BECKHOFF New Automation Technology

Operating manual | EN

ELX2002 and ELX2008

Two and eight channel digital output terminals, 24 V DC, Ex i



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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 Documentation Issue Status

Version	Comment
2.3.0	• ANZEx added: ◦ Chapter *Marking of ELX terminals* updated ◦ Chapter *Technical data* updated ◦ Chapter *Special conditions of use for ELX terminals* updated
2.2.0	• Chapter *Identification of ELX terminals* updated • Technical data updated • Chapter *Arrangement of ELX terminals within a bus terminal block* extended • Chapter *Disposal* added
2.1.0	• Technical data updated • Download links updated • New title page
2.0.0	• ELX2008 added • Chapter *Wiring* updated • Chapter *Identification of ELX terminals* updated • Safety instructions adapted to IEC 82079-1.
1.6.0	• FM notes regarding ANSI/ISA EX added • Chapter *Identification of ELX terminals* updated
1.5.0	• Connection extended with actuator display • Chapter *Configuration of ELX terminals in Bus Terminal block* updated • Chapter *Identification of ELX terminals* updated • Technical data updated
1.4.0	• Chapter *Configuration of ELX terminals in Bus Terminal block* updated
1.3.0	• Chapter *Installation instructions for ELX terminals* updated
1.2.0	• Chapter *Identification of ELX terminals* updated • Technical data updated
1.1.0	• Chapter *Identification of ELX terminals* updated • Technical data updated
1.0.0	• Document structure updated • Technical data updated
0.1	First preliminary version

1.4 Suggestions or proposals for documentation

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

1.5 Marking of ELX terminals

Designation

An ELX terminal has a 15-digit technical designation, composed of

- Family key
- Type
- Software variant
- Revision

Example	Family	Type	Software variant	Revision
ELX1052-0000-0001	ELX terminal	1052: Two-channel digital input terminal for NAMUR sensors, Ex i	0000: Basic type	0001
ELX9560-0000-0001	ELX terminal	9560: Power supply terminal	0000: Basic type	0001

Notes

- The elements mentioned above result in the **technical designation**. ELX1052-0000-0001 is used in the example below.
- Of these, ELX1052-0000 is the order identifier, commonly called just ELX1052 in the "-0000" revision. “-0001” is the EtherCAT revision.
- The **order identifier** is made up of
  - family key (ELX)
  - type (1052)
  - software version (-0000)
- The **Revision** -0001 shows the technical progress, such as the extension of features with regard to the EtherCAT communication, and is managed by Beckhoff.
  In principle, a device with a higher revision can replace a device with a lower revision, unless specified otherwise, e.g. in the documentation.
  Associated and synonymous with each revision there is usually a description (ESI, EtherCAT Slave Information) in the form of an XML file, which is available for download from the Beckhoff website.
  The revision has been applied to the terminals on the outside, see *Fig. ELX1052 with date code 3218FMFM, BTN 10000100 and Ex marking.*
- The hyphen is omitted in the labeling on the side of the terminal. Example:
  Name: ELX1052-0000
  Label: ELX1052 $_{0000}$
- The type, software version and revision are read as decimal numbers, even if they are technically saved in hexadecimal.

Identification numbers

ELX terminals have two different identification numbers:

- date code (batch number)
- **B**eckhoff **T**raceability **N**umber, or BTN for short (as a serial number it clearly identifies each terminal)

Date code

The date code is an eight-digit number given by Beckhoff and printed on the ELX terminal. The date code indicates the build version in the delivery state and thus identifies an entire production batch but does not distinguish between the terminals in a batch.

Structure of the date code: **WW YY FF HH**	Example with date code 02180100:
WW - week of production (calendar week)	02 - week of production 02
YY - year of production	18 - year of production 2018
FF - firmware version	01 - firmware version 01
HH - hardware version	00 - hardware version 00

Beckhoff Traceability Number (BTN)

In addition, each ELX terminal has a unique **B**eckhoff **T**raceability **N**umber (BTN).

1.5.1 Ex marking for ATEX, IECEx and cFMus

Marking

The Ex marking can be found at the top left of the right side of the terminal:

II 3 (1) G Ex ec [ia Ga] IIC T4 Gc
II (1) D [Ex ia Da] IIIC
I (M1) [Ex ia Ma] I
IECEx BVS 18.0005X
BVS 18 ATEX E 005 X

Examples

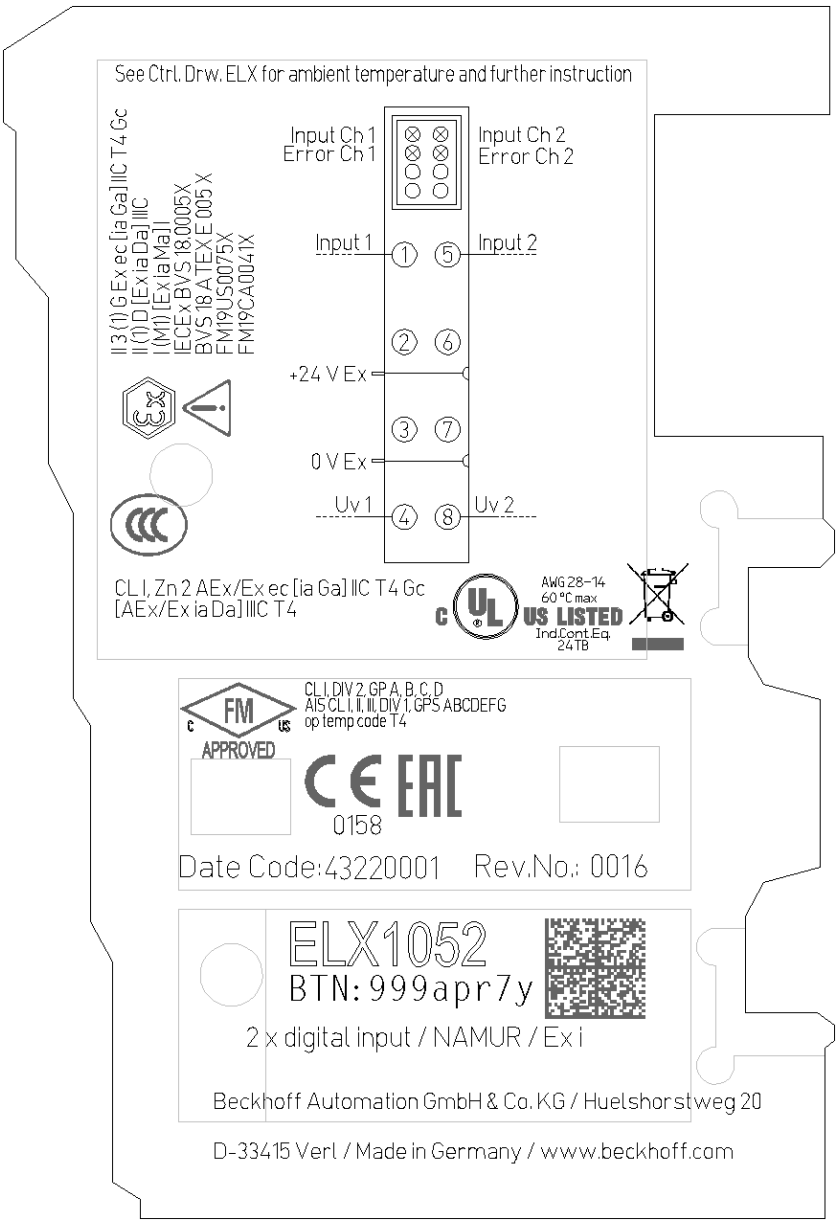


Fig. 1: ELX1052 with date code 43220001, BTN 999apr7y and marking für ATEX, IECEx and cFMus

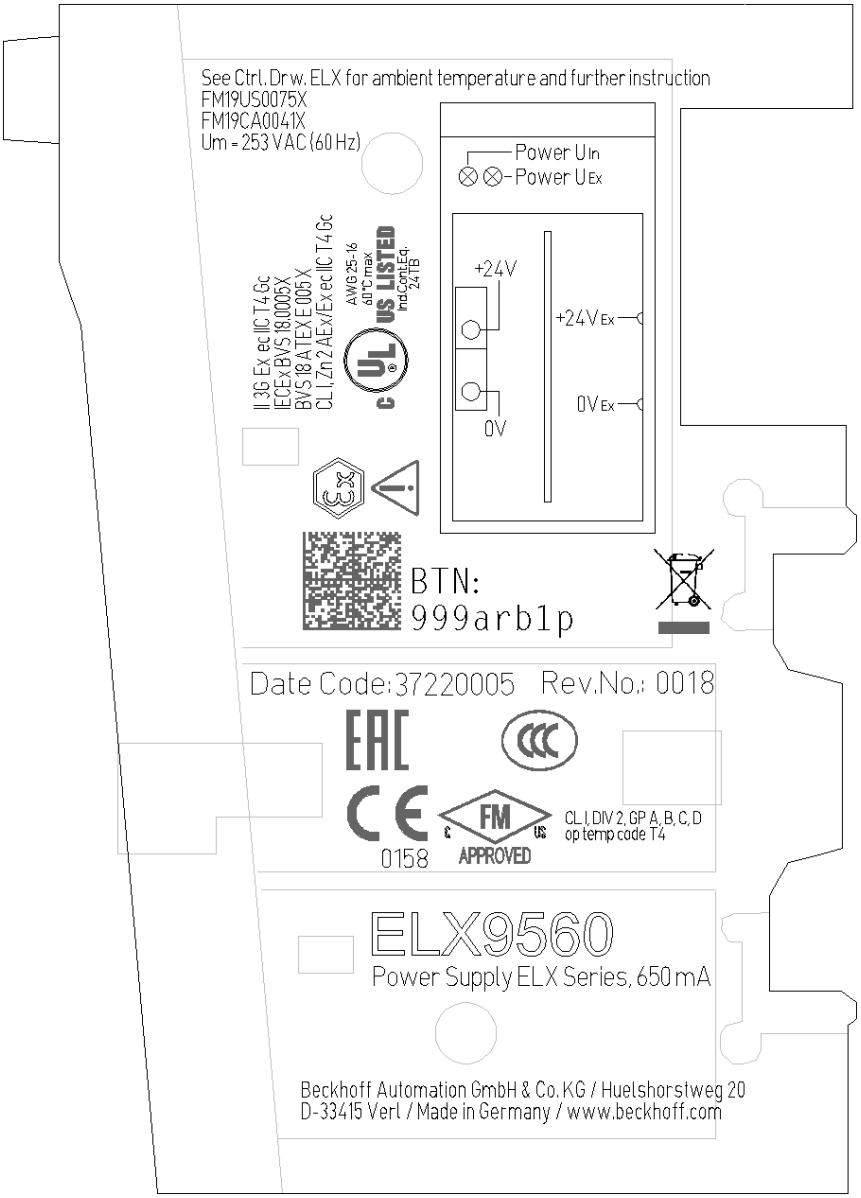


Fig. 2: ELX9560 with date code 37220005, BTN 999arb1p and marking für ATEX, IECEx and cFMus



Fig. 3: ELX9012 with date code 36230000, BTN 000bh4yr and marking für ATEX, IECEx and cFMus

1.5.2 Ex marking for ANZEx

The ANZEx marking is applied for the Australian and New Zealand markets.

Marking ELX signal terminals

The Ex marking can be found at the bottom left of the left side of the terminal:

Beckhoff Automation
ANZEx 20.3004X
Ex ec [ia Ga] IIC T4 Gc
[Ex ia Da] IIIC
[Ex ia Ma] I

Example

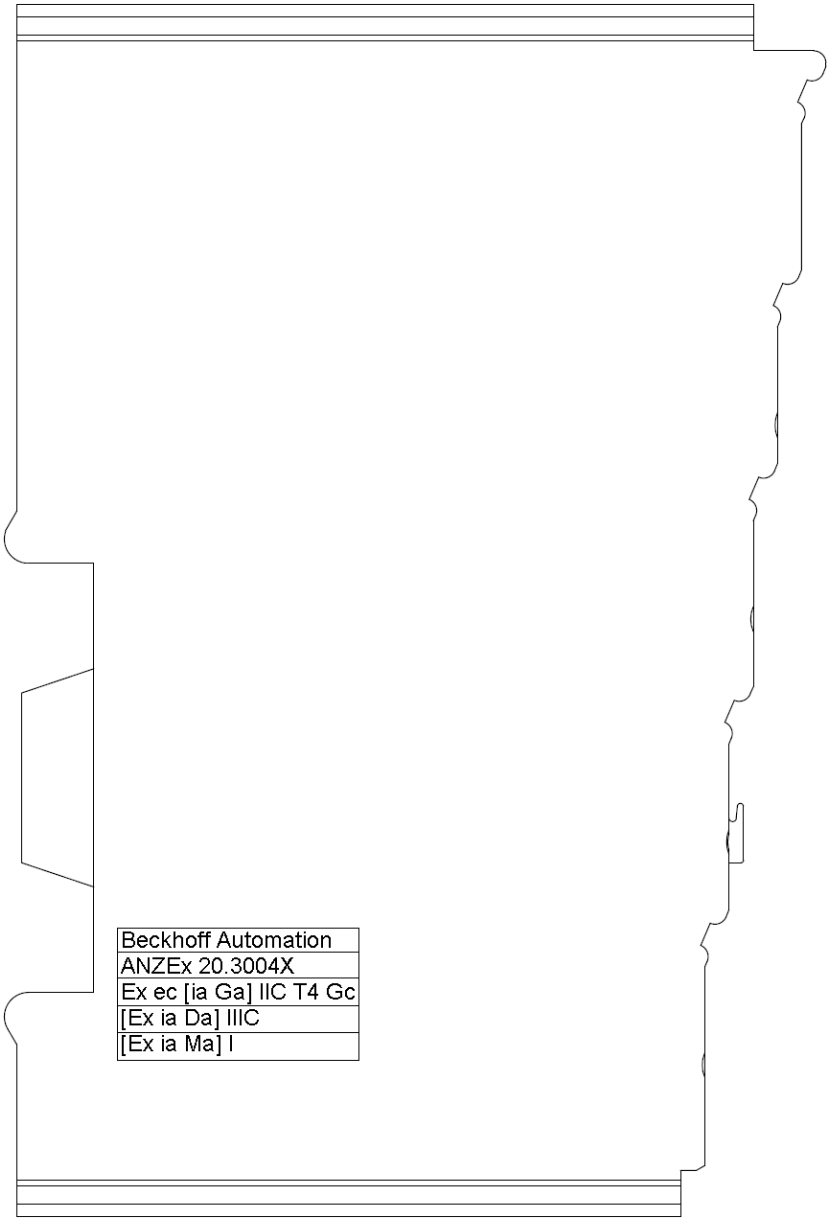


Fig. 4: ELX2002 with marking for ANZEx

Marking ELX9410 and ELX9560

The Ex marking can be found at the bottom left of the left side of the terminal:

Beckhoff Automation
ANZEx 20.3004X
Ex ec IIC T4 Gc

Example

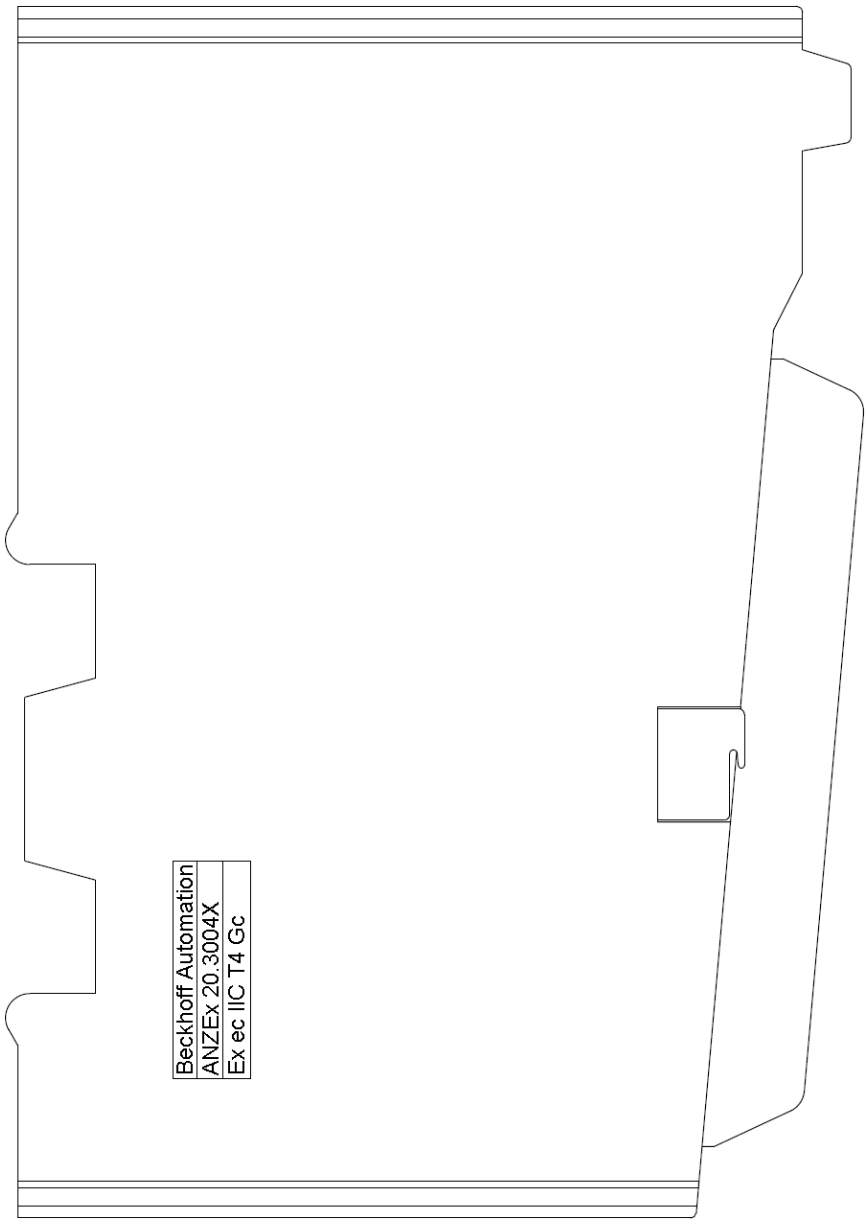


Fig. 5: ELX9560 with marking for ANZEx

2 Product overwiew

2.1 ELX2002 - Introduction

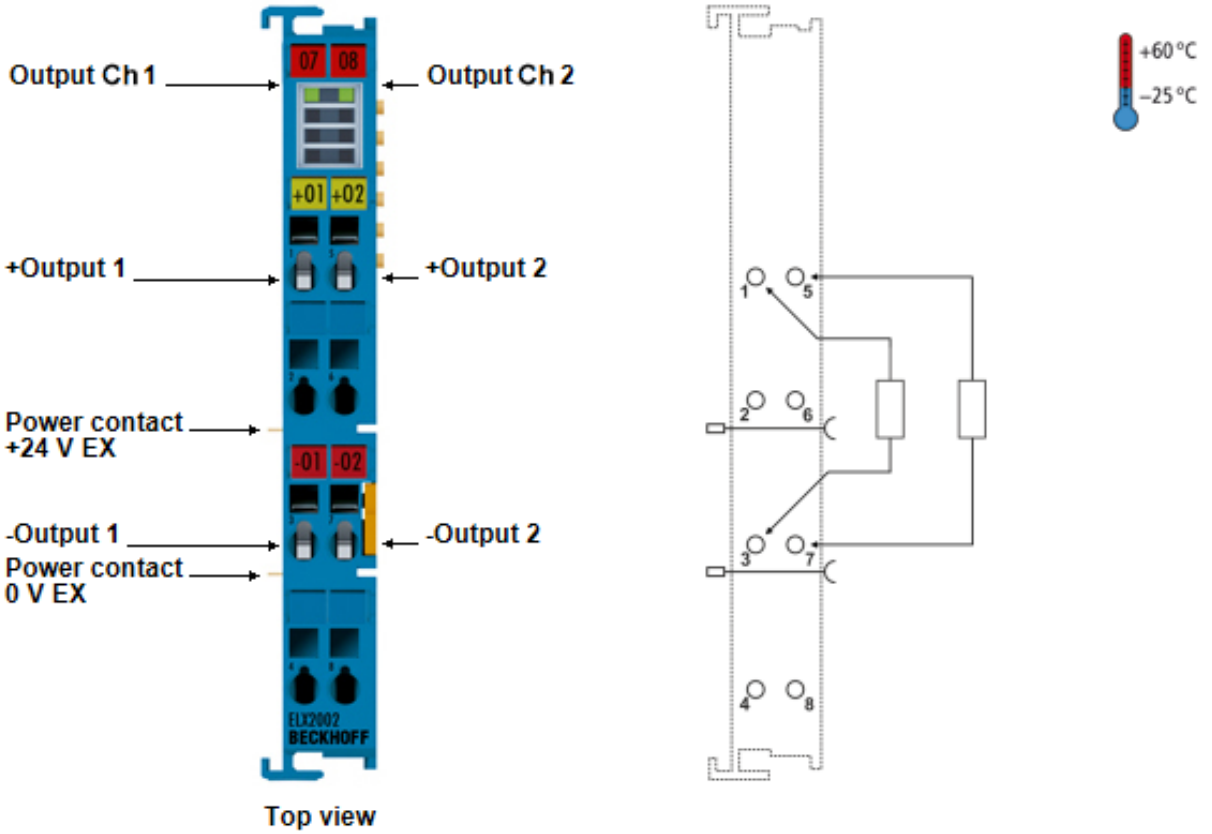


Fig. 6: ELX2002 - Two channel, digital output terminal, 24 V_{DC}, 45 mA, Ex i

The ELX2002 digital output terminal enables the direct connection of intrinsically safe actuators located in hazardous areas classified Zone 0/20 or 1/21. The ELX2002 supplies an output voltage of 24 V_{DC} and a maximum output current of 45 mA per channel, total current is 80 mA. The signal state of the EtherCAT Terminal is indicated by a light emitting diode.

2.2 ELX2008 - Introduction

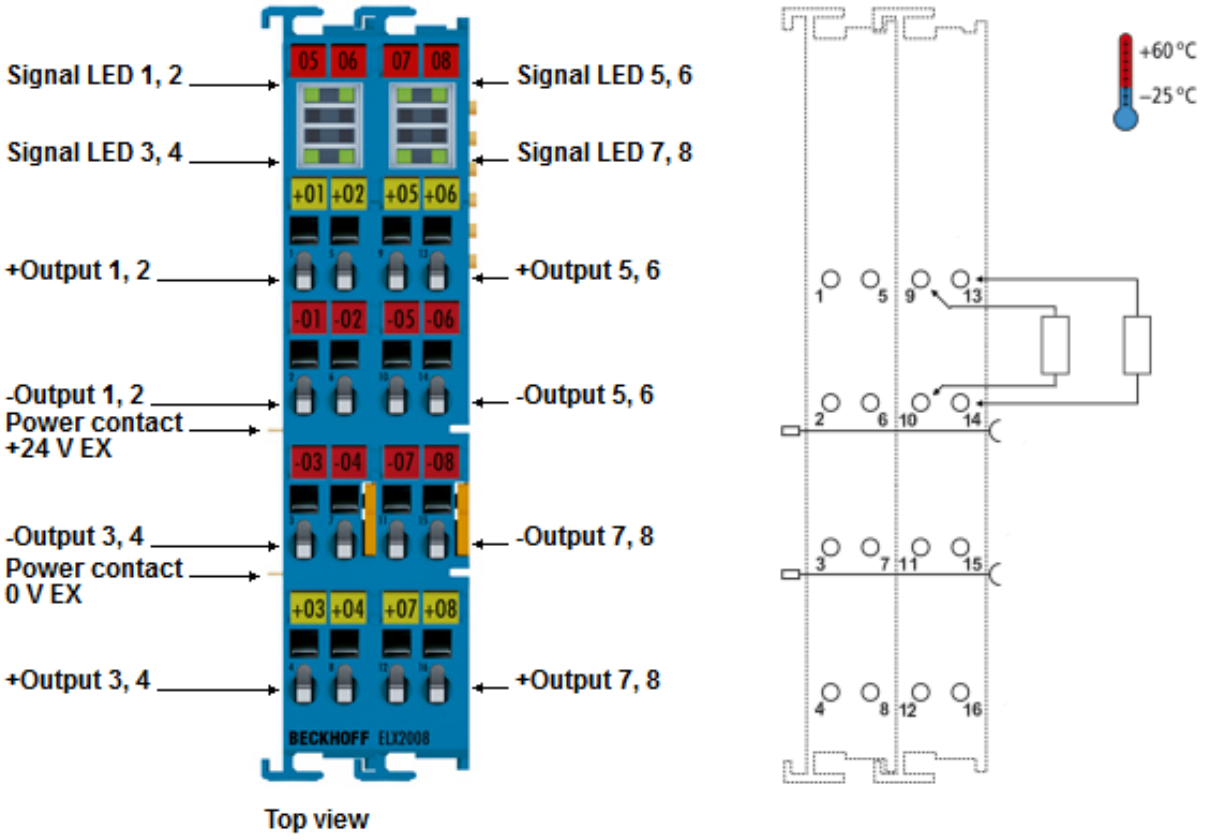


Fig. 7: ELX2008 - Eight channel, digital output terminal, 24 V_{DC}, 30 mA, Ex i

The ELX2008 digital output terminal enables the direct connection of intrinsically safe actuators located in hazardous areas classified Zone 0/20 or 1/21. The ELX2008 supplies an output voltage of 24 V_{DC} and a maximum output current of 30 mA per channel. The signal state of the EtherCAT Terminal is indicated by light emitting diodes.

2.3 Technical data

Technical data	ELX2002-0000	ELX2008-0000
Technology	Intrinsically safe actuators	
Number of outputs	2	8
Connection technology	2-wire	
Nominal auxiliary voltage	24 V_{DC} (RI = 254 Ω)	24 V_{DC} (RI = 272 Ω)
Output current	45 mA per channel, ∑ 80 mA	30 mA per channel, ∑ 240 mA
Load type	ohmic, inductive, capacitive	
Power supply of the electronics	from the E-bus (5 V_{DC}) and the power contacts (24 V_{DC} Ex, supply by ELX9560)	
Current consumption via E-bus	typically 45 mA	typically 60 mA
Current consumption from the power contacts	typically 10 mA + load	typically 30 mA + load
Electrical isolation	1500 V (E-bus / field voltage)	
Configuration	No address or configuration settings	
Bit width in process image	2 x 1 bit	8 x 1 bit
Weight	approx. 55 g	approx. 100 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	
Permissible air pressure (operation, storage, transport)	800 hPa ... 1100 hPa (this is equivalent to an altitude of approx. -690 m to 2000 m above sea level assuming an international standard atmosphere)	
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	
Correct installation position	See chapter Installation position and minimum distances [▶ 25]	
Approvals / markings*	CE, cULus, CCC, ATEX, IECEx, ANZEx, cFMus	CE, cULus, CCC, ATEX, IECEx, ANZEx, cFMus

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

Housing data

Technical data	ELX2002-0000	ELX2008-0000
Design	compact terminal housing with signal LEDs	
Material	Polycarbonate, blue	
Size (W x H x D)	approx. 15 mm x 100 mm x 70 mm (width aligned: 12 mm)	approx. 27 mm x 100 mm x 70 mm (width aligned: 24 mm)
Installation [▶ 26]	on 35 mm mounting rail according to EN 60715 with locking	
Stackable by	double groove-tongue connection	
Labelling	Labeling of the BZxxx series	
Power contacts	2 blade/spring contacts	

ELX2002-0000 - Technical data for explosion protection

Technical data for explosion protection		ELX2002-0000
Ex marking	ATEX	II 3 (1) G Ex ec [ia Ga] IIC T4 Gc II (1) D [Ex ia Da] IIIC I (M1) [Ex ia Ma] I
	IECEx, ANZEx	Ex ec [ia Ga] IIC T4 Gc [Ex ia Da] IIIC [Ex ia Ma] I
	cFMus	AIS Class I, II, III, Division 1, Groups A thru G Class I, Division 2, Groups A, B, C, D Class I, Zone 2, AEx/Ex ec [ia Ga] IIC T4 Gc [AEx/Ex ia Da] IIIC T4
Certificate numbers		BVS 18 ATEX E 005 X IECEx BVS 18.0005X ANZEx 20.3004X FM19US0075X, FM19CA0041X
Power supply		without exception in connection with the ELX9560

Use in connection with an ELX9560 from HW05*		ELX2002-0000	
Field interfaces		U_o = 27.0 V I_o = 109 mA P_o = 730 mW Characteristic curve: linear	
Reactances (without consideration of simultaneity)		**L_o**	**C_o**
	Ex ia I	25 mH	3.75 µF
	Ex ia IIA	17 mH	2.33 µF
	Ex ia IIB	9.9 mH	705 nF
	Ex ia IIC	0.470 mH	90 nF
	Ex ia IIIC	9.9 mH	705 nF

Use in connection with an ELX9560 to HW04*		ELX2002-0000	
Field interfaces		U_o = 27.7 V I_o = 111 mA P_o = 768 mW Characteristic curve: linear	
Reactances (without consideration of simultaneity)		**L_o**	**C_o**
	Ex ia I	24 mH	3.45 µF
	Ex ia IIA	16 mH	2.2 µF
	Ex ia IIB	9.2 mH	663 nF
	Ex ia IIC	0.094 mH	85 nF
	Ex ia IIIC	9.2 mH	663 nF

***) Hardware Version of the ELX9560 power supply terminal**

The hardware version of the ELX9560 can be found on the front side of your power supply terminal from hardware version 04 onwards.

ELX2008-0000 - Technical data for explosion protection

Technical data for explosion protection		ELX2008-0000
Ex marking	ATEX	II 3 (1) G Ex ec [ia Ga] IIC T4 Gc II (1) D [Ex ia Da] IIIC I (M1) [Ex ia Ma] I
	IECEx, ANZEx	Ex ec [ia Ga] IIC T4 Gc [Ex ia Da] IIIC [Ex ia Ma] I
	cFMus	AIS Class I, II, III, Division 1, Groups A thru G Class I, Division 2, Groups A, B, C, D Class I, Zone 2, AEx/Ex ec [ia Ga] IIC T4 Gc [AEx/Ex ia Da] IIIC T4
Certificate numbers		BVS 18 ATEX E 005 X IECEx BVS 18.0005X ANZEx 20.3004X FM19US0075X, FM19CA0041X
Power supply		without exception in connection with the ELX9560

Use in connection with an ELX9560 from HW05*		ELX2008-0000 from HW01**		ELX2008-0000, HW00**	
Field interfaces		U_o = 27.0 V Io = 106 mA P_o = 713 mW Characteristic curve: linear		U_o = 27.0 V I_o = 109 mA P_o = 735 mW Characteristic curve: linear	
Reactances (without consideration of simultaneity)		**L_o**	**C_o**	**L_o**	**C_o**
	Ex ia I	27 mH	3.75 µF	25 mH	3.75 µF
	Ex ia IIA	19 mH	2.33 µF	17 mH	2.33 µF
	Ex ia IIB	11 mH	705 nF	9.9 mH	705 nF
	Ex ia IIC	0.630 mH	90 nF	0.470 mH	90 nF
	Ex ia IIIC	11 mH	705 nF	9.9 mH	705 nF

Use in connection with an ELX9560 to HW04*		ELX2008-0000 from HW01**		ELX2008-0000, HW00**	
Field interfaces		U_o = 27.7 V Io = 109 mA P_o = 751 mW Characteristic curve: linear		U_o = 27.7 V I_o = 111 mA P_o = 773 mW Characteristic curve: linear	
Reactances (without consideration of simultaneity)		**L_o**	**C_o**	**L_o**	**C_o**
	Ex ia I	25 mH	3.45 µF	24 mH	3.45 µF
	Ex ia IIA	17 mH	2.2 µF	16 mH	2.2 µF
	Ex ia IIB	9.6 mH	663 nF	9.2 mH	663 nF
	Ex ia IIC	0.180 mH	85 nF	0.094 mH	85 nF
	Ex ia IIIC	9.6 mH	663 nF	9.2 mH	663 nF

***) Hardware Version of the ELX9560 power supply terminal**

The hardware version of the ELX9560 can be found on the front side of your power supply terminal from hardware version 04 onwards.

****) Hardware Version of the ELX terminal**

The hardware version of the ELX terminal can be found in the date code [▶ 8] on the side of your signal terminal.

2.4 Intended use

⚠ WARNING

Endangering the safety of persons and equipment!

The ELX components may only be used for the purposes described below!

⚠ CAUTION

Observe ATEX and IECEx!

The ELX components may only be used in accordance with the ATEX directive and the IECEx scheme!

The ELX terminals extend the field of application of the Beckhoff bus terminal system with functions for integrating intrinsically safe field devices from hazardous areas. The intended field of application is data acquisition and control tasks in discrete and process engineering automation, taking into account explosion protection requirements.

The ELX terminals are protected by the type of protection "Increased safety" (Ex e) according to IEC 60079-7 and must only be operated in hazardous areas of Zone 2 or in non-hazardous areas.

The field interfaces of the ELX terminals achieve explosion protection through the type of protection "intrinsic safety" (Ex i) according to IEC 60079-11. For this reason, only appropriately certified, intrinsically safe devices may be connected to the ELX terminals. Observe the maximum permissible connection values for voltages, currents and reactances. Any infringement can damage the ELX terminals and thus eliminate the explosion protection.

The ELX terminals are open, electrical equipment for installation in lockable cabinets, enclosures or operating rooms. Make sure that access to the equipment is only possible for authorized personnel.

⚠ CAUTION

Ensure traceability!

The buyer has to ensure the traceability of the device via the Beckhoff Traceability Number (BTN).

3 Mounting and wiring

3.1 Special conditions of use for ELX terminals

⚠ WARNING

Observe the special conditions of use for the intended use of Beckhoff ELX terminals in potentially explosive areas!

- The certified components are to be installed in a suitable housing that guarantees an ingress protection of at least IP54 in accordance with IEC 60079-0! The prescribed environmental conditions during installation, operation and maintenance are thereby to be taken into account! Inside the housing, pollution degree 1 and 2 are permissible as defined in IEC 60664-1.
- 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 of Beckhoff ELX terminals!
- Measures must be taken to protect against the rated operating voltage being exceeded by more than 40% due to short-term interference voltages! The power supply of the ELX9560 power supply terminal must correspond to overvoltage category II according to IEC 60664-1
- The individual terminals may only be unplugged or removed from the bus terminal system if all supply voltages have been switched off or if a non-explosive atmosphere is ensured!
- The connections of the ELX9560 power supply terminal may only be connected or disconnected if all supply voltages have been switched off or if a non-explosive atmosphere is ensured!
- Address selectors and switches may only be adjusted if all supply voltages have been switched off or if a non-explosive atmosphere is ensured!

3.2 Installation notes for ELX terminals

NOTICE

Storage, transport and mounting

- Transport and storage are permitted only in the original packaging!
- Store in a dry place, free from vibrations.
- A brand new ELX terminal with a certified build version is delivered only in a sealed carton. Therefore, check that the carton and all seals are intact before unpacking.
- Do not use the ELX terminal if
  - its packaging is damaged
  - the terminal is visibly damaged or
  - you cannot be sure of the origin of the terminal.
- ELX terminals with a damaged packaging seal are regarded as used.

⚠ WARNING

Observe the accident prevention regulations

During mounting, commissioning, operation and maintenance, adhere to the safety regulations, accident prevention regulations and general technical rules applicable to your devices, machines and plants.

⚠ CAUTION

Observe the erection regulations

Observe the applicable erection regulations.

NOTICE

Protect the terminals against electrostatic discharge (ESD)

Electronic components can be destroyed by electrostatic discharge. Therefore, take the safety measures to protect against electrostatic discharge as described in DIN EN 61340-5-1 among others. In conjunction with this, ensure that the personnel and surroundings are suitably earthed.

NOTICE

Do not place terminals on E-bus contacts

Do not place the ELX terminals on the E-bus contacts located on the right-hand side. The function of the E-bus contacts can be negatively affected by damage caused by this, e.g. scratches.

NOTICE

Protect the terminals against dirt

To ensure the functionality of the ELX terminals they must be protected against dirt, especially on the contact points. For this reason use only clean tools and materials.

NOTICE

Handling

- It is forbidden to insert conductive or non-conductive objects of any kind into the interior of the housing (e.g. through the ventilation slots in the housing).
- Use only the openings provided in the housing front and appropriate tools to actuate the spring-loaded terminal contacts on the front side for attaching connection cables to the terminal; see chapter Wiring [▶ 29].
- The opening of the housing, the removal of parts and any mechanical deformation or machining of an ELX terminal are not permitted!

If an ELX terminal is defective or damaged it must be replaced by an equivalent terminal. Do not carry out any repairs to the devices. For safety reasons repairs may only be carried out by the manufacturer.

NOTICE

Contact marking and pin assignment

The colored inscription labels above the front connection contacts shown in the illustrations in the introduction chapter are only examples and are not part of the scope of delivery!
A clear assignment of channel and terminal designation according to the chapter contact assignment to the actual terminal point can be made via the lasered channel numbers 1 to 8 on the left above the respective terminal point as well as via the laser image.
Observe any possible polarity dependency of connected intrinsically safe circuits!

3.3 Arrangement of ELX terminals within a bus terminal block

⚠ WARNING

Observe the following notes on the arrangement of ELX terminals!

- ELX signal terminals may only be mounted behind an ELX9560 power supply terminal without exception!
- Only signal terminals from the ELX series may be installed behind an ELX9560 power supply terminal!
- Several ELX9560 power supply terminals may be set in a terminal block as long as an ELX9410 is set before each additional ELX9560!
- An ELX9410 power supply terminal must not be mounted to the right of an ELX9560 or to the left of an ELX signal terminal!
- The last terminal of each ELX terminal segment must be covered with an ELX9012 bus cap or an EK1110 EtherCAT extension, unless two ELX9410 power supply terminals are installed directly behind each other in order to continue the terminal segment with standard Beckhoff EtherCAT Terminals (e.g. EL/ES/EK)!

Examples for the arrangement of ELX terminals

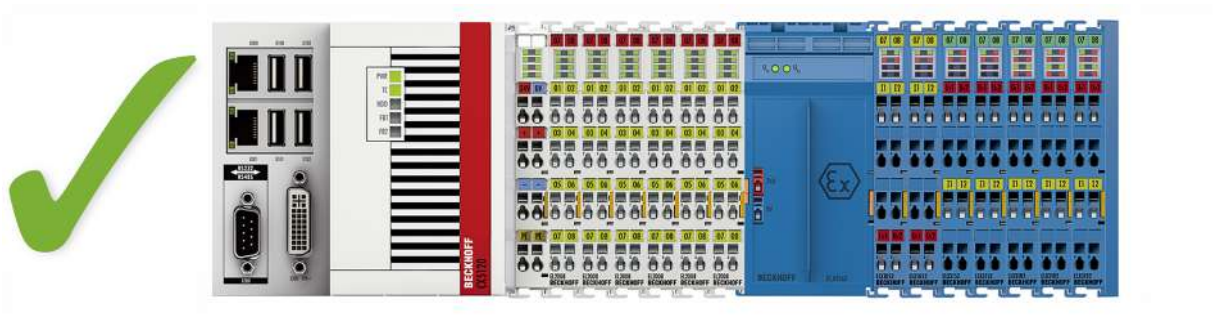


Fig. 8: Permissible arrangement of the ELX terminals (right terminal block).

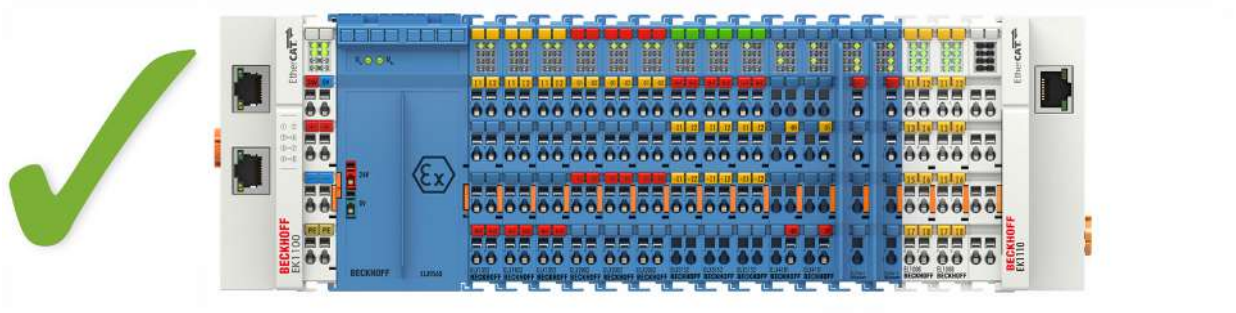


Fig. 9: Permitted arrangement - terminals that do not belong to the ELX series are placed before and after the ELX terminal segment. Isolation is provided by the ELX9560 at the beginning of the ELX terminal segment and two ELX9410 at the end of the ELX terminal segment.

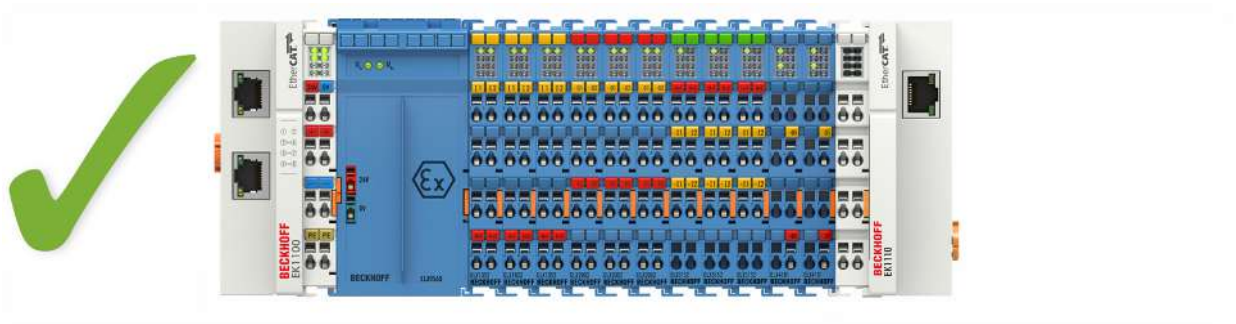


Fig. 10: Permitted arrangement - terminals that do not belong to the ELX series are placed before and after the ELX terminal segment. Isolation is provided by the ELX9560 at the beginning of the ELX terminal segment and the EK1110 at the end of the ELX terminal segment.

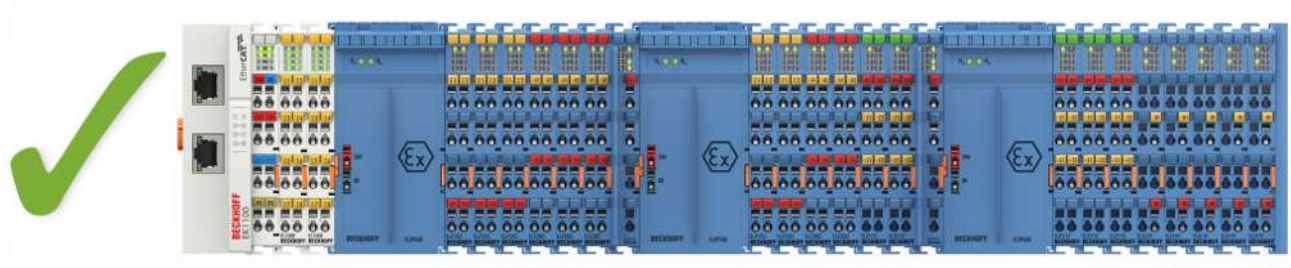


Fig. 11: Permitted arrangement - multiple resupplies by ELX9560 with an upstream ELX9410 in each case.

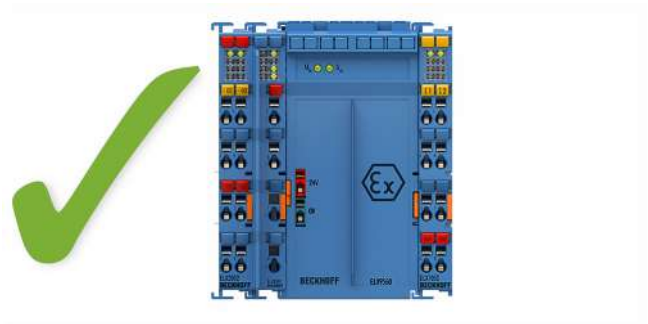


Fig. 12: Permitted arrangement - ELX9410 in front of an ELX9560 power supply terminal.

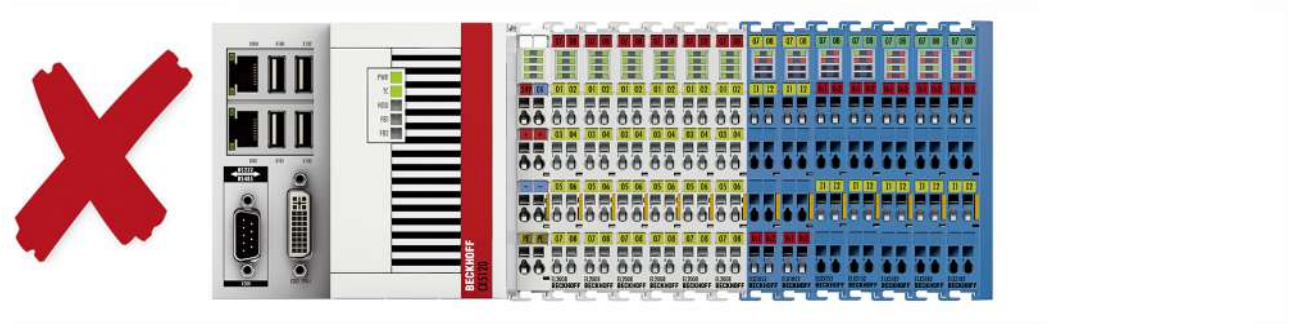


Fig. 13: Illegal arrangement - missing ELX9560 power supply terminal.

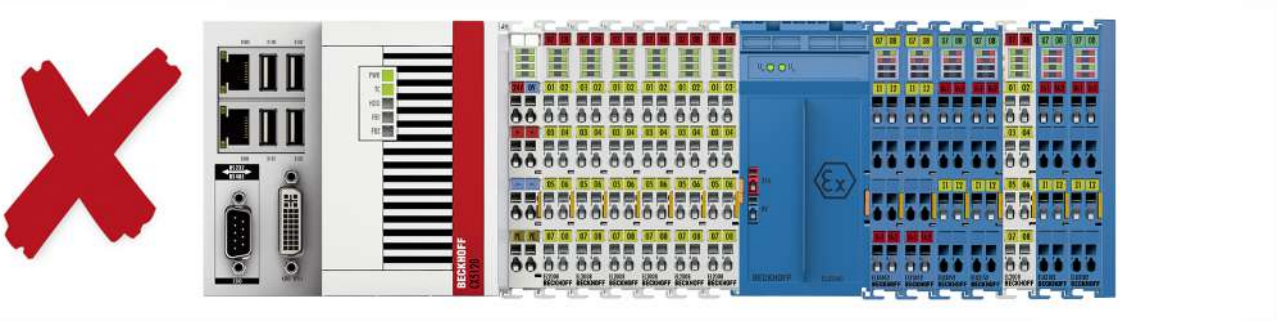


Fig. 14: Impermissible arrangement - terminal in the ELX terminal segment that does not belong to the ELX series

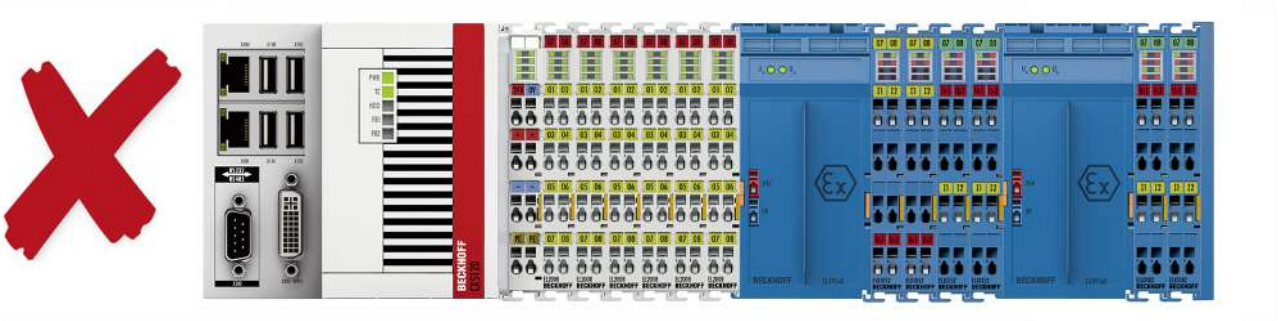


Fig. 15: Impermissible arrangement - second ELX9560 power supply terminal in the ELX terminal segment without upstream ELX9410.

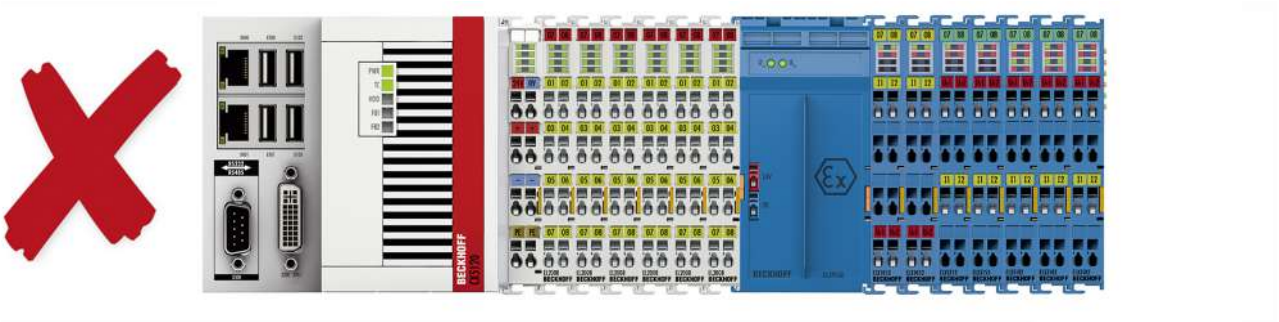


Fig. 16: Illegal arrangement - missing ELX9012 bus end cap.

NOTICE

Note the maximum output current of the ELX9560

When configuring the terminal segment, please observe the maximum available output current of the ELX9560 power supply terminal according to the specified technical data.
If necessary, an additional ELX9560 power supply terminal with upstream ELX9410 (see installation examples) must be installed or a completely new bus terminal block must be configured.

3.4 Installation position and minimum distances

Installation position

For the prescribed installation position the mounting rail is installed horizontally and the mating surfaces of the ELX terminals point toward the front (see illustration below). The terminals are ventilated from below, which enables optimum cooling of the electronics through convection. The direction indication “down” corresponds to the direction of positive acceleration due to gravity.

Minimum distances

Observe the following minimum distances to ensure optimum convection cooling:

- above and below the ELX terminals: 35 mm (required!)
- besides the bus terminal block: 20 mm (recommended)

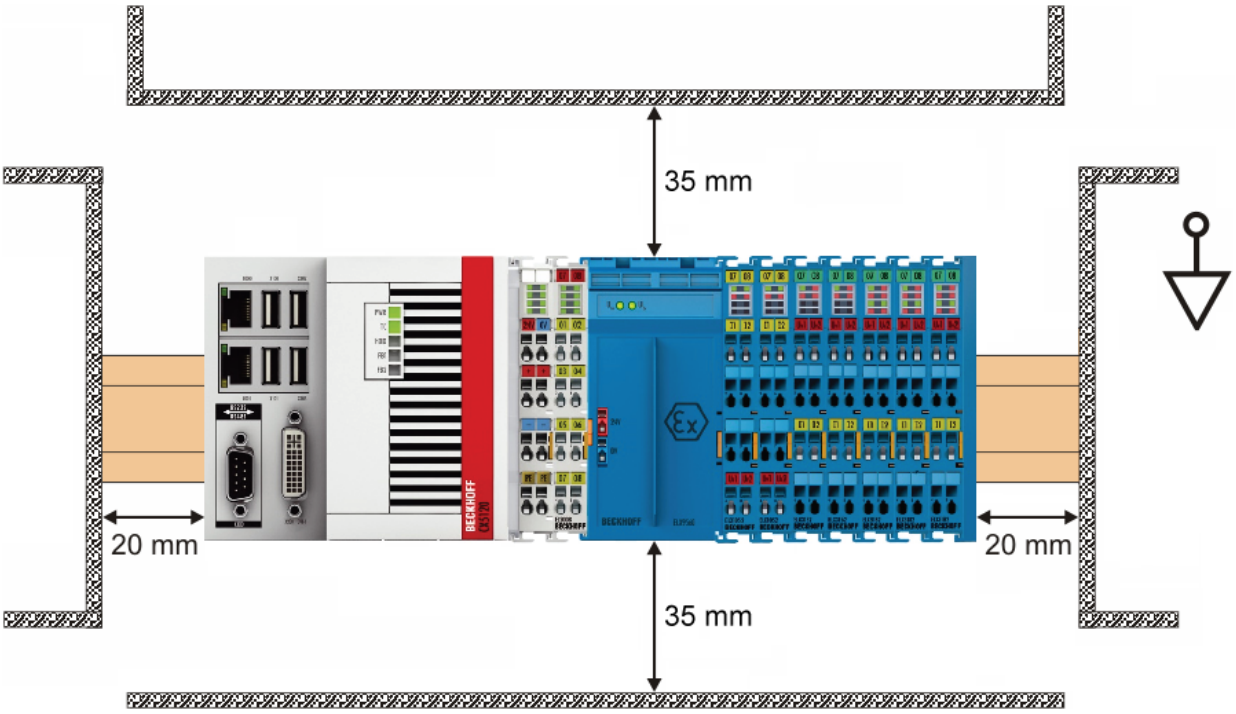


Fig. 17: Installation position and minimum distances

⚠ WARNING

Observe the minimum separation distances according to IEC 60079-14!

Observe the prescribed minimum separation distances between intrinsically safe and non-intrinsically safe circuits according to IEC 60079-14.

3.5 Installation of ELX terminals on mounting rails

⚠ 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!

⚠ CAUTION

Danger of injury due to power contacts!

For your own protection, pay attention to careful and careful handling of the ELX terminals. In particular, the left side mounted, sharp-edged blade contacts pose a potential risk of injury.

Assembly

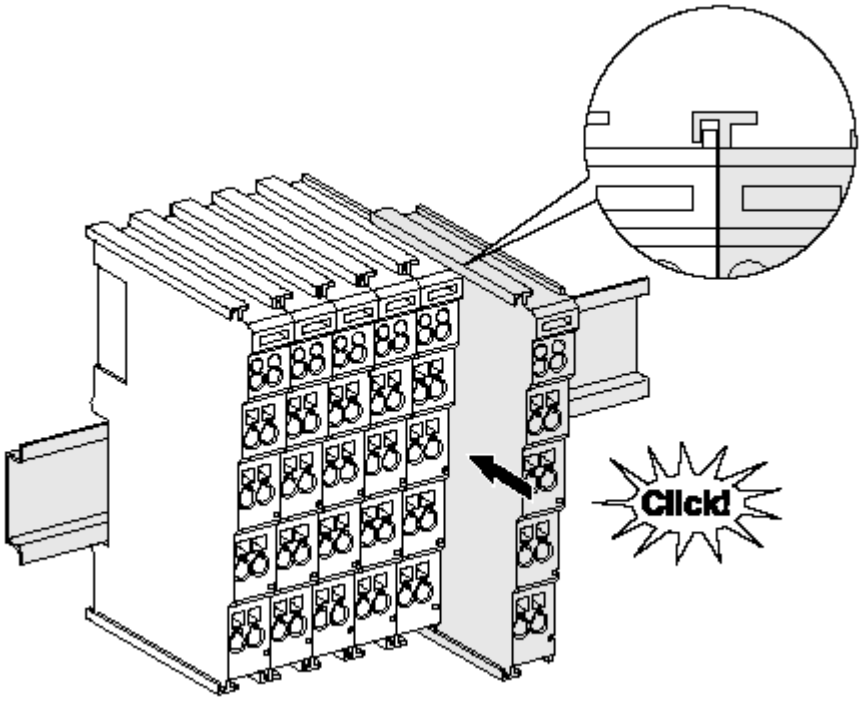


Fig. 18: Attaching on mounting rail

The bus coupler and bus terminals are attached to commercially available 35 mm mounting rails (DIN rails 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. Join the components with tongue and groove and push the terminals against the mounting rail, until the lock clicks onto the mounting rail.
   If the terminals are clipped onto the mounting rail first and then pushed together without tongue and groove, the connection will not be operational! When correctly assembled, no significant gap should be visible between the housings.

Fixing of mounting rails

The locking mechanism of the terminals and couplers extends to the profile of the mounting rail. At the installation, the locking mechanism of the components must not come into conflict with the fixing bolts of the mounting rail. To mount the mounting rails with a height of 7.5 mm under the terminals and couplers, you should use flat mounting connections (e.g. countersunk screws or blind rivets).

Connections within a bus terminal block

The electric connections between the Bus Coupler and the Bus Terminals are automatically realized by joining the components:

- The six spring contacts of the E-Bus deal with the transfer of the data 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 of the ELX terminals are supplied by the ELX9560 power terminal. This interrupts the power contacts and thus represents the beginning of a new supply rail.

Power Contacts

During the design of a bus terminal block, the pin assignment of the individual Bus Terminals must be taken account of, since some types (e.g. analog Bus Terminals or digital 4-channel Bus Terminals) do not or not fully loop through the power contacts.

Disassembly

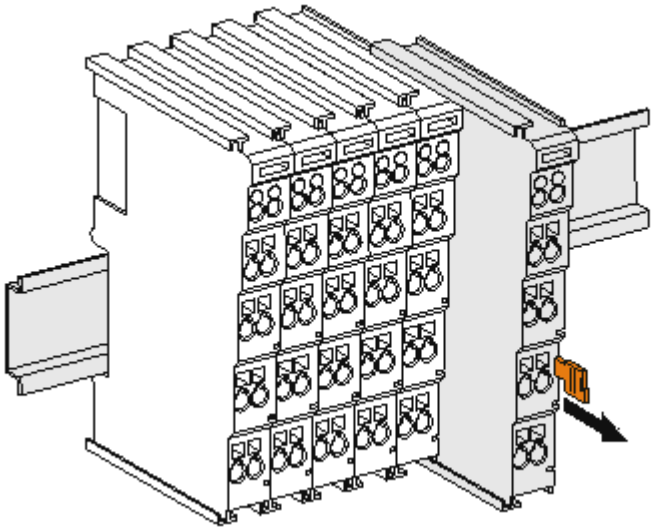


Fig. 19: Disassembling of terminal

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

1. Pull the terminal by its orange-colored lugs approximately 1 cm away from the mounting rail. In doing so for this terminal the mounting rail lock is released automatically and you can pull the terminal out of the bus terminal block easily without excessive force.
2. Grasp the released terminal with thumb and index finger simultaneous at the upper and lower grooved housing surfaces and pull the terminal out of the bus terminal block.

3.6 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.

3.7 Connection

3.7.1 Connection system

⚠ 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!

The terminals of ELXxxxx series include electronics and connection level in a single enclosure.

Standard wiring



Fig. 20: Standard wiring

The terminals of ELXxxxx series feature integrated screwless spring force technology for fast and simple assembly.

High Density Terminals (HD Terminals)



Fig. 21: *High Density Terminals*

The Bus Terminals from these series with 16 connection 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.

Ultrasonically "bonded" (ultrasonically welded) conductors

Ultrasonically “bonded" conductors

It is also possible to connect the Standard and High Density Terminals with ultrasonically "bonded" (ultrasonically welded) conductors. In this case, please note the tables concerning the wire-size width below!

3.7.2 Wiring

⚠ 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!

Terminals for standard wiring

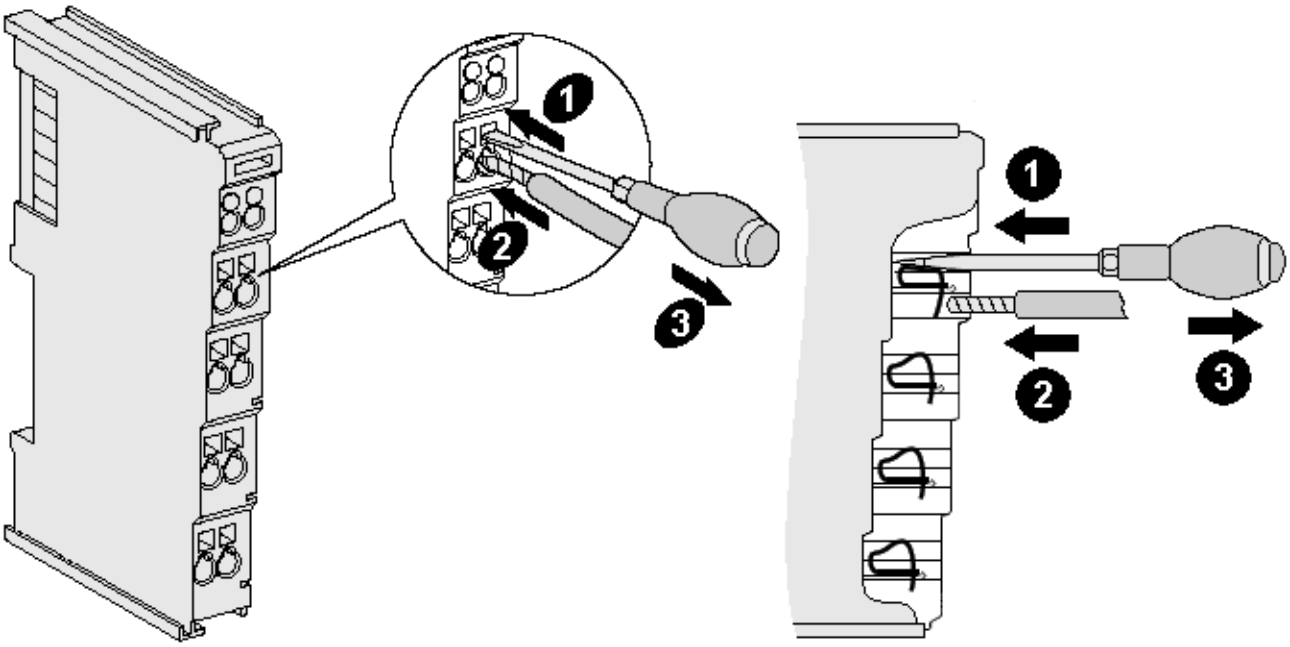


Fig. 22: Connecting a cable on a terminal point

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:

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. The terminal point closes automatically when the pressure is released, holding the wire securely and permanently.

Observe the requirements for connecting cables and cross sections according to IEC 60079-7 and IEC 60079-11. See the following tables for the suitable wire size width.

Terminal housing	Standard wiring	ELX9560
Wire size width (single core wires)	0.08 ... 2.5 mm²	0.14 ... 1.5 mm²
Wire size width (fine-wire conductors)	0.08 ... 2.5 mm²	0.14 ... 1.5 mm²
Wire size width (conductors with a wire end sleeve)	0.14 ... 1.5 mm²	0.14 ... 1.0 mm²
Wire stripping length	8 ... 9 mm	8 ... 9 mm

NOTICE

Maximum screwdriver width for ELX9560

Use a screwdriver with a maximum width of 2 mm to wire the ELX9560 power supply terminal. Wider screwdrivers can damage the terminal points.

High Density Terminals (HD Terminals) with 16 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 mm^2
Wire size width (fine-wire conductors)	0.25 ... 1.5 mm^2
Wire size width (conductors with a wire end sleeve)	0.14 ... 0.75 mm^2
Wire size width (ultrasonically “bonded" conductors)	only 1.5 mm^2
Wire stripping length	8 ... 9 mm

3.7.3 Proper line connection

Always connect only one wire per terminal point.

When using fine-wire conductors it is recommended to connect them with wire end sleeves in order to establish a safe, conductive connection.

In addition, make sure that the pin assignment is correct to prevent damage to the ELX terminals and the connected devices.

3.7.4 Shielding and potential separation

Shielding

Encoder, analog sensors and actors should always be connected with shielded, twisted paired wires!

⚠ CAUTION

Observe installation requirements in areas of potentially explosive atmospheres!

During installation, observe the requirements for cables, shielding and earth potential equalization in areas of potentially explosive atmospheres according to IEC 60079-11, IEC 60079-14 and IEC 60079-25!

⚠ WARNING

Ensure potential separation of the 24 V Ex busbar!

In any case, make sure that the galvanic isolation made by the ELX9560 between the 24 V Ex busbar (power contacts +24 V Ex and 0 V Ex) and other system potentials (if applicable also functional or protective earths) is not removed!

3.7.5 ELX2002 - Contact assignment

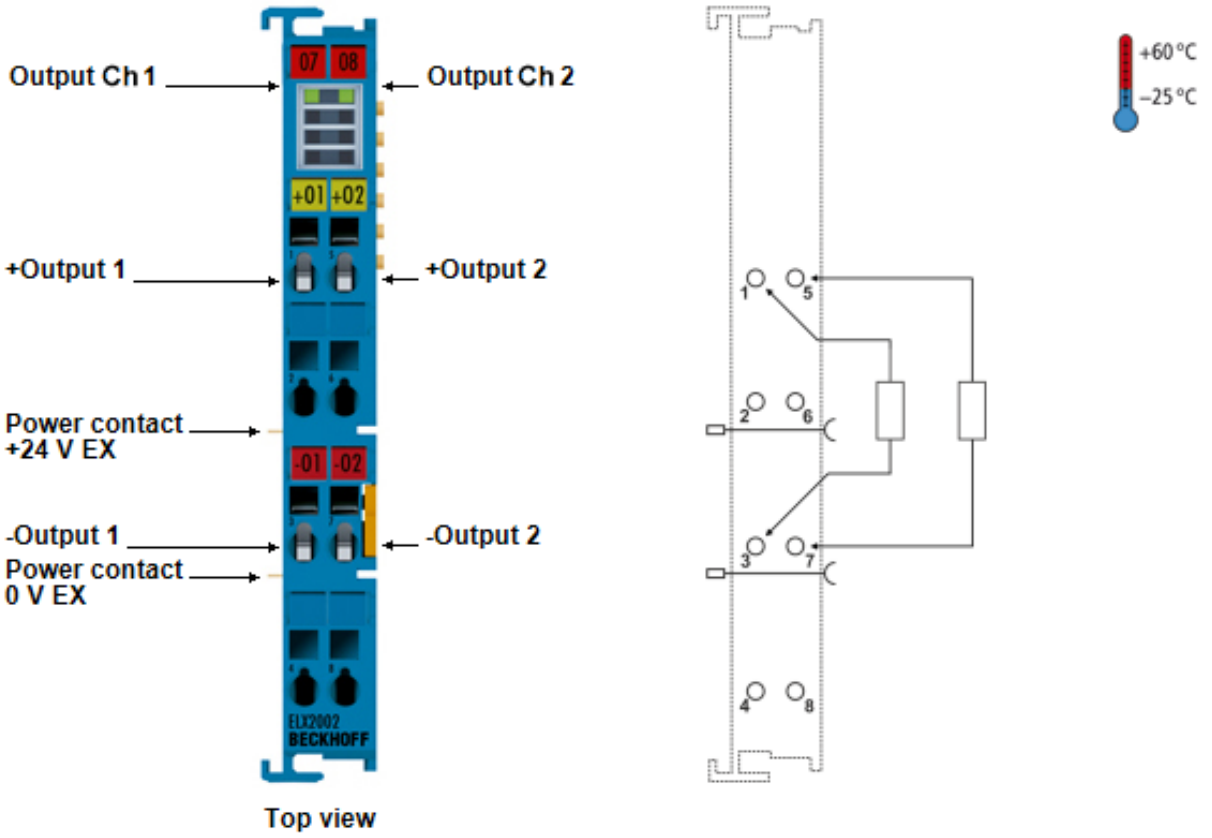


Fig. 23: ELX2002 - Contact assignment

Terminal point		Description
Name	No.	
+ Output 1	1	+ Output channel 1
	2	not implemented
- Output 1	3	- Output channel 1
	4	not implemented
+ Output 2	5	+ Output channel 2
	6	not implemented
- Output 2	7	- Output channel 2
	8	not implemented

LED Display

LED	Status	Meaning
Output Ch 1	on	Output 1 active
Output Ch 2	on	Output 2 active

3.7.6 ELX2008 - Contact assignment

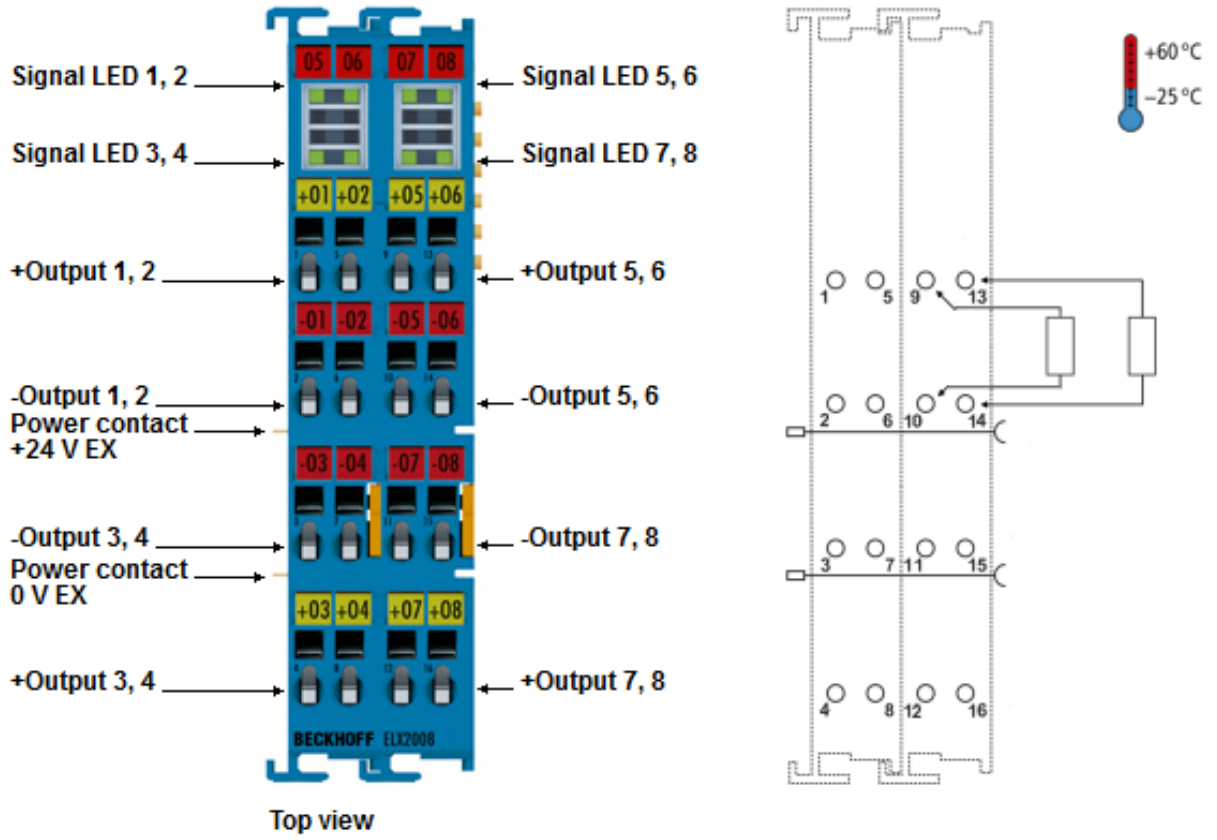


Fig. 24: ELX2008 - Contact assignment

Terminal point		Description
Name	No.	
+ Output 1	1	+ Output channel 1
- Output 1	2	- Output channel 1
- Output 3	3	- Output channel 3
+ Output 3	4	+ Output channel 3
+ Output 2	5	+ Output channel 2
- Output 2	4	- Output channel 2
- Output 4	7	- Output channel 4
+ Output 4	8	+ Output channel 4
+ Output 5	9	+ Output channel 5
- Output 5	10	- Output channel 5
- Output 7	11	- Output channel 7
+ Output 7	12	+ Output channel 7
+ Output 6	13	+ Output channel 6
- Output 6	14	- Output channel 6
- Output 8	15	- Output channel 8
+ Output 8	16	+ Output channel 8

LED Display

LED	Status	Meaning
Output Ch n	on	Output n active (with n = 1 to 8)

4 Appendix

4.1 EtherCAT AL Status Codes

For detailed information please refer to the EtherCAT system description.

4.2 UL notice

Application

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

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).

For devices with Ethernet connectors

Not for connection to telecommunication circuits.

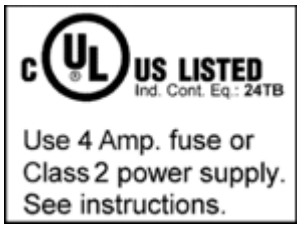
Basic principles

Two UL certificates are met in the Beckhoff EtherCAT product range, depending upon the components:

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



2. UL certification according to UL508 with limited power consumption. The current consumed by the device is limited to a max. possible current consumption of 4 A. Devices with this kind of certification are marked by this sign:



Almost all current EtherCAT products (as at 2010/05) are UL certified without restrictions.

Application

If *restricted* certified devices are used, the current consumption at 24 V_{DC} must be limited accordingly by supplying

- from an isolated source protected by a fuse of max. 4 A (according to UL248) or
- from a voltage supply complying with *NEC class 2*.
  An *NEC class 2* voltage source must not be connected in series or parallel with another *NEC class 2* voltage source!

These requirements apply to the supply of all EtherCAT bus couplers, power supply terminals, bus terminals and their power contacts.

4.3 FM notice

Special notice regarding ANSI/ISA Ex

⚠ WARNING

Observe the permissible range of application!

The I/O modules of the ELX series may only be used in potentially explosive areas of Class I, Division 2, Group A, B, C, D or in non-explosive areas!

⚠ WARNING



Consider the *Control Drawing ELX* documentation!

When installing the I/O modules of the ELX series, be sure to read the *Control Drawing ELX* documentation, which is available in the download area of your ELX terminal on https://www.beckhoff.com/ELXxxxx!

4.4 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

Please contact your Beckhoff branch office or representative for local support and service on Beckhoff products!

The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages: www.beckhoff.com

You will also find further documentation for Beckhoff components there.

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The Beckhoff Support offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with other, wide-ranging services:

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web:	www.beckhoff.com/service

Headquarters Germany

Beckhoff Automation GmbH & Co. KG

Hülshorstweg 20
33415 Verl
Germany

Phone:	+49 5246 963 0
e-mail:	info@beckhoff.com
web:	www.beckhoff.com

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More Information:
www.beckhoff.com/ELXxxxx

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany
Phone: +49 5246 9630
info@beckhoff.com
www.beckhoff.com