Operating Manual

PacDrive™
Controller C600

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ELAU PACKAGING SOLUTIONS

Schneider Electric

Legal notice

Trademark

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Schneider Electric	**Manufacturer's declaration** According to the EC machine guidelines 98/37/EC	ELN 117-02/02.04 page 1/1

The product we delivered:

PacDrive Controller C600

is intended for installation in a machine.

Commissioning is forbidden until it is established that the machine in which this product is to be installed complies with the provisions of the EC guideline. The manufacturer guarantees that the product delivered was manufactured in accordance with the applied harmonized standards / specifications.
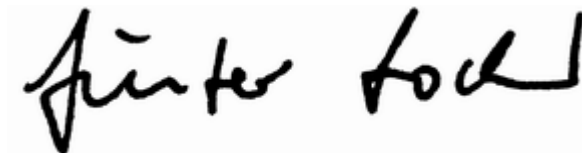
The following standards were applied:

- **EN 60204-1 (2007)** Safety of machinery: Electrical equipment of machines - General requirements
- **EN 50081-2 (3/1994)** Electromagnetic compatibility. Generic emission standard
- **EN 61000-6-2 (3/2000)** Electromagnetic compatibility. Resistance to jamming

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Contents

1 About this manual

1.1 Introduction

Read and observe this manual before you work on the controller for the first time. Take particular note of the safety instructions (see 2.3 Residual risks). As described in section 2.4, only those persons who meet the "Selection and qualification of employees" are allowed to work at the controller.

This manual is intended to help you use the controller and its intended applications safely and properly.
By observing this manual, you will help to

- avoid risks,
- reduce repair costs and down times of the controller,
- increase the life span of the controller
- and increase reliability of the controller.

A copy of this manual must always be available for personnel who are entrusted to work at the controller.

1.2   Symbols, designator and display format of safety notes

This manual divides the safety instructions into four various categories.
Hazards and possible results will be categorized using a certain combination of symbols and signal words.

Symbol / Signal word	Meaning
⚠ DANGER	Indicates an immediate hazardous situation that can lead to death or serious bodily injury if the safety regulations are not observed.
⚠ WARNING	Indicates a potentially hazardous situation that can lead to serious injury or death if the safety regulations are not observed.
⚠ CAUTION	Indicates a potentially hazardous situation that may result in bodily harm if the safety regulations are not followed.
CAUTION	Indicates a potentially dangerous situation that may result in property damage if the safety regulations are not observed.

The following symbols and designators are used in this document:

Symbol/Character	Meaning
💡	**Information Symbol:** After this symbol, you will find important instructions and useful tips on using the components.
	Marker: After this symbol, you will find references for further information.
▪	**Prerequisite symbol:** This symbol indicates a prerequisite you have to fulfill before you start to implement an instruction.
▶	**Activity symbol:** After this symbol, you will find an instruction. Follow the instructions in sequence from top to bottom.
✓	**Result symbol:** The text after this symbol contains the result of an action.
●	First level bullet point
–	Second level bullet point.
📖	**Orientation aid:** Information serving as an orientation aid regarding the section's contents follows this symbol.
bold	If the descriptive text contains keywords, such as parameters, they are highlighted in bold.
`lBufSelect:AXIS_BUF_SELECTION;` `(* Buffer Auswahl *)`	Program code is written in a different font.

2 Notes for working safely with the product

The controller is are state of the art and conform to recognized technical safety regulations. Nevertheless the use of the controller can present a hazard to life and limb or cause property damage. The following section contains general requirements for safe work with the controller. Each person who uses or works on the controller must read and follow these requirements.

2.1 Proper use

Use The controller is are intended to be installed in a machine or assembled with other components to form a machine or system.

The controller is part of the PacDrive System. The PacDrive System is the complete control system comprising of

- PacDrive Controller of C- or P-Series,
- PacDrive Servo Amplifier MC-4 or Power Supply PS-5 with Distribution Box DB-5 and
- PacDrive Motor.

What do you need to observe? Proper use includes that you observe the following points and the resulting rules:

- The regulative, warning and instruction signs on the connected components and in the switching cabinet
- The warning instructions at the controller on the connected components and in the switch cabinet
- The inspection and maintenance instructions
- The operating instructions of the other components
- All other documentation

Flawless State Operate the controller only when they are in a flawless technical condition. Observe the regulations, act with safety and hazards in mind If circumstances occur that impact safety or cause changes in the operating performance of of the controller, switch the controller off immediately and contact the responsible service staff.

Only original equipment must be used Use only the options and mounting parts specified in the documentation and no third-party devices or components that are not expressly approved ELAU recommends.. Do not change or modify the controller inappropriately.

Protection measures provide for Before installing, provide for appropriate protective devices in compliance with the local and national standards. Do not commission components without accordant protective devices. After installation, commissioning or repair, test the protective devices used.

Forbidden environments The ELAU Components must not be used in the following environments:

- In dangerous (explosive) atmospheres
- In mobile, movable or floating systems
- In life support systems
- In domestic appliances

Installation and operating ambient You may only use them in accordance with the installation and operating conditions described in the documentation. The operating conditions at the installation location must be checked and maintained in accordance with the required technical data (performance data and ambient conditions). Commissioning is prohibited until it is guaranteed that the usable machine or system in which the controller is installed meets all requirements of EC Directive 98/37/EC (machinery directive).

In addition, the following standards, directives and regulations are to be observed:

- DIN EN 60204 Safety of machinery: Electrical equipment of machines
- DIN EN 292 Part 1 and Part 2 Safety of machinery: Basic Concepts, General Principles for Design
- DIN EN 50178 Electronic equipment for use in high-current electrical systems
- EMC directive 89/336/EEC : DINT
- The generally applicable local and national safety and accident prevention regulations.
- The rules and regulations on accident prevention and environmental protection that apply in the country where the product is used
- The applicable laws and ordinances

2.2 Selection and qualification of personnel

Target Audience of this manual This manual is geared exclusively toward technically qualified personnel, who have detailed knowledge in the field of automation technology. The description is mainly for construction and application engineers from the engineering and electro-technics division as well as service and commissioning engineers.

Specialist or trained staff Work at the controller may only be carried out by qualified professional or by trained staff under the instruction and supervision of a qualified person in accordance with electrical regulations. Professionals are those persons who, as a result of their training, knowledge, and experience and knowledge of the pertinent regulations, can

- evaluate the transferred work,
- recognize the meaning of the safety instructions and implement them consistently,
- recognize possible hazards and
- take appropriate safety measures.

2.3   Residual risks

Health risks arising from the controller have been reduced by means of safety technology and design engineering. However a residual risk remains, since the controller works with electrical voltage and electrical currents.

If activities involve residual risks, a specific note is made at the appropriate points. The note details the potential hazard and its effects and describes preventative measures to avoid it.

Mounting and handling

⚠ WARNING
RISK OF INJURY DURING HANDLING
• Observe the general construction and safety regulations for handling and mounting. • Use suitable mounting and transport equipment correctly and use special tools if necessary. • Prevent clamping and crushing by taking appropriate precautions. • Wear suitable protective clothing (e.g. safety goggles, safety boots, protective gloves) if necessary. • Do not stand under suspended loads.
Risk of bodily harm from crushing, shearing, cutting and hitting

Touching electrical parts

If parts have contact with voltages greater than 50 V, it can be a hazard for personnel. When electrical devices are in operation, certain parts of these devices must necessarily carry dangerous voltages.

⚠ DANGER

HIGH VOLTAGE

- Observe the general construction and safety regulations for working on high-current electrical systems.
- After installation, check the firm connection of the ground conductor to all electrical units to ensure that connection complies with the connection diagram.
- Always make sure that the ground conductor is connected when operating electrical components.
- Disconnect devices with a voltage greater than 50 volts from the power supply before working on electrical parts.
- Prevent the unit from being switched back on.
- Wait at least 5 minutes after switching off before accessing the components.
- Before accessing the device, check the voltage with a voltage meter to be sure that the voltage is less than 50 volts.
- Do not touch the electrical connection points of the components when the device is switched on.
- Before enabling the device, safely cover the live components to prevent contact.
- Provide for protection against indirect contact (DIN EN 50178, Section 5.3.2).

Electric shock, fire or explosion

Dangerous movements

There can be different causes of dangerous movements:

- Missing or faulty homing of the robot mechanics
- Wiring or cabling errors
- Errors in the application program
- Component errors
- Error in the measured value and signal transmitter
- Operation error

Personal safety must be guaranteed by primary equipment monitoring or measures. Don't just rely on the internal monitoring of the drive components. Monitoring or measures should be implemented based on the specific characteristics of the equipment, in line with a risk and error analysis. This includes the valid safety regulations for the equipment. Under no circumstances must the technical safety devices be removed. Do not make any modifications to a protective device that may put it out of operation. Protect existing work stations against unauthorized operation. Effectively restrict access to the control terminals to allow access only to authorized persons.

⚠ DANGER

DANGEROUS MOVEMENTS

- Prevent entry to a danger zone, e.g. by means protective fencing, mesh guards, protective covers, or light barriers.
- Ensure the protective devices are properly dimensioned.
- Position EMERGENCY OFF switches so that they are easily accessible and can be reached quickly.
- Check the functionality of EMERGENCY OFF equipment before start-up and during maintenance periods.
- Prevent unintentional start-ups by disconnecting the drives from power supply using the EMERGENCY OFF circuit or using a safe start-up lock out.
- Before accessing the drives or entering the danger zone, safely bring the drives to a stop.
- While working on the system, power down the electrical equipment using the main switch and prevent it from being switched back on.
- Before working on the system, secure it against start-up.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines.
- Prior to the initial start-up, check the system and the installation for possible malfunctions in all usage scenarios.
- If necessary, carry out a special EMC check of the system.

Risk of death, serious injury or property damage

"Safe separated extra-low voltage"

PELV Protective Extra-Low Voltage

The signal voltage and control voltage of the PacDrive™ devices are <33 Volts. In this range, the specification as a PELV system in accordance with IEC 60364-4-41 includes a protective measure to guard against direct and indirect contact with dangerous voltage through **the safe separation** of the primary and secondary sides in the system/machine. ELAU strongly recommends providing the system/machine with safe isolation.

⚠ DANGER

HIGH ELECTRICAL VOLTAGE DUE TO INCORRECT CONNECTION

• Please ensure that only devices, electrical components or lines that have sufficient, safe electrical separation from the connected circuits in accordance with the standards (EN 50178 / 1998 edition - Electronic equipment for use in power stations) are connected to the signal voltage connectors of this component.
• Ensure that the existing electrical separation is maintained throughout the entire circuit.

Risk of death or serious injury

FELV Functional Extra-Low Voltage

When using ELAU components in systems that do not have safe separation as a protective measure against direct or indirect contact of dangerous voltages, all connections and contacts (e.g. PacDrive Controller, Sub-D connector, serial interface) that do not meet protection class IP2X require a permanent cover. The cover or the device connection of the connected device must be designed so that it can only be removed by using a tool. The protective measures have to be adhered on all connected devices.

3 System overview

3.1 PacDrive System
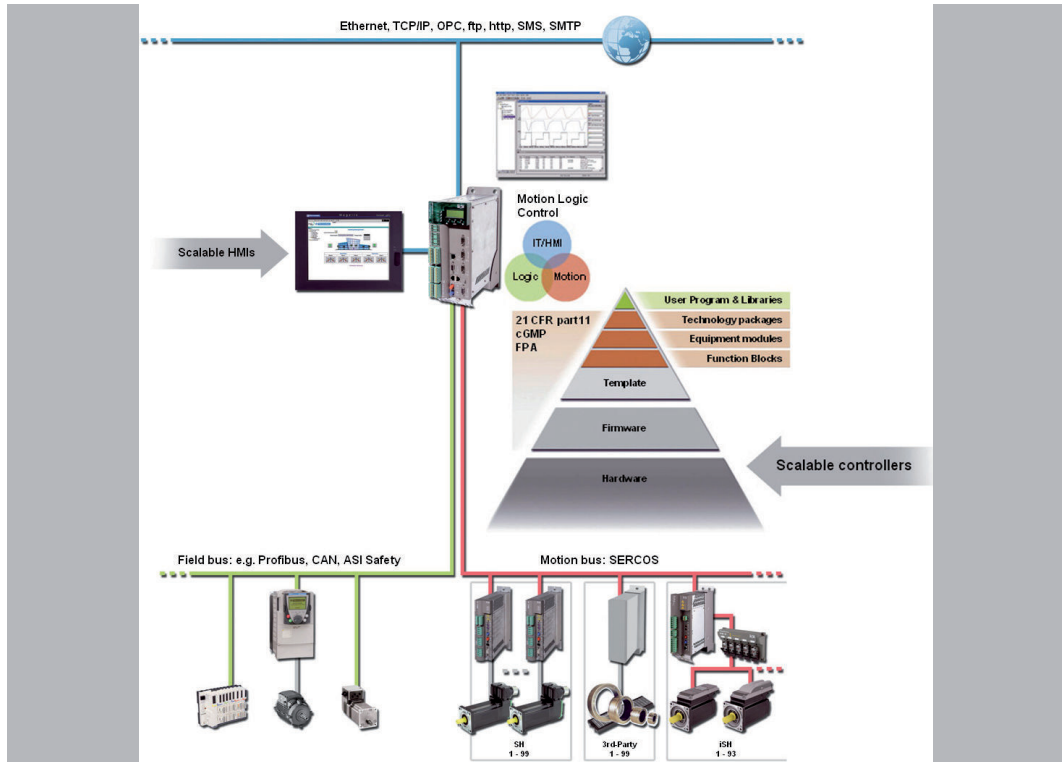
Figure 3-1: PacDrive System Overview

PacDrive Controller Family

The PacDrive Controller, microprocessor-based control hardware with the VxWorks real-time operating system, centrally implements the PLC and motion functions. A PacDrive Controller synchronizes, coordinates, and creates the motion functions for maximum

• 8 drives for the PacDrive Controller C200
• 2 drives for the PacDrive Controller C200 A2
• 16 drives for the PacDrive Controller C400
• 8 drives for the PacDrive Controller C400 A8
• 99 drives for the PacDrive Controller C600

of a food and packaging machine.
Many different HMIs are used for the HMI tasks. Whether it is low-cost clear text or IPC, it is no problem for the flexible PacDrive Controller.
The PacDrive P600 Controller is additionally equipped with a full-fledged PC. Due to its PC-based architecture, it can perform HMI tasks with no problem in addition to the usual motion functions.

PacDrive Power Supply PS-5

The PacDrive PS-5 Power Supply unit features modern technology and a compact and closed construction for switching cabinet installation. Each PacDrive iSH has a PacDrive PS-5 that can be quickly installed with a single connection line. Which means that the PS-5 fits seamlessly into the extremely flexible, modular drive concept.

Highlights

- Integrated mains filter and bleeder
- Intermediate circuit power for up to 25 iSH (depending on the application)
- Integrated SERCOS interface
- Fully diagnosable due to integrated controller
- Simple mounting

PacDrive Distribution Box DB-5

PacDrive DB-5 is the link between PS-5 and iSH. Optionally, 1 to 4 iSH Motors can be connected depending on the number of drives. When operating more than 4 drives simply expand the system using one or more DB-5s.

Highlights

- 1-4 connections for iSH Motors or easily expandable with more DB-5s
- Easy to expand

PacDrive Intelligent Servo Module iSH

The innovative iSH combines the motor, power amplifier, and the digital servo controller for an axis in a space-saving housing. Due to its compact construction with integrated controller it is perfectly suitable for peripheral set-up.
It is available with single or multi-turn encoders and configures itself with the aid of the electronic type plate in the iSH itself.

Highlights

- Compact type of construction
- 3.5 times peak torque
- Integrated SERCOS interface
- High-resolution single or multi-turn encoder
- Protection class IP65
- Simple wiring
- Superior reliability

PacDrive Servo Amplifier MC-4

The digital Servo Amplifier MC-4 features compact, closed, wall-mountable construction as well as state of the art technology. For the innovative MC-4, the power supply unit, the final stage and the software servo regulator for an axis are housed in a space-saving housing. Because it communicates with the PacDrive Controller exclusively via fiber optic cable, it is also suitable for peripheral layout. It does not require a user program, processes single or multi-turn encoders, and configures itself using the electronic type plate in the SH-Motor.

Highlights of the PacDrive MC-4

- World voltage range
- Integrated power supply unit
- Max. 34.5/69 kVA output
- Automatic motor detection
- Minimal design
- Safety input inverter enable
- 250 % overload
- Integrated SERCOS interface

SH-Motor

The AC Servo Motors of the SH series meet the highest demands on dynamics and precision. Five flange sizes with different grades of torque offer the right drive solution for virtually any application. New winding technology with single tooth winding enables compact sizes and reduces production costs compared to traditional motors.

Highly dynamic AC Servo Motors Due to its low moment of inertia compared to other AC Servo Motors, and in conjunction with the high overload capability, the SH-Motor meets all requirements in terms of accuracy, dynamics and profitability.

SH Motors are compatible with SM Motors and are available in five different flange sizes:

- SH-055
- SH-070
- SH-100
- SH-140
- SH-205

Brief summary of technical data:

- Developed for the highest dynamics and precision
- Single tooth winding
- Compact size
- High power density
- Low internal moment of inertia
- High overload capability
- High resistance to winding damages
- Low detent torque

4   Indicators, control elements, diagnosis

The PacDrive™ System supports the user with its comprehensive diagnostic system.

The diagnostic messages can be read out with the Automation Toolkit **EPAS-4** . The PacDrive™ System contains a powerful message logger in which additional diagnostic information is recorded.

Diagnostic messages are usually displayed by a control panel on the machine. If an "error" occurs, read the diagnostic message on this unit and then contact the machine manufacturer.
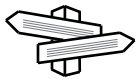
Detailed information on diagnosis is available in the Online Help of the Automation Toolkit **EPAS-4**.

4.1   Indicators and control elements

4.1.1   Displays on the PacDrive Controller C600
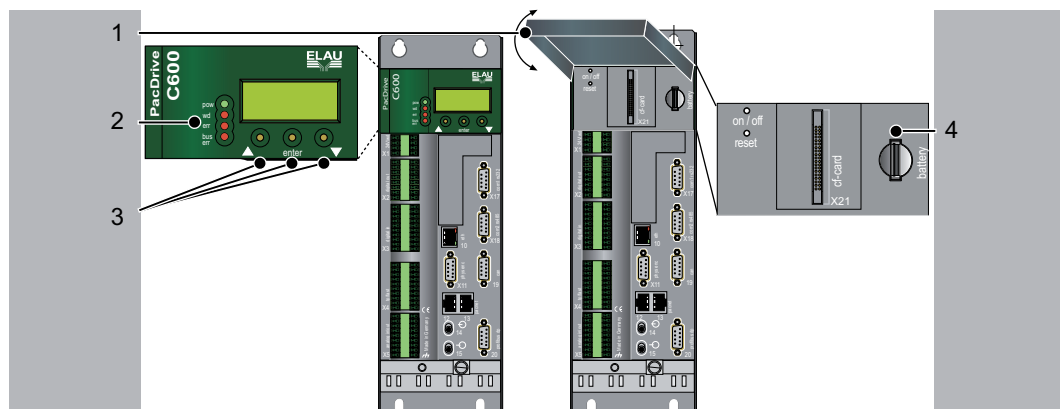
Figure 4-1: PacDrive Controller C600 control unit

1	Operating cover
2	LEDs
3	Button under the display
4	Battery shaft
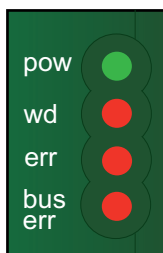
If the cover of the PacDrive Controller is closed, you will see four vertically arranged indicators, which signify various operating states or errors.

- pow (control voltage indicator)
- wd (watchdog indicator)
- err (error display)
- bus err (SERCOS real-time bus error indicator)
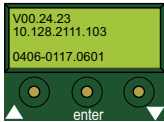
In addition to the LED displays, further information about the operating status of the PacDrive Controller is given on the 4-line LCD display.

Line 1	Firmware version currently in use
Line 2	Current IP number of the PacDrive Controller
Line 3	-
Line 4	FPGA-Version/Bootloader-Version/Software-Version (PIC)

The horizontally arranged buttons on the PacDrive Controller have no function currently.
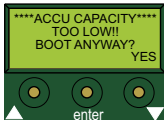
Display while booting with an empty accu pack (USP).
Press the right button beyond the display to continue the boot and to start the loading of the battery pack.

pow (control voltage display)

The "pow" LED indicates the state of the control voltage.

OFF	The control voltage (24 V DC) is not available or too low
ON	Normal operation; control voltage in normal range
Flashes	UPS active

wd (watchdog indicator)

Watchdog is a hardware module to monitor the controller.

OFF	Normal operation
ON	Fatal error; reset required, reboot system

CAUTION
• the CPU is stopped,   • the optional module is reset,   • the outputs are reset and   • the wd (watchdog) relay outputs are opened.   A "fatal error" is a serious hardware problem or an unexpected software problem. When a "fatal error" occurs

err (error display)

The error LED (err) indicates errors. The following table lists the possible display conditions and their accompanying error descriptions.

OFF	Normal operation
Flashes slowly (1.7 Hz)	Error of class 1, 2, 3, 4 or 5 active
Flashes quickly (10 Hz)	PacDrive Controller boot completed, last boot failed. See diagnostic message 209 "last boot failed". PacDrive Controller performed a minimal boot.
Flashes fast and slowly alternately	Firmware download via SERCOS is active.
ON	A serious error occurred during the current boot.

<table>
<tr><td align="center">CAUTION</td></tr>
<tr><td>The err-LED is switched on following "Power on". Once the operating system, user configuration, user parameters and the IEC program have been loaded and the IEC program has been started successfully the err LED will switch off again. The boot procedure is now complete.</td></tr>
</table>

bus err (SERCOS real-time bus error indicator)

OFF	Normal operation
ON	Bus error (problem with fiber-optic cable connection, e.g. transmitting power is too low or too high, cable break, etc.)

<table>
<tr><td align="center">CAUTION</td></tr>
<tr><td>The innovative iSH combines motor, final stages and the digital servo regulator for one axis in a space-saving housing. The sending power (fiber optic cable intensity) is set on the PacDrive Controller in the PLC configuration.</td></tr>
</table>
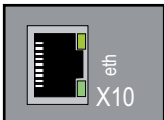
Ethernet LEDs (data throughput indicator and network activity)

There are two LEDs affixed to the Ethernet connection (X10) of the PacDrive Controller.

LED yellow: ON	PacDrive Controller connected
LED yellow: flashing/flickering	Current network traffic
LED yellow: OFF	PacDrive Controller not connected
LED green: ON	100 MB connection
LED green: OFF	10 MB connection

Once you have opened the operating cover you have access to the control elements of the PacDrive Controller:

- CompactFlashTM card slot
- Battery compartment
- on / off button
- reset button

4.1.2 CompactFlashTM card slot
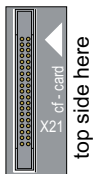
The CompactFlash™ card slot is the connector for the permanent data storage (CF™ card) of the PacDrive Controller.

How to replace the Compact Flash™ in case of servicing:

▶ Switch off PacDrive Controller.
▶ Hold the CF™ card with your thumb and forefinger and pull it out of the slot.
▶ To insert, carefully place the CF™ card on the guide rail and push it into the device.
▶ Push lightly until the card clicks in.

4.1.3 Battery compartment
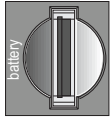
The PacDrive Controller battery buffers controller data (Bios, NVRAM, time, etc.).

Maintenance-interval The battery should be replaced every 6 years. After this period of time the battery must be replaced. If the device (with battery inserted) is not used for an extended period of time, you should check/replace the battery.

Measurement **This is how you measure the battery:**

▸ Replace battery and continue with the manual measurement

or

▸ observe the diagnostic message **"037 Battery down"** in the IEC program and display it on an HMI (panel), if necessary.
▸ Replace battery three days after the first diagnostic message at the latest.

This is how you replace the battery:

▪ You can change the battery while the controller is on or off. There is no loss of data when it is performed with the controller on. When the controller is switched off, the time period allotted for data buffering without a battery is approx. 5 minutes.

⚠ DANGER

USE OF A WRONG BATTERY

• Only use batteries of the type:
Battery 3 V Lithium Renata 2450N

Risk of explosion/fire

▸ Use insulated pliers to lightly pull the old battery out of its slot.

⚠ WARNING

DANGER OF EXPLOSION WHEN REMOVING/REPLACING BATTERY!

• Use suitable, insulated pliers. When replacing the battery use tools which contain no current conducting material on the contact points.
• In general, be careful not to short circuit the battery poles.
• Do not recharge, dismantle or throw battery into fire.

Risk of injury and/or property damage!

▸ Carefully place the new battery on the guide and lightly push it into the device.

For ordering information (see 6.6 Type code).

4.1.4   Switching the PacDrive Controller on/off and resetting
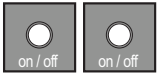
on / off button

▶   Press this button when the controller is switched off, completely wired and con-
nected to the power supply system and the device shall be switched on.

▶   Pressing this button when the system is running will switch off the controller. If
necessary, put the system in a secure position before switching it off.

reset button

▶   Press this button to reset and boot the controller.

Any Servo Amplifiers MC-4 connected have their own reset buttons.

4.2 Diagnosis

4.2.1 PacDrive Controller minimal boot

If a serious boot error occurs as a result of an application error, the user can perform a minimal boot.

The PacDrive Controller automatically performs a minimal boot if:

- a voltage interruption of the control voltage occurs when starting the controller while the "err" indicator is illuminated
- a reset of the PacDrive Controller is issued
- a serious error occurs (memory call up cannot be performed)

During a minimal boot the application data (PLC configuration and IEC program) are not loaded.

Perform a minimal boot as follows:

▶ Boot the PacController by pressing the **"reset"** button.
  ✓ The PacController starts and the **"err"** error indicator lights up.
▶ **Push the "reset** button again while the pre-set IP address is displayed.
  ✓ After the boot, the PacDrive Controller will flash quickly (10 Hz), signaling a minimal boot.

4.2.2 Connection to PacDrive Controller

The connection from the (service) PC (EPAS-4) to the PacDrive Controller can be made in two different ways:

- serial connecting cable
- Ethernet connection 10/100 Base-T

If the Windows computer being used in the service case or for commissioning has a functioning TCP/IP installation, the PacDrive Controller net management tool can be used to establish a connection. Further information on working with the PacDrive Controller Net Manage commissioning tool can be found on the PacDrive EPAS-4 CD.

If a connection between the EPAS-4 and the PacDrive Controller is not possible, one/ several of the following causes may be the problem.

TCP/IP connection ▶ Check IP_Address in EPAS-4 under ONLINE > communication parameters... .
  - Is the channel (umbrella term for connection parameters) set correctly?
  - Is the TCP/IP_Address set correctly?
  - Is the port set to "5000"?
  - Is the Motorola byte order set to "No"?
▶ Check TCP/IP settings in the PLC configuration of the project.
  - Is the parameter IP_SubNetMask correctly filled out?
  - Is the parameter IP_Address correctly entered and does it correspond to the setting under ONLINE > communication parameters in EPAS-4?
  - Is the parameter IP_Gateway address entered correctly?
▶ Establish a serial connection to the PacDrive Controller.
  - Enter settings for a serial connection under ONLINE > communication parameters (Port = "5000"(depending on the computer); Baud rate = "38400"; Parity =

"No"; Stop bits = "1"; Motorola byte order = "No").
- Establish serial connection.

▶ Check setting in the PLC configuration of the PacDrive Controller.
- Is the IP_SubNetMask entered correctly?
- Is the parameter IP_Address correct and does it correspond to the setting under ONLINE > communication parameters in EPAS-4?
- Is the address IP_Gateway entered correctly?

▶ Adjust parameter to detect an error.
- Take over parameter with "ONLINE > Parameter" .
- Activate parameter with "ONLINE > reset controller".

serial connection over COM1

▶ Check serial cable if jumpers are available. The connector plug assignment can be found in the EPAS-4 online help and in the "EPAS-4 Operating Instructions"

▶ Check setting for the PC's serial interface under **ONLINE > communication parameters** (Port = "5000"(depending on computer); baud rate = "38400"; parity = "No"; Stop bits = "1"; Motorola byte order = "No").

▶ Check a modem configured in the PLC configuration under PacDriveM > General > Com1User "Modem / 1". In this case, a modem is expected at the serial interface Com1 of the PacDrive Controller.
- Perform a minimal boot of the PacDrive Controller so that the serial interface COM1 is converted to the direct serial connection with EPAS-4.

For further information.

File-transfer service

Check to see whether the PacDrive Controller flash disk is full:

▶ Log in with EPAS-4 without file transfer.

▶ Check available memory using the disk free parameter in the PLC configuration > PacDrive C600 > Memory & Disks.

▶ Delete files on the flash disk using an FTP client.

▶ If necessary, replace the flash disk in the Pac Controller with a flash disk with a larger storage capacity.

4.2.3   Example of a diagnostic message

2121 Bleeder Temperature Too High

Diagnostic class (standard): 2
Diagnostic code 121
Reaction: B

The bleeder is overloaded.

- ▪   The drive has incorrect dimensions.
- ▶   Check drive sizing.

- ▪   Hardware error: The braking resistor or addressing is defective.
- ▶   Contact ELAU customer service.

The meaning of the diagnostic code is more thoroughly explained in the online help section of the EPAS-4 Automation Toolkit.

A complete list of the diagnostic messages can be found in the chapter entitled Diagnostic messages.

5 Transport, storage, unpacking

5.1 Transport

- ▶ Avoid heavy shocks and/or vibrations during transport.
- ▶ Check the units for visible transport damage and inform the shipping company immediately if necessary.

5.2 Storage

- Store devices in a clean, dry room.
- The air temperature at the storage location must be between - 25 °C and +50 °C.
- Possible temperature variations at the storage location must be maximum 30 K per hour.

5.3 Unpacking

- ▶ Remove the packaging.
- ▶ Check that delivery is complete.
- ▶ Check the delivered goods for transport damage.

5.4 Type plate
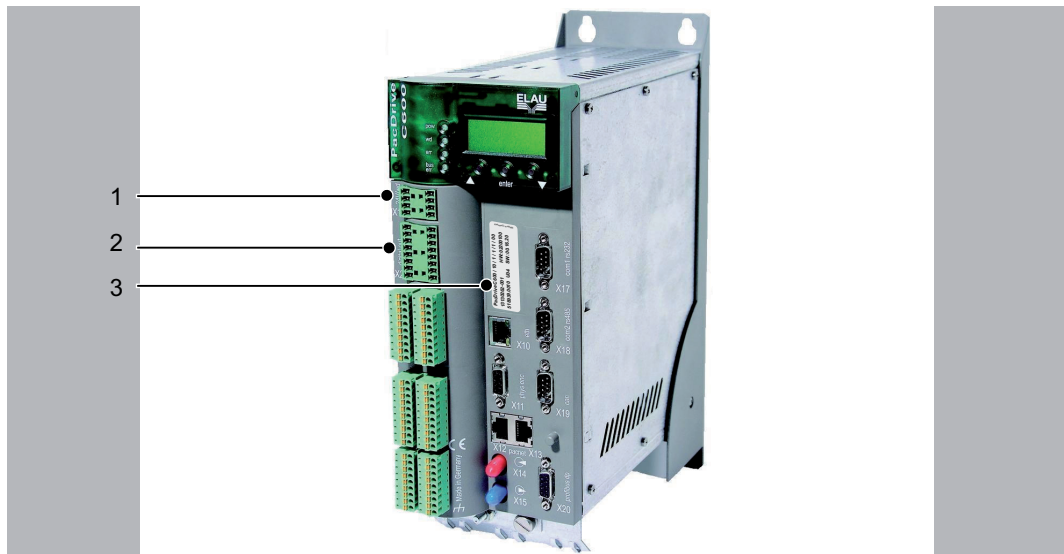
Figure 5-1: PacDrive Controller C600 with type plate

1	Technical type plate
2	Type plate USP
3	Logistic type plate

PacDrive C600/10/1/1/1/00
13130262   HW: 2HB3100451
888067.0010 3008 SW: 00.16.42

Figure 5-2: Logistic type plate of a PacDrive Controller C600

PacDrive C200/C400/C600...	Item name
1313026X	Item no.
888067.0010 3X08	Serial Number
HW	Hardware version
SW	Software version
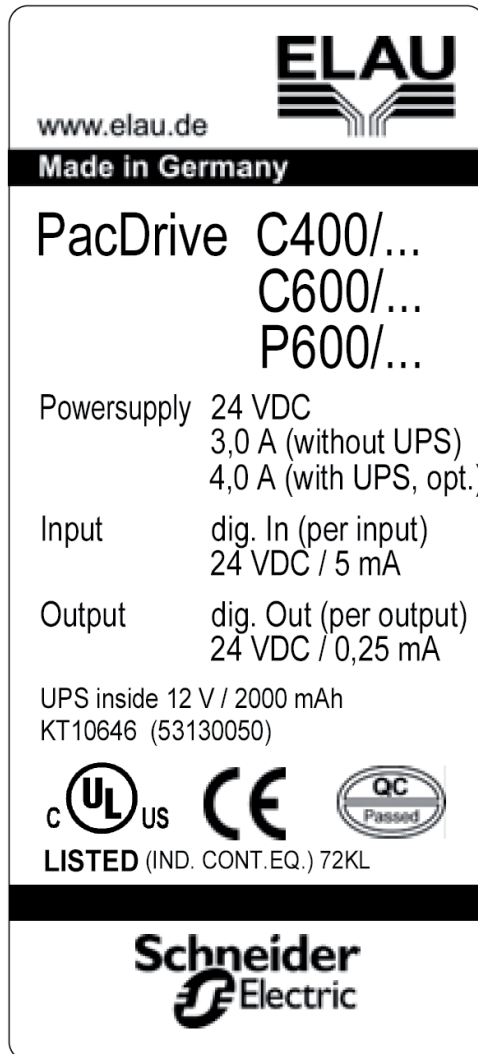
Figure 5-3: Technical type plate of a PacDrive Controller

PacDrive C400, C600, P600	Device type, see type key
PowerSupply	Rated voltage and rated current
Input	Digital inputs / input voltage und input current (per input)
Output	Digital outputs / output voltage und rated current (per input)
USV inside	USV inside (12V/2000mAh)
cUL	cUL mark
CE	CE mark

6 Installation and maintenance

For warranty reasons, we strongly recommend that you contact ELAU personnel for initial start-up. The ELAU personnel

- will check the equipment,
- determine the optimal configuration
- and instruct the operating staff.

6.1 Initial start-up

How to check the shipment and the installation location:

Testing
- ▶ Check that delivery is complete.
- ▶ Check device for sound condition.
  Only operate undamaged devices.
- ▶ Check data against type plates.

- ▶ Observe requirements for the installation location.
- ▶ Observe requirements for the protection class and the EMC rules.

- ▶ Then install controller.

How to wire the controller:

- ▶ Connect devices, beginning with the ground conductor.
- ▶ Check if the terminals are securely fastened and the necessary cable cross sections are correct.

- ▶ Check that shielding is completely correct.
- ▶ Eliminate the possibility of short circuits and interruptions.
- ▶ Check the continuity of the protective conductor system.

Power supply voltage connect
- ▶ Check the power supply voltage and control voltage.
- ▶ Connect external 24V control voltage.
  - ✓ The devices initialze and the LEDs should display the following:

- Controller during initialization:
  - pow: ON
  - err: ON
  - buserr: any state
  - wd: ON

- Controller after initialization:
  - pow: ON
  - err: FLASHING or OFF
  - buserr: OFF
  - wd: OFF

How to finish the initial start-up:

- ▶ Check safety functions such as the EMERGENCY OFF switch.

Mains voltage connect
▶ Activate EMERGENCY STOP switch.
▶ Connect mains voltage.
▶ Check status displays for proper function.
▶ Release EMERGENCY OFF switch and activate ON switch.

Axis move
▶ Use a reliable, small application program when moving the axis for the first time in order to:
- the correct direction of rotation of the axis,
- check the correct setting of the limit switch and
- check the braking distance in both directions

Transmit configuration and program
▶ Transfer project with the EPAS-4 Automation Toolkit to the PacDrive Controller.

⚠ DANGER

DANGEROUS MOVEMENTS

- Ensure that no one is in the danger zone.
- Remove all tools, loose parts and other working aids not belonging to the axis/machine/system from the area of movement. (Ensure machine is in operating state!)
- ELAU recommends waiting to engage the engine until after the function tests have been successfully performed!

Risk of death, serious injury or property damage

Perform function test
▶ In the event of a breakdown it is possible to smoothly replace defective components to guarantee that the fault is quickly eliminated and operation can be resumed.
▶ If you haven't already done it, connect the mains voltage.
▶ Carry out function test using a checklist for axis/machine/system functions.

▶ Resume system operation according to the operating manual (from the packaging machine manufacturer and servo amplifier).

6.2   Configuration, homing and programming

The PacDrive™ System is adapted to your task using the EPAS-4 Automation Tool-kit.
The system will be configured and programmed according to IEC 61131-3 in EPAS-4.

⚠ CAUTION
COMPLEX FUNCTIONALITY OF PACDRIVE™ SYSTEM AND THE MACHINE
• Program changes may only be carried out by trained personnel with detailed knowledge of the system. • Changes may only be carried out by your machine supplier or by ELAU employees. • ELAU GmbH is not liable for damages caused by unauthorized program changes.
Property damage

6.3   EMC Rules

To control and regulate the motors, the mains voltage is stored by rectification in the DC bus of the servo amplifier. This stored energy is supplied to the motor by targeted switching on and off using six semiconductor switches. The steep increase/decrease in voltage places considerable demands on the dielectric strength of the motor winding. An important additional aspect to observe is the electromagnetic compatibility (EMC) with other system components. The high rate of change of the clocked voltage generates harmonics of great intensity up into the high frequency range.

⚠ CAUTION
ELECTROMAGNETIC FIELDS • During installation, select the HF grounding option with the lowest ohm load (e.g. an uncoated mounting plate on the switching cabinet). • Ensure largest possible contact surface area (skin effect). • If necessary remove any existing paint to ensure contact. • Lay the grounding in a star configuration from the Central-Earthing-Point. • Current loops of earthing are prohibited and can cause unnecessary interference. • Only use shielded cables. • Supply large-area shielding bridges. • Do not connect shields via the PIN contacts of connectors. • Observe the circuit suggestions. • Shorten the motor cables to a minimal length. • Do not lay any cable loops in the switching cabinet. • In conjunction with electronic controllers, do not switch inductive loads without suitable interference suppression. • Provide for suitable interference suppression. For direct current operation, this is achieved by using recovery diodes and protector type-based, industry-standard quenching circuits during alternating current activity. • Arrange the interference suppression immediately at the point of inductivity, as otherwise even more interference may be generated by the shock of the switching current on the interference suppression lines. • Avoid sources of interference instead of eliminating the effects of existing interference. • Do not arrange contacts with unsuppressed inductive loads in one room with PacDrive Components. The same applies for connection lines that do not lead suppressed, switched inductances and lines that run parallel to them. • Isolate the controller from such interference sources using a Faraday cage (separately partitioned switching cabinet). • Mains filters and motor filters may by used depending on the combination of the servo amplifier/motor and the cable length. **Interference or system breakdown**

6.4 Maintenance, repair, cleaning

6.4.1 Repair

Proceed as follows in case of repair:

▸ Fill in the fault report form in the attachment (can also be sent per Fax).
▸ When possible, replace defective parts (see 6.7 Device replacement).

CAUTION
To avoid damage in transport and to guarantee that the repair process flows smoothly, follow the method outlined in the chapter on "Device Replacement".

▸ Send the defective part back to ELAU.

6.4.2 Cleaning

How to remove dust and foreign objects from the controller:

⚠ CAUTION
LIQUIDS CAN SEEP IN DUE TO IMPROPER CLEANING
DAMAGE OF THE COMPONENT
• Use cleaning processes appropriate to the protection class of the controller.

▸ Switch controller voltage free.
▸ Remove controller.
▸ Then blow out controller with dry pressurized air (max. 1 bar).

6.5 Spare part inventory

Keep a stock of the most important components to ensure that the equipment is functioning and ready for operation at all times.

You may only exchange units with the same hardware configuration and the same software version.
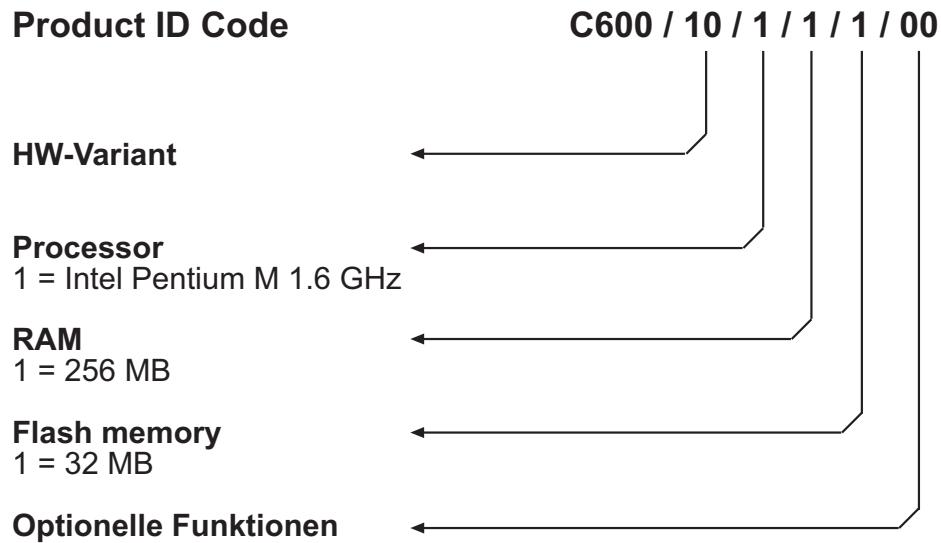
Indicate the following information on the spare part order:

Item name:	e.g. C600/10/1/1/1/100
Item no.:	e. g. 13130262
Hardware code:	e.g. HW: 02200100
Software version:	e.g. SW: 00.16.20

You will find this information on the type plate and in the controller configuration of the PacDrive System.

6.6 Type code

Product ID Code **C600 / 10 / 1 / 1 / 1 / 00**

HW-Variant

Processor
1 = Intel Pentium M 1.6 GHz

RAM
1 = 256 MB

Flash memory
1 = 32 MB

Optionelle Funktionen

6.7 Device replacement

CAUTION
FAULTY REPLACEMENT OR OPENING OF THE CONTROLLER
• Do not open controller to put it into operation or replace it.   • In addition to the following instructions, you must observe the machine manufacturer's specifications when replacing the controller.
Damage of the controller   Manufacturer's warranty expired

⚠ DANGER
HIGH VOLTAGE
• Before working on electrical equipment, always put the main switch in the "OFF" position and secure it against being switched back on.   • Before working on the equipment, discharge the DC bus and use a voltage meter to make sure that there is no voltage.   • Make sure that the drives are at a standstill because potentially fatal voltage can occur on the motor lines in generator operation.   • Disconnect power connector cables only when the system is deactivated.   • Plug in power connector cables only when the system is deactivated.   • If you are not using prefabricated ELAU cables, check that the assignment of the new cables complies with the connection diagram of the machine manufacturer.
Electric shock, fire or explosion

⚠ CAUTION

ELECTROSTATIC DISCHARGE

- Touch circuit boards only on edges.
- Do not touch any of the circuit points or components.
- Discharge any existing static charge by touching a grounded metallic surface such as a grounded housing.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.

Damage to component

6.7.1   C600

How to replace the controller:

▶ Take preliminary measures.
▶ Put main switch in "OFF" position to free system of voltage.
▶ Prevent main switch from being switched back on.

▶ Disconnect cables from the controller.
▶ Remove the screws from the top and bottom of the housing.
▶ Remove PacDrive controller.

▶ Install New controller and tighten screws.
▶ Connect controller according to machine's circuit diagram.
▶ Put the system back in operation.

Proceed as follows for start-up:

▶ Import the user project again using a PC on which the EPAS-4 Automation Toolkit is installed.

or

▶ Remove the controller's already used CompactFlash card in need of repair and insert it into the new controller.
▶ Ensure that the card is functional.
▶ Store the defective PacDrive Controller in a suitable package for transport.
▶ Put the system back in operation.

7 Technical data

7.1 Data tables

Designation	Parameters	Value
Product configuration	Type code (SERCOS node= MC-4,SCL, iSH)	• C600 up to 99 SERCOS slaves: PacDrive C600 / 10 / 1 / 1 / 1 / 00
	Order number	• C600 up to 99 SERCOS slaves: 13 13 02 62
Processor	CPU	• Intel Pentium M 1.6 GHz
	RAM	• 256 MB
	L2 Cache	• 1 MB
	NVRAM	• 256 kB
	CompactFlashTM card	• ≥128 MB
	Real time clock (RTC)	• Yes (battery maintenance interval: 5 years)
	Watchdog	• Yes (max. 60 V < 2 A)
	Diagnosis	• Alphanumeric diagnosis display • Status LEDs
Operating system	Real-time operating system	• VxWorks
Programming languages	Programming languages IEC 61131-3	• Instruction list (IL) • Ladder diagram (LD) • Function block diagram (FBD) • Sequential function chart (SFC) • Structured text (ST) • Continuous function chart (CFC)
Interfaces	Serial interfaces	• COM1: RS232 (**X17**) • COM2: RS485 (**X18**)
	Network connection	• Ethernet (10/100 Base-T) (**X10**)
	Field bus connection	• PROFIBUS DP Master/Slave (12 MBaud) (**X20**) and • CAN (2.0A) or CANopen (**X19**) • DeviceNet Slave (cable adapter required) • EtherNet/IP Slave (optional hardware module required) • EtherNet/IP Scanner (optional hardware module required)
	Real-time bus interface	• SERCOS interface (16 MBaud) (**X14**, **X15**)
	PacNet interface	• 2 PacNet interfaces (**X12**, **X13**)
	Master encoder interface	• 1 SinCos master encoder or • 1 incremental master encoder (**X11**)
	HMI interface	• RS485 (Modbus or PROFIBUS DP) • HMI software tools: OPC server (for Windows NT/2000/XP or Windows CE)

Designation	Parameters	Value
	Diagnostic interface for remote maintenance	• Modem
	Communications protocols	• http • ftp • SMTP (E-Mail)
	integrated trace recorder (software oscilloscope)	• 8 channels, resolution 1 ms
	Integrated data logger for diagnostic messages	• 27 kB
Output	Actuator power	• 99 servo axes with all SERCOS cycle times • Max. of 255 parallel motion profiles possible
	SPS output	• Time for 1000 Bit instructions: 4 µs • unlimited number of PLC processes • Type of PLC processes: 　- continuous, 　- periodic or 　- event-controlled • Cycle time fast task: 250 µs • Nominal I/O response time: 500 µs (read in data, process, set output)
Cam Switch Group	Cam switch group	• Max. 256 cam switches • Dynamic switch group • Outputs: Memory or digital outputs • Inputs: external master encoder, virtual master encoder, axis position • Processing time: 250 µs
I/Os	Digital inputs (X3)	• Number: 20 (IEC61131-2 type 1) • Range U_{IN} 0 Voltage: DC 0 ... 6 V • Range U_{IN} 1 Voltage: DC 20 ... 33 V • Input current: I_{IN} = 5 mA at U_{IN} = 24 V • Polarized: yes • Input filter: 1 or 5 ms can be parameterized
	analog inputs (X5)	• Number: 2 • Range U_{IN}: -10 ... 10 V; resolution 12 Bit, 5 mV (resistor 100 kOhm) or • Range I_{IN}: 0 ... 20 mA; Resolution 12 Bit (5 µA Resistance 500 Ohm)
	Interrupt inputs (X4)	• Number: 4 (IEC61131-2 type 1) • Range U_{IN} 0 Voltage: DC 0 ... 6 V • Range U_{IN} 1 Voltage: DC 20 ... 33 V • Input current: I_{IN} = 5 mA at U_{IN} = 24 V • Polarized: yes • Input filter: 0.1 or 1 ms can be parameterized

Designation	Parameters	Value
	Touchprobe inputs (X4)	• Number: 16 (IEC61131-2 type 1) • Range U_{IN} 0 Voltage: DC 0 ... 6 V • Range U_{IN} 1 Voltage: DC 20 ... 33 V • Input current: I_{IN} = 5 mA at U_{IN} = 24 V • Polarized: yes • Input filter TP0 to TP15: 100 µs resolution TP0 to TP15: 10 µs at a cycle time of 1, 2, 4 ms
	Digital outputs (X2)	• Number: 16 (IEC61131-2 type 1) • Output voltage: (+UL-3 V) < U_{OUT} < +UL • Rated current: I_e = 250 mA per output • Start-up current: I_{emax} < 2 A for 1 s • Leakage current 0 signal: < 0.4 mA • Transmission time: 100 µs • Short-circuit proof: yes • Supply outlet: DC 24 V (-15% / +25%) / 3 A
	Analog outputs (X5)	• Number: 2 • Range U_{OUT}: -10 ... 10 V • Resolution 12 Bit (5 mV) • Load > 5 kOhm (max. offset < +/-75 mV)
	Additional digital and analog I/Os	• Via field bus • Max. 3,584 bytes digital/analog inputs and • Max. 3,584 bytes digital/analog outputs • Max. number of stations: 126 (PROFIBUS)
	Additional fast digital I/OS	• Via PacNet • Max. 128 inputs and 128 outputs
	Additional Touchprobe inputs	• Via PacNet • Max. 128 Touchprobe inputs
Power supply	Power supply unit	• DC 24 V (-15% / +25%) / max. 3.0 A without UPS and 4.5 A with UPS
	Power consumption	• Max. 85 W
	Uninterruptible Power Supply (UPS)	• Internal, optional (maintenance interval 3 years)
Dimensions and ambient conditions	Dimensions packaging	• Width: 130 mm • Height 400 mm • Depth: 300 mm For further information (see 7.3 Dimensions).
	Weight (weight with packaging)	• 3,5 kg (4,1 kg)

	Ambient conditions	• Protection class: IP 20
		• Ambient temperature:
		  – +5...+55 °C (Operating temperature without UPS)
		  – +5...+40 °C (Operating temperature with UPS)
		  – -25...+70 °C (Storage and transport without UPS)
		  – -25...+50 °C (Storage and transport without UPS)
		• Isolation class: degree of pollution 2, no thawing
		• Relative humidity: 5% ... 85% climatic category 3K3 EN 60 721

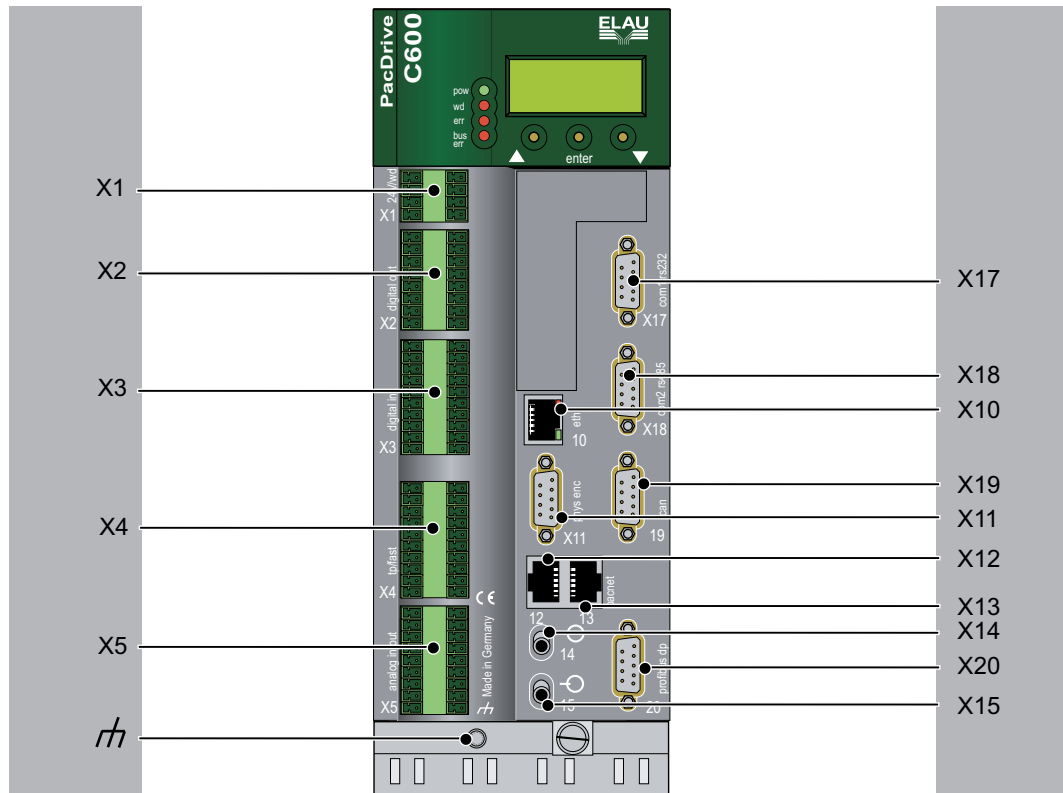| Designation	Parameters	Value
Approval		CE, UL , cUL

7.2 Electrical connections

Figure 7-1: Connection overview - PacDrive Controller C600

Connection	Meaning	max. terminal cross-section [mm²]/	[AWG]
X1	Control voltage/ Watchdog	1.50 mm²	28 - 16
X2	Digital outputs	1.50 mm²	28 - 16
X3	Digital inputs	1.50 mm²	28 - 16
X4	Touchprobe and fast digital inputs	1.50 mm²	28 - 16
X5	Analog inputs/outputs	1.50 mm²	28 - 16
X10	Ethernet connection	-	-
X11	Master encoder (SinCos)	0.25 mm²	-
X11	Master encoder (incremental)	0.25 mm²	-
X12/X13	PacNet	-	-
X17	Com 1 (RS232)	0.25 mm²	-
X18	Com 2 (RS485)	0.25 mm²	-
X19	CAN	0.25 mm²	-
X20	PROFIBUS db	0.25 mm²	-
⏚	Shielded connector	-	-

X1 - Control voltage and watchdog

```
1   5
4   8
```

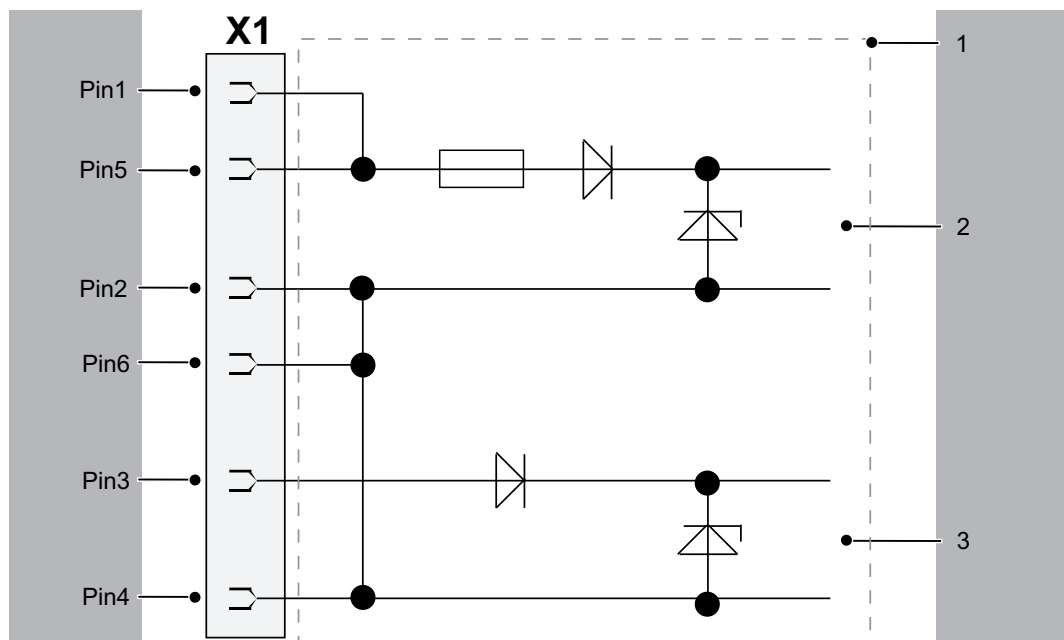| Pin	Designation	Meaning	Range
1	DC +24 V	Supply voltage	- 15 % / +25 %
2	DC 0 V	Supply voltage	
3	+UL	For digital outputs	DC +24 V -15 % / +25 %
4	L0	For digital inputs/outputs	
5	DC +24 V	Supply voltage (with pin 1 bridged, max. ampacity 4A)	-15 % / +25 %
6	DC 0 V	Supply voltage (with pin 2 bridged, max. ampacity 4A)	
7	WD	Watchdog relay	
8	WD	Watchdog relay	

Figure 7-2: Electrical connections C400/C600/P600 / X1 input connection

|	
1	Internal wiring diagram - input connection of power supply (simplified)
2	Internal supply voltage
3	Supply voltage for digital outputs/inputs

⚠ CAUTION

SWITCHING OFF THE CONTROL VOLTAGE.

- Use a UPS.
- Switch off PacDrive Controller control voltage without USP only when all files are closed.
- Refer also to the EPAS-4 online help function *SysShutdown()*.

Loss of data or damage to Flash Disk possible.

X2 - Digital outputs
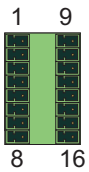
Pin	Designation	Meaning	Range
1	O.00	Digital output 1	DC 20 ... 30 V
2	O.01	Digital output 2	DC 20 ... 30 V
3	O.02	Digital output 3	DC 20 ... 30 V
4	O.03	Digital output 4	DC 20 ... 30 V
5	O.04	Digital output 5	DC 20 ... 30 V
6	O.05	Digital output 6	DC 20 ... 30 V
7	O.06	Digital output 7	DC 20 ... 30 V
8	O.07	Digital output 8	DC 20 ... 30 V
9	O.08	Digital output 9	DC 20 ... 30 V
10	O.09	Digital output 10	DC 20 ... 30 V
11	O.10	Digital output 11	DC 20 ... 30 V
12	O.11	Digital output 12	DC 20 ... 30 V
13	O.12	Digital output 13	DC 20 ... 30 V
14	O.13	Digital output 14	DC 20 ... 30 V
15	O.14	Digital output 15	DC 20 ... 30 V
16	O.15	Digital output 16	DC 20 ... 30 V

*Table 7-1: Electrical connections C400/C600/P600 - X2*

X3 - Digital inputs
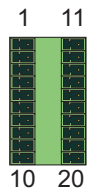
Pin	Designation	Meaning	Range
1	I.00	Digital input 0	DC 20 ... 30 V
2	I.01	Digital input 1	DC 20 ... 30 V
3	I.02	Digital input 2	DC 20 ... 30 V
4	I.03	Digital input 3	DC 20 ... 30 V
5	I.04	Digital input 4	DC 20 ... 30 V
6	I.05	Digital input 5	DC 20 ... 30 V
7	I.06	Digital input 6	DC 20 ... 30 V
8	I.07	Digital input 7	DC 20 ... 30 V
9	I.08	Digital input 8	DC 20 ... 30 V
10	I.09	Digital input 9	DC 20 ... 30 V
11	I.10	Digital input 10	DC 20 ... 30 V
12	I.11	Digital input 11	DC 20 ... 30 V
13	I.12	Digital input 12	DC 20 ... 30 V
14	I.13	Digital input 13	DC 20 ... 30 V
15	I.14	Digital input 14	DC 20 ... 30 V
16	I.15	Digital input 15	DC 20 ... 30 V
17	I.16	Digital input 16	DC 20 ... 30 V
18	I.17	Digital input 17	DC 20 ... 30 V
19	I.18	Digital input 18	DC 20 ... 30 V
20	I.19	Digital input 19	DC 20 ... 30 V

*Table 7-2: Electrical connections C400/C600/P600 - X3*

X4 - Touchprobe and fast digital inputs
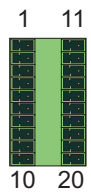
Pin	Designation	Meaning	Range
1	T.00	Touchprobe input 0	DC 20 ... 30 V
2	T.01	Touchprobe input 1	DC 20 ... 30 V
3	T.02	Touchprobe input 2	DC 20 ... 30 V
4	T.03	Touchprobe input 3	DC 20 ... 30 V
5	T.04	Touchprobe input 4	DC 20 ... 30 V
6	T.05	Touchprobe input 5	DC 20 ... 30 V
7	T.06	Touchprobe input 6	DC 20 ... 30 V
8	T.07	Touchprobe input 7	DC 20 ... 30 V
9	T.08	Touchprobe input 8	DC 20 ... 30 V
10	T.09	Touchprobe input 9	DC 20 ... 30 V
11	T.10	Touchprobe input 10	DC 20 ... 30 V
12	T.11	Touchprobe input 11	DC 20 ... 30 V
13	T.12	Touchprobe input 12	DC 20 ... 30 V
14	T.13	Touchprobe input 13	DC 20 ... 30 V
15	T.14	Touchprobe input 14	DC 20 ... 30 V
16	T.15	Touchprobe input 15	DC 20 ... 30 V
17	F.00	Fast input 1	DC 20 ... 30 V
18	F.01	Fast input 2	DC 20 ... 30 V
19	F.02	Fast input 3	DC 20 ... 30 V
20	F.03	Fast input 4	DC 20 ... 30 V

Table 7-3: Electrical connections C400/C600/P600 - X4

1   11

10   20

X5 - analog inputs/outputs
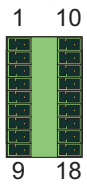
Pin	Designation	Meaning	Range
1	AI.0 +	Analog input 0+	-10 ... +10 V [*] 0 ... 20 mA [**]
2	J.0 +	Br. current input 0 +	
3	AI.0 -	Analog input 0-	
4	A.GND 0	Analog ground 0	
5	12 V Out 0	Output voltage 0	12 V
6	PE	Shield	
7	AO.0	Analog output 0	-10 ... +10 V
8	A.GND AO.0	Analog ground 0	
9	PE	Shield	
10	AI.1 +	Analog input 1+	-10 ... +10 V [*] 0 ... 20 mA [**]
11	J.1 +	Br. current input 1 +	
12	AI.1 -	Analog input 1-	
13	A.GND 1	Analog ground	
14	12 V Out 1	Output voltage 1	12 V
15	PE	Shield	
16	AO.1	Analog output 1	-10 ... +10 V
17	A.GND AO.1	Analog ground	
18	PE	Shield	

[*] Voltage metering and [**] current measurement on AI.0+ / AI.0- (Pin 1 / Pin 3) and AI.1+ / AI.1- (Pin 10 / Pin 12)

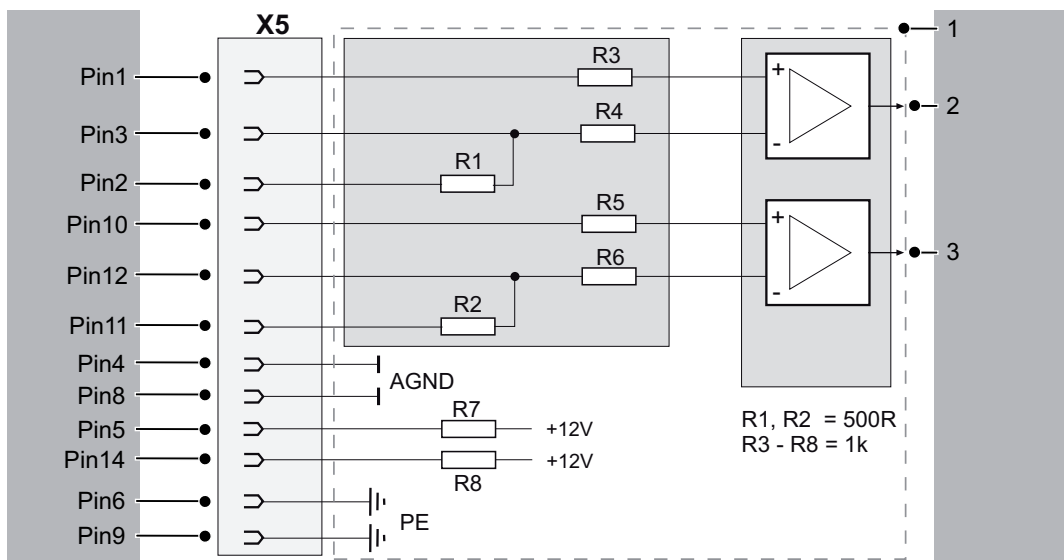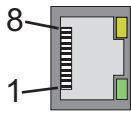[**] Current measurement by bridging to J.0+ (Pin 2) or. J.1+ (Pin 11), refer also to following figure.

Figure 7-3: Electrical connections C400/C600/P600 / X5 input connection

1	Internal wiring diagram - input connections for analog inputs (simplified)
2	Analog Input 1
3	Analog Input 2

X10 - Ethernet

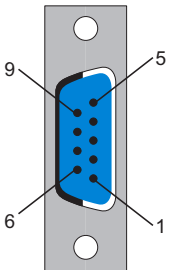| Pin	Designation	Meaning	Range
1	Tx+	OutputTransmitData+	
2	Tx-	OutputTransmitData-	
3	Rx+	InputReceiveData+	
4	-	(PE)	
5	-	(PE)	
6	Rx-	InputReceiveData-	
7	-	(PE)	
8	-	(PE)	

Table 7-4: Electrical connections X10

Depending on the application, you will need different cables to connect the PacDrive Controller via the RJ-45 outlet.

Component A	Component B	required cable
PacDrive Controller	"Firm network" with RJ-45	commercially available patch cable
PacDrive Controller	Hub	commercially available patch cable
PacDrive Controller	PC	crossed RJ-45 network cable

▶ In case of doubt, ask your network administrator.

X11 - Master encoder (SinCos)

Pin	Designation	Meaning	Range
1	REFSIN	Reference Signal Sinus	
2	SIN	Sinus trace	
3	REFCOS	Reference Signal Cosinus	
4	COS	Cosinus trace	
5	+9 V	Supply voltage	
6	RS485-	Parameter channel -	
7	RS485+	Parameter channel +	
8	SC_SEL	Master encoder plugged in (bridge to GND)	
9	GND	Supply voltage	

Table 7-5: Electrical connections C400/C600/P600 - X11

X11 - Master encoder (incremental)
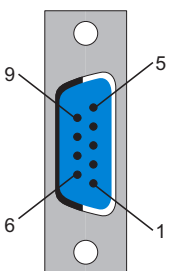
Pin	Designation	Meaning	Range
1	_UA	Track A	
2	UA	Track A	
3	_UB	Track B	
4	UB	Track B	
5	+5 V	Supply voltage	
6	_UO	Track O	
7	UO	Track O	

Pin	Designation	Meaning	Range
8	-	-	
9	GND	Ground	

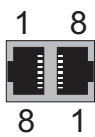*Table 7-6: Electrical connections C400/C600/P600 - X11*

| ⚠ CAUTION |
|---|
| **PLUGGING IN/OUT THE MASTER ENCODER PLUG WHEN SWITCHED ON!** |
| • Only unplug or plug the master encoder when de-energized (disconnect controller from the 24 V supply voltage!). |
| **Damage to master encoder possible!** |

X12/13 - PacNet

Pin	Designation	Meaning	Range
1	TxD+	OutputTransmitData+	
2	TxD-	OutputTransmitData-	
3	RxD+	InputReceiveData+	
4	TxC-	OutputTransmitClock-	
5	TXC+	OutputTransmitClock+	
6	RxD-	InputReceiveData-	
7	RxC+	InputReceiveClock+	
8	RxC-	InputReceiveClock-	

*Table 7-7: Electrical connections C400/C600/P600 - X12, X13*

| CAUTION |
|---|
| Only use approved PacNet cables for the PacNet connection to avoid malfunctions. |

X17 - Com 1 (RS 232)
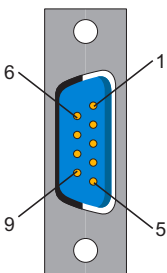
Pin	Designation	Meaning	Range
1	DCD	Data Carrier Detect	
2	RxD	Receive Data	
3	TxD	Transmit Data	
4	DTR	Data Terminal Ready	
5	GND	Signal Ground	
6	DSR	Data Set Ready Clear To Send	
7	RTS	Request To Send	
8	CTS	Clear To Send	
9	RI	Ring Indicator	

Table 7-8: Electrical connections C400/C600/P600 - X17

X2 - Com 2 (RS485)
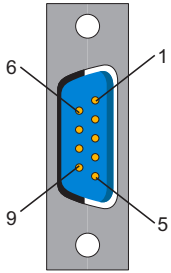
Pin	Designation	Meaning	Range
1	+5 VM	Supply voltage	
2	TxD-	RS485 Transmit -	
3	TxD+	RS485 Transmit+	
4	RxD+	RS485 Receive +	
5	RxD-	RS485 Receive -	
6	GNDR	GND receive RS485	
7	-	reserved	
8	GNDM	Supply voltage	
9	GNDR	GND receive RS485	

Table 7-9: Electrical connections C400/C600/P600 - X18

X19 - CAN
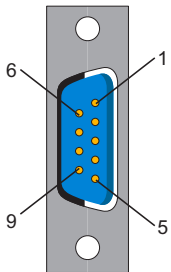
Pin	Designation	Meaning	Range
1	-	reserved	
2	CAN_L	Bus line (low)	
3	GND	Ground	
4	-	reserved	
5	-	reserved	
6	-	reserved	
7	CAN_H	Bus line (high)	
8	-	reserved	
9	-	reserved	

Table 7-10: Electrical connections C400/C600/P600 - X19
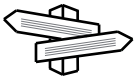
An adapter is required to connect to DeviceNet, see order numbers.

X20 - profibus db
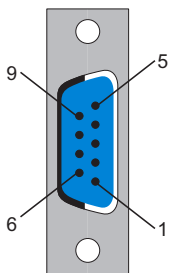
Pin	Designation	Meaning	Range
1	PE	Shield	
2	-	reserved	
3	RxD / TxD -P	Data -P	
4	CNTR-P	Control signal P	
5	DGND	Signal ground	
6	VP	Supply voltage	
7	-	reserved	
8	RxD / TxD -N	Data -N	
9		reserved	

Table 7-11: Electrical connections C400/C600/P600 - X20

Connector

A PROFIBUS connector must be used to connect to the 9 pole PROFIBUS outlet because the bus terminal resistors are in this connector. The possible PROFIBUS connectors with different cable outlets are illustrated below.
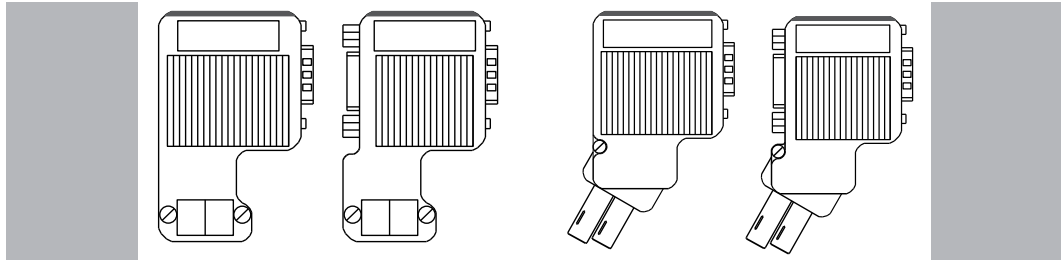

Figure 7-4: PROFIBUS connector

Bus terminal resistors

For the first and last bus nodes, the terminal resistors must be switched on. Otherwise data transmission will not function properly.
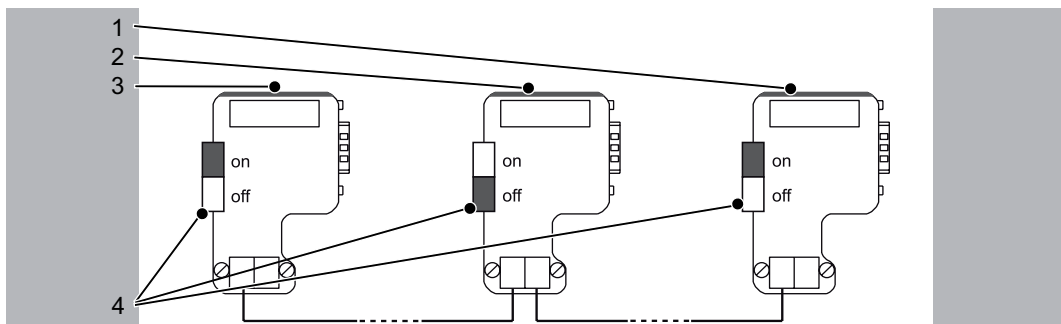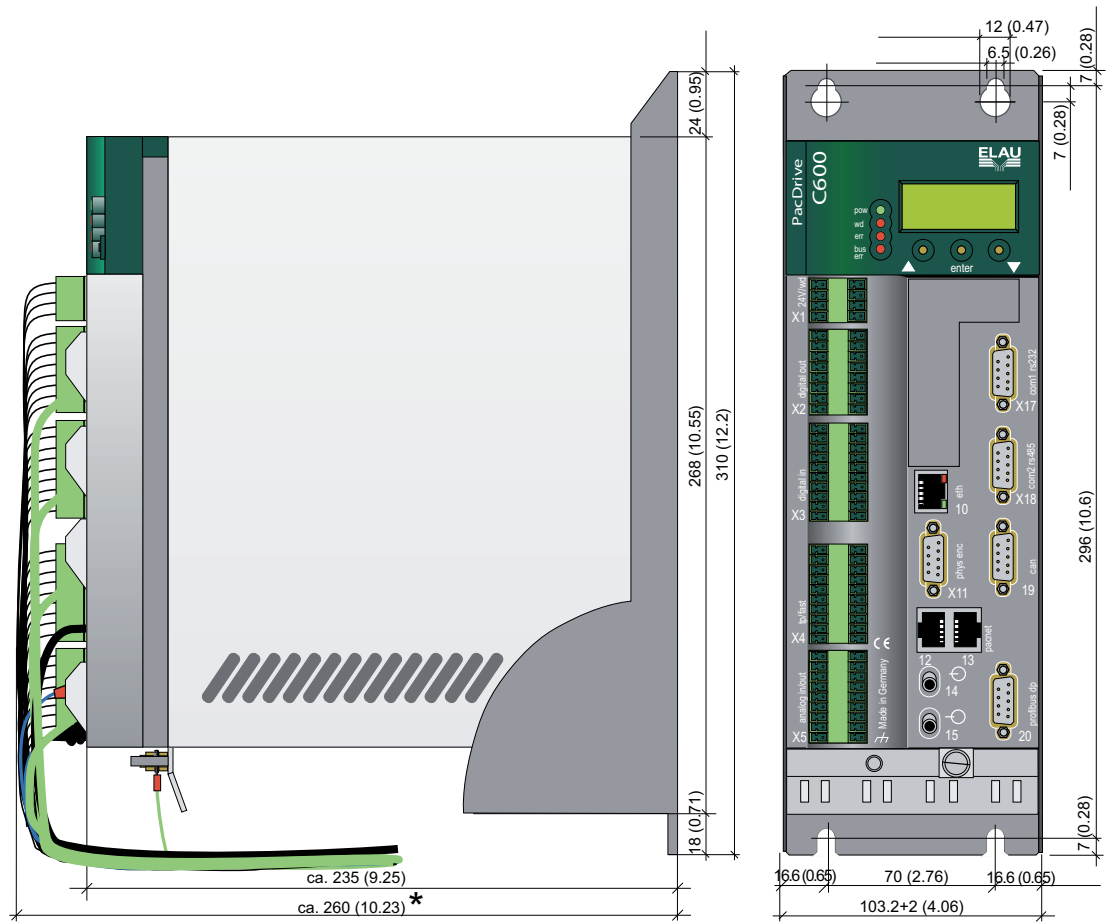The shielding must be applied generously and on both sides.

Figure 7-5: Position of the bus terminal resistors

1	Last bus slave
2	nth bus slave
3	First bus slave
4	Bus terminator

7.3 Dimensions

8   Retroactive installation of UPS

The PacDrive Controllers C400, C600 and P600 can be fitted with an internal battery pack for an uninterruptible power supply.
It is continually charged via the power supply of the controller during operation.

The function of the battery pack is to maintain the power supply to the controller in the event of a power failure long enough to shut down the controller properly and not loose any data. The preset time of a shutdown can be up to 5 minutes.
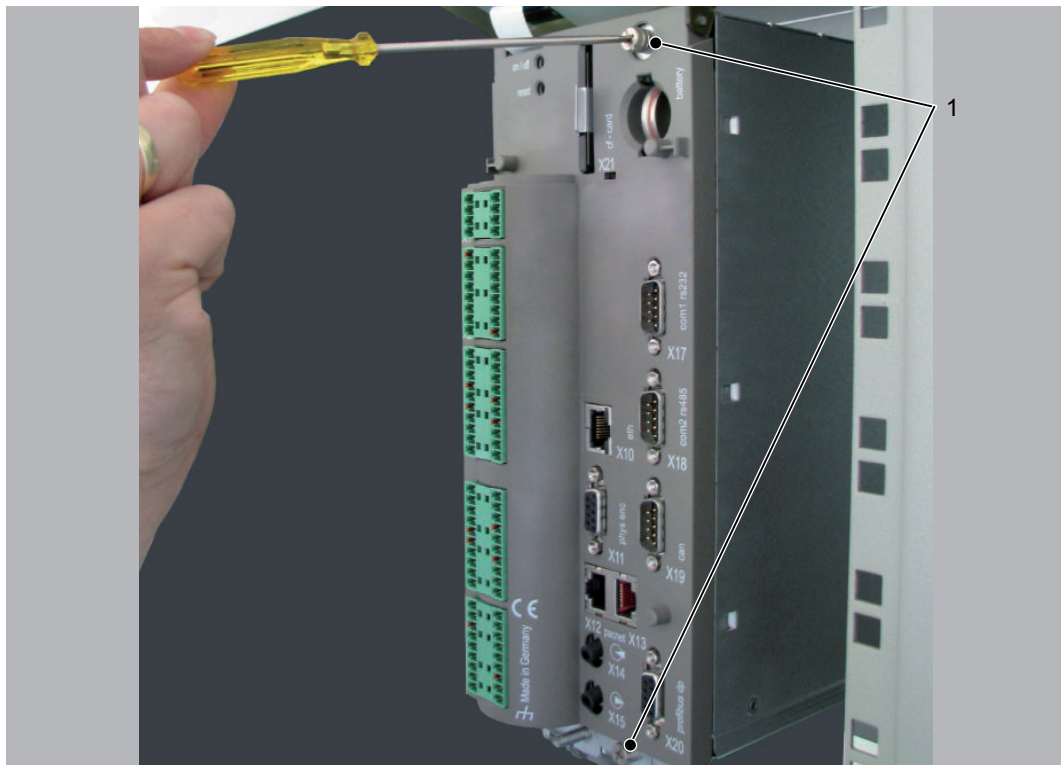
If necessary, the battery pack can also be installed or replaced after the fact for the UPS, see Retroactive installation of UPS.

How to open the controller:

Preparation ▶ Open main switch.
▶ Prevent main switch from being switched back on.
▶ Lift up the PacDrive Controller operating cover.
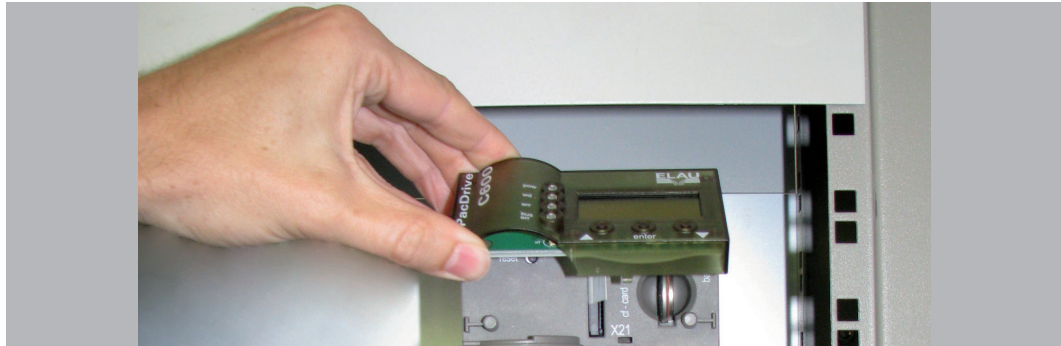
▶ Undo the two fastening screws on the front of the controller **(1)**.

▶ Then remove the electronic module from housing.

⚠ CAUTION
IMPROPER HANDLING OF ELECTRONIC COMPONENTS
•   Always comply with the ESD regulations when opening the PacDrive Controller.
Destruction of and/or damage to electronic components through static charge

How to connect the battery:

▶   Adjust the battery pack and attach with the 2 cable ties (1).

⚠ CAUTION
BATTERY PACK NOT PROPERLY SECURED
•   Only use the supplied cable ties to secure the battery pack (Item no. 53130050).   •   Check that the battery pack is properly secured.
Mechanical damage of PacDrive Controller

▶   Connect battery cable (2).

The maintenance interval for replacing the battery is 3 years. Once this period has gone by the battery pack must be replaced.

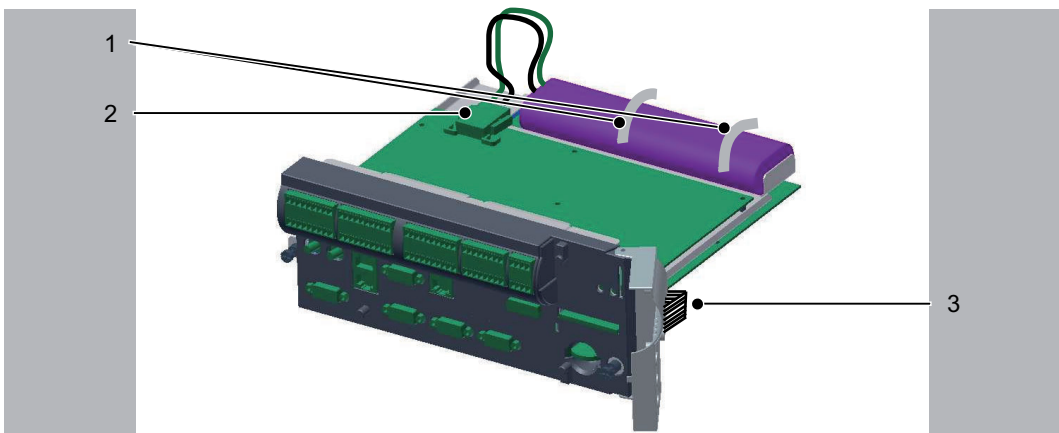| ⚠ CAUTION |
| --- |
| **WRONG INSTALLATION OF THE ELECTRONIC MODULE** |
| •   Watch out that during the installation of the electronic module the display supply cable (3) does not get caught or torn. |
| **Damage to display supply cable** |

Figure 8-1: PacDrive Controller UPS installation

1	Cable ties
2	Battery cable
3	Display supply cable

How to connect the controller:

▶   Carefully push the electronic module of the controller back into the housing.
▶   Tighten the two fastening screws to the front of the controller.
▶   Close operating cover.

▶   See chapter on how to charge battery.

9   Optional module

We recommend that only an ELAU expert installs the optional module.

9.1   Optional module OM-NE

9.1.1   General

The OM-NE module is a general communication module which features two outward Ethernet connectors to realize Ethernet protocols.
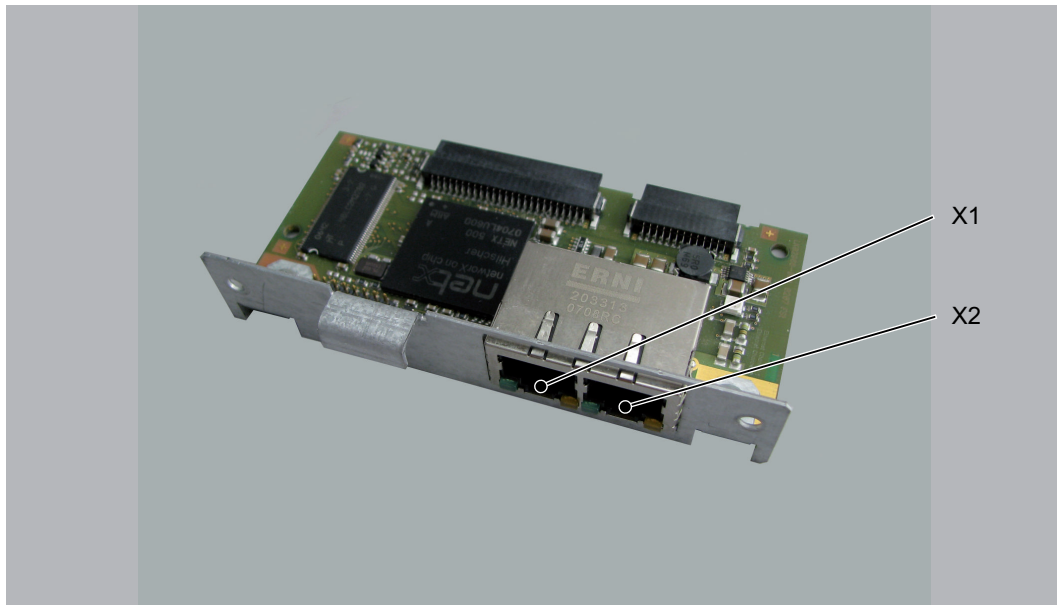

Figure 9-1: OM-NE module with slot assignment

X1	Ethernet connection X1 (RTeth P1)
X2	Ethernet connection X2 (RTeth P2)

Following installation steps, and the controller automatically detects the optional module. Then configure it by using the control configuration in EPAS-4.

IEC POUs for using the EtherNet/IP scanners can be found in the **"IEC Library "System" > Fieldbus > EtherNet/IP Scanner"**
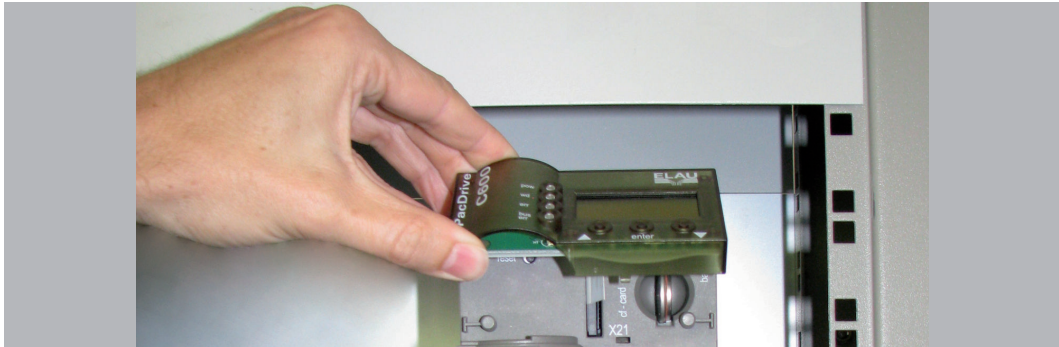
9.1.2   Mechanical installation

required tool
- C600 Front: cross slot max. PH2 alternative PH1; slot max. 1.2 x 7.0
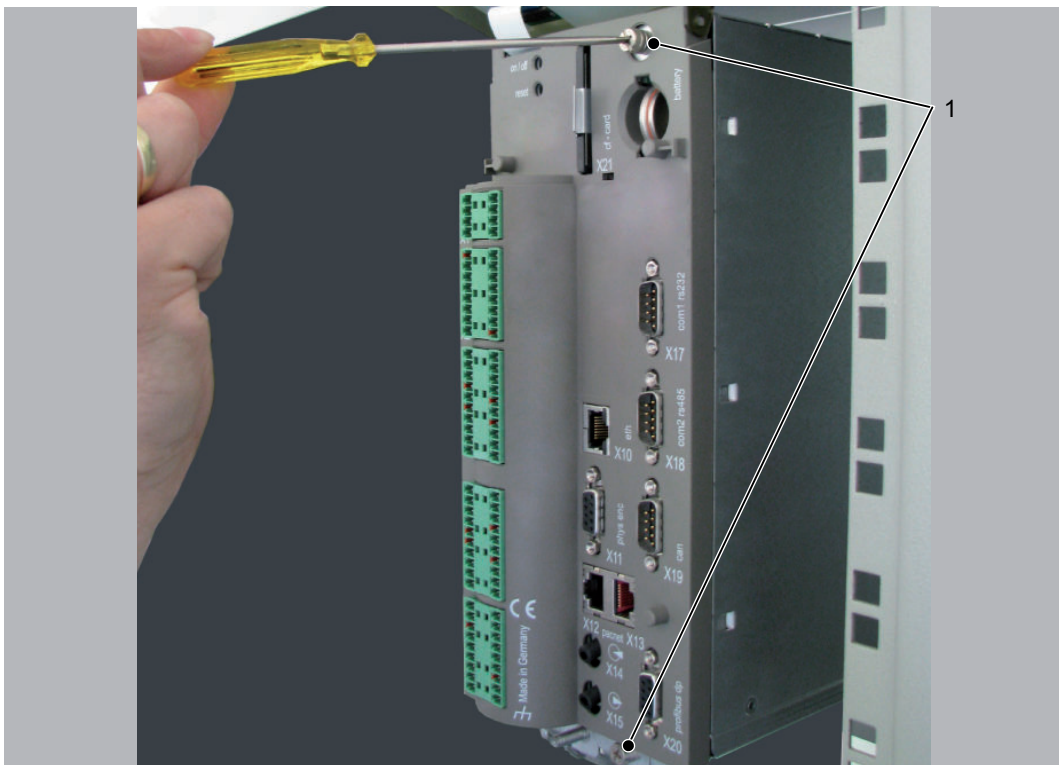- Backplane & blanking plates on the module sockets: cross slot max. PH1

How to open the controller:

Preparation ▶ Open main switch.

▸ Prevent main switch from being switched back on.
▸ Lift up the PacDrive Controller operating cover.

▸ Undo the two fastening screws on the front of the controller **(1)**.

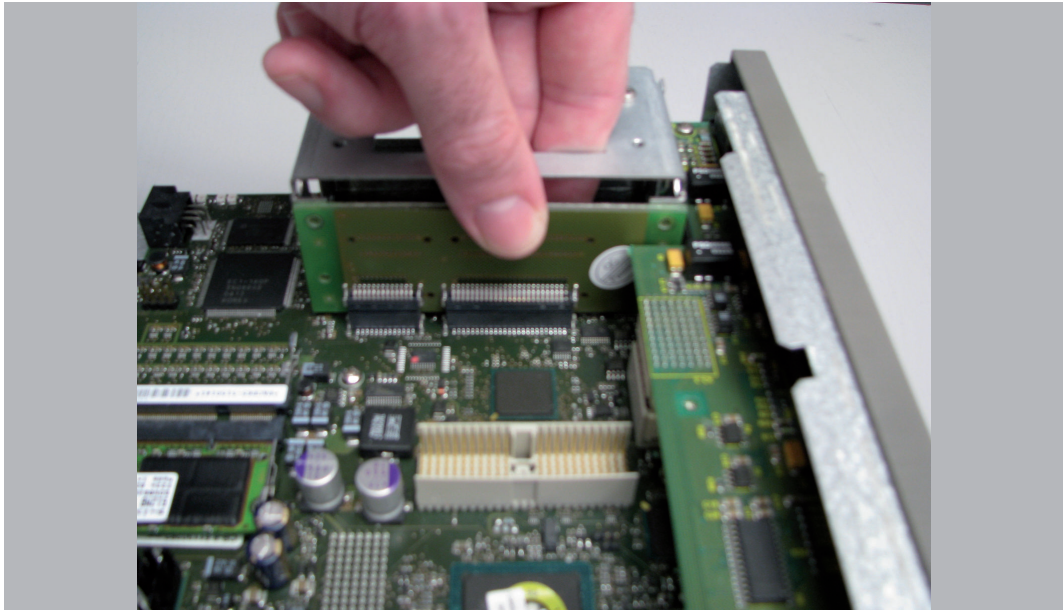▸ Then remove the electronic module from housing.

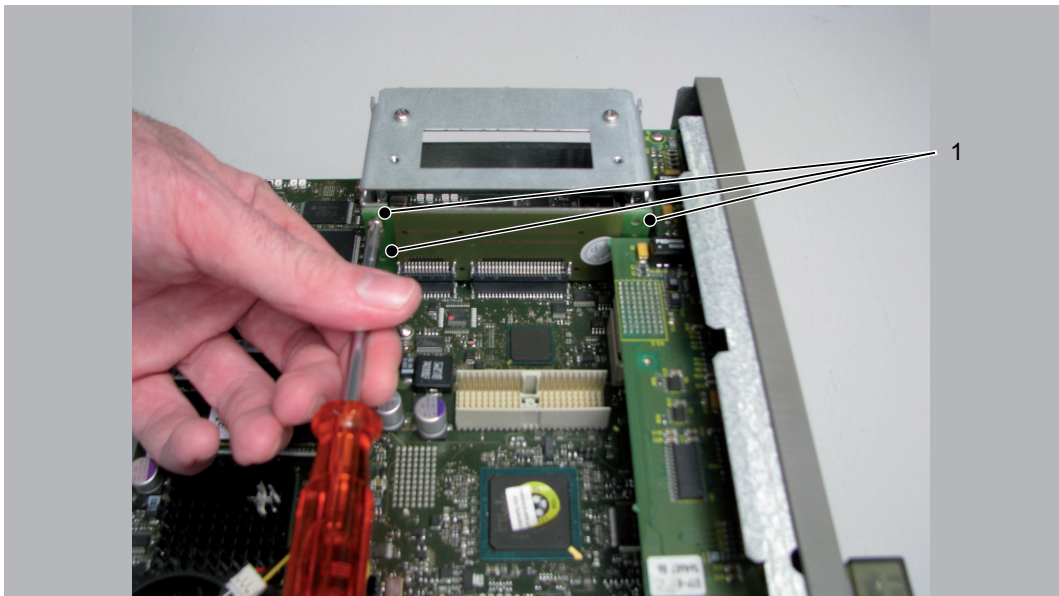| ⚠ CAUTION |
| --- |
| IMPROPER HANDLING OF ELECTRONIC COMPONENTS |
| • Always comply with the ESD regulations when opening the PacDrive Controller. |
| Destruction of and/or damage to electronic components through static charge |

Backplane   The backplane connects the optional module to the controller.

How to install the backplane:

▶   Insert backplane (BPL) on the rear of the module shaft into the controller board.
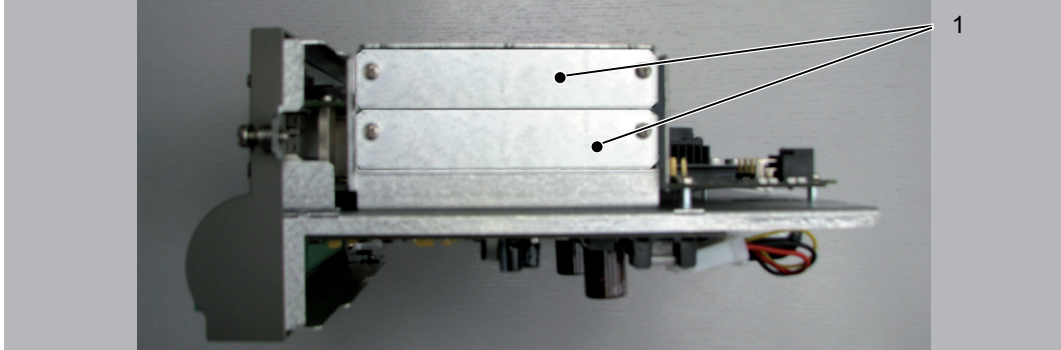

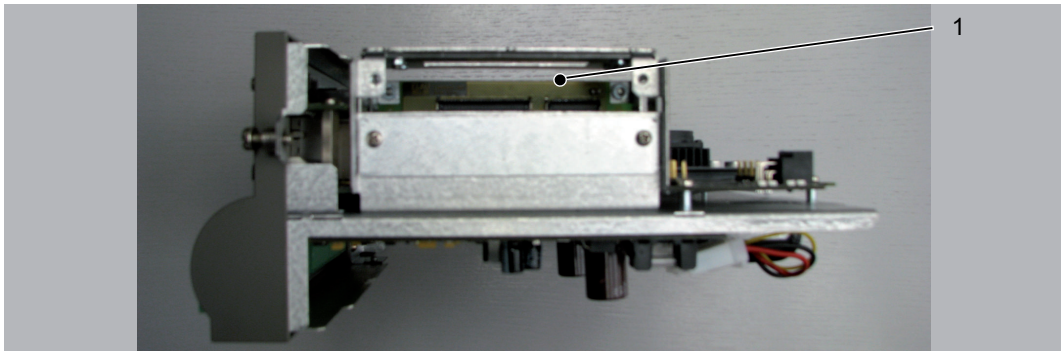▶   Screw on backplane to the three holes provided **(1)**.

How to install the optional module:

Installation
- The module is ready-to-use when delivered.
- You can plug the module into the module slot 1 or module slot 2.
- ▸ Select one of the two module slots **(1)** on the controller.

- ▸ Remove the module slot blanking plate.
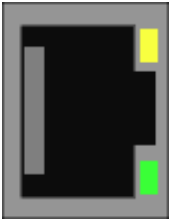- ▸ Insert the module into the open slot **(1)**.

- ▸ Screw module to module shaft with two M3x6 screws.
  - ✓ The module is now installed.

How to connect the controller:

- ▸ Carefully push the electronic module of the controller back into the housing.
- ▸ Tighten the two fastening screws to the front of the controller.
- ▸ Close operating cover.

9.1.3   Electrical connections

Pin	Designation	Meaning
1	Tx+	Transmit Data +
2	Tx-	Transmit Data -
3	Rx+	Receive Data +
4	-	reserved
5	-	reserved
6	Rx-	Receive Data -
7	-	reserved
8	-	reserved

Table 9-1: X1 - Ethernet outlet

Operate EtherNet/IP scanner only by using the connection X1 (RTeth P1). Connection X2 (RTeth P2) is reserved.
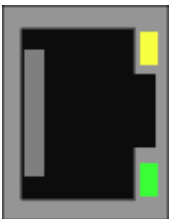
LED	Function
yellow	The Ethernet connection is intact.
green	Data transfer in progress.

9.2 Optional module OM-E

9.2.1 General

The OM-E EtherNet/IP module can cyclically exchange up to 255 Bytes I/O data with an EtherNet/IP scanner. In addition, further data may be exchanged asynchronously.
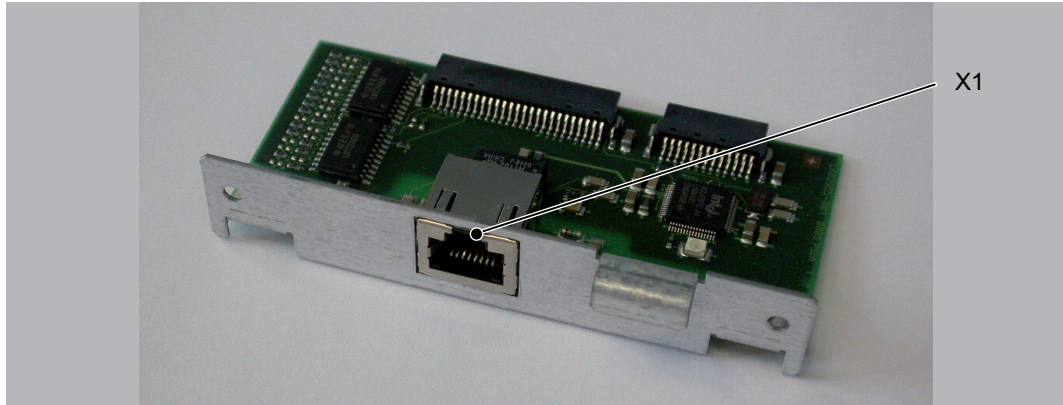
Figure 9-2: OM-E module with slot assignment

X1	Ethernet connection X1
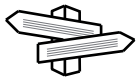
IEC POUs for using the EtherNet/IP adapter can be found in the **"IEC Library "System" > Fieldbus > EtherNet/IP Adapter"**

System requirements:

- PacDrive Controller C600
- PacDrive Firmware version >= V20 (recommended: >= V21)

Following installation steps, and the controller automatically detects the optional module. Then configure it by using the control configuration in EPAS-4.

9.2.2   Mechanical installation

required tool
- C600 Front: cross slot max. PH2 alternative PH1; slot max. 1.2 x 7.0
- Backplane & blanking plates on the module sockets: cross slot max. PH1

How to open the controller:

Preparation
- ▶ Open main switch.
- ▶ Prevent main switch from being switched back on.
- ▶ Lift up the PacDrive Controller operating cover.

- ▶ Undo the two fastening screws on the front of the controller **(1)**.

- ▶ Then remove the electronic module from housing.

⚠ CAUTION
IMPROPER HANDLING OF ELECTRONIC COMPONENTS
•   Always comply with the ESD regulations when opening the PacDrive Controller.
Destruction of and/or damage to electronic components through static charge

Backplane The backplane connects the optional module to the controller.

How to install the backplane:

▶ Insert backplane (BPL) on the rear of the module shaft into the controller board.

▶ Screw on backplane to the three holes provided **(1)**.

How to install the optional module:

Installation
- The module is ready-to-use when delivered.
- You can plug the module into the module slot 1 or module slot 2.
▶ Select one of the two module slots **(1)** on the controller.

▶ Remove the module slot blanking plate.
▶ Insert the module into the open slot **(1)**.

▶ Screw module to module shaft with two M3x6 screws.
  ✓ The module is now installed.

How to connect the controller:

▶ Carefully push the electronic module of the controller back into the housing.
▶ Tighten the two fastening screws to the front of the controller.
▶ Close operating cover.

9.2.3   Electrical connections
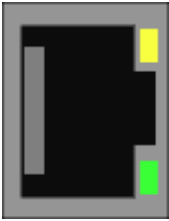
Pin	Designation	Meaning
1	Tx+	Transmit Data +
2	Tx-	Transmit Data -
3	Rx+	Receive Data +
4	-	reserved
5	-	reserved
6	Rx-	Receive Data -
7	-	reserved
8	-	reserved

Table 9-2: X1 - Ethernet outlet
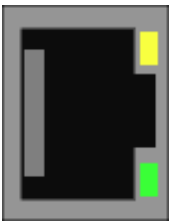
LED	Function
yellow	The Ethernet connection is intact.
green	Data transfer in progress.

9.3   Optional module OM-P

9.3.1   General

Another PROFIBUS interface is made available via the OM-P module.
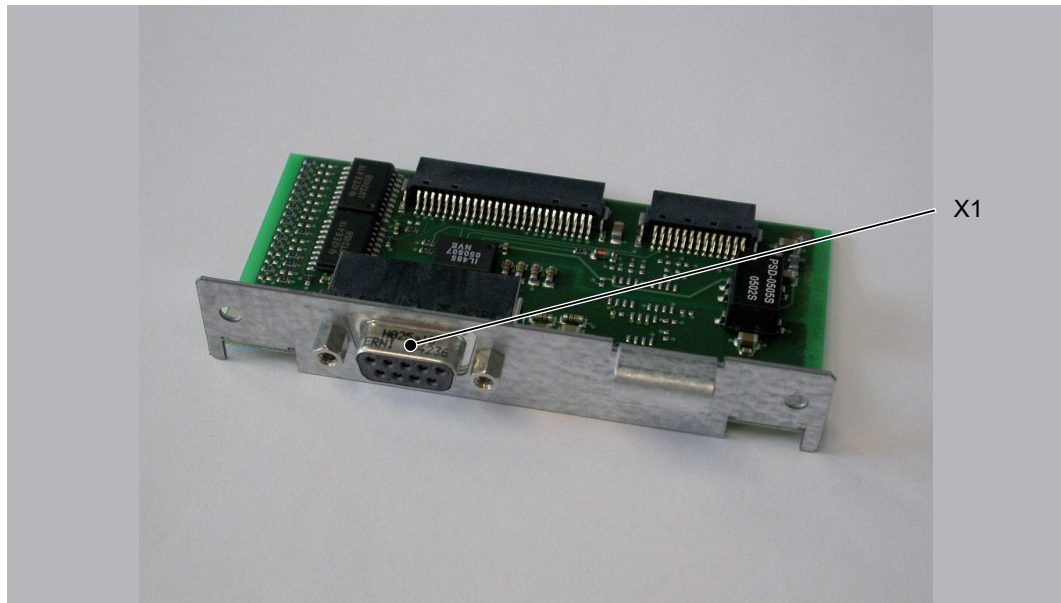
Following installation steps, and the controller automatically detects the optional module. Then configure it by using the control configuration in EPAS-4.

9.3.2   Mechanical installation

required •   C600 Front: cross slot max. PH2 alternative PH1; slot max. 1.2 x 7.0
tool •   Backplane & blanking plates on the module sockets: cross slot max. PH1

How to open the controller:

Preparation ▶   Open main switch.
　　　　　　 ▶   Prevent main switch from being switched back on.
　　　　　　 ▶   Lift up the PacDrive Controller operating cover.

　　　　　　 ▶   Undo the two fastening screws on the front of the controller **(1)**.

　　　　　　 ▶   Then remove the electronic module from housing.

⚠ CAUTION
IMPROPER HANDLING OF ELECTRONIC COMPONENTS
•   Always comply with the ESD regulations when opening the PacDrive Controller.
Destruction of and/or damage to electronic components through static charge

Backplane The backplane connects the optional module to the controller.

How to install the backplane:

▶ Insert backplane (BPL) on the rear of the module shaft into the controller board.
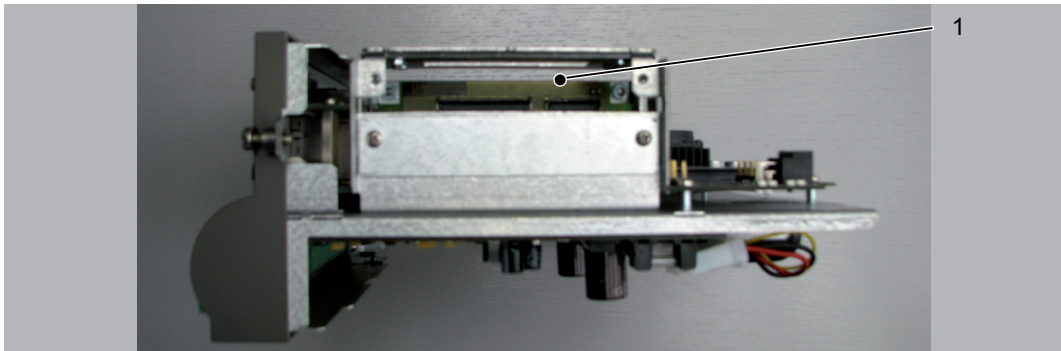

▶ Screw on backplane to the three holes provided **(1)**.

How to install the optional module:

Installation
- The module is ready-to-use when delivered.
- You can plug the module into the module slot 1 or module slot 2.
▶ Select one of the two module slots **(1)** on the controller.

▶ Remove the module slot blanking plate.
▶ Insert the module into the open slot **(1)**.

▶ Screw module to module shaft with two M3x6 screws.
 ✓ The module is now installed.

How to connect the controller:

▶ Carefully push the electronic module of the controller back into the housing.
▶ Tighten the two fastening screws to the front of the controller.
▶ Close operating cover.

9.3.3   Electrical connections
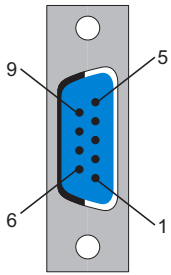
Pin	Designation	Meaning	Range	Max. cross section
1	PE	Shield		0.25 mm^2
2	-	reserved		0.25 mm^2
3	RxD / TxD -P	Data -P		0.25 mm^2
4	CNTR-P	Control signal P		0.25 mm^2
5	DGND	Signal ground		0.25 mm^2
6	VP	Supply voltage		0.25 mm^2
7	-	reserved		0.25 mm^2
8	RxD / TxD -N	Data N		0.25 mm^2
9		reserved		0.25 mm^2

Table 9-3: X1 - Profibus interface

9.4 Optional module OM-C

9.4.1 General

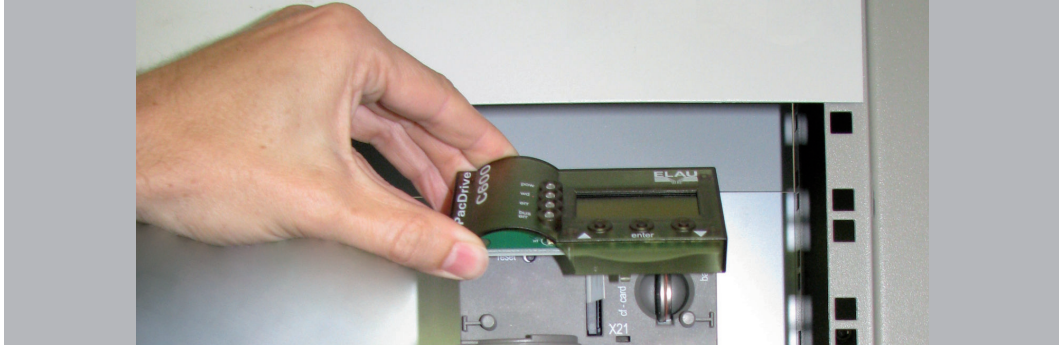Another CANBUS interface is made available via the OM-C module.

Following installation steps, and the controller automatically detects the optional module. Then configure it by using the control configuration in EPAS-4.
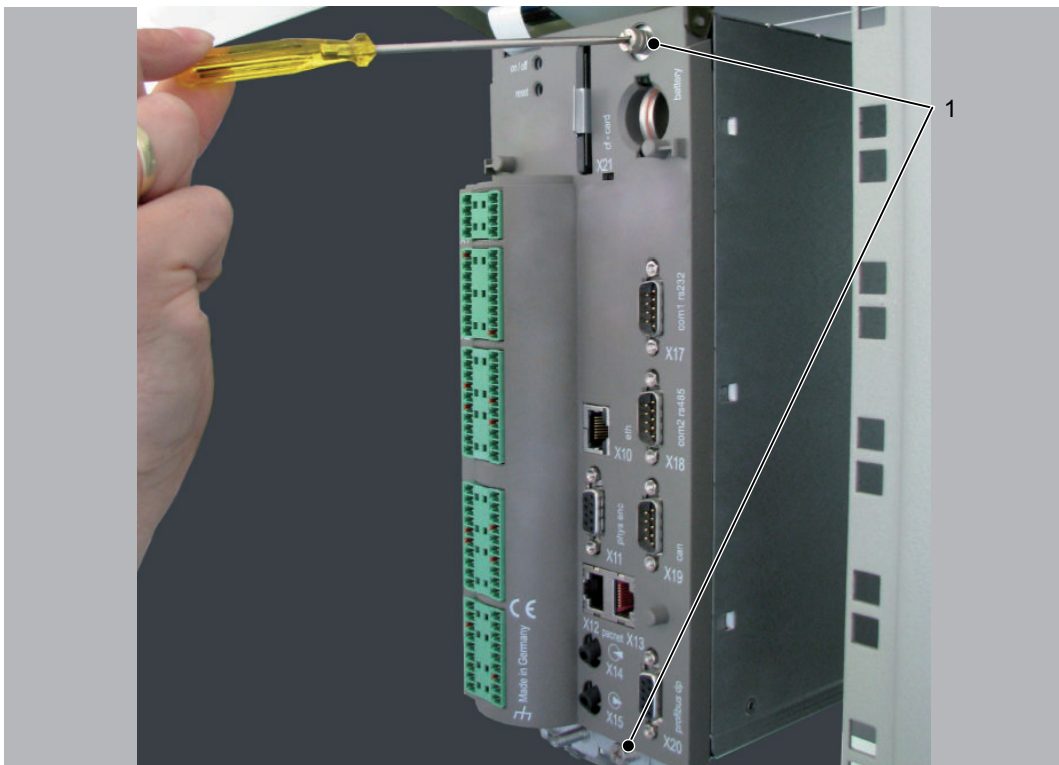
9.4.2 Mechanical installation

required tool
- C600 Front: cross slot max. PH2 alternative PH1; slot max. 1.2 x 7.0
- Backplane & blanking plates on the module sockets: cross slot max. PH1

How to open the controller:

Preparation
▶ Open main switch.
▶ Prevent main switch from being switched back on.
▶ Lift up the PacDrive Controller operating cover.

▶ Undo the two fastening screws on the front of the controller **(1)**.

▶ Then remove the electronic module from housing.
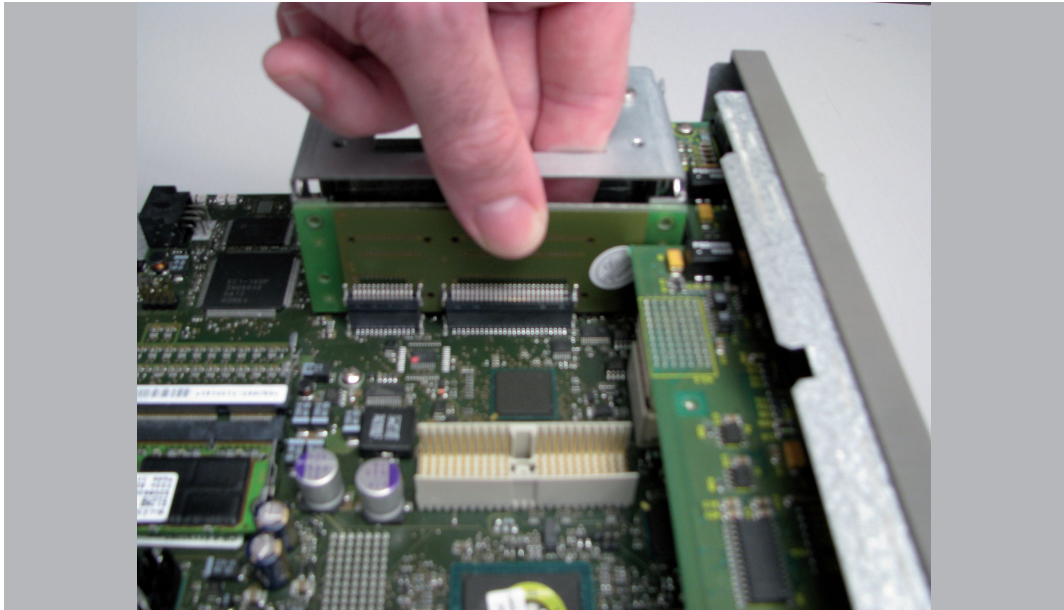
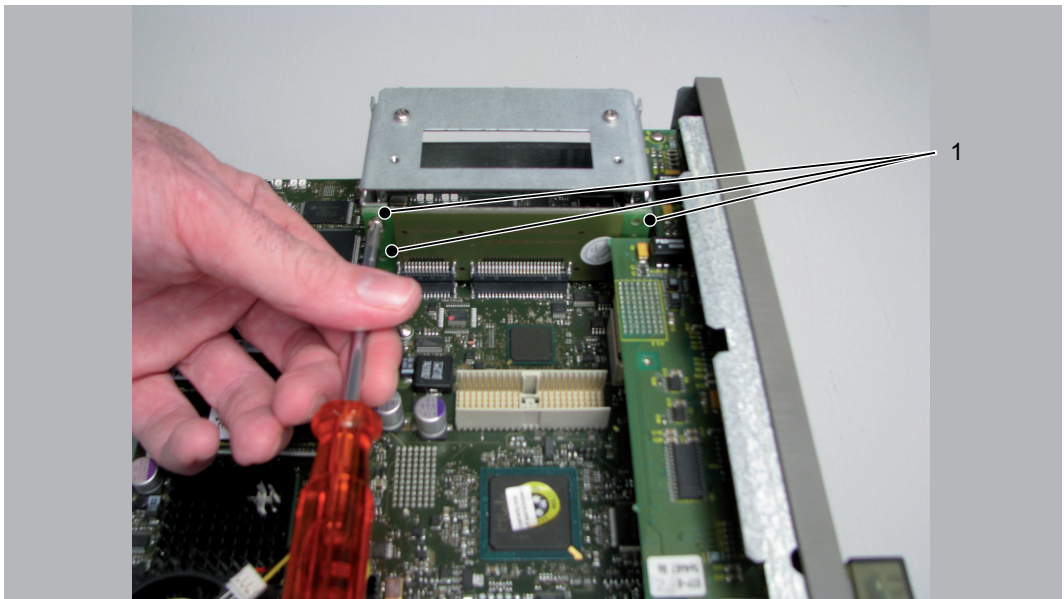| ⚠ CAUTION |
| --- |
| **IMPROPER HANDLING OF ELECTRONIC COMPONENTS** |
| •   Always comply with the ESD regulations when opening the PacDrive Controller. |
| Destruction of and/or damage to electronic components through static charge |

Backplane   The backplane connects the optional module to the controller.

How to install the backplane:

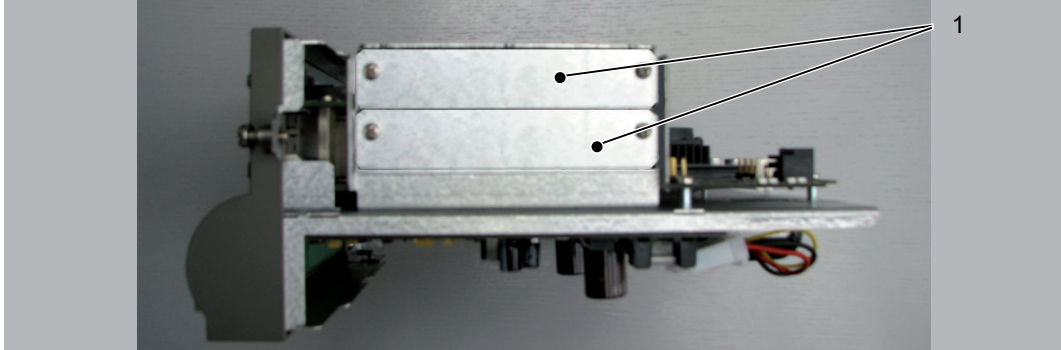▶   Insert backplane (BPL) on the rear of the module shaft into the controller board.

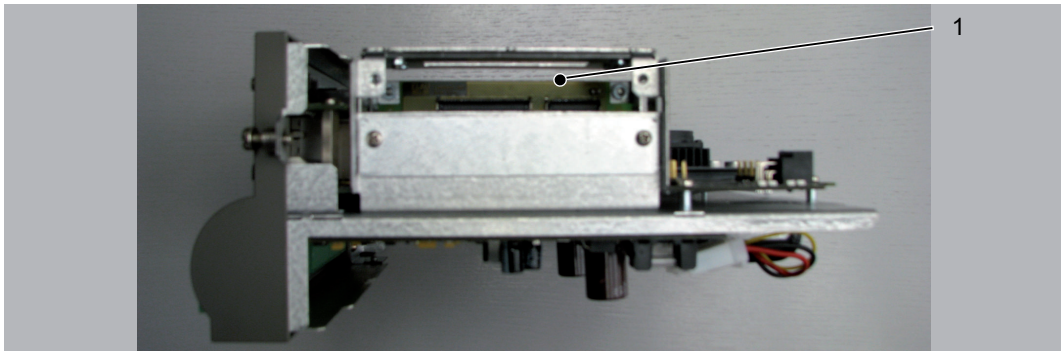

▶   Screw on backplane to the three holes provided **(1)**.

How to install the optional module:

Installation
- ▪ The module is ready-to-use when delivered.
- ▪ You can plug the module into the module slot 1 or module slot 2.
- ▶ Select one of the two module slots **(1)** on the controller.

- ▶ Remove the module slot blanking plate.
- ▶ Insert the module into the open slot **(1)**.

- ▶ Screw module to module shaft with two M3x6 screws.
  - ✓ The module is now installed.

How to connect the controller:

- ▶ Carefully push the electronic module of the controller back into the housing.
- ▶ Tighten the two fastening screws to the front of the controller.
- ▶ Close operating cover.
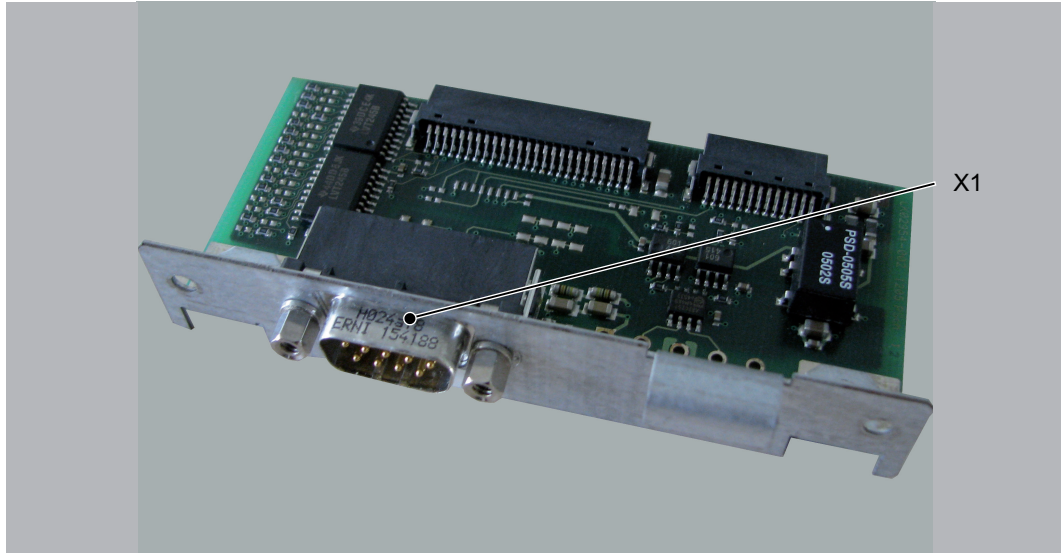
9.4.3   Electrical connections
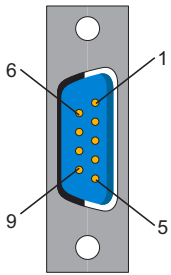
Pin	Designation	Meaning	Range	Max. cross section
1	-	reserved		0.25 mm^2
2	CAN_L	Bus line (low)		0.25 mm^2
3	GND	ground		0.25 mm^2
4	-	reserved		0.25 mm^2
5	-	reserved		0.25 mm^2
6	-	reserved		0.25 mm^2
7	CAN_H	Bus line (high)		0.25 mm^2
8	-	reserved		0.25 mm^2
9	EXVCC	ext. supply trans.		0.25 mm^2

Table 9-4: X1 - CANBUS interface

10 Appendix

10.1 Contact addresses

ELAU GmbH Deutschland

Dillberg 12 - 16
97828 Marktheidenfeld, Germany
Tel.: +49 (0) 9391 / 606 - 0
Fax: 09391/606-300
E-mail: info@elau.de
Internet: www.elau.de

ELAU GmbH Customer Service

Post office box 1255
97821 Marktheidenfeld, Germany
Tel.: +49 (0) 9391 / 606 - 142
Fax: +49 (0) 9391 / 606 - 340
E-mail: info@elau.de
Internet: www.elau.de
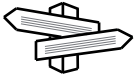
See the ELAU homepage (www.elau.de) for additional contact addresses.

10.2 Product training courses

We also offer a number of training courses about our products.

Our seminar leaders with several years of experience will help you take advantage of the extensive possibilities offered by the PacDrive™ System.

See the ELAU homepage (www.elau.de) for further information and our current seminar schedule.

10.3   Safety tests

The following safety checks for the PacDrive Controller are performed in production in accordance with EN 50178 / EN 60204-1:

Check for end-to-end connection of grounding conductor

with 30 A

Insulating resistance check

with U = 500 V DC

Withstand voltage check

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

10.4   Hardware/software compatibility list

Firmware version	Hardware code
V16.32 or higher	0340020000 or higher
V16.41 or higher	0340020000 or higher
V20.02 or higher	0340020000 or higher
V22.00 or higher	0340020000 or higher

Table 10-1: PacDrive Controller C200 hardware and software compatibility

Firmware version	Hardware code
V16.42 or higher	1743100320 or higher
V20.02 or higher	1743100320 or higher
V22.00 or higher	1743100320 or higher

Table 10-2: PacDrive Controller C600 hardware and software compatibility

10.5   Changes
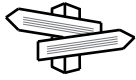
The latest product documentation, application notes and the change service are always available on the ELAU homepage.

01/2004

• New edition of the operating manual

02/2007

• Various error eliminations and additions
• Layout of document revised
• Diagnostic messages expanded
• PROFIBUS connector added
• Chapter on uninterruptible power supply added
• Chapter on hardware/software compatibility list added

08/2008

• Complete revising and restructuring of documentation
• Integrating the optional module (Chapter 10)

12/2008

• Revision of chapter "Electrical connections"
• Change of corporate design

10.6   Fault report form

This fault report is required without fail to enable efficient processing.

Send the fault report to your ELAU GmbH-representative or to:

ELAU GmbH
Customer Service Department
Dillberg 12
97828 Marktheidenfeld
Fax: +49 (0) 93 91 / 606 - 340

Return address:

Company:	City:	Date:
Department:	Name:	Tel.:

Specifications regarding product in question

Item name: ....

Item no.: ....

Serial number: ....

Software version: ....

Hardware code: ....

Parameters included Yes [ ] No [ ]

IEC - Program included: Yes [ ] No [ ]

Information about machine on which the error occurred:

Machine manufacturer: ....

Type: ....

Operating hours: ....

Machine no.: ....

Date of commissioning: ....

Manufacturer / Type of machine control:

....

How did the error present:

....

....

....

Additional information:

Condition of error:	Causes:	Accompanying side effects:
[ ] is always available	[ ] unknown	[ ] problems in the mechanism
[ ] during commissioning	[ ] wiring error	[ ] power failure (24V)

[ ] occurs sporadically   [ ] mechan. damage   [ ] controller failure
[ ] occurs after approx. hours   [ ] moisture in device   [ ] motor failure
[ ] occurs when shaken   [ ] encoder defective   [ ] broken cable
[ ] depends on temperature   [ ] insufficient ventilation
[ ] contaminant in device

Is there an air conditioner in the switch cabinet? Y / N [ ]

Have there been similar errors in the same axis previously?
How often: ....

Did the errors always occur on certain days or at certain times of day?

....

Further information:
....
....
....
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