Operating Manual

PacDrive™
C200 / C200 A2 Controller

ELAU PACKAGING SOLUTIONS

Schneider Electric

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ELAU GmbH

Dillberg 12-16
97828 Marktheidenfeld, Germany

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

E-mail: info@elau.de
Internet: www.elau.de

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 C200 Controller

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.
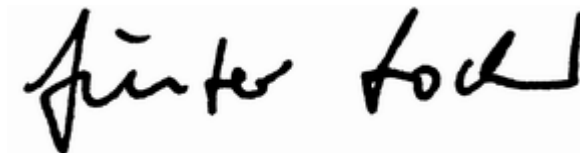
The following standards were applied:

- **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

Manufacturer:
ELAU AG
Dillberg 12-16
97828 Marktheidenfeld, Germany

2004-01-09

Günter Locherer
Member of Executive Board

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1 About this manual

1.1 Introduction

Read and observe this manual before you work on the PacDrive Controller for the first time. Take particular note of the safety instructions (see 2.3 Rest dangers). As described in section 2.2, only those persons who meet the "Selection and qualification of employees" are allowed to work on the PacDrive Controller.

A copy of this manual must always be available for personnel who are entrusted to work on the PacDrive Controller.

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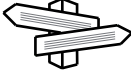By observing this manual, you will help to

- avoid risks,
- reduce repair costs and down times of the PacDrive Controller,
- increase the life span of the PacDrive Controller
- and increase reliability of the PacDrive 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 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 symbol)	**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 PacDrive Controller is state of the art and conform to recognized technical safety regulations. Nevertheless the use of the PacDrive Controller can present a hazard to life and limb or cause property damage. The following section contains general requirements for safe work with the PacDrive Controller. Each person who uses or works on the PacDrive Controller must read and follow these requirements.

2.1 Proper use

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

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 on the PacDrive 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 PacDrive 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 the PacDrive Controller, switch the PacDrive 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 the PacDrive 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 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 PacDrive 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 2004/108/EG
- 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 on the PacDrive 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 Rest dangers

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

If activities involve residual risks, a warning instruction 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
CRUSHING, SHEARING, CUTTING AND HITTING 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.   • Cover edges and angles to protect against cutting damage.   • Wear suitable protective clothing (e.g. safety goggles, safety boots, protective gloves) if necessary.   • Do not stand under suspended loads.
Failure to follow these instructions can result in death or serious injury.

Touching electrical parts

⚠ DANGER

ELECTRIC SHOCK, FIRE OR EXPLOSION CAUSED BY 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.
- Before working on electrical equipment with a voltage greater than 50 volts, the main switch has to be in the "OFF" position and secured, so it cannot be restarted.
- Disconnect devices with a voltage greater than 30 V rms or 42,2 V DC from the power supply before working on electrical parts.
- Wait at least 5 minutes after switching off before accessing the components.
- Before working on the equipment, discharge the DC bus and use a voltage meter to make sure that there is no voltage.
- Do not touch the electrical connection points of the components when the device is switched on.
- Make sure that the drives are at a standstill because potentially fatal voltage can occur on the motor lines in generator operation.
- Before enabling the device, safely cover the live components to prevent contact.
- Disconnect power connector cables only when the system is deactivated.
- Plug in power connector cables only when the system is deactivated.
- Provide for protection against indirect contact (DIN EN 50178, Section 5.3.2).
- 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.

Failure to follow these instructions will result in death or serious injury.

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.

⚠ 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.
- 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.
- 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.
- Secure the system from being switched back on before working on it.
- 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.

Failure to follow these instructions will result in death or serious injury.

"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.

Failure to follow these instructions will result in 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   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.
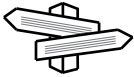
Detailed information on diagnosis is available in the Online Help of the Automation Toolkit **EPAS-4**.

3.1   Indicators on the PacDrive C200 Controller
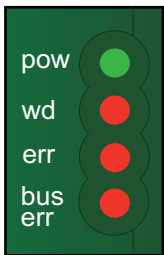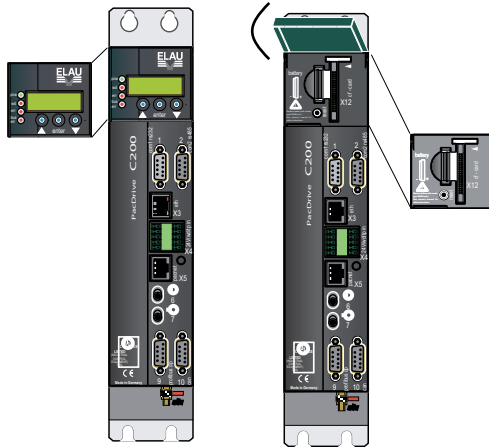
If the cover of the PacDrive Controller is closed, you will see four vertically arranged indicators, which signal different operating- or error conditions.

- pow (control voltage indicator)
- wd (watchdog indicator)
- err (error display)
- bus err (SERCOS real-time bus error indicator)
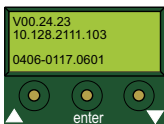
In addition to the LED displays, you will receive further information about the operating status of the PacDrive Controller via the 2-line LCD display.

Line 1	currently used firmware version
Line 2	current IP number of the PacDrive Controller

The horizontal arranged buttons have no function on the PacDrive Controller currently.

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

A "fatal error" is a serious hardware problem or an unexpected software problem. When a "fatal error" occurs

- the CPU is stopped,
- the optional module is reset,
- the outputs are reset and
- the wd (watchdog) relay outputs are opened.

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)	The boot of the PacDrive Controller is completed, the last boot failed. See diagnostic message 209 "last boot failed". The 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.

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.

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.)

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 in the PLC configuration by the PacDrive Controller.
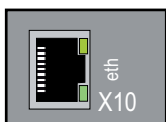
Ethernet LEDs (data throughput indicator and network activity)

On the Ethernet connection (X10) of the PacDrive Controller two LED's are indicated.

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

After opening the operating cover you have access to the control elements of the Pac-Drive Controller:

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

3.2 CompactFlashTM card slot
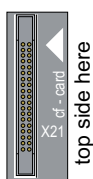
The CompactFlash™ card slot is the entry for the permanent data memory (CF™ card) of the PacDrive Controller.

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

▶ Switch off the 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.

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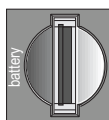
The battery of the PacDrive Controller buffers controller data (Bios, NVRAM, time, etc.).

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 exchange the battery while the controller is on or off. There is no data loss if it is performed while the controller is on. When the controller is switched off, the time period of the data buffering without a battery is approx. 5 minutes.

⚠ WARNING

THERE IS A RISK OF EXPLOSION/FIRE IF THE WRONG BATTERY IS USED

- Only use the type of battery with the following data: 3V Lithium Renata Type 2450N.

Failure to follow these instructions can result in death or serious injury.

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

> ## ⚠ CAUTION
>
> **DANGER OF EXPLOSION WHEN REMOVING/REPLACING BATTERY**
>
> - Use a pair of 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 place battery in fire.
>
> **A non-observance of these instructions can cause bodily injury or damage the equipment.**

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

For ordering information (see 5.6 Type code).

3.4   On- /off / reset of the PacDrive Controller

[reset] button
▸ Press this button to reset the controller and reboot it.

Connected Servo Amplifiers MC-4 have their own **[reset]** button.

3.5   Diagnosis

3.5.1   Minimal boot of the PacDrive Controller

▶ If a serious boot error occurs as a result of an application error, you have to perform a minimal boot. During a minimal boot the application data (PLC configuration and IEC program) are not loaded.

Perform a minimal boot as follows:

▶ Boot the controller by pressing the [reset] button.
■ The controller starts and the err - error indicator lights up.

▶ Press the [reset] button again while the preset IP address is displayed.
■ After the boot, the controller flashes quickly (10Hz), signaling the minimal boot.

The controller automatically performs a minimal boot if,

- a voltage interruption of the controller voltage occurs when starting the controller, while the „err" error indicator lights up.
- a reset of the controller is triggered.
- a serious error occurs (memory call up cannot be performed).

3.5.2   Connection to the PacDrive Controller

You can connect the (Service)-PC (EPAS-4) with the PacDrive Controller in two different ways:

1. Serial connecting cable
2. 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 EPAS-4 and the controller is not possible, the following causes may be the problem:

TCP/IP connection

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

▸ Adjust parameter to detect an error.
- Take over the parameter with **ONLINE > Parameter**.
- Activate the 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 the setting for the serial interface of the PC under **ONLINE > communication parameters** (Port = "5000"(depending on the computer); Baud rate = "38400"; Parity = "No"; Stop bits = "1"; Motorola byte order = "No").

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

File-transfer service

This is how you check if the flash disk of the PacDrive Controller is full:

▸ Log-in with EPAS-4 without file transfer.

▸ Check available memory with the help of the parameter Diskfree 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 controller against a flash disk with a larger storage capacity.

3.5.3   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.

4 Transport, storage, unpacking

4.1 Transport

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

4.2 Storage

▸ Store devices in a clean, dry room.
▸ Make sure that the air temperature at the storage location is between - 25 °C and +70 °C.
▸ Make sure that the temperature variations at the storage location are a not more than maximum 30 K per hour.

For further information (see 6.1 Ambient conditions).

4.3 Unpacking

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

4.4 Type Plate

Figure 4-1: PacDrive Controller C200 with type plate

1	Technical type plate
2	Logistic type plate

Figure 4-2: Logistic type plate of the PacDrive Controller C200

PacDrive C200/C400/C600...	Item name
1313026X	Item no.
888067.0010 3X08	Serial number
HW	Hardware version
SW	Software version
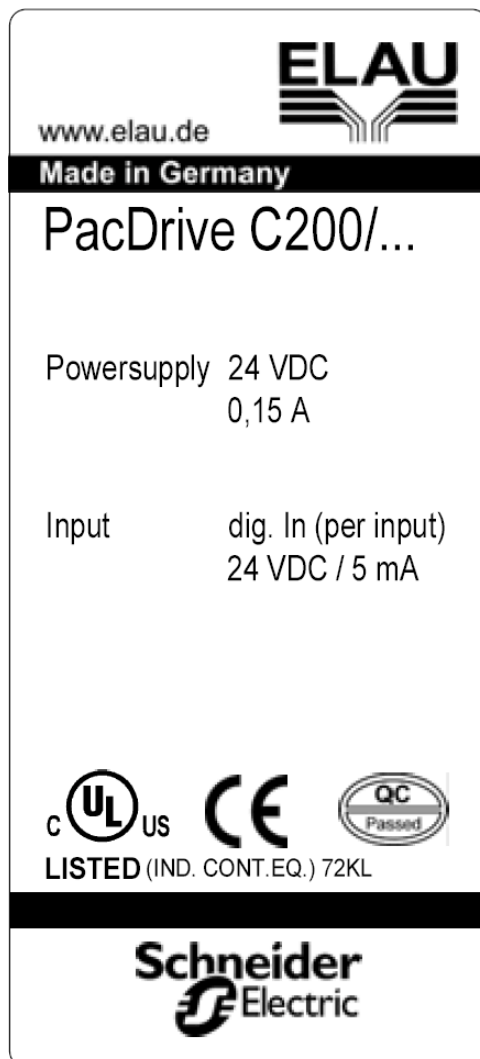
Figure 4-3: Technical type plate of the PacDrive Controller C200

PacDrive C200/...	Device type, see type key
Power supply	Rated voltage and rated current
Input	Digital inputs / input voltage und input current (per input)
cUL	cUL mark
CE	CE mark

5 Installation and maintenance

When carrying out the following steps, make sure to exercise with the necessary accuracy and make arrangements to avoid

- injuries and material damage,
- incorrect installation and programming of components,
- the incorrect operation of components
- and the use of not authorized cables or modified components.

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.

5.1 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 PacDrive Controller.

How to wire :
- ▶ 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.

This is how you connect the control voltage:
- ▶ 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.

This is how you connect the mains voltage:
- ▶ Activate EMERGENCY STOP switch.
- ▶ Connect mains voltage.
- ▶ Check status displays for proper function.
- ▶ Release EMERGENCY OFF switch and activate ON switch.

This is how you move the axis:
- ▶ Use a reliable, small application program to move the axis for the first time in order to get:
  - the correct rotation direction of the axis,
  - check the correct setting of the limit switch and
  - check the braking distance in both directions.

This is how you transmit the configuration and the program:
- ▶ Transfer the project with the EPAS-4 Automation Toolkit onto the PacDrive Controller.

⚠ WARNING

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!

Failure to follow these instructions can result in death or serious injury.

This is how you perform the function test:
- ▶ Check devices and wiring again.
- ▶ 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).

5.2   Configuration, homing and programming

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

CAUTION
FAULTY PROGRAM CHANGES
• 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.
Failure to follow these instructions can result in equipment damage.

5.3 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

SYSTEM FAULTS OR FAILURES DUE TO 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.

Failure to follow these instructions can result in equipment damage.

5.4 Maintenance, repair, cleaning

5.4.1 Repair

Proceed as follows in case of repair:
▶ Fill in the fault report form (see 7.5 Fault report form) in the attachment (can also be sent per Fax).
▶ When possible, replace defective parts.
▶ Send the defective part back to ELAU.

5.4.2 Cleaning

How to remove dust and foreign objects :
▶ De-energize .
▶ Remove .

CAUTION
IMPROPER CLEANING
• Use cleaning processes appropriate to the protection class .   • Do not use any alkaline detergent because the polycarbonate can loose its stability if you have contact with it.   • Do not use any cleaning fluid, as this will damage the motor's aluminum housing.
Failure to follow these instructions can result in equipment damage.

▶ Then blow out with dry pressurized air (max. 1 bar).

5.5 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. PacDrive C200/10/1/1/1/00
Item no.:	e.g. 13130260
Hardware code:	HW: 2JA0233012
Software version:	SW: 00.22.06

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

5.6 Type code

Product ID code **C200 / 10 / 1 / 1 / 1 / 00**

HW-Variant

Processor
1 = ST-PC VEGA

RAM
1 = 128 MB

Flash memory
1 = 32 MB

Optional functions
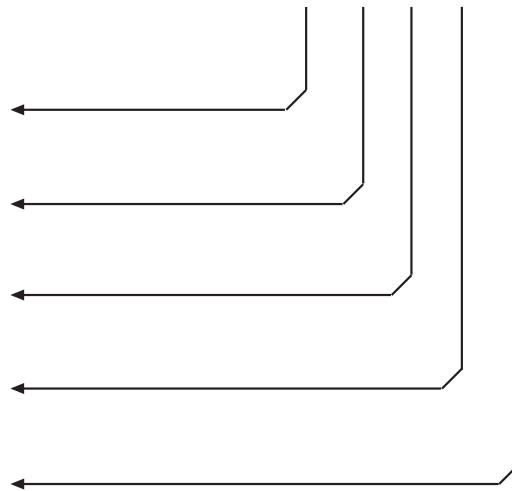
6 Technical data

6.1 Ambient conditions

Procedure	Parameters		Value	Basis
Operation	**Class 3K3**			**IEC/EN 60721-3-3**
	Ambient temperature		+5°C...+45°C	
	Condensation		Prohibited	
	Icing		Prohibited	
	Another water		Prohibited	
	Relative humidity		5% ... 85%	
Transport	**Class 2K3**			**IEC/EN 60721-3-2**
	Ambient temperature		-25°C...+70°C	
	Condensation		Prohibited	
	Icing		Prohibited	
	Another water		Prohibited	
	Relative humidity		5% ... 95%	
Long time storage in transport packaging	**Class 1K4**			**IEC/EN 60721-3-1**
	Ambient temperature		-25°C...+55°C	
	Condensation		Prohibited	
	Icing		Prohibited	
	Another water		Prohibited	
	Relative humidity		5% ... 95%	

Table 6-1: Ambient conditions PacDrive C200 Controller

6.2 Standards and regulations

Certifications	CE, UL , cUL

Table 6-2: Standards and regulations PacDrive C200 Controller

6.3　Mechanical and electrical data

Category	Parameters	Value
Product configuration	Type key C200 up to 8 SERCOS slaves (SERCOS slaves = MC-4, SCL, iSH)	PacDrive C200 / 10 / 1 / 1 / 1 / 00
	Type key C200 up to 2 SERCOS slaves	PacDrive C200 / A2 / 1 / 1 / 1 / 00
	Order number	C200 up to 8 SERCOS slaves: 13 13 02 60
		C200 up to 2 SERCOS slaves: 13 13 02 60-001
Processor	CPU	ST-PC VEGA
	RAM	128 MB
	L2 Cache	-
	NVRAM	128 kB
	CompactFlash™ 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 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 (**X1**) COM2: RS485 (**X2**)
	Network connection	Ethernet (10/100 Base-T) (**X3**)
	Field bus connection	PROFIBUS DP Master/Slave (12 MBaud) (**X9**) or
		CAN (2.0A) or CANopen (**X10**)
	Real-time bus interface	SERCOS interface (16 MBaud) (**X6**, **X7**)
	PacNet interface	1 PacNet interface (**X5**
	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)
	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

Category	Parameters	Value
Output	Actuator power	C200: 4 servo axes: SERCOS cycle time 2 ms
		C200: 8 servo axes: SERCOS cycle time 4 ms
		C200 / A2: 2 servo axes: SERCOS cycle time 2 ms
		C200 / A2: 2 servo axes: SERCOS cycle time 4 ms
		Max. of 255 parallel motion profiles possible
SPS output	Time for 1000 Bit instructions	90 µs
	Number of PLC processes	Unlimited
	Type of PLC processes	Continuous
		Periodic
		Event-controlled
	Cycle time fast task	1 ms
	nominal I/O response time:	2 ms (read in data, process, set output)
Cam Switch Group	Number of cams	Max. 256
	Sequential circuit	Dynamic
	Outputs	Memory or digital outputs
	Inputs	External master encoder
		Virtual master encoder
		Axis position
	Processing time	1 ms
Digital inputs		None
Analog inputs		None
Interrupt inputs		None
Touchprobe inputs (X4)	Number	6 (IEC61131-2)
	Range U_{IN} 0 Voltage	DC 0 ... 6 V
	Range U_{IN} 1 Voltage	DC 20 ... 33 V
	Input data	I_{IN} = 5 mA by U_{IN} = 24 V
	Polarized	Yes
	Input filter TP0 to TP15	100 µs resolution
		10 µs at a cycle time of 1, 2, 4 ms
Digital outputs		None
Analog outputs		None
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. 64 inputs and 64 outputs
Additional Touchprobe inputs	Via PacNet	Max. 16 Touchprobe inputs
Power supply	Power supply unit	DC 24 V (-15% / +25%) / max. 0.5 A (without master encoder)
	Power consumption	Max. 12 W
	Uninterruptible Power Supply (UPS)	External
Dimensions	Dimensions packaging	DxWxH (mm): 300x90x400
Weight	Weight (with packaging)	1.7 kg (2.3 kg)
Protection class	Housing	IP 20

Category	Parameters	Value
Isolation class	Degree of pollution	2

Table 6-3: Technical data PacDrive C200 Controller

6.4 Electrical connections
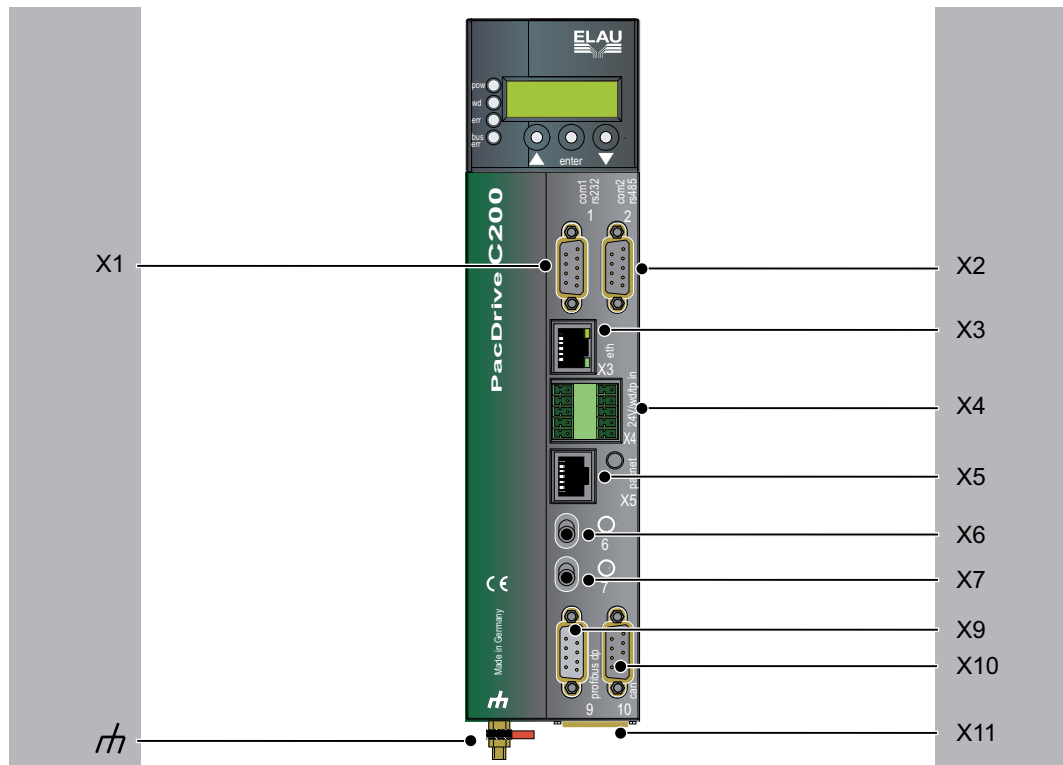
Connection	Meaning	max. terminal cross-section [mm²]/ [AWG]	
X1	Com 1 (RS232)	0.25 mm²	-
X2	Com 2 (RS485)	0.25 mm²	-
X3	Ethernet connection	-	-
X4	Power supply, watchdog and Touchprobe inputs	1 mm²	28 - 16
X5	PacNet	-	-
X6	Motion bus SERCOS input *)	-	-
X7	Motion bus SERCOS output *)	-	-
X9	PROFIBUS db	0.25 mm²	-
X10	CAN	0.25 mm²	-
X11	Master encoder	0.25 mm²	-
⏚	Shielded connector		

Table 6-4: Connection overview PacDrive C200 Controller

X1 - Com 1 (RS232)
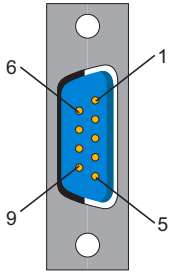
Pin	Designation	Meaning	Range
1	DCD	Data Carrier Detect	
2	RxD	Receive Data	
3	TxD	Transmit Data	
4	DTR	Data Terminal Ready	
5	GND	Signal Ground	
6	DSR	Data Set Ready	
7	RTS	Request To Send	
8	CTS	Clear To Send	
9	RI	Ring Indicator	

Table 6-5: Connection X1

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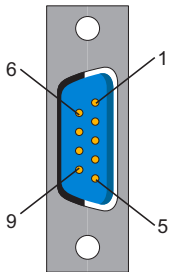
Pin	Designation	Meaning	Range
1	+5 VM	Supply voltage	
2	TxD-	RS485 Transmit -	
3	TxD+	RS485 Transmit+	
4	RxD+	RS485 Receive +	
5	RxD-	RS485 Receive -	
6	GNDR	GND reference RS485	
7	-	Reserved	
8	GNDM	Supply voltage	
9	GNDR	GND reference RS485	

Table 6-6: Connection X2

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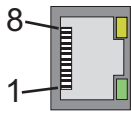
Pin	Designation	Meaning	Range
1	Tx+	OutputTransmitData+	
2	Tx-	OutputTransmitData-	
3	Rx+	InputReceiveData+	
4	-	(PE)	
5	-	(PE)	
6	Rx-	InputReceiveData-	
7	-	(PE)	
8	-	(PE)	

Table 6-7: Connection

Depending on the application, you will need different cables to connect the 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.

X4 - Control voltage, Watchdog and Touchprobe inputs
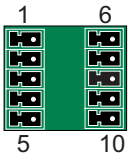
Pin	Designation	Meaning	Range
1	DC +24 V	Supply voltage	-15% / +25%
2	DC 0 V	Supply voltage	
3	T.00	Touchprobe input 0	DC 20 ... 30 V
4	T.01	Touchprobe input 1	DC 20 ... 30 V
5	T.02	Touchprobe input 2	DC 20 ... 30
6	WD	Watchdog relay	
7	WD	Watchdog relay	
8	T.03	Touchprobe input 3	DC 20 ... 30 V
9	T.04	Touchprobe input 4	DC 20 ... 30 V
10	T.05	Touchprobe input 5	DC 20 ... 30 V

*) From insulating length l=9mm; for core cable ends length of the metal bush l=10mm

Table 6-8: Connection X4

CAUTION
SWITCHING OFF THE CONTROL VOLTAGE.
• Use a UPS to avoid loss of data or damage to flash disk.   • Switch off PacDrive Controller control voltage only when all files are closed.
Failure to follow these instructions can result in equipment damage.

Refer also to the EPAS-4 Online Help function **SysShutdown()**.

X5 - PacNet

8
1

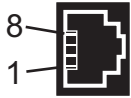| Pin	Designation	Meaning	Range
1	TxD+	OutputTransmit Data+	
2	TxD-	OutputTransmit Data-	
3	RxD+	InputReceive Data+	
4	TxC-	OutputTransmit Clock-	
5	TxC+	OutputTransmit Clock+	
6	RxD-	InputReceive Data-	
7	RxC+	InputReceive Clock+	
8	RxC-	InputReceive Clock-	

Table 6-9: Connection X5

Use only approved PacNet cables at the PacNet connection to avoid malfunction.

X9 - profibus dp

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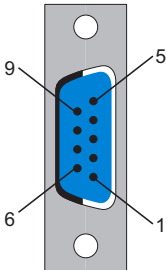
Pin	Designation	Meaning	Range
1	Shield	Shield	
2	-	Reserved	
3	RxD/TxD-P	Data P	
4	CNTR-P	Control signal P	
5	DGND	Signal ground	
6	VP	Supply voltage	
7	-	Reserved	
8	RxD/TxD-N	Data N	
9	-	Reserved	

Table 6-10: Connection X9

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.
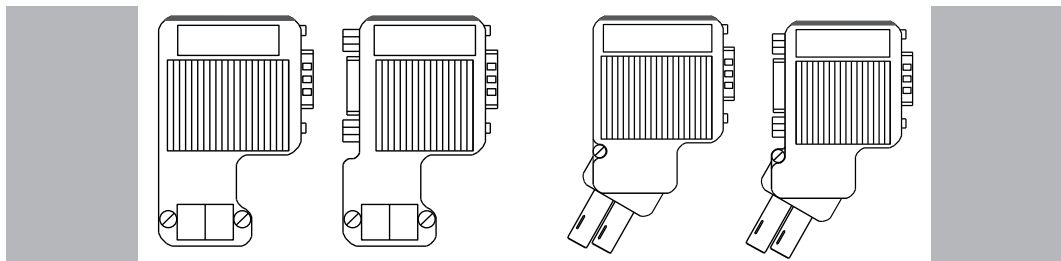
Figure 6-1: PROFIBUS connector

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.
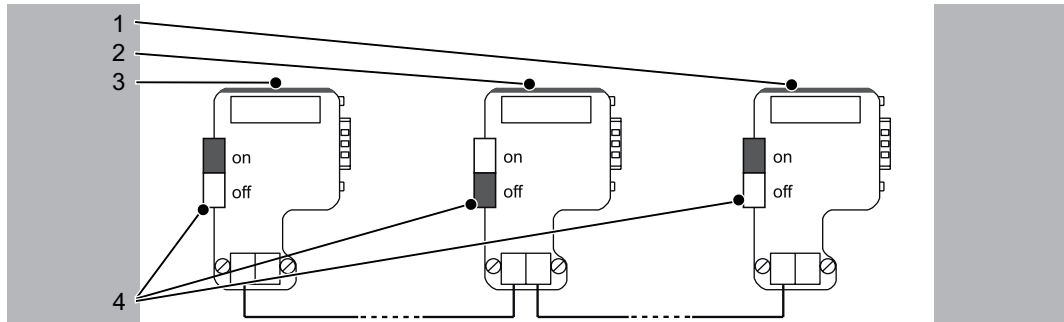
Figure 6-2: Position of the bus terminal resistors

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

X10 - CAN
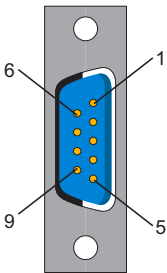
Pin	Designation	Meaning	Range
1	-	Reserved	
2	CAN_L	CAN bus line (low)	
3	GND	Ground	
4	-	Reserved	
5	-	Reserved	
6	GND	Ground	
7	CAN_H	CAN bus line (high)	
8	-	Reserved	
9	-	Reserved	

Table 6-11: Connection X10

CAUTION

MALFUNCTION AND DAMAGE TO FIELD BUS COMPONENTS ON SYNCHRO-NOUS OPERATION OF MULTIPLE FIELD BUSES

- Use only X9 **or** X10. The field bus connections X9/X10 are not electrically separated!
- **Do not** operate more than **one** field bus at a time.

Failure to follow these instructions can result in equipment damage.

An adapter is available for the connection to DeviceNet.

X11 - Master encoder (SinCos)
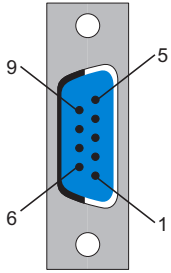
Pin	Designation	Meaning	Range
1	REFSIN	Sinus reference signal	
2	SIN	Sinus trace	
3	REFCOS	Cosine reference signal	
4	COS	Cosine trace	
5	+9 V	Supply voltage	
6	RS485-	Parameter channel	
7	RS485+	Parameter channel +	
8	SC_SEL	Encoder connected (bridge to GND)	
9	GND	Supply voltage	

Table 6-12: Connection X11 - Master encoder (SinCos)

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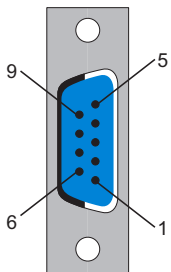
Pin	Designation	Meaning	Range
1	_UA	Track A	
2	UA	Track A	
3	_UB	Track B	
4	UB	Track B	
5	5 V	Supply voltage	
6	_UO	Track O	
7	UO	Track O	
8		Reserved	
9	GND	Ground	

Table 6-13: Connection X11 - Master encoder (incremental)

CAUTION

PLUGGING IN/UNPLUGGING THE MASTER ENCODER PLUG WHEN SWITCHED ON

- Only unplug or plug in master encoder plug when off-circuit.
- Disconnect controller from the 24 V supply voltage.

Failure to follow these instructions can result in equipment damage.

6.5 Dimensions
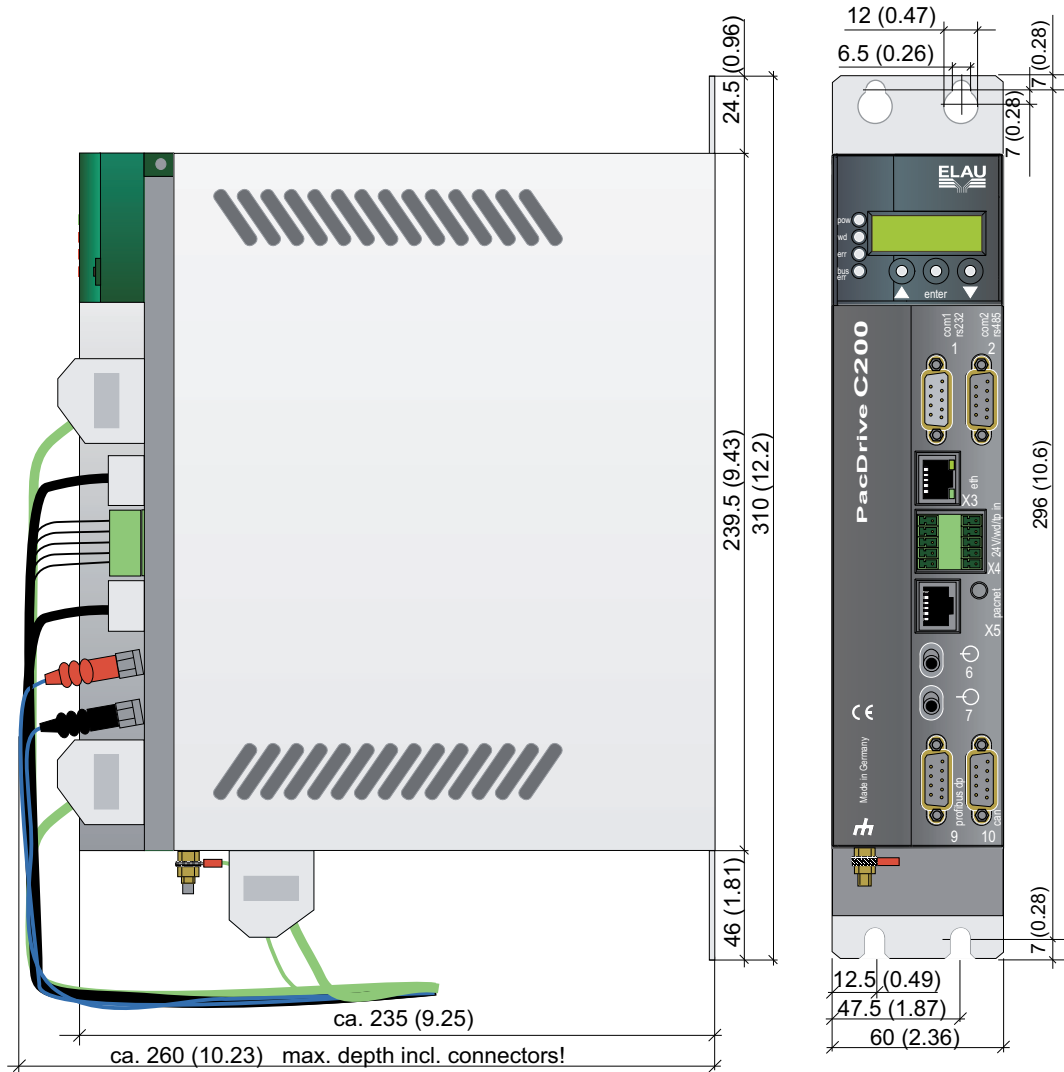
Figure 6-3: Dimensions PacDrive C200 Controller

7 Appendix

7.1 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
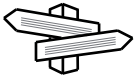
See the ELAU Homepage (www.elau.de) for additional contact addresses.

7.2 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.

7.3 Safety tests

The following safety checks for the PacDrive Controller are performed in the production in accordance to 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.

7.4 Modifications

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

06 / 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 hardware/software compatibility list added

11 / 2008

- Update document structure

7.5   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:	Phone:

Specifications regarding product in question

Item name: ....

Item no.: ....

Serial number: ....

Software version: ....

Hardware code: ....

Parameter 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 by concussion   [ ] defect encoder   [ ] broken cable

[ ] depends on the temperature   [ ] insufficient ventilation

[ ] foreign objects in the 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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PacDrive Controller C200 ELAU GmbH