# Operating Manual

## PacDrive™
## Servo drive MC-4

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ELAU PACKAGING SOLUTIONS

Schneider Electric

**Imprint**



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# Contents

# 1 On this manual

## 1.1 Introduction

Before using ELAU components for the first time, you should familiarize yourself with this operating manual.

In particular, observe the safety notes described in chapter 2.

Only persons who meet the criteria for "Selection and Qualification of Staff" (see chapter 2.4) are allowed to work on ELAU components.

One copy of this manual has to be available for staff working on the components at all times.

This manual helps you use the component safely and expertly and as directed.

Observe this manual. This will help to avoid risks, reduce repair costs and down times and increase the lifetime and reliability of the products.

You also need to observe the valid rules for the prevention of accidents and for environmental protection in the country and place where the device is used.

## 1.2 Symbols, Signs and Forms of Depiction

The following symbols and signs are used in this document:

| Depiction | Meaning |
|---|---|
| ■ | First level enumeration sign. |
| – | Second level enumeration sign. |
| ⏵ | **Action symbol**: The text following this symbol includes an instruction for action. Execute the instruction actions in the given order, from top to bottom. |
| ✓ | **Result symbol**: The text following this symbol contains the result of an action. |
| *Italics* | If the describing text contains special terms (e.g. parameters) then they are written in italics. |
| Serif font | If the manual contains program code, it is marked by Serif font. |
|  | **Information symbol**: This symbol marks notes and useful tips for using the product. |
|  | **Warning sign**: Safety notes can be found in the relevant places. They are marked with this symbol. |
|  | After this symbol, information about contents of the chapter follows as guideline assistance. |

*Table 1-1: Symbols, signs and forms of depiction*

# 2 General Safety Notes

This chapter contains general requirements for working safely. Every person using ELAU components or working on ELAU components has to read and observe these general safety notes.

If activities involve a residual risk, you will find a clear note in the respective places. The note describes the risk that may occur and preventive measures to avoid that risk.

## 2.1 Basics

The ELAU components are built according to the state of technology and generally accepted safety rules. Nevertheless, their use may cause a risk to life and limb or material damage if:

- you do not use the components as directed
- work on the components is not done by experts or instructed staff
- you inexpertly alter or modify a component
- you fail to test the protective measures in place after installation, commissioning or servicing
- you do not observe the safety notes and regulations.

Only operate the components in perfect technical condition as directed, in regard to safety and risks and observe this manual.

The flawless and safe operation of the components requires appropriate transport, storage, mounting and installation as well as careful maintenance.

In case of any circumstances that impair the safety and cause changes in the operating behavior, immediately put the component(s) to a stop and inform the service staff in charge.

In addition to this manual, observe

- the prohibiting warning and mandatory signs on the component, the connected components and in the switching cabinet
- the relevant laws and regulations
- the operating manuals of the other components
- the universally valid local and national rules for safety and the prevention of accidents.

## 2.2 Depiction of Safety Notes

### Risk categories

The safety notes in this manual are grouped into different risk categories. The table below shows which risk and possible consequences the symbol (pictograph) and the signal words indicate.

| Pictograph | Signal word | Definition |
|---|---|---|
|  | **DANGER!** | Indicates an immediately dangerous situation that will result in death or very serious injuries if the safety rules are not observed. |
| | **WARNING!** | Indicates a possible dangerous situation that can result in serious injuries or major material damage if the safety rules are not observed. |
| | **CAUTION!** | Indicates a possible dangerous situation that might result in material damage if the safety rules are not observed. |

*Table 2-1: Risk categories*

## 2.3 Use as Directed

The ELAU components are designed for installation in a machine/ plant or for combination with other components to form a machine/ plant. The components may only be used under the installation and operating conditions described in this documentation. You must use the accessories and ancillary parts (components, cables, etc.) mentioned in the documentation. You must not use any foreign objects or components that are not explicitly approved by ELAU.

"Use as directed" also means that you

- observe the Operating Manuals and other documentations (see appendix),
- observe the instructions for inspection and maintenance.

***Use other than directed***

The operating conditions at the installation location must be checked on the basis of the given technical data (performance information and ambient conditions) and observed.

The device must not be put into operation until it is guaranteed that the useable machine or the plant in which the motor is installed meets in its entirety EC directive 98/37/EC (machine directive).

In addition, observe the following norms, directives and regulations:

- DIN EN 60204 Safety of machines:
  Electrical equipment of machines.
- DIN EN 292 part 1 and part 2 Safety of machines:
  Basics, general design guidelines.
- DIN EN 50178 Equipment of high-voltage plants with electronic operating means.
- EMC directive 89/336/EEC

## 2.4 Selection and Qualification of Staff

This manual is aimed exclusively at technically qualified staff with detailed knowledge in the field of automation technology.

Only qualified staff can recognize the significance of safety notes and implement them accordingly.

This manual is aimed in particular at design and application engineers in the fields of mechanical and electrical engineering, at programmers, service and commissioning engineers.

***Working on electrical equipment***

Work on electrical equipment must only be done by qualified electricians or by instructed staff supervised by an electrician according to the electrotechnical rules.

An electrician is a person who due to his vocational training, know-how and experience as well as knowledge of the valid regulations, is able to:

- evaluate the work he is supposed to do
- identify potential risks
- implement suitable safety measures.

## 2.5 Residual Risks

We minimized the health risk for people by means of appropriate construction and safety technology. Nevertheless, there is a residual risk, since the components work with electrical current and voltage.

## 2.5.1 Installation and Handling

**WARNING!**

Risk of injury while handling the unit!

Risk of injury due to squeezing, cutting or hitting!

- Observe the universally valid construction and safety rules for handling and installation.
- Use suitable installation and transport facilities and use them professionally. If necessary, use special tools.
- Take precautions against squeezing.
- If necessary, use suitable protective clothing (e.g. safety glasses, safety shoes, protective gloves).
- Do not stay under pending loads.
- Remove any leaking liquids from the floor immediately to avoid skidding.

## 2.5.2 Touching Electrical Parts

Touching parts carrying a voltage of 50 Volts or higher can be dangerous. When electric appliances are operated, certain parts of these appliances inevitably carry a dangerous voltage.

**DANGER!**

High voltage!

Life hazard!

- Observe the valid construction and safety regulations for working on high-voltage units.
- After installation, check the fixed connection of the earth conductor on all electric appliances according to the connection plan.
- Operation, even for short-term measuring and test purposes, is only permitted with an earth conductor firmly connected to all electric components.
- Disconnect the unit from mains or power supply and lock it out before accessing electrical parts with voltages exceeding 50 Volts. After switching off, wait at least 5 minutes before touching any components.
- Do not touch electrical connections of the components while the unit is on.
- Before switching the unit on, cover all voltage carrying parts to prevent accidental contact.
- Provide a protection against indirect touching (EN 50178 / 1998 section 5.3.2).

**DANGER!**

High leak current!

Life hazard!

- The leak current is greater than 3.5 mA. Therefore the units must have a firm connection to the power grid (according to DIN EN 50178 / 1998 - equipment of high-voltage systems).

## 2.5.3 "Safely Separated Low Voltages"

***PELV***
***Protective-Extra-Low-Voltage***

Signal voltage and control voltage of the PacDrive units are <33 V. In this range, the specification as PELV system according to IEC 364-4-41 includes a protective measure against directly and indirectly touching dangerous voltages by means of a "safe separation" from the primary to the secondary side in the plant/ machine. ELAU urgently recommends to execute the plant/ machine with safe separation.

**DANGER!**

High voltage due to wrong connection!

Life hazard or risk of serious injury!

- Only units, electric components or cables with a sufficient safe separation of the connected power supplies according to EN 50178 / 1998 (equipment of high-voltage systems with electronic operating means) may be connected to the signal voltage connections of these components.
- Make sure that the existing safe separation is retained throughout the entire current circuit.

***FELV***
***Functional-Extra-Low-Voltage***

When using ELAU components in systems that do not include a safe separation as a means of protection against directly or indirectly touching dangerous voltages, all connections and contacts (e.g. MAx-4, Sub-D connector, serial inerface) that do not comply with protection class IP2X must be permanently covered. The cover or device connection must be arranged such, that it can only be removed with the help of a tool. The protective measure must be observed on all connected devices.

### 2.5.4 Potentially Dangerous Movements

There can be different causes for potentially dangerous movements:

- mistakes in wiring or cable connection
- software errors
- faulty components
- errors in measuring value and signal encoders
- operating mistakes

The protection of people must be insured by superior means or monitoring on the plant side. You must not rely on the internal monitoring in the drive components alone. Monitoring or measures must be provided according to a risk and error analysis by the plant builder according to the specific conditions of the plant. The valid safety rules for the plant have to be included in this process.

**DANGER!**

Potentially dangerous movements!

Life hazard, serious injury or material damage!

- No persons are allowed within the motion range of the machine. This must be ensured with devices like protective fences, grids, covers or photoelectric barriers.
- The fences and covers must be sufficiently strong to withstand the maximum possible motion energy.
- The emergency stop switch must be located very close to the operator. Check the operation of the emergency stop before starting up the plant.
- Secure against unintentional start by enabling the mains contactor of the drives via an emergency off circuit or by means of the function 'safe stop'.
- Before accessing the danger zone, bring the drives to a safe stop.
- To work on the plant, the power must be turned off and locked out.
- Avoid operating high-frequency remote-control and radio devices in the vicinity of the plant's electronics and connecting wires. If the use of those devices is inevitable, check system and plant for possible malfunctions before the first operation. In some cases, a special EMT check may be necessary.

# 3 System Overview

## 3.1 Drive Concepts of Packaging Machines

Modern machine concepts in the packaging industry are characterized by the need for high dynamism, flexibility, modularity and efficiency. Packaging machines were traditionally equipped with a mechanical vertical shaft, which drove the secondary motions in the machine, usually with mechanical components with complicated motion functions. Designing such a machine, flexible for different products is a highly complex task. Even minor changes in the packaging process, particularly in case of a product change, require major modifications and standstill time.

Packaging machines with electronic vertical shafts permit full flexibility. Electronic servo drive systems replace cam and coupling gears and a virtual electronic vertical shaft ensures that the motion axes are synchronous. Any pulse and angle synchronous movements are determined by a central control.

Unplanned machine states, such as stop or emergency off situations or initialization movements can be realized synchronously. Dynamic changes of the goods to be packed or the packaging material in the plant, (like slippage of the products to be packed or expansion of the packaging material) can be registered by sensors while the machine is running and eliminated by modifying the corresponding drive movements. This development substantially changes and highly simplifies the classical mechanical machine concept. The structure of the packaging machine can be broken down into modules that are easy to apply and can be standardized.

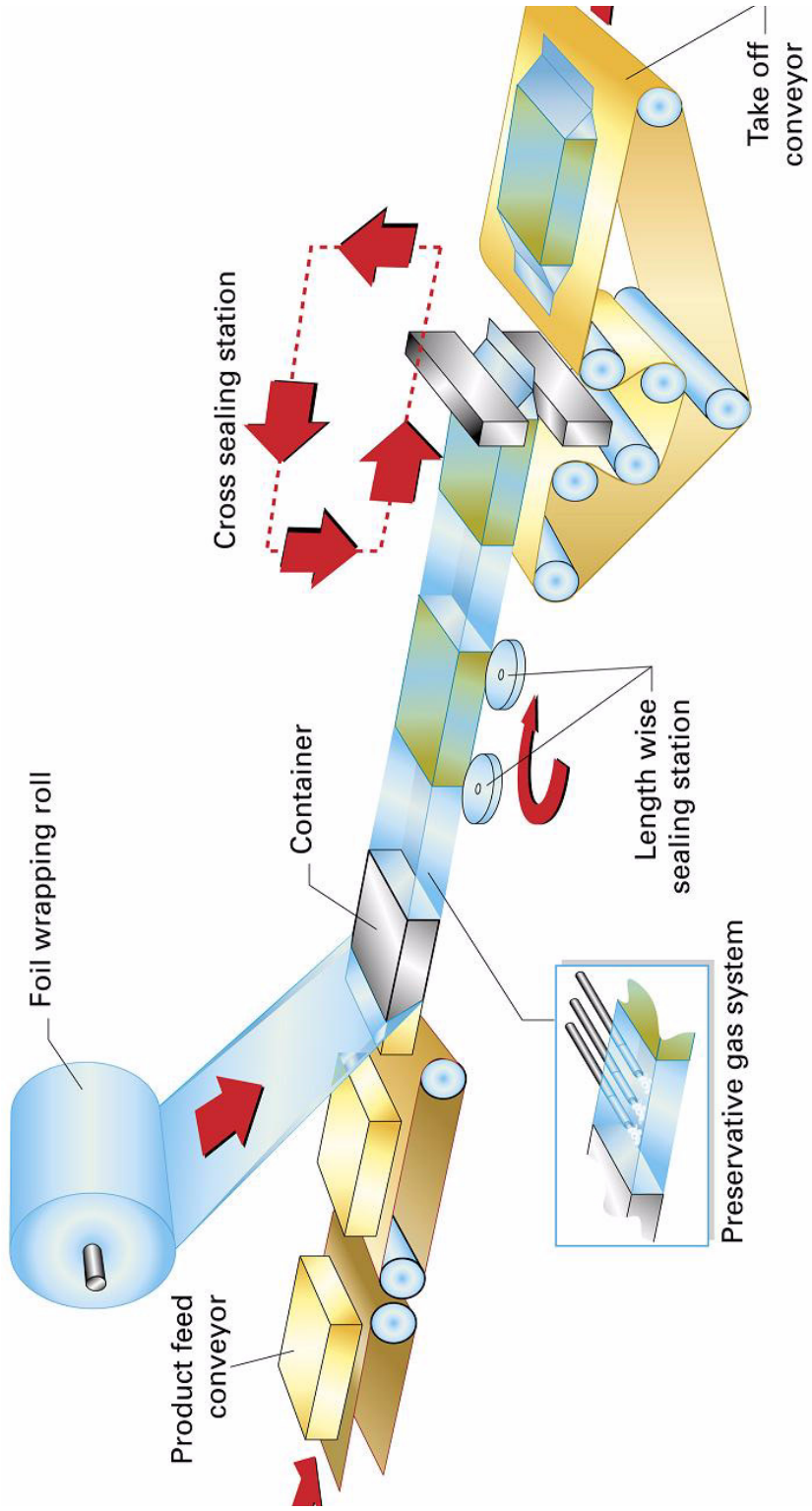


*Fig. 3-1: Sketch of a packaging machine*

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## 3.2 Structure of the PacDrive™ Automation System

The PacDrive™ automation system offers a technically and economically optimal solution for electronic packaging machines. PacDrive™ consists of an efficient PC-based control, the PacDrive Controller and the digital MC-4 servo drive which include the mains connection unit, the end-stage power and the servo regulator of the individual axes (Fig. 3-2).

The PacDrive Controller is the intelligent head of the system, and is based on an industrial PC. The PacDrive Controller synchronizes and coordinates the motion functions of the packaging machine. Using an IEC 1131-3 soft PLC, it ventures into applications previously reserved for standard PLCs. The individual PLC or positioning tasks can be broken down into several parallel tasks, which are implemented with the EPAS-4 programming environment according to the IEC 1131-3 standard. Up to 40 servo axes can be connected to a PacDrive Controller and supplied with positioning data.

The circular digital SERCOS real-time bus realizes the safe data exchange with the servo drive MC-4. Due to the use of optical fiber technology, the data bus is insensitive to electromagnetic disturbances and cyclically supplies the decentralized servo drive MC-4 with new set values at a data rate of 4MBaud. All internal states of the axes can be checked via the real-time bus and processed in the PacDrive Controller.

In addition to digital and analog inputs and outputs, the PacDrive Controller has two serial interfaces and one Ethernet interface. A variety of process visualization and control systems can be connected to the PacDrive™ system via the integrated OPC interface. Further peripheral components can be connected via field bus interface modules. The PacDrive Controller can act as a field bus master or slave.

The international field bus standards CANopen, PROFIBUS-DP and DeviceNet are supported. The built-in interfaces enable remote diagnosis via telephone modem or Internet. Via TCP/IP, PC's can communicate with the PacDrive Controller and diagnose the state of the control directly.

## 3.3 Concept

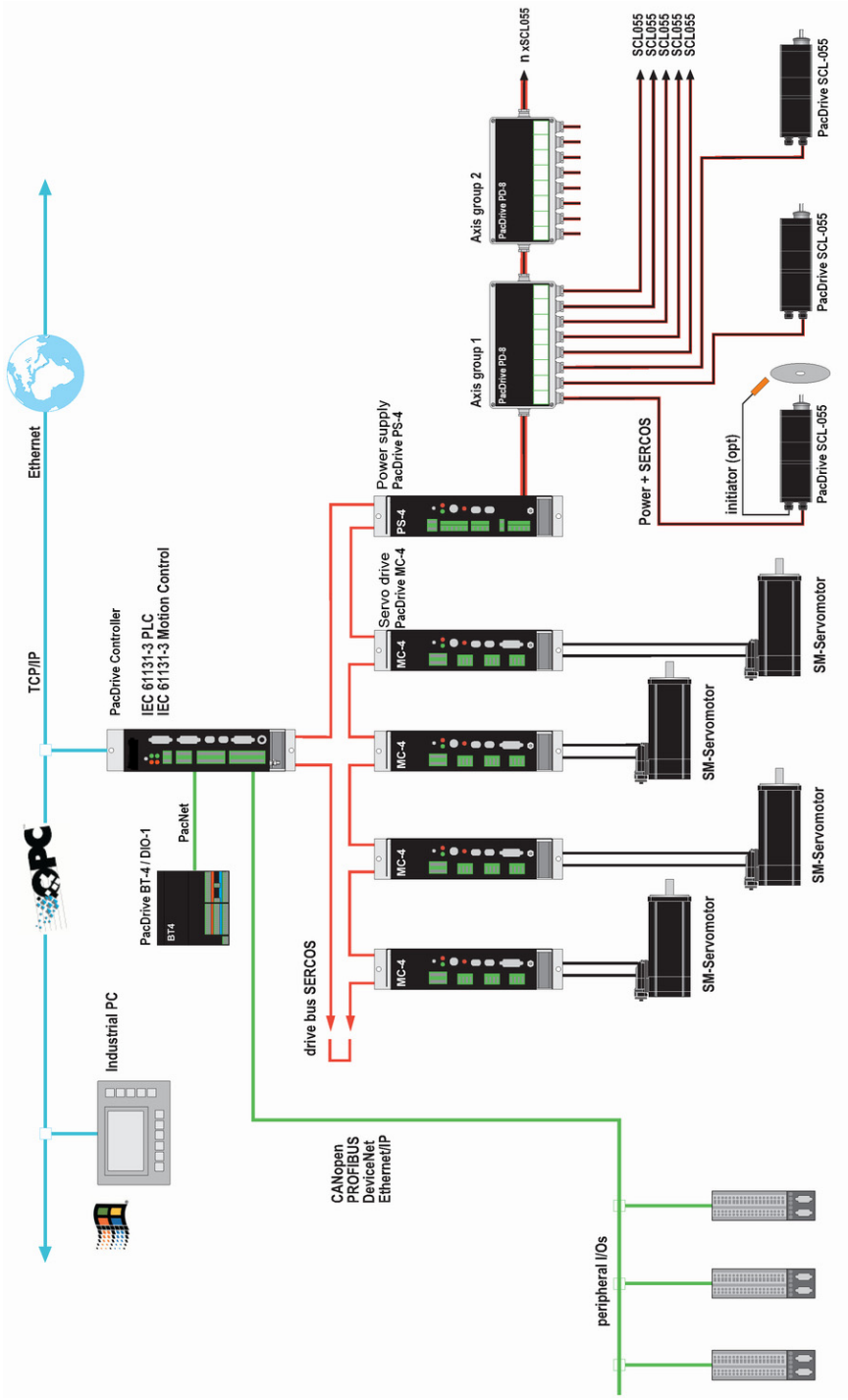


*Fig. 3-2: System overview of the PacDrive™ automation concept*

Alternatively, the PacDrive Controller can be connected to a conventional PLC via a field bus.

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## 3.4 Components

### Automation Toolkit EPAS-4

EPAS-4 has extensive and proven functions and tools. A key advantage of EPAS-4 is, that all components are integrated and intuitive.

For you as a user this means:

Quick familiarization, easy handling, all tools integrated.

***Libraries***

ELAU maintains extensive libraries geared to the packaging industry, helping you obtain cost effective and speedy answers to any concern. They will also help you to improve the quality of your user programs.

Highlights of the EPAS-4 Automation Toolkit

- Runs under Windows (recommended WinXP)
- Programming language IEC 61131-3
- SCOPE tool (oscilloscope functions)
- Diagnostic tool
- very good debugging features
- serial or TCP/IP connection to the PacDrive Controller.

### PacDrive Controller Family

The PacDrive Controller, a microprocessor-based control hardware with VxWorks real-time operating system, realizes the PLC and motion functions.

A PacDrive Controller synchronizes, coordinates and generates the positioning functions for a maximum of:

- 8 drives PacDrive Controller MAx-4 / 8
- 8 drives PacDrive Controller C200
- 16 drives PacDrive Controller C400
- 99 drives PacDrive Controller MAx-4 / 99
- 99 drives PacDrive Controller C600
- 22 drives PacDrive Controller P600

in a food and packaging machine.

For HMI tasks, various standard HMIs are used. Whether low-cost clear text or IPC - it’s no problem for the flexible PacDrive Controller.

The PacDrive Controller P600 is equipped with a complete PC. Due to this PC based technologie, the P600 can also be used for HMI applications.

### Servo drive PacDrive MC-4

***Leading-edge technology***

The digital servo drive MC-4 is characterised by its compact and autonomous structure, suitable for wall mounting as well as its leading-edge technology. The innovative MC-4 has the mains supply unit, end stage and software regulator for one axis integrated in a compact casing. Since it communicates with the PacDrive Controller only via fibre optical cable, it is also suitable for a decentralized structure. It requires no user program. It comes with single- and multi-turn processing features as standard and configures itself with the help of the electronic name plate in the SM motor.

The highlights of the MC-4 MotorController

- World-wide voltage range
- Integrated mains supply unit
- Max. power 34.5 / 69 kVA
- Automatic motor recognition
- Minimum size
- Safety input Inverter Enable
- 250 % overload
- Integrated SERCOS interface
- few types

### SM-Motor

***Highly dynamic servo motors***

Machines with fast cycle rates require highly dynamic AC servo motors. The SM motor series offers you as a user an optimum motor concept for your food and packaging machines. The dynamic brushless servo motors are furnished with high-resolution encoders (single-turn or multi-turn) and electronic name plate. Smooth surface and compact size meets the requirements of the target market.

The highlights of the SM motors

- Low mass moment of inertia
- 4-fold overload
- Reliable high-voltage technology
- Leading-edge magnetic technology
- High-resolution single- or multi-turn encoder
- Electronic name plate
- Plug in junction box
- IP 65 protection

# 4 Transportation, Storage, Unpacking

## 4.1 Transportation

- Avoid shocks.
- Immediately check units for transport damage and inform your transport company, if necessary.

## 4.2 Storage

- Store units in a clean, dry place.

**Storage conditions:**

- air temperature between - 25 °C and + 70 °C.
- temperature fluctuations max. 30 K per hour.

## 4.3 Unpacking

- Check whether the delivery is complete.
- Check all units for transport damage.

### Type plate

The type plate contains all necessary information:


*Fig. 4-1: Type plate on PacDrive MC-4*

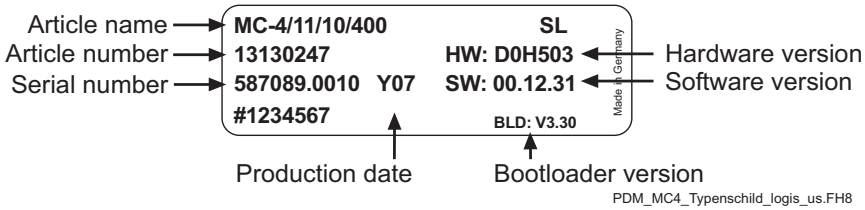


*Fig. 4-2: logistic type plate of a PacDrive MC-4*

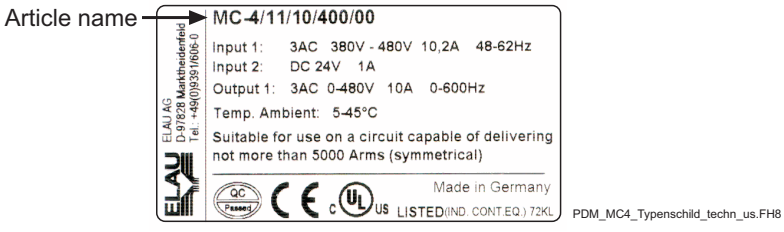


*Fig. 4-3: technical type plate of a PacDrive MC-4*

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# 5 Maintenance

Recognizing and clearing an error quickly helps to keep the related production loss down to a minimum.

The diagnosis messages of the PacDrive™ system, which can be checked using EPAS-4, make it possible to look for errors deliberately and effectively.

In case of an error, defective components can be exchanged with no problem. This ensures that the problem can be solved quickly and operation can be resumed soon. This work must be done by qualified maintenance staff only.

When returning a defective unit to the ELAU customer service, please complete the attached error report form.

## 5.1 Spare Parts, Components

**Stock keeping of spare parts:**

Keeping a stock of the essential components is a key prerequisite for the permanent functionality of the equipment.

**ATTENTION!**

Device compatibility!

System does not operate accurate after exchanging components.

- Only units with identical hardware configuration and identical software version may be exchanged.

**When ordering spare parts, please give the following data:**

| | |
|---|---|
| product name: | e. g. MC-4/11/10/400 |
| article number: | e. g. 13130247 |
| hardware version: | e. g. HW: 504001 |
| software version: | e. g. SW: 00.05.00 |



**NOTE**

You can find this information on the type plate of the equipment (see Fig. 4-2) and in the configuration of the PacDrive™ systems.

## 5.2 Repairs

By all means complete the attached error report form when returning defective components.

You can also make a photocopy of the error report form and use it as a fax message.

**ATTENTION!**

Electro static discharge!

Components may be damaged!

- Electronic parts may only be returned in the original or a comparable packaging. In any case the components must be wrapped in an ESD packaging/foil. Otherwise you will lose your warranty rights.

## 5.3 Service Addresses

**For ordering spare parts**

ELAU AG
Postfach 1255
97821 Marktheidenfeld

Phone: +49 (0) 9391 / 606 - 0
Fax: +49 (0) 9391 / 606 - 300

**Repairs and Servicing**

Please send the components to be repaired or checked, along with the error report, to this address:

ELAU AG
Abt. Kundendienst

| postal address: | house address: |
|---|---|
| Postfach 1255 | Dillberg 12 |
| 97821 Marktheidenfeld | 97828 Marktheidenfeld |

Phone: +49 (0) 9391 / 606 - 142
Fax: +49 (0) 9391 / 606 - 340

**Service team**

Should you need to talk to a member of our service team or require on-site service, please contact:

ELAU AG
Abt. Applikation
Postfach 1255
97821 Marktheidenfeld

Phone: +49 (0) 9391 / 606 - 0
Fax: +49 (0) 9391 / 606 - 300

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## 5.4 Exchanging Units

In addition to the notes below, please observe the information of the machine producer when exchanging the PacDrive MC-4.

**DANGER!**

High Voltage!

Life Hazard!

High voltage possible with servo motors in generator operation!

- Before working on electrical units, disconnect from mains supply and secure against switch-on.
- Make sure that the drives are standing still.
- Do not disconnect connector plugs while they are carrying voltage.
- Before working on the unit, discharge the DC-circuit and use a voltmeter to check that there is no voltage.

**CAUTION!**

Electro static discharge!

Components may be damaged!

- Only touch the boards on the edges. Do not touch any connections or components.
- Existing static charges can be discharged by touching a grounded metallic surface, e.g. a grounded equipment casing.
- Prevent the development of electrostatic charge by using suitable clothing, carpets or furniture and by moving the boards as little as possible.

**Exchange PacDrive MC-4**

- ▸ lift the main switch
- ▸ secure against switch-on

**DANGER!**

Dangerous electrical voltages also after the separation from the network!

Life hazard!

- Wait at least two minutes after the separation from the network, until the inserted condensers are unloaded.
- Check whether the voltages sank after the two minutes to a harmless value.
- Performance plug connectors of the cables only in status without tension of the system separate or join!

**CAUTION!**

Hot surfaces on the PacDrive MC-4 and the brake modules (BM-4)!

Burn danger!

- Wait for the MotorController or the brake modules to cool down by istself or use the protective gloves.

- Separate the access lines of the PacDrive MC-4.
- Screws at upper housing and lower surface loosened.
- Remove PacDrive MC-4.
- Insert new PacDrive MC-4 and tighten the screws.
- Attach the new PacDrive MC-4 according to the machine connection diagram.
- System in operation set again.

**Exchange motor**

- lift the main switch
- secure against switch-on

**DANGER!**

High voltage!

Life hazard!

- Performance plug connectors of the cables only in status without tension ot the system separate or join!

**CAUTION!**

Mechanical force!

Damage of the encoder system is possible!

- When removing and applying clutches on the motor shaft no impact may be executed on the motor shaft, since otherwise the encoder will be damaged. Use suitable tools e. g. pullers.

**WARNING!**

Inadvertent on movements!

Danger of accident!

- With servo axles with indirect distance measurement system over the motor encoder the measure reference is lost with exchange of the engine!
  The measure reference to the machine coordinate system is to be reconstituted therefore after the exchange again!

- While exchange of a motor the specification of the machine manufacturer is to be considered.
- During indirect entry of the position actual values over the motor-own measuring system the measure reference must again be reconstituted.

**Exchange cable**

- lift the main switch
- secure against switch-on

**DANGER!**

High voltage!

Life hazard!

- Seperate or join the plug connectors of the cables only in status without power on the system!
- Performance plug connectors only with dry and clean putting pages join!
- If no finished manufactured cables are used by ELAU, allocation of new cables for agreement with the connection diagram of the machine manufacturer to check!

- During the exchange of cables the specification of the machine manufacturer is to be considered.

## 5.5 Cleaning

With suitable installation the devices are to a large extend maintenance-free.
Dust and foreign bodies, which are near-carried particularly by the cooling air flow, can be removed, as the devices are removed after the unstressed switching and with dry compressed air (max. 1 bar) are blown out.

## 5.6 EMC Rules

To control and regulate motors, the mains voltage is stored in the DC-circuit of the servo drives by means of rectification. This stored energy is fed to the motor by deliberately switching on and off six semiconductor switches. The steep rise and fall of the voltage puts high demands on the insulation strength of the motor winding. Another essential aspect to be considered is the Electro Magnetic Compatibility (EMC) with other system components. The flank steepness of the clocked voltage generates harmonic oscillations of great intensity, up into the high-frequency range.

**Therefore observe the following EMC rules:**

- Choose the earthing option with the lowest possible ohm rate (e.g. unpainted mounting board of the switching cabinet) for installation.
- Contact the largest possible surface (skin effect). If necessary, remove existing paint to achieve large-surface contact.
- From the Central Earthing Point (CEP), lay earthing wires to the respective connections in a star structure. Earthing circuits are not admissible and can cause unnecessary distortions.
- Use shielded cables only.
- Only large-surface shield transitions are admissible.
- Shields must not be contacted via pin contacts of connector plugs.
- By all means observe the switching proposals.
- Cut motor cables to minimum length.
- Do not lay cable circuits inside the switching cabinet.

**CAUTION!**

Electromagnetic fields!

Disturbances or failure of the system possible!

With the installation following rules must be considered, in order to exclude consequences of excessive disturbance effects as far as possible.

- In connection with electronic controls, no inductive loads whatsoever must be switched without suitable interference elimination.
- For DC operation, suitable interference elimination can be achieved by arranging recovery diodes. For AC operation, commercially available erasing elements matching the connector type can be used.
- Only the interference elimination element mounted immediately at the point of inductivity serves this purpose. In any other case, the switching pulse may even emit increased interference via the interference elimination elements. It is much easier to avoid sources of interference in the first place, than to eliminate the effects of existing interference.
- In no case must the contacts switching unshielded inductive loads be arranged in the same room as the PacDrive MC-4; the same goes for cables carrying unshielded, switched inductivity and cables running parallel to them. The control must be separated from such „disorders“ by a Faraday cage (own section in the switching cabinet).

**CAUTION!**

Electromagnetic fields!

Disturbances or failure of the system possible!

- Depend on the combination servo drive / motor and the cable length are to be used possibly system filters or motor filters. Consider for this the projecting manual for the PacDrive™ system.

## 5.7 Commissioning

We recommend to take up first with ELAU commissioning personnel.

This is not only occur for guarantee reasons, but also

- the equipment check,
- which determines optimal configuration,
- the service personnel is instructed at the same time.

**Commissioning procedure:**

**CAUTION!**

The PacDrive units (MC-4, MAx-4, etc.) may be damaged by inexpert installation work!

Possible material damage!

Every person working on the plant / machine / switching cabinet in which PacDrive components are installed must make sure that no objects (e.g. chips, screws, etc.) fall into the ventilation slots of the equipment (in particular, watch the top side!).

- Finish all installation work such as drilling, screwing etc. before you start mounting the units.
- If installation work is necessary after the PacDrive units have been mounted, by all means cover the units with due care (IP20).

***Unpacking and checking***

- Remove packaging.
- Make sure the units are not damaged. Only undamaged units should be put into operation.
- Check if the consignment is complete.
- Check if the optional slots are occupied correctly.
- Check the data with the help of the type plate.

See also chapter „Transportation, Storage, Unpacking“.

***Installation***

- Observe the requirements for the place in which the equipment may be used.
- Observe the requirements for protection and EMC rules.
- Mount devices.

See also chapter „Maintenance“.

**DANGER!**

High leak current!

Life hazard!

- The leak current is greater than 3.5 mA. Therefore the units must have a firm connection to the power grid (according to DIN EN 50178 - equipment of high-voltage systems).

***Electrical installation***

- Connect the units, starting with the ground conductor.
- Make sure the clamps are tight and the required cable cross sections are correct.
- Make sure the shield is executed correctly, rule out short-circuits and interruptions.

See also chapter „Technical Data“and „Maintenance“

***Connecting the control voltage (24V)***

- Check mains and control voltage.
- Connect external 24 V control voltage.
- ✓ The units initialize themselves and the LEDs should show the following state:
  - MAx-4: pow: ON, err: ON, buserr: ON, wd: OFF
  - MC-4: pow: ON, err: flashing, buserr: ON

See also chapter „Technical Data“

***Checking the safety functions***

- Check thermo contact of the motor or PTC (see operating manuals for the connected components).
- Check the functions of the brake (if any).
- Check EMERGENCY OFF chain and EMERGENCY OFF switch.

***Connecting the mains voltage***

- Activate EMERGENCY OFF switch.
- Connect mains voltage.
- Check if the state indicator works correctly.
- Deactivate EMERGENCY OFF switch.

***Moving the axis***

- When you move the axis for the first time, use a reliable small user program in order to check:
  - the correct turning direction of the axis
  - the correct setting of the limit switches
  - the brake path in both directions.

**NOTE**

When the 24V control voltage is connected, the servo amplifier MC-4 automatically detects the motor and corresponding motor data.

***Configuration and program transmission.***

- Transmit the project to the PacDrive Controller with the Automation Toolkit EPAS-4.

**DANGER!**

Potentially dangerous movements!

Life hazard, risk of serious injury or material damage!

- Make sure that there are no persons in the danger zone.
- Remove from the motion range all tools, loose parts and other auxiliaries that do not form part of the axis/machine/plant. (Make sure the plant is ready for operation)
- ELAU recommends not to couple the working machine until the function test has been completed successfully!

***Testing the functionality***

- Check units and cabling again.
- If it has not been done already, connect the mains voltage
- Run function check by means of a check list for axis/machine/ plant functions.

***Further commissioning of the plant***

- Continue to commission the plant according to the operating manual of the machine producer.

## 5.8 Configuration / Programming

The adjustment of the PacDrive™ system to their function takes place with the automation toolkit EPAS-4.
In EPAS-4 the system is configured and programmed after IEC 61131-3.



**NOTE**

For further details on diagnosis, please consult the online help of the Automation Toolkit EPAS-4.

**CAUTION!**

Complex functionality of the PacDrive™ system and the machine!

Damage possible!

- Program modifications may be executed only by trained personnel with detailed knowledge of the system. Modifications may be made therefore only by your machine supplier or by ELAU coworkers. The ELAU AG is not responsible for damage by arbitrary program modifications.

## 5.8.1 LEDs

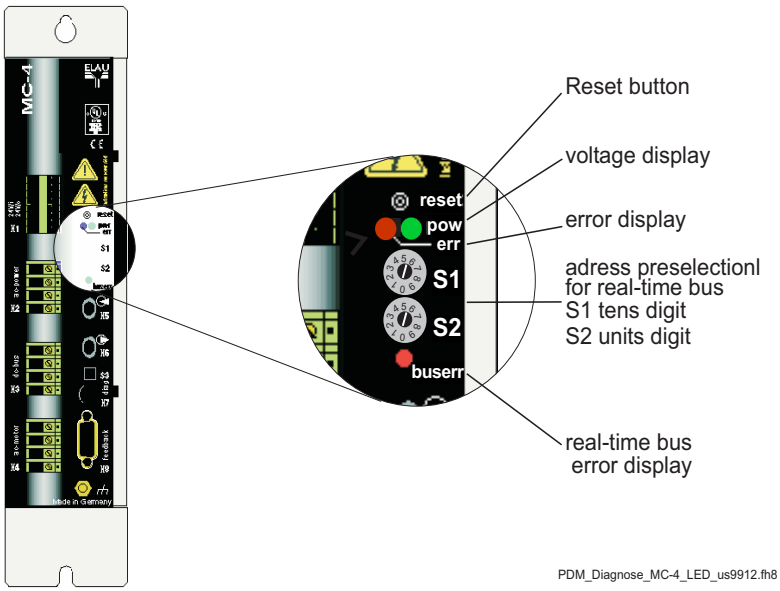



*Fig. 5-1: Diagnosis LEDs of the PacDrive MC-4*


### pow (control voltage display)

The LED „pow“ signals the condition of the control voltage.

| | |
|---|---|
| OFF | control voltage (24 V) missing or too low. |
| ON | normal operation; control voltage in normal range |


### err (error indicator)

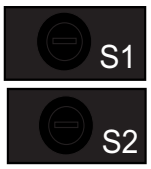
The Error-LED (err) is used for the error display. The following index shows possible display states with the associated error report.

| | |
|---|---|
| OFF | normal operation |
| Flashing slowly (1 Hz) | general error |
| Flashing fast (2 Hz) | SERCOS error |
| ON | serious system error |


### bus err (SERCOS bus error display)

| | |
|---|---|
| OFF | normal operation |
| ON | bus error (fiber-optic connection problem, e. g. transmitting power too low or too high, cable break, ...) |

### S1 / S2 SERCOS address switches




Use the rotary type switches S1 and S2 to set the SERCOS address (0-99) of the servo amplifier MC-4. The tens digit is set with switch S1. The singles digit is set with switch S2.

### S3 fiber-optic intensity


The sender intensity of the fiber-optic light source is set on the PacDrive MC-4 with the DIL switches S3 on the front side. The sender intensity depends on the length of the cable up to the next slave..

| cable length [meter] | intensity |
|---|---|
| 0.1 - 1 | 1 |
| 1.1 - 20 | 2 |
| 20.1 - 40 | 3 |
| 40.1 - 50 | 4 |

*Table 5-1: Fiber-optic intensity with dedicated cable length*

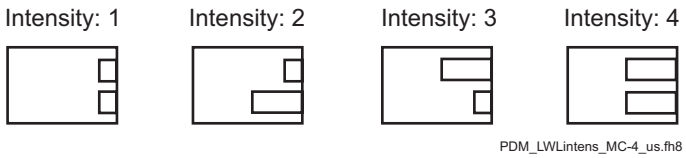



*Fig. 5-2: Positioning switch on the front panel of the PacDrive MC-4*

### reset


Button to reset the servo amplifier MC-4. Only the servo amplifier is rebooted if you activate the „reset“ button. Other PacDrive Controllers MAx-4, C200 etc. that may be connected have their own „reset“ buttons.

## 5.8.2 Example of a diagnosis message

The diagnosis message 121 „Bleeder temperature too high“ is shown.

Meaning of the diagnosis message:

- Class 2 error
- Diagnosis code 121

The meaning of the diagnosis code is further explained in the online help of the Automation Toolkits EPAS-4.

### 121 Bleeder temperature too high

- The bleeder is overloaded.

***Cause*** The drive is dimensioned incorrectly.

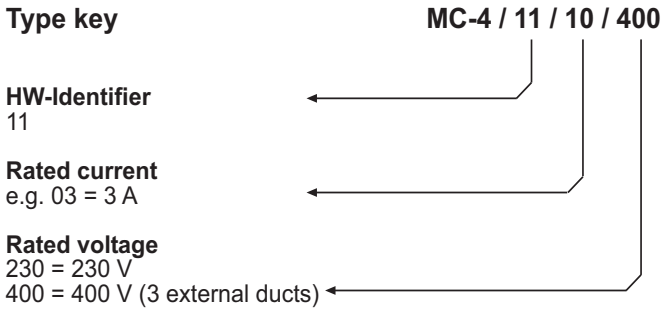
***Solution*** Check drive dimensioning.

***Cause*** Hardware error: Bleeder or control is defective.

***Solution*** Contact our customer service.

# 5.9 Order Numbers

## 5.9.1 PacDrive MC-4




| Order number | Product name | Explanation |
|---|---|---|
| 13 13 02 44 | MC-4 / 11 / 01 / 400 | MC-4 1.5 A 400 V |
| 13 13 02 45 | MC-4 / 11 / 03 / 400 | MC-4 3 A 400 V |
| 13 13 02 46 | MC-4 / 11 / 05 / 230 | MC-4 5 A 230 V |
| 13 13 02 47 | MC-4 / 11 / 10 / 400 | MC-4 10 A 400 V |
| 13 13 02 54 | MC-4 / 11 / 22 / 400 | MC-4 22 A 400 V |
| 13 13 02 56 | MC-4 / 11 / 50 / 400 | MC-4 50 A 400 V |

*Table 5-2: Order numbers and variants for MC-4*

## 5.9.2 Cable

### Motor cables

| Order number | Product name | Explanations |
|---|---|---|
| 15 15 41 01 | E-MO-067 UL cable 1,5 $mm^2$ | SM-070/100<br>on MC-4 X4 |
| 15 15 41 21 | E-MO-092 UL cable 1,5 $mm^2$ | SM-140<br>on MC-4 X4 |
| 15 15 41 12 | E-MO-082 UL cable 2,5 $mm^2$ | SM-140/30/210/..<br>with fan<br>on MC-4 / 22 A X4 |
| 15 15 41 17 | E-MO-087 UL cable 2,5 $mm^2$ | SM-140/30/290;<br>SM-140/30/370<br>on MC-4 / 22 A X4 |
| 15 15 41 20 | E-MO-091 UL cable 4 $mm^2$ | SM-140/30/370/...<br>with fan<br>on MC-4 / 22 A X4<br>on MC-4 / 50 A X4 |
| 15 15 41 02 | E-MO-068 CE cable 1,5 $mm^2$ | SM-070/100<br>on MC-4 X4 |
| 15 15 41 07 | E-MO-073 CE cable 1,5 $mm^2$ | SM-140<br>on MC-4 X4 |
| 15 15 41 03 | E-MO-069 CE cable 2,5 $mm^2$ | SM-140/30/210/...<br>with fan<br>on MC-4 / 22 A X4 |
| 15 15 41 11 | E-MO-081 | SB 205 with plug<br>2,5 $mm^2$<br>on MC-4 X4 |
| 15 15 41 13 | E-MO-083 CE cable 2,5 $mm^2$ | SM-140/30/290;<br>SM-140/30/370<br>on MC-4 / 22 A X4 |
| 15 15 41 14 | E-MO-084 CE cable 4 $mm^2$ | (SM-140/30/370/...<br>with fan)<br>on MC-4 / 22 A X4<br>on MC-4 / 50 A X4 |
| 15 15 41 15-XXX | E-MO-085 SM 1.5 | on MC-4 X4<br>CE cable |
| 15 15 41 16-XXX | E-MO-086 SM 1.5 | SR-058 on<br>MC-4 X4 UL cable |
| 15 15 41 19 | E-MO-090 | SB-205 with<br>connection box<br>10 $mm^2$<br>on MC-4 / 50 A X4 |
| 15 15 41 27 - XXX | E - MO - 111 Kabel 2.5 $mm^2$ | SH055, 070, 100<br>and SH140/30/120,<br>/200 plug small,<br>short |
| 15 15 41 28 - XXX | E - MO - 112 Kabel 2.5 $mm^2$ | SH055, 070, 100<br>and SH140/30/120,<br>/200 plug small,<br>long |
| 15 15 41 29 - XXX | E - MO - 113 Kabel 2.5 $mm^2$ | SH140/30/270,<br>/330 plug large |

*Table 5-3: Order numbers for motor cables*

### Encoder cables

| Order number | Product name | Explanations |
|---|---|---|
| 15 15 42 01 | E-FB-060 UL cable | SM-070; SM-100 X4 on MC-4 X8 |
| 15 15 42 02 | E-FB-061 CE cable | SM-070; SM-100 X4 on MC-4 X8 |
| 15 15 42 06 | E-FB-064 | SB-Motor MIL Stift MC-4 X8 |
| 15 15 42 11-XXX | E-FB-065 MAx-SIN-ME UL | on MAx-4 X9 |
| 15 15 42 12-XXX | E-FB-066 MAx-SIN-ME | on MAx-4 X9 |
| 15 15 42 13-XXX | E-FB-069 SM/SIN | Extension motor side SM070/100 |
| 15 15 42 14-XXX | E-FB-070 SM/SIN | UL cable SR-058 on MC-4 X8 |
| 15 15 42 15 | E-FB-071 UL cable | SM-140 X4 on MC-4 X8 |
| 15 15 42 17 | E-FB-073 CE cable | SM-140 X4 on MC-4 X8 |
| 15 15 20 08 | E-FB-028 | Incremental encoder on MAx-4 / INC-4 |
| 15 15 42 23 - XXX | E - FB - 080 | all SH-Motors |

*Table 5-4: Order numbers for encoder cables*

### Interface cables

| Order number | Product name | Explanations |
|---|---|---|
| 15 15 43 01 | E-SS-054 (PC) | on MAx-4 X5 (COM 1) |
| 15 15 43 03-XXX | E-SS-056 REAL-TIME-BUS | on MC-4 X5 |
| 15 15 43 04-030 | E-SS-057 (PC) | on MC-4 X7 |

*Table 5-5: Order numbers for interface cables*

## 5.9.3 Connector Sets

| Order number | Product name | Explanation |
|---|---|---|
| 15 15 44 04-001 | Connector Set MC-4 1.5-10A SM-Motor | Connector front side MC-4 compl. |
| 15 15 44 04-002 | Connector Set MC-4 22/50A SM-Motor | Connector front side MC-4 compl. |
| 15 15 44 11-001 | Connector Set MC-4 SH-Motor | Set with power plug small, short |
| 15 15 44 11-002 | Connector Set MC-4 SH-Motor | Set with power plug small, long |
| 15 15 44 11-003 | Connector Set MC-4 SH-Motor | Set with power plug large, only 2.5 $mm^2$ |

*Table 5-6: Order numbers for connector sets*

## 5.9.4 Accessories

| Order number | Product name | Explanations |
|---|---|---|
| FI 0 78 76 | FFU 3X08 K-K | mains filter 8 A |
| FI 0 78 77 | FFU 3X30 K-K | mains filter 30 A |
| FI 0 78 78 | FFU 3X55 K-K | mains filter 55 A |
| | | |
| 13 27 00 13 | BM-4/10 | bleeder module |
| 13 13 02 57 | bus clamp BT-4/DIO1 | for PacNet |
| | | |
| 17 19 50 04 | ME/SinCos SRS50 stand alone | master encoder |
| 17 19 50 05 | ME/SinCos SRM50 KVAF multi-turn | master encoder |
| | | |
| 17 19 10 19 - 003 | Incremental master encoder DG 60 LWSR 5.000 incr / rev | master encoder for INC-4 |
| 17 19 10 19 - 006 | Incremental master encoder DG 60 LWSR 10.000 incr / rev | master encoder for INC-4 |
| | | |
| ME 08600 | Warning label: high voltage | 105 x 52mm |
| | | |
| 20 63 00 63 | OPC server | single licence |
| 20 63 00 66 - 001 | PacDrive ECAM-4 | company licence |

*Table 5-7: Order numbers for accessories*

# 6 Technical Data

## 6.1 PacDrive MC-4

**NOTE**

The PacDrive MC-4 supports motors with firmware up to V00.20.XX with a rotary speed up to 6000 $min^{-1}$.

On firmware versions V00.22.XX, the rated speed is supported up to 12000 $min^{-1}$.

In case of ambient temperatures >45 °C, for additional exchange of cooling air provide external fan in the switching cabinet.

**NOTE**

The PacDrive MC-4 is not suitable for fault current protection with a common FI safety switch with a trigger level of 30 mA. The leakage current of the unit can trigger the FI safety switch. Solutions fo this problem:

- Use an FI safety switch (RCD, type B) with a trigger level of 500 mA.

**NOTE**

The PacDrive MC-4 / 1,5 A is adequate only when using firmware versions as from V00.22.XX, in connection with the SH Motor 055.

Is a motor used with a differing power class, the error message „138 invalid motor“ will appear.

## 6.1.1 In General

### PacDrive MC-4 / 1.5A

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | MC-4 / 11 / 01 / 400 V |
| | Order number | 13 13 02 44 |
| ***Power supply*** | - rated connection voltage | 3 AC 380 V (-10%) to 480 V (+10%)<br>- min. 3 AC 380 V (-10%)<br>- max. 3 AC 480 V (+10%) |
| | - mains frequency | 48 ... 62 Hz |
| | - control voltage/current | DC 24 V (-15% / +25%) / 1 A |
| ***DC-circuit*** | - DC-circuit voltage | DC 530 V to 680 V |
| | - capacity | 165 µF |
| | - $U_{Bleeder}$ ON | DC 820 V |
| | - $U_{Bleeder}$ OFF | DC 800 V |
| | - excess voltage | DC 860 V |
| | - bleeder resistance | 120 Ohm |
| | - bleeder - permanent power | 50 W |
| | - bleeder - peak power | 5 kW |
| ***Motor connection*** | - rated power 8 kHz | 1.5 Aeff |
| | - peak current 1 s | 3.75 Aeff |
| | - rated power | 1.1 kVA |
| ***Stray power*** | - electronics supply | approx. 12 W |
| | - bleeder (internal) | 0 ... 50 W (depending on the application) |
| | - power part | approx. 15 W / A |
| ***I/O*** | Inputs | |
| | - inputs voltage / current | DC 20 ... 30 V / 5 mA |
| | - ie-input | DC 20 ... 30 V / 30 mA |
| | - input filter | [5 ms |
| | Outputs | |
| | - relay outputs | DC 20 ... 30 V / 2 A |
| ***Environment*** | Product size<br>Box size | see chapter Dimensions<br>width: 100 mm<br>height: 400 mm<br>depth: 320 mm |
| | Product weight<br>Boxed weight | 3.1 kg<br>4.0 kg |
| | Ventilation | natural convection |
| | Ambient conditions<br>Protection class<br>- casing<br>- installation location<br><br>- ambient temperature during operation<br>- for storage and transport<br>-insulation<br><br>- excess voltage category<br>- excess voltage proofness<br>- degree of radio distortion<br>rel. humidity | <br><br>IP20<br>IP54, if the safety wiring is used with Inverter Enable<br>+5 ... +45 °C (+55 °C with reduced power)<br>-2% per K at $I_{NC}$ and $I_{SC}$)<br>-25 ... +70 °C<br>degree of pollution 2 ..., dewing prohibited<br><br>K III, T2 (DIN VDE 0110)<br>class 1 (DIN VDE 0160)<br>class A EN 55011 / EN 61800 - 3<br>5% - 85% climatic category 3K3 EN 60 721 |
| ***Approval*** | Approvals | CE, UL, cUL |

*Table 6-1: Technical data of the PacDrive MC-4 / 01*

## PacDrive MC-4 / 3 A

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | MC-4 / 11 / 03 / 400 V |
| | Order number | 13 13 02 45 |
| | | |
| ***Power supply*** | - rated connection voltage | 3 AC 380 V (-10%) to 480 V (+10%)<br>- min. 3 AC 380 V (-10%)<br>- max. 3 AC 480 V (+10%) |
| | - mains frequency | 48 ... 62 Hz |
| | - control voltage/current | DC 24 V (-15% / +25%) / 1 A |
| | | |
| ***DC-circuit*** | - DC-circuit voltage | DC 530 V to 680 V |
| | - capacity | 165 µF |
| | - $U_{Bleeder}$ ON | DC 820 V |
| | - $U_{Bleeder}$ OFF | DC 800 V |
| | - excess voltage | DC 860 V |
| | - bleeder resistance | 120 Ohm |
| | - bleeder - permanent power | 50 W |
| | - bleeder - peak power | 5 kW |
| | | |
| ***Motor connection*** | - rated power 8 kHz | 3 Aeff |
| | - peak current 1 s | 7.5 Aeff |
| | - rated power | 2.1 kVA |
| | | |
| ***Stray power*** | - electronics supply | ca. 12 W |
| | - bleeder (internal) | 0 ... 50 W (depending on the application) |
| | - power part | ca. 15 W / A |
| | | |
| ***I/O*** | Inputs | |
| | - inputs voltage / current | DC 20 ... 30 V / 5 mA |
| | - ie-input | DC 20 ... 30 V / 30 mA |
| | - input filter | [5 ms |
| | Outputs | |
| | - relay outputs | DC 20 ... 30 V / 2 A |
| | | |
| ***Environment*** | Product size | see chapter Dimensions |
| | Box size | width: 100 mm<br>height: 400 mm<br>depth: 320 mm |
| | Product weight | 3.1 kg |
| | Boxed weight | 4.0 kg |
| | Ventilation | natural convection |
| | Ambient conditions | |
| | Protection class | |
| | - casing | IP20 |
| | - installation location | IP54, if the safety wiring is used with Inverter Enable |
| | - ambient temperature during operation | +5 ... +45 °C (+55 °C with reduced power)<br>-2% per K at $I_{NC}$ and $I_{SC}$) |
| | - for storage and transport -insulation | -25 ... +70 °C<br>degree of pollution 2 ..., dewing prohibited |
| | - excess voltage category | K III, T2 (DIN VDE 0110) |
| | - excess voltage proofness | class 1 (DIN VDE 0160) |
| | - degree of radio distortion | class A EN 55011 / EN 61800 - 3 |
| | rel. humidity | 5% - 85% climatic category 3K3 EN 60 721 |
| | | |
| ***Approval*** | Approvals | CE, UL, cUL |

*Table 6-2: Technical data of the PacDrive MC-4 / 03*

## PacDrive MC-4 / 5 A

**CAUTION!**

Unit has different rated connection voltage! Wrong connection voltage may destroy the MotorController! During wiring and installation, make sure that the connection voltage matches the MotorController.

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | MC-4 / 11 / 05 / 230 V |
| | Order number | 13 13 02 46 |
| ***Power supply*** | - rated connection voltage | 3 AC / 1 AC 220 V (-10%) to 240 V (+10%) |
| | - mains frequency | 48 ... 62 Hz |
| | - control voltage/current | DC 24 V (-15% / +25%) / 1 A |
| ***DC-circuit*** | - DC-circuit voltage | DC 260 V to 370 V |
| | - capacity | 660 µF |
| | - $U_{Bleeder}$ ON | DC 410 V |
| | - $U_{Bleeder}$ OFF | DC 400 V |
| | - excess voltage | DC 430 V |
| | - bleeder resistance | 33 Ohm |
| | - bleeder - permanent power | 50 W |
| | - bleeder - peak power | 5 kW |
| ***Motor connection*** | - rated power 8 kHz | 5 Aeff |
| | - peak current 1 s | 12.5 Aeff |
| | - rated power | 1.9 kVA |
| ***Stray power*** | - electronics supply | ca. 12 W |
| | - bleeder (internal) | 0 ... 50 W (depending on the application) |
| | - power part | ca. 15 W / A |
| ***I/O*** | Inputs | |
| | - inputs voltage / current | DC 20 ... 30 V / 5 mA |
| | - ie-input | DC 20 ... 30 V / 30 mA |
| | - input filter | [5 ms |
| | Outputs | |
| | - relay outputs | DC 20 ... 30 V / 2 A |
| ***Environment*** | Product size | see chapter Dimensions |
| | Box size | width: 100 mm<br>height: 400 mm<br>depth: 320 mm |
| | Product weight | 3.1 kg |
| | Boxed weight | 4.0 kg |
| | Ventilation | natural convection |
| | Ambient conditions | |
| | Protection class | |
| | - casing | IP20 |
| | - installation location | IP54, if the safety wiring is used with Inverter Enable |
| | - ambient temperature during operation | +5 ... +45 °C (+55 °C with reduced power)<br>-2% per K at $I_{NC}$ and $I_{SC}$) |
| | - for storage and transport | -25 ... +70 °C |
| | -insulation | degree of pollution 2 ..., dewing prohibited |
| | - excess voltage category | K III, T2 (DIN VDE 0110) |
| | - excess voltage proofness | class 1 (DIN VDE 0160) |
| | - degree of radio distortion | class A EN 55011 / EN 61800 - 3 |
| | rel. humidity | 5% - 85% climatic category 3K3 EN 60 721 |
| ***Approval*** | Approvals | CE, UL, cUL |

*Table 6-3: Technical data of the PacDrive MC-4 / 05*

## PacDrive MC-4 / 10 A

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | MC-4 / 11 / 10 / 400 V |
| | Order number | 13 13 02 47 |
| | | |
| ***Power supply*** | - rated connection voltage<br>- mains frequency<br>- control voltage/current | 3 AC 380 V (-10%) to 480 V (+10%)<br>48 ... 62 Hz<br>DC 24 V (-15% / +25%) / 1 A |
| | | |
| ***DC-circuit*** | - DC-circuit voltage<br>- capacity<br>- $U_{Bleeder}$ ON<br>- $U_{Bleeder}$ OFF<br>- excess voltage<br>- bleeder resistance<br>- bleeder - permanent power<br>- bleeder - peak power | DC 530 V to 680 V<br>330 µF<br>DC 820 V<br>DC 800 V<br>DC 860 V<br>60 Ohm<br>100 W<br>10 kW |
| | | |
| ***Motor connection*** | - rated power 8 kHz<br>- peak current 1 s<br>- rated power | 10 Aeff<br>25 Aeff<br>6.9 kVA |
| | | |
| ***Stray power*** | - electronics supply<br>- bleeder (internal)<br>- power part | ca. 12 W<br>0 ... 100 W (depending on the application)<br>ca. 15 W / A |
| | | |
| ***I/O*** | Inputs<br>- inputs voltage / current<br>- ie-input<br>- input filter | <br>DC 20 ... 30 V / 5 mA<br>DC 20 ... 30 V / 30 mA<br>[5 ms |
| | Outputs<br>- relay outputs | <br>DC 20 ... 30 V / 2 A |
| | | |
| ***Environment*** | Product size<br>Box size | see chapter Dimensions<br>width: 100 mm<br>height: 400 mm<br>depth: 320 mm |
| | Product weight<br>Boxed weight | 3.6 kg<br>4.5 kg |
| | Ventilation | natural convection (temperature controlled) |
| | Ambient conditions<br>Protection class<br>- casing<br>- installation location<br><br>- ambient temperature during operation<br>- for storage and transport<br>-insulation<br><br>- excess voltage category<br>- excess voltage proofness<br>- degree of radio distortion<br>rel. humidity | <br><br>IP20<br>IP54, if the safety wiring is used with Inverter Enable<br>+5 ... +45 °C (+55 °C with reduced power)<br>-2% per K at $I_{NC}$ and $I_{SC}$)<br>-25 ... +70 °C<br>degree of pollution 2 ..., dewing prohibited<br><br>K III, T2 (DIN VDE 0110)<br>class 1 (DIN VDE 0160)<br>class A EN 55011 / EN 61800 - 3<br>5% - 85% climatic category 3K3 EN 60 721 |
| | | |
| ***Approval*** | Approvals | CE, UL, cUL |

*Table 6-4: Technical data of the PacDrive MC-4 / 10*

## PacDrive MC-4 / 22 A

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | MC-4 / 11 / 22 / 400 V |
| | Order number | 13 13 02 54 |
| | | |
| ***Power supply*** | - rated connection voltage<br>- mains frequency<br>- control voltage/current | 3 AC / 1 AC 380 V (-10%) to 480 V (+10%)<br>48 ... 62 Hz<br>DC 24 V (-15% / +25%) / 1 A |
| | | |
| ***DC-circuit*** | - DC-circuit voltage<br>- capacity<br>- $U_{Bleeder}$ ON<br>- $U_{Bleeder}$ OFF<br>- excess voltage<br>- bleeder resistance<br>- bleeder - permanent power<br>- bleeder - peak power | DC 530 V to 680 V<br>705 µF<br>DC 820 V<br>DC 800 V<br>DC 860 V<br>42 Ohm<br>150 W<br>15 kW |
| | | |
| ***Motor connection*** | - rated power 8 kHz<br>- peak current 1 s<br>- rated power | 22 Aeff<br>55 Aeff<br>15.2 kVA |
| | | |
| ***Stray power*** | - electronics supply<br>- bleeder (internal)<br>- power part | ca. 12 W<br>0 ... 150 W (depending on the application)<br>ca. 15 W / A |
| | | |
| ***I/O*** | Inputs<br>- inputs voltage / current<br>- ie-input<br>- input filter | <br>DC 20 ... 30 V / 5 mA<br>DC 20 ... 30 V / 30 mA<br>[5 ms |
| | Outputs<br>- relay outputs | <br>DC 20 ... 30 V / 2 A |
| | | |
| ***Environment*** | Product size<br>Box size | see chapter Dimensions<br>width: 160 mm<br>height: 400 mm<br>depth: 310 mm |
| | Product weight<br>Boxed weight | 6.3 kg<br>7.0 kg |
| | Ventilation | natural convection (temperature controlled) |
| | Ambient conditions<br>Protection class<br>- casing<br>- installation location<br><br>- ambient temperature during operation<br>- for storage and transport<br>-insulation<br><br>- excess voltage category<br>- excess voltage proofness<br>- degree of radio distortion<br>rel. humidity | <br><br><br>IP20<br>IP54, if the safety wiring is used with Inverter Enable<br>+5 ... +45 °C (+55 °C with reduced power)<br>-2% per K at $I_{NC}$ and $I_{SC}$)<br>-25 ... +70 °C<br>degree of pollution 2 ..., dewing prohibited<br><br>K III, T2 (DIN VDE 0110)<br>class 1 (DIN VDE 0160)<br>class A EN 55011 / EN 61800 - 3<br>5% - 85% climatic category 3K3 EN 60 721 |
| | | |
| ***Approval*** | Approvals | CE, UL, cUL |

*Table 6-5: Technical data of the PacDrive MC-4 / 22*

## PacDrive MC-4 / 50 A

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | MC-4 / 11 / 50 / 400 V |
| | Order number | 13 13 02 56 |
| | | |
| ***Power supply*** | - rated connection voltage<br>- mains frequency<br>- control voltage/current | 3 AC / 1 AC 380 V (-10%) to 480 V (+10%)<br>48 ... 62 Hz<br>DC 24 V (-15% / +25%) / max. 3 A |
| | | |
| ***DC-circuit*** | - DC-circuit voltage<br>- capacity<br>- $U_{Bleeder}$ ON<br>- $U_{Bleeder}$ OFF<br>- excess voltage<br>- bleeder resistance<br>- bleeder - permanent power<br>- bleeder - peak power | DC 530 V to 680 V<br>1400 µF<br>DC 820 V<br>DC 800 V<br>DC 860 V<br>18 Ohm<br>approx. 600 W at 45 °C ambient temp.<br>35 kW |
| | | |
| ***Motor connection*** | - rated power 8 kHz<br>- peak current 1 s<br>- rated power | 50 Aeff<br>125 Aeff<br>34.6 kVA |
| | | |
| ***Stray power*** | - electronics supply<br>- bleeder (internal)<br>- power part | ca. 55 W<br>0 ... 600 W (depending on the application)<br>ca. 15 W / A |
| | | |
| ***I/O*** | Inputs<br>- inputs voltage / current<br>- ie-input<br>- input filter | <br>DC 20 ... 30 V / 5 mA<br>DC 20 ... 30 V / 30 mA<br>[5 ms |
| | Outputs<br>- relay outputs | <br>DC 20 ... 30 V / 2 A |
| | | |
| ***Environment*** | Product size<br>Box size | see chapter Dimensions<br>width: 350 mm<br>height: 450 mm<br>depth: 310 mm |
| | Product weight<br>Boxed weight | 16.5 kg<br>19.0 kg |
| | Ventilation | natural convection (temperature controlled) |
| | Ambient conditions<br>Protection class<br>- casing<br>- installation location<br><br>- ambient temperature during operation<br>- for storage and transport<br>-insulation<br><br>- excess voltage category<br>- excess voltage proofness<br>- degree of radio distortion<br><br>rel. humidity | <br><br><br>IP20<br>IP54, if the safety wiring is used with Inverter Enable<br>+5 ... +45 °C (+55 °C with reduced power)<br>-2% per K at $I_{NC}$ and $I_{SC}$)<br>-25 ... +70 °C<br>degree of pollution 2 ..., dewing prohibited<br><br>K III, T2 (DIN VDE 0110)<br>class 1 (DIN VDE 0160)<br>class A EN 55011 / EN 61800 - 3 with external mains filter<br>5% - 85% climatic category 3K3 EN 60 721 |
| | | |
| ***Approval*** | Approvals | CE, UL, cUL (in preparation) |

*Table 6-6: Technical data of the PacDrive MC-4 / 50*

**CAUTION!**

Firmware version V00.11.XX or higher is required to operate the PacDrive MC-4 / 50 A! Some functions (including safety-relevant functions) are not supported in firmware versions older than V00.11.XX.

- Only use the PacDrive MC-4 / 50A with firmware in original condition.
- If a firmware change is inevitable, only use versions higher than V00.11.XX.



**NOTE**

The „ambient temperature during operation“ up to 45 °C is only valid if the control voltage is at least DC 24 V, so that the fans can work with the required power.



**NOTE**

To observe EMT requirements, it is necessary to use an external mains filter (order number FI07878).

## 6.1.2 Interface

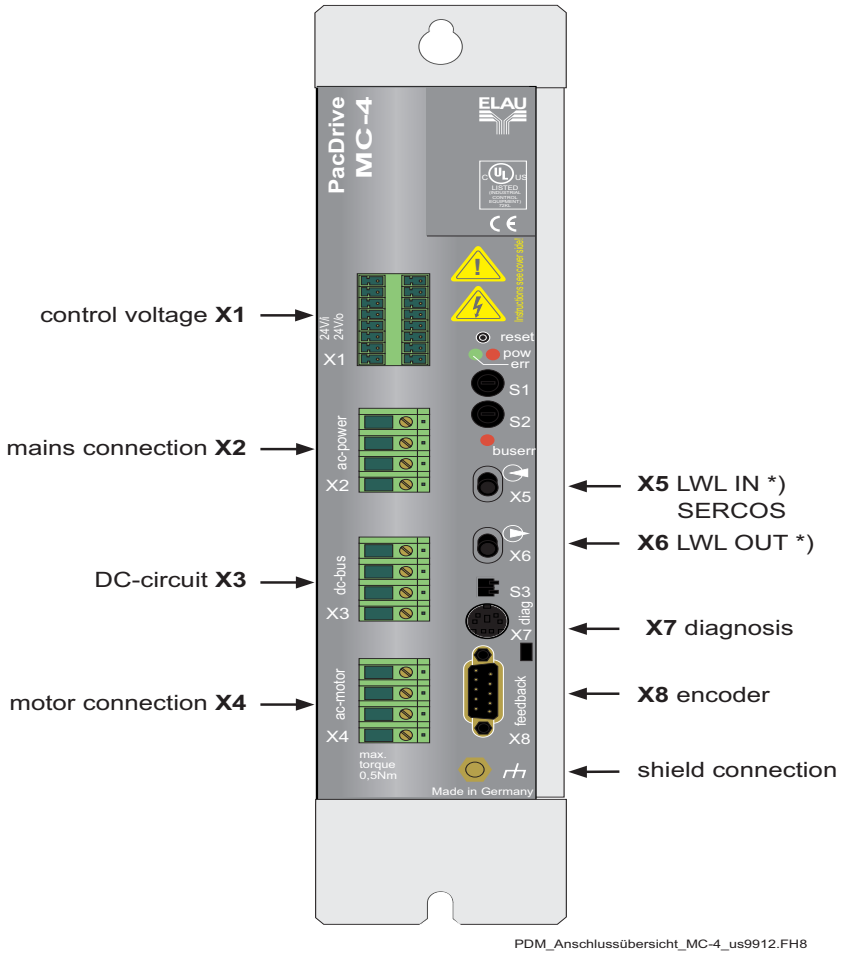
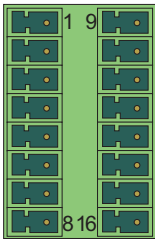



*Fig. 6-1: Overview of connections of the PacDrive MC-4*

## 6.1.3 Electrical Connections

### X1 - control voltage (MC-4 1.5 A to 10 A)



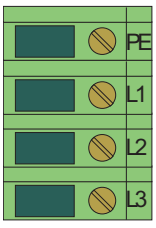

| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | 24 V | supply voltage | -15% / +25% | 1.5 mm$^2$ |
| 2 | 0 V | supply voltage | | 1.5 mm$^2$ |
| 3 | iei | inverter enable | | 1.5 mm$^2$ |
| 4 | en | enable | DC 24V (acc. IEC61131-2 Typ I) | 1.5 mm$^2$ |
| 5 | ϑ (5) | PTC motor temp. | | 1.5 mm$^2$ |
| 6 | ϑ (6) | PTC motor temp. | | 1.5 mm$^2$ |
| 7 | bi+ | power supply holding brake | DC +24V | 1.5 mm$^2$ |
| 8 | bi- | power supply holding brake | DC 0V | 1.5 mm$^2$ |
| 9 | 24 V | bridged with Pin 1 | | 1.5 mm$^2$ |
| 10 | 0 V | bridged with Pin 2 | | 1.5 mm$^2$ |
| 11 | ieo | inverter enable output | | 1.5 mm$^2$ |
| 12 | ieo | inverter enable output | | 1.5 mm$^2$ |
| 13 | rdy | ready contact (opens in case of error) | DC 20...30V / 2A | 1.5 mm$^2$ |
| 14 | rdy | ready contact | DC 20...30V / 2A | 1.5 mm$^2$ |
| 15 | bo+ (8) | connection holding brake | DC +24V | 1.5 mm$^2$ |
| 16 | bo- (7) | connection holding brake | 0V | 1.5 mm$^2$ |

*Table 6-7: Electrical connections of the MC-4 (1.5 ... 10 A) / X1*

**NOTE**

The permissible permanent current of the plug-in terminal „X1 control voltage“ (MC-4 1.5 A to 10 A) is 8 A.
The maximum number of MCs connected parallel via the plg-in terminal X 1 must be no greater than six.

### X2 - mains connection (MC-4 1.5 A to 10 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PE | earth conductor connection | | 2.5 mm$^2$ |
| 2 | L1 | phase L1 | 3 AC 380 - 480 V | 2.5 mm$^2$ |
| 3 | L2 | phase L2 | 3 AC 380 - 480 V | 2.5 mm$^2$ |
| 4 | L3 | phase L3 | 3 AC 380 - 480 V | 2.5 mm$^2$ |

*Table 6-8: Electrical connections of the MC-4 (1.5 ... 10 A) / X2*

**NOTE**

The permissible permanent current of the plug-in terminal „X2 mains connection“ (MC-4 1.5 A to 10 A) is 24 A.

**NOTE**

The range for the MC-4 / 5 A is 220 - 240 V with 3-phase or 1-phase feed. With 1-phase feed, connect L to L1 and N to L2. Leave L3 free.

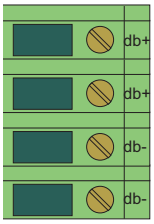
**CAUTION!**

No safe contact!

Cables and clamps may be damaged!

- For cables with a cross section of 2.5 $mm^2$, use end sleeves without plastic collar and a length of at least 12 mm or end sleeves with plastic collar and a metal sleeve that is at least 12 mm long.

### X3 - DC-circuit (MC-4 1.5 A to 10 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | db + | DC-circuit voltage + | DC 0 - 860 V | 2.5 $mm^2$ |
| 2 | db + | DC-circuit voltage + | DC 0 - 860 V | 2.5 $mm^2$ |
| 3 | db - | DC-circuit voltage - | DC 0 - 860 V | 2.5 $mm^2$ |
| 4 | db - | DC-circuit voltage - | DC 0 - 860 V | 2.5 $mm^2$ |

*Table 6-9: Electrical connections of the MC-4 (1.5 ... 10 A) / X3*

**NOTE**

The permissible permanent current of the plug-in terminal „X3 Dc-circuit“ (MC-4 1.5 A to 10 A) is 24 A.

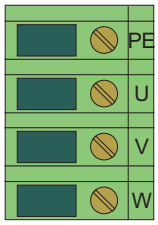
**CAUTION!**

No safe contact!

Cables and clamps may be damaged!

- For cables with a cross section of 2.5 $mm^2$, use end sleeves without plastic collar and a length of at least 12 mm or end sleeves with plastic collar and a metal sleeve that is at least 12 mm long.

### X4 - motor connection (MC-4 1.5 A to 10 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PE | earth conductor connection | | 2.5 mm$^2$ |
| 2 | U | phase U | 3 AC 0 - 480 V | 2.5 mm$^2$ |
| 3 | V | phase V | 3 AC 0 - 480 V | 2.5 mm$^2$ |
| 4 | W | phase W | 3 AC 0 - 480 V | 2.5 mm$^2$ |

*Table 6-10: Electrical connections of the MC-4 (1.5 ... 10 A) / X4*

**NOTE**

The permissible permanent current of the plug-in terminal „X4 motor connection (MC-4 1.5 A to 10 A) is 24 A.

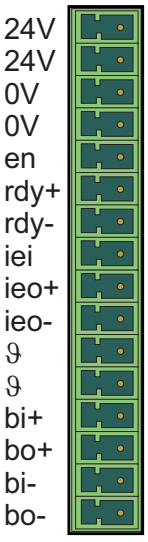
**CAUTION!**

No safe contact!

Cables and clamps may be damaged!

- For cables with a cross section of 2.5 mm$^2$, use end sleeves without plastic collar and a length of at least 12 mm or end sleeves with plastic collar and a metal sleeve that is at least 12 mm long.

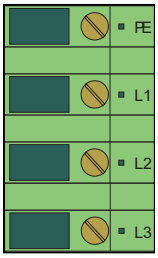
### X1 - control voltage (MC-4 22 A, 50 A)




| Pin | Designation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | 24 V | supply voltage | -15% / +25% | 1.5 mm$^2$ |
| 2 | 24 V | bridged with pin 1 | | 1.5 mm$^2$ |
| 3 | 0 V | supply voltage | | 1.5 mm$^2$ |
| 4 | 0 V | bridged with Pin 3 | | 1.5 mm$^2$ |
| 5 | en | enable | DC 24V (acc. IEC61131-2 Typ I) | 1.5 mm$^2$ |
| 6 | rdy+ | ready contact | DC 20...30V / 2A | 1.5 mm$^2$ |
| 7 | rdy- | ready contact (opens in case of error) | DC 20...30V / 2A | 1.5 mm$^2$ |
| 8 | iei | inverter enable | | 1.5 mm$^2$ |
| 9 | ieo+ | inverter enable output | | 1.5 mm$^2$ |
| 10 | ieo- | inverter enable output | | 1.5 mm$^2$ |
| 11 | (5) | PTC motor temp. | | 1.5 mm$^2$ |
| 12 | (6) | PTC motor temp. | | 1.5 mm$^2$ |
| 13 | bi+ | power supply holding brake | DC +24V | 1.5 mm$^2$ |
| 14 | bo+ (8) | connection holding brake | DC +24V | 1.5 mm$^2$ |
| 15 | bi- | power supply holding brake | DC 0V | 1.5 mm$^2$ |
| 16 | bo- (7) | connection holding brake | 0V | 1.5 mm$^2$ |

*Table 6-11: Electrical connections of the MC-4 (22 A, 50 A) / X1*

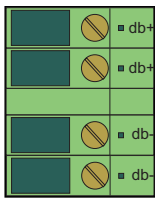
## X2 - mains connection (MC-4 22 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PE | earth conductor connection | | 4 mm$^2$ |
| 2 | L1 | phase L1 | 3 AC 380 - 480V | 4 mm$^2$ |
| 3 | L2 | phase L2 | 3 AC 380 - 480V | 4 mm$^2$ |
| 4 | L3 | phase L3 | 3 AC 380 - 480V | 4 mm$^2$ |

*Table 6-12: Electrical connections of the MC-4 (22 A) / X2*

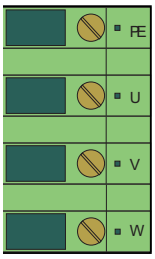
## X3 - DC-circuit (MC-4 22 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | db + | DC-circuit voltage + | DC 0 - 860 V | 4 mm$^2$ |
| 2 | db + | DC-circuit voltage + | DC 0 - 860 V | 4 mm$^2$ |
| 3 | db - | DC-circuit voltage - | DC 0 - 860 V | 4 mm$^2$ |
| 4 | db - | DC-circuit voltage - | DC 0 - 860 V | 4 mm$^2$ |

*Table 6-13: Electrical connections of the MC-4 (22 A) / X3*

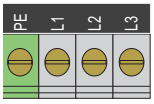
## X4 - motor connection (MC-4 22 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PE | earth conductor connection | | 4 mm$^2$ |
| 2 | U (1) | phase U | 3 AC 0 - 480V | 4 mm$^2$ |
| 3 | V (2) | phase V | 3 AC 0 - 480V | 4 mm$^2$ |
| 4 | W (3) | phase W | 3 AC 0 - 480V | 4 mm$^2$ |

*Table 6-14: Electrical connections of the MC-4 (22 A) / X4*

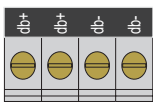
## X2 - mains connection (MC-4 50 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PE | earth conductor connection | | 16 mm$^2$ |
| 2 | L1 | phase L1 | 3 AC 380 - 480V | 16 mm$^2$ |
| 3 | L2 | phase L2 | 3 AC 380 - 480V | 16 mm$^2$ |
| 4 | L3 | phase L3 | 3 AC 380 - 480V | 16 mm$^2$ |

*Table 6-15: Electrical connections of the MC-4 (50 A) / X2*

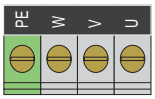
## X3 - DC-circuit (MC-4 50 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | db + | DC-circuit voltage + | DC 0 - 860 V | 16 mm$^2$ |
| 2 | db + | DC-circuit voltage + | DC 0 - 860 V | 16 mm$^2$ |
| 3 | db - | DC-circuit voltage - | DC 0 - 860 V | 16 mm$^2$ |
| 4 | db - | DC-circuit voltage - | DC 0 - 860 V | 16 mm$^2$ |

*Table 6-16: Electrical connections of the MC-4 (50 A) / X3*

## X4 - motor connection (MC-4 50 A)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PE | earth conductor connection | | 16 $mm^2$ |
| 2 | W (3) | phase W | 3 AC 0 - 480V | 16 $mm^2$ |
| 3 | V (2) | phase V | 3 AC 0 - 480V | 16 $mm^2$ |
| 4 | U (1) | phase U | 3 AC 0 - 480V | 16 $mm^2$ |

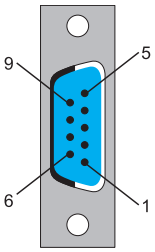
*Table 6-17: Electrical connections of the MC-4 (50 A) / X4*

## X7 - diagnosis


| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | PRO_SEL | | | 0.25 $mm^2$ |
| 2 | RxD | Receive Data | | 0.25 $mm^2$ |
| 3 | TxD | Transmit Data | | 0.25 $mm^2$ |
| 4 | GND | Signal Ground | | 0.25 $mm^2$ |
| 5 | RS232_SEL | | | 0.25 $mm^2$ |
| 6 | VCC | | | 0.25 $mm^2$ |

*Table 6-18: Electrical connections of the MC-4 / X7*

## X8 - motor encoder (SinCos)




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | REFSIN | sinus reference signal | | 0.25 $mm^2$ |
| 2 | SIN | sinus trace | | 0.25 $mm^2$ |
| 3 | REFCOS | cosine reference signal | | 0.25 $mm^2$ |
| 4 | COS | cosine trace | | 0.25 $mm^2$ |
| 5 | +12V | supply voltage | | 0.25 $mm^2$ |
| 6 | RS485 | parameter channel - | | 0.25 $mm^2$ |
| 7 | RS485 | parameter channel + | | 0.25 $mm^2$ |
| 8 | SC_SEL | encoder connected (bridge to GND) | | 0.25 $mm^2$ |
| 9 | GND | supply voltage | | 0.25 $mm^2$ |

*Table 6-19: Electrical connections of the MC-4 / X8*

**CAUTION!**

Disconnection of SinCos encoder plug while unit is powered on!

SinCos encoder may be damaged!

- Disconnect and connect the SinCos encoder plug only in voltage-free state (disconnect PacDrive MC-4 from 24 V power supply!).

## 6.1.4 Dimensions

### PacDrive MC-4 / 1.5 A and 3 A

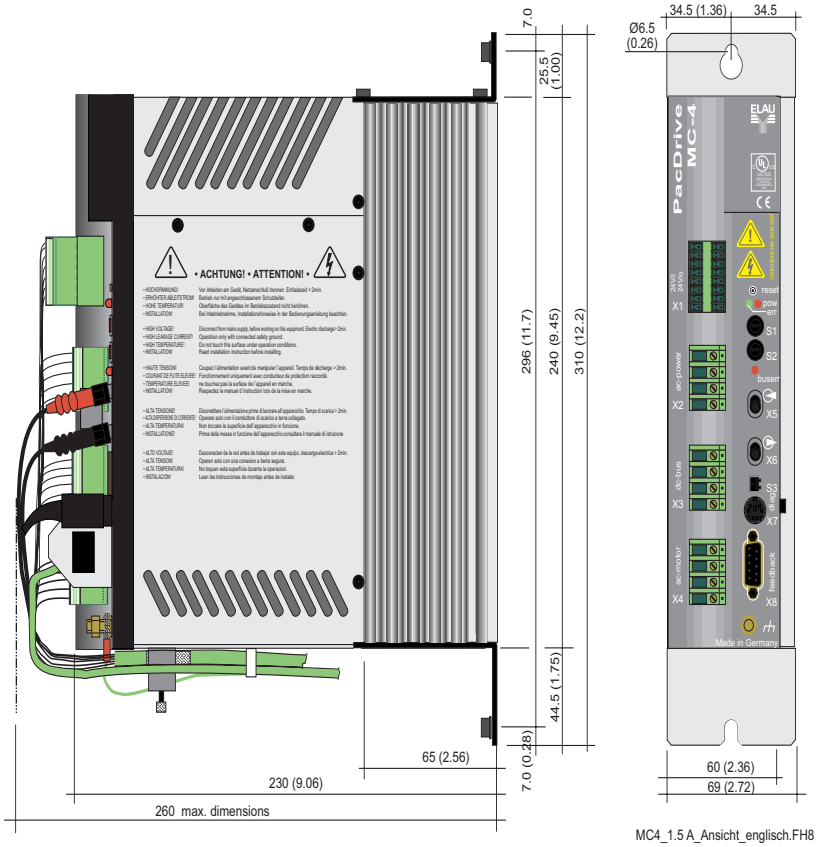



*Fig. 6-2: Dimensions of the PacDrive MC-4 / 1.5 A and 3 A*

## PacDrive MC-4 / 5 A (230 V)

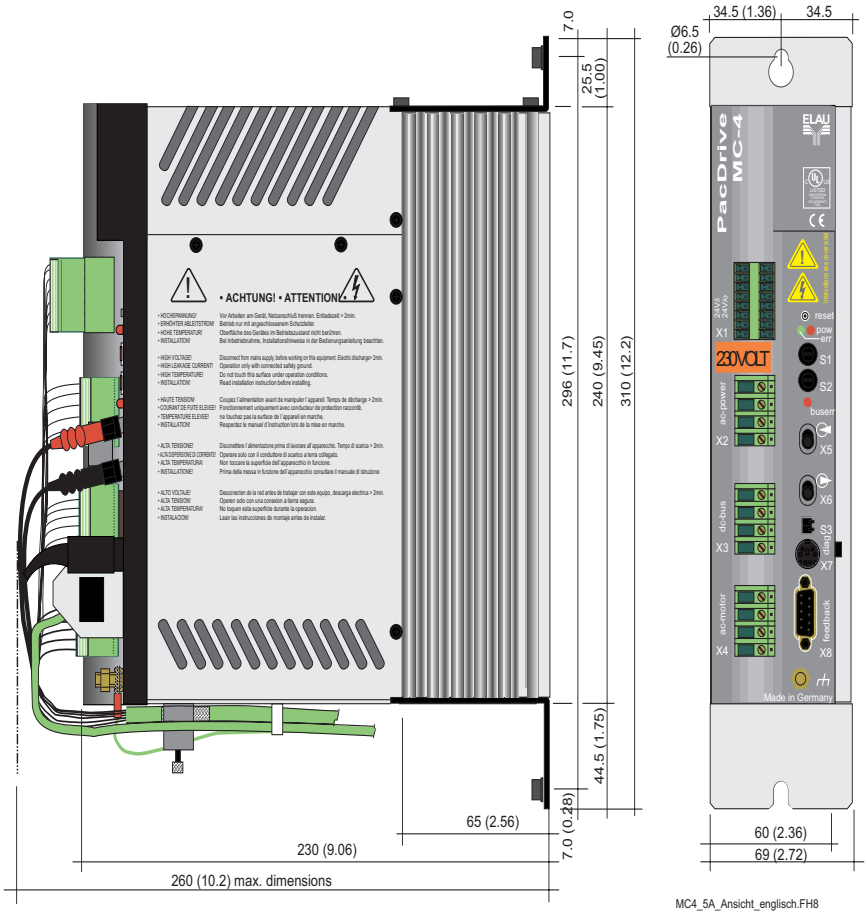



*Fig. 6-3: Dimensions of the PacDrive MC-4 / 5 A*

PDM_OpMaMC-4_06_us.FM

## PacDrive MC-4 / 10 A

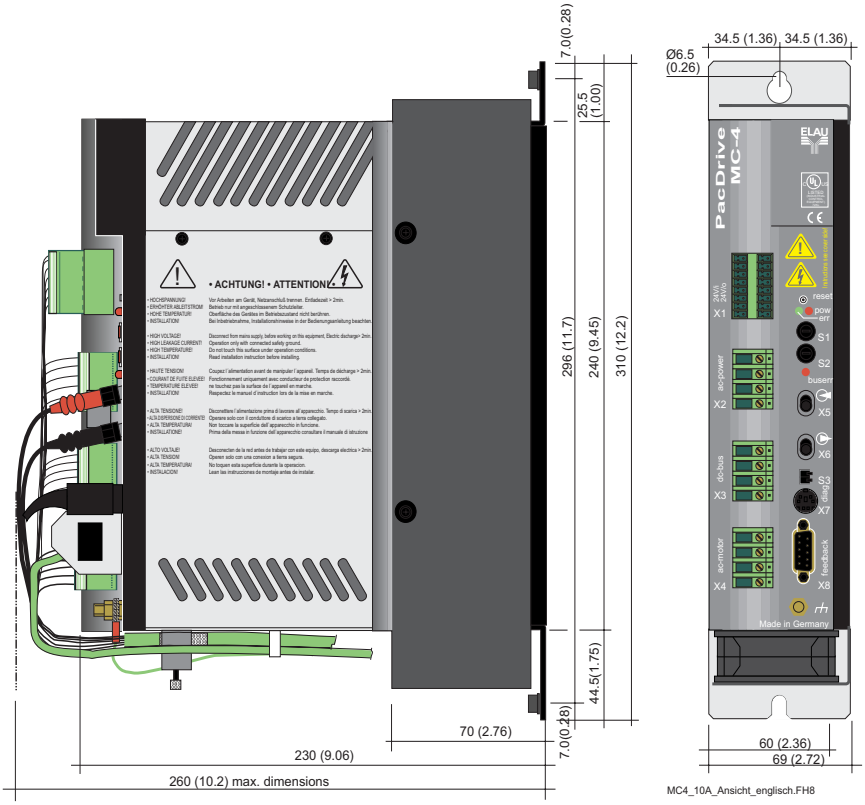



*Fig. 6-4: Dimensions of the PacDrive MC-4 / 10 A*

## PacDrive MC-4 / 22 A

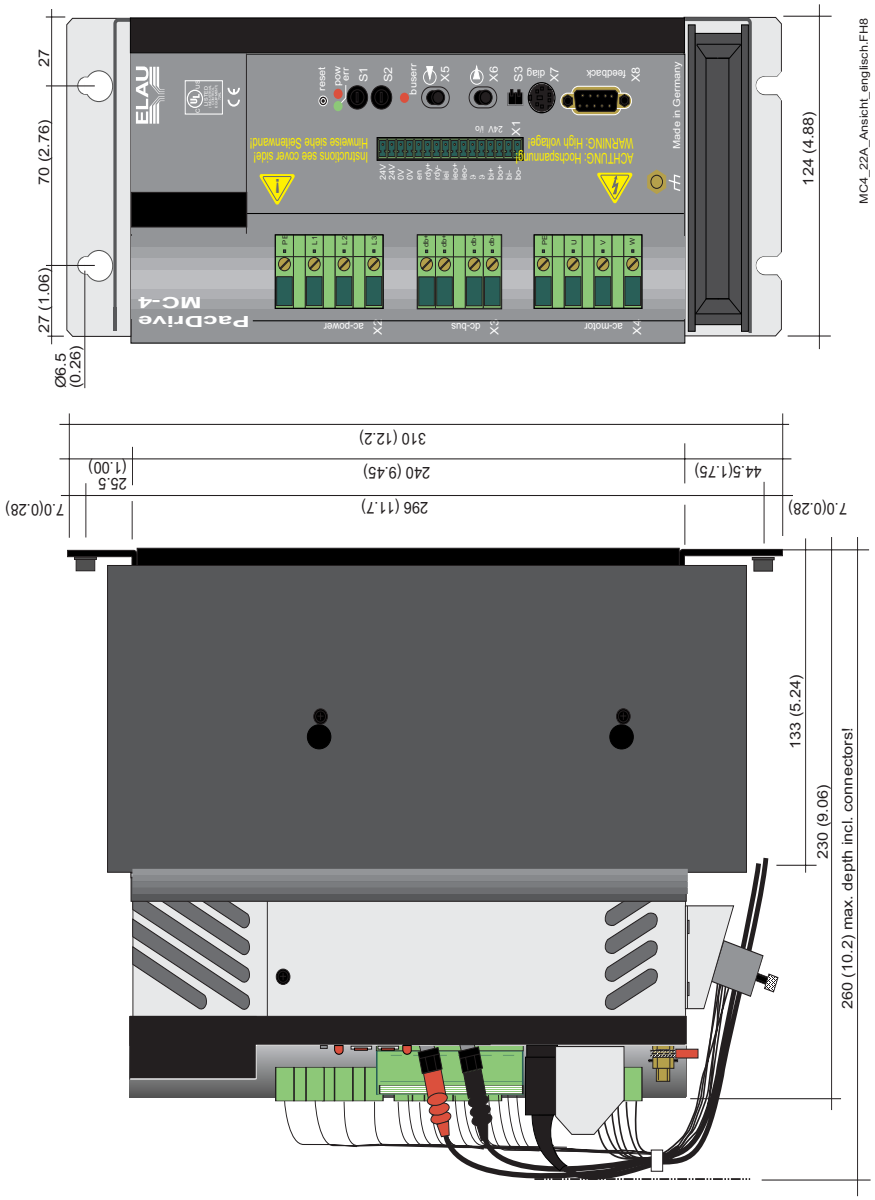



*Fig. 6-5: Dimensions of the MC-4 / 22 A*

PDM_OpMaMC-4_06_us.FM

## PacDrive MC-4 / 50 A

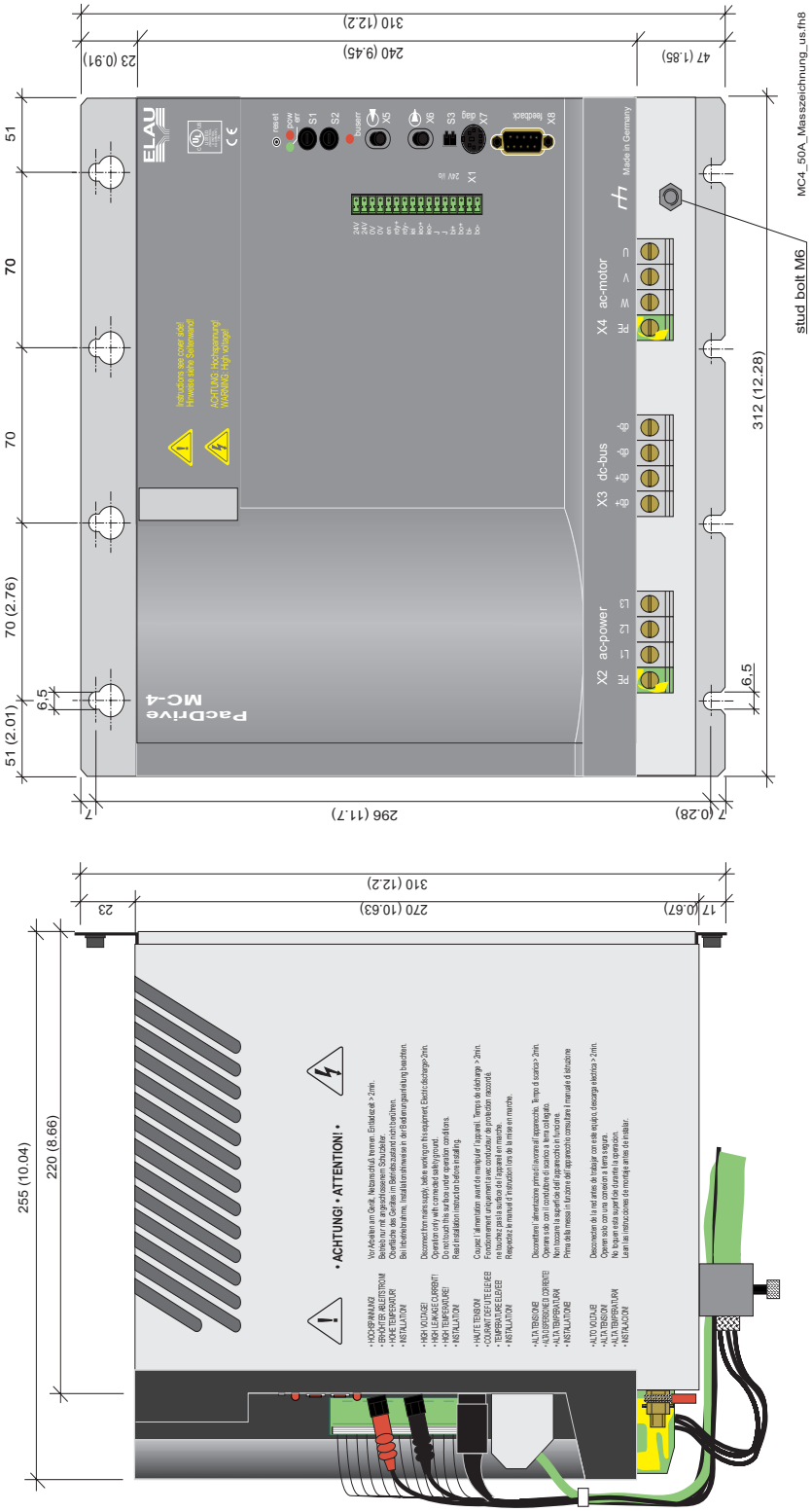



*Fig. 6-6: Dimensions of the MC-4 / 50 A*

# 6.2 PacDrive BM-4

## 6.2.1 In General

| | Parameter | Value |
|---|---|---|
| ***Product configuration*** | Product name | BM-4 bleeder module |
| | Order number | 13 27 00 13 |
| ***Power supply*** | Supply voltage | DC 24 V (-15 / +25 %), 0.5 A |
| ***Bleeder limits*** | - $U_{Bleeder}$ ON<br>- $U_{Bleeder}$ OFF | DC 790 ... 820 V in 10V steps<br>20 V below $U_{Bleeder}$ ON |
| ***Power details*** | Resistance | 18 Ohm |
| | Permanent power | 800 W |
| | Peak power | 45 kW |
| ***I/O*** | Outputs<br>- relay outputs | <br>DC 20 ... 30 V / 2 A |
| ***Environment*** | Product size<br>Box size | see chapter Dimensions<br>width: 100 mm<br>height: 400 mm<br>depth: 320 mm |
| | Product weight | 2.5 kg |
| | Admissible ambient temperature<br>- during operation<br>- for storage and transport | <br>0 ... +55 °C<br>-20 °C ... +80 °C |
| ***Approval*** | Approvals | CE, UL, cUL |

*Table 6-20: Technical data of the PacDrive BM-4 bleeder module*

## 6.2.2 Display and operating units

**reset**


Button to reset the PacDrive BM-4. Only the bleeder module is rebooted when you press the „reset“ button. Other PacDrive components have their own „reset“ buttons.

**pow**


The „pow“ LED indicates the state of the control voltage.

| | |
|---|---|
| OFF | control voltage (24 V) missing or too low. |
| ON | normal operation; control voltage in normal range |

**err (error indicator)**


The error LED (err) indicates errors. The table below listspossible states of the error LED with corresponding error descriptions.

| | |
|---|---|
| OFF | normal operation |
| Flashing slowly (on:500ms / off: 2000ms) | bleeder I²t at the limit |
| Flashing fast (an:500ms / aus:500ms) | -DC-circuit voltage too high<br>- supply voltage too low<br>- temperature too high (no reset necessary; the device is ready-to-operate again after cooling down) |
| ON | bleeder error |

**bla (bleeder active)**


When the PacDrive BM-4 is in a active condition, the display shines „bla“.

## 6.2.3 Interface

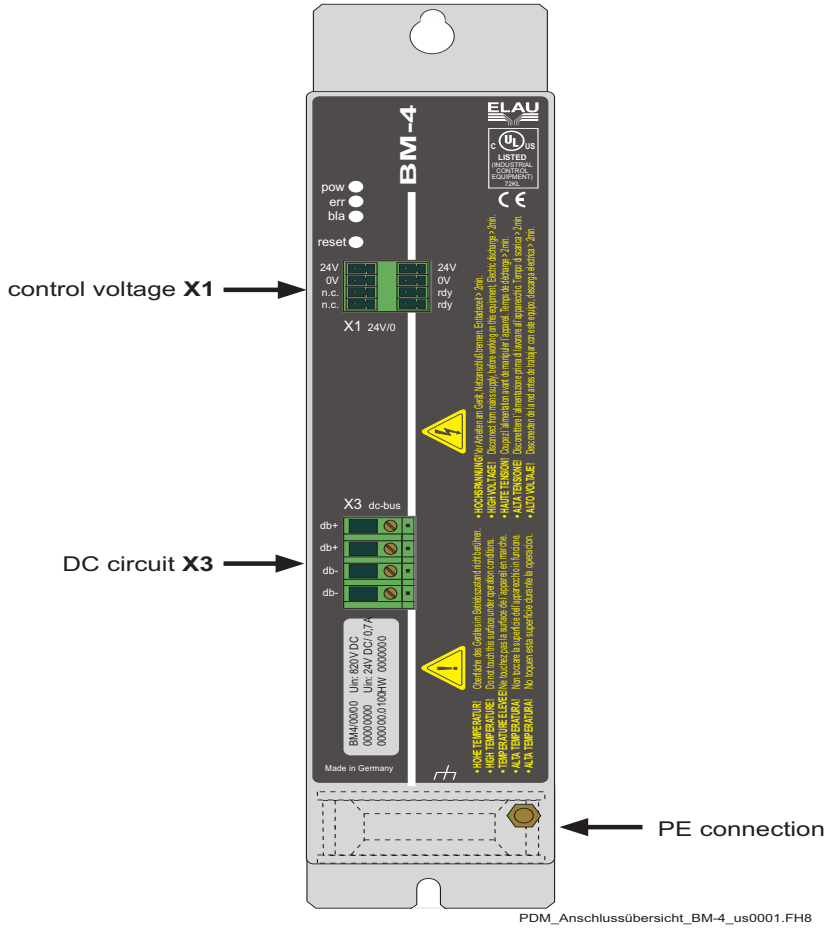
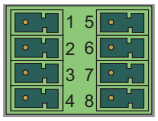



*Fig. 6-7: Overview of connections of the BM-4 bleeder module*

## 6.2.4 Electrical Connections

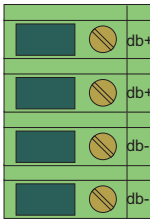
### X1 - power supply / watchdog




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | DC +24V | supply voltage | -15% / +25% | 1.5 $mm^2$ |
| 2 | DC 0V | supply voltage | | 1.5 $mm^2$ |
| 3 | | reserved | | 1.5 $mm^2$ |
| 4 | | reserved | | 1.5 $mm^2$ |
| 5 | DC +24V | supply voltage | -15% / +25% | 1.5 $mm^2$ |
| 6 | DC 0V | supply voltage | | 1.5 $mm^2$ |
| 7 | rdy | ready | | 1.5 $mm^2$ |
| 8 | rdy | ready | | 1.5 $mm^2$ |

*Table 6-21: Electrical connections of the BM-4 / X1*

### X2 - DC-circuit




| Pin | Desig-nation | Meaning | Range | Max. cross section |
|---|---|---|---|---|
| 1 | db + | DC-circuit voltage + | DC 530 - 860 V | 2.5 $mm^2$ |
| 2 | db + | DC-circuit voltage + | DC 530 - 860 V | 2.5 $mm^2$ |
| 3 | db - | DC-circuit voltage - | DC 530 - 860 V | 2.5 $mm^2$ |
| 4 | db - | DC-circuit voltage - | DC 530 - 860 V | 2.5 $mm^2$ |

*Table 6-22: Electrical connections of the BM-4 / X2*

**CAUTION!**

No safe contact!

Cable and clamp may be damaged!

- For cables with a cross section of 2.5 $mm^2$, use end sleeves without plastic collar and a length of at least 12 mm or end sleeves with plastic collar and a metal sleeve that is at least 12 mm long.

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## 6.2.5 Dimensions

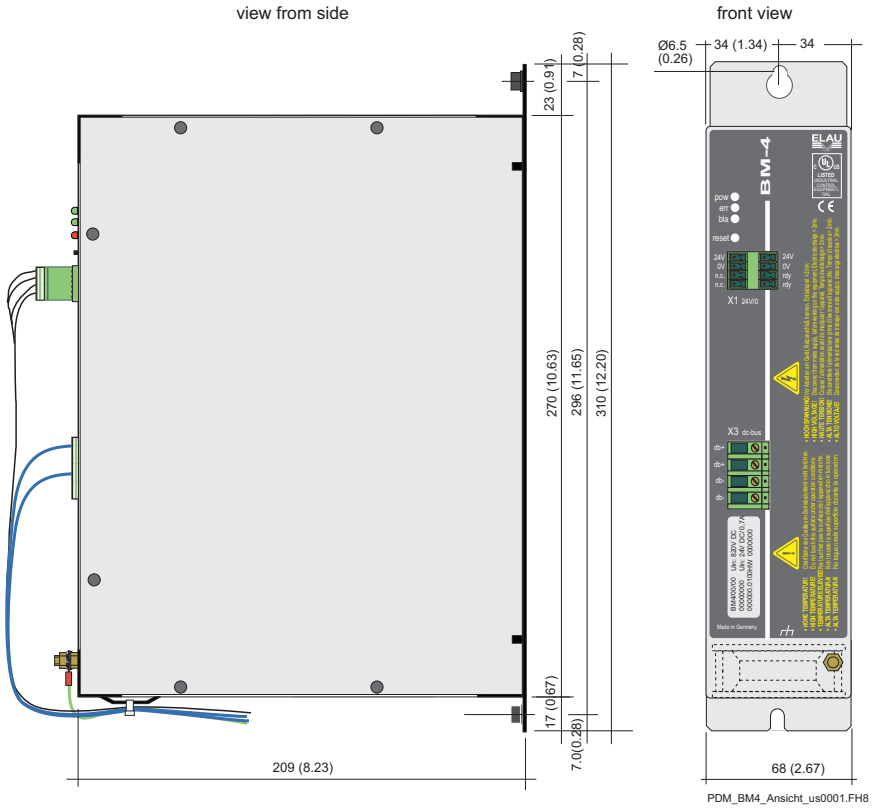



*Fig. 6-8: Dimensions of the BM-4 bleeder module*

# 6.3 PacDrive Mains Filter

## 6.3.1 In General

Following are the mains filters for all service types of the PacDrive system. The characteristics the mains filters stand for are:

- high symmetrical and asymmetrical damping
- rated voltage 3 AC 480 V
- compact design
- touch-proof clamps
- in accordance with UL 1283

| Parameter | Value |
|---|---|
| mechanical design | aluminium housing |
| rated voltage | 3 AC 480 V |
| operating frequency | 50 / 60 Hz |
| leakage current ( bei 50 Hz) | < 35 mA (3 phases) 100 mA (max.) |
| temperature range | -25 ... +50 °C |
| connection | L1 / L2 / L3:<br>touch proof screw terminal<br>PE-connection: bolt M5 / M6 / M8 |
| protection class | IP 20 |

*Table 6-23: Technical data of the mains filter in general*

### Mains filter 3X08 K-K

| Parameter | Value |
|---|---|
| product name | mains filter FFU 3X08 K-K |
| order number | FI07876 |
| rated power | 8 A |
| power loss | 4 W |
| connection cross-section | 4 $mm^2$ |
| weight | 0.6 kg |

*Table 6-24: Technical data of the mains filter FFU 3X08 K-K*

### Mains filter FFU 3X30 K-K

| Parameter | Value |
|---|---|
| product name | mains filter FFU 3X30 K-K |
| order number | FI07877 |
| rated power | 30 A |
| power loss | 12 W |
| connection cross-section | 10 $mm^2$ |
| weight | 1.3 kg |

*Table 6-25: Technical data of the mains filter FFU 3X30 K-K*

### Mains filter FFU 3X55 K-K

| Parameter | Value |
|---|---|
| product name | mains filter FFU 3X55 K-K |
| order number | FI07878 |
| rated power | 55 A |
| power loss | 18 W |
| connection cross-section | 16 $mm^2$ |
| weight | 1.9 kg |

*Table 6-26: Technical data of the mains filter FFU 3X55 K-K*

**NOTE**

If you need mains filters with higher rated currents, please contact our application department.

## 6.3.2 Electrical Connections

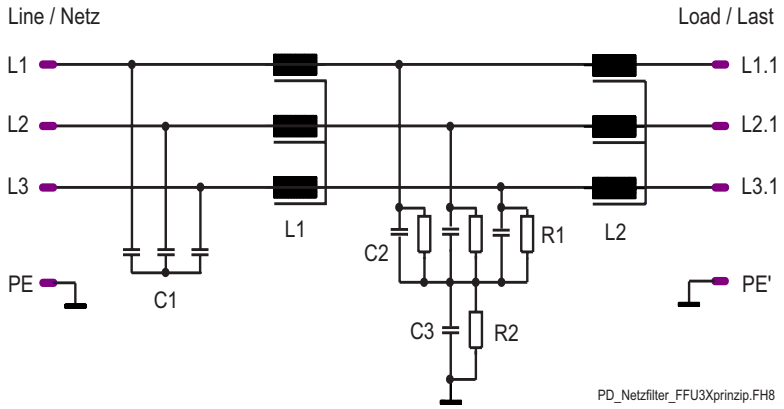



*Fig. 6-9: Principle circuit diagram of the mains filter FFU 3X.. K-K*

## 6.3.3 Electrical Connections

### FI 07876 / 8A

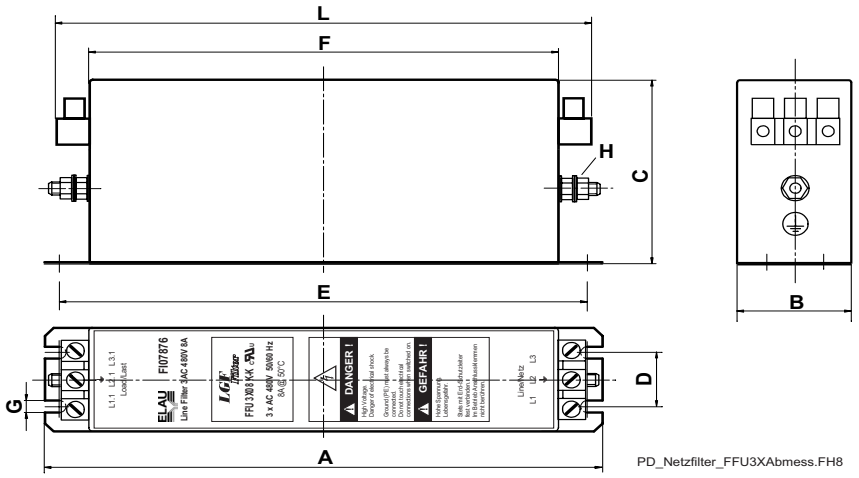



*Fig. 6-10: Dimensional drawing of the mains filters*

| product name (order no.) | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | H | L [mm] |
|---|---|---|---|---|---|---|---|---|---|
| FFU 3X08 K-K (FI07876) | 190 | 40 | 70 | 20 | 180 | 160 | 5,4 | M5 | 185 |
| FFU 3X30 K-K (FI07877) | 270 | 50 | 85 | 30 | 255 | 240 | 5,4 | M5 | 265 |
| FFU 3X55 K-K (FI07878) | 250 | 85 | 90 | 60 | 235 | 220 | 5,4 | M6 | 258 |

*Table 6-27: Dimensions of the mains filters*

## 6.4 PacDrive Mains Choke

### 6.4.1 Application of mains choke

The use of PacDrive systems requires protection measures in the network supply of the PacDrive servo drives. For each mains contactor group, the insertion of a separate choke is necessary.

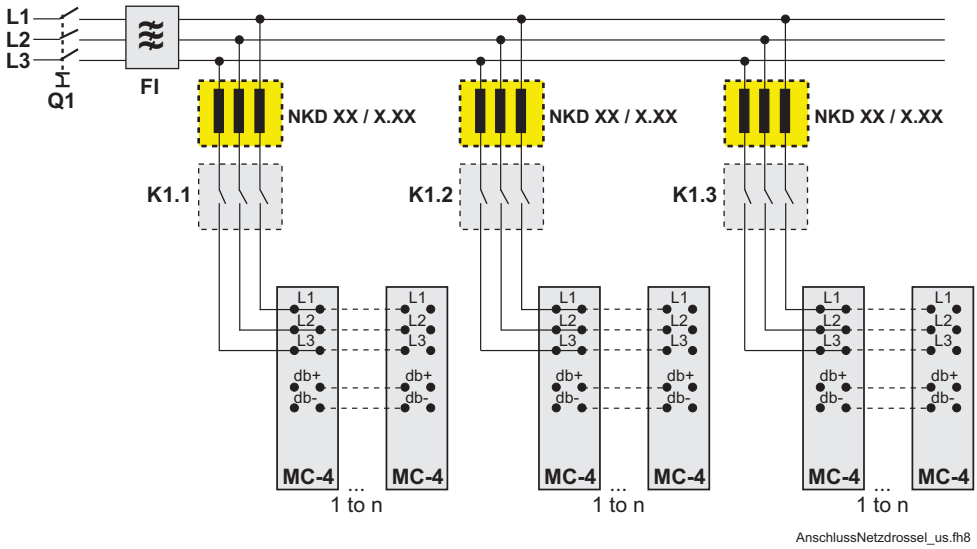



*Fig. 6-11: Schematic diagram for the use of the mains chokes*

For a failure-free operation, you have to have the correct dimensioning of the mains choke. The dimensioning is based upon the effective power of the respective mains contactor group.

There are three different construction sizes available:

| Continuous current | ELAU Article number | Description |
|---|---|---|
| 10A | FI07880 | NKD 10 / 2.93 |
| 25A | FI07874 | NKD 25 / 1.17 |
| 50A | FI07875 | NKD 50 / 0.59 |

*Table 6-28: Article number of the mains chokes*

You can purchase the mains chokes directly by ELAU, stating the above mentioned Article numbers.

## 6.4.2 Dimensions

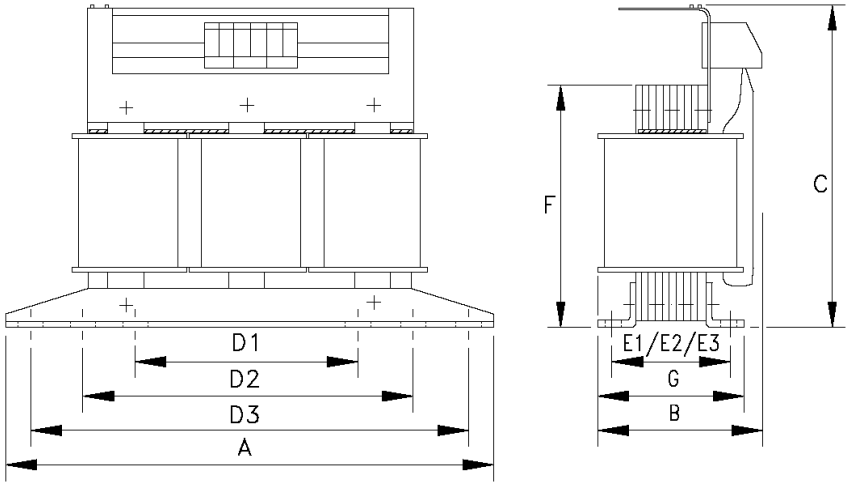



*Fig. 6-12: Figure 2: 10A and 25A mains chokes NKD 10 / 2.93 and NKD 25 / 1.17*

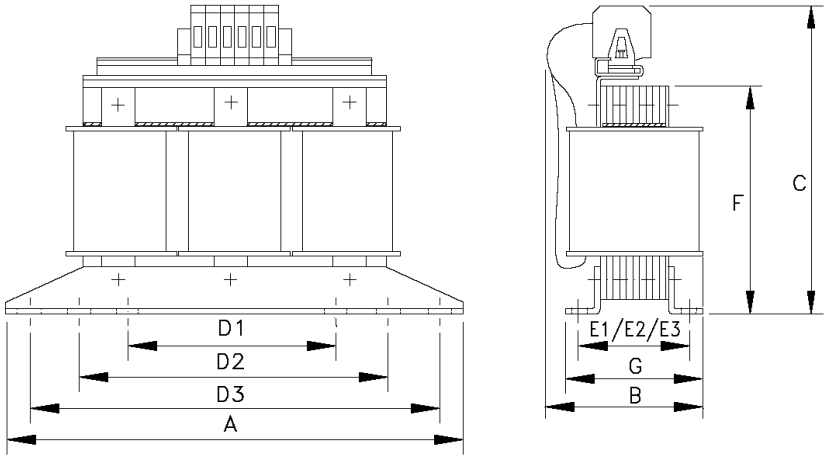



*Fig. 6-13: Figure 3: 50A mains choke NKD 50 / 0.59*

| Mains choke | A | B | C | D1 | D2 | D3 | E1 | E2 | E3 | F | G |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NKD 10 / 2.93 | 148 | 76 | 151 | 90 | 100 | 136 | 39 | 45 | 49 | 110 | 69 |
| NKD 25 / 1.17 | 178 | 106 | 175 | 113 | 130 | 166 | 64,5 | 71,5 | 69,5 | 133 | 89,5 |
| NKD 50 / 0.59 | 267 | 115 | 265 | 176 | 180 | 249 | 71 | 98 | 79 | 200 | 115 |

*Table 6-29: Dimensions of the mains chokes in [mm]*

# 10 Appendix

## 10.1 Contact Addresses

**For repair**

Please send the components to be repaired or checked along with the error report, to this address:

**ELAU AG**
Abt. Kundendienst
Postfach 1255
97821 Marktheidenfeld

house address:
Dillberg 12
97828 Marktheidenfeld

Phone: +49 (0) 93 91 / 606-142
Fax: +49 (0) 93 91 / 606-340

**Service team**

Should you need to talk to a member of our service team or require on-site service, please contact:

**ELAU AG**
Dillberg 12
D-97828 Marktheidenfeld
Phone: +49 (0) 9391 / 606 - 0
Fax: +49 (0) 9391 / 606 - 300
e-mail: info@elau.de
Internet: www.elau.de

**ELAU, Inc.**
165 E. Commerce Drive
Schaumburg, IL 60173 - USA
Phone: +1 847 490 4270
Fax: +1 847 490 4206
e-mail: info@elau.com
Internet: www.elau.com

**ELAU SYSTEMS ITALIA S.r.l.**
Via Speranza, 48/A
I-40068 San Lazzaro Di Savena (BO)
Phone: +39 051 / 7818 70
Fax: +39 051 / 7818 69
e-mail: info@elau.it
Internet: www.elau.it



**NOTE**

You can find further contact addresses on the ELAU homepage (www.elau.de).

## 10.2 Further Literature

ELAU can provide you with these manuals and instructions on the PacDrive™ System:[1]

**Project Manual**

Art.No. 17 13 00 58 - 00x (DE, EN, FR)

**Programming Manual**

Art.No. 17 13 00 61 - 00x (DE, EN)

**Operating Manual MC-4 Servo Drive**

Art.No. 17 13 00 62 - 00x (DE, EN, IT, FR)

**Operating Manual CAN L2**

Art.No. 17 13 00 66 - 00x (DE, EN)

**Operating Manual PROFIBUS-DP**

Art.No. 17 13 00 67 - 00x (DE, EN)

**Operating Manual SM Motor**

Art.No. 17 13 00 68 - 00x (DE, EN, IT, FR)

**Operating Manual EPAS-4**

Art.No. 17 13 00 70 - 00x (DE, EN)

**Operating Manual PacDrive Controller MAx-4**

Art.No. 17 13 00 71 - 00x (DE, EN, IT, FR)

**Operating Manual OPC-Server**

Art.No. 17 13 00 73 - 00x (DE, EN)

**Operating Manual Device Net**

Art.No. 17 13 00 76 - 00x (DE, EN)

**Operating Manual HMI Libraries**

Art.No. 17 13 00 77 - 00x (DE, EN)

**Operating Manual INC-4 Incremental Encoder Module**

Art.No. 17 13 00 78 - 00x (DE, EN)

**Operating Manual CANopen**

Art.No. 17 13 00 79 - 00x (DE, EN)

**Operating Manual VarioCam® Editor ECAM-4**

Art.No. 17 13 00 80 - 00x (DE, EN)

**Operating Manual PacNet Module PN-4**

Art.No. 17 13 00 81 - 00x (DE, EN)

**Operating Manual SR Motor**

Art.No. 17 13 00 82 - 00x (DE, EN)



1. Art.No. -000 (DE) german -001 (EN) english -002 (IT) italian -003 (FR) french

**Operating Manual BusTerminal BT-4/DIO1**
Art.No. 17 13 00 83 - 00x (DE, EN)

**Operating Manual TTS**
Art.No. 17 13 00 88 - 00x (DE)

**User Manual Automatic Controller Optimization**
Art.No. 17 13 00 89 - 00x (DE, EN)

**Operating Manual PacDrive SCL**
Art.No. 17 13 00 93 - 00x (DE, EN)

**Operating Manual PacDrive PS-4 und PacDrive PD-8**
Art.No. 17 13 00 94 - 00x (DE, EN)

**Operating Manual Evaluation Kit**
Art.No. 17 13 00 95 - 00x (DE)

**Operating Manual PacDrive Controller P600**
Art.No. 17 13 00 96 - 00x (DE, EN, FR)

**Operating Manual PacDrive Controller C200**
Art.No. 17 13 00 97 - 00x (DE, EN, FR)

**Operating Manual PacDrive Controller C400**
Art.No. 17 13 00 98 - 00x (DE, EN, FR)

**Operating Manual PacDrive Controller C600**
Art.No. 17 13 00 99 - 00x (DE, EN, FR)

**Operating Manual PacDrive SH-Motor**
Art.No. 17 13 01 05- 00x (DE, EN)

## 10.3 Product Training

We offer practical workshops and seminars.

Our experienced seminar leaders will enable you to make optimum use of the vast possibilities of the PacDrive™ system.

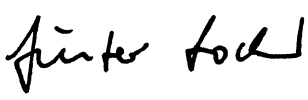


**NOTE**

Please contact us for further information or to order our seminar program. See also our homepage (www.elau.de).

# 7.4 Declaration by the manufacturer

| ELAU | **Herstellererklärung / Declaration by the manufacturer / Déclaration du fabricant** | **ELN 118-02/01.01** Page 1/1 |
|---|---|---|

| Produkt: | product: | produit: |
|---|---|---|
| **Motorcontroller** | **Motorcontroller** | **Motorcontroller** |
| **MC-4 / 11 / 01**<br>**MC-4 / 11 / 03**<br>**MC-4 / 11 / 05**<br>**MC-4 / 11 / 10**<br>**MC-4 / 11 / 22**<br>**MC-4 / 11 / 50** | **MC-4 / 11 / 01**<br>**MC-4 / 11 / 03**<br>**MC-4 / 11 / 05**<br>**MC-4 / 11 / 10**<br>**MC-4 / 11 / 22**<br>**MC-4 / 11 / 50** | **MC-4 / 11 / 01**<br>**MC-4 / 11 / 03**<br>**MC-4 / 11 / 05**<br>**MC-4 / 11 / 10**<br>**MC-4 / 11 / 22**<br>**MC-4 / 11 / 50** |
| Der Hersteller erklärt, dass das gelieferte Produkt in Übereinstimmung mit den angewendeten harmonisierten Normen / Spezifikationen hergestellt worden ist. | The manufacturer declares that the product delivered has been manufactured in accordance with the stated harmonized standards / specifications. | Le fabricant déclare que le produit livrés ont été fabriqués conformément a indiqués standards / spécifications harmonisés. |
| **Angewendete harmonisierte Normen:** | **Applied harmonized standards:** | **Harmonisée standards appliqués:** |
| **EN 60204-1 (11/1998)**<br>Sicherheit von Maschinen - elektrische Ausrüstung | **EN 60204-1 (11/1998)**<br>Safety of machines - electrical equipment | **EN 60204-1 (11/1998)**<br>Sécurité des machines-équipement électrique |
| **EN 50081-2 (3/1994)**<br>Fachgrundnorm für die Störaussendung | **EN 50081-2 (3/1994)**<br>generic standard for noisy emission | **EN 50081-2 (3/1994)**<br>norme générique pour l'emission brouillée |
| **EN 61000-6-2 (3/2000)**<br>Fachgrundnorm Störfestigkeit | **EN 61000-6-2 (3/2000)**<br>generic standard interference-resistant | **EN 61000-6-2 (3/2000)**<br>norme générique résistance au brouillage |
| **Hersteller:**<br>ELAU AG<br>Dillberg 12<br>D-97828 Marktheidenfeld | **Manufacturer:**<br>ELAU AG<br>Dillberg 12<br>D-97828 Marktheidenfeld | **Fabricant:**<br>ELAU AG<br>Dillberg 12<br>D-97828 Marktheidenfeld |
| **Stellung im Betrieb / Position:**<br>Vorstand/Chairman<br>  <br>18.1.2001 Günter Locherer<br>.....<br>(Datum, Date / Unterschrift, Signature) | | |

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## 7.5 Safety Checks

For the MotorController MC-4 manufacturing the following security examinations are executed under EN 50178 / EN 60204-1:

**Check for continuous connection of the protective grounding system**

with 30 A

**Insulation resistance check**

with U = 500 V DC

**Tension strain check**

with U = 2500 V DC
for a time period of 1 min.

## 7.6 Hard-/Software Compatibility list

| FW-Family | HW-Code | | | |
|---|---|---|---|---|
| | **smaller Bxxxxx** | **Bxxxxx** | **Cxxxxx** | **Exxxxx** |
| V05 | V00.05.xx | from V00.05.20 | from V00.05.22 | from V00.05.31 |
| V07 | V00.07.xx | from V00.07.20 | from V00.07.22 | from V00.07.31 |
| V10 | V00.10.xx | from V00.10.20 | from V00.10.22 | from V00.10.31 |
| V11 | V00.11.xx | from V00.11.20 | from V00.11.22 | from V00.11.31 |
| V12 | V00.12.xx | from V00.12.01 | from V00.12.02 | from V00.12.31 |
| V15 | V00.15.xx | V00.15.xx | V00.15.xx | from V00.15.31 |
| V16<br>V20<br>... | V00.16.xx<br>V00.20.xx<br>... | V00.16.xx<br>V00.20.xx<br>... | V00.16.xx<br>V00.20.xx<br>... | V00.16.xx<br>V00.20.xx<br>... |

*Fig. 7-1: PacDrive MC-4 Hard- and Software compatibility*

## 7.7 Modifications

**01 / 1999**

- Operating Manual newly written

**07 / 1999**

- Terms such as MAx-4, MC-4 and PacDrive™ M adjusted
- Sales regions updated

**12 / 1999**

- Structure of the document modified
- Description of the 22 A MC-4 improved

**01 / 2001**

- MC-4 / 50 / 400 new
- Mains filter HLD 110-500/55 new
- Various errors cleared and improvements made

**08 / 2004**

- Included new mains filter series
- Over-worked the structure of the document
- Various errors cleared and improvements made
- Adjusted product names and terms

**05 / 2005**

- Included new chapter „Mains Choke“

**12/ 2005**

- MC-4 / 1.5 A



**NOTE**

The latest documentation and modification service on this product are available on the ELAU Homepage (http://www.elau.de).

## 7.8 Index

## 10.8 Form for Error Report

This error report is absoluteley necessary in order to enable efficient processing.

Send the error report to your ELAU representative or to:

ELAU AG, Abt. Kundendienst
Dillberg 12, D-97828 Marktheidenfeld
**Fax: +49 (0) 93 91 / 606 - 340**

Sender:

| | | |
|---|---|---|
| Company: | City: | Date: |
| Department: | Name: | Phone: |

**Details of the defective product**

Product name: .....

Article number: .....

Serial number: .....

Software version: .....

Hardware code: .....

Parameter enclosed: yes [ ] no [ ]

IEC program enclosed: yes [ ] no [ ]

**Details of the machine on which the problem occurred:**

Machine producer: .....

Type: .....

Hours of operation: .....

Machine number: .....

Date of commissioning: .....

Producer/Type of machine control:

.....

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**Description of the problem:**

.....

.....

.....

**Additional information:**

| **Problem state:** | **Causes:** | **Concomitant phenomena:** |
|---|---|---|
| [ ] persistent | [ ] unknown | [ ] mechanical problems |
| [ ] when commissioning | [ ] wiring error | [ ] failure of mains supply (24V) |
| [ ] occurs sporadically | [ ] mechanical damage | [ ] failure of PMC-2 |
| [ ] occurs after about.....hours | [ ] moisture inside the unit | [ ] motor failure |
| [ ] occurs in case of shocks | [ ] encoder defective | [ ] broken cable |
| [ ] depends on temperature | | [ ] insufficient ventilation |
| [ ] foreign object inside unit | | |

Does the switching cabinet have an air conditioning system?Y/N [ ]

Have similar problems occurred before on the same axis?
How often: .....

Did the problems occur on certain days or times of the day?

.....

further information:

.....

.....

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