BECKHOFF New Automation Technology

Documentation | EN

EL9xxx

EtherCAT System Terminals



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1 Foreword

1.1 Notes on the documentation

Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the documentation and the following notes and explanations are followed when installing and commissioning these components.
The qualified personnel is obliged to always use the currently valid documentation.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development.

We reserve the right to revise and change the documentation at any time and without prior announcement.

No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Signal words

The signal words used in the documentation are classified below. In order to prevent injury and damage to persons and property, read and follow the safety and warning notices.

Personal injury warnings

⚠ DANGER
Hazard with high risk of death or serious injury.

⚠ WARNING
Hazard with medium risk of death or serious injury.

⚠ CAUTION
There is a low-risk hazard that could result in medium or minor injury.

Warning of damage to property or environment

NOTICE
The environment, equipment, or data may be damaged.

Information on handling the product

This information includes, for example:
recommendations for action, assistance or further information on the product.

1.3 Guide through documentation

NOTICE



Further components of documentation

This documentation describes device-specific content. It is part of the modular documentation concept for Beckhoff I/O components. For the use and safe operation of the devices described in this documentation, additional cross-product descriptions are required, which can be found in the following table.

Title	Description
EtherCAT System Documentation (PDF)	• System overview • EtherCAT basics • Cable redundancy • Hot Connect • EtherCAT devices configuration
Explosion Protection for Terminal Systems (PDF)	Notes on the use of the Beckhoff terminal systems in hazardous areas according to ATEX and IECEx
Control Drawing I/O, CX, CPX (PDF)	Connection diagrams and Ex markings (conform to cFMus)
EtherCAT Terminals in the Marine Sector (PDF)	Notes for operation of the Beckhoff EtherCAT Terminal System in the Marine Sector (DNV)
Infrastructure for EtherCAT/Ethernet (PDF)	Technical recommendations and notes for design, implementation and testing
Software Declarations I/O (PDF)	Open source software declarations for Beckhoff I/O components

The documentations can be viewed at and downloaded from the Beckhoff website (www.beckhoff.com) via:

- the “Documentation and Download” area of the respective product page,
- the Download finder,
- the Beckhoff Information System.

If you have any suggestions or proposals for our documentation, please send us an e-mail stating the documentation title and version number to: documentation@beckhoff.com

1.4 Documentation issue status

Version	Comment
5.0.0	• Update chapter “Notes on the documentation” • Update chapter “Interference-free bus terminals” • Update chapter “Installation positions” • Update chapter “Support and Service” • Structural update
4.9.0	• Update chapter “Product description” • Update Technical data • Structural update
4.8.1	• Update chapter “UL notes” • Update chapter “Technical data” • Structural update
4.8	• Product images for EL9150, EL9160, EL9250, and EL9260 updated • Technical data updated • Structural update
4.7	• Update chapter “Technical data” • Update chapter “LEDs and connection” • Addendum UL note • Structural update
4.6	• Update chapter “LEDs and connection” • Structural update
4.5	• Update chapter “Interference-free terminals” • Structural update
4.4	• EL9540 and EL9550, application example amended • Structural update
4.3	• Update chapter “Technical data” • Structural update
4.2	• Update chapter “LEDs and connection” • Structural update
4.1	• EL9550-0010, EL9450-0010 amended • Update chapter “Technical data” • Structural update
4.0	• Update chapter “Technical data” • Structural update
0.1 … 3.9	*archived*

1.5 Intended use

⚠ WARNING

Intended use

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.6 Interference-free bus terminals

Implementing interference-free bus or EtherCAT Terminals in safety applications

When a bus terminal or EtherCAT Terminal is described as interference-free, this means that the downstream terminal will be passive in a safety application (e.g., during all-pole disconnection of a potential group).
In this context, the terminals do not constitute an active part of the safety controller and do not influence the safety integrity level (SIL) or performance level (PL) achieved in the safety application.
Please refer to the TwinSAFE Application Manual, chapter “All-pole disconnection of a potential group with downstream interference-free standard terminals (Category 4, PL e)” and subsequent sections.

NOTICE

Note the hardware version

Please refer to the “Technical data” and “Firmware compatibility” sections for information on the hardware version and interference-free nature of the respective bus terminal!
Only terminals with the correct hardware version may be used – otherwise the achieved SIL/PL may be affected!

The terminals regarded as interference-free at the point that this document was drafted are listed in the following tables along with their respective hardware versions.

Bus terminals

Terminal name	From hardware version
KL2134	09
KL2408	05
KL2424	05
KL2432	00
KL2434	00
KL2809	02
KL9110	07

ED Terminals

Terminal name	From hardware version
ED1859	00
ED2008	00
ED2032	00
ED2034	00
ED2807	00
ED2808	00
ED2809	00
ED2828	00
ED2838	00
ED2887	00
ED2889	00
ED9100	00
ED9110	00
ED9183	00
ED9184	00
ED9186	00
ED9188	00
ED9189	00
ED9410	00

EL Terminals

Terminal name	From hardware version
EL2004	15
EL2008	07
EL2014	00
EL2022	09
EL2024	06
EL2034	06
EL2042	06
EL2044	01
EL2068	00
EL2212	00
EL2258	00
EL2407	00
EL2409	00
EL2489	00
EL2809	01
EL2819	00
EL2828	00
EL2838	00
EL2869	00
EL2872	01
EL2878-0005	00
EL9110	13
EL9184	00
EL9185	00
EL9186	00
EL9187	00
EL9188	00
EL9189	00
EL9410	16

ELX Terminals

Terminal name	From hardware version
ELX1052	00
ELX1054	00
ELX1058	00
ELX2002	00
ELX2008	00
ELX2792	00
ELX3152	00
ELX3158	00
ELX3181	00
ELX3184	00
ELX3202	00
ELX3204	00
ELX3252	00
ELX3312	00
ELX3314	00
ELX3351	00
ELX4154	01
ELX4181	00
ELX5151	00
ELX6233	00
ELX9560	03

External wiring

The following requirements are to be ensured *by the system manufacturer* and must be incorporated into the user documentation.

- **IP54 protection rating**
  The terminals must be installed in IP54 control cabinets to assure the required IP54 protection rating.
- **Power supply**
  The standard terminals must be supplied with 24 V by an SELV/PELV power supply unit with an output voltage limit of U_{max} = 60 V in the event of a fault.
- **Prevention of feedback**
  Feedback can be prevented through different measures. These are described below. In addition to mandatory requirements, there are also optional requirements – only one of these must be selected.
  - **Do not switch loads with a separate power supply**
    Loads that have their own power supply may not be switched by standard terminals, since in this case feedback via the load cannot be ruled out.

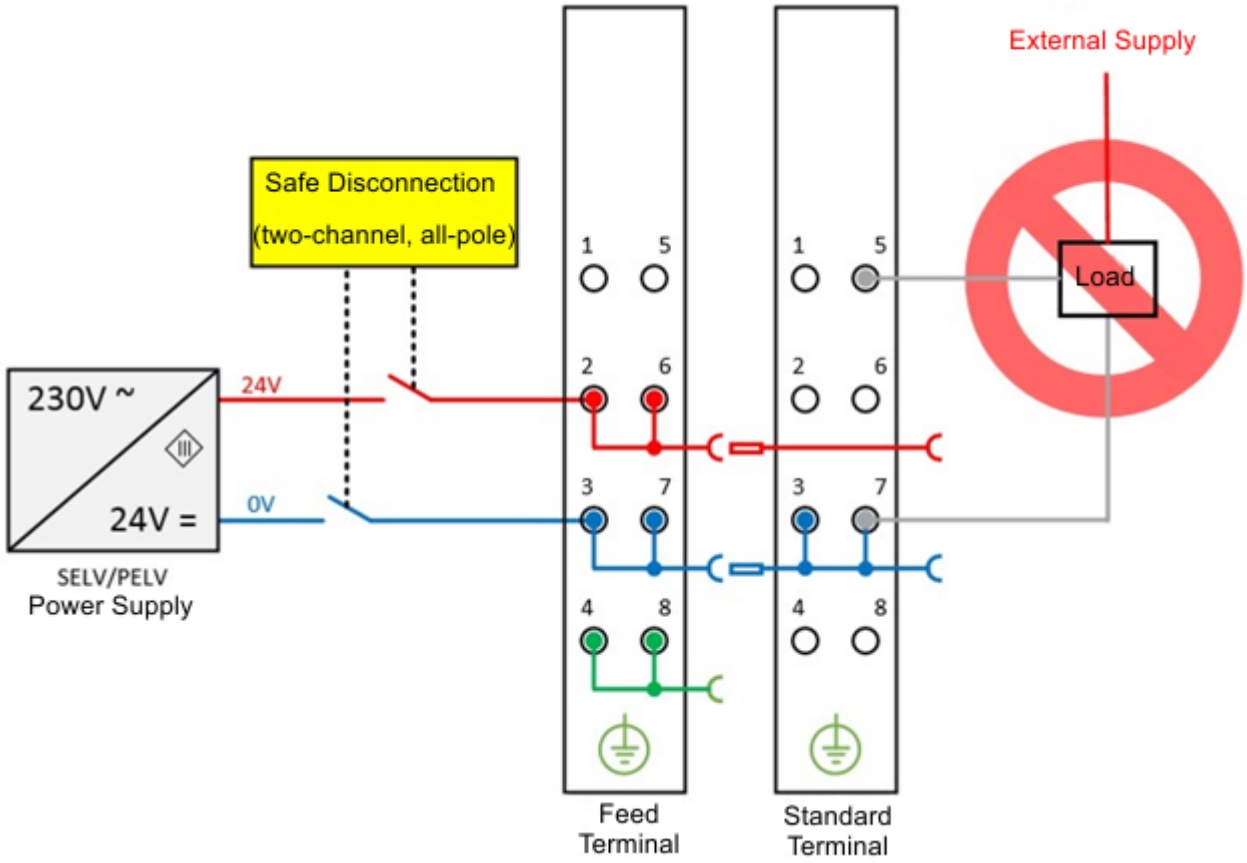


Fig. 1: Negative example – active load

  - **A negative example** here could be activating an STO input for a variable frequency drive. **Exceptions** to the general requirement are only permitted if the manufacturer of the connected load guarantees that feedback to the control input cannot occur. This can be achieved, for example, through compliance with load-specific standards.

◦ **Option 1: Ground return and all-pole disconnection**
The ground connection for the connected load must be fed back to the safely switched ground.

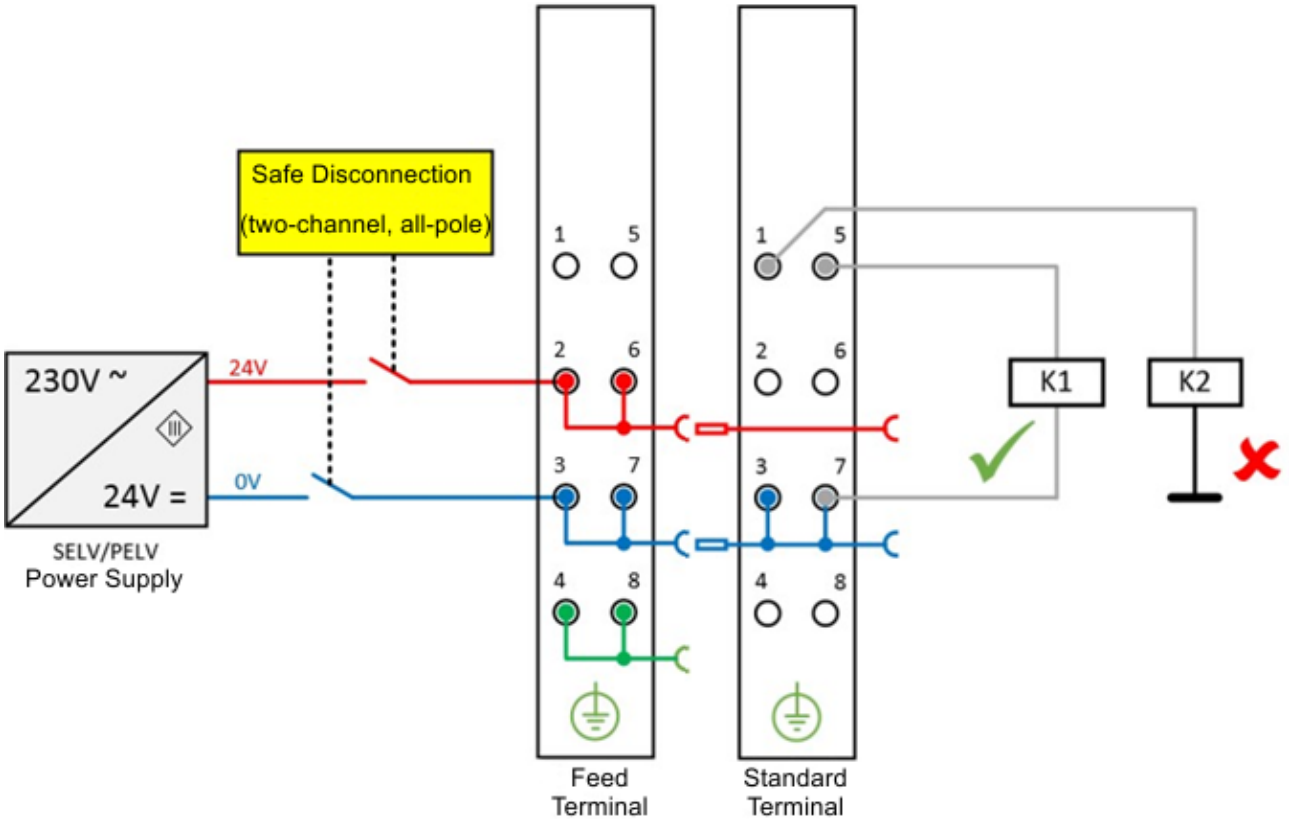


Fig. 2: Ground connection of the load: correct (K1) and incorrect (K2)

◦ If either
a) the load's ground is not connected back to the terminal, or
b) the ground is not safely switched but permanently connected

, it is necessary to rule out faults related to short circuits with external potential in order to achieve Cat. 4 PLe in accordance with DIN EN ISO 13849-1:2007 or SIL 3 in accordance with IEC 61508:2010 (see the overview in the chapter "Effect of the options on the safety level").

- **Option 2: Excluding cable short-circuiting faults**
  If option 1 is not feasible, the ground return and all-pole disconnection can be dispensed with if the danger of feedback due to a cable short-circuit can be excluded by other measures. These measures, which can be implemented as alternatives, are described in the following sections.

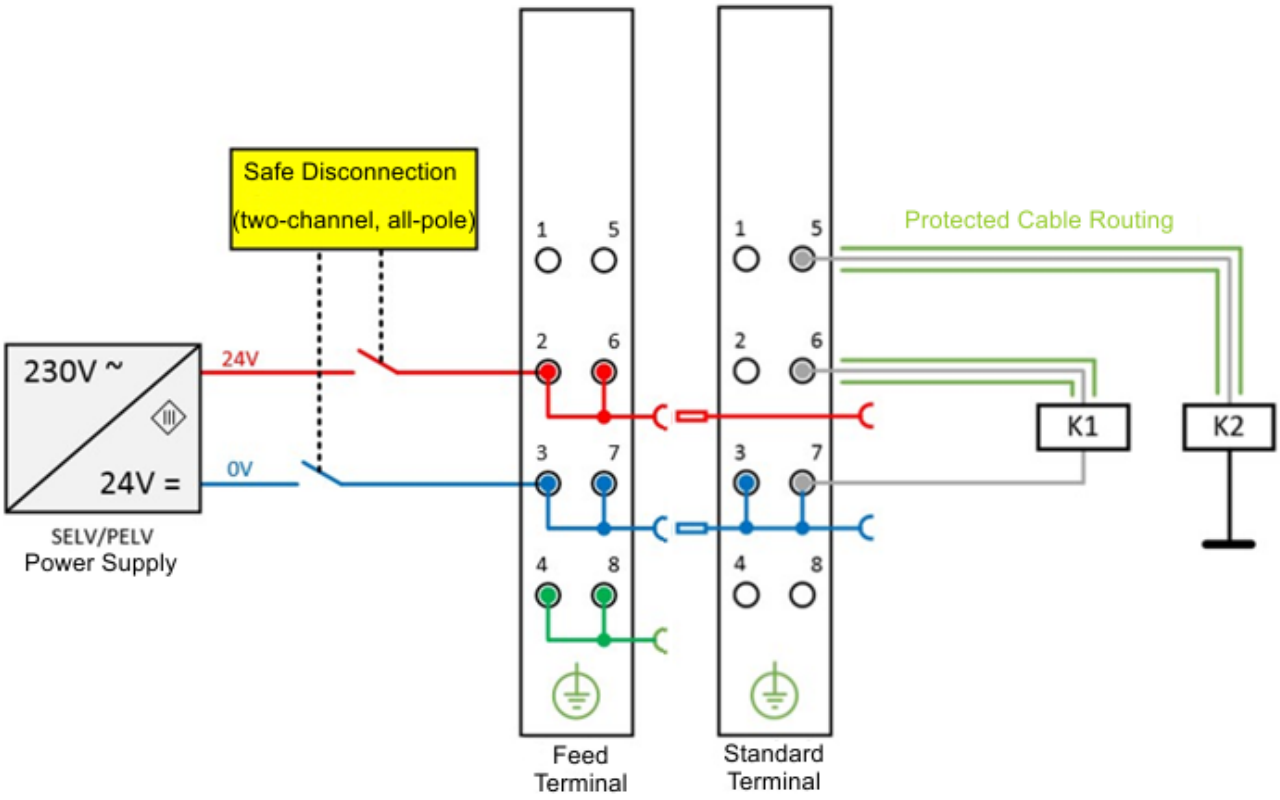


Fig. 3: Excluding a short-circuit fault by protecting cables

- **a) Option 1: Load connection using separate sheathed cables**
  The non-safely switched potential for the standard terminal may not be grouped inside the same sheathed cable as other potential-conducting lines. *(Fault exclusion, see DIN EN ISO 13849-2:2013, Table D.4)*
- **b) Option 2: Wiring is kept internal within the control cabinet**
  All loads connected to the non-safe standard terminals must be located in the same control cabinet as the terminals. The cables are routed entirely inside the control cabinet. *(Fault exclusion, see DIN EN ISO 13849-2:2013, Table D.4)*
- **c) Option 3: Dedicated earth connection per conductor**
  All conductors connected to the non-safe standard terminals are protected by their own earth connection. *(Fault exclusion, see DIN EN ISO 13849-2:2013, Table D.4)*
- **d) Option 4: Wiring permanently (fixed) installed and protected against external damage**
  All conductors connected to the non-safe standard terminals are permanently fixed in place and protected against external damage, for example, by a cable channel or conduit.

- **The options' effect on the safety level**
  In principle, standard terminals in safely switched potential groups are not an active part of the safety controller. This means that **the safety level attained is solely defined by the higher-level safety controller**: the standard terminals are not included in the calculation! However, the wiring of the standard terminals can lead to limitations on the maximum safety level that can be achieved.
  There are different maximum achievable safety levels which are dependent on the selected solution option (see Option 1 and Option 2) for preventing feedback and the applicable safety standard, and these are summarized in the following table:

Summary of safety levels

Feedback prevention measures	DIN EN ISO 13849-1	IEC 61508	EN 62061
Cable short-circuit fault exclusion	max. Cat. 4	max. SIL3	max. SIL2*
Ground return and all-pole disconnection	PL e		max. SIL3

⚠ WARNING

Please follow the instructions for operating interference-free terminals!

- All terminals in a potential group must be interference-free!
- Make sure that, even in the event of a fault, no power can be fed back through external wiring!

2 Product description

2.1 Overview EtherCAT System and Function terminals

EL9011 [▶ 17]	(End cap)
EL9012 [▶ 17]	(End cap)
EL9070 [▶ 20]	(Shield terminal)
EL9080 [▶ 17]	(Separation terminal)
EL9100 [▶ 23]	(Power supply terminal, 24 V DC)
EL9110 [▶ 23]	(Power supply terminal, 24 V DC with diagnosis)
EL9150 [▶ 27]	(Power supply terminal, 230 V AC [120 V AC])
EL9160 [▶ 27]	(Power supply terminal, 230 V AC [120 V AC] with diagnosis)
EL9180 [▶ 31]	(Potential distribution terminal, 2 terminal points per power contact)
EL9181 [▶ 34]	(HD potential distribution terminal, 2 separated potentials)
EL9182 [▶ 34]	(HD potential distribution terminal, 8 separated potentials)
EL9183 [▶ 34]	(HD potential distribution terminal, 1 potential, 16 terminal points)
EL9184 [▶ 46]	(HD potential distribution terminal, 2 x 8 channels)
EL9185 [▶ 37]	(Potential distribution terminal, 2 x 4 channels)
EL9185-0010 [▶ 40]	(Potential distribution terminal, 2 x 4 channels, potential supply function up to 230 V AC)
EL9186, EL9187 [▶ 43]	(Potential distribution terminals, 8 channels)
EL9188, EL9189 [▶ 46]	(HD potential distribution terminals, 16 channels)
EL9190 [▶ 23]	(Power supply terminal, up to 230 V AC/DC)
EL9195 [▶ 51]	(Shield terminal, up to 230 V AC/DC)
EL9200 [▶ 54]	(Power supply terminal with fine-wire fuse, 24 V DC)
EL9210 [▶ 54]	(Power supply terminal with fine-wire fuse, 24 V DC with diagnosis)
EL9250 [▶ 58]	(Power supply terminal with fine-wire fuse, 230 V AC)
EL9260 [▶ 58]	(Power supply terminal with fine-wire fuse, 230 V AC with diagnosis)
EL9290 [▶ 54]	(power supply terminal with fine-wire fuse, up to 230 V AC)
EL9400 [▶ 62]	(Power supply terminal for E-bus refresh)
EL9410 [▶ 62]	(Power supply terminal for E-bus refresh, with diagnosis)
EL9540 [▶ 66]	(Surge filter field supply)
EL9540-0010 [▶ 66]	(Surge filter field supply with diagnosis, for analog terminals)
EL9550 [▶ 72]	(Surge filter system and field supply)
EL9550-0010 [▶ 72]	(Surge filter system and field supply with diagnosis, for digital terminals)
EL9550-0012 [▶ 72]	(Surge filter system and field supply, up to 10 A)
EL9570 [▶ 78]	(Buffer capacitor terminal)

2.2 EL9011, EL9012, EL9080

2.2.1 EL9011, EL9012, EL9080 - Introduction and Technical Data

End caps



Fig. 4: EL9011, EL9012

The EL9011 and EL9012 end caps serve as mechanical and electrical termination of the EtherCAT bus terminal block.
The EL9012 also covers the power contacts in addition to the E-bus and is color-matched to the EL terminal series.

Separation terminal



Fig. 5: EL9080

The EL9080 separation terminal interrupts the power contacts within a bus terminal block. The terminal allows operation with different voltages on both sides of the separated power contacts. However, the E-bus will pass through. The interruption of the power contacts is particularly emphasized by the orange front panel of the EL9080. The EL9080 separation terminal has no additional functions or connection options.

Technical data

Technical data	EL9011	EL9012	EL9080
Electrical isolation	-		500 V (E-bus/field voltage)
Bit width in process image	0		
Configuration	no address or configuration settings required		
Diagnostics	-		
Renewed infeed	-		
Connection facility to additional power contact	-		
Side by side mounting on EtherCAT Terminals with power contact	yes		
Side by side mounting on EtherCAT Terminals without power contact	yes		
Electrical connection to mounting rail	no		
Configuration	no address or configuration settings required		
Weight	approx. 8 g	approx. 10 g	approx. 40 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C		
Permissible ambient temperature range during storage	-40 °C ... +85 °C		
Permissible relative air humidity	95 %, no condensation		
Dimensions (W x H x D)	approx. 8 mm x 100 mm x 34 mm (width aligned: 5 mm)	approx. 8 mm x 100 mm x 55 mm (width aligned: 5 mm)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Installation [▶ 89]	mounted on the last terminal of the bus terminal block		on 35 mm mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	-	-	yes, see also Installation instructions [▶ 95] for enhanced mechanical load capacity
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27		
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4		
Protection rating	IP20		
Installation position	variable		
Markings*	CE, UKCA, EAC		
Approvals*	ATEX [▶ 84], IECEx [▶ 85], CCC, cULus [▶ 88]	cULus [▶ 88]	ATEX [▶ 84], IECEx [▶ 85], CCC, cULus [▶ 88]

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

2.3 EL9070

2.3.1 EL9070 - Introduction and Technical Data

Shield terminal

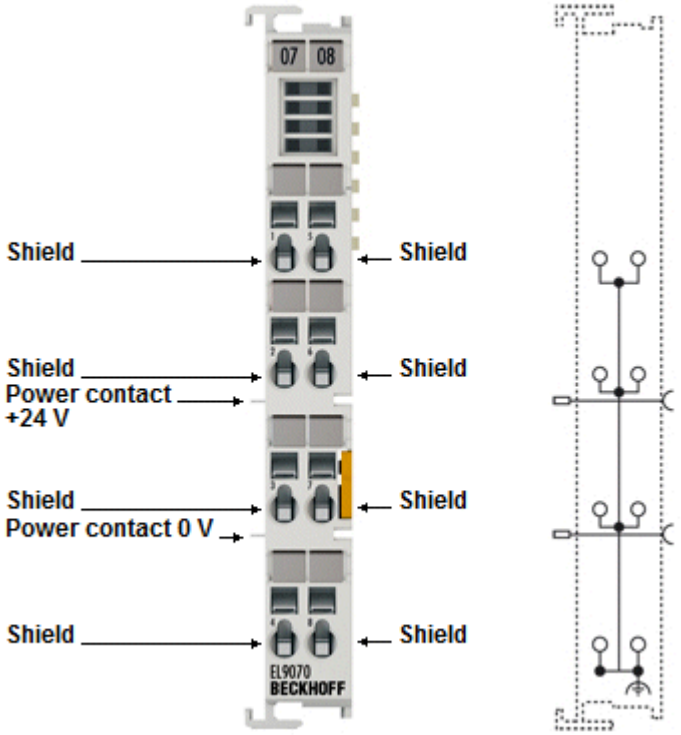


Fig. 6: EL9070

The EL9070 shield terminal provides eight terminal points with the potential of the mounting rail and enables the screening to be picked up without further modular terminal blocks or wiring. With its internal seamless copper surface, the EL9070 offers good screening between two EtherCAT Terminals.

Technical data

Technical data	EL9070
Technology	Shield terminal
Current load	≤ 10 A
Power LED	-
Defect LED	-
E-bus current consumption	-
Nominal voltage	any up to 230 V AC
Built-in fine-wire fuse	-
Electrical isolation	500 V (E-bus/field voltage)
Diagnostics in the process image	-
Message to E-bus	-
Shield connection	8 x
E-bus looped through	yes
Bit width in process image	0
Electrical connection to mounting rail	yes (dissipation of EMC interference via large copper surfaces)
Electrical connection to power contacts	-
Renewed infeed	-
Side by side mounting on EtherCAT Terminals with power contact	yes, left without power contact ground
Side by side mounting on EtherCAT Terminals without power contact	-
Connection facility to additional power contact	no
Configuration	no address or configuration settings required
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Weight	approx. 50 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC,

*) Real applicable approvals/markings see type plate on the side (product marking).

Connection

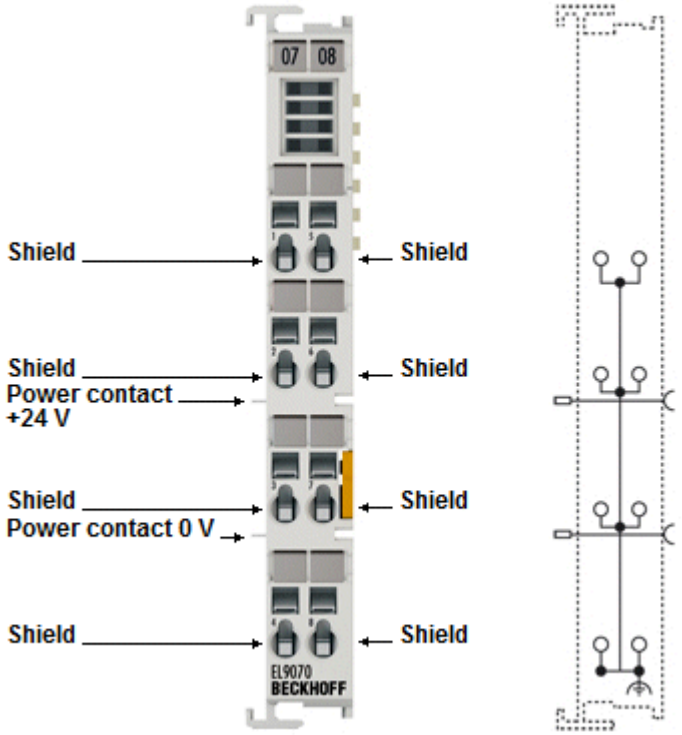


Fig. 7: EL9070 connection

Terminal point		Description
Name	No.	
1 - 8	1 - 8	Terminal points 1 - 8 are connected to each other

2.4 EL9100, EL9110, EL9190

2.4.1 EL9100, EL9110, EL9190 - Introduction and Technical Data

Power supply terminal 24 V DC

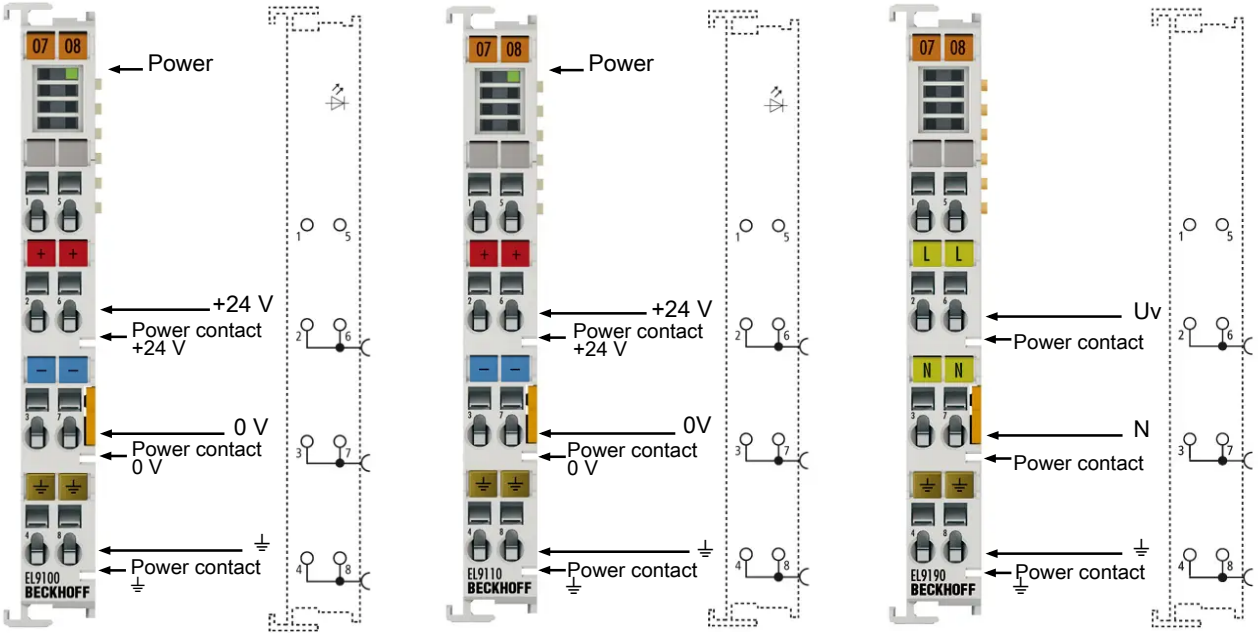


Fig. 8: EL9100, EL9110, EL9190

The EL9100, EL9110, and EL9190 power supply terminals can be placed at any position between the input/output terminals to create an additional potential group or to supply the terminals to the right with higher currents in case of high current loads.

The E-bus will pass through.

Unlike the EL9100 and EL9190, the EL9110 has diagnostics displayed in the process image.

Technical data

Technical data	EL9100	EL9110	EL9190
Nominal voltage	24 V DC		variable, up to 230 V AC/DC
Power contact current load	max. 10 A		
Electrical isolation	500 V (E-bus/field voltage)		
Current consumption via E-bus	-	typ. 90 mA	-
Bit width in process image	-	1 diagnostic bit	-
Configuration	no address or configuration settings required		
Power LED	yes	yes	no
Diagnostics	no	yes, in the process image	no
Electrical connection to mounting rail	no		
Renewed infeed	yes		
Connection facility to additional power contact	1		
Side by side mounting on EtherCAT Terminals with power contact	yes		
Side by side mounting on EtherCAT Terminals without power contact	yes		
Weight	approx. 50 g		
Permissible ambient temperature range during operation	-25 °C ... +60 °C		
Permissible ambient temperature range during storage	-40 °C ... +85 °C		
Permissible relative air humidity	95 %, no condensation		
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)		
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715		
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 95] for enhanced mechanical load capacity		-
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27		
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4		
Protection rating	IP20		
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	variable	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 84], IECEx [▶ 85]		CE, cULus [▶ 88], UKCA, EAC

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9100, EL9110, EL9190 connection

⚠ CAUTION

Danger for persons and equipment!

- In the project planning of the bus terminal system, observe the different potentials on the power contacts (24 V DC and 230 V AC/DC) and if necessary use potential separation terminals (EL9080) to isolate the potentials!
- Bring the bus terminal system into a safe, de-energized state before starting installation, disassembly or wiring of the terminal modules!

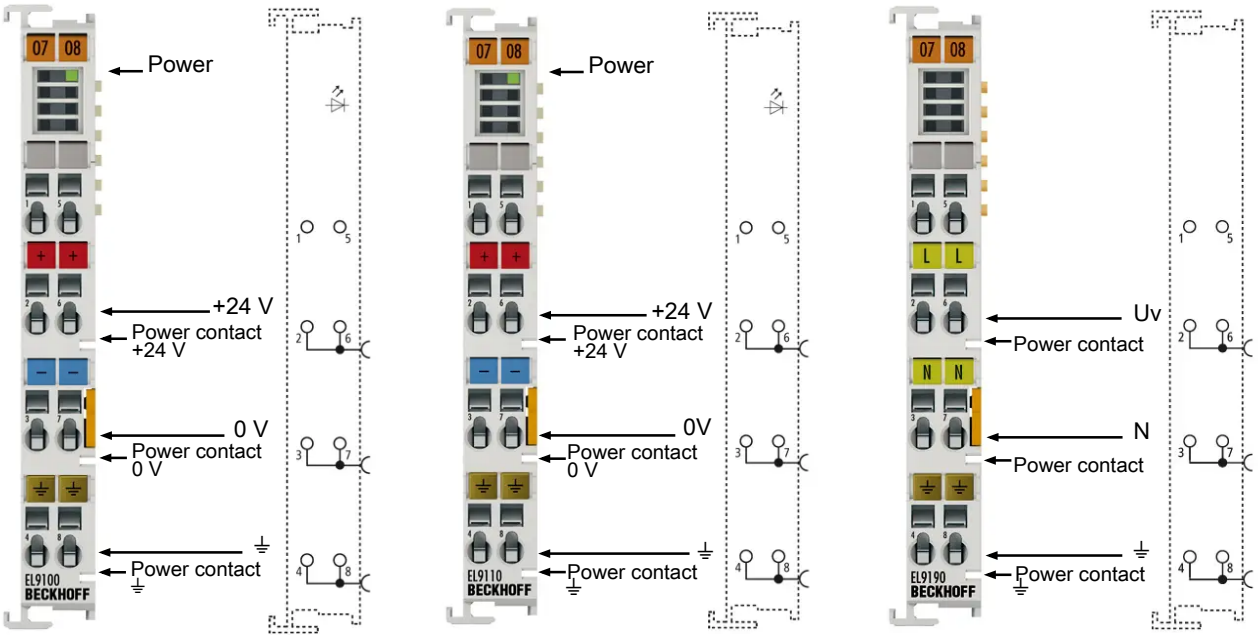


Fig. 9: Connection - EL9100, EL9110, EL9190

EL91100, EL9110			EL9190		
Terminal point		Description	Terminal point		Description
Name	No.		Name	No.	
	1	not used		1	not used
+24 V	2	Supply input +24 V internally connected to terminal point 6 and positive power contact	230 V AC/DC	2	Supply input 230 V AC/DC [any voltage up to 230 V AC/DC] internally connected to terminal point 6 and 230 V AC/DC power contact
0 V	3	0 V internally connected to terminal point 7 and negative power contact	N	3	N internally connected to terminal point 7 and neutral conductor power contact
⏚*	4	Ground (internally connected to terminal point 8 and power contact ground)	⏚*	4	Ground (internally connected to terminal point 8 and power contact ground)
	5	not used		5	not used
+24 V	6	Supply input +24 V internally connected to terminal point 2 and positive power contact	230 V AC/DC	6	Supply input 230 V AC/DC [any voltage up to 230 V AC/DC] internally connected to terminal point 2 and 230 V AC/DC power contact
0 V	7	0 V internally connected to terminal point 3 and negative power contact	N	7	N internally connected to terminal point 3 and neutral conductor power contact
⏚*	8	Protective conductor (internally connected with terminal point 4 and power contact ground)	⏚*	8	Ground (internally connected to terminal point 4 and power contact ground)
* from hardware version 02					

LEDs (EL9100 and EL9110 only)

LED	Color	Meaning	
Power LED	green	off	No supply voltage
		on	24 V DC at the supply input

Process data (EL9110 only)

The EL9110 has a bit width of 1 bit (diagnostic bit for voltage at the power contacts, "PowerOK") in the process image and is represented in the TwinCAT tree as follows:

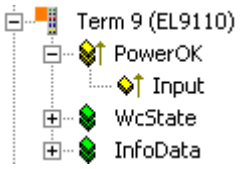


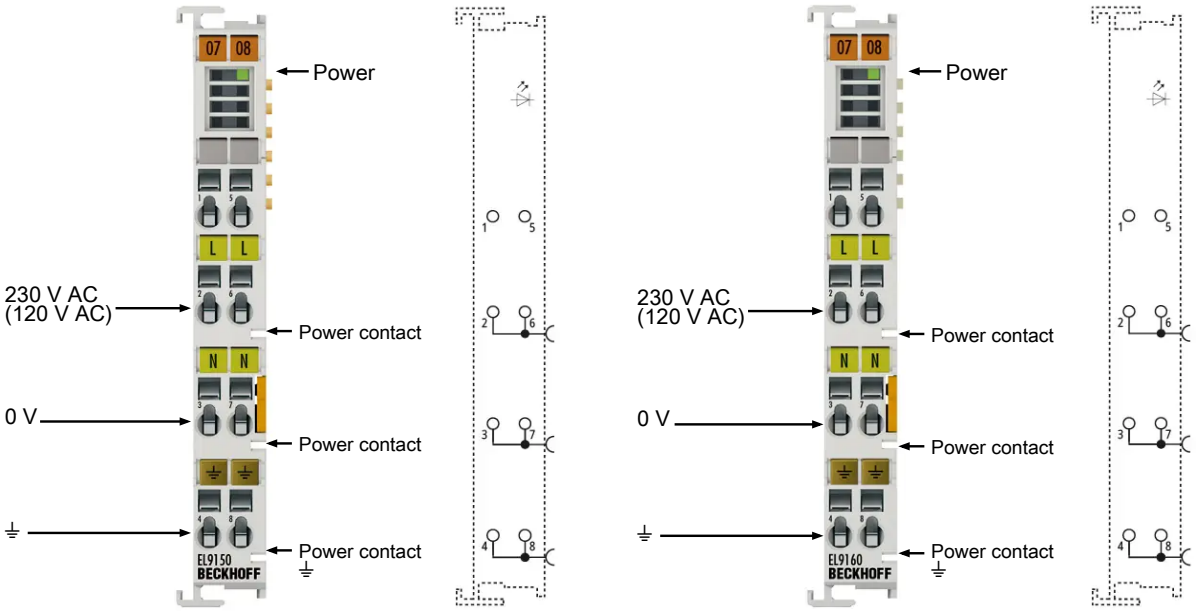
Fig. 10: EL9110 in the TwinCAT tree

If there is no voltage at the power contacts, the corresponding diagnostic bit "PowerOK" is set to FALSE (0).

2.5 EL9150, EL9160

2.5.1 EL9150, EL9160 - Introduction and Technical Data

Power supply terminals, 230 V AC



EL9150, EL9160

The EL9150 power supply terminal can be positioned at any location between the input and output terminals, for establishing a further potential group, or for supplying the terminals following on the right in applications with high current load. The E-bus will pass through.

Unlike the EL9150, the EL9160 has diagnostics displayed in the process image.

Technical data

Technical data	EL9150	EL9160
Nominal voltage	230 V_{AC} (120 V_{AC})	
Power contact current load	max. 10 A	
Electrical isolation	500 V (E-bus/field voltage)	
Current consumption via E-bus	-	typ. 90 mA
Bit width in process image	0	1 diagnostic bit
Configuration	no address or configuration settings required	
Power LED	yes	
Diagnostics	no	yes, in the process image
Electrical connection to mounting rail	no	
Renewed infeed	yes	
Connection facility to additional power contact	1	
Side by side mounting on EtherCAT Terminals with power contact	yes	
Side by side mounting on EtherCAT Terminals without power contact	yes	
Weight	approx. 50 g	
Permissible ambient temperature range during operation	-25 °C ... +60 °C	
Permissible ambient temperature range during storage	-40 °C ... +85 °C	
Operating altitude	max. 2000 m	
Overvoltage category	II	
Pollution degree	2	
Permissible relative air humidity	95 %, no condensation	
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)	
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715	
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection rating	IP20	
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	variable
Approvals / markings*	CE, cULus [▶ 88], EAC, UKCA	

*) Real applicable approvals/markings see type plate on the side (product marking).

EL9150, EL9160 connection

⚠ CAUTION

Danger for persons and equipment!

- In the project planning of the bus terminal system, observe the different potentials on the power contacts (24 V DC and 230 V AC) and if necessary use potential separation terminals (EL9080) to isolate the potentials!
- Bring the bus terminal system into a safe, de-energized state before starting installation, disassembly or wiring of the terminal modules!

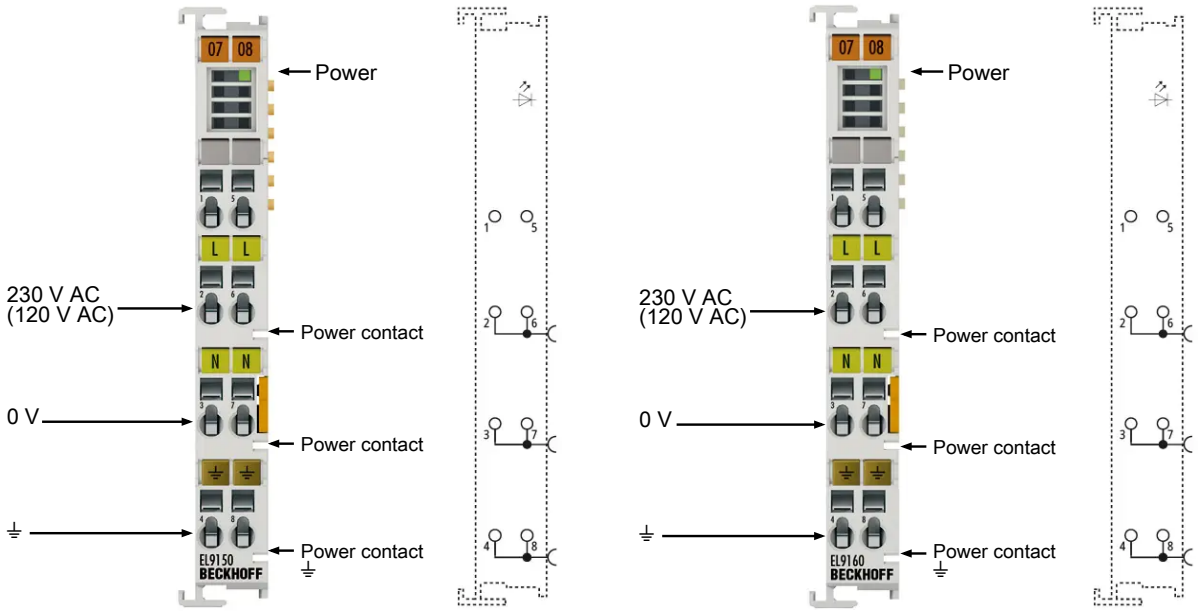


Fig. 11: EL9150, EL9160 connection

Terminal point		Description
Name	No.	
	1	not used
230 VAC (120 VAC)	2	Supply input 230 V_{AC} (120 V_{AC}), internally connected to terminal point 6 and power contact)
0 V	3	0 V for supply input (internally connected to terminal points 7 and power contact)
⏚	4	Ground (internally connected to terminal point 8 and power contact ground)
	5	not used
230 VAC (120 VAC)	6	Supply input 230 V_{AC} (120 V_{AC}), internally connected to terminal point 2 and power contact)
0 V	7	0 V for supply input (internally connected to terminal points 3 and power contact)
⏚	8	Ground (internally connected to terminal point 4 and power contact ground)

LEDs

LED	Color	Meaning	
Power LED	green	off	No voltage at the supply input
		on	230 V_{AC} (120 V_{AC}) at the supply input

Process data (EL9160 only)

The EL9160 has a bit width of 1 bit (diagnostic bit for voltage at the power contacts, "PowerOK") in the process image and is represented in the TwinCAT tree as follows:

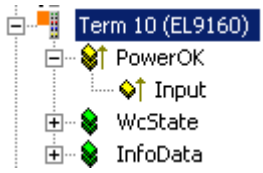


Fig. 12: EL9160 in the TwinCAT tree

If there is no voltage at the power contacts, the corresponding diagnostic bit "PowerOK" is set to FALSE (0).

2.6 EL9180

2.6.1 EL9180 - Introduction and Technical Data

Potential distribution terminal

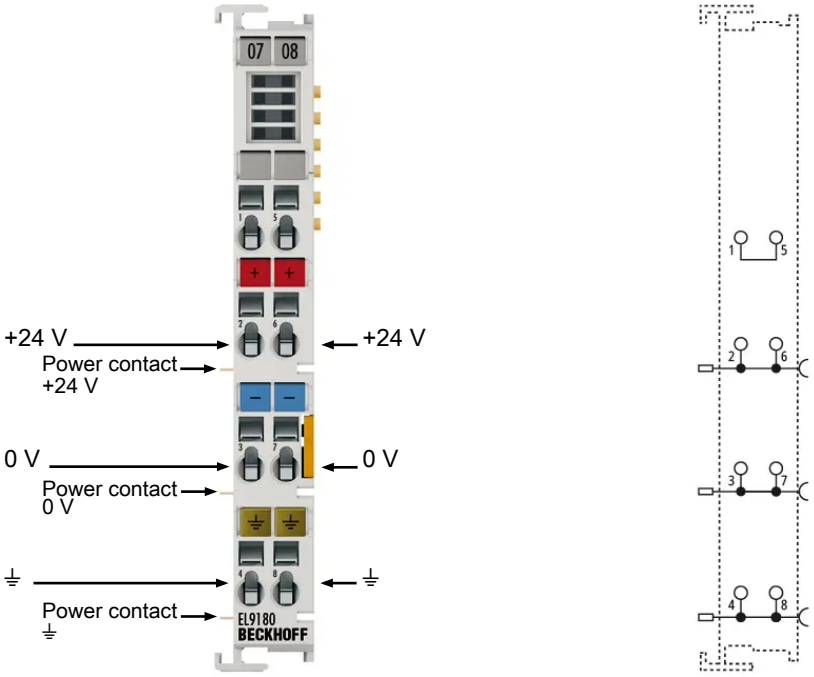


Fig. 13: EL9180

The EL9180 EtherCAT Terminal ensures that the supply voltage is tapped multiple times via spring-loaded terminals. It eliminates the need for additional terminal blocks on the terminal strip.

Technical data

Technical data	EL9180
Technology	Potential distribution terminal
Current load	≤ 10 A
Power LED	-
Defect LED	-
Current consumption via E-bus	-
Nominal voltage	any up to 230 V AC/DC
Built-in fine-wire fuse	-
Electrical isolation	500 V (E-bus/field voltage)
Diagnostics	-
Message to E-bus	-
Power contact	3 x power contact
Shield connection	-
Renewed infeed	-
Connection facility to additional power contact	2
Side by side mounting on EtherCAT Terminals with power contact	yes
Side by side mounting on EtherCAT Terminals without power contact	-
Electrical connection to mounting rail	yes
Bit width in process image	0
Configuration	no address or configuration settings required
Weight	approx. 50 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 95] for enhanced mechanical load capacity
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 83], IECEx [▶ 85],

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9180 connection

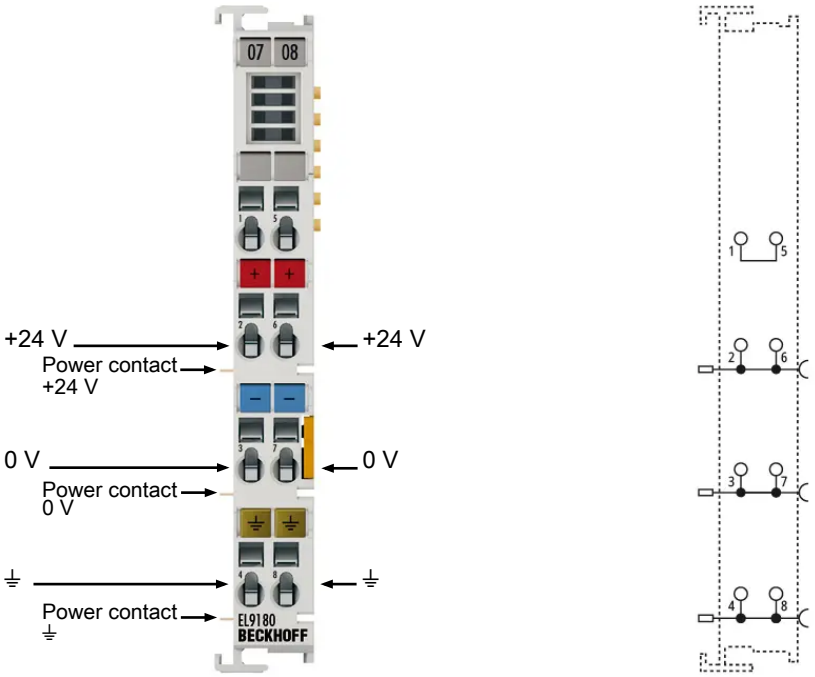


Fig. 14: EL9180 connection

Terminal point		Description
Name	No.	
	1	internally connected to terminal point 5
+24 V	2	internally connected to terminal point 6 and positive power contact
0 V	3	internally connected to terminal point 7 and negative power contact
⏚	4	Ground internally connected to terminal point 8 and power contact ground
	5	internally connected to terminal point 1
+24 V	6	internally connected to terminal point 2 and positive power contact
0 V	7	internally connected to terminal point 3 and negative power contact
⏚	8	Ground internally connected to terminal point 4 and power contact ground

2.7 EL9181, EL9182, EL9183

2.7.1 EL9181, EL9182, EL9183 - Introduction and Technical Data

Potential distribution terminals in HD housing

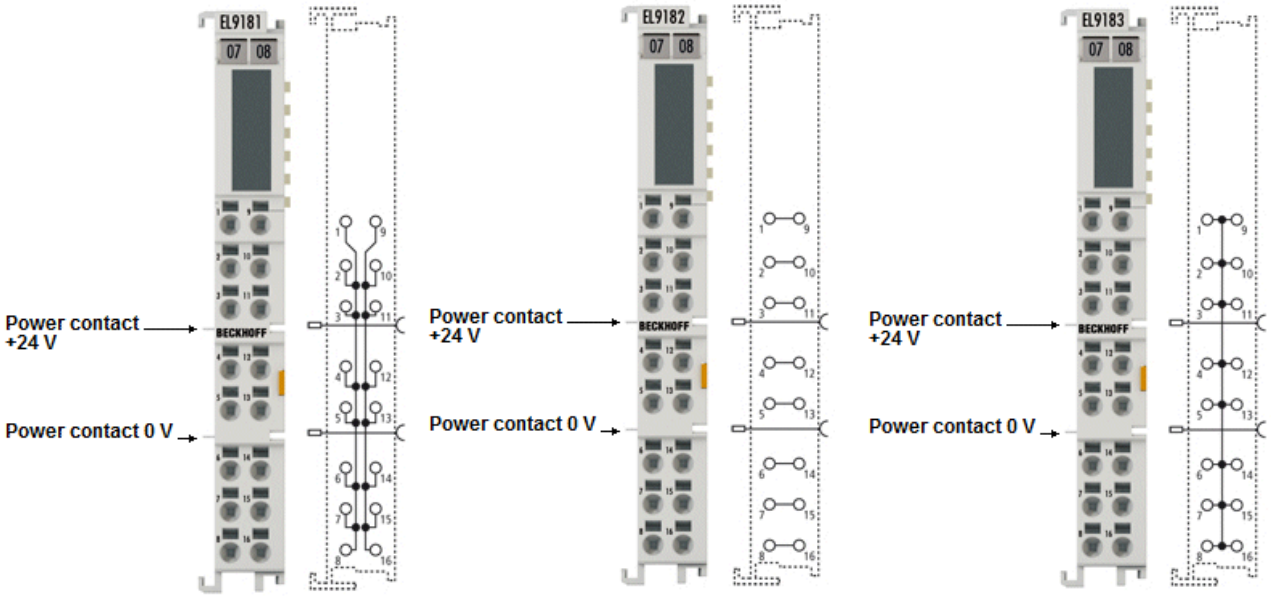


Fig. 15: EL9181, EL9182, EL9183

The EL9181, EL9182 and EL9183 potential distribution terminals provide 16 terminal points for potential distribution and enables the tapping of the voltages without further terminal blocks or wiring work.

The power contacts are fed through to the next terminal without connecting to the terminal points.

The HD EtherCAT Terminals (High Density) with increased packing density contain 16 connection points in the housing of a 12 mm-wide EtherCAT Terminal. Solid wire conductors can be connected without tools using the direct plug-in technique.

Technical data

Technical data	EL9181	EL9182	EL9183
Technology	Potential distribution terminal		
Number of separated potentials	2	8	1
Terminal points per potential	8	2	16
Nominal voltage	≤ 60 V AC/DC		
Current load	max. 10 A		
E-bus current consumption	-		
E-bus looped through	yes		
Power contacts looped through	yes (2 power contacts)		
Diagnostics	-		
Message to E-bus	-		
Renewed infeed	-		
Connection facility to additional power contact	-		
Side by side mounting on EtherCAT Terminals with power contact	yes		
Side by side mounting on EtherCAT Terminals without power contact	-		
Bit width in process image	0		
Electrical connection to mounting rail	-		
Electrical connection to power contacts	-		
Electrical isolation	500 V (E-bus/field voltage)		
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)		
Configuration	no address or configuration settings required		
Conductor types	solid wire, stranded wire and ferrule		
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver		
Rated cross-section	solid wire: 0.08 ... 1.5 mm²; stranded wire: 0.25 ... 1.5 mm²; ferrule: 0.14 … 0.75 mm²		
Weight	approx. 60 g		
Permissible ambient temperature range during operation	-25 °C ... +60 °C		
Permissible ambient temperature range during storage	-40 °C ... +85 °C		
Permissible relative air humidity	95 %, no condensation		
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715		
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 95] for enhanced mechanical load capacity		
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27		
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4		
Protection rating	IP20		
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]		
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 84], IECEx [▶ 85]	CE, cULus [▶ 88], UKCA, EAC	

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9181, EL9182, EL9183 connection

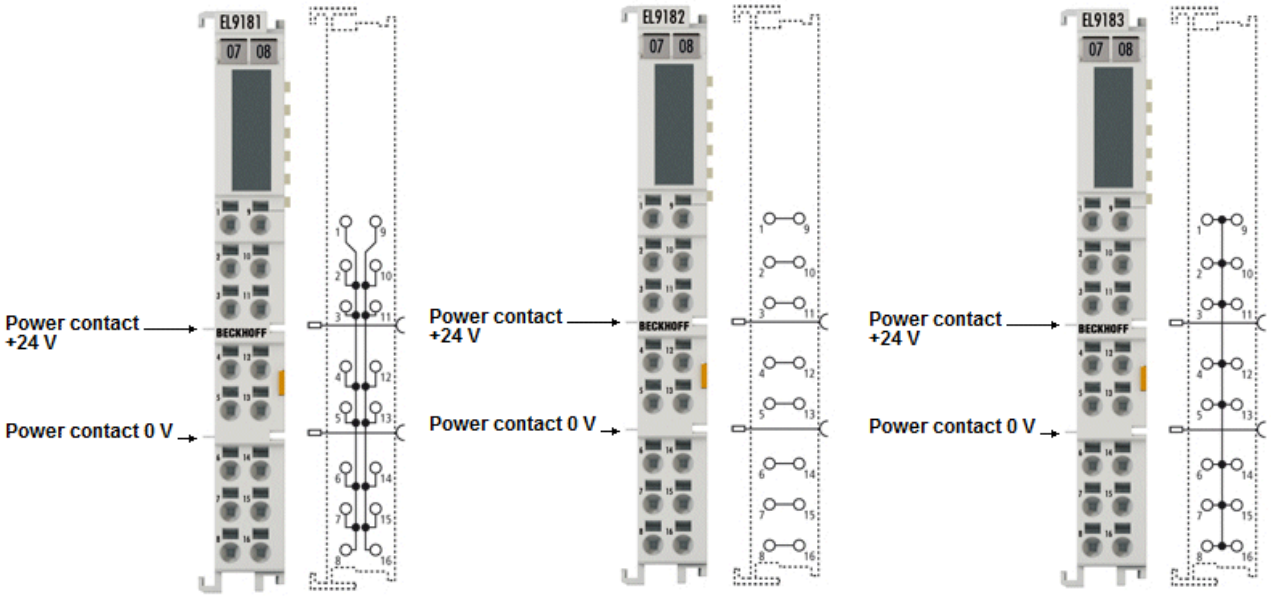


Fig. 16: EL9181, EL9182, EL9183 connection

Connection EL9181

Terminal point		Meaning
Indication	No.	
1 - 8	1 - 8	Terminal points 1 - 8 are connected internally
9 - 16	9 - 16	Terminal points 9 - 16 are connected internally

EL9182 connection

Terminal point		Description
Name	No.	
1, 9	1 + 9	Terminal points 1 + 9 are connected to each other
2, 10	2 + 10	Terminal points 2 +10 are connected to each other
3, 11	3 + 11	Terminal points 3 + 11 are connected to each other
4, 12	4 + 12	Terminal points 4 + 12 are connected to each other
5, 13	5 + 13	Terminal points 5 + 13 are connected to each other
6, 14	6 + 14	Terminal points 6 + 14 are connected to each other
7, 15	7 + 15	Terminal points 7 + 15 are connected to each other
8, 16	8 + 16	Terminal points 8 + 16 are connected to each other

EL9183 connection

Terminal point		Description
Name	No.	
1 - 16	1 - 16	Terminal points 1 - 16 are connected to each other

2.8 EL9184, EL9185, EL9185-0010, EL9186, EL9187, EL9188, EL9189

2.8.1 Potential distribution terminals - EL9185, EL9185-0010, EL9186, EL9187

2.8.1.1 EL9185 - Introduction and technical data

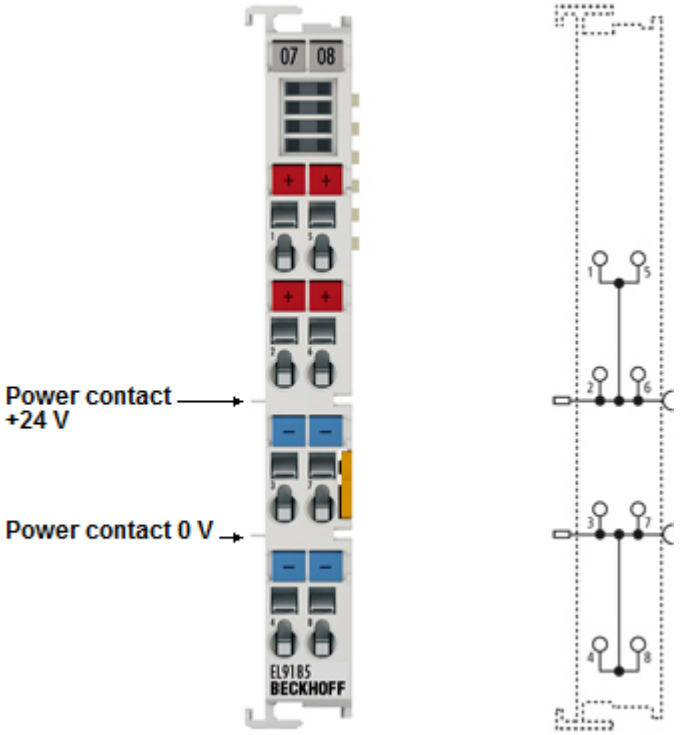


Fig. 17: EL9185

The EL9185 EtherCAT Terminal ensures that the supply voltage is tapped multiple times via spring-loaded terminals. It eliminates the need for additional terminal blocks on the terminal strip.

Technical data

Technical data	EL9185
Nominal voltage	any up to 230 V AC/DC
Current load	≤ 10 A
Diagnostics	-
Message to E-bus	-
Shield connection	-
E-bus current consumption	-
Bit width in process image	0
Electrical connection to mounting rail	-
Electrical isolation	500 V (E-bus/field voltage)
Renewed infeed	-
Side by side mounting on EtherCAT Terminals with power contact	only 2 power contacts, no power contact ground
Side by side mounting on EtherCAT Terminals without power contact	-
Connection facility to additional power contact	4
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Configuration	no address or configuration settings required
Weight	approx. 65 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see Installation instructions [▶ 95] for terminals with enhanced mechanical load capacity
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 84], IECEx [▶ 85]

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9185 connection

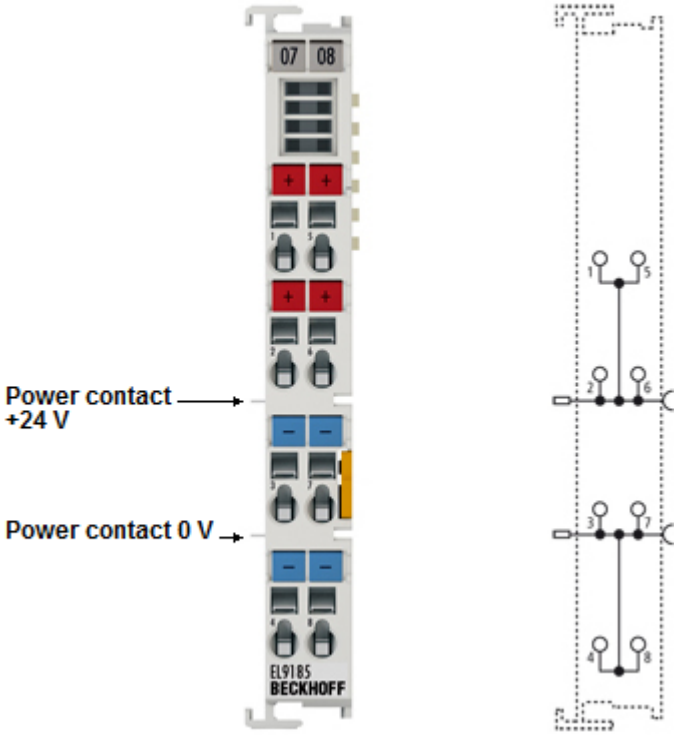


Fig. 18: EL9185 connection

Terminal point		Description
Name	No.	
Output 1, 2 ,5, 6	1, 2 ,5, 6	Output 1, 2, 5, 6 (connected to positive power contact)
Output 3, 4, 7, 8	3, 4, 7, 8	Output 3, 4, 7, 8 (connected to negative power contact)

2.8.1.2 EL9185-0010 - Introduction and technical data

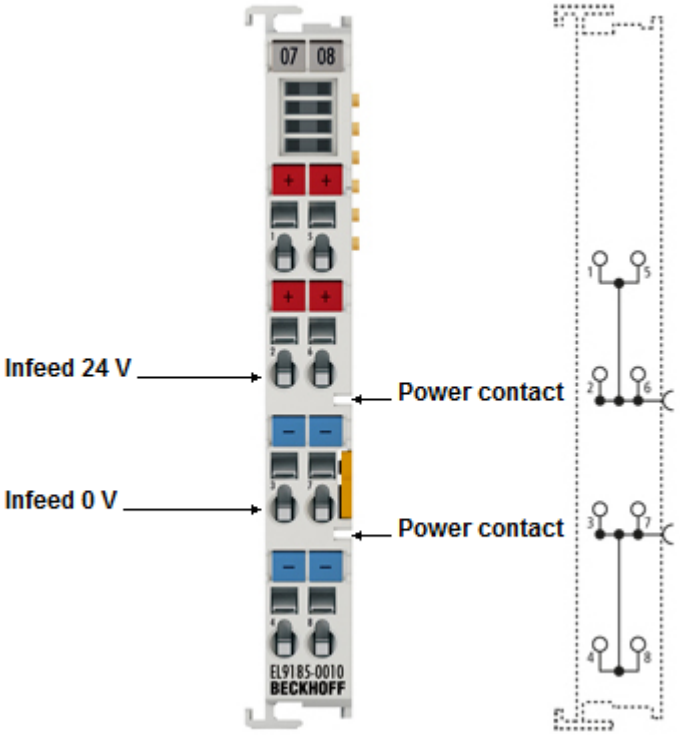


Fig. 19: EL9185-0010

The EL9185-0010 potential distribution terminal with additional feed function enables multiple tapping of the supply voltage at the terminal points.

It also supplies the supply voltage for the subsequent terminals via the power contacts, thereby forming a new potential group, as there are no power contacts on the left-hand side of the EL9185-0010.

The EL9185-0010 eliminates the need for additional terminal blocks on the terminal strip.

Technical data

Technical data	EL9185-0010
Nominal voltage	any up to 230 V AC/DC
Current load	≤ 10 A
Diagnostics	-
Message to E-bus	-
Shield connection	-
E-bus current consumption	-
Bit width in process image	0
Electrical connection to mounting rail	-
Electrical isolation	500 V (E-bus/field voltage)
Renewed infeed	yes
Side by side mounting on EtherCAT Terminals with power contact	yes
Side by side mounting on EtherCAT Terminals without power contact	yes
Connection facility to additional power contact	3
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Configuration	no address or configuration settings required
Weight	approx. 65 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals/markings*)	CE, UKCA, EAC

*) Real applicable approvals/markings see type plate on the side (product marking).

EL9185-0010 connection

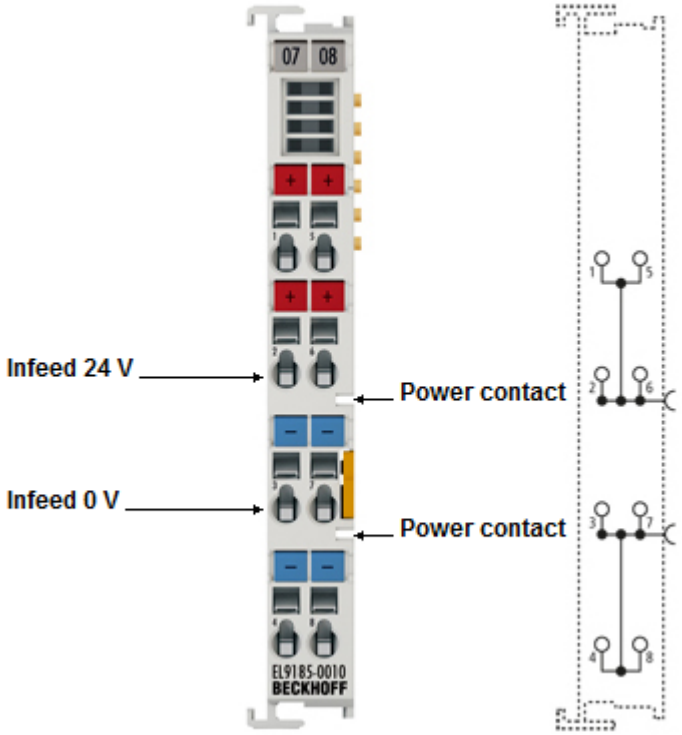


Fig. 20: EL9185-0010 connection

Terminal point		Description
Name	No.	
Output 1, 2 ,5, 6	1, 2 ,5, 6	Output 1, 2 ,5, 6 (connected to positive power contact, right-hand side)
Output 3, 4, 7, 8	3, 4, 7, 8	Output 3, 4, 7, 8 (connected to negative power contact, right-hand side)

2.8.1.3 EL9186, EL9187 - Introduction and technical data

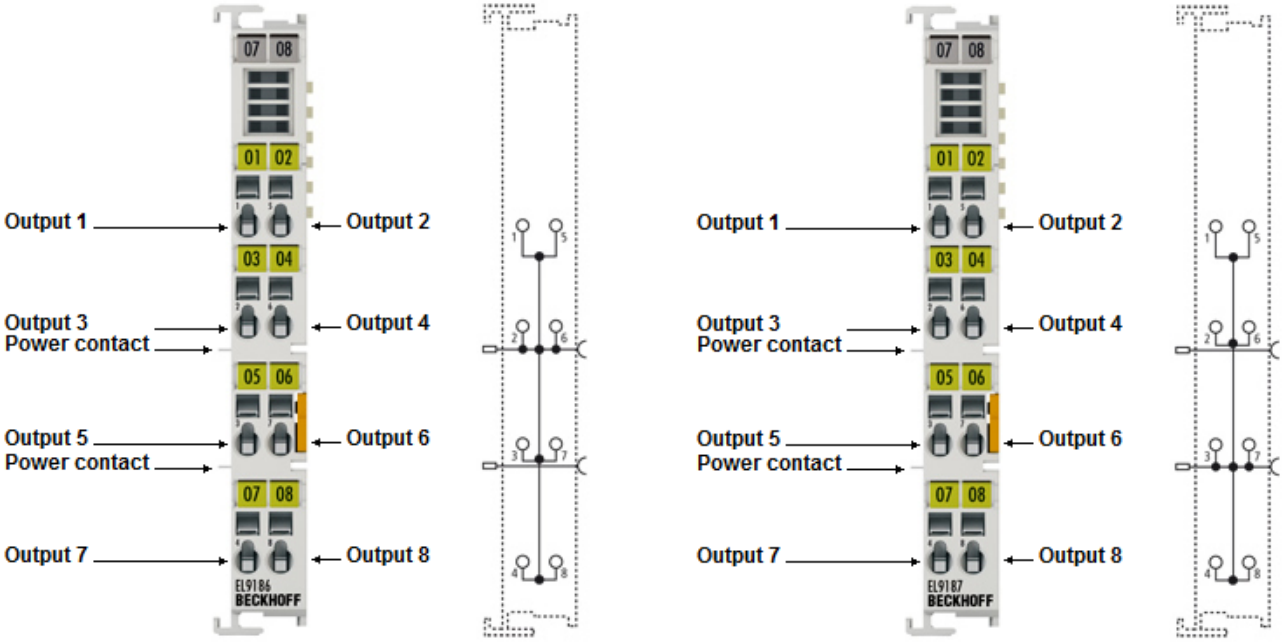


Fig. 21: EL9186, EL9187

The EL9186 and EL9187 potential distribution terminals provide 8 terminal points with a potential and enable the tapping of voltage without further bus terminal blocks or wiring.

Technical data

Technical data	EL9186	EL9187
Nominal voltage	≤ 60 V DC / ≤ 30 V AC	
Current load	≤ 10 A	
Diagnostics	-	
Message to E-bus	-	
Shield connection	-	
Outputs	8 (internally connected to positive power contact)	8 (internally connected to negative power contact)
E-bus current consumption	-	
Bit width in process image	0	
Electrical connection to mounting rail	-	
Electrical isolation	500 V (E-bus/field voltage)	
Renewed infeed	-	
Side by side mounting on EtherCAT Terminals with power contact	yes, left without power contact ground	
Side by side mounting on EtherCAT Terminals without power contact	-	
Connection facility to additional power contact	8	
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)	
Configuration	no address or configuration settings required	
Weight	approx. 65 g	
Permissible ambient temperature range during operation	-25°C ... +60°C	
Permissible ambient temperature range during storage	-40°C ... +85°C	
Permissible relative air humidity	95 %, no condensation	
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715	
Enhanced mechanical load capacity	yes, see Installation instructions [▶ 95] for terminals with enhanced mechanical load capacity	
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection rating	IP20	
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	
Approvals/markings*)	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 84], IECEx [▶ 85],	

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9186, EL9187 connection

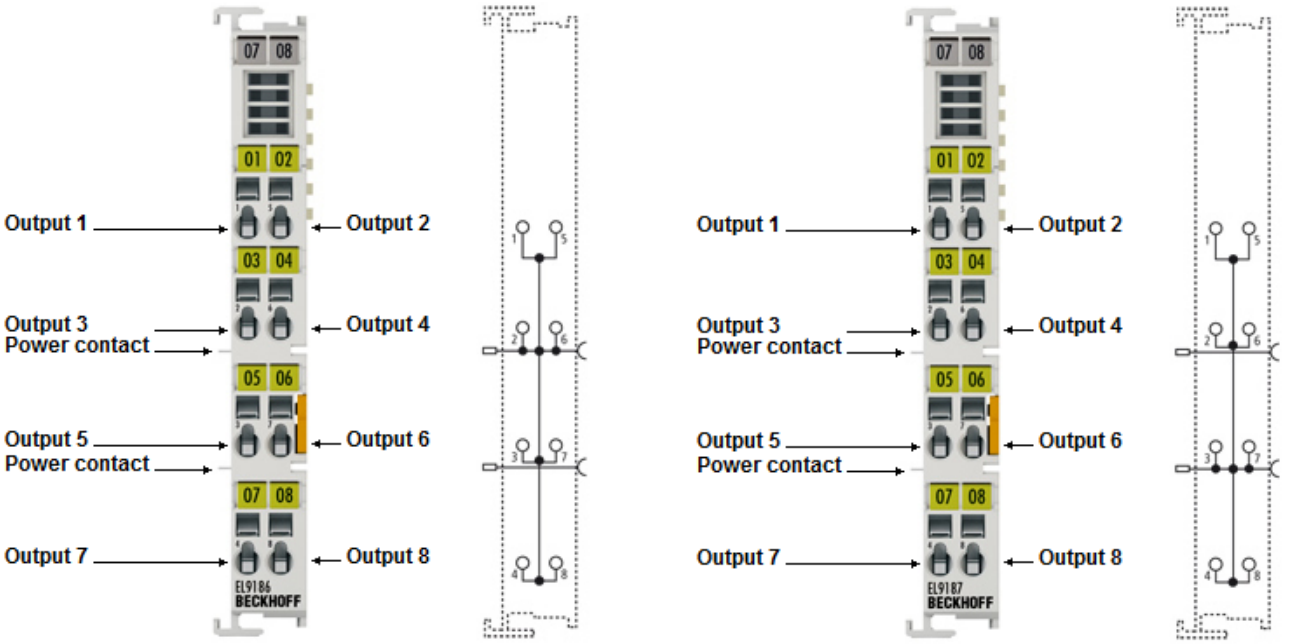


Fig. 22: Connection - EL9186, EL9187

EL9186 connection

Terminal point		Description
Name	No.	
Output 1 - 8	1 - 8	Output 1 - 8 (connected to positive power contact)

EL9187 connection

Terminal point		Description
Name	No.	
Output 1 - 8	1 - 8	Output 1 - 8 (connected to negative power contact)

2.8.2 HD potential distribution terminals - EL9184, EL9188, EL9189

2.8.2.1 EL9148, EL9188, EL9189 - Introduction and technical data

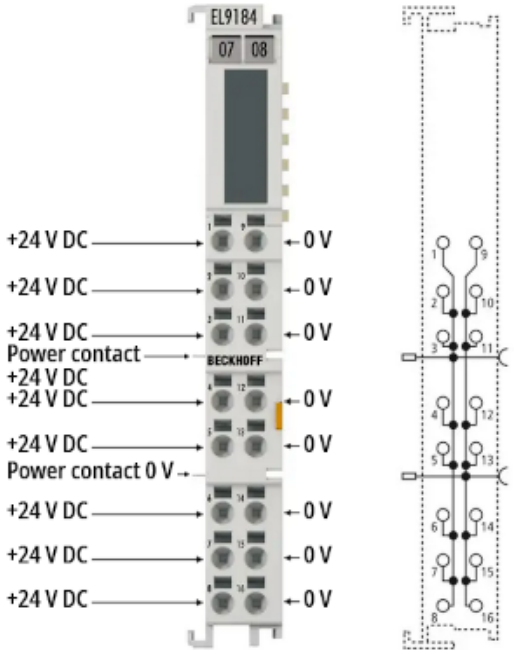


Fig. 23: EL9184

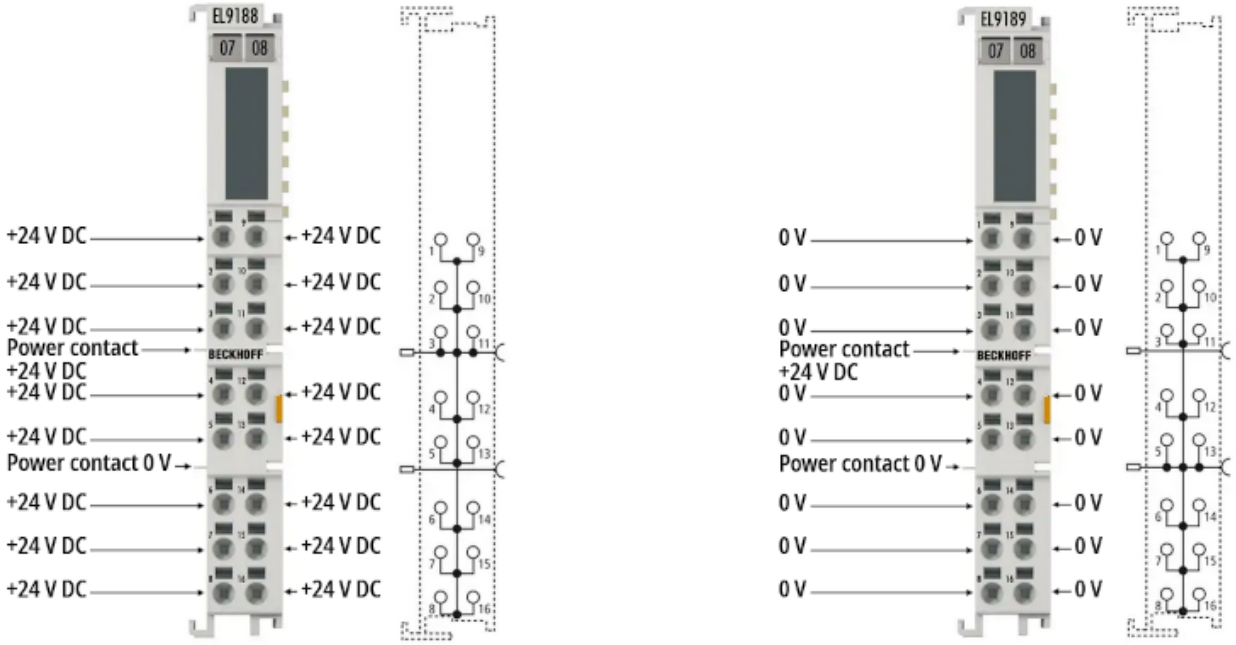


Fig. 24: EL9188, EL9189

The EL9188 and EL9189 potential distribution terminals provide 16 terminal points with a potential and enable the tapping of voltage without further bus terminal blocks or wiring.

The EL9184 provides the potential of the 24 V DC contact at eight terminal points and the potential of the 0 V contact at eight terminal points.

Single-wire conductors can be connected without tools using the direct plug-in technique.

The HD EtherCAT Terminals (High Density) with increased packing density are equipped with 16 connection points in the housing of a 12-mm terminal block.

Technical data

Technical data	EL9184	EL9188	EL9189
Nominal voltage	≤ 60 V_{DC}		
Current load	≤ 10 A		
Power LED	-		
Defect LED	-		
Message to E-bus	-		
Shield connection	-		
Renewed infeed	-		
Connection facility to additional power contact	8	16	
Side by side mounting on EtherCAT Terminals with power contact	yes, left without power contact ground		
Side by side mounting on EtherCAT Terminals without power contact	-		
Outputs	2 x 8 e.g.: 8 x 24 V contact, 8 x 0 V contact	16 e.g.: 16 x 24 V contact	16 e.g.: 16 x 0 V contact
E-bus current consumption	-		
Bit width in process image	0		
Electrical connection to mounting rail	-		
Electrical isolation	500 V (E-bus/field voltage)		
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)		
Configuration	no address or configuration settings required		
Conductor types	solid wire, stranded wire and ferrule		
Conductor connection	solid wire conductors: direct plug-in technique; stranded wire conductors and ferrules: spring actuation by screwdriver		
Rated cross-section	solid wire: 0.08 ... 1.5 mm²; stranded wire: 0.25 ... 1.5 mm²; ferrule: 0.14 … 0.75 mm²		
Weight	approx. 60 g		
Permissible ambient temperature range during operation	-25°C ... +60°C		
Permissible ambient temperature range during storage	-40°C ... +85°C		
Permissible relative air humidity	95 %, no condensation		
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715		
Enhanced mechanical load capacity	yes, see Installation instructions [▶ 95] for terminals with enhanced mechanical load capacity		
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27		
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4		
Protection rating	IP20		
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]		
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 84], IECEx [▶ 85]		

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9184 connection

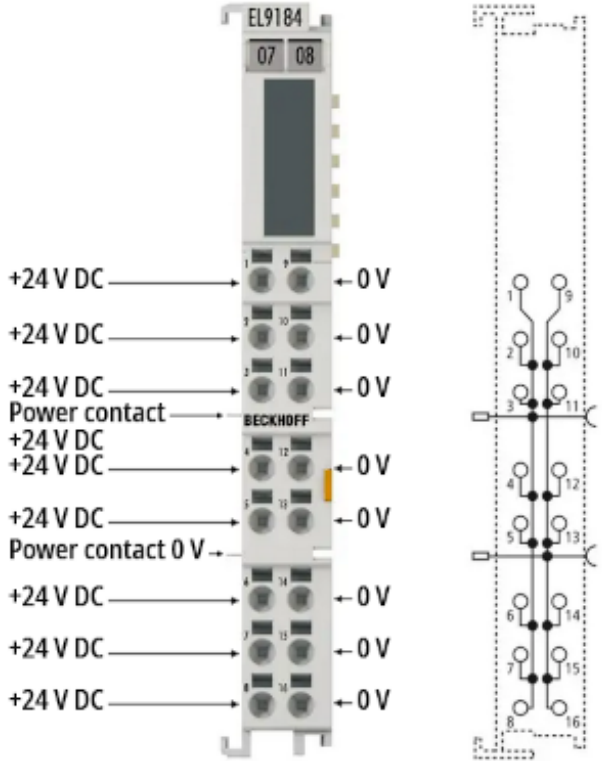


Fig. 25: EL9184 connection

Terminal point		Description
Name	No.	
+24 V	1 - 8	+24 V output (connected to positive power contact)
0 V	9 - 16	0 V output (connected to negative power contact)

EL9188 connection

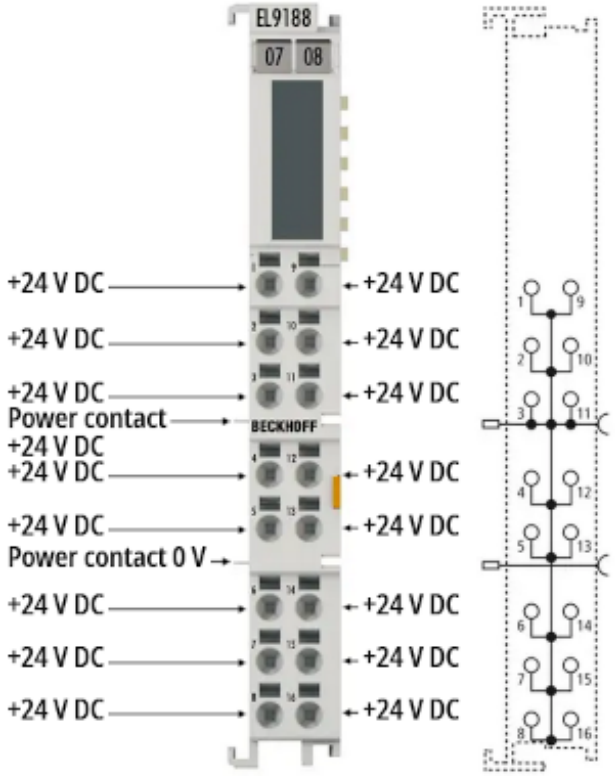


Fig. 26: EL9188 connection

Terminal point		Description
Name	No.	
+24 V	1 - 16	+24 V output (connected to positive power contact)

EL9189 connection

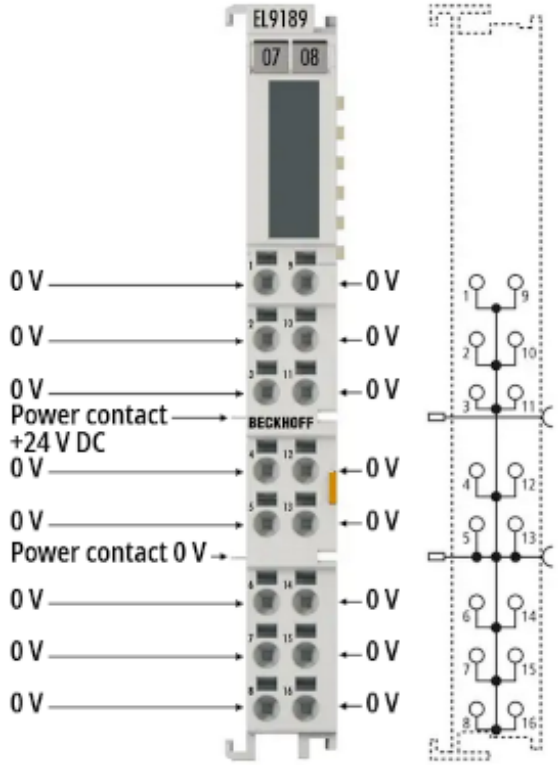


Fig. 27: EL9189 connection

Terminal point		Description
Name	No.	
0 V	1 - 16	0 V output (connected to negative power contact)

2.9 EL9195

2.9.1 EL9195 - Introduction and Technical Data

Shield terminal

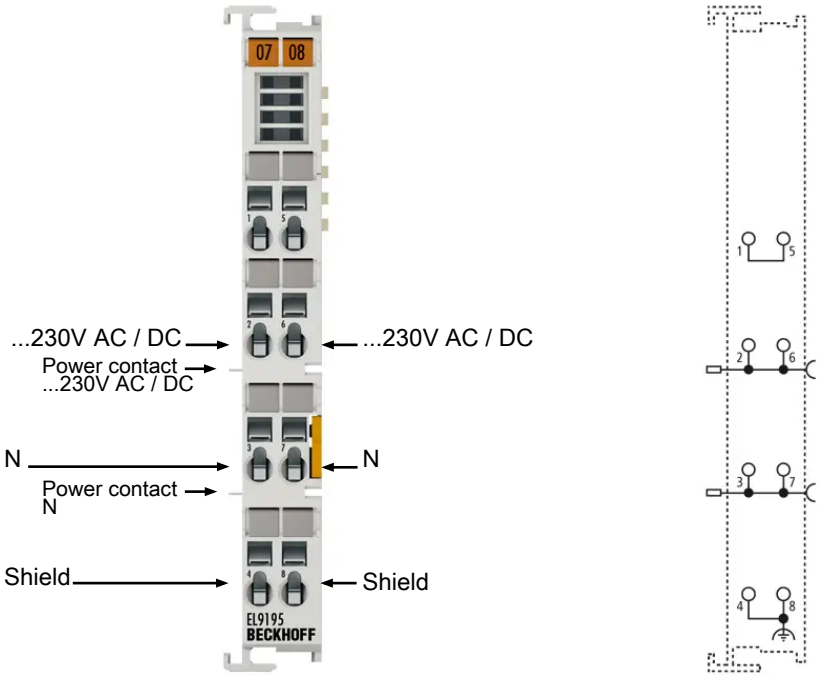


Fig. 28: EL9195

The EL9195 shield terminal enables the connection of the shield from the front via 2 terminal contacts, which are connected directly to the DIN rail, in order to be able to optimally dissipate electromagnetic irradiation.

The multiple tapping of the supply voltage via the front-side terminal contacts is additionally ensured by the EL9195 EtherCAT Terminal. 24 V and 0 V can each be tapped twice from the front. The power contacts are connected to the front-side terminal contacts and are passed through to the adjacent terminal. With the EL9195, the use of additional terminal blocks on the terminal strip can be reduced.

Technical data

Technical data	EL9195
Technology	Shield terminal for dissipating EMC interference
Power contact current load	max. 10 A
Power LED	-
Defect LED	-
Current consumption via E-bus	-
Nominal voltage	any up to 230 V AC/DC
Built-in fine-wire fuse	-
Electrical isolation	500 V (E-bus/field voltage)
Diagnostics	-
Message to E-bus	-
Power contact	2 x power contact
Renewed infeed	-
Connection facility to additional power contact	2
Side by side mounting on EtherCAT Terminals with power contact	only 2 power contacts
Side by side mounting on EtherCAT Terminals without power contact	-
Shield connection	2 x
Electrical connection to mounting rail	yes
Bit width in process image	0
Configuration	no address or configuration settings required
Weight	approx. 50 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 95] for enhanced mechanical load capacity
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 83], IECEx [▶ 85],

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9195 connection

⚠ CAUTION

Danger for persons and equipment!

- In the project planning of the bus terminal system, observe the different potentials on the power contacts (24 V DC and 230 V AC) and if necessary use potential separation terminals (EL9080) to isolate the potentials!
- Bring the bus terminal system into a safe, de-energized state before starting installation, disassembly or wiring of the terminal modules!

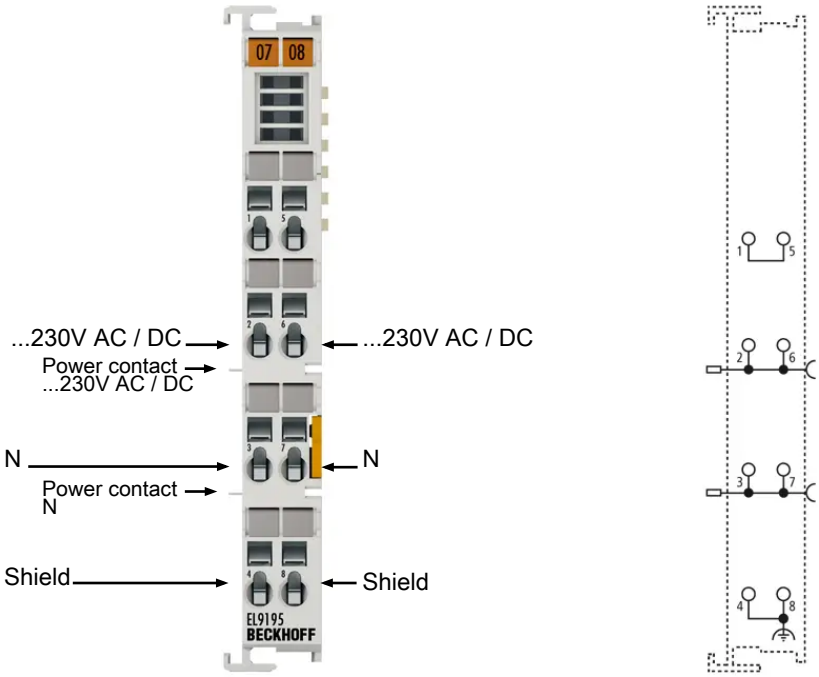


Fig. 29: EL9195 connection

Terminal point		Description
Name	No.	
	1	internally connected to terminal point 5
…230 V AC/DC	2	Supply input: any voltage up to 230 V AC/DC internally connected to terminal point 6 and positive or phase power contact
N	3	0 V / N internally connected to terminal point 7 and negative or neutral conductor power contact
Shield	4	Shield (internally connected to terminal point 8 and DIN rail contact)
	5	internally connected to terminal point 1
…230 V AC / DC	6	Supply input: any voltage up to 230 V AC/DC internally connected to terminal point 6 and positive or phase power contact
N	7	0 V / N internally connected to terminal point 3 and negative or neutral conductor power contact
Shield	8	Shield (internally connected to terminal points 4 and 8 and DIN rail contact)

2.10 EL9200, EL9210, EL9290

2.10.1 EL9200, EL9210, EL9290 - Introduction and Technical Data

Power supply terminals, 24 V DC

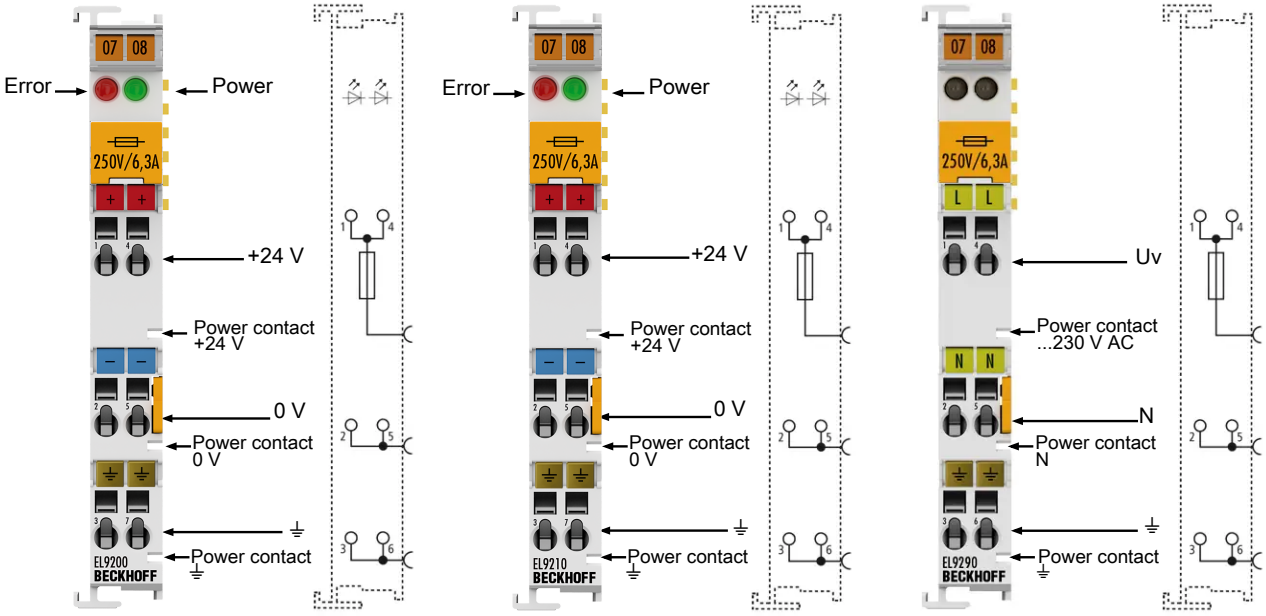


Fig. 30: EL9200, EL9210, EL9290

The EL9200, EL9210, and EL9290 power supply terminals can be placed at any position between the input/output terminals to create an additional potential group or to supply the terminals to the right with higher currents in case of high current loads.

The E-bus will pass through.

Unlike the EL9200 and EL9290, the EL9210 has diagnostics displayed in the process image.

The power supply is protected with a 6.3 A fine-wire fuse at all terminals.

Technical data

Technical data	EL9200	EL9210	EL9290
Nominal voltage	24 V_{DC}		variable, up to 230 V AC
Power contact current load	max. 10 A		
Electrical isolation	500 V (E-bus/field voltage)		
Built-in fine-wire fuse	yes; 6.3 A		
Current consumption via E-bus	-	typ. 90 mA	-
Bit width in process image	-	2 diagnostic bits (PowerOK; FuseError)	-
Configuration	no address or configuration settings required		
Power LED	yes	yes	no
Diagnostics (fuse)	yes, error-LED	yes, in the process image and error-LED	no
Electrical connection to mounting rail	no		
Renewed infeed	yes		
Connection facility to additional power contact	1		
Side by side mounting on EtherCAT Terminals with power contact	yes		
Side by side mounting on EtherCAT Terminals without power contact	yes		
Weight	approx. 55 g		
Permissible ambient temperature range during operation	0 °C ... +55 °C	-25 °C ... +55 °C	0 °C ... +55 °C
Permissible ambient temperature range during storage	-25 °C ... +85 °C	-40 °C ... +85 °C	-25 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation		
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)		
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715		
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27		
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4		
Protection rating	IP20		
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	variable	variable, see chapter Mounting of passive terminals [▶ 96]
Markings*	CE, UKCA, EAC		
Approvals*	CCC, cULus [▶ 88], ATEX [▶ 83], IECEx [▶ 85]	CCC, cULus [▶ 88], DNV, ATEX [▶ 83], IECEx [▶ 85]	-

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

EL9200, EL9210, EL9290 connection

⚠ CAUTION

Danger for persons and equipment!

- In the project planning of the bus terminal system, observe the different potentials on the power contacts (24 V DC and 230 V AC) and if necessary use potential separation terminals (EL9080) to isolate the potentials!
- Bring the bus terminal system into a safe, de-energized state before starting installation, disassembly or wiring of the terminal modules!

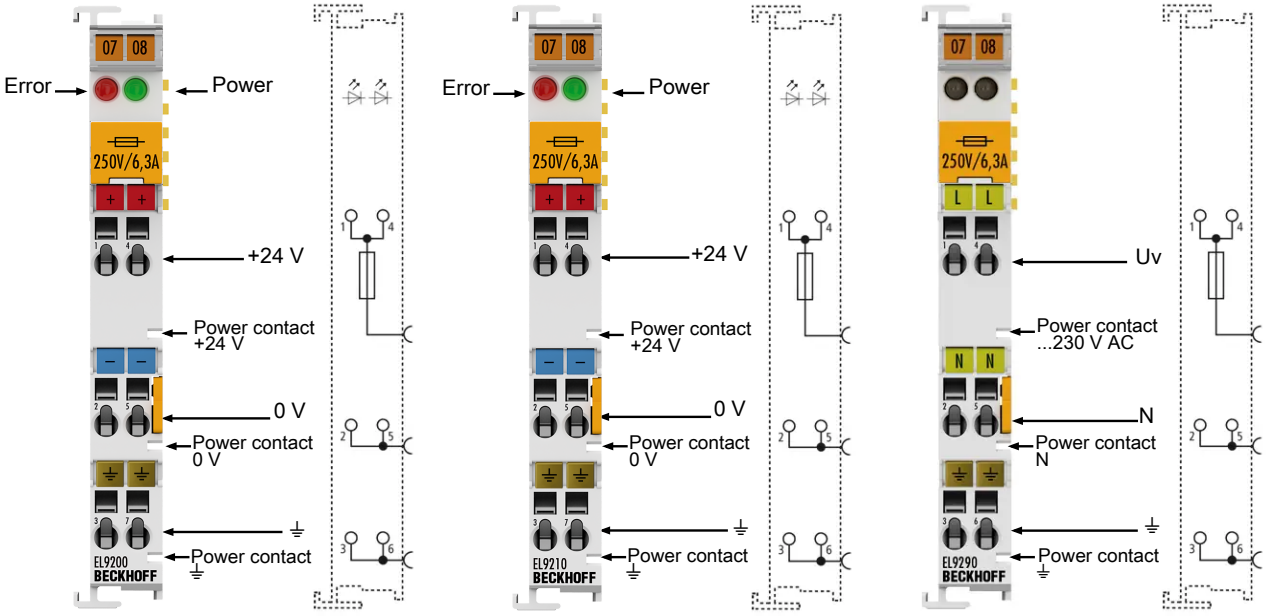


Fig. 31: Connection - EL9200, EL9210, EL9290

EL9200, EL9210			EL9290		
Terminal point		Description	Terminal point		Description
Name	No.		Name	No.	
+24 V	1	Supply input +24 V internally connected to terminal point 4 and positive power contact	230 V AC	1	Supply input 230 V AC [any voltage up to 230 V AC] internally connected to terminal point 4 and 230 V AC power contact
0 V	2	0 V internally connected to terminal point 5 and negative power contact	N	2	N internally connected to terminal point 5 and neutral conductor power contact
⏚	3	Ground (internally connected to terminal point 6 and power contact ground)	⏚	3	Ground (internally connected to terminal point 6 and power contact ground)
+24 V	4	Supply input +24 V internally connected to terminal point 1 and positive power contact	230 V AC	4	Supply input 230 V AC [any voltage up to 230 V AC] internally connected to terminal point 1 and 230 V AC power contact
0 V	5	0 V internally connected to terminal point 2 and negative power contact	N	5	N internally connected to terminal point 2 and neutral conductor power contact
⏚	6	Ground (internally connected to terminal point 3 and power contact ground)	⏚	6	Ground (internally connected to terminal point 3 and power contact ground)

LEDs (EL9200, EL9210 only)

LED	Color	Meaning	
Power LED	green	off	No supply voltage
		on	24 V_{DC} at the supply input
Error LED	red	off	Fuse OK
		on	Fuse defective

Process data (EL9210 only)

The EL9210 has a bit width of 2 bits (diagnostic bit for voltage at the power contacts, "PowerOK" and diagnostic bit for defective fuse; "FuseError") in the process image and is represented in the TwinCAT tree as follows:

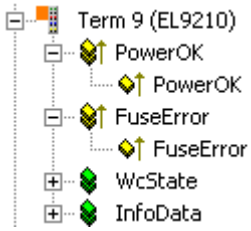


Fig. 32: EL9210 in the TwinCAT tree

If there is *no* voltage at the power contacts, the corresponding diagnostic bit "PowerOK" is set to FALSE (0). If the fuse is defective, the corresponding diagnostic bit "FuseError" is set to TRUE (1).

2.11 EL9250, EL9260

2.11.1 EL9250, EL9260 - Introduction and Technical Data

Power supply terminals, 230 V AC

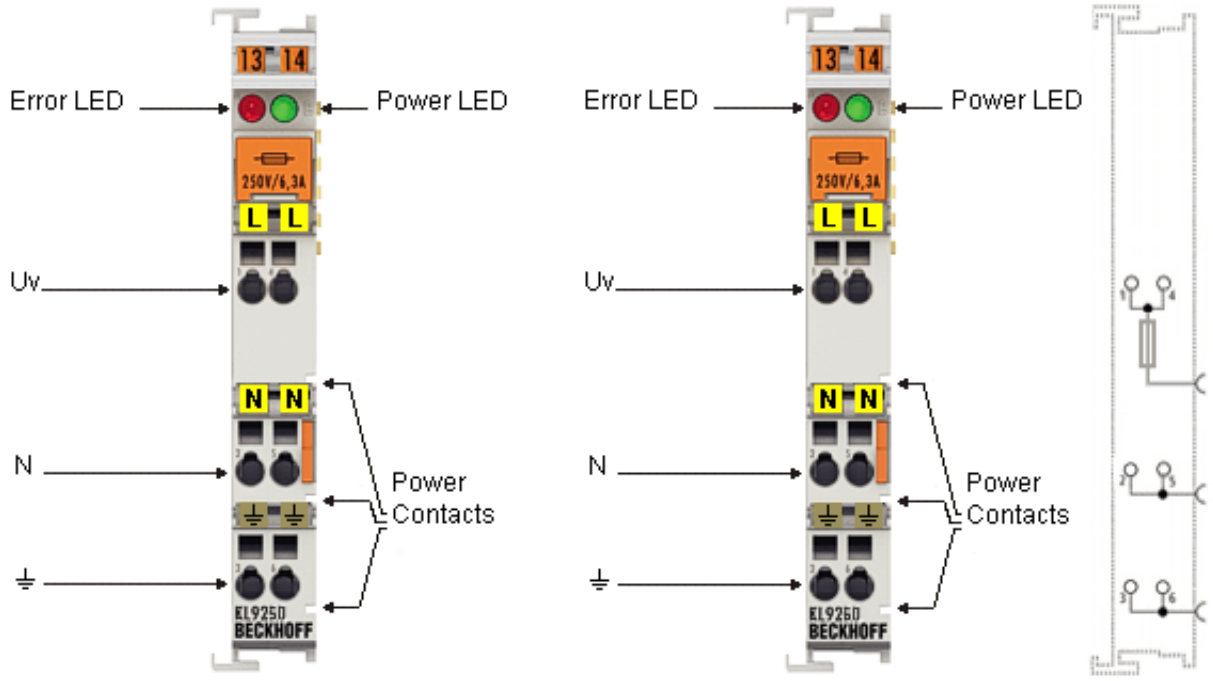


Fig. 33: EL9250, EL9260

The EL9250 and EL9260 power supply terminals can be placed at any position between the input/output terminals to create an additional potential group or to supply the terminals to the right with higher currents in case of high current loads.

The E-bus will pass through.

Unlike the EL9250, the EL9260 has diagnostics displayed in the process image.

The power supply is protected with a 6.3 A fine-wire fuse at all terminals.

Technical data

Technical data	EL9250	EL9260
Nominal voltage	230 V AC	
Power contact current load	max. 10 A	
Electrical isolation	500 V (E-bus/field voltage)	
Built-in fine-wire fuse	yes; 6.3 A (see also UL note [▶ 88]!)	
Current consumption via E-bus	-	typ. 90 mA
Bit width in process image	-	2 diagnostic bits (PowerOK; FuseError)
Configuration	no address or configuration settings required	
Power LED	yes	yes
Diagnostics (fuse)	yes, error-LED	yes, in the process image and error-LED
Electrical connection to mounting rail	no	
Renewed infeed	yes	
Connection facility to additional power contact	1	
Side by side mounting on EtherCAT Terminals with power contact	yes	
Side by side mounting on EtherCAT Terminals without power contact	yes	
Weight	approx. 55 g	
Permissible ambient temperature range during operation	0 °C ... +55 °C	
Permissible ambient temperature range during storage	-25 °C ... +85 °C	
Operating altitude	max. 2000 m	
Overvoltage category	II	
Pollution degree	2	
Permissible relative air humidity	95 %, no condensation	
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)	
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715	
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection rating	IP20	
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	variable
Approvals / markings*	CE, UKCA, EAC	

*) Real applicable approvals/markings see type plate on the side (product marking).

EL9250, EL9260 connection

⚠ CAUTION

Danger for persons and equipment!

- In the project planning of the bus terminal system, observe the different potentials on the power contacts (24 V DC and 230 V AC) and if necessary use potential separation terminals (EL9080) to isolate the potentials!
- Bring the bus terminal system into a safe, de-energized state before starting installation, disassembly or wiring of the terminal modules!

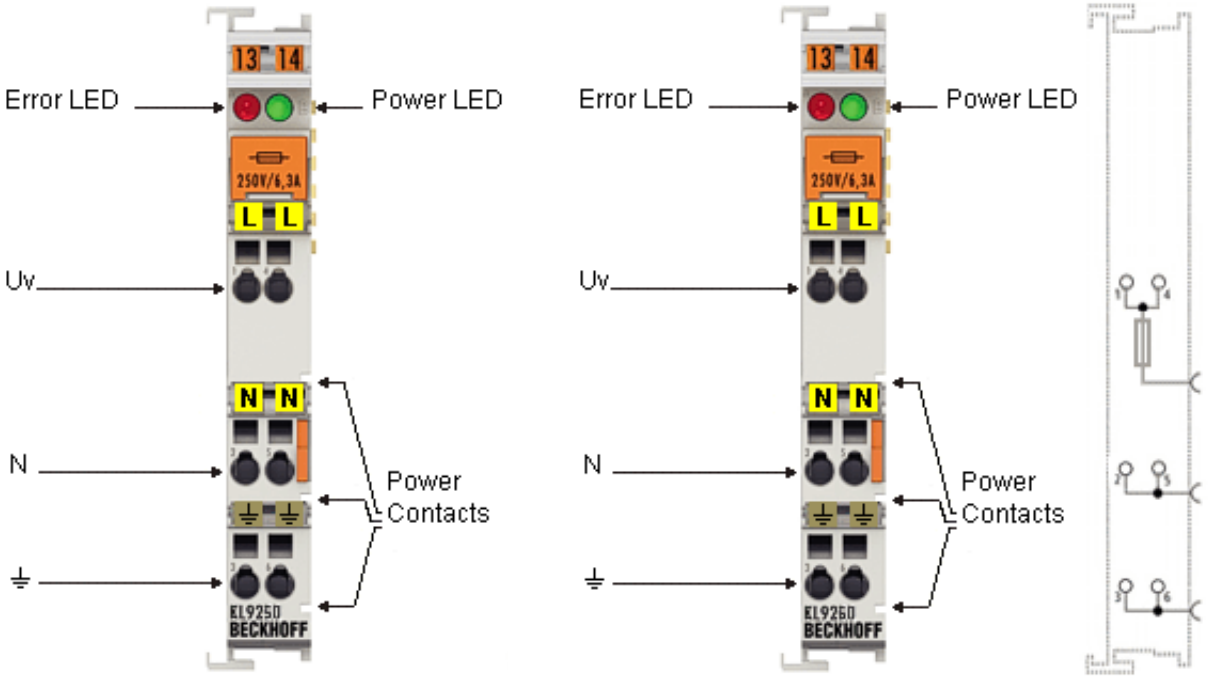


Fig. 34: Connection - EL9250, EL9260

Terminal point		Description
Name	No.	
230 V AC	1	Supply input 230 V AC; internally connected to terminal point 4 and power contact 230 V AC
N	2	N; internally connected to terminal point 5 and neutral conductor power contact
⏚	3	Ground (internally connected to terminal point 6 and power contact ground)
230 V AC	4	Supply input 230 V AC; internally connected to terminal point 1 and power contact 230 V AC
N	5	N; internally connected to terminal point 2 and neutral conductor power contact
⏚	6	Ground (internally connected to terminal point 3 and power contact ground)

LEDs

LED	Color	Meaning	
Power LED	green	off	No supply voltage
		on	230 V AC at the supply input
Error LED	red	off	Fuse OK
		on	Fuse defective

Process data (EL9260 only)

The EL9260 has a bit width of 2 bits (diagnostic bit for voltage at the power contacts, "PowerOK" and diagnostic bit for defective fuse; "FuseError") in the process image and is represented in the TwinCAT tree as follows:

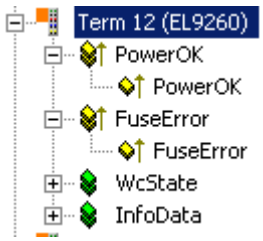


Fig. 35: EL9260 in the TwinCAT tree

If there is *no* voltage at the power contacts, the corresponding diagnostic bit "PowerOK" is set to FALSE (0). If the fuse is defective, the corresponding diagnostic bit "FuseError" is set to TRUE (1).

2.12 EL9400, EL9410

2.12.1 EL9400, EL9410 - Introduction and Technical Data

Power supply terminals

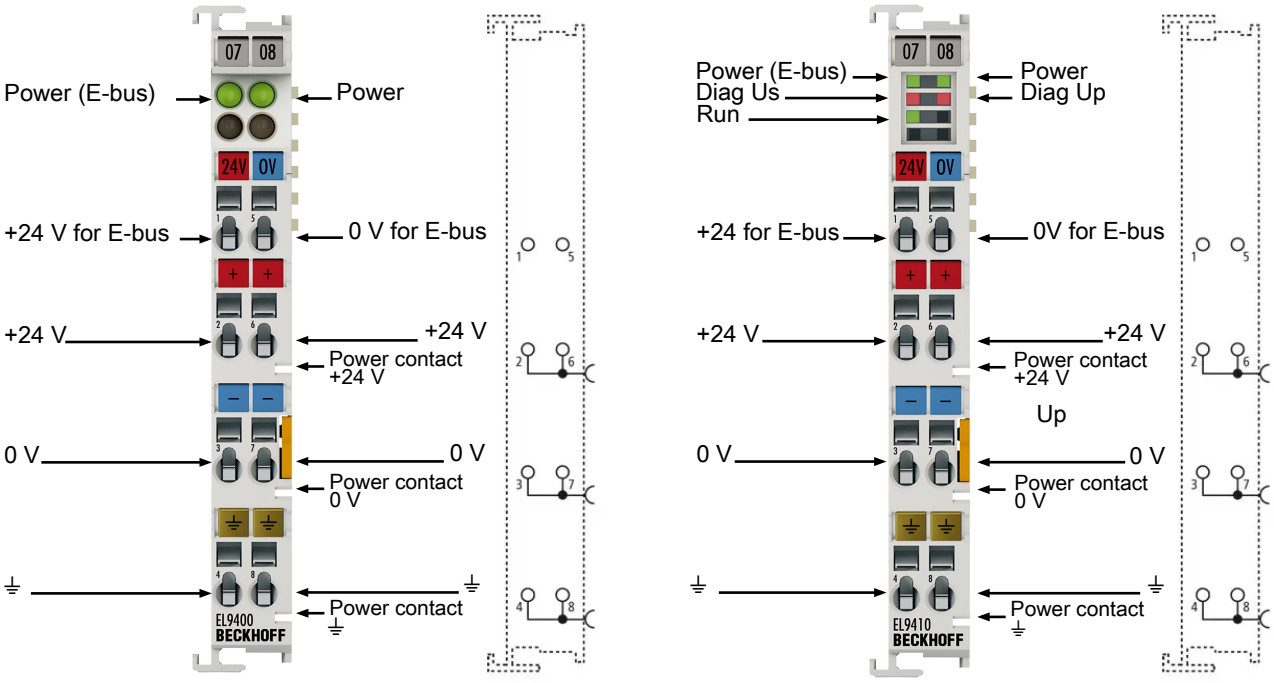


Fig. 36: EL9400, EL9410

The EL9400 and EL9410 power supply terminals are used to refresh the E-bus via which the data exchange between EtherCAT Couplers and Terminals takes place. Each EtherCAT Terminal requires a certain current from the E-bus (see technical data: "Current consumption via E-bus"). This current is fed into the E-bus by the power supply unit of the respective EtherCAT Coupler. For configurations with a large number of EtherCAT Terminals, the EL9400/EL9410 can be used to increase the power supply to the E-bus by 2 A.

Unlike the EL9400, the EL9410 has diagnostics displayed by LED and in the process image. At the same time, the EL9400/EL9410 can establish a further potential group on the right-hand side by means of an external 24 V supply via the power contacts.

Technical data

Technical data	EL9400	EL9410
Input voltage	24 V_{DC}	
Output current to supply the E-bus	2 A	
Power contact voltage	24 V_{DC}	
Power contact current load	max. 10 A	
Electrical isolation	500 V (E-bus/field voltage)	
Current consumption via E-bus	-	-
Diagnostics	no	via LED and in the process image
Electrical connection to mounting rail	no	
Renewed infeed	yes	
Connection facility to additional power contact	1	
Side by side mounting on EtherCAT Terminals with power contact	yes	
Side by side mounting on EtherCAT Terminals without power contact	yes	
Bit width in process image	-	2 diagnostic bits
Configuration	no address or configuration settings required	
Weight	approx. 65 g	
Permissible ambient temperature range during operation	0 °C ... +55 °C	-25 °C ... +55 °C
Permissible ambient temperature range during storage	-25 °C ... +85 °C	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation	
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)	
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715	
Enhanced mechanical load capacity	yes, see also Installation instructions [▶ 95] for enhanced mechanical load capacity	
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection rating	IP20	
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	variable
Approvals / markings*	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 83], IECEx [▶ 85]	CE, cULus [▶ 88], UKCA, EAC, CCC, ATEX [▶ 83], IECEx [▶ 85], DNV

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

Connection and LEDs EL9400, EL9410

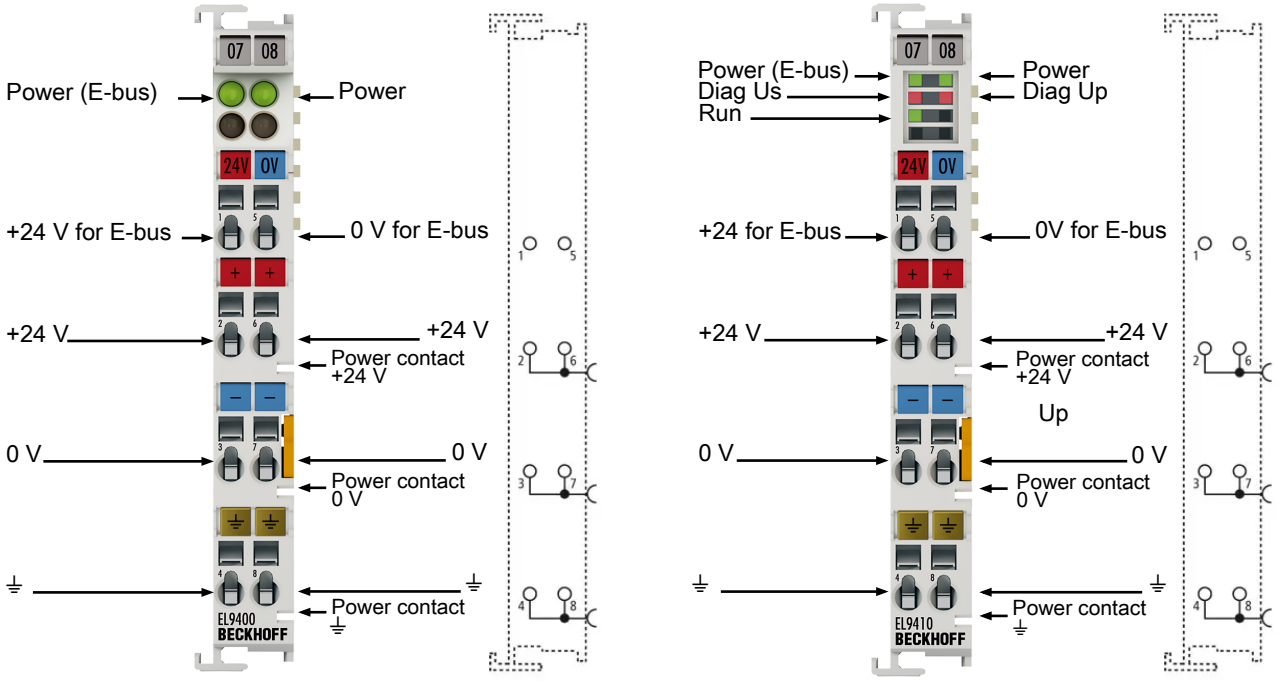


Fig. 37: EL9400, EL9410 connection

Terminal point		Description
Name	No.	
+24 V for E-bus	1	Supply input +24 V for the E-bus
+24 V	2	Supply input +24 V (internally connected to terminal point 6 and positive power contact)
0 V	3	0 V for supply input (internally connected to terminal point 7 and negative power contact)
⏚	4	Ground (internally connected to terminal point 8)
0 V for E-bus	5	0 V for E-bus supply input
+24 V	6	Supply input +24 V (internally connected to terminal point 2 and positive power contact)
0 V	7	0 V for supply input (internally connected to terminal point 3 and negative power contact)
⏚	8	Ground (internally connected to terminal point 4)

LEDs

LED	Color	Meaning	
Power (E-bus)	green	off	No voltage at the supply input for the E-bus
		on	24 V_{DC} at the supply input for the E-bus
Power	green	off	No voltage at the supply input
		on	24 V_{DC} at the supply input
Diag Us**	red	off	No error
		on	Undervoltage: Us or Up below 17 V
Diag Up**	red	off	No error
		on	Undervoltage: Us or Up below 17 V
RUN**	green	These LEDs indicate the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		Flashing (2 Hz)	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Flashing (1 Hz)	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync Manager channels and the distributed clocks. Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operating state; mailbox and process data communication is possible
		Flashing (10 Hz)	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates of the terminal, for example
**EL9410 only			

Process data (EL9410 only)

The EL9410 has a bit width of 2 bits (diagnostic bits for voltage Us [supply voltage for E-bus] and Up [voltage at the power contacts], "undervoltage") in the process image and is represented in the TwinCAT tree as follows:

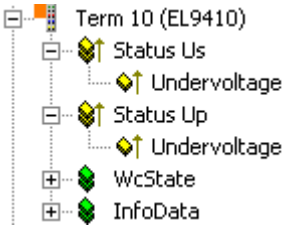


Fig. 38: EL9410 in the TwinCAT tree

If the Up or Us voltage drops below 17 V, the corresponding "Undervoltage" diagnostic bit is set to TRUE (1).

2.13 EL9540, EL9540-0010

2.13.1 EL9540, EL9540-0010 – Introduction

Surge filter terminals field supply, up to 10 A

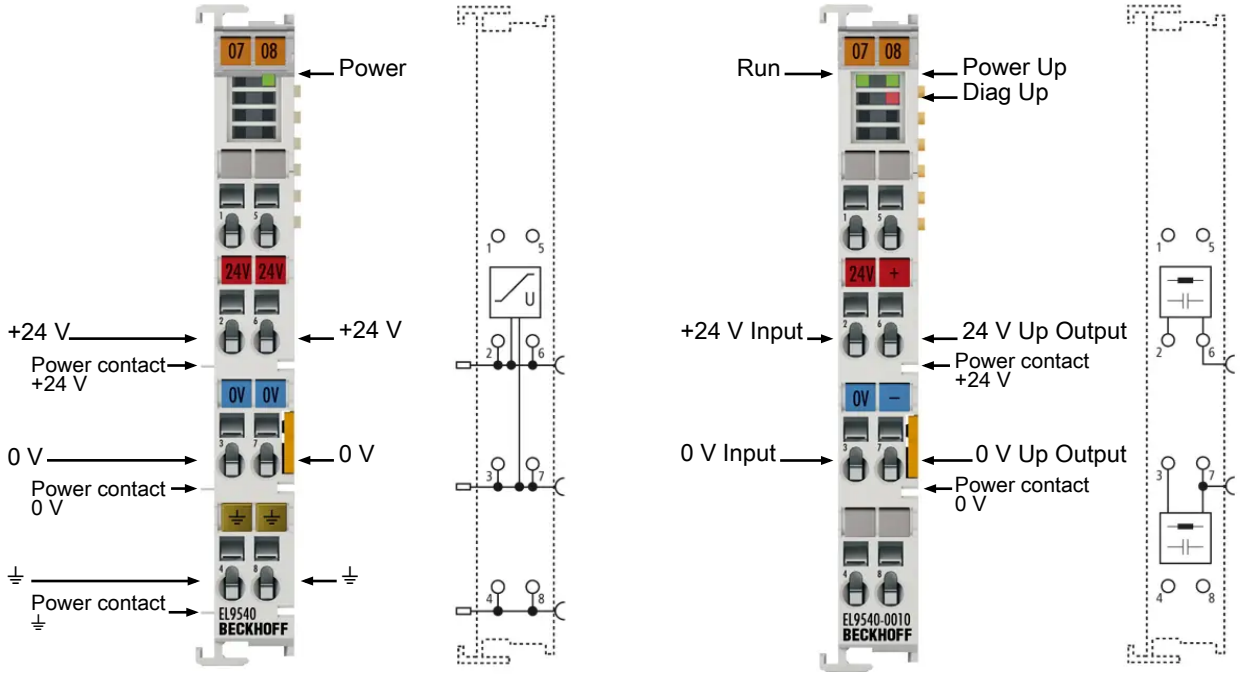


Fig. 39: EL9540, EL9540-0010

The surge filter terminals protect the EtherCAT Terminals from line-bound surge voltages that can occur on the supply lines due to high-energy, dynamic disturbances, e.g., switching surges from inductive loads or overvoltage from indirect lightning strikes.

The EL9540 EtherCAT Terminal can be used to protect the terminal station from damage in particularly harsh environments, such as onshore and offshore areas.

The EL9540-0010 is especially suitable for protecting analog terminals.
The EL9550-0010 terminal is especially suitable for protecting digital terminals.
Both terminals can be used in shipbuilding, for example.

The EL954x has a filter for the 24 V DC field supply.

Other surge filter terminals

With the EL955x series, additional terminals with a filter are available for the 24 V DC field and system supply (see chapter “EL9550, EL9550-0010, EL9550-0012 [▶ 72]”).

2.13.2 EL9540, EL9540-0010 - Technical data

Technical data	EL9540	EL9540-0010
Function	Surge filter field supply	
Nominal voltage	24 V (-15 %/+20 %)	
Surge filter field supply	yes	
Surge filter system supply	-	
Current carrying capacity field supply	≤ 10 A	≤ 5 A
Current carrying capacity system supply	-	
Diagnostics	-	yes
Message to E-bus	-	yes
Shield connection	-	
E-bus current consumption	-	typ. 40 mA
Bit width in process image	-	2
Electrical connection to mounting rail	-	
Electrical isolation	500 V (E-bus/field voltage)	
Renewed infeed	-	yes
Connection facility to additional power contact	2	1
Side by side mounting on EtherCAT Terminals with power contact	yes	
Side by side mounting on EtherCAT Terminals without power contact	-	yes
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)	
Configuration	no address or configuration settings required	
Weight	approx. 50 g	
Permissible ambient temperature range during operation	-25 °C ... +60 °C	
Permissible ambient temperature range during storage	-40 °C ... +85 °C	
Permissible relative air humidity	95 %, no condensation	
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715	
Enhanced mechanical load capacity	yes, see Installation instructions [▶ 95] for terminals with enhanced mechanical load capacity	-
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27	
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4	
Protection rating	IP20	
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]	
Markings*	CE, UKCA EAC	
Approvals*	cULus [▶ 88], CCC, ATEX [▶ 84], IECEx [▶ 85],	DNV, CCC, ATEX [▶ 84], IECEx [▶ 85],

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

2.13.3 EL9540 - LEDs and connection

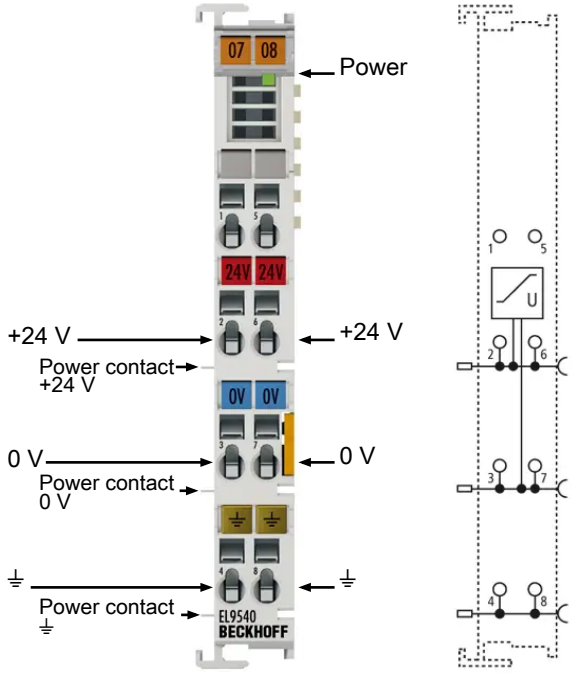


Fig. 40: EL9540

LED	Color	Meaning	
Power-LED	green	off	24 V_{DC} - field supply not available
		on	24 V_{DC} - field supply available

Terminal point		Description
Description	No.	
n.c.	1	not connected
+24 V	2	+24 V (internally connected to terminal point 6 and positive power contact)
0 V	3	0 V (internally connected to terminal point 7 and negative power contact)
⏚	4	Ground (internally connected to terminal point 8 and power contact ground)
n.c.	5	not connected
+24 V	6	+24 V (internally connected to terminal point 2 and positive power contact)
0 V	7	0 V (internally connected to terminal point 3 and negative power contact)
⏚	8	Ground (internally connected to terminal point 4 and power contact ground)

2.13.4 EL9540-0010 - LEDs, connection and process data

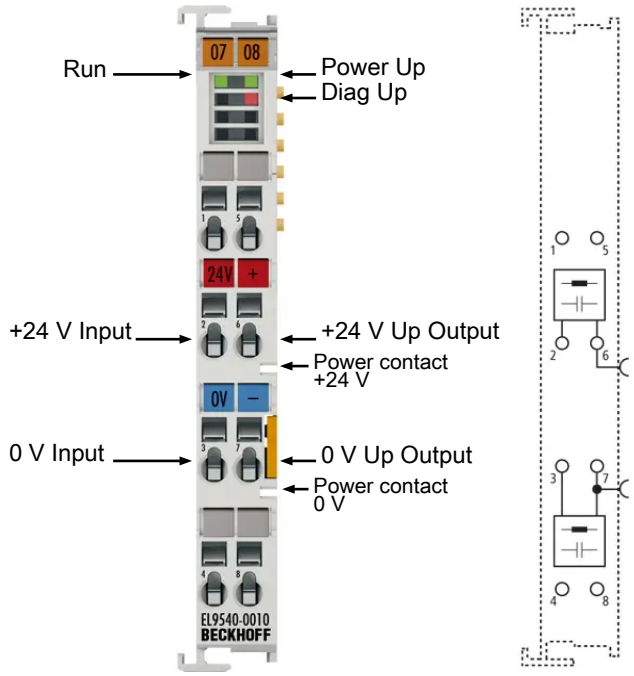


Fig. 41: EL9540-0010

LED	Color	Meaning	
Power Up	green	off	No voltage
		on	OK
Diag Up	red	off	No error
		on	Undervoltage: U_p below 18 V
RUN	green	This LED indicates the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		Flashing (2 Hz)	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Flashing (1 Hz)	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync Manager channels and the distributed clocks. Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operating state; mailbox and process data communication is possible
		Flashing (10 Hz)	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates of the terminal, for example

Terminal point		Description
Description	No.	
n.c.	1	not connected
Input +24 V	2	+24 V input
Input 0 V	3	0 V input
n.c	4	not connected
n.c.	5	not connected
+24 V Up Output	6	+24 V output
0 V Up Output	7	0 V output
n.c	8	not connected

Process data EL9540-0010

The EL9540-0010 has a bit width of 2 bits [diagnostic bits for undervoltage and overvoltage] in the process image and is represented in the TwinCAT tree as follows:

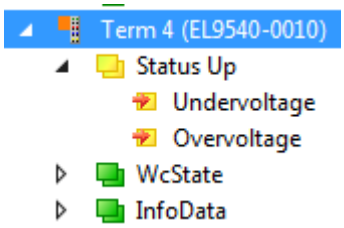


Fig. 42: EL9540-0010 in the TwinCAT tree

2.13.5 EL9540, EL9540-0010, EL9550 - Application example

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before starting mounting, disassembly or wiring of the bus terminals!

The example shows

- an EL9550 surge filter terminal for supplying
  - the bus coupler (U_S: E-bus supply)
  - the field voltage for the digital terminals (U_{P1}: power contacts, potential group 1)
- an EL9540-0010 surge filter terminal for supplying
  - the field voltage for the analog terminal (U_{P2}: power contacts, potential group 2)
- an EL9540 surge filter terminal in conjunction with the EL9190 power supply terminal for supplying
  - the field voltage for the digital terminal (U_{P3}: power contacts, potential group 3)

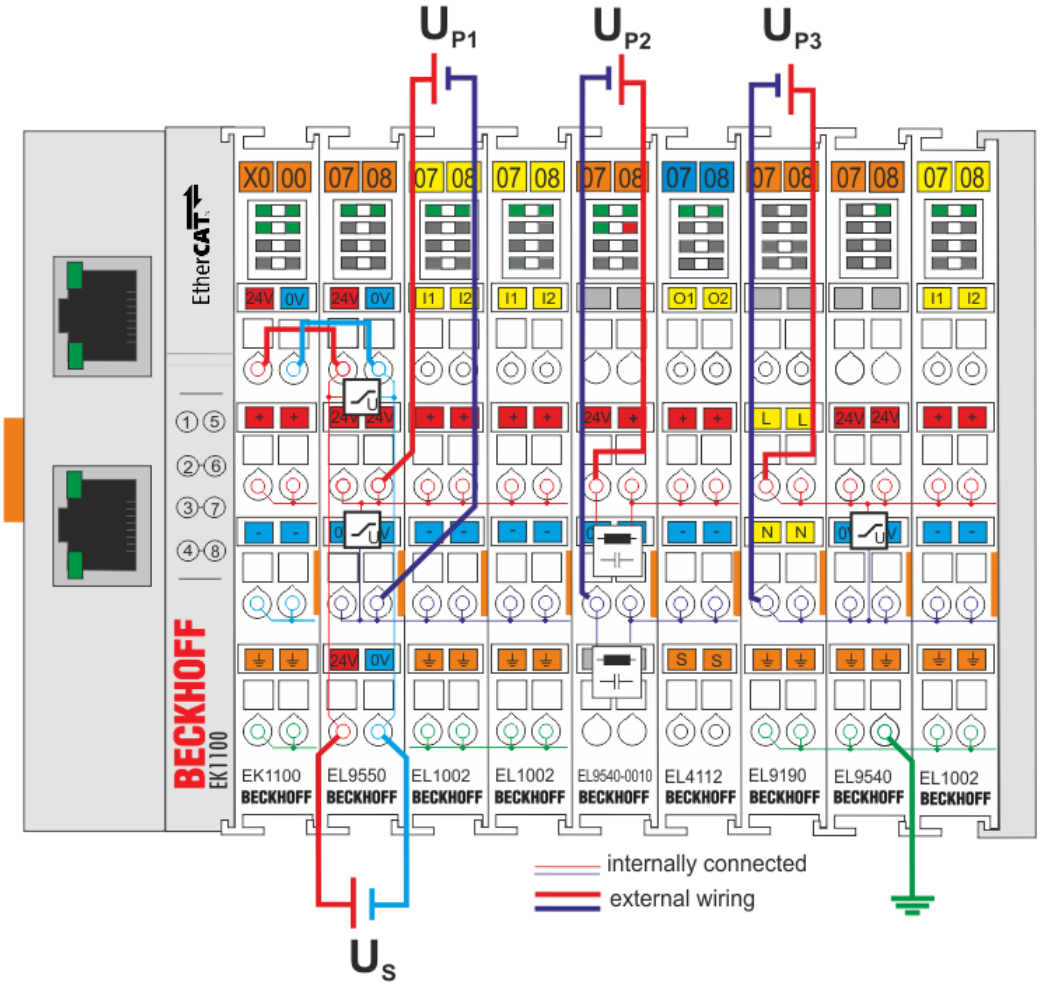


Fig. 43: Application example EL9540, EL9540-0010, EL9550

2.14 EL9550, EL9550-0010, EL9550-0012

2.14.1 EL9550, EL9550-0010, EL9550-0012 – Introduction

Surge filter terminals System and field supply, up to 10 A

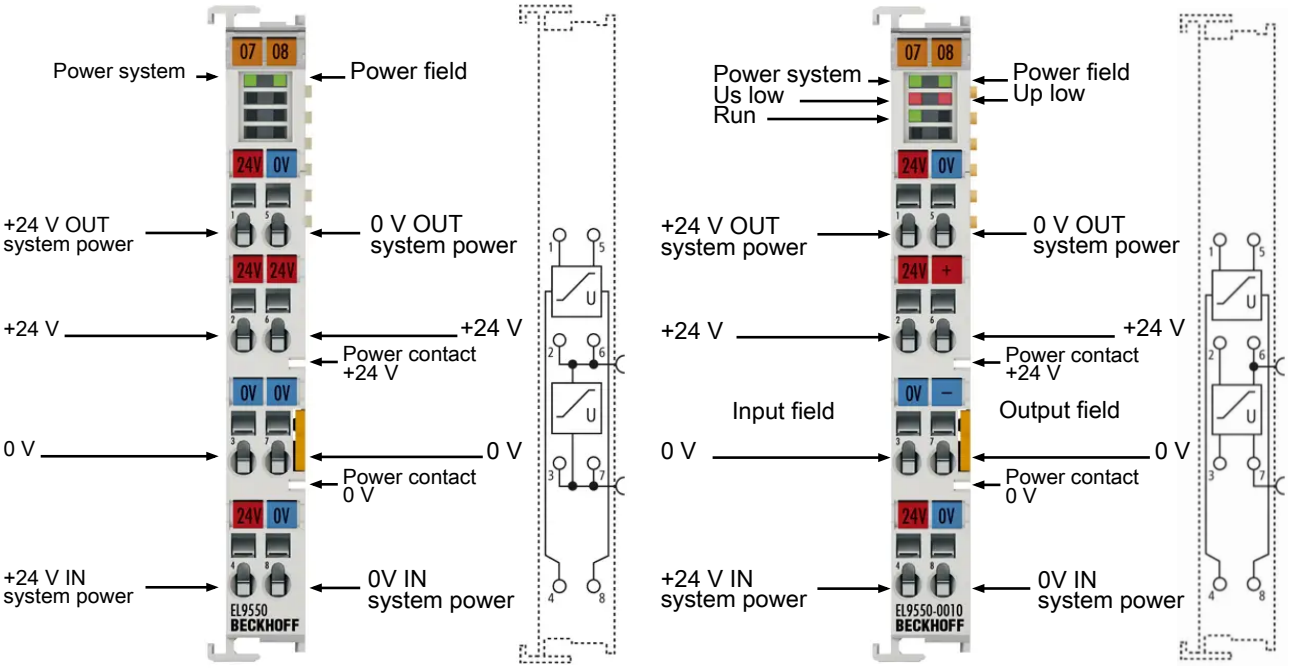


Fig. 44: EL9550/EL9550-0012, EL9550-0010

The surge filter terminals protect the EtherCAT Terminals from line-bound surge voltages that can occur on the supply lines due to high-energy, dynamic disturbances, such as switching surges from inductive loads or overvoltage from indirect lightning strikes.

The EL955x terminals have a filter for the 24 V DC field and system supply.

With the EL9550 and EL9550-0012 EtherCAT Terminals, the terminal station can be protected against damage in particularly harsh environments, such as onshore and offshore areas.

The EL9550-0010 has a total field and system supply of 10 A.
It is especially suitable for protecting digital terminals.
The EL9540-0010 is especially suitable for protecting analog terminals.
Both terminals can be used in shipbuilding, for example.

With the EL9550-0012 variant, the current load for both the field supply and the system supply is 10 A each. The higher system supply is advantageous when supplying embedded PCs, which have a higher current consumption.

Other surge filter terminals

With the EL9540 series, additional terminals with a filter for the 24 V DC field supply are available (see chapter EL9540, EL9540-0010 [▶ 66]).

2.14.2 EL9550, EL9550-0010, EL9550-0012 - Technical data

Technical data	EL9550	EL9550-0010	EL9550-0012
Function	Surge filter system and field supply		
Nominal voltage	24 V (-15 %/+20 %)		
Surge filter field supply	yes		
Surge filter system supply	yes		
Current carrying capacity field supply	≤ 10 A	up to 10 A, field+system in total 10 A	≤ 10 A
Current carrying capacity system supply	≤ 1.5 A (from hardware version 03)	up to 10 A, field+system in total 10 A	≤ 10 A
Diagnostics	-	yes	-
Message to E-bus	-	yes	-
Shield connection	-		
E-bus current consumption	-	typ. 40 mA	-
Bit width in process image	-	4	-
Electrical connection to mounting rail	-		
Electrical isolation	500 V (E-bus/field voltage)		
Renewed infeed	yes		
Connection facility to additional power contact	1		
Side by side mounting on EtherCAT Terminals with power contact	yes		
Side by side mounting on EtherCAT Terminals without power contact	yes		
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)		
Configuration	no address or configuration settings required		
Weight	approx. 50 g		
Permissible ambient temperature range during operation	-25 °C ... +60 °C		0 °C ... +55 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C		-25 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation		
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715		
Enhanced mechanical load capacity	yes, see Installation instructions [▶ 95] for terminals with enhanced mechanical load capacity	-	-
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27		
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4		
Protection rating	IP20		
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]		
Markings*	CE, UKCA EAC		
Approvals*	cULus [▶ 88], CCC, ATEX [▶ 84], IECEx [▶ 85], cFMus [▶ 86],	DNV	-

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc
cFMus	Class I, Division 2, Groups A, B, C, D Class I, Zone 2, AEx/Ex ec IIC T4 Gc

2.14.3 EL9550, EL9550-0012 - Connection and LEDs

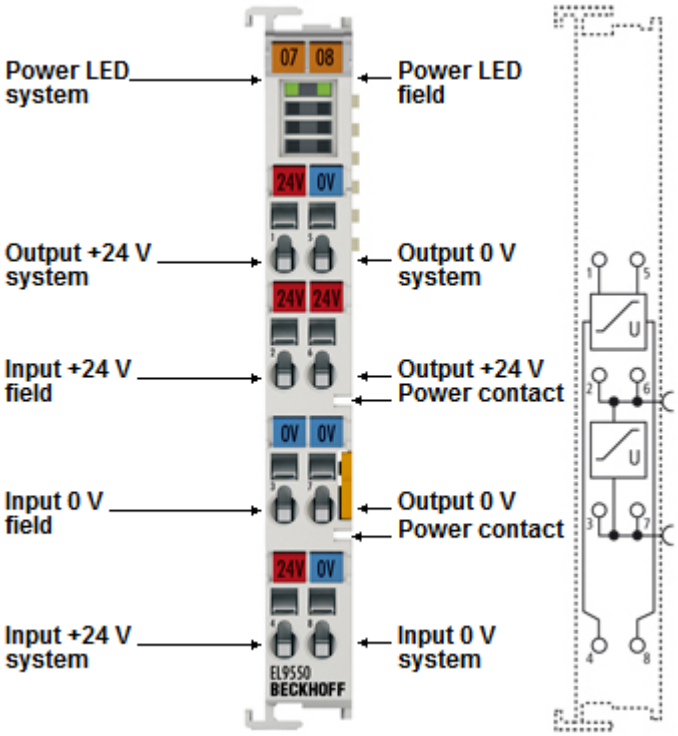


Fig. 45: EL9550/EL9550-0012

LED	Color	Meaning	
Power-LED field	green	off	24 V_{DC} - field supply not available
		on	24 V_{DC} - field supply available
Power-LED system	green	off	24 V_{DC} - system supply not available
		on	24 V_{DC} - system supply available

Terminal point		Description
Name	No.	
Output +24 V system	1	Output +24 V (system)
Input +24 V field	2	Input +24 V (field) (internally connected to terminal point 6 and positive power contact)
Input 0 V field	3	Input 0 V (field) (internally connected to terminal point 7 and negative power contact)
Input +24 V system	4	Input +24 V (system)
Output 0 V system	5	Output 0 V (system)
Input +24 V field	6	Input +24 V (field) (internally connected to terminal point 2 and positive power contact)
Input 0 V field	7	Input 0 V (field) (internally connected to terminal point 3 and negative power contact)
Input 0 V system	8	Input 0 V (system)

2.14.4 EL9550-0010 - Connection, LEDs and process data

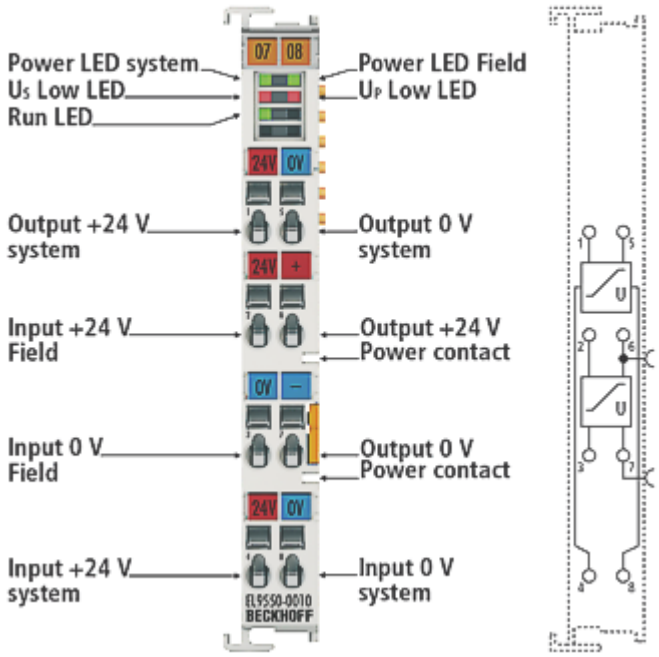


Fig. 46: EL9550-0010

LED	Color	Meaning	
Power-LED field	green	off	24 V_{DC} - field supply not available
		on	24 V_{DC} - field supply available
Power-LED system	green	off	24 V_{DC} - system supply not available
		on	24 V_{DC} - system supply available
Us Low LED	red	off	no error
		on	Undervoltage, Us below 18 V
Up Low LED	red	off	no error
		on	Undervoltage, Up below 18 V
RUN	green	These LEDs indicate the terminal's operating state:	
		off	State of the EtherCAT State Machine: **INIT** = initialization of the terminal
		Flashing (2 Hz)	State of the EtherCAT State Machine: **PREOP** = function for mailbox communication and different default settings set
		Flashing (1 Hz)	State of the EtherCAT State Machine: **SAFEOP** = verification of the Sync Manager channels and the distributed clocks. Outputs remain in safe state
		on	State of the EtherCAT State Machine: **OP** = normal operating state; mailbox and process data communication is possible
		Flashing (10 Hz)	State of the EtherCAT State Machine: **BOOTSTRAP** = function for Firmware updates of the terminal, for example

Terminal point		Description
Name	No.	
Output +24 V system	1	Output +24 V (system)
Input +24 V field	2	Input +24 V (field)
Input 0 V field	3	Input 0 V (field)
Input +24 V system	4	Input +24 V (system)
Output 0 V system	5	Output 0 V (system)
Input +24 V field	6	Input +24 V (field) (internally connected to positive power contact)
Input 0 V field	7	Input 0 V (field) (internally connected to negative power contact)
Input 0 V system	8	Input 0 V (system)

Process data EL9550-0010

The EL9550-0010 has a bit width of 4 bits (diagnostic bits for Up/Us undervoltage and overvoltage) in the process image and is represented in the TwinCAT tree as follows:

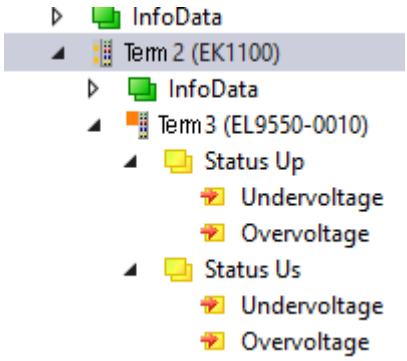


Fig. 47: EL9550-0010 in the TwinCAT tree

2.14.5 EL9550-0010, EL9550-0012 - Application example

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before starting mounting, disassembly or wiring of the bus terminals!

The example shows

- an EL9550-0012 surge filter terminal for supplying
  - of the embedded PC (U_S: E-bus supply)
  - the field voltage for the digital terminals (U_{P1}: power contacts, potential group 1)
- an EL9550-0010 surge filter terminal for supplying
  - the field voltage for the digital terminals (U_{P2}: power contacts, potential group 2)

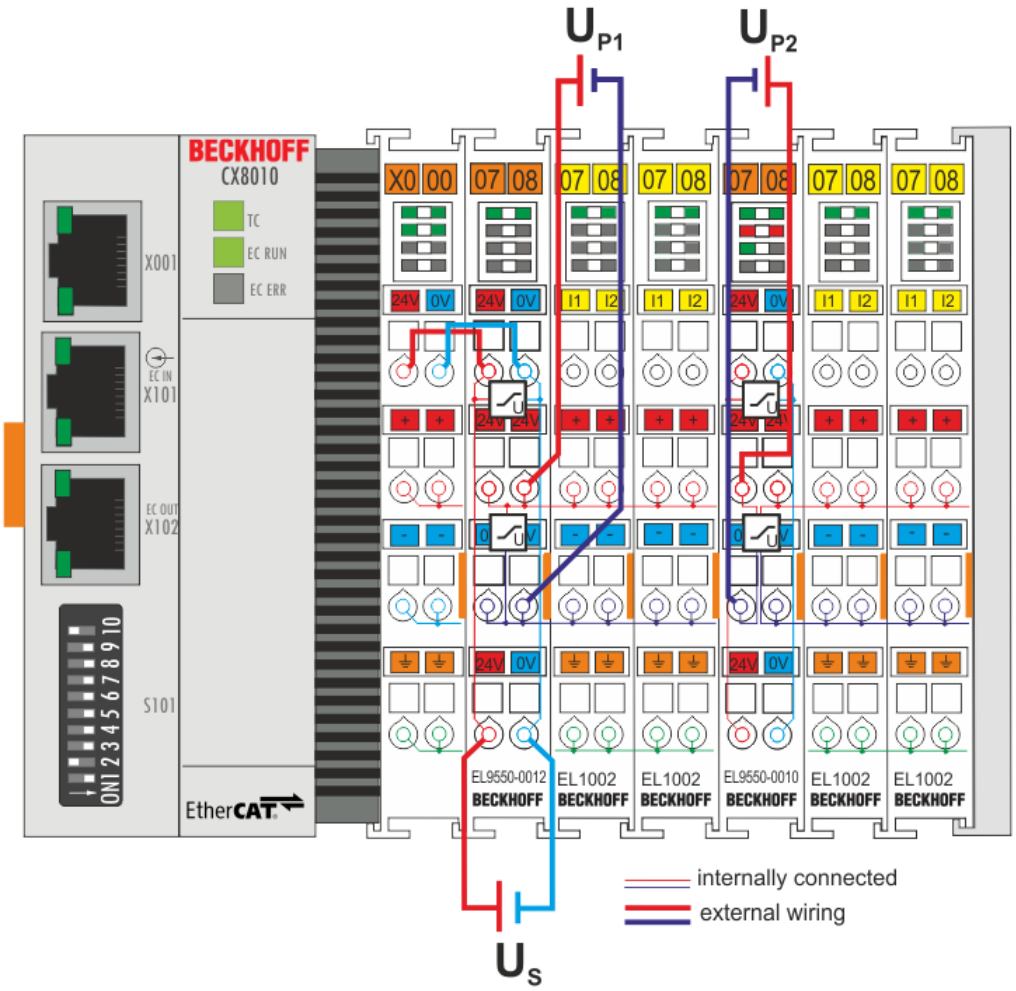


Fig. 48: Application example EL9550-0012, EL9550-0010

2.15 EL9570

2.15.1 EL9570 - Introduction and technical data Buffer capacitor terminal

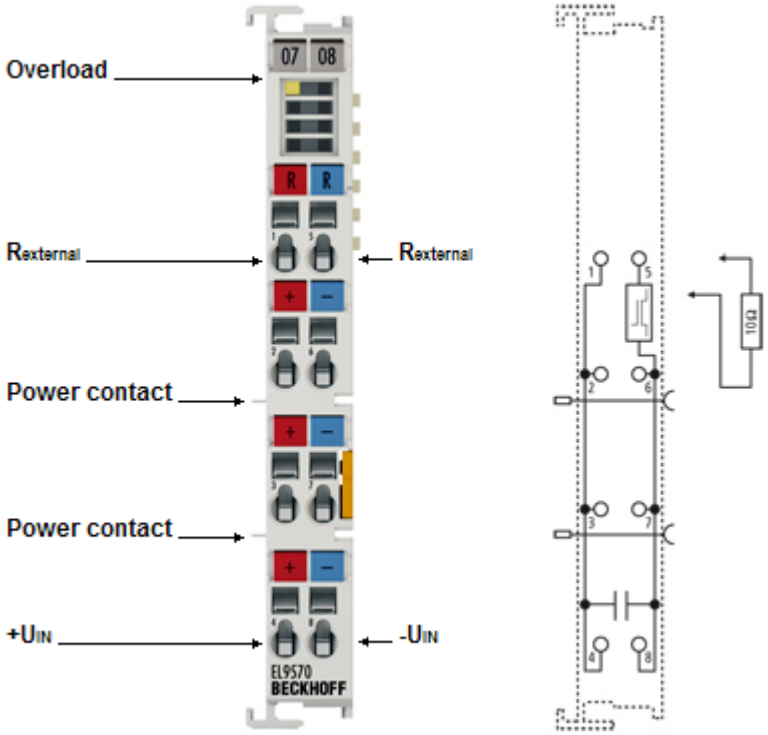


Fig. 49: EL9570

The EL9570 EtherCAT Terminal contains high-performance capacitors for stabilizing supply voltages.

The EL9570 can be used, for example, in conjunction with the EL7041 stepper motor terminal, the EL7342 DC motor terminal or the EL7201 servomotor terminal.

Low internal resistance and high pulse current capability enable good buffering in parallel with a power supply unit. Reverse currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the recovery energy exceeds the capacity of the capacitors, energy can be dissipated via an external braking resistor.

Technical data

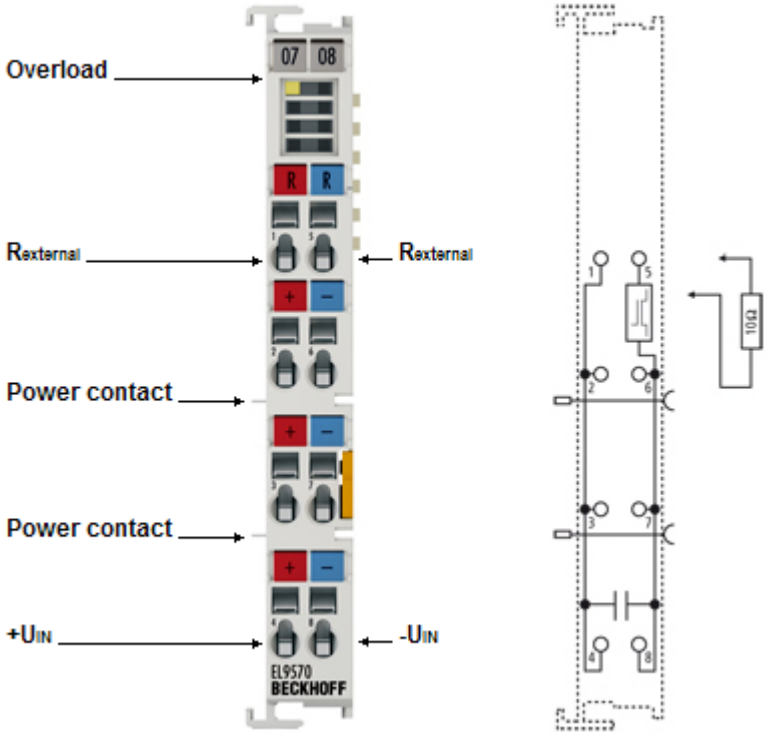
Technical data	EL9570
Technology	Buffer capacitor
Nominal voltage	50 V
Capacitance	500 µF
Ripple current	10 A in continuous operation
Internal resistance	< 10 mΩ
Overvoltage protection	> 56 V
Recommended braking resistor	10 Ω, 10 W typ.
Overvoltage control range	±2 V
Braking resistor clock rate	load-dependent, 2-point control
Electrical isolation	1500 V
Diagnostics	-
Message to E-bus	-
Shield connection	-
E-bus current consumption	-
Bit width in process image	0
Electrical connection to mounting rail	-
Renewed infeed	-
Connection facility to additional power contact	-
Side by side mounting on EtherCAT Terminals with power contact	yes, left side without power contact ground
Side by side mounting on EtherCAT Terminals without power contact	yes
Dimensions (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)
Configuration	no address or configuration settings required
Weight	approx. 90 g
Permissible ambient temperature range during operation	0 °C ... +55 °C
Permissible ambient temperature range during storage	-25 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Installation [▶ 89]	on 35 mm mounting rail, conforms to EN 60715
Vibration / shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation position	variable, see chapter Mounting of passive terminals [▶ 96]
Approvals/markings*)	CE, UKCA, EAC, CCC, ATEX [▶ 83], IECEx [▶ 85]

*) Real applicable approvals/markings see type plate on the side (product marking).

Ex markings

Standard	Marking
ATEX	II 3 G Ex ec IIC T4 Gc
IECEx	Ex ec IIC T4 Gc

Connection and LEDs EL9570



EL9570 – Connection and LEDs

Terminal point		Description
Name	No.	
$R_{external}$	1	Connection for braking resistor
$+U_{IN}$	2	Positive input for buffer voltage (internally connected to terminal points 3 and 4)
$+U_{IN}$	3	Positive input for buffer voltage (internally connected to terminal points 2 and 4)
$+U_{IN}$	4	Positive input for buffer voltage (internally connected to terminal points 2 and 3)
$R_{external}$	5	Connection for braking resistor
$-U_{IN}$	6	Negative input for buffer voltage (internally connected to terminal points 7 and 8)
$-U_{IN}$	7	Negative input for buffer voltage (internally connected to terminal points 6 and 8)
$-U_{IN}$	8	Negative input for buffer voltage (internally connected to terminal points 6 and 7)

LED	Color	Meaning	
Overload	green	off	No error
		on	Overload, energy is dissipated into external braking resistors

2.15.2 Application example

⚠ WARNING

Risk of electric shock and damage of device!

Bring the bus terminal system into a safe, powered down state before starting installation, disassembly or wiring of the Bus Terminals!

Application example

- The capacitor within the EL9570 compensates peaks on the power supply of the stepper motor / DC motor.
- As soon as the supply voltages increases 55 V, the EL9570 switches on the brake resistor $R_{EXTERNAL}$, to burn the back loaded braking energy of the stepper motor / DC motor connected to the EL7041.

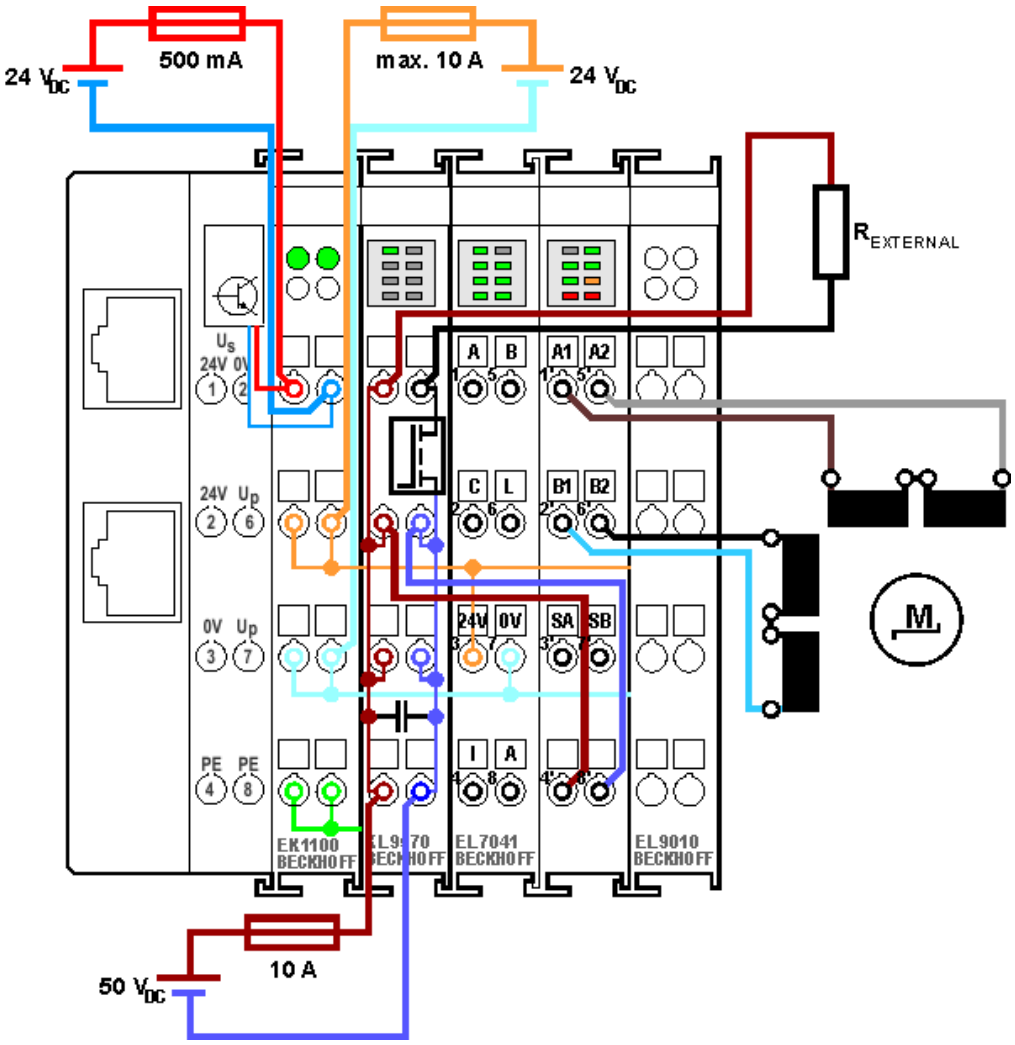


Fig. 50: Application example EL9570

More motors

A capacitor EL9570 terminal is able to condition the power supply of several motors.

NOTICE

Dimensioning of the brake resistor

The brake resistor $R_{EXTERNAL}$ (typically 10 Ω) should be dimensioned in that way, that it can stand the expected heat without damage!

3 Mounting and wiring

3.1 Notes on ESD protection

NOTICE

Devices can be destroyed by electrostatic charging!

The devices contain electrostatically sensitive components which can be damaged by improper handling.

- When handling the components, take care to avoid electrostatic discharge; also, prevent direct contact with the spring-loaded contacts (see illustration).
- Contact with highly insulating materials (synthetic fibers, plastic films, etc.) should be avoided when simultaneously handling components.
- When handling the components, ensure proper earthing of the environment (workplace, packaging, and persons).
- Each bus station must be terminated with the EL9011 or EL9012 end cap on its right side to guarantee the protection rating and ESD protection.

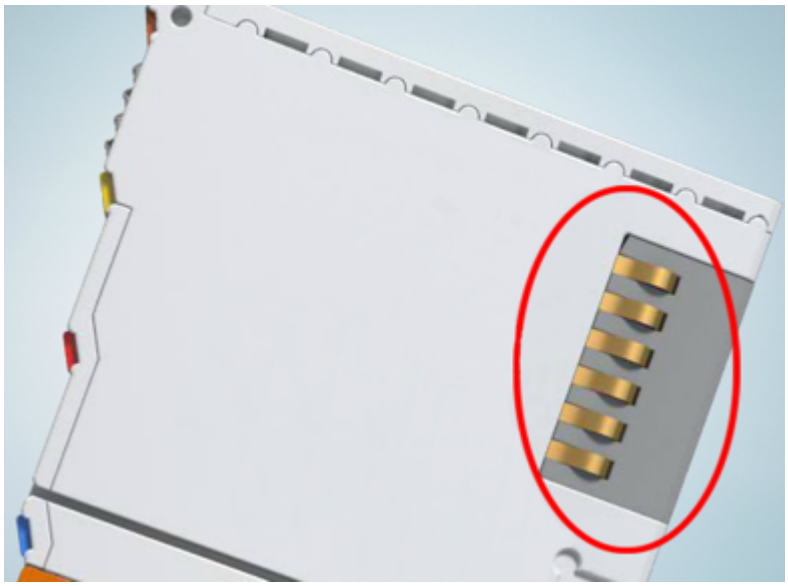


Fig. 51: Spring contacts of Beckhoff I/O components

3.2 Explosion protection

3.2.1 ATEX - Special conditions (standard temperature range)

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components with standard temperature range in potentially explosive areas!

- The certified components are to be installed in a suitable housing that guarantees a protection class of at least IP54 in accordance with EN 60079-7! The environmental conditions during use are thereby to be taken into account!
- If the temperatures during rated operation are higher than 70°C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values!
- Observe the permissible ambient temperature range of 0 to 55°C for the use of Beckhoff fieldbus components standard temperature range in potentially explosive areas!
- Measures must be taken to protect against the rated operating voltage being exceeded by more than 40% due to short-term interference voltages!
- The individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The connections of the certified components may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The fuses of the KL92xx/EL92xx power feed terminals may only be exchanged if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!

Standards

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

- EN IEC 60079-0:2018
- EN 60079-7:2015+A1:2018

Marking

The Beckhoff fieldbus components with standard temperature range certified according to regulations for potentially explosive areas bear the following marking:



II 3 G Ex ec IIC T4 Gc
KEMA 10 ATEX0075 X
DEKRA 22UKEX6024X
Ta: 0 ... + 55°C

3.2.2 ATEX - Special conditions (extended temperature range)

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components with extended temperature range (ET) in potentially explosive areas!

- The certified components are to be installed in a suitable housing that guarantees a protection class of at least IP54 in accordance with EN 60079-7! The environmental conditions during use are thereby to be taken into account!
- If the temperatures during rated operation are higher than 70°C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values!
- Observe the permissible ambient temperature range of -25 to 60°C for the use of Beckhoff fieldbus components with extended temperature range (ET) in potentially explosive areas!
- Measures must be taken to protect against the rated operating voltage being exceeded by more than 40% due to short-term interference voltages!
- The individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The connections of the certified components may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The fuses of the KL92xx/EL92xx power feed terminals may only be exchanged if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!

Standards

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

- EN IEC 60079-0:2018
- EN 60079-7:2015+A1:2018

Marking

The Beckhoff fieldbus components with extended temperature range (ET) certified according to regulations for potentially explosive areas bear the following marking:



II 3 G Ex ec IIC T4 Gc
KEMA 10 ATEX0075 X
DEKRA 22UKEX6024X
Ta: -25 ... + 60°C

3.2.3 IECEx - Special conditions

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components in potentially explosive areas!

- For gas: The equipment shall be installed in a suitable enclosure providing a degree of protection of IP54 according to IEC 60079-7, taking into account the environmental conditions under which the equipment is used!
- The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1!
- Provisions shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 119 V!
- If the temperatures during rated operation are higher than 70°C at the feed-in points of cables, lines or pipes, or higher than 80°C at the wire branching points, then cables must be selected whose temperature data correspond to the actual measured temperature values!
- Observe the permissible ambient temperature range for the use of Beckhoff fieldbus components in potentially explosive areas!
- The individual terminals may only be unplugged or removed from the Bus Terminal system if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The connections of the certified components may only be connected or disconnected if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and ID switches may only be adjusted if the supply voltage has been switched off or if a non-explosive atmosphere is ensured!
- The front hatch of certified units may only be opened if the supply voltage has been switched off or a non-explosive atmosphere is ensured!

Standards

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

- IEC 60079-0:2017 (Edition 7.0)
- IEC 60079-7:2017 (Edition 5.1)

Marking

Beckhoff fieldbus components that are certified in accordance with IECEx for use in areas subject to an explosion hazard bear the following marking:

IECEx DEK 16.0078 X

Ex ec IIC T4 Gc

3.2.4 Continuative documentation for ATEX and IECEx

NOTICE



Continuative documentation about explosion protection according to ATEX and IECEx

Pay also attention to the continuative documentation

Ex. Protection for Terminal Systems
Notes on the use of the Beckhoff terminal systems in hazardous areas according to ATEX and IECEx,

that is available for download within the download area of your product on the Beckhoff homepage www.beckhoff.com!

3.2.5 cFMus - Special conditions

⚠ WARNING

Observe the special conditions for the intended use of Beckhoff fieldbus components in potentially explosive areas!

- The equipment shall be installed within an enclosure that provides a minimum ingress protection of IP54 in accordance with ANSI/UL 60079-0 (US) or CSA C22.2 No. 60079-0 (Canada).
- The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1.
- Transient protection shall be provided that is set at a level not exceeding 140% of the peak rated voltage value at the supply terminals to the equipment.
- The circuits shall be limited to overvoltage Category II as defined in IEC 60664-1.
- The Fieldbus Components may only be removed or inserted when the system supply and the field supply are switched off, or when the location is known to be non-hazardous.
- The Fieldbus Components may only be disconnected or connected when the system supply is switched off, or when the location is known to be non-hazardous.

Standards

The fundamental health and safety requirements are fulfilled by compliance with the following standards:

M20US0111X (US):

- FM Class 3600:2018
- FM Class 3611:2018
- FM Class 3810:2018
- ANSI/UL 121201:2019
- ANSI/ISA 61010-1:2012
- ANSI/UL 60079-0:2020
- ANSI/UL 60079-7:2017

FM20CA0053X (Canada):

- CAN/CSA C22.2 No. 213-17:2017
- CSA C22.2 No. 60079-0:2019
- CAN/CSA C22.2 No. 60079-7:2016
- CAN/CSA C22.2 No.61010-1:2012

Marking

Beckhoff fieldbus components that are certified in accordance with cFMus for use in areas subject to an explosion hazard bear the following markings:

FM20US0111X (US):	**Class I, Division 2, Groups A, B, C, D** **Class I, Zone 2, AEx ec IIC T4 Gc**
FM20CA0053X (Canada):	**Class I, Division 2, Groups A, B, C, D** **Ex ec T4 Gc**

3.2.6 Continuative documentation for cFMus

NOTICE	
	**Continuative documentation about explosion protection according to cFMus** Pay also attention to the continuative documentation **Control Drawing I/O, CX, CPX** Connection diagrams and Ex markings, that is available for download within the download area of your product on the Beckhoff homepage www.beckhoff.com!

3.3 UL notice

⚠ CAUTION

Application

Beckhoff EtherCAT modules are intended for use with Beckhoff's UL Listed EtherCAT System only.

⚠ CAUTION

Examination

For cULus examination, the Beckhoff I/O System has only been investigated for risk of fire and electrical shock (in accordance with UL508 and CSA C22.2 No. 142).

⚠ CAUTION

For devices with Ethernet connectors

Not for connection to telecommunication circuits.

⚠ CAUTION

Usage of suitable copper cables

In order to comply with UL approval, use copper cables that are designed for operating temperatures >= 90°C.

⚠ CAUTION

External overcurrent protection

External overcurrent protection is required for each input exceeding levels of 30Vrms, 42.4Vpeak or 60Vdc.

⚠ WARNING

Operating of the Beckhoff Terminal EL9260 [▶ 58] with Beckhoff Terminal EL1702-0020

Fuses have to be specified as 250Vac/6.3A/size 20x5.2mm as all of these parameters are critical for safety.

Basic principles

UL certification according to UL508. Devices with this kind of certification are marked by this sign:



3.4 Mounting rail installation

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before beginning to mount, disassemble, or wire the bus terminals!

The bus terminal system is designed for installation in a control cabinet or junction box.

Installation

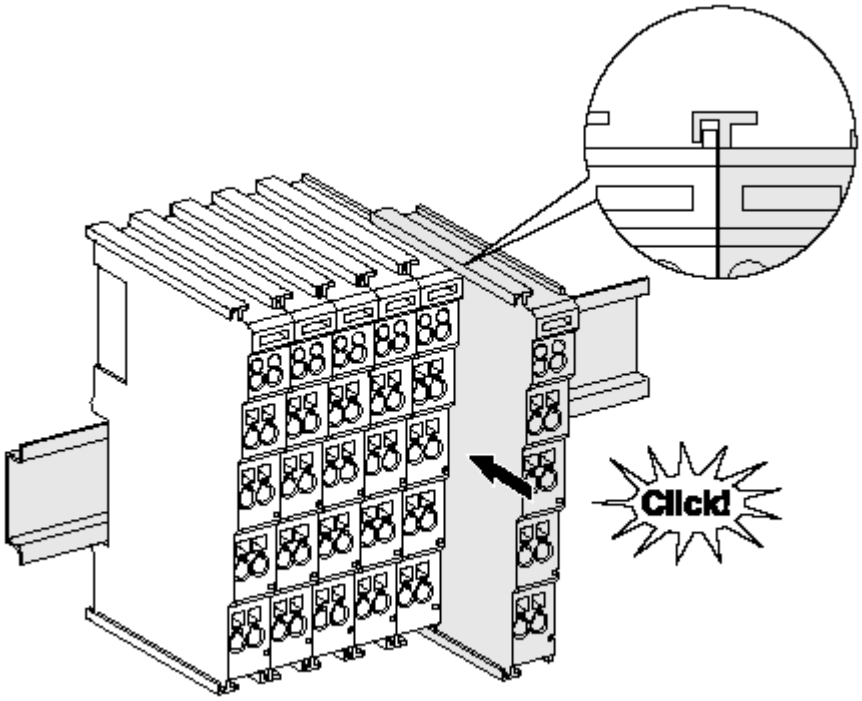


Fig. 52: Installation on the mounting rail

The bus couplers and bus terminals are attached to commercially available 35 mm mounting rails (DIN rail according to EN 60715) by applying slight pressure:

1. First attach the fieldbus coupler to the mounting rail.
2. The bus terminals are now attached on the right-hand side of the fieldbus coupler. To do this, connect the components with the slot and key and push the terminals against the mounting rail until the latch audibly engages on the mounting rail.
   If you snap the terminals onto the mounting rail first and then push them next to each other without the slot and key engaging, no functional connection will be established! When correctly assembled, no significant gap should be visible between the housing units.

Fastening the mounting rails

The locking mechanism of the terminals and couplers protrudes into the profile of the mounting rail. When installing the components, make sure that the locking mechanism doesn't come into conflict with the fixing bolts of the mounting rail. When fastening mounting rails with a height of 7.5 mm under the terminals and couplers, use flat fastening components such as countersunk head screws or blind rivets.

NOTICE

Earth the mounting rail!

Make sure the mounting rail is properly earthed.

Connections within a bus terminal block

The electric connections between the bus coupler and the bus terminals are made automatically by joining the components:

- The six spring-loaded contacts of the E-bus/K-bus deal with the data transfer and the supply of the bus terminal electronics.
- The power contacts deal with the supply for the field electronics and thus represent a supply rail within the bus terminal block. The power contacts are supplied via terminal points on the bus coupler (up to 24 V) or via power supply terminals for higher voltages.

Power contacts

When configuring a bus terminal block, note the contact assignments of the individual bus terminals, as some types

- do not loop through the power contacts or do not loop them through completely (e. g. analog bus terminals or digital 4-channel bus terminals),
- the power contacts are disconnected, thus marking the start of a new supply rail (power supply terminals).

Power contact ⏚

The power contact marked ⏚ (ground connection in accordance with IEC 60417-5017) can be used as a ground. For safety reasons this contact mates first when plugging together, and can ground short-circuit currents of up to 125 A.

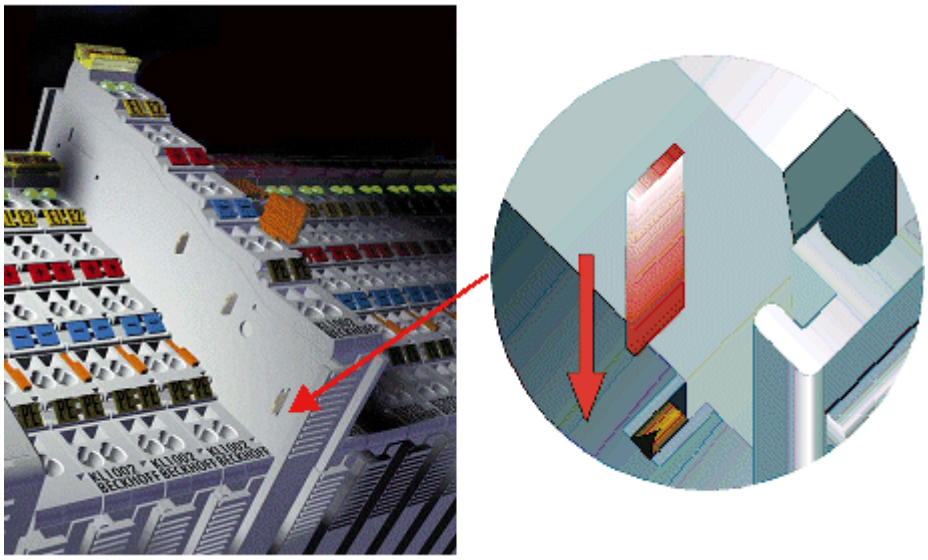


Fig. 53: Power contact on the left

⚠ WARNING

Risk of injury from electric shock!

The power contact marked ⏚ may not be used for other potentials!

NOTICE

Risk of damage to the device

Note that, for electromagnetic compatibility, the earth contacts are capacitatively coupled to the mounting rail. This may lead to incorrect results during insulation testing or to damage to the terminal (e.g. disruptive discharge to the earth line during insulation testing of a consumer with a rated voltage of 230 V). For insulation testing, disconnect the earth supply line at the bus coupler or the power supply terminal! In order to decouple further supply points for testing, these power supply terminals can be released and pulled at least 10 mm from the group of terminals.

Disassembly

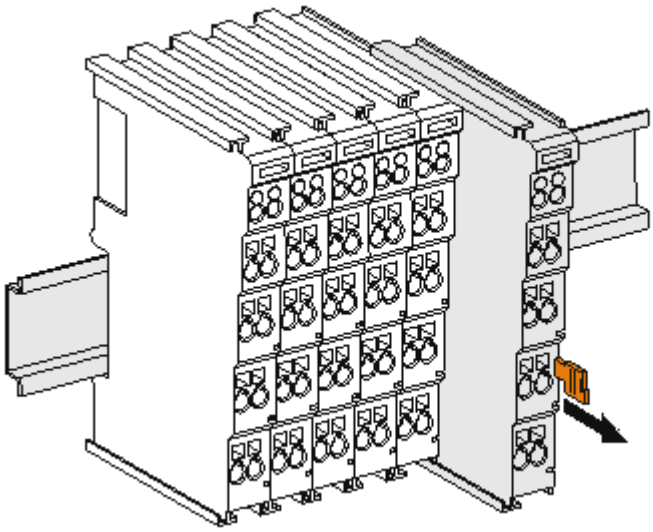


Fig. 54: Removal from mounting rail

Each terminal is secured by a lock on the mounting rail, which must be released for disassembly:

1. Pull down the terminal at its orange-colored straps from the mounting rail by approx. 1 cm. The rail locking of this terminal is automatically released, and you can now pull the terminal out of the bus terminal block with little effort.
2. To do this, grasp the unlocked terminal simultaneously at the top and bottom of the housing surfaces with your thumb and index finger and pull it out of the bus terminal block.

3.5 Installation positions

NOTICE

Constraints regarding installation position and operating temperature range

- Please refer to the technical data of the device to ascertain whether any restrictions regarding the installation position and/or the operating temperature range have been specified.
- When installing devices with increased heat dissipation, ensure that there is sufficient space above and below the devices during operation to guarantee adequate ventilation!

The installation positions and their names for mounting devices on mounting rails are specified below. The illustration of the devices in the following figures is an example.
The following applies to all installation positions: the reference direction “down” (see arrow) is the direction of the earth's gravitational force.

Horizontal installation (standard installation)

The mounting rail is mounted horizontally on a vertical mounting plate.
The connection level of the devices points to the front.

The devices are ventilated from below, which enables optimum cooling of the electronics through convection. This is therefore also the recommended installation position.

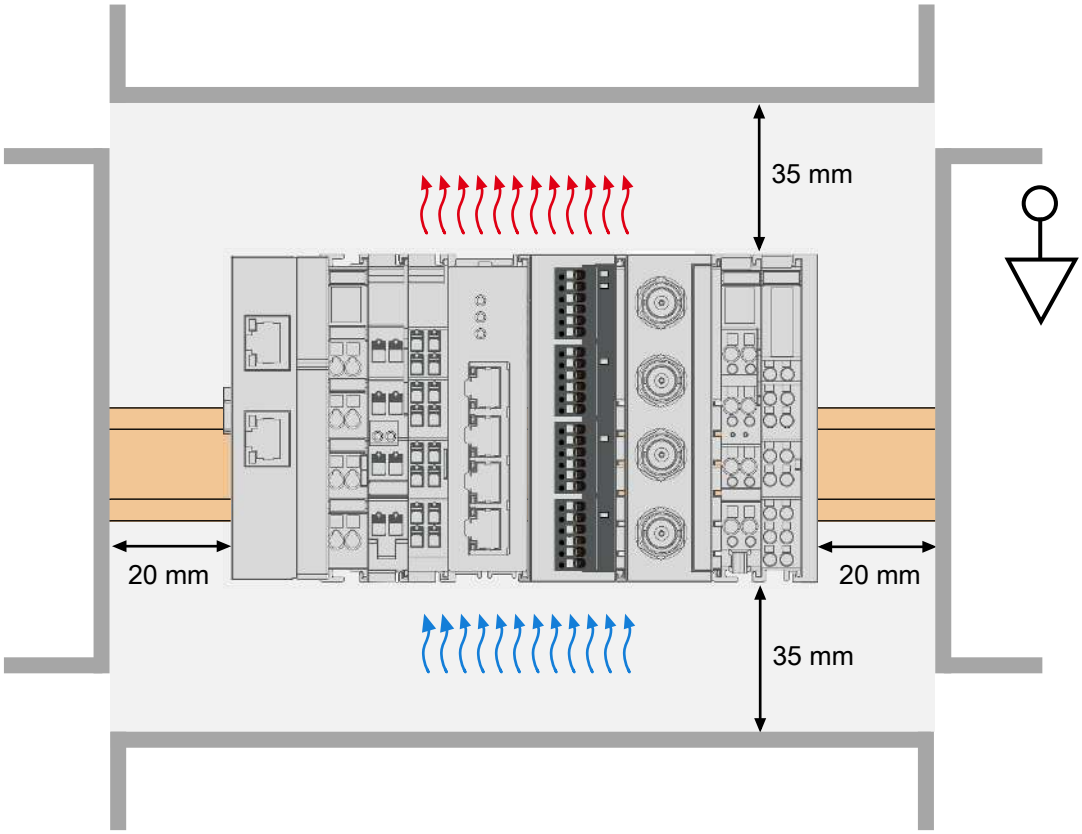


Fig. 55: Recommended minimum distances for standard installation position

NOTICE

Compliance with the minimum distances

Compliance with the minimum distances shown in the figure “Recommended minimum distances for standard installation position” is strongly recommended in all installation positions.

Vertical installation

The mounting rail is mounted vertically on a vertical mounting plate.
The connection level of the devices faces the front.
The devices can be arranged as follows:

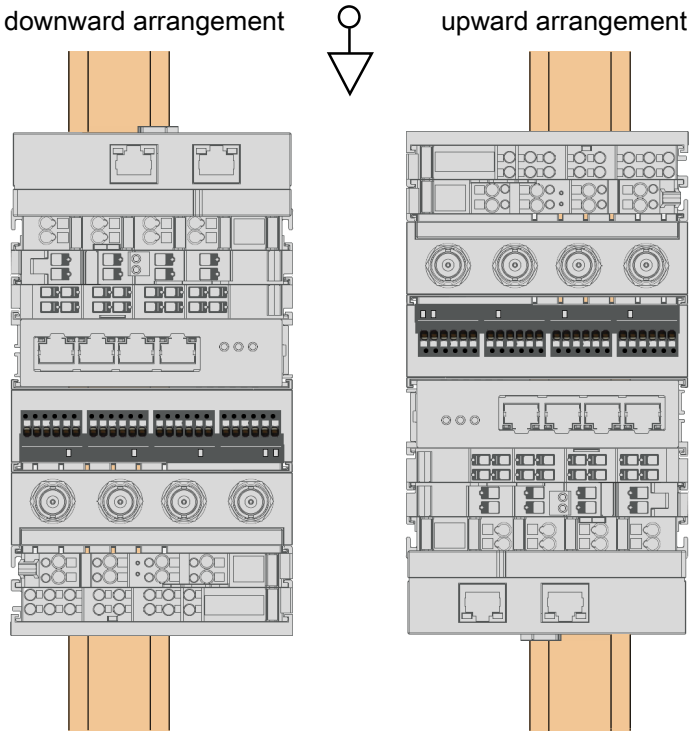


Fig. 56: Installation position: Vertical, downward arrangement (left)/upward arrangement (right)

Flat installation

The mounting rail is mounted on a horizontal mounting plate.
The connection level of the devices points upwards.

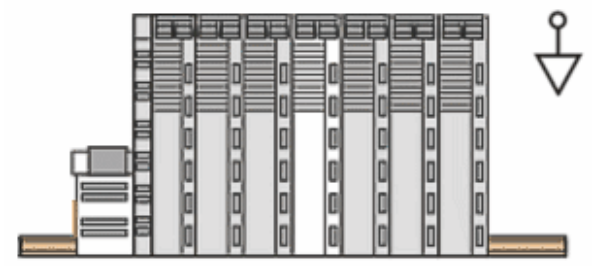


Fig. 57: Flat installation

NOTICE

Danger of sliding off the mounting rail

Particularly in the “vertical” installation position, but also in other installation positions under corresponding mechanical load, the terminal segment may move on the mounting rail. These can lead to undesirable malfunctions.

- If this risk exists, secure the terminal segment with appropriate locking devices, e.g. by clamping it to the mounting rail.

NOTICE

Compliance with the minimum distances

Compliance with the minimum distances shown in the figure “Recommended minimum distances for standard installation position” is strongly recommended in all installation positions.

Installation positions with ZB8610 fan cartridge

If the cooling should or must be increased for the intended application, the ZB8610 fan cartridge can be mounted on the underside of the device. In the horizontal installation position, the devices are ventilated from bottom to top by the fan cartridge. This optimum cooling is further enhanced by convection ventilation (see following figure).

The fan cartridge can be used in any installation position.

Further information on operation with and without a fan can be found in the technical data for the device (e.g. derating, information on installation positions, etc.).

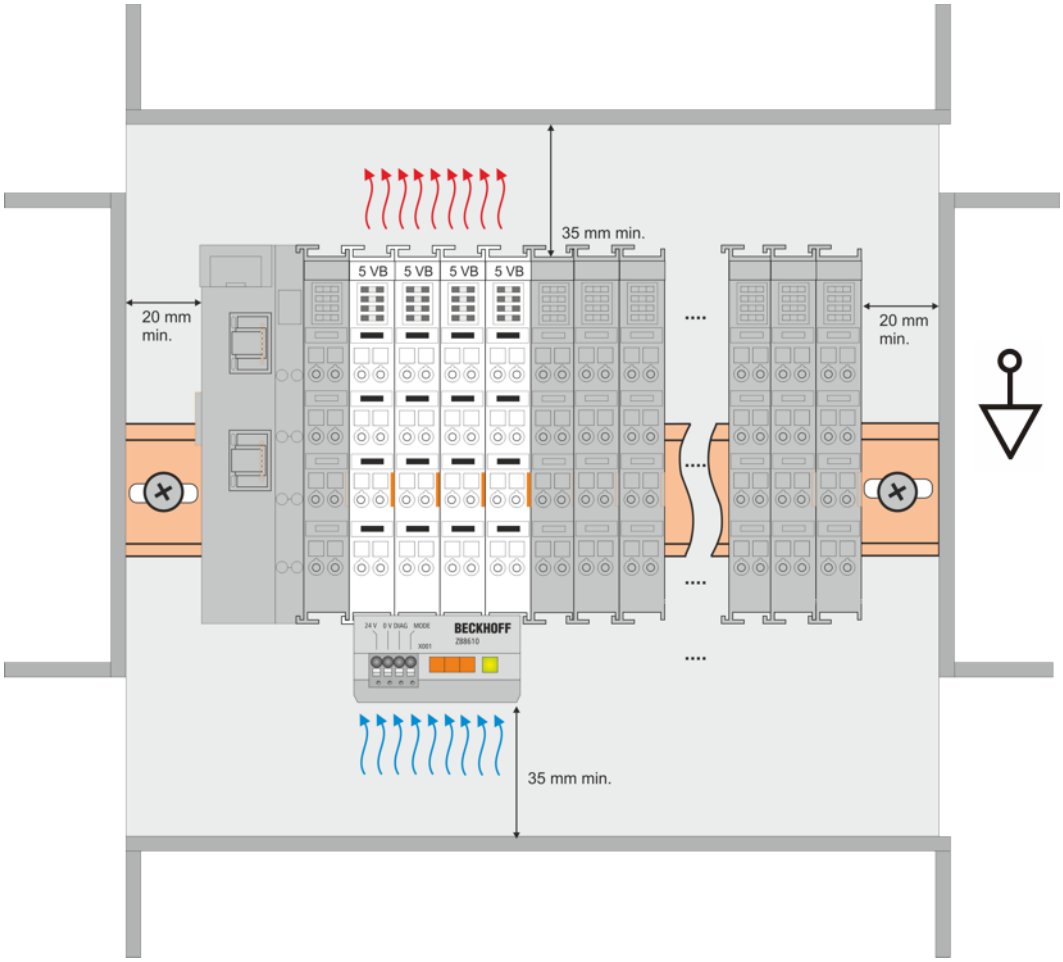


Fig. 58: Recommended minimum distances for operation with fan, using horizontal installation position as an example

NOTICE

Compliance with the minimum distances

Compliance with the minimum distances as shown in the figure “Recommended minimum distances for operation with fan” is strongly recommended.

3.6 Installation instructions for enhanced mechanical load capacity

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the Bus Terminal system into a safe, de-energized state before starting mounting, disassembly or wiring of the Bus Terminals!

Additional checks

The terminals have undergone the following additional tests:

Verification	Explanation
Vibration	10 frequency runs in 3 axes
	6 Hz < f < 60 Hz displacement 0.35 mm, constant amplitude
	60.1 Hz < f < 500 Hz acceleration 5 *g*, constant amplitude
Shocks	1000 shocks in each direction, in 3 axes
	25 *g*, 6 ms

Additional installation instructions and notes

For terminals with enhanced mechanical load capacity, the following additional installation instructions and notes apply:

- The enhanced mechanical load capacity is valid for all permissible installation positions.
- Use a mounting rail according to EN 60715 TH35-15.
- Fix the terminal segment on both sides of the mounting rail with a mechanical fixture, e.g. an earth terminal or reinforced end clamp.
- The maximum total extension of the terminal segment (without coupler) is:
  64 terminals (12 mm mounting width) or 32 terminals (24 mm mounting width)
- Avoid deformation, twisting, crushing and bending of the mounting rail during edging and installation of the rail.
- The mounting points of the mounting rail must be set at 5 cm intervals.
- Use countersunk head screws to fasten the mounting rail.
- The free length between the strain relief and the wire connection should be kept as short as possible. A distance of approx. 10 cm should be maintained to the cable duct.

3.7 Positioning of passive terminals

Note on the placement of passive terminals in the bus terminal block

EtherCAT Terminals that do not take part in active data exchange within the bus terminal block are referred to as passive terminals. These terminals can be recognized because they do not consume power from the E-bus. To ensure optimal data exchange, no more than two passive terminals may be connected directly to each other!

Examples of the placement of passive terminals (highlighted in light color)

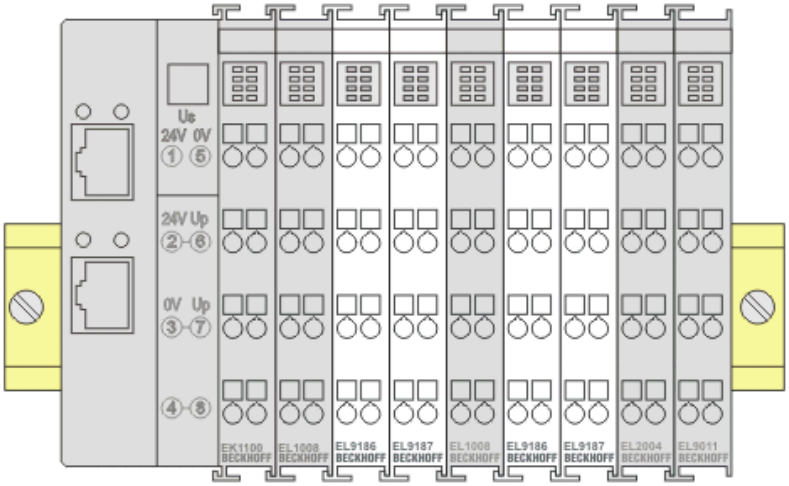


Fig. 59: Proper positioning

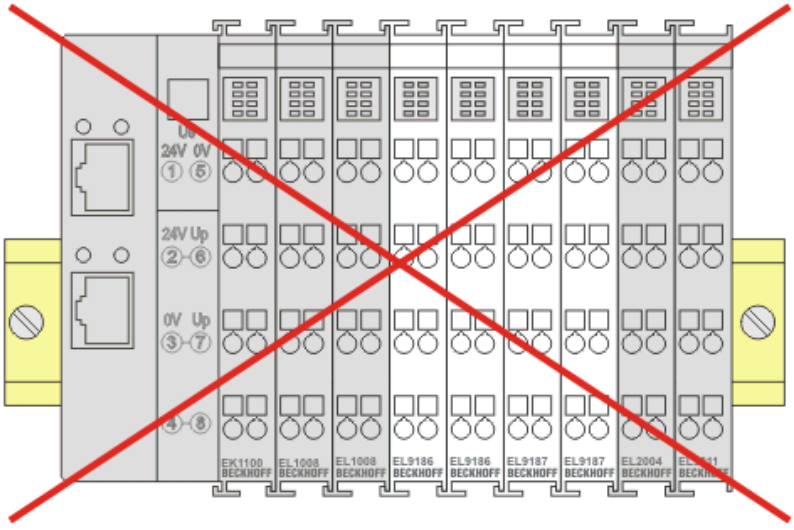


Fig. 60: Incorrect positioning

3.8 Note on power supply

⚠ WARNING

Power supply from SELV / PELV power supply unit!

SELV / PELV circuits (safety extra-low voltage / protective extra-low voltage) according to IEC 61010-2-201 must be used to supply this device.

Notes:

- SELV / PELV circuits may give rise to further requirements from standards such as IEC 60204-1 et al, for example with regard to cable spacing and insulation.
- A SELV supply provides safe electrical isolation and limitation of the voltage without a connection to the protective conductor, a PELV supply also requires a safe connection to the protective conductor.

3.9 Connection

3.9.1 Connection system

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before beginning to mount, disassemble, or wire the bus terminals!

Overview

The bus terminal system offers different connection options for optimum adaptation to the respective application:

- The terminals of ELxxxx and KLxxxx series with standard wiring include electronics and connection level in a single enclosure.
- The terminals of ESxxxx and KSxxxx series feature a pluggable connection level and enable steady wiring while replacing.
- The High Density Terminals (HD Terminals) include electronics and connection level in a single enclosure and have advanced packaging density.

Standard wiring (ELxxxx / KLxxxx)



Fig. 61: Standard wiring

The terminals of the ELxxxx and KLxxxx series integrate screwless spring-cage technology for quick and easy wiring.

Pluggable wiring (ESxxxx / KSxxxx)

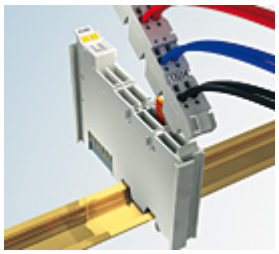


Fig. 62: Pluggable wiring

The terminals of ESxxxx and KSxxxx series feature a pluggable connection level.
The assembly and wiring procedure is the same as for the ELxxxx and KLxxxx series.
The pluggable connection level enables the complete wiring to be removed as a plug connector from the top of the housing for servicing.
The lower section can be removed from the terminal block by pulling the unlocking tab.
Insert the new component and plug in the connector with the wiring. This reduces the installation time and eliminates the risk of wires being mixed up.

The familiar dimensions of the terminal only had to be changed slightly. The new connector adds about 3 mm. The maximum height of the terminal remains unchanged.

A tab for strain relief of the cable simplifies assembly in many applications and prevents tangling of individual connection wires when the connector is removed.

Conductor cross sections between 0.08 mm^2 and 2.5 mm^2 can continue to be used with the proven spring force technology.

The overview and nomenclature of the product names for ESxxxx and KSxxxx series has been retained as known from ELxxxx and KLxxxx series.

High Density Terminals (HD Terminals)



Fig. 63: High Density Terminals

The terminals from these series with 16/32 terminal points are distinguished by a particularly compact design, as the packaging density is twice as large as that of the standard 12 mm bus terminals. Massive conductors and conductors with a wire end sleeve can be inserted directly into the spring loaded terminal point without tools.

Wiring HD Terminals

The High Density Terminals of the ELx8xx and KLx8xx series doesn't support pluggable wiring.

Ultrasonically compacted (ultrasonically welded) strands

Ultrasonically compacted (ultrasonically welded) strands

Ultrasonically compacted (ultrasonically welded) strands can also be connected to the standard and high-density terminals. In this case, please note the tables concerning the wire-size width [▶ 101]!

3.9.2 Wiring

⚠ WARNING

Risk of injury through electric shock and damage to the device!

Bring the bus terminal system into a safe, de-energized state before beginning to mount, disassemble, or wire the bus terminals!

Terminals for standard wiring ELxxxx/KLxxxx and for pluggable wiring ESxxxx/KSxxxx

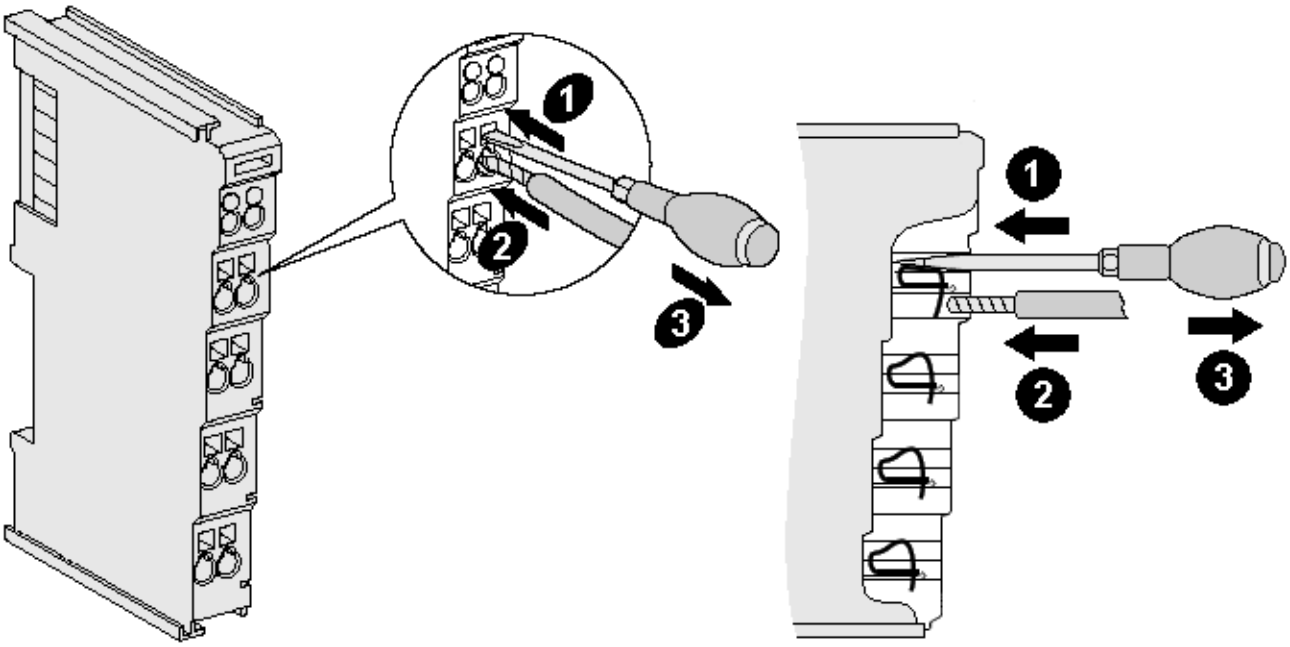


Fig. 64: Connecting a cable on a terminal point

Up to eight terminal points enable the connection of solid or finely stranded cables to the bus terminal. The terminal points are implemented in spring force technology. Connect the cables as follows (see fig. “Connecting a cable on a terminal point”:

1. Open a terminal point by pushing a screwdriver straight against the stop into the square opening above the terminal point. Do not turn the screwdriver or move it alternately (don't toggle).
2. The wire can now be inserted into the round terminal opening without any force.
3. When the screwdriver is removed, the terminal point closes automatically and holds the wire securely and permanently in place

See the following table for the suitable wire size width:

Terminal housing	ELxxxx, KLxxxx	ESxxxx, KSxxxx
Wire size width (single core wires)	0.08 ... 2.5 mm²	0.08 ... 2.5 mm²
Wire size width (fine-wire conductors)	0.08 ... 2.5 mm²	0.08 ... 2.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 1.5 mm²	0.14 ... 1.5 mm²
Wire stripping length	8 ... 9 mm	9 ... 10 mm

High Density Terminals (HD Terminals [▶ 99]) with 16/32 terminal points

The conductors of the HD Terminals are connected without tools for single-wire conductors using the direct plug-in technique, i.e. after stripping the wire is simply plugged into the terminal point. The cables are released, as usual, using the contact release with the aid of a screwdriver. See the following table for the suitable wire size width.

Terminal housing	High Density Housing
Wire size width (single core wires)	0.08 ... 1.5 mm²
Wire size width (fine-wire conductors)	0.25 ... 1.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 0.75 mm²
Wire size width (ultrasonically compacted [ultrasonically welded] strands)	only 1.5 mm² (see notice [▶ 99])
Wire stripping length	8 ... 9 mm

3.9.3 Shielding

Shielding

Encoders, analog sensors, and actuators should always be connected with shielded, pair-wise twisted cables.

3.10 Recommended accessory: Insertable label cover BZ32xx



Fig. 65: BZ3201

NOTICE

Accessory recommendation (BZ32xx) for terminals with potentially hazardous voltages

When connecting potentially hazardous voltages to terminals of the ELxxxx and KLxxxx series with standard wiring, Beckhoff recommends using the insertable, transparent labeling cover BZ3201 with the laser-engraved lettering “HIGH VOLTAGE” or the unlabeled version BZ3200.

3.11 Disposal



Products marked with a crossed-out wheeled bin shall not be discarded with the normal waste stream. The device is considered as waste electrical and electronic equipment. The national regulations for the disposal of waste electrical and electronic equipment must be observed.

4 TwinCAT System Manager

4.1 Configuration with TwinCAT System Manager - passive terminals

EL9011, EL9070, EL9080;
EL9100, EL9150, EL9181, EL9182, EL9183, EL9184, EL9186, EL9187, EL9188, EL9189, EL9190;
EL9200, EL9250, EL9290;
EL9400;
EL9540, EL9550;
EL9570

There are no address or configuration settings necessary for the mentioned passive terminals.

5 Appendix

5.1 EtherCAT AL Status Codes

For detailed information please refer to the EtherCAT system description.

5.2 Firmware compatibility - passive terminals

The passive terminals [▶ 96] ELxxxx terminal series have no firmware to update.

5.3 Support and Service

Beckhoff Support and Service provides assistance with questions regarding Beckhoff products and system solutions, as well as with their planning, commissioning, and operation.

Beckhoff subsidiaries and representative offices

Please contact your Beckhoff subsidiary or your representative office for local support and service for Beckhoff products. You can find the addresses of Beckhoff subsidiaries and representative offices at: www.beckhoff.com/worldwide.

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Web page:	www.beckhoff.com/support

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