

IndraDrive

Supply Units, Power Sections
HMV, HMS, HMD, HCS02, HCS03

Project Planning Manual
R911318790

Edition 06



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1 Introduction

1.1 About this documentation

WARNING

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

Observe the contents of the documentations relevant to your drive system (see chapter [1.3 Overview of documentations, page 3](#)).

In particular, take the Project Planning Manual "Rexroth IndraDrive Drive Systems with HMV01/02, HMS01/02, HMD01, HCS02/03" into account.

Purpose of documentation

This documentation provides information on

- the project planning of IndraDrive systems
- considering the components

Supply units

- HMV01
- HMV02

Power sections

- HMS01
- HMS02
- HMD01
- HCS02
- HCS03

1.2 Editions

Edition	Release date	Notes
01	2007-03	-
02	2007-08	-
03	2013-11	-
04	2017-01	-
05	2019-06	Changes in comparison to previous edition: • Included note on RoHS conformity of the CSB01, CSH01 and CDB01 control sections (chapter "Important directions for use") • Updated type code • Updated type plate • Updated chapter "Overview of documentations" • Mains choke HNL01.1E-0100-N0202-A-480-NNNN (R911306578) replaced by follow-up type HNL01.1E-0100-N0220-A-480-NNNN (R911379296) • HCS02: Included information that devices with power supply from the DC bus (xxxV) cannot use the optional safety technology in conjunction with CSx02 control sections.
06	2020-04	Changes in comparison to previous edition: • Included new documentation: R911401938, DOK-CONNEC-MS2N*INDRV*-CAxx-EN-P, Motor cables and connections with IndraDrive • HMS01.1N-W0350: Corrected pictures of connection points at device

Tab. 1-1: Editions

1.3 Overview of documentations

1.3.1 Drive systems, system components

Title IndraDrive ...	Type of documentation	Document typecode ¹⁾ DOK-INDRV*-...	Material number R911...
Drive Systems with HMV01/02 HMS01/02, HMD01, HCS02/03	Project Planning Manual	SYSTEM*****-PRxx-EN-P	309636
Mi Drive Systems with KCU02, KSM02, KMS02	Project Planning Manual	KCU02+KSM02-PRxx-EN-P	335703
Supply Units, Power Sections HMV, HMS, HMD, HCS02, HCS03	Project Planning Manual	HMV-S-D+HCS-PRxx-EN-P	318790
Control sections CSB01, CSH01, CDB01	Project Planning Manual	CSH*****-PRxx-EN-P	295012
Control sections CSE02, CSB02, CDB02, CSH02	Project Planning Manual	Cxx02*****-PRxx-EN-P	338962
Additional Components and Accessories	Project Planning Manual	ADDCOMP****-PRxx-EN-P	306140

1) In the document typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: PR01 is the first edition of a Project Planning Manual)

Tab. 1-2: Documentations – overview

Title	Type of documentation	Document typecode ¹⁾	Material number R911...
Automation Terminals of the Rexroth Inline Rexroth Inline	Application Manual	DOK-CONTRL-ILSYSINS***- AWxx-EN-P	317021

1) In the document typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: AW01 is the first edition of an Application Manual)

Tab. 1-3: Documentations – overview

1.3.2 Motors

Title	Type of documentation	Document typecode ¹⁾ DOK-MOTOR*-...	Material number R911...
MAD / MAF Asynchronous Motors MAD / MAF	Project Planning Manual	MAD/MAF****-PRxx-EN-P	295781
MBS-H Synchronous Kit Spindle Motors	Project Planning Manual	MBS-H*****-PRxx-EN-P	297895
MLF Synchronous Linear Motors	Project Planning Manual	MLF*****-PRxx-EN-P	293635
MCL Ironless Linear Motors MCL	Project Planning Manual	MCL *****-PRxx-EN-P	330592

Title	Type of documentation	Document typecode ¹⁾ DOK-MOTOR*-...	Material number R911...
MKE Synchronous Motors Synchronous Servo Motors for Potentially Explosive Areas acc. to ATEX and UL / CSA	Project Planning Manual	MKE*GEN2***-PRxx-EN-P	297663
MSK Synchronous Servo Motors	Project Planning Manual	MSK*****-PRxx-EN-P	296289
MSK Synchronous Servo Motors for Potentially Explosive Areas	Project Planning Manual	MSK*EXGIIK3-PRxx-EN-P	312709
MSM Synchronous Servo Motors	Data Sheet	MSM*****-DAxx-EN-P	329338
MS2E Synchronous Servo Motors acc. to ATEX Directive 2014/34/EU	Project Planning Manual	MS2E*****-PR01-EN-P	394140
MS2N Synchronous Servo Motors	Project Planning Manual	MS2N*****-PRxx-EN-P	347583
MBT Synchronous Torque Motors	Project Planning Manual	MBT*****-PRxx-EN-P	298798

1) In the documentation typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: PR01 is the first edition of a Project Planning Manual)

Tab. 1-4: Documentations – motors

1.3.3 Cables

Title	Type of documentation	Document typecode ¹⁾ DOK-CONNEC-...	Material number R911...
Connection cable IndraDrive and IndraDyn	Selection Data	CABLE*INDRV-CAxx-EN-P	322949
Motor cables and connections with IndraDrive	Product Information	MS2N*INDRV*-CAxx-EN-P	401938

1) In the document typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: CA02 is the second edition of the "Selection Data" documentation)

Tab. 1-5: Documentations – overview

1.3.4 Firmware

Title Rexroth IndraDrive ...	Type of documentation	Document typecode ¹⁾ DOK-INDRV*-...	Part number R911...
Firmware for Drive Controllers MPH-08, MPB-08, MPD-08, MPC-08	Functional Description	MP*-08VRS**-APxx-EN-P	332643
Firmware for Drive Controllers MPH-07, MPB-07, MPD-07, MPC-07	Functional Description	MP*-07VRS**-FKxx-EN-P	328670
Firmware for Drive Controllers MPH-06, MPB-06, MPD-06, MPC-06	Functional Description	MP*-06VRS**-FKxx-EN-P	326766
Firmware for Drive Controllers MPH-05, MPB-05, MPD-05	Functional Description	MP*-05VRS**-FKxx-EN-P	320182
Firmware for Drive Controllers MPH-04, MPB-04, MPD-04	Functional Description	MP*-04VRS**-FKxx-EN-P	315485
Firmware for Drive Controllers MPH-03, MPB-03, MPD-03	Functional Description	MP*-03VRS**-FKxx-EN-P	308329
Firmware for Drive Controllers MPH-02, MPB-02, MPD-02	Functional Description	MP*-02VRS**-FKxx-EN-P	299223
Drive Controllers MPx-02 to MPx-08	Parameter Description	GEN-**VRS**-PAxx-EN-P	297317
MPx-02 to MPx-08 and HMV	Troubleshooting Guide	GEN-**VRS**-WAxx-EN-P	297319
Integrated Safety Technology	Functional and Application Description	SI*-**VRS**-FKxx-EN-P	297838
Integrated Safety Technology According to IEC61508	Functional Description	SI2-**VRS**-FKxx-EN-P	327664
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: FK02 is the second edition of a Functional Description)

Tab. 1-6: Documentations – Overview

Title	Type of documentation	Document typecode ¹⁾ DOK-INDRV*-...	Material number R911...
IndraDrive MPx-21 Functions	Application Manual	MP*-21VRS**-APxx-EN-P	385758
IndraDrive MPx-20 Functions	Application Manual	MP*-20VRS**-APxx-EN-P	345608

Title	Type of documentation	Document typecode¹⁾ DOK-INDRV*-...	Material number R911...
IndraDrive MPx-20 Version Notes	Release Notes	MP*-20VRS**-RNxx-EN-P	345606
IndraDrive Power Supply Basic PSB-21 Functions	Application Manual	PSB-21VRS**-APxx-EN-P	385754
IndraDrive Power Supply Basic PSB-21 Version Notes	Release Notes	PSB-21VRS**-RNxx-EN-P	385752
IndraDrive Power Supply Basic PSB-20 Functions	Application Manual	PSB-20VRS**-APxx-EN-P	345610
Rexroth IndraDrive Power Supply Basic PSB-19 Functions	Application Manual	PSB-19VRS**-APxx-EN-P	345602
Rexroth IndraDrive MPx-18 Functions	Application Manual	MP*-18VRS**-APxx-EN-P	338673
Rexroth IndraDrive MPx-18 Version Notes	Release Notes	MP*-18VRS**-RNxx-EN-P	338658
Rexroth IndraDrive MPx-17 Functions	Application Manual	MP*-17VRS**-APxx-EN-P	331236
Rexroth IndraDrive MPx-17 Version Notes	Release Notes	MP*-17VRS**-RNxx-EN-P	331588
Rexroth IndraDrive MPx-16 Functions	Application Manual	MP*-16VRS**-APxx-EN-P	326767
Rexroth IndraDrive MPx-16 Version Notes	Release Notes	MP*-16VRS**-RNxx-EN-P	329272
IndraDrive MPx-16 to MPx-21 and PSB Parameters	Reference Book	GEN1-PARA**-RExx-EN-P	328651

Title	Type of documentation	Document typecode ¹⁾ DOK-INDRV*-...	Material number R911...
IndraDrive MPx-16 to MPx-21 and PSB Diagnostics	Reference Book	GEN1-DIAG**-RExx-EN-P	326738
Rexroth IndraDrive Integrated Safety Technology "Safe Torque Off" (as of MPx-16)	Application Manual	SI3-**VRS**-APxx-EN-P	332634
IndraDrive Integrated Safety Technology "Safe Motion" (as of MPx-18)	Application Manual	SI3*SMO-VRS-APxx-EN-P	338920
Rexroth IndraDrive Rexroth IndraMotion MLD Libraries as of MPx-17	Reference Book	MLD-SYSLIB2-RExx-EN-P	332627
IndraDrive Rexroth IndraMotion MLD Libraries as of MPx-18	Reference Book	MLD-SYSLIB3-RExx-EN-P	338916
Rexroth IndraDrive Rexroth IndraMotion MLD as of MPx-17	Application Manual	MLD2-**VRS*-APxx-EN-P	334351
IndraDrive IndraMotion MLD MPx-18 and above	Application Manual	MLD3-**VRS*-APxx-EN-P	338914

1) In the document typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: RE02 is the second edition of a Reference Book)

Tab. 1-7: Documentations – firmware

Title	Type of documentation	Document typecode ¹⁾	Material number R911...
Productivity Agent Extended Diagnostic Functions with Rexroth IndraDrive	Application Manual	DOK-INDRV*-MLD-PAGENT*- AWxx-EN-P	323947

1) In the document typecodes, "xx" is a placeholder for the current edition of the documentation (e.g.: AW01 is the first edition of an Application Manual)

Tab. 1-8: Documentations – overview

1.4 Your comments



Your experience is important for our improvement processes of products and documentations.

If you find any mistakes in this documentation or have suggestions for changes, please send your feedback to the following address:

Bosch Rexroth AG

Dept. DC-AE/EPI5

Bürgermeister-Dr.-Nebel-Str. 2

97816 Lohr am Main, Germany

Email: dokusupport@boschrexroth.de

2 Important directions for use

2.1 Intended use

2.1.1 Introduction

Rexroth products are developed and manufactured to the state-of-the-art. The products are tested prior to delivery to ensure operational safety and reliability.

WARNING

Personal injury and property damage by using products incorrectly!

The products have been designed for use in an industrial environment and may only be used as intended. Failure to use them in the intended way may cause situations resulting in property damage and personal injury.



Rexroth as the manufacturer shall not honor any warranty, liability or compensatory claims for damages resulting from unintended use of the products. The user alone shall bear the risks of unintended use of the products.

Before using Rexroth products, make sure that all the prerequisites for an intended 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 their intended use.
- Leave hardware products in their original state, i.e., do not make any structural modifications. It is not permitted to decompile software products or alter their source codes.
- Do not install damaged or faulty products or put them into operation.
- Make sure that the products have been installed as described in the relevant documentation.

2.1.2 Areas of use and application

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

Controlling and monitoring the Drive controllers may require additional sensors and actuators.



The drive controllers may only be used with the accessories and attachments specified in this documentation. Components that are not expressly mentioned may neither be attached nor connected. The same applies to cables and lines.

Operation is only allowed in the specified configurations and combinations of the components using the software and firmware as specified in the relevant functional descriptions.

Drive controllers have to be programmed before commissioning to ensure that the motor executes the functions specific to the application.

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

Device types with different drive power and interfaces are available for using the Drive controllers in specific applications.

Typical applications include, for example:

- Handling and mounting systems
- Packaging and food machines
- Printing and paper converting machines
- Machine tools

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



Note regarding the **RoHS Directive 2011/65/EU**:

The CSB01, CSH01 and CDB01 control sections do not meet the requirements of the RoHS Directive 2011/65/EU.

However, the CSB01, CSH01 and CDB01 control sections may still be placed on the market within the EU if they are exclusively used in applications that are so-called "large-scale stationary industrial tools" or so-called "large-scale fixed installations".

This is stated by the derogation contemplated by Article 2, paragraph 4 of the RoHS Directive 2011/65/EU. Article 3 of this Directive specifies the definitions.

2.2 Unintended use

"Unintended use" refers to using the Drive controllers outside of the operating conditions, technical data and specifications described in this documentation.

Drive controllers must not be used, if ...

- they are exposed to operating conditions that do not meet the specified ambient conditions. This includes, for example, operation under water, under extreme temperature fluctuations or extreme maximum temperatures.
- Furthermore, Drive controllers may not be used in applications that have not been expressly authorized by Rexroth. Therefore, please carefully follow the specifications outlined in the general safety instructions!



Components of the IndraDrive system are **products of Category C3** (with restricted distribution) in accordance with IEC 61800-3. This Category comprises EMC limit values for line-based and radiated noise emission. Compliance with this Category (limit values) requires the appropriate measures of interference suppression to be used in the drive system (e.g., mains filters, shielding measures).

These components are not provided for use in a public low-voltage mains supplying residential areas. If these components are used in such a mains, high-frequency interference is to be expected. This can require additional measures of interference suppression.

3 Safety instructions for electric drives and controls

3.1 Definitions of terms

Application documentation	Application documentation comprises the entire documentation used to inform the user of the product about the use and safety-relevant features for configuring, integrating, installing, mounting, commissioning, operating, maintaining, repairing and decommissioning the product. The following terms are also used for this kind of documentation: Operating Instructions, Commissioning Manual, Instruction Manual, Project Planning Manual, Application Description, etc.
Component	A component is a combination of elements with a specified function, which are part of a piece of equipment, device or system. Components of the electric drive and control system are, for example, supply units, drive controllers, mains choke, mains filter, motors, cables, etc.
Control system	A control system comprises several interconnected control components placed on the market as a single functional unit.
Device	A device is a finished product with a defined function, intended for users and placed on the market as an individual piece of merchandise.
Electrical equipment	Electrical equipment encompasses all devices used to generate, convert, transmit, distribute or apply electrical energy, such as electric motors, transformers, switching devices, cables, lines, power-consuming devices, circuit board assemblies, plug-in units, control cabinets, etc.
Electric drive system	An electric drive system comprises all components from mains supply to motor shaft; this includes, for example, electric motor(s), motor encoder(s), supply units and drive controllers, as well as auxiliary and additional components, such as mains filter, mains choke and the corresponding lines and cables.
Installation	An installation consists of several devices or systems interconnected for a defined purpose and on a defined site which, however, are not intended to be placed on the market as a single functional unit.
Machine	A machine is the entirety of interconnected parts or units at least one of which is movable. Thus, a machine consists of the appropriate machine drive elements, as well as control and power circuits, which have been assembled for a specific application. A machine is, for example, intended for processing, treatment, movement or packaging of a material. The term "machine" also covers a combination of machines which are arranged and controlled in such a way that they function as a unified whole.
Manufacturer	The manufacturer is an individual or legal entity bearing responsibility for the design and manufacture of a product which is placed on the market in the individual's or legal entity's name. The manufacturer can use finished products, finished parts or finished elements, or contract out work to subcontractors. However, the manufacturer must always have overall control and possess the required authority to take responsibility for the product.
Product	Examples of a product: Device, component, part, system, software, firmware, among other things.
Project Planning Manual	A Project Planning Manual is part of the application documentation used to support the sizing and planning of systems, machines or installations.
Qualified persons	In terms of this application documentation, qualified persons are those persons who are familiar with the installation, mounting, commissioning and operation of the components of the electric drive and control system, as well as with the hazards this implies, and who possess the qualifications their

work requires. To comply with these qualifications, it is necessary, among other things,

- to be trained, instructed or authorized to switch electric circuits and devices safely on and off, to ground them and to mark them.
- to be trained or instructed to maintain and use adequate safety equipment.
- to attend a course of instruction in first aid.

Qualified personnel for handling functionally safe products

Individuals configuring, commissioning and operating functionally safe products must have the knowledge specified under "[Qualified persons](#)". Additionally, these individuals must be familiar with technical safety concepts as well as prevailing standards and regulations in the field of functional safety.

User A user is a person installing, commissioning or using a product which has been placed on the market.

3.2 General information

3.2.1 Using the Safety instructions and passing them on to others

Do not attempt to install and operate the components of the electric drive and control system without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with these components. If you do not have the user documentation for the components, contact your responsible Rexroth sales partner. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the components.

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

Improper use of these components, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, could result in property damage, injury, electric shock or even death.

3.2.2 Requirements for safe use

Read the following instructions before initial commissioning of the components of the electric drive and control system in order to eliminate the risk of injury and/or property damage. You must follow these safety instructions.

- Rexroth is not liable for damages resulting from failure to observe the safety instructions.
- Read the operating, maintenance and safety instructions in your language before commissioning. If you find that you cannot completely understand the application documentation in the available language, please ask your supplier to clarify.
- Proper and correct transport, storage, mounting and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the component.
- Only qualified persons may work with components of the electric drive and control system or within its proximity.
- Only use accessories and spare parts approved by Rexroth.

- Follow the safety regulations and requirements of the country in which the components of the electric drive and control system are operated.
- Only use the components of the electric drive and control system in the manner that is defined as appropriate. See chapter "Appropriate Use".
- The ambient and operating conditions given in the available application documentation must be observed.
- Applications for functional safety are only allowed if clearly and explicitly specified in the application documentation "Integrated Safety Technology". If this is not the case, they are excluded. Functional safety is a safety concept in which measures of risk reduction for personal safety depend on electrical, electronic or programmable control systems.
- The information given in the application documentation with regard to the use of the delivered components contains only examples of applications and suggestions.

The machine and installation manufacturers must

- make sure that the delivered components are suited for their individual application and check the information given in this application documentation with regard to the use of the components,
- make sure that their individual 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 allowed once it is sure that the machine or installation in which the components are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only allowed 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 application documentation.

The machine or installation manufacturer is responsible for compliance with the limit values as prescribed in the national regulations.

- The technical data, connection and installation conditions of the components are specified in the respective application documentations and must be followed at all times.

National regulations which the user has to comply with

- European countries: In accordance with 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)

3.2.3 Hazards by improper use

- High electrical voltage and high working current! Danger to life or serious injury by electric shock!
- High electrical voltage by incorrect connection! Danger to life or injury by electric shock!
- Dangerous movements! Danger to life, serious injury or property damage by unintended motor movements!
- Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electric drive systems!
- Risk of burns by hot housing surfaces!
- Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!
- Risk of injury by improper handling of batteries!
- Risk of injury by improper handling of pressurized lines!

3.3 Instructions with regard to specific dangers

3.3.1 Protection against contact with electrical parts and housings



This section concerns components of the electric drive and control system with voltages of **more than 50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating components of the electric drive and control system, it is unavoidable that some parts of these components conduct dangerous voltage.

High electrical voltage! Danger to life, risk of injury by electric shock or serious injury!

- Only qualified persons are allowed to operate, maintain and/or repair the components of the electric drive and control system.
- Follow the general installation and safety regulations when working on power installations.
- Before switching on, the equipment grounding conductor must have been permanently connected to all electric components in accordance with the connection diagram.
- Even for brief measurements or tests, operation is only allowed if the equipment grounding conductor has been permanently connected to the points of the components provided for this purpose.
- Before accessing electrical parts with voltage potentials higher than 50 V, you must disconnect electric components from the mains or from the power supply unit. Secure the electric component from reconnection.
- With electric components, observe the following aspects:
Always wait **30 minutes** after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.

- Install the covers and guards provided for this purpose before switching on.
- Never touch any electrical connection points of the components while power is turned on.
- Do not remove or plug in connectors when the component has been powered.
- Under specific conditions, electric drive systems can be operated at mains protected by residual-current-operated circuit-breakers sensitive to universal current (RCDs/RCMs).
- Secure built-in devices from penetrating foreign objects and water, as well as from direct contact, by providing an external housing, for example a control cabinet.

High housing voltage and high leakage current! Danger to life, risk of injury by electric shock!

- Before switching on and before commissioning, ground or connect the components of the electric drive and control system to the equipment grounding conductor at the grounding points.
- Connect the equipment grounding conductor of the components of the electric drive and control system permanently to the main power supply at all times. The leakage current is greater than 3.5 mA.
- Establish an equipment grounding connection with a minimum cross section according to the table below. With an outer conductor cross section smaller than 10 mm² (8 AWG), the alternative connection of two equipment grounding conductors is allowed, each having the same cross section as the outer conductors.

Cross section outer conductor	Minimum cross section equipment grounding conductor Leakage current ≥ 3.5 mA	
	1 equipment grounding conductor	2 equipment grounding conductors
1.5 mm ² (16 AWG)	10 mm ² (8 AWG)	2 × 1.5 mm ² (16 AWG)
2.5 mm ² (14 AWG)		2 × 2.5 mm ² (14 AWG)
4 mm ² (12 AWG)		2 × 4 mm ² (12 AWG)
6 mm ² (10 AWG)		2 × 6 mm ² (10 AWG)
10 mm ² (8 AWG)		-
16 mm ² (6 AWG)	16 mm ² (6 AWG)	-
25 mm ² (4 AWG)		-
35 mm ² (2 AWG)		-
50 mm ² (1/0 AWG)	25 mm ² (4 AWG)	-
70 mm ² (2/0 AWG)	35 mm ² (2 AWG)	-
...	...	...

Tab. 3-1: Minimum cross section of the equipment grounding connection

3.3.2 Protective extra-low voltage as protection against electric shock

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

On components of an electric drive and control system provided by Rexroth, all connections and terminals with voltages up to 50 volts are PELV ("Protective Extra-Low Voltage") systems. It is allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections.

Danger to life, risk of injury by electric shock! High electrical voltage by incorrect connection!

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 ("Protective Extra-Low Voltage").

3.3.3 Protection against dangerous movements

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

- Improper or wrong wiring or cable connection
- Operator errors
- Wrong input of parameters before commissioning
- Malfunction of sensors and encoders
- Defective components
- Software or firmware errors

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

The monitoring functions in the components of the electric drive and control system will normally be sufficient to avoid malfunction in the connected drives. Regarding personal safety, especially the danger of injury and/or property 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, serious injury or property damage!

A **risk assessment** must be prepared for the installation or machine, with its specific conditions, in which the components of the electric drive and control system are installed.

As a result of the risk assessment, the user must provide for monitoring functions and higher-level measures on the installation side for personal safety. The safety regulations applicable to the installation or machine must be taken into consideration. Unintended machine movements or other malfunctions are possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, injury and/or property damage:

- Keep free and clear of the machine's range of motion and moving machine parts. Prevent personnel from accidentally entering the machine's range of motion by using, for example:
 - Safety fences
 - Safety guards
 - Protective coverings
 - Light barriers
- Make sure the safety fences and protective coverings are strong enough to resist maximum possible kinetic energy.
- Mount emergency stopping switches in the immediate reach of the operator. Before commissioning, verify that the emergency stopping equipment works. Do not operate the machine if the emergency stopping switch is not working.
- Prevent unintended start-up. Isolate the drive power connection by means of OFF switches/OFF buttons or use a safe starting lockout.
- Make sure that the drives are brought to 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 counterbalancing of the vertical axes.
- The standard equipment **motor holding brake** or an external holding brake controlled by the drive controller is **not sufficient to guarantee personal safety!**
- Disconnect electrical power to the components of the electric drive and control system using the master switch and secure them from reconnection ("lock out") 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 components of the electric drive and control system and their supply leads. If the use of these devices cannot be avoided, check the machine or installation, at initial commissioning of the electric drive and control system, for possible malfunctions when operating such high-frequency, remote control and radio equipment in its possible positions of normal use. It might possibly be necessary to perform a special electromagnetic compatibility (EMC) test.

3.3.4 Protection against electromagnetic and magnetic fields during operation and mounting

Electromagnetic and magnetic fields!

Health hazard for persons with active implantable medical devices (AIMD) such as pacemakers or passive metallic implants.

- Hazards for the above-mentioned groups of persons by electromagnetic and magnetic fields in the immediate vicinity of drive controllers and the associated current-carrying conductors.

- Entering these areas can pose an increased risk to the above-mentioned groups of persons. They should seek advice from their physician.
- If overcome by possible effects on above-mentioned persons during operation of drive controllers and accessories, remove the exposed persons from the vicinity of conductors and devices.

3.3.5 Protection against contact with hot parts

Hot surfaces of components of the electric drive and control system. Risk of burns!

- Do not touch hot surfaces of, for example, braking resistors, heat sinks, supply units and drive controllers, motors, windings and laminated cores!
- According to the operating conditions, temperatures of the surfaces can be **higher than 60 °C** (140 °F) during or after operation.
- Before touching motors after having switched them off, let them cool down for a sufficient period of time. Cooling down can require **up to 140 minutes!** The time required for cooling down is approximately five times the thermal time constant specified in the technical data.
- After switching chokes, supply units and drive controllers 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, and in accordance with the respective safety regulations, the manufacturer of the machine or installation must take measures to avoid injuries caused by burns in the final application. These measures can be, for example: Warnings at the machine or installation, guards (shieldings or barriers) or safety instructions in the application documentation.

3.3.6 Protection during handling and mounting

Risk of injury by improper handling! Injury by crushing, shearing, cutting, hitting!

- Observe the relevant statutory regulations of accident prevention.
- Use suitable equipment for mounting and transport.
- Avoid jamming and crushing by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- Use suitable protective equipment (hard hat, safety goggles, safety shoes, safety gloves, for example).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids from the floor due to the risk of falling!

3.3.7 Battery safety

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

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 attempt to 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 the electrical parts installed in the devices.
- Only use the battery types specified for the product.



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 separately from other waste. Observe the national regulations of your country.

3.3.8 Protection against pressurized systems

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

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 (safety goggles, safety shoes, safety gloves, for example).
- Immediately clean up any spilled liquids from the floor due to the risk of falling!



Environmental protection and disposal! The agents (e.g., fluids) used to operate the product might not be environmentally friendly. Dispose of agents harmful to the environment separately from other waste. Observe the national regulations of your country.

3.4 Explanation of signal words and the Safety alert symbol

The Safety Instructions in the available application documentation contain specific signal words (DANGER, WARNING, CAUTION or NOTICE) and, where required, a safety alert symbol (in accordance with ANSI Z535.6-2011).

The signal word is meant to draw the reader's attention to the safety instruction and identifies the hazard severity.

The safety alert symbol (a triangle with an exclamation point), which precedes the signal words DANGER, WARNING and CAUTION, is used to alert the reader to personal injury hazards.

DANGER

In case of non-compliance with this safety instruction, death or serious injury **will** occur.

WARNING

In case of non-compliance with this safety instruction, death or serious injury **could** occur.

CAUTION

In case of non-compliance with this safety instruction, minor or moderate injury could occur.

NOTICE

In case of non-compliance with this safety instruction, property damage could occur.

4 General data and specifications

4.1 Acceptance tests and approvals

Declaration of conformity Declarations of conformity confirm that the components comply with the valid EN standards and EC directives. If required, our sales representative can provide you with the declarations of conformity for components.

 DX000011v01_en.FH11	Drive controllers, Supply units	Motors
CE conformity regarding Low-Voltage Directive	EN 61800-5-1:2007	EN 60034-1:2010+Cor.:2010 EN 60034-5:2001+A1:2007
CE conformity regarding EMC product standard	EN 61800-3:2004 + A1:2012	

Tab. 4-1: CE - applied standards

C-UL-US listing The components are listed by **UL** (Underwriters Laboratories Inc.®). Proof of certification can be found online. Enter the terms "UL" and "databases" in a search engine to get to the relevant UL web page. With the file number you will find the proof of certification.

 Listed POW. CONV. EQ. 97Y4 DX000009v01_en.B1	- UL standard: UL 508C - CSA standard: C22.2 No. 274-13
	Company Name BOSCH REXROTH ELECTRIC DRIVES & CONTROLS GMBH Category Name: Power Conversion Equipment
	File numbers IndraDrive components: - E134201 - E227957 The control sections are part of the listed components. The HAB01.1-0350-1640-NN fan unit is part of the listed components HMV01.1R-W0210 and HMS01.1N-W0350.

Tab. 4-2: C-UL listing



UL ratings

When using the component in the scope of CSA / UL, observe the UL ratings for each component.

Only the following components have been approved in the scope of CSA / UL for supplying HMS, HMD, KCU, KSM, KMS components:

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

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



UL wiring material

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 "Ambient and operating conditions").

C-UR-US listing

The components are listed by **UL** (Underwriters Laboratories Inc.®). Proof of certification can be found online. Enter the terms "UL" and "databases" in a search engine to get to the relevant UL web page. With the file number you will find the proof of certification.

 CUR_Zeichen.fh11	• UL standard: UL 1004-1 • CSA standard: Canadian National Standard C22.2 No. 100
	Company Name BOSCH REXROTH ELECTRIC DRIVES & CONTROLS GMBH
	Category Name: Servo and Stepper Motors - Component
	File numbers MSK, MSM motors: E335445

Tab. 4-3: C-UR listing



UL wiring material (ready-made Rexroth cables)

In the scope of CSA / UL, use copper only; class 6 or equivalent only with minimum allowed wire temperature of 75°C.



Allowed pollution degree

Comply with the allowed pollution degree of the components (see "Ambient and operating conditions").

CCC (China Compulsory Certification)

The CCC mark is 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 existed since 2003.

CNCA is the Chinese authority responsible for certification guidelines. When a product is imported in China, the certification will be checked at customs using the entries in a database. Three criteria are typically critical for certification being required:

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

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

4.2 Transport and storage

4.2.1 Transporting the components

Ambient and operating conditions - transport

Description	Symbol	Unit	Value
Temperature range	T_{a_tran}	°C	-20 ... +70
Relative humidity		%	5 ... 95
Absolute humidity		g/m ³	1 ... 60
Climatic category (IEC 721)			2K3
Moisture condensation			Not allowed
Icing			Not allowed

Tab. 4-4: Ambient and operating conditions - transport

4.2.2 Storing the components

NOTICE

Risk of damage to components from long-term storage!

Some components contain electrolytic capacitors which may deteriorate during storage.

When storing the following components for a longer period of time, run them **once a year for at least 1 hour**:

- Converters and supply units: Operated with mains voltage U_{LN}
- Inverters and DC bus capacitor units: Operated with DC bus voltage U_{DC}

Ambient and operating conditions - storage

Description	Symbol	Unit	Value
Temperature range	T_{a_store}	°C	-20 ... +55
Relative humidity		%	5 ... 95
Absolute humidity		g/m ³	1 ... 29
Climatic category (IEC721)			1K3
Moisture condensation			Not allowed
Icing			Not allowed

Tab. 4-5: Ambient and operating conditions - storage

4.3 Installation conditions

4.3.1 Ambient and operating conditions

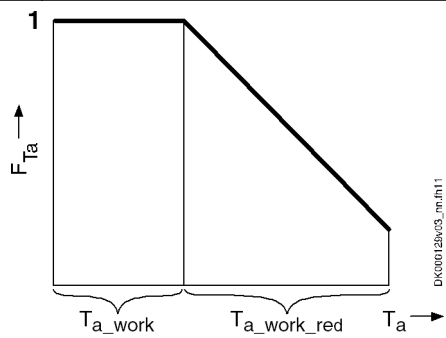
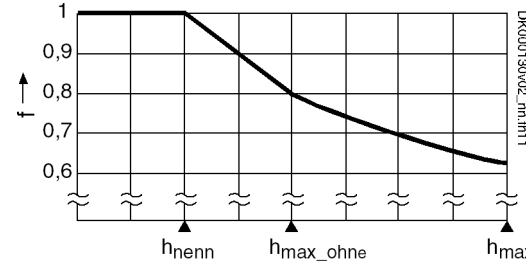


Check that the ambient conditions, in particular the control cabinet temperature, are complied with by calculating the heat levels in the control cabinet. Afterwards, make the corresponding measurements to verify that the ambient conditions have actually been complied with.

In the technical data of the individual components, the power dissipation is specified as an important input value for calculating the heat levels.

Ambient and operating conditions (HCS, HMV, HMS, HMD, HCQ, HCT, KCU, HLC, HNF)

Description	Symbol	Unit	Value
Conductive dirt contamination	-	-	Not allowed Protect the devices against conductive dirt contamination by mounting them in control cabinets with the degree of protection IP54 (in accordance with IEC529).
Degree of protection of the device (IEC529)	-	-	IP20
Use within scope of CSA / UL	-	-	For use in NFPA 79 Applications only!
Temperature during storage	-	-	See chapter 4.2.2 "Storing the components" on page 23
Temperature during transport	-	-	See chapter 4.2.1 "Transporting the components" on page 23
Allowed mounting position Definition of mounting positions: See chapter "Mounting positions of components" on page 26	-	-	G1 ³⁾
Installation altitude	h_{nenn}	m	1000
Ambient temperature range	T_{a_work}	°C	0 ... 40

Description	Symbol	Unit	Value
Derating vs. ambient temperature: The performance data are reduced by the factor F_{Ta} in the ambient temperature range $T_{a_work_red}$: $F_{Ta} = 1 - [(T_a - 40) \times f_{Ta}]$ Example: With an ambient temperature $T_a = 50\text{ °C}$ and a capacity utilization factor $f_{Ta} = 2\%/K$, the rated power is reduced to $P_{DC_cont_red} = P_{DC_cont} \times F_{Ta} =$ $P_{DC_cont} \times (1 - [(50 - 40) \times 0.02]) = P_{DC_cont} \times 0.8$ Operation at ambient temperatures outside of T_{a_work} and $T_{a_work_red}$ is not allowed!			
	$T_{a_work_red}$	°C	40 ... 55
	f_{Ta}	%/K	2.0 Exception HMV02.1R-W0015-A-07-NNNN: 2.7
Derating vs. installation altitude: At an installation altitude $h > h_{nenn}$, the available performance data are reduced by the factor f^2 . At an installation altitude in the range h_{max_ohne} to h_{max} , an isolating transformer has to be installed at the drive system mains connection. Operation above h_{max} is not allowed!			
	h_{max_ohne}	m	2000
	h_{max}	m	4000
Simultaneous derating for ambient temperature and installation altitude	Allowed; reduce performance data with the product $f \times F_{Ta}$		
Relative humidity	-	%	5 ... 95
Absolute humidity	-	g/m ³	1 ... 29
Climatic category (IEC 60721-3-3)	-	-	3K3
Allowed pollution degree (EN 50178)	-	-	2
Resistance to chemically active substances (IEC 60721-3-3)	-	-	Class 3C1
Vibration sine: amplitude (peak-peak) at 10 ... 57 Hz ¹⁾	-	mm	0.15
Vibration sine: acceleration at 57 ... 150 Hz ¹⁾	-	g	1
Overvoltage category	-	-	III (according to IEC 60664-1)

1)
2)

According to EN 60068-2-6
Reduced performance data for drive controllers: allowed DC bus continuous power, braking resistor continuous power, continuous current; additionally for HCS01, HCQ, HCT drive controllers: allowed mains voltage

- 3) Some components can be operated in mounting positions other than G1. The allowed mounting positions are specified in the technical data of the components.

Tab. 4-6: *Ambient and operating conditions (HCS, HMV, HMS, HMD, HCQ, HCT, KCU, HLC, HNF)*

4.3.2 Mounting position

Mounting positions of components

NOTICE

Risk of damage to the components by incorrect mounting position!

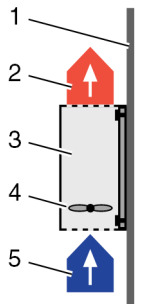
Only operate the components in their allowed mounting positions. The allowed mounting positions are specified in the technical data of the components.

For supply units and drive controllers installed in control cabinets, only the mounting position G1 is usually allowed.

Some components can also be operated in mounting positions other than G1. The allowed mounting positions are specified in the technical data of the component.

Mounting positions

The allowed mounting positions are specified with G1, G2, G3, G4 or G5 in the technical data of the components.

Mounting position	Description
G1	 DF000659v01_nn.FH11 Normal mounting position The air heated inside the component can flow unimpeded vertically upward. In the case of components with integrated fans, the natural convection supports the forced cooling air current. 1. Mounting surface 2. Outgoing, heated air 3. Component 4. Fan within the component (forces the cooling air current) 5. Cooling air
G2	180° to normal mounting position
G3	90° to normal mounting position
G4	bottom mounting; mounting surface on the bottom
G5	top mounting; mounting surface at the top

Tab. 4-7: *Mounting positions*

4.3.3 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 the controls and drives, it cannot be completely ruled out that any reactions with the materials we use 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/materials.

4.4 Voltage testing and insulation resistance testing

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

Testing	Test rate
Voltage testing	100% (EN 61800-5-1)
Insulation resistance testing	100% (EN 60204-1)

Tab. 4-8: Applied standards

4.5 Control voltage (24V supply)



PELV¹⁾ for 24V power supply unit

For the 24V supply of the devices of the IndraDrive range, use a power supply unit or a control-power transformer with protection by PELV 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_{peak} or 30 V_{ac}
- Max. output power: 10000 VA

The data in the table below generally apply to the 24V supply of the devices of the IndraDrive range. For other data, such as power consumption and inrush currents, see the technical data for each 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 without operation of motor holding brakes in Rexroth motors	U _{N3}	V	20.4 ... 28.8 (24 +20% -15%) When using HMV01.1E, HMV01.1R, HMV02.1R, HLB01.1D supply units: 22.8 ... 27.3 (24 -5%, 26 +5%)
Control voltage for drive systems with operation of motor holding brakes in Rexroth motors	U _{N3}	V	Depending on the motor cable length, the control voltage has to be within the following voltage ranges: • Motor cable length < 50 m: 22.8 ... 25.2 (24 ±5%) • Motor cable length > 50 m: 24.7 ... 27.3 (26 ±5%) Take the data of the corresponding motor holding brake into account.

1) **Protective Extra Low Voltage**

Description	Symbol	Unit	Value
External control voltage at HCS02 devices of "NNNV" design (see HCS02 type code; other design: DC 24 V power supply from the DC bus and external)	U_{N3}	V	26 ... 28.8 The output voltage of the internal switching power supply unit is $24 \pm 10\%$.
Max. ripple content	w	-	The amplitudes of the alternating component on U_{N3} must be within the specified voltage range.
Maximum allowed overvoltage	U_{N3max}	V	33 (max. 1 ms)

Tab. 4-9: Control voltage

**Overvoltage**

Overvoltage greater than 33 V has to be discharged by 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 also 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.



Applies to all devices except HCS01 and HMV02:

Insulation monitoring impossible

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

5 Power sections for converters - IndraDrive C

5.1 Types

Converter	Types	Features
HCS02	W0012	Compact modular design 1.5 kW to 11 kW Continuous currents up to 28 A
	W0028	
	W0054	
	W0070	
HCS03	W0070	Compact modular design 25 kW to 120 kW Continuous currents up to 200 A
	W0100	
	W0150	
	W0210	
	W0280	
	W0350	

Tab. 5-1: Types

5.2 HCS02 power sections

5.2.1 Brief description, use and design

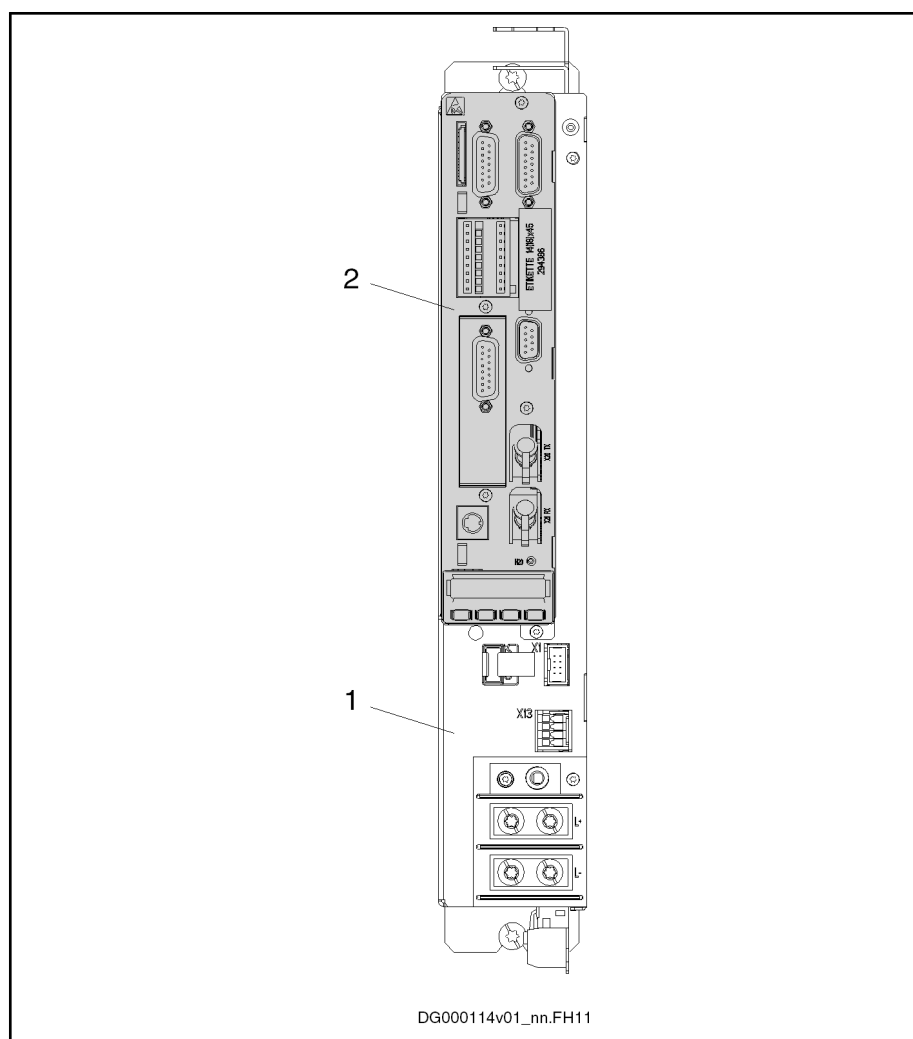
Brief description The HCS02 compact converters are part of the Rexroth IndraDrive C product range and are used to operate single axes.

Use The different types are used as follows:

Type	Use
HCS02.1E-Wxxxx-NNNN HCS02.1E-Wxxxx-NNNV	Operation of a three-phase a.c. motor (asynchronous or synchronous motor) in the power range from 1.5 kW to 11 kW.
HCS02.1E-Wxxxx-LxxN Load-dependent fan control	Applications with operation at partial load and requirement of a low degree of noise development.

Tab. 5-2: Use of HCS02

Structure, block diagrams



1

Power section

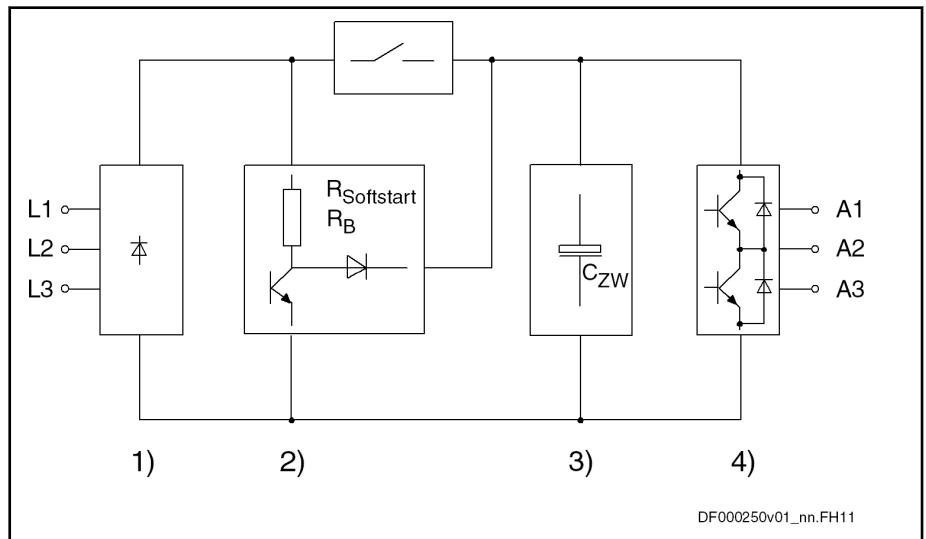
2

Control section

Fig. 5-1:

Basic structure of the drive controller

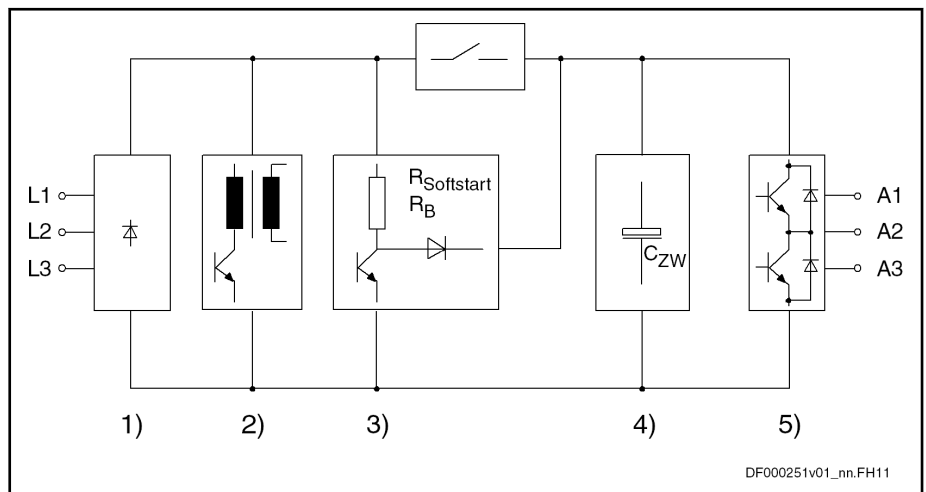
HCS02.1E-W0012-NNNN; -LNNN



- 1) Mains input with rectifier
- 2) Braking resistor circuit; charging current limitation
- 3) DC bus capacitances
- 4) Inverter stage with output to motor

Fig. 5-2: HCS02.1E-W0012-NNNN, -LNNN - block diagram

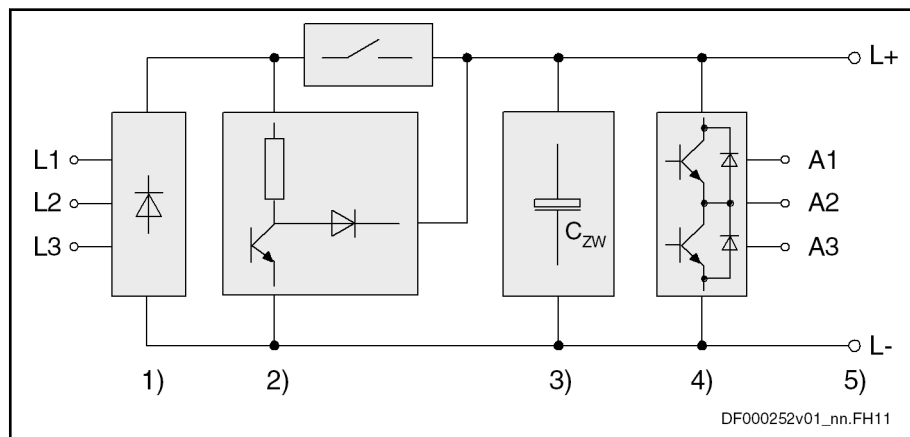
HCS02.1E-W0012-NNNV



- 1) Mains input with rectifier
- 2) Optional integrated control voltage supply
- 3) Braking resistor circuit; charging current limitation
- 4) DC bus capacitances
- 5) Inverter stage with output to motor

Fig. 5-3: HCS02.1E-W0012-NNNV - block diagram

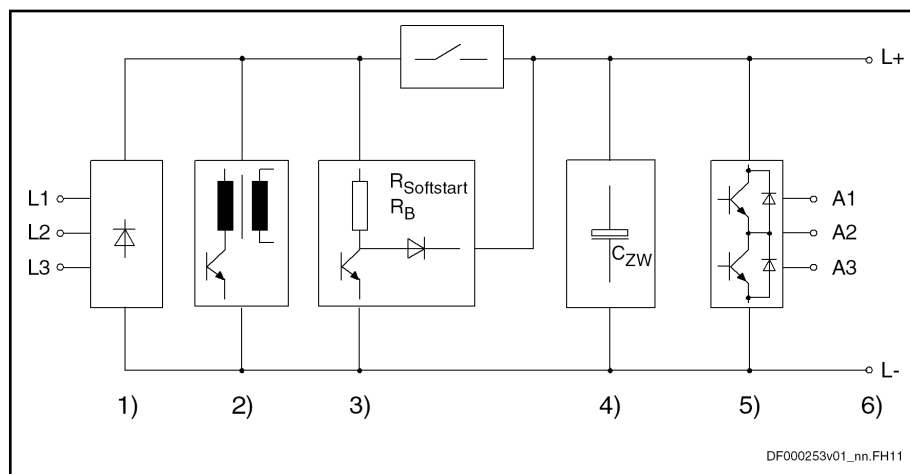
HCS02.1E-W0028-NNNN; -LNNN



- 1) Mains input with rectifier
- 2) Braking resistor circuit; charging current limitation
- 3) DC bus capacitances
- 4) Inverter stage with output to motor
- 5) DC bus connection

Fig. 5-4: HCS02.1E-W0028-NNNN; -LNNN - block diagram

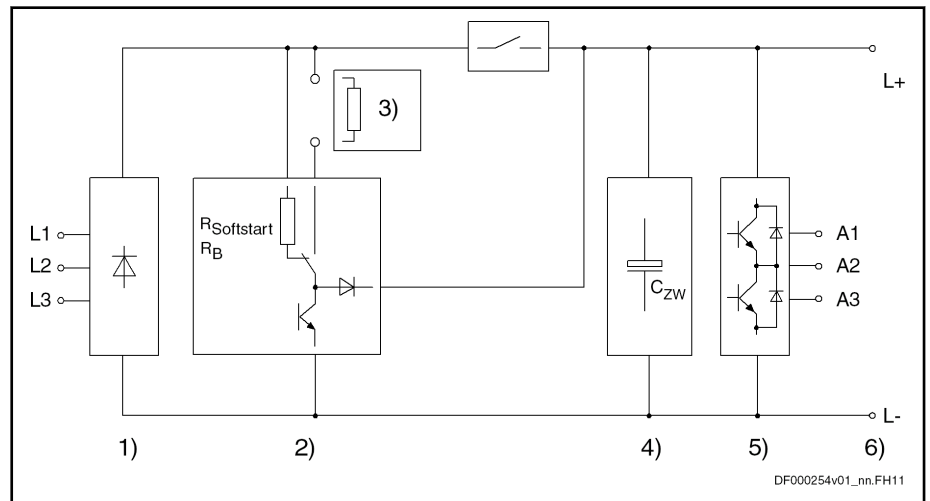
HCS02.1E-W0028-NNNV



- 1) Mains input with rectifier
- 2) Optional integrated control voltage supply
- 3) Braking resistor circuit; charging current limitation
- 4) DC bus capacitances
- 5) Inverter stage with output to motor
- 6) DC bus connection

Fig. 5-5: HCS02.1E-W0028-NNNV - block diagram

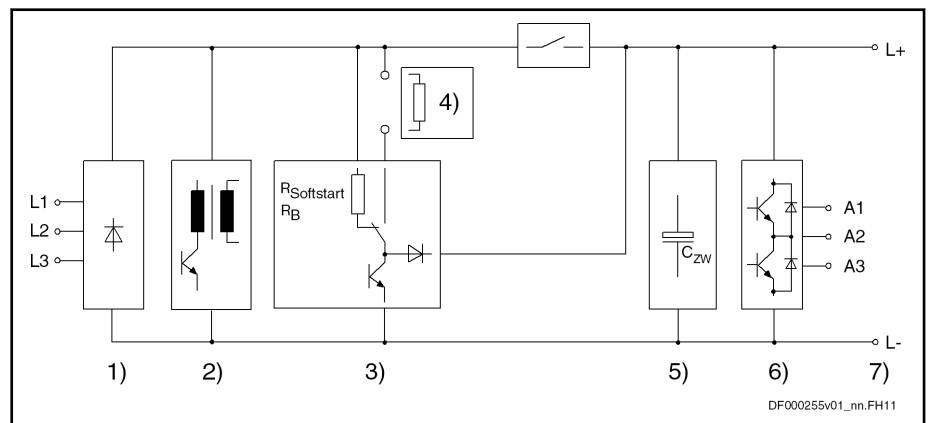
HCS02.1E-W0054/70-NNNN; -LNNN



- 1) Mains input with rectifier
- 2) Braking resistor circuit; charging current limitation
- 3) Optional external braking resistor (activated via parameter "P-0-0860, Converter configuration")
- 4) DC bus capacitances
- 5) Inverter stage with output to motor
- 6) DC bus connection

Fig. 5-6: HCS02.1E-W0054/70-NNNN; -LNNN - block diagram

HCS02.1E-W0054/70-NNNV



- 1) Mains input with rectifier
- 2) Optional integrated control voltage supply
- 3) Braking resistor circuit; charging current limitation
- 4) Optional external braking resistor (activated via parameter "P-0-0860, Converter configuration")
- 5) DC bus capacitances
- 6) Inverter stage with output to motor
- 7) DC bus connection

Fig. 5-7: HCS02.1E-W0054/70-NNNV - block diagram

5.2.2 Type code and identification

Type code



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

HCS02

Short type designation	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	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
Example:	H	C	S	0	2	.	1	E	-	W	0	0	1	2	-	A	-	0	3	-	N	N	N	N																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														

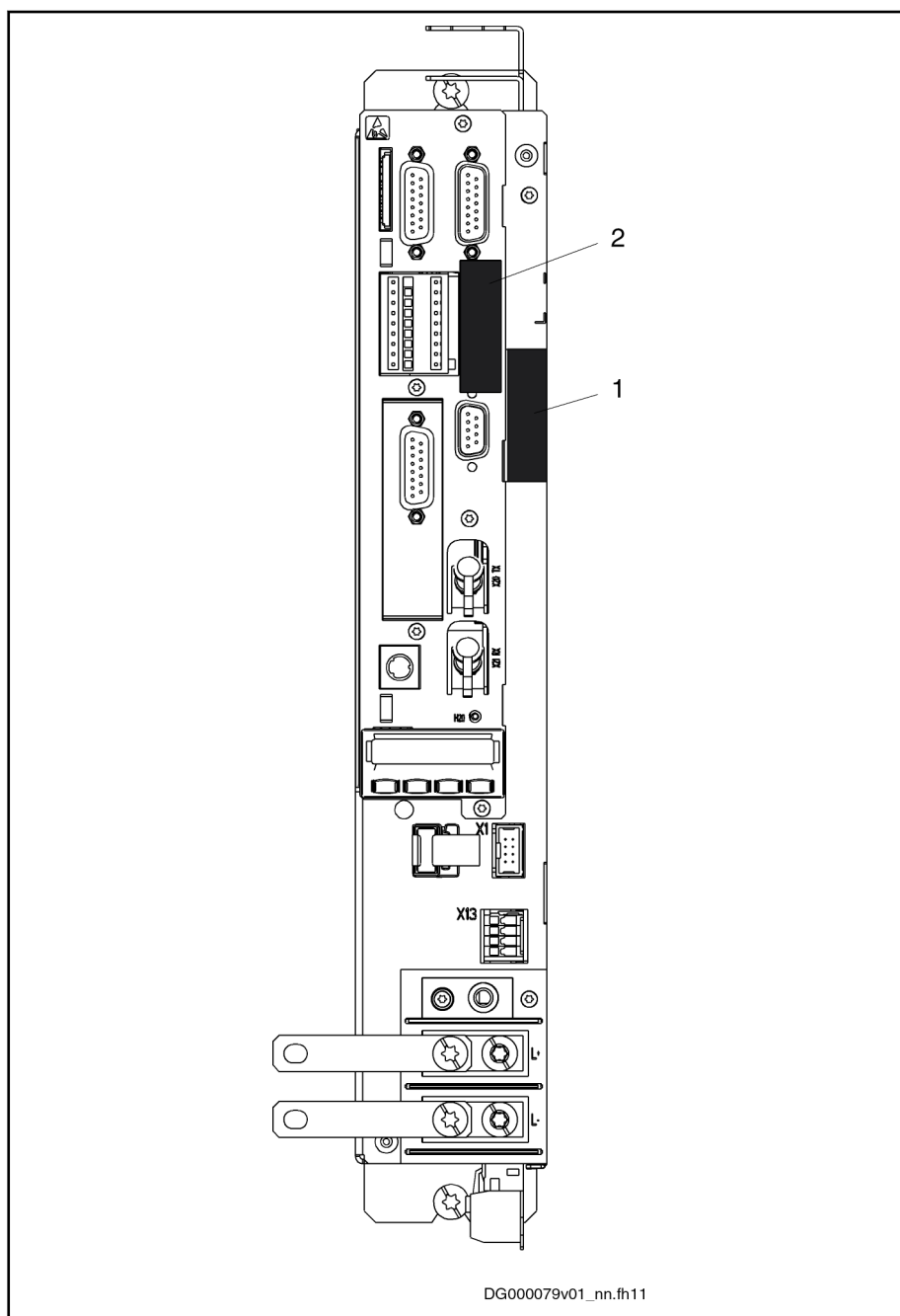
1)

Devices with power supply from the DC bus (xxxV) **cannot** use the optional safety technology in conjunction with CSx02 control sections.

Tab. 5-3: HCS02, type code

Identification

Type plate arrangement



- 1 power section type plate
- 2 control section type plate

Fig. 5-8: Type plate arrangement

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 5-9: Type plate (electrical equipment)

5.2.3 Scope of supply

- 1 × touch guard
- Connectors for the electrical connection points at the device
- 1 × Instruction Manual (in the English language)

5.2.4 Technical data

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage" on page 23](#).

Installation conditions: See [chapter 4.3 "Installation conditions" on page 24](#).

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Short circuit current rating	SCCR	A rms	42000			
Rated input voltage, power ¹⁾	U _{LN_nenn}	V	3 x AC 200...500			
Rated input current	I _{LN}	A	6.0	13.0	20.0	30.0
Output voltage	U _{out}	V	3 x AC 0...530			
Output current	I _{out}	A	4.5	12.0	20.6	28.0
Latest amendment: 2019-02-20						

- 1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 5-4: HCS - Ambient and operating conditions - UL ratings

Information on standards

Applied standards

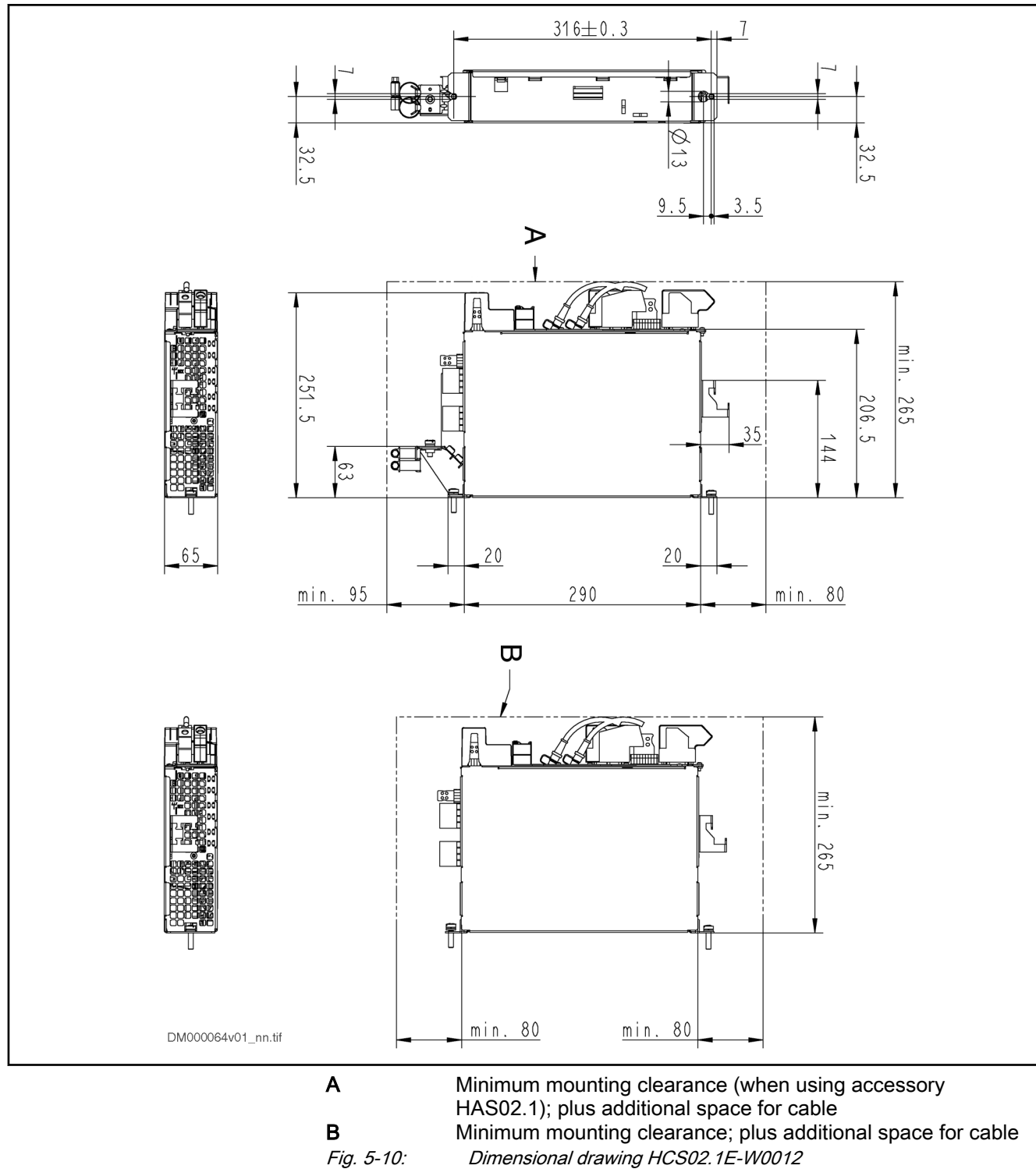
Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Listing in accordance with UL standard			UL 508C			
UL files			E134201			
Listing in accordance with CSA standard			C22.2 No. 274-13			
Latest amendment: 2019-02-20						

Tab. 5-5: HCS - Applied standards

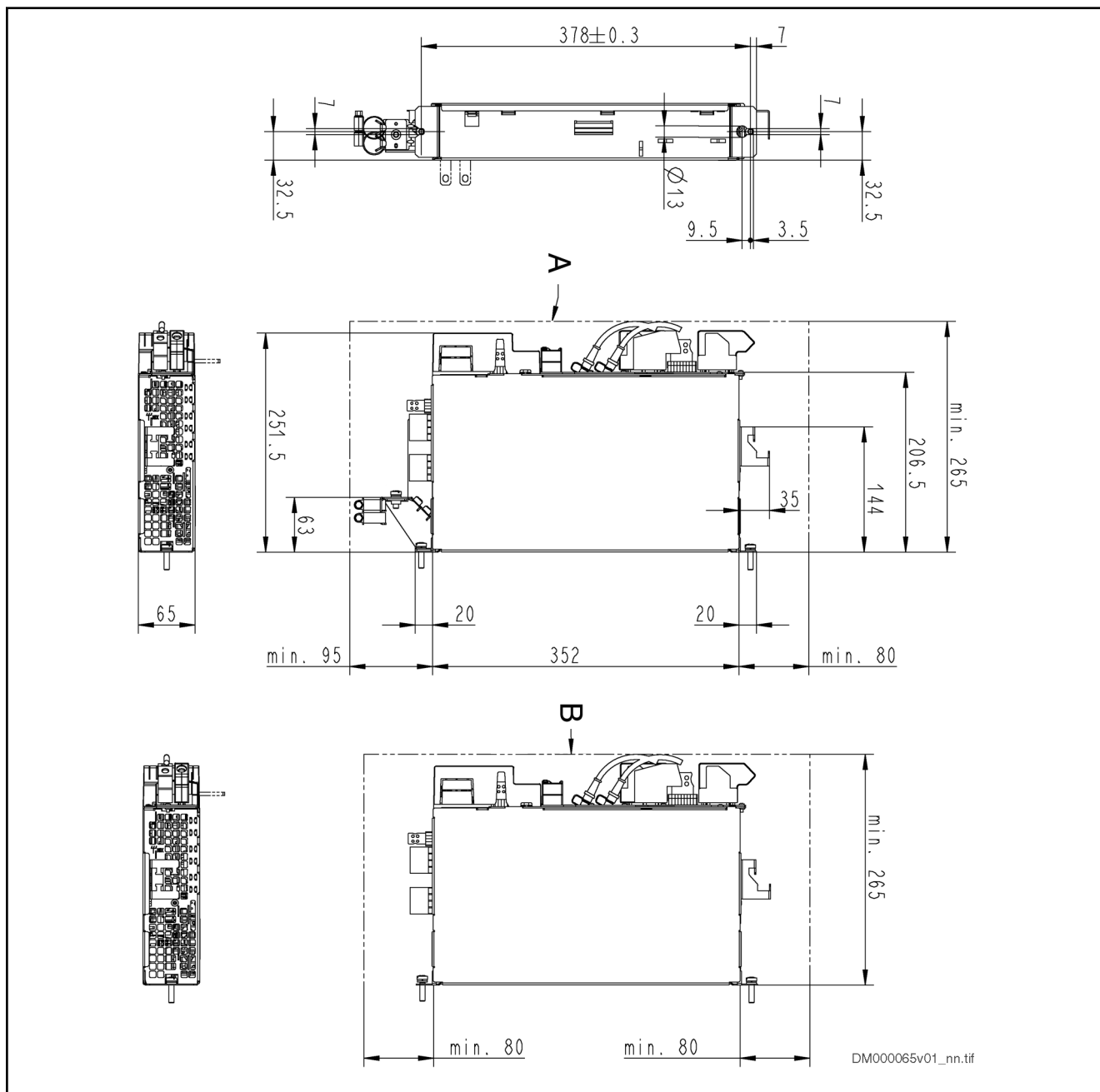
Mechanics and mounting

Dimensional drawings

Dimensional drawing HCS02.1E-W0012

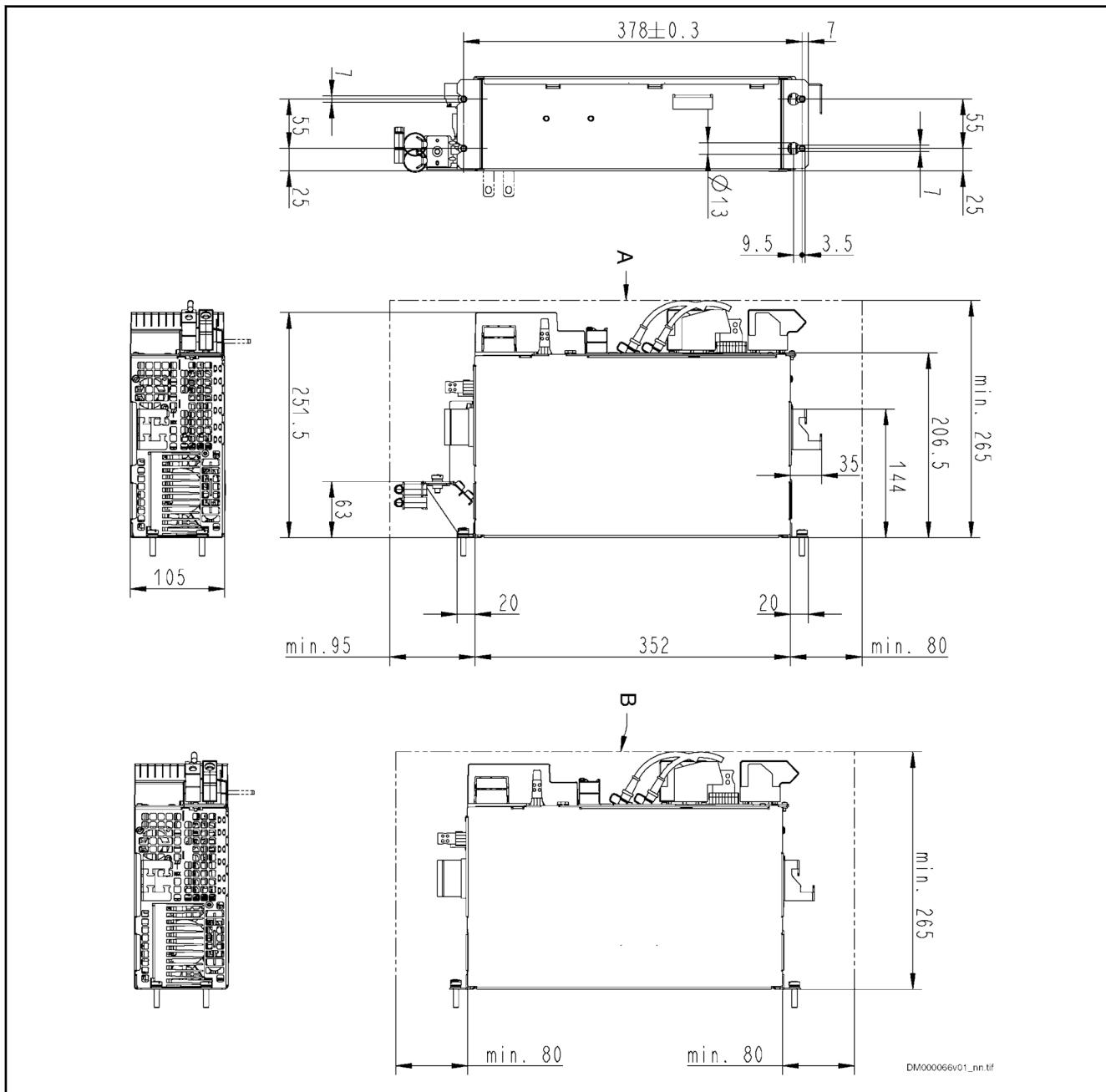


Dimensional drawing HCS02.1E-W0028



- A** Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable
- B** Minimum mounting clearance; plus additional space for cable
- Fig. 5-11: Dimensional drawing HCS02.1E-W0028

Dimensional drawing HCS02.1E-W0054/70



- A** Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable
- B** Minimum mounting clearance; plus additional space for cable
- Fig. 5-12: Dimensional drawing HCS02.1E-W0054 and HCS02.1E-W0070*

Dimensions, mass, insulation, sound pressure level

Data for mass, sound pressure level, insulation

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Mass	m	kg	2.90	3.80	6.70	6.80
Device height ¹⁾	H	mm	290	352		
Device depth ²⁾	T	mm	206			
Device width ³⁾	B	mm	65		105	
Insulation resistance at 500 V DC	R _{is}	Mohm	1.00	8.00		
Capacitance against housing	C _Y	nF	2 x 100			
Average sound pressure level (accuracy class 2) at P _{DC_cont} ⁴⁾	L _P	dB (A)	60		61	
Latest amendment: 2019-02-20						

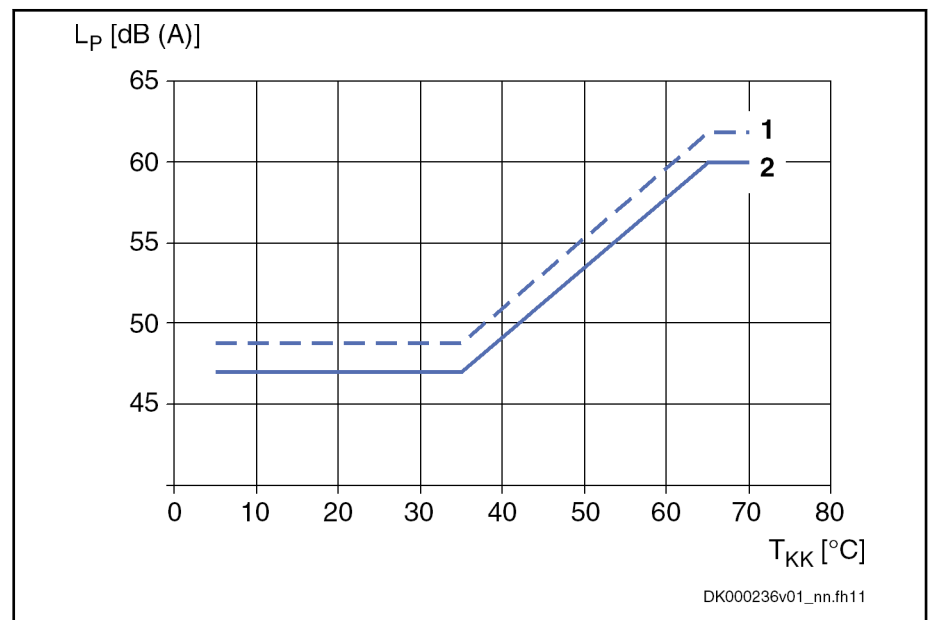
1) 2) 3)
4)

Housing dimension; see also related dimensional drawing
According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 5-6: HCS - Data for mass, dimensions, sound pressure level, insulation

Temperature-dependent fan control

In devices of the "-L***" design, the internal fan of the cooling system is controlled depending on the temperature of the cooling system. As the load increases, the temperature at the heat sink rises and thereby the sound pressure level according to the characteristic below. The specified "average sound pressure level L_P" applies to operation under rated conditions.



T_{KK}

Temperature at heat sink

L_P

Average sound pressure level

1

HCS02.1E-W0054/W0070-...-L***

2

HCS02.1E-W0012/W0028-...-L***

Fig. 5-13:

Characteristic of sound pressure level for HCS02 with "-L***" design

Power dissipation, mounting position, cooling, distances**Cooling and power dissipation data**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Ambient temperature range for operation with nominal data	T _{a_work}	°C	0...40			
Ambient temperature range for operation with reduced nominal data	T _{a_work_red}	°C	0...55			
Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red}	f _{Ta}	%/K	2.0			
Allowed mounting position			G1			
Cooling type			Forced ventilation			
Volumetric capacity of forced cooling	V	m³/h	approx. 24		approx. 40	
Allowed switching frequencies ¹⁾	f _s	kHz	4, 8, 12, 16			
Power dissipation at I _{out_cont} = 0 A; f _s = f _s (min.) ²⁾	P _{Diss_0A_fs_min}	W	25	35	85	
Power dissipation at I _{out_cont} = 0 A; f _s = f _s (max.) ³⁾	P _{Diss_0A_fs_max}	W	70	110	195	185
Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾	P _{Diss_cont}	W	80.00	130.00	270.00	300.00
Minimum distance on the top of the device ⁵⁾	d _{top}	mm	80			
Minimum distance on the bottom of the device ⁶⁾	d _{bot}	mm	80			
Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD}	ΔT	K	12	40		50
Latest amendment: 2019-02-20						

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}
- 4) Plus dissipation of braking resistor and control section
- 5) 6) See fig. "Air intake and air outlet at device"
- Tab. 5-7: HCS - Data for cooling and power dissipation

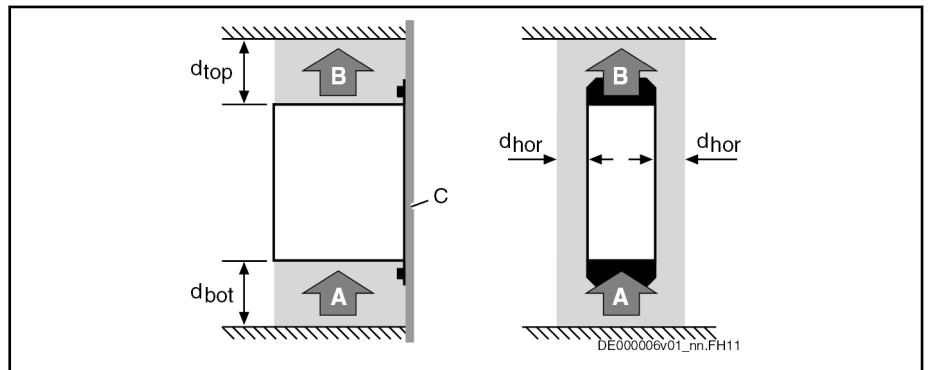
NOTICE

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



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

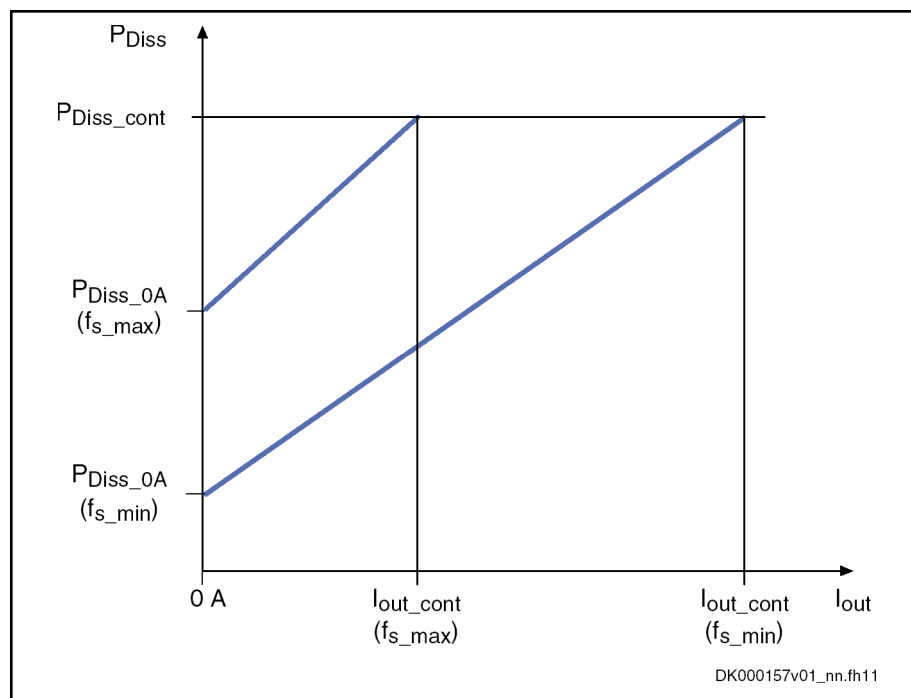
Fig. 5-14: Air intake and air outlet at device

Power dissipation vs. output current

The figure below illustrates the connection between power dissipation and output current, depending on the switching frequency f_s which was set at the drive controller. See also Parameter Description "P-0-0001, Switching frequency of the power output stage".



In addition, take the power at the braking resistor and the power consumption of the control section into account. Both powers are not contained in the figure.



I_{out} Output current
 P_{Diss} Power dissipation
 f_s Switching frequency

Fig. 5-15: Power Dissipation vs. Output Current

For the data P_{Diss_cont} , $P_{Diss_0A_f_{s_max}}$ and $P_{Diss_0A_f_{s_min}}$, see the table "Data for Cooling and Power Dissipation".

Basic data of HCS02 power section

General information

This section contains

- Data for control voltage supply
- Data for mains voltage supply
- Data of DC bus
- Data of integrated braking resistor and requirements on an external braking resistor
- Data of inverter
- Data for cooling and power dissipation



The order of the data tables below follows the energy flow in the drive controller - from mains connection to motor output.

Control voltage

Control voltage supply data

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Control voltage input ¹⁾	U _{N3}	V	24 ± 20%			
Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾	U _{N3}	V	24 ± 5 %			
Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾	U _{N3}	V	26 ± 5 %			
Max. inrush current at 24 V supply	I _{EIN3_max}	A	2.80			
Pulse width of I _{EIN3}	t _{EIN3Lade}	ms	15			
Input capacitance	C _{N3}	mF	0.56			
Rated power consumption control voltage input at U _{N3} ⁴⁾	P _{N3}	W	12	14	23	
Latest amendment: 2019-02-20						

- 1) 2) 3) Observe supply voltage for motor holding brake
4) See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 5-8: HCS - Control voltage supply data



Rated power consumption control voltage input at U_{N3}

Plus motor holding brake and control section, plus safety option



HCS02/HCS03 converters of the **design "-N**V"** have an **integrated 24V supply**. In applications without motor holding brake and with CSB01.1N-FC control section, they can be operated without external 24V supply. Observe the notes on project planning for the mains connection.

Mains voltage

Mains voltage supply data

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Mains frequency	f _{LN}	Hz	50...60			
Tolerance input frequency		Hz	± 2			
Maximum allowed mains frequency change	Δf _{LN} /Δt	Hz/s	-			
Rotary field condition			None			
Short circuit current rating	SCCR	A rms	42000			
Latest amendment: 2019-02-20						

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Nominal mains voltage	U _{LN,nom}	V	3 AC 400			
Mains voltage, single-phase	U _{LN}	V	200...250			
Three-phase mains voltage at TN-S, TN-C, TT mains	U _{LN}	V	200...500			
Mains voltage, three-phase at IT mains ¹⁾	U _{LN}	V	200...230			
Mains voltage, three-phase at Corner-grounded-Delta mains ²⁾	U _{LN}	V	200...230			
Tolerance rated input voltage U _{LN}		%	±10			
Minimum short circuit power of the mains for failure-free operation	S _{k,min}	MVA	0.2	0.4	0.6	0.8
Minimum inductance of mains supply (mains phase inductance) ³⁾	L _{min}	µH	40			
Assigned type of mains choke			HNL01.1E-1000-N0012-A-500-NNNN		HNL01.1E-1000-N0020-A-500-NNNN	HNL01.1E-0600-N0032-A-500-NNNN
Inrush current	I _{L,trans_max_on}	A	1.4...4.3	3.5...10.7	6.3...19.3	9.9...27.5
Maximum allowed ON-OFF cycles per minute ⁴⁾			1			
Mains input continuous current at U _{LN,nenn} and P _{DC,cont} (single-phase, without mains choke) ⁵⁾	I _{LN}	A	-			
Mains input continuous current at U _{LN,nenn} and P _{DC,cont} (three-phase, without mains choke) ⁶⁾	I _{LN}	A	6.00	13.00	20.00	30.00
Mains input continuous current at U _{LN,nenn} and P _{DC,cont} (single-phase, with mains choke) ⁷⁾	I _{LN}	A	-			
Mains input continuous current at U _{LN,nenn} and P _{DC,cont} (three-phase, with mains choke) ⁸⁾	I _{LN}	A	-			
Nominal current AC1 for mains contactor at nom. data			I LN			
Mains fuse according to EN 60204-1 (single-phase, without mains choke)		A	-			
Mains fuse according to EN 60204-1 (three-phase, without mains choke)		A	tbd			
Latest amendment: 2019-02-20						

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Mains fuse according to EN 60204-1 (single-phase, with mains choke)		A	-			
Mains fuse according to EN 60204-1 (three-phase, with mains choke)		A	10	16	25	35
Required wire size in accordance with NFPA 79 and UL 508 A (internal wiring); ⁹⁾	A _{LN}	AWG	14 AWG		12 AWG	10 AWG
Mains connected load at U _{LN_nenn} and P _{DC_cont} (three-phase, without mains choke)	S _{LN}	kVA	3.50	8.50	11.00	16.00
Mains connected load at U _{LN_nenn} and P _{DC_cont} (three-phase, with mains choke)	S _{LN}	kVA	3.50	7.30	13.30	18.50
Mains connection power at U _{LN_nenn} and P _{DC_cont} (single-phase, without mains choke)	S _{LN}	kVA	-			
Mains connection power at U _{LN_nenn} and P _{DC_cont} (single-phase, with mains choke)	S _{LN}	kVA	-			
Power factor TPF (λ_L) at U _{LN_nenn} and P _{DC_cont} (single-phase, without mains choke) ¹⁰⁾	TPF		0.40			
Power factor TPF (λ_L) at U _{LN_nenn} and P _{DC_cont} (three-phase, without mains choke) ¹¹⁾	TPF		0.60		0.64	0.56
Power factor TPF (λ_L) at U _{LN_nenn} and P _{DC_cont} (single-phase, with mains choke) ¹²⁾	TPF		-			
Power factor TPF (λ_L) at U _{LN_nenn} and P _{DC_cont} (three-phase, with mains choke) ¹³⁾	TPF		-	0.70	0.75	0.76
Power factor TPF (λ_L) at U _{LN_nenn} and 10% P _{DC_cont} (single-phase, without mains choke)	TPF _{10%}		-			
Power factor TPF (λ_L) at U _{LN_nenn} and 10% P _{DC_cont} (three-phase, without mains choke)	TPF _{10%}		0.40			
Power factor TPF (λ_L) at U _{LN_nenn} and 10% P _{DC_cont} (single-phase, with mains choke)	TPF _{10%}		-			
Latest amendment: 2019-02-20						

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, with mains choke)	$TPF_{10\%}$		-			
Power factor of fundamental component DPF at P_{DC_cont} (single-phase, without mains choke)	$\cos\phi^{h1}$		-			
Power factor of fundamental component DPF at P_{DC_cont} (three-phase, without mains choke)	$\cos\phi^{h1}$		0.97			
Power factor of fundamental component DPF at P_{DC_cont} (single-phase, with mains choke)	$\cos\phi^{h1}$		-			
Power factor of fundamental component DPF at P_{DC_cont} (three-phase, with mains choke)	$\cos\phi^{h1}$		0.95			
Latest amendment: 2019-02-20						

1) 2)

Mains voltage > U_{LN} : Use a transformer with grounded neutral point, do not use autotransformers!

3)

Otherwise use HNL mains choke

4)

Observe allowed number of switch-on processes; without external capacitors at the DC bus

5) 6) 7) 8) 10) 11) 12) 13)

Find interim values by interpolation

9)

Copper wire; PVC-insulation (conductor temperature 90 °C; $T_a \leq 40$ °C) in accordance with

NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 5-9:

HCS - Mains voltage supply data

DC bus**Power section data - DC bus**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
DC bus voltage	U_{DC}	V	$U_{LN} \times 1.41$			
Capacitance in DC bus	C_{DC}	mF	0.14	0.27	0.54	0.68
DC resistance in DC bus (L+ to L-)	R_{DC}	kohm	approx. 300	approx. 150	approx. 75	approx. 60
Rated power (t > 10 min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; with mains choke	P_{DC_cont}	kW	2.10	5.10	10.00	14.00
Rated power (t > 10 min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; without mains choke	P_{DC_cont}	kW	2.10	5.10	7.00	9.00
Latest amendment: 2019-02-20						

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
P _{DC_cont} and P _{DC_max} vs. mains input voltage; U _{LN} ≤ U _{LN_nenn}		%/V	PDC_cont (ULN) = PDC_cont x [1 - (400-ULN) x 0.0025]			
P _{DC_cont} and P _{DC_max} vs. mains input voltage; U _{LN} > U _{LN_nenn}		%/V	PDC_cont (ULN) = PDC_cont x [1 + (ULN-400) x 0.002]			
Maximum allowed DC bus power at U _{LN_nenn} ; with mains choke	P _{DC_max}	kW	5.00	10.00	16.00	19.00
Maximum allowed DC bus power at U _{LN_nenn} ; without mains choke	P _{DC_max}	kW	5.00	8.00	12.00	14.00
Balancing factor for P _{DC_cont} (for parallel operation at common DC bus) with mains choke			-	0.80		
Balancing factor for P _{DC_cont} (for parallel operation at common DC bus) without mains choke			-	0.50		
Monitoring value maximum DC bus voltage, switch-off threshold	U _{DC_limit_max}	V	900			
Monitoring value minimum DC bus voltage, undervoltage threshold	U _{DC_limit_min}	V	can be parameterized, see "P-0-0114, Undervoltage threshold"			
Charging resistor continuous power	P _{DC_Start}	kW	0.05	0.15	0.35	0.50
Allowed external DC bus capacitance (nom.) at U _{LN_nenn} ¹⁾	C _{DCext}	mF	-	5.00	7.00	13.00
Charging time for maximum external DC bus capacitance C _{DCext} at U _{LN_nenn}	t _{lade_DC_Cext}	s	2.00			
Latest amendment: 2019-02-20						

1) Use assigned mains choke
Tab. 5-10: HCS - Power section data - DC bus

Single-phase mains connection



Single-phase mains connection

Single-phase mains connection is implemented via the connections **L1** and **L2**.

The maximum allowed DC bus power P_{DC_max} is limited to the specified continuous power $P_{DC_cont_1ph}$.

Data of power section with single-phase mains connection

Description	Symbol	Unit	HCS02.1E- W0012-_03	HCS02.1E- W0028-_03	HCS02.1E- W0054-_03	HCS02.1E- W0070-_03
Mains voltage, single-phase	U_{LN}	V	200...250			
Continuous power ($t > 10$ min)	$P_{DC_cont_1ph}$	W	50...70	100...160	150...250	260...400

Tab. 5-11: HCS - Data of power section with single-phase mains connection

Braking resistor**Integrated braking resistor****Integrated braking resistor data**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Braking resistor continuous power	P _{BD}	kW	0.05	0.15	0.35	0.50
Braking resistor peak power	P _{BS}	kW	4.00	10.00	18.00	25.00
Nominal braking resistance	R _{DC_Bleeder}	ohm	180	72	40	28
Braking resistor switch-on threshold - independent of mains voltage ¹⁾	U _{R_DC_On_f}	V	820; see also "P-0-0833, Braking resistor threshold" and "P-0-0860, Converter configuration"			
Braking resistor switch-on threshold - depending on mains voltage ²⁾	U _{R_DC_On_v}		see "P-0-0833, Braking resistor threshold" and "P-0-0860, Converter configuration"			
Maximum allowed duty cycle	t _{on_max}	s	0.25	0.50		
Minimum allowed cycle time	T _{cycl}	s	20.00	33.00	26.00	25.00
Regenerative power to be absorbed	W _{R_max}	kWs	1.00	5.00	9.00	13.00
Balancing factor for P _{BD} (for parallel operation at common DC bus)	f		-	0.80		
Cooling of integrated braking resistor			Forced			
Latest amendment: 2019-02-20						

1) 2) Factory setting

Tab. 5-12: HCS - Integrated braking resistor data

External braking resistor**Minimum requirement on external braking resistor**

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Resistance value of external braking resistor ¹⁾	R _{DC_Bleeder}	ohm	-		40.0	28.0
Assigned HLR01 braking resistor types ²⁾			-		HLR01.1N-01 K8-N40R0; HLR01.1N-03 K8-N40R0	HLR01.1N-02 K4-N28R0; HLR01.1N-05 K5-N28R0
Latest amendment: 2019-02-20						

1) See Parameter Description "P-0-0858, Data of external braking resistor"

2) See also Project Planning Manual "Additional Components"

Tab. 5-13: HCS - Minimum requirement on external braking resistor

Inverter

Power section data - inverter

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Allowed switching frequencies ¹⁾	f_s	kHz	4, 8, 12, 16			
Output voltage, fundamental wave in V/Hz (U/f) control	U_{out_eff}	V	$\sim U_{DC} \times 0.71$			
Output voltage, fundamental wave in closed-loop operation	U_{out_eff}	V	$\sim U_{DC} * 0.71$			
Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾	dv/dt	kV/ μ s	5.00			
Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾	dv/dt	kV/ μ s	5.00			
Output frequency range when $f_s = 2$ kHz	f_{out_2k}	Hz	-			
Output frequency range when $f_s = 4$ kHz	f_{out_4k}	Hz	0...400			
Output frequency range when $f_s = 8$ kHz	f_{out_8k}	Hz	0..800			
Output frequency range when $f_s = 12$ kHz	f_{out_12k}	Hz	0..1200			
Output frequency range when $f_s = 16$ kHz	f_{out_16k}	Hz	0...1600			
Output frequency threshold to detect motor standstill ⁴⁾	f_{out_still}	Hz	2...4			
Maximum output current when $f_s = 2$ kHz	I_{out_max2}	A	-			
Maximum output current when $f_s = 4$ kHz	I_{out_max4}	A	11.5	28.3	54.0	70.8
Maximum output current when $f_s = 8$ kHz	I_{out_max8}	A	11.5	28.3	54.0	70.8
Maximum output current when $f_s = 12$ kHz	I_{out_max12}	A	11.5	28.3	54.0	70.8
Maximum output current when $f_s = 16$ kHz	I_{out_max16}	A	11.5	28.3	54.0	70.8
Continuous output current when $f_s = 2$ kHz	I_{out_cont2}	A	-			
Continuous output current when $f_s = 4$ kHz	I_{out_cont4}	A	4.5	12.0	20.6	28.0
Latest amendment: 2019-02-20						

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Continuous output current when f _s = 8 kHz	I _{out_cont8}	A	4.5	9.2	20.6	21.4
Continuous output current when f _s = 12 kHz ⁵⁾	I _{out_cont12}	A	4.0	5.1	13.8	14.1
Continuous output current when f _s = 16 kHz ⁶⁾	I _{out_cont16}	A	2.8	4.4	11.1	10.5
Continuous output current when f _s = 2 kHz; output frequency f _{out} less than f _{out_still}	I _{out_cont0Hz _2}	A	-			
Continuous output current when f _s = 4 kHz; output frequency f _{out} less than f _{out_still}	I _{out_cont0Hz _4}	A	4.5	9.7	20.2	
Continuous output current when f _s = 8 kHz; output frequency f _{out} less than f _{out_still}	I _{out_cont0Hz _8}	A	3.3	5.6	13.1	11.9
Continuous output current when f _s = 12 kHz; output frequency f _{out} less than f _{out_still} ⁷⁾	I _{out_cont0Hz _12}	A	1.2	2.3	7.5	6.7
Continuous output current when f _s = 16 kHz; output frequency f _{out} less than f _{out_still} ⁸⁾	I _{out_cont0Hz _16}	A	0.7	2.1	6.1	4.2
Assigned output filters at nom. data; f _s = 4 kHz			HMF01.1A-N0K2-M0012		HMF01.1A-N0K2-M0028	
Latest amendment: 2019-02-20						

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s

Tab. 5-14: HCS - Power section data - inverter



Guide value "Rise of voltage at output"

Observe that the voltage load at the motor is almost independent of the power section used.

Especially when using **standard motors**, make sure that they comply with the occurring voltage load.

Observe the information on third-party motors at drive controllers (see documentation "Rexroth IndraDrive Drive Systems with HMV01/02 HMS01/02, HMD01, HCS02/03", index entry "Third-party motors → At drive controllers").



Reduced output current at motor standstill

Depending on the electric output frequency, the output current is reduced for thermal protection of the power section.

The output current is reduced, when the electric output frequency has fallen below the threshold to detect motor standstill.

Exemplary data for applications

General information

This section contains

- Examples of allowed current profiles
- Examples of allowed performance profiles
- Data for selecting standard motors

Current profiles

Examples of allowed current profiles

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{1)}$	$I_{out_peak1_2}$	A	-			
Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_2}$	A	-			
Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{2)}$	$I_{out_peak1_4}$	A	9.07	24.29	41.66	56.56
Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_4}$	A	3.63	9.72	16.66	22.62
Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{3)}$	$I_{out_peak1_8}$	A	9.07	15.06	33.59	34.77
Base load current at $I_{out_peak_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_8}$	A	3.63	6.02	13.43	13.91
Maximum output current at $I_{out_base_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{4)}$	$I_{out_peak1_12}$	A	6.03	8.42	21.96	23.12
Base load current at $I_{out_peak_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_12}$	A	2.41	3.37	8.78	9.25
Maximum output current at $I_{out_base_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{5)}$	$I_{out_peak1_16}$	A	4.25	7.29	17.77	17.16

Latest amendment: 2019-02-20

Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Base load current at $I_{out_peak_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$	$I_{out_base1_1}$ 6	A	1.70	2.92	7.11	6.86
Maximum output current at $I_{out_base_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(6)}$	$I_{out_peak3_2}$	A	-			
Base load current at $I_{out_peak_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_2}$	A	-			
Maximum output current at $I_{out_base_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(7)}$	$I_{out_peak3_4}$	A	7.79	20.90	35.86	48.68
Base load current at $I_{out_peak_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_4}$	A	3.90	10.45	17.93	24.34
Maximum output current at $I_{out_base_3}$; $f_s = 8$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(8)}$	$I_{out_peak3_8}$	A	7.79	13.55	30.54	31.36
Base load current at $I_{out_peak_3}$; $f_s = 8$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_8}$	A	3.90	6.77	15.27	15.68
Maximum output current at $I_{out_base_3}$; $f_s = 12$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(9)}$	$I_{out_peak3_1}$ 2	A	5.57	7.56	19.88	20.81
Base load current at $I_{out_peak_3}$; $f_s = 12$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_1}$ 2	A	2.78	3.78	9.94	10.40
Maximum output current at $I_{out_base_3}$; $f_s = 16$ kHz; $t = 2$ s; $T = 20$ min; $K = 2.0^{(10)}$	$I_{out_peak3_1}$ 6	A	3.90	6.55	16.06	15.42
Base load current at $I_{out_peak_3}$; $f_s = 16$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$	$I_{out_base3_1}$ 6	A	1.95	3.27	8.03	7.71
Base load current at $I_{out_peak_4}$; $f_s = 2$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_2}$	A	-			
Maximum output current at $I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{(11)}$	$I_{out_peak4_2}$	A	-			
Maximum output current at $I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{(12)}$	$I_{out_peak4_4}$	A	5.22	14.79	25.13	33.74
Latest amendment: 2019-02-20						

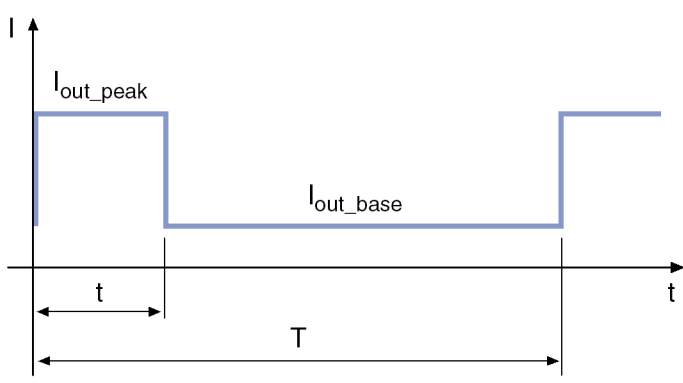
Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Base load current at $I_{out_peak_4}$; $f_s = 4$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_4}$	A	3.48	9.86	16.76	22.49
Maximum output current at $I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{13)}$	$I_{out_peak4_8}$	A	5.22	10.25	22.97	24.33
Base load current at $I_{out_peak_4}$; $f_s = 8$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_8}$	A	3.48	6.83	15.32	16.22
Maximum output current at $I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{14)}$	$I_{out_peak4_12}$	A	4.32	5.71	14.88	16.10
Base load current at $I_{out_peak_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_12}$	A	2.88	3.81	9.92	10.74
Maximum output current at $I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{15)}$	$I_{out_peak4_16}$	A	3.02	4.95	12.00	11.93
Base load current at $I_{out_peak_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$	$I_{out_base4_16}$	A	2.01	3.30	8.00	7.95
Maximum output current at $I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{16)}$	$I_{out_peak5_2}$	A	-			
Base load current at $I_{out_peak_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_2}$	A	-			
Maximum output current at $I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{17)}$	$I_{out_peak5_4}$	A	4.70	12.75	21.82	29.55
Base load current at $I_{out_peak_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_4}$	A	4.27	11.59	19.84	26.87
Maximum output current at $I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{18)}$	$I_{out_peak5_8}$	A	4.70	9.46	21.79	22.20
Base load current at $I_{out_peak_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_8}$	A	4.27	8.60	19.81	20.18
Maximum output current at $I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{19)}$	$I_{out_peak5_12}$	A	4.14	5.27	14.10	14.68
Latest amendment: 2019-02-20						

Description	Symbol	Unit	HCS02.1E- W0012-_-03	HCS02.1E- W0028-_-03	HCS02.1E- W0054-_-03	HCS02.1E- W0070-_-03
Base load current at $I_{out_peak_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_1}$ 2	A	3.76	4.79	12.82	13.35
Maximum output current at $I_{out_base_5}$; $f_s = 16$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{20)}$	$I_{out_peak5_1}$ 6	A	2.89	4.57	11.37	10.87
Base load current at $I_{out_peak_5}$; $f_s = 16$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$	$I_{out_base5_1}$ 6	A	2.63	4.15	10.33	9.88
Latest amendment: 2019-02-20						

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See
UEL_I_e
profile
definition

Tab. 5-15: HCS - Examples of allowed current profiles

Current profile "UEL_I_e" The following current profiles have been defined for converters and inverters.

| Profile | Explanation |
|---|--|
| <p>current profile "UEL_I_e"</p>  <p>DK000149v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.</p> |

Tab. 5-16: Definition of current profiles

Performance profiles

Examples of allowed performance profiles

| Description | Symbol | Unit | HCS02.1E-
W0012-_-03 | HCS02.1E-
W0028-_-03 | HCS02.1E-
W0054-_-03 | HCS02.1E-
W0070-_-03 |
|--|-------------------|------|-------------------------|-------------------------|-------------------------|-------------------------|
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; without mains choke ¹⁾ | $P_{DC_peak_1}$ | kW | 4.25 | 10.33 | 14.17 | 18.19 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with mains choke ²⁾ | $P_{DC_peak_1}$ | kW | - | | 20.24 | 28.30 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; without mains choke ³⁾ | $P_{DC_base_1}$ | kW | 1.68 | 4.12 | 5.67 | 7.26 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with mains choke ⁴⁾ | $P_{DC_base_1}$ | kW | - | | 8.11 | 11.30 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; without mains choke ⁵⁾ | $P_{DC_peak_3}$ | kW | 3.64 | 8.88 | 12.19 | 15.65 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; with mains choke ⁶⁾ | $P_{DC_peak_3}$ | kW | - | | 17.41 | 24.34 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; without mains choke ⁷⁾ | $P_{DC_base_3}$ | kW | 1.82 | 4.44 | 6.09 | 7.82 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; with mains choke ⁸⁾ | $P_{DC_base_3}$ | kW | - | | 8.70 | 12.17 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min; $K = 1.5$; without mains choke ⁹⁾ | $P_{DC_peak_4}$ | kW | 2.44 | 6.29 | 8.54 | 10.85 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min; $K = 1.5$; with mains choke ¹⁰⁾ | $P_{DC_peak_4}$ | kW | - | | 12.20 | 16.87 |
| Latest amendment: 2019-02-20 | | | | | | |

| Description | Symbol | Unit | HCS02.1E-
W0012-_-03 | HCS02.1E-
W0028-_-03 | HCS02.1E-
W0054-_-03 | HCS02.1E-
W0070-_-03 |
|---|-------------------|------|-------------------------|-------------------------|-------------------------|-------------------------|
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; without mains choke ¹¹⁾ | $P_{DC_base_4}$ | kW | 1.62 | 4.19 | 5.70 | 7.23 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; with mains choke ¹²⁾ | $P_{DC_base_4}$ | kW | - | | 8.14 | 11.25 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; without mains
choke ¹³⁾ | $P_{DC_peak_5}$ | kW | 2.19 | 5.42 | 7.41 | 9.50 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; with mains
choke ¹⁴⁾ | $P_{DC_peak_5}$ | kW | - | | 10.59 | 14.78 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; without mains choke ¹⁵⁾ | $P_{DC_base_5}$ | kW | 1.99 | 4.93 | 6.74 | 8.64 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_max}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; with mains choke ¹⁶⁾ | $P_{DC_base_5}$ | kW | - | | 9.63 | 13.44 |
| Latest amendment: 2019-02-20 | | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) See UEL_P_e profile definition

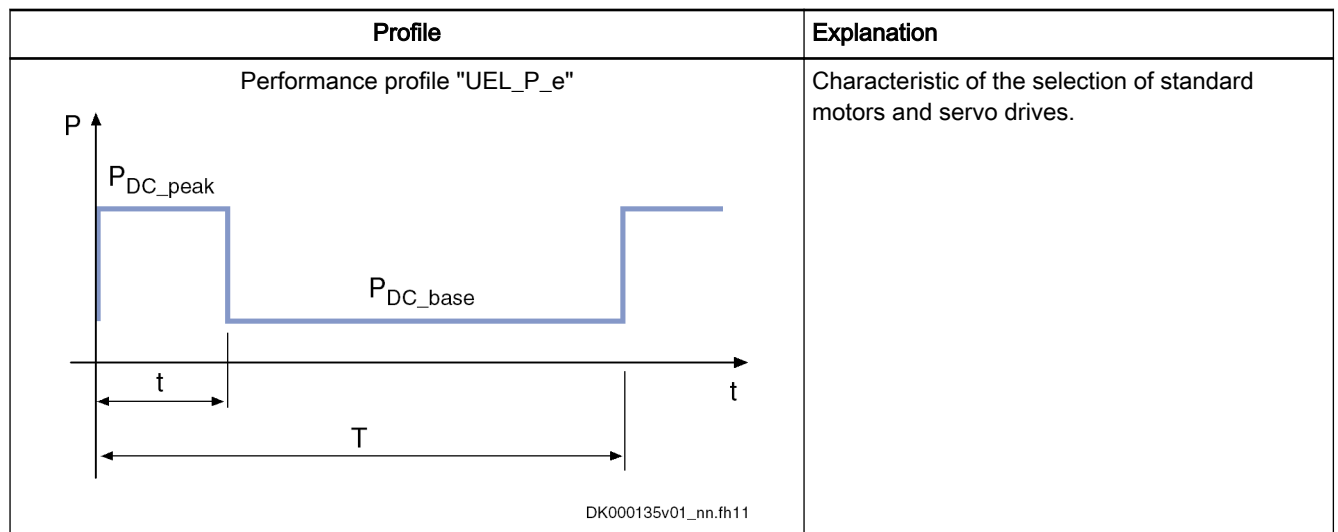
Tab. 5-17: HCS - Examples of allowed performance profiles

Performance profile "UEL_P_e"

The following performance profiles have been defined for converters and inverters.



Observe the allowed performance data P_{DC_peak} and P_{DC_base} in the corresponding performance profile of the supply unit or converter.



Tab. 5-18: Definition of Performance Profiles, Infeeding Supply Units and Converters

Operation with standard motors

General information

Selecting standard motors

The tables below show the nominal powers P_{nenn} of standard motors which can be operated at the respective drive controller. The following conditions apply to the data in the tables:

- Motor design:
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 400 V, 50 Hz at mains voltage $U_{\text{LN}} \geq 3 \text{ AC } 400 \text{ V}$ or
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 460 V, 60 Hz at mains voltage $U_{\text{LN}} \geq 3 \text{ AC } 460 \text{ V}$
- Assigned mains choke is used
- Operation at minimum switching frequency $f_s = f_s (\text{min.})$
- Rotary field at output with $f_{\text{out}} > f_{\text{out_still}}$
- Ambient temperature $T_a \leq T_{a_work}$
- Overload ratio $K = P_{\text{DC_peak}} / P_{\text{DC_base}}$ according to performance profile "UEL_P_e"
- Type of mains connection: Individual Supply



When choosing standard motors for inverters, select an appropriate supply unit. Observe the performance data $P_{\text{DC_peak}}$ and $P_{\text{DC_base}}$ in the performance profile "UEL_P_e" of the supply unit.

Operating standard motors at 3 AC 400 V**Selecting standard motors 3 AC 400V - exemplary profiles**

| Description | Symbol | Unit | HCS02.1E-
W0012-_-03 | HCS02.1E-
W0028-_-03 | HCS02.1E-
W0054-_-03 | HCS02.1E-
W0070-_-03 |
|---|------------|------|-------------------------|-------------------------|-------------------------|-------------------------|
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t > 10$ min;
$K = 1.0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 1.50 | 4.00 | 7.50 | 11.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 10$ min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 1.50 | 4.00 | 7.50 | 11.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 5$ min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 1.10 | 4.00 | 5.50 | 11.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 2$ s;
$T = 20$ s; $K = 2.0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 1.10 | 3.00 | 5.50 | 7.50 |
| Latest amendment: 2019-02-20 | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition

Tab. 5-19: HCS - Selecting standard motors 3 AC 400V - exemplary profiles

Operating standard motors at 3 AC 460 V**Selecting standard motors 3 AC 460V - exemplary profiles**

| Description | Symbol | Unit | HCS02.1E-
W0012-_-03 | HCS02.1E-
W0028-_-03 | HCS02.1E-
W0054-_-03 | HCS02.1E-
W0070-_-03 |
|--|------------|------|-------------------------|-------------------------|-------------------------|-------------------------|
| Nominal power standard motor
3AC460V; 60 Hz; $t > 10$ min;
$K = 1.0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 1.50 | 5.50 | 11.00 | 15.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 60$ s;
$T = 10$ min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 1.50 | 5.50 | 11.00 | 15.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 60$ s;
$T = 5$ min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 1.10 | 5.50 | 7.50 | 15.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 2$ s; $T = 20$ s;
$K = 2.0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 1.10 | 3.70 | 7.50 | 11.00 |
| Latest amendment: 2019-02-20 | | | | | | |

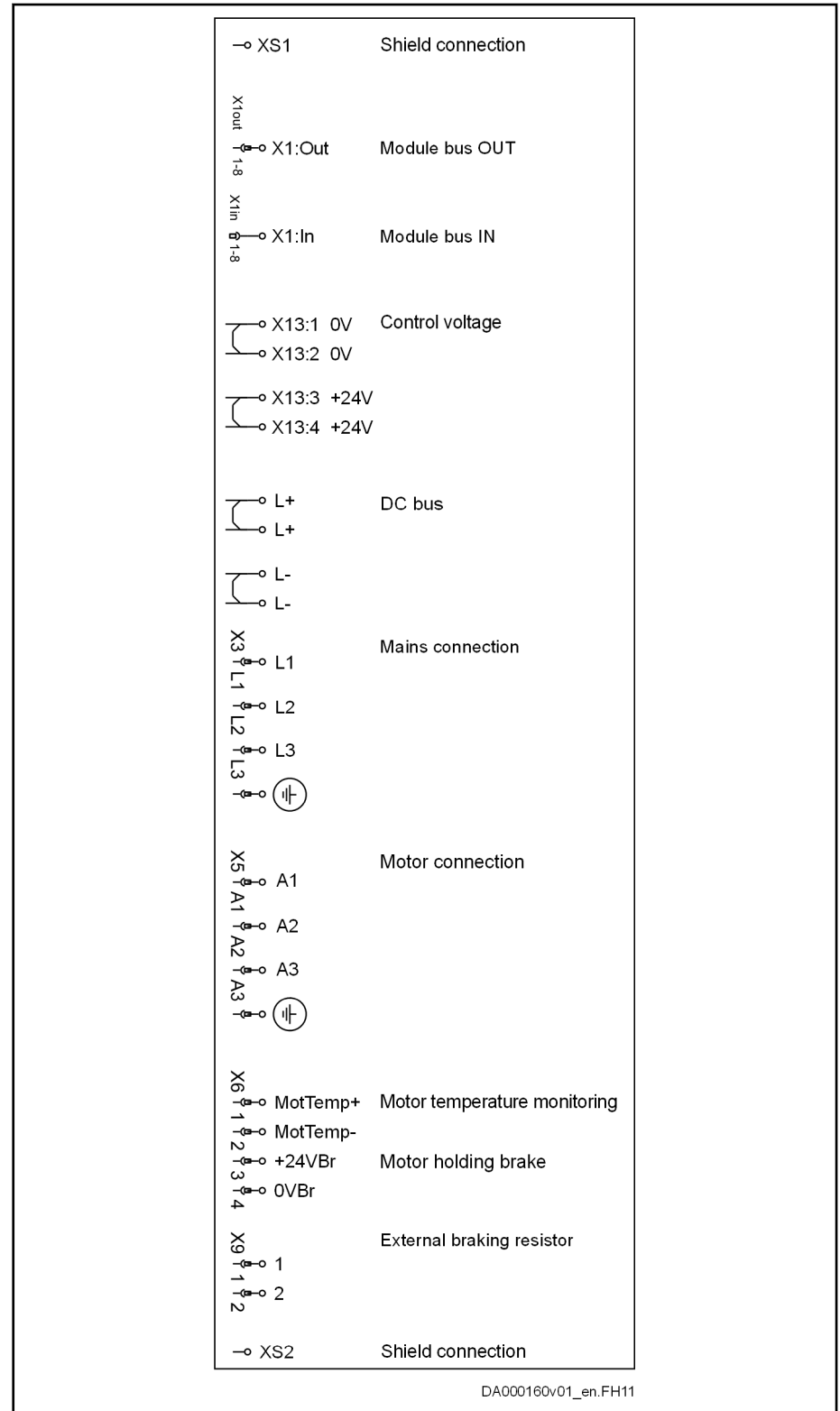
1) 2) 3) 4) See UEL_P_e profile definition; 1 kW ~ 1.36 hp

Tab. 5-20: HCS - Selecting standard motors 3 AC 460V - exemplary profiles

5.2.5 Connections and interfaces

Overview

Overall connection diagram



X1, L+/L- Not available for HCS02.1E-W0012

X9 Not available for HCS02.1E-W0012 and -W0028

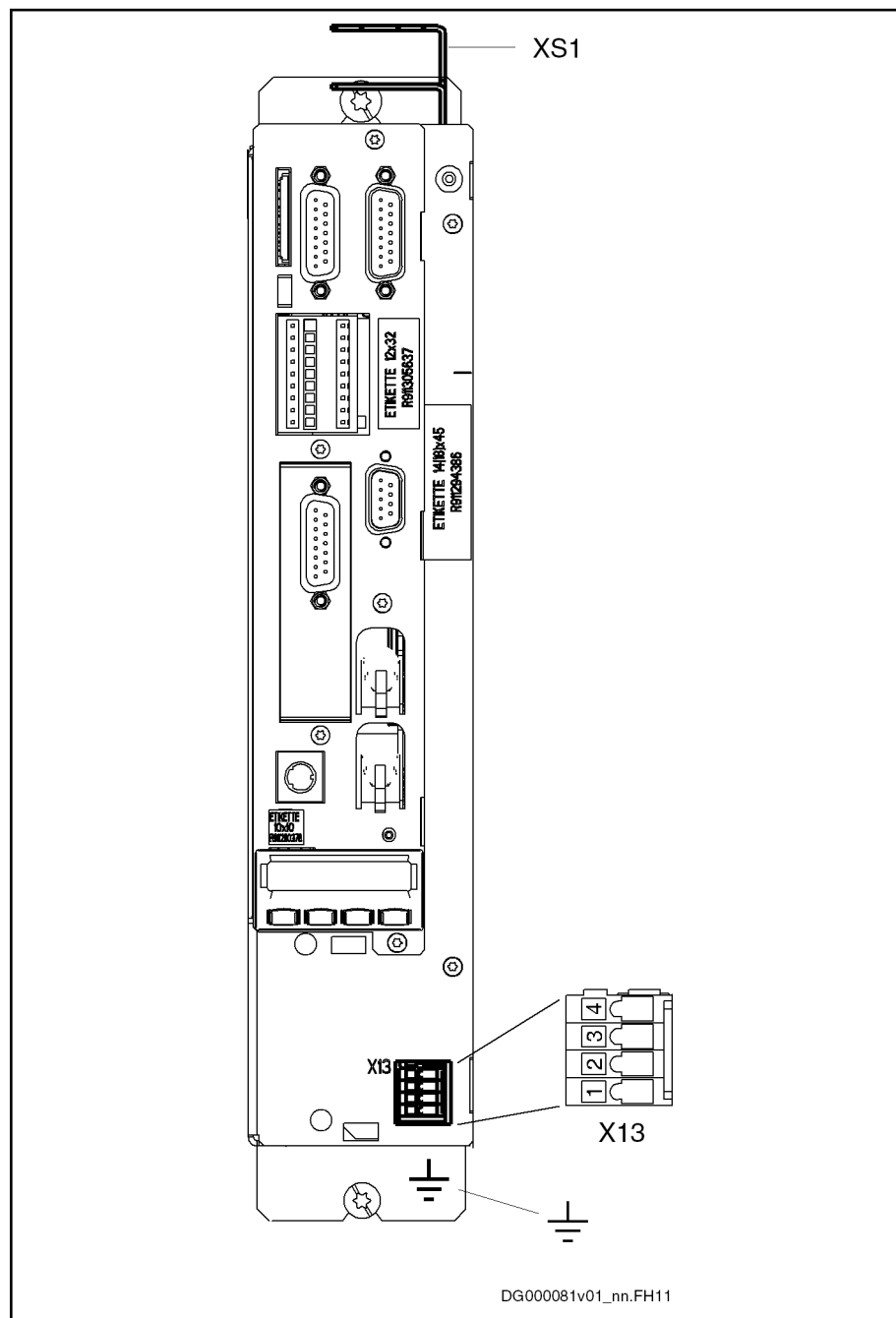
Fig. 5-16: Overall Connection Diagram



Apart from the indicated connections, it is necessary to wire the **Bb contact at the control section** for signaling the readiness for operation of the drive controller (see Project Planning Manual "Rexroth IndraDrive Drive Controllers Control Sections").

Arrangement of the connection points

Connection points power section HCS02.1E-W0012 (front)



X13

Control voltage

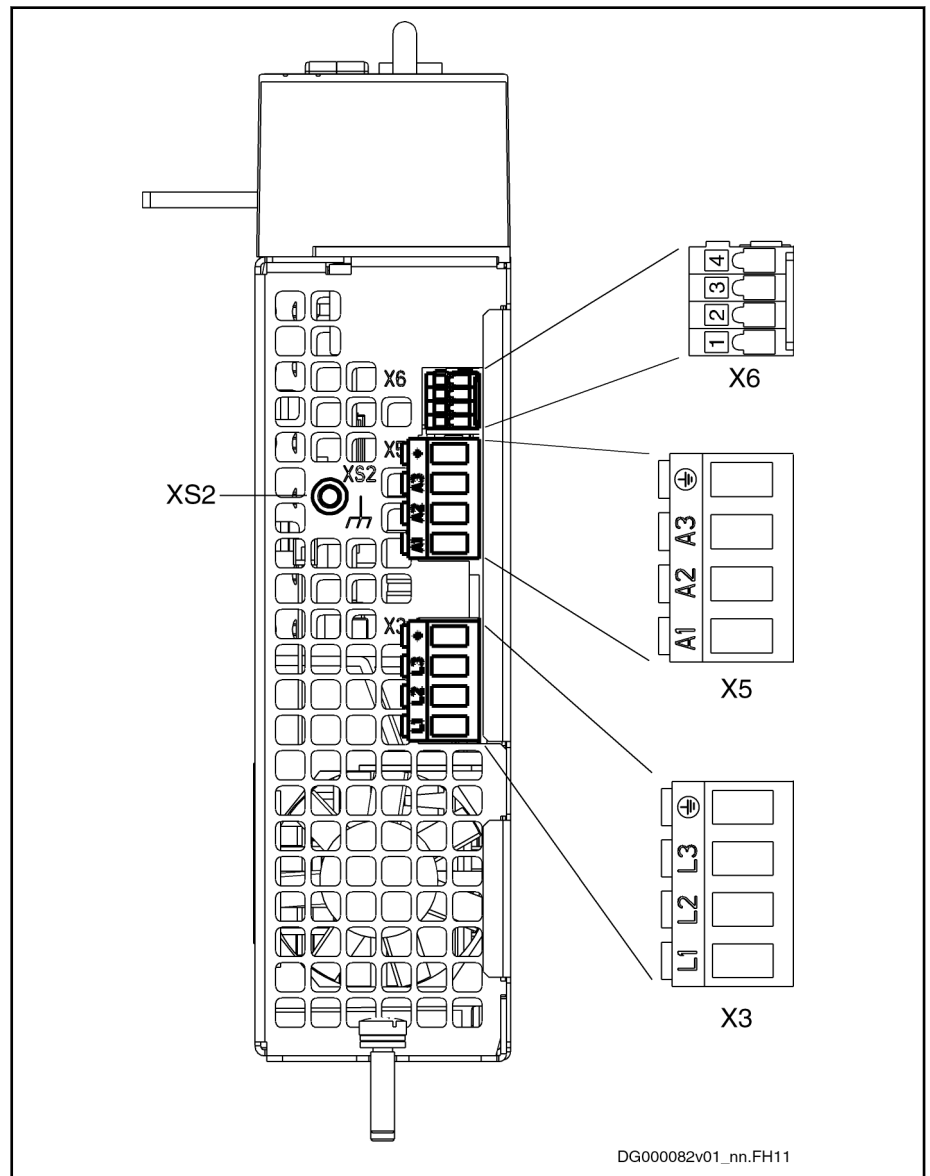
XS1

Control line shield connection

Fig. 5-17:

Connection points power section HCS02.1E-W0012 (front)

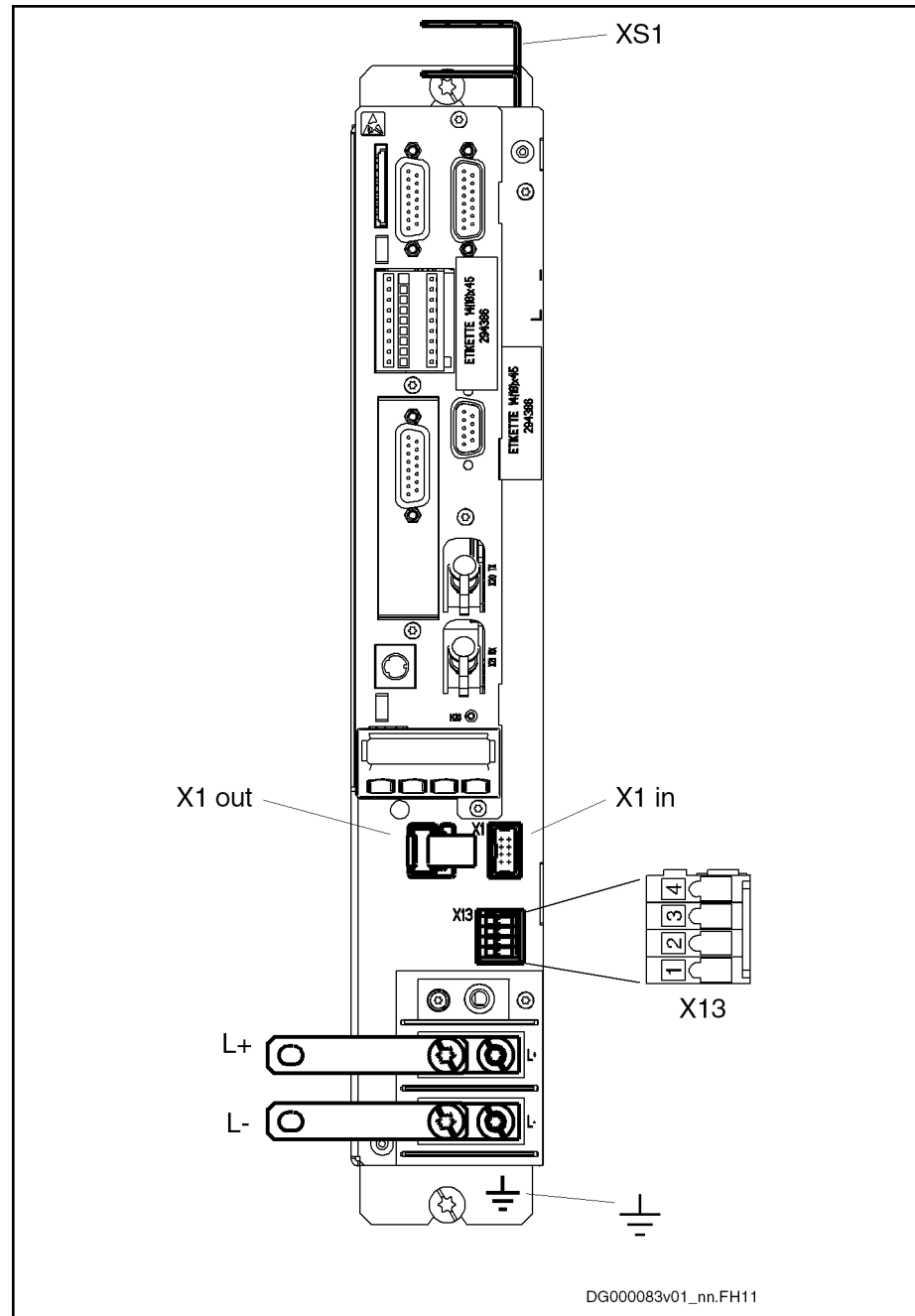
Connection points power section HCS02.1E-W0012 (bottom)



- X3** Mains connection
- X5** Motor connection
- X6** Motor temperature monitoring, motor holding brake
- XS2** Motor cable shield connection

Fig. 5-18: Connection points power section HCS02.1E-W0012 (bottom)

Connection points power sections HCS02.1E-W0028, -W0054, -W0070
(front)

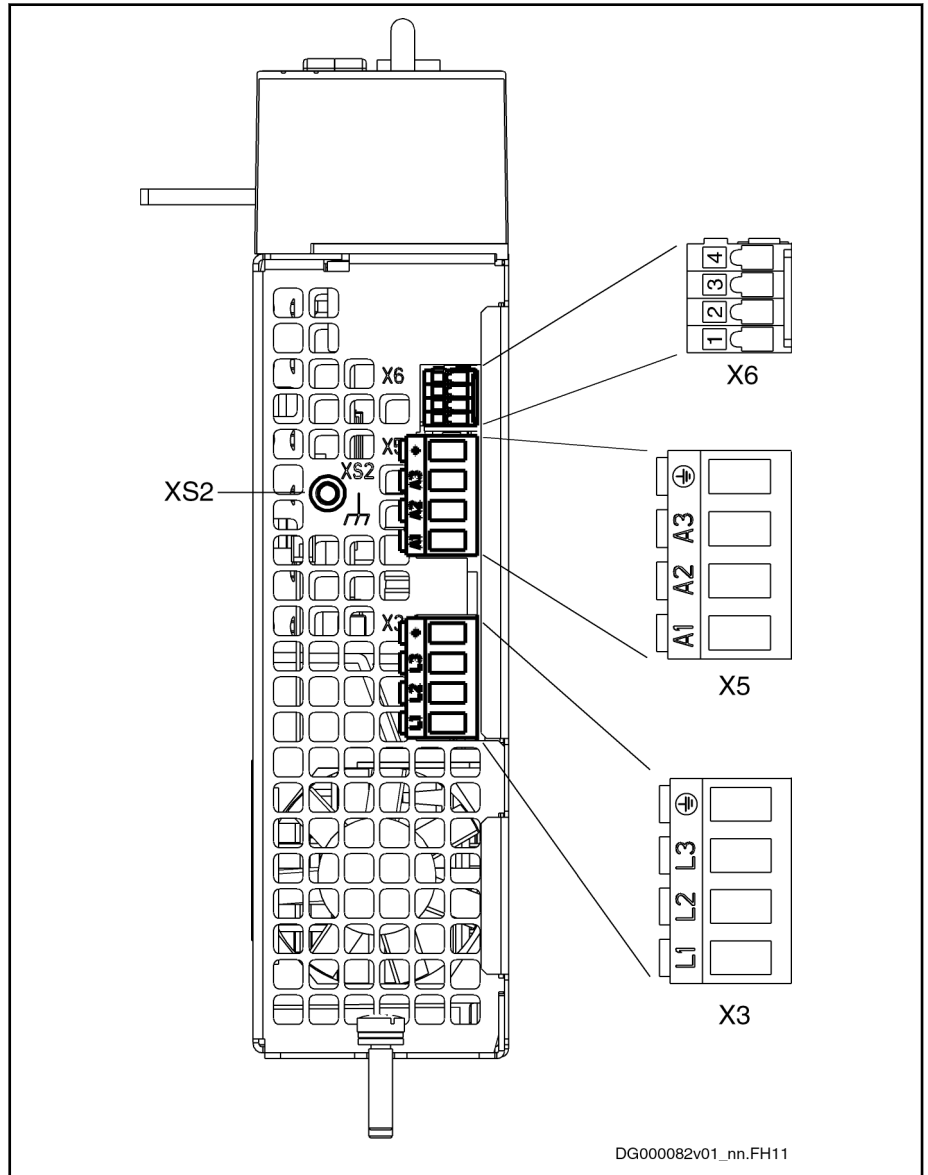


X1 Module bus
X13 Control voltage
XS1 Control line shield connection
L+, L- DC bus

Fig. 5-19:

Connection points power sections HCS02.1E-W0028, -W0054,
-W0070 (front)

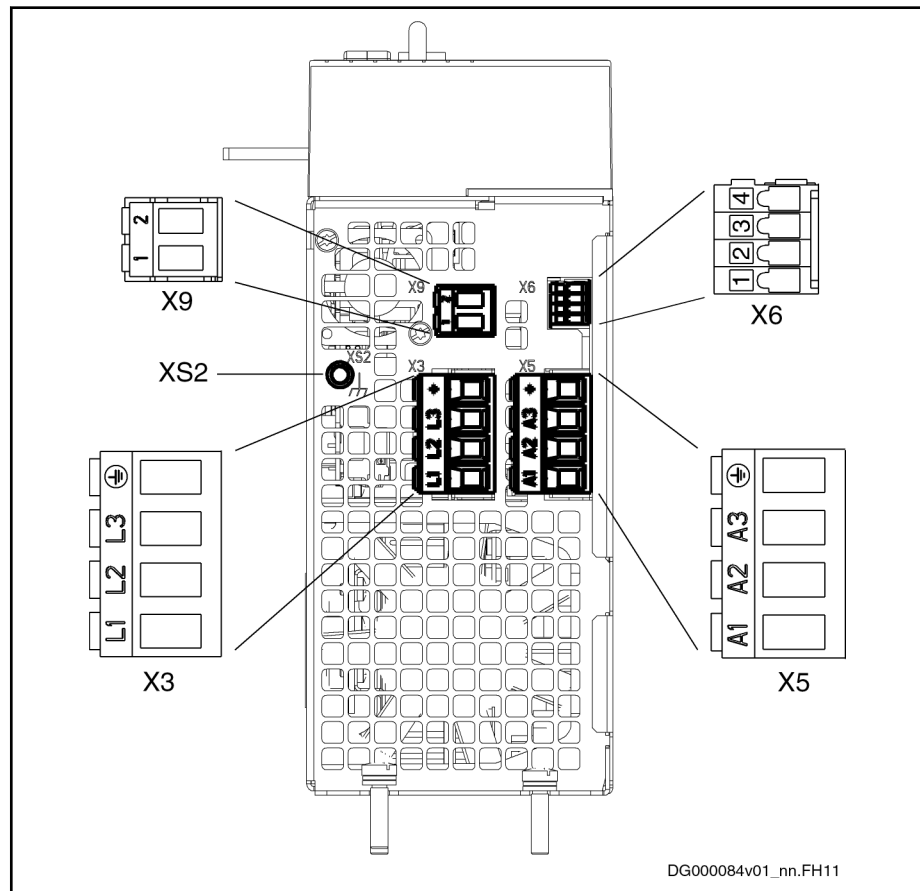
Connection points power section HCS02.1E-W0028 (bottom)



- X3** Mains connection
- X5** Motor connection
- X6** Motor temperature monitoring, motor holding brake
- XS2** Motor cable shield connection

Fig. 5-20: Connection points power section HCS02.1E-W0028 (bottom)

Connection points power sections HCS02.1E-W0054, -W0070 (bottom)



- X3** Mains connection
X5 Motor connection
X6 Motor temperature monitoring, motor holding brake
X9 External braking resistor
XS2 Motor cable shield connection

Fig. 5-21: Connection points power sections HCS02.1E-W0054, -W0070 (bottom)

⚠ WARNING

Lethal electric shock from live parts with more than 50V!

Via the connection X3 (mains connection), connect the drive controller to the equipment grounding conductor system.

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 261.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 325.

5.3 HCS03 power sections

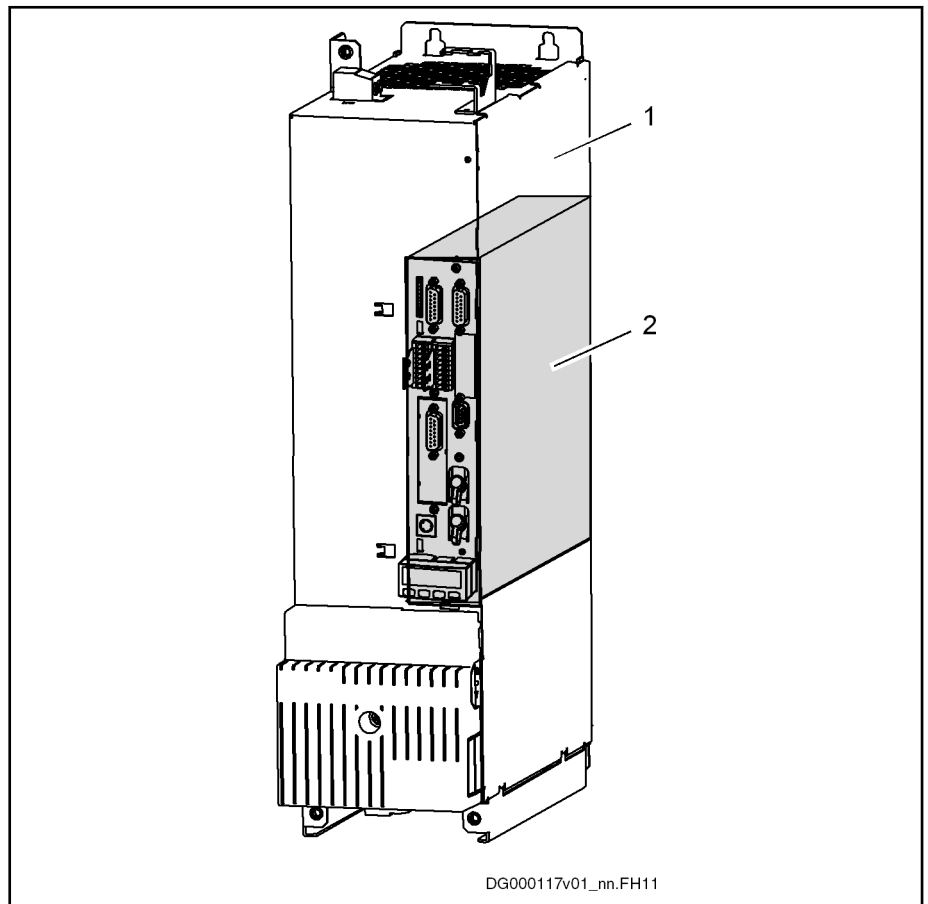
5.3.1 Brief description, use and design

Brief description The HCS03 compact converters are part of the Rexroth IndraDrive C product range and are used to operate single axes.

| Use | Type | Use |
|-----|--|---|
| | HCS03.1E-Wxxx-NNNN
HCS03.1E-Wxxx-NNNV
HCS03.1E-Wxxx-NNBN
HCS03.1E-Wxxx-NNBV | Operation of a three-phase a.c. motor (asynchronous or synchronous motor) |
| | HCS03.1E-Wxxx-LNBV
HCS03.1E-Wxxx-LNBN
Load-dependent fan control | Applications with operation at partial load and requirement of a low degree of noise development. |

Tab. 5-21: Use of HCS03

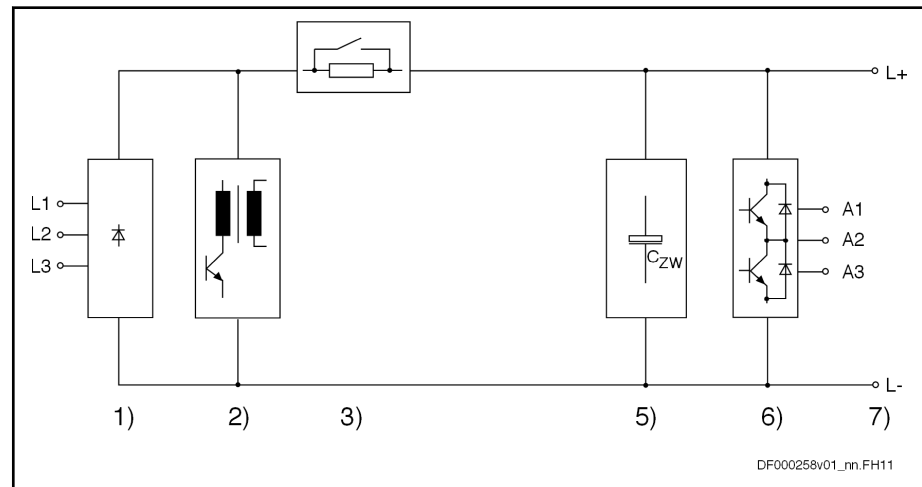
Structure, block diagrams



1 Power section
2 Control section

Fig. 5-22: Basic structure of the drive controller

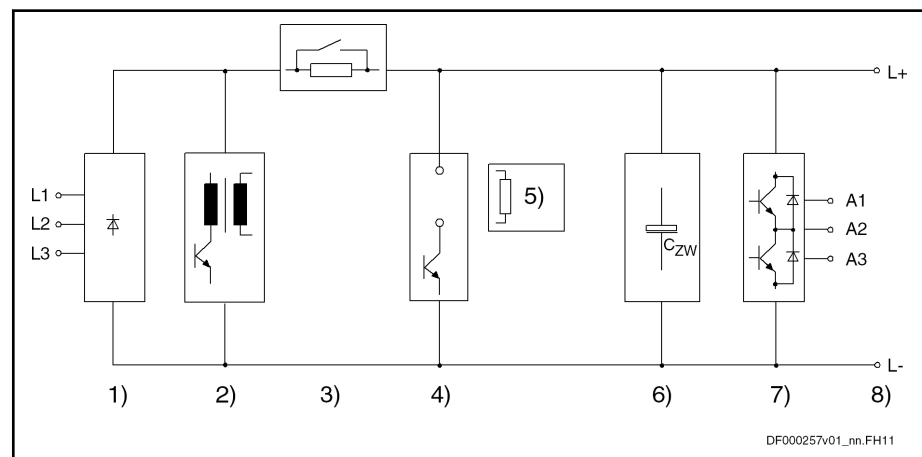
HCS03.1E-...-NNNV; -LNxV



- 1) Mains input with rectifier
- 2) integrated control voltage supply
- 3) Charging current limitation, for -W0210/280/350 with thyristors
- 5) DC bus capacitances
- 6) Inverter stage with output to motor
- 7) DC bus connection

Fig. 5-23: HCS03.1E-...-NNNV - block diagram

HCS03.1E-...-NNBV; -LNBV



- 1) Mains input with rectifier
- 2) integrated control voltage supply
- 3) Charging current limitation, for -W0210/280/350 with thyristors
- 4) Optional braking transistor
- 5) Optional external braking resistor
- 6) DC bus capacitances
- 7) Inverter stage with output to motor
- 8) DC bus connection

Fig. 5-24: HCS03.1E-...-NNBV - block diagram

5.3.2 Type code and identification

Type code



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

HCS03

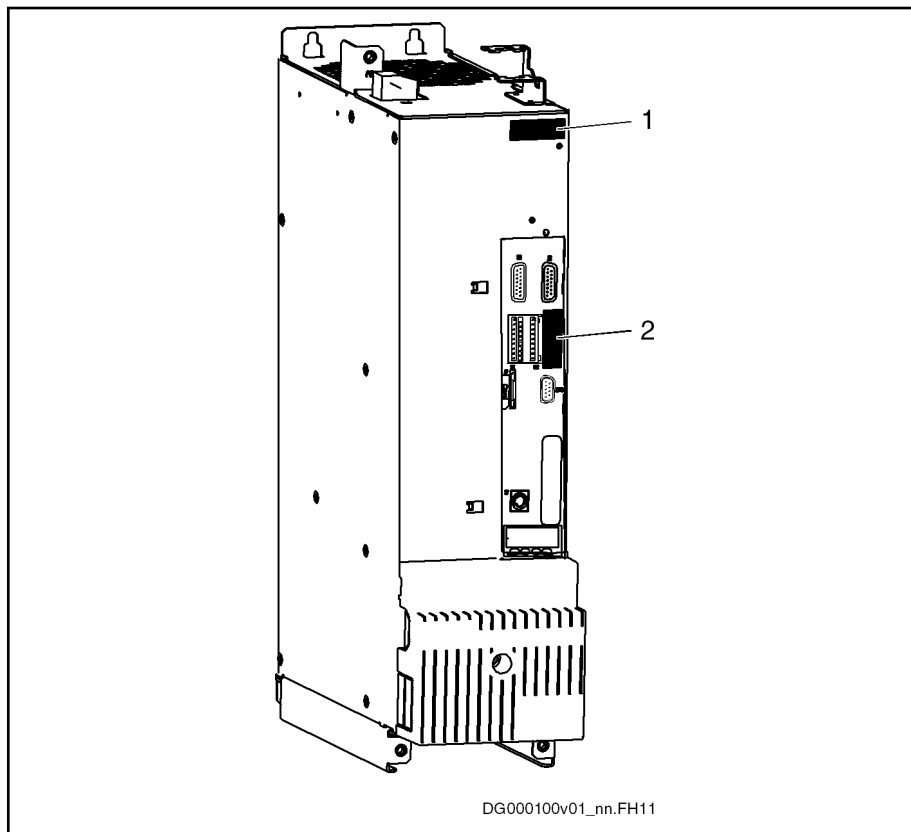
[illegible]

| | |
|----|--|
| 1) | Devices with power supply from DC bus (xxxV) with control sections CSx02 are not able to use optional safety technique. |
|----|--|

Tab. 5-22: HCS03, Type code

Identification

Type plate arrangement



- 1 Power section type plate
- 2 Control section type plate

Fig. 5-25: Type plate arrangement

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 5-26: Type plate (electrical equipment)

5.3.3 Scope of supply

- 1 × touch guard
- Connectors for the electrical connection points at the device
- 1 × Instruction Manual (in the English language)

5.3.4 Technical data

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage"](#) on page 23.

Installation conditions: See [chapter 4.3 "Installation conditions"](#) on page 24.

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|---------------|-------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Short circuit current rating | SCCR | A rms | 42000 | | | | | |
| Rated input voltage, power ¹⁾ | $U_{LN,nenn}$ | V | 3 x AC 400...500 | | | | | |
| Rated input current | I_{LN} | A | 50.0 | 80.0 | 106.0 | 146.0 | 167.0 | 201.0 |
| Output voltage | U_{out} | V | 3 x AC 0...480 | | | | | |
| Output current | I_{out} | A | 45.0 | 75.0 | 95.0 | 145.0 | 165.0 | 200.0 |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 5-23: HCS - Ambient and operating conditions - UL ratings

Information on standards

Applied standards

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|--------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Listing in accordance with UL standard | | | UL 508C | | | | | |
| UL files | | | E134201 | | | | | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | | | | | |
| Latest amendment: 2017-01-23 | | | | | | | | |

Tab. 5-24: HCS - Applied standards

Mechanics and mounting

Dimensional drawings

Dimensional drawing HCS03.1E-W0070

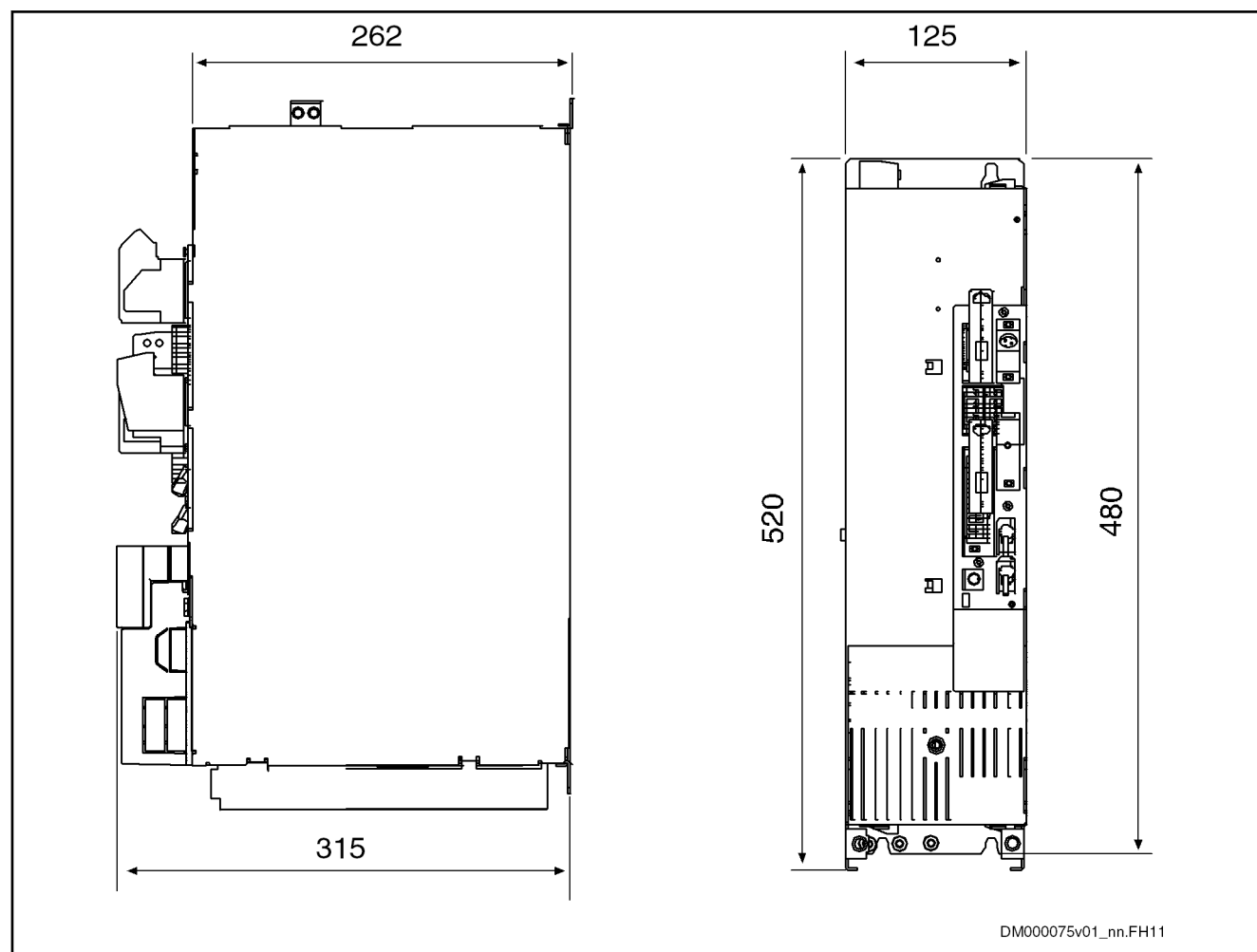


Fig. 5-27: Dimensional drawing HCS03.1E-W0070

Dimensional drawing HCS03.1E-W0070 with HAS02

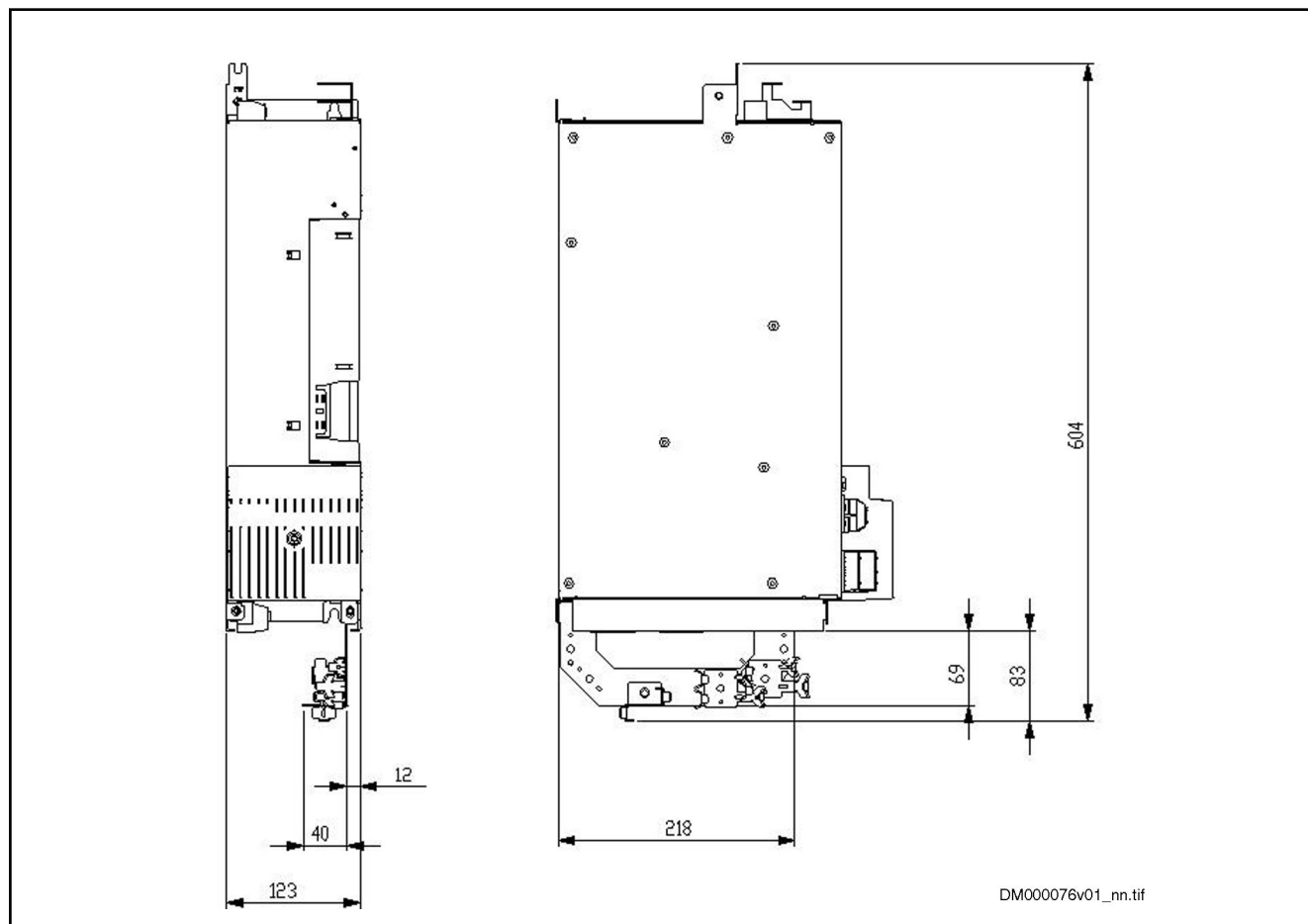
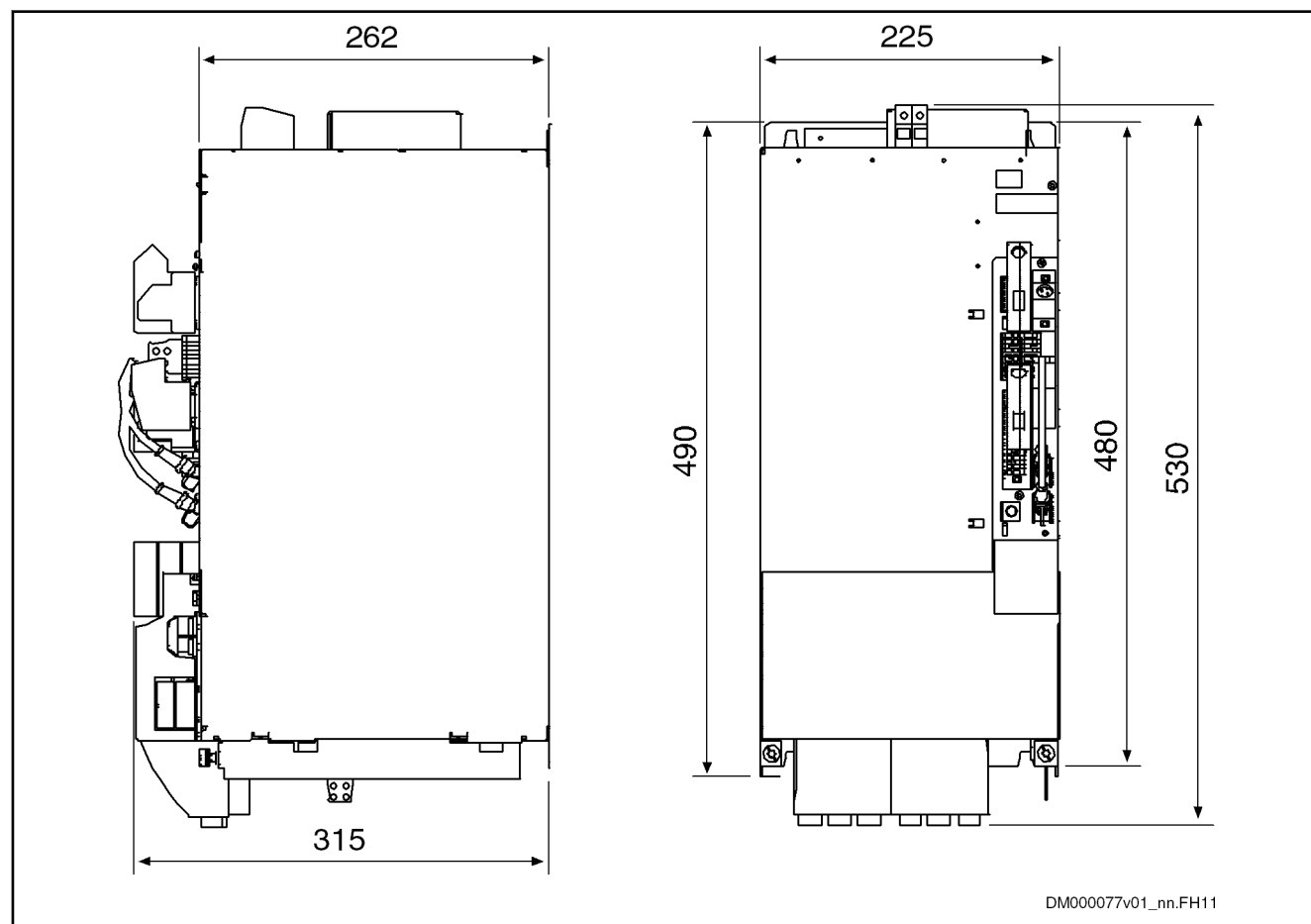


Fig. 5-28: Dimensional drawing HCS03.1E-W0070 with HAS02

Dimensional drawing HCS03.1E-W0100 and HCS03.1E-W150

*Fig. 5-29: Dimensional drawing HCS03.1E-W0100 and HCS03.1E-W150*

Dimensional drawing HCS03.1E-W0100 and HCS03.1E-W150 with HAS02

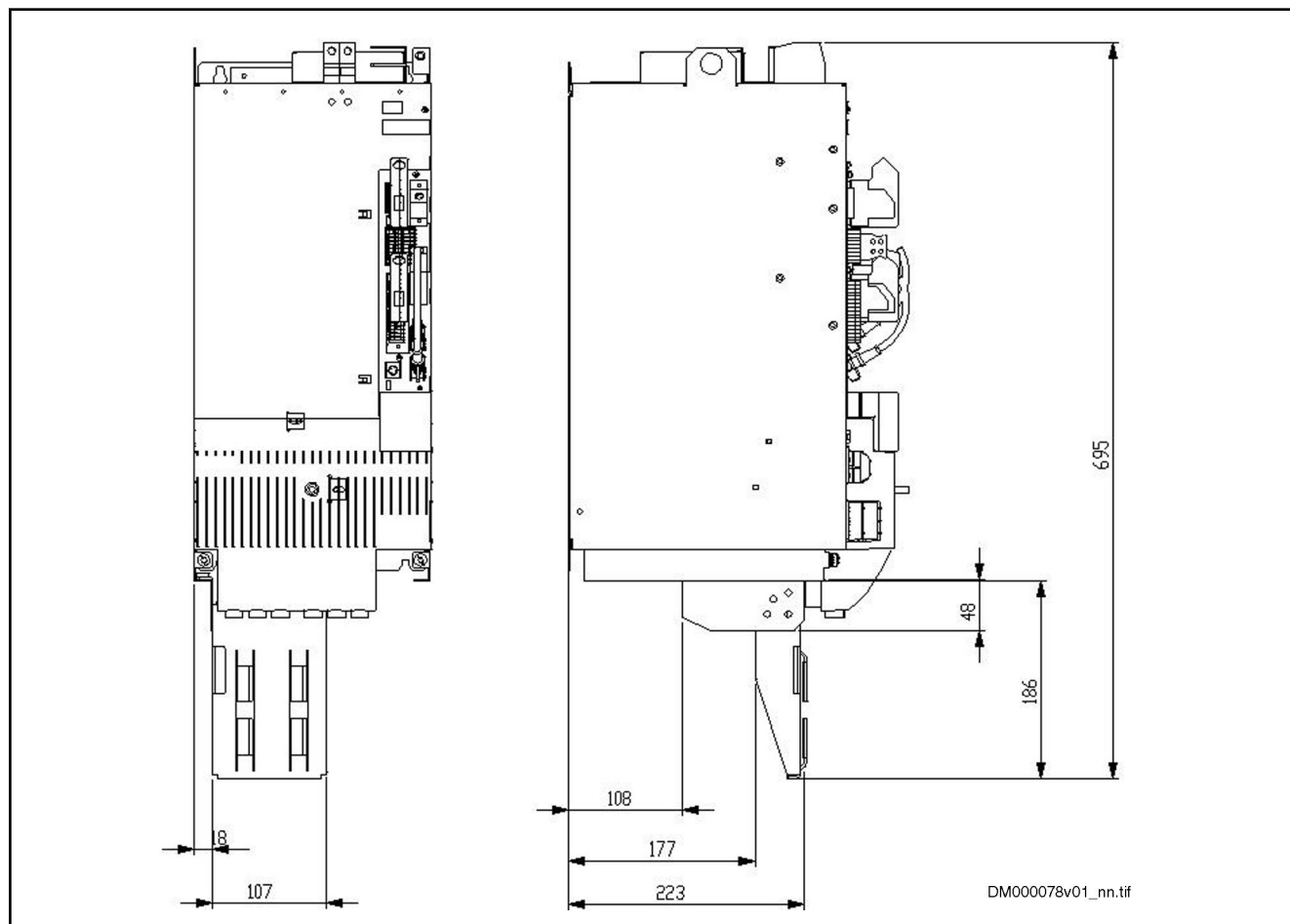
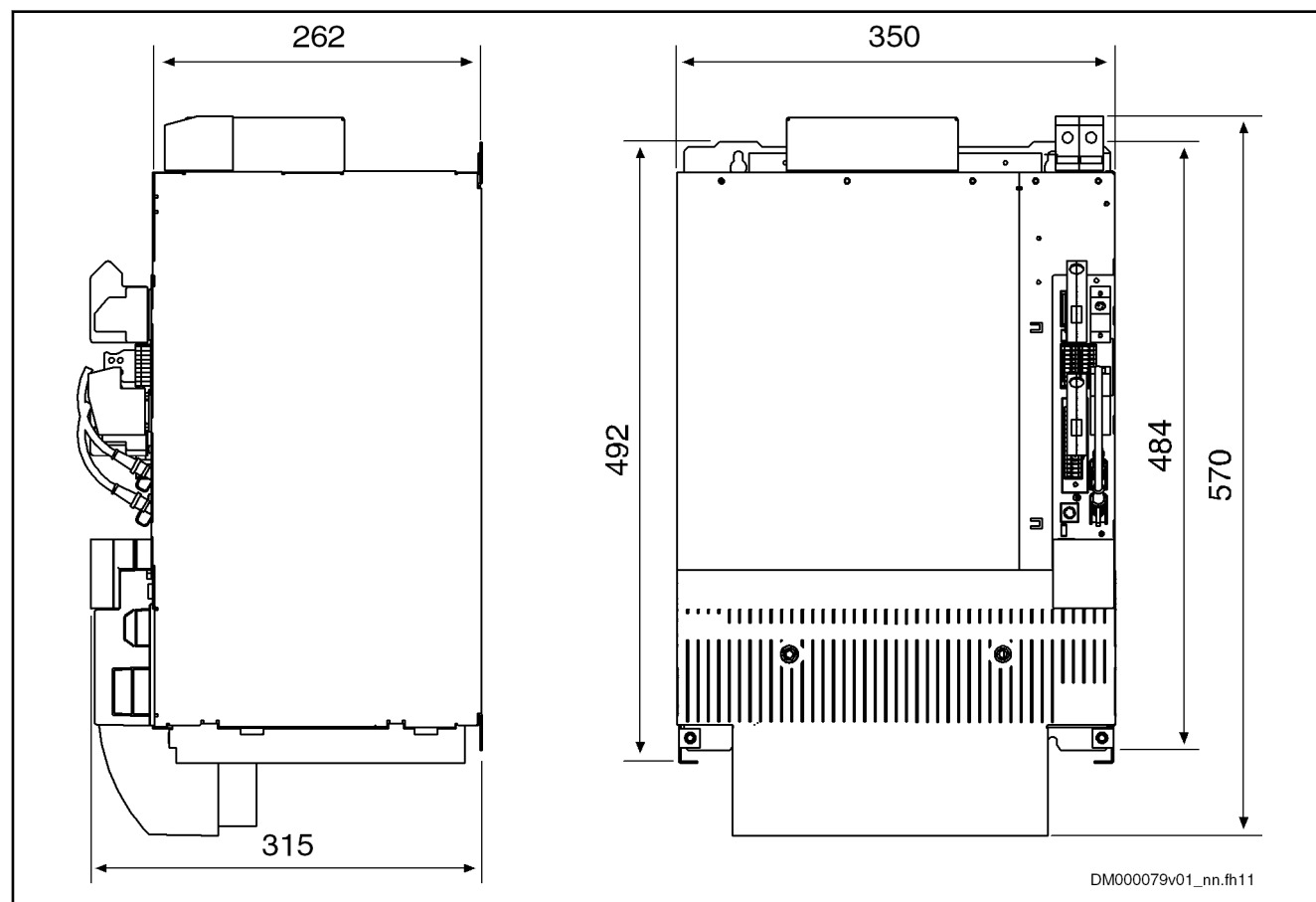


Fig. 5-30: Dimensional drawing HCS03.1E-W0100 and HCS03.1E-W150 with HAS02

Dimensional drawing HCS03.1E-W0210

*Fig. 5-31: Dimensional drawing HCS03.1E-W0210*

Dimensional drawing HCS03.1E-W0210 with HAS02

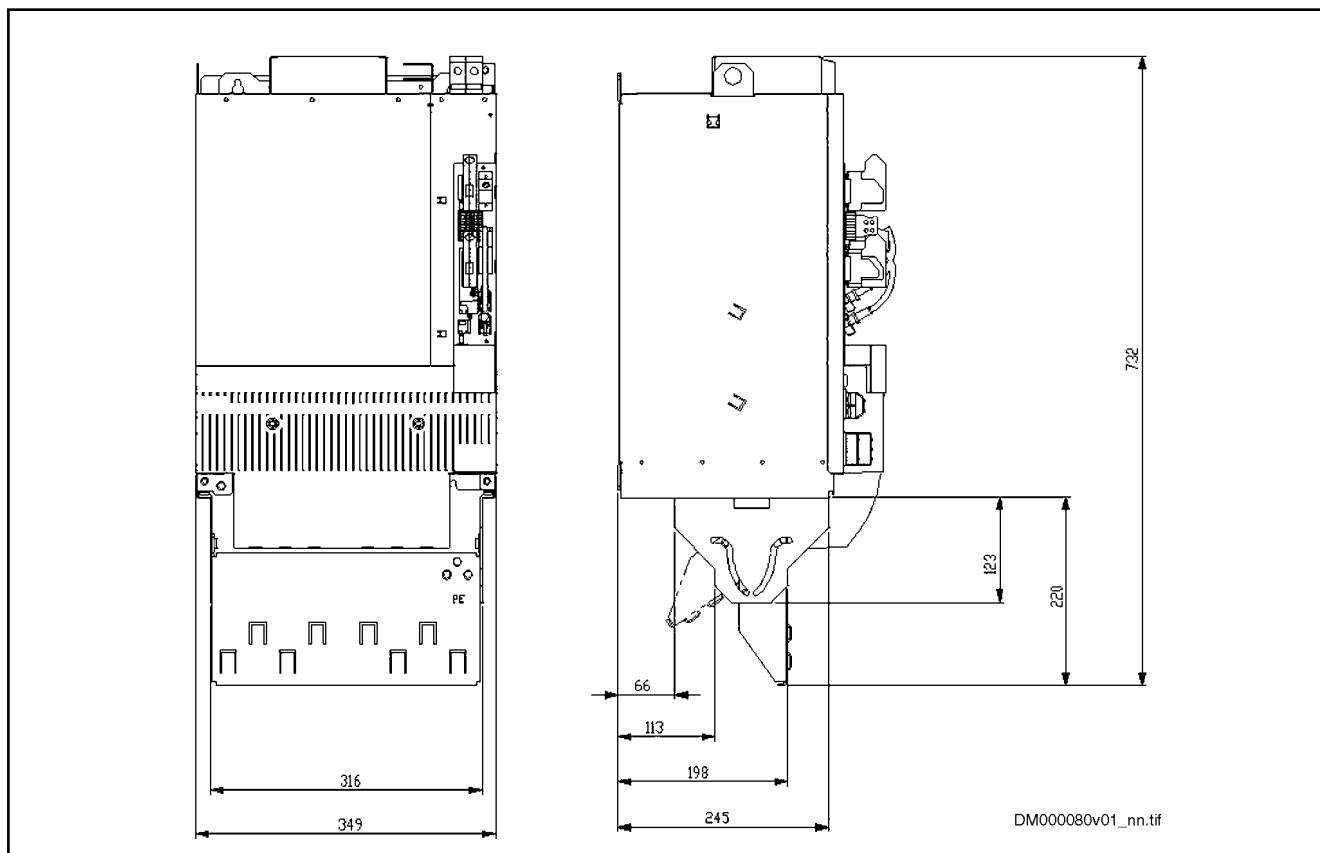
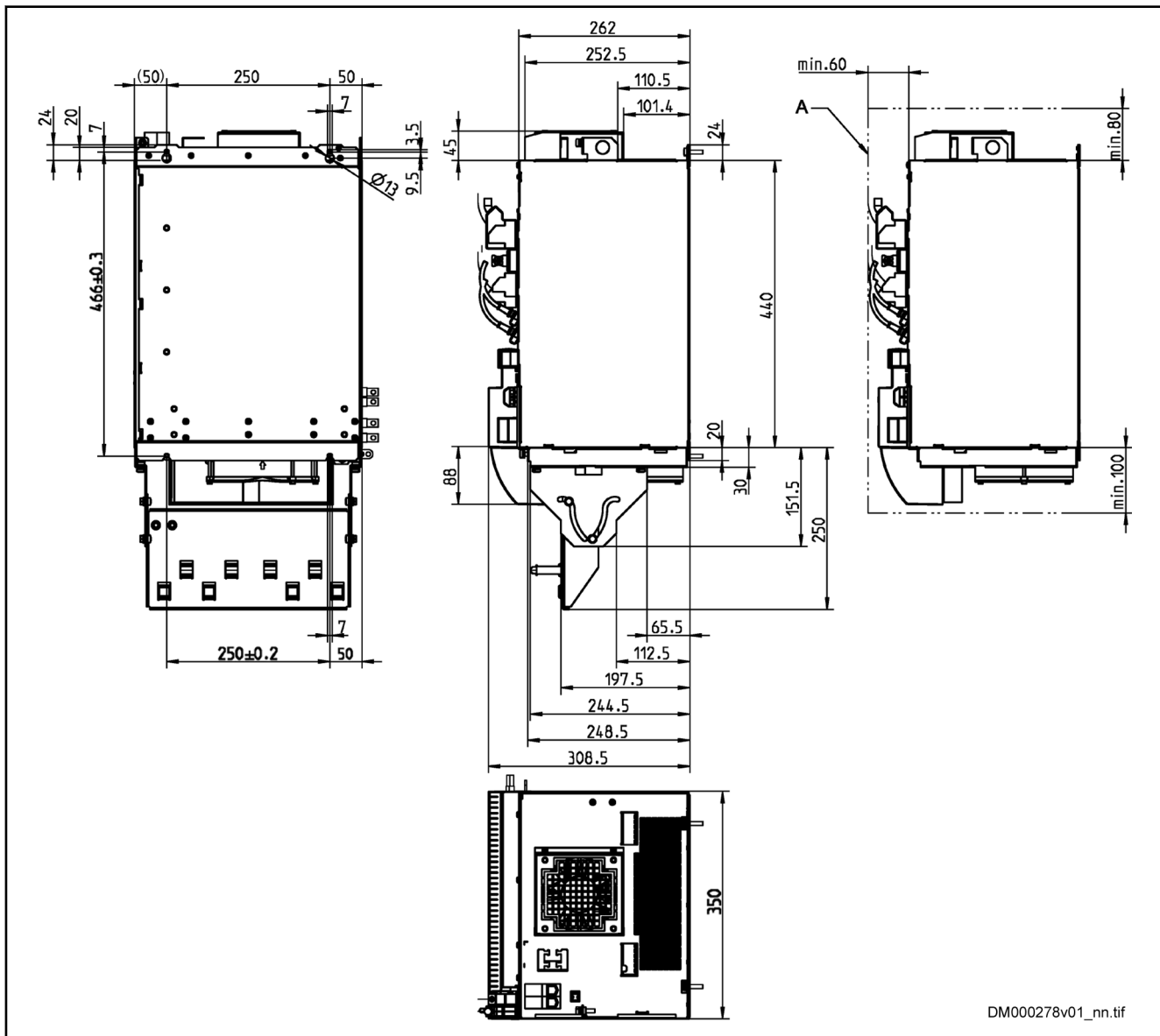


Fig. 5-32:

Dimensional drawing HCS03.1E-W0210 with HAS02

Dimensional drawing HCS03.1E-W0280 and HCS03.1E-W0350

**A**

Minimum mounting clearance

Fig. 5-33:

Dimensional drawing HCS03.1E-W0280 and HCS03.1E-W0350

Boring dimensions HCS03.1E-W0070

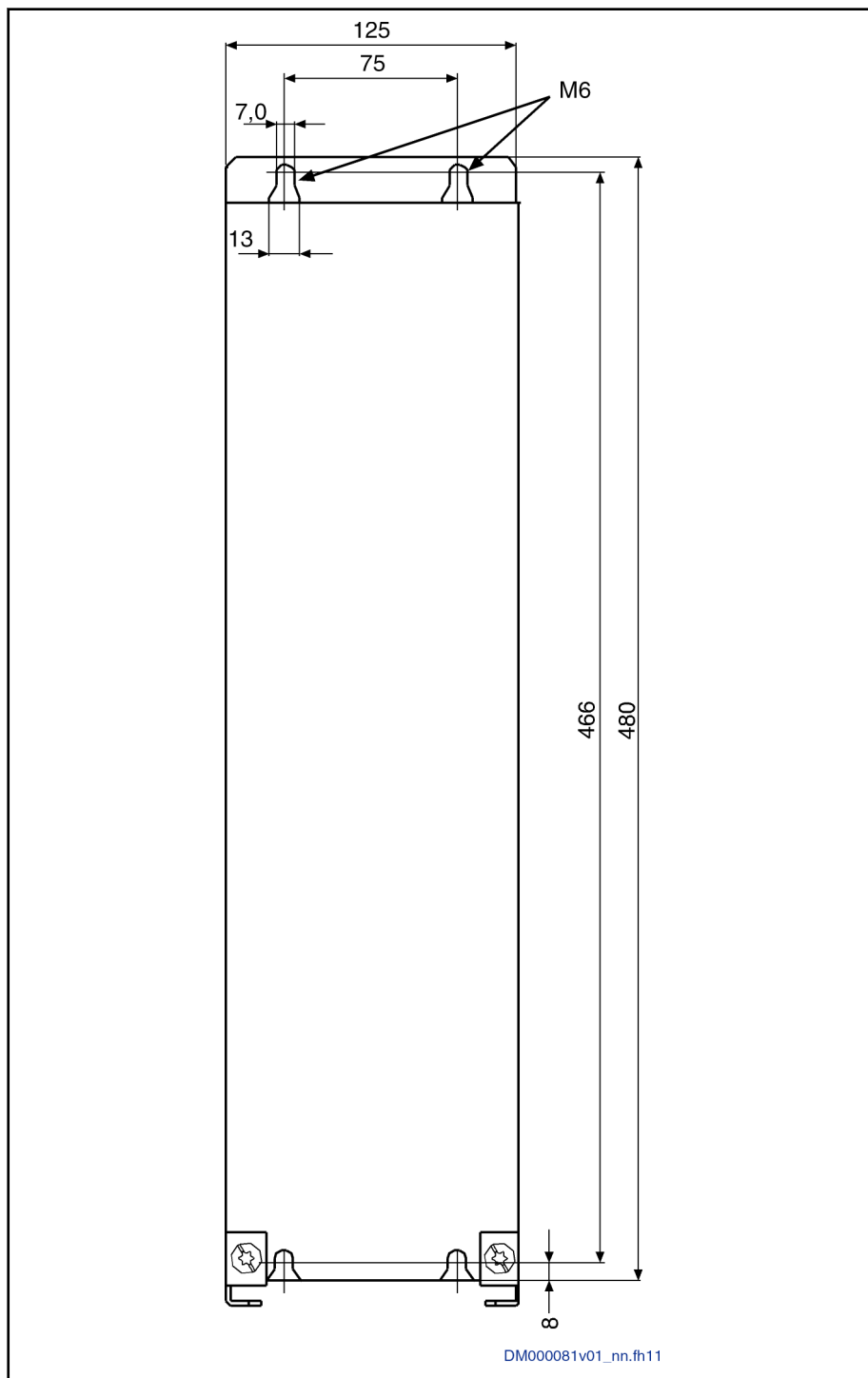


Fig. 5-34: Boring dimensions HCS03.1E-W0070

Boring dimensions HCS03.1E-W0100 and HCS03.1-W0150

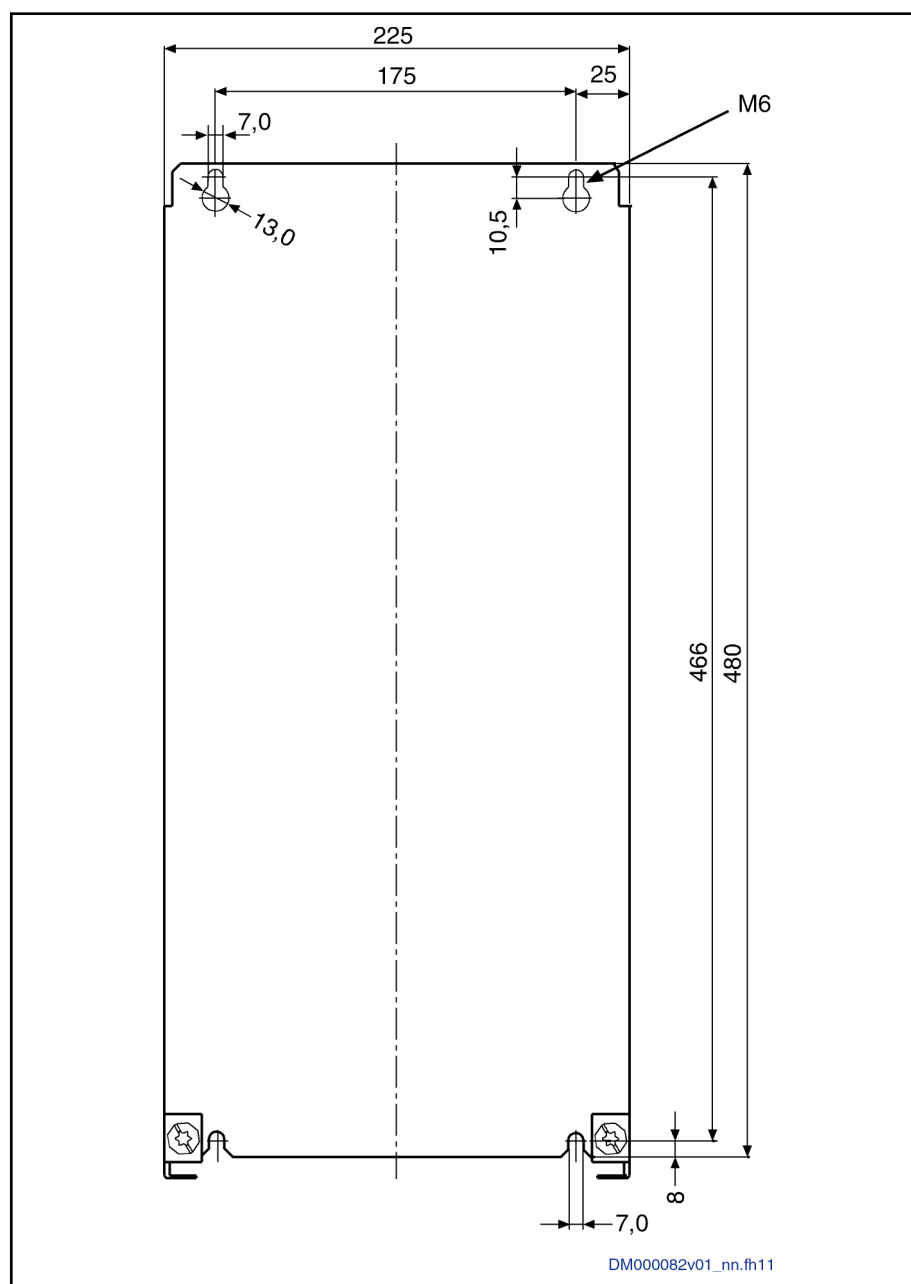


Fig. 5-35: Boring dimensions HCS03.1E-W0100 and HCS03.1-W0150

Boring dimensions HCS03.1E-W0210/280/350

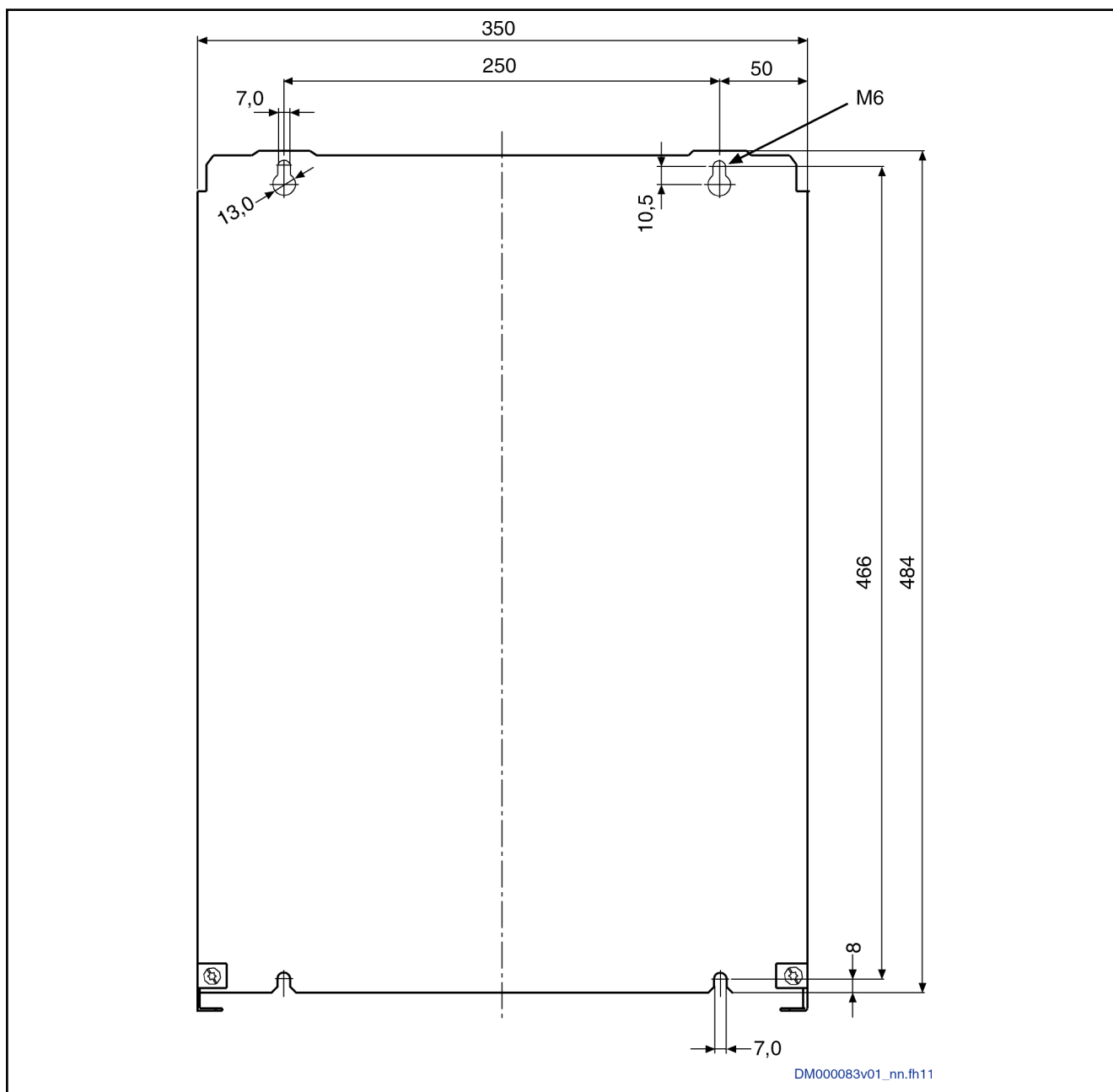


Fig. 5-36: Boring dimensions HCS03.1E-W0210/280/350

Dimensions, mass, insulation, sound pressure level

Data for mass, dimensions, sound pressure level, insulation

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|------------------------------|--------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Mass | m | kg | 13.00 | 20.00 | | 32.50 | 36.50 | |
| Device height ¹⁾ | H | mm | 490 | | | | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|-----------------|--------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Device depth ²⁾ | T | mm | 262 | | | | | |
| Device width ³⁾ | B | mm | 125 | 225 | | 350 | | |
| Insulation resistance at 500 V DC | R _{is} | Mohm | 11.00 | | | | | |
| Capacitance against housing | C _Y | nF | 2 x 100 | | | | | |
| Average sound pressure level
(accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | 65 | 61 | | 69 | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

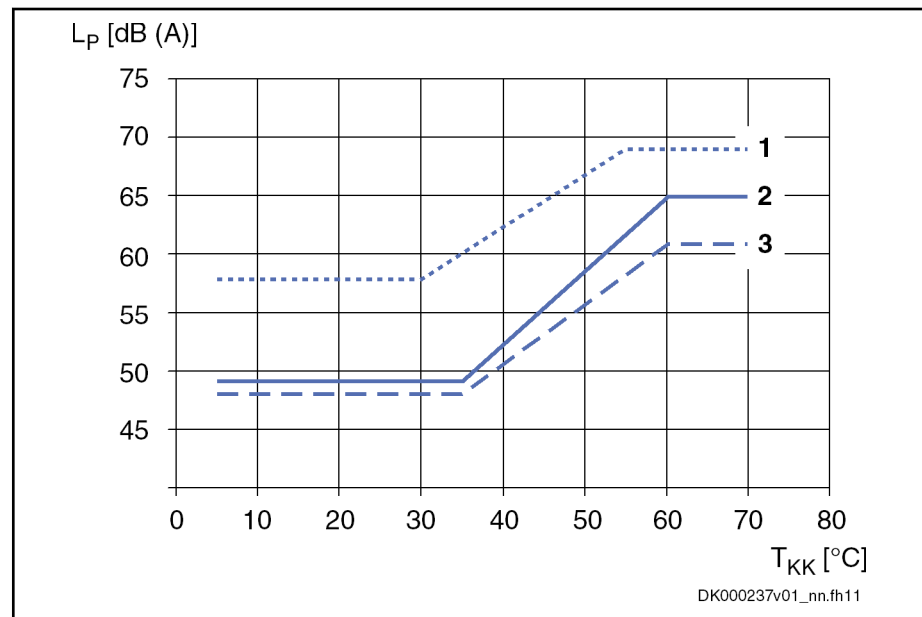
1) 2) 3)
4)

Housing dimension; see also related dimensional drawing
According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 5-25: HCS - Data for mass, dimensions, sound pressure level, insulation

Temperature-dependent fan control, sound pressure level

Devices of the L*** design control the internal fan of the cooling system depending on the temperature of the cooling system. As the load increases, the temperature at the heat sink rises and thereby the sound pressure level (see characteristic below). The specified "average sound pressure level L_p" applies to operation under rated conditions.



T_{KK}

Temperature at heat sink

L_p

Average sound pressure level

1

HCS03.1E-W0210/280/350-...-L***

2

HCS03.1E-W0070-...-L***

3

HCS03.1E-W0100/W0150-...-L***

Fig. 5-37:

Sound pressure level of HCS03.1E-...-L*** devices

Power dissipation, mounting position, cooling, distances

Cooling and power dissipation data

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|-----------------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...40 | | | | | |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...55 | | | | | |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2.0 | | | | | |
| Allowed mounting position | | | G1 | G1, G4 | | | | |
| Cooling type | | | Forced ventilation | | | | | |
| Volumetric capacity of forced cooling | V | m³/h | 265.00 | 367.00 | | 780.00 | | |
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8, 12, 16 | | | | | 4, 8 |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (min.) ²⁾ | P _{Diss_0A_fs_min} | W | 240 | 290 | 350 | 600 | 350 | |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (max.) ³⁾ | P _{Diss_0A_fs_max} | W | 630 | 750 | 900 | 1600 | 700 | |
| Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾ | P _{Diss_cont} | W | 800.00 | 950.00 | 1150.00 | 2000.00 | 1900.00 | 2300.00 |
| Minimum distance on the top of the device ⁵⁾ | d _{top} | mm | 80 | | | | | |
| Minimum distance on the bottom of the device ⁶⁾ | d _{bot} | mm | 100 | | | | | |
| Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD} | ΔT | K | 30 | | | | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}
- 4) Plus dissipation of braking resistor and control section
- 5) 6) See fig. "Air intake and air outlet at device"

Tab. 5-26: HCS - Data for cooling and power dissipation

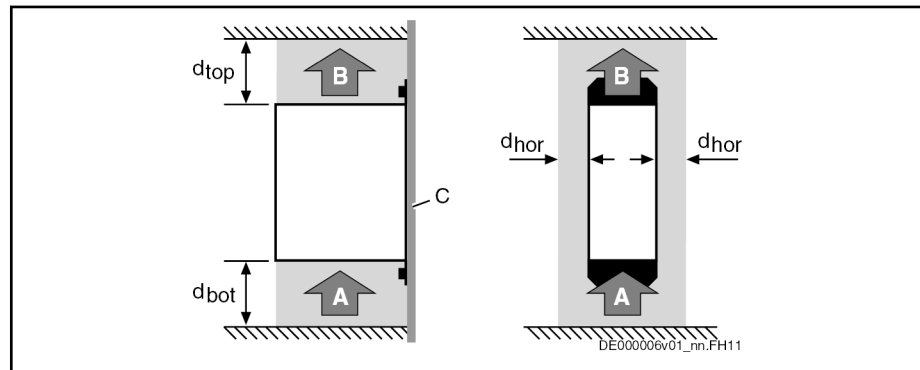
NOTICE

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



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

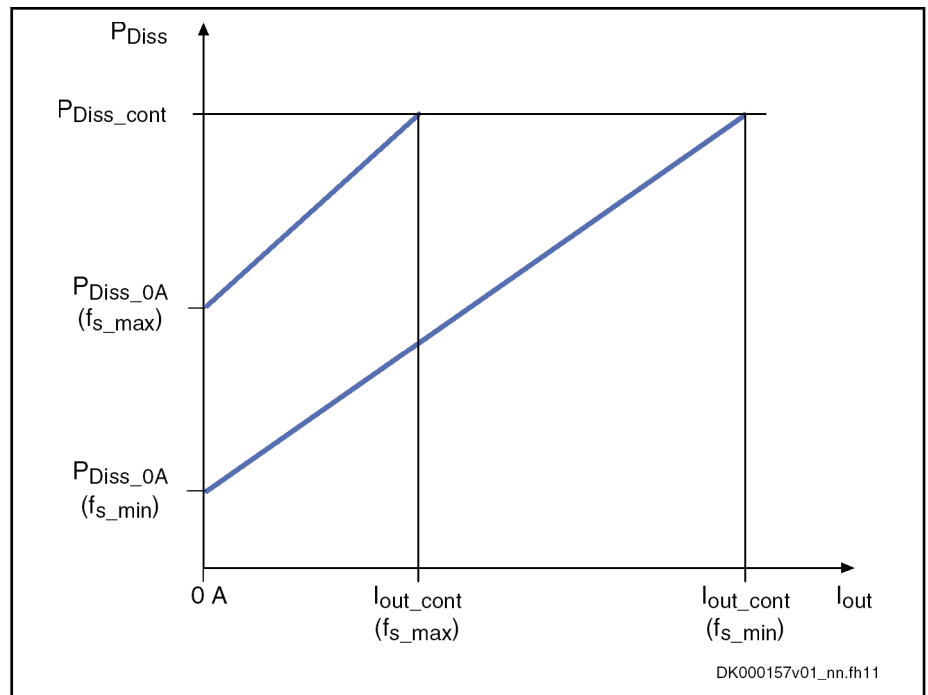
Fig. 5-38: Air intake and air outlet at device

Power dissipation vs. output current

The figure below illustrates the connection between power dissipation and output current, depending on the switching frequency f_s which was set at the drive controller. See also Parameter Description "P-0-0001, Switching frequency of the power output stage".



In addition, take the power at the braking resistor and the power consumption of the control section into account. Both powers are not contained in the figure.



I_{out} Output current
 P_{Diss} Power dissipation
 f_s Switching frequency

Fig. 5-39: Power Dissipation vs. Output Current

For the data P_{Diss_cont} , $P_{Diss_0A_fsmax}$ and $P_{Diss_0A_fsmin}$, see the table "Data for Cooling and Power Dissipation".

Basic data of HCS03 power section

General information

This chapter contains:

- Data for control voltage supply
- Data for mains voltage supply
- Data of DC bus
- Data of integrated braking resistor and requirements on an external braking resistor
- Data of inverter
- Data for cooling and power dissipation



The order of the data tables below follows the energy flow in the drive controller - from mains connection to motor output.

Control voltage**Control voltage supply data**

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|-----------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Control voltage input ¹⁾ | U _{N3} | V | 24 ± 20% | | | | | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U _{N3} | V | 24 ± 5 % | | | | | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U _{N3} | V | 26 ± 5 % | | | | | |
| Max. inrush current at 24 V supply | I _{EIN3_max} | A | 2.80 | | | | | |
| Pulse width of I _{EIN3} | t _{EIN3Lade} | ms | 5 | | | | | |
| Input capacitance | C _{N3} | mF | 0.56 | | | | | |
| Rated power consumption control voltage input at U _{N3} ⁴⁾ | P _{N3} | W | 22 | 25 | | 30 | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

- 1) 2) 3) Observe supply voltage for motor holding brake
 4) See information on "Rated power consumption control voltage input at U_{N3}"

Tab. 5-27: HCS - Control voltage supply data

**Rated power consumption control voltage input at U_{N3}**

Plus motor holding brake and control section, plus safety option



HCS02/HCS03 converters of the **design "-N**V"** have an **integrated 24V supply**. In applications without motor holding brake and with CSB01.1N-FC control section, they can be operated without external 24V supply. Observe the notes on project planning for the mains connection.

Mains voltage**Mains voltage supply data**

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|------------------------------|-----------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Mains frequency | f _{LN} | Hz | 50...60 | | | | | |
| Tolerance input frequency | | Hz | ± 2 | | | | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|--------------------------|---------|---|---|---|---|------------------------------------|--------------------------------|
| Maximum allowed mains frequency change | $\Delta f_{LN}/\Delta t$ | Hz/s | - | | | | | |
| Rotary field condition | | | None | | | | | |
| Short circuit current rating | SCCR | A rms | 42000 | | | | | |
| Nominal mains voltage | U_{LN_nom} | V | 3 AC 400 | | | | | |
| Mains voltage, single-phase | U_{LN} | V | - | | | | | |
| Three-phase mains voltage at TN-S, TN-C, TT mains | U_{LN} | V | 400...500 | | | | | |
| Mains voltage, three-phase at IT mains ¹⁾ | U_{LN} | V | Not allowed | | | | | |
| Mains voltage, three-phase at Corner-grounded-Delta mains ²⁾ | U_{LN} | V | Not allowed | | | | | |
| Tolerance rated input voltage U_{LN} | | % | +10 -15 | | | | | |
| Minimum short circuit power of the mains for failure-free operation | S_{k_min} | MVA | 1.1 | 2.0 | 2.7 | 3.8 | 5.0 | 6.3 |
| Minimum inductance of mains supply (mains phase inductance) ³⁾ | L_{min} | μH | 40 | | | | | |
| Assigned type of mains choke | | | HNL01.1
E-0571-
N0050-
A-500-
NNNN;
HNK01.1
A-A075-
E0050-
A-500-
NNNN | HNL01.1
E-0362-
N0080-
A-500-
NNNN;
HNK01.1
A-A075-
E0080-
A-500-
NNNN | HNL01.1
E-0240-
N0106-
A-500-
NNNN;
HNK01.1
A-A075-
E0106-
A-500-
NNNN | HNL01.1
E-0170-
N0146-
A-500-
NNNN;
HNK01.1
A-A075-
E0146-
A-500-
NNNN | HNL01.1E-0100-
N0220-A-480-NNNN | |
| Inrush current | $I_{L_trans_max_on}$ | A | 2.80 | 5.70 | | 17.00 | 25.00 | |
| Maximum allowed ON-OFF cycles per minute ⁴⁾ | | | 1 | | | 3 | 2 | |
| Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (single-phase, without mains choke) ⁵⁾ | I_{LN} | A | - | | | | | |
| Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (three-phase, without mains choke) ⁶⁾ | I_{LN} | A | 50.00 | 80.00 | 106.00 | 146.00 | 176.00 | 201.00 |
| Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (single-phase, with mains choke) ⁷⁾ | I_{LN} | A | - | | | | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

Power sections for converters - IndraDrive C

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 | |
|--|----------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------|
| Mains input continuous current at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke) ⁸⁾ | I_{LN} | A | - | | | | | 167.00 | 201.00 |
| Nominal current AC1 for mains contactor at nom. data | | | I LN | | | | | | |
| Mains fuse according to EN 60204-1 (single-phase, without mains choke) | | A | - | | | | | | |
| Mains fuse according to EN 60204-1 (three-phase, without mains choke) | | A | tbd | | | | | | |
| Mains fuse according to EN 60204-1 (single-phase, with mains choke) | | A | - | | | | | | |
| Mains fuse according to EN 60204-1 (three-phase, with mains choke) | | A | 63 | 100 | 125 | 160 | 200 | 250 | |
| Required wire size in accordance with NFPA 79 and UL 508 A (internal wiring); ⁹⁾ | A_{LN} | AWG | 8 AWG | 4 AWG | 2 AWG | 1/0 AWG | 2/0 AWG | 3/0 AWG | |
| Mains connected load at U_{LN_nenn} and P_{DC_cont} (three-phase, without mains choke) | S_{LN} | kVA | 22.60 | 40.30 | 54.00 | 76.00 | 123.00 | 140.30 | |
| Mains connected load at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke) | S_{LN} | kVA | 35.00 | 55.20 | 72.90 | 99.30 | 114.20 | 136.40 | |
| Mains connection power at U_{LN_nenn} and P_{DC_cont} (single-phase, without mains choke) | S_{LN} | kVA | - | | | | | | |
| Mains connection power at U_{LN_nenn} and P_{DC_cont} (single-phase, with mains choke) | S_{LN} | kVA | - | | | | | | |
| Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (single-phase, without mains choke) ¹⁰⁾ | TPF | | - | | | | | | |
| Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (three-phase, without mains choke) ¹¹⁾ | TPF | | 0.57 | 0.59 | 0.61 | 0.62 | 0.71 | 0.74 | |
| Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (single-phase, with mains choke) ¹²⁾ | TPF | | - | | | | | | |
| Latest amendment: 2016-12-07 | | | | | | | | | |

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|--------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke) ¹³⁾ | TPF | | 0.85 | 0.83 | 0.81 | 0.78 | 0.93 | |
| Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (single-phase, without mains choke) | TPF _{10%} | | - | | | | | |
| Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, without mains choke) | TPF _{10%} | | 0.40 | | | | 0.57 | 0.58 |
| Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (single-phase, with mains choke) | TPF _{10%} | | - | | | | | |
| Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, with mains choke) | TPF _{10%} | | - | | | | | |
| Power factor of fundamental component DPF at P_{DC_cont} (single-phase, without mains choke) | $\cos\varphi^{h1}$ | | - | | | | | |
| Power factor of fundamental component DPF at P_{DC_cont} (three-phase, without mains choke) | $\cos\varphi^{h1}$ | | 0.64 | 0.67 | 0.70 | 0.73 | 1.00 | |
| Power factor of fundamental component DPF at P_{DC_cont} (single-phase, with mains choke) | $\cos\varphi^{h1}$ | | - | | | | | |
| Power factor of fundamental component DPF at P_{DC_cont} (three-phase, with mains choke) | $\cos\varphi^{h1}$ | | 0.95 | | 0.94 | 0.93 | 0.99 | |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) 2)

Mains voltage > U_{LN} : Use a transformer with grounded neutral point, do not use autotransformers!

3)

Otherwise use HNL mains choke

4)

Observe allowed number of switch-on processes; without external capacitors at the DC bus

5) 6) 7) 8) 10) 11) 12) 13)

Find interim values by interpolation

9)

Copper wire; PVC-insulation (conductor temperature 90 °C; $T_a \leq 40$ °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 5-28:

HCS - Mains voltage supply data

DC bus

Power section data - DC bus

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|----------------------|------|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| DC bus voltage | U_{DC} | V | ULN x 1.41 | | | | | |
| Capacitance in DC bus | C_{DC} | mF | 0.94 | 1.44 | 1.88 | 4.70 | 6.80 | |
| DC resistance in DC bus (L+ to L-) | R_{DC} | kohm | approx.
95 | approx. 47 | | approx.
16 | approx. 17 | |
| Rated power (t > 10 min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; with mains choke | P_{DC_cont} | kW | 25.00 | 43.00 | 56.00 | 85.00 | 100.00 | 120.00 |
| Rated power (t > 10 min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; without mains choke | P_{DC_cont} | kW | 13.00 | 24.00 | 34.00 | 47.00 | 83.00 | 100.00 |
| P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} \leq U_{LN_nenn}$ | | %/V | $P_{DC_cont} (ULN) = P_{DC_cont} \times [1 - (400 - ULN) \times 0.0025]$ | | | | | |
| P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} > U_{LN_nenn}$ | | %/V | $P_{DC_cont} (ULN) = P_{DC_cont} \times [1 + (ULN - 400) \times 0.002]$ | | | | | |
| Maximum allowed DC bus power at U_{LN_nenn} ; with mains choke | P_{DC_max} | kW | 40.00 | 59.00 | 89.00 | 124.00 | 170.00 | 210.00 |
| Maximum allowed DC bus power at U_{LN_nenn} ; without mains choke | P_{DC_max} | kW | 20.00 | 33.00 | 54.00 | 68.00 | 146.00 | 175.00 |
| Balancing factor for P_{DC_cont} (for parallel operation at common DC bus) with mains choke | | | 1.00 | | | | | |
| Balancing factor for P_{DC_cont} (for parallel operation at common DC bus) without mains choke | | | 0.80 | | | | | |
| Monitoring value maximum DC bus voltage, switch-off threshold | $U_{DC_limit_max}$ | V | 900 | | | | | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | $U_{DC_limit_min}$ | V | can be parameterized, see "P-0-0114, Undervoltage threshold" | | | | | |
| Charging resistor continuous power | P_{DC_Start} | kW | - | | | | | |
| Allowed external DC bus capacitance (nom.) at U_{LN_nenn} ¹⁾ | C_{DCext} | mF | - | | | 50 (HWI > 01) | | |
| Charging time for maximum external DC bus capacitance C_{DCext} at U_{LN_nenn} | $t_{lade_DC_Cext}$ | s | - | | | 4.00 | | |

Latest amendment: 2016-12-07

1) Use assigned mains choke
 Tab. 5-29: HCS - Power section data - DC bus

External braking resistor

Requirements on external braking resistor

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|-------------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Resistance value of external
braking resistor ¹⁾ | R _{DC_Bleeder} | ohm | 17.5 | 11.7 | 7.0 | 5.0 | | |
| Assigned braking resistor types
HLR01 ²⁾ | | | HLR01.1
N-0300-
N17R5 | HLR01.1
N-0470-
N11R7 | HLR01.1
N-0780-
N07R0 | HLR01.1N-1K08-N05R0 | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) See Parameter Description "P-0-0858, Data of external braking resistor"

2) See also Project Planning Manual "Additional Components"

Tab. 5-30: HCS - Requirements on external braking resistor

Inverter

Power section data - inverter

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|----------------------|-------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8, 12, 16 | | | | 4, 8 | |
| Output voltage, fundamental wave in V/Hz (U/f) control | U _{out_eff} | V | ~ UDC x 0.71 | | | | | |
| Output voltage, fundamental wave in closed-loop operation | U _{out_eff} | V | ~ UDC * 0.71 | | | | | |
| Rise of voltage at output with U _{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾ | dv/dt | kV/μs | 5.00 | | | | | |
| Rise of voltage at output with U _{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾ | dv/dt | kV/μs | 5.00 | | | | | |
| Output frequency range when f _s = 2 kHz | f _{out_2k} | Hz | - | | | | | |
| Output frequency range when f _s = 4 kHz | f _{out_4k} | Hz | 0...400 | | | | | |
| Output frequency range when f _s = 8 kHz | f _{out_8k} | Hz | 0..800 | | | | | |
| Output frequency range when f _s = 12 kHz | f _{out_12k} | Hz | 0..1200 | | | | - | |
| Output frequency range when f _s = 16 kHz | f _{out_16k} | Hz | 0...1600 | | | | - | |
| Latest amendment: 2016-12-07 | | | | | | | | |

Power sections for converters - IndraDrive C

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|----------------------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Output frequency threshold to detect motor standstill ⁴⁾ | f _{out_still} | Hz | 2...4 | | | | | |
| Maximum output current when f _s = 2 kHz | I _{out_max2} | A | - | | | | | |
| Maximum output current when f _s = 4 kHz | I _{out_max4} | A | 70.0 | 100.0 | 150.0 | 210.0 | 280.0 | 350.0 |
| Maximum output current when f _s = 8 kHz | I _{out_max8} | A | 62.0 | 86.0 | 137.0 | 190.0 | 280.0 | 350.0 |
| Maximum output current when f _s = 12 kHz | I _{out_max12} | A | 47.0 | 60.0 | 105.0 | 135.0 | - | |
| Maximum output current when f _s = 16 kHz | I _{out_max16} | A | 34.0 | 50.0 | 86.0 | 105.0 | - | |
| Continuous output current when f _s = 2 kHz | I _{out_cont2} | A | - | | | | | |
| Continuous output current when f _s = 4 kHz | I _{out_cont4} | A | 45.0 | 73.0 | 95.0 | 145.0 | 165.0 | 200.0 |
| Continuous output current when f _s = 8 kHz | I _{out_cont8} | A | 33.0 | 50.0 | 66.0 | 100.0 | 98.0 | 116.0 |
| Continuous output current when f _s = 12 kHz ⁵⁾ | I _{out_cont12} | A | 24.0 | 37.0 | 48.0 | 72.0 | - | |
| Continuous output current when f _s = 16 kHz ⁶⁾ | I _{out_cont16} | A | 18.0 | 27.0 | 37.0 | 54.0 | - | |
| Continuous output current when f _s = 2 kHz; output frequency f _{out} less than f _{out_still} | I _{out_cont0Hz
_2} | A | - | | | | | |
| Continuous output current when f _s = 4 kHz; output frequency f _{out} less than f _{out_still} | I _{out_cont0Hz
_4} | A | 29.2 | 46.9 | 60.9 | 92.5 | 107.2 | 122.5 |
| Continuous output current when f _s = 8 kHz; output frequency f _{out} less than f _{out_still} | I _{out_cont0Hz
_8} | A | 18.3 | 30.4 | 39.6 | 57.8 | 55.5 | 58.7 |
| Continuous output current when f _s = 12 kHz; output frequency f _{out} less than f _{out_still} ⁷⁾ | I _{out_cont0Hz
_12} | A | 12.0 | 20.8 | 27.4 | 38.3 | - | |
| Latest amendment: 2016-12-07 | | | | | | | | |

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|------------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Continuous output current when $f_s = 16$ kHz; output frequency f_{out} less than f_{out_still} ⁸⁾ | $I_{out_cont0Hz_16}$ | A | 8.6 | 15.0 | 20.0 | 27.9 | - | |
| Assigned output filters at nom. data; $f_s = 4$ kHz | | | HMF01,1
A-N0K2-
D0045 | HMF01,1
A-N0K2-
D0073 | HMF01,1
A-N0K2-
D0095 | HMF01,1
A-N0K2-
D0145 | tbd | |
| Latest amendment: 2016-12-07 | | | | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s
- Tab. 5-31: HCS - Power section data - inverter



Guide value "Rise of voltage at output"

Observe that the voltage load at the motor is almost independent of the power section used.

Especially when using **standard motors**, make sure that they comply with the occurring voltage load.

Observe the information on third-party motors at drive controllers (see documentation "Rexroth IndraDrive Drive Systems with HMV01/02 HMS01/02, HMD01, HCS02/03", index entry "Third-party motors → At drive controllers").



Reduced output current at motor standstill

Depending on the electric output frequency, the output current is reduced for thermal protection of the power section.

The output current is reduced, when the electric output frequency has fallen below the threshold to detect motor standstill.

Exemplary data for applications

General information

This chapter contains:

- Examples of allowed current profiles
- Examples of allowed performance profiles
- Data for selecting standard motors

Current profiles

Examples of allowed current profiles

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|----------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{1)}$ | $I_{out_peak1_2}$ | A | - | | | | | |
| Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_2}$ | A | - | | | | | |
| Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0,4$ s; $T = 4$ s; $K = 2,5^{2)}$ | $I_{out_peak1_4}$ | A | 70.00 | 100.00 | 150.00 | 210.00 | 280.00 | 350.00 |
| Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0,4$ s; $T = 4$ s; $K = 2,5$ | $I_{out_base1_4}$ | A | 28.00 | 40.00 | 60.00 | 84.00 | 104.00 | 123.00 |
| Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{3)}$ | $I_{out_peak1_8}$ | A | 56.29 | 78.09 | 116.46 | 169.54 | 162.00 | 195.60 |
| Base load current at $I_{out_peak_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_8}$ | A | 22.52 | 31.24 | 46.58 | 67.81 | 64.80 | 78.20 |
| Maximum output current at $I_{out_base_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{4)}$ | $I_{out_peak1_12}$ | A | 41.49 | 57.08 | 85.83 | 122.51 | - | |
| Base load current at $I_{out_peak_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_12}$ | A | 16.60 | 22.83 | 34.33 | 49.00 | - | |
| Maximum output current at $I_{out_base_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{5)}$ | $I_{out_peak1_16}$ | A | 31.31 | 42.79 | 65.24 | 92.58 | - | |
| Base load current at $I_{out_peak_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_16}$ | A | 12.52 | 17.12 | 26.10 | 37.03 | - | |
| Maximum output current at $I_{out_base_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{6)}$ | $I_{out_peak3_2}$ | A | - | | | | | |
| Base load current at $I_{out_peak_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$ | $I_{out_base3_2}$ | A | - | | | | | |
| Maximum output current at $I_{out_base_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2,0^{7)}$ | $I_{out_peak3_4}$ | A | 66.15 | 91.81 | 135.86 | 210.00 | 245.40 | 300.00 |
| Latest amendment: 2016-12-07 | | | | | | | | |

Latest amendment: 2016-12-07

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|----------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Base load current at $I_{out_peak_3}$;
$f_s = 4$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2,0$ | $I_{out_base3_4}$ | A | 33.07 | 45.91 | 67.93 | 105.00 | 122.70 | 150.00 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 8$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^8)$ | $I_{out_peak3_8}$ | A | 47.56 | 63.92 | 95.46 | 148.43 | 145.20 | 174.80 |
| Base load current at $I_{out_peak_3}$;
$f_s = 8$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_8}$ | A | 23.78 | 31.96 | 47.73 | 74.22 | 72.60 | 87.40 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 12$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^9)$ | $I_{out_peak3_12}$ | A | 34.94 | 46.52 | 70.06 | 106.87 | - | |
| Base load current at $I_{out_peak_3}$;
$f_s = 12$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_12}$ | A | 17.47 | 23.26 | 35.03 | 53.44 | - | |
| Maximum output current at
$I_{out_base_3}$; $f_s = 16$ kHz; $t = 2$ s;
$T = 20$ min; $K = 2.0^{10)}$ | $I_{out_peak3_16}$ | A | 26.33 | 34.78 | 53.13 | 80.58 | - | |
| Base load current at $I_{out_peak_3}$;
$f_s = 16$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_16}$ | A | 13.17 | 17.39 | 26.57 | 40.29 | - | |
| Base load current at $I_{out_peak_4}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_2}$ | A | - | | | | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{11)}$ | $I_{out_peak4_2}$ | A | - | | | | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1,5^{12)}$ | $I_{out_peak4_4}$ | A | 47.66 | 75.04 | 108.03 | 162.72 | 181.50 | 220.20 |
| Base load current at $I_{out_peak_4}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1,5$ | $I_{out_base4_4}$ | A | 31.77 | 50.02 | 72.02 | 108.48 | 121.00 | 146.80 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{13)}$ | $I_{out_peak4_8}$ | A | 34.02 | 51.94 | 75.38 | 112.29 | 106.80 | 127.50 |
| Base load current at $I_{out_peak_4}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_8}$ | A | 22.68 | 34.62 | 50.26 | 74.86 | 71.20 | 85.00 |
| Latest amendment: 2016-12-07 | | | | | | | | |

Power sections for converters - IndraDrive C

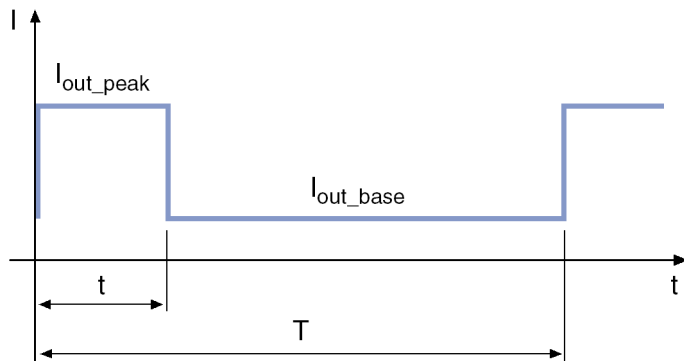
| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|--------------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Maximum output current at $I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{14)}$ | $I_{out_peak4_1}$
2 | A | 24.90 | 37.66 | 55.12 | 80.57 | - | |
| Base load current at $I_{out_peak_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$ | $I_{out_base4_1}$
2 | A | 16.60 | 25.10 | 36.75 | 53.71 | - | |
| Maximum output current at $I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{15)}$ | $I_{out_peak4_1}$
6 | A | 18.73 | 28.08 | 41.70 | 60.61 | - | |
| Base load current at $I_{out_peak_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$ | $I_{out_base4_1}$
6 | A | 12.49 | 18.72 | 27.80 | 40.41 | - | |
| Maximum output current at $I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{16)}$ | $I_{out_peak5_2}$ | A | - | | | | | |
| Base load current at $I_{out_peak_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_2}$ | A | - | | | | | |
| Maximum output current at $I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1,1^{17)}$ | $I_{out_peak5_4}$ | A | 46.36 | 73.69 | 98.64 | 150.11 | 170.30 | 206.40 |
| Base load current at $I_{out_peak_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1,1$ | $I_{out_base5_4}$ | A | 42.14 | 66.99 | 89.67 | 136.47 | 154.80 | 187.60 |
| Maximum output current at $I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{18)}$ | $I_{out_peak5_8}$ | A | 33.06 | 50.97 | 68.66 | 103.39 | 100.00 | 119.30 |
| Base load current at $I_{out_peak_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_8}$ | A | 30.05 | 46.34 | 62.42 | 93.99 | 91.00 | 108.40 |
| Maximum output current at $I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{19)}$ | $I_{out_peak5_1}$
2 | A | 24.20 | 36.95 | 50.13 | 74.09 | - | |
| Base load current at $I_{out_peak_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_1}$
2 | A | 22.00 | 33.59 | 45.57 | 67.36 | - | |
| Latest amendment: 2016-12-07 | | | | | | | | |

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|--------------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Maximum output current at $I_{out_base_5}$; $f_s = 16$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{(20)}$ | $I_{out_peak5_1}$
6 | A | 18.20 | 27.55 | 37.90 | 55.70 | - | - |
| Base load current at $I_{out_peak_5}$; $f_s = 16$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_1}$
6 | A | 16.54 | 25.05 | 34.45 | 50.64 | - | - |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See
UEL_I_e
profile
definition

Tab. 5-32: HCS - Examples of allowed current profiles

Current profile "UEL_I_e" The following current profiles have been defined for converters and inverters.

| Profile | Explanation |
|--|--|
| <p>current profile "UEL_I_e"</p>  <p>DK000149v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.</p> |

Tab. 5-33: Definition of current profiles

Performance profiles

Examples of allowed performance profiles

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|-------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; without mains choke ¹⁾ | $P_{DC_peak_1}$ | kW | 20.22 | 32.88 | 53.68 | 68.07 | 136.20 | 165.60 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with mains choke ²⁾ | $P_{DC_peak_1}$ | kW | 38.89 | 58.90 | 88.42 | 123.10 | 164.10 | 198.70 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; without mains choke ³⁾ | $P_{DC_base_1}$ | kW | 8.09 | 13.15 | 21.47 | 27.23 | 54.50 | 66.20 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s; $K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with mains choke ⁴⁾ | $P_{DC_base_1}$ | kW | 15.56 | 23.56 | 35.37 | 49.24 | 65.70 | 79.50 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; without mains choke ⁵⁾ | $P_{DC_peak_3}$ | kW | 19.12 | 30.18 | 48.64 | 68.07 | 122.80 | 148.90 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; with mains choke ⁶⁾ | $P_{DC_peak_3}$ | kW | 36.75 | 54.08 | 80.09 | 123.10 | 147.90 | 178.70 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; without mains choke ⁷⁾ | $P_{DC_base_3}$ | kW | 9.56 | 15.09 | 24.30 | 34.03 | 61.40 | 74.50 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s; $K = 2.0$; with mains choke ⁸⁾ | $P_{DC_base_3}$ | kW | 18.37 | 27.04 | 40.04 | 61.55 | 74.00 | 89.40 |
| maximum DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min; $K = 1.5$; without mains choke ⁹⁾ | $P_{DC_peak_4}$ | kW | 13.78 | 24.66 | 38.65 | 52.74 | 90.80 | 109.30 |
| DC bus power at U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min; $K = 1.5$; with mains choke ¹⁰⁾ | $P_{DC_peak_4}$ | kW | 26.48 | 44.20 | 63.68 | 95.39 | 109.40 | 131.20 |
| Latest amendment: 2016-12-07 | | | | | | | | |

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|-------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; without mains choke ¹¹⁾ | $P_{DC_base_4}$ | kW | 9.19 | 16.44 | 25.77 | 35.17 | 60.50 | 72.90 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; with mains choke ¹²⁾ | $P_{DC_base_4}$ | kW | 17.65 | 29.46 | 42.45 | 63.59 | 72.90 | 87.50 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; without mains
choke ¹³⁾ | $P_{DC_peak_5}$ | kW | 13.40 | 23.23 | 35.29 | 48.65 | 85.20 | 102.50 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; with mains
choke ¹⁴⁾ | $P_{DC_peak_5}$ | kW | 25.76 | 43.41 | 58.15 | 88.00 | 102.70 | 123.00 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; without mains choke ¹⁵⁾ | $P_{DC_base_5}$ | kW | 12.16 | 22.03 | 32.10 | 44.24 | 77.50 | 93.20 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_max}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; with mains choke ¹⁶⁾ | $P_{DC_base_5}$ | kW | 23.41 | 39.46 | 52.86 | 80.00 | 93.30 | 111.80 |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) See UEL_P_e profile definition

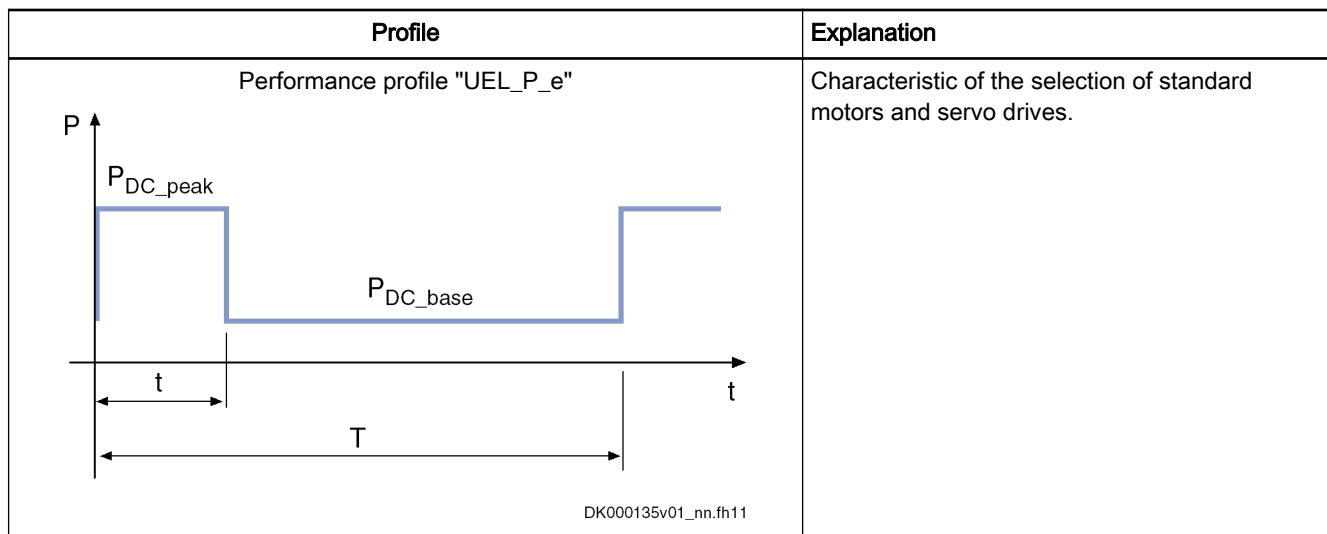
Tab. 5-34: HCS - Examples of allowed performance profiles

Performance profile "UEL_P_e"

The following performance profiles have been defined for converters and inverters.



Observe the allowed performance data P_{DC_peak} and P_{DC_base} in the corresponding performance profile of the supply unit or converter.



Tab. 5-35: Definition of Performance Profiles, Infeeding Supply Units and Converters

Operation with standard motors

General information

Selecting standard motors

The tables below show the nominal powers P_{nenn} of standard motors which can be operated at the respective drive controller. The following conditions apply to the data in the tables:

- Motor design:
4-pole standard motor (2 pole pairs) with rated voltage 3 AC 400 V, 50 Hz at mains voltage $U_{\text{LN}} \geq 3 \text{ AC } 400 \text{ V}$ or
4-pole standard motor (2 pole pairs) with rated voltage 3 AC 460 V, 60 Hz at mains voltage $U_{\text{LN}} \geq 3 \text{ AC } 460 \text{ V}$
- Assigned mains choke is used
- Operation at minimum switching frequency $f_s = f_s (\text{min.})$
- Rotary field at output with $f_{\text{out}} > f_{\text{out, still}}$
- Ambient temperature $T_a \leq T_{a, \text{work}}$
- Overload ratio $K = P_{\text{DC_peak}} / P_{\text{DC_base}}$ according to performance profile "UEL_P_e"
- Type of mains connection: Individual Supply



When choosing standard motors for inverters, select an appropriate supply unit. Observe the performance data $P_{\text{DC_peak}}$ and $P_{\text{DC_base}}$ in the performance profile "UEL_P_e" of the supply unit.

Operating standard motors at 3 AC 400 V

Selecting standard motors 3 AC 400 V - exemplary profiles

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|---|-------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Nominal power standard motor
3 AC 400 V; 50 Hz; t > 10 min;
K = 1.0; f _s = 4 kHz ¹⁾ | P _{Nenn} | kW | 22.00 | 37.00 | 45.00 | 75.00 | 90.00 | 110.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; t = 60 s;
T = 10 min; K = 1.1; f _s = 4 kHz ²⁾ | P _{Nenn} | kW | 18.50 | 30.00 | 45.00 | 75.00 | | 90.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; t = 60 s; T = 5
min; K = 1.5; f _s = 4 kHz ³⁾ | P _{Nenn} | kW | 15.00 | 22.00 | 37.00 | 55.00 | | 75.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; t = 2 s;
T = 20 s; K = 2.0; f _s = 4 kHz ⁴⁾ | P _{Nenn} | kW | 15.00 | 22.00 | 37.00 | 55.00 | | 75.00 |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition

Tab. 5-36: HCS - Selecting standard motors 3 AC 400V - exemplary profiles

Operating standard motors at 3 AC 460 V

Selecting standard motors 3 AC 460 V - exemplary profiles

| Description | Symbol | Unit | HCS03.1
E-
W0070-
_05 | HCS03.1
E-
W0100-
_05 | HCS03.1
E-
W0150-
_05 | HCS03.1
E-
W0210-
_05 | HCS03.1
E-
W0280-
_05 | HCS03.1
E-
W0350-
_05 |
|--|-------------------|------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Nominal power standard motor
3AC460V; 60 Hz; t > 10 min;
K = 1,0; f _s = 4 kHz ¹⁾ | P _{Nenn} | kW | 30.00 | 45.00 | 55.00 | 92.00 | 90.00 | 110.00 |
| Nominal power standard motor
3AC460V; 60 Hz; t = 60 s;
T = 10 min; K = 1.1; f _s = 4 kHz ²⁾ | P _{Nenn} | kW | 22.00 | 37.00 | 55.00 | 92.00 | 90.00 | 110.00 |
| Nominal power standard motor
3AC460V; 60 Hz; t = 60 s;
T = 5 min; K = 1.5; f _s = 4 kHz ³⁾ | P _{Nenn} | kW | 18.50 | 30.00 | 45.00 | 75.00 | | |
| Nominal power standard motor
3AC460V; 60 Hz; t = 2 s; T = 20 s;
K = 2,0; f _s = 4 kHz ⁴⁾ | P _{Nenn} | kW | 18.50 | 30.00 | 45.00 | 75.00 | | |
| Latest amendment: 2016-12-07 | | | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition; 1 kW ~ 1.36 hp

Tab. 5-37: HCS - Selecting standard motors 3 AC 460V - exemplary profiles

5.3.5 Connections and interfaces

Overview

Overall connection diagram

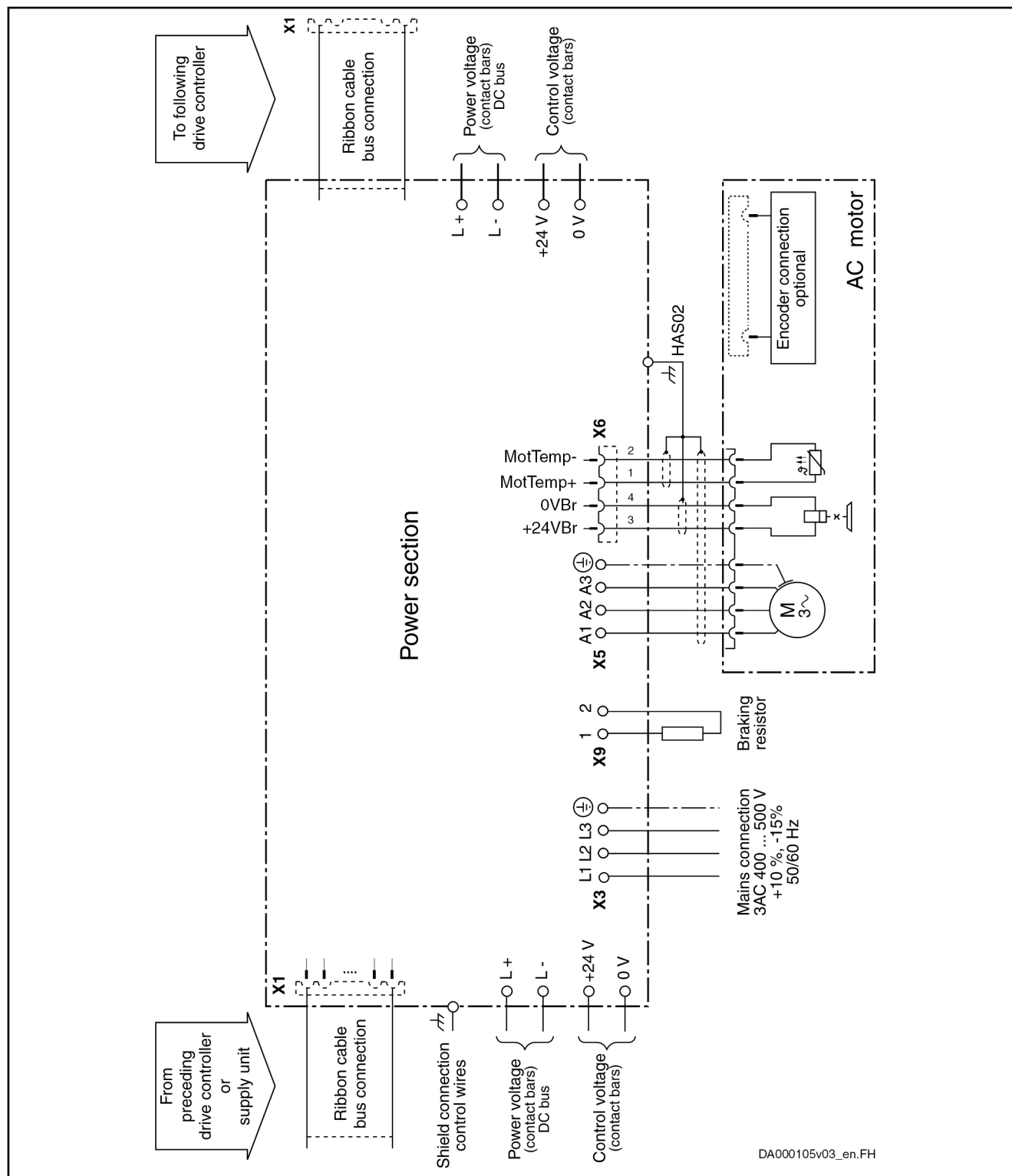


Fig. 5-40: Overall Connection Diagram

Arrangement of the connection points

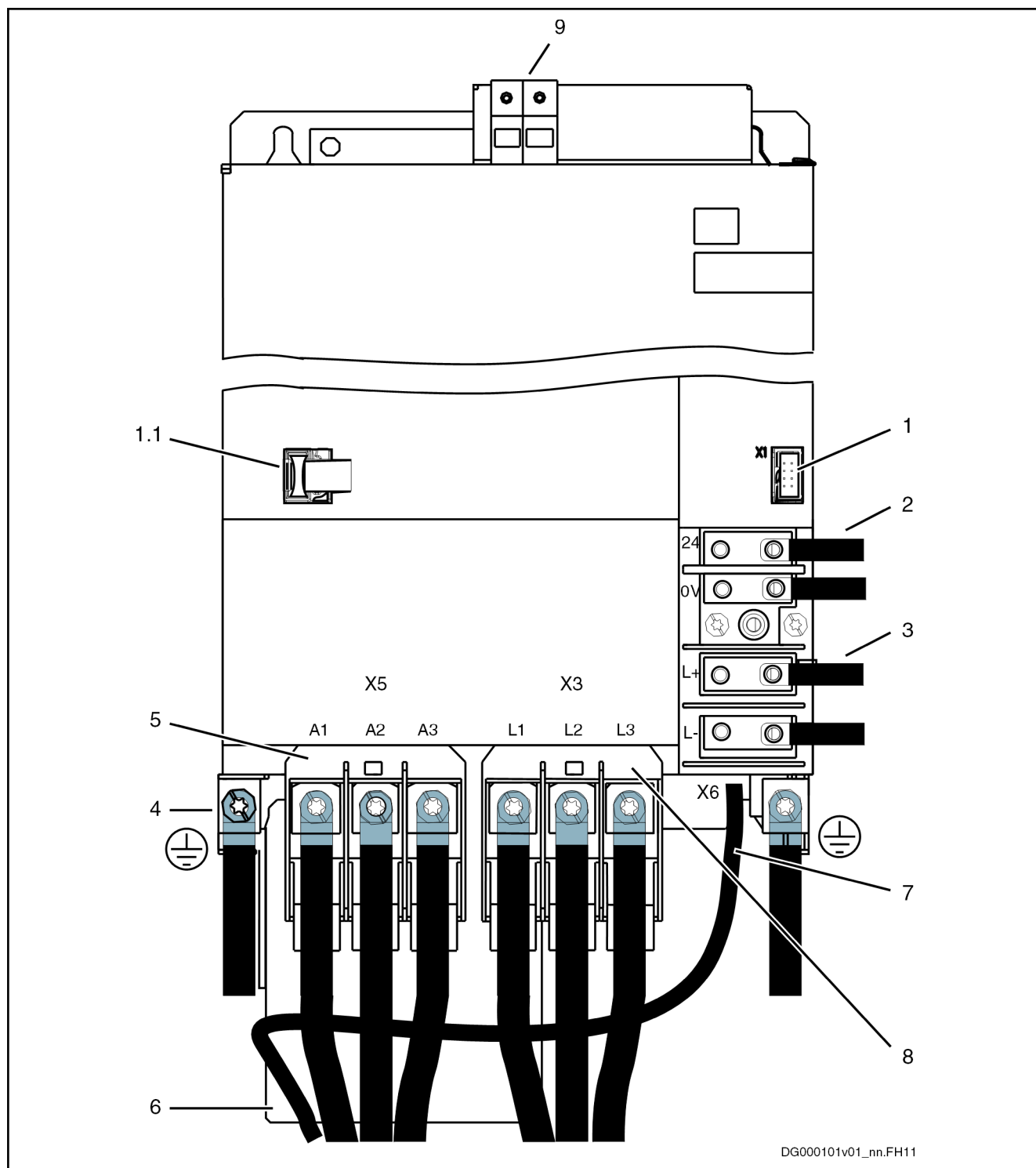
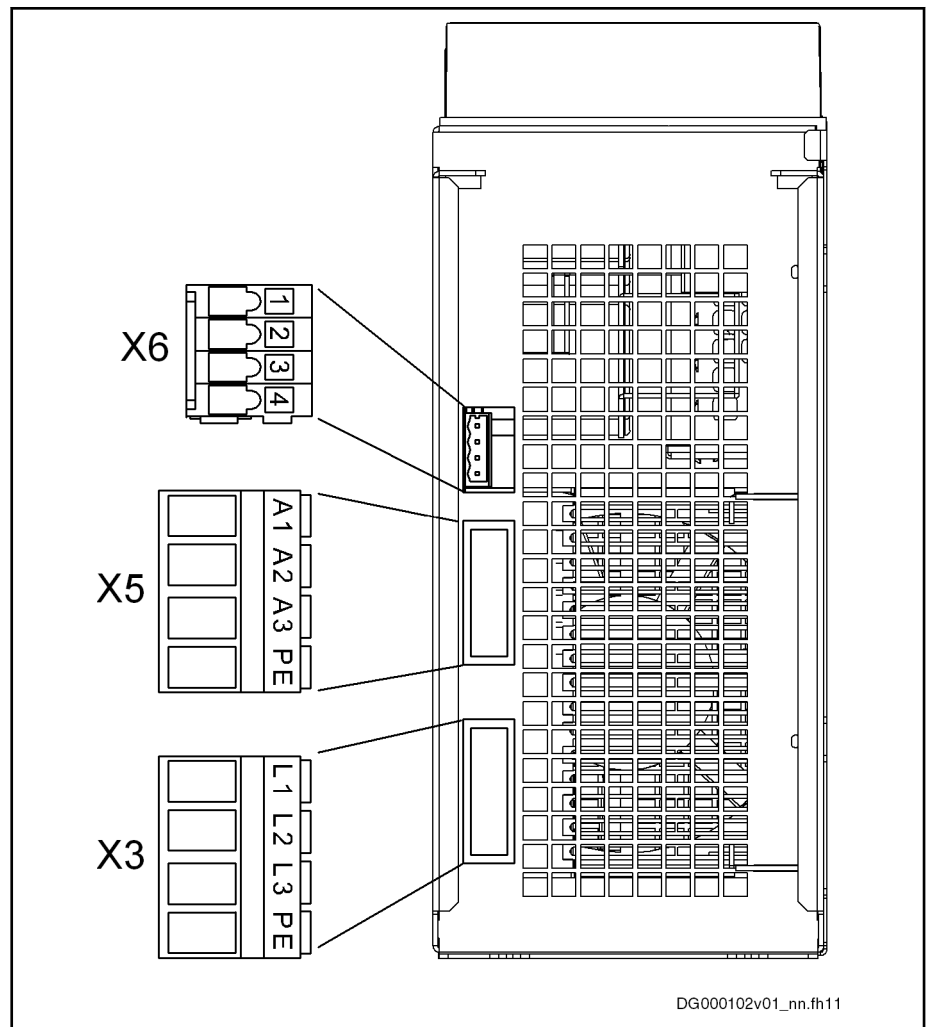


Fig. 5-41: Connections at HCS03.1 power section

| No . | Description | Design | Connection obligatory? | Note on terminal description |
|------|---|--|--|---|
| 1 | Module bus X1 | Ribbon cable | No | The module bus connection is only necessary, if a converter of identical performance or an inverter is connected to L+ and L-. |
| 1.1 | Parking position X1 | | | |
| 2 | Control voltage +24 V and 0 V | Bars | Yes (for compliance with UL terms and utilization of integrated safety technology) | Connection of an external 24 V supply is only necessary, if an external mains contactor or a holding brake is used. If connection with bars is impossible, short twisted wires may be used as an alternative. |
| 3 | DC bus L+ and L- | Bars | No | Connection is only necessary, if two converters of identical performance are to be linked via the DC bus or if an inverter is connected.

If connection with bars is impossible, wires may be used as an alternative. |
| 4 | Equipment grounding conductor | Joint bar | Yes | If connection with joint bar is impossible, wires may be used as an alternative. |
| 5 | Motor (X5) | Shielded motor cable | Yes | 4 connections: A1, A2, A3, equipment grounding conductor |
| 6 | Motor cable shield | | Yes | Using the HAS02 accessory, connect the shield of the motor cable to the housing over the largest possible surface area. |
| 7 | Motor temperature monitoring and motor holding brake (X6) | Shielded cable or shielded motor cable with integrated connection cable for X6 | No | This connection is only required, if the motor is equipped with temperature monitoring function and/or holding brake and if these functions are to be used. |
| 8 | Mains | Single cores or 4-core non-metallic-sheathed cable | Yes | |
| 9 | Braking resistor | Single cores | No | |

Tab. 5-38: Connections at HCS03.1 power section



X3 Mains
X5 Motor
X6 Motor temperature, motor holding brake

Fig. 5-42: Connections at HCS03.1E-W0070 power section (bottom)

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 261.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 325.

6 Power sections for inverters - IndraDrive M

6.1 Overview of types

| Inverter | Types | Features |
|----------|---|--|
| HMS01.1N | W0020
W0036
W0054
W0070
W0110
W0150
W0210
W0300
W0350 | Compact modular design
Continuous currents up to 250 A |
| HMD01.1N | W0012
W0020
W0036 | Compact modular design
Continuous currents up to 20 A |
| HMS02.1N | W0028
W0054 | Compact modular design
Continuous currents up to 25 A
Minor mounting dimensions than HMS01 |

Tab. 6-1: Inverters overview

6.2 HMS01 power sections

6.2.1 Brief description, use and design

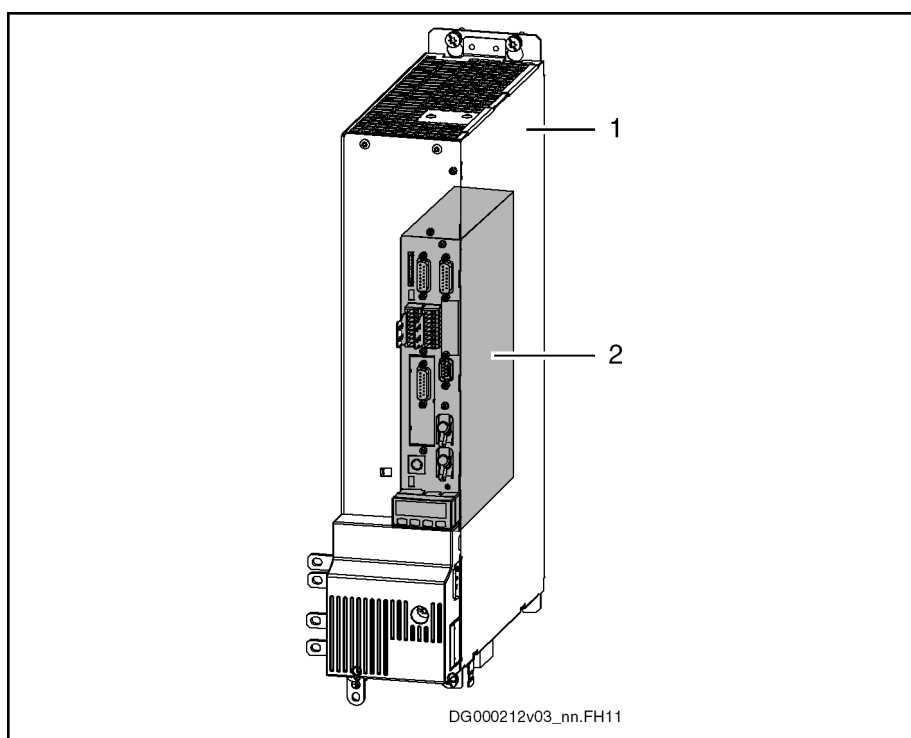
Brief description The HMS01 inverters are part of the Rexroth IndraDrive M product range and are used to operate single axes.

Use The different types are used as follows:

| Type | Use |
|--------------------|--|
| HMS01.1N-Wxxx-NNNN | <ul style="list-style-type: none"> Single-axis device Operation of a three-phase a.c. motor (asynchronous or synchronous motor). |

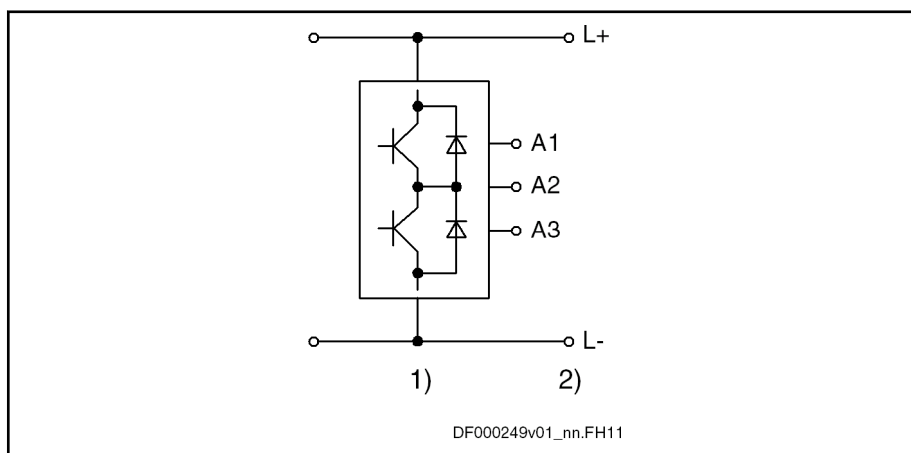
Tab. 6-2: Use of HMS01

Structure, block diagrams



- 1 Power section
2 Control section

Fig. 6-1: Basic structure of the drive controller



- 1) Inverter stage with output to motor
2) DC bus connection

Fig. 6-2: HMS01 - Block diagram

6.2.2 Type code and identification

Type code



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

| Abbrev. column | | | |
|----------------|--|--|--|
| → | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 2 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 4 | 0 | | |
| Example: | | H | M | S | 0 | 1 | . | 1 | N | - | W | 0 | 0 | 2 | 0 | - | A | - | 0 | 7 | - | N | N | N | N | | |

1. Product

1.1 HMS = HMS

2. Series

2.1 1..... = 01

3. Design

3.1 1..... = 1

4. Power supply unit

4.1 Without = N

5. Cooling type

5.1 Air, internal (by integrated fan) = W

6. Maximum current

6.1 20 A..... = 0020

6.2 36 A..... = 0036

6.3 54 A..... = 0054

6.4 70 A..... = 0070

6.5 110 A..... = 0110

6.6 150 A..... = 0150

6.7 210 A..... = 0210

6.8 300 A..... = 0300

6.9 350 A..... = 0350

7. Degree of protection

7.1 IP 20..... = A

8. Nominal DC bus voltage

8.1 DC 700 V..... = 07

9. Other design

9.1 None = NNNN

9.2 Temperature-dependent fan control = NNLN ¹⁾

10. Standard reference

Standard

DIN EN 60529

Title

Degrees of protection provided by enclosures (IP code)

Edition

2000-09

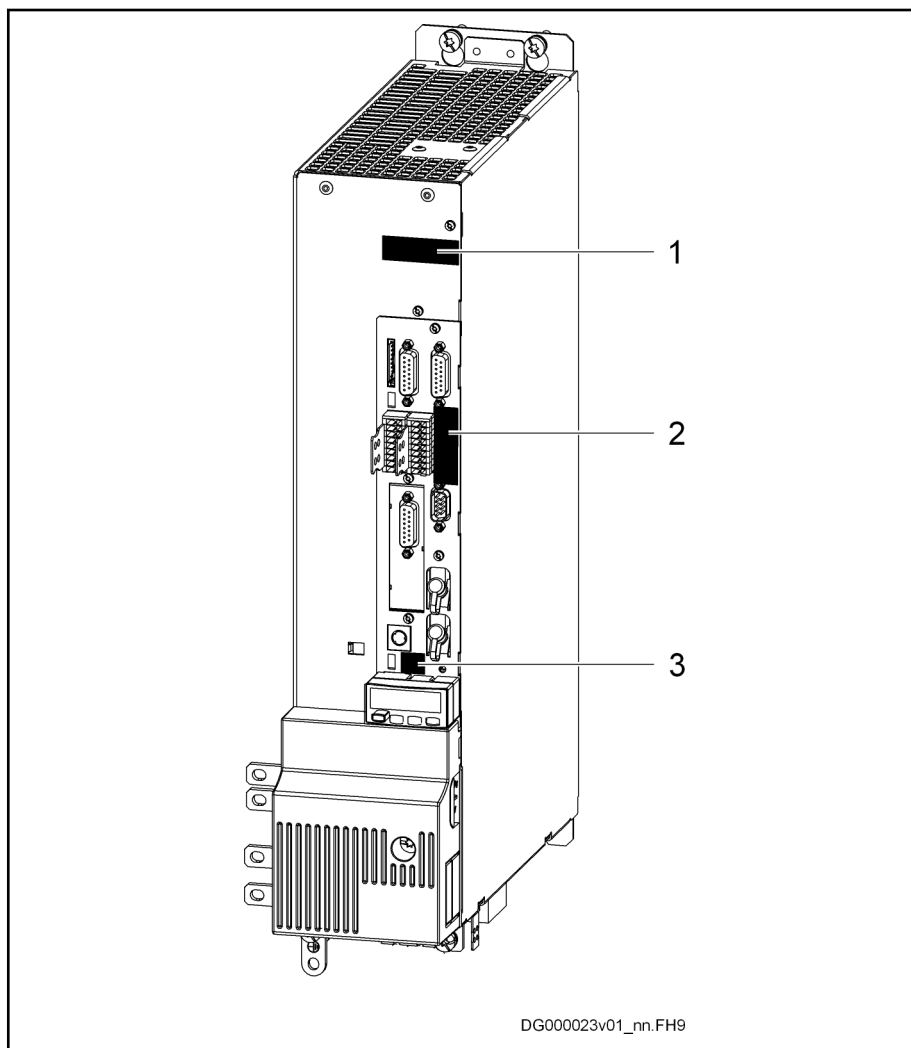
1) Other design NNLN not available with maximum current "0350"

DT000036v03_de.FH11

Fig. 6-3: HMS01 type code

Identification

Type plate arrangement



1 Power section type plate
2 Control section type plate
3 Firmware type plate
Fig. 6-4: Type plates at the drive controller

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 6-5: Type plate (electrical equipment)

6.2.3 Scope of supply

- 1 × touch guard
- Connectors for the electrical connection points at the device
- 1 × Instruction Manual (in the English language)

6.2.4 Technical data

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage"](#) on page 23.

Installation conditions: See [chapter 4.3 "Installation conditions"](#) on page 24.

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMS01.1N-W0020 | HMS01.1N-W0036 | HMS01.1N-W0054 | HMS01.1N-W0070 |
|--|----------------|-------|----------------|----------------|----------------|----------------|
| Short circuit current rating | SCCR | A rms | 42000 | | | |
| Rated input voltage, power ¹⁾ | U_{LN_nenn} | V | DC 254...750 | | | |
| Rated input current | I_{LN} | A | 14.0 | 24.5 | 40.0 | 49.0 |
| Output voltage | U_{out} | V | 3 x AC 0...500 | | | |
| Output current | I_{out} | A | 12.1 | 21.3 | 35.0 | 42.4 |
| Latest amendment: 2009-01-28 | | | | | | |

- 1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 6-3: HMS - Ambient and operating conditions - UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|----------------------|-------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Short circuit current rating | SCCR | A rms | 42000 | | | | |
| Rated input voltage, power ¹⁾ | U _{LN_nenn} | V | DC 254...750 | | | | |
| Rated input current | I _{LN} | A | 80.0 | 115.0 | 167.0 | | 290.0 |
| Output voltage | U _{out} | V | 3 x AC 0...500 | | | | |
| Output current | I _{out} | A | 68.5 | 100.0 | 151.0 | | 250.0 |
| Latest amendment: 2019-06-04* | | | | | | | |

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 6-4: HMS - Ambient and operating conditions - UL ratings

Information on standards**Applied standards**

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|--------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Listing in accordance with UL standard | | | UL 508C | | | |
| UL files | | | E134201 | | | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | | | |
| Latest amendment: 2017-01-23 | | | | | | |

Tab. 6-5: HMS - Applied standards

Applied standards

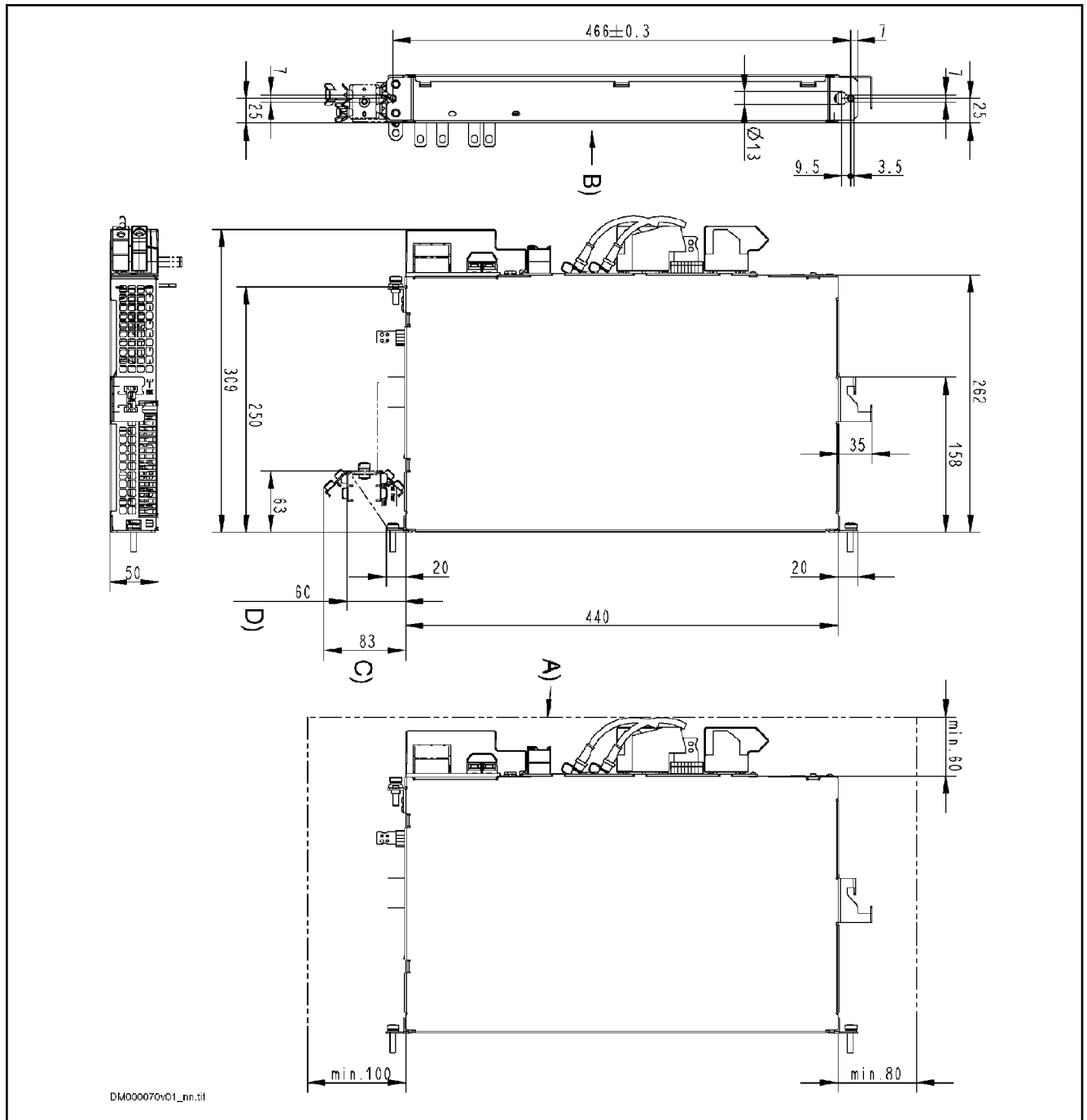
| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|---|--------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Listing in accordance with UL standard | | | UL 508C | | | | |
| UL files | | | E134201 | | | | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | | | | |
| Latest amendment: 2017-01-23 | | | | | | | |

Tab. 6-6: HMS - Applied standards

Mechanics and mounting

Dimensional drawings

HMS01.1N-W0020 and HMS01.1N-W0036

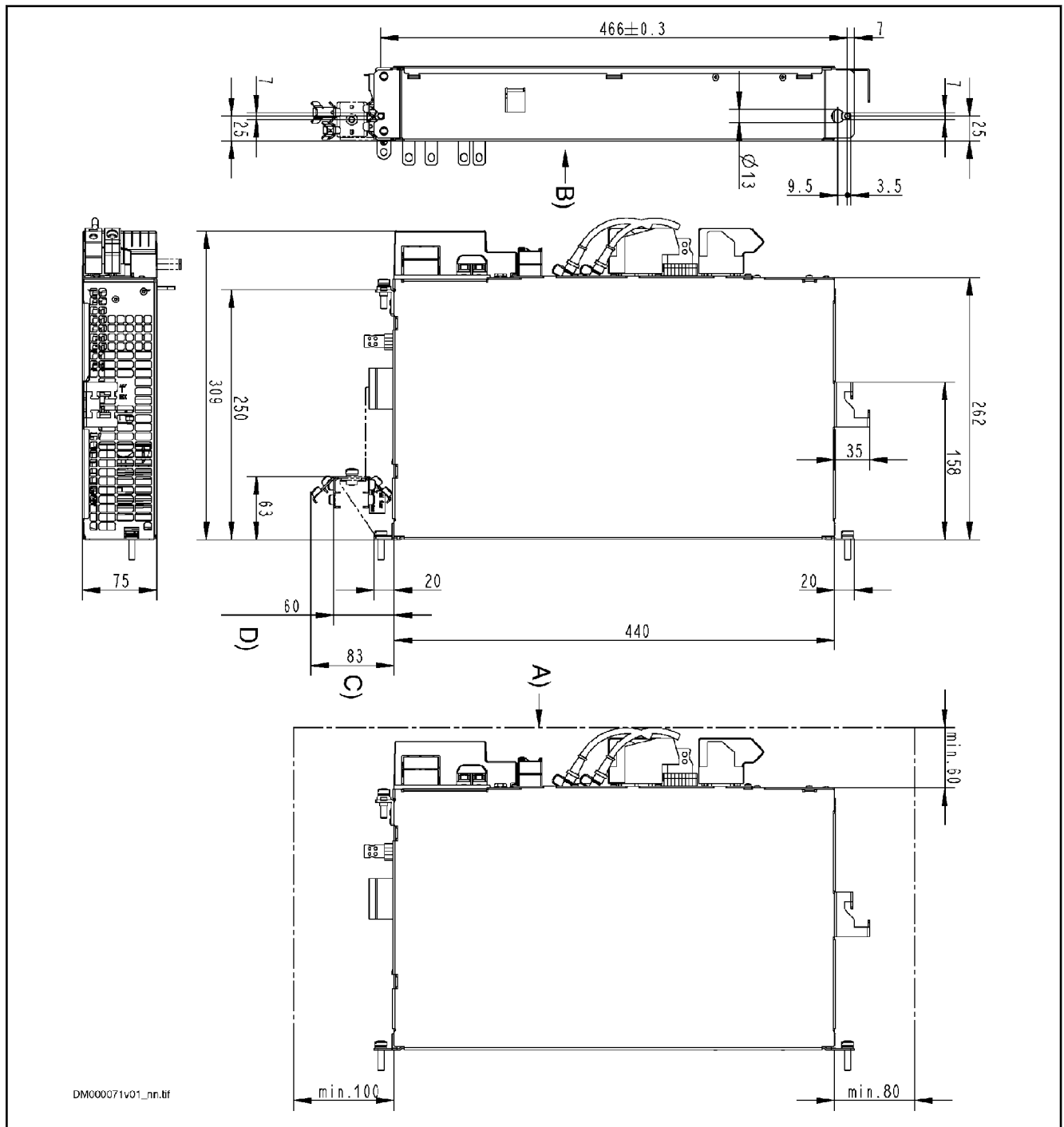


- A)** Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B)** Rear view!
- C)** Dimensions for accessory HAS02.1 when motor cable run with 45°

D) Dimensions for accessory HAS02.1 when motor cable run horizontally

Fig. 6-6: Dimensions HMS01.1N-W0020 and HMS01.1N-W0036

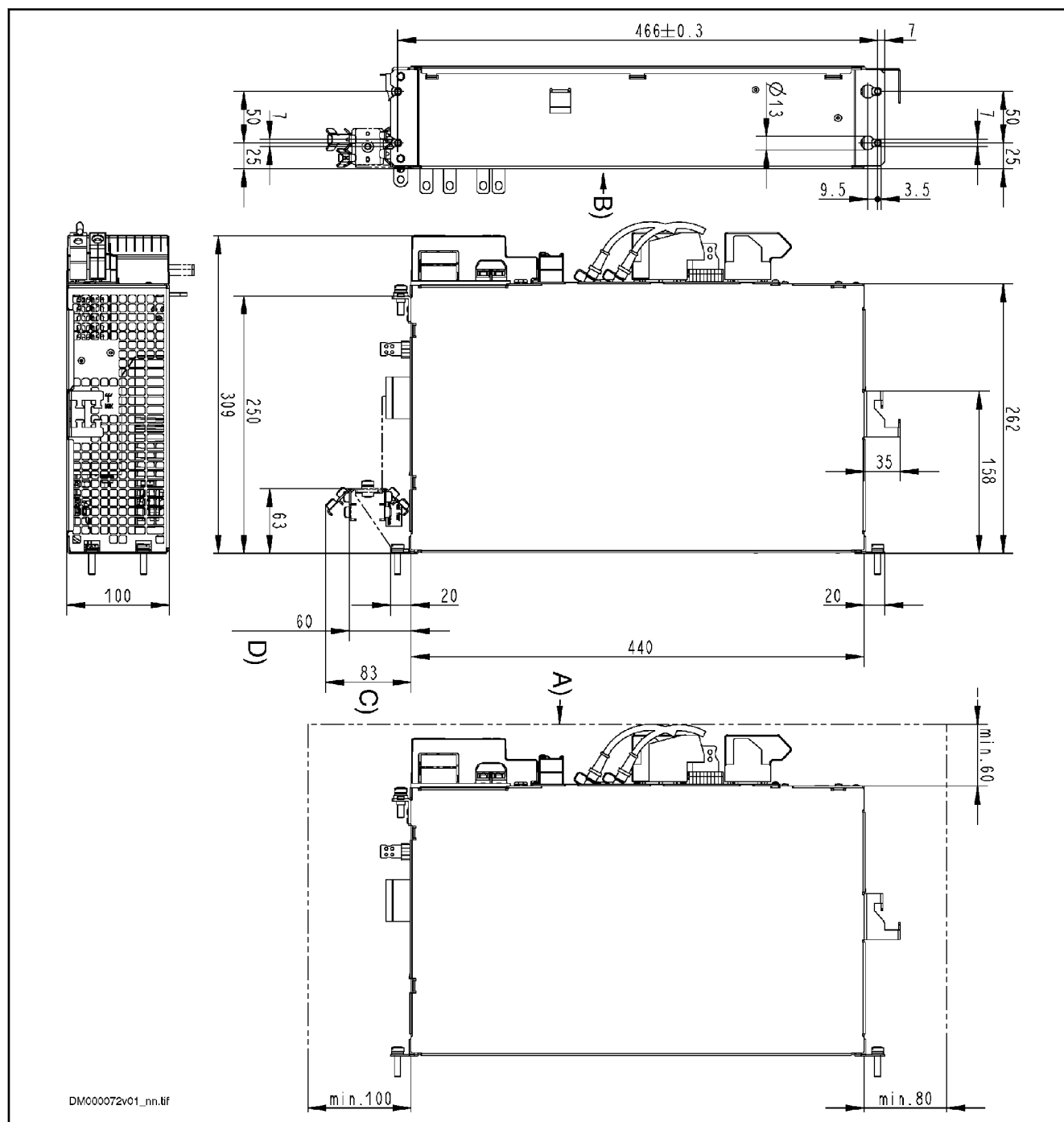
HMS01.1N-W0054



- A) Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B) Rear view!
- C) Dimensions for accessory HAS02.1 when motor cable run with 45°
- D) Dimensions for accessory HAS02.1 when motor cable run horizontally

Fig. 6-7: Dimensions HMS01.1N-W0054

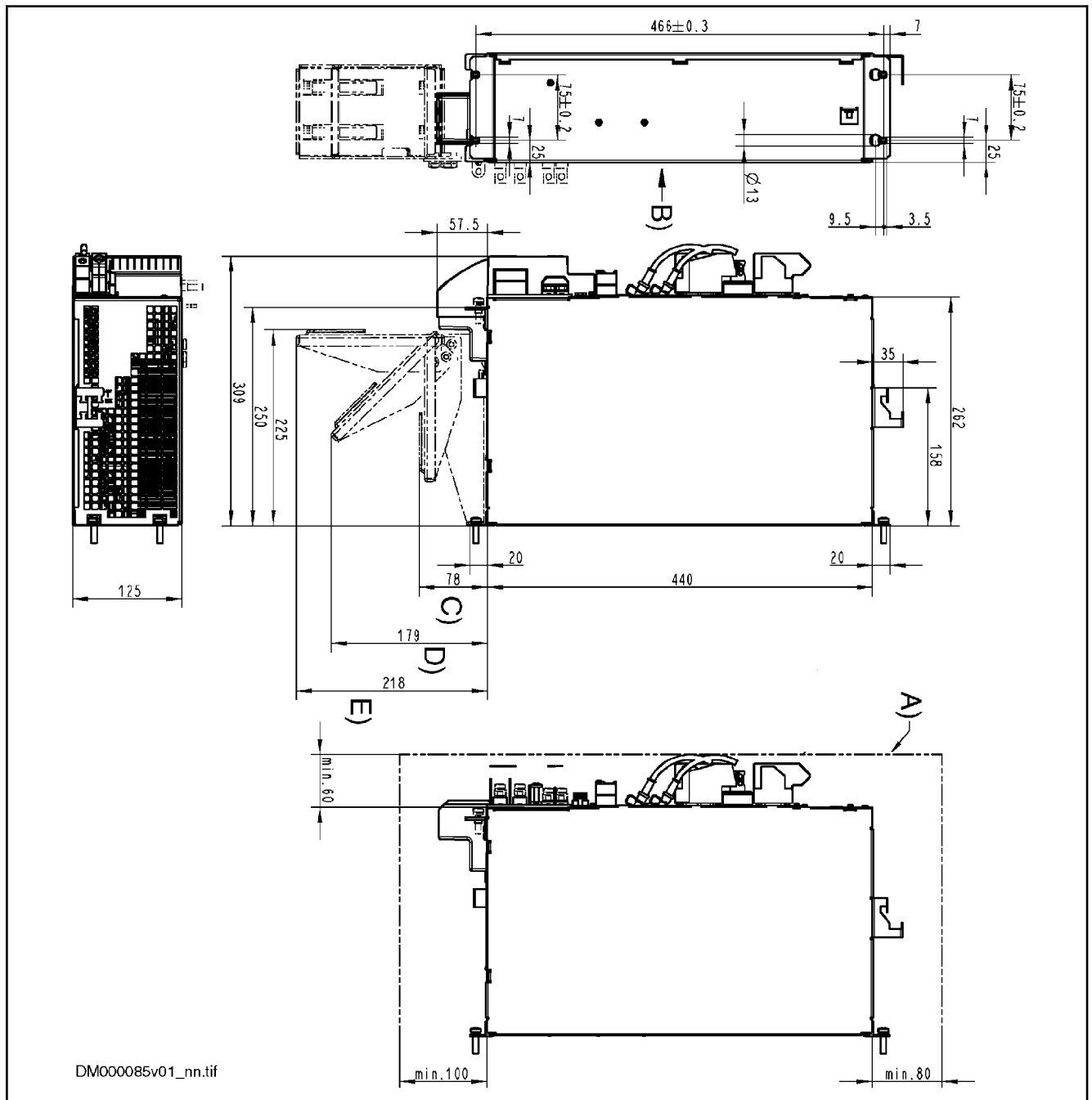
HMS01.1N-W0070



- A) Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B) Rear view!
- C) Dimensions for accessory HAS02.1 when motor cable run with 45°
- D) Dimensions for accessory HAS02.1 when motor cable run horizontally

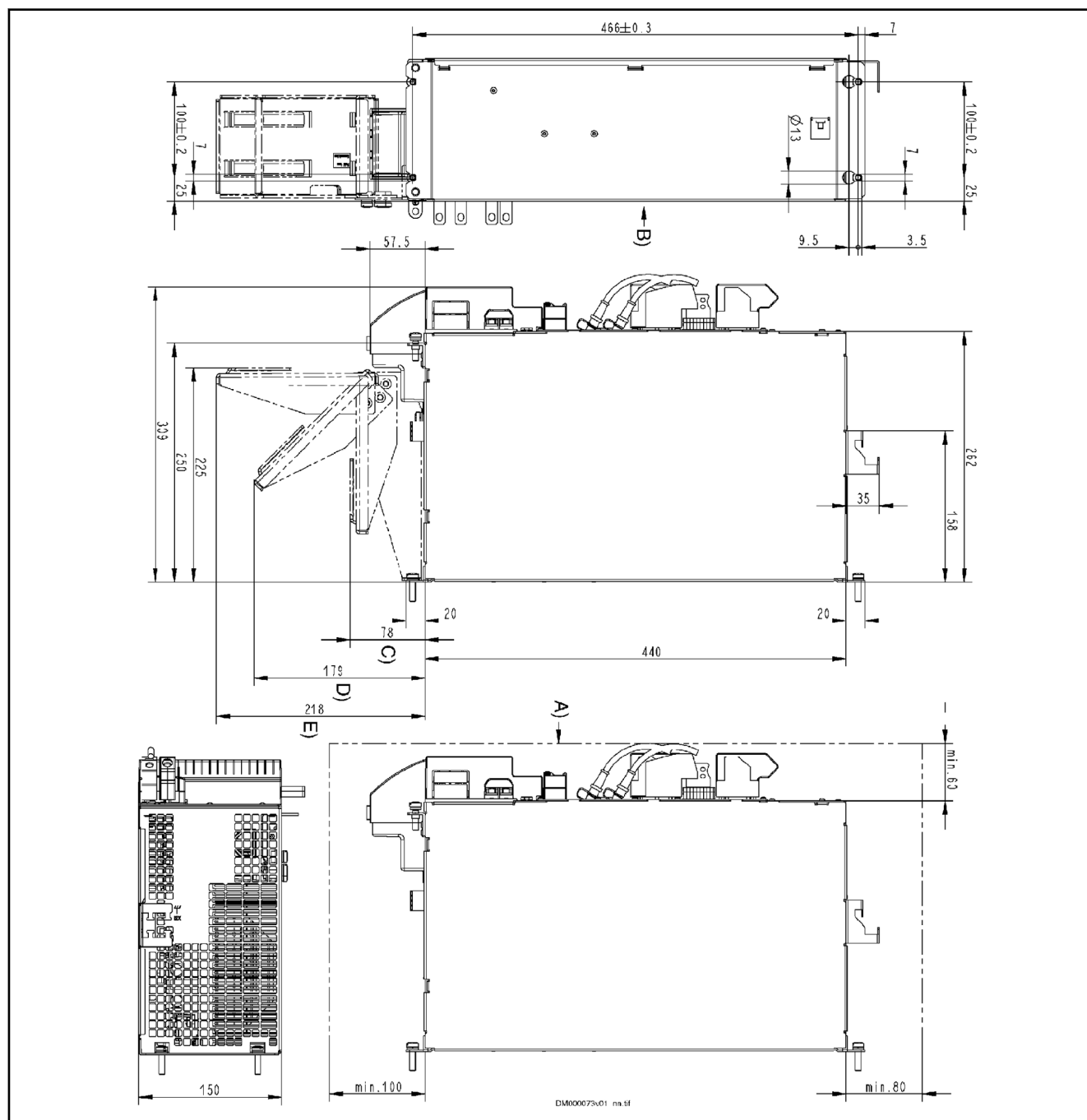
Fig. 6-8: Dimensions HMS01.1N-W0070

HMS01.1N-W0110



- A) Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B) Rear view!
- C) Dimensions for accessory HAS02.1 when motor cable run horizontally
- D) Dimensions for accessory HAS02.1 when motor cable run with 45°
- E) Dimensions for accessory HAS02.1 when motor cable run vertically

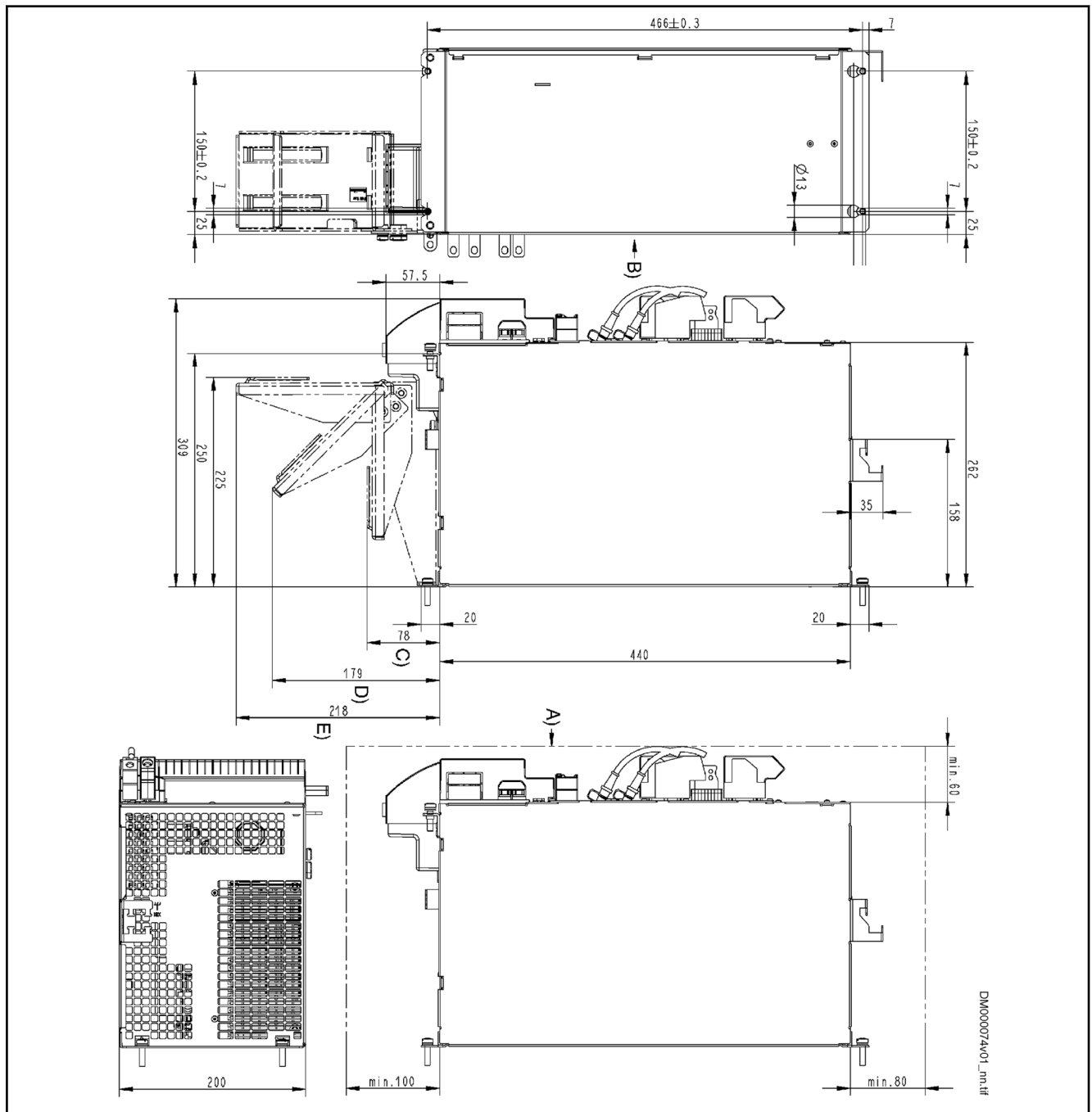
Fig. 6-9: Dimensions HMS01.1N-W0110



- | | |
|----|---|
| A) | Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance! |
| B) | Rear view! |
| C) | Dimensions for accessory HAS02.1 when motor cable run horizontally |
| D) | Dimensions for accessory HAS02.1 when motor cable run with 45° |
| E) | Dimensions for accessory HAS02.1 when motor cable run vertically |

Fig. 6-10: Dimensions HMS01.1N-W0150

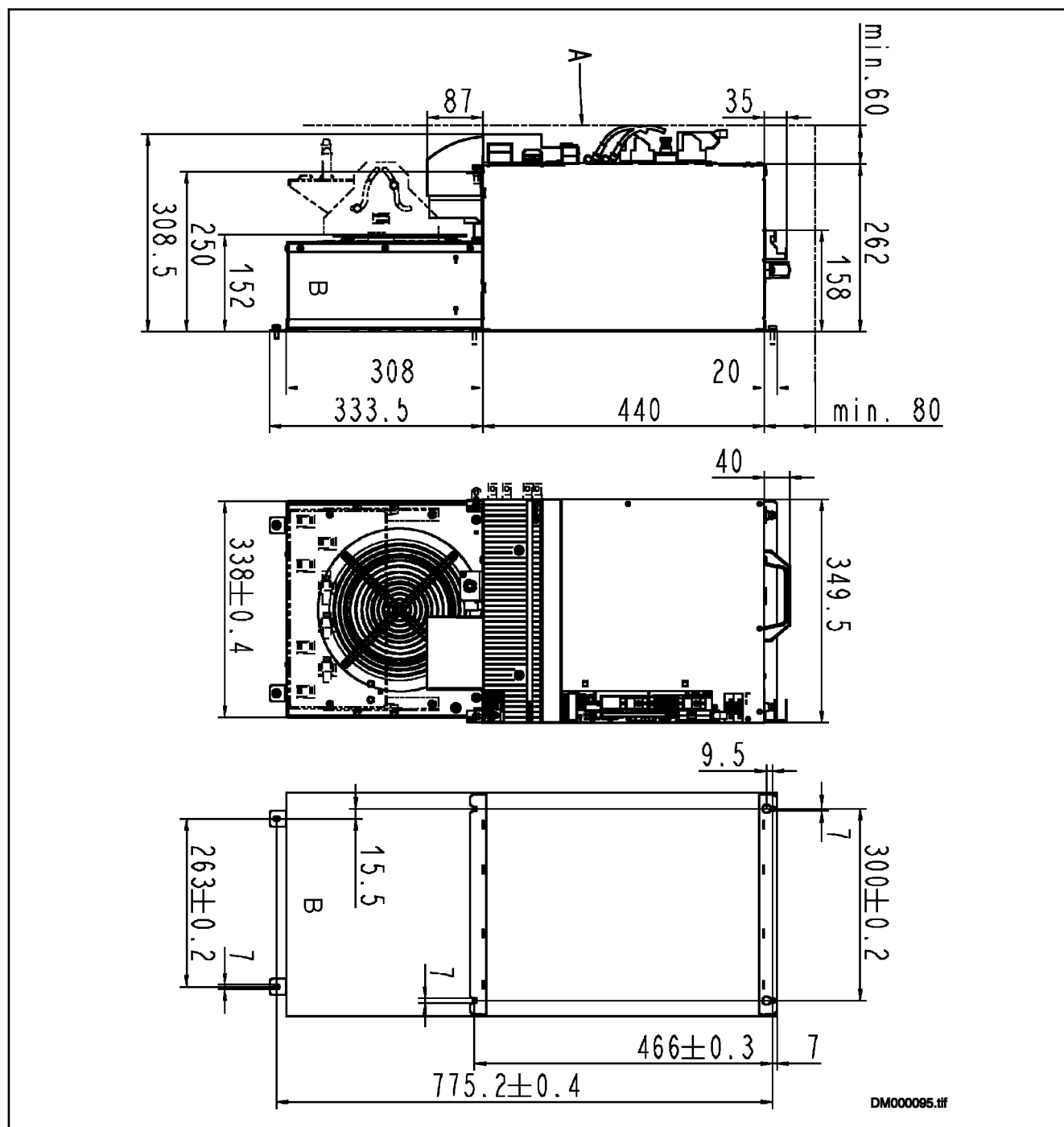
HMS01.1N-W0210 and HMS01.1N-W0300



- A) Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B) Rear view!
- C) Dimensions for accessory HAS02.1 when motor cable run horizontally
- D) Dimensions for accessory HAS02.1 when motor cable run with 45°
- E) Dimensions for accessory HAS02.1 when motor cable run vertically

Fig. 6-11: Dimensions HMS01.1N-W0210 and HMS01.1N-W0300

HMS01.1N-W0350 with External Fan unit HAB01



- A** Minimum mounting clearance (plus additional space for motor cable)
- B** HAB01 fan unit (notes on data and mounting: see index entry "[HAB01 → Data](#)", "[HAB01 → Mounting](#)")
- Note: Rexroth IndraDrive supply units require greater mounting clearance!

Fig. 6-12: Dimensions HMS01.1N-W0350

Dimensions, mass, insulation, sound pressure level

Data for mass, sound pressure level, insulation

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|-----------------|--------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Mass | m | kg | 5.27 | | 6.68 | 7.94 |
| Device height ¹⁾ | H | mm | 440 | | | |
| Device depth ²⁾ | T | mm | 262 | | | |
| Device width ³⁾ | B | mm | 50 | | 75 | 100 |
| Insulation resistance at 500 V DC | R _{is} | Mohm | > 50 | | | |
| Capacitance against housing | C _Y | nF | 2 x 68 | | | |
| Average sound pressure level
(accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | tbd | | | |
| Latest amendment: 2007-07-18 | | | | | | |

1) 2) 3)
4)

Housing dimension; see also related dimensional drawing
According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 6-7: HMS - Data for mass, sound pressure level, insulation

Data for mass, dimensions, sound pressure level, insulation

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|-----------------|--------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Mass | m | kg | 11.06 | 12.74 | 16.44 | | 31.70 |
| Device height ¹⁾ | H | mm | 440 | | | | |
| Device depth ²⁾ | T | mm | 262 | | | | |
| Device width ³⁾ | B | mm | 125 | 150 | 200 | | 350 |
| Insulation resistance at 500 V DC | R _{is} | Mohm | > 50 | | | | |
| Capacitance against housing | C _Y | nF | 2 x 100 | | | | |
| Average sound pressure level
(accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | 76 | tbd | | | 80 |
| Latest amendment: 2013-11-15 | | | | | | | |

1) 2) 3)
4)

Housing dimension; see also related dimensional drawing
According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 6-8: HMS - Data for mass, dimensions, sound pressure level, insulation

Power dissipation, mounting position, cooling, distances

Cooling and power dissipation data

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|-------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Ambient temperature range for operation with nominal data | T_{a_work} | °C | 0...40 | | | |
| Ambient temperature range for operation with reduced nominal data | $T_{a_work_red}$ | °C | 0...55 | | | |
| Derating of P_{DC_cont} ; P_{BD} ; I_{out_cont} when $T_{a_work} < T_a < T_{a_work_red}$ | f_{Ta} | %/K | 2.0 | | | |
| Allowed mounting position | | | G1 | | | |
| Cooling type | | | Forced ventilation | | | |
| Volumetric capacity of forced cooling | V | m³/h | 27.00 | 44.00 | 56.00 | 80.00 |
| Allowed switching frequencies ¹⁾ | f_s | kHz | 4, 8, 12, 16 | | | |
| Power dissipation at $I_{out_cont} = 0$ A; $f_s = f_s$ (min.) ²⁾ | $P_{Diss_0A_fs_min}$ | W | 60 | 40 | 90 | 110 |
| Power dissipation at $I_{out_cont} = 0$ A; $f_s = f_s$ (max.) ³⁾ | $P_{Diss_0A_fs_max}$ | W | 120 | 130 | 260 | 330 |
| Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾ | P_{Diss_cont} | W | 165.00 | 210.00 | 420.00 | 485.00 |
| Minimum distance on the top of the device ⁵⁾ | d_{top} | mm | 80 | | | |
| Minimum distance on the bottom of the device ⁶⁾ | d_{bot} | mm | 100 | | | |
| Temperature increase with minimum distances d_{bot} ; d_{top} ; P_{BD} | ΔT | K | 40 | 50 | 40 | 50 |
| Latest amendment: 2009-09-24 | | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}
- 4) Plus dissipation of braking resistor and control section
- 5) 6) See fig. "Air intake and air outlet at device"
- Tab. 6-9: HMS - Data for cooling and power dissipation

Cooling and power dissipation data

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 | |
|--|-----------------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|----------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...40 | | | | | |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...55 | | | | | |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2.0 | | | | | |
| Allowed mounting position | | | G1 | | | | | |
| Cooling type | | | Forced ventilation | | | | | |
| Volumetric capacity of forced cooling | V | m³/h | 165.00 | 185.00 | 357.00 | | 1400.00 | |
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8, 12, 16 | | | | | 4, 8, 12 |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (min.) ²⁾ | P _{Diss_0A_fs_min} | W | 60 | 70 | 160 | 170 | 280 | |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (max.) ³⁾ | P _{Diss_0A_fs_max} | W | 160 | 130 | 400 | 365 | 520 | |
| Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾ | P _{Diss_cont} | W | 640.00 | 965.00 | 1570.00 | 1700.00 | 2750.00 | |
| Minimum distance on the top of the device ⁵⁾ | d _{top} | mm | 80 | | | | | |
| Minimum distance on the bottom of the device ⁶⁾ | d _{bot} | mm | 100 | | | | | |
| Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD} | ΔT | K | 35 | 45 | | tbd | 50 | |
| Latest amendment: 2013-11-15 | | | | | | | | |

1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz

2) 3) Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}

4) Plus dissipation of braking resistor and control section

5) 6) See fig. "Air intake and air outlet at device"

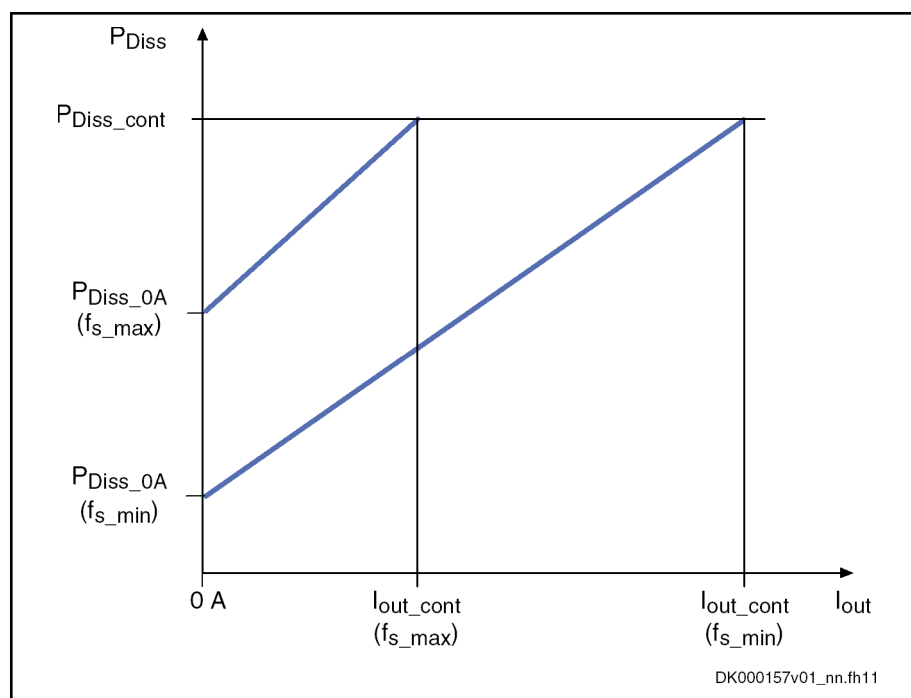
Tab. 6-10: HMS - Data for cooling and power dissipation

Power dissipation vs. output current

The figure below illustrates the connection between power dissipation and output current, depending on the switching frequency f_s which was set at the drive controller. See also Parameter Description "P-0-0001, Switching frequency of the power output stage".



In addition, take the power at the braking resistor and the power consumption of the control section into account. Both powers are not contained in the figure.



I_{out} Output current
 P_{Diss} Power dissipation
 f_s Switching frequency

Fig. 6-13: Power Dissipation vs. Output Current

For the data P_{Diss_cont} , $P_{Diss_0A_fsmax}$ and $P_{Diss_0A_fsmin}$, see the table "Data for Cooling and Power Dissipation".

Distances

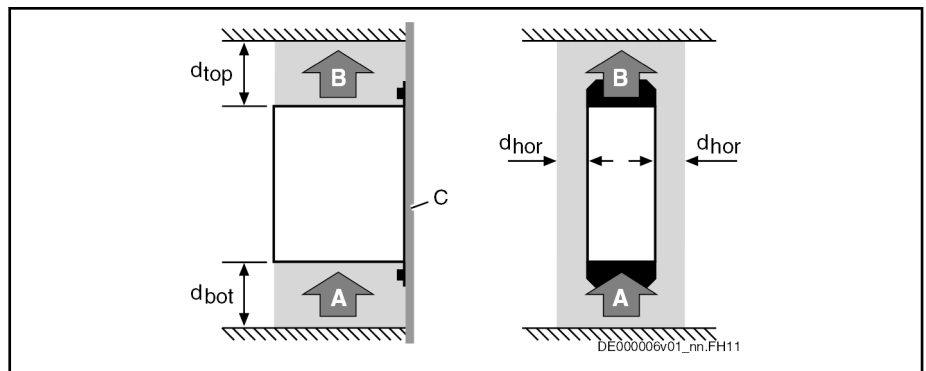
NOTICE

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



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

Fig. 6-14: Air intake and air outlet at device

Basic data of HMS01 power section

General information

This chapter contains:

- Data for control voltage supply
- Data of DC bus
- Data of inverter



The order of the data tables below follows the energy flow in the drive controller - from mains connection to motor output.

Control voltage

Control voltage supply data

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|-----------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Control voltage input ¹⁾ | U _{N3} | V | 24 ± 20% | | | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U _{N3} | V | 24 ± 5 % | | | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U _{N3} | V | 26 ± 5 % | | | |
| Max. inrush current at 24 V supply | I _{EIN3_max} | A | 4.20 | | | |
| Pulse width of I _{EIN3} | t _{EIN3Lade} | ms | 5 | | | |
| Latest amendment: 2007-07-17 | | | | | | |

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|----------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Input capacitance | C_{N3} | mF | 0.47 | | | |
| Rated power consumption control voltage input at U_{N3} ⁴⁾ | P_{N3} | W | 10 | 15 | 10 | 16 |
| Latest amendment: 2007-07-17 | | | | | | |

- 1) 2) 3) Observe supply voltage for motor holding brake
4) See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 6-11: HMS - Control voltage supply data



Rated power consumption control voltage input at U_{N3}

Plus motor holding brake and control section, plus safety option

Control voltage supply data

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|-----------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Control voltage input ¹⁾ | U _{N3} | V | 24 ± 20% | | | | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U _{N3} | V | 24 ± 5 % | | | | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U _{N3} | V | 26 ± 5 % | | | | |
| Max. inrush current at 24 V supply | I _{EIN3_max} | A | 8.50 | 4.20 | | | Less than 10 |
| Pulse width of I _{EIN3} | t _{EIN3Lade} | ms | 6 | | | | - |
| Input capacitance | C _{N3} | mF | 1.00 | | | | 1.05 |
| Rated power consumption control voltage input at U _{N3} ⁴⁾ | P _{N3} | W | 34 | 23 | 75 | 100 | 218 |
| Latest amendment: 2013-11-15 | | | | | | | |

- 1) 2) 3) Observe supply voltage for motor holding brake
4) See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 6-12: HMS - Control voltage supply data



Rated power consumption control voltage input at U_{N3}

Plus motor holding brake and control section, plus safety option

Power section - DC bus

Power section data - DC bus

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|---------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| DC bus voltage | U _{DC} | V | 254...750 | | | |
| Capacitance in DC bus | C _{DC} | mF | - | | | |
| DC resistance in DC bus (L+ to L-) | R _{DC} | kohm | approx. 1000 | | | |
| Monitoring value maximum DC bus voltage, switch-off threshold | U _{DC_limit_max} | V | 900 | | | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | U _{DC_limit_min} | V | 254 | | | |
| Latest amendment: 2013-08-02 | | | | | | |

Tab. 6-13: HMS - Power section data - DC bus

Power section data - DC bus

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 | |
|---|---------------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|------------|
| DC bus voltage | U _{DC} | V | 254...750 | | | | | |
| Capacitance in DC bus | C _{DC} | mF | - | | | | | 4.90 |
| DC resistance in DC bus (L+ to L-) | R _{DC} | kohm | approx. 1000 | | | | | approx. 50 |
| Monitoring value maximum DC bus voltage, switch-off threshold | U _{DC_limit_max} | V | 900 | | | | | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | U _{DC_limit_min} | V | 254 | | | | | |
| Latest amendment: 2013-11-15 | | | | | | | | |

Tab. 6-14: HMS - Power section data - DC bus

Power section - inverter

Power section data - inverter

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|----------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8, 12, 16 | | | |
| Output voltage, fundamental wave
in V/Hz (U/f) control | U _{out_eff} | V | ~ UDC x 0.71 | | | |
| Output voltage, fundamental wave
in closed-loop operation | U _{out_eff} | V | ~ UDC x 0.71 | | | |
| Latest amendment: 2013-09-02 | | | | | | |

Power sections for inverters - IndraDrive M

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|-------------------|-------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾ | dv/dt | kV/μs | 5.00 | | | |
| Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾ | dv/dt | kV/μs | 5.00 | | | |
| Output frequency range when $f_s = 2$ kHz | f_{out_2k} | Hz | - | | | |
| Output frequency range when $f_s = 4$ kHz | f_{out_4k} | Hz | 0...400 | | | |
| Output frequency range when $f_s = 8$ kHz | f_{out_8k} | Hz | 0...800 | | | |
| Output frequency range when $f_s = 12$ kHz | f_{out_12k} | Hz | 0...1200 | | | |
| Output frequency range when $f_s = 16$ kHz | f_{out_16k} | Hz | 0...1600 | | | |
| Output frequency threshold to detect motor standstill ⁴⁾ | f_{out_still} | Hz | 2...4 | | | |
| Maximum output current when $f_s = 2$ kHz | I_{out_max2} | A | - | | | |
| Maximum output current when $f_s = 4$ kHz | I_{out_max4} | A | 20.0 | 36.0 | 54.0 | 70.7 |
| Maximum output current when $f_s = 8$ kHz | I_{out_max8} | A | 20.0 | 36.0 | 54.0 | 70.7 |
| Maximum output current when $f_s = 12$ kHz | I_{out_max12} | A | 16.0 | 31.0 | 45.0 | 65.0 |
| Maximum output current when $f_s = 16$ kHz | I_{out_max16} | A | 11.0 | 24.0 | 35.0 | 51.0 |
| Continuous output current when $f_s = 2$ kHz | I_{out_cont2} | A | - | | | |
| Continuous output current when $f_s = 4$ kHz | I_{out_cont4} | A | 12.1 | 21.3 | 35.0 | 42.4 |
| Continuous output current when $f_s = 8$ kHz | I_{out_cont8} | A | 8.3 | 15.0 | 20.0 | 24.1 |
| Continuous output current when $f_s = 12$ kHz ⁵⁾ | I_{out_cont12} | A | 5.0 | 9.5 | 12.0 | 14.4 |
| Continuous output current when $f_s = 16$ kHz ⁶⁾ | I_{out_cont16} | A | 2.7 | 6.0 | 7.5 | 9.3 |
| Latest amendment: 2013-09-02 | | | | | | |

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Continuous output current when $f_s = 2$ kHz; output frequency f_{out} less than f_{out_still} | $I_{out_cont0Hz_2}$ | A | - | | | |
| Continuous output current when $f_s = 4$ kHz; output frequency f_{out} less than f_{out_still} | $I_{out_cont0Hz_4}$ | A | 8.1 | 14.2 | 23.4 | 28.3 |
| Continuous output current when $f_s = 8$ kHz; output frequency f_{out} less than f_{out_still} | $I_{out_cont0Hz_8}$ | A | 5.5 | 10.0 | 13.4 | 16.1 |
| Continuous output current when $f_s = 12$ kHz; output frequency f_{out} less than f_{out_still} ⁷⁾ | $I_{out_cont0Hz_12}$ | A | 3.3 | 6.4 | 8.2 | 9.6 |
| Continuous output current when $f_s = 16$ kHz; output frequency f_{out} less than f_{out_still} ⁸⁾ | $I_{out_cont0Hz_16}$ | A | 1.8 | 4.0 | 5.1 | 6.2 |
| Assigned output filters at nom. data; $f_s = 4$ kHz | | | - | | | |
| Latest amendment: 2013-09-02 | | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s

Tab. 6-15: HMS - Power section data - inverter

Power section data - inverter

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|---|----------------------|-------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8, 12, 16 | | | | 4, 8, 12 |
| Output voltage, fundamental wave in V/Hz (U/f) control | U _{out_eff} | V | ~ UDC x 0.71 | | | | |
| Output voltage, fundamental wave in closed-loop operation | U _{out_eff} | V | ~ UDC x 0.71 | | | | |
| Rise of voltage at output with U _{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾ | dv/dt | kV/μs | 5.00 | | | | |
| Rise of voltage at output with U _{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾ | dv/dt | kV/μs | 5.00 | | | | |
| Latest amendment: 2013-11-15 | | | | | | | |

Power sections for inverters - IndraDrive M

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|---|-----------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Output frequency range when $f_s = 2$ kHz | f_{out_2k} | Hz | - | | | | |
| Output frequency range when $f_s = 4$ kHz | f_{out_4k} | Hz | 0...400 | | | | |
| Output frequency range when $f_s = 8$ kHz | f_{out_8k} | Hz | 0...800 | | | | |
| Output frequency range when $f_s = 12$ kHz | f_{out_12k} | Hz | 0...1200 | | | | |
| Output frequency range when $f_s = 16$ kHz | f_{out_16k} | Hz | 0...1600 | | | | - |
| Output frequency threshold to detect motor standstill ⁴⁾ | f_{out_still} | Hz | 2...4 | | | | |
| Maximum output current when $f_s = 2$ kHz | I_{out_max2} | A | - | | | | |
| Maximum output current when $f_s = 4$ kHz | I_{out_max4} | A | 110.0 | 150.0 | 210.0 | 300.0 | 350.0 |
| Maximum output current when $f_s = 8$ kHz | I_{out_max8} | A | 110.0 | 150.0 | 210.0 | 267.7 | 250.0 |
| Maximum output current when $f_s = 12$ kHz | I_{out_max12} | A | 75.0 | 136.0 | 190.0 | 203.5 | 170.0 |
| Maximum output current when $f_s = 16$ kHz | I_{out_max16} | A | 60.0 | 106.0 | 155.0 | 160.0 | - |
| Continuous output current when $f_s = 2$ kHz | I_{out_cont2} | A | - | | | | |
| Continuous output current when $f_s = 4$ kHz | I_{out_cont4} | A | 68.5 | 99.7 | 150.7 | 150.1 | 250.0 |
| Continuous output current when $f_s = 8$ kHz | I_{out_cont8} | A | 43.5 | 67.5 | 101.7 | 108.0 | 170.0 |
| Continuous output current when $f_s = 12$ kHz ⁵⁾ | I_{out_cont12} | A | 32.0 | 48.4 | 72.6 | 77.9 | 126.0 |
| Continuous output current when $f_s = 16$ kHz ⁶⁾ | I_{out_cont16} | A | 25.5 | 36.8 | 54.2 | 59.2 | - |
| Continuous output current when $f_s = 2$ kHz; output frequency f_{out} less than f_{out_still} | $I_{out_cont0Hz_2}$ | A | - | | | | |
| Continuous output current when $f_s = 4$ kHz; output frequency f_{out} less than f_{out_still} | $I_{out_cont0Hz_4}$ | A | 42.2 | 57.0 | 86.1 | 107.2 | 150.0 |
| Continuous output current when $f_s = 8$ kHz; output frequency f_{out} less than f_{out_still} | $I_{out_cont0Hz_8}$ | A | 24.9 | 38.6 | 58.2 | 67.2 | 92.0 |

Latest amendment: 2013-11-15

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|---------------------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Continuous output current when
f _s = 12 kHz; output frequency
f _{out} less than f _{out_still} ⁷⁾ | I _{out_cont0Hz}
_12 | A | 18.3 | 27.7 | 41.5 | 46.3 | 68.0 |
| Continuous output current when
f _s = 16 kHz; output frequency
f _{out} less than f _{out_still} ⁸⁾ | I _{out_cont0Hz}
_16 | A | 14.7 | 21.1 | 31.0 | 33.6 | - |
| Assigned output filters at nom.
data; f _s = 4 kHz | | | - | | | | |
| Latest amendment: 2013-11-15 | | | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s

Tab. 6-16: HMS - Power section data - inverter



Guide value "Rise of voltage at output"

Observe that the voltage load at the motor is almost independent of the power section used.

Especially when using **standard motors**, make sure that they comply with the occurring voltage load.

Observe the information on third-party motors at drive controllers (see documentation "Rexroth IndraDrive Drive Systems with HMV01/02 HMS01/02, HMD01, HCS02/03", index entry "Third-party motors → At drive controllers").



Reduced output current at motor standstill

Depending on the electric output frequency, the output current is reduced for thermal protection of the power section.

The output current is reduced, when the electric output frequency has fallen below the threshold to detect motor standstill.

Exemplary data for applications

General information

This chapter contains:

- Examples of allowed current profiles
- Examples of allowed performance profiles
- Data for selecting standard motors

Current profiles

Examples of allowed current profiles

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|----------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{1)}$ | $I_{out_peak1_2}$ | A | - | | | |
| Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_2}$ | A | - | | | |
| Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{2)}$ | $I_{out_peak1_4}$ | A | 19.05 | 34.71 | 54.00 | 66.87 |
| Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_4}$ | A | 7.62 | 13.88 | 21.60 | 26.75 |
| Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{3)}$ | $I_{out_peak1_8}$ | A | 13.22 | 24.83 | 34.39 | 38.76 |
| Base load current at $I_{out_peak_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_8}$ | A | 5.29 | 9.93 | 13.76 | 15.50 |
| Maximum output current at $I_{out_base_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{4)}$ | $I_{out_peak1_12}$ | A | 8.06 | 15.90 | 21.07 | 23.40 |
| Base load current at $I_{out_peak_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_12}$ | A | 3.22 | 6.36 | 8.43 | 9.36 |
| Maximum output current at $I_{out_base_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{5)}$ | $I_{out_peak1_16}$ | A | 4.40 | 10.10 | 13.21 | 15.18 |
| Base load current at $I_{out_peak_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_16}$ | A | 1.76 | 4.04 | 5.28 | 6.07 |
| Maximum output current at $I_{out_base_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{6)}$ | $I_{out_peak3_2}$ | A | - | | | |
| Base load current at $I_{out_peak_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$ | $I_{out_base3_2}$ | A | - | | | |
| Maximum output current at $I_{out_base_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{7)}$ | $I_{out_peak3_4}$ | A | 17.28 | 31.32 | 52.93 | 60.94 |
| Latest amendment: 2006-09-20 | | | | | | |

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|----------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Base load current at $I_{out_peak_3}$;
$f_s = 4$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_4}$ | A | 8.64 | 15.66 | 26.46 | 30.47 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 8$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(8)}$ | $I_{out_peak3_8}$ | A | 11.93 | 22.27 | 30.67 | 35.04 |
| Base load current at $I_{out_peak_3}$;
$f_s = 8$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_8}$ | A | 5.96 | 11.14 | 15.33 | 17.52 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 12$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(9)}$ | $I_{out_peak3_12}$ | A | 7.24 | 14.19 | 18.73 | 21.06 |
| Base load current at $I_{out_peak_3}$;
$f_s = 12$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_12}$ | A | 3.62 | 7.09 | 9.36 | 10.53 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 16$ kHz; $t = 2$ s;
$T = 20$ min; $K = 2.0^{(10)}$ | $I_{out_peak3_16}$ | A | 3.94 | 8.98 | 11.72 | 13.63 |
| Base load current at $I_{out_peak_3}$;
$f_s = 16$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_16}$ | A | 1.97 | 4.49 | 5.86 | 6.81 |
| Base load current at $I_{out_peak_4}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_2}$ | A | - | | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(11)}$ | $I_{out_peak4_2}$ | A | - | | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(12)}$ | $I_{out_peak4_4}$ | A | 12.60 | 22.45 | 40.45 | 45.67 |
| Base load current at $I_{out_peak_4}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_4}$ | A | 8.40 | 14.97 | 26.97 | 30.45 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(13)}$ | $I_{out_peak4_8}$ | A | 8.64 | 15.85 | 23.26 | 26.02 |
| Base load current at $I_{out_peak_4}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_8}$ | A | 5.76 | 10.57 | 15.51 | 17.35 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(14)}$ | $I_{out_peak4_12}$ | A | 5.22 | 10.04 | 14.16 | 15.56 |
| Latest amendment: 2006-09-20 | | | | | | |

Power sections for inverters - IndraDrive M

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|--------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Base load current at $I_{out_peak_4}$;
$f_s = 12$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_1}$
2 | A | 3.48 | 6.69 | 9.44 | 10.37 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{15)}$ | $I_{out_peak4_1}$
6 | A | 2.83 | 6.33 | 8.85 | 10.05 |
| Base load current at $I_{out_peak_4}$;
$f_s = 16$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_1}$
6 | A | 1.89 | 4.22 | 5.90 | 6.70 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{16)}$ | $I_{out_peak5_2}$ | A | - | | | |
| Base load current at $I_{out_peak_5}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_2}$ | A | - | | | |
| Maximum output current at
$I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{17)}$ | $I_{out_peak5_4}$ | A | 12.26 | 21.67 | 36.47 | 43.32 |
| Base load current at $I_{out_peak_5}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_4}$ | A | 11.15 | 19.70 | 33.16 | 39.38 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{18)}$ | $I_{out_peak5_8}$ | A | 8.39 | 15.28 | 20.91 | 24.63 |
| Base load current at $I_{out_peak_5}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_8}$ | A | 7.63 | 13.89 | 19.01 | 22.39 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{19)}$ | $I_{out_peak5_1}$
2 | A | 5.07 | 9.67 | 12.71 | 14.71 |
| Base load current at $I_{out_peak_5}$;
$f_s = 12$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_1}$
2 | A | 4.61 | 8.79 | 11.56 | 13.37 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 16$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{20)}$ | $I_{out_peak5_1}$
6 | A | 2.75 | 6.09 | 7.94 | 9.50 |
| Base load current at $I_{out_peak_5}$;
$f_s = 16$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_1}$
6 | A | 2.50 | 5.54 | 7.22 | 8.63 |
| Latest amendment: 2006-09-20 | | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See
UEL_I_e

profile
definition

Tab. 6-17: HMS - Examples of allowed current profiles

Examples of allowed current profiles

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|----------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(1)}$ | $I_{out_peak1_2}$ | A | - | | | | |
| Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_2}$ | A | - | | | | |
| Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(2)}$ | $I_{out_peak1_4}$ | A | 106.40 | 150.00 | 210.00 | 261.30 | 350.00 |
| Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_4}$ | A | 42.56 | 60.00 | 84.00 | 104.52 | 140.00 |
| Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(3)}$ | $I_{out_peak1_8}$ | A | 67.91 | 107.09 | 156.29 | 177.70 | 250.00 |
| Base load current at $I_{out_peak_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_8}$ | A | 27.16 | 42.84 | 62.52 | 71.08 | 100.00 |
| Maximum output current at $I_{out_base_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(4)}$ | $I_{out_peak1_12}$ | A | 50.36 | 77.35 | 112.47 | 129.16 | 170.00 |
| Base load current at $I_{out_peak_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_12}$ | A | 20.14 | 30.94 | 44.99 | 51.66 | 68.00 |
| Maximum output current at $I_{out_base_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(5)}$ | $I_{out_peak1_16}$ | A | 40.62 | 58.83 | 84.38 | 98.56 | - |
| Base load current at $I_{out_peak_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_16}$ | A | 16.25 | 23.53 | 33.75 | 39.43 | - |
| Maximum output current at $I_{out_base_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(6)}$ | $I_{out_peak3_2}$ | A | - | | | | |
| Base load current at $I_{out_peak_3}$; $f_s = 2$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0$ | $I_{out_base3_2}$ | A | - | | | | |
| Maximum output current at $I_{out_base_3}$; $f_s = 4$ kHz; $t = 2$ s; $T = 20$ s; $K = 2.0^{(7)}$ | $I_{out_peak3_4}$ | A | 95.87 | 140.83 | 208.94 | 232.52 | 350.00 |
| Latest amendment: 2013-11-15 | | | | | | | |

Power sections for inverters - IndraDrive M

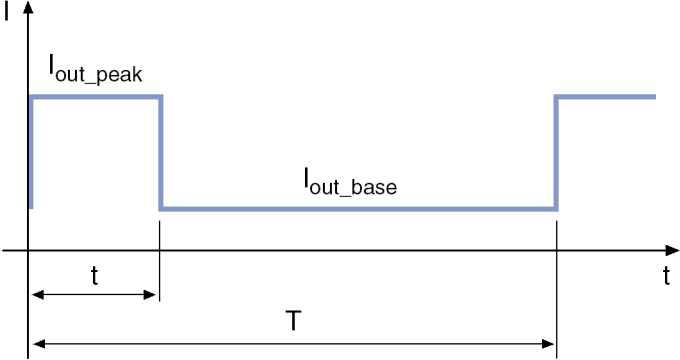
| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|----------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Base load current at $I_{out_peak_3}$;
$f_s = 4$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_4}$ | A | 47.93 | 70.41 | 104.47 | 116.26 | 175.00 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 8$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(8)}$ | $I_{out_peak3_8}$ | A | 60.73 | 96.70 | 142.91 | 156.97 | 240.00 |
| Base load current at $I_{out_peak_3}$;
$f_s = 8$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_8}$ | A | 30.36 | 48.35 | 71.45 | 78.48 | 120.00 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 12$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(9)}$ | $I_{out_peak3_12}$ | A | 44.90 | 69.65 | 102.46 | 113.70 | 170.00 |
| Base load current at $I_{out_peak_3}$;
$f_s = 12$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_12}$ | A | 22.45 | 34.83 | 51.23 | 56.85 | 85.00 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 16$ kHz; $t = 2$ s;
$T = 20$ min; $K = 2.0^{(10)}$ | $I_{out_peak3_16}$ | A | 36.17 | 52.97 | 76.75 | 86.62 | - |
| Base load current at $I_{out_peak_3}$;
$f_s = 16$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_16}$ | A | 18.09 | 26.49 | 38.37 | 43.31 | - |
| Base load current at $I_{out_peak_4}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_2}$ | A | - | | | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(11)}$ | $I_{out_peak4_2}$ | A | - | | | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(12)}$ | $I_{out_peak4_4}$ | A | 70.02 | 106.73 | 162.71 | 163.51 | 273.00 |
| Base load current at $I_{out_peak_4}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_4}$ | A | 46.68 | 71.16 | 108.47 | 109.01 | 182.00 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(13)}$ | $I_{out_peak4_8}$ | A | 43.90 | 72.42 | 110.19 | 109.44 | 178.00 |
| Base load current at $I_{out_peak_4}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_8}$ | A | 29.27 | 48.28 | 73.46 | 72.96 | 119.00 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(14)}$ | $I_{out_peak4_12}$ | A | 32.34 | 52.00 | 78.67 | 78.93 | 133.00 |
| Latest amendment: 2013-11-15 | | | | | | | |

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|--------------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Base load current at $I_{out_peak_4}$;
$f_s = 12$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_1}$
2 | A | 21.56 | 34.67 | 52.45 | 52.62 | 89.00 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{15)}$ | $I_{out_peak4_1}$
6 | A | 26.01 | 39.54 | 58.83 | 60.01 | - |
| Base load current at $I_{out_peak_4}$;
$f_s = 16$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_1}$
6 | A | 17.34 | 26.36 | 39.22 | 40.00 | - |
| Maximum output current at
$I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{16)}$ | $I_{out_peak5_2}$ | A | - | | | | |
| Base load current at $I_{out_peak_5}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_2}$ | A | - | | | | |
| Maximum output current at
$I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{17)}$ | $I_{out_peak5_4}$ | A | 69.32 | 101.61 | 153.95 | 153.87 | 264.00 |
| Base load current at $I_{out_peak_5}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_4}$ | A | 63.02 | 92.38 | 139.95 | 139.89 | 240.00 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{18)}$ | $I_{out_peak5_8}$ | A | 43.73 | 68.78 | 104.01 | 108.42 | 172.00 |
| Base load current at $I_{out_peak_5}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_8}$ | A | 39.75 | 62.53 | 94.56 | 98.56 | 156.00 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{19)}$ | $I_{out_peak5_1}$
2 | A | 32.21 | 49.37 | 74.19 | 78.19 | 128.00 |
| Base load current at $I_{out_peak_5}$;
$f_s = 12$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_1}$
2 | A | 29.28 | 44.88 | 67.45 | 71.08 | 117.00 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 16$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{20)}$ | $I_{out_peak5_1}$
6 | A | 25.90 | 37.54 | 55.46 | 59.44 | - |
| Base load current at $I_{out_peak_5}$;
$f_s = 16$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_1}$
6 | A | 23.55 | 34.13 | 50.42 | 54.03 | - |
| Latest amendment: 2013-11-15 | | | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See
UEL_I_e
profile
definition

Tab. 6-18: HMS - Examples of allowed current profiles

Current profile "UEL_I_e" The following current profiles have been defined for converters and inverters.

| Profile | Explanation |
|--|--|
| <div><p>current profile "UEL_I_e"</p><p>DK000149v01_nn.fh11</p></div> | <p>The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.</p> |

Tab. 6-19: Definition of current profiles

Operation with standard motors

General information

Selecting standard motors

The tables below show the nominal powers P_{nenn} of standard motors which can be operated at the respective drive controller. The following conditions apply to the data in the tables:

- Motor design:
4-pole standard motor (2 pole pairs) with rated voltage 3 AC 400 V, 50 Hz at mains voltage $U_{LN} \geq 3$ AC 400 V or
4-pole standard motor (2 pole pairs) with rated voltage 3 AC 460 V, 60 Hz at mains voltage $U_{LN} \geq 3$ AC 460 V
- Assigned mains choke is used
- Operation at minimum switching frequency $f_s = f_s \text{ (min.)}$
- Rotary field at output with $f_{out} > f_{out_still}$
- Ambient temperature $T_a \leq T_{a_work}$
- Overload ratio $K = P_{DC_peak} / P_{DC_base}$ according to performance profile "UEL_P_e"
- Type of mains connection: Individual Supply



When choosing standard motors for inverters, select an appropriate supply unit. Observe the performance data P_{DC_peak} and P_{DC_base} in the performance profile "UEL_P_e" of the supply unit.

Operating standard motors at 3 AC 400 V

Selecting standard motors 3 AC 400V - exemplary profiles

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|---|------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t > 10$ min;
$K = 1.0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 5.50 | 11.00 | 18.50 | 22.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 10$ min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 4.00 | 7.50 | 15.00 | 18.50 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 5$ min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 3.00 | 7.50 | 11.00 | 15.00 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 2$ s;
$T = 20$ s; $K = 2.0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 3.00 | 7.50 | 11.00 | 15.00 |
| Latest amendment: 2006-11-13 | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition

Tab. 6-20: HMS - Selecting standard motors 3 AC 400V - exemplary profiles

Selecting standard motors 3 AC 400 V - exemplary profiles

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|---|-------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Nominal power standard motor
3 AC 400 V; 50 Hz; t > 10 min;
K = 1.0; f _s = 4 kHz ¹⁾ | P _{Nenn} | kW | tbd | 55.00 | 75.00 | tbd | |
| Nominal power standard motor
3 AC 400 V; 50 Hz; t = 60 s;
T = 10 min; K = 1.1; f _s = 4 kHz ²⁾ | P _{Nenn} | kW | tbd | 45.00 | 75.00 | tbd | |
| Nominal power standard motor
3 AC 400 V; 50 Hz; t = 60 s;
T = 5 min; K = 1.5; f _s = 4 kHz ³⁾ | P _{Nenn} | kW | tbd | 37.00 | 55.00 | tbd | |
| Nominal power standard motor
3 AC 400 V; 50 Hz; t = 2 s;
T = 20 s; K = 2.0; f _s = 4 kHz ⁴⁾ | P _{Nenn} | kW | tbd | 37.00 | 55.00 | tbd | |
| Latest amendment: 2013-11-15 | | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition

Tab. 6-21: HMS - Selecting standard motors 3 AC 400V - exemplary profiles

Operating standard motors at 3 AC 460 V

Selecting standard motors 3 AC 460V - exemplary profiles

| Description | Symbol | Unit | HMS01.1N-
W0020-A-07-
NNNN | HMS01.1N-
W0036-A-07-
NNNN | HMS01.1N-
W0054-A-07-
NNNN | HMS01.1N-
W0070-A-07-
NNNN |
|--|-------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Nominal power standard motor
3AC460V; 60 Hz; t > 10 min;
K = 1.0; f _s = 4 kHz ¹⁾ | P _{Nenn} | kW | 5.50 | 11.00 | 18.40 | 22.10 |
| Nominal power standard motor
3AC460V; 60 Hz; t = 60 s;
T = 10 min; K = 1.1; f _s = 4 kHz ²⁾ | P _{Nenn} | kW | 5.50 | 11.00 | 18.40 | 22.10 |
| Nominal power standard motor
3AC460V; 60 Hz; t = 60 s;
T = 5 min; K = 1.5; f _s = 4 kHz ³⁾ | P _{Nenn} | kW | 3.70 | 7.40 | 14.70 | |
| Nominal power standard motor
3AC460V; 60 Hz; t = 2 s; T = 20 s;
K = 2.0; f _s = 4 kHz ⁴⁾ | P _{Nenn} | kW | 3.70 | 7.40 | 14.70 | |
| Latest amendment: 2007-07-18 | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition; 1 kW ~ 1.36 hp

Tab. 6-22: HMS - Selecting standard motors 3 AC 460V - exemplary profiles

Selecting standard motors 3 AC 460 V - exemplary profiles

| Description | Symbol | Unit | HMS01.1
N-W0110 | HMS01.1
N-W0150 | HMS01.1
N-W0210 | HMS01.1
N-W0300 | HMS01.1
N-W0350 |
|--|-------------------|------|--------------------|--------------------|--------------------|--------------------|--------------------|
| Nominal power standard motor
3AC460V; 60 Hz; t > 10 min;
K = 1.0; f _s = 4 kHz ¹⁾ | P _{Nenn} | kW | 36.80 | 55.20 | 91.90 | tbd | |
| Nominal power standard motor
3AC460V; 60 Hz; t = 60 s;
T = 10 min; K = 1.1; f _s = 4 kHz ²⁾ | P _{Nenn} | kW | 36.80 | 55.20 | 73.60 | tbd | |
| Nominal power standard motor
3AC460V; 60 Hz; t = 60 s;
T = 5 min; K = 1.5; f _s = 4 kHz ³⁾ | P _{Nenn} | kW | 22.10 | 36.80 | 55.20 | tbd | |
| Nominal power standard motor
3AC460V; 60 Hz; t = 2 s; T = 20 s;
K = 2.0; f _s = 4 kHz ⁴⁾ | P _{Nenn} | kW | 22.10 | 36.80 | 55.20 | tbd | |
| Latest amendment: 2013-11-15 | | | | | | | |

1) 2) 3) 4) See UEL_P_e profile definition; 1 kW ~ 1.36 hp

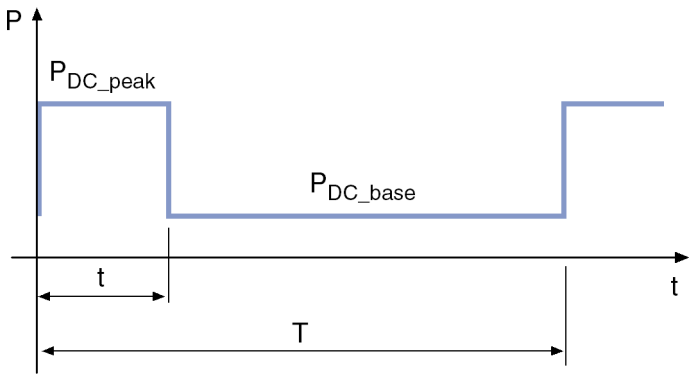
Tab. 6-23: HMS - Selecting standard motors 3 AC 460V - exemplary profiles

Performance profile "UEL_P_e"

The following performance profiles have been defined for converters and inverters.



Observe the allowed performance data P_{DC_peak} and P_{DC_base} in the corresponding performance profile of the supply unit or converter.

| Profile | Explanation |
|---|--|
| <p>Performance profile "UEL_P_e"</p>  <p>DK000135v01_nn.fh11</p> | <p>Characteristic of the selection of standard motors and servo drives.</p> |

Tab. 6-24: Definition of Performance Profiles, Infeeding Supply Units and Converters

6.2.5 Connections and interfaces

Overview

Overall connection diagram

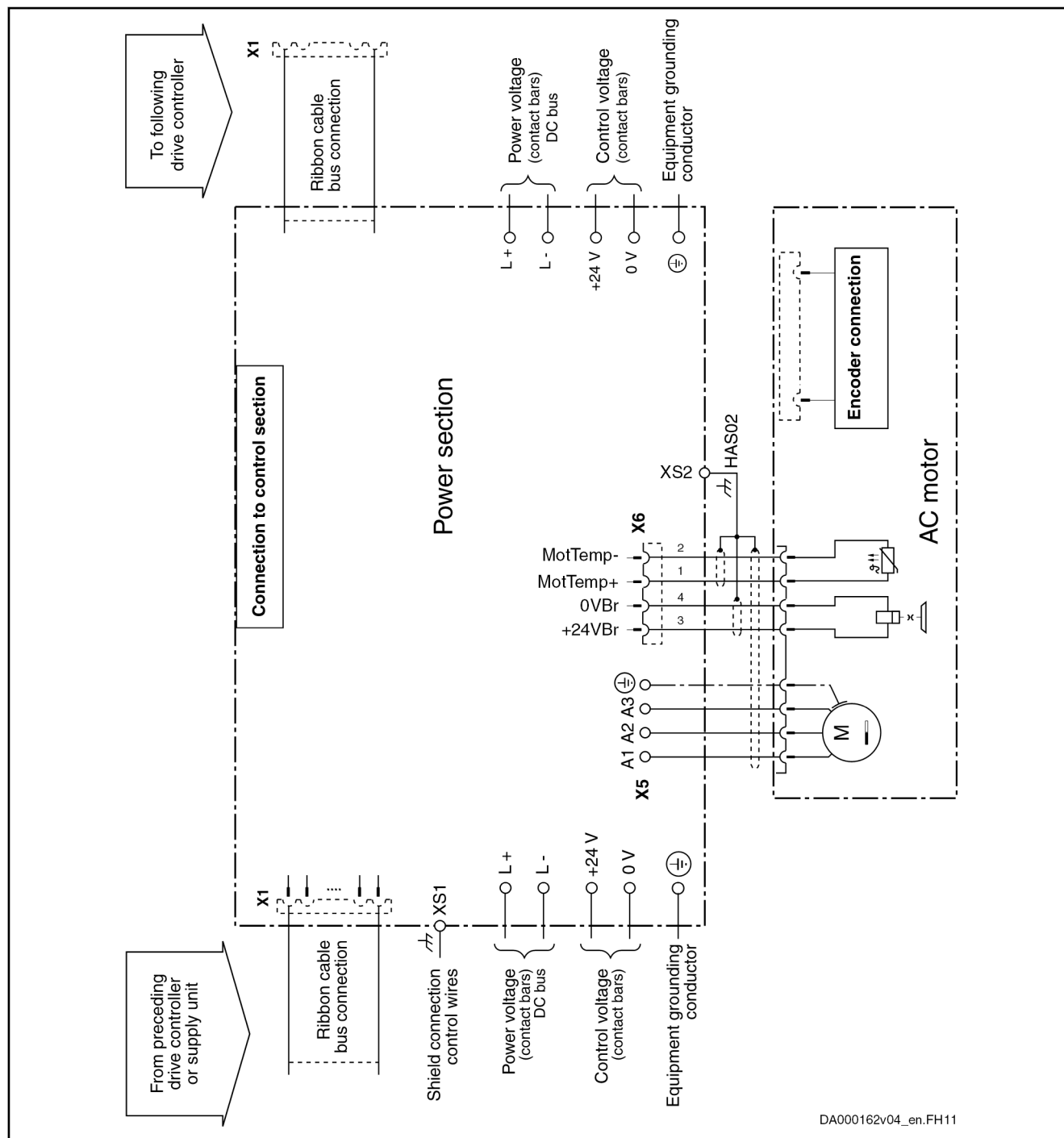
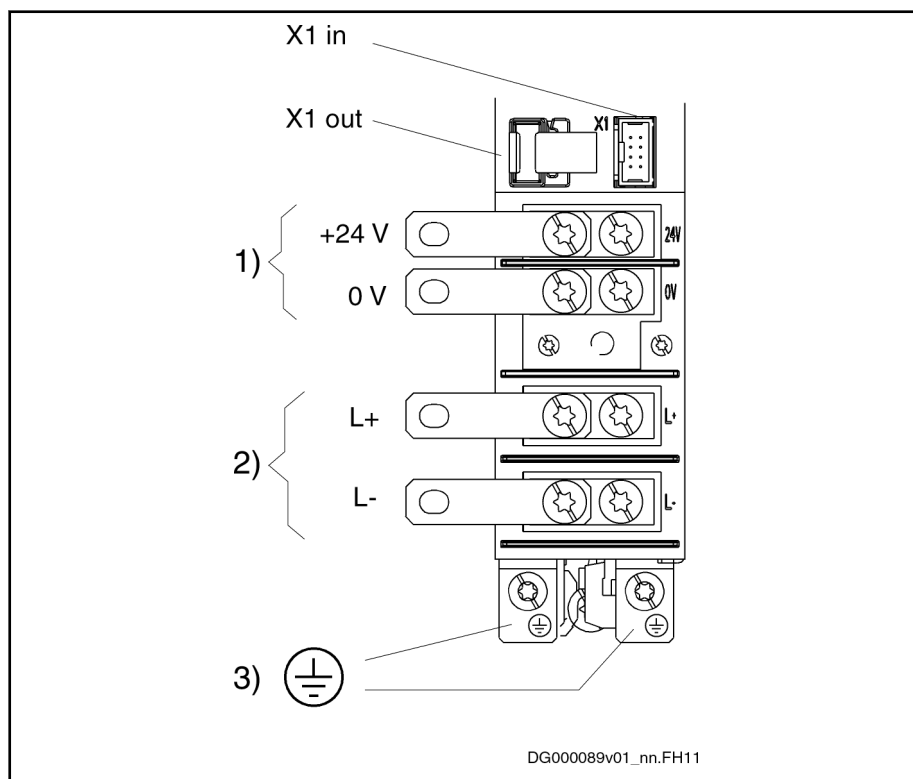


Fig. 6-15: Connection diagram HMS01.1-Wxxx

Arrangement of the connection points

Connection points at HMS01.1N-W0020 and HMS01.1N-W0036

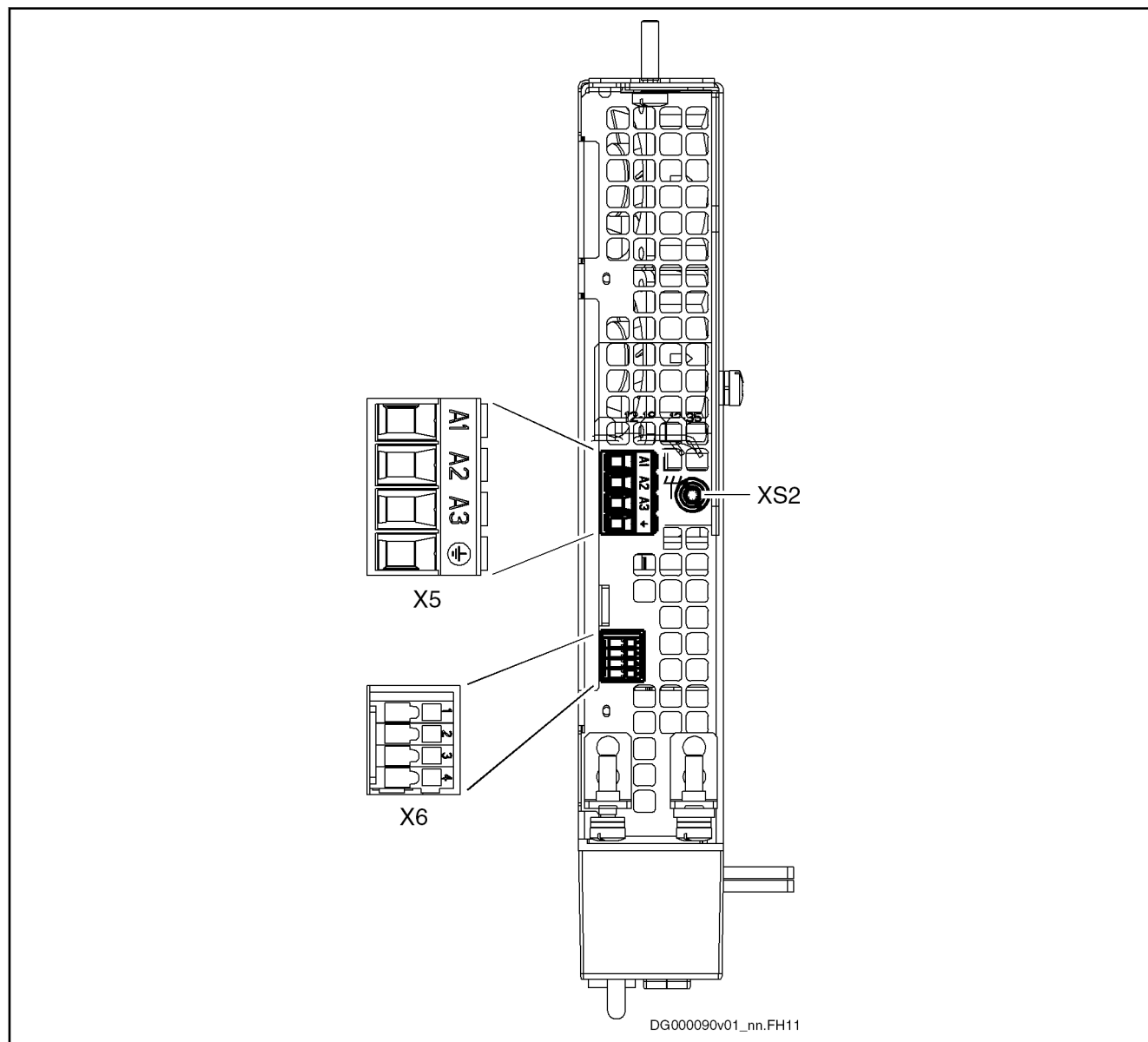
Connections at power section (front)



- 1) Control voltage
- 2) DC bus
- 3) Equipment grounding conductor
- X1 in, X1 out Module bus

Fig. 6-16: Connections at power section (front) HMS01.1N-W0020 and HMS01.1N-W0036

Connections at power section (bottom)

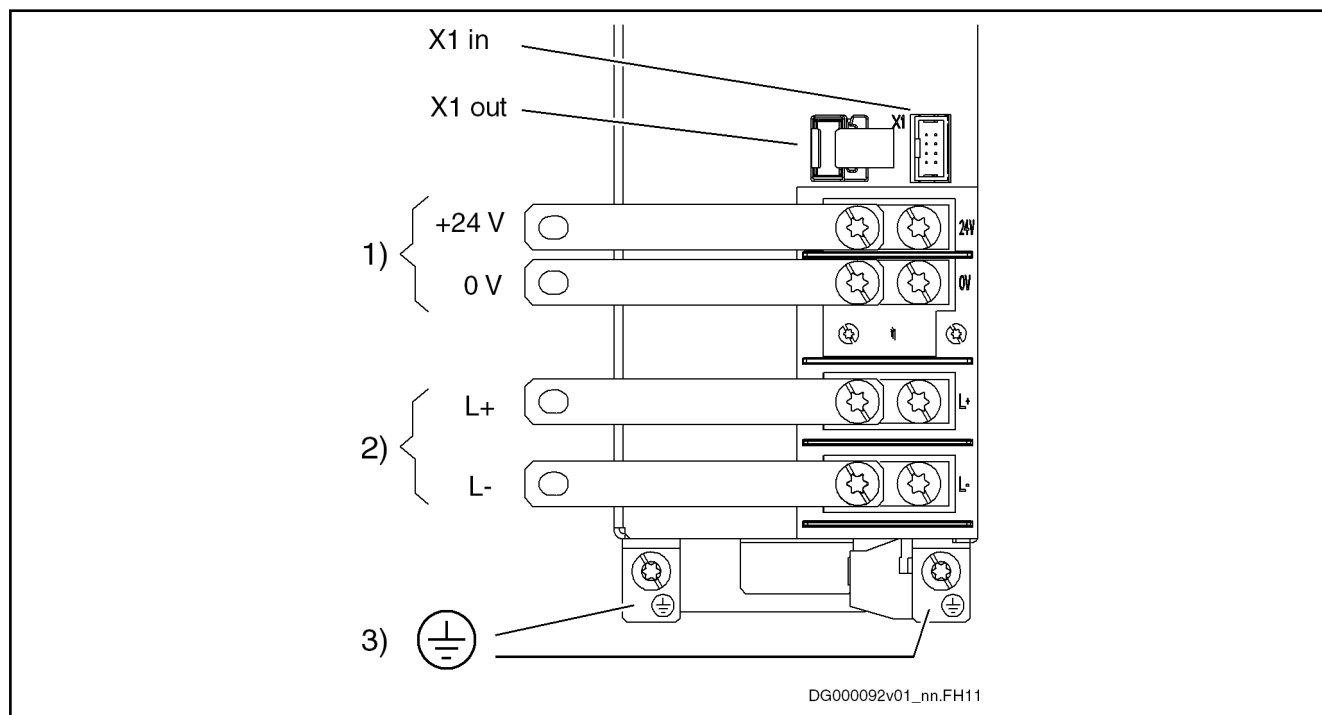


- X5** Motor connection
X6 Motor temperature monitoring and motor holding brake
XS2 Thread for mounting the HAS02 accessories to connect the shield of the motor power cable

Fig. 6-17: Connections at power section (bottom) HMS01.1N-W0020, -W0036

Connection points at HMS01.1N-W0054 and HMS01.1N-W0070

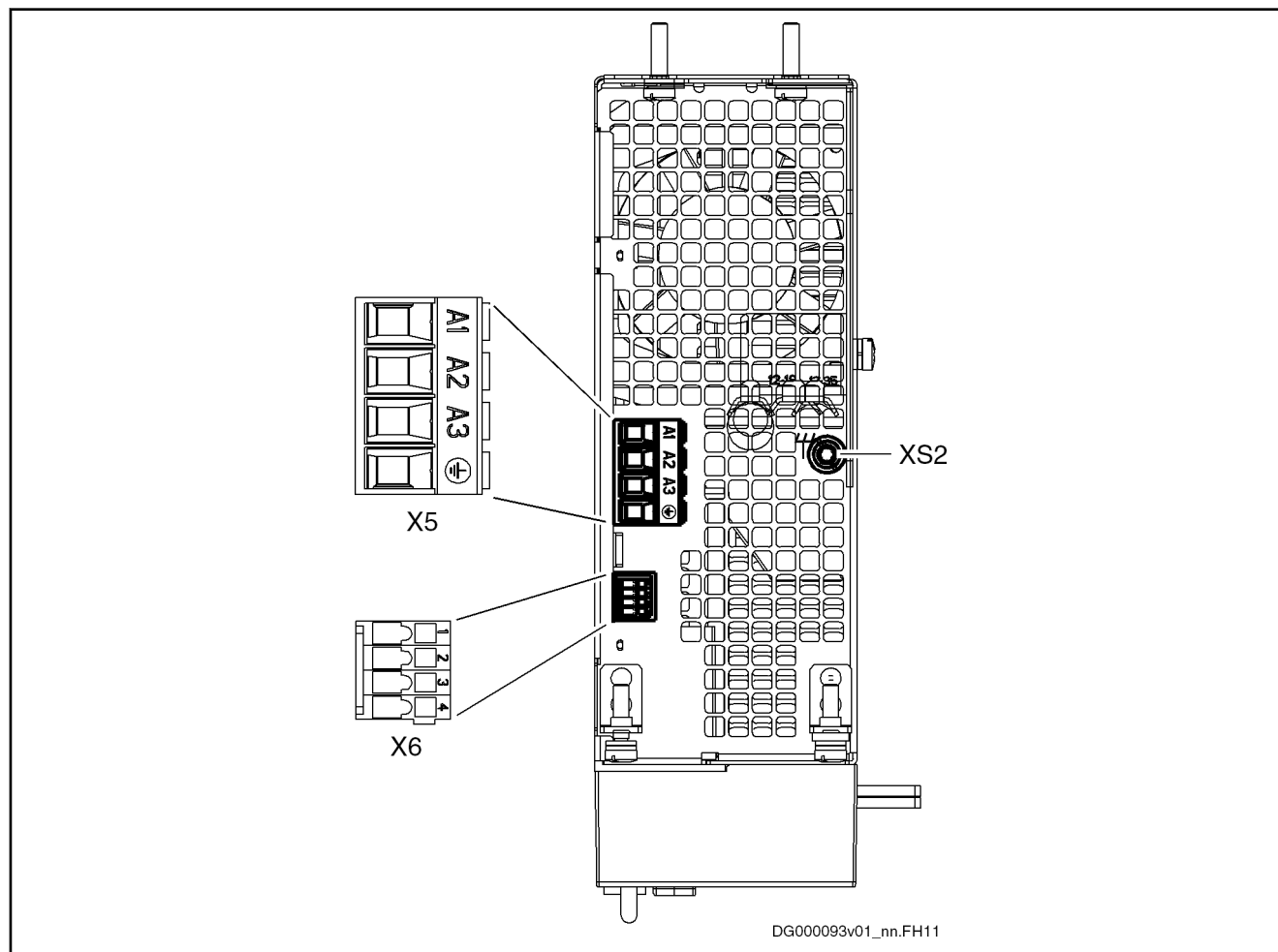
Connections at power section (front)



- 1) Control voltage
- 2) DC bus
- 3) Equipment grounding conductor
- X1 in, X1 out Module bus

Fig. 6-18: Connections at power section (front) HMS01.1N-W0054 and -W0070

Connections at power section (bottom)

**X5**

Motor connection

X6

Motor temperature monitoring and motor holding brake

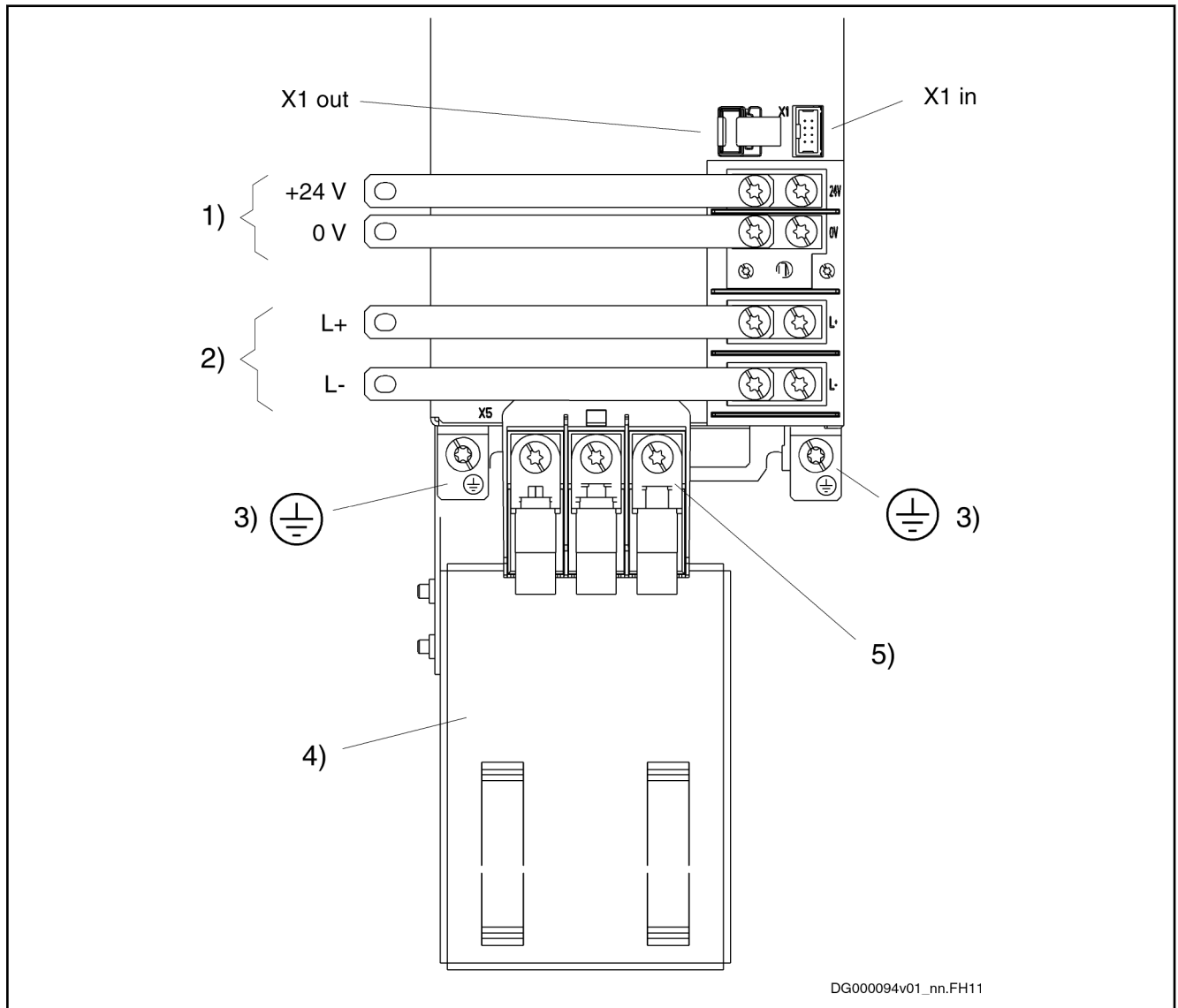
XS2

Thread for mounting the HAS02 accessories to connect the shield of the motor power cable

*Fig. 6-19:**Connections at power section (bottom) HMS01.1N-W0054 and -W0070*

**Connection points at HMS01.1N-W0110, HMS01.1N-W0150,
HMS01.1N-W0210, HMS01.1N-W0300**

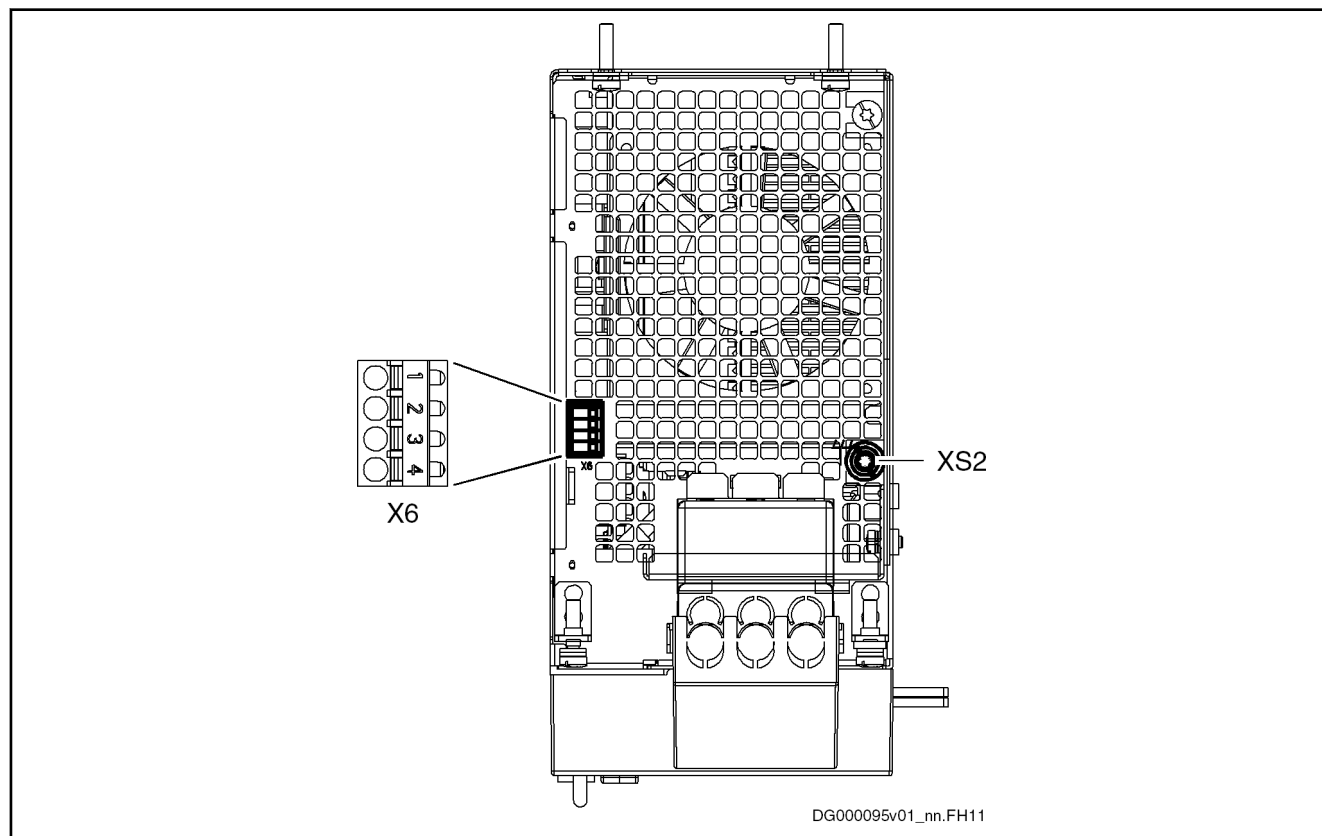
Connections at power section (front)



- 1) Control voltage
- 2) DC bus
- 3) Equipment grounding conductor
- 4) Plate for shield connection of motor cable (optional)
- 5) Motor connection
- X1 in, X1 out Module bus

Fig. 6-20: Connections at power section (front) HMS01.1N-W0110, HMS01.1N-W0150, HMS01.1N-W0210, HMS01.1N-W0300

Connections at power section (bottom)



X6
XS2

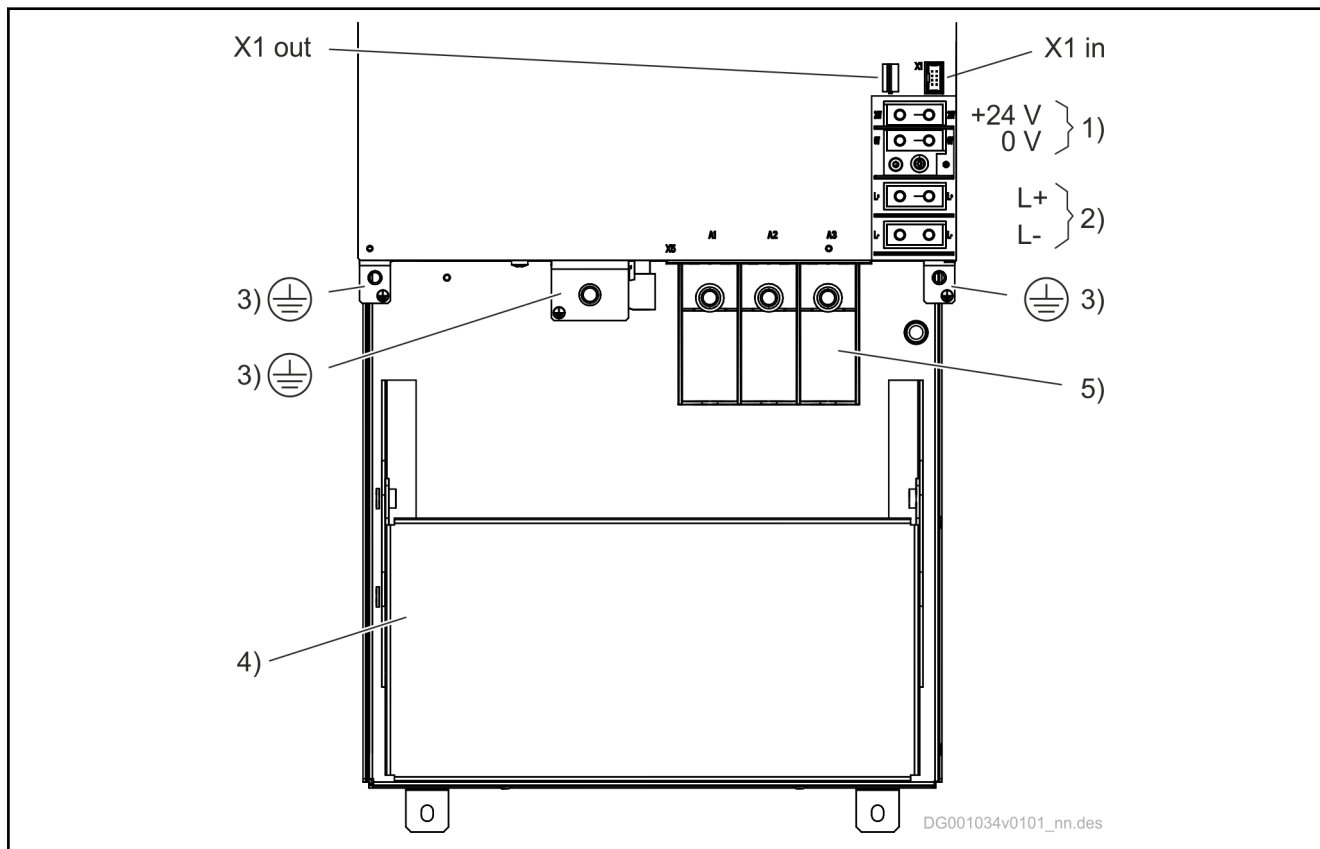
Motor temperature monitoring and motor holding brake
Thread for mounting the HAS02 accessories to connect the
shield of the motor power cable

Fig. 6-21:

*Connections at power section (bottom) HMS01.1N-W0110,
HMS01.1N-W0150, HMS01.1N-W0210, HMS01.1N-W0300*

Connection points at HMS01.1N-W0350

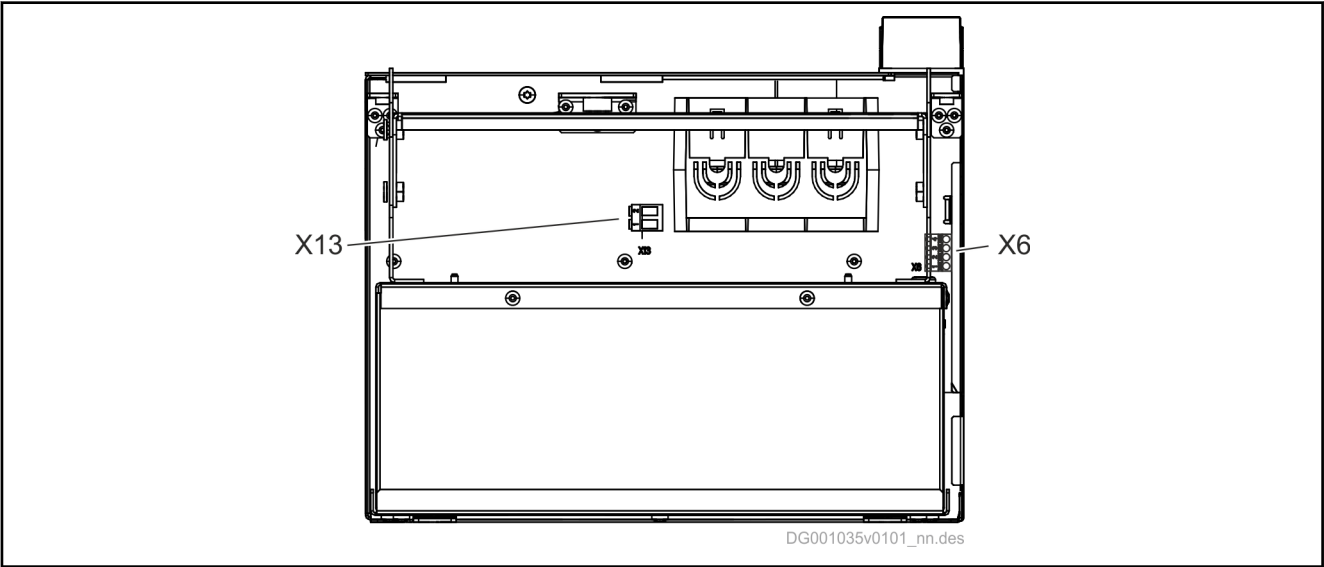
Connections at power section (front)



- 1) Control voltage
- 2) DC bus
- 3) Equipment grounding conductor
- 4) Plate for shield connection of motor cable (optional)
- 5) Motor connection
- X1 in, X1 out Module bus

Fig. 6-22: Connections at power section (front) HMS01.1N-W0350

Connections at power section (bottom)



- X6
- Motor temperature monitoring and motor holding brake
- X13
- Voltage connection for fan unit

Fig. 6-23: Connections at power section (bottom) HMS01.1N-W0350

Description of the connection points

The connection points are described in detail in chapter 8 Functions and connection points, page 261.

Touch guard

The touch guard is described in detail in chapter 9 Touch guard at devices, page 325.

6.3

HMS02.1N-Wxxxx power sections (W cooling type, air-cooled)

6.3.1

Brief description, use and design

Brief description

The HMS02 inverters are part of the Rexroth IndraDrive M product range and are used to operate single axes.

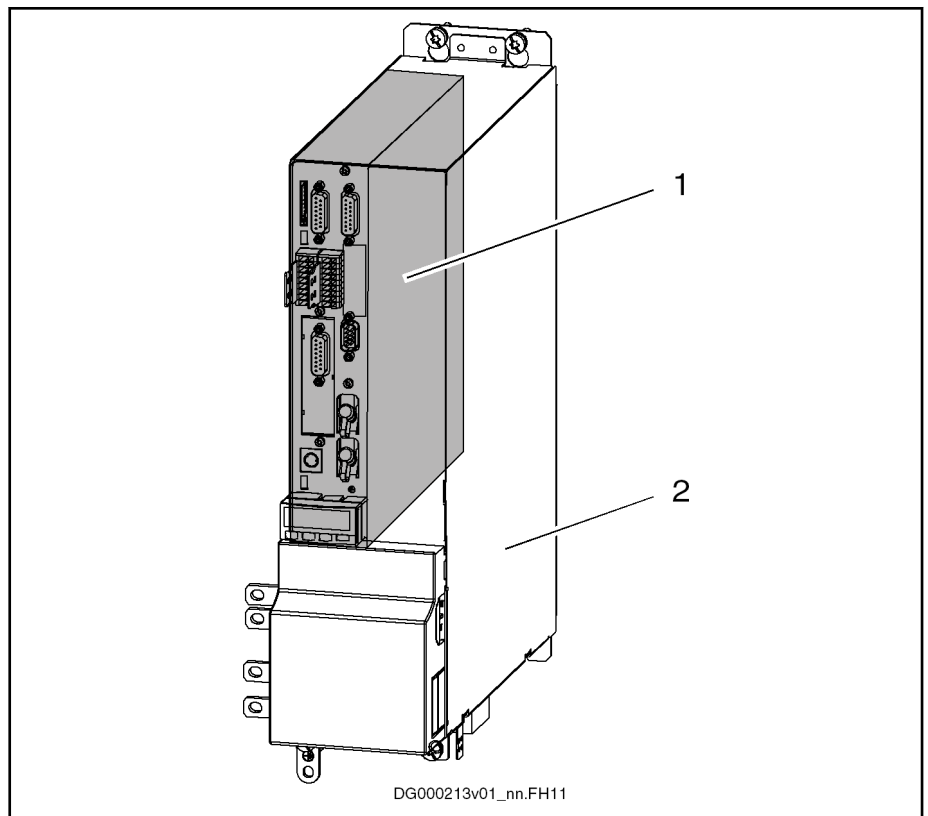
Use

The different types are used as follows:

| Type | Use |
|---------------------|---|
| HMS02.1N-Wxxxx-NNNN | <ul style="list-style-type: none">Single-axis deviceOperation of a three-phase a.c. motor (asynchronous or synchronous motor). |

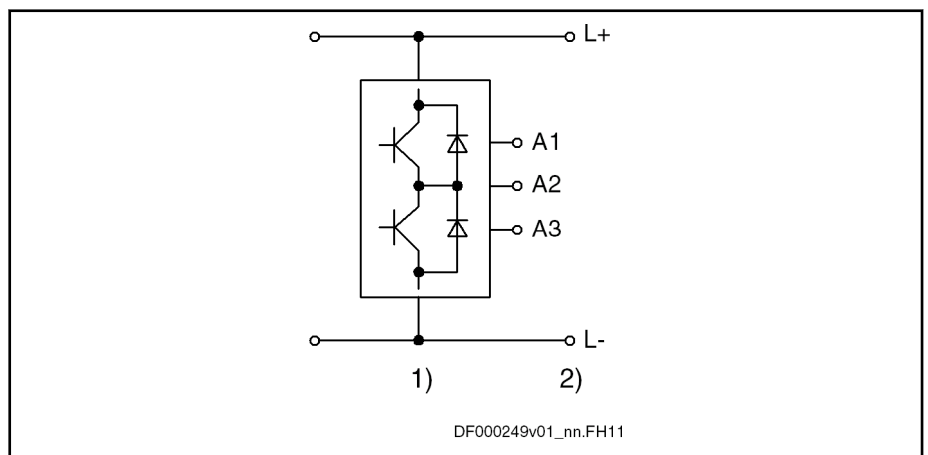
Tab. 6-25: Use

Structure, block diagrams



- 1 Power section
- 2 Control section

Fig. 6-24: Basic structure of the drive controller



- 1) Inverter stage with output to motor
- 2) DC bus connection

Fig. 6-25: Block diagram

6.3.2 Type code and identification

Type code



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

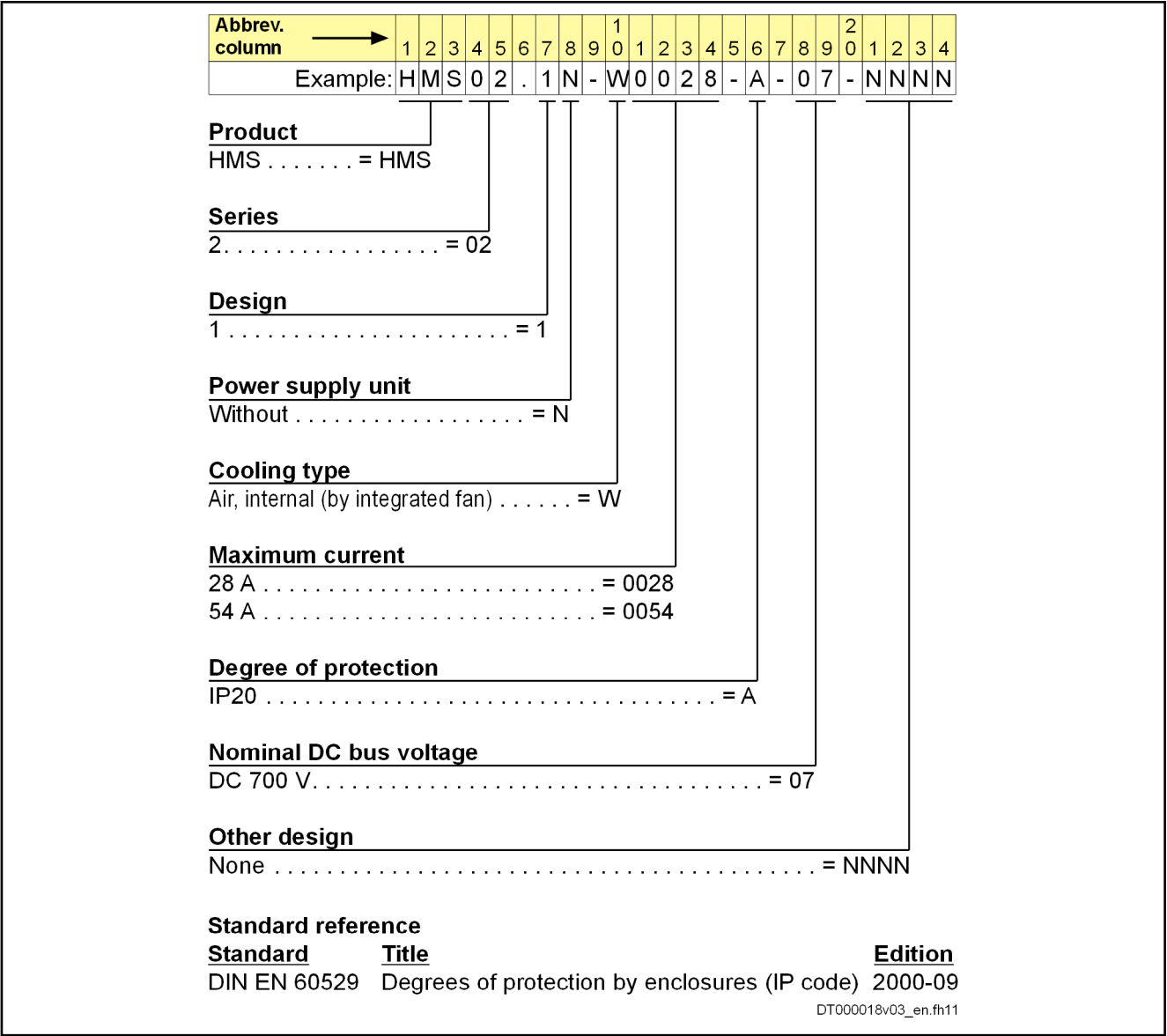
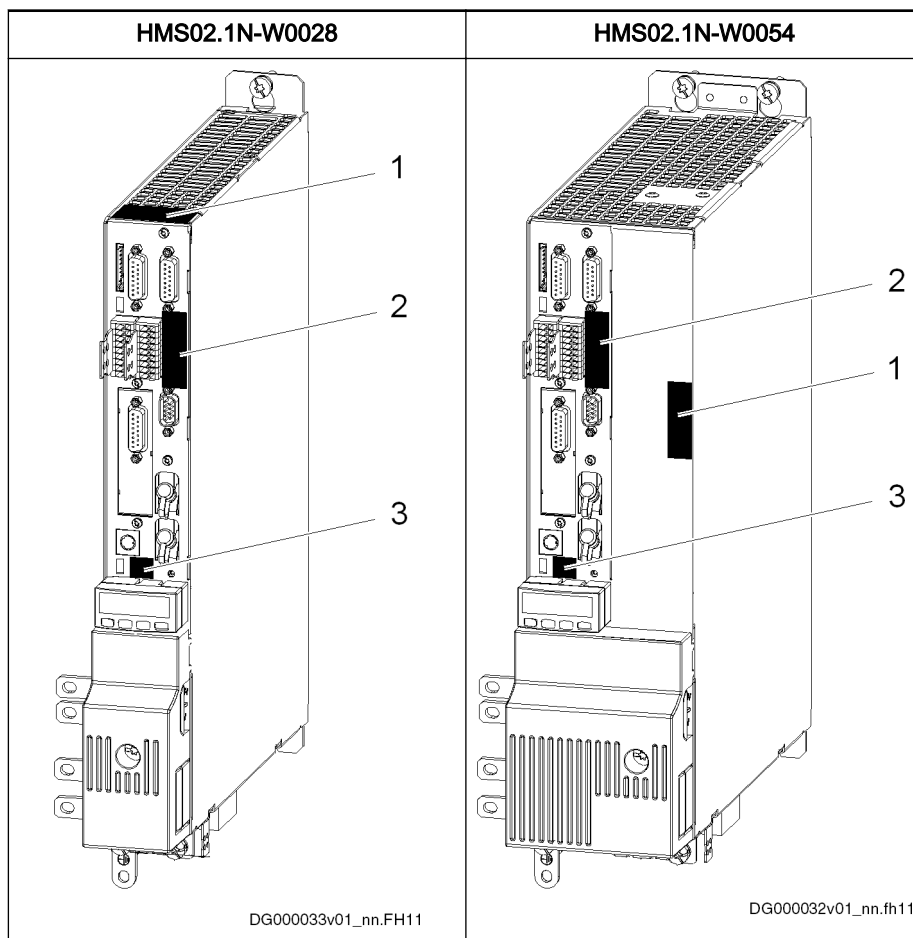


Fig. 6-26: HMS02 type code

Identification

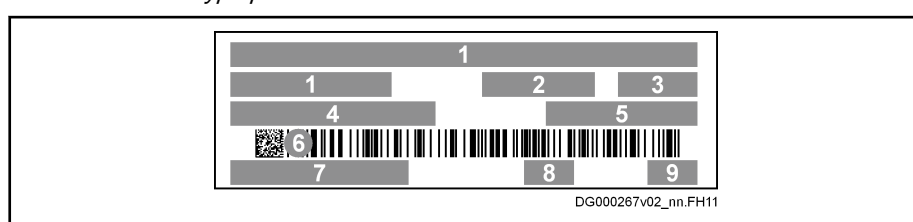
Type plate arrangement



- 1 Power section type plate
- 2 Control section type plate
- 3 Firmware type plate

Tab. 6-26: Type plates at the drive controller

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 6-27: Type plate (electrical equipment)

6.3.3 Scope of supply

- 1 × touch guard

- Connectors for the electrical connection points at the device
- 1 × Instruction Manual (in the English language)

6.3.4 Technical data HMS02.1N-Wxxxx

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage" on page 23](#).

Installation conditions: See [chapter 4.3 "Installation conditions" on page 24](#).

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|----------------|-------|--------------------------|--------------------------|
| Short circuit current rating | SCCR | A rms | 42000 | |
| Rated input voltage, power ¹⁾ | U_{LN_nenn} | V | DC 254...750 | |
| Rated input current | I_{LN} | A | 18.4 | 30.7 |
| Output voltage | U_{out} | V | 3 x AC 0...500 | |
| Output current | I_{out} | A | 13.8 | 25.0 |
| Latest amendment: 2019-06-04* | | | | |

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 6-27: HMS - Ambient and operating conditions - UL ratings

Applied standards

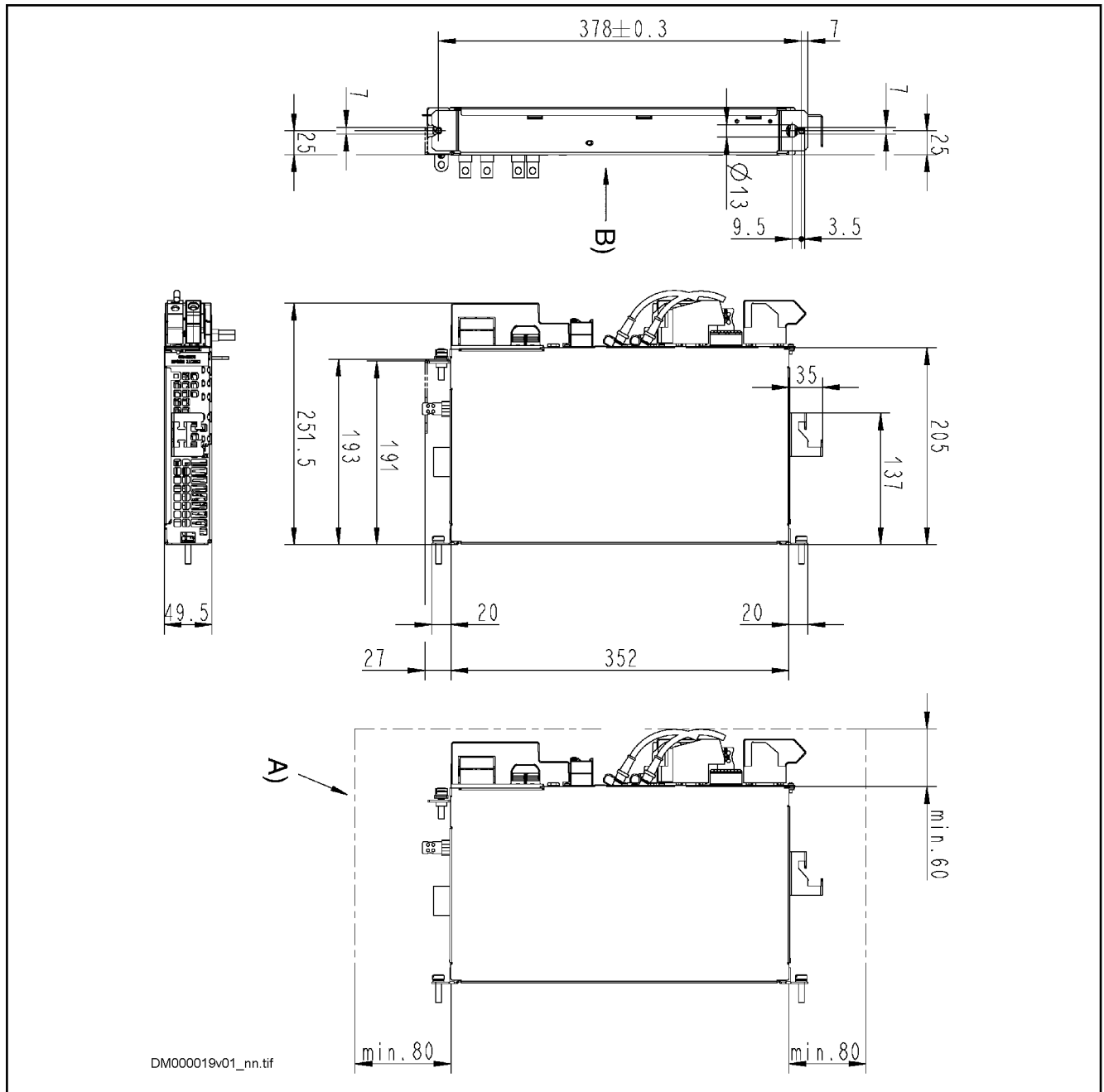
| Description | Symbol | Unit | HMS02.1N-W0028 | HMS02.1N-W0054 |
|---|--------|------|------------------|----------------|
| Listing in accordance with UL standard | | | UL 508C | |
| UL files | | | E134201 | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | |
| Latest amendment: 2017-01-23 | | | | |

Tab. 6-28: HMS - Applied standards

Mechanics and mounting

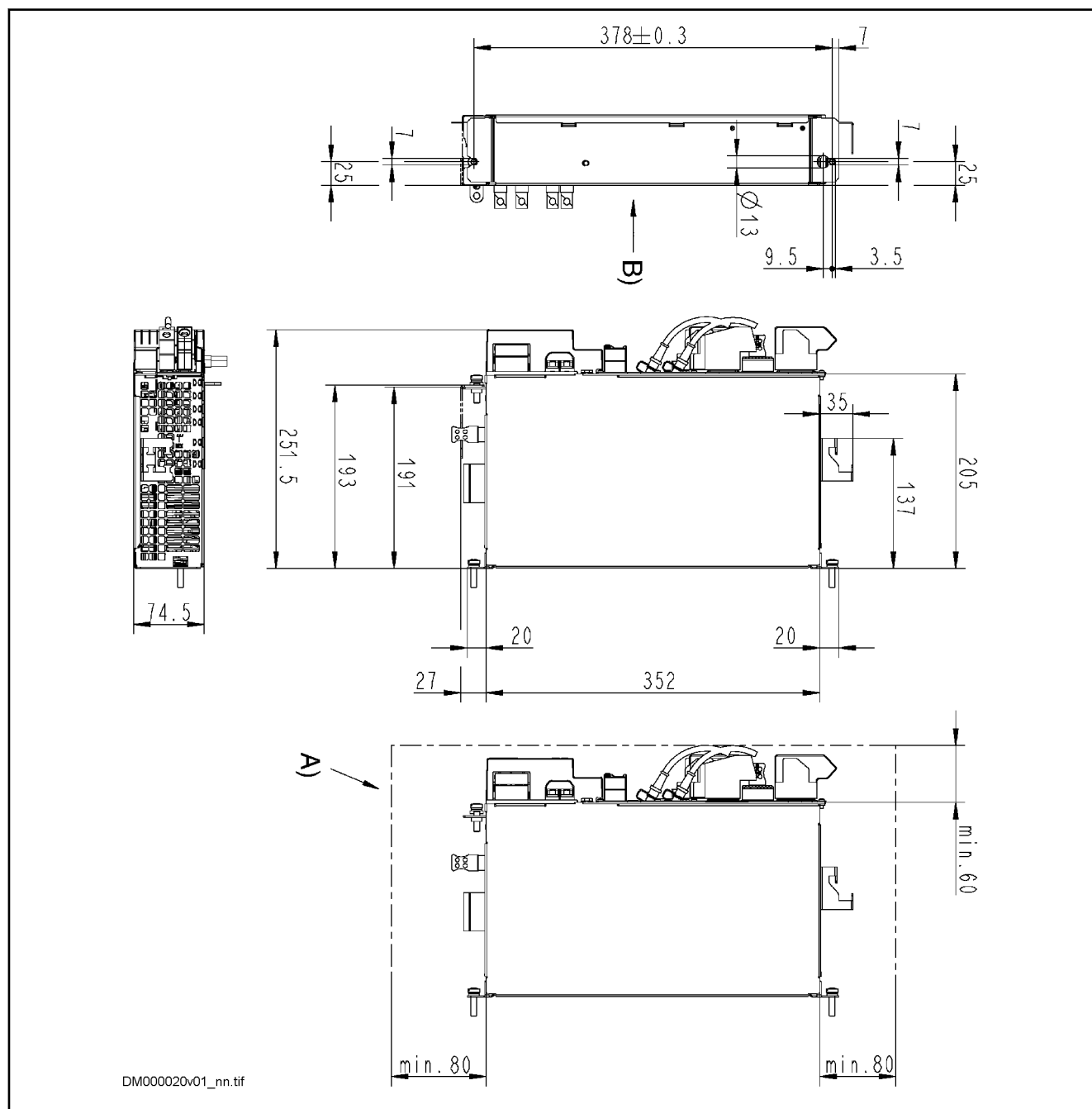
Dimensional drawings

Dimensions HMS02.1N-W0028



- A)** Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B)** Rear view!
Fig. 6-28: Dimensions HMS02.1N-W0028

Dimensions HMS02.1N-W0054



A)

Minimum mounting clearance (plus additional space for motor cable)

Note: Rexroth IndraDrive supply units require greater mounting clearance!

B)

Rear view!

Fig. 6-29:

Dimensions HMS02.1N-W0054

Dimensions, mass, insulation, sound pressure level

Data for mass, sound pressure level, insulation

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|---|-----------------|--------|--------------------------|--------------------------|
| Mass | m | kg | 3.50 | 5.00 |
| Device height ¹⁾ | H | mm | 352 | |
| Device depth ²⁾ | T | mm | 205 | |
| Device width ³⁾ | B | mm | 50 | 75 |
| Insulation resistance at 500 V DC | R _{is} | Mohm | >8 | |
| Capacitance against housing | C _Y | nF | 2 x 68 | |
| Average sound pressure level (accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | tbd | |

Latest amendment: 2007-01-02

1) 2) 3) Housing dimension; see also related dimensional drawing
4) According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 6-29: HMS - Data for mass, dimensions, sound pressure level, insulation

Power dissipation, mounting position, cooling, distances

Cooling and power dissipation data

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|-----------------------------|------|--------------------------|--------------------------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...40 | |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...55 | |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2 | |
| Allowed mounting position | | | G1 | |
| Cooling type | | | Forced ventilation | |
| Volumetric capacity of forced cooling | V | m³/h | 17.20 | 37.00 |
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8 | 4, 8, 12, 16 |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (min.) ²⁾ | P _{Diss_0A_fs_min} | W | 35 | 40 |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (max.) ³⁾ | P _{Diss_0A_fs_max} | W | 70 | 150 |
| Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾ | P _{Diss_cont} | W | 150.00 | 350.00 |

Latest amendment: 2009-10-26

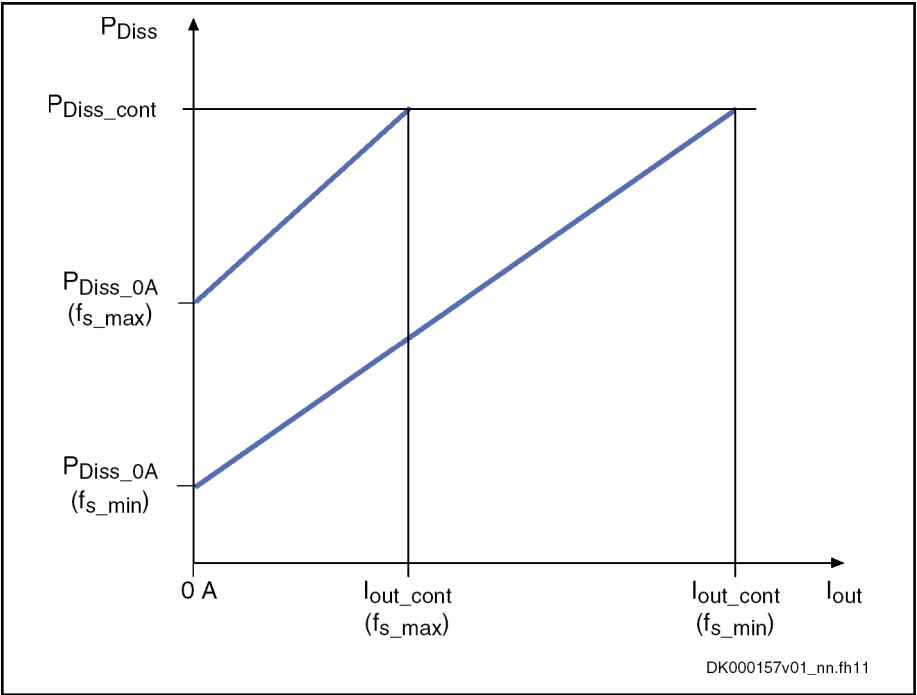
| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|---|------------------|------|--------------------------|--------------------------|
| Minimum distance on the top of the device ⁵⁾ | d _{top} | mm | 80 | |
| Minimum distance on the bottom of the device ⁶⁾ | d _{bot} | mm | 80 | |
| Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD} | ΔT | K | 65 | |
| Latest amendment: 2009-10-26 | | | | |

- 1)
- 2) 3)
- 4)
- 5) 6)
- Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}
- Plus dissipation of braking resistor and control section
- See fig. "Air intake and air outlet at device"
- Tab. 6-30: HMS - Data for cooling and power dissipation

Power dissipation vs. output current

The figure below illustrates the connection between power dissipation and output current, depending on the switching frequency f_s which was set at the drive controller. See also Parameter Description "P-0-0001, Switching frequency of the power output stage".

 In addition, take the power at the braking resistor and the power consumption of the control section into account. Both powers are not contained in the figure.



I_{out}
 P_{Diss}
 f_s

Output current
Power dissipation
Switching frequency

Fig. 6-30: Power Dissipation vs. Output Current

For the data P_{Diss_cont} , $P_{Diss_0A_fsmax}$ and $P_{Diss_0A_fsmin}$, see the table "Data for Cooling and Power Dissipation".

Distances

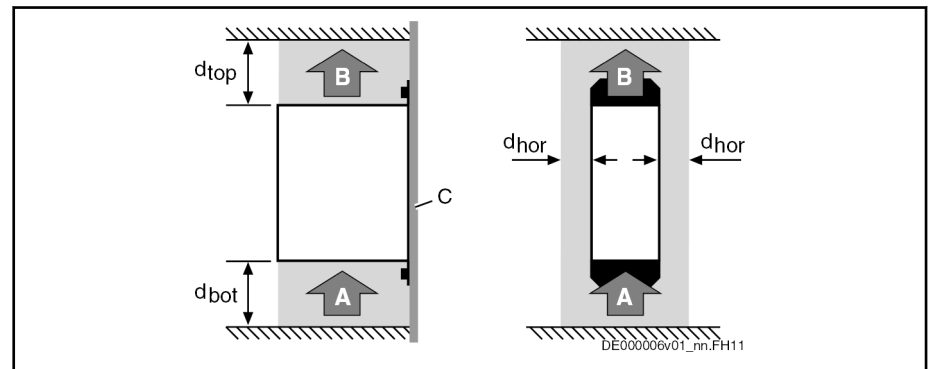
NOTICE

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



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

Fig. 6-31: Air intake and air outlet at device

Basic data of HMS02.1N-Wxxxx power section

General information

This section contains

- Data for control voltage supply
- Data of DC bus
- Data of inverter



The order of the data tables below follows the energy flow in the drive controller - from mains connection to motor output.

Control voltage**Control voltage supply data**

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|-----------------|------|--------------------------|--------------------------|
| Control voltage input ¹⁾ | U_{N3} | V | 24 ± 20% | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U_{N3} | V | 24 ± 5 % | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U_{N3} | V | 26 ± 5 % | |
| Max. inrush current at 24 V supply | I_{EIN3_max} | A | 4.80 | |
| Pulse width of I_{EIN3} | $t_{EIN3Lade}$ | ms | 10 | |
| Input capacitance | C_{N3} | mF | 1.20 | |
| Rated power consumption control voltage input at U_{N3} ⁴⁾ | P_{N3} | W | 13 | 17 |
| Latest amendment: 2007-01-02 | | | | |

- 1) 2) 3) Observe supply voltage for motor holding brake
 4) See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 6-31: HMS - Control voltage supply data

**Rated power consumption control voltage input at U_{N3}**

Plus motor holding brake and control section, plus safety option

Power section - DC bus**Power section data - DC bus**

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|---|---------------------------|------|--------------------------|--------------------------|
| DC bus voltage | U _{DC} | V | 254...750 | |
| Capacitance in DC bus | C _{DC} | mF | 0.14 | 0.27 |
| DC resistance in DC bus (L+ to L-) | R _{DC} | kohm | approx. 300 | approx. 150 |
| Monitoring value maximum DC bus voltage, switch-off threshold | U _{DC_limit_max} | V | 900 | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | U _{DC_limit_min} | V | 254 | |
| Latest amendment: 2007-07-27 | | | | |

Tab. 6-32: HMS - Power section data - DC bus

Power section - inverter

Power section data - inverter

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|---|------------------|-------------|--------------------------|--------------------------|
| Allowed switching frequencies ¹⁾ | f_s | kHz | 4, 8 | 4, 8, 12, 16 |
| Output voltage, fundamental wave in V/Hz (U/f) control | U_{out_eff} | V | ~ UDC x 0.71 | |
| Output voltage, fundamental wave in closed-loop operation | U_{out_eff} | V | ~ UDC x 0.71 | |
| Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾ | dv/dt | kV/ μ s | 5.00 | |
| Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾ | dv/dt | kV/ μ s | 5.00 | |
| Output frequency range when $f_s = 2$ kHz | f_{out_2k} | Hz | - | |
| Output frequency range when $f_s = 4$ kHz | f_{out_4k} | Hz | 0...400 | |
| Output frequency range when $f_s = 8$ kHz | f_{out_8k} | Hz | 0...800 | |
| Output frequency range when $f_s = 12$ kHz | f_{out_12k} | Hz | - | 0...1200 |
| Output frequency range when $f_s = 16$ kHz | f_{out_16k} | Hz | - | 0...1600 |
| Output frequency threshold to detect motor standstill ⁴⁾ | f_{out_still} | Hz | 2...4 | |
| Maximum output current when $f_s = 2$ kHz | I_{out_max2} | A | - | |
| Maximum output current when $f_s = 4$ kHz | I_{out_max4} | A | 28.3 | 54.0 |
| Maximum output current when $f_s = 8$ kHz | I_{out_max8} | A | 28.3 | 54.0 |
| Maximum output current when $f_s = 12$ kHz | I_{out_max12} | A | - | 54.0 |
| Maximum output current when $f_s = 16$ kHz | I_{out_max16} | A | - | 40.0 |
| Continuous output current when $f_s = 2$ kHz | I_{out_cont2} | A | - | |
| Continuous output current when $f_s = 4$ kHz | I_{out_cont4} | A | 13.8 | 25.0 |
| Continuous output current when $f_s = 8$ kHz | I_{out_cont8} | A | 8.5 | 20.0 |

Latest amendment: 2007-02-12

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|-------------------------------|------|--------------------------|--------------------------|
| Continuous output current when $f_s = 12 \text{ kHz}^{5)}$ | $I_{\text{out_cont12}}$ | A | - | 12.7 |
| Continuous output current when $f_s = 16 \text{ kHz}^{6)}$ | $I_{\text{out_cont16}}$ | A | - | 10.2 |
| Continuous output current when $f_s = 2 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ | $I_{\text{out_cont0Hz_2}}$ | A | - | |
| Continuous output current when $f_s = 4 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ | $I_{\text{out_cont0Hz_4}}$ | A | 9.2 | 19.2 |
| Continuous output current when $f_s = 8 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ | $I_{\text{out_cont0Hz_8}}$ | A | 5.1 | 12.5 |
| Continuous output current when $f_s = 12 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}^{7)}$ | $I_{\text{out_cont0Hz_12}}$ | A | - | 7.0 |
| Continuous output current when $f_s = 16 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}^{8)}$ | $I_{\text{out_cont0Hz_16}}$ | A | - | 5.6 |
| Assigned output filters at nom. data; $f_s = 4 \text{ kHz}$ | | | - | |
| Latest amendment: 2007-02-12 | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s
- Tab. 6-33: HMS - Power section data - inverter



Guide value "Rise of voltage at output"

Observe that the voltage load at the motor is almost independent of the power section used.

Especially when using **standard motors**, make sure that they comply with the occurring voltage load.

Observe the information on third-party motors at drive controllers (see documentation "Rexroth IndraDrive Drive Systems with HMV01/02 HMS01/02, HMD01, HCS02/03", index entry "Third-party motors → At drive controllers").



Reduced output current at motor standstill

Depending on the electric output frequency, the output current is reduced for thermal protection of the power section.

The output current is reduced, when the electric output frequency has fallen below the threshold to detect motor standstill.

Exemplary data for applications

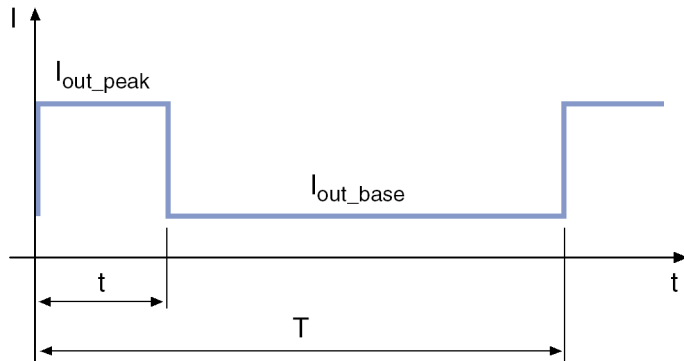
General information

This chapter contains:

- Examples of allowed current profiles
- Examples of allowed performance profiles
- Data for selecting standard motors

Current profiles

Current profile "UEL_I_e" The following current profiles have been defined for converters and inverters.

| Profile | Explanation |
|--|--|
| <p>current profile "UEL_I_e"</p>  <p>DK000149v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.</p> |

Tab. 6-34: Definition of current profiles

Examples of allowed current profiles

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|---|---------------------|------|--------------------------|--------------------------|
| Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(1)}$ | $I_{out_peak1_2}$ | A | - | - |
| Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_2}$ | A | - | - |
| Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(2)}$ | $I_{out_peak1_4}$ | A | 23.11 | 48.74 |
| Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_4}$ | A | 9.25 | 19.50 |
| Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{(3)}$ | $I_{out_peak1_8}$ | A | 14.13 | 31.93 |

Latest amendment: 2007-01-02

Power sections for inverters - IndraDrive M

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|--------------------------|------|--------------------------|--------------------------|
| Base load current at $I_{out_peak_1}$;
$f_s = 8 \text{ kHz}$; $t = 0.4 \text{ s}$; $T = 4 \text{ s}$;
$K = 2.5$ | $I_{out_base1_8}$ | A | 5.65 | 12.77 |
| Maximum output current at
$I_{out_base_1}$; $f_s = 12 \text{ kHz}$; $t = 0.4 \text{ s}$;
$T = 4 \text{ s}$; $K = 2.5^4)$ | $I_{out_peak1_1}$
2 | A | - | 20.49 |
| Base load current at $I_{out_peak_1}$;
$f_s = 12 \text{ kHz}$; $t = 0.4 \text{ s}$; $T = 4 \text{ s}$;
$K = 2.5$ | $I_{out_base1_1}$
2 | A | - | 8.20 |
| Maximum output current at
$I_{out_base_1}$; $f_s = 16 \text{ kHz}$; $t = 0.4 \text{ s}$;
$T = 4 \text{ s}$; $K = 2.5^5)$ | $I_{out_peak1_1}$
6 | A | - | 16.56 |
| Base load current at $I_{out_peak_1}$;
$f_s = 16 \text{ kHz}$; $t = 0.4 \text{ s}$; $T = 4 \text{ s}$;
$K = 2.5$ | $I_{out_base1_1}$
6 | A | - | 6.62 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 2 \text{ kHz}$; $t = 2 \text{ s}$;
$T = 20 \text{ s}$; $K = 2.0^6)$ | $I_{out_peak3_2}$ | A | - | |
| Base load current at $I_{out_peak_3}$;
$f_s = 2 \text{ kHz}$; $t = 2 \text{ s}$; $T = 20 \text{ s}$;
$K = 2.0$ | $I_{out_base3_2}$ | A | - | |
| Maximum output current at
$I_{out_base_3}$; $f_s = 4 \text{ kHz}$; $t = 2 \text{ s}$;
$T = 20 \text{ s}$; $K = 2.0^7)$ | $I_{out_peak3_4}$ | A | 21.88 | 43.44 |
| Base load current at $I_{out_peak_3}$;
$f_s = 4 \text{ kHz}$; $t = 2 \text{ s}$; $T = 20 \text{ s}$;
$K = 2.0$ | $I_{out_base3_4}$ | A | 10.94 | 21.72 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 8 \text{ kHz}$; $t = 2 \text{ s}$;
$T = 20 \text{ s}$; $K = 2.0^8)$ | $I_{out_peak3_8}$ | A | 13.35 | 29.04 |
| Base load current at $I_{out_peak_3}$;
$f_s = 8 \text{ kHz}$; $t = 2 \text{ s}$; $T = 20 \text{ s}$;
$K = 2.0$ | $I_{out_base3_8}$ | A | 6.67 | 14.52 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 12 \text{ kHz}$; $t = 2 \text{ s}$;
$T = 20 \text{ s}$; $K = 2.0^9)$ | $I_{out_peak3_1}$
2 | A | - | 18.56 |
| Base load current at $I_{out_peak_3}$;
$f_s = 12 \text{ kHz}$; $t = 2 \text{ s}$; $T = 20 \text{ s}$;
$K = 2.0$ | $I_{out_base3_1}$
2 | A | - | 9.28 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 16 \text{ kHz}$; $t = 2 \text{ s}$;
$T = 20 \text{ min}$; $K = 2.0^{10)}$ | $I_{out_peak3_1}$
6 | A | - | 14.97 |
| Latest amendment: 2007-01-02 | | | | |

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|--------------------------|------|--------------------------|--------------------------|
| Base load current at $I_{out_peak_3}$;
$f_s = 16$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_1}$
6 | A | - | 7.49 |
| Base load current at $I_{out_peak_4}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_2}$ | A | - | - |
| Maximum output current at
$I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(11)}$ | $I_{out_peak4_2}$ | A | - | - |
| Maximum output current at
$I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(12)}$ | $I_{out_peak4_4}$ | A | 14.84 | 33.90 |
| Base load current at $I_{out_peak_4}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_4}$ | A | 9.89 | 22.60 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(13)}$ | $I_{out_peak4_8}$ | A | 9.03 | 24.84 |
| Base load current at $I_{out_peak_4}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_8}$ | A | 6.02 | 16.56 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(14)}$ | $I_{out_peak4_1}$
2 | A | - | 15.81 |
| Base load current at $I_{out_peak_4}$;
$f_s = 12$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_1}$
2 | A | - | 10.54 |
| Maximum output current at
$I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(15)}$ | $I_{out_peak4_1}$
6 | A | - | 12.74 |
| Base load current at $I_{out_peak_4}$;
$f_s = 16$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_1}$
6 | A | - | 8.49 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{(16)}$ | $I_{out_peak5_2}$ | A | - | - |
| Base load current at $I_{out_peak_5}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_2}$ | A | - | - |
| Maximum output current at
$I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{(17)}$ | $I_{out_peak5_4}$ | A | 14.23 | 26.35 |
| Latest amendment: 2007-01-02 | | | | |

| Description | Symbol | Unit | HMS02.1N-W0028-A-07-NNNN | HMS02.1N-W0054-A-07-NNNN |
|--|----------------------|------|--------------------------|--------------------------|
| Base load current at $I_{out_peak_5}$;
$f_s = 4$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_4}$ | A | 12.93 | 23.95 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{18)}$ | $I_{out_peak5_8}$ | A | 8.65 | 20.79 |
| Base load current at $I_{out_peak_5}$;
$f_s = 8$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_8}$ | A | 7.87 | 18.90 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{19)}$ | $I_{out_peak5_12}$ | A | - | 13.21 |
| Base load current at $I_{out_peak_5}$;
$f_s = 12$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_12}$ | A | - | 12.00 |
| Maximum output current at
$I_{out_base_5}$; $f_s = 16$ kHz; $t = 60$ s;
$T = 10$ min; $K = 1.1^{20)}$ | $I_{out_peak5_16}$ | A | - | 10.63 |
| Base load current at $I_{out_peak_5}$;
$f_s = 16$ kHz; $t = 60$ s; $T = 10$ min;
$K = 1.1$ | $I_{out_base5_16}$ | A | - | 9.66 |
| Latest amendment: 2007-01-02 | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See
UEL_I_e
profile
definition

Tab. 6-35: HMS - Examples of allowed current profiles

Operation with standard motors

General information

Selecting standard motors

The tables below show the nominal powers P_{nenn} of standard motors which can be operated at the respective drive controller. The following conditions apply to the data in the tables:

- Motor design:
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 400 V, 50 Hz at mains voltage $U_{LN} \geq 3$ AC 400 V or
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 460 V, 60 Hz at mains voltage $U_{LN} \geq 3$ AC 460 V
- Assigned mains choke is used
- Operation at minimum switching frequency $f_s = f_s$ (min.)
- Rotary field at output with $f_{out} > f_{out_still}$
- Ambient temperature $T_a \leq T_{a_work}$
- Overload ratio $K = P_{DC_peak} / P_{DC_base}$ according to performance profile "UEL_P_e"
- Type of mains connection: Individual Supply



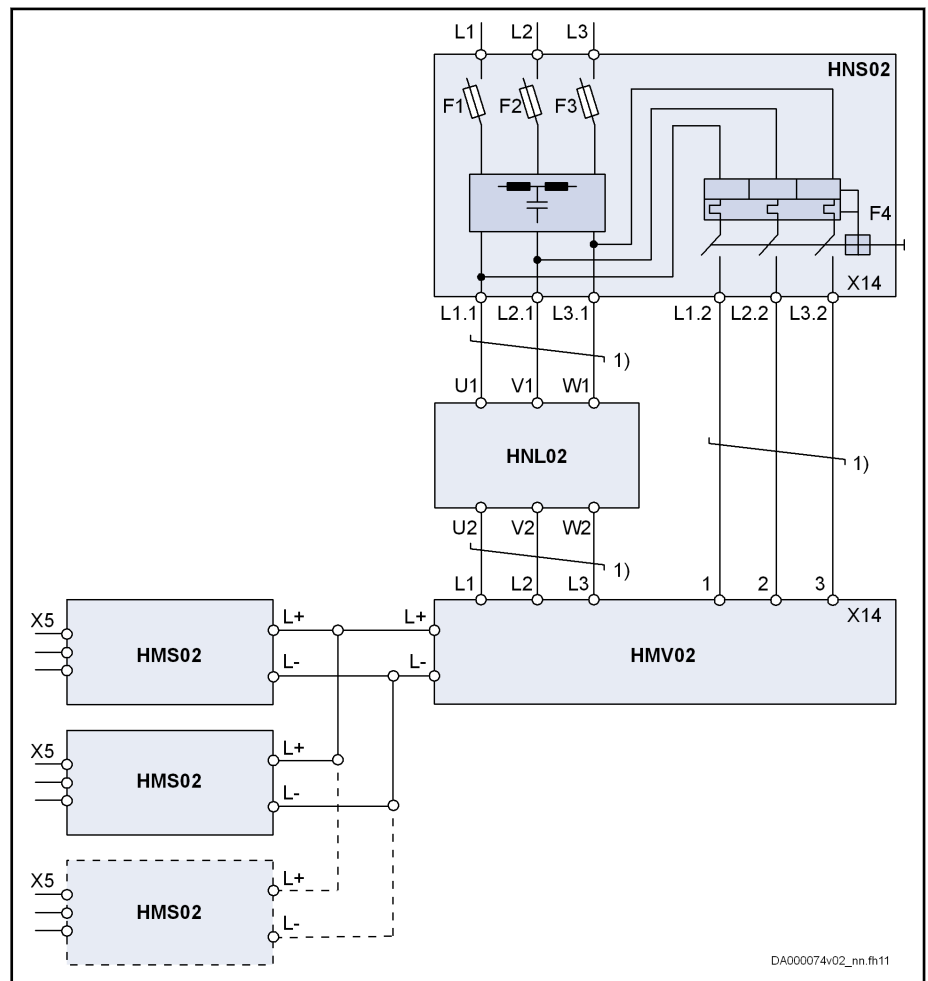
When choosing standard motors for inverters, select an appropriate supply unit. Observe the performance data P_{DC_peak} and P_{DC_base} in the performance profile "UEL_P_e" of the supply unit.

6.3.5 Connections and interfaces

Overview

Overall connection diagram

Overall connection diagram with mains filter, mains choke, supply unit, power section



HNS02 Mains filter
HNL02 Mains choke
HNV02 Supply unit
HMS02 Power section

Fig. 6-32: Overall connection diagram (mains filter, mains choke, supply unit, power section)

Connection diagram of power section

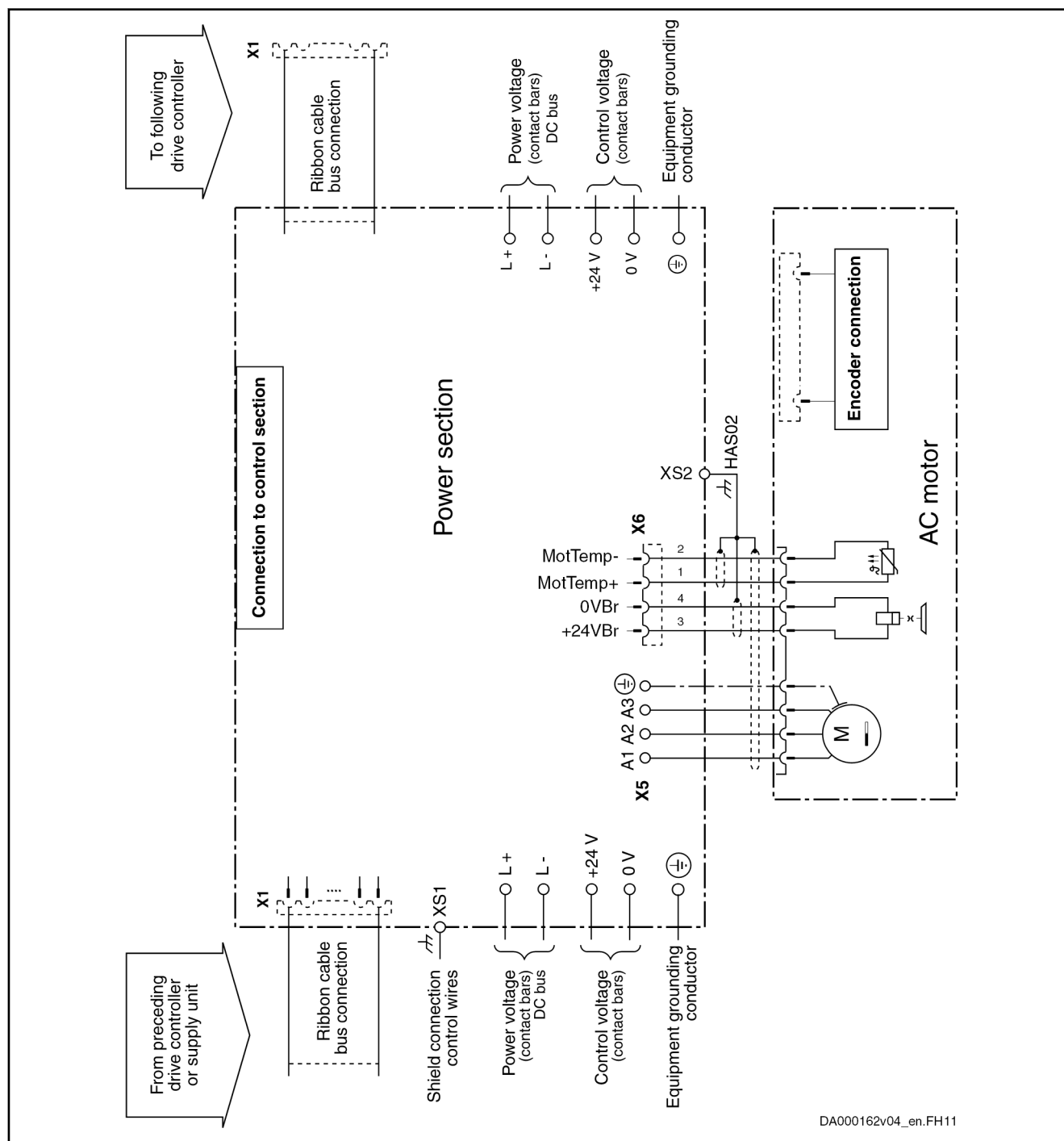
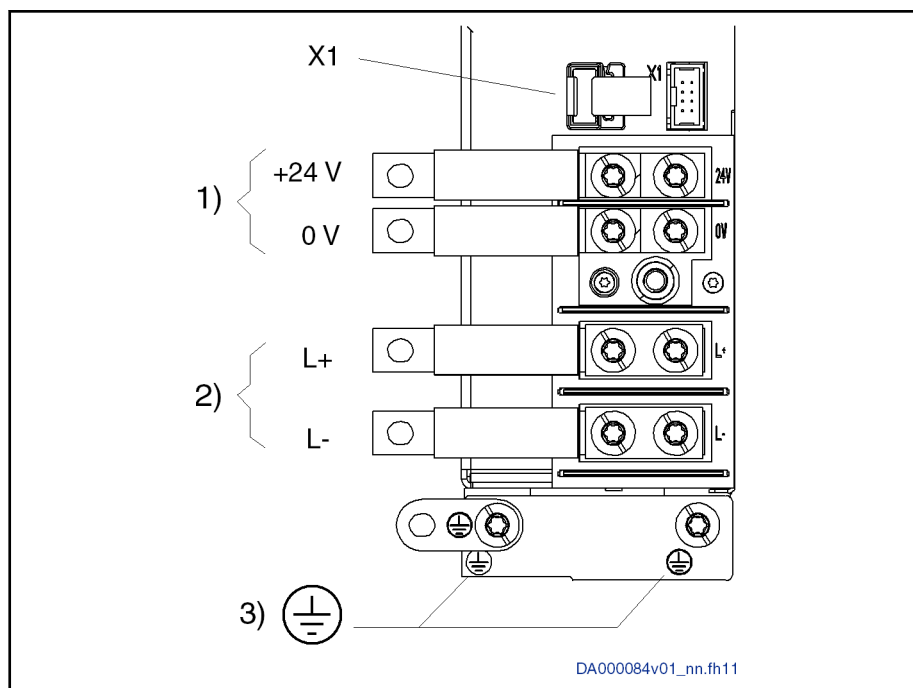
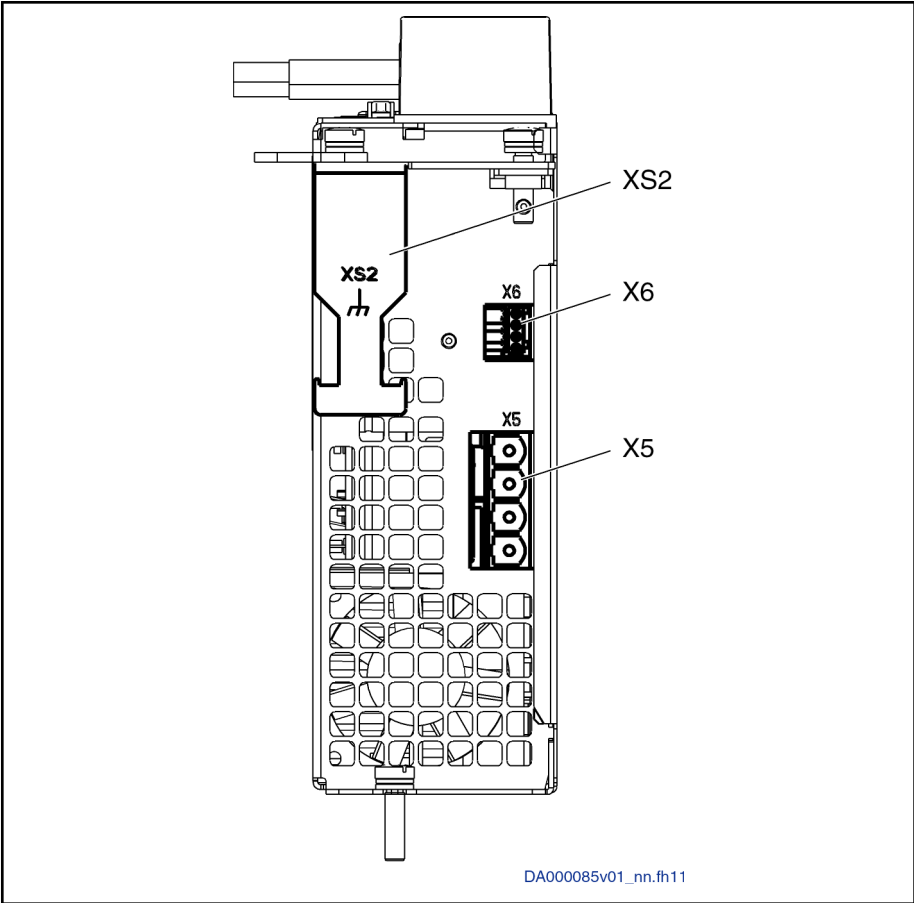


Fig. 6-33: Connection diagram HMS02.1-Wxxxx

Arrangement of the connection points



1) Control voltage
2) DC bus
3) Equipment grounding conductor
X1 in, X1 out Module bus
Fig. 6-34: Connections at power section (front)



X5

X6

XS2

Motor connection

Motor temperature monitoring and motor holding brake

Shield connection (motor power cable)

Fig. 6-35: Connections at power section (bottom)

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 261.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 325.

6.4 HMD01 power sections

6.4.1 Brief description, use and design

- Brief description

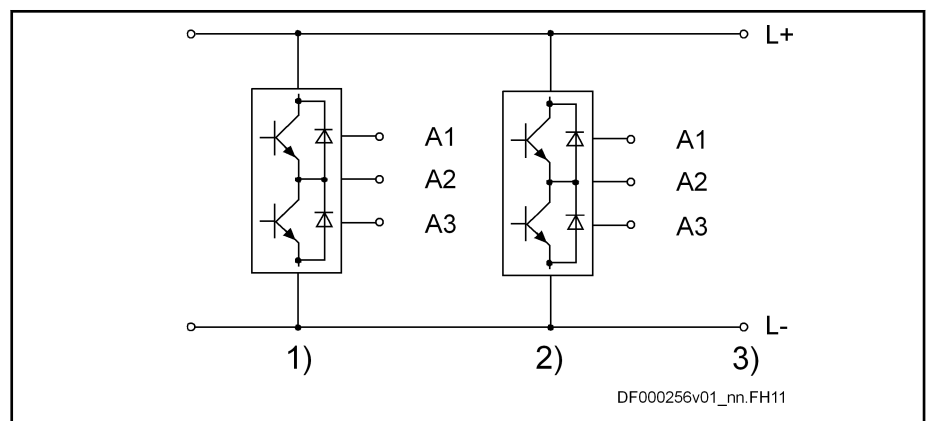
The HMD01 inverters are part of the Rexroth IndraDrive M product range and are used to operate 2 single axes.
- Use

The different types are used as follows:

| Type | Use |
|---------------------|--|
| HMD01.1E-Wxxxx-NNNN | <ul style="list-style-type: none">• Double-axis device• Operation of two three-phase a.c. motors (asynchronous or synchronous motors) |

Tab. 6-36: Use of HMD01

Structure, block diagrams



- 1) Inverter stage axis 1 with output to motor
- 2) Inverter stage axis 2 with output to motor
- 3) DC bus connection

Fig. 6-36: HMD - Block diagram

6.4.2 Type code and identification

Type code



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

| Abbrev. column | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|---|---|---|----|---|---|---|---|---|---|---|---|---|----|--|--|
| → | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 20 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 30 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 40 | | |
| Example | | H | M | D | 0 | 1 | . | 1 | N | - | W | 0 | 0 | 2 | 0 | - | A | - | 0 | 7 | - | N | N | N | N | | | | | | | | | | | | | | | | | | |
| 1. | Product | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1 | HMD..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2. | Series | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1 | 1..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. | Design | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | 1..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4. | Power supply | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Without..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5. | Cooling mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1 | Fan, internal (by mounted fan) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. | Eff. peak current | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | 12 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.2 | 20 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3 | 36 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7. | Protection mode | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.1 | IP20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. | DC bus nominal voltage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.1 | DC 700 V..... | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9. | Other design | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.1 | None | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.2 | Temperature-dependent fan control | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10. | Normative reference | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | DIN EN 60529 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Title | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Protection mode by housing (IP code) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Edition | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2000-09 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1. Product

1.1 HMD..... = HMD

2. Series

2.1 1..... = 01

3. Design

3.1 1..... = 1

4. Power supply

4.1 Without..... = N

5. Cooling mode

5.1 Fan, internal (by mounted fan) = W

6. Eff. peak current

6.1 12 A = 0012

6.2 20 A = 0020

6.3 36 A = 0036

7. Protection mode

7.1 IP20 = A

8. DC bus nominal voltage

8.1 DC 700 V..... = 07

9. Other design

9.1 None = NNNN

9.2 Temperature-dependent fan control = NNLN

10. Normative reference

Standard

DIN EN 60529

Title

Protection mode by housing (IP code)

Edition

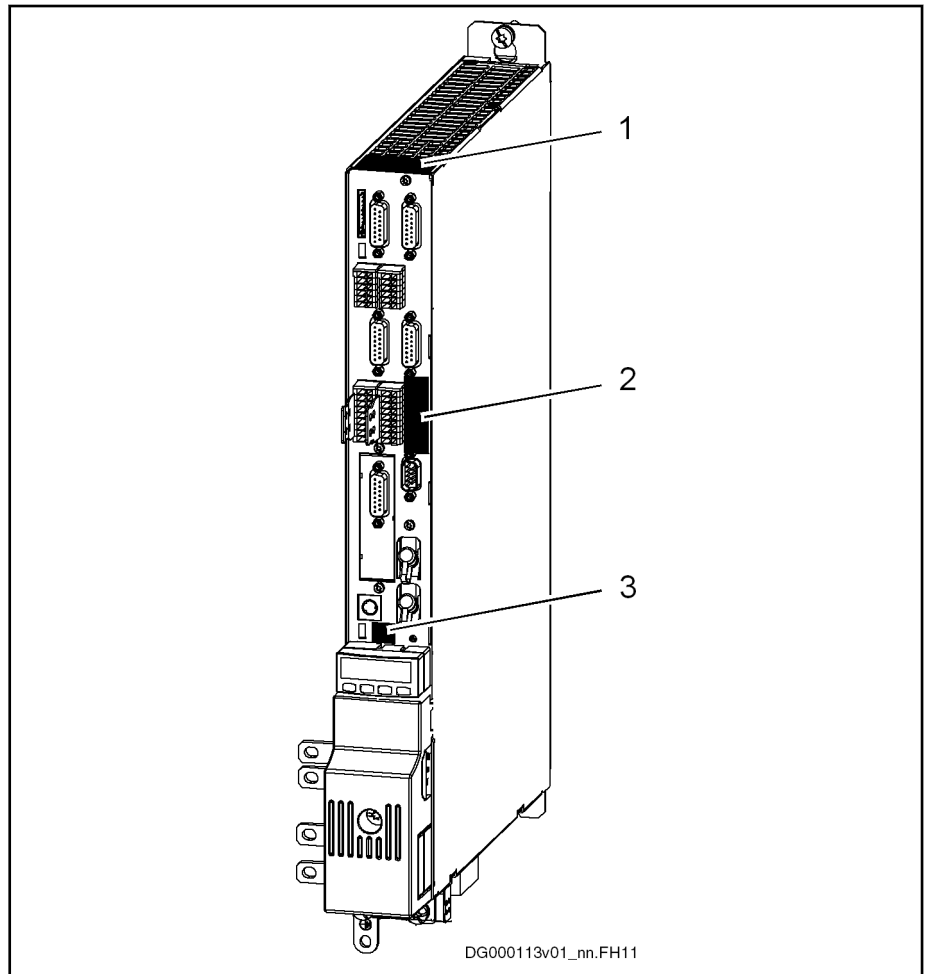
2000-09

DT000037v02_de.FH11

Fig. 6-37: HMD01 type code

Identification

Type plate arrangement



- 1 Power section type plate
- 2 Control section type plate
- 3 Firmware type plate

Fig. 6-38: Type plates at the drive controller

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 6-39: Type plate (electrical equipment)

6.4.3 Scope of supply

- 1 × touch guard
- Connectors for the electrical connection points at the device
- 1 × Instruction Manual (in the English language)

6.4.4 Technical data

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage" on page 23](#).

Installation conditions: See [chapter 4.3 "Installation conditions" on page 24](#).

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|----------------------|-------|--------------------------|--------------------------|--------------------------|
| Short circuit current rating | SCCR | A rms | 42000 | | |
| Rated input voltage, power ¹⁾ | U _{LN_nenn} | V | DC 254...750 | | |
| Rated input current | I _{LN} | A | 17.0 | 24.5 | 49.0 |
| Output voltage | U _{out} | V | 3 x AC 0...530 | | |
| Output current | I _{out} | A | 6.9 | 10.0 | 20.0 |
| Latest amendment: 2009-01-28 | | | | | |

1) Mains input L1, L2, L3 (for HMD and HCS only); For use on a solidly grounded wye source only.

Tab. 6-37: HMD - Ambient and operating conditions - UL ratings

Information on standards

Applied standards

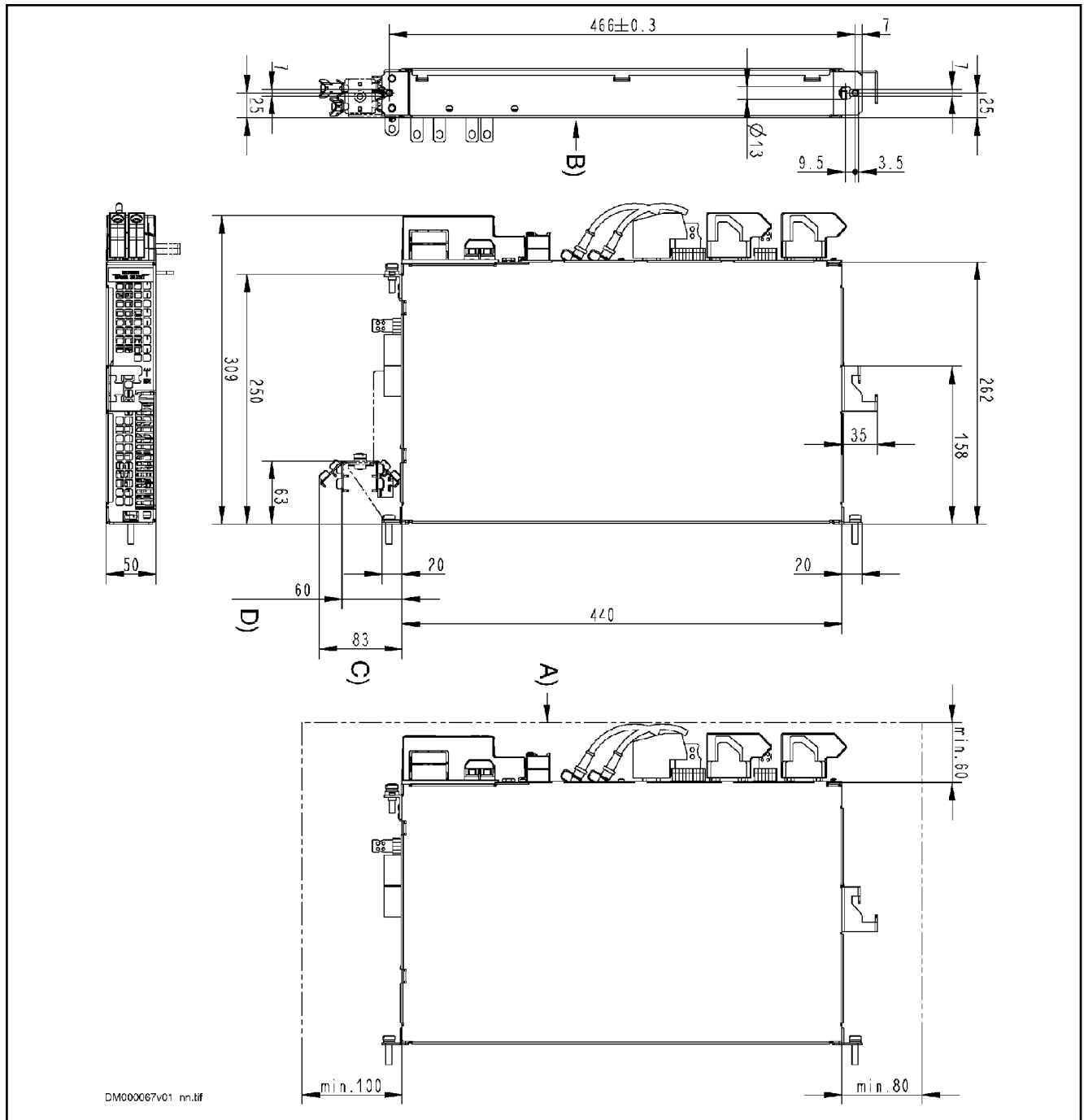
| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|--------|------|--------------------------|--------------------------|--------------------------|
| Listing in accordance with UL standard | | | UL 508C | | |
| UL files | | | E134201 | | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | | |
| Latest amendment: 2017-01-23 | | | | | |

Tab. 6-38: HMD - Applied standards

Mechanics and mounting

Dimensional drawings

HMD01.1N-W0012

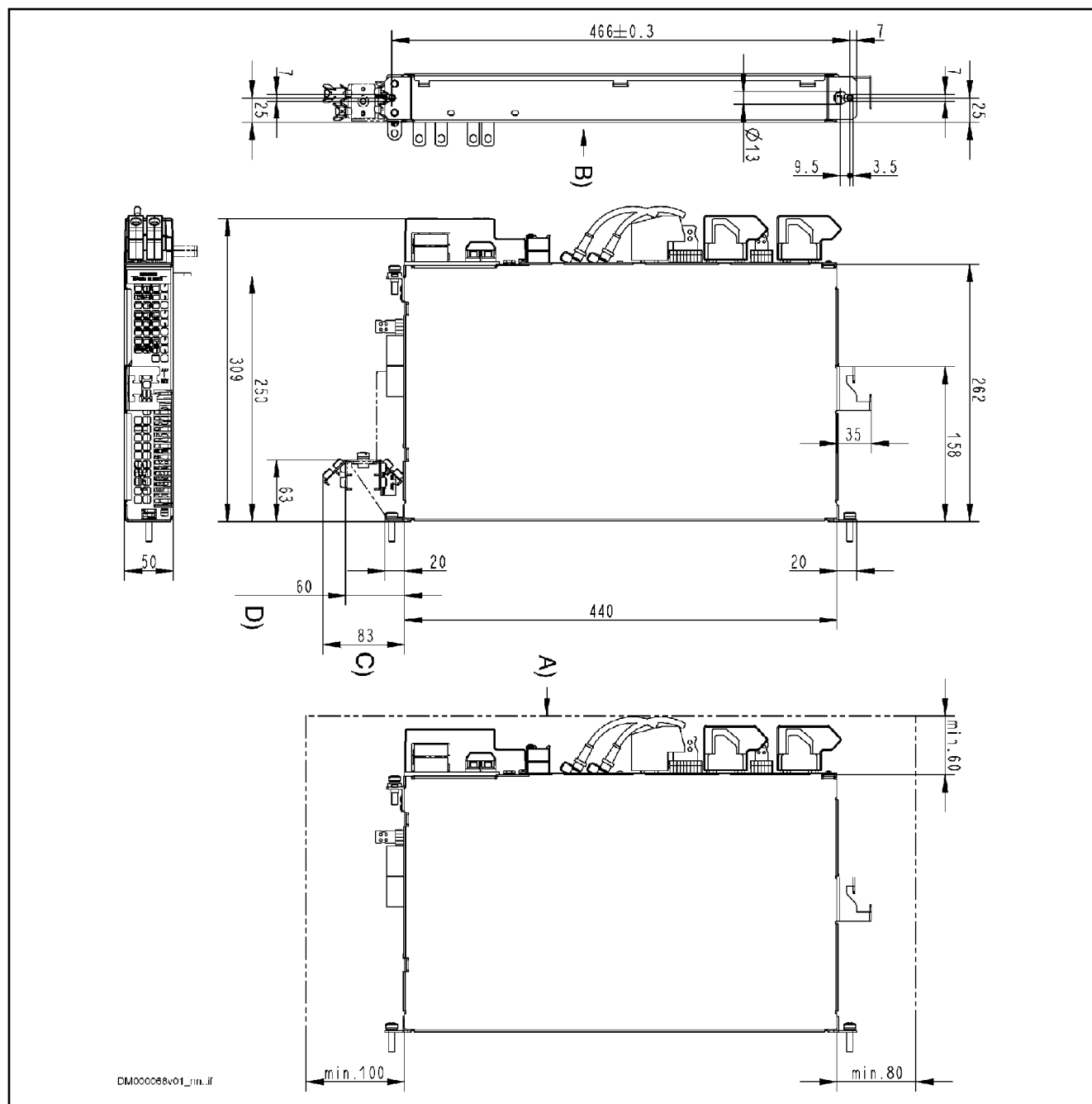


- A) Minimum mounting clearance (plus additional space for motor cable) Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B) Rear view!
- C) Dimensions for accessory HAS02.1 when motor cable run with 45°

D) Dimensions for accessory HAS02.1 when motor cable run horizontally

Fig. 6-40: Dimensions HMD01.1N-W0012

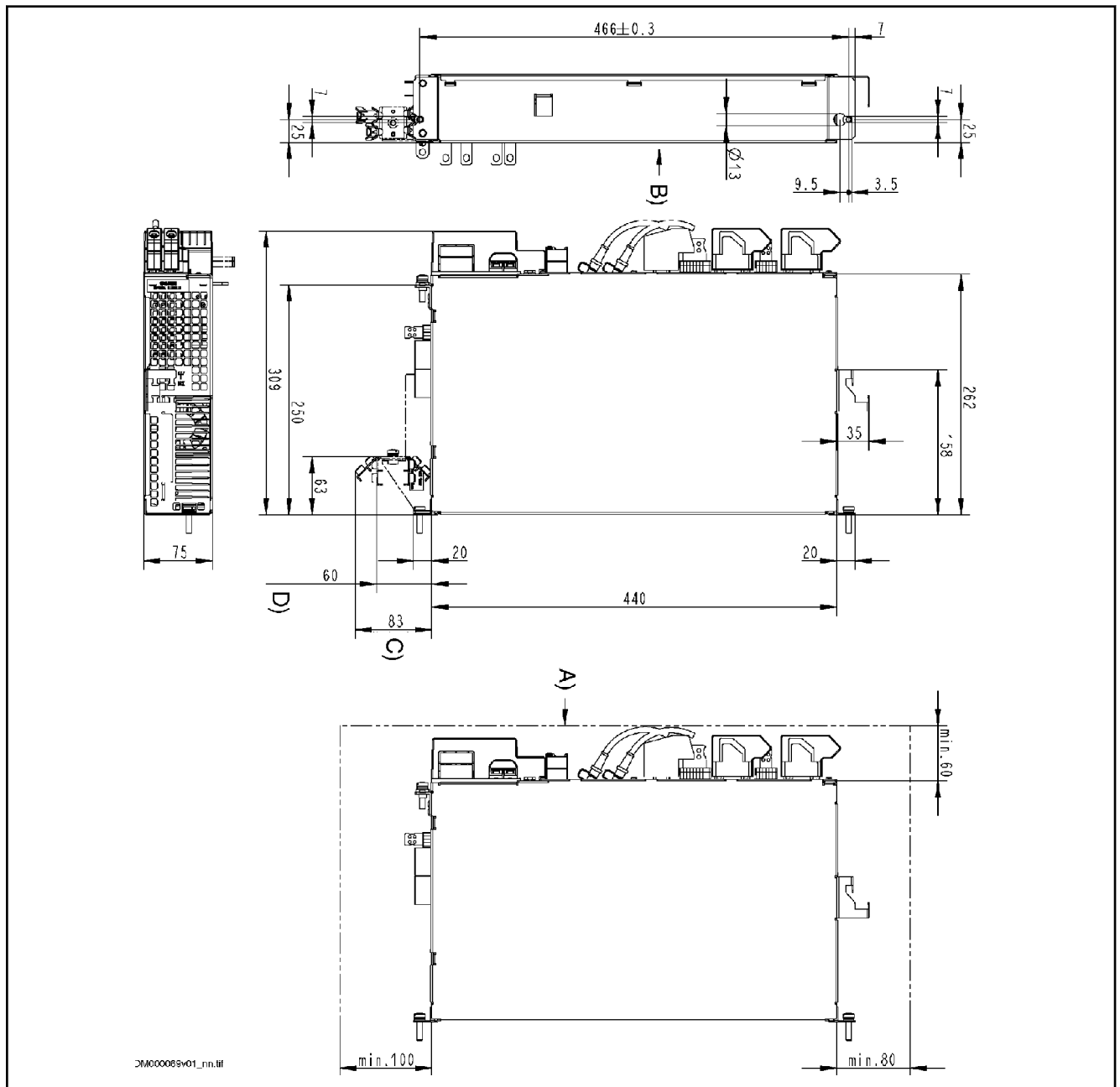
HMD01.1N-W0020



- A)** Minimum mounting clearance (plus additional space for motor cable) Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B)** Rear view!
- C)** Dimensions for accessory HAS02.1 when motor cable run with 45°
- D)** Dimensions for accessory HAS02.1 when motor cable run horizontally

Fig. 6-41: Dimensions HMD01.1N-W0020

HMD01.1N-W0036



- A) Minimum mounting clearance (plus additional space for motor cable) Note: Rexroth IndraDrive supply units require greater mounting clearance!
- B) Rear view!
- C) Dimensions for accessory HAS02.1 when motor cable run with 45°
- D) Dimensions for accessory HAS02.1 when motor cable run horizontally

Fig. 6-42: Dimensions HMD01.1N-W0036

Dimensions, mass, insulation, sound pressure level

Data for mass, dimensions, sound pressure level, insulation

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|-----------------|--------|--------------------------|--------------------------|--------------------------|
| Mass | m | kg | 5.50 | 5.60 | 7.50 |
| Device height ¹⁾ | H | mm | 440 | | |
| Device depth ²⁾ | T | mm | 262 | | |
| Device width ³⁾ | B | mm | 50 | | 75 |
| Insulation resistance at 500 V DC | R _{is} | Mohm | > 50 | | |
| Capacitance against housing | C _Y | nF | 2 x 68 | | |
| Average sound pressure level (accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | tbd | | |
| Latest amendment: 2010-05-26 | | | | | |

1) 2) 3) Housing dimension; see also related dimensional drawing
 4) According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L *** design: load-dependent

Tab. 6-39: HMD - Data for mass, dimensions, sound pressure level, insulation

Power dissipation, mounting position, cooling, distances

Cooling and power dissipation data

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|-----------------------------|------|--------------------------|--------------------------|--------------------------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...40 | | |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...+55 | | |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2.0 | | |
| Allowed mounting position | | | G1 | | |
| Cooling type | | | Forced ventilation | | |
| Volumetric capacity of forced cooling | V | m³/h | 17.00 | 28.00 | 46.00 |
| Allowed switching frequencies ¹⁾ | f _s | kHz | 4, 8 | | |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (min.) ²⁾ | P _{Diss_0A_fs_min} | W | 2 x 35 | 2 x 10 | 2 x 15 |
| Power dissipation at I _{out_cont} = 0 A; f _s = f _s (max.) ³⁾ | P _{Diss_0A_fs_max} | W | 2 x 50 | 2 x 10 | 2 x 25 |
| Latest amendment: 2009-10-26 | | | | | |

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|------------------------|------|--------------------------|--------------------------|--------------------------|
| Power dissipation at continuous current and continuous DC bus power respectively ⁴⁾ | P _{Diss_cont} | W | 2 x 95 | 2 x 135 | 2 x 205 |
| Minimum distance on the top of the device ⁵⁾ | d _{top} | mm | 80 | | |
| Minimum distance on the bottom of the device ⁶⁾ | d _{bot} | mm | 100 | | |
| Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD} | ΔT | K | 40 | | 45 |
| Latest amendment: 2009-10-26 | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Plus dissipation of braking resistor and control section; find interim values by interpolation to P_{Diss_cont}
- 4) Plus dissipation of braking resistor and control section
- 5) 6) See fig. "Air intake and air outlet at device"
- Tab. 6-40: HMD - Data for cooling and power dissipation

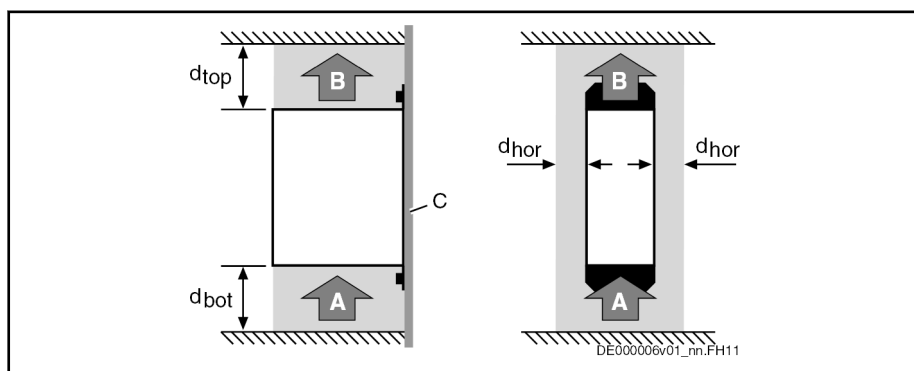
NOTICE

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



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

Fig. 6-43: Air intake and air outlet at device

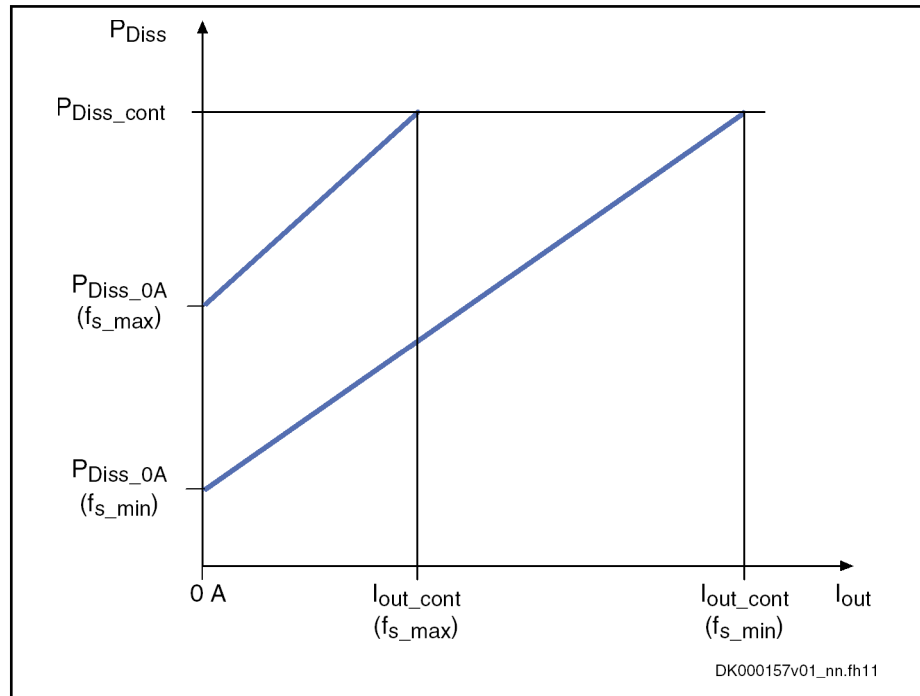
Power dissipation vs. output current

The figure below illustrates the connection between power dissipation and output current, depending on the switching frequency f_s which was set at the

drive controller. See also Parameter Description "P-0-0001, Switching frequency of the power output stage".



In addition, take the power at the braking resistor and the power consumption of the control section into account. Both powers are not contained in the figure.



I_{out} Output current
 P_{Diss} Power dissipation
 f_s Switching frequency

Fig. 6-44: Power Dissipation vs. Output Current

For the data P_{Diss_cont} , $P_{Diss_0A_fsmax}$ and $P_{Diss_0A_fsmin}$, see the table "Data for Cooling and Power Dissipation".

Basic data of HMD01 power section

General information

This chapter contains:

- Data for control voltage supply
- Data of DC bus
- Data of inverter



The order of the data tables below follows the energy flow in the drive controller - from mains connection to motor output.

Control voltage

Control voltage supply data

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|-----------------------|------|--------------------------|--------------------------|--------------------------|
| Control voltage input ¹⁾ | U _{N3} | V | 24 ± 20% | | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U _{N3} | V | 24 ± 5 % | | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U _{N3} | V | 26 ± 5 % | | |
| Max. inrush current at 24 V supply | I _{EIN3_max} | A | 6.30 | | |
| Pulse width of I _{EIN3} | t _{EIN3Lade} | ms | 5 | | |
| Input capacitance | C _{N3} | mF | 0.47 | | |
| Rated power consumption control voltage input at U _{N3} ⁴⁾ | P _{N3} | W | 17 | | 11 |
| Latest amendment: 2007-07-18 | | | | | |

- 1) 2) 3) Observe supply voltage for motor holding brake
4) See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 6-41: HMD - Control voltage supply data



Rated power consumption control voltage input at U_{N3}

Plus motor holding brake and control section, plus safety option

DC bus

Power section data - DC bus

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|---------------------------|------|--------------------------|--------------------------|--------------------------|
| DC bus voltage | U _{DC} | V | 254..750 | | |
| Capacitance in DC bus | C _{DC} | mF | - | | |
| DC resistance in DC bus (L+ to L-) | R _{DC} | kohm | approx. 1000 | | |
| Monitoring value maximum DC bus voltage, switch-off threshold | U _{DC_limit_max} | V | 900 | | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | U _{DC_limit_min} | V | 254 | | |
| Latest amendment: 2007-07-27 | | | | | |

Tab. 6-42: HMD - Power section data - DC bus

Inverter**Power section data - inverter**

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|------------------|-------------|--------------------------|--------------------------|--------------------------|
| Allowed switching frequencies ¹⁾ | f_s | kHz | 4, 8 | | |
| Output voltage, fundamental wave in V/Hz (U/f) control | U_{out_eff} | V | ~ UDC x 0.71 | | |
| Output voltage, fundamental wave in closed-loop operation | U_{out_eff} | V | ~ UDC x 0.71 | | |
| Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-phase (10-90%) ²⁾ | dv/dt | kV/ μ s | 5.00 | | |
| Rise of voltage at output with U_{LN_nenn} and 15 m motor cable length phase-ground (10-90%) ³⁾ | dv/dt | kV/ μ s | 5.00 | | |
| Output frequency range when $f_s = 2$ kHz | f_{out_2k} | Hz | - | | |
| Output frequency range when $f_s = 4$ kHz | f_{out_4k} | Hz | 0..400 | | |
| Output frequency range when $f_s = 8$ kHz | f_{out_8k} | Hz | 0...800 | | |
| Output frequency range when $f_s = 12$ kHz | f_{out_12k} | Hz | - | | |
| Output frequency range when $f_s = 16$ kHz | f_{out_16k} | Hz | - | | |
| Output frequency threshold to detect motor standstill ⁴⁾ | f_{out_still} | Hz | 2..4 | | |
| Maximum output current when $f_s = 2$ kHz | I_{out_max2} | A | - | | |
| Maximum output current when $f_s = 4$ kHz | I_{out_max4} | A | 12.0 | 20.0 | 36.0 |
| Maximum output current when $f_s = 8$ kHz | I_{out_max8} | A | 12.0 | 20.0 | 36.0 |
| Maximum output current when $f_s = 12$ kHz | I_{out_max12} | A | - | | |
| Maximum output current when $f_s = 16$ kHz | I_{out_max16} | A | - | | |
| Continuous output current when $f_s = 2$ kHz | I_{out_cont2} | A | - | | |
| Continuous output current when $f_s = 4$ kHz | I_{out_cont4} | A | 6.9 | 10.0 | 20.0 |
| Latest amendment: 2007-07-18 | | | | | |

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|-------------------------------|------|--------------------------|--------------------------|--------------------------|
| Continuous output current when $f_s = 8 \text{ kHz}$ | $I_{\text{out_cont8}}$ | A | 3.7 | 6.1 | 13.0 |
| Continuous output current when $f_s = 12 \text{ kHz}$ ⁵⁾ | $I_{\text{out_cont12}}$ | A | - | | -- |
| Continuous output current when $f_s = 16 \text{ kHz}$ ⁶⁾ | $I_{\text{out_cont16}}$ | A | - | | |
| Continuous output current when $f_s = 2 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ | $I_{\text{out_cont0Hz_2}}$ | A | - | | |
| Continuous output current when $f_s = 4 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ | $I_{\text{out_cont0Hz_4}}$ | A | 4.4 | 7.0 | 13.7 |
| Continuous output current when $f_s = 8 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ | $I_{\text{out_cont0Hz_8}}$ | A | 1.7 | 4.1 | 8.9 |
| Continuous output current when $f_s = 12 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ ⁷⁾ | $I_{\text{out_cont0Hz_12}}$ | A | - | | |
| Continuous output current when $f_s = 16 \text{ kHz}$; output frequency f_{out} less than $f_{\text{out_still}}$ ⁸⁾ | $I_{\text{out_cont0Hz_16}}$ | A | - | | |
| Assigned output filters at nom. data; $f_s = 4 \text{ kHz}$ | | | - | | |
| Latest amendment: 2007-07-18 | | | | | |

- 1) Also depending on firmware and control section; see parameter description "P-0-0001, Switching frequency of the power output stage"; see "P-0-4058, Amplifier type data"; for supply units the switching frequency is 4.2 kHz
- 2) 3) Guide value, see following note
- 4) See following note regarding output current reduction
- 5) 6) 7) 8) See parameter description "P-0-0556, Config word of axis controller", load-dependent reduction of switching frequency f_s

Tab. 6-43: HMD - Power section data - inverter



Guide value "Rise of voltage at output"

Observe that the voltage load at the motor is almost independent of the power section used.

Especially when using **standard motors**, make sure that they comply with the occurring voltage load.

Observe the information on third-party motors at drive controllers (see documentation "Rexroth IndraDrive Drive Systems with HMD01/02 HMS01/02, HMD01, HCS02/03", index entry "Third-party motors → At drive controllers").

**Reduced output current at motor standstill**

Depending on the electric output frequency, the output current is reduced for thermal protection of the power section.

The output current is reduced, when the electric output frequency has fallen below the threshold to detect motor standstill.

Exemplary data for applications**General information**

This chapter contains:

- Examples of allowed current profiles
- Examples of allowed performance profiles
- Data for selecting standard motors

Current profiles**Examples of allowed current profiles**

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|----------------------|------|--------------------------|--------------------------|--------------------------|
| Maximum output current at $I_{out_base_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{1)}$ | $I_{out_peak1_2}$ | A | - | | |
| Base load current at $I_{out_peak_1}$; $f_s = 2$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_2}$ | A | - | | |
| Maximum output current at $I_{out_base_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{2)}$ | $I_{out_peak1_4}$ | A | 11.66 | 17.38 | 33.44 |
| Base load current at $I_{out_peak_1}$; $f_s = 4$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_4}$ | A | 4.67 | 6.95 | 13.38 |
| Maximum output current at $I_{out_base_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{3)}$ | $I_{out_peak1_8}$ | A | 6.35 | 10.76 | 22.14 |
| Base load current at $I_{out_peak_1}$; $f_s = 8$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_8}$ | A | 2.54 | 4.31 | 8.86 |
| Maximum output current at $I_{out_base_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{4)}$ | $I_{out_peak1_12}$ | A | - | | |
| Base load current at $I_{out_peak_1}$; $f_s = 12$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5$ | $I_{out_base1_12}$ | A | - | | |
| Maximum output current at $I_{out_base_1}$; $f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s; $K = 2.5^{5)}$ | $I_{out_peak1_16}$ | A | - | | |
| Latest amendment: 2006-06-30 | | | | | |

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|--------------------------|------|--------------------------|--------------------------|--------------------------|
| Base load current at $I_{out_peak_1}$;
$f_s = 16$ kHz; $t = 0.4$ s; $T = 4$ s;
$K = 2.5$ | $I_{out_base1_1}$
6 | A | - | | |
| Maximum output current at
$I_{out_base_3}$; $f_s = 2$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(6)}$ | $I_{out_peak3_2}$ | A | - | | |
| Base load current at $I_{out_peak_3}$;
$f_s = 2$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_2}$ | A | - | | |
| Maximum output current at
$I_{out_base_3}$; $f_s = 4$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(7)}$ | $I_{out_peak3_4}$ | A | 10.50 | 15.44 | 30.13 |
| Base load current at $I_{out_peak_3}$;
$f_s = 4$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_4}$ | A | 5.25 | 7.72 | 15.07 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 8$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(8)}$ | $I_{out_peak3_8}$ | A | 5.67 | 9.52 | 19.79 |
| Base load current at $I_{out_peak_3}$;
$f_s = 8$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_8}$ | A | 2.84 | 4.76 | 9.89 |
| Maximum output current at
$I_{out_base_3}$; $f_s = 12$ kHz; $t = 2$ s;
$T = 20$ s; $K = 2.0^{(9)}$ | $I_{out_peak3_1}$
2 | A | - | | |
| Base load current at $I_{out_peak_3}$;
$f_s = 12$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_1}$
2 | A | - | | |
| Maximum output current at
$I_{out_base_3}$; $f_s = 16$ kHz; $t = 2$ s;
$T = 20$ min; $K = 2.0^{(10)}$ | $I_{out_peak3_1}$
6 | A | - | | |
| Base load current at $I_{out_peak_3}$;
$f_s = 16$ kHz; $t = 2$ s; $T = 20$ s;
$K = 2.0$ | $I_{out_base3_1}$
6 | A | - | | |
| Base load current at $I_{out_peak_4}$;
$f_s = 2$ kHz; $t = 60$ s; $T = 5$ min;
$K = 1.5$ | $I_{out_base4_2}$ | A | - | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 2$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(11)}$ | $I_{out_peak4_2}$ | A | - | | |
| Maximum output current at
$I_{out_base_4}$; $f_s = 4$ kHz; $t = 60$ s;
$T = 5$ min; $K = 1.5^{(12)}$ | $I_{out_peak4_4}$ | A | 8.01 | 11.72 | 23.37 |
| Latest amendment: 2006-06-30 | | | | | |

Power sections for inverters - IndraDrive M

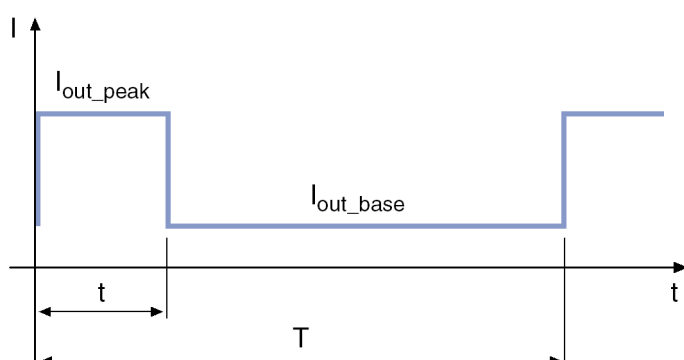
| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|----------------------|------|--------------------------|--------------------------|--------------------------|
| Base load current at $I_{out_peak_4}$; $f_s = 4$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$ | $I_{out_base4_4}$ | A | 5.34 | 7.81 | 15.58 |
| Maximum output current at $I_{out_base_4}$; $f_s = 8$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{13)}$ | $I_{out_peak4_8}$ | A | 4.29 | 7.19 | 15.23 |
| Base load current at $I_{out_peak_4}$; $f_s = 8$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$ | $I_{out_base4_8}$ | A | 2.86 | 4.79 | 10.16 |
| Maximum output current at $I_{out_base_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{14)}$ | $I_{out_peak4_12}$ | A | - | | |
| Base load current at $I_{out_peak_4}$; $f_s = 12$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$ | $I_{out_base4_12}$ | A | - | | |
| Maximum output current at $I_{out_base_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5^{15)}$ | $I_{out_peak4_16}$ | A | - | | |
| Base load current at $I_{out_peak_4}$; $f_s = 16$ kHz; $t = 60$ s; $T = 5$ min; $K = 1.5$ | $I_{out_base4_16}$ | A | - | | |
| Maximum output current at $I_{out_base_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{16)}$ | $I_{out_peak5_2}$ | A | - | | |
| Base load current at $I_{out_peak_5}$; $f_s = 2$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_2}$ | A | - | | |
| Maximum output current at $I_{out_base_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{17)}$ | $I_{out_peak5_4}$ | A | 7.25 | 10.49 | 20.93 |
| Base load current at $I_{out_peak_5}$; $f_s = 4$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_4}$ | A | 6.59 | 9.54 | 19.02 |
| Maximum output current at $I_{out_base_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{18)}$ | $I_{out_peak5_8}$ | A | 3.87 | 6.43 | 13.60 |
| Base load current at $I_{out_peak_5}$; $f_s = 8$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1$ | $I_{out_base5_8}$ | A | 3.52 | 5.84 | 12.36 |
| Maximum output current at $I_{out_base_5}$; $f_s = 12$ kHz; $t = 60$ s; $T = 10$ min; $K = 1.1^{19)}$ | $I_{out_peak5_12}$ | A | - | | |
| Latest amendment: 2006-06-30 | | | | | |

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|--------------------------|------|--------------------------|--------------------------|--------------------------|
| Base load current at $I_{out_peak_5}$;
$f_s = 12 \text{ kHz}$; $t = 60 \text{ s}$; $T = 10 \text{ min}$;
$K = 1.1$ | $I_{out_base5_1}$
2 | A | | - | |
| Maximum output current at
$I_{out_base_5}$; $f_s = 16 \text{ kHz}$; $t = 60 \text{ s}$;
$T = 10 \text{ min}$; $K = 1.1^{(20)}$ | $I_{out_peak5_1}$
6 | A | | - | |
| Base load current at $I_{out_peak_5}$;
$f_s = 16 \text{ kHz}$; $t = 60 \text{ s}$; $T = 10 \text{ min}$;
$K = 1.1$ | $I_{out_base5_1}$
6 | A | | - | |
| Latest amendment: 2006-06-30 | | | | | |

1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) 17) 18) 19) 20) See
UEL_I_e
profile
definition

Tab. 6-44: HMD - Examples of allowed current profiles

Current profile "UEL_I_e" The following current profiles have been defined for converters and inverters.

| Profile | Explanation |
|---|--|
| <p>current profile "UEL_I_e"</p>  <p>DK000149v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.</p> |

Tab. 6-45: Definition of current profiles

Operation with standard motors

General information

Selecting standard motors

The tables below show the nominal powers P_{nenn} of standard motors which can be operated at the respective drive controller. The following conditions apply to the data in the tables:

- Motor design:
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 400 V, 50 Hz at mains voltage $U_{LN} \geq 3 \text{ AC } 400 \text{ V}$ or
 - 4-pole standard motor (2 pole pairs) with rated voltage 3 AC 460 V, 60 Hz at mains voltage $U_{LN} \geq 3 \text{ AC } 460 \text{ V}$
- Assigned mains choke is used
- Operation at minimum switching frequency $f_s = f_s (\text{min.})$

- Rotary field at output with $f_{out} > f_{out_still}$
- Ambient temperature $T_a \leq T_{a_work}$
- Overload ratio $K = P_{DC_peak} / P_{DC_base}$ according to performance profile "UEL_P_e"
- Type of mains connection: Individual Supply



When choosing standard motors for inverters, select an appropriate supply unit. Observe the performance data P_{DC_peak} and P_{DC_base} in the performance profile "UEL_P_e" of the supply unit.

Operating standard motors at 3 AC 400 V

Selecting standard motors 3AC 400 V - exemplary profiles

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|------------|------|--------------------------|--------------------------|--------------------------|
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t > 10$ min;
$K = 1.0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 3.00 | 4.00 | 7.50 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 10$ min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 2.20 | 4.00 | 7.50 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 60$ s;
$T = 5$ min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 2.20 | 3.00 | 7.50 |
| Nominal power standard motor
3 AC 400 V; 50 Hz; $t = 2$ s;
$T = 20$ s; $K = 2.0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 2.20 | 3.00 | 7.50 |

Latest amendment: 2006-11-13

1) 2) 3) 4) See UEL_P_e profile definition

Tab. 6-46: HMD - Selecting standard motors 3 AC 400 V - exemplary profiles

Operating standard motors at 3 AC 460 V

Selecting standard motors 3 AC 460 V - exemplary profiles

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|--|------------|------|--------------------------|--------------------------|--------------------------|
| Nominal power standard motor
3AC460V; 60 Hz; $t > 10$ min;
$K = 1.0$; $f_s = 4$ kHz ¹⁾ | P_{Nenn} | kW | 3.70 | 5.50 | 11.00 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 60$ s;
$T = 10$ min; $K = 1.1$; $f_s = 4$ kHz ²⁾ | P_{Nenn} | kW | 2.20 | 3.70 | 11.00 |

Latest amendment: 2007-07-18

| Description | Symbol | Unit | HMD01.1N-W0012-A-07-NNNN | HMD01.1N-W0020-A-07-NNNN | HMD01.1N-W0036-A-07-NNNN |
|---|------------|------|--------------------------|--------------------------|--------------------------|
| Nominal power standard motor
3AC460V; 60 Hz; $t = 60$ s;
$T = 5$ min; $K = 1.5$; $f_s = 4$ kHz ³⁾ | P_{Nenn} | kW | 2.20 | 3.70 | 7.40 |
| Nominal power standard motor
3AC460V; 60 Hz; $t = 2$ s; $T = 20$ s;
$K = 2.0$; $f_s = 4$ kHz ⁴⁾ | P_{Nenn} | kW | 2.20 | 3.70 | 7.40 |

Latest amendment: 2007-07-18

1) 2) 3) 4) See UEL_P_e profile definition; 1 kW ~ 1.36 hp

Tab. 6-47: HMD - Selecting standard motors 3 AC 460 V - exemplary profiles

Performance profile "UEL_P_e"

The following performance profiles have been defined for converters and inverters.



Observe the allowed performance data P_{DC_peak} and P_{DC_base} in the corresponding performance profile of the supply unit or converter.

| Profile | Explanation |
|--|---|
| <p>Performance profile "UEL_P_e"</p> <p style="text-align: right;">DK000135v01_nn.fh11</p> | <p>Characteristic of the selection of standard motors and servo drives.</p> |

Tab. 6-48: Definition of Performance Profiles, Infeeding Supply Units and Converters

6.4.5 Connections and interfaces

Overview

Overall connection diagram

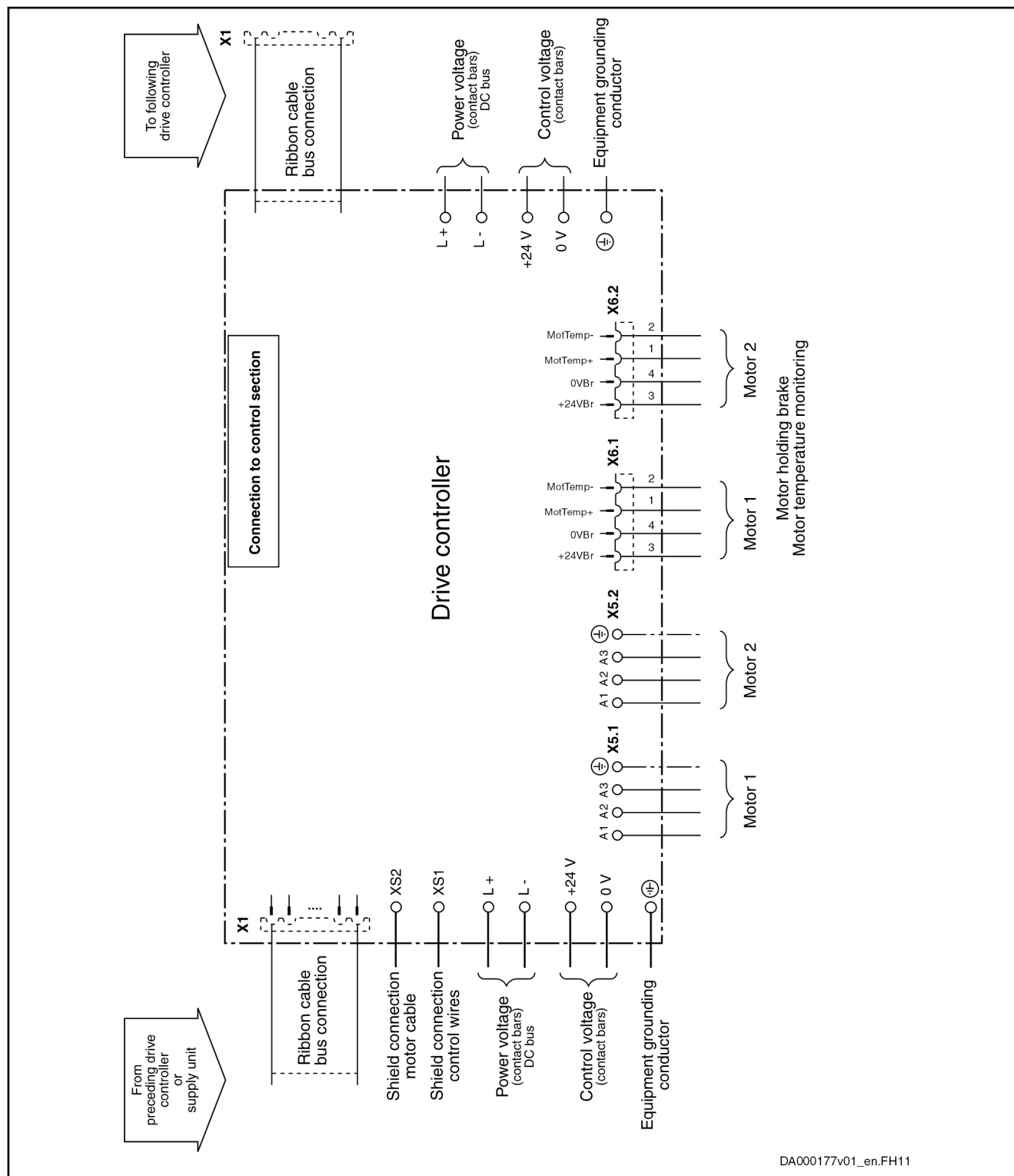
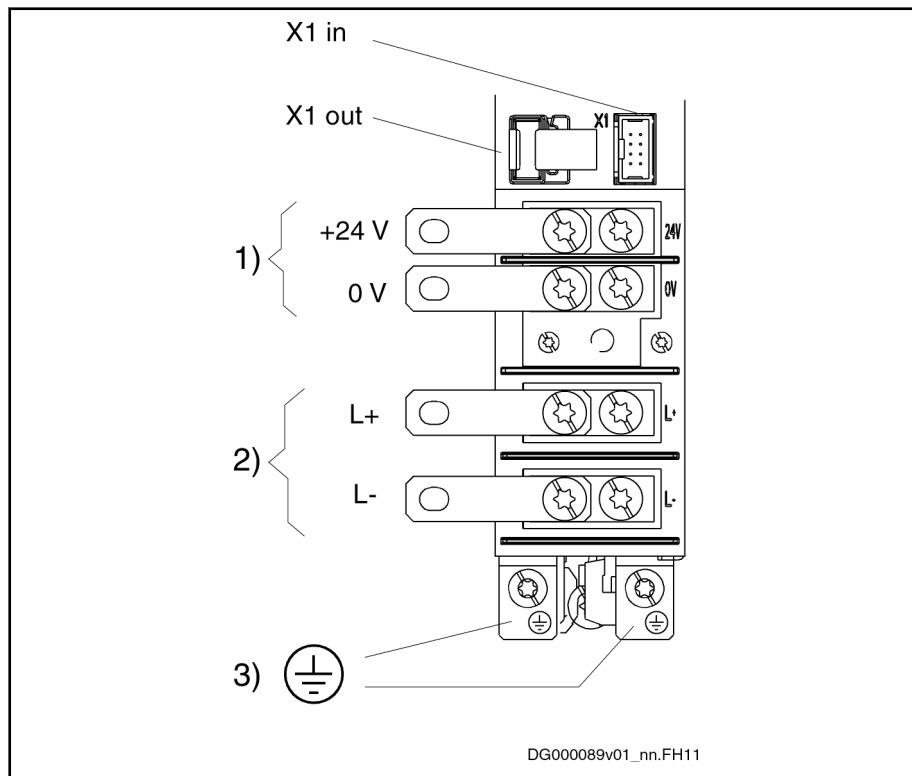


Fig. 6-45: HMD01 connection diagram

Arrangement of the connection points

Connection points at HMD01.1N-W0012, HMD01.1N-W0020 and HMD01.1N-W0036

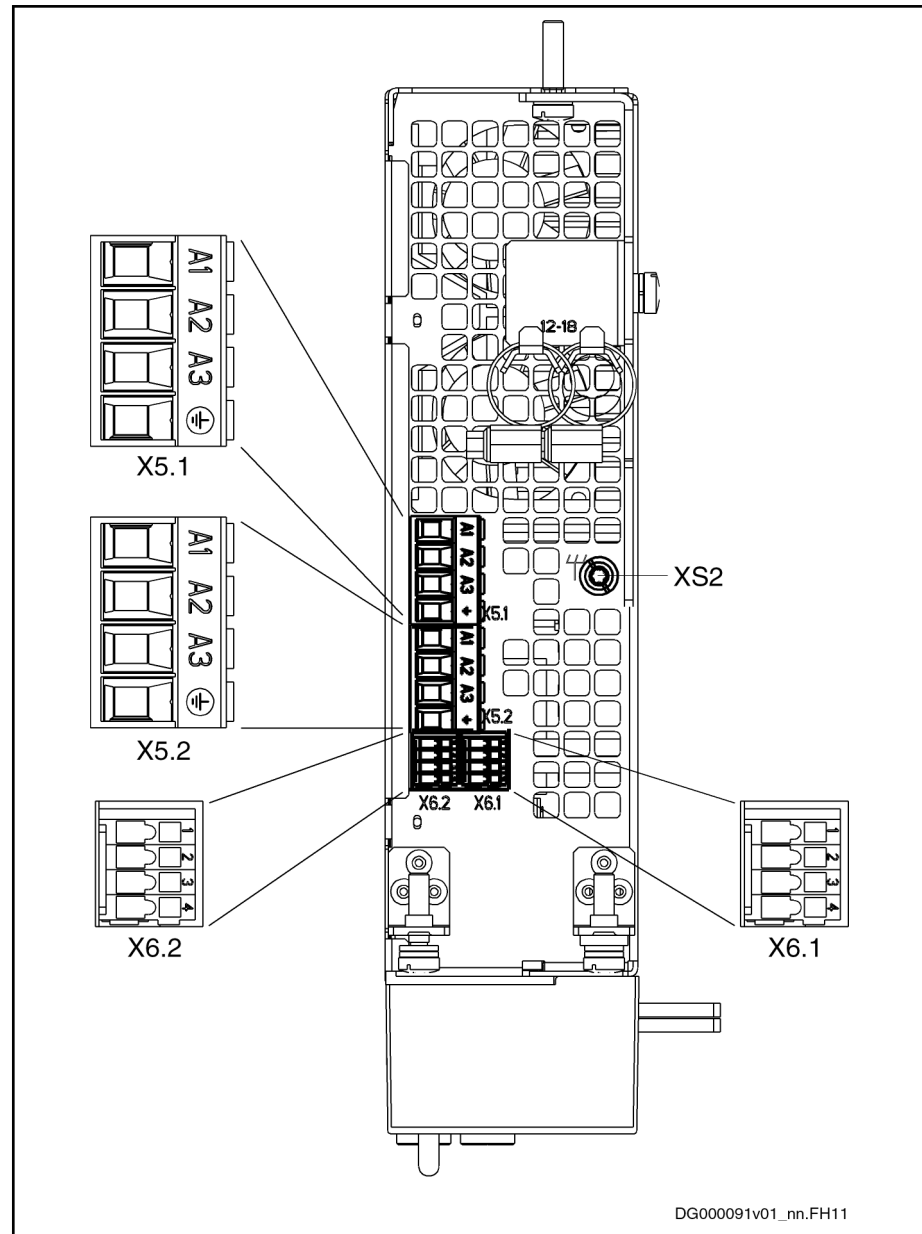
Connections at power section (front)



- 1) Control voltage
- 2) DC bus
- 3) Equipment grounding conductor
- X1 in, X1 out Module bus

Fig. 6-46: Connections at power section (front)

Connections at power section (bottom) HMD01.1N-W0012, HMD01.1N-W0020, -W0036



X5.1, X5.2 Motor connection
 X6.1, X6.2 Motor temperature monitoring and motor holding brake
 XS2 Shield connection (motor power cable)

Fig. 6-47: Connections at power section (bottom)

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 261.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 325.

7 IndraDrive M supply units

7.1 Types

| Supply unit | Characteristic | Types | Features |
|-------------|----------------|----------------------------------|--|
| HMV01.1E | Feeding | W0030
W0075
W0120 | Supplies HMS01 and HMD01 drive controllers |
| HMV01.1R | Regenerative | W0018
W0045
W0065
W0120 | Supplies HMS01 and HMD01 drive controllers |
| HMV02.1R | Regenerative | W0015 | Supplies HMS02 drive controllers |

Tab. 7-1: Overview

7.2 HMV01.1E supply units, feeding

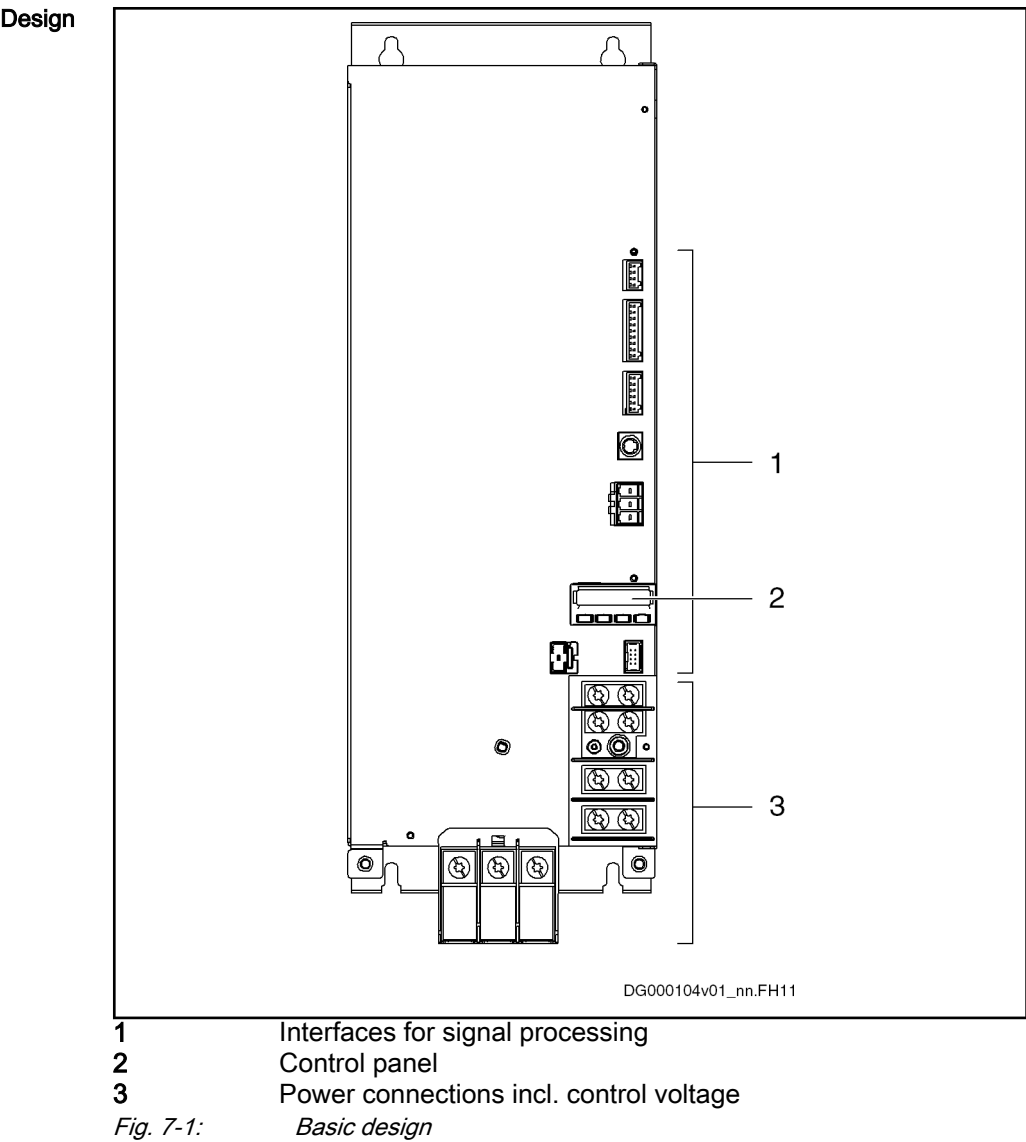
7.2.1 Brief description, use and design

Brief description HMV supply units are used to supply modular HMS and HMD devices.

Use The different types can be used as follows:

| Type | Use |
|----------|---|
| HMV01.1E | Feeding
To supply HMS01 and HMD01 drive controllers |

Tab. 7-2: Use of supply units



7.2.2 Type code and identification

Type code



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

| | | | | | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | 3 | | | | | | 4 | | | | |
|------------------------|---------------------------------|
| Short type designation | 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 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
| Example: | H | M | V | 0 | 1 | . | 1 | E | - | W | 0 | 0 | 3 | 0 | - | A | - | 0 | 7 | - | N | N | N | N | - | A | A | | | | | | | | | | | | | |
| | | ① | | ② | | | ③ | ④ | | ⑤ | | | ⑥ | | | | ⑦ | | ⑧ | | | | ⑨ | | | | ⑩ | | | | | | | | | | | | | |
| ① | Product:
H M V = Supply unit | |
| ② | Series:
01 = 01 |

Tab. 7-3:

Possible combinations of Other design, Power supply unit and Rated power:

| Other design | Power supply unit "E" | | | Power supply unit "R" | | | | | | | |
|--------------|-----------------------|------|------|-----------------------|------|------|------|------|------|------|------|
| | Rated power | | | Rated power | | | | | | | |
| | 0030 | 0075 | 0120 | 0018 | 0030 | 0045 | 0055 | 0065 | 0075 | 0105 | 0120 |
| FNN2 | – | – | – | ✓ | – | ✓ | – | ✓ | – | – | ✓ |
| NNNN | ✓ | ✓ | ✓ | ✓ | – | ✓ | – | ✓ | – | – | ✓ |
| NNLN | ✓ | ✓ | ✓ | ✓ | – | ✓ | – | ✓ | – | – | – |

Tab. 7-4: Possible combinations of Other design, Power supply unit and Rated power

Identification

Type plate arrangement

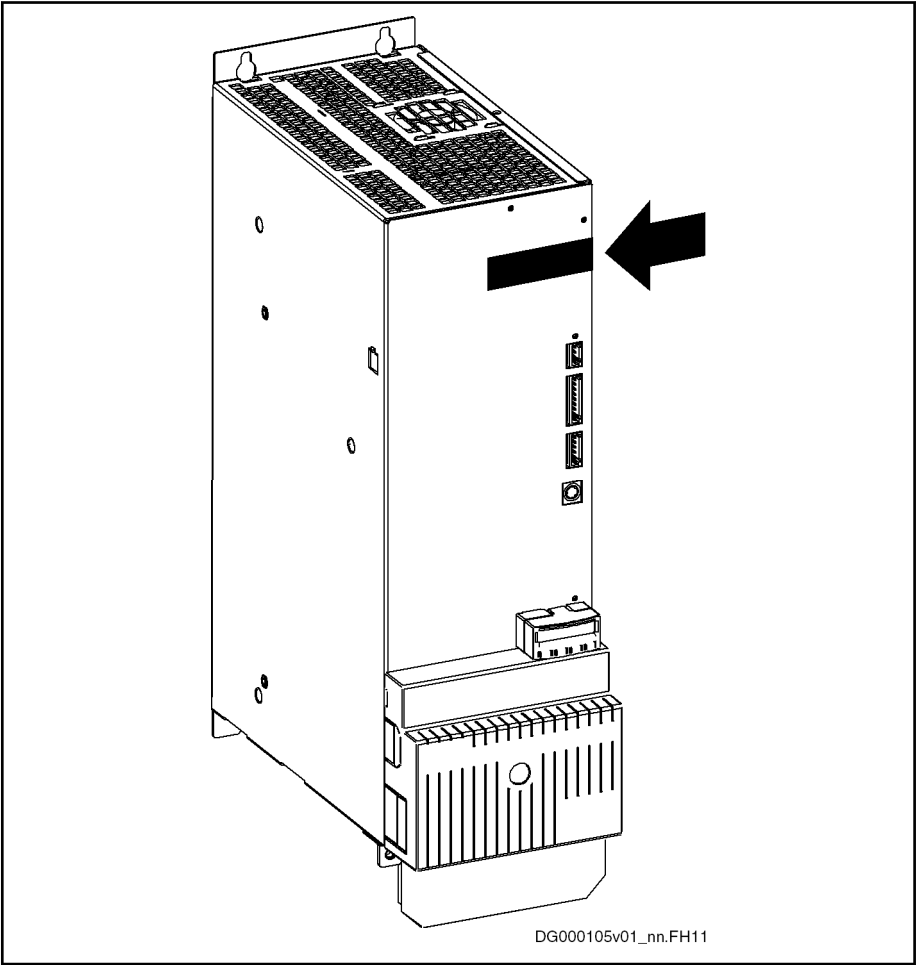


Fig. 7-2: Type plate at device

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 7-3: Type plate (electrical equipment)

7.2.3 Scope of supply

- 1 × touch guard
- 1 × joint bar to connect the equipment grounding conductor to a neighboring device
- Connectors for the electrical connection points at the device
- 1 × standard control panel each
- 1 × Instruction Manual (in the English language)

7.2.4 Technical data HMV01.1E

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage"](#) on page 23.

Installation conditions: See [chapter 4.3 "Installation conditions"](#) on page 24.

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|--|----------------|-------|--------------------------|--------------------------|--------------------------|
| Short circuit current rating | SCCR | A rms | 42000 | | |
| Rated input voltage, power ¹⁾ | U_{LN_nenn} | V | 3 x AC 380...480 | | |
| Rated input current | I_{LN} | A | 51.0 | 125.0 | 204.0 |
| Latest amendment: 2017-01-20 | | | | | |

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|------------------------------|-----------|------|--------------------------|--------------------------|--------------------------|
| Output voltage | U_{out} | V | DC 435...680 | | |
| Output current | I_{out} | A | 69.0 | 173.0 | 276.0 |
| Latest amendment: 2017-01-20 | | | | | |

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 7-5: HMV - Ambient and operating conditions - UL ratings

Information on standards

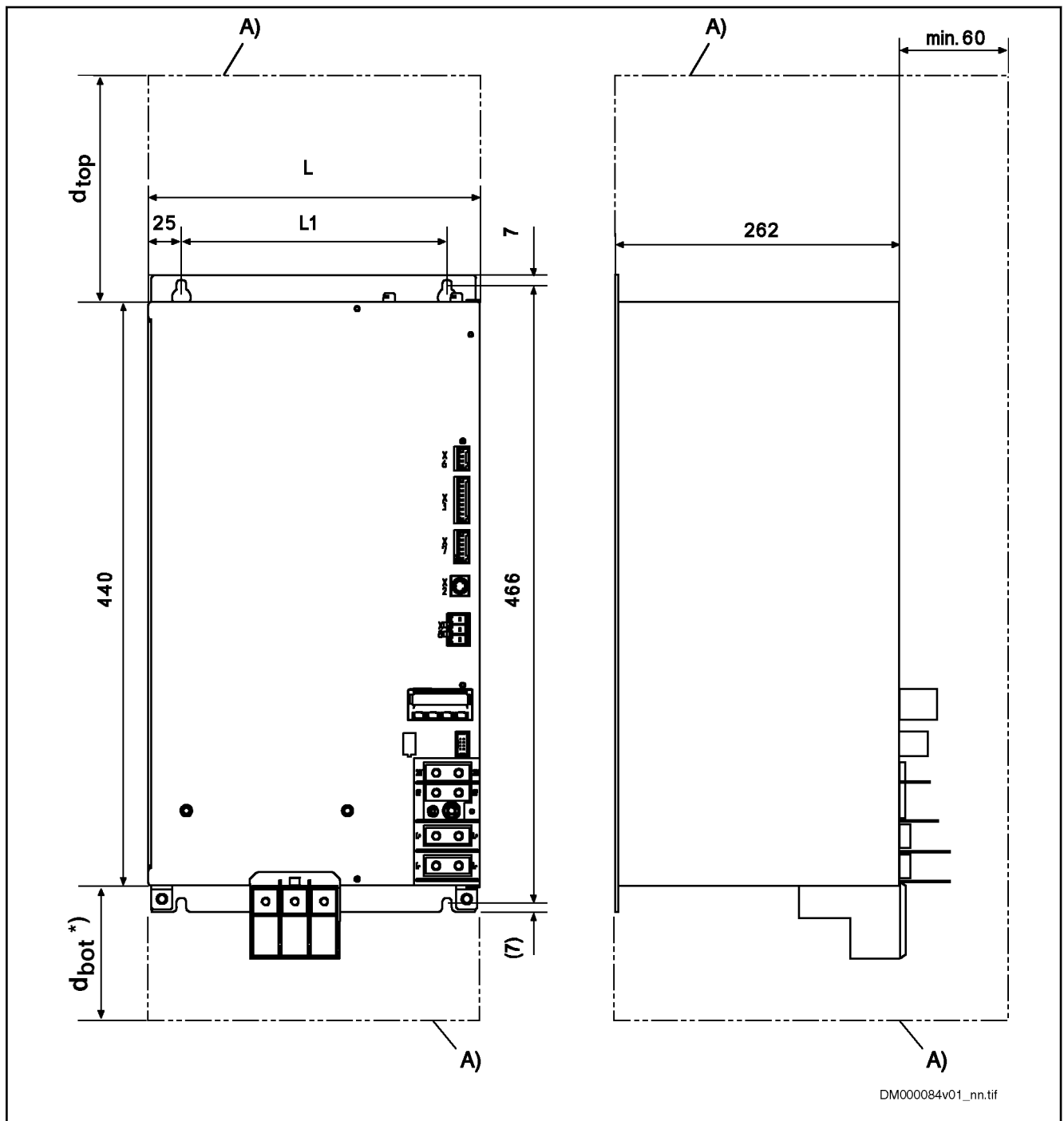
Applied standards

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|---|--------|------|--------------------------|--------------------------|--------------------------|
| Listing in accordance with UL standard | | | UL 508C | | |
| UL files | | | E134201 | | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | | |
| Latest amendment: 2017-01-20 | | | | | |

Tab. 7-6: HMV - Applied standards

Mechanics and mounting

Dimensions



A)
 d_{top} , d_{bot}

*)

Minimum mounting clearance
see chapter "Power dissipation, mounting position, cooling, distances"
plus additional space for mains connection cable (the required space depends on the minimum bending radius of the connected mains connection cable)

Fig. 7-4:

Dimensions

| Device | L
[mm] | L1
[mm] |
|----------------|-----------|------------|
| HMV01.1E-W0030 | 150 | 100 |
| HMV01.1E-W0075 | 250 | 200 |
| HMV01.1E-W0120 | 350 | 300 |

Tab. 7-7: Dimensions

Dimensions, mass, insulation, sound pressure level**Data for mass, sound pressure level, insulation**

| Description | Symbol | Unit | HMV01.1E-W0030-
A-07-NNNN | HMV01.1E-W0075-
A-07-NNNN | HMV01.1E-W0120-
A-07-NNNN |
|---|-----------------|--------|------------------------------|------------------------------|------------------------------|
| Mass | m | kg | 13.50 | 22.00 | 32.00 |
| Device height ¹⁾ | H | mm | 440 | | |
| Device depth ²⁾ | T | mm | 262 | | |
| Device width ³⁾ | B | mm | 150 | 250 | 350 |
| Insulation resistance at 500 V DC | R _{is} | Mohm | tbd | | |
| Capacitance against housing | C _y | nF | 2 x 470 | | |
| Average sound pressure level (accuracy class 2) at P _{DC_cont} ⁴⁾ | L _p | dB (A) | tbd | | |

Latest amendment: 2008-11-20

1) 2) 3)
4)Housing dimension; see also related dimensional drawing
According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 7-8: HMV - Data for mass, sound pressure level, insulation

Power dissipation, mounting position, cooling, distances**Cooling and power dissipation data**

| Description | Symbol | Unit | HMV01.1E-W0030-
A-07-NNNN | HMV01.1E-W0075-
A-07-NNNN | HMV01.1E-W0120-
A-07-NNNN |
|--|-------------------------|------|------------------------------|------------------------------|------------------------------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...+40 | | |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...55 | | |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2.0 | | |
| Allowed mounting position | | | G1 | | |
| Cooling type | | | Forced ventilation | | |
| Volumetric capacity of forced cooling | V | m³/h | 140.00 | 228.00 | 465.00 |

Latest amendment: 2009-10-22

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|---|------------------------|------|--------------------------|--------------------------|--------------------------|
| Power dissipation at continuous current and continuous DC bus power respectively ¹⁾ | P _{Diss_cont} | W | 150.00 | 340.00 | 500.00 |
| Rated power consumption control voltage input at U _{N3} ²⁾ | P _{N3} | W | 25 | 30 | 55 |
| Minimum distance on the top of the device ³⁾ | d _{top} | mm | 300 | | |
| Minimum distance on the bottom of the device ⁴⁾ | d _{bot} | mm | 130 | | |
| Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD} | ΔT | K | 65 | | |
| Latest amendment: 2009-10-22 | | | | | |

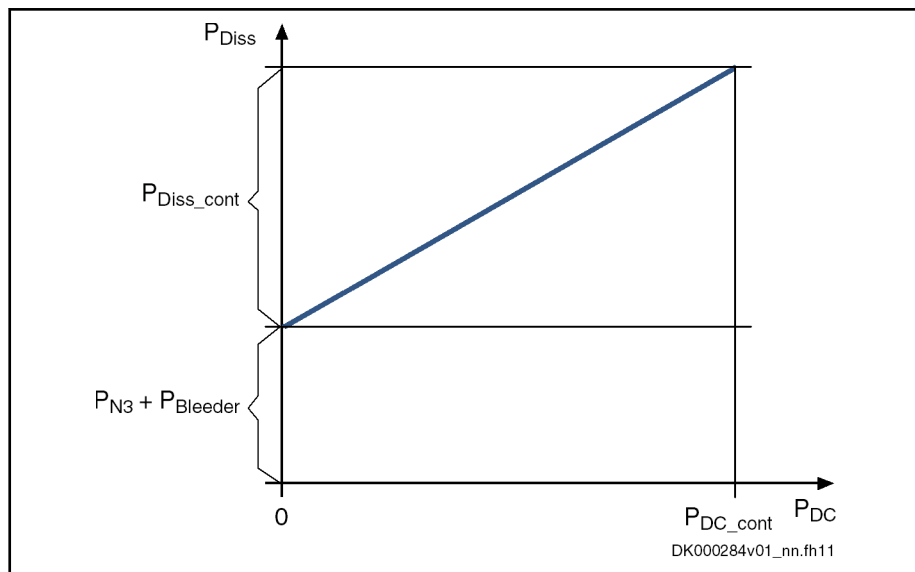
- 1) Plus dissipation of braking resistor and control section
2) See information on "Rated power consumption control voltage input at U_{N3} "
3) 4) See fig. "Air intake and air outlet at device"

Tab. 7-9: HMV - Data for cooling and power dissipation

Power dissipation vs. Output power

Due to their operating principle, feeding supply units (HMVxx.xE) generate power dissipation even if they do not supply power at the DC bus. The power dissipation in the working point $P_{DC_cont} = 0$ kW is approx. P_{N3}

For other working points, it is possible to interpolate with the figure below.



P_{Diss_cont}

P_{N3}

$P_{Bleeder}$

Fig. 7-5:

Power dissipation at P_{DC_cont}

Rated power consumption control voltage input

Power generated at integrated braking resistor, max. P_{BD}

HMVxx.xE - Power dissipation vs. Output power

Distances

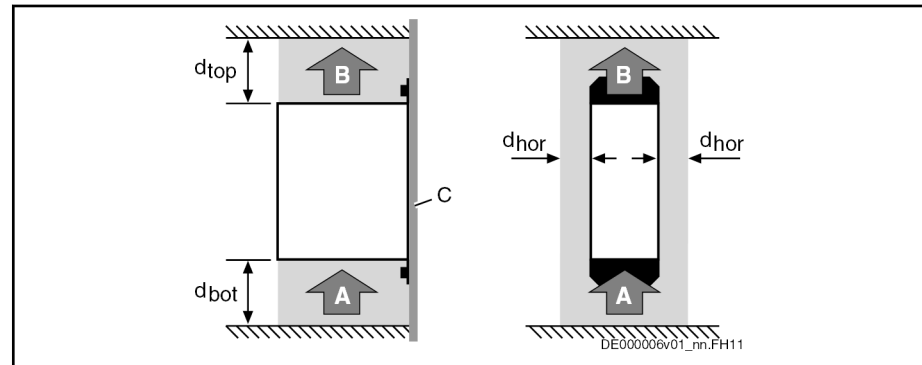
NOTICE

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



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

Fig. 7-6: Air intake and air outlet at device

Basic data of HMV01 supply unit, feeding

General information

This chapter contains:

- Data for control voltage supply
- Data for mains voltage supply
- Data of DC bus
- Data of integrated braking resistor and requirements on an external braking resistor
- Data for cooling and power dissipation



The order of the data tables below follows the energy flow in the supply unit - from mains connection to DC bus output.

Control voltage

Control voltage supply data

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|--|-----------------|------|--------------------------|--------------------------|--------------------------|
| Control voltage input ¹⁾ | U_{N3} | V | 24 ± 5 % | | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U_{N3} | V | 24 ± 5 % | | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U_{N3} | V | 26 ± 5 % | | |
| Max. inrush current at 24 V supply | I_{EIN3_max} | A | 5.00 | 5.50 | 10.00 |
| Pulse width of I_{EIN3} | $t_{EIN3Lade}$ | ms | 15 | | 50 |
| Input capacitance | C_{N3} | mF | tbd | | |
| Rated power consumption control voltage input at U_{N3} ⁴⁾ | P_{N3} | W | 25 | 30 | 55 |
| Latest amendment: 2008-11-20 | | | | | |

1) 2) 3)

4)

Observe supply voltage for motor holding brake
See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 7-10: HMV - Control voltage supply data

Mains voltage

Mains voltage supply data

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|---|----------------------|-------|--------------------------|--------------------------|--------------------------|
| Mains frequency | f _{LN} | Hz | 50...60 | | |
| Tolerance input frequency | | Hz | ± 2 | | |
| Maximum allowed mains frequency change | Δf _{LN} /Δt | Hz/s | 1 | | |
| Rotary field condition | | | None | | |
| Short circuit current rating | SCCR | A rms | 42000 | | |
| Nominal mains voltage | U _{LN_nenn} | V | 3 AC 400 | | |
| Mains voltage, single-phase | U _{LN} | V | -- | | |
| Three-phase mains voltage at TN-S, TN-C, TT mains | U _{LN} | V | 380...480 | | |
| Mains voltage, three-phase at IT mains ¹⁾ | U _{LN} | V | 200...230 | | |
| Mains voltage, three-phase at Corner-grounded-Delta mains ²⁾ | U _{LN} | V | 200...230 | | |
| Latest amendment: 2017-01-20* | | | | | |

IndraDrive M supply units

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|--|-----------------------------|------|----------------------------|---------------------------|---------------------------|
| Tolerance rated input voltage U _{LN} | | | | | |
| Minimum inductance of mains supply (mains phase inductance) ³⁾ | L _{min} | μH | 40 | | |
| Assigned type of mains choke | | | HNL01.1E-0400-N0051-A-480 | HNL01.1E-0200-N0125-A-480 | HNL01.1E-0100-N0220-A-480 |
| Minimum short circuit power of the mains for failure-free operation | S _{k_min} | MVA | 1.6 | 3.4 | 5.4 |
| Assigned type of mains filter | | | | | |
| Inrush current | I _{L_trans_max_on} | A | I LN | | |
| Maximum allowed ON-OFF cycles per minute ⁴⁾ | | | 1 | | |
| Power factor TPF (λ _L) at P _{DC_cont} with mains choke; U _{LN_nenn} | TPF | | 0.88 | | |
| Power factor TPF (λ _L) at P _{DC_cont} without mains choke; U _{LN_nenn} ⁵⁾ | TPF | | 0.64 | | |
| Power factor TPF (λ _L) at 10% P _{DC_cont} without mains choke; U _{LN_nenn} ⁶⁾ | TPF _{10%} | | 0.40 | | |
| Power factor TPF (λ _L) at P _{DC_cont} (single-phase); U _{LN} = 1 AC 230 V | TPF | | - | | |
| Power factor of fundam. component DPF at P _{DC_cont} with mains choke | cosφ ^{h1} | | 0.97 | | |
| Power factor of fundamental component DPF at P _{DC_cont} without mains choke | cosφ ^{h1} | | 0.97 | | |
| Mains connection power at P _{DC_cont} ; U _{LN_nenn} with mains choke | S _{LN} | kVA | 35.00 | 86.00 | tbd |
| Mains connection power at P _{DC_cont} ; U _{LN_nenn} without mains choke | S _{LN} | kVA | 31.00 | 68.00 | 108.00 |
| Rated input current | I _{LN} | A | 51.0 | 125.0 | 204.0 |
| Nominal current AC1 for mains contactor at nom. data | | | Integrated mains contactor | | |
| Latest amendment: 2017-01-20* | | | | | |

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|---|-----------------|------|--------------------------|--------------------------|--------------------------|
| Mains fuse according to EN 60204-1 | | A | 63 | 160 | 250 |
| Required wire size in accordance with NFPA 79 and UL 508 A (internal wiring); ⁷⁾ | A _{LN} | AWG | 6 AWG | 1 AWG | 4/0 AWG |
| Latest amendment: 2017-01-20* | | | | | |

- 1) 2) Mains voltage > U_{LN}: Use a transformer with grounded neutral point, do not use autotransformers!
3) Otherwise use HNL mains choke
4) Observe allowed number of switch-on processes; without external capacitors at the DC bus
5) 6) Find interim values by interpolation
7) Copper wire; PVC-insulation (conductor temperature 90 °C; T_a ≤ 40 °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 7-11: HMV - Mains voltage supply data

Supply unit - DC bus

Supply unit data - DC bus

| Description | Symbol | Unit | HMV01.1E-W0030 | HMV01.1E-W0075 | HMV01.1E-W0120 |
|---|----------------------|------|--|----------------|----------------|
| DC bus voltage | U _{DC} | V | ULN x 1.41 | | |
| Capacitance in DC bus | C _{DC} | mF | 1.41 | 3.76 | 5.64 |
| DC resistance in DC bus (L+ to L-) | R _{DC} | kohm | approx. 27 | approx. 14 | approx. 10 |
| Rated power (t > 10 min) at f _s = 4 kHz; U _{LN_nenn} ; control factor a ₀ > 0.8; with mains choke | P _{DC_cont} | kW | 30.00 | 75.00 | 120.00 |
| Rated power (t > 10 min) at f _s = 4 kHz; U _{LN_nenn} ; control factor a ₀ > 0.8; without mains choke | P _{DC_cont} | kW | 18.00 | 45.00 | 72.00 |
| P _{DC_cont} and P _{DC_max} vs. mains input voltage; U _{LN} ≤ U _{LN_nenn} | | %/V | PDC_cont (ULN) = PDC_cont x [1 - (400-ULN) x 0.0025] | | |
| P _{DC_cont} and P _{DC_max} vs. mains input voltage; U _{LN} > U _{LN_nenn} | | %/V | PDC_cont (ULN) = PDC_cont x [1 + (ULN-400) x 0.002] | | |
| Maximum allowed DC bus power at U _{LN_nenn} ; with mains choke | P _{DC_max} | kW | 45.00 | 112.50 | 180.00 |
| Maximum allowed DC bus power at U _{LN_nenn} ; without mains choke | P _{DC_max} | kW | 45.00 | 112.50 | 180.00 |
| Balancing factor for P _{DC_cont} (for parallel operation at common DC bus) with mains choke | | | 0.80 | | |
| Latest amendment: 2008-11-20 | | | | | |

IndraDrive M supply units

| Description | Symbol | Unit | HMV01.1E-W0030 | HMV01.1E-W0075 | HMV01.1E-W0120 |
|---|---------------------------|------|---|----------------|----------------|
| Balancing factor for P _{DC_cont} (for parallel operation at common DC bus) without mains choke | | | Not allowed | | |
| Monitoring value maximum DC bus voltage, switch-off threshold | U _{DC_limit_max} | V | 900, see also Troubleshooting Guide for E8025, F2817 | | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | U _{DC_limit_min} | V | 1.06 x ULN; see also Troubleshooting Guide for E2026, F2026 | | |
| Charging resistor continuous power | P _{DC_Start} | kW | Charging via current source | | |
| Allowed external DC bus capacitance (nom.) at U _{LN_nenn} ¹⁾ | C _{DCext} | mF | 150.00 | | |
| Charging time for maximum external DC bus capacitance C _{DCext} at U _{LN_nenn} | t _{lade_DC_Cext} | | | | |
| Latest amendment: 2008-11-20 | | | | | |

1) Use assigned mains choke
 Tab. 7-12: HMV - Supply unit data - DC bus

Integrated braking resistor**Integrated braking resistor data**

| Description | Symbol | Unit | HMV01.1E-W0030 | HMV01.1E-W0075 | HMV01.1E-W0120 |
|---|-------------------------|------|--------------------------------|----------------|----------------|
| Braking resistor continuous power | P _{BD} | kW | 1.50 | 2.00 | 2.50 |
| Braking resistor peak power | P _{BS} | kW | 36.00 | 90.00 | 130.00 |
| Nominal braking resistance | R _{DC_Bleeder} | ohm | 14 | 6 | 4 |
| Braking resistor switch-on threshold - independent of mains voltage ¹⁾ | U _{R_DC_On_f} | V | 820; see also X32 | | |
| Braking resistor switch-on threshold - depending on mains voltage ²⁾ | U _{R_DC_On_v} | | ULN * 1.41 + 80V; see also X32 | | |
| Maximum allowed duty cycle | t _{on_max} | s | 2.80 | | 3.80 |
| Minimum allowed cycle time | T _{cycl} | s | 66.70 | 125.00 | 200.00 |
| Regenerative power to be absorbed | W _{R_max} | kWs | 100.00 | 250.00 | 500.00 |
| Balancing factor for P _{BD} (for parallel operation at common DC bus) | f | | tbd | | |
| Cooling of integrated braking resistor | | | Forced ventilation | | |
| Latest amendment: 2015-08-10 | | | | | |

1) 2) Factory setting
 Tab. 7-13: HMV - Integrated braking resistor data

Exemplary data for applications

General information

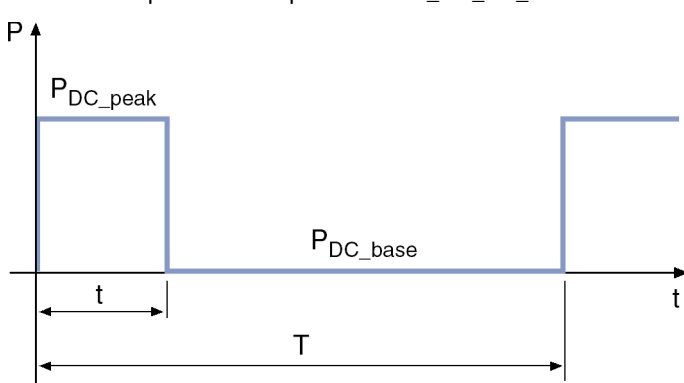
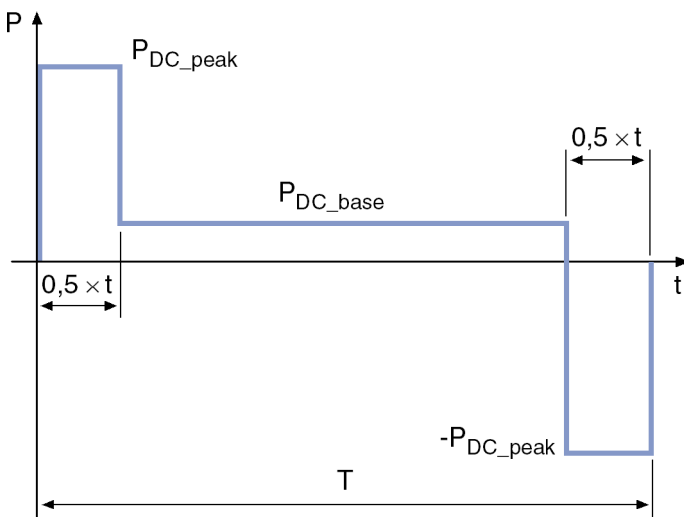
This chapter contains:

- Examples of allowed performance profiles

Performance profiles

Performance profiles of infeeding supply units

The following performance profiles have been defined for infeeding supply units.

| Profile | Explanation |
|---|---|
| <p>performance profile "WZM_HS_KB_e"</p>  <p>DK000155v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of applications in machine tools, short-time operation of the main spindle.</p> |
| <p>performance profile "WZM_HS_Fr_e"</p>  <p>DK000150v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding supply units.</p> <p>Characteristic of main spindles in milling machines.</p> |

| Profile | Explanation |
|--|--|
| <p>performance profile "WZM_SA_acc_e"</p> <p>DK000154v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding supply units.</p> <p>Characteristic of servo drives at machine tools.</p> |
| <p>performance profile "DRM_S1_acc_e"</p> <p>DK000152v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of starting and operation at printing machines.</p> |
| <p>performance profile "UEL_P_e"</p> <p>DK000135v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of applications using standard motors in overload operation.</p> |

Tab. 7-14: Definitions of performance profiles, infeeding supply units

Examples of allowed performance profiles, supply units HMV....E

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|--|--------------------|------|--------------------------|--------------------------|--------------------------|
| DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; without mains choke ¹⁾ | $P_{DC_base_10}$ | kW | 0.0 | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; without mains choke ²⁾ | $P_{DC_peak_10}$ | kW | 24.30 | 60.70 | 97.20 |
| DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; with mains choke ³⁾ | $P_{DC_base_10}$ | kW | 0.0 | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; with mains choke ⁴⁾ | $P_{DC_peak_10}$ | kW | 40.50 | 97.50 | 162.00 |
| DC bus power at U_{LN_nenn} ; $t = 3$ s; $t = 60$ s; without mains choke ⁵⁾ | $P_{DC_base_11}$ | kW | 9.00 | 22.50 | 36.00 |
| maximum DC bus power at U_{LN_nenn} ; $t = 3$ s; $t = 60$ s; without mains choke ⁶⁾ | $P_{DC_peak_11}$ | kW | 39.60 | 94.50 | 180.00 |
| DC bus power at U_{LN_nenn} ; $t = 3$ s; $t = 60$ s; with mains choke ⁷⁾ | $P_{DC_base_11}$ | kW | 16.50 | 41.20 | 66.00 |
| maximum DC bus power at U_{LN_nenn} ; $t = 3$ s; $t = 60$ s; with mains choke ⁸⁾ | $P_{DC_peak_11}$ | kW | 45.00 | 112.50 | 180.00 |
| DC bus power at U_{LN_nenn} ; $t = 0.2$ s; $t = 4$ s; without mains choke ⁹⁾ | $P_{DC_base_12}$ | kW | 0.0 | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 0.2$ s; $t = 4$ s; without mains choke ¹⁰⁾ | $P_{DC_peak_12}$ | kW | 45.00 | 112.50 | 180.00 |
| DC bus power at U_{LN_nenn} ; $t = 0.2$ s; $t = 4$ s; with mains choke ¹¹⁾ | $P_{DC_base_12}$ | kW | 0.0 | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 0.2$ s; $t = 4$ s; with mains choke ¹²⁾ | $P_{DC_peak_12}$ | kW | 45.00 | 112.50 | 180.00 |
| DC bus power at U_{LN_nenn} ; $t = 60$ s; $T = 900$ s; without mains choke ¹³⁾ | $P_{DC_base_13}$ | kW | 16.20 | 40.50 | 64.80 |
| maximum DC bus power at U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; without mains choke ¹⁴⁾ | $P_{DC_peak_13}$ | kW | 36.00 | 72.00 | 180.00 |
| Latest amendment: 2008-11-20 | | | | | |

| Description | Symbol | Unit | HMV01.1E-W0030-A-07-NNNN | HMV01.1E-W0075-A-07-NNNN | HMV01.1E-W0120-A-07-NNNN |
|---|------------------------|------|--------------------------|--------------------------|--------------------------|
| DC bus power at U_{LN_nenn} ; $t = 60$ s;
$t = 900$ s; with mains choke ¹⁵⁾ | $P_{DC_base_1}$
3 | kW | 27.00 | 67.50 | 108.00 |
| maximum DC bus power at
U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; with
mains choke ¹⁶⁾ | $P_{DC_peak_1}$
3 | kW | 45.00 | 101.20 | 180.00 |
| Latest amendment: 2008-11-20 | | | | | |

1) 2) 3) 4) See WZM_HS_KB_e profile definition
 5) 6) 7) 8) See WZM_HS_Fr_e profile definition
 9) 10) 11) 12) See WZM_SA_acc_e profile definition
 13) 14) 15) 16) See DRM_S1_acc_e profile definition
 Tab. 7-15: *HMV...E - Examples of allowed performance profiles*

7.2.5 Connections and interfaces

Overview

Overall connection diagram

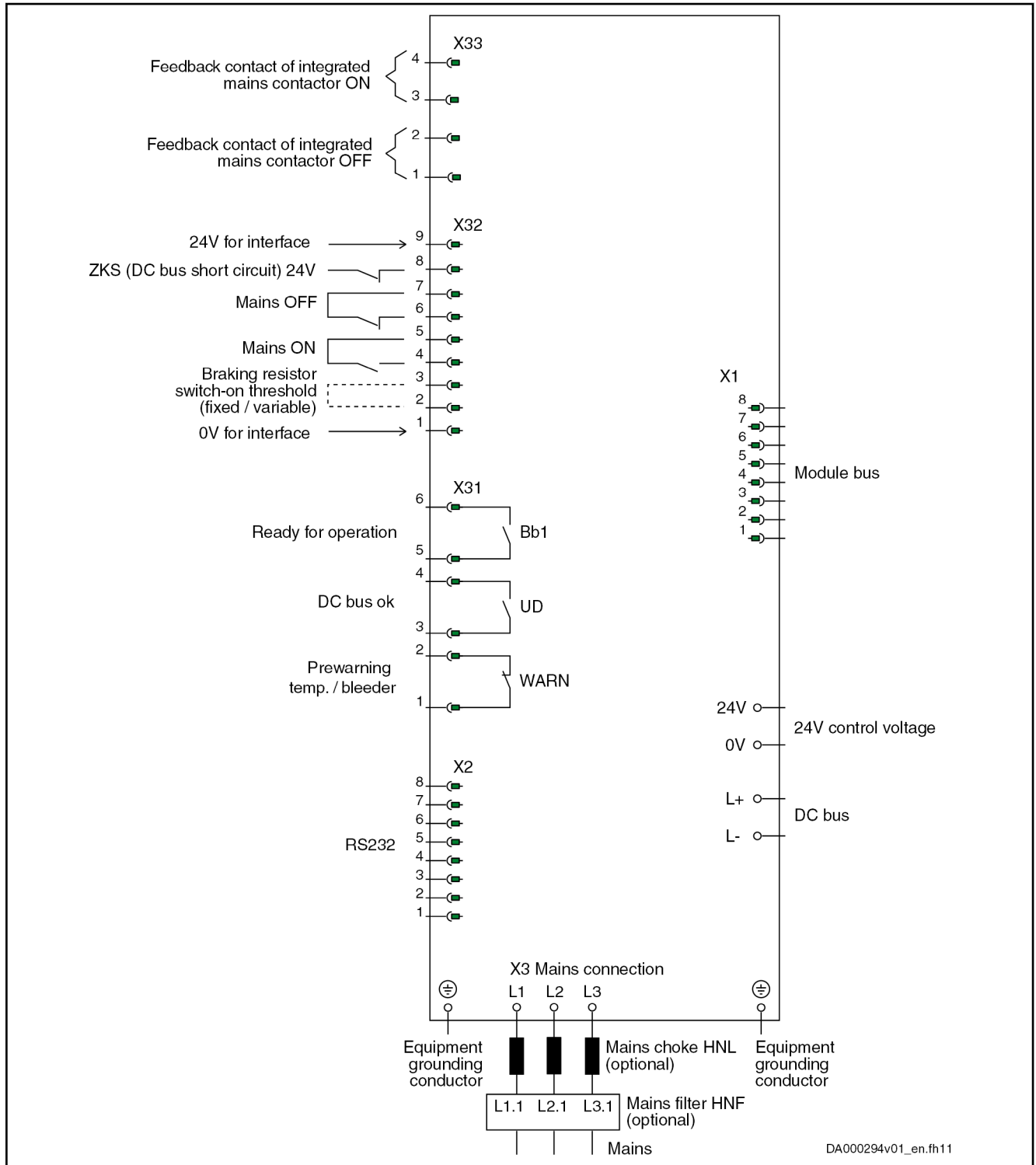
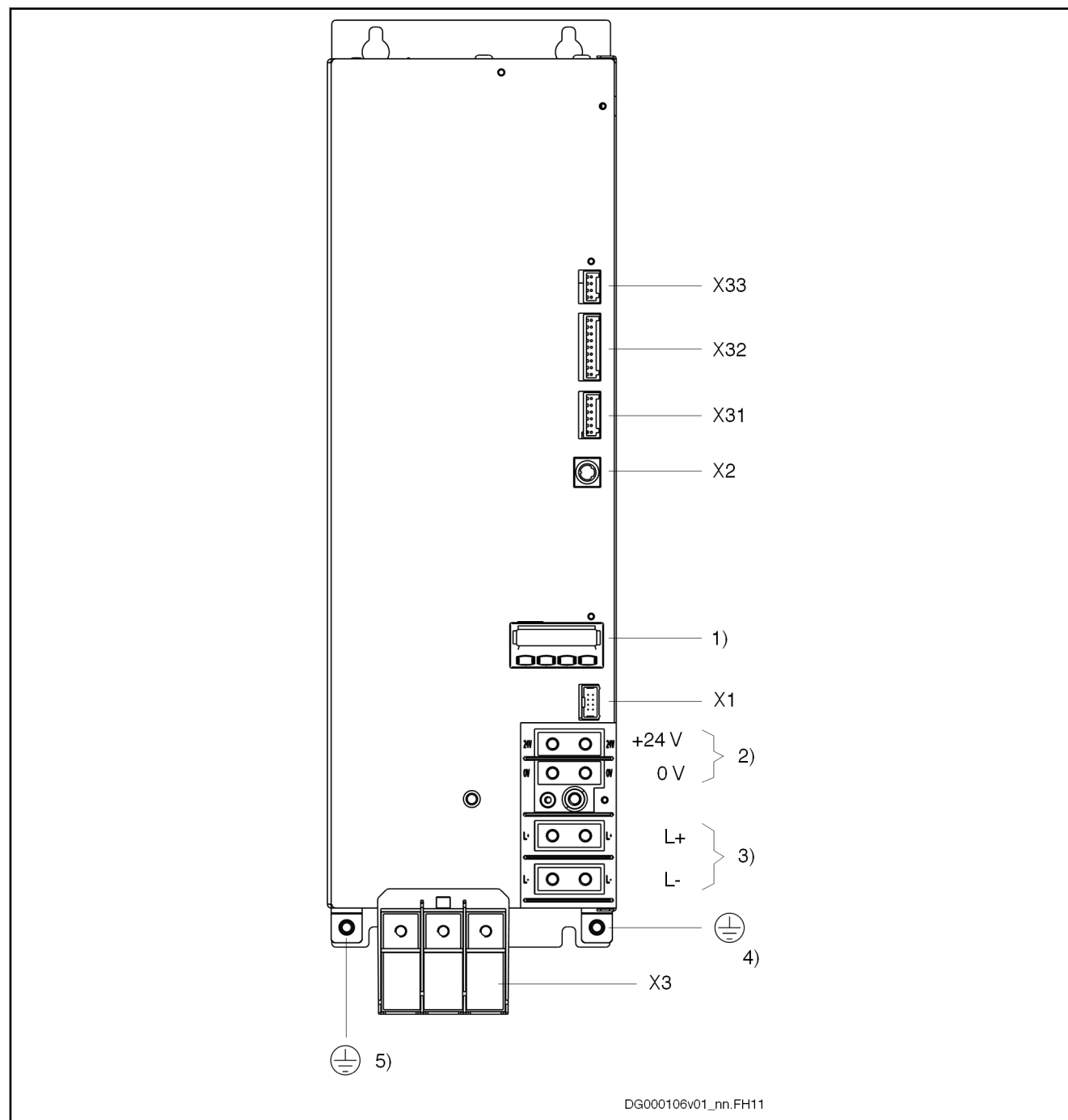


Fig. 7-7: Connection diagram HMV01.1E-W0030; -W0075; -W0120

Arrangement of the connection points

Connections HMV01.1E-W0030 and HMV01.1E-W0075

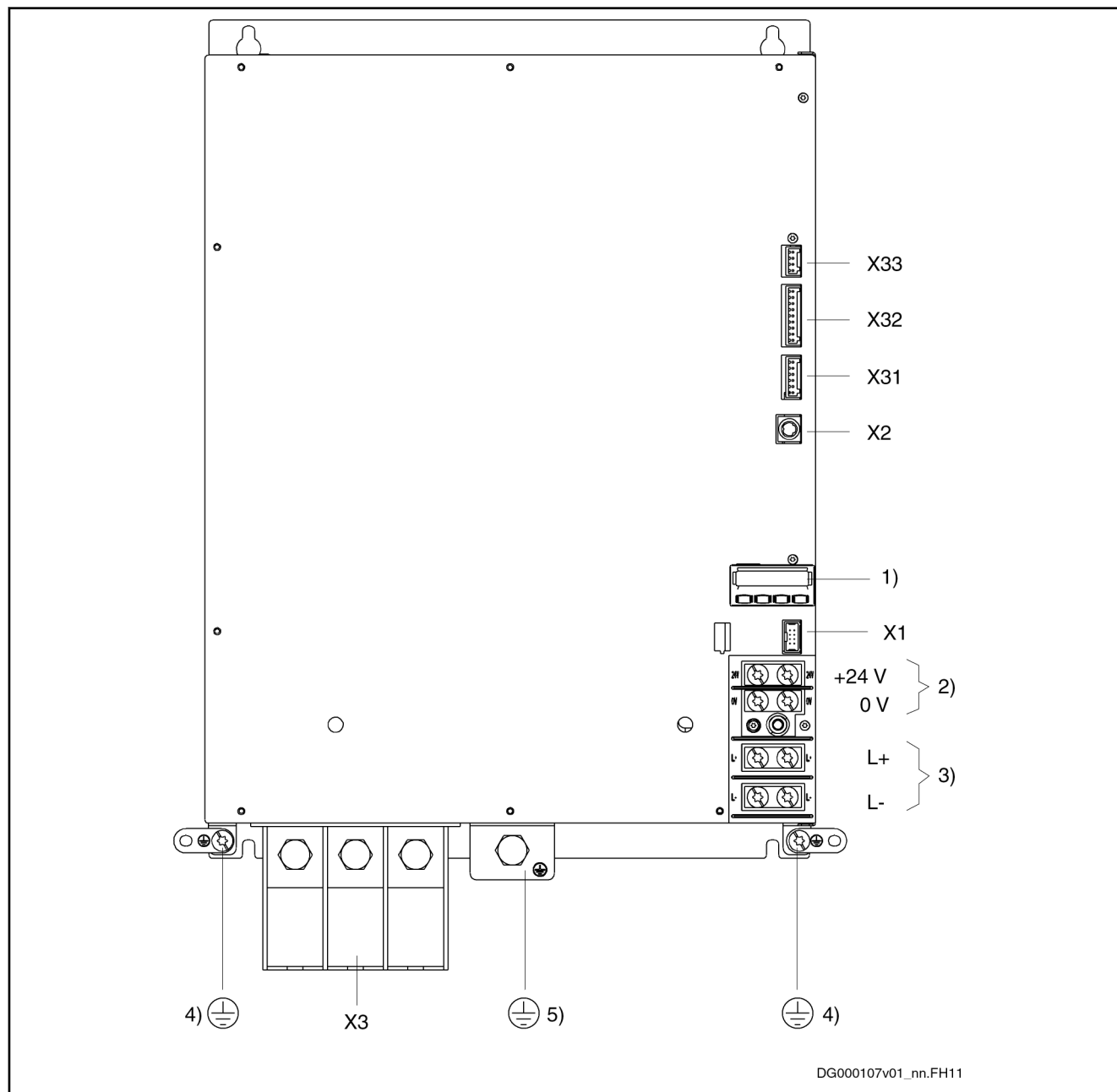


| | |
|------------|--|
| X33 | Acknowledgment messages of mains contactor |
| X32 | Mains contactor control and DC bus short circuit (ZKS) |
| X31 | Connection for messages |
| X2 | RS232 |
| X1 | Module bus |
| X3 | Mains connection |
| | Equipment grounding conductor connection point |
| 1) | Control panel |
| 2) | Control voltage |

- 3) DC bus
- 4) Connection point of equipment grounding conductor (with joint bar to neighboring device)
- 5) Connection point of equipment grounding conductor (mains)

Fig. 7-8: Connections HMV01.1E-W0030 and HMV01.1E-W0075

Connections HMV01.1E-W0120



| | |
|------------|--|
| X33 | Acknowledgment messages of mains contactor |
| X32 | Mains contactor control and DC bus short circuit (ZKS) |
| X31 | Connection for messages |
| X2 | RS232 |
| X1 | Module bus |
| X3 | Mains connection |
| 1) | Control panel |
| 2) | Control voltage |
| 3) | DC bus |
| 4) | Connection point of equipment grounding conductor (with joint bar to neighboring device) |
| 5) | Connection point of equipment grounding conductor (mains) |

Fig. 7-9:

Connections HMV01.1E-W0120

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points, page 261](#).

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices, page 325](#).

7.3 HMV01.1R supply units, regenerative

7.3.1 Brief description, use and design

- Brief description HMV01 supply units
- supply modular HMS and HMD devices
 - have an integrated mains contactor (exception: HMV01.1R-W0120)



Observe the **functional differences** between the connection points **X33** and **X40**, depending on the supply unit!

- Supply units **with** integrated mains contactor:
 X33 provides message signals on the status of the integrated mains contactor
- Supply units **without** integrated mains contactor:
 X40 receives message signals on the status of the external mains contactor

| Use | Type | Use |
|-----|----------|--|
| | HMV01.1R | Regenerative
To supply HMS01 and HMD01 drive controllers |

Tab. 7-16: Use of supply units

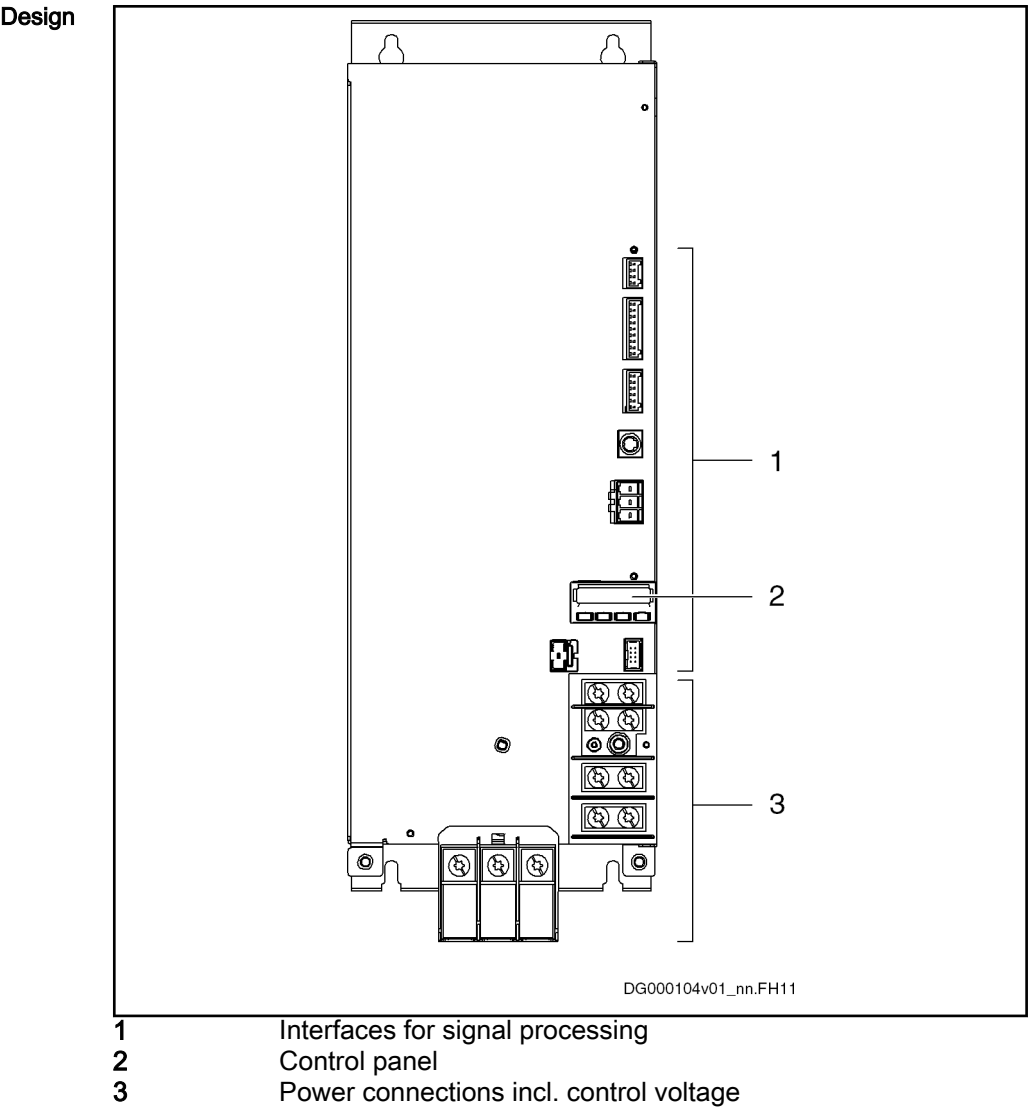


Fig. 7-10: Basic design

7.3.2 Type code and identification

Type code

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

| | | | | | | | | | | 1 | | | | | | | | | | | 2 | | | | | | | | | | 3 | | | | | | | 4 | | |
|------------------------|-------------------------------|
| Short type designation | 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 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
| Example: | H | M | V | 0 | 1 | . | 1 | E | - | W | 0 | 0 | 3 | 0 | - | A | - | 0 | 7 | - | N | N | N | N | - | A | A | | | | | | | | | | | | | |
| | ① | | ② | | | | ③ | ④ | | ⑤ | | | ⑥ | | | | ⑦ | | ⑧ | | | ⑨ | | | | ⑩ | | | | | | | | | | | | | | |
| ① | Product:
HMV = Supply unit | |
| ② | Series:
01 = 01 |

[illegible]

1) See table "Possible combinations of Other design, Power supply unit, Rated power"

Tab. 7-17: *HMV01 type code*

Possible combinations of Other design, Power supply unit and Rated power:

| Other design | Power supply unit "E" | | | Power supply unit "R" | | | | | | | |
|--------------|-----------------------|------|------|-----------------------|------|------|------|------|------|------|------|
| | Rated power | | | Rated power | | | | | | | |
| | 0030 | 0075 | 0120 | 0018 | 0030 | 0045 | 0055 | 0065 | 0075 | 0105 | 0120 |
| FNN2 | – | – | – | ✓ | – | ✓ | – | ✓ | – | – | ✓ |
| NNNN | ✓ | ✓ | ✓ | ✓ | – | ✓ | – | ✓ | – | – | ✓ |
| NNLN | ✓ | ✓ | ✓ | ✓ | – | ✓ | – | ✓ | – | – | – |

Tab. 7-18: Possible combinations of Other design, Power supply unit and Rated power

Identification

Type plate arrangement

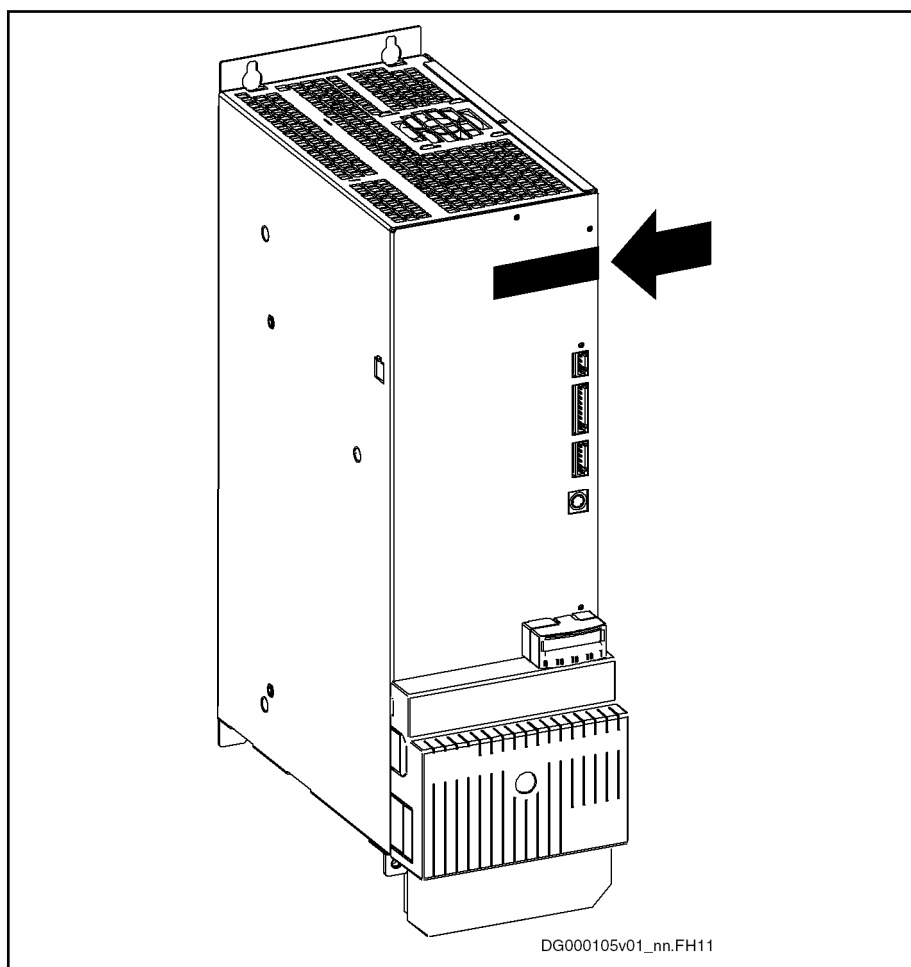


Fig. 7-11: Type plate at device

Type plate



- 1 Type designation
- 2 Country of manufacture
- 3 Factory
- 4 Customer material number
- 5 Material number
- 6 Bar code, 2D code
- 7 Serial number
- 8 Production week; 18W23, for example, means year 2018, week 23
- 9 Hardware index

Fig. 7-12: Type plate (electrical equipment)

7.3.3 Scope of supply

- 1 × touch guard
- 1 × joint bar to connect the equipment grounding conductor to a neighboring device
- Connectors for the electrical connection points at the device
- 1 × standard control panel each
- 1 × Instruction Manual (in the English language)

7.3.4 Technical data HMV01.1R

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage"](#) on page 23.

Installation conditions: See [chapter 4.3 "Installation conditions"](#) on page 24.

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|--|---------------------|-------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Short circuit current rating | SCCR | A rms | 42000 | | | |
| Rated input voltage, power ¹⁾ | U _{LN,enn} | V | 3 x AC 380...480 | | | |
| Rated input current | I _{LN} | A | 26.0 | 65.0 | 94.0 | 181.0 |
| Latest amendment: 2014-08-05 | | | | | | |

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|------------------------------|-----------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Output voltage | U_{out} | V | DC 750 | | | |
| Output current | I_{out} | A | 24.0 | 60.0 | 87.0 | 160.0 |
| Latest amendment: 2014-08-05 | | | | | | |

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 7-19: HMV - Ambient and operating conditions - UL ratings

Information on standards

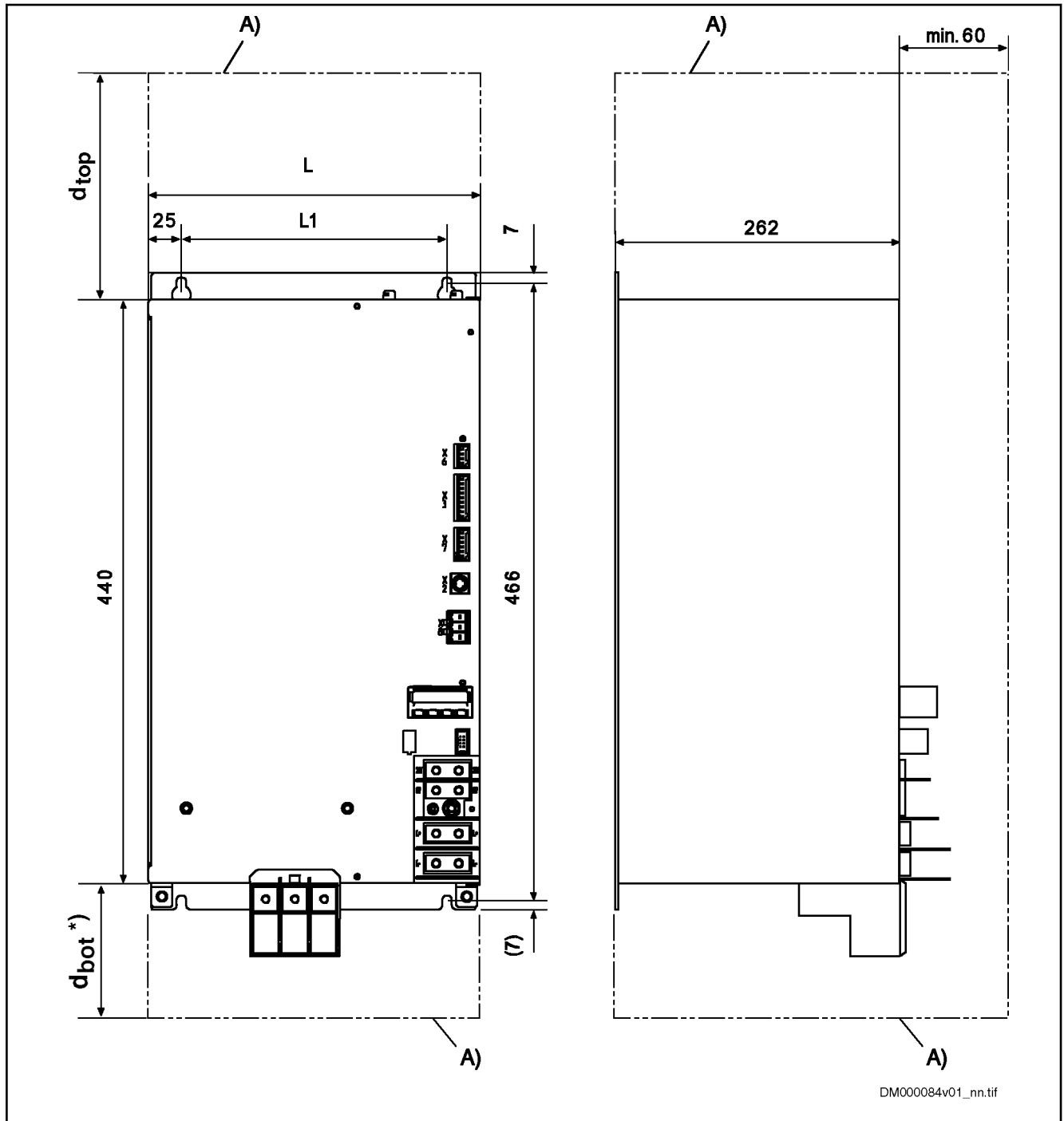
Applied standards

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|---|--------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Listing in accordance with UL standard | | | UL 508C | | | |
| UL files | | | E134201 | | | |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 | | | |
| Latest amendment: 2017-01-20 | | | | | | |

Tab. 7-20: HMV - Applied standards

Mechanics and mounting

Dimensions



A)
 d_{top} , d_{bot}

*)

Minimum mounting clearance
see chapter "Power dissipation, mounting position, cooling, distances"
plus additional space for mains connection cable (the required space depends on the minimum bending radius of the connected mains connection cable)

Fig. 7-13:

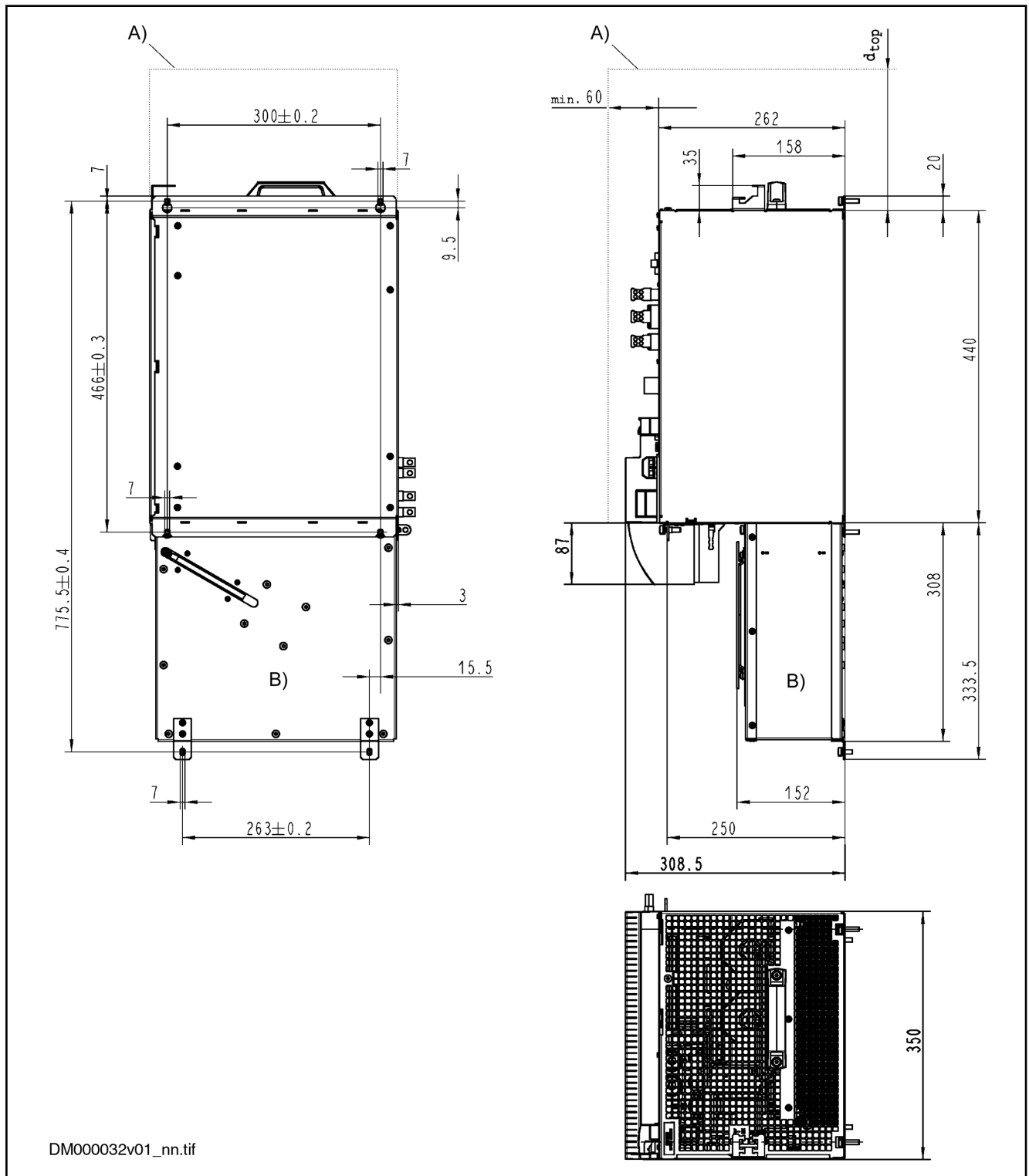
Dimensions

| Device | L
[mm] | L1
[mm] |
|-------------------|-----------|------------|
| HMV01.1R-W0018 | 175 | 125 |
| HMV01.1R-W0045 | 250 | 200 |
| HMV01.1R-W0065 | 350 | 300 |
| HMV01.1R-W0120 *) | 350 | 300 |

*) See also fig. 7-14 "Dimensional drawing HMV01.1R-W0120
with external HAB01 fan unit" on page 223

Tab. 7-21: Dimensions

Dimensional drawing HMV01.1R-W0120 with external HAB01 fan unit



- A) Minimum mounting clearance
 B) HAB01 fan unit (notes on data and mounting: see index entry
 "HAB01 → Data", "HAB01 → Mounting")
 d_{top} see index entry "HMV01.1R → Cooling"

Fig. 7-14:

Dimensional drawing HMV01.1R-W0120 with external HAB01 fan unit

HAB01 fan unit

Type code

| |
|---------------------|
| Short text column → | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 2 |
| Example: | H | A | B | 0 | 1 | . | 1 | - | 0 | 3 | 5 | 0 | - | 1 | 6 | 4 | 0 | - | N | N | |

Product
HAB = HAB

Series
01..... = 01

Design
1 = 1

Device width
350 mm..... = 0350

Volume flow
1640 m³ / h = 1640

Other design
None..... = NN

DT000084v01_en.FH11

Fig. 7-15: Type code

| | | |
|------|----------------------|--|
| Data | Use | HAB01 cools <ul style="list-style-type: none">• HMDV01.1R-W0120 supply units• HMS01.1N-W0350 power sections |
| | Complete designation | HAB01.1-0350-1640-NN |
| | Flow rate | 1,640 m³/h |
| | Weight | 7.5 kg |
| | Supply voltage | 24 V |
| | Current consumption | 6.5 A |
| | Power consumption | 155 W |
| | Dimensions | See dimensional drawing |

Tab. 7-22: HAB01 Fan Unit - Data

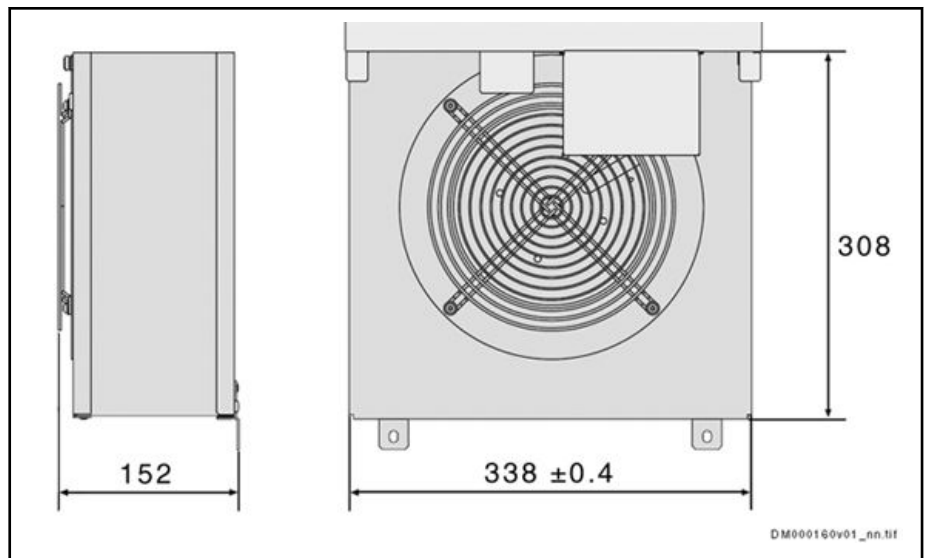
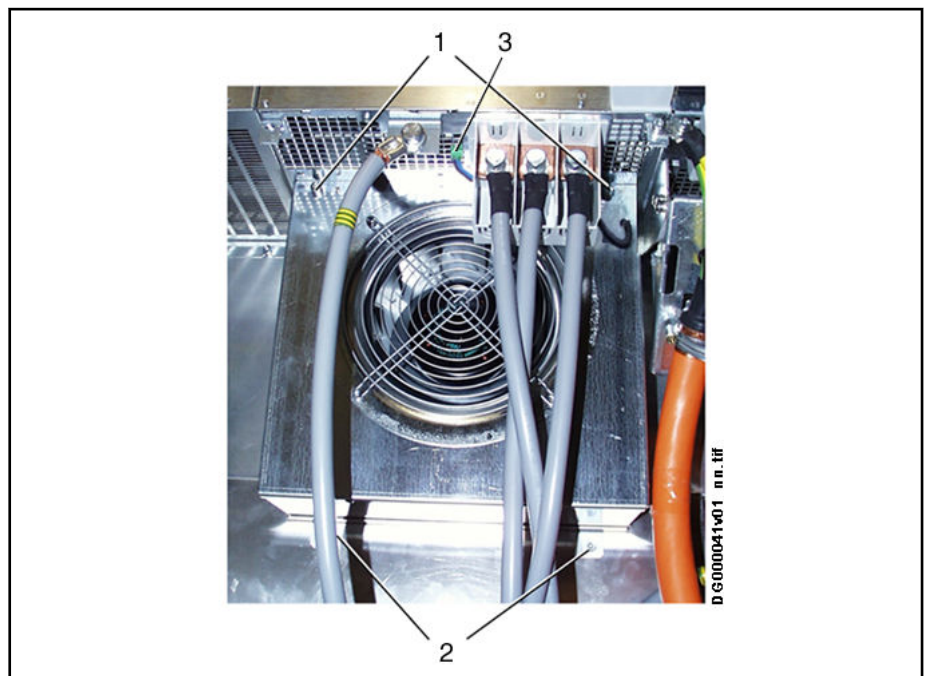


Fig. 7-16: HAB01 Fan Unit - Dimensional Drawing

See also dimensional drawing [HMV01.1R-W0120](#) or [HMS01.1N-W0350](#) in the documentation of the supply units and power sections.

- Mounting**
1. Mount supply unit or power section
 2. Fit HAB01
 3. Screw on bottom of HAB01
 4. Screw on top of HAB01
 5. Connect HAB01 to X13



- 1 Screws to fix HAB01 to supply unit or power section
- 2 Screws to fix HAB01 to mounting plate
- 3 Connection X13 for power supply of HAB01 fan unit

Fig. 7-17: HAB01 Fan Unit - Mounting and Connection

Dimensions, mass, insulation, sound pressure level

Data for mass, sound pressure level, insulation

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN | |
|--|-----------------|--------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----|
| Mass | m | kg | 13.50 | 20.00 | 31.00 | 34.50 | |
| Device height ¹⁾ | H | mm | 440 | | | | |
| Device depth ²⁾ | T | mm | 262 | | | | |
| Device width ³⁾ | B | mm | 175 | 250 | 350 | | |
| Insulation resistance at 500 V DC | R _{is} | Mohm | tbd | | | | |
| Capacitance against housing | C _Y | nF | tbd | | | | |
| Average sound pressure level
(accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | tbd | | | | 80 |
| Latest amendment: 2008-11-20 | | | | | | | |

1) 2) 3) Housing dimension; see also related dimensional drawing
 4) According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 7-23: HMV - Data for mass, sound pressure level, insulation

Power dissipation, mounting position, cooling, distances

Cooling and power dissipation data

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|--|-------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...+40 | | | |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...55 | | | |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2.0 | | | |
| Allowed mounting position | | | G1 | | | |
| Cooling type | | | Forced ventilation | | | |
| Volumetric capacity of forced cooling | V | m³/h | 95.00 | 257.00 | 559.00 | 1400.00 |
| Power dissipation at continuous current and continuous DC bus power respectively ¹⁾ | P _{Diss_cont} | W | 290.00 | 680.00 | 800.00 | 2000.00 |
| Rated power consumption control voltage input at U _{N3} ²⁾ | P _{N3} | W | 31 | 41 | 108 | 224 |
| Latest amendment: 2009-10-22 | | | | | | |

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|---|------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Minimum distance on the top of the device ³⁾ | d _{top} | mm | 300 | | | |
| Minimum distance on the bottom of the device ⁴⁾ | d _{bot} | mm | 130 | | | 334 |
| Temperature increase with minimum distances d _{bot} ; d _{top} ; P _{BD} | ΔT | K | 65 | | | |
| Latest amendment: 2009-10-22 | | | | | | |

- 1) Plus dissipation of braking resistor and control section
 2) See information on "Rated power consumption control voltage input at U_{N3} "
 3) 4) See fig. "Air intake and air outlet at device"

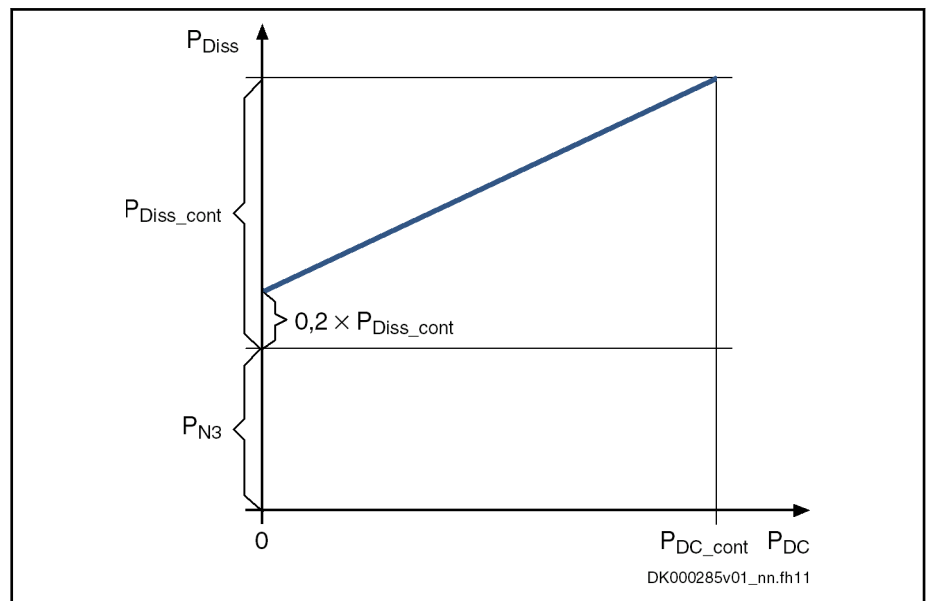
Tab. 7-24: HMV - Data for cooling and power dissipation

Power dissipation vs. output power

Due to their operating principle, regenerative supply units generate power dissipation even if they do not supply power at the DC bus.

The power dissipation in the working point $P_{DC_cont} = 0$ kW is approx. $P_{N3} + 0.2 \times P_{Diss_cont}$

For other working points, it is possible to interpolate with the figure below.



P_{Diss_cont}

Power dissipation at P_{DC_cont}

P_{N3}

Power consumption of control voltage

Fig. 7-18:

Power Dissipation vs. Output Power

Distances

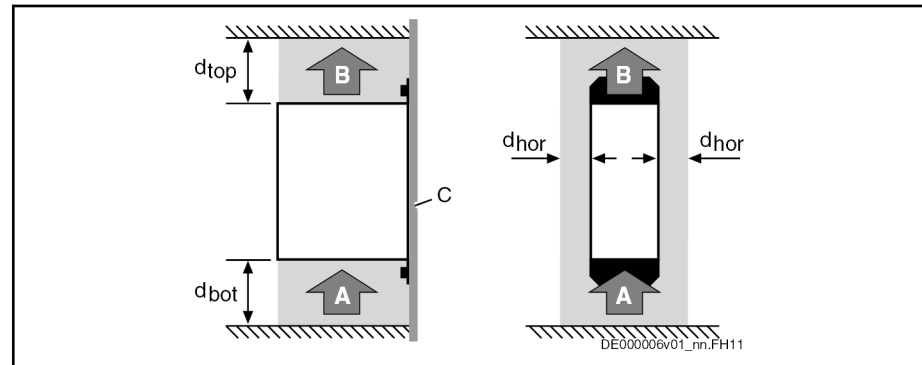
NOTICE

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



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

Fig. 7-19: Air intake and air outlet at device

Basic data of HMV01 supply unit, regenerative

General information

This chapter contains data with regard to:

- Control voltage supply
- Mains voltage supply
- DC bus
- Integrated braking resistor or requirements on an external braking resistor
- Cooling and power dissipation



The order of the data tables below follows the energy flow in the drive controller - from mains connection to DC bus output.

Control voltage

Control voltage supply data

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|--|-----------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Control voltage input ¹⁾ | U_{N3} | V | 24 ± 5 % | | | |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U_{N3} | V | 24 ± 5 % | | | |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U_{N3} | V | 26 ± 5 % | | | |
| Max. inrush current at 24 V supply | I_{EIN3_max} | A | 5.50 | 7.00 | 7.50 | 13.00 |
| Pulse width of I_{EIN3} | $t_{EIN3Lade}$ | ms | 15 | | | 2000 |
| Input capacitance | C_{N3} | mF | 10.00 | | | 1.00 |
| Rated power consumption control voltage input at U_{N3} ⁴⁾ | P_{N3} | W | 31 | 41 | 108 | 224 |
| Latest amendment: 2008-11-20 | | | | | | |

1) 2) 3)
4)

Observe supply voltage for motor holding brake
See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 7-25: HMV - Control voltage supply data

Mains voltage

Mains voltage supply data

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|--|----------------------|-------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Mains frequency | f _{LN} | Hz | 50...60 | | | |
| Tolerance input frequency | | Hz | ± 2 | | | |
| Maximum allowed mains frequency change | Δf _{LN} /Δt | Hz/s | 1 | | | |
| Rotary field condition | | | None | | | |
| Short circuit current rating | SCCR | A rms | 42000 | | | |
| Nominal mains voltage | U _{LN_nenn} | V | 3 AC 400 | | | |
| Three-phase mains voltage at TN-S, TN-C, TT mains | U _{LN} | V | 380...480 | | | |
| Mains voltage, three-phase at IT mains ¹⁾ | U _{LN} | V | 200...230 | | | |
| Latest amendment: 2014-08-05 | | | | | | |

IndraDrive M supply units

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|---|------------------------|------|---|---|---|-----------------------------------|
| Mains voltage, three-phase at Corner-grounded-Delta mains ²⁾ | U_{LN} | V | 200...230 | | | |
| Tolerance rated input voltage U_{LN} | | % | ±10 | | | |
| Minimum inductance of mains supply (mains phase inductance) ³⁾ | L_{min} | μH | 40 | | | |
| Assigned type of mains choke | | | HNL01.1R-09
80-C0026-
A-480;
HNL01.1R-42
00-S0026-
A-480 | HNL01.1R-05
90-C0065-
A-480;
HNL01.1R-63
00-S0065-
A-480 | HNL01.1R-05
40-C0094-
A-480;
HNL01.1R-30
00-S0094-
A-480 | HNL01.1R-03
00-C0180-
A-480 |
| Assigned type of mains filter | | | | | | |
| Minimum short circuit power of the mains for failure-free operation | $S_{k,min}$ | MVA | 1.9 | 4.7 | 6.8 | 13.2 |
| Inrush current | $I_{L,trans_max_on}$ | A | 40.00 | 94.00 | 150.00 | I LN |
| Maximum allowed ON-OFF cycles per minute ⁴⁾ | | | 1 | | | |
| Power factor TPF (λ_L) at P_{DC_cont} with mains choke; U_{LN_nenn} | TPF | | 0.99 | | | |
| Power factor of fundam. component DPF at P_{DC_cont} with mains choke | $\cos\phi^{h1}$ | | 0.99 | | | |
| Mains connection power at P_{DC_cont} ; U_{LN_nenn} with mains choke | S_{LN} | kVA | 19.00 | 47.00 | 68.00 | 132.00 |
| Rated input current | I_{LN} | A | 26.0 | 65.0 | 94.0 | 181.0 |
| Nominal current AC1 for mains contactor at nom. data | | | Integrated mains contactor | | | |
| Mains fuse according to EN 60204-1 | | A | 35 | 80 | 100 | 250 |
| Required wire size in accordance with NFPA 79 and UL 508 A (internal wiring); ⁵⁾ | A_{LN} | AWG | 10 AWG | 6 AWG | 3 AWG | 3/0 AWG |
| Latest amendment: 2014-08-05 | | | | | | |

1) 2)

Mains voltage > U_{LN} : Use a transformer with grounded neutral point, do not use autotransformers!

3)

Otherwise use HNL mains choke

4)

Observe allowed number of switch-on processes; without external capacitors at the DC bus

5)

Copper wire; PVC-insulation (conductor temperature 90 °C; $T_a \leq 40$ °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 7-26:

HMV - Mains voltage supply data

Supply unit - DC bus

Supply unit data - DC bus

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|--|---------------------------|------|---|----------------------------------|----------------------------------|----------------------------------|
| Nominal value of regulated DC bus voltage ¹⁾ | U _{DC_nenn} | V | 750 | | | |
| Capacitance in DC bus | C _{DC} | mF | 0.70 | 1.88 | 2.82 | 4.95 |
| DC resistance in DC bus (L+ to L-) | R _{DC} | kohm | approx. 67 | approx. 28 | approx. 14 | approx. 46 |
| Rated power (t > 10 min) at f _s = 4 kHz; U _{LN_nenn} ; control factor a ₀ > 0.8; with mains choke | P _{DC_cont} | kW | 18.00 | 45.00 | 65.00 | 120.00 |
| P _{DC_cont} and P _{DC_max} vs. mains input voltage; U _{LN} ≤ U _{LN_nenn} | | %/V | PDC_cont (ULN) = PDC_cont x [1 - (400-ULN) x 0.0025] | | | |
| P _{DC_cont} and P _{DC_max} vs. mains input voltage; U _{LN} > U _{LN_nenn} | | %/V | PDC_cont | | | |
| Maximum allowed DC bus power at U _{LN_nenn} ; with mains choke | P _{DC_max} | kW | 45.00 | 112.00 | 162.00 | 180.00 |
| Monitoring value maximum DC bus voltage, switch-off threshold | U _{DC_limit_max} | V | 900, see also Troubleshooting Guide for E8025, F2817 | | | |
| Monitoring value minimum DC bus voltage, undervoltage threshold | U _{DC_limit_min} | V | 1.06 x ULN; see also Troubleshooting Guide for E2026, F2026 | | | |
| Allowed external DC bus capacitance (nom.) at U _{LN_nenn} ²⁾ | C _{DCext} | mF | 150.00 | | | |
| Charging time for maximum external DC bus capacitance C _{DCext} at U _{LN_nenn} | t _{lade_DC_Cext} | s | 90.00 | | | |
| Latest amendment: 2008-11-20 | | | | | | |

1) Only devices with regulated DC bus

2) Use assigned mains choke

Tab. 7-27: HMV - Supply unit data - DC bus

Supply units FNN2

In the following aspects, HMV0x.1R-W0***-A-07-FNN2 (Smart Energy Mode) supply units differ from HMV0x.1R-W0***-A-07-NNNN supply units:

- The **mains-side maximum power** is reduced to the 1.1-fold rated power (P_{DC_cont})
- The **maximum allowed DC bus power** (P_{DC_max}) is available when sufficient additional capacitance is available

Integrated braking resistor



HMV01.1R-W0120 supply units do not have an integrated braking resistor.

Integrated braking resistor data

| Description | Symbol | Unit | HMV01.1R-W0018-A-07-NNNN | HMV01.1R-W0045-A-07-NNNN | HMV01.1R-W0065-A-07-NNNN |
|---|-------------------------|------|--------------------------|--------------------------|--------------------------|
| Braking resistor continuous power | P _{BD} | kW | 0.40 | | |
| Braking resistor peak power | P _{BS} | kW | 36.00 | 90.00 | 130.00 |
| Nominal braking resistance | R _{DC_Bleeder} | ohm | 19 | 8 | 5 |
| Braking resistor switch-on threshold - independent of mains voltage ¹⁾ | U _{R_DC_On_f} | V | 820; see also X32 | | |
| Regenerative power to be absorbed | W _{R_max} | kWs | 80.00 | 100.00 | 150.00 |
| Cooling of integrated braking resistor | | | Forced | | |
| Latest amendment: 2008-11-20 | | | | | |

1) Factory setting

Tab. 7-28: HMV - Integrated braking resistor data

Exemplary data for applications

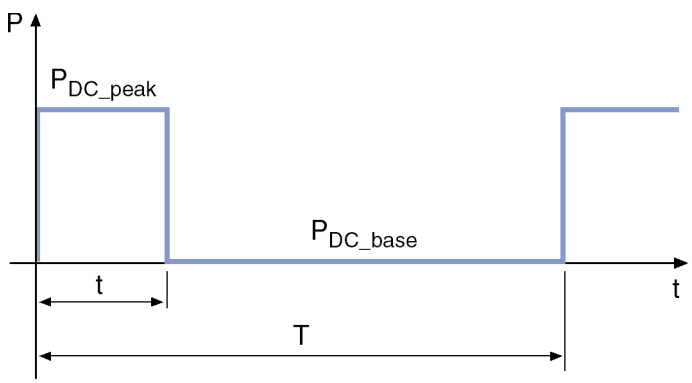
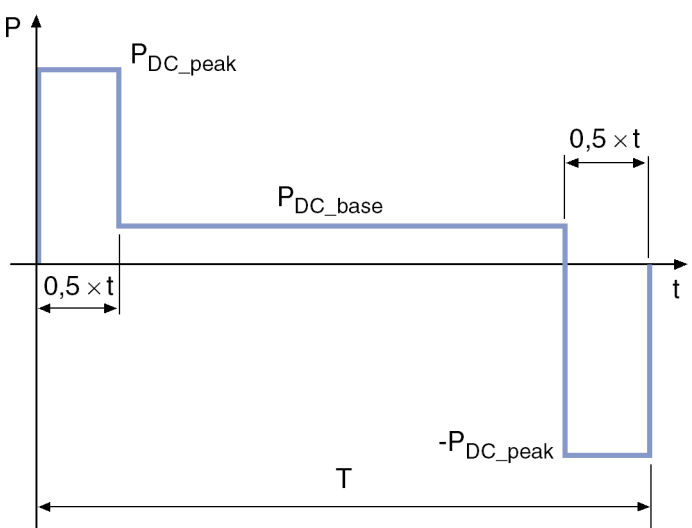
General information

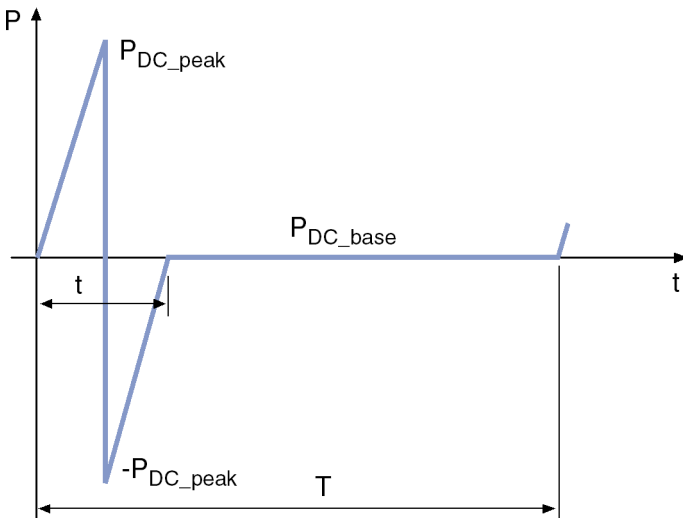
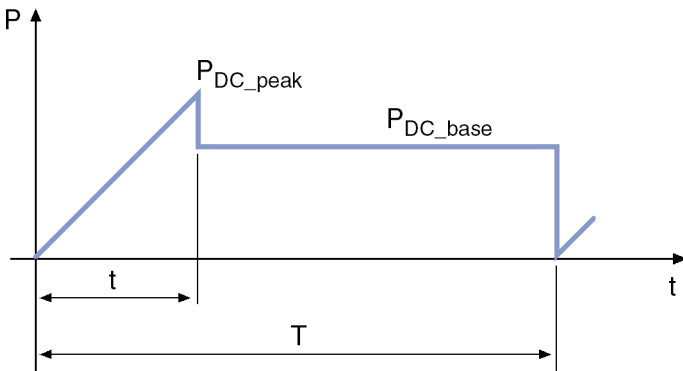
This chapter contains examples of allowed performance profiles.

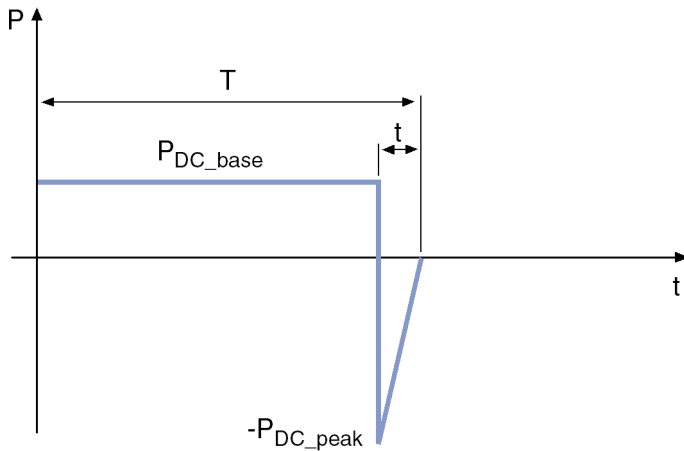
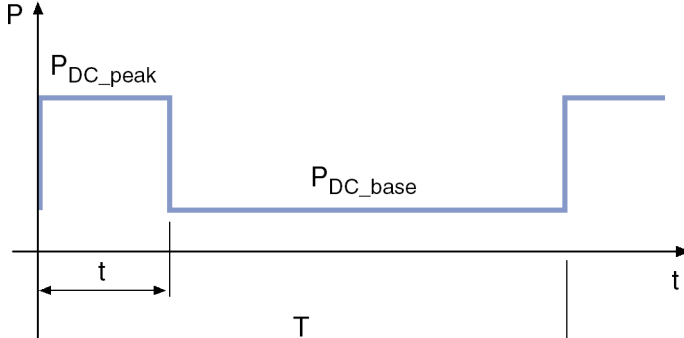
Performance profiles

Performance profiles of regenerative supply units

The following profiles have been defined for regenerative supply units.

| Profile | Explanation |
|--|---|
| <p>performance profile "WZM_HS_KB_e"</p>  <p>DK000155v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of applications in machine tools, short-time operation of the main spindle.</p> |
| <p>performance profile "WZM_HS_Fr_r"</p>  <p>DK000150v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select regenerative supply units.</p> <p>Characteristic of main spindles in milling machines.</p> |

| Profile | Explanation |
|---|---|
| <p>performance profile "WZM_SA_acc_r"</p>  <p>DK000151v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select regenerative supply units.</p> <p>Characteristic of servo drives at machine tools.</p> |
| <p>performance profile "DRM_S1_acc_e"</p>  <p>DK000152v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of starting and operation at printing machines.</p> |

| Profile | Explanation |
|--|--|
| <p>performance profile "DRM_S1_acc_r"</p>  <p>DK000153v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select regenerative supply units.</p> <p>Characteristic of deceleration at printing machines.</p> |
| <p>performance profile "UEL_P_e"</p>  <p>DK000135v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of applications using standard motors in overload operation.</p> |

Tab. 7-29: Definitions of performance profiles, regenerative supply units

Examples of allowed performance profiles, supply units HMV....R

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|---|------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; with mains choke ¹⁾ | $P_{DC_base_1}$
4 | kW | 0 | | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; with mains choke ²⁾ | $P_{DC_peak_1}$
4 | kW | 21.60 | 45.00 | 68.20 | 102.00 |
| DC bus power at U_{LN_nenn} ; $t = 6$ s; $t = 60$ s; with mains choke ³⁾ | $P_{DC_base_1}$
5 | kW | 3.60 | 9.00 | 13.00 | 96.00 |
| maximum DC bus power at U_{LN_nenn} ; $t = 6$ s; $t = 60$ s; with mains choke ⁴⁾ | $P_{DC_peak_1}$
5 | kW | 45.00 | 103.50 | 133.20 | 180.00 |
| Latest amendment: 2008-11-20 | | | | | | |

IndraDrive M supply units

| Description | Symbol | Unit | HMV01.1R-
W0018-A-07-
NNNN | HMV01.1R-
W0045-A-07-
NNNN | HMV01.1R-
W0065-A-07-
NNNN | HMV01.1R-
W0120-A-07-
NNNN |
|---|------------------------|------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| DC bus power at U_{LN_nenn} ; $t = 0.4$ s; $t = 4$ s; with mains choke ⁵⁾ | $P_{DC_base_1}$
6 | kW | 0 | | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 0.4$ s; $t = 4$ s; with mains choke ⁶⁾ | $P_{DC_peak_1}$
6 | kW | 45.00 | 112.50 | 162.50 | 180.00 |
| DC bus power at U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; with mains choke ⁷⁾ | $P_{DC_base_1}$
3 | | | | | |
| maximum DC bus power at U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; with mains choke ⁸⁾ | $P_{DC_peak_1}$
3 | | | | | |
| DC bus power at U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; with mains choke ⁹⁾ | $P_{DC_base_1}$
7 | kW | 16.20 | 40.50 | 58.50 | 108.00 |
| maximum DC bus power at U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; with mains choke ¹⁰⁾ | $P_{DC_peak_1}$
7 | kW | 32.40 | 63.00 | 97.50 | 168.00 |
| Latest amendment: 2008-11-20 | | | | | | |

1) 2)

See WZM_HS_KB_e profile definition

3) 4)

See WZM_HS_Fr_r profile definition

5) 6)

See WZM_SA_acc_r profile definition

7) 8)

See DRM_S1_acc_e profile definition

9) 10)

See DRM_S1_acc_r profile definition

Tab. 7-30:

HMV....R - Examples of allowed performance profiles

7.3.5 Connections and interfaces

Overall connection diagram HMV01.1R-W0018, -W0045, -W0065

HMV01.1R-W0018; -W0045; -W0065

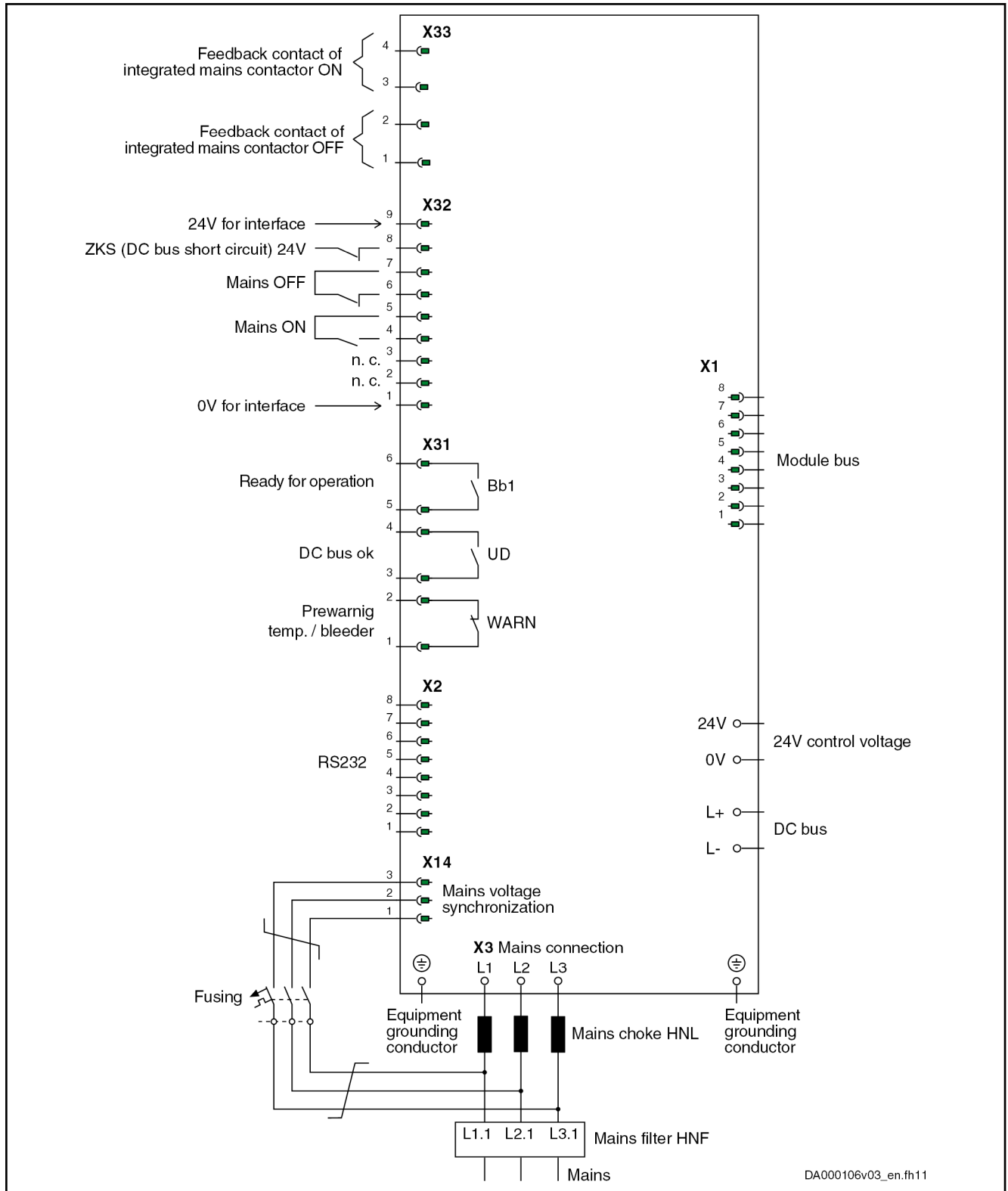


Fig. 7-20: Connection Diagram HMV01.1R-W0018; -W0045; -W0065

Overall connection diagram HMD01.1R-W0120

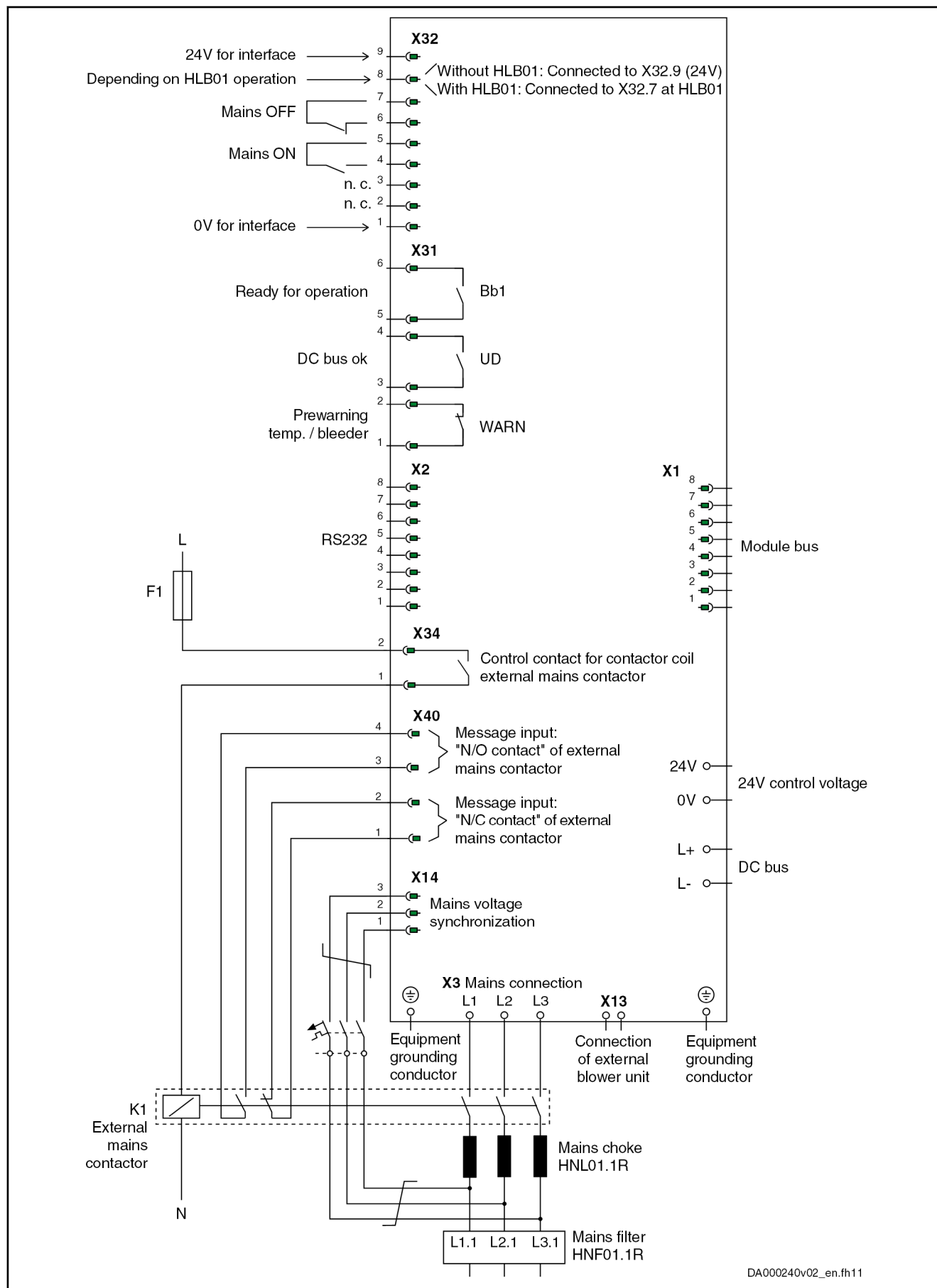


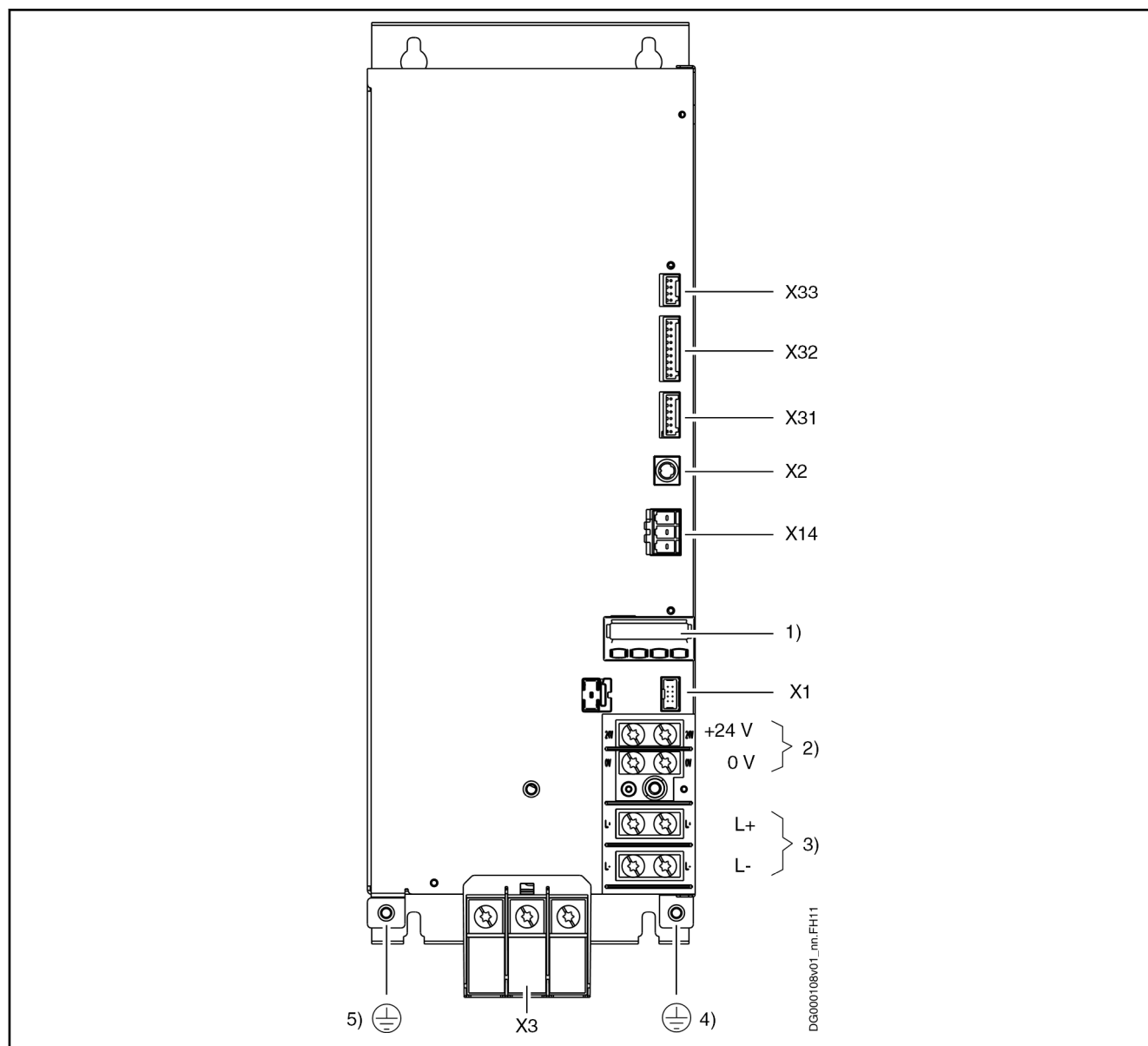
Fig. 7-21: Connection diagram HMD01.1R-W0120

Connection diagram with HLB01

 For connection diagrams with HLB01 and control circuits for the mains connection, see the documentation "Rexroth IndraDrive Drive Systems with HMV01/02, HMS01/02, HMD01, HCS02/03" (index entry "Mains connection → Control circuits").

Arrangement of the connection points

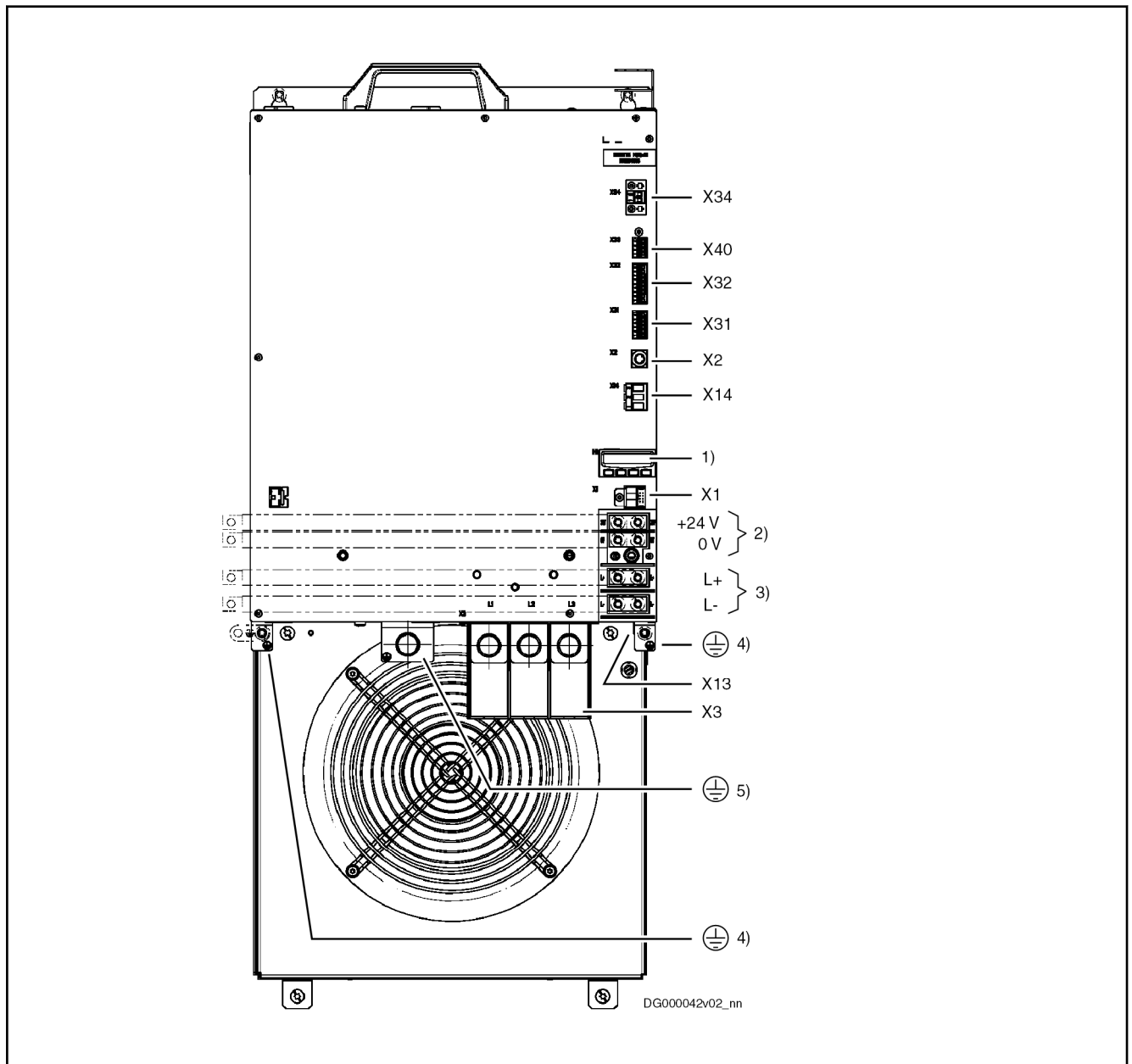
Connections HMV01.1R-W0018, -W0045, -W0065



| | |
|------------|--|
| X33 | Acknowledgment messages of mains contactor |
| X32 | Mains contactor control and DC bus short circuit (ZKS) |
| X31 | Connection for messages |
| X2 | RS232 |
| X14 | Mains voltage synchronization |
| X3 | Mains connection |
| X1 | Module bus |
| 1) | Control panel |
| 2) | Control voltage |
| 3) | DC bus |
| 4) | Connection point of equipment grounding conductor (with joint bar to neighboring device) |
| 5) | Connection point of equipment grounding conductor (mains) |

Fig. 7-22: Connections HMV01.1R-W0018, -W0045, -W0065

Connections HMV01.1R-W0120



| | |
|------------|--|
| X34 | Contact for external mains contactor |
| X40 | Acknowledgment messages of mains contactor |
| X32 | Mains contactor control and DC bus short circuit (ZKS) |
| X31 | Connection for messages |
| X2 | RS232 |
| X14 | Mains voltage synchronization |
| X13 | Voltage connection for fan unit |
| X3 | Mains connection |
| X1 | Module bus |
| 1) | Control panel |
| 2) | Control voltage |
| 3) | DC bus |
| 4) | Connection point of equipment grounding conductor (with joint bar to neighboring device) |

- 5) Connection point of equipment grounding conductor (mains)
Fig. 7-23: Connections HMV01.1R-W0120



Connect **HMV01.1R-W0120** supply units to the mains via an **external mains contactor**. The **X40** connection receives the message signals on the state of the external mains contactor (see also index entry "**X40** → [acknowledgment messages of external mains contactor](#)").

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 261.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 325.

7.4 HMV02.1R-Wxxxx supply units, regenerative

7.4.1 Brief description, use and design

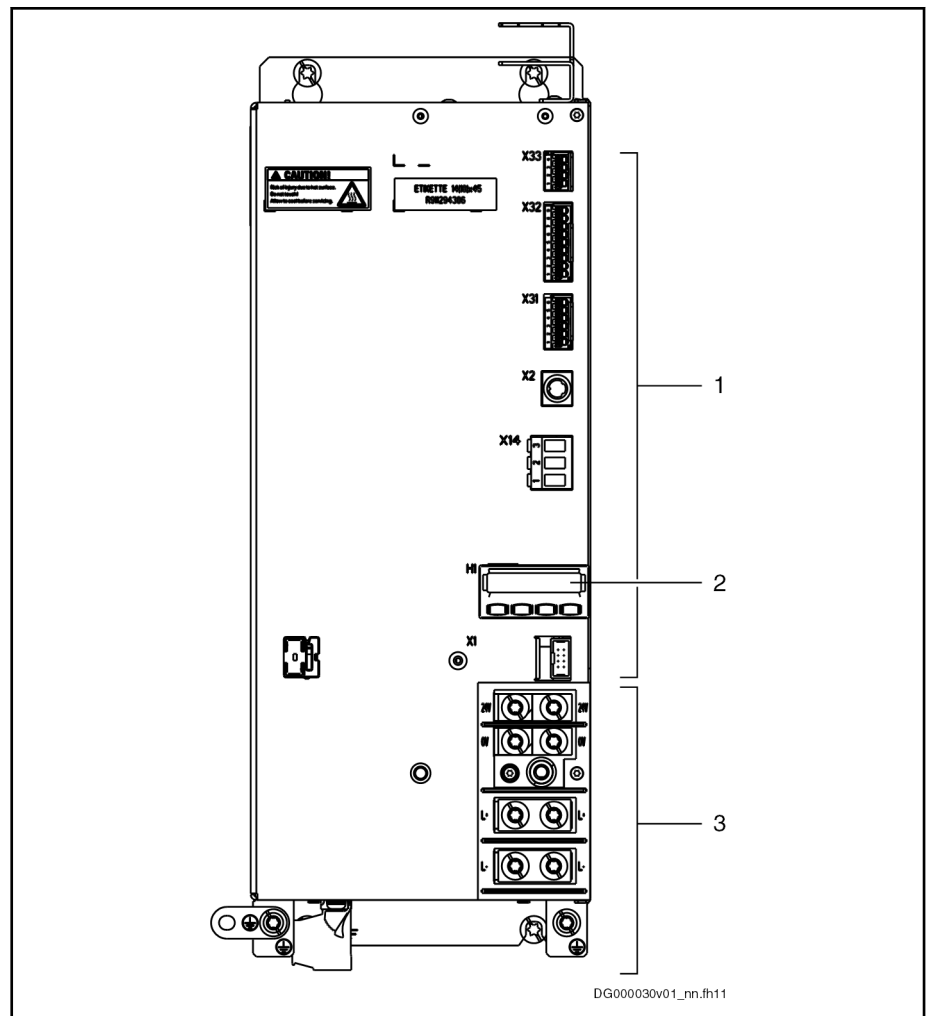
Brief description HMV supply units supply modular HMS and HMD devices.

Use The different types can be used as follows:

| Type | Use |
|----------|--|
| HMV02.1R | Regenerative, air-cooled
To supply HMS02.1-Wxxxx drive controllers |

Tab. 7-31: Use of supply units

Design



- 1 Interfaces for signal processing
 - 2 Control panel
 - 3 Power connections incl. control voltage
- Fig. 7-24: Basic design

7.4.2 Type code and identification

Type code



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

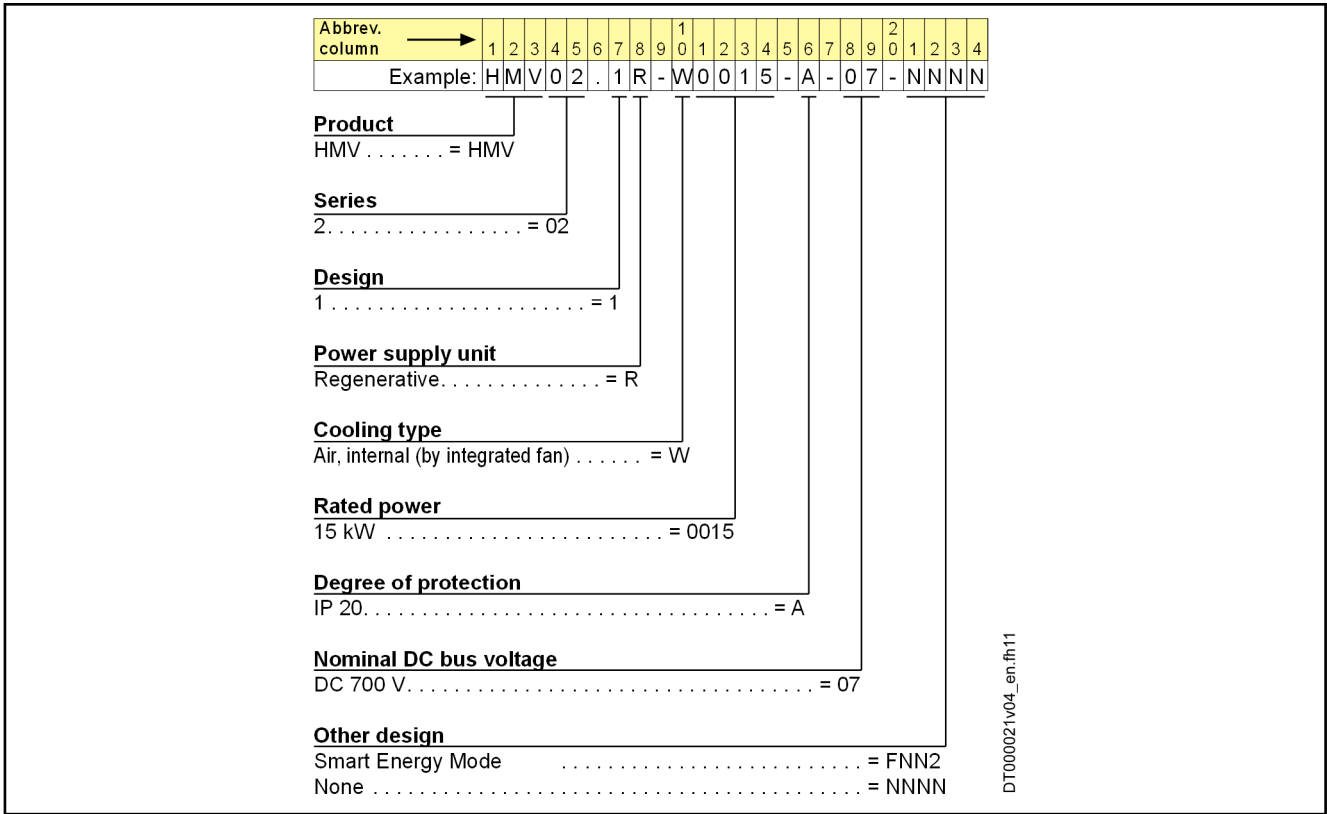


Fig. 7-25: Type code

Identification

Type plate arrangement

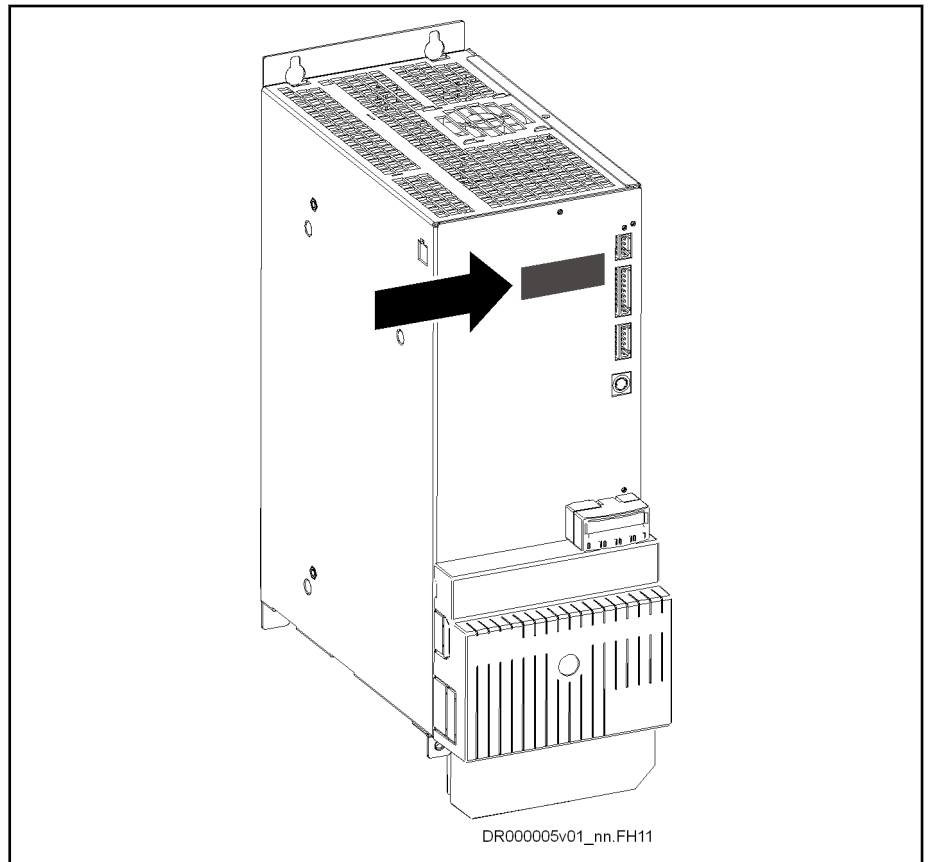


Fig. 7-26: Type plate at device

Type plate



- | | |
|---|---|
| 1 | Type designation |
| 2 | Country of manufacture |
| 3 | Factory |
| 4 | Customer material number |
| 5 | Material number |
| 6 | Bar code, 2D code |
| 7 | Serial number |
| 8 | Production week; 18W23, for example, means year 2018, week 23 |
| 9 | Hardware index |

Fig. 7-27: Type plate (electrical equipment)

7.4.3 Scope of supply

- 1 × touch guard
- 1 × joint bar to connect the equipment grounding conductor to a neighboring device
- Connectors for the electrical connection points at the device
- 1 × standard control panel each

- 1 × Instruction Manual (in the English language)

7.4.4 Technical data HMV02.1R

Ambient and operating conditions

General information

Conditions for [transport](#) and [storage](#): See [chapter 4.2 "Transport and storage"](#) on page 23.

Installation conditions: See [chapter 4.3 "Installation conditions"](#) on page 24.

This chapter contains:

- Limit values for use in the scope of CSA / UL
- Applied standards (CE conformity, UL listing)

UL ratings

Ambient and operating conditions - UL ratings

| Description | Symbol | Unit | HMV02.1R-W0015 |
|--|----------------------|-------|------------------|
| Short circuit current rating | SCCR | A rms | 42000 |
| Rated input voltage, power ¹⁾ | U _{LN_nenn} | V | 3 x AC 380...480 |
| Rated input current | I _{LN} | A | 23.0 |
| Output voltage | U _{out} | V | DC 750 |
| Output current | I _{out} | A | 20.0 |
| Latest amendment: 2014-08-05 | | | |

1) Mains input L1, L2, L3 (for HMV and HCS only); For use on a solidly grounded wye source only.

Tab. 7-32: HMV - Ambient and operating conditions - UL ratings

Applied standards

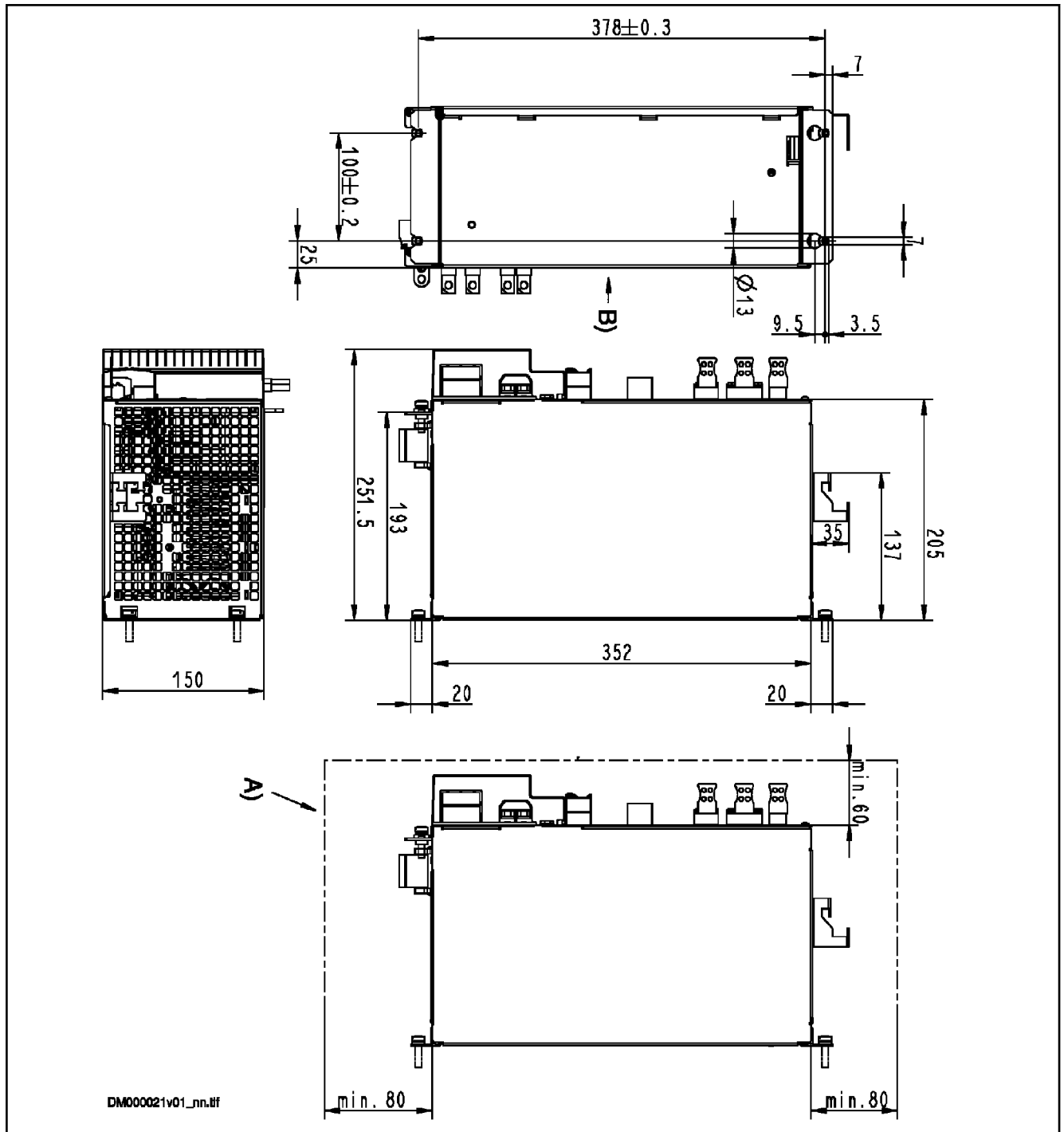
| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|--------|------|------------------|
| Listing in accordance with UL standard | | | UL 508C |
| UL files | | | E134201 |
| Listing in accordance with CSA standard | | | C22.2 No. 274-13 |
| Latest amendment: 2017-01-20 | | | |

Tab. 7-33: HMV - Applied standards

Mechanics and mounting

Dimensions

HMV02.1R-W0015



- A** Minimum mounting clearance (plus additional space for mains connection cable [the required space depends on the minimum bending radius of the connected mains connection cable])
- B** Rear view!

Fig. 7-28: Dimensional drawing HMV02.1R-W0015

Dimensions, mass, insulation, sound pressure level**Data for mass, dimensions, sound pressure level, insulation**

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|-----------------|--------|----------------|
| Mass | m | kg | 9.50 |
| Device height ¹⁾ | H | mm | 352 |
| Device depth ²⁾ | T | mm | 205 |
| Device width ³⁾ | B | mm | 150 |
| Insulation resistance at 500 V DC | R _{is} | Mohm | 5.00 |
| Capacitance against housing | C _Y | nF | 2x 470 |
| Average sound pressure level (accuracy class 2) at P _{DC_cont} ⁴⁾ | L _P | dB (A) | 75 |
| Latest amendment: 2007-01-02 | | | |

1) 2) 3) Housing dimension; see also related dimensional drawing
 4) According to DIN EN ISO 11205; comparative value at 1 m distance, out of cabinet; HCS types in -L*** design: load-dependent

Tab. 7-34: HMV - Data for mass, dimensions, sound pressure level, insulation

Power dissipation, mounting position, cooling, distances**Cooling and power dissipation data**

| Description | Symbol | Unit | HMV02.1R-W0015 |
|--|-------------------------|------|--------------------|
| Ambient temperature range for operation with nominal data | T _{a_work} | °C | 0...+40 |
| Ambient temperature range for operation with reduced nominal data | T _{a_work_red} | °C | 0...55 |
| Derating of P _{DC_cont} ; P _{BD} ; I _{out_cont} when T _{a_work} < T _a < T _{a_work_red} | f _{Ta} | %/K | 2.7 |
| Allowed mounting position | | | G1 |
| Cooling type | | | Forced ventilation |
| Volumetric capacity of forced cooling | V | m³/h | 115.00 |
| Power dissipation at continuous current and continuous DC bus power respectively ¹⁾ | P _{Diss_cont} | W | 500.00 |
| Rated power consumption control voltage input at U _{N3} ²⁾ | P _{N3} | W | 27 |
| Minimum distance on the top of the device ³⁾ | d _{top} | mm | 80 |
| Latest amendment: 2008-06-30 | | | |

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|------------------|------|----------------|
| Minimum distance on the bottom of the device ⁴⁾ | d_{bot} | mm | 80 |
| Temperature increase with minimum distances d_{bot} ; d_{top} ; P_{BD} | ΔT | K | 65 |
| Latest amendment: 2008-06-30 | | | |

- 1) Plus dissipation of braking resistor and control section
2) See information on "Rated power consumption control voltage input at U_{N3} "

3) 4) See fig. "Air intake and air outlet at device"

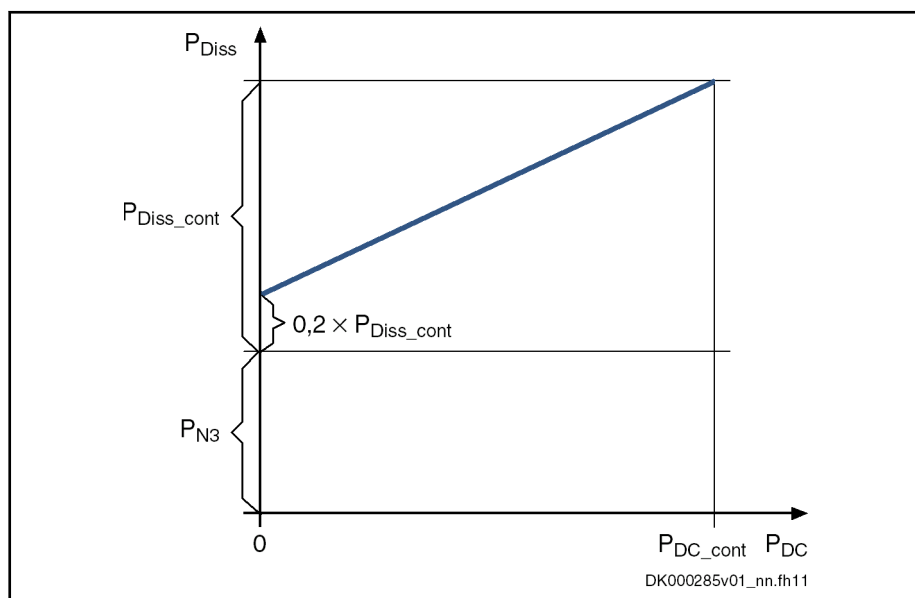
Tab. 7-35: HMV - Data for cooling and power dissipation

Power dissipation vs. output power

Due to their operating principle, regenerative supply units generate power dissipation even if they do not supply power at the DC bus.

The power dissipation in the working point $P_{\text{DC_cont}} = 0$ kW is approx. $P_{N3} + 0.2 \times P_{\text{Diss_cont}}$

For other working points, it is possible to interpolate with the figure below.



$P_{\text{Diss_cont}}$

Power dissipation at $P_{\text{DC_cont}}$

P_{N3}

Power consumption of control voltage

Fig. 7-29: Power Dissipation vs. Output Power

Distances

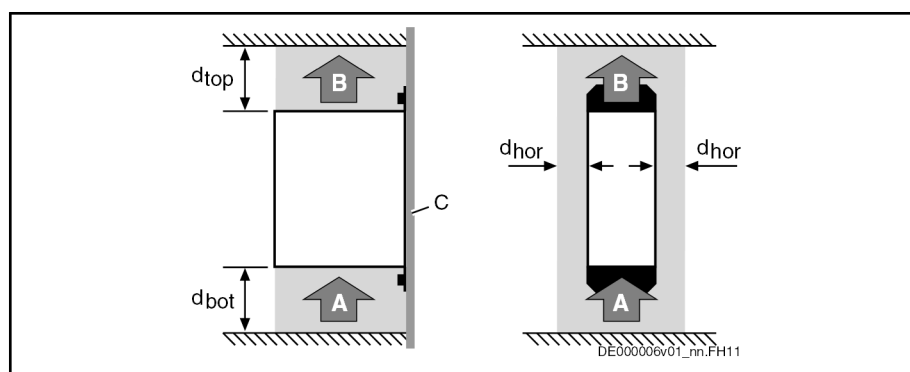
NOTICE

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



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

Fig. 7-30: Air intake and air outlet at device

Basic data of HMV02 supply unit, regenerative

General information

This chapter contains data with regard to:

- Control voltage supply
- Mains voltage supply
- DC bus
- Integrated braking resistor and requirements on an external braking resistor
- Cooling and power dissipation



The order of the data tables below follows the energy flow in the supply unit - from mains connection to DC bus output.

Control voltage

Control voltage supply data

| Description | Symbol | Unit | HMV02.1R-W0015 |
|--|-----------------|------|----------------|
| Control voltage input ¹⁾ | U_{N3} | V | $24 \pm 5 \%$ |
| Control voltage when using motor holding brake with motor cable length less than 50 m (HCS01 less than 40 m) ²⁾ | U_{N3} | V | $24 \pm 5 \%$ |
| Control voltage when using motor holding brake with motor cable length more than 50 m (HCS01 more than 40 m) ³⁾ | U_{N3} | V | $26 \pm 5 \%$ |
| Max. inrush current at 24 V supply | I_{EIN3_max} | A | 5.50 |
| Pulse width of I_{EIN3} | $t_{EIN3Lade}$ | ms | 15 |
| Latest amendment: 2007-01-02 | | | |

| Description | Symbol | Unit | HMV02.1R-W0015 |
|--|----------|------|----------------|
| Input capacitance | C_{N3} | mF | 10.00 |
| Rated power consumption control voltage input at $U_{N3}^{4)}$ | P_{N3} | W | 27 |
| Latest amendment: 2007-01-02 | | | |

1) 2) 3)
4)

Observe supply voltage for motor holding brake
See information on "Rated power consumption control voltage input at U_{N3} "

Tab. 7-36: HMV - Control voltage supply data

Mains voltage

Mains voltage supply data

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|--------------------------|---------|---------------------------|
| Mains frequency | f_{LN} | Hz | 50...60 |
| Tolerance input frequency | | Hz | ± 2 |
| Maximum allowed mains frequency change | $\Delta f_{LN}/\Delta t$ | Hz/s | 1 |
| Rotary field condition | | | None |
| Short circuit current rating | SCCR | A rms | 42000 |
| Nominal mains voltage | U_{LN_nenn} | V | 3 AC 400 |
| Three-phase mains voltage at TN-S, TN-C, TT mains | U_{LN} | V | 380...480 |
| Mains voltage, three-phase at IT mains ¹⁾ | U_{LN} | V | 200...230 |
| Mains voltage, three-phase at Corner-grounded-Delta mains ²⁾ | U_{LN} | V | 200...230 |
| Tolerance rated input voltage U_{LN} | | % | ± 10 |
| Minimum inductance of mains supply (mains phase inductance) ³⁾ | L_{min} | μH | 50 |
| Assigned type of mains choke | | | HNL02.1R-0980-C0023-A-480 |
| Assigned type of mains filter | | | |
| Minimum short circuit power of the mains for failure-free operation | S_{k_min} | MVA | 1.6 |
| Inrush current | $I_{L_trans_max_on}$ | A | I LN |
| Maximum allowed ON-OFF cycles per minute ⁴⁾ | | | 1 |
| Power factor TPF (λ_L) at P_{DC_cont} with mains choke; U_{LN_nenn} | TPF | | 0.99 |
| Latest amendment: 2014-08-05 | | | |

IndraDrive M supply units

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|-----------------|------|----------------------------|
| Power factor of fundam. component DPF at P_{DC_cont} with mains choke | $\cos\phi^{h1}$ | | 0.99 |
| Mains connection power at P_{DC_cont} ; U_{LN_nenn} with mains choke | S_{LN} | kVA | 15.75 |
| Rated input current | I_{LN} | A | 23.0 |
| Nominal current AC1 for mains contactor at nom. data | | | Integrated mains contactor |
| Mains fuse according to EN 60204-1 | | A | 35 |
| Required wire size in accordance with NFPA 79 and UL 508 A (internal wiring); ⁵⁾ | A_{LN} | AWG | 10 AWG |
| Latest amendment: 2014-08-05 | | | |

- 1) 2) Mains voltage > U_{LN} : Use a transformer with grounded neutral point, do not use autotransformers!
- 3) Otherwise use HNL mains choke
- 4) Observe allowed number of switch-on processes; without external capacitors at the DC bus
- 5) Copper wire; PVC-insulation (conductor temperature 90 °C; $T_a \leq 40$ °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 7-37: HMV - Mains voltage supply data

Supply unit - DC bus**Supply unit data - DC bus**

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|----------------------|------|--|
| Nominal value of regulated DC bus voltage ¹⁾ | U_{DC_nenn} | V | 750 |
| Capacitance in DC bus | C_{DC} | mF | 0.70 |
| DC resistance in DC bus (L+ to L-) | R_{DC} | kohm | approx. 67 |
| Rated power (t > 10 min) at $f_s = 4$ kHz; U_{LN_nenn} ; control factor $a_0 > 0.8$; with mains choke | P_{DC_cont} | kW | 15.00 |
| P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} \leq U_{LN_nenn}$ | | %/V | $PDC_cont (ULN) = PDC_cont \times [1 - (400-ULN) \times 0.0025]$ |
| P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} > U_{LN_nenn}$ | | %/V | PDC_cont |
| Maximum allowed DC bus power at U_{LN_nenn} ; with mains choke | P_{DC_max} | kW | 30.00 |
| Monitoring value maximum DC bus voltage, switch-off threshold | $U_{DC_limit_max}$ | V | 900, see also Troubleshooting Guide for E8025, F2817 |
| Latest amendment: 2007-07-30 | | | |

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|----------------------|------|----------------|
| Monitoring value minimum DC bus voltage, undervoltage threshold | $U_{DC_limit_min}$ | V | 600 |
| Allowed external DC bus capacitance (nom.) at $U_{LN_nenn}^{2)}$ | C_{DCext} | mF | 50.00 |
| Charging time for maximum external DC bus capacitance C_{DCext} at U_{LN_nenn} | $t_{lade_DC_Cext}$ | | |
| Latest amendment: 2007-07-30 | | | |

- 1) Only devices with regulated DC bus
 2) Use assigned mains choke
Tab. 7-38: HMV - Supply unit data - DC bus

Supply units FNN2

In the following aspects, HMV0x.1R-W0***-A-07-FNN2 (Smart Energy Mode) supply units differ from HMV0x.1R-W0***-A-07-NNNN supply units:

- The **mains-side maximum power** is reduced to the 1.1-fold rated power (P_{DC_cont})
- The **maximum allowed DC bus power** (P_{DC_max}) is available when sufficient additional capacitance is available

Braking resistor

Integrated braking resistor data

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|--------------------|------|-------------------|
| Braking resistor continuous power | P_{BD} | kW | 0.30 |
| Braking resistor peak power | P_{BS} | kW | 33.00 |
| Nominal braking resistance | $R_{DC_Bleeder}$ | ohm | 16 |
| Braking resistor switch-on threshold - independent of mains voltage ¹⁾ | $U_{R_DC_On_f}$ | V | 820; see also X32 |
| Regenerative power to be absorbed | W_{R_max} | kWs | 40.00 |
| Cooling of integrated braking resistor | | | Forced |
| Latest amendment: 2007-07-27 | | | |

- 1) Factory setting
Tab. 7-39: HMV - Integrated braking resistor data

Exemplary data for applications

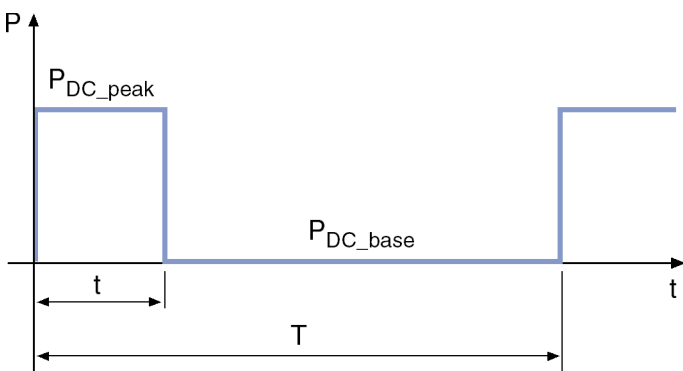
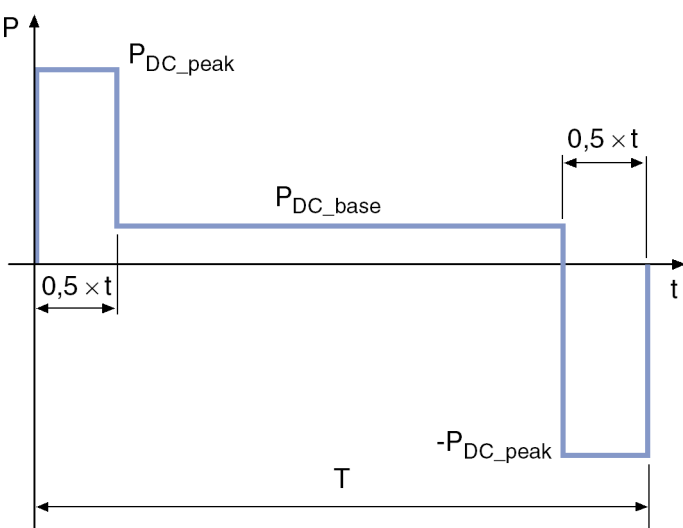
General information

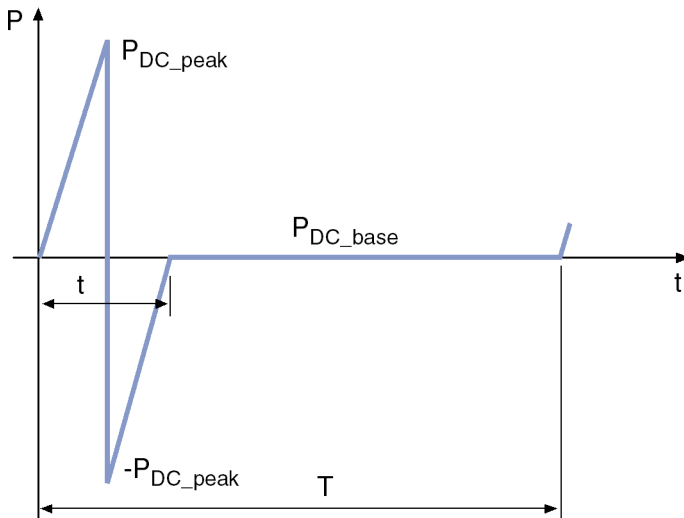
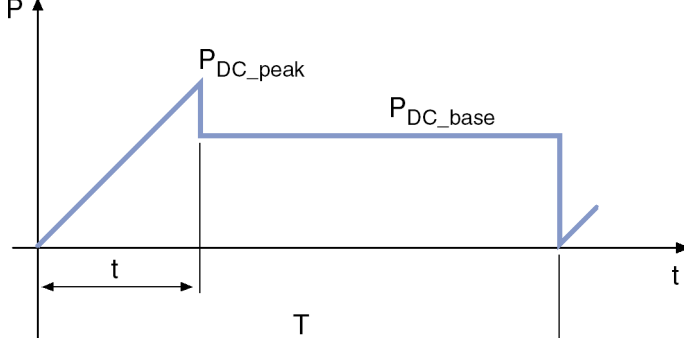
This chapter contains examples of allowed performance profiles.

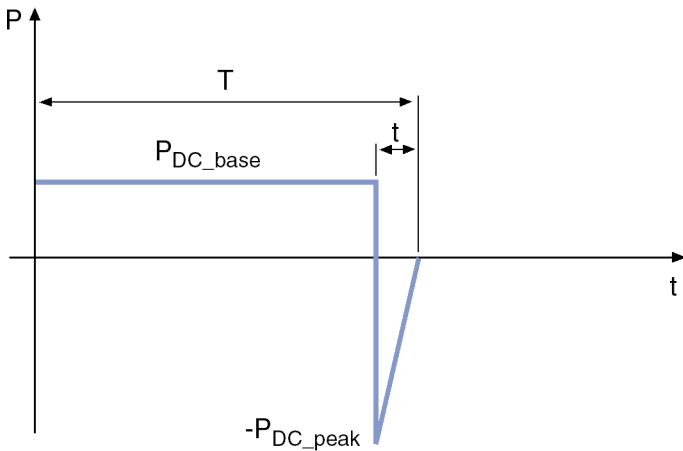
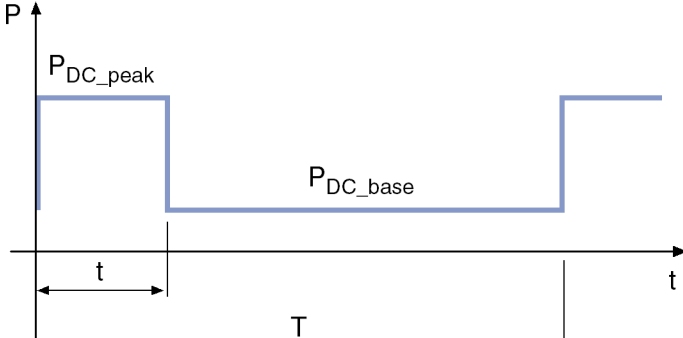
Performance profiles

Performance profiles of regenerative supply units

The following profiles have been defined for regenerative supply units.

| Profile | Explanation |
|--|---|
| <p>performance profile "WZM_HS_KB_e"</p>  <p>DK000155v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of applications in machine tools, short-time operation of the main spindle.</p> |
| <p>performance profile "WZM_HS_Fr_r"</p>  <p>DK000150v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select regenerative supply units.</p> <p>Characteristic of main spindles in milling machines.</p> |

| Profile | Explanation |
|--|---|
| <p>performance profile "WZM_SA_acc_r"</p>  <p>The graph shows power (P) on the vertical axis and time (t) on the horizontal axis. The profile starts at the origin, rises linearly to a peak power P_{DC_peak}, then falls linearly to a negative peak power $-P_{DC_peak}$. It then rises linearly to a base power P_{DC_base} and remains constant for a duration T. The time t is indicated for the initial acceleration phase.</p> <p>DK000151v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select regenerative supply units.</p> <p>Characteristic of servo drives at machine tools.</p> |
| <p>performance profile "DRM_S1_acc_e"</p>  <p>The graph shows power (P) on the vertical axis and time (t) on the horizontal axis. The profile starts at the origin, rises linearly to a peak power P_{DC_peak}, then falls linearly to a base power P_{DC_base} and remains constant for a duration T. The time t is indicated for the initial acceleration phase.</p> <p>DK000152v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of starting and operation at printing machines.</p> |

| Profile | Explanation |
|--|--|
| <p>performance profile "DRM_S1_acc_r"</p>  <p>DK000153v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select regenerative supply units.</p> <p>Characteristic of deceleration at printing machines.</p> |
| <p>performance profile "UEL_P_e"</p>  <p>DK000135v01_nn.fh11</p> | <p>The characteristic data of the profile are used to select infeeding and regenerative supply units.</p> <p>Characteristic of applications using standard motors in overload operation.</p> |

Tab. 7-40: Definitions of performance profiles, regenerative supply units

Examples of allowed performance profiles, supply units HMV....R

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|------------------------|------|----------------|
| DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; with mains choke ¹⁾ | $P_{DC_base_1}$
4 | kW | 0 |
| maximum DC bus power at U_{LN_nenn} ; $t = 132$ s; $T = 300$ s; with mains choke ²⁾ | $P_{DC_peak_1}$
4 | kW | 15.00 |
| DC bus power at U_{LN_nenn} ; $t = 6$ s; $t = 60$ s; with mains choke ³⁾ | $P_{DC_base_1}$
5 | kW | 3.00 |
| maximum DC bus power at U_{LN_nenn} ; $t = 6$ s; $t = 60$ s; with mains choke ⁴⁾ | $P_{DC_peak_1}$
5 | kW | 30.00 |
| Latest amendment: 2007-02-09 | | | |

| Description | Symbol | Unit | HMV02.1R-W0015 |
|---|------------------------|------|----------------|
| DC bus power at U_{LN_nenn} ;
$t = 0.4$ s; $t = 4$ s; with mains
choke ⁵⁾ | $P_{DC_base_1}$
6 | kW | 0 |
| maximum DC bus power at
U_{LN_nenn} ; $t = 0.4$ s; $t = 4$ s; with
mains choke ⁶⁾ | $P_{DC_peak_1}$
6 | kW | 30.00 |
| DC bus power at U_{LN_nenn} ; $t = 60$ s;
$t = 900$ s; with mains choke ⁷⁾ | $P_{DC_base_1}$
7 | kW | 9.00 |
| maximum DC bus power at
U_{LN_nenn} ; $t = 60$ s; $t = 900$ s; with
mains choke ⁸⁾ | $P_{DC_peak_1}$
7 | kW | 15.00 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 0.4$ s;
$T = 4$ s; $K = 2.5$;
$P_{DC_peak} = P_{DC_max}$; with mains
choke ⁹⁾ | $P_{DC_peak_1}$ | kW | 25.00 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 0.4$ s; $T = 4$ s;
$K = 2.5$; $P_{DC_peak} = P_{DC_max}$; with
mains choke ¹⁰⁾ | $P_{DC_base_1}$ | kW | 10.00 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 2$ s;
$T = 20$ s; $K = 2.0$; with mains
choke ¹¹⁾ | $P_{DC_peak_3}$ | kW | 22.00 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 2$ s; $T = 20$ s;
$K = 2.0$; with mains choke ¹²⁾ | $P_{DC_base_3}$ | kW | 11.00 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; with mains choke ¹³⁾ | $P_{DC_peak_4}$ | kW | 16.00 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_work}$; $t = 60$ s; $T = 5$ min;
$K = 1.5$; with mains choke ¹⁴⁾ | $P_{DC_base_4}$ | kW | 10.60 |
| maximum DC bus power at
U_{LN_nenn} ; $T_a \leq T_{a_work}$; $t = 60$ s;
$T = 10$ min; $K = 1.1$; with mains
choke ¹⁵⁾ | $P_{DC_peak_5}$ | kW | 15.00 |
| DC bus power at U_{LN_nenn} ;
$T_a \leq T_{a_max}$; $t = 60$ s; $T = 10$ min;
$K = 1.1$; with mains choke ¹⁶⁾ | $P_{DC_base_5}$ | kW | 13.60 |
| Latest amendment: 2007-02-09 | | | |

1) 2)
3) 4)
5) 6)
7) 8)

See WZM_HS_KB_e profile definition
See WZM_HS_Fr_r profile definition
See WZM_SA_acc_r profile definition
See DRM_S1_acc_r profile definition

9) 10) 11) 12) 13) 14) 15) 16) See UEL_P_e profile definition

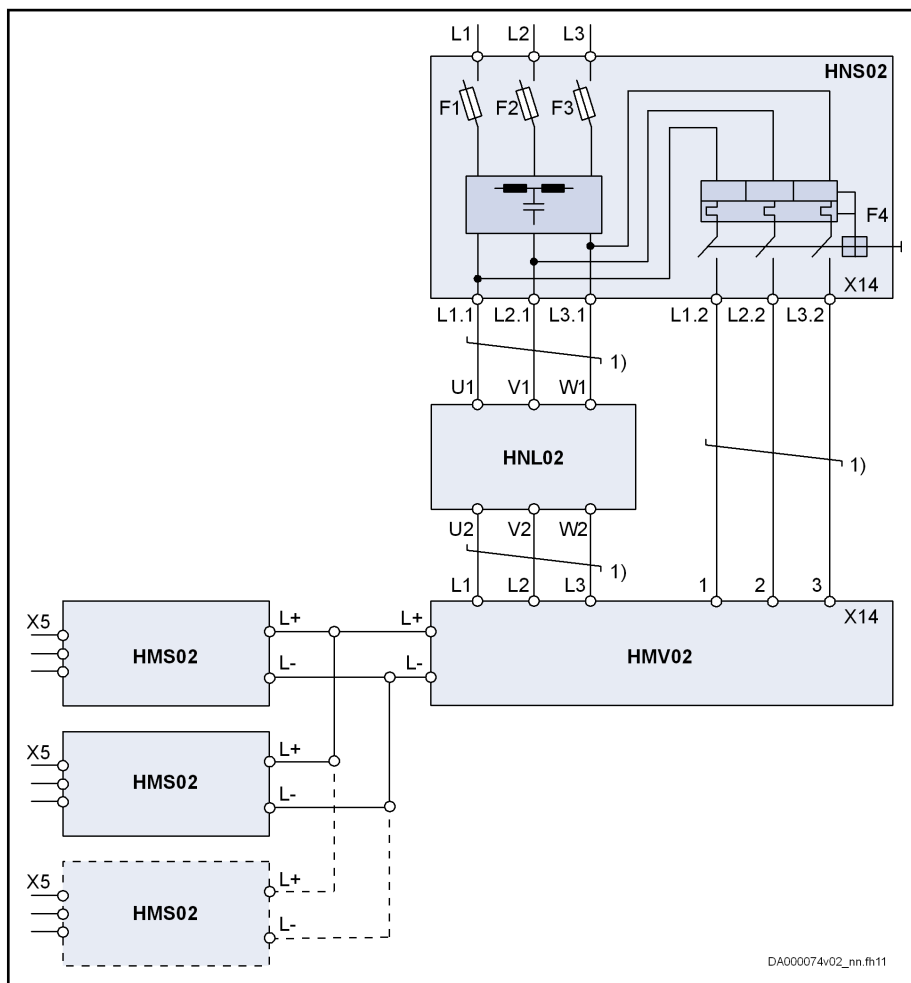
Tab. 7-41: HMV...R - Examples of allowed performance profiles

7.4.5 Connections and interfaces

Overview

Overall connection diagram

Overall connection diagram with mains filter, mains choke, supply unit, power section



- 1) Twist wires
HNS02 Mains filter
HNL02 Mains choke
HMD02 Supply unit
HMS02 Power section

Fig. 7-31: Overall connection diagram (mains filter, mains choke, supply unit, power section)

Overall connection diagram of supply unit

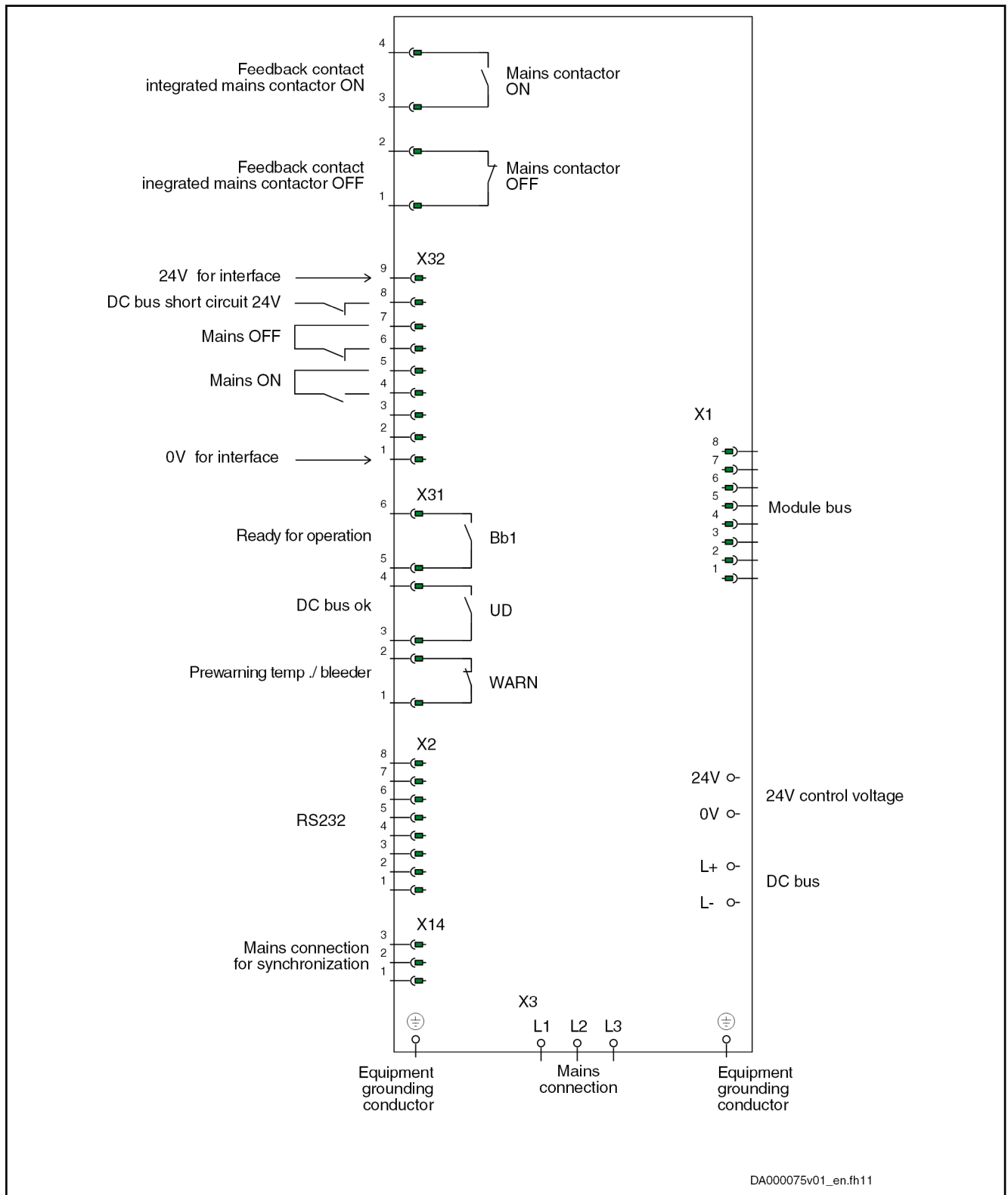
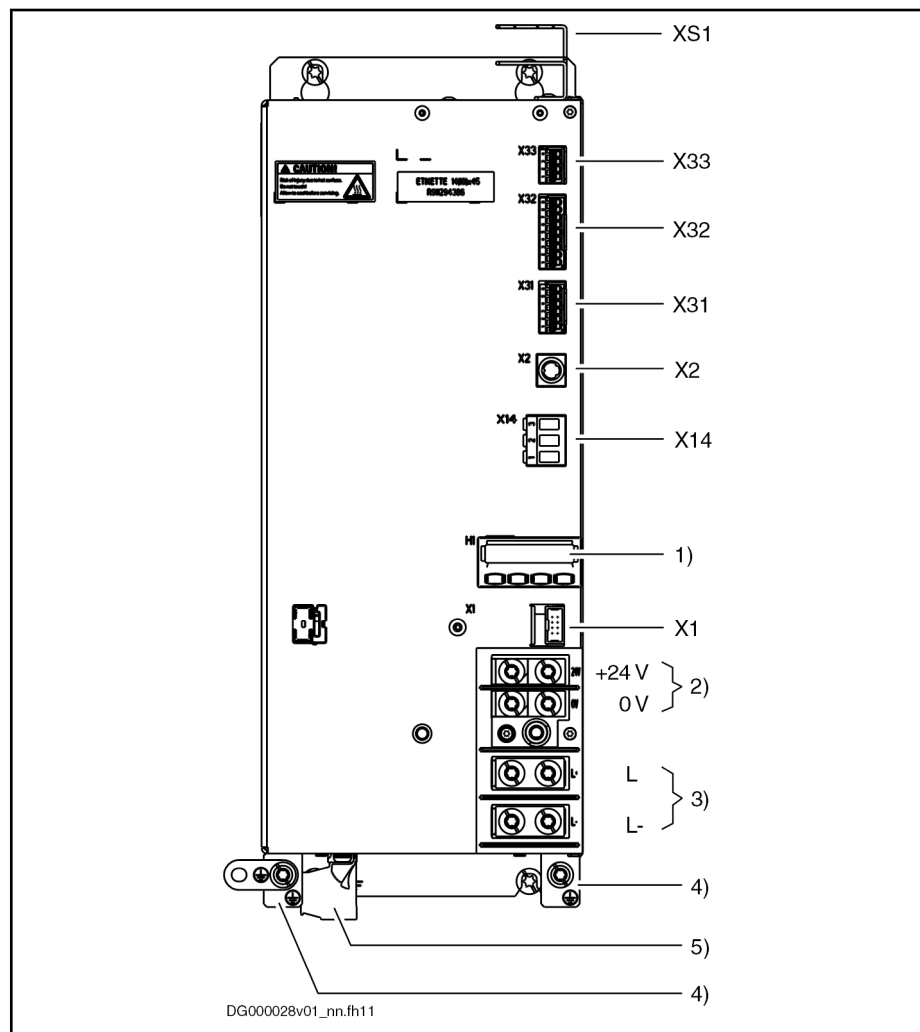


Fig. 7-32: Connection diagram

Arrangement of the connection points



| | |
|-----|--|
| XS1 | Shield connection for control lines |
| X33 | Acknowledgment messages of mains contactor |
| X32 | Mains contactor control and DC bus short circuit (ZKS) |
| X31 | Connection for messages |
| X2 | RS232 |
| X14 | Mains voltage synchronization |
| X1 | Module bus |
| 1) | Control panel |
| 2) | Control voltage |
| 3) | DC bus |
| 4) | Equipment grounding conductor connection point |
| 5) | Mains connection |

Fig. 7-33:

Connections HMD02.1R

Description of the connection points

The connection points are described in detail in chapter 8 [Functions and connection points](#), page 261.

Touch guard The touch guard is described in detail in chapter 9 [Touch guard at devices](#), page 325.

8 Functions and connection points

8.1 Overview of functions, power sections and supply units

The table below shows the most important hardware functions which the devices provide.

| Functions | Device | Connection | Description |
|-------------------------------------|--|-------------|--|
| General | | | |
| Data exchange via module bus | HCS02 ¹⁾
HCS03
HMS01
HMS02
HMOV01
HMOV02 | X1 | Information on the status of the drive controllers is exchanged via the module bus. |
| Commissioning and service interface | HMOV01
HMOV02
Control sections | X2 | Serial interface RS232 |
| 24-V-supply | | | |
| Integrated control voltage supply | HCS02.1E-...-xxxV
(optional equipment) | - | 24V supply is generated from the DC bus via a switching power supply unit.
$U_{DC} > 200 \text{ V}$ |
| | HCS03.1E-...-xxxV | - | 24V supply is generated from the DC bus via a switching power supply unit.
$U_{DC} > 300 \text{ V}$ |
| Plug with screw flange | HCS02 | X13 | |
| Screw connection | HCS03
HMS01
HMS02
HMOV01
HMOV02 | +24V;
0V | Provides the option to "loop through" the supply via contact bars. |
| Signaling contacts | | | |
| Message ready for operation (Bb) | HMOV01
HMOV02 | X31 | Floating contact which shows the status of the drive controller. |
| Message DC bus (UD) | HMOV01
HMOV02 | X31 | Floating contact which shows the status of the DC bus of the supply unit. |
| Message warning (WARN) | HMOV01
HMOV02 | X31 | Floating contact which shows the status of the drive controller. |
| Mains input | | | |

¹⁾ Not available for HCS02.1E-W0012

Functions and connection points

| Functions | Device | Connection | Description |
|---|---|--------------------------|--|
| For supply with mains voltage, feeding and regenerative | HMV01.1R
HMV02.1R | X3 | |
| For supply with mains voltage, feeding | HMV01.1E
HCS02.1E
HCS03.1E | X3 | |
| Input mains voltage synchronization | HMV01.1R
HMV02.1R | X14 | Used for synchronizing regeneration stage with supply mains at X3 |
| Plug with screw flange | HCS02.1E-W0012...
0070
HCS03.1E-W0070 | X3 | |
| Screw connection | HCS03.1E-W0100...
0350 | X3 | |
| Mains contactor and mains control | | | |
| Mains contactor integrated | HMV01 ²⁾
HMV02.1R | - | |
| Mains contactor not integrated | HCS02
HCS03
HMV01.1R-W0120 | - | |
| Contact for controlling the external mains contactor | HMV with mains contactor not integrated | X34 | |
| Input for N/O contact (EIN) | HMV01 ³⁾ | X32 | Connection for ON switch of mains connection |
| Input for N/C contact (AUS) | HMV01 ⁴⁾ | X32 | Connection for OFF switch of mains connection |
| Integrated feedback contacts | HMV with integrated mains contactor | X33 | 1 N/O contact and 1 N/C contact |
| Inputs for feedback contacts | HMV without integrated mains contactor | X40 | For 1 N/O contact and 1 N/C contact |
| DC bus functions | | | |
| Connection for DC bus | HMV
HMS
HMD
HCS ⁵⁾ | Terminal block
L+; L- | Provides the option to "loop through" the supply via contact bars. |
| Controlled DC bus voltage | HMV01.1R
HMV02.1R | | |

2) Not available for HMV01.1R-W0120

3) Not available for HMV01.1R-W0120

4) Not available for HMV01.1R-W0120

5) Not available for HCS02.1E-W0012

| Functions | Device | Connec
tion | Description |
|---|--|----------------|---|
| DC bus short circuit protection device (ZKS-stage) | HMV01.1E
HLB01.1C, D | X32 | Input via which the ZKS stage can be controlled.
ZKS stage (DC bus short circuit protection device):
Feature used to <ul style="list-style-type: none"> quickly discharge the DC bus decelerate synchronous motors with permanent magnet excitation when the drive controller fails |
| Braking resistor | | | |
| Integrated braking resistor | HCS02
HMV01 ⁶⁾
HMV02.1R | - | |
| Connection external braking resistor | HCS02.1E-W0054...
0070
HCS03.1E-W0070...
0350 | X9 | Connection for HLR braking resistors |
| Braking resistor switch-on threshold | HMV01.1E | X32 | This input determines how the switch-on threshold of the built-in braking resistor is generated. |
| Braking resistor switch-on threshold active, in spite of failure of external 24V supply | HCS02.1E-Wxxxx-A-03-xxxV
HCS03.1E-Wxxxx-A-05-xxxV | - | Supply from DC bus via integrated switching power supply unit |
| Motor output | | | |
| Input motor temperature monitoring | HCS
HMS
HMD | X6 | Input (per axis) used to connect sensor of motor temperature evaluation |
| Output for controlling motor holding brake via electronic contact | HMS01
HMD01
HCS03 | X6 | Output (per axis) via which motor holding brake can be controlled |
| Output for controlling motor holding brake via electromechanic contact | HCS02
HMS02 | X6 | Output (per axis) via which motor holding brake can be controlled |
| Plug with screw flange | HCS02.1E-W0012...
0070
HCS03.1E-W0070 | X5 | |
| Screw connection | HCS03.1E-W0100...
W0350
HMV01 | X5 | |
| Others | | | |
| Cable shield - control lines | HMS
HMD | XS1 | Control line shield connection |

⁶⁾ Not available for HMV01.1R-W0120

| Functions | Device | Connection | Description |
|---|--|------------|---|
| Cable shield - motor lines | HMS
HMD | XS2 | For accessory HAS02
Motor cable shield connection |
| Supply external fan unit HAB01 | HMV01.1R-W0120 | X13 | System-internal connection |
| Fan control depending on cooling system load | HCS02.1E-Wxxx-A-03-Lxxx
HCS03.1E-Wxxx-A-05-Lxxx | - | Reduces noise development in operation under partial load |
| Mechanical receptacle for braking resistor HLR01 at the top | HCS03.1E-W0070...350 | - | Allows ventilating braking resistor HLR in "outlet air" of converter |
| Mechanical receptacle for mains filter HNK01 and motor filter HMF01 at the bottom | HCS03.1E-W0070...350 | - | Allows ventilating mains filter HNK01 and motor filter HMF01 in "supply air" of converter |

Tab. 8-1: Functions

8.2 Electrical connection points – Overview

| Connection point | Device | Brief description |
|------------------|--|--|
| X1 | HCS02 ⁷⁾
HCS03
HMS01
HMS02
HMD01
HMV01
HMV02
HLB01 | Module bus
Connection in drive system |
| X2 | HMV01
HMV02 | Commissioning and service interface |
| X3 | HCS02
HCS03
HMV01
HMV02 | Mains connection |
| X5 | HCS02
HCS03
HMS01
HMS02 | Inverter output
Connection to motor |
| X5.1
X5.2 | HMD01 | Inverter output
Connection to motor |

7)

Not available at HCS02.1E-W0012

| Connection point | Device | Brief description |
|-------------------|---|---|
| X6 | HCS02
HCS03
HMS01
HMS02 | Connection for temperature monitoring and holding brake
Connection to motor |
| X6.1
X6.2 | HMD01 | Connection for temperature monitoring and holding brake
Connection to motor |
| X9 | HCS02.1E-W0054
HCS02.1E-W0070
HCS03.1E-Wxxxx-xxBx | Connection external braking resistor |
| X13 | HCS02.1E | Control voltage (24V, 0V) |
| X13 | HMV01.1R-W0120 | System-internal connection
Supply of external fan unit HAB01 |
| X14 | HMV01.1R
HMV02.1R
HNS02 | Mains voltage synchronization |
| X31 | HMV01
HMV02
HLB01 | Messages Bb1, UD, WARN
UD not available for HLB01 |
| X32 | HMV01
HMV02 | Mains contactor control and DC bus short circuit (ZKS) |
| X32 | HLB01 | DC bus short circuit control, clear errors, braking resistor switch-on threshold |
| X33 | HMV01
HMV02 | Provides message signals of the integrated mains contactor |
| X34 | HMV01.1R-W0120 | Contact for controlling the external mains contactor |
| X40 ⁸⁾ | HMV01.1R-W0120 | Receives message signals of the external mains contactor |
| X41.1; X41.2 | HNS02 | Converter from D-Sub to terminal blocks for "optional safety technology modules L1, S1" connections at control sections |
| +24V; 0V | HCS03
HMS01
HMS02
HMD01
HMV01
HMV02 | Control voltage supply
Connections integrated in terminal block |

8)

$HWI \geq A11$; $HWI < A11$: X33

| Connection point | Device | Brief description |
|---|---|--|
| L+; L- | HCS02 ⁹⁾
HCS03
HMS01
HMS02
HMD01
HMD02
HMD03
HMD04
HMD05
HMD06
HMD07
HMD08
HMD09
HMD10
HMD11
HMD12
HMD13
HMD14
HMD15
HMD16
HMD17
HMD18
HMD19
HMD20
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HMD73
HMD74
HMD75
HMD76
HMD77
HMD78
HMD79
HMD80
HMD81
HMD82
HMD83
HMD84
HMD85
HMD86
HMD87
HMD88
HMD89
HMD90
HMD91
HMD92
HMD93
HMD94
HMD95
HMD96
HMD97
HMD98
HMD99
HMD100 | DC bus connection
Connections integrated in terminal block |
| XS1 | HCS02
HMS
HMD | Shield connection, control lines
Cable shields |
| XS2 | HCS02
HMS
HMD | Shield connection, motor cable
Connection for accessory HAS02 |
| Ground connection | All | Connection of housing to ground potential |
|  | All | Equipment grounding conductor connection of the component |

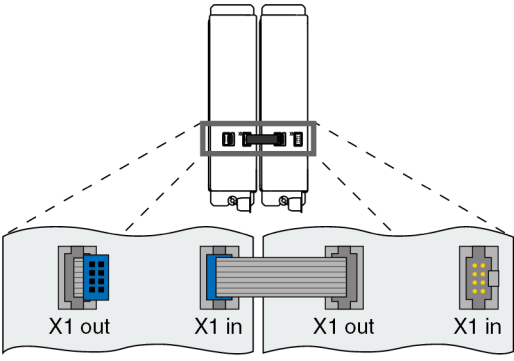
Tab. 8-2: Electrical Connection Points – Overview

9)

Not available at HCS02.1E-W0012

8.3 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 |
|---|----------------|--|
|  | X1 in | Receives the module bus connector |
| | X1 out | Passes the module bus connection to the neighboring device |

Tab. 8-3: X1, Module Bus

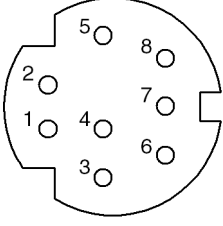
Installation instructions

- Keep the ribbon cable in the **parking position**, if the connection to the neighboring device is not established.
- If used for the module bus, **extension cables** must be **shielded**. Their total length may not exceed a **maximum of 40 m**. The module bus connection can be extended by means of accessory **RKB0001**.
- 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.

8.4 X2, serial interface (RS232)

8.4.1 General information

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

| Connection point | Type | Number of poles | Stranded wire [mm ²] | Description | Figure |
|------------------|--------------------------|-----------------|----------------------------------|------------------|--|
| X2 | MiniDin, female (device) | 8 | 0,25-0,5 | Serial interface | 
DA000049v01_nn.FH |

Tab. 8-4: 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 _{cc} | Supply voltage |
| 7 | n. c. | n. c. |
| 8 | n. c. | n. c. |

n. c. not connected

Tab. 8-5: 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 |

Tab. 8-6: Features



The accessory **HAS05.1-005** makes available a converter from RS232 to RS485 (see Project Planning Manual for additional components and accessories).

8.4.2 Connection diagrams serial interface to PC

Serial Interface to PC with 9-Pin D-Sub

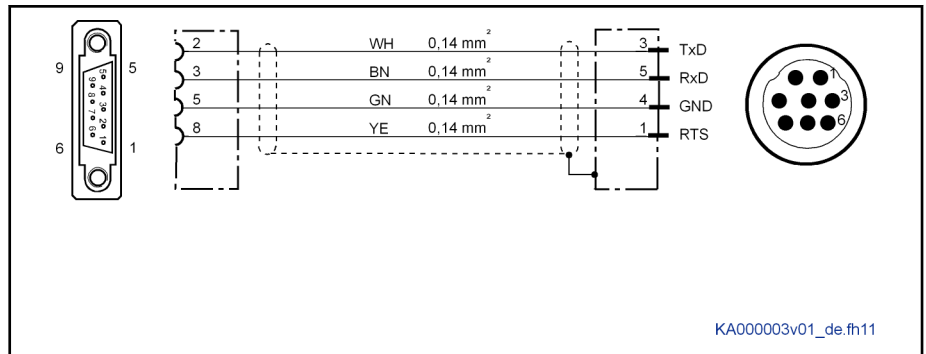


Fig. 8-1: Connection of Serial Interface to PC with 9-Pin D-Sub



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

Serial interface to PC with 25-Pin D-Sub

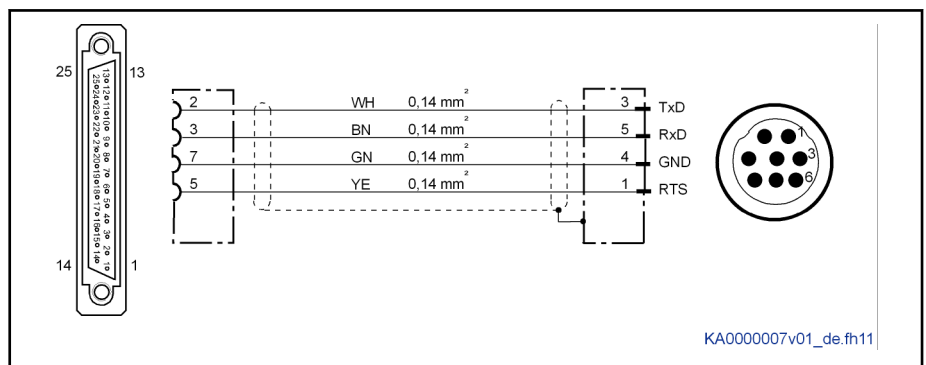


Fig. 8-2: Connection of Serial Interface to PC with 25-Pin D-Sub

8.5 X3, mains connection

8.5.1 Important notes

WARNING

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

Only operate the device

- with the connectors plugged on (even if no lines have been connected to the connectors) and
- with the equipment grounding conductor connected!

Notes on installation

Dimension the **required cross section** of the connection cables according to the determined phase current I_{LN} and the mains fuse.



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, **HMV01** and **HMV02** supply units at least **10 mm² (AWG 8)**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- For **HCS02.1E** drive controllers, **at least 4 mm² (AWG 10)**, 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 mm², you can reduce the cross section of the equipment grounding connection according to the table "Equipment Grounding Conductor Cross Section".

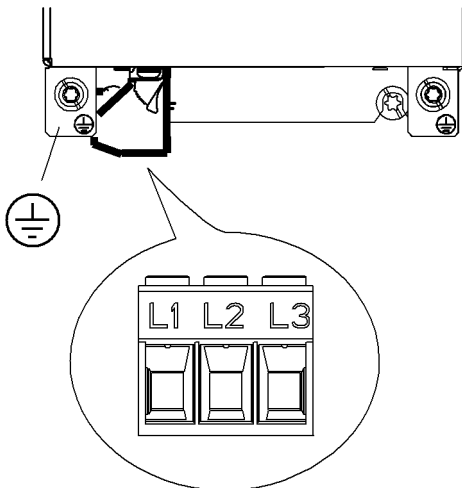
| Cross-sectional area A of outer conductors | Minimum cross-sectional area A_{PE} of equipment grounding connection |
|--|---|
| $A \leq 16 \text{ mm}^2$ | A |
| $16 \text{ mm}^2 < A \leq 35 \text{ mm}^2$ | 16 |
| $35 \text{ mm}^2 < A$ | $A / 2$ |

Tab. 8-7: Equipment grounding conductor cross section

NOTICE**Damage to the device!**

Provide strain relief for the terminal connectors of the device in the control cabinet or use the optionally available connection accessory HAS02.

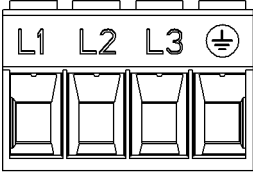
8.5.2 X3, mains connection HMV02.1R-W0015

| View | Identification | Function 3-phase operation | |
|---|---|---|--|
|  <p>DA000181v01_nn.FH11</p> | L1 | Connection to supply mains (L1) | |
| | L2 | Connection to supply mains (L2) | |
| | L3 | Connection to supply mains (L3) | |
| |  | Connection of equipment grounding conductor of drive controller | |

| Screw connection at connector | Unit | Min. | Max. |
|--|-----------------|--|------|
| Tightening torque | Nm | 1,5 | 1,7 |
| Connection cable | mm ² | 1,5 | 6 |
| Stranded wire | AWG | 16 | 10 |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{LN} and A_{LN}) | |
| Occurring voltage load | V | See technical data of device used (U_{LN} or U_{LN_nenn}) | |

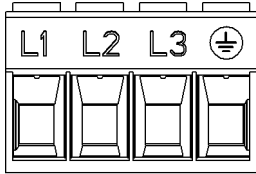
Tab. 8-8: Function, Pin Assignment, Properties

8.5.3 X3, mains connection HCS02.1E-W0012, -W0028

| View | Identification | Function 3-phase operation | Function 1-phase operation |
|--|---|---|--|
|  <p>DA000179v01_nn.FH11</p> | L1 | connection to supply mains (L1) | |
| | L2 | connection to supply mains (L2) | connection to neutral conductor supply mains |
| | L3 | connection to supply mains (L3) | n.c. |
| |  | connection of equipment grounding conductor of drive controller | |
| Screw connection at connector | Unit | Min. | Max. |
| tightening torque | Nm | 0,5 | 0,6 |
| connection cross section
stranded wire | mm ² /
AWG | 1,5 / 16 | 4 / 10 |
| occurring current load and minimum required
connection cross section | A | see technical data of device used (I_{L_cont} , I_{L_max} and A_{LN}) | |
| occurring voltage load | V | see technical data of device used (U_{LN}) | |

Tab. 8-9: Function, pin assignment, properties

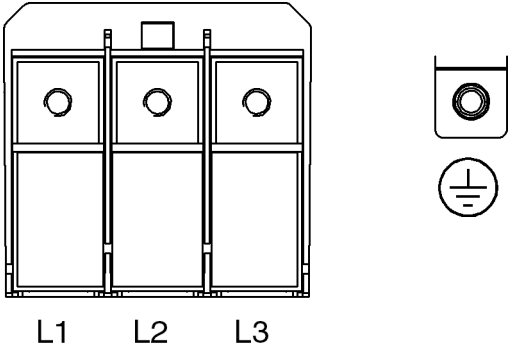
8.5.4 X3, mains connection HCS02.1E-W0054, -W0070 and HCS03.1E-W0070

| View | Identification | Function 3-phase operation | Function 1-phase operation ¹⁾ |
|---|---|---|--|
|  <p>DA000179v01_nn.FH11</p> | L1 | connection to supply mains (L1) | |
| | L2 | connection to supply mains (L2) | connection to neutral conductor supply mains |
| | L3 | connection to supply mains (L3) | n.c. |
| |  | connection of equipment grounding conductor of drive controller | |
| | | | |
| Screw connection at connector | Unit | Min. | Max. |
| tightening torque | Nm | 1,5 | 1,7 |
| connection cross section
stranded wire | mm ² /
AWG | 1,5 / 16 | 16 / 6 |
| occurring current load and minimum required
connection cross section | A | see technical data of device used (I_{L_cont} , I_{L_max} and A_{LN}) | |
| occurring voltage load | V | see technical data of device used (U_{LN}) | |

1) only allowed for HCS02.1E drive controllers

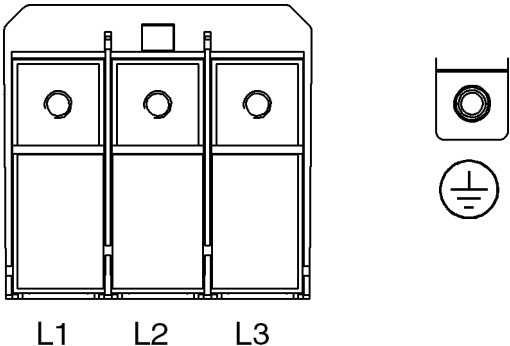
Tab. 8-10: Function, pin assignment, properties

8.5.5 X3, mains connection HCS03.1E-W0100...0150 and HMV01.1R-W0018...0065; HMV01.1E-W0030...0075

| View | Identification | Function | |
|--|---|---|------|
|  <p>DA000180v01_nn.FH11</p> | L1 | Connection to supply mains (L1) | |
| | L2 | Connection to supply mains (L2) | |
| | L3 | Connection to supply mains (L3) | |
| |  | Connection of equipment grounding conductor of drive controller | |
| Terminal block | Unit | Min. | Max. |
| Screw thread | | M6 | |
| Tightening torque | Nm | 5,5 | 6,5 |
| Connection cables
Stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35; 1×50
2×25; 2×35; 2×50
2×16 with accessories | |
| | AWG | 1×6; 1×4; 1×2; 1×1
2×4; 2×2; 2×1
2×6 with accessories | |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{LN} and A_{LN}) | |
| Occurring voltage load | V | See technical data of device used (U_{LN} or U_{LN_nenn}) | |

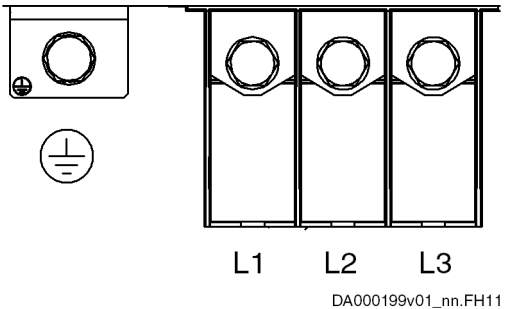
Tab. 8-11: Function, Pin Assignment, Properties

8.5.6 X3, mains connection HCS03.1E-W0210, -W0280, -W0350

| View | Identification | Function | |
|---|---|---|------|
|  <p>L1 L2 L3</p> <p>DA000180v01_nn.FH11</p> | L1 | connection to supply mains (L1) | |
| | L2 | connection to supply mains (L2) | |
| | L3 | connection to supply mains (L3) | |
| |  | connection of equipment grounding conductor of drive controller | |
| Terminal block | Unit | Min. | Max. |
| screw thread | | M10 | |
| tightening torque | Nm | 16 | 20 |
| connection cables
stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35; 1×50
2×25; 2×35; 2×50
2×16 with accessories | |
| | AWG | 1×6; 1×4; 1×2; 1×1
2×4; 2×2; 2×1
2×6 with accessories | |
| occurring current load and minimum required connection cross section | A | see technical data of device used (I_{L_cont} , I_{L_max} and A_{LN}) | |
| occurring voltage load | V | see technical data of device used (U_{LN}) | |

Tab. 8-12: Function, pin assignment, properties

8.5.7 X3, mains connection HMV01.1x-W0120

| View | Identification | Function 3-phase operation | |
|--|---|--|------|
|  <p>DA000199v01_nn.FH11</p> | L1 | Connection to supply mains (L1) | |
| | L2 | Connection to supply mains (L2) | |
| | L3 | Connection to supply mains (L3) | |
| |  | Connection of equipment grounding conductor of drive controller | |
| Terminal block | Unit | Min. | Max. |
| Screw thread | | M10 | |
| Tightening torque | Nm | 16 | 20 |
| Connection cables
Stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35; 1×50; 1×70; 1×120
2×16 (with different angles)
2×25; 2×35; 2×50; 2×70; 2×120 | |
| | AWG | 1×6; 1×4; 1×2; 1×1; 1×1/0; 1×2/0; 1×4/0
2×6 (with different angles)
2×4; 2×2; 2×1; 2×1/0; 2×2/0; 2×4/0 | |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{LN} and A_{LN}) | |
| Occurring voltage load | V | See technical data of device used (U_{LN} or U_{LN_nenn}) | |

Tab. 8-13: X3, Mains Connection

8.6 X5, motor connection

8.6.1 Important notes

⚠ WARNING

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

Only operate the device

- with the connectors plugged on (even if no lines have been connected to the connectors) and
- with the equipment grounding conductor connected!

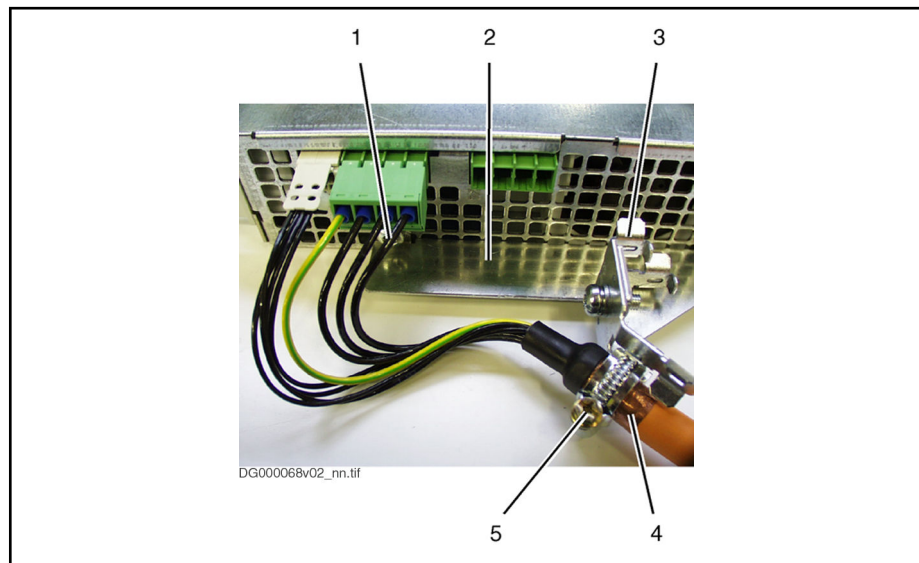
Notes on installation

The connection cross section data refer to the line cross sections which can be connected. Dimension the **required cross section** of the connection lines according to the occurring current load by the motor which is used.

NOTICE

Damage to the device!

Provide strain relief for the terminal connectors of the device in the control cabinet or use the optionally available connection accessory HAS02.



- 1 Screw in thread XS2
- 2 Sheet metal of accessories
- 3 Fixing device
- 4 Shield of motor cable
- 5 Clip

Fig. 8-3: Strain relief, shield connection of motor cable with accessory HAS02 - example HCS02



- Use HAS02 accessory to reach an optimum shielding of the motor power cable.
- For connecting drive controller and motor use our ready-made motor power cables. (Refer to document "Rexroth Connection Cables").
- Using the NFD03.1 mains filter, the maximum permitted power cross-section is limited to 4 mm².
- To select the motor cables, observe the notes within the Project Planning Manual of the drive system ("Connection cable to the motor").

Coding of the connectors



At the **HMD** power sections with two inverter outputs, the outputs have been coded, i.e. provided with a coding section. This avoids accidentally interchanging the two cables.

Coding

- X5.1: Coding section at pin 2
- X5.2: Coding section at pin 1

For ready-made Rexroth motor power cables, you therefore have to change the coding of the **male connector at the motor power cable** for **X5.2**, i.e. put the coding section at the male connector (not at the female connector at the drive controller) from pin 1 to pin 2. For X5.1, you do not need to change the coding of the male connector at the motor power cable.

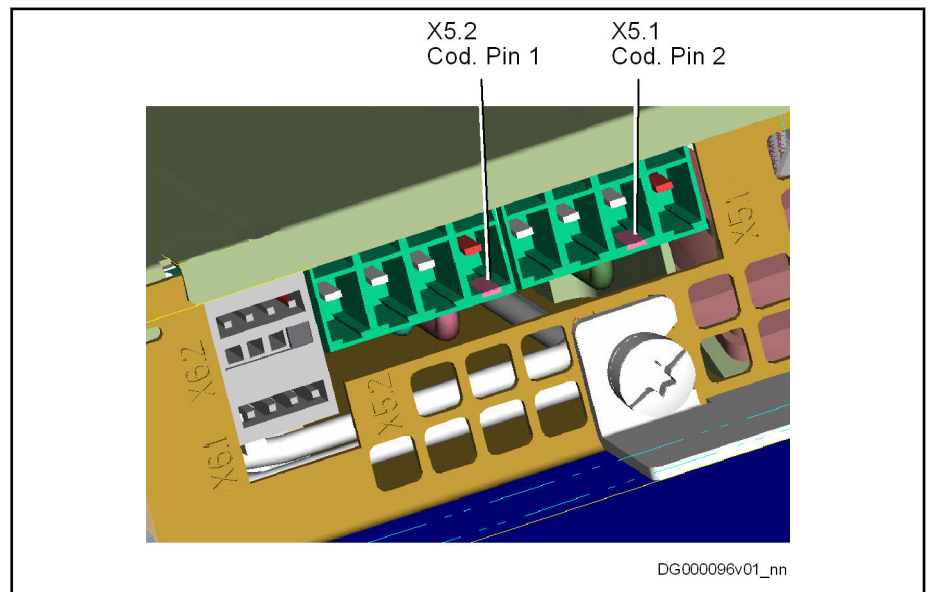
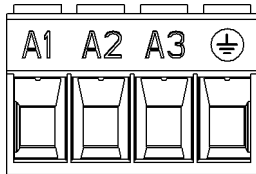


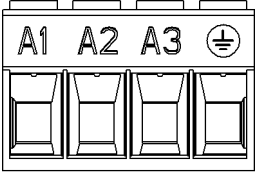
Fig. 8-4: Coding of X5.1 and X5.2

8.6.2 X5, motor connection HCS02.1E-W0012, -W0028 and HMS01.1N-W0020, -W0036 and HMD01.1N-W0012...0036 and HMS02.1N-W0028

| View | Identification | Function | |
|--|---|---|------|
| <div><p>DA000173v01_nn.FH11</p></div> | A1 | For power connection U1 at motor | |
| | A2 | For power connection V1 at motor | |
| | A3 | For power connection W1 at motor | |
| |  | For equipment grounding conductor of motor | |
| | | | |
| Screw connection at connector | Unit | Min. | Max. |
| Tightening torque | Nm | 0.5 | 0.6 |
| Connection cable | mm ² | 1.0 | 4 |
| Stranded wire | AWG | 18 | 10 |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (<i>I_{out}</i>) | |
| Occurring voltage load | V | See technical data of device used (<i>U_{out}</i>) | |
| Short circuit protection | | A1, A2, A3 against each other and each of them against ground | |

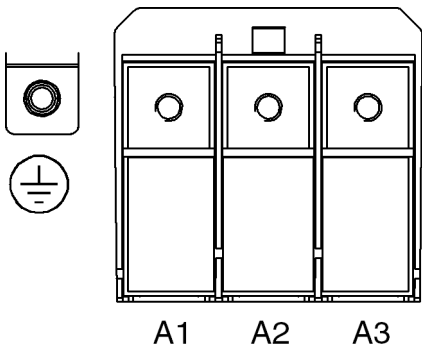
Tab. 8-14: Function, pin assignment, properties

8.6.3 X5, motor connection HCS02.1E-W0054, -W0070 and HCS03.1E-W0070 and HMS01.1N-W0054, -W0070 and HMS02.1N-W0054

| View | Identification | Function | |
|--|---|---|------|
|  <p>DA000173v01_nn.FH11</p> | A1 | For power connection U1 at motor | |
| | A2 | For power connection V1 at motor | |
| | A3 | For power connection W1 at motor | |
| |  | For equipment grounding conductor of motor | |
| Screw connection at connector | Unit | Min. | Max. |
| Tightening torque | Nm | 1.5 | 1.7 |
| Connection cable | mm ² | 1.5 | 16 |
| Stranded wire | AWG | 16 | 6 |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{out}) | |
| Occurring voltage load | V | See technical data of device used (U_{out}) | |
| Short circuit protection | | A1, A2, A3 against each other and each of them against ground | |

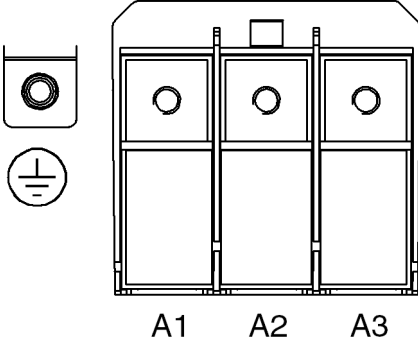
Tab. 8-15: Function, pin assignment, properties

8.6.4 X5, motor connection HMS01.1N-W0110

| View | Identification | Function | |
|--|---|---|------|
|  <p>DA000174v01_nn.FH11</p> | A1 | For power connection U1 at motor | |
| | A2 | For power connection V1 at motor | |
| | A3 | For power connection W1 at motor | |
| |  | For equipment grounding conductor of motor | |
| Terminal block | Unit | Min. | Max. |
| Screw thread | | M6 | |
| Tightening torque | Nm | 5.5 | 6.5 |
| Connection cables
Stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35
2×16; 2×25; 2×35 | |
| | AWG | 1×6; 1×4; 1×2; 1×1
2×6; 2×4; 2×2; 2×1 | |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{out}) | |
| Occurring voltage load | V | See technical data of device used (U_{out}) | |
| Short circuit protection | | A1, A2, A3 against each other and each of them against ground | |

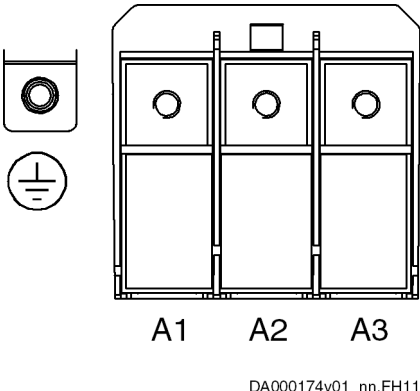
Tab. 8-16: Function, pin assignment, properties

8.6.5 X5, motor connection HCS03.1E-W0100...0150 and HMS01.1N-W0150...0300

| View | Identification | Function | |
|--|---|---|------|
|  <p>DA000174v01_nn.FH11</p> | A1 | For power connection U1 at motor | |
| | A2 | For power connection V1 at motor | |
| | A3 | For power connection W1 at motor | |
| |  | For equipment grounding conductor of motor | |
| Terminal block | Unit | Min. | Max. |
| Screw thread | | M6 | |
| Tightening torque | Nm | 5.5 | 6.5 |
| Connection cables
Stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35; 1×50
2×25; 2×35; 2×50
2×16 with accessories | |
| | AWG | 1×6; 1×4; 1×2; 1×1
2×4; 2×2; 2×1
2×6 with accessories | |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{out}) | |
| Occurring voltage load | V | See technical data of device used (U_{out}) | |
| Short circuit protection | | A1, A2, A3 against each other and each of them against ground | |

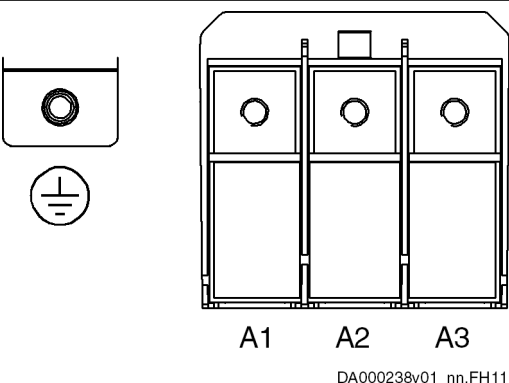
Tab. 8-17: Function, pin assignment, properties

8.6.6 X5, motor connection HCS03.1E-W0210, -W0280, -W0350

| View | Identification | Function | |
|--|---|---|------|
|  | A1 | For power connection U1 at motor | |
| | A2 | For power connection V1 at motor | |
| | A3 | For power connection W1 at motor | |
| |  | For equipment grounding conductor of motor | |
| Terminal block | Unit | Min. | Max. |
| Screw thread | | M10,  M8 | |
| Tightening torque | Nm | 16 | 20 |
| Connection cables
Stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35; 1×50
2×25; 2×35; 2×50
2×16 with accessories | |
| | AWG | 1×6; 1×4; 1×2; 1×1
2×4; 2×2; 2×1
2×6 with accessories | |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{L_cont} , I_{L_max} and A_{LN}) | |
| Occurring voltage load | V | See technical data of device used (U_{LN}) | |
| Short circuit protection | | A1, A2, A3 against each other and each of them against ground | |

Tab. 8-18: Function, pin assignment, properties

8.6.7 X5, motor connection HMS01.1N-W0350

| View | Identification | Function | |
|--|---|--|------|
|  <p>DA000238v01_nn.FH11</p> | A1 | For power connection U1 at motor | |
| | A2 | For power connection V1 at motor | |
| | A3 | For power connection W1 at motor | |
| |  | For equipment grounding conductor of motor | |
| Terminal block | Unit | Min. | Max. |
| Screw thread | | M10 | |
| Tightening torque | Nm | 16 | 20 |
| Connection cable
Stranded wire with ring cable lug | mm ² | 1×16; 1×25; 1×35; 1×50; 1×70; 1×120
2×16; 2×25; 2×35; 2×50; 2×70; 2×120 | |
| | AWG | 1×6; 1×4; 1×2; 1×1; 1×1/0; 1×2/0; 1×4/0
2×6; 2×4; 2×2; 2×1; 2×1/0; 2×2/0; 2×4/0 | |
| Occurring current load and minimum required connection cross section | A | See technical data of device used (I_{L_cont} , I_{L_max} and A_{LN}) | |
| Occurring voltage load | V | See technical data of device used (U_{LN}) | |
| Short circuit protection | | A1, A2, A3 against each other and each of them against ground | |

Tab. 8-19: X5, motor connection

8.7 X6, motor temperature monitoring and motor holding brake

8.7.1 Important notes

WARNING

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

Only operate the device

- with the connectors plugged on (even if no lines have been connected to the connectors) and
- with the equipment grounding conductor connected!

WARNING

Dangerous movements! Danger to persons from falling or dropping axes!

The standard motor holding brake provided or an external motor holding brake controlled directly by the drive controller are not sufficient on their own to guarantee personal safety!

Personal safety must be achieved using higher-level, fail-safe measures:

- Block off danger zones with safety fences or safety guards
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example,
 - mechanically securing the vertical axes
 - adding external braking/arrester/clamping mechanisms
 - ensuring sufficient equilibration of the vertical axes

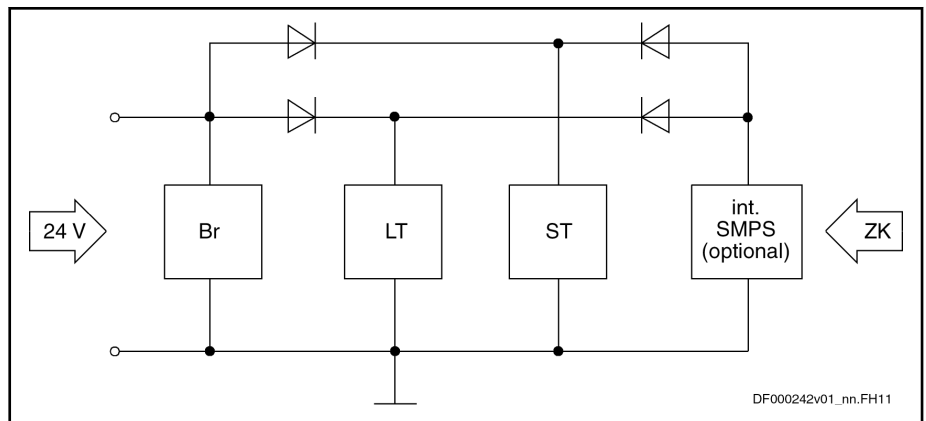
Function The connection point X6 contains the connections for

- monitoring the motor temperature
- controlling the motor holding brake



Via an integrated contact element (BR), the power section switches the voltage of the **external** 24V supply (connection X13 at HCS02 power sections) to the output for controlling the motor holding brake.

The integrated 24V control voltage supply of power sections of the order code **-NxxV** is not available at the connection point X6 (see figure below "Block Diagram of Internal Control Voltage"). Therefore, an **external** 24V supply is required for controlling the motor holding brake.



| | |
|------------------|---|
| BR | Circuit for brake control |
| LT | Power section, e.g. HCS02 |
| ST | Control section, e.g. CSB01 |
| int. SMPS | For types HCS0x.1E-Wxxx-NxxV: Internal switched-mode power supply |
| ZK | DC bus |

Fig. 8-5: Block diagram of internal control voltage

Notes on Installation



Make sure the voltage supply for the motor holding at the motor brake is sufficient. You have to take into account that voltage drops on the supply line. Use connecting lines with the highest possible cross section of the single strands.



An external contact element is required, if motor holding brakes with higher currents than the allowed current load are to be supplied at X6.

Coding of the connectors



At the **HMD** power sections with two inverter outputs, the outputs have been coded, i.e. provided with a coding section. This avoids accidentally interchanging the two cables.

Coding

- X6.1: Coding section at pin 4
- X6.2: Coding section at pin 1

For ready-made Rexroth motor power cables, you therefore have to code the **male connector at the motor power cable** accordingly for X6.1 and X6.2:

- For connector X6.1: Cut off plastic pin 4 at connector
- For connector X6.2: Cut off plastic pin 1 at connector

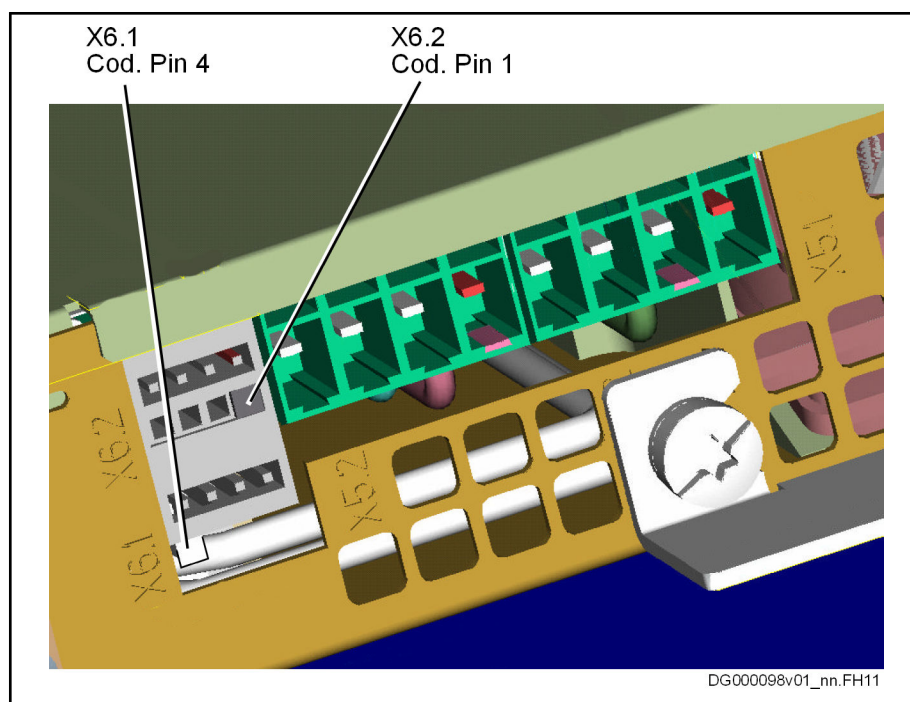
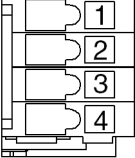


Fig. 8-6: Coding of X6.1 and X6.2

8.7.2 Connection point

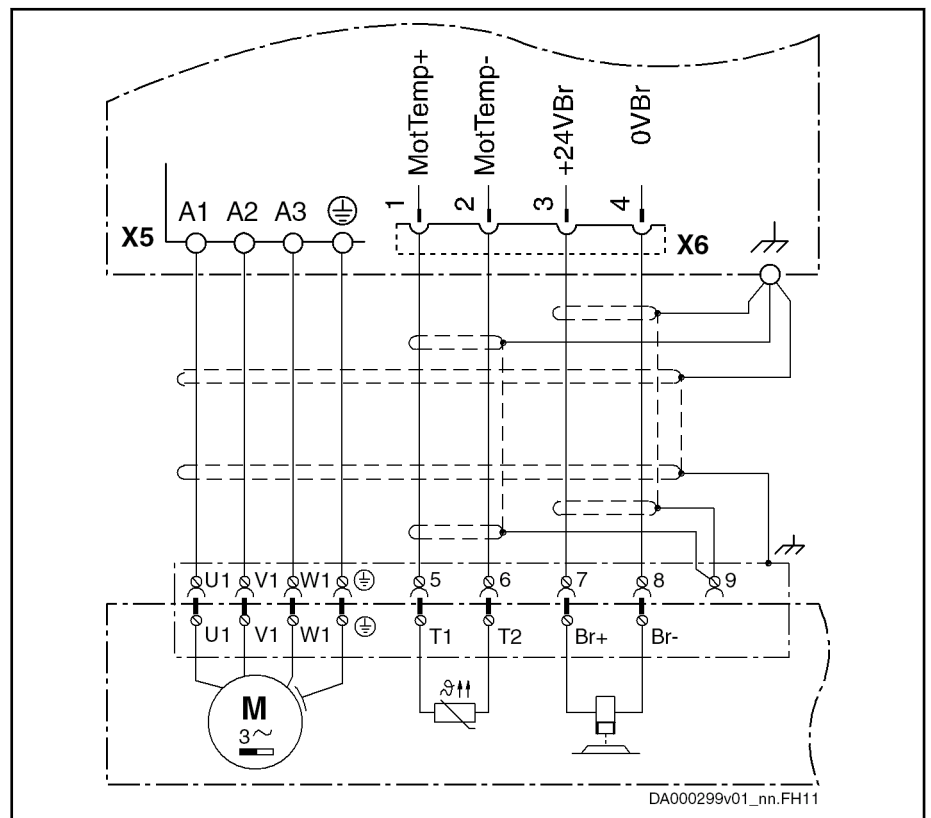
| View | Connection | Signal name | Funktion |
|--|-----------------|-------------|--|
|  <p>DG000097v01_nn.FH11</p> | 1 | MotTemp+ | Motor temperature evaluation input |
| | 2 | MotTemp- | |
| | 3 | +24V | Output for controlling motor holding brake |
| | 4 | 0V | |
| Spring terminal (connector) | Unit | Min. | max. |
| Connection cable solid wire | mm ² | 0.5 | 1.5 |
| Connection cable, stranded wire | mm ² | 0.5 | 1.5 |
| | AWG | 20 | 16 |
| Current carrying capacity X6.3, X6.4: | | | |
| HCS02.1E-W0012; -W0028; -W0054; -W0070 | A | - | 2 |
| HCS03.1E-W0070; -W0100; -W0150; -W0210; -W0280; -W0350 | | | 2 |
| HMS01.1N-W0020; -W0036 | | | 1.6 |
| HMS01.1N-W0054; -W0070 | | | 2 |
| HMS01.1N-W0110; -W0150; -W0210; -W0300; -W0350 | | | 2.5 |
| HMS02.1N-W0028; -W0054 | | | 2 |
| HMD01.1N-W0012; -W0020; -W0036 | | | 1.5 per axis |

| | | | |
|---|----|---|-----|
| Number of switching actions of integrated contact element for controlling motor holding brake | | HCS02: > 250,000; electromechanical contact
HCS03: wear-free electronic contact
HMS01: wear-free electronic contact
HMS02: > 250,000; electromechanical contact
HMD01: wear-free electronic contact | |
| Time constant of load ¹⁾ | ms | - | 50 |
| Switching frequency | Hz | - | 0.5 |
| Short circuit protection | | X6.3 against X6.4 (output for controlling the motor holding brake) | |
| Overload protection | | X6.3 against X6.4 (output for controlling the motor holding brake) | |

1) Maximum time constant of load: $t = R_{Br} / L_{Br}$ (R_{Br} = resistance of brake; L_{Br} = inductivity of brake)

Tab. 8-20: Function, pin assignment

Connection Diagram



The connection of the equipment grounding conductor can either be at terminal connector X5 or directly at the drive controller (this figure shows a terminal connector X5 with connection of the equipment grounding conductor).

Fig. 8-7: Connection of Motor Temperature Monitoring and Motor Holding Brake

8.8 X9, external braking resistor

8.8.1 Important notes

⚠ WARNING

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

Only operate the device

- with the connectors plugged on (even if no lines have been connected to the connectors) and
 - with the equipment grounding conductor connected!
-



The external braking resistor must be **parameterized** via the firmware to protect the drive controller and the braking resistor against overload.

See also Parameter Description of the firmware used:

"P-0-0860, Converter configuration"

and

"P-0-0858, Data of external braking resistor"

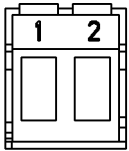
The drive controller monitors the operating data of the external braking resistor against the data in "P-0-0858, Data of external braking resistor". Select braking resistors with a performance that corresponds to the parameterized values or more powerful braking resistors.

8.8.2 X9, external braking resistor HCS02.1E-W0054 and -W0070

Function, pin assignment X9 is used to connect an external braking resistor which is controlled via the internal switch.



For HCS02 devices, the connection X9 is contained in all designs, except for -W0012 and -W0028.

| View | Connection | Signal name | Function |
|--|-----------------|---|-----------------------------|
| 
DA000178v01_nn.FH11 | 1 | n.s. | Connection braking resistor |
| | 2 | n.s. | Connection braking resistor |
| | | | |
| Screw terminal (connector) | Unit | Min. | max. |
| Connection line | mm ² | 2.5 | 4 |
| Stranded wire | AWG | 14 | 10 |
| Tightening torque | Nm | 1.5 | 1.7 |
| Current load | A | Peak value: 30
R.m.s. value: 15 | |
| Voltage load | V | n.s. | |
| Short-circuit protection | | To be ensured by means of appropriate fusing elements in the mains connection at X3 | |

n.s. Not specified

Tab. 8-21: Function, pin assignment

Notes on installation Maximum allowed line length to external braking resistor: **5 m**

Twist unshielded lines.

The accessory HAS05.1-015-NNN-NN (snap-on ferrite) ensures that Class C3 of the EMC Directive EN 61800-3 is complied with for braking resistors installed outside of the control cabinet.

The snap-on ferrite is designed for the following components:

- HCS01.1E-W0018 + HLR01.2N-01K0-N68R0-E-007
- HCS01.1E-W0028 + HLR01.2N-01K0-N68R0-E-007
- HCS01.1E-W0054 + HLR01.2N-01K0-N28R0-E-007

⚠ WARNING

Lethal electric shock from live parts with more than 50 V!

Risk of burns by hot housing surfaces! Risk of fire!

The temperature of the housing surface of an external HLR braking resistor can rise up to 150 °C. Run the connection lines with a sufficient distance (> 200 mm) to the housing of the HLR braking resistor to avoid damaging the insulation of the connection lines. Outside of the control cabinet, run the connection lines of an HLR braking resistor in a metal pipe with a wall thickness of at least 1 mm.

Do not touch hot housing surfaces! Mount the HLR braking resistor on a temperature-resistant mounting surface. Provide a sufficient distance between the HLR braking resistor and heat-sensitive materials. Make sure the cooling air supply is unrestricted. Take care that the environment can discharge the dissipation heat.

NOTICE

Danger by insufficient installation!

Protect the lines with the appropriate fusing elements in the supply feeder.

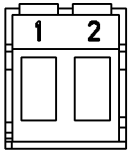
For the connection lines at X9, use at least the cross section of the lines for mains connection at X3. If this is impossible, select the cross section of the connection line at X9 in accordance with the continuous power of the braking resistor.

8.8.3 X9, external braking resistor HCS03.1E-W0070...0350

Function, pin assignment X9 is used to connect an external braking resistor which is controlled via the internal switch.



For HCS03 devices, the connection X9 is contained in the order code -xxBV.

| View | Connection | Signal name | Function |
|--|-----------------|---|-----------------------------|
| 
DA000178v01_nn.FH11 | 1 | n.s. | Connection braking resistor |
| | 2 | n.s. | Connection braking resistor |
| | | | |
| Screw terminal (connector) | Unit | min. | max. |
| HCS03.1E-W0070 | | | |
| Connection line | mm ² | 16 | |
| Stranded wire | AWG | 6 | |
| Tightening torque | Nm | 1.5 | 1.7 |
| HCS03.1E-W0100, -W0150 | | | |
| Connection line | mm ² | 25 | |
| Stranded wire | AWG | 4 | |
| Tightening torque | Nm | 2.0 | 2.5 |
| HCS03.1E-W0210, -W0280, -W0350 | | | |
| Connection line | mm ² | 50 | |
| Stranded wire | AWG | 0 | |
| Tightening torque | Nm | 8.0 | 9.0 |
| HCS03.1E-W0xxx | | | |
| Voltage load | V | n.s. | |
| Short circuit protection | | To be ensured by means of appropriate fusing elements in the mains connection at X3 | |

n.s. Not specified

Tab. 8-22: Function, pin assignment

Notes on installation Maximum allowed line length to external braking resistor: **5 m**

Twist unshielded lines.

The accessory HAS05.1-015-NNN-NN (snap-on ferrite) ensures that Class C3 of the EMC Directive EN 61800-3 is complied with for braking resistors installed outside of the control cabinet.

The snap-on ferrite is designed for the following components:

- HCS01.1E-W0018 + HLR01.2N-01K0-N68R0-E-007
- HCS01.1E-W0028 + HLR01.2N-01K0-N68R0-E-007

■ HCS01.1E-W0054 + HLR01.2N-01K0-N28R0-E-007

⚠ WARNING

Lethal electric shock from live parts with more than 50 V!

Risk of burns by hot housing surfaces! Risk of fire!

The temperature of the housing surface of an external HLR braking resistor can rise up to 150 °C. Run the connection lines with a sufficient distance (> 200 mm) to the housing of the HLR braking resistor to avoid damaging the insulation of the connection lines. Outside of the control cabinet, run the connection lines of an HLR braking resistor in a metal pipe with a wall thickness of at least 1 mm.

Do not touch hot housing surfaces! Mount the HLR braking resistor on a temperature-resistant mounting surface. Provide a sufficient distance between the HLR braking resistor and heat-sensitive materials. Make sure the cooling air supply is unrestricted. Take care that the environment can discharge the dissipation heat.

NOTICE

Danger by insufficient installation!

Protect the lines with the appropriate fusing elements in the supply feeder.

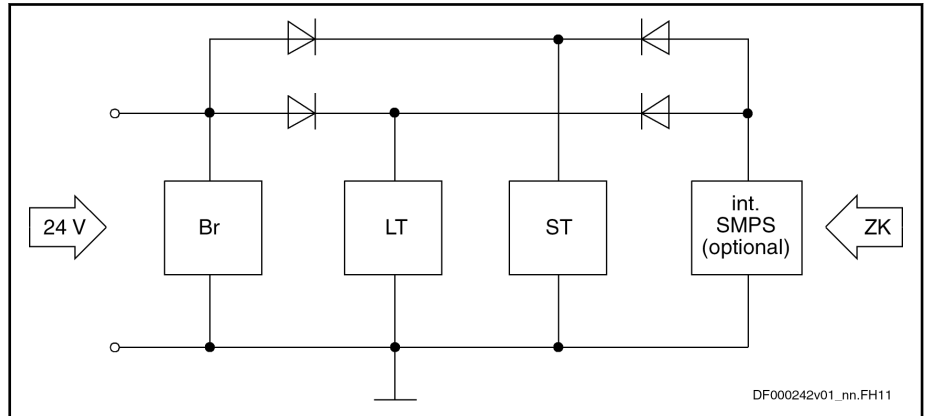
For the connection lines at X9, use at least the cross section of the lines for mains connection at X3. If this is impossible, select the cross section of the connection line at X9 in accordance with the continuous power of the braking resistor.

8.9 X13, control voltage (24V, 0V)

Function, pin assignment The external 24V supply is applied via connection point X13 for

- the power section of the drive controller
- brake control via X6
- the control section of the drive controller with the optional modules, except for such optional modules (e.g. safety technology S1) which require their own power supply

Control voltage block diagram 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

int. SMPS

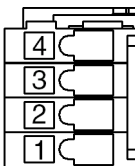
For types HCS0x.1E-Wxxxx-NxxV: Internal switched-mode power supply

ZK

DC bus

Fig. 8-8:

Block diagram of internal 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 ² | 1,0 | 1,5 |
| Connection cross section stranded wire | mm ² | 1,0 | 1,5 |
| 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 | |

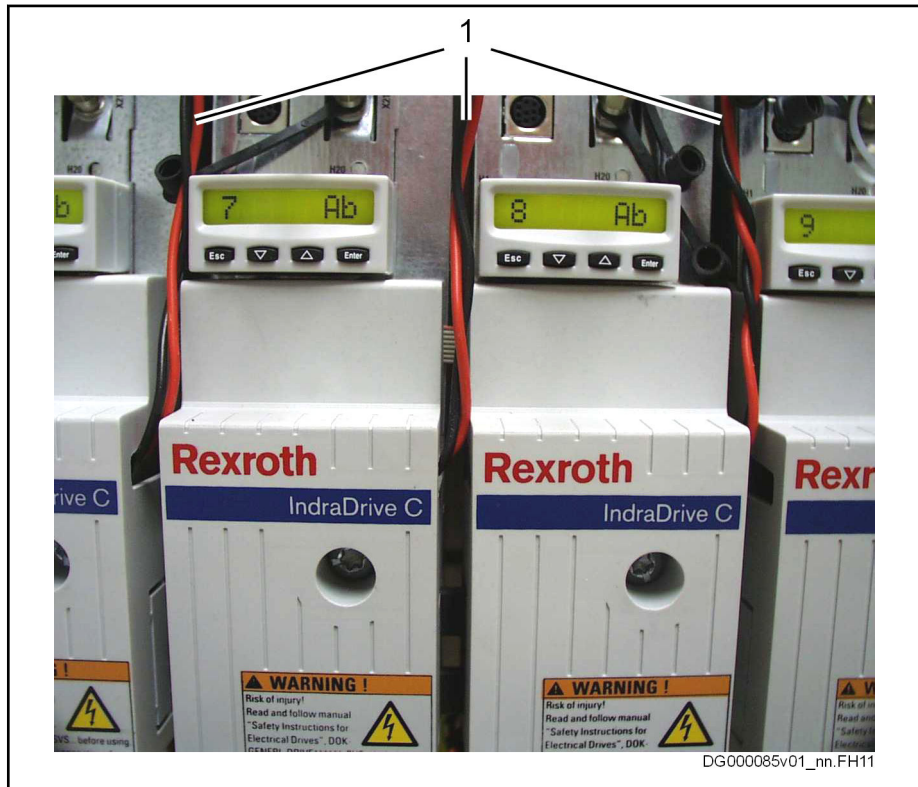
Tab. 8-23: Function, Pin Assignment, Properties

Notes on installation

Requirements on the connection to the 24V supply:

- Minimum cross section: 1 mm²
- Maximum allowed inductance: 100 µH (2 twisted single strands, 75 m long)
- Parallel line routing where possible

The control voltage supply is routed to the connection X13 from **above**:



1 Lines to control voltage supply

Fig. 8-9: Control Voltage Supply at X13



The input 0V is connected in conductive form to the housing potential. It is therefore impossible to use an insulation monitor at +24V and 0V against housing.

8.10 X13, fan unit HAB01 supply

Description Via this connection, the HAB01 fan unit of HMV01.1R-W0120 and HMS01.1N-W0350 devices is supplied with voltage (24V, 0V). The connection is situated at the bottom of the device.

NOTICE

Risk of damage by overheating!

Always operate HMV01.1R-W0120 and HMS01.1N-W0350 with the HAB01 fan unit.



Do not operate any other loads at connection X13.

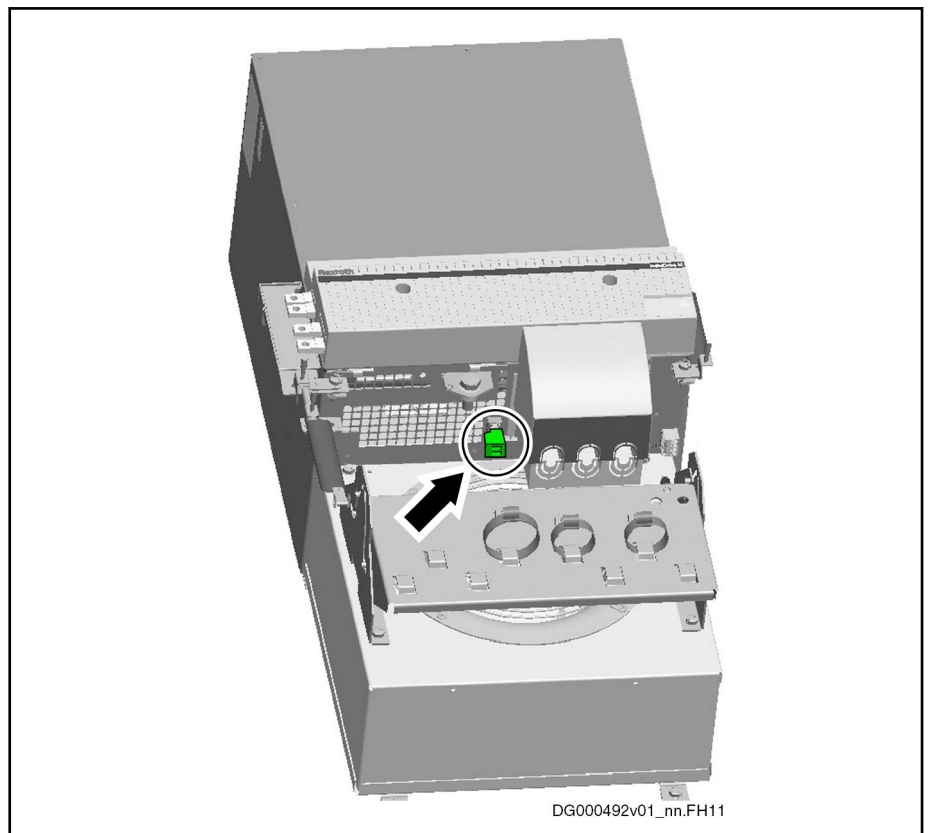


Fig. 8-10: Connection X13 at the bottom of the device

Function, pin assignment

| Connection | Signal name | Function |
|------------|-------------|--|
| 1 | 24V | Power supply for external fan unit HAB01. |
| 2 | 0V | Power consumption contained in P_{N3} of HMV or HMS. |

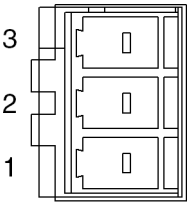
Tab. 8-24: Function, pin assignment

8.11 X14, mains voltage synchronization

8.11.1 Connection point

Function, pin assignment The connection point is used to

- connect the mains voltage for mains voltage synchronization
- precharge the DC bus

| View | Identification | Function | | |
|--|-----------------|--|--|------------------|
| 

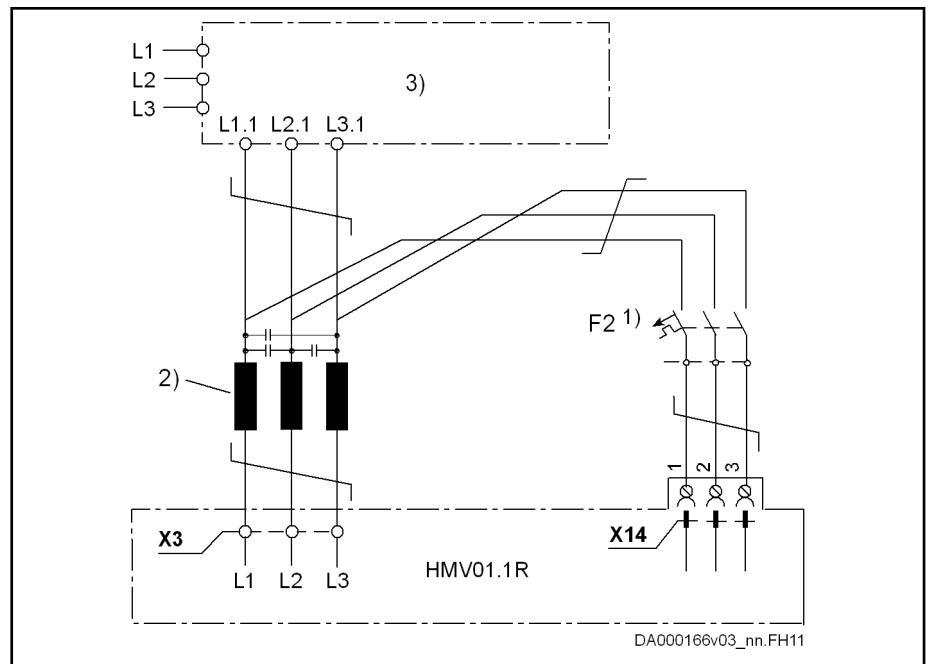
DA000165v01_nn.FH11 | 3 | Mains connection phase L3 before choke | | |
| | 2 | Mains connection phase L2 before choke | | |
| | 1 | Mains connection phase L1 before choke | | |
| | | | | |
| Screw connection at connector | Unit | Min. | | Max. |
| Number of poles | | 3 | | |
| Type | | STECK - LE 7,62 M PC 4,0 / 3G | | |
| Design | | Male connector at device | | |
| Connection cable solid wire | mm ² | 1,5 | | 4 |
| Connection cable stranded wire | mm ² | 1,5 | | 2,5 |
| | AWG | 14 | | 12 |
| Tightening torque | Nm | 0,5 | | 0,6 |
| Allowed input current | A | | | 5 |
| Input voltage | V | | | Max. 3 AC
530 |

Tab. 8-25: Function, Pin Assignment

8.11.2 Mains voltage synchronization

The synchronizing voltage has to be picked off before the mains choke and after the mains filter. Power voltage and synchronizing voltage connection have to be in phase (see figure).

The synchronizing voltage has to be connected to the input for mains voltage synchronization (X14) of the supply unit.



- 1) Fusing of connection X14
2) Mains choke
3) Mains filter

Fig. 8-11: Synchronizing Voltage by the Example of HMV01.1R



Install a motor circuit breaker with setting < 5 A in the supply line to connection X14.



Connect the connections X3 and X14 in phase:

- X3.L1 in phase with X14.1
- X3.L2 in phase with X14.2
- X3.L3 in phase with X14.3

8.11.3 Mains voltage synchronization HMV02.1R-W0015

For mains synchronization, connect the output X14 of the HNS02 mains filter to the input for mains voltage synchronization X14 of HMV02.1R-W0015.

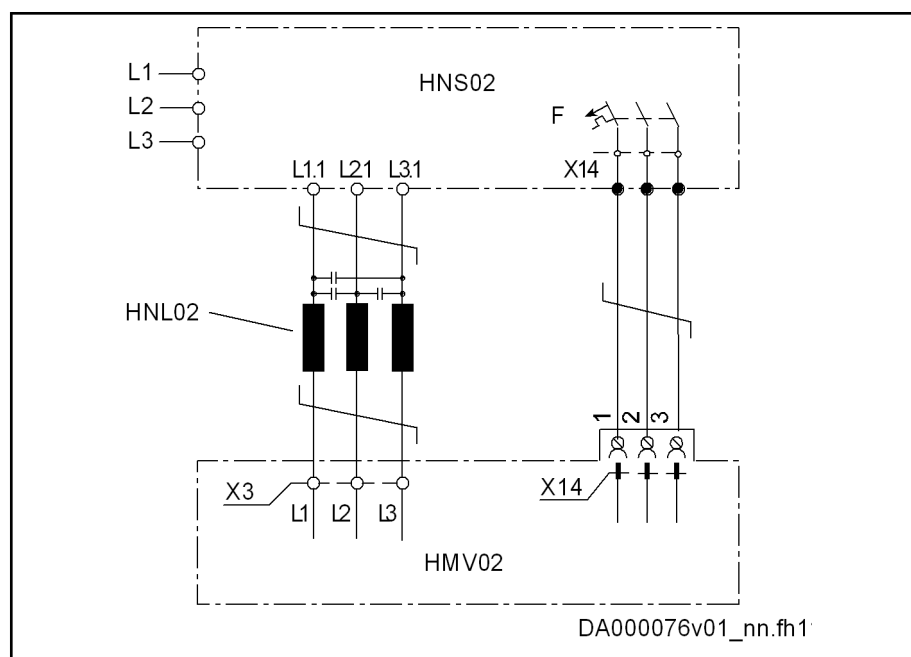


Fig. 8-12: Synchronizing Voltage HNV02.1R-W0015

8.12 X31, messages Bb1, UD, WARN

View

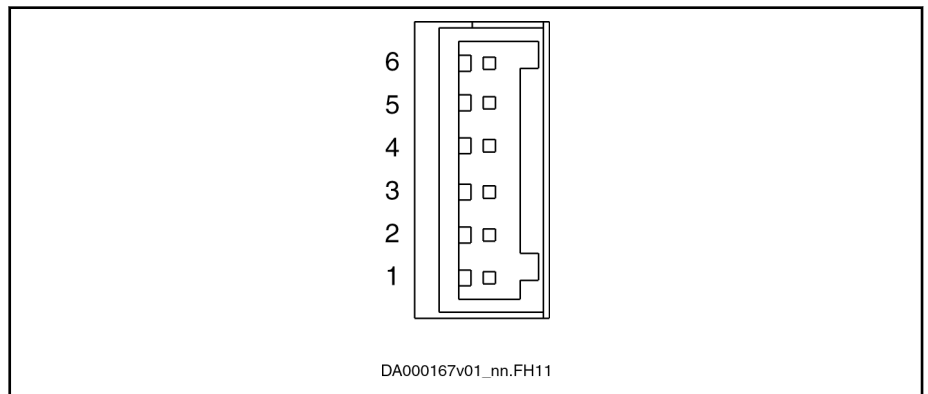


Fig. 8-13: View

Function, pin assignment

The connection point X31 provides message signals on the status of the supply unit. The messages have been designed as floating contacts.

| Pin assignment | Connection | Signal name | Function |
|----------------|------------|-------------|---|
| | 6 | Bb1_2 | N/O contact signals readiness for connecting the external mains contactor

Closed with:
Readiness for operation of supply unit

Open with: <ul style="list-style-type: none"> Error messages F2800 to F2899 Error messages F8069 and F8070 |
| | 5 | Bb1_1 | |
| | 4 | UD_2 | N/O contact signals status of DC bus voltage U_{DC}

Closed with:
DC bus voltage in specified range |
| | 3 | UD_1 | |
| | 2 | WARN_2 | N/C contact signals warning states

Open with: <ul style="list-style-type: none"> Overload at integrated braking resistor Overttemperature at supply unit |
| | 1 | WARN_1 | |
| | | | |
| | | | |

Tab. 8-26: Function, pin assignment

**Contact Bb1**

Integrate the Bb1 contact in the control circuit for the mains connection (see also Project Planning Manual of drive system; index entry "Mains connection → Control circuits").

When Bb1 contact opens, the mains contactor must interrupt the power supply.

Technical properties

| Data | Unit | Min. | Typ. | Max. |
|---------------------------------------|-----------------|-----------------|-----------------|------|
| Number of poles | | 6 | | |
| Type | | Spring terminal | | |
| Design | | Pins on device | | |
| Connection cable solid wire | mm ² | 0.5 | | 1.5 |
| Connection cable stranded wire | mm ² | 0.5 | | 1.5 |
| | AWG | 20 | | 16 |
| Current carrying capacity | A | | | 1 |
| Voltage load capacity | V | | | DC30 |
| Minimum load of the contacts | mA | 10 | | |
| Contact resistance at minimum load | mOhm | | | |
| Number of mechanical switching cycles | | | 10 ⁶ | |

Tab. 8-27: *Technical properties*

Notes on installation

For the application prototypes of the supply units, the "WARN" contact had been realized as N/O contact. From the following hardware indices (HWIs) upwards, the "WARN" contact is implemented as an N/C contact:

- HMDV01.1E-W0030: From HWI -14 upwards
- HMDV01.1E-W0075: From HWI -14 upwards
- HMDV01.1E-W0120: From HWI -15 upwards
- HMDV01.1R-W0018: From HWI -17 upwards
- HMDV01.1R-W0045: From HWI -17 upwards
- HMDV01.1R-W0065: From HWI -18 upwards

8.13 X32, mains contactor control and DC bus short circuit

View

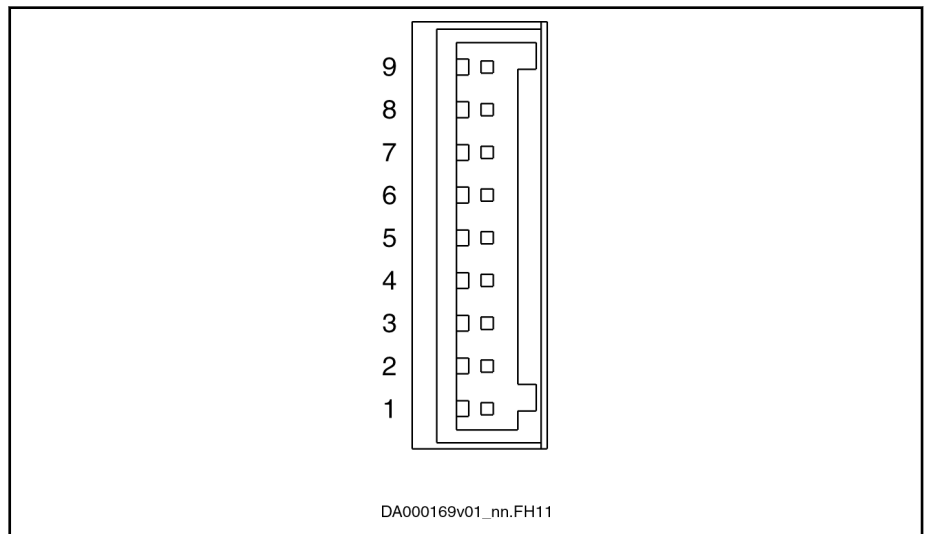


Fig. 8-14: View

Function, pin assignment

Is used to connect the signals for controlling

- the mains contactor
- the ZKS stage (ZKS = DC bus short circuit)
- the braking resistor switch-on threshold

NOTICE

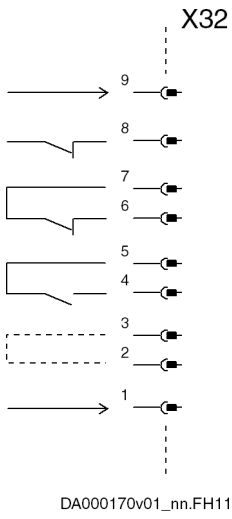
Risk of fire caused by the "sacrificing behavior" of the ZKS stage!

The "ZKS" input activates the "DC bus short circuit" function, when the 24V control voltage has not been applied and when there isn't any current flowing to the input. This condition can occur in the following situations:

- Failure of 24V control voltage
- Wire break
- Activation of serially connected contacts (e.g. axis limit switches)

If the kinetic energy of the mechanical axis system regenerated when braking is greater than the energy absorption capacity of HLB, the HLB device remains active when braking via ZKS takes place, until it is thermally destroyed (sacrificing behavior). Risk of fire! In this case, braking via ZKS may only come into effect in the case of an emergency (e.g. activation of an axis limit switch causes the mains supply to be cut off and simultaneously causes the 24V supply of the ZKS input to be interrupted).

Install a 24V UPS, if the "sacrificing behavior" of HLB is relevant to your drive system in the case of an emergency. This prevents the braking via ZKS which causes HLB to be destroyed due to the failure of the 24V control voltage. Braking via ZKS then will only take place in cases of emergency.

| Pin assignment | Connection | Signal name | Function |
|--|------------|--------------------------------------|--|
|  <p>DA000170v01_nn.FH11</p> | 9 | 24V_IF | Supply of circuits for control of DC bus short circuit and mains contactor |
| | 1 | 0V | |
| | 2 | 24V | Output (24 V) for connecting input X32.3 |
| | 3 | Braking resistor switch-on threshold | Switching the braking resistor switch-on threshold
Feeding supply units: <ul style="list-style-type: none"> Connected to 24 V of X32.2:
Activates fixed threshold (independent of mains voltage) Not connected:
Activates variable threshold (depending on mains voltage) Regenerative supply units:
The input is not active.
Switch-on thresholds: See technical data, table "Data of Integrated Braking Resistor" |
| | 4 | EIN2 | Connection for N/O contact to control the mains contactor (switch-on)
The input is edge-controlled |
| | 5 | EIN1 | |
| | 6 | AUS2 | Connection for N/C contact to control the mains contactor (switch-off) |
| | 7 | AUS1 | |
| | 8 | ZKS | Controls the ZKS stage: <ul style="list-style-type: none"> Not connected: ZKS active Connected to 24 V: ZKS not active |

Tab. 8-28: Connection point X32

**Contact Bb1**

Integrate the Bb1 contact in the control circuit for the mains connection (see also Project Planning Manual of drive system; index entry "Mains connection → Control circuits").

When Bb1 contact opens, the mains contactor must interrupt the power supply.



Input EIN2

If the supply unit is operated with an additional mains contactor, the signal at the input EIN2 (X32.4) must be switched to level "L" within the tolerated mains failure time, when this additional mains contactor is switched off.

See also "F2819 Mains failure" in the firmware documentation "Troubleshooting Guide"

Technical properties

| Data | Unit | Min. | Typ. | Max. |
|------------------------------------|-----------------|-----------------|------|------|
| Number of poles | | 9 | | |
| Type | | Spring terminal | | |
| Design | | Pins on device | | |
| Connection cable solid wire | mm ² | 0.5 | | 1.5 |
| Connection cable stranded wire | mm ² | 0.5 | | 1.5 |
| | AWG | 20 | | 16 |
| Current consumption (X32.9, X32.1) | A | | 0.1 | |
| Voltage load capacity | V | | | DC30 |

Tab. 8-29: Technical properties

8.14

X33, acknowledgment messages of integrated mains contactor

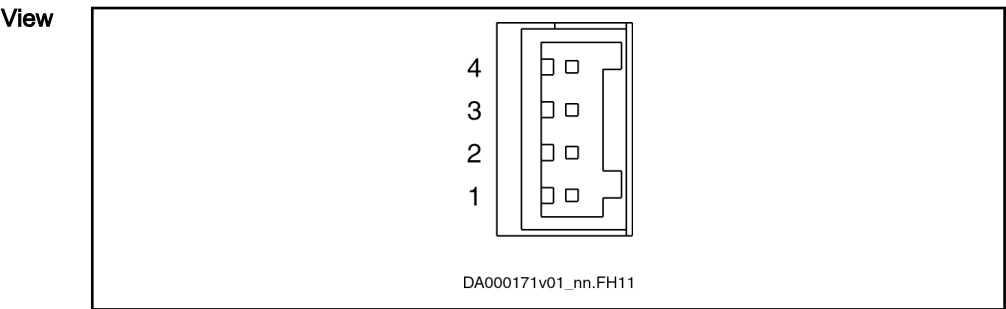


Fig. 8-15: View

Function, pin assignment

Observe the **functional differences** between the connection points **X33** and **X40**, depending on the supply unit:

- Supply units **with** integrated mains contactor:
X33 **provides** message signals on the status of the integrated mains contactor
- Supply units **without** integrated mains contactor:
X40 **receives** message signals on the status of the external mains contactor

The connection point **X40** is available at supply units **H MV01.1R-W0120 with hardware index $\geq$ A11** (see type plate). These supply units do not have connection point X33.

| Pin assignment | Connection | Signal name | Function |
|---|------------|-------------|---|
| Supply units with integrated mains contactor | | | Provides message signals for evaluation on the status of the integrated mains contactor.

The floating contacts are mechanically connected to the integrated mains contactor. |
| | 4 | - | A) N/O contact of integrated mains contactor: |
| | 3 | - | Closed with mains contactor picked up |
| | 2 | - | B) N/C contact of integrated mains contactor: |
| | 1 | - | Open with mains contactor picked up |

DA000172v01_nn.FH11

Tab. 8-30: Function, pin assignment

Properties

| Data | Unit | Min. | Typ. | Max. |
|-----------------|------|-----------------|------|------|
| Number of poles | | 4 | | |
| Type | | Spring terminal | | |

| Data | Unit | Min. | Typ. | Max. |
|---|-----------------|----------------|-----------------|------|
| Design | | Pins on device | | |
| Connection cable solid wire | mm ² | 0,5 | | 1,5 |
| Connection cable stranded wire | mm ² | 0,5 | | 1,5 |
| | AWG | 20 | | 16 |
| Data of integrated N/O and N/C contacts (A and B) of HMV01.1 (except for HMV01.1R-W0120) and HMV02.1 | | | | |
| Current carrying capacity | A | | | 1 |
| Peak current when switching on | A | | | 5 |
| Voltage load capacity | V | | | DC30 |
| Minimum load of the contacts | mA | 10 | | |
| Contact resistance at minimum load | mOhm | | | 1000 |
| Number of mechanical switching cycles | | | 10 ⁶ | |
| Number of switching actions at maximum time constant of load | | 100.000 | | |
| Time constant of load | ms | | | 50 |
| Pick up delay | ms | | | 10 |
| Drop out delay | ms | | | 10 |

Tab. 8-31: Properties

8.15 X34, contact for controlling the external mains contactor

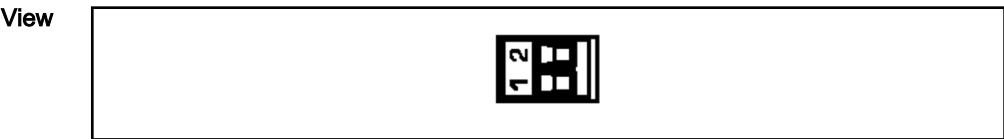


Fig. 8-16: View

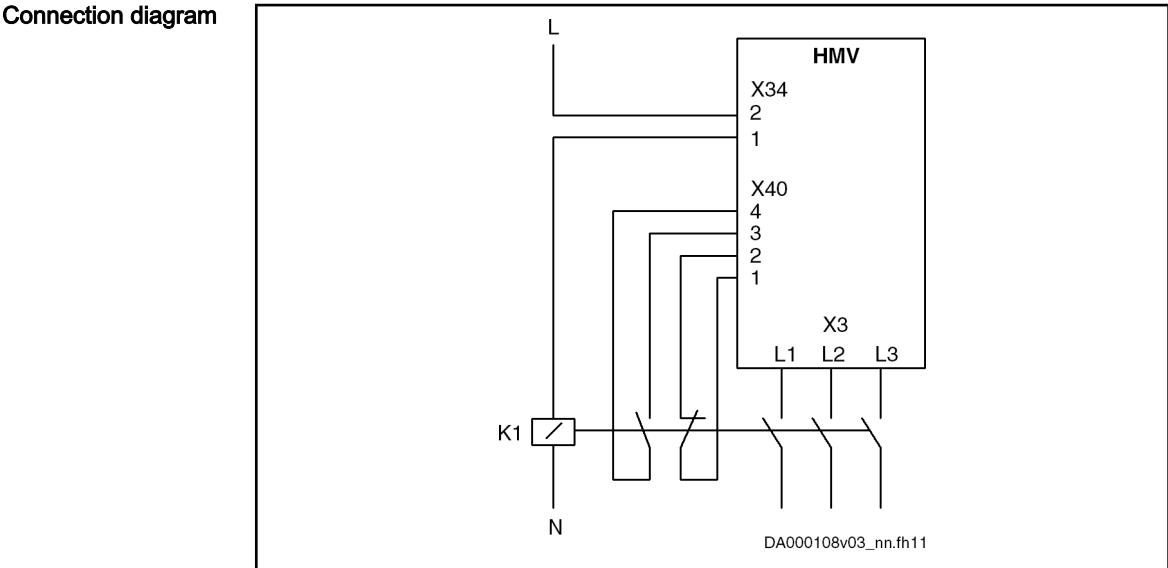
Function, pin assignment

The contact at X34 is used to control the external mains contactor of supply units without integrated mains contactor (e.g. HMV01.1R-W0120).

The contact is included in the **control circuits for mains connection** (see Project Planning Manual of drive system).

| Pin assignment | Connection | Signal name | Function |
|--|------------|-------------|-------------|
| 
DA000017v01_nn.fh11 | 1 | - | N/O contact |
| | 2 | - | |

Tab. 8-32: Function, Pin Assignment

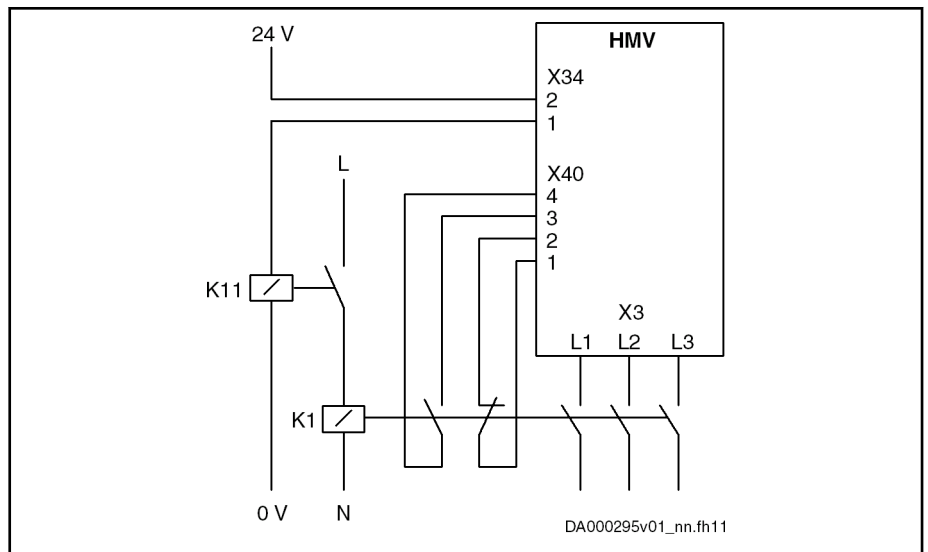


K1
L, N

External mains contactor
Supply voltage for mains contactor control

Fig. 8-17: X34, X40 connection diagram - block diagram

Connection diagram with contactor
relay



K1 External mains contactor

K11 Contactor relay

L, N Supply voltage for mains contactor control

Fig. 8-18: X34, X40 Connection Diagram with Contactor Relay - Block Diagram

Properties

| Data | Unit | Min. | Typ. | Max. |
|--|-----------------|-----------------|-----------------|---------------|
| Number of poles | | 2 | | |
| Type | | Spring terminal | | |
| Design | | Pins on device | | |
| Connection cable solid wire | mm ² | 0,5 | | 1,5 |
| Connection cable stranded wire | mm ² | 0,5 | | 1,5 |
| | AWG | 20 | | 16 |
| Current carrying capacity | A | | | DC1
AC2 |
| Fuse F1 | A | | | 2 |
| Peak current when switching on | A | | | 5 |
| Voltage load capacity | V | | | DC30
AC250 |
| Minimum load of the contacts | mA | 10 | | |
| Contact resistance at minimum load | mOhm | | | 1000 |
| Number of mechanical switching cycles | | | 10 ⁶ | |
| Number of switching actions at maximum time constant of load | | 100.000 | | |
| Time constant of load | ms | | | 50 |
| Pick up delay | ms | | | 10 |
| Drop out delay | ms | | | 10 |

Tab. 8-33: Properties

Notes on installation Use

- mains contactors with overvoltage limiter at the contactor coil
- preferably contactors with AC excitation (if necessary, use conversion contactor)

When selecting mains contactor K1 and, if necessary, contactor relay K11, observe the **maximum allowed delay time**:

The mains voltage must have been applied to the input terminals X3 at the latest **100 ms** after the control signal was output. Otherwise, "F2835 Mains contactor wiring error" is signaled.

8.16 X40, acknowledgment messages of external mains contactor



The connection point **X40** is available at supply units **HMV01.1R-W0120 with hardware index $\geq$ A11** (see type plate). These supply units do not have connection point X33.

View

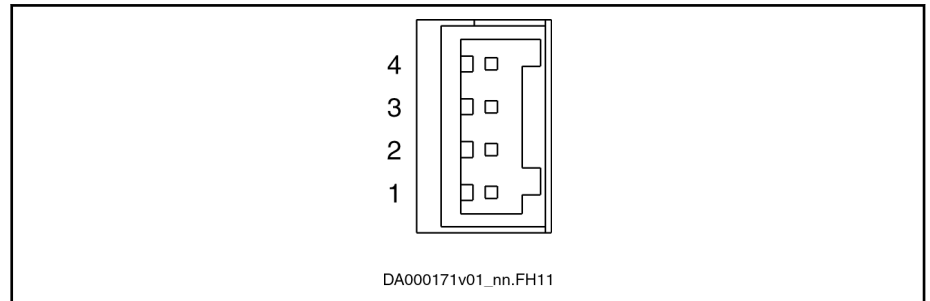


Fig. 8-19: View

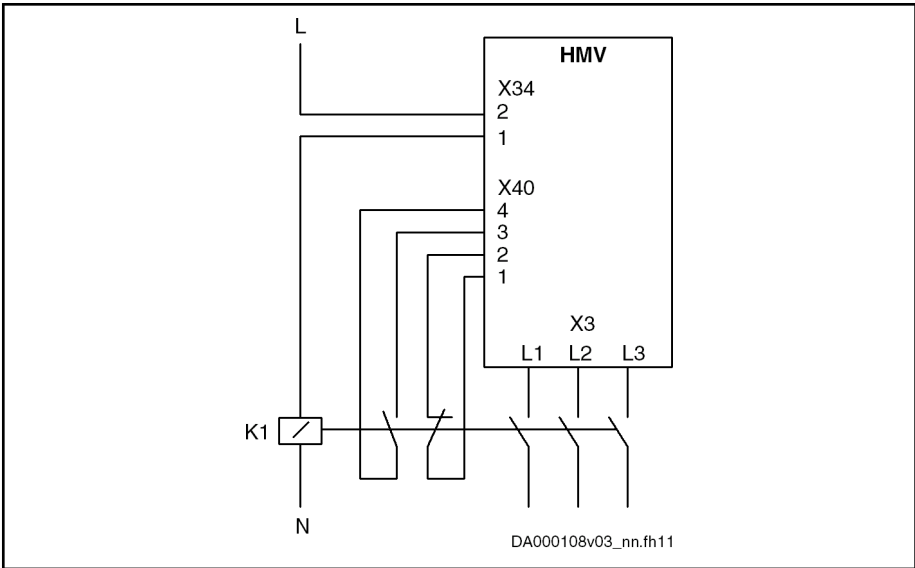
Function, pin assignment

| Pin assignment | Connection | Signal name | Function |
|--|------------|-------------|--|
| Supply units with external mains contactor
HMV01.1R-W0120 | | | Receives message signals on the status of the external mains contactor. |
| | 4 | - | A) Connect N/O contact of external mains contactor |
| | 3 | - | |
| | 2 | - | B) Connect N/C contact of external mains contactor |
| | 1 | - | |
| <p>The output current is approx. 8 mA (at 24 V). Use suitable electric-designed contacts.</p> <p>The contacts are included in the control circuits for mains connection (see Project Planning Manual of drive system).</p> | | | |

Tab. 8-34: Function, pin assignment

Connection diagram

Supply units **without integrated** mains contactor



K1 External mains contactor
L, N Supply voltage for mains contactor control
Fig. 8-20: X34, X40 connection diagram - block diagram



Mains contactor cannot be switched on in spite of "VM bb" !

In spite of the display "VM Bb" or "VM bb", it can sometimes be impossible to switch the mains contactor on.

Possible cause:

This can be caused by a defective external mains contactor with, for example, contacts stuck together. The error message "F2837 Contactor monitoring error" cannot be diagnosed in such cases.

With contacts of the main circuit stuck together, the N/C contact (X40.1/2) remains open in the position of rest and the switch-on circuit is thereby interrupted.

Remedy:

Check and, if necessary, replace the external mains contactor.

Properties

| Data | Unit | min. | typ. | max. |
|---------------------------------|-----------------|-----------------|------|------|
| Number of poles | | 4 | | |
| Type | | Spring terminal | | |
| Design | | Pins on device | | |
| Connection cable solid wire | mm ² | 0.5 | | 1.5 |
| Connection cable, stranded wire | mm ² | 0.5 | | 1.5 |
| | AWG | 20 | | 16 |

Tab. 8-35: Properties

8.17 Terminal block, 24V - 0V (24V supply)

Function, pin assignment

Connection of external 24V supply:

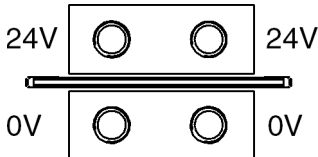
24V supply of HMS, HMD, HCS power sections (not at HCS02)

- For the power section of the drive controller
- For brake control via X6
- For the control section of the drive controller with the optional modules, except for such optional modules (e.g. safety technology S1) which require their own power supply

24V supply of HMD supply units

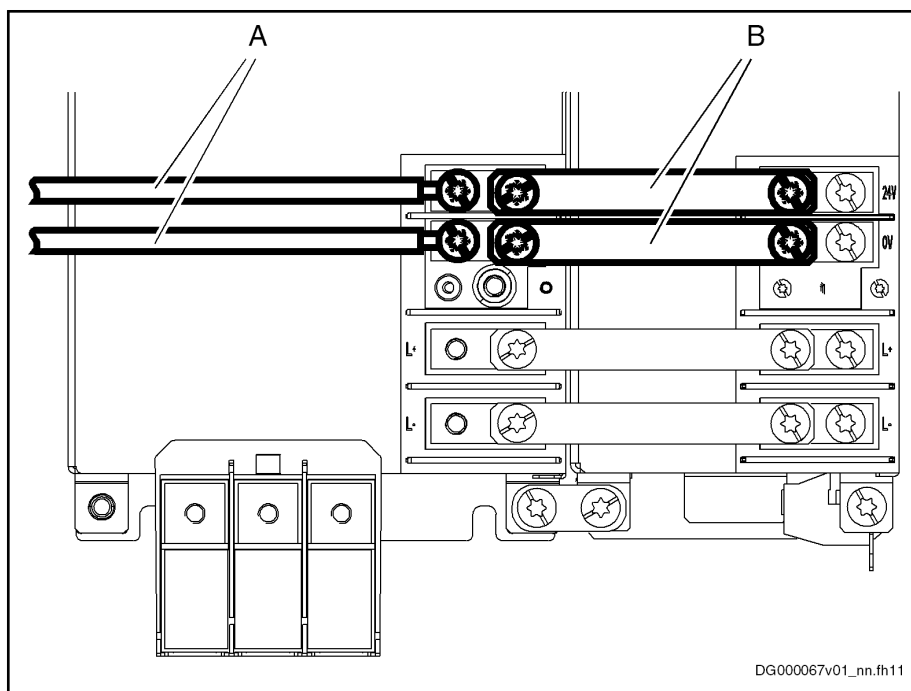
- For the integrated electronics
- For the 24V interface of the mains connection for ON/OFF control

Technical data of the connection point

| View | Identification | 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 | |
| | | | |
| Screw connection | Unit | Min. | Max. |
| M6 thread at device (terminal block) | | | |
| Tightening torque | Nm | 5.5 | 6.5 |
| Power consumption | W | P _{N3} (see technical data) | |
| Voltage load capacity | V | U _{N3} (see technical data) | |
| Polarity reversal protection | | Within the allowed voltage range by internal protective diode | |
| Current carrying capacity "looping through" from 24V to 24V, 0V to 0V
(contact bars in scope of supply of accessory HAS01) | | | |
| With contact bars -072 | A | 220 | |

Tab. 8-36: Function, pin assignment, properties

Connection diagram



DG000067v01_nn.fh11

A Cable (to source of control voltage supply)**B** Contact bars*Fig. 8-21: Connection points and connections of control voltage***Notes on installation**

Requirements on the connection to the 24V supply:

- Maximum allowed inductance of 100 μ H (2 twisted single strands, 75 m long)
- Parallel line routing where possible



The input 0V is connected in conductive form to the housing potential. It is therefore impossible to use an insulation monitor at +24V and 0V against housing.

8.18 L+ L-, DC bus connection

⚠ WARNING

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

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

Wait at least **30 minutes** after switching off the supply voltages to allow **discharging**.

Check whether voltage has fallen below 50 V before touching live parts!

Function, pin assignment

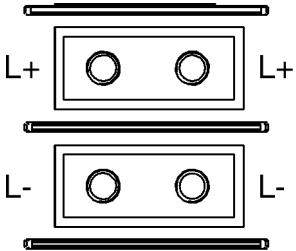
The DC bus connection connects

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



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

Technical Data of the Connection Point

| View | Identification | Function | |
|--|----------------|---|------|
|  <p>DA000176v01_nn.FH11</p> | L+ | Connection points for connecting DC bus connections | |
| | L- | | |
| | | | |
| Screw connection | Unit | Min. | Max. |
| 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 | |
| Current carrying capacity "looping through" from L+ to L+, L- to L-
(contact bars in scope of supply of accessory HAS01) | | | |
| With contact bars -072 | A | | 220 |
| Additionally with contact bars -042 and end piece | A | | 245 |

Tab. 8-37: Function, Pin Assignment, Properties

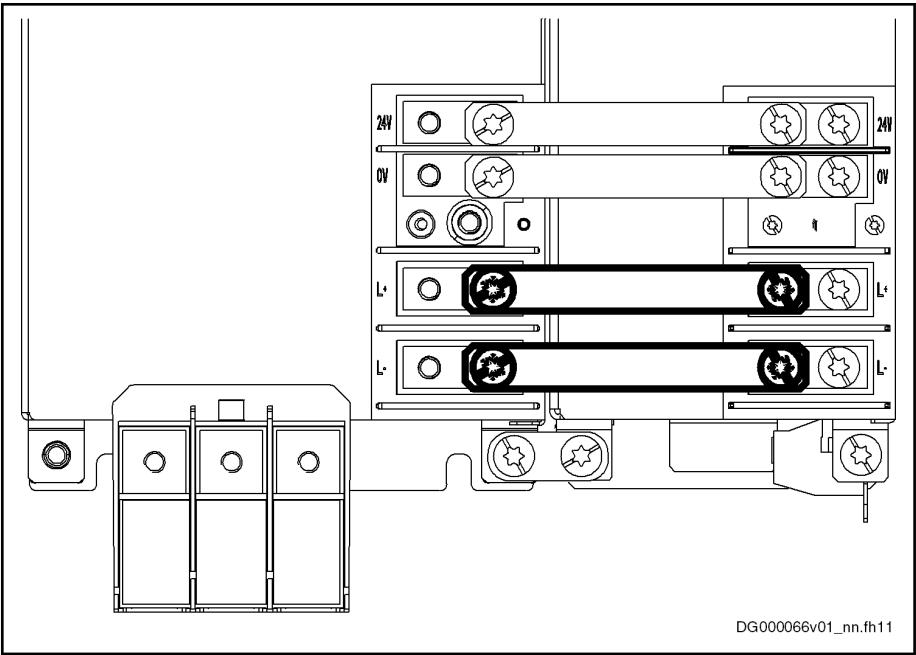


Fig. 8-22: DC Bus Connection with Contact Bars

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.

NOTICE

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 ² ,
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) |

Tab. 8-38: DC Bus Line

8.19 XS1, shield connection control lines

NOTICE

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



Always connect the shields with the largest possible metal-to-metal contact surface.

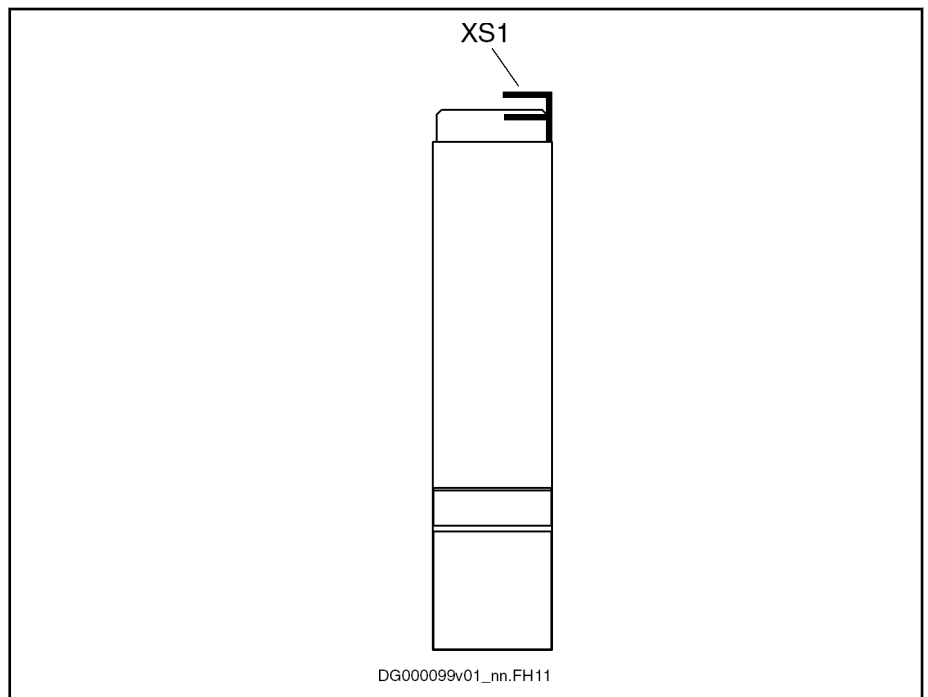


Fig. 8-23: Shield Connection XS1 (Control Lines)

Function Connection point for the shields of lines connected to the control section and of which the connectors do not have their own shield connection.

8.20 XS2, shield connection motor cable

NOTICE

Risk of damage to the drive controller by too long screws!

Exclusively use screws of a **maximum length of 12 mm** for the thread of shield connection XS2.

The connection consists of an M6 thread and is used for mounting the fixing device for shield connection of the motor cable.

The [accessory HAS02](#) contains all parts required for effective shield connection of the motor cable (see index entry "[Accessories](#)").

8.21 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 of the drive system (index entry "Mains connection → Project planning").

8.22 Connection point of equipment grounding conductor, HMV

WARNING

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

Via the joint bar on the front, connect the drive controller **to the supply unit**.

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

Connect the equipment grounding conductor connection of the supply unit to the equipment grounding conductor 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:

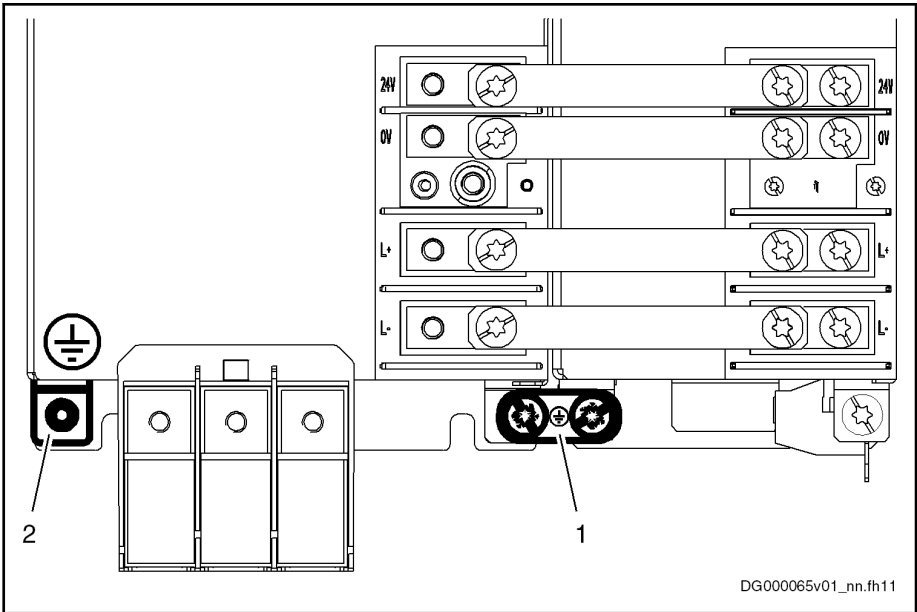
- For **HCS03.1E** drive controllers, **HMV01** and **HMV02** supply units at least **10 mm² (AWG 8)**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- For **HCS02.1E** drive controllers, **at least 4 mm² (AWG 10)**, but not smaller than the cross sections 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.

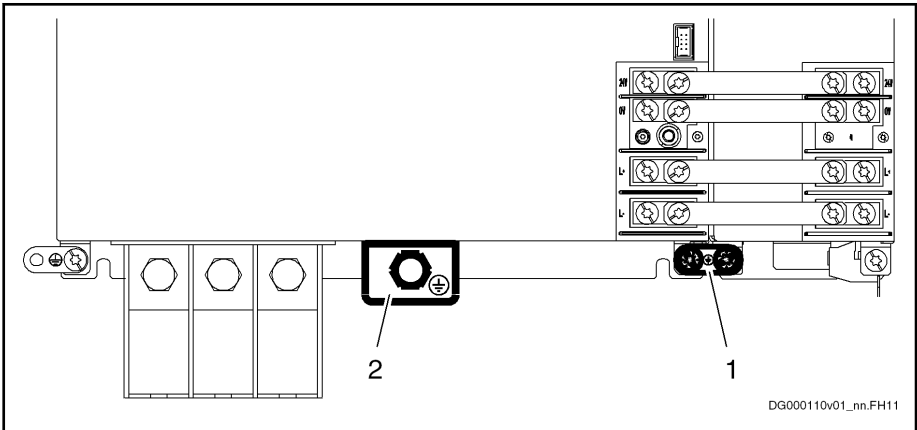
For outer conductors with a cross section greater than 16 mm², you can reduce the cross section of the equipment grounding connection according to the table "Equipment Grounding Conductor Cross Section".

| Cross-sectional area A of outer conductors | Minimum cross-sectional area A _{PE} 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 |

Tab. 8-39: *Equipment grounding conductor cross section*



1 Joint bar
2 Equipment grounding conductor connection at supply unit
Fig. 8-24: Equipment Grounding Conductor Connection at Supply Unit or Neighboring Device



1 Joint bar
2 Equipment grounding conductor connection at supply unit
Fig. 8-25: Equipment Grounding Conductor Connection at HMV01.1-W0120 Supply Unit or Neighboring Device

Design The equipment grounding conductor is connected with screws:

| | |
|--|----------------------------------|
| HMV01.1E-W0030, -W0075
HMV01.1R-W0018, -W0045, -W0065
HMV02.1R-W0015 | HMV01.1E-W0120
HMV01.1R-W0120 |
| M6 × 25 | M10 |

Tab. 8-40: Design

Tightening torque

| | |
|--|----------------------------------|
| HMV01.1E-W0030, -W0075
HMV01.1R-W0018, -W0045, -W0065
HMV02.1R-W0015 | HMV01.1E-W0120
HMV01.1R-W0120 |
| 6 Nm | 18 Nm |

Tab. 8-41: Tightening Torque

8.23 Connection of equipment grounding conductor

WARNING

Lethal electric shock 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, **HMV01** and **HMV02** supply units at least **10 mm² (AWG 8)**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- For **HCS02.1E** drive controllers, **at least 4 mm² (AWG 10)**, 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.

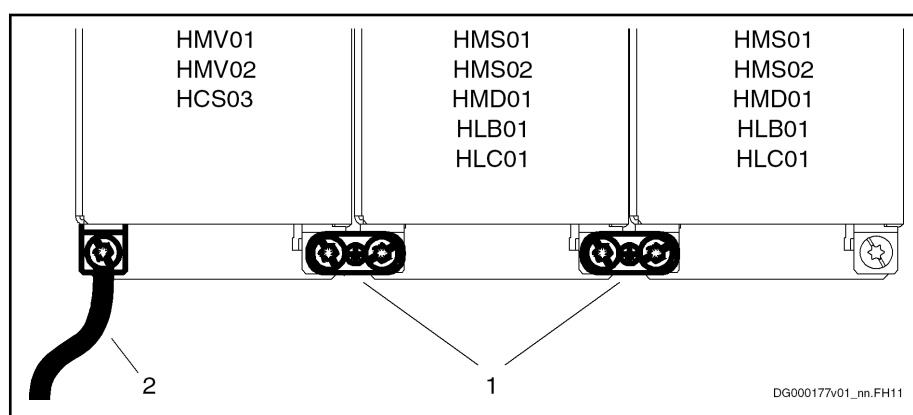
For outer conductors with a cross section greater than 16 mm², you can reduce the cross section of the equipment grounding connection according to the table "Equipment Grounding Conductor Cross Section".

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

Tab. 8-42: Equipment grounding conductor cross section

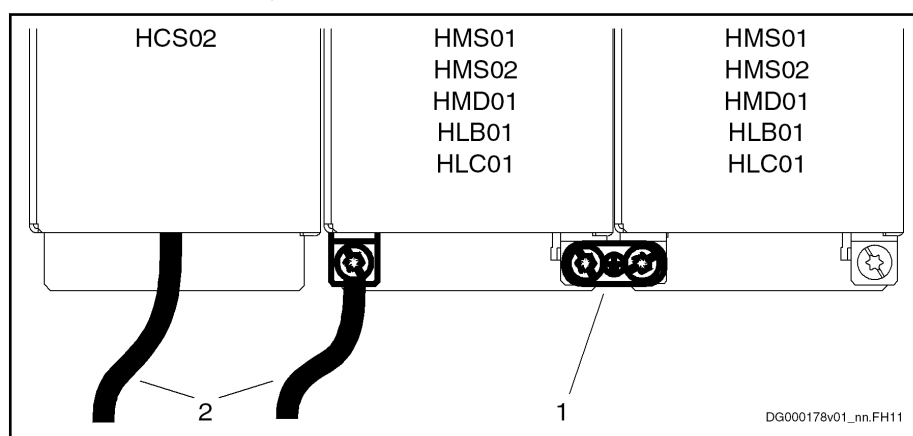


The line for the connection of the equipment grounding conductor must have at least the cross section of the mains supply feeder. With cross sections of the mains supply feeder smaller than 10 mm^2 (AWG 8), the equipment grounding conductor must have at least 10 mm^2 (AWG 8).



- 1 Joint bar
2 Connection to equipment grounding system

Fig. 8-26: Equipment Grounding Conductor Connection for Supply via HMV01, HMV02, HCS03



- 1 Joint bar
2 Connection to equipment grounding system

Fig. 8-27: 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 |

Tab. 8-43: Data of Connection Point

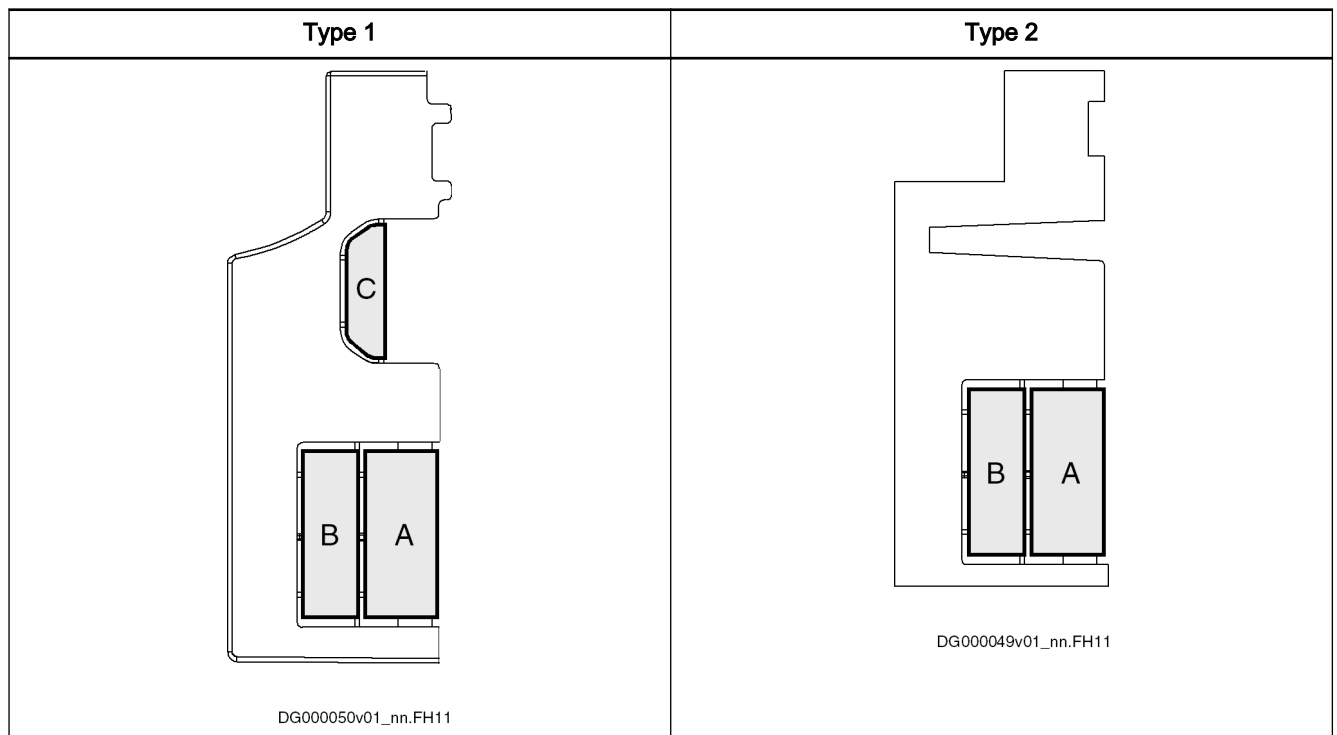
9 Touch guard at devices

9.1 Cutouts

⚠ WARNING

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

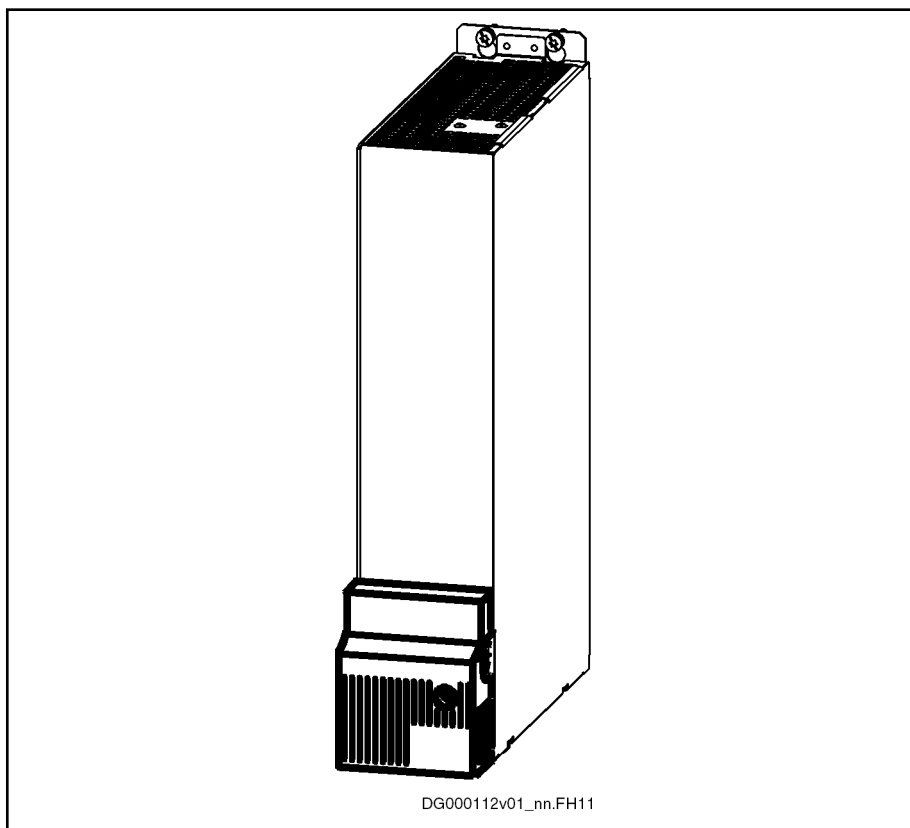
- The appropriate touch guard must be mounted for each device following connection work.
- Never mount a damaged touch guard.
- Immediately replace a damaged touch guard by an undamaged touch guard.
- Keep the cutouts at the touch guard as small as possible. Only remove the cutouts if necessary.



Tab. 9-1: 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.

9.2 Mounting



DG000112v01_nn.FH11

Fig. 9-1: Touch Guard at Device

The touch guard is fixed to the device with screws.

Tightening torque **Max. 2.8 Nm**

10 Commissioning, operation and diagnostics

10.1 Supply units

10.1.1 Control panel

Brief description

Rexroth IndraDrive supply units have a standard control panel with an 8-digit display and four keys.

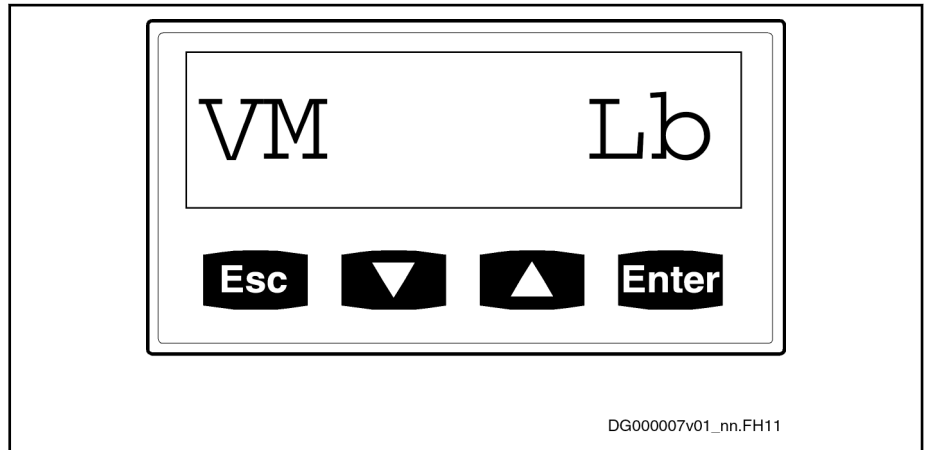


Fig. 10-1: Standard control panel with display and keys

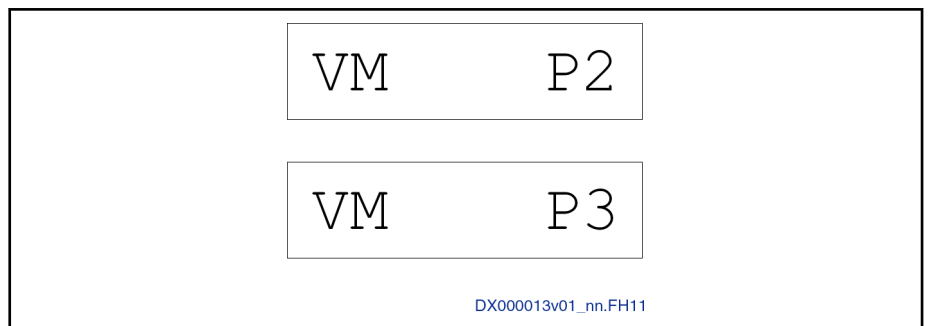
Functional description

Displays

The display automatically shows:

- phases during device initialization
- operating states
- activated commands
- diagnostic command messages
- warnings
- diagnostic error messages

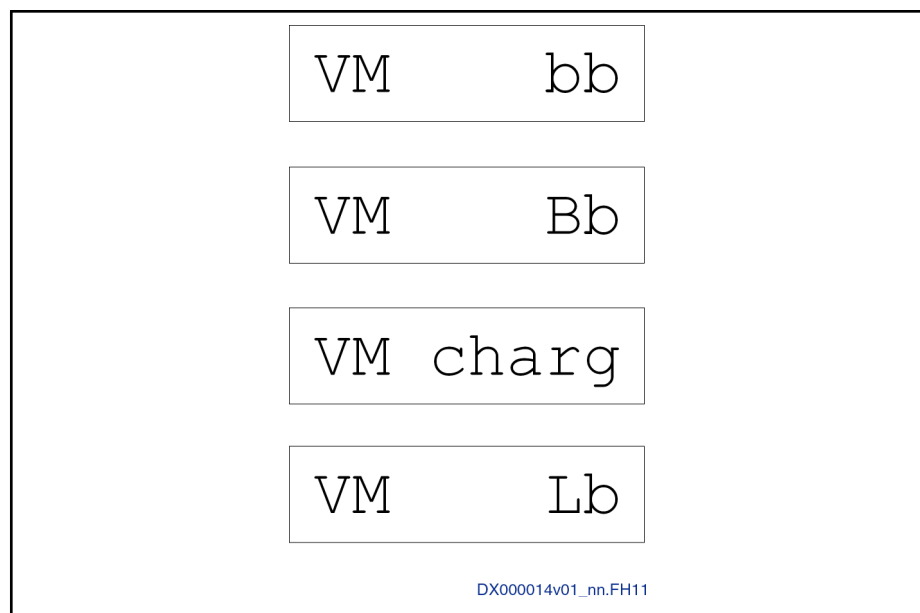
Display during device initialization



P2 phase 2
P3 phase 3

Fig. 10-2: Display during device initialization

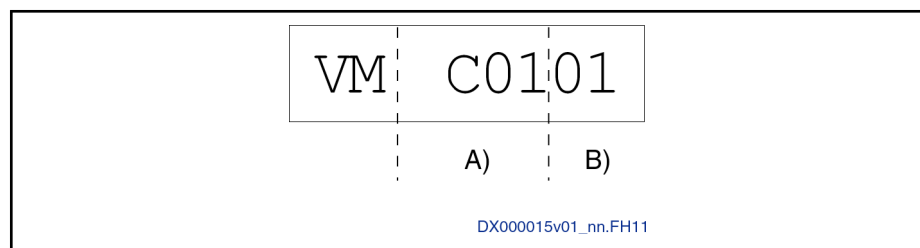
Display of operating states



bb ready for operation
Bb ready for operation, mains voltage applied
charg DC bus charging
Lb ready for power output

Fig. 10-3: Display of operating states

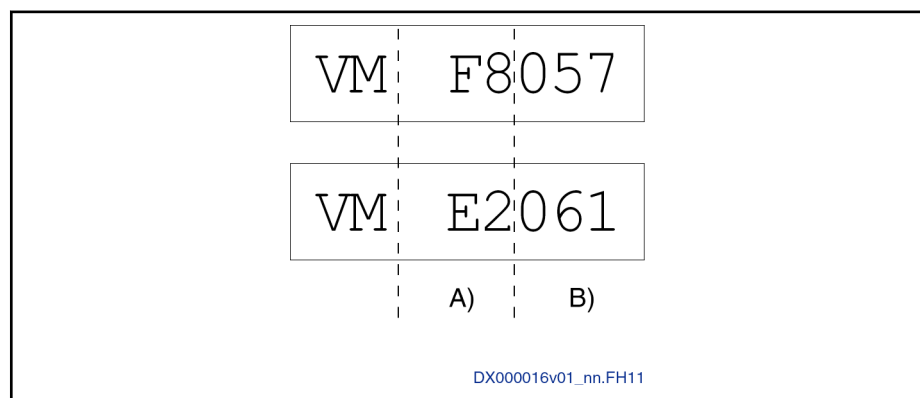
Diagnostic command messages



A) displays currently active command
B) displays number of diagnostic command message

Fig. 10-4: Diagnostic command messages

Warnings and diagnostic error messages



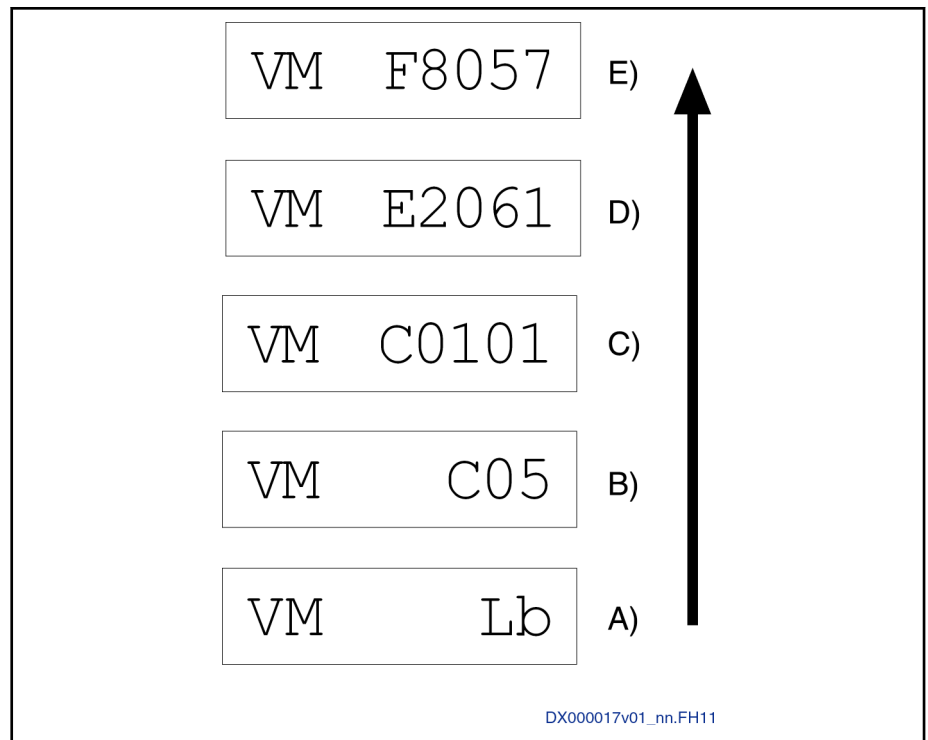
A) displays error class and warning class
B) displays error number and warning number

Fig. 10-5: Warnings and diagnostic error messages

Priorities of display

The displays have different priorities because it is impossible to have various displays at the same time.

The current drive status is displayed with highest priority.



- E) error messages (highest priority)
D) warnings
C) diagnostic command messages
B) commands
A) operating status (lowest priority)

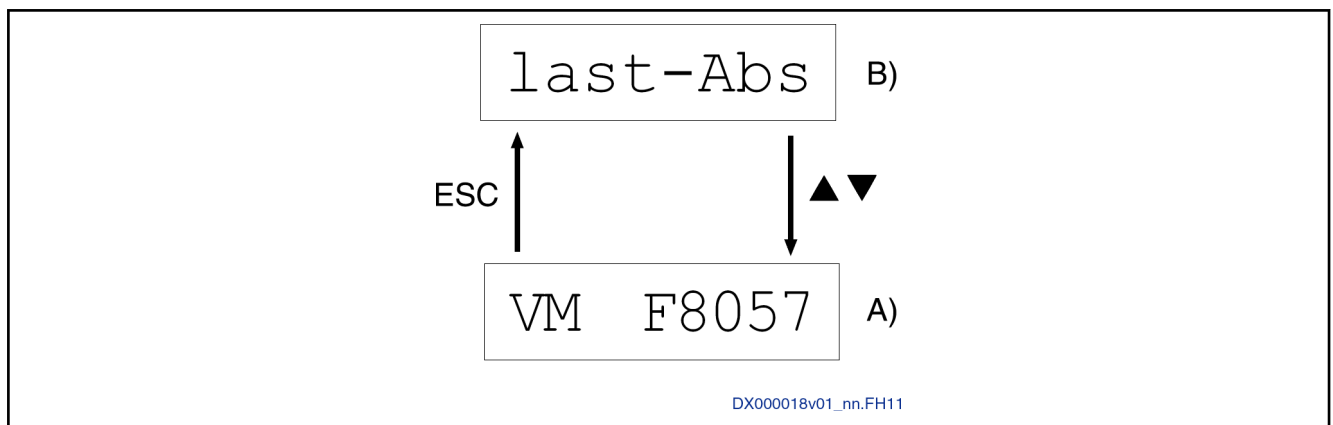
Fig. 10-6: Priority of displays with examples

Complete diagnostic message text

Call complete diagnostic message text for diagnostic message currently displayed:

- initial state: standard display (e.g. "VM F8057")
- press key "v" or "^"

The diagnostic message text is displayed in the form of a marquee text. After the marquee text was completely displayed, the standard display appears again.



- B) current diagnostic message (marquee text)
A) standard display

Fig. 10-7: Calling complete diagnostic message text

Extended displays

Call extended displays (see also figure below):

- initial state: standard display (e.g. "VM Lb")
- simultaneously press "Enter" and "Esc" keys for at least 8 seconds
- press "Enter" key
- press "v" or "^" key until desired display appears
- press "Enter" key

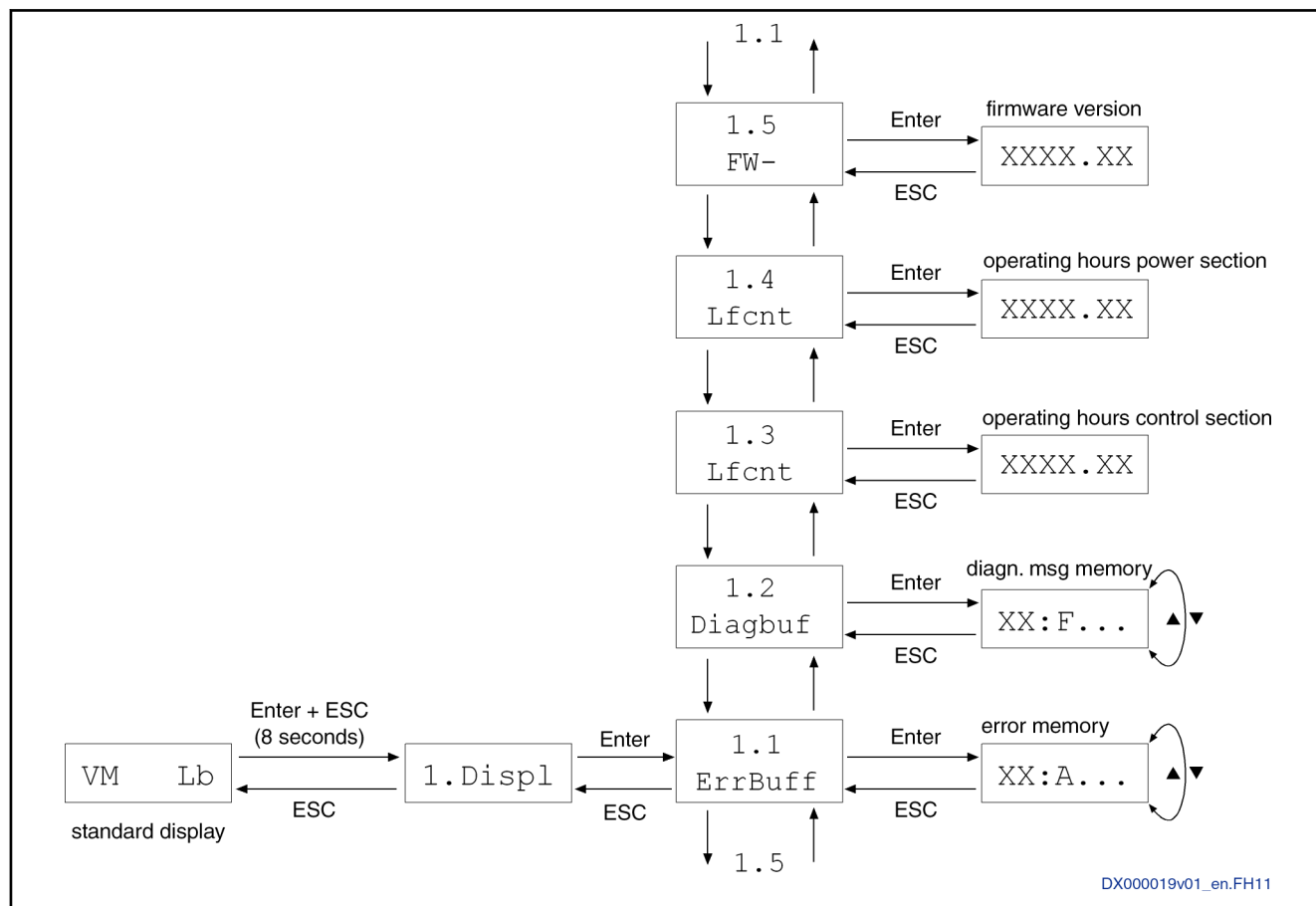


Fig. 10-8: Calling extended displays

There are the following extended displays:

- **1.1 ErrBuff:** error memory; with the "v" or "^" key you can browse the memory
- **1.2 DiagBuf:** diagnostic message memory; with the "v" or "^" key you can browse the memory
- **1.3 Lfcnt:** operating hours counter control section
- **1.4 Lfcnt:** operating hours counter power section (only for HMV01.1R)
- **1.5 FW-***:** type designation of the firmware active in the device

Setting the language

Set language in which diagnostic message texts are displayed (see also figure below):

- initial state: standard display (e.g. "VM Lb")
- simultaneously press "Enter" and "Esc" keys for at least 8 seconds

- press "^" key
- press "Enter" key
- press "Enter" key
- with "v" or "^" key select the desired language

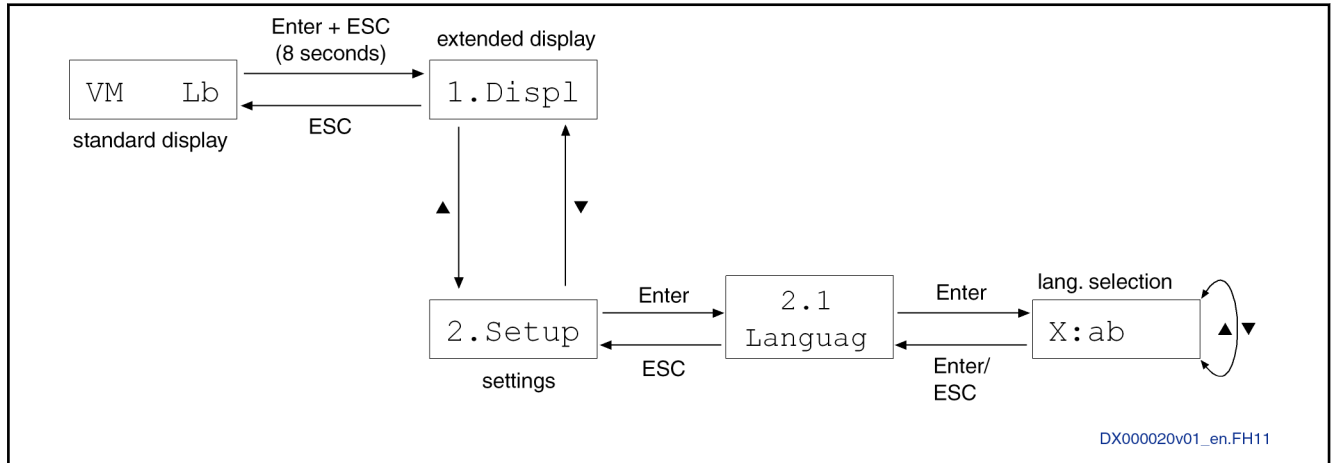


Fig. 10-9: Setting the language

10.1.2 Diagnostic displays at IndraDrive M supply units

HMV - Diagnostic messages for operating states and during the initialization phase



For the detailed descriptions of the listed diagnostic displays see the description of diagnostic messages of the firmware documentation.

| Display | Number | Diagnostics |
|---------|--------|---|
| VM P0 | A0000 | Communication phase 0 |
| VM P1 | A0001 | Communication phase 1 |
| VM P2 | A0002 | Communication phase 2 |
| VM P3 | A0003 | Communication phase 3 |
| VM Bb | A0012 | <p>Control and power sections ready for operation</p> <p>In spite of the display "VM Bb" or "VM bb", it might be impossible to activate the mains contactor.</p> <p>Possible cause:</p> <p>This can be caused by a defective external mains contactor with, for example, contacts stuck together. In this case, it is impossible to diagnose the error message "F2837 Contactor monitoring error".</p> <p>With contacts of the main circuit stuck together, the N/C contact (X40.1/2) remains open in the position of rest and the switch-on circuit is thereby interrupted.</p> <p>Remedy:</p> <p>Check and, if necessary, replace the external mains contactor.</p> |

| Display | Number | Diagnostics |
|---------|--------|----------------------------------|
| VM bb | A0013 | Ready for power on |
| VM | A0500 | Supply module in voltage control |
| VM | A0502 | Supply module in operation |
| VM | A0503 | DC bus charging active |
| VM | A0520 | DC bus quick discharge active |
| VM | A0800 | Unknown operating mode |

Tab. 10-1: Initialization and operating states of HMV

HMV - Diagnostic warning messages



For the detailed descriptions of the causes and remedies relating to the listed "diagnostic message numbers", see the description of diagnostic messages of the firmware documentation.

| Display | Number | Diagnostics |
|----------|--------|---------------------------------------|
| VM E2026 | E2026 | Undervoltage in power section |
| VM E2050 | E2050 | Device overtemp. Prewarning |
| VM E2061 | E2061 | Device overload prewarning |
| VM E2810 | E2810 | Drive system not ready for operation |
| VM E2818 | E2818 | Phase failure |
| VM E2819 | E2819 | Mains failure |
| VM E2820 | E2820 | Braking resistor overload prewarning |
| VM E8025 | E8025 | Overvoltage in power section |
| VM E8026 | E8026 | Undervoltage in power section |
| VM E8057 | E8057 | Device overload, current limit active |
| VM E8802 | E8802 | PLL is not synchronized |
| VM E8814 | E8814 | Undervoltage in mains |
| VM E8815 | E8815 | Overvoltage in mains |
| VM E8818 | E8818 | Phase failure |
| VM E8819 | E8819 | Mains failure |

Tab. 10-2: Diagnostic warning messages of HMV

HMV - Diagnostic error messages



For the detailed descriptions of the causes and remedies relating to the listed "diagnostic message numbers", see the description of diagnostic messages of the firmware documentation.

| Display | Number | Diagnostics |
|----------|--------|----------------------------------|
| VM PL | F2009 | PL Load parameter default values |
| VM F2018 | F2018 | Device overtemperature shutdown |

| Display | Number | Diagnostics |
|----------|--------|---|
| VM F2022 | F2022 | Device temperature monitor defective |
| VM F2026 | F2026 | Undervoltage in power section |
| VM F2077 | F2077 | Current measurement trim wrong |
| VM F2087 | F2087 | Module group communication error |
| VM F2110 | F2110 | Error in non-cyclical data communic. of power section |
| VM F2802 | F2802 | PLL is not synchronized |
| VM F2814 | F2814 | Undervoltage in mains |
| VM F2815 | F2815 | Overvoltage in mains |
| VM F2816 | F2816 | Softstart fault power supply unit |
| VM F2817 | F2817 | Overvoltage in power section |
| VM F2818 | F2818 | Phase failure |
| VM F2819 | F2819 | Mains failure |
| VM F2820 | F2820 | Braking resistor overload |
| VM F2821 | F2821 | Error in control of braking resistor |
| VM F2833 | F2833 | Ground fault in motor line |
| VM F2834 | F2834 | Contactor control error |
| VM F2835 | F2835 | Mains contactor wiring error |
| VM F2836 | F2836 | DC bus balancing monitor error |
| VM F2837 | F2837 | Contactor monitoring error |
| VM F2840 | F2840 | Error supply shutdown |
| VM F2860 | F2860 | Overcurrent in mains-side power section |
| VM F2890 | F2890 | Invalid device code |
| VM F2891 | F2891 | Incorrect interrupt timing |
| VM F2892 | F2892 | Hardware variant not supported |
| VM F8057 | F8057 | Device overload shutdown |
| VM F8069 | F8069 | +/-15Volt DC error |
| VM F8070 | F8070 | +24Volt DC error |
| VM F8813 | F8813 | Connection error mains choke |
| VM F9001 | F9001 | Error internal function call |
| VM F9003 | F9003 | Watchdog |
| VM F9004 | F9004 | Hardware trap |

Tab. 10-3: Diagnostic error messages of HMV

HMV - Diagnostic command messages



For the detailed descriptions of the listed diagnostic displays see the description of diagnostic messages of the firmware documentation.

Diagnostic command messages of HMV

| Display | Number | Diagnostics |
|----------|--------|---|
| VM C01 | C0100 | Communication phase 3 transition check |
| VM C0101 | C0101 | Invalid parameters (-> S-0-0021) |
| VM C0102 | C0102 | Limit error in parameter (-> S-0-0021) |
| VM C02 | C0200 | Exit parameterization level procedure command |
| VM C0201 | C0201 | Invalid parameters (->S-0-0423) |
| VM C0202 | C0202 | Parameter limit error (->S-0-0423) |
| VM C0203 | C0203 | Parameter calculation error (->S-0-0423) |
| VM C0212 | C0212 | Invalid control section data (->S-0-0423) |
| VM C0298 | C0298 | Impossible to exit parameterization level |
| VM C04 | C0400 | Activate parameterization level 1 procedure command |
| VM C0401 | C0401 | Switching not allowed |
| VM C05 | C0500 | Reset class 1 diagnostics, error reset |
| VM C08 | C0800 | Load basic parameters command |
| VM C0851 | C0851 | Parameter default value incorrect (-> S-0-0021) |
| VM C0852 | C0852 | Locked with password |

Tab. 10-4: Diagnostic command messages of HMV

10.2 Drive controllers

10.2.1 Control panel



For the detailed description of the standard control panel, see the "Control Panels" section in the Functional Description of the firmware documentation.

10.2.2 Diagnostic displays at drive controllers



For the detailed descriptions of all diagnostic displays at drive controllers, see the description of diagnostic messages of the firmware documentation.

11 Accessories

11.1 General information

This section describes the accessories

- [HAS01, basic accessories](#)
- [HAS02, shield connection](#)

For the complete scope of available accessories in the IndraDrive system, see documentation "Rexroth IndraDrive Additional Components and Accessories".

11.2 HAS01, basic accessories

11.2.1 Type code



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

| Short text
column | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 2 |
|--|---|
| Example: | H | A | S | 0 | 1 | . | 1 | - | 0 | 5 | 0 | - | 0 | 7 | 2 | - | M | 2 | . | . | . |
| Product | |
| Accessories | |
| IndraDrive ... = HAS | |
| Series | |
| Basic accessories. ... = 01 | |
| Design | |
| 1 ... = 1 | |
| Device width in mm | |
| 50 ... = 050 | |
| 65 ... = 065 | |
| 75 ... = 075 | |
| 100 ... = 100 | |
| 105 ... = 105 | |
| 125 ... = 125 | |
| 150 ... = 150 | |
| 175 ... = 175 | |
| 200 ... = 200 | |
| 225 ... = 225 | |
| 250 ... = 250 | |
| 350 ... = 350 | |
| Independent of device width. ... = NNN | |
| Contact bar | |
| With cross section 48 mm ² = 048 | |
| With cross section 72 mm ² = 072 | |
| Without. ... = NNN ① | |
| Other design | |
| Compact devices. ... = CN | |
| Compact device, HCS04.1E-x500 ... = CA | |
| Modular devices of series "02" ... = M2 | |
| Modular devices ... = MN | |
| None. ... = NN | |
| Additional module HLL. ... = S1 | |
| Notes: | |
| ① Only for device widths "065", "105", "125", "150", "175",
"225", "250", "350" and "NNN" | |

DT000003v02_en.fh11

Fig. 11-1: Type code HAS01.1

11.2.2 Short description

Accessories for mounting and installing the drive controllers in a group, i.e. next to each other.

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.

11.2.3 Use

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")
- inform the user on safety risks. The HAS01 accessory contains adhesive labels with notes on safety in the English and French languages. Place the adhesive labels clearly visibly at the device or in the immediate vicinity of the device, if the adhesive labels existing at the device are hidden by neighboring devices.



Using 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, 24 - 0V \(24V supply\)](#)" in the Project Planning Manual for supply units and power sections.

11.2.4 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 | ■ |
| | W0300 | 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 | - |
| HLB01.1 | D | 100 | 100 | - |
| HLC01.1 | D | 75 | 075 | - |
| HMD01.1E- | W0030 | 150 | 150 | - |
| | W0075 | 250 | 250 | ■ |
| | W0120 | 350 | 350 | ■ |
| HMD01.1R- | W0018 | 175 | 175 | - |
| | W0045 | 250 | 250 | ■ |
| | W0065 | 350 | 350 | ■ |
| | W0120 | 350 | 350 | ■ |
| HMD02.1R- | W0015 | 150 | 150 | - |
| 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 | ■ |
| | W0280 | 350 | 350 | ■ |
| | W0350 | 350 | 350 | ■ |

Tab. 11-1: Device Width

11.2.5 Scope of supply

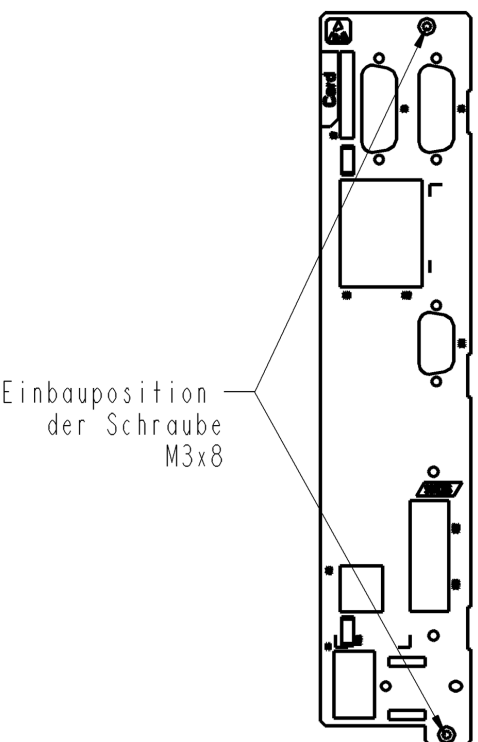
Made in Germany
109-1304-4815-01

HAS01.1-NNN-NNN-MN



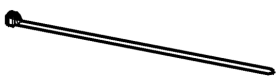
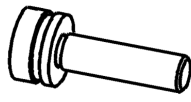
R911324332

| | | |
|-------------|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 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 |
| Stck | Benennung | MNR |



1:2

BEIPACKZETTEL HAS01.1-NNN-NNN-MN

| Stck | Benennung | MNR |
|---|--|------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
|  <p style="text-align: right;">1:1</p> | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
|  <p style="text-align: right;">1:4</p> | | |
| 13 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|  <p style="text-align: right;">1:1</p> | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|  <p style="text-align: right;">2:5</p> | | |

| | | | | |
|--------------|------------|-----------|----------------------------------|------------------|
| Datum | 2008-04-17 | Benennung | BEIPACKZETTEL HAS01.1-NNN-NNN-MN | |
| Name | rainhirt | | | |
| Material-Nr. | R911324333 | Zeich-Nr. | 109-1304-4220-01 | |
| Datei | DB228234 | Ers.durch | .. | AEM-Nr. 5-046292 |

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Fig. 11-2: Product insert

Made in Germany

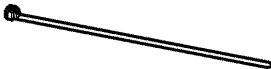
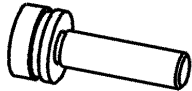
109-1253-4801-06

HAS01.1-050-072-MN

R911306620

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-050-072 ISOL. | R911309945 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 12 | 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-050-072-MN

| Stck | Benennung | MNR | | | | | | | | | | | | |
|--|---|----------------------------------|-------|------------|-----------|------|------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | |
| DB-40080 |  | 1:1 | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | |
| DB146855 |  | 1:4 | | | | | | | | | | | | |
| 12 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | |
| DB-54729 |  | 1:1 | | | | | | | | | | | | |
| 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 | R911326524 | | | | | | | | | | | | |
| DB220871 |  | 2:5 | | | | | | | | | | | | |
| <table> <tr> <td>Datum</td><td>2004-02-20</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Hirt</td><td>BEIPACKZETTEL HAS01.1-050-072-MN</td></tr> <tr> <td>Material-Nr.</td><td>R911306606</td><td>Zeich-Nr. 109-1253-4201-07</td></tr> <tr> <td>Datei</td><td>DB166239</td><td>Ers.durch .. AEM-Nr. 5-046292</td></tr> </table> | | | Datum | 2004-02-20 | Benennung | Name | Hirt | BEIPACKZETTEL HAS01.1-050-072-MN | Material-Nr. | R911306606 | Zeich-Nr. 109-1253-4201-07 | Datei | DB166239 | Ers.durch .. AEM-Nr. 5-046292 |
| Datum | 2004-02-20 | Benennung | | | | | | | | | | | | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-050-072-MN | | | | | | | | | | | | |
| Material-Nr. | R911306606 | Zeich-Nr. 109-1253-4201-07 | | | | | | | | | | | | |
| Datei | DB166239 | Ers.durch .. AEM-Nr. 5-046292 | | | | | | | | | | | | |

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Fig. 11-3: Product insert

Made in Germany
109-1228-4812-04

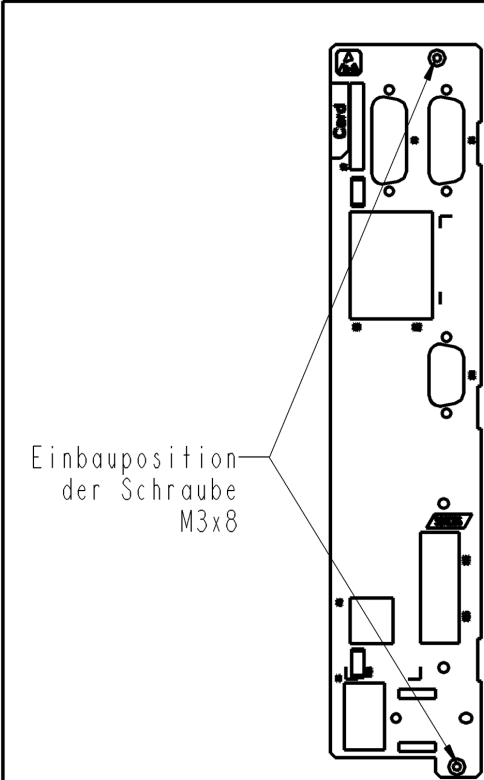
HAS01.1-065-NNN-CN



R911306007

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 2 | 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 |

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|



1:2

BEIPACKZETTEL HAS01.1-065-NNN-CN

| Stck | Benennung | MNR |
|------|---------------------------------------|------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |

1:1



| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 1:4 | | |
| 2 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 1:2 | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 2:5 | | |
| | | |

| | | | | |
|--------------|------------|----------------------------------|------------------|------------------|
| Datum | 2004-01-29 | Benennung | | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-065-NNN-CN | | |
| Material-Nr. | R911306096 | Zeich-Nr. | 109-1228-4230-05 | |
| Datei | DB165225 | Ers.durch | .. | AEM-Nr. 5-046292 |

DL000130v01_nn.tif

Fig. 11-4: Product insert

Made in Germany

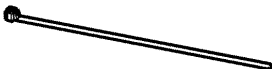
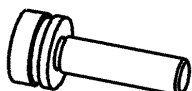
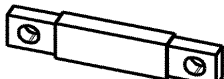
109-1253-4802-06

HAS01.1-075-072-MN

R911306619

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-075-072 ISOL. | R911309946 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 12 | 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-075-072-MN

| Stck | Benennung | MNR | | | | | | | | | | | | |
|--|--|----------------------------------|-------|------------|-----------|------|------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | |
| DB-40060 |  | 1:1 | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | |
| DB146855 |  | 1:4 | | | | | | | | | | | | |
| 12 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | |
| DB-54729 |  | 1:1 | | | | | | | | | | | | |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 | | | | | | | | | | | | |
| DB139203 |  | 1:2 | | | | | | | | | | | | |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 | | | | | | | | | | | | |
| DB184465 |  | 1:2 | | | | | | | | | | | | |
| 4 | SCHIENE-VERBINDUNG HAS01.1-075-072 ISOL. | R911309946 | | | | | | | | | | | | |
| DB166231 |  | 1:2 | | | | | | | | | | | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 | | | | | | | | | | | | |
| DB220871 |  | 2:5 | | | | | | | | | | | | |
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| Datum | 2004-02-20 | Benennung | | | | | | | | | | | | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-075-072-MN | | | | | | | | | | | | |
| Material-Nr. | R911306607 | Zeich-Nr. 109-1253-4202-07 | | | | | | | | | | | | |
| Datei | DB166241 | Ers.durch .. AEM-Nr. 5-046292 | | | | | | | | | | | | |

DL000060v01_nn.tif

Fig. 11-5: Product insert

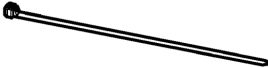
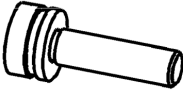
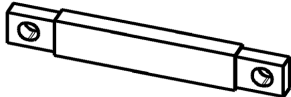
Made in Germany
109-1253-4803-06

HAS01.1-100-072-MN



R911306621

| | | |
|-------------|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 4 | SCHIENE-VERBINDUNG HAS01.1-100-072 ISOL. | R911309947 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 14 | 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 |
| Stck | Benennung | MNR |

| BEIPACKZETTEL HAS01.1-100-072-MN | | |
|----------------------------------|---|------------|
| Stck | Benennung | MNR |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| DB-40060 |  | 1:1 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| DB16855 |  | 1:4 |
| 14 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| DB-54729 |  | 1:1 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| DB139203 |  | 1:2 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| DB184465 |  | 1:2 |
| 4 | SCHIENE-VERBINDUNG HAS01.1-100-072 ISOL. | R911309947 |
| DB166232 |  | 1:2 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| DB220871 |  | 2:5 |

| | | |
|--------------|------------|----------------------------------|
| Datum | 2004-02-20 | Benennung |
| Name | Hirt | BEIPACKZETTEL HAS01.1-100-072-MN |
| Material-Nr. | R911306608 | Zeich-Nr. 109-1253-4203-07 |
| Datei | DB166243 | Ers.durch ... AEM-Nr. 5-046292 |

Fig. 11-6: Product insert HAS01.1-100-072-MN (page 1)

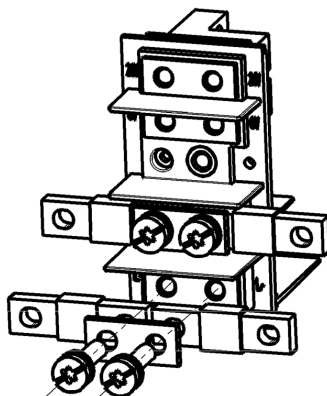
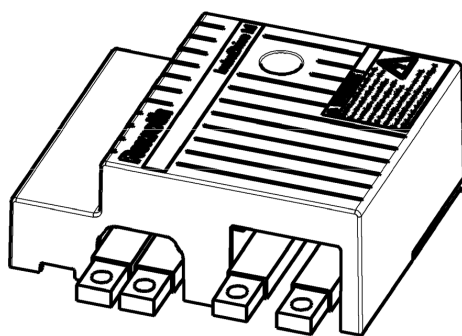
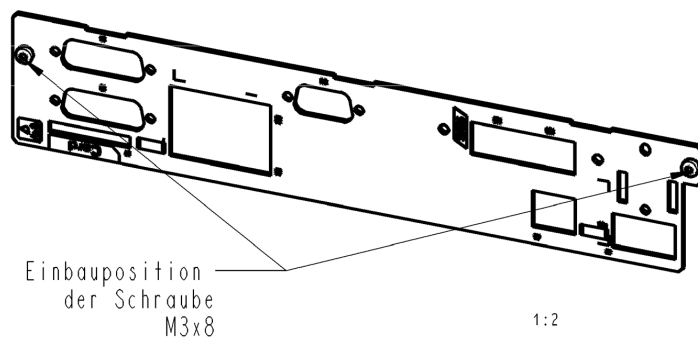


Fig. 11-7: Product insert HAS01.1-100-072-MN (page 2)

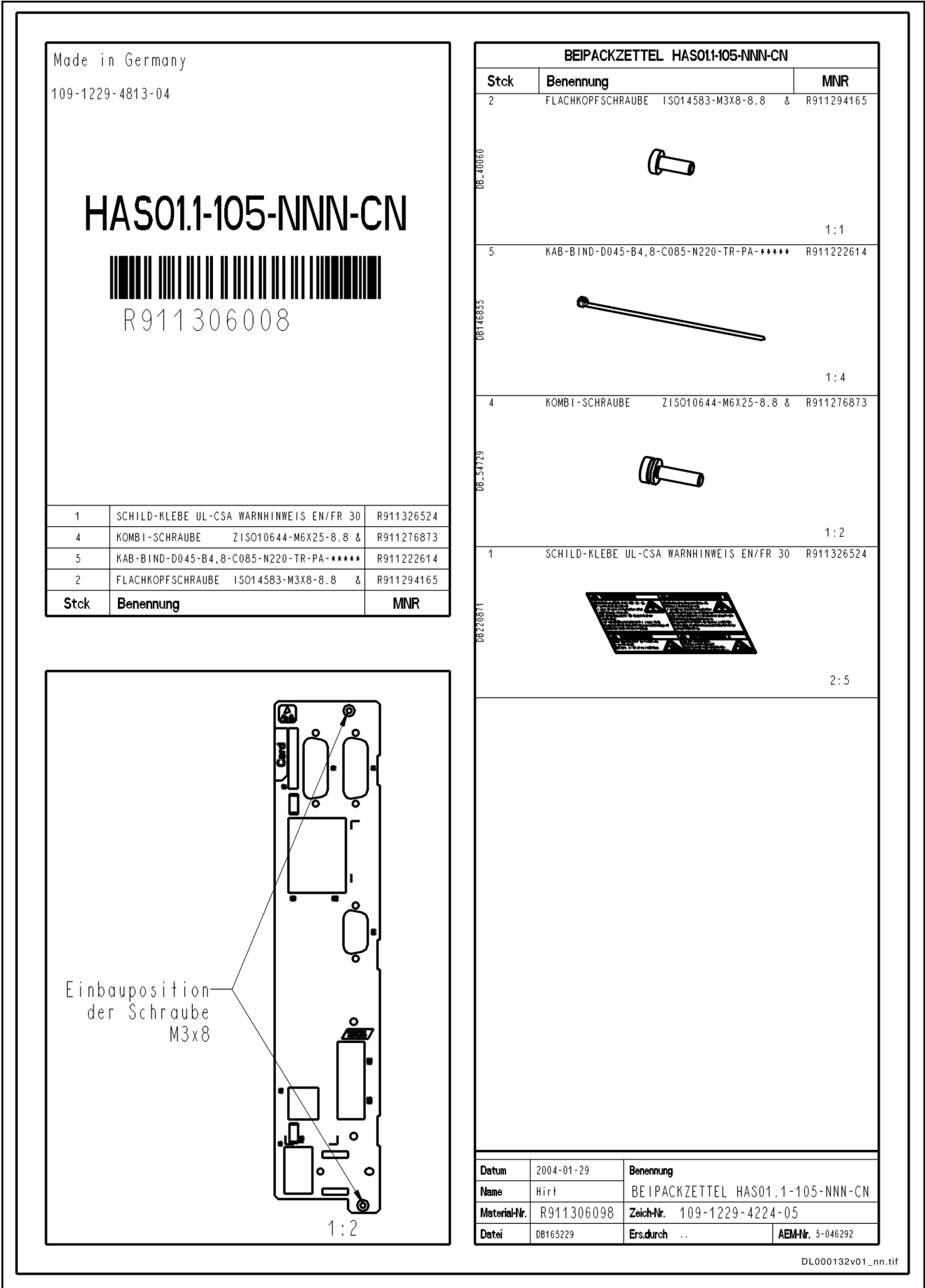


Fig. 11-8: Product insert

Made in Germany

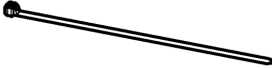
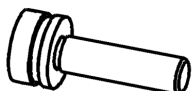
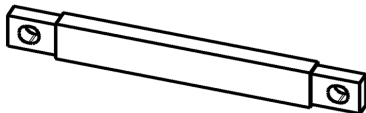
109-1253-4845-01

HAS01.1-125-072-MN

R911315182

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL. | R911309948 |
| 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-125-072-MN

| Stck | Benennung | MNR |
|--------------|--|----------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| DB-40060 |  | 1:1 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| DB146855 |  | 1:4 |
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| DB-54729 |  | 1:1 |
| 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 | R911326524 |
| DB220811 |  | 2:5 |
| Datum | 2005-10-28 | Benennung |
| Name | rainhirt | BEIPACKZETTEL HAS01.1-125-072-MN |
| Material-Nr. | R911315185 | Zeich-Nr. 109-1253-4279-01 |
| Datei | DB193171 | Ers.durch .. AEM-Nr. 5-046292 |

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Fig. 11-9: Product insert

Made in Germany

109-1253-4851-01

HAS01.1-150-NNN-M2



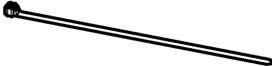
R911316848

| | | |
|------|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 2 | 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-150-NNN-M2

| Stck | Benennung | MNR |
|------|--|------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |

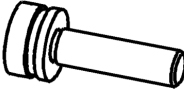
DB146855



1:4

| | | |
|----|--------------------------------------|------------|
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|----|--------------------------------------|------------|

DB-54729



1:1

| | | |
|---|---------------------------|------------|
| 2 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
|---|---------------------------|------------|

DB139703



1:2

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|---|--|------------|

DB220871



2:5

| | | |
|--------------|------------|----------------------------------|
| Datum | 2006-03-23 | Benennung |
| Name | rainhirt | BEIPACKZETTEL HAS01.1-150-NNN-M2 |
| Material-Nr. | R911316849 | Zeich-Nr. 109-1253-4293-01 |
| Datei | DB198361 | Ers.durch .. AEM-Nr. 5-046292 |

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Fig. 11-10: Product insert

Made in Germany

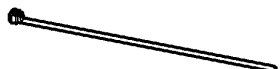
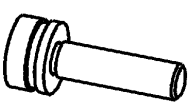
109-1253-4804-06

HAS01.1-150-072-MN

R911306622

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-150-072 ISOL. | R911309949 |
| 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-150-072-MN

| Stck | Benennung | MNR | | | | | | | | | | | | |
|--|--|----------------------------------|-------|------------|-----------|------|------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | |
| DB-40050 |  | 1:1 | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | |
| DB140855 |  | 1:4 | | | | | | | | | | | | |
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | |
| DB-54729 |  | 1:1 | | | | | | | | | | | | |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 | | | | | | | | | | | | |
| DB130203 |  | 1:2 | | | | | | | | | | | | |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 | | | | | | | | | | | | |
| DB184465 |  | 1:2 | | | | | | | | | | | | |
| 4 | SCHIENE-VERBINDUNG HAS01.1-150-072 ISOL. | R911309949 | | | | | | | | | | | | |
| DB166233 |  | 1:2 | | | | | | | | | | | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 | | | | | | | | | | | | |
| DB220871 |  | 2:5 | | | | | | | | | | | | |
| <table> <tr> <td>Datum</td><td>2004-02-20</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Hirt</td><td>BEIPACKZETTEL HAS01.1-150-072-MN</td></tr> <tr> <td>Material-Nr.</td><td>R911306614</td><td>Zeich-Nr. 109-1253-4204-07</td></tr> <tr> <td>Datei</td><td>DB166245</td><td>Ers.durch .. AEM-Nr. 5-046292</td></tr> </table> | | | Datum | 2004-02-20 | Benennung | Name | Hirt | BEIPACKZETTEL HAS01.1-150-072-MN | Material-Nr. | R911306614 | Zeich-Nr. 109-1253-4204-07 | Datei | DB166245 | Ers.durch .. AEM-Nr. 5-046292 |
| Datum | 2004-02-20 | Benennung | | | | | | | | | | | | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-150-072-MN | | | | | | | | | | | | |
| Material-Nr. | R911306614 | Zeich-Nr. 109-1253-4204-07 | | | | | | | | | | | | |
| Datei | DB166245 | Ers.durch .. AEM-Nr. 5-046292 | | | | | | | | | | | | |

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Fig. 11-11: Product insert

Made in Germany
109-1253-4809-04

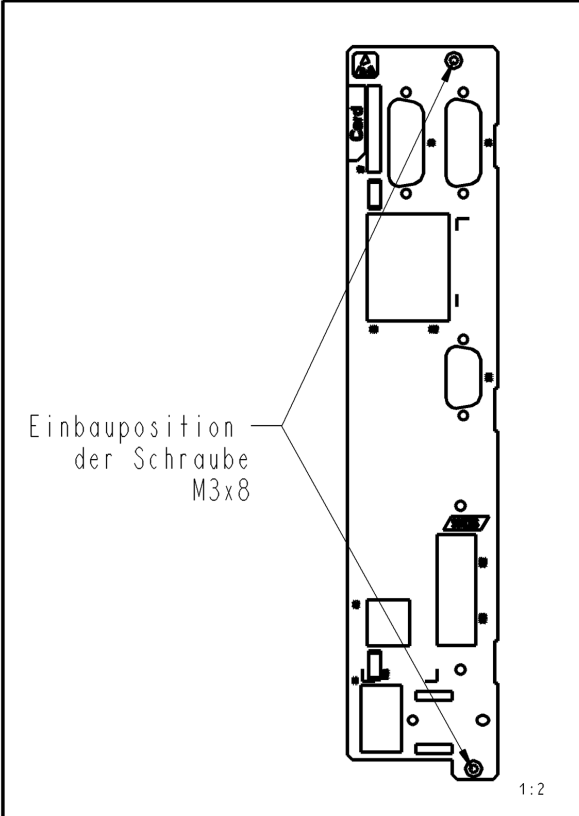
HAS01.1-150-NNN-MN



R911306629

| | | |
|----|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 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 |

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|



Einbauposition
der Schraube
M3x8

1:2

| BEIPACKZETTEL HAS01.1-150-NNN-MN | | |
|----------------------------------|---------------------------------------|------------|
| Stck | Benennung | MNR |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |

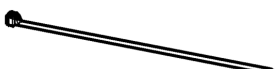
DB-40060



1:1

| | | |
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|---|--|------------|

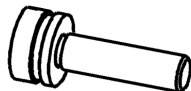
DB146855



1:4

| | | |
|----|--------------------------------------|------------|
| 13 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|----|--------------------------------------|------------|

DB-54729



1:1

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|---|--|------------|

DB220871



2:5

| | | | |
|--------------|------------|----------------------------------|------------------|
| Datum | 2004-02-20 | Benennung | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-150-NNN-MN | |
| Material-Nr. | R911306635 | Zeich-Nr. | 109-1253-4217-04 |
| Datei | DB166332 | Ers.durch | .. |
| | | AEM-Nr. | 5-046292 |

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Fig. 11-12: Product insert

Made in Germany

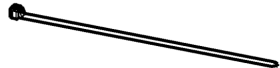
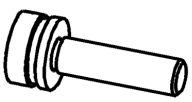
109-1253-4805-06

HAS01.1-175-072-MN

R911306623

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-175-072 ISOL. | R911309950 |
| 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-175-072-MN

| Stck | Benennung | MNR | | | | | | | | | | | | |
|--|--|----------------------------------|-------|------------|-----------|------|------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | |
| DB-40060 |  | 1:1 | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | |
| DB146855 |  | 1:4 | | | | | | | | | | | | |
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | |
| DB-54729 |  | 1:1 | | | | | | | | | | | | |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 | | | | | | | | | | | | |
| DB139203 |  | 1:2 | | | | | | | | | | | | |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 | | | | | | | | | | | | |
| DB184465 |  | 1:2 | | | | | | | | | | | | |
| 4 | SCHIENE-VERBINDUNG HAS01.1-175-072 ISOL. | R911309950 | | | | | | | | | | | | |
| DB166234 |  | 7:20 | | | | | | | | | | | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 | | | | | | | | | | | | |
| DB220871 |  | 2:5 | | | | | | | | | | | | |
| <table> <tr> <td>Datum</td><td>2004-02-20</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Hirt</td><td>BEIPACKZETTEL HAS01.1-175-072-MN</td></tr> <tr> <td>Material-Nr.</td><td>R911306615</td><td>Zeich-Nr. 109-1253-4205-07</td></tr> <tr> <td>Datei</td><td>DB166274</td><td>Ers.durch .. AEM-Nr. 5-046292</td></tr> </table> | | | Datum | 2004-02-20 | Benennung | Name | Hirt | BEIPACKZETTEL HAS01.1-175-072-MN | Material-Nr. | R911306615 | Zeich-Nr. 109-1253-4205-07 | Datei | DB166274 | Ers.durch .. AEM-Nr. 5-046292 |
| Datum | 2004-02-20 | Benennung | | | | | | | | | | | | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-175-072-MN | | | | | | | | | | | | |
| Material-Nr. | R911306615 | Zeich-Nr. 109-1253-4205-07 | | | | | | | | | | | | |
| Datei | DB166274 | Ers.durch .. AEM-Nr. 5-046292 | | | | | | | | | | | | |

DL000063v01_nn.tif

Fig. 11-13: Product insert

Made in Germany
109-1253-4810-04

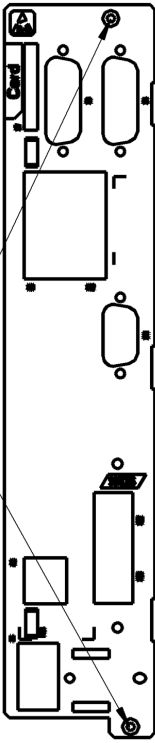
HAS01.1-175-NNN-MN



R911306630

| | | |
|----|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 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 |

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|



Einbauposition
der Schraube
M3x8

1:2

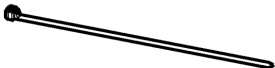
| BEIPACKZETTEL HAS01.1-175-NNN-MN | | |
|----------------------------------|---------------------------------------|------------|
| Stck | Benennung | MNR |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |

DB-40060



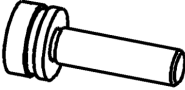
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DB146855



1:4

DB-54729



1:1

DB220871



2:5

| | | | |
|-------|------------|--------------|----------------------------------|
| Datum | 2004-02-20 | Benennung | BEIPACKZETTEL HAS01.1-175-NNN-MN |
| Name | Hirt | Material-Nr. | R911306636 |
| | | Zeich-Nr. | 109-1253-4218-04 |
| Datei | DB166319 | Ers.durch | .. |
| | | AEM-Nr. | 5-046292 |

DL000068v01_de.tif

Fig. 11-14: Product insert

Accessories

Made in Germany

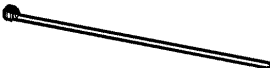
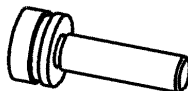
109-1253-4806-06

HAS01.1-200-072-MN

R911306624

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-200-072 ISOL. | R911309951 |
| 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 HAS01.1-200-072-MN | | |
|---|---------------------------------------|------------|
| Stck | Benennung | MNR |
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | R911311982 |
|  | | |
| | | 1:2 |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
|  | | |
| | | 1:1 |

| BEIPACKZETTEL HAS01.1-200-072-MN | | |
|---|--|----------------------------------|
| Stck | Benennung | MNR |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
|  | | |
| | | 1:4 |
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|  | | |
| | | 1:1 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
|  | | |
| | | 1:2 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
|  | | |
| | | 1:2 |
| 4 | SCHIENE-VERBINDUNG HAS01.1-200-072 ISOL. | R911309951 |
|  | | |
| | | 7:20 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|  | | |
| | | 2:5 |
| | | |
| Datum | 2004-02-20 | Benennung |
| Name | Hirt | BEIPACKZETTEL HAS01.1-200-072-MN |
| Material-Nr. | R911306616 | Zeich-Nr. 109-1253-4206-07 |
| Datei | DB166247 | Ers.durch |
| | | AEM-Nr. 5-046292 |

DL000064v01_de.tif

Fig. 11-15: Product insert

Made in Germany

109-1253-4807-07

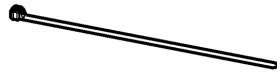
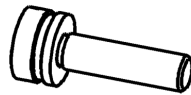
HAS01.1-250-072-MN



R911306625

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 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 |
|----------|---|------------|
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | R911311982 |
| 0818131 |  | 1:2 |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| 08-40060 |  | 1:1 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 0814655 |  | 1:4 |
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 08-54729 |  | 1:1 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 08139203 |  | 1:2 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 08184465 |  | 1:2 |
| 4 | SCHIENE-VERBINDUNG HAS01.1-250-072 ISOL. | R911309953 |
| 08166236 |  | 1:4 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 08220871 |  | 2:5 |

| | | |
|--------------|------------|----------------------------------|
| Datum | 2004-02-20 | Benennung |
| Name | Hirt | BEIPACKZETTEL HAS01.1-250-072-MN |
| Material-Nr. | R911306617 | Zeich-Nr. 109-1253-4207-08 |
| Datei | 08166276 | Ers.durch .. AEM-Nr. 5-046292 |

DL000065v01_de.tif

Fig. 11-16: Product insert

Made in Germany

109-1253-4811-05

HAS01.1-250-NNN-MN

R911306631

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-250-NNN-MN

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|

| | | |
|---|--------------------------------------|------------|
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | R911311982 |
|---|--------------------------------------|------------|

DB181131



1:2

| | | |
|---|---------------------------------------|------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
|---|---------------------------------------|------------|

DB-40660



1:1

| | | |
|---|--|------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
|---|--|------------|

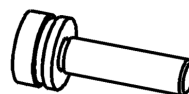
DB146855



1:4

| | | |
|----|--------------------------------------|------------|
| 13 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|----|--------------------------------------|------------|

DB-54129



1:1

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|---|--|------------|

DB220811



2:5

| | | |
|--------------|------------|----------------------------------|
| Datum | 2004-02-20 | Benennung |
| Name | Hirt | BEIPACKZETTEL HAS01.1-250-NNN-MN |
| Material-Nr. | R911306637 | Zeich-Nr. 109-1253-4219-05 |
| Datei | DB166334 | Ers.durch .. AEM-Nr. 5-046292 |

DL000069v01_de.tif

Fig. 11-17: Product insert

Made in Germany

109-1253-4808-07

HAS01.1-350-072-MN



R911306626

| Stck | Benennung | MN |
|------|--|------------|
| 4 | SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E | R913000050 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 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 |
| 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 |
| 4 | FEDERRING DIN127-B10-FST & | R911213251 |
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | R911311982 |

| BEIPACKZETTEL HAS01.1-350-072-MN | | |
|----------------------------------|---------------------------------------|------------|
| Stck | Benennung | MN |
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | R911311982 |
| 4 | FEDERRING DIN127-B10-FST & | R911213251 |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |

| BEIPACKZETTEL HAS01.1-350-072-MN | | |
|----------------------------------|--|------------|
| Stck | Benennung | MN |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 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 | R911326524 |
| 4 | SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E | R913000050 |

| | | | |
|-----------|------------------|--------------|----------------------------------|
| Datum | 2004-02-23 | Benennung | BEIPACKZETTEL HAS01.1-350-072-MN |
| Name | Hirt | Material-Nr. | R911306618 |
| Zeich-Nr. | 109-1253-4208-08 | Ers.durch | .. |
| Datei | DB166280 | AEM-Nr. | 5-046292 |

DL000066v01_de.tif

Fig. 11-18: Product insert

Made in Germany

109-1253-4812-06

HAS01.1-350-NNN-MN

R911306632

| 4 | SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E | R913000050 |
|------|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 4 | SCHEIBE 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| 15 | 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 |
| 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 | | | | | | | | | | | | |
| 4 | FEDERRING DIN127-B10-FST & | R911213251 | | | | | | | | | | | | |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | |
| 15 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | |
| 4 | SCHEIBE 10,50X 20,00X 2,00 DIN 125 A | R911213277 | | | | | | | | | | | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 | | | | | | | | | | | | |
| 4 | SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E | R913000050 | | | | | | | | | | | | |
| <table> <tr> <td>Datum</td><td>2004-02-24</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Hirt</td><td>BEIPACKZETTEL HAS01.1-350-NNN-MN</td></tr> <tr> <td>Material-Nr.</td><td>R911306633</td><td>Zeich-Nr. 109-1253-4220-06</td></tr> <tr> <td>Datei</td><td>DB166325</td><td>Ers.durch .. AEM-Nr. 5-046292</td></tr> </table> | | | Datum | 2004-02-24 | Benennung | Name | Hirt | BEIPACKZETTEL HAS01.1-350-NNN-MN | Material-Nr. | R911306633 | Zeich-Nr. 109-1253-4220-06 | Datei | DB166325 | Ers.durch .. AEM-Nr. 5-046292 |
| Datum | 2004-02-24 | Benennung | | | | | | | | | | | | |
| Name | Hirt | BEIPACKZETTEL HAS01.1-350-NNN-MN | | | | | | | | | | | | |
| Material-Nr. | R911306633 | Zeich-Nr. 109-1253-4220-06 | | | | | | | | | | | | |
| Datei | DB166325 | Ers.durch .. AEM-Nr. 5-046292 | | | | | | | | | | | | |

DL000070v01_de.tif

Fig. 11-19: Product insert

Made in Germany

109-1253-4827-01

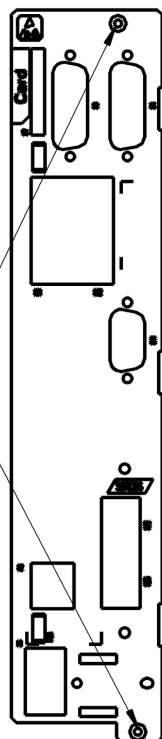
HAS01.1-065-072-CN



R911311807

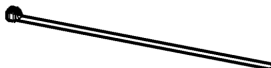
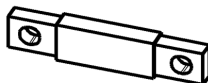
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 2 | SCHIENE-VERBINDUNG HAS01.1-065-072 ISOL. | R911311806 |
| 6 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| Stck | Benennung | MNR |

Einbauposition
der Schraube
M3x8



1:2

BEIPACKZETTEL HAS01.1-065-072-CN

| Stck | Benennung | MNR | | | | | | | | | | | | | | | | | | | | |
|--|---|------------|----------------------------------|------------|-----------|----------------------------------|------|----------|--|--|--------------|------------|-----------|------------------|-------|----------|-----------|----|--|--|---------|----------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | | | | | | | | | |
| DB-40860 |  | 1:1 | | | | | | | | | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | | | | | | | | | |
| DB16855 |  | 1:4 | | | | | | | | | | | | | | | | | | | | |
| 6 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | | | | | | | | | |
| DB-54729 |  | 1:2 | | | | | | | | | | | | | | | | | | | | |
| 2 | SCHIENE-VERBINDUNG HAS01.1-065-072 ISOL. | R911311806 | | | | | | | | | | | | | | | | | | | | |
| DB187254 |  | 1:2 | | | | | | | | | | | | | | | | | | | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 | | | | | | | | | | | | | | | | | | | | |
| DB220871 |  | 2:5 | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>Datum</td><td>2005-06-01</td><td>Benennung</td><td>BEIPACKZETTEL HAS01.1-065-072-CN</td></tr><tr><td>Name</td><td>rainhirt</td><td></td><td></td></tr><tr><td>Material-Nr.</td><td>R911311810</td><td>Zeich-Nr.</td><td>109-1253-4265-01</td></tr><tr><td>Datei</td><td>DB187295</td><td>Ers.durch</td><td>..</td></tr><tr><td></td><td></td><td>AEM-Nr.</td><td>5-046292</td></tr></table> | | | Datum | 2005-06-01 | Benennung | BEIPACKZETTEL HAS01.1-065-072-CN | Name | rainhirt | | | Material-Nr. | R911311810 | Zeich-Nr. | 109-1253-4265-01 | Datei | DB187295 | Ers.durch | .. | | | AEM-Nr. | 5-046292 |
| Datum | 2005-06-01 | Benennung | BEIPACKZETTEL HAS01.1-065-072-CN | | | | | | | | | | | | | | | | | | | |
| Name | rainhirt | | | | | | | | | | | | | | | | | | | | | |
| Material-Nr. | R911311810 | Zeich-Nr. | 109-1253-4265-01 | | | | | | | | | | | | | | | | | | | |
| Datei | DB187295 | Ers.durch | .. | | | | | | | | | | | | | | | | | | | |
| | | AEM-Nr. | 5-046292 | | | | | | | | | | | | | | | | | | | |

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Fig. 11-20: Product insert

Made in Germany

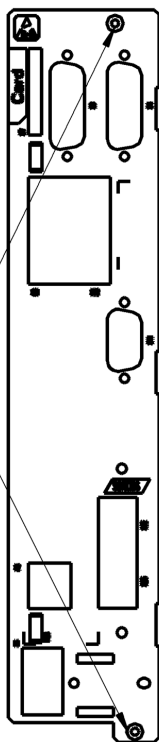
109-1253-4828-01

HAS01.1-105-072-CN

R911311808

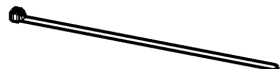
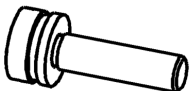
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 2 | SCHIENE-VERBINDUNG HAS01.1-105-072 ISOL. | R911311805 |
| 8 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| Stck | Benennung | MNR |

Einbauposition
der Schraube
M3x8



1:2

BEIPACKZETTEL HAS01.1-105-072-CN

| Stck | Benennung | MNR | | | | | | | | | | | | |
|---|--|----------------------------------|-------|------------|-----------|------|----------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 | | | | | | | | | | | | |
| 08-40060 |  | 1:1 | | | | | | | | | | | | |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 | | | | | | | | | | | | |
| 08146855 |  | 1:4 | | | | | | | | | | | | |
| 8 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 | | | | | | | | | | | | |
| 08-54729 |  | 1:1 | | | | | | | | | | | | |
| 2 | SCHIENE-VERBINDUNG HAS01.1-105-072 ISOL. | R911311805 | | | | | | | | | | | | |
| 08187255 |  | 1:2 | | | | | | | | | | | | |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 | | | | | | | | | | | | |
| 08220871 |  | 2:5 | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Datum</td><td>2005-06-01</td><td>Benennung</td></tr> <tr> <td>Name</td><td>rainhirt</td><td>BEIPACKZETTEL HAS01.1-105-072-CN</td></tr> <tr> <td>Material-Nr.</td><td>R911311812</td><td>Zeich-Nr. 109-1253-4266-01</td></tr> <tr> <td>Datei</td><td>08187297</td><td>Ers.durch .. AEM-Nr. 5-046292</td></tr> </table> | | | Datum | 2005-06-01 | Benennung | Name | rainhirt | BEIPACKZETTEL HAS01.1-105-072-CN | Material-Nr. | R911311812 | Zeich-Nr. 109-1253-4266-01 | Datei | 08187297 | Ers.durch .. AEM-Nr. 5-046292 |
| Datum | 2005-06-01 | Benennung | | | | | | | | | | | | |
| Name | rainhirt | BEIPACKZETTEL HAS01.1-105-072-CN | | | | | | | | | | | | |
| Material-Nr. | R911311812 | Zeich-Nr. 109-1253-4266-01 | | | | | | | | | | | | |
| Datei | 08187297 | Ers.durch .. AEM-Nr. 5-046292 | | | | | | | | | | | | |

DL000057v01_de.tif

Fig. 11-21: Product insert

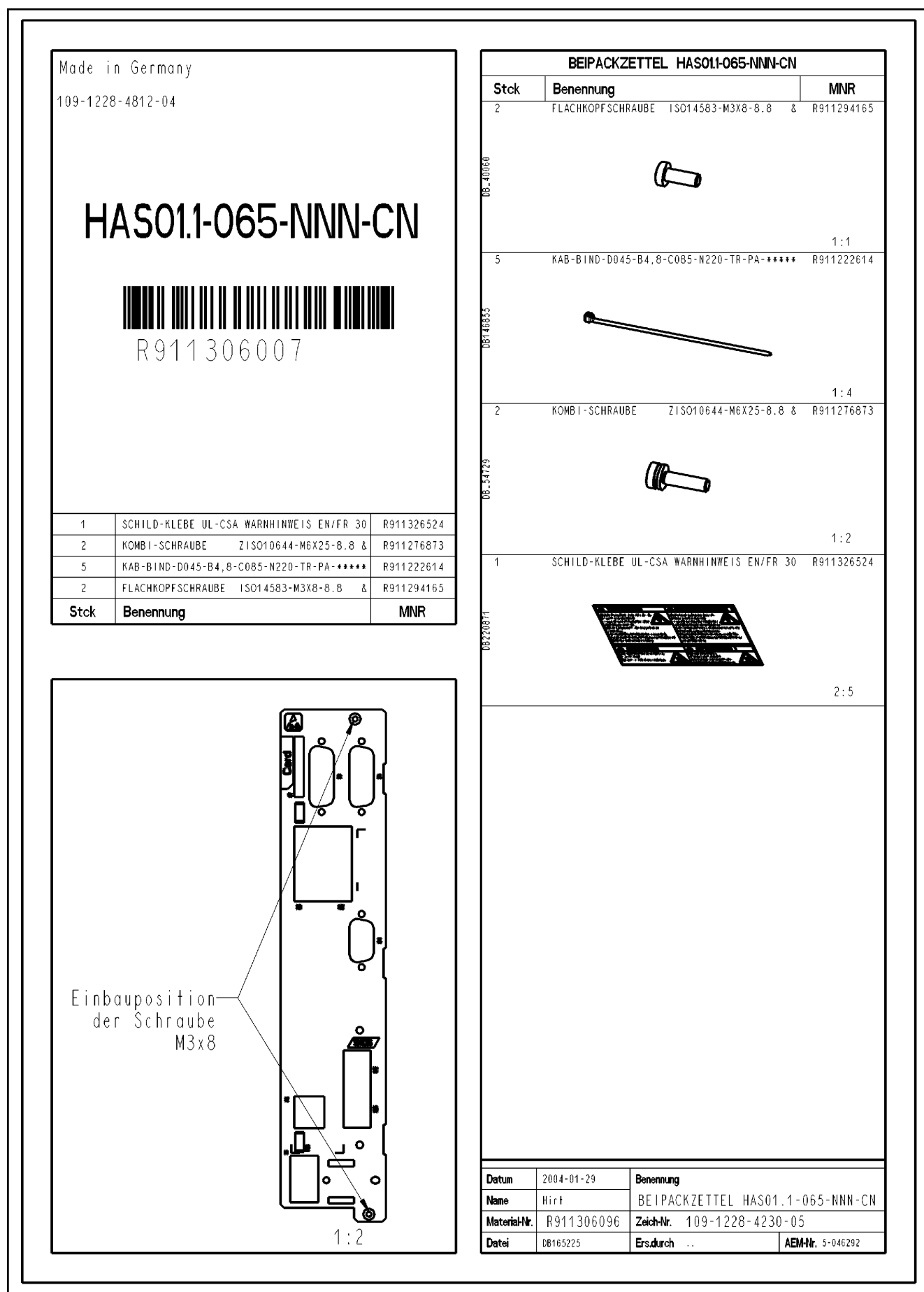


Fig. 11-22: Product insert

Made in Germany

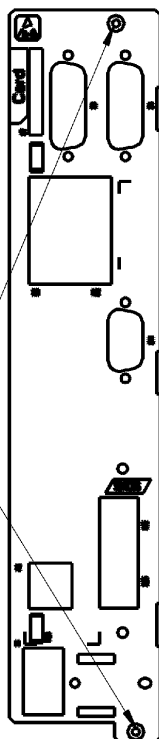
109-1229-4813-04

HAS01.1-105-NNN-CN



R911306008

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | 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 |
| Stck | Benennung | MNR |

Einbauposition
der Schraube
M3x8

1:2

BEIPACKZETTEL HAS01.1-105-NNN-CN

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|

| | | |
|---|---------------------------------------|------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
|---|---------------------------------------|------------|

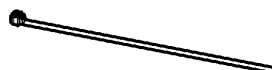
DB-40050



1:1

DB146855

| | | |
|---|--|------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
|---|--|------------|



1:4

DB-54729

| | | |
|---|--------------------------------------|------------|
| 4 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|---|--------------------------------------|------------|



1:2

DB-20871

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|---|--|------------|



2:5

| | | | | |
|--------------|------------|-----------|----------------------------------|------------------|
| Datum | 2004-01-29 | Benennung | BEIPACKZETTEL HAS01.1-105-NNN-CN | |
| Name | Hirt | | | |
| Material-Nr. | R911306098 | Zeich-Nr. | 109-1229-4224-05 | |
| Datei | DB165229 | Ers.durch | .. | AEM-Nr. 5-046292 |

Fig. 11-23: Product insert

Made in Germany

109-1253-4813-05

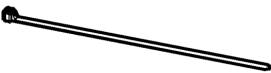
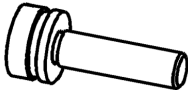
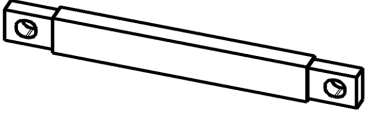
HAS01.1-125-072-CN



R911306664

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL. | R911309948 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 15 | 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-125-072-CN

| Stck | Benennung | MNR |
|--------------|---|----------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| 08-40060 |  | 1:1 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 08146855 |  | 1:4 |
| 15 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 08-54729 |  | 1:1 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 08139203 |  | 1:2 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 08184465 |  | 1:2 |
| 4 | SCHIENE-VERBINDUNG HAS01.1-125-072 ISOL. | R911309948 |
| 08166341 |  | 1:2 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 08220871 |  | 2:5 |
| Datum | 2004-02-26 | Benennung |
| Name | Hirt / Slevén | BEIPACKZETTEL HAS01.1-125-072-CN |
| Material-Nr. | R911306672 | Zeich-Nr. 109-1253-4223-06 |
| Datei | 08166375 | Ers.durch .. AEM-Nr. 5-046292 |

DL000071v01_de.tif

Fig. 11-24: Product insert

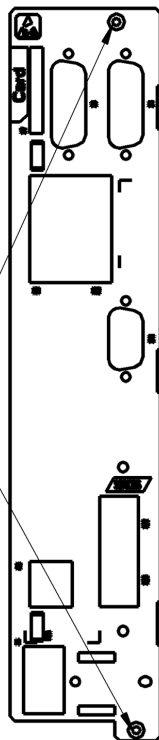
Made in Germany

109-1253-4814-04

HAS01.1-125-NNN-CN

R911306665

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 11 | 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 |
| Stck | Benennung | MNR |

Einbauposition
der Schraube
M3x8

1:2

BEIPACKZETTEL HAS01.1-125-NNN-CN

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|

| | | |
|---|---------------------------------------|------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
|---|---------------------------------------|------------|

DB-40060



1:1

| | | |
|---|--|------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
|---|--|------------|

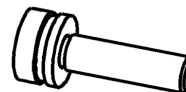
DB146855



1:4

| | | |
|----|--------------------------------------|------------|
| 11 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|----|--------------------------------------|------------|

DB-54729



1:1

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|---|--|------------|

DB220871



2:5

| | | | |
|-------|---------------|--------------|----------------------------------|
| Datum | 2004-02-26 | Benennung | BEIPACKZETTEL HAS01.1-125-NNN-CN |
| Name | Hirt / Slevén | Material-Nr. | R911306674 |
| | | Zeich-Nr. | 109-1253-4224-04 |
| Datei | DB166377 | Ers.durch | .. |
| | | AEM-Nr. | 5-046292 |

DL000072v01_de.tif

Fig. 11-25: Product insert

Made in Germany

109-1253-4815-05

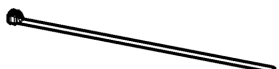
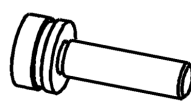
HAS01.1-225-072-CN



R911306666

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 4 | SCHIENE-VERBINDUNG HAS01.1-225-072 ISOL. | R911309952 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 21 | 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 |
| Stck | Benennung | MNR |

BEIPACKZETTEL HAS01.1-225-072-CN

| Stck | Benennung | MNR |
|--------------|---|----------------------------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
| 08-40060 |  | 1:1 |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 08146855 |  | 1:4 |
| 21 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 08-54729 |  | 1:1 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | R911294924 |
| 08139203 |  | 1:2 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-032-042 | R911311751 |
| 08184465 |  | 1:2 |
| 4 | SCHIENE-VERBINDUNG HAS01.1-225-072 ISOL. | R911309952 |
| 08166342 |  | 1:4 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 08220871 |  | 2:5 |
| Datum | 2004-02-26 | Benennung |
| Name | Hirt / Slevén | BEIPACKZETTEL HAS01.1-225-072-CN |
| Material-Nr. | R911306675 | Zeich-Nr. 109-1253-4225-06 |
| Datei | 08166379 | Ers.durch .. AEM-Nr. 5-046292 |

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Fig. 11-26: Product insert

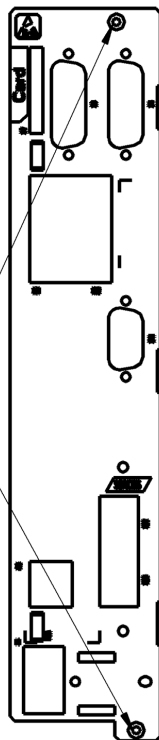
Made in Germany

109-1253-4816-04

HAS01.1-225-NNN-CN

R911306667

| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|------|--|------------|
| 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 |
| Stck | Benennung | MNR |

Einbauposition
der Schraube
M3x8

1:2

BEIPACKZETTEL HAS01.1-225-NNN-CN

| Stck | Benennung | MNR |
|------|-----------|-----|
|------|-----------|-----|

| | | |
|---|---------------------------------------|------------|
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |
|---|---------------------------------------|------------|

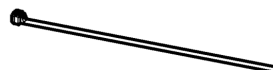
DB-40060



1:1

| | | |
|---|--|------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
|---|--|------------|

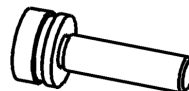
DB146855



1:4

| | | |
|----|--------------------------------------|------------|
| 17 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
|----|--------------------------------------|------------|

DB-54729



1:1

| | | |
|---|--|------------|
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
|---|--|------------|

DB220871



2:5

| | | |
|--------------|---------------|----------------------------------|
| Datum | 2004-02-26 | Benennung |
| Name | Hirt / Steven | BEIPACKZETTEL HAS01.1-225-NNN-CN |
| Material-Nr. | R911306677 | Zeich-Nr. 109-1253-4226-04 |
| Datei | DB166381 | Ers.durch .. AEM-Nr. 5-046292 |

DL000074v01_de.tif

Fig. 11-27: Product insert

Made in Germany

109-1253-4848-01

HAS01.1-350-072-CA



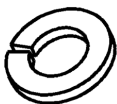
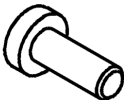
R911315684

| 9 | SECHSKANTSCHRAUBE | ISO4017-M10X30-8.8A1E | R913000050 |
|------|--|------------------------------|------------|
| 9 | SECHSKANTMUTTER | ISO4032-M10-8-E0P | R911213275 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | | R911326524 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL. | | R911309954 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-350-072 HCS04 | | R911316683 |
| 9 | SCHEIBE | 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | | R911294924 |
| 16 | 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 |
| 9 | FEDERRING | DIN127-B10-FST & | R911213251 |
| Stck | Benennung | | MN |

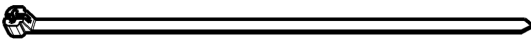
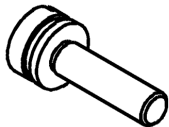
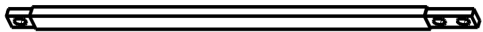
Einbauposition der
Schraube M3x8

7:20

BEIPACKZETTEL HAS01.1-350-072-CA

| Stck | Benennung | | MN |
|------|-------------------|---|------------|
| 9 | FEDERRING | DIN127-B10-FST & | R911213251 |
| | |  | 1:1 |
| 2 | FLACHKOPFSCHRAUBE | ISO14583-M3X8-8.8 & | R911294165 |
| | |  | 2:1 |

BEIPACKZETTEL HAS01.1-350-072-CA

| Stck | Benennung | | MN |
|--------------|--|---|----------------------------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | | R911222614 |
| | |  | 1:2 |
| 16 | KOMBI-SCHRAUBE | ZISO10644-M6X25-8.8 & | R911276873 |
| | |  | 1:1 |
| 1 | LASCHE HMD/HMS01.1 ERDUNG | | R911294924 |
| | |  | 1:1 |
| 9 | SCHEIBE | 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| | |  | 1:1 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-350-072 HCS04 | | R911316683 |
| | |  | 1:4 |
| 2 | SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL. | | R911309954 |
| | |  | 1:4 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | | R911326524 |
| | |  | 1:4 |
| 9 | SECHSKANTMUTTER | ISO4032-M10-8-E0P | R911213275 |
| | |  | 1:1 |
| 9 | SECHSKANTSCHRAUBE | ISO4017-M10X30-8.8A1E | R913000050 |
| | |  | 1:2 |
| Datum | 2006-04-19 | Benennung | BEIPACKZETTEL HAS01.1-350-072-CA |
| Name | sonjrazz | Material-Nr. | R911317176 |
| Material-Nr. | R911317176 | Zeich-Nr. | 109-1253-4282-01 |
| Datei | 08199188 | Ers.durch | .. |
| | | AEM-Nr. | 5-046292 |

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Fig. 11-28: Product insert

Accessories

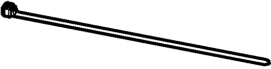
Made in Germany

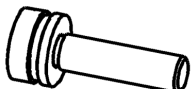
109-1253-4817-07

HAS01.1-350-072-CN

R911306668

| 1 | SECHSKANTSCHRAUBE | ISO4017-M8X25-8.8 | & | R911292421 |
|------|--------------------|---------------------------------|---|------------|
| 6 | SECHSKANTSCHRAUBE | ISO4017-M10X30-8.8A1E | | R913000050 |
| 1 | SCHILD-KLEBE | UL-CSA WARNHINWEIS EN/FR 30 | | R911326524 |
| 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 |
| 15 | 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 |
| 6 | FEDERRING | DIN127-B10-FST | & | R911213251 |
| 2 | ENDSTUECK | HAS01.1 SCHIENE-VERBINDUNG | | R911311982 |
| Stck | Benennung | | | MN |

| 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 |
| 2 | FLACHKOPFSCHRAUBE | ISO14583-M3X8-8.8 | & | R911294165 |
| |  | | | 1:1 |
| 5 | KAB-BIND | D045-B4,8-C085-N220-TR-PA-***** | | R911222614 |
| |  | | | 1:4 |

| BEIPACKZETTEL HAS01.1-350-072-CN | | | | |
|----------------------------------|---|-----------------------|----------------------------------|------------------|
| Stck | Benennung | | | MN |
| 15 | KOMBI-SCHRAUBE | ZISO10644-M6X25-8.8 | & | R911276873 |
| DB-54729 |  | | | 1:1 |
| 1 | LASCHE | HCS03.1E-W0210 | ERDUNG | R911025419 |
| DB180040 |  | | | 1:4 |
| 1 | LASCHE | HMD/HMS01.1 | ERDUNG | R911294924 |
| DB139203 |  | | | 1:2 |
| 6 | SCHEIBE | 10,50X 20,00X 2,00 | DIN 125 A | R911213277 |
| DB-49243 |  | | | 1:2 |
| 2 | SCHIENE-VERBINDUNG | HAS01.1-032-042 | | R911311751 |
| DB184465 |  | | | 1:2 |
| 4 | SCHIENE-VERBINDUNG | HAS01.1-350-072 | ISOL. | R911309954 |
| DB166237 |  | | | 1:5 |
| 1 | SCHILD-KLEBE | UL-CSA WARNHINWEIS | EN/FR 30 | R911326524 |
| DB220811 |  | | | 1:4 |
| 6 | SECHSKANTSCHRAUBE | ISO4017-M10X30-8.8A1E | | R913000050 |
| DB115916 |  | | | 1:2 |
| 1 | SECHSKANTSCHRAUBE | ISO4017-M8X25-8.8 | & | R911292421 |
| DB-51517 |  | | | 1:2 |
| | | | | |
| Datum | 2004-02-28 | | Benennung | |
| Name | Hirt / Steven | | BEIPACKZETTEL HAS01.1-350-072-CN | |
| Material-Nr. | R911306678 | | Zeich-Nr. 109-1253-4227-08 | |
| Datei | DB166387 | | Ers.durch .. | AEM-Nr. 5-046292 |

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Fig. 11-29: Product insert

Made in Germany
109-1253-4818-07

HAS01.1-350-NNN-CN



R911306669

| | | |
|----|--|------------|
| 1 | SECHSKANTSCHRAUBE ISO4017-M8X25-8.8 & | R911292421 |
| 6 | SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E | R913000050 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 6 | SCHEIBE 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| 1 | LASCHE HCS03.1E-W0210 ERDUNG | R911025419 |
| 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 |
| 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 |
|------|--|------------|
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | R911222614 |
| 13 | KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & | R911276873 |
| 1 | LASCHE HCS03.1E-W0210 ERDUNG | R911025419 |
| 6 | SCHEIBE 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| 1 | SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 6 | SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E | R913000050 |
| 1 | SECHSKANTSCHRAUBE ISO4017-M8X25-8.8 & | R911292421 |

BEIPACKZETTEL HAS01.1-350-NNN-CN

| Stck | Benennung | MN |
|------|---------------------------------------|------------|
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | R911311982 |
| 6 | FEDERRING DIN127-B10-FST & | R911213251 |
| 2 | FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & | R911294165 |

| | | |
|--------------|---------------|----------------------------------|
| Datum | 2004-02-26 | Benennung |
| Name | Hirt / Slevén | BEIPACKZETTEL HAS01.1-350-NNN-CN |
| Material-Nr. | R911306679 | Zeich-Nr. 109-1253-4228-08 |
| Datei | DB166390 | Ers.durch .. AEM-Nr. 5-046292 |

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Fig. 11-30: Product insert

Made in Germany

109-1253-4849-01

HAS01.1-350-NNN-CA

R911315683

| 9 | SECHSKANTSCHRAUBE | ISO4017-M10X30-8.8A1E | R913000050 |
|------|--|------------------------------|------------|
| 9 | SECHSKANTMUTTER | ISO4032-M10-8-E0P | R911213275 |
| 1 | SCHILD-KLEBE | UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 9 | SCHEIBE | 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| 16 | 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 |
| 9 | FEDERRING | DIN127-B10-FST & | R911213251 |
| 2 | ENDSTUECK | HAS01.1 SCHIENE-VERBINDUNG | R911311982 |
| Stck | Benennung | | MN |

| BEIPACKZETTEL HAS01.1-350-NNN-CA | | | |
|----------------------------------|--------------------------------------|---------------------|------------|
| Stck | Benennung | | MN |
| 2 | ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG | | R911311982 |
| 9 | FEDERRING | DIN127-B10-FST & | R911213251 |
| 2 | FLACHKOPFSCHRAUBE | ISO14583-M3X8-8.8 & | R911294165 |
| | | | |

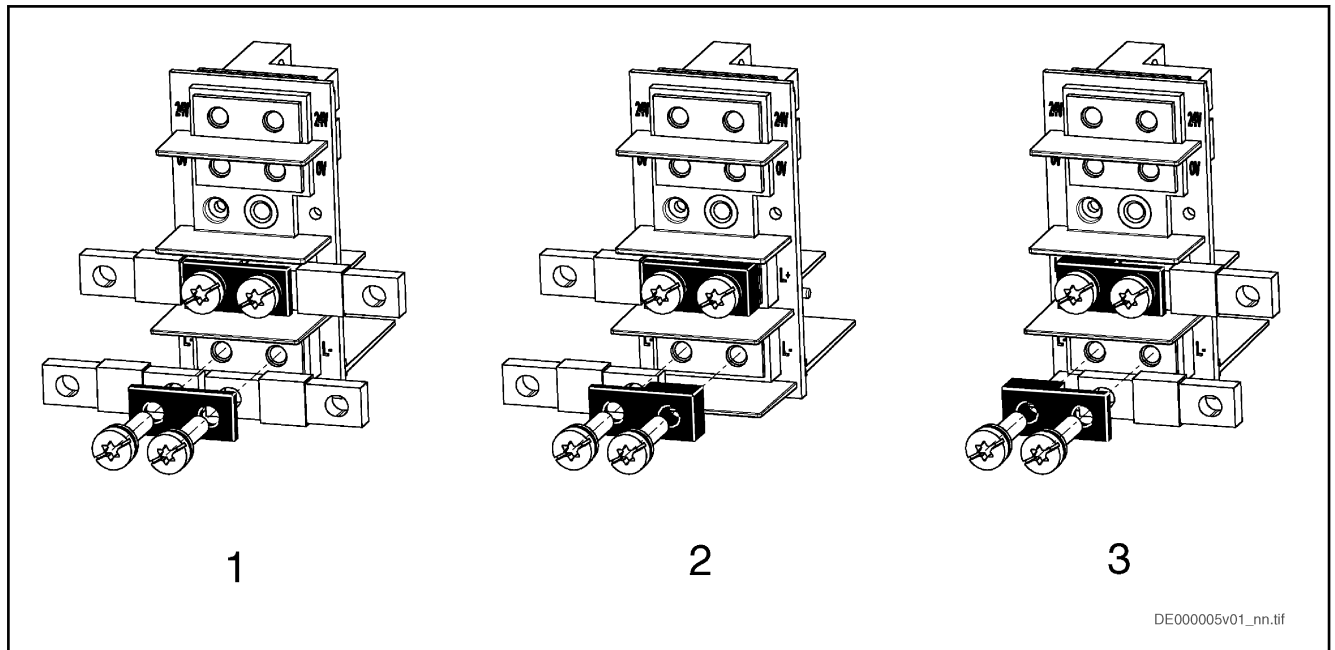
| BEIPACKZETTEL HAS01.1-350-NNN-CA | | | |
|----------------------------------|--|----------------------------------|------------------|
| Stck | Benennung | | MN |
| 5 | KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** | | R911222614 |
| 16 | KOMBI-SCHRAUBE | ZISO10644-M6X25-8.8 & | R911276873 |
| 9 | SCHEIBE | 10,50X 20,00X 2,00 DIN 125 A | R911213277 |
| 1 | SCHILD-KLEBE | UL-CSA WARNHINWEIS EN/FR 30 | R911326524 |
| 9 | SECHSKANTMUTTER | ISO4032-M10-8-E0P | R911213275 |
| 9 | SECHSKANTSCHRAUBE | ISO4017-M10X30-8.8A1E | R913000050 |
| | | | |
| Datum | 2006-01-17 | Benennung | |
| Name | sonjra22 | BEIPACKZETTEL HAS01.1-350-NNN-CA | |
| Material-Nr. | R911315811 | Zeich-Nr. | 109-1253-4283-01 |
| Datei | DB195173 | Ers.durch | .. |
| | | AEM-Nr. | 5-046292 |

DL00091v01_nn.tif

Fig. 11-31: Product insert

11.2.6 Mounting the "bar" and "end piece" parts of the HAS01 accessory

The "bar" and "end piece" parts 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. 11-32: Mounting the bar and end piece of HAS01

- **To 1:** Use the bars (-042) contained in all HAS01.1-***-072-** as shown in the figure at L+ and L-.
- **To 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.

11.3 HAS02, shield connection

11.3.1 General information

Accessories used to correctly connect the motor cable to the drive controller, especially to the shield connection of the motor cable.

Appropriate HAS02 accessories are available for the different drive controllers.

[illegible]

Bosch Rexroth AG R911318790 Edition 06

| HAS02.1 device assignment | | |
|---------------------------|-------------------------------|------------------------------------|
| HMS01.1N-W0020 = 001 | HMS02.1N-W0054 = 011 | HCS04.2E-W1240 = 027 |
| HMS01.1N-W0036 = 001 | HCS04.1E-x0500 = 012 | HCS04.2E-W1540 = 028 |
| HMS01.1N-W0054 = 001 | HNFO1.1N-N2K0-C0303 = 013 | HMS02.1N-F0150 = 029 |
| HMS01.1N-W0070 = 001 | HNFO1.1A-E0309 = 013 | HMS02.1N-W0210 = 030 |
| HCS02.1E-W0012 = 002 | HMS01.1N-W0350 = 014 | HCP02.1E-B0070-...-NNNN/NNM2 = 031 |
| HCS02.1E-W0028 = 002 | KCU01.2 = 015 | HCP02.1E-B0070-...-NNM1 = 032 |
| HCS02.1E-W0054 = 002 | KCU02.1 = 015 | HMS01.1N-W0020 = 033 |
| HCS02.1E-W0070 = 002 | HMS02.1N-F0070 = 016 | HMS01.1N-W0036 = 033 |
| HMD01.1N-W0020 = 002 | HMS02.1N-F0110 = 017 | HMD01.1N-W0012 = 033 |
| HMD01.1N-W0036 = 002 | HMS02.1N-F0028 = 018 | HMD01.1N-W0020 = 033 |
| HMS01.1N-W0110 = 003 | HMS02.1N-F0054 = 019 | HMD01.1N-W0036 = 033 |
| HMS01.1N-W0150 = 003 | HCS02.1E-W0012, RKB0001 = 020 | HCS02.1E-W0012 = 033 |
| HMS01.1N-W0210 = 003 | HCS02.1E-W0028, RKB0001 = 020 | HCS02.1E-W0028 = 033 |
| HCS03.1E-W0070 = 004 | HCS02.1E-W0054, RKB0001 = 021 | HMS01.1N-W0054 = 034 |
| HCS03.1E-W0100 = 005 | HCS02.1E-W0070, RKB0001 = 021 | HMS01.1N-W0070 = 034 |
| HCS03.1E-W0150 = 005 | HCS04.2E-W0290 = 022 | HCS02.1E-W0054 = 034 |
| HNK01.1A-A075-E0050 = 006 | HCS04.2E-W0350 = 023 | HCS02.1E-W0070 = 034 |
| HNK01.1A-A075-E0080 = 007 | HCS04.2E-W0420 = 024 | HMS01.1N-W0110 = 035 |
| HNK01.1A-A075-E0106 = 007 | HCS04.2E-W0520 = 025 | HMS01.1N-W0150 = 035 |
| HCS03.1E-W0210 = 008 | HCS04.2E-W0640 = 026 | HMS01.1N-W0210 = 035 |
| HNK01.1A-A075-E0146 = 009 | HCS04.2E-W0790 = 026 | HMS01.1N-W0300 = 035 |
| HMS02.1N-W0028 = 010 | HCS04.2E-W1010 = 027 | |

Tab. 11-3: HAS02.1 device assignment

11.3.3 Use

The HAS02 accessories are used to connect the shield of the motor cable to the drive controller.

11.3.4 Scope of supply

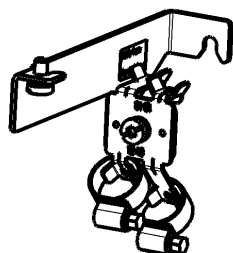
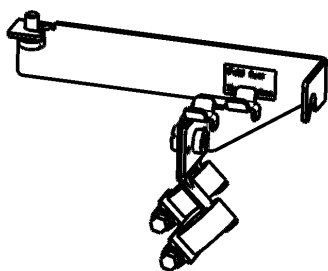
For the scope of supply and the parts of HAS02, see the corresponding product inserts.

HAS02.1-001-NNN-NN



R911306330

| 1 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
|------|---|------------|
| 1 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
| 2 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
| 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 | | | | | | | | | | | | |
|---|---|----------------------------------|-------|------------|-----------|------|------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 1 | BLECH HCS02.1 KABELBEFESTIGUNG | R911305851 | | | | | | | | | | | | |
| DB163070 | | 1:5 | | | | | | | | | | | | |
| 1 | HALTERUNG HMS01.1 KABELD. 12-30 | R911306336 | | | | | | | | | | | | |
| DB163826 | | 7:20 | | | | | | | | | | | | |
| 2 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 | | | | | | | | | | | | |
| DB-38-005 | | 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-46868 | | 1:2 | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Datum</td><td>2004-02-03</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Hirt</td><td>BEIPACKZETTEL HAS02.1-001-NNN-NN</td></tr> <tr> <td>Material-Nr.</td><td>R911306332</td><td>Zeich-Nr. 109-1214-4213-03</td></tr> <tr> <td>Datei</td><td>DB165406</td><td>Ers.durch .. AEM-Nr. 5-046998</td></tr> </table> | | | Datum | 2004-02-03 | Benennung | Name | Hirt | BEIPACKZETTEL HAS02.1-001-NNN-NN | Material-Nr. | R911306332 | Zeich-Nr. 109-1214-4213-03 | Datei | DB165406 | Ers.durch .. AEM-Nr. 5-046998 |
| Datum | 2004-02-03 | Benennung | | | | | | | | | | | | |
| Name | Hirt | BEIPACKZETTEL HAS02.1-001-NNN-NN | | | | | | | | | | | | |
| Material-Nr. | R911306332 | Zeich-Nr. 109-1214-4213-03 | | | | | | | | | | | | |
| Datei | DB165406 | Ers.durch .. AEM-Nr. 5-046998 | | | | | | | | | | | | |

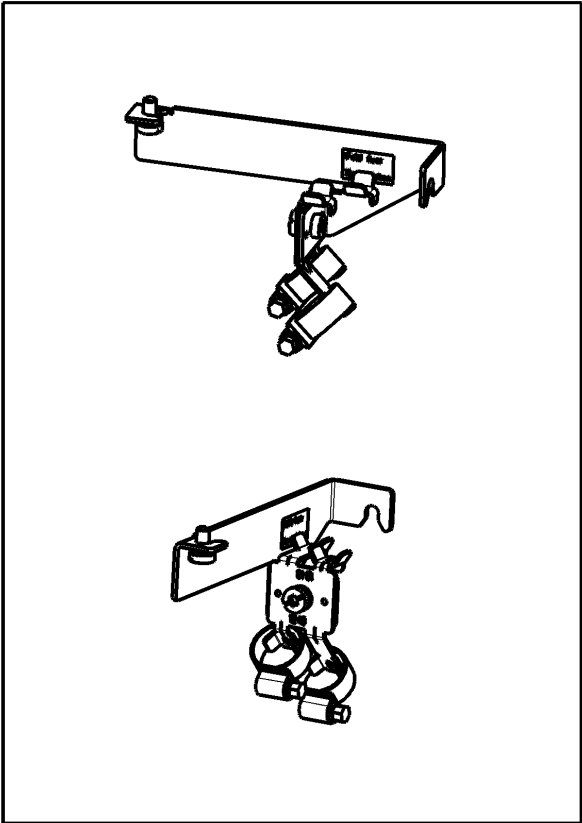
Fig. 11-33: Product insert

HAS02.1-002-NNN-NN



R911306106

| | | |
|------|---|------------|
| 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
| 2 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
| 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 |
| 1 | BLECH HCS02.1 KABELBEFESTIGUNG | R911305851 |
| Stck | Benennung | MN |



BEIPACKZETTEL HAS02.1-002-NNN-NN

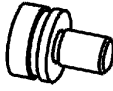
| Stck | Benennung | MN |
|------|---|------------|
| 1 | BLECH HCS02.1 KABELBEFESTIGUNG | R911305851 |
| 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 |
| 2 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
| 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
| Stck | Benennung | MN |



1:5



7:20



1:1



1:2

| | | | | |
|--------------|------------|-----------|----------------------------------|------------------|
| Datum | 2004-01-30 | Benennung | BEIPACKZETTEL HAS02.1-002-NNN-NN | |
| Name | michborn | Zeich-Nr. | 109-1228-4231-03 | |
| Material-Nr. | R911306107 | Erschuld. | ... | AEH-Nr. 5-046998 |
| Datei | DB165311 | Erschuld. | ... | AEH-Nr. 5-046998 |

Fig. 11-34: Product insert

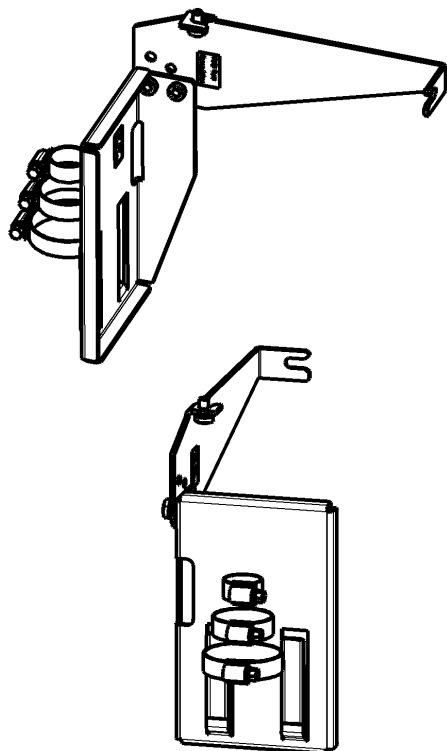
Made in Germany

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 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
| 1 | SCHELLE-SCHL-S023*035-B12-ZN-SW7*S-3017 | R911274472 |
| 1 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
| 1 | BLECH HMS01.1-W0210 ABSCHIRMANSCHLUSS | R911305940 |
| Stck | Benennung | MN |

**BEIPACKZETTEL HAS02.1-003-NNN-NN**

| Stck | Benennung | MN | | | | | | | | | | | | |
|--|--|----------------------------------|-------|------------|-----------|------|-----------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------------|
| 1 | BLECH HMS01.1-W0210 ABSCHIRMANSCHLUSS | R911305940 | | | | | | | | | | | | |
| DB164075 | | 1:4 | | | | | | | | | | | | |
| 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-46868 | | 1:2 | | | | | | | | | | | | |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 | | | | | | | | | | | | |
| DB148075 | | 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 | | | | | | | | | | | | |
| DB164163 | | 1:5 | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Datum</td><td>2004-02-03</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Koblinger</td><td>BEIPACKZETTEL HAS02.1-003-NNN-NN</td></tr> <tr> <td>Material-Nr.</td><td>R911306333</td><td>Zeich-Nr. 109-1217-4262-02</td></tr> <tr> <td>Datei</td><td>DB164151</td><td>Ers.durch ... AEM-Nr. 5-07273</td></tr> </table> | | | Datum | 2004-02-03 | Benennung | Name | Koblinger | BEIPACKZETTEL HAS02.1-003-NNN-NN | Material-Nr. | R911306333 | Zeich-Nr. 109-1217-4262-02 | Datei | DB164151 | Ers.durch ... AEM-Nr. 5-07273 |
| Datum | 2004-02-03 | Benennung | | | | | | | | | | | | |
| Name | Koblinger | BEIPACKZETTEL HAS02.1-003-NNN-NN | | | | | | | | | | | | |
| Material-Nr. | R911306333 | Zeich-Nr. 109-1217-4262-02 | | | | | | | | | | | | |
| Datei | DB164151 | Ers.durch ... AEM-Nr. 5-07273 | | | | | | | | | | | | |

Fig. 11-35: Product insert

Made in Germany

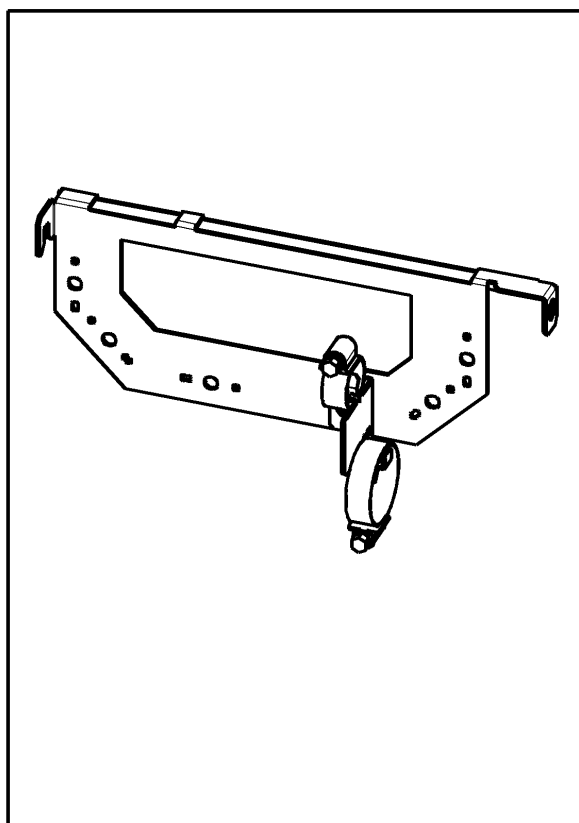
109-1253-4819-01

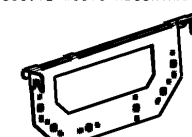
HAS02.1-004-NNN-NN



R911306720

| I | WINKEL HCS03.1E-W0070 ABSCHIRMANSCHLUSS | R911024542 |
|------|--|------------|
| I | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z4I | R911252551 |
| I | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| I | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
| I | HALTERUNG HMS01.1 KABELD. 12-35 | R911296081 |
| Stck | Benennung | MN |



| BEIPACKZETTEL HAS02.1-004-NNN-NN | | | |
|----------------------------------|---|--|------------|
| Stck | Benennung | | MN |
| I | HALTERUNG HMS01.1 KABELD. 12-35 | | R911296081 |
| DB143411 |  | | 7:20 |
| I | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | | R911274471 |
| DB146819 |  | | 1:2 |
| I | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | | R911274472 |
| DB146866 |  | | 1:2 |
| I | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z4I | | R911252551 |
| DB138405 |  | | 1:1 |
| I | WINKEL HCS03.1E-W0070 ABSCHIRMANSCHLUSS | | R911024542 |
| DB186610 |  | | 3:20 |
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Fig. 11-36: Product insert

Made in Germany

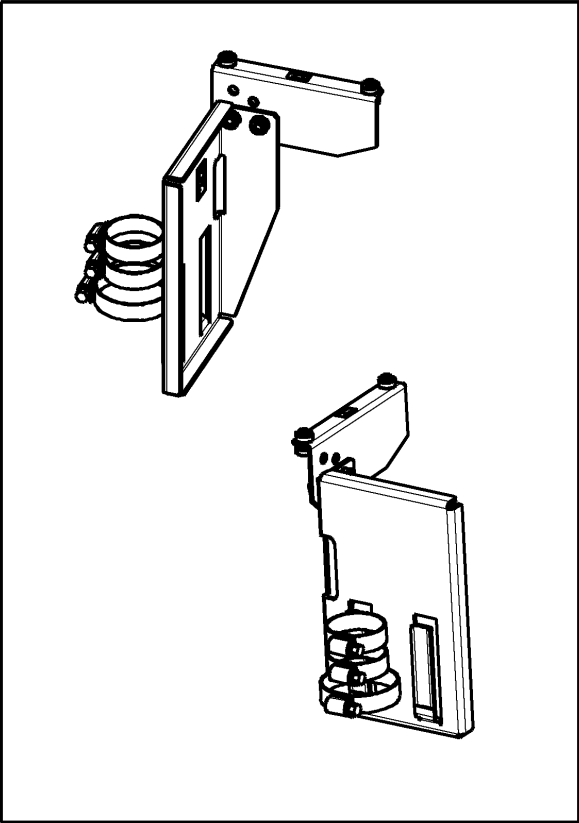
109-1253-4820-02

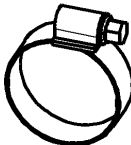
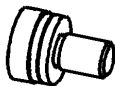
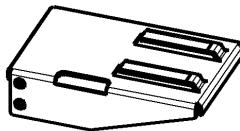
HAS02.1-005-NNN-NN



R911306721

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| 1 | WINKEL HMS01.1-W0210 ABSCHIRMANSCHLUSS | R911305950 |
| 4 | SCHR-LIN-M 6,0X12,0-K-8.8-IS07045-ZN-Z41 | R911252551 |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| 1 | BLECH HCS03.1E-W0150 ABSCHIRMANSCHLUSS | R911025559 |
| Stck | Benennung | MN |



| BEIPACKZETTEL HAS021-005-NNN-NN | | | |
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| Stck | Benennung | | MN |
| 1 | BLECH HCS03.1E-W0150 ABSCHIRMANSCHLUSS | | R911025559 |
| 08166065 |  | | 1:4 |
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| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | | R911274472 |
| 08146868 |  | | 1:2 |
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| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | | R911296565 |
| 08176073 |  | | 7:20 |
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| 4 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | | R911252551 |
| 08138705 |  | | 1:1 |
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| 1 | WINKEL HMS01.1-W0210 ABSCHIRMANSCHLUSS | | R911305950 |
| 08167163 |  | | 1:5 |
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Fig. 11-37: Product insert

Made in Germany

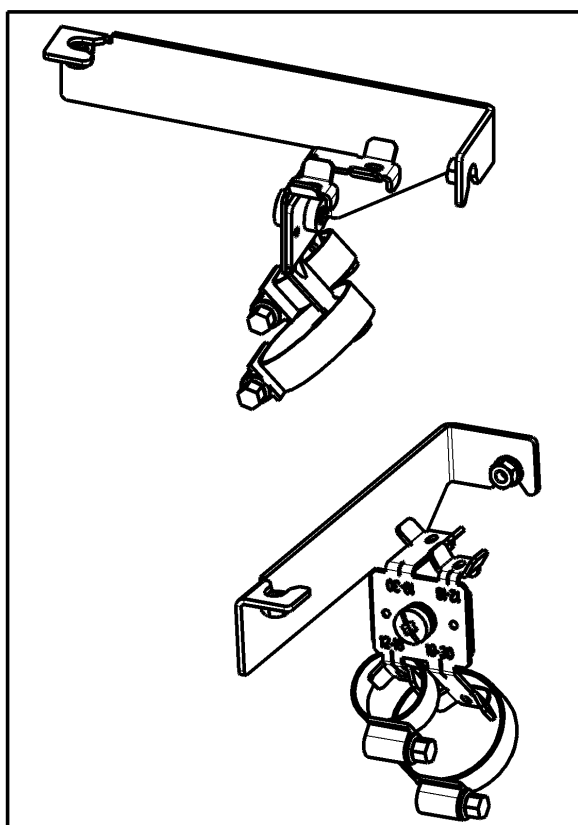
109-1253-4821-01

HAS02.1-006-NNN-NN



R911306722

| 1 | 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 |
| 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 |



BEIPACKZETTEL HAS02.1-006-NNN-NN

| Stck | Benennung | MN |
|------|--|------------|
| 1 | BLECH HCS02.1 KABELBEFESTIGUNG | R911305851 |
| 1 | HALTERUNG HMS01.1 KABELD. 12-30 | R911306336 |
| 2 | MUTTER-KOM-M 5,0-D10-H05,80 A2-B | R911210162 |
| 1 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
| 1 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| 1 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | R911252551 |

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|--------------|---------------|--------------|----------------------------------|
| Datum | 2004-03-02 | Benennung | BEIPACKZETTEL HAS02.1-006-NNN-NN |
| Name | Hirt / Steven | Material-Nr. | R911306726 |
| Material-Nr. | R911306726 | Zeich-Nr. | 109-1253-4231-01 |
| Datei | DB166624 | Ers.durch | ... |
| | | AEM-Nr. | 5-07273 |

Fig. 11-38: Product insert

Made in Germany

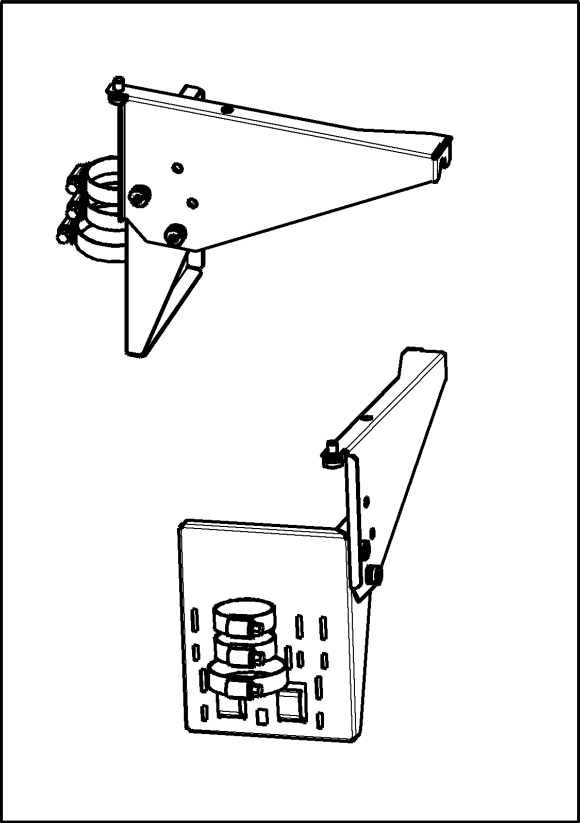
109-1253-4822-01

HAS02.1-007-NNN-NN



R911306723

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| 1 | WINKEL HNK01.1A-A075-W0080/0106 ABSCHIRM | R911024565 |
| 3 | SCHR-LIN-M 6,0X12,0-K-8.8-IS07045-ZN-Z41 | R911252551 |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| 1 | BLECH HNK01.1A-A075-E0080/0106 ABSCHIRM | R911024564 |
| Stck | Benennung | MN |



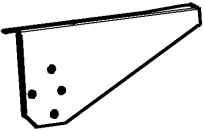
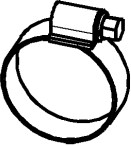
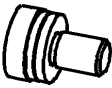
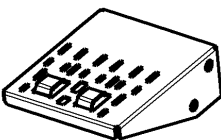
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| Stck | Benennung | | MN |
| 1 | BLECH HNK01.1A-A075-E0080/0106 ABSCHIRM | | R911024564 |
| DB188446 |  | | 3:20 |
| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | | R911274472 |
| DB146868 |  | | 1:2 |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | | R911296565 |
| DB178073 |  | | 7:20 |
| 3 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | | R911252551 |
| DB138705 |  | | 1:1 |
| 1 | WINKEL HNK01.1A-A075-W0080/0106 ABSCHIRM | | R911024565 |
| DB186587 |  | | 1:5 |
| | | | |
| Datum | 2004-03-02 | Benennung | |
| Name | Hirt / Steven | BEIPACKZETTEL HAS02.1-007-NNN-NN | |
| Material-Nr. | R911306727 | Zeich-Nr. 109-1253-4232-02 | |
| Datei | 08166625 | Ers.durch .. | AEM-Nr. 5-015092 |

Fig. 11-39: Product insert

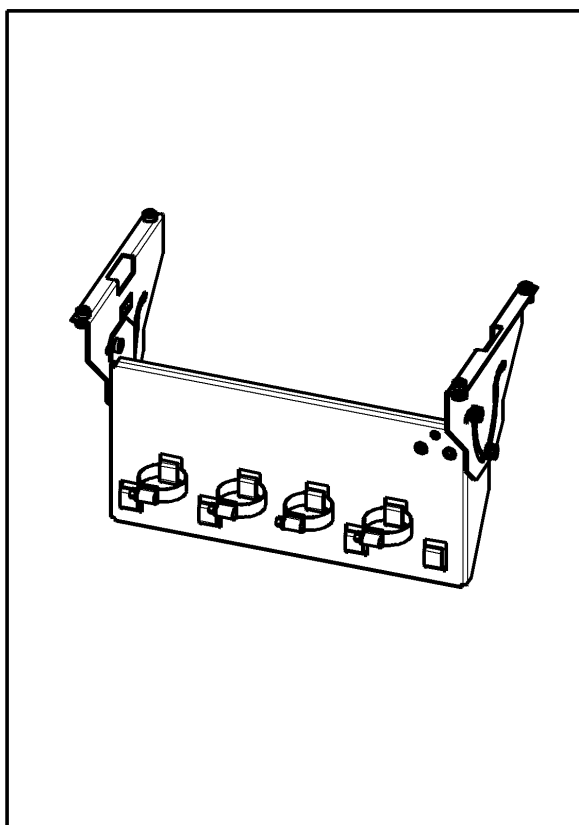
Made in Germany
109-1253-4823-00

HAS02.1-008-NNN-NN



R911309579

| 1 | WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025285 |
|------|--|------------|
| 4 | SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C | R900014492 |
| 4 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | R911252551 |
| 4 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| 4 | SCHEIBE 6,40X 12,00X 1,60 DIN 125 | R911212427 |
| 4 | FEDERRING DIN127-B6-FST | R911213515 |
| 2 | BLECH HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025286 |
| Stck | Benennung | MN |



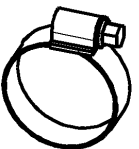
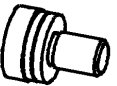
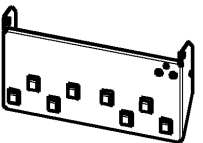
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| Stck | Benennung | | MN |
| 2 | BLECH HCS03.1E-W0210 ABSCHIRMANSCHLUSS | | R911025286 |
| DB186112 |  | | 3:20 |
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| 4 | FEDERRING | DIN127-B6-FST | R911213515 |
| DB_55462 |  | | 1:1 |
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| 4 | SCHEIBE | 6,40X 12,00X 1,60 DIN 125 | R911212427 |
| DB_42215 |  | | 1:1 |
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| 4 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 | |
| DB_46868 |  | | 1:2 |
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| 4 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | R911252551 | |
| DB_38405 |  | | 1:1 |
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| 4 | SECHSKANTSCHRAUBE | ISO4017-M6X12-8.8-A2C | R900014492 |
| DB1818150 |  | | 1:1 |
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| 1 | WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025285 | |
| DB186125 |  | | 1:10 |
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Fig. 11-40: Product insert

Made in Germany

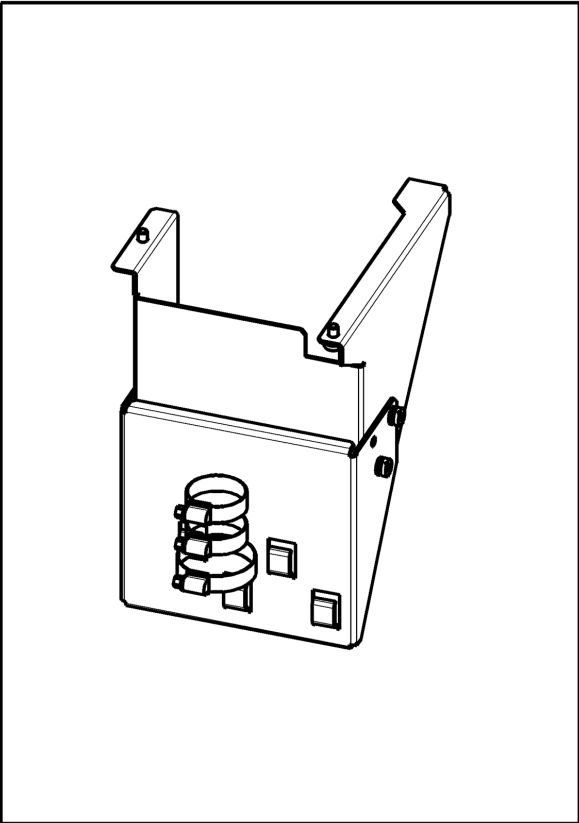
109-1253-4824-02

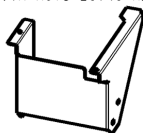
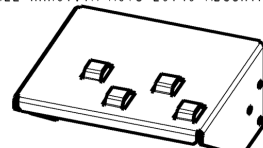
HAS02.1-009-NNN-NN



R911308225

| | | |
|------|--|------------|
| 1 | WINKEL HNK01.1A-A075-E0146 ABSCHIRMANSCH | R911025036 |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| 6 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
| 1 | BLECH HNK01.1A-A075-E0146 ABSCHIRMANSCH | R911025035 |
| Stck | Benennung | MN |



| BEIPACKZETTEL HAS021-009-NNN-NN | | | |
|---------------------------------|--|--|------------|
| Stck | Benennung | | MN |
| 1 | BLECH HNK01.1A-A075-E0146 ABSCHIRMANSCH | | R911025035 |
| DB186560 |  | | 1:10 |
| | | | |
| 6 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | | R911252551 |
| DB_38405 |  | | 1:1 |
| | | | |
| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | | R911274472 |
| DB_46868 |  | | 1:4 |
| | | | |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | | R911296565 |
| DB148043 |  | | 1:4 |
| | | | |
| 1 | WINKEL HNK01.1A-A075-E0146 ABSCHIRMANSCH | | R911025036 |
| DB186428 |  | | 1:5 |
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Fig. 11-41: Product insert

Made in Germany
109-1253-4841-00

HAS02.1-010-NNN-NN

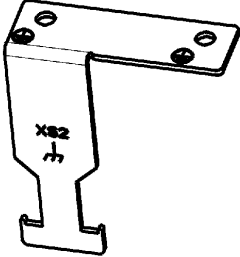

R911306209

| | | |
|------|---------------------------------------|------------|
| 1 | KLEMME SK 20 | R911313176 |
| 1 | BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS | R911311526 |
| Stck | Benennung | MN |

BEIPACKZETTEL HAS02.1-010-NNN-NN

| Stck | Benennung | MN |
|------|---------------------------------------|------------|
| 1 | BLECH HMS02.1-W0054 ABSCHIRMANSCHLUSS | R911311526 |

08183532



1:2

| | | |
|---|--------------|------------|
| 1 | KLEMME SK 20 | R911313176 |
|---|--------------|------------|

08183513



1:2

| | | |
|--------------|------------|----------------------------------|
| Datum | 2005-08-19 | Benennung |
| Name | rainhirt | BEIPACKZETTEL HAS02.1-010-NNN-NN |
| Material-Nr. | R911313050 | Zeich-Nr. 109-1253-4277-00 |
| Datei | 08190746 | Ersch durch .. AEM-Nr. .. |

Fig. 11-42: Product insert

Made in Germany

109-1253-4842-00

HAS02.1-011-NNN-NN



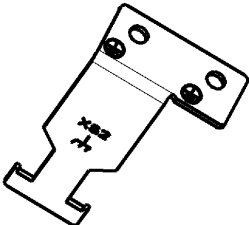
R911306471

| | | |
|------|---------------------------------------|------------|
| 1 | KLEMME SK 20 | R911313176 |
| 1 | BLECH HMS02.1 W0028 ABSCHIRMANSCHLUSS | R911311525 |
| Stck | Benennung | MN |

BEIPACKZETTEL HAS02.1-011-NNN-NN

| | | |
|------|---------------------------------------|------------|
| Stck | Benennung | MN |
| 1 | BLECH HMS02.1 W0028 ABSCHIRMANSCHLUSS | R911311525 |

DB186447



1:2

| | | |
|---|--------------|------------|
| 1 | KLEMME SK 20 | R911313176 |
|---|--------------|------------|

DB183573



1:2

| | | |
|--------------|------------|----------------------------------|
| Datum | 2005-08-19 | Benennung |
| Name | rainhirt | BEIPACKZETTEL HAS02.1-011-NNN-NN |
| Material-Nr. | R911306628 | Zeich-Nr. 109-1253-4278-00 |
| Datei | DB190747 | Ers.durch .. AEM-Nr. .. |

Fig. 11-43: Product insert

Made in Germany

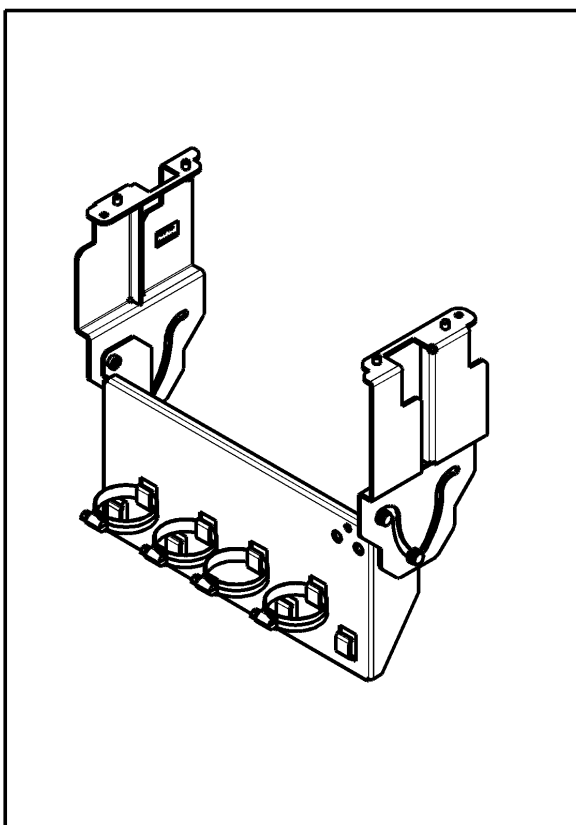
109-1253-4850-00

HAS02.1-012-NNN-NN



R911315682

| 1 | WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025285 |
|------|--|------------|
| 4 | SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C | R900014492 |
| 4 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | R911252551 |
| 4 | SCHELLE-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

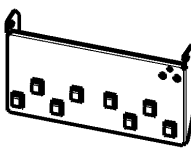
| Stck | Benennung | MN | | | | | | | | | | | | |
|--|---|----------------------------------|-------|------------|-----------|------|----------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------|
| 2 | BLECH HCS04.1E-W0500 ABSCHIRMANSCHLUSS | R911027316 | | | | | | | | | | | | |
| DB195166 |  | 1:10 | | | | | | | | | | | | |
| 4 | FEDERRING DIN127-B6-FST & | R911213515 | | | | | | | | | | | | |
| DB_55462 |  | 1:1 | | | | | | | | | | | | |
| 4 | SCHEIBE 6,40X 12,00X 1,60 DIN 125 | R911212427 | | | | | | | | | | | | |
| DB_22215 |  | 1:1 | | | | | | | | | | | | |
| 4 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 | | | | | | | | | | | | |
| DB148043 |  | 2:5 | | | | | | | | | | | | |
| 4 | SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 | R911252551 | | | | | | | | | | | | |
| DB_38405 |  | 1:1 | | | | | | | | | | | | |
| 4 | SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C | R900014492 | | | | | | | | | | | | |
| DB118150 |  | 1:1 | | | | | | | | | | | | |
| 1 | WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025285 | | | | | | | | | | | | |
| DB186125 |  | 1:10 | | | | | | | | | | | | |
| <table> <tr> <td>Datum</td><td>2006-01-19</td><td>Benennung</td></tr> <tr> <td>Name</td><td>Sonjrazz</td><td>BEIPACKZETTEL HAS02.1-012-NNN-NN</td></tr> <tr> <td>Material-Nr.</td><td>R911315849</td><td>Zeich-Nr. 109-1253-4284-00</td></tr> <tr> <td>Datei</td><td>DB195390</td><td>Ers.durch .. AEM-Nr. ..</td></tr> </table> | | | Datum | 2006-01-19 | Benennung | Name | Sonjrazz | BEIPACKZETTEL HAS02.1-012-NNN-NN | Material-Nr. | R911315849 | Zeich-Nr. 109-1253-4284-00 | Datei | DB195390 | Ers.durch .. AEM-Nr. .. |
| Datum | 2006-01-19 | Benennung | | | | | | | | | | | | |
| Name | Sonjrazz | BEIPACKZETTEL HAS02.1-012-NNN-NN | | | | | | | | | | | | |
| Material-Nr. | R911315849 | Zeich-Nr. 109-1253-4284-00 | | | | | | | | | | | | |
| Datei | DB195390 | Ers.durch .. AEM-Nr. .. | | | | | | | | | | | | |

Fig. 11-44: Product insert

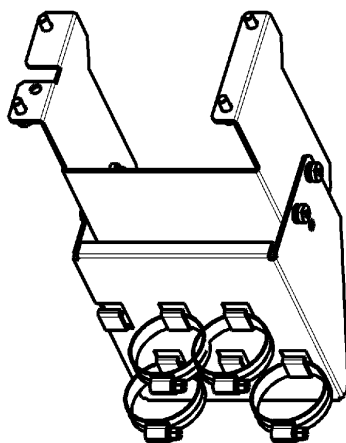
Made in Germany

109-1287-4820-00

HAS02.1-013-NNN-NN

R911318183

| 4 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
|------|---|------------|
| 8 | KOMBI-SCHRAUBE ZISO10644-M6X16-8.8 & | R911294530 |
| 1 | 0027843 SCHIRMAUFLAGE HCS0500 | R911203470 |
| 1 | 0027842 HALTER SCHIRMAUFLAGE HCS0500 | R911203471 |
| Stck | Benennung | MN |

**BEIPACKZETTEL HAS02.1-013-NNN-NN**

| Stck | Benennung | MN | | | | | | | | | | | | |
|---|---|----------------------------------|-------|------------|-----------|------|----------|----------------------------------|--------------|------------|----------------------------|-------|----------|-------------------------|
| 1 | 0027842 HALTER SCHIRMAUFLAGE HCS0500 | R911203471 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 1 | 0027843 SCHIRMAUFLAGE HCS0500 | R911203470 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 8 | KOMBI-SCHRAUBE ZISO10644-M6X16-8.8 & | R911294530 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| 4 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| <table border="1"> <tr> <td>Datum</td><td>2006-08-21</td><td>Benennung</td></tr> <tr> <td>Name</td><td>motlome1</td><td>BEIPACKZETTEL HAS02.1-013-NNN-NN</td></tr> <tr> <td>Material-Nr.</td><td>R911318184</td><td>Zeich-Nr. 109-1287-4203-00</td></tr> <tr> <td>Datei</td><td>08204202</td><td>Ers.durch .. AEM-Nr. ..</td></tr> </table> | | | Datum | 2006-08-21 | Benennung | Name | motlome1 | BEIPACKZETTEL HAS02.1-013-NNN-NN | Material-Nr. | R911318184 | Zeich-Nr. 109-1287-4203-00 | Datei | 08204202 | Ers.durch .. AEM-Nr. .. |
| Datum | 2006-08-21 | Benennung | | | | | | | | | | | | |
| Name | motlome1 | BEIPACKZETTEL HAS02.1-013-NNN-NN | | | | | | | | | | | | |
| Material-Nr. | R911318184 | Zeich-Nr. 109-1287-4203-00 | | | | | | | | | | | | |
| Datei | 08204202 | Ers.durch .. AEM-Nr. .. | | | | | | | | | | | | |

Fig. 11-45: Product insert

Made in Germany

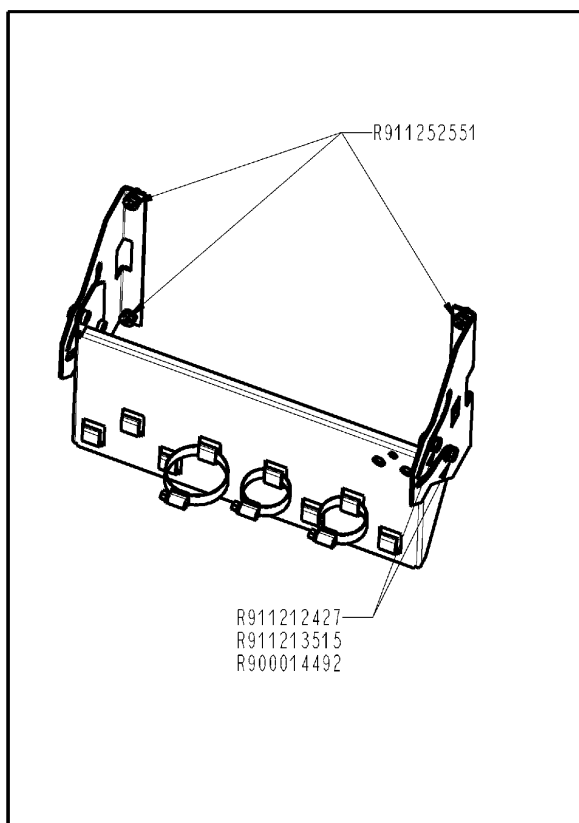
109-1253-4857-00

HAS02.1-014-NNN-NN



R911319050

| 1 | WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025285 |
|------|---|------------|
| 4 | SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C | R900014492 |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
| 2 | SCHELLE-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 |
| Stck | Benennung | MN |



BEIPACKZETTEL HAS02.1-014-NNN-NN

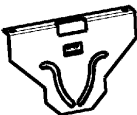
| Stck | Benennung | MN |
|--------------|---|----------------------------------|
| 2 | BLECH HMS01.1-W0350 ABSCHIRMANSCHLUSS | R911318661 |
| 08204747 |  | 3:20 |
| 4 | FEDERRING DIN127-B6-FST & | R911213515 |
| 08355402 |  | 1:1 |
| 4 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
| 0838405 |  | 1:1 |
| 4 | SCHEIBE 6,40X 12,00X 1,60 DIN 125 | R911212427 |
| 0842215 |  | 1:1 |
| 2 | SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 | R911274472 |
| 0846868 |  | 2:5 |
| 1 | SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017 | R911296565 |
| 08480143 |  | 2:5 |
| 4 | SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C | R900014492 |
| 08478150 |  | 1:1 |
| 1 | WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS | R911025285 |
| 08480125 |  | 1:10 |
| | | |
| Datum | 2006-10-11 | Benennung |
| Name | siegfisd | BEIPACKZETTEL HAS02.1-014-NNN-NN |
| Material-Nr. | R911319013 | Zeich-Nr. |
| | | 109-1253-4298-00 |
| Datei | 08205990 | Erschuldurch |
| | | ABM-Nr. |

Fig. 11-46: Product insert

Made in Germany

109-1253-4850-AB

HAS02.1-015-NNN-NN

R911320785

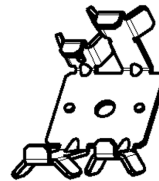
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| 1 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
| 1 | HALTERUNG HMS01.1 KABELD. 12-30 | R911306336 |
| Stck | Benennung | MN |

BEIPACKZETTEL HAS02.1-015-NNN-NN

| Stck | Benennung | MN |
|------|-----------|----|
|------|-----------|----|

| | | |
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| 1 | HALTERUNG HMS01.1 KABELD. 12-30 | R911306336 |
|---|---------------------------------|------------|

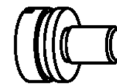
DB14824



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DB38705

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| 1 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 |
|---|--------------------------------------|------------|



1:1

| | | |
|---|---|------------|
| 1 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 |
|---|---|------------|

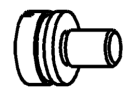
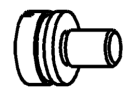
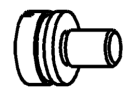
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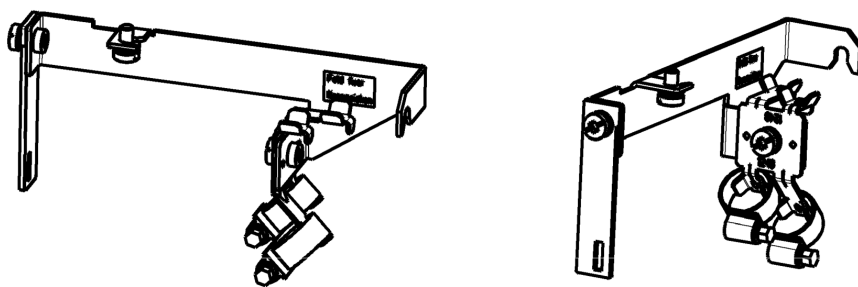
| | | | | |
|--------------|------------|----------------------------------|------------------|-----------------|
| Datum | 2007-03-09 | Benennung | | |
| Name | rainbird | BEIPACKZETTEL HAS02.1-015-NNN-NN | | |
| Material-Nr. | R911320791 | Zeich-Nr. | 109-1253-4299-AB | |
| Datei | DB212340 | Ers.durch | 109-1253-4299-00 | AEM-Nr. 5-75318 |

Fig. 11-47: Product insert

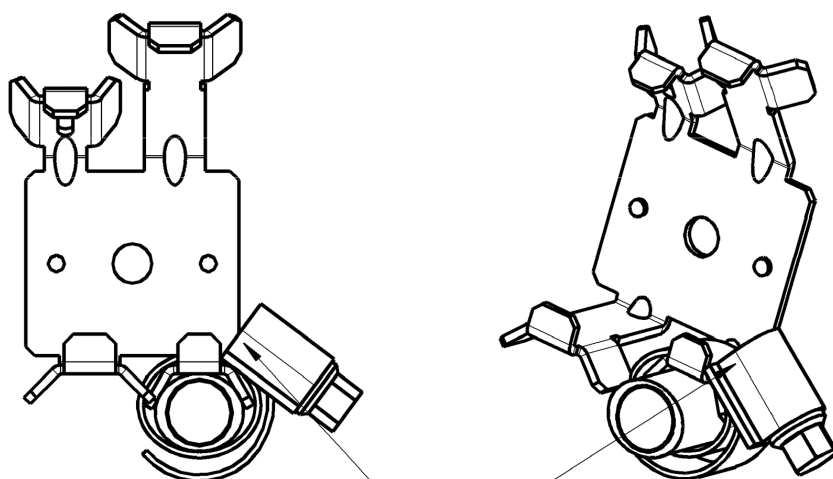
| <p>Made in Germany</p> <p>109-1304-4813-00</p> <h2 style="text-align: center; margin: 10px 0;">HAS02.1-020-NNF-NN</h2> <div style="text-align: center;">  <p>R911323839</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr> <td style="width: 5%; text-align: center;">2</td> <td style="width: 85%;">SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017</td> <td style="width: 10%; text-align: center;">R911274471</td> </tr> <tr> <td style="text-align: center;">3</td> <td>KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &</td> <td style="text-align: center;">R911252551</td> </tr> <tr> <td style="text-align: center;">1</td> <td>HALTERUNG HCS02.1 KABELD. 12-18</td> <td style="text-align: center;">R911305852</td> </tr> <tr> <td style="text-align: center;">1</td> <td>BLECH HAS02.1-020-NNF-NN</td> <td style="text-align: center;">R911323763</td> </tr> <tr> <td style="text-align: center;">1</td> <td>ABSCHIRMBLECH HAS02.1-020-NNF-NN</td> <td style="text-align: center;">R911323764</td> </tr> <tr> <td style="text-align: center;">Stck</td> <td style="text-align: center;">Benennung</td> <td style="text-align: center;">MN</td> </tr> </table> | | | 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 | 3 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 | 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 | 1 | BLECH HAS02.1-020-NNF-NN | R911323763 | 1 | ABSCHIRMBLECH HAS02.1-020-NNF-NN | R911323764 | Stck | Benennung | MN | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="4" style="text-align: center; padding: 5px;">BEIPACKZETTEL HAS02.1-020-NNF-NN</th> </tr> <tr> <th style="width: 5%;">Stck</th> <th style="width: 75%;">Benennung</th> <th style="width: 15%;">MN</th> <th style="width: 5%;"></th> </tr> <tr> <td style="text-align: center;">1</td> <td>ABSCHIRMBLECH HAS02.1-020-NNF-NN</td> <td style="text-align: center;">R911323764</td> <td></td> </tr> <tr> <td style="text-align: center;">DB225152</td> <td style="text-align: center;">  </td> <td style="text-align: center;">1:5</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td>BLECH HAS02.1-020-NNF-NN</td> <td style="text-align: center;">R911323763</td> <td></td> </tr> <tr> <td style="text-align: center;">DB225270</td> <td style="text-align: center;">  </td> <td style="text-align: center;">1:4</td> <td></td> </tr> <tr> <td style="text-align: center;">1</td> <td>HALTERUNG HCS02.1 KABELD. 12-18</td> <td style="text-align: center;">R911305852</td> <td></td> </tr> <tr> <td style="text-align: center;">DB163246</td> <td style="text-align: center;">  </td> <td style="text-align: center;">1:4</td> <td></td> </tr> <tr> <td style="text-align: center;">3</td> <td>KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &</td> <td style="text-align: center;">R911252551</td> <td></td> </tr> <tr> <td style="text-align: center;">DB_38405</td> <td style="text-align: center;">  </td> <td style="text-align: center;">1:1</td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td>SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017</td> <td style="text-align: center;">R911274471</td> <td></td> </tr> <tr> <td style="text-align: center;">DB_46879</td> <td style="text-align: center;">  </td> <td style="text-align: center;">1:2</td> <td></td> </tr> </table> | | | BEIPACKZETTEL HAS02.1-020-NNF-NN | | | | Stck | Benennung | MN | | 1 | ABSCHIRMBLECH HAS02.1-020-NNF-NN | R911323764 | | DB225152 |  | 1:5 | | 1 | BLECH HAS02.1-020-NNF-NN | R911323763 | | DB225270 |  | 1:4 | | 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 | | DB163246 |  | 1:4 | | 3 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 | | DB_38405 |  | 1:1 | | 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 | | DB_46879 |  | 1:2 | |
|---|---|------------|---|---|------------|---|--------------------------------------|------------|---|---------------------------------|------------|---|--------------------------|------------|---|----------------------------------|------------|-------------|------------------|-----------|--|--|--|----------------------------------|--|--|--|------|-----------|----|--|---|----------------------------------|------------|--|----------|---|-----|--|---|--------------------------|------------|--|----------|---|-----|--|---|---------------------------------|------------|--|----------|---|-----|--|---|--------------------------------------|------------|--|----------|--|-----|--|---|---|------------|--|----------|---|-----|--|
| 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | BLECH HAS02.1-020-NNF-NN | R911323763 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | ABSCHIRMBLECH HAS02.1-020-NNF-NN | R911323764 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stck | Benennung | MN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BEIPACKZETTEL HAS02.1-020-NNF-NN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Stck | Benennung | MN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | ABSCHIRMBLECH HAS02.1-020-NNF-NN | R911323764 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB225152 |  | 1:5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | BLECH HAS02.1-020-NNF-NN | R911323763 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB225270 |  | 1:4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB163246 |  | 1:4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB_38405 |  | 1:1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB_46879 |  | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | | |
|--------------|------------|-----------|----------------------------------|------------------|
| Datum | 2008-02-28 | Benennung | BEIPACKZETTEL HAS02.1-020-NNF-NN | |
| Name | rainhirt | | | |
| Material-Nr. | R911323843 | Zeich-Nr. | 109-1304-4218-01 | |
| Datei | DB226241 | Ers.durch | .. | AEM-Nr. 5-046998 |

Fig. 11-48: HAS02.1-020-NNF-NN product insert (page 1)



Montage der Kabelschelle mit REXROTH-Kabel INK0653
(Litzen- $\varnothing$ 4x1,0 mm² + 2x0,75 mm²)



Position des
Schneckenantriebs !!!

Fig. 11-49: HAS02.1-020-NNF-NN product insert (page 2)

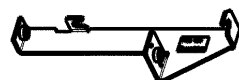
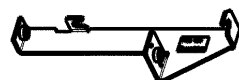
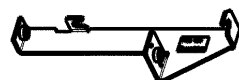
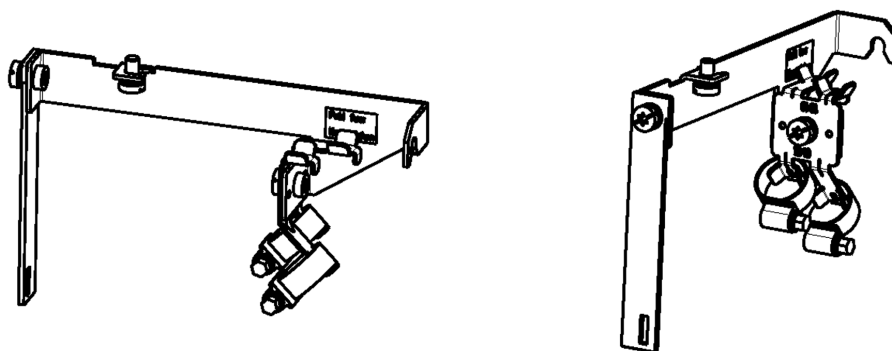
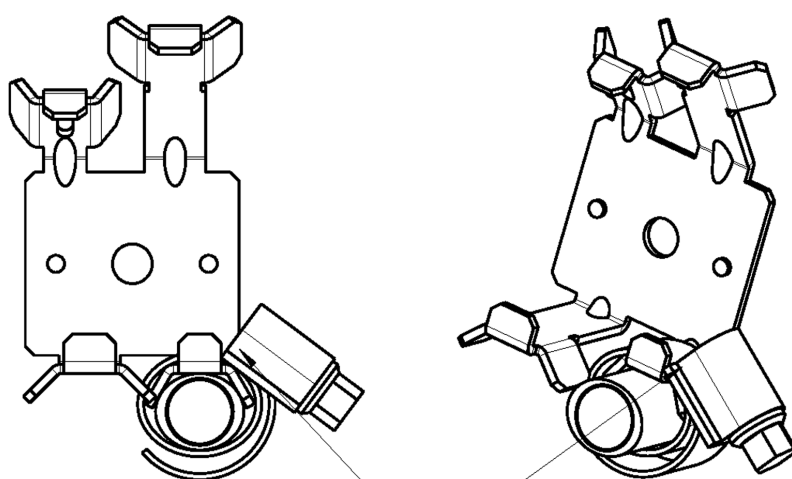
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|---|---|----------------------------------|--|------------------|--|-------|------------|-----------|---|----------------------------------|------------|----------|---|-----|---|--------------------------|------------|-----------|---|-----|-------|---------------------------------|------------|----------|---|-----|---|--------------------------------------|------------|----------|--|-----|---|---|------------|----------|---|-----|
| Stck | Benennung | MN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | ABSCHIRMBLECH HAS02.1-021-NNF-NN | R911323765 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB222748 |  | 1:5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | BLECH HAS02.1-021-NNF-NN | R911323762 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB222881 |  | 1:4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | HALTERUNG HCS02.1 KABELD. 12-18 | R911305852 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB163246 |  | 1:4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 & | R911252551 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB-38405 |  | 1:1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017 | R911274471 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DB-46819 |  | 1:2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">Datum</td> <td style="width: 20%;">2008-02-28</td> <td style="width: 20%;">Benennung</td> <td colspan="2"></td> </tr> <tr> <td>Name</td> <td>rainhirt</td> <td colspan="3">BEIPACKZETTEL HAS02.1-021-NNF-NN</td> </tr> <tr> <td>Material-Nr.</td> <td>R911323842</td> <td>Zeich-Nr.</td> <td colspan="2">109-1304-4219-01</td> </tr> <tr> <td>Datei</td> <td>DB226255</td> <td>Ers.durch</td> <td>..</td> <td>AEM-Nr. 5-046998</td> </tr> </table> | | | Datum | 2008-02-28 | Benennung | | | Name | rainhirt | BEIPACKZETTEL HAS02.1-021-NNF-NN | | | Material-Nr. | R911323842 | Zeich-Nr. | 109-1304-4219-01 | | Datei | DB226255 | Ers.durch | .. | AEM-Nr. 5-046998 | | | | | | | | | | | | | |
| Datum | 2008-02-28 | Benennung | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Name | rainhirt | BEIPACKZETTEL HAS02.1-021-NNF-NN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Material-Nr. | R911323842 | Zeich-Nr. | 109-1304-4219-01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Datei | DB226255 | Ers.durch | .. | AEM-Nr. 5-046998 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Fig. 11-50: HAS02.1-021-NNF-NN product insert (page 1)



Montage der Kabelschelle mit REXROTH-Kabel INK0653
(Litzen- $\varnothing$ 4x1,0 mm² + 2x0,75 mm²)



Position des
Schneckenantriebs !!!

Fig. 11-51: HAS02.1-021-NNF-NN product insert (page 2)

Made in Germany

R911374117-AA

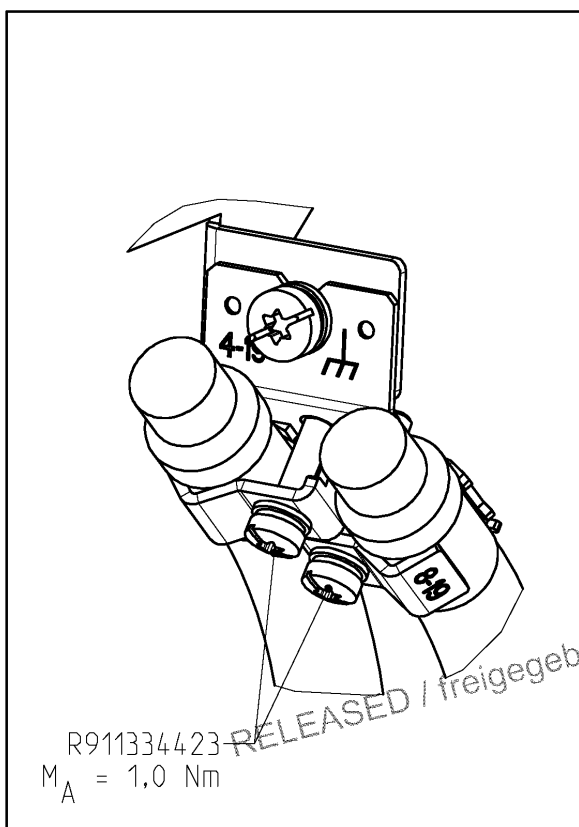
Rexroth
Bosch Group

HAS02.1-033-NNN-NN



R911374117

| 2 | KOMBI-SCHRAUBE | ZISO10644-M5X30-8.8 | R911334423 |
|------|----------------|-----------------------|------------|
| 2 | BLECH | | R911330442 |
| 1 | BLECH | HCS02.1 KABELBEFESTIG | R911305851 |
| 2 | KOMBI-SCHRAUBE | ZISO10644-M6X12-8.8 | R911252551 |
| 1 | BLECH | KLEMMAUFLAGE 04-19 | R911373055 |
| Stck | Benennung | | MN |



| BEIPACKZETTEL | | HAS02.1-033-NNN-NN | |
|--|----------------|-----------------------|------------|
| Stck | Benennung | | MN |
| 1 | BLECH | KLEMMAUFLAGE 04-19 | R911373055 |
| 327168 | | | 1:2 |
| 2 | KOMBI-SCHRAUBE | ZISO10644-M6X12-8.8 | R911252551 |
| DB_38405 | | | 1:1 |
| 1 | BLECH | HCS02.1 KABELBEFESTIG | R911305851 |
| DB163070 | | | 1:2 |
| 2 | BLECH | | R911330442 |
| DB237050 | | | 1:1 |
| 2 | KOMBI-SCHRAUBE | ZISO10644-M5X30-8.8 | R911334423 |
| DB265269 | | | 1:1 |
| <p>RELEASED / freigegeben</p> <p>UTC:2016-01-20T11:00:01</p> | | | |
| AA | -- | 20160107 | juliweig |
| Ind. | Change/Aend. | YYYYMMDD | Drawn/Gez. |
| Title | | HAS02.1-033-NNN-NN | |
| Benennung | | HAS02.1-033-NNN-NN | |
| Doc.type | RA56245396 | | DP/TD |
| BPZ | | | Ind. |
| MNR | R911374248 | Repl.by | 001 AA |

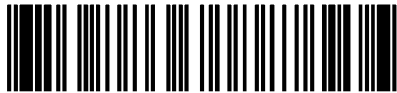
Fig. 11-52: HAS02.1-033-NNN-NN product insert

Made in Germany

R911374118-AA

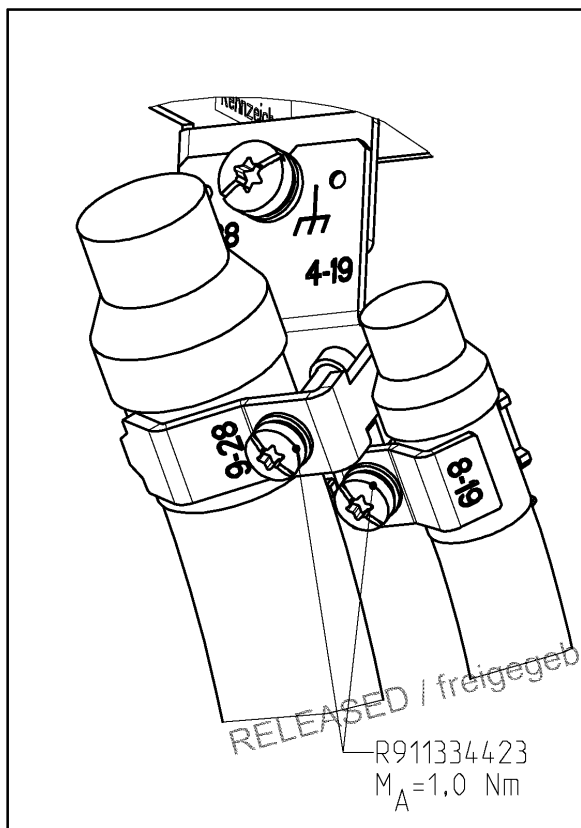
Rexroth
Bosch Group

HAS02.1-034-NNN-NN



R911374118

| 2 | KOMBI-SCHRAUBE | ZISO10644-M5X30-8.8 | R911334423 |
|------|----------------|-----------------------|------------|
| 1 | BLECH | HCS01.1 SCHIRM KLEMM& | R911330693 |
| 1 | BLECH | HCS02.1 KABELBEFESTI& | R911330442 |
| 1 | BLECH | HCS02.1 KABELBEFESTI& | R911305851 |
| 2 | KOMBI-SCHRAUBE | ZISO10644-M6X12-8.8 | R911252551 |
| 1 | BLECH | KLEMMAUFLAGE 04-28 | R911373056 |
| Stck | Benennung | | MN |



| BEIPACKZETTEL | | HAS02.1-034-NNN-NN | |
|---------------|----------------|-----------------------|------------|
| Stck | Benennung | | MN |
| 1 | BLECH | KLEMMAUFLAGE 04-28 | R911373056 |
| | | | |
| | | | 1:2 |
| 2 | KOMBI-SCHRAUBE | ZISO10644-M6X12-8.8 | R911252551 |
| | | | |
| | | | 1:1 |
| 1 | BLECH | HCS02.1 KABELBEFESTI& | R911305851 |
| | | | |
| | | | 1:2 |
| 1 | BLECH | HCS01.1 SCHIRM KLEMM& | R911330693 |
| | | | |
| | | | 1:1 |
| 1 | BLECH | HCS02.1 KABELBEFESTI& | R911330442 |
| | | | |
| | | | 1:1 |
| 2 | KOMBI-SCHRAUBE | ZISO10644-M5X30-8.8 | R911334423 |
| | | | |
| | | | 1:1 |
| AA | -- | 20160108 | juliweig |
| Ind. | Change/Aend. | YYYYMMDD | Drawn/Gez. |
| Title | | HAS02.1-034-NNN-NN | |
| Benennung | | HAS02.1-034-NNN-NN | |
| Doc.type | RA56251083 | | DP/TD |
| BPZ | | | Ind. |
| MNR | R911374249 | Repl.by | 001 AA |

RA56251083 / AA.4 / RA56250718 / ASSEM / AA.0

Fig. 11-53: HAS02.1-034-NNN-NN product insert

Made in Germany

R911374115-AA

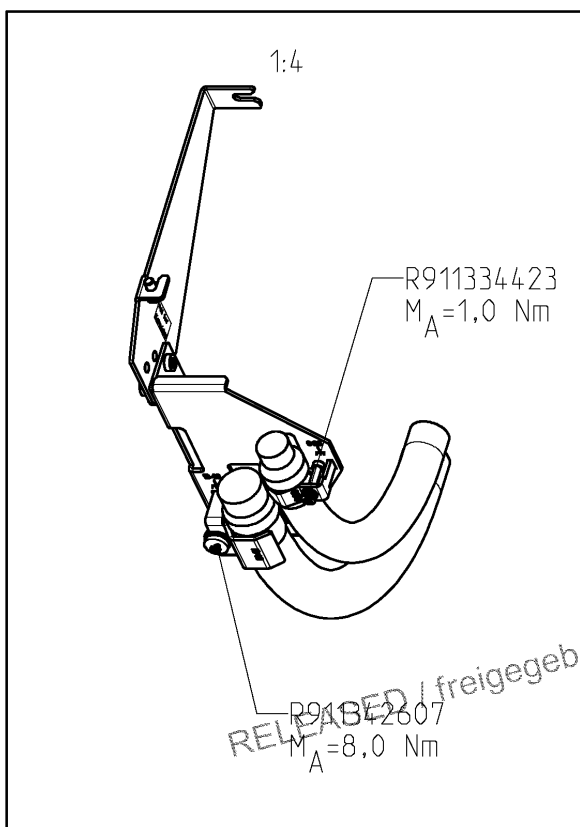
Rexroth
Bosch Group

HAS02.1-035-NNN-NN



R911374115

| 1 | ABSCHIRMBLECH | KLEMMBUEGEL 16-40 | R911373746 |
|------|----------------|-----------------------|------------|
| 1 | ABSCHIRMBLECH | KLEMMAUFLAGE 09-40 | R911373748 |
| 1 | KOMBI-SCHRAUBE | ZISO10644-M5X30-8.8 | R911334423 |
| 1 | BLECH | HCS01.1 SCHIRM KLEMM& | R911330693 |
| 1 | BLECH | HMS01.1-W0210 ABSCHI& | R911305940 |
| 3 | KOMBI-SCHRAUBE | ZISO10644-M6X12-8.8 | R911252551 |
| 1 | KOMBI-SCHRAUBE | | R911342607 |
| Stck | Benennung | | MN |



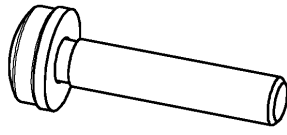
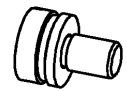
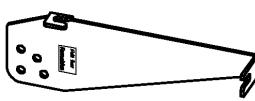
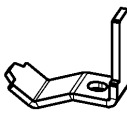
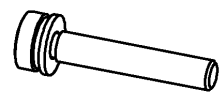
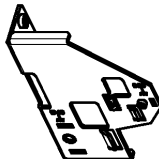
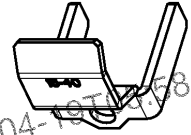
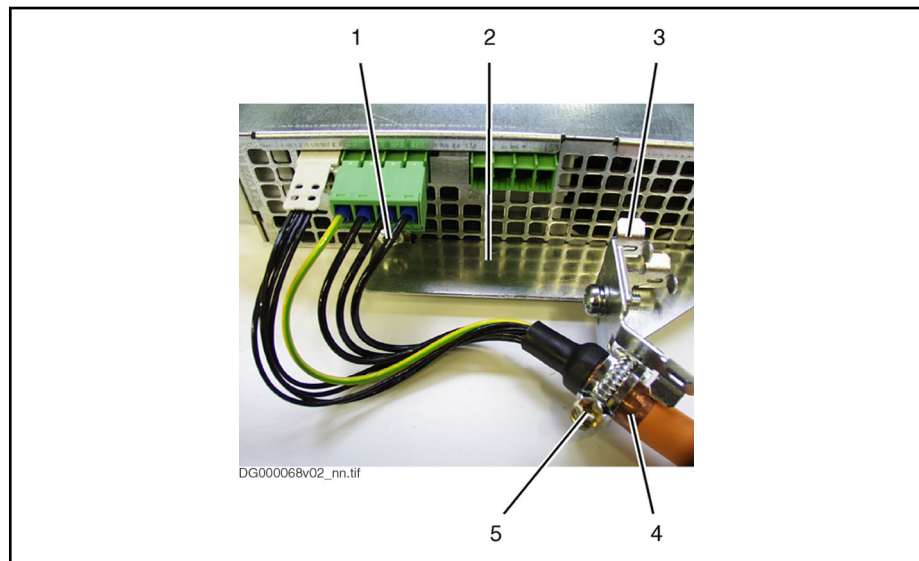
| BEIPACKZETTEL | | HAS02.1-035-NNN-NN | |
|---------------|---|----------------------------------|------------------------------|
| Stck | Benennung | MN | |
| 1 | KOMBI-SCHRAUBE | R911342607 | |
| 298541 |  | 1:1 | |
| 3 | KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 | R911252551 | |
| DB_38405 |  | 1:1 | |
| 1 | BLECH HMS01.1-W0210 ABSCHI& | R911305940 | |
| DB164075 |  | 1:5 | |
| 1 | BLECH HCS01.1 SCHIRM KLEMM& | R911330693 | |
| DB24769 |  | 1:2 | |
| 1 | KOMBI-SCHRAUBE ZISO10644-M5X30-8.8 | R911334423 | |
| DB268269 |  | 1:1 | |
| 1 | ABSCHIRMBLECH KLEMMAUFLAGE 09-40 | R911373748 | |
| RA55348548 |  | 1:5 | |
| 1 | ABSCHIRMBLECH KLEMMBUEGEL 16-40 | R911373746 | |
| RA55535012 |  | 1:2 | |
| AA | -- | 20160108 | juliweig 109-1304-4248 |
| Ind. | Change/Aend. | YYYYMMDD | Drawn/Gez. hist. Dokumentnr. |
| Title | | PACKING NOTE HAS02.1-035-NNN-NN | |
| Benennung | | BEIPACKZETTEL HAS02.1-035-NNN-NN | |
| Doc.type | BPZ | | DP/TD Ind. 001 AA |
| MNR | R911374250 | | Repl.by |

Fig. 11-54: HAS02.1-035-NNN-NN product insert

11.3.5 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. 11-55: Strain Relief and Shield Connection of Motor Cable

- Unscrew bottom or bottom left mounting screw of drive controller.
- Put fixing device from accessories to bottom of drive controller and screw down mounting screw of drive controller again.

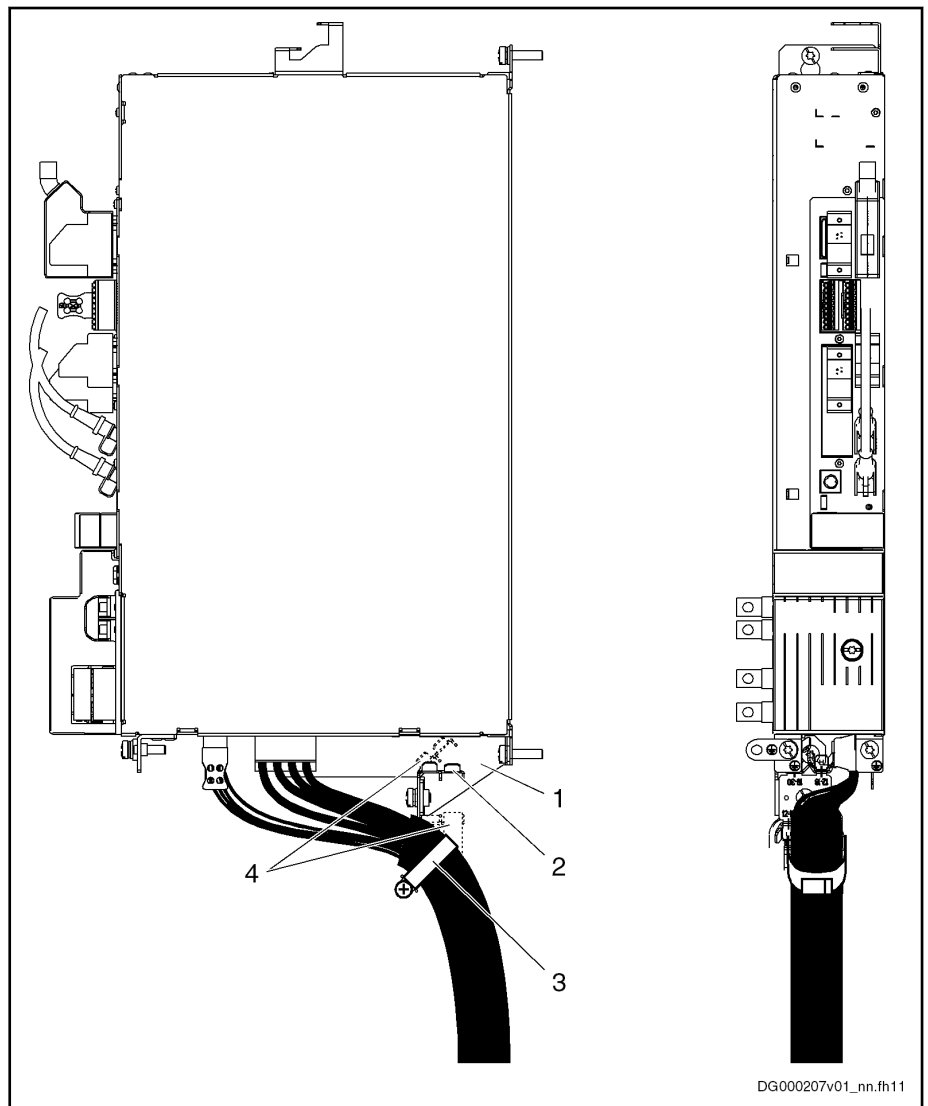
NOTICE

Risk of damage to the drive controller by too long screws!

Exclusively use screws of a **maximum length of 12 mm** for the thread of shield connection XS2.

- Screw second screw (M6 × 12) into thread XS2 at bottom of drive controller.
- Screw shielding plate to sheet metal from 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

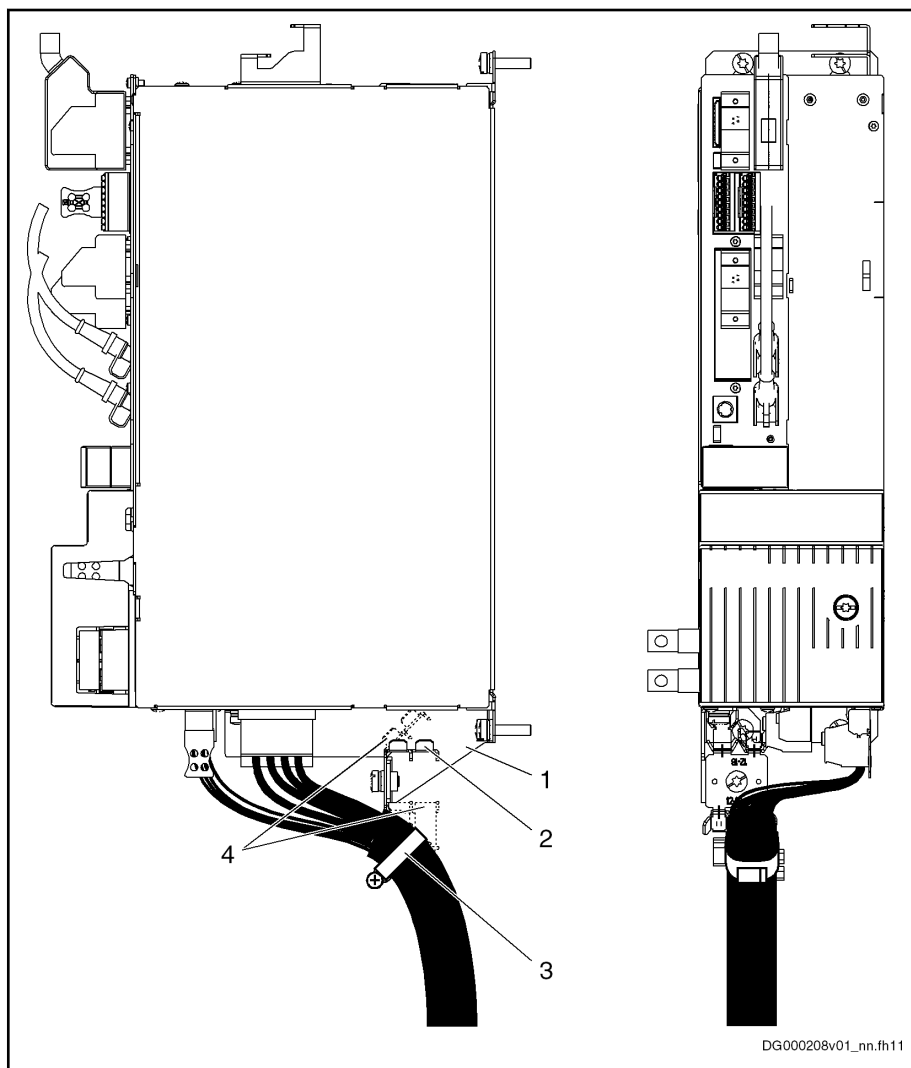


- | | |
|---|--|
| 1 | Fixing device |
| 2 | Shielding plate |
| 3 | Clip |
| 4 | Different mounting options for the shielding plate, according to motor cable routing |

Fig. 11-56: HAS02.1-001 at bottom of HMS01.1N-W0054 drive controller

- Mounting**
1. Using the 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.

HAS02.1-002 at HCS02.1E-W0054



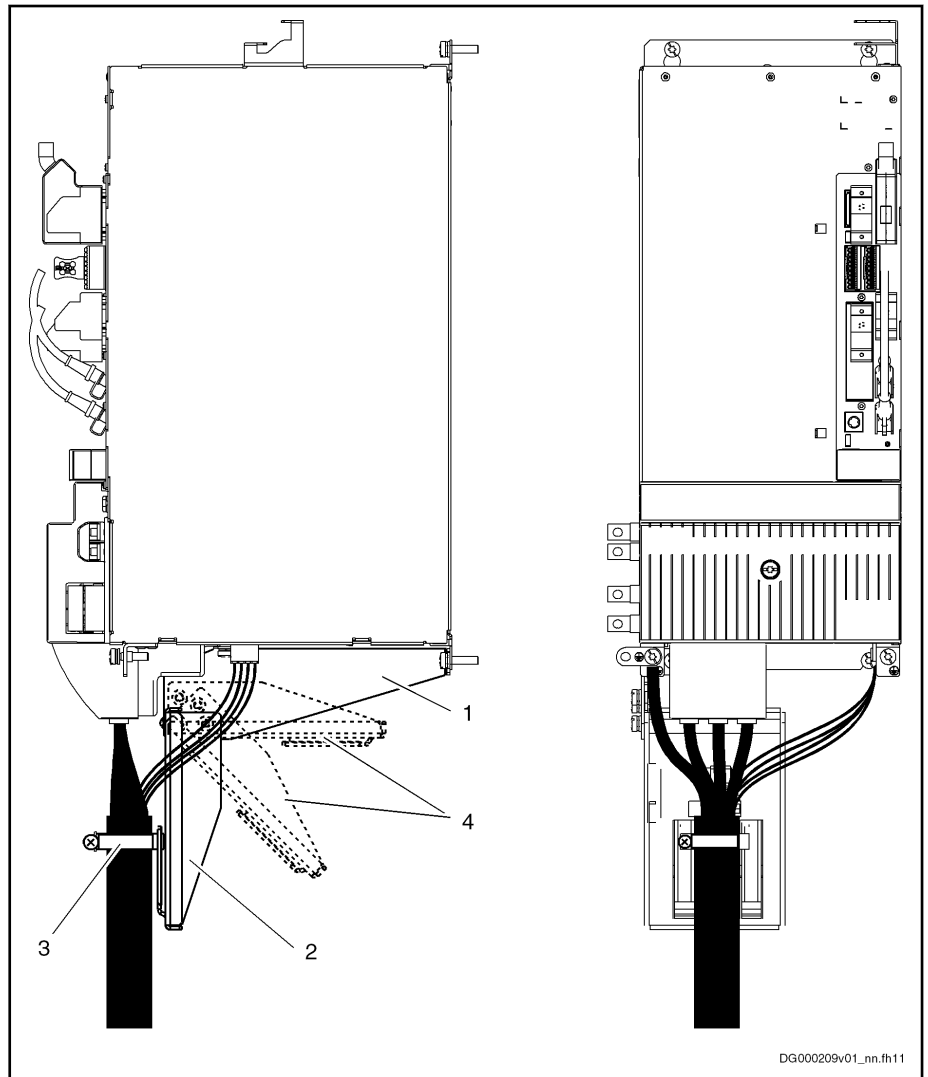
- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different mounting options for the shielding plate, according to motor cable routing

Fig. 11-57: HAS02.1-002 at bottom of HCS02.1E-W0054 drive controller

Mounting

1. Using the 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-W0210/300



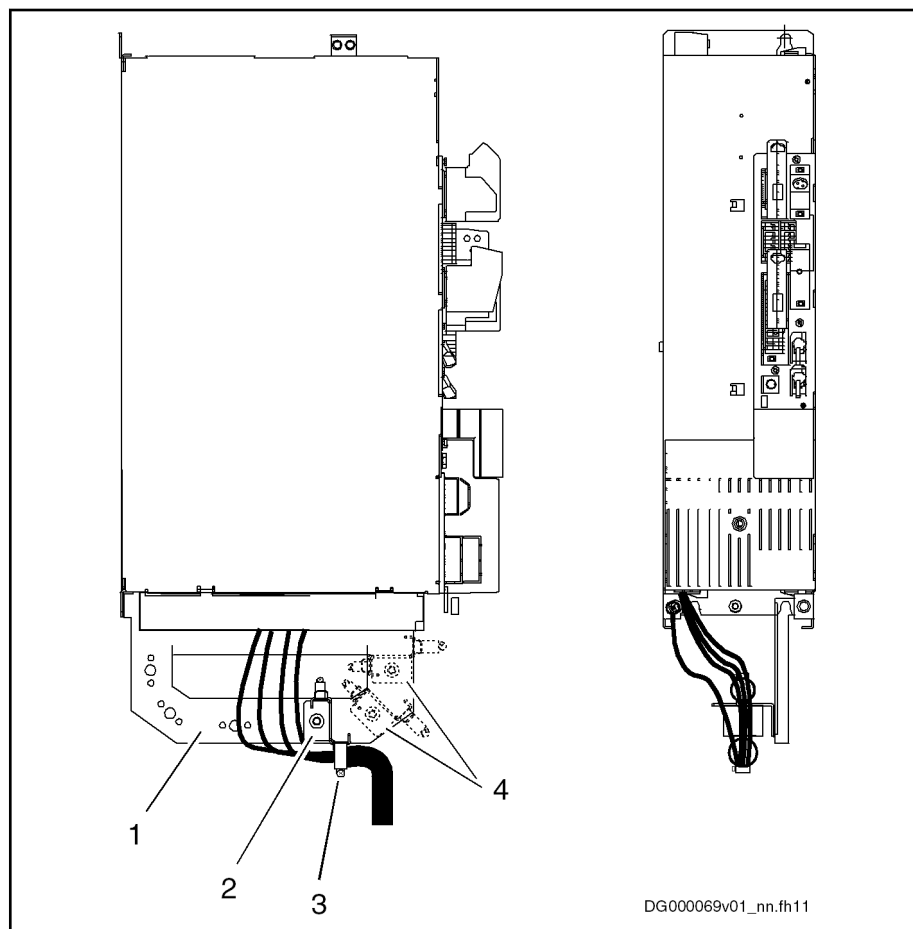
- | | |
|---|--|
| 1 | Fixing device |
| 2 | Shielding plate |
| 3 | Clip |
| 4 | Different mounting options for the shielding plate, according to motor cable routing |

Fig. 11-58: HAS02.1-003 at bottom of HMS01.1N-W0210 / 300 drive controller

Mounting

1. Using the 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.

HAS02.1-004 at HCS03.1E-W0070

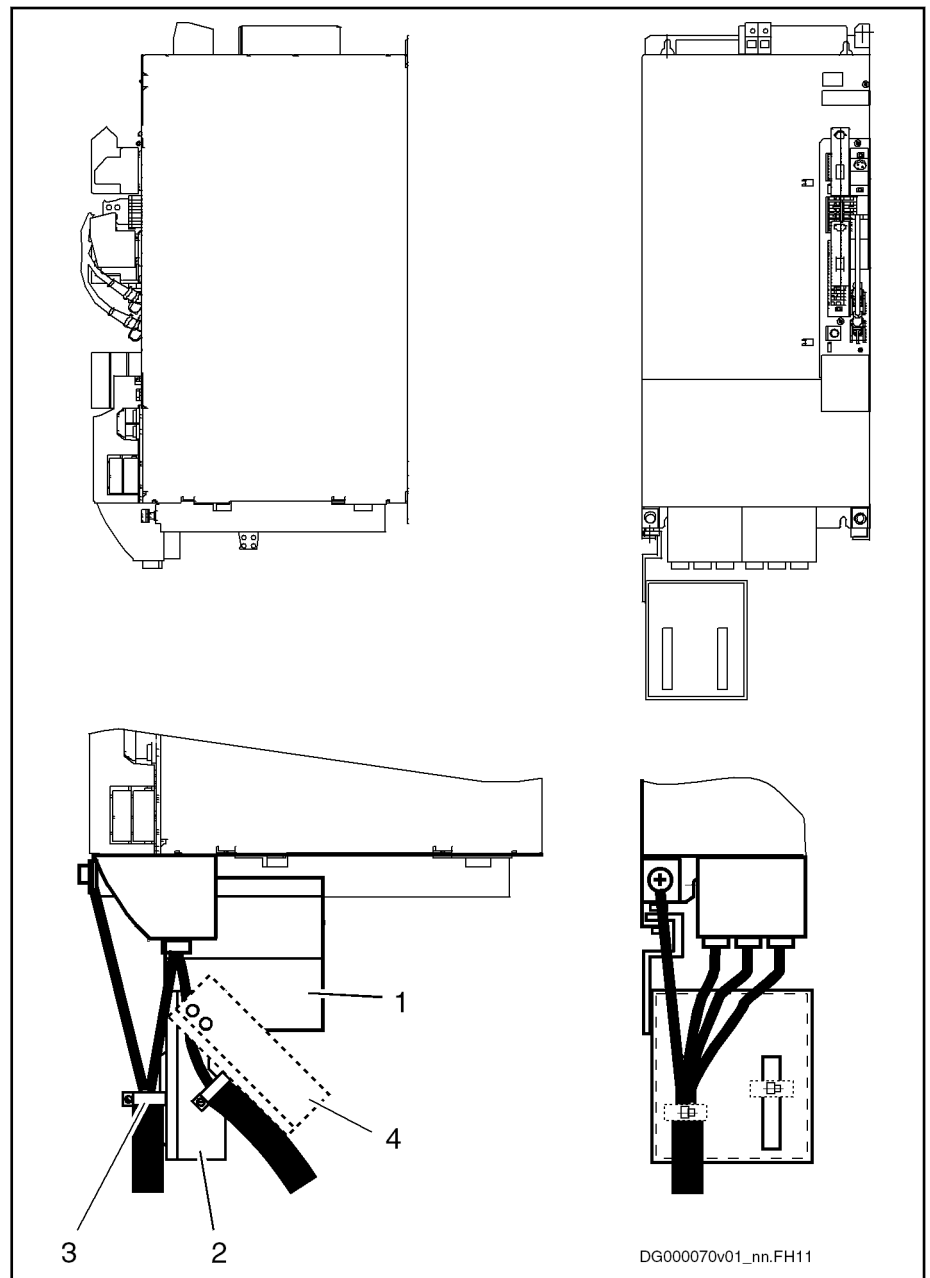


- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different mounting options for the shielding plate, according to motor cable routing

Fig. 11-59: HAS02.1-004 at bottom of HCS03.1E-W0070 drive controller

- Mounting**
1. Using the 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

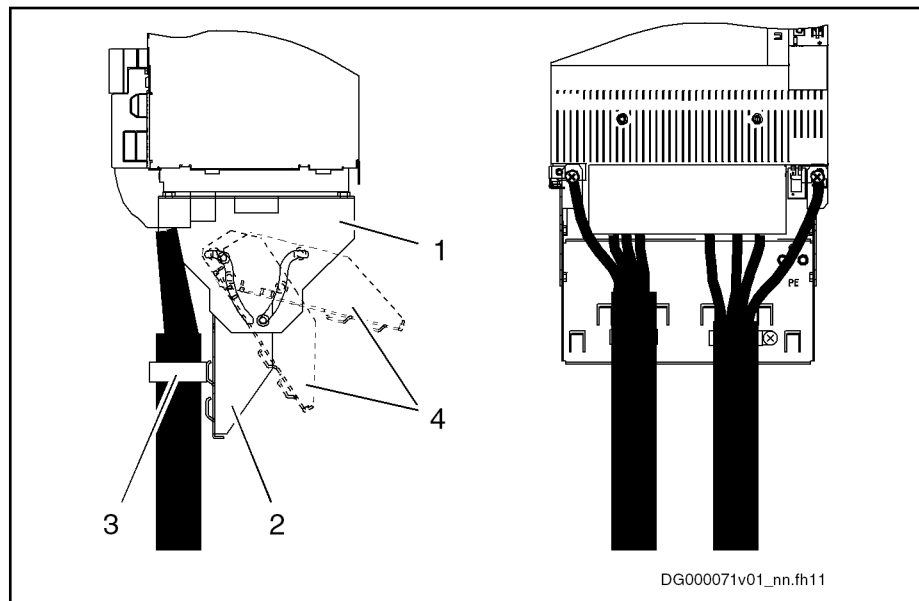


- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different mounting options for the shielding plate, according to motor cable routing

Fig. 11-60: HAS02.1-005 at bottom of HCS03.1E-W0100/0150 drive controller

- Mounting**
1. Using the 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.

HAS02.1-008 at HCS03.1E-W0210/280/350

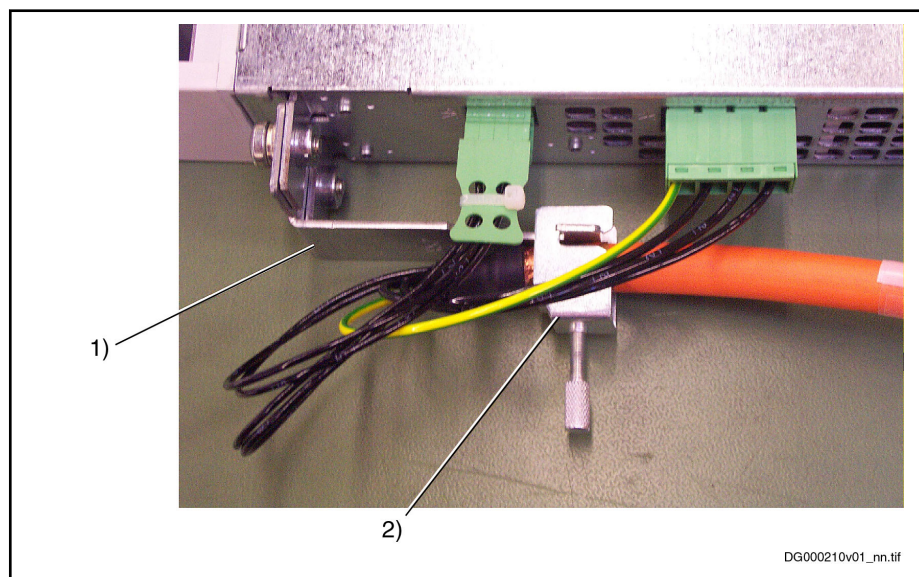


- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different mounting options for the shielding plate, according to motor cable routing

Fig. 11-61: HAS02.1-008 at bottom of HCS03.1E-W0210/280/350 drive controller

- Mounting**
1. Using the 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.

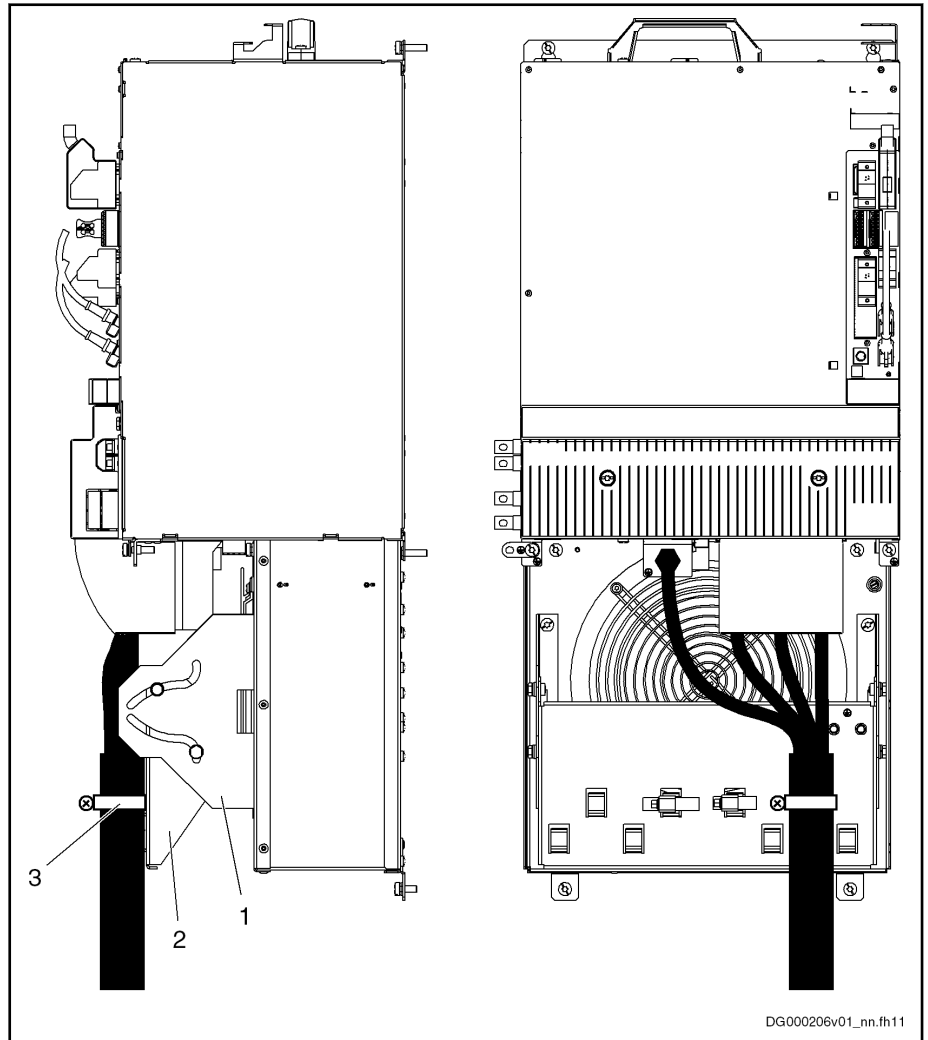
HAS02.1-010 at HMS02.1N-W0028/54



- 1 Fixing device
 - 2 Shielding plate
- Fig. 11-62: HAS02.1-010-NNN-NN at bottom of 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. 11-63: HAS02.1-014 at bottom of HMS01.1N-W0350 drive controller

1. Using the supplied screws, fasten fixing device to front of fan unit.
2. Fix shielding plate to fixing device.
3. Fix shield of cable to shielding plate with appropriate clip.

11.3.6 Connecting the motor cable shield via mains filter

General information

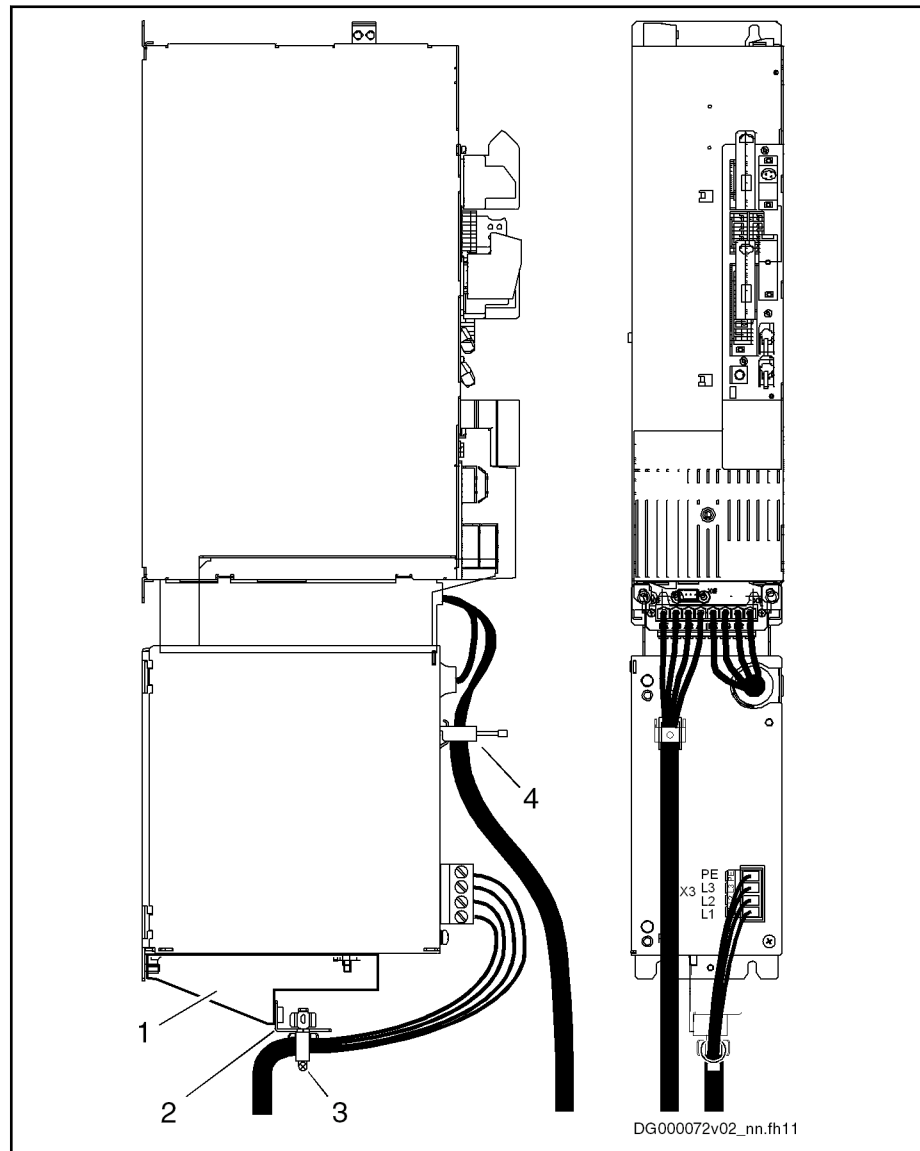
For shield connection of the motor cable at the drive controller via the mains filter, a special shielding plate is available:



Using the shielding plate guarantees optimum shield contact of the motor cable. Therefore, **where possible always** use the shielding plate.

The shielding plate is only available as an option.

HAS02.1-006 with mains filter



- 1 Fixing device
- 2 Shielding plate (power supply cable)
- 3 Clip
- 4 Shielding plate (motor cable)

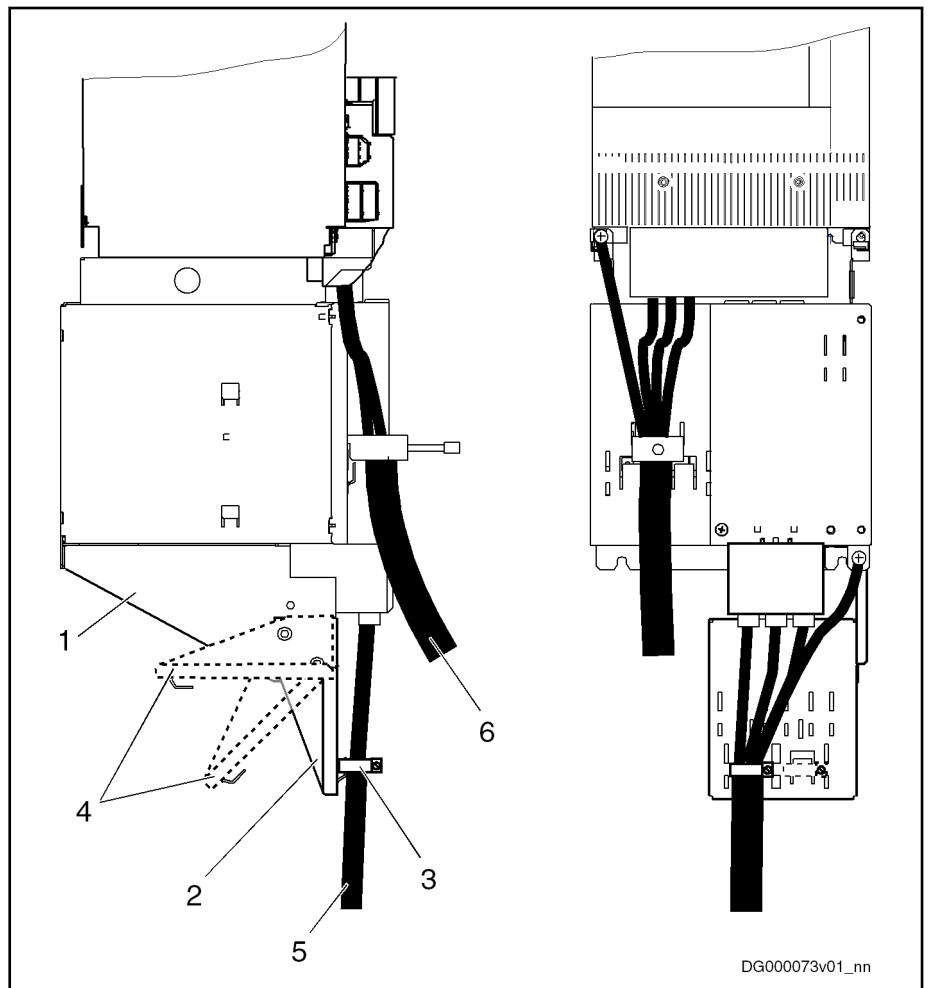
Fig. 11-64: HAS02.1-006 at bottom of mains filter (rated current 50 A)

1. Fit fixing device to threaded bolts at bottom of mains filter and fasten it using the supplied nuts.
2. Screw shielding plate to fixing device.
3. Fix shield of cable to shielding plate with appropriate clip.



The shield terminals cannot be used to provide strain relief.

HAS02.1-007 with mains filter



- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different mounting options for the shielding plate, according to motor cable routing
- 5 Power supply cable
- 6 Motor cable

Fig. 11-65: 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 it with supplied screws.

2. Screw shielding plate to fixing device.

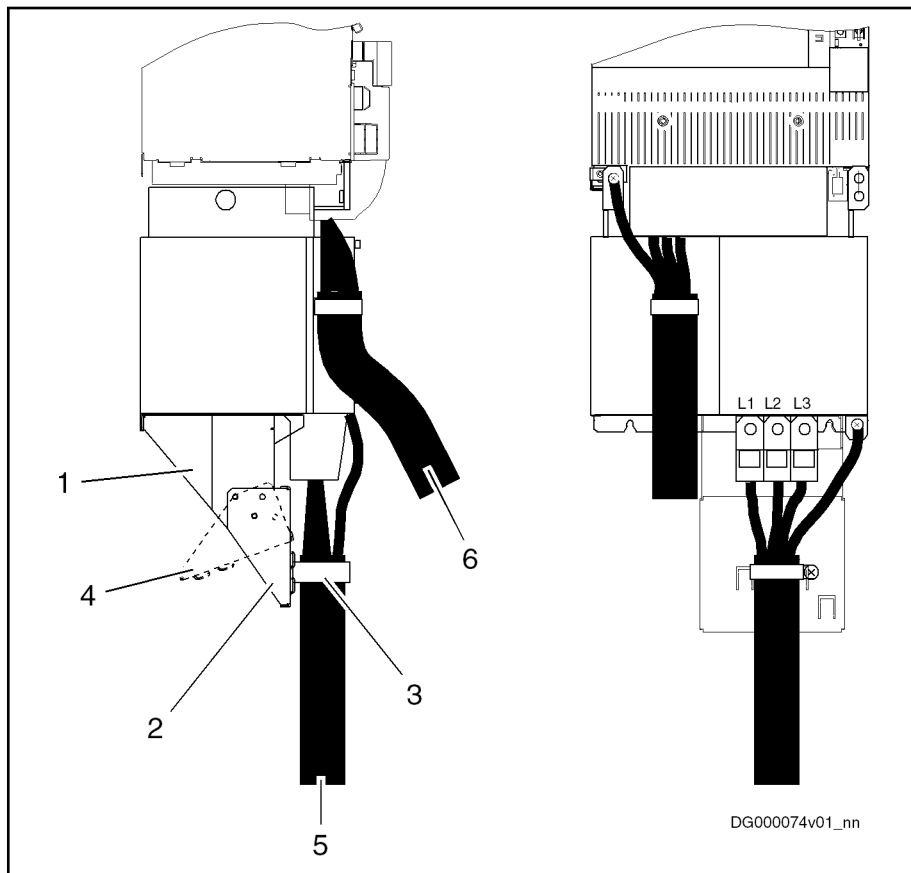
According to desired cable routing, the shielding plate can be mounted in different positions.

3. Fix shield of cable to shielding plate with clip.



The shield terminals cannot be used to provide strain relief.

HAS02.1-009 with power supply cable and mains filter



- 1 Fixing device
- 2 Shielding plate
- 3 Clip
- 4 Different mounting options for the shielding plate, according to motor cable routing
- 5 Power supply cable
- 6 Motor cable

Fig. 11-66: HAS02.1-009 shielding plate at bottom of mains filter (rated current 146 A)

- Mounting**
1. Using the 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 cannot be used to provide strain relief.

12 Environmental protection and disposal

12.1 Environmental protection

| | | |
|---|---|---|
| Production processes | The products are manufactured in 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. | |
| No release of hazardous substances | Our products do not contain any hazardous substances which may be released in case of appropriate use. Normally, our products will not have any negative influences on the environment. | |
| Significant components | Significant components of our products are: | |
| | Electronic devices <ul style="list-style-type: none"> • Steel • Aluminum • Copper • Plastics • Electronic components | Motors <ul style="list-style-type: none"> • Steel / Stainless steel • Aluminum • Copper • Brass • Magnetic materials • Elektronic components |

12.2 Disposal

| | |
|-----------------------------------|---|
| Return of products | <p>Our products can be returned to us for disposal free of charge. However, this requires that the products be free from oil, grease or other dirt.</p> <p>Furthermore, the products returned for disposal may not contain any undue foreign material or foreign components.</p> <p>Deliver the products "free domicile" to the following address:</p> <p style="text-align: center;">Bosch Rexroth AG
Electric Drives and Controls
Buergermeister-Dr.-Nebel-Straße 2
97816 Lohr am Main, Germany</p> |
| Packaging | <p>Packaging materials consist of cardboard, wood and polystyrene. They can be recycled anywhere without any problem.</p> <p>For ecological reasons, please refrain from returning the empty packages to us.</p> |
| Batteries and accumulators | <p>Batteries and accumulators can be labeled with this symbol.</p> <div style="text-align: center;">  </div> <p>The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.</p> <p>End users in the EU are legally bound to return used batteries and accumulators. Outside the validity of the EU Directive 2006/66/EC, the particularly applicable regulations must be followed.</p> <p>Batteries and accumulators can contain hazardous substances which can harm the environment or people's health when improperly stored or disposed of.</p> <p>After use, the batteries or accumulators contained in Rexroth products must be properly disposed of according to the country-specific collection systems.</p> |

Recycling Most of the products can be recycled due to their high content of metal. In order to recycle the metal in the best possible way, the products must be disassembled into individual assemblies.

Metals contained in electric and electronic assemblies can also be recycled by means of special separation processes.

Plastic parts of the products may contain flame retardants. These plastic parts are labeled according to EN ISO 1043. They have to be recycled separately or disposed of according to the applicable legal provisions.

13 Service and support

Our worldwide service network provides an optimized and efficient support. Our experts offer you advice and assistance should you have any queries. You can contact us **24/7**.

Service Germany Our technology-oriented Competence Center in Lohr, Germany, is responsible for all your service-related queries for electric drive and controls.

Contact the **Service Hotline** and **Service Helpdesk** under:

Phone: **+49 9352 40 5060**
Fax: **+49 9352 18 4941**
E-mail: service.svc@boschrexroth.de
Internet: <http://www.boschrexroth.com>

Additional information on service, repair (e.g. delivery addresses) and training can be found on our internet sites.

Service worldwide Outside Germany, please contact your local service office first. For hotline numbers, refer to the sales office addresses on the internet.

Preparing information To be able to help you more quickly and efficiently, please have the following information ready:

- Detailed description of malfunction and circumstances
- Type plate specifications of the affected products, in particular type codes and serial numbers
- Your contact data (phone and fax number as well as your e-mail address)

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Notes

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