

MANUAL

Digital Servo Controller DPC – 4xx – AC for EC-Servo-Motors AC Induction Motors



Edition / Version

06-2013 V 03

Stegmaier-Haupt GmbH
Industrieelektronik-Servoantriebstechnik
Untere Röte 5
D-69231 Rauenberg
Tel.: 06222-61021
Fax: 06222-64988
Email: info@stegmaier-haupt.de
Http: // www.stegmaier-haupt.de

1 Contents

2	Basic informationen	3
2.1	History	3
2.2	Further products	3
2.3	Engineering instructions (MANUAL).....	3
2.4	Validity	4
2.5	Designations and symbols	4
2.6	Scope of delivery	4
2.7	General product information	5
2.8	Application / build / features	6
2.9	Safety regulations	8
2.10	Commissioning	10
2.11	Safety advices	11
2.12	Intended applications	12
2.13	Regulations and guidelines	13
2.14	Risks	14
2.15	Technical data	15
3	Mechanical Installation	19
3.1	Importen notes	19
3.2	Device version / Dimension.....	20
3.3	Dimensions accessories	31
4	Electrical Installation	33
4.1	Important notes	33
4.2	Block diagram	35
4.3	Connection diagram	37
4.4	Connectors	38
4.5	EMC	39
4.6	Isolation	40
4.7	Mains connection	41
4.8	Auxiliary voltage connection	43
4.9	Brake	43
4.10	Motor power connection	44
4.11	Regenerative circuit	45
4.12	Regen circuit	46
5	Control Connection	47

Basic informationen

5.1	Digital input	47
5.2	Safety input RFE (Rotation enable)	48
5.3	Digital logic outputs (open emitter)	49
5.4	Interface RS 232	52
5.5	CAN-BUS	53
5.6	Resolver - connection	54
5.7	Encoder TTL Connection	55
5.8	SIN COS 1Vss Connection	56
5.9	Rotor position encoder – connection via a bl-tacho	57
5.10	X8 TTL-Encoder output or input (2)	58
5.11	X8 as TTL Encoder output	59
5.12	LED displays on the Servo	60
5.13	Error displays on the servo	61
5.14	Warning signals	62
5.15	Measured data	63
5.16	Output stage temperatur	64
6	Warranty	65
6.1	Warranty	65

Basic informationen

2 Basic informationen

2.1 History

Version	Modification	Date
07-2012 - V01	Complete revision	01.07.2012
07-2012 - V02	Chapter titel / logo	12.12.2012
06-2013 - V01	Warning signals/Safty/Scope of delivery/temp.-graph	01.06.2013
06-2013 - V02	Chap. Electrical Installation Conductor cross section of spring terminal complement	10.06.2014
06/2013 – V03	Error list / Alarms / Indicators (Chapter 5)	18.11.2014

2.2 Further products

Digital servo-amplifiers for small power values	>>>		DS205, DS403
Analog three-phase servo-amplifiers TVD3, TVD6, AS	>>>		Series
Analog dc servo-amplifiers TV3, TV6, TVQ6	>>>		Series
Thyristor current converters 1Q, 4Q, Servo	>>>		Series Classic 200W to 800kW
DC and ac servo-amplifiers for battery operation A2, A3, D3			Series BAMO
Analog and digital			Series BAMOBIL Series BAMOCAR

2.3 Engineering instructions (MANUAL)

- | | | | |
|----|--------|------------|---------------------------------|
| 1. | MANUAL | DPC 4xx-AC | Hardware |
| 2. | MANUAL | NDrive2 | Software |
| 3. | MANUAL | DS, DPC | commissioning - troubleshooting |

Use all three MANUALs for the engineering, the installation, and the commisioning!

CD (DOKU-SOFT) supplied with the delivery of the units.




The hardware MANUAL comprises warning and safety advices, explanations of standards, mechanical and electrical installation advices.

The MANUAL must be available for all persons who are concerned with the unit.

2.4 Validity

Hardware state:	
Firmware state:	

2.5 Designations and symbols

Unit:	DPC 440-x, DPC460-x
User:	Manufacturers or operators of machines or installations in the industrial sector (B2B, secondary environment).
Dealer:	Stegmaier-Haupt GmbH Industrieelektronik
	Caution – Danger to life! High voltage!
	Warning! Important!
	Dangerous electric fields!

2.6 Scope of delivery

DPC4xx - devices
plug Phoenix 10pol, plug Phoenix 11pol
Plug Phoenix 4pol, D-plug 9pol, D-plug 15pol
(ventilator box plug Phoenix 2pol)
documentation, CD Unitek-Doku-soft
in Box

Not included
programming cable

Basic informationen

2.7 General product information

The digital 3-phase current servo amplifiers DS/DPC xxx in combination with the synchronous servo motor (EC motor) or the asynchronous servo motor (ac motor) provide a drive solution free of maintenance and with a wide dynamic control range.

The drive displays the well-known good control characteristics of dc drives without the disadvantages of the carbon brushes' wear and the commutation limits.

For synchronous motors the generated heat in the motor only occurs in the stator, the rotor remains cold. The motors can easily be cooled via the surface (efficiency up to 96%).

The physical characteristics correspond to those of dc motors, i.e., the current is proportional to the torque and the voltage is proportional to the speed. The speed is steadily controlled up to the current limit (max. torque. In case of an overload the speed drops and the current remains constant.

The speed/torque characteristic is rectangular.

Current, speed, and position are precisely measured. The field frequency is not controllable, it is automatically adjusted.

The rotor moment of inertia is notably smaller and the limiting performance is higher which results in up to 5 times higher acceleration values.

Asynchronous servo motors are less expensive and do not require solenoids in the rotor.

The control characteristics are very good due to the space-vector control, the performance and the efficiency are lower. Due to the heated rotor it is necessary to use a motor fan for large control ranges.

The EC and ac motors have the protection rating IP65.

The motor voltages and the motor currents are sinusoidal. A maximum motor efficiency is achieved by means of a compensating current control.

DPC 4xx drives can be used as single-axis position amplifiers or torque or speed amplifiers.

The position and speed actual value is generated in the encoder unit (resolver, incremental, or SIN/COS encoder). The encoder pulses are emitted from the amplifier for a superordinate PLC/CNC control.

The control circuits of current, speed, and position are PID controllers which are easy to program. They can be programmed by means of the PC Software NDrive2.

The communication with superordinate controls is effected by means of BUS systems (standard CAN-BUS, RS232) or by analogue interfaces.

Note:

For dc, ac, or EC servo amplifiers which are supplied by a bus circuit, it must be checked that the energy is fed back into the bus during brake operation (lift drives, winding machines, great centrifugal masses).

External ballast resistor.

2.8 Application / build / features

Machines and installations of all types with a drive power of 35kW under hard application conditions especially as 4Q-servo-drive

- highly dynamic acceleration and braking cycles
- a wide control range
- a high efficiency
- small motor dimensions
- a uniform, accurate and smooth running

For speed or torque control or combined speed/torque control incorporated within or independent of position control loops..

Suitable for:

pitch and azimuth drives

as well as component inserting machines, testing machines, sheet-metal working machines, machine tools, plastic working machines, assembly machines, knitting and sewing machines, textile working machines, grinding machines, wood and stone working machines, metal working machines, food processing machines, robots and handling systems, conveyors, extruders, calenders, and many other machines and installations.

Build:

- Robust units for switch cabinet mounting, steel housing, according to the VDE, DIN and EC regulations, protection rating IP20, VGB4
- Cooling unit for insertion mounting or switch cabinet mounting
- Standard digital control electronics
- Power electronics of 40 and 60A (S1 operation)
- Power input voltage 230V~ to 400V~
- Diode-decoupled emergency power battery input
- Independent 24V chopper power supply unit for the auxiliary voltages

Galvanic isolation

- between the housing and all electric parts
- between the auxiliary voltage connection and the power section and the control electronics
- between the power section and the control electronics
- between the control electronics and the logic inputs
- between brake - output

The distance of air gaps and leakage paths adhere to the EU standards.

Components used:

- completely isolated IGBT power semi-conductors, comfortably over-dimensioned
- only components customary in trade and industrially standardised are used
- SMD equipment
- LED displays , 7-segment displays

Features:

- ✓ EMC protected steel housing
- ✓ Shock and vibration-proof build
- ✓ Cooling unit for insertion mounting or switch cabinet mounting
- ✓ Direct mains connection 230V~ to 480V~
- ✓ Charging current limiting
- ✓ Phase monitoring
- ✓ Battery connection for emergency operation, up to 400V=
- ✓ Independent auxiliary voltage connection 24V=
- ✓ Digital interfaces RS232, CAN-BUS (further option)
- ✓ Analog inputs, programmable differential inputs
- ✓ Digital inputs/outputs, programmable, optically de-coupled
- ✓ Output for brake 24V/3A with load watchdog
- ✓ logic for enable and the output stage switch, emergency stop function, safety
- ✓ BTB ready for operation, solid state relay
- ✓ Position, speed and torque control
- ✓ Encoder systems: resolver, TTL incremental encoder, SINCOS 1Vss, rotor position
- ✓ Encoder output
- ✓ Static and dynamic current limiting
- ✓ Uniform, completely digital control unit
- ✓ Intrinsically safe and short-circuit proof power section (EN50178)
- ✓ Anti-interference choke in the bus circuit
- ✓ Integrated ballast circuitry
- ✓ DC power bus
- ✓ Processor-independent hardware switch-off in case of short-circuits, circuits to earth, over-voltage, under-voltage, and over-temperature of the amplifier or the motor
- ✓ **Option:** Bus circuit power supply unit for a potential-free internal 24V auxiliary voltage

2.9 Safety regulations

Elektronic equipment is not fault proof!

Caution – High voltage

> 900V AC/DC ~/=

Shock hazard! / Danger to life!

Discharge time of the bus circuit >4min!



Before installation or commissioning begins, this manual must be thoroughly read and understood by the skilled technical staff involved. It must be ensured that the documentation (manuals) and thus, the knowledge of the unit and especially the safety advices must be available for all persons who are concerned with the unit

If any uncertainty arises or if any function is not or not sufficiently described in the documentation, the manufacturer or dealer should be contacted.

Any incorrect installation/connection may damage the device!

Any incorrect programming may cause dangerous movements!

Intended applications:

The devices of the DPC 4xx -AC series are power electric parts used for regulating energy flow. They are designed to control EC synchronous motors and ac asynchronous motors in stationary machines or installations for industrial applications.

For applications in residential areas additional EMC measures are necessary.

Any other type of application must be approved by the manufacturer.

The user must draw up a hazard analysis for his end product.

Protection rating IP20 for stationary switch cabinet mounting.

Power supply connection only to an earthed three-phase current system.

Battery connection for an emergency operation (observe the note on page xx)

Operation only allowed when the switch cabinet is closed or locked!

The control and power connections may be voltage-carrying without the axis operating!

The discharge time of the bus circuit is superior to 4 min!

Measure the voltage before any disassembly!



Basic informationen

The user must draw up a hazard analysis for his machine, vehicle, or installation.

The user must ensure that in the event of:

- device failure
- incorrect operation,
- loss of regulation or control

the axis will be safely de-activated.



It must also be ensured that the machines, equipment, or vehicles are fitted with device independent monitoring and safety features.

Appropriate measures must be taken so that man as well as property are not exposed to danger due to incorrect or improper movements at any time!

During operation the switch cabinet must be closed and the safety systems must be enabled.

When the switch cabinet is open and/or the safety systems are de-activated, it must be ensured by the operator that only skilled and suitably trained personnel has access to the units.



Assembly

- should only be carried out when all voltages have been removed and the units are secured
- should only be carried out by suitably trained personnel

Installation

- should only be carried out when all voltages have been removed and the units are secured
- should only be carried out by suitably trained personnel for electrics
- should only be carried out in accordance with health and safety guidelines

Adjustments and programming

- should only be carried out by suitably trained personnel with knowledge in electronic drives and their software
- should only be carried out in accordance with the programming advice
- should only be carried out in accordance with health and safety guidelines

2.10 Commissioning

When mounting the units into machines and installations the proper operation of the units may not be started until it is ensured that the machine, the installation, or the vehicle comply with the regulations of the EC machinery directive 2006/42/EG and the EMC guideline 2004/108/EG.

On the installation and test conditions described in the chapter 'EMV advices' it is adhered to the EC guideline 2004/108/EG including the EMC standards EN61000-2 and EN61000-4.

For applications in residential areas additional EMC measures are necessary.

A manufacturer's declaration can be requested.

The manufacturer of the machine or installation is responsible for observing the threshold values demanded by the EMC laws.

2.11 Safety advices

Machinery directive

The manufacturer of the machine or installation must draw up a hazard analysis for his product. He must make sure that any unpredictable movements do not cause damage neither to persons nor to property.

Skilled personnel

Hardware

The skilled qualified personnel must feature a training and instruction for an assignment in the field of electronic drive engineering. They must have knowledge of the standards and accident prevention regulations for drive engineering applications and they must be familiar with this field of activity. Eventually occurring dangerous situations are realized.

The local regulations (IEC, VDE, VGB) are known to the qualified personnel and they are observed during the works.

Software

The skilled qualified personnel for handling the software must be trained to safely program the units in the machines and installations. Incorrect parameter settings may cause improper and impermissible movements. Any parameter settings have to be checked for faulty operation.

Acceptance tests must be thoroughly carried out according the four-eyes principle

Working environment

Incorrect handling of the units may cause damage to persons or property.

When operating the units the switch cabinet must be closed and the safety systems must be enabled! Exceptions to this are the first commissioning or if switch cabinet repair works have to be carried out by the skilled qualified personnel.

Any unit covers must not be removed!

Disconnect the power supply prior to any works on electric connections and safeguard the switch cabinet against switching-on.

Any voltages and residual voltages (buffer circuit) must be measured prior to any works on the unit. Max. permissible voltage <42V.

High temperatures (> 70°C) may arise.

The working environment may be dangerous for persons having electronic medical aids or appliances (e.g. cardiac pacemakers). Sufficient distance to these electrical parts must be observed.

Exposure

During transport and storage the prescribed and specified climatic conditions must be adhered to. The units must not be mechanically damaged. Warped and bent housing parts may influence or damage the isolation distances. Damaged units must never be installed!

The units comprise parts which may be damaged by electrostatic discharge. The general recommendations for handling electrostatic devices must be observed. Special attention should be paid to strongly isolating plastic films and synthetic fiber.

For the operation it must be ensured that the environmental conditions in the switch cabinet are adhered to. This applies in particular to the impermissible condensation on the units.

2.12 Intended applications

The devices are designed to control EC synchronous motors and ac asynchronous motors in stationary machines or installations.

Any other type of application must be approved by the manufacturer.

Protectionrating IP20.

It is only allowed to install the units in stationary switch cabinets or machine frames which are similar to switch cabinets. Industrial site of operation only.

For applications in residential areas additional EMC measures are necessary.

The user must draw up a hazard analysis for his end product.

Power supply connection only to the earthed TN three-phase current system with a maximum three-phase voltage of 480V~ (max. 280V~, phase - N (PE)). For any other types of power supply (IT, TT power supply) matching transformers have to be installed.

Voltage peaks must not exceed 1000V between the phase conductors and they must not exceed 2000V between the phase conductors and the housing.

The capacities between the clocked power modules (converter, motor, filter) result in high leakage currents. It is necessary to provide a safe and screwed earthing on the switch cabinet and the motor. Protective earth conductors must comply with the standards EN50178 and IEC 364.

Bad protective earth conductors are highly hazardous for health and life.

Protective parts for earth leakage (earth leakage circuit breakers) must be ac/dc sensitive and designed and rated according to the standards EN 50178.

For emergency battery connection it must be borne in mind that the battery voltages are at power supply voltage. All safety regulations regarding direct power supply connections must be observed (protection against accidental contact with exposed parts, short-circuit protection, etc.).

The control connections of the unit (terminals X1, pins X7, X8, X9, X10) adhere to the 'safe electrical isolation' according to the standard EN 61800-5-1. The user must ensure that the complete control wiring complies with the standards.

It must be paid attention to the equipotential bonding for components which are connected to the unit and which do not have isolated inputs and outputs (equalizing connection GND). The equalizing currents may destroy components and parts.

When measuring the isolation the units must be disconnected or the power connections must be bridged together and the control connections must be bridged together. Non-observance will cause damage to the semi-conductors in the unit.

Repeating circuits to earth and short circuits the values of which are all below the response threshold for short circuits may cause damage to the output stages (conditionally short-circuit proof acc. to standard EN 50178)

Impermissible applications

- in life-sustaining medical devices or machines
- across unearthed or asymmetrical power supplies
- on ships
- in explosive environments
- in environments with acrid fumes

Basic informationen

2.13 Regulations and guidelines

The device and its associated components can only be installed and switched on where the local regulations and technical standards have been strictly adhered to:

EU Guidelines	2004/108/EG, 2006/95/EG, 2006/42/EG, 2002/96/EG
EU Standards	EN60204-1, EN292, EN 50178, EN60439-1, EN61800-3, ECE-R100
International standards	ISO 6469, ISO 26262, ISO 16750, ISO 20653, ISO 12100
IEC/UL Regulations	IEC 61508, IEC364, IEC 664, UL508C, UL840
VDE Regulations and TÜV Regulations	VDE 100, VDE 110, VDE 160
Regulations of the statutory accident insurance and prevention institution	VGB4

EU standards and regulations observed for the components of the unit

Standard	Description	Version
EN 60146-1,-2	Semiconductor converters	2010
EN 61800-1,-2,-3	Speed-variable electrical drives	2010
EN 60664-1	Isolation coordinates - low voltage	2012
EN 61010	Safety regulations - control units	2011
EN 61800-5-1	Electric power drive systems	2010
EN 61508-5	Functional safety of electric, electronic systems	2011
EN 60068-1,-2	Environmental influences	2011
ISO 20653	Type of protection of the electrical equipment of vehicles	
ECE-R100	Conditions for battery-driven electric vehicles	
UL 508 C	UL Regulations - converter	2002
UL 840	UL Regulation - clearance and creepage distances	2005

EU standards and regulations which must be observed by the user

Standard	Description	Version
EN 60204	Safety and electrical equipment of machines	2011
EN 50178	Equipment of power plants	1998
EN 61800-3	Speed-variable electric drives - EMC	2010
EN 60439	Low voltage switching device combinations	2011
EN 1175-1	Safety of electric industrial trucks	2011
ISO 6469	Electric road vehicles	2009
ISO 26262	Functional safety of electric road vehicles	2011
ISO 16750	Electrical components - vehicles	2010
ISO 12100	Safety of machines	2011
ISO 13849	Safety of machines and controls	2011
IEC 364	Protection against electric shocks	2010
IEC 664	Isolation coordinates - low voltage	2011

2.14 Risks

The manufacturer aims to keep the remaining risks emanating from the unit as low as possible by means of constructive, electrical, and software measures.

In the field of drive engineering the following known remaining risks must be considered regarding the risks arising from machines, vehicles, and installations.

Impermissible movements

caused by:

- failure of safety watchdogs or switched-off safety watchdogs during commissioning or repair works
- software errors in upstream controls, errors in bus systems
- non-monitored hardware and software errors in actuating elements and connecting cables
- inverted sense of control
- faults during the parameter setting and wiring
- limited response time of the control features. Ramps, limits
- operations not permitted in the specifications
- electromagnetic interferences
- electrostatic interferences, lightning strikes
- failure of components
- failure in the brakes

Dangerous temperatures

caused by:

- faults during the installation
- faulty connections, bad contacts, aging
- faults in the electric safety system, incorrect types of fuses
- operations not permitted in the specifications
- negative climatic conditions, lightning strikes
- failure of components

Dangerous voltages

caused by:

- faulty earthing of the unit or motor
- faulty connections, bad contacts, aging
- faulty potential isolation, failure of components
- conductive contamination, condensation

Dangerous fields

The units, the inductive and capacitive accessories as well as the power wiring can generate strong electric and electromagnetic fields. These fields may be dangerous for persons having electronic medical aids or appliances (e.g. cardiac pacemakers). Sufficient distance to these electrical parts must be observed.

2.15 Technical data

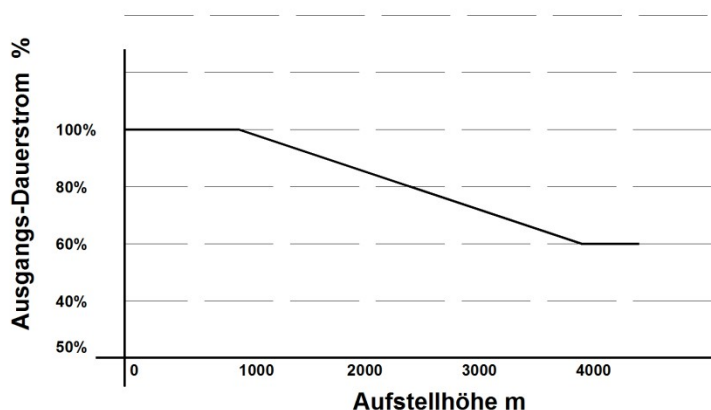
Power supply connection	3x 230V~ to 480V~ +10% 50/60Hz
Auxiliary voltage connection	24V= ±10% / 2A residual ripple <10% regenerating fuse

Data	Unit	DPC-440	DPC-460	DPC-
Supply voltage - rated value	V~	3x400 (480)		
Max. output voltage - rated value	V~eff	3x390(470)		
Bus circuit voltage	V=	560 (675)		
Battery voltage	V=	max. 400		
Max. connection power S1	kVA	28	40	
Max. power output S1	kW	25	35	
Permanent current	Aeff	40	60	
Max. peak current	Alo	80	120	
Max. power loss	W	80	150	
Clock frequency	kHz	8		
Ballast switch-on voltage	V=	790 ± 10		
Over-voltage switching threshold	V=	860 ± 10		
Min. external ballast resistance	Ω	8	8	
Input fuse	A	10	20	
Switch-off integral	A²s	150	200	
Weight	kg	12		
Dimensions h x w x d	mm	320x85x190		

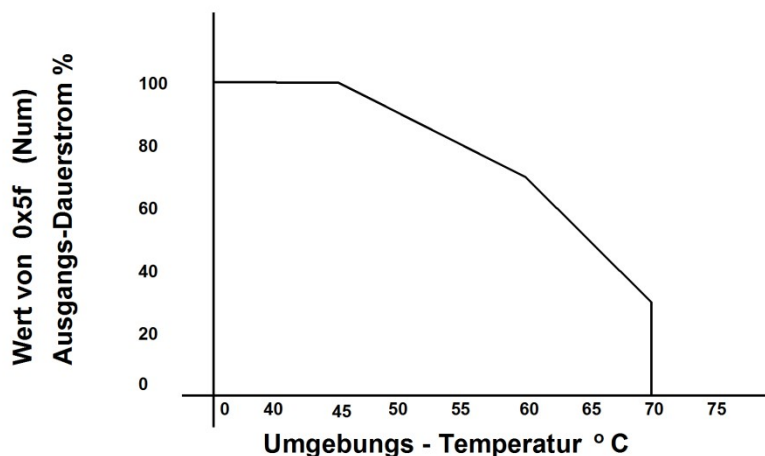
Control signals		V	A	Function	Connection
Analog inputs		± 10	0.005	differential input	X1
Digital inputs	ON	10-30	0.010	optically decoupled	X1
	OFF	<6	---		
Digital outputs		+24	0.03	optically decoupled	X1
Resolver				differential input	X7
Encoder input		>3.6V		optically decoupled	X7
Encoder output		>4.7		optically decoupled	X8
CAN interface				optically decoupled	X9
RS232 interface				9600 Baud	X10

Ambient conditions	
Protection rating	IP20, VGB4
Standards	EN60204, EN61800-2
Operating temperature range	0 to +45°C
Extended operating temperature range	+45°C to +60°C performance reduced by 2%/°C
Storage temperature	-30°C to +80°C
Humidity range	class F humidity <85% no condensation allowed! Option: humidity sensor
Site of installation	≤ 1000m above sea level 100 %, >1000m performance reduced by 2%/100m
Ventilation	Inserted cooling unit For S1 operation or RMS current > 35A use a blower
Mounting position	vertical cooling unit, performance reduced by 20% when mounted horizontally

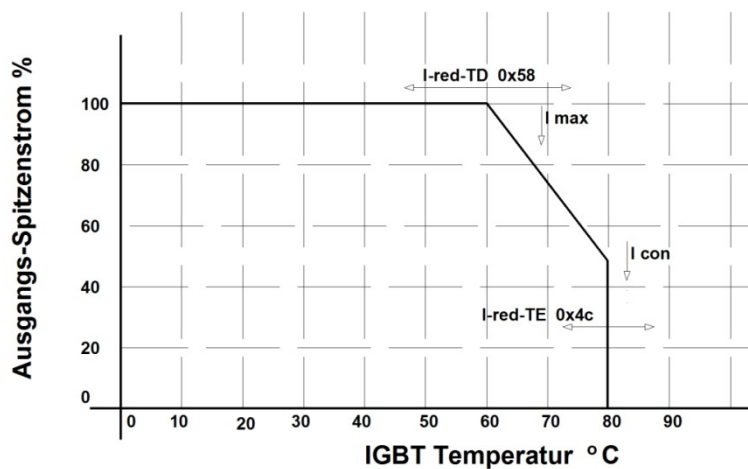
Motor current reduction depending on the installation altitude



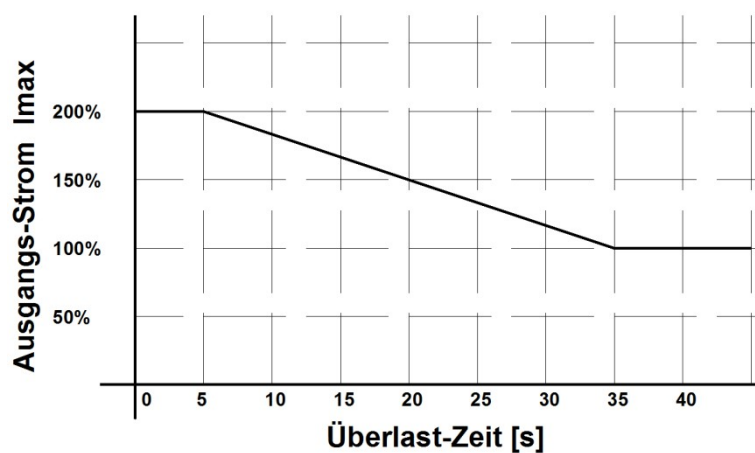
Motor current reduction depending on the ambient temperature



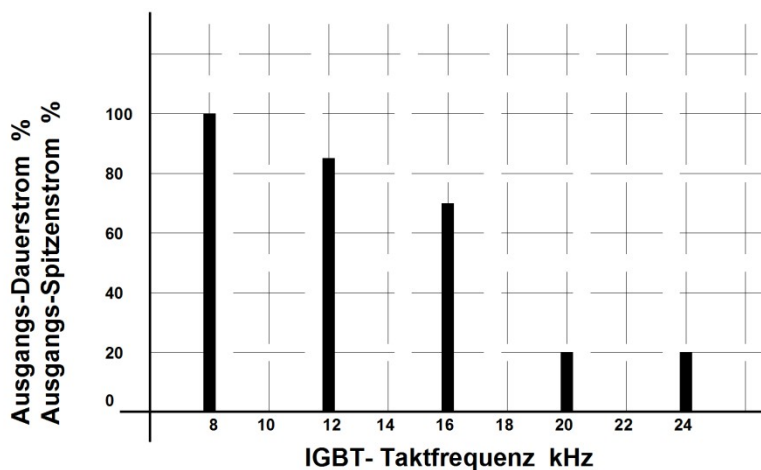
Motor current reduction depending on the stage temperature



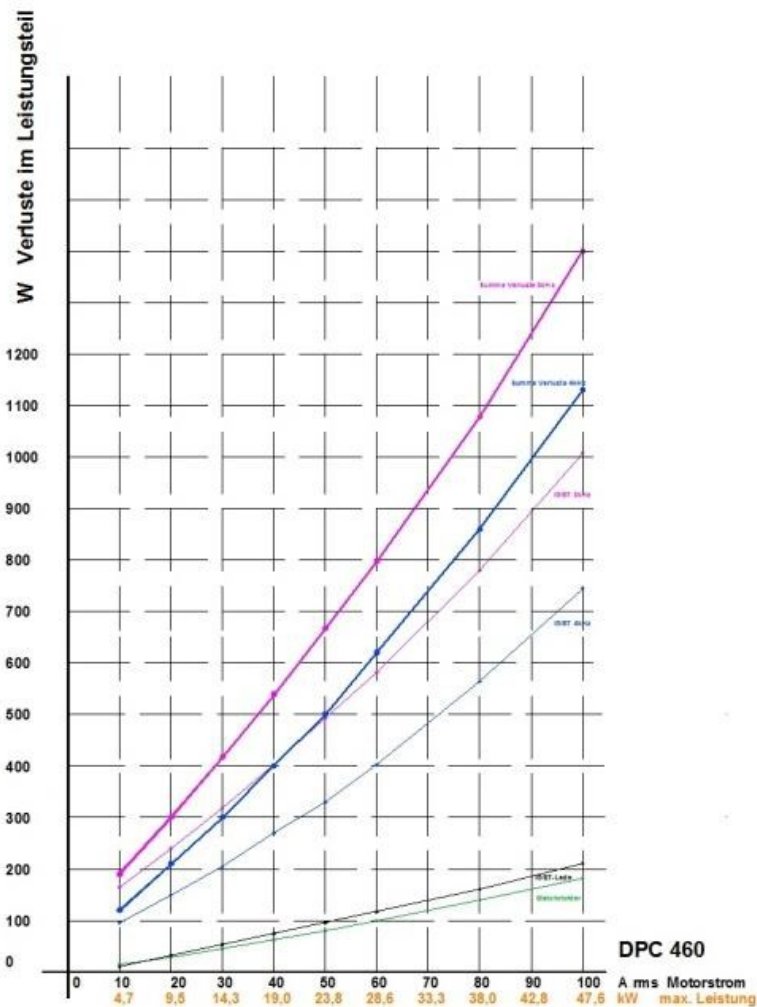
Motor current reduction depending on the power amp overload



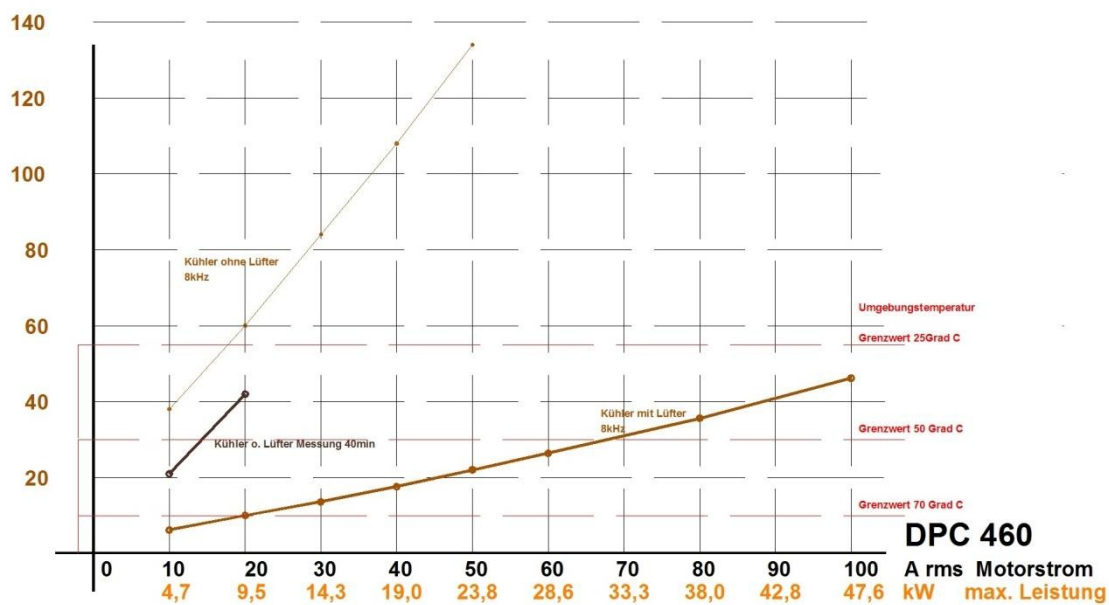
Motor current reduction depending on the output stage switching frequency



Power dissipation of the amplifier



Current performance limits when operating with and without fan set



Mechanical Installation

3 Mechanical Installation

3.1 Importen notes

Pay attention to the ESD advices.

Blank mounting surface, no lacquer (EMC surface-to-surface contact)

The unit must be safely protected in the switch cabinet against mist and water and the intrusion of metallic dust.

Check the device for mechanical damage.

Only devices in perfect working order can be mounted.

Disconnect the power supply prior to any assembly.

For installations connected to an electric power supply install the shorting plug and affix the warning signs.

The device must only mounted by suitably trained personnel.



Vertical mounting position.

Please note that there will be a performance reduction when the devices are mounted horizontally.

For insertion mounting the user must ensure that the heat losses are led off.

For switch cabinet mounting ensure that there is enough space for the discharged ventilation air (min. 100mm).

Any bore hole dimensions for the fixation of the device must be taken from the dimension diagrams or from the drilling plan, not from the device.

Drill the mounting bore holes into the mounting plate.

For insertion mounting insert the sealing. Use a screw sealing.

Insert the device and fasten the screws.

Note: Protect the device against intrusion of foreign particles (bore chips, screws, etc.)!

The filter and the choke have to be mounted near to the device

The line shields and the mounting plate must have surface-to-surface contact.

Unshielded cable heads must be kept as short as possible.

Braking resistors may become very hot (200°C).

Install the resistors such that neither persons will be injured (burns) nor damage will occur due to the heat.



Use vibration-proof screw connections.

Inside temperature of the switch cabinet: **max. 45°C**

For internal mounting ensure that the switch cabinet ventilation is sufficient.

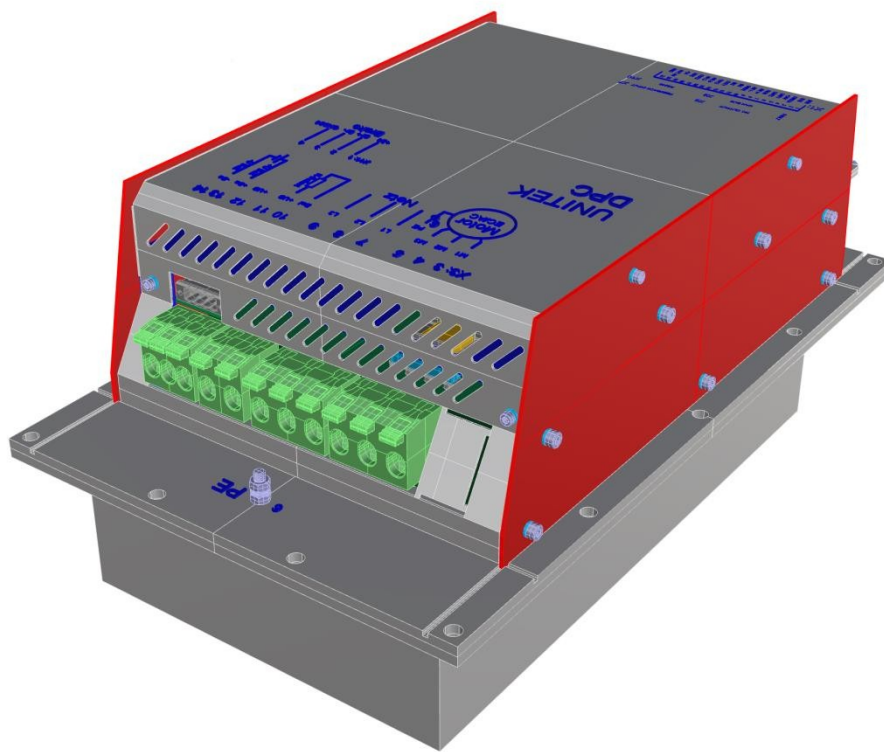
Use an air conditioning unit if the room temperatures are too high (>30°C).

Note: The operation of bedewed devices is not permissible.

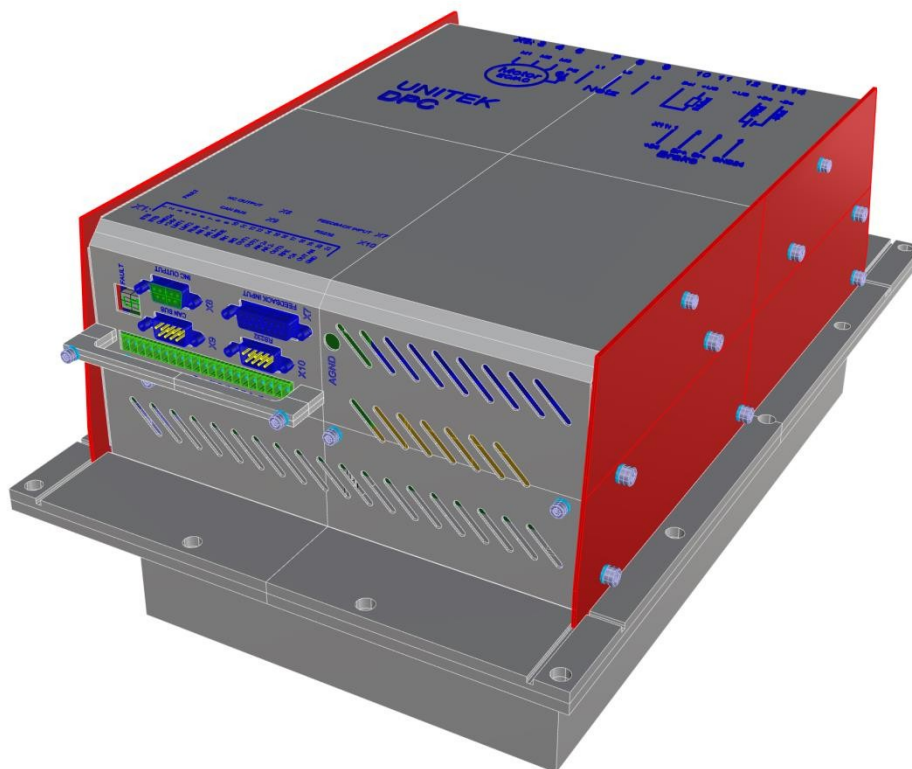
Mechanical Installation

3.2 Device version / Dimension

Through wall mounting cabinet



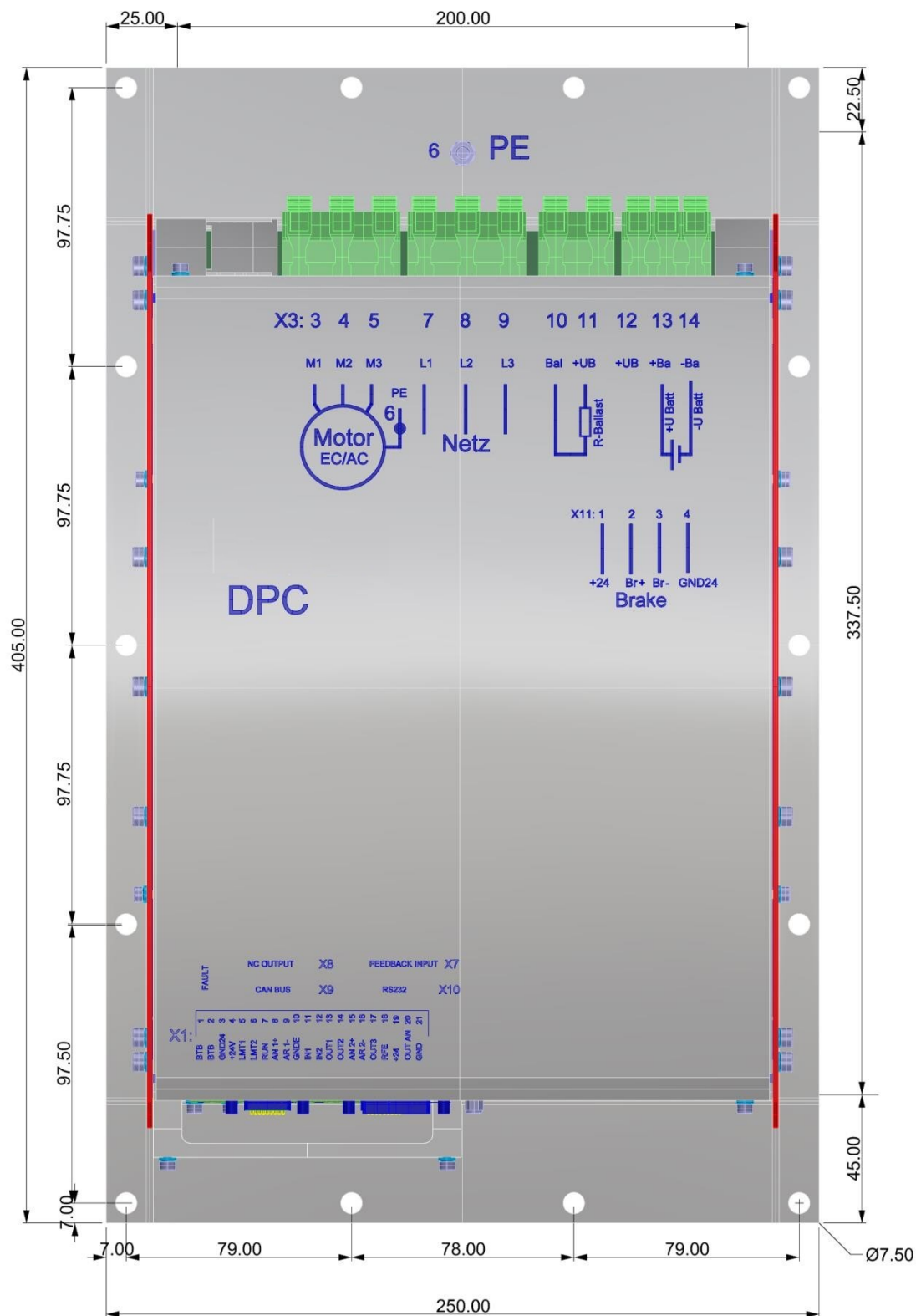
Manuals-Zeichnungen-DPC-Front-persp-publik-1



Manuals-Zeichnungen-DPC4-ruck-persp-publik-1

Mechanical Installation

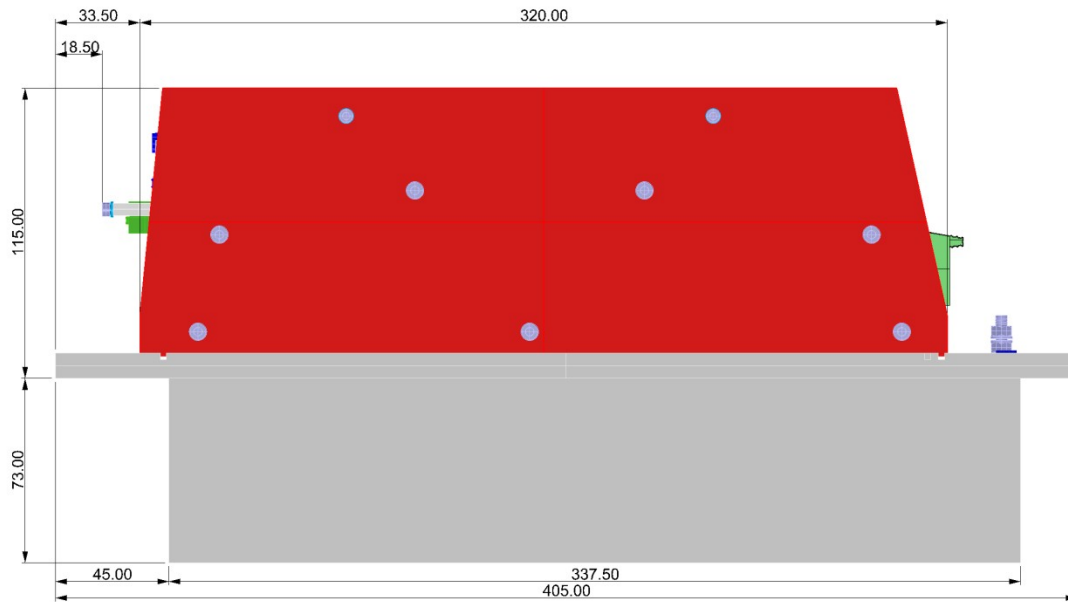
Through wall mounting cabinet



Manuals-Zeichnungen-DPC-oben-publik-1

Attachment screw M6x20 (empfohlen DIN 912)

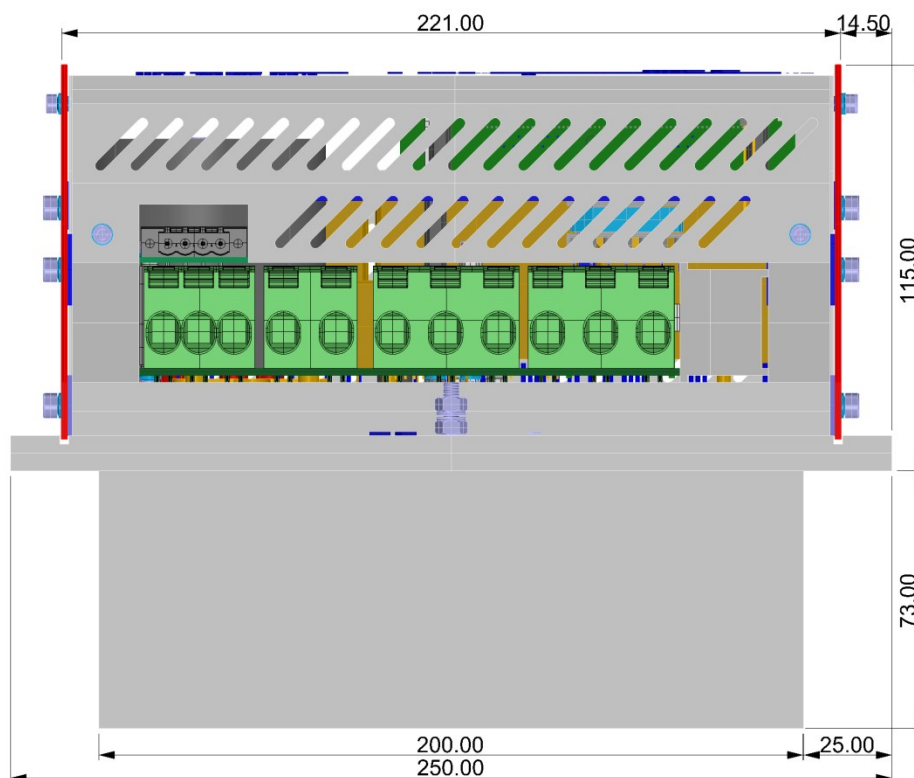
Through wall mounting cabinet



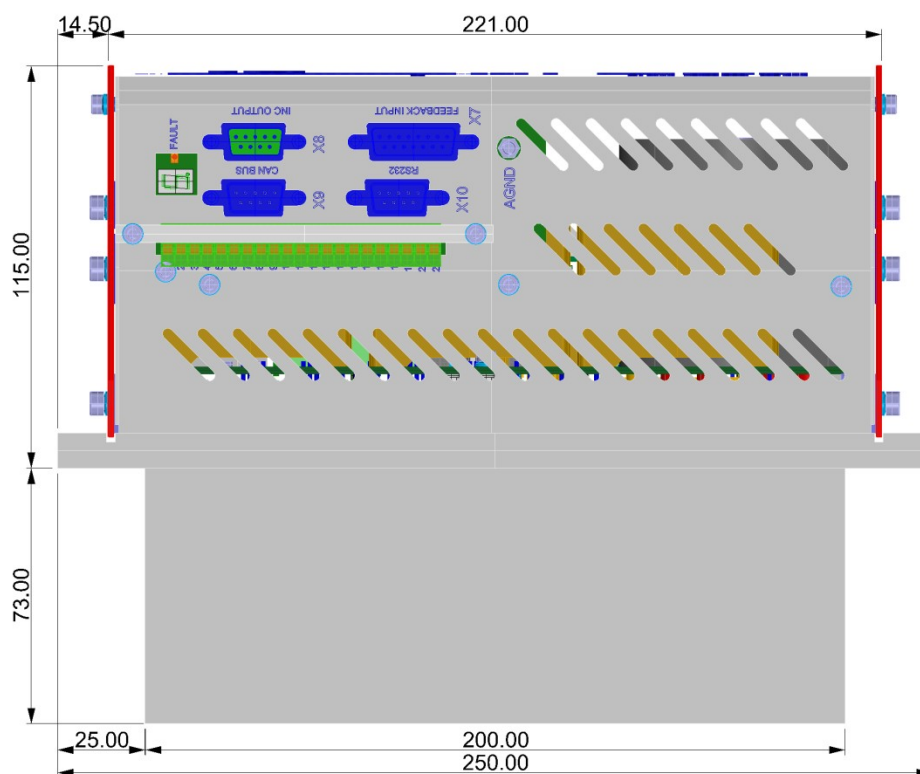
Zeichnungen-seite1-publik-1

Device version / Dimension

Through wall mounting cabinet

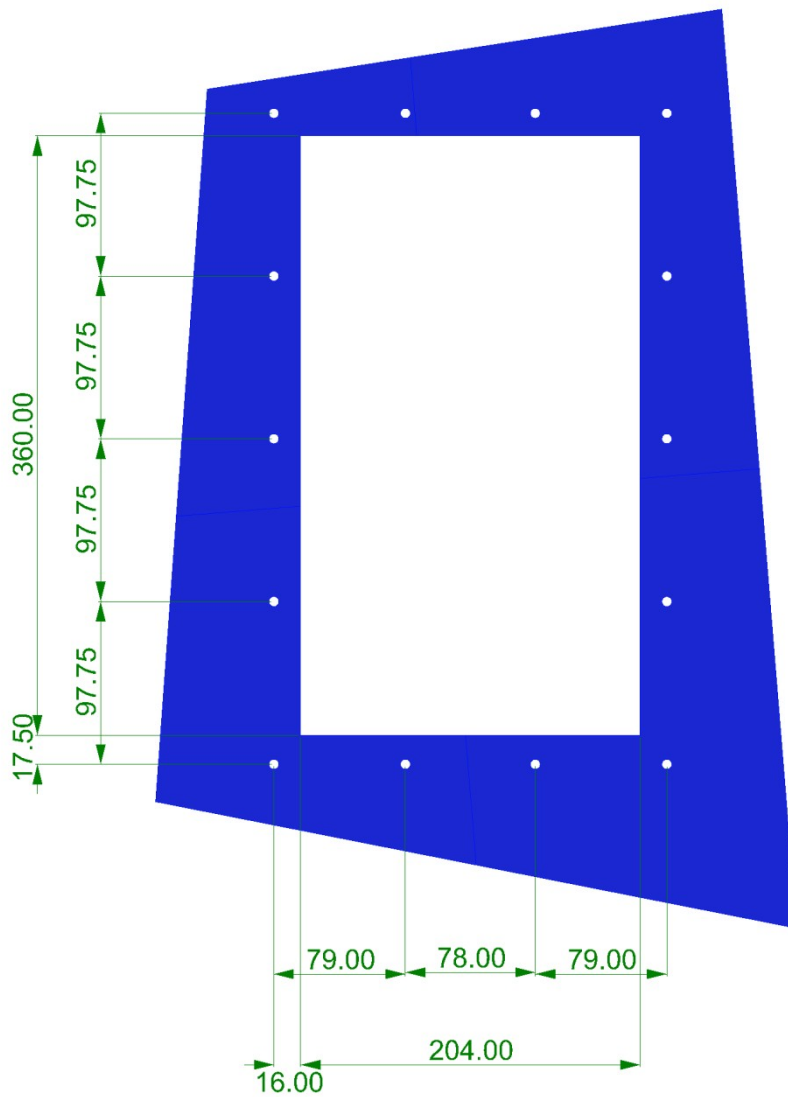


Zeichnungen-DPC-front-publik-1



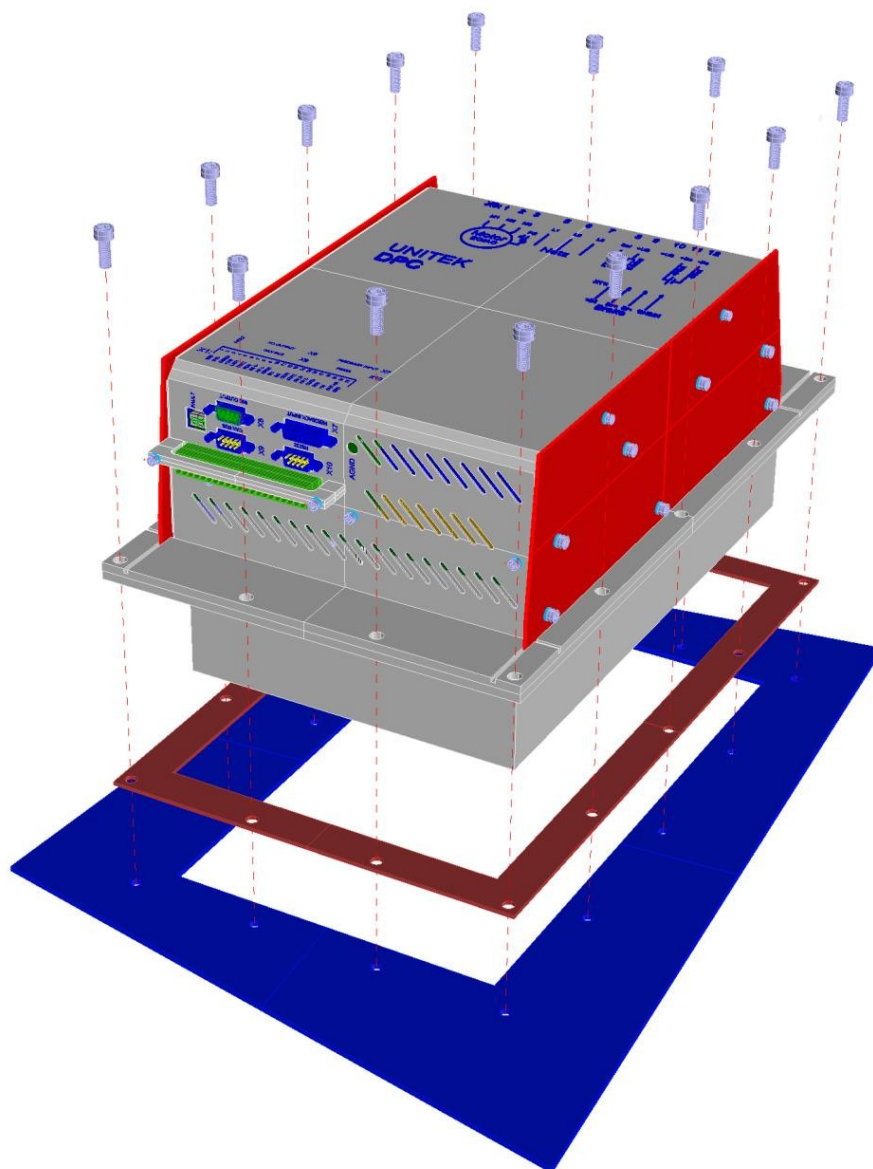
Zeichnungen-DPC-rück-publik-1

Drilling through wall mounting cabinet



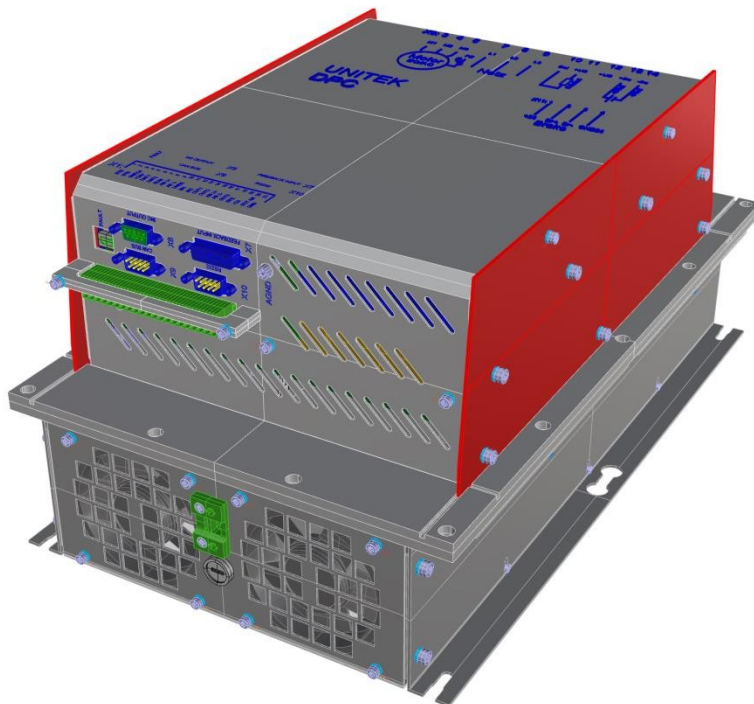
DPC-Durch-Montage-mass-1

Mounting through wall

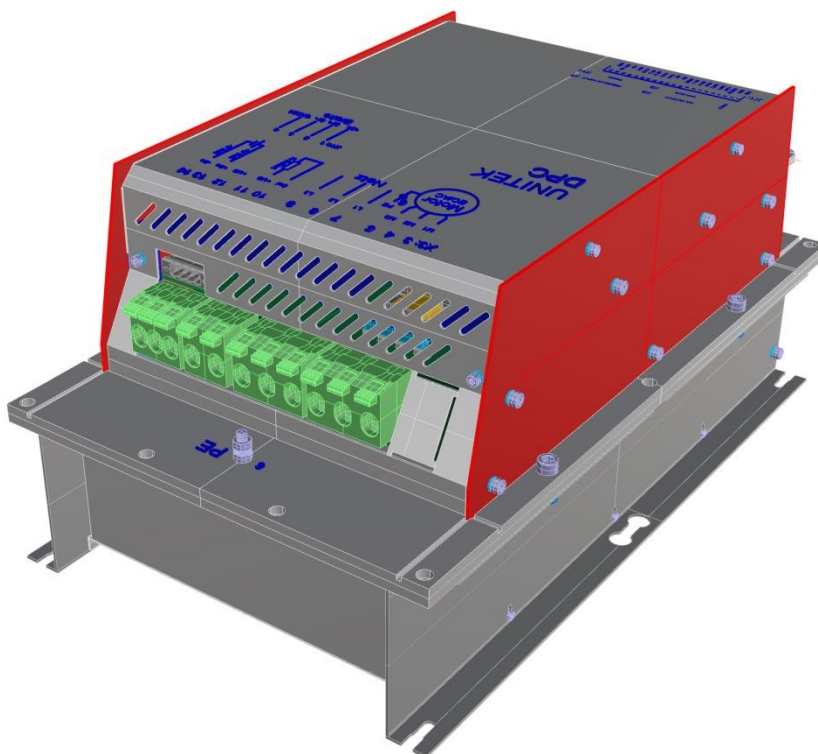


DPC-Durch-Montage-explo-1

Variante: Indoor mounting cabinet



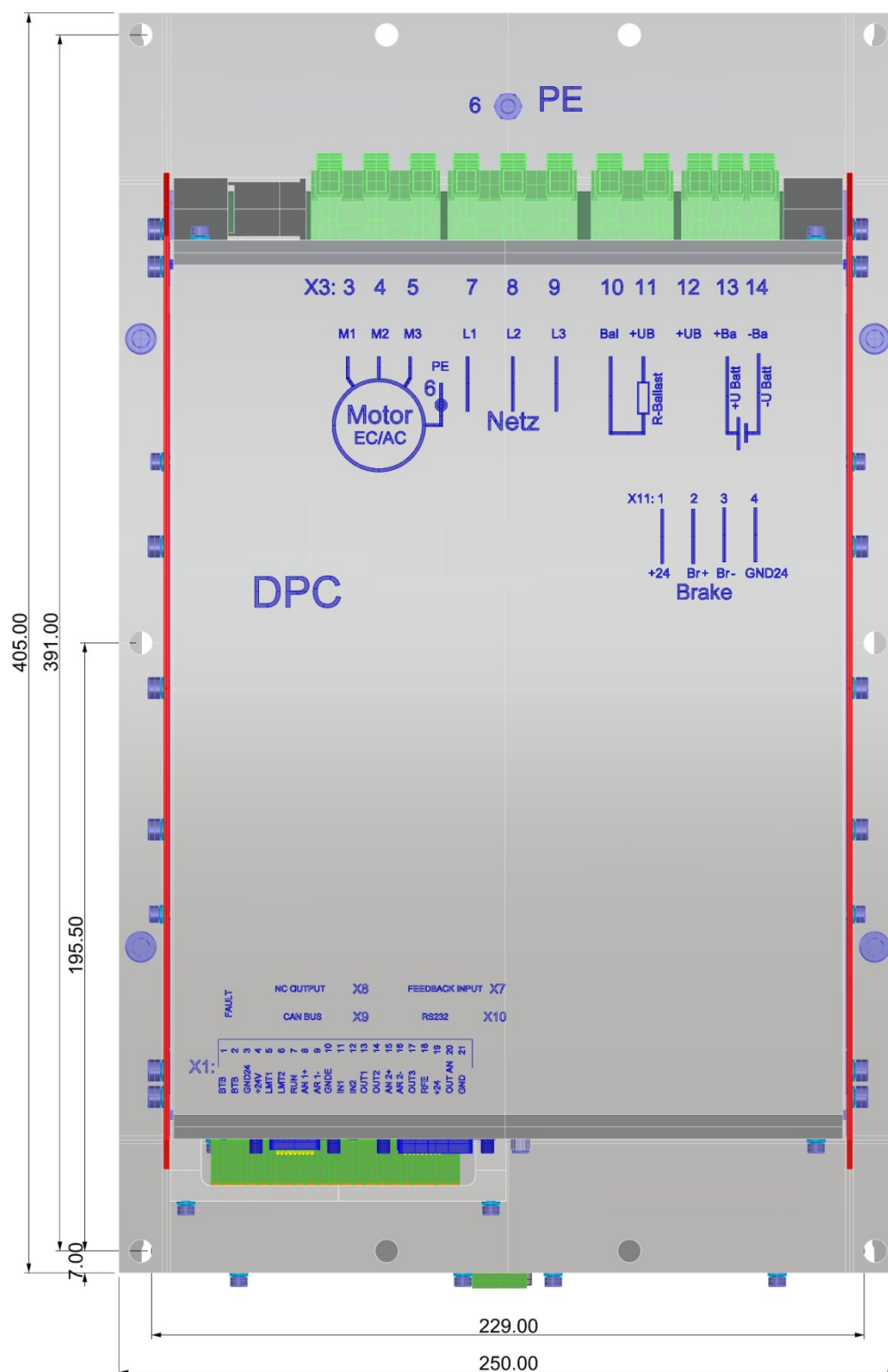
DCP-LÜ-Front-persp-publik-1



DCP-LÜ-Rück-persp-publik-1

Mechanical Installation

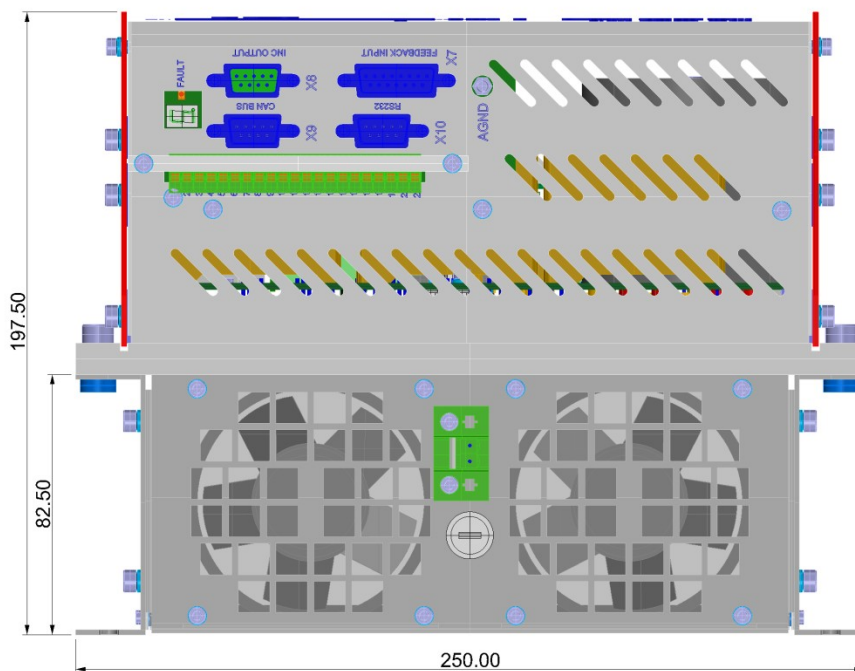
Variante: Indoor mounting cabinet



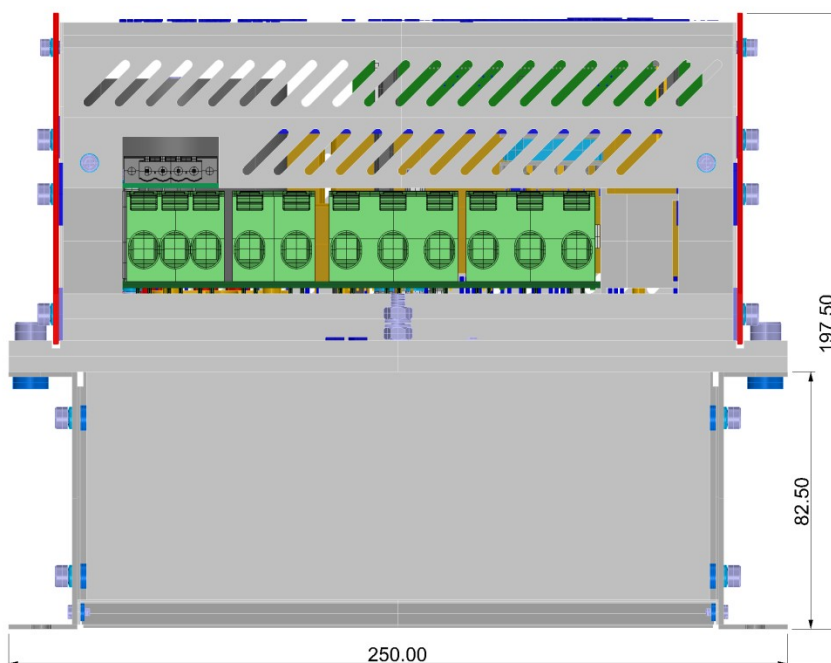
DCP-LÜ-oben-publik-1

Mechanical Installation

Variante: Cabinet indoor installation



Zeichnungen-DCP-LÜ-Front-publik-1

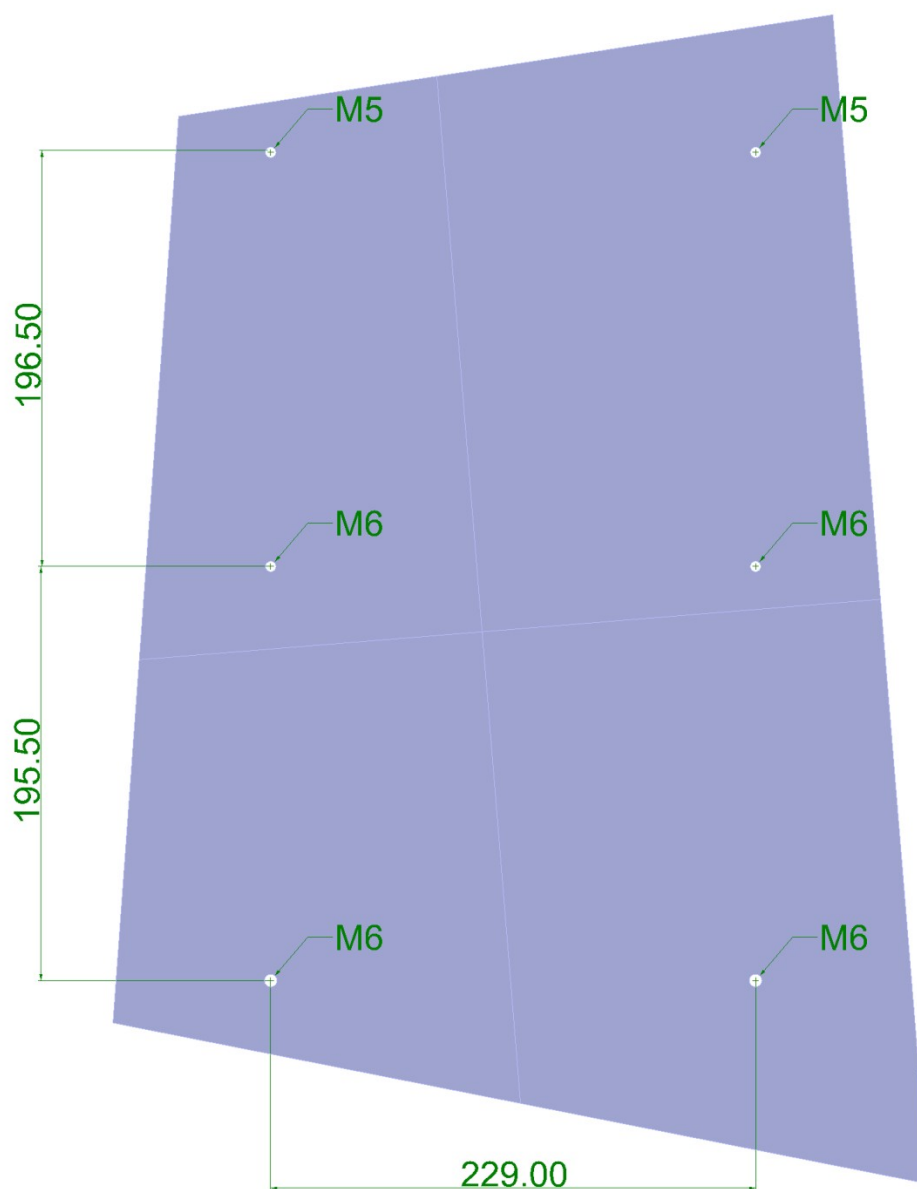


Zeichnungen-DCP-Lü-Rück-publik-1

Mechanical Installation

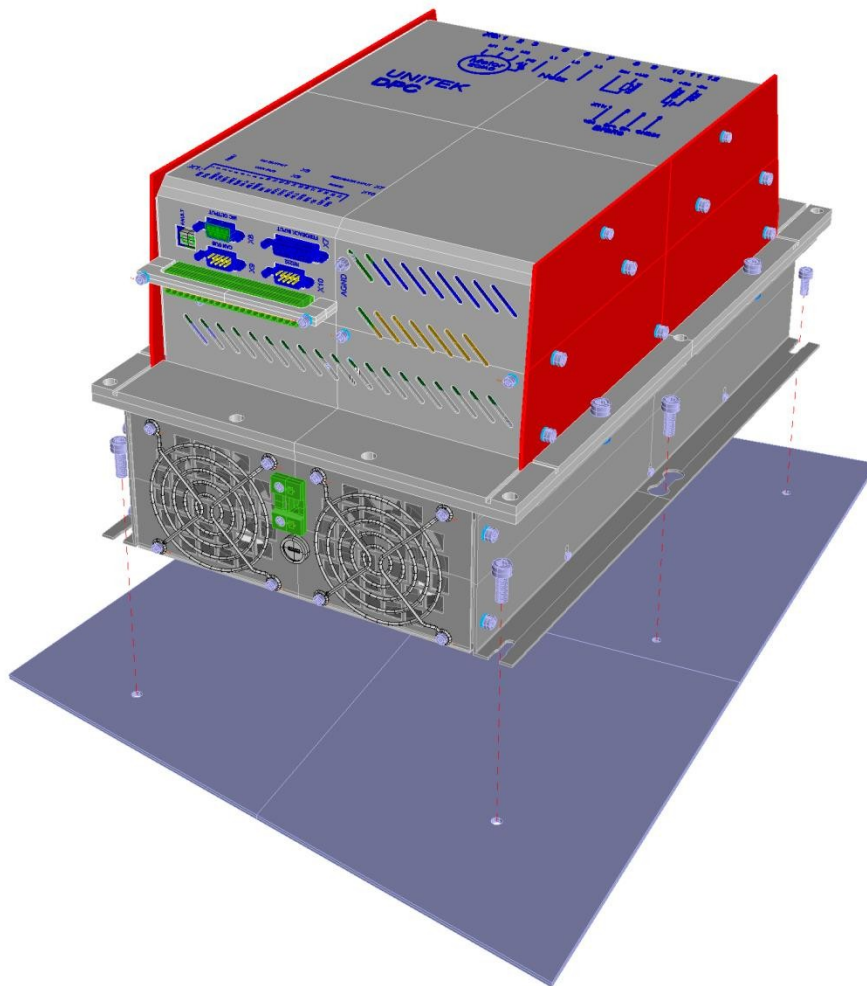
Drilling

Variante: Cabinet indoor installation



Zeichnungen-DCP-Durch-Montage-mass-1

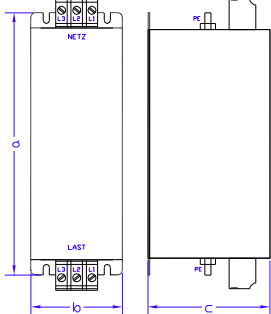
Cabinet indoor mounting

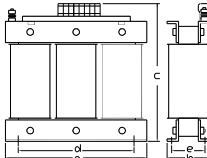


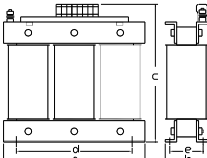
Zeichnungen-DPC-Auf-Montage-explo-1

Mechanical Installation

3.3 Dimensions accessories

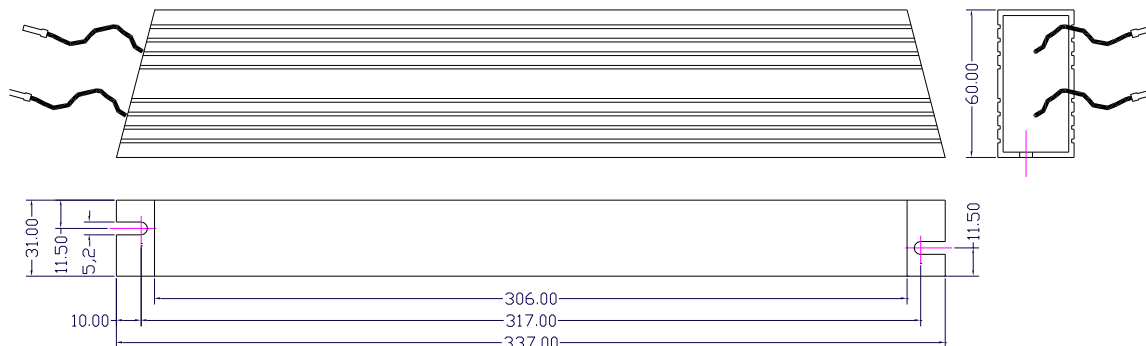
EMV-Filter  Zubehör-Filter-FN258-1	Type	Voltage V~	Current A~	Dimension a x b x c	Wight kg
	FN 255-42	3x480	3x42	329x70x185	2,5
	FN 258-55	3x480	3x55	329x80x185	2,9
	FN 258x75	3x480	3x75	329x80x220	3,9
<p>Filters at high EMC requirements. In residential and commercial areas or unknown locations. Filter directly on the device mount. DC link and input filter capacitors are installed in the device.</p>					

Power Choke  Zubehör-Drehstrom-257	Type	Current A	Indukt. mH	Dimension a x b x c	Wight kg
	KD 2,5b – 50	50	0,3	155x90x150	5,8
	KD 3a-75	75	0,2	190x90x220	9,5
<p>Power choke used in unknown and harsh industrial environments. And to reduce the load of the intermediate circuit</p>					

Motor choke  Zubehör-Drehstromtrafo-257	Type	Current A	Indukt. mH	Dimension a x b x c	Wight kg
	MDD 3,5a-75	75	0,45	210x105x220	13,5
	MDD 3c-50	50	0.5	190x115x180	11
<p>Motor choke cable core to screen capacitance >5nF. Cable length 25m approx..</p>					

Mechanical Installation

Regen resistor 300W



Zeichnungen-Zubehör-BAWID-300-996

Weight 1,1 kg / mounting screw M5x12

Regenerative discharge resistor in IP65 protection standard aluminium housing



Attention:

The regenerative resistor can get as hot as 200°C. Protect the resistor against accidental touch when installing it. Do not place any heat-sensitive components directly at the resistor or in the hot airflow.
Mount resistor outside

4 Electrical Installation

4.1 Important notes

With reference to allocation of connections to the plug and terminal numbers the connection notes are binding!

All other notes on this subject are not binding.

The input and output lines can be changed and supplemented to comply with electrical regulations and guidelines.



The regulations to be observed are:

- Connection and operation notes
- Local regulations
- EG regulations such as the 2006/42/EG machine directive,
- VDE, TÜV and trade association regulations

Cut all power prior to the electrical installation

Auf sichere Freischaltung achten.

Insert shortening plugs,

attach warning signs,

installation is permissible only by electro technically competent professionals.

Compare connected loads with information on rating plate.

Ensure adequate fuse protection for the feed, the auxiliary voltage and the external regenerative resistors.

Lay power cables and control lines spatially separated.

Perform shield connections and earthing work in compliance with EMC guidelines. Use the right lead cross sections.

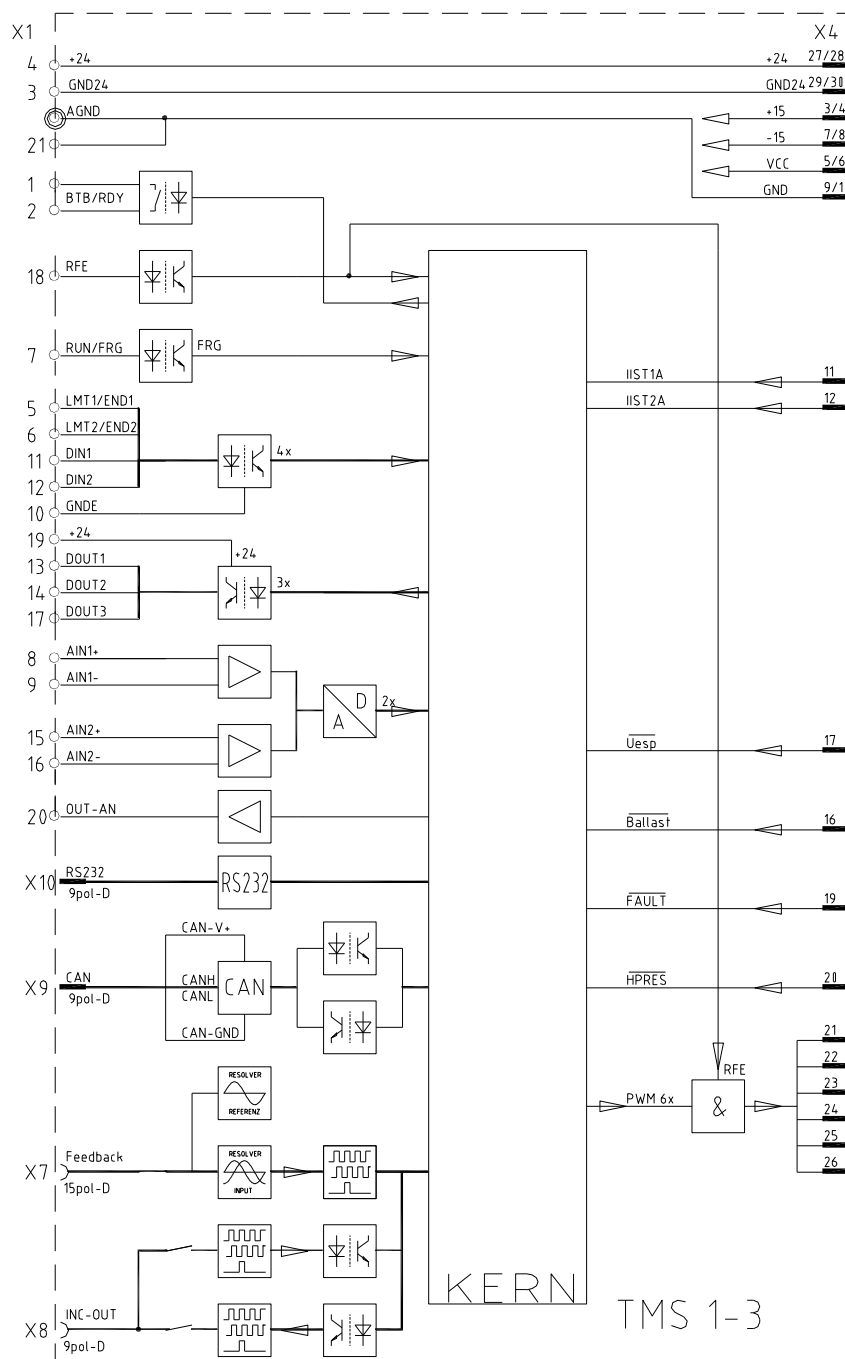


Caution: BTB-contact always put into the safety circuit!

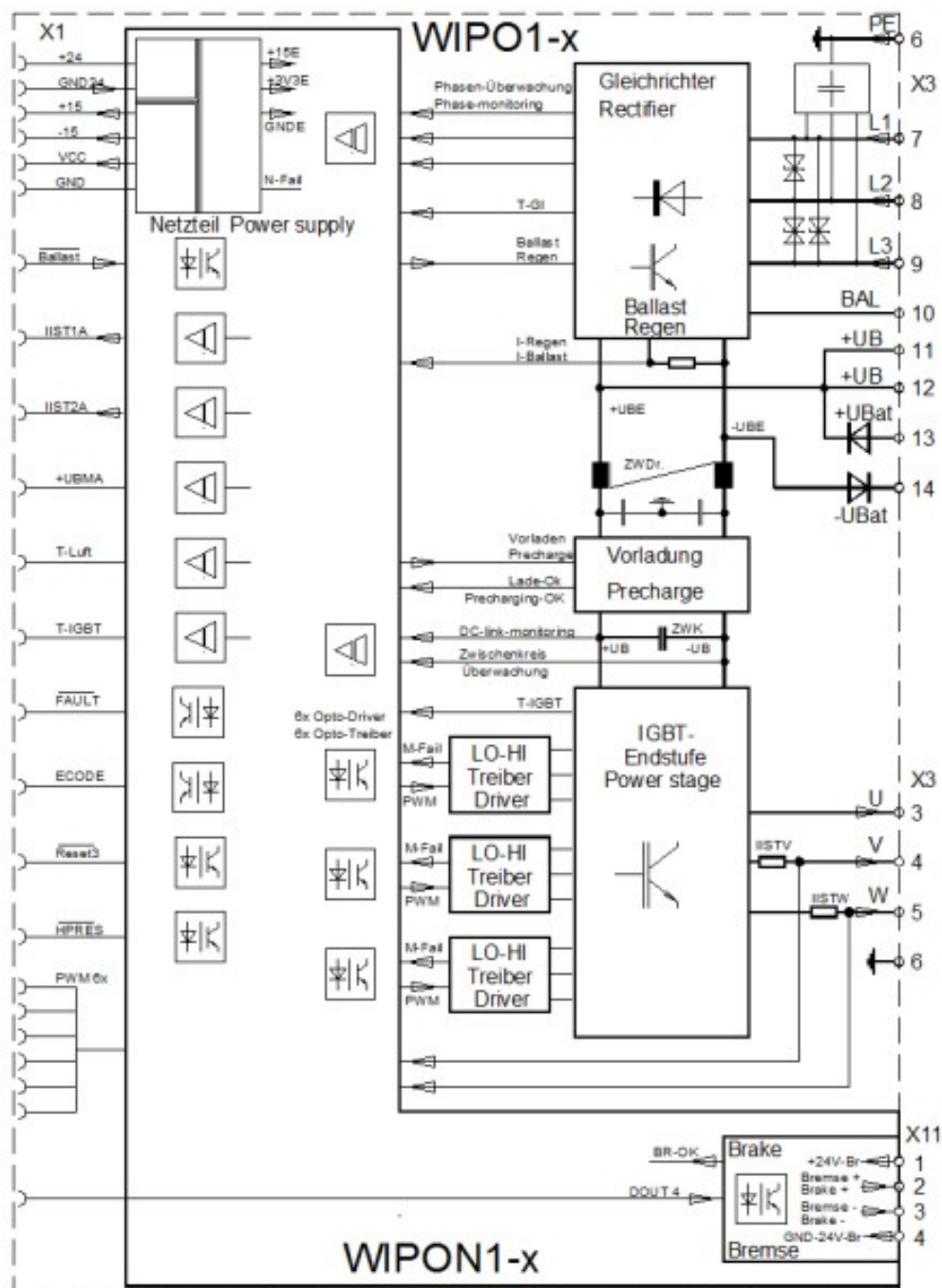
Caution: Operation without a „PE-connection“ is forbidden!

(Leere Seite - drucktechnisch bedingt / blank page – printing technology)

4.2 Block diagram



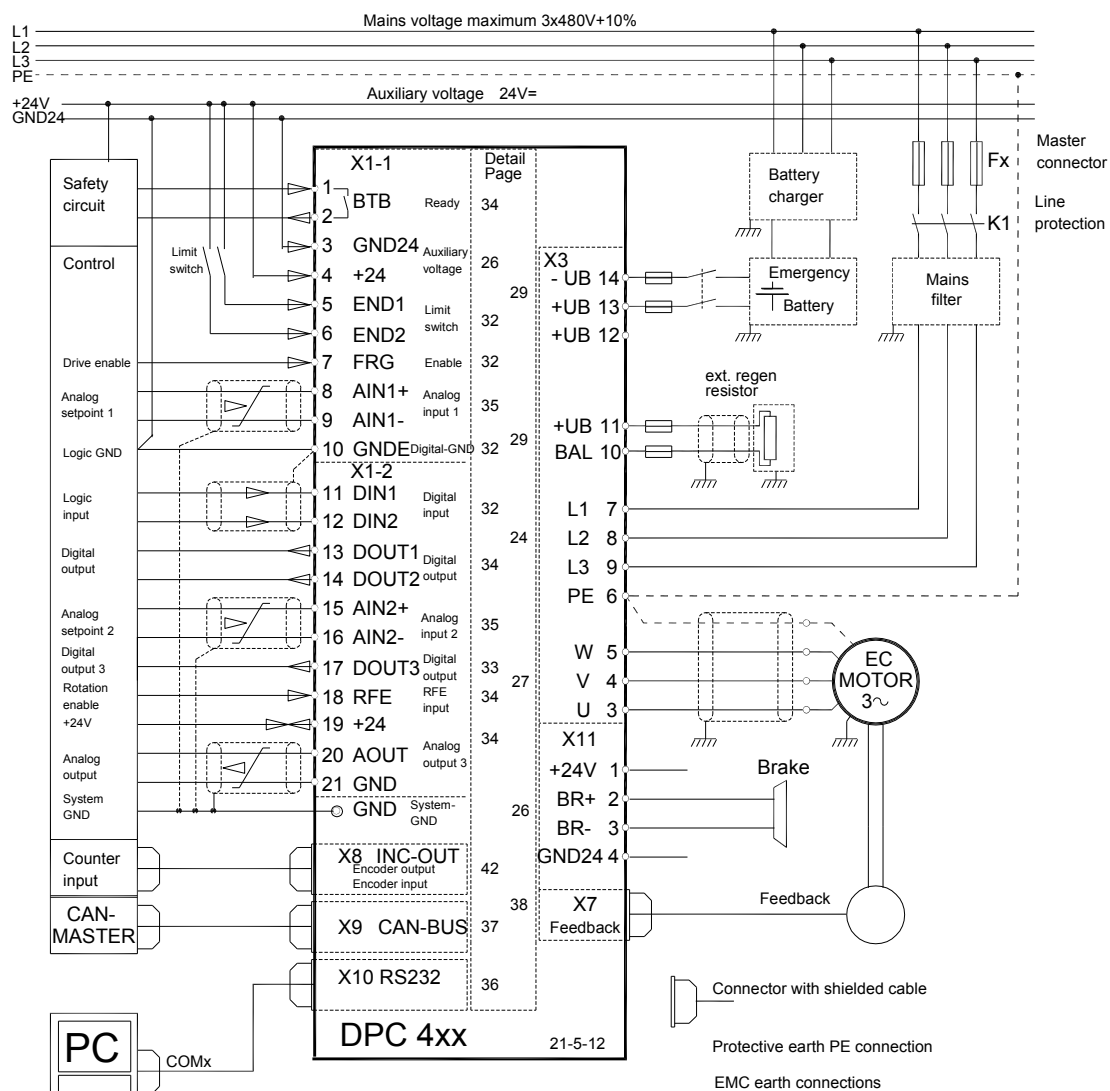
DS-400-blockbild-2-tms



Electrical Installation

4.3 Connection diagram

Electrical Connections - Overview DPC440, DPC460

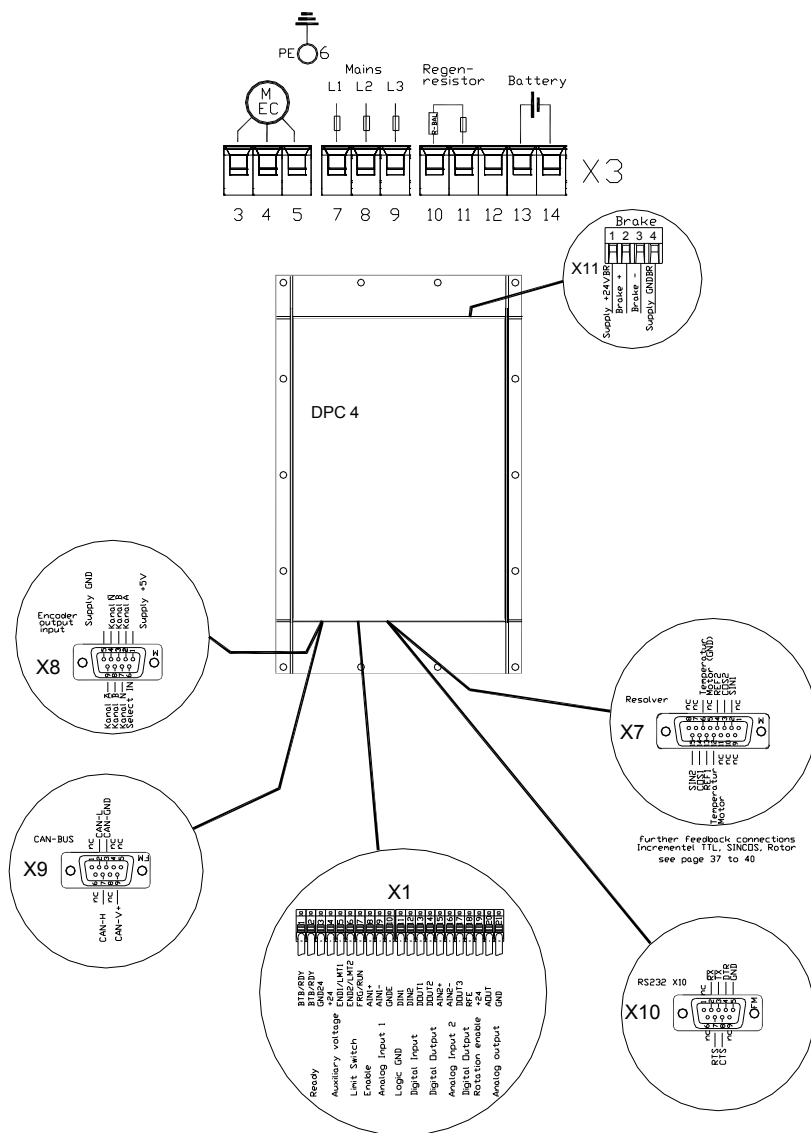


Zeichnungen-E-DPC4-anschlpl-MoAC-3

4.4 Connectors

Connectors overview DPC40, DPC460

Control connection



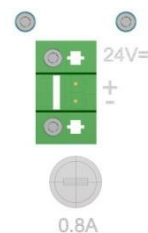
Zeichnungen-E-DPCe-steckerübers-3

Power Connection

- Plug X1: 10pol Phönix , 11pol Phönix
- Plug X7: D-Stecker 15pol
- Plug X8: D-Stecker 9pol
- Plug X9: D-Stecker 9pol
- Plug X10: D-Stecker 9pol
- Plug X11: 4pol Phönix

Ventilator box: Stecker 2pol Phönix

Ventilator-connetion24V=



EMC



EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC

EMC



EMC

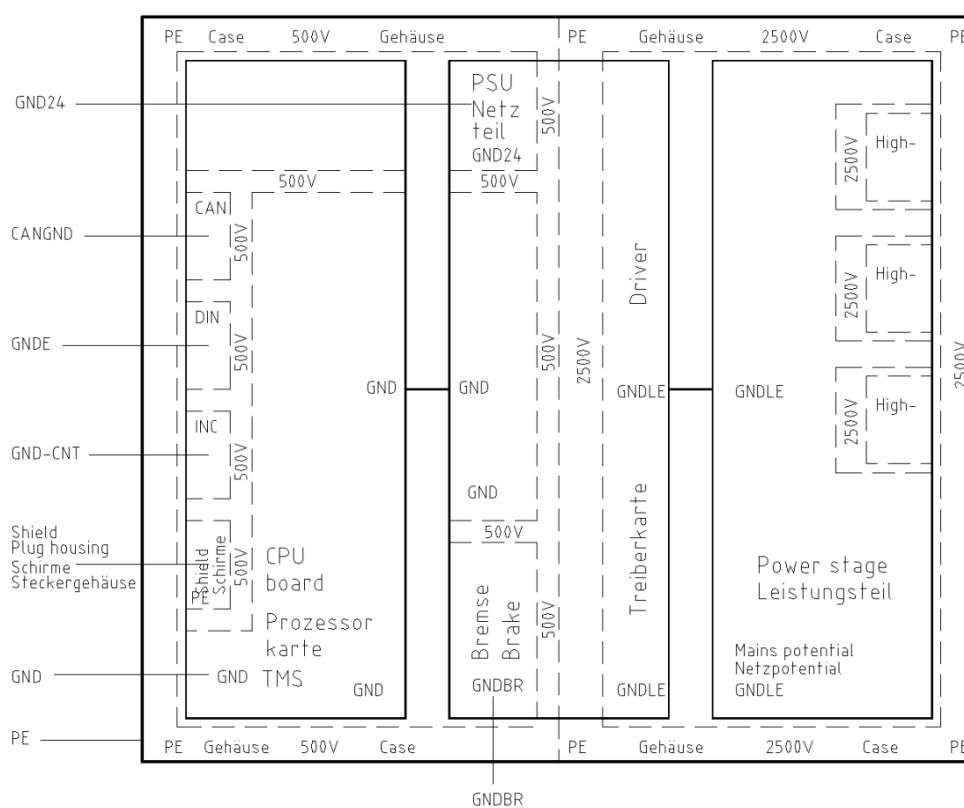
EMC

EMC

4.6 Isolation

Grounding (PE)

Earth connection EN 61800-5-1



DPC-Isolation-1

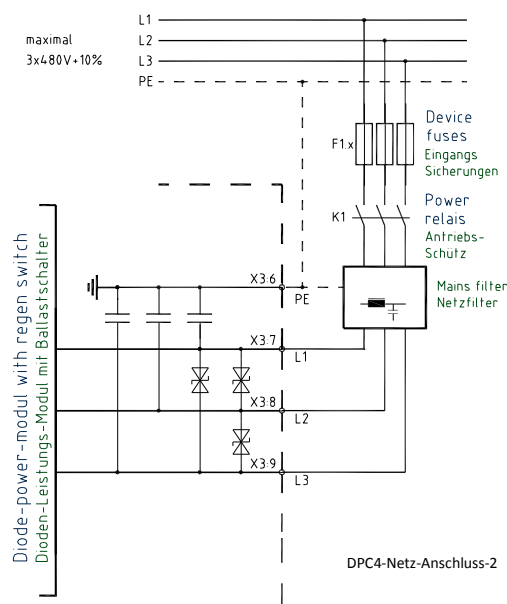
Electrical Installation

4.7 Mains connection

Connection to the grounded AC or three-phase system (TN-C-Mains)

Unbalanced grounded and do not connect grounded systems only isolation transformer!

Connection on the T-NC network



Do not, even briefly, exceed maximum connected voltage of 528V~.

Destruction hazard!!!

F1 = FF safety fuses or semiconductor cutouts

Additional power filter in increased EMC conditions.

DC link filter and input capacitors are installed.

Leakage current > 60mA

Maximum charging current limit 48A~

Charging time 5ms

Connection on the T-NC network with autotransformer

Do not, even briefly, exceed maximum connected voltage of 528V~.

Destruction hazard!!!

F1 = FF safety fuses or semiconductor cutouts

Additional surge protection to transformer switching overvoltages.

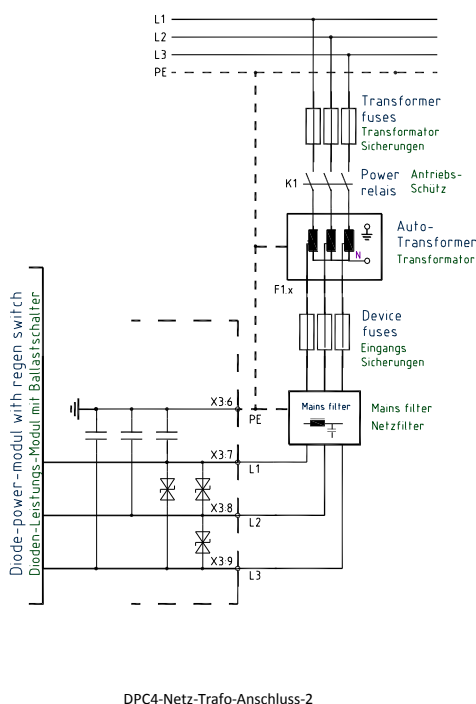
Additional power filter in increased EMC conditions.

DC link filter and input capacitors are installed.

Leakage current > 60mA

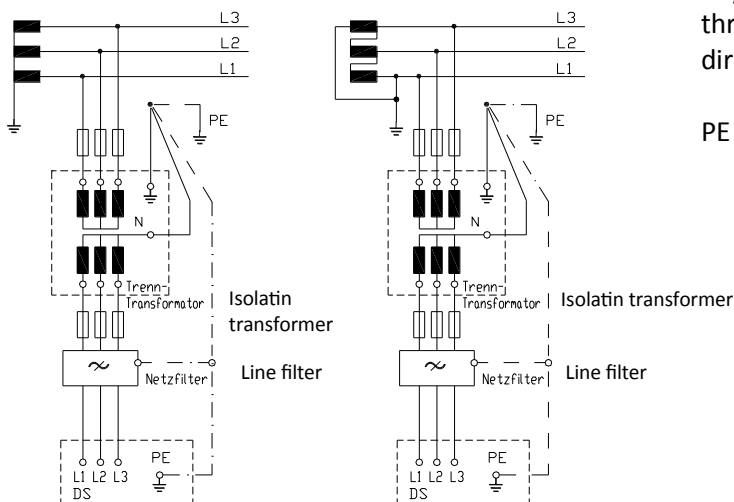
Maximum charging current limit 48A~

charging time 5ms



Attention: In case of supply networks without PE conductor.
Connection only via isolation transformer

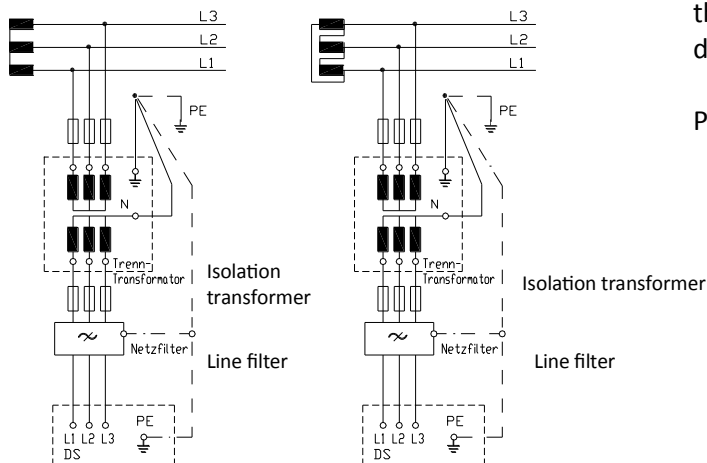
Connection on TT network



TT network
Asymmetric three- or four-wire
three-phase system with a
direct ground.

PE device on earth

Connection on IT network



IT network
Asymmetric three- or four-wire
three-phase system with no
direct grounding.

PE device on earth

Connection

Type	Drehstrom-Anschluss 3x230V -10% bis 3x480V +10% 50/60 Hz	min. mm ²	Cable- Dimension AWG	Fuses AFF	Power relais Dime	Mains filter type
440	L1=X3:3, L2=X3:4, L3=X3:5	2.5	14	40 AFF	DL0	F400V-B150-35
460		4	12	63 AFF	DL1	

PE-connection point: X3:9

Warning! Use without PE is forbidden!!!

Maximum wire-cross-section for spring terminal PLH = rigid 16 mm², flexible 25 mm²

Electrical Installation

4.8 Auxiliary voltage connection

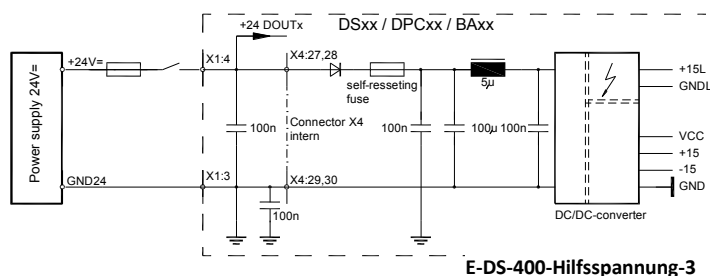
Mains potential-free 24V= +/- 10% / 2A
auxiliary direct current.

The auxiliary voltage has a:

- galvanic connection to the logic voltage,
- galvanic safety dc decoupling to all internal supply voltages of the device,
- EMC filter,

External fuse only for line protection

Input voltage	24V DC	X1:4
	GND24	X1:3
Ripple	10%	
Power up current	2A	
Nominal current	0.8A	



GND connection must be earthed!

Attention: In addition to the internal supply current (0.8A) the sum of the output currents (DOUT) must be provided by the mains module 24V.

Attention: Less than 18V auxiliary voltage generates an error message.
If the auxiliary voltage is inferior to 16V- even in case of short-time voltage Drop-outs. The speed and the position command values are set to zero and any Calibrated data are deleted.
The LED signal for the state „OK“ is dark.

4.9 Brake

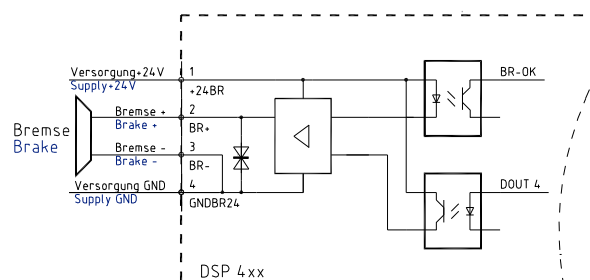
The brake driver is isolated at all voltages.

Brake supply	+24V	X11:1
Brake plus		X11:2
Brake minus		X11:2
Brake supply	GND24	X11:4

max. Brake current 4A

Fault message at

- Line break
- Short-circuit
- Over voltage
- Missing supply

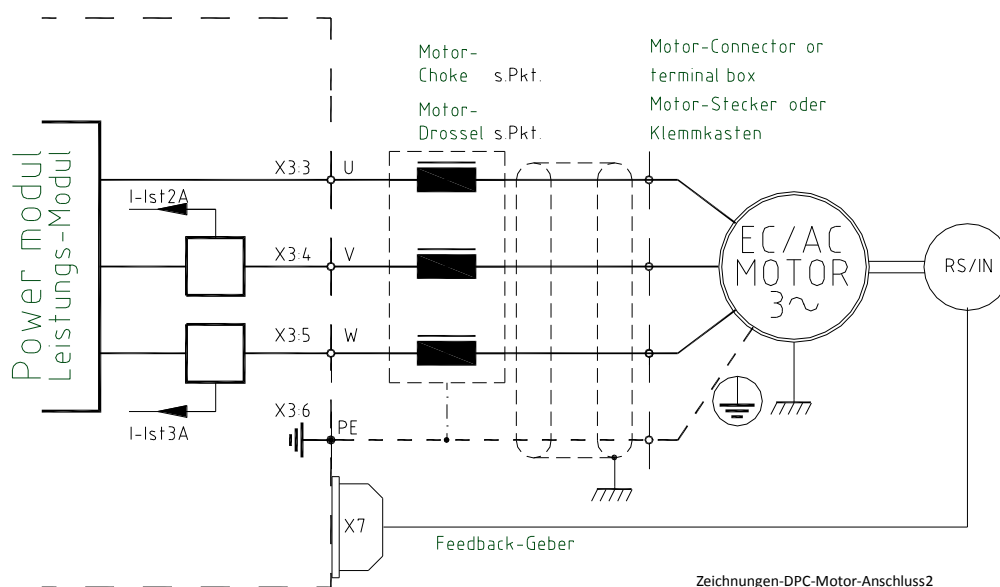


E-DPC4-Anschlpl-Bremse-2

4.10 Motor power connection

Use only manufactory approved, electronically commutated synchronous motors (brushless DC motors, EC motors) with a resolver or an incremental encoder.

See Appendix A (specific motor connection and parametrizing rules).

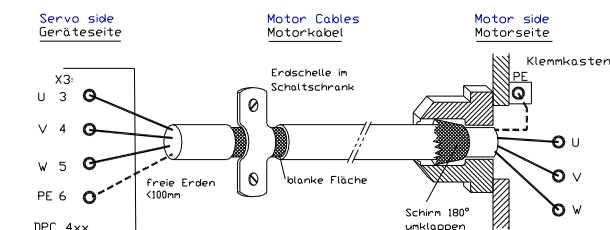


Zeichnungen-DPC-Motor-Anschluss2

Cabel indication	PE	U	V	W	Motor cables 3 wires + simply shielded protective earth conductor for 600V~, 1000V=, shield capacity 150pF/m. See table for minimum cross-section.
Connector	X3:6	X3:3	X3:4	X3:5	
Correct wiring is essential!!!					

Type DPC	440	460		Motor choke Only required upwards of a shield capacity of >5nF. Approx.. 25m motor cable.
Cable dim. mm ²	4	10		
Cable dim. AWG	10	6		

Maximum wire-cross-section for spring terminal PLH = rigid 16 mm², flexible 25 mm²



Zeichnungen-DPC4-Motor-Kabel-2

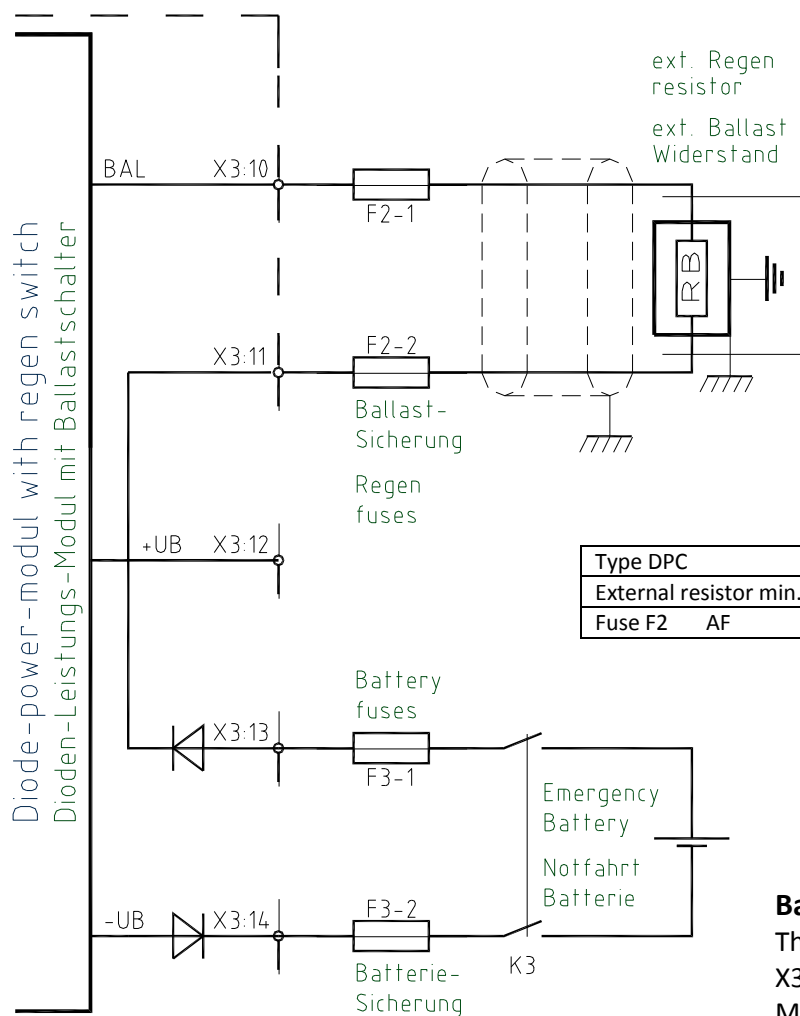
Manual-Zeichnungen-DPC4-Motor-Anschluss-3

Shielded connection:
Surface connection at entry to
control cabinet. Surface or as
short as possible connection
at the motor end.

Use multiple earthing for long motor leads (e.g. an earth clamp on the machine body every 5m). Connection sequence, cable cross section, shield connection

4.11 Regenerative circuit

The energy generated during braking is refed to the DC-BUS.
The Elkos DC-Buses are able to store only a small amount of energy.
The excess energy has to be converted into heat in the regenerative resistor.



**Always use external
Regenerative resistors.**

**F2-protection form earth
fault. Electronic limit from
overload and regenerative
discharge short circuit.**

Type DPC	440	460
External resistor min. Ohm	8	8
Fuse F2 AF	50	50

Battery connection

The back up-battery is to
X3:1 und X3:2 connected.
Maximum battery voltage
400V=
Short-circuit fuses
F3 = 63 A

Zeichnungen-DPC4-Ballast-Batterie-Anschluss-2

4.12 Regen circuit

External regen resistor

Dimensioning

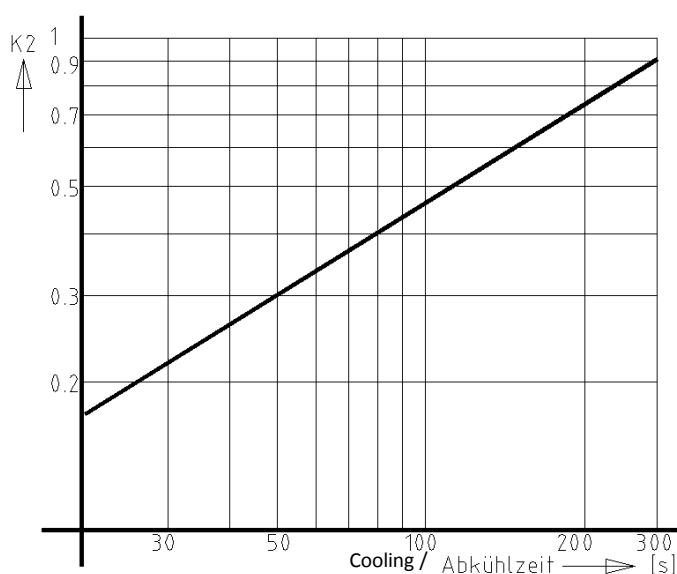
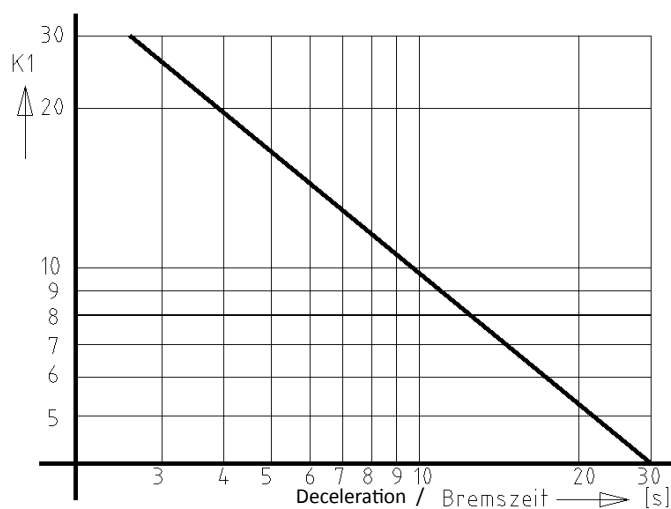
Maximum breaking power calculation

$$P_{\max} [\text{W}] = \frac{J_g \times \Delta n \times n}{91 \times t_b}$$

J_g = Total inertia at motor [kgm²]
 n = maximum speed [min⁻¹]
 Δn = difference in speed [min⁻¹]
 t_b = braking time [s]

Power regen resistor

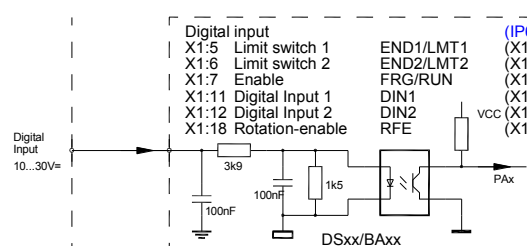
$$P_{\text{Ballast}} [\text{W}] = \frac{P_{\max}}{K1 \times K2}$$



5 Control Connection

5.1 Digital input

6 Opto-input



Input voltage	
H-level (ON)	+10 bis +30V
L-level (Off)	<+6V
input current	Max. 7,5 mA
Ratet voltage/cure	24V/6mA
Referenc ground	GNDE (X1:10)

E-DS-400-digi-in-3

The enable input (FRG/RUN) and the input for the rotating field enable (RFE) are fixed, they cannot be programmed.

Without the enable FRG/RUN the servo-drive is electronically disabled (no PWM pulses).

Without the rotating field enable RFE the rotating field of the output stage is additionally electronically disabled (2nd disable channel).

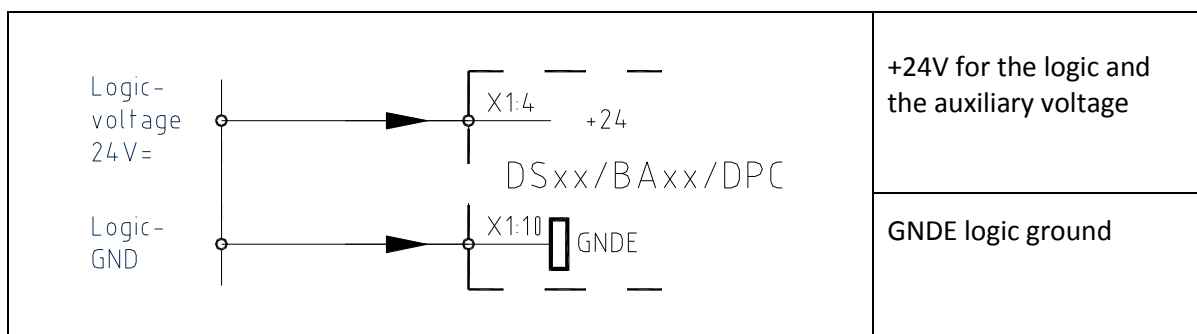
The drive is free of torque (no holding torque).

The remaining four digital inputs can be programmed.

The inputs LMT1 (X1:5) and LMT2 (X1:6) are preferably to be used as inputs of the output stage switch.

Input	Plug	Function	Status	Parameter
FRG/RUN	X1:7	Enable	fixed	
RFE	X1:18	Rotation Enable	fixed	
END1/LMT1	X1:5	Limit switch 1 / Dig. Input	programmable	
END2/LMT2	X1:6	Limit switch 2 / Dig. Input		
DIN1	X1:11	Digital Input 1		
DIN2	X1:12	Digital Input 2		

External power supply for inputs and outputs



E-DS-400-Logiksp-1

5.2 Safety input RFE (Rotation enable)

Warning!

If the input of the enable or of the rotating field enable are switched off, the drive is free of torque. The drive could move if there is no mechanical brake or block provided. The motor conductors are not dead. Only the rotating field is disabled. Prior to any work or maintenance on the motor or servo-drive, the servo-drive must be completely disconnected from the mains power supply.



Operation with RFE input

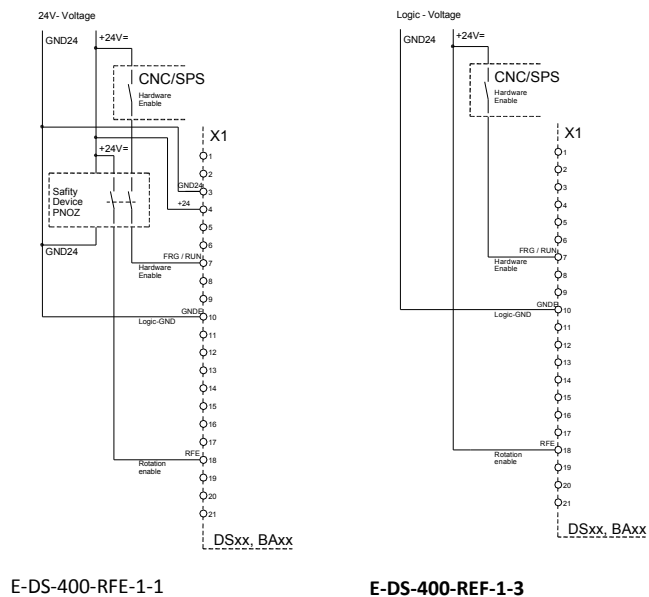
Two-channel disable of the enable via a safety switching device. Enable input FRG/RUN + rotating field enable input RFE.

Switching-on

Contacts of the safety device closed: enable input RFE.

Switching-on

Contacts of the safety device open:
- there is no FRG/RUN signal in the 1 disable channel to disable the PWM



pulses in the processor
- there is no RFE signal in the 2 disable channel to disable the PWM pulses at the output of the processor.

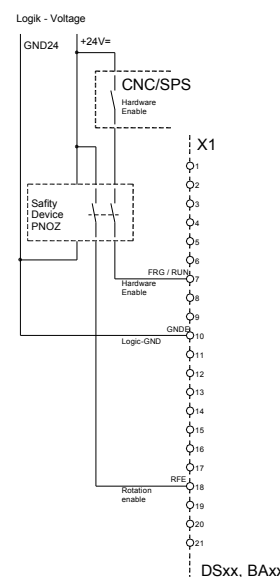
Restart

Release the safety switching device. Contact of the safety device closed. The motor can only move after a second disable FRG/RUN (after the rotating field enable).

Operation without RFE input

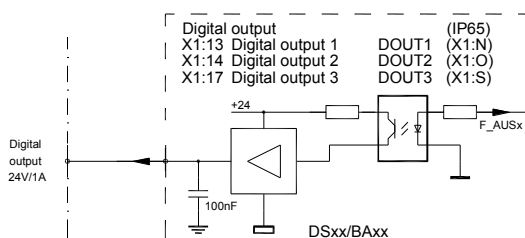
The input RFE must be bridged with the logic voltage. If the logic voltage corresponds to the supply voltage, the RFE input is bridged with +24V. Enable FRG/RUN at least 0.5s after the RFE signal.

E-DS-400-RFE1-2



5.3 Digital logic outputs (open emitter)

The logic outputs 1 to 3 are rated for 24V and 1A (short-time:2A)



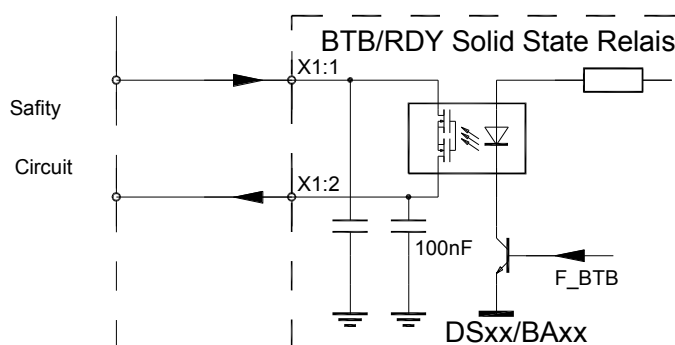
E-DS-400-Digi-Out-4

Output voltage		
ON - level	max.	+24V=
OUT - level		<1V=
Output current	nom	1A
Output current	max.	2A
Voltage reference	+24V	(X1:4)
Ground reference	GNDE	(X1:10)

It is possible to program an energy saving program (clocked output).

The logic output 4 (24V, 3A) at the power section is only available with certain devices.

Signal contact / Ready BTB / RDY (Solid State Relays)



E-DS-400-BTB-3

Contact for	max.
Capacitive load	48V/0.2A
Contact resistance	max. 1mΩ
External fuse	max. 2 Ohm
	0.5 Aeff

The contact is closed is powered up device.
Display with 7-segment LED status on error, the contact is openend.



BTB/RDY contact is always in the insert safety circuit!

Control Connection

BTB opens (red LED open relay contact)

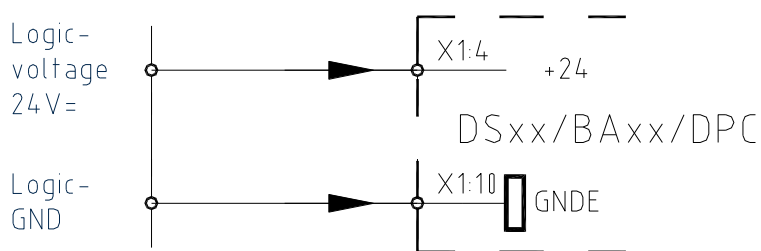
In case of error messages

In case of under-voltage of the auxiliary voltage (<20V)

The message „under-voltage in the bus circuit“ can be programmed (see Manual NDrive)

Output	Plug	Function	Status	Parameter
BTB/RDY	X1:1, X1:2	Ready	fix / relay	
DOUT1	X1:13	Digital output 1	programmable	
DOUT2	X1:14	Digital output 2	programmable	
DOUT3	X1:17	Digital output 3	programmable	
DOUT4	Xx:Xx	Digital output 4	programmable	

External power supply for inputs and outputs



+ 24V for logic an auxiliary voltage

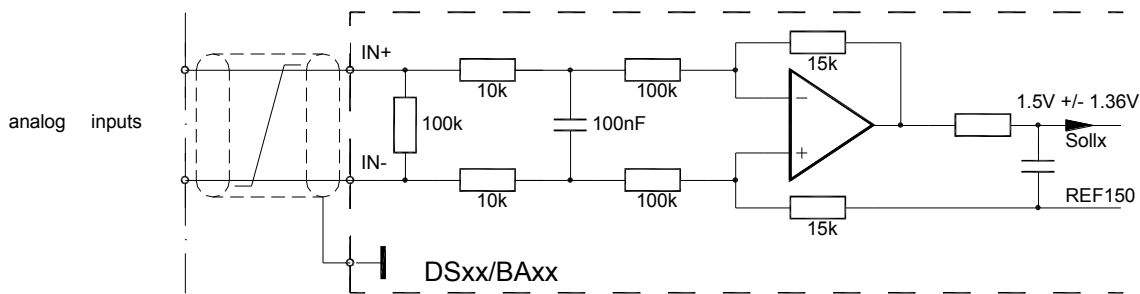
GNDE Logic

Observe total current of all outputs

E- DS-400-Logiksp-1

Control Connection

Analoge inputs +/- 10V



E-DS-400-Ana-In-3

Input	Plug	Basic-Function	Voltage	Status	Parameter
AIN1+, AIN1-	X1:8, X1:9	speed-setpoint	+/- 10V	prog.	
AIN2+, AIN2-	X1:15, X1:16	current - limit	+/- 10V	prog.	

Characteristics

Differential input	AIN1+ / AIN1-	AIN2+ / AIN2-	
Input resistance	70k		
Maximum voltage	+/- 12V		
Resolution	11Bit + sign		

The direction of rotation of the motor can either be changed by swapping the \pm connections at the differential input, or by means of a logic input or by programming.

The analog inputs can be assigned to different functions.

With a digital command value (RS232, x-bus)

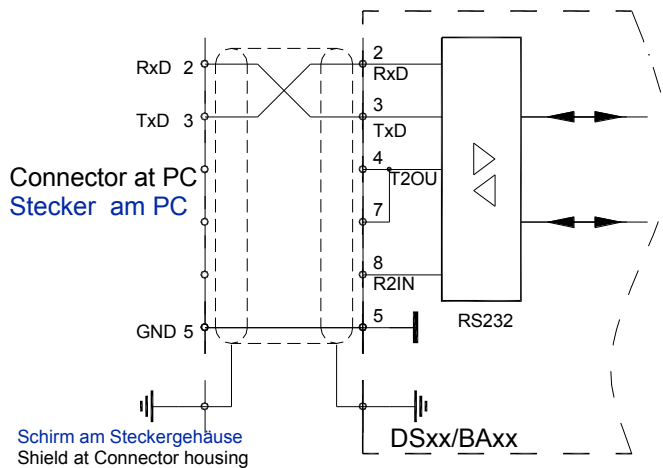
- the analog input AIN1 can be programmed as external analog speed limit
- and the analog input AIN2 can be programmed as external analog current limit.

Analog output +/- 10V

Output	Connection	Basic function	Voltage	State	Parameter
AOUT1	X2:20	speed actual value	+/-10V	program.	
GND	X2:21	signal zero	0V	fixed	

5.4 Interface RS 232

Via the serial PC RS232 interface the DS400 amplifier is programmed and operated for the start-up. The software is described in the DS software manual.



The serial interface is galvanically coupled with the device – zero (GND).

E-DS-400-RS232-1

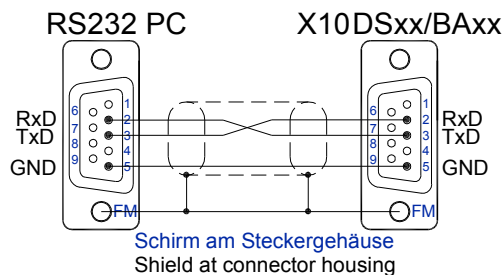
The DS-xxx (D connector X10) and the serial interface (COMx) of the pc must only be connected using a null modem cable. Do not use a null modem link cable! Install the cable only after disconnecting the device from the mains. The interface is hard-coded to **115200Baud**.

Null modem cable

Pin assignment. Solder side.

Contact shield with the plug housing.

Cable length max. 10m

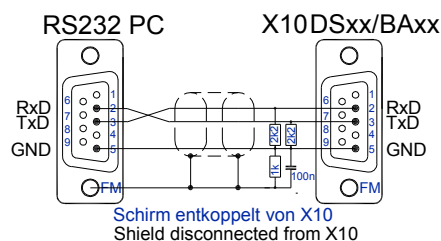


E-DS-400-RS232-VERB-1

FM = Buchse

In case of strong interferences at the interface a line filter should be installed.

Notebooks with a USB-RS232 converter are usually susceptible to interference.

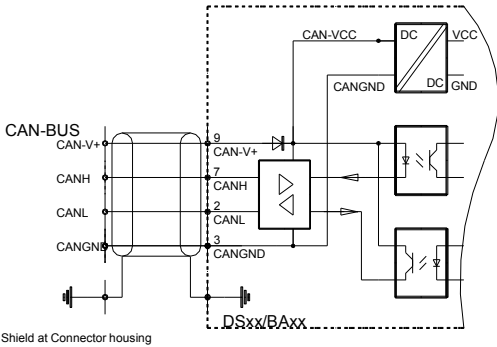


E-DS-400-RS232-FI-1

Control Connection

5.5 CAN-BUS

The CAN-BUS is a digital connection to the CNC control.
 Optimum conditions are achieved with CNC controls and CAN components of LABOD electronic or CAN Open.
 Programming and operation by means of the control panel via the CAN-BUS.
 Interface complies with the standard ISO 11898.
 Adjustment and programming see Manual DS-CAN.



Shield at Connector housing

E-DS-400-CAN-4

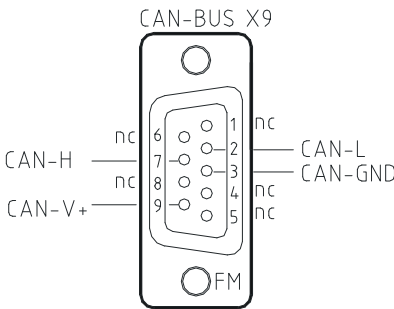
The CAN-BUS input is galvanically separated.
 The power supply is from the intern DC/DC

Pin assignment. Solder side.

CAN-BUS-cable

Use a shielded bus conductor with a low shielding capacity.
 Signal plus GND (+supply).
 D-connector with a metal or metallized housing. LiYCY
 4x0.25+shield.

Designation	Connector-no.	Cabel colour	Cable no.
CAN-V+	9	brown	1
CAN-GND	3	white	4 (PE)
CAN-H	7	green	3
CAN-L	2	yellow	2

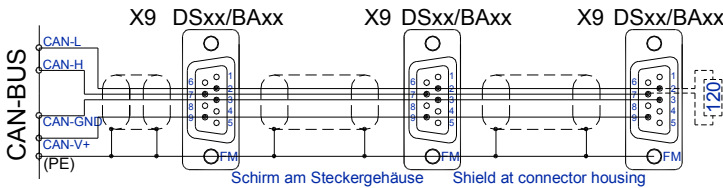


Zeichnungen-DS-BAx-DS400-stecker-can

FM=Female Connecotr

CAN-BUS-connection with several multiple devices

Master Adresse xx Adresse xx Adresse xx



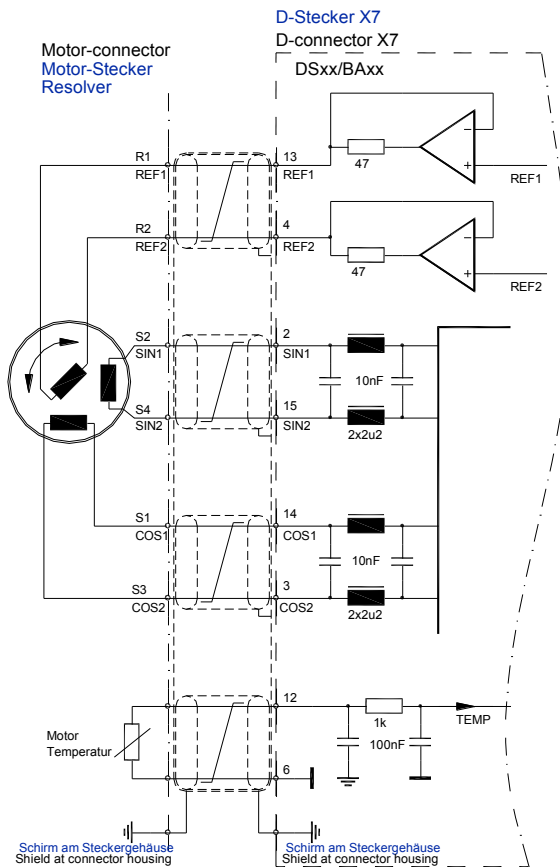
E-DS-400-CAN-3x-3

Terminating resistor at the end of the bus line > 120 Ohm between CAN-H and CAN-L

Control Connection

5.6 Resolver - connection

Applicable only for DS4xx-RS



E-DS-400-Resco-anschl-3

Only manufacturer-approved motors with 2,4,6 or 8 pole resolver. Engine-specific connection sheet note (RS)!

Connecting plug: X7 15pin D-plug

Connecting lead: 4 Twisted pair, individually shielded plus outer shield.

For Link-chains, only suitable cable should be used.

Cable length: For >25m usw only high quality resolver cable with adequate shielding properties.

Shielded connection: at plug X7 contact shield with the plug housing.

at the motor plug contact shield with the plug housing.

For setup-parameters: see DS software manual

The resolver is an absolute measuring system for one motor revolution. It is rugged and not sensitive to high motor temperatures. Its set-up is like a rotating transformer. The rotor is fed by the reference (10kHz).

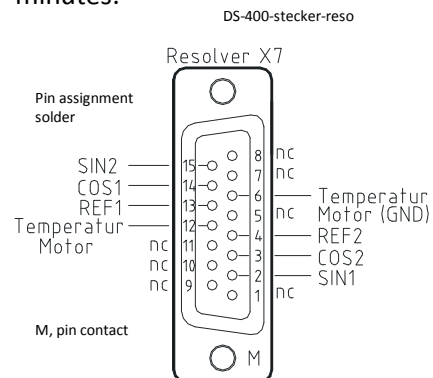
The stator provides the sinus and cosine signals modulated by the rotation reference.

The amplitudes of these signals are evaluated and digitalized in the servo amplifier.

The resolution is automatically adjusted to the optimum to 10.12, or 14 bits.

The maximum possible rotational speed is 50 000 (10bit).

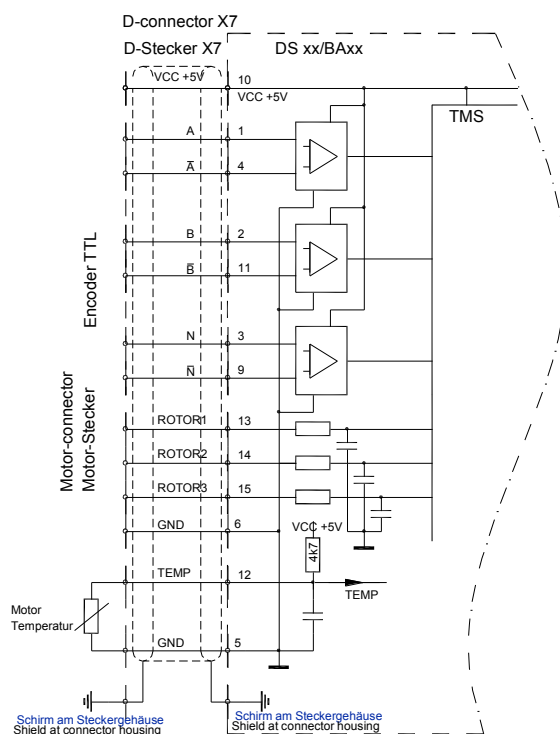
The digitalized signals are used for the rotor angle, the position and speed control and for the incremental output. The absolute accuracy is approx +/- 10 angular minutes.



Control Connection

5.7 Encoder TTL Connection

Applicable only for variant IN



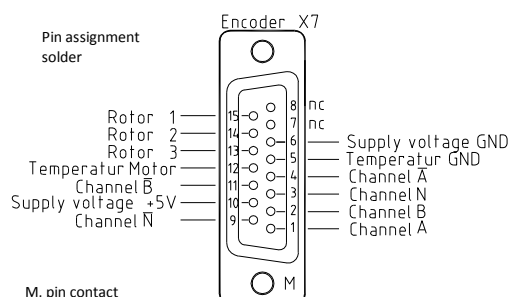
Incremental encoders with 2 counting tracks and a zero track plus 3 rotor position tracks. Counting tracks with push-pull output.

For simple connection (A, B, N channels) prove not negated inputs

Counting – input corresponds to RS485. Maximum counting frequency 500kHz.

The incremental encoder is galvanically coupled with the device -zero (GND)

Supply voltage 5V



E-DS400-Enco-TTL-anschl-3

DS-400-stecker-encoin

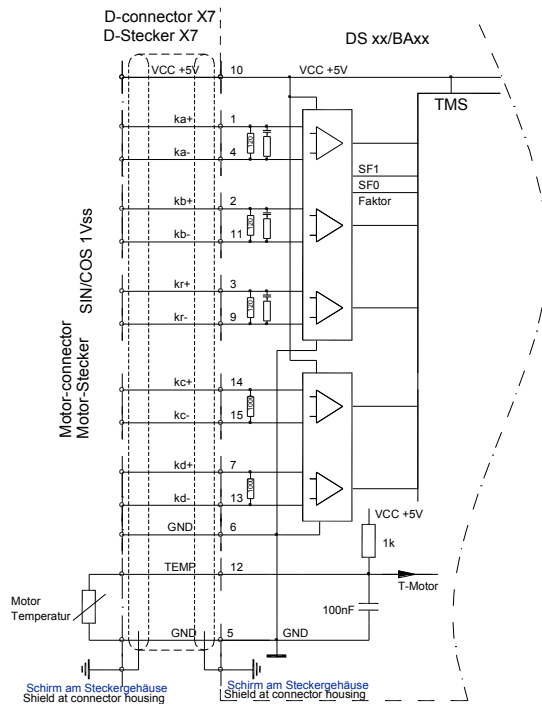
Only manufacturer-approved motors with incremental encoders and rotor encoders. Note motor-specific connection sheet!

Connecting plug	X7	15 pin D-plug
Connecting lead	10 signal wires, shielded	minimum cross section 0,14 mm
	2 supply wires	minimum cross section 0,5 mm
	Use only suitable cables in a power carrier chain	
Cable length	the next step up for a section of >25m	
Shielded connection	a plug X7	contact shield with the plug housing
	at the motor plug	contact shield with the plug housing
Setup-Parameters	see Software-Manual DS	

Control Connection

5.8 SIN COS 1Vss Connection

Only for Variant SC



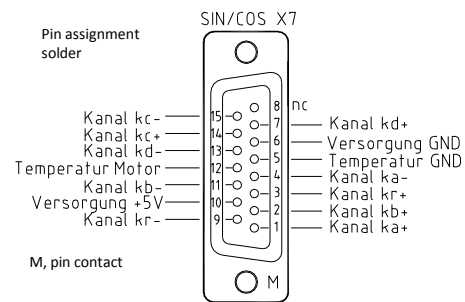
E-DS-400-SINCOS-ansch-3

Incremental encoder with 2 analog sinusoidal counter tracks and 1 zero track plus 2 commutating tracks.
Differential inputs 1Vss

Max. counting frequency 500kHz

The incremental encoder is galvanically connected with device zero (GND).
Supply voltage 5V, provided by the servo.

The resolution is automatically adjusted to an optimum.



Zeichnungen-DS400-stecker-sincos

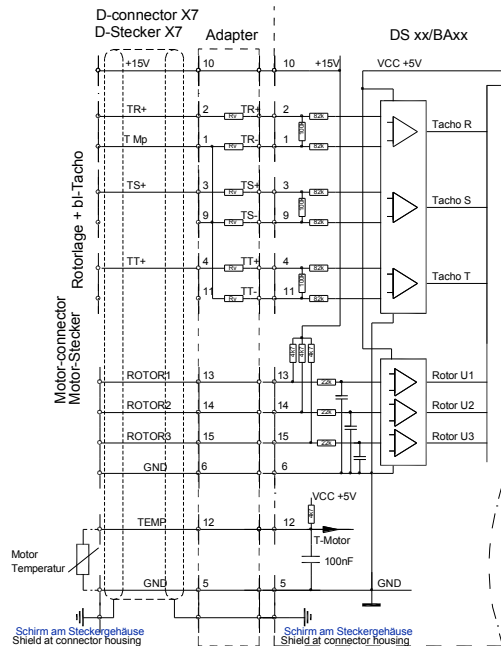
Only manufacturer approved motors with SIN / COS Geber (SC).
Note motor-specific (SC) connection sheet.

Connecting plug	X7	15 pin D-plug
Connecting lead	4 signal conductors twisted an shielded 2 signal conductors, shielded 4 supply lines, temp.	min. cross-section 0.14 mm min. cross-section 0.14 mm min. cross-section 0.5 mm
Cable type	(4x(2x0.14)+(4x0.14)C+4x0.5)C	
Cable length	for >25m the cross-section of the cable used must be increased by one grade	
Shielded connection	a plug X7 at the motor plug	contact shield with the plug housing contact shield with the plug housing
Setup-Parameters	see Software-Manual DS	

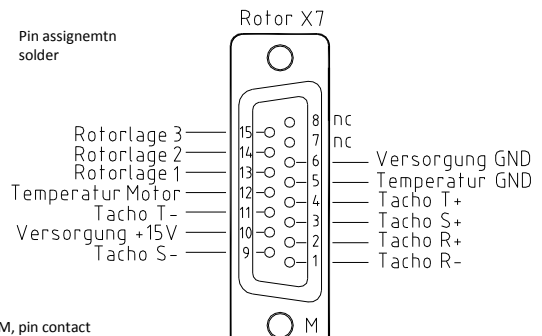
Control Connection

5.9 Rotor position encoder – connection via a bl-tacho

Only for variant bl



3 rotor position encoder signals (hall sensors) for the commutation; with or without a brushless tacho. The rotor position encoder is galvanically connected with the device zero (GND). The voltage of 15V is supplied by the servo-drive. Provide an adapter in case the tacho voltage at rated speed is superior to 10V~. For lower tacho voltages connect X7: pin 1,9 and 11. Connect the tacho center point to X7:1.



DS-400-bl-anschl-3

Zeichnungen-ZeichnungenDS-BAx-DS400-stecker-rotor

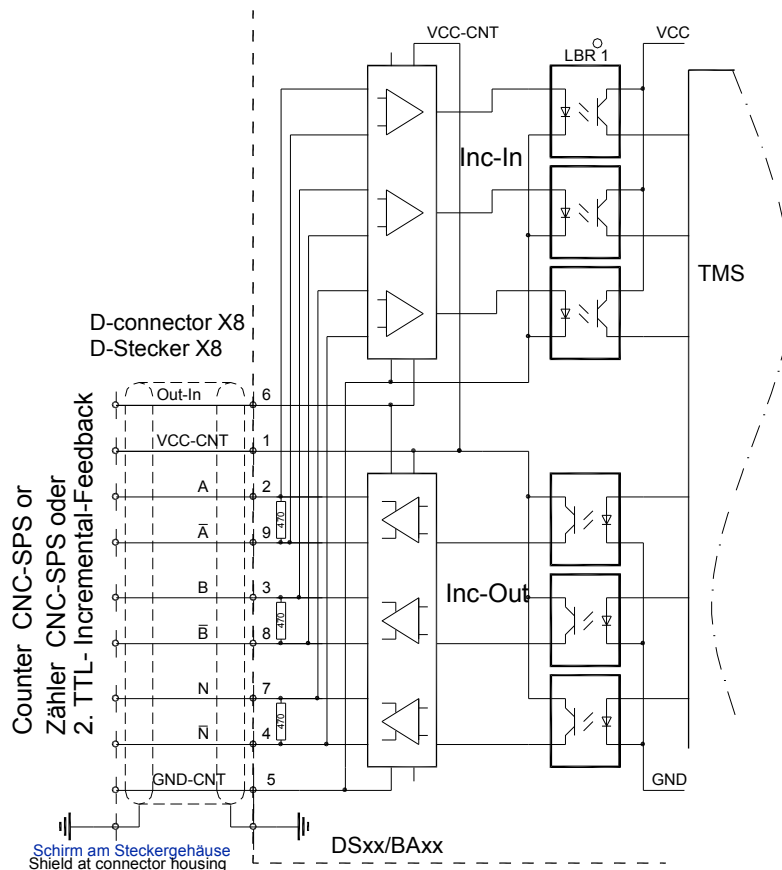
Only manufacturer-approved motors with incremental encoders and rotor encoders. Note motor-specific connection sheet!

Connecting plug	X7	15 pin D-plug
Connecting lead	12 signal wires, shielded	minimum cross section 0,25 mm
	Use only suitable cables in a power carrier chain	
Cable length	the next step up for a section of >25m	
Shielded connection	a plug X7	contact shield with the plug housing
	at the motor plug	contact shield with the plug housing
Setup-Parameters	see Software-Manual DS NDrive	

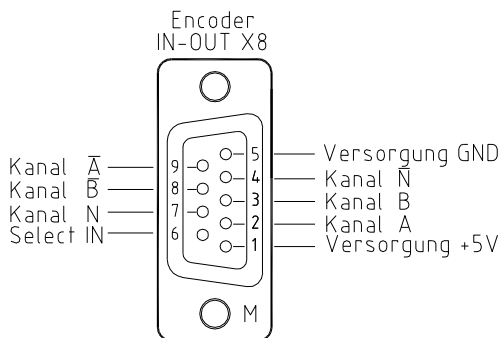
5.10 X8 TTL-Encoder output or input (2)

Der D-connector X8 is connected as input or output (Default)

Output	X8 Pin 6 not connected or bridge to GND
Input	X8 Pin 6 bright to +5V (X8:1)



E-DS-400-Enco-In-Out-TTL-anschl-3



DS400-stecker-encout

9 pin D-Stecker (M, pins)
Connector assignment
Soldering side

Attention:
X8 as input

X8:6 (Select IN) with X8:1
(+5V) connect with the D
connector

Control Connection

5.11 X8 as TTL Encoder output

The encoder signals supplied by the motor (feedback) are available at the output of the D-connector X8 for the CNC control.

The encoder output is internally isolated.

The voltage is supplied via the encoder line from the CNC/PLC control.

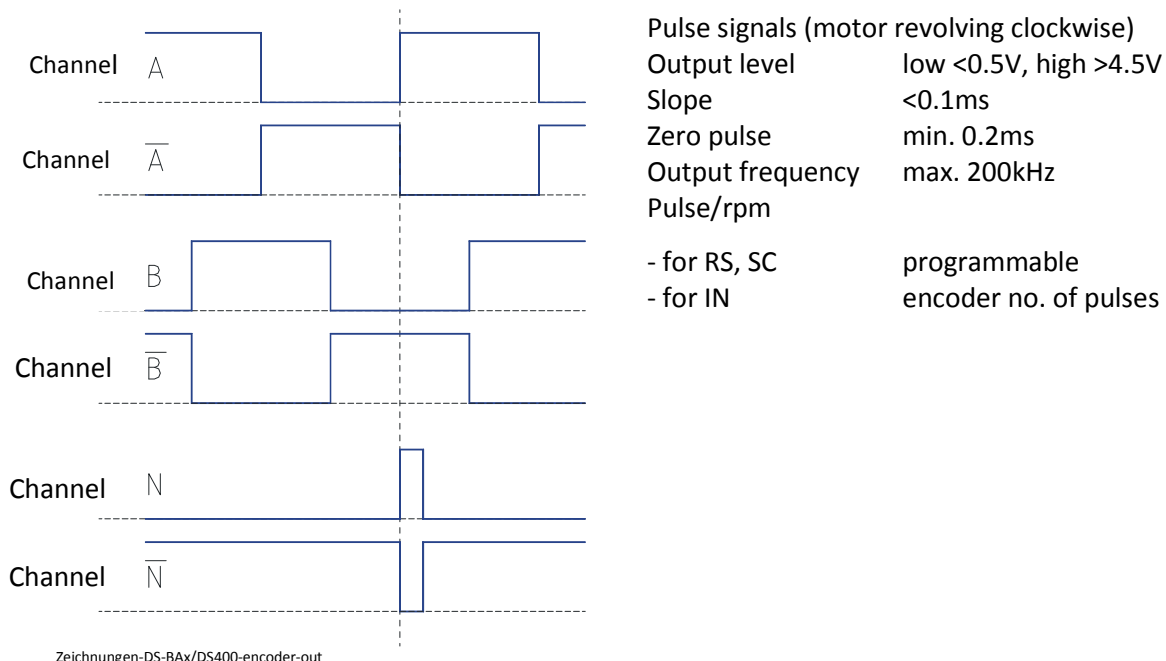
Voltage supply +5V \pm 0.2V.

The output signal corresponds to RS485.

Option: Internal supply from the servo (LBR1 + LBR2)

For RS and SC the resolution can be programmed (parameter 0xa4), Bit1).

For IN it is equal to the number of encoder pulses.



X8 as TTL Encoder input

Attention: X8 pin6 (select IN) and X8 pin1 (+5V) must be bridged!

The encoder input is internally isolated.

The voltage is supplied via the encoder line.

Option: Internal supply from the servo

The input signals correspond to RS485.

Input frequency: max. 200 kHz

Option: Internal supply from the servo (LBR1 + LBR2)

The encoder input can be programmed to fulfill different functions.

5.12 LED displays on the Servo

The state **"normal"** is signalled by a bright green seven-segment display + decimal point (display of the state).

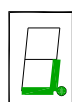
The state **"fault"** is signalled by a bright red fault LED and the seven-segment display indicates the error no.

The state **"warning"** is signalled by the flashing red fault LED and the seven-segment display indicates alternately the state and the warning no.

Display of the servo-drive state

Display	Point/segment	State	State of NDrive
	flashing	Processor active	
	dark	Auxiliary voltage missing or inherent hardware failure	
	flashing	Starting state after reset (auxil. voltage 24V off-on). The first enable stops the flashing display.	OK = 0
	bright	Drive enable	OK = 1, ENA = 1
	dark	Drive disabled (not enabled)	OK = 1, ENA = 0
	bright	Speed zero (standstill signal)	N0 = 1
	bright	Drive revolves clockwise, N currently positive	N0 = 0
	bright	Drive revolves anti-clockwise, N currently negative	N0 = 0
	flashing	Motor current reduced to continuous current I_{cns}	$I_{cns} = 1$
	bright	Motor current at max. current limit I_{max}	$I_{cns} = 0$
	dark	Normal operation; Motor current within the current limits	$I_{cns} = 0$
	bright for 0.1 s	Left segment:	A new command (value) was received from the BUS or RS232
		Right segment:	Digital input change

Example: Motor revolving clockwise



Point flashes = active processor
 Bottom segment = drive enabled
 Right segment = motor revolves clockwise

Ballast circuit switching:

The direction segment (at the right or left bottom) is switched off when the ballast circuit is switched on.

Control Connection

5.13 Error displays on the servo

The red LED "fault" is bright and the fault no. is indicated by the green seven-segment display.

List of errors

Display Controller	Error display on the NDrive	Meaning
0	BADPARAS	Damaged parameter
1	POWER FAULT	Output stage error
2	RFE FAULT	Safety bus fault
3	BUS TIMEOUT	Transmission fault BUS
4	FEEDBACK	Encoder signal faulty
5	POWERVOLTAGE	No power supply voltage
6	MOTORTEMP	Motor temperature too high
7	DEVICETEMP	Device temperature too high
8	OVERVOLTAGE	Overvoltage $>1.8 \times U_N$
9	I_PEAK	Over-current 300%
A	RACEAWAY	Drive races (without command value, wrong direction)
B	USER	User - choice of error
C	12R	Overload
D	RESERVE	
E	ADC-INT	Current measurement error
F (Depending on device)	BALLAST	Ballast-circuit overloaded
Decimal point flashing	Processing unit active	
Decimal point dark	Auxiliary voltage missing or inherent hardware failure	

LED displays on the servo

In case of an error the red LED 'fault' lights up and the error no. is indicated.

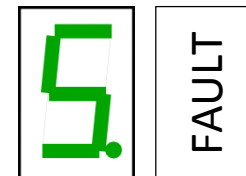
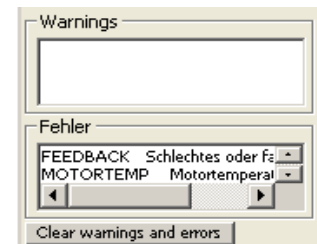
The BTB (ready) contact is opened.
The software 'BTB message' switches from 1 to 0.
The state message 'RDY' extinguishes.

When the enable is switched off, the error message is still displayed.

The error message is deleted:
When the enable is switched on, the function 'cancel errors' is activated via a digital input or a CAN BUS.

Note:

When applying the 24V auxiliary voltage with the enable closed (FRG/RUN X1:7 active) the red LED signals an error. There is no fault signal displayed in the 7-segment display.



5.14 Warning signals

The state "**warning**" is signalled by the flashing red fault LED and the seven-segment display indicates alternately the state and the warning no.

List of warning signals

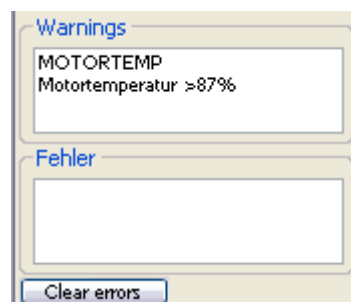
Display Controller	Warning signals on the NDrive	Meaning	ID-Address
			REGID 0x8f
0	WARNING_0	Device identify inconsistent	Bit 16
1	ILLEGAL STATUS	RUN Signal	Bit 17
2	WARNING_2	FE Signal inactive	Bit 18
3			Bit 19
4			Bit 20
5	POWERVOLTAGE	Power voltage too small or missing	Bit 21
6	MOTOREMP	Motor temperature >87%	Bit 22
7	DEVICETEMP	device temperature >87%	Bit 23
8	OVERVOLTAGE	surge >11.5 x UN	Bit 24
9	I_PEAK	overcurrent 200 %	Bit 25
A			Bit 26
B			Bit 27
C	I2R	overload	Bit 28
D			Bit 29
E			Bit 30
F	BALLAST	ballast circuit >87% overloaded	Bit 31



Fault

Example:

flashing red,
The display swaps between the state and the warning no.,
Warning no. 5



5.15 Measured data

BUS circuit voltage

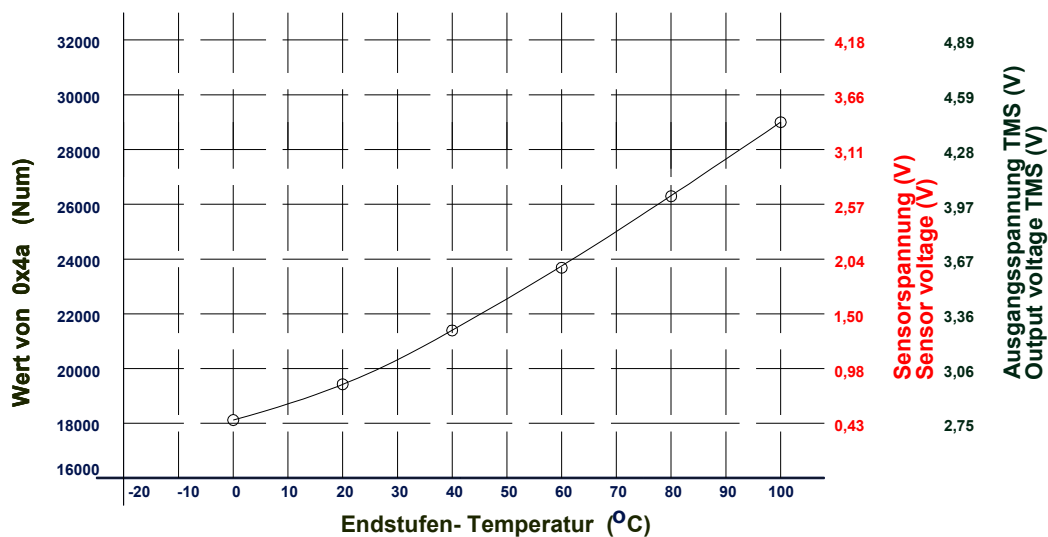
DPC-xx	Bus circuit voltage	Parameter 0xeb	DC-BUS - %
Max. voltage	740V	22250	135
Battery voltage	400V	12030	74
Overvoltage switch-off	860V	25860	158
Charging voltage	790V	23755	144
Standardization			
DC-BUS	1V	30,07	0,184

Current actual value

BPC	I 100 %	Calibration rated current I-device			Peak current DC blocked	
Max. value +/- 11Bit	mV	Num	Aeff	A=	Num	A=
440	394	560	40	56	800	80
460	590	840	60	84	1200	120

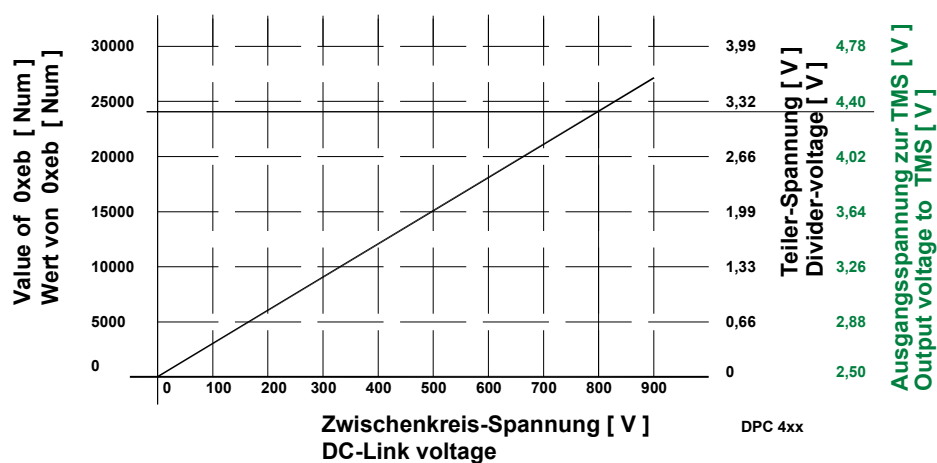
5.16 Output stage temperatur

IGBT modul temperature	Analog voltage X4 Pin6	Parameter 0x4a
Maximal +80	2.70	26474 (FW>400)



Zeichnungen-DP4-Temperatur-IGBT Bamocar-DPC4

BUS circuit voltage



6 Warranty

6.1 Warranty

We warrant that the device is free from material and production defects. Test results are recorded and archived with the serial number.

The warranty time begins from the time the device is shipped, and lasts two years.

We undertake no warranties for devices which have been modified for special applications.

During the warranty period, we will, at its option, either repair or replace products that prove to be defective, this includes guaranteed functional attributes. **specifically disclaims the implied warranties or merchantability and fitness for a particular purpose.** For warranty service or repair, this product must be returned to a service facility designated by.

For products returned to for warranty service, the buyer shall prepay shipping charges to **us** and we shall pay shipping charges to return the product to the buyer.

However, the buyer shall pay all shipping charges, duties and taxes for products returned to **us** from another country.

The foregoing warranty shall not apply to defects resulting from:

- improper or inadequate repairs effected by the buyer or a third party,
- non-observance of the manual which is included in all consignments,
- non-observance of the electrical standards and regulations,
- improper maintenance
- acts of nature.

All further claims on transformation, diminution and replacement of any kind of damage, especially damage, which does not affect the device, cannot be considered. Follow-on damage within the machine or system, which may arise due to malfunction or defect in the device cannot be claimed. This limitation does not affect the product liability laws as applied in the place of manufacture (i.e. Germany).

We reserves the right to change any information included this MANUAL.

All connection circuitry described is meant for general information purposes and is not mandatory.

The local legal regulations, and those of the standards authorities have to be adhered to. **we** does not assume any liability, expressly or inherently, for the information contained in this MANUAL, for the functioning of the device or its suitability for any specific application.

All rights are reserved.

Copying, modifying and translations lie outside our liability and thus are not prohibited.

Our products are not authorised for use as critical components in the life support devices or systems without express written approval.

The onus is on the reader to verify that the information here is current.