

Operating Manual

(Translation of the original German Operating Manual)

PacDrive

Bus Terminal BT-4

for PacDrive M and PacDrive 3

10.2018



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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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1 About this manual

1.1 Introduction

Read and understand the material contained in this manual before you work on the PacDrive Component for the first time. Take particular note of the safety information (see 2.3 Residual risks). As described in section 2.2, only those persons who meet the "Selection and qualification of employees" are allowed to work on the PacDrive Component.

A copy of this manual must be available for personnel who work on the PacDrive Component.

This manual is supposed to help you use the capabilities of the PacDrive Component safely and properly.

Follow the instructions within this manual to:

- avoid risks
- reduce repair costs and downtime of the PacDrive Component
- increase the service life of the PacDrive Component
- increase reliability of the PacDrive Component

1.2 Symbols, designator and display format of safety messages

Important Information

NOTE Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to warn the user of potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.


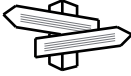

! CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, can result in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

The following symbols and designators are used in this document:

Symbol/Character	Meaning
	Information Symbol: After this symbol, you will find important information 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.
x	Problem symbol: This symbol is followed by a description of the problem and an instruction how to solve the problem.
▶	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.
(1), (2), (3)	Image numbers in the text always refer to the image numbers in the referenced figure.
	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.
<code>lBuffSelect</code>	Program code is written using a different font.

2 Safety information



This section contains information regarding working with the PacDrive Component. Qualified personnel working on the PacDrive Component must read and observe this information. The PacDrive component is conform to recognized technical safety regulations.

2.1 Proper use

The PacDrive component must only be installed in a closed electrical equipment (for example, control cabinet).

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

Perform a risk evaluation concerning the specific use before operating the product and take appropriate security measures.

If circumstances occur that affect the safety or cause changes to the operating behavior of the PacDrive Component, then immediately shut down the PacDrive Component and contact your Schneider Electric contact person.

Use original-equipment only Use only the accessories and mounting parts specified in the documentation and no third-party devices or components that have not been expressly approved by Schneider Electric. Do not change the PacDrive Component inappropriately.

The components must not be used in the following environments:

Forbidden environments

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

Installation and operating conditions Only use the components in accordance with the installation and operating conditions described in this documentation. The operating conditions at the installation location must be inspected and maintained in accordance with the required technical data (performance data and ambient conditions). Commissioning is prohibited until the usable machine or system in which the PacDrive Component is installed meets all requirements of EC guidelines 2006/42/EC (machinery directive).

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

- EN ISO 13849-1:2008 Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
- EN 60204-1 Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- EN ISO 12100-1 - Safety of machines - Basic terms, general principles for design - Part 1: Basic terminology, methodology
- EN ISO 12100-2 - Safety of machines - Basic terms, general principles of design - Part 2: Technical guidelines
- EN 50178 - Electronic equipment for use in power installations
- EN 61800-3 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods

- 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.

2.2 Qualification of Personnel

Target audience for this manual Electrical equipment must be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

Qualified person A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

The qualified personnel must be able to detect possible hazards that may arise from parameterization, changing parameter values and generally from mechanical, electrical or electronic equipment. The qualified personnel must be familiar with the standards, provisions and regulations for the prevention of industrial accidents, which they must observe when working on the drive system.

2.3 Residual risks



Health risks arising from the PacDrive Component have been reduced. However a residual risk remains, since the PacDrive Component works with electrical voltage and electrical currents.

If activities involve residual risks, a safety message is made at the appropriate points. This includes potential hazard(s) that may arise, their possible consequences, and describes preventive measures to avoid the hazard(s). The following types of warnings concerning residual risks which cannot be assigned to a specific handling. The structure of a warning instruction is identical to that of a safety label.

Assembly and handling

WARNING

CRUSHING, SHEARING, CUTTING AND HITTING DURING HANDLING

- Observe the general construction and safety regulations for handling and assembly.
- 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.

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

Electrical parts

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Operate electrical components only with a connected protective conductor.
- After the installation, verify the fixed connection of the protective conductor to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the unit is switched on.
- Provide protection against indirect contact (EN 50178).
- Disconnect/plug in Plug-in type connectors of the cables, plug-in terminals on the device and Bus Bar Module only when the system is disconnected from the power supply.
- Insulate the unused conductors on both ends of the motor cable because AC voltages in the motor cable can couple to unused conductors.

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

Hazardous movements

There can be different causes of hazardous movements:

- Missing or incorrect homing of the drive
- Wiring or cabling errors
- Errors in the application program
- Potential component errors
- Potential error in the measured value and signal transmitter



Provide for personal safety by primary equipment monitoring or measures. Do not rely only on the internal monitoring of the drive components. Adapt the monitoring or other arrangements and measures to the specific conditions of the installation in accordance with a risk and error analysis carried out by the system manufacturer.

⚠ DANGER

MISSING OR INADEQUATE PROTECTION DEVICE(S)

- Prevent entry to a zone of operation with, for example, protective fencing, mesh guards, protective coverings, or light barriers.
- Dimension the protective devices properly and do not remove them.
- Do not make any modifications that can degrade, incapacitate or in any way invalidate protection devices.
- Before accessing the drives or entering the zone of operation, bring the drives to a stop.
- Protect existing work stations and operating terminals against unauthorized operation.
- Position EMERGENCY STOP switches so that they are easily accessible and can be reached quickly.
- Validate the functionality of EMERGENCY STOP equipment before start-up and during maintenance periods.
- Prevent unintentional start-up by disconnecting the power connection of the drive using the EMERGENCY STOP circuit or using an appropriate lock-out tag-out sequence.
- Validate the system and installation before the initial start-up.
- Avoid operating high-frequency, remote control, and radio devices close to the system electronics and their feed lines and perform, if necessary, an EMC validation of the system.

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

PELV circuits

The signal voltage and the control voltage of the devices are <30Vdc and have to be carried out as PELV circuits. In this range the specification as PELV system, according to EN 61800-5-1 contains a protective measure against direct and indirect contact with dangerous voltage through a implemented safe separation in the system/machine of the primary and the secondary side. We recommend to design the system/machine with a safe separation (PELV Protective-Extra-Low-Voltage).

⚠ DANGER

HAZARD OF ELECTRIC SHOCK BY INADEQUATE PROTECTIVE SEPARATION

Only connect devices, electrical components or lines to the signal voltage connectors of these components that feature a sufficient, protective separation from the connected circuits in accordance with the standards (IEC 61800-5-1: Adjustable speed electrical power drive systems - safety requirements).

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

- ▶ Achieve a safe separation in the entire process of the electric circuit.

3 PacNet (modular I/O enhancement)

PacNet is a modular I/O extension for the PacDrive System automation. The focus here is the demand of very fast I/O's.

This is the main advantage of the PacNet in comparison to the I/O extension with the common field bus systems. With PacNet it is possible to achieve a cycle time of less than 1 ms from an input event till setting an output.

For this the bus terminals **BT-4/DIO1** and **BT-4/ENC1** are available as I/O extensions.



The bus terminal **BT-4/ENC1** can only be connected to the PacNet connection of the controllers **Cx00**, **P600** and **LMC 300/400/600 C**.

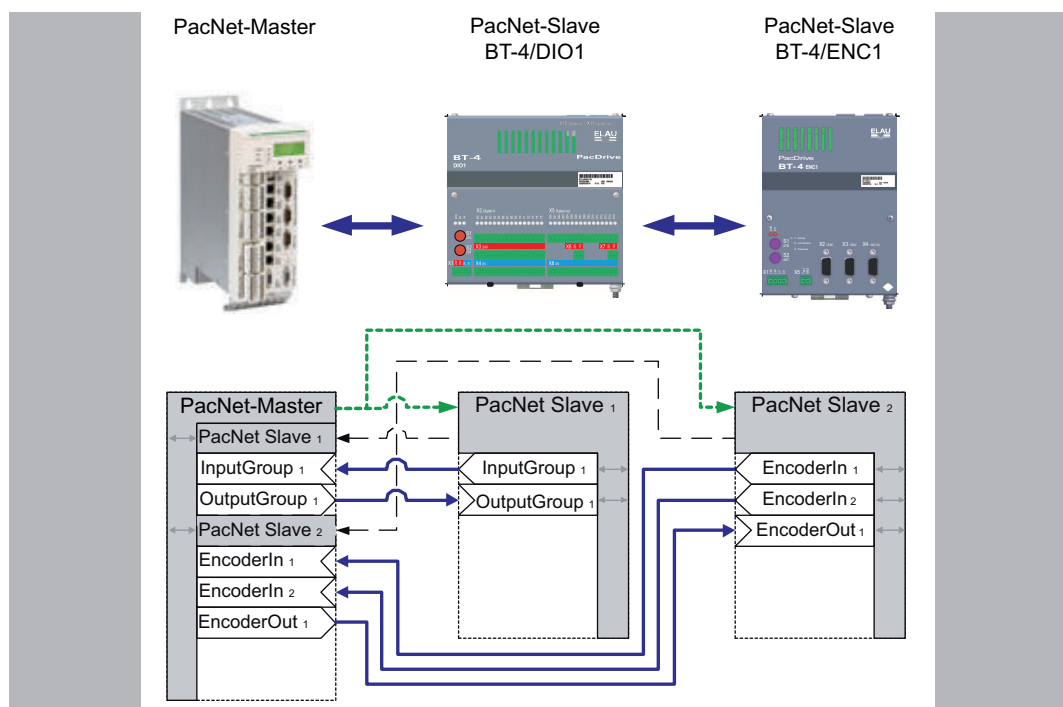


Figure 3-1: PacNet system structure

Basic properties of PacNet

PacNet is a high-speed bus system for I/O extension with which distributed digital inputs/outputs and encoders (incremental and SinCos encoders) can be networked with the PacDrive system. The bus is used for the communication between the controllers **Cx00**, **P600**, **LMC 300/400/600 C** and the bus terminal **BT-4/DIO1** or between the controllers **Cx00**, **P600**, **LMC 300/400/600 C** and the bus terminal **BT-4/ENC1**. The input and output states are transferred via this interface.

Up to four extension modules **BT-4/DIO1** or **BT-4/ENC1** can be connected to the bus of the PacNet. Thereby the bus terminals can also be mixed.



A terminating connector must be attached to the bus line on "PacNet out" of the last **BT-4** module for trouble-free PacNet bus operation.

Bus terminal BT-4/DIO1

- 16 in- and 16 outputs per Bus Terminal **BT-4/DIO1**
- Per PacNet connection of the controller a maximum of 4 bus terminals is permitted, so that with 4 connected Bus Terminals **BT-4/DIO1** a maximum of 64 in- and 64 outputs are available (a maximum of 128 in- and 128 outputs by the **Cx00** Controller because it has 2 PacNet connections).
- The maximum 64 inputs can also be used as maximum 64 measuring inputs (Touchprobe), if the concerned Bus Terminals **BT-4/DIO1** are entered as "BT-4/DIO1 TP" in the PLC Configuration.

Bus terminal BT-4/ENC1

- 4 incremental encoder inputs or 2 SinCos encoder inputs as well as 1 encoder simulation per Bus Terminal **BT-4/ENC1**
- Per PacNet connection of the controller a maximum of 4 bus terminals is permitted, so that with 4 connected Bus Terminals **BT-4/ENC1** a maximum of 12 incremental encoder inputs or 8 SinCos encoder inputs as well as 4 encoder simulations are available (a maximum of 24 incremental encoder inputs or 16 SinCos encoder inputs as well as 8 encoder simulations by the **Cx00** Controller, because it has 2 PacNet connections).

Limitations to the field bus

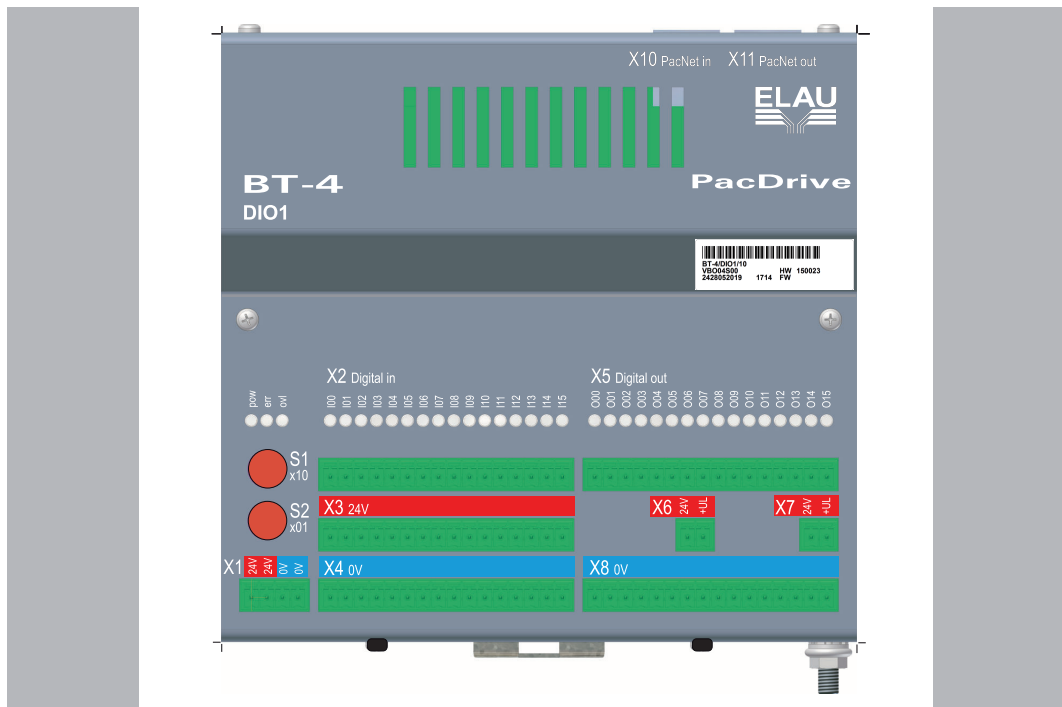
PacNet is an extension of the PacDrive system. This is why PacNet can only replace a field bus up to a certain limit.

PacNet features:

- Fast I/O extension (cycle time 10µs).
- For all the **Cx00**, **P600** and **LMC 300/400/600 C** controllers a maximum of four modules with a cable distance of 5m each per PacNet connection between the slaves is permitted.
- Manufacturer-specific bus protocol
- Per PacNet connection of the controller a maximum of 64 in- and 64 outputs, therefrom a maximum of 64 Touchprobe inputs
- Per PacNet connection of the controller a maximum of 12 incremental encoder inputs or 8 SinCos encoder inputs as well as 4 encoder simulations

3.1 PacDrive bus terminal BT-4/DIO1

The I/O terminal **BT-4 / DIO1** (**BusTerminal-4 / Digital I/O1**) is a Slave unit and is used to extend the I/O of the PacDrive system.



Features:

- 16 inputs
- 16 outputs
- Electrical isolation of the I/O level
- Optical display of the input state
- Overload display
- Open circuit detection

3.2 PacDrive bus terminal BT-4/ENC1

The bus terminal **BT-4/ENC1** (**BusTerminal-4 / ENC or 1**) is used as a master encoder extension of the PacDrive™ System. Every bus terminal provides 2 master encoder inputs (incremental or SinCos) as well as an incremental encoder input / incremental encoder output.



Figure 3-2: View of the BT-4/ENC1 bus terminal

It is possible to loop in an incremental encoder input onto the incremental encoder output.

The essential properties are described in keywords below:

- Three encoder inputs / one incremental encoder output with the following variants:
 - Evaluate a maximum of three encoder inputs (incremental encoder output not possible)
 - Evaluate a maximum of two encoder inputs and one incremental encoder output
- Encoder detection (SinCos)
- Zero track evaluation
- Track monitoring
- Max. frequency 1MHz (encoder input and encoder output)
- Optional, a connection of incremental or SinCos encoders (with two encoder inputs) is possible
- 24 Vdc supply voltage
- Encoder supply voltage is switchable between 5 V, 8 V, and 24 V
- Communication via the PacNet interface

Encoder inputs

The first two encoder inputs (connector X2 and X3) can evaluate an incremental encoder or a SinCos encoder. The bus terminal distinguishes the encoder type according to the assignment of pin 8 of the encoder connector. This detection also determines the power supply of the encoders (5V incremental encoder and the 8V SinCos encoder).

Incremental encoder inputs Incremental encoder inputs are designed to connect encoders with rectangular signals (RS422). A maximum of three encoders can be connected. An incremental encoder input shares the connection with the incremental encoder output. This results in the following variants:

- A maximum of three incremental encoder inputs (no incremental encoder output)
- A maximum of two incremental encoder inputs and one incremental encoder output

SinCos encoder inputs The SinCos encoder inputs (connection **X2** and **X3**) are designed to connect HIPERFACE® encoders. A maximum of two encoders can be connected (connection **X4** can only be used as an incremental encoder input or output). SinCos encoder inputs share connections with incremental encoder inputs. This results in the following variants:

- A maximum of three incremental encoder inputs (no SinCos encoder inputs)
- A maximum of two incremental encoder inputs and one SinCos encoder input (connection **X2** or **X3**)
- A maximum of one incremental encoder input and two SinCos encoder inputs (connection **X2** and **X3**)

Encoder output

The encoder output can be used for incremental encoder simulations and to loop in (encoder mapping) the second encoder input. The release of the incremental encoder simulation and the encoder mapping are locked against each other. All the signals are displayed as rectangular signals in the RS422 level.

Incremental encoder simulation The incremental encoder simulation is implemented via a digital controlled oscillator in the FPGA that generates the incremental encoder signals with an adjustable frequency. This is issued on the signal pins "A track" and "B track". In addition, a zero impulse is generated by the encoder simulation that is issued via the "Z track" connection pin.

Encoder figure The second incremental encoder input (connector X3) can be issued on the incremental encoder output (connector X4). Thereby the input signals are switched onto the outputs directly.

Power supply

The connected encoders receive their power supply from the bus terminal **BT-4/ENC1**. Here are three power supply options:

- 5 VDC: Incremental encoder
- 24 VDC: Incremental encoder
- 8 VDC: SinCos encoder

The 5 V and the 8 V are generated in the module. The 24 V have to be supplied by using an additional supply voltage connector. The power supply is switched with the EncPowerSupply parameter. To protect the module, the power supply of the individual encoders is limited via a 300 mA fuse.

NOTICE

BYPASSING GALVANIC ISOLATION OF THE BUS TERMINAL

Use galvanic isolation between external encoder power supply and bus terminal power supply.

Failure to follow these instructions can result in equipment damage.

System requirements for the operation of the Bus Terminal BT-4/ENC1

Software:

PacDrive System	Automation Toolkit	SW version
PacDrive M	EPAS-4	V00.22.00 or higher
PacDrive 3	Logic Builder	V1.33.19.0 or higher

PacDrive System	PacDrive controller	FW version
PacDrive M	Cx00, P600	V00.22.00 or higher
PacDrive 3	LMC 300/400/600 C	V1.33.6.0 or higher

Hardware:

PacDrive System	PacDrive controller	Hardware code	FPGA version
PacDrive M	C200	≥ xxxxxx3xxx	≥ 0302
	C400, C600, P600	≥ xxxxxx4xx	≥ 0406
PacDrive 3	LMC 300/400/600 C	Hardware revision status ≥ 01	≥ 0201

4 Indicators and control elements

The PacDrive system supports the user with its comprehensive diagnostic system. The diagnostic messages can be read out with the Toolkit EPAS-4 (PacDrive M) or Logic Builder (PacDrive 3). The PacDrive System also contains a powerful message logger in which additional diagnostic information is recorded. Diagnostic messages are usually displayed on a control panel of the machine. In case of a "detected error" you must read the diagnostic message and contact the machine manufacturer.



Detailed information on diagnostic can be found in the Online Help of the EPAS-4 Automation Toolkit or the Logic Builder.

4.1 Diagnosis BT-4/ENC1 LEDs

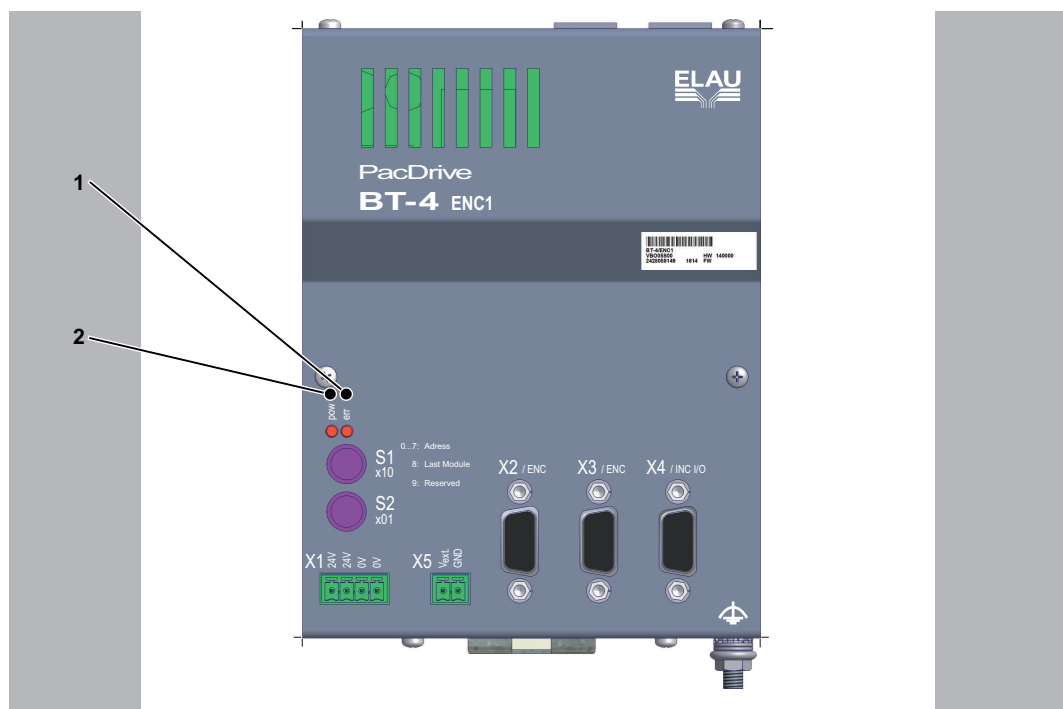


Figure 4-1: Diagnostic BT-4/ENC1 LEDs

1	err: Error LED
2	pow: Power LED

LED	Meaning
pow	<ul style="list-style-type: none"> OFF - The control voltage (24 V DC) is not available or too low ON - Normal operation FLASHES - Firmware update is active
err	<ul style="list-style-type: none"> OFF - Normal operation FLASHES SLOWLY (1 Hz, 1 s ON) - Connection established, but does not receive any valid PacNet data FLASHES FAST (5 Hz, 0.2 s ON) - No connection with the PacNet interface (PacDrive Controller) ON - No connection to the PacDrive Controller:

Table 4-1: Diagnostic BT-4/ENC1 LEDs

4.2 Diagnosis BT-4/DIO1 LEDs

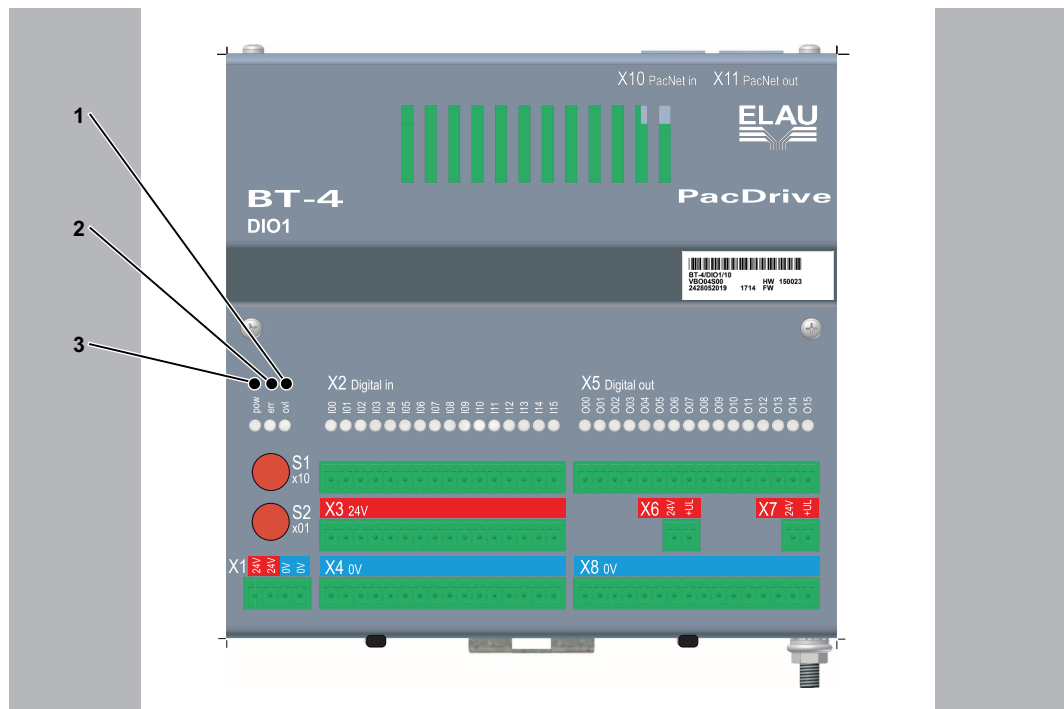


Figure 4-2: Diagnostic BT-4/DIO1 LEDs

1	pow: Power LED
2	err: Error LED
3	ovl: Ovl LED

LED	Meaning
pow	<ul style="list-style-type: none"> OFF - The control voltage (24 V DC) is not available or too low ON - Normal operation FLASHES - Firmware update is active
err	<ul style="list-style-type: none"> OFF - Normal operation FLASHES SLOWLY (1 Hz, 1 s ON) - Connection established, but does not receive any valid PacNet data FLASHES FAST (5 Hz, 0.2 s ON) - No connection with the PacNet interface (PacDrive Controller) ON - No connection to the PacDrive Controller:
ovl	<ul style="list-style-type: none"> OFF - Normal operation ON - One or more active outputs are overloaded or have a short-circuit against L0.

Table 4-2: Diagnostic BT-4/DIO1 LEDs

5 Transport, storage, unpacking

5.1 Transport

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



For further information on transportation. (see 7.1 Ambient conditions)

5.2 Storage

- ▶ PacDrive Component has to be stored in a clean and dry room.



Further storage information. (see 7.1 Ambient conditions)

5.3 Type plate

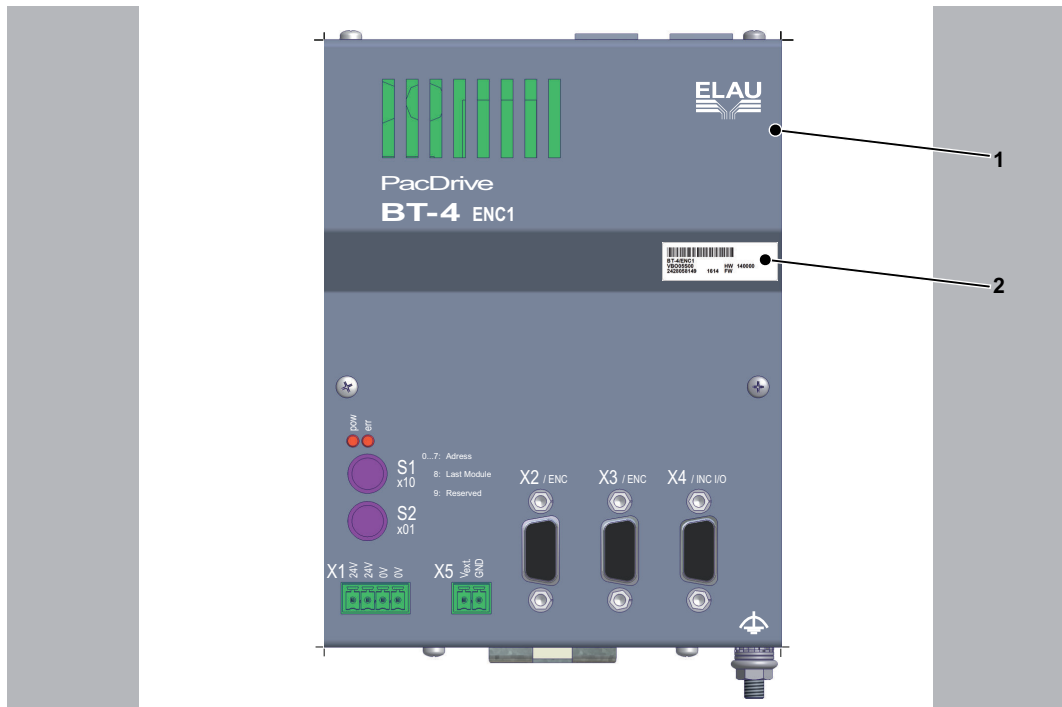
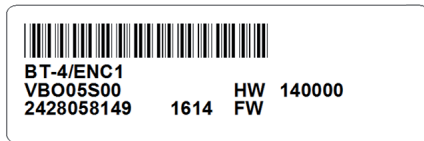


Figure 5-1: Nameplate and cULus / CE marking on the Bus Terminal BT-4 (here exemplary for BT-4/ENC1)

1	cULus / CE marking (laterally pasted)
2	Type plate



Nameplate and cULus / CE marking - Bus Terminal BT-4/DIO1



Nameplate and cULus / CE marking - Bus Terminal BT-4/ENC1

Label	Meaning
BT-4/ENC1	Bus Terminal BT-4/ENC1
VBO05S00	Item no.
2428058149	Job number
1614	Calendar week / Year
HW: 140000	Hardware code:
FW	Firmware Version (BT-4/DIO1 and BT-4/ENC1 have no firmware)

Table 5-1: Explanation of the nameplate using the example BT-4/ENC1

6 Installation and maintenance

Proceed with care during the following steps and take all precautions described in order to help to avoid the following points:

- Injuries and material damage
- Incorrect installation and programming of components
- the incorrect operation of components
- The use of non-authorized cables or modified components

6.1 Commissioning

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Operate electrical components only with a connected protective conductor.
- After the installation, verify the fixed connection of the protective conductor to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the unit is switched on.
- Provide protection against indirect contact (EN 50178).
- Disconnect/plug in Plug-in type connectors of the cables, plug-in terminals on the device and Bus Bar Module only when the system is disconnected from the power supply.
- Insulate the unused conductors on both ends of the motor cable because AC voltages in the motor cable can couple to unused conductors.

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

6.1.1 Preparing commissioning

- ▶ Observe the following instructions for ESD protection in order to avoid any damage due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.
- If necessary at all, touch circuit boards only on the edges.
- Move the circuit boards as little as possible, to avoid the formation of electrostatic charge caused by clothing, carpet, or furnishings.
- Remove existing static charge by touching a grounded, metallic surface, like for example, a grounded housing.

Failure to follow these instructions can result in equipment damage.

Unpacking **How to unpack the device:**

- ▶ Remove packaging.
- ▶ Dispose of the packaging material in accordance with the relevant local regulations.

Verifying **How to check the device:**

- ▶ Verify that the delivery is complete on the basis of the delivery slip.
- ▶ Verify if the device is in working condition.

WARNING

UNINTENDED EQUIPMENT OPERATION

- Do not mount or commission damaged drive systems.
- Do not modify the drive systems.
- Send back inoperative devices.

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

- ▶ Check the data with the help of the nameplates.
- ▶ Observe requirements for the installation location.
- ▶ Observe requirements for the degree of protection and the EMC rules.
- ▶ Then install PacDrive Component.

6.1.2 Wiring of the PacDrive Component

- ▶ Connect devices, beginning with the functional earth ground conductor (FE).
- ▶ Check if the terminals are fastened securely and the necessary cable cross sections are correct.
- ▶ Connect PacDrive bus terminators BT-4 using green PacNet cables.
- ▶ Use terminating plug at the output of the last bus terminal.
- ▶ Check if shielding is completely correct.
- ▶ Eliminate the possibility of short circuits and interruptions.
- ▶ Check the continuity of the functional earth ground conductor system (FE).

NOTICE

WRONG ADDRESS SETTING

- Ensure that the address setting of BT-4 bus terminal matches the address in the PLC Configuration in the parameter **BusAddr** of the "BT-4" object.
- Always assign the address 8x (coding switch S1 Adr. 8) to the last bus terminal BT-4/ENC1 on the PacNet.
- Take care that the address setting on the bus terminal BT-4 is applied only after a power cycle of the module.

Failure to follow these instructions can result in equipment damage.

*Control
voltage*

- ▶ Check the power supply voltage and control voltage.
- ▶ Connect external 24V control voltage.

6.2 Electromagnetic compatibility, EMC

WARNING

ELECTROMAGNETIC DISTURBANCES OF SIGNALS AND DEVICES

Use proper EMC shielding techniques to help prevent unintended device operation.
Failure to follow these instructions can result in death or serious injury.

Enclosure layout The prerequisite for compliance with the specified limit values is an EMC compatible layout. Comply with the following specifications:

EMC measures	Target
Use galvanized or chromium-plated sub plates, bond metallic parts across large surface areas, remove paint layer from contact surfaces.	Good conductivity by surface area contact
Ground enclosure, door and sub plates by using grounding strips or grounding cables with a cross-section of 10 mm ² (AWG 6).	Reduce emission.
Supplement switch devices such as contactors, relays or magnetic valves with interference suppression combinations or spark suppressor elements (e.g. diodes, varistors, RC elements).	Reduces mutual interference
Fit power and control components separately.	Reduces mutual interference

Shielded cables

EMC measures	Target
Place cable shields on the surface, use cable clamps and grounding strips.	Reduce emission.
At the control cabinet outfeed, connect the shield of all shielded cables via cable clamps to the sub plate across large surface areas.	Reduce emission.
Ground shields of digital signal cables on both sides across large surface areas or through conducting connector housings.	Reduce interference action on signal cables, reduce emissions.
Ground shield of analog signal cables directly on the device (signal input), insulate the shield at the other cable end or ground the same through a capacitor, such as 10 nF.	Reduce grounding loops by low frequency interferences.
Use only shielded motor supply cables with a copper braid and at least 85% cover, ground shield on both sides across a large surface area.	Specifically discharge interference currents, reduce emissions.

Cable routing

EMC measures	Target
Do not route fieldbus cables and signal cables together with cabling for direct and alternating voltages above 60 V in the same cable duct (fieldbus cables can be routed together with signal cables and analog cables in the same duct). Recommendation: Routing in separated cable cuts with a distance of at least 20 cm (7.84 in.).	Reduces mutual interference
Keep the cables as short as possible. Do not install any unnecessary cable loops, short cable routing from a central grounding point in the control cabinet to the external grounding connection.	Reduce capacitive and inductive interference couplings.
Insert a potential equalization for: <ul style="list-style-type: none"> • large surface installation • different voltage infeeds • networking across buildings 	Reduce current on cable shield, reduce emissions.
Use fine wire potential equalization conductor.	Discharging of high frequency interference currents.

EMC measures	Target
If motor and machine are not connected in a conducting fashion, e.g. due to an insulated flange or a connection not across a full surface, the motor must be grounded via a grounding cable > 10 mm ² (AWG 6) or a grounding strip.	Reduce emissions, increase interference resistance.
Use twisted pair for 24 Vdc signals.	Reduce interference action on signal cables, reduce emissions.

Motor and encoder cables

From an EMC perspective, motor supply cables and encoder cables are particularly critical. Only use pre-configured cables, or cables with the prescribed properties, and comply with the following EMC measures.

EMC measures	Target
Do not install switching elements in motor cables or encoder cables.	Reduces interference.
Route motor cable with a distance of at least 20 cm (7.84 in.) to the signal cables or insert shield plates between the motor supply cable and the signal cable.	Reduces mutual interference
For long cabling, use potential equalization cables.	Reduce current on cable shield.
Route motor supply cables and encoder cables without any separation point. ¹⁾	Reduces emission.
¹⁾ If a cable must be cut through for installation purposes, the cables must be connected at the point of separation by means of screen connections and metal housing.	

Additional measures for improving the EMC

Depending on the respective application, the following measures may lead to an EMC compatible layout:

EMC measures	Target
Upstream connection of line chokes	Reduction of the harmonic network oscillations, extension of the service life of the product.
Upstream connection of external integrated mains filters	Improvement of the EMC limit values.
Special EMC-suitable layout, e.g. within an enclosed control cabinet complete with 15 dB attenuation of the interferences emitted	Improvement of the EMC limit values.

6.3 Maintenance, repair, cleaning

- ▶ Observe the following instructions before carrying out maintenance on Device:

How to de-energize the system:

- ▶ Set main switch to "OFF Position".
- ▶ Prevent main switch from being switched back on.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on or inside equipment.
Failure to follow these instructions will result in death or serious injury.

6.3.1 Repair

In case of repair proceed as follows:

- ▶ Contact the Schneider Electric Customer Service (see 8.1 Contact addresses).

6.4 Spare part inventory

- ▶ Keep a stock of the most important components to make certain the equipment is functioning and ready for operation at all times.
- ▶ Only exchange devices with the same or higher hardware code to ensure the compatibility.
- ▶ Indicate the following information on the spare part order:

Item name:	e.g. BT-4/ENC1
Item no.:	e.g. VBO05S00
Hardware code:	e.g. HW: 140000



This information can be found on the nameplate (see 5.3 Type plate).

6.5 Device-, parts- or cable exchange

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Operate electrical components only with a connected protective conductor.
- After the installation, verify the fixed connection of the protective conductor to all electrical devices to ensure that connection complies with the connection diagram.
- Before enabling the device, safely cover the live components to prevent contact.
- Do not touch the electrical connection points of the components when the unit is switched on.
- Provide protection against indirect contact (EN 50178).
- Disconnect/plug in Plug-in type connectors of the cables, plug-in terminals on the device and Bus Bar Module only when the system is disconnected from the power supply.
- Insulate the unused conductors on both ends of the motor cable because AC voltages in the motor cable can couple to unused conductors.

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

NOTICE

IMPROPER REPLACEMENT OR OPENING OF THE DEVICE HOUSING

- Do not open the housing of the device for commissioning, replacement or any other reason whatsoever.
- Observe and respect the instructions and specifications of the machine manufacturer when replacing the device.
- Replace defective devices as a whole.

Failure to follow these instructions can result in equipment damage.

- ▶ Observe the following instructions for ESD protection in order to avoid any damage due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.
- If necessary at all, touch circuit boards only on the edges.
- Move the circuit boards as little as possible, to avoid the formation of electrostatic charge caused by clothing, carpet, or furnishings.
- Remove existing static charge by touching a grounded, metallic surface, like for example, a grounded housing.

Failure to follow these instructions can result in equipment damage.

6.5.1 BT-4

How to replace the PacDrive Component:

WARNING

INCORRECT EXCHANGE OF THE COMPONENT

- Do not open the PacDrive Component for exchange.
- In addition to the following instructions, you must observe the machine manufacturer's specifications when replacing the PacDrive Component.

Failure to follow these instructions can result in equipment damage.

- ▶ Observe the following instructions for ESD protection in order to avoid any damage due to electrostatic discharge:

NOTICE

ELECTROSTATIC DISCHARGE

- Do not touch any of the electrical connections or components.
- Prevent electrostatic charges; e.g., by wearing appropriate clothing.
- If necessary at all, touch circuit boards only on the edges.
- Move the circuit boards as little as possible, to avoid the formation of electrostatic charge caused by clothing, carpet, or furnishings.
- Remove existing static charge by touching a grounded, metallic surface, like for example, a grounded housing.

Failure to follow these instructions can result in equipment damage.

How to de-energize the system:

- ▶ Set main switch to "OFF Position".
- ▶ Prevent main switch from being switched back on.

DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

Turn off all power supplying this equipment before working on or inside equipment.

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

- ▶ Remove the connector from the terminal.
- ▶ Remove the connection of the functional earth ground conductor (FE).
- ▶ Remove the module from the cap rail.
- ▶ Set the PacNet address on the "new" bus terminal the same way as it is on the "old" bus terminal via the two rotary switches on the front panel.

NOTICE

WRONG ADDRESS SETTING

- Ensure that the address setting of BT-4 bus terminal matches the address in the PLC Configuration in the parameter **BusAddr** of the "BT-4" object.
- Always assign the address 8x (coding switch S1 Adr. 8) to the last bus terminal BT-4/ENC1 on the PacNet.
- Take care that the address setting on the bus terminal BT-4 is applied only after a power cycle of the module.

Failure to follow these instructions can result in equipment damage.

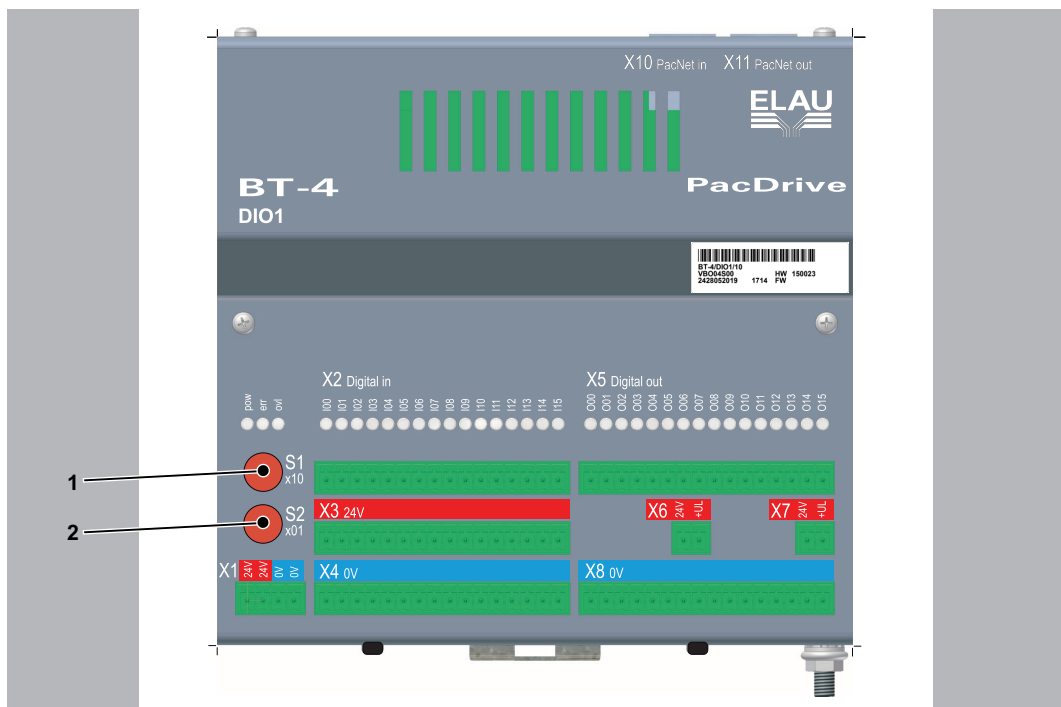


Figure 6-1: Address setting via the rotary switches S1 and S2

1	Rotary switch S1 for the address setting
2	Rotary switch S2 for the address setting

- ▶ Attach the module to the cap rail.
- ▶ Attach the connection of the functional earth ground conductor (FE).
- ▶ Attach the connector to the terminal again.
- ▶ Put the system back in operation.

7 Technical data

7.1 Ambient conditions

Procedure	Parameter	Value	Basis
Operation	Class 3K3		IEC/EN 60721-3-3
	Degree of protection	IP 20	
	Pollution degree	2	
	Ambient temperature	+5°C...+55°C / +41°F ... 131°F	
	Condensation	Prohibited	
	Formation of ice	Prohibited	
	Relative humidity	5% ... 95%	
	Class 3M3		
	Shock	70 m/s ²	
Vibration	5 m/s ²		
Transport	Class 2K3		IEC/EN 60721-3-2
	Ambient temperature	-25°C...+70°C / -13° F ... +158°F	
	Condensation	Prohibited	
	Formation of ice	Prohibited	
	Relative humidity	5% ... 95%	
	Class 2M2		
	Shock	300 m/s ²	
	Vibration	15 m/s ²	
Long-term storage in transport packaging	Class 1K4		IEC/EN 60721-3-1
	Ambient temperature	-25°C...+55°C / -13°F ... + 131°F	
	Condensation	Prohibited	
	Formation of ice	Prohibited	
	Relative humidity	5% ... 95%	

Table 7-1: Ambient conditions for control cabinet devices

7.2 Mechanical and electrical data

7.2.1 PacDrive bus terminal BT-4/DIO1

Category	Parameter	Value
Product configuration	Item name	Bus Terminal BT-4/DIO1
	Order number	VBO04Sxx, with xx = "00" for standard
Power supply	Supply voltage	DC 24 V -15 % / +20 %, typ. 300 mA (without outputs)
16 inputs (according to EN 61131-2 Type I)	Area U_{IN} 0-state	$-3\text{ V} < U_{IN} < 5\text{ V}$
	Area U_{IN} 1-state	$15\text{ V} < U_{IN} < 30\text{ V}$
	Input current	$I_{IN} = 3\text{ mA}$ by $U_{IN} = 15\text{ V}$
	Time constant during signal change	TID = 100 μs
16 outputs (according to EN 61131-2 Type I)	Output voltage	$U_L - 3\text{ V} < U_{OUT} < U_L$
	Rated current	$I_e = 100\text{ mA}$ per output
	Switching current	$I_{e\text{max}} < 1\text{ A}$ for 1 s
	Leakage current with 0 signal	$< 0.4\text{ mA}$
	Output delay time	$T_{QD} = 100\text{ }\mu\text{s}$
	Short-circuit protection	Via output driver
PacNet	Expansion	Maximum of 5m between the bus slaves
	Plug-in connectors	RJ45
	Transmission medium	PacNet cable
	Transmission time	10 μs for all I/Os
	Slave module	Maximum of 4 BT-4 modules on a PacNet port
PD Controller Hardware PacDrive M	PacDrive Controller C200	Hardware code \geq xxxxxx3xxx & FPGA Version \geq 0302
	PacDrive C400, C600, P600	Hardware code \geq xxxxxx4xx & FPGA Version \geq 0406
	MAx-4 ¹⁾	Hardware Code \geq C44288
PD Controller Hardware PacDrive 3	PacDrive Controller LMC 300/400/600 C	Hardware revision status \geq 01 & FPGA Version \geq 0201
PD Controller Firmware PacDrive M	PacDrive Controller C200, C400, C600, P600, MAx-4 ¹⁾	\geq V00.12.02
PD Controller Firmware PacDrive 3	PacDrive Controller LMC 300/400/600 C	\geq V1.33.6.0
Weight		700 g
Degree of protection		IP 20
Pollution degree		2 according to EN 61131-2

¹⁾ The product MAx-4 was discontinued on March 31, 2010. For questions on this, please contact your Schneider Electric partner.

Table 7-2: Technical data of the Bus Terminal BT-4/DIO1

7.2.2 PacDrive bus terminal BT-4/ENC1

Category	Parameter	Value
Product configuration	Item name	Bus Terminal BT-4/ENC1
	Order number	VBO05Sxx, with xx = "00" for standard
Power supply	Supply voltage	DC 24 V -15 % / +20 %, typ. 200 mA (without encoder), max. 300 mA (internal encoder supply)
	Encoder power supply	Internal DC 5 V (incremental encoder)
		Internal DC 8 V (SinCos encoder)
		External connector X5 DC 24 V (incremental encoder) Maximum 200 mA per incremental encoder maximum 100 mA per SinCos encoder
Interfaces	Connector X2	Incremental encoder input or SinCos encoder input ¹⁾
	Connector X3	Incremental encoder input or SinCos encoder input ¹⁾
	Connector X4	Incremental encoder input or incremental encoder output
	Maximum frequency (incremental encoder)	1 MHz
	Sampling time	SERCOS cycle time (1, 2 or 4 ms)
PacNet	Expansion	Maximum of 5m between the bus slaves
	Plug-in connectors	RJ45
	Transmission medium	PacNet cable
	Slave module	Maximum of 4 BT-4 modules on a PacNet port
PD Controller Hardware PacDrive M	PacDrive Controller C200	Hardware code \geq xxxxxx3xxx & FPGA Version \geq 0302
	PacDrive C400, C600, P600	Hardware code \geq xxxxxx4xx & FPGA Version \geq 0406
PD Controller Hardware PacDrive 3	PacDrive Controller LMC 300/400/600 C	Hardware revision status \geq 01 & FPGA Version \geq 0201
PD Controller Firmware PacDrive M	PacDrive Controller C200, C400, C600, P600	\geq V00.12.02
PD Controller Firmware PacDrive 3	PacDrive Controller LMC 300/400/600 C	\geq V1.33.6.0
Weight		520 g
Degree of protection	Housing	IP 20
Pollution degree		2 according to EN 61131-2, condensation during operation is not permitted

¹⁾ SICK Stegmann Hiperface encoder (Supported encoders: See parameter **EncoderType** in the **EPAS-4** online help (PacDrive M) or **EcoStruxure Machine Expert** online help (PacDrive 3))

Table 7-3: Technical data of the Bus Terminal BT-4/ENC1

7.3 Electrical connections

7.3.1 PacDrive bus terminal BT-4/DIO1

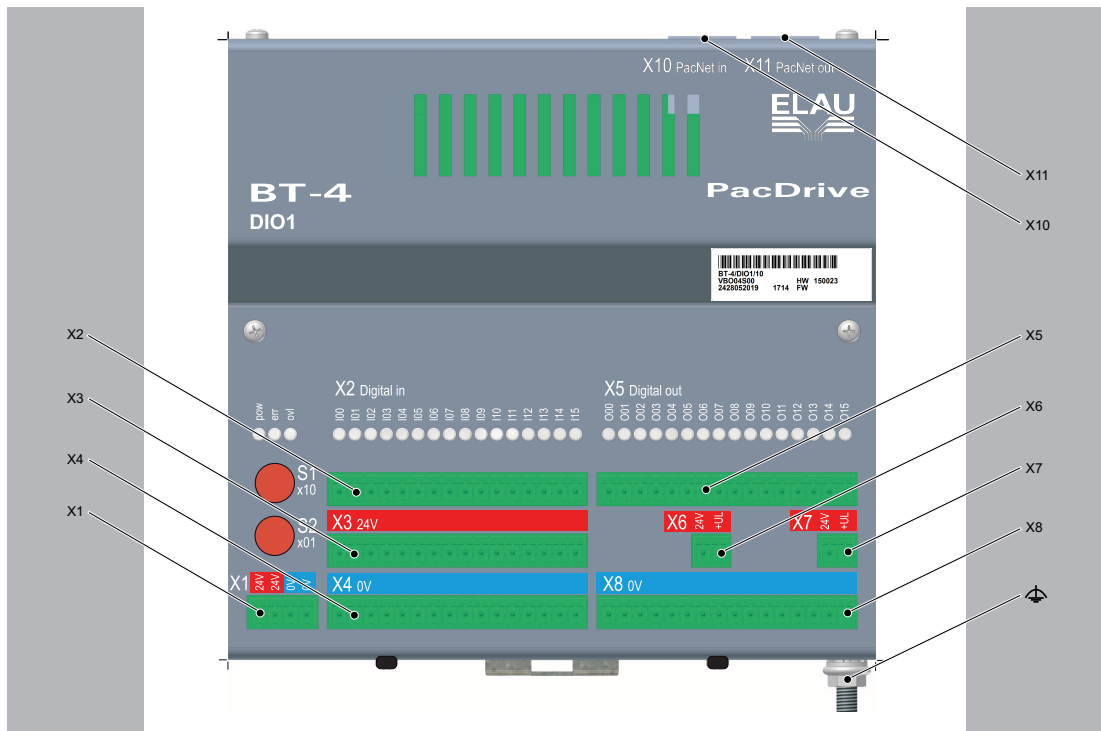
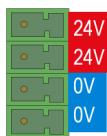


Figure 7-1: Electrical connections PacDrive bus terminal BT-4/DIO1

Connection	Meaning	Connection cross-section [mm ²]/ [AWG]		Tightening torque [Nm]/[lbf in]
	Shield connection - Functional earth ground conductor (FE)	4	11	1 / 8.85

X1 - Control voltage

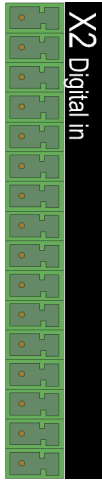


Pin	Designation	Meaning	Range
1	24 V	Supply voltage	-15 % / +20 %
2	24 V	Supply voltage	-15 % / +20 %
3	0 V	Supply voltage	
4	0 V	Supply voltage	

Maximum cross-section 1.0 mm²; stripping length l=9 mm; length of the metal sleeves by wire end sleeves l=10 mm;
 all 24 V Pins are connected with each other electro-conductive (internally bridged):
 X1 Pin 1 and X1 Pin 2 and X6 Pin 1 and X7 Pin 1 and X3 Pin 1-16;
 all 0 V Pins are connected with each other electro-conductive (internally bridged):
 X1 Pin 3 and X1 Pin 4 and X4 Pin 1-16 and X8 Pin 1-16;

Table 7-4: Electrical connection BT-4/DIO1/X1

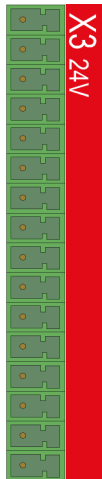
X2 Digital in



Pin	Designation	Meaning	Range
1	I00	Input	EN 61131-2 type I
2	I01	Input	EN 61131-2 type I
3	I02	Input	EN 61131-2 type I
4	I03	Input	EN 61131-2 type I
5	I04	Input	EN 61131-2 type I
6	I05	Input	EN 61131-2 type I
:			
16	I15	Input	EN 61131-2 type I
Maximum cross-section 1.0 mm ² ; stripping length l=9 mm; with conductor end sleeves, metal sleeve length l=10 mm			

Table 7-5: Electrical connection BT-4/DIO1/X2

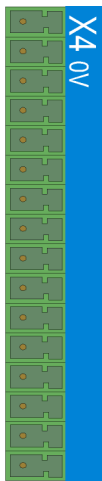
X3 - Power supply 24 V



Pin	Designation	Meaning	Range
1	I00	Power supply I00	DC 24 V (-15 % / +20 %)
2	I01	Power supply I01	DC 24 V (-15 % / +20 %)
3	I02	Power supply I02	DC 24 V (-15 % / +20 %)
4	I03	Power supply I03	DC 24 V (-15 % / +20 %)
5	I04	Power supply I04	DC 24 V (-15 % / +20 %)
6	I05	Power supply I05	DC 24 V (-15 % / +20 %)
:			
16	I15	Power supply I15	DC 24 V (-15 % / +20 %)
Maximum cross-section 1.0 mm ² ; stripping length l=9 mm; with conductor end sleeves, metal sleeve length l=10 mm			

Table 7-6: Electrical connection BT-4/DIO1/X3

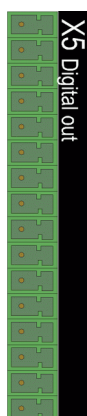
X4 - Power supply 0 V



Pin	Designation	Meaning	Range
1	I00	Power supply I00	DC 0 V
2	I01	Power supply I01	DC 0 V
3	I02	Power supply I02	DC 0 V
4	I03	Power supply I03	DC 0 V
5	I04	Power supply I04	DC 0 V
6	I05	Power supply I05	DC 0 V
:			
16	I15	Power supply I15	DC 0 V
Maximum cross-section 1.0 mm ² ; stripping length l=9 mm; with conductor end sleeves, metal sleeve length l=10 mm			

Table 7-7: Electrical connection BT-4/DIO1/X4

X5 - Digital out



Pin	Designation	Meaning	Range
1	O00	Output	EN 61131-2 type I
2	O01	Output	EN 61131-2 type I
3	O02	Output	EN 61131-2 type I
4	O03	Output	EN 61131-2 type I
5	O04	Output	EN 61131-2 type I
6	O05	Output	EN 61131-2 type I
:			
16	O15	Input	EN 61131-2 type I
Maximum cross-section 1.0 mm ² ; stripping length l=9 mm; with conductor end sleeves, metal sleeve length l=10 mm			

Table 7-8: Electrical connection BT-4/DIO1/X5

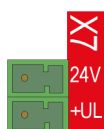
X6 - Power supply O00 - O07



Pin	Designation	Meaning	Range
1	24 V	Power supply (X1)	-15 % / +20 %
2	+UL	Power supply (for O00 - O07)	
Maximum cross-section 1.0 mm ² ; stripping length l=9 mm; length of the metal sleeves by wire end sleeves l=10 mm			
all 24 V Pins are connected with each other electro-conductive (internally bridged): X1 Pin 1 and X1 Pin 2 and X6 Pin 1 and X7 Pin 1 and X3 Pin 1-16;			
By a supply of the outputs via the device supply the X6 Pin 1 has to be bridged with the X6 Pin 2.			
By a supply of the outputs via an external power supply:			
- Do not use a bridge between the X6 Pin 1 and X6 Pin 2.			
- Connect the positive pole of the external power supply to the X6 Pin 2.			
- Connect the negative pole of the external power supply to any 0 V Pin (X1 Pin 3 or X1 Pin 4 or X4 Pin 1-16 or X8 Pin 1-16).			

Table 7-9: Electrical connection BT-4/DIO1/X6

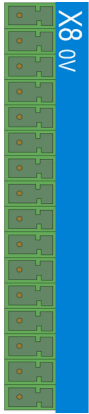
X7 - Power supply O08 - O15



Pin	Designation	Meaning	Range
1	24 V	Power supply (X1)	-15 % / +20 %
2	+UL	Power supply (for O08 - O15)	
Maximum cross-section 1.0 mm ² ; stripping length l=9 mm; length of the metal sleeves by wire end sleeves l=10 mm			
all 24 V Pins are connected with each other electro-conductive (internally bridged): X1 Pin 1 and X1 Pin 2 and X6 Pin 1 and X7 Pin 1 and X3 Pin 1-16;			
By a supply of the outputs via the device supply the X7 Pin 1 has to be bridged with the X7 Pin 2.			
By a supply of the outputs via an external power supply:			
- Do not use a bridge between the X7 Pin 1 and X7 Pin 2.			
- Connect the positive pole of the external power supply to the X7 Pin 2.			
- Connect the negative pole of the external power supply to any 0 V Pin (X1 Pin 3 or X1 Pin 4 or X4 Pin 1-16 or X8 Pin 1-16).			

Table 7-10: Electrical connection BT-4/DIO1/X7

X8 - Power supply 0 V

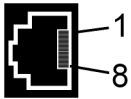


Pin	Designation	Meaning	Range
1	O00	Power supply O00	DC 0 V
2	O01	Power supply O01	DC 0 V
3	O02	Power supply O02	DC 0 V
4	O03	Power supply O03	DC 0 V
5	O04	Power supply O04	DC 0 V
6	O05	Power supply O05	DC 0 V
:			
16	O15	Power supply O15	DC 0 V

Maximum cross-section 1.0 mm²; stripping length l=9 mm; with conductor end sleeves, metal sleeve length l=10 mm

Table 7-11: Electrical connection BT-4/DIO1/X8

X10 - PacNet in



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 7-12: Electrical connection BT-4/DIO1/X10

X11 - PacNet out



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 7-13: Electrical connection BT-4/DIO1/X11



A terminating connector must be attached to the bus line on "PacNet out" of the last BT-4 module for trouble-free PacNet bus operation.

7.3.2 PacDrive bus terminal BT-4/ENC1

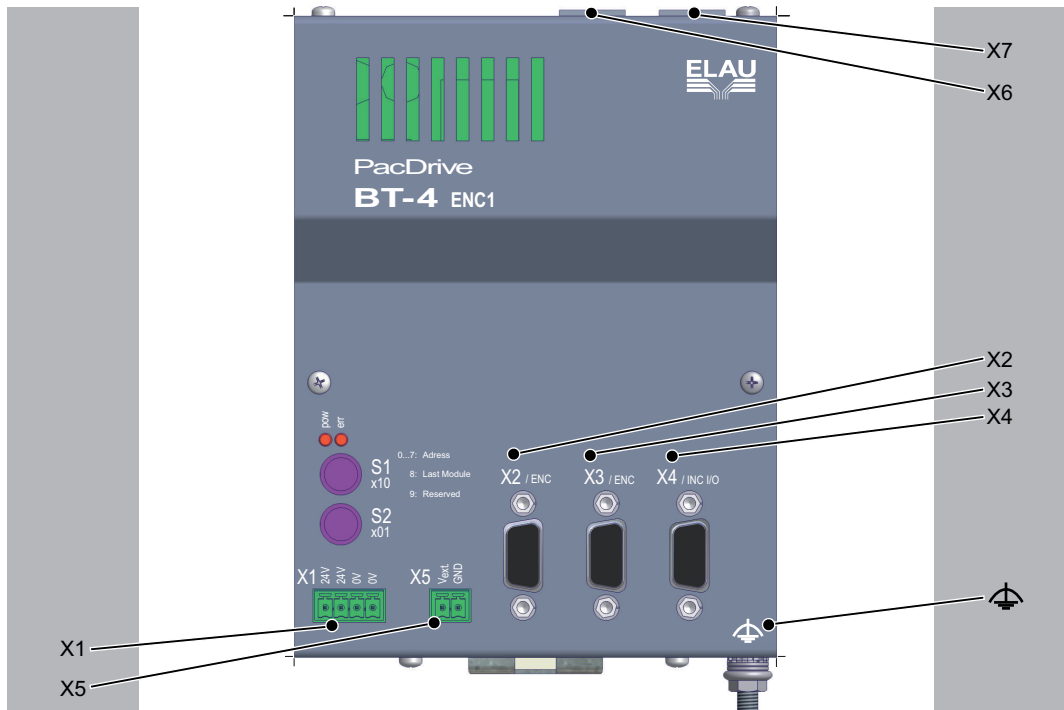
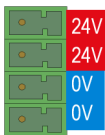


Figure 7-2: Electrical connections of PacDrive Bus Terminal BT-4/ENC1

Conne- ction	Meaning	Connection cross-section [mm²]/ [AWG]		Tightening torque [Nm]/[lbf in]
	Shield connection - Functional earth ground conductor (FE)	4	11	1 / 8.85

X1 - Control voltage

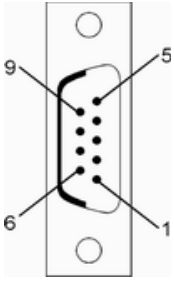


Pin	Designation	Meaning	Range
1	24 V	Supply voltage	-15 % / +20 %
2	24 V	Supply voltage	-15 % / +20 %
3	0 V	Supply voltage	
4	0 V	Supply voltage	

Maximum cross-section 1.0 mm²; stripping length l=9 mm; length of the metal sleeves by wire end sleeves l=10 mm;
 X1 Pin 1 and X1 Pin 2 internally bridged; X1 Pin 3 and X1 Pin 4 internally bridged;

Table 7-14: Electrical connection BT-4/ENC1/X1

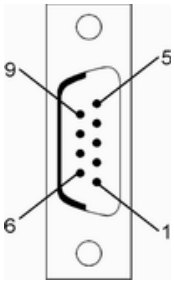
X2 ... X3 - Encoder Input (incremental encoder or SinCos)



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	_U0	Track 0-	
7	U0	Track 0	
8	-	Reserved	
9	GND	Ground	

Maximum cross-section 0.25 mm²

Table 7-15: Electrical connection BT-4/ENC1/X2 ... 3 (incremental encoder input)

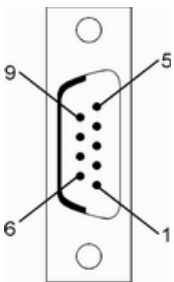


Pin	Designation	Meaning	Range
1	REFSIN	Reference signal sine	
2	SIN	Sinusoidal trace	
3	REFCOS	Reference signal Cosinus	
4	COS	Cosinus trace	
5	+8 V	Supply voltage	
6	RS485-	Parameter channel -	
7	RS485+	Parameter channel +	
8	Encoder detection	Encoder plugged (Bridge to GND)	
9	GND	Ground	

Maximum cross-section 0.25 mm²

Table 7-16: Electrical connection BT-4/ENC1/X2 ... 3 (SinCos encoder input)

X4 - Incremental encoder input/output

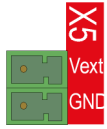


Pin	Designation	Meaning	Range
1	_UA	Track A-	
2	UA	Track A	
3	_UB	Track B-	
4	UB	Track B	
5	VCC	Supply voltage	
6	_U0	Track 0-	
7	U0	Track 0	
8	-	Reserved	
9	GND	Ground	

Maximum cross-section 0.25 mm²

Table 7-17: Electrical connection BT-4/ENC1/X4 (incremental encoder input/output)

X5 - Encoder power supply



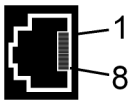
Pin	Designation	Meaning	Range
1	Vext.	External power supply of the encoder	24 V (see encoder data sheet)
2	GND	External power supply of the encoder	GND (see encoder data sheet)

Maximum cross-section 1.0 mm²; stripping length l=9 mm; length of the metal sleeves by wire end sleeves l=10 mm

The supply voltage of all the connected encoders is set with the parameter **EncPowerSupply** in the PLC Configuration. The encoders are normally powered by the power supply of the **BT-4/ENC1** (X1 plug).

Table 7-18: Electrical connection BT-4/ENC1/X5

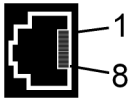
X6 - PacNet in



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 7-19: Electrical connection BT-4/ENC1/X6

X7 - PacNet out



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 7-20: Electrical connection BT-4/ENC1/X7



A terminating connector must be attached to the bus line on "PacNet out" of the last BT-4 module for trouble-free PacNet bus operation.

7.4 Dimensions

7.4.1 PacDrive bus terminal BT-4/DIO1

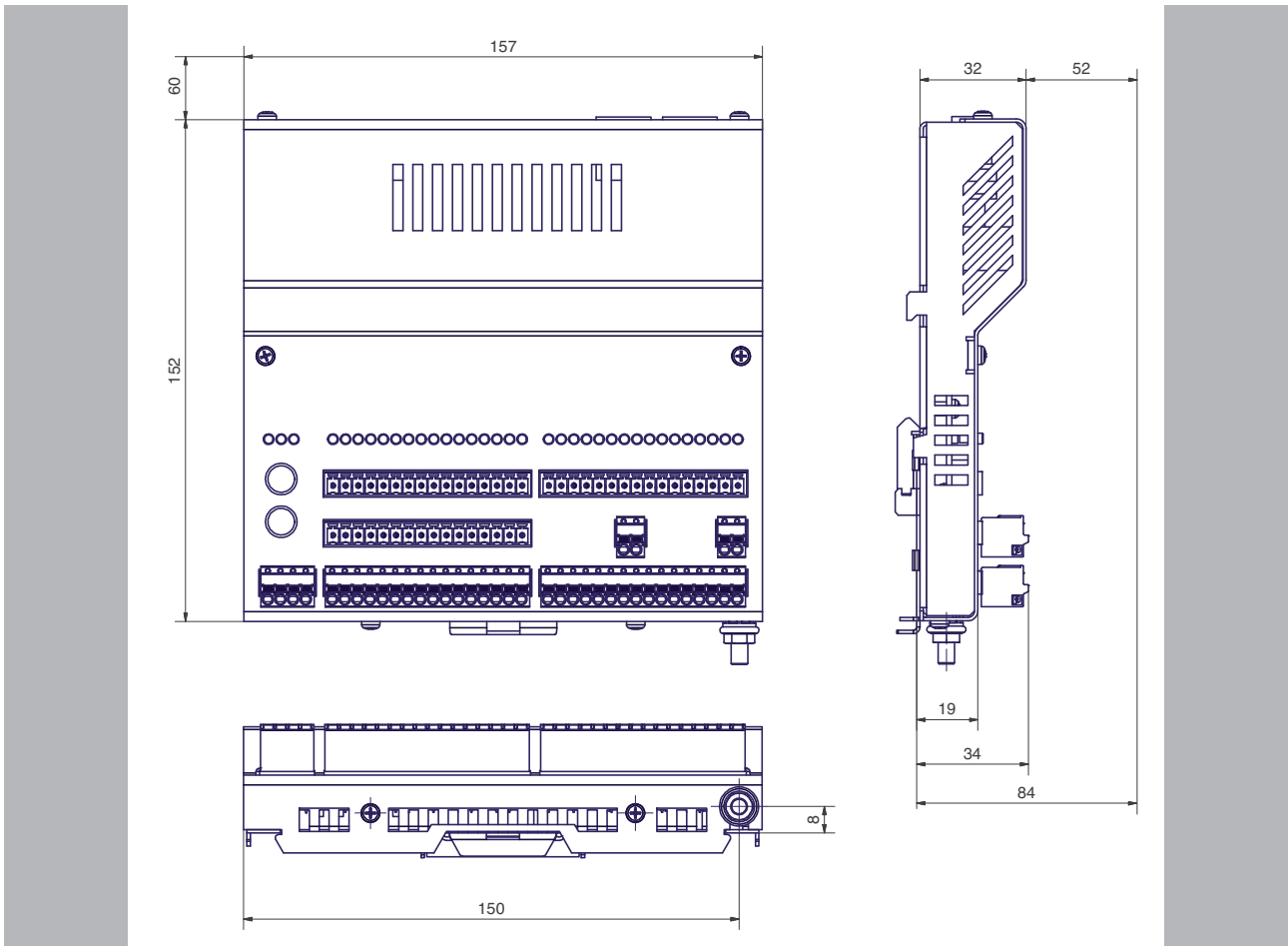


Figure 7-3: Measurements of the Bus Terminal BT-4/DIO1 in mm (conversion table in the appendix)

Assembly arrangement

Assembly arrangement: vertical (shield connection on the bottom)

7.4.2 PacDrive bus terminal BT-4/ENC1

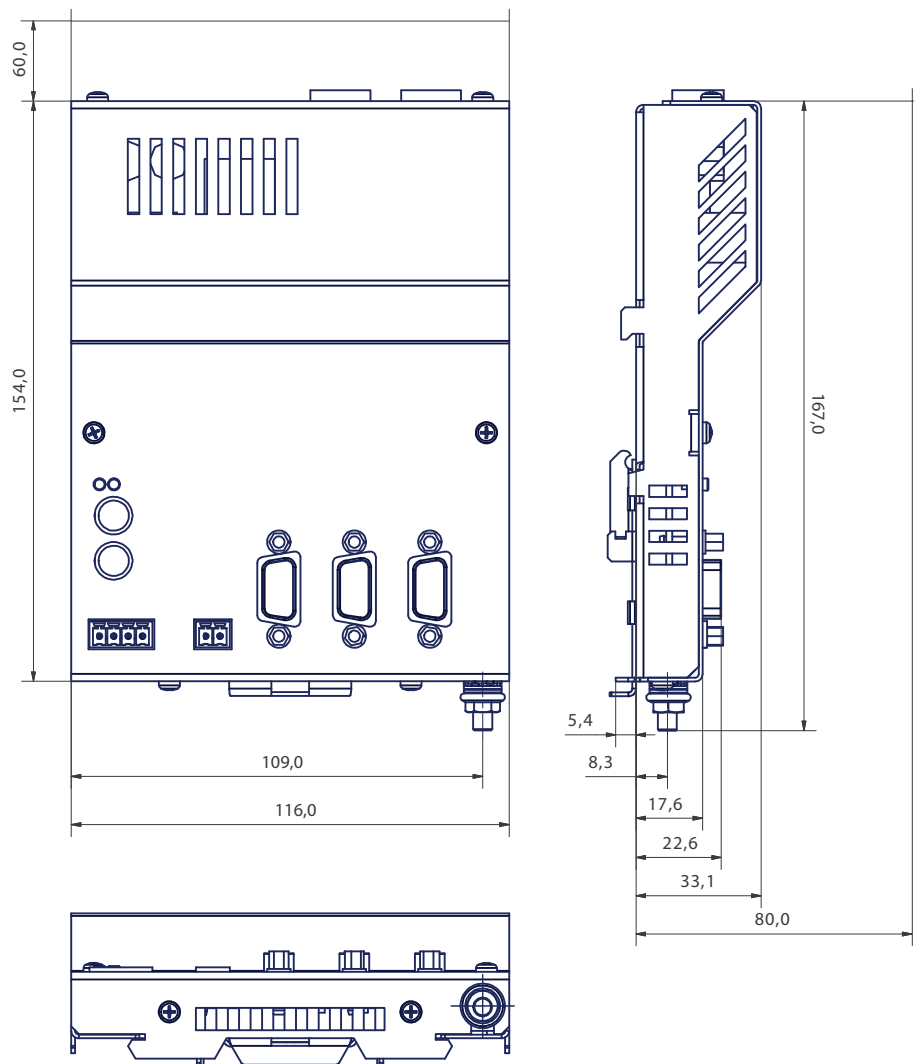


Figure 7-4: Measurements of the Bus Terminal BT-4/ENC1 in mm (conversion table in the appendix)

Assembly arrangement

Assembly arrangement: vertical (shield connection on the bottom)

8 Appendix

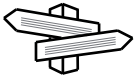
8.1 Contact addresses

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Internet: www.schneider-electric.com

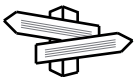


See the homepage for additional contact addresses:
www.schneider-electric.com

8.2 Product training courses

Schneider Electric offers a number of product training courses.

Our training instructors will help you take advantage of the extensive possibilities offered by the system.



See the homepage (www.schneider-electric.com) for further information and our current seminar schedule.

8.3 EC declaration of conformity

EC DECLARATION OF CONFORMITY
 Document number / Month.Year: HRB7966900_01 / 05.2014
 - Original -



We: Schneider Electric Automation GmbH
 Subsidiary of Schneider Electric (F-92500 Rueil-Malmaison)
 Schneiderplatz 1
 97828 Marktheidenfeld Germany

hereby declare that the products:

Trademark:	Schneider Electric
Product, Type, Function:	Accessories for SCL / iSH servomodule
Models:	VBO
Serial number:	YYZZXXXXXX (YY: Year, 22=2012, 23=2013; ZZ: Supplier Code; XXXXXX: Continuous number)

with the references

Reference	Description
VBO01zxx	POWER DISTRIBUTION BOARD PD 4
VBO02zxx	POWER DISTRIBUTION UNIT PD 8, ASEPATIC
VBO03zxx	ISH DISTRIBUTION BOX DB 5
VBO04zxx**	PACNET BUSTERMINAL BT 4 DIO1 16I 16O
VBO05zxx**	PACNET ENCODER MODULE BT 4 ENC1

z are letters, x are numbers for different variations

** only EN 61800-3:2004 + A1:2002

are in conformity with the requirements of the following directives and conformity was checked in accordance with the following standards:

Directive	Harmonized Standard
DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (EMC) of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC	EN 61800-3:2004 + A1:2012 Adjustable speed electrical power drive systems - Part 3: EMC requirements and specific test methods (IEC 61800-3:2004 + A1:2011)
DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits	EN 61800-5-1:2007 Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1:2007)
DIRECTIVE 2011/65/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL (Restriction of the use of certain hazardous substances (RoHS)) of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment	EN 50581:2012 (DIN EN 50581) Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

It is important that the component is subject to correct installation, maintenance and use conforming to its intended purpose, to the applicable regulations and standards, to the supplier's instructions, user manual and to the accepted rules of the art.

First year of affixing CE Marking: 2008

Issued at Marktheidenfeld, Germany - May 05,2014

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8.4 Units and conversion tables

8.5 Changes

03/2002

- New edition of the operating manual

07/2006

- New BT-4/ENC1 bus terminal

01/2007

- Address setting on the BT-4/ENC1 (last module) was added.
- Technical data of PacNet added.

7/2007

- Revision of the chapter structure
- Revision of the figures
- Revision of the chapter 6 "Installation and Maintenance"

6/2014

- Using the bus terminals BT-4/DIO1 and BT-4/ENC1 for PacDrive 3 also (so far only PacDrive M)

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