BECKHOFF New Automation Technology

Operating Instructions | EN

EL6930

TwinSAFE Logic Terminal with PROFIsafe Gateway

Safety over
EtherCAT®

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1 Notes on the documentation

1.1 Disclaimer

Beckhoff products are subject to continuous further development. We reserve the right to revise the operating instructions 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 these operating instructions.

In these operating instructions we define all permissible use cases whose properties and operating conditions we can guarantee. The use cases we define are fully tested and certified. Use cases beyond this, which are not described in these operating instructions, require the approval of Beckhoff Automation GmbH & Co KG.

1.1.1 Trademarks

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1.1.2 Patents

The EtherCAT technology is protected by patent rights through the following registrations and patents with corresponding applications and registrations in various other countries:

- EP1590927
- EP1789857
- EP1456722
- EP2137893
- DE102015105702

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1.1.3   Limitation of liability

All components in this product as described in the operating instructions are delivered in a specific configuration of hardware and software, depending on the application regulations. Modifications and changes to the hardware and/or software configuration that go beyond the documented options are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.

The following is excluded from the liability:

- Failure to observe these operating instructions
- Improper use
- Use of untrained personnel
- Use of unauthorized spare parts

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1.2   Version numbers

Ausgabe	Kommentar
2.0.0	• Migration • Redaktionell überarbeitet • Foreword changed to Notes on the documentation [▶ 5] and For your safety [▶ 11] • In chapter Technical data [▶ 22] link to download page of certificates added
1.2.0	• Reliability document updated • Safety parameters updated • Foreword overworked
1.1.2	• Reliability document added • Reaction times added
1.1.1	• Certificate updated
1.1.0	• Company address amended • Documentation versions added • References to EN954 removed
1.0.2	• Document origin added • Description of PROFIsafe connection expanded
1.0.1	• Reference to EN 60068-2-29 removed
1.0.0	• First released version

Currentness

Please check whether you are using the current and valid version of this document. The current version can be downloaded from the Beckhoff homepage at http://www.beckhoff.de/twinsafe. In case of doubt, please contact Technical Support (see Beckhoff Support and Service [▶ 10]).

Origin of the document

The original documentation is written in German. All other languages are derived from the German original.

Product features

Only the product properties specified in the current operating instructions are valid. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

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1.3   Staff qualification

These operating instructions are intended exclusively for trained specialists in control technology and automation with the relevant knowledge.

The trained specialist personnel must ensure that the applications and use of the described product meet all safety requirements. This includes all applicable and valid laws, regulations, provisions and standards.

Trained specialists

Trained specialists have extensive technical knowledge from studies, apprenticeships or technical training. Understanding of control technology and automation is available. Trained specialists can:

- Independently identify, avoid and eliminate sources of hazard.
- Apply relevant standards and directives.
- Implement specifications from accident prevention regulations.
- Evaluate, prepare and set up the workplaces.
- Evaluate, optimize and execute work independently.

1.4 Safety and instruction

Read the contents that refer to the activities you have to perform with the product. Always read the chapter For your safety [▶ 11] in the operating instructions.

Observe the warnings in the chapters so that you can handle and work with the product as intended and safely.

1.4.1 Explanation of symbols

Various symbols are used for a clear arrangement:

1. The numbering indicates an action that should be taken.
• The bullet point indicates an enumeration.
[…] The square brackets indicate cross-references to other text passages in the document.
[1] The number in square brackets indicates the numbering of a referenced document.

1.4.1.1 Pictograms

In order to make it easier for you to find text passages, pictograms and signal words are used in warning notices:

⚠ DANGER
Failure to observe will result in serious or fatal injuries.

⚠ WARNING
Failure to observe may result in serious or fatal injuries.

⚠ CAUTION
Failure to observe may result in minor or moderate injuries.

NOTE
Notes
Notes are used for important information on the product. The possible consequences of failure to observe these include: • Malfunctions of the product   • Damage to the product   • Damage to the environment

i **Information**

This sign indicates information, tips and notes for dealing with the product or the software.

1.5   Beckhoff Support and Service

Support

Beckhoff Support offers technical advice on the use of individual Beckhoff products and system planning. The employees support you in the programming and commissioning of sophisticated automation systems.

Hotline:	+49 5246/963-157
E-mail:	support@beckhoff.com
Web:	www.beckhoff.com/support

Training

Training in Germany takes place in our training center at the Beckhoff headquarters in Verl, at subsidiaries or, by arrangement, at the customer's premises.

Hotline:	+49 5246/963-5000
E-mail:	training@beckhoff.com
Web:	www.beckhoff.com/training

Service

The Beckhoff Service Center supports you with after-sales services such as on-site service, repair service or spare parts service.

Hotline:	+49 5246/963-460
E-mail:	service@beckhoff.com
Web:	www.beckhoff.com/service

Download area

In the download area you can obtain product information, software updates, the TwinCAT automation software, documentation and much more.

Web:	www.beckhoff.com/download

Headquarters

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20
33415 Verl
Germany

Phone:	+49 5246/963-0
E-mail:	info@beckhoff.com
Web:	www.beckhoff.com

For the addresses of our worldwide locations, please visit our website at Global Presence.

2   For your safety

Read this chapter containing general safety information. In addition, always observe the safety instructions and warnings in these operating instructions for your own safety, the safety of other persons and the safety of the product.

When working with control and automation products, many dangers can result from careless or incorrect use. Work particularly thoroughly, not under time pressure and responsibly towards other people.

2.1   Duty of care

ℹ️ Read entire documentation for TwinSAFE component
- TwinSAFE application manual
- EL6910 TwinSAFE logic terminal operating manual
- TwinSAFE Logic FB documentation manual

The operator must comply with all the requirements and notes specified in these operating instructions in order to fulfill his duty of care. This includes in particular that you

- comply with the provisions defined in the chapter Limitation of liability [▶ 6].
- only operate the TwinSAFE component when it is in perfect working order.
- provide the operating instructions in a legible condition and complete at the place of use of the TwinSAFE component.
- do not remove the safety markings attached to the TwinSAFE component and maintain their legibility.

No disposal in domestic waste
Products marked with a crossed-out waste bin must not be disposed of with domestic waste. The device is considered waste electrical and electronic equipment when it is disposed of. Observe the national regulations for the disposal of waste electrical and electronic equipment.

2.2 Safety image signs

On Beckhoff products you will find attached or lasered safety pictograms, which vary depending on the product. They serve to serve to ensure safety for people and to prevent damage to the products. Safety pictograms must not be removed and must be legible for the user.
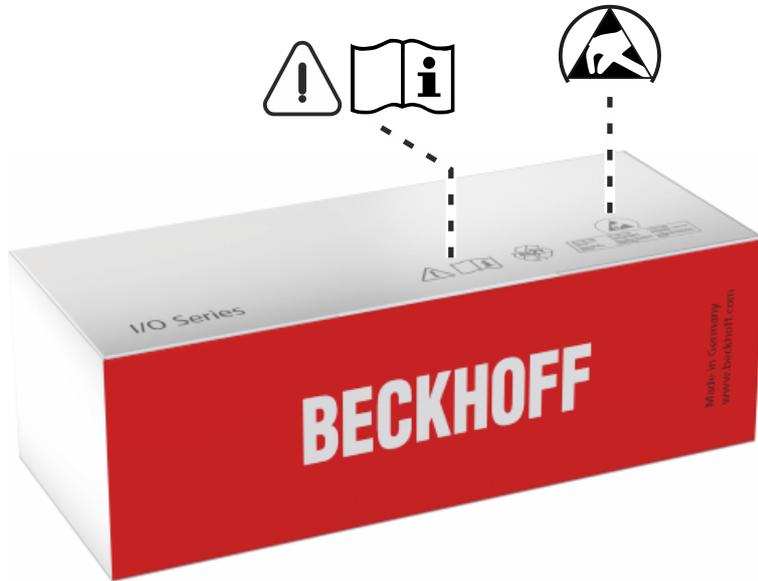
Read and observe the operating instructions
Commissioning is only permitted if the operating instructions have been read and understood beforehand. This applies in particular to the safety instructions and warnings.

Electrostatic sensitive components
Work with and on the TwinSAFE component is only permitted in protected workplaces.

2.3   General safety instructions

2.3.1   Before operation

Use in machines according to the Machinery Directive

Only use the TwinSAFE component in machines that comply with the Machinery Directive. This is how you ensure safe operation.

Ensure traceability

Ensure the traceability of the TwinSAFE component via the serial number.

Use SELV/PELV power supply

Use a SELV/PELV power supply unit with an output-side voltage limit of $U_{max} = 36\ V_{DC}$ to supply the TwinSAFE component with 24 V_{DC}.

Failure to observe this will endanger the safety function of the product. Depending on the machine, death and danger to life, serious physical injury and damage to the machine may result.

Use ferrules with plastic collar

If you use fine-wire cables for the signal connections, use ferrules with plastic collars. This leads to a higher availability of the system when the test pulses for the corresponding channels are switched off.

Carry out commissioning test

Before commissioning, wiring faults to the sensors must be excluded. Before commissioning, carry out a commissioning test. After a successful commissioning test, you can use the TwinSAFE component for the intended safety-related task.

In case of wiring errors, the safety function of the product is at risk. Depending on the machine, death and danger to life, serious bodily injury and damage to the machine may result.

2.3.2   In operation

Interference due to emitted interference

Do not operate the following devices in the vicinity of the TwinSAFE component: for example, radio telephones, radios, transmitters or high-frequency systems.

TwinSAFE components comply with the requirements of the applicable electromagnetic compatibility standards with regard to interference emission and immunity. If you exceed the limits for emitted interference specified in the standards, the function of the TwinSAFE component may be impaired.

2.3.3   After operation

De-energize and switch off components before working on them

Check all safety-relevant equipment for functionality before working on the TwinSAFE component. Secure the working environment. Secure the machine or plant against being inadvertently started up. Observe the chapter Decommissioning [▶ 65].

3 System description

3.1 The Beckhoff Bus Terminal system

The Beckhoff Bus Terminal system is used for decentralized connection of sensors and actuators to a control system. The Beckhoff Bus Terminal system components are mainly used in industrial automation and building management applications. In its minimum configuration, a bus station consists of a Bus Coupler or a Bus Terminal Controller and Bus Terminals connected to it. The Bus Coupler forms the communication interface to the higher-level controller, and the terminals are the interface to sensors and actuators. The whole bus station is clipped onto a 35 mm DIN mounting rail (EN 60715). The mechanical cross connection of the bus station is established via a slot and key system at the Bus Coupler and the Bus Terminals.

The sensors and actuators are connected with the terminals via the screwless (spring-loaded) connection system.
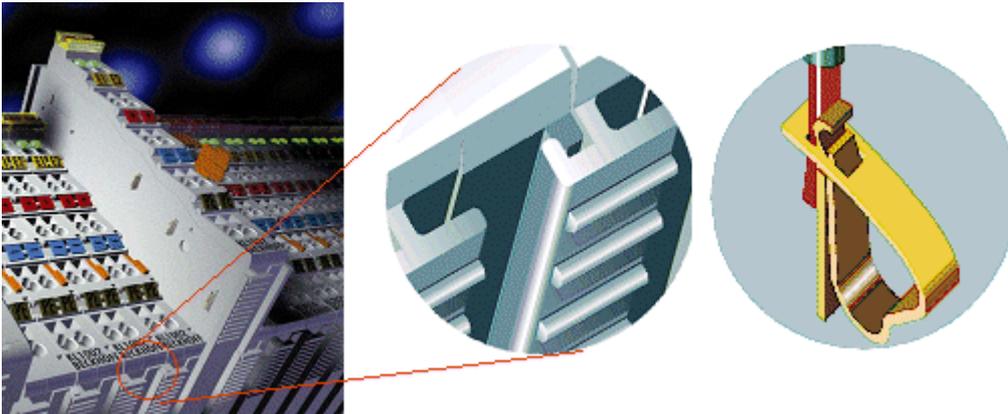
Fig. 1: Slot and key system and screwless (spring-loaded) connection system.

In order to accommodate the wide range of different communication standards encountered in industrial automation, Beckhoff offers Bus Couplers for a number of common bus systems (e.g. EK1100 for EtherCAT).

3.1.1   Bus Coupler

Mechanical data	Bus Coupler
Material	polycarbonate, polyamide (PA6.6).
Dimensions (W x H x D)	44 mm x 100 mm x 68 mm
Mounting	on 35 mm mounting rail (EN 60715) with locking
Attachable by	double slot and key connection
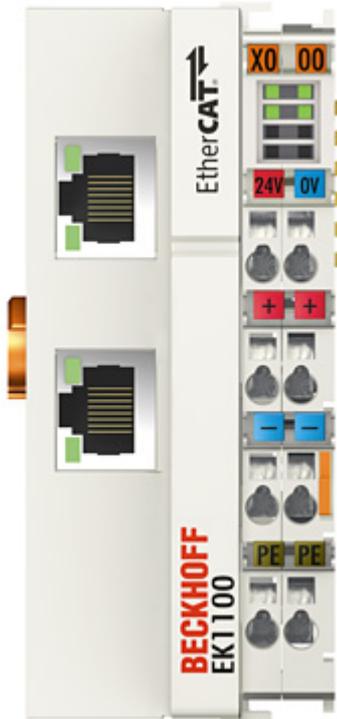
Fig. 2: Bus Coupler (EtherCAT)

Connection technology	Bus Coupler
Wiring	spring-loaded system
Connection cross-section	0.08 mm² ... 2.5 mm², stranded wire, solid wire
Fieldbus connection	depending on fieldbus
Power contacts	3 spring contacts
Current load	10 A
Rated voltage	24 V_{DC}

3.1.2   Bus Terminals

Mechanical data	Bus Terminal
Material	polycarbonate, polyamide (PA6.6).
Dimensions (W x H x D)	12 mm x 100 mm x 68 mm or 24 mm x 100 mm x 68 mm
Mounting	on 35 mm mounting rail (EN 60715) with locking
Attachable by	double slot and key connection
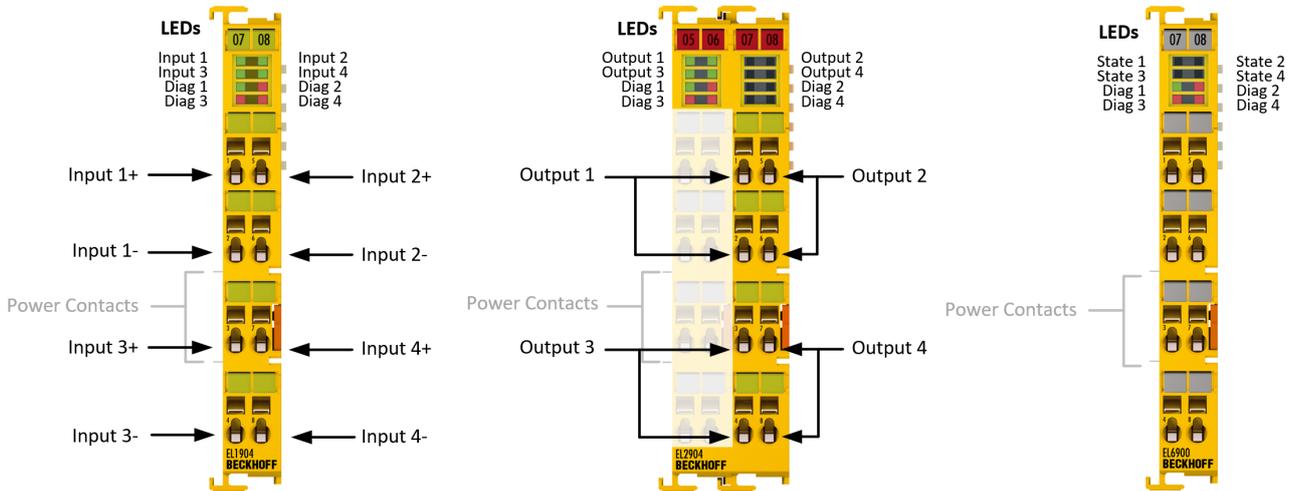
Fig. 3: TwinSAFE Terminals (EtherCAT)

Connection technology	Bus Terminal
Wiring	spring-loaded system
Connection cross-section	0.08 mm² ... 2.5 mm², stranded wire, solid wire
Fieldbus connection	E-bus
Power contacts	up to 3 blade/spring contacts
Current load	10 A
Rated voltage	depends on Bus Terminal type

3.1.3   E-bus

The E-bus is the data path within a terminal strip. The E-bus is led through from the Bus Coupler through all the terminals via six contacts on the terminals' side walls.

3.1.4   Power contacts

The operating voltage is passed on to following terminals via three power contacts. Terminal strip can be split into galvanically isolated groups by means of potential feed terminals as required. The power feed terminals play no part in the control of the terminals, and can be inserted at any locations within the terminal strip.

3.2 TwinSAFE

3.2.1 The I/O construction kit is extended safely

With the TwinSAFE Terminals, Beckhoff offers the option of simply expanding the proven Bus Terminal system, and to transfer the complete cabling for the safety circuit into the already existing fieldbus cable. Safe signals can be mixed with standard signals without restriction. This saves design effort, installation and material. Maintenance is simplified significantly through faster diagnosis and simple replacement of only a few components.

The new ELx9xx series Bus Terminals only include three basic functionalities: digital inputs EL19xx, digital outputs EL29xx and a logic unit EL6900. For a large number of applications, all sensors and actuators can be wired on these Bus Terminals. The required logical link of the inputs and the outputs is handled by the EL6900. For small to medium-sized configurations, the tasks of a fail-safe PLC can thus be handled within the Bus Terminal system.

3.2.2 Safety concept

TwinSAFE: Safety and I/O technology in one system

- Extension of the familiar Beckhoff I/O system with TwinSAFE terminals
- Freely selectable mix of safe and standard signals
- Logical link of the I/Os in the EL6930 TwinSAFE logic terminal
- Safety-relevant networking of machines via bus systems

TwinSAFE protocol (FSoE)

- Transfer of safety-relevant data via any media ("genuine black channel")
- TwinSAFE communication via fieldbus systems such as EtherCAT, Lightbus, PROFIBUS or Ethernet
- IEC 61508:2010 SIL 3 compliant

Configuring instead of wiring: the TwinSAFE configurator

- Configuration of the TwinSAFE system via the TwinCAT System Manager
- System Manager for editing and displaying all bus parameters
- Certified function blocks such as emergency stop, operation mode, etc.
- Simple handling
- Typical function blocks for machine safety
- any bus connection with the EL6930 TwinSAFE logic terminal

TwinSAFE logic Bus Terminal EL6930

- Link unit between TwinSAFE input and output terminals
- Configuration of a simple, flexible, cost-effective, decentralized safety controller
- No safety requirements for higher-level control system
- TwinSAFE enables networks with up to 65535 TwinSAFE devices.
- TwinSAFE Logic Terminal can establish up to 127 connections (TwinSAFE connections) and a PROFIsafe slave connection to a PROFIsafe master controller.
- Several TwinSAFE Logic Terminals are cascadable in a network
- Safety functions such as emergency stop, protective door, etc. are already included
- Suitable for applications up to SIL 3 according to IEC 61508:2010 and DIN EN ISO 13849-1:2006 (Cat 4, PL e).

TwinSAFE digital input (EL1904) and output terminal (EL2904)

- All current safety sensors can be connected
- Operation with a TwinSAFE logic terminal
- EL1904 with 4 fail-safe inputs for sensors (24 VDC) with potential-free contacts
- EL2904 with four safe channels for actuators (24 VDC, 0.5 A per channel)
- Conforming to IEC 61508:2010 SIL 3 and EN ISO 13849-1:2006 (Cat 4, PL e) requirements.

3.2.3 EL1904, EL2904 - Bus Terminals with 4 fail-safe inputs or outputs

The EL1904 and EL2904 Bus Terminals enable connection of common safety sensors and actuators. They are operated with the EL6930 TwinSAFE logic terminal. The TwinSAFE logic terminal is the link unit between the TwinSAFE input and output terminals. It enables the configuration of a simple, flexible and cost-effective decentralized safety control system.

Therefore, there are no safety requirements for the higher-level controller! The typical safety functions required for the automation of machines, such as emergency stop, protective door, two-hand etc., are already permanently programmed in the EL6930. The user configures the EL6930 terminal according to the safety requirements of his application.

3.2.4 EL6930 - TwinSAFE logic terminal

The TwinSAFE Logic Terminal is the link unit between the TwinSAFE input and output terminals. The EL6930 meets the requirements of IEC 61508:2010 SIL 3 and EN ISO 13849-1:2006 (Cat 4, PL e).

3.2.5 The fail-safe principle (Fail Stop)

The basic rule for a safety system such as TwinSAFE is that failure of a part, a system component or the overall system must never lead to a dangerous condition. The safe state is always the switched off and wattless state.

4   Product description

4.1   EL6930 - TwinSAFE logic terminal

The TwinSAFE logic terminal is the link unit between the TwinSAFE input and output terminals.

The EL6930 meets the requirements of IEC 61508:2010 SIL 3, DIN EN ISO 13849-1:2006 (Cat 4, PL e), NRTL, UL508, UL1998 and UL991.

The TwinSAFE terminal has the typical design of an EtherCAT terminal.
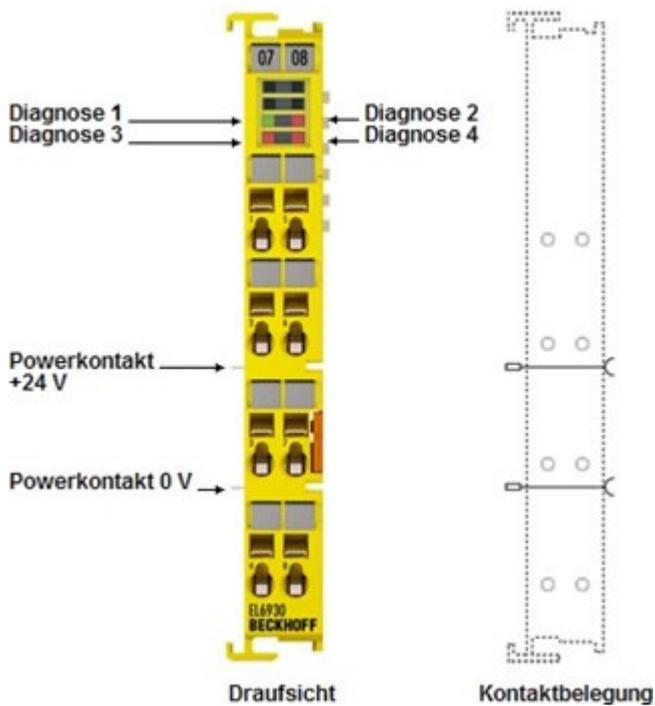
Fig. 4: EL6930 TwinSAFE Logic Terminal

4.2 Intended use

⚠ WARNING
Caution - Risk of injury!
TwinSAFE components may only be used for the purposes described below!

The TwinSAFE Terminals expand the application area of Beckhoff Bus Terminal system with functions that enable them to be used for machine safety applications. The TwinSAFE Terminals are designed for machine safety functions and directly associated industrial automation tasks. They are therefore only approved for applications with a defined fail-safe state. This safe state is the switched-off and de-energized state. Fail-safety according to the relevant standards is required.

The TwinSAFE I/O components allow the connection of:

- 24 V_{DC} sensors such as
  emergency stop push-buttons, rope pull switches, position switches, two-hand switches, safety switching mats, light curtains, light barriers, laser scanners, etc.
- 24 V_{DC} actuators such as
  contactors, protective door switches with tumbler, signal lamps, servo drives, etc.

ℹ **Test pulses**

When selecting actuators please ensure that the test pulses of the TwinSAFE component do not lead to switching of the actuator or a diagnostic message of the TwinSAFE component.

The following TwinSAFE components were developed for these tasks:

- The EL1904 is an EtherCAT Terminal with 4 digital fail-safe inputs
- The EL2904 is an EtherCAT Terminal with 4 digital fail-safe outputs
- The EL6910 is an EtherCAT Terminal with integrated TwinSAFE logic

These TwinSAFE components are suitable for operation on the

- Beckhoff EKxxxx series Bus Couplers
- Beckhoff CXxxxx series Embedded PCs with E-bus connection

⚠ WARNING
System limits
The TÜV SÜD certificate applies to this TwinSAFE component, the function blocks available in it, the documentation and the engineering tool. *TwinCAT 3.1* and the *TwinSAFE Loader* are permitted as engineering tools. Any deviations from these procedures or tools, particularly externally generated xml files for TwinSAFE import or externally generated automatic project creation procedures, are not covered by the certificate.

⚠ WARNING
Power supply from SELV/PELV power supply unit!
The TwinSAFE components must be supplied with 24 V_{DC} by an SELV/PELV power supply unit with an output voltage limit U_{max} of 36 V_{DC}. Failure to observe this can result in a loss of safety.

⚠ WARNING
Commissioning test
Before the EL2912 can be used for safety-related tasks, a commissioning test must be carried out by the user so that faulty sensor wiring can be ruled out.

⚠ **CAUTION**
Follow the machinery directive!
The TwinSAFE components may only be used in machines as defined in the machinery directive.

⚠ **CAUTION**
Ensure traceability!
The buyer has to ensure the traceability of the device via the serial number.

4.3 Technical data

The current certificates of all TwinSAFE products with the underlying standards and directives can be found at https://www.beckhoff.com/en-en/support/download-finder/certificates-approvals/.

Product designation	EL6930
Number of inputs	0
Number of outputs	0
Status display	4 diagnostic LEDs
Minimum cycle time	approx. 500 µs
Error reaction time	≤ watchdog times
Watchdog time	Min. 1 ms, max. 60000 ms
Input process image	Dynamic according to the TwinSAFE configuration in the TwinCAT System Manager
Output process image	Dynamic according to the TwinSAFE configuration in the TwinCAT System Manager
Power supply	24 V_{DC} (−15%/+20%)
Current consumption via E-bus	approx. 188 mA
Power dissipation of the terminal	typically 1 W
Dimensions (W x H x D)	12 mm x 100 mm x 68 mm
Weight	approx. 50 g
Permissible ambient temperature (operation)	0°C to +55°C
Permissible ambient temperature (transport/storage)	-25°C to +70°C
Permissible air humidity	5% to 95%, non-condensing
Permissible air pressure (operation/storage/transport)	750 hPa to 1100 hPa (this corresponds to a height of approx. -690 m to 2450 m over sea level assuming an international standard atmosphere)
Climate category according to EN 60721-3-3	3K3 (the deviation from 3K3 is possible only with optimal environmental conditions and also applies only to the technical data which are specified differently in this documentation)
Permissible pollution degree according to EN 60664-1	2 (comply with the chapter Maintenance)
Impermissible operating conditions	TwinSAFE terminals must not be used under the following operating conditions: • under the influence of ionizing radiation (that exceeds the level of the natural environmental radiation) • in corrosive environments • in an environment that leads to unacceptable soiling of the Bus Terminal
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
Shocks	15 g with pulse duration 11 ms in all three axes
Protection class	IP20
Permitted operating environment	In the control cabinet or terminal box, with minimum protection class IP54 according to IEC 60529
Permissible installation position	see chapter Installation position and minimum distances [▶ 26]

4.4   Safety parameters

Key figures	EL6930
Lifetime [a]	20
Prooftest Interval [a]	not required [1]
PFH_D	1.03E-09
%SIL3	1,03%
PFD	8.23E-05
%SIL3	8,23%
$MTTF_d$	high
DC	high
Performance level	PL e
Category	4
HFT	1
Element classification [2]	Type B

1. Special proof tests are not required during the entire service life of the EL6930 EtherCAT terminal.
2. Classification according to IEC 61508-2:2010 (see chapters 7.4.4.1.2 and 7.4.4.1.3)

The EL6930 EtherCAT Terminal can be used for safety-related applications within the meaning of IEC 61508:2010 up to SIL3 and EN ISO 13849-1 up to PL e (Cat4).

For the calculation or estimation of the $MTTF_d$ value from the PFH_D value, further information can be found in the TwinSAFE application manual or in ISO 13849-1:2015 Table K.1.

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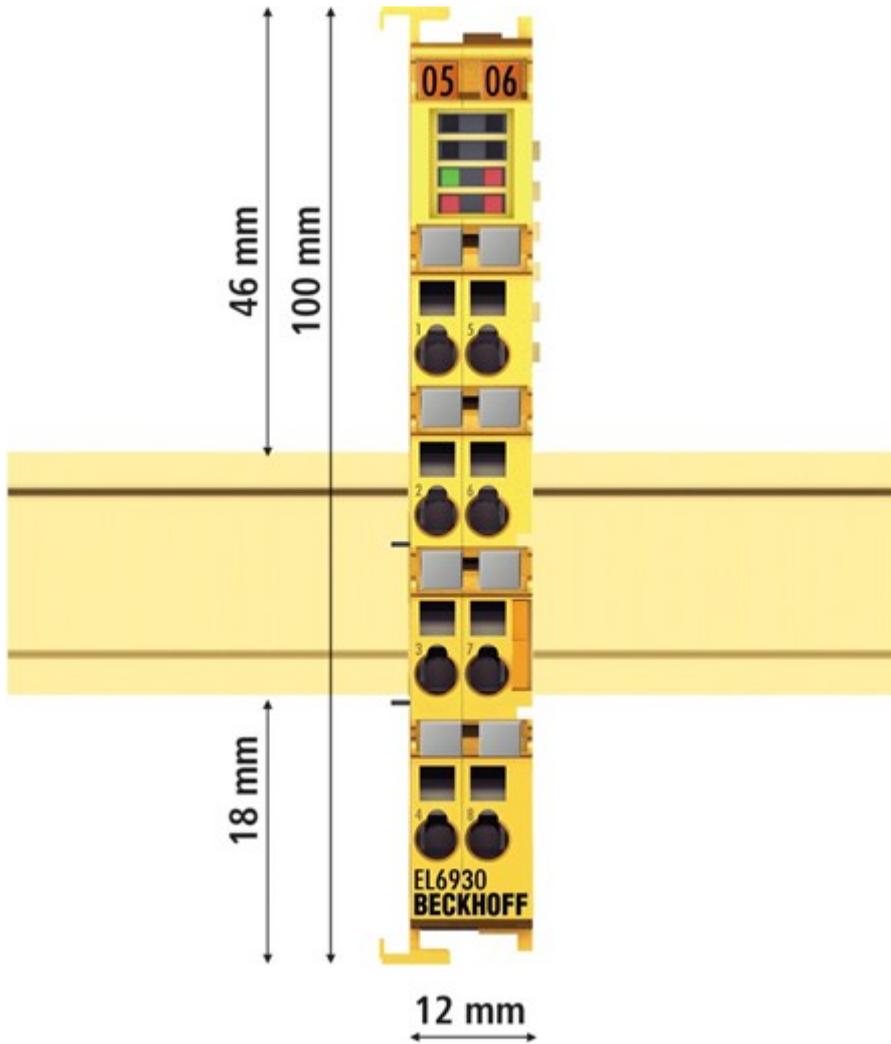
4.5 Dimensions

Fig. 5: Dimensions EL6930

Width: 12 mm (side-by-side installation)
Height: 100 mm
Depth: 68 mm

5   Operation

5.1   Environmental conditions

Please ensure that the TwinSAFE components are only transported, stored and operated under the specified conditions (see technical data)!

⚠ WARNING
Risk of injury!
The TwinSAFE components must not be used under the following operating conditions.
• under the influence of ionizing radiation (that exceeds the level of the natural environmental radiation)
• in corrosive environments
• in an environment that leads to unacceptable soiling of the TwinSAFE component

NOTE
Electromagnetic compatibility
The TwinSAFE components comply with the current standards on electromagnetic compatibility with regard to spurious radiation and immunity to interference in particular.
However, in cases where devices such as mobile phones, radio equipment, transmitters or high-frequency systems that exceed the interference emissions limits specified in the standards are operated near TwinSAFE components, the function of the TwinSAFE components may be impaired.

5.2   Installation

5.2.1   Safety instructions

Before installing and commissioning the TwinSAFE components please read the safety instructions in the foreword of this documentation.

5.2.2   Transport / storage

Use the original packaging in which the components were delivered for transporting and storing the TwinSAFE components.

⚠ CAUTION
Note the specified environmental conditions
Please ensure that the digital TwinSAFE components are only transported and stored under the specified environmental conditions (see technical data).

5.2.3   Mechanical installation

⚠ WARNING
Risk of injury!
Bring the bus system into a safe, de-energized state before starting installation, disassembly or wiring of the devices!

5.2.3.1   Control cabinet / terminal box

The TwinSAFE terminals must be installed in a control cabinet or terminal box with IP54 protection class according to IEC 60529 as a minimum.

5.2.3.2   Installation position and minimum distances

For the prescribed installation position the mounting rail is installed horizontally and the mating surfaces of the EL/KL 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.
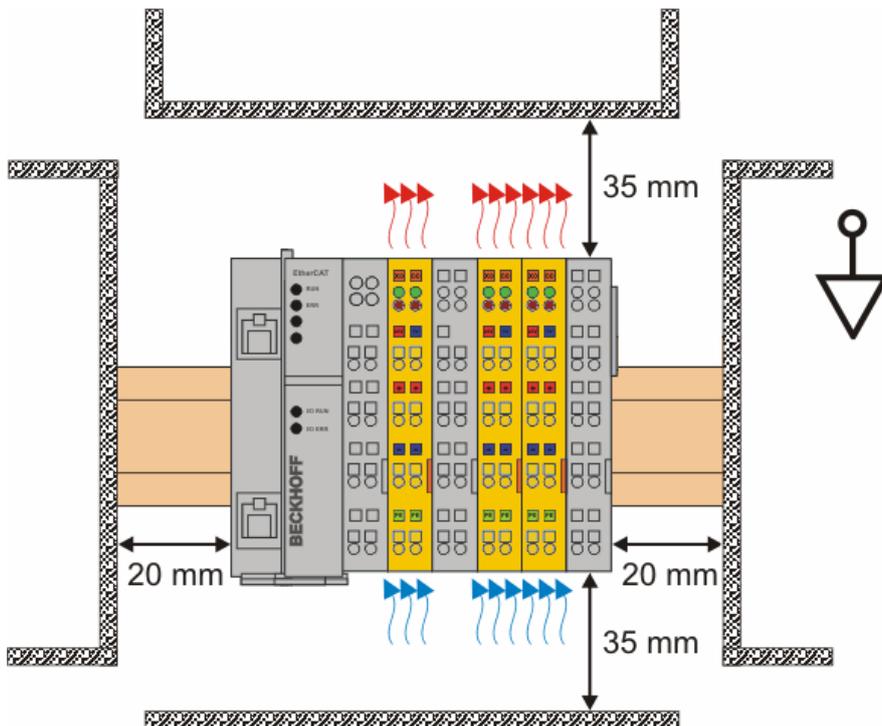
Fig. 6: Installation position and minimum distances

In order to ensure optimum convection cooling, the distances to neighboring devices and to control cabinet walls must not be smaller than those shown in the diagram.

5.2.3.3   Installation 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!

Mounting
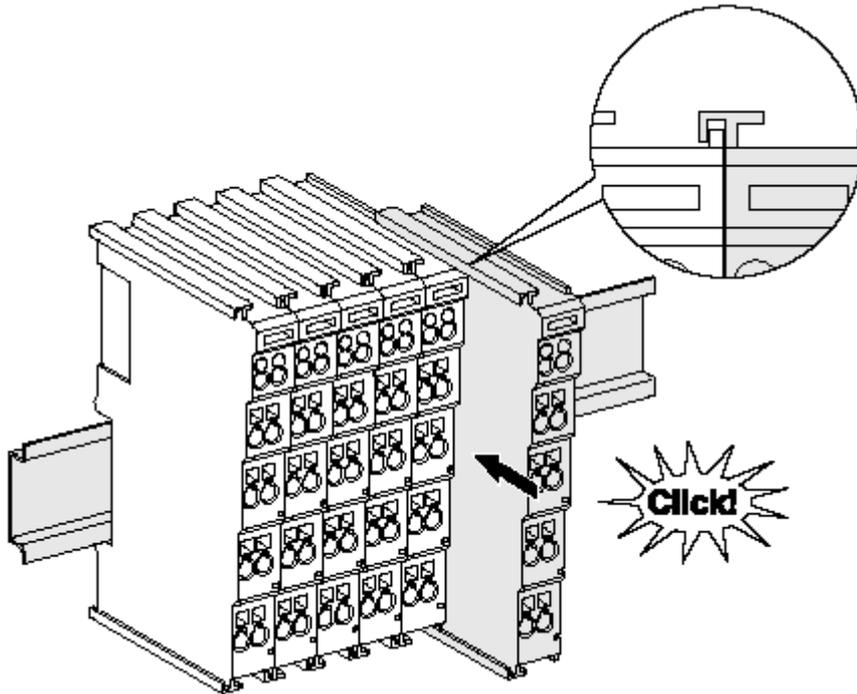
Fig. 7: Installation on the mounting rail

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. Join the components with slot and key 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 slot and key, the connection will not be operational! When correctly assembled, no significant gap should be visible between the housings.

i   Fastening of 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. For 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.

Disassembly
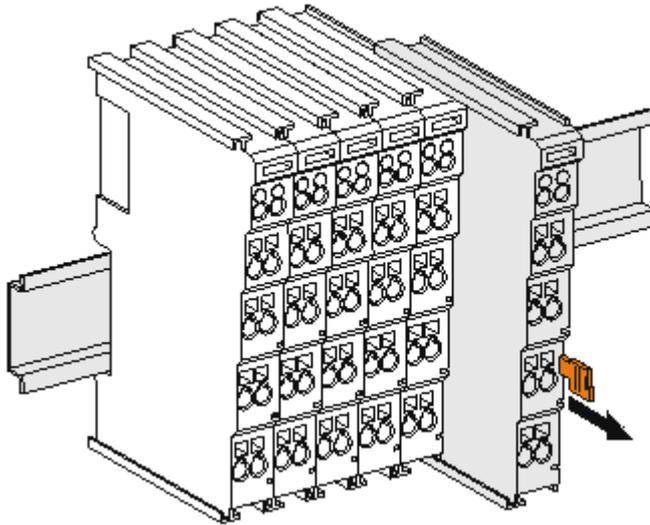
Fig. 8: Removal from mounting rail

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.

5.2.4   Electrical installation

5.2.4.1   Connections within a Bus Terminal block

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

Spring contacts (E-bus)

The six spring contacts of the E-bus deal with the transfer of the data and the supply of the Bus Terminal electronics.

NOTE
Observe the E-bus current
Observe the maximum current that your Bus Coupler can supply to the E-bus! Use the EL9410 Power Supply Terminal if the current consumption of your terminals exceeds the maximum current that your Bus Coupler can feed to the E-bus supply.

Power contacts

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 terminals on the Bus Coupler.

> ● **Note the connection of the power contacts**
> **i** 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.
> Potential supply terminals (EL91xx, EL92xx) interrupt the power contacts and thus represent the start of a new supply rail.

PE power contact

The power contact labelled PE can be used as a protective earth. For safety reasons this contact mates first when plugging together, and can ground short-circuit currents of up to 125 A.
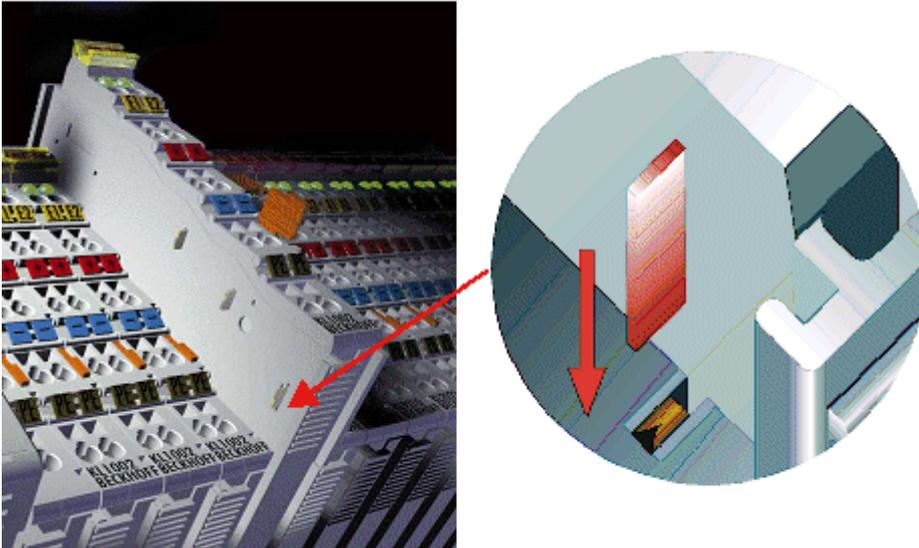
Fig. 9: PE power contact

⚠ **CAUTION**
Insulation tests
Note that, for reasons of electromagnetic compatibility, the PE contacts are capacitatively coupled to the mounting rail. This may lead to incorrect results during insulation testing or to damage on the terminal (e.g. disruptive discharge to the PE line during insulation testing of a consumer with a rated voltage of 230 V). For insulation testing, disconnect the PE supply line at the Bus Coupler or the Potential Supply Terminal! In order to decouple further feed points for testing, these Power Feed Terminals can be released and pulled at least 10 mm from the group of terminals.

⚠ **DANGER**
Serious risk of injury!
The PE power contact must not be used for other potentials!

5.2.4.2   Overvoltage protection

If protection against overvoltage is necessary in your plant, provide a surge filter for the voltage supply to the Bus Terminal blocks and the TwinSAFE terminals.

5.2.4.3 Wiring
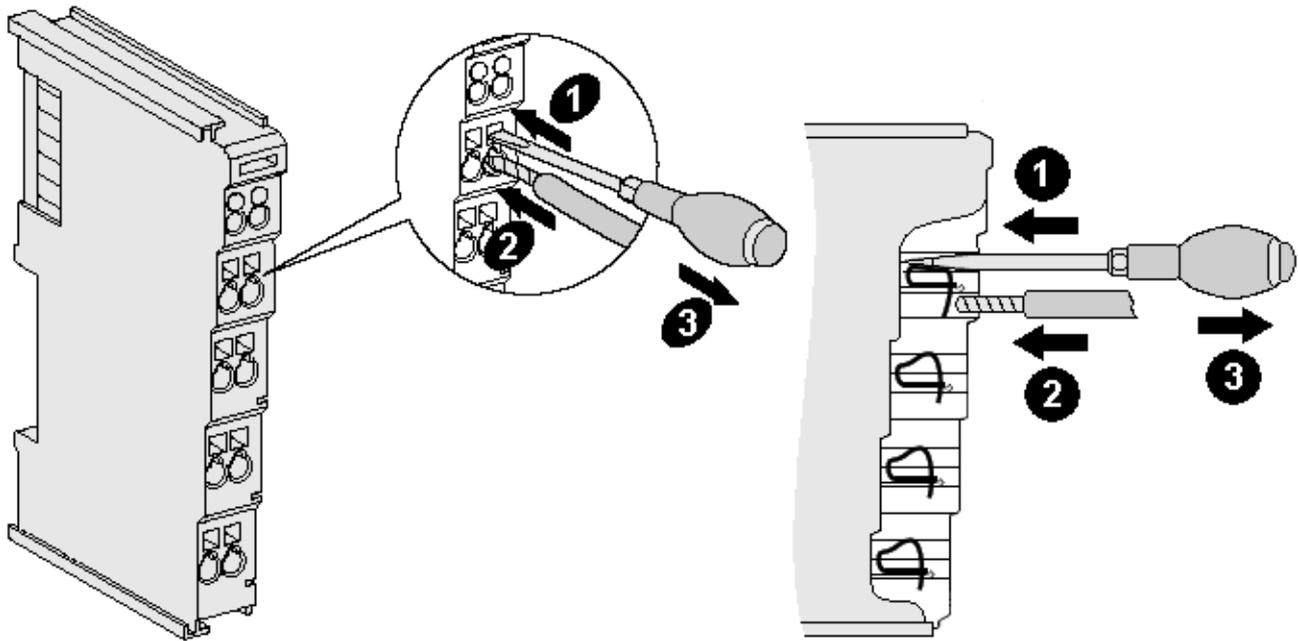
Fig. 10: Connection of a cable to a terminal point

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 closes automatically when the pressure is released, holding the wire safely and permanently.

See the following table for the suitable wire size width.

Wire cross section	0.08 ... 2.5 mm^2
Wire stripping length	8 ... 9 mm

5.2.4.4   EL6930 pin assignment
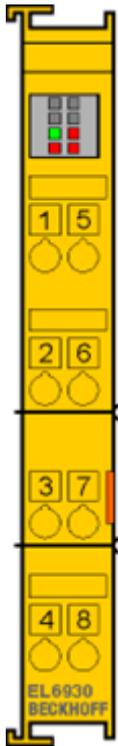
Fig. 11: EL6930 pin assignment

Terminal point	Output	Signal
1	-	not used, no function
2		not used, no function
3	-	not used, no function
4		not used, no function
5	-	not used, no function
6		not used, no function
7	-	not used, no function
8		not used, no function

BECKHOFF

5.2.5 TwinSAFE reaction times

The TwinSAFE terminals form a modular safety system that exchanges safety-oriented data via the Safety-over-EtherCAT protocol. This chapter is intended to help you determine the system's reaction time from the change of signal at the sensor to the reaction at the actuator.

5.2.5.1 Typical reaction time

The typical reaction time is the time that is required to transmit information from the sensor to the actuator, if the overall system is working without error in normal operation.
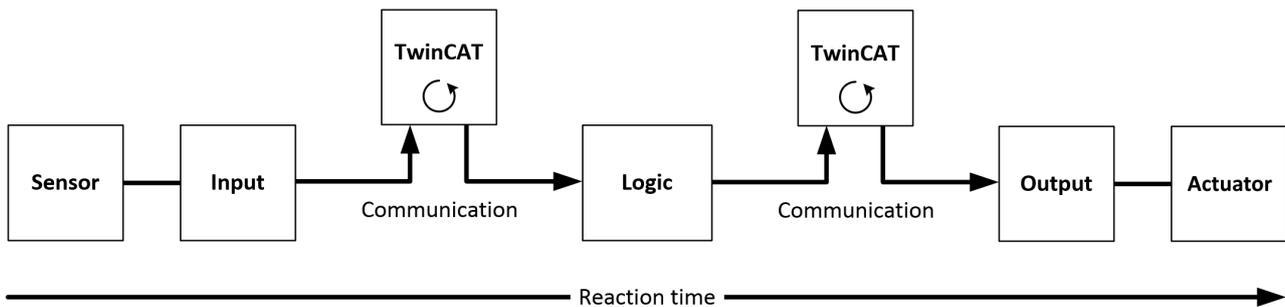
Fig. 12: Typical reaction time

Definition	Description
RTSensor	Reaction time of the sensor until the signal is provided at the interface. Typically supplied by the sensor manufacturer.
RTInput	Reaction time of the safe input, such as EL1904 or EP1908. This time can be found in the technical data. In the case of the EL1904 it is 4 ms.
RTComm	Reaction time of the communication This is typically 3x the EtherCAT cycle time, because new data can only be sent in a new Safety-over-EtherCAT telegram. These times depend directly on the higher-level standard controller (cycle time of the PLC/NC).
RTLogic	Reaction time of the logic terminal. This is the cycle time of the logic terminal and typically ranges from 500 µs to 10 ms for the TwinSAFE Logic Terminal, depending on the size of the safety project. The actual cycle time can be read from the terminal.
RTOutput	Reaction time of the output terminal. This typically lies within the range of 2 to 3 ms.
RTActor	Reaction time of the actuator. This information is typically supplied by the actuator manufacturer
WDComm	Watchdog time of the communication

This results in the following equation for the typical reaction time:

$$ReactionTime_{typ} = RT_{Sensor} + RT_{Input} + 3 * RT_{Comm} + RT_{Logic} + 3 * RT_{Comm} + RT_{Output} + RT_{Actuator}$$

with, for example

$$ReactionTime_{typ} = 5\,ms + 4\,ms + 3*1\,ms + 10\,ms + 3*1\,ms + 3\,ms + 20\,ms = 48\,ms$$

5.2.5.2   Worst-case reaction time

The worst case reaction time is the maximum time required to switch off the actuator in the case of an error.
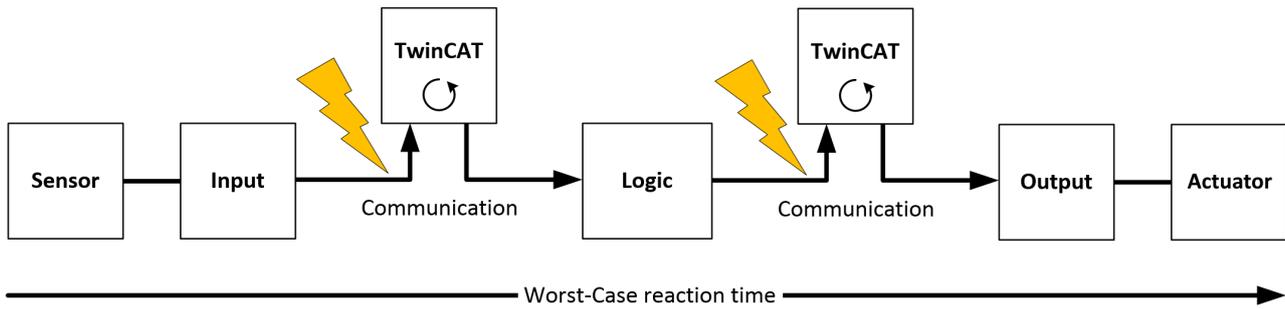
Fig. 13: Worst-case reaction time

This assumes that a signal change occurs at the sensor and is transmitted to the input. A communication error occurs at precisely the moment when the signal is to be transferred to the communication interface. This is detected by the logic following the watchdog time of the communication link. This information should then be transferred to the output, but a further communication error occurs here. This error is detected at the output following the expiry of the watchdog time and leads to the switch-off.

This results in the following equation for the worst-case reaction:

$$ReactionTime_{max} = WD_{Comm} + WD_{Comm} + RT_{Actuator}$$

with, for example

$$ReactionTime_{max} = 15\,ms + 15\,ms + 20\,ms = 50\,ms$$

5.2.6   Tested EL1904 devices

The following list contains devices that were tested together with the EL1904 TwinSAFE terminal. The results only apply for the current device hardware version at the time of testing. The tests were carried out in a laboratory environment. Modifications of these products cannot be considered here. If you are unsure please test the hardware together with the TwinSAFE terminal.

Manufacturer	Type	Comment
SICK	C4000	Safety light curtain
SICK	S3000	Safety laser scanner
Wenglor	SG2-14ISO45C1	Safety light grids
Leuze	lumiflex ROBUST 42/43/44	Safety light barriers
Schmersal	BNS250-11ZG	Safety switch
ifm	GM701S	Inductive safety sensor
Keyence	SL-V (with PNP cable set)	Safety light curtain

The tests were carried out as function tests only. The information provided in the respective manufacturer documentation remains valid.

5.2.7   Tested EL2904 devices

The following list contains devices that were tested together with the EL2904 TwinSAFE terminal. The results only apply for the current device hardware version at the time of testing. The tests were carried out in a laboratory environment. Modifications of these products cannot be considered here. If you are unsure please test the hardware together with the TwinSAFE terminal.

Manufacturer	Type	Comment
Beckhoff	AX5801	TwinSAFE Drive option card: safe restart lock
Beckhoff	AX2000 AS option	safe restart lock
Siemens	SIRIUS series S00 3RT1016-1BB42	Contactor
Telemecanique	LP1K09	Contactor

The tests were carried out as function tests only. The information provided in the respective manufacturer documentation remains valid.

> **Recommended protective circuits**
>
> We recommend R/C or diode-based protective circuits for these devices.
> Varistor-based protective circuits should not be used.

5.3   Configuration of the terminal in TwinCAT

> **Identical configuration**
>
> The configuration of the terminal in TwinCAT is identical for the variant.

⚠ **CAUTION**

Do not change CoE objects!

Do not change any of the CoE objects in the TwinSAFE terminals. Any modifications (e.g. via TwinCAT) of the CoE objects will permanently set the terminals to the Fail-Stop state or lead to unexpected behavior of the terminals!

5.3.1   Configuration requirements

Version 2.11 build 1544 or higher of the TwinCAT automation software is required for configuring the TwinSAFE component. The current version is available for download from the Beckhoff website (www.beckhoff.de).

5.3.2   Inserting a Bus Coupler

See TwinCAT automation software documentation.

5.3.3   Inserting a Bus Terminal

See TwinCAT automation software documentation.

5.3.4   Inserting an EL6930

An EL6930 is inserted in the same way as any other Beckhoff Bus Terminal. In the list open *Safety Terminals (ELx9xx)* and select the EL6930.
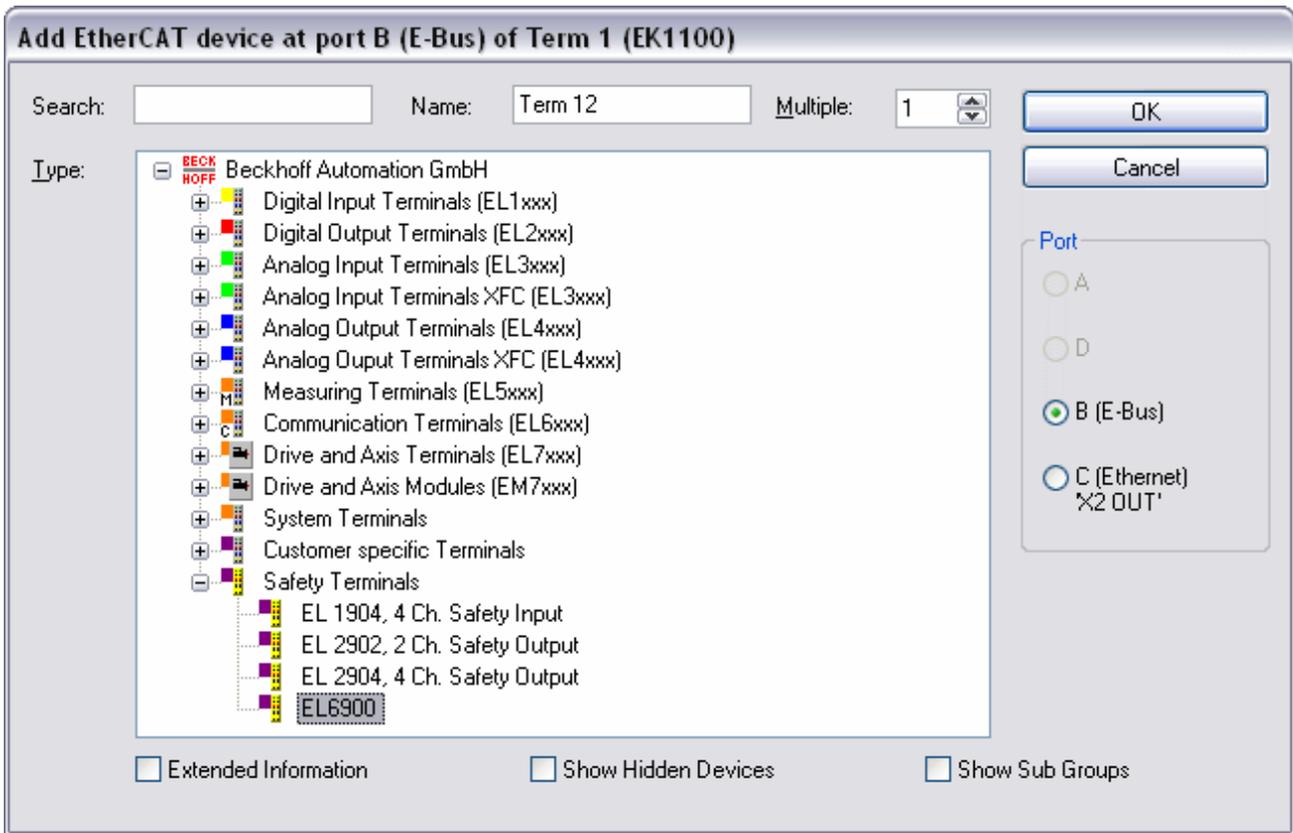
Fig. 14: Inserting an EL6930

> **ⓘ** **Size of the process image**
>
> The process image of the EL6930 is adjusted dynamically based on the TwinSAFE configuration created in the TwinCAT automation software.

5.3.5 Address settings on TwinSAFE terminals with 1023 possible addresses
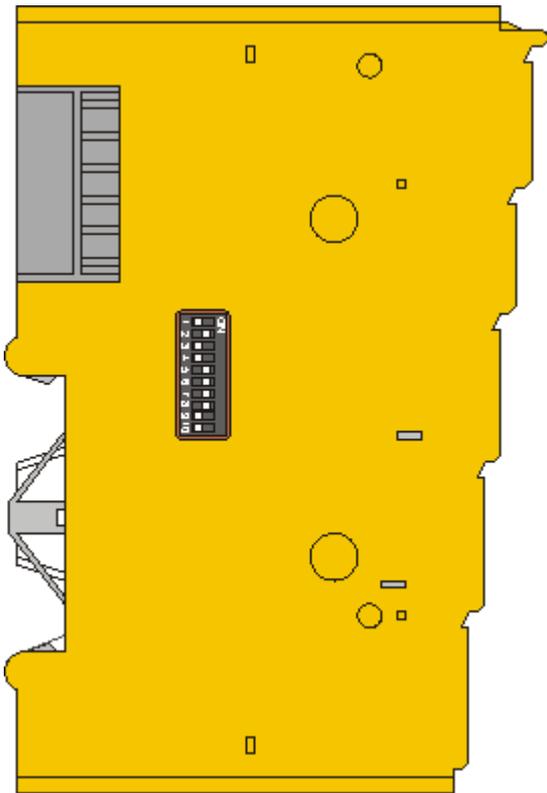
Fig. 15: Address settings on TwinSAFE terminals with 1023 possible addresses

The TwinSAFE address of the terminal is set via the 10-way DIP switch on the left-hand side of the TwinSAFE terminal. TwinSAFE addresses between 1 and 1023 are available.

DIP switch										Address
1	2	3	4	5	6	7	8	9	10	
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	2
ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	3
OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	4
ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	5
OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	6
ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	7
...	...	...	...	...	...	...	...	...	...	...
ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	1023

⚠ WARNING
TwinSAFE address Each TwinSAFE address may only be used once within a network / a configuration! The address 0 is not a valid TwinSAFE address!

5.3.6 Registering the TwinSAFE addresses in the TwinCAT automation software

The TwinSAFE address set at the DIP switch must also be entered under the *TwinSAFE Logic* tab (*TwinSAFE address* entry).
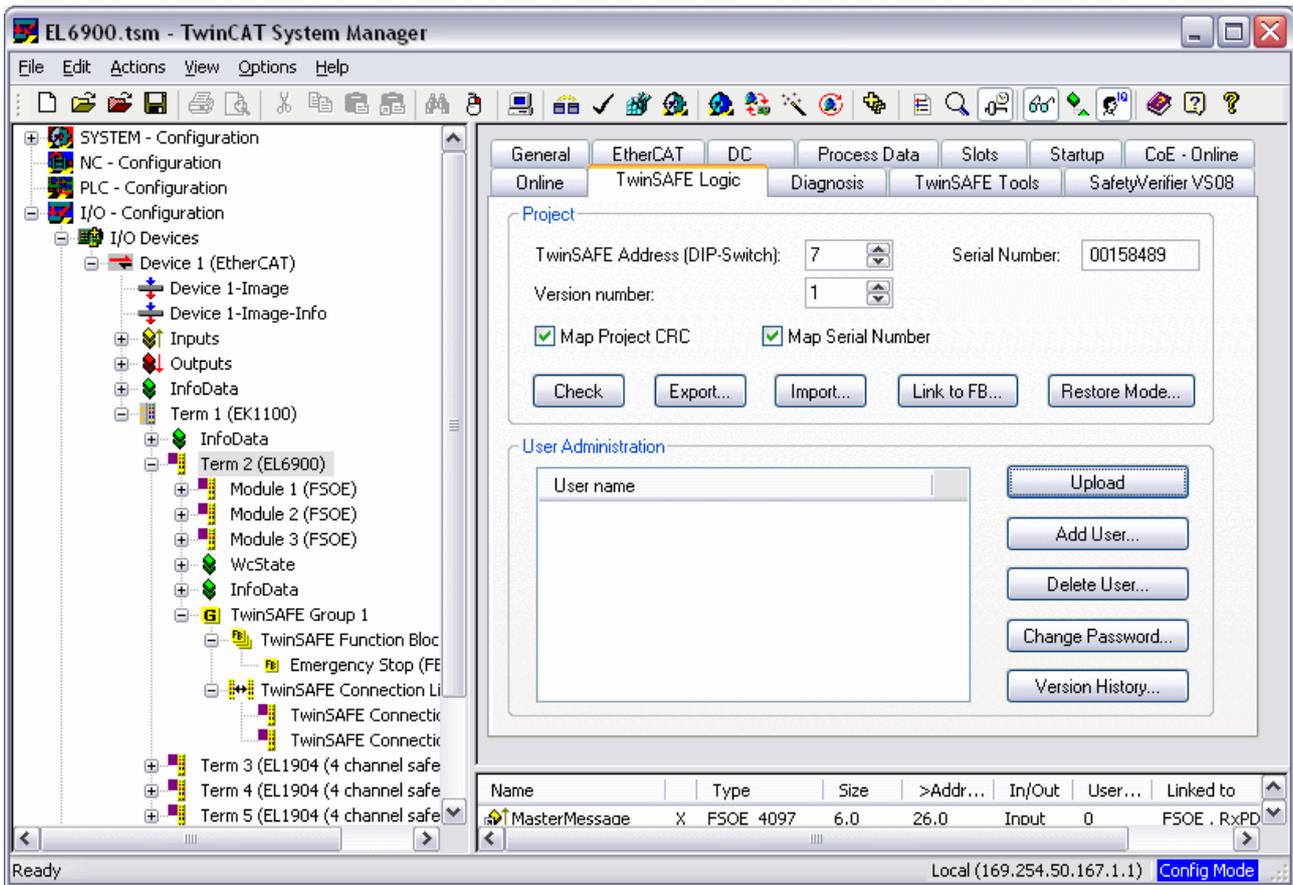
Fig. 16: Registering the TwinSAFE addresses in the TwinCAT automation software

5.3.7   Creating a TwinSAFE group

A TwinSAFE group is a group of TwinSAFE terminals (inputs and outputs) that are logically linked via an EL6930. Any communication faults in the TwinSAFE connections of this group lead to the whole group being switched off. Other TwinSAFE groups are not affected.

A TwinSAFE group is added by right-clicking on the associated EL6930 in the tree structure and selecting *Append TwinSAFE group* in the dialog box (see diagram).

BECKHOFF
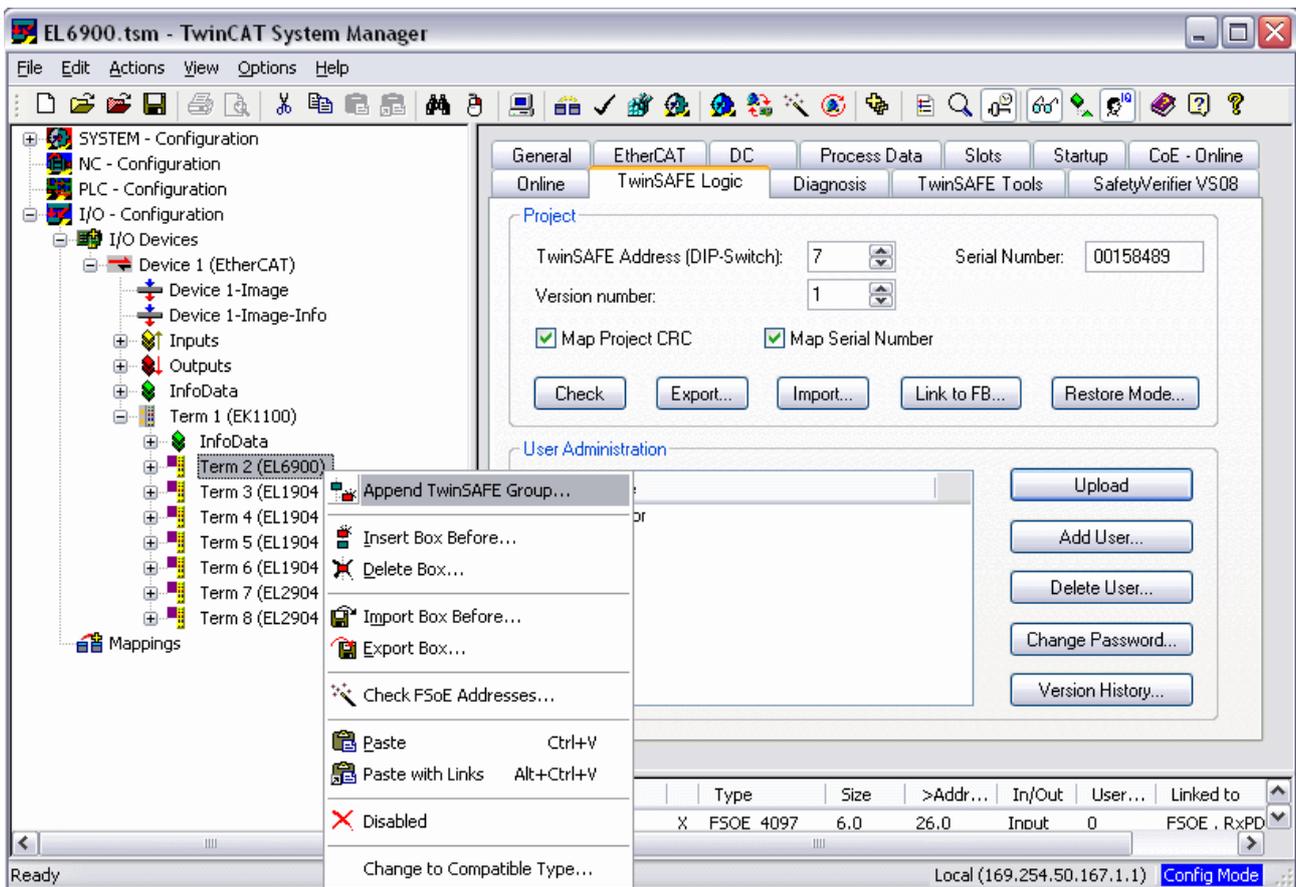
Fig. 17: Creating a TwinSAFE group

Version: 2.0.0

5.3.8 TwinSAFE group signals
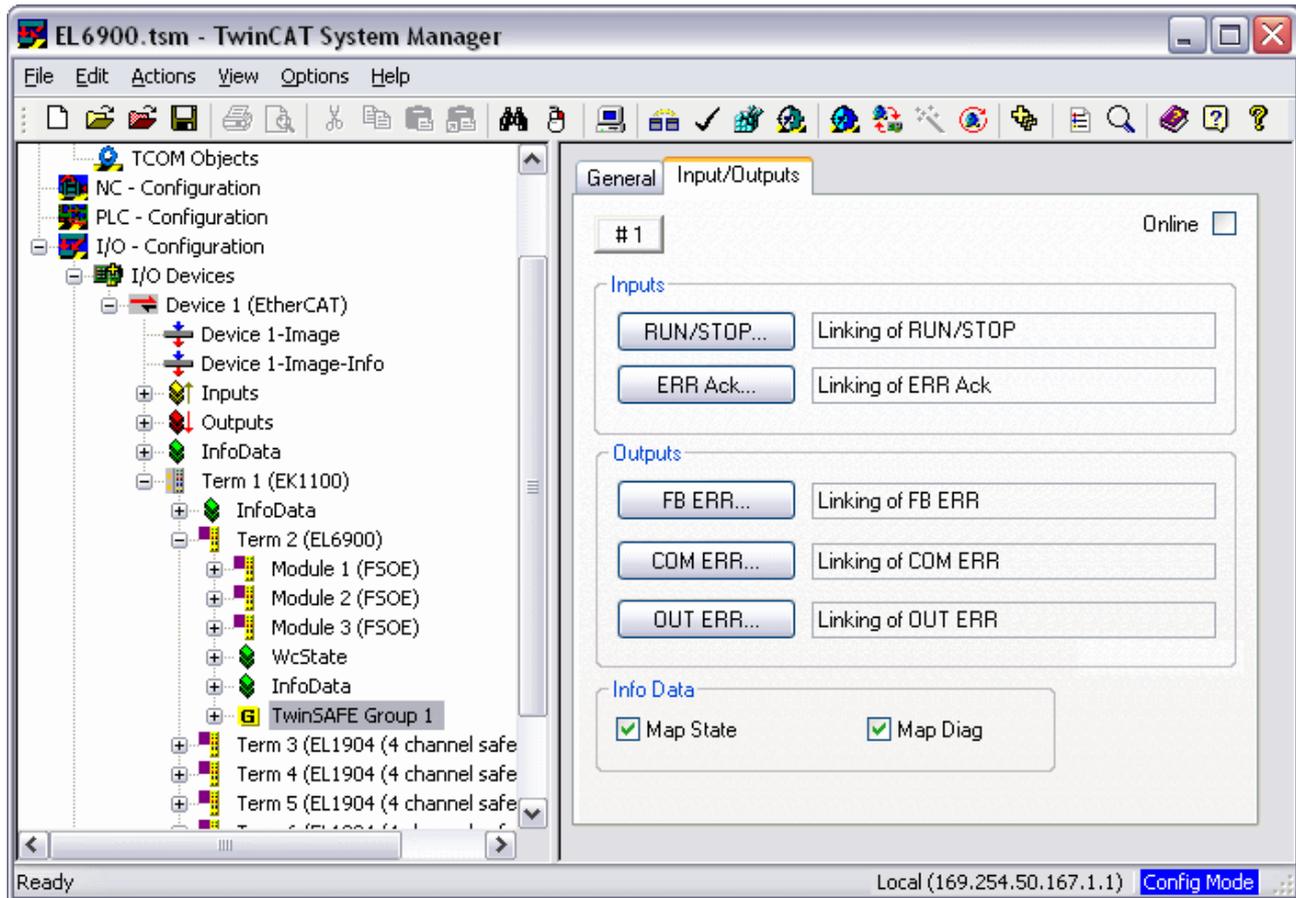
Fig. 18: TwinSAFE group signals

TwinSAFE group inputs

Name	Permitted type	Description	
RUN	FB-Out Standard-In	TRUE	The function blocks assigned to the TwinSAFE group are executed. When the input is not linked it is in the TRUE state
		FALSE	All of the TwinSAFE group assigned function blocks are at a STOP state and thus all associated outputs are in a safe state.
ERR Ack	FB-Out Standard-In	All pending errors in the assigned function blocks and in the TwinSAFE connections are acknowledged by the FALSE->TRUE->FALSE signal sequence.	

TwinSAFE group outputs

Name	Permitted type	Description	
FB ERR	TwinSAFE-Out FB-In Standard-Out	TRUE	At least one assigned function block has an error
		FALSE	All assigned function blocks have no errors
COM ERR	TwinSAFE-Out FB-In Standard-Out	TRUE	At least one TwinSAFE connection of TwinSAFE group has an error
		FALSE	All TwinSAFE connections of the TwinSAFE group have no errors
OUT ERR	TwinSAFE-Out FB-In Standard-Out	FALSE	Always FALSE, since the EL6930 has no local outputs

5.3.9   Append a function block

The TwinSAFE logic terminal features function blocks like Emergency Stop, Machine Monitoring, AND, OR, Decoupler, Operation Mode, etc.

A function block is added by right-clicking on the associated *TwinSAFE function block list* in the tree structure and selecting *Append Function Block* in the dialog box with the left mouse button (see diagram).
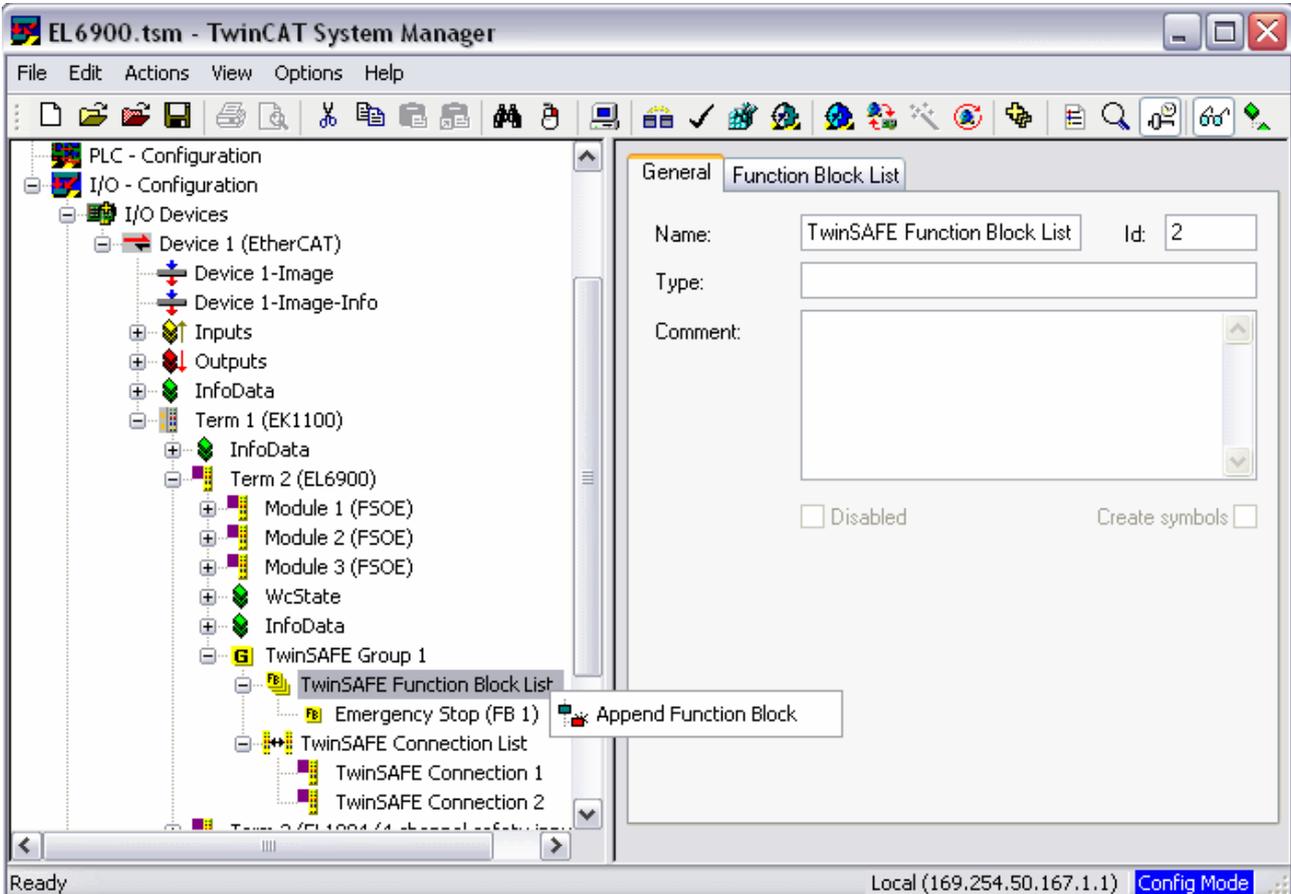
Fig. 19: Appending a function block

The required function block can then be selected from the following window.
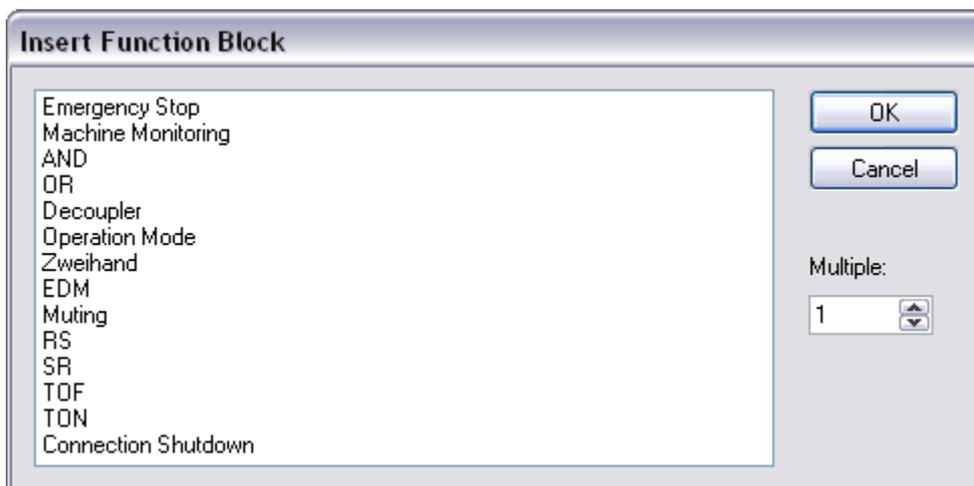
Fig. 20: Selection of the desired function block
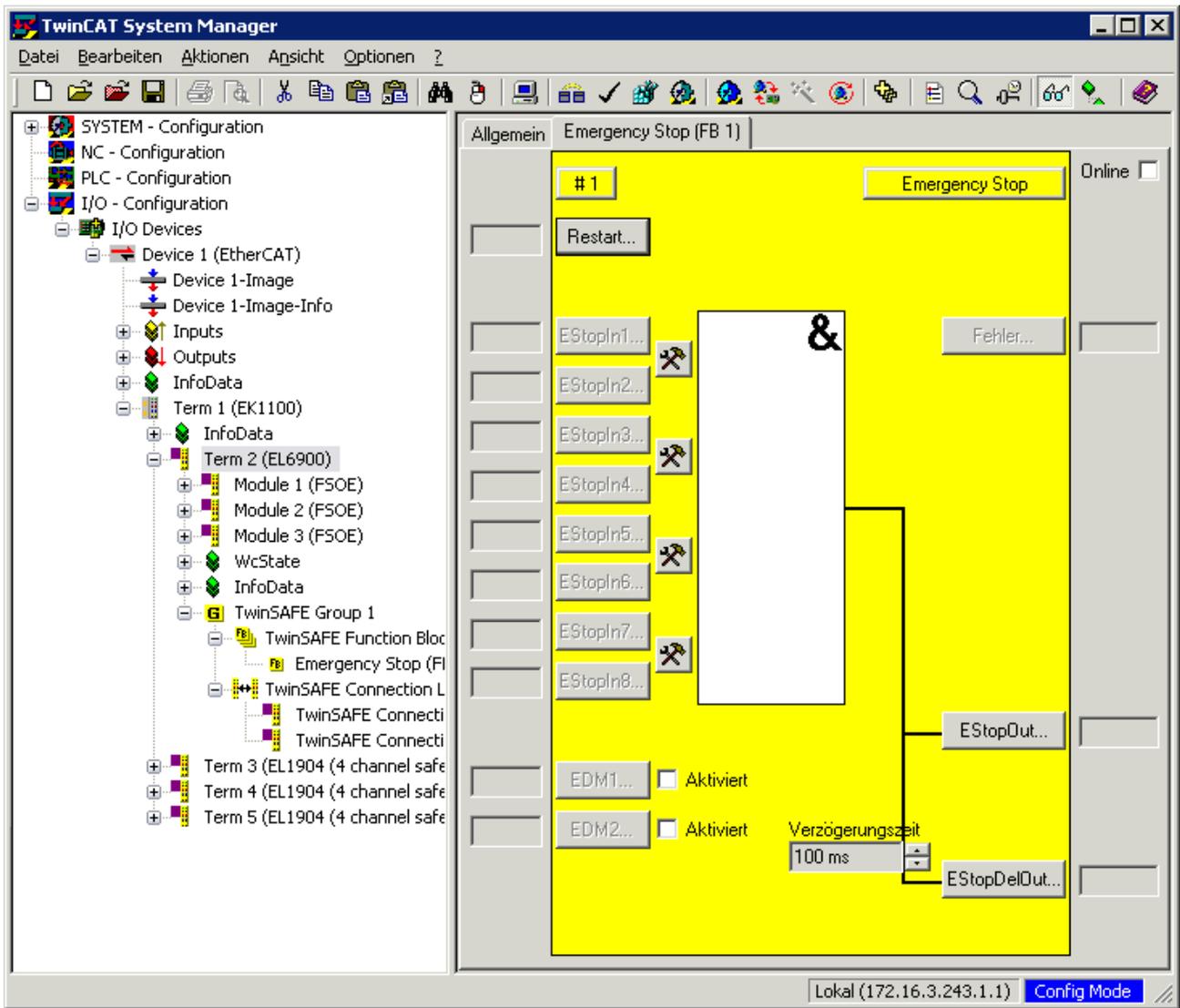
Fig. 21: Appended Emergency Stop block

5.3.9.1 Activating and configuring the block inputs
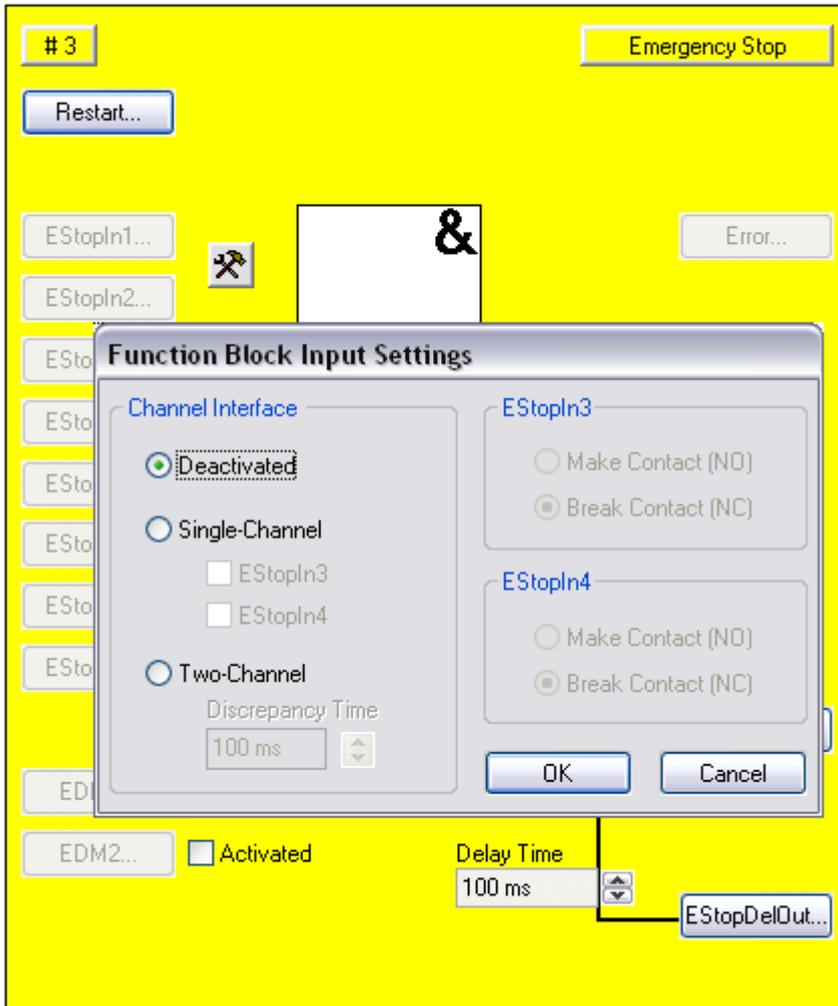
Fig. 22: Function Block Input Settings

The following parameters can be set:

Deactivated: The input is not used

Single-channel: The inputs are linked independent of each other

Two-channel: The inputs are monitored for equality or inequality, depending on the contact type setting. A *Discrepancy Time* can be set for monitoring the two inputs for simultaneous switching.

Make Contact: Contact type setting

Break Contact: Contact type setting

The inputs are now activated.
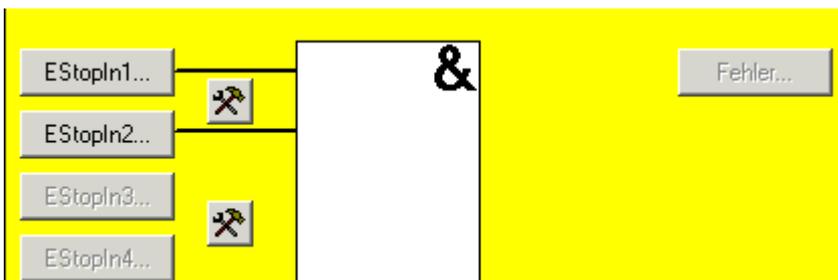
Fig. 23: Activated inputs

The inputs can now be linked.
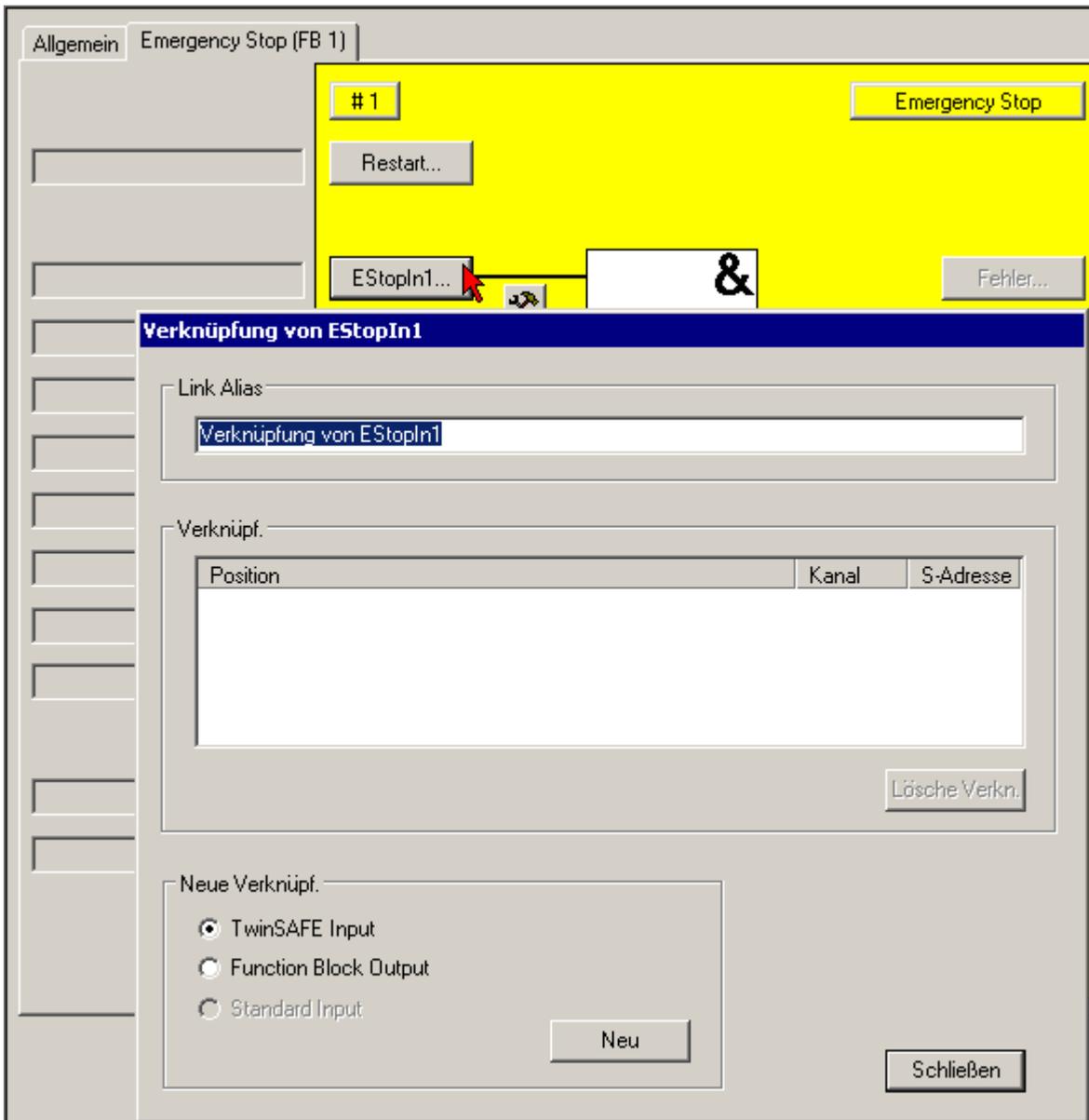
Fig. 24: Link inputs

Select the variable type:
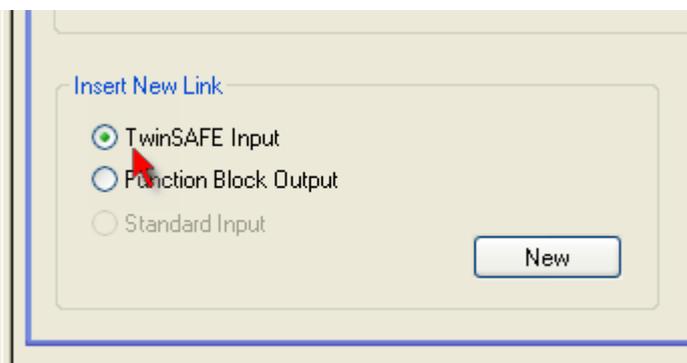
Fig. 25: Select the variable type

Clicking on the *New* button opens the following dialog:
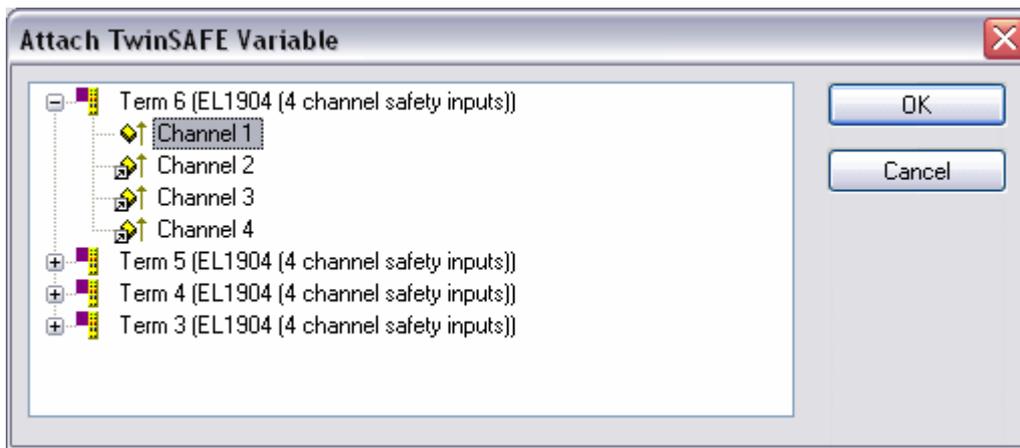
Fig. 26: Available channels

All available channels are displayed as selected.

The desired channel is selected and marked with the mouse. The selection is confirmed via the OK button.
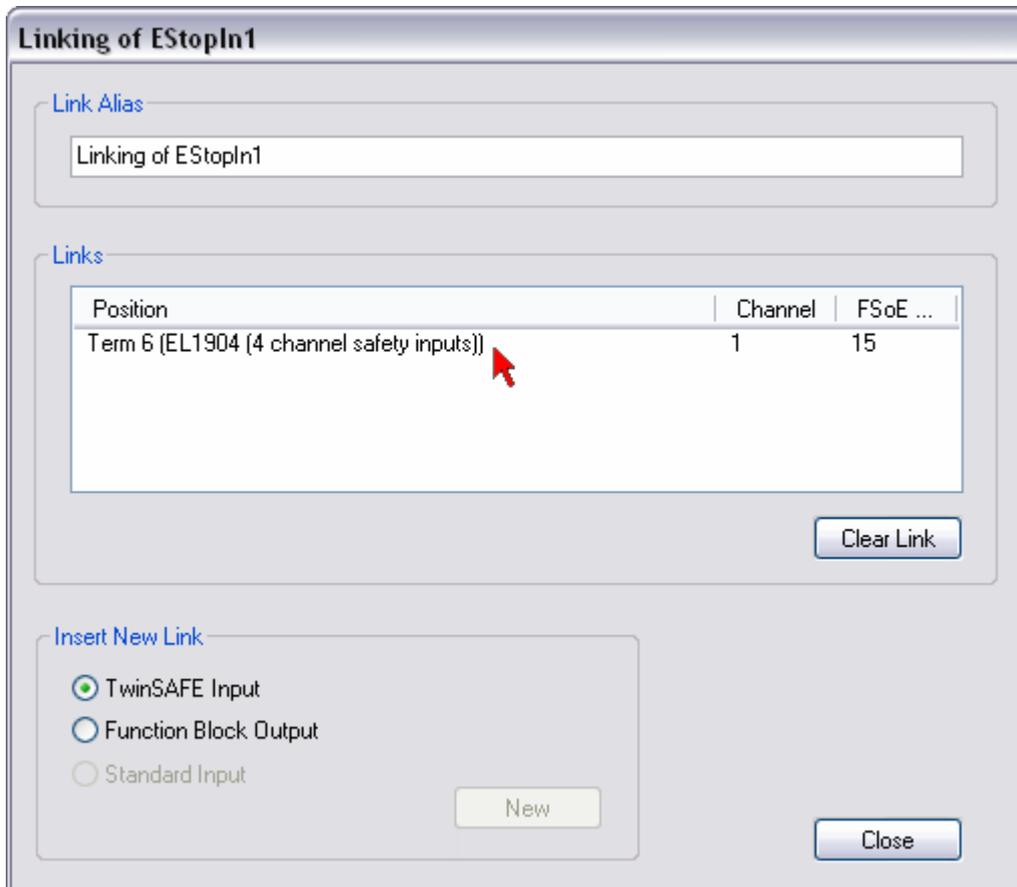
Fig. 27: Selection of the desired channel

The name of the variables should now be entered in the *Link Alias* field.
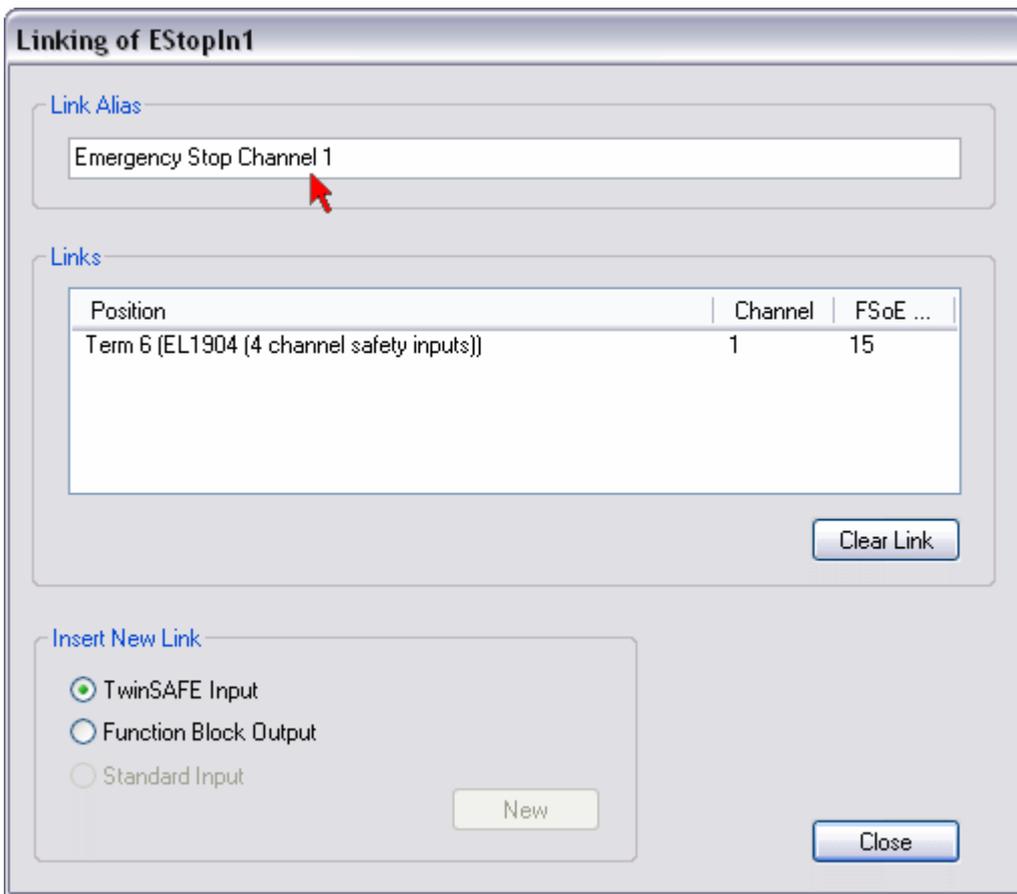
Fig. 28: Enter alias

Repeat the process for the other inputs. Inputs that are already in use are identified with an arrow.
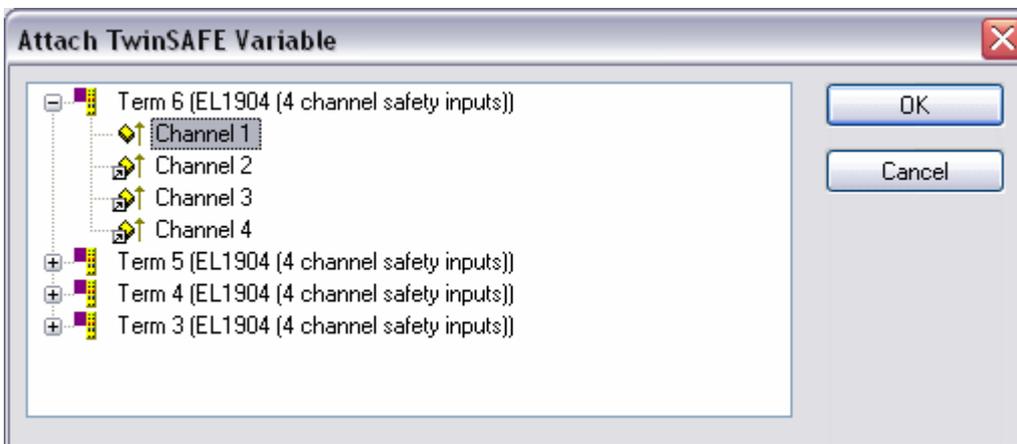
Fig. 29: Identification of inputs already in use

5.3.10   EL6930 user and version administration

The EL6930 has a user administration function. The user *Administrator* can't be deleted, but its default password can and should be changed into a customer specific one. This is to be done via the button Change Password. The default password is *TwinSAFE*. The new password has to be 6 characters long at minimum. Up to 8 further users can be created.
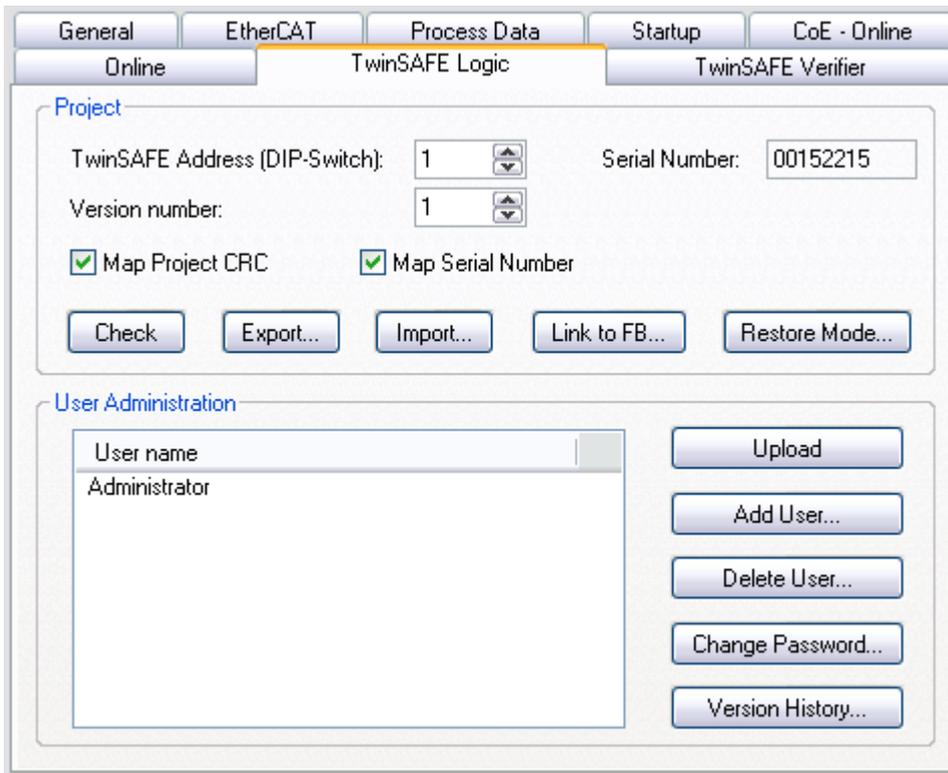
Fig. 30: EL6930 user administration

Clicking on the button *Version History* will bring up the version history for the EL6930 (which cannot be deleted) that indicates who activated what version of a project on the EL6930, and when.
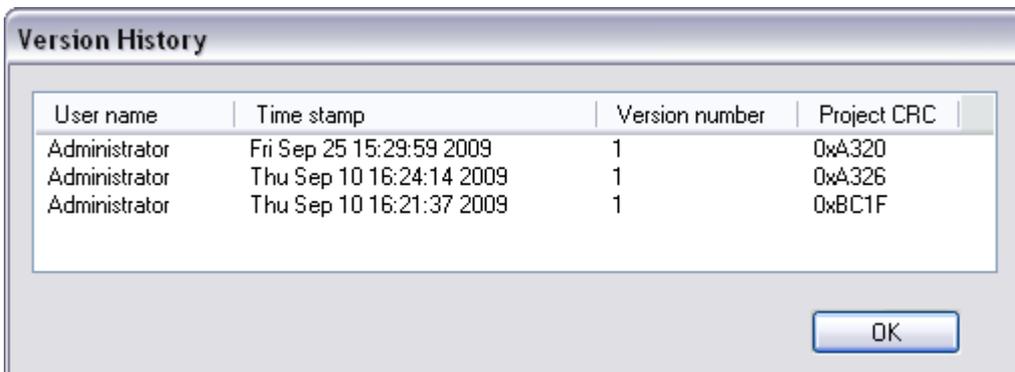
Fig. 31: Display of the version history

5.3.11 Loading the project into the EL6930

The project is loaded into the EL6930 via the fieldbus.

⚠ CAUTION
Use only qualified tools
Only use a qualified tool for loading, verifying and enabling the project on the EL6930!

Click the *Download* button on the *TwinSAFE Verifier* tab for loading the project.

The user must enter

- his user name (default: Administrator),
- the terminal serial number (printed on the outside, e.g. 197535), and
- his password (default: TwinSAFE).

ℹ **User name and password are case-sensitive**

Pay attention to upper/lower case characters for the user name and password.
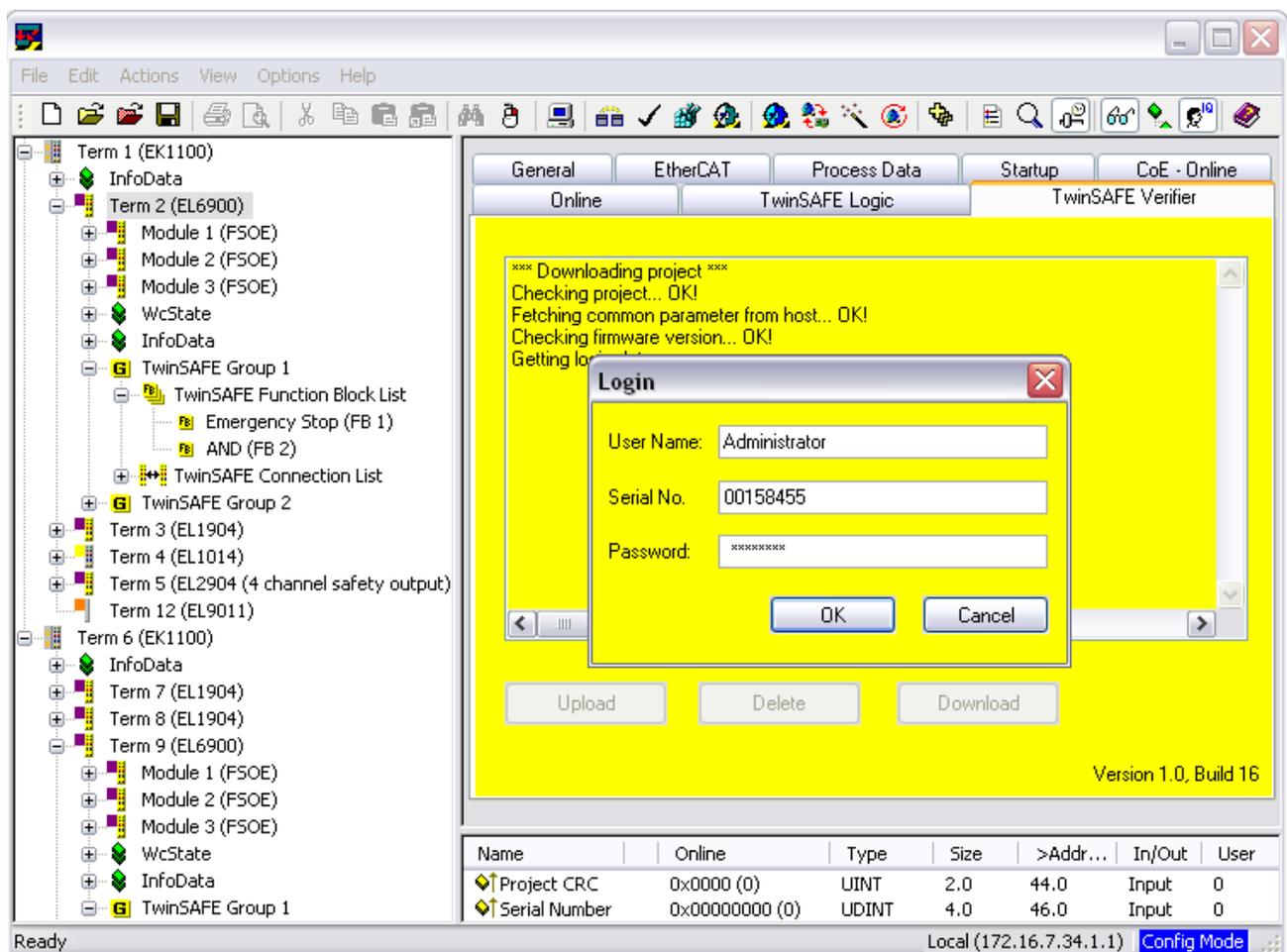
Fig. 32: Loading the project into the EL6930

The project is then displayed in text mode, and the user has to confirm consistency between the information displayed and the currently projected application by re-entering the password. The project is then started on the EL6930.

5.3.11.1 EL6930 project design limits

TwinSAFE connections	max. 127 (with 1 or 2 bytes safe user data per connection)
	max. 50 connections per TwinSAFE group
	Only 16 connections of an EL6930 can be slave connections.
PROFIsafe connections	1 PROFIsafe slave connection (must always be the first connection in the configuration)
Supported hardware for EL6930 TwinSAFE connections	EL1904 (all)
	EL2904 (all)
	EL2902 (all)
	KL1904 (from 2008)
	KL2904 (from 2008)
	KL6904 as slave (from 2008)
	AX5805 (all)
Safe data per connection	up to 14 bytes safe user data (correspondingly lower total number of connections)
TwinSAFE blocks	255 max.
TwinSAFE groups	32 max.
Standard PLC inputs	dynamic up to 255 bit
Standard PLC outputs	dynamic up to 255 bit

● **TwinSAFE connection**

i Only one TwinSAFE connection between two TwinSAFE terminals is possible. Between two EL6930 logic terminals a connection can be set up that may contain up to 14 bytes safe user data.

5.3.12   Communication between TwinCAT controllers

The MASTER_MESSAGE and SLAVE_MESSAGE data types are used for communication between two or more TwinCAT controllers via network variables.

Associated variables have to be created under Publisher and Subscriber on the communicating controllers.

During TwinSAFE communication one side acts as the master, the other one as the slave.

This results in the following data types:

TwinSAFE Master Publisher	MASTER_MESSAGE
TwinSAFE Master Subscriber	SLAVE_MESSAGE
TwinSAFE Slave Publisher	SLAVE_MESSAGE
TwinSAFE Slave Subscriber	MASTER_MESSAGE

The link with the TwinSAFE logic terminal is established with the following dialog.
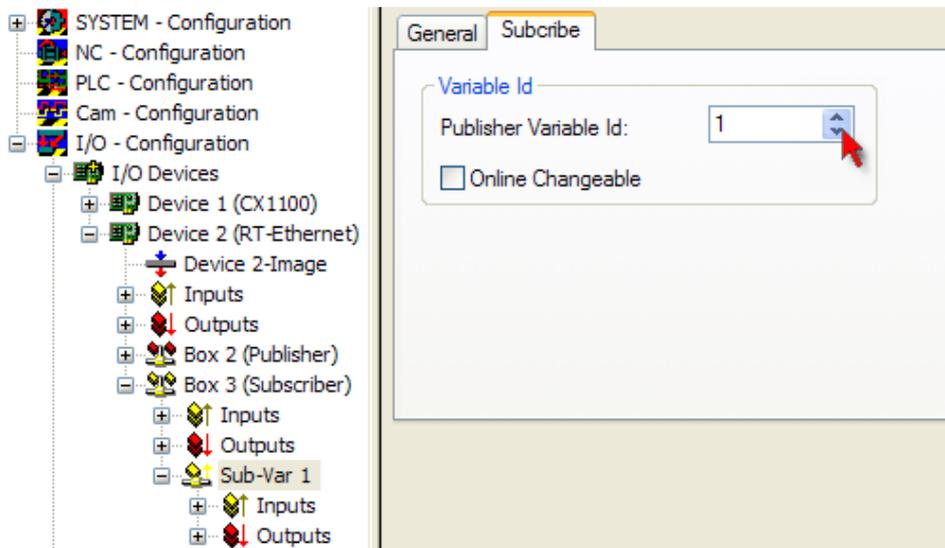
Fig. 33: Link with the TwinSAFE logic terminal

The connection created must now be made known to the TwinSAFE logic terminal. This is done by marking the TwinSAFE connection list and pressing the right mouse button.
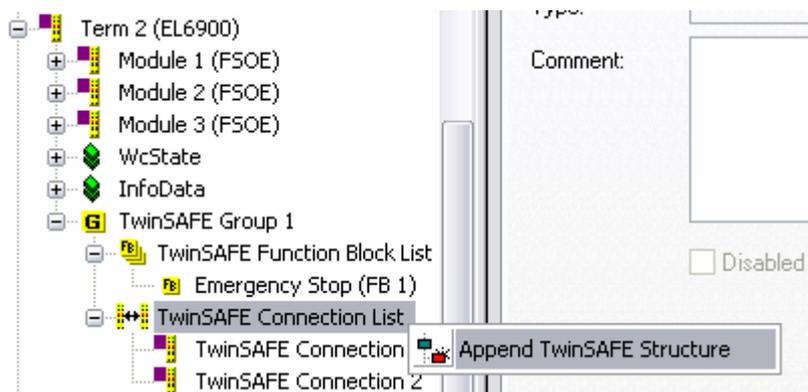
Fig. 34: Make known the connection created to the TwinSAFE logic terminal

Create a new connection in the list of connections and create associated variables of the required type under Module1 (FSoE).
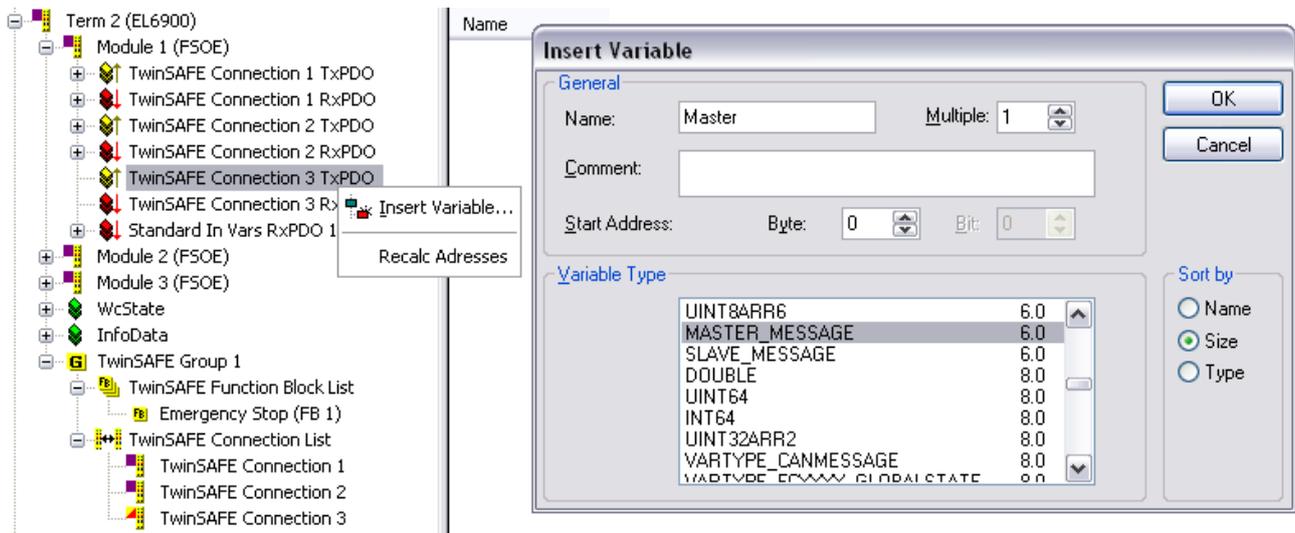
Fig. 35: Creation of a variable for the master message
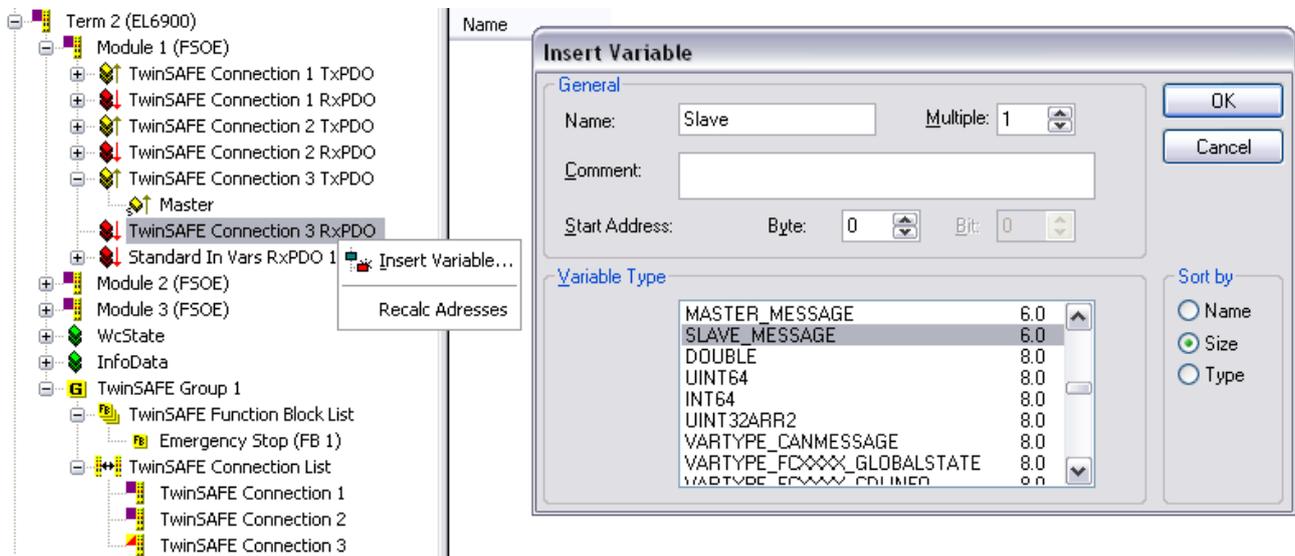
Fig. 36: Creation of a variable for the slave message

These newly-created variables are now linked with the network variables already created. This is carried out for both the master and the slave message.
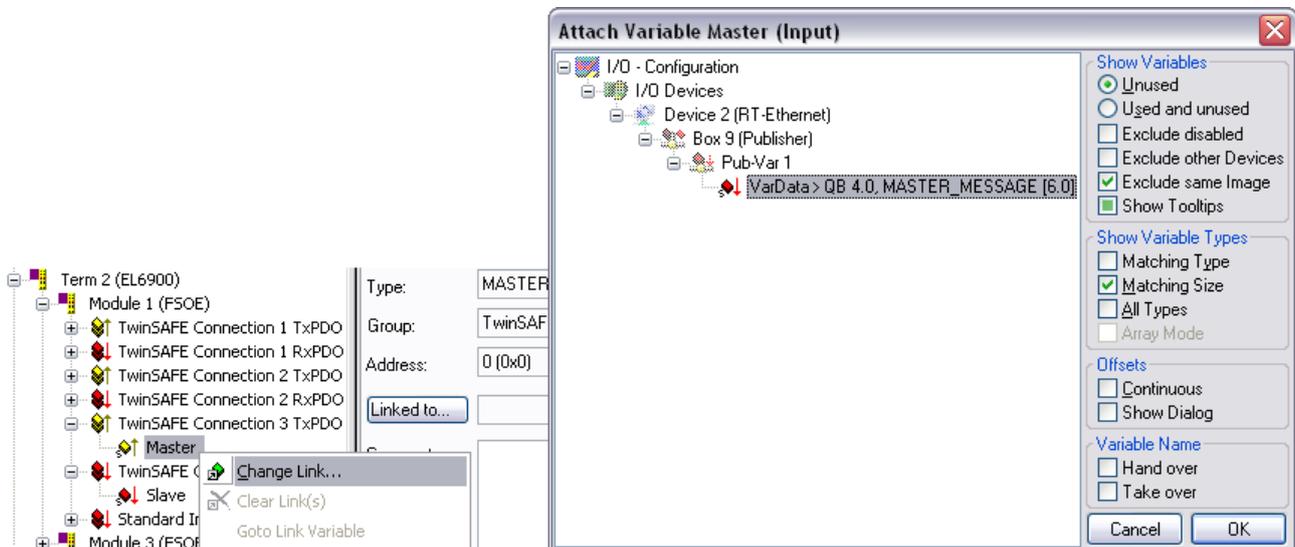
Fig. 37: Linking the variables

The settings for the TwinSAFE connection can then be set, including FSoE address, FSoE watchdog and the communication device type. In addition, the connection can be identified as FSoE master or FSoE slaves, and the information to be mapped in the cyclic process image can be specified.
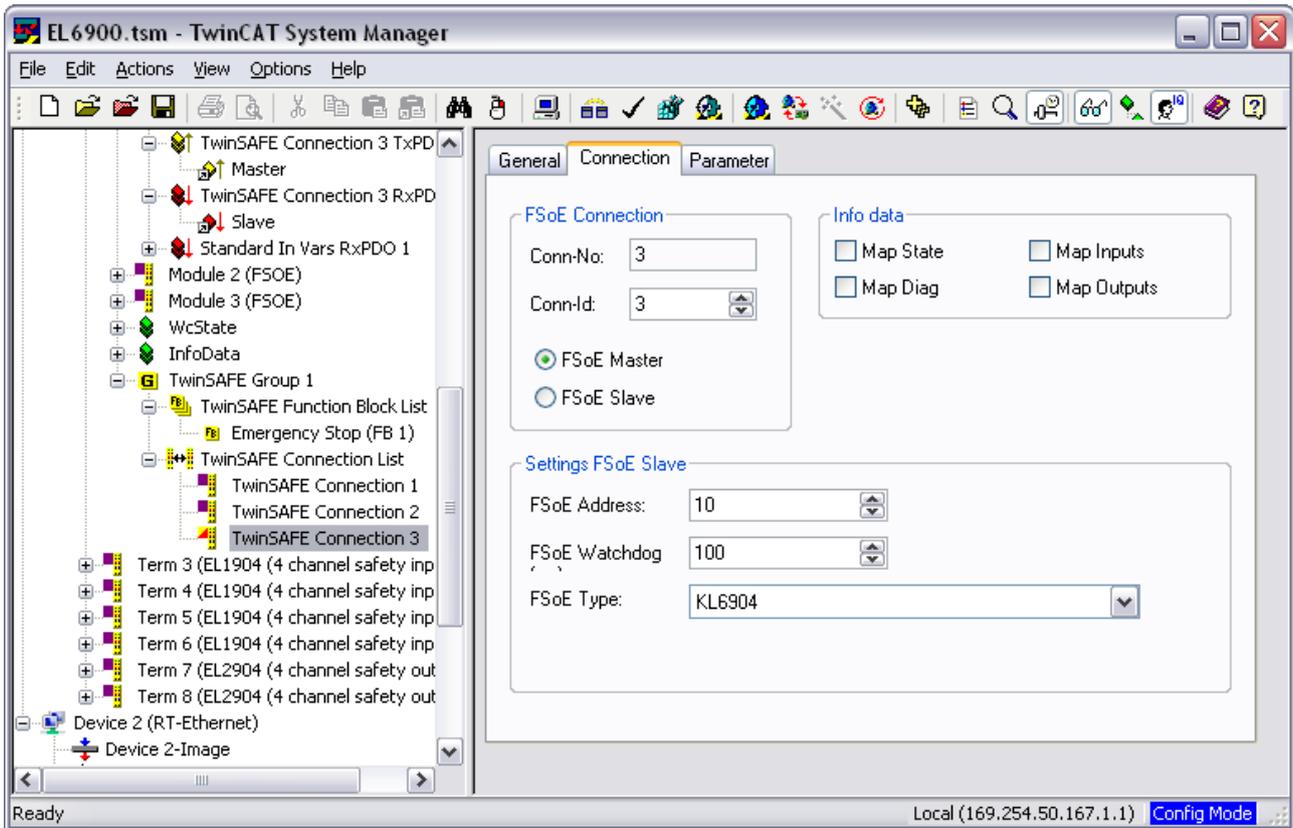
Fig. 38: Settings for the TwinSAFE connection

If several connections are to be established, a unique ID must be set for each Publisher variable.
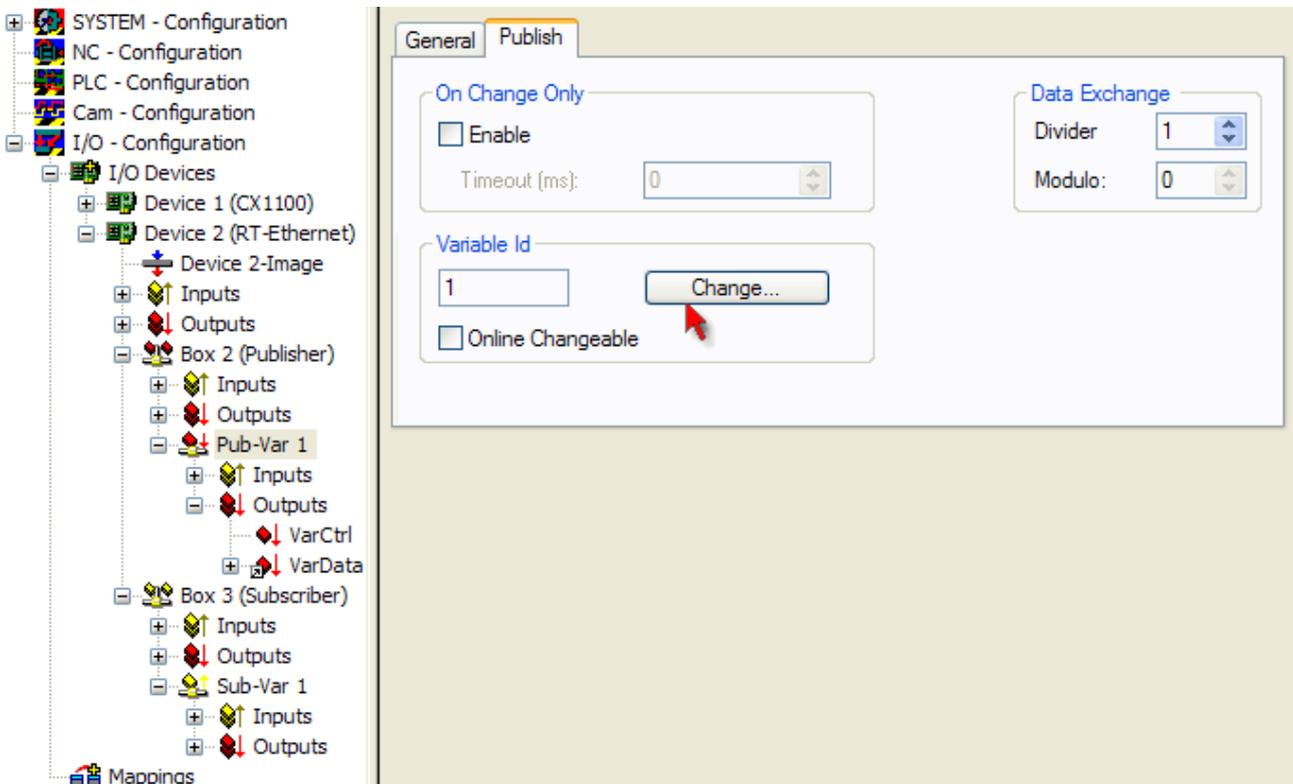
Fig. 39: Setting a unique ID

This ID must also be set on the partner device, i.e. the Subscriber.

The network variables can now be used in the project. The inputs are shown TwinSAFE Input, the outputs under TwinSAFE Output.
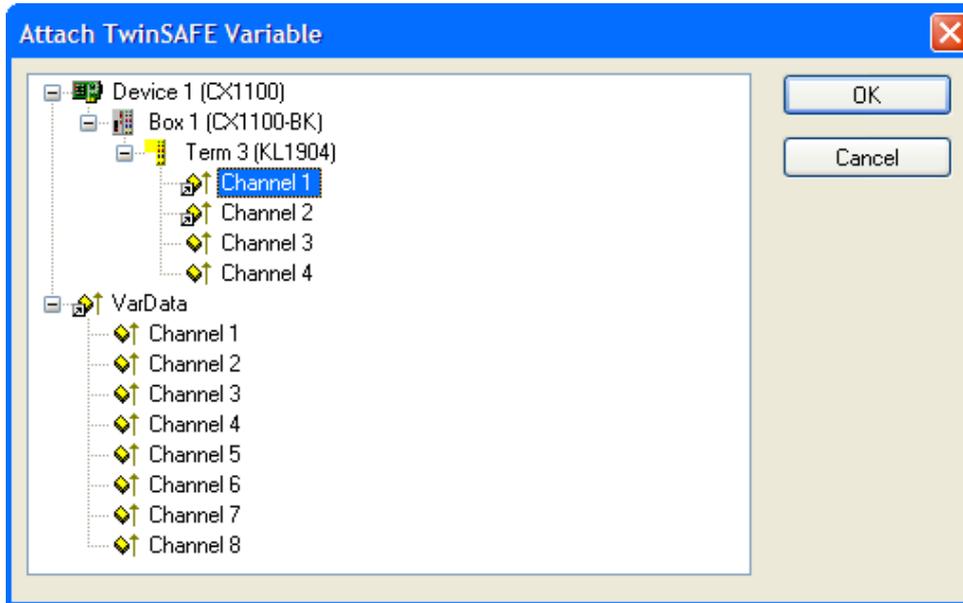
Fig. 40: Attach TwinSAFE variable for inputs
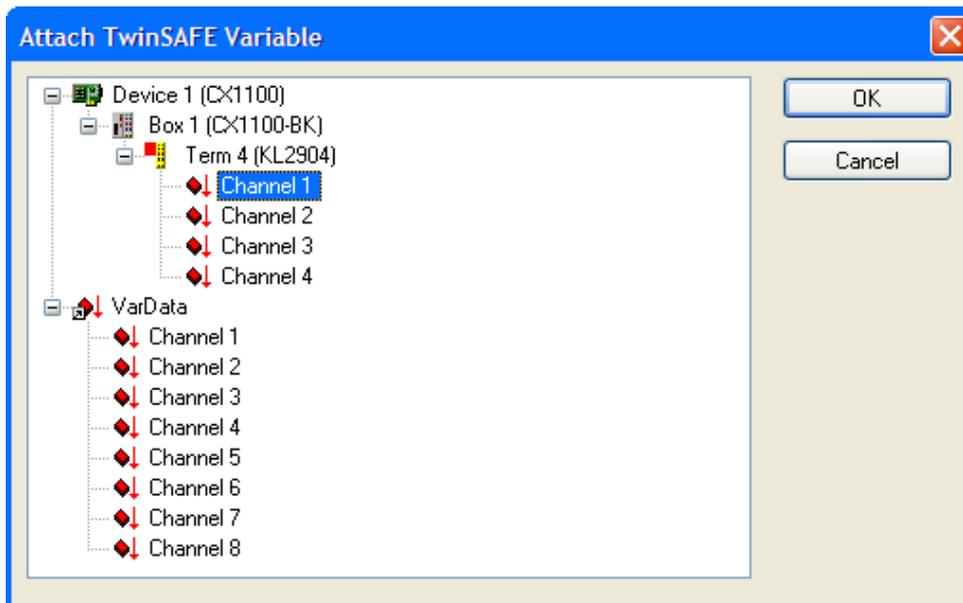
Fig. 41: Attach TwinSAFE variable for outputs

5.3.13   Creating the PROFIsafe slave connection

The EL6930 supports a PROFIsafe slave connection, which must always be created as the first

TwinSAFE connection. The procedure for this is as follows:

1. Append a TwinSAFE message structure to the TwinSAFE connection list of the first TwinSAFE Group:
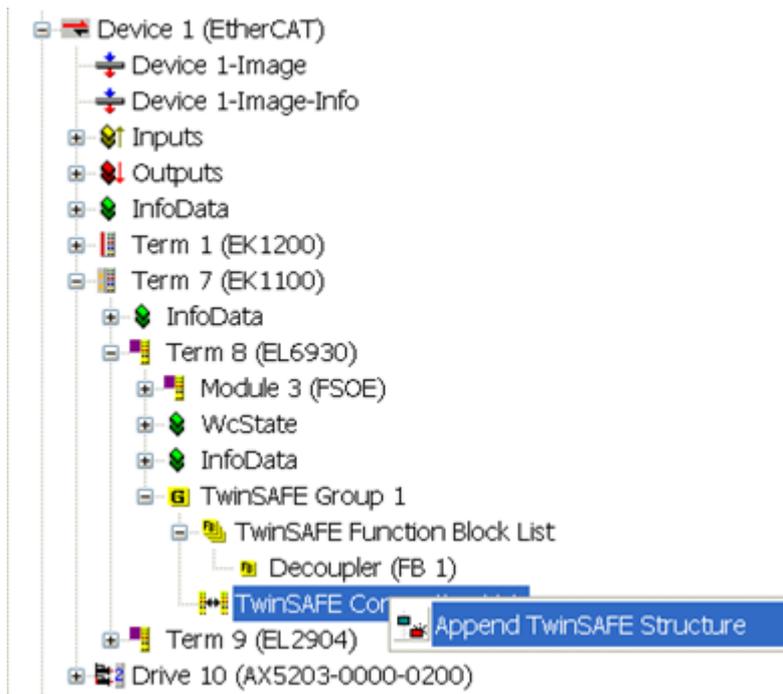
Fig. 42: Select TwinSAFE group

2. Insert the corresponding PROFIsafe message variable (VARTYPE_PROFISAFEMESSAGE_5 for a 5-byte PROFIsafe message (1 byte safe data), VARTYPE_PROFISAFEMESSAGE_6 for a 6-byte PROFIsafe message (2 bytes safe data), VARTYPE_PROFISAFEMESSAGE_8 for an 8-byte PROFIsafe message (4 bytes safe data)) on the first TxPDO under module 1 of the EL6930:
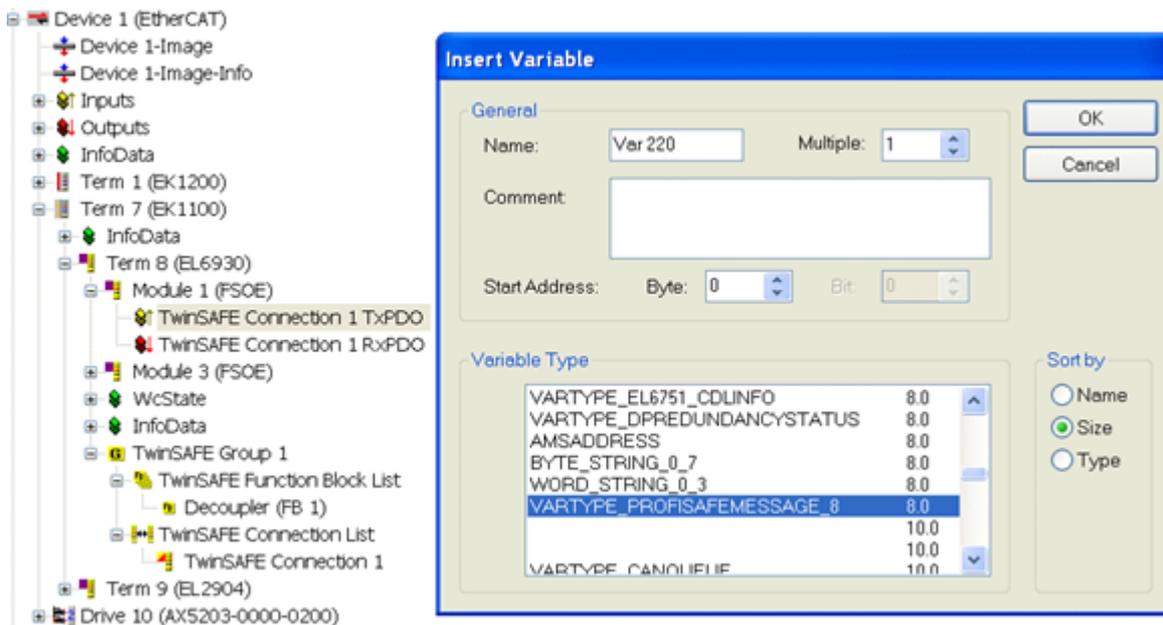
Fig. 43: Select PROFIsafe variable

3. Link the variable with the appropriate variable of the PROFIsafe module:

BECKHOFF
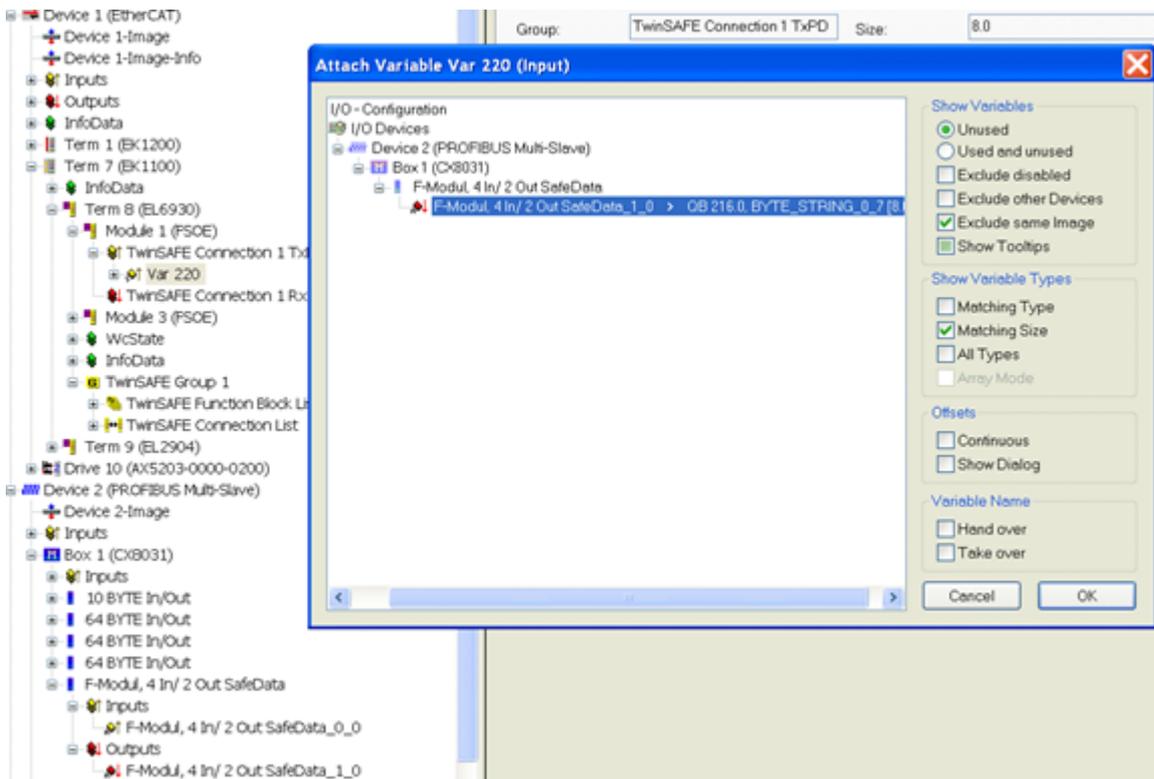
Fig. 44: Link PROFIsafe variable

4. Insert the corresponding PROFIsafe message variable on the first RxPDO under module 1 of the EL6930:
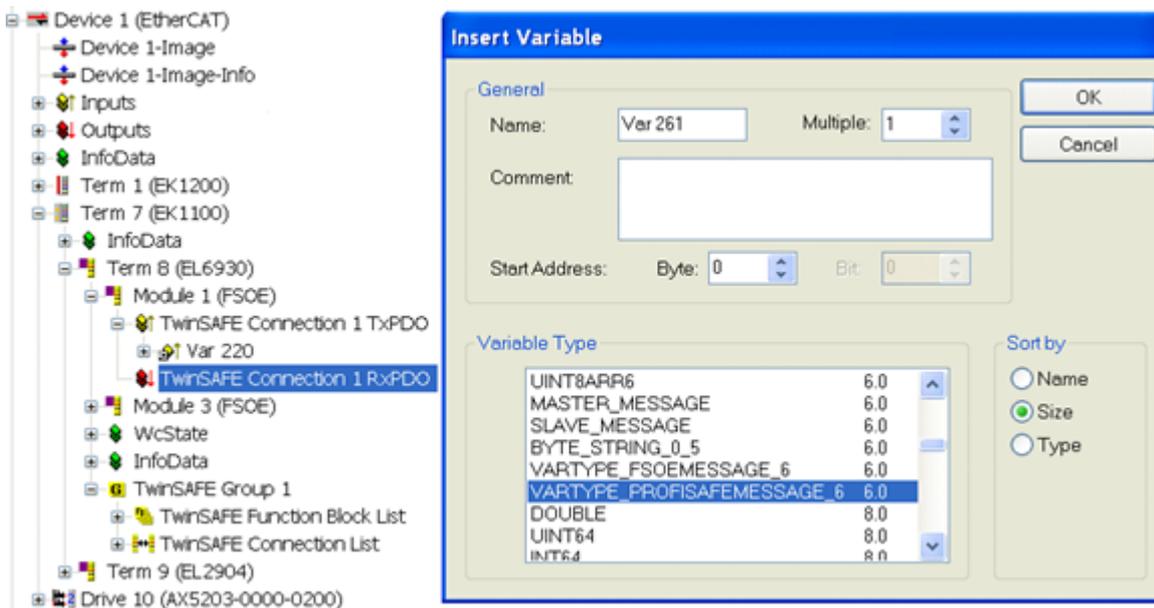
Fig. 45: Insert PROFIsafe message variable

5. Link the variable with the appropriate variable of the PROFIsafe module:
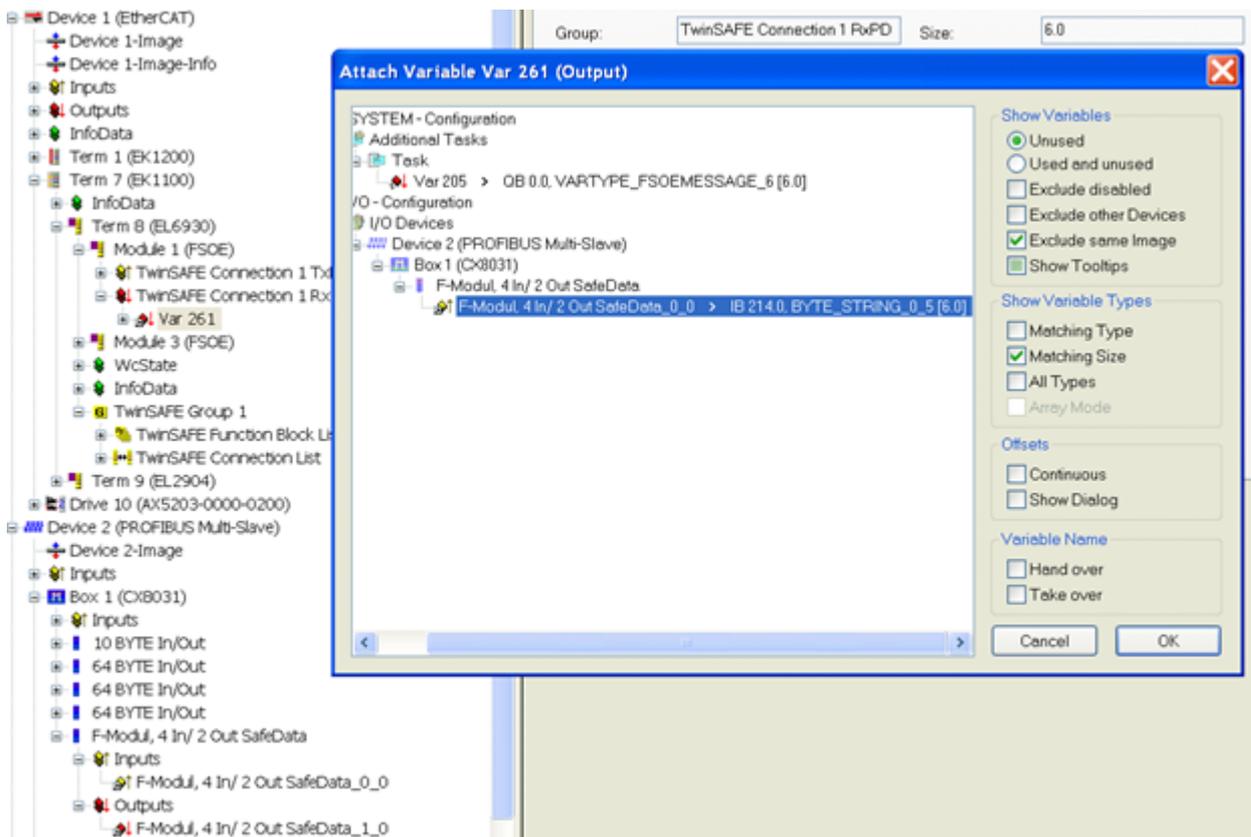
Fig. 46: Attach variable

6. Set the connection type PROFIsafe Slave on the Connection tab of the TwinSAFE connection added in step 1:
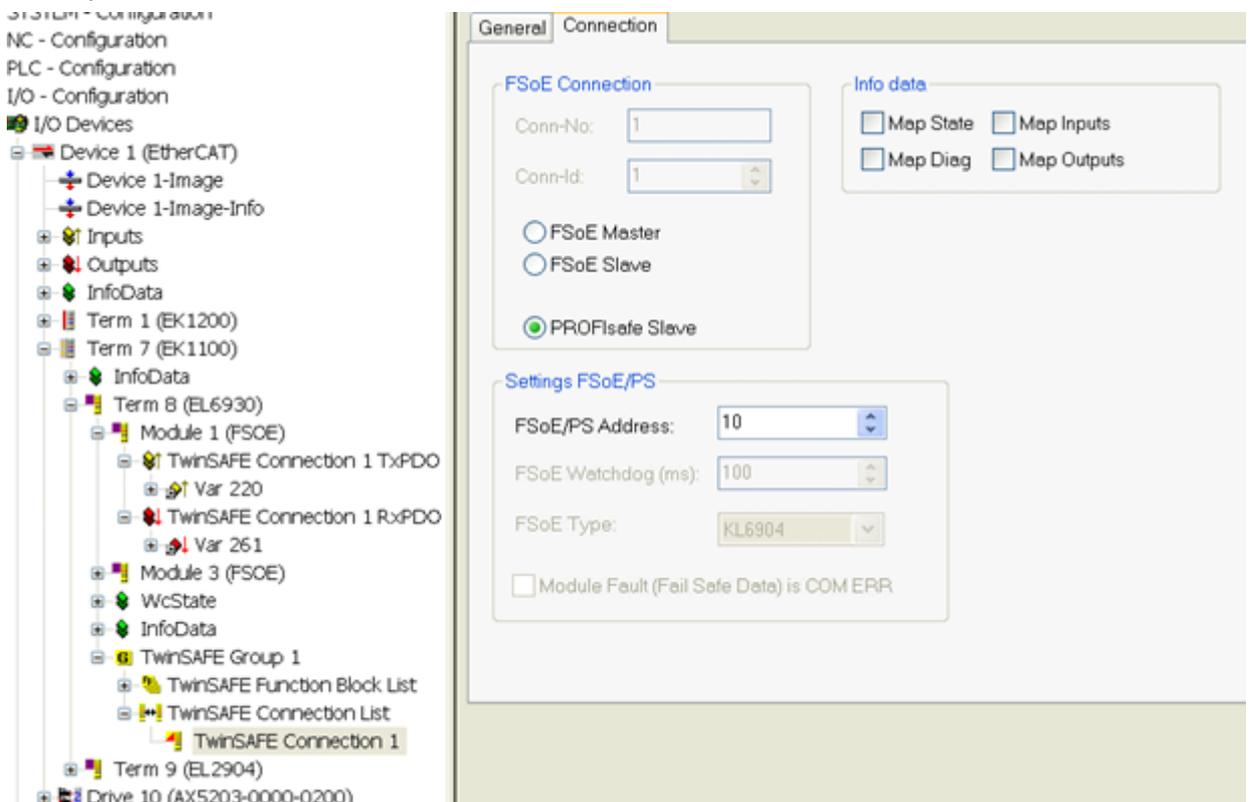
Fig. 47: Set connection type

5.4 Commissioning on Siemens F-CPU

5.4.1 Requirements

The requirement for the commissioning of the EL6930 with a PROFIsafe connection is a safety controller with PROFIBUS or PROFINET and with a certified PROFIsafe host. Furthermore the *Simatic Step7* program with the extension S7 *distributed Safety* is needed for the configuration.

5.4.2 Installing the EL6930 in Step7

So that the EL6930 is selectable later in the device catalogue, the device description file for PROFIBUS (GSD) or PROFINET (GSDML) must be installed first. This can be done in the Step7 program HW Config as follows:

Fig. 48: Installing the EL6930 in Step7

5.4.3 Configuration of the hardware

First of all the head station must be selected from the device catalogue of the HW Config (CX8031 with PROFIBUS is used here as an example).
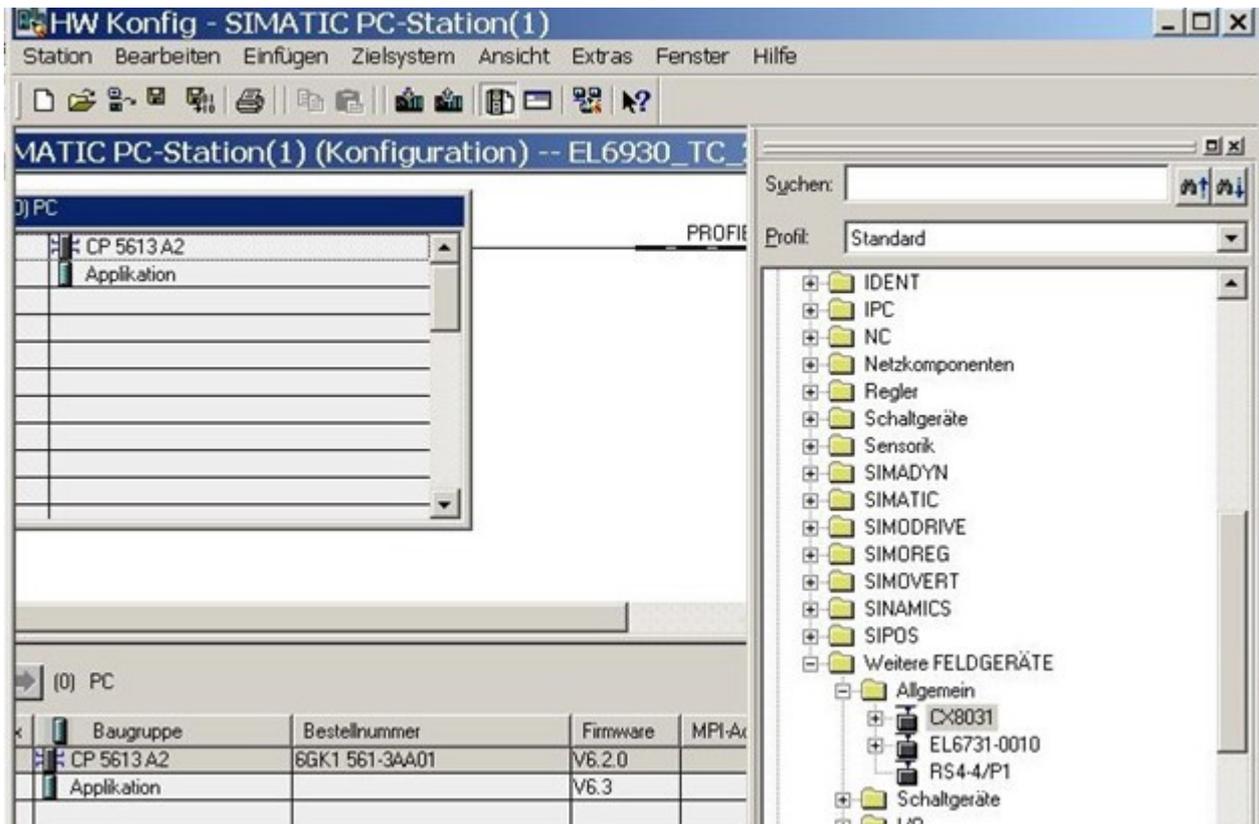
Fig. 49: HW Config Overview

The EL6930 presents itself to this head station as a normal module and can be added in the usual way.
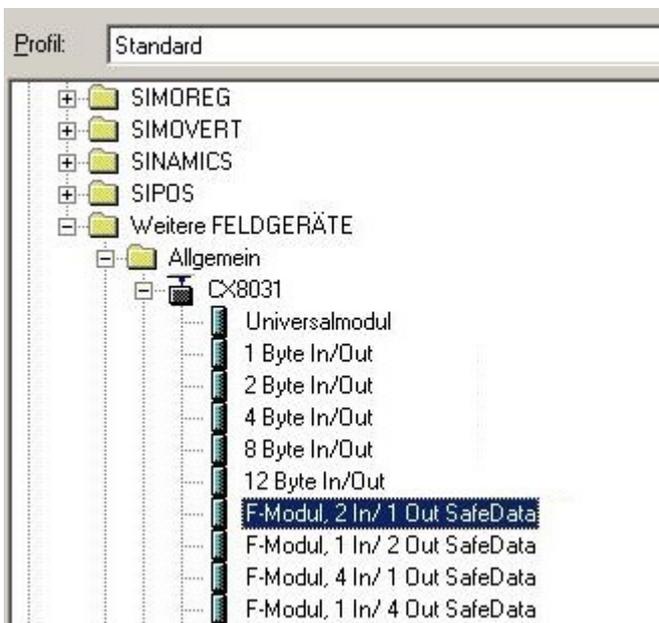
Fig. 50: Select EL6930
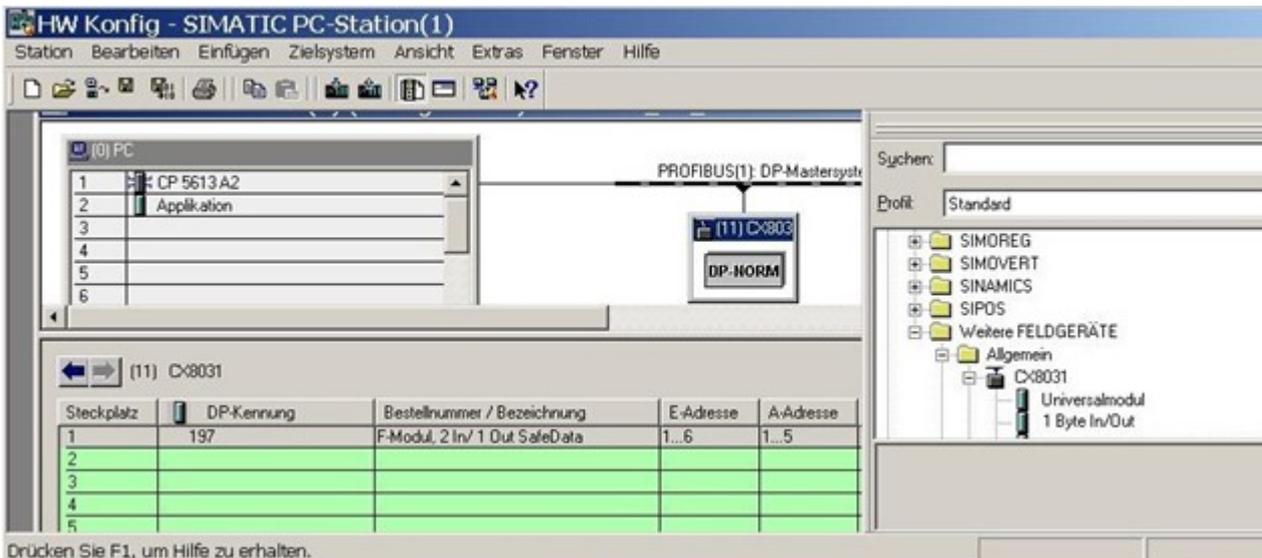
Fig. 51: HW Config

The F-parameters can be adjusted by double-clicking on the module.
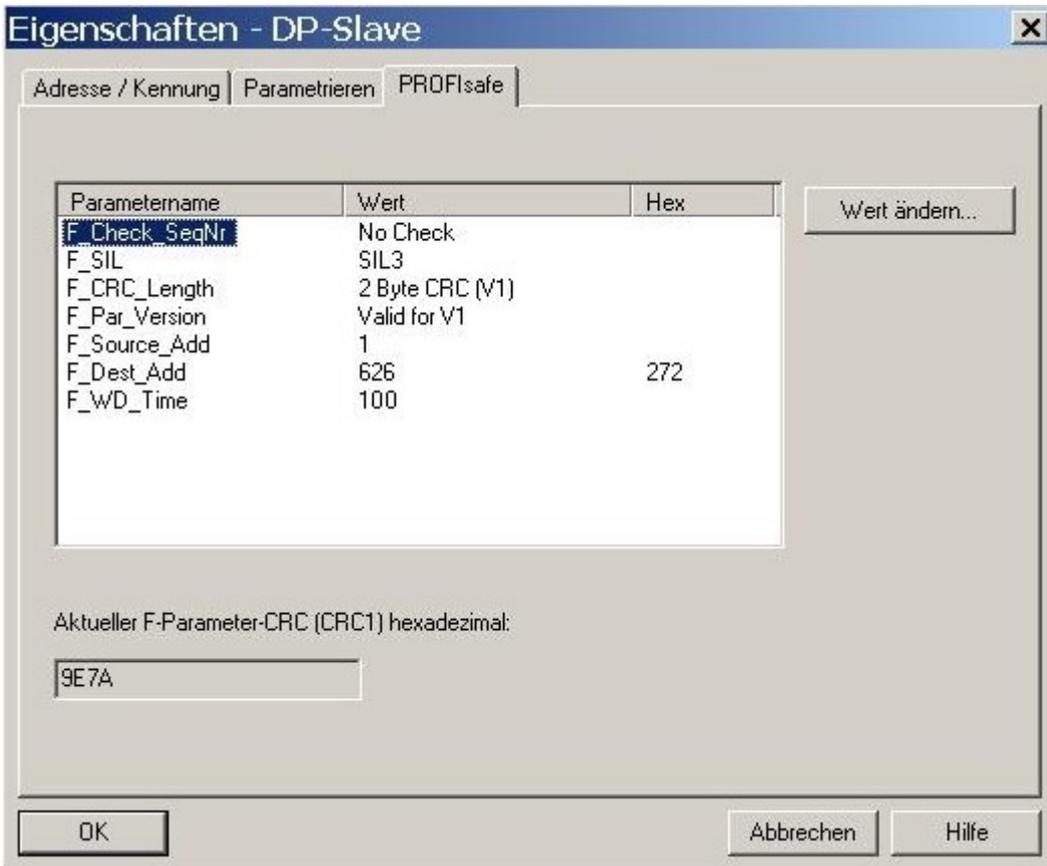
Fig. 52: F-parameters

5.4.3.1   F_Check_SeqNr

Valid only for PROFIsafe version 1. With this you can set whether or not the SeqNr is included in the CRC calculation of the PROFIsafe telegram (default is *No Check*).

5.4.3.2   F_SIL

Specification of the SIL level; the EL6930 always has SIL3.

5.4.3.3   F_CRC_Length

Length of the checksum in the PROFIsafe telegram; the EL6930 has a 2-byte checksum for PROFIsafe version 1 and a 3-byte checksum for version 2. This value must be consistent with the parameter F_PAR_Version.

5.4.3.4   F_PAR_Version

Indicates the version of the PROFIsafe connection. The EL6930 supports PROFIsafe versions 1 and 2. This value must be consistent with the parameter F_CRC_Length.

5.4.3.5   F_Source_Add

Address of the PROFIsafe host; this is specified by the configuration program.

5.4.3.6   F_Dest_Add

Address of the PROFIsafe device; this is assigned by the user and must be unique in the entire safety network.

5.4.3.7   F_WD_Time

This parameter sets the watchdog for the safety connection. The value must always be higher than the cycle time of the fieldbus, since it can take several fieldbus cycles before a PROFIsafe telegram is dispatched.

5.5 Diagnostics

5.5.1 Diagnostic LEDs

The LEDs Diag 1 to Diag 4 display diagnostic information for the EL6930.
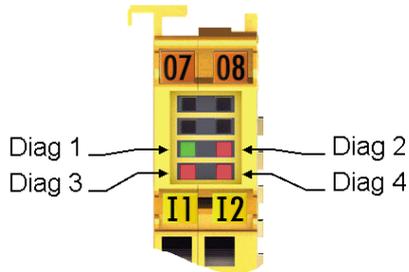
Fig. 53: EL6930 diagnostic LEDs

5.5.1.1 Diag 1 LED (green)

The Diag 1 LED is currently always on when a project is loaded into the terminal.

Display	Meaning
lit	A project is stored in the terminal.

5.5.1.2 Diag 2 LED (red)

The Diag 2 LED indicates internal process variable errors (in preparation).

Display	Meaning
-	in preparation

5.5.1.3 Diag 3 LED (red)

The Diag 3 LED provides further details for the Diag 4 LED (see below).

5.5.1.4 Diag 4 LED (red) if Diag 3 LED (red) is lit

If the Diag 3 LED is lit, the Diag 4 LED indicates internal terminal errors.

Diag 3 LED	Diag 4 LED	Source of error
lit	flashing	µC1
lit	off	µC2

● **Returning the terminal**

i These errors lead to the shutdown of the terminal (global fault). The terminal must be checked by Beckhoff Automation GmbH & Co. KG.

5.5.1.5 Diag 4 LED (red) if Diag 3 LED (red) is not lit.

If the Diag 3 LED is not lit, the Diag 4 LED indicates the state of the TwinSAFE terminal.

Diag 3 LED	Diag 4 LED: Flashing Code	Meaning
off	1 flash pulse (uniform flashing)	Function block error in one of the TwinSAFE groups
off	2 flash pulses (2 pulses with longer pause in between)	Communication error in one of the TwinSAFE groups
off	3 flash pulses (3 pulses with longer pause in between)	Function block and communication error in one of the TwinSAFE groups
off	Steadily lit	Supply voltage or internal temperature of the terminal outside the permissible range. The diagnostic object FA00hex provides you with more detailed information.

5.5.2 Diagnostic object

⚠ CAUTION
Do not change CoE objects!
Do not make any modifications to the CoE objects in the TwinSAFE components! Any modifications (e.g. using TwinCAT) of the CoE objects will permanently set the TwinSAFE components to the Fail-Stop state.

Index FA00$_{hex}$: Diagnostic object

The CoE object FA00$_{hex}$ displays further diagnostic information.

Index	Name	Meaning		Flags	Default
FA00:0	Diag	The following sub-indices contain detailed diagnostic information.		RO	
FA00:03	Temperature error	0005$_{hex}$	Maximum temperature exceeded	RO	0000$_{hex}$
		0006$_{hex}$	Temperature fell below minimum		
		0007$_{hex}$	Temperature difference between the measuring points exceeded		
	Supply error	0101$_{hex}$	max. supply voltage µC1 exceeded		
		0102$_{hex}$	max. supply voltage µC2 exceeded		
		0103$_{hex}$	voltage fell below min. supply voltage µC1		
		0104$_{hex}$	voltage fell below min. supply voltage µC2		

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5.5.3 Status LEDs

The LEDs State 1 to State 4 indicate the current status of the EL6930.
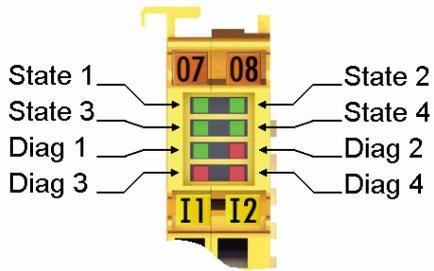
Fig. 54: EL6930 status LEDs

State 1	State 2	State 3	State 4	Meaning
off	off	off	lit	• No project present on the terminal
off	off	lit	lit	• Project present on the terminal • EtherCAT status: Pre-Operational (Pre-OP)
lit	lit	lit	lit	• Project present on the terminal • EtherCAT status: Operational (OP)

6   Service life

The TwinSAFE terminals are designed for a service life of 20 years.

Due to the high diagnostic coverage within the lifecycle no special proof tests are required.

The TwinSAFE terminals bear a date code, which is composed as follows:

Date code: CW YY SW HW

Legend:	Sample: Date Code 17 11 05 00
CW: Calendar week of manufacture	Calendar week: 17
YY: Year of manufacture	Year: 2011
SW: Software version	Software version: 05
HW: Hardware version	Hardware version: 00

In addition the TwinSAFE terminals bear a unique serial number.
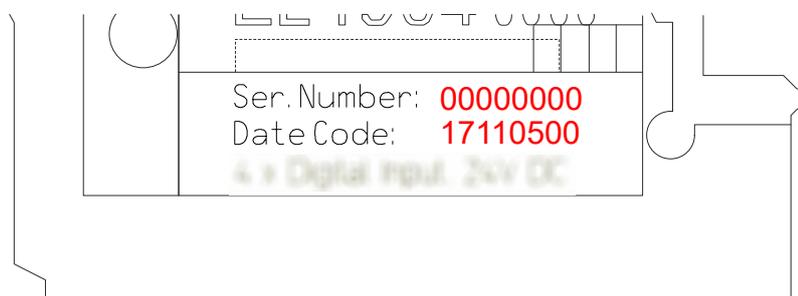
Fig. 55: Unique serial number of a TwinSAFE terminal

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7 Maintenance and cleaning

● **Cleaning by the manufacturer only**

i Do not operate the TwinSAFE component if it is impermissibly dirty according to protection class IP20. Send impermissibly dirty TwinSAFE components to the manufacturer for cleaning.

TwinSAFE components are basically maintenance-free.

8 Decommissioning

8.1 Disposal

NOTE
Correct disposal
Observe the applicable national laws and guidelines for disposal.
Incorrect disposal may result in environmental damage.

Remove the TwinSAFE component for disposal.

Depending on your application and the products used, make sure that the respective components are disposed of properly:

Cast iron and metal

Hand over cast iron and metal parts to scrap metal recycling.

Cardboard, wood and polystyrene

Dispose of packaging materials made of cardboard, wood or Styrofoam in accordance with regulations.

Plastic and hard plastic

You can recycle parts made of plastic and hard plastic via the waste management center or reuse them in accordance with the component regulations and markings.

Oils and lubricants

Dispose of oils and lubricants in separate containers. Hand over containers to the waste oil collection point.

Batteries and accumulators

Batteries and accumulators may also be marked with the crossed-out wheeled garbage can symbol. You must separate these components from waste. You are legally obliged to return used batteries and accumulators within the EU. Outside the validity of the EU Directive 2006/66/EC, observe the respective regulations.

8.1.1 Returning to the vendor

In accordance with the WEEE-2012/19/EU directives, you can return used devices and accessories for professional disposal. The transport costs are borne by the sender.

Send the used devices with the note "For disposal" to:

Beckhoff Automation GmbH & Co. KG
Gebäude „Service"
Stahlstraße 31
D-33415 Verl

In addition, you have the option to contact a local certified specialist company for the disposal of used electrical and electronic appliances. Dispose of the old components in accordance with the regulations applicable in your country.

9   Appendix

9.1   Volatility

If there are requirements concerning the volatility of products in your application, for example of the U.S. Department of Defense or similar authorities or security organizations, the following process applies:

The product has both volatile and non-volatile components. Volatile components lose their data immediately after removing power. Non-volatile components keep the data even after loss of power.

If there is customer specific data saved on the product, it cannot be ensured that this data might not be restored through for example forensic measures, even after the data is deleted through the provided tool chain. If this data is confidential, the scrapping of the product after usage is recommended to protect this data.

9.2 Focus of certificates

The most decisive document for certified components of the TwinSAFE department is the EC type examination certificate. The document contains both the test coverage and the regarded component and component family.

The current certificates of all TwinSAFE components with the underlying standards and directives can be found at https://www.beckhoff.com/en-en/support/download-finder/certificates-approvals/.

If the document refers only to the first four figures of a product (ELxxxx), the certificate is valid for all available variants of the component (ELxxxx-abcd). This is applicable for all components like EtherCAT Terminals, EtherCAT Boxes, EtherCAT plug-in modules and Bus Terminals.

EC-Type Examination Certificate

No. M6A 062386 0055 Rev. 01

Holder of Certificate:	Beckhoff Automation GmbH & Co. KG Hülshorstweg 20 33415 Verl GERMANY
Product:	Safety components
Model(s):	EL1918
Parameters:	Supply voltage: 24VDC (-15%/+20%) Ambient temperature: -25°C...+55°C Protection class: IP20

This EC Type Examination Certificate is issued according to Article 12(3) b or 12(4) a of Council Directive 2006/42/EC relating to machinery. It confirms that the listed Annex-IV equipment complies with the principal protection requirements of the directive. It refers only to the sample submitted to TÜV SÜD Product Service GmbH for testing and certification. For details see: www.tuvsud.com/ps-cert

Test report no.:	BV99670C

If you regard the example EL1918 in the picture, the certificate is valid for both the EL1918 and the available variant EL1918-2200.

9.3   Certificate

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EG-Konformitätserklärung
EC Declaration of Conformity

Nummer: 2017043EL6930-2, Datum: 31.07.2017
Number, Date

Hersteller
Manufacturer

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20, 33415 Verl, Germany

erklärt, dass das Produkt
declares that the product

TwinSAFE EL6930
TwinSAFE-Logic-Klemme mit PROFIsafe Gateway
TwinSAFE Logic Terminal with PROFIsafe gateway

Sicherheitsbauteil nach EG-Richtlinie 2006/42/EG, Anhang IV
safety component according to EC directive 2006/42/EC, annex IV

den einschlägigen Bestimmungen der Maschinenrichtlinie 2006/42/EG entspricht.
complies with the relevant requirements of the machinery directive 2006/42/EC.

Angewandte Normen
Applied Standards

EN 62061:2005+A1:2013

Sicherheit von Maschinen – Funktionale Sicherheit sicherheitsbezogener elektrischer, elektronischer und programmierbarer elektronischer Steuerungssysteme
Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems

EN61131-2:2007

Speicherprogrammierbare Steuerungen - Teil 2: Betriebsmittelanforderungen und Prüfungen
Industrial-process control systems - Instruments with analogue inputs and two- or multi-state outputs - Part 2: Guidance for inspection and routine testing

EN 50581:2012

Technische Dokumentation zur Beurteilung von Elektro- und Elektronikgeräten hinsichtlich der Beschränkung gefährlicher Stoffe
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

EN ISO 13849-1:2015

Sicherheit von Maschinen – Sicherheitsbezogene Teile von Steuerungen
Safety of machinery – Safety-related parts of control systems

EN 61000-6-2:2011

Elektromagnetische Verträglichkeit (EMV) – Störfestigkeit für Industriebereiche
Electromagnetic compatibility (EMC) – Immunity for industrial environments

EN 61000-6-4:2011

Elektromagnetische Verträglichkeit (EMV) - Störaussendung für Industriebereiche
Electromagnetic compatibility (EMC) - Emission standard for industrial environments

Die Übereinstimmung eines Baumusters des bezeichneten Produkts mit der EG-Richtline wurde bescheinigt von
The accordance of a production sample of the designated product with the EC directive is certified by

Benannte Stelle
Notified body

TÜV SÜD Product Service GmbH
Ridlerstraße 65, 80339 München, Germany

EG-Baumusterprüfbescheinigung
EC-type examination certificate

M6A 17 07 62386 043, 28.07.2017

Verantwortlich für die Zusammenstellung der technischen Unterlagen
Responsible for the compilation of technical documentation

Bevollmächtigter
Authorised person

Beckhoff Automation GmbH & Co. KG
Hülshorstweg 20, 33415 Verl, Germany

Verl, 31.07.2017

Dipl.-Phys. Hans Beckhoff

Geschäftsführer Beckhoff Automation GmbH & Co. KG
CEO Beckhoff Automation GmbH & Co. KG

Fig. 56: EL6930 EC Declaration of Conformity

List of illustrations

More Information:
www.beckhoff.com/EL6930