The Drive & Control Company

Rexroth
Bosch Group

Rexroth IndraDrive

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

Project Planning Manual
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Edition 04

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1 Introduction

1.1 About this documentation

⚠ WARNING **Personal injury and property damage caused by improper project planning for applications, machines and installations!**

Observe the contents of the documentations relevant to your drive system (see chapter 1.2 Overview of documentations, page 10).

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 Rexroth IndraDrive systems
- considering the components

  Supply units
  - HMV01
  - HMV02

  Power sections
  - HMS01
  - HMS02
  - HMD01
  - HCS02
  - HCS03

Changes in comparison to previous edition

Chapter	Changes
Introduction	Updated overview of documentations
Power Sections for Converters	• Updated type code • New recorded – HCS03.1E-W0280 – HCS03.1E-W0350
Power Sections for Converters Power Sections for Inverters Supply units	Details about listing in accordance with CSA standard

Tab. 1-1: Changes

1.2 Overview of documentations

1.2.1 Drive systems, system components

Title Rexroth 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 KCU01, KSM01, KMS01	Project Planning Manual	KCU+KSM****-PRxx-EN-P	320924
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
Drive controllers 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 Accesso-ries	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 Product Range	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

1.2.2 Motors

Title Rexroth IndraDyn …	Type of documentation	Document typecode[1)] DOK-MOTOR*-…	Material number R911…
A Asynchronous Motors MAD / MAF	Project Planning Manual	MAD/MAF****-PRxx-EN-P	295781
H Synchronous Kit Spindle Motors	Project Planning Manual	MBS-H******-PRxx-EN-P	297895
L Synchronous Linear Motors	Project Planning Manual	MLF********-PRxx-EN-P	293635
L Ironless Linear Motors MCL	Project Planning Manual	MCL********-PRxx-EN-P	330592
S Synchronous Motors MKE	Project Planning Manual	MKE*GEN2***-PRxx-EN-P	297663

Title Rexroth IndraDyn …	Type of documentation	Document typecode[1)] DOK-MOTOR*-…	Material number R911…
S Synchronous Motors MSK	Project Planning Manual	MSK********-PRxx-EN-P	296289
S Synchronous Motors MSM	Data Sheet	MSM********-DAxx-EN-P	329338
S Synchronous Motors MS2N	Project Planning Manual	MS2N*******-PRxx-EN-P	347583
T Synchronous Torque Motors	Project Planning Manual	MBT********-PRxx-EN-P	298798

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. 1-4: Documentations – motors

1.2.3 Cables

Title	Type of documentation	Document typecode[1)] DOK-…	Material number R911…
Rexroth Connection Cables IndraDrive and IndraDyn	Selection Data	CONNEC-CABLE*INDRV-CAxx-EN-P	322949

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

1.2.4 Firmware

Title Rexroth IndraDrive …	Kind 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

Title Rexroth IndraDrive …	Kind of documentation	Document typecode[1)] DOK-INDRV*-…	Part number R911…
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 Rexroth IndraDrive ...	Type of documentation	Document typecode[1)] DOK-INDRV*-…	Material number R911…
MPx-20 Functions	Application Manual	MP*-20VRS**-APxx-EN-P	345608
MPx-20 Version Notes	Release Notes	MP*-20VRS**-RNxx-EN-P	345606
MPx-18 Functions	Application Manual	MP*-18VRS**-APxx-EN-P	338673
MPx-18 Version Notes	Release Notes	MP*-18VRS**-RNxx-EN-P	338658
MPx-17 Functions	Application Manual	MP*-17VRS**-APxx-EN-P	331236
MPx-17 Version Notes	Release Notes	MP*-17VRS**-RNxx-EN-P	331588
MPx-16 Functions	Application Manual	MP*-16VRS**-APxx-EN-P	326767
MPx-16 Version Notes	Release Notes	MP*-16VRS**-RNxx-EN-P	329272
MPx-16 to MPx-18 Parameters	Reference Book	GEN1-PARA**-RExx-EN-P	328651
MPx-16 to MPx-18 Diagnostic Messages	Reference Book	GEN1-DIAG**-RExx-EN-P	326738
Integrated Safety Technology as of MPx-1x	Application Manual	SI3-**VRS**-APxx-EN-P	332634
Integrated Safety Technology as of MPx-1x (Safe Motion)	Application Manual	SI3*SMO-VRS-APxx-EN-P	338920

Title Rexroth IndraDrive ...	Type of documentation	Document typecode[1)] DOK-INDRV*-...	Material number R911...
Rexroth IndraMotion MLD Libraries as of MPx-17	Reference Book	MLD-SYSLIB2-RExx-EN-P	332627
Rexroth IndraMotion MLD Libraries as of MPx-18	Reference Book	MLD-SYSLIB3-RExx-EN-P	338916
Rexroth IndraMotion MLD as of MPx-17	Application Manual	MLD2-**VRS*-APxx-EN-P	334351
Rexroth IndraMotion MLD as of MPx-18	Application Manual	MLD3-**VRS*-APRS-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

1.3 Your feedback

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

Inform us about mistakes you discovered in this documentation and changes you suggest; we would be grateful for your feedback.

Please send your remarks to:

Address for your feedback

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2 Important directions for use

2.1 Appropriate use

2.1.1 Introduction

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

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

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

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

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

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

2.1.2 Areas of use and application

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

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

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

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

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

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

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

Typical applications include, for example:

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

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

2.2 Inappropriate use

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

Drive controllers may not be used, if …

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

☞ Components of the Rexroth 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.

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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.

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 mm² (16 AWG)	10 mm² (8 AWG)	2 × 1.5 mm² (16 AWG)
2.5 mm² (14 AWG)		2 × 2.5 mm² (14 AWG)
4 mm² (12 AWG)		2 × 4 mm² (12 AWG)
6 mm² (10 AWG)		2 × 6 mm² (10 AWG)
10 mm² (8 AWG)		-
16 mm² (6 AWG)	16 mm² (6 AWG)	-
25 mm² (4 AWG)		-
35 mm² (2 AWG)		-
50 mm² (1/0 AWG)	25 mm² (4 AWG)	-
70 mm² (2/0 AWG)	35 mm² (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 equip-

ment 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.

<table>
<tr><th>DX000011v01_nn.FH11</th><th>Drive controllers,
Supply units</th><th>Motors</th></tr>
<tr><td>CE conformity regarding Low-Voltage Directive</td><td>EN 61800-5-1:2007</td><td>EN 60034-1:2010+Cor.:2010
EN 60034-5:2001+A1:2007</td></tr>
<tr><td>CE conformity regarding EMC product standard</td><td colspan="2">EN 61800-3:2004 + A1:2012</td></tr>
</table>

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:

www.ul.com/database

Under "UL File Number" enter the file number or under "Company Name" enter the company name "Bosch Rexroth AG".

<table>
<tr><td rowspan="3">Listed
POW. CONV. EQ.
97Y4
DX000009v01_nn.tif</td><td>• UL standard: UL 508C
• CSA standard: C22.2 No. 274-13</td></tr>
<tr><td>Company Name
BOSCH REXROTH ELECTRIC DRIVES & CONTROLS GMBH
Category Name:
Power Conversion Equipment</td></tr>
<tr><td>File numbers
Rexroth 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.</td></tr>
</table>

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 indicated **SCCR short-circuit rating** is not exceeded, e.g., by using 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:

www.ul.com/database

Under "UL File Number" enter the file number or under "Company Name" enter the company name "Bosch Rexroth AG".

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 for transport

Description	Symbol	Unit	Value
Temperature range	T_{a_tran}	°C	-20 … +70
Relative humidity		%	5 … 95
Absolute humidity		g/m³	1 … 60
Climatic category (IEC 721)			2K3
Moisture condensation			Not allowed
Icing			Not allowed

Tab. 4-4: Ambient and operating conditions for 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 for 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 (IEC 721)			1K3
Moisture condensation			Not allowed
Icing			Not allowed

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

4.3 Installation conditions

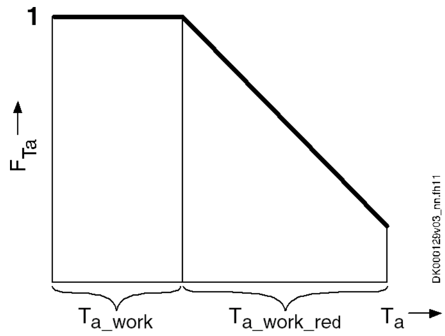
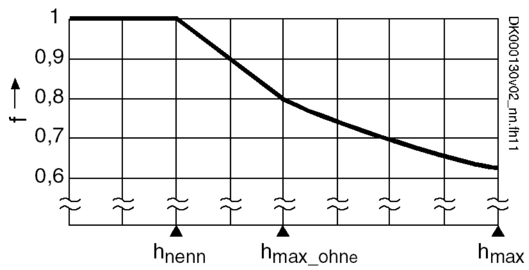
4.3.1 Ambient and operating conditions

☞ 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.

The power dissipation is indicated in the technical data of the individual components as an important input value for calculating the heat levels.

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

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.

<table>
<tr><th>Description</th><th>Symbol</th><th>Unit</th><th>Value</th></tr>
<tr><td>Temperature during storage</td><td></td><td></td><td>see chapter 4.2.2 "Storing the components" on page 30</td></tr>
<tr><td>Temperature during transport</td><td></td><td></td><td>see chapter 4.2.1 "Transporting the components" on page 29</td></tr>
<tr><td>Allowed mounting position
Definition of mounting positions: See chapter "Mounting positions of components" on page 32</td><td></td><td></td><td>G1 [3)]</td></tr>
<tr><td>Installation altitude</td><td>h_{nenn}</td><td>m</td><td>1000</td></tr>
<tr><td>Ambient temperature range</td><td>T_{a_work}</td><td>°C</td><td>0 … 40</td></tr>
<tr><td rowspan="3">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 $T_a = 50$ °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!</td><td colspan="3">
</td></tr>
<tr><td>$T_{a\_work\_red}$</td><td>°C</td><td>40 … 55</td></tr>
<tr><td>f_{Ta}</td><td>%/K</td><td>2.0
Exception HMV02.1R-W0015-A-07-NNNN:
2.7</td></tr>
<tr><td rowspan="3">Derating vs. installation altitude:
At an installation altitude $h > h_{nenn}$, the performance data reduced by factor f[2)] are available.
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!</td><td colspan="3">
</td></tr>
<tr><td>h_{max_ohne}</td><td>m</td><td>2000</td></tr>
<tr><td>h_{max}</td><td>m</td><td>4000</td></tr>
<tr><td>Simultaneous derating for ambient temperature and installation altitude</td><td colspan="3">Allowed;
reduce performance data with the product $f \times F_{Ta}$</td></tr>
<tr><td>Relative humidity</td><td></td><td>%</td><td>5 … 95</td></tr>
<tr><td>Absolute humidity</td><td></td><td>g/m^3</td><td>1 … 29</td></tr>
<tr><td>Climatic category (IEC 60721-3-3)</td><td></td><td></td><td>3K3</td></tr>
<tr><td>Allowed pollution degree (EN 50178)</td><td></td><td></td><td>2</td></tr>
<tr><td>Resistance to chemically active substances (IEC 60721-3-3)</td><td></td><td></td><td>Class 3C1</td></tr>
</table>

General data and specifications

Description	Symbol	Unit	Value
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) According to EN 60068-2-6

2) 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 component.

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

4.3.2 Mounting position

Mounting positions of components

NOTICE **Risk of damage to the components by incorrect mounting position!**

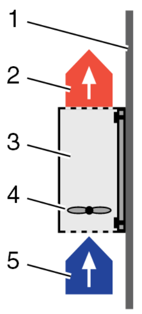
Only operate the components in their allowed mounting positions. The allowed mounting positions are specified in the technical data of the components.

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	

Mounting position	Description
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 Rexroth 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)

PELV[1] for 24V power supply unit

For the 24V supply of the devices of the Rexroth IndraDrive range, use a power supply unit or a control-power transformer with protection by PELV 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 Rexroth 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!

1) *Protective Extra Low Voltage*

General data and specifications

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.
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 ±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 means of the appropriate electrical equipment of the machine or installation.

This includes:

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

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

Tab. 5-1: Types

5.2 HCS02 Power sections

5.2.1 Brief description, use and design

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

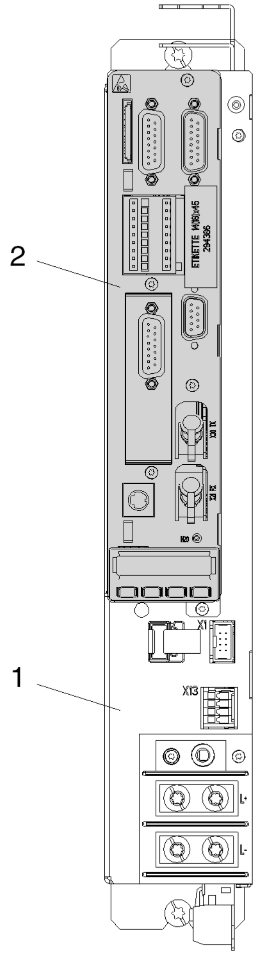
Use The different types are used as follows:

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: Usage of HCS02

Power sections for converters - IndraDrive C

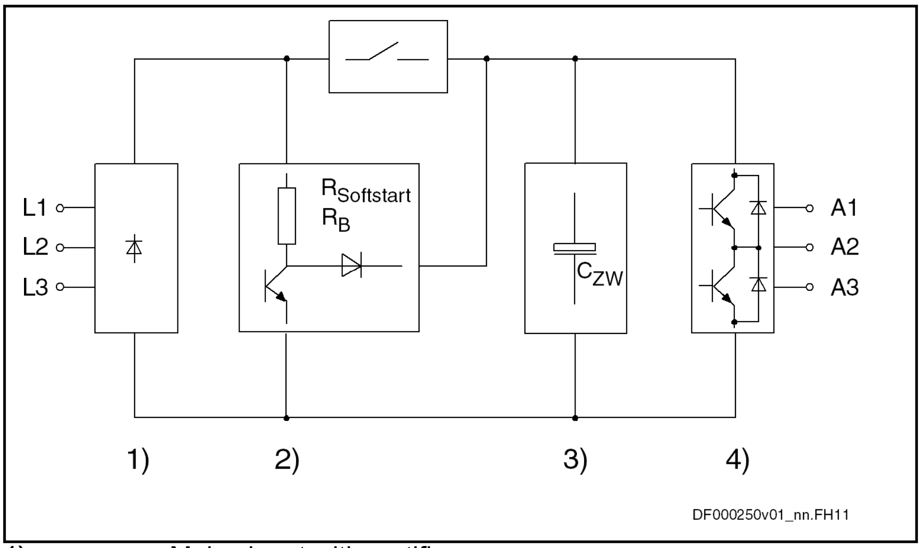
Structure, block diagrams



1	Power section
2	Control section

Fig. 5-1: Basic Structure of the Drive Controller

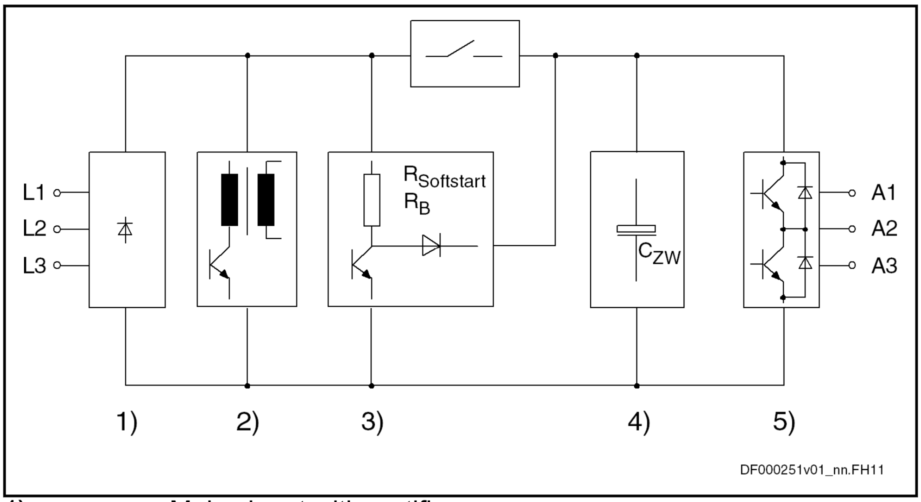
HCS02.1E-W0012-NNNN; -LNNN



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

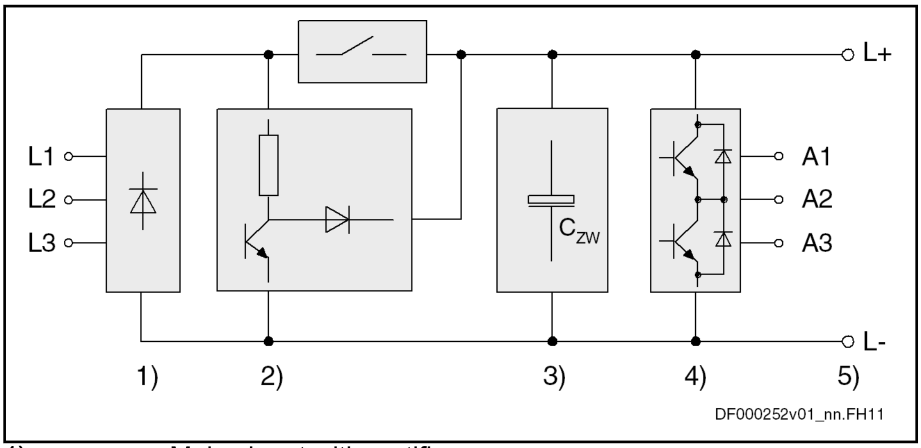


1)	Mains input with rectifier
2)	Optional integrated control voltage supply
3)	Braking resistor circuit; charging current limitation
4)	DC bus capacitances
5)	Inverter stage with output to motor

Fig. 5-3: HCS02.1E-W0012-NNNV - Block Diagram

Power sections for converters - IndraDrive C

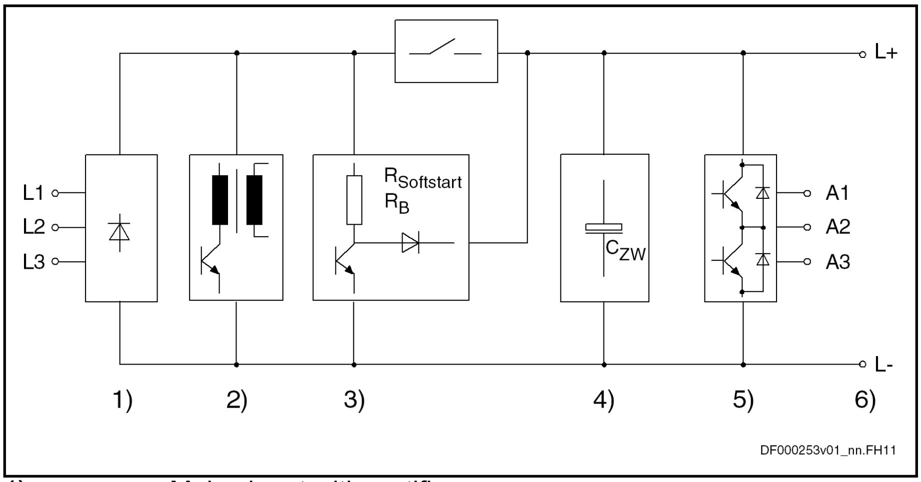
HCS02.1E-W0028-NNNN; -LNNN



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

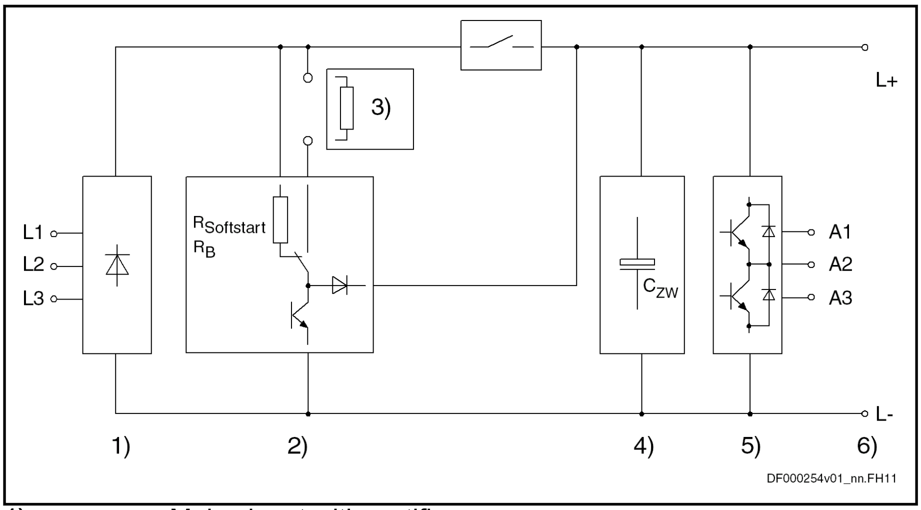
HCS02.1E-W0028-NNNV



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

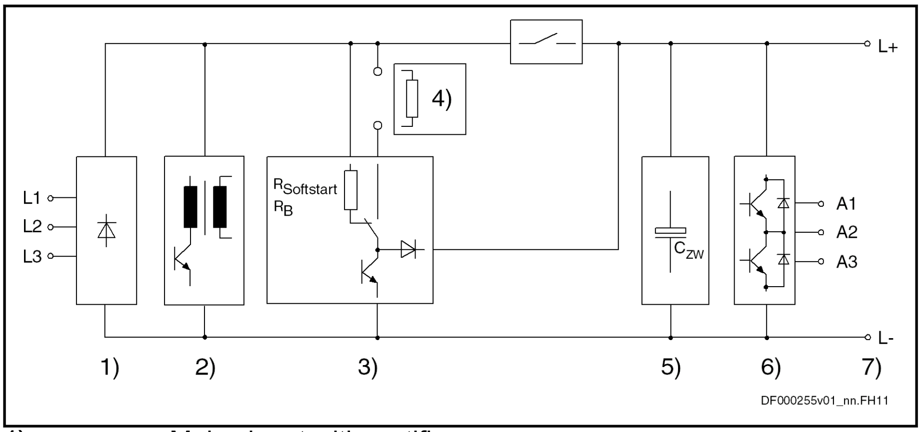
HCS02.1E-W0054/70-NNNN; -LNNN



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

Power sections for converters - IndraDrive C

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	C	S	0	2	.	1	E	-	W	0	0	1	2	-	A	-	0	3	-	N	N	N	N																

1. Product
1.1 HCS. . . . . = HCS

2. Line
2.1 1.5 to 11 kW. . . . . = 02

3. Design
3.1 1 . . . . = 1

4. Power supply
4.1 Infeeding. . . . .= E

5. Cooling mode
5.1 Air, internal (through integrated blower) = W

6. Maximum current
6.1 12 A . . . . = 0012
6.2 28 A . . . . = 0028
6.3 54 A . . . . = 0054
6.4 70 A . . . . = 0070

7. Degree of protection
7.1 IP 20. . . . . = A

8. Mains connection voltage
8.1 AC 200 to 500V ±10%. . . . . = 03

9. Other design
9.1 None. . . . .= NNNN
9.2 Temperature-dependent blower control . . . . = LNNN
9.3 DC 24 V power supply from DC bus and from external = NNNV

10. Standard reference

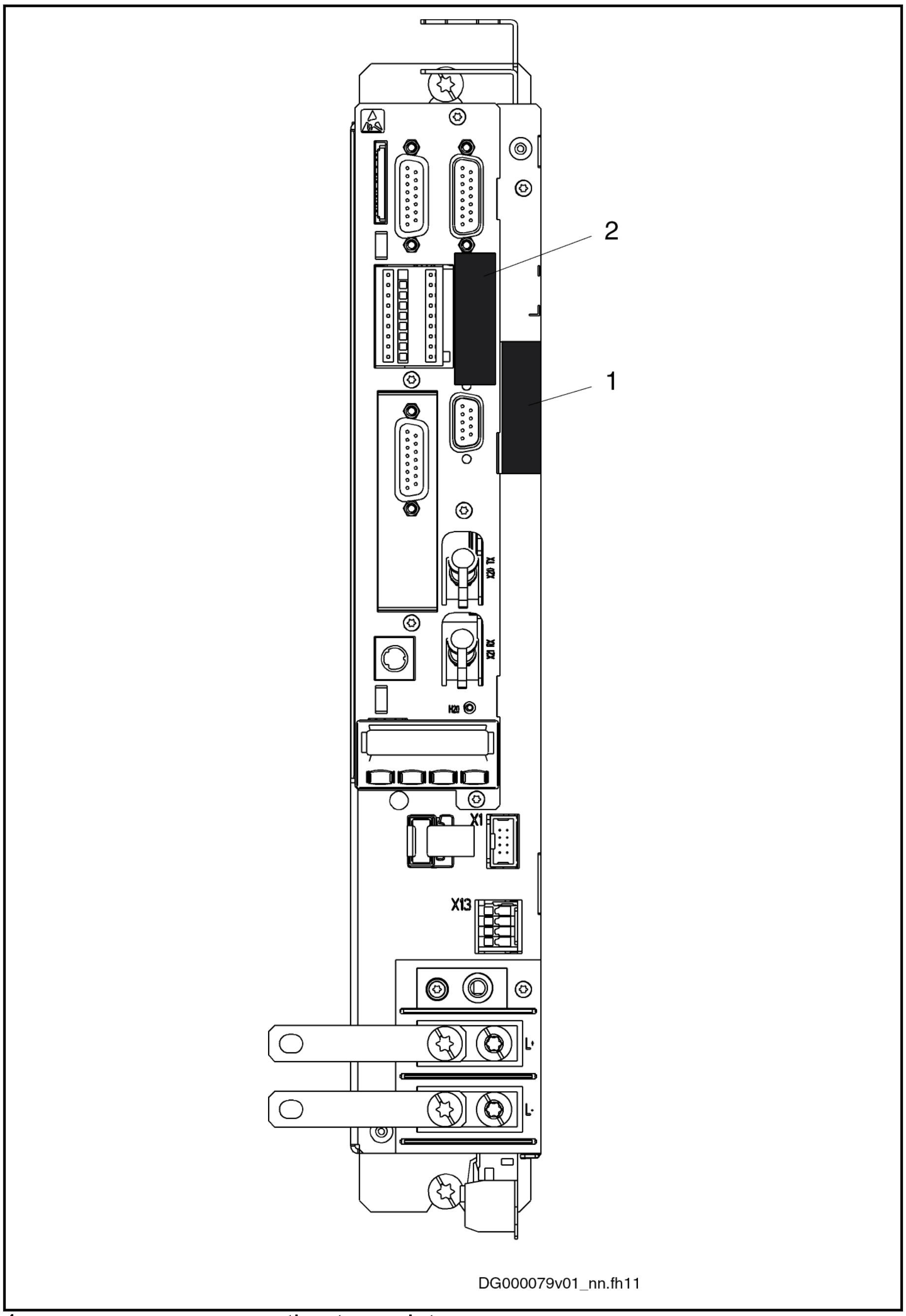
Standard	Title	Edition
DIN EN 60529	Degrees of protection provided by enclosures (IP-Code)	2000-09

DT000034v01_en.fh11

Fig. 5-8: Type Code HCS02

Identification

Type plate arrangement

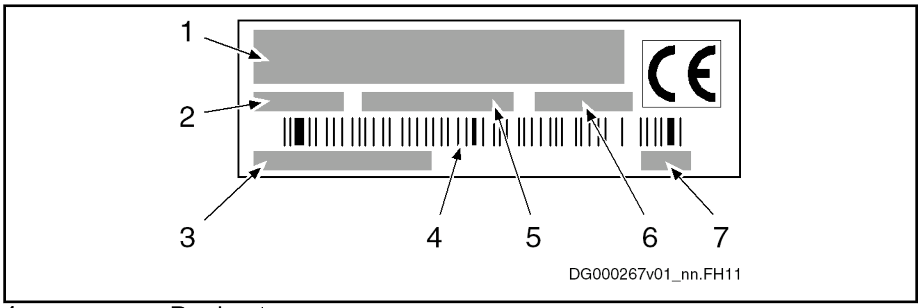


1	power section type plate
2	control section type plate

Fig. 5-9: Type plate arrangement

Power sections for converters - IndraDrive C

Type plate (power sections, supply units)



1 Device type
2 Part number
3 Serial number
4 Bar code
5 Country of manufacture
6 Production week; e.g. 08W23 meaning year 2008, week 23
7 Hardware index

Fig. 5-10: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL Data

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
Last modification: 2017-01-23						

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

Tab. 5-3: 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			
Last modification: 2017-01-23						

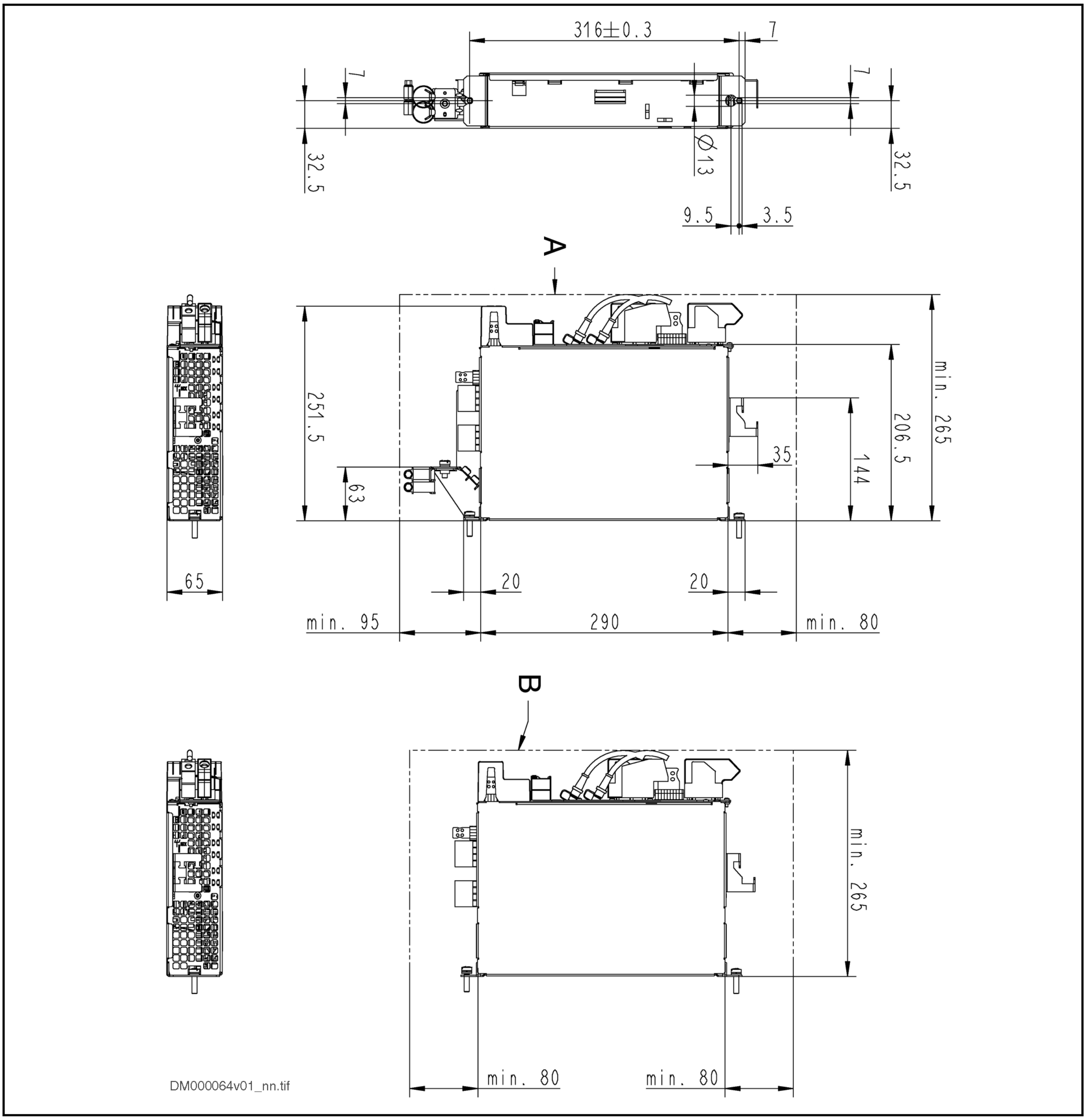
Tab. 5-4: HCS - Applied Standards

Power sections for converters - IndraDrive C

Mechanics and mounting

Dimensional drawings

Dimensional drawing HCS02.1E-W0012

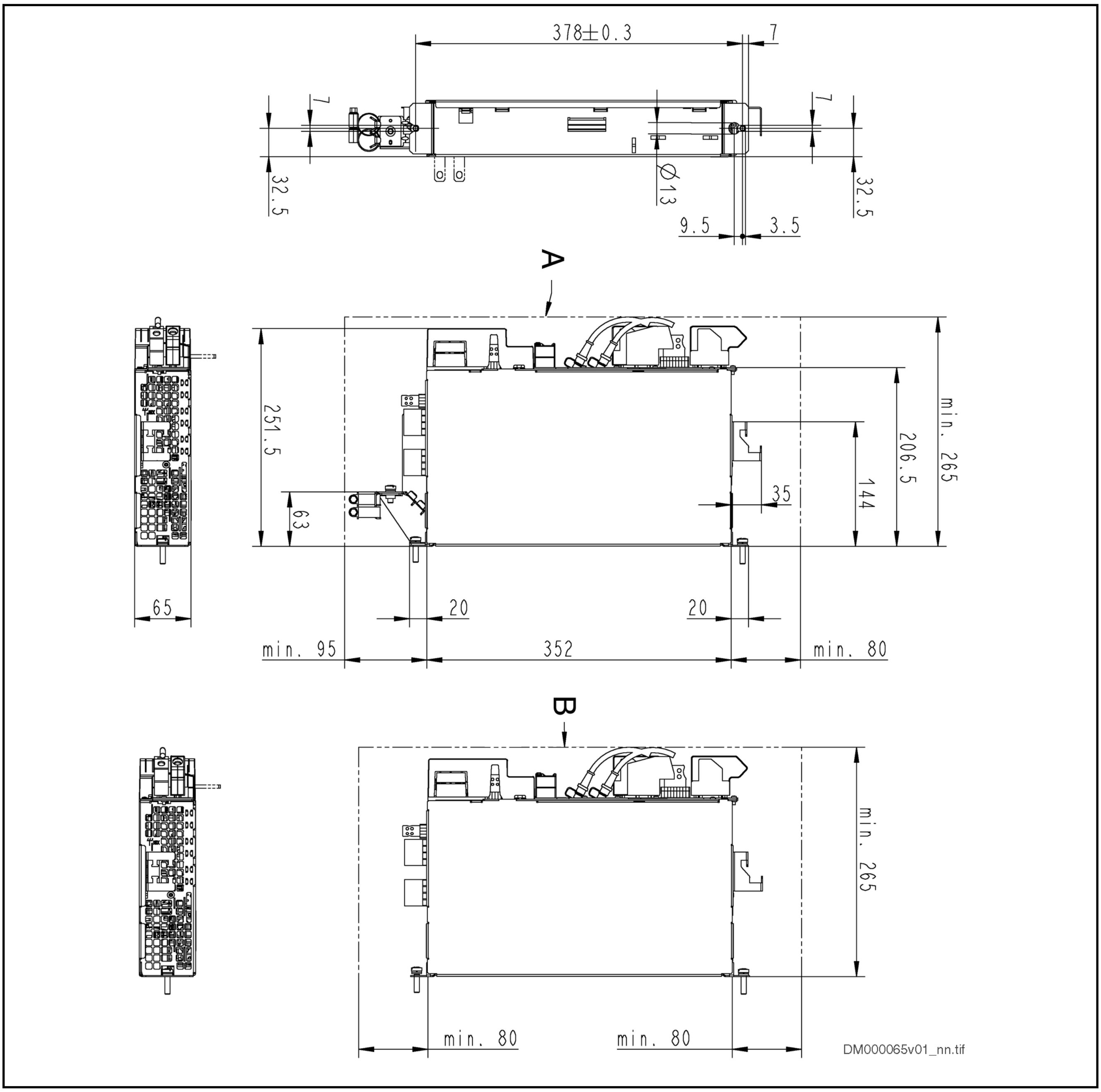


A Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable

B minimum mounting clearance; plus additional space for cable

Fig. 5-11: Dimensional drawing HCS02.1E-W0012

Dimensional drawing HCS02.1E-W0028

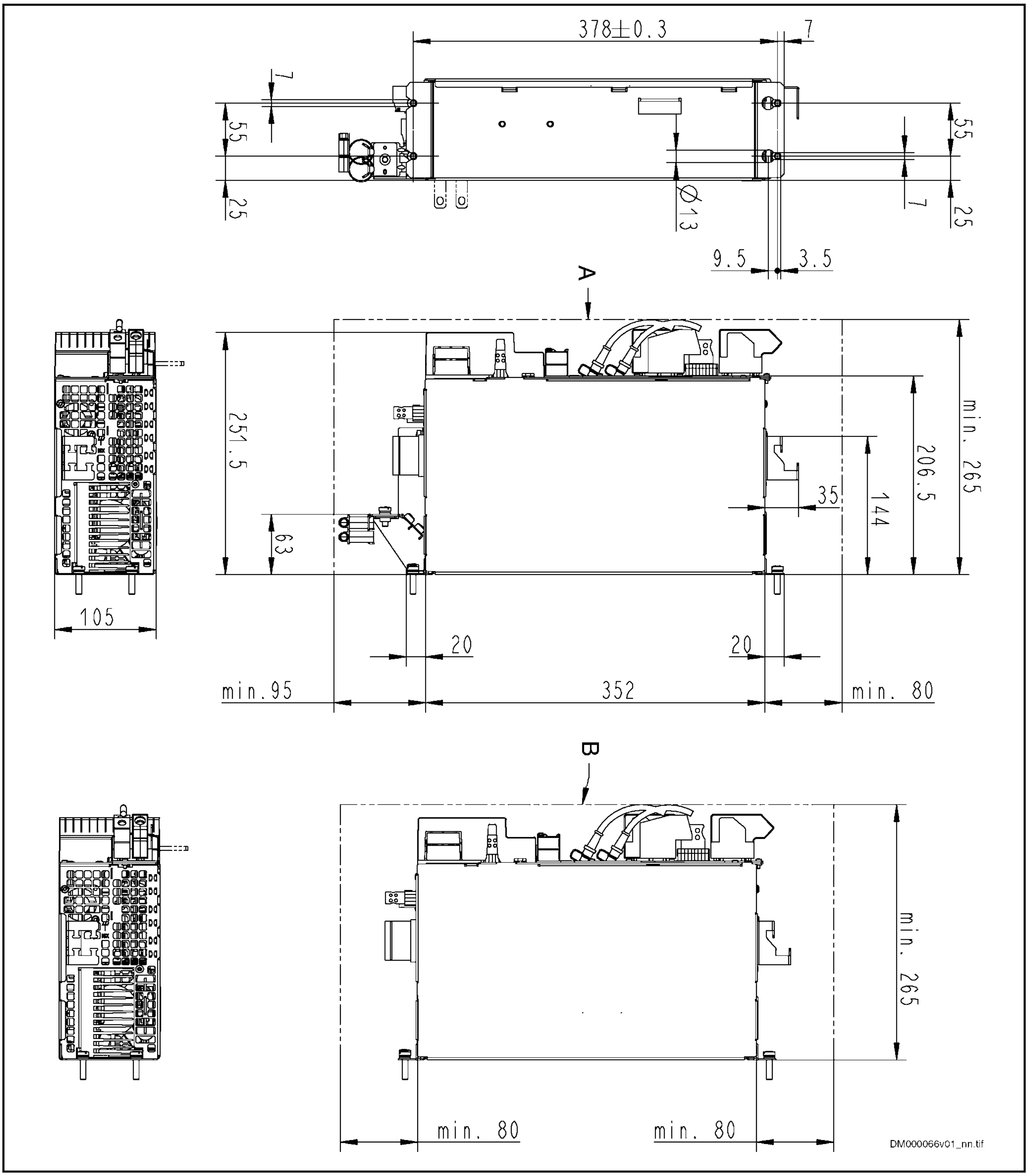


A	Minimum mounting clearance (when using accessory HAS02.1); plus additional space for cable
B	minimum mounting clearance; plus additional space for cable

Fig. 5-12: Dimensional drawing HCS02.1E-W0028

Power sections for converters - IndraDrive C

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. 5-13: Dimensional drawing HCS02.1E-W0054 and HCS02.1E-W0070

Dimensions, mass, insulation, sound pressure level

Data for mass, sound pressure level, insulation

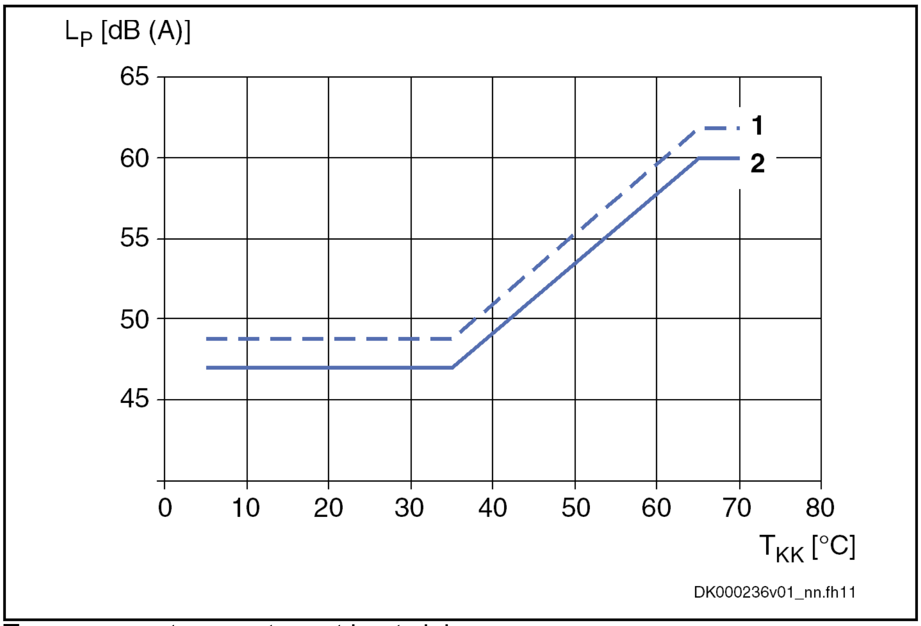
Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Mass	m	kg	2.90	3.80	6.70	6.80
Device height[1)]	H	mm	290	352		
Device depth[2)]	T	mm	206			
Device width[3)]	B	mm	65		105	
Insulation resistance at 500 V DC	R_{is}	MOhm	1.00	8.00		
Capacitance against 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	
Last modification: 2010-08-04						

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

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

Temperature-dependent fan control

In devices of the order code "-L***", 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. 5-14: Characteristic of Sound Pressure Level for HCS02 with Order Code "-L***"*

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			
	f_{Ta}	%/K	2.0			
Allowed mounting position			G1			
Cooling type			Forced ventilation			
Volumetric capacity of forced cooling	V	m^3/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
Last modification: 2014-09-23						

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"

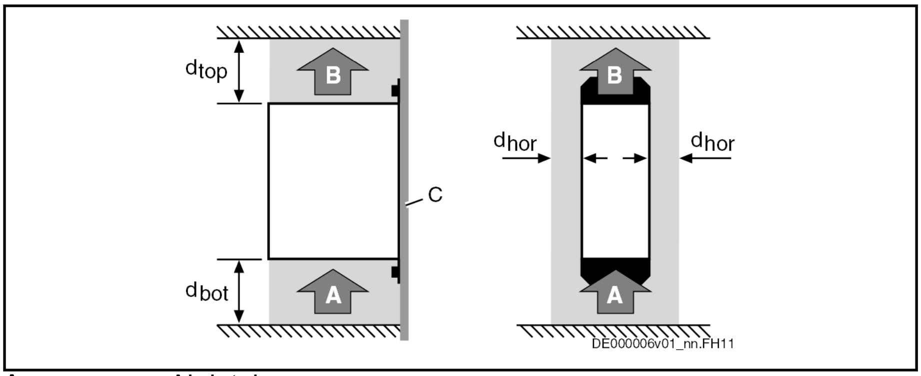
Tab. 5-6: HCS - Data for cooling and power dissipation

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



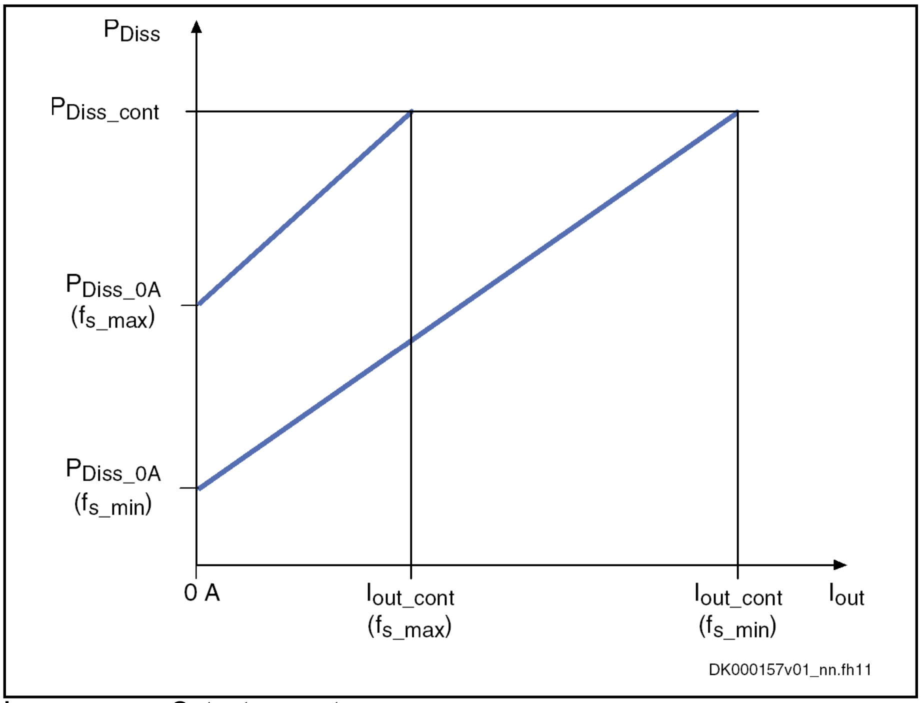
A	Air intake
B	Air outlet
C	Mounting surface in control cabinet
d_{top}	Distance top
d_{bot}	Distance bottom
d_{hor}	Distance horizontal

Fig. 5-15: 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. 5-16: 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 power section HCS02

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_{IN3_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	
Last modification: 2010-08-04						

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

Tab. 5-7: 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			
Mains frequency tolerance		Hz	± 2			
Maximum allowed mains frequency change	$\Delta f_{LN}/\Delta t$	Hz/s	-			
Rotary field condition			None			
Short circuit current rating	SCCR	A rms	42000			
Last modification: 2013-11-26						

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_nenn}	V	3 AC 400			
Single-phase mains voltage	U_{LN}	V	200...250			
Three-phase mains voltage at TN-S, TN-C, TT mains	U_{LN}	V	200...500			
Three-phase mains voltage at IT mains[1)]	U_{LN}	V	200...230			
Three-phase mains voltage 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			

Last modification: 2013-11-26

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 connection power 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 connection power 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)	$TPF_{10\%}$		-			
Last modification: 2013-11-26						

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
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)	$\cos\varphi^{h1}$		0.97			
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			
Last modification: 2013-11-26						

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. 5-8: 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	ULN x 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
P_{DC_cont} and P_{DC_max} vs. mains input voltage; $U_{LN} \leq U_{LN\_nenn}$		%/V	PDC_cont (ULN) = PDC_cont x [1 - (400-ULN) x 0,0025]			
Last modification: 2010-08-04						

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 + (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 at maximum allowed C_{DCext} external DC bus capacitance at U_{LN_nenn}	$t_{lade\_DC\_Cext}$	s	2.00			
Last modification: 2010-08-04						

1) Use assigned mains choke

Tab. 5-9: HCS - Power section data - DC bus

Single-phase mains connection

Single-phase mains connection

Single-phase mains connection is carried out 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
Single-phase mains voltage	U_{LN}	V	200...250			
continuous power (t > 10 min)	$P_{DC\_cont\_1ph}$	W	50...70	100...160	150...250	260...400

Tab. 5-10: 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 resistor	$R_{DC\_Bleeder}$	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 on-time duty	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			
Last modification: 2010-08-04						

1) 2) Factory setting

Tab. 5-11: HCS - Integrated braking resistor data

External braking resistor

Requirements 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 braking resistor type HLR01[2)]			-		HLR01.1N-01K8-N40R0; HLR01.1N-03K8-N40R0	HLR01.1N-02K4-N28R0; HLR01.1N-05K5-N28R0
Last modification: 2010-08-04						

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

2) See also Project Planning Manual "Additional Components"

Tab. 5-12: HCS - Requirements 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 for V/Hz (U/f) control	U_{out_eff}	V	~ UDC x 0.71			
Output voltage, fundamental wave for 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			
Output frequency threshold for detecting 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
Last modification: 2010-08-04						

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
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	
Last modification: 2010-08-04						

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 fs

Tab. 5-13: 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 → On 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
Last modification: 2010-08-04						

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	$I_{out\_base1\_16}$	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)	$I_{out\_peak3\_12}$	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	$I_{out\_base3\_12}$	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)	$I_{out\_peak3\_16}$	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	$I_{out\_base3\_16}$	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
Last modification: 2010-08-04						

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
Last modification: 2010-08-04						

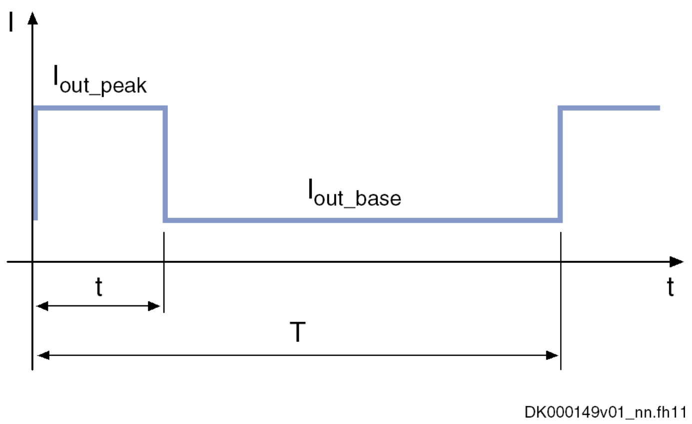
Power sections for converters - IndraDrive C

Description	Symbol	Unit	HCS02.1E-W0012-_-03	HCS02.1E-W0028-_-03	HCS02.1E-W0054-_-03	HCS02.1E-W0070-_-03
Base load current at $I_{out\_peak\_5}$; f_s = 12 kHz; t = 60 s; T = 10 min; K = 1.1	$I_{out\_base5\_12}$	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]	$I_{out\_peak5\_16}$	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	$I_{out\_base5\_16}$	A	2.63	4.15	10.33	9.88
Last modification: 2010-08-04						

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

Tab. 5-14: HCS - Examples of allowed current profiles

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

Profile	Explanation
current profile "UEL_I_e" 	The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.

Tab. 5-15: 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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 bei U_{LN_nenn}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; t = 60 s; T = 5 min; K = 1.5; with mains choke 10)	$P_{DC\_peak\_4}$	kW	-		12.20	16.87
Last modification: 2010-08-04						

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
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
Last modification: 2010-08-04						

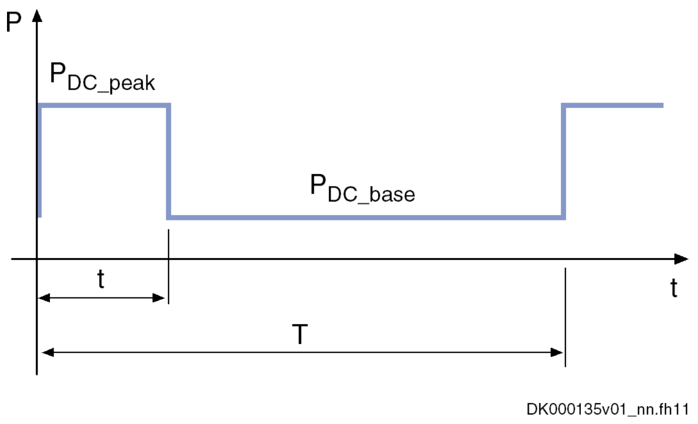
1) 2) 3) 4) 5) 6) 7) 8) 9) 10) 11) 12) 13) 14) 15) 16) See UEL_P_e profile definition

Tab. 5-16: 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.

Profile	Explanation
Performance profile "UEL_P_e" 	Characteristic of the selection of standard motors and servo drives.

Tab. 5-17: 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 $U_{LN} \geq$ 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.

Power sections for converters - IndraDrive C

Operating standard motors at 3 AC 400 V

Selection of 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
Last modification: 2010-08-04						

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

Tab. 5-18: HCS - Selection of standard motors 3 AC 400V - Exemplary profiles

Operating standard motors at 3 AC 460 V

Selection of 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
Last modification: 2010-08-04						

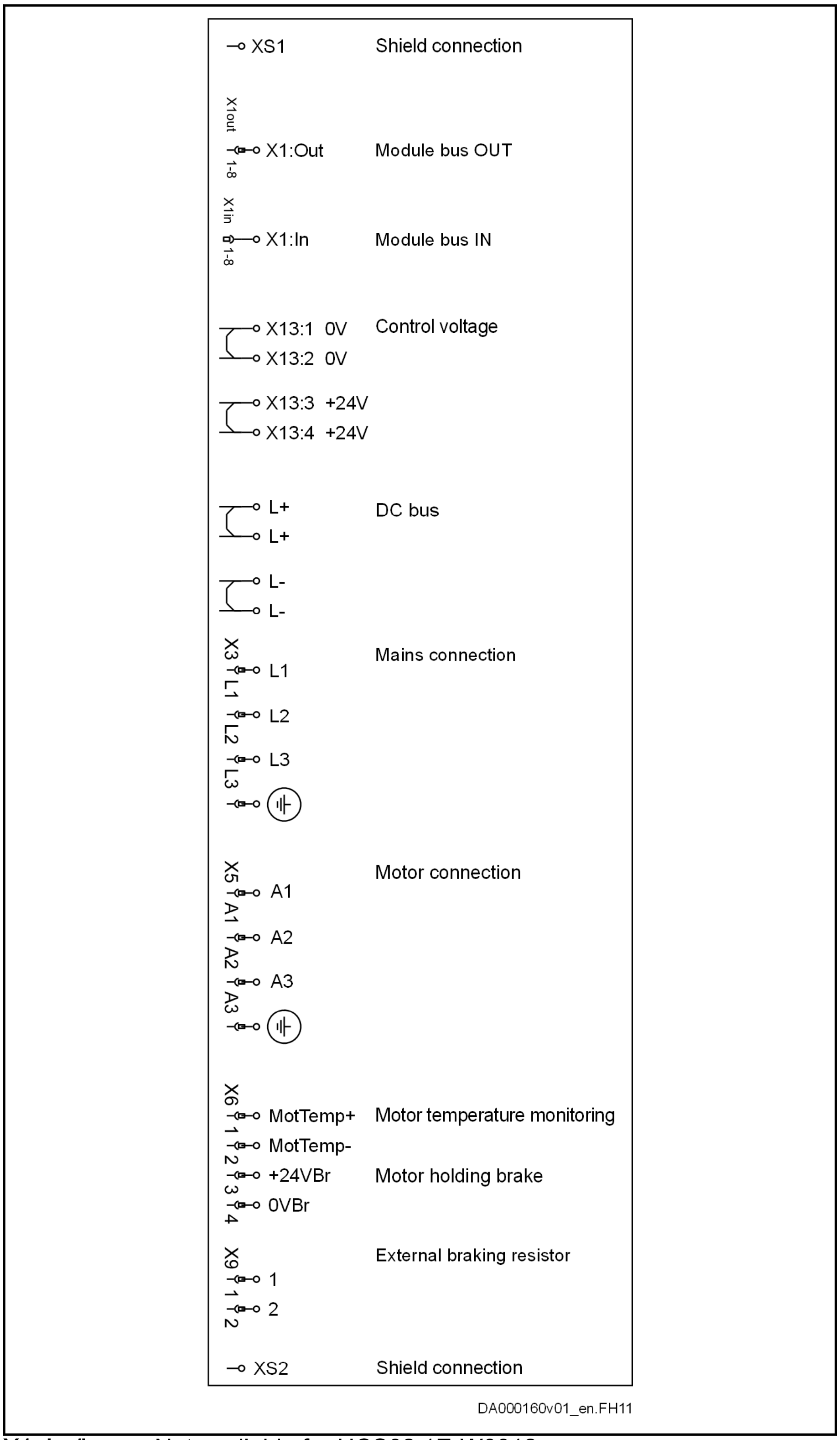
1) 2) 3) 4) See definition profile UEL_P_e; 1 kW ~ 1.36 hp

Tab. 5-19: HCS - Selection of 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

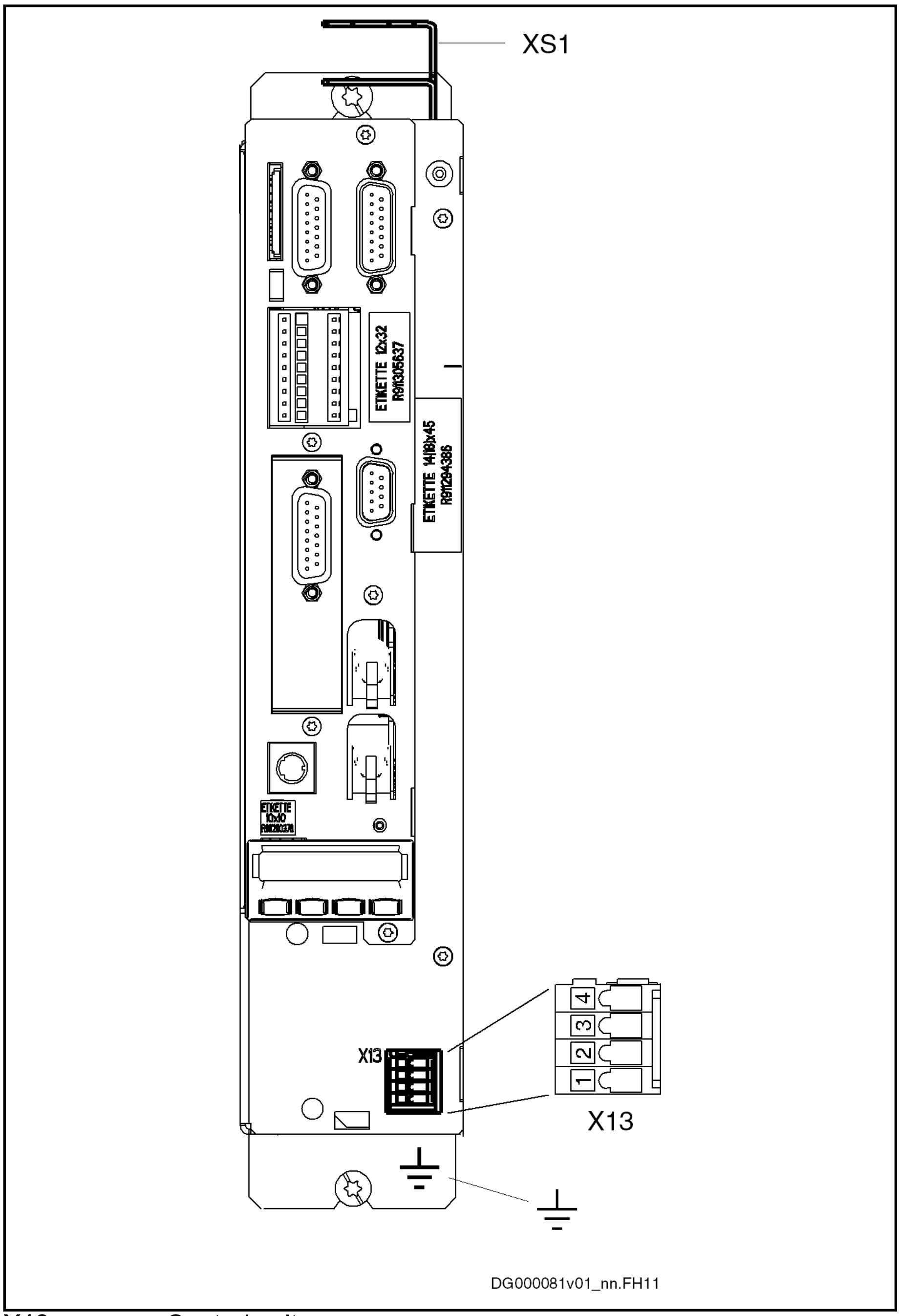
X9 Not available for HCS02.1E-W0012 and -W0028

Fig. 5-17: 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

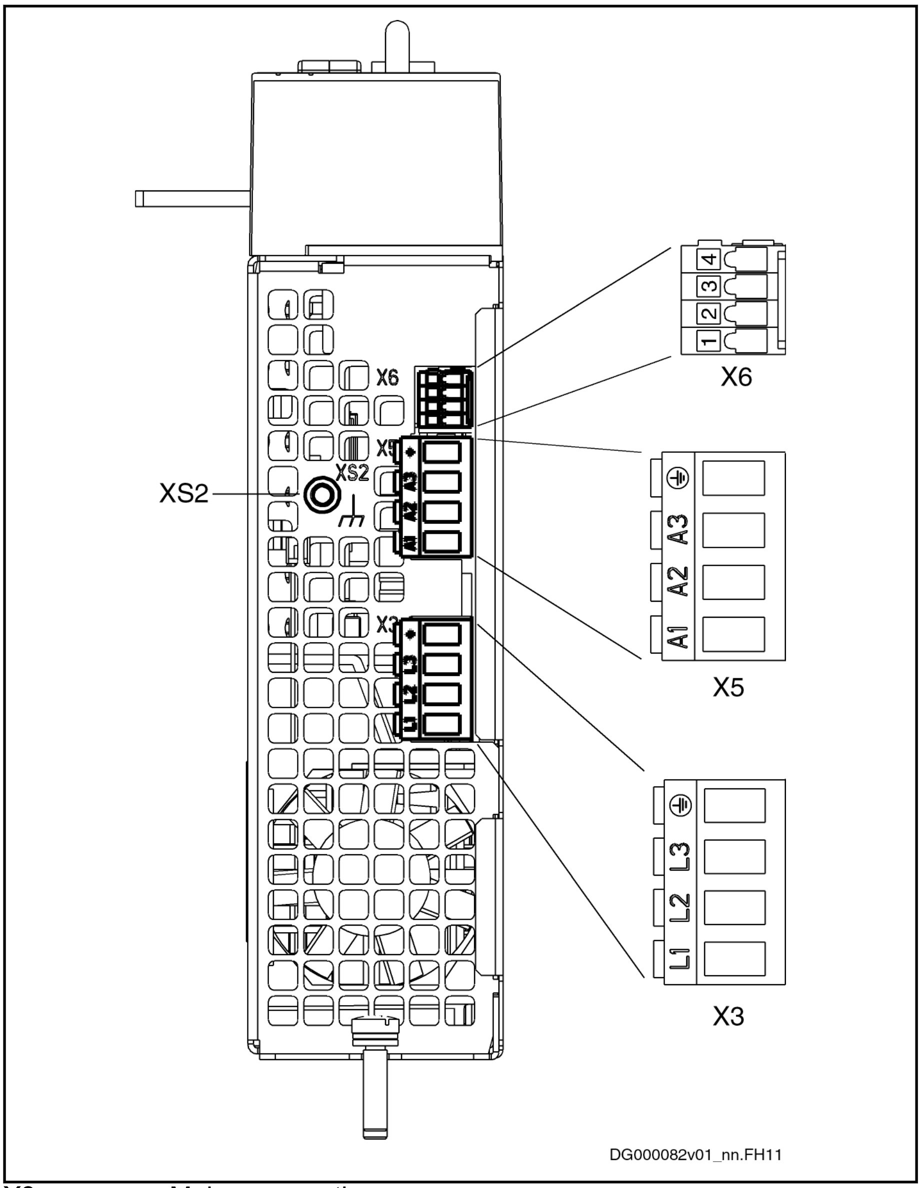
Connection points power section HCS02.1E-W0012 (front)



X13 Control voltage
XS1 Control line shield connection

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

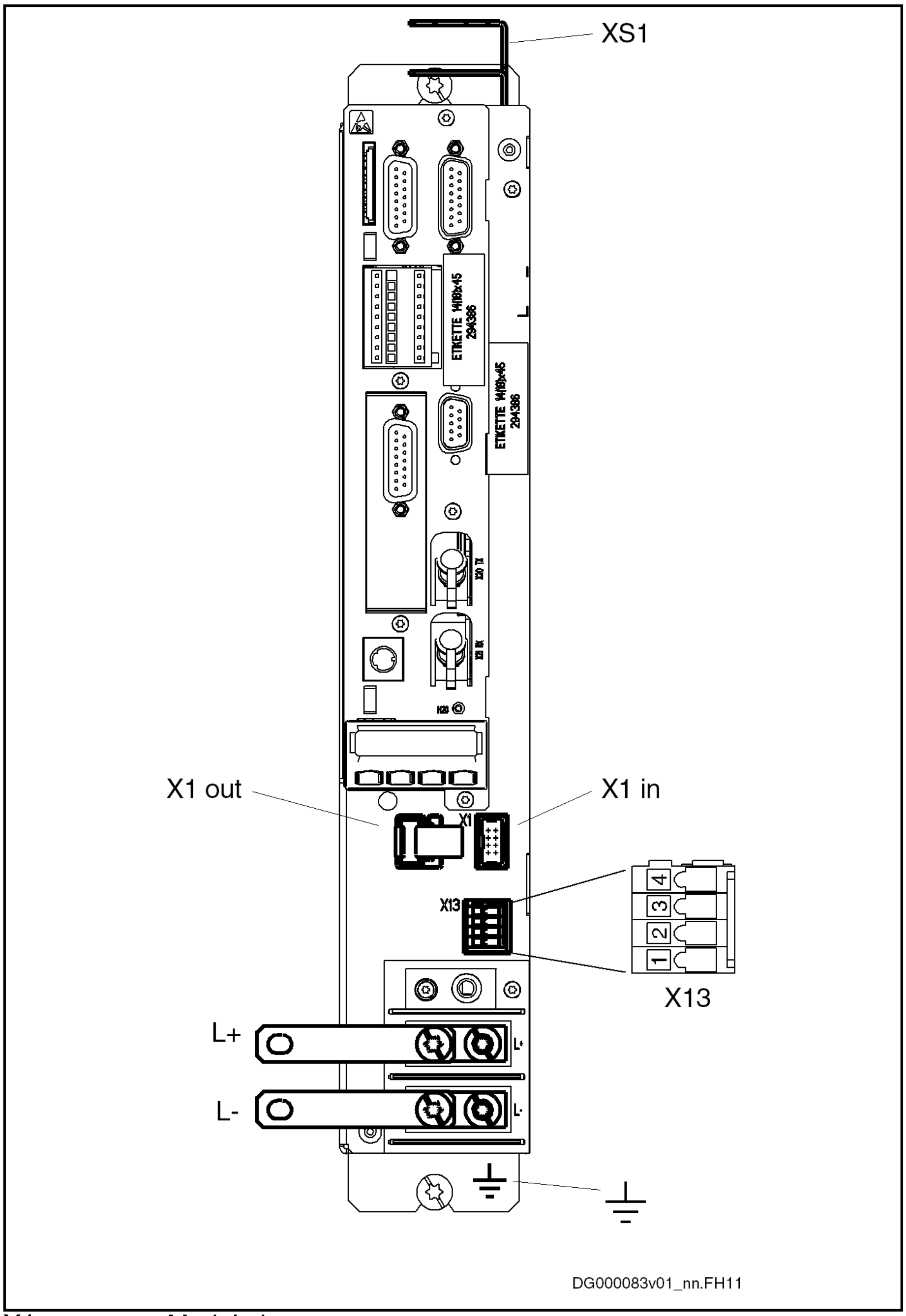
Connection points power section HCS02.1E-W0012 (bottom)



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

Fig. 5-19: Connection points power section HCS02.1E-W0012 (bottom)

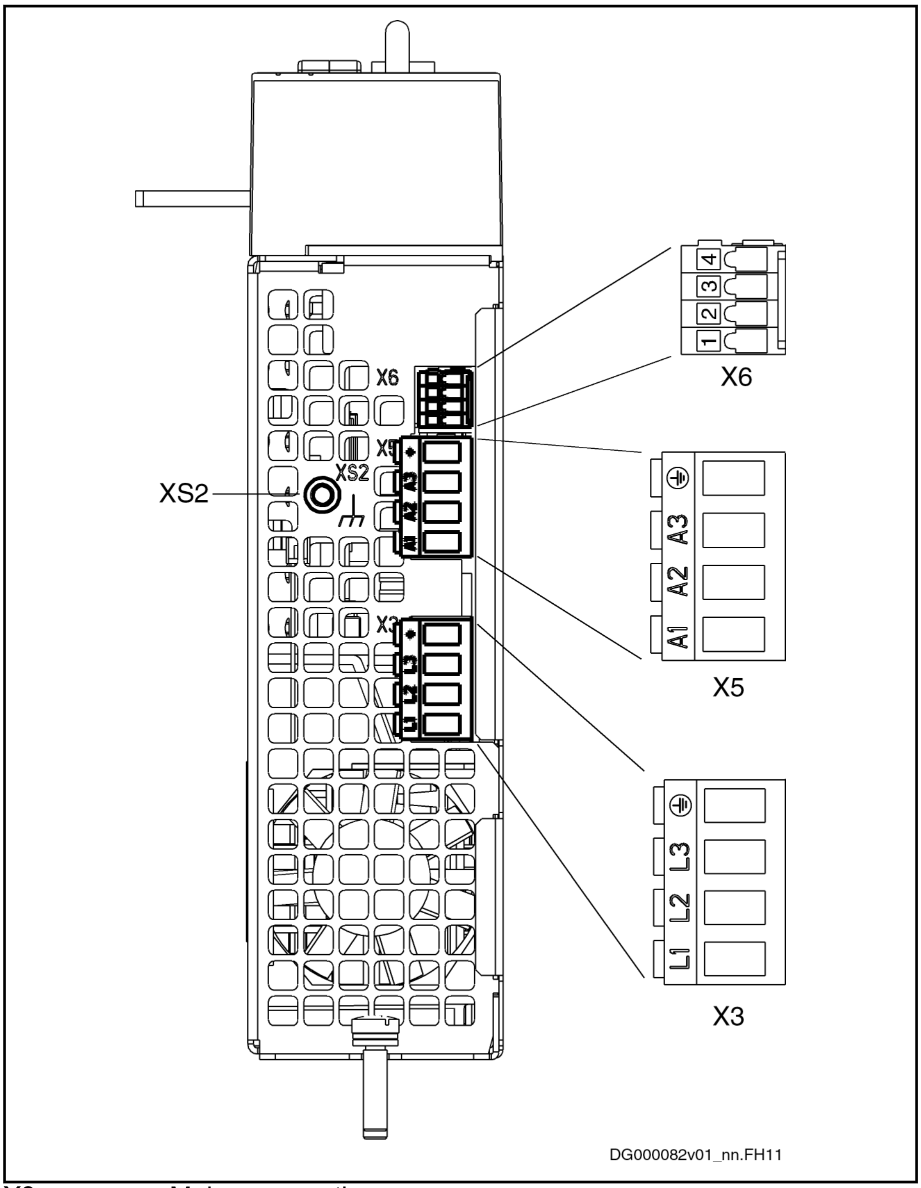
Connection points power sections HCS02.1E-W0028, -W0054, -W0070 (front)



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

Fig. 5-20: Connection points power sections HCS02.1E-W0028, -W0054, -W0070 (front)

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

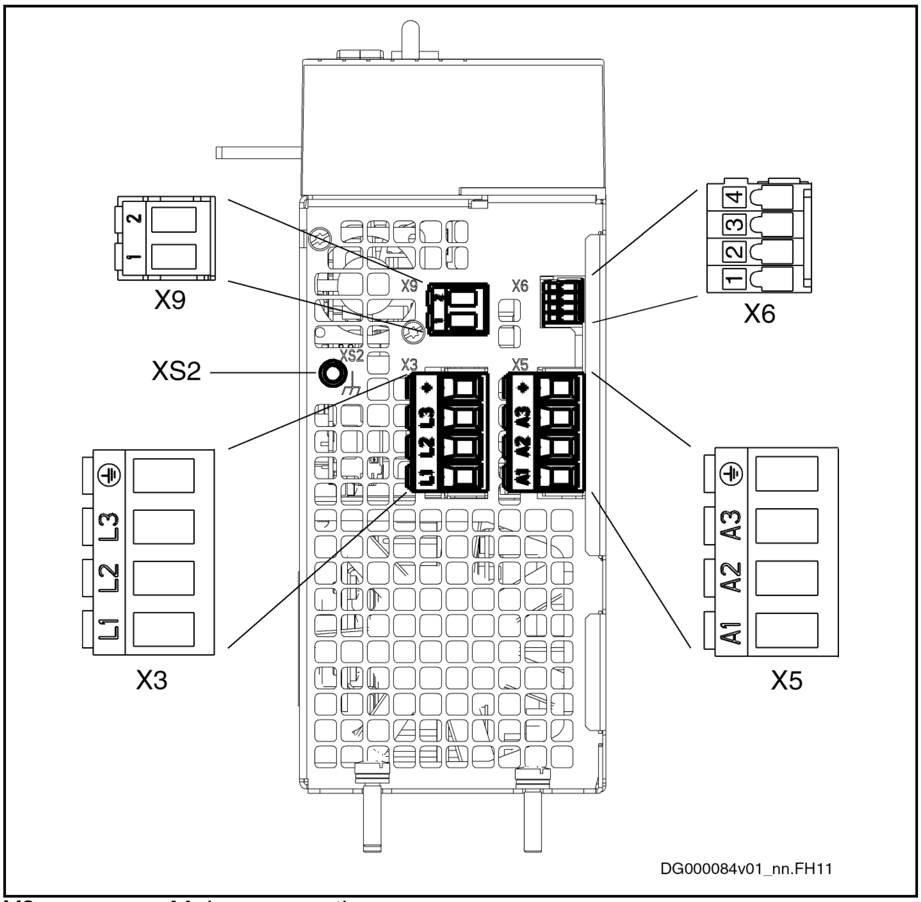


X3	Mains connection
X5	Motor connection
X6	Motor temperature monitoring, motor holding brake
XS2	Motor cable shield connection

Fig. 5-21: Connection points power section HCS02.1E-W0028 (bottom)

Power sections for converters - IndraDrive C

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. 5-22: 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 271.

Touch guard

The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

5.3 HCS03 power sections

5.3.1 Brief description, use and design

Short description

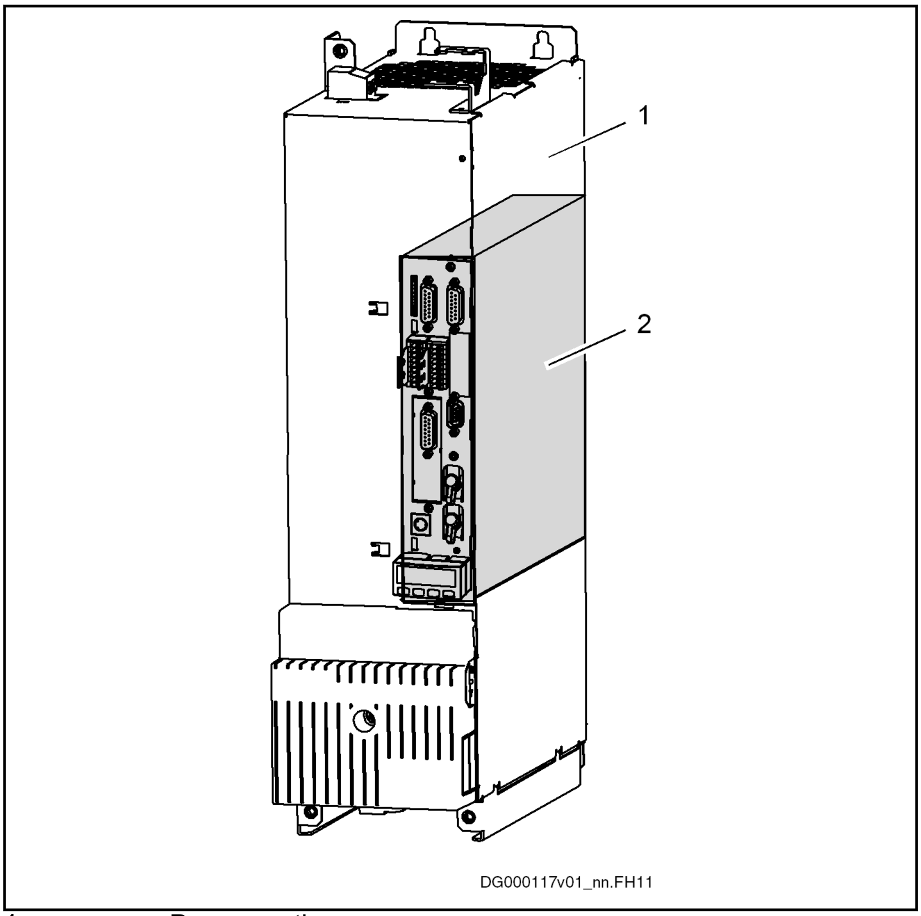
The compact converters HCS03 are part of the Rexroth IndraDrive C product range and are used to operate single axes.

Use

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

Tab. 5-20: Usage of HCS03

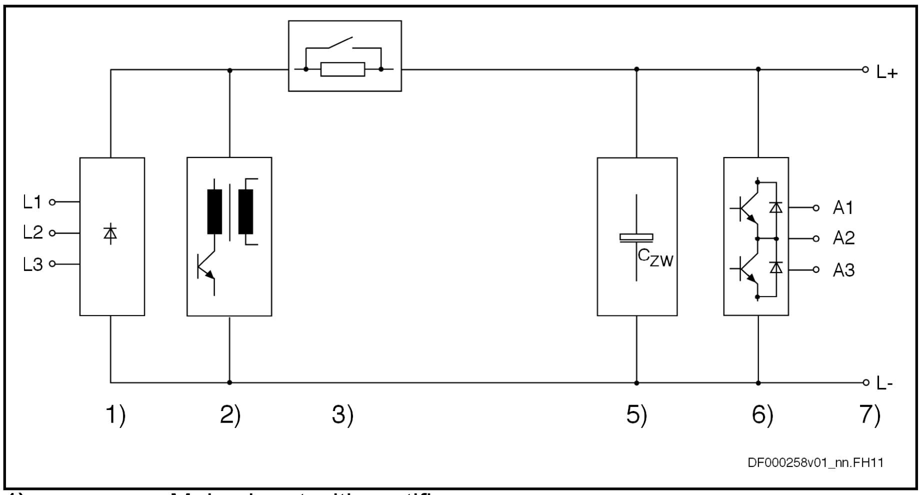
Structure, block diagrams



1 Power section
2 Control section

Fig. 5-23: Basic Structure of the Drive Controller

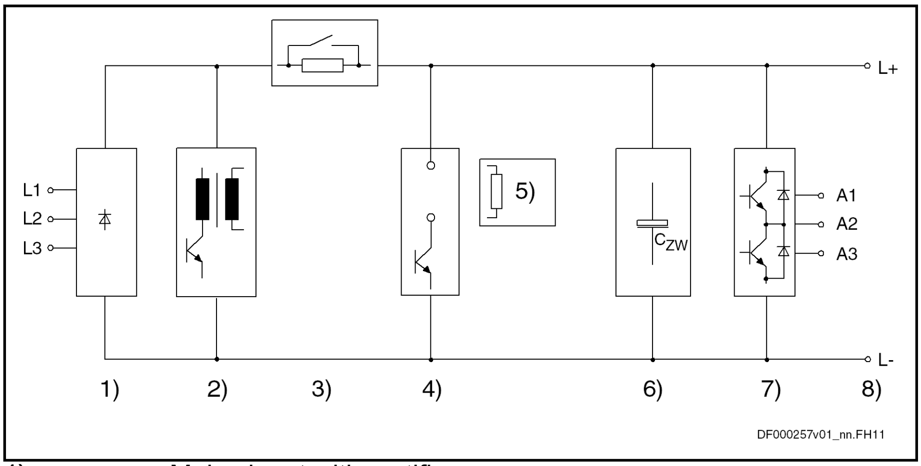
HCS03.1E-…-NNNV; -LNxV



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. 5-24: 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. 5-25: 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

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

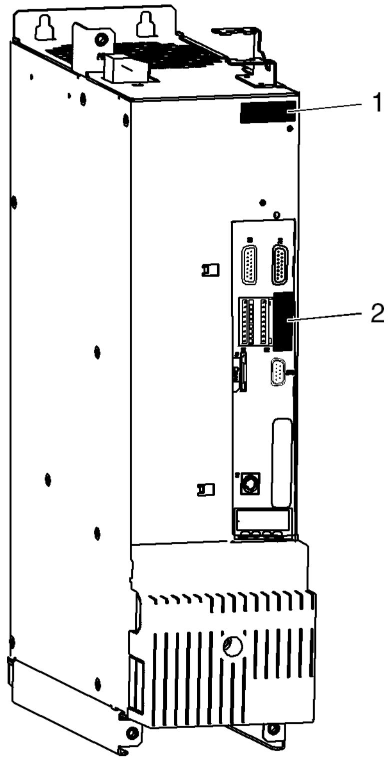
①	**Product:** HCS = HCS
②	**Series:** 03 = 15 … 120 kW
③	**Design:** 1 = 1
④	**Power supply unit:** E = Feeding
⑤	**Cooling type:** W = Air, internal (due to mounted fan)
⑥	**Maximum current:** 0070 = 70 A 0100 = 100 A 0150 = 150 A 0210 = 210 A 0280 = 280 A 0350 = 350 A
⑦	**Degree of protection:** A = IP 20
⑧	**Mains connection voltage:** 05 = 3 × AC 400 … 500 V +10% -15%
⑨	**Other design:** NNNN = None NNNV = DC 24 V power supply from the DC bus and external)[1)] NNBN = braking transistor integrated, DC 24 V external NNBV = braking transistor integrated, DC-24-V-power supply from DC bus and from external[1)] LNBN = Temperature-dependent fan control, braking transistor integrated, DC 24 V external LNBV = Temperature-dependent fan control, braking transistor integrated, DC-24-V-power supply from DC bus and from external[1)]

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

Tab. 5-21: HCS03, Type code

Identification

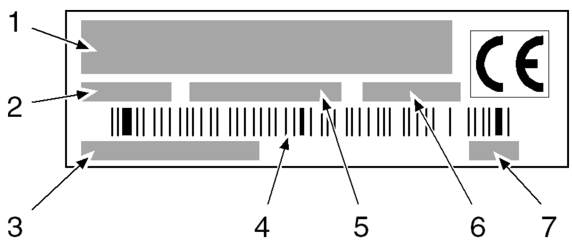
Type plate arrangement



1	Power section type plate
2	Control section type plate

Fig. 5-26: Type Plate Arrangement

Type plate (power sections, supply units)



1	Device type
2	Part number
3	Serial number
4	Bar code
5	Country of manufacture
6	Production week; e.g. 08W23 meaning year 2008, week 23
7	Hardware index

Fig. 5-27: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL Data

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
Last modification: 2016-12-07								

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

Tab. 5-22: 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					
Last modification: 2017-01-23								

Tab. 5-23: HCS - Applied Standards

Power sections for converters - IndraDrive C

Mechanics and mounting

Dimensional drawings

Dimensional drawing HCS03.1E-W0070

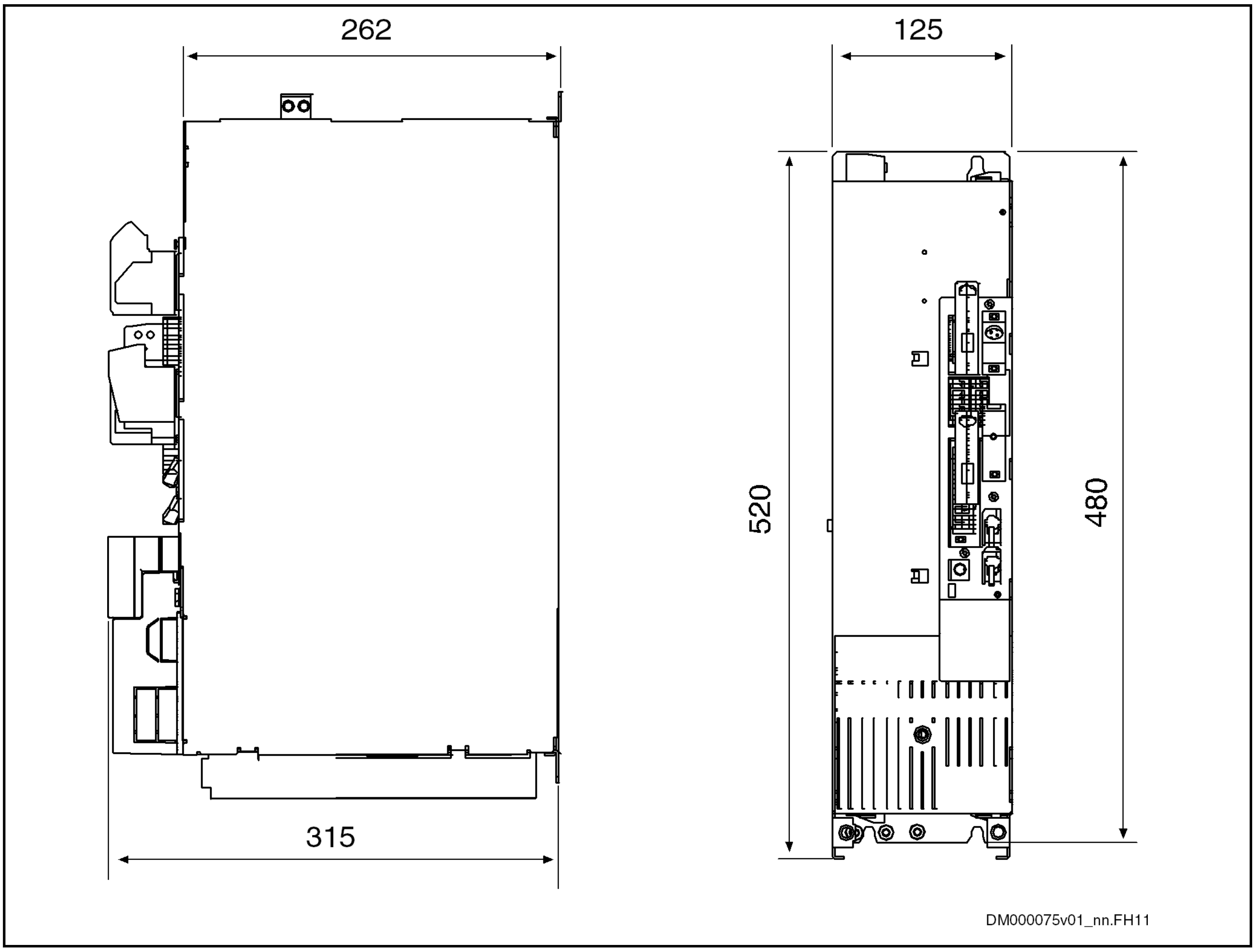


Fig. 5-28: Dimensional drawing HCS03.1E-W0070

Dimensional drawing HCS03.1E-W0070 with HAS02

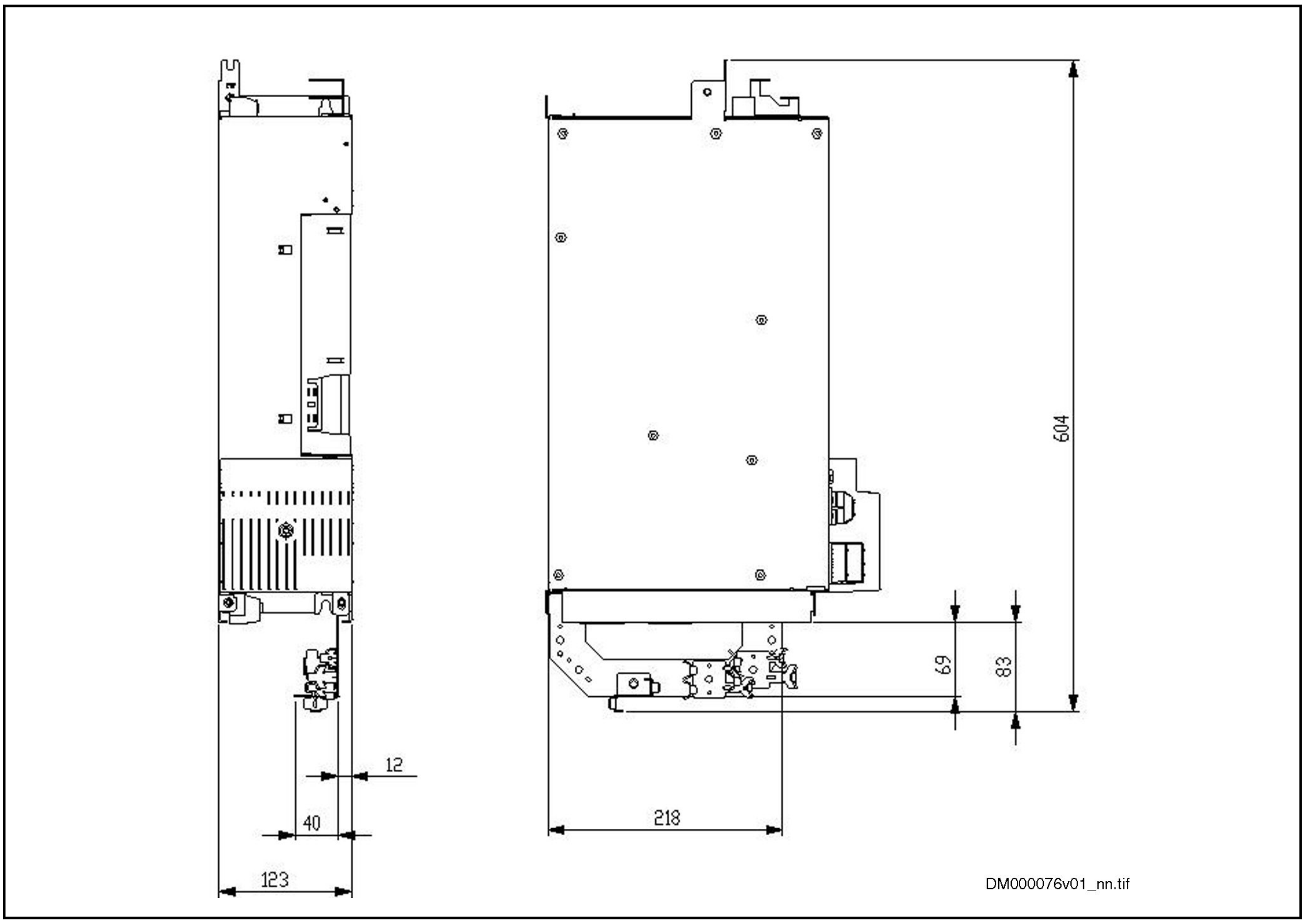


Fig. 5-29: Dimensional drawing HCS03.1E-W0070 with HAS02

Power sections for converters - IndraDrive C

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

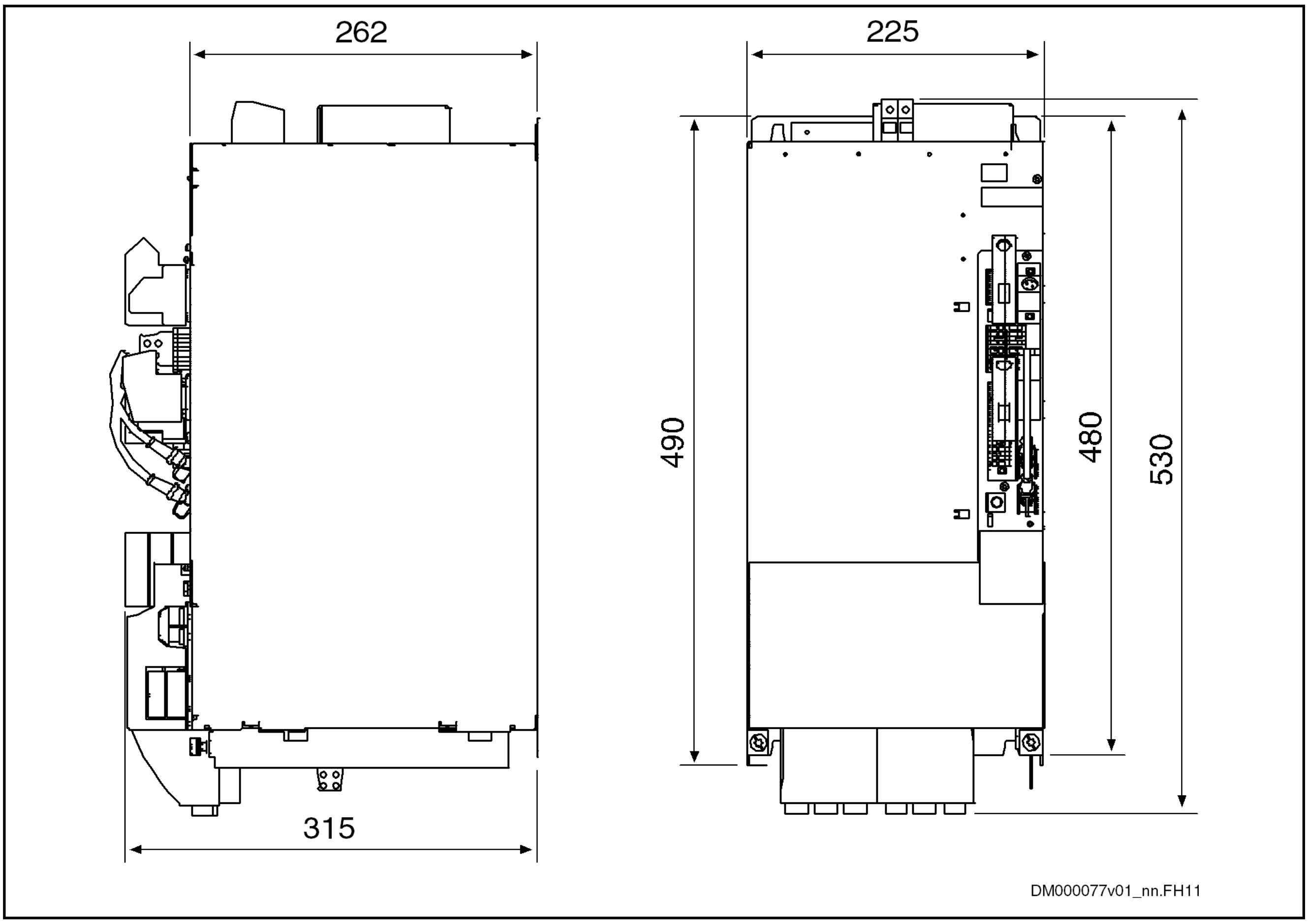


Fig. 5-30: Dimensional drawing HCS03.1E-W0100 and HCS03.1E-W150

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

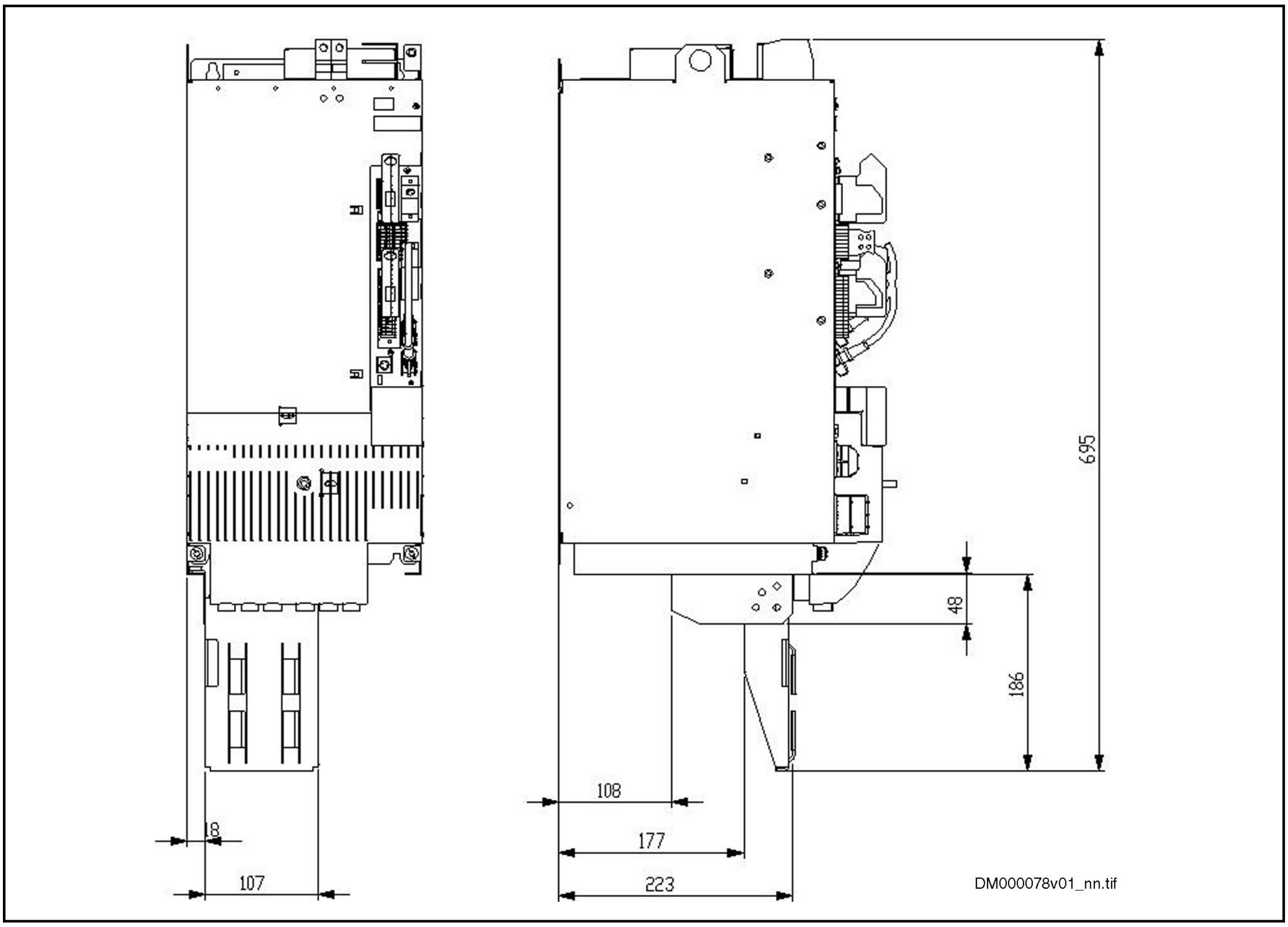


Fig. 5-31: Dimensional drawing HCS03.1E-W0100 and HCS03.1E-W150 with HAS02

Power sections for converters - IndraDrive C

Dimensional drawing HCS03.1E-W0210

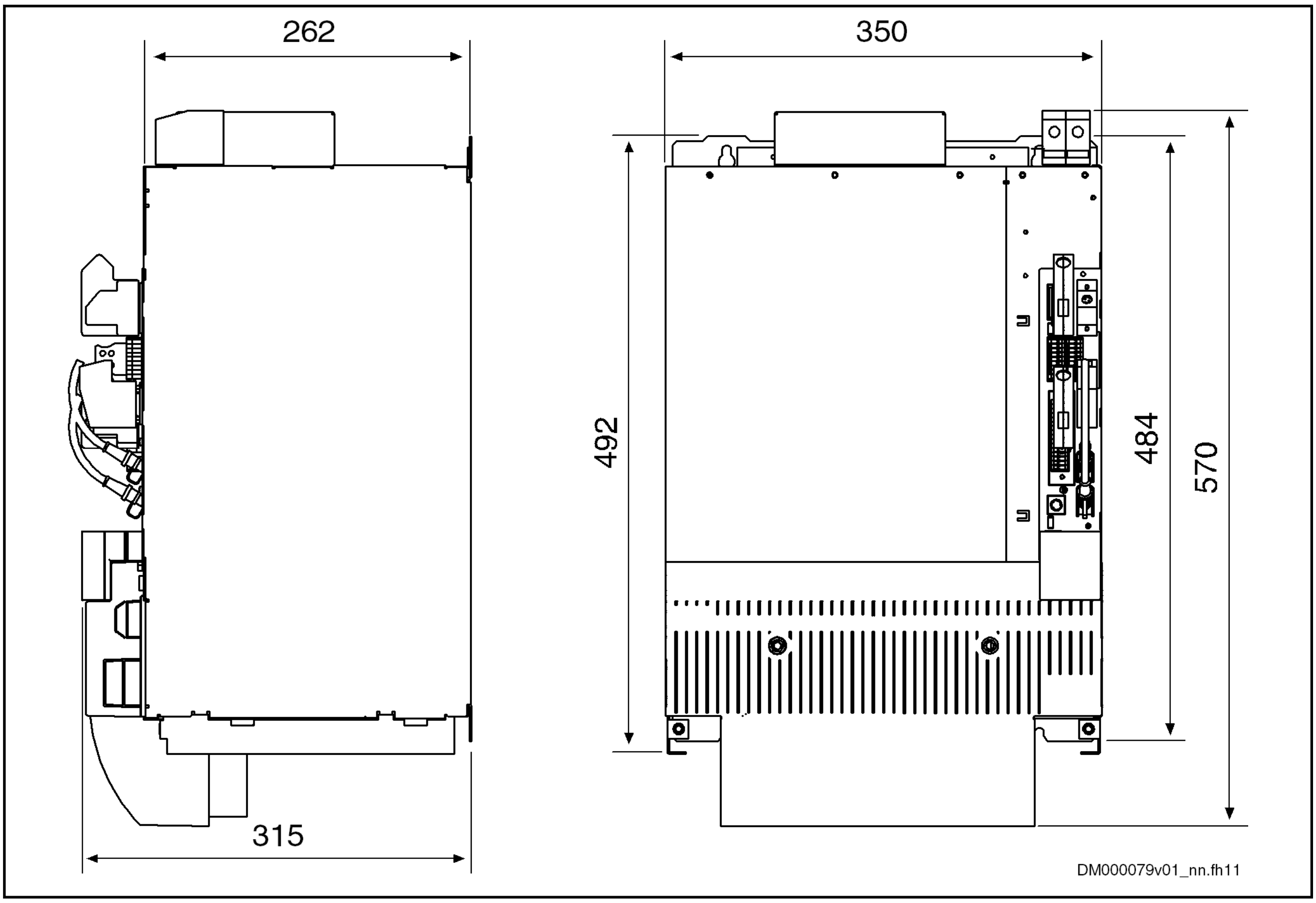


Fig. 5-32: Dimensional drawing HCS03.1E-W0210

Dimensional drawing HCS03.1E-W0210 with HAS02

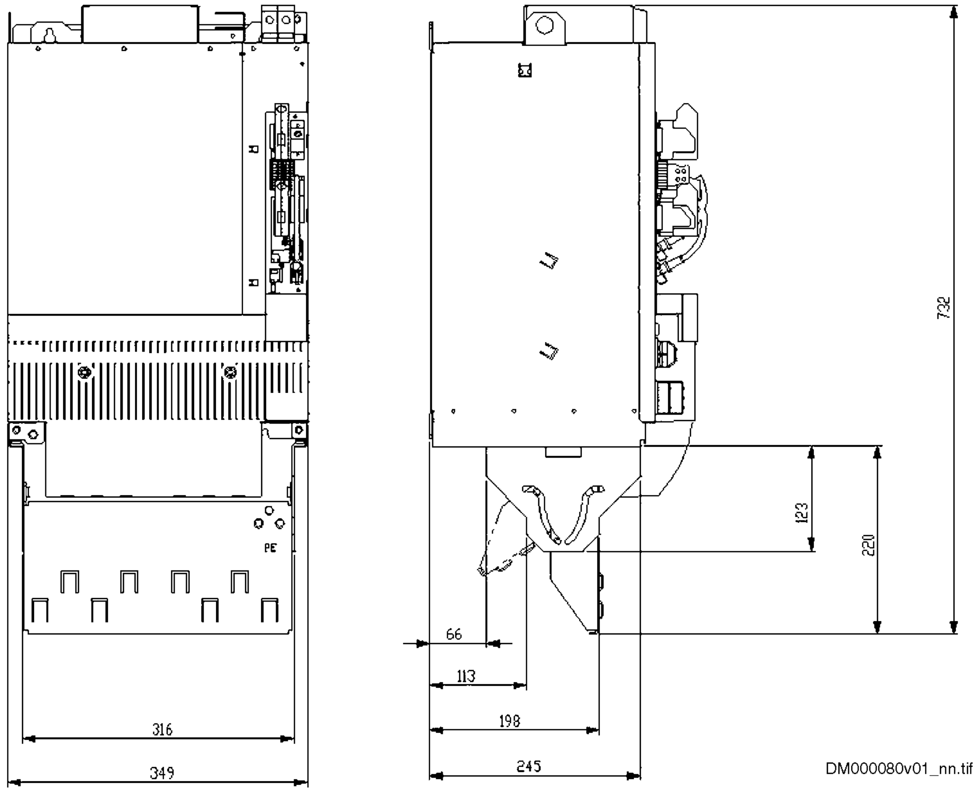
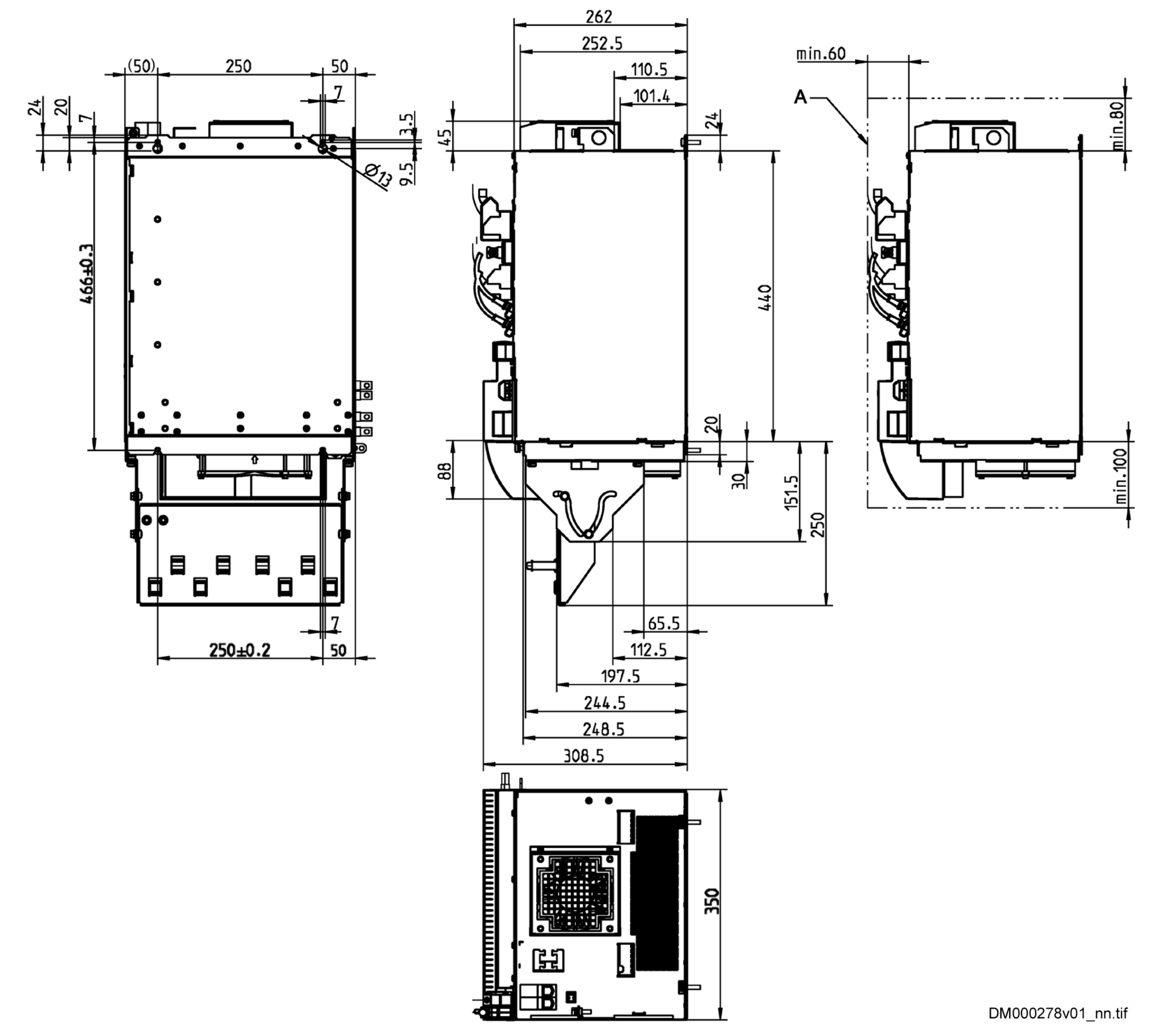


Fig. 5-33: Dimensional drawing HCS03.1E-W0210 with HAS02

Power sections for converters - IndraDrive C

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



A Minimum mounting clearance

Fig. 5-34: Dimensional drawing HCS03.1E-W0280 and HCS03.1E-W0350

Boring dimensions HCS03.1E-W0070

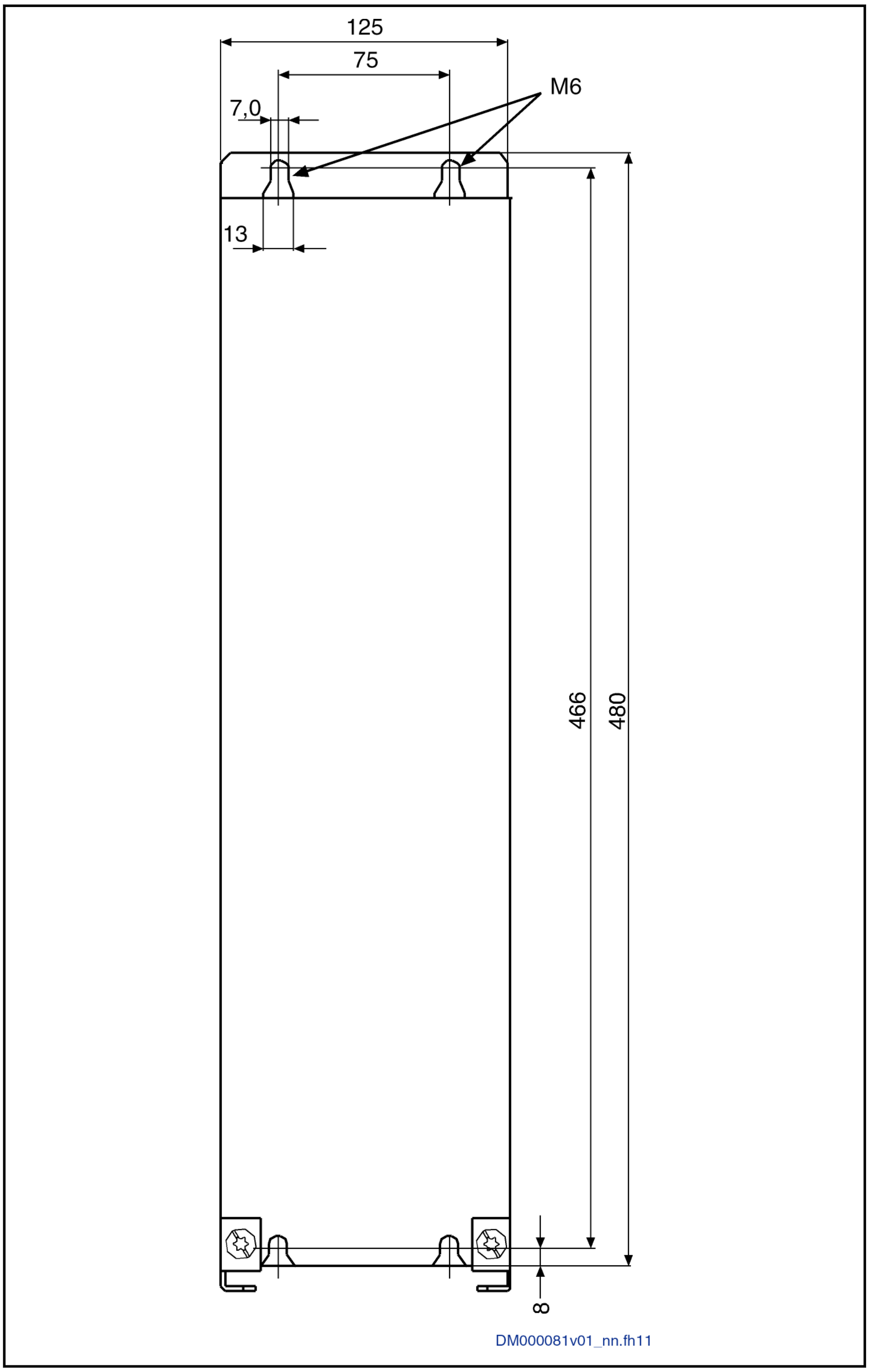


Fig. 5-35: Boring dimensions HCS03.1E-W0070

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

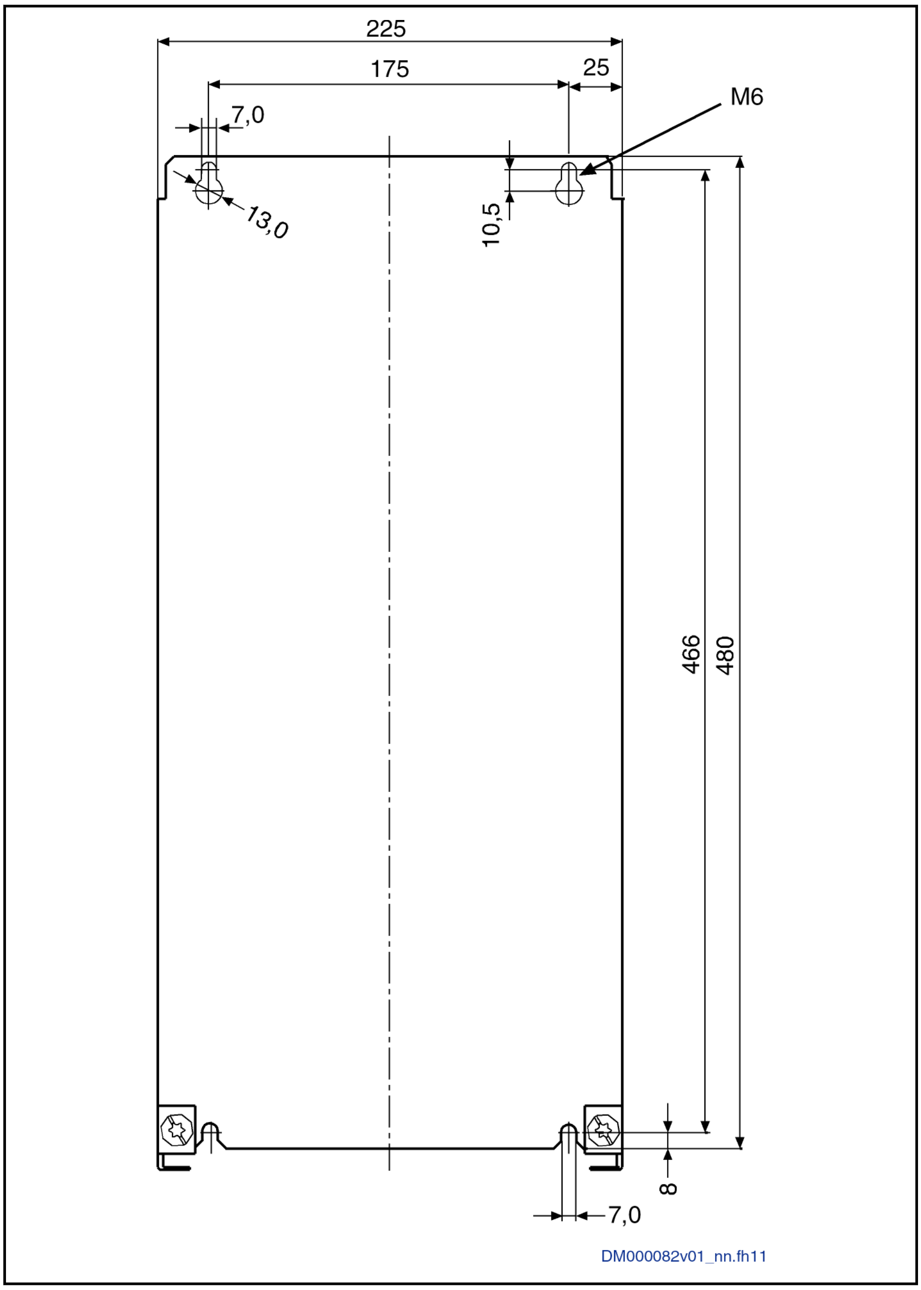


Fig. 5-36: Boring dimensions HCS03.1E-W0100 and HCS03.1-W0150

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

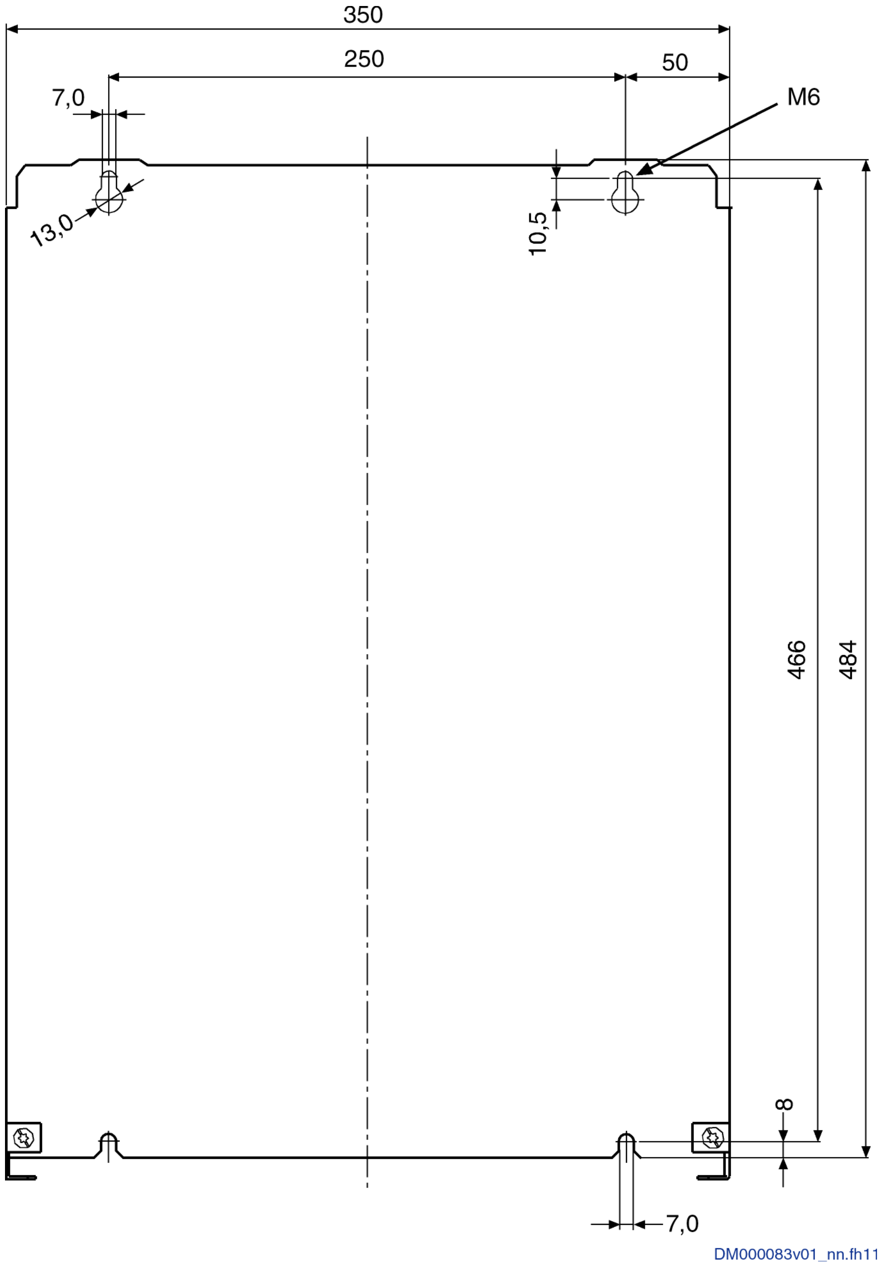


Fig. 5-37: Boring dimensions HCS03.1E-W0210/280/350

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					
Last modification: 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
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		

Last modification: 2016-12-07

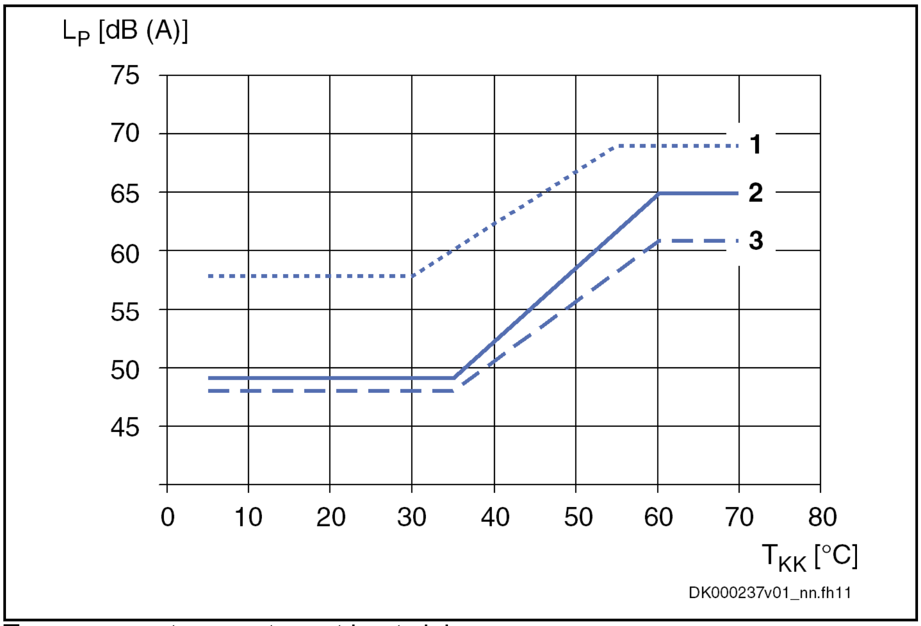
1) 2) 3) Housing dimension; see also related dimensional drawing

4) According to DIN EN ISO 11205; comparative value at distance 1 m, out of cabinet; HCS types with order code -L***: load-dependent

Tab. 5-24: HCS - Data for mass, dimensions, sound pressure level, insulation

Temperature-dependent fan control, sound pressure level

Devices of the order code L*** 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. 5-38: 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					
	f_{Ta}	%/K	2.0					
Allowed mounting position			G1	G1, G4				
Cooling type			Forced ventilation					
Volumetric capacity of forced cooling	V	m^3/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					
Last modification: 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"

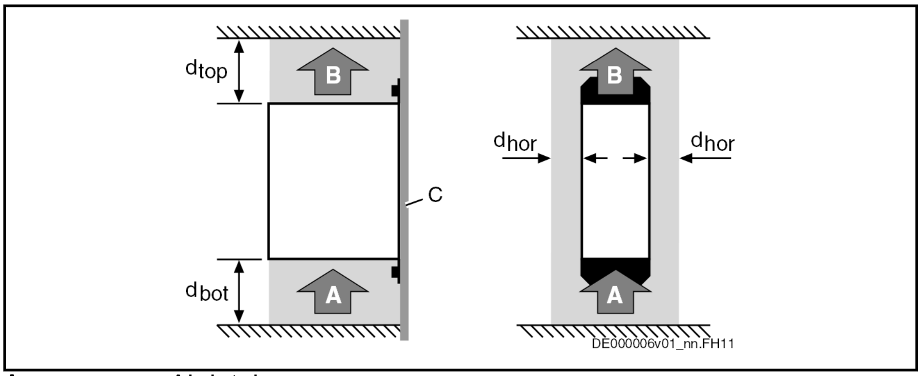
Tab. 5-25: HCS - Data for cooling and power dissipation

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



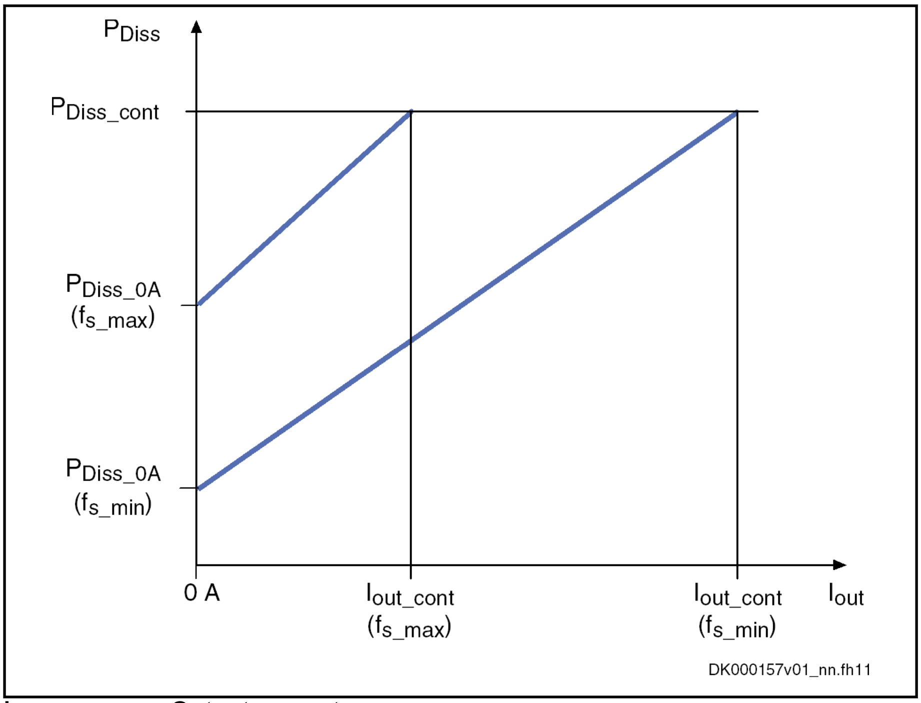
A	Air intake
B	Air outlet
C	Mounting surface in control cabinet
d_{top}	Distance top
d_{bot}	Distance bottom
d_{hor}	Distance horizontal

Fig. 5-39: 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. 5-40: 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 power section HCS03

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 input1)	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_{IN3_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		
Last modification: 2016-12-07								

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

Tab. 5-26: 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					
Mains frequency tolerance		Hz	± 2					
Last modification: 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_nenn}	V	3 AC 400					
Single-phase mains voltage	U_{LN}	V	-					
Three-phase mains voltage at TN-S, TN-C, TT mains	U_{LN}	V	400...500					
Three-phase mains voltage at IT mains[1)]	U_{LN}	V	Not allowed					
Three-phase mains voltage 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			HNL01.1E-0571-N0050-A-500-NNNN; HNK01.1A-A075-E0050-A-500-NNNN	HNL01.1E-0362-N0080-A-500-NNNN; HNK01.1A-A075-E0080-A-500-NNNN	HNL01.1E-0240-N0106-A-500-NNNN; HNK01.1A-A075-E0106-A-500-NNNN	HNL01.1E-0170-N0146-A-500-NNNN; HNK01.1A-A075-E0146-A-500-NNNN	HNL01.1E-0100-N0202-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	-					
Last modification: 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 connection power 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 connection power 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		-					
Last modification: 2016-12-07								

<table>
<tr><th>Description</th><th>Symbol</th><th>Unit</th><th>HCS03.1 E-W0070-_-05</th><th>HCS03.1 E-W0100-_-05</th><th>HCS03.1 E-W0150-_-05</th><th>HCS03.1 E-W0210-_-05</th><th>HCS03.1 E-W0280-_-05</th><th>HCS03.1 E-W0350-_-05</th></tr>
<tr><td>Power factor TPF (λ_L) at U_{LN_nenn} and P_{DC_cont} (three-phase, with mains choke)[13)]</td><td>TPF</td><td></td><td>0.85</td><td>0.83</td><td>0.81</td><td>0.78</td><td colspan="2">0.93</td></tr>
<tr><td>Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (single-phase, without mains choke)</td><td>$TPF_{10\%}$</td><td></td><td colspan="6">-</td></tr>
<tr><td>Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, without mains choke)</td><td>$TPF_{10\%}$</td><td></td><td colspan="4">0.40</td><td>0.57</td><td>0.58</td></tr>
<tr><td>Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (single-phase, with mains choke)</td><td>$TPF_{10\%}$</td><td></td><td colspan="6">-</td></tr>
<tr><td>Power factor TPF (λ_L) at U_{LN_nenn} and 10% P_{DC_cont} (three-phase, with mains choke)</td><td>$TPF_{10\%}$</td><td></td><td colspan="6">-</td></tr>
<tr><td>Power factor of fundamental component DPF at P_{DC_cont} (single-phase, without mains choke)</td><td>$\cos\varphi^{h1}$</td><td></td><td colspan="6">-</td></tr>
<tr><td>Power factor of fundamental component DPF at P_{DC_cont} (three-phase, without mains choke)</td><td>$\cos\varphi^{h1}$</td><td></td><td>0.64</td><td>0.67</td><td>0.70</td><td>0.73</td><td colspan="2">1.00</td></tr>
<tr><td>Power factor of fundamental component DPF at P_{DC_cont} (single-phase, with mains choke)</td><td>$\cos\varphi^{h1}$</td><td></td><td colspan="6">-</td></tr>
<tr><td>Power factor of fundamental component DPF at P_{DC_cont} (three-phase, with mains choke)</td><td>$\cos\varphi^{h1}$</td><td></td><td colspan="2">0.95</td><td>0.94</td><td>0.93</td><td colspan="2">0.99</td></tr>
<tr><td colspan="9">Last modification: 2016-12-07</td></tr>
</table>

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; $T_a \le 40$ °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 5-27: 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	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	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 at maximum allowed C_{DCext} external DC bus capacitance at U_{LN_nenn}	$t_{lade\_DC\_Cext}$	s	-			4.00		
Last modification: 2016-12-07								

1) Use assigned mains choke

Tab. 5-28: 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 type HLR01[2]			HLR01.1N-0300-N17R5	HLR01.1N-0470-N11R7	HLR01.1N-0780-N07R0	HLR01.1N-1K08-N05R0		
Last modification: 2016-12-07								

1) See Parameter Description "P-0-0858, Data of external braking resistor"
2) See also Project Planning Manual "Additional Components"

Tab. 5-29: 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 for U/f-control	U_{out_eff}	V	~ UDC x 0.71					
Output voltage, fundamental wave for 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				-	
Last modification: 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 for detecting 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	-	
Last modification: 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	
Last modification: 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 fs

Tab. 5-30: 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 → On 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

Last modification: 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

Last modification: 2016-12-07

Power sections for converters - IndraDrive C

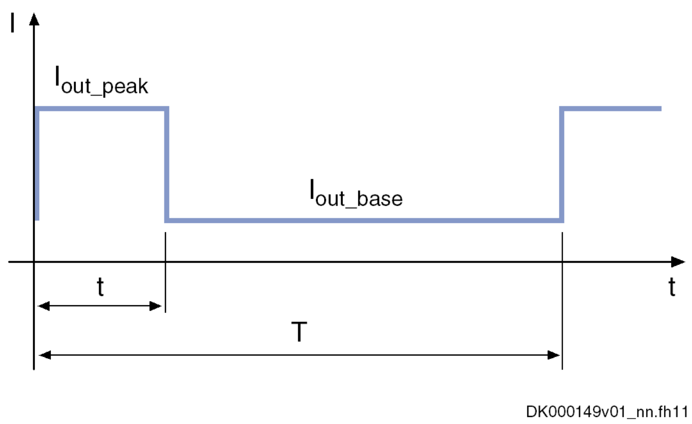
Description	Symbol	Unit	HCS03.1 E-W0070-_-05	HCS03.1 E-W0100-_-05	HCS03.1 E-W0150-_-05	HCS03.1 E-W0210-_-05	HCS03.1 E-W0280-_-05	HCS03.1 E-W0350-_-05
Maximum output current at $I_{out\_base\_4}$; f_s = 12 kHz; t = 60 s; T = 5 min; K = 1.5[14)]	$I_{out\_peak4\_12}$	A	24.90	37.66	55.12	80.57	-	
Base load current at $I_{out\_peak\_4}$; f_s = 12 kHz; t = 60 s; T = 5 min; K = 1.5	$I_{out\_base4\_12}$	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)]	$I_{out\_peak4\_16}$	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	$I_{out\_base4\_16}$	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)]	$I_{out\_peak5\_12}$	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	$I_{out\_base5\_12}$	A	22.00	33.59	45.57	67.36	-	
Last modification: 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)]	$I_{out\_peak5\_16}$	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	$I_{out\_base5\_16}$	A	16.54	25.05	34.45	50.64	-	
Last modification: 2016-12-07								

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

Tab. 5-31: HCS - Examples of allowed current profiles

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

Profile	Explanation
current profile "UEL_I_e" 	The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.

Tab. 5-32: 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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}; $T_a \le T_{a\_work}$; 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
Last modification: 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 UU_{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 atU_{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
Last modification: 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

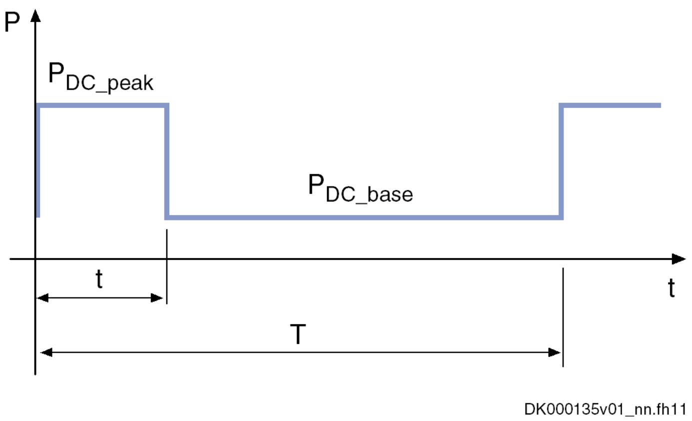
Tab. 5-33: HCS - Examples of allowed performance profiles

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.

Power sections for converters - IndraDrive C

Profile	Explanation
Performance profile "UEL_P_e" 	Characteristic of the selection of standard motors and servo drives.

Tab. 5-34: 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_{LN} ≥ 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} ≥ 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.

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	75.0	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	75.0		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		75.0
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		75.0
Last modification: 2016-12-07								

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

Tab. 5-35: 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	75.0		
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	75.0		
Last modification: 2016-12-07								

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

Tab. 5-36: HCS - Selecting Standard Motors 3 AC 460V - Exemplary Profiles

Power sections for converters - IndraDrive C

5.3.5 Connections and interfaces

Overview

Overall connection diagram

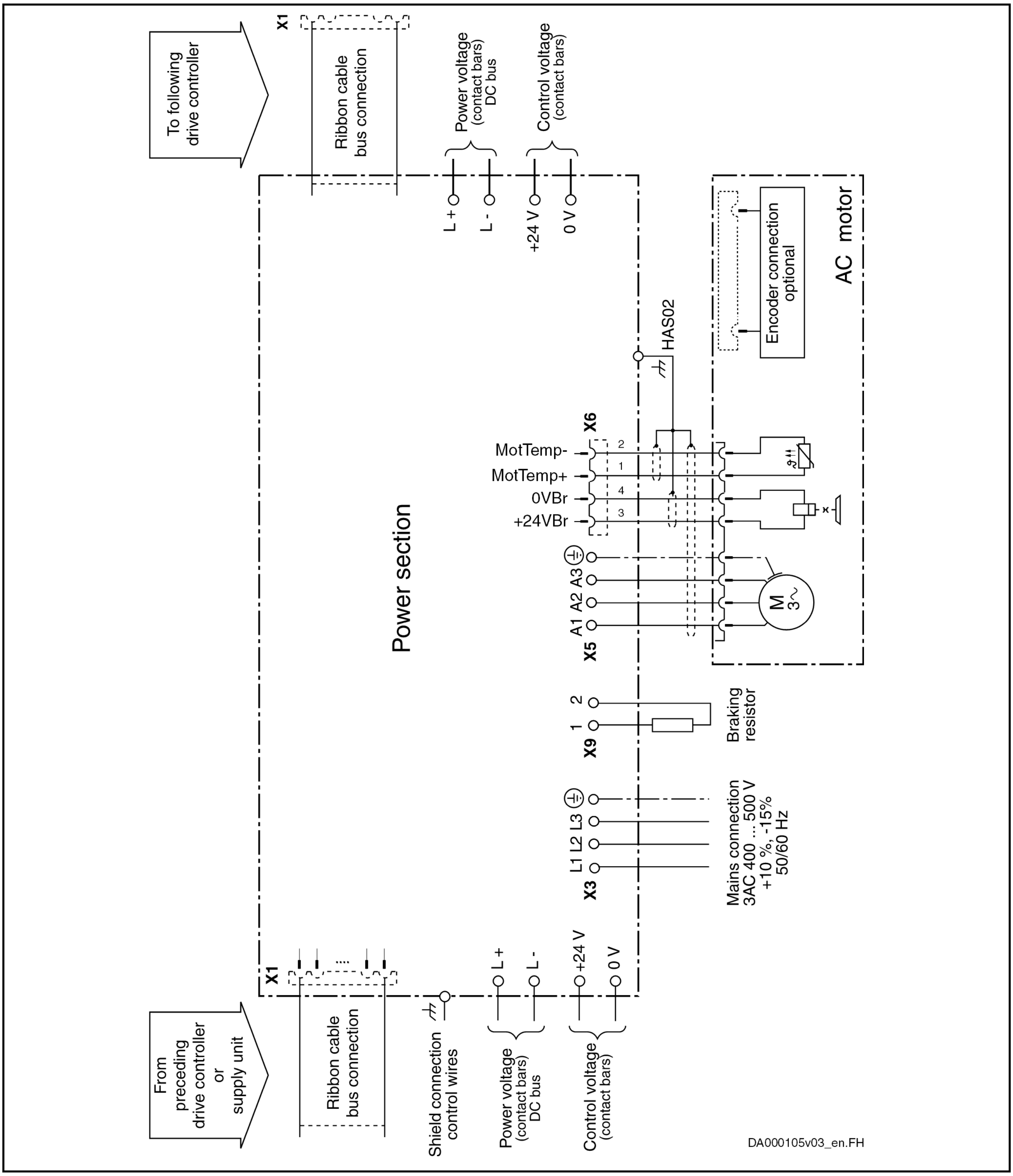


Fig. 5-41: Overall Connection Diagram

Arrangement of the connection points

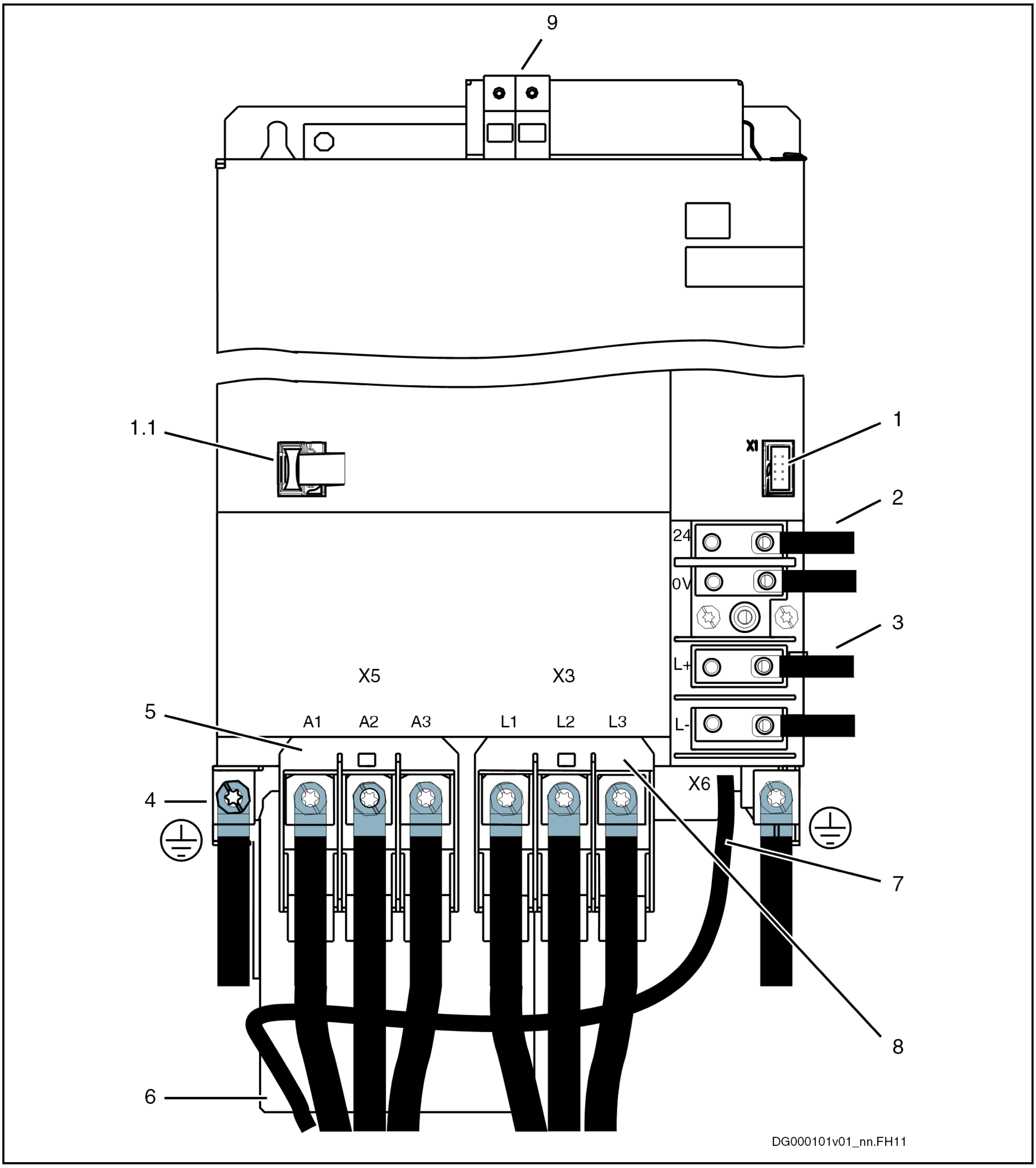
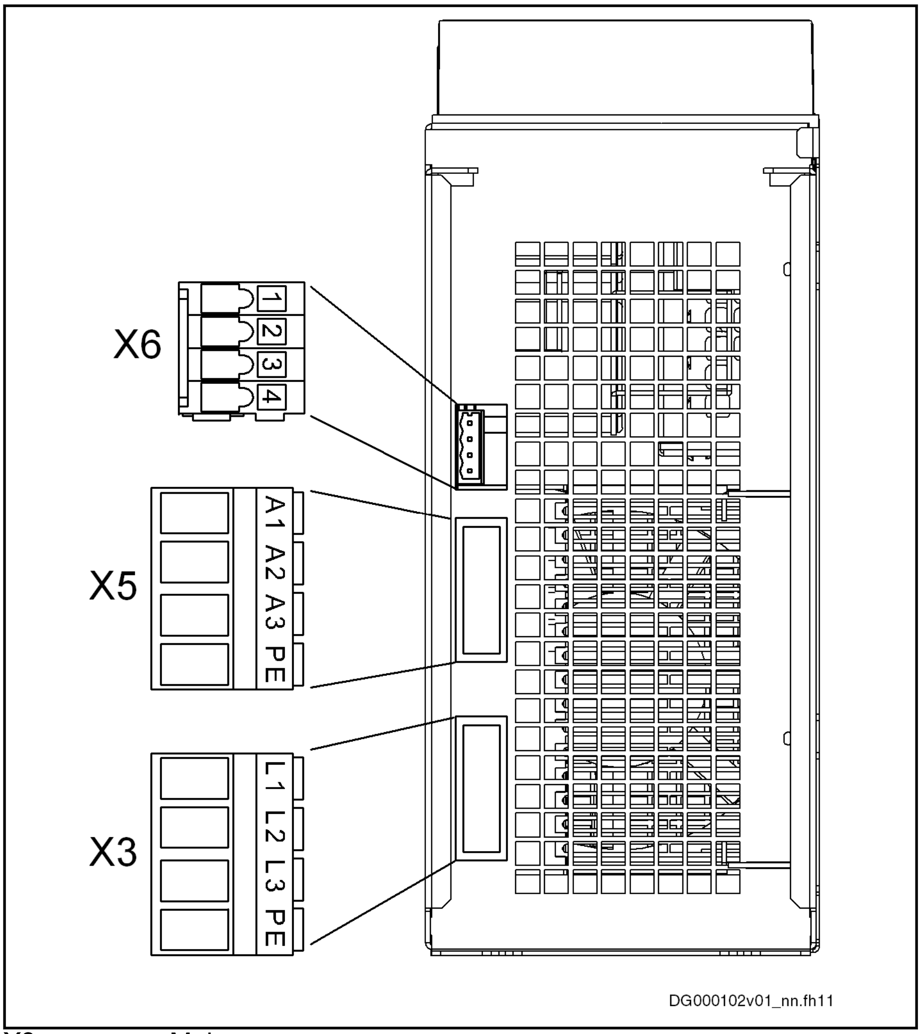


Fig. 5-42: Connections at HCS03.1 Power Section

Power sections for converters - IndraDrive C

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 not possible, 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, lines may be used as an alternative.
4	Equipment grounding conductor	Joint bar	Yes	If connection with joint bar is impossible, lines 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	By means of 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. 5-37: Connections at HCS03.1 Power Section



X3 Mains
X5 Motor
X6 Motor temperature, motor holding brake

Fig. 5-43: 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 271.

Touch guard The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

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: Overview of Inverter Types

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.

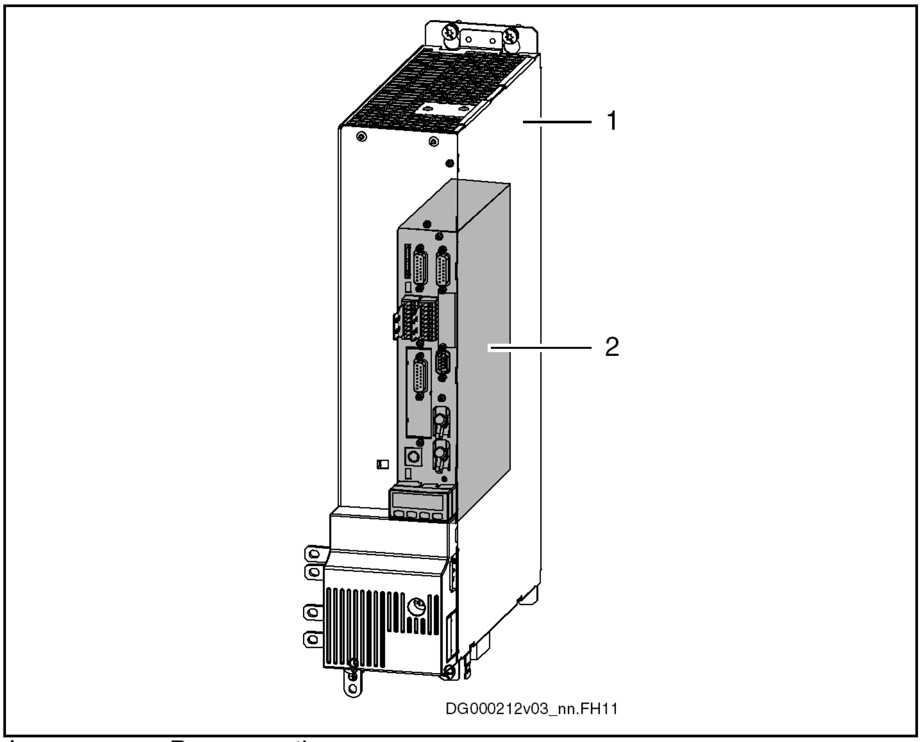
Use The different types are used as follows:

Type	Use
HMS01.1N-Wxxxx-NNNN	• Single-axis device • Operation of a three-phase a.c. motor (asynchronous or synchronous motor).

Tab. 6-2: Usage of HMS01

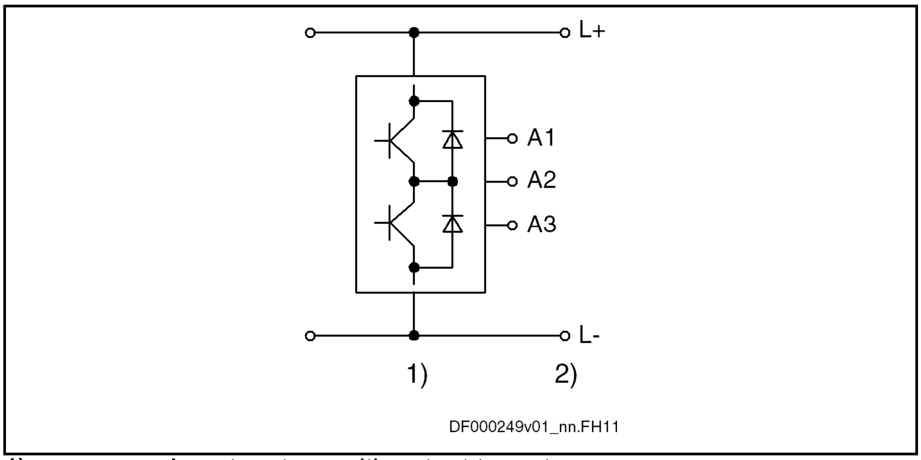
Power sections for inverters - IndraDrive M

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	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. . . . . = HMD

2. Series
2.1 1 . . . . = 01

3. Design
3.1 1 . . . . = 1

4. Power supply
4.1 None. . . . . = N

5. Cooling mode
5.1 Air, internal (due to 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 rated 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	Title	Edition
DIN EN 60529	Protection mode by housing (IP-Code)	2000-09

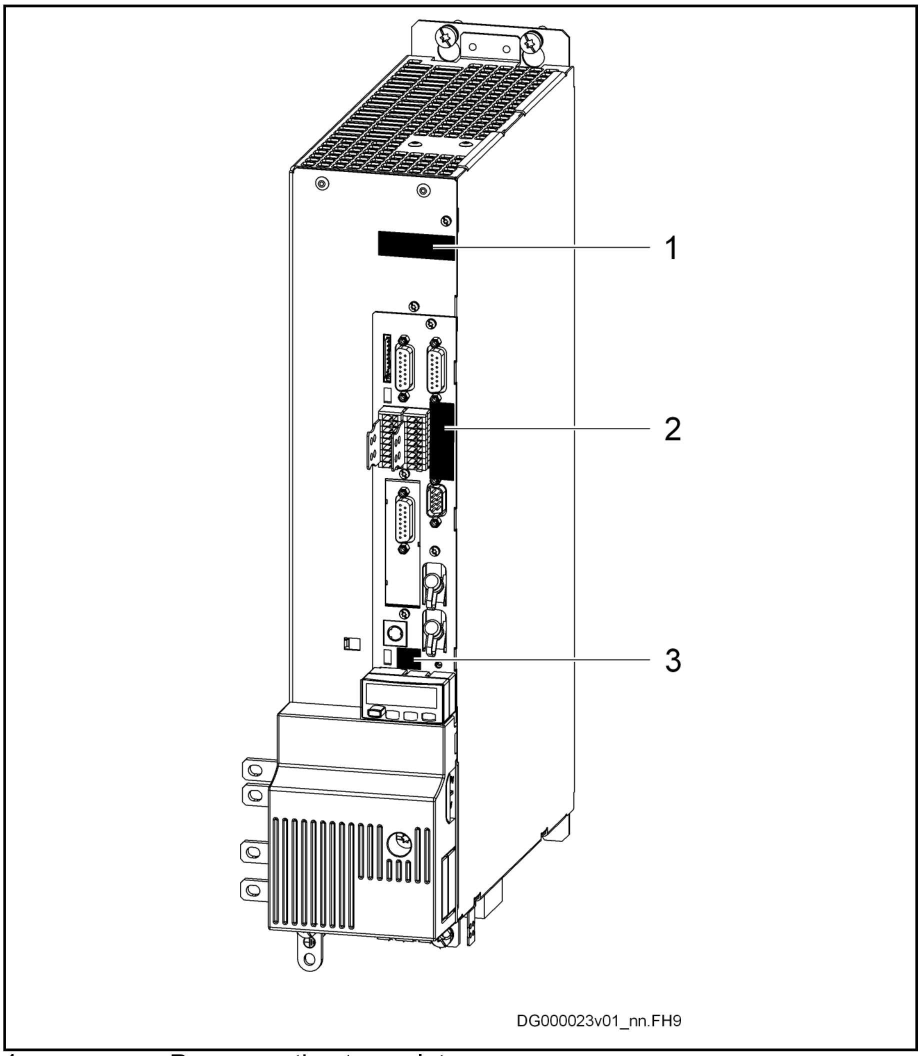
DT000037v02_de.FH11

Fig. 6-3: Type Code HMS01

Power sections for inverters - IndraDrive M

Identification

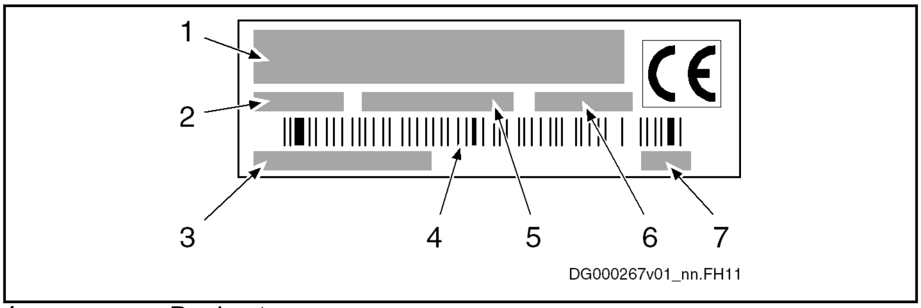
Type plate arrangement



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 (power sections, supply units)



1	Device type
2	Part number
3	Serial number
4	Bar code
5	Country of manufacture
6	Production week; e.g. 08W23 meaning year 2008, week 23
7	Hardware index

Fig. 6-5: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL data

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
Last modification: 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

Power sections for inverters - IndraDrive M

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	145.0		250.0
Last modification: 2013-11-15							

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			
Last modification: 2017-01-23						

Tab. 6-5: HMS - Applied Standards

Applied standards

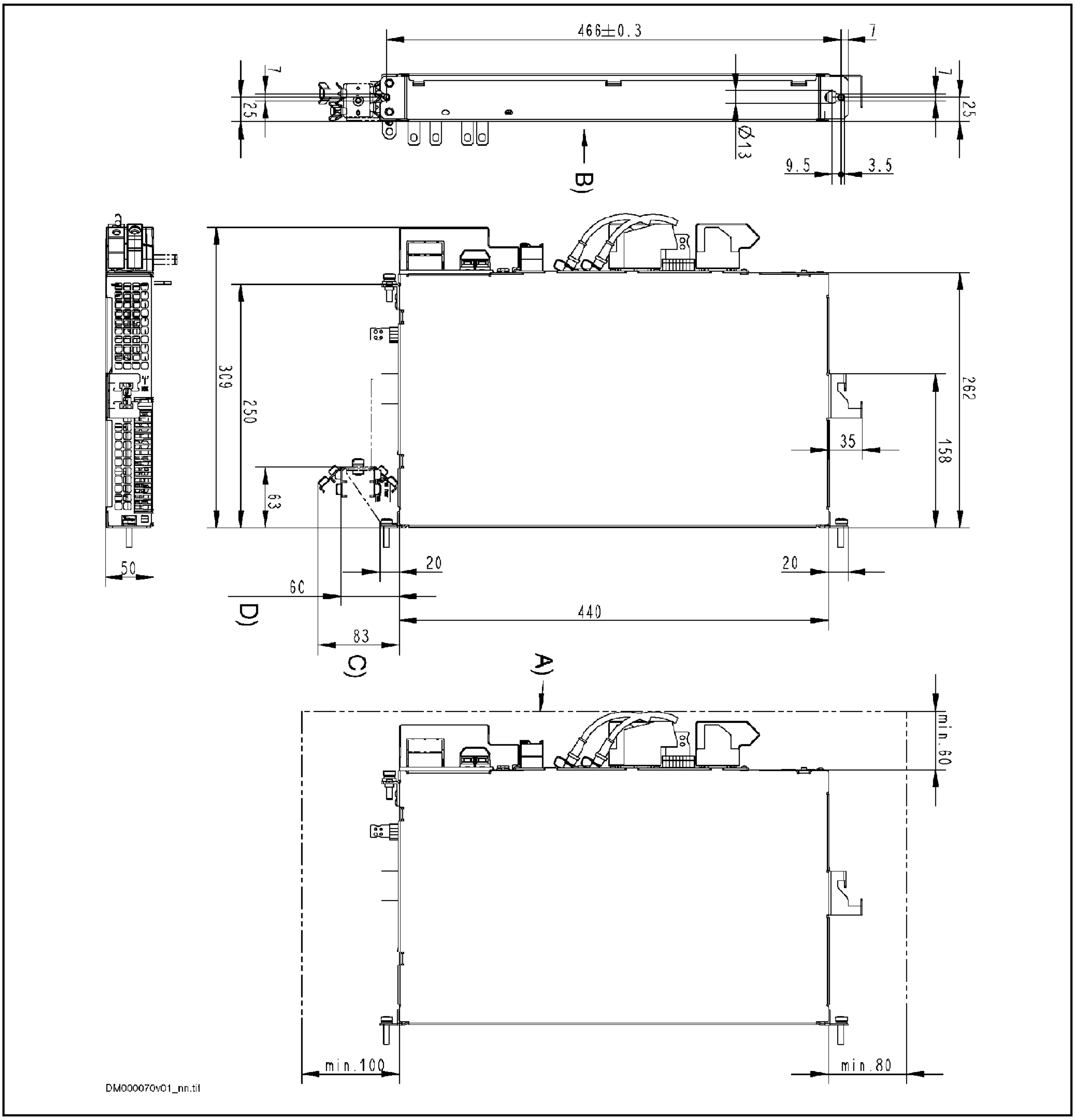
Description	Symbol	Unit	HMS01.1 N-W0110	HMS01.1 N-W0150	HMS01.1 N-W0210	HMS01.1 N-W0300	HMS01.1 N-W0350
Listing in accordance with UL standard			UL 508C				
UL-Files			E134201				
Listing in accordance with CSA standard			C22.2 No. 274-13				
Last modification: 2017-01-23							

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!

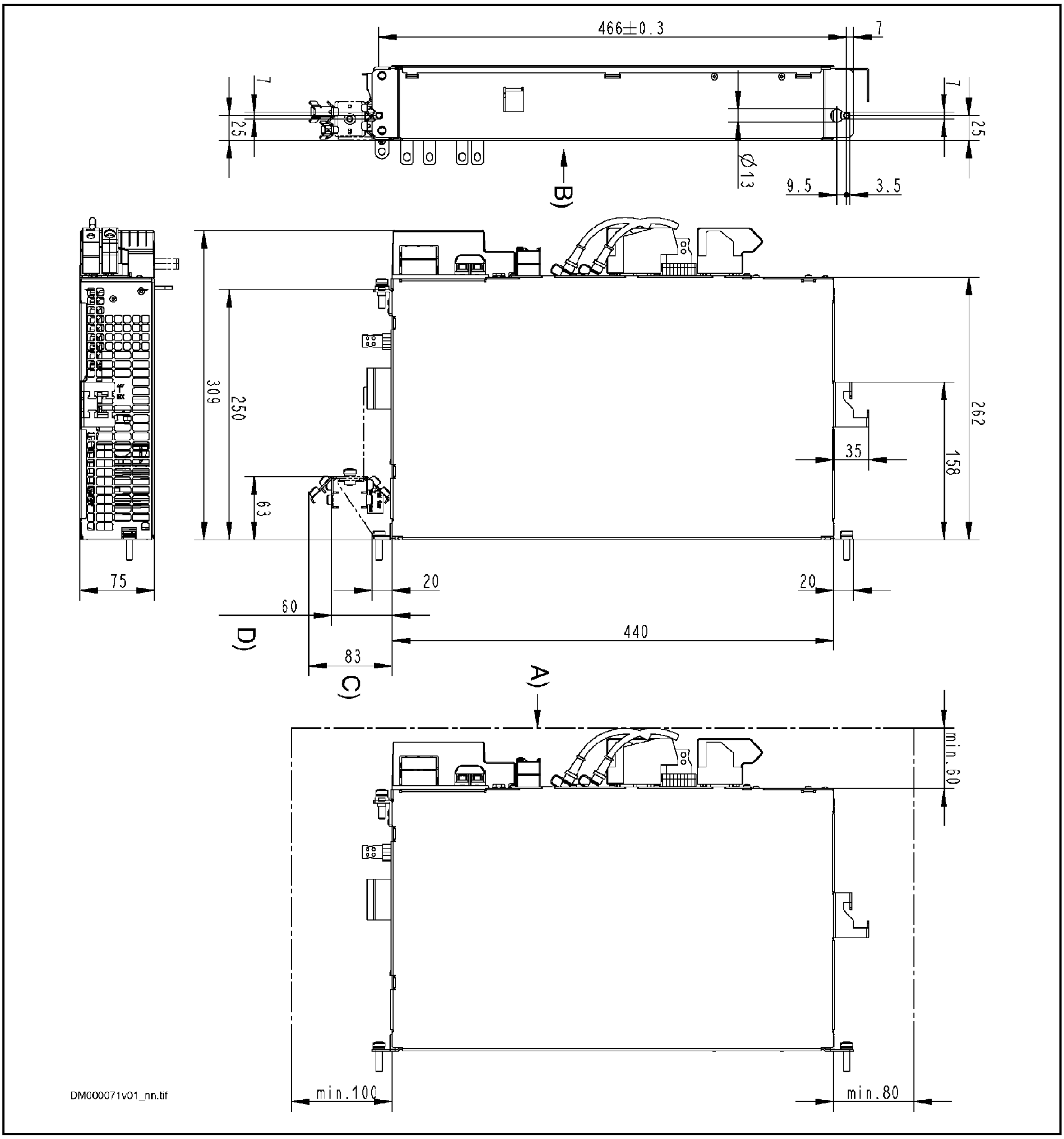
B) Rear view!

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

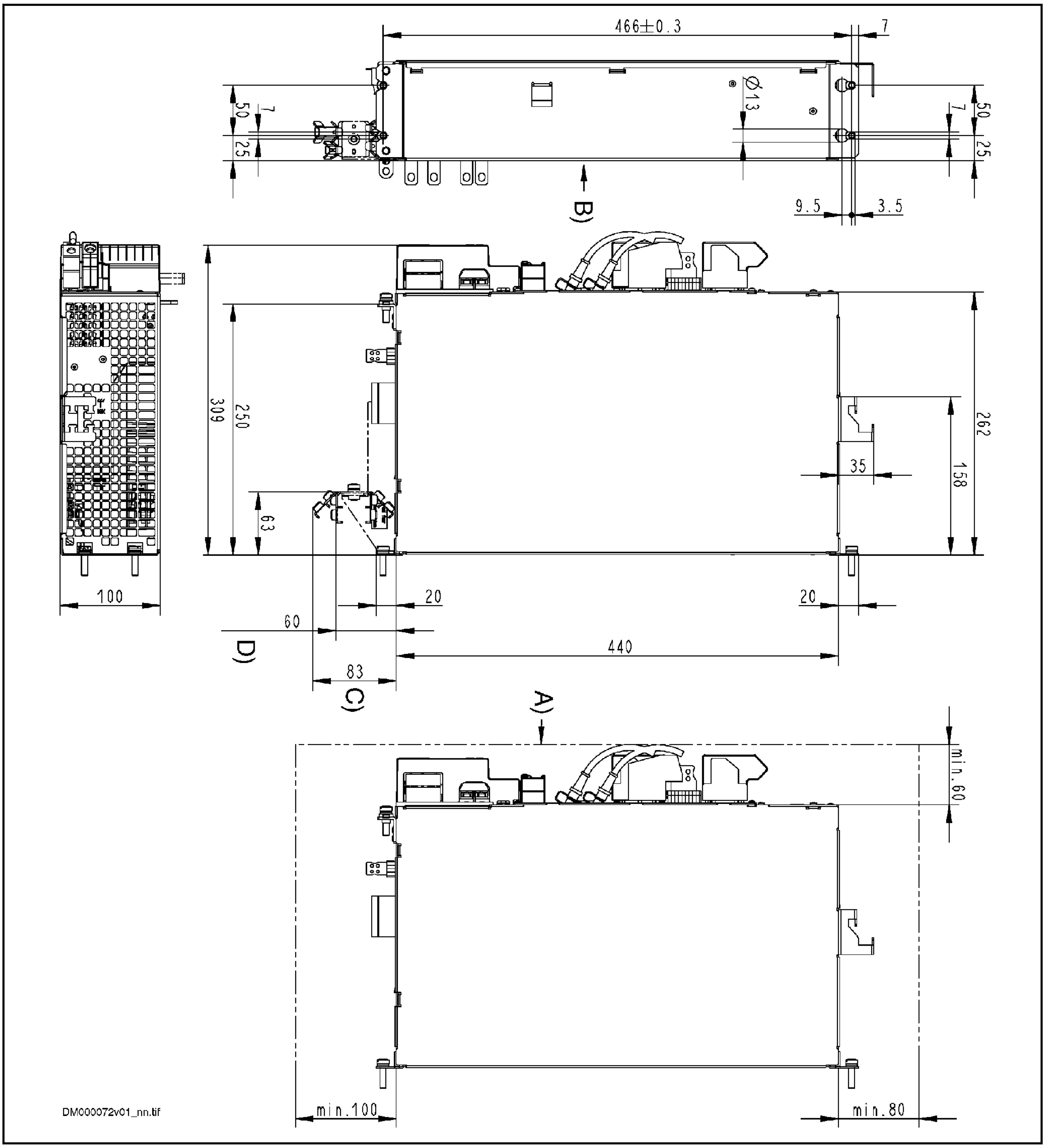


A)	Minimum mounting clearance (plus additional space for motor cable) Note: Rexroth IndraDrive supply units require greater mounting clearance!
B)	Rear view!
C)	Dimensions for accessory HAS02.1 when motor cable run with 45°
D)	Dimensions for accessory HAS02.1 when motor cable run horizontally

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

Power sections for inverters - IndraDrive M

HMS01.1N-W0070



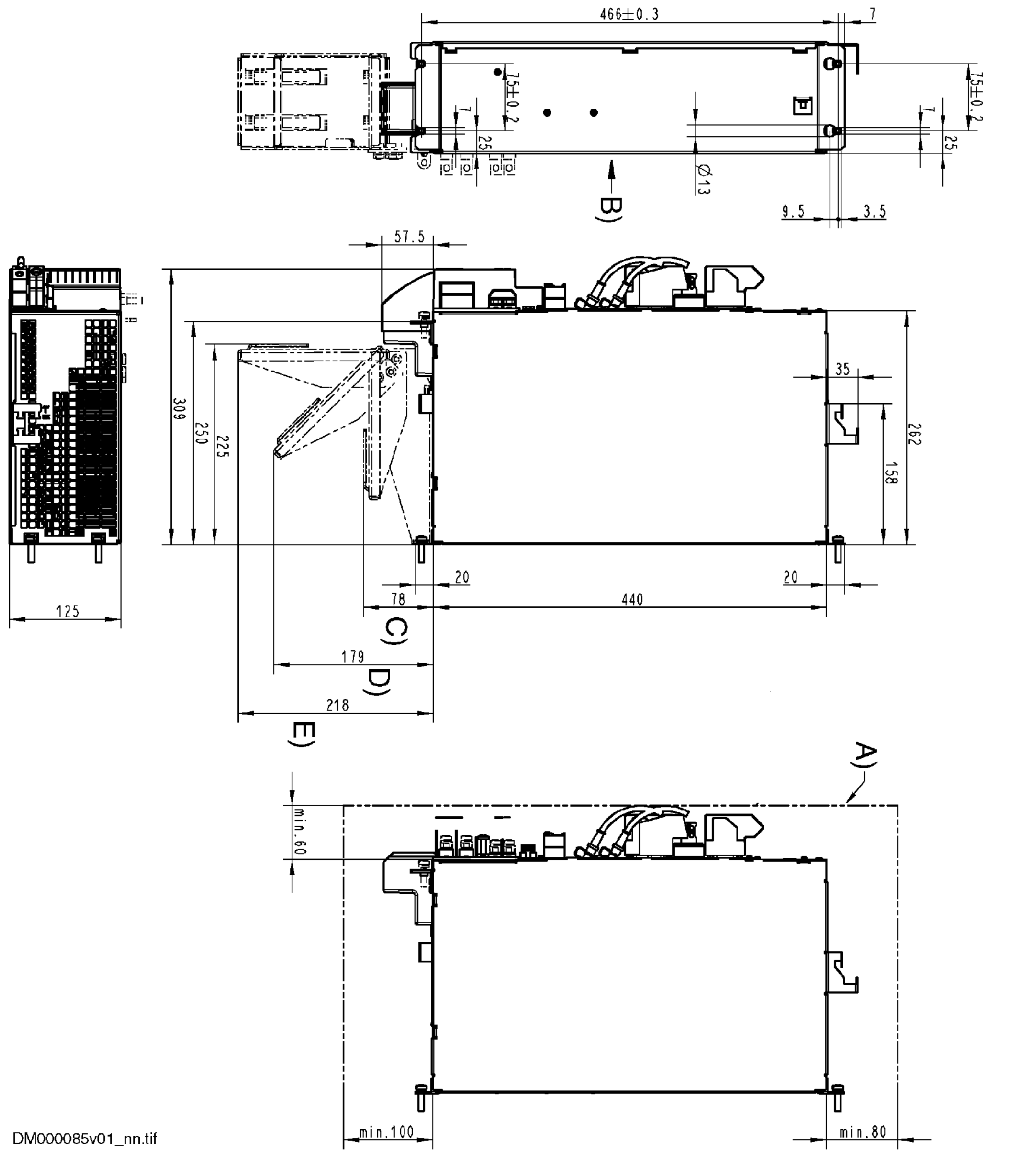
A)	Minimum mounting clearance (plus additional space for motor cable) Note: Rexroth IndraDrive supply units require greater mounting clearance!
B)	Rear view!
C)	Dimensions for accessory HAS02.1 when motor cable run with 45°

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

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

Power sections for inverters - IndraDrive M

HMS01.1N-W0110



DM000085v01_nn.tif

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

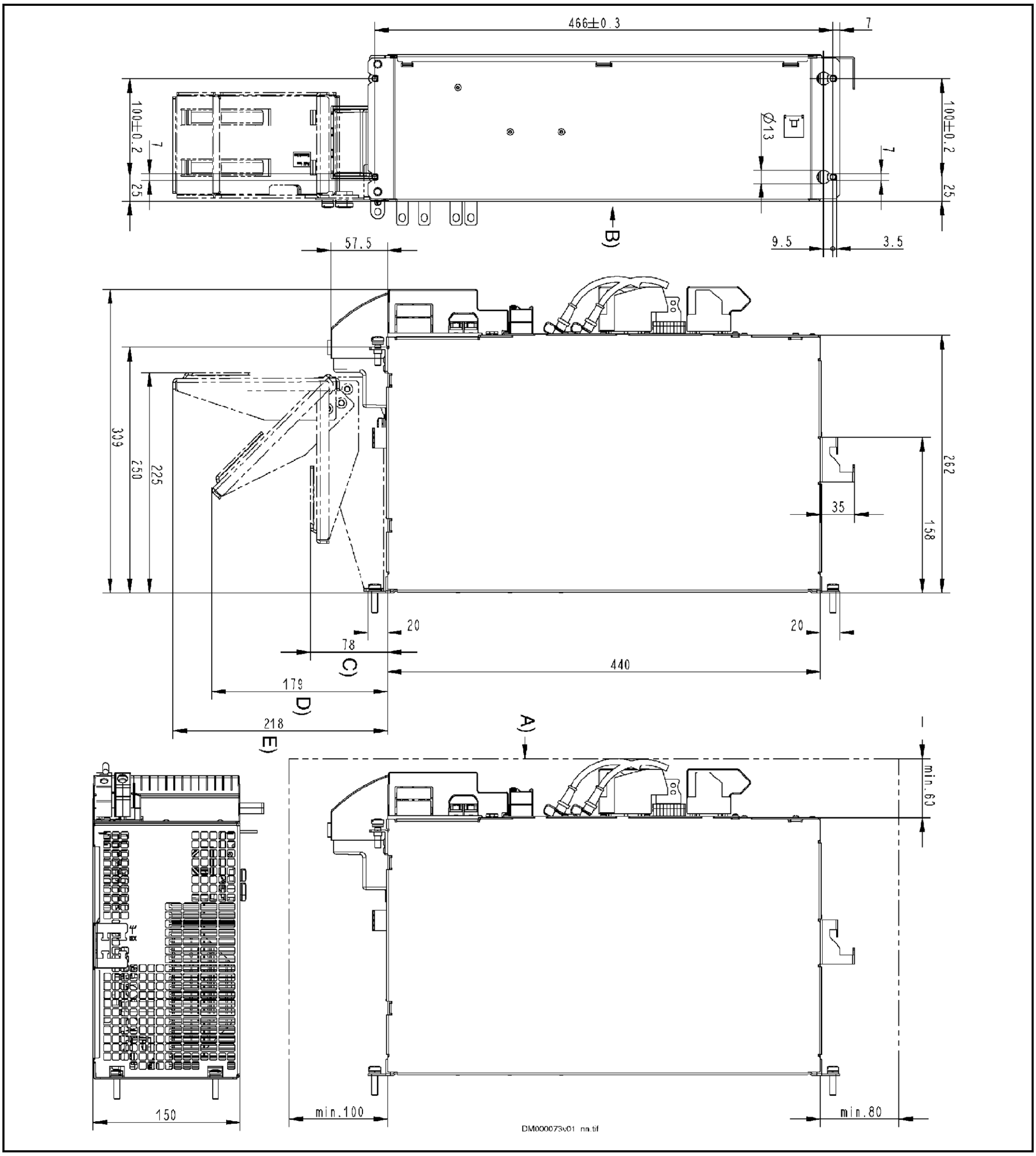
D) Dimensions for accessory HAS02.1 when motor cable run with 45°

E) Dimensions for accessory HAS02.1 when motor cable run vertically

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

Power sections for inverters - IndraDrive M

HMS01.1N-W0150



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

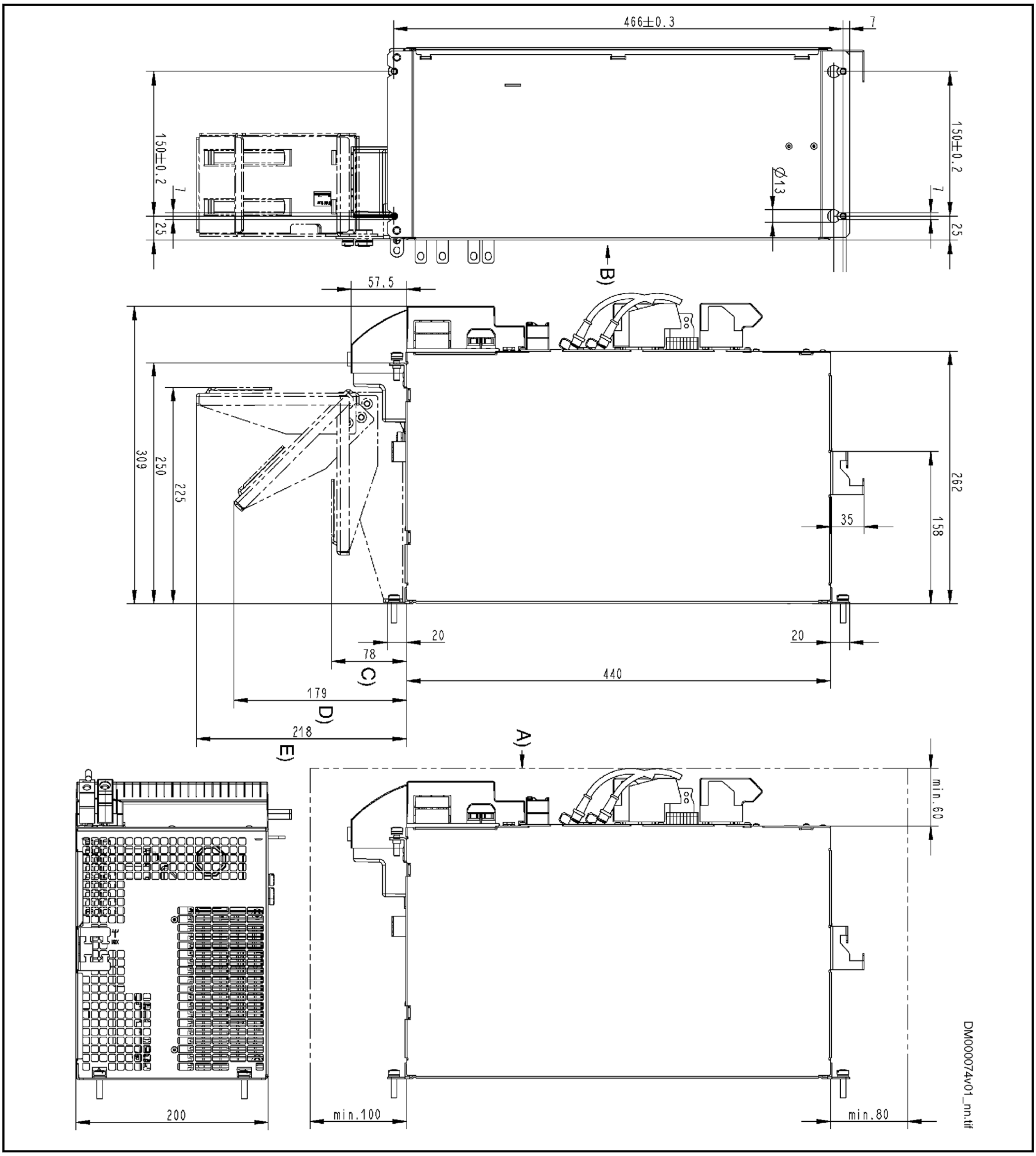
D) Dimensions for accessory HAS02.1 when motor cable run with 45°

E) Dimensions for accessory HAS02.1 when motor cable run vertically

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

Power sections for inverters - IndraDrive M

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!

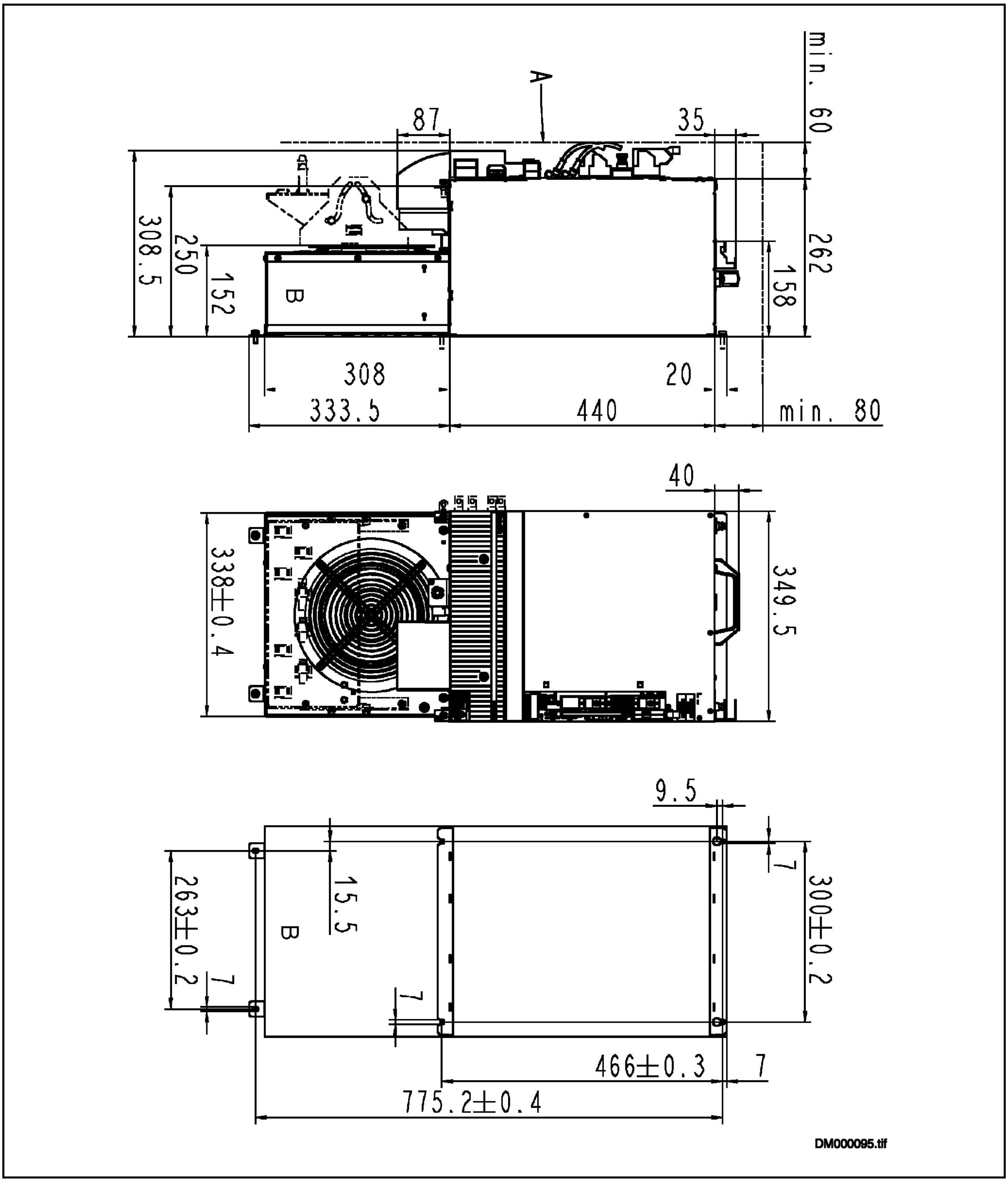
C) Dimensions for accessory HAS02.1 when motor cable run horizontally

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

Power sections for inverters - IndraDrive M

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-W350

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 height1)	H	mm	440			
Device depth2)	T	mm	262			
Device width3)	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			
Last modification: 2007-07-18						

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

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

Data for mass, dimensions, sound pressure level, insulation

Description	Symbol	Unit	HMS01.1N-W0110	HMS01.1N-W0150	HMS01.1N-W0210	HMS01.1N-W0300	HMS01.1N-W0350
Mass	m	kg	11.06	12.74	16.44		31.70
Device height1)	H	mm	440				
Device depth2)	T	mm	262				
Device width3)	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
Last modification: 2013-11-15							

1) 2) 3) Housing dimension; see also related dimensional drawing
4) According to DIN EN ISO 11205; comparative value at distance 1 m, out of cabinet; HCS types with order code -L***: 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			
	f_{Ta}	%/K	2.0			
Allowed mounting position			G1			
Cooling type			Forced ventilation			
Volumetric capacity of forced cooling	V	m^3/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
Last modification: 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				
	f_{Ta}	%/K	2.0				
Allowed mounting position			G1				
Cooling type			Forced ventilation				
Volumetric capacity of forced cooling	V	m^3/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
Last modification: 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

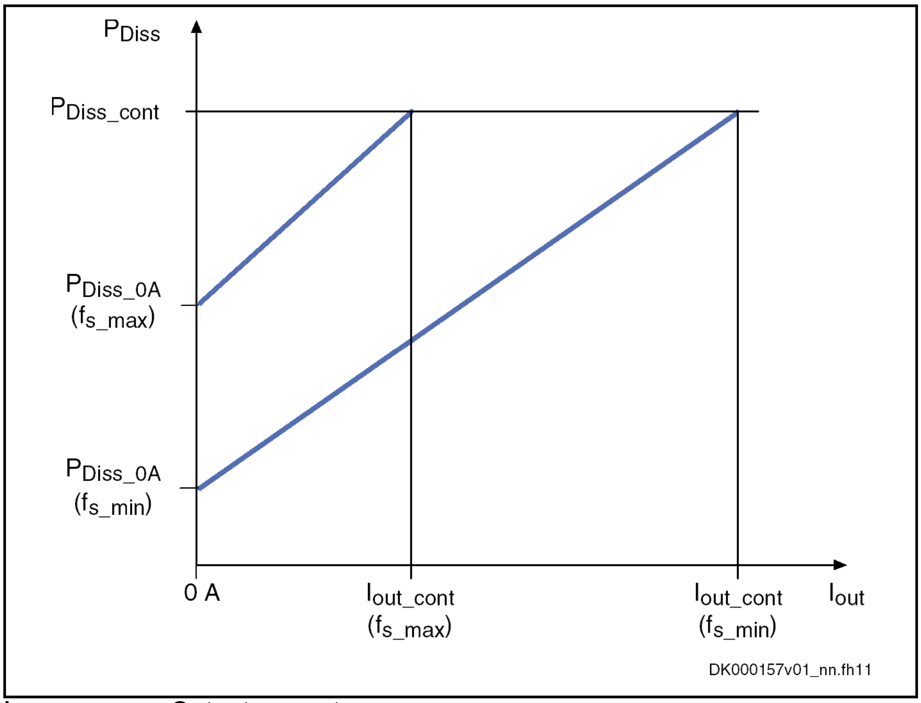
5) 6) See fig. "Air intake and air outlet at device"

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".

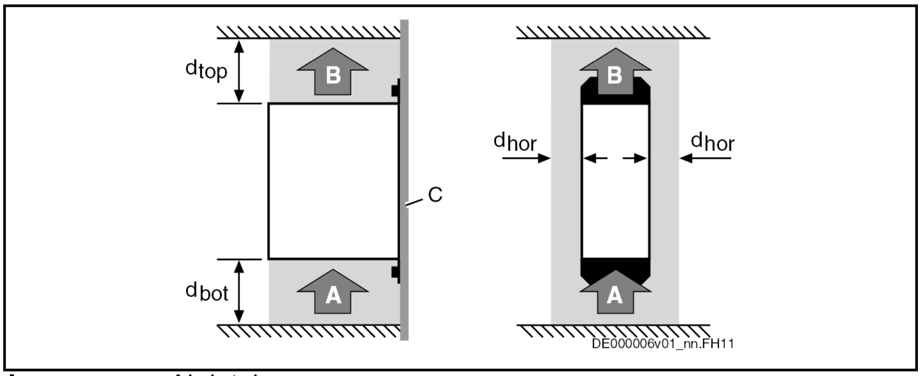
Distances

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 power section HMS01

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 input1)	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			
Last modification: 2007-07-17						

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
Input capacitance	C_{N3}	mF	0.47			
Rated power consumption control voltage input at U_{N3} 4)	P_{N3}	W	10	15	10	16
Last modification: 2007-07-17						

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

Tab. 6-11: HMS - Data for control voltage supply

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	HMS01.1N-W0110	HMS01.1N-W0150	HMS01.1N-W0210	HMS01.1N-W0300	HMS01.1N-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
Last modification: 2013-11-15							

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

Tab. 6-12: HMS - Data for control voltage supply

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			
Last modification: 2013-08-02						

Tab. 6-13: HMS - Data of Power Section - DC bus

Power section data - DC bus

Description	Symbol	Unit	HMS01.1N-W0110	HMS01.1N-W0150	HMS01.1N-W0210	HMS01.1N-W0300	HMS01.1N-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				
Last modification: 2013-11-15							

Tab. 6-14: HMS - Data of Power Section - 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 for V/Hz (U/f) control	U_{out_eff}	V	~ UDC x 0.71			
Output voltage, fundamental wave for closed-loop operation	U_{out_eff}	V	~ UDC x 0.71			
Last modification: 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 for detecting 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

Last modification: 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			-			
Last modification: 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 fs

Tab. 6-15: HMS - Data of Power Section - Inverter

Power section data - inverter

Description	Symbol	Unit	HMS01.1N-W0110	HMS01.1N-W0150	HMS01.1N-W0210	HMS01.1N-W0300	HMS01.1N-W0350
Allowed switching frequencies 1)	f_s	kHz	4, 8, 12, 16				4, 8, 12
Output voltage, fundamental wave for V/Hz (U/f) control	U_{out_eff}	V	~ UDC x 0.71				
Output voltage, fundamental wave for 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				
Last modification: 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 for detecting 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

Last modification: 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			-				
Last modification: 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 fs

Tab. 6-16: HMS - Data of Power Section - 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 → On 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
Last modification: 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
Last modification: 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	$I_{out\_base4\_12}$	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)]	$I_{out\_peak4\_16}$	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	$I_{out\_base4\_16}$	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)]	$I_{out\_peak5\_12}$	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	$I_{out\_base5\_12}$	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)]	$I_{out\_peak5\_16}$	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	$I_{out\_base5\_16}$	A	2.50	5.54	7.22	8.63
Last modification: 2006-09-20						

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

file
UEL_I_e

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
Last modification: 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
Last modification: 2013-11-15							

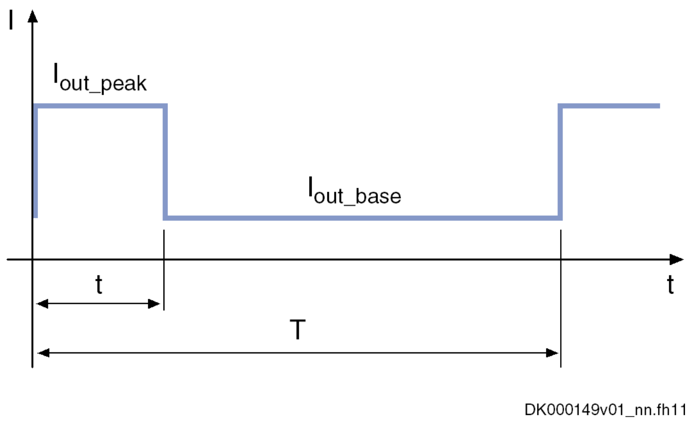
Description	Symbol	Unit	HMS01.1 N-W0110	HMS01.1 N-W0150	HMS01.1 N-W0210	HMS01.1 N-W0300	HMS01.1 N-W0350
Base load current at $I_{out\_peak\_4}$; f_s = 12 kHz; t = 60 s; T = 5 min; K = 1.5	$I_{out\_base4\_12}$	A	21.56	34.67	52.45	52.62	89.00
Maximum output current at $I_{out\_base\_4}$; f_s = 16 kHz; t = 60 s; T = 5 min; K = 1.5[15)]	$I_{out\_peak4\_16}$	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	$I_{out\_base4\_16}$	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)]	$I_{out\_peak5\_12}$	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	$I_{out\_base5\_12}$	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)]	$I_{out\_peak5\_16}$	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	$I_{out\_base5\_16}$	A	23.55	34.13	50.42	54.03	-
Last modification: 2013-11-15							

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

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
current profile "UEL_I_e" 	The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.

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 $f_s = f_s$ (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

Selection of 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
Last modification: 2006-11-13						

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

Tab. 6-20: HMS - Selection of standard motors 3 AC 400V - Exemplary profiles

Selecting standard motors 3 AC 400 V - exemplary profiles

Description	Symbol	Unit	HMS01.1N-W0110	HMS01.1N-W0150	HMS01.1N-W0210	HMS01.1N-W0300	HMS01.1N-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	
Last modification: 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

Selection of 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	
Last modification: 2007-07-18						

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

Tab. 6-22: HMS - Selection of standard motors 3 AC 460V - Exemplary profiles

Selecting standard motors 3 AC 460 V - exemplary profiles

Description	Symbol	Unit	HMS01.1N-W0110	HMS01.1N-W0150	HMS01.1N-W0210	HMS01.1N-W0300	HMS01.1N-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	
Last modification: 2013-11-15							

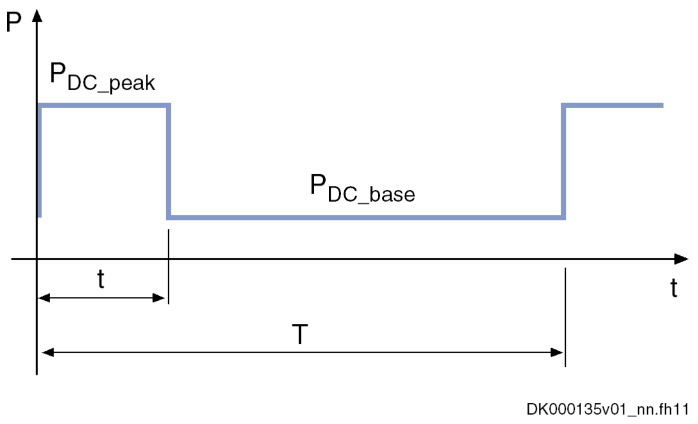
1) 2) 3) 4) See definition profile UEL_P_e; 1 kW ~ 1.36 hp

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
Performance profile "UEL_P_e" 	Characteristic of the selection of standard motors and servo drives.

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

6.2.5 Connections and interfaces

Overview

Overall connection diagram

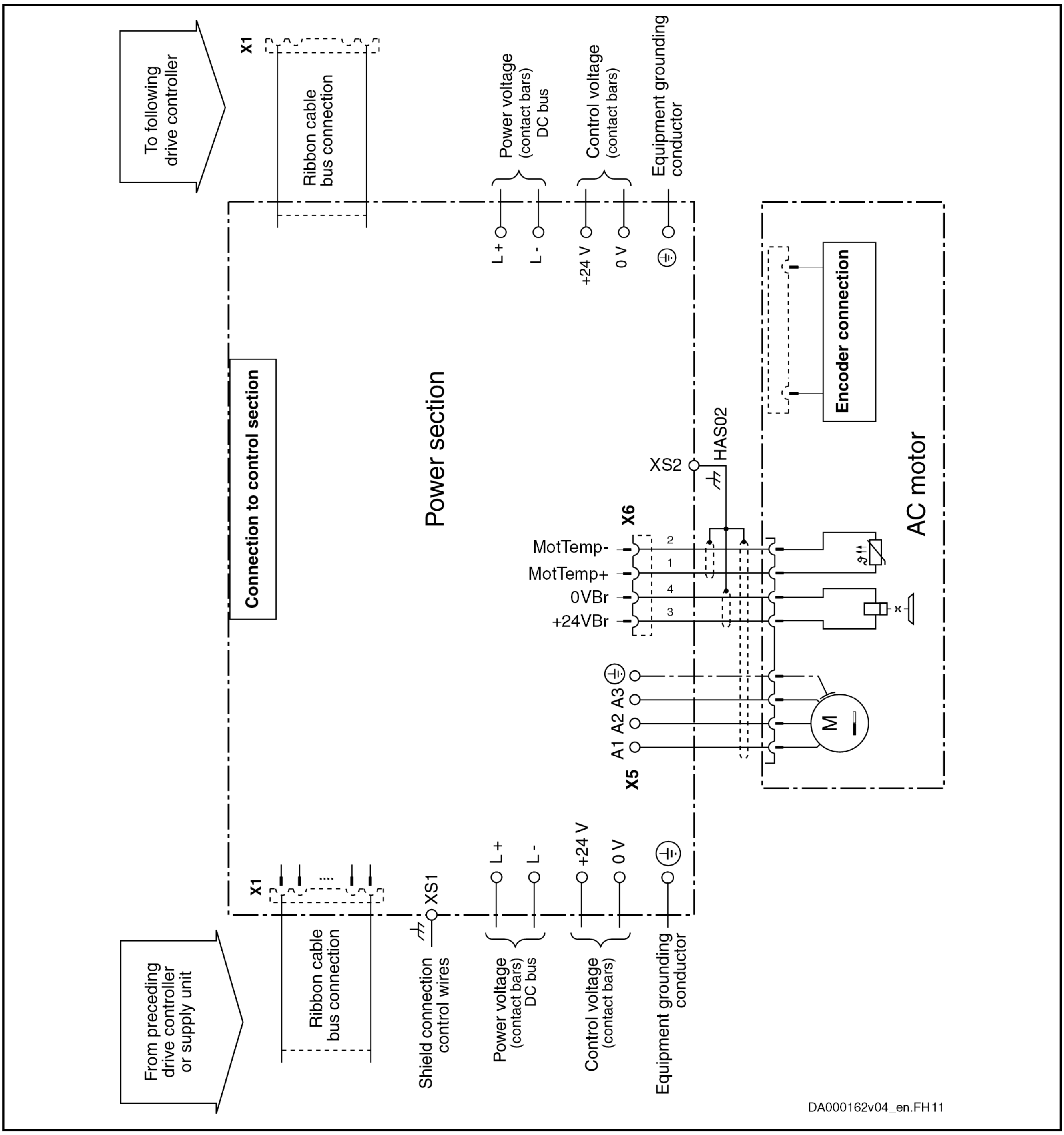
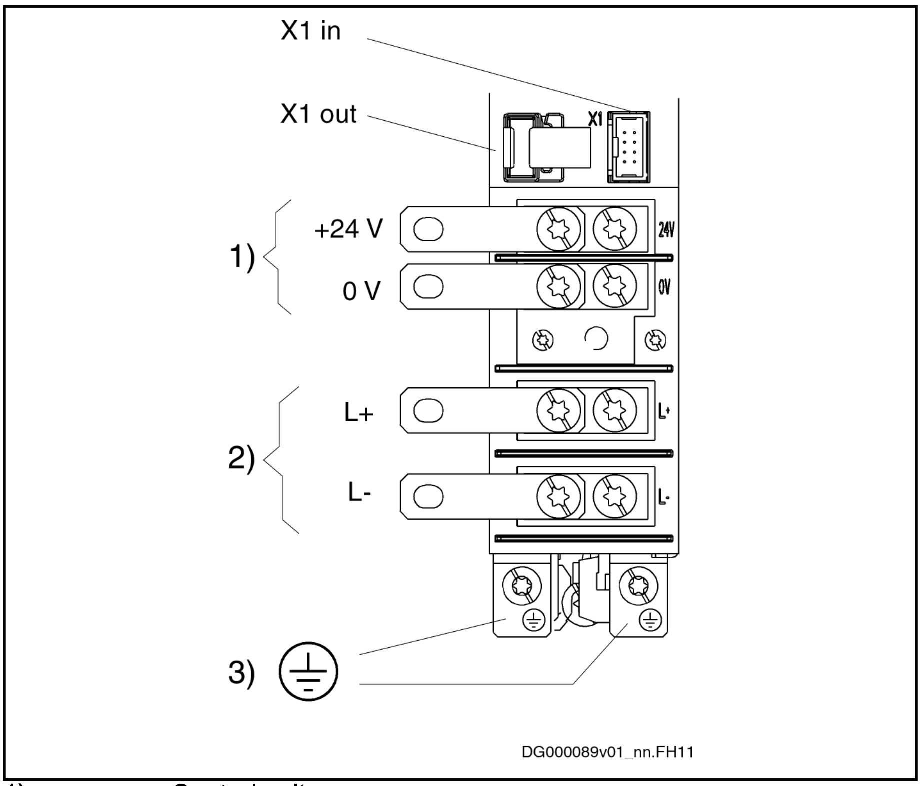


Fig. 6-15: Connection Diagram HMS01.1-Wxxxx

Arrangement of the connection points

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

Connections at power section (front)

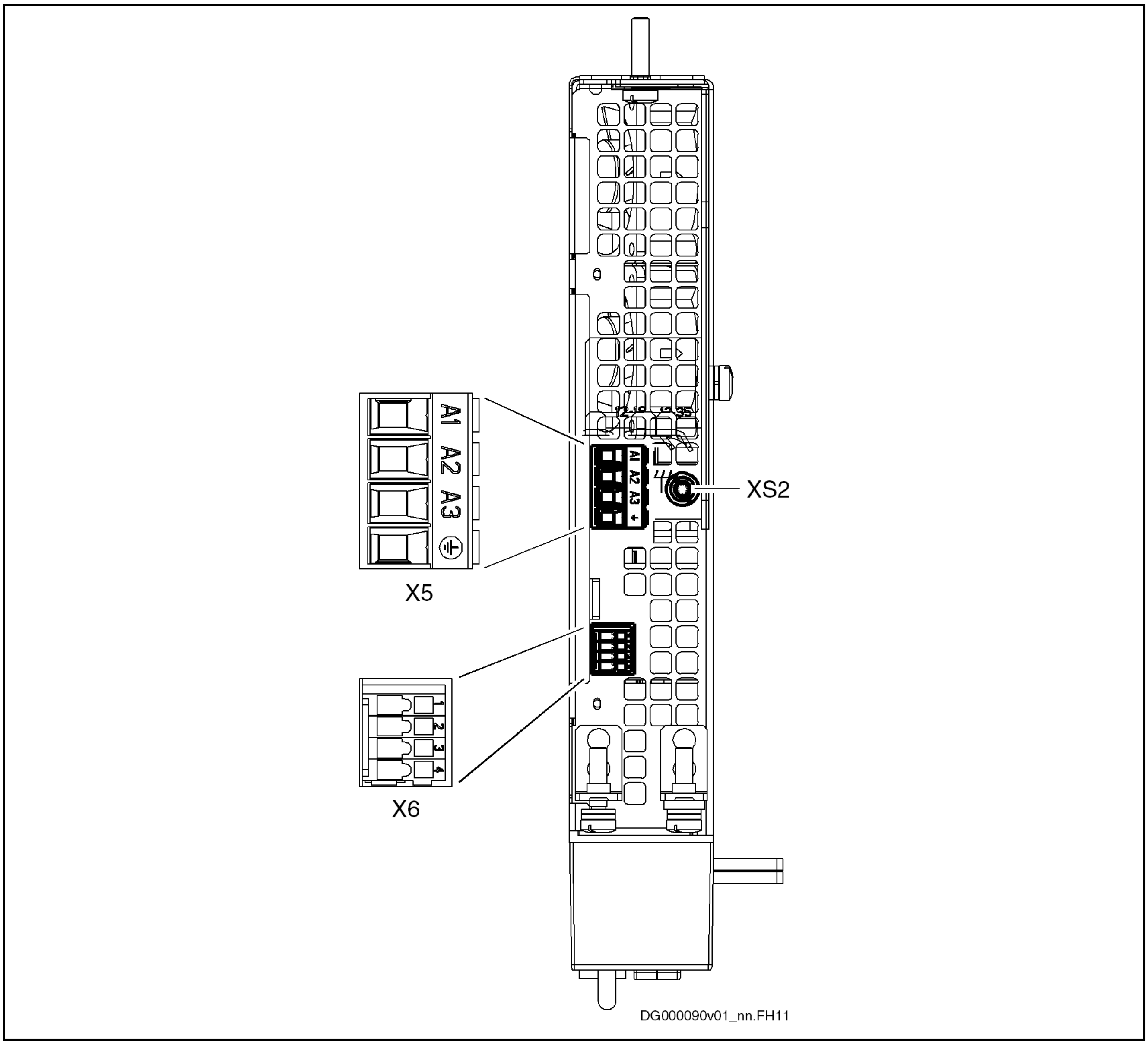


1)	Control voltage
2)	DC bus
3)	Equipment grounding conductor
X1 in, X1 out	Module bus

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

Power sections for inverters - IndraDrive M

Connections at power section (bottom)

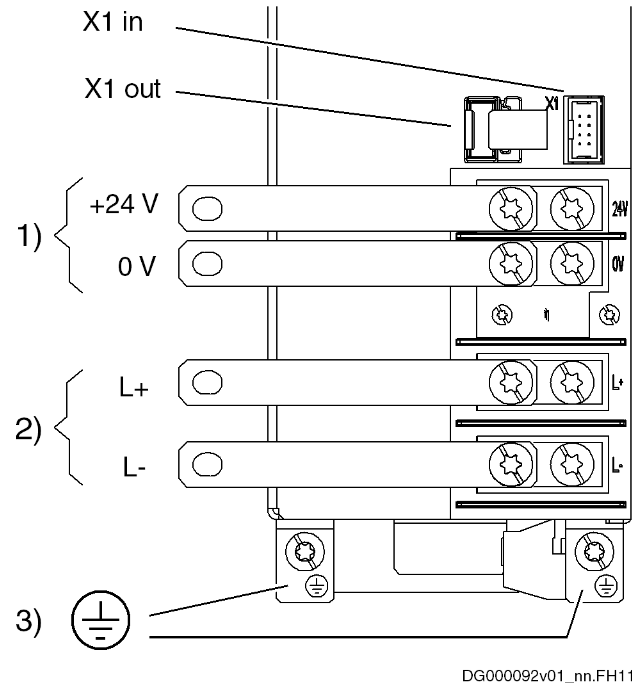


X5	Motor connection
X6	Motor temperature monitoring and motor holding brake
XS2	Thread for mounting the HAS02 accessory to connect the shield of the motor power cable

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)

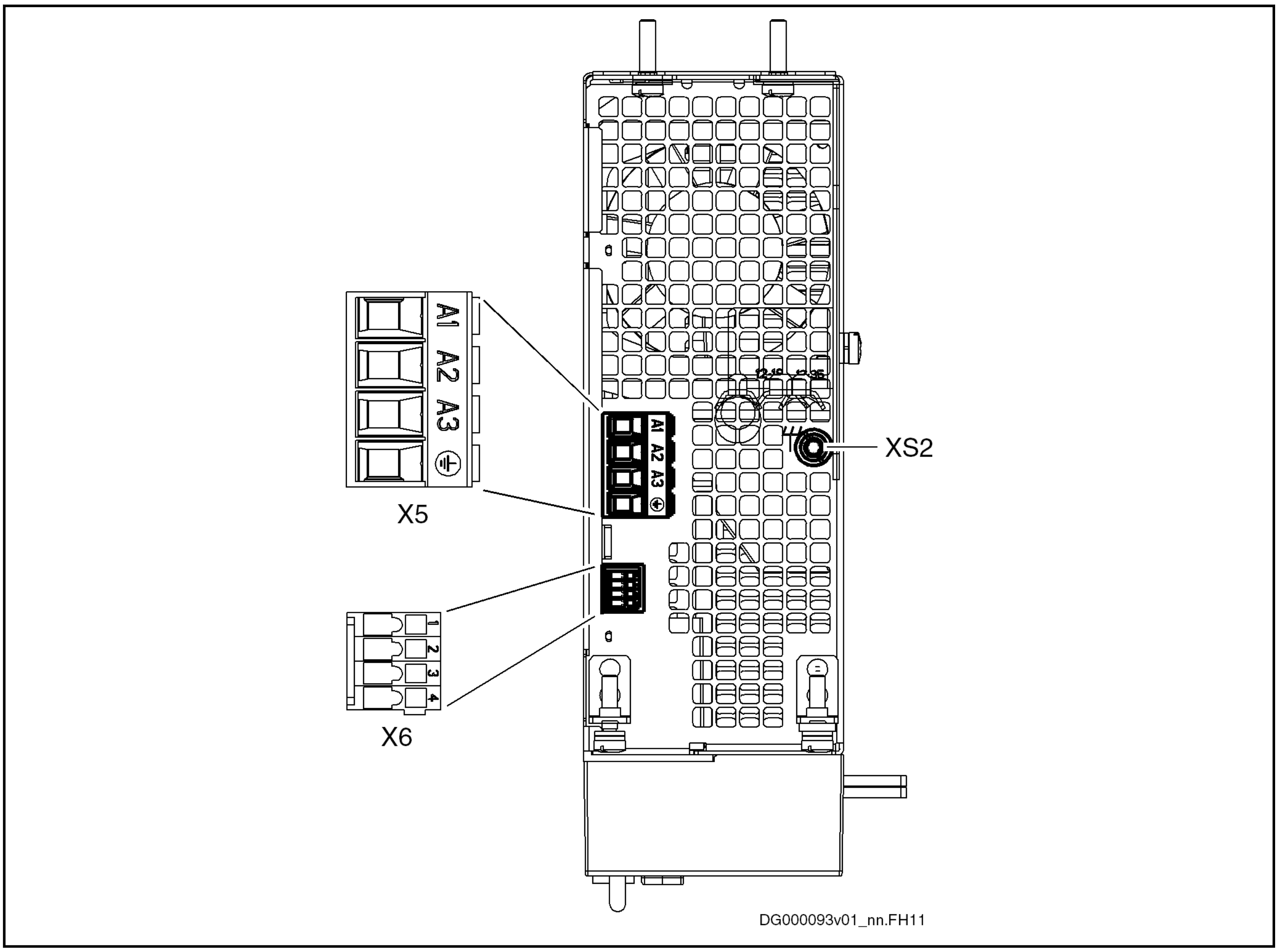


1) Control voltage
2) DC bus
3) Equipment grounding conductor
X1 in, X1 out Module bus

Fig. 6-18: Connections at Power Section (Front) HMS01.1N-W0054 and -W0070

Power sections for inverters - IndraDrive M

Connections at power section (bottom)

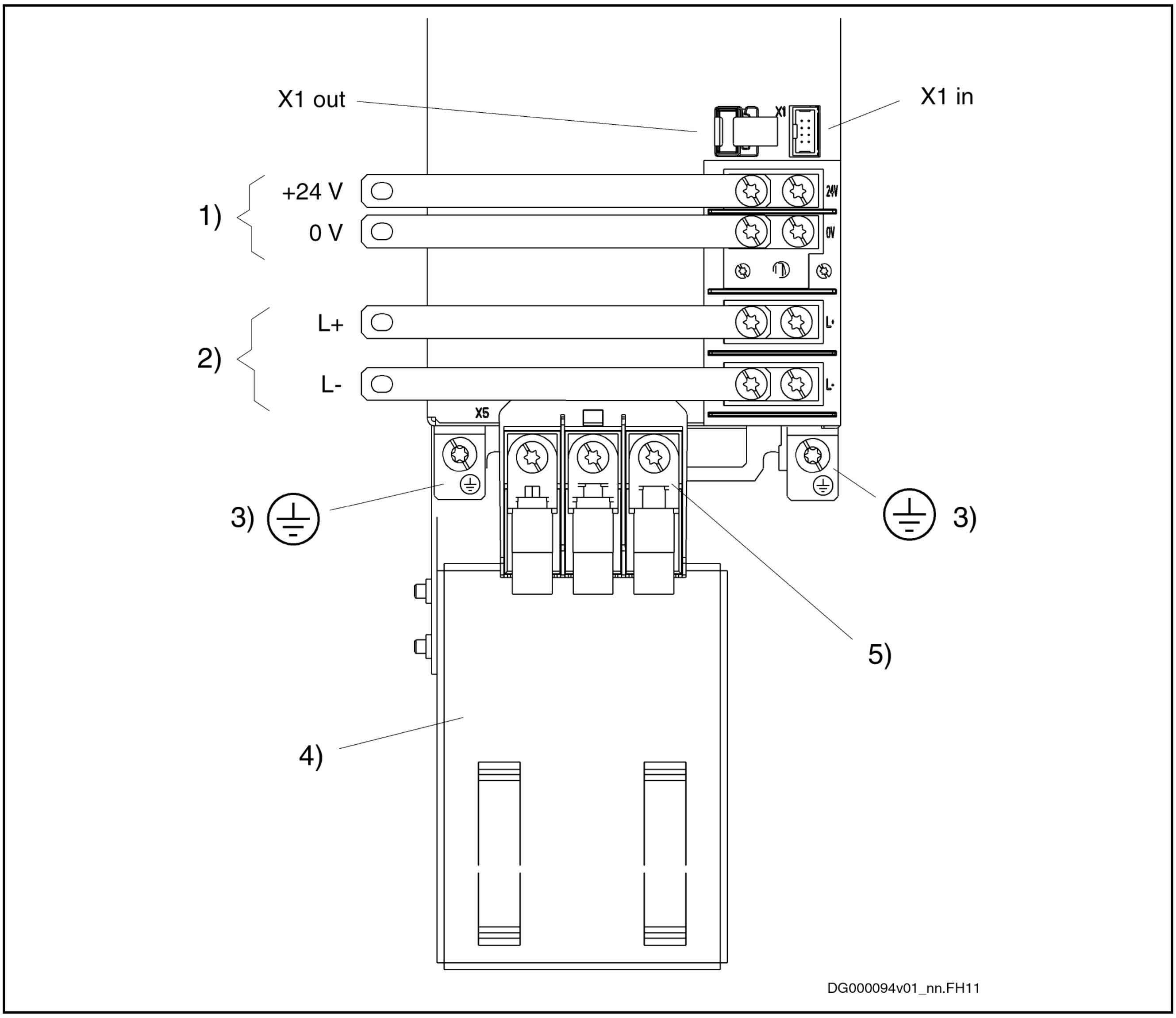


X5 Motor connection
X6 Motor temperature monitoring and motor holding brake
XS2 Thread for mounting the HAS02 accessory to connect the shield of the motor power cable

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)

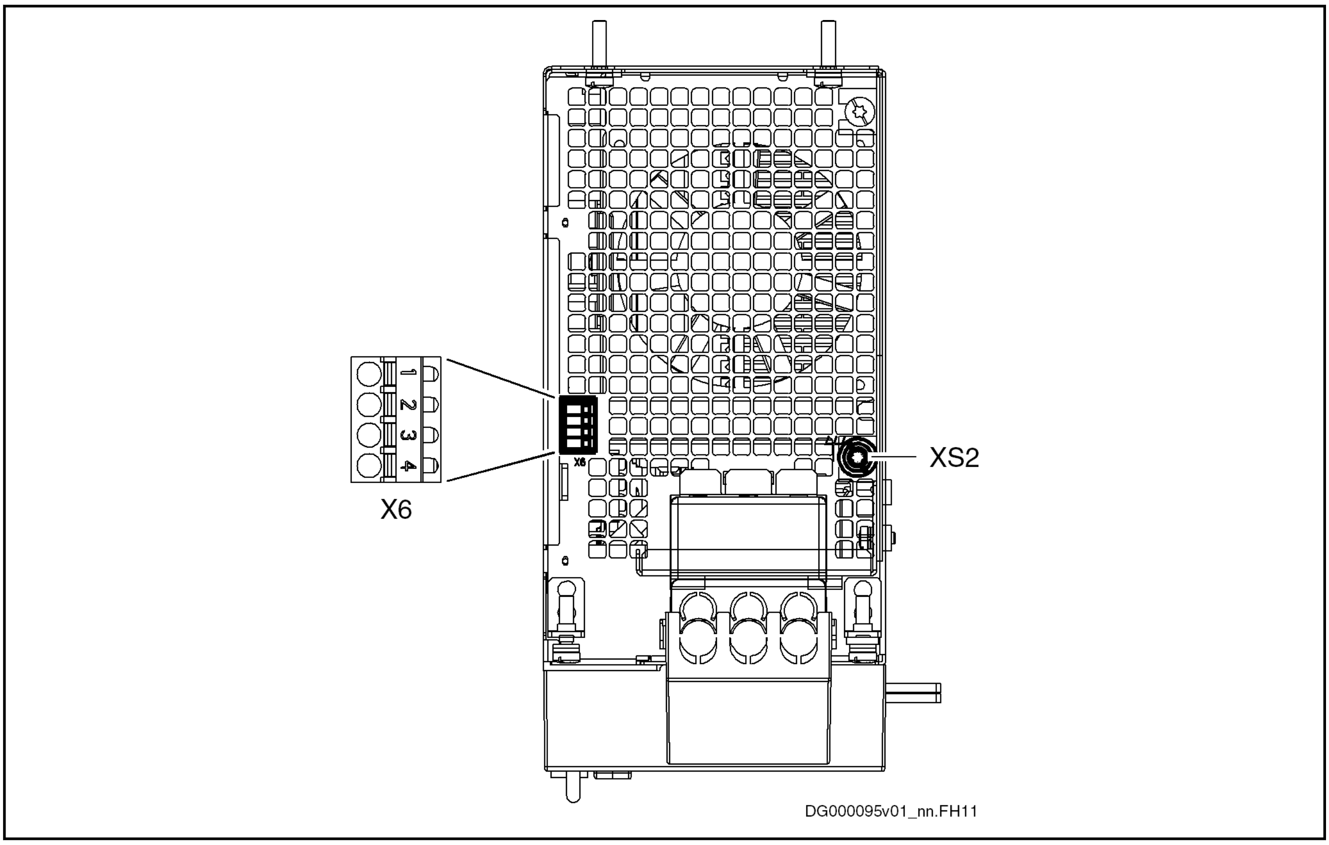


1)	Control voltage
2)	DC bus
3)	Equipment grounding conductor
4)	Plate for shield connection of motor cable (optional)
5)	Motor connection
X1 in, X1 out	Module bus

Fig. 6-20: Connections at Power Section (Front) HMS01.1N-W0110, HMS01.1N-W0150, HMS01.1N-W0210, HMS01.1N-W0300

Power sections for inverters - IndraDrive M

Connections at power section (bottom)



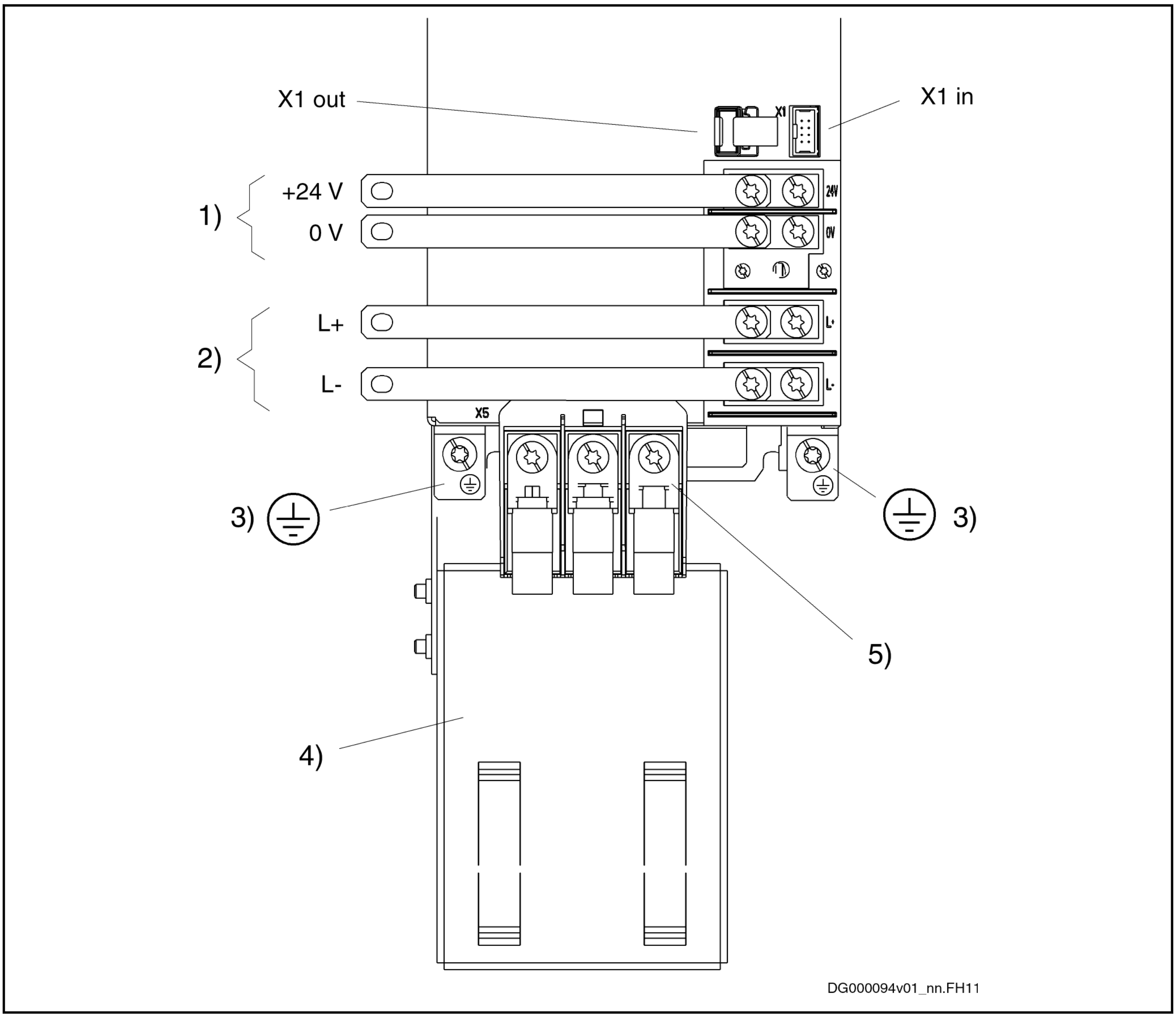
X6 Motor temperature monitoring and motor holding brake

XS2 Thread for mounting the HAS02 accessory 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)

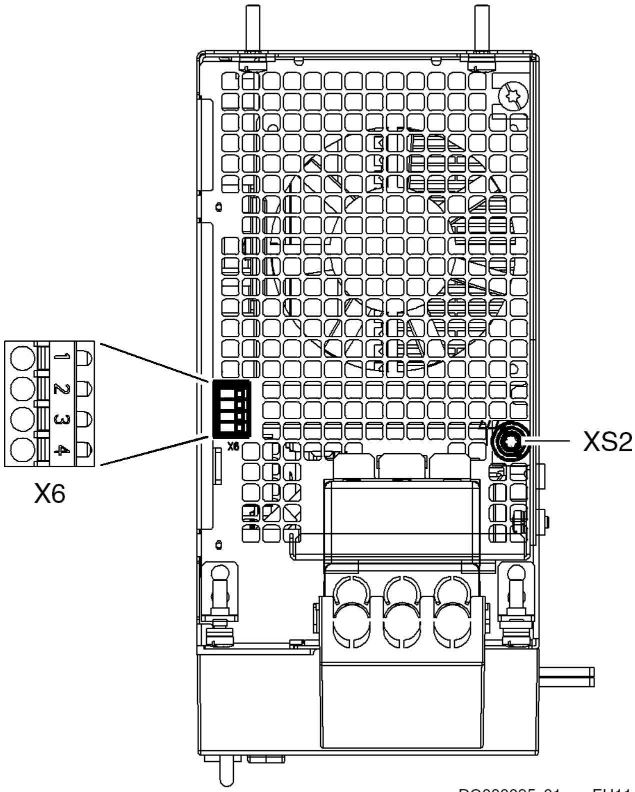


1)	Control voltage
2)	DC bus
3)	Equipment grounding conductor
4)	Plate for shield connection of motor cable (optional)
5)	Motor connection
X1 in, X1 out	Module bus

Fig. 6-22: Connections at Power Section (Front) HMS01.1N-W0350

Power sections for inverters - IndraDrive M

Connections at power section (bottom)



X6	Motor temperature monitoring and motor holding brake
XS2	Thread for mounting the HAS02 accessory to connect the shield of the motor power cable

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 271.

Touch guard

The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

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.

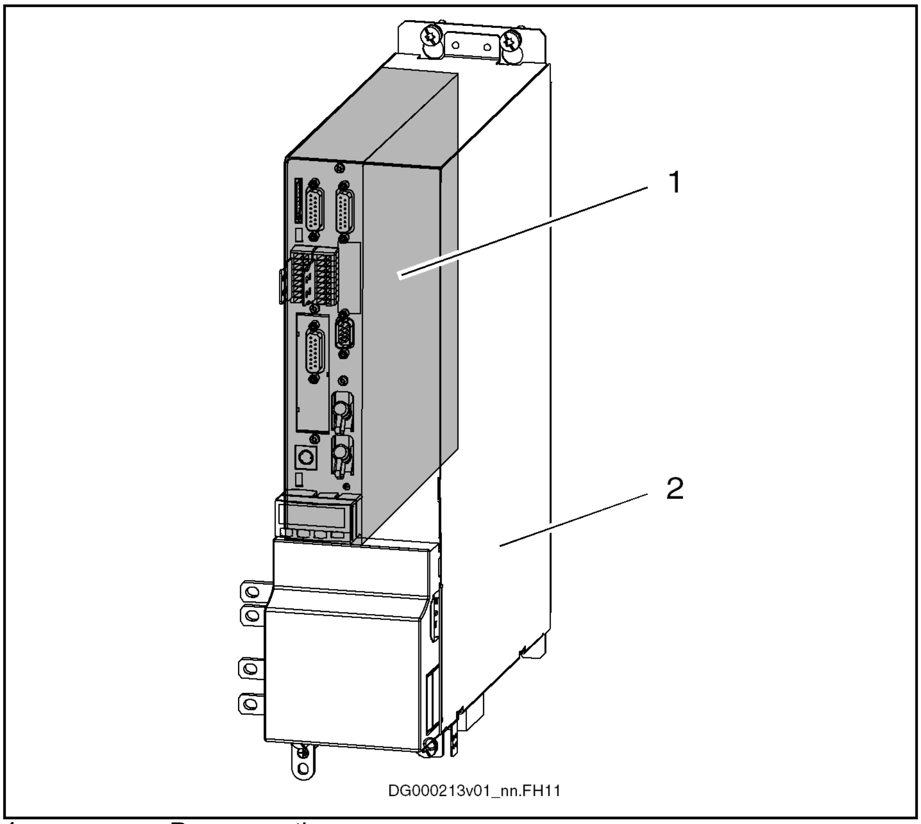
Use

The different types are used as follows:

Type	Use
HMS02.1N-Wxxxx-NNNN	• Single-axis device • Operation of a three-phase a.c. motor (asynchronous or synchronous motor).

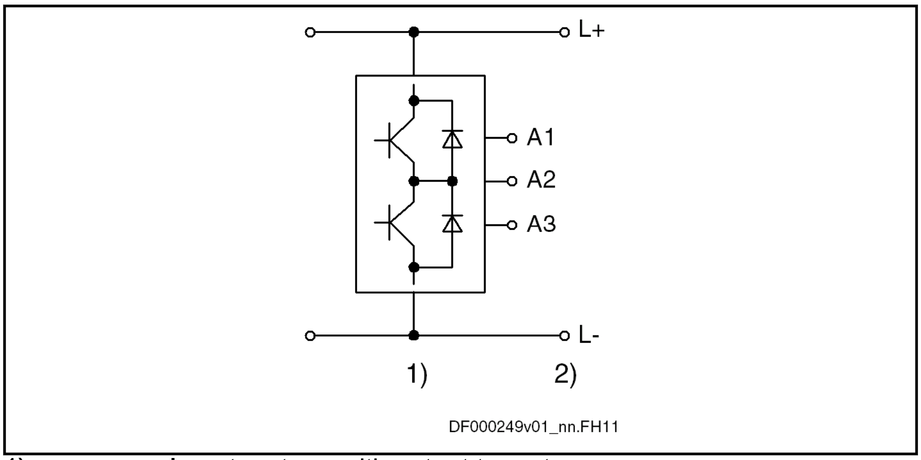
Tab. 6-25: Use

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.

Power sections for inverters - IndraDrive M

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
Example:	H	M	S	0	2	.	1	N	-	W	0	0	2	8	-	A	-	0	7	-	N	N	N	N	

Product
HMS . . . . = HMS

Line
2. . . . . = 02

Design
1 . . . . = 1

Power supply
Without . . . . = N

Cooling mode
Liquid cooling. . . . . = F
Air, internal (through integrated blower) = W (1)

Maximum current
28 A . . . . = 0028
54 A . . . . = 0054
70 A . . . . = 0070
110 A . . . . = 0110
150 A . . . . = 0150
210 A . . . . = 0210

Degree of protection
IP20 . . . . = A

DC bus nominal voltage
DC 700 V. . . . . = 07

Other design
None . . . . = NNNN

Note
(1) Cooling mode "W" is only available with Maximum current "0028" and "0054"

Standard reference

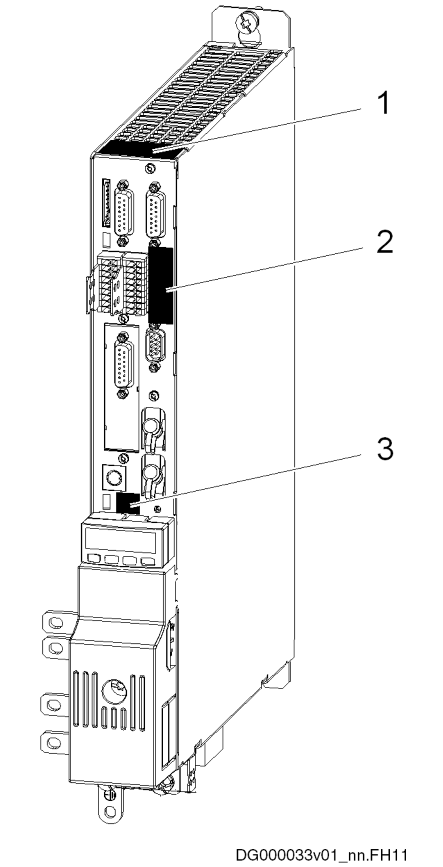
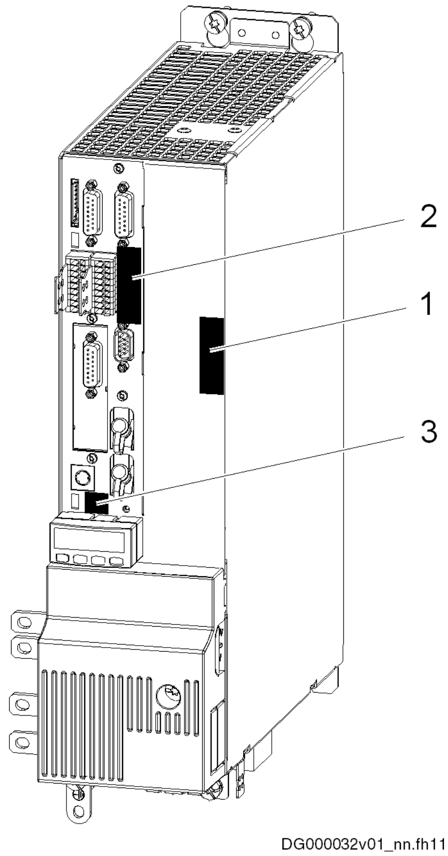
Standard	Title	Edition
DIN EN 60529	Degrees of protection provided by enclosures (IP-Code)	2000-09

DT000018v02_en.fh11

Fig. 6-26: Type Code HMS02

Identification

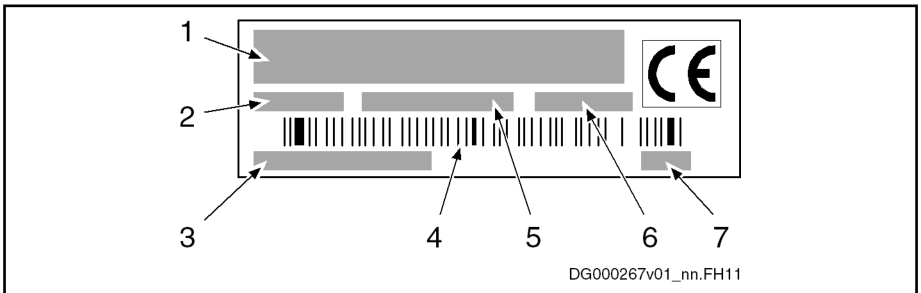
Type plate arrangement

HMS02.1N-W0028	HMS02.1N-W0054
	

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 (power sections, supply units)



1 Device type
2 Part number
3 Serial number
4 Bar code
5 Country of manufacture
6 Production week; e.g. 08W23 meaning year 2008, week 23
7 Hardware index

Fig. 6-27: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL data

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	15.0	25.0
Last modification: 2009-01-28				

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

Tab. 6-27: HMS - Ambient and Operating Conditions - UL Ratings

Applied standards

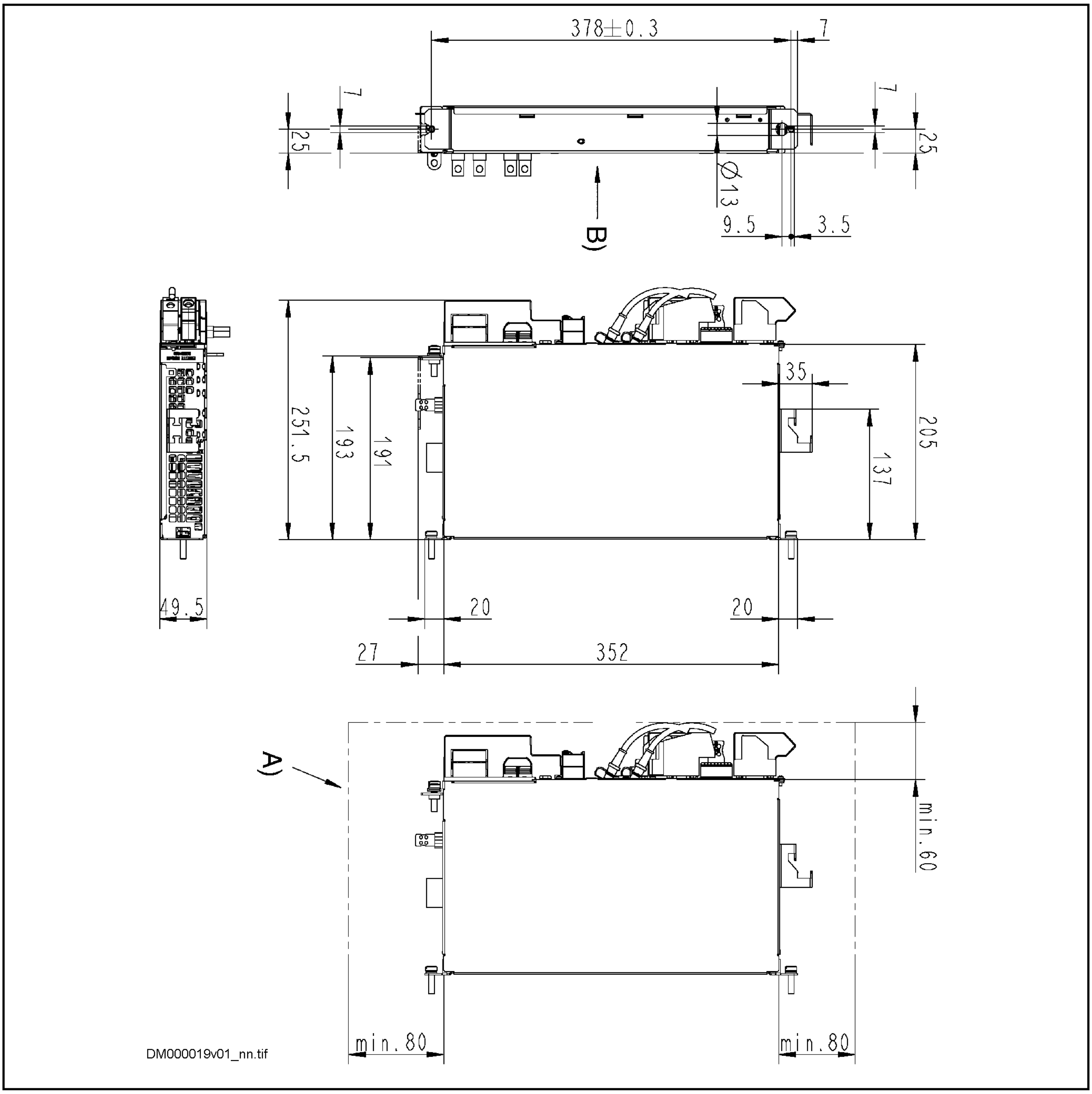
Description	Symbol	Unit	HMS02.1N-W0028	HMS02.1N-W0054
Listing in accordance with UL standard			UL 508C	
UL-Files			E134201	
Listing in accordance with CSA standard			C22.2 No. 274-13	
Last modification: 2017-01-23				

Tab. 6-28: HMS - Applied Standards

Mechanics and mounting

Dimensional drawings

Dimensions HMS02.1N-W0028



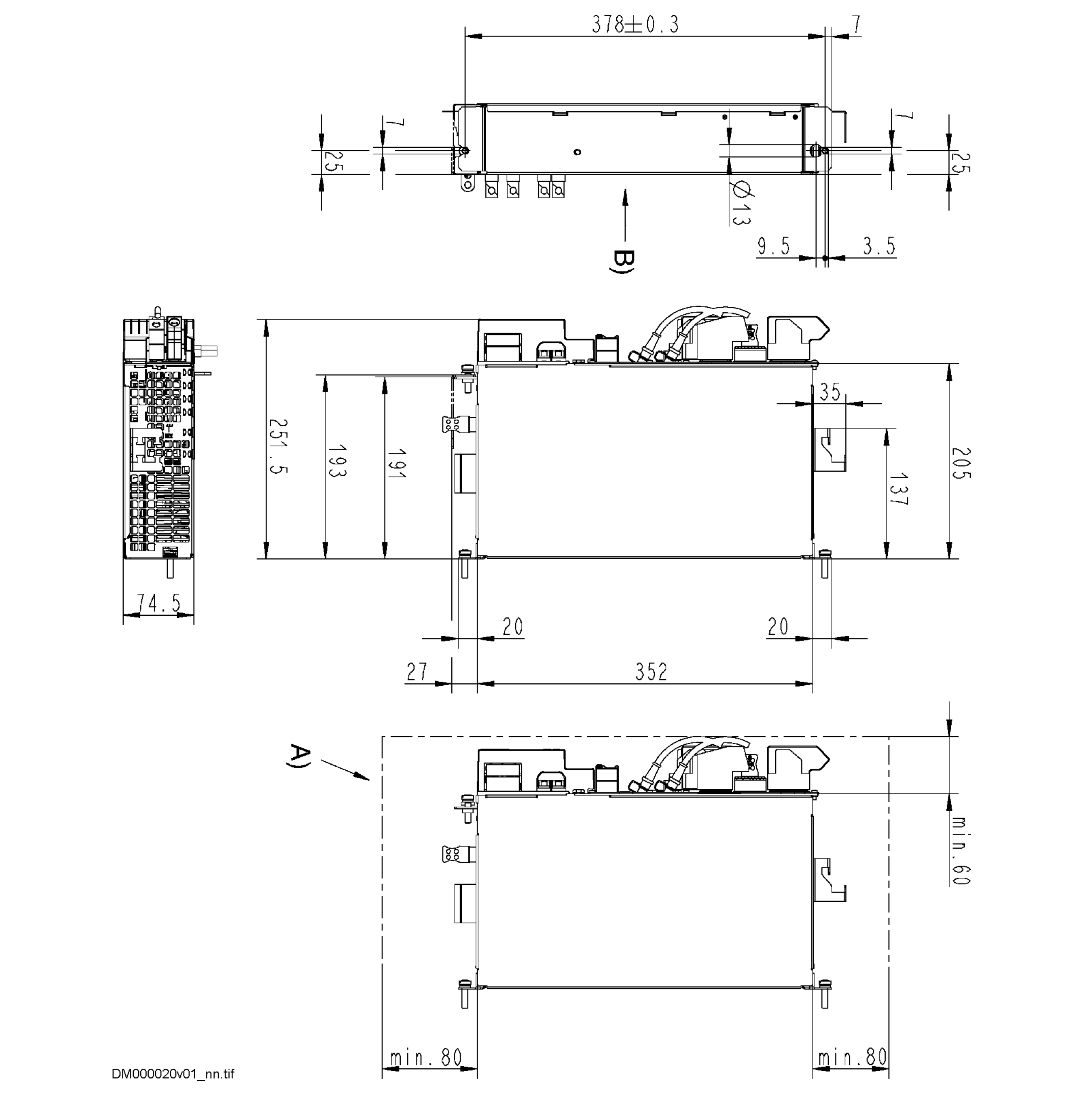
A) Minimum mounting clearance (plus additional space for motor cable)
Note: Rexroth IndraDrive supply units require greater mounting clearance!

B) Rear view!

Fig. 6-28: Dimensions HMS02.1N-W0028

Power sections for inverters - IndraDrive M

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	
Last modification: 2007-01-02				

1) 2) 3) Housing dimension; see also related dimensional drawing
4) According to DIN EN ISO 11205; comparative value at distance 1 m, out of cabinet; HCS types with order code -L***: 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	
	f_{Ta}	%/K	2	
Allowed mounting position			G1	
Cooling type			Forced ventilation	
Volumetric capacity of forced cooling	V	m^3/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
Minimum distance on the top of the device[5]	d_{top}	mm	80	
Last modification: 2009-10-26				

Power sections for inverters - IndraDrive M

Description	Symbol	Unit	HMS02.1N-W0028-A-07-NNNN	HMS02.1N-W0054-A-07-NNNN
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	
Last modification: 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

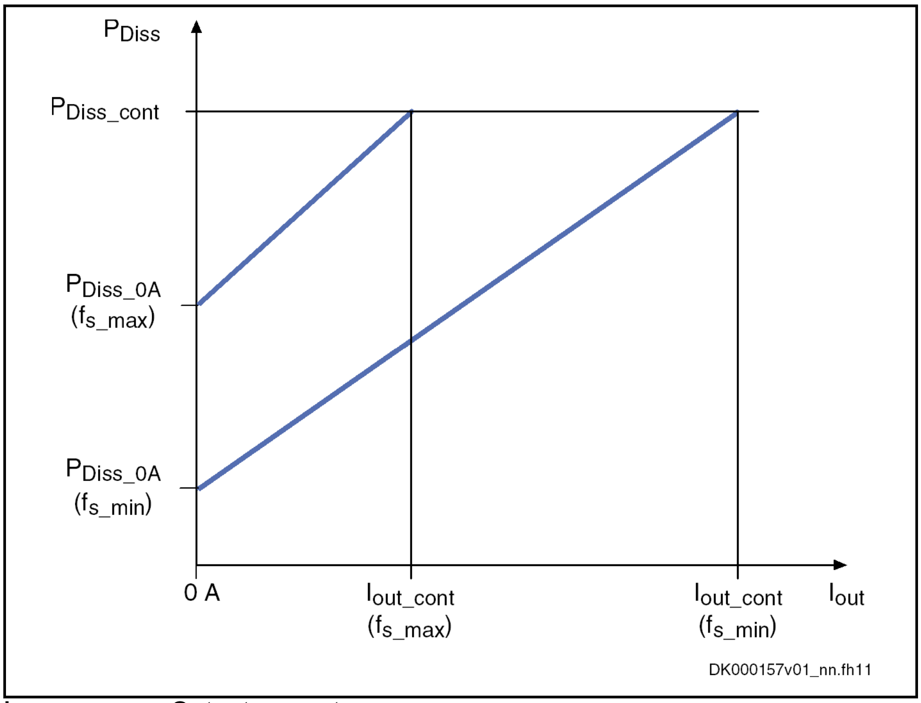
5) 6) See fig. "Air intake and air outlet at device"

Tab. 6-30: 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} Output current

P_{Diss} Power dissipation

f_s 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".

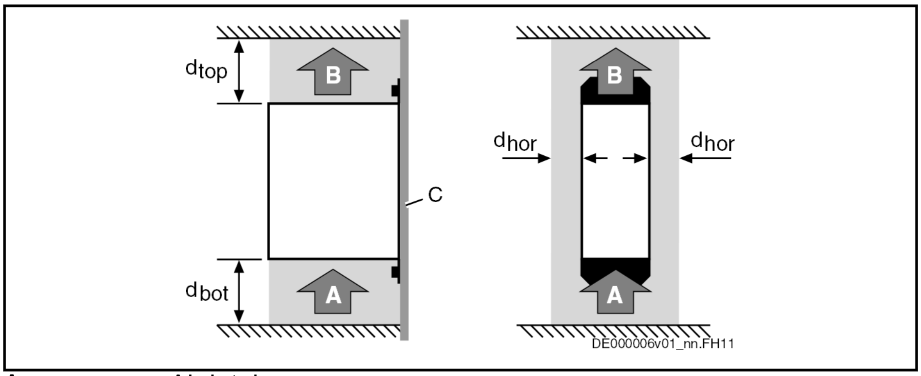
Distances

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 power section HMS02.1N-Wxxxx

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 %	
Last modification: 2007-01-02				

Description	Symbol	Unit	HMS02.1N-W0028-A-07-NNNN	HMS02.1N-W0054-A-07-NNNN
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
Last modification: 2007-01-02				

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

Tab. 6-31: HMS - Data for control voltage supply

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	
Last modification: 2007-07-27				

Tab. 6-32: HMS - Data of Power Section - 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 frequencies1)	f_s	kHz	4, 8	4, 8, 12, 16
Output voltage, fundamental wave for V/Hz (U/f) control	U_{out_eff}	V	~ UDC x 0.71	
Output voltage, fundamental wave for closed-loop operation	U_{out_eff}	V	~ UDC x 0.71	
Last modification: 2007-02-12				

Description	Symbol	Unit	HMS02.1N-W0028-A-07-NNNN	HMS02.1N-W0054-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 for detecting 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
Continuous output current when f_s = 12 kHz[5)]	I_{out_cont12}	A	-	12.7
Continuous output current when f_s = 16 kHz[6)]	I_{out_cont16}	A	-	10.2
Continuous output current when f_s = 2 kHz; output frequency f_{out} less than f_{out_still}	$I_{out\_cont0Hz\_2}$	A	-	
Last modification: 2007-02-12				

Power sections for inverters - IndraDrive M

Description	Symbol	Unit	HMS02.1N-W0028-A-07-NNNN	HMS02.1N-W0054-A-07-NNNN
Continuous output current when f_s = 4 kHz; output frequency f_{out} less than f_{out_still}	$I_{out\_cont0Hz\_4}$	A	9.2	19.2
Continuous output current when f_s = 8 kHz; output frequency f_{out} less than f_{out_still}	$I_{out\_cont0Hz\_8}$	A	5.1	12.5
Continuous output current when f_s = 12 kHz; output frequency f_{out} less than f_{out_still} 7)	$I_{out\_cont0Hz\_12}$	A	-	7.0
Continuous output current when f_s = 16 kHz; output frequency f_{out} less than f_{out_still} 8)	$I_{out\_cont0Hz\_16}$	A	-	5.6
Assigned output filters at nom. data; f_s = 4 kHz			-	
Last modification: 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 fs

Tab. 6-33: HMS - Data of Power Section - 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 → On 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

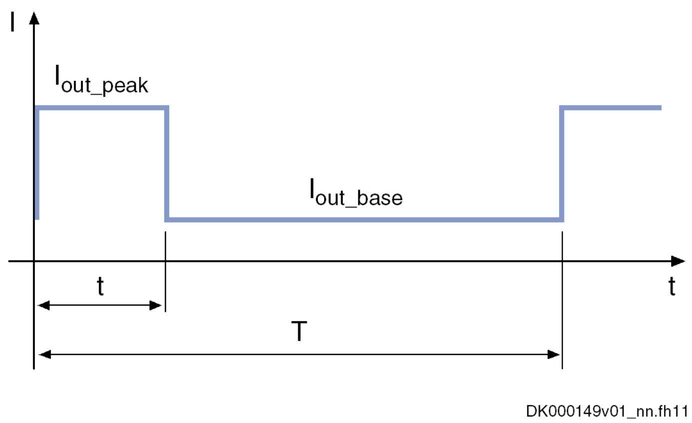
This chapter contains:

- 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
current profile "UEL_I_e" 	The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.

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
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	5.65	12.77
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	-	20.49
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	-	8.20
Last modification: 2007-01-02				

Power sections for inverters - IndraDrive M

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 = 16 kHz; t = 0.4 s; T = 4 s; K = 2.5[5)]	$I_{out\_peak1\_16}$	A	-	16.56
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	-	6.62
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	21.88	43.44
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	10.94	21.72
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	13.35	29.04
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	6.67	14.52
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	-	18.56
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	-	9.28
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	-	14.97
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	-	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	-	
Last modification: 2007-01-02				

Description	Symbol	Unit	HMS02.1N-W0028-A-07-NNNN	HMS02.1N-W0054-A-07-NNNN
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)]	$I_{out\_peak4\_12}$	A	-	15.81
Base load current at $I_{out\_peak\_4}$; f_s = 12 kHz; t = 60 s; T = 5 min; K = 1.5	$I_{out\_base4\_12}$	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)]	$I_{out\_peak4\_16}$	A	-	12.74
Base load current at $I_{out\_peak\_4}$; f_s = 16 kHz; t = 60 s; T = 5 min; K = 1.5	$I_{out\_base4\_16}$	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
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
Last modification: 2007-01-02				

Power sections for inverters - IndraDrive M

Description	Symbol	Unit	HMS02.1N-W0028-A-07-NNNN	HMS02.1N-W0054-A-07-NNNN
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
Last modification: 2007-01-02				

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

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.

Operation with standard motors

Operating standard motors at 3 AC 400 V

In preparation

Operating standard motors at 3 AC 460 V

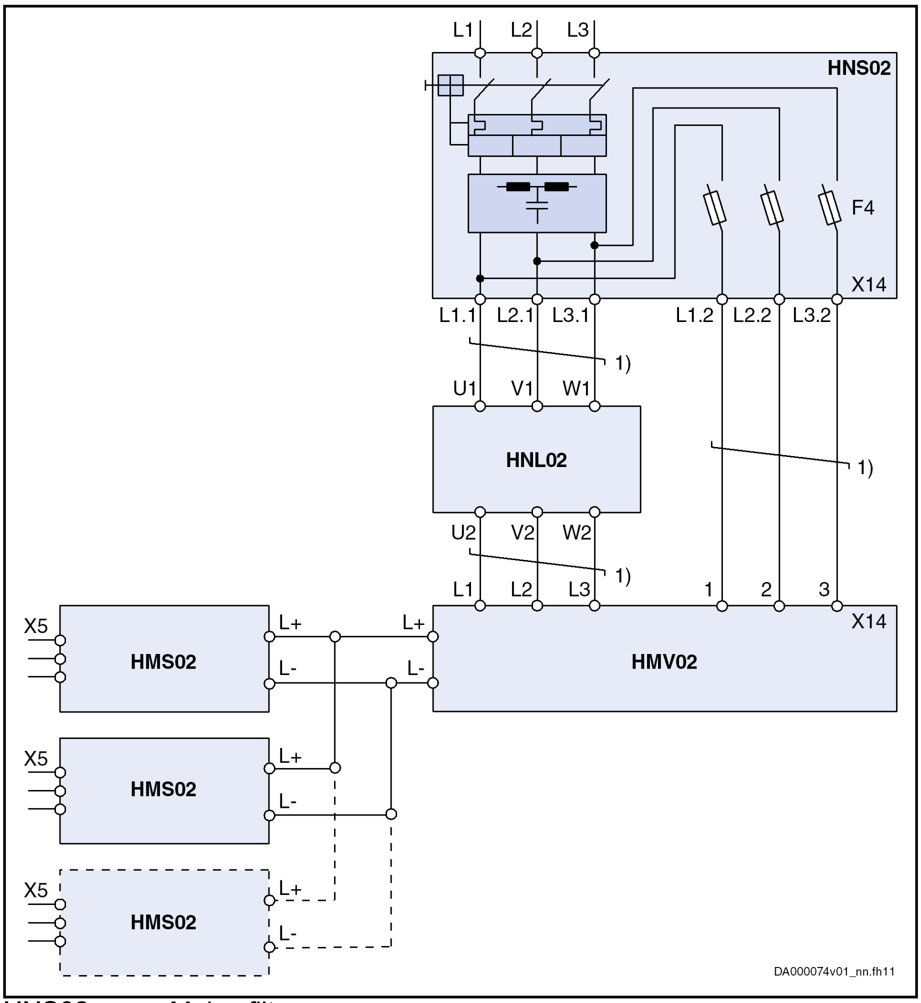
In preparation

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
HMV02 Supply unit
HMS02 Power section

Fig. 6-32: Overall Connection Diagram (Mains Filter, Mains Choke, Supply Unit, Power Section)

Power sections for inverters - IndraDrive M

Connection diagram of power section

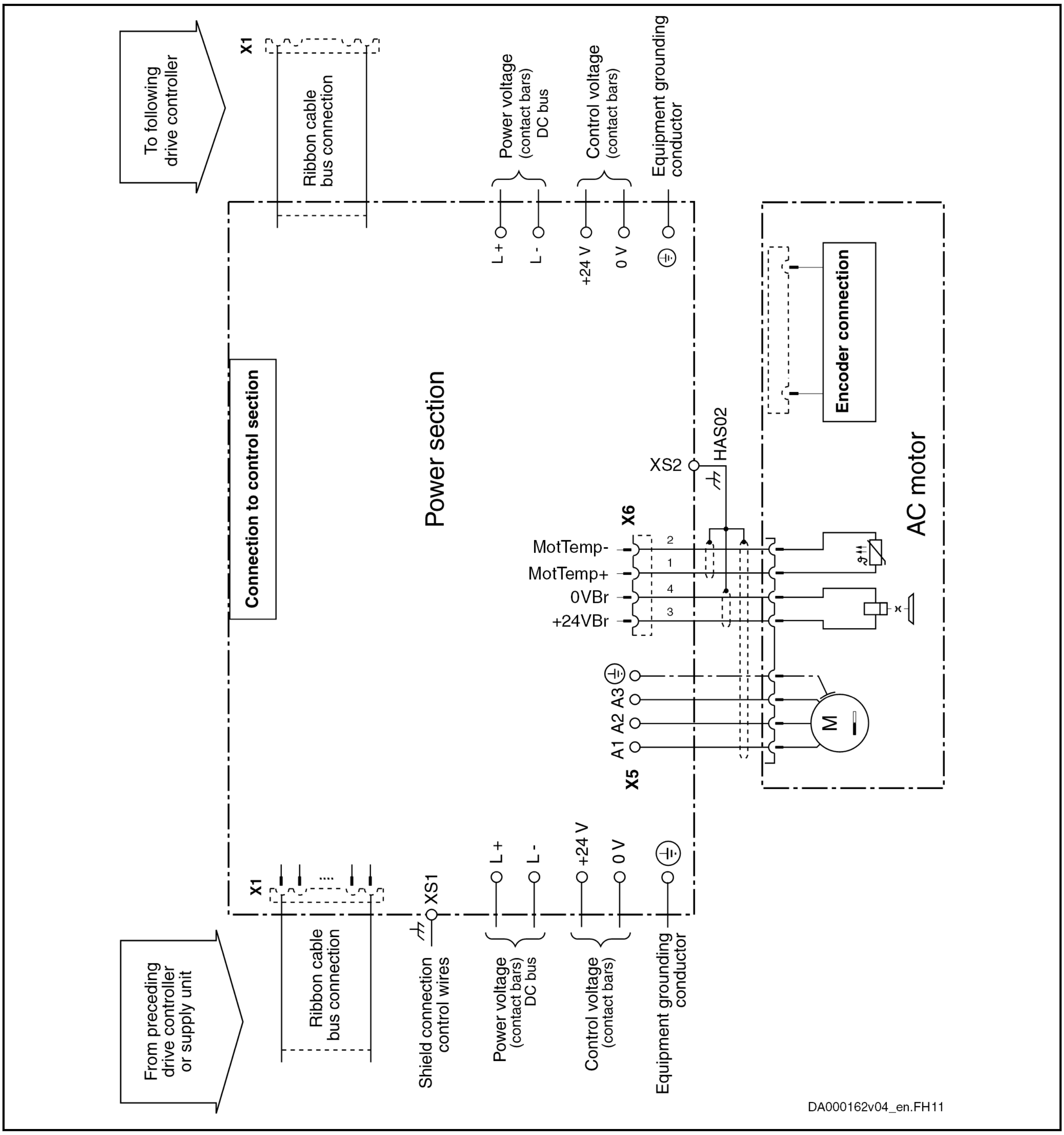
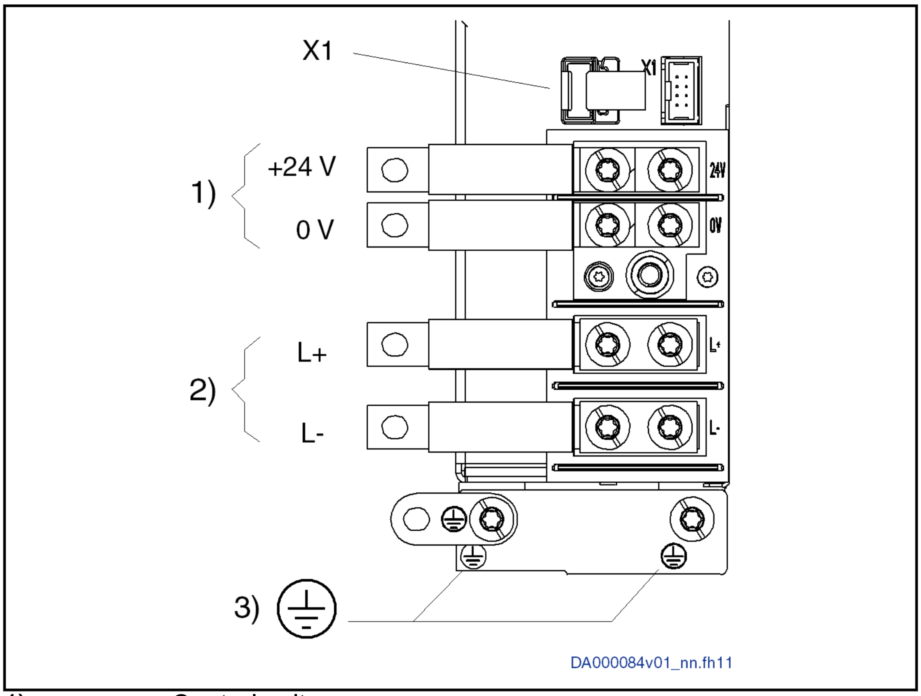


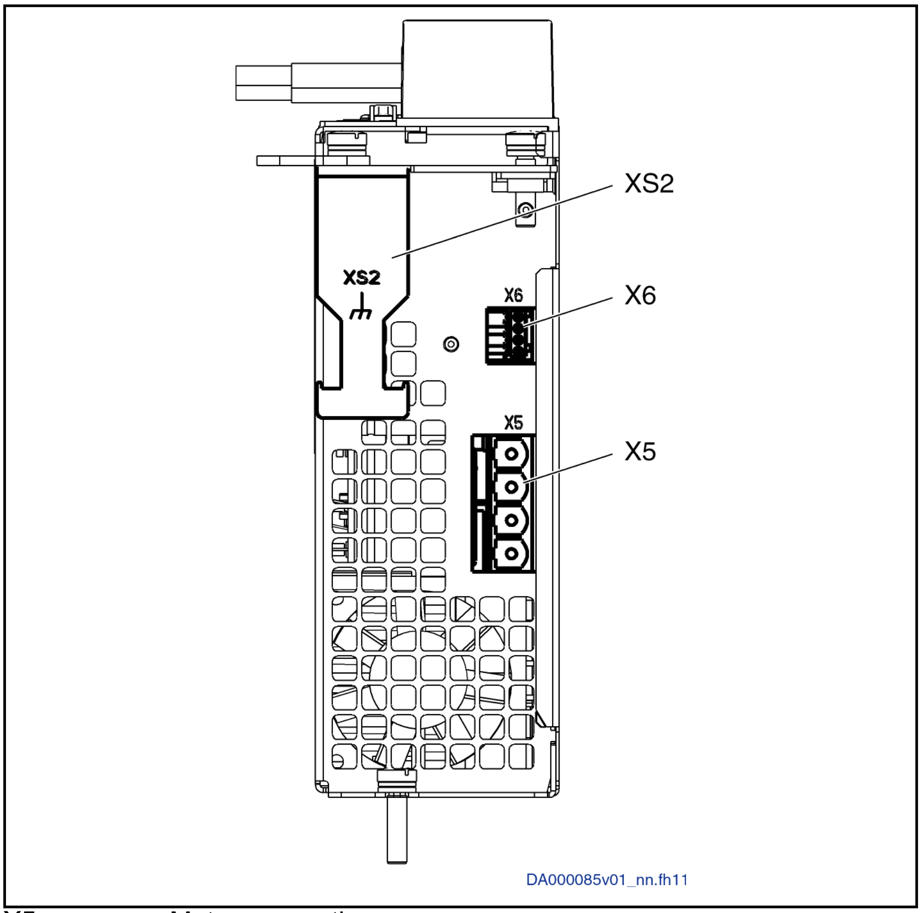
Fig. 6-33: Connection Diagram HMS02.1-Wxxxx

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	Motor connection
X6	Motor temperature monitoring and motor holding brake
XS2	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 271.

Touch guard The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

6.4 HMD01 Power Sections

6.4.1 Brief description, use and design

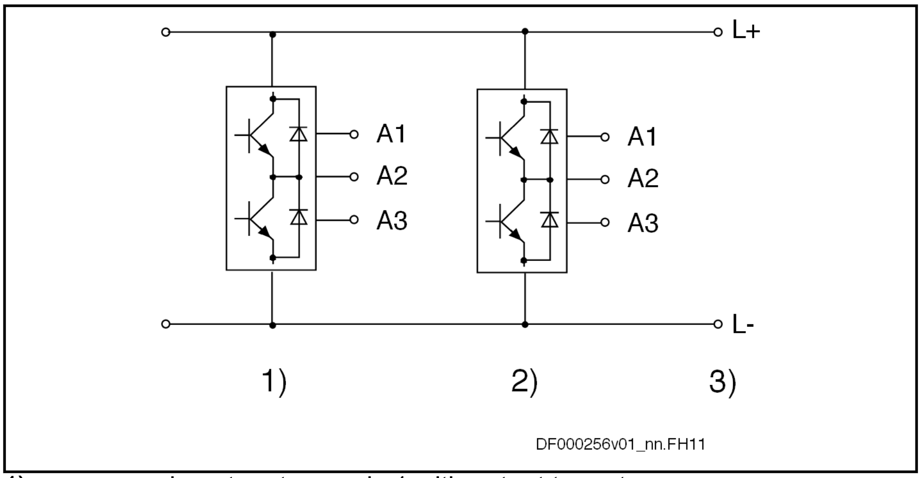
Brief description The HMD01 inverters are part of the Rexroth IndraDrive M product range and are used to operate 2 single axes.

Use The different types are used as follows:

Type	Use
HMD01.1E-Wxxxx-NNNN	• double-axis device • Operation of two three-phase a.c. motors (asynchronous or synchronous motors).

Tab. 6-36: Usage 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.

Power sections for inverters - IndraDrive M

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. . . . . = 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

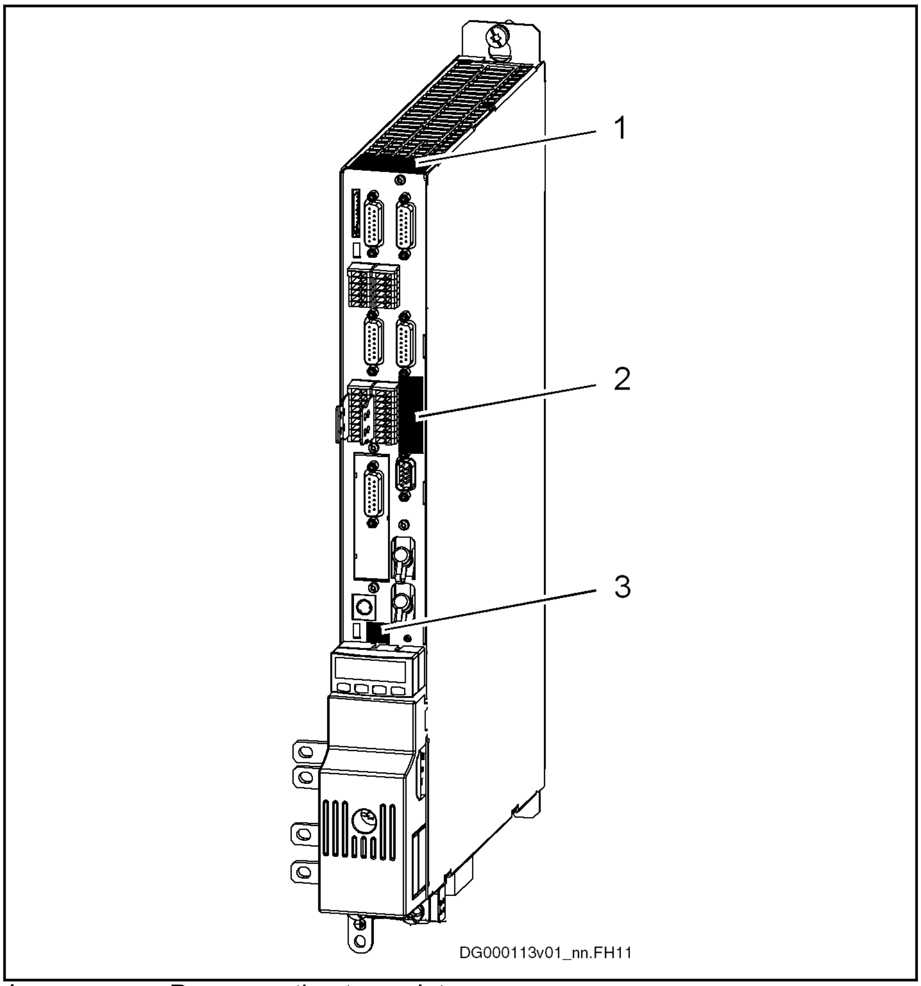
Standard	**Title**	**Edition**
DIN EN 60529	Protection mode by housing (IP code)	2000-09

DT000037v02_de.FH11

Fig. 6-37: Type Code HMD01

Identification

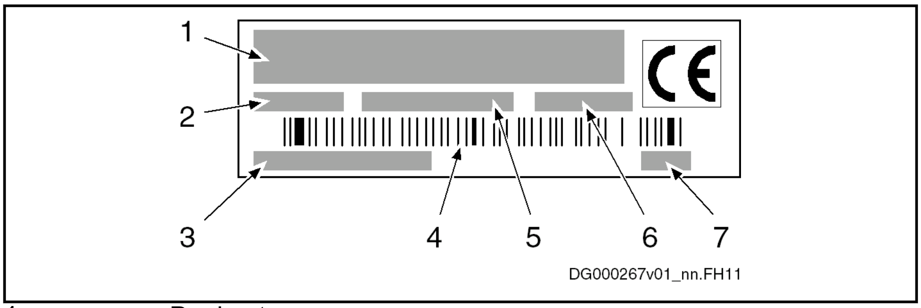
Type Plate Arrangement



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 (power sections, supply units)



1 Device type
2 Part number
3 Serial number
4 Bar code
5 Country of manufacture
6 Production week; e.g. 08W23 meaning year 2008, week 23
7 Hardware index

Fig. 6-39: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL Data

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
Last modification: 2009-01-28					

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

Tab. 6-37: HMD - Ambient and Operating Conditions - UL Ratings

Information on Standards

Applied Standards

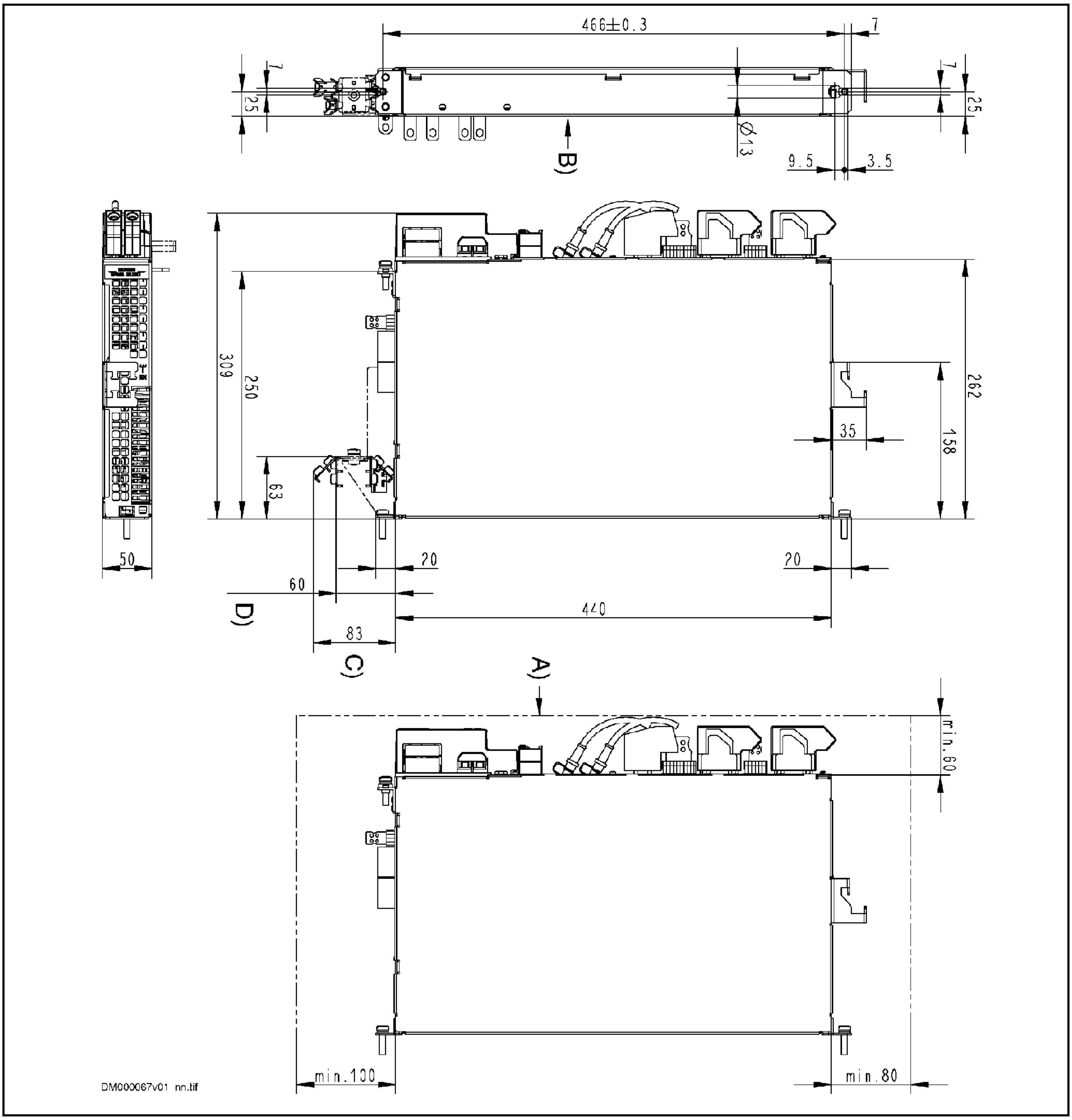
Description	Symbol	Unit	HMD01.1N-W0012-A-07-NNNN	HMD01.1N-W0020-A-07-NNNN	HMD01.1N-W0036-A-07-NNNN
Listing in accordance with UL standard			UL 508C		
UL-Files			E134201		
Listing in accordance with CSA standard			C22.2 No. 274-13		
Last modification: 2017-01-23					

Tab. 6-38: HMD - Applied Standards

Mechanics and mounting

Dimensional Drawings

HMD01.1N-W0012



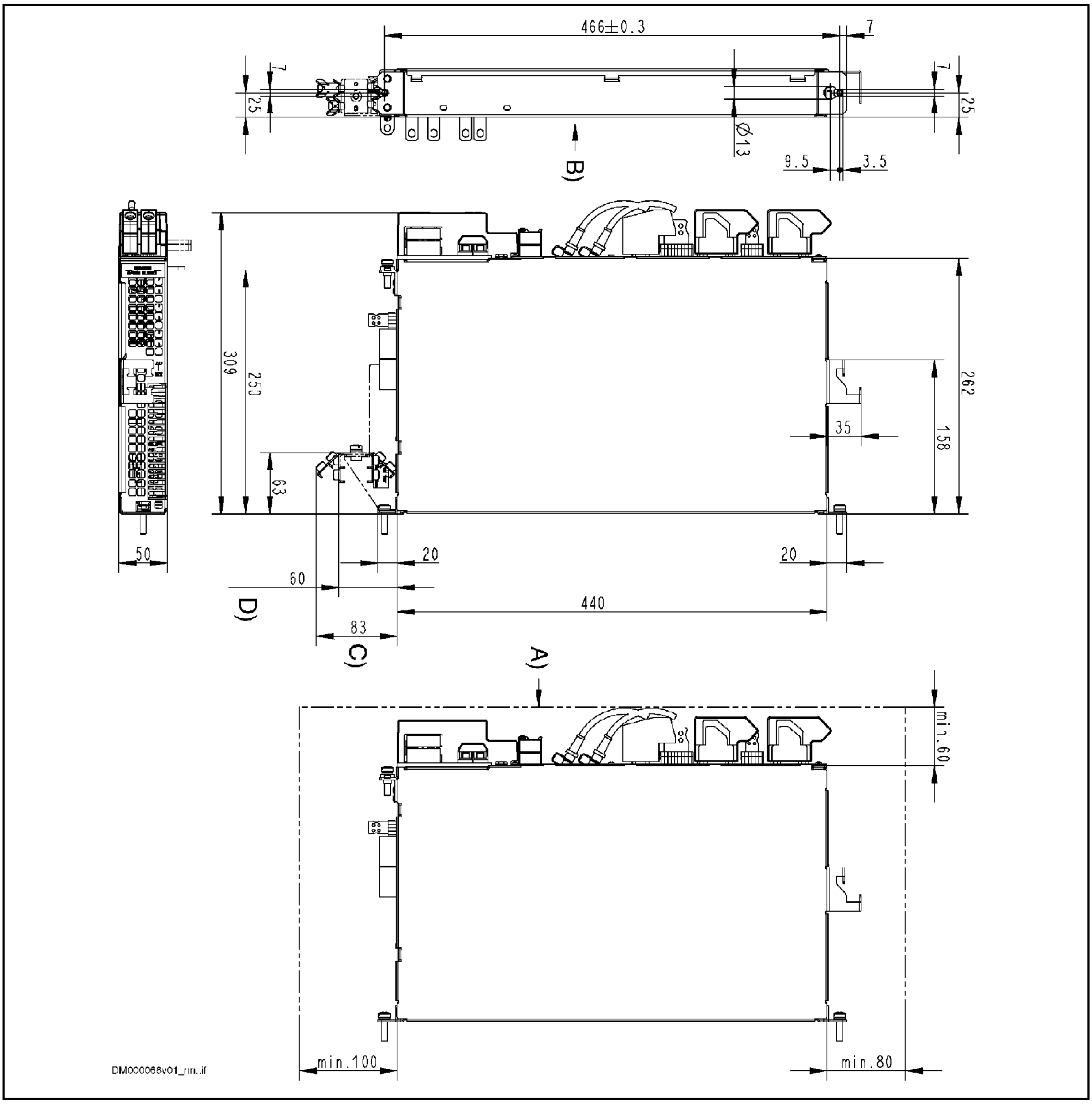
A) minimum mounting clearance (plus additional space for motor cable) Note: Rexroth IndraDrive supply units require greater mounting clearance!
B) Rear view!
C) Dimensions for accessory HAS02.1 when motor cable run with 45°

Power sections for inverters - IndraDrive M

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!

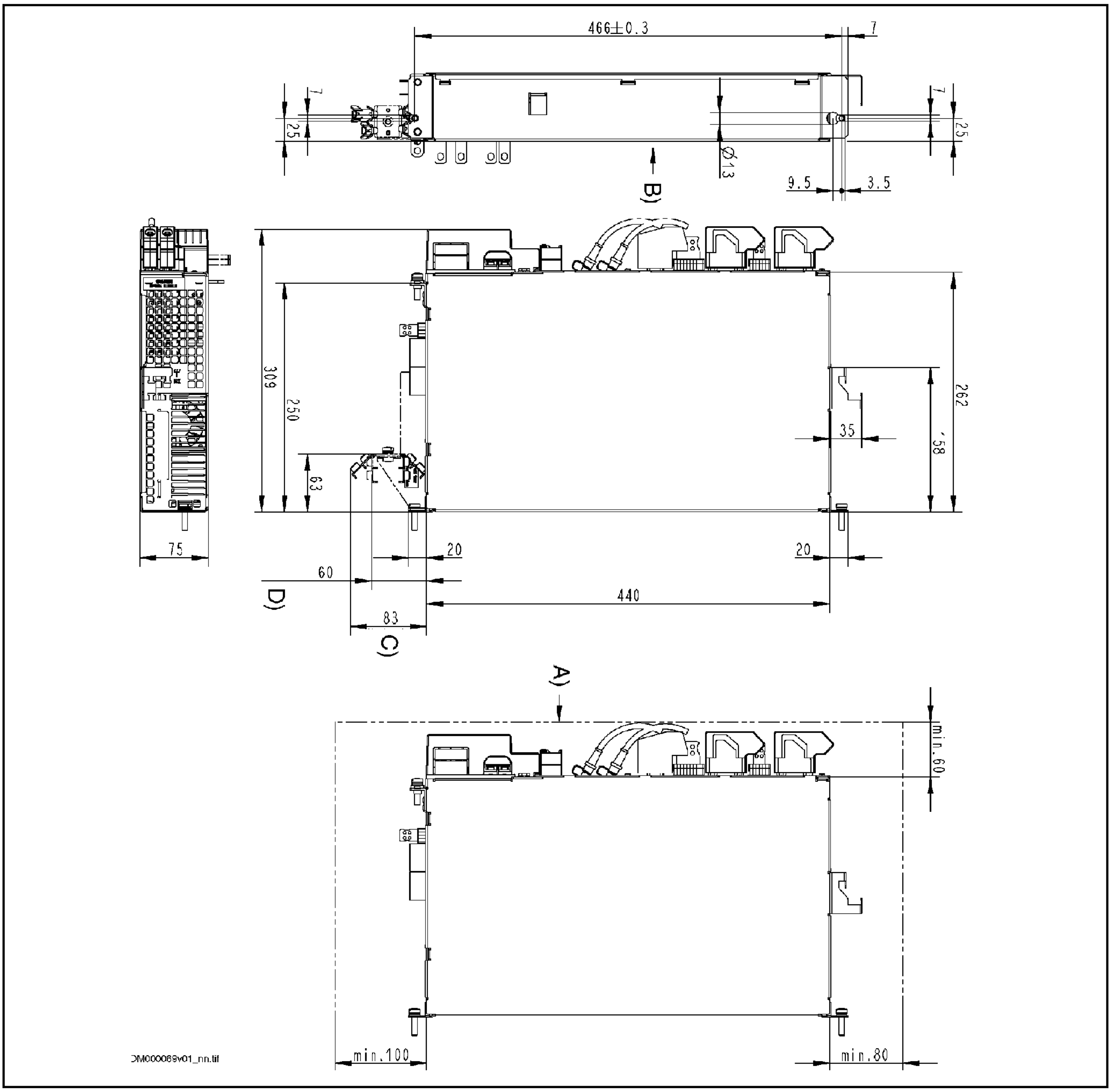
B) Rear view!

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

Power sections for inverters - IndraDrive M

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		
Last modification: 2010-05-26					

1) 2) 3) Housing dimension; see also related dimensional drawing
4) According to DIN EN ISO 11205; comparative value at distance 1 m, out of cabinet; HCS types with order code -L***: 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		
	f_{Ta}	%/K	2.0		
Allowed mounting position			G1		
Cooling type			Forced ventilation		
Volumetric capacity of forced cooling	V	m^3/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
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
Last modification: 2009-10-26					

Description	Symbol	Unit	HMD01.1N-W0012-A-07-NNNN	HMD01.1N-W0020-A-07-NNNN	HMD01.1N-W0036-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	100		
Temperature increase with minimum distances d_{bot}; d_{top}; P_{BD}	ΔT	K	40		45
Last modification: 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"

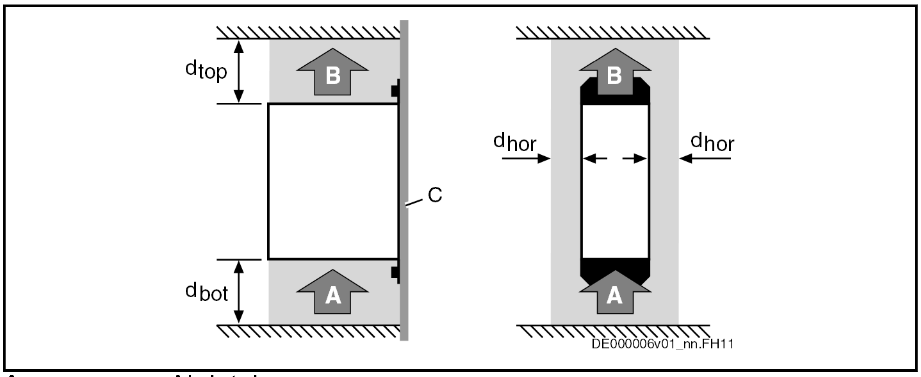
Tab. 6-40: HMD - Data for Cooling and Power Dissipation

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



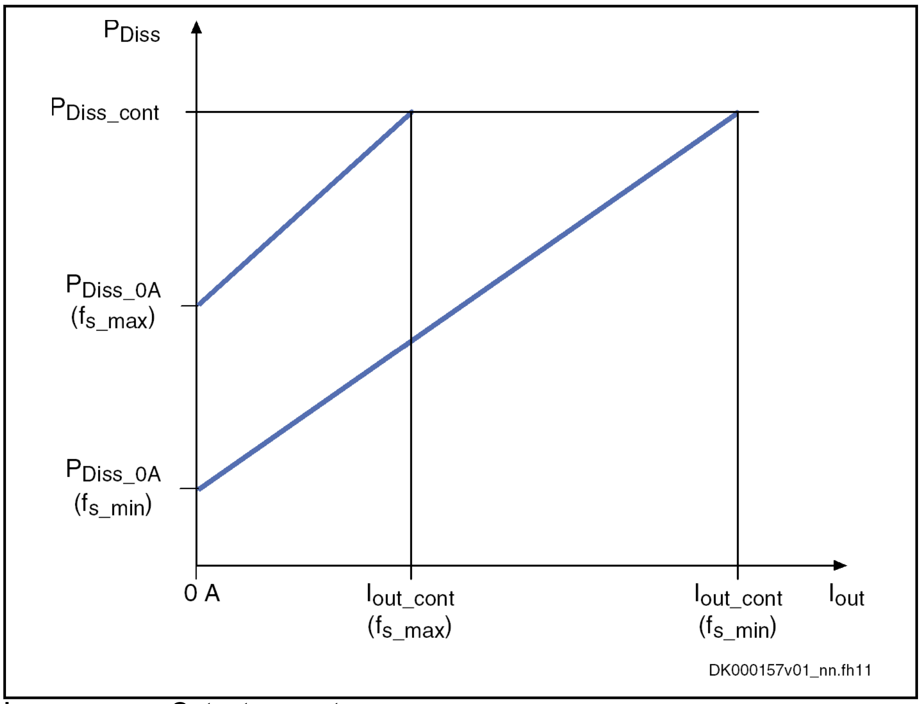
A Air intake
B Air outlet
C Mounting surface in control cabinet
d_{top} Distance top
d_{bot} Distance bottom
d_{hor} Distance horizontal

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 Power Section HMD01

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
Last modification: 2007-07-18					

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

Tab. 6-41: HMD - Data for Control Voltage Supply

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		
Last modification: 2007-07-27					

Tab. 6-42: HMD - Data of Power Section - DC bus

Power sections for inverters - IndraDrive M

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 for U/f-control	U_{out_eff}	V	~ UDC x 0.71		
Output voltage, fundamental wave for 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		
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 for detecting 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

Last modification: 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 kHz	I_{out_cont8}	A	3.7	6.1	13.0
Continuous output current when f_s = 12 kHz[5)]	I_{out_cont12}	A	-		--
Continuous output current when f_s = 16 kHz[6)]	I_{out_cont16}	A	-		
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	4.4	7.0	13.7
Continuous output current when f_s = 8 kHz; output frequency f_{out} less than f_{out_still}	$I_{out\_cont0Hz\_8}$	A	1.7	4.1	8.9
Continuous output current when f_s = 12 kHz; output frequency f_{out} less than f_{out_still}[7)]	$I_{out\_cont0Hz\_12}$	A	-		
Continuous output current when f_s = 16 kHz; output frequency f_{out} less than f_{out_still}[8)]	$I_{out\_cont0Hz\_16}$	A	-		
Assigned output filters at nom. data; f_s = 4 kHz			-		
Last modification: 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 fs

Tab. 6-43: HMD - Data of Power Section - 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 → On 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	-		
Last modification: 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	$I_{out\_base1\_16}$	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)]	$I_{out\_peak3\_12}$	A	-		
Base load current at $I_{out\_peak\_3}$; f_s = 12 kHz; t = 2 s; T = 20 s; K = 2.0	$I_{out\_base3\_12}$	A	-		
Maximum output current at $I_{out\_base\_3}$; f_s = 16 kHz; t = 2 s; T = 20 min; K = 2.0[10)]	$I_{out\_peak3\_16}$	A	-		
Base load current at $I_{out\_peak\_3}$; f_s = 16 kHz; t = 2 s; T = 20 s; K = 2.0	$I_{out\_base3\_16}$	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
Last modification: 2006-06-30					

Power sections for inverters - IndraDrive M

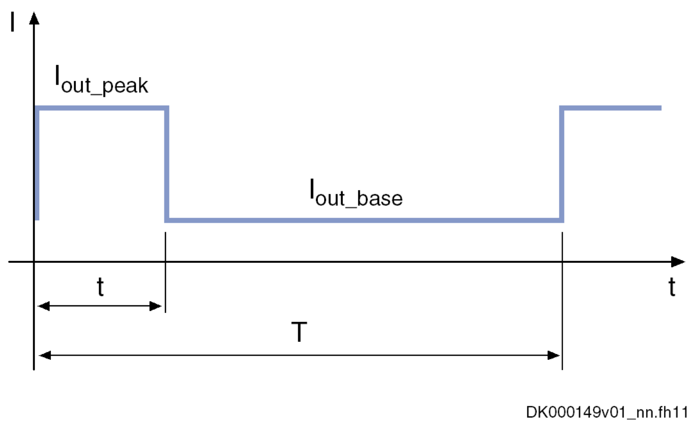
Description	Symbol	Unit	HMD01.1N-W0012-A-07-NNNN	HMD01.1N-W0020-A-07-NNNN	HMD01.1N-W0036-A-07-NNNN
Base load current at $I_{out\_peak\_4}$; f_s = 4 kHz; t = 60 s; T = 5 min; K = 1,5	$I_{out\_base4\_4}$	A	5.34	7.81	15.58
Maximum output current at $I_{out\_base\_4}$; f_s = 8 kHz; t = 60 s; T = 5 min; K = 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	-		
Last modification: 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 kHz; t = 60 s; T = 10 min; K = 1.1	$I_{out\_base5\_12}$	A		-	
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		-	
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		-	
Last modification: 2006-06-30					

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

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
current profile "UEL_I_e" 	The characteristic data of the profile are used to select converters and inverters for operation with standard motors and servo drives.

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} ≥ 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} ≥ 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.

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
Last modification: 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
Last modification: 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
Last modification: 2007-07-18					

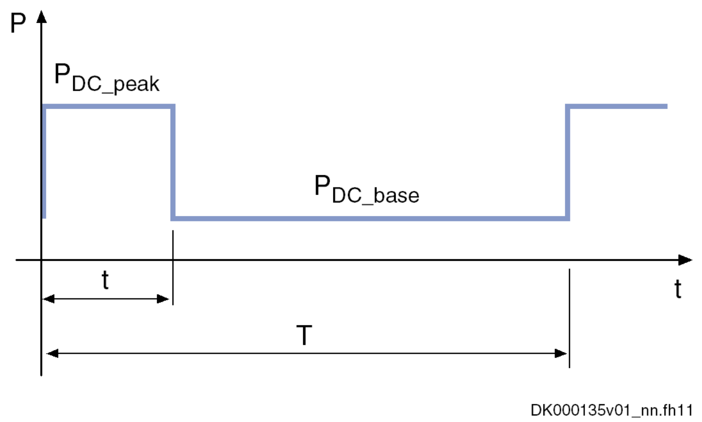
1) 2) 3) 4) See definition profile UEL_P_e; 1 kW ~ 1.36 hp

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
Performance profile "UEL_P_e" 	Characteristic of the selection of standard motors and servo drives.

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

6.4.5 Connections and Interfaces

Overview

Overall connection diagram

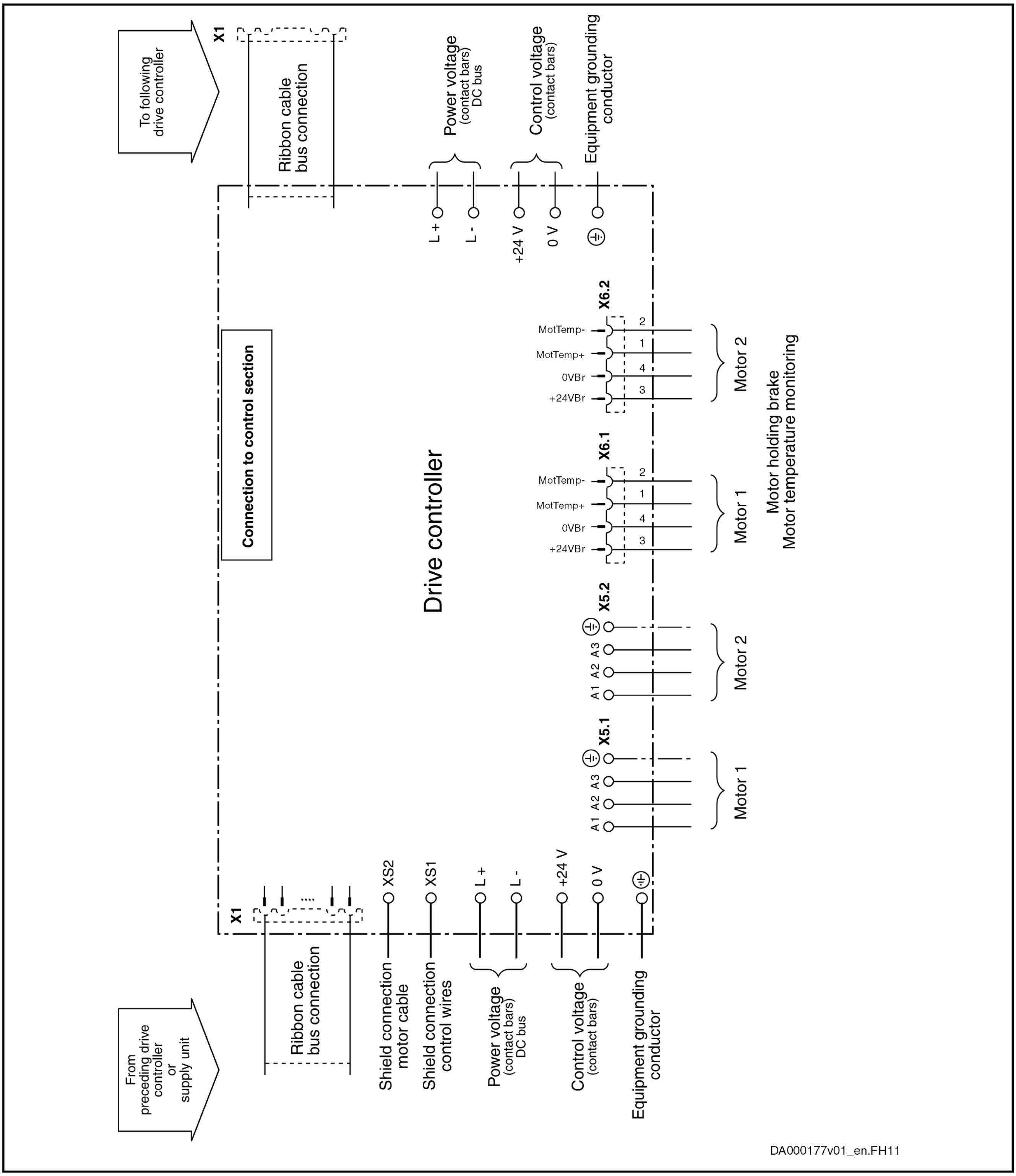
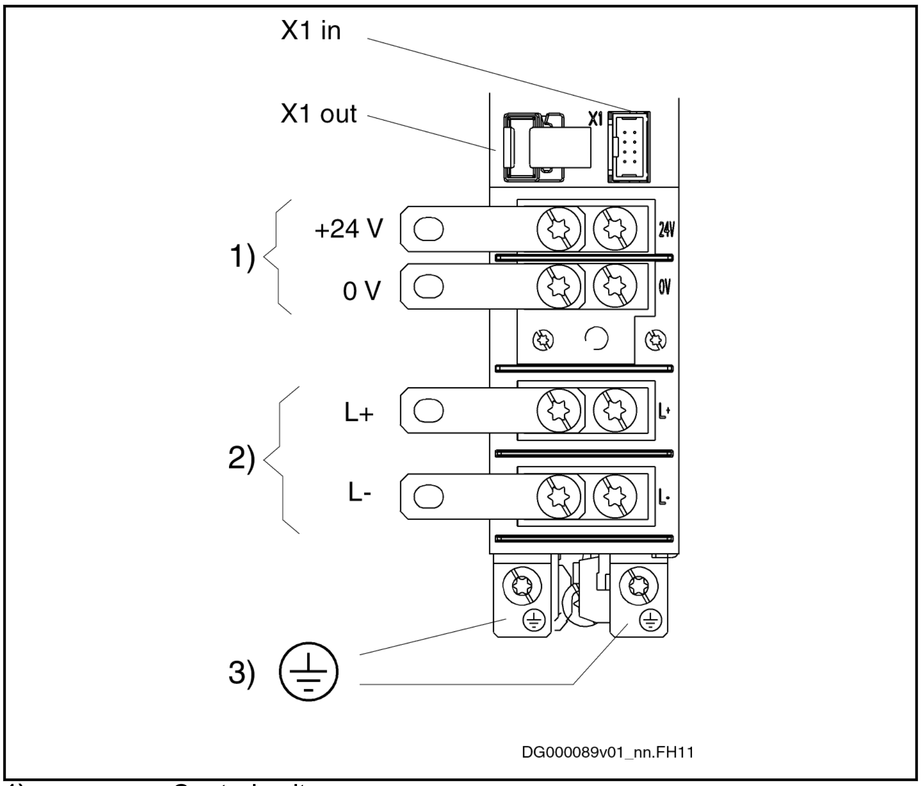


Fig. 6-45: Connection Diagram HMD01

Arrangement of the Connection Points

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

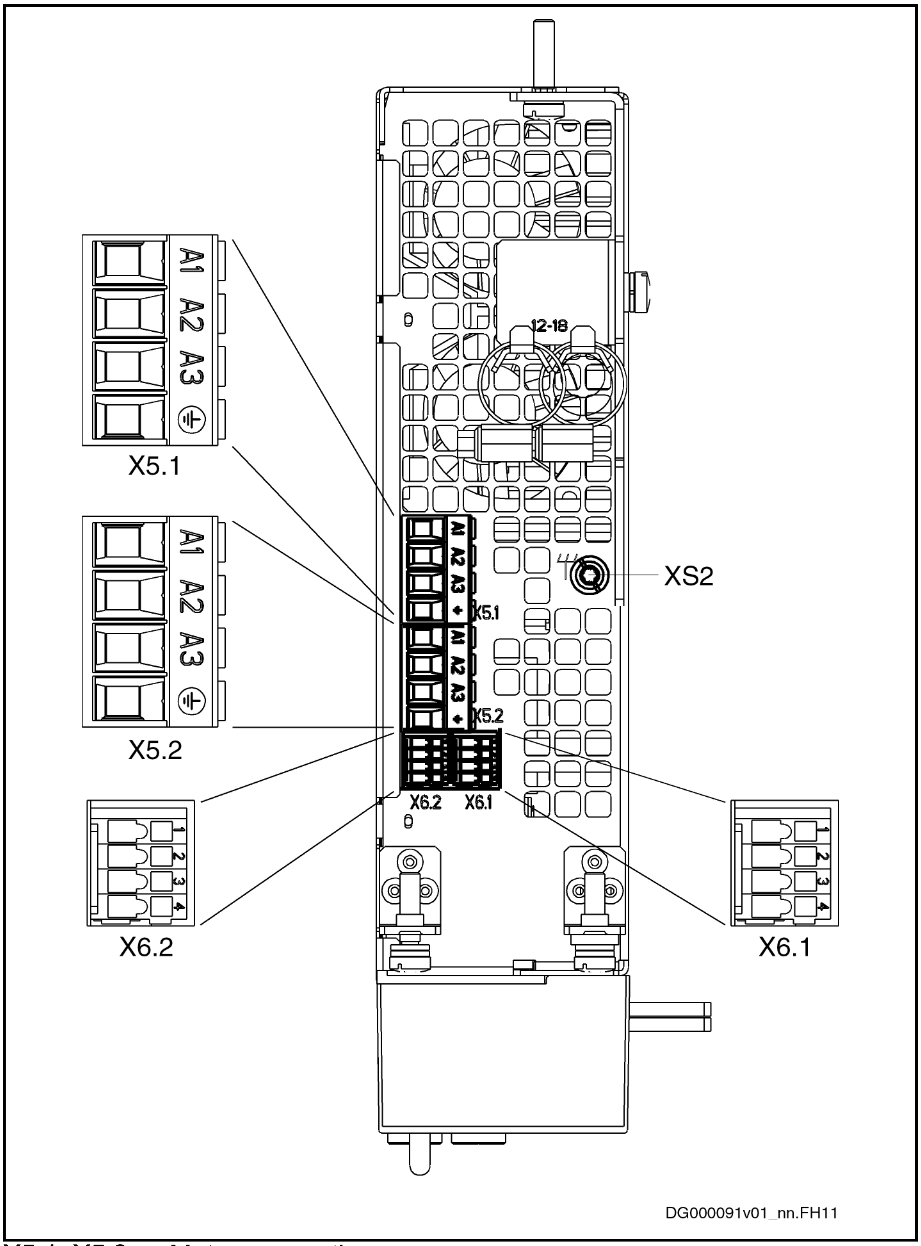
Connections at Power Section (Front)



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 271.

Touch guard The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

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

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

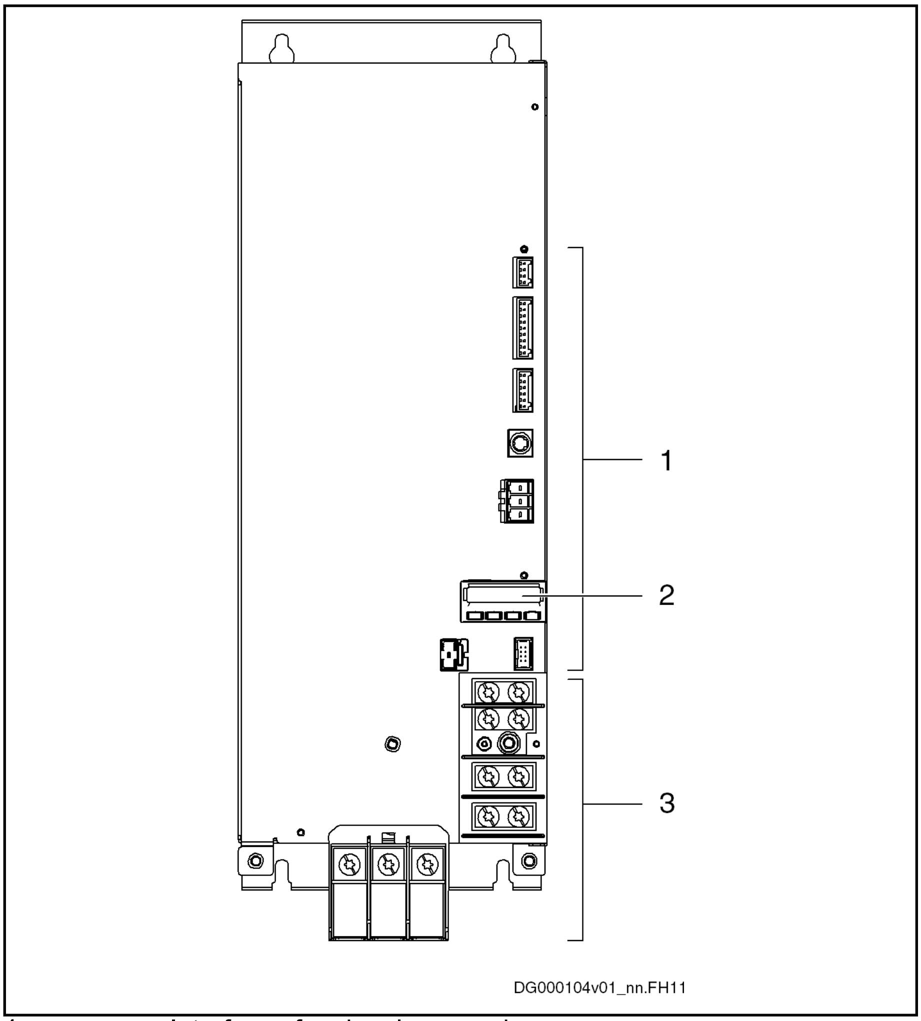
Use The different types can be used as follows:

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

Tab. 7-2: Usage of Supply Units

IndraDrive M supply units

Design



1 Interfaces for signal processing
2 Control panel
3 Power connections incl. control voltage

Fig. 7-1: Basic Design

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.

Type short description	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	V	0	1	.	1	E	-	W	0	0	3	0	-	A	-	0	7	-	N	N	N	N	-	A	A													

01 Product
Supply module ..... = HMV

02 Line
1 .... = 01

03 Design
1 .... = 1

04 Power supply 1)
Feeded .... = E
Regenerative .... = R

05 Cooling mode
Air, internal
(through integrated blower) .... = W

06 Rated output 1)
18 kW .... = 0018
30 kW .... = 0030
45 kW .... = 0045
55 kW .... = 0055
65 kW .... = 0065
75 kW .... = 0075
105 kW .... = 0105
120 kW .... = 0120

07 Protection mode
IP 20 ....= A

08 DC-bus nominal voltage
DC 700 V .... = 07
1 x AC 400...500 V + 10%, - 15%.................................. = 15 * 2)

09 Other design 1)
Special firmware: changed reaction at power failure and
Mains contactor with encapsulated auxiliary contacts.............. = FCN1 *
Special firmware: changed reaction at power failure................ = FNN1 *
Smart Energy Mode.. = FNN2
Special firmware for Split Phase .... = FNN3 *
Special firmware: Reduced dc-bus nominal voltage 650 V,
Bleeder barrier 700 V.. = FNN4 3)
Mains contactor with encapsulated auxiliary contacts.............. = NCNN *
Isolated braking resistor.. = NINN *
None.. = NNNN
Demo system.. = PSPN *

Fig. 7-2: HMV01, type code (part 1)

IndraDrive M supply units

Type short description	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	V	0	1	.	1	E	-	W	0	0	3	0	-	A	-	0	7	-	N	N	N	N	-	A	A													

10 **Brand lable**

The attribute is not applicable when it is not required

Costumer specific: KEBA..= AA*

Note:

* Special product

1) Other design, Power supply and Rated output are only available in following combinations:

Other Design	Power supply "E"			Power supply "R"							
	Rated output			Rated output							
	0030	0075	0120	0018	0030	0045	0055	0065	0075	0105	120
NCNN	X	X	X	-	-	-	-	X	-	-	-
NINN	-	-	-	X	-	X	-	X	-	-	-
FCN1	X	X	X	-	-	-	-	X	-	-	-
FNN1	-	X	-	X	-	X	-	X	-	-	-
FNN2	-	-	-	X	-	X	-	X	-	-	X
FNN3	-	-	-	-	X	-	-	-	X	-	-
FNN4	-	-	-	-	-	-	X	-	-	X	-
NNNN	X	X	X	X	-	X	-	X	-	-	X

Fig. 7-3: HMV01, type code (part 2)

Identification

Type plate arrangement

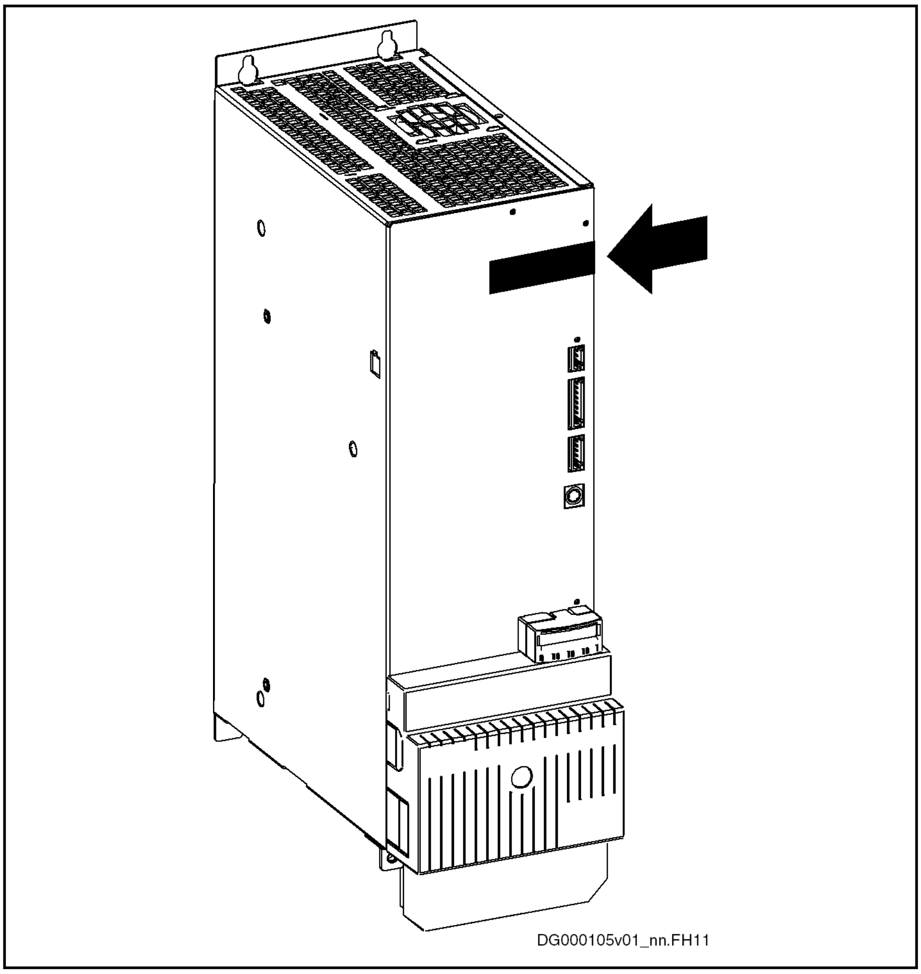
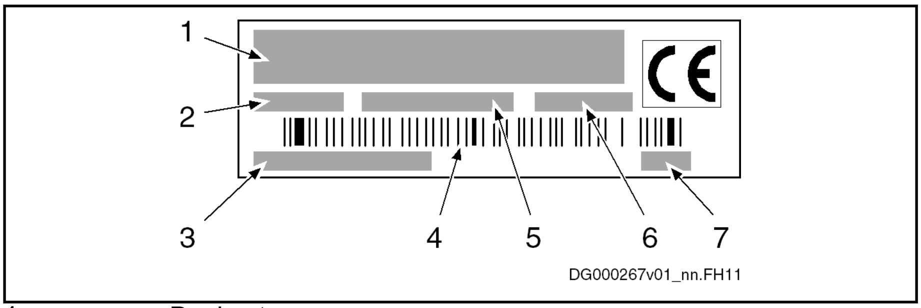


Fig. 7-4: Type Plate at Device

Type plate (power sections, supply units)



1	Device type
2	Part number
3	Serial number
4	Bar code
5	Country of manufacture
6	Production week; e.g. 08W23 meaning year 2008, week 23
7	Hardware index

Fig. 7-5: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL data

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
Output voltage	U_{out}	V	DC 435…680		
Output current	I_{out}	A	69.0	173.0	276.0
Last modification: 2017-01-20					

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

Tab. 7-3: HMV - Ambient and Operating Conditions - UL Ratings

Information on standards

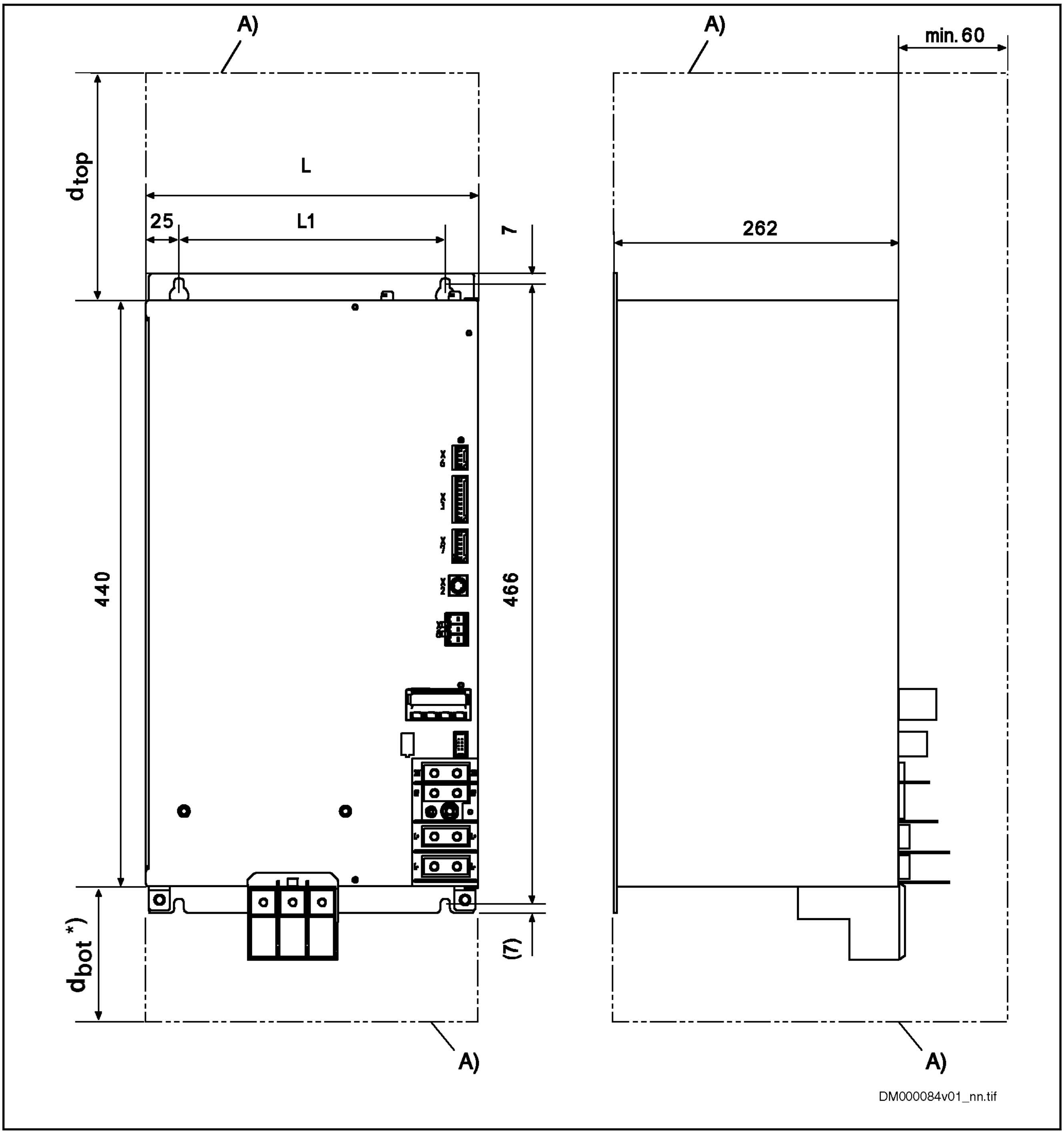
Applied standards

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		
Last modification: 2017-01-20					

Tab. 7-4: HMV - Applied Standards

Mechanics and mounting

Dimensions



A)	Minimum mounting clearance
d_{top}, d_{bot}	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. 7-6: Dimensions

IndraDrive M supply units

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

Tab. 7-5: 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 height1)	H	mm	440		
Device depth2)	T	mm	262		
Device width3)	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		
Last modification: 2008-11-20					

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

Tab. 7-6: HMV - Data for mass, dimensions, 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		
	f_{Ta}	%/K	2.0		
Allowed mounting position			G1		
Cooling type			Forced ventilation		
Volumetric capacity of forced cooling	V	m^3/h	140.00	228.00	465.00
Last modification: 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
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		
Last modification: 2009-10-22					

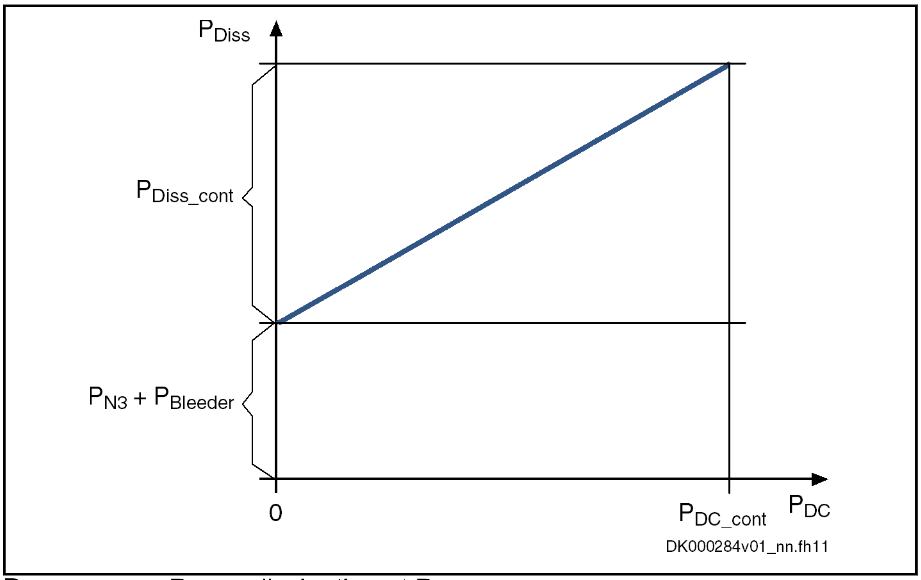
1) Plus dissipation of braking resistor and control section
2) See information on "Rated power consumption control voltage input at U_{N3}"
3) 4) See fig. "Air intake and air outlet at device"

Tab. 7-7: 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} Power dissipation at P_{DC_cont}
P_{N3} Power consumption of control voltage
$P_{Bleeder}$ Power generated at integrated braking resistor, max. P_{BD}

Fig. 7-7: HMVxx.xE - Power Dissipation vs. Output power

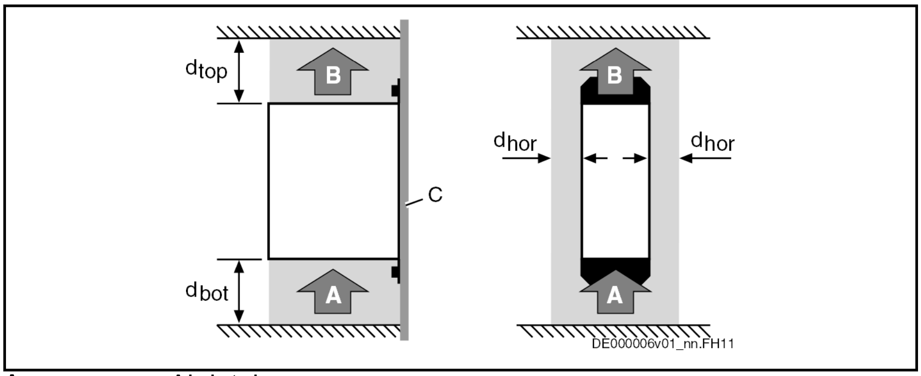
Distances

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. 7-8: Air intake and air outlet at device

Basic data supply unit HMV01, feeding

General

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
Last modification: 2008-11-20					

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

Tab. 7-8: HMV - Data for control voltage supply

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		
Mains frequency tolerance		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		
Single-phase mains voltage	U_{LN}	V	--		
Three-phase mains voltage at TN-S, TN-C, TT mains	U_{LN}	V	380...480		
Three-phase mains voltage at IT mains[1]	U_{LN}	V	200...230		
Three-phase mains voltage at Corner-grounded-Delta mains[2]	U_{LN}	V	200...230		
Last modification: 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}		%	±10		
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-N0202-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 minute4)			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	$\cos\varphi^{h1}$		0.97		
Power factor of fundamental component DPF at P_{DC_cont} without mains choke	$\cos\varphi^{h1}$		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			Mains contactor integrated		
					Last modification: 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
Last modification: 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. 7-9: HMV - Data for Mains Voltage Supply

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	ca. 27	Approx. 14	ca. 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; $U_{LN} \leq U_{LN\_nenn}$		%/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		
Last modification: 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 at maximum allowed C_{DCext} external DC bus capacitance at U_{LN_nenn}	$t_{lade\_DC\_Cext}$				
					Last modification: 2008-11-20

1) Use assigned mains choke

Tab. 7-10: HMV - Data of supply unit - 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 resistor	$R_{DC\_Bleeder}$	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 on-time duty	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		
					Last modification: 2015-08-10

1) 2) Factory setting

Tab. 7-11: HMV - Data of Integrated Braking Resistor

Exemplary data for applications

General information

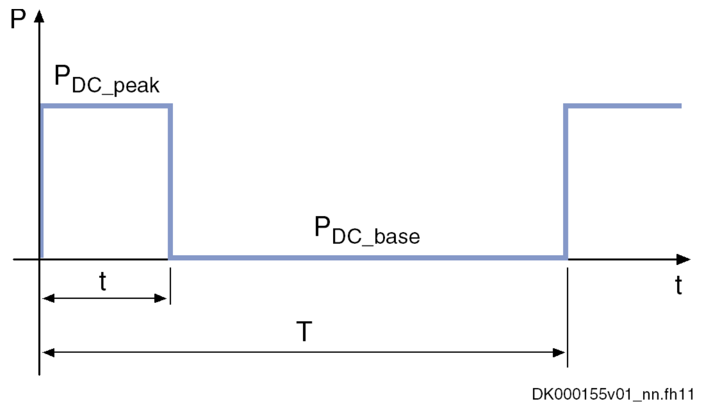
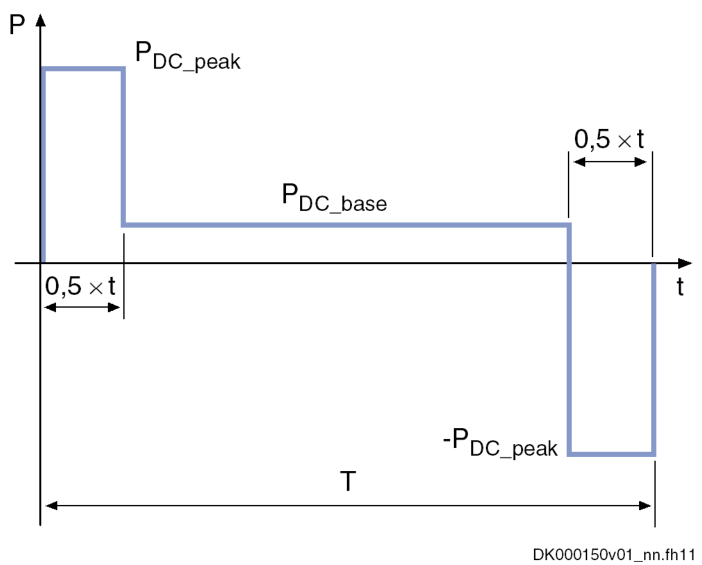
This chapter contains:

- Examples of allowed performance profiles

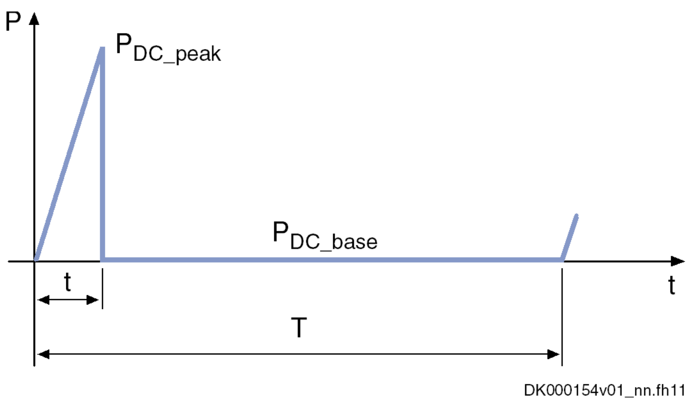
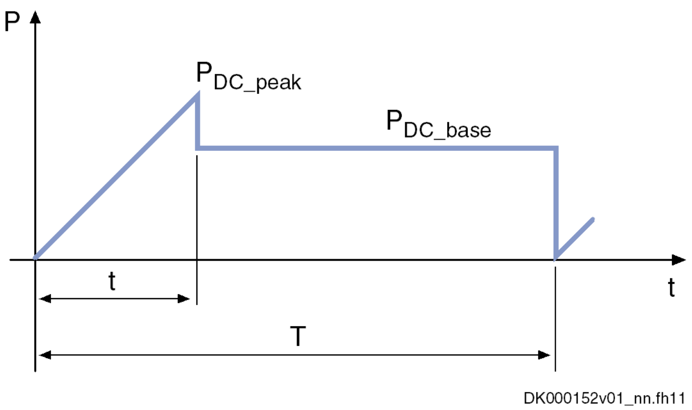
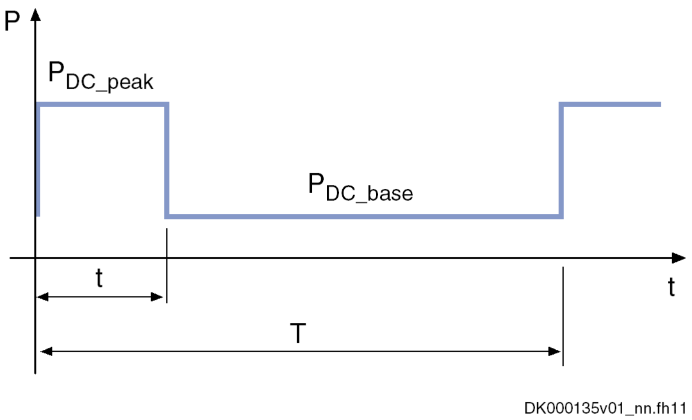
Performance profiles

Performance profiles of infeeding supply units

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

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

IndraDrive M supply units

Profile	Explanation
performance profile "WZM_SA_acc_e" 	The characteristic data of the profile are used to select infeeding supply units. Characteristic of servo drives at machine tools.
performance profile "DRM_S1_acc_e" 	The characteristic data of the profile are used to select infeeding and regenerative supply units. Characteristic of starting and operation at print- ing machines.
performance profile "UEL_P_e" 	The characteristic data of the profile are used to select infeeding and regenerative supply units. Characteristic of applications using standard motors in overload operation.

Tab. 7-12: 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
Last modification: 2008-11-20					

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
DC bus power at U_{LN_nenn}; t = 60 s; t = 900 s; with mains choke[15)]	$P_{DC\_base\_13}$	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)]	$P_{DC\_peak\_13}$	kW	45.00	101.20	180.00
Last modification: 2008-11-20					

1) 2) 3) 4) See definition profile WZM_HS_KB_e
5) 6) 7) 8) See definition profile WZM_HS_Fr_e
9) 10) 11) 12) See definition profile WZM_SA_acc_e
13) 14) 15) 16) See definition profile DRM_S1_acc_e

Tab. 7-13: HMV....E - Examples of allowed performance profiles

7.2.5 Connections and interfaces

Overview

Overall connection diagram

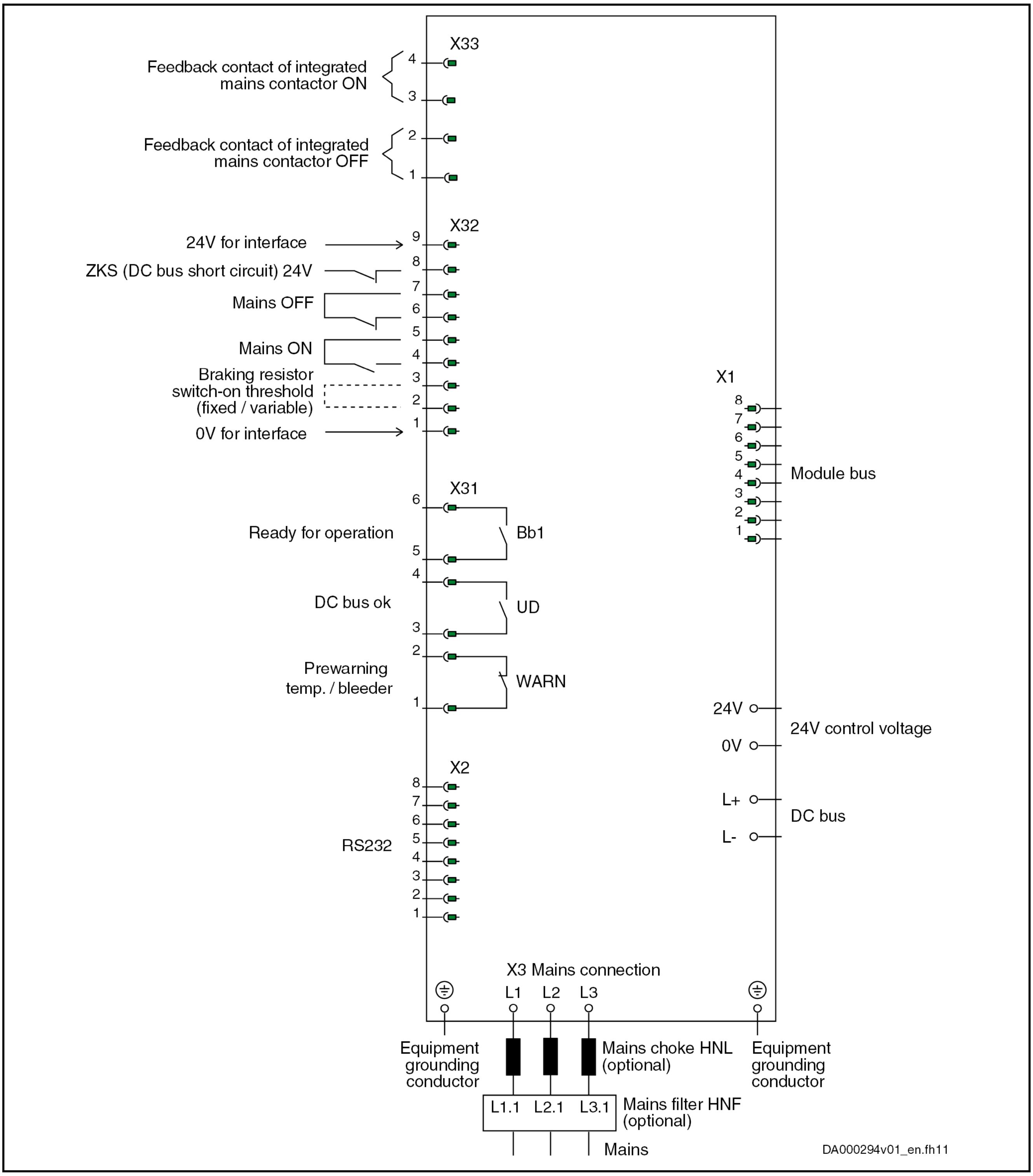
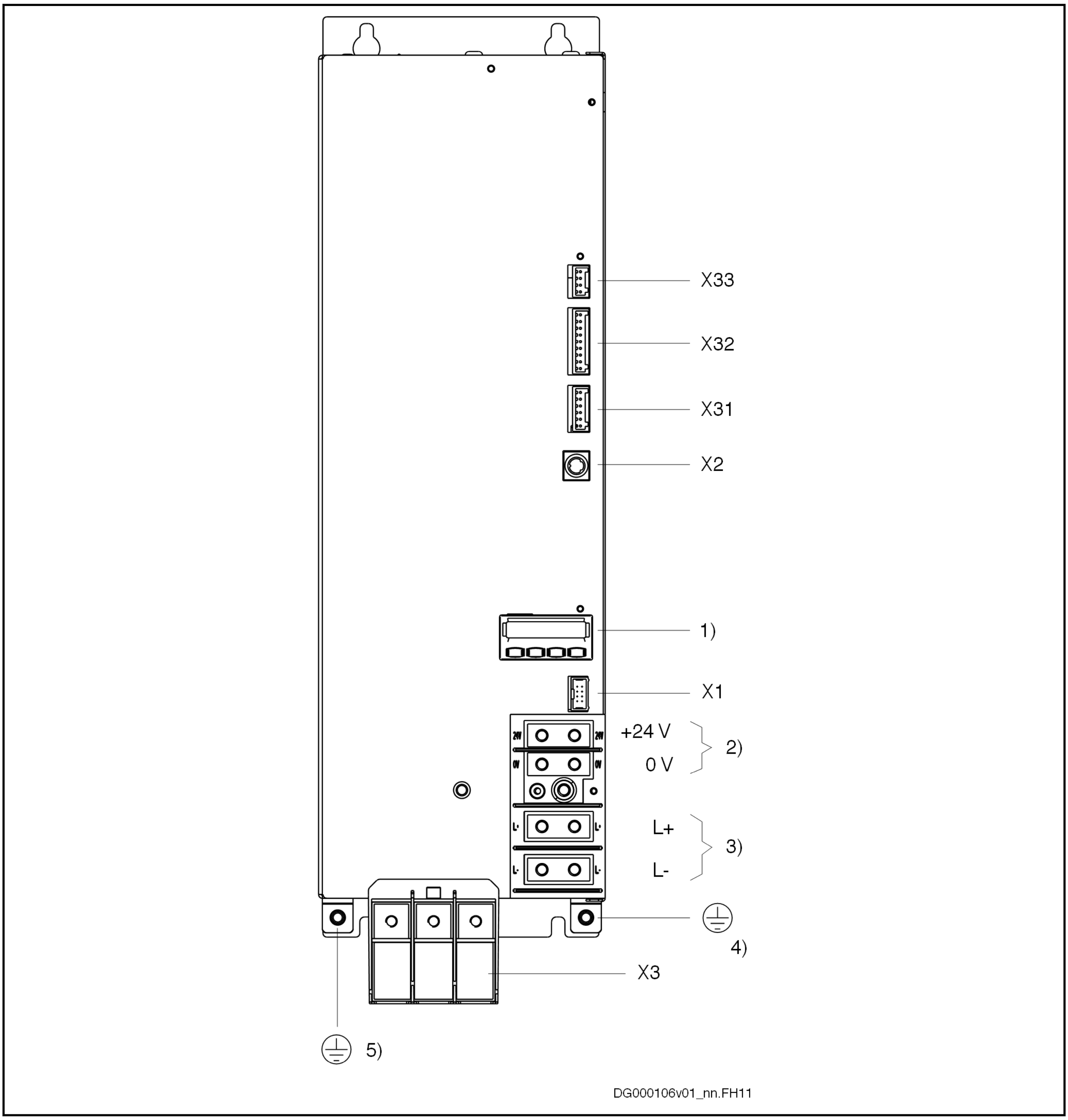


Fig. 7-9: Connection diagram HMV01.1E-W0030; -W0075; -W0120

IndraDrive M supply units

Arrangement of the connection points

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



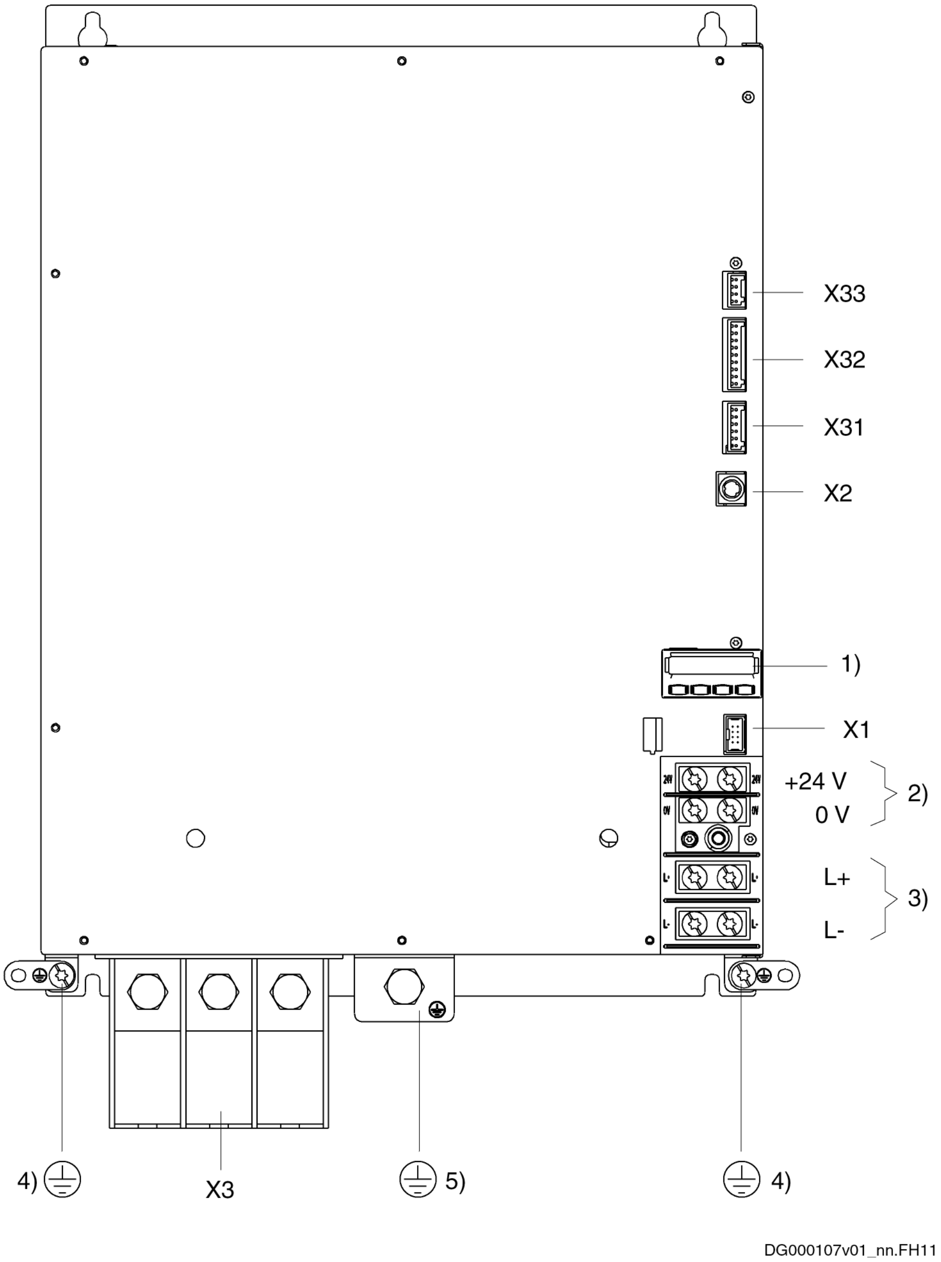
X33	Acknowledgment messages of mains contactor
X32	Mains contactor control and DC bus short circuit (ZKS)
X31	Connection for messages
X2	RS232
X1	Module bus
X3	Mains connection
	Equipment grounding conductor connection point
1)	Control panel
2)	Control voltage

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. 7-10: Connections HMV01.1E-W0030 and HMV01.1E-W0075

IndraDrive M supply units

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. 7-11: Connections HMV01.1E-W0120

Description of the connection points

The connection points are described in detail in chapter 8 Functions and connection points, page 271.

Touch guard The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

7.3 HMV01.1R supply units, regenerative

7.3.1 Brief description, use and design

Short 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

---

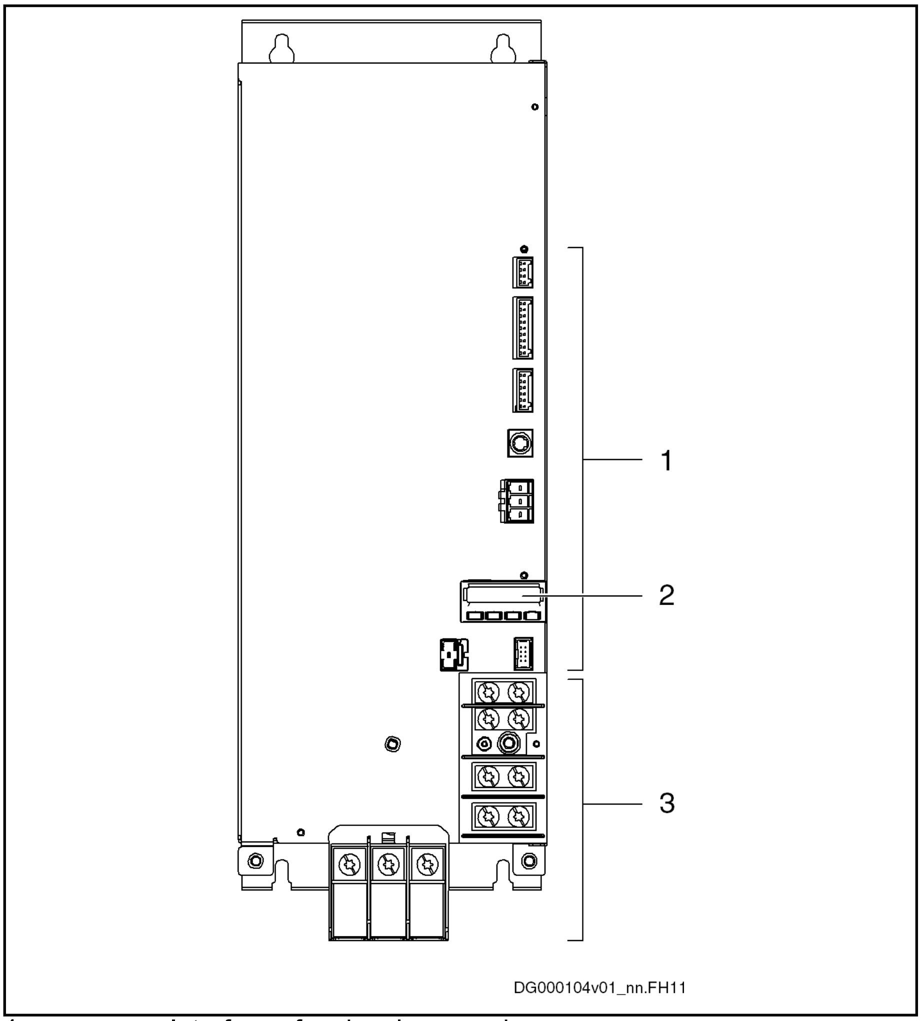
Use

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

Tab. 7-14: Usage of Supply Units

IndraDrive M supply units

Structure



1 Interfaces for signal processing
2 Control panel
3 Power connections incl. control voltage

Fig. 7-12: 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.

Type short description 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 V 0 1 . 1 E - W 0 0 3 0 - A - 0 7 - N N N N - A A

01 **Product**
Supply module ..... = HMV

02 **Line**
1 .... = 01

03 **Design**
1 .... = 1

04 **Power supply** [1)]
Feeded .... = E
Regenerative .... = R

05 **Cooling mode**
Air, internal
(through integrated blower) .... = W

06 **Rated output** [1)]
18 kW .... = 0018
30 kW .... = 0030
45 kW .... = 0045
55 kW .... = 0055
65 kW .... = 0065
75 kW .... = 0075
105 kW .... = 0105
120 kW .... = 0120

07 **Protection mode**
IP 20 .... = A

08 **DC-bus nominal voltage**
DC 700 V .... = 07
1 x AC 400...500 V + 10%, - 15%.................................... = 15 * [2)]

09 **Other design** [1)]
Special firmware: changed reaction at power failure and
Mains contactor with encapsulated auxiliary contacts.............. = FCN1 *
Special firmware: changed reaction at power failure................ = FNN1 *
Smart Energy Mode.. = FNN2
Special firmware for Split Phase .... = FNN3 *
Special firmware: Reduced dc-bus nominal voltage 650 V,
Bleeder barrier 700 V.. = FNN4 [3)]
Mains contactor with encapsulated auxiliary contacts.............. = NCNN *
Isolated braking resistor.. = NINN *
None .... = NNNN
Demo system.. = PSPN *

Fig. 7-13: HMV01, type code (part 1)

IndraDrive M supply units

Type short description	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	V	0	1	.	1	E	-	W	0	0	3	0	-	A	-	0	7	-	N	N	N	N	-	A	A													

10 **Brand lable**

The attribute is not applicable when it is not required

Costumer specific: KEBA...= AA*

Note:

* Special product

1) Other design, Power supply and Rated output are only available in following combinations:

Other Design	Power supply "E"			Power supply "R"							
	Rated output			Rated output							
	0030	0075	0120	0018	0030	0045	0055	0065	0075	0105	120
NCNN	X	X	X	-	-	-	-	X	-	-	-
NINN	-	-	-	X	-	X	-	X	-	-	-
FCN1	X	X	X	-	-	-	-	X	-	-	-
FNN1	-	X	-	X	-	X	-	X	-	-	-
FNN2	-	-	-	X	-	X	-	X	-	-	X
FNN3	-	-	-	-	X	-	-	-	X	-	-
FNN4	-	-	-	-	-	-	X	-	-	X	-
NNNN	X	X	X	X	-	X	-	X	-	-	X

Fig. 7-14: HMV01, type code (part 2)

Identification

Type plate arrangement

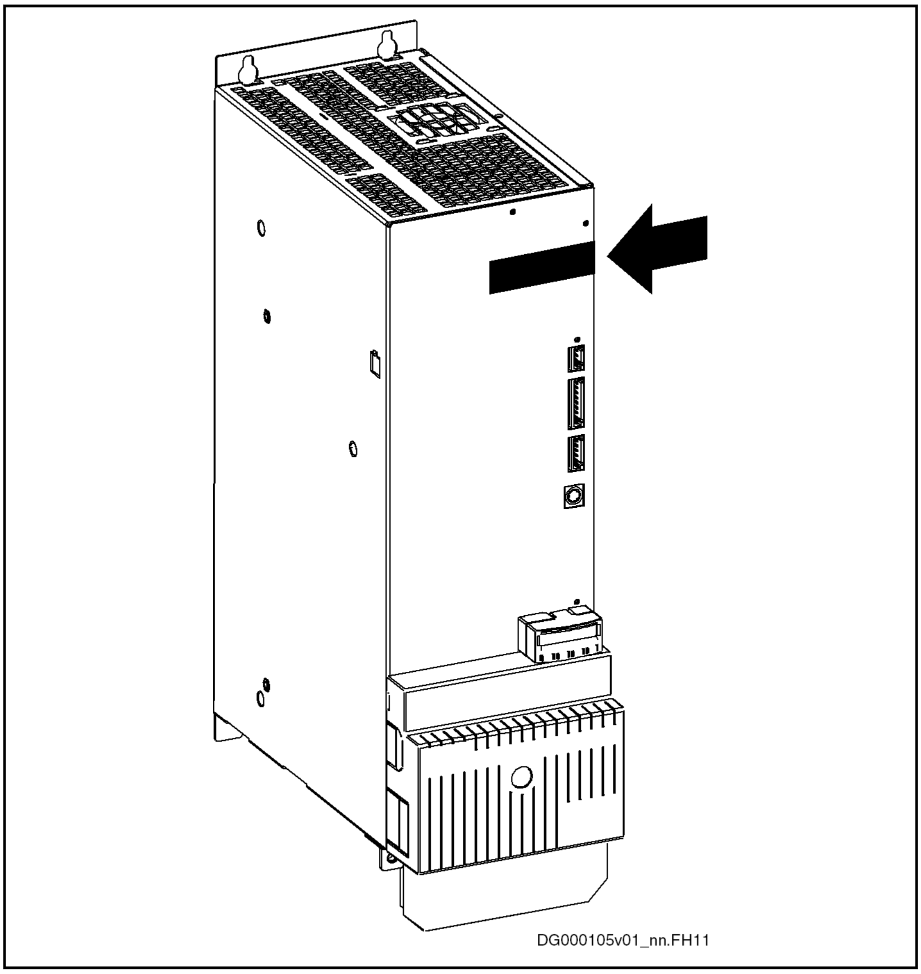
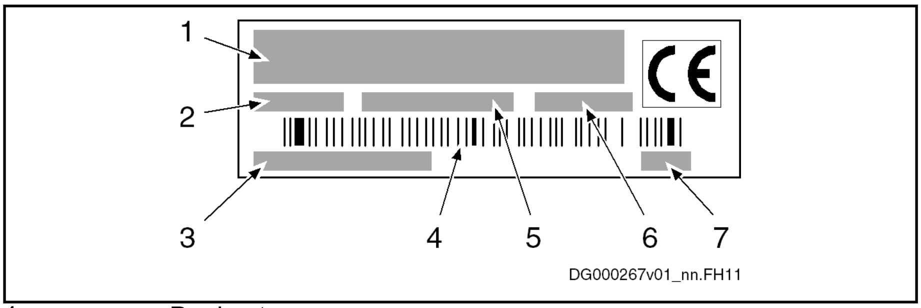


Fig. 7-15: Type plate at device

Type plate (power sections, supply units)



1	Device type
2	Part number
3	Serial number
4	Bar code
5	Country of manufacture
6	Production week; e.g. 08W23 meaning year 2008, week 23
7	Hardware index

Fig. 7-16: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL data

Ambient and operating conditions - UL ratings

Designation	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_nenn}	V	3 x AC 380...480			
Rated input current	I_{LN}	A	26.0	65.0	94.0	181.0
Output voltage	U_{out}	V	DC 750			
Output current	I_{out}	A	24.0	60.0	87.0	160.0
Last modification: 2014-08-05						

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

Tab. 7-15: HMV - Ambient and Operating Conditions - UL Ratings

Information on standards

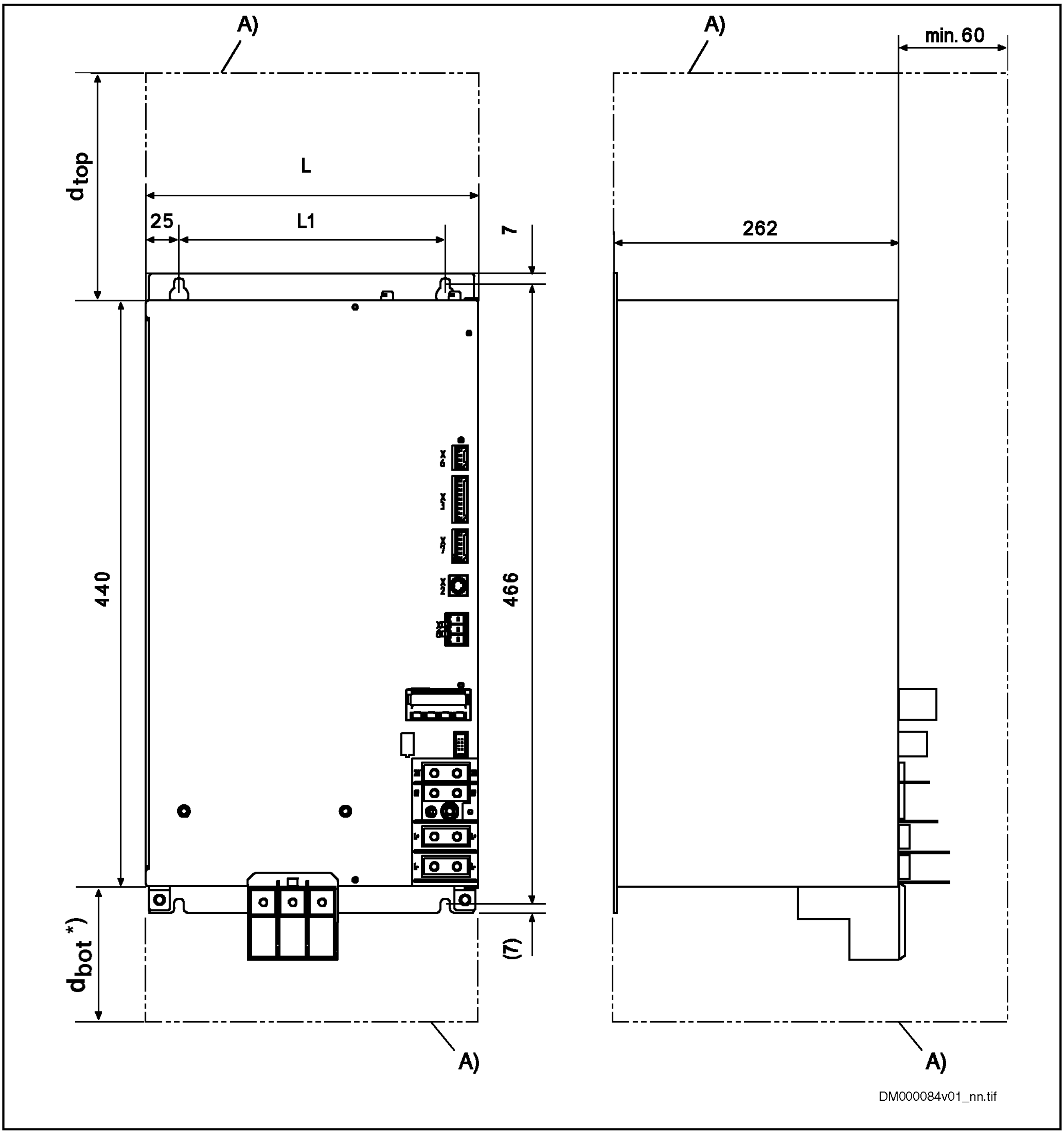
Applied standards

Designation	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			
Last modification: 2017-01-20						

Tab. 7-16: HMV - Applied Standards

Mechanics and mounting

Dimensions



A)	Minimum mounting clearance
d_{top}, d_{bot}	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. 7-17: Dimensions

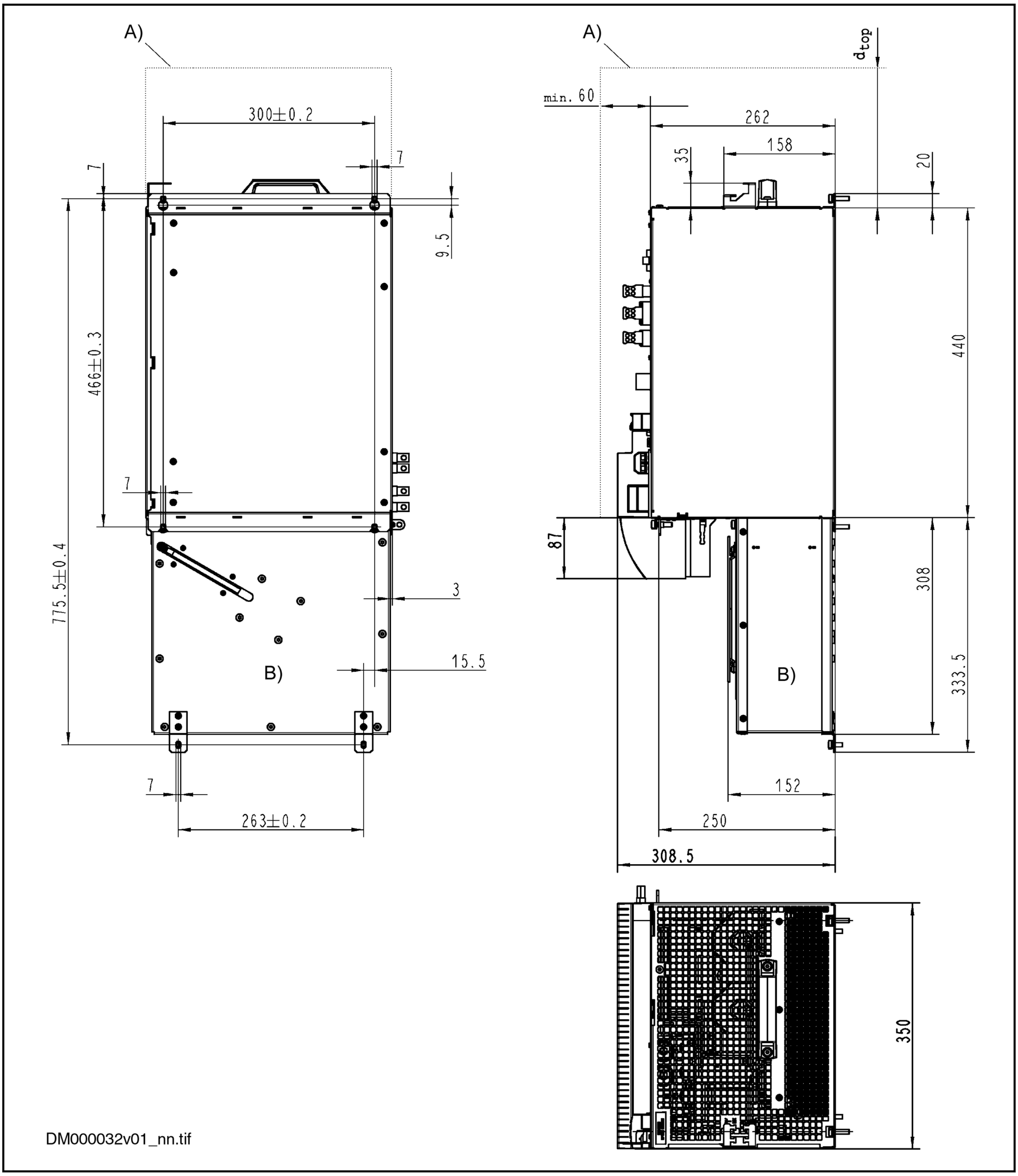
IndraDrive M supply units

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. 7-18 "Dimensional Drawing HMV01.1R-W0120 with External HAB01 Fan Unit" on page 233

Tab. 7-17: Dimensions

Dimensional Drawing HMV01.1R-W0120 with External Fan Unit HAB01



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. 7-18: Dimensional Drawing HMV01.1R-W0120 with External HAB01 Fan Unit

HAB01 fan unit

Type code

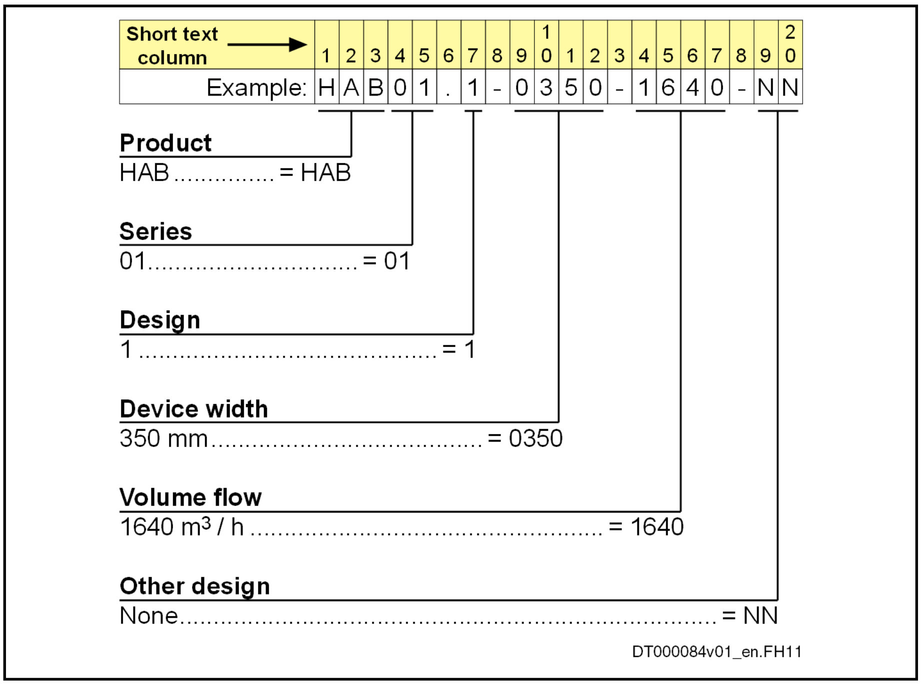


Fig. 7-19: Type code

Data

Use	HAB01 cools • HMV01.1R-W0120 supply units • HMS01.1N-W0350 power sections
Complete designation	HAB01.1-0350-1640-NN
Flow rate	1,640 m^3/h
Weight	7.5 kg
Supply voltage	24 V
Current consumption	6.5 A
Power consumption	155 W
Dimensions	See dimensional drawing

Tab. 7-18: HAB01 Fan Unit - Data

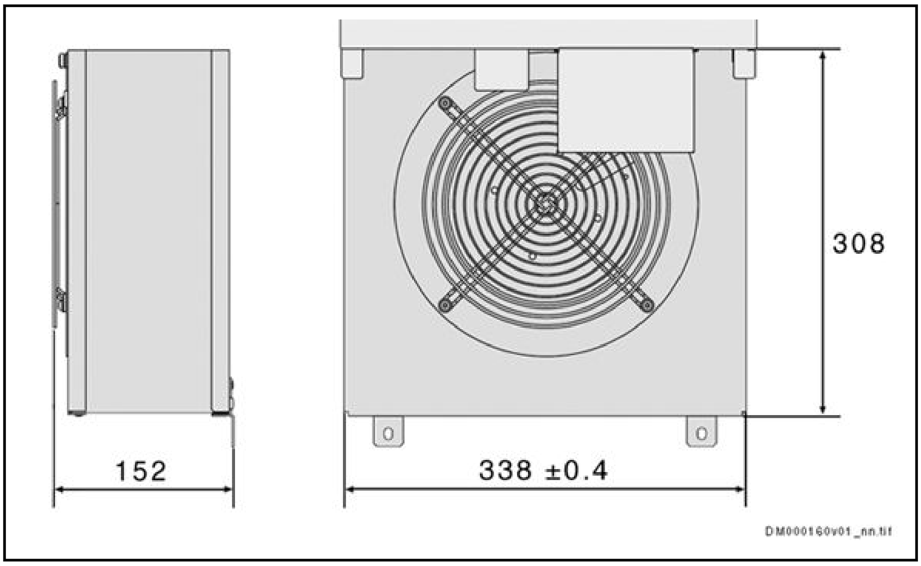
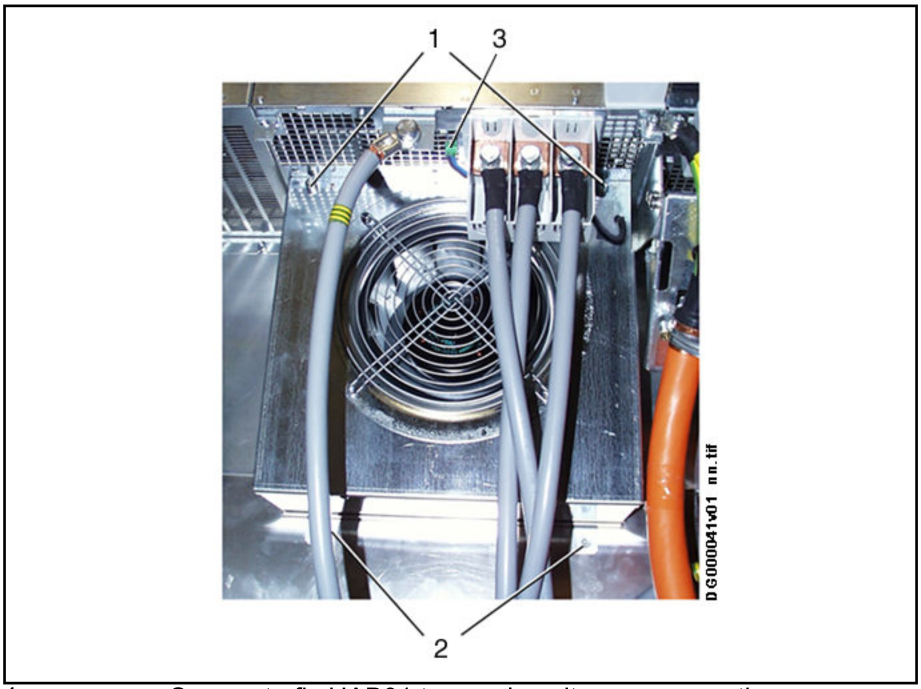


Fig. 7-20: HAB01 Fan Unit - Dimensional Drawing

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. 7-21: 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
Last modification: 2008-11-20						

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

Tab. 7-19: HMV - Data for mass, dimensions, 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			
	f_{Ta}	%/K	2.0			
Allowed mounting position			G1			
Cooling type			Forced ventilation			
Volumetric capacity of forced cooling	V	m^3/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
Power consumption control voltage input at U_{N3}[2]	P_{N3}	W	31	41	108	224
Last modification: 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			
Last modification: 2009-10-22						

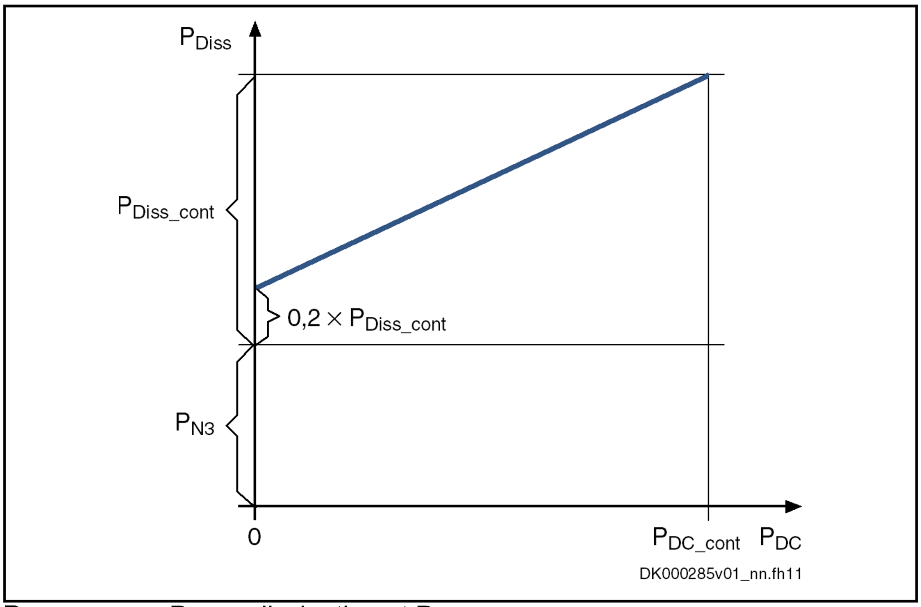
1) Plus dissipation of braking resistor and control section
2) See information on "Rated power consumption control voltage input at U_{N3}"
3) 4) See fig. "Air intake and air outlet at device"

Tab. 7-20: HMV - Data for Cooling and Power Dissipation

Power dissipation vs. output power

Due to their operating principle, regenerative supply units (HMVxx.xR) 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. 7-22: HMVxx.xR - Power Dissipation vs. Output Power

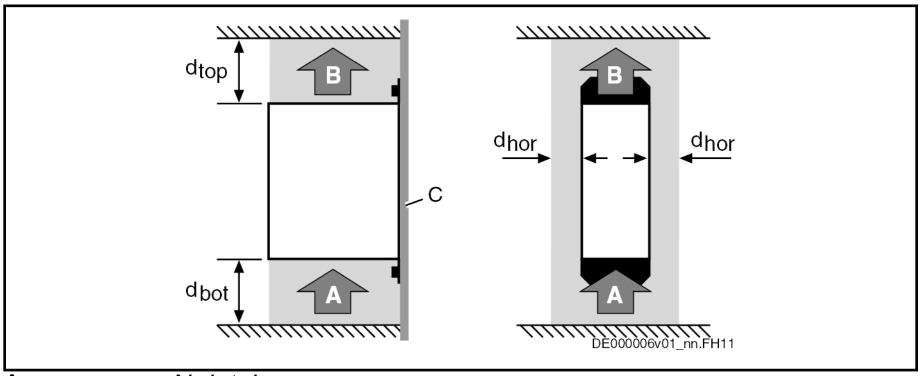
Distances

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. 7-23: Air intake and air outlet at device

Basic data supply unit HMV01, 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
Last modification: 2008-11-20						

1) 2) 3) Observe supply voltage for motor holding brakes

4) See information on "Rated power consumption control voltage input at U_{N3}"

Tab. 7-21: HMV - Data for control voltage supply

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			
Mains frequency tolerance		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			
Three-phase mains voltage at IT mains[1)]	U_{LN}	V	200...230			
Last modification: 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
Three-phase mains voltage at Corner-grounded-Delta mains2)	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-0980-C0026-A-480; HNL01.1R-4200-S0026-A-480	HNL01.1R-0590-C0065-A-480; HNL01.1R-6300-S0065-A-480	HNL01.1R-0540-C0094-A-480; HNL01.1R-3000-S0094-A-480	HNL01.1R-0300-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 minute4)			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	$\cos\varphi^{h1}$		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			Mains contactor integrated			I LN
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
Last modification: 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 ≤ 40 °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 7-22: HMV - Data for Mains Voltage Supply

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; $U_{LN} \leq U_{LN\_nenn}$		%/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 at maximum allowed C_{DCext} external DC bus capacitance at U_{LN_nenn}	$t_{lade\_DC\_Cext}$	s	90.00			
Last modification: 2008-11-20						

1) Only devices with regulated DC bus voltage
2) Use assigned mains choke

Tab. 7-23: HMV - Data of supply unit - 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.

IndraDrive M supply units

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 resistor	$R_{DC\_Bleeder}$	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		
Last modification: 2008-11-20					

1) Factory setting

Tab. 7-24: HMV - Data of Integrated Braking Resistor

Exemplary data for applications

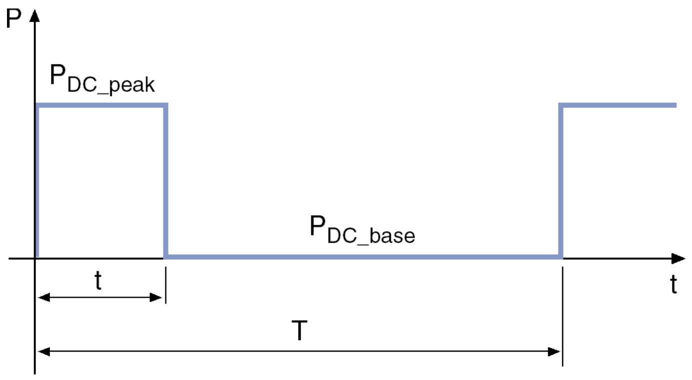
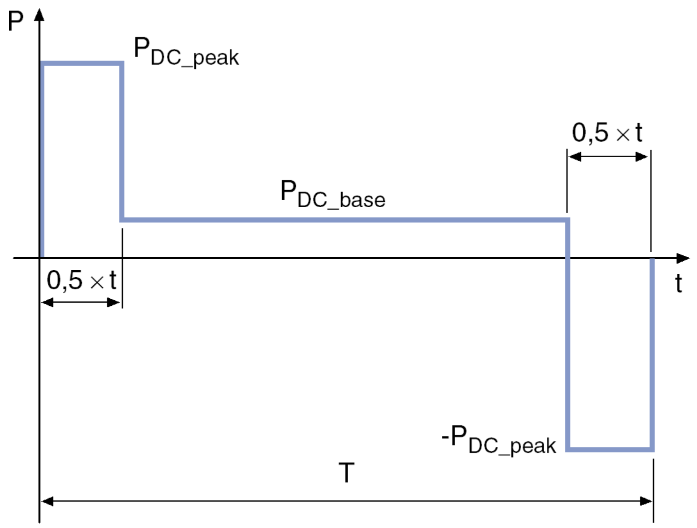
General information

This chapter contains examples of allowed performance profiles.

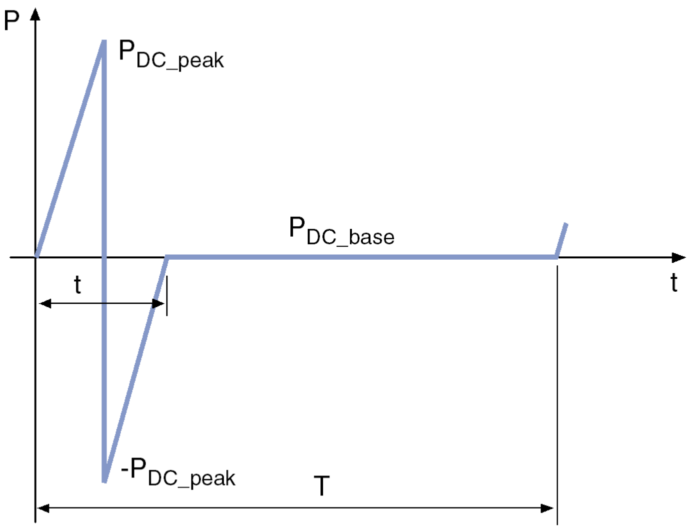
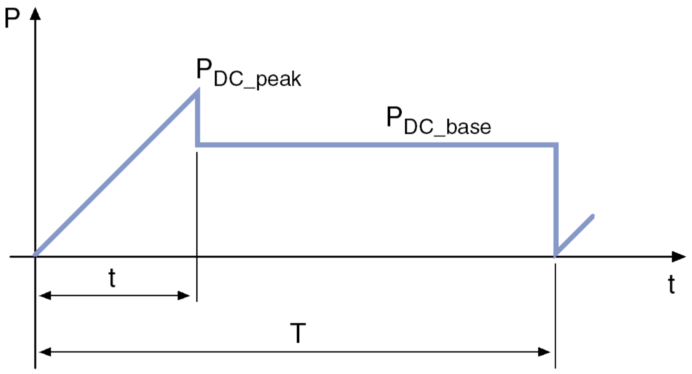
Performance profiles

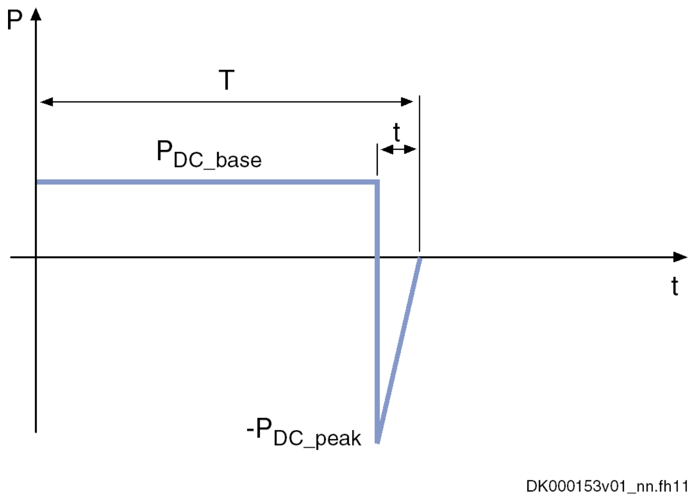
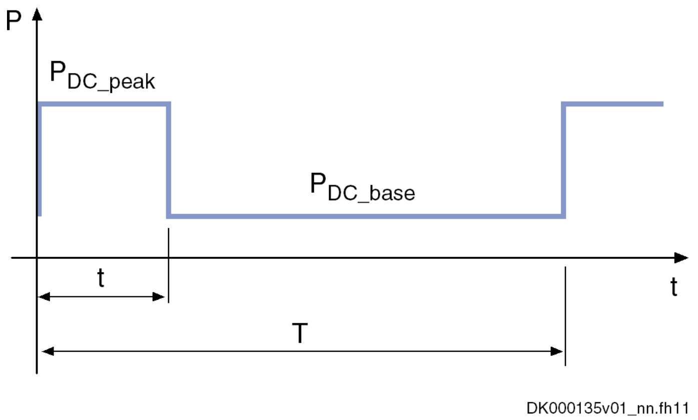
Performance profiles of regenerative supply units

The following profiles have been defined for regenerative supply units.

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

IndraDrive M supply units

Profile	Explanation
performance profile "WZM_SA_acc_r"  DK000151v01_nn.fh11	The characteristic data of the profile are used to select regenerative supply units. Characteristic of servo drives at machine tools.
performance profile "DRM_S1_acc_e"  DK000152v01_nn.fh11	The characteristic data of the profile are used to select infeeding and regenerative supply units. Characteristic of starting and operation at printing machines.

Profile	Explanation
performance profile "DRM_S1_acc_r" 	The characteristic data of the profile are used to select regenerative supply units. Characteristic of deceleration at printing machines.
performance profile "UEL_P_e" 	The characteristic data of the profile are used to select infeeding and regenerative supply units. Characteristic of applications using standard motors in overload operation.

Tab. 7-25: 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)]	$P_{DC\_base\_14}$	kW	0			
maximum DC bus power at U_{LN_nenn}; t = 132 s; T = 300 s; with mains choke[2)]	$P_{DC\_peak\_14}$	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)]	$P_{DC\_base\_15}$	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)]	$P_{DC\_peak\_15}$	kW	45.00	103.50	133.20	180.00
Last modification: 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)]	$P_{DC\_base\_16}$	kW	0			
maximum DC bus power at U_{LN_nenn}; t = 0.4 s; t = 4 s; with mains choke[6)]	$P_{DC\_peak\_16}$	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)]	$P_{DC\_base\_13}$					
maximum DC bus power at U_{LN_nenn}; t = 60 s; t = 900 s; with mains choke[8)]	$P_{DC\_peak\_13}$					
DC bus power at U_{LN_nenn}; t = 60 s; t = 900 s; with mains choke[9)]	$P_{DC\_base\_17}$	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)]	$P_{DC\_peak\_17}$	kW	32.40	63.00	97.50	168.00
Last modification: 2008-11-20						

1) 2) see definition profile WZM_HS_KB_e
3) 4) see definition profile WZM_HS_Fr_r
5) 6) see definition profile WZM_SA_acc_r
7) 8) see definition profile DRM_S1_acc_e
9) 10) see definition profile DRM_S1_acc_r

Tab. 7-26: 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

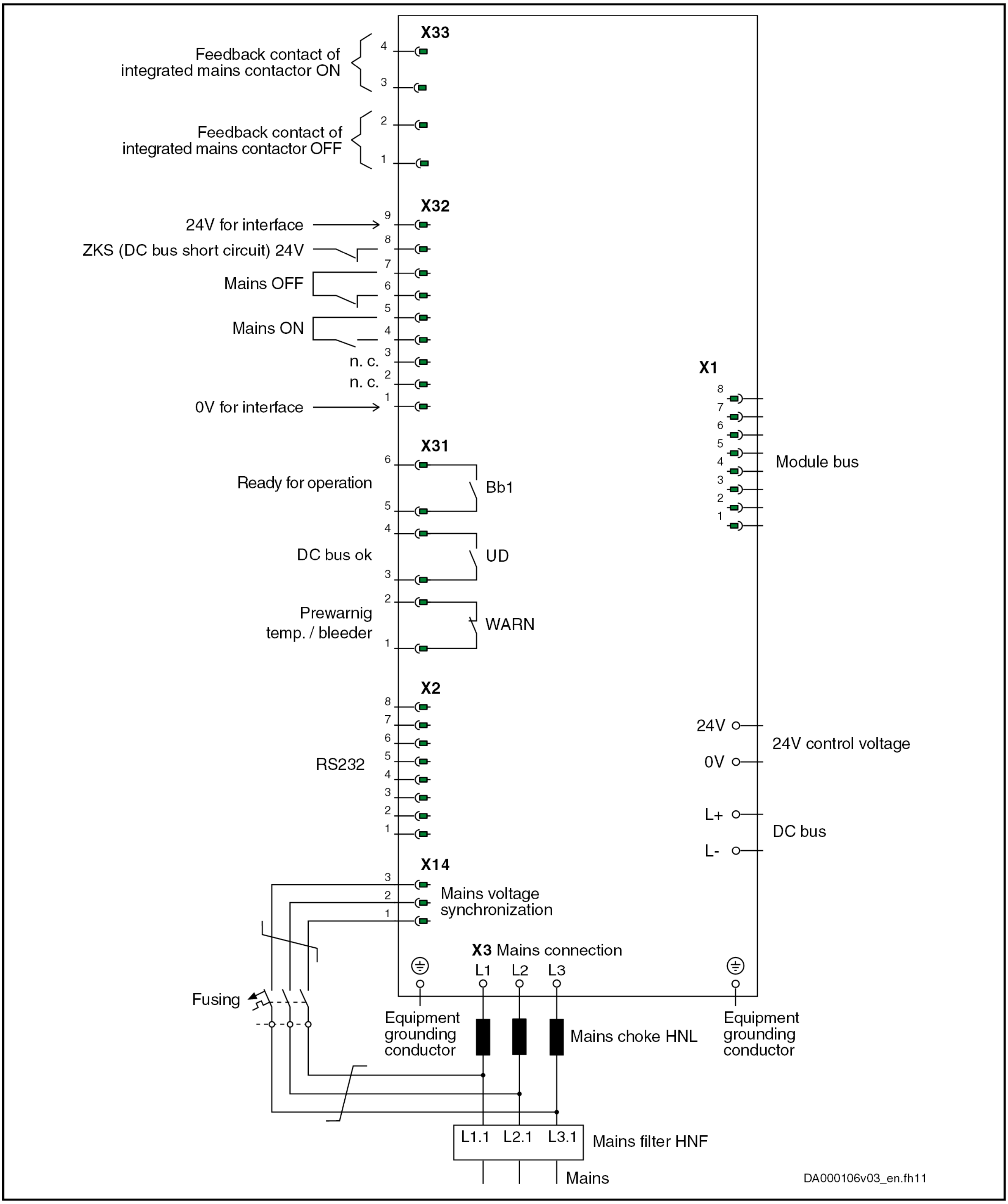


Fig. 7-24: Connection Diagram HMV01.1R-W0018; -W0045; -W0065

IndraDrive M supply units

Overall connection diagram HMV01.1R-W0120

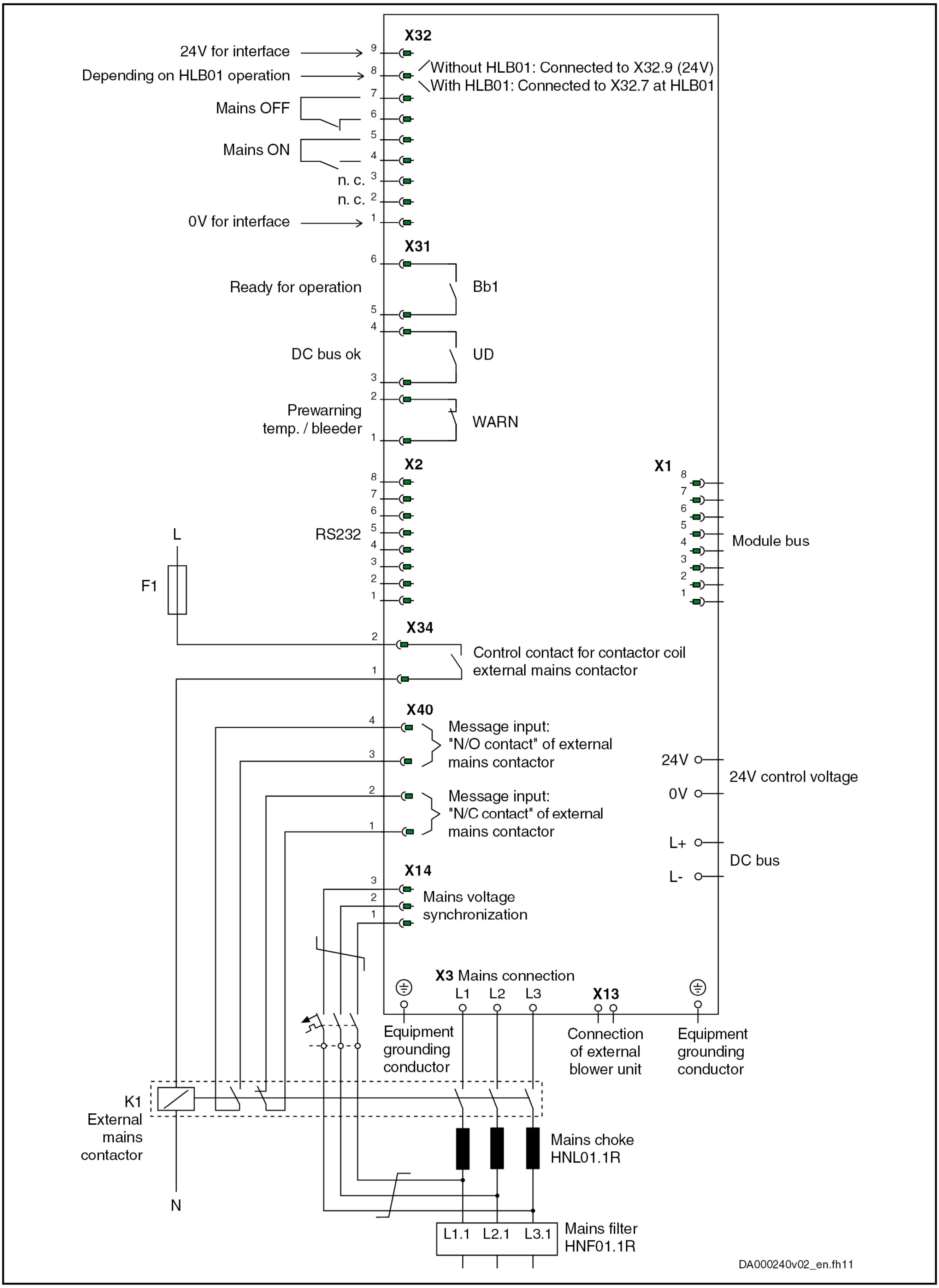


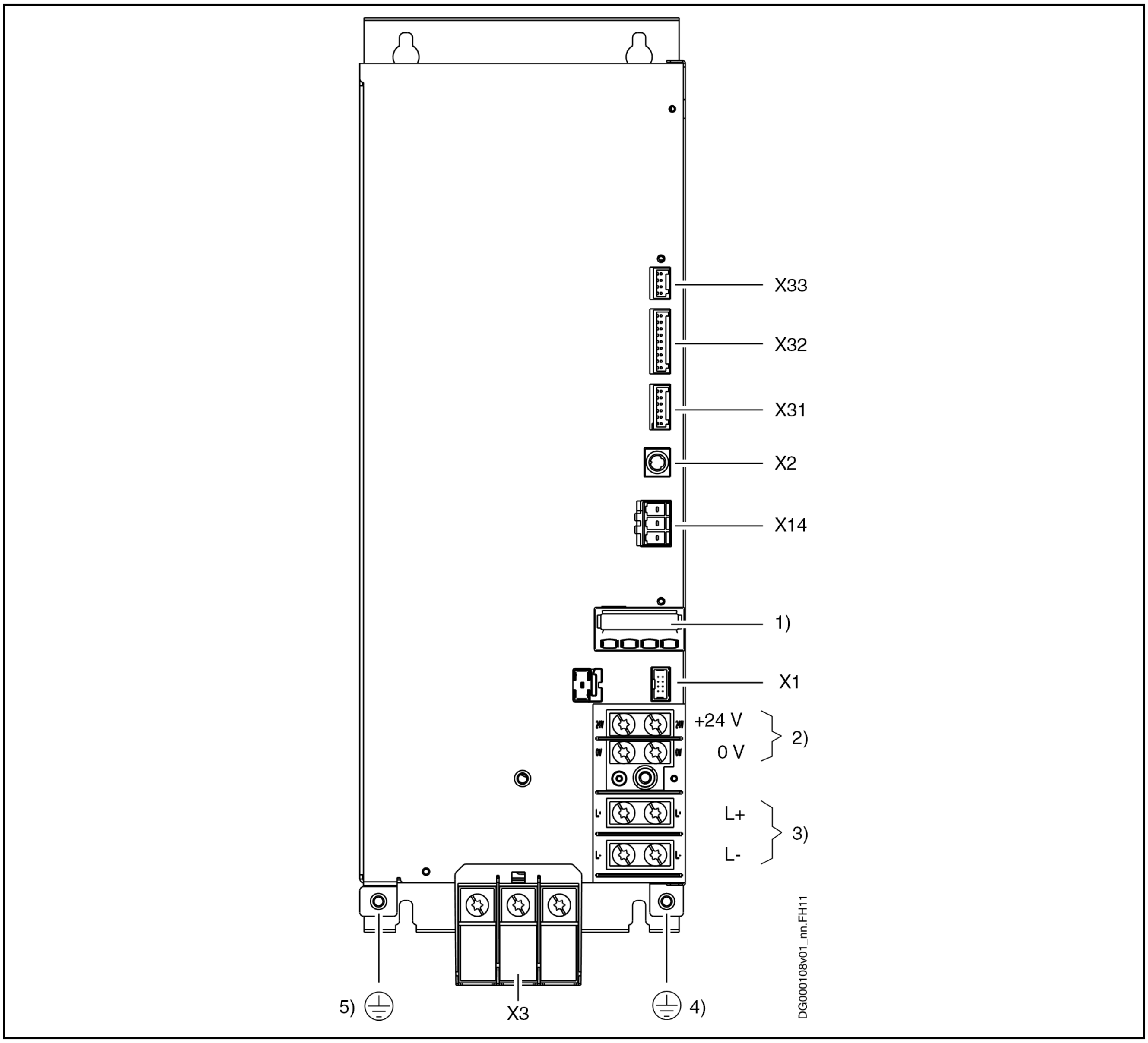
Fig. 7-25: Connection diagram HMV01.1R-W0120

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

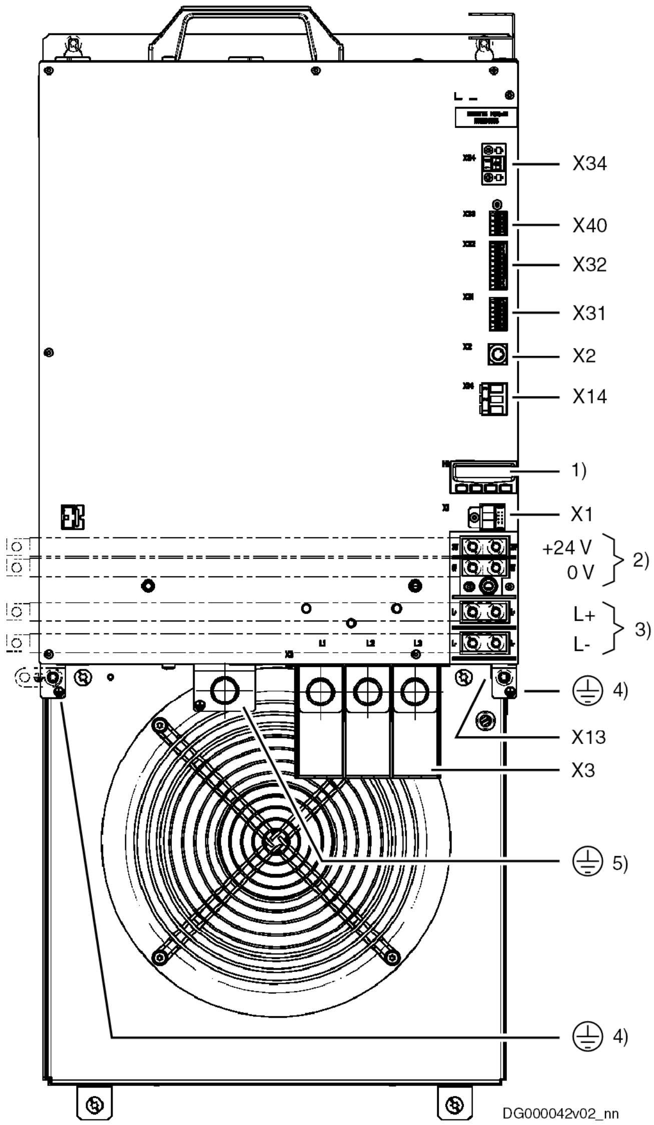
Connections HMV01.1R-W0018, -W0045, -W0065



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. 7-26: 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. 7-27: Connections HMV01.1R-W0120

☞ Connect **HMV01.1R-W0120** supply units to the mains via an **external mains contactor**. The connection **X40** receives the message signals on the state of the external mains contactor (see also index entry "X40 → Acknowledge messages of external mains contacto"r).

Description of the connection points

The connection points are described in detail in chapter 8 Functions and connection points, page 271.

Touch guard The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

7.4 HMV02.1R-Wxxxx supply units, regenerative

7.4.1 Brief description, use and design

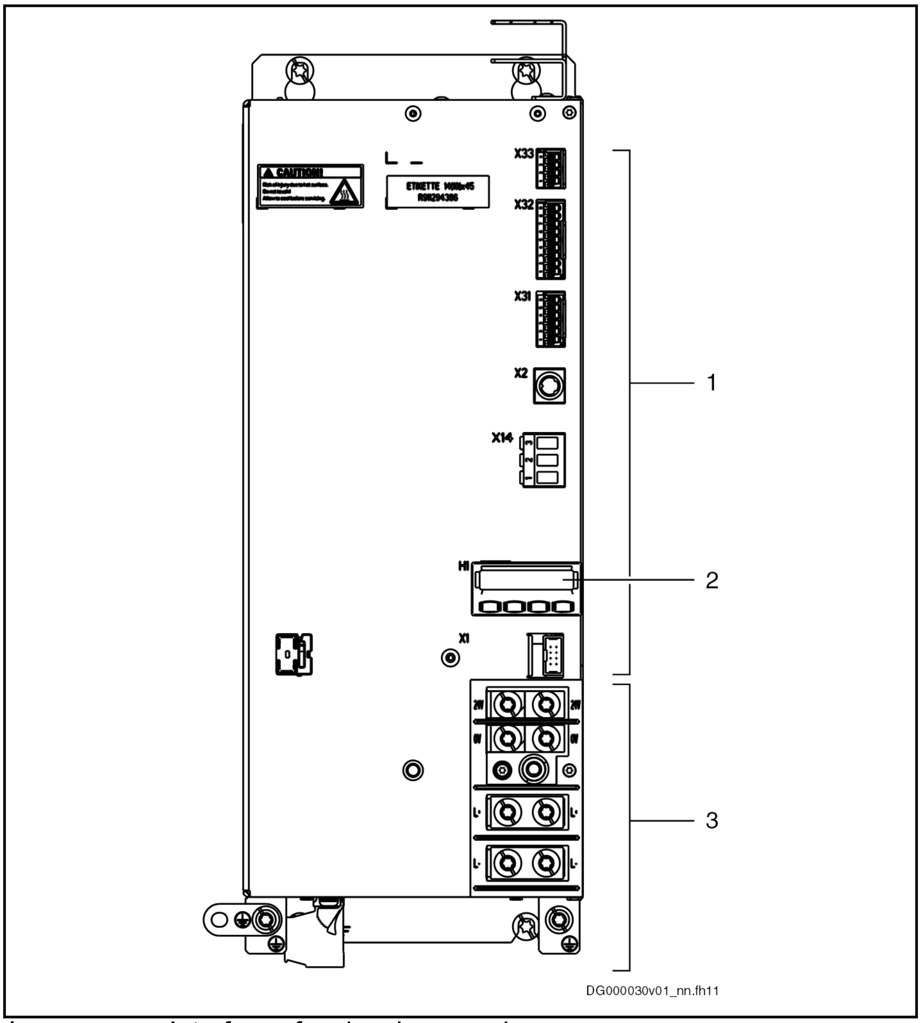
Short description HMV supply units supply modular HMS and HMD devices.

Use The different types can be used as follows:

Type	Use
HMV02.1R	**Regenerative, air-cooled** To supply HMS02.1-Wxxxx drive controllers

Tab. 7-27: Usage of Supply Units

Structure



1 Interfaces for signal processing
2 Control panel
3 Power connections incl. control voltage
4 Coolant connections for cooling type F

Fig. 7-28: 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.

IndraDrive M supply units

Short text 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
Example:	H	M	V	0	2	.	1	R	-	W	0	0	1	5	-	A	-	0	7	-	N	N	N	N

Product
HMV . . . . = HMV

Series
2. . . . . = 02

Design
1 . . . . = 1

Power supply unit
Regenerative . . . . = R

Cooling type
Air, internal (by integrated fan) = W

Rated power ①
15 kW . . . . = 0015

Degree of protection
IP 20. . . . . = A

Nominal DC bus voltage
DC 700 V. . . . . = 07

Other design
Smart Energy Mode . . . . = FNN2 ①
None . . . . = NNNN

Notes
① Other design „FNN2“ is only available with power supply unit "R"

Standard reference

Standard	Title	Edition
DIN EN 60529	Degrees of protection ... (IP code)	2000-09

DT000021v03_en.fh11

Fig. 7-29: Type code

Identification

Type plate arrangement

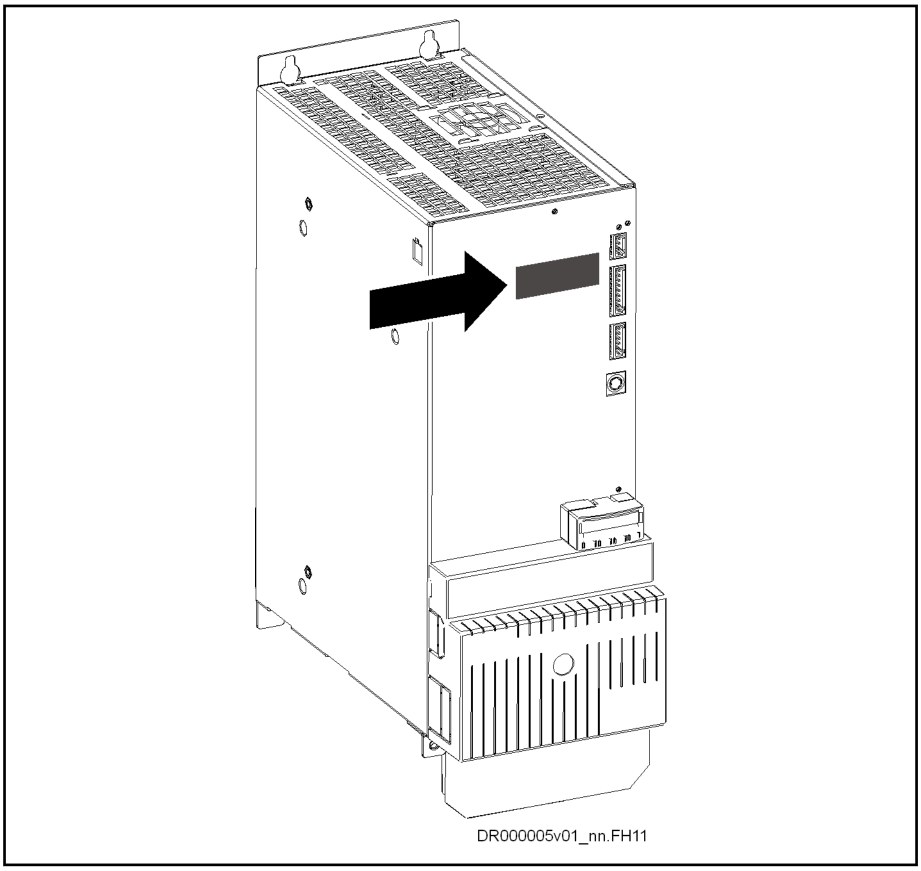
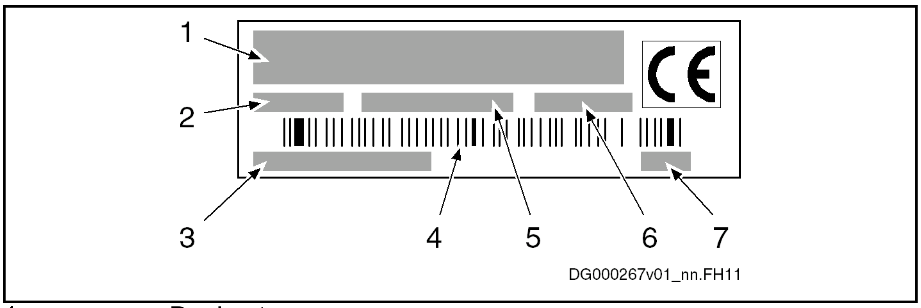


Fig. 7-30: Type Plate at Device

Type plate (power sections, supply units)



1	Device type
2	Part number
3	Serial number
4	Bar code
5	Country of manufacture
6	Production week; e.g. 08W23 meaning year 2008, week 23
7	Hardware index

Fig. 7-31: Type Plate (Power Sections, Supply Units)

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 29.

Installation conditions: See chapter 4.3 "Installation conditions" on page 30.

This chapter contains:

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

UL Data

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
			Last modification: 2014-08-05

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

Tab. 7-28: HMV - Ambient and Operating Conditions - UL Ratings

Applied Standards

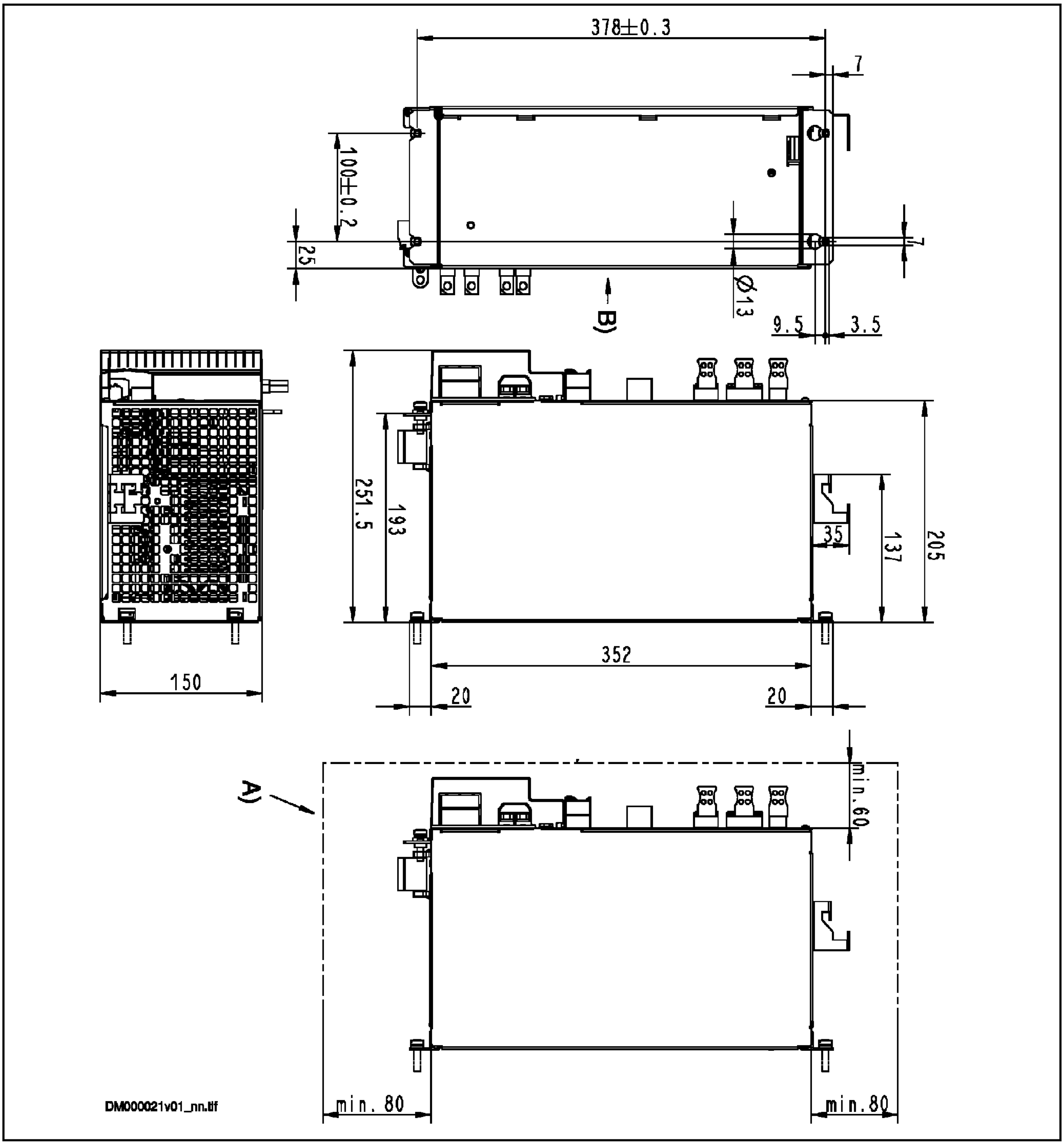
Description	Symbol	Unit	HMV02.1R-W0015
Listing in accordance with UL standard			UL 508C
UL-Files			E134201
Listing in accordance with CSA standard			C22.2 No. 274-13
			Last modification: 2017-01-20

Tab. 7-29: 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. 7-32: Dimensional Drawing HMV02.1R-W0015

IndraDrive M supply units

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
			Last modification: 2007-01-02

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

Tab. 7-30: 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
	f_{Ta}	%/K	2.7
Allowed mounting position			G1
Cooling type			Forced ventilation
Volumetric capacity of forced cooling	V	m^3/h	115.00
Power dissipation at continuous current and continuous DC bus power respectively[1]	P_{Diss_cont}	W	500.00
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
			Last modification: 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
			Last modification: 2008-06-30

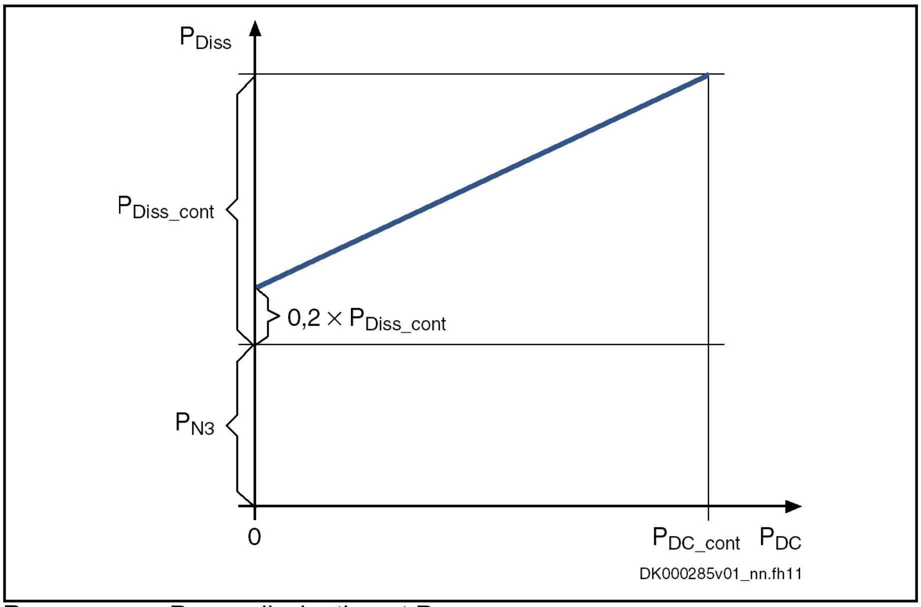
1) Plus dissipation of braking resistor and control section
2) See information on "Rated power consumption control voltage input at U_{N3}"
3) 4) See fig. "Air intake and air outlet at device"

Tab. 7-31: HMV - Data for Cooling and Power Dissipation

Power dissipation vs. output power

Due to their operating principle, regenerative supply units (HMVxx.xR) 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. 7-33: HMVxx.xR - Power Dissipation vs. Output Power

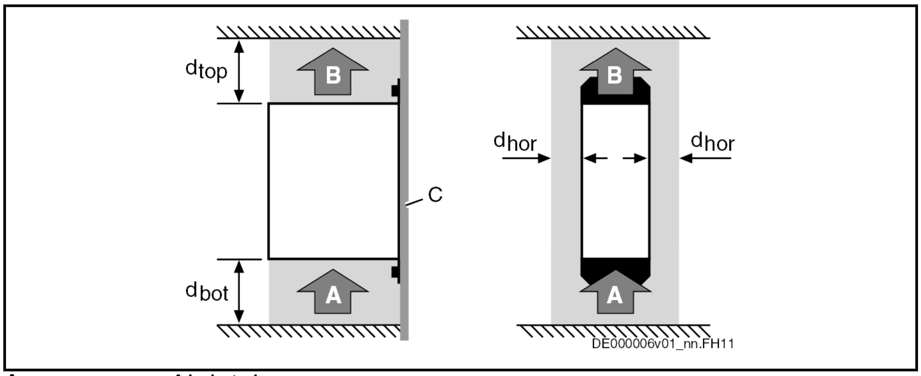
Distances

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. 7-34: Air intake and air outlet at device

Basic data supply unit HMV02, 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 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 ± 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
Pulse width of I_{EIN3}	$t_{EIN3Lade}$	ms	15
			Last modification: 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
			Last modification: 2007-01-02

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

Tab. 7-32: HMV - Data for control voltage supply

Mains voltage

Mains voltage supply data

Description	Symbol	Unit	HMV02.1R-W0015
Mains frequency	f_{LN}	Hz	50...60
Mains frequency tolerance		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
Three-phase mains voltage at IT mains 1)	U_{LN}	V	200...230
Three-phase mains voltage 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
			Last modification: 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	$\cos\varphi^{h1}$		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			Mains contactor integrated
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
Last modification: 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 ≤ 40 °C) in accordance with NFPA 79 chapter 12 and UL 508A chapter 28

Tab. 7-33: HMV - Data for Mains Voltage Supply

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; $U_{LN} \le U_{LN\_nenn}$		%/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	30.00
Monitoring value maximum DC bus voltage, switch-off threshold	$U_{DC\_limit\_max}$	V	900, see also Troubleshooting Guide for E8025, F2817
Last modification: 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 at maximum allowed C_{DCext} external DC bus capacitance at U_{LN_nenn}	$t_{lade\_DC\_Cext}$		
Last modification: 2007-07-30			

1) Only devices with regulated DC bus voltage
2) Use assigned mains choke

Tab. 7-34: HMV - Data of supply unit - 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 resistor	$R_{DC\_Bleeder}$	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
Last modification: 2007-07-27			

1) Factory setting

Tab. 7-35: HMV - Data of Integrated Braking Resistor

Exemplary data for applications

General information

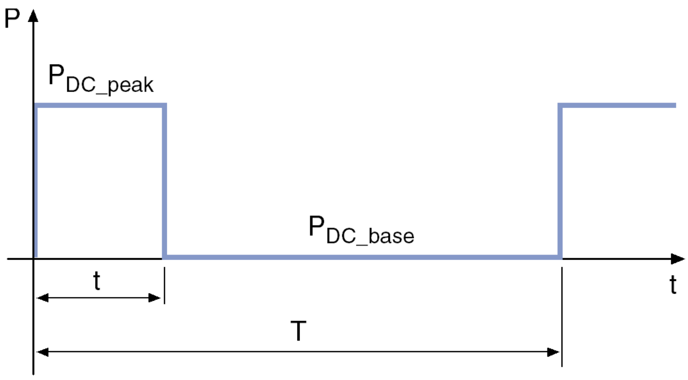
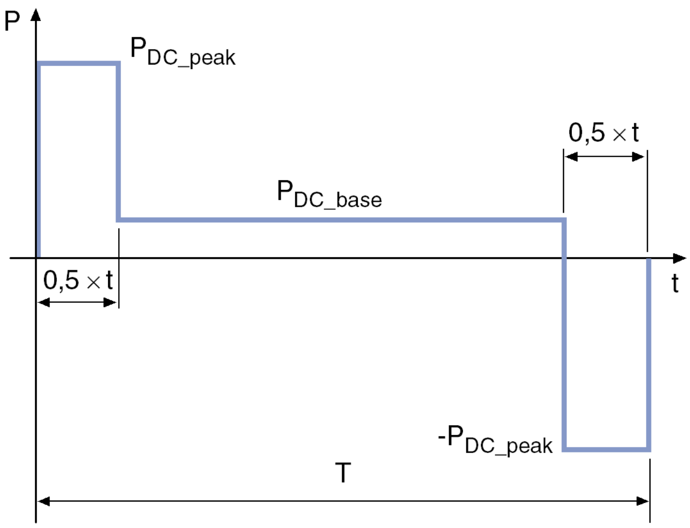
This chapter contains examples of allowed performance profiles.

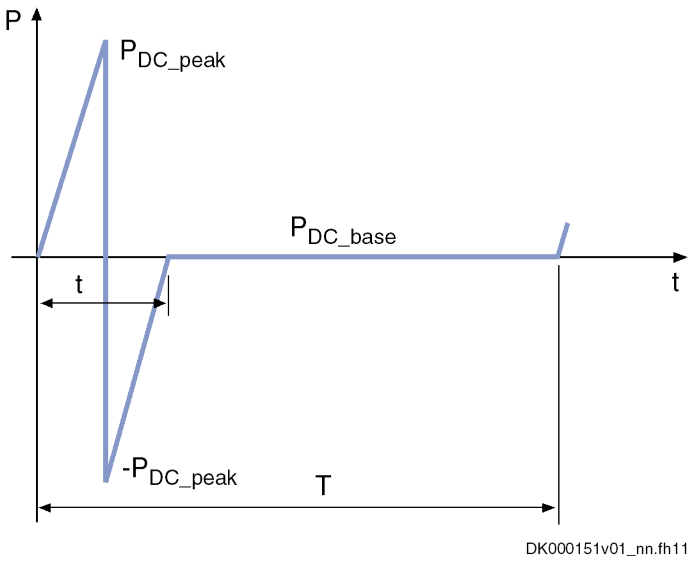
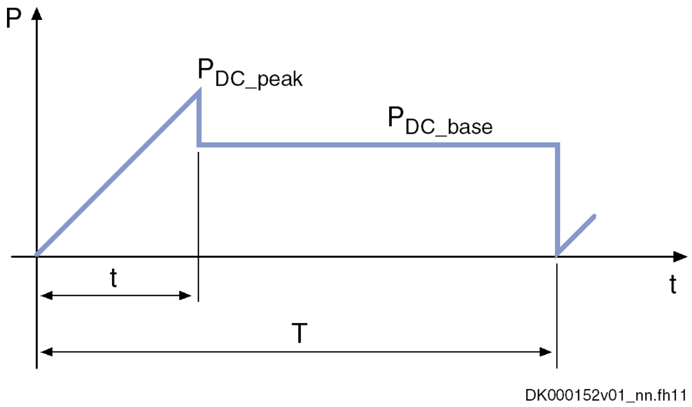
Performance profiles

Performance profiles of regenerative supply units

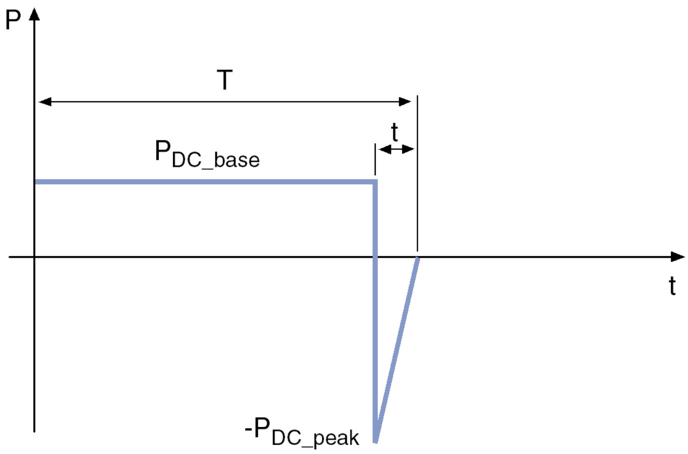
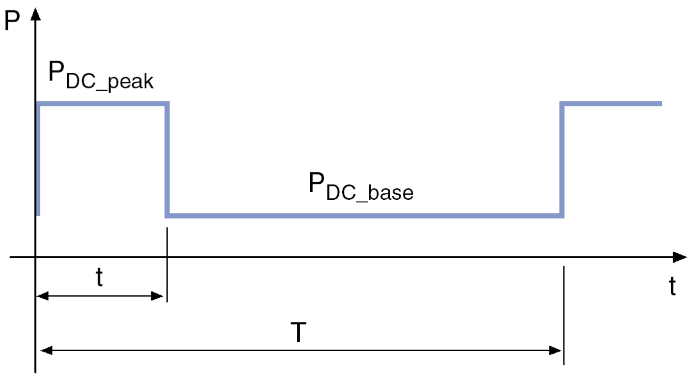
The following profiles have been defined for regenerative supply units.

IndraDrive M supply units

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

<table>
<tr><th>Profile</th><th>Explanation</th></tr>
<tr><td>performance profile "WZM_SA_acc_r"

</td><td>The characteristic data of the profile are used to select regenerative supply units.
Characteristic of servo drives at machine tools.</td></tr>
<tr><td>performance profile "DRM_S1_acc_e"

</td><td>The characteristic data of the profile are used to select infeeding and regenerative supply units.
Characteristic of starting and operation at printing machines.</td></tr>
</table>

IndraDrive M supply units

Profile	Explanation
performance profile "DRM_S1_acc_r"  DK000153v01_nn.fh11	The characteristic data of the profile are used to select regenerative supply units. Characteristic of deceleration at printing machines.
performance profile "UEL_P_e"  DK000135v01_nn.fh11	The characteristic data of the profile are used to select infeeding and regenerative supply units. Characteristic of applications using standard motors in overload operation.

Tab. 7-36: 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)]	$P_{DC\_base\_14}$	kW	0
maximum DC bus power at U_{LN_nenn}; t = 132 s; T = 300 s; with mains choke[2)]	$P_{DC\_peak\_14}$	kW	15.00
DC bus power at U_{LN_nenn}; t = 6 s; t = 60 s; with mains choke[3)]	$P_{DC\_base\_15}$	kW	3.00
maximum DC bus power at U_{LN_nenn}; t = 6 s; t = 60 s; with mains choke[4)]	$P_{DC\_peak\_15}$	kW	30.00
Last modification: 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 choke5)	$P_{DC\_base\_16}$	kW	0
maximum DC bus power at U_{LN_nenn}; t = 0.4 s; t = 4 s; with mains choke6)	$P_{DC\_peak\_16}$	kW	30.00
DC bus power at U_{LN_nenn}; t = 60 s; t = 900 s; with mains choke7)	$P_{DC\_base\_17}$	kW	9.00
maximum DC bus power at U_{LN_nenn}; t = 60 s; t = 900 s; with mains choke8)	$P_{DC\_peak\_17}$	kW	15.00
maximum DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 0.4 s; T = 4 s; K = 2.5; $P_{DC\_peak} = P_{DC\_max}$; with mains choke9)	$P_{DC\_peak\_1}$	kW	25.00
DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 0.4 s; T = 4 s; K = 2.5; $P_{DC\_peak} = P_{DC\_max}$; with mains choke10)	$P_{DC\_base\_1}$	kW	10.00
maximum DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 2 s; T = 20 s; K = 2.0; with mains choke11)	$P_{DC\_peak\_3}$	kW	22.00
DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 2 s; T = 20 s; K = 2.0; with mains choke12)	$P_{DC\_base\_3}$	kW	11.00
DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 60 s; T = 5 min; K = 1.5; with mains choke13)	$P_{DC\_peak\_4}$	kW	16.00
DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 60 s; T = 5 min; K = 1.5; with mains choke14)	$P_{DC\_base\_4}$	kW	10.60
maximum DC bus power at U_{LN_nenn}; $T_a \le T_{a\_work}$; t = 60 s; T = 10 min; K = 1,1; with mains choke15)	$P_{DC\_peak\_5}$	kW	15.00
DC bus power at U_{LN_nenn}; $T_a \le T_{a\_max}$; t = 60 s; T = 10 min; K = 1,1; with mains choke16)	$P_{DC\_base\_5}$	kW	13.60
Last modification: 2007-02-09			

1) 2)	see definition profile WZM_HS_KB_e
3) 4)	see definition profile WZM_HS_Fr_r
5) 6)	see definition profile WZM_SA_acc_r
7) 8)	see definition profile DRM_S1_acc_r

9) 10) 11) 12) 13) 14) 15) 16) See UEL_P_e profile definition

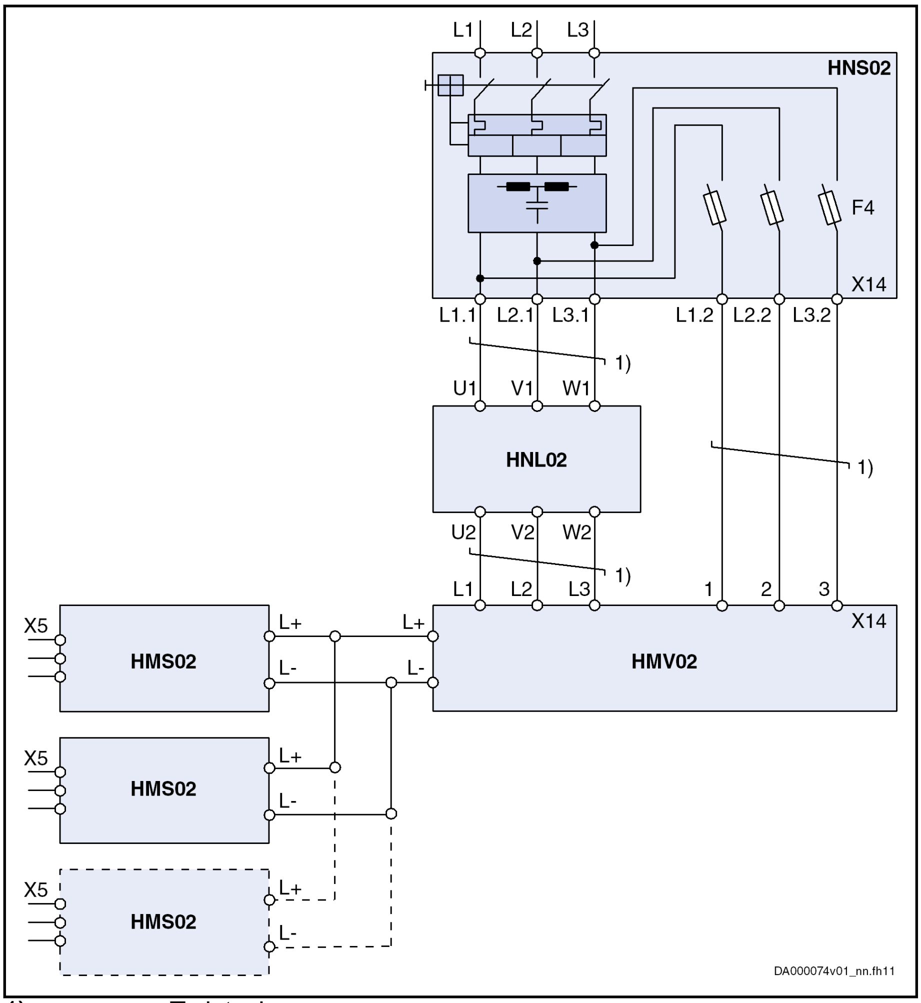
Tab. 7-37: HMV....R - Examples of allowed performance profiles

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
HMV02	Supply unit
HMS02	Power section

Fig. 7-35: Overall Connection Diagram (Mains Filter, Mains Choke, Supply Unit, Power Section)

Overall connection diagram of supply unit

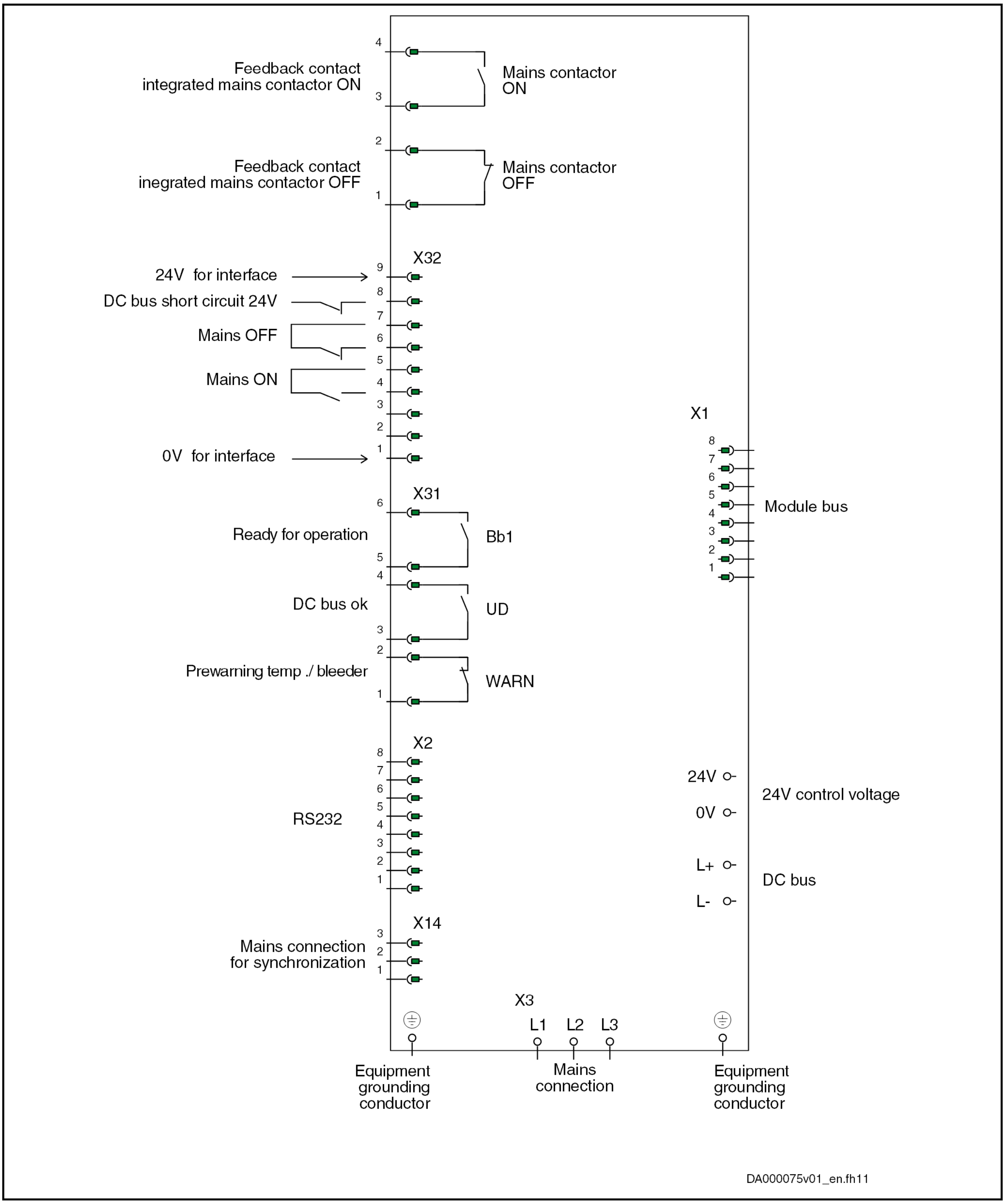
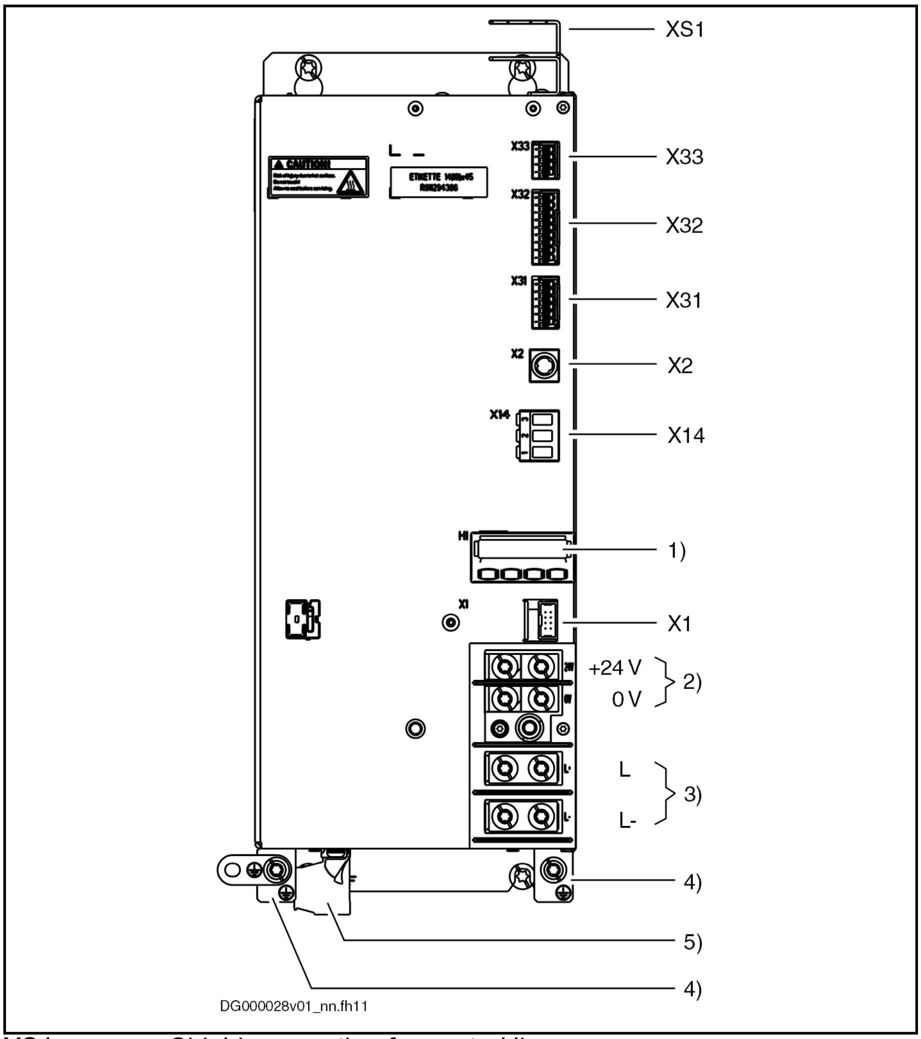


Fig. 7-36: Connection diagram

IndraDrive M supply units

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. 7-37: Connections HMV02.1R

Description of the connection points

The connection points are described in detail in chapter 8 Functions and connection points, page 271.

Touch guard The touch guard is described in detail in chapter 9 Touch guard at devices, page 335.

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 HMV01 HMV02	X1	Information on the status of the drive controllers is exchanged via the module bus.
Commissioning and service interface	HMV01 HMV02 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 V
	HCS03.1E-…-xxxV	-	24V supply is generated from the DC bus via a switching power supply unit. U_{DC} > 300 V
Plug with screw flange	HCS02	X13	
Screw connection	HCS03 HMS01 HMS02 HMV01 HMV02	+24V; 0V	Provides the option to "loop through" the supply via contact bars.
Signaling contacts			
Message ready for operation (Bb)	HMV01 HMV02	X31	Floating contact which shows the status of the drive controller.
Message DC bus (UD)	HMV01 HMV02	X31	Floating contact which shows the status of the DC bus of the supply unit.
Message warning (WARN)	HMV01 HMV02	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	Con-nection	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 ● 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 and connection points

Functions	Device	Con-nection	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-Wxxxx-A-03-Lxxx HCS03.1E-Wxxxx-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 ≥ A11; HWI < A11: X33

Functions and connection points

Connection point	Device	Brief description
L+; L-	HCS02[9)] HCS03 HMS01 HMS02 HMD01 HMV01 HMV02	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

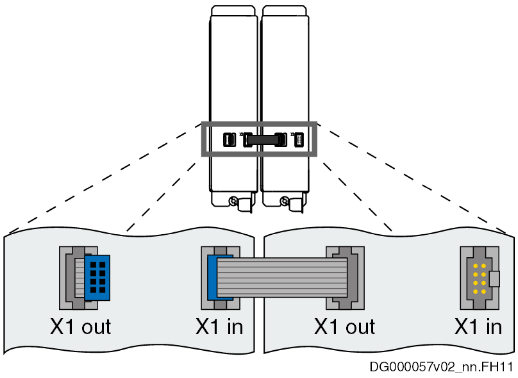
Tab. 8-2: Electrical Connection Points – Overview

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

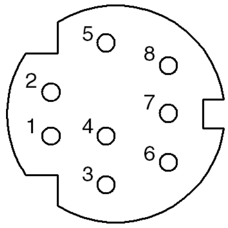
- Keep the ribbon cable in the **parking position**, if the connection to the neighboring device is not established.
- If used for the module bus, **extension cables** must be **shielded**. Their total length may not exceed a **maximum of 40 m**. The module bus connection can be extended by means of 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.

Connec-tion point	Type	Num-ber of poles	Stranded wire [mm²]	Description	Figure
X2	MiniDin, female (device)	8	0,25-0,5	Serial interface	

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

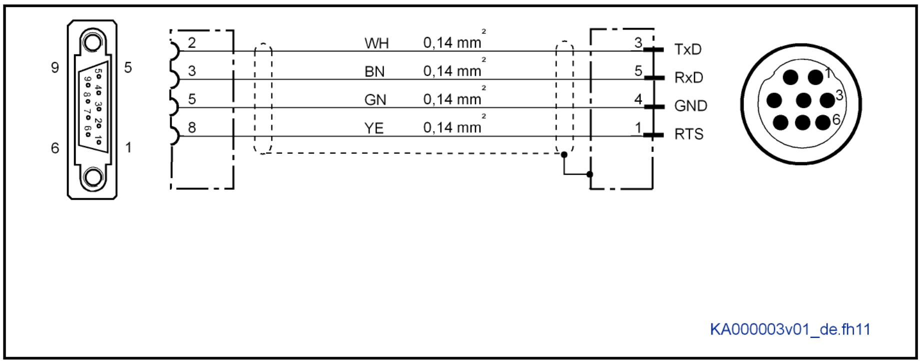


Fig. 8-1: Connection of Serial Interface to PC with 9-Pin D-Sub

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

Serial interface to PC with 25-Pin D-Sub

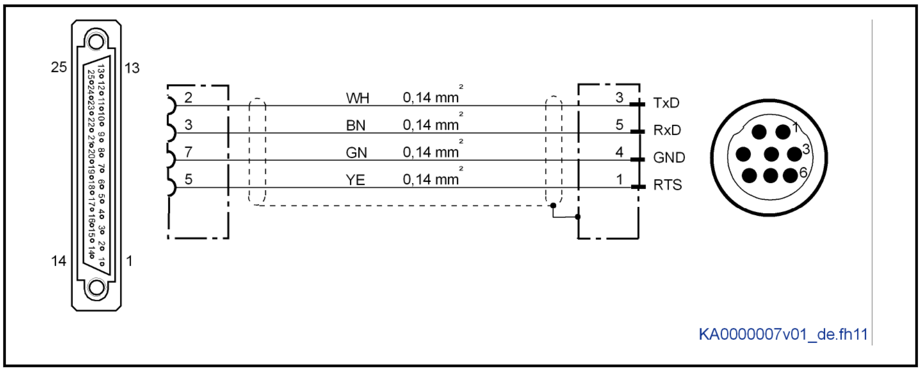


Fig. 8-2: Connection of Serial Interface to PC with 25-Pin D-Sub

8.5 X3, mains connection

8.5.1 Important notes

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

Exclusively operate the device

- with plugged on connectors (even if there haven't been any lines connected to the connectors) and
- with connected equipment grounding conductor!

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 mm^2 (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 mm^2 (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".

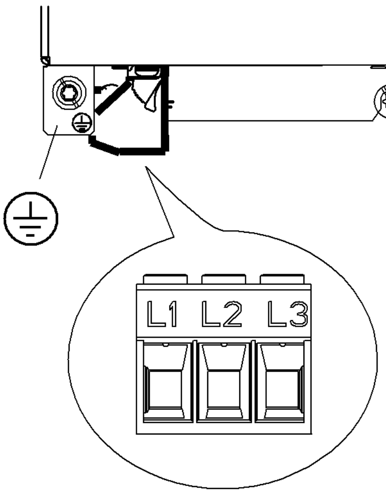
Cross-sectional area A of outer conductors	Minimum cross-sectional area A_{PE} of equipment grounding connection
A ≤ 16 mm²	A
16 mm² < A ≤ 35 mm²	16
35 mm² < A	A / 2

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.

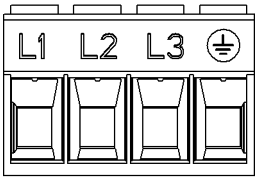
8.5.2 X3, mains connection HMV02.1R-W0015

<table>
<tr><th>View</th><th>Identifica-tion</th><th colspan="2">Function 3-phase operation</th></tr>
<tr><td rowspan="4">

DA000181v01_nn.FH11</td><td>L1</td><td colspan="2">Connection to supply mains (L1)</td></tr>
<tr><td>L2</td><td colspan="2">Connection to supply mains (L2)</td></tr>
<tr><td>L3</td><td colspan="2">Connection to supply mains (L3)</td></tr>
<tr><td>⏚</td><td colspan="2">Connection of equipment grounding conductor of drive controller</td></tr>
<tr><td colspan="4"></td></tr>
<tr><th>Screw connection at connector</th><th>Unit</th><th>Min.</th><th>Max.</th></tr>
<tr><td>Tightening torque</td><td>Nm</td><td>1,5</td><td>1,7</td></tr>
<tr><td rowspan="2">Connection cable
Stranded wire</td><td>mm²</td><td>1,5</td><td>6</td></tr>
<tr><td>AWG</td><td>16</td><td>10</td></tr>
<tr><td>Occurring current load and minimum required connection cross section</td><td>A</td><td colspan="2">See technical data of device used (I_{LN} and A_{LN})</td></tr>
<tr><td>Occurring voltage load</td><td>V</td><td colspan="2">See technical data of device used (U_{LN} or U_{LN_nenn})</td></tr>
</table>

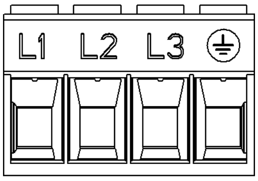
Tab. 8-8: Function, Pin Assignment, Properties

8.5.3 X3, mains connection HCS02.1E-W0012, -W0028

View	Identification	Function 3-phase operation	Function 1-phase operation
 DA000179v01_nn.FH11	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 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

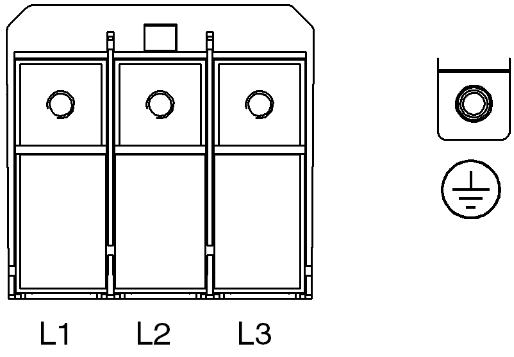
8.5.4 X3, mains connection HCS02.1E-W0054, -W0070 and HCS03.1E-W0070

View	Identification	Function 3-phase operation	Function 1-phase operation[1)]
 DA000179v01_nn.FH11	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

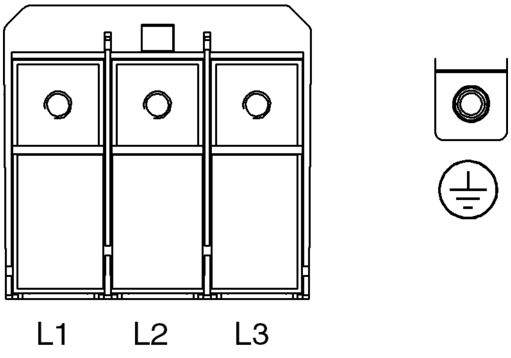
8.5.5 X3, mains connection HCS03.1E-W0100…0150 and HMV01.1R-W0018…0065; HMV01.1E-W0030…0075

View	Identification	Function
 DA000180v01_nn.FH11	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

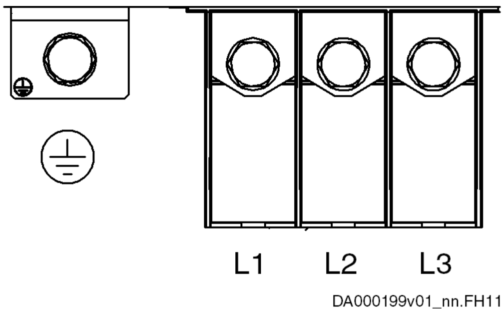
8.5.6 X3, mains connection HCS03.1E-W0210, -W0280, -W0350

View	Identification	Function
 DA000180v01_nn.FH11	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	
	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!**

Exclusively operate the device

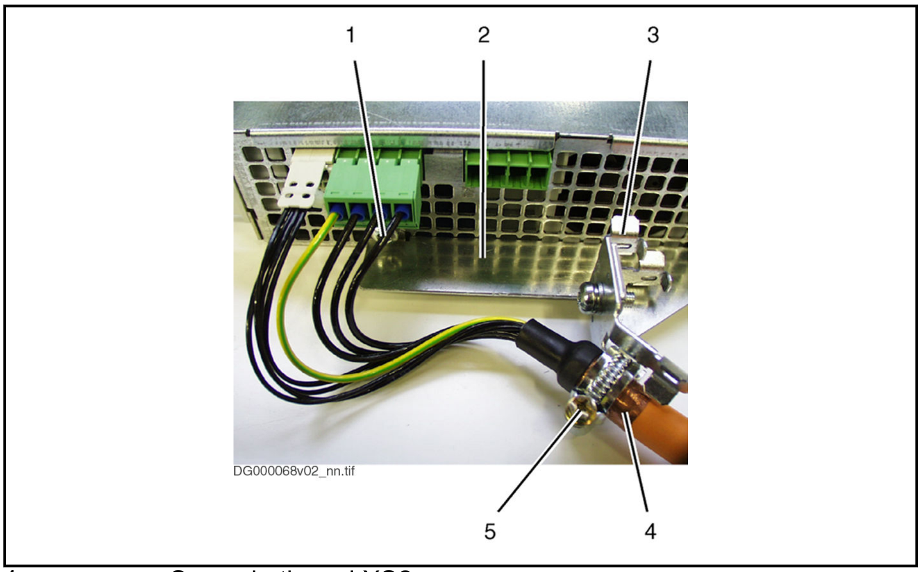
- with plugged on connectors (even if there haven't been any lines connected to the connectors) and
- with connected equipment grounding conductor!

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 mm^2.
- 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.

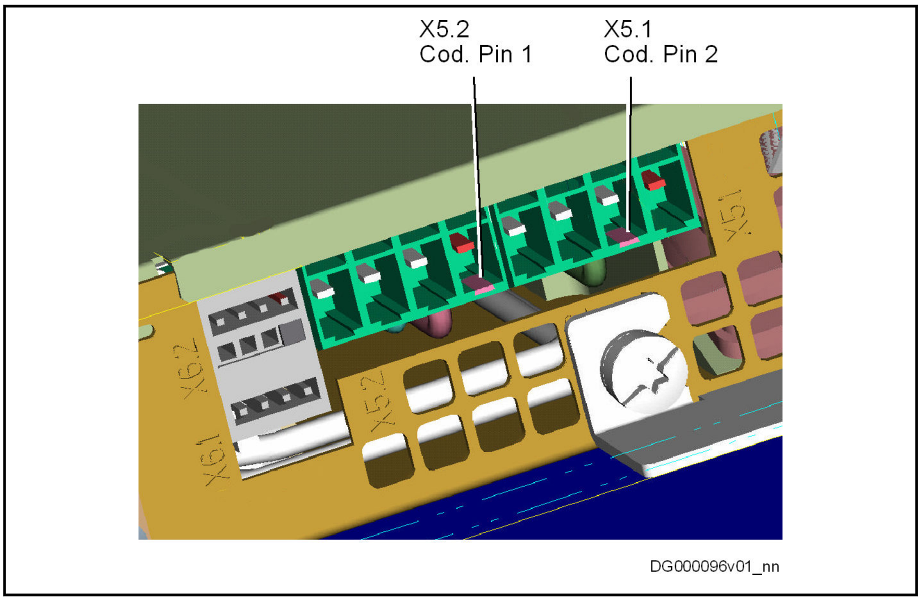
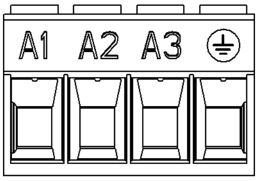


Fig. 8-4: Coding of X5.1 and X5.2

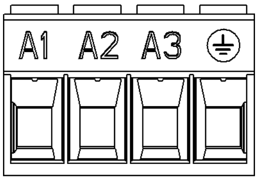
8.6.2 X5, Motor connection HCS02.1E-W0012, -W0028 and HMS01.1N-W0020, -W0036 and HMD01.1N-W0012…0036 and HMS02.1N-W0028

View	Identification	Function
 DA000173v01_nn.FH11	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 Stranded wire	mm^2	1,0	4
	AWG	18	10
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. 8-14: Function, Pin Assignment, Properties

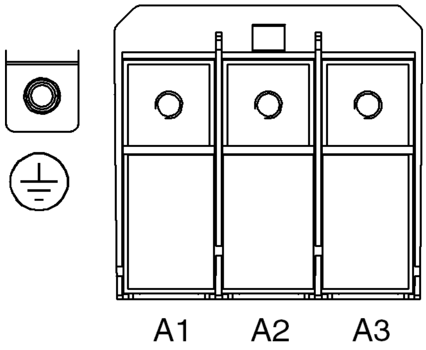
8.6.3 X5, Motor connection HCS02.1E-W0054, -W0070 and HCS03.1E-W0070 and HMS01.1N-W0054, -W0070 and HMS02.1N-W0054

View	Identification	Function
 DA000173v01_nn.FH11	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 Stranded wire	mm^2	1,5	16
	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

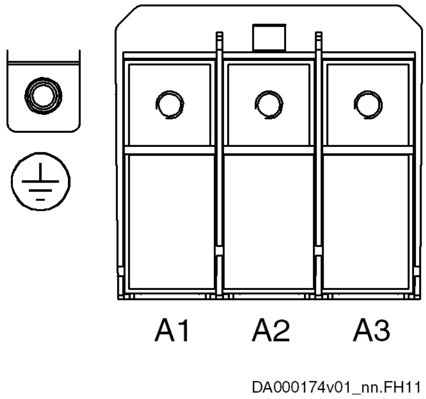
8.6.4 X5, Motor connection HMS01.1N-W0110

View	Identifica-tion	Function
 DA000174v01_nn.FH11	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

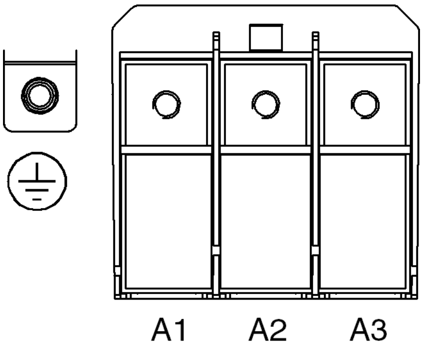
8.6.5 X5, Motor connection HCS03.1E-W0100…0150 and HMS01.1N-W0150…0300

<table>
<tr><th>View</th><th>Identifica-tion</th><th>Function</th></tr>
<tr><td rowspan="4">
</td><td>A1</td><td>For power connection U1 at motor</td></tr>
<tr><td>A2</td><td>For power connection V1 at motor</td></tr>
<tr><td>A3</td><td>For power connection W1 at motor</td></tr>
<tr><td>⏚</td><td>For equipment grounding conductor of motor</td></tr>
</table>

<table>
<tr><th>Terminal block</th><th>Unit</th><th>Min.</th><th>Max.</th></tr>
<tr><td>Screw thread</td><td></td><td colspan="2">M6</td></tr>
<tr><td>Tightening torque</td><td>Nm</td><td>5,5</td><td>6,5</td></tr>
<tr><td rowspan="2">Connection cables
Stranded wire with ring cable lug</td><td>mm²</td><td colspan="2">1×16; 1×25; 1×35; 1×50
2×25; 2×35; 2×50
2×16 with accessories</td></tr>
<tr><td>AWG</td><td colspan="2">1×6; 1×4; 1×2; 1×1
2×4; 2×2; 2×1
2×6 with accessories</td></tr>
<tr><td>Occurring current load and minimum required connection cross section</td><td>A</td><td colspan="2">See technical data of device used (I_{out})</td></tr>
<tr><td>Occurring voltage load</td><td>V</td><td colspan="2">See technical data of device used (U_{out})</td></tr>
<tr><td>Short circuit protection</td><td></td><td colspan="2">A1, A2, A3 against each other and each of them against ground</td></tr>
</table>

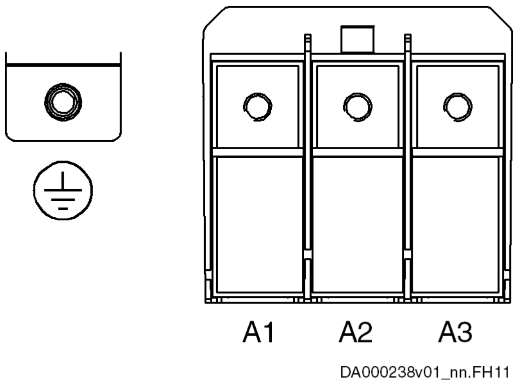
Tab. 8-17: Function, Pin Assignment, Properties

8.6.6 X5, Motor connection HCS03.1E-W0210, -W0280, -W0350

View	Identification	Function	
 DA000174v01_nn.FH11	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
	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!**

Exclusively operate the device

- with plugged on connectors (even if there haven't been any lines connected to the connectors) and
- with connected equipment grounding conductor!

⚠ 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

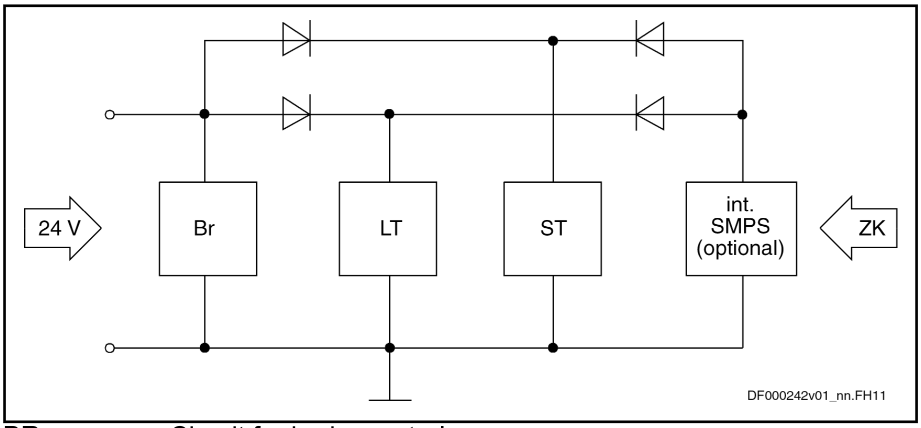
Function

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-Wxxxx-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

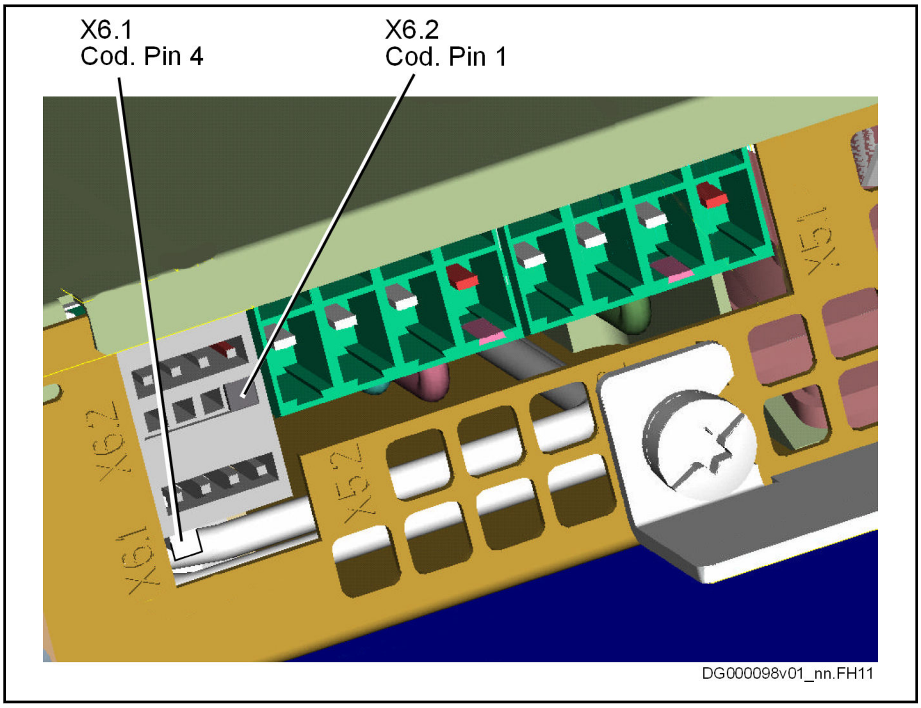
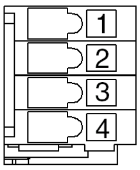


Fig. 8-6: Coding of X6.1 and X6.2

8.7.2 Connection point

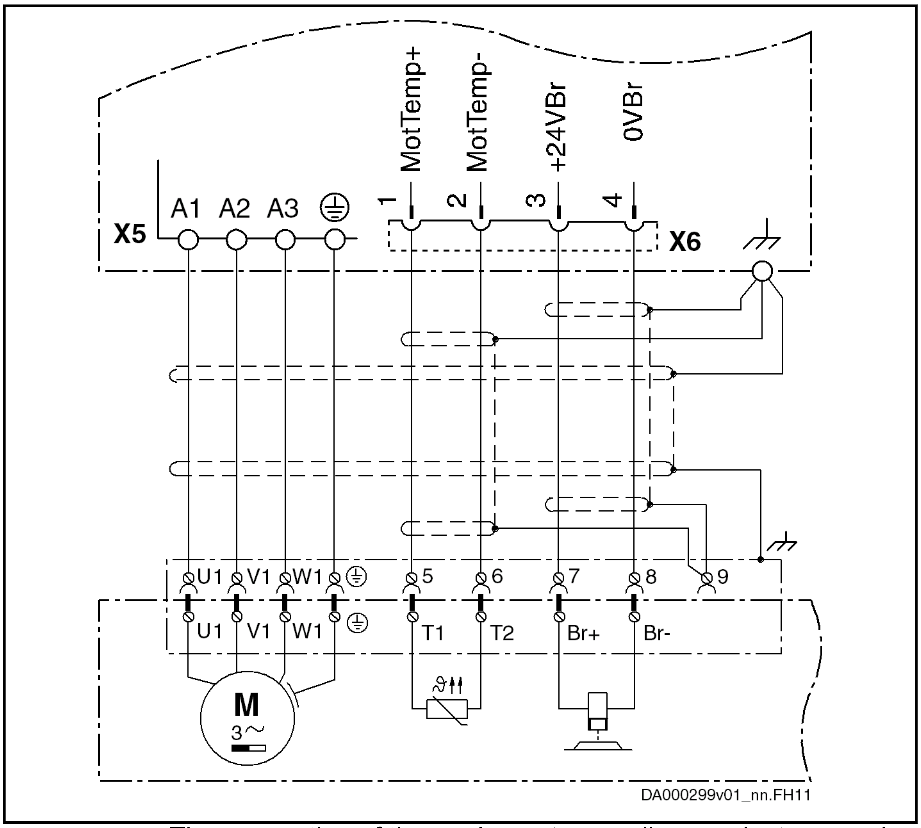
View	Connection	Signal name	Funktion
 DG000097v01_nn.FH11	1	MotTemp+	Motor temperature evaluation input
	2	MotTemp-	
	3	+24V	Output for controlling motor holding brake
	4	0V	
Spring terminal (connector)	**Unit**	**Min.**	**max.**
Connection cable solid wire	mm^2	0.5	1.5
Connection cable, stranded wire	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!**

Exclusively operate the device

- with plugged on connectors (even if there haven't been any lines connected to the connectors) and
- with connected equipment grounding conductor!

☞ 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"

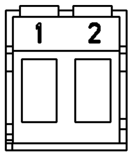
The drive controller monitors the operating data of the external braking resistor against the data in "P-0-0858, Data of external braking resistor". Select braking resistors with a performance that corresponds to the parameterized values or more powerful braking resistors.

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	Connec-tion	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 Stranded wire	mm^2	2.5	4
	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-W00**18** + HLR01.2N-01K0-N**68**R0-E-007
- HCS01.1E-W00**28** + HLR01.2N-01K0-N**68**R0-E-007
- HCS01.1E-W00**54** + HLR01.2N-01K0-N**28**R0-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.

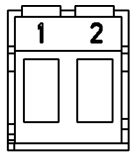
For the connection lines at X9, use at least the cross section of the lines for mains connection at X3. If this is impossible, select the cross section of the connection line at X9 in accordance with the continuous power of the braking resistor.

8.8.3 X9, external brake 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 -xx**B**V.

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 Stranded wire	mm^2	16	
	AWG	6	
Tightening torque	Nm	1.5	1.7
HCS03.1E-W0100, -W0150			
Connection line Stranded wire	mm^2	25	
	AWG	4	
Tightening torque	Nm	2.0	2.5
HCS03.1E-W0210, -W0280, -W0350			
Connection line Stranded wire	mm^2	50	
	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-W00**18** + HLR01.2N-01K0-N**68**R0-E-007
- HCS01.1E-W00**28** + HLR01.2N-01K0-N**68**R0-E-007

- HCS01.1E-W00**54** + HLR01.2N-01K0-N**28**R0-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)

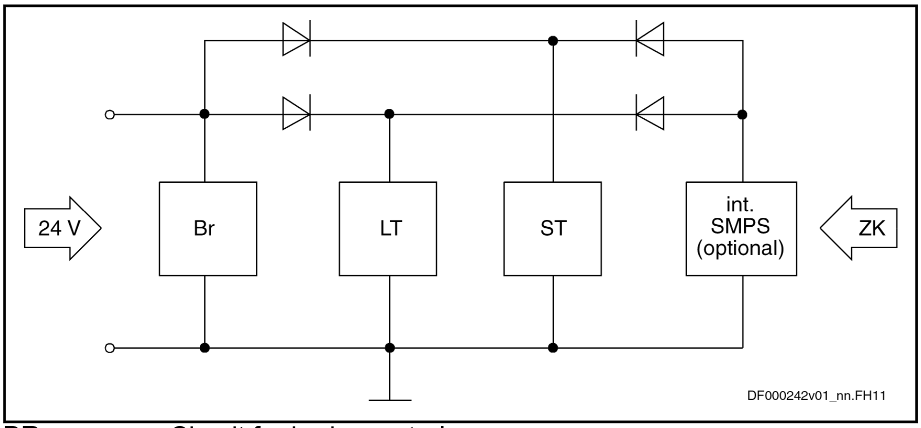
Function, pin assignment

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

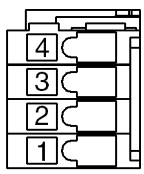
Control voltage block diagram

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 mm^2
- 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, Supply Fan Unit HAB01

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.

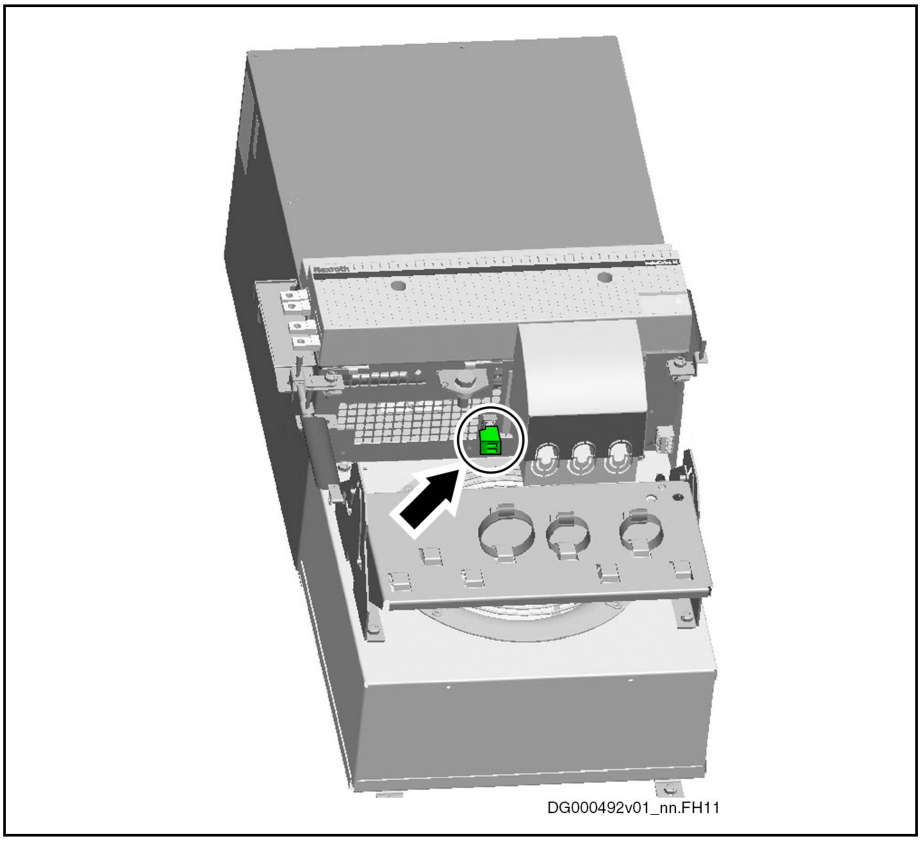


Fig. 8-10: Connection X13 at the Bottom of the Device

Function, Pin Assignment

Connection	Signal name	Function
1	24V	Power supply for external fan unit HAB01. Power consumption contained in P_{N3} of HMV or HMS.
2	0V	

Tab. 8-24: Function, Pin Assignment

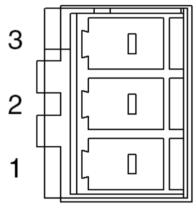
8.11 X14, mains voltage synchronization

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

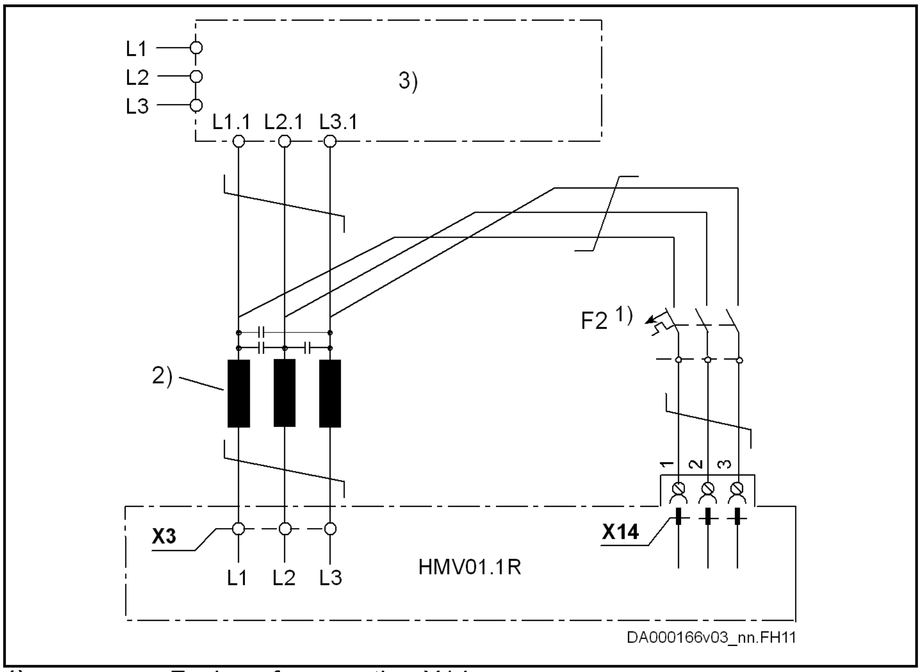
Screw connection at connector	Unit	Min.		Max.
Number of poles		3		
Type		STECK - LE 7,62 M PC 4,0 / 3G		
Design		Male connector at device		
Connection cable solid wire	mm^2	1,5		4
Connection cable stranded wire	mm^2	1,5		2,5
	AWG	14		12
Tightening torque	Nm	0,5		0,6
Allowed input current	A			5
Input 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.

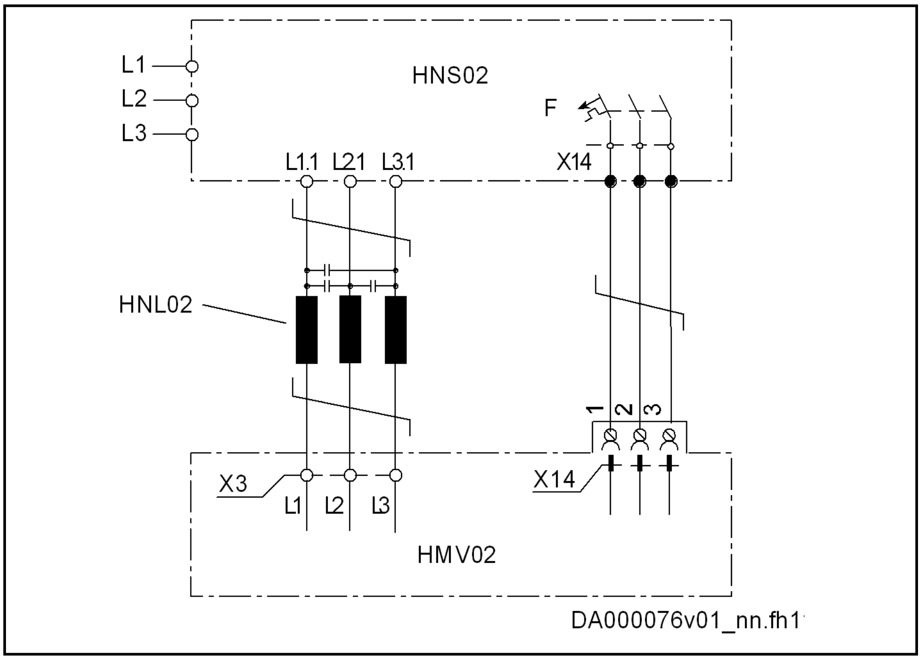


Fig. 8-12: Synchronizing Voltage HMV02.1R-W0015

8.12 X31, Messages Bb1, UD, WARN

View

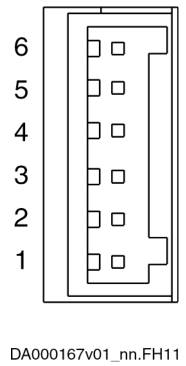
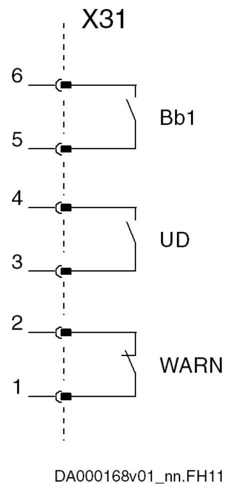


Fig. 8-13: View

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:** • 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:** • Overload at integrated braking resistor • Overtemperature 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 realized as N/C contact:

- HMV01.1E-W0030: From HWI -14 upwards
- HMV01.1E-W0075: From HWI -14 upwards
- HMV01.1E-W0120: From HWI -15 upwards
- HMV01.1R-W0018: From HWI -17 upwards
- HMV01.1R-W0045: From HWI -17 upwards
- HMV01.1R-W0065: From HWI -18 upwards

8.13 X32, Mains contactor control and DC bus short circuit

View

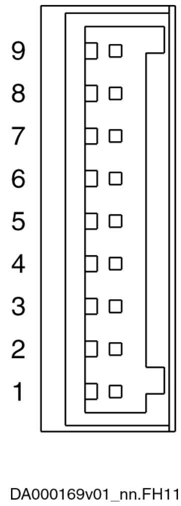


Fig. 8-14: View

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!

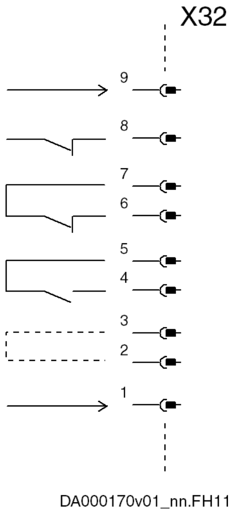
The "ZKS" input activates the "DC bus short circuit" function, when the 24V control voltage has not been applied and when there isn't any current flowing to the input. This condition can occur in the following situations:

- 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.

Functions and connection points

Pin assignment	Connection	Signal name	Function
	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**: • 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: • 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, acknowledge messages of integrated mains contactor

View

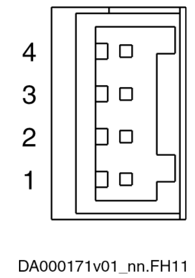


Fig. 8-15: View

Function, pin assignment

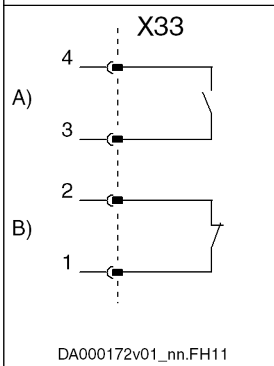
☞ Observe the **functional differences** between the connection points **X33** and **X40**, depending on the supply unit:

- 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 **HMV01.1R-W0120 with hardware index ≥ 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: Closed with mains contactor picked up
	3	-	
	2	-	B) N/C contact of integrated mains contactor: Open with mains contactor picked up
	1	-	

Tab. 8-30: Function, Pin Assignment

Properties

Data	Unit	Min.	Typ.	Max.
Number of poles			4	
Type			Spring terminal	
Design			Pins on device	

Data	Unit	Min.	Typ.	Max.
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

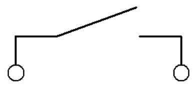
View

Fig. 8-16: View

Function, pin assignment

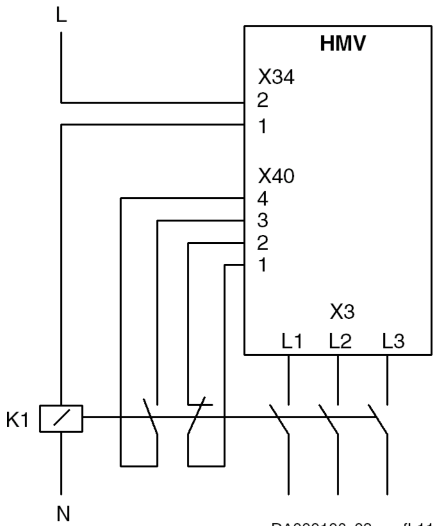
The contact at X34 is used to control the external mains contactor of supply units without integrated mains contactor (e.g. HMV01.1R-W0120).

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

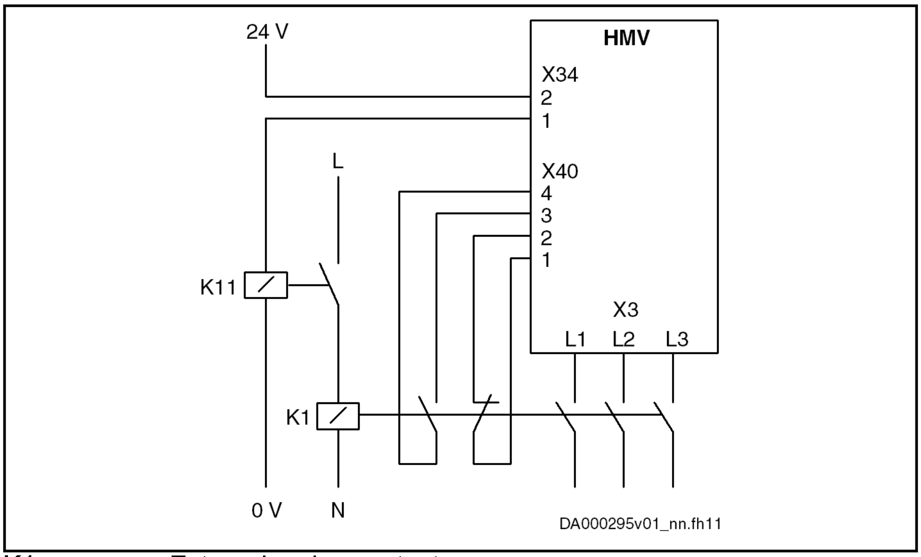
Connection diagram



K1 External mains contactor
L, N 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

Functions and connection points

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 ≥ A11** (see type plate). These supply units do not have connection point X33.

View

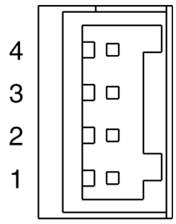
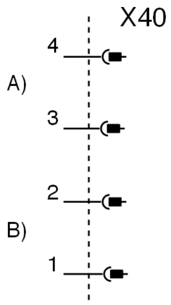


Fig. 8-19: View

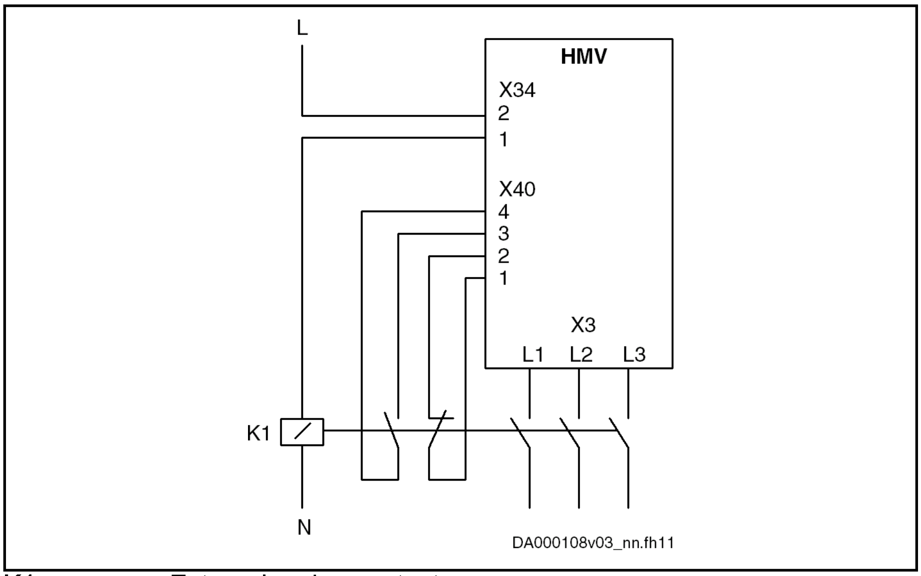
Function, pin assignment

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	-	
The **output current** is **ca. 8 mA** (at 24 V). Use suitable electric-designed contacts. The contacts are included in the control circuits for mains connection (see Project Planning Manual of drive system).			

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:

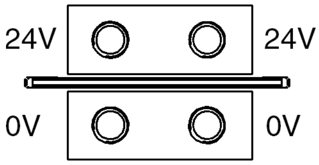
24V supply of HMS, HMD, HCS power sections (not at HCS02)

- 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 HMV supply units

- For the integrated electronics
- For the 24V interface of the mains connection for ON/OFF control

Technical Data of the Connection Point

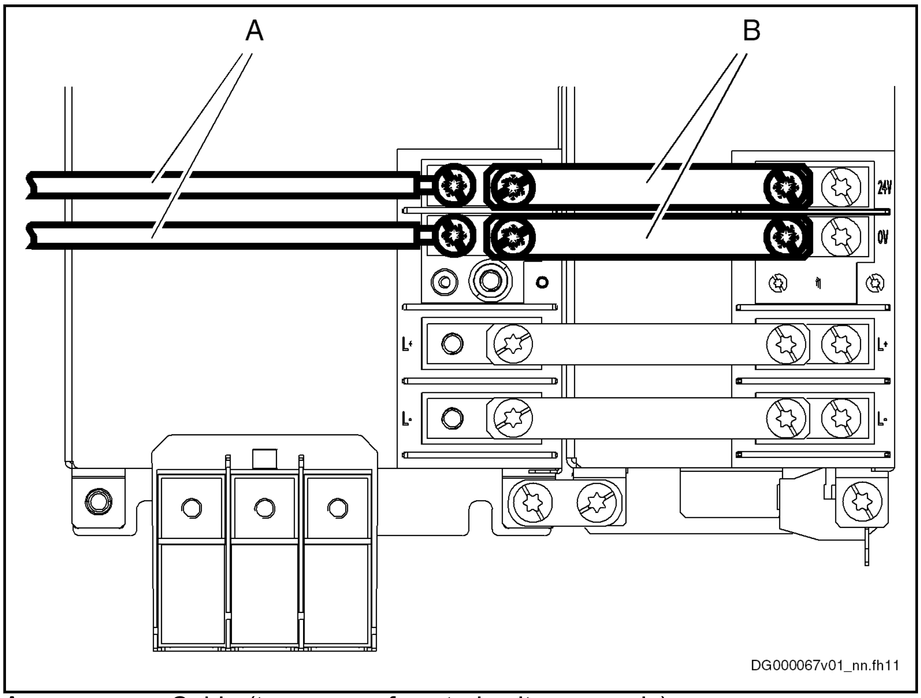
View	Identification	Function
 DA000175v01_nn.FH11	+24V	Power supply Connection to neighboring devices with contact bars from accessory HAS01.1
	0V	Reference potential for power supply Connection to neighboring devices with contact bars from accessory HAS01.1

Screw connection M6 thread at device (terminal block)	**Unit**	**Min.**	**Max.**
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

Functions and connection points

Connection diagram



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 µH (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!

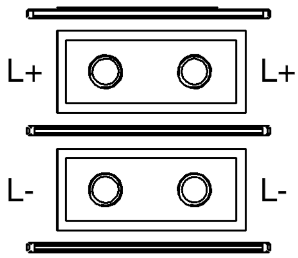
Function, pin assignment

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	
 DA000176v01_nn.FH11	L+ L-	Connection points for connecting DC bus connections	
Screw connection M6 thread at device (terminal block)	**Unit**	**Min.**	**Max.**
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

Functions and connection points

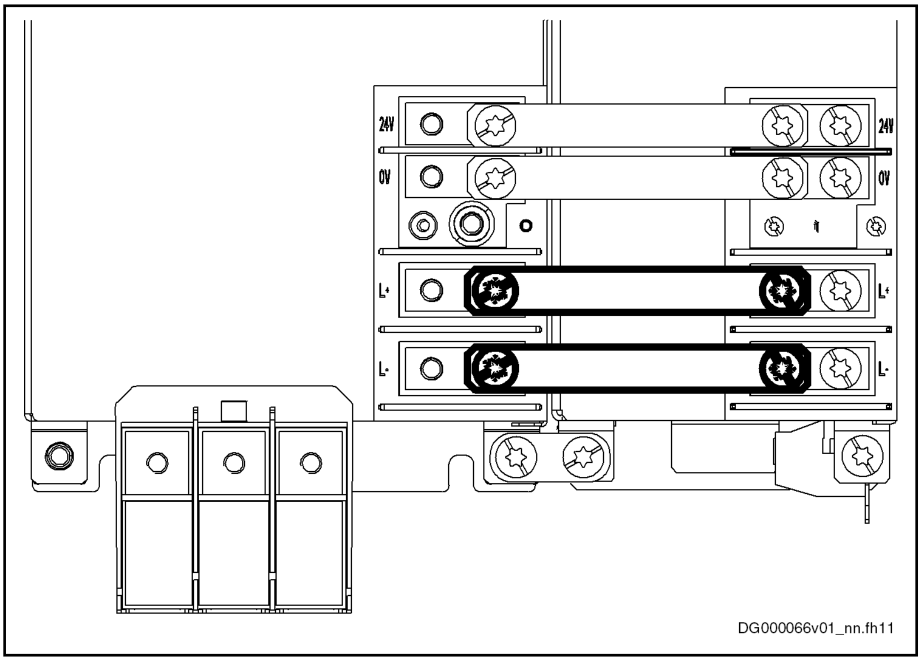


Fig. 8-22: DC Bus Connection with Contact Bars

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.

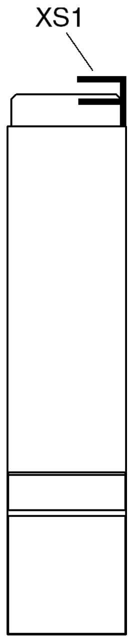


Fig. 8-23: Shield Connection XS1 (Control Lines)

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:

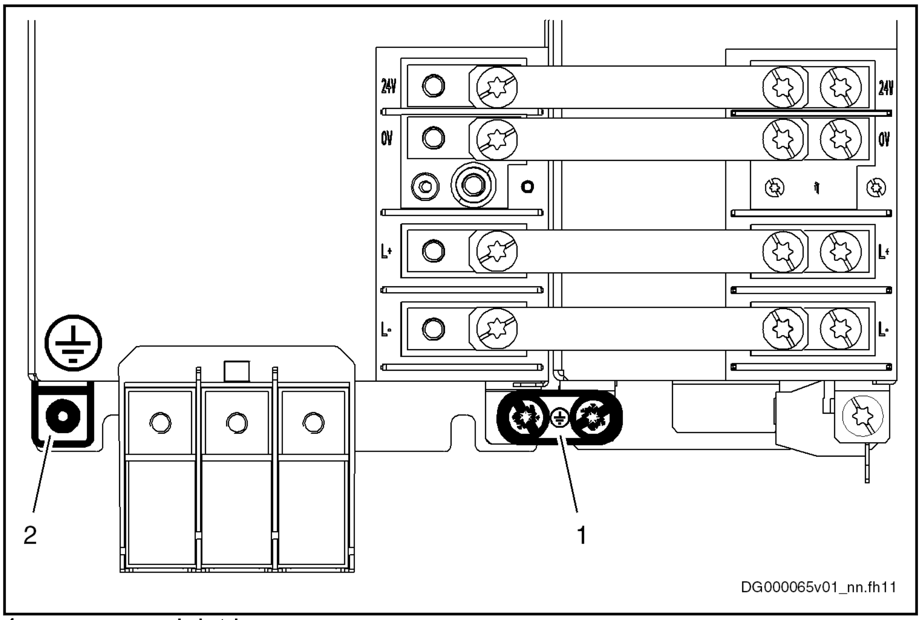
- For **HCS03.1E** drive controllers, **HMV01** and **HMV02** supply units at least **10 mm^2 (AWG 8)**, but not smaller than the cross sections of the outer conductors of the mains supply feeder
- For **HCS02.1E** drive controllers, **at least 4 mm^2 (AWG 10)**, but not smaller than the cross sections 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".

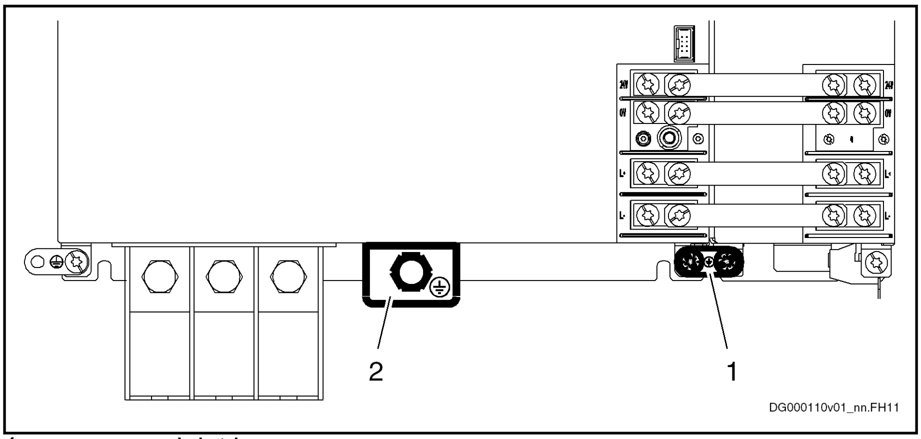
Cross-sectional area A of outer conductors	Minimum cross-sectional area A_{PE} of equipment grounding connection
A ≤ 16 mm²	A
16 mm² < A ≤ 35 mm²	16
35 mm² < A	A / 2

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

Functions and connection points

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 mm^2 (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 mm^2 (AWG 10)**, but not smaller than the cross sections of the outer conductors of the mains supply feeder

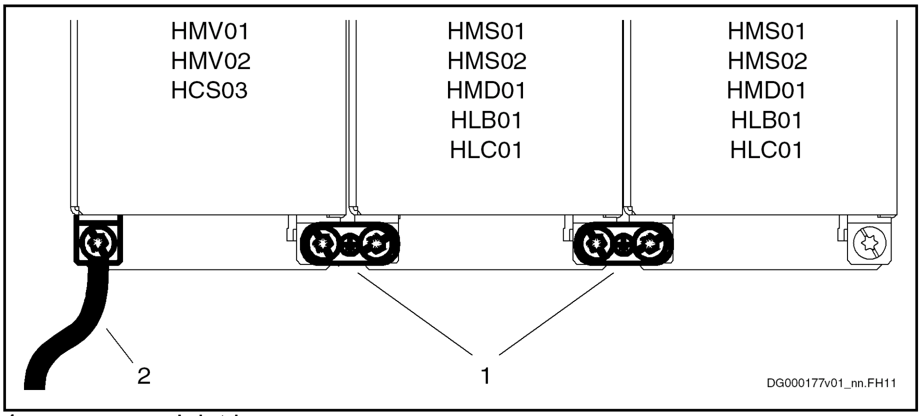
  Additionally, mount the housing of HCS02.1E to a bare metal mounting plate. Connect the mounting plate, too, with at least the same cross section to the equipment grounding conductor system in the control cabinet.

For outer conductors with a cross section greater than 16 mm^2, 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 ≤ 16 mm²	A
16 mm² < A ≤ 35 mm²	16
35 mm² < A	A / 2

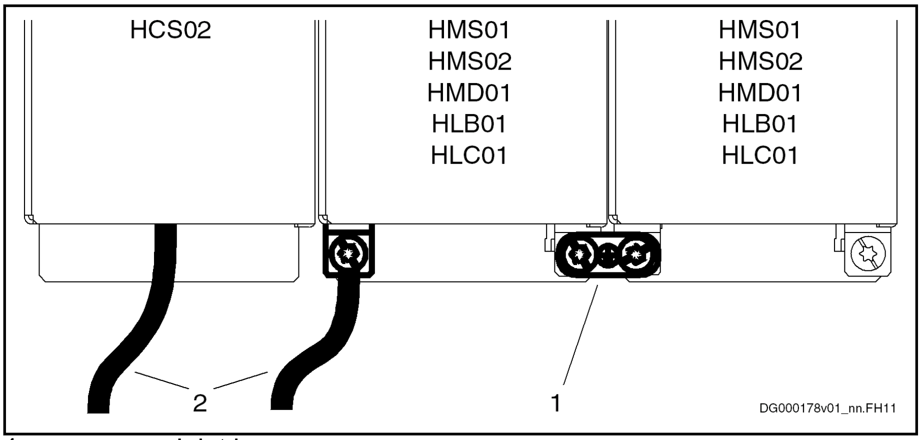
Tab. 8-42: Equipment grounding conductor cross section

☞ 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

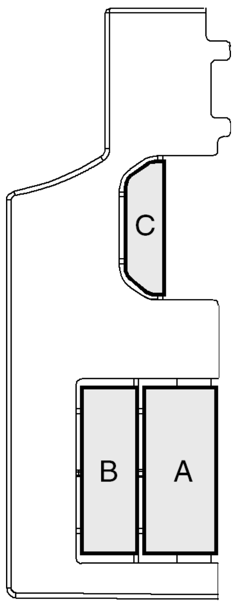
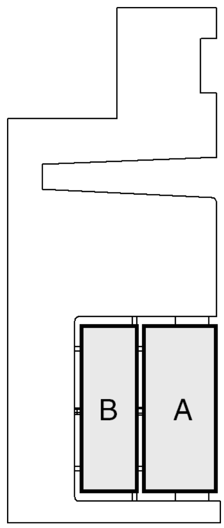
Tab. 8-43: Data of Connection Point

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.

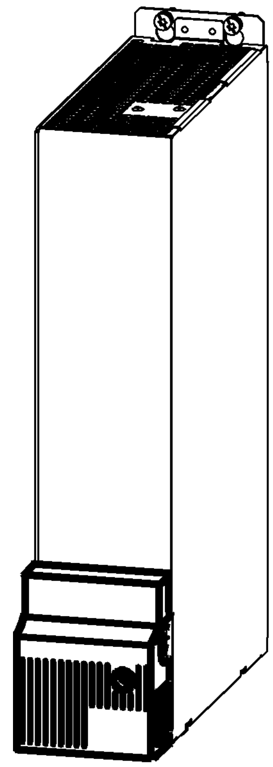
Type 1	Type 2
 DG000050v01_nn.FH11	 DG000049v01_nn.FH11

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.

Touch guard at devices

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.

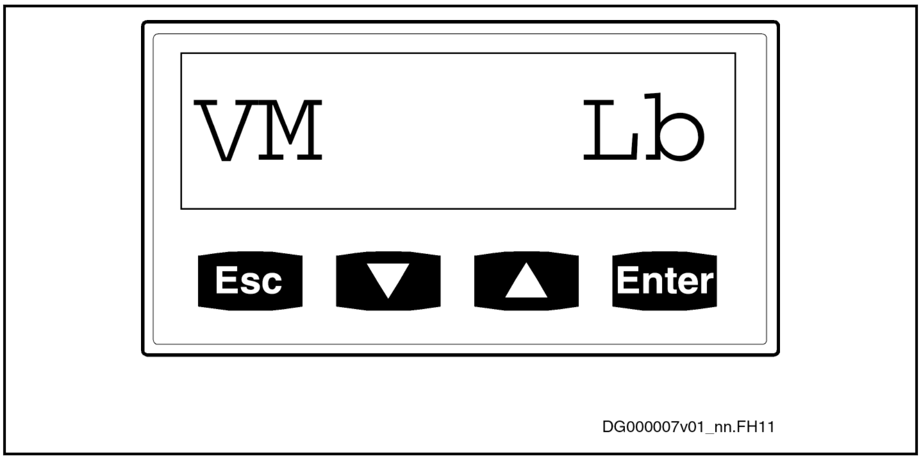


Fig. 10-1: Standard control panel with display and keys

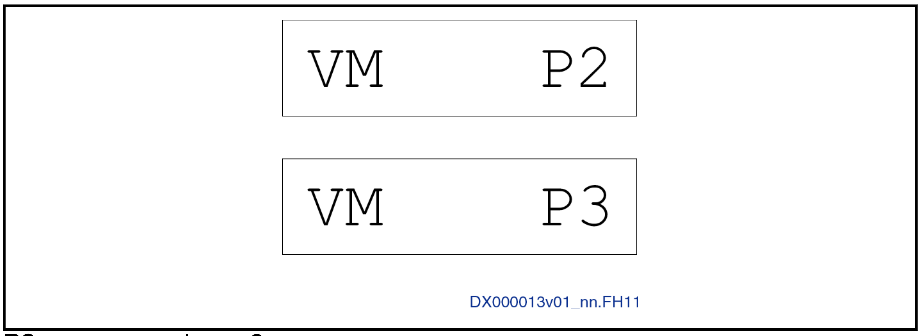
Functional description

Displays

The display automatically shows:

- phases during device initialization
- operating states
- activated commands
- diagnostic command messages
- warnings
- diagnostic error messages

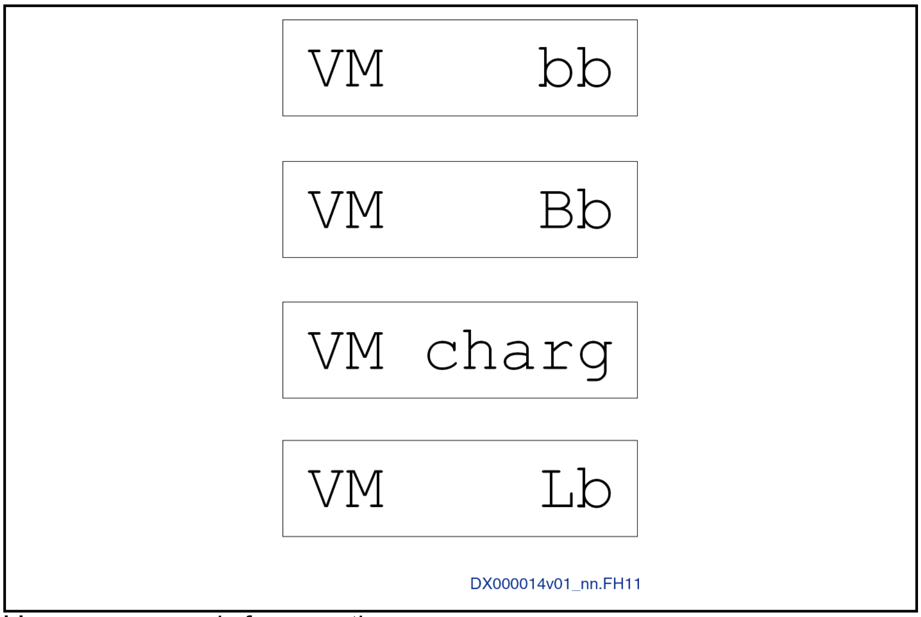
Display during device initialization



P2	phase 2
P3	phase 3

Fig. 10-2: Display during device initialization

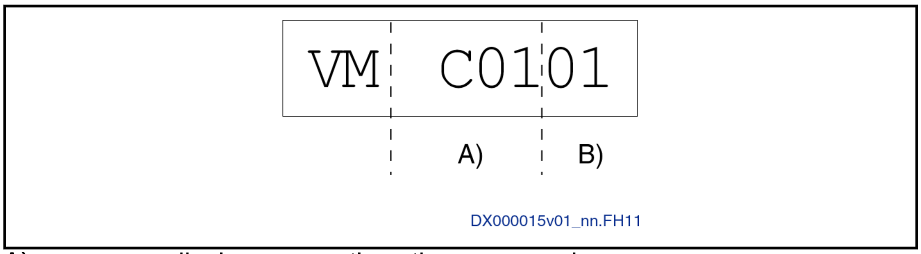
Display of operating states



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

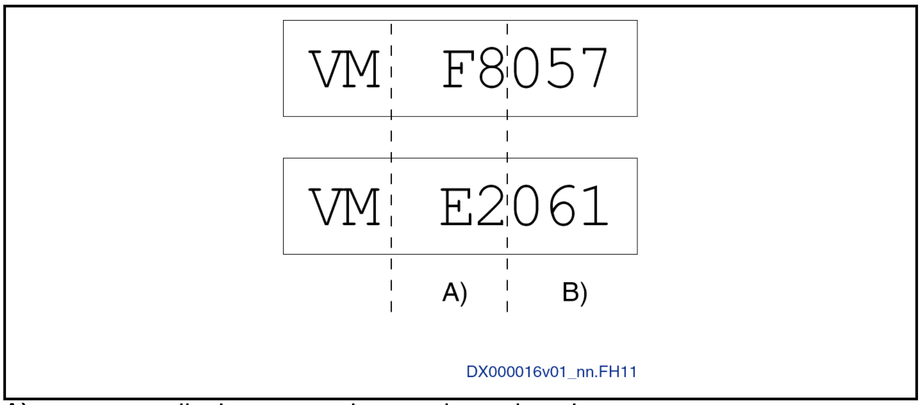
Diagnostic command messages



A)	displays currently active command
B)	displays number of diagnostic command message

Fig. 10-4: Diagnostic command messages

Warnings and diagnostic error messages



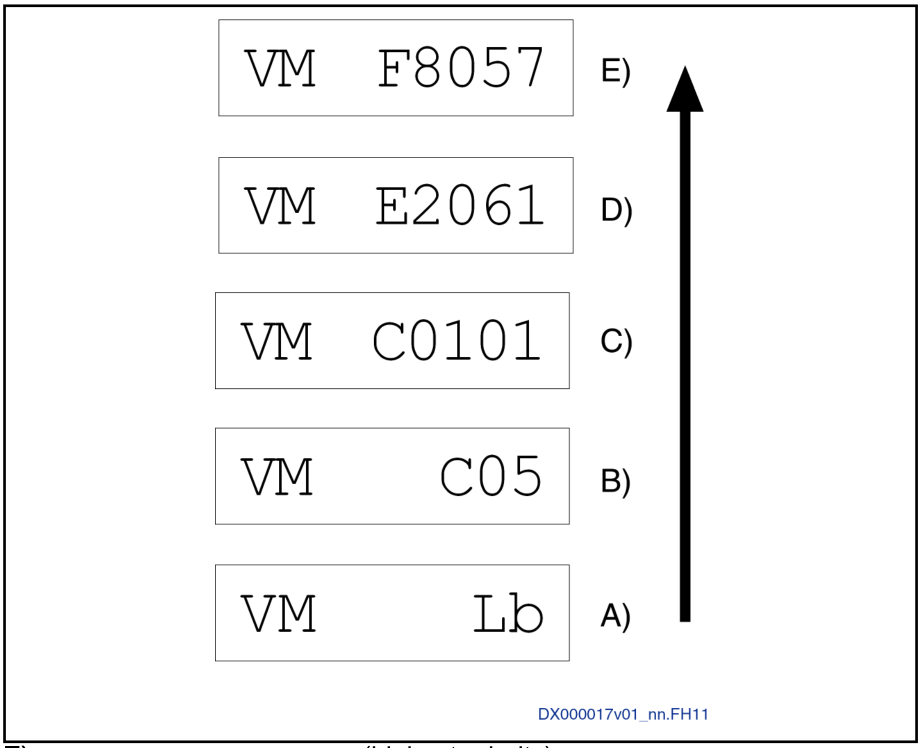
A)	displays error class and warning class
B)	displays error number and warning number

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)

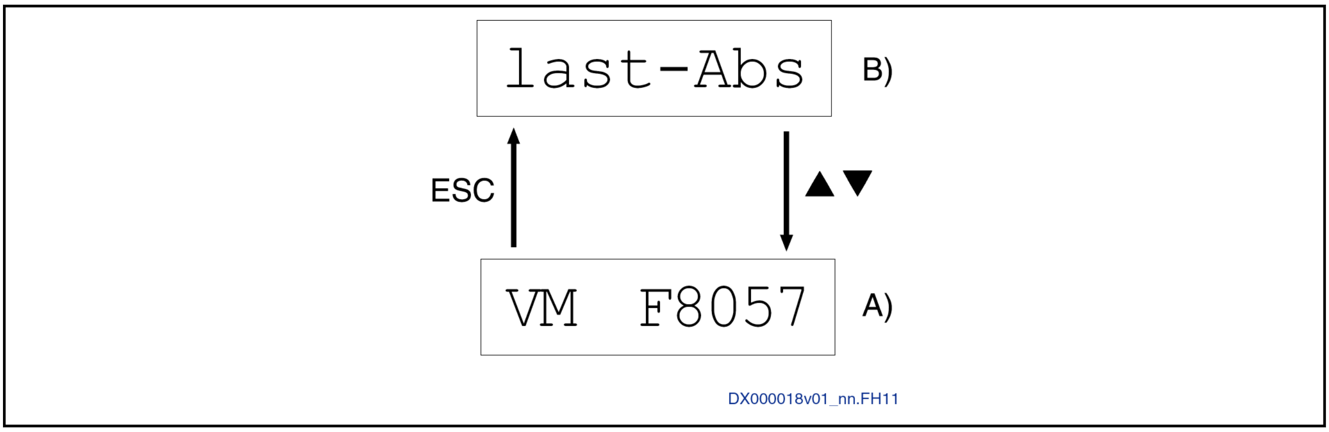
Fig. 10-6: Priority of displays with examples

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

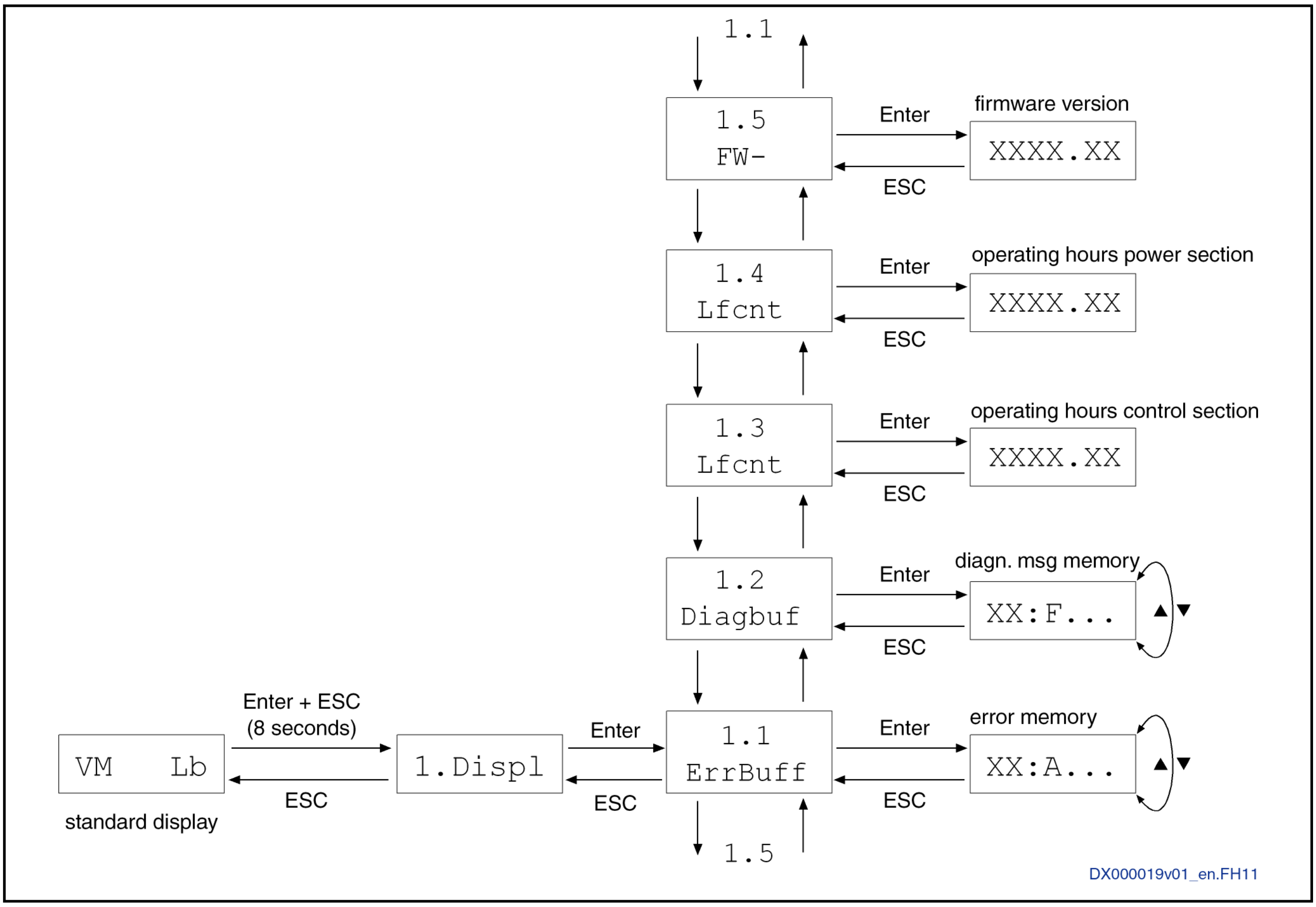


Fig. 10-8: Calling extended displays

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

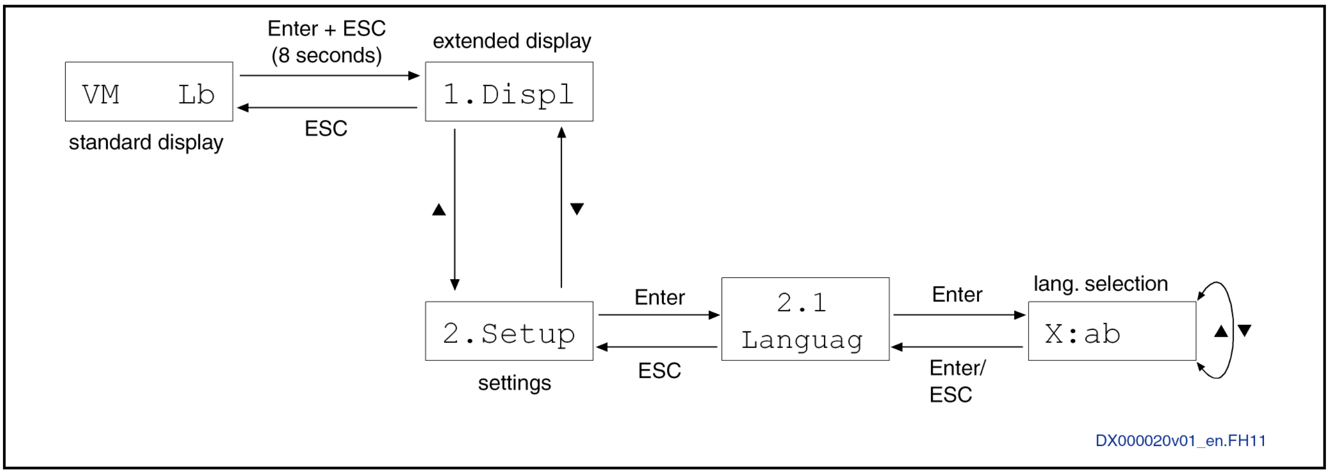


Fig. 10-9: Setting the language

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	Control and power sections ready for operation In spite of the display "VM Bb" or "VM bb", it might be impossible to activate the mains contactor. Possible cause: 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". 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.

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 Rexroth 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.

Accessories

Short text column	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20
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 mm². . . . . = 048
With cross section 72 mm². . . . . = 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	-
HMV01.1E-	W0030	150	150	-
	W0075	250	250	■
	W0120	350	350	■
HMV01.1R-	W0018	175	175	-
	W0045	250	250	■
	W0065	350	350	■
	W0120	350	350	■
HMV02.1R-	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

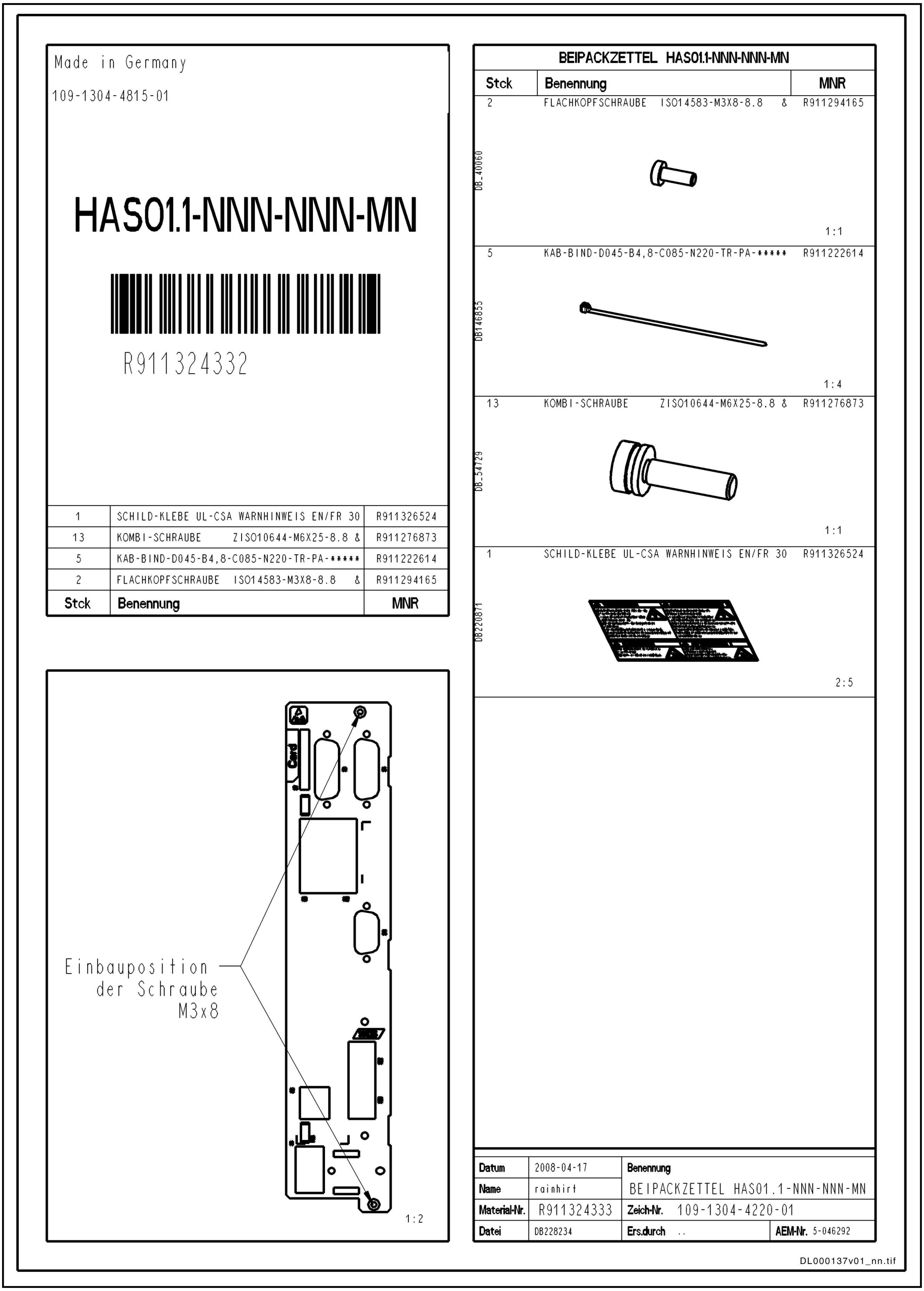


Fig. 11-2: Product insert

Accessories

Made in Germany

109-1253-4801-06

HAS01.1-050-072-MN

R911306620

Stck	Benennung	MNR
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 Z1SO10644-M6X25-8.8 &	R911276873
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

BEIPACKZETTEL HAS01.1-050-072-MN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

DB_40060

1:1

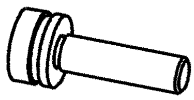
Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146855

1:4

Stck	Benennung	MNR
12	KOMBI-SCHRAUBE Z1SO10644-M6X25-8.8 &	R911276873

DB_54129



1:1

Stck	Benennung	MNR
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924

DB139203

1:2

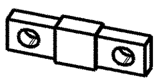
Stck	Benennung	MNR
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751

DB184465

1:2

Stck	Benennung	MNR
4	SCHIENE-VERBINDUNG HAS01.1-050-072 ISOL.	R911309945

DB166230



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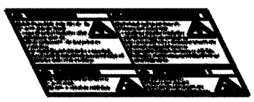
Stck	Benennung	MNR
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

DB220871



2:5

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

DL000059v01_nn.tif

Fig. 11-3: Product insert

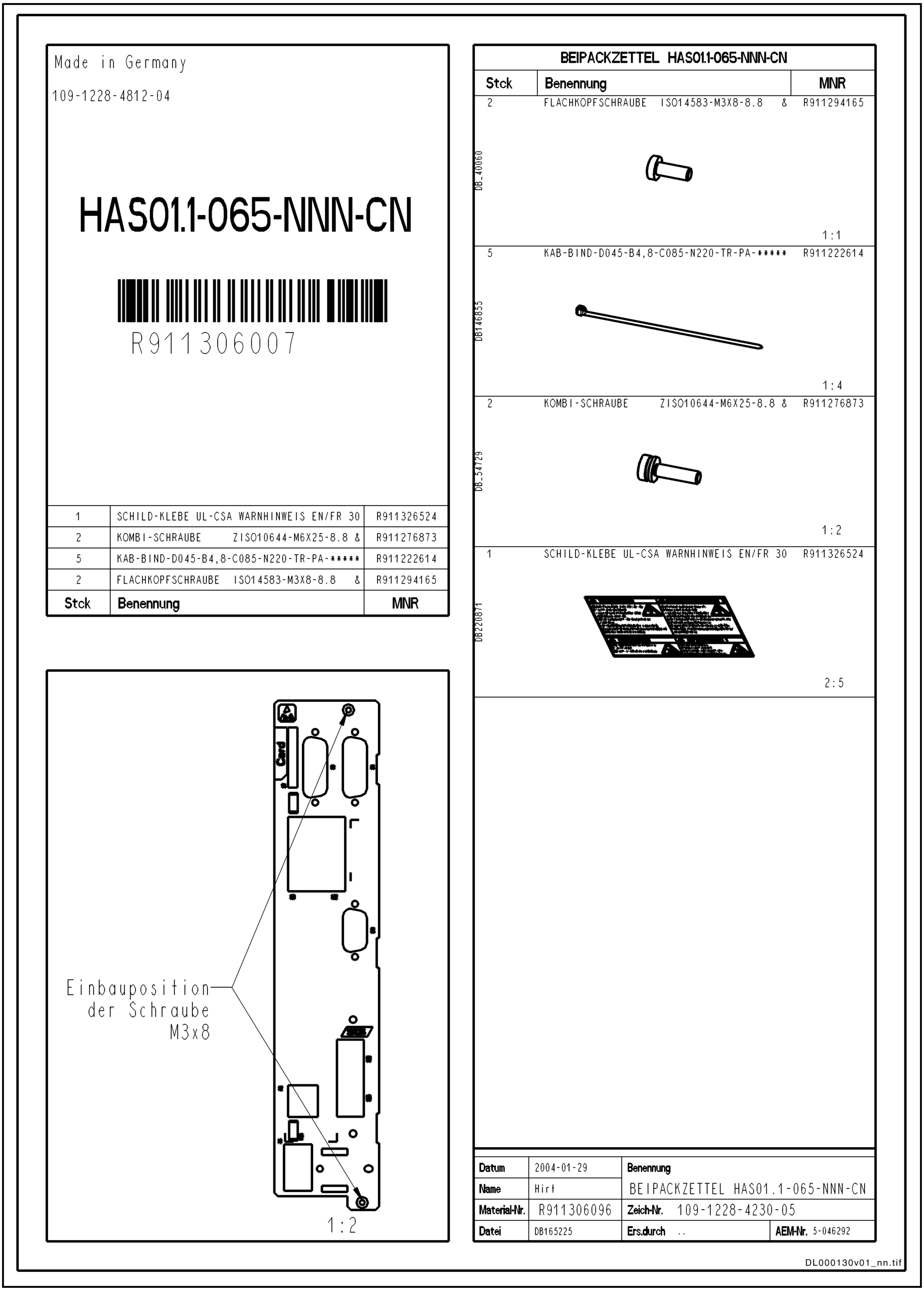
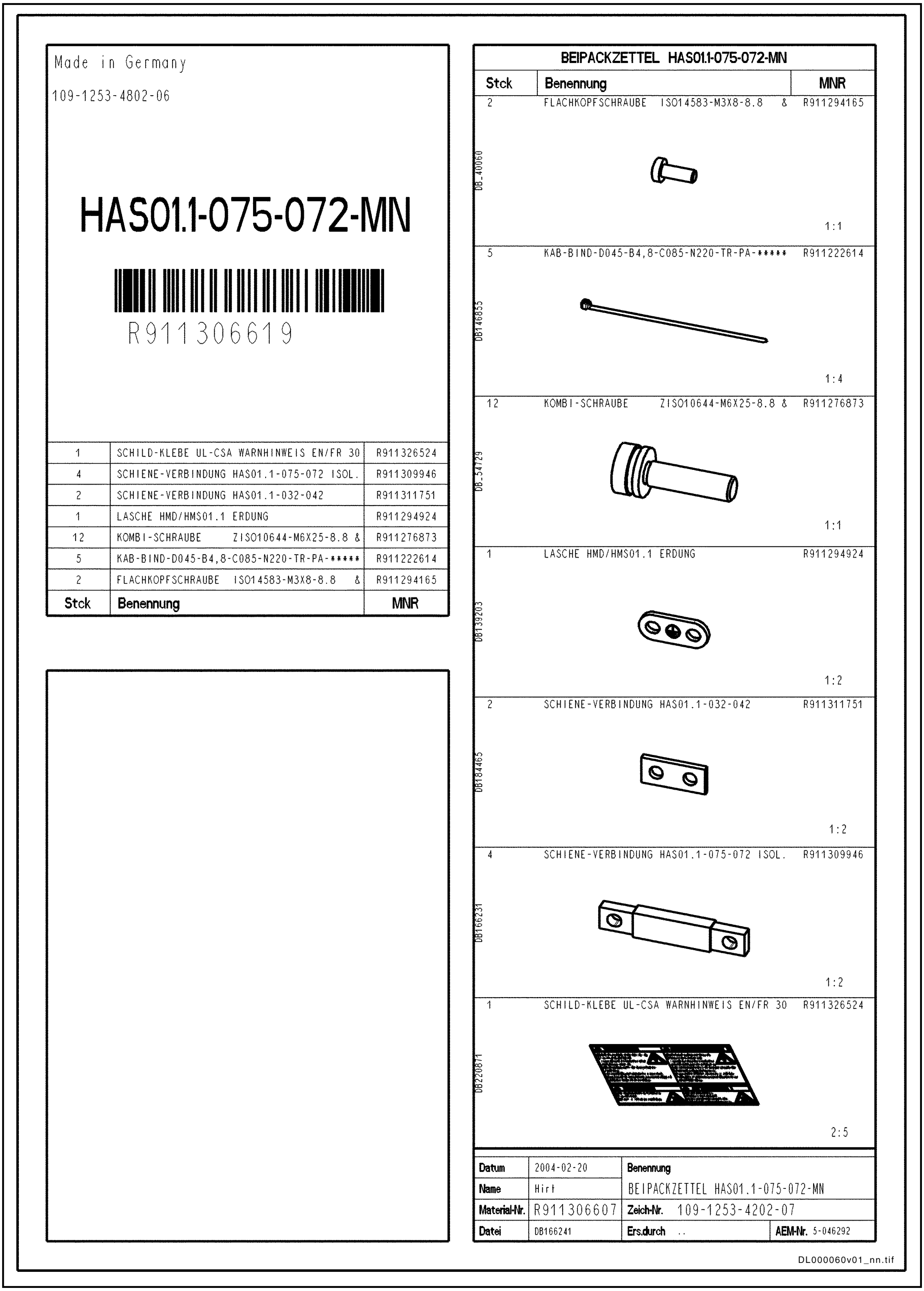


Fig. 11-4: Product insert

Accessories



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 Z ISO10644-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
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
12	KOMBI-SCHRAUBE Z ISO10644-M6X25-8.8 &	R911276873
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751
4	SCHIENE-VERBINDUNG HAS01.1-075-072 ISOL.	R911309946
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

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

Stck	Benennung	MNR
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

BEIPACKZETTEL HAS01.1-100-072-MN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

DB_40060

1:1

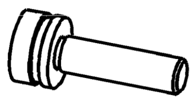
Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146835

1:4

Stck	Benennung	MNR
14	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873

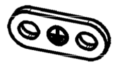
DB_54729



1:1

Stck	Benennung	MNR
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924

DB139203



1:2

Stck	Benennung	MNR
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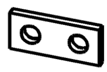
DB184465



1:2

Stck	Benennung	MNR
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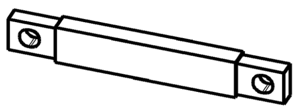
DB166232



1:2

Stck	Benennung	MNR
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)

Accessories

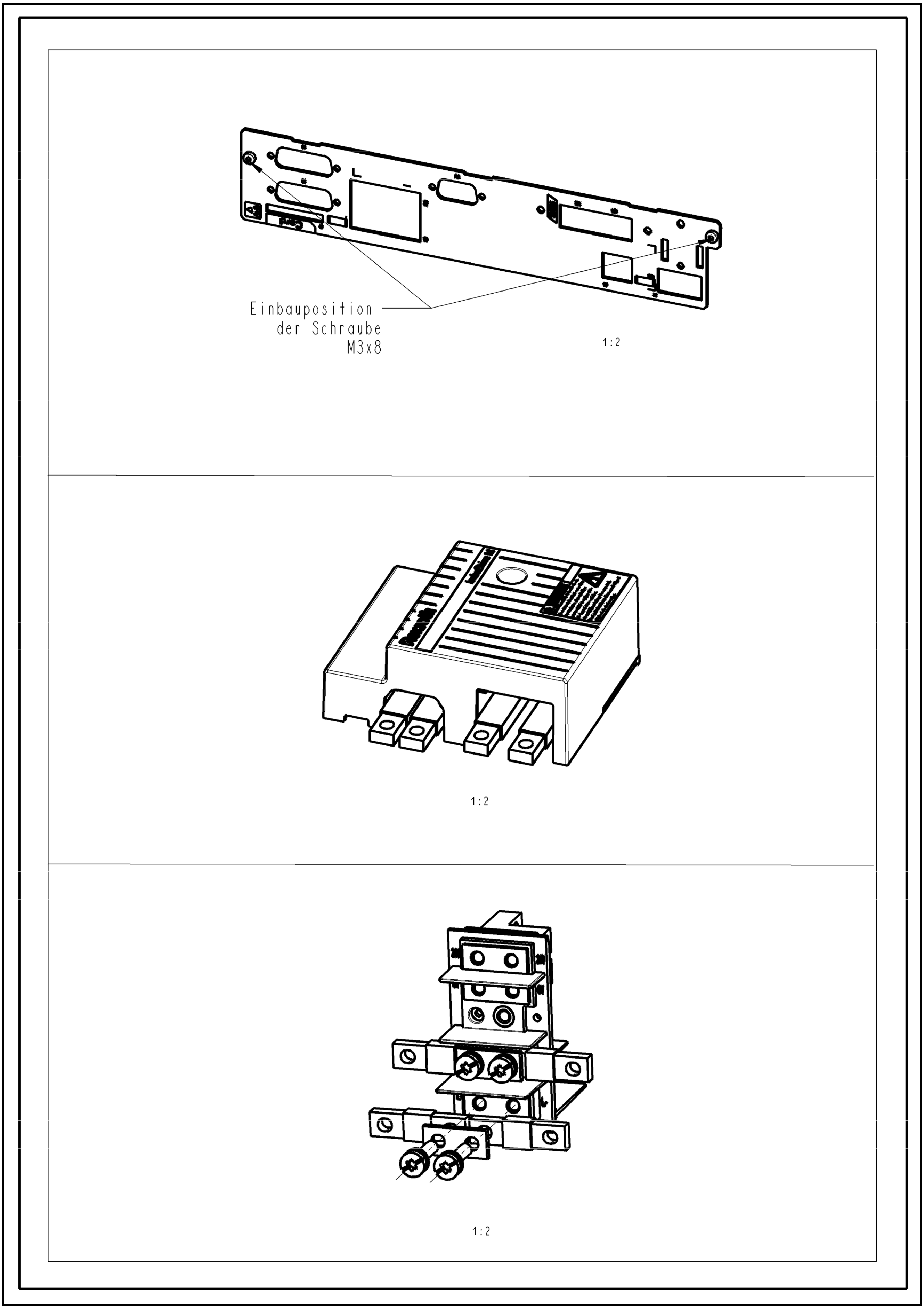


Fig. 11-7: Product insert HAS01.1-100-072-MN (page 2)

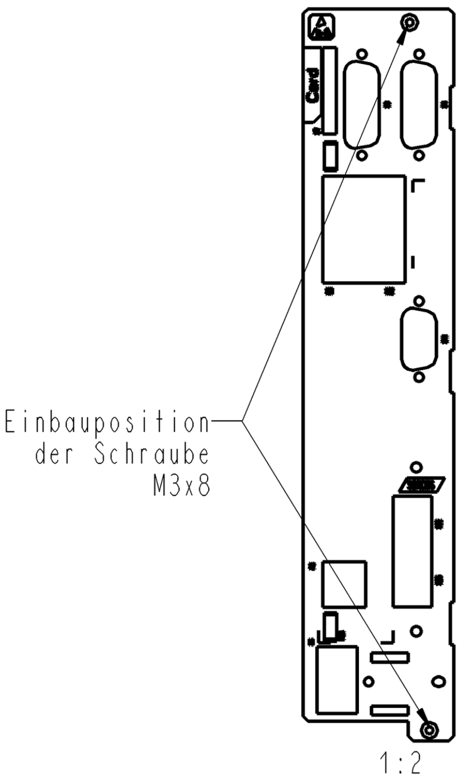
Made in Germany

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**



BEIPACKZETTEL HAS01.1-105-NNN-CN

Stck	Benennung	MNR
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DB.40060

1:1

5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146855

1:4

4	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873

DB.54729

1:2

1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

DB220871

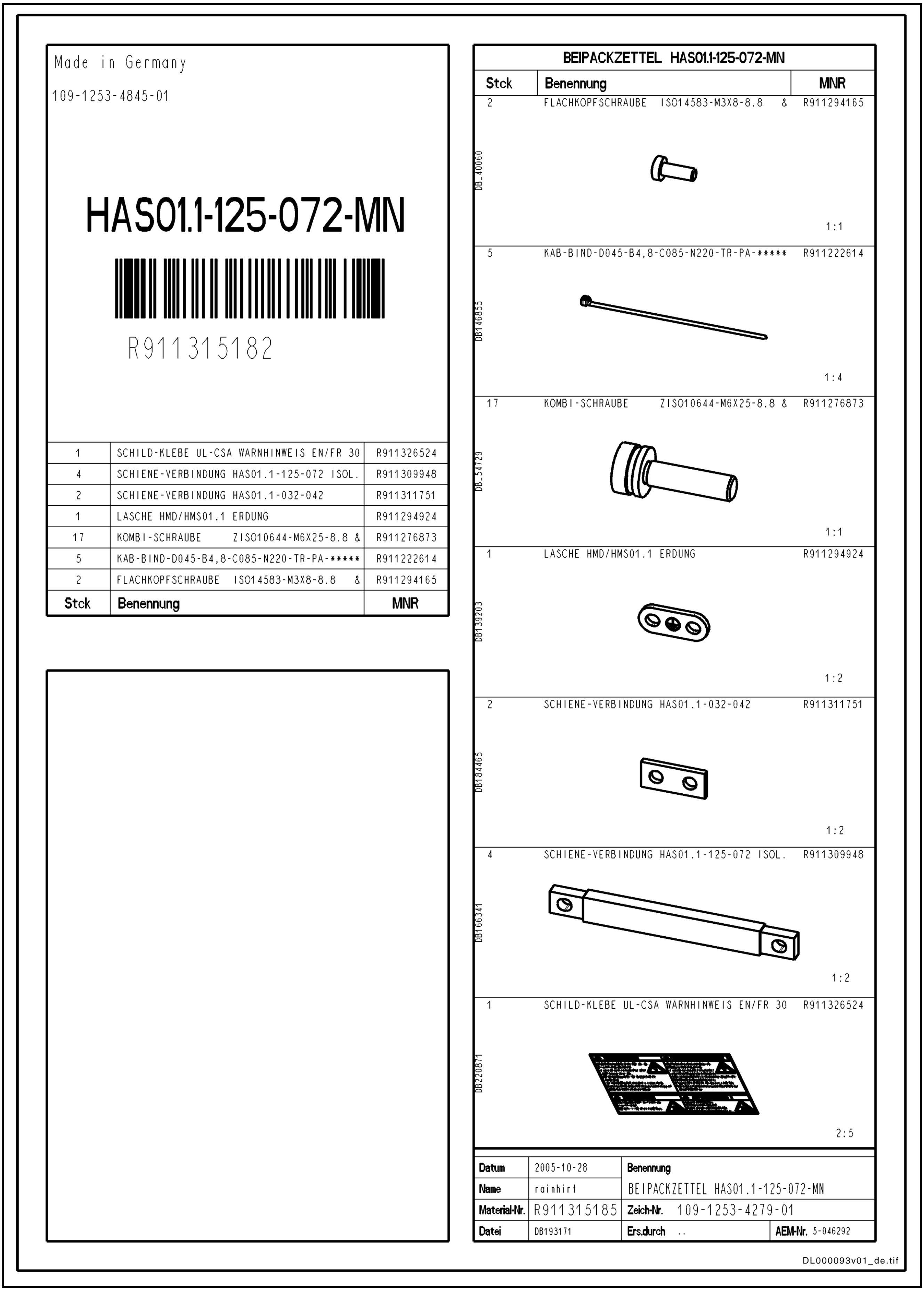
2:5

Datum	2004-01-29	**Benennung**			
Name	Hirt	BEIPACKZETTEL HAS01.1-105-NNN-CN			
Material-Nr.	R911306098	**Zeich-Nr.**	109-1229-4224-05		
Datei	DB165229	**Ers.durch**	..	**AEM-Nr.**	5-046292

DL000132v01_nn.tif

Fig. 11-8: Product insert

Accessories



Made in Germany

109-1253-4845-01

HAS01.1-125-072-MN

R911315182

Stck	Benennung	MNR
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

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_54129, 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	DB220871, 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

DL000093v01_de.tif

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

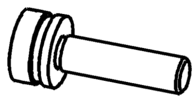
Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146855

1:4

Stck	Benennung	MNR
17	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873

DB_54729



1:1

Stck	Benennung	MNR
2	LASCHE HMD/HMS01.1 ERDUNG	R911294924

DB139203

1:2

Stck	Benennung	MNR
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

DL000098v01_de.tif

Fig. 11-10: Product insert

Accessories

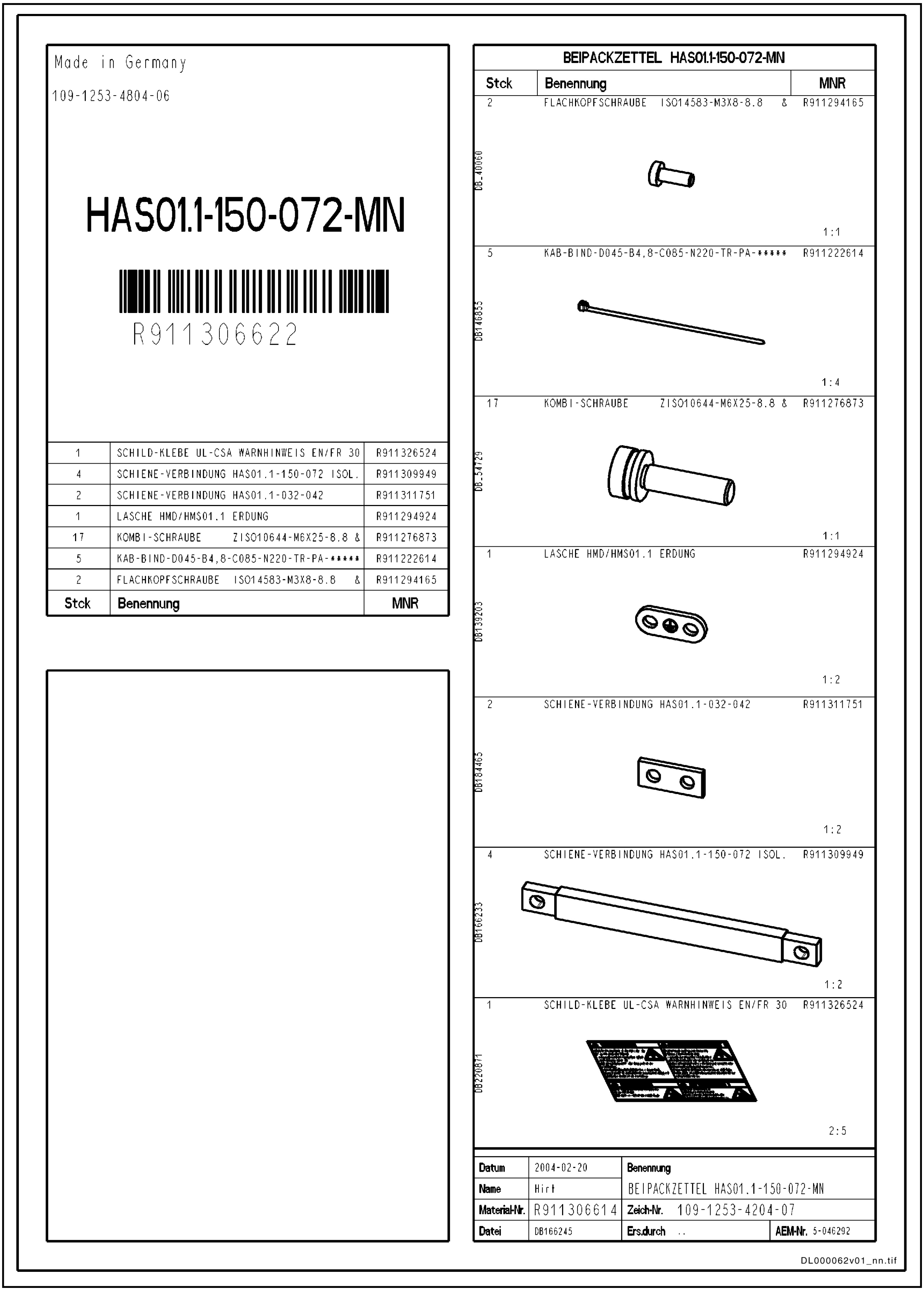


Fig. 11-11: Product insert

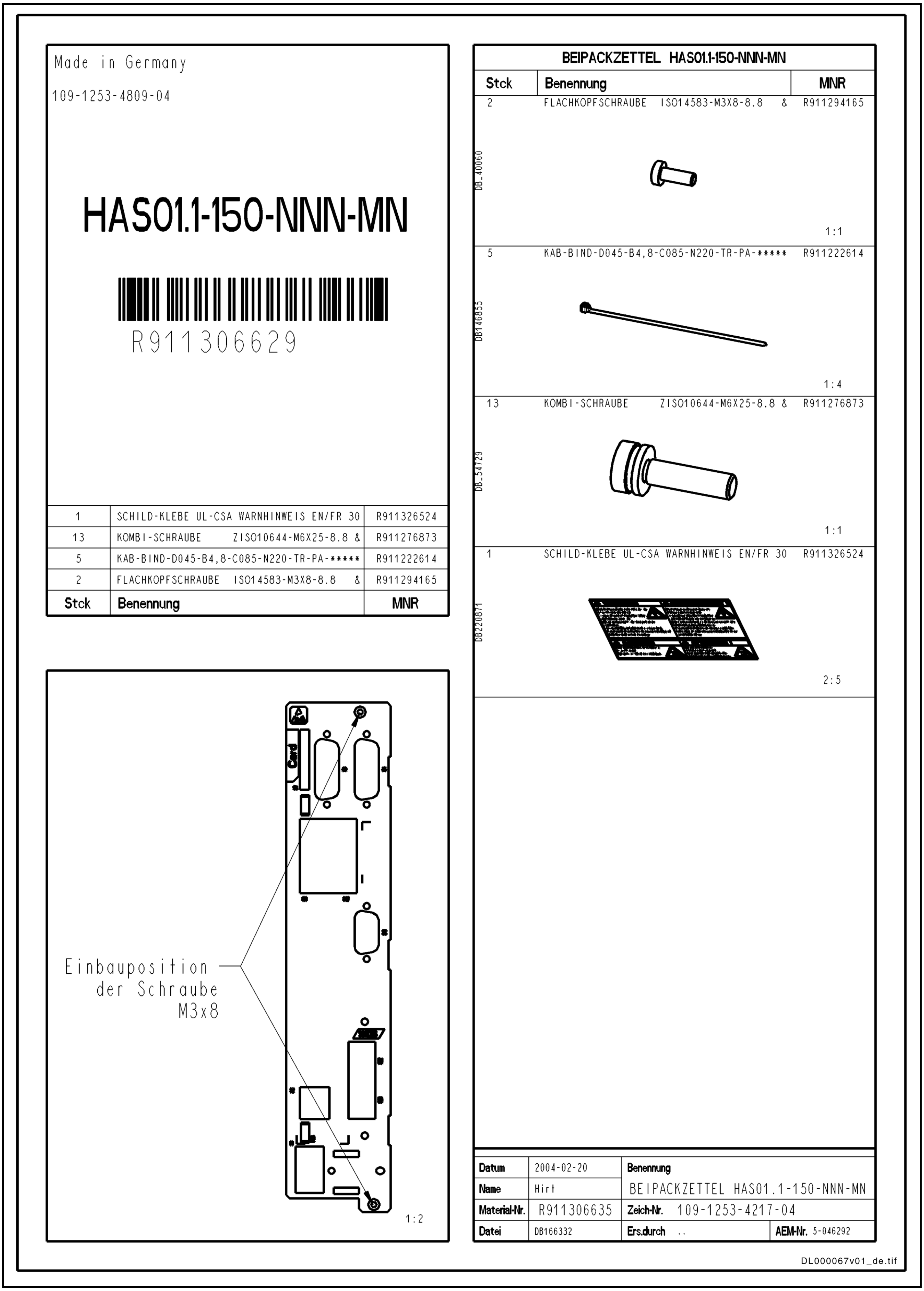


Fig. 11-12: Product insert

Accessories

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 Z ISO10644-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

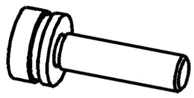
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146855

1:4

17	KOMBI-SCHRAUBE Z ISO10644-M6X25-8.8 &	R911276873

DB_54729



1:1

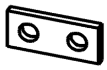
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924

DB139203

1:2

2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751

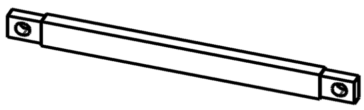
DB184465



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

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

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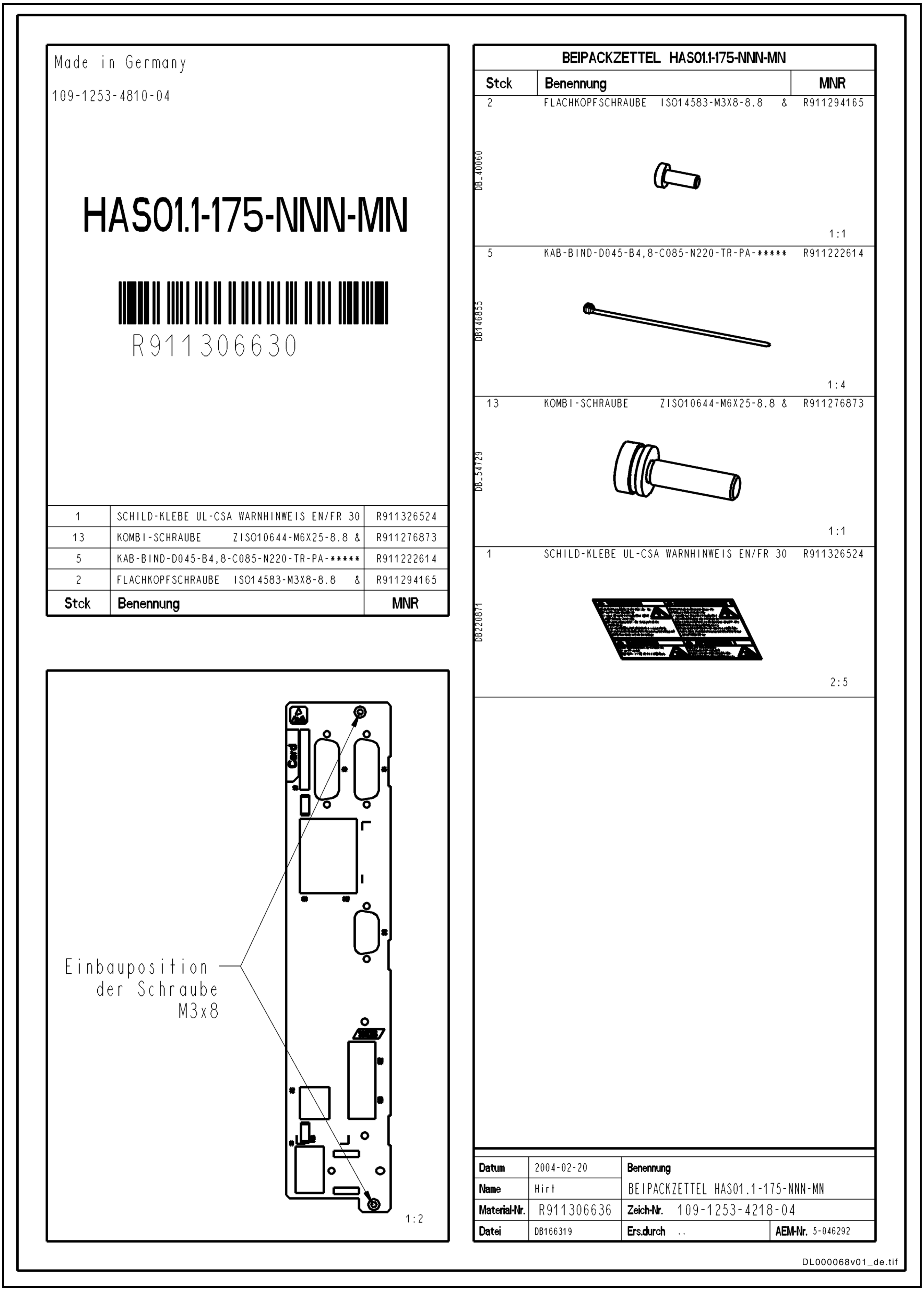
Fig. 11-13: Product insert



Made in Germany

109-1253-4810-04

HAS01.1-175-NNN-MN

R911306630

Stck	Benennung	MNR
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524
13	KOMBI-SCHRAUBE Z1SO10644-M6X25-8.8 &	R911276873
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

Einbauposition der Schraube M3x8

1:2

BEIPACKZETTEL HAS01.1-175-NNN-MN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
13	KOMBI-SCHRAUBE Z1SO10644-M6X25-8.8 &	R911276873
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

DB.40060 1:1
DB146855 1:4
DB.54729 1:1
DB220871 2:5

Datum	2004-02-20	Benennung			
Name	Hirt	BEIPACKZETTEL HAS01.1-175-NNN-MN			
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

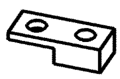
R911306624

Stck	Benennung	MNR
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 Z1SO10644-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

BEIPACKZETTEL HAS01.1-200-072-MN

Stck	Benennung	MNR
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982

DB187131



1:2

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

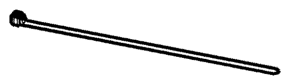
DB_40060

1:1

BEIPACKZETTEL HAS01.1-200-072-MN

Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

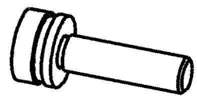
DB146855



1:4

Stck	Benennung	MNR
17	KOMBI-SCHRAUBE Z1SO10644-M6X25-8.8 &	R911276873

DB_54729



1:1

Stck	Benennung	MNR
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924

DB139203

1:2

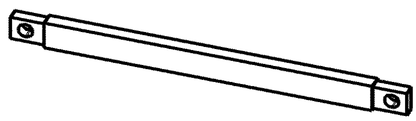
Stck	Benennung	MNR
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751

DB184465

1:2

Stck	Benennung	MNR
4	SCHIENE-VERBINDUNG HAS01.1-200-072 ISOL.	R911309951

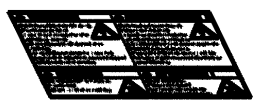
DB166235



7:20

Stck	Benennung	MNR
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

DB220871



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

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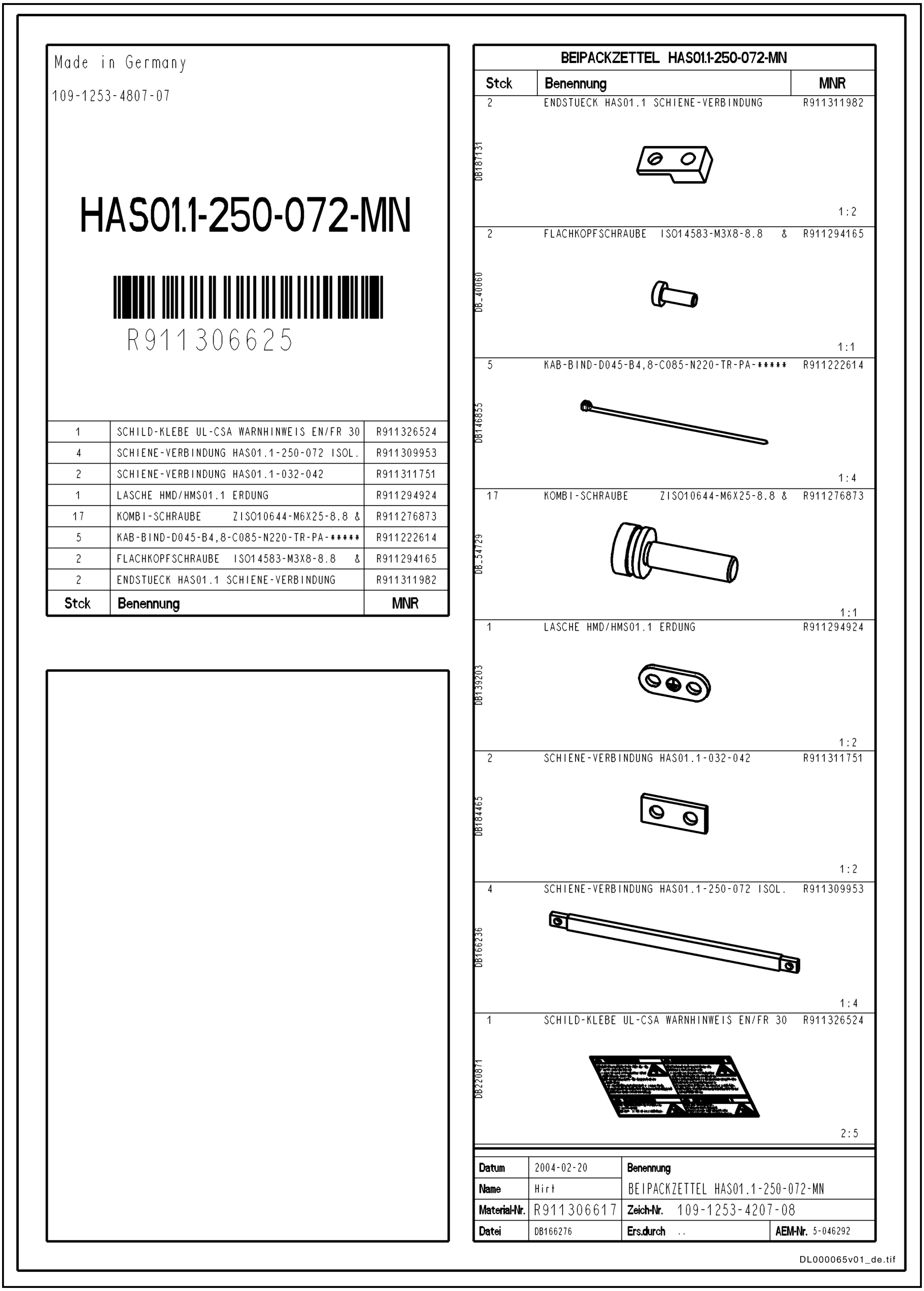
Fig. 11-15: Product insert



Made in Germany

109-1253-4807-07

HAS01.1-250-072-MN

R911306625

Stck	Benennung	MNR
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 Z ISO10644-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

BEIPACKZETTEL HAS01.1-250-072-MN

Stck	Benennung	MNR	Scale	DB
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982	1:2	DB181131
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165	1:1	DB_40060
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614	1:4	DB146855
17	KOMBI-SCHRAUBE Z ISO10644-M6X25-8.8 &	R911276873	1:1	DB_54729
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924	1:2	DB139203
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751	1:2	DB184465
4	SCHIENE-VERBINDUNG HAS01.1-250-072 ISOL.	R911309953	1:4	DB166236
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524	2:5	DB220871

Datum	2004-02-20	Benennung	BEIPACKZETTEL HAS01.1-250-072-MN
Name	Hirt		
Material-Nr.	R911306617	Zeich-Nr.	109-1253-4207-08
Datei	DB166276	Ers.durch ..	AEM-Nr. 5-046292

DL000065v01_de.tif

Fig. 11-16: Product insert

Accessories

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 Z1SO10644-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

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

DB_40060

1:1

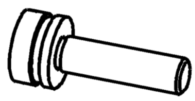
Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146855

1:4

Stck	Benennung	MNR
13	KOMBI-SCHRAUBE Z1SO10644-M6X25-8.8 &	R911276873

DB_54729



1:1

Stck	Benennung	MNR
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

DB220871

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

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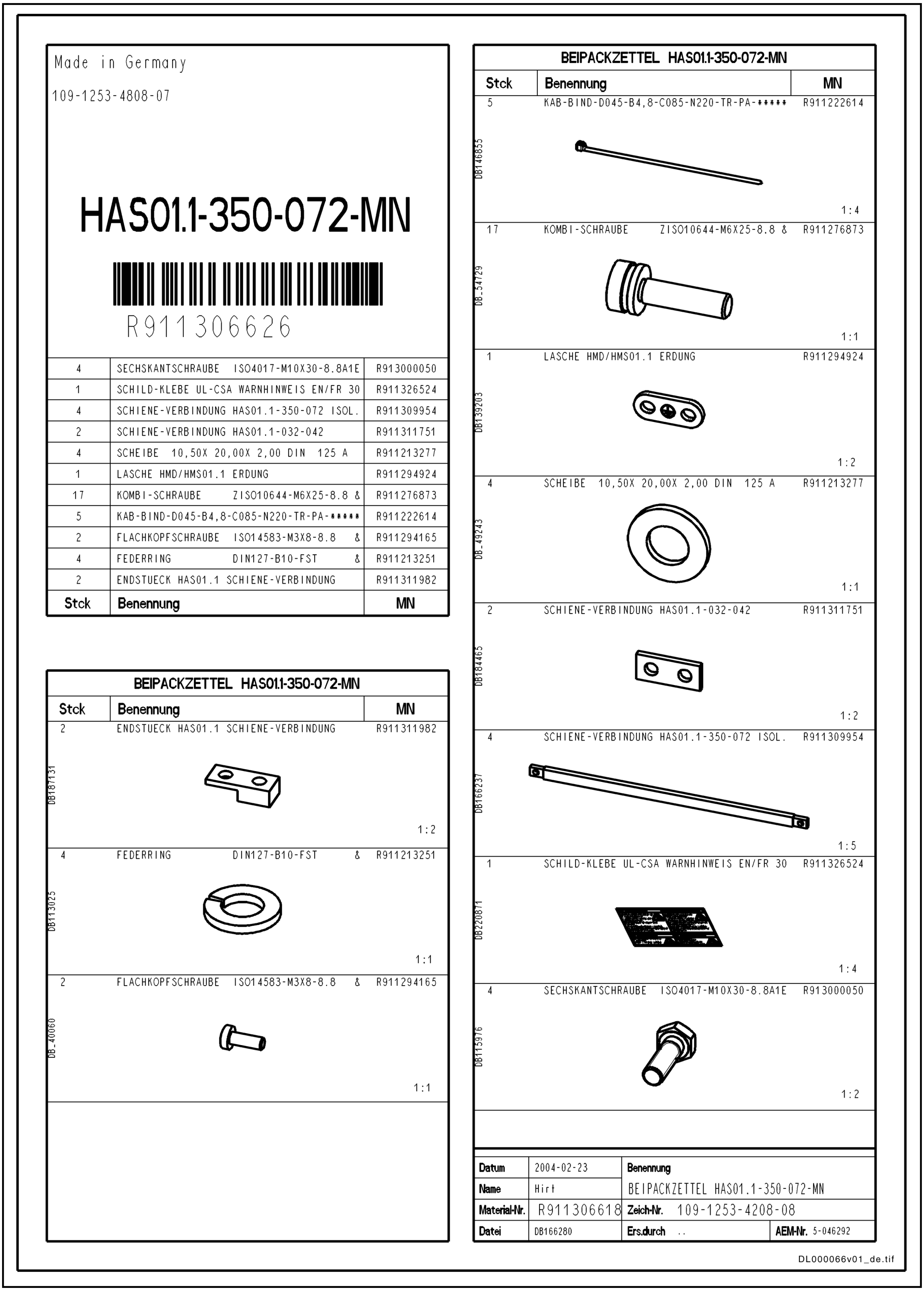
Fig. 11-17: Product insert



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	DB187131	1:2
4	FEDERRING DIN127-B10-FST &	R911213251	DB113025	1:1
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165	DB_40060	1:1

BEIPACKZETTEL HAS01.1-350-072-MN

Stck	Benennung	MN		
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
4	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277	DB_49243	1:1
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	DB220871	1:4
4	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050	DB115976	1:2

Datum	2004-02-23	Benennung			
Name	Hirt	BEIPACKZETTEL HAS01.1-350-072-MN			
Material-Nr.	R911306618	Zeich-Nr.	109-1253-4208-08		
Datei	DB166280	Ers.durch	..	AEM-Nr.	5-046292

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Fig. 11-18: Product insert

Accessories

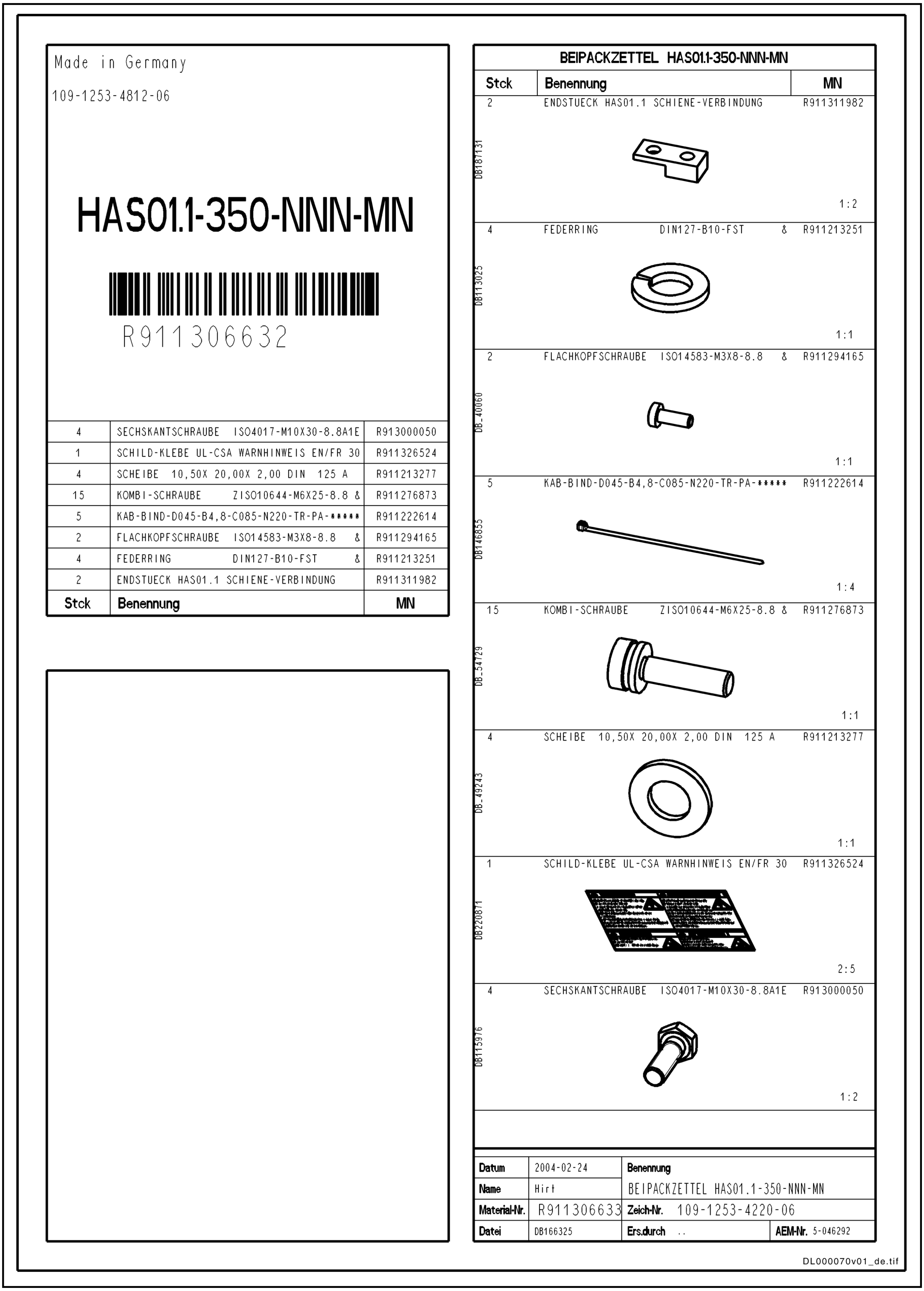
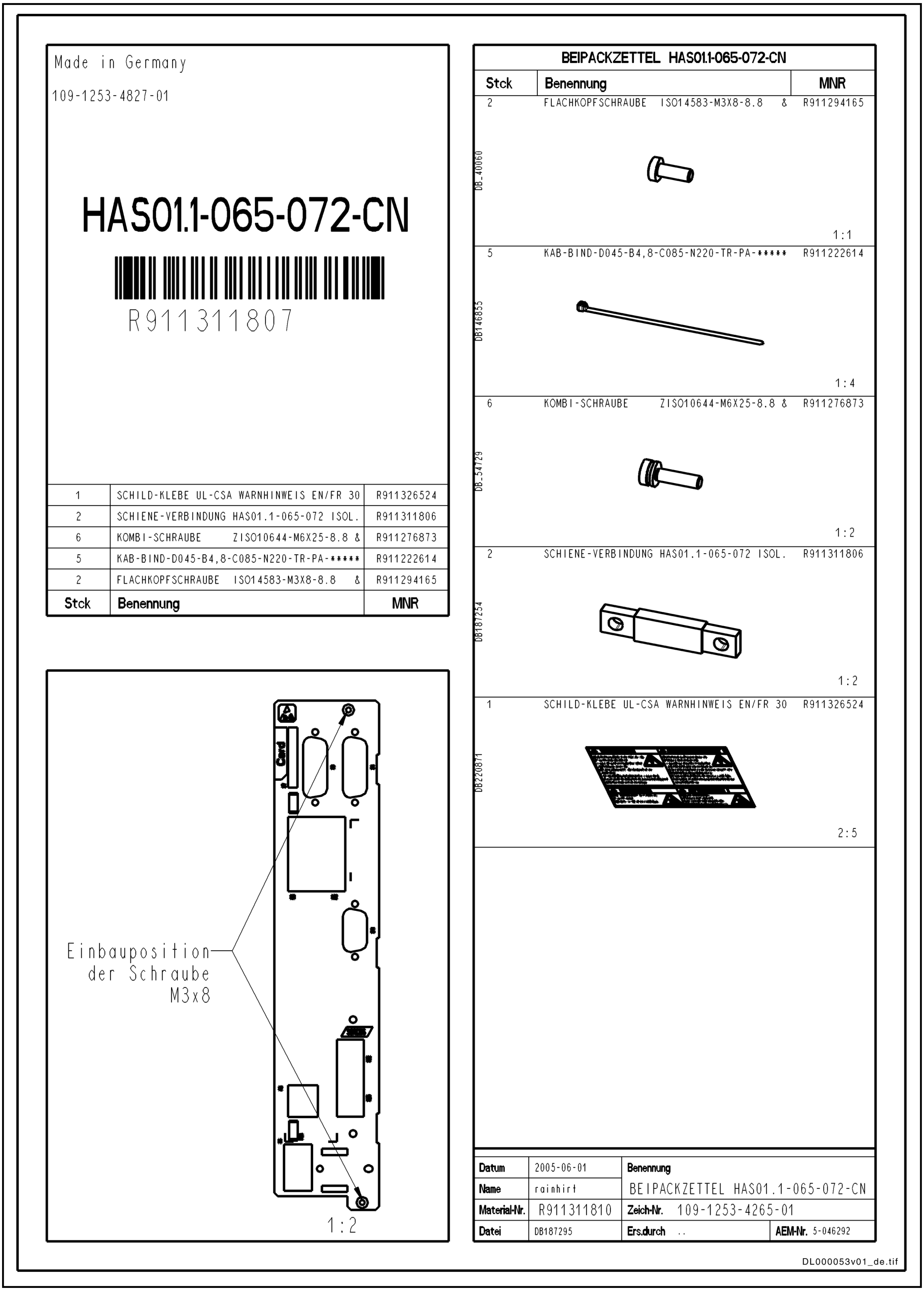


Fig. 11-19: Product insert



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

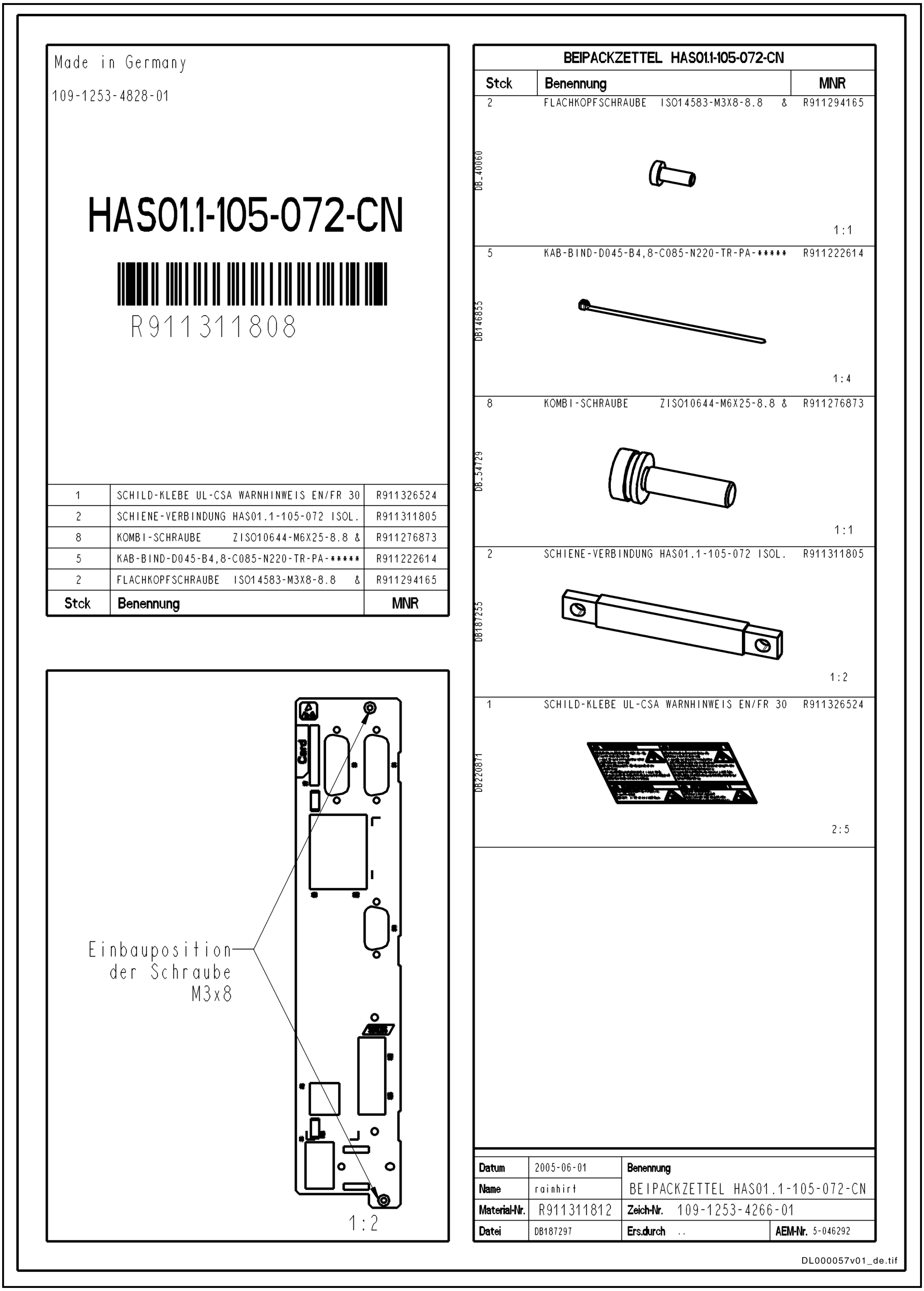
BEIPACKZETTEL HAS01.1-065-072-CN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & (DB.40060, 1:1)	R911294165
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** (DB146855, 1:4)	R911222614
6	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & (DB.54729, 1:2)	R911276873
2	SCHIENE-VERBINDUNG HAS01.1-065-072 ISOL. (DB187254, 1:2)	R911311806
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 (DB220871, 2:5)	R911326524

Datum	2005-06-01	Benennung	
Name	rainhirt	BEIPACKZETTEL HAS01.1-065-072-CN	
Material-Nr.	R911311810	Zeich-Nr. 109-1253-4265-01	
Datei	DB187295	Ers.durch ..	AEM-Nr. 5-046292

DL000053v01_de.tif

Fig. 11-20: Product insert



Made in Germany

109-1253-4828-01

HAS01.1-105-072-CN

R911311808

Stck	Benennung	MNR
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

Einbauposition der Schraube M3x8

1:2

BEIPACKZETTEL HAS01.1-105-072-CN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & (DB_40060, 1:1)	R911294165
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** (DB146855, 1:4)	R911222614
8	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & (DB_54129, 1:1)	R911276873
2	SCHIENE-VERBINDUNG HAS01.1-105-072 ISOL. (DB187255, 1:2)	R911311805
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 (DB220871, 2:5)	R911326524

Datum	2005-06-01	Benennung	
Name	rainhirt	BEIPACKZETTEL HAS01.1-105-072-CN	
Material-Nr.	R911311812	Zeich-Nr. 109-1253-4266-01	
Datei	DB187297	Ers.durch ..	AEM-Nr. 5-046292

DL000057v01_de.tif

Fig. 11-21: Product insert

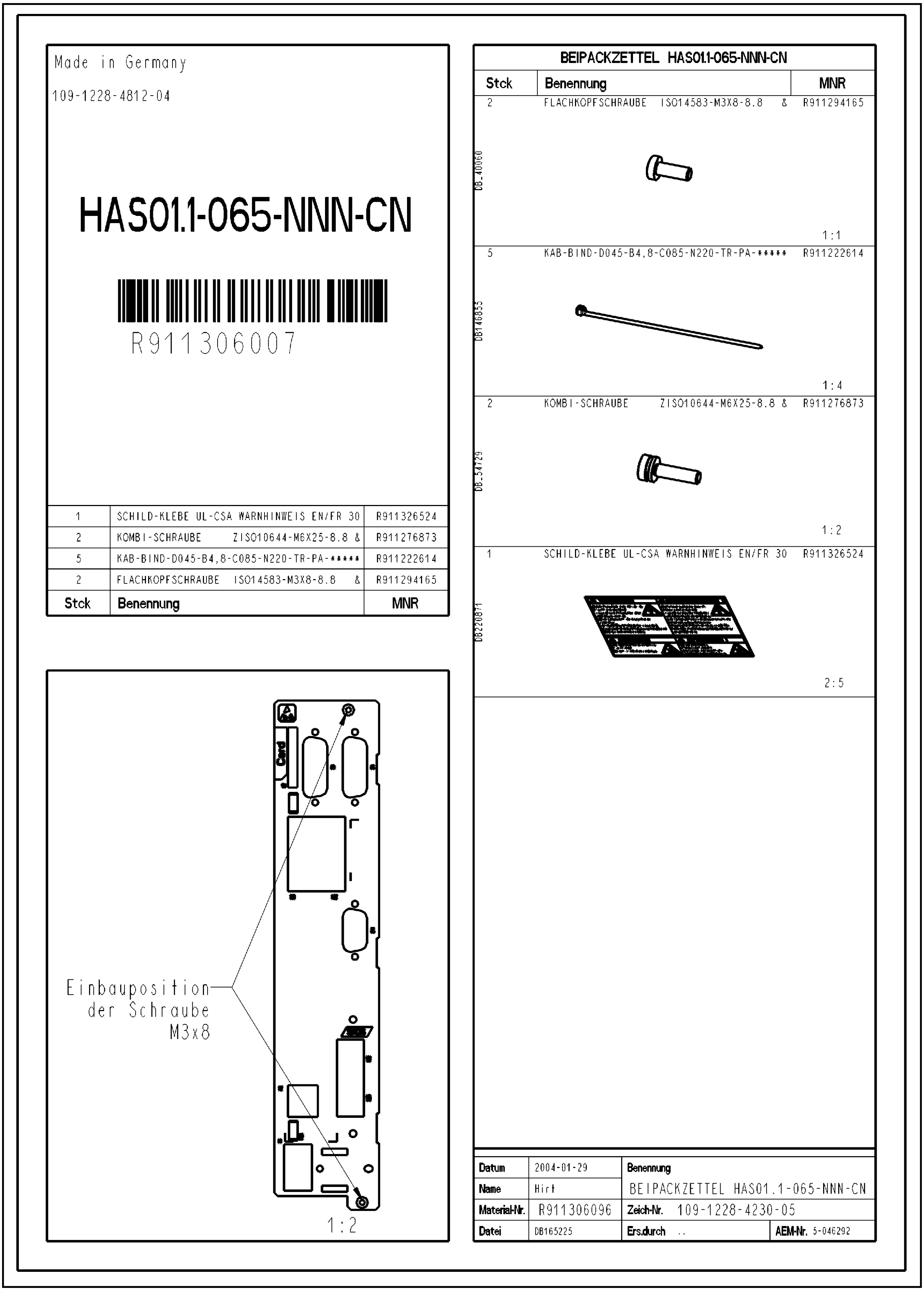


Fig. 11-22: *Product insert*

Accessories

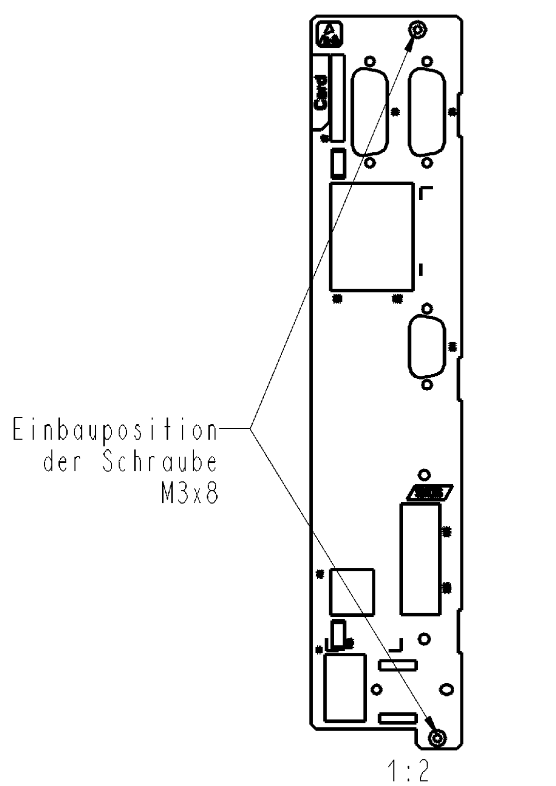
Made in Germany

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**



BEIPACKZETTEL HAS01.1-105-NNN-CN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614
4	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

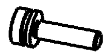
DB 40060

1:1

DB146855

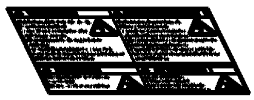
1:4

DB 54129



1:2

DB220871

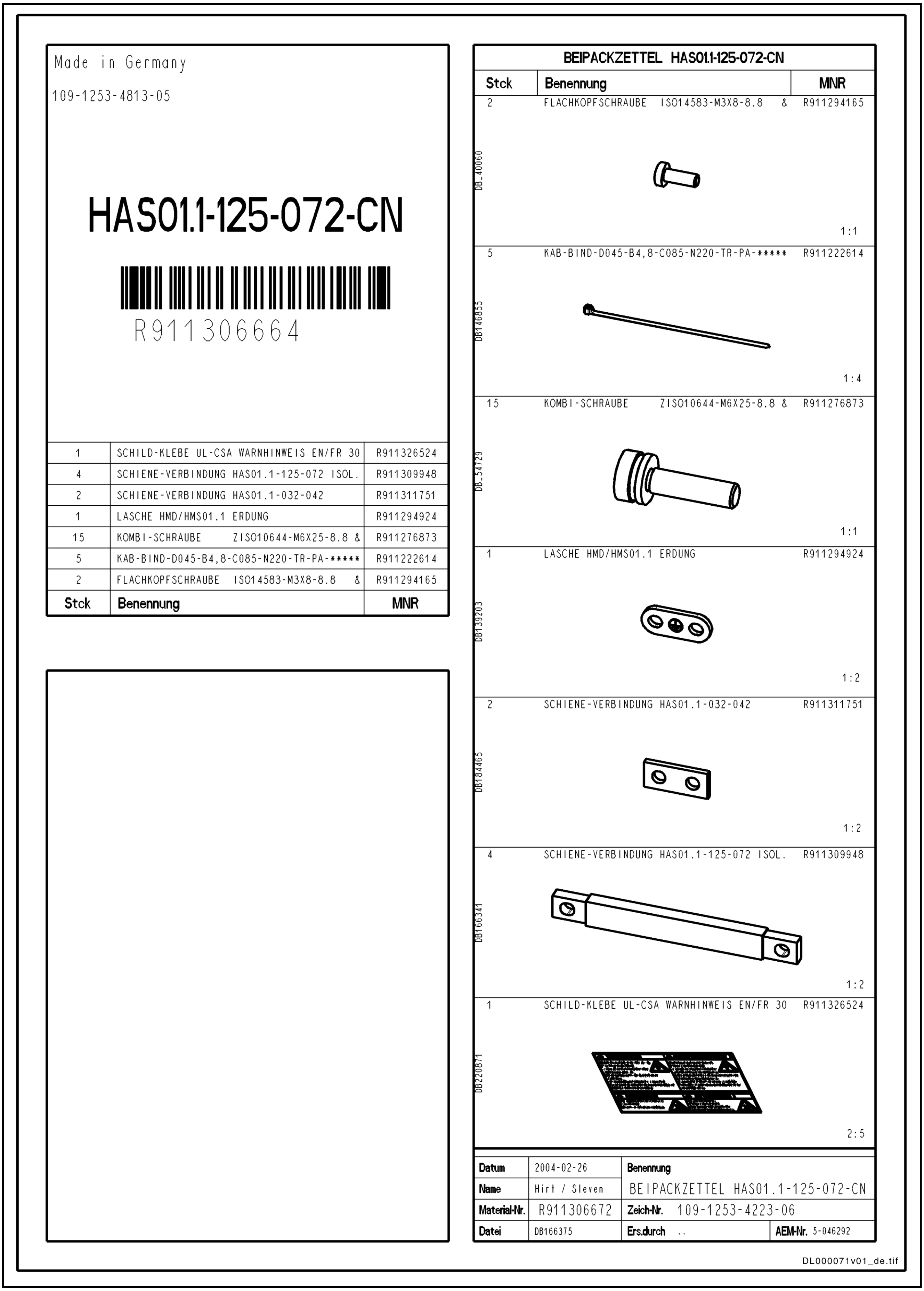


2:5

Datum	2004-01-29	Benennung	
Name	Hirt	BEIPACKZETTEL HAS01.1-105-NNN-CN	
Material-Nr.	R911306098	Zeich-Nr. 109-1229-4224-05	
Datei	DB165229	Ers.durch ..	AEM-Nr. 5-046292

Fig. 11-23: Product insert

Accessories



Made in Germany

109-1253-4813-05

HAS01.1-125-072-CN

R911306664

Stck	Benennung	MNR
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

BEIPACKZETTEL HAS01.1-125-072-CN

Stck	Benennung	MNR	Zeichnung	Maßstab
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
15	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	DB220871	2:5

Datum	2004-02-26	Benennung	
Name	Hirt / Sleven	BEIPACKZETTEL HAS01.1-125-072-CN	
Material-Nr.	R911306672	Zeich-Nr. 109-1253-4223-06	
Datei	DB166375	Ers.durch ..	AEM-Nr. 5-046292

DL000071v01_de.tif

Fig. 11-24: Product insert

Accessories

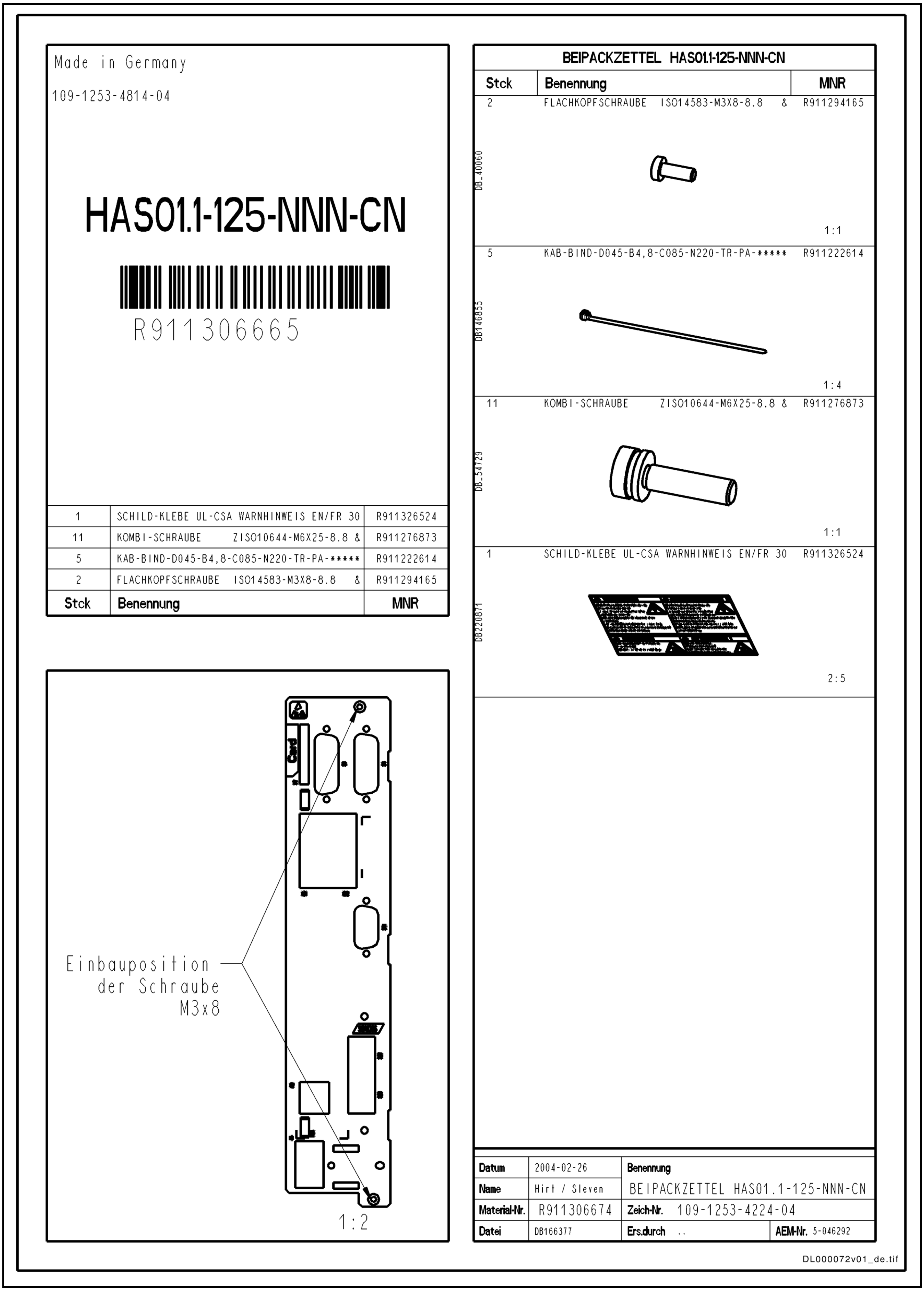


Fig. 11-25: Product insert

Made in Germany

109-1253-4815-05

HAS01.1-225-072-CN

R911306666

Stck	Benennung	MNR
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

BEIPACKZETTEL HAS01.1-225-072-CN

Stck	Benennung	MNR
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165

DB.40060

1:1

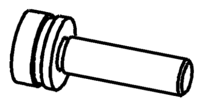
Stck	Benennung	MNR
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614

DB146855

1:4

Stck	Benennung	MNR
21	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873

DB.54729



1:1

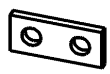
Stck	Benennung	MNR
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924

DB139203

1:2

Stck	Benennung	MNR
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751

DB184465



1:2

Stck	Benennung	MNR
4	SCHIENE-VERBINDUNG HAS01.1-225-072 ISOL.	R911309952

DB166342

1:4

Stck	Benennung	MNR
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524

DB220871

2:5

Datum	2004-02-26	Benennung	
Name	Hirt / Sleven	BEIPACKZETTEL HAS01.1-225-072-CN	
Material-Nr.	R911306675	Zeich-Nr.	109-1253-4225-06
Datei	DB166379	Ers.durch ..	AEM-Nr. 5-046292

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Fig. 11-26: Product insert

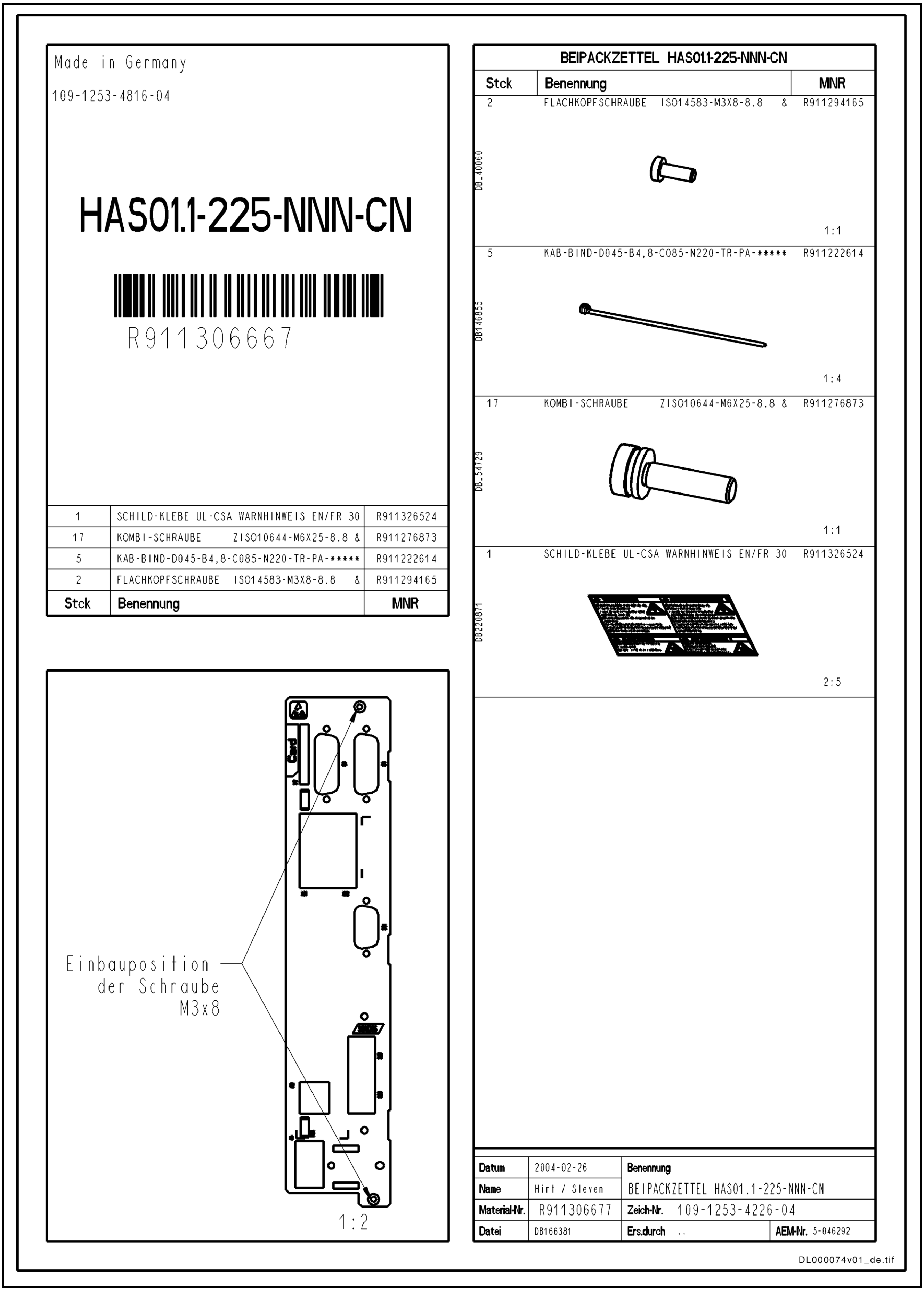
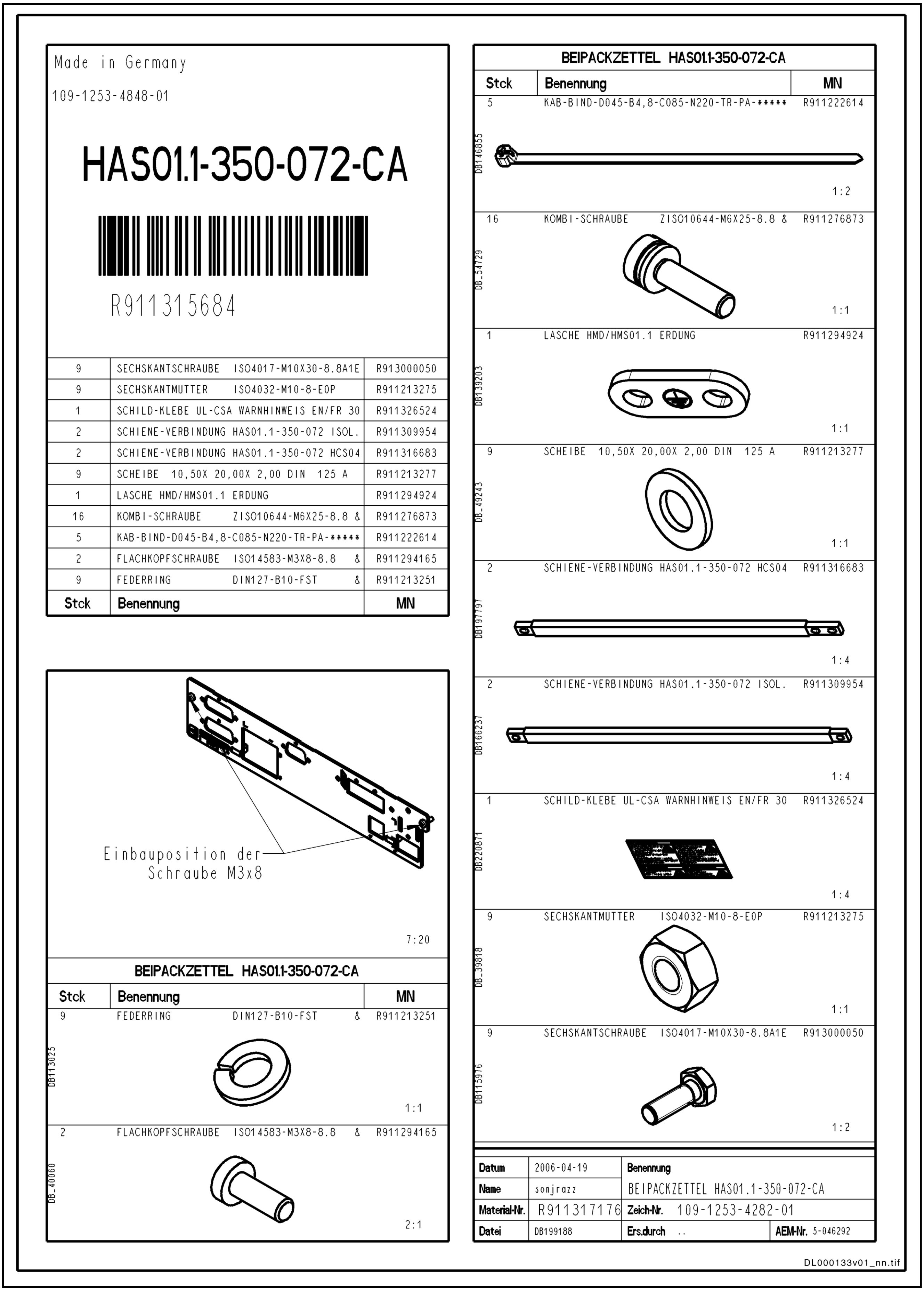


Fig. 11-27: Product insert


Made in Germany

109-1253-4848-01

HAS01.1-350-072-CA

R911315684

Stck	Benennung	MN
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

BEIPACKZETTEL HAS01.1-350-072-CA

Stck	Benennung	MN	Zeichnung	Maßstab
9	FEDERRING DIN127-B10-FST &	R911213251	DB113025	1:1
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165	DB_40060	2:1

BEIPACKZETTEL HAS01.1-350-072-CA

Stck	Benennung	MN	Zeichnung	Maßstab
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614	DB146855	1:2
16	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873	DB_54729	1:1
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924	DB139203	1:1
9	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277	DB_49243	1:1
2	SCHIENE-VERBINDUNG HAS01.1-350-072 HCS04	R911316683	DB191797	1:4
2	SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL.	R911309954	DB166237	1:4
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524	DB220871	1:4
9	SECHSKANTMUTTER ISO4032-M10-8-E0P	R911213275	DB_39818	1:1
9	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050	DB115976	1:2

Datum	2006-04-19	Benennung	
Name	sonjrazz	BEIPACKZETTEL HAS01.1-350-072-CA	
Material-Nr.	R911317176	Zeich-Nr.	109-1253-4282-01
Datei	DB199188	Ers.durch ..	AEM-Nr. 5-046292

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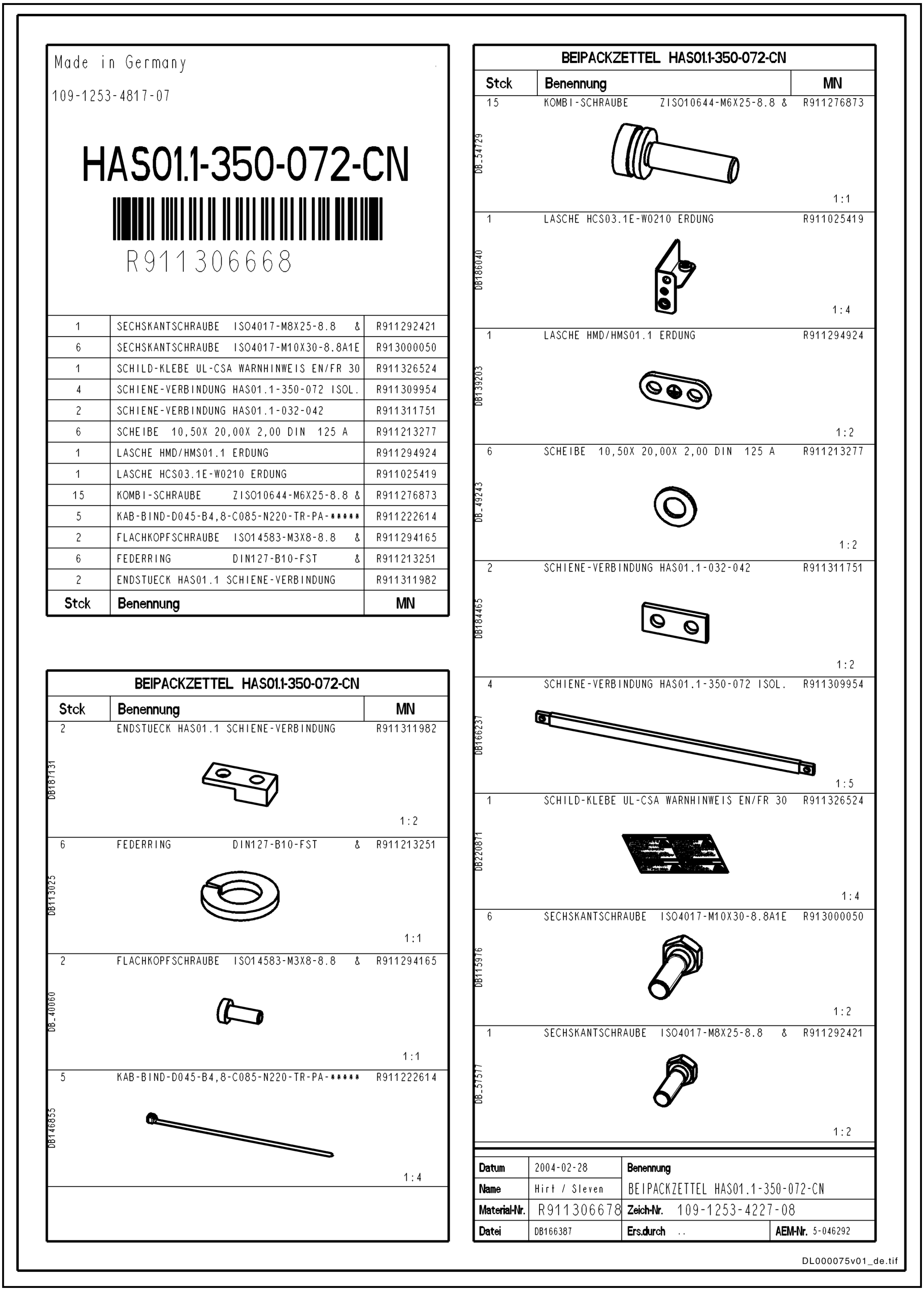
Fig. 11-28: Product insert

Accessories



Made in Germany

109-1253-4817-07

HAS01.1-350-072-CN

R911306668

Stck	Benennung	MN
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

BEIPACKZETTEL HAS01.1-350-072-CN

Stck	Benennung	MN		
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG	R911311982	1:2	DB181131
6	FEDERRING DIN127-B10-FST &	R911213251	1:1	DB113025
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 &	R911294165	1:1	DB_40060
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-*****	R911222614	1:4	DB146855

BEIPACKZETTEL HAS01.1-350-072-CN

Stck	Benennung	MN		
15	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 &	R911276873	1:1	DB_54729
1	LASCHE HCS03.1E-W0210 ERDUNG	R911025419	1:4	DB186040
1	LASCHE HMD/HMS01.1 ERDUNG	R911294924	1:2	DB139203
6	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A	R911213277	1:2	DB_49243
2	SCHIENE-VERBINDUNG HAS01.1-032-042	R911311751	1:2	DB184465
4	SCHIENE-VERBINDUNG HAS01.1-350-072 ISOL.	R911309954	1:5	DB166237
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30	R911326524	1:4	DB220871
6	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E	R913000050	1:2	DB115976
1	SECHSKANTSCHRAUBE ISO4017-M8X25-8.8 &	R911292421	1:2	DB_57517

Datum	2004-02-28	Benennung			
Name	Hirt / Sleven	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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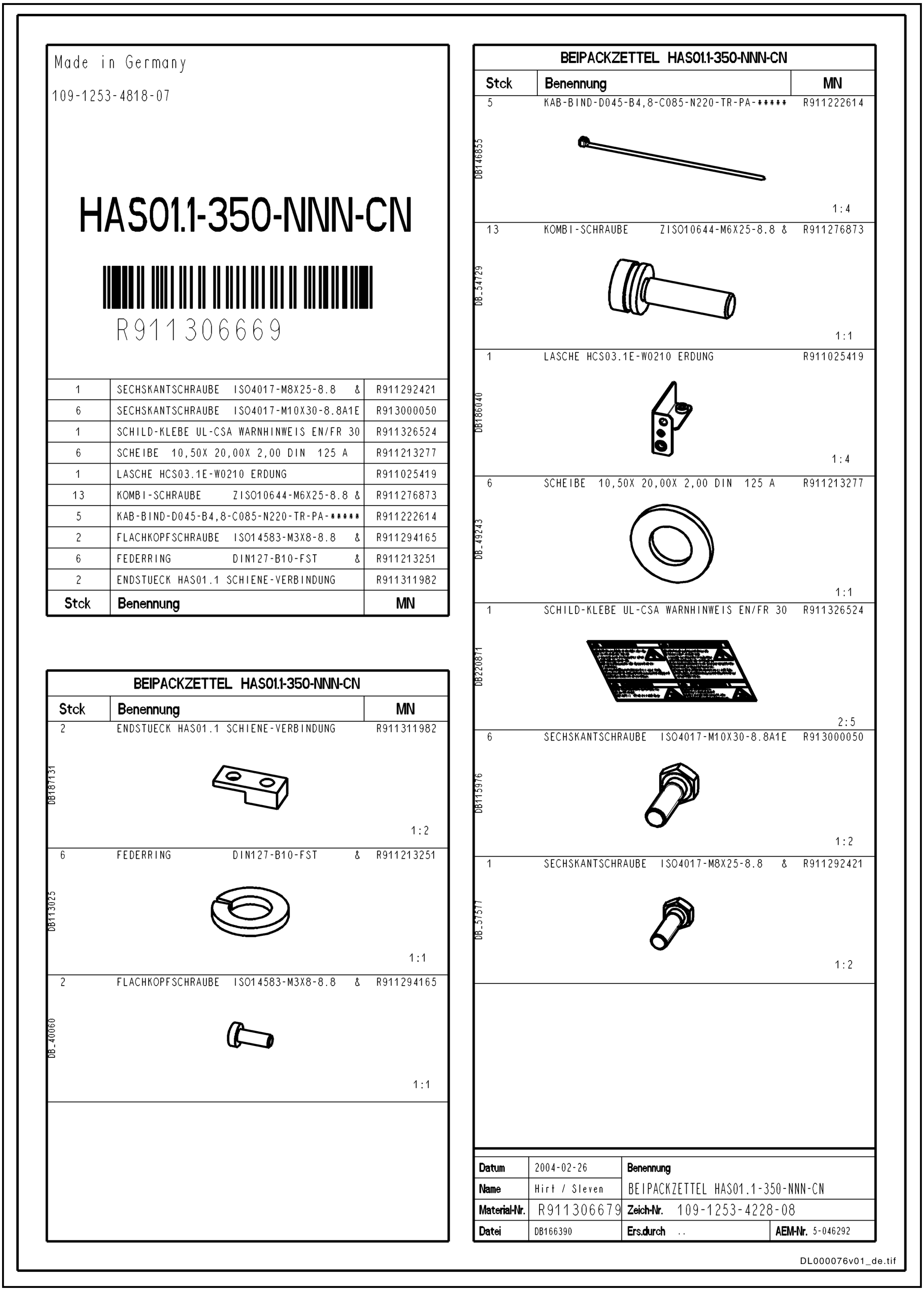
Fig. 11-29: Product insert



Made in Germany

109-1253-4818-07

HAS01.1-350-NNN-CN

R911306669

Stck	Benennung	MN
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

BEIPACKZETTEL HAS01.1-350-NNN-CN

Stck	Benennung	MN	Scale
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG (DB187131)	R911311982	1:2
6	FEDERRING DIN127-B10-FST & (DB113025)	R911213251	1:1
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & (DB_40060)	R911294165	1:1

BEIPACKZETTEL HAS01.1-350-NNN-CN

Stck	Benennung	MN	Scale
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** (DB146855)	R911222614	1:4
13	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & (DB_54729)	R911276873	1:1
1	LASCHE HCS03.1E-W0210 ERDUNG (DB186040)	R911025419	1:4
6	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A (DB_49243)	R911213277	1:1
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 (DB220871)	R911326524	2:5
6	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E (DB115976)	R913000050	1:2
1	SECHSKANTSCHRAUBE ISO4017-M8X25-8.8 & (DB_57577)	R911292421	1:2

Datum	2004-02-26	Benennung	
Name	Hirt / Sleven	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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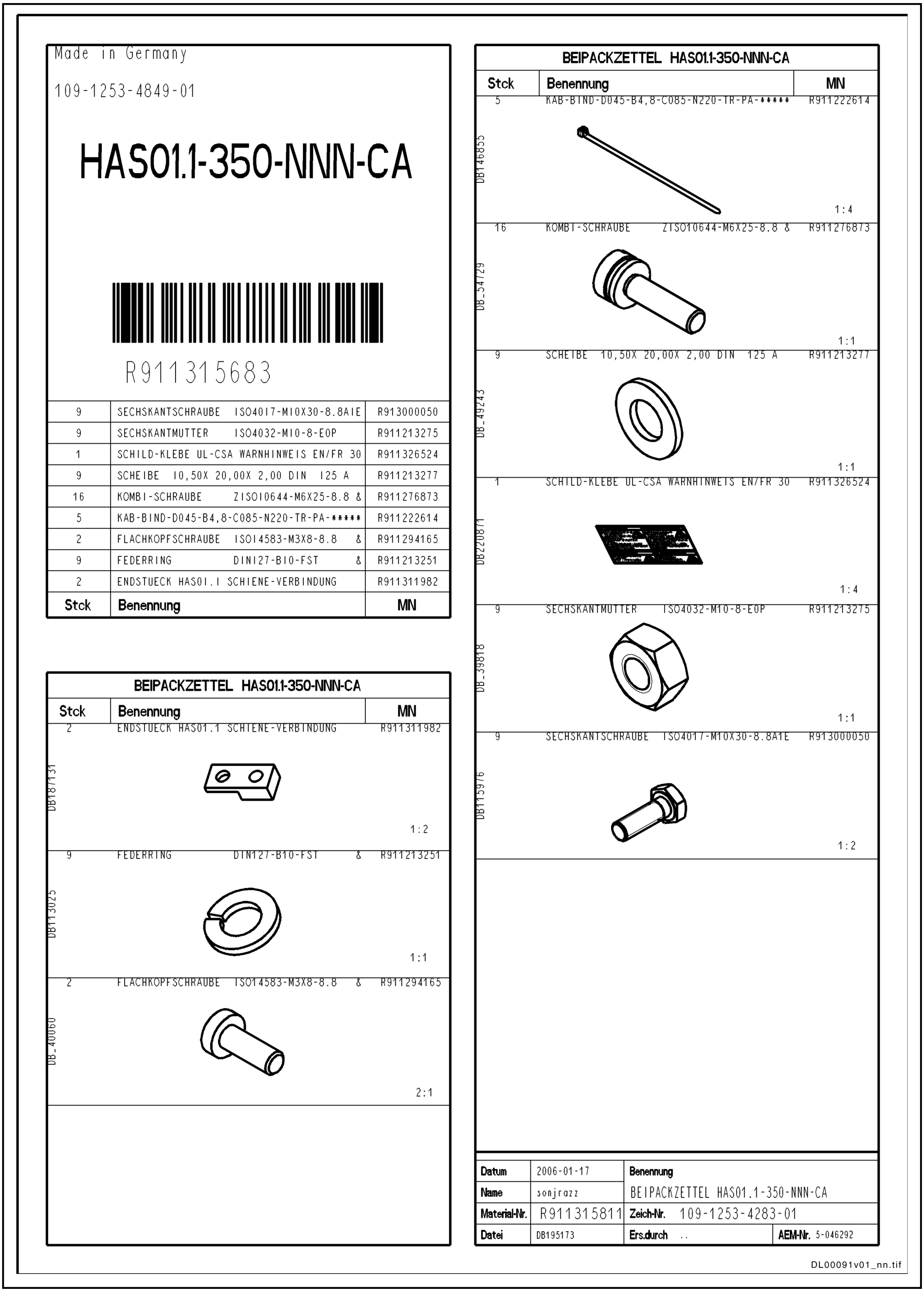
Fig. 11-30: *Product insert*

Accessories



Made in Germany

109-1253-4849-01

HAS01.1-350-NNN-CA

R911315683

Stck	Benennung	MN
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

BEIPACKZETTEL HAS01.1-350-NNN-CA

Stck	Benennung	MN	Scale
2	ENDSTUECK HAS01.1 SCHIENE-VERBINDUNG (DB187131)	R911311982	1:2
9	FEDERRING DIN127-B10-FST & (DB113025)	R911213251	1:1
2	FLACHKOPFSCHRAUBE ISO14583-M3X8-8.8 & (DB_40060)	R911294165	2:1

BEIPACKZETTEL HAS01.1-350-NNN-CA

Stck	Benennung	MN	Scale
5	KAB-BIND-D045-B4,8-C085-N220-TR-PA-***** (DB146855)	R911222614	1:4
16	KOMBI-SCHRAUBE ZISO10644-M6X25-8.8 & (DB_54729)	R911276873	1:1
9	SCHEIBE 10,50X 20,00X 2,00 DIN 125 A (DB_49243)	R911213277	1:1
1	SCHILD-KLEBE UL-CSA WARNHINWEIS EN/FR 30 (DB220871)	R911326524	1:4
9	SECHSKANTMUTTER ISO4032-M10-8-E0P (DB_39818)	R911213275	1:1
9	SECHSKANTSCHRAUBE ISO4017-M10X30-8.8A1E (DB115976)	R913000050	1:2

Datum	2006-01-17	Benennung			
Name	sonjrazz	BEIPACKZETTEL HAS01.1-350-NNN-CA			
Material-Nr.	R911315811	Zeich-Nr.	109-1253-4283-01		
Datei	DB195173	Ers.durch	..	AEM-Nr.	5-046292

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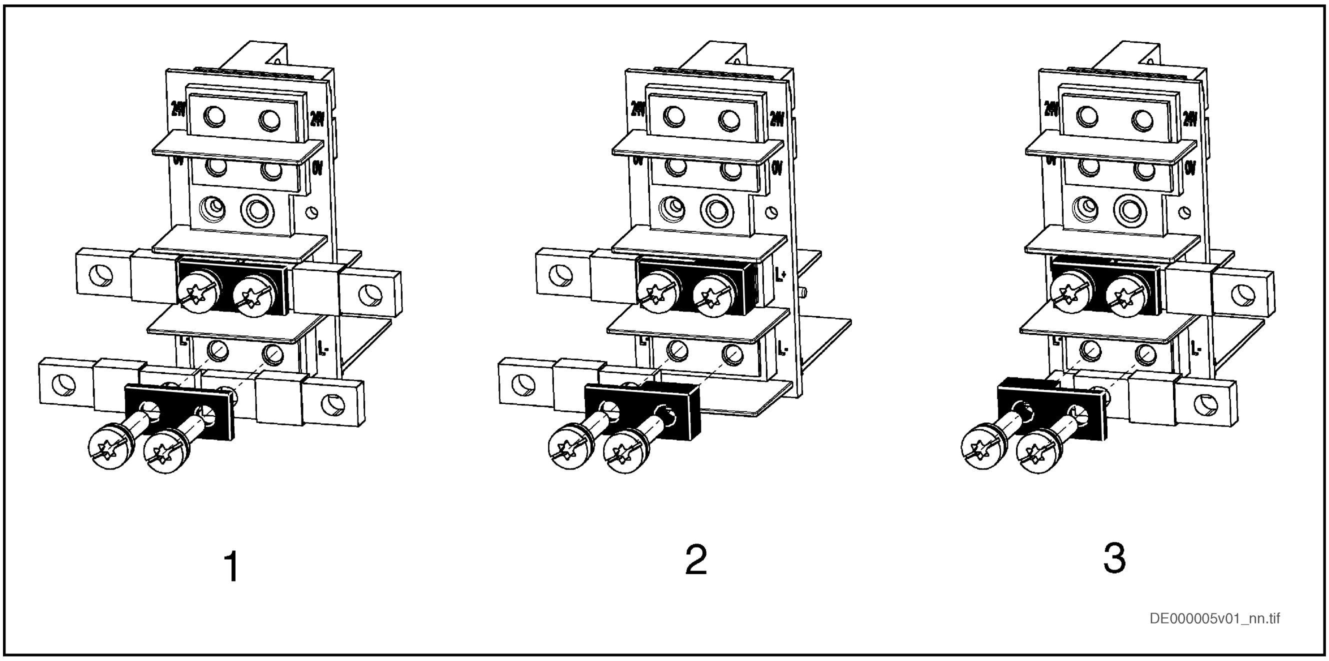
Fig. 11-31: Product insert

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

There are appropriate HAS02 accessories for the different drive controllers.

11.3.2 Type code

Short text column	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20
Example:	H	A	S	0	2	.	1	-	0	0	1	-	N	N	N	-	N	N		

Product
Accessories
IndraDrive . . . = HAS

Series
Shield connection. . . .= 02

Design
1 . . . . = 1

Device assignment
HMS01.1N-W0020 . . . . = 001
HMS01.1N-W0036 . . . . = 001
HMS01.1N-W0054 . . . . = 001
HMS01.1N-W0070 . . . . = 001
HCS02.1E-W0012 . . . . = 002
HCS02.1E-W0028 . . . . = 002
HCS02.1E-W0054 . . . . = 002
HCS02.1E-W0070 . . . . = 002
HMD01.1N-W0020 . . . . = 002
HMD01.1N-W0036 . . . . = 002
HMS01.1N-W0110 . . . . = 003
HMS01.1N-W0150 . . . . = 003
HMS01.1N-W0210 . . . . = 003
HCS03.1E-W0070 . . . . = 004
HCS03.1E-W0100 . . . . = 005
HCS03.1E-W0150 . . . . = 005
HNK01.1A-A075-E0050 . . . . = 006
HNK01.1A-A075-E0080 . . . . = 007
HNK01.1A-A075-E0106 . . . . = 007
HCS03.1E-W0210/280/350. . . . .= 008
HNK01.1A-A075-E0146 . . . . = 009
HMS02.1N-W0028 . . . . = 010
HMS02.1N-W0054 . . . . = 011
HCS04.1E-X0500 . . . . = 012
HMF01.1N-N2K0-C0303 . . . . . . = 013
HNF01.1A-E0309 . . . . = 013
HMS01.1N-W0350 . . . . = 014
KCU01.2 . . . . = 015
HMS02.1N-F0070 . . . . = 016
HMS02.1N-F0110 . . . . = 017
HMS02.1N-F0028 . . . . = 018
HMS02.1N-F0054 . . . . = 019
HCS02.1E-W0012, RKB0001 = 020 ①
HCS02.1E-W0028, RKB0001 = 020 ①
HCS02.1E-W0054, RKB0001 = 021 ①
HCS02.1E-W0070, RKB0001 = 021 ①
HCS04.2E-W0290 . . . . = 022
HCS04.2E-W0350 . . . . = 023
HCS04.2E-W0420 . . . . = 024
HCS04.2E-W0520 . . . . = 025
HCS04.2E-W0640 . . . . = 026
HCS04.2E-W0790 . . . . = 026
HCS04.2E-W1010 . . . . = 027
HCS04.2E-W1240 . . . . = 027
HCS04.2E-W1540 . . . . = 028
HMS02.1N-F0150 . . . . = 029
HMS02.1N-W0210 . . . . = 030
HCP02.1E-B0070-...-NNNN/NNM2 = 031
HCP02.1E-B0070-...-NNN1 . . . . = 032

Other properties
Additional cable routing, RKB0001 . . . . = NNF ①
None . . . . = NNN

Other design
None . . . . = NN

Notes
① Other property "NNF" is only possible for device assignment "020" and "021"

DT000004v02_en.fh11

Fig. 11-33: Type Code HAS02.1

11.3.3 Use

The HAS02 accessories are used to

- provide strain relief of the motor cable
- connect the shield of the motor cable to the drive controller

11.3.4 Assignment of accessory HAS02

See section "Type Code (Device Assignment)"

11.3.5 Scope of supply

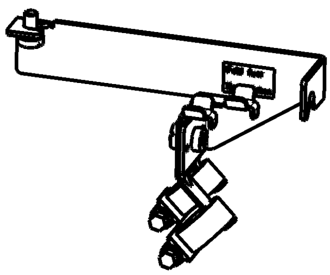
For the scope of supply and the components of HAS02, see the corresponding product inserts.

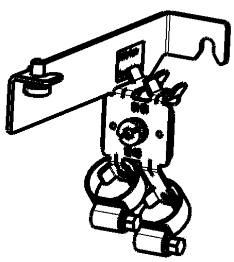
Accessories

HAS02.1-001-NNN-NN

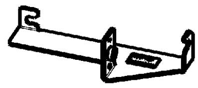
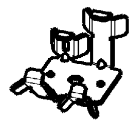
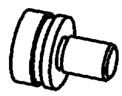
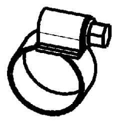
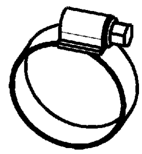
R911306330

Stck	Benennung	MN
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





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
DB164826		7:20
2	KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &	R911252551
DB_38405		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

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. 11-34: Product Insert

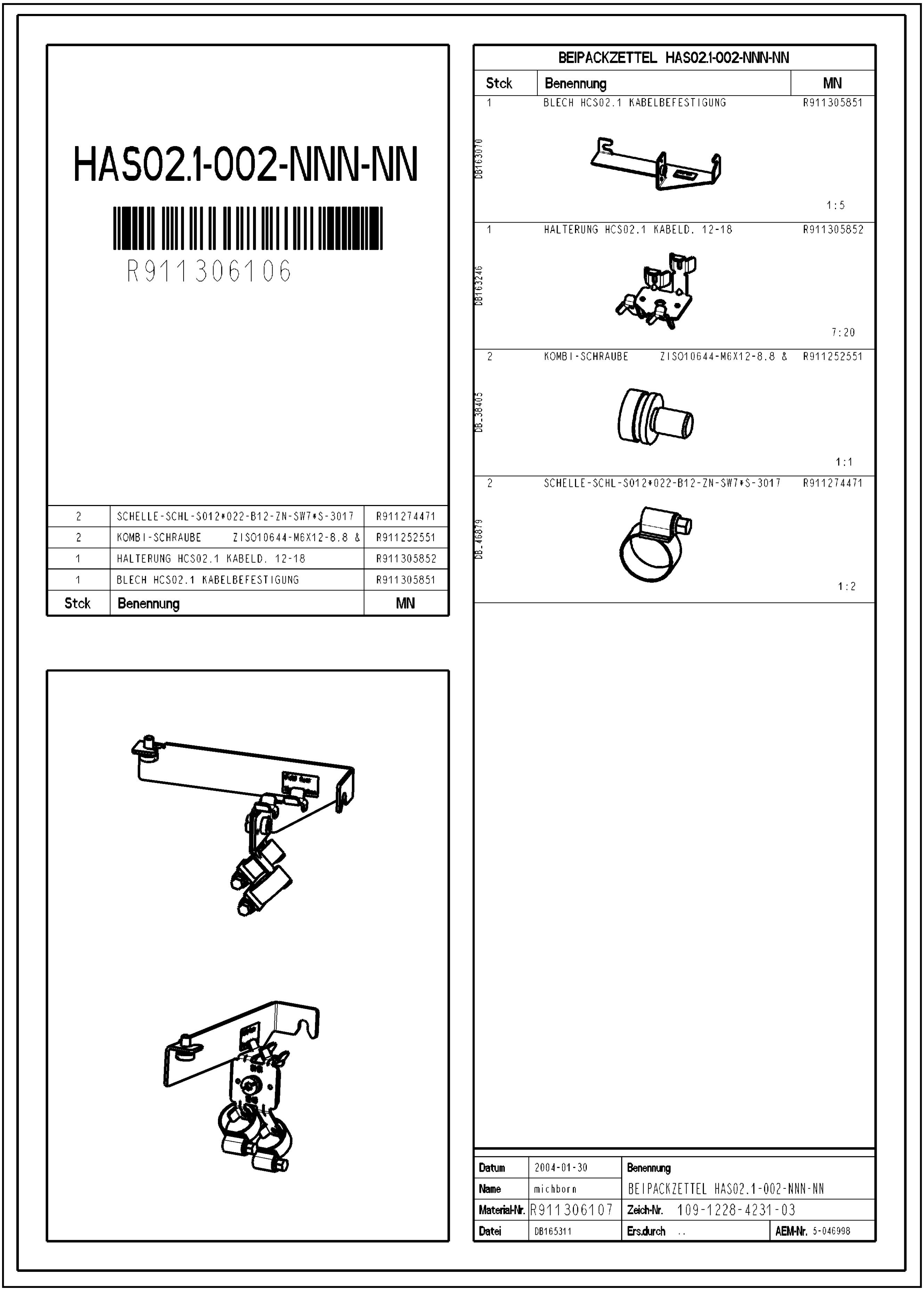


Fig. 11-35: Product Insert

Accessories

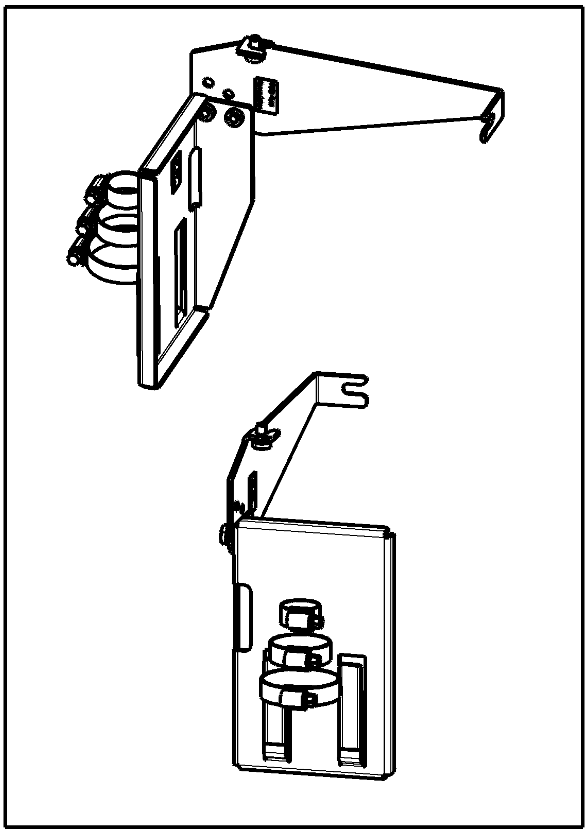
Made in Germany

109-1217-4816-02

HAS02.1-003-NNN-NN

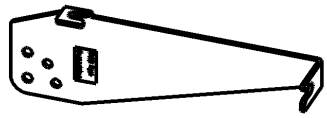
R911306331

Stck	Benennung	MN
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

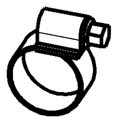


BEIPACKZETTEL HAS02.1-003-NNN-NN

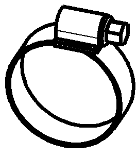
Stck	Benennung	MN
1	BLECH HMS01.1-W0210 ABSCHIRMANSCHLUSS	R911305940



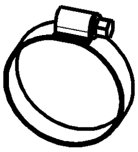
Stck	Benennung	MN
1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471



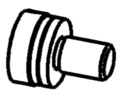
Stck	Benennung	MN
1	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472



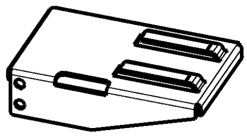
Stck	Benennung	MN
1	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565



Stck	Benennung	MN
3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551

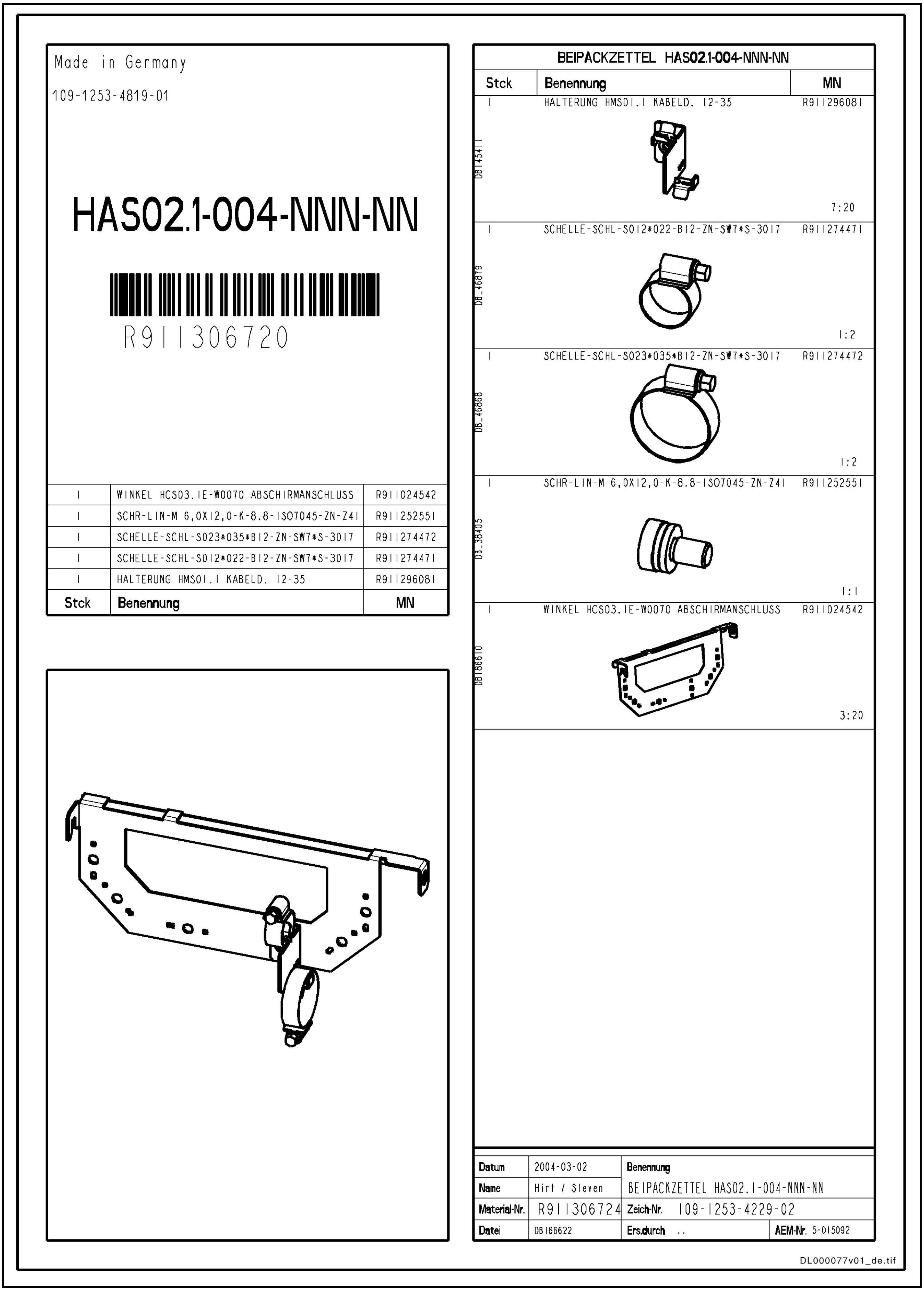


Stck	Benennung	MN
1	WINKEL HMS01.1-W0210 ABSCHIRMANSCHLUSS	R911305950



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. 11-36: Product Insert



Made in Germany

109-1253-4819-01

HAS02.1-004-NNN-NN

R911306720

Stck	Benennung	MN
1	WINKEL HCS03.1E-W0070 ABSCHIRMANSCHLUSS	R911024542
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
1	HALTERUNG HMS01.1 KABELD. 12-35	R911296081

BEIPACKZETTEL HAS02.1-004-NNN-NN

Stck	Benennung	MN	
1	HALTERUNG HMS01.1 KABELD. 12-35	R911296081	DB145411, 7:20
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	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551	DB_38405, 1:1
1	WINKEL HCS03.1E-W0070 ABSCHIRMANSCHLUSS	R911024542	DB186610, 3:20

Datum	2004-03-02	Benennung	
Name	Hirt / Sleven	BEIPACKZETTEL HAS02.1-004-NNN-NN	
Material-Nr.	R911306724	Zeich-Nr. 109-1253-4229-02	
Datei	DB166622	Ersdurch ..	AEM-Nr. 5-015092

DL000077v01_de.tif

Fig. 11-37: Product Insert

Accessories

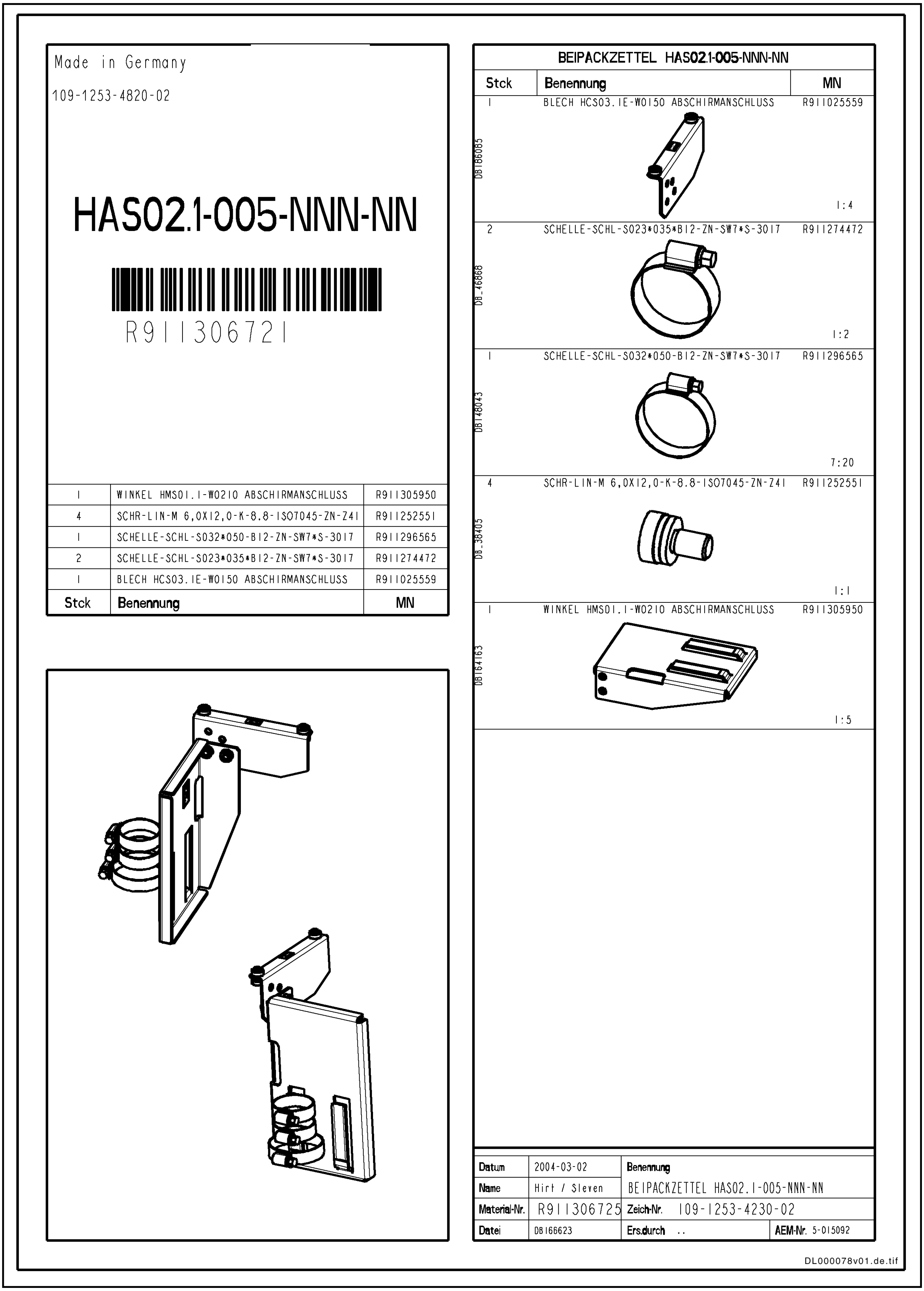


Fig. 11-38: Product Insert

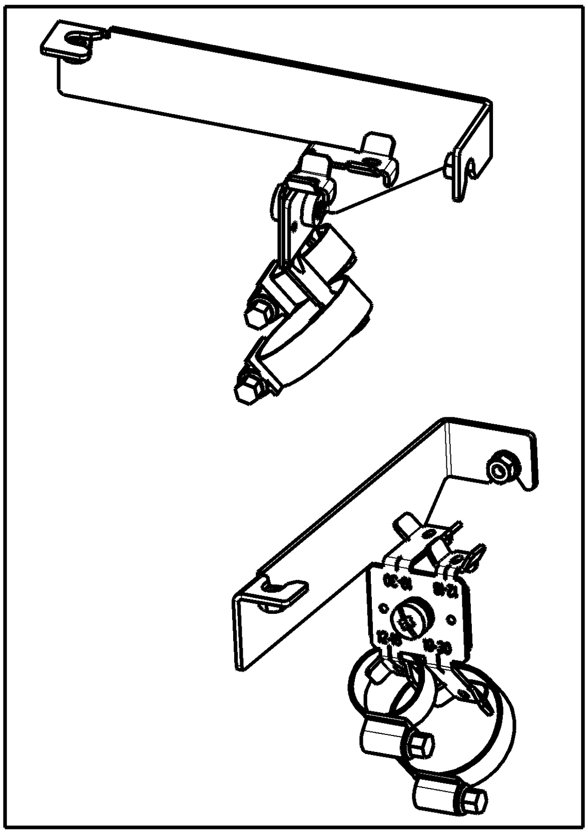
Made in Germany

109-1253-4821-01

HAS02.1-006-NNN-NN

R911306722

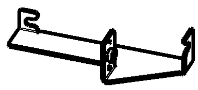
Stck	Benennung	MN
1	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
1	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
2	MUTTER-KOM-M 5,0-D10-H05,80 A2-B	R911210162
1	HALTERUNG HMS01.1 KABELD. 12-30	R911306336
1	BLECH HCS02.1 KABELBEFESTIGUNG	R911305851



BEIPACKZETTEL HAS02.1-006-NNN-NN

Stck	Benennung	MN
1	BLECH HCS02.1 KABELBEFESTIGUNG	R911305851

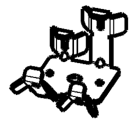
DB163070



1:5

Stck	Benennung	MN
1	HALTERUNG HMS01.1 KABELD. 12-30	R911306336

DB164826



7:20

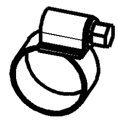
Stck	Benennung	MN
2	MUTTER-KOM-M 5,0-D10-H05,80 A2-B	R911210162

DB_39161

1:1

Stck	Benennung	MN
1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471

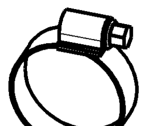
DB_46879



1:2

Stck	Benennung	MN
1	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472

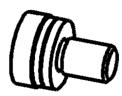
DB_46868



1:2

Stck	Benennung	MN
1	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551

DB_38405



1:1

Datum	2004-03-02	Benennung	
Name	Hirt / Sleven	BEIPACKZETTEL HAS02.1-006-NNN-NN	
Material-Nr.	R911306726	Zeich-Nr.	109-1253-4231-01
Datei	DB166624	Ers.durch ..	AEM-Nr. 5-07273

Fig. 11-39: Product Insert

Accessories

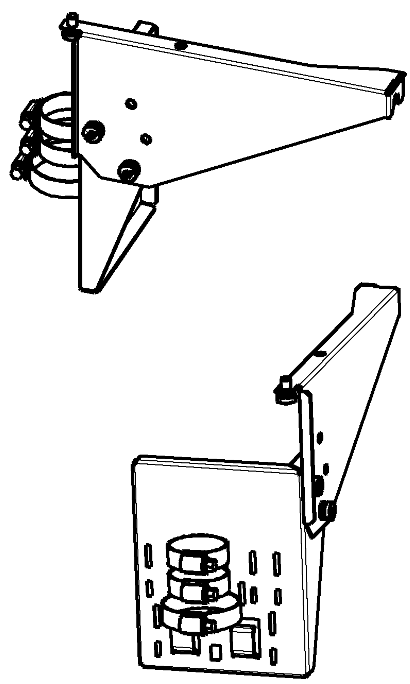
Made in Germany

109-1253-4822-01

HAS02.1-007-NNN-NN

R911306723

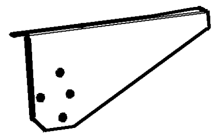
Stck	Benennung	MN
1	WINKEL HNK01.1A-A075-W0080/0106 ABSCHIRM	R911024565
3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551
1	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
2	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472
1	BLECH HNK01.1A-A075-E0080/0106 ABSCHIRM	R911024564



BEIPACKZETTEL HAS02.1-007-NNN-NN

Stck	Benennung	MN
1	BLECH HNK01.1A-A075-E0080/0106 ABSCHIRM	R911024564

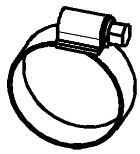
DB186446



3:20

Stck	Benennung	MN
2	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472

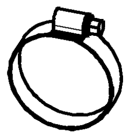
DB.46868



1:2

Stck	Benennung	MN
1	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565

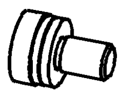
DB148043



7:20

Stck	Benennung	MN
3	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551

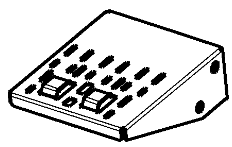
DB.38405



1:1

Stck	Benennung	MN
1	WINKEL HNK01.1A-A075-W0080/0106 ABSCHIRM	R911024565

DB186587



1:5

Datum	2004-03-02	Benennung	
Name	Hirt / Sleven	BEIPACKZETTEL HAS02.1-007-NNN-NN	
Material-Nr.	R911306727	Zeich-Nr. 109-1253-4232-02	
Datei	DB166625	Ers.durch ..	AEM-Nr. 5-015092

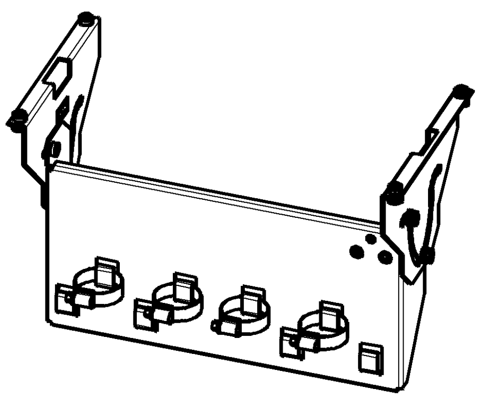
Fig. 11-40: Product Insert

Made in Germany
109-1253-4823-00

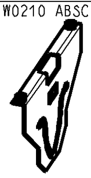
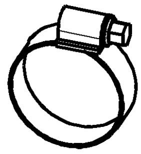
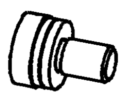
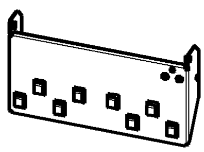
HAS02.1-008-NNN-NN

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**



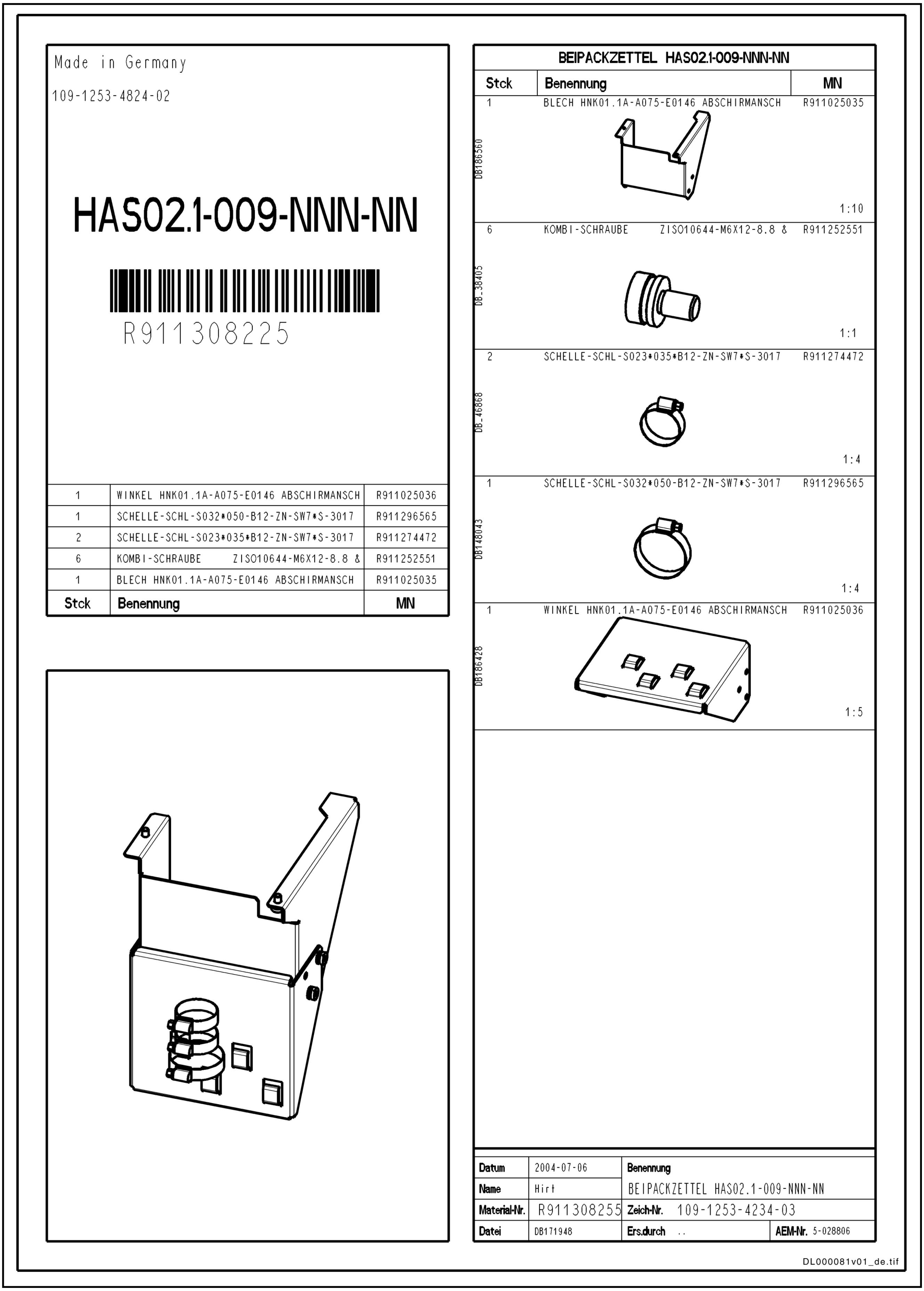
BEIPACKZETTEL HAS02.1-008-NNN-NN

	Stck	Benennung	MN
DB186112	2	BLECH HCS03.1E-W0210 ABSCHIRMANSCHLUSS 	R911025286 3:20
DB_55462	4	FEDERRING DIN127-B6-FST & 	R911213515 1:1
DB_42275	4	SCHEIBE 6,40X 12,00X 1,60 DIN 125 	R911212427 1:1
DB_46868	4	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017 	R911274472 1:2
DB_38405	4	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41 	R911252551 1:1
DB178750	4	SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C 	R900014492 1:1
DB186125	1	WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS 	R911025285 1:10

Datum	2004-11-08	**Benennung**	
Name	Sieven	BEIPACKZETTEL HAS02.1-008-NNN-NN	
Material-Nr.	R911311655	**Zeich-Nr.** 109-1253-4233-01	
Datei	DB178779	**Ers.durch** ..	**AEM-Nr.** 5-015092

Fig. 11-41: Product Insert

Accessories



Made in Germany

109-1253-4824-02

HAS02.1-009-NNN-NN

R911308225

Stck	Benennung	MN
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

BEIPACKZETTEL HAS02.1-009-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

Datum	2004-07-06	Benennung			
Name	Hirt	BEIPACKZETTEL HAS02.1-009-NNN-NN			
Material-Nr.	R911308255	Zeich-Nr.	109-1253-4234-03		
Datei	DB171948	Ers.durch	..	AEM-Nr.	5-028806

DL000081v01_de.tif

Fig. 11-42: Product Insert

Made in Germany

109-1253-4841-00

HAS02.1-010-NNN-NN

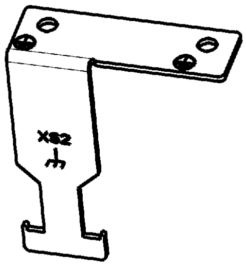
R911306209

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

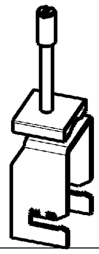
DB185832



1:2

Stck	Benennung	MN
1	KLEMME SK 20	R911313176

DB183513

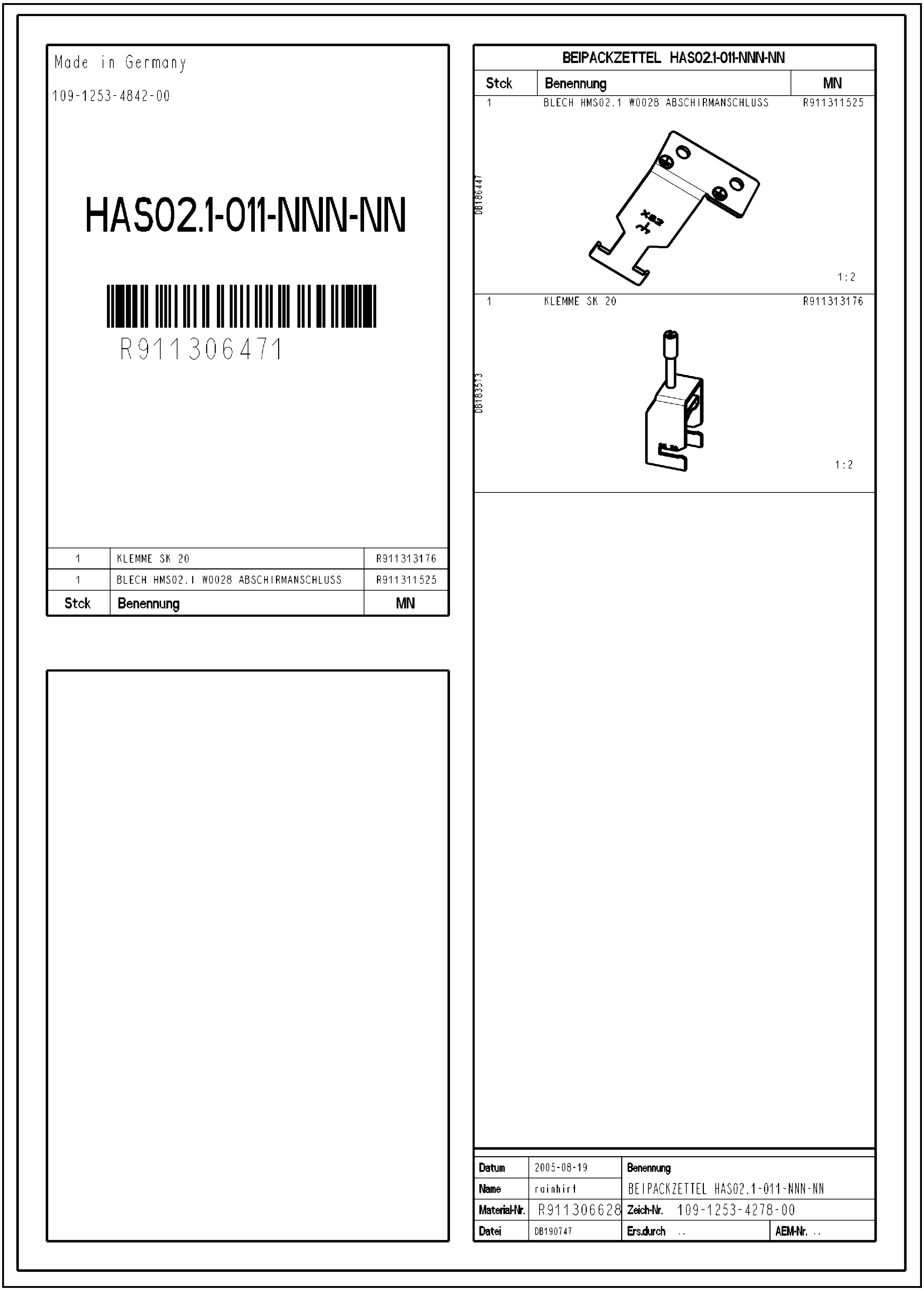


1:2

Datum	2005-08-19	Benennung	
Name	rainhirt	BEIPACKZETTEL HAS02.1-010-NNN-NN	
Material-Nr.	R911313050	Zeich-Nr. 109-1253-4277-00	
Datei	DB190746	Ers.durch ..	AEM-Nr. ..

Fig. 11-43: Product Insert

Accessories



Made in Germany

109-1253-4842-00

HAS02.1-011-NNN-NN

R911306471

Stck	Benennung	MN
1	KLEMME SK 20	R911313176
1	BLECH HMS02.1 W0028 ABSCHIRMANSCHLUSS	R911311525

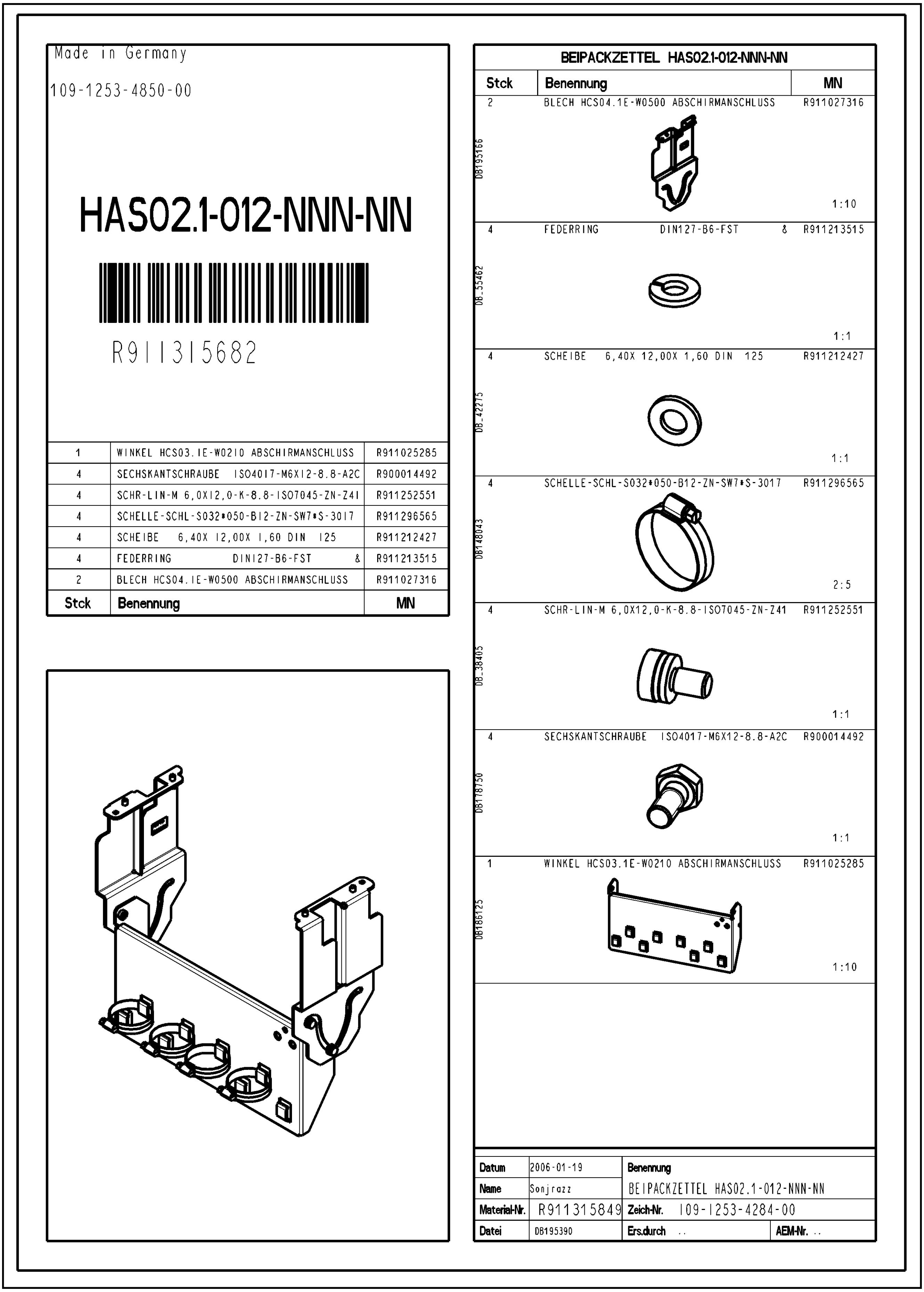
BEIPACKZETTEL HAS02.1-011-NNN-NN

Stck	Benennung	MN
1	BLECH HMS02.1 W0028 ABSCHIRMANSCHLUSS	R911311525
1	KLEMME SK 20	R911313176

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. 11-44: Product Insert



Made in Germany

109-1253-4850-00

HAS02.1-012-NNN-NN

R911315682

Stck	Benennung	MN
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

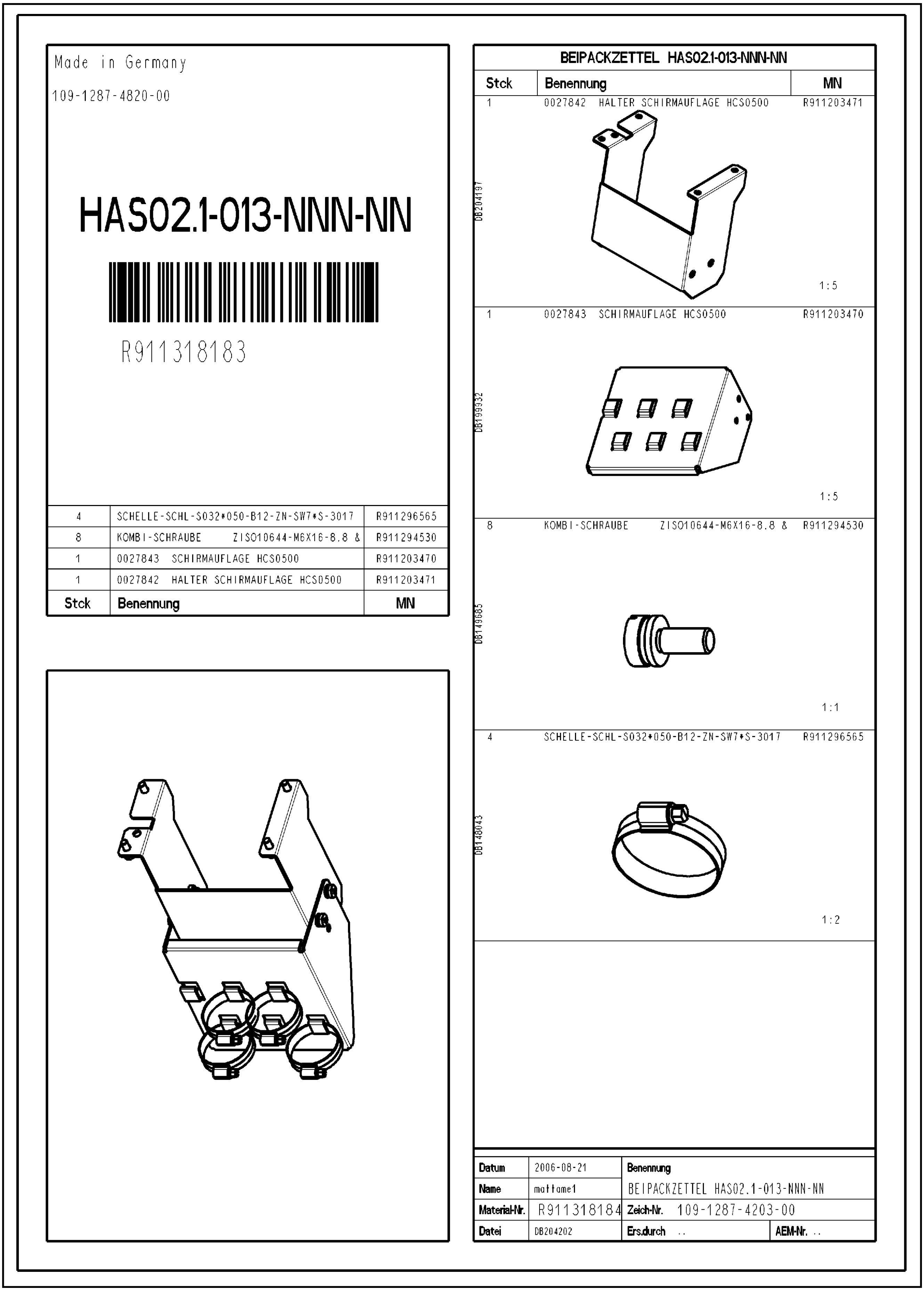
BEIPACKZETTEL HAS02.1-012-NNN-NN

Stck	Benennung	MN		
2	BLECH HCS04.1E-W0500 ABSCHIRMANSCHLUSS	R911027316	1:10	DB195166
4	FEDERRING DIN127-B6-FST &	R911213515	1:1	DB_55462
4	SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427	1:1	DB_42275
4	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565	2:5	DB148043
4	SCHR-LIN-M 6,0X12,0-K-8.8-ISO7045-ZN-Z41	R911252551	1:1	DB_38405
4	SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C	R900014492	1:1	DB118750
1	WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS	R911025285	1:10	DB186125

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. 11-45: Product Insert

Accessories


Made in Germany

109-1287-4820-00

HAS02.1-013-NNN-NN

R911318183

Stck	Benennung	MN
4	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565
8	KOMBI-SCHRAUBE Z ISO10644-M6X16-8.8 &	R911294530
1	0027843 SCHIRMAUFLAGE HCS0500	R911203470
1	0027842 HALTER SCHIRMAUFLAGE HCS0500	R911203471

BEIPACKZETTEL HAS02.1-013-NNN-NN

Stck	Benennung	MN
1	0027842 HALTER SCHIRMAUFLAGE HCS0500	R911203471
1	0027843 SCHIRMAUFLAGE HCS0500	R911203470
8	KOMBI-SCHRAUBE Z ISO10644-M6X16-8.8 &	R911294530
4	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565

DB204197 1:5

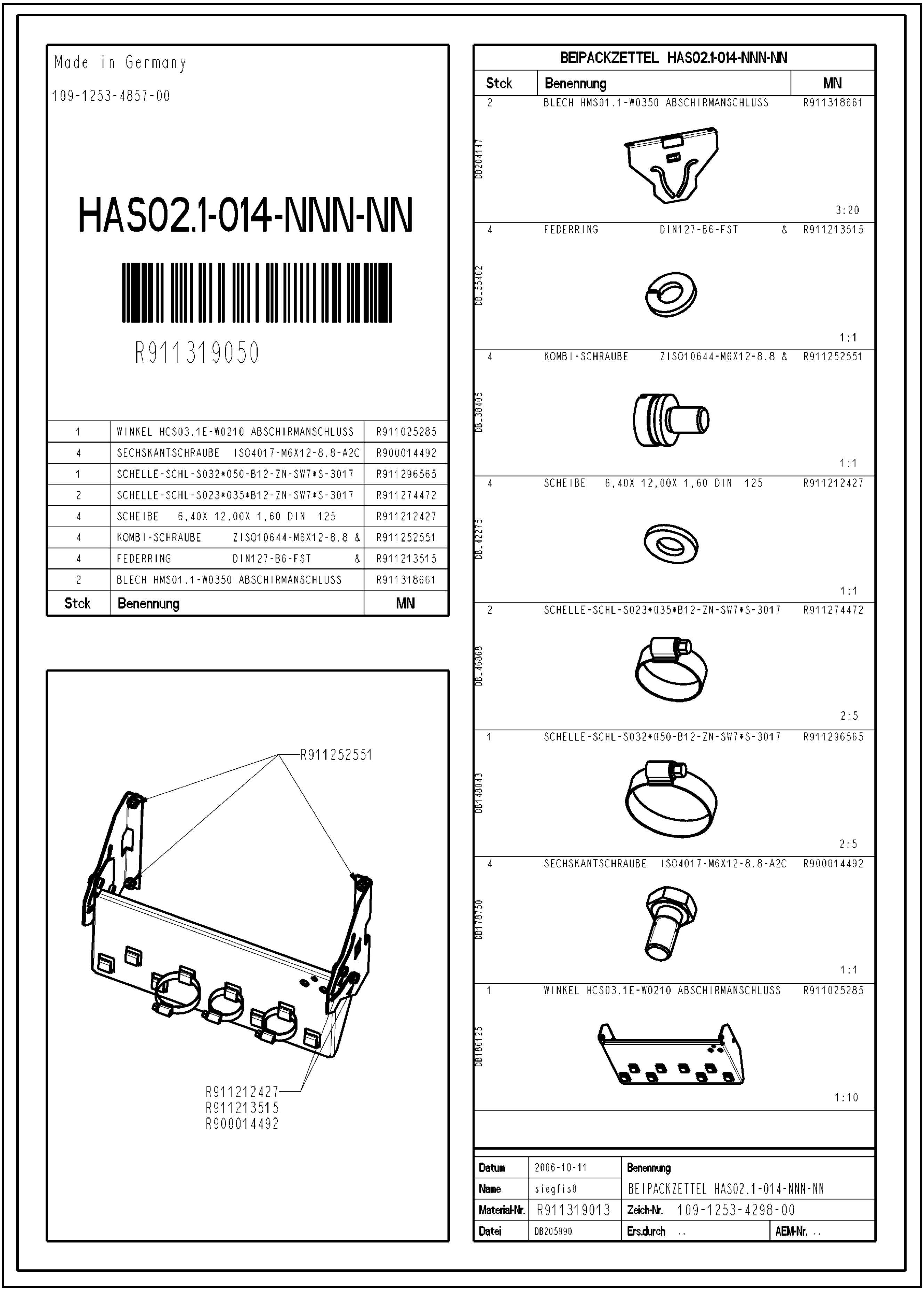
DB199932 1:5

DB149685 1:1

DB148043 1:2

Datum	2006-08-21	Benennung			
Name	mattame1	BEIPACKZETTEL HAS02.1-013-NNN-NN			
Material-Nr.	R911318184	Zeich-Nr.	109-1287-4203-00		
Datei	DB204202	Ers.durch	..	AEM-Nr.	..

Fig. 11-46: Product Insert



Made in Germany

109-1253-4857-00

HAS02.1-014-NNN-NN

R911319050

Stck	Benennung	MN
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

BEIPACKZETTEL HAS02.1-014-NNN-NN

Stck	Benennung	MN	Scale
2	BLECH HMS01.1-W0350 ABSCHIRMANSCHLUSS	R911318661	3:20
4	FEDERRING DIN127-B6-FST &	R911213515	1:1
4	KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &	R911252551	1:1
4	SCHEIBE 6,40X 12,00X 1,60 DIN 125	R911212427	1:1
2	SCHELLE-SCHL-S023*035*B12-ZN-SW7*S-3017	R911274472	2:5
1	SCHELLE-SCHL-S032*050-B12-ZN-SW7*S-3017	R911296565	2:5
4	SECHSKANTSCHRAUBE ISO4017-M6X12-8.8-A2C	R900014492	1:1
1	WINKEL HCS03.1E-W0210 ABSCHIRMANSCHLUSS	R911025285	1:10

Datum	2006-10-11	Benennung	
Name	siegfis0	BEIPACKZETTEL HAS02.1-014-NNN-NN	
Material-Nr.	R911319013	Zeich-Nr. 109-1253-4298-00	
Datei	DB205990	Ers.durch ..	AEM-Nr. ..

Fig. 11-47: Product Insert

Accessories

Made in Germany

109-1253-4850-AB

HAS02.1-015-NNN-NN

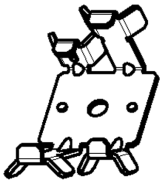
R911320785

1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471
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
1	HALTERUNG HMS01.1 KABELD. 12-30	R911306336

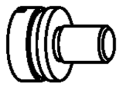
DB164824



1:2

1	KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &	R911252551

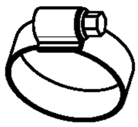
DB_38405



1:1

1	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471

DB_46879



1:2

Datum	2007-03-09	Benennung			
Name	rainhirt	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. 11-48: Product Insert

Made in Germany

109-1304-4813-00

HAS02.1-020-NNF-NN

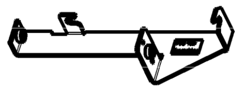
R911323839

Stck	Benennung	MN
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

BEIPACKZETTEL HAS02.1-020-NNF-NN

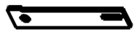
Stck	Benennung	MN
1	ABSCHIRMBLECH HAS02.1-020-NNF-NN	R911323764
1	BLECH HAS02.1-020-NNF-NN	R911323763
1	HALTERUNG HCS02.1 KABELD. 12-18	R911305852
3	KOMBI-SCHRAUBE ZISO10644-M6X12-8.8 &	R911252551
2	SCHELLE-SCHL-S012*022-B12-ZN-SW7*S-3017	R911274471

DB225152



1:5

DB225270

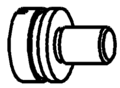


1:4

DB163246

1:4

DB_38405



1:1

DB_46819

1:2

Datum	2008-02-28	Benennung	
Name	rainhirt	BEIPACKZETTEL HAS02.1-020-NNF-NN	
Material-Nr.	R911323843	Zeich-Nr. 109-1304-4218-01	
Datei	DB226241	Ers.durch ..	AEM-Nr. 5-046998

Fig. 11-49: Product Insert HAS02.1-020-NNF-NN (Page 1)

Accessories

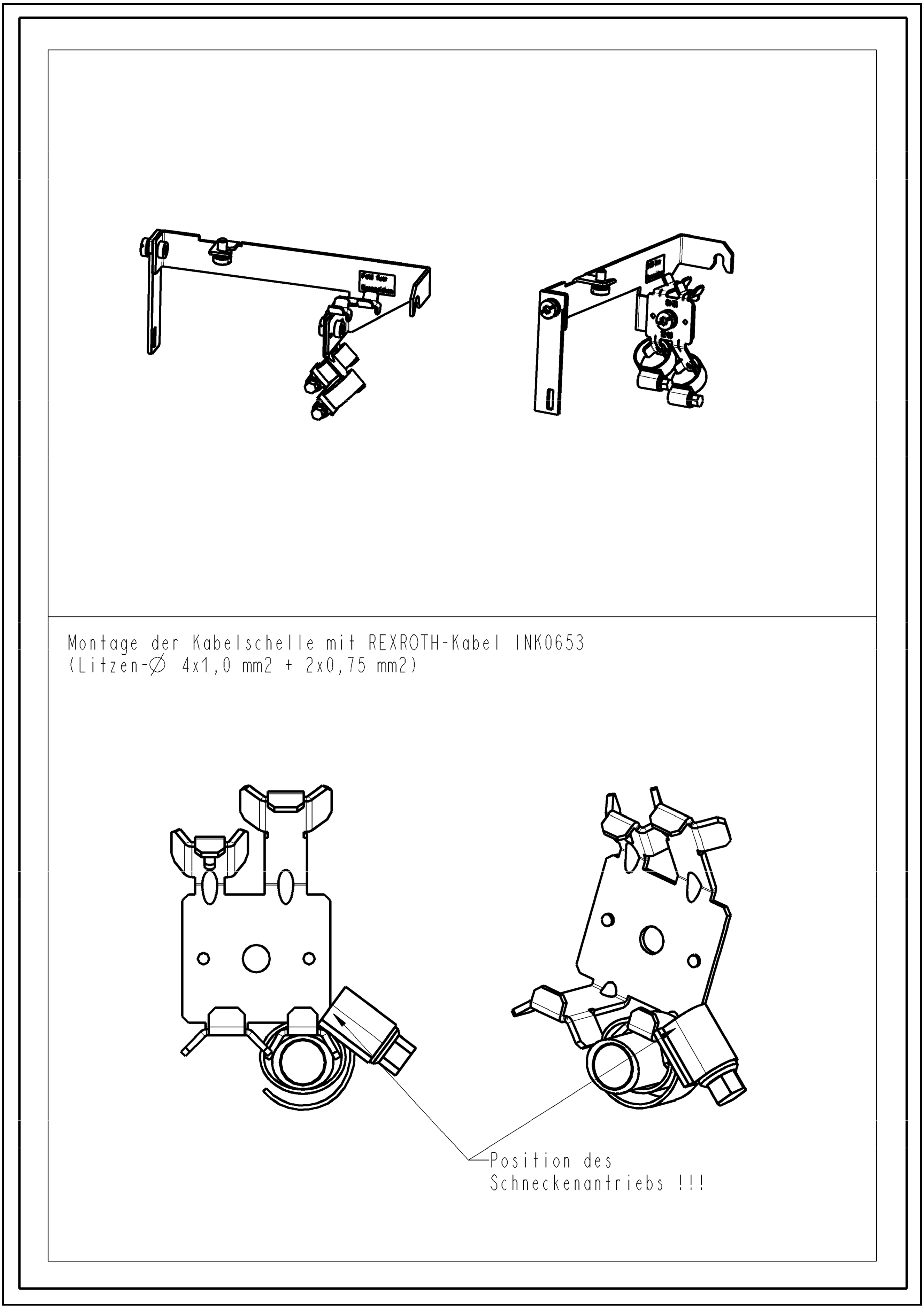


Fig. 11-50: Product Insert HAS02.1-020-NNF-NN (Page 2)

Made in Germany

109-1304-4814-00

HAS02.1-021-NNF-NN

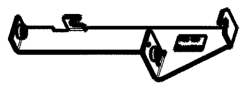
R911323840

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 HAS02.1-021-NNF-NN	R911323762
1	ABSCHIRMBLECH HAS02.1-021-NNF-NN	R911323765
Stck	**Benennung**	**MN**

BEIPACKZETTEL HAS02.1-021-NNF-NN

Stck	Benennung	MN
1	ABSCHIRMBLECH HAS02.1-021-NNF-NN	R911323765
1	BLECH HAS02.1-021-NNF-NN	R911323762
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

DB222748



1:5

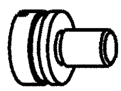
DB222881

1:4

DB163246

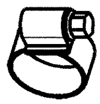
1:4

DB_38405



1:1

DB_46819



1:2

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. 11-51: Product Insert HAS02.1-021-NNF-NN (Page 1)

Accessories

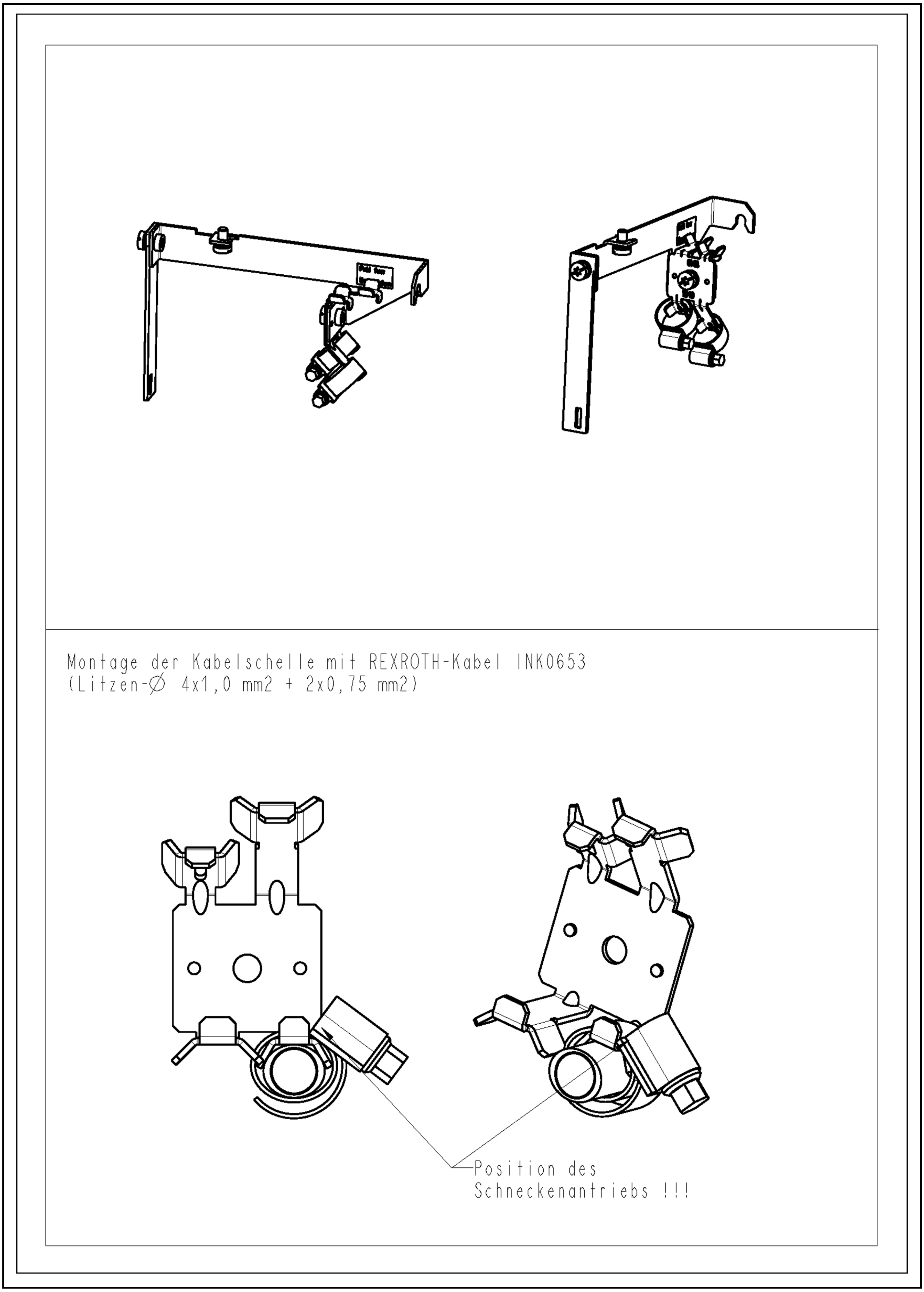
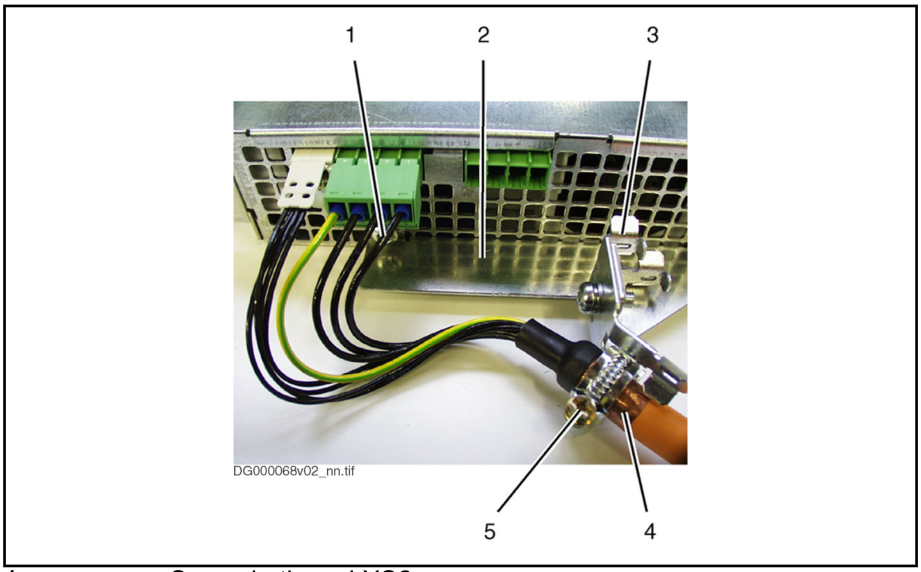


Fig. 11-52: Product Insert HAS02.1-021-NNF-NN (Page 2)

11.3.6 Mounting the accessory HAS02

General information



1	Screw in thread XS2
2	Fixing device of shielding plate
3	Shielding plate
4	Shield of motor cable
5	Clip

Fig. 11-53: Strain Relief and Shield Connection of Motor Cable

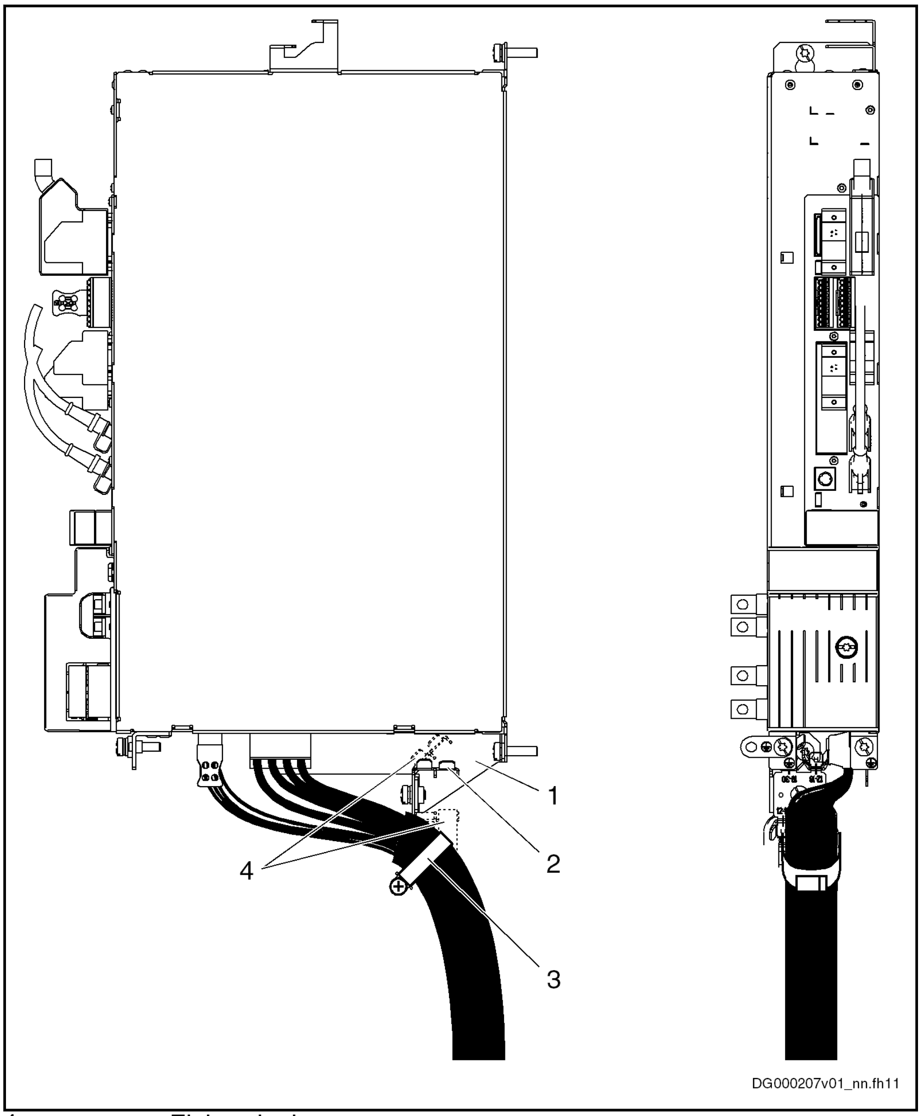
- Unscrew bottom or bottom left mounting screw of drive controller.
- Put fixing device of accessories to bottom of drive controller and screw down mounting screw of drive controller again.

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) in thread XS2 at bottom of drive controller.
- Screw shielding plate to sheet metal of accessories according to desired cable routing of motor cable (45° or horizontal). (The figure below illustrates cable routing with 45°.)
- According to diameter of motor cable, fix motor cable at corresponding point of shielding plate (12-18 mm or 19-30 mm) with a clip. Make sure that shield of motor cable has good contact with shielding plate (see figure below).

HAS02.1-001 at HMS01.1N-W0054



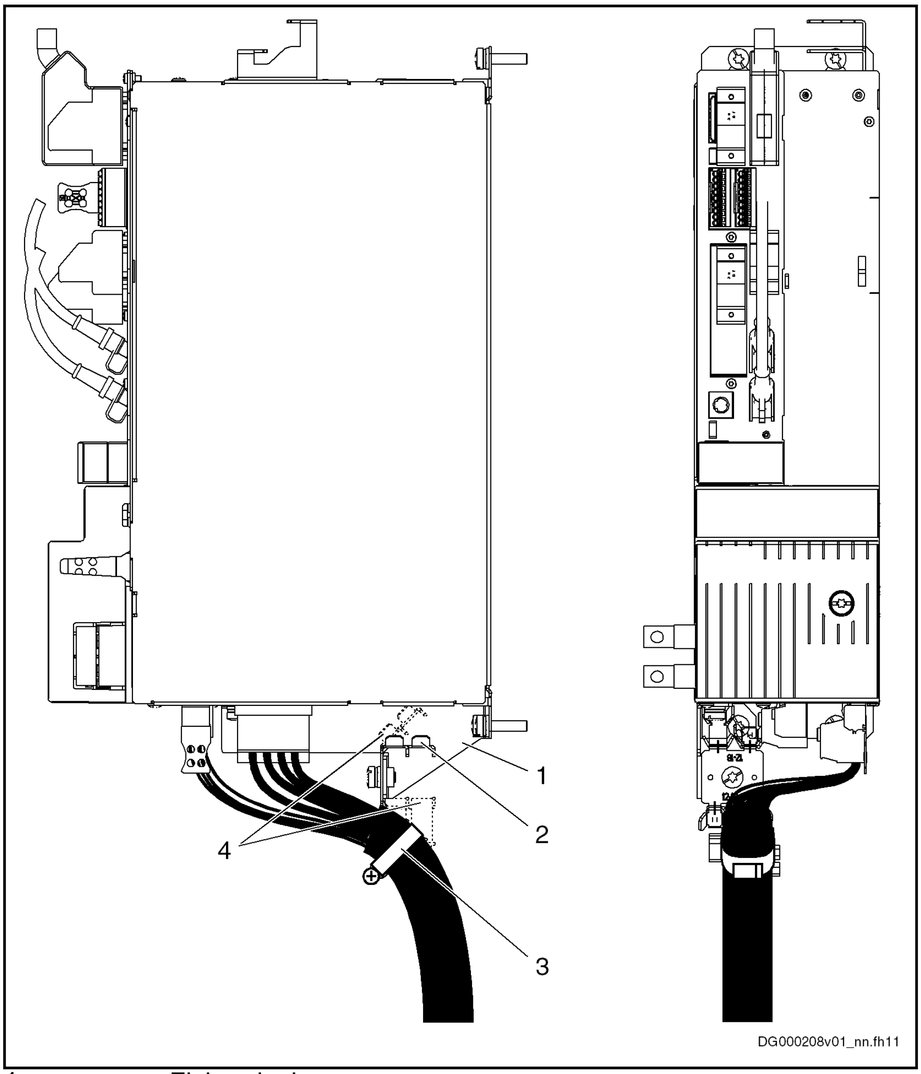
1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 11-54: HAS02.1-001 at Bottom of Drive Controller HMS01.1N-W0054

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

HAS02.1-002 at HCS02.1E-W0054



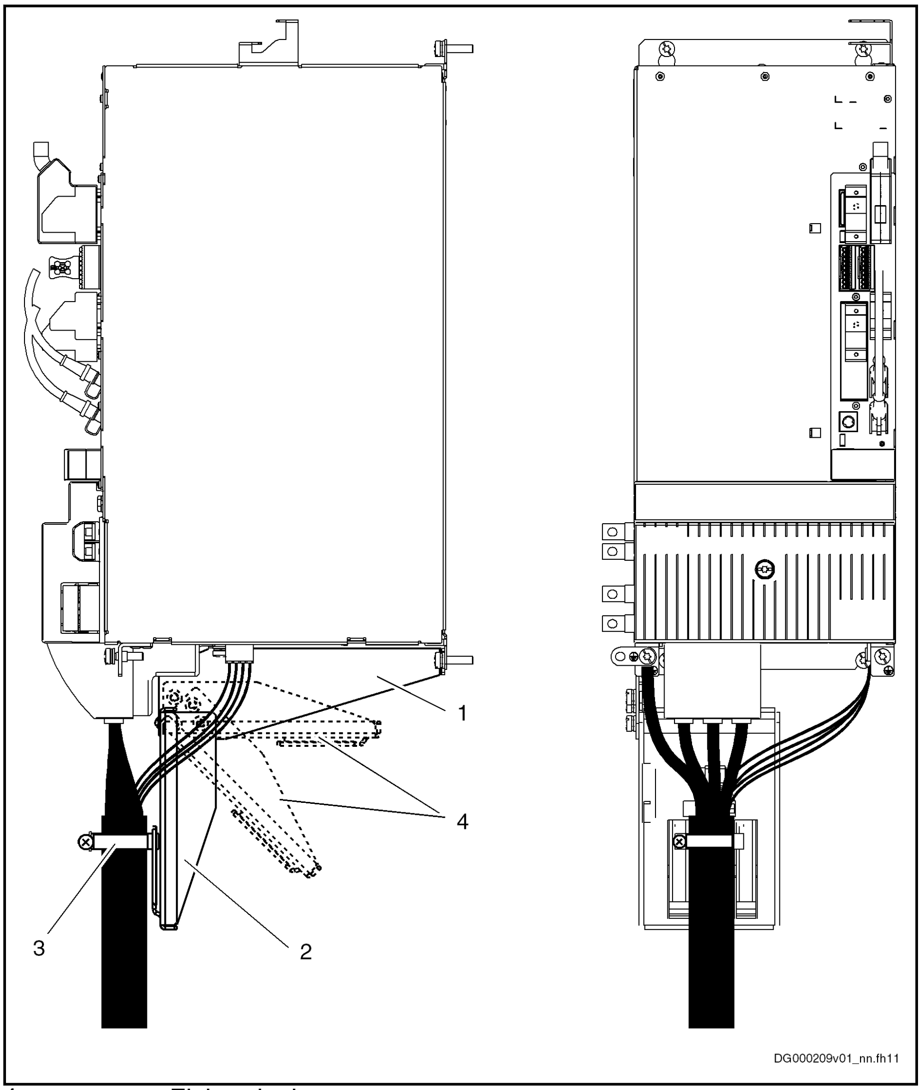
1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 11-55: HAS02.1-002 at Bottom of Drive Controller HCS02.1E-W0054

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

HAS02.1-003 at HMS01.1N-W0210/300



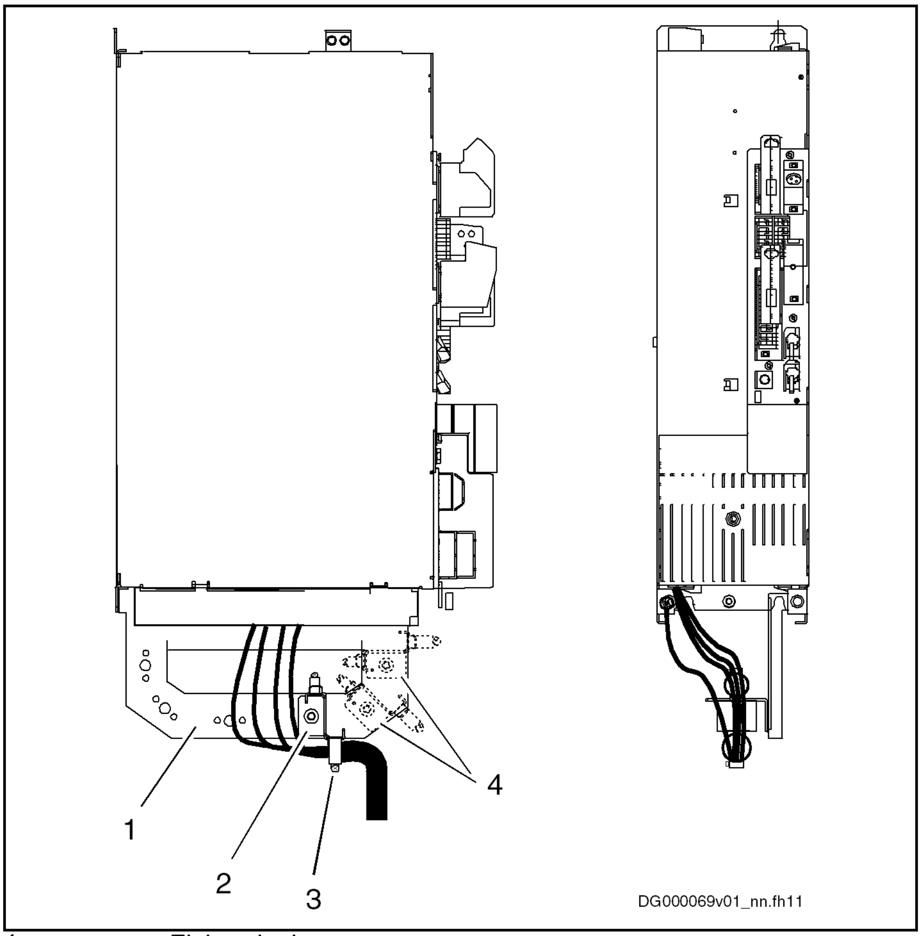
1 Fixing device
2 Shielding plate
3 Clip
4 Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 11-56: HAS02.1-003 at Bottom of Drive Controller HMS01.1N-W0210/300

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

HAS02.1-004 at HCS03.1E-W0070



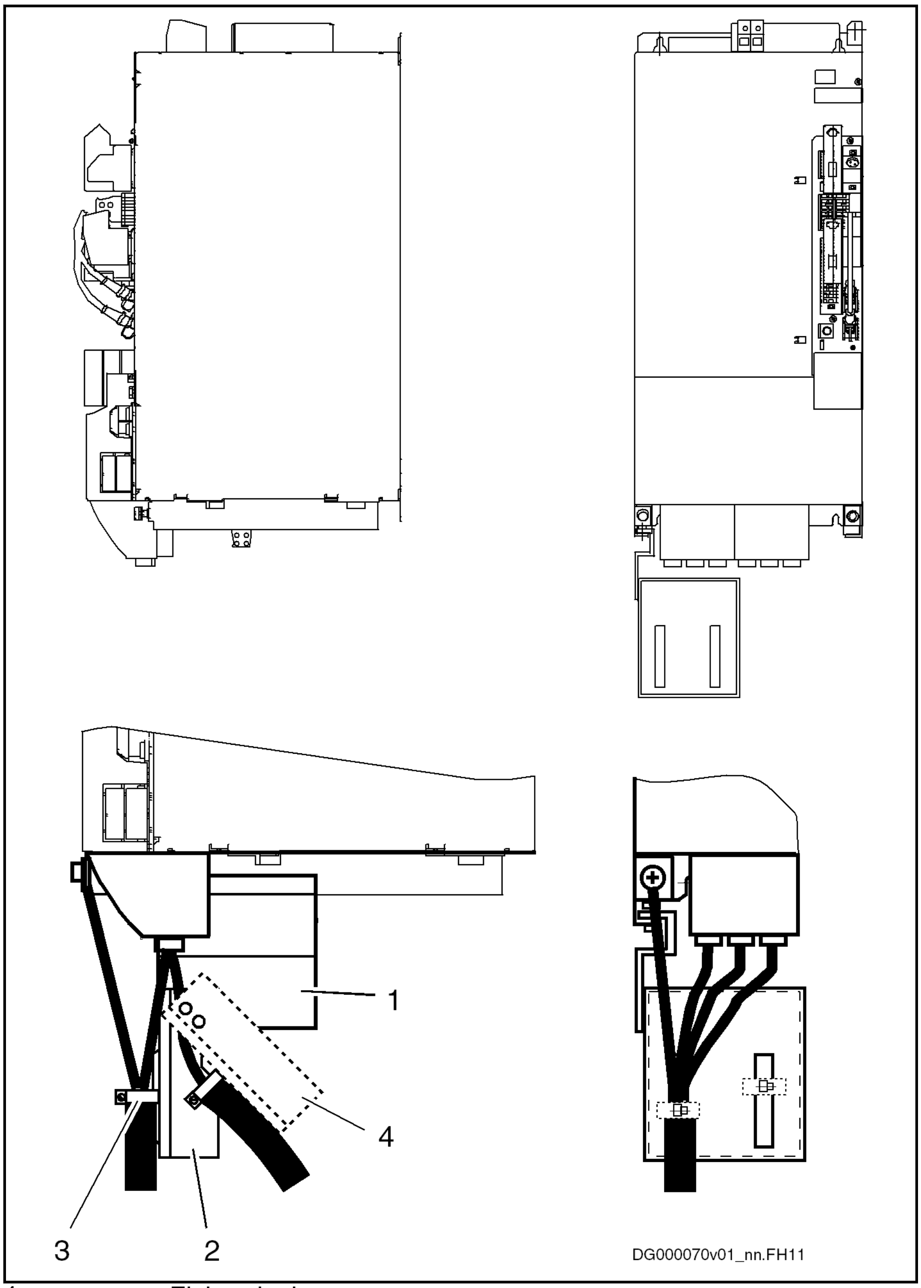
1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 11-57: HAS02.1-004 at Bottom of Drive Controller HCS03.1E-W0070

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

HAS02.1-005 at HCS03.1E-W0100/150



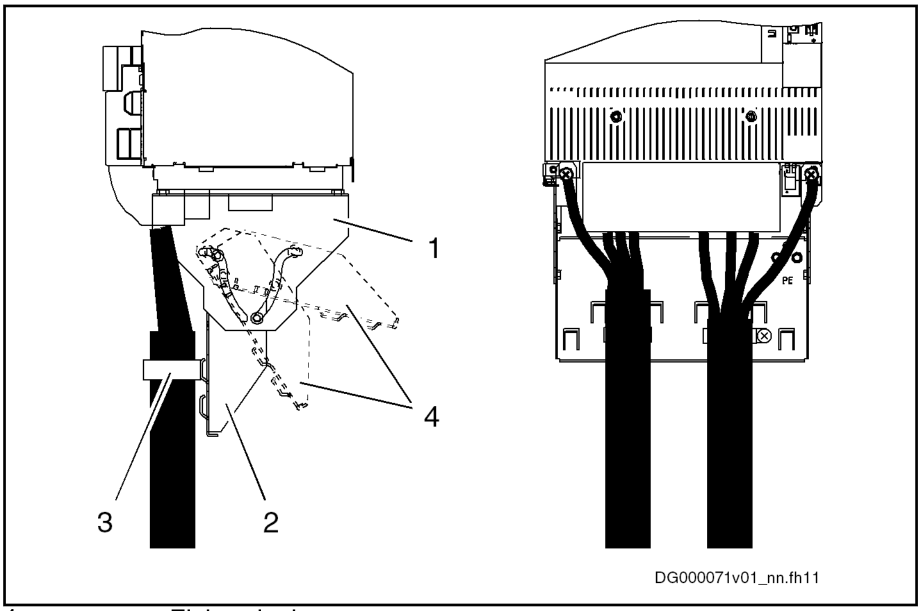
1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 11-58: HAS02.1-005 at Bottom of Drive Controller HCS03.1E-W0100/0150

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

HAS02.1-008 at HCS03.1E-W0210/280/350



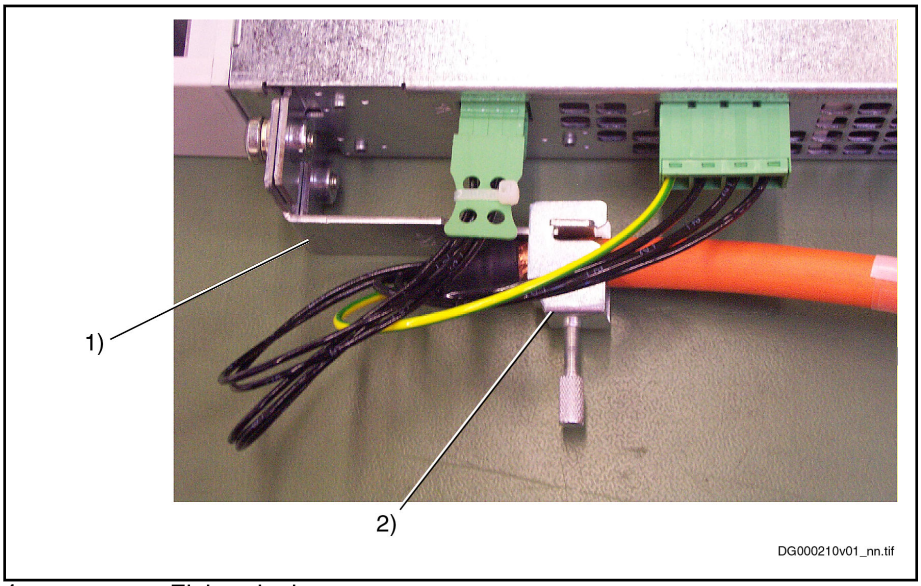
1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to motor cable routing

Fig. 11-59: HAS02.1-008 at Bottom of Drive Controller HCS03.1E-W0210/280/350

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

HAS02.1-010 at HMS02.1N-W0028/54

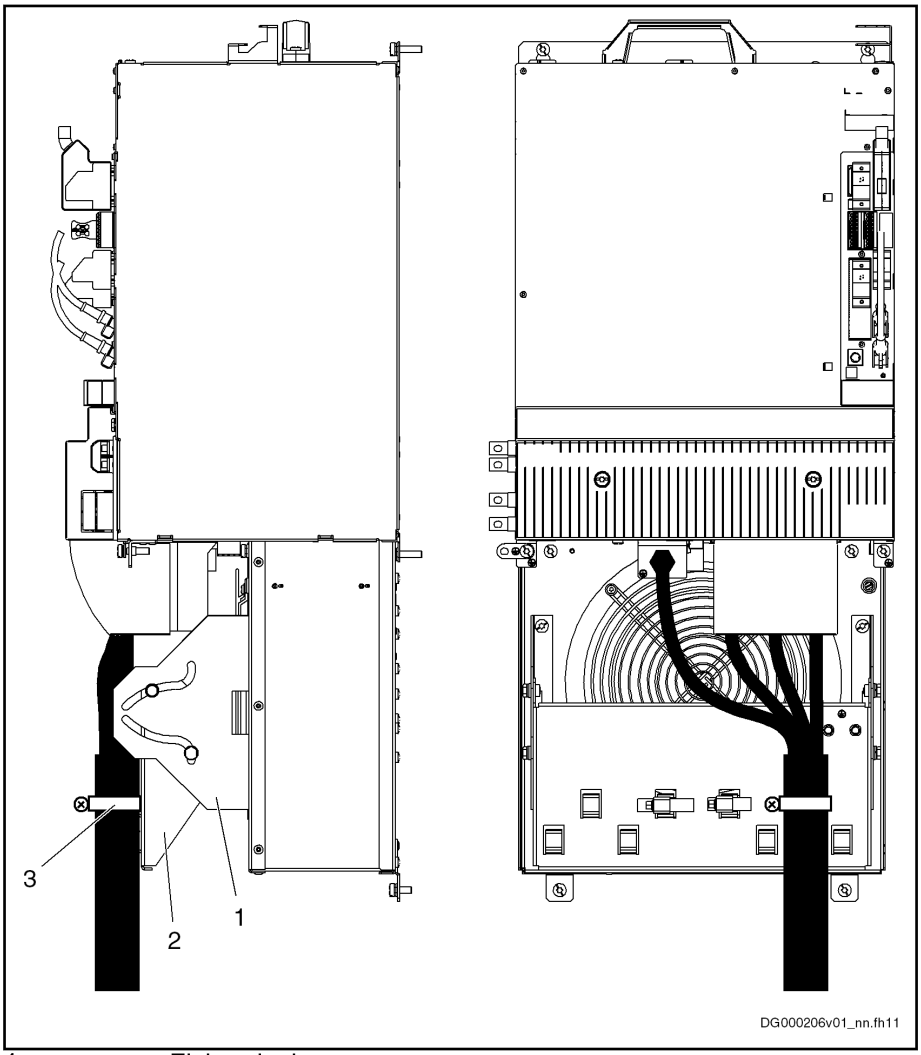


1 Fixing device
2 Shielding plate

Fig. 11-60: HAS02.1-010-NNN-NN at Bottom of Drive Controller HMS02.1N-W0028/54

1. Screw fixing device to equipment grounding conductor connection of drive controller.
2. Fix shield of cable with shielding plate to fixing device.

HAS02.1-014 at HMS01.1N-W0350



1 Fixing device
2 Shielding plate
3 Clip

Fig. 11-61: HAS02.1-014 at Bottom of Drive Controller HMS01.1N-W0350

1. By means of 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.

11.3.7 Shield connection of the motor cable via mains filter

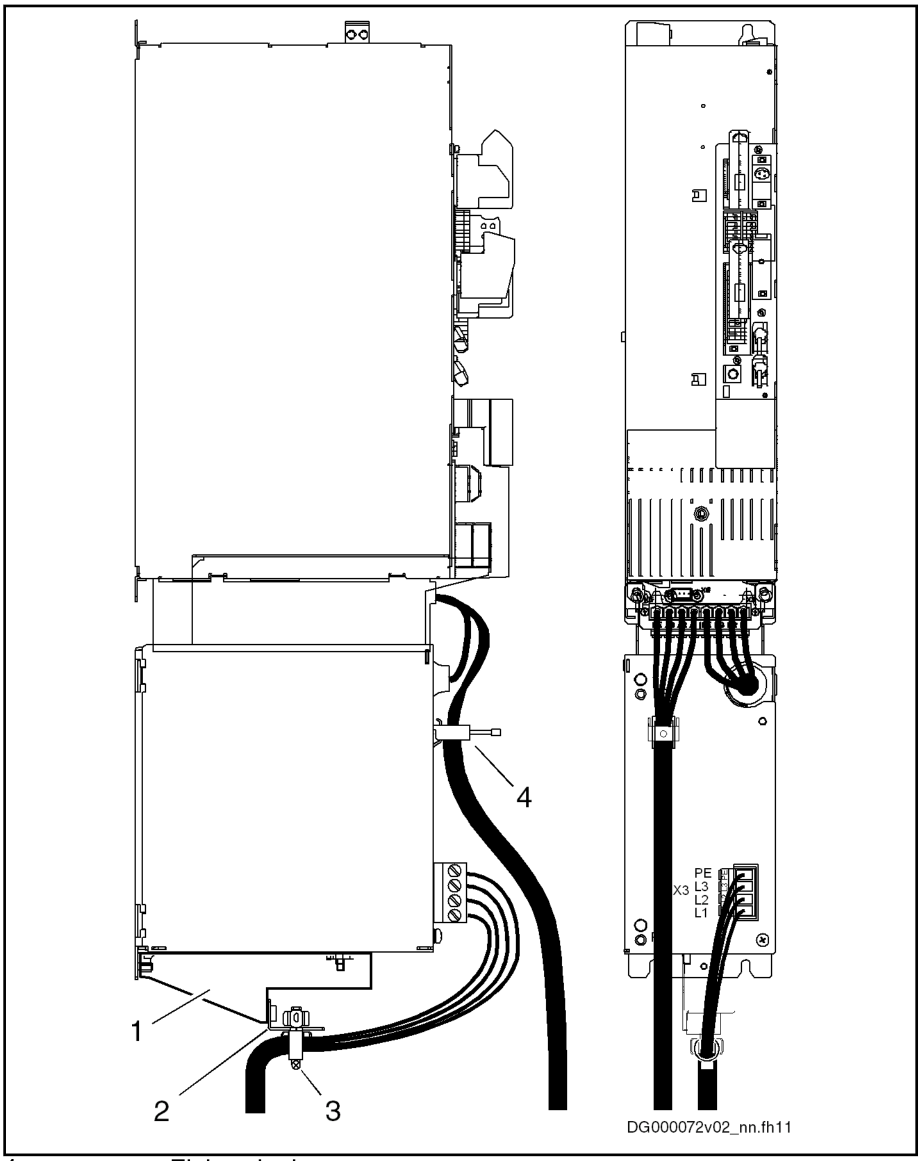
General information

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. You should 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. 11-62: HAS02.1-006 at Bottom of Mains Filter (Rated Current 50 A)

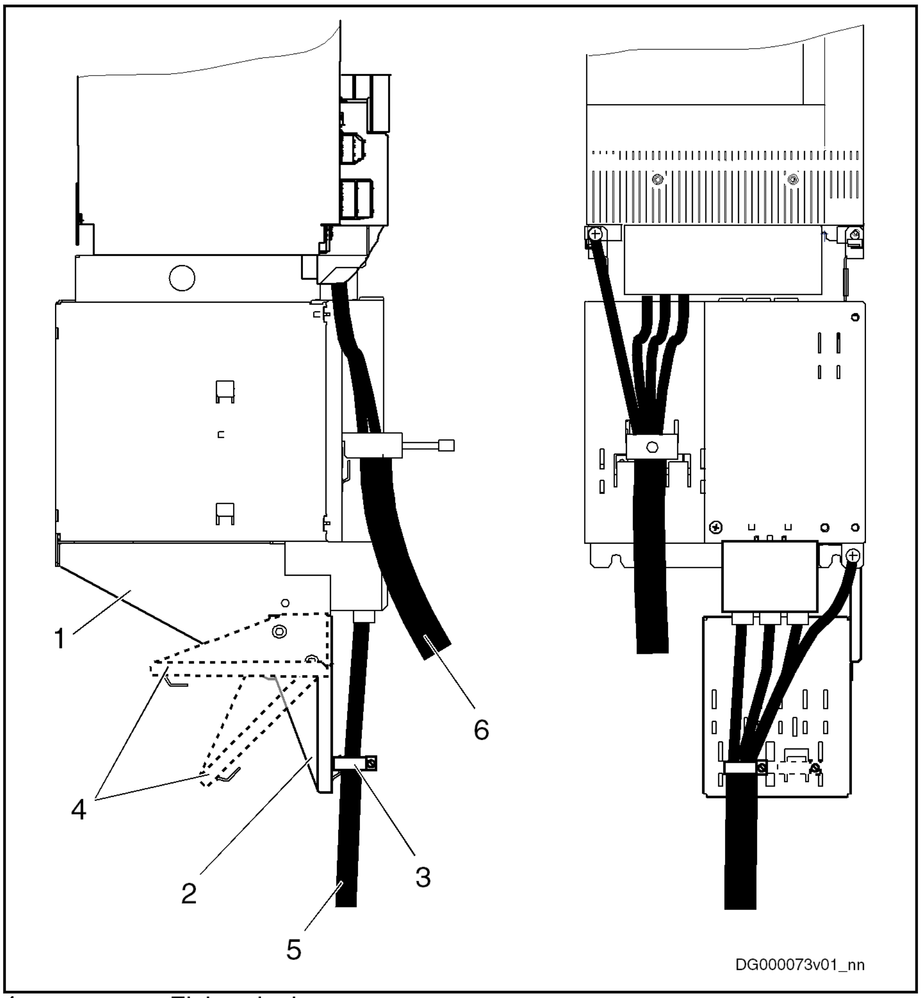
1.Hang up fixing device at bottom of mains filter at threaded bolts and fasten with supplied nuts.

2. Screw shielding plate to fixing device.

3. Fix shield of cable to shielding plate with appropriate clip.

☞ The shield terminals must not be used to provide strain relief.

HAS02.1-007 with mains filter



1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to cable routing
5	Power supply cable
6	Motor cable

Fig. 11-63: HAS02.1-007 at Bottom of Mains Filter (Rated Current 80 A / 106 A)

1.Hang up fixing device at bottom of mains filter and fasten with supplied screws.

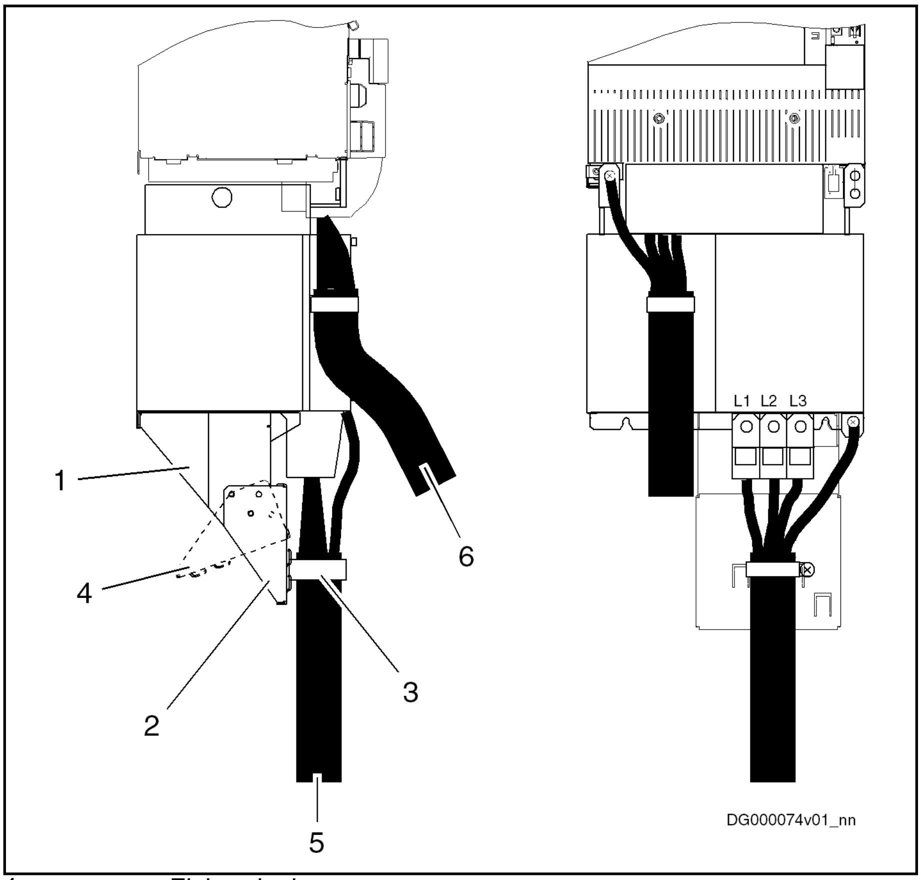
2. Screw shielding plate to fixing device.

According to desired cable routing, the shielding plate can be mounted in different positions.

3. Fix shield of cable to shielding plate with clip.

☞ The shield terminals must not be used to provide strain relief.

HAS02.1-009 with power supply cable and mains filter



1	Fixing device
2	Shielding plate
3	Clip
4	Different possibilities of mounting the shielding plate, according to cable routing
5	Power supply cable
6	Motor cable

Fig. 11-64: Shielding Plate HAS02.1-009 at Bottom of Mains Filter (Rated Current 146 A)

Mounting

1. By means of supplied screws, fasten fixing device to bottom of drive controller.
2. Fix shielding plate to fixing device according to desired motor cable routing.
3. Fix shield of cable to shielding plate with appropriate clip.

☞ The shield terminals must not be used to provide strain relief.

12 Environmental protection and disposal

12.1 Environmental protection

Production processes

The products are made with energy- and resource-optimized production processes which allow re-using and recycling the resulting waste. We regularly try to replace pollutant-loaded raw materials and supplies by more environment-friendly alternatives.

No release of hazardous substances

Our products do not contain any hazardous substances which may be released in the case of appropriate use. Normally, our products will not have any negativ influences on the environment.

Significant components

Basically, our products contain the following components:

Electronic devices
- steel
- aluminum
- copper
- synthetic materials
- electronic components and modules

Motors
- steel
- aluminum
- copper
- brass
- magnetic materials
- electronic components and modules

12.2 Disposal

Return of products

Our products can be returned to our premises free of charge for disposal. It is a precondition, however, that the products are free of oil, grease or other dirt.

Furthermore, the products returned for disposal must not contain any undue foreign material or foreign components.

Send the products ”free domicile” to the following address:

Bosch Rexroth AG
Electric Drives and Controls
Buergermeister-Dr.-Nebel-Strasse 2
97816 Lohr am Main, Germany

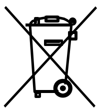
Packaging

The packaging materials consist of cardboard, wood and polystyrene. These materials can be recycled anywhere without any problem.

For ecological reasons, please refrain from returning the empty packages to us.

Batteries and accumulators

Batteries and accumulators can be labeled with this symbol.



The symbol indicating "separate collection" for all batteries and accumulators is the crossed-out wheeled bin.

The end user within the EU is legally obligated to return used batteries. Outside the validity of the EU Directive 2006/66/EC keep the stipulated directives.

Used batteries can contain hazardous substances, which can harm the environment or the people´s health when they are improper stored or disposed of.

After use, the batteries or accumulators contained in Rexroth products have to be properly disposed of according to the country-specific collection.

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 modules.

Metals contained in electric and electronic modules can also be recycled by means of special separation processes.

Products made of plastics can 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 valid legal requirements.

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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