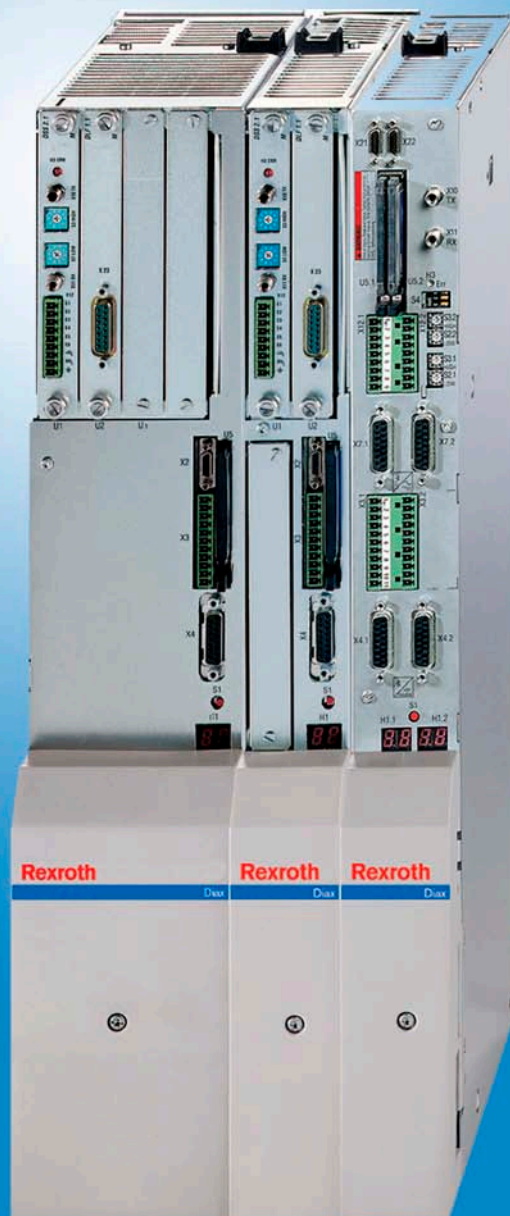


Rexroth DiAx 04 HDD and HDS Drive Controllers 2nd Generation

R911320338
Edition 01

Instruction Manual



Title Rexroth Diax 04
HDD and HDS
Drive Controllers 2nd Generation

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Purpose of Documentation This documentation provides information on the installation and operation of the described products, by persons trained and qualified to work with electrical installations.

Record of Revisions

Description	Release Date	Notes
Instruction Manual	03.2007	1 st edition

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1 Important Notes

1.1 Safety Instructions

General Information

- Do not attempt to install or commission this device without first reading all documentations provided with the product. Read and understand these safety instructions and all user documentation prior to working with the device. If you do not have the user documentation for the device, contact your responsible Bosch Rexroth sales representative. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the device.
- If these documentations contain some information you do not understand, it is absolutely necessary that you ask Bosch Rexroth for explanation before you start working on or with the devices.
- Only persons who are trained and qualified for the use and operation of the device may work on this device or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment as well as an understanding of all warnings and precautionary measures noted in this documentation.
- Only trained, instructed and qualified persons are allowed to switch electrical circuits and devices on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. These persons must have adequate safety equipment and be trained in first aid.
- Technical data, connections and operational conditions are specified in the reference documentations for the product and must be followed at all times.
- If the products take the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Only use spare parts and accessories approved by Bosch Rexroth.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- If the device is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the device in the official language of the user's country.
- Proper and correct transport, storage, assembly and installation as well as care in operation and maintenance are prerequisites for optimal and safe operation of this device. Observe the data contained in the corresponding product documentations.



WARNING

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

⇒ Observe the following safety instructions!

Contact with Electrical Parts



DANGER

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

- Follow general construction and safety regulations when working on power installations.
- Before switching on the device, the equipment grounding conductor must have been non-detachably connected to all electrical equipment and motors in accordance with the connection diagram.

The equipment grounding conductor of the electrical equipment and the units must be non-detachably and permanently connected to the power supply unit at all times. The leakage current is greater than 3.5 mA.

Over the total length, use copper wire of a cross section of a minimum of 10 mm² for this equipment grounding connection!

- Before working with electrical parts with voltage potentials higher than 50 V, the device must be disconnected from the mains voltage or power supply unit. Provide a safeguard to prevent reconnection.
- Wait **30 minutes** after switching off power to allow capacitors to discharge before beginning to work. Measure the electric voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
- Never touch the electrical connection points of a component while power is turned on.
- Install the covers and guards provided with the equipment properly before switching the device on. Before switching the equipment on, cover and safeguard live parts safely to prevent contact with those parts.
- A residual-current-operated circuit-breaker or r.c.d. cannot be used for electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device according to the relevant standards.

Handling and Assembly



CAUTION

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

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

Dangerous Movements

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

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

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

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



DANGER

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

- For the above reasons, ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation.

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

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

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

Magnetic and Electromagnetic Fields



WARNING

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

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

Hot Parts



CAUTION

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

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

1.2 Appropriate Use

This product may only be used for the applications mentioned in the reference documentations (see chapter “Reference Documentations”) and under the described application, ambient and operating conditions.

2 Identification

2.1 Type Codes

HDS

Note: The following figures illustrate the basic structure of the type codes. Your sales representative will help you with the current status of available versions.

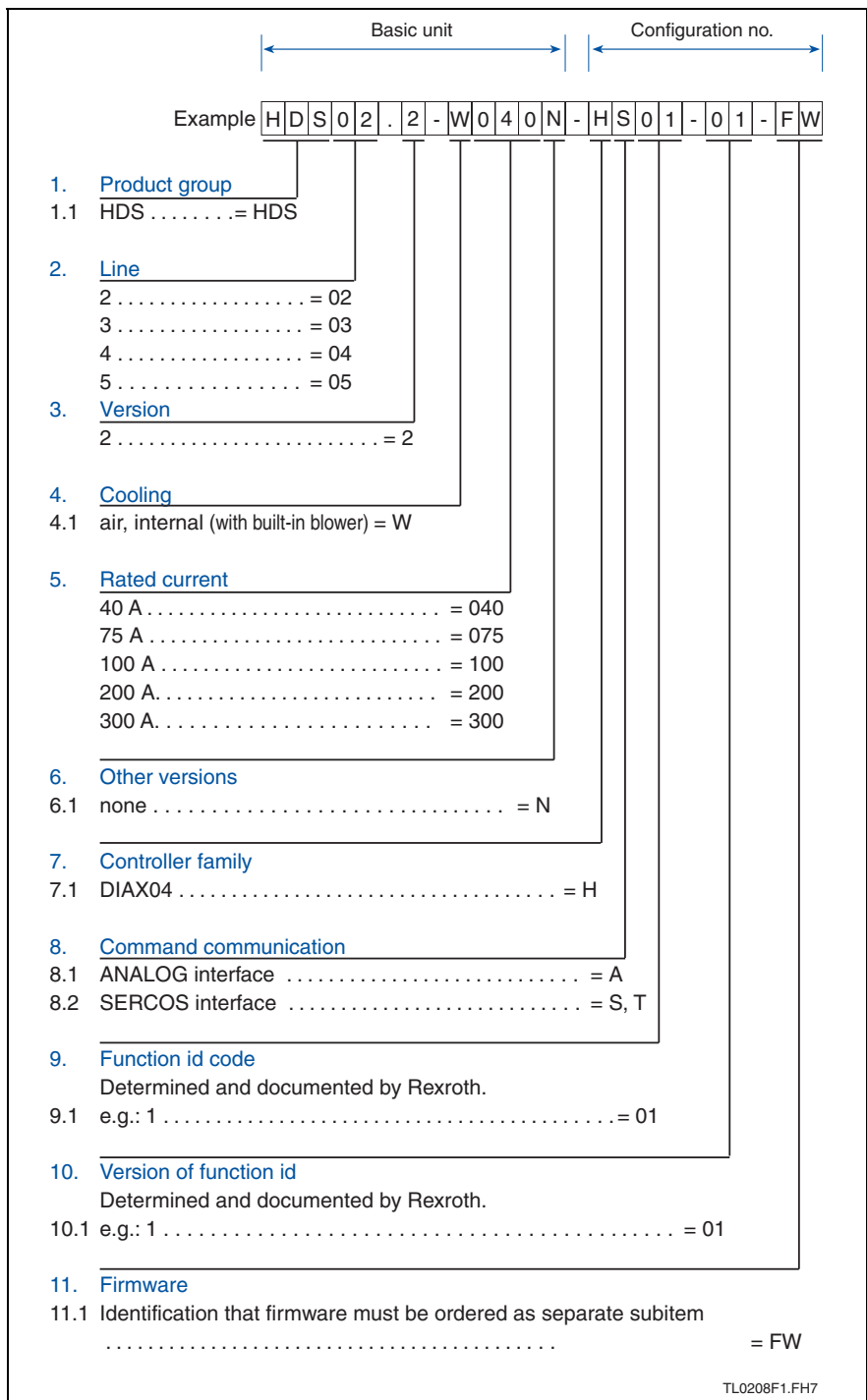


Fig. 2-1: Type codes HDS

Unit type

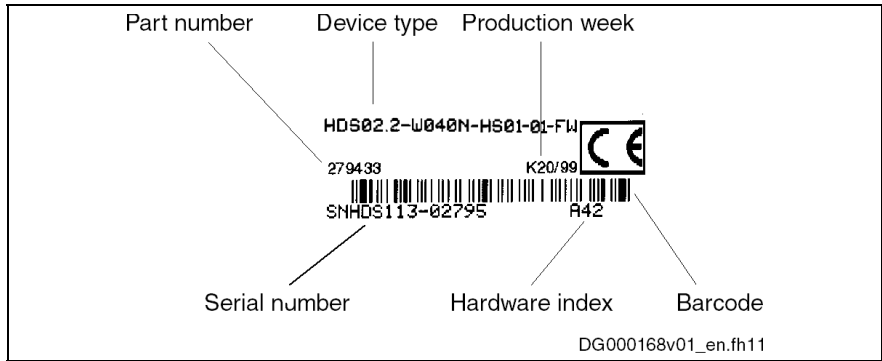


Fig. 2-4: Type plate – example

2.3 Scope of Supply

- Drive controller HDx0x.2
(According to the ordering with firmware module and plug-in modules)
- Contact guard
- 2 cables for DC bus connection
- Connectors:
for HDD02.2-W0xxN-HD32:
X3.1, X3.2, X5.1, X5.2, X6.1, X6.2, X12.1, X12.2

for HDS0x.2-W0xxx-RExx:

Type	Connector			Mounting plate (Shield connection motor cable)	Hose clamp (small)	Hose clamp (big)
	X3	X5	X6			
HDS02.2	x	x	x	-	x	-
HDS03.2	x	-	x	-	x	x
HDS04.2	x	-	x	-	x	x
HDS05.2	x	-	x	x	x	x

- further parts for HDD02.2:
 - 2 hose clamps (for mounting shield of motor cable)
 - 2 protection caps for interfaces X10/X11
 - covers for interfaces X7.1 and X7.2

3 Ratings and Dimensions

3.1 HDD02.2 and HDS02.2-W040N

Description	Symbol	Unit	HDD02.2- W016N -HD32	HDD02.2- W040N -HD32	HDS02.2- W040N
listing according UL-standard (UL)			UL 508 C		
listing according CSA-standard (UL)			Canadian National Standard(s) C22.2 No. 14-05		
UL files (UL)			E 134201		
pollution degree (UL)			Use in a pollution degree 2 environment		
maximum ambient temperature with nominal data (UL)	T_{amax}	°C	45		
maximum ambient temperature with reduced nominal data (UL)	T_{amax_red}	°C	55		
Weight	m	kg	7	7	6,5
device height (UL) ¹⁾	H	mm	498		
device depth (UL) ²⁾	T	mm	308		
device width (UL) ³⁾	B	mm	50		
minimum distance on the top of the device ⁴⁾	d_{top}	mm	300		
minimum distance on the bottom of the device ⁵⁾	d_{bot}	mm	100		
rated control voltage input (UL) ⁶⁾	U_{N3}	V	26 ±2%		
rated power consumption control voltage input without holding brake, without control section at $U_{N3} = DC 24 V$ (UL)	P_{N3}	W	45	45	20
short circuit current rating, SCCR, symmetrical amperes (UL) ⁷⁾	I_{SCCR}	A rms	42000		
rated input voltage, power (UL) ⁸⁾		V	530 ... 670		
maximum input current (UL) ⁹⁾	I_{L_cont}	A	8,7	25	37
field wiring material (UL) ¹⁰⁾			Use 60/75 °C copper wire only, use class 1 wire only or equivalent		
maximum output voltage (UL)	U_{out}	V	500		
output number of phases (UL)			3		
maximum output current (UL)	I_{out_max}	A	8,5	15	20
maximum output frequency (UL)	f_{out}	Hz	1000		
power dissipation at continuous current I_{out_cont} and continuous DC bus power P_{DC_cont} respectively (UL) ¹¹⁾	P_{Diss_cont}	W	75 per axis	110 per axis	125

1) 2) 3)

4) 5)

6)

7)

8)

9)

10)

11)

housing dimension; see related dimension sheet also see fig. "Air intake and air outlet of drive controller"

observe supply voltage for motor holding brakes

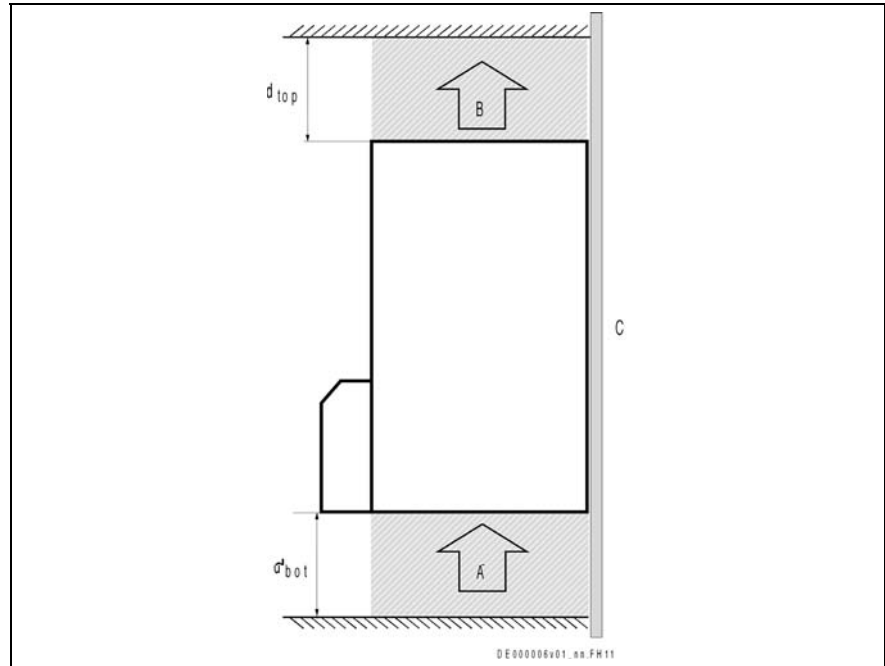
Suitable for use on a circuit capable of delivering not more than this SCCR value, 600 V AC or less. The drive series shall be used with listed AC input line fuses or listed circuit breakers specified in this documentation.

HDS, HDD, HZB, HZK: DC bus L+, L-; HVE/HVR: mains input U, V, W at P_{DC_cont}

tightening torque: see project planning manual, electrical terminals plus dissipation of braking resistor

Abb. 3-1: UL ratings and dimensions

Distances



- A: air intake
- B: air outlet
- C: mounting surface in control cabinet
- d_{top} : distance top
- d_{bot} : distance bottom

Fig. 3-2: Air intake and air outlet at drive controller

3.2 HDS03.2 ... HDS05.2

Description	Symbol	Unit	HDS03.2- W075N	HDS03.2- W100N	HDS04.2- W200N	HDS05.2- W300N
listing according UL-standard (UL)			UL 508 C			
listing according CSA-standard (UL)			Canadian National Standard(s) C22.2 No. 14-05			
UL files (UL)			E 134201			
pollution degree (UL)			Use in a pollution degree 2 environment			
maximum ambient temperature with nominal data (UL)	T_{amax}	°C	45			
maximum ambient temperature with reduced nominal data (UL)	T_{amax_red}	°C	55			
Weight	m	kg	11	11	19	25
device height (UL) ¹⁾	H	mm	498			
device depth (UL) ²⁾	T	mm	308			
device width (UL) ³⁾	B	mm	100	100	150	200
minimum distance on the top of the device ⁴⁾	d_{top}	mm	300			
minimum distance on the bottom of the device ⁵⁾	d_{bot}	mm	100			
rated control voltage input (UL) ⁶⁾	U_{N3}	V	26 ±2%			
rated power consumption control voltage input without holding brake, without control section at $U_{N3} = DC 24 V$ (UL)	P_{N3}	W	25	25	30	55
short circuit current rating, SCCR, symmetrical amperes (UL) ⁷⁾	I_{SCCR}	A rms	42000			
rated input voltage, power (UL) ⁸⁾		V	530 ... 670			
maximum input current (UL) ⁹⁾	I_{L_cont}	A	37	60	60	140
field wiring material (UL) ¹⁰⁾			Use 60/75 °C copper wire only, use class 1 wire only or equivalent			
maximum output voltage (UL)	U_{out}	V	500			
output number of phases (UL)			3			
maximum output current (UL)	I_{out_max}	A	40	50	120	175
maximum output frequency (UL)	f_{out}	Hz	1000			
power dissipation at continuous current I_{out_cont} and continuous DC bus power P_{DC_cont} respectively (UL) ¹¹⁾	P_{Diss_cont}	W	220	280	800	1200

1) 2) 3)

4) 5)

6)

7)

8)

9)

10)

11)

housing dimension; see related dimension sheet also

see fig. "Air intake and air outlet of drive controller"

observe supply voltage for motor holding brakes

Suitable for use on a circuit capable of delivering not more than this SCCR value, 600 V AC or less. The drive series shall be used with listed AC input line fuses or listed circuit breakers specified in this documentation.

HDS, HDD, HZB, HZK: DC bus L+, L-; HVE/HVR: mains input U, V, W

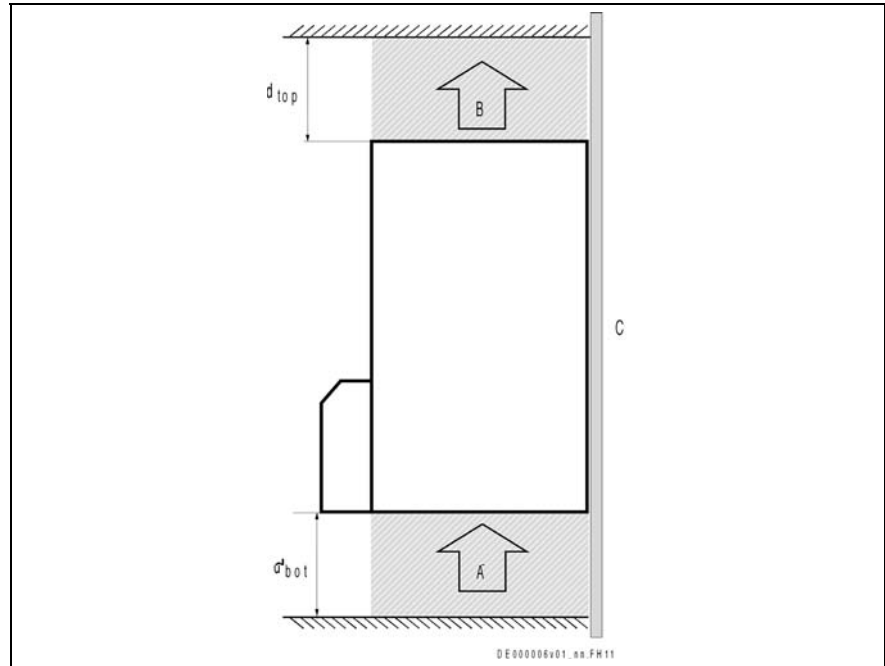
at P_{DC_cont}

find value for tightening torque in project planning manual, electrical terminals

plus dissipation of braking resistor

Abb. 3-3: UL ratings and dimensions

Distances



- A: air intake
- B: air outlet
- C: mounting surface in control cabinet
- d_{top} : distance top
- d_{bot} : distance bottom

Fig. 3-4: Air intake and air outlet at drive controller

4 Reference Documentations

4.1 Overview

Title	Type of documentation	Document typecode
DIAX04 HVE and HVR 2 nd Generation Power Supply Units	Application Manual	DOK-POWER*-HVE+HVR**G2-AWxx-EN-P
"List of Connecting Cables for DIAX04 and ECODRIVE03"	Selection lists	DOK-CONNEC-CABLE*STAND-AUxx-EN-P
"LWL - Handling"	Application Manual	DOK-CONNEC-CABLE*LWL-AWxx-EN-P
"Electromagnetic Compatibility (EMC) in Drive and Control Systems"	Project Planning Manual	DOK-GENERL-EMV*****-PRxx-EN-P
DIAX04 Drive With Electric Gear Function	Functional Description	DOK-DIAX04-ELS-05VRS**FKB1-EN-P
DIAX04 Drive With Electric Gear Function	Troubleshooting Guide	DOK-DIAX04-ELS-05VRS**-WAR1-EN-P
DIAX04 Drive With Servo Function	Functional Description	DOK-DIAX04-SSE-01VRS**FKB1-EN-P
DIAX04 Drive With Servo Function	Troubleshooting Guide	DOK-DIAX04-SSE-01VRS**-WAR1-EN-P
DIAX04 Drive With Servo Function	Functional Description	DOK-DIAX04-SSE-02VRS**FKB1-EN-P
DIAX04- Drive With Servo Function	Troubleshooting Guide	DOK-DIAX04-SSE-02VRS**-WAR1-EN-P
DIAX04 Drive With Servo Function	Functional Description	DOK-DIAX04-SSE-03VRS**-FK01-EN-P
DIAX04 Drive With Servo Function	Troubleshooting Guide	DOK-DIAX04-SSE-03VRS**-WA01-EN-P
DIAX04 Drive With Main Spindle Function, SERCOS interface	Functional Description	DOK-DIAX04-SHS-03VRS**-FK01-EN-P
DIAX04 Drive With Main Spindle Function, SERCOS interface	Troubleshooting Guide	DOK-DIAX04-SHS-03VRS**-WA01-EN-P
DIAX04 Drive With Servo Function, Analog- and Parallelinterface	Functional Description	DOK-DIAX04-ASE-02VRS**FKB1-EN-P
DIAX04 Drive With Servo Function, Analog- and Parallelinterface	Troubleshooting Guide	DOK-DIAX04-ASE-02VRS**-WAR1-EN-P
DIAX04 Drive With Main Spindle Function, Analog And Parallelinterface	Functional Description	DOK-DIAX04-AHS-03VRS**FKB1-EN-P
DIAX04 Drive With Main Spindle Function, Analog And Parallelinterface	Troubleshooting Guide	DOK-DIAX04-AHS-03VRS**-WAR1-EN-P
"Digital AC Motors MKD"	Project Planning Manual	DOK-MOTOR*-MKD*****-PRxx-EN-P
"Digital AC Motors MHD"	Project Planning Manual	DOK-MOTOR*-MHD*****-PRxx-EN-P
"MKE Digital AC Motors for potentially explosive areas"	Project Planning Manual	DOK-MOTOR*-MKE*****-PRxx-EN-P
"2AD AC Motor"	Project Planning Manual	DOK-MOTOR*-2AD*****-PRxx-EN-P
"ADF Main Spindle Motors"	Project Planning Manual	DOK-MOTOR*-ADF*****-PRxx-EN-P
"1MB Frameless Spindle Motor"	Project Planning Manual	DOK-MOTOR*-1MB*****-PRxx-EN-P
"Synchronous MBS Kit Spindle Motors"	Project Planning Manual	DOK-MOTOR*-MBS*****-PRxx-EN-P
LAR 070-132 Housing Linear Motor	Selection and Project Planning	DOK-MOTOR*-LAR*****-AWxx-EN-P
"LAF050 – 121 Linear Motors"	Selection and Project Planning	DOK-MOTOR*-LAF*****-AWxx-EN-P
"Linear Synchronous Direct Drives LSF"	Project Planning Manual	DOK-MOTOR*-LSF*****-PRxx-EN-P
"AC Drive Units in Personnel Conveyor Systems"	Application Manual	DOK-GENERL-ANTR*PERSON-ANxx-EN-P
"AC Drive Units in Hazardous Areas (Expl. Protection)"	Application Manual	DOK-GENERL-ANTR*EXPLOS-ANxx-EN-P

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

Fig. 4-1: Documentations - Overview

5 Instructions for Use

5.1 Overcurrent Protection

Branch circuit protection has to be provided externally according to the maximum values (voltage and current or voltage and percent of FLA of the fuses [FLA: Full Load Ampacity]).

5.2 Connections

Wiring Diagram (Supply Unit HVE)

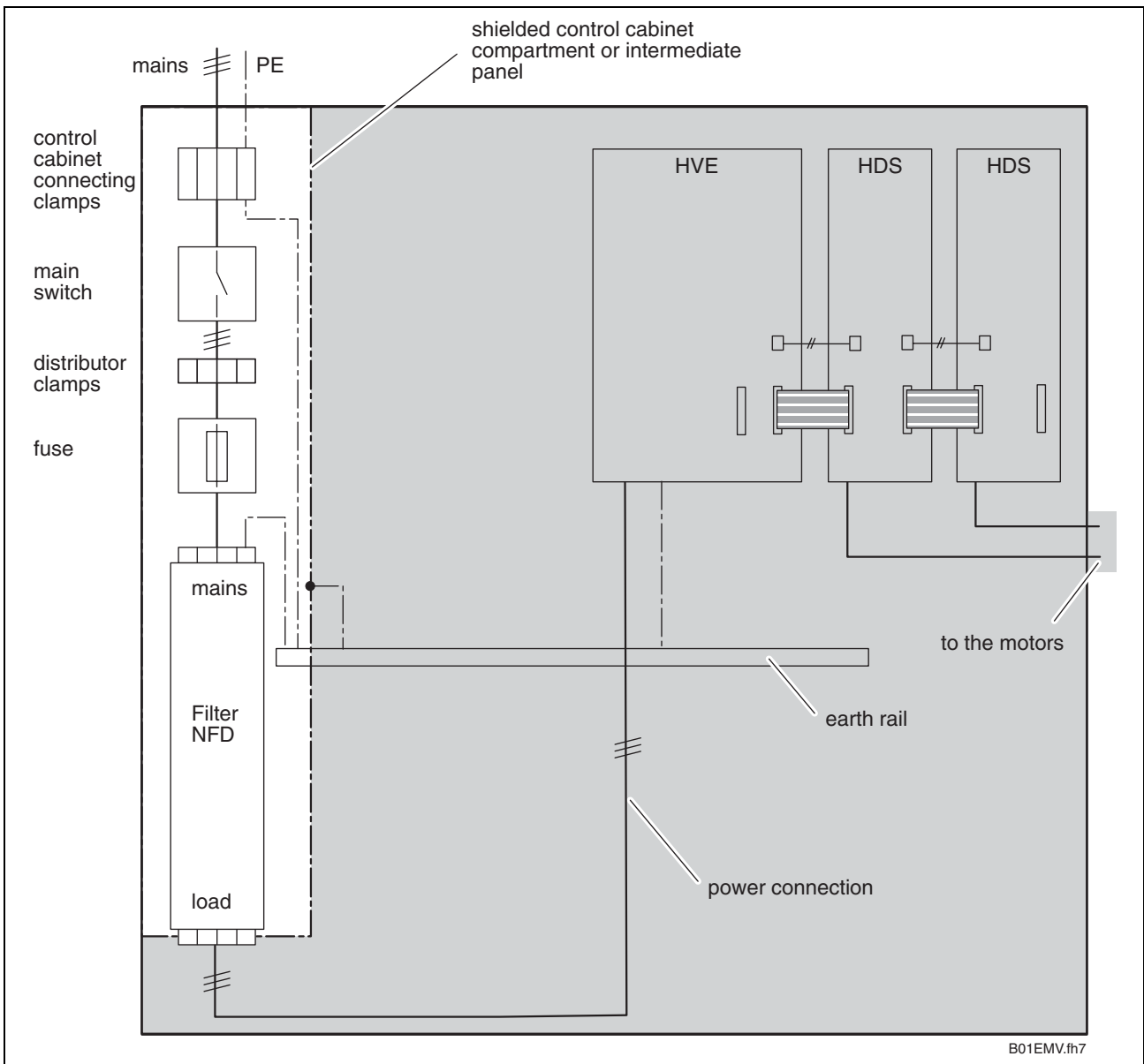


Fig. 5-1: Wiring Diagram (Supply Unit HVE)

Wiring Diagram (Supply Unit HVR)

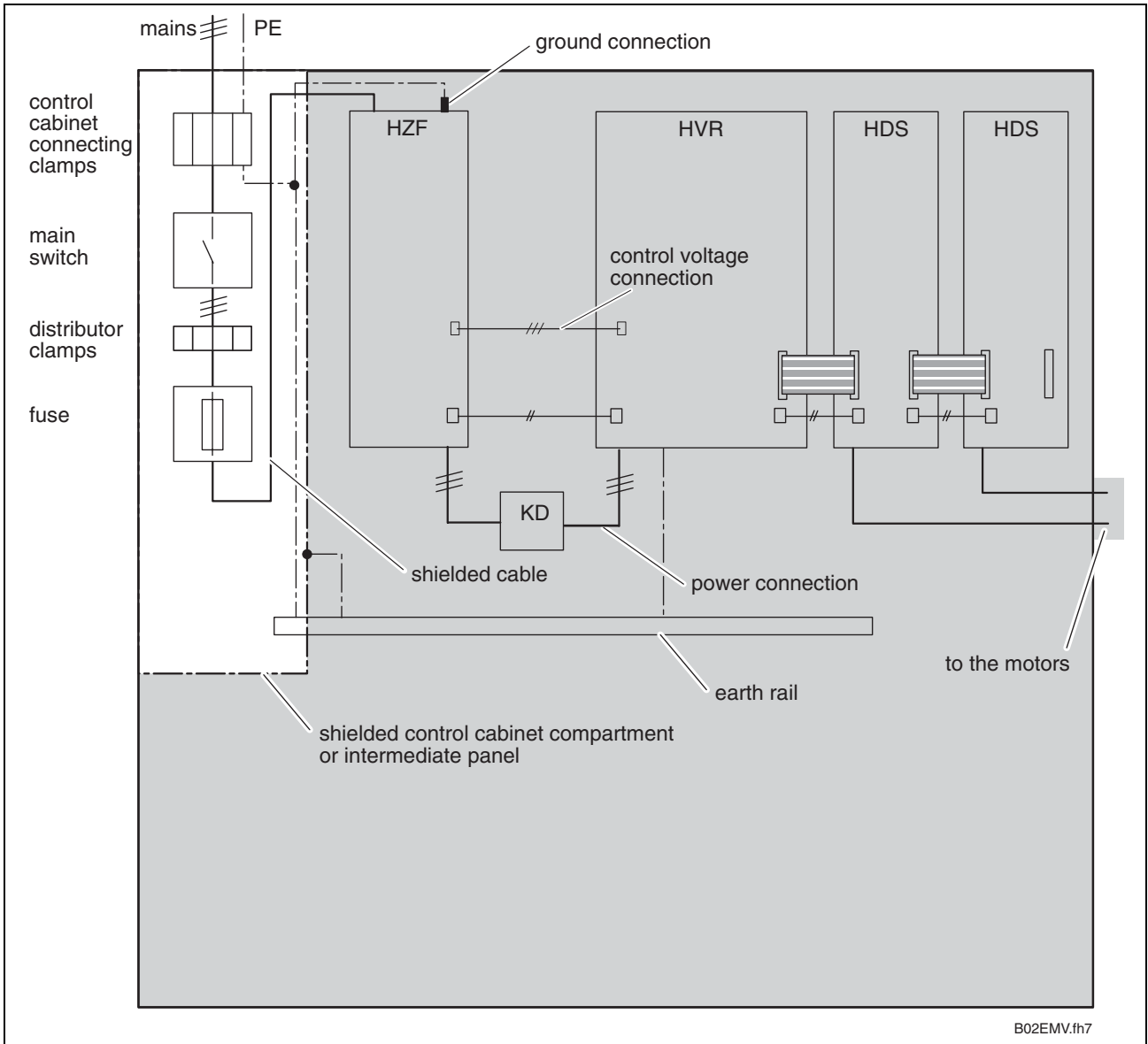


Fig. 5-2: Wiring Diagram (Supply Unit HVR)

Connection Diagram

Rexroth DiAx 04 (HDS)

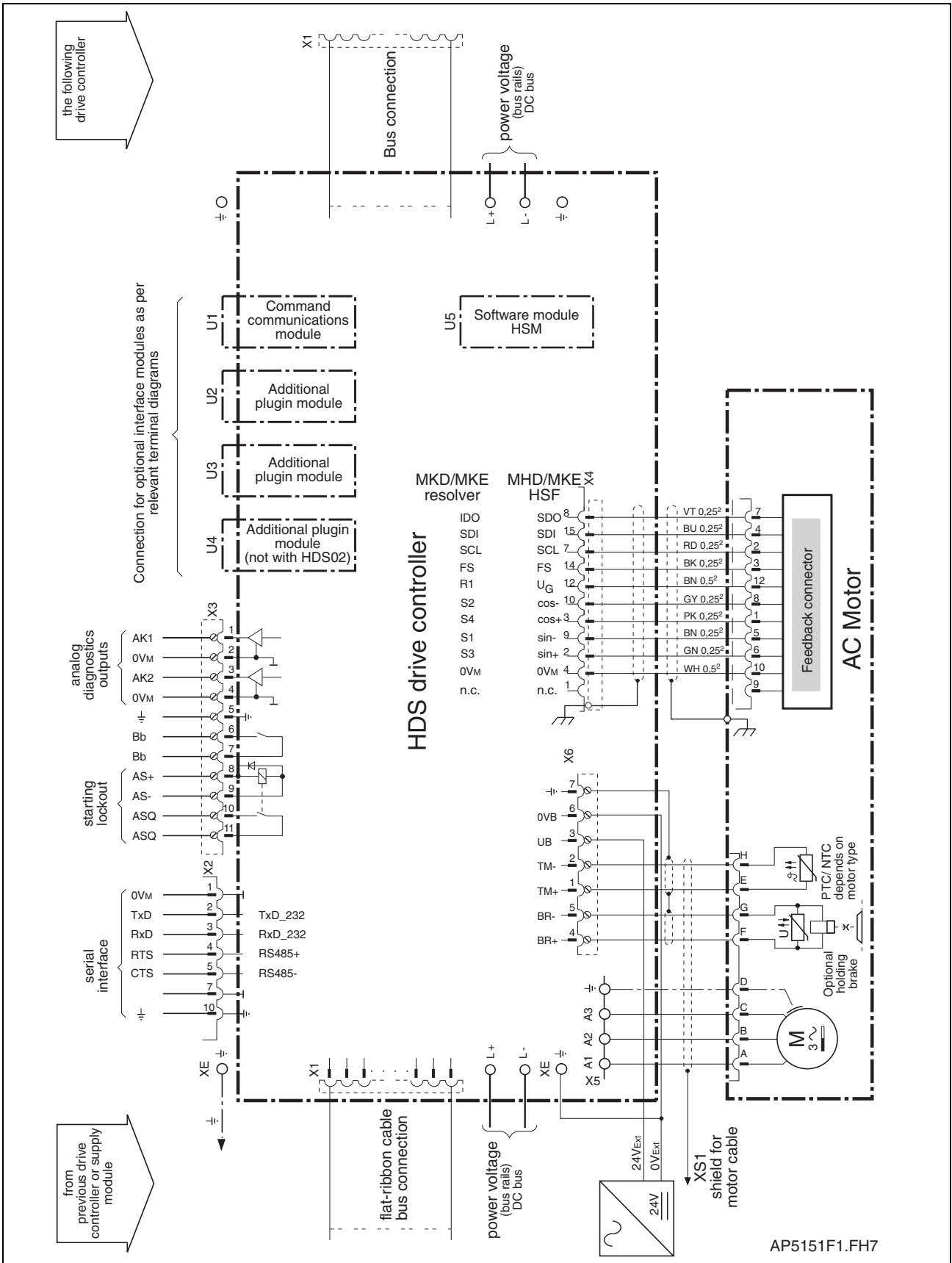


Fig. 5-3: Total connection diagram HDS

Rexroth DiAx 04 (HDD)

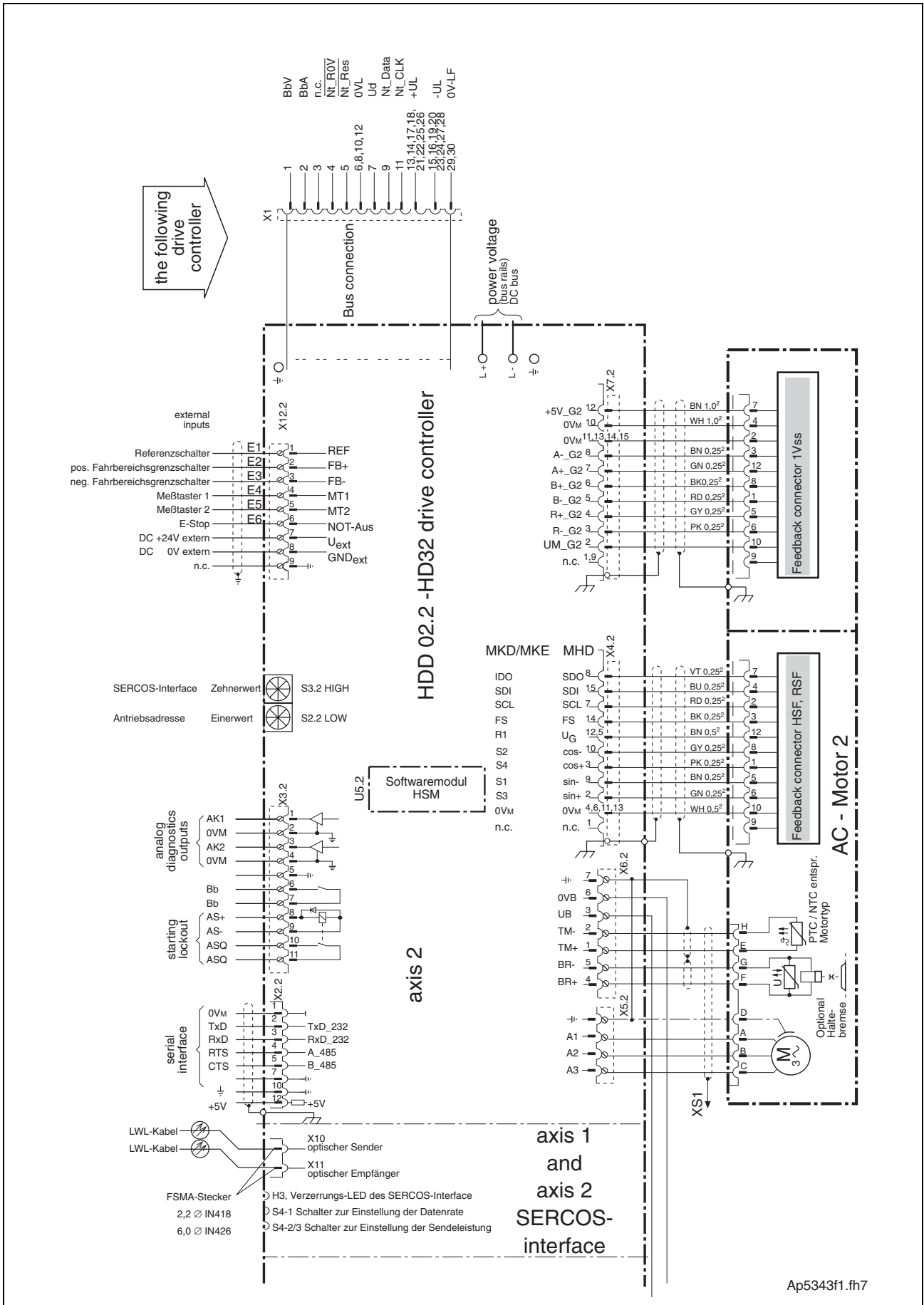


Fig. 5-4: Total connection diagram HDD (to be continued)

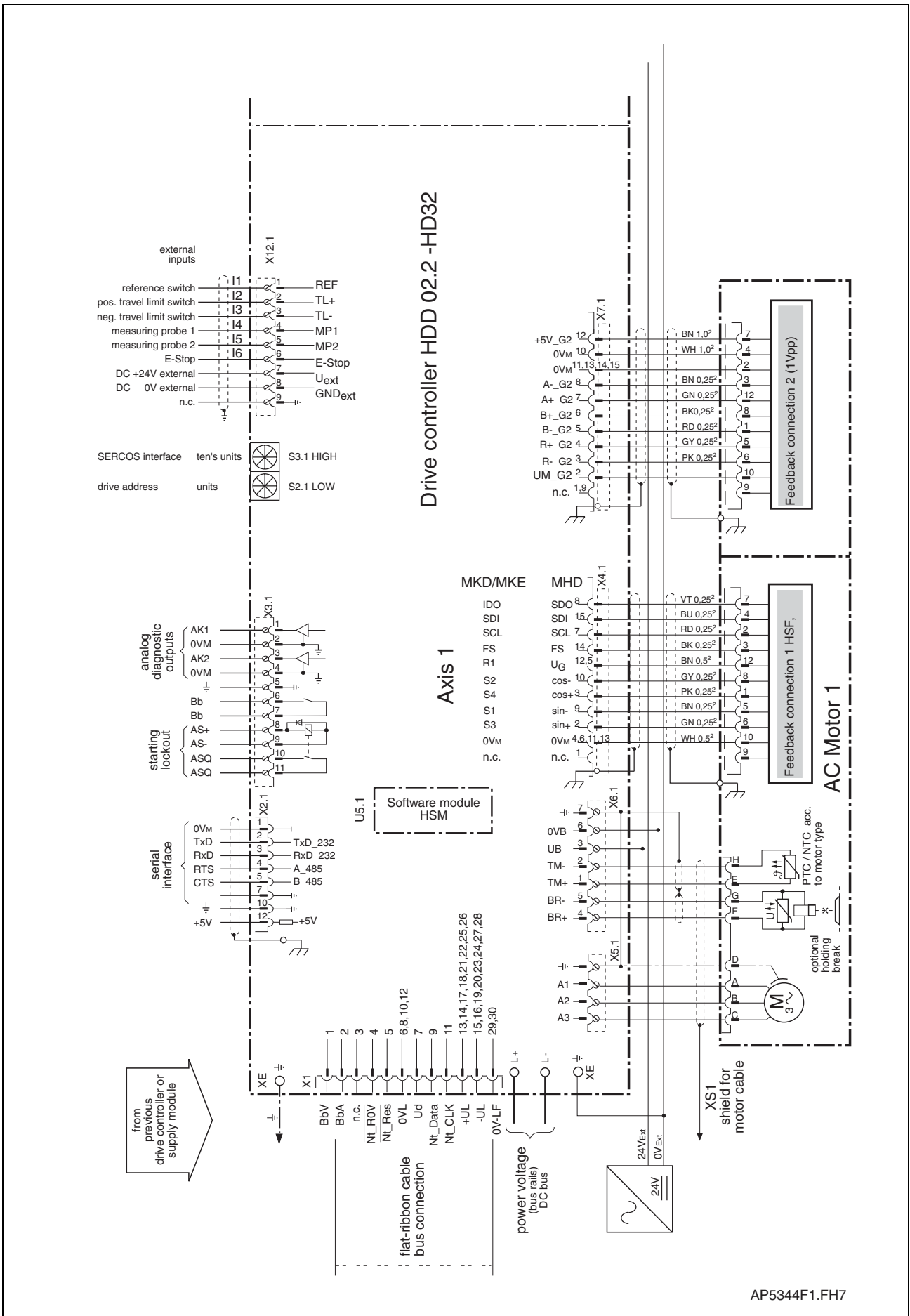


Fig. 5-5: Total connection diagram HDD (continued)

Connection of Control Interfaces and Terminals



See project planning manual for more details.

X1, Connector for integrated bus connections from the neighboring unit

Technical data of connector

Connector X1, bus connection The control electronics of the drive controller receive their power via connector X1. The connection starts at the supply unit and runs to the drive controller with the help of the flat-ribbon cable integrated into the units. Maximum length here also equals one meter (if extensions are used)!

Illustration:

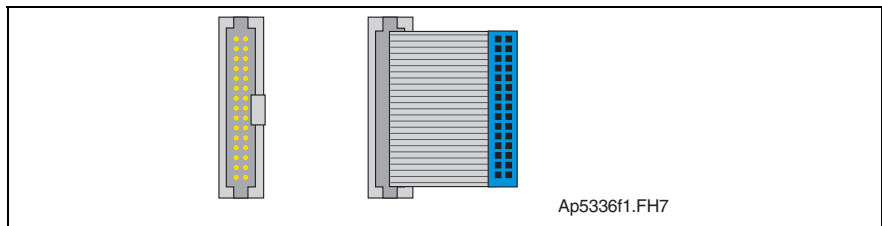


Fig. 5-6: Connector X1

Design

Type	No. of pins	Design
ribbon cable connector	30	connector at the unit
ribbon cable bushing	30	bushing at the ribbon cable

Fig. 5-7: Design

Note: This is an internal connection between the supply unit and the drive controller.

X5, DC bus and motor connections

Technical data of connector

Illustration:

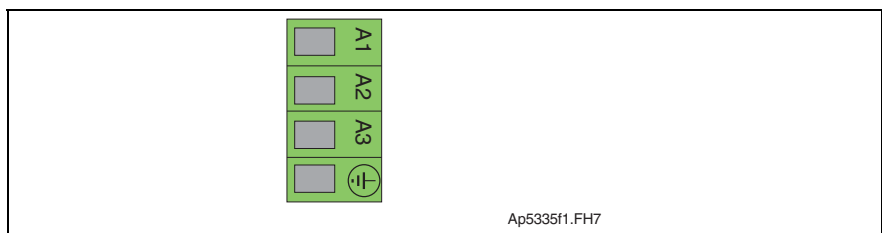


Fig. 5-8: Connector X5 HDD02, HDS02

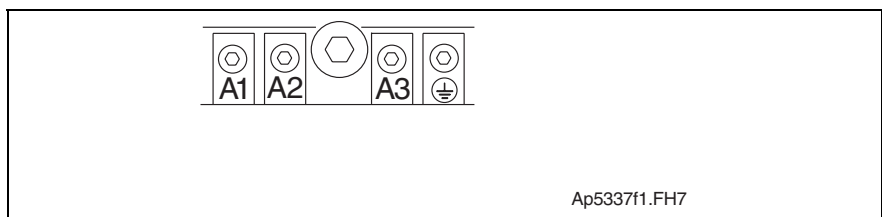


Fig. 5-9: Connector X5 HDS03, HDS04

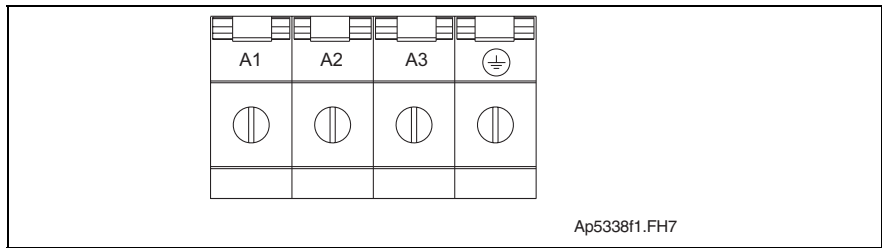


Fig. 5-10: Connector X5 HDS05

Design:

Type	No. of pins	Design
Screw-type terminal	4	socket at the unit

Fig. 5-11: Design

Connection cross section:

	Cross section single wire [mm ²]	Cross section multi core wire [mm ²]	Cross section in AWG gauge no.
HDD02, HDS02	0,2-4	0,2-4	24-10
HDS03	2,5-10	4-16	12-4
HDS04	2,5-16	2,5-35	12-2
HDS05	16-50	16-50	6-0

Fig. 5-12: Connection cross section: X5

Tightening torque:

	DC Bus	Motor connection
HDD02, HDS02	3 Nm	0,5 - 0,6 Nm
HDS03	3 Nm	2 Nm
HDS04	3 Nm	4 Nm
HDS05	3 Nm	6 Nm

Fig. 5-13: Tightening torques: X5

Ground connections to the supply module

HDD and HDS drive controllers are equipped with two ground connections (grounding system) to the supply module:

- back wall of the unit and the mounting rails as well as
- grounding bracket in the front of the unit (see illustration)

To ensure the connection of the devices to the protective conductor system, connect the neighboring devices to both sides via the grounding brackets:

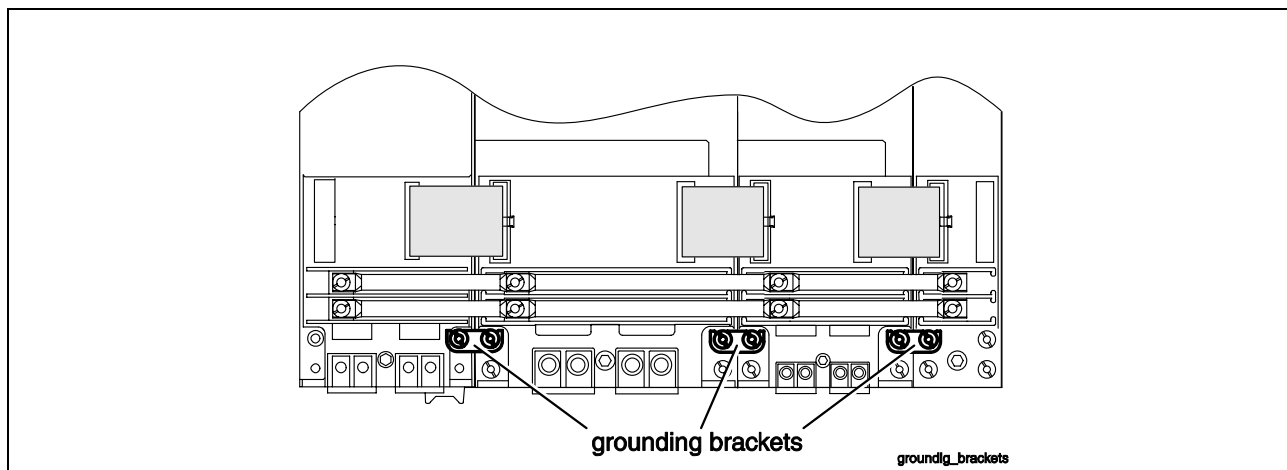


Abb. 5-14: Grounding brackets



DANGER

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

⇒ Check the continuity of the protective conductors from the mains connection to the connected motors.

Motor power cable connection

Rexroth motor power cables should be used to connect drive controller and motor.

The Rexroth motor power cable contains:

- three supply wires for the motor power connection
- a wire for the grounded conductor connection
- a separately shielded pair of wires for the motor temperature monitor
- a separately shielded pair of wires for the motor holding brake
- a complete shield mounted to shield attachment

The motor power cable is available as a ready-made cable from Rexroth. The cable can also be made of four twisted individual supply wires (3 phases, 1 grounded conductor) with a separately conducted, shielded supply wire for temperature monitoring and the brake connection.

For supplementary technical data on connections and diameters, see the relevant motor description.

Line length

Maximum cable lengths equals 75 meters if Rexroth cables are used.

DC bus voltage connection

Adjacent drive controllers are generally connected via the connection wires (supplied with the drive).

If a connection with the connection wires should not be possible, then establish the connection using twisted supply lines that are as short as possible (maximum length equals one meter, minimum cross section 25 mm²).

Connector XS1, shield attachment of motor cable

The entire shield of the motor cable is mounted to shield attachment XS1 using the enclosed clamp fitting. It is matched to the diameter of the cable by simply selecting the relevant clamp base on the mounting panel. The cable output direction can be either horizontal or vertical and is achieved by adjusting the mounting panel.

Note: Always connect shield of cables with a large metal-to-metal contact surface to shield connection.

For cable cross-sections greater than 25 mm² you can use a special mounting plate as shield attachment. The following figures show the mounting plate at the drive controller. You can mount the mounting plate horizontally or vertically at the drive controller.

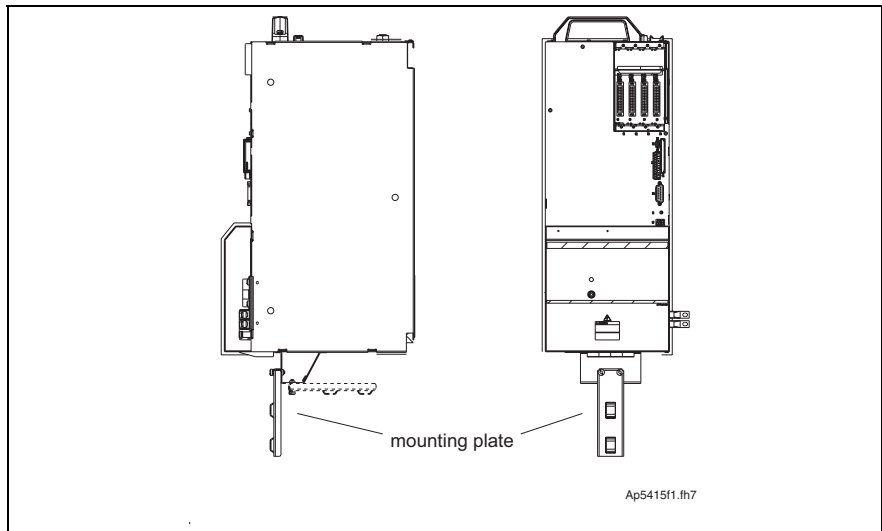


Fig. 5-15: Mounting plate for cable cross-sections greater than 25 mm²

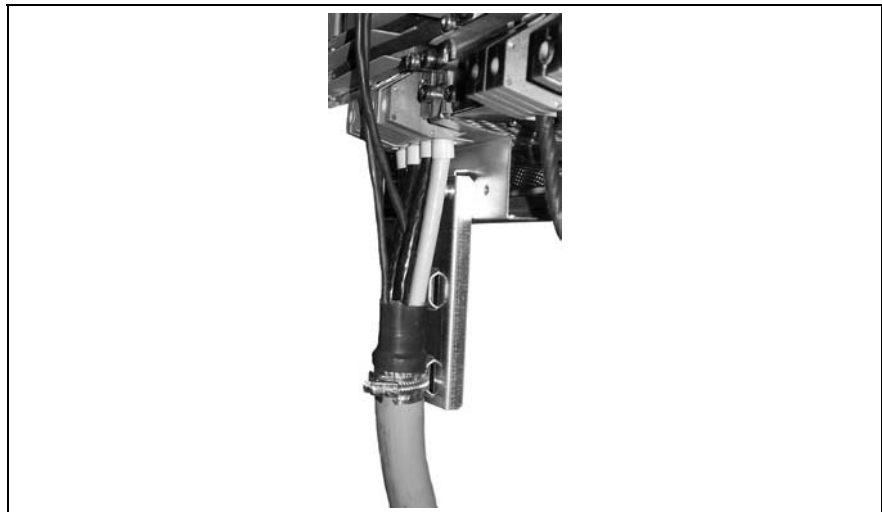


Fig. 5-16: Vertically arranged mounting plate



Fig. 5-17: Horizontally arranged mounting plate

X6, Holding brake, motor temperature monitoring

Technical data of connector

Illustration

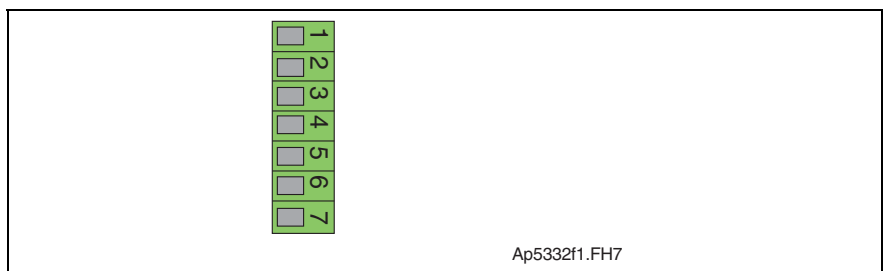


Fig. 5-18: Connector X6

Design

Type	No. of pins	Design
screw-type terminal	7	pins at the unit

Fig. 5-19: Design

Connection cross section

Cross section single wire [mm ²]	Cross section multi core wire [mm ²]	Cross section in AWG gauge no.
0,14 - 1,5	0,14 - 1,5	28 - 16

Fig. 5-20: Connection cross section

Connector X6, holding brake, for temperature monitor

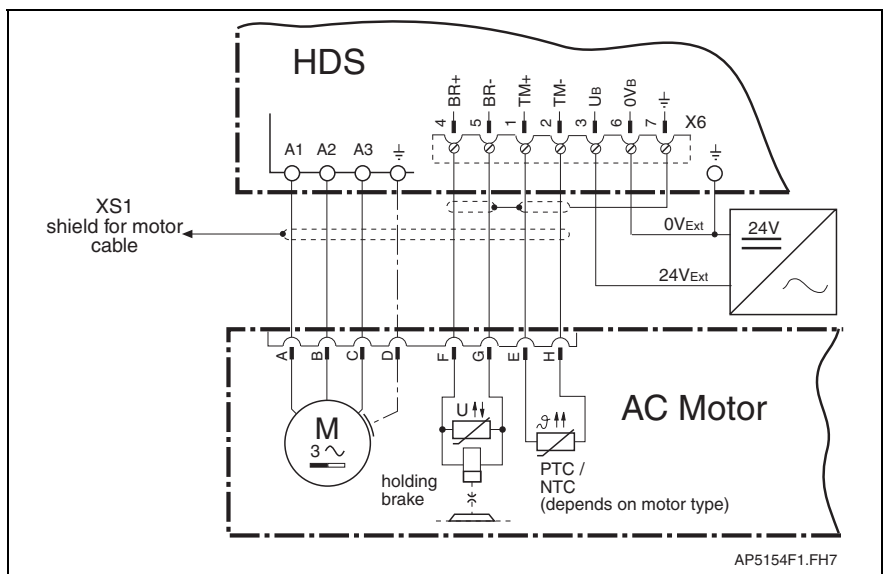


Fig. 5-21: Motor cable, holding brake and temperature monitor connection

**DANGER****Dangerous movements! Persons at risk by falling or dropping axes!**

- ⇒ The standard motor holding brake as delivered, or any external motor holding brake activated by the drive controller by itself does not provide adequate personal protection!
- ⇒ Personal protection must be ensured by primary failsafe measures:
The dangerous zone must be blocked off by a safety fence or safety grates.
After the motor is switched off, vertical axes must be additionally protected from falling or dropping, e.g. as follows:
 - by mechanically locking the vertical axis,
 - by an external braking, catching or clamping unit,
 - by adequately counterbalancing the weight of the load.

**Warning**

If a motor holding brake is used, then it is necessary to connect an external 24 V three-phase voltage source. The 0 V_{ext} (= 0 V_B) must be galvanically connected with the reference potential or housing of the drive controllers!

Maximum permissible brake current: 2 A

If the brake currents exceed this value, the motor holding brake must be actuated via an external switching device. When you use an external switching device the control of the holding brake must not be done by the drive controller directly.

Current consumption of the holding brake is listed in the Project Planning Manual of AC motors.

The AC motor holding brake is not a dynamic brake. It wears down after about 20,000 motor revolutions against the closed brake disc.

Note: To release a holding brake in the MHD/MKD servo motors, an external +24 V DC / +10 % must be supplied to the drive. The voltage to release the brake is applied to X6/3 (+24 V) and X6/6 (0 V). It must be ensured that the brake will release even if longer motor power cables are used (voltage drop with long motor power cables can be compensated by increasing supply voltage (up to DC +26.5 V) and/or with a regulated voltage supply at X6/3 and X6/6).

Control of the motor holding brake

The drive controller controls the holding brake. When you use an external switching device the control of the holding brake must not be done by the drive controller directly.

Motor temperature monitoring (TM+, TM)

Connections TM+ and TM- are used to evaluate the temperature of connected Rexroth motors. These are equipped with a temperature-dependent resistor (either PTC or NTC dependent on the motor type) to monitor temperature. The connection leads are in the motor power cable.

Connection monitoring
TM+, TM-:

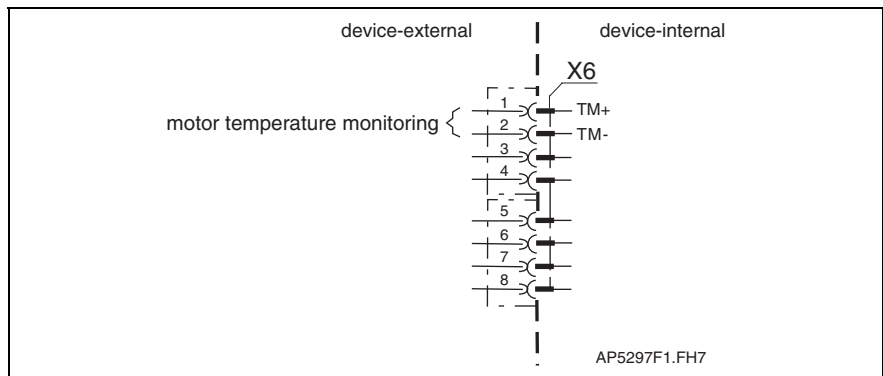
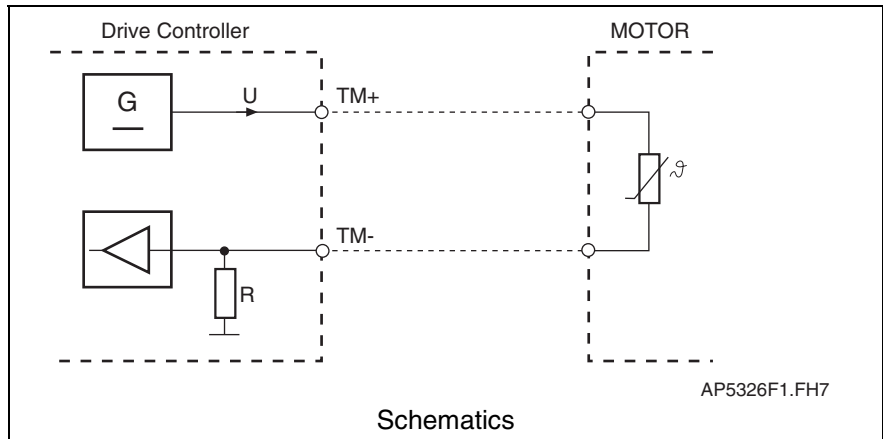


Fig. 5-22: Motor temperature monitoring

Motor temperature evaluation:



U: approximately 5 V
 R: approximately 2 k

Fig. 5-23: Motor temperature evaluation

Note: Connections TM+ and TM- are only to be used with Rexroth motors.

⇒ See also firmware functional description: "Temperature monitoring".

5.3 Connecting drive controllers to the power supply unit

Note: For the connection of the drive and control system to the power supply unit it is necessary to distinguish between the arrangement of the units one below the other and one above the other.

Arranging the units horizontally

Power connection If the units in the control cabinet are arranged horizontally, use the copper strands and PE bridges, included in the delivery scope, for the power connection of the drive and control systems.

Connection to the control voltage supply Use the flat cable for the connection to the control voltage bus (terminal X1). One side of the flat cable is firmly connected to the unit on one side. Plug the connector of the free end onto terminal X1 of the next unit.

If the units are not arranged directly horizontally, you will need a longer cable for the connection of the X1 terminals:

Cable	Length	Item / Material number
INB648/0250	250 mm	292 519
INB648/0800	800 mm	282 398
INB648/1000	1000 mm	288 731

Fig. 5-24: Cable

Arranging the units vertically

Note: With a combined unit arrangement, it is absolutely necessary that between the two rows of drive units a baffle is mounted, in order to prevent the blowers of the upper row from sucking in the warm air of the bottom row.



CAUTION

Property damages due to overheated units!

⇒ Mount a baffle between the two unit rows. Otherwise the performance data of the units can decrease and the units can be damaged with undiminished performance requirement.

Mains connection

If the units in the control cabinet are arranged vertically, you need to use twisted single conductors for the power connection of the drive and control systems (terminal L+, L-) instead of the supplied copper strands. The single conductors for the power connection of the drive and control systems may have a maximum length (twisted) of 1 m (Material number of cable: 291 268; Length: 1,2 m).

The ground connections of units (unit rows) that are vertically arranged must be connected by a separate cord. The minimum cross section for this cord is 10 mm².

Connection to the control voltage bus

The control voltage bus must be connected with the designed Rexroth cable (designation: INB0647). Lay the shield of this cable to the unit grounding bolt (terminal X12) on the supply module.

The cable lengths listed below are available:

Cable length [m]	Item / Material number
0,8	282 300
1,0	287 677

Fig. 5-25: Shielded flat cable for the control voltage bus

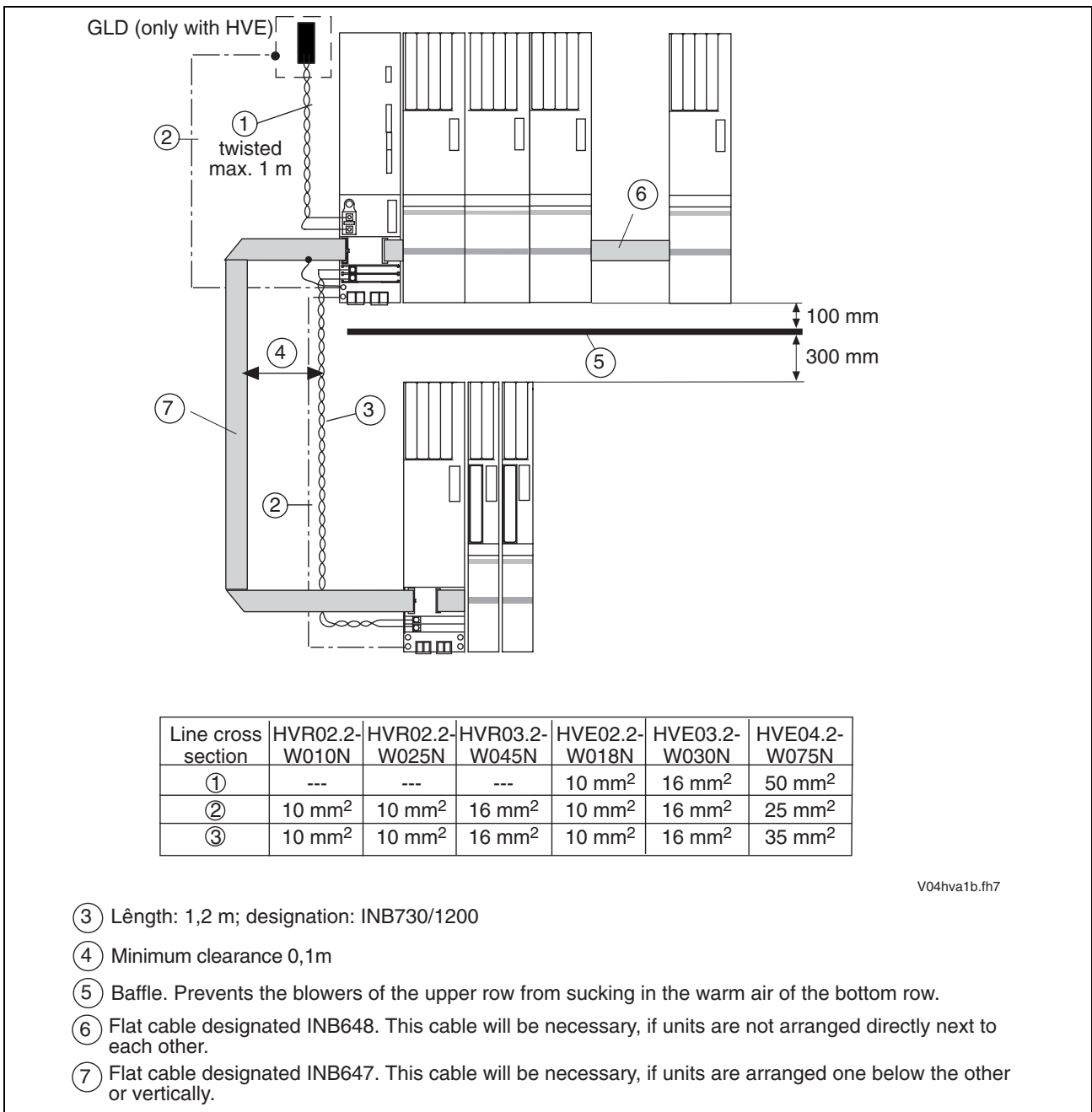


Fig. 5-26: Connecting the drive controller

5.4 Installation

General Information on How to Install the Drive Controller

Damage can be caused to the drive controller or circuit boards if electrostatic charging present in people and/or tools is discharged across them. Therefore, please note the following information:



CAUTION

Electrostatic charges can cause damage to electronic components and interfere with their operational safety!

⇒ Exposed conductive parts coming into contact with components and circuit boards must be discharged by means of grounding. Otherwise errors may occur when triggering motors and moving elements.

Such exposed conductive parts include:

- the copper bit when soldering
- the human body (ground connection caused by touching a conductive, grounded item)
- parts and tools (place them on a conductive support)

Endangered components may only be stored or dispatched in conductive packaging.

Note: Rexroth connection diagrams are only to be used for producing installation connection diagrams. The machine manufacturer's installation connection diagrams must be used for wiring the installation!

- Lay signal lines separately from the load resistance lines because of the occurrence of interference.
 - Transmit analog signals (e.g. command values, actual values) via shielded lines.
 - Do not connect mains, DC bus or power leads to low voltages or allow them to come into contact with these.
 - When carrying out a high voltage test or an applied-overvoltage withstand test on the machine's electrical equipment, disconnect all connections to the devices. This protects the electronic components (allowed in accordance with EN 60204-1). During their routine testing, Rexroth drive components are tested for high voltage and insulation in accordance with EN 50178.
-



CAUTION

Risk of damage to the drive controller by connecting and disconnecting live connections!

⇒ Do not connect and disconnect live connections.

Touch Guard at Devices



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.



Abb. 5-27: Supply unit (left) and drive controllers with touch guards

Sizing of Enclosure and Control Cabinet

Control Cabinet with Multiple-Line Structure

Note: Particular attention should be paid to the maximum allowed air intake temperature of components when they are arranged in multiple lines in the control cabinet. Where necessary, cooling air guides are to be provided with blowers specially used for this purpose.

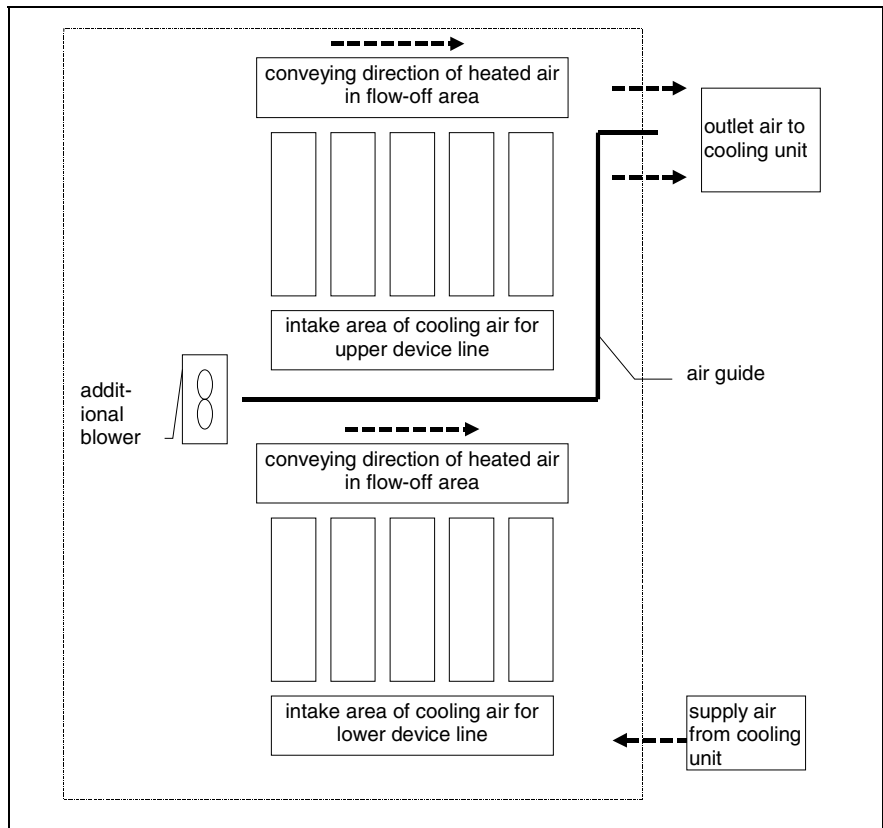


Fig. 5-28: Example of arrangement for multiple-line structure with components

Arrangement of Cooling Units



CAUTION

Possible damage to the drive controller
Operational safety of the machine endangered!
Note the following instructions!

Avoiding Dripping or Sprayed Water

Due to the operating principle, condensation water is formed when cooling units are used. For this reason, please observe the following information:

- Always position cooling units in such a way that condensation water cannot drip onto electronic equipment in the control cabinet.
- Position the cooling unit in such a way that the blower of the cooling unit does not spray accumulated condensation water onto electronic equipment.

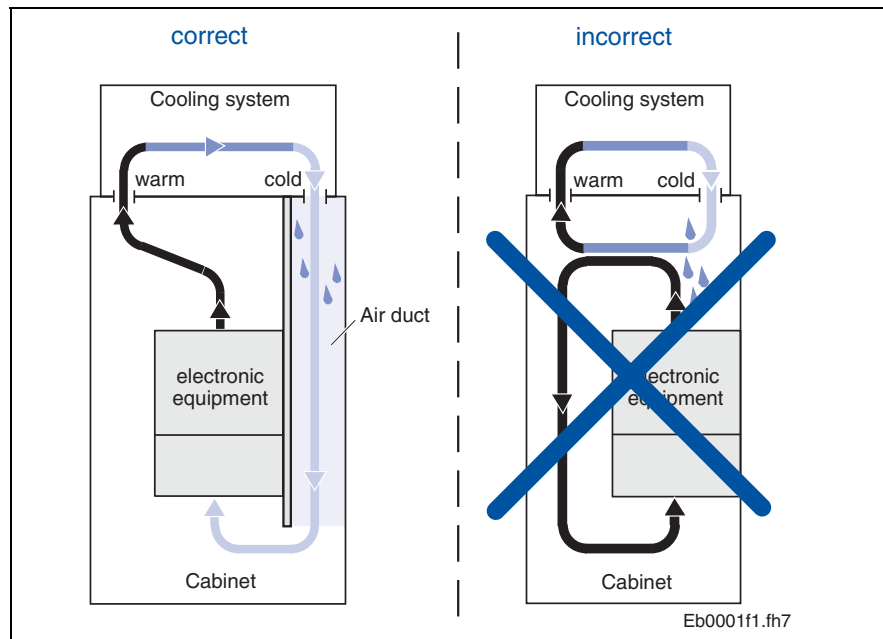


Fig. 5-29: Arranging the cooling unit on the control cabinet

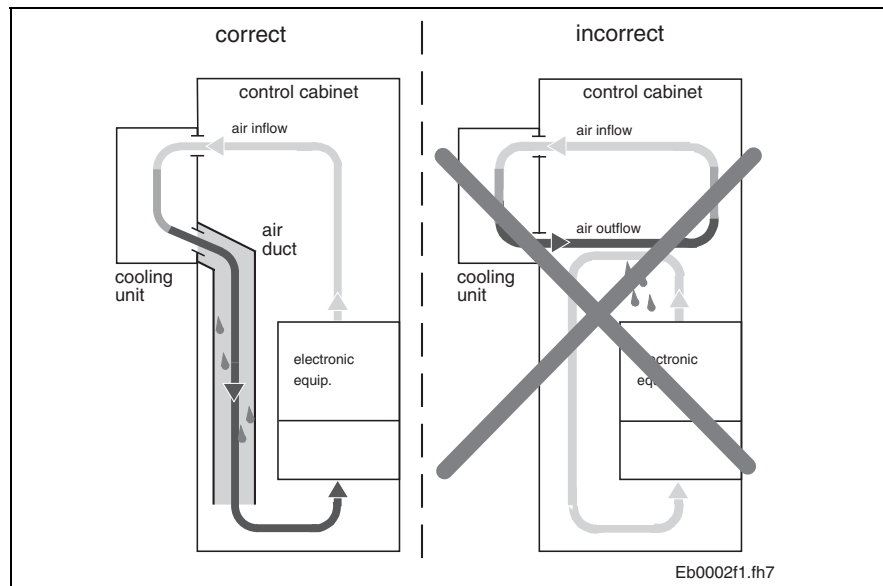


Fig. 5-30: Arranging the cooling unit at the front of the control cabinet

Avoiding Moisture Condensation

Moisture condensation occurs when the temperature of the device is lower than the ambient temperature.

- Set cooling units with temperature adjustment to the maximum surrounding temperature and not lower!
- Set cooling units with follow-up temperature in such a way that the interior temperature of the control cabinet is no lower than the temperature of the surrounding air. Set the temperature limitation to the maximum surrounding temperature!
- Only use well-sealed control cabinets so that moisture condensation cannot arise as a result of warm and moist external air entering the cabinet.

In the event that control cabinets are operated with the doors open (commissioning, servicing etc.) it is essential to ensure that after the doors are closed the drive controllers cannot at any time be cooler than the air in the control cabinet, as otherwise moisture condensation can occur. For this reason sufficient circulation must be provided inside the control cabinet to avoid pockets of heat.

6 Appendix

6.1 Discharging of DC Bus Capacitors

In the drive system capacitors are used in the DC bus as energy stores. In the drive controllers and particularly in the supply units such capacitors have already been integrated.

Energy stores maintain their energy even when energy supply has been cut off and have to be discharged before somebody gets in contact with them.

Discharging devices have been integrated in the components of the drive system; within the indicated discharging time these devices discharge the voltage below the allowed 50 V.

If additional capacitances in the form of

- DC bus capacitor units or
- additional capacitors

are connected, make sure that these capacitors, too, are discharged before somebody gets in contact with them.

Due to the operating principle, the discharging time is the longer

- the bigger the energy store (the capacitance value)
- the higher the voltage to which the energy store has been charged
- the greater the resistance for discharging the capacitors.

Components of the drive system have been dimensioned in such a way that after the energy supply was cut off the voltage value falls below 50 V within a discharging time of a maximum of 30 minutes.



WARNING

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

- ⇒ Wait at least 30 minutes after switching off power to allow discharging.
- ⇒ Check whether voltage has fallen below 50 V before touching live parts!

To shorten the waiting time until voltage has fallen below 50 V you can take the following measures:

- Activate the function "ZKS" (DC bus short circuit)



WARNING

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

- ⇒ Before touching live parts check whether the voltage has fallen below 50 V!

- Use the discharging device described below.

6.2 Discharging Device



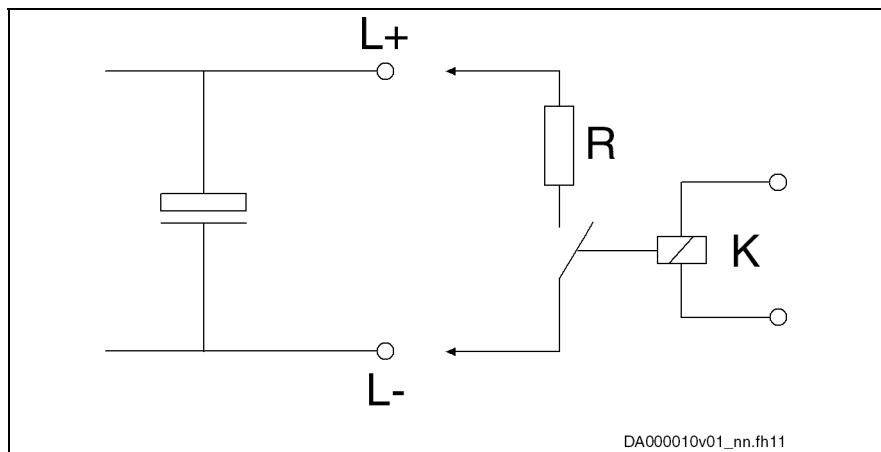
WARNING

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

⇒ Before touching live parts check in any case whether the voltage between the DC bus terminals L+ and L- has fallen below 50 V!

Operating Principle

A contactor is installed to switch a resistor to the terminals L+ and L- of the DC bus connection to discharge the capacitors. The contactor is activated via a control input which is supplied with appropriate control voltage.



R: discharging resistor
K: contactor contact

Fig. 6-1: Operating principle of discharging device

Dimensioning

The individual components have to be sufficiently dimensioned:

- The value of the discharging resistor has to be dimensioned with 1000 ohm and at least 1000 W.
- The discharging resistor and the contactor contact have to withstand the loads of practical operation (for example in the case of frequent use of the discharging device or the occurring continuous power).
- The contactor contact has to withstand the occurring direct voltage of min. 1000 V.
- The contactor contact has to withstand the occurring discharge current according to the resistance value that is used, i.e. 1 A with 1000 ohm.

How to Proceed for Discharging

Observe the proceeding when using the discharging device:

1. Install discharging device before switching energy supply on for the first time and establish safe electrical connection between discharging device and object to be discharged.
2. On mains side switch off energy supply to drive system before activating discharging device.
3. Activate discharging device.

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