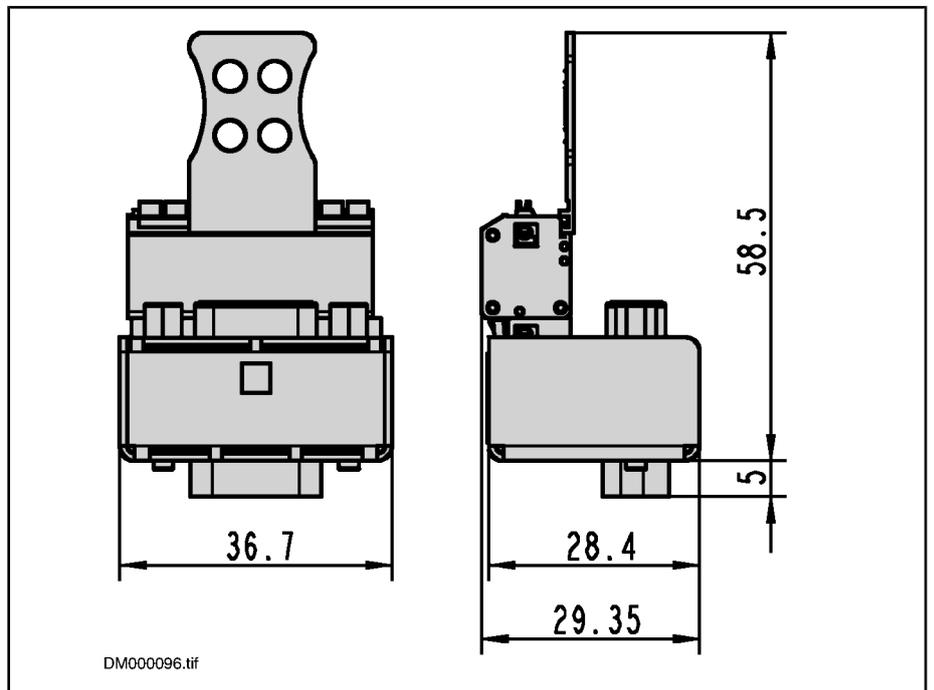
HAS05.1-007-NNL



Data in mm

Fig. 16-121: Mounting dimensions HAS05.1-007-NNL

HAS05.1-007-NNR



Data in mm

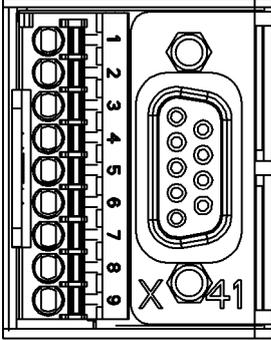
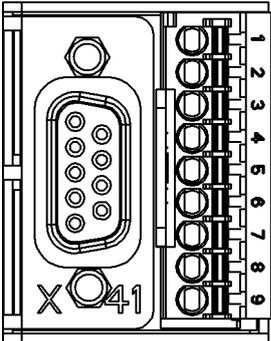
Fig. 16-122: Mounting dimensions HAS05.1-007-NNR



Observe the minimum bending radiuses of the lines used. This requires additional mounting clearance at the front of the drive controller.

Accessories

Connection Point X41

View	Con- tion (termi- nal)	Signal name	Function
<p>HAS05.1-007-NNL Spring terminal / D-Sub female connector</p>  <p>DA000233v01_nn.FH11</p>	1	X41.1	<p>The adapter brings the connections of the optional modules L1 or S1 to the connections 1–9 of a spring terminal and a D-Sub female connector.</p>  <p>Description of connection point X41: See Project Planning Manual "Rexroth IndraDrive Control Sections", section "Optional Modules for Control Sections, Safety Technology".</p>
	2	X41.2	
	3	X41.3	
	4	X41.4	
	5	X41.5	
	6	X41.6	
	7	X41.7	
	8	X41.8	
	9	X41.9	
<p>HAS05.1-007-NNR D-Sub female connector / spring terminal</p>  <p>DA000220v01_nn.FH11</p>			
<b>Spring terminal (connector)</b>	<b>Unit</b>	<b>Min.</b>	<b>Max.</b>
Cable cross section stranded wire	mm <sup>2</sup>	0,5	1,5
Cable cross section	AWG	20	16
Coding	At both types of design, the connection point 5 has been coded, i.e. provided with a coding section. The spring terminal was already assembled accordingly at the factory.		

<b>Electrical data</b>	Description of connection point X41: See Project Planning Manual "Rexroth IndraDrive Control Sections", section "Optional Modules for Control Sections, Safety Technology".
<ul style="list-style-type: none"> <li>• <b>Mating connector for D-Sub female connector</b></li> <li>• <b>Ribbon cable</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>RBS0017/S05</b> → D-Sub connector, 9-pin</li> <li>• <b>REB0401</b> → ribbon cable, 9-pin, can be ordered in steps of 0.5 m</li> </ul> <p>For professional assembly of the ribbon cable in the D-Sub connector, use the following Tyco tools:</p> <ul style="list-style-type: none"> <li>• Pistol-Grip tool (part number 734155-1)</li> <li>• Matrix for D-Sub connector (part number 734148-1)</li> </ul>

Fig. 16-123: Function, pin assignment

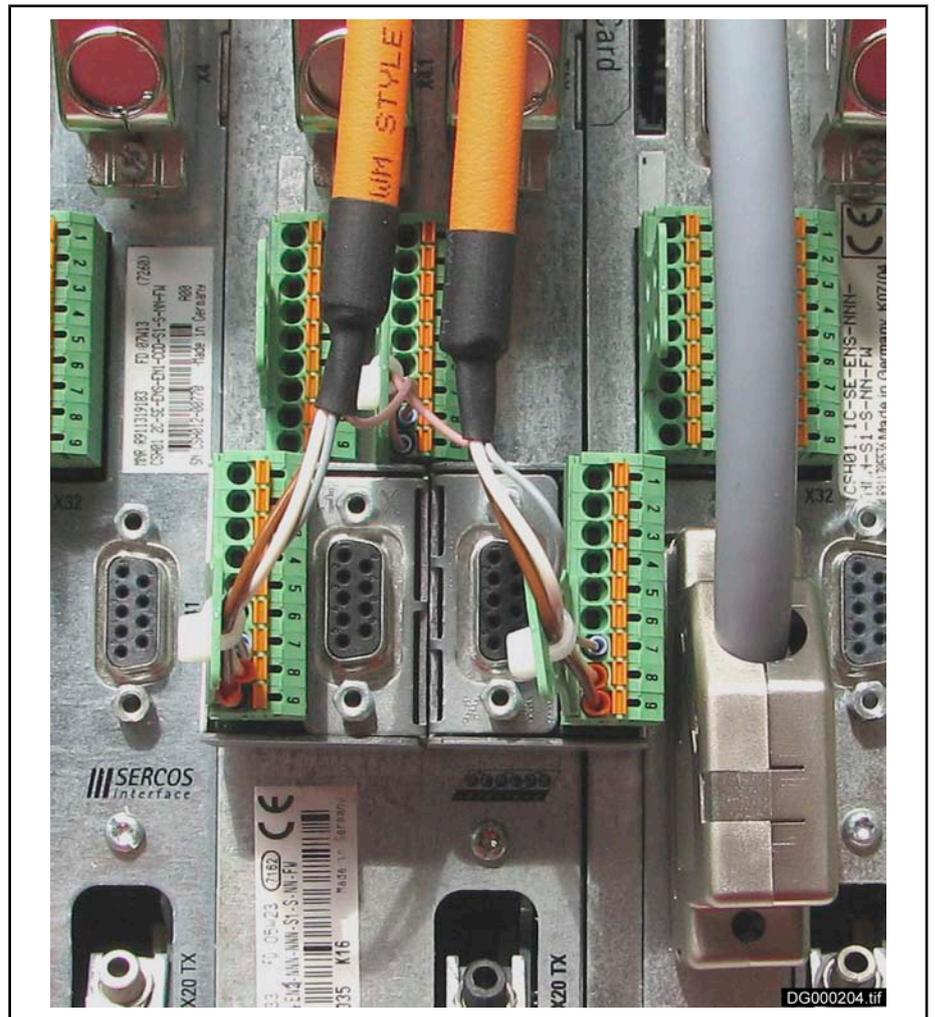
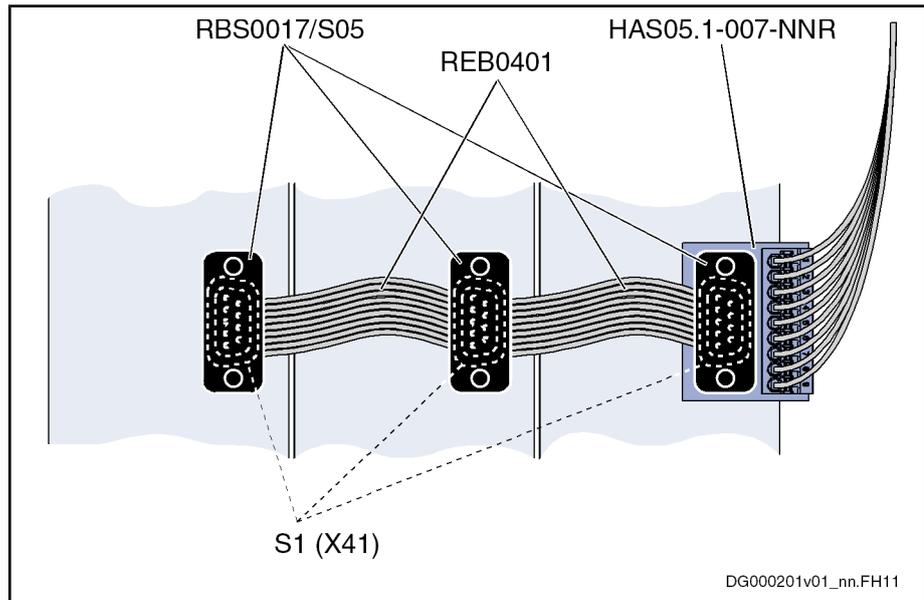


Fig. 16-124: HAS05.1-007-NNL and HAS05.1-007-NNR at CDB control section

**Wiring Example With  
HAS05.1-007-NNR**

HAS05.1-007-NNR is the preferred adapter for the bus connection of several optional modules S1.

Accessories



RBS0017/ S05 D-Sub connector with connection for ribbon cable

REB0401 ribbon cable

Fig. 16-125: HAS05.1-007-NNR

At CSH01.1C control sections, the adapter HAS05.1-007-NNL can only be used at the left end of the bus connection, when option 3 has not been equipped.

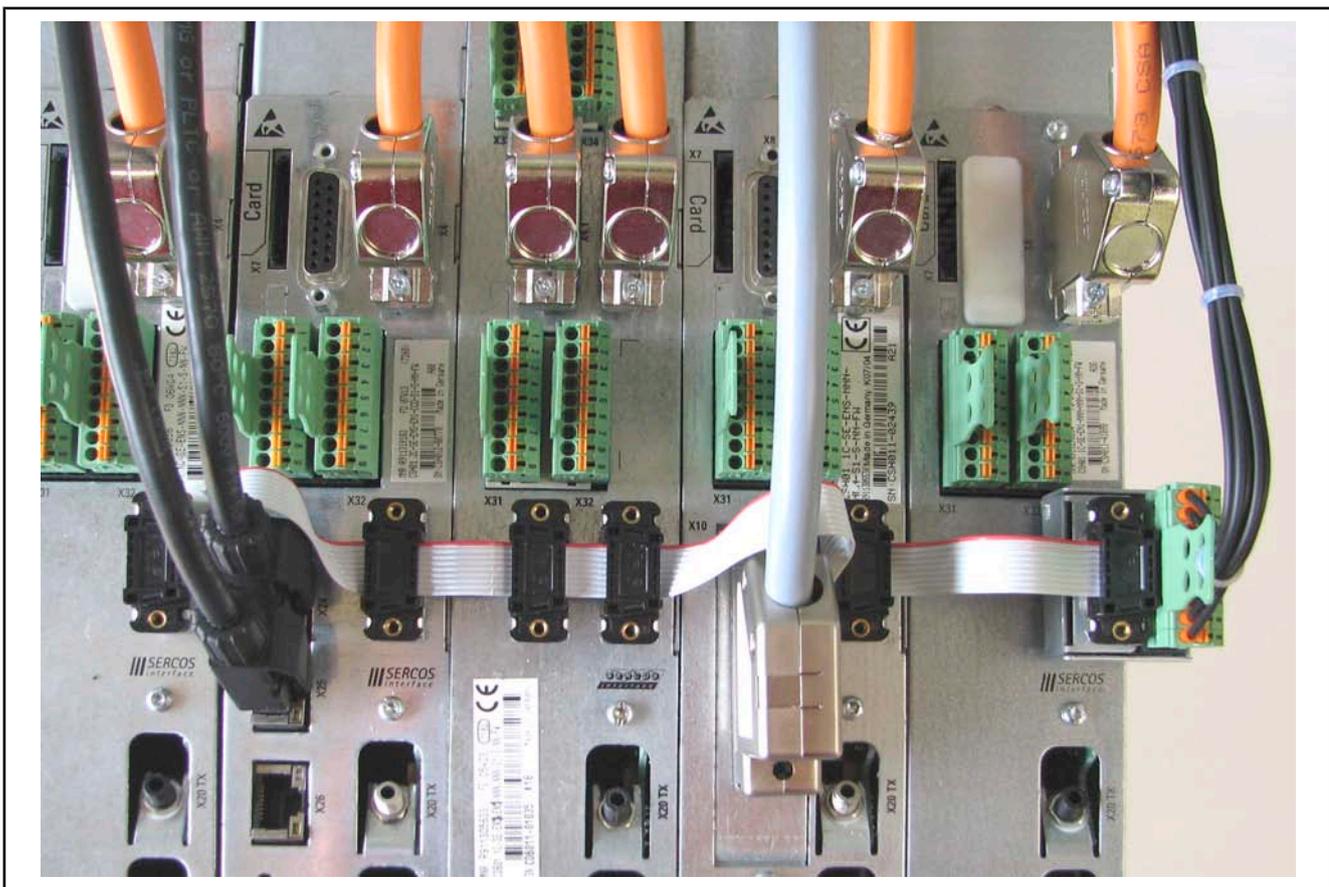


Fig. 16-126: HAS05.1-007-NNR, RBS0017/S05 and REB0401 for bus connection of optional modules S1 of the axes of one zone

## 16.5.10 HAS05.1-008, Adapter for Connecting two Cables

### Usage

- Assignment** The accessory HAS05.1-008 can be used at the following drive controllers:
- HCS03.1E-W0100...0210
  - HMS01.1N-W0150...0210
- Function** With the accessory HAS05.1-008, you can connect two 16 mm<sup>2</sup> cables with ring cable lugs at the mentioned devices at terminal block X5 (motor connection), each at A1, A2 and A3.
- Scope of Supply** The accessory contains:
- 3 × adapter
  - 3 × screw M6 × 25

Accessories

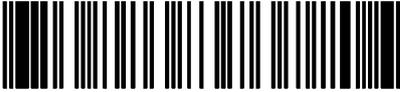
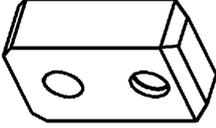
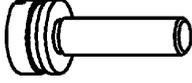
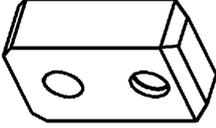
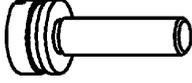
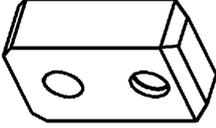
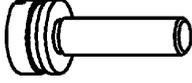
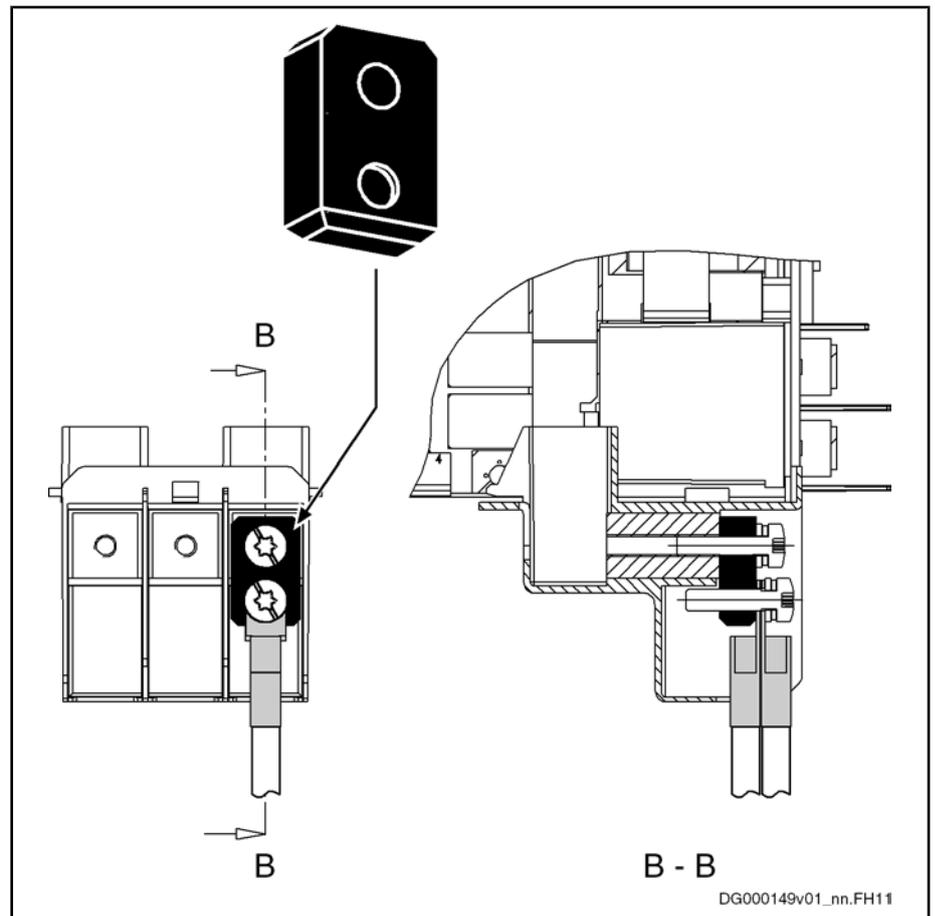
<p>Made in Germany 109-1304-4803-00</p> <p style="text-align: right;"><b>Rexroth Bosch Group</b></p> <h2 style="text-align: center;">HAS05.1-008-NNN-NN</h2>  <p style="text-align: center;">R911319898</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 5%;">3</td> <td style="width: 40%;">KOMBI-SCHRAUBE</td> <td style="width: 30%;">ZISO10644-M6X25-8.8 &amp;</td> <td style="width: 25%;">R911276873</td> </tr> <tr> <td>3</td> <td>ADAPTERBLECH HMS01.1-W0150 AS-BLOCK</td> <td></td> <td>R911319243</td> </tr> <tr> <td><b>Stck</b></td> <td><b>Benennung</b></td> <td></td> <td><b>MN</b></td> </tr> </table>	3	KOMBI-SCHRAUBE	ZISO10644-M6X25-8.8 &	R911276873	3	ADAPTERBLECH HMS01.1-W0150 AS-BLOCK		R911319243	<b>Stck</b>	<b>Benennung</b>		<b>MN</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: center;">BEIPACKZETTEL HAS05.1-008-NNN-NN</th> </tr> <tr> <th style="width: 10%;">Stck</th> <th style="width: 60%;">Benennung</th> <th colspan="2" style="width: 30%;">MN</th> </tr> <tr> <td style="text-align: center;">3</td> <td>ADAPTERBLECH HMS01.1-W0150 AS-BLOCK</td> <td colspan="2" style="text-align: right;">R911319243</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB-20079</td> <td style="text-align: center;">  </td> <td colspan="2" style="text-align: right; vertical-align: middle;">1:1</td> </tr> <tr> <td style="text-align: center;">3</td> <td>KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &amp;</td> <td colspan="2" style="text-align: right;">R911276873</td> </tr> <tr> <td style="text-align: center; vertical-align: middle;">DB-51129</td> <td style="text-align: center;">  </td> <td colspan="2" style="text-align: right; vertical-align: middle;">1:1</td> </tr> <tr> <td colspan="4" style="text-align: center; padding: 10px;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2006-12-18</td> <td colspan="2" style="width: 60%;">Benennung</td> </tr> <tr> <td>Name</td> <td>rainhirt</td> <td colspan="2">BEIPACKZETTEL HAS05.1-008-NNN-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911319900</td> <td>Zeich-Nr.</td> <td>109-1304-4203-00</td> </tr> <tr> <td>Datei</td> <td>DB209292</td> <td>Ers.durch</td> <td>.. AEM-Nr. ..</td> </tr> </table> </td> </tr> </table>	BEIPACKZETTEL HAS05.1-008-NNN-NN				Stck	Benennung	MN		3	ADAPTERBLECH HMS01.1-W0150 AS-BLOCK	R911319243		DB-20079		1:1		3	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873		DB-51129		1:1		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2006-12-18</td> <td colspan="2" style="width: 60%;">Benennung</td> </tr> <tr> <td>Name</td> <td>rainhirt</td> <td colspan="2">BEIPACKZETTEL HAS05.1-008-NNN-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911319900</td> <td>Zeich-Nr.</td> <td>109-1304-4203-00</td> </tr> <tr> <td>Datei</td> <td>DB209292</td> <td>Ers.durch</td> <td>.. AEM-Nr. ..</td> </tr> </table>				Datum	2006-12-18	Benennung		Name	rainhirt	BEIPACKZETTEL HAS05.1-008-NNN-NN		Material-Nr.	R911319900	Zeich-Nr.	109-1304-4203-00	Datei	DB209292	Ers.durch	.. AEM-Nr. ..
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<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">Datum</td> <td style="width: 25%;">2006-12-18</td> <td colspan="2" style="width: 60%;">Benennung</td> </tr> <tr> <td>Name</td> <td>rainhirt</td> <td colspan="2">BEIPACKZETTEL HAS05.1-008-NNN-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911319900</td> <td>Zeich-Nr.</td> <td>109-1304-4203-00</td> </tr> <tr> <td>Datei</td> <td>DB209292</td> <td>Ers.durch</td> <td>.. AEM-Nr. ..</td> </tr> </table>				Datum	2006-12-18	Benennung		Name	rainhirt	BEIPACKZETTEL HAS05.1-008-NNN-NN		Material-Nr.	R911319900	Zeich-Nr.	109-1304-4203-00	Datei	DB209292	Ers.durch	.. AEM-Nr. ..																																						
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Fig.16-127: Accompanying note

## Mounting



B - B Transverse profile of connection

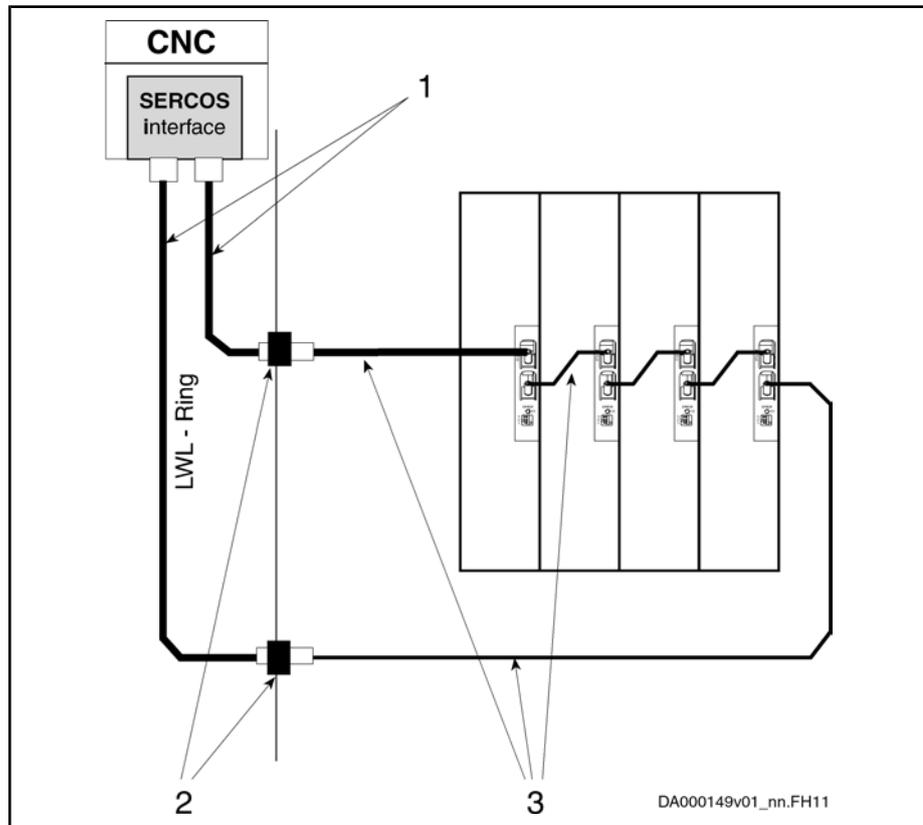
Fig. 16-128: HAS05.1-008 at an X5 connection point

1. Screw adapter to connection point with supplied screw.
2. Connect cable as shown and screw it on.
3. Repeat steps 1 and 2 for each connection point.

Accessories

## 16.6 Fiber Optic Cable Connections

### 16.6.1 Overview of Types



- 1 Fiber optic cable connections outside of control cabinet
- 2 Control cabinet duct
- 3 Fiber optic cable connections inside of control cabinet

Fig. 16-129: Fiber optic cable connections

Installation location	Description	Type designation
Outside of control cabinet	Robust fiber optic cable connections from peripherals to control cabinet	RKO0101
At control cabinet	Control cabinet duct with plug-in connectors	INS0610
Inside of control cabinet	Fiber optic cable connections to and between drive controllers	RKO0100

Fig. 16-130: Fiber optic cable connection elements



For ordering the fiber optic cable connection, you have to generate the complete order code containing details on type and length. For the type designation see the above table and add the required length to it. Determine the length by means of the list of different device arrangements.

Example of order code for arrangement HCS02 (left 105 mm) next to HCS02 (right 65 mm):

- Required length: 0.25 m
- Type designation: RKO0100
- Order code RKO0100 / 0,25

## 16.6.2 Interconnection of Drive Controllers

### General Information

For selecting the fiber optic cable connection of drive controllers, take different possible combinations and different device widths into account.

### Combination of HCS02 and HCS02

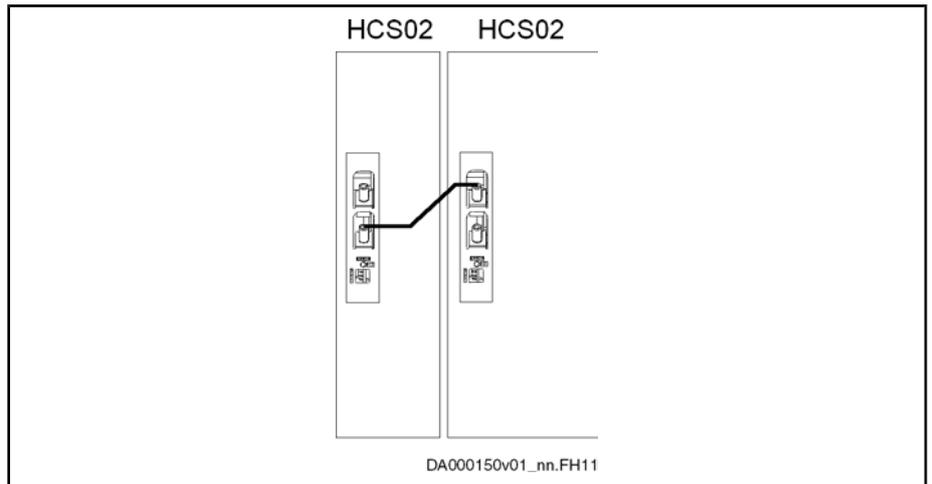


Fig. 16-131: HCS02 with HCS02



For fiber optic cables from **CSB01.1N-SE** control sections to other control section types, take fiber optic cables which are **0.05 m** longer (at the devices, SERCOS connections are at different heights and sides).

Observe the routing guidelines and technical data (e.g. allowed bending radiuses) contained in documentation "Rexroth Connection Cables", DOK-CONN-CABLE\*LWL\*\*-AW\*\*-\*\*-\*

Required fiber optic cable length [m]		
Width left HCS02 [mm]	Width right HCS02 [mm]	
	65	105
65	0,15	0,15
105	0,25	0,25

Fig. 16-132: Fiber optic cable lengths

Accessories

Combination of HCS02 to the Right of HMS or HMD

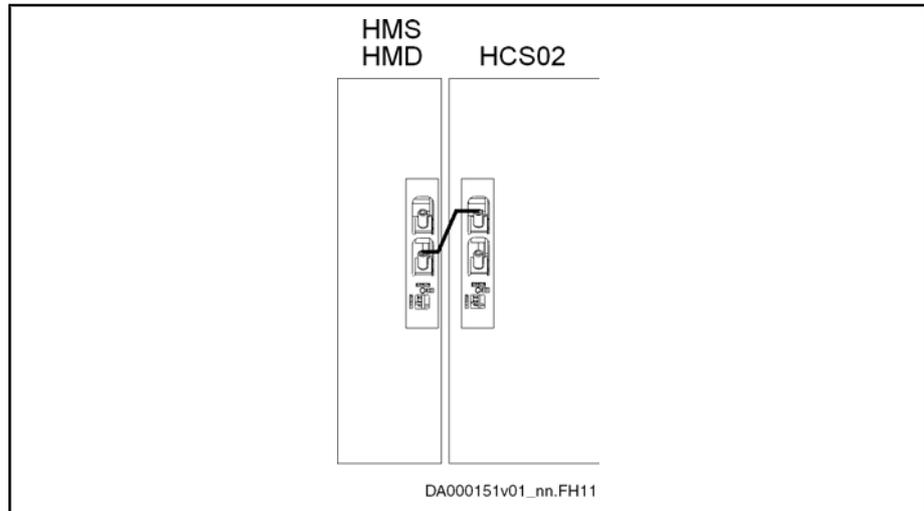


Fig.16-133: HCS02 to the right of HMS or HMD  
Independent of the width of the devices, cable length is 0.15 m.

Combination of HCS02 to the Left of HMS or HMD

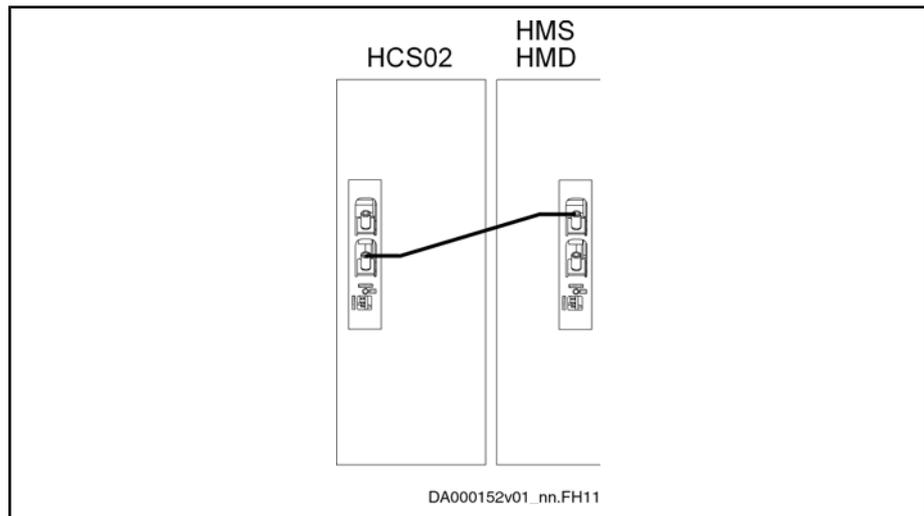


Fig.16-134: HCS02 to the left of HMS or HMD



For fiber optic cables from **CSB01.1N-SE** control sections to other control section types, take fiber optic cables which are **0.05 m** longer (at the devices, SERCOS connections are at different heights and sides).

Observe the routing guidelines and technical data (e.g. allowed bending radiuses) contained in documentation "Rexroth Connection Cables", DOK-CONNEX-CABLE\*LWL\*\*-\*AW\*\*-\*-\*.\*.

Cable length = width HCS02 + width HMS/HMD + 10 cm

Required fiber optic cable length [m]				
Width HCS02 [mm]	Width HMS / HMD [mm]			
	50	75	100	125

Required fiber optic cable length [m]				
65	0,25	0,25	--	--
105	0,25	0,30	0,30	0,30

Fig. 16-135: Fiber optic cable lengths

### Combination of HCS03 to the Right of HMS or HMD

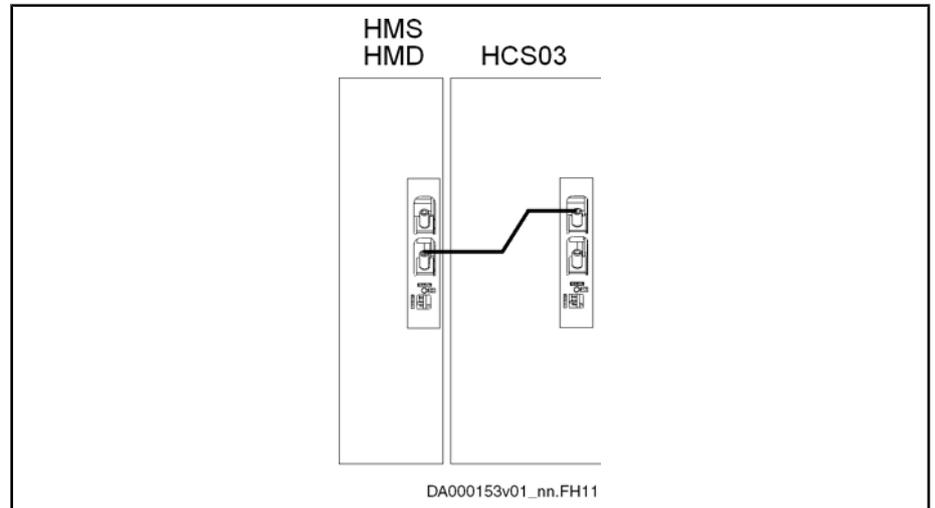


Fig. 16-136: HCS03 to the right of HMS or HMD

### Combination of HCS03 to the Left of HMS or HMD

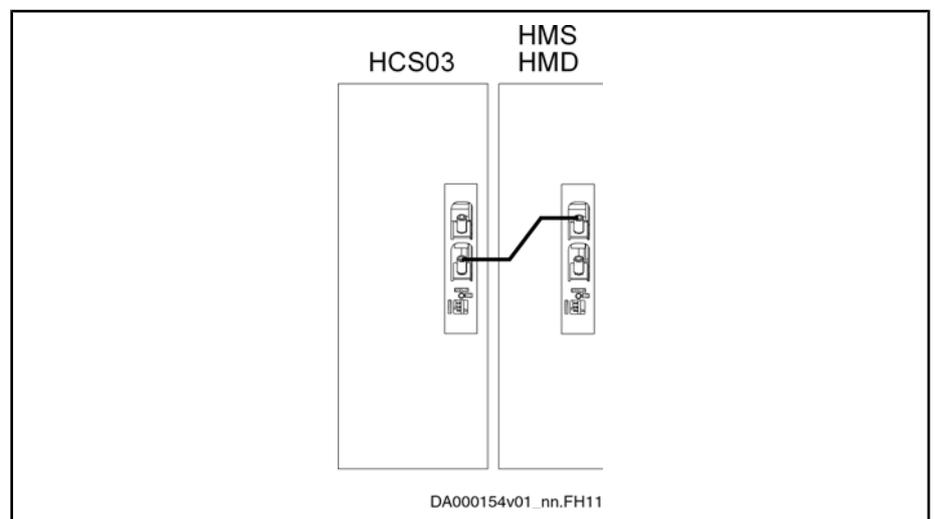


Fig. 16-137: HCS03 to the left of HMS or HMD



For fiber optic cables from **CSB01.1N-SE** control sections to other control section types, take fiber optic cables which are **0.05 m** longer (at the devices, SERCOS connections are at different heights and sides).

Observe the routing guidelines and technical data (e.g. allowed bending radiuses) contained in documentation "Rexroth Connection Cables", DOK-CONNEX-CABLE\*LWL\*\*--AW\*\*--\*\*-\*.

## Accessories

Required fiber optic cable length [m]								
Width left device [mm]	Width right device [mm]							
	50	75	100	125	150	200	225	350
50	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
75	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
100	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
125	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
150	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
200	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
225	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50
350	0,15	0,25	0,25	0,25	0,30	0,50	0,50	0,50

Fig. 16-138: Fiber optic cable lengths

## 16.7 RKB0001, Extension for Module Bus Connections

### 16.7.1 Usage

**Assignment** The extension **RKB0001** can be used at:

- HMV01.1E
- HMV01.1R
- HMS01.1N
- HMD01.1N
- HMV02.1R
- HMS02.1N
- HCS03.1E-W0070, -W0100; -W0150



The extension RKB0001 cannot be mounted at HCS02 drive controllers.

**Function** With the accessory RKB0001 you can extend the module bus connection between devices, when the distance between the drive controllers is greater than 5 mm (e.g. in the case of multiple-line arrangement).

**Lengths That can be Ordered, Order Code** Lengths: 0.5 m to 40 m (in steps of 0.5 m)

Parts:

- Housing with hinged cover
- Cable with strain relief mounted at both ends

Indicate the complete order code for your order.

Example:

- Required length: 2.5 m
- Type designation: RKB0001
- Order code **RKB0001 / 02,5**

## 16.7.2 Mounting

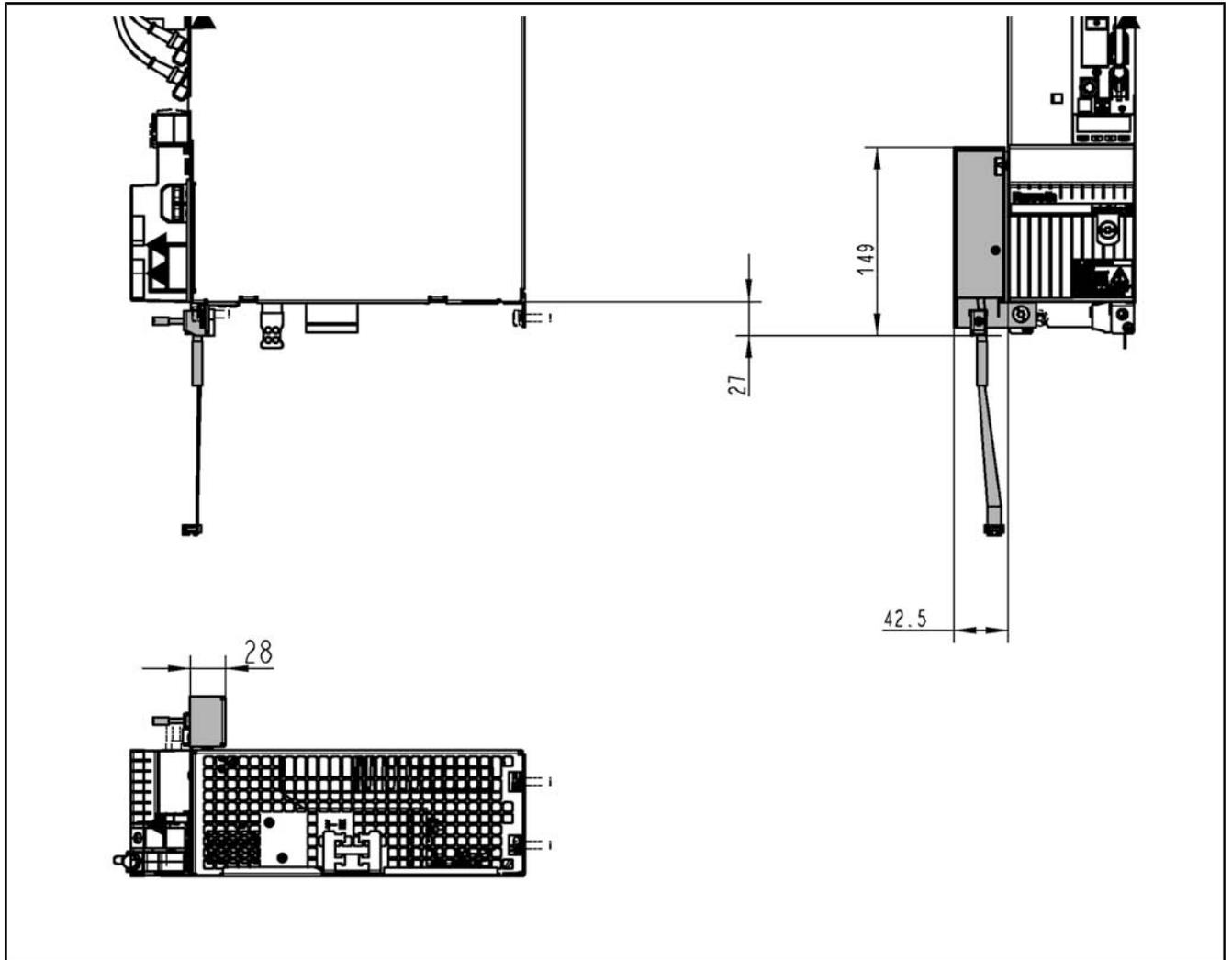


Fig. 16-139: Dimensions RKB0001

Accessories



*Fig. 16-140: Extension of module bus  
Mounting RKB bus cable*

1. Mount housing to point of connection for equipment grounding conductor.
2. Open cover and plug ribbon cable of right device into circuit board.
3. Close cover.
4. Screw strain relief down to point of connection for equipment grounding conductor.
5. Plug ribbon cable into X1.



Make sure the connection between strain relief and point of connection for equipment grounding conductor is well conductive.  
By means of appropriate wiring, establish equipment grounding connections of devices that are not directly adjoining.

## 17 Environmental Protection and Disposal

### 17.1 Environmental Protection

#### 17.1.1 Production Processes

The products are made with energy- and resource-optimized production processes which allow re-using and recycling the resulting waste. We regularly try to replace pollutant-loaded raw materials and supplies by more environment-friendly alternatives.

#### 17.1.2 Prohibited Substances

We guarantee that our products do not contain any of the substances specified in the German regulation of prohibited chemicals ("Chemikalien-Verbotsverordnung"). We furthermore declare that our products are free of mercury, asbestos, PCB and chlorinated hydrocarbons.

#### 17.1.3 No Release of Hazardous Substances

Our products do not contain any hazardous substances which may be released in the case of appropriate use. Accordingly, our products will normally not have any negative effect on the environment.

#### 17.1.4 Principal Components

The principal components contained in our products are listed below:

Electronic devices	Motors
<ul style="list-style-type: none"> <li>• steel</li> <li>• aluminum</li> <li>• copper</li> <li>• synthetic materials</li> <li>• electronic components and modules</li> </ul>	<ul style="list-style-type: none"> <li>• steel</li> <li>• aluminum</li> <li>• copper</li> <li>• brass</li> <li>• magnetic materials</li> <li>• electronic components and modules</li> </ul>

Fig. 17-1: Principal components

### 17.2 Disposal

#### 17.2.1 Return of Products

Our products can be returned to us free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt.

Furthermore, the products returned for disposal mustn't contain any undue foreign matter or foreign component.

Please send the products free domicile to the following address:

Bosch Rexroth AG  
Electric Drives and Controls  
Bürgermeister-Dr.-Nebel-Strasse 2  
D-97816 Lohr am Main

#### 17.2.2 Packaging Materials

The packaging materials consist of cardboard, wood and polystyrene. These materials can be recycled anywhere without any problem.

## Environmental Protection and Disposal

For ecological reasons, please refrain from returning the empty packages to us.

### 17.2.3 Recycling

Due to their high content of metal, most of the product components can be recycled. In order to recycle the metal in the best possible way, the products must be disassembled into individual modules.

Metals contained in electric and electronic modules can also be recycled by means of special separation processes. The synthetic materials remaining after these processes can be thermally recycled.

If the products contain batteries or accumulators, these have to be removed before recycling and disposed of.

## 18 Service and Support

### 18.1 Helpdesk

Our service helpdesk at our headquarters in Lohr, Germany, will assist you with all kinds of inquiries.

Contact us:

- By phone through the Service Call Entry Center  
Monday to Friday: 7:00 am - 6:00 pm Central European Time  
**+49 (0) 9352 40 50 60**
- By fax  
**+49 (0) 9352 40 49 41**
- By e-mail: [service.svc@boschrexroth.de](mailto:service.svc@boschrexroth.de)

### 18.2 Service Hotline

Out of helpdesk hours please contact our German service department directly:

**+49 (0) 171 333 88 26**

or

**+49 (0) 172 660 04 06**

Hotline numbers for other countries can be found in the addresses of each region on the Internet (see below).

### 18.3 Addresses

For the current addresses of our sales and service offices, see

<http://www.boschrexroth.com>

On this website you will find additional notes regarding service, maintenance (e.g. delivery addresses) and training.

Outside Germany please contact our sales/service office in your area first.

### 18.4 Helpful Information

For quick and efficient help please have the following information ready:

- Detailed description of the fault and the circumstances
- Information on the type plate of the affected products, especially type codes and serial numbers
- Your phone and fax numbers and e-mail address, so we can contact you in case of questions



## 19 Appendix

### 19.1 Discharging of Capacitors

#### 19.1.1 Discharging of DC Bus Capacitors

In the drive system Rexroth IndraDrive, capacitors are used in the DC bus as energy stores. In drive controllers and particularly in supply units, such capacitors have already been integrated.

Energy stores maintain their energy even when the supply voltage has been cut off and have to be discharged before somebody gets in contact with them.

Discharging devices have been integrated in the components of the drive system Rexroth IndraDrive; within the indicated discharging time these devices discharge the voltage below the allowed 50 V.

If additional capacitors (such as DC bus capacitor units) are connected, these capacitors, too, have to be discharged before somebody gets in contact with them.

Due to the operating principle, the discharging time is the longer

- the bigger the energy store (the capacitance value)
- the higher the voltage to which the energy store has been charged
- the greater the resistance for discharging the capacitors

Components of the drive system Rexroth IndraDrive have been dimensioned in such a way that after the supply voltage was cut off, the voltage value falls below 50 V within a discharging time of a maximum of 30 minutes.

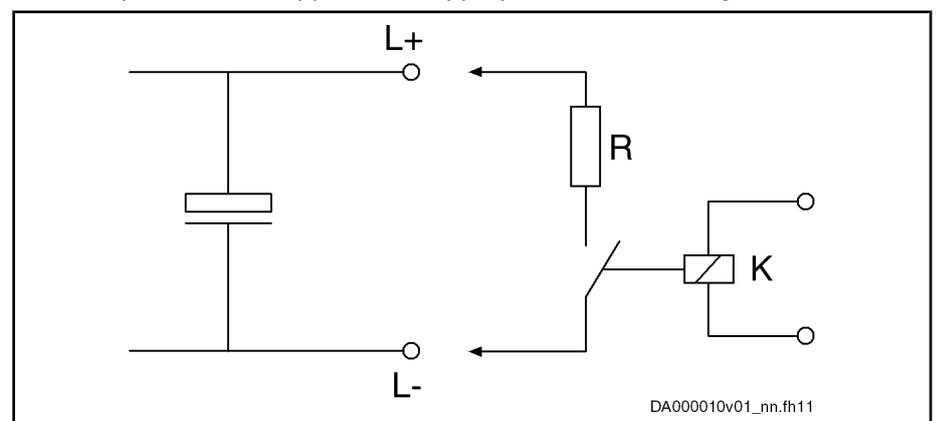
To shorten the waiting time until voltage has fallen below 50 V, you can take the following measures:

- When using HMV01 supply units: activate the function "ZKS" (DC bus short circuit)
- Use the discharging device described below.

#### 19.1.2 Discharging Device

##### Operating Principle

A contactor is installed to switch a resistor to the terminals L+ and L- of the DC bus connection to discharge the capacitors. The contactor is activated via a control input which is supplied with appropriate control voltage.



R discharging resistor  
K contactor contact

Fig. 19-1: Operating principle of discharging device

## Appendix

### Dimensioning

The individual components have to be sufficiently dimensioned:

- Value of the discharging resistor: 1000 ohm and at least 1000 W
- The discharging resistor and the contactor contact have to withstand the loads of practical operation (for example in the case of frequent use of the discharging device of the occurring continuous power).
- The contactor contact has to withstand the occurring direct voltage of a minimum of 1000 V.
- The contactor contact has to withstand the occurring discharge current according to the resistance value that is used, i.e. 1 A with 1000 ohm.

### How to Proceed for Discharging

---



**WARNING**

#### **Lethal electric shock caused by live parts with more than 50 V!**

Before working on live parts: De-energize the installation and secure the power switch against unintentional or unauthorized re-energization.

Wait at least **30 minutes** after switching off the supply voltages to allow discharging.

Check whether voltages have fallen below 50 V before touching live parts!

---

1. Install discharging device before switching on supply voltage for the first time.
2. Establish safe electrical connection between discharging device and object to be discharged.
3. On mains side, switch off supply voltages to drive system before activating discharging device.
4. Activate discharging device.

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# Notes

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