Rexroth
Bosch Group

Rexroth RD 500 RD42 Power Supply

R911200190
Edition 03

Operating Guide

Title RD 500 RD42
Power Supply

Type of Documentation Operating Guide

Document Typecode DOK-RD500*-RD42*******-IB03-EN-P

Internal File Reference 120-1950-B314-03/EN

Purpose of Documentation This documentation describes the power supply of the produkt family RD 500 RD42

- for planning the mechanical control cabinet construction.
- for planning the electrical control cabinet construction.
- for start-up.
- for fault messages and notes to couse and remedy.

Record of Revisions

Description	Release Date	Notes
DOK-RD500*-RD42*******-IB01-EN-P	12.2000	First edition
DOK-RD500*-RD42*******-IB02-EN-P	01.2003	Warning added
DOK-RD500*-RD42*******-IB03-EN-P	11.2003	Error correction

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Published by Indramat Refu GmbH
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Note This document has been printed on chlorine-free bleached paper.

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1 Description

1.1 General information

The RD42 supply modules, which are capable of regenerative feedback, are designed to be connected to inverters with DC connection from the REFUdrive 500 series. They are suitable for regenerating into the line supply, for example, when drives are braked.
The three-phase supply is fed-in via a line filter and an uncontrolled three-phase bridge rectifier. The DC link capacitors are pre-charged via series resistors and an auxiliary contactor. If faults develop in the power section, or e.g. if the drive converter is powered-up with a ground fault at the DC link output, pre-charging is automatically and safely interrupted. When the system runs-up correctly, the charged capacitors are connected to the line supply through a diode rectifier using a power contactor, and then the inverter is enabled.
The supply modules have two operating modes:

Operating mode, standby:

(terminals X52.5 and .6 open-circuit)

The regenerative feedback into the line supply is active. The quiescent current (if there is no regenerative feedback) is almost zero. The regenerative power is limited to 50 % of the specified values; refer to the technical data.

Operating mode, run:

(Terminals X52.5 and .6 closed or there is a significant level of regenerative feedback)

The regenerative feedback into the line supply is active. The quiescent current (if there is no regenerative feedback) is approx. 30 % of the rated current. The regenerative feedback power corresponds to the specified values, refer to the technical data. The changeover into the run operating mode can be externally initiated (X52), or is automatically set as a function of the regenerative feedback power.

1.2 Dimensioning information

Dimensioning the power sections

Two criteria are taken into account when dimensioning the power sections:

Power consumption

This is the sum of the power drawn from the DC link, taking into account losses and a coincidence factor. The power which may be drawn from the DC link is specified under 1.3 Technical data.

Total number of units which can be connected

Capacitors are used in the inverters which are used to smooth the DC link voltage. When the drive converter is powered-up, these must be charged using a pre-charging device. If too many inverter modules are connected to the DC link, then there is a danger that the pre-charging device will be overloaded.

Every inverter has a power code, which can be taken from the type code (e.g. RD52.1-7N-022... => power code 22). In order that the pre-charging

device is not overloaded, the sum of the power codes of the connected inverters may not exceed 200% of the power code of the power supply module used.

Dimensioning for dynamic regenerative feedback operations

Depending on the dynamic behavior, the following dimensioning should be considered: For applications, where the DC link power must be provided within 5 and 15 ms, the peak regenerative feedback power ≤ the rated output of the unit. For applications where the DC link power increases more slowly (rise time > 30 ms), the unit can be dimensioned with a peak regenerative power ≤ peak power of the unit. Independent of this, it must be guaranteed, that as an average, the rated output of the unit is not exceeded.

1.3 Technical data

RD42 power code		**026**	**053**	**084**	**105**
Line supply		3-ph. 380 V AC ...480 V ±10 %, 50 / 60 Hz 3-ph. 500 V AC ± 10 %, 50 / 60 Hz			
Fuse, FF	[A]	63	125	200	250
Control voltage supply		3-ph. 380 V AC ... 480 V ± 10 %, 50 / 60 Hz 3-ph. 500 V AC ± 10 %, 50 / 60 Hz			
DC link voltage		530 ... 640 V DC ± 10 % 660 V DC ± 10 %			
DC side					
DC rated current	[A]	50	100	160	200
Peak current for 60 s	[A]	75	150	240	300
Line supply side					
For $V_{line\ supply}$ = 400 V Rated output Peak output	 [kW] [kW]	 26 40	 53 80	 84 127	 105 160
For $V_{line\ supply}$ = 480 V Rated output Peak output for 60 s	 [kW] [kW]	 32 48	 64 96	 102 154	 128 192
For $V_{line\ supply}$ = 500 V Rated output Peak output for 60 s	 [kW] [kW]	 33 50	 66 100	 105 160	 132 200
Line supply rated current at the rated line supply power	[A]	45	90	150	180
Power factor, line supply		Approx. 1			
Losses at rated output	[kW]	0.8	1.15	1.5	2
Ambient conditions, radio interference suppression level, noise immunity					
Cooling airflow requirement	m³/s	0.08	0.12	0.2	0.3
Environmental Class		3K3 acc. to DIN IEC 721-3-3 (ambient temperature 0-40 °C)			
Radio interference suppression level / noise immunity		A 1 acc. to EN 55011 / EN 61800-3			
Mechanical design					
Size Class		D	E	F	G
Degree of protection		IP 20 acc. to EN 60529			

Fig. 1-1: Technical data

Note: The specified values refer to the “Run” operating mode. In the “Standby” mode, the regenerative feedback only represents 50 % of the specified values.

1.4 Block circuit diagram

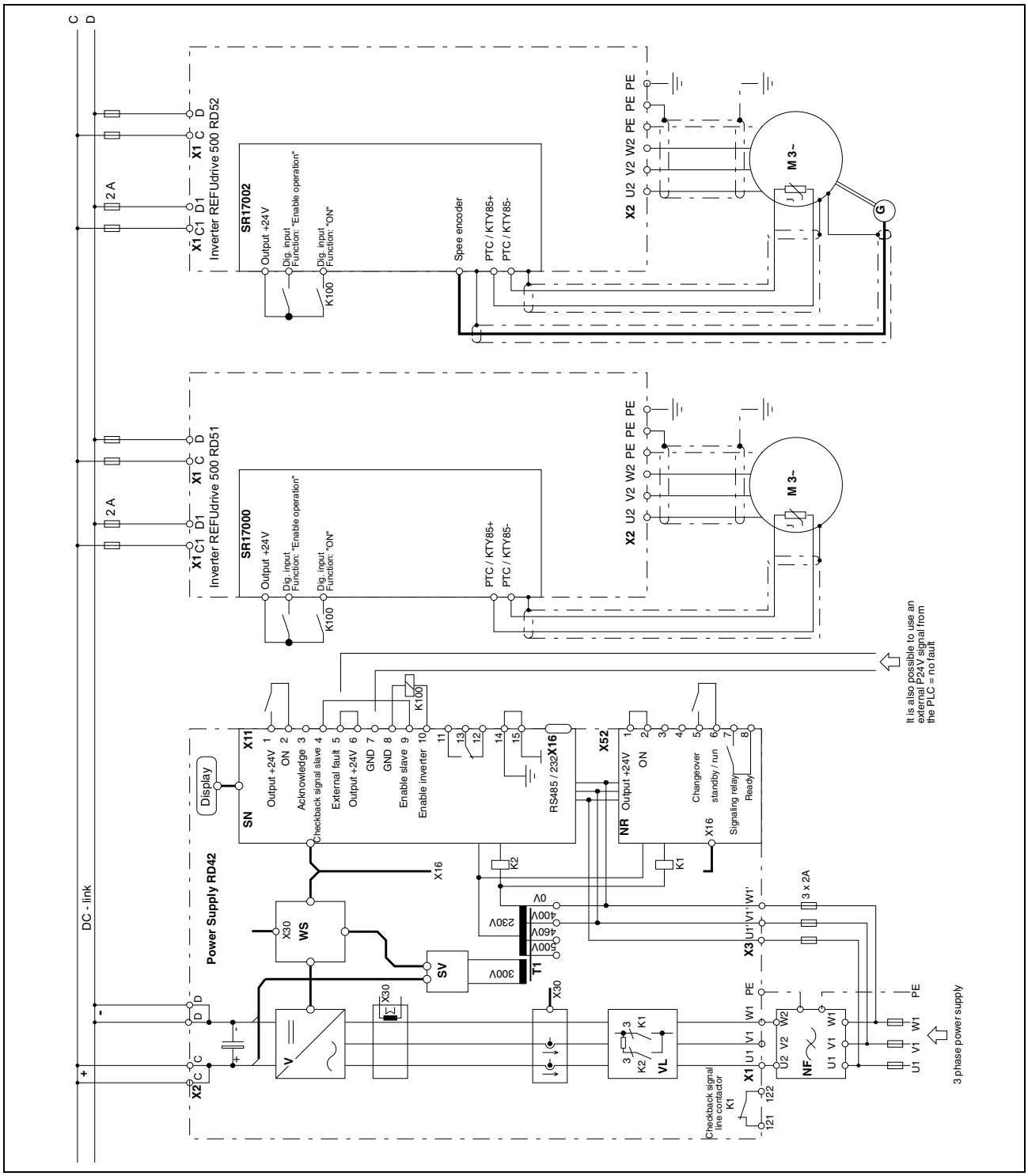


Fig. 1-2: Block circuit diagram RD42

1.5 Type code

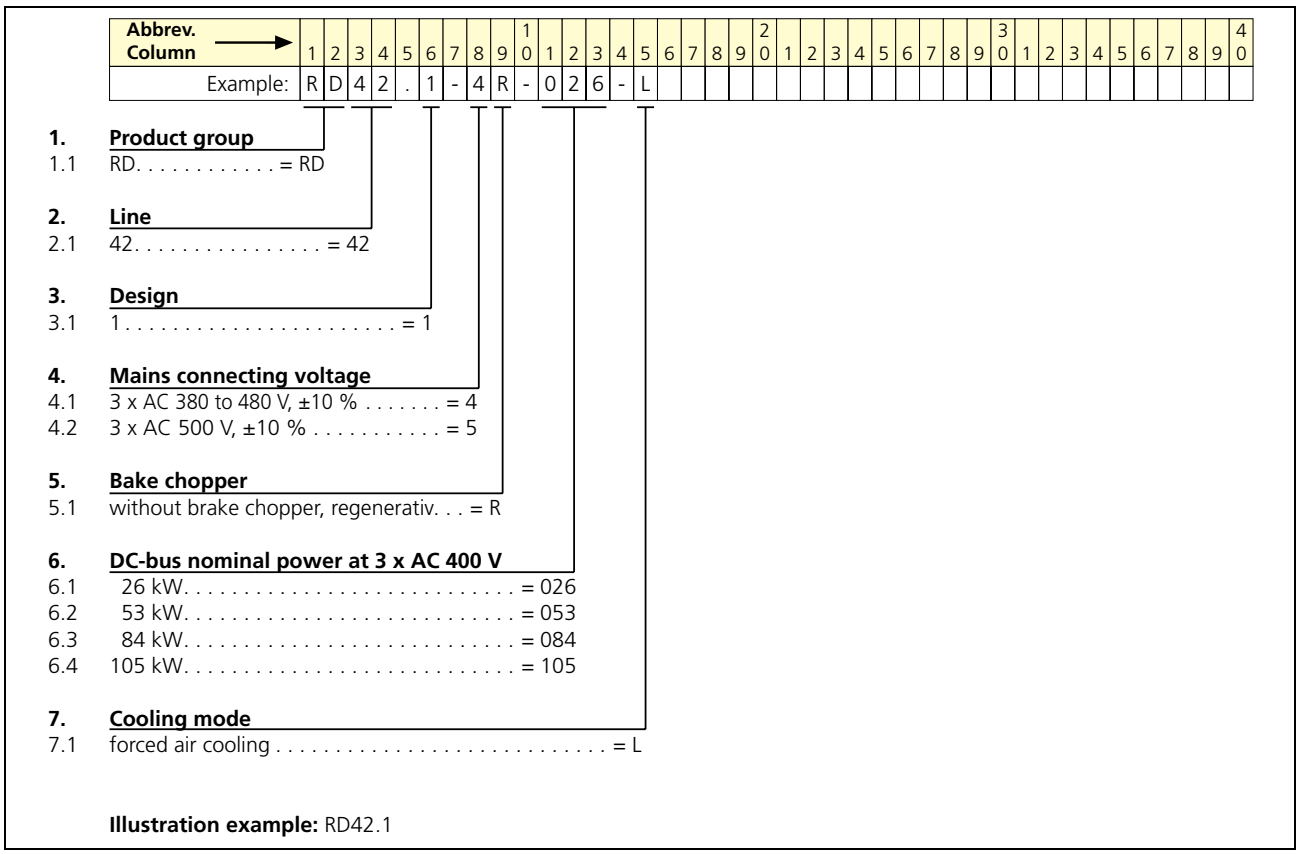


Fig. 1-3: Type code RD42

2 Mechanical mounting and installation

2.1 Storage and mounting location

Storage

The units must be stored in clean, dry rooms. The storage temperature must lie between -25° C and +70° C. Temperature fluctuations exceeded 20 K per hour are not permissible. (environmental Class 3K3 according to DIN IEC 721-3-3)

Hinweis: Supply modules accommodate Al Elko DC link capacitors. They can be stored for 2 years at a storage temperature of ≤ 40 °C.

Minimum requirements at the mounting location

- The operating room/area should be dust-free. Dust-laden air must be filtered.
- The ambient temperature must lie in the range 0 ... 40°C.
- The relative air humidity may not exceed 90 %; moisture condensation is not permissible.
- The air drawn-in may not contain any aggressive or electrically conductive gases which could have a negative impact on the function of the equipment.
- The fan airflow may not be restricted. The specified minimum clearances for air intake and air discharge may not be restricted by additional mounted components.
- The unit has a certain power loss and heats-up its environment. This means that it is important that there is sufficient clearance to temperature-sensitive devices and equipment.

Installation altitudes above 1000 meters sea level:

If the unit is mounted above 1000 meters above sea level, the supply module utilization must be reduced corresponding to the adjacent diagram.

It is not permissible to install the unit at altitudes above 2000 meters above sea level!

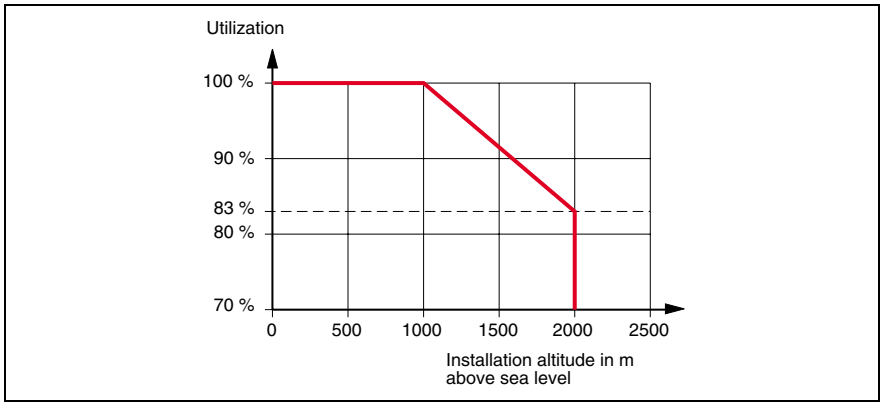


Fig.. 2-1: Derating as a function of the installation altitude

2.2 Mounting the supply modules

- The modules must be mounted vertically onto a flat surface.
- A minimum clearance of 100 mm both above and below the units must be maintained to ensure that the airflow is not restricted.
- When the units are mounted in a cabinet, the cooling air requirement of the installed units (refer to Section 1: Technical data) must be calculated and the cabinet cooling/ventilation appropriately dimensioned.
- For supply modules, size Classes D to G, the line filter is externally mounted for space reasons. We recommend that the line filter is mounted below the unit; refer to the dimension drawings.
- Please refer to the dimension drawings for the mounting dimensions and the location of the retaining points.
- Use M6x10 Z 2 DIN 7985 screws to mount the units.

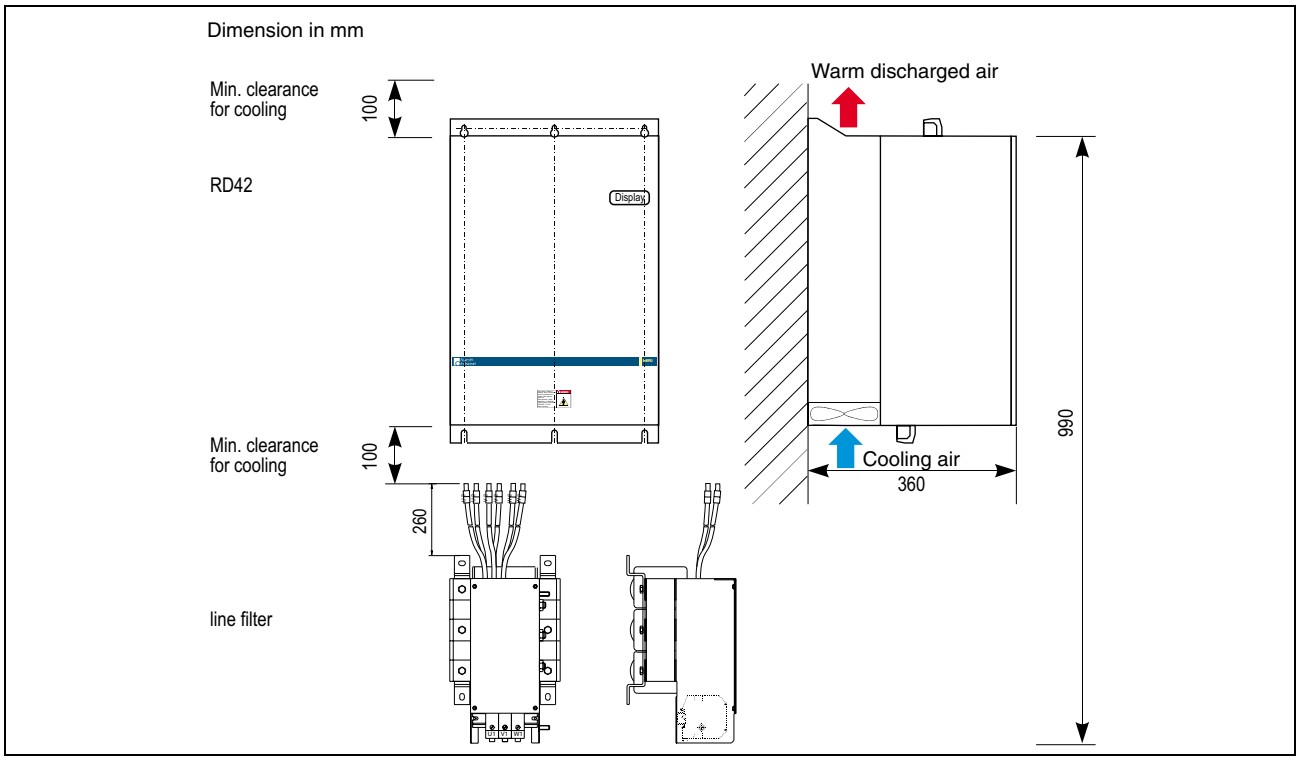


Fig. 2-2: Minimum clearance

2.3 Dimension drawings

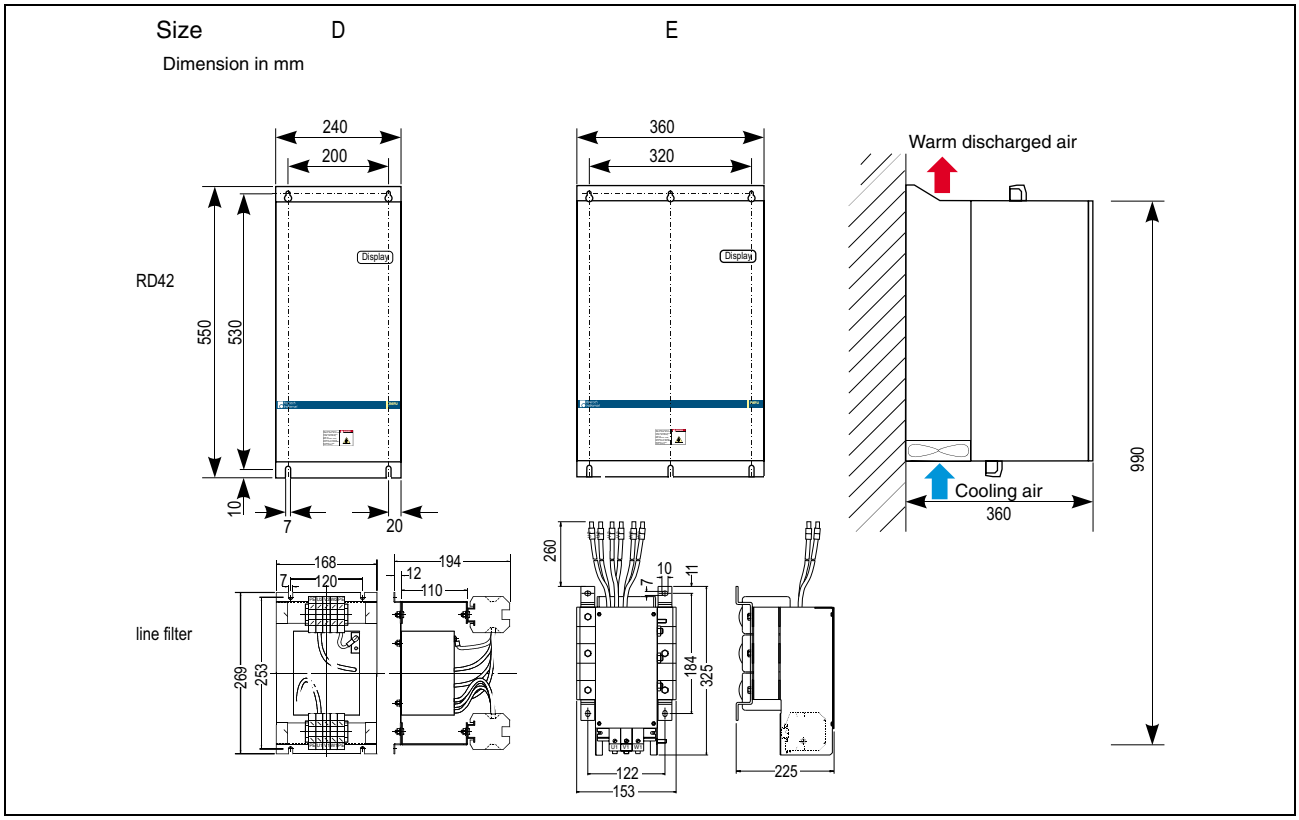


Fig. 2-3: Dimension drawing, size Classes D and E

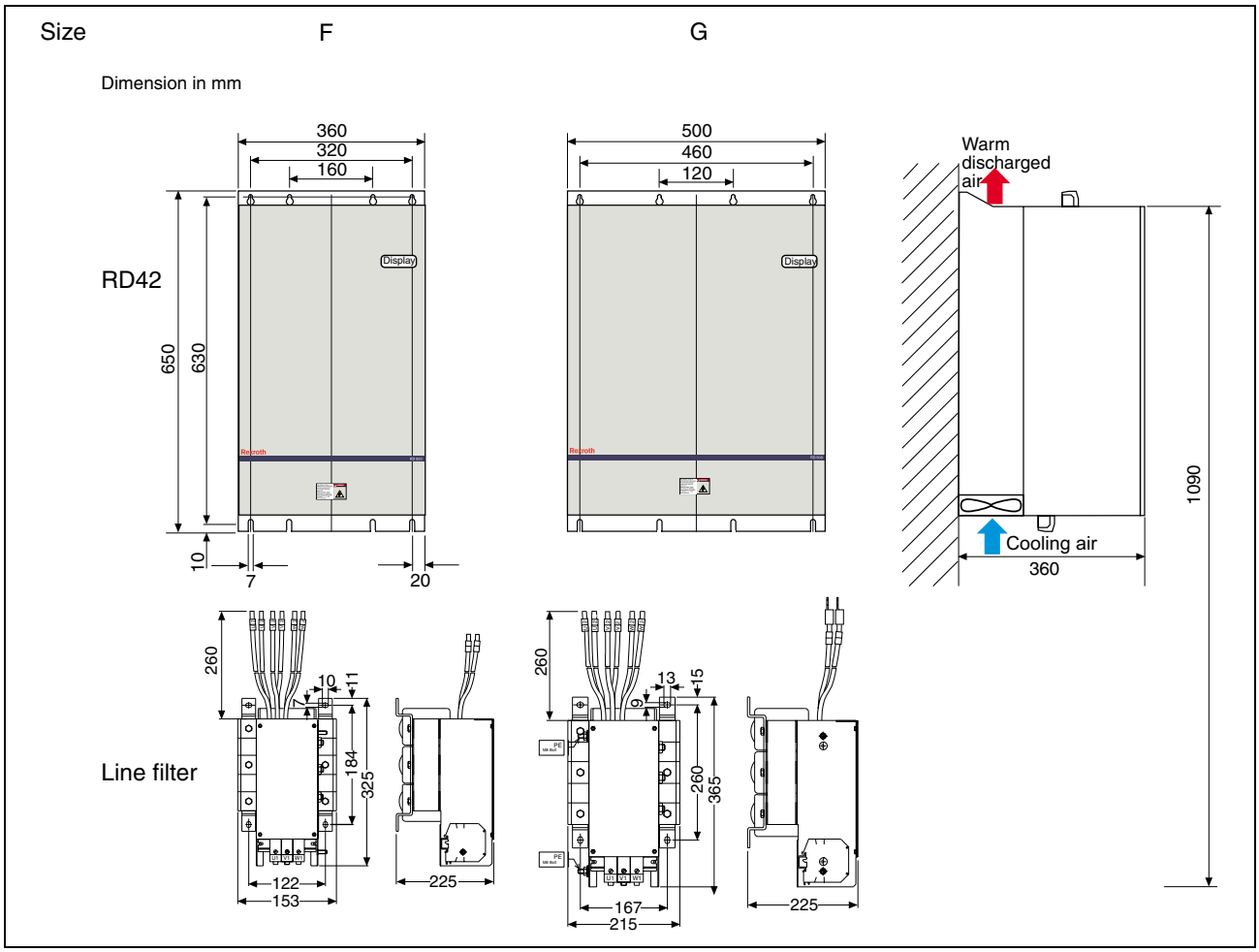


Fig. 2-4: Dimension drawing, size Classes F and G

3 Electrical installation

3.1 EMC-correct design of drives

The following 10 rules are the basic guidelines for EMC-correct design of drive systems. Details are provided in separate instructions.

Rules 1 to 7 are generally valid. Rules 8 to 10 are especially important to limit noise emission.

Rule 1 All of the metal parts and components of the cabinet must be connected to one another through the largest possible surface area. (Not paint on paint!) If necessary, use contact or serrated washers. The cabinet door should be connected to the cabinet itself through grounding strips which should be kept as short as possible.

Rule 2 Signal, line supply and motor cables and power cables should be routed separately from one another (avoid having any mutual coupling lengths of cable!). Minimum clearance: 20 cm. Provide separating sheet metal panels between power and signal cables. These panels should be grounded at several locations along their length.

Rule 3 Contactors, relays, solenoid valves, electromechanical operating hour counters etc. in the cabinet must be provided with noise suppression devices. These can include, e.g. RC elements, diodes, varistors. These devices must be connected directly to the coil.

Rule 4 Non-shielded cables belonging to the same circuit (outgoing and incoming conductors) should be twisted and the surface area between the outgoing and incoming conductors should be kept as small as possible. Ground the cores which are not used at both ends.

Rule 5 Noise which is coupled-in is generally reduced if cables are routed close to grounded sheet metal panels. This is the reason that wiring shouldn't be freely routed in the cabinet, but should be routed close to the cabinet housing or to mounting panels. This is also true for cables which are presently not being used.

Rule 6 Tachometers, encoders or resolvers must be connected using a shielded cable. The shield should be connected to the tachometer, encoder or resolver and to the AC drive converter through the largest possible surface area. The shield may not be interrupted, e.g. by using intermediate terminals. For encoders and resolvers, pre-assembled cables with multiple shielding should be used.

Rule 7 The shields of signal cables must be connected at both ends to ground (sender and receiver) through the largest possible surface area. If there is poor potential bonding between the shield connections, to reduce the current flowing through the shield, an additional bonding conductor, minimum 10 mm² cross-section should be routed parallel to the shield. The shield can be connected at several locations with ground (=cabinet housing). The shields may also be grounded at several locations outside the cabinet. Avoid using foil-type shields. Their shielding effect is a minimum of a factor of 5 less than braided shields.

If the potential bonding is poor, analog signal cables may only be grounded at one end at the AC converter, in order to eliminate low-frequency noise (50 Hz) on the shield.

Rule 8 A radio interference suppression filter must always be located close to the noise source. The filter must be connected flush with the cabinet housing, mounting panel etc. The most favorable solution is a bare metal mounting plate (e.g. manufactured out of stainless steel, galvanized steel), as in this case, the complete mounting surface establishes the electrical contact.

Input and output cables to and from the radio interference suppression filter must be routed separately from one another.

Rule 9 All variable-speed motors must be connected-up using shielded cables. The shields must be connected at both ends to the housings/enclosures through a low-inductance connection (large surface area). The motor cables must also be shielded inside the cabinet or at least shielded using separating sheet metal panels.

Rule 10 Steel-shielded cables are not suitable.

Rule 11 A suitable PG gland with shield contact can be used to connect the shield at the motor (e.g. “SKINDICHT SHV/SRE/E”, from the Lapp Company, Stuttgart). It should be ensured that there is a low-impedance connection between the motor terminal box and motor enclosure. If required, connect using an additional grounding conductor.
Never use motor terminal boxes manufactured out of plastic!

Rule 12 The shield between the motor and AC drive converter may not be interrupted, i.e. by mounting components such as output reactors, sinusoidal filters, motor filters, fuses, contactors. The components should be mounted on a mounting panel, which simultaneously serves as a screen connection for the incoming and outgoing motor cable. If required, separating sheet metal panels should be used to shield the components.

3.2 Warnings and information

GEFAHR

Electric shock which can lead to death as a result of live components at voltage levels more than 50 V!

⇒ The supply modules are operated with high voltages. All work must be carried-out with the equipment in a no-voltage condition!

⇒ Only qualified, fully-trained personnel may carry out any work!

⇒ Death, severe bodily injury or significant material damage can result if this warning information is not observed.

⇒ The equipment is still a hazardous voltage level even after it has been powered-down for up to 5 minutes due to the DC link capacitors. This means that it is only permissible to work on the equipment or the DC link terminals at the earliest after the appropriate delay time and after having first carefully checked that the equipment actually is in a no-voltage condition.

⇒ The power and control terminals can still be live (under voltage) even if the motor is stationary.

⇒ If the DC link is supplied centrally, it must be ensured that the inverter is reliably isolated from the DC link voltage!

⇒ When working on equipment which has been opened-up, it should be observed that live components are accessible.

⇒ The user is responsible in ensuring that all of the units have been mounted and connected-up in full compliance with recognized technical regulations of the particular country as well as any other regionally valid regulations and specifications. The correct cable dimensions, fusing/protection, grounding, powering-down, isolation and overcurrent protection must be especially taken into account.

CAUTION

Damaging the units by applying the incorrect supply voltage!

⇒ The equipment supply modules are built for various line supply voltages! This is the reason that line supply voltages are not specified in the drawings and tables for the terminal strips.

⇒ When connecting-up, take care to observe the rating plate and the line supply voltage specified in the technical data.

Information on protective grounding: Due to the discharge currents of the units (>3.5 mA) via the protective conductor (PE), the cable cross-section of the protective conductor to the cabinet must be at least 10mm^2 Cu in accordance with DIN VDE 0160, or a second protective conductor must be routed in parallel (VDE 0160, Section 6.5.2). The discharge currents of the units can be up to 100 mA.

For larger connected powers, the minimum cross-section of the protective conductor must be in the appropriate ratio to the cross-section of the phase conductor. Please refer to DIN 57100 Part 540 / VDE 0100 Part 540 Table 2. The line-side circuit of the drive converter corresponds to circuit type 7 (DIN VDE 0160-5.5.3.4.2 Fig. 8).

In this case, an e.l.c.b. may not be used as protection.

3.3 Cable cross-sections

Power code	Recommended minimum cross-section of the feeder cable	Maximum cross-section		Line supply fusing FF
		Solid wire	Finely stranded conductors	
	Supply / DC link		Supply / DC link	
026	6 / 6 mm^2	16 mm^2	10 / 2x10 mm^2	63 A
053	25 / 25mm^2	35 mm^2	25 / 2x25 mm^2	125 A
084	50 / 50 mm^2	50 mm^2	50 / 2x50 mm^2	200 A
105	95 / 2x50 mm^2	120 mm^2	95 / 2x50 mm^2	250 A

Fig. 3-1: Cable cross-sections

For supply modules with power code 105, 2 cables, each 50 mm^2 must be used to connect to the DC link

Alternative fuse types

J.M. M00 (M1) üf2 / ...A 500 V~ gR	32 A ...	250 A
Sitor 3NE80... 660 V~ gR	35 A ...	63 A
Sitor 3NE8727... 660 V~ aR	125 A ...	250 A

The cross-section of the **protective conductor** (PE) is, according to VDE 0160 for all equipment classes, **minimum 10 mm^2**.

Note: Control cables and power cables must always be routed separately with a specific clearance between them.

Shielded cables must be used to connect setpoint inputs and measured value outputs. The shield is connected, on the equipment side, to the strain relief element.

3.4 Power terminals RD42

A supply module, size Class G is shown in the terminal layout diagram. The position of the terminals corresponds to the narrower or wider units.

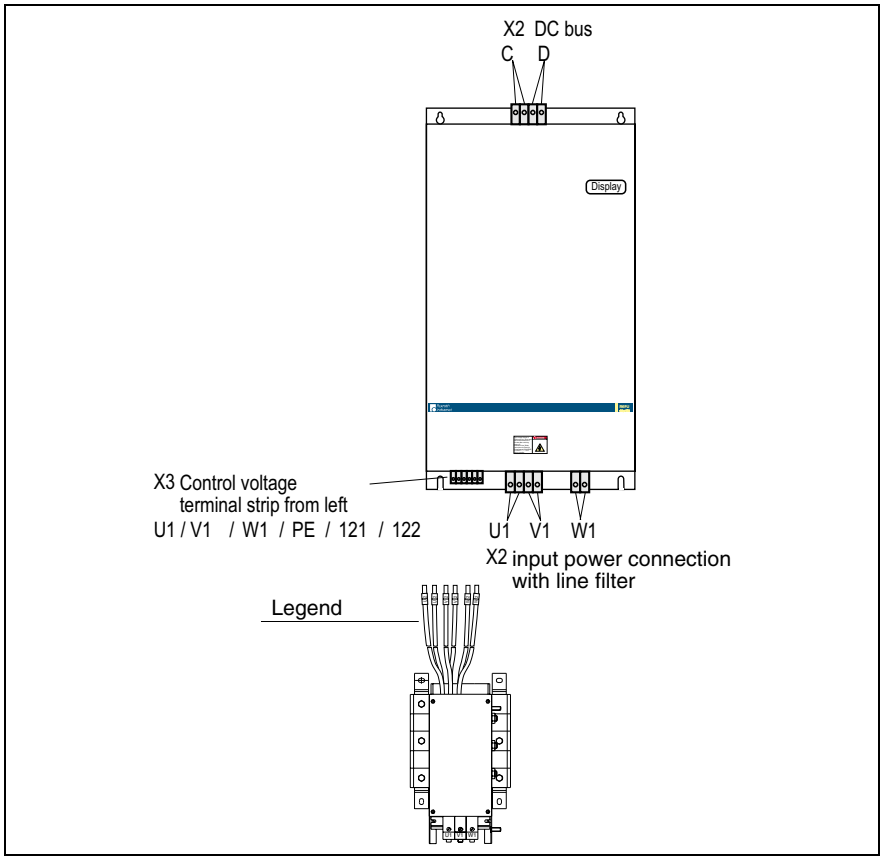


Fig. 3-2: Terminal diagram RD42

3.5 Line filter connection

Terminal	Designation
PE	Protective conductor
U1	Line supply connection, 3 phases L1, L2, L3
V1	
W1	
U2	Connection to the supply module
V2	
W2	

Fig. 3-3: Line filter connection

3.6 Supply module connection

Power terminal X1

Terminal X1	Designation
PE	Protective conductor
U1	Supply connection via the external line filter 3 phases L1, L2, L3
V1	
W1	

Fig. 3-4: Power terminal X1

Power terminal X2

Terminal X2	Designation
C	DC link connection + (double terminal)
D	DC link connection – (double terminal)

Fig. 3-5: Power terminal X2

Power terminal X3

Terminal X3	Designation
121	Checkback signal contact (NC contact) from the main contactor
122	
U1	Control supply voltage, 3-ph. 380 V – 500 V AC
V1	
W1	

Fig. 3-6: Power terminal X3

Please observe the following when connecting the control voltage:

Depending on the control voltage, the power supply transformer must be changed-over. The power supply transformer T1 has 3 connections: 380/400 V, 460 V and 500 V; also refer to Fig. 1-2: Circuit principle RD42. You can see the position of the power supply transformer from Fig. 3-7: Terminal diagram for size Classes D to F.

The control voltage must be externally fused using 2A slow-acting fuses.

When connecting the control voltage, the phase rotation and phase position must be the same as the three-phase system at terminals X1, power input U1,V1,W1.

3.7 Control terminals

Terminal diagram

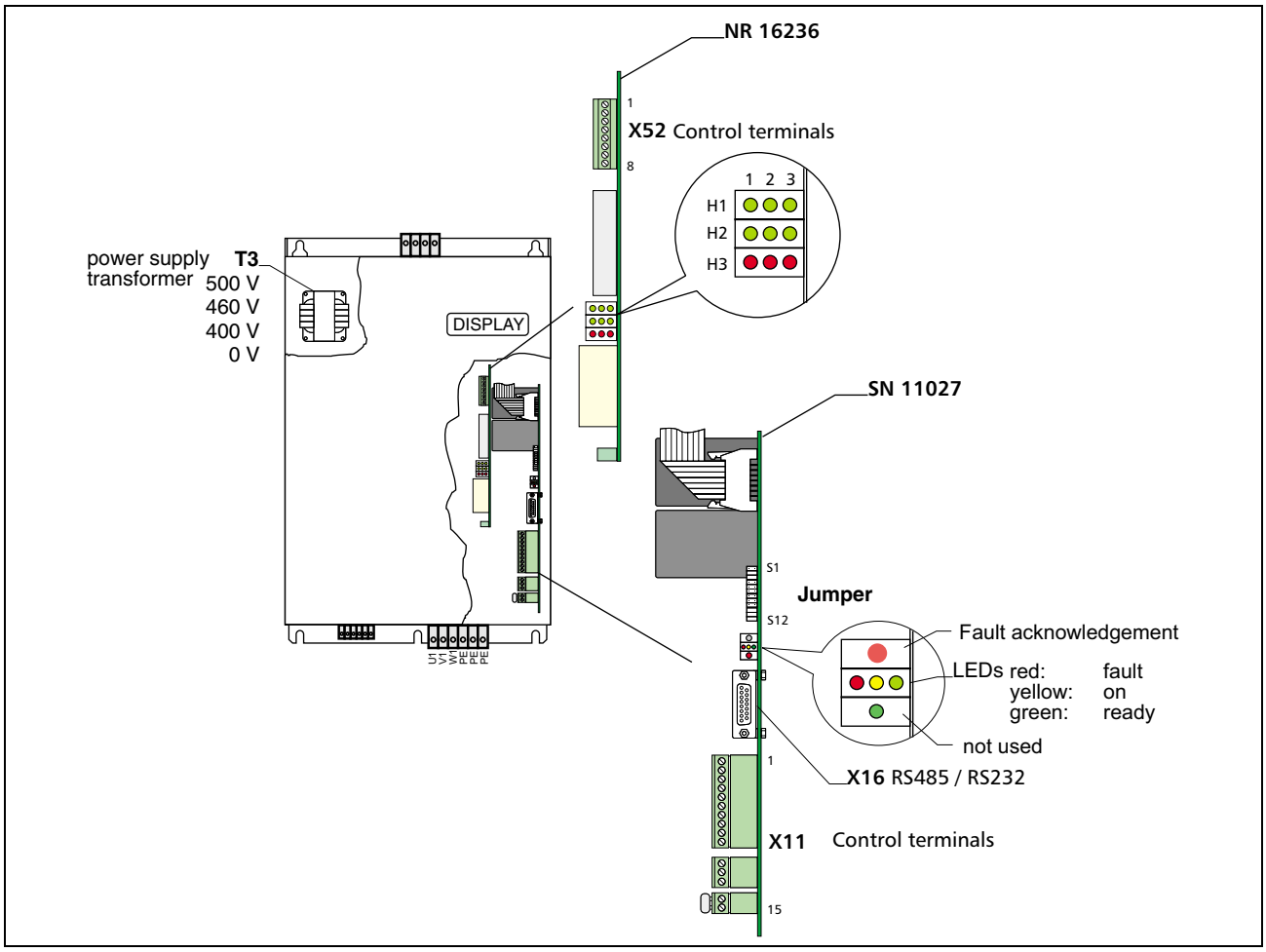


Fig. 3-7: Terminal diagram for size Classes D to F

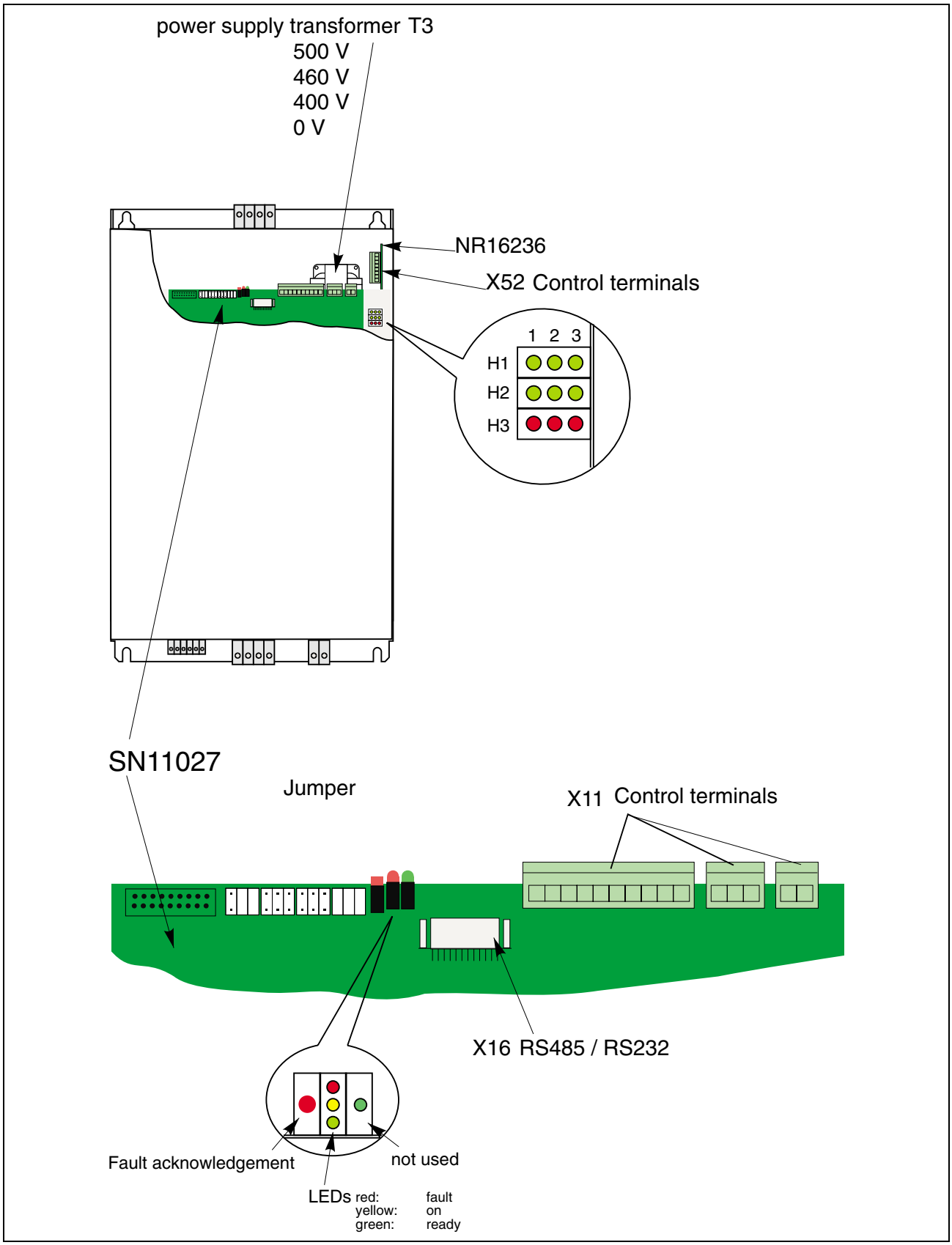


Fig. 3-8: Terminal diagram for size Class G

Control terminal strip X11 on SN11027

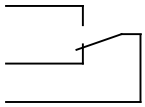
Terminal X11	Designation	
Digital inputs		
1	P24 V output (80 mA load capacity)	
2	“ON” control command	
3	“Fault acknowledgement” control command (a positive edge is required to acknowledge a fault)	
4	Checkback signal, slave for parallel operation; when supplied, there is a jumper between X11.4 – X11.9	
5	External fault (low active)	
6	P24 V output (80 mA load capacity)	
7	Ground	
Digital outputs		
8	Ground	
9	“Enable slave” control signal for a parallel configuration as master; when supplied a jumper is inserted between X11.4 – X11.9	
10	“Enable inverter” control signal or “Slave checkback signal” for parallel operation as slave	
Relay		
11	Relay with changeover contact; “Fault” signal	Contact in the quiescent position: 
12	Terminal 12/13 closed -> fault	
13	Terminal 11/13 closed -> no fault Load capacity: 250 V AC, 7 A; 30 V DC, 7A	
14	Ground	When supplied: Jumper X11.14 – X11.15
15	Protective conductor	

Fig. 3-9: Control terminal strip X11

Digital inputs

Input voltage:	min.	max.
High	13 V	33 V
Low	-3 V	5 V
	or open-circuit terminal	
Input current at 24 V	8.6 mA	

Fig. 3-10: Digital inputs

Digital outputs

Output voltage	min.	max.
High	16 V	30 V
Low	High-ohmic	
Load capacity	50 mA	

Fig. 3-11: Digital outputs

ATTENTION

Demages by overloading of the electronic component!

⇒ To comply with the EMC-requirements it is absolute essential to use shielded cable for the control wire.

Control terminal strip X52 on NR16236

Terminal X52	Designation	Function for the regenerative feedback modules
1	P24V	Jumper must always be inserted between 1 and 2
2	NR_EIN	
3		Not inserted
4		
5	Changeover standby / run	If the terminal is jumpered, the “Run” mode is forced; e.g. signaling relay with the function "braking operation”. If the terminals are open-circuit, the operating mode is defined by evaluating the internal current sensing. The terminals may only be jumpered using floating contacts.
6		
7	Signaling relay Ready	When the unit is ready, the contact is closed; if the unit is not ready, because e.g. the line supply voltage is not OK or there is an overload, the contact is opened for at least 2 seconds. Load capacity: 250V AC 5A / 30V DC 5A
8		

Fig. 3-12: Control terminal strip X52

3.8 Serial interface

The supply module can be controlled and parameters read-in and read-out via the serial interface on the SN11027 control board. The serial RS232 and RS485/422 interfaces are connected to a common connector X16 (15-pin sub D connector with pins). The interface is automatically changed-over.

Caution: It must be guaranteed that data is only transferred through one interface, and the other interface is in an inactive condition.

Data transfer protocol

The RS232 and RS485/422 interfaces support the USS protocol, where a PLC is used to control the drive converter. The USS protocol (universal serial interface protocol) defines an access technique according to the master-slave principle for communications via a serial bus.

The data transfer protocol is permanently specified. Only telegram type 2, 2/6 words (20 bytes) is supported.

Data transfer parameters:	Protocol	4/6 words
	Baud rate	9600
	Parity	Even
	Stop bits	1

Connector assignment X16

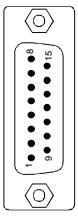
Connector pins X16		RS232	RS485/422
	2	TxD	-
	3	RxD	-
	6	GND	GND
	7	-	RxD-
	8	-	RxD+
	14	-	TxD-
	15	-	TxD+

Fig. 3-13: Connector assignment X16

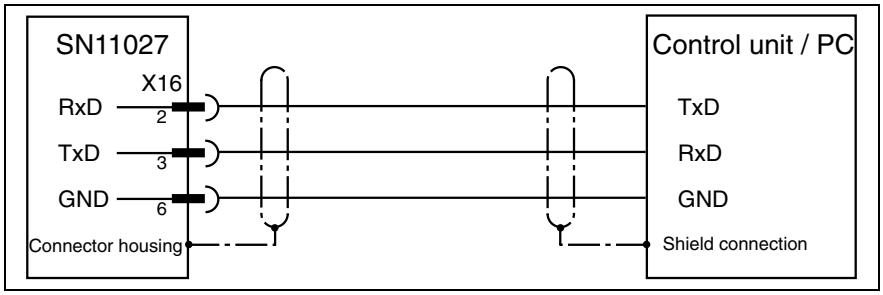


Fig. 3-14: RS232

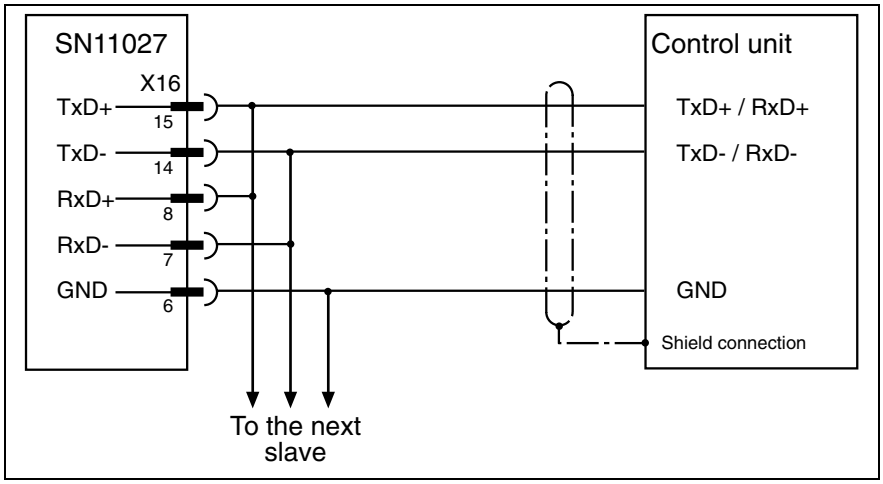


Fig. 3-15: RS485/422 2-wire connection

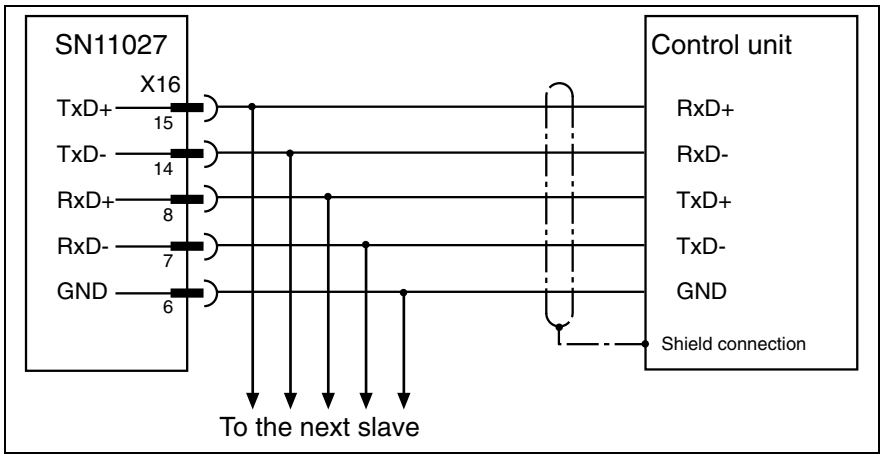


Fig. 3-16: RS485/422 4-wire connection

4 Commissioning

4.1 Connection

DANGER

Warning against hazardous voltages

After the line supply voltage has been powered-down, the unit can still have hazardous voltages at the DC link capacitors. As a result of this, the power supply can still be maintained for some time (the fan runs on). Work may only be carried-out at the unit after it has been absolutely ensured that there are no hazardous voltages at the input and output terminals.

Connect the power and control circuits according to the terminal assignments (refer to Section,) and the connection diagram for the control terminal strips.

4.2 Setting the unit configuration

The unit configuration can be set using coded plug-in jumpers. The position can be taken from the terminal layout diagram and the function, from the table below.

Jumper	S1	S2	S3	S4	S5	S6	S7 – S12
Inserted	No function	Edge controlled	German	Address 1	Address 2	Address 4	Spaces where unused jumpers can be located
Not inserted		Status controlled	English	-	-	-	

Fig. 4-1: Unit configuration, coding jumpers

Setting the display language

The display language can be toggled between German and English using jumper S3.

Setting the interface address

The address of the serial RS232 interface cannot be set; address 0 must be sent in the address byte. The address of the serial interface (only RS485) can be set from 0 to 7 binary.

Powering-up / down the supply module

The supply module is powered-up from the terminal strip via input X11.2 “On” or via the control word of the serial interface (X16), e.g. from the REFU*win* operator control program.

You can changeover from static to edge-controlled operation using jumper S2. The selected operating mode is valid for both control signals.

Terminal strip

The power-on command is initiated by connecting a positive voltage at input X11.2.

Static operation:

+24 V = power-on 0 V = power-off

Edge-controlled operation:

Edge 0 to +24V = power-on 0 V = power-off

Serial interface

The power-on command is initiated by setting the ON bit in the interface control word (refer to the USS protocol instructions).

Edge-controlled operation:

Edge 0 to 1 = power-on 0 = power-off

The interface is only activated for an edge control. The terminal strip signals still keep their function. The command source is not changed-over

If the system is only to be powered-up and powered-down via the interface, then input X11.2 “On” must be connected to terminal X11.1 “P24V” before the line supply voltage is connected, and the “Edge-controlled operation” function must be selected. After the line supply voltage is connected, an edge is not recognized at the terminal strip, and the system can be powered-up via the interface.

The system can always be powered-down via the terminal strip.

The “ON” control bit is not taken into account if the interface is not activated.

4.3 Powering-up

The unit is powered-up by connecting P24 V to X11.2. After the power-on command, the DC link capacitors are charged-up via an auxiliary contactor and series resistors. If this operation runs correctly, the charged capacitors are then connected to the line supply via the main contactor and bridge rectifier. The gating pulses for the power section (regenerative feedback) are enabled and the inverter is enabled.

Depending on the external control, either the “Standby” or “Run” mode is active.

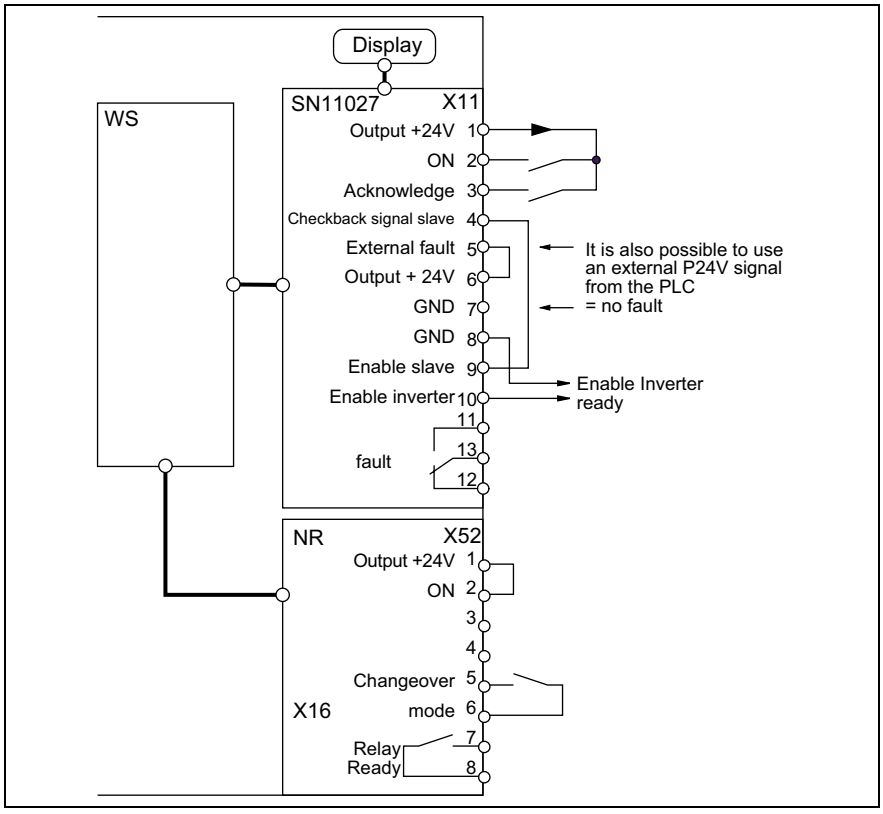


Fig. 4-2: Connection diagram, supply module

4.4 Changing-over the operating mode

For drives, which don’t continually regenerate into the line supply, it is practical to changeover the operating mode. The “Run” mode is forced when terminals X52.5 and .6 are connected (jumpered).

Changing-over using the programmed drive converter signaling relay, e.g.

- ⇨ “Run” signaling relay for drives which are not continuously active
- ⇨ "Braking operation” signaling relay for drives which are continually active, but seldomly brake.

4.5 Ready signal

The “Ready” signal is output when the inverter is enabled (P24V at terminals X11.10). The additional signaling relay, ready (terminals X52.7/8) has a lower priority, and does not have to be evaluated.

If a signal is not output, the causes can be as follows:

Cause	Remedy
The DC link voltage is either not present, is too high or too low	Check the wiring; force the “Run” mode if a high dynamic regenerative feedback power is the cause.
The line supply is either not present, is too high or too low	Check the wiring and fuses, measure the line supply voltage
Heatsink temperature too high	Ensure that the air intake is not restricted
Power section fault	Call Customer Service

Fig. 4-3: Cause and remedy if there is no signal

4.6 Operating display

The actual values and operating status, alarms and faults can be displayed in the integrated 32-digit display.

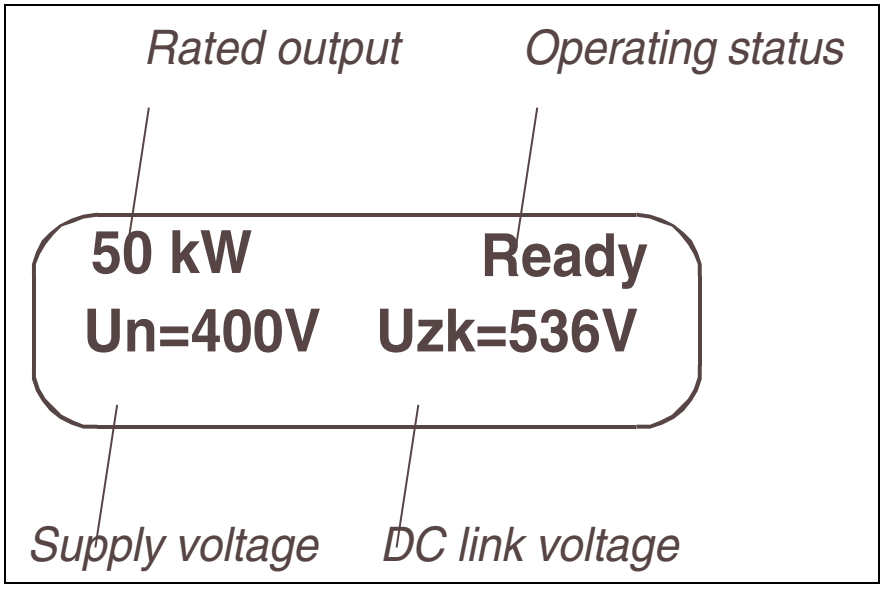


Fig. 4-4: Operating display

5 Fault display and fault diagnostics

5.1 General information

If a fault occurs, the line contactor is switched-out and the power section goes into a no-voltage condition. The appropriate fault message is displayed.

A maximum of ten fault messages can be saved in the SN11027 fault memory; these are not lost if the power fails. It is only possible to call-up the fault memory via the serial interface. The particular field (0..9) of the fault memory is called-up with the index word. The fault memory can be read-out using the REFU*win* software tool.

5.2 Fault signal

If the unit has a fault, then the fault relay changeover contact changes position:

Terminal X11.11/13 closed -> no fault

Terminal X11.12/13 closed -> fault

We recommend that this fault relay is included in the fault circuit.

5.3 Fault acknowledgement

After the unit has been fault tripped, it is not possible to power it up again until this fault has been acknowledged. It is not possible to acknowledge the fault until the cause of the fault has been removed.

There are several ways of acknowledging the fault message:

- ⇨ By pressing the reset button S13 on the SN11027 control board.
- ⇨ Connecting an H signal (+24 V) to terminal strip 11.3 (fault acknowledgement). To acknowledge a fault, the edge has to change from a low to a high.
- ⇨ Sending the appropriate control word via the serial interface, e.g. using REFU*win*.

5.4 Fault display

You should always first evaluate the fault display. Additional information can be taken from the block of LEDs on the regenerative feedback control NR16236.

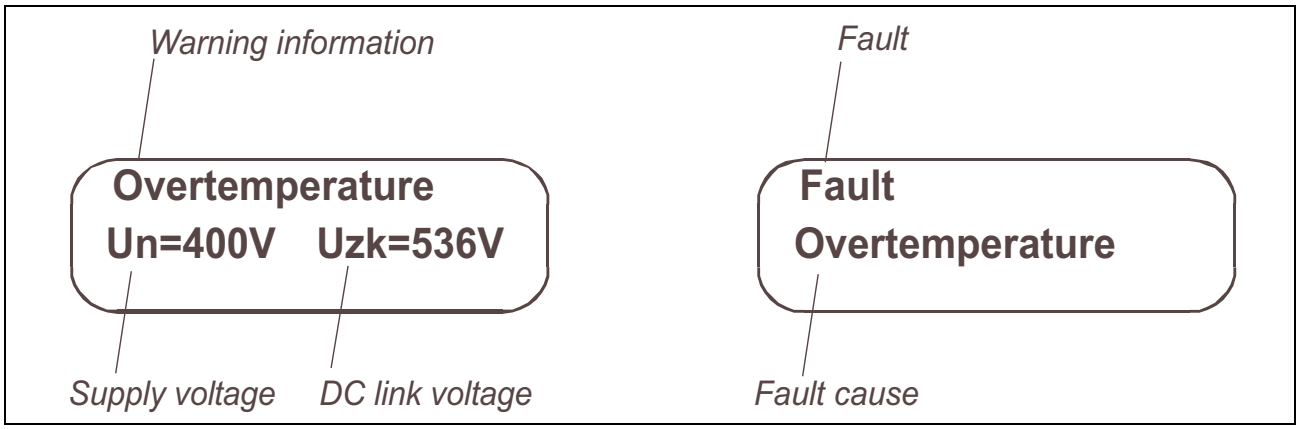


Fig. 5-1: Fault display, warning information and fault

5.5 Fault messages – cause and remedy

No.	Designation	Message
	Cause	**Remedy / Comment**
1	External	
	An H signal is present at terminal strip X11.5 (input, external fault).	
2	Slave	
	The master line rectifier/supply unit does not receive a checkback signal (H signal) from the slave rectifier/supply unit.	Check the checkback signal cable from X11.10 (slave) to X11.4 (master); for solo operation, a jumper must be inserted between X11.4 - X11.9, otherwise the slave has a fault/error condition.
3	DC link voltage too high	
	The DC link voltage is increased due to the motor regenerating into the DC link in the generator mode. The fault is initiated when the limit value $V_{DC\ link\ max}$ > 830 V.	If the fault occurs when braking, set the down ramp of the drive converter ramp-function generator slower. Force the “Run” mode by installing a jumper between X52.5 – X52.6
4	DC link voltage too low	
	During operation, the DC link voltage drops below the limit value: $V_{DC\ link\ min}$ < 400 V	The main contactor contact is interrupted; defective line supply rectifier, line supply voltage too low.
5	Power supply failure	
	This is only initiated in conjunction with a DC link voltage which is too low when one or several phases fail.	
6	Line supply voltage too high	
	This does not occur during operation, but only in the “Ready to power-up” status, if the line supply voltage is too high in order to protect the DC link capacitors from being over-charged.	
7	Overtemp unit (unit has an overtemperature condition)	
	The measured heatsink temperature is too high. The unit is fault tripped at 70 °C	The ambient temperature is too high; defective fan; fan filter blocked; defective NTC (temperature sensor).
9	Main contactor	
	The main contactor does not provide a checkback signal. The line contactor either does not pull-in or falls-out during operation	Check the main contactor control voltage; check the auxiliary contact for the checkback signal
10	Pre-charging	
	After power-on, the DC link voltage charge status with respect to time is monitored. The pre-charging operation is interrupted if inadmissible deviations occur.	Check whether there is a short circuit between terminals C and D or a ground fault at terminal C or D.

Fig. 5-2: Fault messages – cause and remedy

5.6 Fault display on the regenerative feedback control NR16236

If the unit is shutdown due to a fault, there is a panel with 9 LEDs on the NR16236 regenerative feedback control (also refer to the terminal layout diagram) - information on the fault cause. With the exception of LEDs H1.1 and H1.2, the other LED displays are only updated if there is an ON command or a fault. If you wish to identify the cause of the fault, then a new ON command may only be issued, if the fault display was evaluated. After the supply voltage has been connected for the first time, displays can be random which have no relevance. All of the LEDs are updated after the ON command was issued.

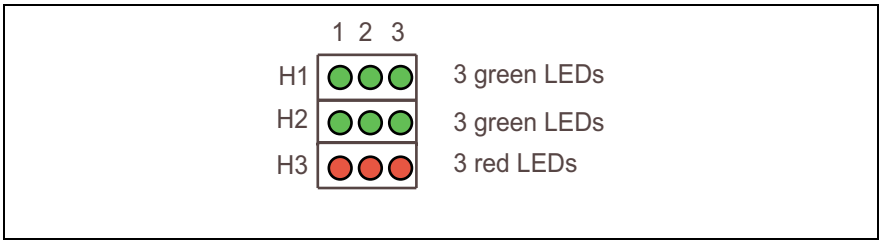


Fig. 5-3: LEDs

LED	Significance	Explanation
H1.1	Power section enabled	The IGBT power transistors have been enabled; for fast line supply fluctuations or for overcurrent conditions, the LED briefly goes dark, as the power section briefly inhibits itself.
H1.2	Operating mode	If the LED is lit, then the standby mode is active.
H1.3	Line supply OK	If the LED is no longer bright after a fault trip, then the line supply voltage was the cause due to overvoltage/undervoltage.
H2.1	Main contactor ON	If the LED is dark after a fault trip, then the fault is in the main contactor.
H2.2	n. c.	
H2.3	$V_{DC\ link}$ OK	If the LED is dark after a fault trip, then the DC link voltage was the cause due to overvoltage/undervoltage.
H3.1	General fault	Displays a general fault trip
H3.2	Power section fault	The fault trip was due to a power section fault
H3.3	Overload	The fault trip was due to an overload fault

Fig. 5-4: Explanation of the various LEDs

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Printed in Germany
DOK-RD500*-RD42*******-IB03-EN-P