

COMBIVERT P6

INSTRUCTIONS FOR USE | **INSTALLATION P6 PITCH INVERTER**
18/19/23P6 HOUSING G, R

Translation of the original manual
Document 20095484 EN 02



Preface

The hardware and software described in this document are products of KEB. The information contained in this document is valid at the time of publishing. KEB reserves the right to update this document in response to misprints, mistakes or technical changes.

Signal words and symbols

Certain procedures within this document can cause safety hazards during the installation or operation of the device. Refer to the safety warnings in this document when performing these procedures. Safety signs are also located on the device where applicable. A safety warning is marked by one of the following warning signs:

DANGER	Dangerous situation, which will cause death or serious injury if this safety warning is ignored.
WARNING	Dangerous situation, which may cause death or serious injury if this safety warning is ignored.
CAUTION	Dangerous situation, which may cause minor injury if this safety warning is ignored.
NOTICE	Situation, which can cause damage to property if this safety warning is ignored.

RESTRICTION

Used when the following statements depend on certain conditions or are only valid for certain ranges of values.



Used for informational messages or recommended procedures.

More symbols

- ▶ This arrow starts an action step.
- / - Enumerations are marked with dots or indents.
- => Cross reference to another chapter or another page.



Note to further documentation.
www.keb.de/service/downloads



Laws and guidelines

KEB Automation KG confirms with the EC declaration of conformity and the CE mark on the device nameplate that it complies with the essential safety requirements.

The EC declaration of conformity can be downloaded on demand via our website.

Warranty and liability

The warranty and liability on design, material or workmanship for the acquired device is given in the general sales conditions.



Here you will find our general sales conditions.
www.keb.de/terms-and-conditions



Further agreements or specifications require a written confirmation.

Support

Although multiple applications are referenced, not every case has been taking into account. If you require further information or if problems occur which are not referenced in the documentation, you can request the necessary information via the local KEB agency.

The use of our units in the target products is outside of our control and therefore lies exclusively in the area of responsibility of the customer.

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the intended use. However, they are regarded as being only informal and changes are expressly reserved, in particular due to technical changes. This also applies to any violation of industrial property rights of a third-party. Selection of our units in view of their suitability for the intended use must be done generally by the user.

Tests can only be done within the intended end use of the product (application) by the customer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.

Copyright

The customer may use the instructions for use as well as further documents or parts from it for internal purposes. Copyrights are with KEB and remain valid in its entirety.

This KEB product or parts thereof may contain third-party software, including free and/or open source software. If applicable, the license terms of this software are contained in the instructions for use. The instructions for use are already available to you, can be downloaded free of charge from the KEB website or can be requested from the respective KEB contact person.

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Glossary

0V	Earth-potential-free common point	Endat	Bidirectional encoder interface of the company Heidenhain
1ph	1-phase mains	EtherCAT	Real-time Ethernet bus system of the company Beckhoff
3ph	3-phase mains	Ethernet	Real-time bus system - defines protocols, plugs, types of cables
AC	AC current or voltage	FE	Functional earth
AFE	From 07/2019 AIC replaces the previous name AFE	FSoE	Functional Safety over Ethernet
AFE filter	From 07/2019 AIC filter replaces the previous name AFE filter	FU	Drive controller
AIC	Active Infeed Converter	GND	Reference potential, ground
AIC filter	Filter for Active Infeed Converter	GTR7	Braking transistor
Application	The application is the intended use of the KEB product	HF filter	High frequency filter to the mains
ASCL	Asynchronous sensorless closed loop	Hiperface	Bidirectional encoder interface of the company Sick-Stegmann
Auto motor ident.	Automatically motor identification; calibration of resistance and inductance	HMI	Human machine interface (touch screen)
AWG	American wire gauge	HSP5	Fast, serial protocol
B2B	Business-to-business	HTL	Incremental signal with an output voltage (up to 30V) -> TTL
BiSS	Open source real-time interface for sensors and actuators (DIN 5008)	IEC	International standard
CAN	Fieldbus system	IP xx	Degree of protection (xx for level)
CDF	Cyclic duration factor	KEB product	The KEB product is subject of this manual
CDM	Complete drive module including auxiliary equipment (control cabinet)	KTY	Silicium temperature sensor (polarized)
COMBIVERT	KEB drive controller	Manufacturer	The manufacturer is KEB, unless otherwise specified (e.g. as manufacturer of machines, engines, vehicles or adhesives)
COMBIVIS	KEB start-up and parameterizing software	MCM	American unit for large wire cross sections
Customer	The customer has purchased a KEB product from KEB and integrates the KEB product into his product (customer product) or resells the KEB product (dealer)	Modulation	Means in drive technology that the power semiconductors are controlled
DC	DC current or voltage	MTTF	Mean service life to failure
DI	Demineralized water, also referred to as deionized (DI) water	NN	Sea level
DIN	German Institut for standardization	OC	Overcurrent
DS 402	CiA DS 402 - CAN device profile for drives	OH	Overheat
EMC	Electromagnetic compatibility	OL	Overload
Emergency stop	Shutdown of a drive in emergency case (not de-energized)	OSSD	Output signal swithcing device; - an output signal that is checked in regular intervals on its shutdown. (safety technology)
Emergency switching off	Switching off the voltage supply in emergency case	PDS	Power drive system incl. motor and measuring probe
EMS	Energy Management System	PE	Protective earth
EN	European standard	PELV	Protective Extra Low Voltage
Encoder emulation	Software-generated encoder output	PFD	Term used in the safety technology (EN 61508-1...7) for the size of error probability
End customer	The end customer is the user of the customer product		

GLOSSARY

PFH	Term used in the safety technology (EN 61508-1...7) for the size of error probability per hour
PLC	Programmable logic controller
Pt100	Temperature sensor with $R_0=100\Omega$
Pt1000	Temperature sensor with $R_0=1000\Omega$
PTC	PTC-resistor for temperature detection
PWM	Pulse width modulation
RJ45	Modular connector with 8 lines
SCL	Synchronous sensorless closed loop
SELV	Safety Extra Low Voltage (<60V)
SIL	The safety integrity level is a measure for quantifying the risk reduction. Term used in the safety technology (EN 61508 -1...7)
SS1	Safety function „Safe stop 1“ in accordance with IEC 61800-5-2
SSI	Synchronous serial interface for encoder
STO	Safety function „Safe Torque Off“ in accordance with IEC 61800-5-2
TTL	Incremental signal with an output voltage up to 5V
USB	Universal serial bus
VARAN	Real-time Ethernet bus system

Standards for drive controllers

Product standards that apply directly to the drive controller

EN61800-2	Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency a.c. power drive systems (VDE 0160-102, IEC 61800-2)
EN61800-3	Speed-adjustable electrical drives. Part 3: EMC requirements and specific test methods (VDE 0160-103, IEC 61800-3)
EN61800-5-1	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1); German version EN 61800-5-1
EN61800-5-2	Adjustable speed electrical power drive systems - Part 5-2: Safety Requirements - Functional (IEC 22G/264/CD)
UL61800-5-1	American version of the EN61800-5-1 with „National Deviations“

Basic standards to which drive controller standards refer directly

EN 55011	Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement (CISPR 11); German version EN 55011
EN 55021	Interference to mobile radiocommunications in the presence of impulse noise - Methods of judging degradation and measures to improve performance (IEC/ CISPR/D/230/FDIS); German version prEN 55021
EN 60529	Degrees of protection provided by enclosures (IP Code) (IEC 60529)
EN 60664-1	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests (IEC 60664-1)
EN 60721-3-1	Classification of environmental conditions - Part 3-1: Classification of groups of environmental parameters and their severities - Section 1: Storage (IEC 60721-3-1); German version EN 60721-3-1
EN 60721-3-2	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transportation and handling (IEC 104/670/CD)
EN 60721-3-3	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities; section 3: Stationary use at weatherprotected locations; Amendment A2 (IEC 60721-3-3); German version EN 60721-3-3
EN 61000-2-1	Electromagnetic compatibility (EMC) - Part 2: Environment - Section 1: Description of the environment - Electromagnetic environment for low-frequency conducted disturbances and signalling in public power supply systems
EN 61000-2-4	Electromagnetic compatibility (EMC) - Part 2-4: Environment; Compatibility levels in industrial plants for low-frequency conducted disturbances (IEC 61000-2-4); German version EN 61000-2-4
EN 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2); German version EN 61000-4-2
EN 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3); German version EN 61000-4-3
EN 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (IEC 61000-4-4); German version EN 61000-4-4

STANDARDS FOR DRIVE CONTROLLERS

EN61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test (IEC 61000-4-5); German version EN 61000-4-5
EN61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6); German version EN 61000-4-6
EN61000-4-34	Electromagnetic compatibility (EMC) - Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase (IEC 61000-4-34); German version EN 61000-4-34
EN61508-1...7	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1...7 (VDE 0803-1...7, IEC 61508-1...7)
EN62061	Safety of machinery - functional safety of electrical, electronic and programmable electronic safety-related systems (VDE 0113-50, IEC 62061)
EN ISO 13849-1	Safety of machinery - safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1); German version EN ISO 13849-1

Standards that are used in the environment of the drive controller

DGUV regulation 3	Electrical installations and equipment
DIN IEC 60364-5-54	Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors (IEC 64/1610/CD)
DIN EN 60939-1	Passive filter units for electromagnetic interference suppression - Part 1: Generic specification (IEC 60939-1:2010); German version EN 60939-1:2010
DIN VDE 0100-729	Low-voltage electrical installations - Part 7-729: Requirements for special installations or locations - Operating or maintenance gangways (IEC 60364-7-729:2007, modified); German implementation HD 60364-7-729:2009
DNVGL-CG-0339	Environmental test specification for electrical, electronic and programmable equipment and systems
EN 1037	Safety of machinery - Prevention of unexpected start-up; German version EN 1037
EN 12502-1...5	Protection of metallic materials against corrosion - Part 1...5
EN 60204-1	Safety of machinery - electrical equipment of machines Part 1: General requirements (VDE 0113-1, IEC 44/709/CDV)
EN 60439-1	Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1); German version EN 60439-1
EN 60947-7-1	Low-voltage switchgear and controlgear - Part 7-1: Ancillary equipment - Terminal blocks for copper conductors (IEC 60947-7-1:2009); German version EN 60947-7-1:2009
EN 60947-8	Low-voltage switchgear and controlgear - Part 8: Control units for built-in thermal protection (PTC) for rotating electrical machines (IEC 60947-8:2003 + A1:2006 + A2:2011)
EN 61373	Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373); German version EN 61373
EN 61439-1	Low-voltage switchgear and controlgear assemblies - Part 1: General rules (IEC 121B/40/CDV); German version FprEN 61439-1
Germ. Lloyd, 7-2	Environmental test specification for electrical, electronic and programmable equipment and systems (DNVGL Class Guidelines DNVGL-CG-0339)
VGB R 455 P	Water treatment and use of materials in cooling systems

1 Basic Safety Instructions

The COMBIVERT is designed and constructed in accordance with state-of-the-art technology and the recognized safety rules and regulations. However, the use of such devices may cause functional hazards for life and limb of the user or third parties, or damages to the system and other material property.

The following safety instructions have been created by the manufacturer for the area of electric drive technology. They can be supplemented by local, country- or application-specific safety instructions. This list is not exhaustive. Violation of the safety instructions by the customer, user or other third party leads to the loss of all resulting claims against the manufacturer.

NOTICE



Hazards and risks through ignorance.

- ▶ Read the instructions for use !
- ▶ Observe the safety and warning instructions !
- ▶ If anything is unclear, please contact KEB Automation KG !

1.1 Target group

These instructions for use are intended exclusively for qualified electricians. Electrical personnel for the purpose of this instruction manual must have the following qualifications:

- Knowledge and understanding of the safety instructions.
- Skills for installation and assembly.
- Knowledge of the start-up and operation of the product.
- Understanding of the function in the used machine.
- Detection of hazards and risks of the electrical drive technology.
- Knowledge of *DIN IEC 60364-5-54*.
- Knowledge of the national safety regulations (e.g. *DGUV regulation 3*).

1.2 Transport, storage and proper use

The transport is carried out by qualified persons in accordance with the environmental conditions specified in this manual. Drive controller shall be protected against excessive strains.

Do not store the product

- in the environment of aggressive and/or conductive liquids or gases.
- in areas with direct sunlight.
- outside the specified environmental conditions.

1.3 Installation

⚠ DANGER



Do not operate in an explosive environment!

- ▶ The COMBIVERT is not intended for the use in potentially explosive environment.

⚠ CAUTION



Design-related edges and high weight!

Contusions and bruises!

- ▶ Never stand under suspended loads.
- ▶ Wear safety shoes.
- ▶ Secure drive controller accordingly when using lifting gear.

To prevent damages to the device:

- Make sure that no components are bent and/or isolation distances are changed.
- The device must not be put into operation in case of mechanical defects.
- Do not allow moisture or mist to penetrate the unit.
- Avoid dust permeating the device. Allow for sufficient heat dissipation if installed in a dust-proof housing.
- Note installation position and minimum distances to surrounding elements. Do not cover the ventilation openings.
- Mount the drive controller according to the specified degree of protection.
- Make sure that no small parts fall into the COMBIVERT during assembly and wiring (drilling chips, screws etc.). This also applies to mechanical components, which can lose small parts during operation.
- Check the reliable fit of the device connections in order to avoid contact resistances and sparking.
- Do not walk-on drive controller.
- Follow all safety instructions!

1.4 Electrical connection

DANGER



Voltage at the terminals and in the device!

Danger to life due to electric shock !

- ▶ Never work on the open device or never touch exposed parts.
- ▶ Wait until all drives has been stopped in order that no regenerative energy can be generated.
- ▶ For any work on the unit switch off the supply voltage and secure it against switching on. Even after the mains supply has been switched off, the drive controller continues to be supplied from an energy storage device at the DC link for back-up operation. Since the discharge of the energy storage device can sometimes take several days, the absence of voltage must be checked by measuring the input terminals L1/L2/L3 and BT+/BT-. Only then work may be continued on the device.
- ▶ If personal protection is required, install suitable protective devices for drive controllers.
- ▶ Never bridge upstream protective devices (not even for test purposes).
- ▶ Connect the protective earth conductor always to drive controller and motor.
- ▶ Install all required covers and protective devices for operation.
- ▶ The control cabinet shall be kept closed during operation.
- ▶ Residual current: This product can cause a DC current in the protective earth conductor. When a residual current device (RCD) or a residual current monitor (RCM) is used for the protection of direct or indirect contact, only a RCD or RCM of Type B is permitted for this product on the power supply side.
- ▶ The drive controllers are intended for a stationary connection. Protective earth conductors are to be laid out in accordance with the local regulations for equipment with high leakage currents according to *EN 61800-5-1*, *EN 60204-1* or *DIN IEC 60364-5-54*.



If personnel protection is required during installation of the system, suitable protective devices must be used for drive controllers.

www.keb.de/fileadmin/media/Techinfo/dr/tn/ti_dr_tn-rcd-00008_en.pdf



Installations which include drive controller shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. act respecting technical equipment, accident prevention rules etc. They must always be complied with, also for drive controller bearing a CE marking.

For a trouble-free and safe operation, please pay attention to the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses are to be dimensioned by the user in accordance with the minimum/maximum values specified for the application.
- The drive controllers may only be connected to symmetrical TN systems with a phase (L1, L2, L3) to neutral/earth (N/PE) voltage of no more than 300 V. An isolating transformer must be used for supply networks which exceed this value. In case of non-compliance the control is not longer considered as safe separate circuit.
- With existing or newly wired PELV circuits the person installing the units or machines must ensure the requirements are met.
- In the case of drive controllers without safe separation from the supply circuit (according to *EN 61800-5-1*), all control lines must be included in additional protective measures (e.g. double insulation or shielded, grounded and insulated).
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Failure to comply can result in the components being destroyed by equalizing currents.

1.4.1 EMC-compatible installation

Observance of the limit values required by EMC law is the responsibility of the customer.



Notes on EMC-compatible installation can be found here.

www.keb.de/fileadmin/media/Manuals/dr/emv/0000neb0000.pdf



1.4.2 Voltage test

Testing with AC voltage (in accordance with *EN 60204-1* chapter 18.4) may not be executed, since there is danger for the power semiconductors in the drive controller.



Due to the radio interference suppression capacitors, the test generator will switch off immediately with a current fault.



According to *EN 60204-1* it is permissible to disconnect already tested components. Drive controllers of the KEB Automation KG are delivered ex works voltage tested to 100% according to product standard.

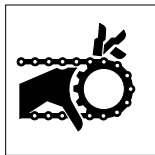
1.4.3 Insulation measurement

An insulation measurement (according to *EN 60204-1* chapter 18.3) with DC 500 V is permitted if all connections in the power section (grid-connected potential) are bridged with each other and all control connections are bridged with PE. The insulation resistance of each product can be found in the technical data.

1.5 Start-up and operation

The drive controller must not be started until it is determined that the installation complies with the machine directive; Account is to be taken of *EN 60204-1*.

⚠ WARNING



Software protection and programming!

Hazards caused by unintentional behavior of the drive!

- ▶ Check especially during initial start-up or replacement of the drive controller if parameterization is compatible to application.
- ▶ Securing a unit solely with software-supported functions is not sufficient. It is imperative to install external protective measures (e.g. limit switch) that are independent of the drive controller.
- ▶ Secure motors against automatic restart.

⚠ CAUTION



High temperatures on the heat sink!

Burning of the skin!

- ▶ Cover hot surfaces safe-to-touch.
- ▶ If necessary, attach warning signs on the system.
- ▶ Check surface before touching.
- ▶ Before any working let the unit cool down.

- During operation, all covers and doors shall be kept closed.
- Use only approved accessories for this device.
- Never touch terminals, busbars or cable ends.



If a P6 drive controller has not been in operation for more than a year, observe the following information.

www.keb.de/fileadmin/media/Techinfo/dr/tn/ti_dr_tn-format-capacitors-00009_en.pdf



Short-circuit proof

The drive controllers are conditional short-circuit proof. After resetting the internal protection devices, the function as directed is guaranteed.

Exceptions:

- If ground faults or short circuits occur repeatedly at the U / V / W output, this can lead to a defect in the device.
- If a ground or short circuit occurs at RB+ / RB-, this can lead to a defect in the device.
- If a ground fault occurs at 18/19P6 at BT-, HB+, HB- or F2, this can lead to a defect in the device.
- If a ground fault occurs at 23P6 at BT-, this can lead to a defect in the device.

1.6 Maintenance

The following maintenance work must be carried out by trained personnel as required, but at least once a year.

- ▶ Switch off the power to the system, => „1.4 Electrical connection“.
- ▶ Check unit for loose screws and plugs and if necessary tighten up.
- ▶ Clean drive controller from dirt and dust deposits. Pay attention especially to cooling fins and protective grid of the fans.
- ▶ Examine and clean extracted air filter and cooling air filter of the control cabinet.
- ▶ Check the function of the fans of the drive controller. The fans must be replaced in case of audible vibrations or squeak.

1.7 Repair

In case of malfunction, unusual noises or smells inform a person in charge!

⚠ DANGER



Unauthorized exchange, repair and modifications!

Unpredictable malfunctions!

- ▶ The function of the drive controller is dependent on its parameterization. Never replace without knowledge of the application.
- ▶ Modification or repair is permitted only by KEB Automation KG authorized personnel.
- ▶ Only use original manufacturer parts.
- ▶ Infringement will annul the liability for resulting consequences.

In case of failure, please contact the machine manufacturer. Only the machine manufacturer knows the parameterisation of the used drive controller and can provide an appropriate replacement or induce the maintenance.

1.8 Disposal

Electronic devices of the KEB Automation KG are exclusively professional devices for further industrial processing (so-called B2B devices).

Manufacturers of B2B devices are obliged to take back and recycle devices manufactured after 14.08.2018. These devices may not be disposed at the collection centres of public sector disposal organisations.



If no deviating agreement has been made between the customer and KEB or no deviating mandatory legal regulation exists, KEB products marked in this way can be returned. Company and keyword to the return point can be taken from the list below. Shipping costs are paid by the customer. Thereupon the devices will be professionally recycled and disposed.

The entry numbers are listed country-specific in the following table. The corresponding KEB return addresses can be found on our website.

Withdrawal by	WEEE-Reg.-No.	Keyword
Austria		
KEB Automation GmbH	ERA: 51976	Stichwort „Rücknahme WEEE“
France		
RÉCYLUM - Recycle point	ADEME: FR021806	Mots clés „KEB DEEE“
Germany		
KEB Automation KG	EAR: DE12653519	Stichwort „Rücknahme WEEE“
Italy		
COBAT	AEE: (IT) 19030000011216	Parola chiave „Ritiro RAEE“
Spain		
KEB Automation KG	RII-AEE 7427	Palabra clave „Retirada RAEE“
Česko		
KEB Automation KG	RETELA 09281/20 ECZ	Klíčové slovo: Zpětný odběr OEEZ

The packaging must be feed to paper and cardboard recycling.

2 Product Description

The COMBIVERT P6 series are drive controllers that have been developed for use as pitch controllers in wind turbines. They are used to actively adjust the rotor blades of the wind turbine, which therefore allows controlling the rotor speed and the turbine output power.

As part of the safety system, the COMBIVERT P6 drive controllers can protect the wind turbine from a dangerous overspeed or bring it to a standstill in case of a turbine fault by quickly turning the rotor blades "out of the wind".

In order to be able to perform this safety function even in case of a power failure, energy storage devices (rechargeable batteries or ultracapacitors) are connected to the P6 as a backup supply.

The COMBIVERT meets the requirements of the Low-Voltage Directive. The harmonized standards of the series [EN 61800-5-1](#) for drive controller were used.

The COMBIVERT is a product of limited availability in accordance with [EN 61800-3](#). This product may cause radio interference in residential areas. In this case the operator may need to take corresponding measures.

The machine directive, EMC directive, Low Voltage Directive and other guidelines and regulations must be observed depending on the version.

2.1 Specified application

The COMBIVERT is used exclusively for the control and regulation of three-phase motors or DC motors. It is intended for installation in wind turbines.

Technical data and information for connection conditions shall be taken from the type plate and from the instruction manual and must be strictly observed.

The used semiconductors and components of the KEB Automation KG are developed and dimensioned for the use in industrial products.

Restriction

If the product is used in machines, which work under exceptional conditions or if essential functions, life-supporting measures or an extraordinary safety step must be fulfilled, the necessary reliability and security must be ensured by the machine builder.

2.1.1 Residual risks

Despite intended use, the drive controller can reach unexpected operating conditions in case of error, with wrong parameterization, by faulty connection or unprofessional interventions and repairs. This can be:

- wrong direction of rotation
- motor speed too high or too low
- motor is running into limitation
- motor can be under voltage even in standstill
- automatic start

2.2 Unintended use

The operation of other electric consumers is prohibited and can lead to the destruction of the unit. The operation of our products outside the indicated limit values of the technical data leads to the loss of any liability claims.

2.3 Product features

This instruction for use describes the following devices:

Unit type:	Drive controller
Series:	COMBIVERT P6
Power range:	18...42 kW / 400V
Housing:	G, R

The COMBIVERT P6 is an "all-in-one" drive controller for pitch applications, which is characterised by the following features:

- Control of induction, synchronous and DC motors
- Braking resistor integrated
- Charging circuit for ultracapacitors / rechargeable batteries
- Monitoring of Ultracapacitors / rechargeable batteries
- Control and supply for an electromechanical brake on the motor shaft
- Two encoder interfaces for motor encoder and blade encoder
- Motor temperature monitoring with PTC, KTY or Pt1000 (software-dependent)
- A complete PLC
- Digital inputs and outputs, relay output (potential-free) for safety chain, Pt100 inputs
- Fieldbus interface
- Integrated EMC filter
- Wide operating temperature range
- High vibration resistance
- Through panel mounting heat sink
- Temperature-controlled fans, monitored and easily replaceable

Special functions for the pitch application:

- Freely programmable PLC (according to *IEC 61131*) with prepared function blocks
- Safety run with backup from ultracapacitors / batteries
- Speed control or position control
- Adjustable torque limit, ramps and s-curves (to protect gearbox)
- Detection of mains failure and phase failure
- Automatic reaction (safety run) in case of encoder failure and other errors
- General protection functions of the COMBIVERT series against overcurrent, short circuit, earth fault and overtemperature

2.4 Options

The pitch drive controller can be equipped with the following options:

- Brake supply and control 24 V (18/19P6) or 50...300 V (18/19/23P6)
- Output 24 V/4.2A can be used for customer components if no 24 V brake is connected (18/19P6)
- Output 24 V/3A can be used for customer components (23P6)
- External braking resistor for high power
- Integrated heating resistor for cold climate version and as moisture/condensation protection
- Humidity sensor, mounting orientation sensor, analog inputs
- Fieldbus interface CANopen, ProfiBus, Interbus, PROFINET, POWERLINK, EtherCAT
- Fan rotation axes either in the X, Y or Z direction (to match with the mounting orientation)
- Extended pitch library for the built-in PLC with the following function blocks:
 - Reaction on Grid Loss (LVRT)
 - Monitoring of ultracapacitors
 - Monitoring of batteries
 - Monitoring of the fuses and cabling to the energy storage
 - Measurement of capacitance and internal resistance of ultracapacitors
 - Controlled discharge of the ultracapacitors (for service)
 - Error memory and real-time clock
 - Data logger

2.5 Type code

xx	P6	x	x	x-x	x	x	x
Fieldbus interface / Software library		0: PROFIBUS ^{® 3)}		Basic Library			
		1: CANopen ^{® 2)}					
		2: Interbus					
		3: PROFINET ^{® 4)} Slave					
		4: POWERLINK Controlled Node					
		5: EtherCAT ^{® 1)} Slave					
		A: PROFIBUS ^{® 3)}		Extended Pitch Library			
		B: CANopen ^{® 2)}					
		C: Interbus					
		D: PROFINET ^{® 4)} Slave					
		E: POWERLINK Controlled Node					
		F: EtherCAT ^{® 1)} Slave					
Mechanical design		X: through-mount version; fans in X direction					
		Y: through-mount version; fans in Y direction					
		Z: through-mount version; fans in Z direction					
Electrical equipment		0: Without heating resistors / with high-voltage brake					
		1: Without heating resistors / without high-voltage brake					
		2: With heating resistors 400 V / with high-voltage brake					
		3: With heating resistors 400 V / without high-voltage brake					
Voltage, switching frequency, software current limit, Overcurrent		3: 3ph 400 VAC; 4 kHz; 200 %; 240 %					
		C: 3ph 400 VAC; 2 kHz; 230 %; 276 %					
		D: 3ph 400 VAC; 4 kHz; 292 %; 350 %					
		Y: 3ph 400 VAC; Customer /special units					
Housing		G, R					
Braking resistor, motor type		Braking resistor		Motor type			
		1: external		AC			
		2: 12 Ω (18/19P6) / 5 Ω (23P6)		AC			
		4: 10 Ω		AC			
		9: external		DC			
		A: 12 Ω		DC			
		B: 10 Ω		DC			
Control type		G: without sensors (humidity, mounting orientation, analog inputs)					
		H: with sensors (humidity, mounting orientation, analog inputs)					
Series		COMBIVERT P6					
Inverter size		18, 19, 23					

Table 1: Type code

- 1) EtherCAT[®] is a registered trademark and patented technology licensed by the Beckhoff Automation GmbH, Germany.
- 2) CANopen[®] is a registered trademark of the CAN in AUTOMATION - International Users and Manufacturers Group e.V.
- 3) PROFIBUS[®] is a registered trademark of the PROFIBUS user organization e.V.
- 4) PROFIBUS[®] is a registered trademark of the PROFIBUS user organization e.V.



The type code is not used as order code, but only for identification!

3 Technical Data

3.1 Operating conditions

3.1.1 Climatic ambient conditions

Storage	Standard	Class	Descriptions			
Ambient temperature	EN 60721-3-1	1K4	Extended to -40°C...70°C			
Relative humidity	EN 60721-3-1	1K3	5...95 % (without condensation)			
Storage altitude	–	–	Max. 3000 m above sea level			
Transport	Standard	Class	Descriptions			
Ambient temperature	EN 60721-3-2	2K3	Extended to -40°C...70°C			
Relative humidity	EN 60721-3-2	2K3	Maximum 95 % at 40 °C (without condensation)			
Operation	Standard	Class	Descriptions			
Ambient temperature	EN 60721-3-3	3K3	Place	18P6	19P6	23P6
			At the heat sink	-30...60 °C	-30...55 °C	-30...50 °C
			In the cabinet	-30...70 °C	-30...65 °C	-30...60 °C
Relative humidity	EN 60721-3-3	3K3	5...85 % (without condensation)			
Protection degree	EN 60529	IP20	Inner part (cabinet side) Protection against foreign material > ø12.5 mm No protection against water Non-conductive pollution, occasional condensation when PDS is out of service.			
		IP54	Through panel mounted heat sink side Protection against interior dust deposits Complete touch protection Protected against spray water			
Site altitude	–	–	Max. 3000 m above sea level • With site altitude above 1000m a current derating of 1 % per 100 m must be taken into account.			

Table 2: Climatic ambient conditions

3.1.2 Mechanical ambient conditions

Storage	Standard	Class	Descriptions
Vibration limits	<i>EN 60721-3-1</i>	1M3	Vibration amplitude 3.0 mm (2...9 Hz) Acceleration amplitude 10 m/s ² (9...200 Hz)
	<i>EN 61373</i>	–	Railway
	<i>Germ. Lloyd, 7-2</i>	–	–
Shock limits	<i>EN 60721-3-1</i>	1M3	100 m/s ² ; 11 ms
Transport	Standard	Class	Descriptions
Vibration limits	<i>EN 60721-3-2</i>	2M1	Vibration amplitude 3.5 mm (2...9 Hz) Acceleration amplitude 10 m/s ² (9...200 Hz) (acceleration amplitude 15 m/s ² (200...500 Hz)) ¹⁾
	<i>EN 61373</i>	–	Railway
	<i>Germ. Lloyd, 7-2</i>	–	–
Shock limits	<i>EN 60721-3-2</i>	2M1	100 m/s ² ; 11 ms
Operation	Standard	Class	Descriptions
Vibration limits	<i>EN 60721-3-3</i>	3M4	Vibration amplitude 3.0 mm (2...9 Hz) Acceleration amplitude 10 m/s ² (9...200 Hz)
	<i>EN 61800-5-1</i>	–	Vibration amplitude 0.075 mm (10...57 Hz) Acceleration amplitude 10 m/s ² (57...150 Hz)
	<i>EN 61373</i>	–	Railway
	<i>Germ. Lloyd, 7-2</i>	–	–
Shock limits	<i>EN 60721-3-3</i>	3M4	100 m/s ² ; 11 ms

Table 3: Mechanical ambient conditions

¹⁾ Not tested.

3.1.3 Chemical / mechanical active substances

Storage	Standard	Class	Descriptions	
Contamination	<i>EN 60721-3-1</i>	Gases	1C2	–
		Solids	1S2	–
Transport	Standard	Class	Descriptions	
Contamination	<i>EN 60721-3-2</i>	Gases	2C2	–
		Solids	2S2	–
Operation	Standard	Class	Descriptions	
Contamination	<i>EN 60721-3-3</i>	Gases	3C2	–
		Solids	3S2	–

Table 4: Chemical / mechanical active substances

3.1.4 Electrical operating conditions

3.1.4.1 Device classification

Requirement	Standard	Class	Descriptions
Overvoltage category	EN 61800-5-1	II	Only for the heating circuit => „5.11 Connection of the internal heating“
		III	–
Pollution degree	EN 60664-1	2	Non-conductive pollution, occasional condensation when PDS is out of service

Table 5: Device classification

3.1.4.2 Electromagnetic compatibility

EMC emitted interference	Standard	Class		Descriptions
Conducted emissions	EN 61800-3	C2		–
Radiated emissions	EN 61800-3	C2		–
Immunity	Standard	Level		Descriptions
Static discharges ¹⁾	EN 61000-4-2	8 kV		AD (air discharge)
		4 kV		CD (contact discharge)
Burst - Ports for process measurement control lines and signal interfaces	EN 61000-4-4	2 kV		–
Burst - AC - Power ports	EN 61000-4-4	4 kV		–
Surge - Power ports	EN 61000-4-5	1 kV		Phase-phase
		2 kV		Phase-ground
Conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	10 V		0.15...80 MHz
Electromagnetic fields	EN 61000-4-3	Standard	Safety	80 MHz...1 GHz 1...2 GHz 2...2.7 (6) GHz
		10 V/m	20 V/m	
		3 V/m	10 V/m	
Voltage fluctuations/ voltage dips ²⁾	EN 61000-2-1	–		-15%...+10%
	EN 61000-4-34	–		Class 3
Frequency changes ²⁾	EN 61000-2-4	–		≤ 2%
Voltage deviations ²⁾	EN 61000-2-4	–		±10%
Voltage unbalance	EN 61000-2-4	–		≤ 3%

Table 6: Electromagnetic compatibility

¹⁾ Unless the drive controller is installed in a closed control cabinet and the electrical connections are not accessible during operation, additional ESD protection measures are required. Details on request.

²⁾ The P6 may be operated at the limit values specified here according to the standard. Furthermore, it may also be operated up to the limits (=> „3.2 Electrical data“) especially if an energy storage (ultracapacitors / batteries) is connected.

3.2 Electrical data

Inverter size			18	19	19 DC ¹⁾	23
Housing			G			R
Input phases			3			3
Output rated power	@ 400 V	P_{out} / kW	18			42
	@ 480 V	P_{out} / kW	22			50
Rated output current AC		²⁾ I_{out} / A	45	52	–	120
Maximum current AC at 0Hz for 3s		³⁾ I_{OL_0} / A	60	83	–	280 ⁴⁾
Maximum current AC at ≥ 6 Hz for 3s		⁵⁾ I_{OL} / A	90	120	–	350 ⁴⁾
Overcurrent		I_{OC} / A	108	144	–	420
Output rated current DC		I_{Out_dc} / A	–	–	52	–
Maximum current DC for 12s		I_{OL_dc} / A	–	–	120	–
Rated current for shunt winding		I_{F2} / A	–	–	5	–
Input rated current		I_{in} / A	28			75
Max. permissible mains fuse gG or MCB with characteristic C, D or K		I_{fuse} / A	50			100
Rated switching frequency		f_{SN} / kHz	4	2		4
Max. switching frequency		f_{S_max} / kHz	4	4 (at $I_{out} < 45A$)		4 (at $I_{out} < 190A$)
Min. switching frequency		f_{S_min} / kHz	2			
Power losses at rated operation		⁶⁾ P_D / kW	410	460		1160
Max. heat sink temperature		t_{max} / °C	90			
Max. motor cable length shielded		l / m	10			15
Rated input voltage		U_N / V	400			
Input voltage range		U_{in} / V	320...528 ± 0			
Input voltage at DC backup power supply		U_{in_dc} / V	U_{in} down to 150			
Mains frequency		f_N / Hz	47...62			45...65
Output voltage		U_{out} / V	3AC 0... U_{in}	0...1.3* U_{in}		3AC 0... U_{in}
Output voltage at DC backup power supply		U_{out} / V	3AC 0... $U_{in_dc} / \sqrt{2}$	0... U_{in_dc}		3AC 0... $U_{in_dc} / \sqrt{2}$
Output frequency		f_{out} / Hz	0...200			
Insulation resistance @ $U_{dc} = 500$ V		R_{iso} / M Ω	>0.5			>1.1

Table 7: Electrical data

- ¹⁾ Device version for DC motors => „2.5 Type code“.
- ²⁾ In continuous operation, the **rated output power** the drive controller must not be exceeded, therefore a reduction of the **output current** is required at output voltages > AC 200 V (19P6 and 23P6) or > AC 230 V (18P6), respectively. In the application as a pitch inverter, this operating case does not occur in continuous operation; therefore no measures are required here.
- ³⁾ Max. current before the overload function (OL2) function triggers.
- ⁴⁾ With an output current > 190 A, the drive controller reduces the switching frequency to 2 kHz depending on the operating point.
- ⁵⁾ With the regulated systems 5% are to be subtracted as control reserve.
- ⁶⁾ Calculated losses at cabinet side + heat sink side, at 50% output voltage, 100% output current and rated switching frequency. The power losses are smaller at smaller motors.



The technical data are designed for pitch motors. When using other motors, please contact KEB.

3.2.1 Braking resistor

The devices can be equipped with different braking resistors. The configuration is specified in the 6th digit of the material number, => „2.5 Type code“.

Inverter size		18 / 19 / 19 DC ¹⁾				23	
6. Digit of the material number		1	2	4	B	1	2
Braking resistor (integrated)	R_B / Ω	–	12	10	10	–	5
Energy absorption capacity braking resistor (integrated)	²⁾ E_B / kJ	–	12	35	20	–	56
Continuous power braking resistor (integrated)	P_B / W	–	320			–	900
Min. brake resistor (external)	R_{B_min} / Ω	8	–			5	–
Max. permitted average braking power over 120 s (external)	P_{AV_max} / kW	17	–			11	–

Table 8: Braking resistor

¹⁾ Device version for DC motors => „2.5 Type code“.

²⁾ Energy absorption capacity within 1 s; repetition allowed every 120 s.



This data applies to devices manufactured since 2019.

Restriction

Customer-specific devices ("Y" in the 8th position of the material number or "Rev. 0A" after the material number) can be equipped with other braking resistors.

3.2.2 Other inputs/outputs of the power unit

Inverter size		18	19	19 DC ¹⁾	23
Max. charging current of the energy storage	I_{chg} / A	5			10
Max. charging voltage of the energy storage	²⁾ U_{chg} / V	493			
Max. current at the 24 V brake output	I_{out_BR} / A	4.2			–
Max. current at the 50...300 V brake output	I_{out_HV} / A	0.7			1.4 / 1.0 ³⁾
Max. voltage at the 50...300 V brake output	²⁾ U_{out_HV} / V	450			
Max. current at the 24 V output	I_{out_24} / A	–			3
Rated voltage internal heating	U_H / V	400			
Rated power internal heating	P_H / W	150			320

Table 9: Other inputs/outputs of the power unit

¹⁾ Device version for DC motors => „2.5 Type code“.

²⁾ If the DC link voltage is sufficient.

³⁾ 1.4 (overexcitation) / 1.0 (rated current).

3.3 Overload function

Valid for drive controllers from firmware version 2.2.0.43.

The overload duration achievable in practice depends essentially on the cooling conditions. The overload protection of the drive controller is triggered by the following causes:

- Permissible heat sink temperature is exceeded, leading to the error message "OH (Error overheat powermodules)".
- Exceeding the tripping time leads to the error message "ERROR overload", => „Figure 1: Maximum tripping time depending on the overload for AC motors“.

3.3.1 AC-Motor (18/19/23P6)

3.3.1.1 Overload function (OL)

The OL function protects the drive controller against permanent overload. Depending on the cooling, long-term operation in the overload range can lead to the "ERROR overheat powermodules", which trips the drive before the OL function responds.

The following graphic shows the tripping time as a function of the respective constant overload:

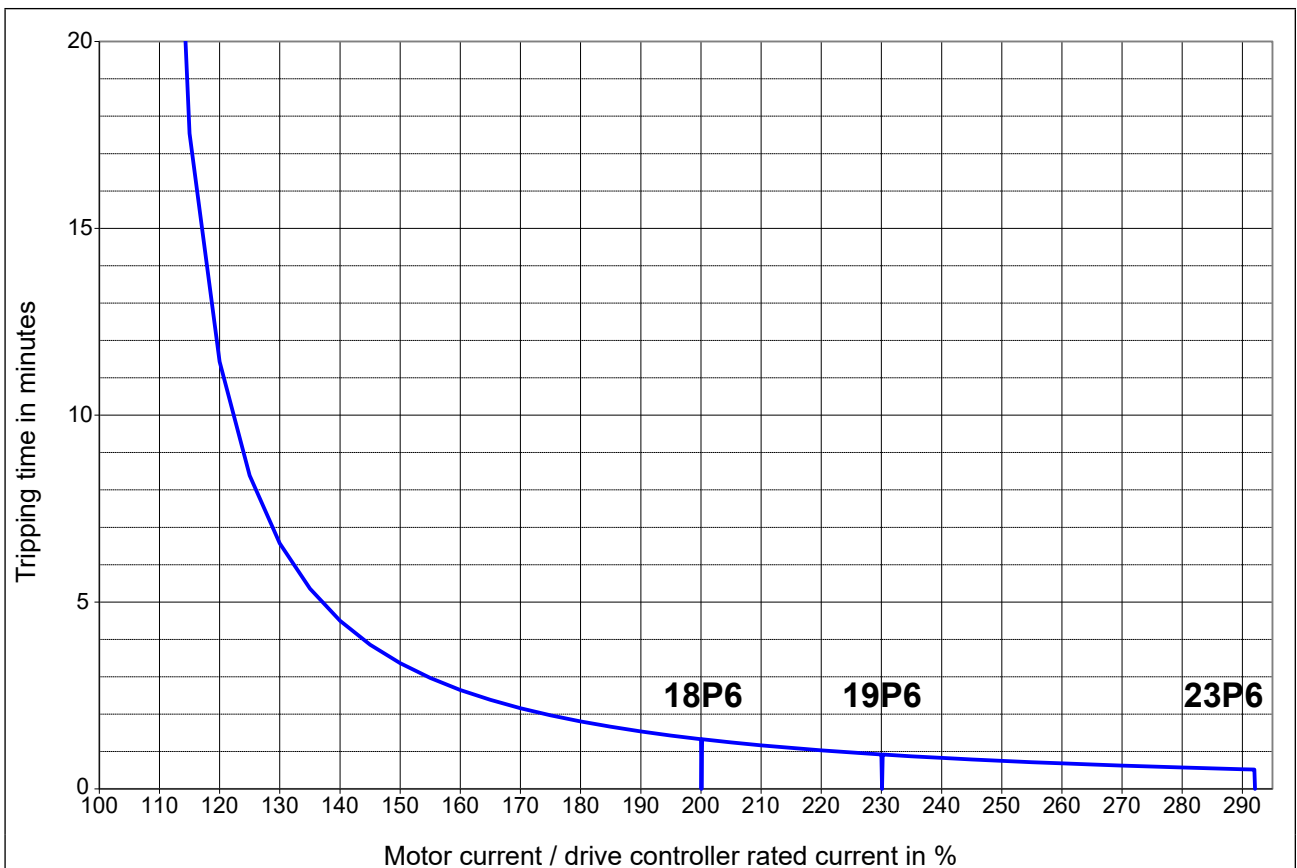
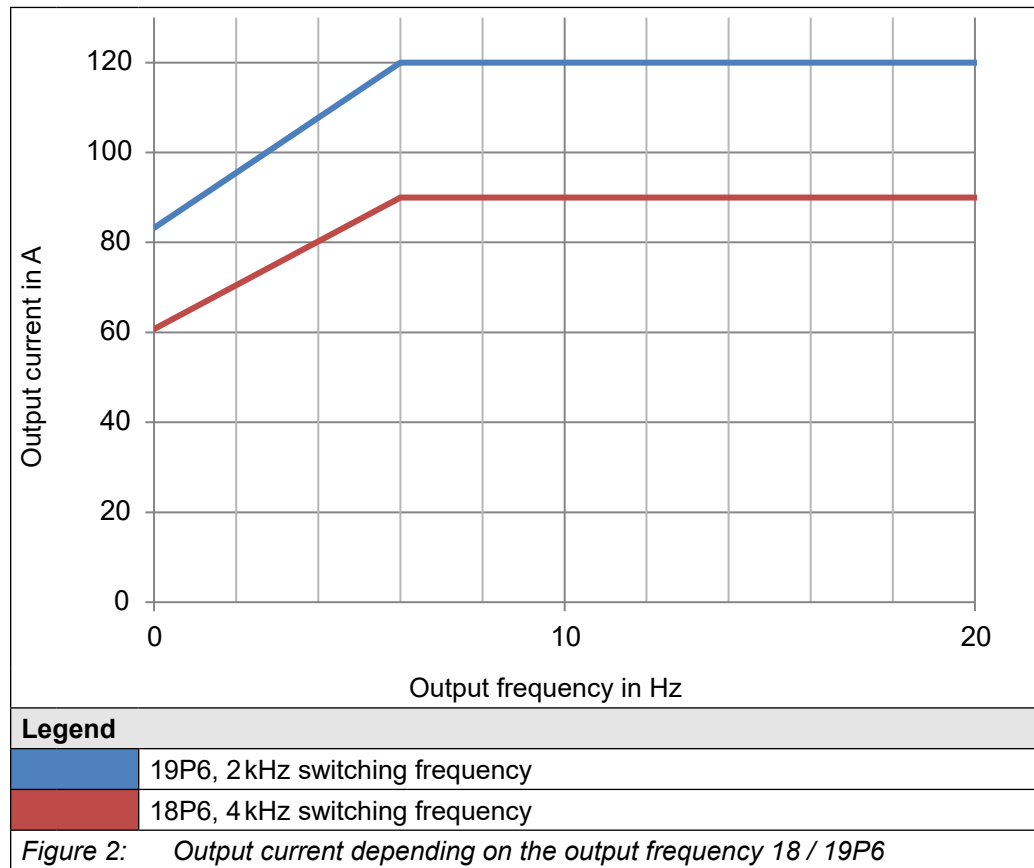


Figure 1: Maximum tripping time depending on the overload for AC motors

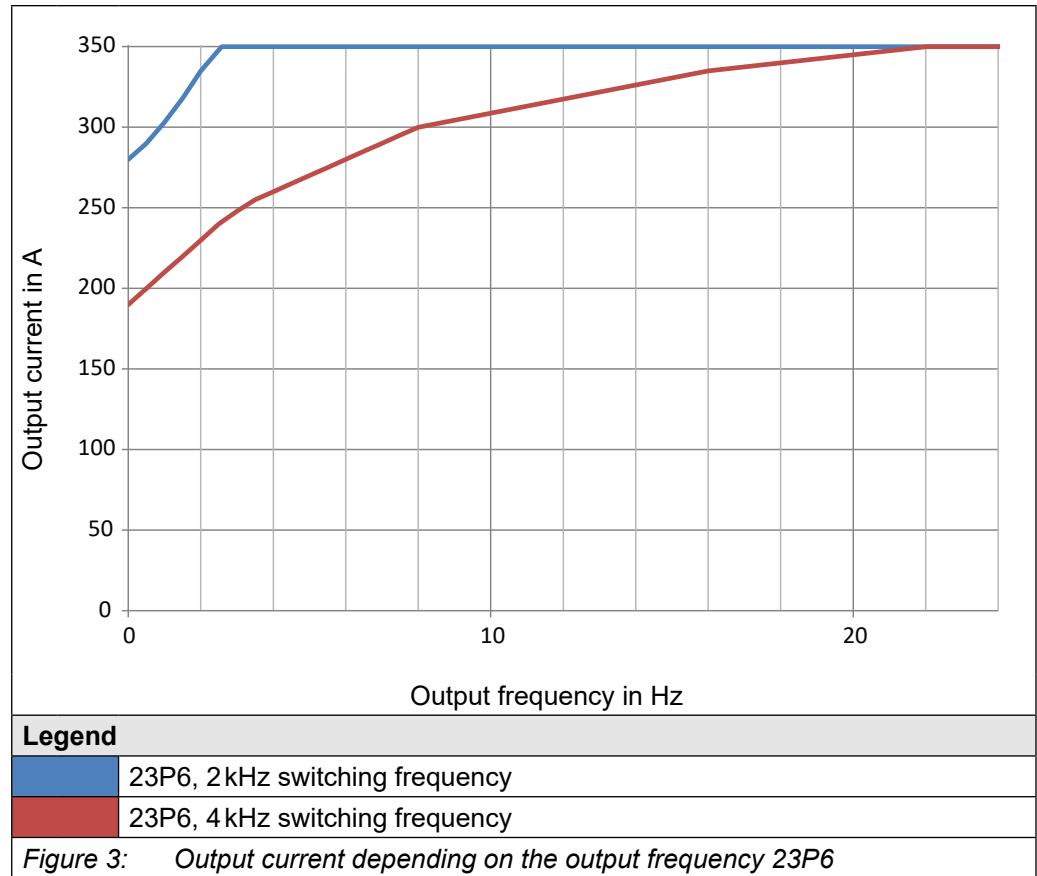
3.3.1.2 Overload function in the lower speed range (OL2) for 18 / 19P6

In the lower speed range the permissible output current is depending on the output frequency. Depending on the setting of parameter is14, if the output current is exceeded, the error E.OL2 is triggered or the output current is limited.



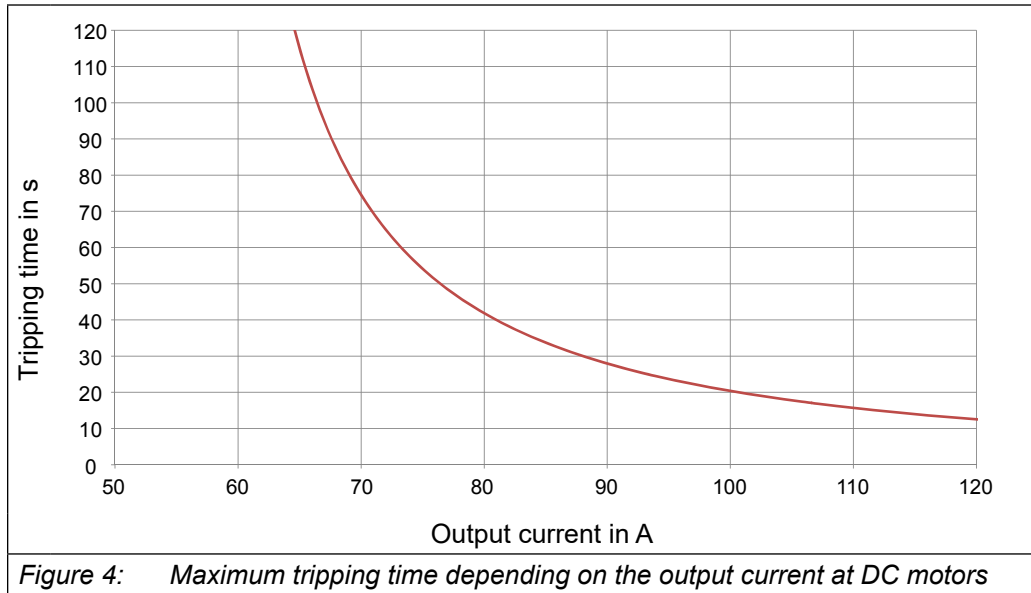
3.3.1.3 Overload function in the lower speed range (OL2) for 23P6

In the lower speed range the permissible output current is depending on the output frequency. Depending on the setting of parameter is14, if the output current is exceeded, the error E.OL2 is triggered or the output current is limited.



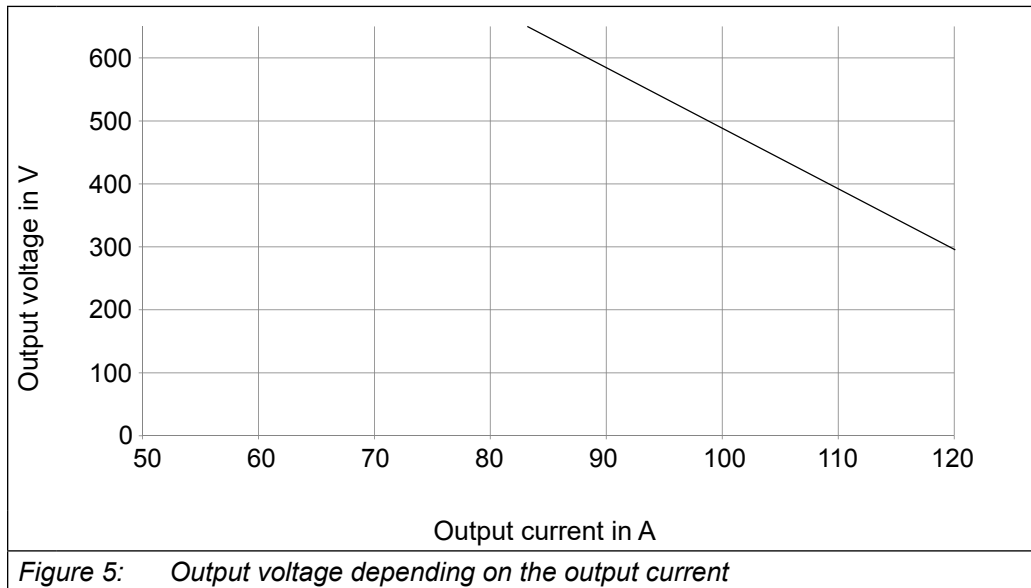
3.3.2 DC motor (19P6 DC)

3.3.2.1 Overload function (OL)



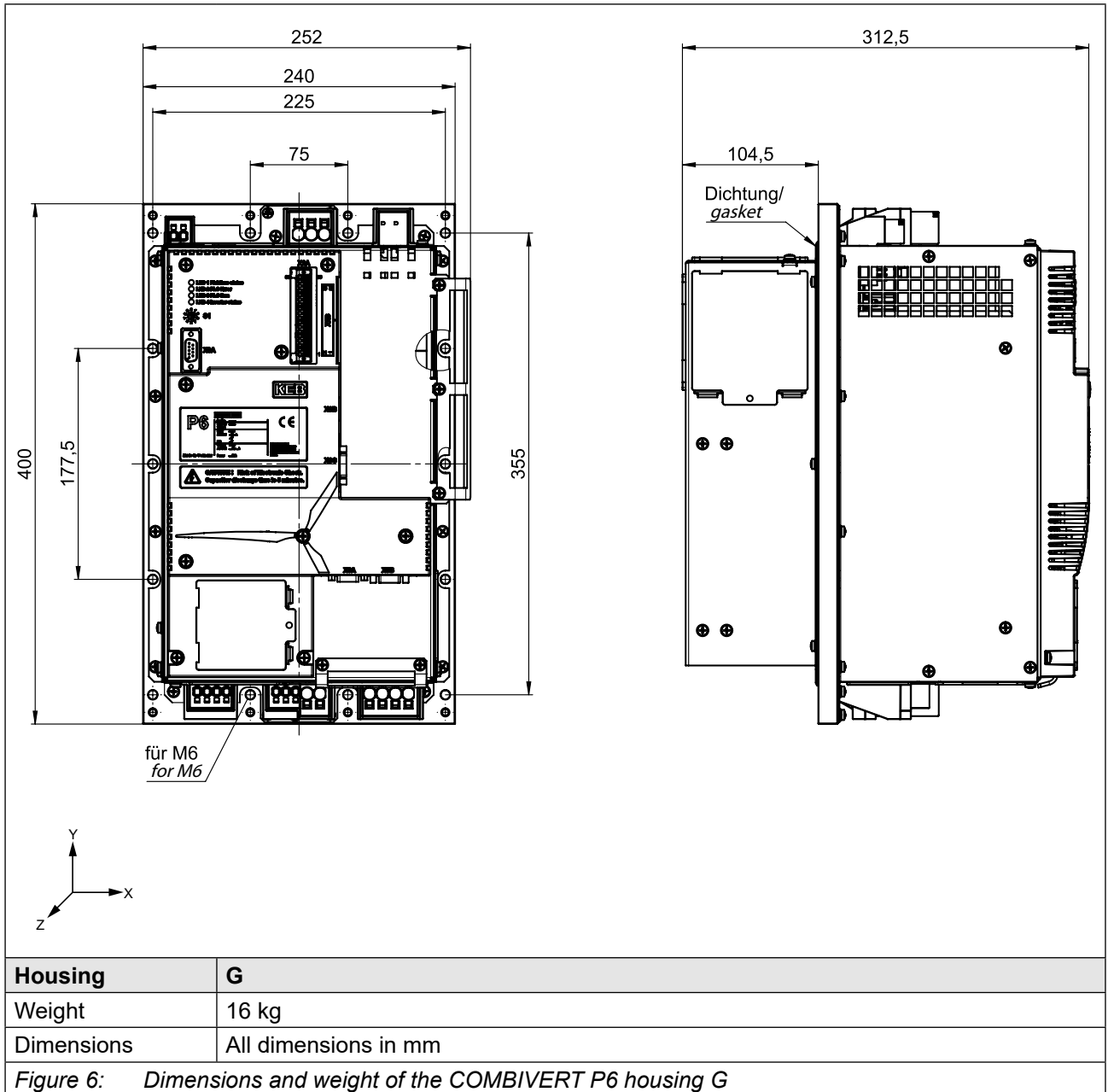
3.3.2.2 Maximum output voltage

The maximum output voltage depending on the output current is shown in the following characteristic. The output voltage cannot be higher than 1.3 times of the input voltage U_{in} .



3.4 Dimensions and weights

3.4.1 Housing G



3.4.2 Mounting cutout housing G

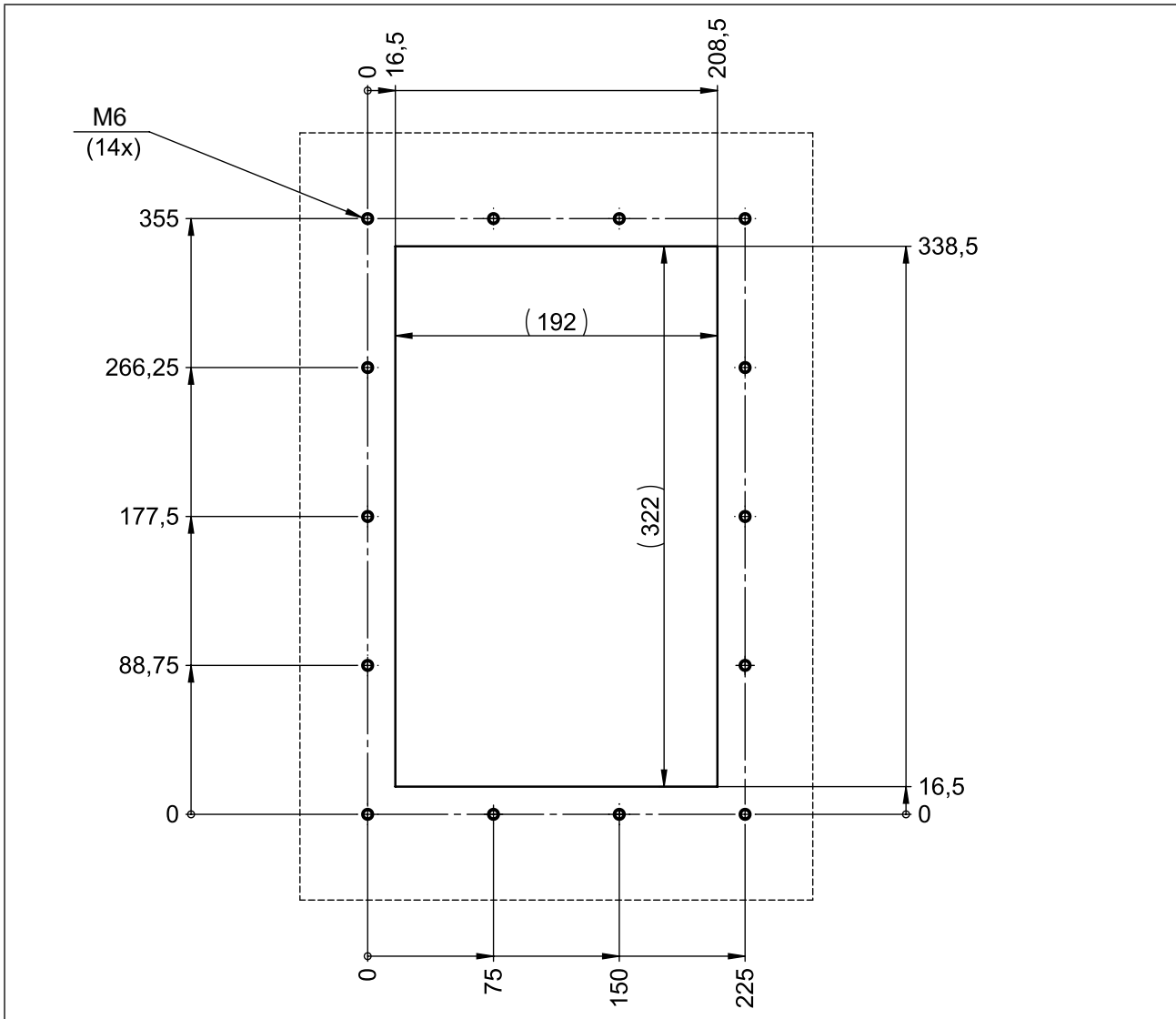
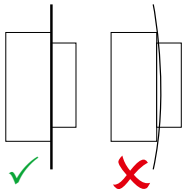


Figure 7: Mounting cutout for COMBIVERT P6 (provided by customer)

NOTICE



Ensure correct material thickness !

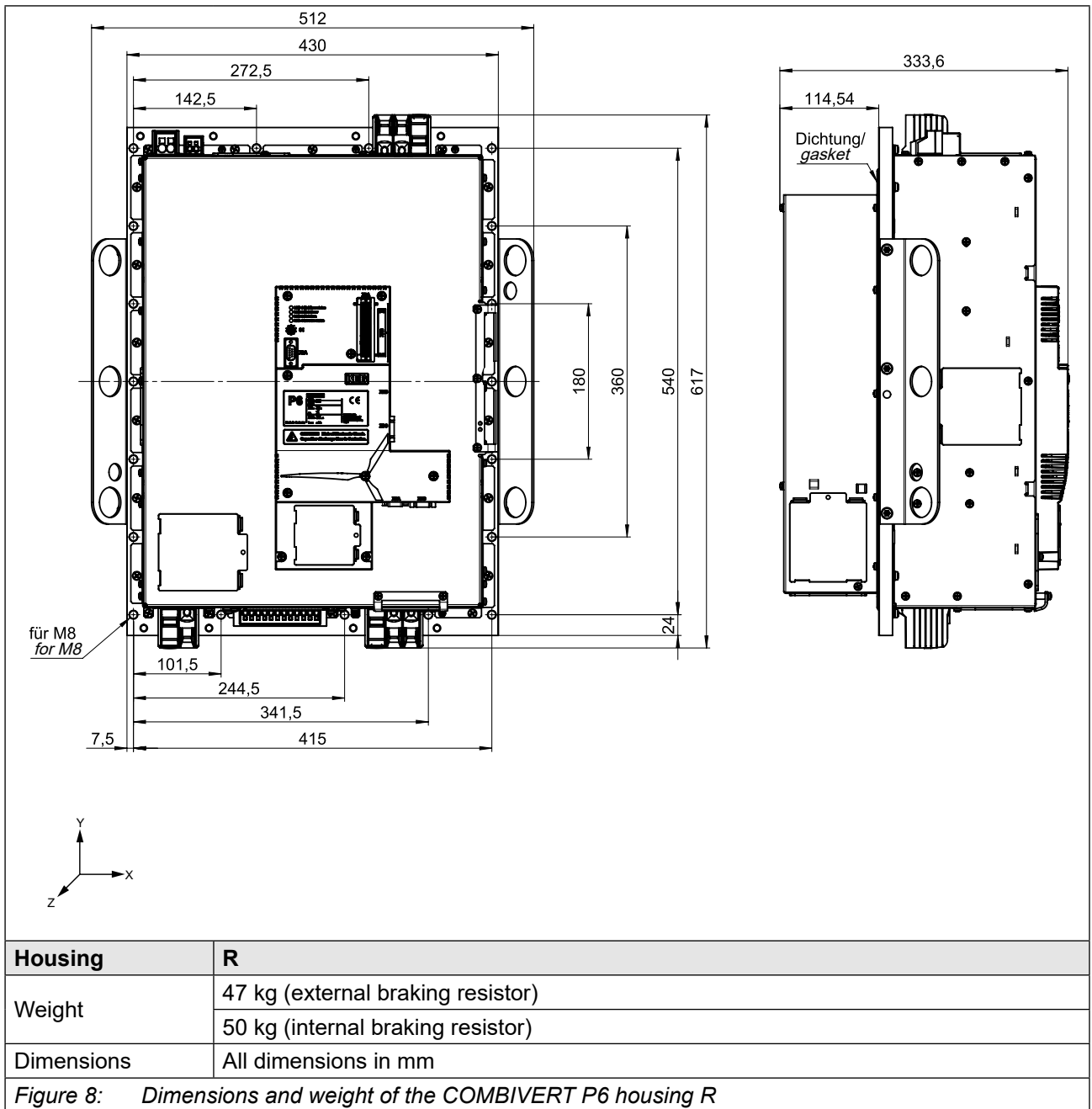
The material thickness of the cabinet back wall and the mounting method must be chosen that way the material does not bend. Together with the rubber seal of the P6, protection class IP54 is maintained. If the material thickness exceeds 8 mm (18 / 19P6) or 14 mm (23P6), the P6 must be removed from the cabinet prior to replacing the heatsink fan.

NOTICE

Observe fan direction !

The installation of the drive controller in the control cabinet and its installation in the wind turbine must be carried out such that the fan axis of the drive controller is parallel to the rotational axis of the hub of the wind turbine.

3.4.3 Housing R



3.4.4 Mounting cutout housing R

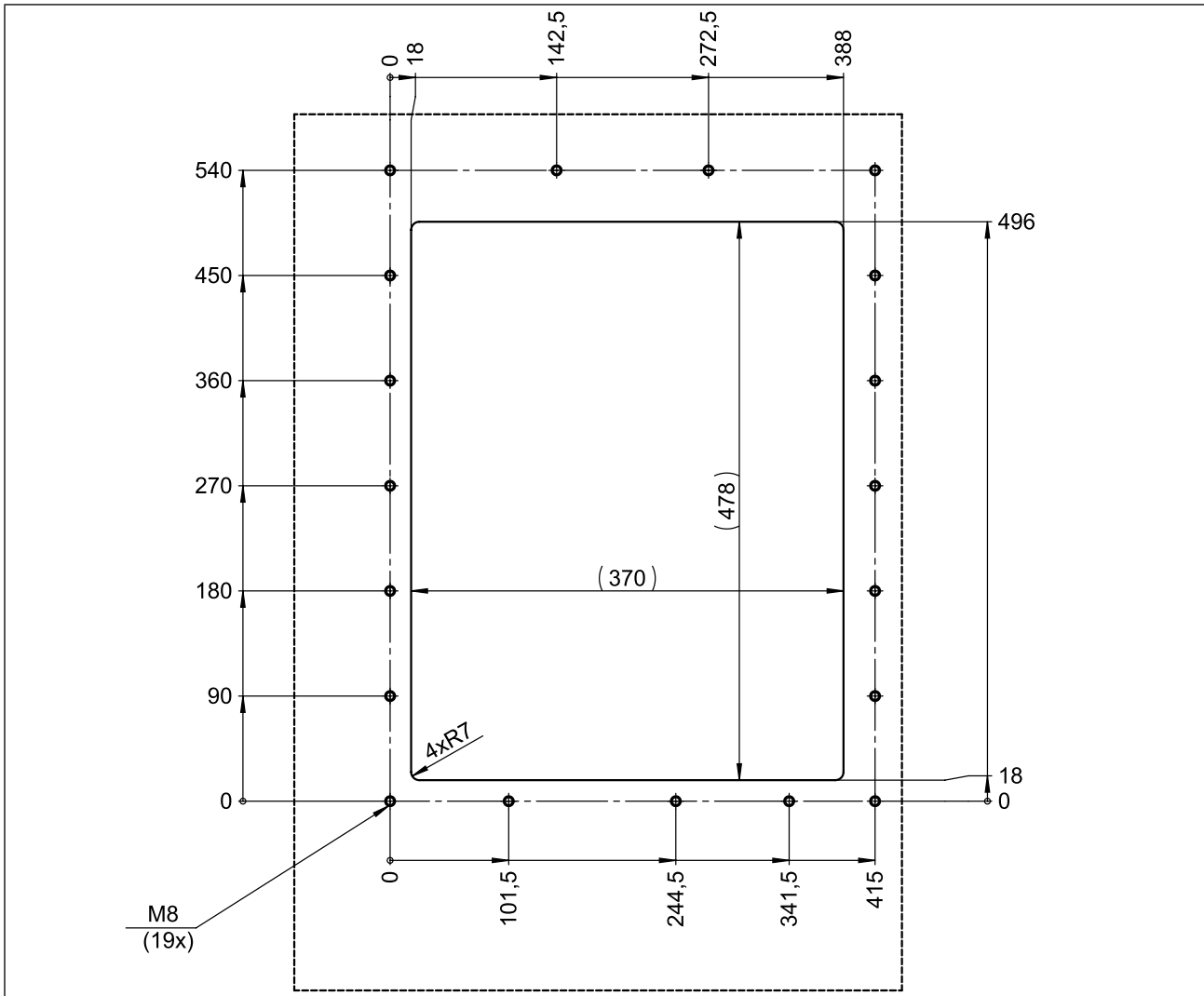
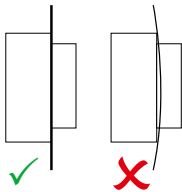


Figure 9: Mounting cutout for COMBIVERT P6 housing R (provided by customer)

NOTICE



Ensure correct material thickness !

The material thickness of the cabinet back wall and the mounting method must be chosen that way the material does not bend. Together with the rubber seal of the P6, protection class IP54 is maintained. If the material thickness exceeds 8 mm (18 / 19P6) or 14 mm (23P6), the P6 must be removed from the cabinet prior to replacing the heatsink fan.

NOTICE

Observe fan direction !

The installation of the drive controller in the control cabinet and its installation in the wind turbine must be carried out such that the fan axis of the drive controller is parallel to the rotational axis of the hub of the wind turbine.

4 Device overview

4.1 Top view of housing G

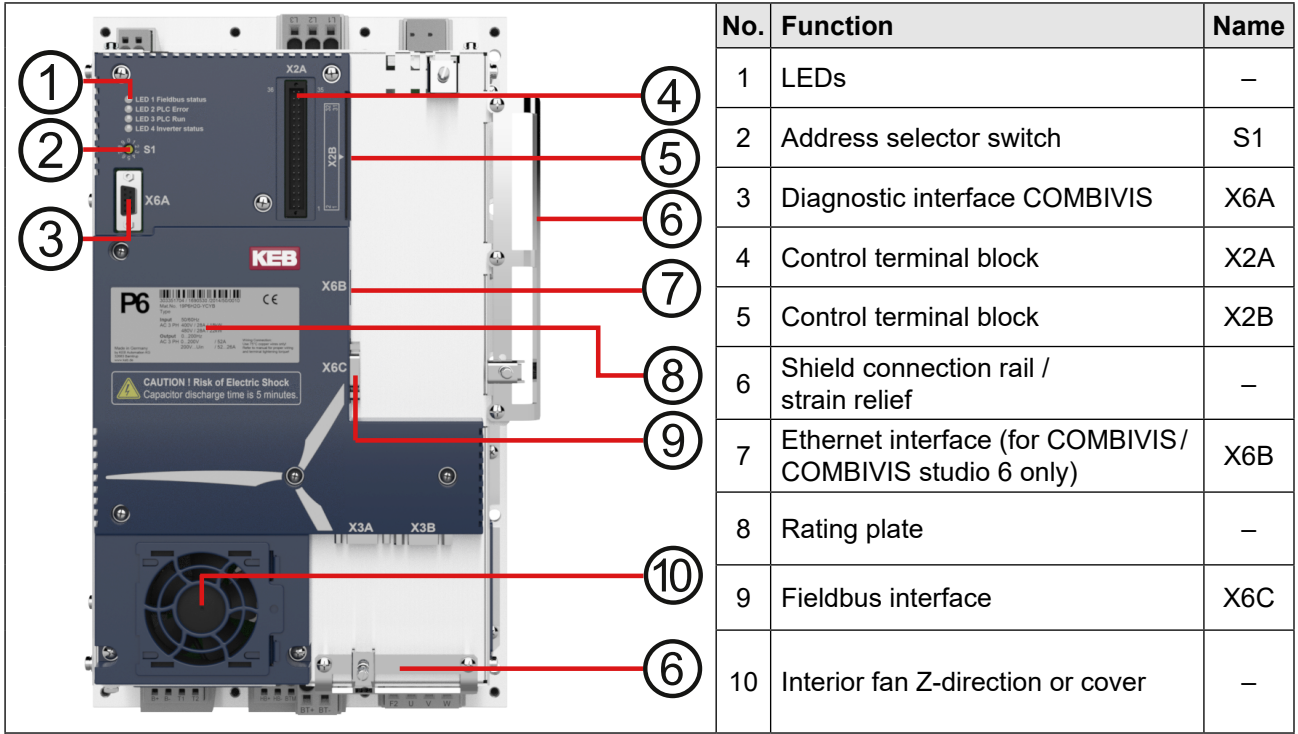


Figure 10: Top view of housing G

4.2 Rear view of housing G

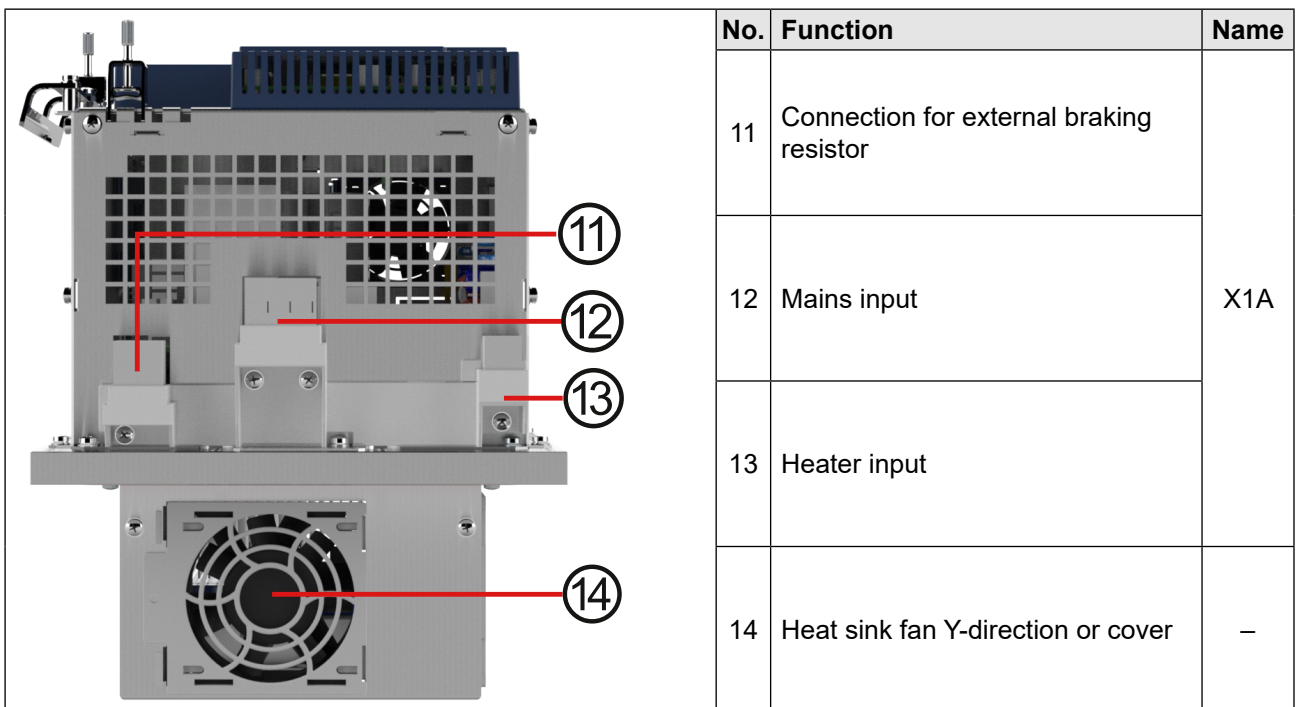


Figure 11: Rear view of housing G

4.3 Front view of housing G

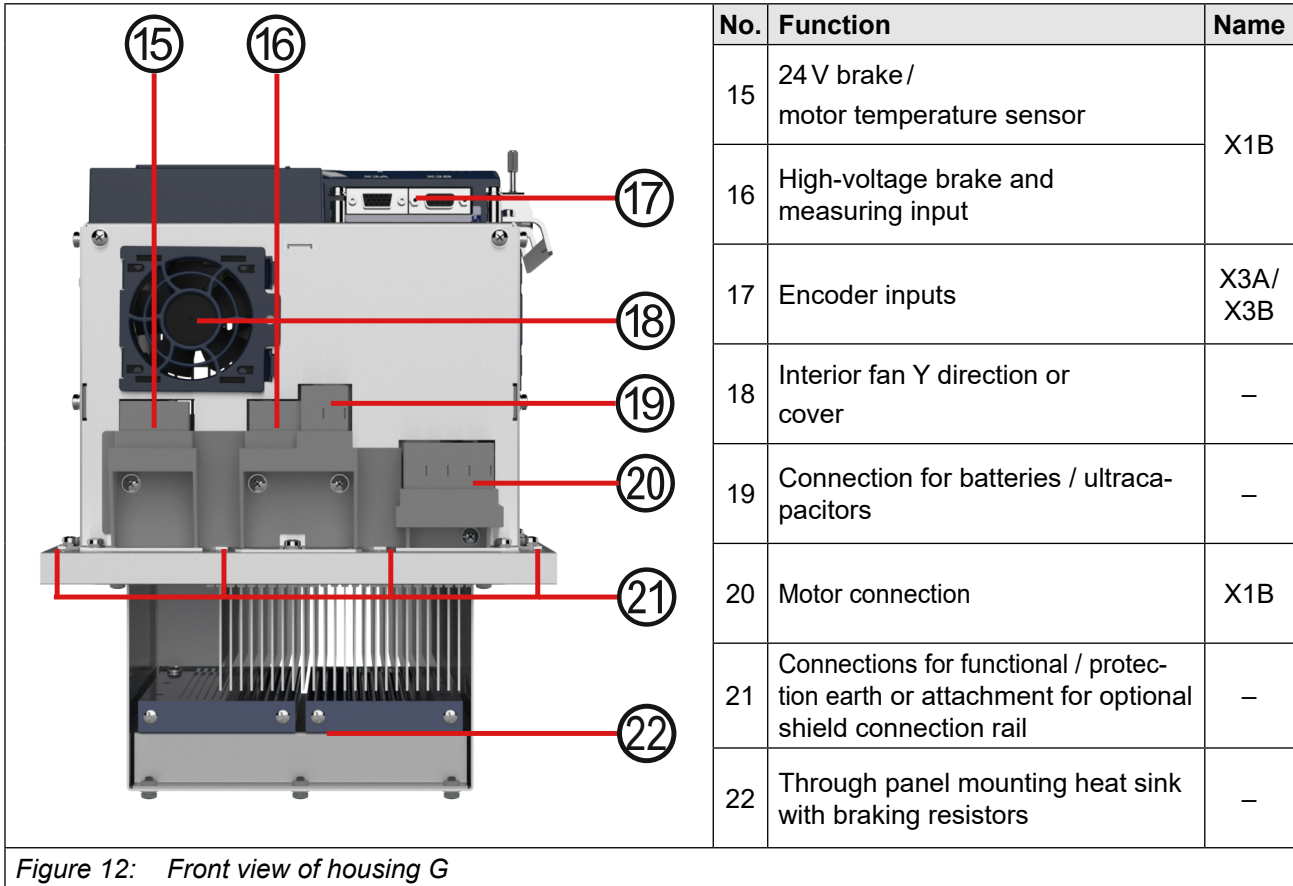


Figure 12: Front view of housing G

4.4 Side views of housing G

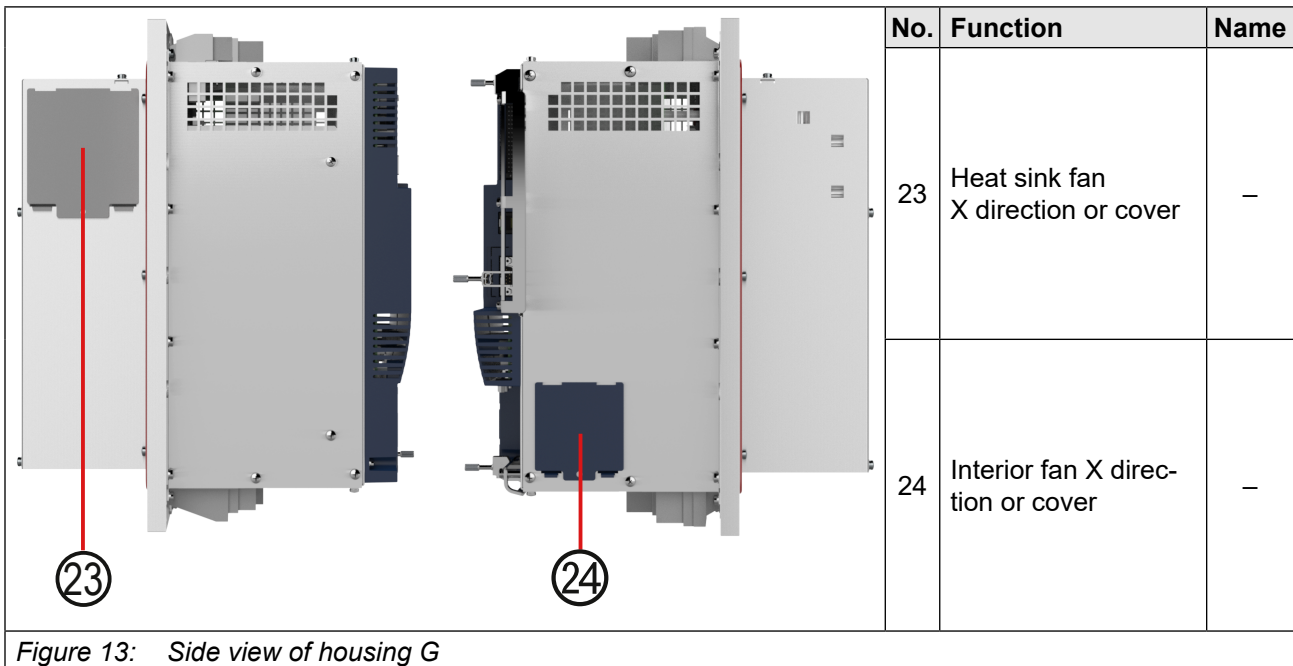


Figure 13: Side view of housing G

4.5 Top view of housing R

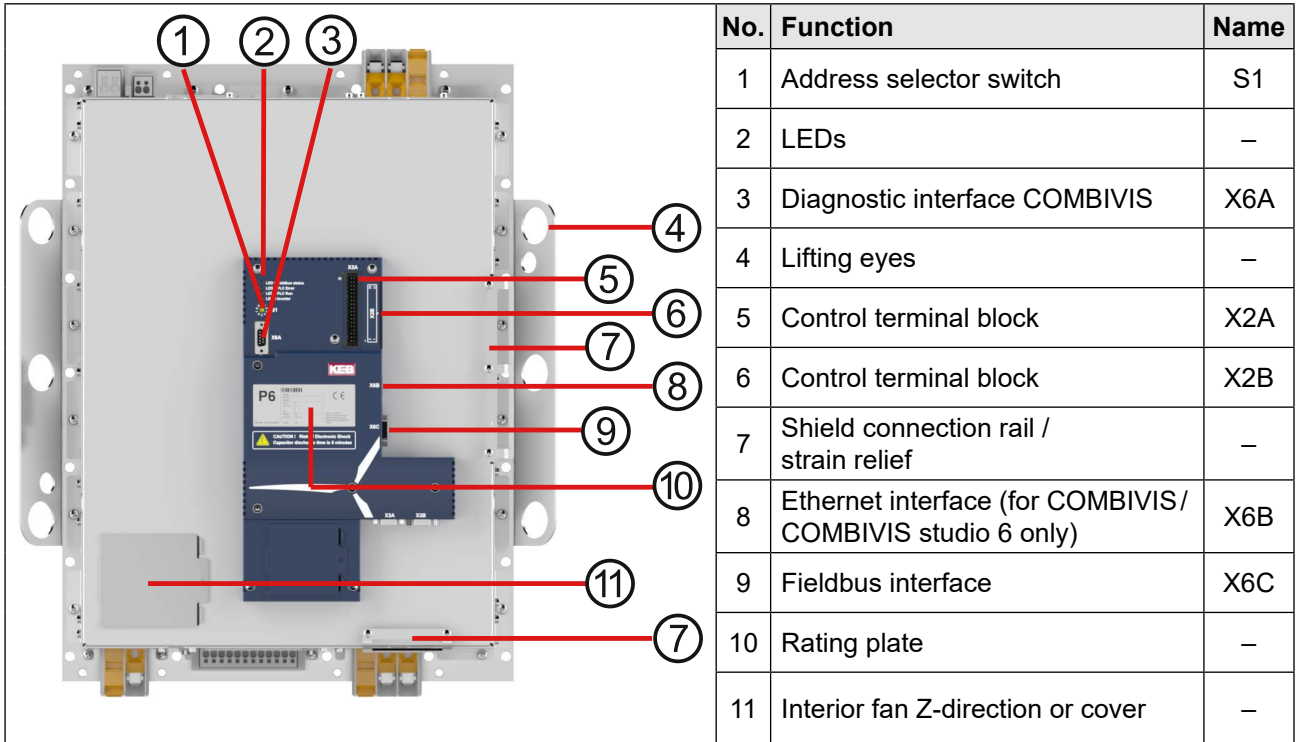


Figure 14: Top view of housing R

4.6 Rear view of housing R

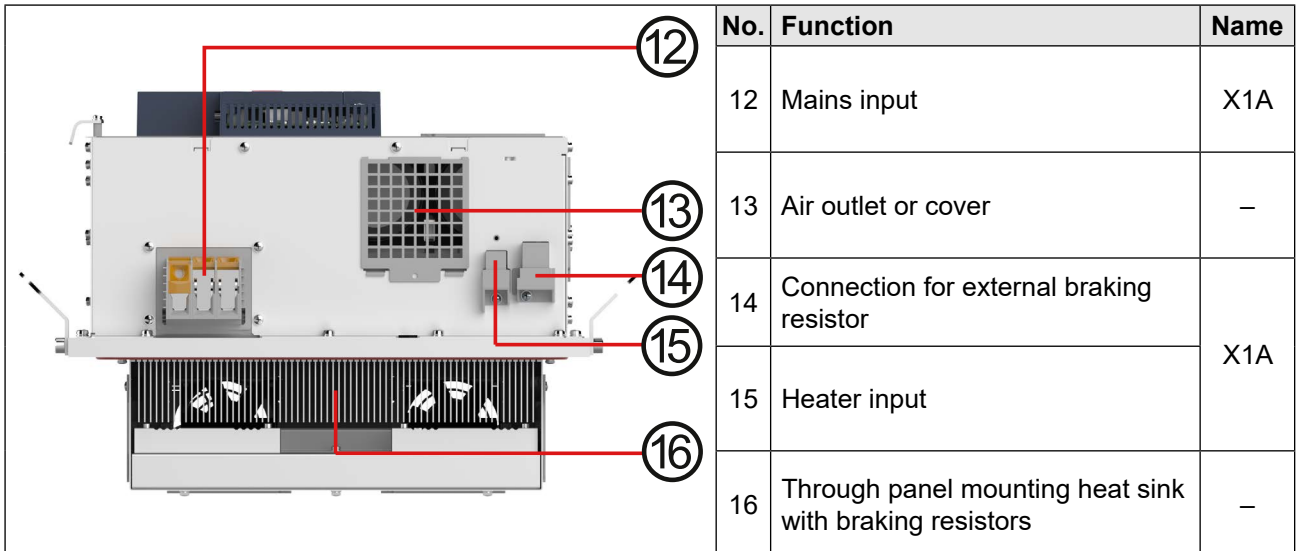
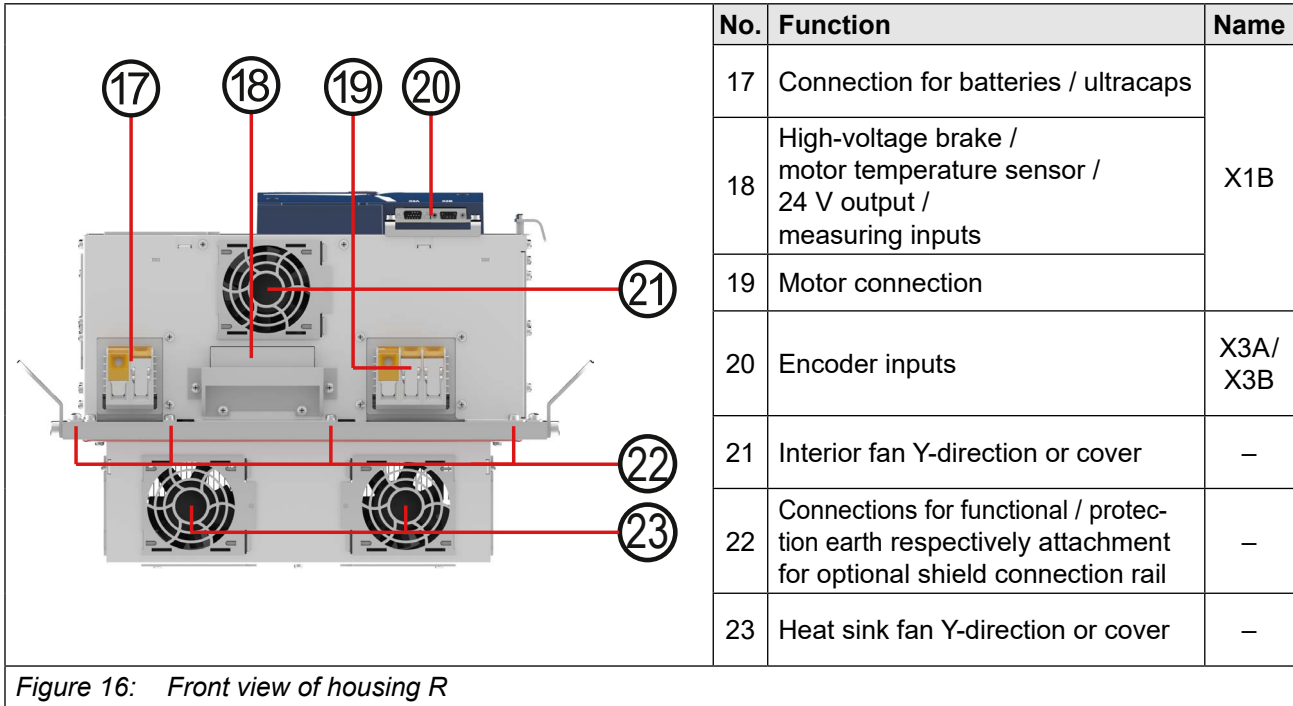
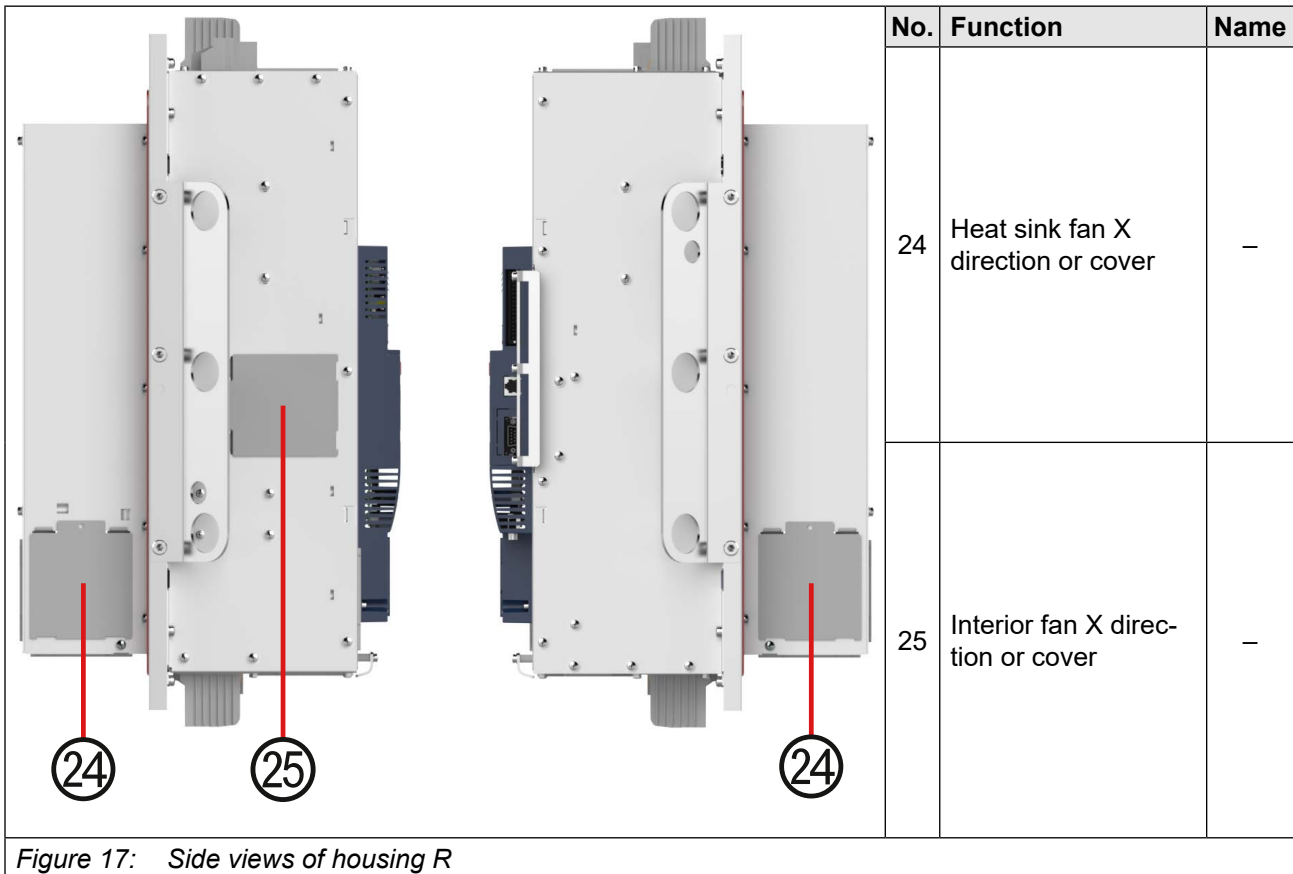


Figure 15: Rear view of housing R

4.7 Front view of housing R



4.8 Side views of housing R



4.9 Accessories

4.9.1 Shield connection rail

For EMC conform installation of the power cables a shield connection rail is available as option. Commercially available shield connection clamps for rails 3x10 mm can be used. The Shield connection clamps (screw or spring type) must match the to cable diameter and are therefore not included.



Figure 18: Shield connection rail housing G



Figure 19: Shield connection rail housing R

Accessory	Housing	Material number
Shield connection rail	G	00P6ZGG-0002
	R	00P6ZGR-0002

Table 10: Shield connection rail

5 Power unit

5.1 Terminal block X1A size 18 / 19




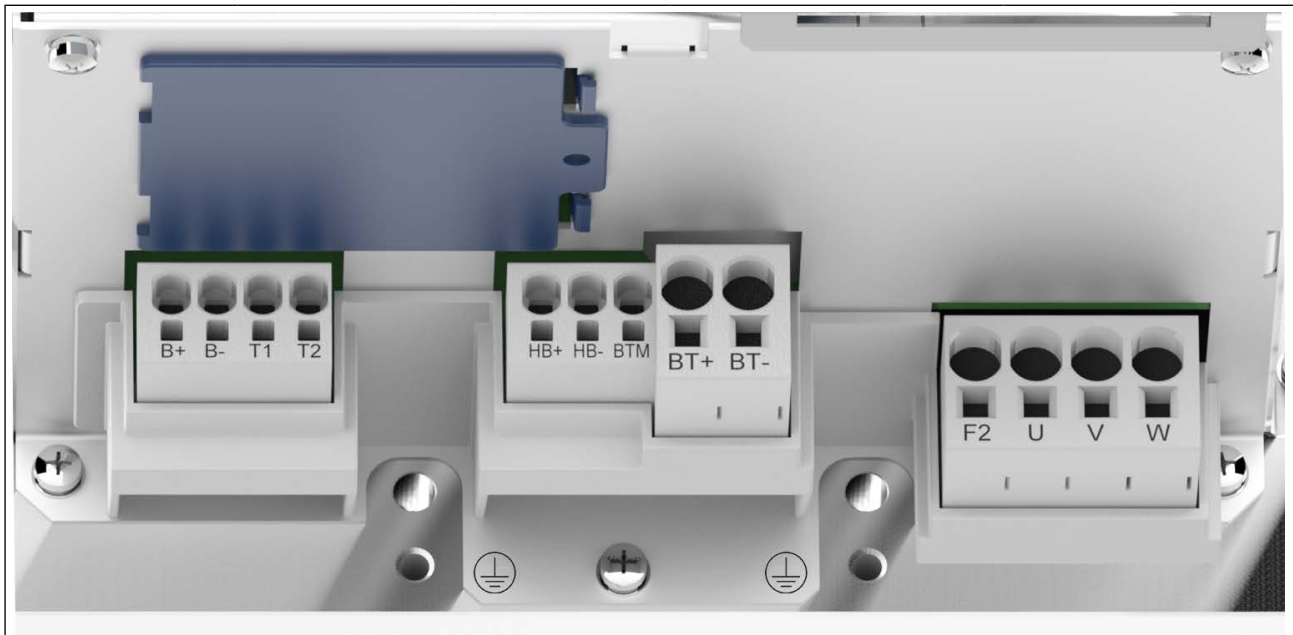
Terminals	Function	Cable cross-section in mm ²		Stripping length in mm
L1, L2, L3	Mains input 3-phase	0.75...16 ¹⁾		18
RB+, RB-	External braking resistor (optional)	0.75...16 ¹⁾		18
H1, H2	Input for heating 400 V (optional)	0.25...6		15
Terminals	Function	Screw connection	Depth of thread in mm	Tightening torque in Nm
PE, 	Protective earth	4 x M6	10	4.8

Figure 20: Terminal block X1A size 18 / 19

¹⁾ Ferrules with plastic collar only up to 10 mm².

5.2 Terminal block X1B size 18 / 19

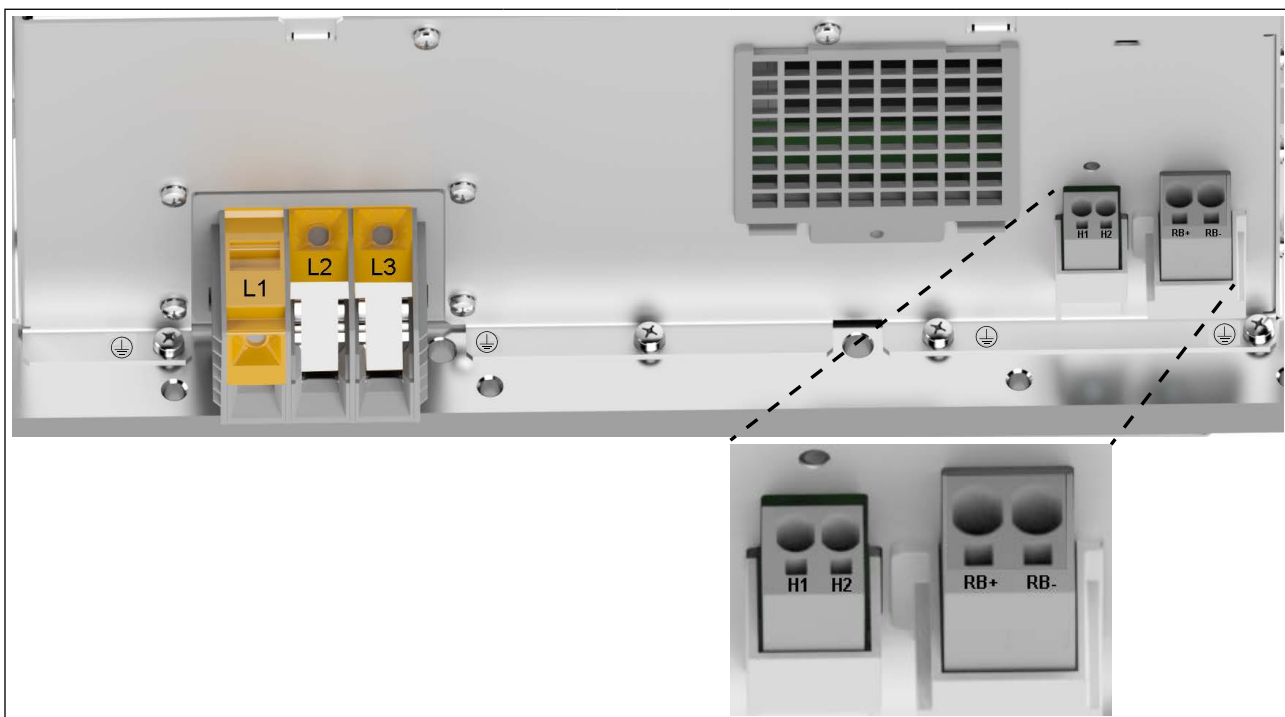


Terminals	Function		Cable cross-section in mm ²	Stripping length in mm
U, V, W	Motor output 3-phase		0.75...16 ¹⁾	18
F2, U, V, W	Connection for DC motor			
BT+, BT-	Connection for batteries / ultracaps			
B+, B-	Output for brake DC 24 V		0.25...6	15
T1, T2	Input for temperature sensor			
HB+, HB-	Output for high-voltage brake DC 50...300 V (optional)			
BTM	Measuring input DC voltage measurement			
Terminals	Function	Screw connection	Depth of thread in mm	Tightening torque in Nm
PE, ⊕	Protective earth	4 x M6	10	4.8

Figure 21: Terminal block X1B size 18 / 19

¹⁾ Ferrules with plastic collar only up to 10 mm².

5.3 Terminal block X1A size 23



Terminals	Function	Cable cross-section in mm ²		Stripping length in mm
L1, L2, L3	Mains input 3-phase	10...50 ¹⁾		for 10...25mm ² 18 for 35...50mm ² 20
RB+, RB-	External braking resistor (optional)	0.75...16 ²⁾		18
H1, H2	Input for heating 400 V (optional)	0.25...6		15
Terminals	Function	Screw connection	Depth of thread in mm	Tightening torque in Nm
PE, ⊕	Protective earth	4 x M8	15.5	10

Figure 22: Terminal block X1A size 23

¹⁾ 10 mm² only with wire end ferrule.

²⁾ Ferrules with plastic collar only up to 10 mm².

5.4 Terminal block X1B size 23



Terminals	Function	Cable cross-section in mm ²		Stripping length in mm
U, V, W	Motor output 3-phase	10...50 ¹⁾		for 10...25 mm ² 18
BT+, BT-	Connection for batteries / ultracaps			for 35...50 mm ² 20
24V, 0V	DC 24 V output	0.25...6		15
BTM0... BTM5	Measuring inputs DC voltage measurement			
HB+, HB-	Output for high-voltage brake DC 50...300 V			
T1, T2	Input for temperature sensor			
Terminals	Function	Screw connection	Depth of thread in mm	Tightening torque in Nm
PE, ⊕	Protective earth	4 x M8	15.5	10

Figure 23: Terminal block X1B size 23

¹⁾ 10 mm² only with wire end ferrule.

5.5 Connecting cables to X1A and X1B

5.5.1 Grey terminals




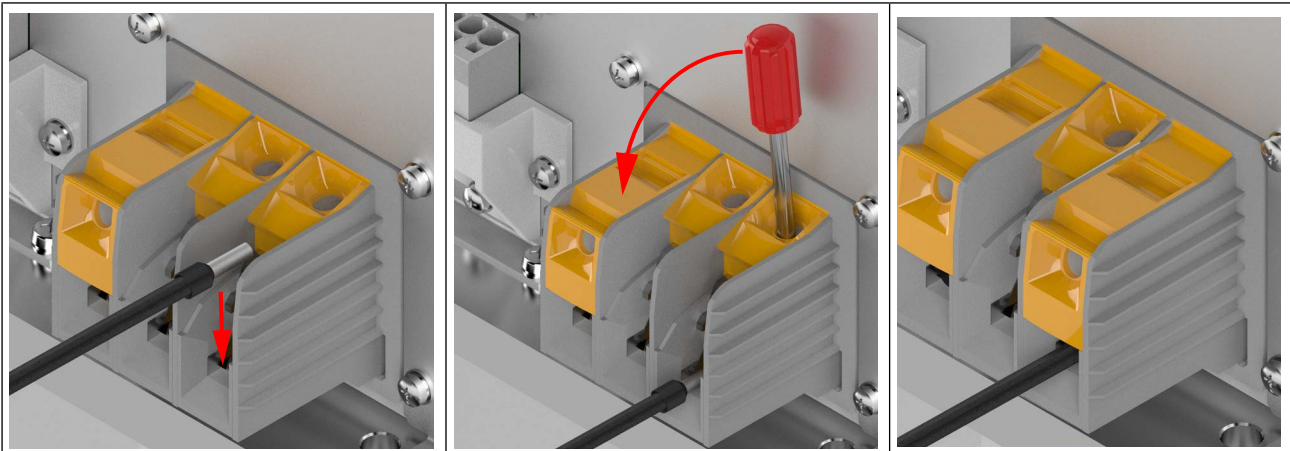
Stripping the cables	
<ul style="list-style-type: none"> ▶ Strip the cable according to specifications. => „5.1 Terminal block X1A size 18 / 19“ and „5.2 Terminal block X1B size 18 / 19“ or => „5.3 Terminal block X1A size 23“ and „5.4 Terminal block X1B size 23“. ▶ Use wire end ferrules if necessary. 	
Connecting the cables	
<ul style="list-style-type: none"> ▶ Push cable into the round slot, that no wire end ferrule (wire) can be seen from the outside. In the case of small cable cross-sections, first press into the rectangular opening with a narrow slotted screwdriver to open the spring. ▶ Cable is locked automatically. ▶ Check if the cable is clamped by pulling it back slightly. 	
Disconnecting the cables	
<ul style="list-style-type: none"> ▶ Push into the rectangular opening with a narrow slotted screwdriver to unlock the clamp. ▶ Maintain pressure. ▶ Pull out cable. 	

Figure 24: Grey terminals

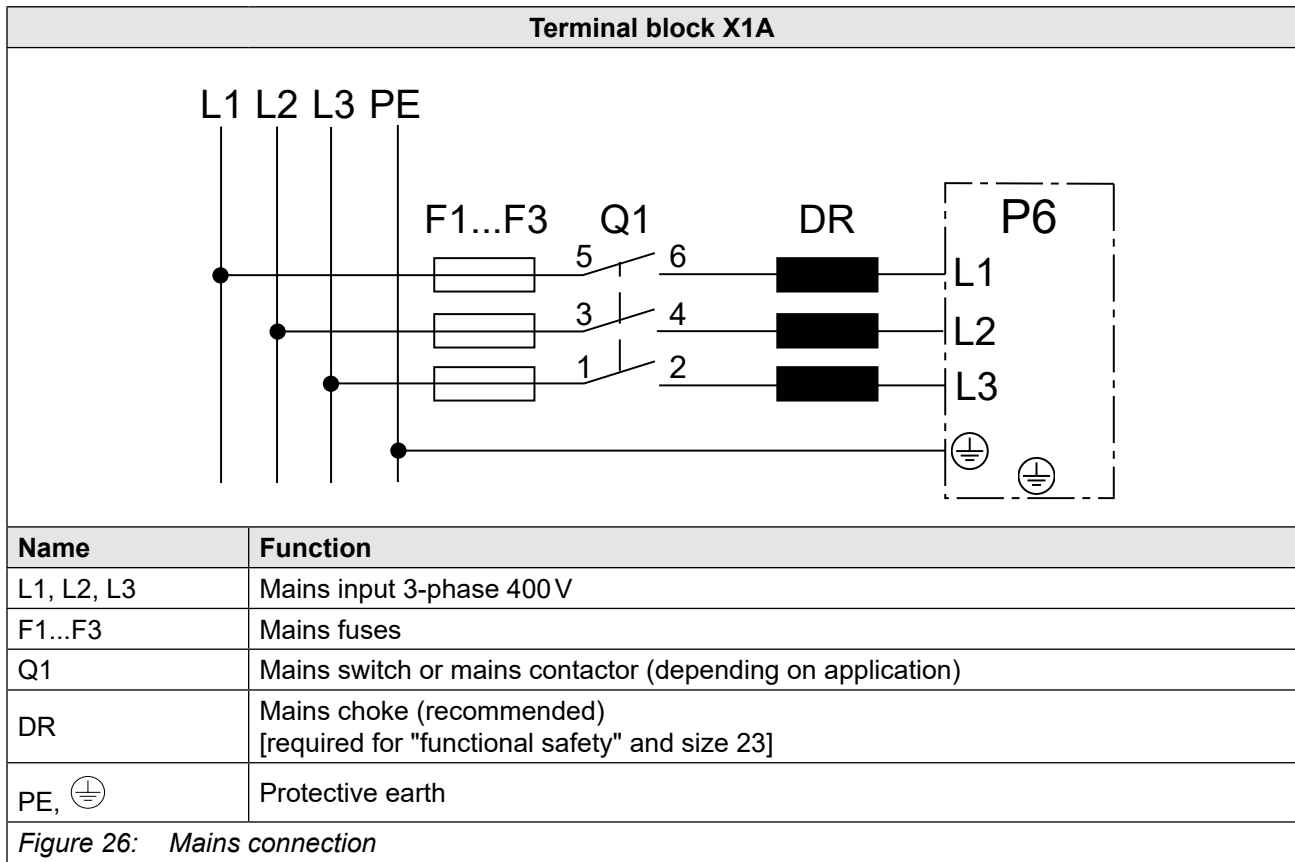
5.5.2 Orange terminals (23P6 only)



- ▶ Strip the cable according to specifications.
=> „5.3 Terminal block X1A size 23“ and „5.4 Terminal block X1B size 23“.
- ▶ Use wire end ferrules if necessary.
- ▶ Place the stripped area (or wire end ferrule) on the marked surface.
- ▶ Insert a screwdriver into the opening shown and lever down.
- ▶ The terminal locks. The cable is clamped.

Figure 25: Orange terminals

5.6 Mains connection

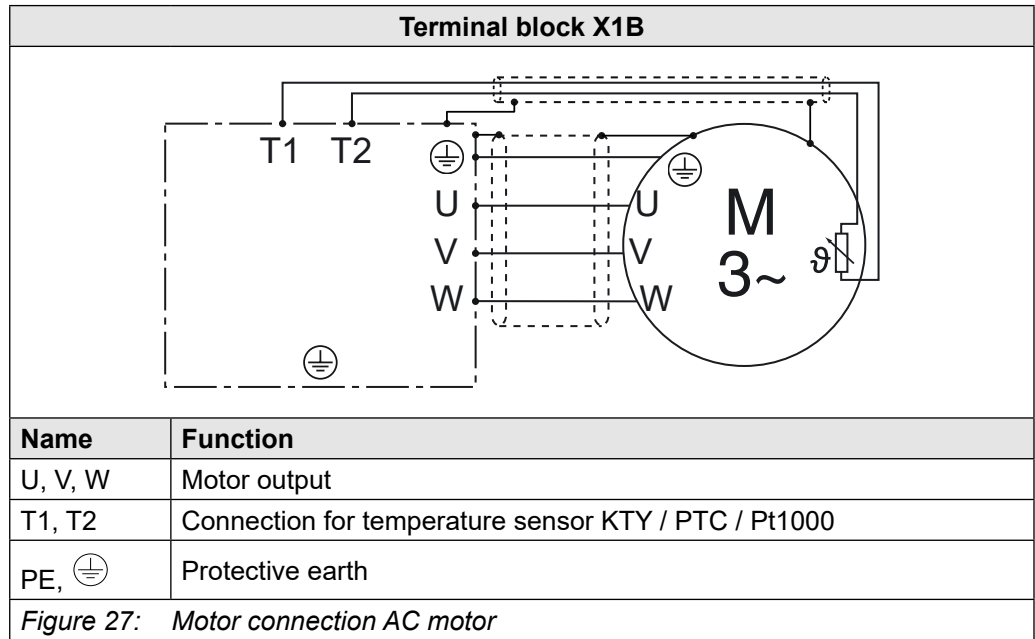


For 18/19P6, the use of a mains choke is recommended. If using functional safety of the P6 in the application (safety run with PL d according to [EN ISO 13849-1](#)) a mains choke (e.g. 13Z1B04-1000...19Z1B04-1000) is required. For 23P6, a mains choke (e.g. 16Z1B04-1000...21Z1B04-1000) is required.

5.7 Motor connection

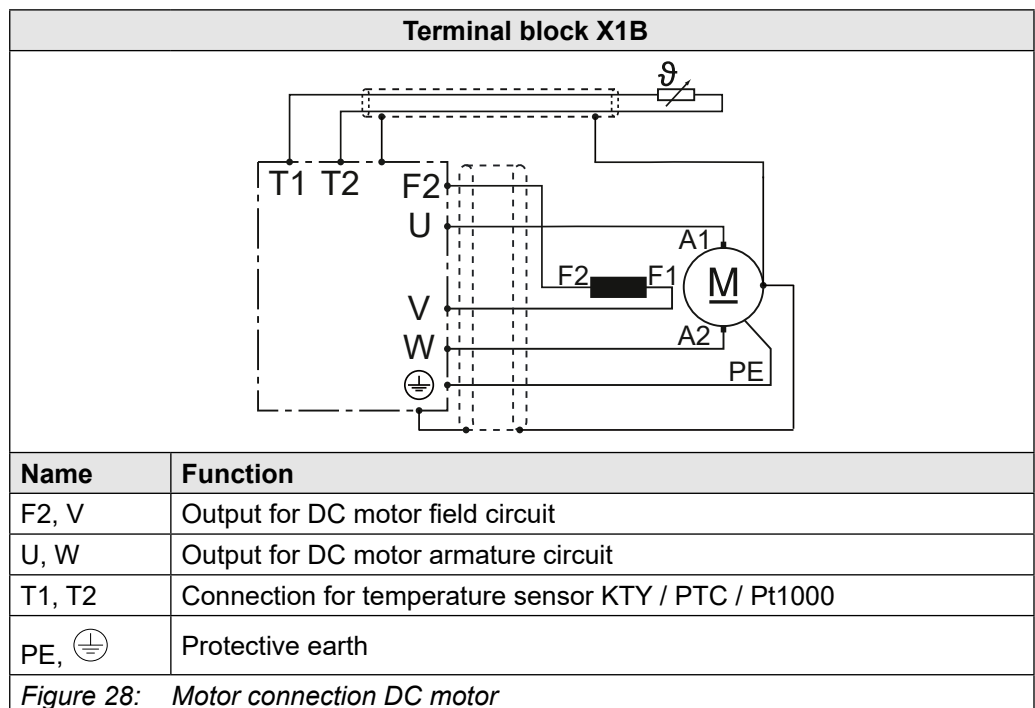
5.7.1 AC motor connection

Connection of encoder feedback => „6.3.3 Encoder interfaces“.



5.7.2 DC motor connection (19P6 DC only)

A shunt, series- or compound motor can be connected. An eventually required rectifier for the series winding is not included in the scope of delivery. Connection of encoder feedback => „6.3.3 Encoder interfaces“.



5.7.3 Motor temperature detection

The COMBIVERT P6 has a switchable KTY84 / PTC / Pt1000 evaluation. The input has „basic insulation“ to the supply and to the „safely insulated voltage“ (control board voltage)! The desired function is set with dr33 and works according to the following table:

dr33	Function of T1, T2	Resistance	Display ru28
0	KTY84 (standard)	< 330 Ω	Short circuit
		359 Ω	-40°C
		1 kΩ	100°C
		1.722 kΩ	200°C
		> 1800 Ω	Open circuit
1	PTC (in accordance with EN 60947-8)	< 750 Ω	PTC closed
		0.75...1.65 kΩ (reset resistance)	undefined
		1.65...4 kΩ (tripping resistance)	undefined
		> 4 kΩ	PTC open
4	Pt1000 (from Drive Unit Firmware 2.7.0.11 and Power Unit Firmware 2.4.0.13)	< 330 Ω	Short circuit
		843 Ω	-40°C
		1000 Ω	0°C
		1385 Ω	100°C
		1759 Ω	200°C
		> 1800 Ω	Open circuit

Table 11: Motor temperature monitoring with PTC, KTY or Pt1000

NOTICE

Faults and malfunctions !

- ▶ KTY, PTC or Pt1000 cable inside the motor cable only permissible with double shielding!
- ▶ Do not lay KTY, PTC or Pt1000 cable of the motor (even shielded) together with control cable!

NOTICE

No protection of the motor winding in case of wrong connection !

- ▶ Operate KTY sensors in the forward direction. Non-observance leads to incorrect measurement in the upper temperature range.

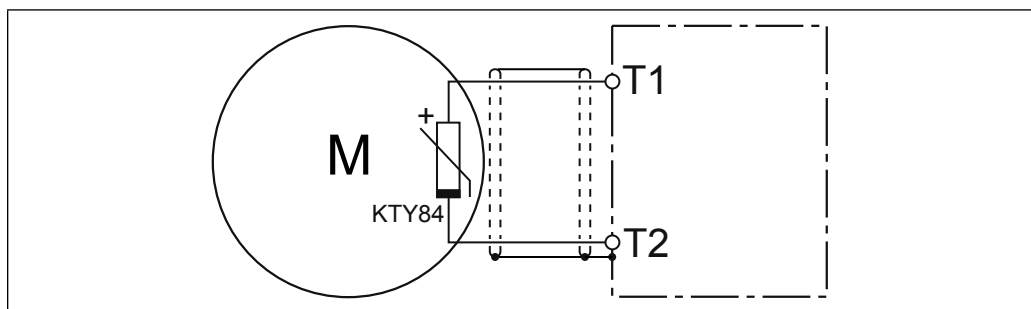
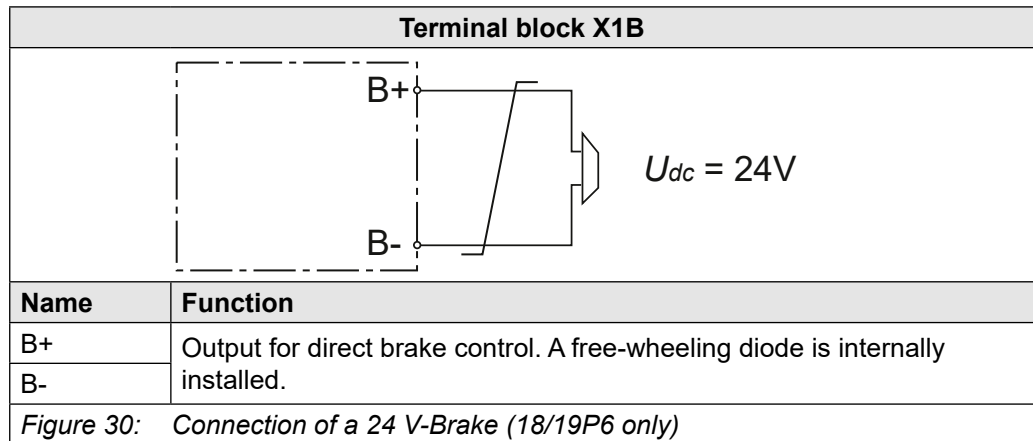


Figure 29: Connection of a KTY sensor

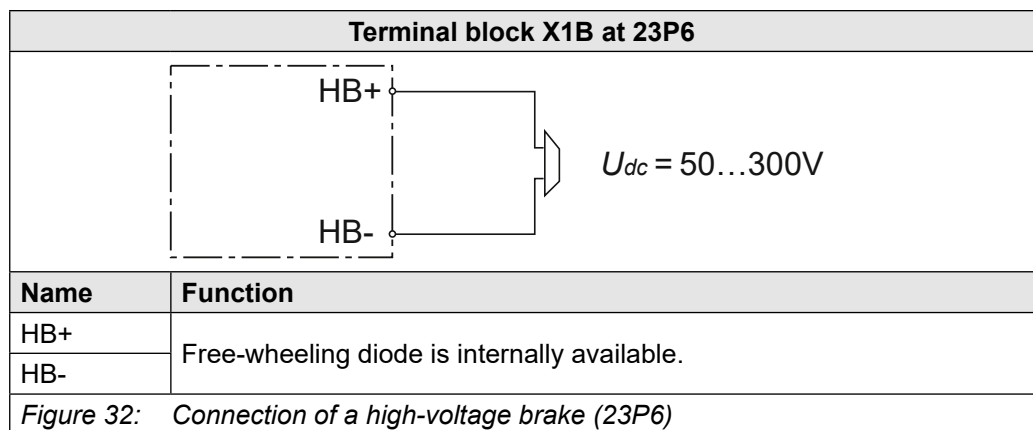
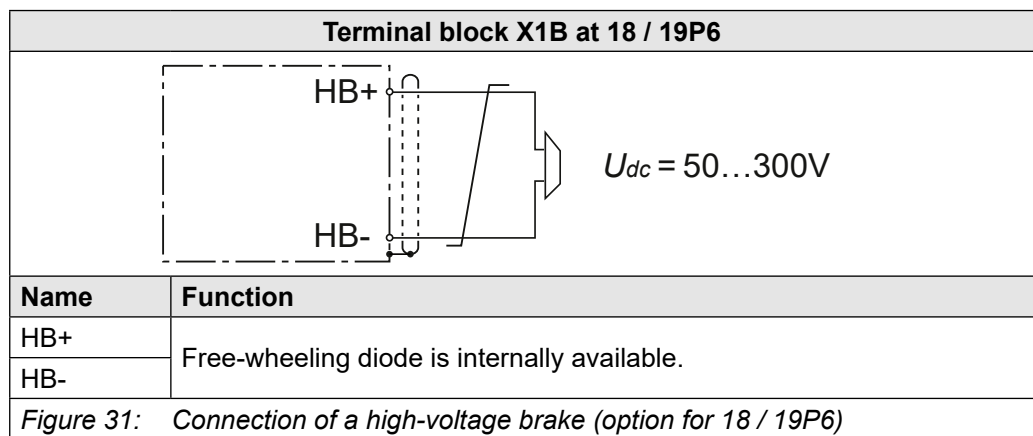
5.8 Brake connection

5.8.1 Connection of a 24 V-Brake (18/19P6 only)

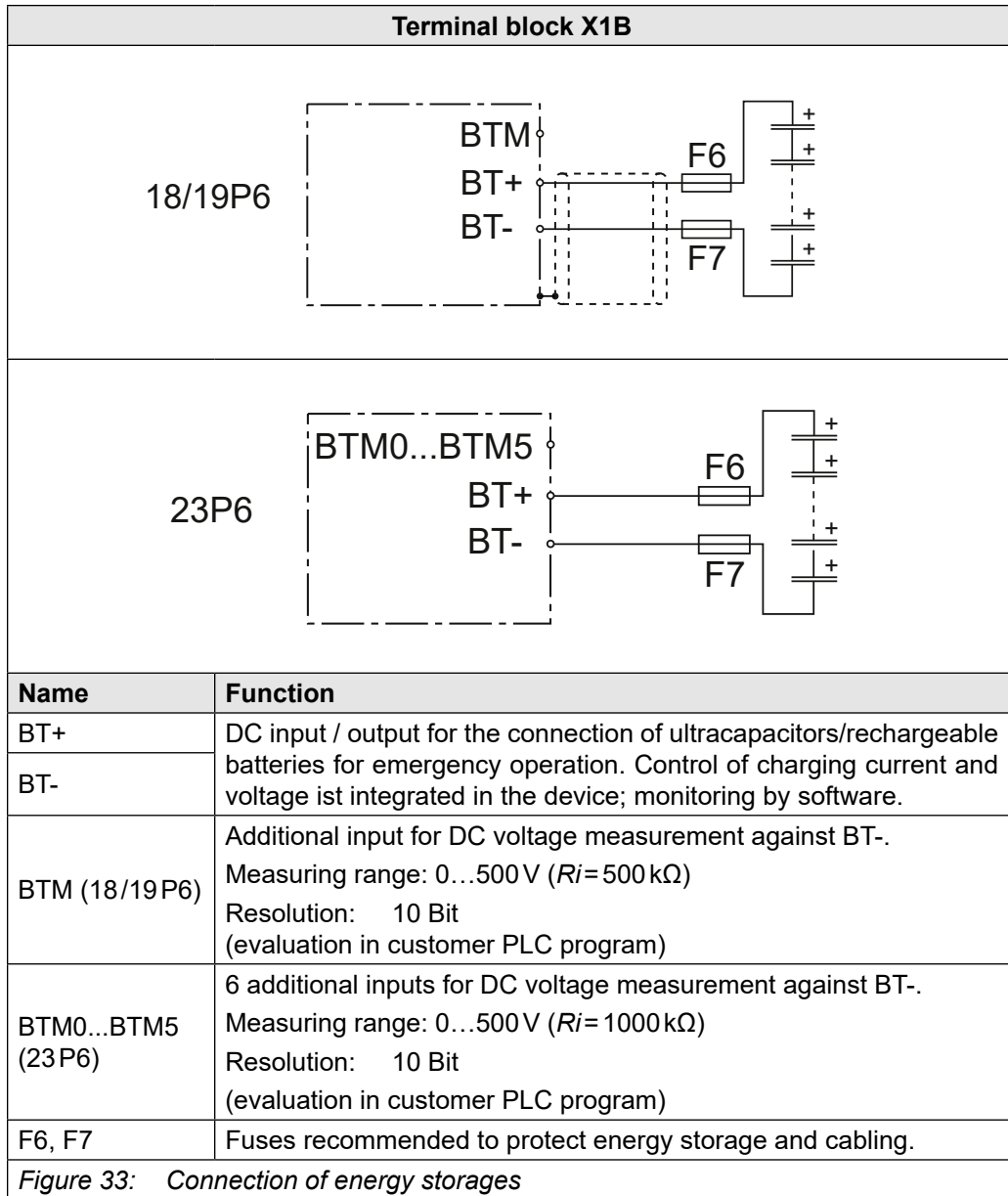


5.8.2 Connection of a high voltage brake

Output for direct control of a high voltage brake with a rated voltage of U_{dc} 50...300V. Voltage and current can be parameterised and monitored via software.



5.9 Connection of batteries / ultracapacitors



NOTICE

Damage at the switchgear

There is no internal inrush current limiting at terminals BT+ and BT-. Therefore, energy storages should only be connected if they are discharged. Instructions for switchgear use at these terminals and for the recommended switching sequence on request at KEB. Non-observance may lead to damage of the switchgear.

5.10 Connection of an external braking resistor

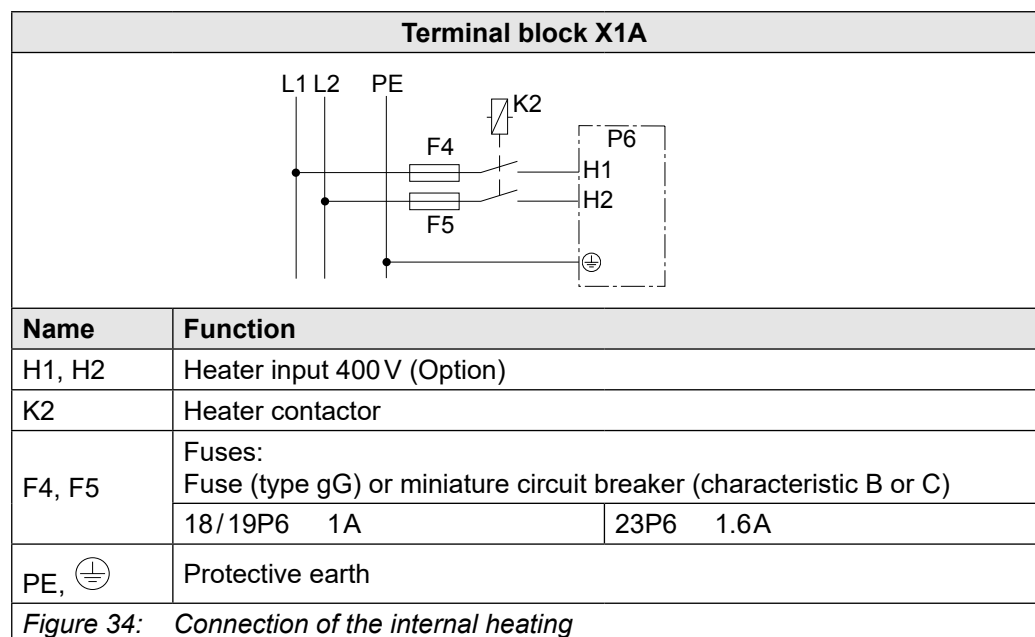
The COMBIVERT P6 provides internal braking resistors as standard. If the COMBIVERT P6 is equipped with the option "for external braking resistor", the braking resistor must be connected with shielded cable at RB+ und RB-.

NOTICE

Only intrinsically safe braking resistors permitted!

Only "intrinsically safe" braking resistors are permitted, as these interrupt themselves like a fuse, in case of fault, without the risk of fire.

5.11 Connection of the internal heating



NOTICE

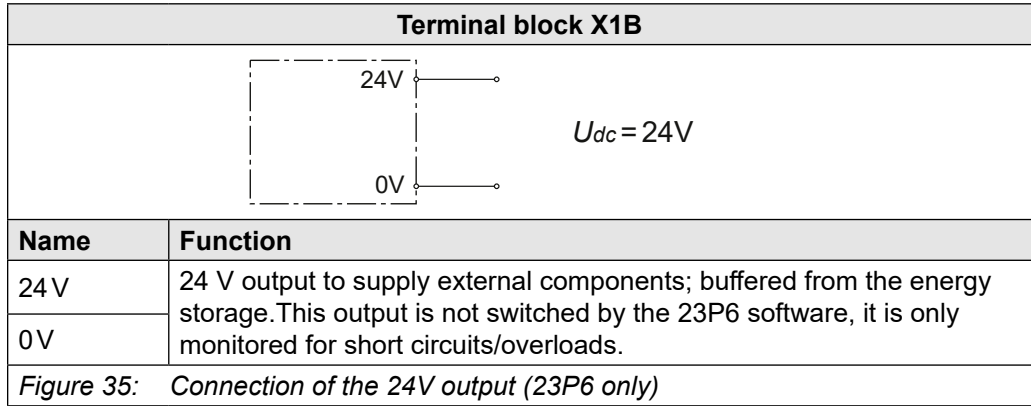
Damage by overvoltages!

Overvoltage protection must be installed in the power supply of the heater to limit overvoltages to values for category II ([EN 61800-5-1](#)).



The COMBIVERT P6 contains the heater elements only. The control and monitoring suitable for the application must be carried out by the customer by the heater contactor K2.

5.12 Connection of the 24V output (23P6 only)



6 Control unit

6.1 Description of the indicators and controls



Name	Description
LEDs	Program run and error display
S1	Address selector switch
X2A	Digital outputs; Relay output; Pt100 inputs; ext. 24V supply; analog inputs (option)
X2B	Digital inputs
X3A	Encoder feedback channel 1 (e.g. for motor)
X3B	Encoder feedback channel 2 (e.g. for rotor blade)
X6A	Diagnostic interface RS232 for COMBIVIS
X6B	Ethernet interface for COMBIVIS/COMBIVIS Studio 6
X6C	Fieldbus interface

Figure 36: Description of the indicators and controls

6.1.1 LEDs for program run and error display

Description	Function
LED1 Fieldbus status	
Off	Fieldbus driver is not activated in the PLC program; PLC program stopped or not available; fieldbus interface other than CAN equipped
Flashing (2.5Hz)	CAN node status = pre-operational
On	CAN node status = operational
LED2 PLC Error	
Off	Program OK or PLC program not available
On	Program error, exact error cause can be determined via COMBIVIS. This LED can also be controlled customer-specific by the PLC program.
Fast flashing	Hardware error, PLC must be restarted
LED3 PLC Run	
Off	PLC program stopped or not available
On	PLC program in run mode
LED4 Inverter status	
Off	Drive controller part defective or no program
On	OK (24 V control voltage available)
Flashing (1Hz)	Error in the drive controller part.Exact error cause can be determined via COMBIVIS.
<i>Table 12: Function of the LED's LD1...LD4</i>	

6.1.2 Address selector switch S1

The function is defined in the customer PLC program.

6.1.3 Real-time clock

The installed clock is maintenance-free (no battery) and runs without voltage supply for about 30 days. Then it must be set again. A readable parameter displays the validity of the date and time. For complete charging the control shall remain switched on for at least 30 minutes. Leap years are automatically recognized until 2099. Date and time can be read and set via COMBIVIS or the control program (library "SysTime").

6.2 Connection instructions control unit

6.2.1 Assembly of the wires to PUSH IN terminals

NOTICE

Malfunctions caused by loose cable connections!

- ▶ Observe metal sleeve length and stripping length
- ▶ When using shorter wire-end ferrules, reliable contacting cannot be guaranteed

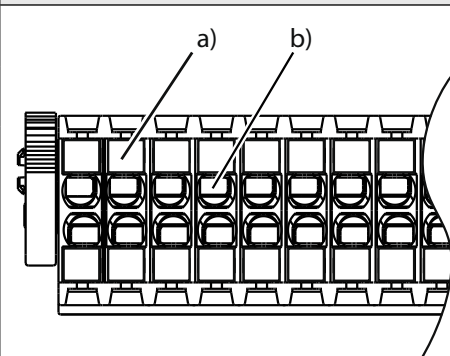
Cross-section	Wire-end ferrule	Metal sleeve length	Stripping length
0.50 mm ²	with plastic collars (DIN 46228-4)	10 mm	12 mm
0.75 mm ²		12 mm	14 mm
1.00 mm ²		12 mm	15 mm
1.50 mm ²	without plastic collars (DIN 46228-1)	10 mm	10 mm
0.2...1.5 mm ² single-wire or fine-wire	without wire-end ferrule	–	10...12 mm

Table 13: Wire-end ferrules and stripping length



KEB generally recommends the use of wire-end ferrules in industrial environments.

Front view terminal block



a) Pusher

b) Wire hole

Figure 37: Assembly of the control cable

- Press pusher by hand. Insert connecting wires into the respective hole, that no single wires can be seen from the outside or bend outward. A first resistance must be overcome when inserting. Release the pusher.
- The connecting wire can also be inserted without pressing the pusher in case of cross-sections from 1 mm².
- Check that the connecting wire is fixed and can not be pulled-out. It is important to ensure that the connecting wire and not the insulation is clamped.

6.2.2 Shield connection

Shield connection rails 3x10 mm are available for strain relief / shield connection of the control cables. Commercially available shield connection clamps (screw- or spring type) of suitable size or cable ties can be used on them.

6.2.3 D-SUB sockets and plugs

All D-SUB connectors have screw sockets with UNC 4-40 thread (tightening torque 0.4 Nm).

6.3 Description of the terminals

6.3.1 Control terminal block X2A

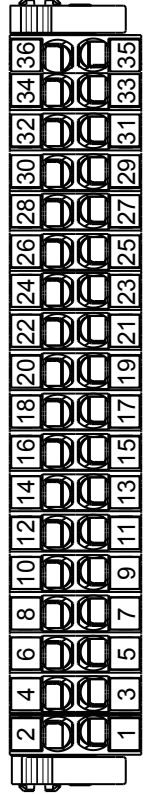
Function	Name	PIN		PIN	Name	Function
Input for external 24 V supply of the control board	Uin	36		35	0Vin	Reference potential for 24 V supply
Digital output 2A	DO 8	34		33	0V	Reference potential for digital outputs
Digital output 250 mA each	DO 7	32		31	0V	
	DO 6	30		29	0V	
	DO 5	28		27	0V	
	DO 4	26		25	0V	
	DO 3	24		23	0V	
	DO 2	22		21	0V	
	DO 1	20		19	0V	
Pt100 inputs	DO 0	18		17	0V	
	R3+	16		15	R3-	Pt100 inputs
	R2+	14		13	R2-	
	R1+	12		11	R1-	
R0+	10	9		R0-		
Analog inputs (Option)	AI 1+	8		7	AI 1-	Analog inputs (Option)
	AI 0+	6		5	AI 0-	
Analog ground	COM	4		3	COM	Analog ground
Relay output (NO contact)	RLC	2		1	RLA	Relay output (NO contact)

Figure 38: X2A pluggable terminal block with cage clamp terminals

DESCRIPTION OF THE TERMINALS

6.3.1.1 External supply of the control board

Using the external supply, the control board, I/Os, fieldbus, sensors (temperatures, humidity, mounting orientation) and the interior fan (of 18/19P6) remain in operation even if the power unit is disconnected.

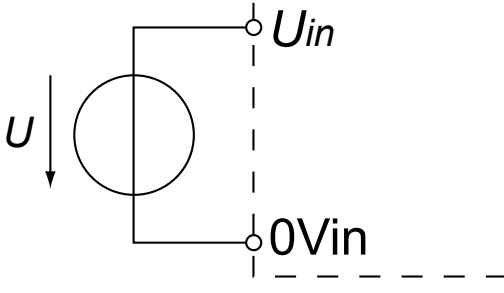
	Terminals		Specification
	X2A.35	0Vin	$U_{in}: 24\text{ V} \pm 10\%$
	X2A.36	Uin	
	Others		
Current consumption:			
Own use 0.65A			
+ load currents at X2B.1/3 ... 31			

Figure 39: External supply of the control board

6.3.1.2 Digital outputs

All outputs are short-circuit proof. They are suitable for inductive loads (without free-wheeling diode up to 300 mJ max.). The sum of the load currents at the 24V outputs of the control card (DO0...DO8, X2B.1/3...31 and X3A und X3B) must not exceed 3.4A.

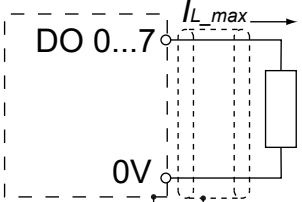
	Terminals		Specification
	X2A.18/20...32	DO 0...7	$U_{dc}: 24\text{ V}$
	X2A.17/19...31	0 V	$I_{L_max}: 250\text{ mA}$

Figure 40: Digital outputs DO 0...DO 7

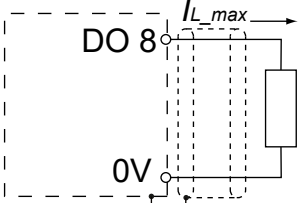
	Terminals		Specification
	X2A.34	DO 8	$U_{dc}: 24\text{ V}$
	X2A.33	0 V	$I_{L_max}: 2\text{ A}$

Figure 41: Digital output DO 8

6.3.1.3 Temperature inputs

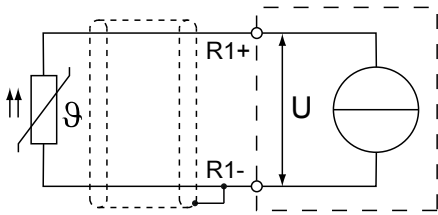
	Terminals		Input type
	X2A.10/12/14/16	R0+...R3+	Pt100
	X2A.9/11/13/15	R0-...R3-	
	Connection		Measuring range
two-wire		-40...+80 °C	

Figure 42: Temperature inputs

NOTICE**No potential separation!**

The inputs are not electrically isolated from the control board, therefore a motor temperature sensor must not be connected!

=> „5.7.3 Motor temperature detection“

6.3.1.4 Analog inputs

The analog inputs are optional.

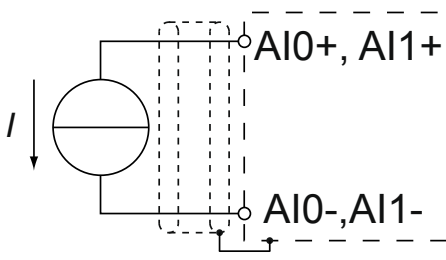
	Terminals		Differential inputs
	X2A.6/8	AI0+/AI1+	AI 0, AI 1
	X2A.5/7	AI0-/AI1-	
	Specification		Resolution
<i>U/I</i> adjustable: 0...±10 V ($R_i=55\text{ k}\Omega$) 0...±20 mA ($R_i=250\ \Omega$) 4...20 mA ($R_i=250\ \Omega$)		11 Bit + sign	

Figure 43: Analog inputs

6.3.1.5 Relay output

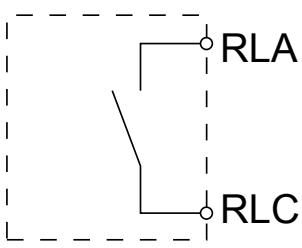
	Terminals		Output
	X2A.1/2		RLA / RLC
	Specification		
	U_{dc} : Max. 30 V / 0.01...1 A		
	Max. number of switching cycles		
	10 ⁸ mechanical; 500,000 at U_{dc} : 30 V / 1 A		
Others			
Ohmic load only, or inductive load with suitable protective circuit			

Figure 44: Relay output

6.3.2 Control terminal block X2B

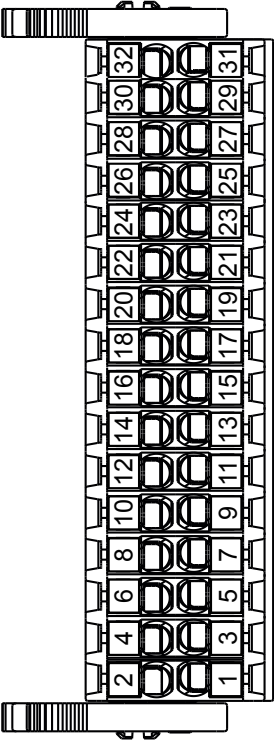
Function	Name	PIN		PIN	Name	Function
Free programmable, digital inputs	DI 15	32		31	24V	24V outputs to supply the digital inputs
	DI 14	30		29	24V	
	DI 13	28		27	24V	
	DI 12	26		25	24V	
	DI 11	24		23	24V	
	DI 10	22		21	24V	
	DI 9	20		19	24V	
	DI 8	18		17	24V	
	DI 7	16		15	24V	
	DI 6	14		13	24V	
	DI 5	12		11	24V	
	DI 4	10		9	24V	
	DI 3	8		7	24V	
	DI 2	6		5	24V	
	DI 1	4		3	24V	
Control release	DI 0	2	1	24V		

Figure 45: X2B pluggable terminal block with cage clamp terminals

6.3.2.1 Digital inputs

The digital inputs are specified in accordance with IEC61131-2 Type 3. All 24V terminals together are short circuit protected (250 mA).

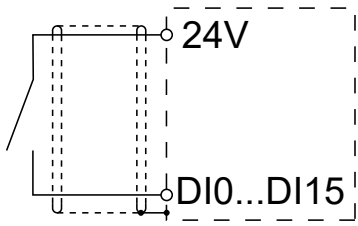
	Terminals		Input
	X2B.2/4...32	DI0...15	DI 0...15
	X2B.1/3...31	24V	
			Specification
			Status „0“: -3...5V Status „1“: 11...30V <i>I_{in}</i> : 4mA

Figure 46: Digital inputs

6.3.3 Encoder interfaces

The COMBIVERT P6 has two encoder interfaces for different encoders. The encoder types are defined by parameters ec16.

A total current of up to 300 mA for 5 V encoders and 300 mA for 24 V encoders can be drawn at X3A and X3B.

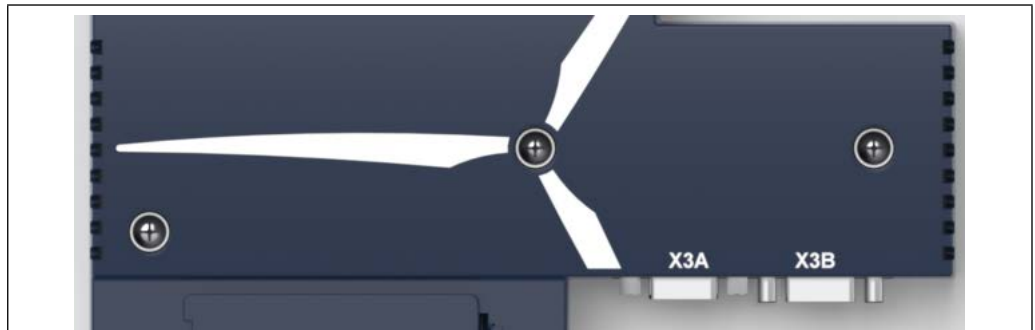


Figure 47: Encoder interfaces

6.3.3.1 Pin assignment encoder channel 1 (X3A)

Socket D-SUB-15				
PIN	Incremental encoder TTL		Resolver	
1	B-	Differential signal to B+	–	
2	A-	Differential signal to A+	–	
3	–		SIN -	Sinus signal low
4	–		COS-	Cosinus signal low
5	–		REF-	Exciter voltage low
6	B+	Input channel B	–	
7	A+	Input channel A	–	
8	–		SIN+	Sinus signal high
9	–		COS+	Cosinus signal high
10	–		REF+	Exciter voltage high
11	N+	Input zero track	–	
12	5/24V	Voltage output (parameterizable by ec15)	–	
13	COM	Reference potential	–	
14	–		COM	Reference potential
15	N-	Differential signal to N+	–	
Housing	GND	Shielding of the encoder cable. Housing is connected internally to the drive controller PE.		

Figure 48: Pin assignment encoder channel 1 (X3A)

NOTICE**Observe pin assignment!**

The pin assignment for incremental encoders is different from that of the COMBIVERT F5 series! The encoder cables 00F4V09-xxxx are available for 5 V incremental encoders (Heidenhain, Kübler, Sick-Stegmann).

NOTICE**Connection of third-party motors!**

For resolver connection KEB signal names are used in the above table. They match with KEB motors and KEB cables. If connecting third-party motors, other definitions of the signal names are often used, which can result in a reverse rotational direction. Connection instructions upon request.

Resolver specification	
Number of poles	2-pole (Tamagawa calls these "1X-BRX")
Excitation voltage	2.55 V _{RMS} , current consumption max. 30 mA _{RMS}
Excitation frequency	10 kHz
Transmission ratio	0.5 ± 10 %
Phase shifting	0° ± 5°
<i>Table 14: Resolver specification</i>	

6.3.3.2 Pin assignment encoder channel 2 (X3B)

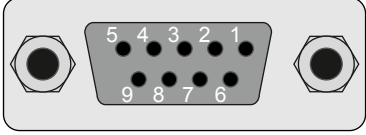
Socket D-SUB-9				
				
PIN	Incremental encoder TTL		SSI	
1	A+	Input channel A	CL+	Output clock signal
2	B+	Input channel B	DAT+	Input data channel
3	N+	Input zero track	–	
4	5V	Voltage output 5 V	5V	Voltage output 5 V
5	24V	Voltage output 24 V	24V	Voltage output 24 V
6	A-	Differential signal to A+	CL-	Differential signal to CL+
7	B-	Differential signal to B+	DAT-	Differential signal to DAT+
8	N-	Differential signal to N+	–	
9	COM	Reference potential	COM	Reference potential
Housing	GND	Shielding of the encoder cable. Housing is connected internally to the drive controller PE.		

Figure 49: Pin assignment encoder channel 2 (X3B)

6.3.3.3 Encoder cable

General information on connecting encoder cables:

- Use encoder cable double shielded and twisted in pairs.
- Connect outside shield to GND at both ends. At the drive controller end, connect outside shield either
 - onto the shield connection rail using shield connection clamps
 - or
 - to the housing of the SubD plug (connect inside the plug).
- Connect interior shielding at one side at the inverter to COM.
- Do not connect outside and inside shield!

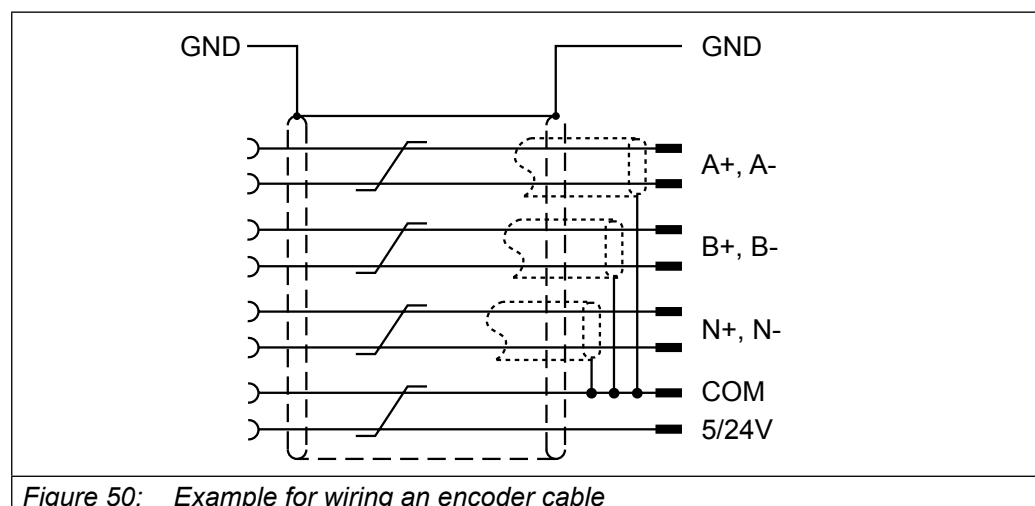


Figure 50: Example for wiring an encoder cable

6.3.4 Diagnostic interface X6A

The socket X6A is a serial RS232/485 interface. It serves for the connection of the control with a PC or other operating units via the protocol DIN66019II. The control unit has the node address 0, the drive unit has the node address 1. Alternatively, this interface can be accessed by the IEC control program as desired, thus providing many different protocol variants (library "SysCom").

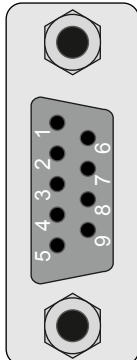
X6A	Name	Description	Socket D-SUB-9
1	PGM	Don't connect!	
2	TxD	Transmission signal RS232	
3	RxD	Receive signal RS232	
4	RxD-A	Receive signal RS485 A	
5	RxD-B	Receive signal RS485 B	
6	PGM+	Don't connect!	
7	DGND	Data reference potential	
8	TxD-A	Transmission signal RS485 A	
9	TxD-B	Transmission signal RS485 B	
Housing	GND	Housing is connected internally to the drive controller PE.	

Figure 51: Diagnostic interface X6A

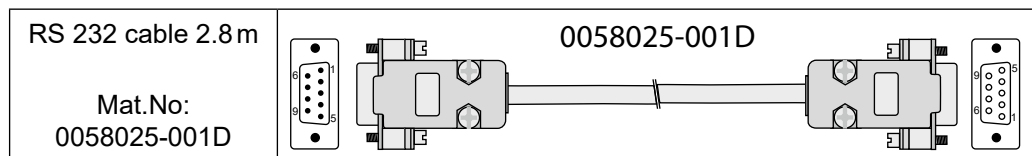


Figure 52: RS232 cable for diagnostic interface



The maximum cable length at X6A must not exceed 30m.

6.3.5 Ethernet interface (X6B)

The standardized 10/100base-T interface supports the protocols TCP/IP and UDP/IP. The following ports have the functions:

The run-time system uses ports 1740-1743 for the connection to the outside. The parameters of the firmware are available via port 8001. TCP or UDP is possible as protocol, at which encapsulated DIN66019II data telegrams will be transferred (the control unit has the node address 0, the drive unit has the node address 1). The file system can be read/written via port 8002 (only UDP) with KEB FTP file transfer protocol (writing only with application password). Furthermore, other ports of this interface can be accessed via the IEC control program. The interface supports automatic polarity detection, Auto-Crossover and automatic speed detection, adjustable by parameter Et15.



Connection to programming system !

A correct adjustment is important for the programming system connection. The IP address can be set by parameter Et01. The subnet mask is set by parameter Et11.

Default:	IP-Address 192.168.0.100
	Subnet mask 255.255.255.0

NOTICE

Protect COMBIVERT against unauthorized access !

Each user within a network can take access to the control with knowledge of the IP address. The write access via port 8001 can be restricted by parameter Et09.

6.3.6 Fieldbus interface X6C

The type code (=> „2.5 Type code“) shows the fieldbus interface that is installed in COMBIVERT P6.

6.3.6.1 Profibus DP

The connection is described in the installation instruction (8.021). This can be downloaded from www.profibus.com.

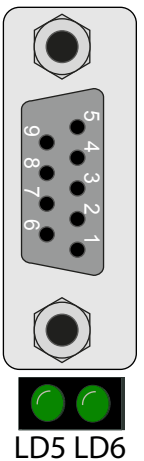
Socket D-SUB-9	PIN	Signal	Description	
	1	–	Reserved	
	2	–	Reserved	
	3	RxD/TxD-P	Transmit/receive signal P	
	4	–	Reserved	
	5	DGND	Data reference potential	
	6	VP	Supply voltage for terminating resistor	
	7	–	Reserved	
	8	RxD/TxD-N	Transmit/receive signal N	
	9	–	Reserved	
	Housing	–	High-resistance earthed	
	LED	Signal	Light pattern	Meaning
	LD5	Ready	On	Ready for operation
			Off	Not ready for operation
LD6	Data	On	Data are transmitted by the PROFIBUS	
		Off	No data transmission	

Figure 53: PROFIBUS DP interface

6.3.6.2 CAN-Bus

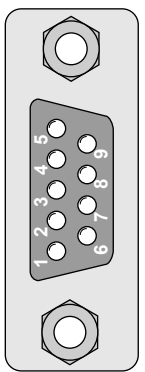
SubD-9 connector (male)	PIN	Signal	Description
	1	Reserved	Not connected here
	2	CAN_L	CAN-Bus signal dominant low
	3	CAN_GND	Not connected here
	4	Reserved	Not connected here
	5	CAN_SHLD	Capacitively earthed
	6	GND	Not connected here
	7	CAN_H	CAN-Bus signal dominant high
	8	Reserved	Not connected here
	9	CAN_V+	Not connected here
Housing	–		Resistively / capacitively earthed

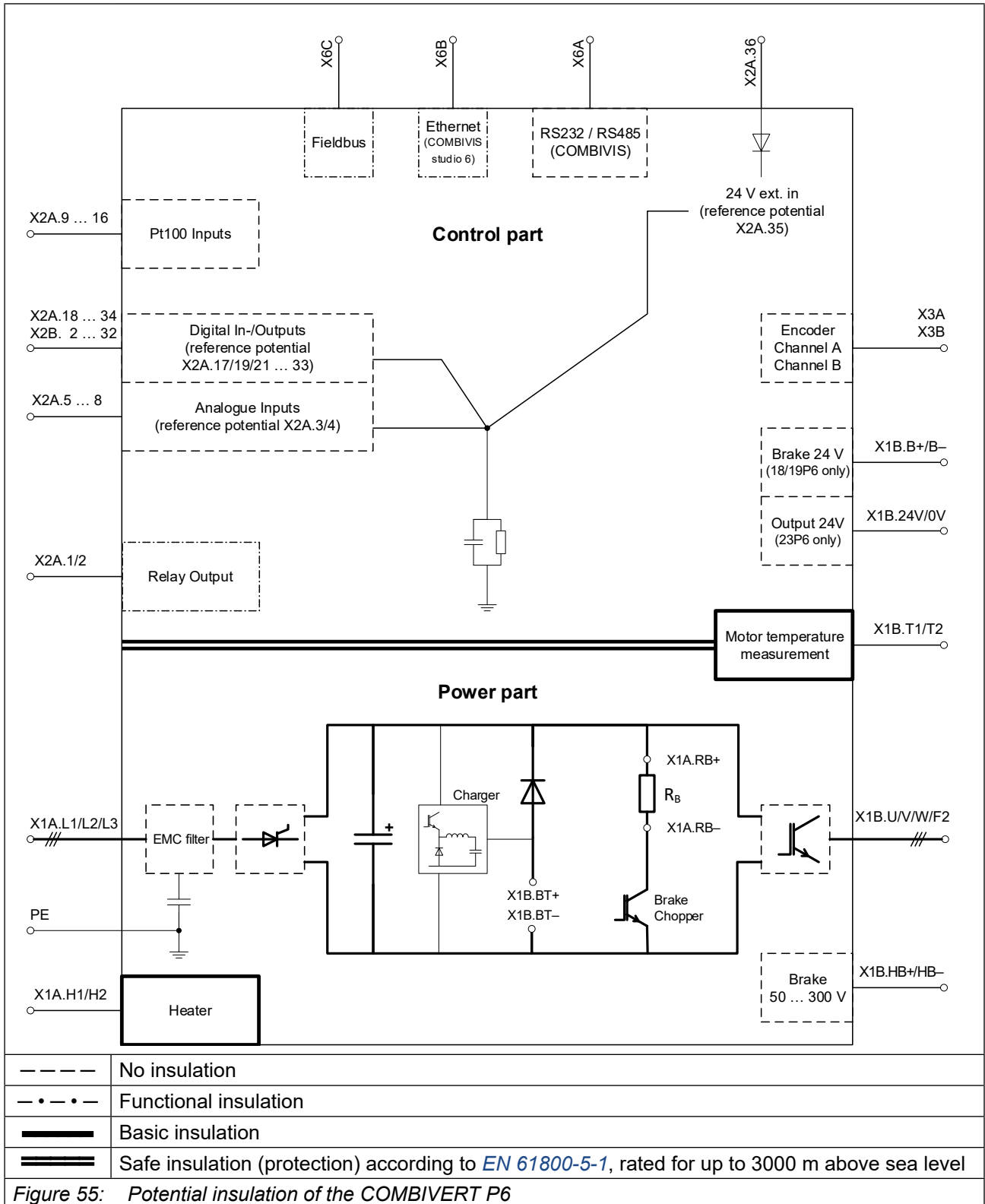
Figure 54: CAN-Bus interface

6.3.6.3 Further bus systems

Further bus systems are described in separate manuals.

7 Functional Overview

7.1 Potential insulation



7.2 Supply of the digital inputs and outputs

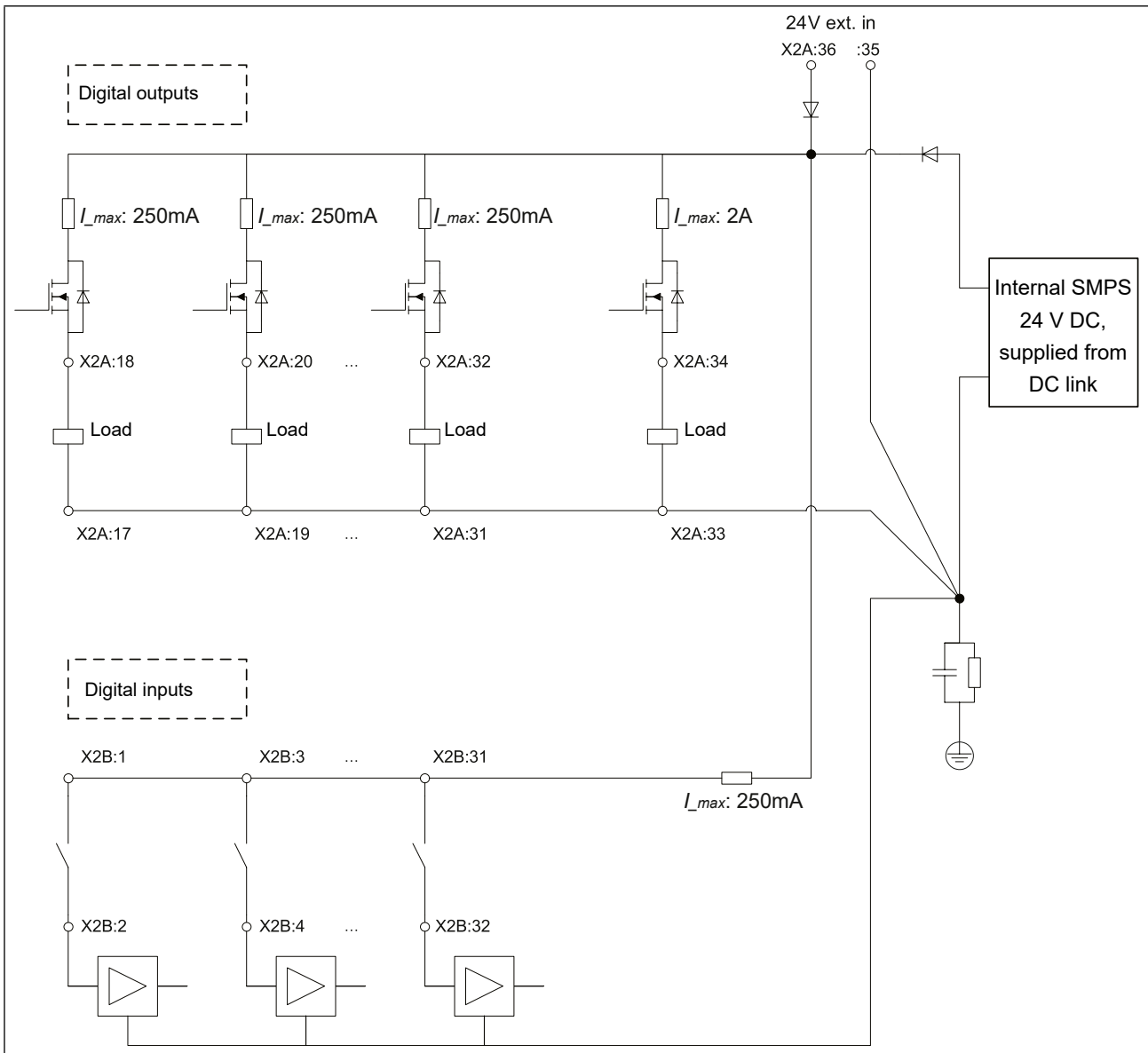


Figure 56: Supply of the digital inputs and outputs

8 Certification

8.1 CE Marking

CE marked drive controllers were developed and manufactured to comply with the regulations of the Low-Voltage Directive and EMC directive. The harmonized standards of the series *EN 61800-5-1* and *EN 61800-3* were used.

8.2 UL certification

Not planned for 18/19P6.

For 23P6 only:

	Acceptance according to UL is marked at KEB drive controllers with the adjacent logo on the nameplate.
--	--

To be conform according to UL for use on the North American and Canadian Market the following additional instructions must be observed (English original text):

Special Considerations

- The product was evaluated for use in and under the provisions for installation in a Pollution Degree 2 and Overvoltage Category III environment.
- The product is not intended for use in corner-grounded delta systems, the phase-to-ground rated system voltage is 277V AC or 230V AC respectively.
- All wiring terminals are suitable for field wiring.
- These devices also comply with IEC 61800-5-1.

Use – When installed in the final use equipment, the following are among the considerations to be made:

- Short Circuit and Breakdown of Component testing was conducted in normal mode and stored energy mode with the following external ultracapacitor modules and external fuses:

Part	Manufacturer	Type	Cat. No.	Min./Max. Capacitance	Max. Voltage
Ultra Capacitors	Maxwell BBBG2.MH26456	160V 6F Module	BMOD0006 E160 C02	6.0 (50k cycles)	162Vdc per Module
Fuses	MERSEN JFHR2/8.E76491	50A, 500Vdc IR 50kA _{dc}	FR14GR69 V50T	N/A	500Vdc

12 of the above modules were used in serial connection of 3 modules, 4 of such series connections in parallel, for U_{dc}=480V.

Any other external ultracapacitor modules and/or external fuses shall be judged in the end use.

- The need for disconnecting means of the drive from the ultracapacitor supply for service and testing shall be determined in the end use. This means shall open all ungrounded conductors, be rated for the voltage and current involved, and have a short-circuit current rating equal to or greater than the maximum available fault current from the ultracapacitors.
- A suitable enclosure shall be provided in the end-product application.

- Push through heat sink part only:
For the heat sink extending the ultimate enclosure – “Type 1 Enclosure”
- Brake resistor ratings and duty cycle:
Internal resistors
 - Duty cycle 1%
 - Max. 1.2 sec on-time, (118.8 sec off-time)
 External resistors
 - Duty cycle 10%
 - Max. 12 sec on-time, (108 sec off-time)
- Maximum Surrounding Air Temperature: 60°C
- Use 75°C Copper Conductors Only
- Ground terminal tightening torque 221 lb-in (25 Nm).
- SCCR-Rating
Suitable For Use On A Circuit Capable Of Delivering Not More Than 25,000 rms Symmetrical Amperes, 480 Volts Maximum when protected by MCCB, Model XT1N 125 TMF 100-1000 3p FF, manufactured by ABB (DIVQ/E93565), see instruction manual for Branch Circuit Protection details.
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes.
CSA: For Canada:
Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Canadian Electrical Code, Part I.
LA PROTECTION INTÉGRÉE CONTRE LES COURTSCIRCUITS N'ASSURE PAS LA PROTECTION DE LA DÉRIVATION. LA PROTECTION DE LA DÉRIVATION DOIT ÊTRE EXÉCUTÉE CONFORMÉMENT AU CODE CANADIEN DE L'ÉLECTRICITÉ, PREMIÈRE PARTIE.
- For installations according to Canadian National Standard C22.2 No. 274-13:
Control Circuit Overcurrent Protection Required.
Internal Overload Protection Operates prior to reaching the 130% of the Motor Full Load Current, see manual for adjustment instructions.
- **WARNING** – The opening of the branch circuit protective device may be an indication that a fault current has been interrupted. To reduce the risk of fire or electrical shock, current-carrying parts and other components of the controller should be examined and replaced if damaged. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.
CSA: For Canada:
ATTENTION - LE DÉCLENCHEMENT DU DISPOSITIF DE PROTECTION DU CIRCUIT DE DÉRIVATION PEUT ÊTRE DÙ À UNE COUPURE QUI RÉSULTE D'UN COURANT DE DÉFAUT. POUR LIMITER LE RISQUE D'INCENDIE OU DE CHOC ÉLECTRIQUE, EXAMINER LES PIÈCES PORTEUSES DE COURANT ET LES AUTRES ÉLÉMENTS DU CONTRÔLEUR ET LES REMPLACER S'ILS SONT ENDOMMAGÉS. EN CAS DE GRILLAGE DE L'ÉLÉMENT TRAVERSÉ PAR LE COURANT DANS UN RELAIS DE SURCHARGE, LE RELAIS TOUT ENTIER DOIT ÊTRE REMPLACÉ.

8.3 Further informations and documentation

You find supplementary manuals and instructions for the download under www.keb.de/service/downloads

General instructions

- EMC and safety instructions
- Manuals for control boards, safety modules, fieldbus modules, etc.

Instruction and information for construction and development

- Input fuses in accordance with UL
- Programming manual for control and power unit
- Motor configurator, for selecting the right drive controller, as well as for creating downloads for parameterizing the drive controller

Approvals and approbations

- Declaration of conformity CE
- TÜV certificate
- FS certification

Others

- COMBIVIS, the software for comfortable parameterization of drive controllers via PC (available per download)
- EPLAN drawings

9 Revision History

Version	Date	Description
1A	2011-11	First published version with material number 00P6NDB-0000
1B	2011-12	Technical data adapted, maximum current for encoder interfaces inserted
1C	2012-04	Notes for the seal at the heat sink inserted
00	2015-01	Complete revision. Changeover to documents management 20095484
01	2019-10	- <i>For internal use only</i> - changeover to new KEB CI optics, extension by device size 23
02	2022-06	Extension of detailed technical data for device size 23, preciseing technical data for device size 18/19, complete editorial revision

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