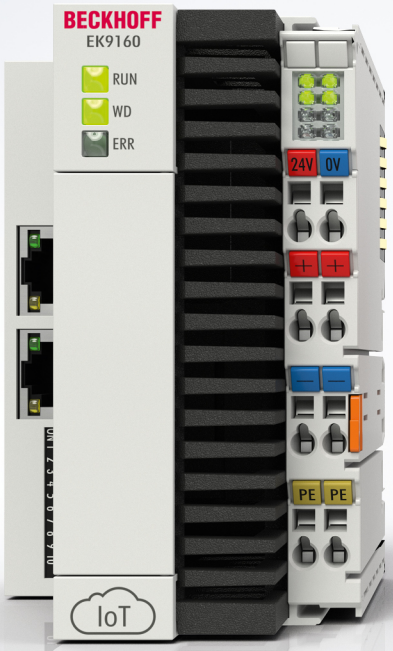
BECKHOFF New Automation Technology

Documentation | EN

EK9160

IoT Bus Coupler for EtherCAT Terminals



2025-02-06 | Version: 1.1.0

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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 Guide through documentation

NOTICE

Further components of documentation

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

Title	Description
EtherCAT System Documentation (PDF)	• System overview • EtherCAT basics • Cable redundancy • Hot Connect • EtherCAT devices configuration
Infrastructure for EtherCAT/Ethernet (PDF)	Technical recommendations and notes for design, implementation and testing
Software Declarations I/O (PDF)	Open source software declarations for Beckhoff I/O components

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

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

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

1.3 For your safety

Read the chapter on safety and follow the instructions in order to protect from personal injury and damage to equipment.

Limitation of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Unauthorized modifications and changes to the hardware or software configuration, which go beyond the documented options, are prohibited and nullify the liability of Beckhoff Automation GmbH & Co. KG.
In addition, the following actions are excluded from the liability of Beckhoff Automation GmbH & Co. KG:

- Failure to comply with this documentation.
- Improper use.
- Use of untrained personnel.
- Use of unauthorized replacement parts.

1.3.1 Intended use

An EKxxxx Bus Coupler is a control system for use in machine and system engineering for automation, visualization and communication. The EKxxxx Bus Coupler is designed for installation in a control cabinet or terminal box and is used together with Bus or EtherCAT Terminals to receive digital and analog signals from sensors and output them to actuators or forward them to higher-level controllers.

An EKxxxx Bus Coupler has been developed for a working environment that satisfies protection class IP20. This involves finger protection and protection against solid foreign objects up to 12.5 mm, but not protection against water. Operation of the devices in wet and dusty environments is not permitted, unless otherwise specified. The specified limits for electrical and technical data must be adhered to.

Improper use

An EKxxxx Bus Coupler is not suitable for use in the following areas:

- Hazardous area.
- Areas with an aggressive environment, e.g. aggressive gases or chemicals.
- Living areas. In living areas, the relevant standards and guidelines for interference emissions must be adhered to, and the devices must be installed in housings or control boxes with suitable attenuation of shielding.

1.3.2 Staff qualification

All operations involving Beckhoff software and hardware may only be carried out by specialists with knowledge of control and automation technology. The specialists must have knowledge of the administration of the bus coupler and the associated network.

All interventions must be carried out with knowledge of control programming, and the specialists must be familiar with the current standards and guidelines for the automation environment.

1.3.3 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.

1.3.4 Notes on information security

The products of Beckhoff Automation GmbH & Co. KG (Beckhoff), insofar as they can be accessed online, are equipped with security functions that support the secure operation of plants, systems, machines and networks. Despite the security functions, the creation, implementation and constant updating of a holistic security concept for the operation are necessary to protect the respective plant, system, machine and networks against cyber threats. The products sold by Beckhoff are only part of the overall security concept. The customer is responsible for preventing unauthorized access by third parties to its equipment, systems, machines and networks. The latter should be connected to the corporate network or the Internet only if appropriate protective measures have been set up.

In addition, the recommendations from Beckhoff regarding appropriate protective measures should be observed. Further information regarding information security and industrial security can be found in our https://www.beckhoff.com/secguide.

Beckhoff products and solutions undergo continuous further development. This also applies to security functions. In light of this continuous further development, Beckhoff expressly recommends that the products are kept up to date at all times and that updates are installed for the products once they have been made available. Using outdated or unsupported product versions can increase the risk of cyber threats.

To stay informed about information security for Beckhoff products, subscribe to the RSS feed at https://www.beckhoff.com/secinfo.

1.4 Transport and storage

Transport

NOTICE

Short circuit due to moisture

Moisture can form during transport in cold weather or in the event of large temperature fluctuations.

Avoid moisture formation (condensation) in the bus coupler, and leave it to adjust to room temperature slowly. If condensation has occurred, wait at least 12 hours before switching on the bus coupler.

Despite the robust design of the unit, the components are sensitive to strong vibrations and impacts. Transporting a control cabinet with a built-in bus coupler can result in excessive impact on the bus coupler.

- During transport, the device must therefore be protected from excessive mechanical stress.
- Appropriate packaging of the bus coupler, in particular the original packaging, can improve the vibration resistance during transport.
- Send the bus coupler in the original packaging and additional outer packaging.

Storage

Store the bus coupler in its original packaging.

1.5 Documentation issue status

Version	Comment
1.1.0	• Chapter “Time synchronization” added
1.0.0	• First release
0.x.x	• Pre-release versions

Image Version EK9160

Firmware	Hardware version	Description
3.01	2.5	Housing production converted
	2.4	Change of assembly - Base code raised to 4024 - Discontinuities in the Device Manager corrected
2.38	2.3	Release Version
2.33	2.2	Prototypes

1.6 Version identification of EtherCAT devices

Name plate EK9160

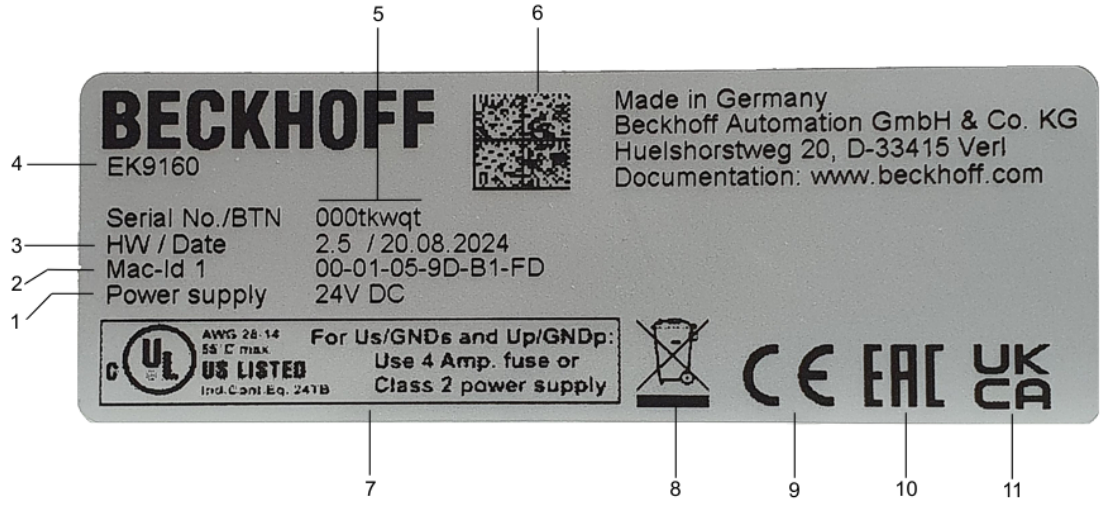


Fig. 1: EK9160 name plate

No.	Description
1	Power supply 24 V DC.
2	MAC addresses of the built-in Ethernet interface.
3	Hardware version and date of manufacture.
4	Product name to identify the coupler.
5	Serial number/Beckhoff Traceability Number (BTN) for the unambiguous identification of the product. The host name is formed based on BTN and the serial number/Beckhoff Traceability Number (BTN). Example: The BTN 000tkwqt results in the host name **BTN000tkwqt**.
6	BIC [▶ 13] (Beckhoff Identification Code) Machine-readable information in the form of a Data Matrix Code (DMC, code scheme ECC200), which can be used for better identification and management.
7	UL marking with prescribed information on power supply, fuse, temperature, and cable cross-sections.
8	Marking for garbage disposal. Do not dispose of this product with household waste.
9	CE marking
10	EAC marking
11	UKCA marking

1.6.1 Beckhoff Identification Code (BIC)

The Beckhoff Identification Code (BIC) is increasingly being applied to Beckhoff products to uniquely identify the product. The BIC is represented as a Data Matrix Code (DMC, code scheme ECC200), the content is based on the ANSI standard MH10.8.2-2016.

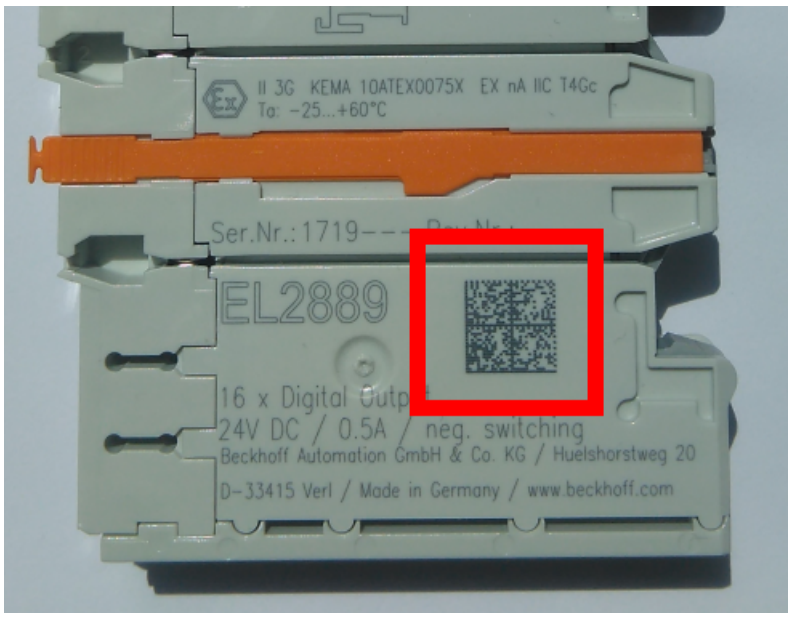


Fig. 2: BIC as data matrix code (DMC, code scheme ECC200)

The BIC will be introduced step by step across all product groups.

Depending on the product, it can be found in the following places:

- on the packaging unit
- directly on the product (if space suffices)
- on the packaging unit and the product

The BIC is machine-readable and contains information that can also be used by the customer for handling and product management.

Each piece of information can be uniquely identified using the so-called data identifier (ANSI MH10.8.2-2016). The data identifier is followed by a character string. Both together have a maximum length according to the table below. If the information is shorter, spaces are added to it.

Following information is possible, positions 1 to 4 are always present, the other according to need of production:

Position	Type of information	Explanation	Data identifier	Number of digits incl. data identifier	Example
1	Beckhoff order number	**Beckhoff order number**	1P	8	**1P**072222
2	Beckhoff Traceability Number (BTN)	**Unique serial number, see note below**	SBTN	12	**SBTN**k4p562d7
3	Article description	**Beckhoff article description, e.g. EL1008**	1K	32	**1K**EL1809
4	Quantity	**Quantity in packaging unit, e.g. 1, 10, etc.**	Q	6	**Q**1
5	Batch number	Optional: Year and week of production	2P	14	**2P**401503180016
6	ID/serial number	Optional: Present-day serial number system, e.g. with safety products	51S	12	**51S**678294
7	Variant number	Optional: Product variant number on the basis of standard products	30P	12	**30P**F971, 2*K183
...					

Further types of information and data identifiers are used by Beckhoff and serve internal processes.

Structure of the BIC

Example of composite information from positions 1 to 4 and with the above given example value on position 6. The data identifiers are highlighted in bold font:

1P072222**SBTN**k4p562d7**1K**EL1809 **Q**1 **51S**678294

Accordingly as DMC:

Fig. 3: Example DMC **1P**072222**SBTN**k4p562d7**1K**EL1809 **Q**1 **51S**678294

BTN

An important component of the BIC is the Beckhoff Traceability Number (BTN, position 2). The BTN is a unique serial number consisting of eight characters that will replace all other serial number systems at Beckhoff in the long term (e.g. batch designations on IO components, previous serial number range for safety products, etc.). The BTN will also be introduced step by step, so it may happen that the BTN is not yet coded in the BIC.

NOTICE

This information has been carefully prepared. However, the procedure described is constantly being further developed. We reserve the right to revise and change procedures and documentation at any time and without prior notice. No claims for changes can be made from the information, illustrations and descriptions in this documentation.

2 Product overview

2.1 EKxxxx - System overview

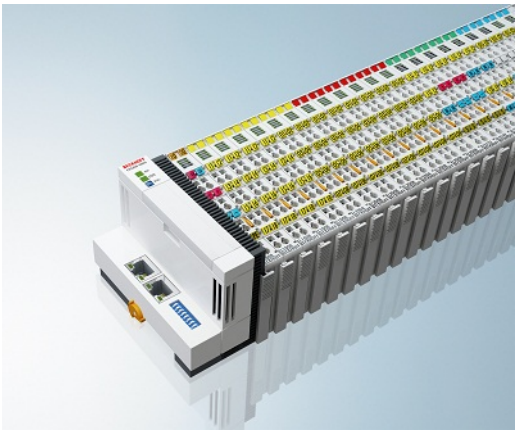


Fig. 4: EtherCAT Terminals at an EKxxxx series Bus Coupler

The Bus Couplers from the EKxxxx series allow EtherCAT Terminals to be operated on conventional fieldbus systems. The ultra-fast, high-performance EtherCAT Terminals with their large range of signal types are thus also available for other fieldbus and Industrial Ethernet systems.

The EKxxxx Bus Couplers are fieldbus slaves and contain an EtherCAT master for the EtherCAT terminals. They convert the telegrams from the higher-level fieldbus systems into the E-bus signal representation. A station consists of an EKxxxx and a number of EtherCAT Terminals.

The EKxxxx is integrated in exactly the same way as the Bus Couplers from the BKxxxx series via the corresponding fieldbus system configuration tools and the associated configuration files, such as GSD, ESD or GSDML.

EtherCAT makes a very flexible topology configuration possible. Thanks to the Ethernet physics, long distances can also be bridged without the bus speed being affected. When changing to the field level – without a control cabinet – the EtherCAT Box modules (EPxxxx) in protection class IP65 can also be connected to the EK9xxx.

Bus Couplers for various fieldbus systems

The variants from the EKxxxx series differ from one another by the interface for the higher-level fieldbus system.
An overview of the various Beckhoff Bus Couplers covering the most important fieldbus systems can be found on the Beckhoff Website.

Embedded PCs with fieldbus interface and decentralized control

The TwinCAT-programmable variant is the CX80xx Embedded PC series.

The variants from the CX80xx series differ from one another by the interface for the higher-level fieldbus system and the possibility to program it.
An overview of the various Beckhoff Embedded PCs covering the most important fieldbus systems can be found on the Beckhoff Website.

2.2 EK9160 - Introduction

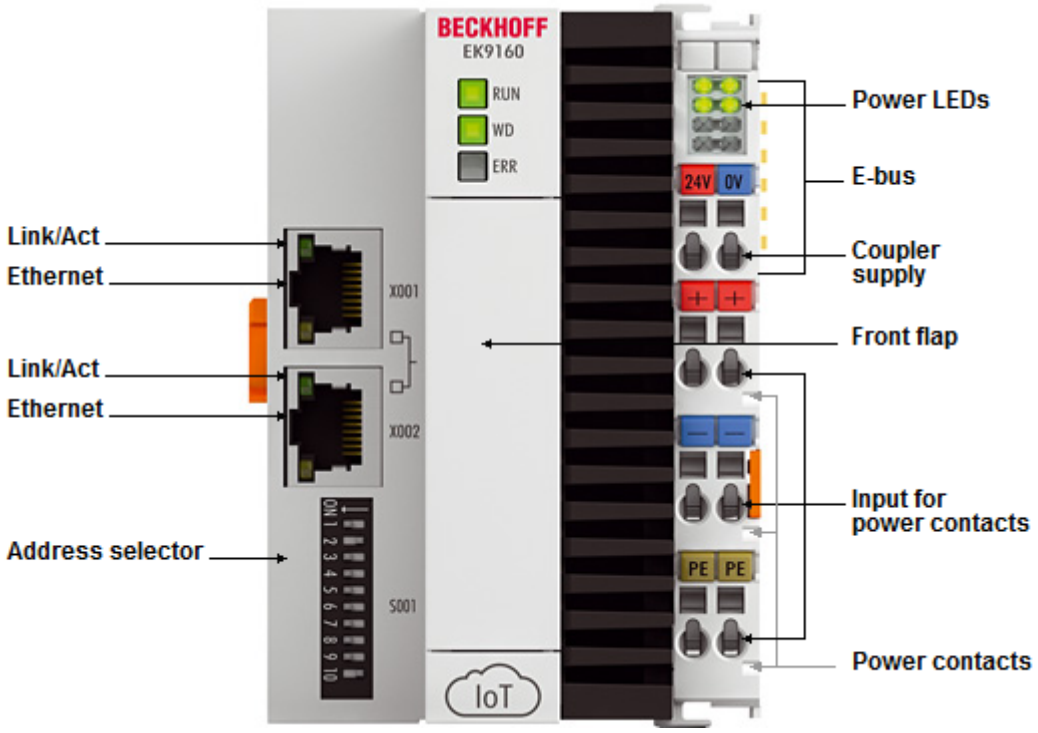


Fig. 5: EK9160

Microsoft Azure Certified

The EK9160 coupler connects the EtherCAT I/Os to the Internet of Things (IoT) directly and without control program. It converts the E-bus signal representation to various IoT communication protocols. It thus enables the simple and standardized integration of I/O data into cloud-based communication and data services. Neither a controller nor programming is necessary. The I/O data is parameterized in a simple configuration dialog of the integrated web server using any browser. The respective cloud services and security functions (authentication, encryption, etc.) can also be configured conveniently using a browser. Following parameterization, the coupler independently takes up the sending of the digital or analog I/O values to the cloud service, including timestamp.

Configuration

The EK9160 is configured based on HTML pages [▶ 34] provided by the bus coupler.

2.3 Technical data

Technical data	EK9160
Protocol	MQTT, OPC UA server (Data Access, Historical Access, Alarms & Conditions)
Operating system	Microsoft Windows Embedded Compact 7
Flash memory	microSD card (ATP) 512 MB
Interfaces	2 x RJ45 Ethernet 100 Mbit/s (switched)
Diagnostic LEDs [▶ 63]	1 x RUN, 1 X WD, 1 x ERR
Clock	Internal battery-backed clock (RTC) for time and date (CR 2032 battery exchangeable)
I/O connection	E-bus (EtherCAT Terminals)
I/O terminals	Support of EtherCAT Terminals (EL and ES) with standard digital signal processing (e.g. EL1xxx / EL2xxx) and standard analog signal processing (e.g. EL3xxx /EL4xxx), No gateway EC terminals (e.g. EL6xxx), no EC terminals with XFC or distributed clock function, no general EtherCAT devices
Power supply	24 V_{DC} (-15 %/+20 %)
Input current	160 mA + (total E-bus current)/4
Inrush current during boot process	420 mA
Power contacts	24 V_{DC} max./10 A max.
E-bus power supply (5 V) (at higher current consumption the EL9410 power supply terminal can be used in addition)	max. 2 A (-25 °C ... +60 °C)
Max size of process data	max. 1440 bytes input and output data
Electrical isolation	500 V (power contact/supply voltage/Ethernet)
Dimensions (W x H x L)	71 mm x 100 mm x 73 mm
Weight	230 g
Permissible ambient temperature range during operation	-25 °C ... +60 °C
Permissible ambient temperature range during storage	-40 °C ... +85 °C
Permissible relative air humidity	95 %, no condensation
Installation [▶ 20]	on 35 mm mounting rail, conforms to EN 60715
Enhanced mechanical load capacity	yes, see also Installation instructions for enhanced mechanical load capacity
Vibration / shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity / emission	conforms to EN 61000-6-2 / EN 61000-6-4
Protection rating	IP20
Installation positions	see chapter "Installation [▶ 20]"
Marking*)	CE, EAC, UKCA, cULus [▶ 29]

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

System data	IoT (EK9160)
Data transfer medium	4 x 2 twisted-pair copper cable category 5 (100 Mbaud)
Cable length	100 m
Data transfer rate	100 Mbit/s
Topology	star wiring, line topology

2.4 Technical data IoT

Technical data Ethernet	EK9160
Number of ports	2
integrated switch	2 x Ethernet 100 Mbit/s
Bus interface	2 x RJ 45 (switched)
100 Mbit/s	Yes, full duplex
Autocrossing	Yes
Protocol	
MQTT	Yes. Binary and JSON format
OPC UA Server	Yes, OPC UA functions: Data Access, Historical Access, Alarms & Conditions
OPC UA Client	No
Services	
DHCP	Yes

3 Mounting and wiring

3.1 Instructions for ESD protection

NOTICE

Destruction of the devices by electrostatic discharge possible!

The devices contain components at risk from electrostatic discharge caused by improper handling.

- When handling the components, ensure that there is no electrostatic discharge; also avoid touching the spring contacts directly (see illustration).
- Contact with highly insulating materials (synthetic fibers, plastic films, etc.) should be avoided when handling components at the same time.
- When handling the components, ensure that the environment (workplace, packaging and persons) is properly earthed.
- Each bus station must be terminated on the right-hand side with the EL9011 or EL9012 end cap to ensure the degree of protection and ESD protection.

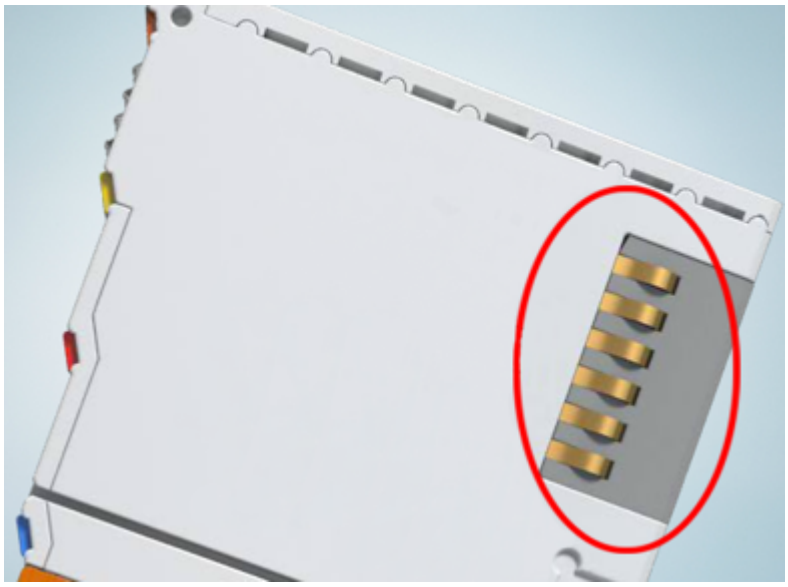


Fig. 6: Spring contacts of the Beckhoff I/O components

3.2 Mounting

3.2.1 Dimensions

The following illustrations show the dimensions of the bus couplers.

Drawings in DWF and STEP format can be found in the Download area of the Beckhoff website.

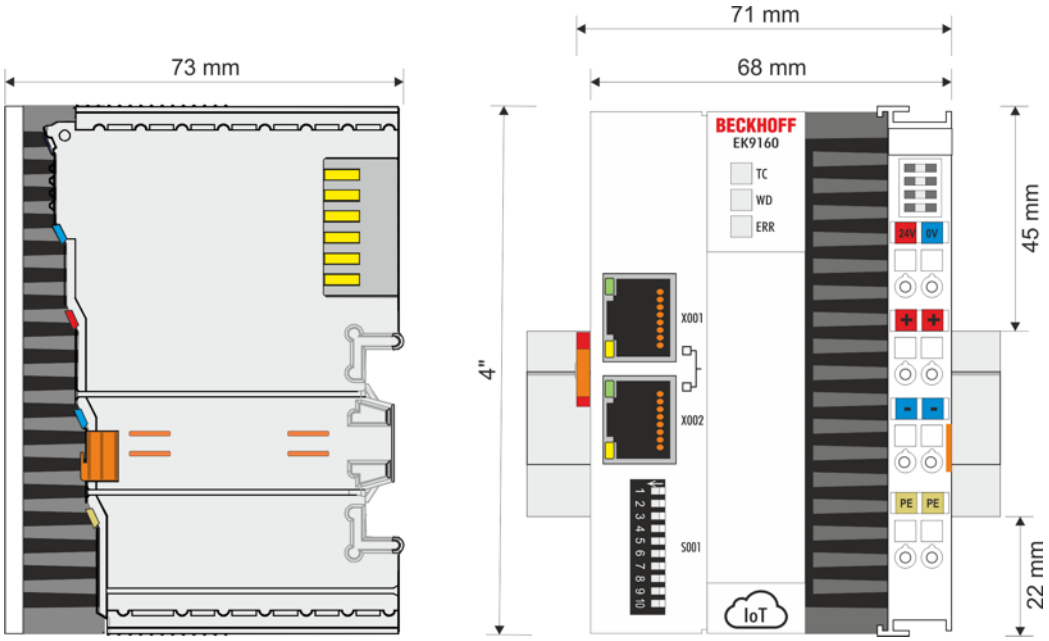


Fig. 7: EK9160 - Dimensions

3.2.2 Observe permissible installation types

Increased heat generation

The bus coupler may overheat if the installation position is incorrect or the minimum distances are not adhered to.

Ensure adequate ventilation. A horizontal installation position is ideal. Leave at least 30 mm clearance above and below the bus coupler.

Note the following specifications for the control cabinet:

- Keep to the prescribed ambient temperature. Measure the temperature below the bus coupler at a distance of 30 mm to the cooling fins, in order to determine the ambient temperature correctly.
- Adhere to the minimum distances of 30 mm above and below the bus coupler.
- Additional electrical equipment affects the heat generation in the control cabinet. Select a suitable control cabinet enclosure depending on the application, or ensure that excess heat is dissipated from the control cabinet.

Prescribed installation position for temperatures up to 60 °C

Install the bus coupler horizontally in the control cabinet on a mounting rail, in order to ensure optimum heat dissipation.

Ventilation openings are located at the top and bottom of the housing. This ensures an optimum airflow through the bus coupler in vertical direction. In addition, a minimum clearance of 30 mm above and below the bus coupler is required, in order to ensure adequate ventilation.

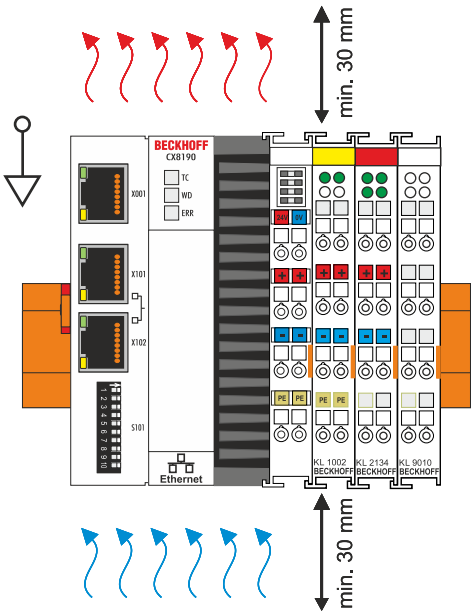


Fig. 8: Device in horizontal installation position

Installation positions with reduced temperature range up to 50 °C

You can also mount the bus coupler vertically or horizontally on the mounting rail. Note that you can then only operate the bus coupler up to an ambient temperature of 50 °C.

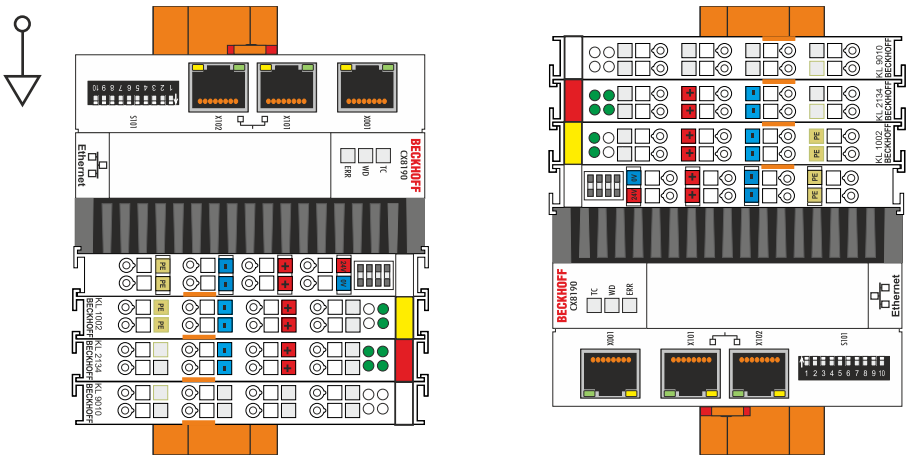


Fig. 9: Device in vertical installation position

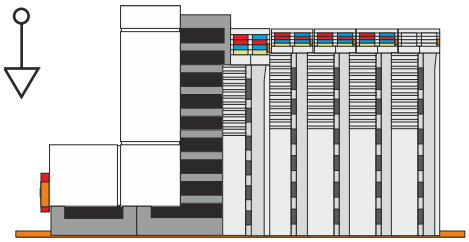


Fig. 10: Device in horizontal installation position

Ensure that bus terminals that are connected to the bus coupler are designed for operation in vertical or horizontal position.

3.2.3 Installation on mounting rails – Bus Coupler

Snapping onto the mounting rail

The Bus Coupler can simply be snapped onto the mounting rail. To this end position the block on the mounting rail and push it slightly until it engages on the right-hand side. This is indicated by a distinct click. Use a screwdriver to push up the lock on the left-hand side, thereby turning it and causing it to engage audibly.

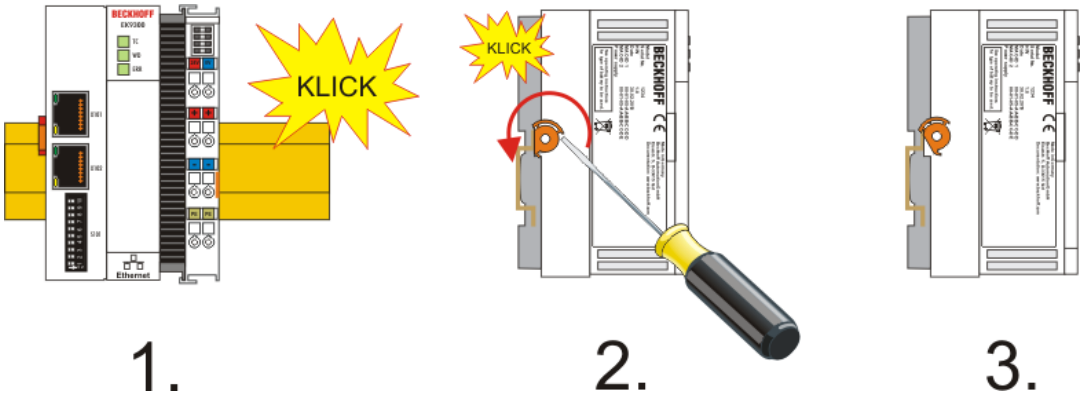


Fig. 11: EK9300 - Snapping onto the mounting rail

NOTICE

Avoid damage!

Do not force the module or apply excessive pressure!

3.3 Wiring

3.3.1 Power supply

The bus coupler requires a supply voltage of 24 VDC (-15 %/+20 %) for operation.

The connection is made via the two upper terminal points labeled 24 V and 0 V. This power supply supplies the electronics of the bus coupler and the electronics of the EtherCAT Terminals via the E-bus. It is electrically isolated from the peripheral supply (Up) of the power contacts.

In order to guarantee the operation of the bus coupler and the terminal segment in all cases, the power supply must supply 2 A at 24 V.

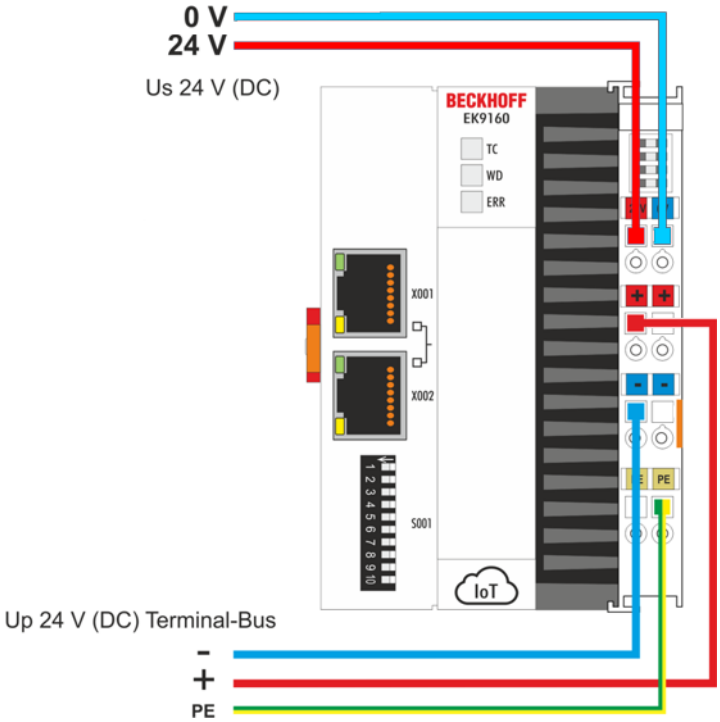


Fig. 12: Power supply bus coupler EK9160

Requirements for the 24 V power supply

In order to guarantee the operation of the Bus Coupler and the terminal segment in all cases, the power supply unit must supply 2.0 A at 24 V.

LEDs

If the power supply unit is connected correctly and the power supply is switched on, the two upper LEDs in the terminal prism are green. The left LED (Us) indicates the CPU supply. The right LED (Up) indicates the terminal supply. The other LEDs indicate the Terminal Bus status. A detailed description of the LEDs can be found in section "LED troubleshooting".

PE power contacts

NOTICE

Power contact “PE”

The "PE" power contact must not be used for other potentials.

3.3.2 Ethernet

3.3.2.1 Ethernet connections

Fig. 13: RJ45 interface

Assignment of the RJ45 interface, port (switched)

EK9xxx: X001 / X002

PIN	Signal	Description
1	TD +	Transmit +
2	TD -	Transmit -
3	RD +	Receive +
4	connected	reserved
5		
6	RD -	Receive -
7	connected	reserved
8		

3.3.2.2 Ethernet cable

Transmission standards

10Base5

The transmission medium for 10Base5 consists of a thick coaxial cable ("yellow cable") with a max. transmission speed of 10 Mbit/s arranged in a line topology with branches (drops) each of which is connected to one network device. Because all the devices are in this case connected to a common transmission medium, it is inevitable that collisions occur often in 10Base5.

10Base2

10Base2 (Cheaper net) is a further development of 10Base5, and has the advantage that the coaxial cable is cheaper and, being more flexible, is easier to lay. It is possible for several devices to be connected to one 10Base2 cable. It is frequent for branches from a 10Base5 backbone to be implemented in 10Base2.

10BaseT

Describes a twisted pair cable for 10 Mbit/s. The network here is constructed as a star. It is no longer the case that every device is attached to the same medium. This means that a broken cable no longer results in failure of the entire network. The use of switches as star couplers enables collisions to be reduced. Using full-duplex connections they can even be entirely avoided.

100BaseT

Twisted pair cable for 100 Mbit/s. It is necessary to use a higher cable quality and to employ appropriate hubs or switches in order to achieve the higher data rate.

10BaseF

The 10BaseF standard describes several optical fiber versions.

Short description of the 10BaseT and 100BaseT cable types

Twisted-pair copper cable for star topologies, where the distance between two devices may not exceed 100 meters.

UTP

Unshielded twisted pair
This type of cable belongs to category 3, and is not recommended for use in an industrial environment.

S/UTP

Screened/unshielded twisted pair (screened with copper braid)
Has an overall shield of copper braid to reduce influence of external interference. This cable is recommended for use with Bus Couplers.

FTP

Foiled shielded twisted pair (screened with aluminum foil)
This cable has an overall shield of laminated aluminum and plastic foil.

S/FTP

Screened/foiled-shielded twisted pair (screened with copper braid and aluminum foil)
Has a laminated aluminum screen with a copper braid on top. Such cables can provide up to 70 dB reduction in interference power.

STP

Shielded twisted pair
Describes a cable with an outer screen, without defining the nature of the screen any more closely.

S/STP

Screened/shielded twisted pair (wires are individually screened)
This identification refers to a cable with a shield for each of the two wires as well as an overall shield.

ITP

Industrial Twisted-Pair
The structure is similar to that of S/STP, but, in contrast to S/STP, it has only one pair of conductors.

3.3.2.3 EK9300 PROFINET topology sample

EK9160

The EK9160 can be installed in a line, but the following points should be observed:

- A maximum of 20 couplers in a row
- No switches should be used in the line

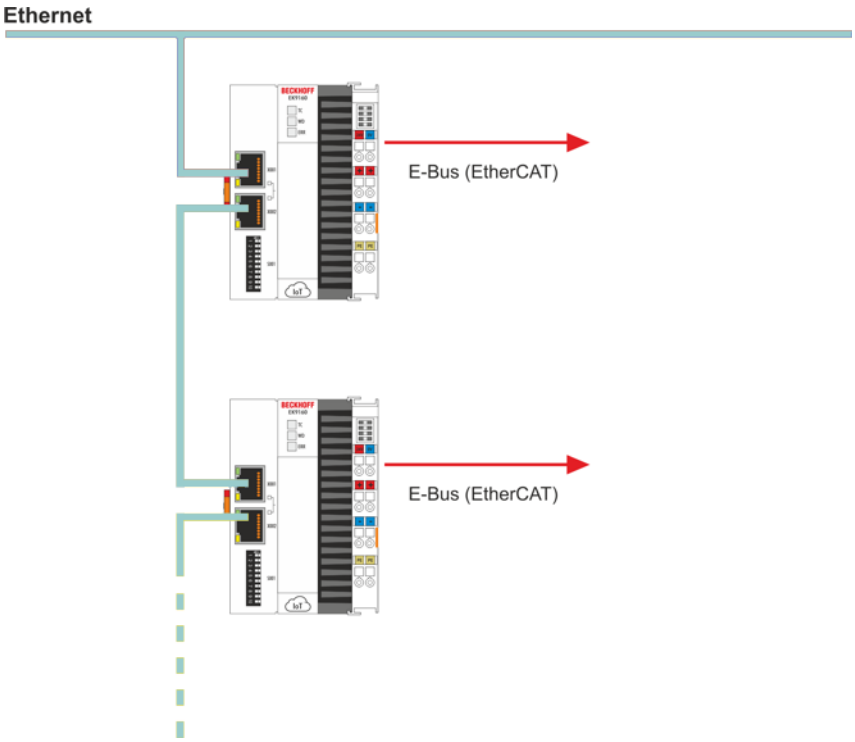


Fig. 14: EK9160 - Topology example

3.4 UL notice

⚠ CAUTION

Application

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

⚠ CAUTION

Examination

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

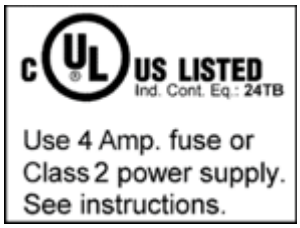
⚠ CAUTION

For devices with Ethernet connectors

Not for connection to telecommunication circuits.

Basic principles

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:



Application

If terminals certified *with restrictions* are used, then the current consumption at 24 V_{DC} must be limited accordingly by means of supply

- 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*.
  A voltage source complying with *NEC class 2* may not be connected in series or parallel with another *NEC class 2*compliant voltage supply!

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

3.5 Note - power supply

⚠ WARNING

Power supply from SELV / PELV power supply unit!

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

Notes:

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

3.6 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.

4 Parameterization and commissioning

4.1 Meaning of the DIP switch

Setting the IP address via DIP switch

The IP address for the switched Ethernet interfaces X001/X002 can be set using the DIP switches S001.

The DIP switches have priority over the settings in the Device Manager. After a change, a reboot must be carried out (open Device Manager => Device => Boot => Reboot).

Delivery state

On delivery, the EK9160 is set to DHCP (DIP switch 9 to "off" and 10 to "on"). When the EK9160 is connected to an Ethernet network, it expects to be assigned an IP address. If there is no DHCP server in the network, a random IP address 192.168.1.xxx is selected.

The last byte of the IP address can be set using the DIP switches.

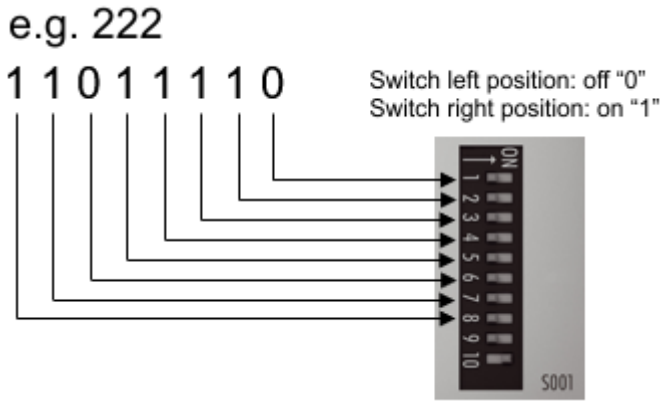


Fig. 15: DIP switch S001

DIP switch S001	Meaning
DIP 1 to 8 all **on** 9 **off** and 10 **off**	The complete IP address is taken from the setting in the web interface (Beckhoff Device Manager)
9 **off** and 10 **off**	DHCP inactive. By default, the fixed IP address 192.168.1.xxx and the subnet mask 255.255.255.0 are used. The last byte of the IP address 192.168.1.xxx is edited with DIP switches 1 to 8. The first three bytes of the IP address can be changed via the web interface (Beckhoff Device Manager).
9 **off** and 10 **on**	DHCP active. Default setting ex factory. The DIP switches 1 to 8 then have no meaning.

4.2 Other operating and functional elements

Further operating and functional elements are located under the flap of the EK9160.

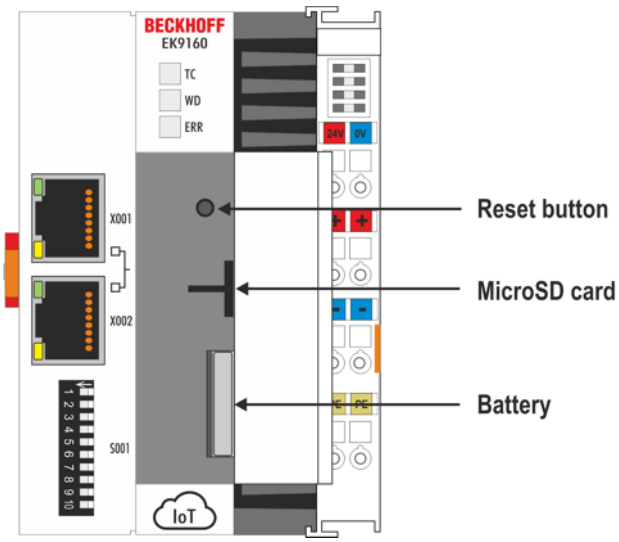


Fig. 16: Additional interfaces of the EK9xx0

Battery

The battery compartment is under the front flap. The battery stores the time and date. The time and date are reset if the battery is removed.

The battery must be replaced every 5 years. Spare batteries can be ordered from Beckhoff Service. A CR2032 battery is used in the EK9160.

Reset button

The reset button is reserved for later functions.

microSD card

The basic equipment of the EK9160 includes a 512 MB microSD card. The cards employed are SLC memory with extended temperature range for industrial applications. Use exclusively microSD cards approved by Beckhoff.

Order identifier	Capacity	Description
CX1900-0122	512 MB	microSD card (SLC memory) with extended temperature range for industrial applications as spare part.
CX1900-0124	1 GB	
CX1900-0126	2 GB	
CX1900-0128	4 GB	
CX1900-0130	8 GB	

5 Configuration

5.1 Online configuration via the Device Manager of the EK9160

A "Device Manager" web configuration page for the EK9160 is available for configuration.

The Device Manager can be accessed by entering "https://IP-address/config" in the URL line of a browser. (e.g.: https://192.168.1.2/config). We recommend using the latest version of Chrome™ or Firefox to open the Device Manager.

Example of entry with IP address:

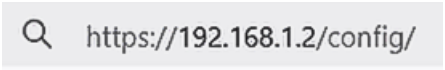


Fig. 17: Enter IP address

If DHCP is used, enter the name of the EK9160 instead of the IP address. The default name of the bus coupler starts with the string "EK-", followed by the last 3 bytes of its MAC address (MAC-ID). The MAC address can be found on the sticker on the left of the EtherCAT Coupler.

Example: The MAC address is 00-01-05-02-03-04.
The resulting default name is "EK-020304".

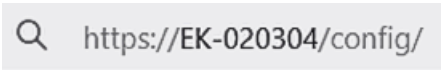


Fig. 18: Determine default name via MAC address.

The EK9160 uses a self-signed certificate. Since the browser does not recognize this certificate, you are expected to trust this certificate and continue. This is only necessary the first time you open the Device Manager with your browser. You will then be asked to enter your user name and password.

The default login name is “Administrator” and the default password is “1” (without quotation marks). For security reasons, the Device Manager first opens the security configuration page so that you can set up a new user name and password:

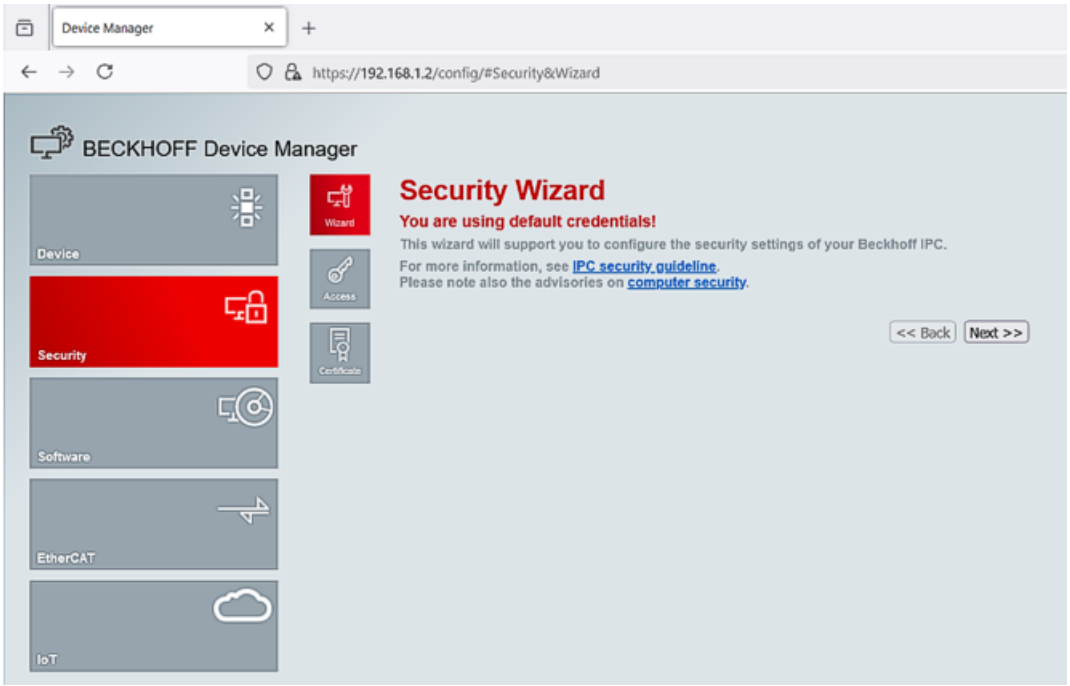


Fig. 19: Device Manager with security configuration page

5.2 IoT

IoT-Broker

The main configurations for the MQTT connection are set on the Device Manager website IoT / IoT Broker.

The following buttons are located at the top of the configuration page:

Fig. 20: Configuration page buttons

The **disk icon (Save settings to config file)** is used to save the current configuration in the config file of the EK9160. If changes in the configuration were only activated with the **tick button (Activate Parameters)** and the EtherCAT Coupler was switched off, the settings will be lost if they were not saved beforehand.

Clicking on the **gear icon (Configuration Management)** opens a dialog box in which you can upload or download the configurations.

The **arrow button (Upload certificate or key)** opens a dialog box for uploading certificates

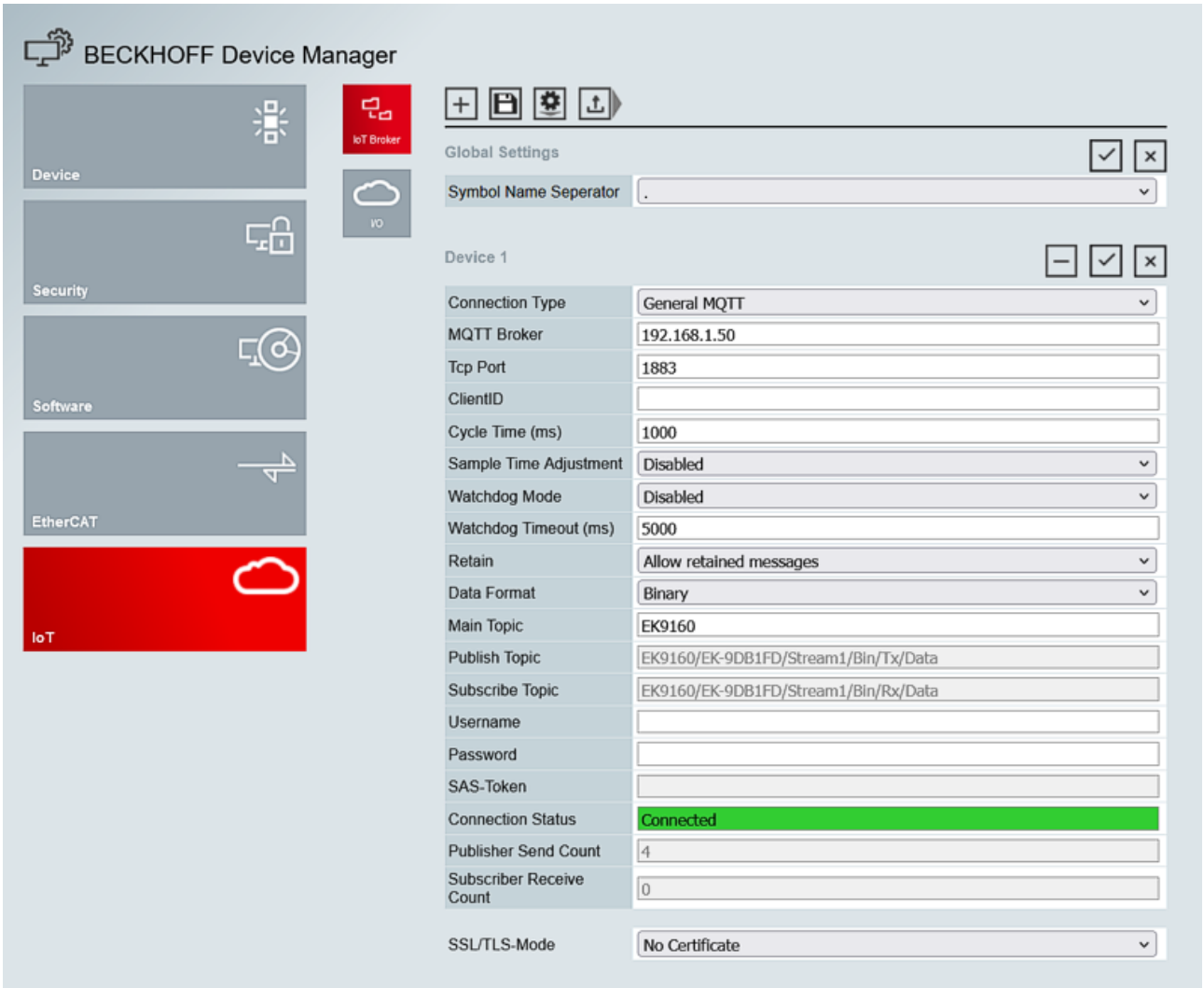


Fig. 21: Device Manager web page IoT / IoT Broker

Global Settings (apply to all configured devices)

Symbol Name Seperator

This can be used to change the separators of the MQTT topic

Device 1 (this configuration applies to the displayed MQTT broker)

Connection Type

Use this to select the connection type.

- General MQTT for standard MQTT transmission and connections to Beckhoff PLC
- MQTT - Amazon Web Services contains presets for AWS
- MQTT - Microsoft Azure Azure IoT Hub contains presets for the Azure IoT Hub

MQTT Broker

Enter the IP address or the name of the MQTT Broker here.

Tcp Port

Port number for TCP communication (e.g. 1883 for unsecured transmission, 8883 for secured transmission)

ClientID

Can remain empty for General MQTT. Corresponds to the device name of the EK9160

Cycle Time (ms)

Specifies the time interval at which the process data of the connected EtherCAT Terminals is sent

Sample Time Adjustment

Factory set to “Disable”, for time synchronization see further information [▶ 39].

Watchdog Mode

In Watchdog Mode, written outputs are reset in the event of a communication interruption after the watchdog timeout.

You can choose between Disabled and Enable. The watchdog is enabled with every telegram to the process data.

- **Disabled**
  The watchdog is switched off, outputs that are set are retained even in the event of a communication interruption.
- **Enable**
  The watchdog is switched on; outputs that are set are reset after the watchdog time in the event of a communication interruption.

Watchdog Timeout (ms)

The timeout in [ms] is to be entered here, recommended values 500 ms - 5000 ms; smaller values are not recommended because this can very quickly lead to a watchdog error.

Retain

Selection of whether MQTT retained messages are allowed (Allow retained messages) or not (Don't allow retained messages)

Data Format

Selection of data format from binary format or JSON format

MainTopic

Freely adjustable Main Topic of the MQTT Message. Default “ EK9160“

Publish Topic

Displays the Publish Topic for telegrams.

Subscribe Topic

Displays the Subscribe Topic for telegrams.

Username

Username for secure connection

Password

Password for secure connection

SAS-Token

Enter your Shared Access Signature (SAS) here if it is required for the message broker connection

Connection Status

Indicates whether a connection to the configured message broker exists "Connected" or is interrupted "Not connected"

Publisher Send Count

Counter for Publisher MQTT messages

Subscriber Receive Count

Counter for Subscriber MQTT messages

SSL/TLS-Mode

TLS/SSL certificates secure communication by authenticating and encrypting the data.

- No Certificate: Default value, no encryption.
- CA certificates: Encryption, the certificate must be uploaded to the EK9160 using the "upload certificate or key" button
- CA and Client Certificate: Encryption, the certificates must be uploaded to the EK9160 using the "upload certificate or key" button

Beckhoff Device Manager - IO

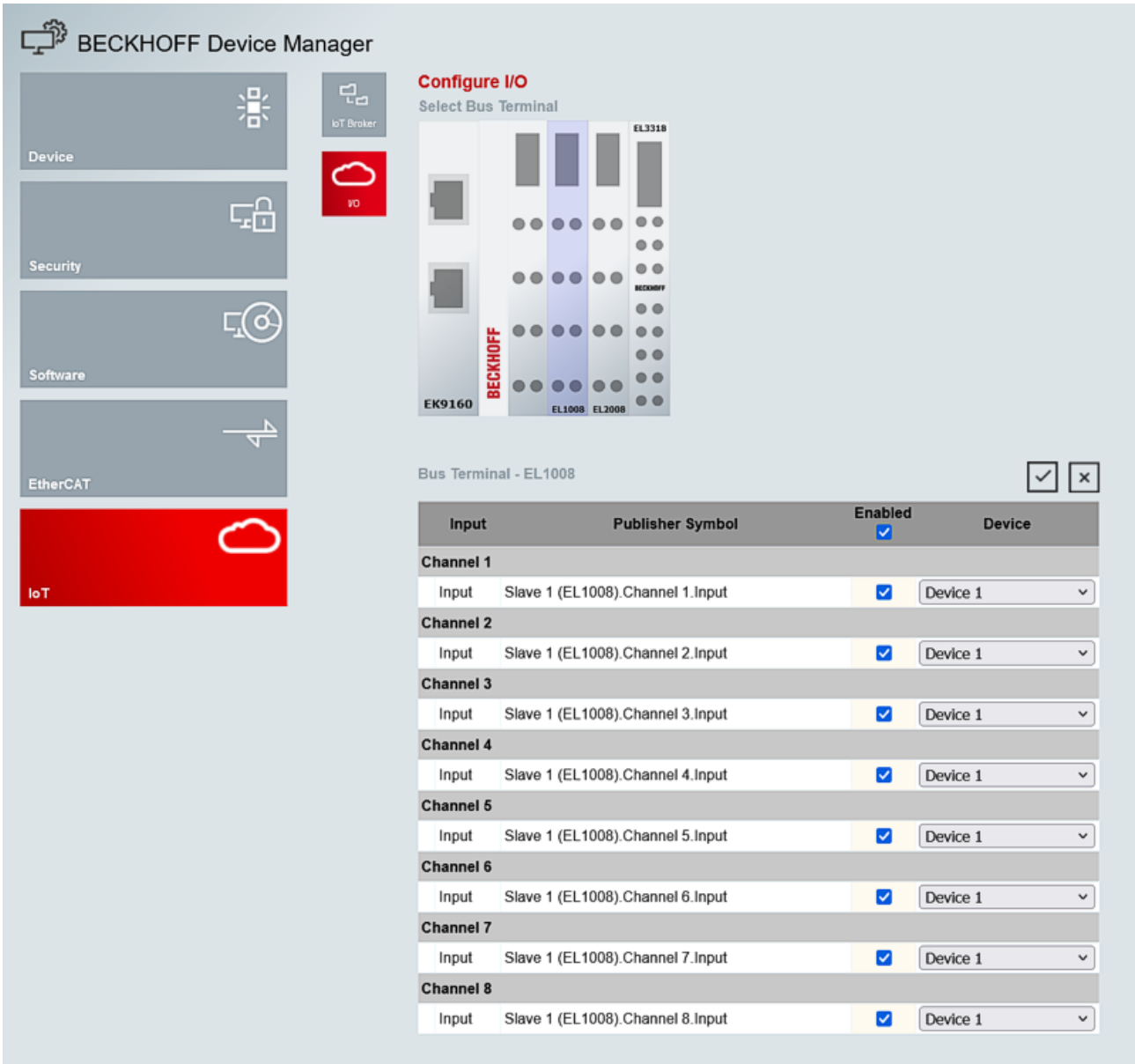


Fig. 22: Beckhoff Device Manager – IoT

Configure IO

The EtherCAT Terminals scanned by the EK9160 are displayed on the IoT / I/O Device Manager page. The selected terminal is highlighted in color and the available terminal channels are displayed in the table.

The screen shot above shows the EL1008 with its 8 input channels. Only channels that are marked as "Enabled" are sent as data via MQTT. If all channels are to be transmitted, simply select the top tick for "Enabled".

A previously created device can be assigned to each channel under the "Device" column. This means that the terminal signals from one terminal can be sent to different MQTT brokers. Only one device can be assigned to each channel.

To accept a changed configuration, click on the button with the gray tick.

5.2.1 Time synchronization

The “Sample Time Adjustment” configuration parameter can be used to set time synchronization with an SNTP server.

To ensure compatibility with older firmware versions [▶ 11], the factory setting is “Disabled”.

For synchronization, the value must be set to “Enabled”.

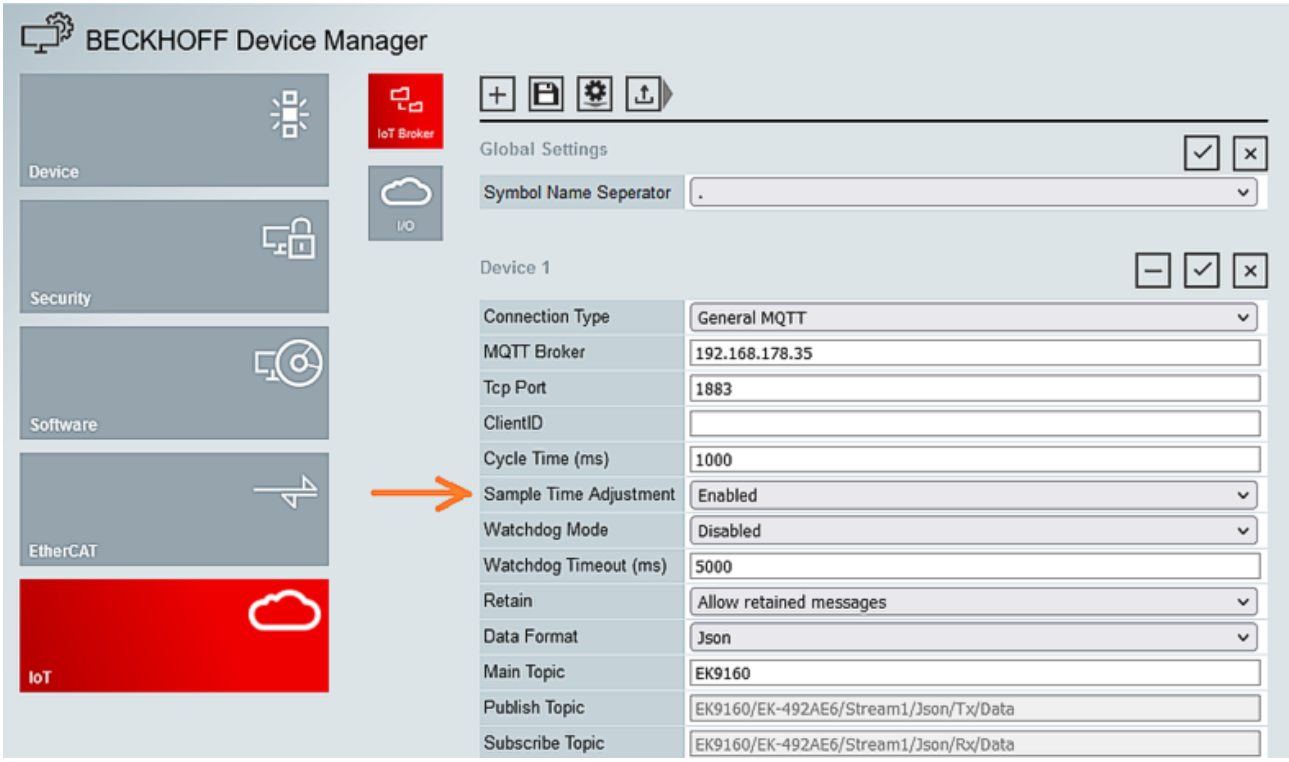


Fig. 23: Setting the time synchronization

Time synchronization is set using the SNTP server configuration, which can be selected via the “Software -> System” web configuration page.

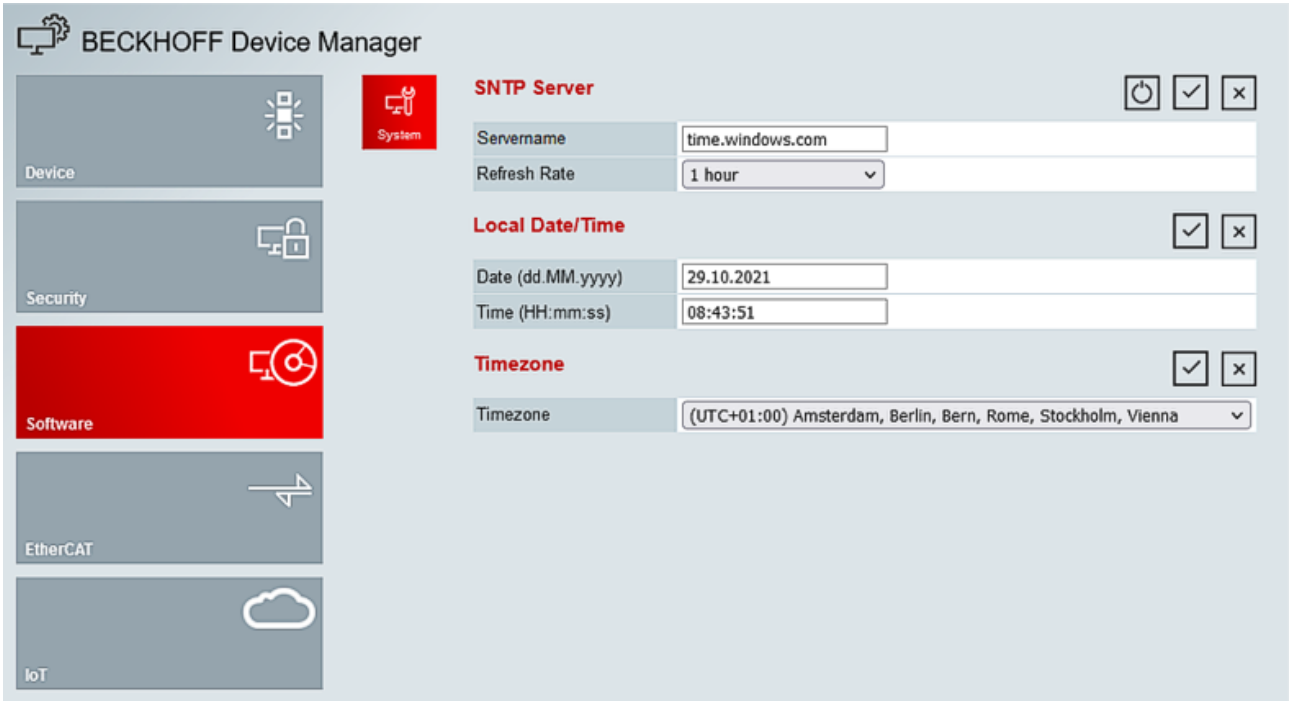


Fig. 24: SNTP server setting

With this configuration, for example, the time server “time.windows.com” is queried every hour and written to the clocks of the EK9160.

The next MQTT timestamp sent will then be based on this new time.

To apply the new settings, a reboot must be performed.

5.3 EtherCAT

Master

EtherCAT Terminals can be configured and parameterized via the EtherCAT / Master Device Manager page.

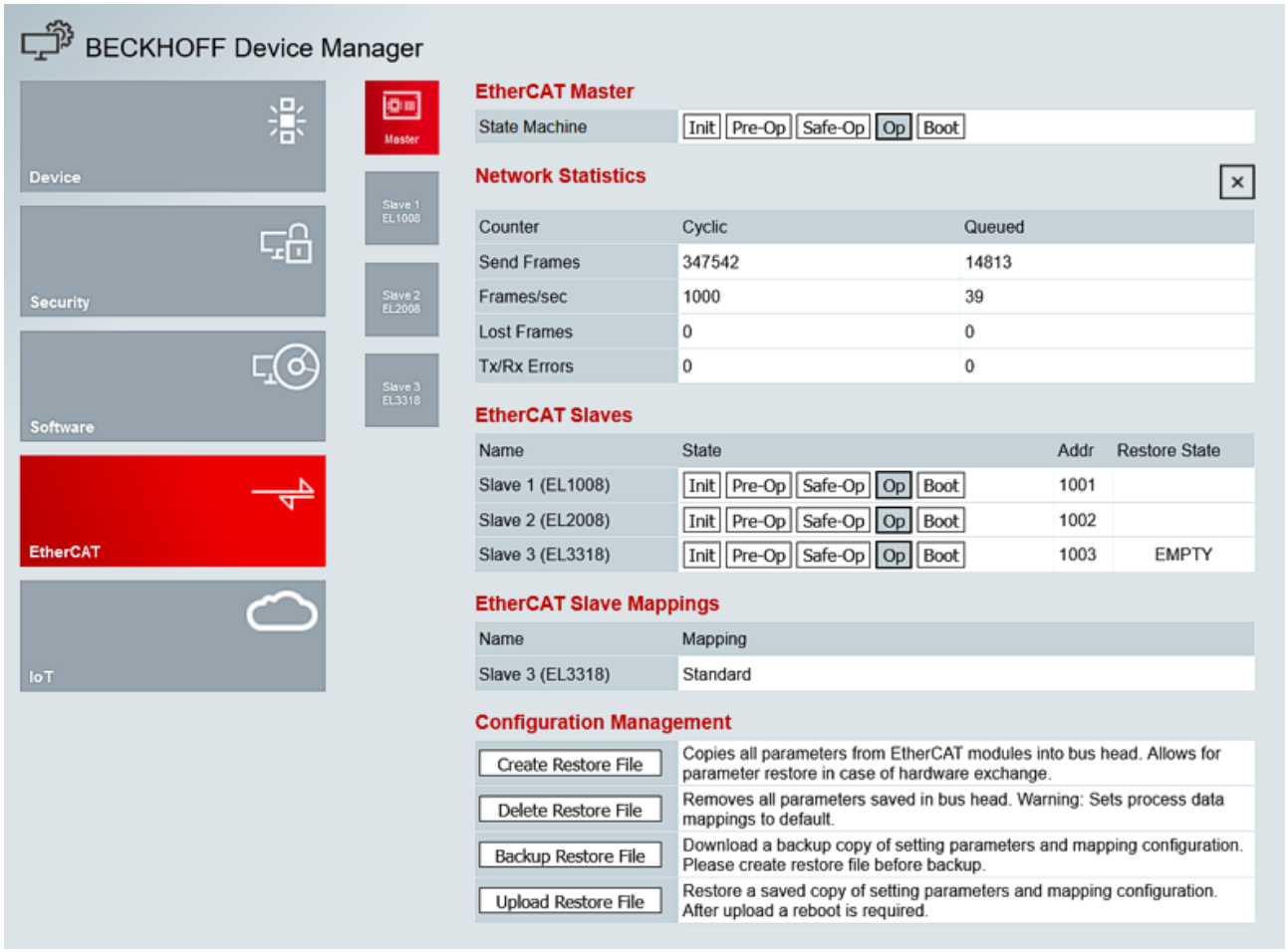


Fig. 25: Beckhoff Device Manager – EtherCAT Master

EtherCAT Master

The current state of the EtherCAT Master on the EK coupler is displayed here. Normally the EtherCAT master should be in OP.

Network Statistics

The EtherCAT statistics are output here.

EtherCAT Slaves

Display of the EtherCAT slaves and their states. The Restore State indicates whether a Restore File has been created for the terminals.

Configuration & Restore File

The Restore File is required in order to be able to parameterize EtherCAT Terminals again. If EtherCAT Terminals are replaced and have been parameterized, this parameterization is usually lost when the EtherCAT Terminals are replaced. The Restore File reloads the parameters to the corresponding new terminal when the coupler is started. The Restore File must be created if you want or need to change the default mapping of the terminals.

- Restore State
  - EMPTY
    means there is no restore file for the terminal

- VALID
  a valid Restore File has been created
- MAPPING
  The terminal mapping has been changed, but is not yet stored in the Restore File.

EtherCAT Slaves Mappings

In some EtherCAT Terminals the process image can be changed; it must be stored in the EtherCAT master. The terminals that can be changed are displayed under “EtherCAT Slaves Mappings”, the corresponding mapping must be set and stored in the Restore File. A restart of the coupler is required so that the coupler can activate the mapping (note: this changes the process image).

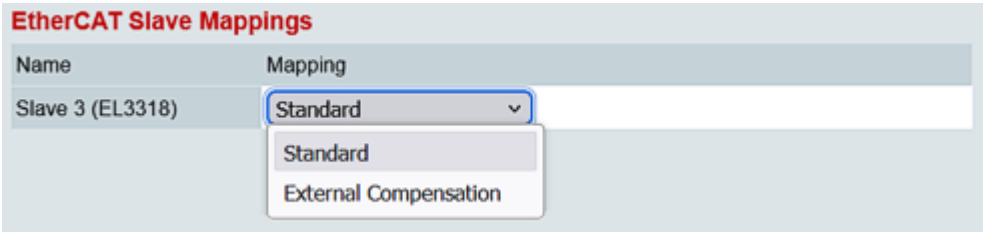


Fig. 26: Configuration via Device Manager - EtherCAT slave mapping

Slaves

Parameterization of the EtherCAT Terminals

To parameterize an EtherCAT Terminal, select the corresponding terminal in the Device Manager. The terminal objects are then displayed and can be edited if necessary. The settings are then stored in the terminal. Note that any modifications are lost if the terminal is replaced. In this case, use the restore file (see above), as your changes are also stored in the Restore File.

Fig. 27: Configuration via Device Manager - Parameterizing the EtherCAT Terminals

The screenshot "Configuration via Device Manager - Parameterizing the EtherCAT objects" shows the parameterization of the EtherCAT Terminal. The thermocouple type of an EL3318 is changed to another type by the selecting object 8000:19.

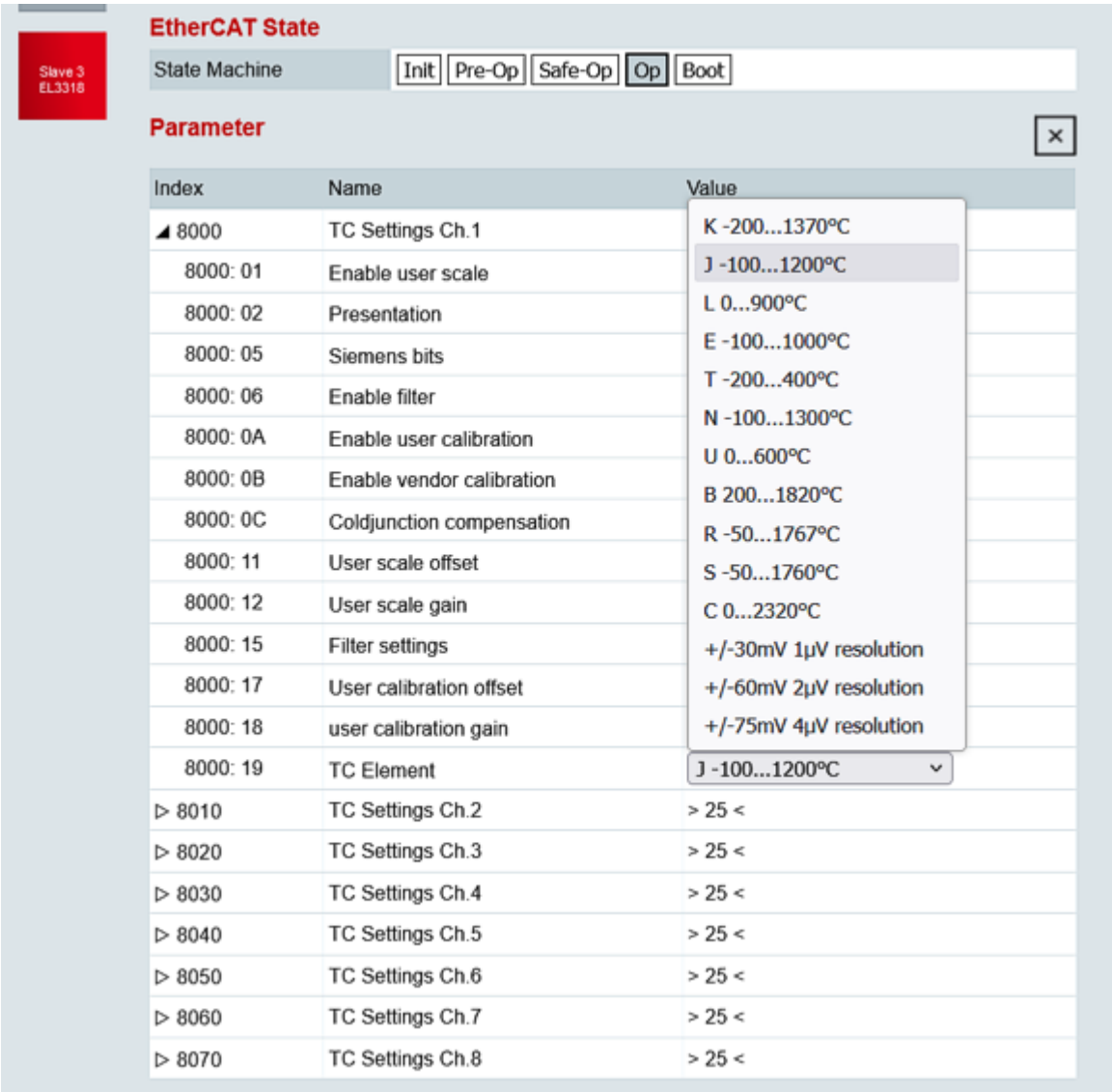


Fig. 28: Configuration via Device Manager - Parameterizing the EtherCAT objects

5.4 Software

System

The time settings of the EK9160 are displayed on the Software / System Device Manager page.

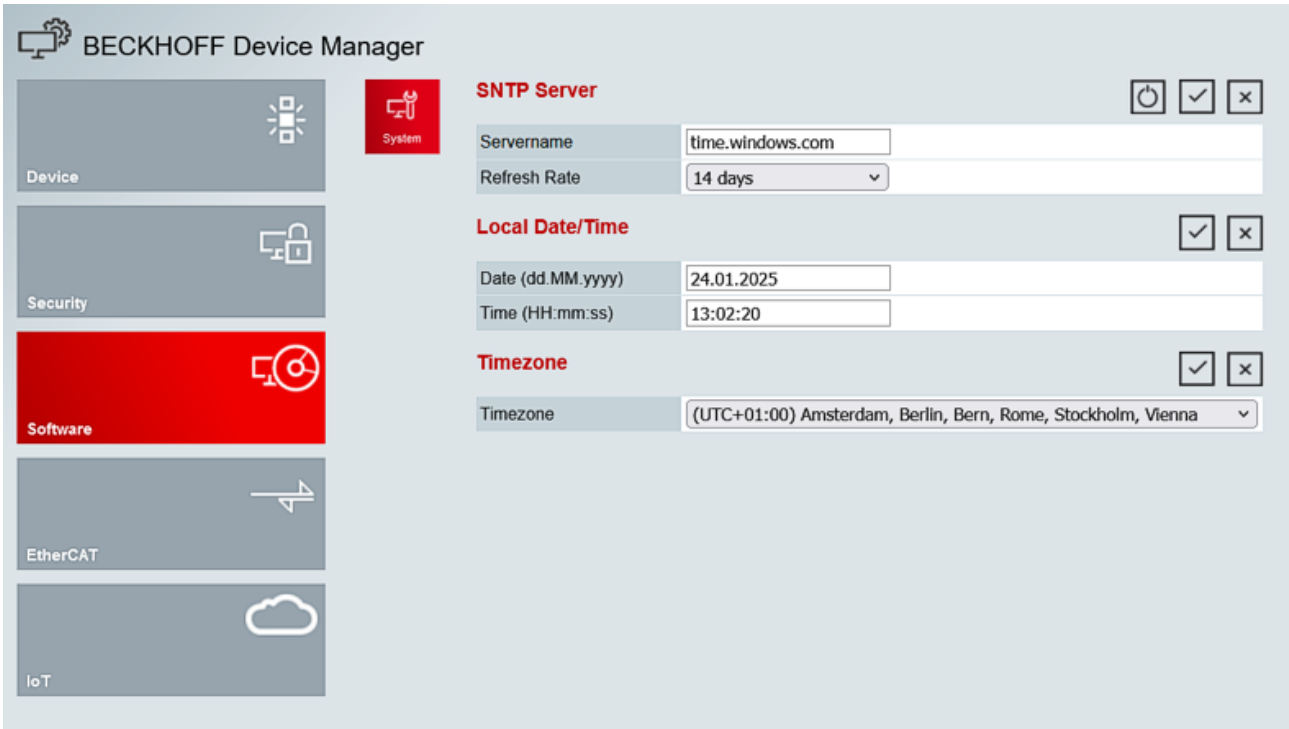


Fig. 29: Beckhoff Device Manager Software - System

SNTP Server

Configuration of which SNTP server and at what intervals the internal clock is synchronized. Synchronization can also be disabled.

Local Date/Time

The date and time can be entered directly here.

Timezone

Selection of the time zone valid for the installation location of the EK9160.

5.5 Security

Wizard

You will be asked to enter a new password on the Security /Wizard Device Manager page.

On delivery, the EK9160 has a pre-set user name and password, which is required for logging in to the Beckhoff Device Manager.

- User name: Administrator
- Password: 1

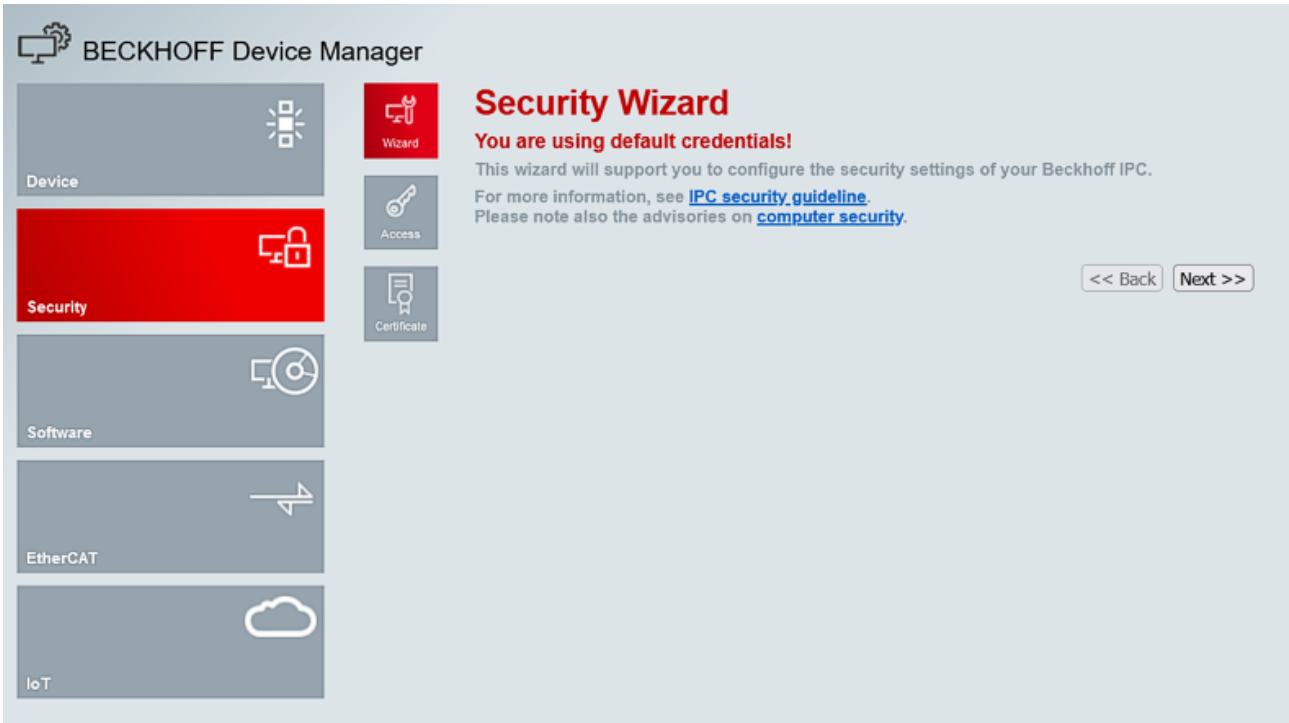


Fig. 30: Beckhoff Device Manager Software – System

Click on Next or on Access to go to the settings page for passwords.

Access

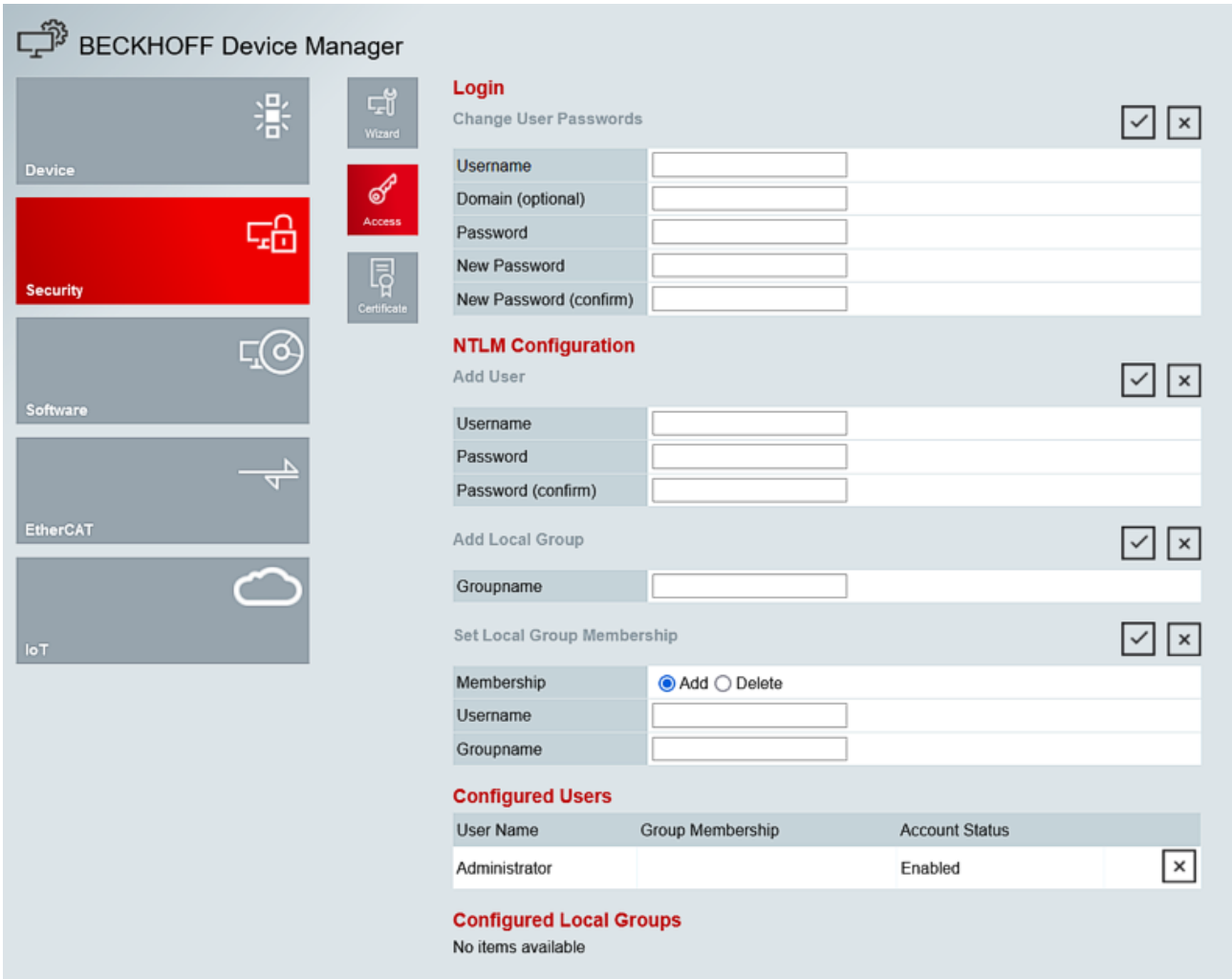


Fig. 31: Beckhoff Device Manager Security - Access

Login

Under Login you can change the password for a username or for the currently logged in user. To be on the safe side, you should change the administrator's password immediately or create a new user and delete the administrator account.

Make a note of the registration information. The password can only be reset by installing new firmware. All configurations are lost in the process.

NTLM Configuration

You can add further users under Add User. The pre-set password can be changed via the Beckhoff Device Manager.

Configured Users

In this list you can see all accounts of the existing users. You can delete existing users by clicking on the X and confirming.

To permanently save changes to user names or passwords, reboot the EK9160.

Certificate

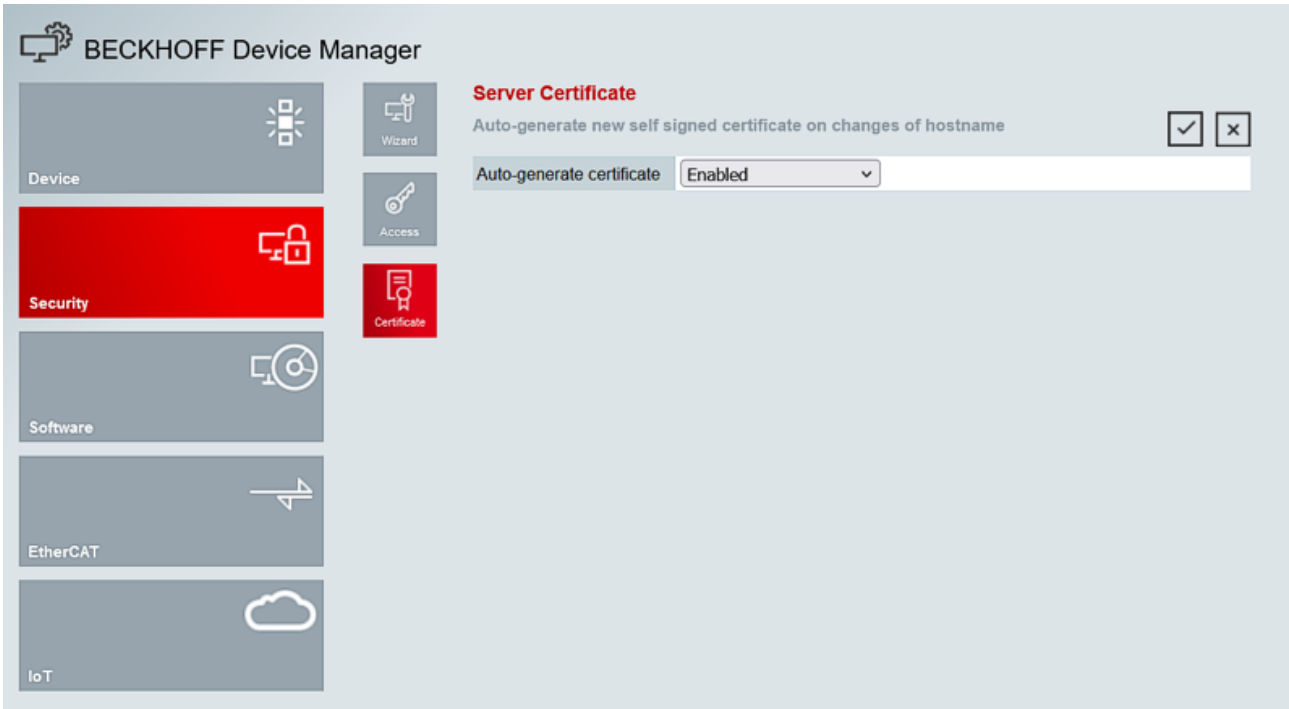


Fig. 32: Beckhoff Device Manager Security - Certifficates

Server Certificate

Here it is possible to activate (default) or disable the automatic generation of a new self-signed certificate when the host name is changed.

5.6 Device

Boot

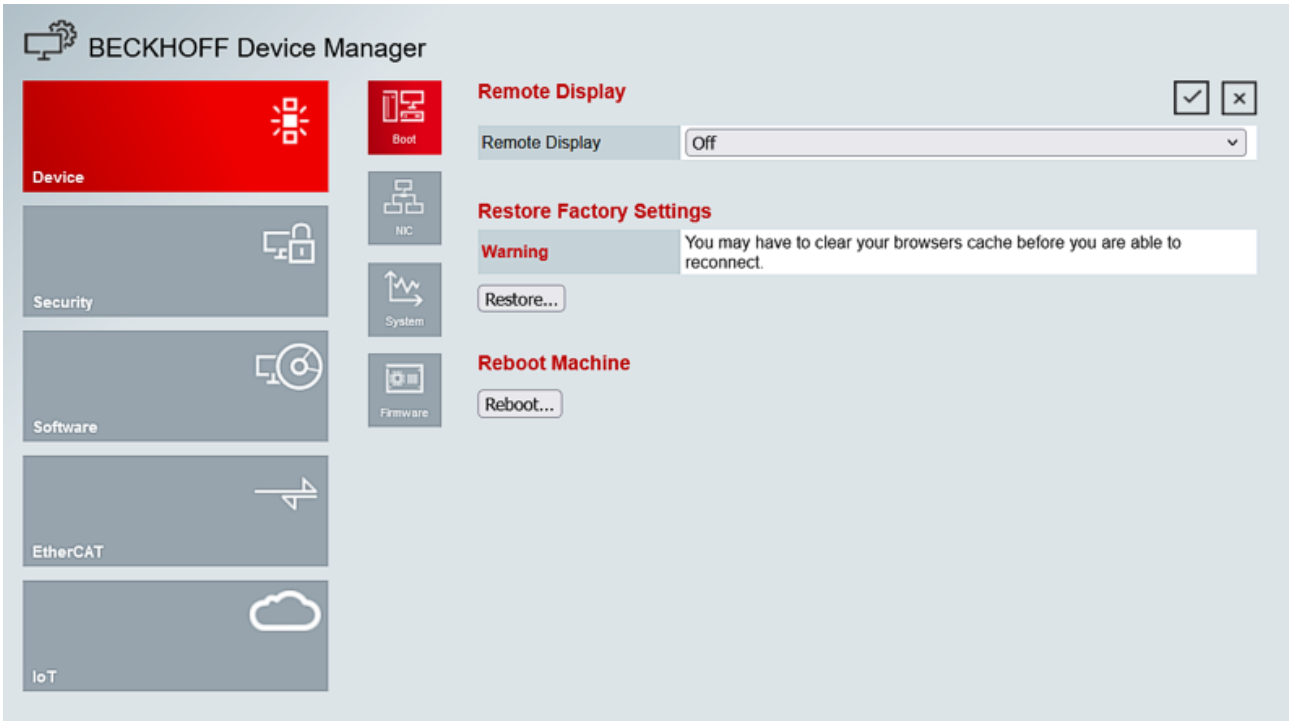


Fig. 33: Beckhoff Device Manager Device - Boot

Remote Display

A remote connection to the EK9160 can be established using the Remote Display Control (CERHOST) program. This gives you remote access to the CE operating system of the EK9160. First you must activate Remote Display in the Beckhoff Device Manager. The Remote Display is disabled by default.

Prerequisites:

- Host PC and embedded PC must be located in the same network.
- Remote Display of the EK9160 is switched to On and active.
- Remote Display Control (CERHOST) is started on the host PC.
  - Download at: cerhost.zip
- Start the remote connection by clicking on File in the menu bar and then on Connect.
- Enter the host name or IP address of the EK9160 and confirm with OK (do not fill in the password).

Restore Factory Settings

The function is identical to Reboot Machine.

Reboot Machine

A reboot of the EK9160 is necessary to apply changes that affect the operating system. If the appropriate settings are made, you will be notified that a reboot is required.

NIC

Fig. 34: Beckhoff Device Manager Device - NIC

Network Interfaces

The addresses for the Ethernet port are set on the Device / NIC web pages of the Device Manager.

Changing the IP Address, Subnet Mask and Default Gateway is only possible if DHCP is set to "Disabled".

System

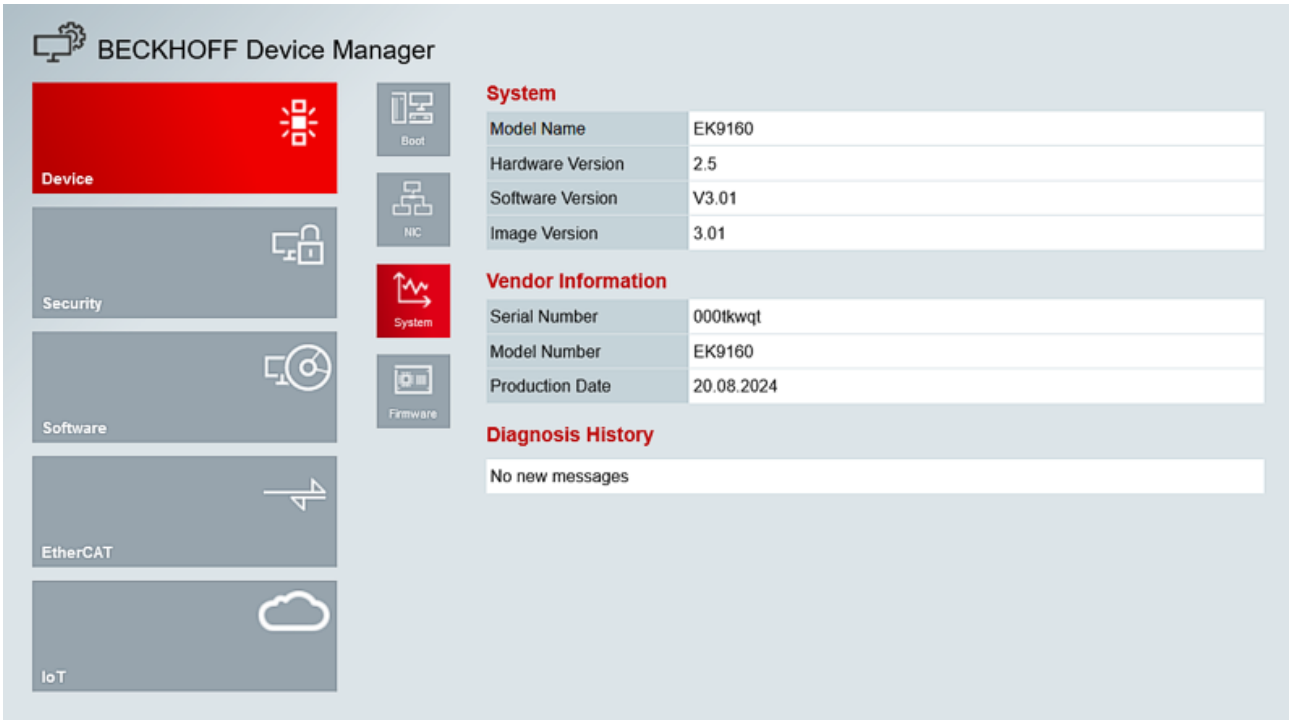


Fig. 35: Beckhoff Device Manager Device - System

System, Vendor Information, Diagnosis History

The Device Manager web pages Device / System is a purely informative page. Here you can read, for example, the hardware version, software version and production date of the EK9160.

Firmware

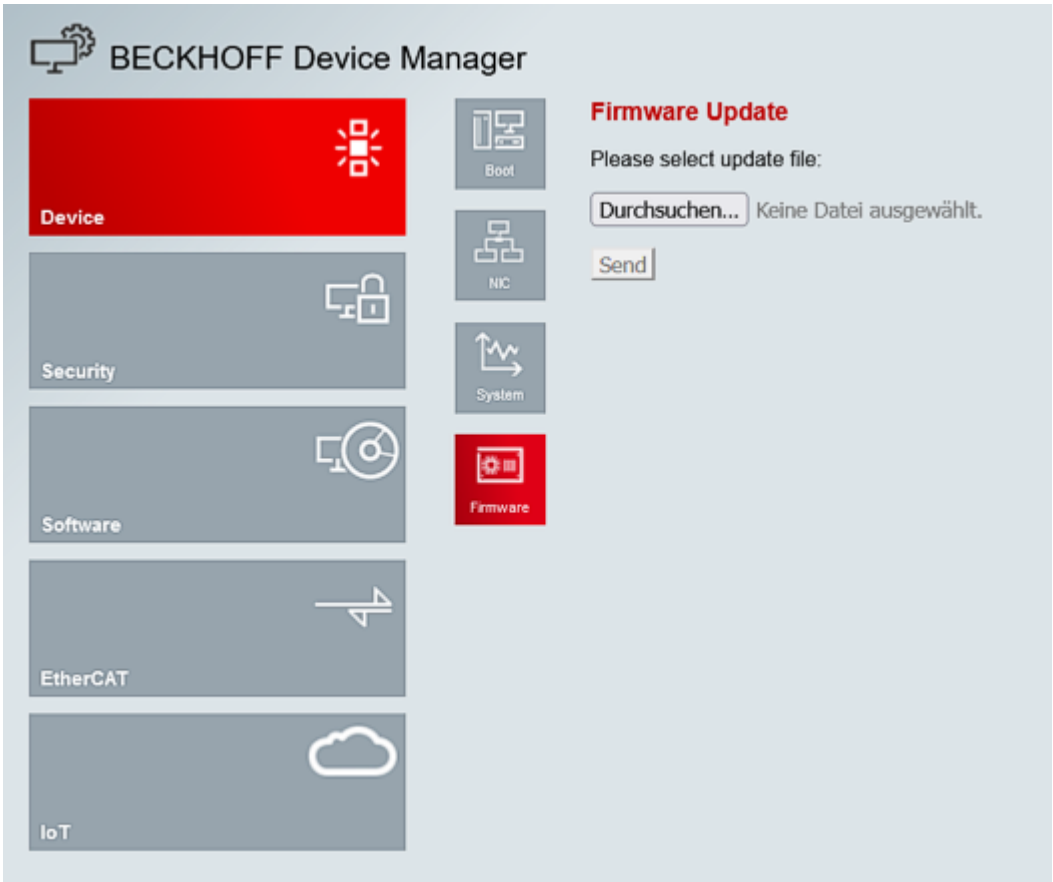


Fig. 36: Beckhoff Device Manager Device - Firmware

Firmware Update

It is possible to update the firmware on the Device Manager web pages Device / Firmware. If required, you can obtain an "EK9160_xxx.efw" file from Beckhoff Support.

- Open the Device Manager of the EK9160
- Select Device => Firmware
- Search for the firmware file with the extension .efw on the host PC via "Browse..."
- Send the firmware to the EK9160
- You will then be prompted to perform a reboot

If no connection to the EK1960 is possible (e.g. forgotten password), a firmware update can also be carried out using a microSD card.

- Remove the microSD card from the EK9160
- Insert the microSD card into a USB reader and format the microSD card
- Copy the new firmware (NK.bin) to the memory card
- Insert the memory card back into the EK9160
- The first boot will take a little longer

5.7 Configure EK9160 under TC3 as IoT MQTT Device

TC3 provides two I/O devices, the “IoT MQTT Controller” and “IoT MQTT Device”, which can be used to establish an MQTT-based communication connection. This makes it very easy to configure the EK9160 as an IoT MQTT device for a TC3 runtime. The advantage is that the EK9160 can make the process data of the EtherCAT slaves available to the TwinCAT user program via a standard TCP/IP network.

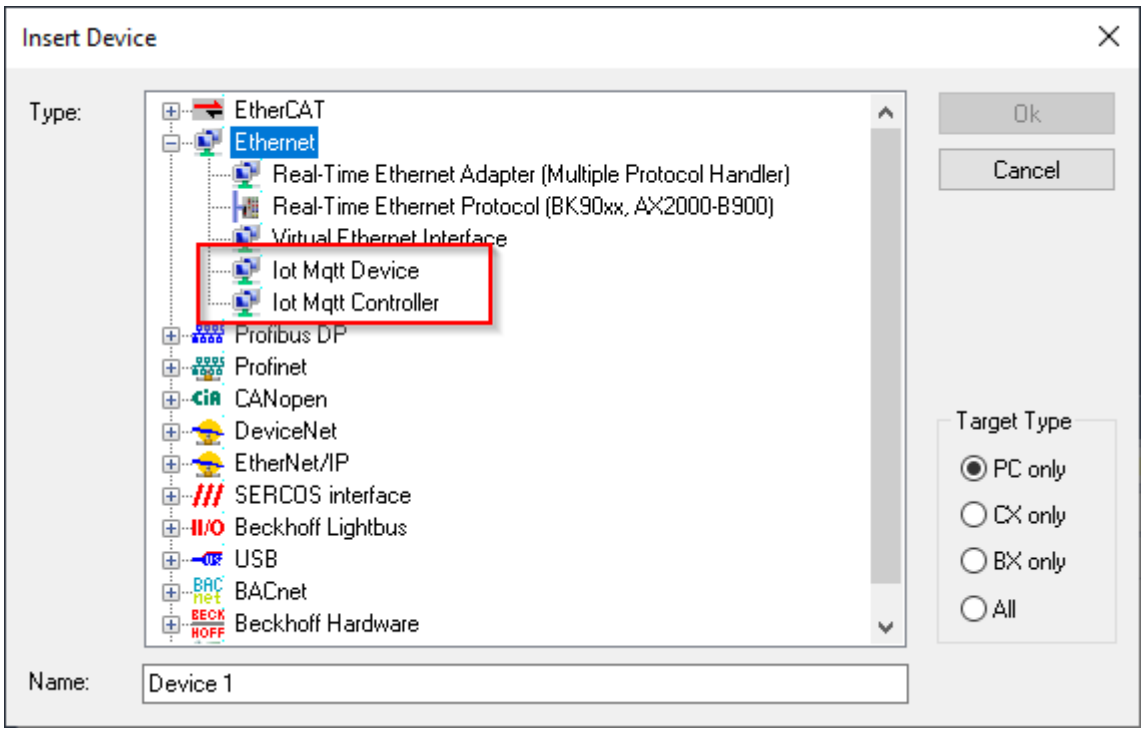


Fig. 37: Insert MQTT Device

The following diagram shows possible application scenarios. This type of communication link enables both TwinCAT systems to be coupled to each other and TwinCAT to be coupled to one or more EK9160s.

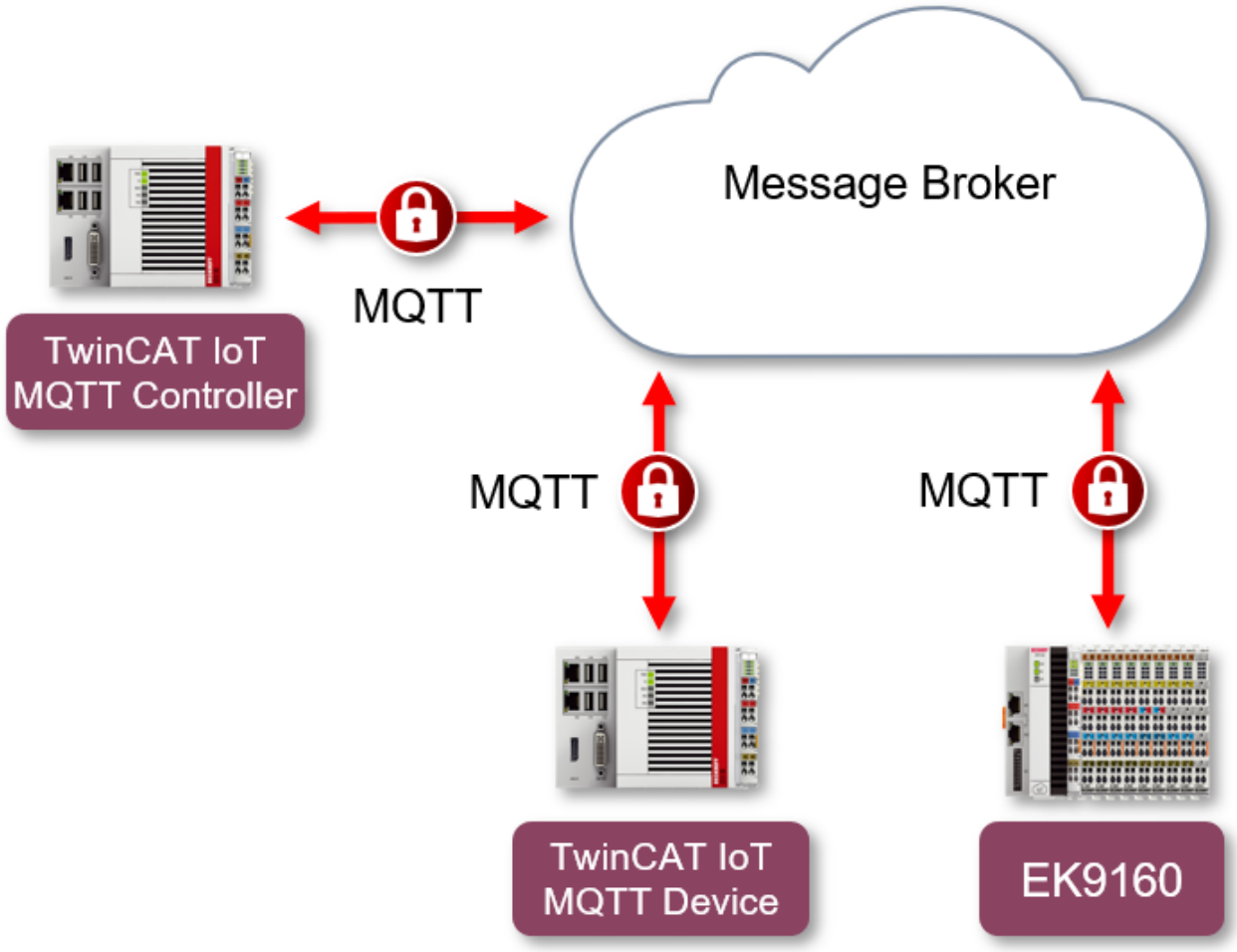


Fig. 38: Application scenarios for MQTT communication

For an "IoT MQTT Device", symbol information for all configured variables in the process image is stored on the message broker in a specific topic. An "IoT MQTT Controller" then has the ability to scan this symbol information and create matching variables in its own process image. The EK9160 is automatically always an "IoT MQTT Device".

EK9160 configuration

The EK9160 is automatically configured as an "IoT MQTT Device" in the background as soon as the device is configured to connect to an MQTT message broker. As a prerequisite, "Binary" must be selected as the data format and retain messages must be activated. The following screenshot shows the corresponding section of the EK9160 configuration web page.

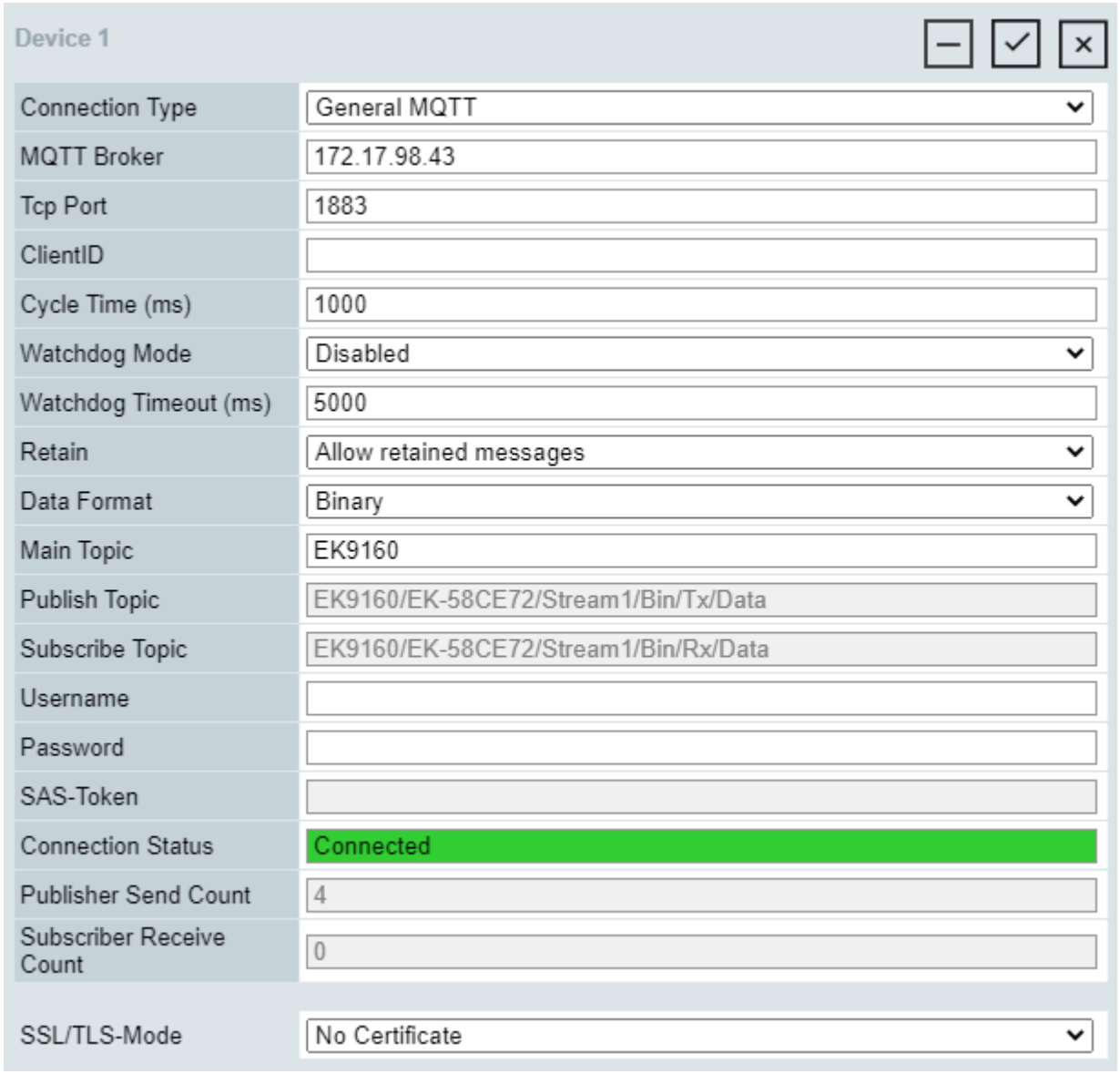


Fig. 39: Configuration of the EK9160 as an MQTT Device

All I/O terminals have been activated for the communication connection with the message broker. The following screenshot shows an example of this process on the configuration interface.

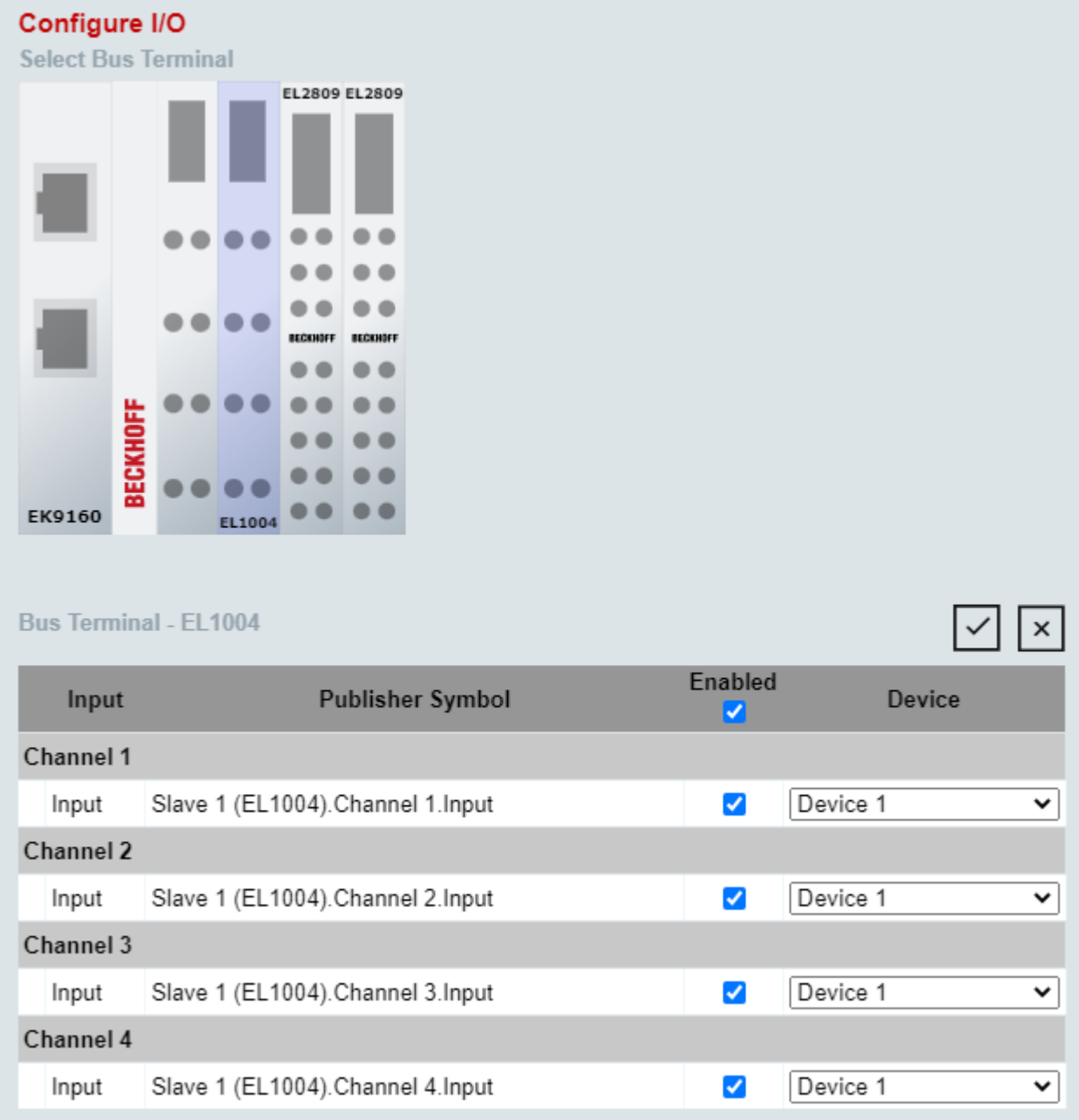


Fig. 40: Enabling I/O terminals

NOTICE

Do not use umlauts in the identifiers!

If you are using TwinCAT as an IoT MQTT Controller, switch the language setting to English or change the "ä" to "ae" in designations such as "inputs" or "outputs", as some MQTT brokers do not accept umlauts.

TwinCAT as „IoT MQTT Device“

In addition to the EK9160, TwinCAT itself can also act as an "IoT MQTT Device". In this case, the corresponding configuration steps must be carried out via the TwinCAT I/O area in TwinCAT XAE. The "IoT MQTT Device" then behaves identically to the EK9160 with regard to the further process.

Configuration in TwinCAT

In order for TwinCAT to be able to process the symbol information and process values from the EK9160, an "IoT MQTT Controller" must be created in the I/O area of TwinCAT XAE and configured for the connection with the message broker. It is important that the fields "Main Topic", "Device" and "Stream" match the configuration of the EK9160. The following screenshot illustrates this process.

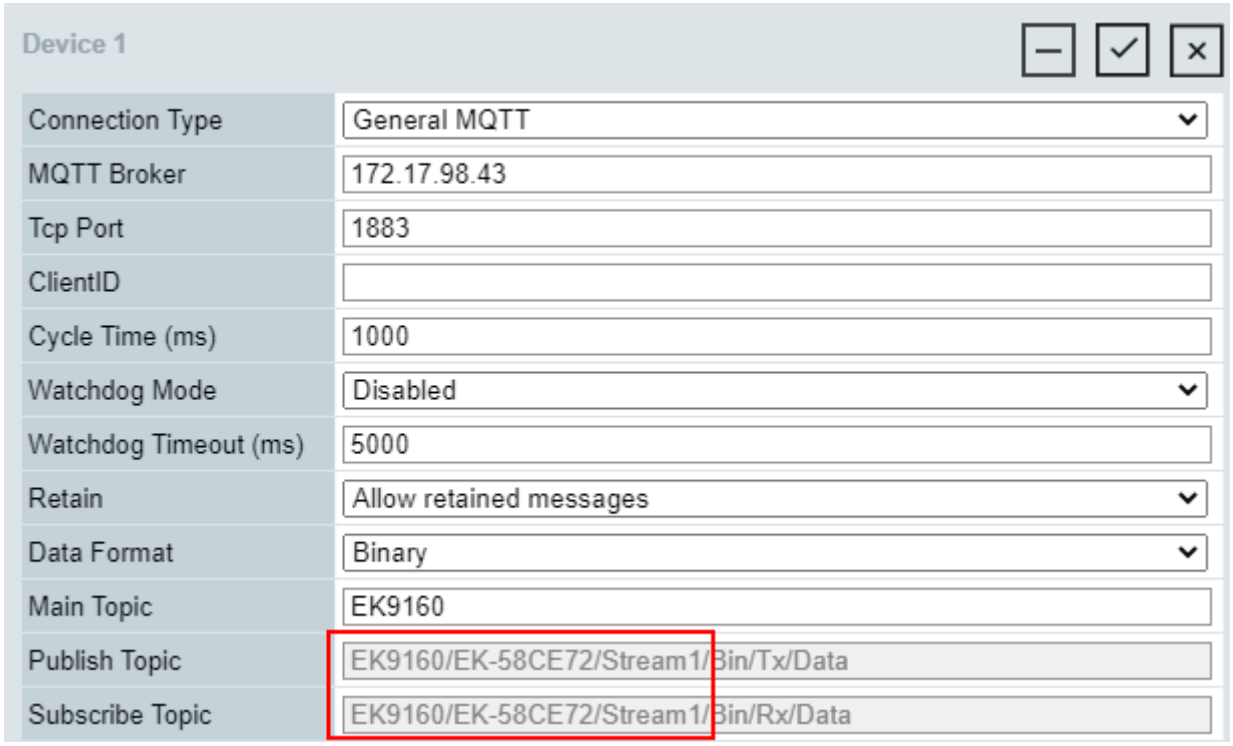


Fig. 41: The "Publish Topic" and "Subcribe Topic" fields must match the configuration of the EK9160

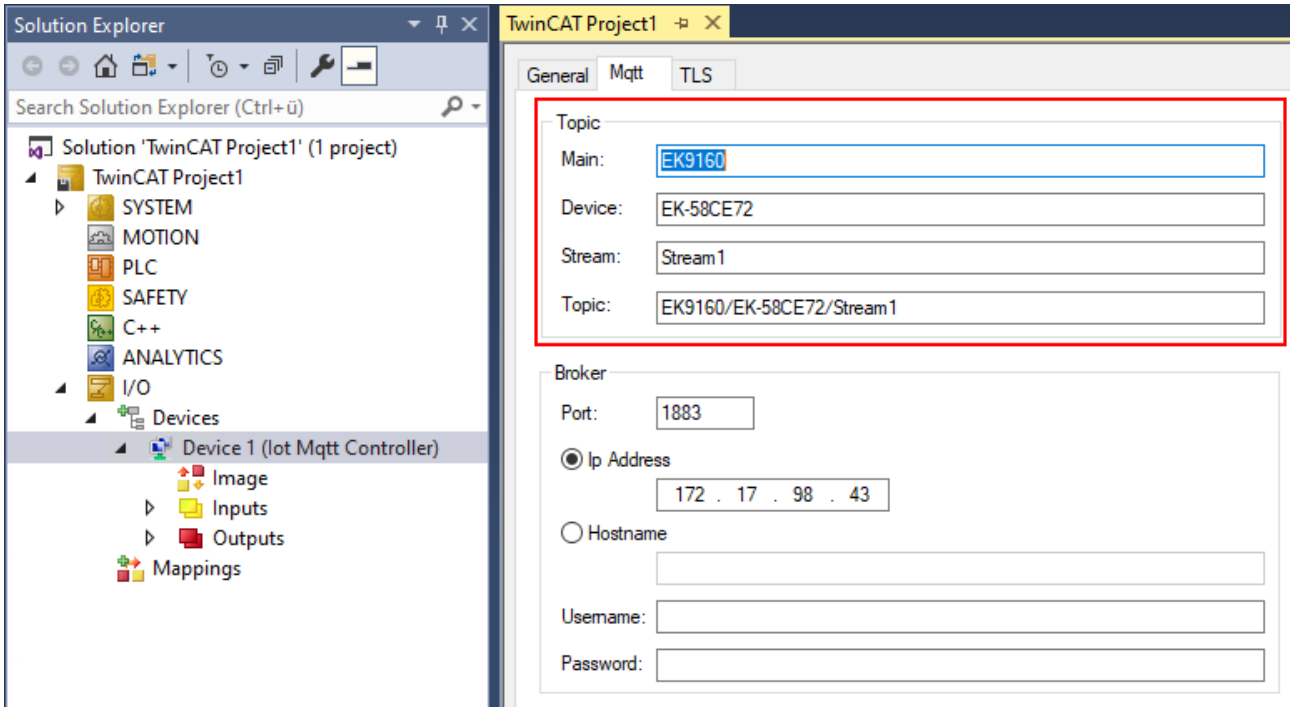


Fig. 42: Ensure that the configuration matches

Publishers and Subscribers can then be created below the "IoT MQTT Controller", depending on whether you want to scan the output or input terminals. Input terminals are operated via the "Publisher" and output terminals via the "Subscriber".

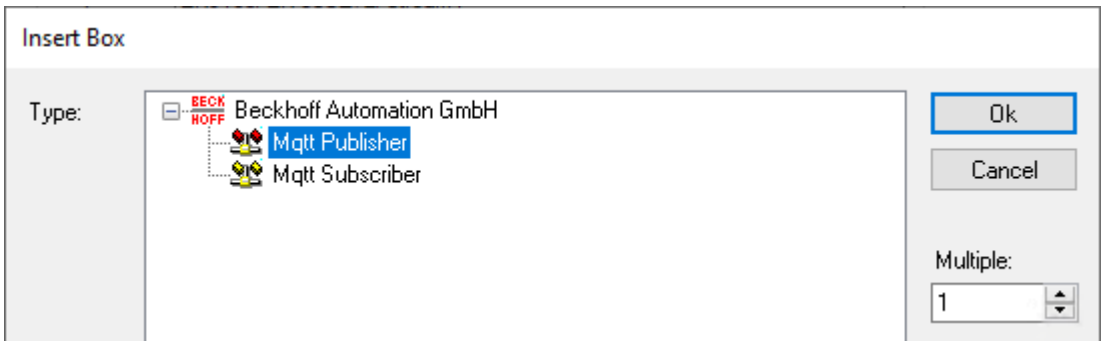


Fig. 43: Creation of "MQTT Publisher" and "MQTT Subscriber"

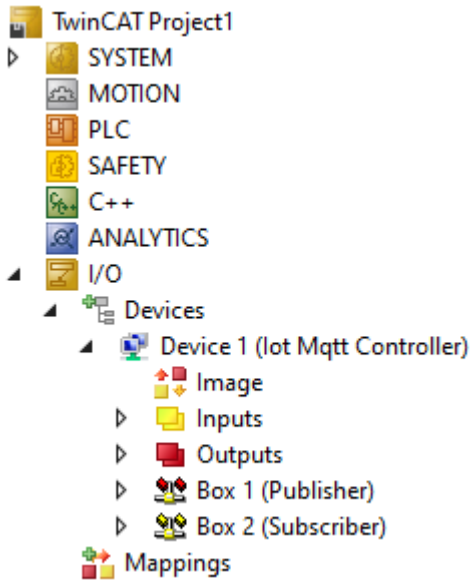


Fig. 44: Input terminals are operated via the “Publisher” and output terminals via the “Subscriber”

Subsequently, the symbol information can be read out via a scan mechanism and corresponding input/output variables can be automatically created in the process image of the device.

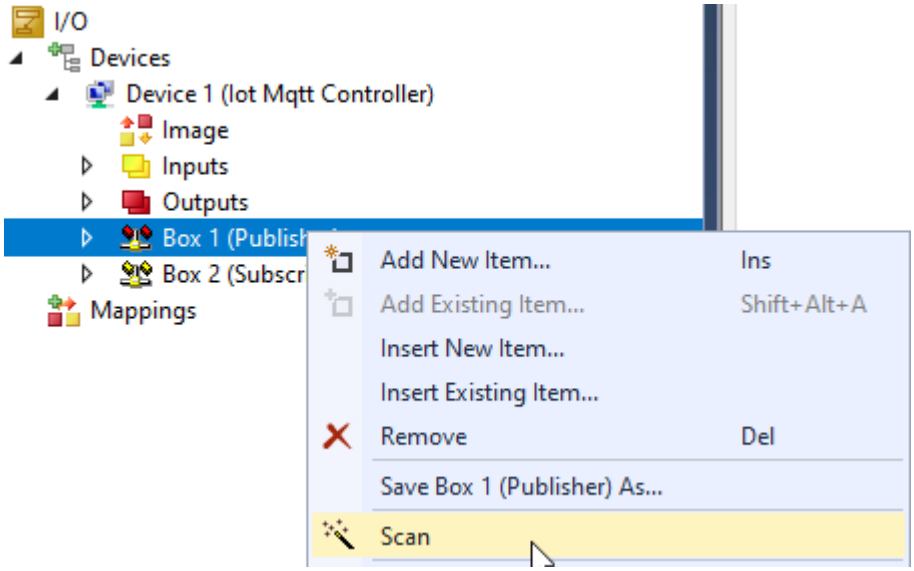


Fig. 45: Scanning via context menu

Result (taking the subscriber as an example):

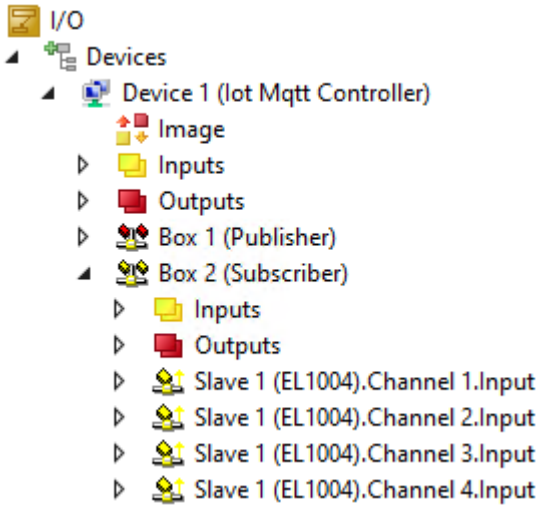


Fig. 46: Display of the inputs

Further information

After the configuration has been activated on the EK9160, three topics below the configured "Main Topic" are used on the message broker:

1. The Symbol Topic contains the symbol information for the connected I/O terminals and is filled by the EK9160 after the communication connection with the message broker has been established.
2. The Description Topic contains general status information about the device and is filled by the EK9160 after the communication connection with the message broker has been established.
3. The Data Topic contains the pure process data of the connected I/O terminals. This topic is thus cyclically filled with data by the EK9160.

The following screenshot shows a section of the Mosquitto Message Broker in verbose mode, on which you can see the individual publishes of the EK9160 on the above-mentioned topics.

```
1632306820: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q1, r1, m4, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Symbols', ... (488 bytes
1632306820: Sending PUBACK to Device1_72ce5805_000010a49f2 (m4, rc0)
1632306820: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q1, r1, m5, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Desc', ... (179 bytes))
1632306820: Sending PUBACK to Device1_72ce5805_000010a49f2 (m5, rc0)
1632306821: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306822: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306823: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306824: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306825: Received PINGREQ from Device1_72ce5805_000010a49f2
1632306825: Sending PINGRESP to Device1_72ce5805_000010a49f2
1632306825: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306826: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306827: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306828: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306829: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306830: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306831: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306832: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306833: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
1632306834: Received PUBLISH from Device1_72ce5805_000010a49f2 (d0, q0, r0, m0, 'EK9160/EK-58CE72/Stream1/Bin/Tx/Data', ... (44 bytes))
```

Fig. 47: Mosquitto Message Broker in verbose mode

5.8 Connection of EK9160 with OPC UA

Connection with UaExpert

The connection with an OPC UA client gives you full access to the data of the connected EtherCAT Terminals.

Fig. 48: Start UaExpert

- Start UaExpert and click on "Add Server"
- Enter the server URL, e.g. for host name EK-492AE2:

opc.tcp://EK-492AE2:4840

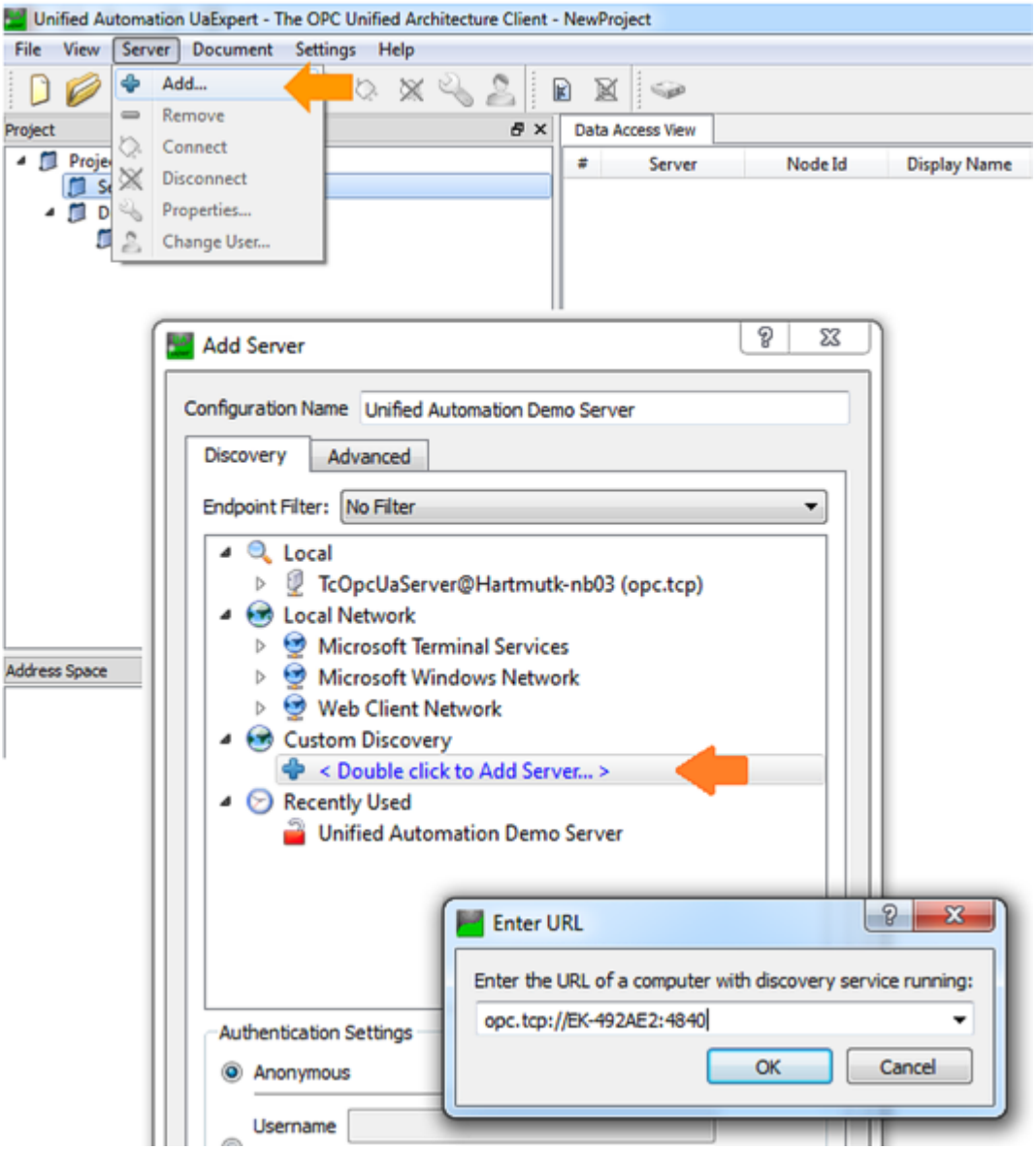


Fig. 49: Enter server URL

Check the server settings:

- Security Policy:
  Basic256Sha256
- Message Security Mode:
  Sign
- Authentication Settings:
  Username: Administrator
  Password: 1

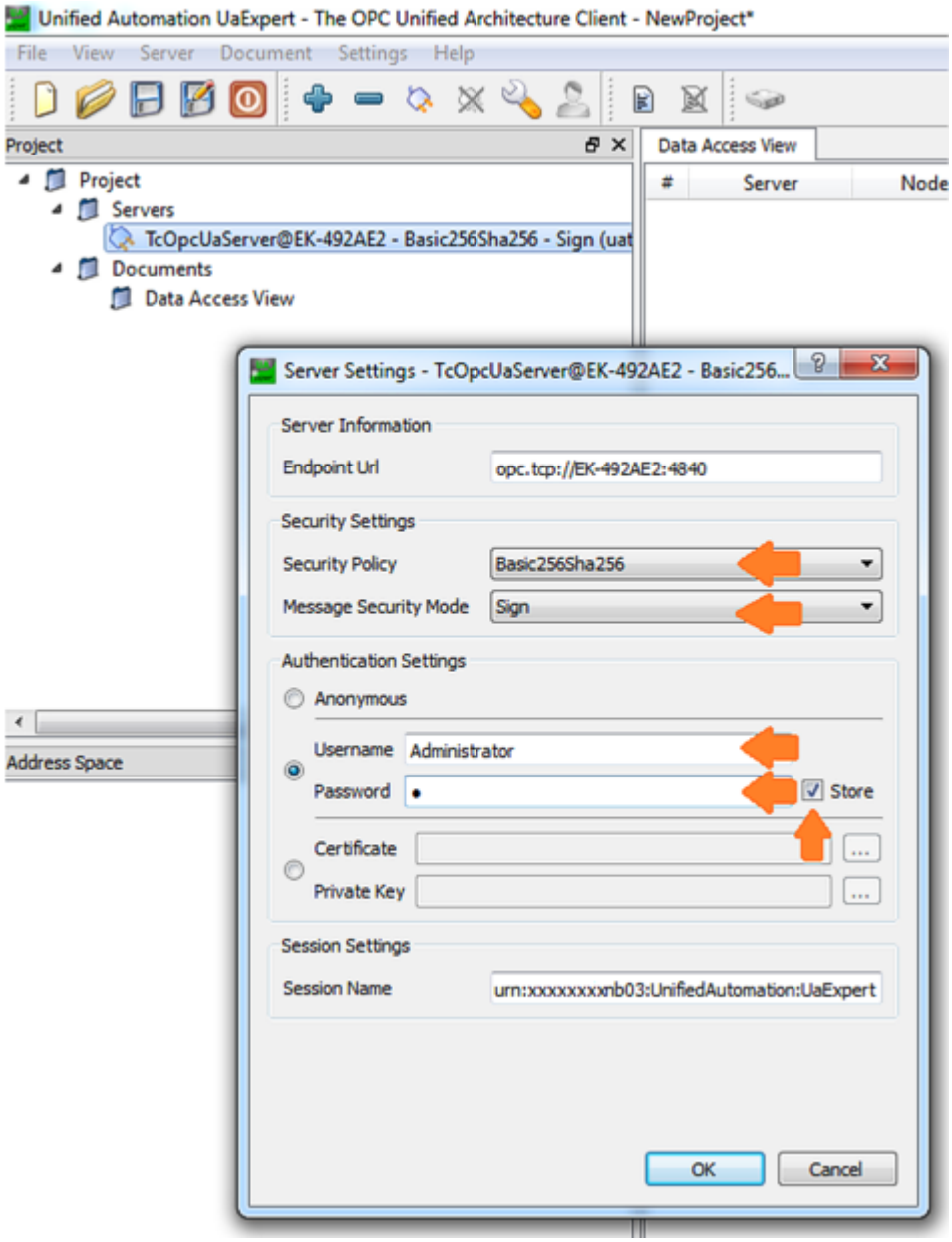


Fig. 50: Check server settings

- The process data of the EtherCAT Terminals appear in the structure tree under IO
- Process values can be dragged into the "Data Access View" window
- Output values can be controlled

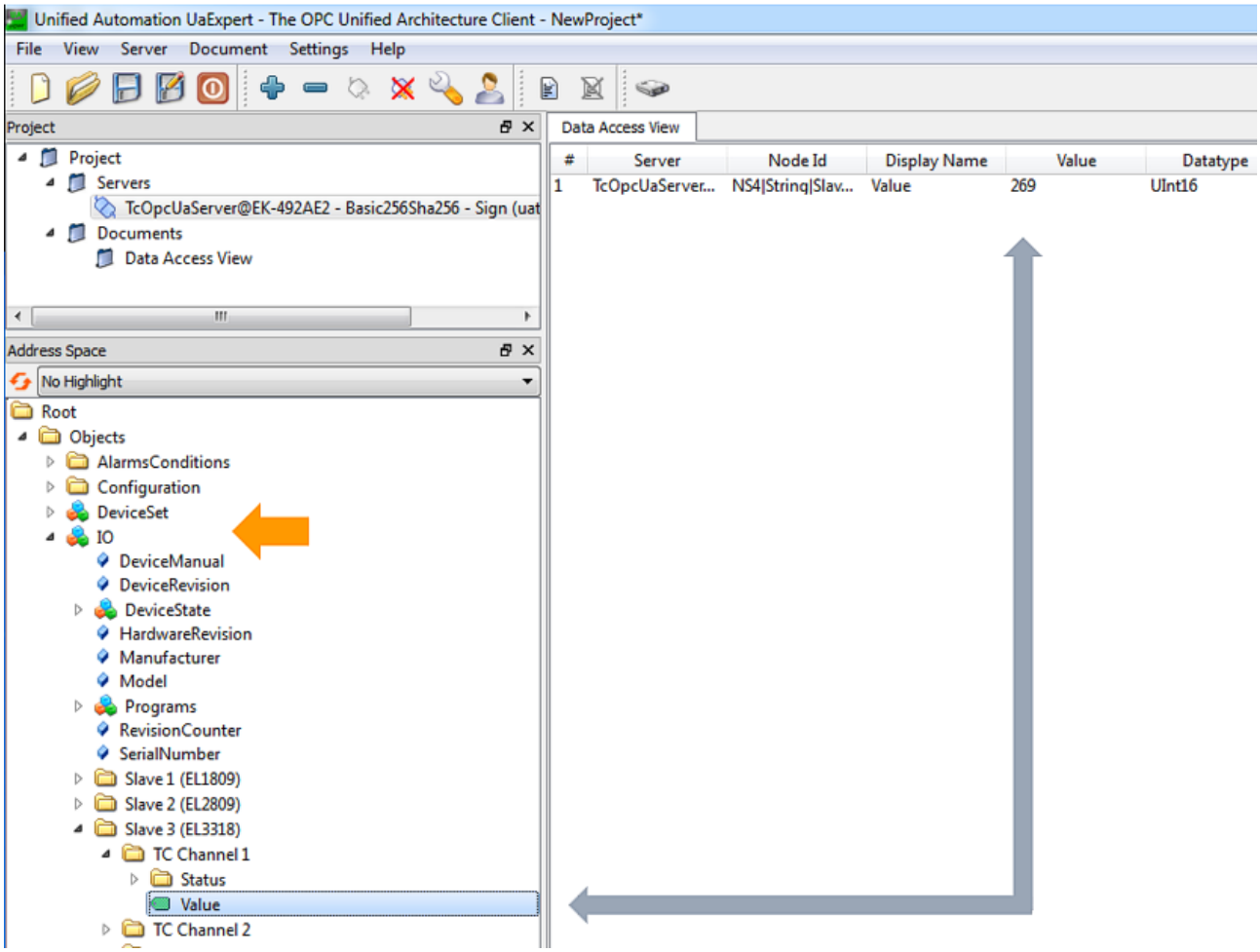


Fig. 51: Drag process values into the "Data Access View" windowl

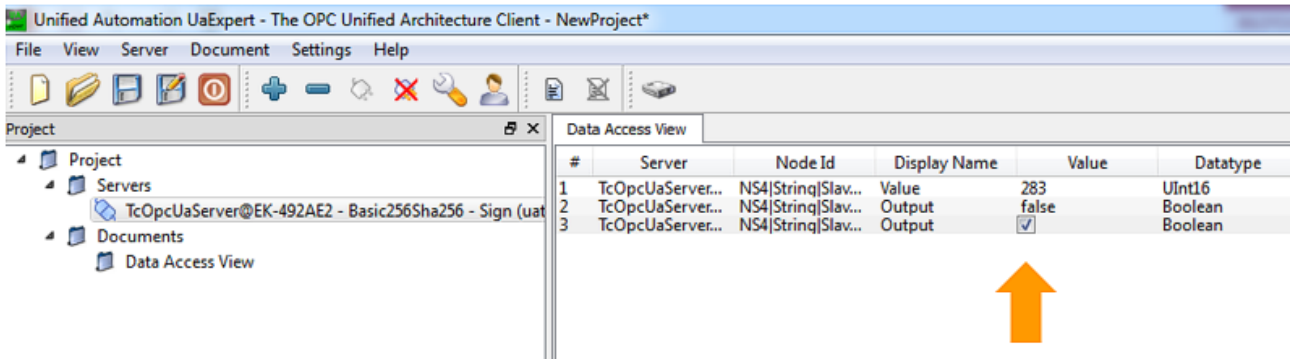


Fig. 52: Control of the output values

6 Diagnostic LEDs

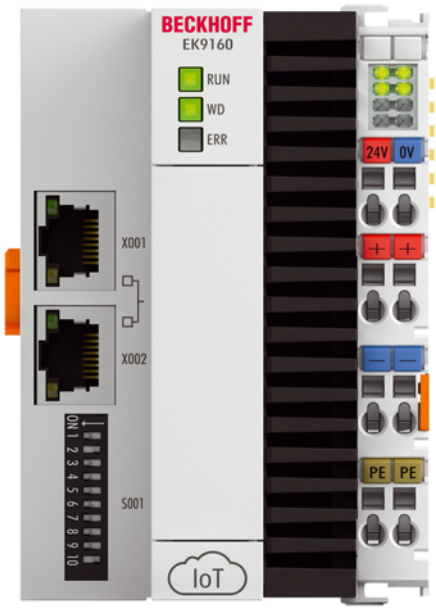


Fig. 53: EK9160 LEDs

Ethernet interface

Interface X001/X002	Ethernet (EK9160)	Meaning
LED green	on	Link available/activity
LED yellow	is not used	-

LED coupler

Labeling	Meaning	Color		Meaning
RUN	Indicates the status of the coupler	Green		Coupler is ready
		Blue		EK9160 in invalid state. Restart must be carried out.
LED WD		-		Intended for later functions
Err		Color change red -> yellow -> green		Booting the EK9160
		red	flashing	EK9160 in error (e.g. no microSD card inserted)

LED power supply terminal

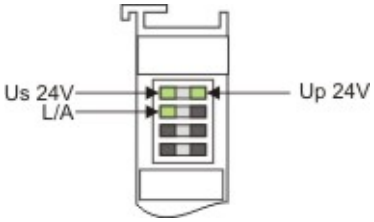


Fig. 54: LED power supply terminal

Operation with E-bus terminals

Display LED	Description	Meaning
1 Us 24 V (top left, 1st row)	Supply voltage	on: 24 V connected
2 Up 24 V (top right, 1st row)	Supply voltage power contacts	on: 24 V connected
3 L/A (left center, 2nd row)	EtherCAT LED	flashing green: EtherCAT communication active on: E-bus connected / no data traffic off: E-bus not connected

7 Appendix

7.1 List of Abbreviations

ADS

Automation Device Specification (disclosed protocol for the communication of all BECKHOFF controllers)

DAP

Device Access Point

I/O

Inputs and outputs

E-bus

Designation for EtherCAT terminals in the terminal group (ELxxxx, ESxxxx, or EMxxxx)

EtherCAT

EtherCAT (Ethernet for Control Automation Technology) is the Ethernet solution for industrial automation, characterized by outstanding performance and particularly simple handling.

Fast Ethernet

Data rate 100 Mbits/s according to the 100 Base-T standard.

IP20

Protection class of the Bus Terminals, EtherCAT Terminals

IPC

Industrial PC

IoT

Internet **O**f **T**hings

K-bus

Terminal bus (KLxxxx, KMxxxx or KSxxxx terminals)

MQTT

MQTT is an open network protocol for machine-to-machine (M2M) communication. An MQTT server ("broker") holds all the data of its communication partners and can thus be used as a state database.

OPC UA

OPC Unified Architecture (OPC UA) is a standard for data exchange as a platform-independent, service-oriented architecture. Machine data (controlled variables, measurements, parameters, etc.) are not only transported, but also semantically written in a machine-readable form.

PE

The PE power contact can be used as a protective earth.

TwinCAT

The Windows Control and Automation Technology, programmer and configuration tool from the BECKHOFF company.

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