Operating Instruction for

EP1908

TwinSAFE EtherCAT Box with 8 fail-safe inputs

Version: 2.2.0
Date: 2017-05-29

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Version: 2.2.0

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 following notes and explanations are followed when installing and commissioning these components.

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.

Origin of the document

This documentation was originally written in German. All other languages are derived from the German original.

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.com/english/download/twinsafe.htm. In case of doubt, please contact Technical Support [▶ 43].

Product features

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

Disclaimer

The documentation has been prepared with care. The products described are subject to cyclical revision. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics. 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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Patent Pending

The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, DE102004044764, DE102007017835 with corresponding applications or registrations in various other countries.

The TwinCAT Technology is covered, including but not limited to the following patent applications and patents: EP0851348, US6167425 with corresponding applications or registrations in various other countries.

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Delivery conditions

In addition, the general delivery conditions of the company Beckhoff Automation GmbH & Co. KG apply.

1.2 Safety instructions

1.2.1 Delivery state

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.

1.2.2 Operator's obligation to exercise diligence

The operator must ensure that

- the TwinSAFE products are only used as intended (see chapter Product description);
- the TwinSAFE products are only operated in sound condition and in working order.
- the TwinSAFE products are operated only by suitably qualified and authorized personnel.
- the personnel is instructed regularly about relevant occupational safety and environmental protection aspects, and is familiar with the operating instructions and in particular the safety instructions contained herein.
- the operating instructions are in good condition and complete, and always available for reference at the location where the TwinSAFE products are used.
- none of the safety and warning notes attached to the TwinSAFE products are removed, and all notes remain legible.

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1.2.3 Description of safety symbols

In these operating instructions the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

	Serious risk of injury!
DANGER	**Failure** to follow the safety instructions associated with this symbol directly endangers the life and health of persons.
	Risk of injury!
WARNING	**Failure** to follow the safety instructions associated with this symbol endangers the life and health of persons.
	Personal injuries!
CAUTION	**Failure** to follow the safety instructions associated with this symbol can lead to injuries to persons.
	Damage to the environment or devices
Attention	**Failure** to follow the instructions associated with this symbol can lead to damage to the environment or equipment.
	Tip or pointer
Note	This symbol indicates information that contributes to better understanding.

Version: 2.2.0

1.3 Documentation issue status

Version	Comment
2.2.0	• Characteristic curve of the inputs added • Note to earthing connection added • Description U_S updated
2.1.1	• Technical data *permissible air pressure* expanded
2.1.0	• Chapter *EP1908 process image* added
2.0.0	• Migration and structural adaptation • Reliability document updated • Safety parameters updated • Foreword revised
1.2.2	• Reliability document added • Description of the test pulses added • Reaction time updated in the technical data
1.2.1	• Certificate updated
1.2.0	• Company address amended • Documentation versions added • DateCode description added • HFT and element classification according to EN 61508:2010 added
1.1.2	• Clock output currents in the technical data amended • Notes regarding the M8 and M12 connectors expanded
1.1.1	• Reference to EN 60068-2-29 removed
1.1.0	• First released version

2 System description

2.1 EtherCAT Box Modules

The EtherCAT system has been extended with EtherCAT Box modules with protection class IP 67. Through the integrated EtherCAT interface the modules can be connected directly to an EtherCAT network without an additional Coupler Box. The high-performance of EtherCAT is thus maintained into each module.

The extremely low dimensions of only 126 x 30 x 26.5 mm (H x W x D) are identical to those of the Fieldbus Box extension modules. They are thus particularly suitable for use where space is at a premium. The small mass of the EtherCAT modules facilitates applications with mobile I/O interface (e.g. on a robot arm). The EtherCAT connection is established via screened M8 connectors.
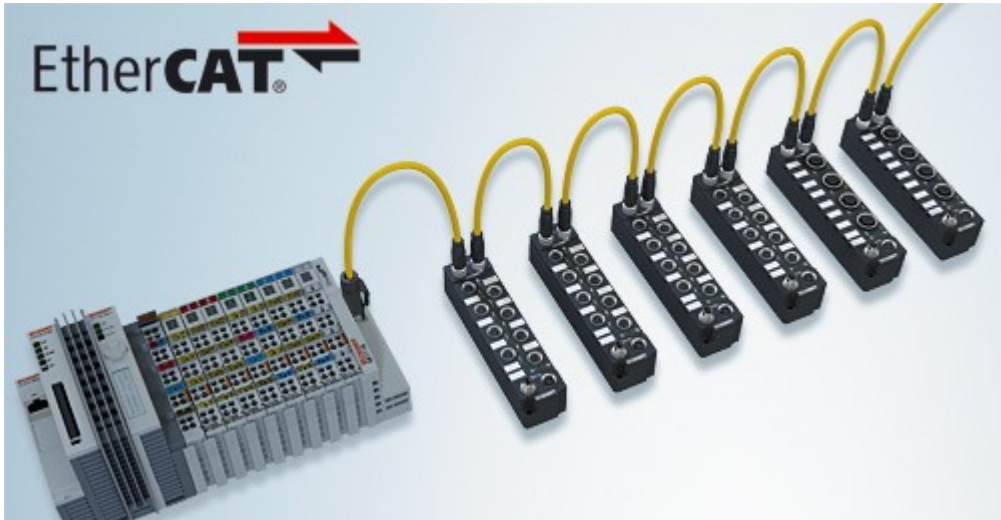
Fig. 1: EtherCAT Box modules extend the EtherCAT system with IP67 protection

The robust design of the EtherCAT Box modules enables them to be used directly at the machine. Control cabinets and terminal boxes are now no longer required. The modules are fully sealed and therefore ideally prepared for wet, dirty or dusty conditions.

Pre-assembled cables significantly simplify EtherCAT and signal wiring. Very few wiring errors are made, so that commissioning is optimized. In addition to pre-assembled EtherCAT, power and sensor cables, field-configurable connectors and cables are available for maximum flexibility. Depending on the application, the sensors and actuators are connected through M8 or M12 connectors.

i Note	**Basic EtherCAT documentation**
	You will find a detailed description of the EtherCAT system in the Basic System Documentation for EtherCAT, which is available for download from our website (www.beckhoff.de) under *Downloads*.

3 Product description

3.1 EP1908-0002
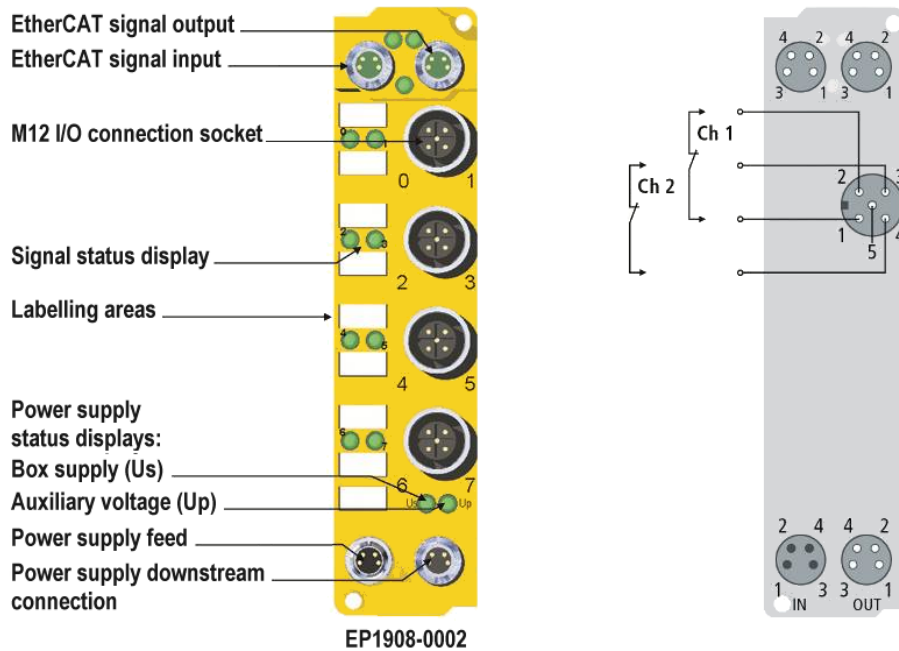
Fig. 2: EP1908-0002

The EP1908-0002 is an EtherCAT Box with digital inputs for 24 V_{DC} encoders or for potential-free contacts. The EtherCAT Box has eight fail-safe inputs.

In addition to the possibility to read potential-free contacts, the EP1908-0002 also supports the connection of encoders with OSSD signals whose test pulse length does not exceed 350 µs and of safety mats that operate based on the cross-circuit principle.

Frequency measurement is also supported, in order to enable standstill and speed monitoring. The frequency below which a logical 1 is reported at the input is specified in steps of 0.1 Hz. The module supports a minimum frequency of 2 Hz and a maximum frequency of 500 Hz. Frequencies above of 500 Hz result in a diagnostic message for the module. In this case all inputs are set to safe state (logical 0). This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.

With a two-channel connection, the EP1908-0002 meets the requirements of EN 61508-1:2010 SIL 3 and DIN EN ISO 13849-1:2006 (Cat 4, PL e).

The control voltage U_S supplies the module electronics. The sensors (test pulse outputs) are supplied from the control voltage U_P.

The TwinSAFE EtherCAT Box has the typical design of an EtherCAT Box.

3.2   Intended use

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

The TwinSAFE EtherCAT Box expands the application range of the Beckhoff system with functions that enable it to be used for machine safety applications. The TwinSAFE Boxes 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 wattless state. Fail-safety according to the relevant standards is required.

The TwinSAFE EtherCAT Box allows the connection of:

24 V_{DC} sensors such as

- emergency stop push buttons, pull cord switches, position switches, two-hand switches, safety mats, light curtains, light barriers, laser scanners etc.
- initiators and encoders for speed measurement (frequency) with a signal voltage of 24 V_{DC}

⚠ **WARNING**	**The fail-safe principle** 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.
⚠ **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.
⚠ **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.

3.3   Technical data

Product designation	EP1908-0002
Fieldbus	EtherCAT
Number of inputs	8
Connecting the inputs	M12
Status display	8 (one green LED per input)
Reaction time (Read input/write to E-bus)	typically: 5.5 ms, maximally: see error reaction time
Watchdog time	adjustable from 2 ms to 60 s
Error reaction time	≤ watchdog time
Frequency range for speed measurement	2 Hz to 500 Hz
Cable length between sensor and EtherCAT Box	Unshielded: 30 m max. (at 0.75 or 1 mm²)
	Shielded: 30 m max. (at 0.75 or 1 mm²)
Output current of the clock outputs	typically 10 mA, max. 15 mA
Input process image	6 bytes
Output process image	6 bytes
Supply voltage for the EP1908	24 V_{DC} (−15%/+20%)
Power consumption U_S (connected with eight potential-free contacts)	8 channels occupied: typically 87 mA 0 channel occupied: typically 80 mA
Current consumption U_P	8 channels occupied: approx. 27 mA
(connected with eight potential-free contacts)	0 channel occupied: approx. 6 mA
Power dissipation of the EtherCAT Box	typically 3 watts
Electrical isolation (between the channels)	no
Electrical isolation (between the channels and EtherCAT)	yes
Insulation voltage (between the channels and EtherCAT, under common operating conditions)	insulation tested with 500 V_{DC}
Dimensions (W x H x D)	30mm x 126mm x 26.5mm
Housing material	PA6-F (polyamide)
Sealing compound	polyurethane
Weight	approx. 170 g
Permissible ambient temperature (operation)	-25°C to +60°C
Permissible ambient temperature (transport/storage)	-40°C to +85°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)
Impermissible operating conditions	TwinSAFE EtherCAT boxes must not be used under the following conditions: • under the influence of ionizing radiation (that exceeds the level of the natural environmental radiation) • in corrosive environments
EMC immunity/emission	conforms to EN 61000-6-2 / EN 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6 / EN 60068-2-27
Shocks	15 g with pulse duration 11 ms in all three axes
Protection class (when screwed together)	IP65, IP66, IP67 (according to EN 60529)
Permissible installation position	variable
Approvals	CE, TÜV SÜD

3.4   Safety parameters

Key figures	EP1908-0002
Lifetime [a]	20
Prooftest Interval [a]	not required[1]
PFH_D	1.56E-09
%SIL3	1,56%
PFD	1.06E-04
%SIL3	10,59%
$MTTF_d$	high
DC	high
Performance level	PL e
Category	4
HFT	1
Element classification[2]	Type B

1. Special proof tests throughout the service life of the EtherCAT Box are not required.
2. Classification according to EN 61508-2:2010 (see chapters 7.4.4.1.2 and 7.4.4.1.3)

The EP1908-0002 EtherCAT Box can be used for safety-related applications according to IEC 61508 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.

3.5   Characteristic curve of the inputs

The characteristic curve of the inputs is similar to type 3 according to EN 61131-2.
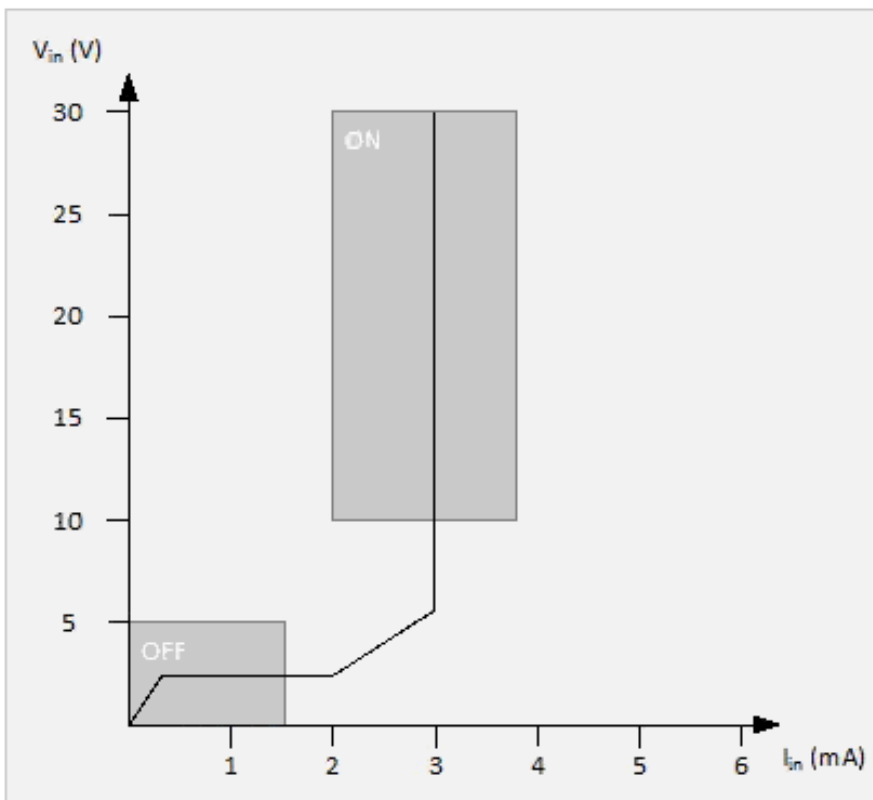

Fig. 3: Characteristic curve of the inputs

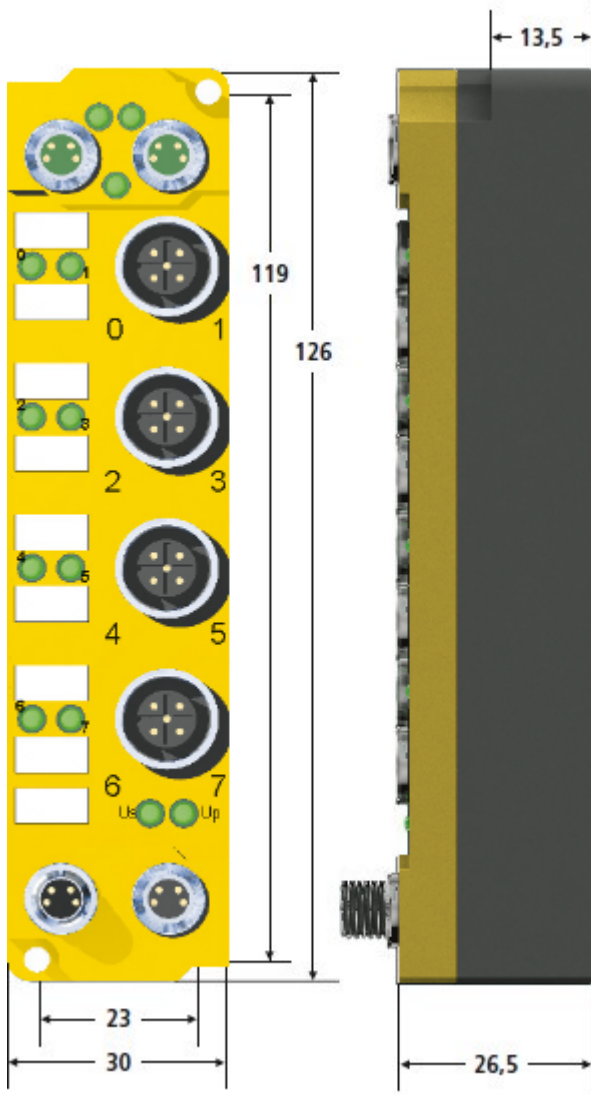**BECKHOFF**

3.6   Dimensions

Fig. 4: Dimensions of the EP1908-0002

The EP1908-0002 module has the following dimensions.
Width: 30 mm
Height: 126 mm
Depth: 26.5 mm

When fully wired, the connected cables increase the total depth of the module.

4 Operation

4.1 Environmental conditions

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

⚠️ WARNING	**Risk of injury!** The TwinSAFE EtherCAT boxes must not be used under the following conditions. • under the influence of ionizing radiation (that exceeds the level of the natural environmental radiation) • in corrosive environments
❗ Attention	**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.

4.2 Installation

4.2.1 Safety instructions

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

4.2.2 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).

4.2.3 Address settings on the TwinSAFE EtherCAT Box

Fig. 5: Rotary switch for setting the TwinSAFE address

The TwinSAFE address of the box must be set using the three rotary switches at the bottom of the EP1908-0002 TwinSAFE EP Box. TwinSAFE addresses between 1 and 4095 are available.

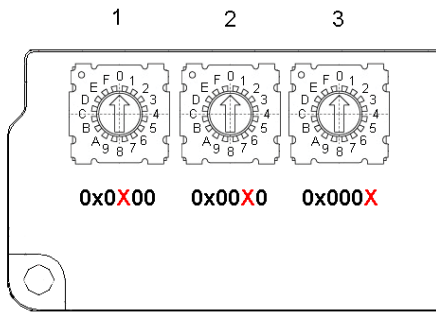| Rotary switch			Address
1 (left)	2 (center)	3 (right)	
0	0	1	1
0	0	2	2
0	0	3	3
…	…	…	…
0	0	F	15
0	1	0	16
0	1	1	17
…	…	…	…
0	F	F	255
1	0	0	256
1	0	1	257
…	…	…	…
F	F	F	4095

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

4.2.4 Mounting

ℹ️ Note	Protect connectors against soiling
	Protect all connections from contamination during module installation!
	Protection class IP67 can only be guaranteed if all cables and connectors are connected!
	Unused connections must be protected with the appropriate connectors (connector sets see catalogue)!

The modules are mounted with two M3 screws. The bolts must be longer than 15 mm. The fixing holes are not threaded. Note when mounting that the overall height is increased further by the fieldbus connections.

Mounting rail ZS5300-0001

The mounting rail ZS5300-0001 (500 mm x 129 mm) allows time-saving configuration of the modules. The rail is made of 1.5 mm thick stainless steel (V2A) and features ready-made M3 threads. Use M5 screws (5.3 mm oblong holes) to attach the rail to the machine.

Fig. 6: Mounting rail ZS5300-0001

The rail is 500 mm long and enables the installation of 15 modules, with a distance of 2 mm between them. It can be shortened as required for your particular application.

4.2.5   Connection

4.2.5.1   Tightening torque for connectors

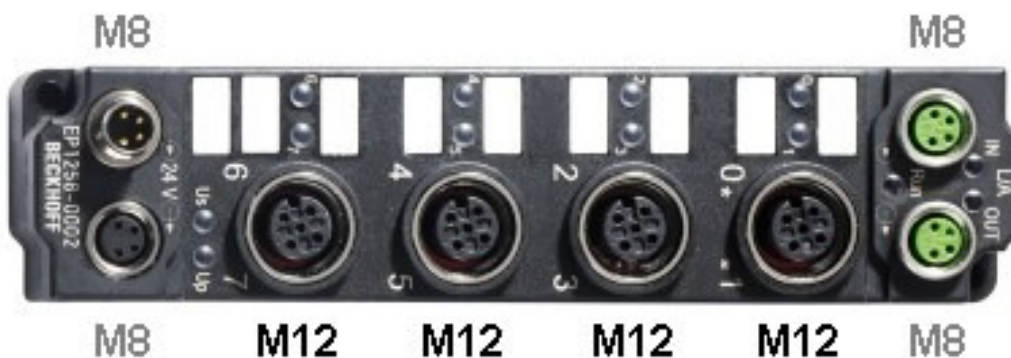The plug connectors should be tightened with the recommended torque.

Fig. 7: EtherCAT Box with M8 and M12 connectors

Type	Connection	Nm	ft-lb
M8	Power supply, EtherCAT	0,4	0,3
M12	Input signals	0,6	0,44

Torque wrench

Fig. 8: Torque wrench ZB8801

i Note	**Ensure the proper torque is used** Use torque wrenches available from Beckhoff to tighten the plug connectors (see accessories)!

4.2.5.2   EtherCAT connection

The EtherCAT Box (EPxxxx) has two M8 connectors marked **green** for the incoming and outgoing EtherCAT connection.
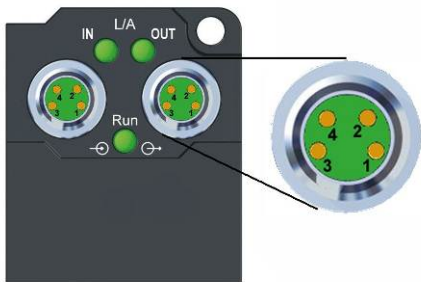
Fig. 9: EtherCAT Box: M8, 30 mm housing

Assignment

There are various different standards for the assignment and colors of connectors and cables for EtherCAT.

EtherCAT		Connector	Cable		Standard
Signal	Description	M8	ZB9010, ZB9020, ZK1090-6292	ZB903x, ZK1090-31xx	TIA-568B
Tx +	Transmit Data+	Pin 1	yellow1	orange/white2	white/orange
Tx -	Transmit Data-	Pin 4	orange1	orange2	orange
Rx +	Transmit Data-	Pin 2	white1	blue/white2	white/green
Rx -	Receive Data-	Pin 3	blue1	blue2	green
Shield	Shield	Housing	Shield	Shield	Shield

1) Wire colors according to EN 61918

2) Wire colors

4.2.5.3 EtherCAT- Fieldbus LEDs

Fig. 10: EtherCAT LEDs

LED indicators

LED	Display	Meaning
IN L/A	off	no connection to the preceding EtherCAT module
	lit	LINK: connection to the preceding EtherCAT module
	flashing	ACT: communication with the preceding EtherCAT module
OUT L/A	off	no connection to the following EtherCAT module
	lit	LINK: connection to the following EtherCAT module
	flashing	ACT: Communication with the following EtherCAT module
Run	-	See chapter 4.4.1 [▶ 29]

4.2.5.4 EtherCAT cables

For connecting EtherCAT devices only Ethernet cables that meet the requirements of at least **category 5 (CAT5) according to EN 50173 or ISO/IEC 11801** should be used.

ℹ️ **Note**	**Wiring recommendations**
	Detailed recommendations for EtherCAT wiring can be found in the documentation "Design recommendations for EtherCAT/Ethernet infrastructure", which is available for download from www.Beckhoff.de.

EtherCAT uses four cable wires for signal transmission. Due to automatic cable detection (auto-crossing) symmetric (1:1) or cross-over cables can be used between EtherCAT devices from BECKHOFF.

4.2.5.5 Power Connection

Two M8 connectors at the low-end of the modules are used for feeding and routing the supply voltages:

- IN: left M8 connector for feeding the supply voltages
- OUT: right M8 connector for routing the supply voltages
- Earthing screw: The earthing screw is installed in the factory. An additional M3 ring cable lug and the earthing cable are required for the installation.

ℹ️ **Note**	**Earthing connection**
	It is recommended to connect the earth connection to PE with low resistance.

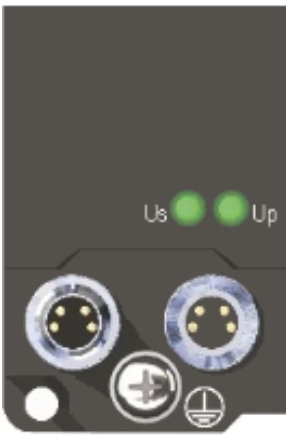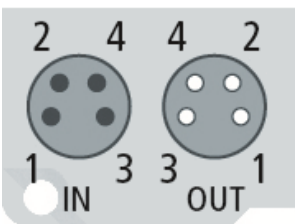Fig. 11: Connections for the supply voltages

Fig. 12: Pin assignment of the M8 connector the supply voltages

Contact	Voltage
1	Control voltage Us, +24 V_{DC}
2	Peripheral voltage Up, +24 V_{DC}
3	GNDs*
4	GNDp*
PE	Earthing connection

The contacts of the M8 plug connectors can conduct a maximum current of 4 A.

Two LEDs indicate the status of the supply voltages.

! **Attention**	**Do not confuse the power port with EtherCAT port!**
	Never connect the power cables (M8, 24 V_{DC}) to the green-marked EtherCAT sockets of the EtherCAT Box Modules. This can cause the destruction of the modules!

Control voltage Us: 24 V_{DC}

Power is supplied to the fieldbus, the processor logic and also to the inputs from the 24 V_{DC} control voltage Us. The control voltage is electrically isolated from the fieldbus circuitry.

Peripheral voltage Up: 24 V_{DC}

The peripheral voltage Up supplies the digital pulse outputs; it can be brought in separately. Hence, if the load voltage is switched off, the fieldbus function as well as the supply and function of the inputs are retained.

Redirection of the supply voltages

The power IN and OUT connections are bridged in the module. Hence, the supply voltages Us and Up can be passed from EtherCAT Box to EtherCAT Box in a simple manner.

	Note the maximum current!
⚠ Attention	Ensure that the maximum permitted current of 4 A for the M8 plug connectors is not exceeded when routing the supply voltages Us and Up!

4.2.5.6   Status-LEDs for the power supply
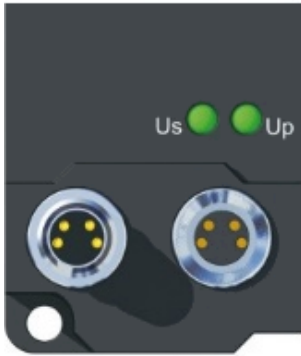
Fig. 13: Status-LEDs for the power supply

LED	Display	Meaning
U_S (control voltage)	off	the power supply voltage, U_S, is not present
	green illuminated	the power supply voltage, U_S, is present
U_P (peripheral voltage)	off	the power supply voltage, U_P, is not present
	green illuminated	The power supply voltage, U_P, is present

4.2.5.7   Overvoltage protection

If protection against overvoltage is necessary in your system, provide a surge filter for the power supply to the EtherCAT Box.

4.2.5.8   Signal connection
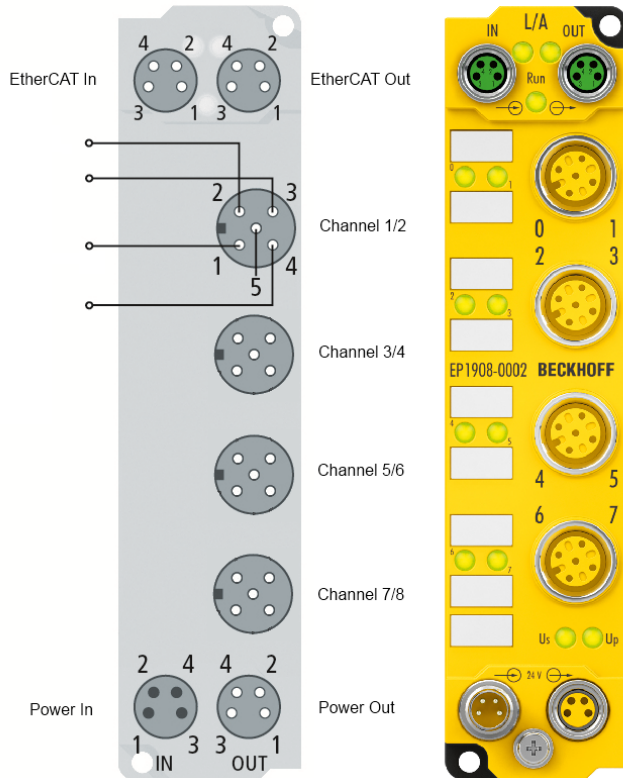
Fig. 14: Signal connection

M12 connection	Contact	Channel	Signal
1	1	1	Pulse output 1
	2		Input 1
	3	2	Pulse output 2
	4		Input 2
	5	-	not connected
2	1	3	Pulse output 3
	2		Input 3
	3	4	Pulse output 4
	4		Input 4
	5	-	not connected
3	1	5	Pulse output 5
	2		Input 5
	3	6	Pulse output 6
	4		Input 6
	5	-	not connected
4	1	7	Pulse output 7
	2		Input 7
	3	8	Pulse output 8
	4		Input 8
	5	-	not connected

i **Note**	**Configurable inputs** The inputs 1 to 8 can be occupied as you want with normally closed contacts or normally open contacts. The corresponding analysis is carried out in the safety PLC.

4.2.6 Signal cables

Permitted cable length

Fig. 15: Permitted cable length

When connecting a single switching contact via a dedicated continuous cable (or via a non-metallic sheathed cable), the maximum permitted cable length is 30 m if a sensor test is active.

The use of contact points, plug connectors or additional switching contacts in the cabling also reduces the maximum propagation.

Cable routing

Fig. 16: Cable routing

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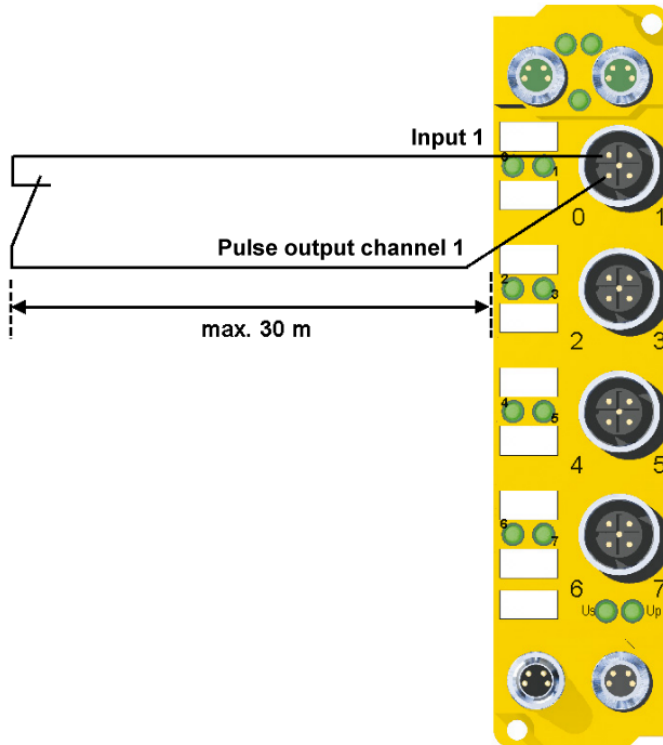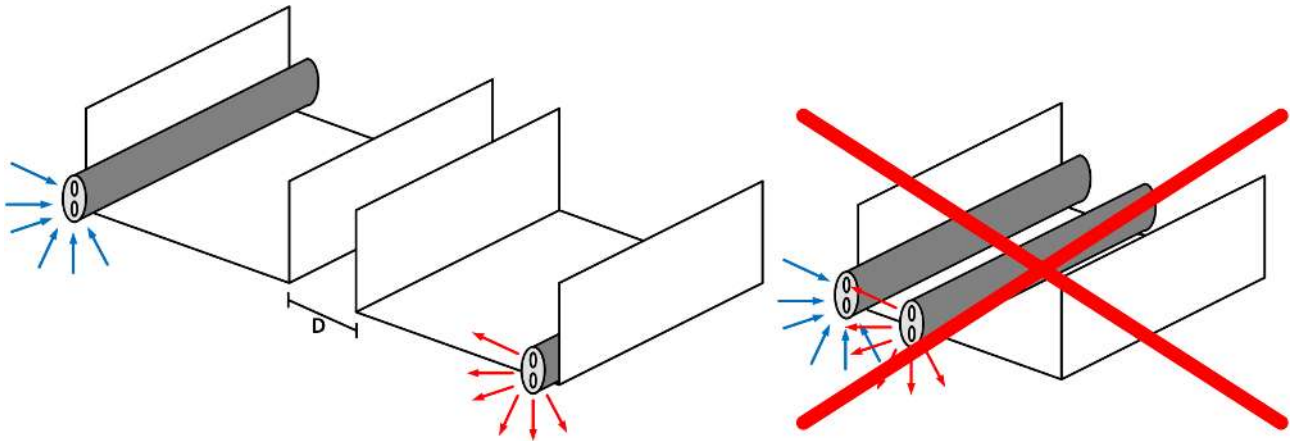| ⚠️ **Attention**	**Route the signal cable separately**
	The signal cable must be routed separately from potential sources of interference, such as motor supply cables, 230 V$_{AC}$ power cables etc.!
	Interference caused by cables routed in parallel can influence the signal form of the test pulses and thus cause diagnostic messages (e.g. sensor errors or OpenLoad errors).
	D: Distance between the cable ducts should be as large as possible
	blue arrows: signal line
	red arrows: potential source of interference

The common routing of signals together with other clocked signals in a common cable also reduces the maximum propagation, since crosstalk of the signals can occur over long cable lengths and cause diagnostic messages.

The test pulses can be switched off (sensor test parameter) if the connection of a common cable is unavoidable. However, this then leads to a reduction in the degree of diagnostic cover when calculating the performance level.

4.2.7   Description of the EP1908 test pulses

The typical length of a test pulse (switching from 24 V to 0 V and back to 24 V) is 350 µs and takes place approx. 180 times per second.

The test pulses at the outputs Pulse Output 1 to Pulse Output 8 are generated separately for each channel in order to be able to detect cross-circuits between the individual channels of a terminal and also between channels of different terminals. In order to generate test pulses as shown in the diagram, the *Sensor test active* safety parameter must be set to *true* for the respective channels. The test cycle for all 8 channels is typically 5.5 ms. The times between the test pulses of different channels vary, thus allowing better diagnostic detection.
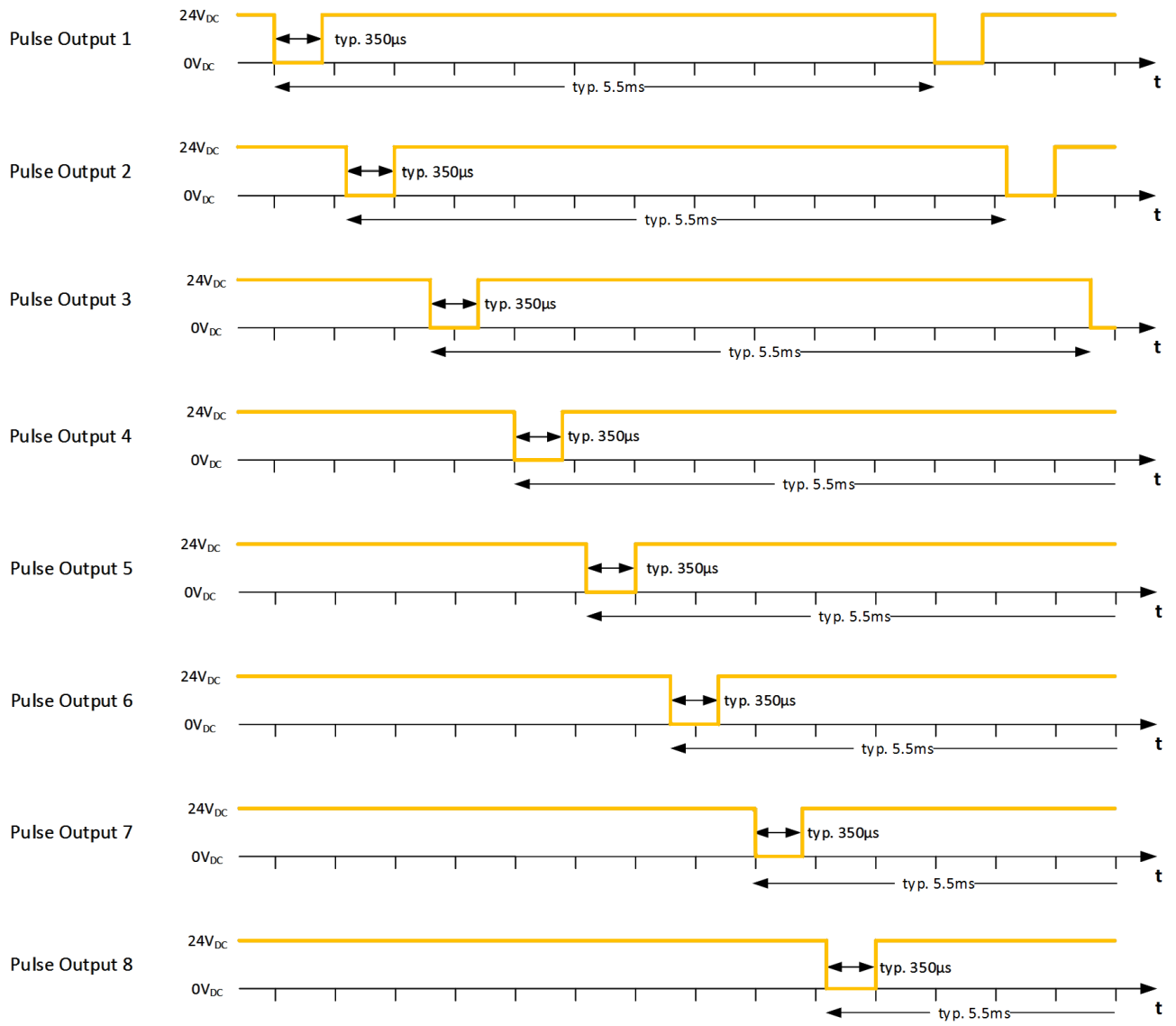
Fig. 17: EP1908 test pulses

If self-testing sensors are to be used on the safe inputs, please refer to chapter 4.5.3.1 [▶ 35].

4.2.8 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.

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.
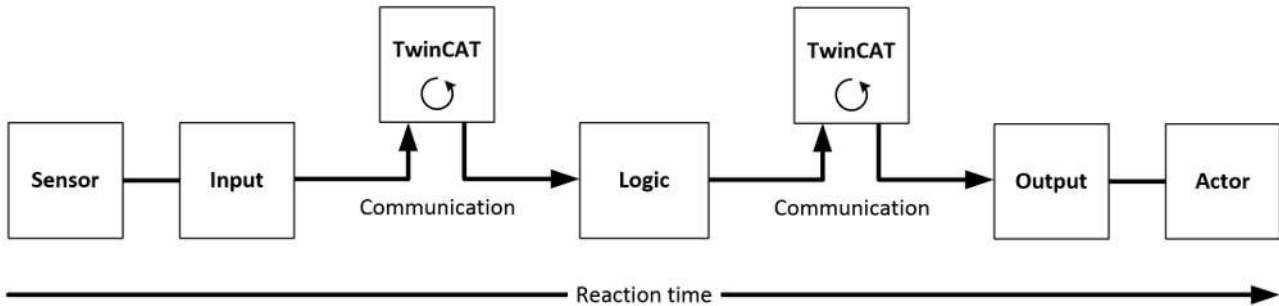

Fig. 18: Typical reaction time

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 EL6900, 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:

$$ReactionTime_{typ} = RT_{Sensor} + RT_{Input} + 3 * RT_{Comm} + RT_{Logic} + 3 * RT_{Comm} + RT_{output} + RT_{Actor}$$

with, for example

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

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.
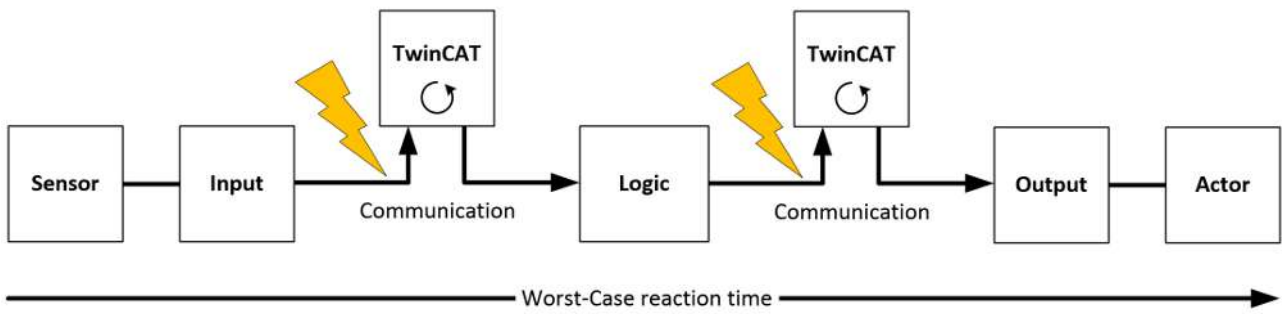
Fig. 19: Worst-case reaction time

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:

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

with, for example

$$ReactionTime_{max} = 2*15ms + 20ms = 50ms$$

4.3 Operation modes

Operation mode	Description
Single logic channel x/y	Each channel is evaluated individually
Asynchronous analysis OSSD, sensortest deactivated	Mode for connecting devices with OSSD signals. The test pulses of the OSSD devices must not occur simultaneously. The maximum supported test pulse length is 350 µs. In this mode the sensor test must be switched off for the input pair used.
Any pulse repetition OSSD, sensortest deactivated	Mode for connecting devices with OSSD signals. The test pulses of the OSSD devices may occur simultaneously. The maximum supported test pulse length is 350 µs. In this mode the sensor test must be switched off for the input pair used.
Short cut channel x/y is no module fault	Mode for connecting safety mats. In this mode the two inputs of the input pair used are monitored for cross-circuit. If a cross-circuit occurs a person has walked on the safety mat, and the inputs report logical 0 in pairs. The sensor test must be switched on for the inputs used.
Velocity control channel x / Single logic channel y	Speed monitoring channel x / individual evaluation channel y The first channel (x) returns a logical 1 if the current frequency is below the frequency set under *Velocity limit channel x*. The second channel (y) supplies the current signal state at input y. The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.
Single logic channel x / Velocity control channel y	Individual evaluation channel x / Speed monitoring channel y The first channel (x) reports the current signal state of input x. The second channel (x) returns a logical 1 if the current frequency is below the frequency set under *Velocity limit channel y*. The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.
Velocity control channel x/y	Speed monitoring channel x / speed monitoring channel y The first channel (x) returns a logical 1 if the current frequency is below the frequency set under *Velocity limit channel x*. The second channel (x) returns a logical 1 if the current frequency is below the frequency set under *Velocity limit channel y*. The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.
Two channel sync. Velocity control channel x/y	Two-channel evaluation of the frequency, whereby at least one input signal always has to be at logical 1. The frequencies and the upper limit frequencies have to be the same. The two channels return logical 1 if the current frequency is below the frequency set under *Velocity limit channel x/y*. The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.
Two channel encoder velocity control channel x/y	Two-channel evaluation of the frequency. The upper limit frequencies are specified separately, but should but the same. The same frequencies have to be supplied, whereby all states are permitted that may occur at the encoder interface. The two channels return logical 1 if the current frequency is below the frequency set under *Velocity limit channel x/y*. The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.
Two channel async. velocity control channel x/y	Two-channel evaluation of the frequencies. In this mode is only the compliance with the limits for the two channels is monitored. The upper limit frequencies are specified separately. The two channels return logical 1 if both frequencies are below the frequency set under *Velocity limit channel x/y*. The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.

i **Note**	**Speed / frequency measurement** The permitted frequency range is between 2 Hz and 500 Hz. Values below are reported as 0 Hz, values above result in a diagnostic messages of the EP1908-0002. This diagnostic message can be reset through a rising edge at the safe output signal ErrAck of the EP1908-0002.

4.4 EP1908 process image

The process image of the EP1908-0002 consists of 6 bytes of input data and 6 bytes of output data. These data contain the Safety over EtherCAT protocol. The eight safe input channels of the EP1908-0002 are contained in the safe input data. The first channel of the safe output data contains the ErrAck signal, which can be used to reset a diagnostic message of the EP1908, such as exceeding of the maximum allowable frequency.
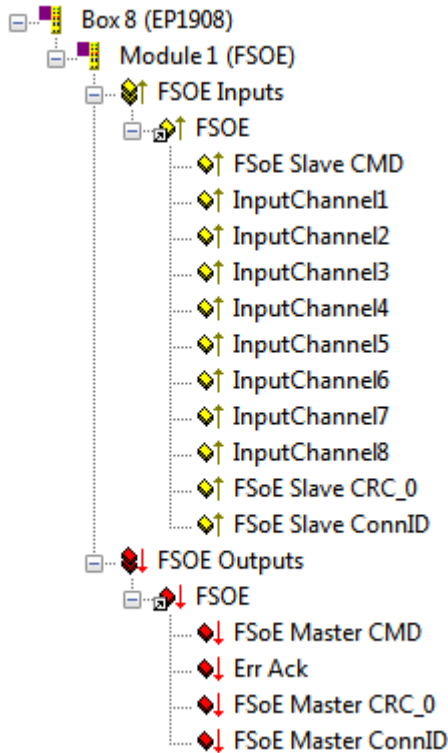

Fig. 20: EP1908 process image

4.5 Diagnostics

4.5.1 Run LED diagnostics

The Run LED shows diagnostic information for the EP1908-0002.

Fig. 21: Run LED diagnostics

Run LED (green)

The *Run* LED lights green when the EP1908-0002 has booted without error.

Run LED (red)

The *Run* LED lights red when the TwinSAFE EtherCAT Box has detected an error, such as cross-circuit, external feed or exceeding of the maximum frequency.

4.5.2   Diagnostic objects

The CoE objects indicate additional diagnostic information.

⚠️ **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.

CoE object 0xA008: FSOE Velocity

Index	Name	Meaning	Flags	Default
0xA008:0	FSOE Velocity	The following sub-indices contain the currently measured frequencies in 0.1 Hz.	RO	
0xA008:01 … 0xA008:08	Velocity 1 … Velocity 8	Frequency at channels 1 to 8 in 0.1 Hz	RO	

CoE object 0xA009: FSOE max Velocity

Index	Name	Meaning	Flags	Default
0xA009:0	FSOE max Velocity	The following sub-indices contain the maximum frequencies (in 0.1 Hz) determined since the last startup of the TwinSAFE communication with the EP1908-0002.	RO	
0xA009:01 … 0xA009:08	maxVelocity 1 … maxVelocity 8	Maximum frequency at channels 1 to 8 in 0.1 Hz	RO	

CoE object 0x800E: Diagnostic objects

Index	Name	Meaning			Flags	Default
800E:0	FSoE Internal Data	The following sub-indices contain detailed diagnostic information.			RO	
800E:0A	Sensor test error	Bit	Error during sensor test. This may be an external feed, for example.		RO	
		0	1_{bin}	Error at input 1		0_{bin}
		1	1_{bin}	Error at input 2		0_{bin}
		2	1_{bin}	Error at input 3		0_{bin}
		3	1_{bin}	Error at input 4		00_{bin}
		4	1_{bin}	Error at input 5		0_{bin}
		5	1_{bin}	Error at input 6		0_{bin}
		6	1_{bin}	Error at input 7		0_{bin}
		7	1_{bin}	Error at input 8		0_{bin}
800E:0B	Error during two-channel evaluation	Bit	Error during the contiguous evaluation of two channels, i.e. the two channels contradict each other.		RO	
		0	1_{bin}	Error in the first input pair		0_{bin}
		1	1_{bin}	Error in the second input pair		0_{bin}
		2	1_{bin}	Error in the third input pair		0_{bin}
		3	1_{bin}	Error in the fourth input pair		0_{bin}
800E:0C	Error in the safety mat operation mode: input pair disagree	Bits	Error in the input pair		RO	
		1, 0	11_{bin}	Error in the first input pair		00_{bin}
		3, 2	11_{bin}	Error in the second input pair		00_{bin}
		5, 4	11_{bin}	Error in the third input pair		00_{bin}
		7, 6	11_{bin}	Error in the fourth input pair		00_{bin}
800E:0D	Error in the safety mat operation mode: external supply	Bit	Error in the test pulses in the safety mat operating mode; i.e. the EtherCAT Box has detected an external supply.		RO	
		0	1_{bin}	Error at input 1		0_{bin}
		1	1_{bin}	Error at input 2		0_{bin}
		2	1_{bin}	Error at input 3		0_{bin}
		3	1_{bin}	Error at input 4		0_{bin}
		4	1_{bin}	Error at input 5		0_{bin}
		5	1_{bin}	Error at input 6		0_{bin}
		6	1_{bin}	Error at input 7		0_{bin}
		7	1_{bin}	Error at input 8		0_{bin}
800E:13	Speed monitoring error: Overspeed	Bit	Overspeed was detected at an input.		RO	
		0	1_{bin}	Speed at input 1 is too high		0_{bin}
		1	1_{bin}	Speed at input 2 is too high		0_{bin}
		2	1_{bin}	Speed at input 3 is too high		0_{bin}
		3	1_{bin}	Speed at input 4 is too high		0_{bin}
		4	1_{bin}	Speed at input 5 is too high		0_{bin}
		5	1_{bin}	Speed at input 6 is too high		0_{bin}
		6	1_{bin}	Speed at input 7 is too high		0_{bin}
		7	1_{bin}	Speed at input 8 is too high		0_{bin}
800E:14	Error in operating mode: *Two Channel Sync Velocity Control*	Bit	Both inputs of an input pair were read with inactive state.		RO	
		0	1_{bin}	Error in the first input pair		0_{bin}
		1	1_{bin}	Error in the second input pair		0_{bin}
		2	1_{bin}	Error in the third input pair		0_{bin}
		3	1_{bin}	Error in the fourth input pair		0_{bin}
800E:15	Error in operating mode*: Two Channel Sync Velocity Control* and *Two Channel Encoder Velocity Control*	Bit	Different speeds were identified for the two inputs of an input pair.		RO	
		0	1_{bin}	Error in the first input pair		0_{bin}
		1	1_{bin}	Error in the second input pair		0_{bin}
		2	1_{bin}	Error in the third input pair		0_{bin}
		3	1_{bin}	Error in the fourth input pair		0_{bin}

i **Note** — **Differing diagnostic messages possible**

Due to the variable order or execution of the test series, diagnostic messages differing from those given in the table above are possible.

4.6 EP1908 configuration in TwinCAT

⚠ **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.

4.6.1 Adding an EtherCAT device

See TwinCAT automation software documentation.

4.6.2 Adding a EP1908

An EP1908-0002 is added in exactly the same way as any other Beckhoff EtherCAT Box. In the list open the item *Safety Terminals* and select the EP1908-0002.
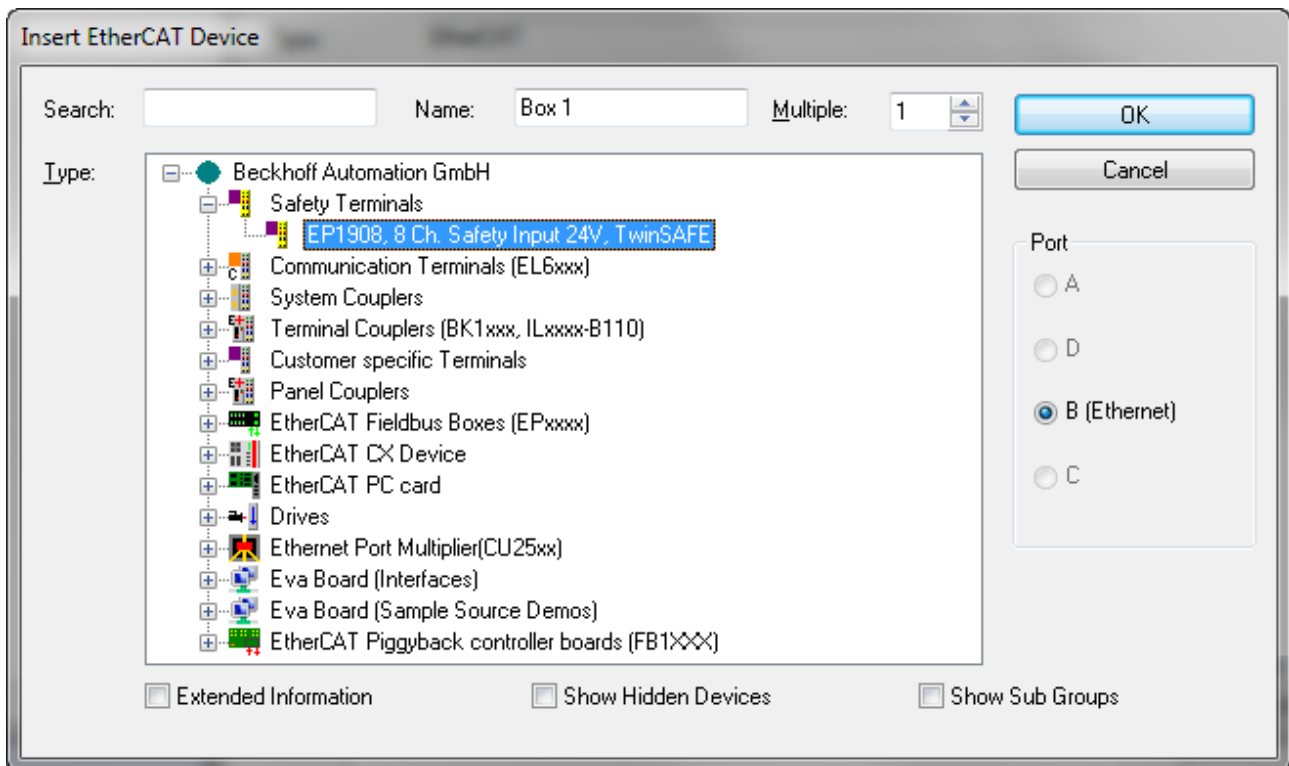

Fig. 22: TwinCAT - Adding a EP1908

4.6.3 Entering a TwinSAFE address and parameters in the System Manager

The TwinSAFE address set at the rotary switch must be entered under the tab *Safe Parameters* (*FSoE Address* entry) below the EP1908-0002. All other parameters can also be set there. They can also be found under the respective TwinSAFE connection on the tab *Safe Parameters*.
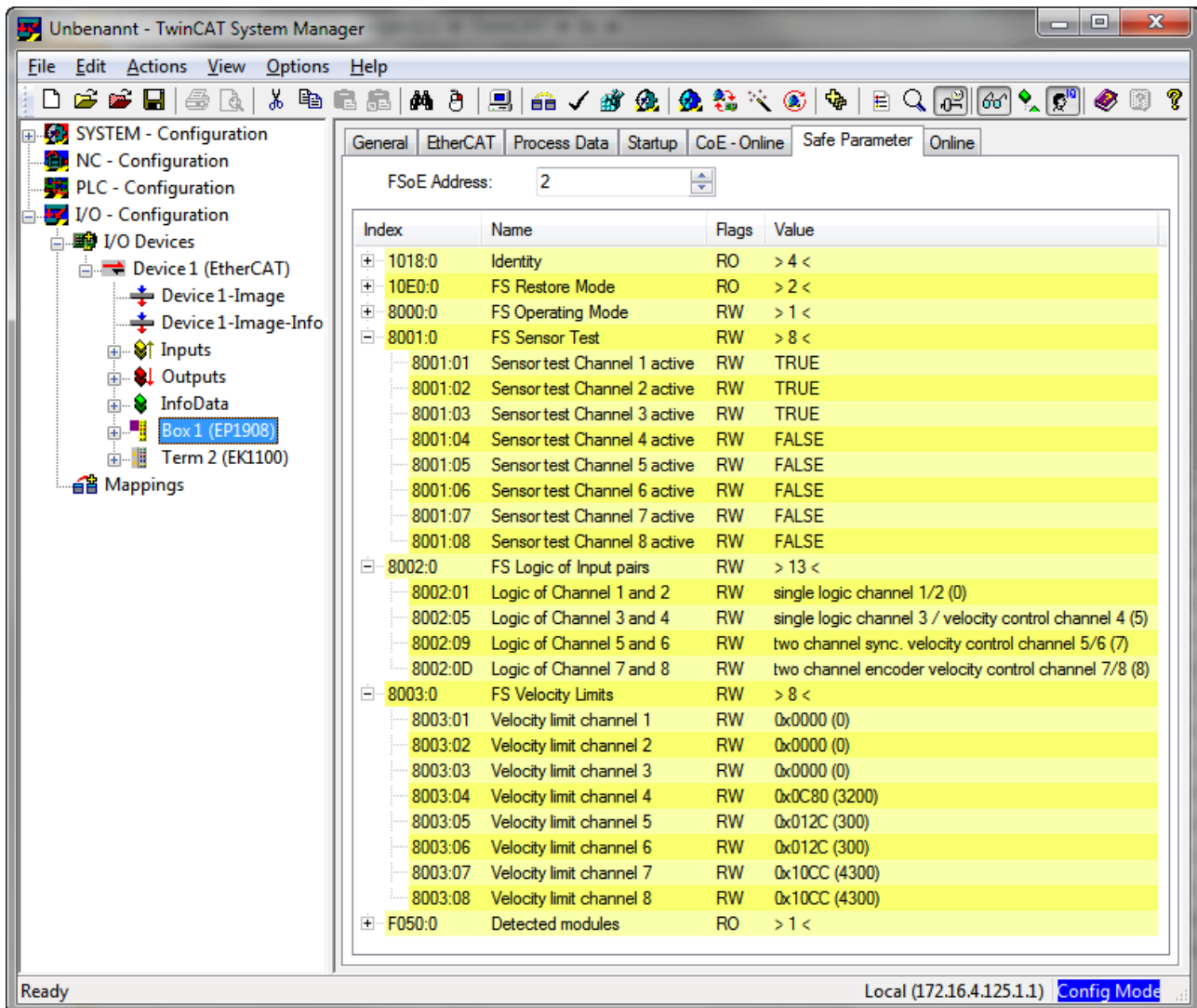

Fig. 23: Safe Parameter tab

The connection-specific parameters are set in the respective TwinSAFE connection on the *Connection* tab.
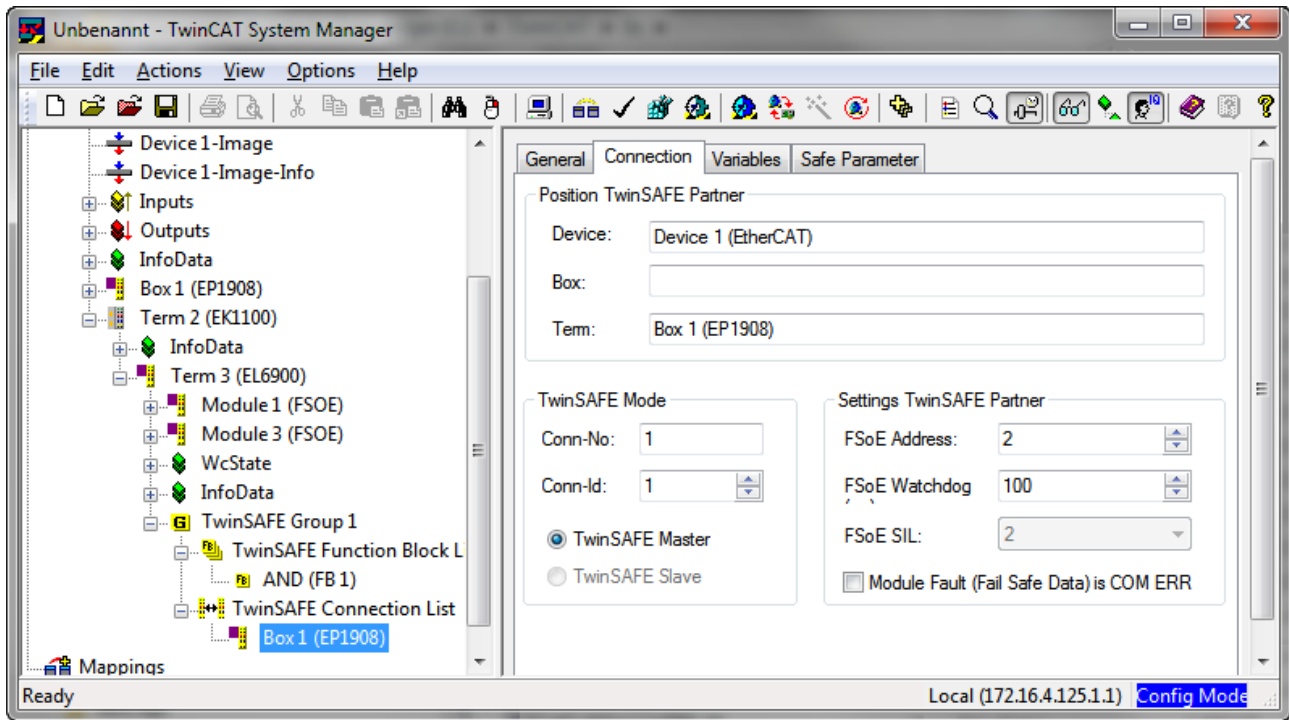
BECKHOFF

Fig. 24: Connection tab

Overview of the TwinSAFE parameters

Parameter name	Meaning	Values
FSoE_Address	Address of the rotary switch or the setting in the EP1908	1 to 4095
Operating Mode	Digital	Digital
Sensor test channel 1 active	The clock signal of channel 1 (pin 1) is checked at the channel 1 input (pin 2).	TRUE / FALSE
Sensor test channel 2 active	The clock signal of channel 2 (pin 3) is checked at the channel 2 input (pin 4).	TRUE / FALSE
Sensor test channel 3 active	The clock signal of channel 3 (pin 1) is checked at the channel 3 input (pin 2).	TRUE / FALSE
Sensor test channel 4 active	The clock signal of channel 4 (pin 3) is checked at the channel 4 input (pin 4).	TRUE / FALSE
Sensor test channel 5 active	The clock signal of channel 5 (pin 1) is checked at the channel 5 input (pin 2).	TRUE / FALSE
Sensor test channel 6 active	The clock signal of channel 6 (pin 3) is checked at the channel 6 input (pin 4).	TRUE / FALSE
Sensor test channel 7 active	The clock signal of channel 7 (pin 1) is checked at the channel 7 input (pin 2).	TRUE / FALSE
Sensor test channel 8 active	The clock signal of channel 8 (pin 3) is checked at the channel 8 input (pin 4).	TRUE / FALSE
Logic channel 1 and 2	Logic of channels 1 and 2	see operating modes table
Logic channel 3 and 4	Logic of channels 3 and 4	see operating modes table
Logic channel 5 and 6	Logic of channels 5 and 6	see operating modes table
Logic channel 7 and 8	Logic of channels 7 and 8	see operating modes table
Velocity limit channel 1	Upper frequency limit for channel 1	Frequency in 1/10 Hz
Velocity limit channel 2	Upper frequency limit for channel 2	Frequency in 1/10 Hz
Velocity limit channel 3	Upper frequency limit for channel 3	Frequency in 1/10 Hz
Velocity limit channel 4	Upper frequency limit for channel 4	Frequency in 1/10 Hz
Velocity limit channel 5	Upper frequency limit for channel 5	Frequency in 1/10 Hz
Velocity limit channel 6	Upper frequency limit for channel 6	Frequency in 1/10 Hz
Velocity limit channel 7	Upper frequency limit for channel 7	Frequency in 1/10 Hz
Velocity limit channel 8	Upper frequency limit for channel 8	Frequency in 1/10 Hz
Store Code	This parameter is required for the TwinSAFE Restore Mode	0x0000
Project CRC	This parameter is required for the TwinSAFE Restore Mode	0x0000
Identity	internal use (read only)	
Detected Modules	internal use (read only)	

4.6.3.1 EP1908-0002 configuration for light barriers, light grids, light curtains, etc.

The EP1908-0002 also supports direct connection of contact-free protective devices with two self-testing outputs such as light barriers, light grids, light curtains, laser scanners, etc.

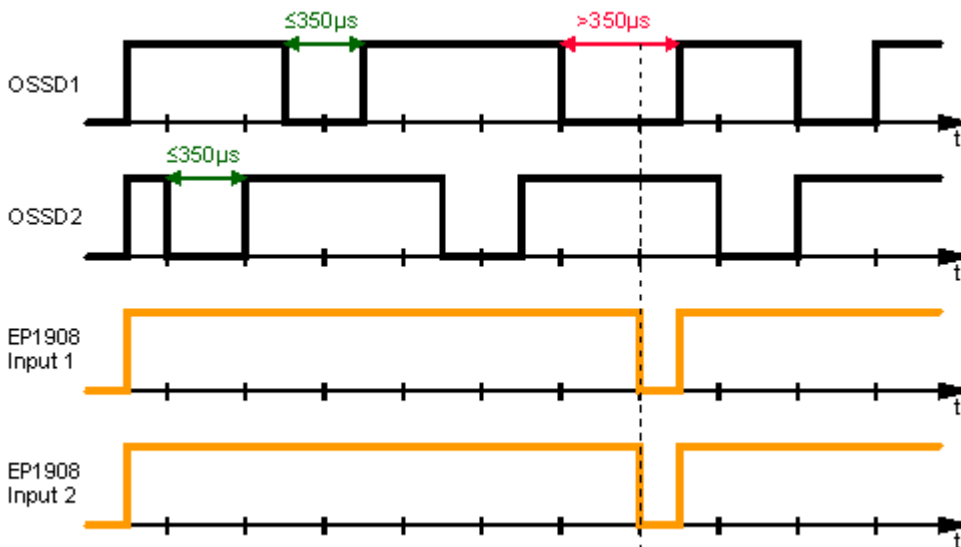| ⚠️ **CAUTION**	**Sensors with self-testing outputs** Only sensors with self-testing outputs and a maximum sensor self-test duration of 350 µs may be connected to the EP1908-0002.

Fig. 25: Maximum permissible sensor self-test duration

Parameter

To connect these sensors please set the following parameters for the EP1908-0002 in the TwinCAT System Manager:

- Connect the two sensor signals either to channels 1 & 2, 3 & 4 and 5 & 6 or channels 7 & 8 and activate *asynchronous repetition OSSD* or *any pulse repetition* for the two inputs used under parameter *Logic for channel x and y*. The difference between these settings is that with *any pulse repetition* simultaneous tests of the OSSD signals up to 350 µs are allowed.
- For the two inputs used set the sensor test for the EL1908-0002 to *false*.

4.6.3.2 EP1908-0002 configuration for safety switching mats

The EP1908-0002 also supports direct connection of safety mats that operate based on the cross-circuit principle.

Parameter

To connect these safety mats please set the following parameters for the EP1908-0002 in the TwinCAT System Manager:

- Connect the two sensor signals either to channels 1 & 2, 3 & 4 and 5 & 6 or channels 7 & 8 and activate the entry *short cut channel x/y is no module fault* for the two inputs used under parameter *Logic for channel x and y*.

4.6.3.3   Configuration of the EP1908-0002 for mode Velocity Control Channel x

The TwinSAFE EtherCAT Box also supports direct connection of initiators and encoders for speed measurement or frequency (24 V_{DC}).
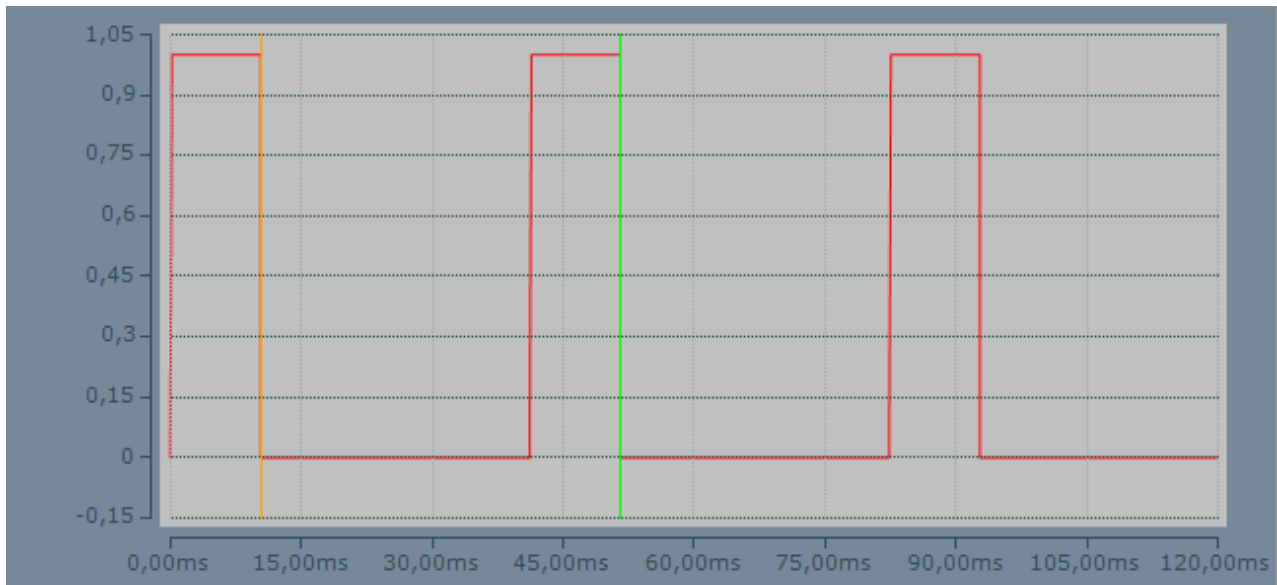
If mode *Velocity Control Channel x* is set, a frequency is determined from two consecutive falling edges of the respective input signal. This mode can be set for each channel individually.

If the current frequency is below the set limit frequency, the corresponding input channel returns a logical 1. If the frequency is above the set limit frequency, the corresponding channel returns a logical 0.

The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.

Parameter

- Connect the signals of the sensors used to the respective channel(s).
- Switch off the sensor test for the inputs used
  (*Sensor test Channel x active* = FALSE)
- Set the parameter *Logic of Channel x and y* to
    - *velocity control channel x / single logic channel y* or
    - *single logic channel x / velocity control channel y* or
    - *velocity control channel x/y*,
      depending on which channel(s) of the input pair is to be used for this mode.
- Set the parameter *Velocity limit channel x* of the used channel to the required value. The entered value has the unit 0.1 Hz.

Example of the signal curve of the input signal in the operating mode Velocity Control Channel x

Read the corresponding current frequencies via CoE Online (0xA008:01 to 0xA008:08).
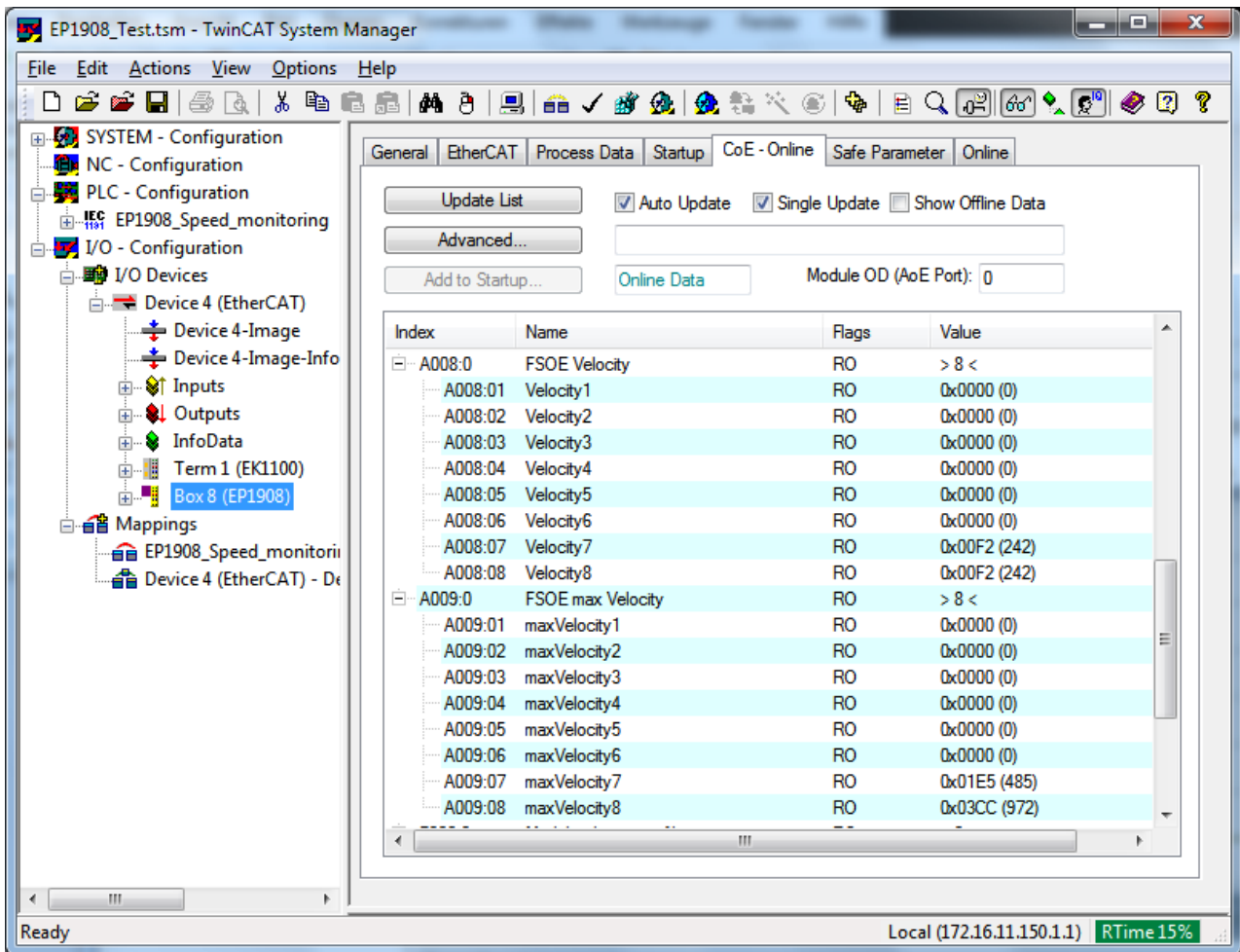
Frequencies read out via CoE-Online

4.6.3.4   Configuration of the EP1908 for mode Two Channel Sync Velocity Control

The TwinSAFE EtherCAT Box also supports direct connection of initiators and encoders for speed measurement or frequency (24 V_{DC}).

The set mode *Two Channel SyncVelocity Control Channel x/y* determines a frequency from the signals of an input pair of the EP1908-0002, whereby one input signal always has to be set to logical 1. The frequencies of the two input signals must be the same.

If the current frequency is below the limit frequency set for both channels (*Velocity limit channel x/y*), the corresponding input pair returns a logical 1. If the frequency is above the set limit frequency, the corresponding input pair returns a logical 0. The limit frequencies must be the same.

The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.

Parameter

- Connect the signals of the used sensors to the input pairs
    - 1 and 2,
    - 3 and 4,
    - 5 and 6 or
    - 7 and 8
- Switch off the sensor test for the inputs used
  (*Sensor test Channel x active* = FALSE)

- Set the parameter *Logic of Channel x and y* to
  Two Channel SyncVelocity Control Channel x/y

- Set the parameters *Velocity limit channel x* and *Velocity limit channel y* of the used channels to the required value. The entered value has the unit 1/10 Hz.
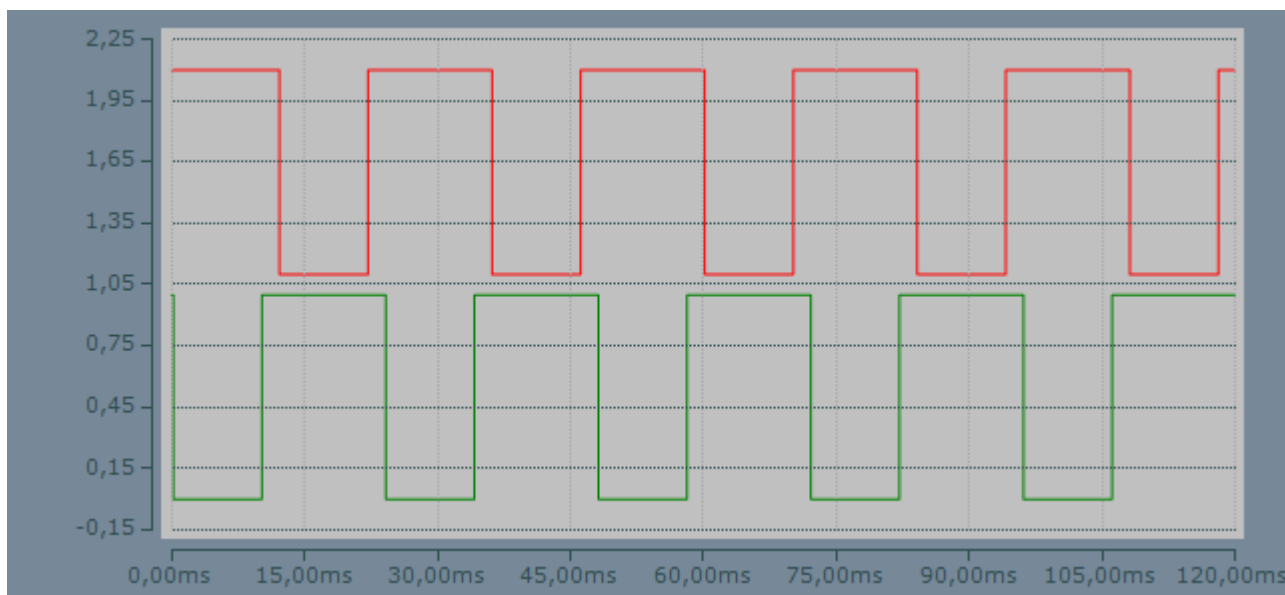

Fig. 26: Example of the signal curve of the input signal in the operating mode Two Channel Sync Velocity Control

4.6.3.5   Configuration of the EP1908 for mode Two Channel Encoder Velocity Control

The TwinSAFE EtherCAT Box also supports direct connection of initiators and encoders for speed measurement or frequency (24 V_{DC}).

The set mode *Two Channel Encoder Velocity Control Channel x/y* is used to determine a frequency from the signals of an input pair of the EP1908-0002. The upper limit frequencies are specified separately, but should but the same. The same frequencies have to be supplied, whereby all states are permitted that may occur at the encoder interface.

If the current frequency is below the limit frequency set for both channels
(*Velocity limit channel x/y*), the corresponding input pair returns a logical 1. If the frequency is above the set limit frequency, the corresponding input pair returns a logical 0.

The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.

Parameter

- Connect the signals of the used sensors/encoders to the input pairs
    ◦ 1 and 2,
    ◦ 3 and 4,
    ◦ 5 and 6 or
    ◦ 7 and 8

- Switch off the sensor test for the inputs used
  (*Sensor test Channel x active* = FALSE)

- Set the parameter *Logic of Channel x and y* to
  Two Channel SyncVelocity Control Channel x/y

- Set the parameters *Velocity limit channel x* and *Velocity limit channel y* of the used channels to the required value. The entered value has the unit 1/10 Hz.
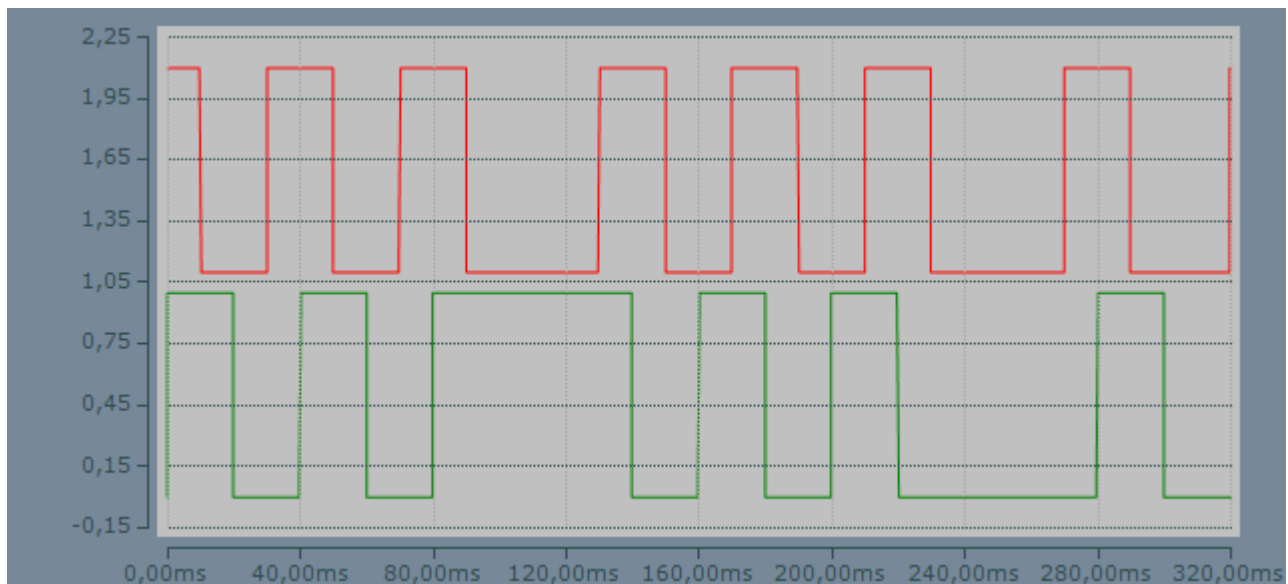
Fig. 27: Example of the signal curve of the input signal in the operating mode Two Channel Encoder Velocity Control

4.6.3.6   Configuration of the EP1908-0002 for mode Two Channel Async Velocity Control

The TwinSAFE EtherCAT Box also supports direct connection of initiators and encoders for speed measurement or frequency (24 V_{DC}).

The set mode *Two Channel AsyncVelocity Control Channel x/y* is used to determine a frequency from the signals of an input pair of the EP1908-0002. In this mode is only the compliance with the limits for the two channels is monitored. The upper limit frequencies are specified separately.
The two channels return logical 1 if both frequencies are below the frequency set under *Velocity limit channel x/y*.

If the current frequency of the two channels is below the set limit frequency(*Velocity limit channel x/y*) for the respective channel, the corresponding input pair returns a logical 1. If the current frequency of a channel is above the set limit frequency for this channel, the corresponding input pair returns a logical 0.

The minimum supported frequency is 2 Hz. Values below this are shown as 0. The maximum supported frequency is 500 Hz. Values above this result in a diagnostic messages of the EP1908-0002. This message can be reset through a rising edge of the safe output signal ErrAck of the EP1908-0002.

Parameter

- Connect the signals of the used sensors to the input pairs
    - 1 and 2,
    - 3 and 4,
    - 5 and 6 or
    - 7 and 8
- Switch off the sensor test for the inputs used
  (*Sensor test Channel x active* = FALSE)
- Set the parameter *Logic of Channel x and y* to
  Two Channel Async Velocity Control Channel x/y
- Set the parameters *Velocity limit channel x* and *Velocity limit channel y* of the used channels to the required value. The entered value has the unit 1/10 Hz.
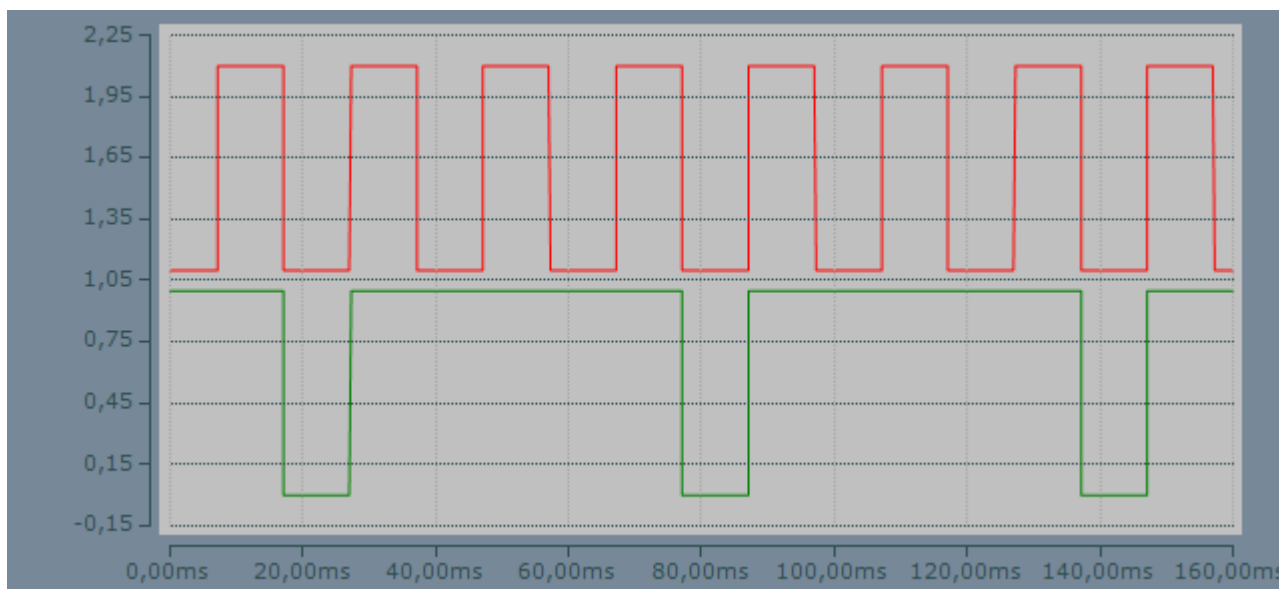
Fig. 28: Example of the signal curve of the input signal in the operating mode Two Channel Async Velocity Control

4.7 Maintenance

Maintenance

The TwinSAFE EtherCAT boxes are maintenance free!

Environmental conditions

⚠️ **WARNING**	**Observe the specified environmental conditions!**
	Please ensure that the TwinSAFE EtherCAT Boxes are only transported, stored and operated under the specified conditions (see technical data)!

If the EtherCAT Box is operated outside the permitted temperature range it will switch to *Global Fault* state. The state *Global Fault* can only be excited by switching the EtherCAT Box off and on again.

Cleaning

Protect the TwinSAFE EtherCAT Boxes from unacceptable soiling during operation and storage!

If the TwinSAFE EtherCAT Boxes were exposed to unacceptable soiling, they may no longer be operated!

⚠️ **WARNING**	**Have soiled EtherCAT Boxes checked!**
	Cleaning of the TwinSAFE EtherCAT Boxes by the user is not allowed! Please send soiled TwinSAFE EtherCAT Boxes to the manufacturer for inspection and cleaning!

4.8 Service life

The TwinSAFE EtherCAT Boxes have a service life of 20 years.

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

Date code

The TwinSAFE EtherCAT Boxes have a date code (D:), which is structured as follows:

Date code: WW YY SW HW

Legend:	Sample: Date code 45 12 05 00
WW: Calendar week of manufacture	Calendar week: 45
YY: Year of manufacture	Year: 2012
SW: Software version	Software version: 01
HW: Hardware version	Hardware version: 00

Serial number (S.No.)

In addition, the TwinSAFE EtherCAT Boxes have a unique serial number (S.No.).
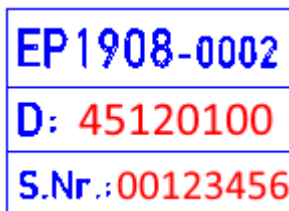
Fig. 29: Unique serial number (S.No.) of a TwinSAFE EtherCAT Box

4.9 Decommissioning

⚠️ **DANGER**	**Serious risk of injury!** Bring the bus system into a safe, de-energized state before starting disassembly of the EtherCAT Boxes!

Disposal

The device must be removed for disposal.

- Housing parts (polyamide PA6-F) are suitable for plastics recycling
- Sealing compound: Polyurethane resin
- Metal parts can be sent for metal recycling.
- Electronic parts such as disk drives and circuit boards must be disposed of in accordance with national electronics scrap regulations.

5 Appendix

5.1 Protection classes according to IP code

The levels of protection are defined and divided into different classes in the IEC 60529 standard (DIN EN 60529). The designation follows the scheme below.

1st digit: Protection against ingress of dust and access to hazardous parts

1st digit	Meaning
0	Non-protected
1	Protection against access to hazardous parts with back of hand. Protection against ingress of solid foreign objects = 50 mm diameter
2	Protection against access to hazardous parts with a finger. Protection against ingress of solid foreign objects = 12.5 mm diameter
3	Protection against access to hazardous parts with a tool. Protection against ingress of solid foreign objects = 2.5 mm diameter
4	Protection against access to hazardous parts with a wire. Protection against ingress of solid foreign objects = 1 mm diameter
5	Protection against access to hazardous parts with a wire. Protection against ingress of dust. Ingress of dust is not prevented completely, although the quantity of dust able to penetrate is limited to such an extent that the proper function of the device and safety are not impaired
6	Protection against access to hazardous parts with a wire. Dust-proof. No ingress of dust

2nd digit: Protection against ingress of water*

2nd digit	Meaning
0	Non-protected.
1	Protection against dripping water.
2	Protection against dripping water when housing tilted up to 15°.
3	Protection against spraying. Water sprayed at an angle of up to 60° from vertical must not have any adverse effect.
4	Protection against splashing. Water splashing against the housing from any direction must not have any adverse effects.
5	Protection against jetting.
6	Protection against powerful jetting.
7	Protection against the effects of temporary immersion. The quantity of water being able to penetrate if the housing is submerged in water for 30 minutes at a depth of 1 m must not have any adverse effects.

*) These protection classes only define protection against water, not against other liquids.

5.2 Support and Service

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

Beckhoff's branch offices and representatives

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

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

You will also find further documentation for Beckhoff components there.

Beckhoff Headquarters

Beckhoff Automation GmbH & Co. KG

Huelshorstweg 20
33415 Verl
Germany

Phone:	+49(0)5246/963-0
Fax:	+49(0)5246/963-198
e-mail:	info@beckhoff.com

Beckhoff Support

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

- support
- design, programming and commissioning of complex automation systems
- and extensive training program for Beckhoff system components

Hotline:	+49(0)5246/963-157
Fax:	+49(0)5246/963-9157
e-mail:	support@beckhoff.com

Beckhoff Service

The Beckhoff Service Center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Hotline:	+49(0)5246/963-460
Fax:	+49(0)5246/963-479
e-mail:	service@beckhoff.com

5.3   Certificates

Reliability of EP1908

Test and Certification body

TÜV SÜD Rail GmbH
Rail Automation - IQSE
Barthstraße 16
D-80339 Munich

Manufacturer

Beckhoff Automation GmbH & Co. KG
Huelshorstweg 20
D-33415 Verl

Safety parameters EP1908

Key figures	EP1908
Lifetime [a]	20
Prooftest Intervall [a]	not required [1]
PFH_D	1.56E-09
%SIL3	1.56%
PFD	1.06E-04
%SIL3	10.59%
$MTTF_d$	High
B10d (cycles)	-
DC	High
Performance level	PL e
Category	4
HFT	1
Element classification*	Type B

*) Classification according to IEC 61508-2:2010 (see chapters 7.4.4.1.2 and 7.4.4.1.3)

The EP1908 EtherCAT Box 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).

[1] Special proof tests for the product are not required during the lifetime of the EP1908 EtherCAT box as a result of the high diagnostic coverage of the system.

Munich, 2016-03-07

Günter Greil

Digital unterschrieben von
Guenter Greil
DN: c=DE, o=TUEV SUED Rail
GmbH, ou=Rail & Automation,
cn=Guenter Greil,
email=guenter.greil@tuev-
sued.de
Datum: 2016.03.07 17:51:25
+01'00'

8   TwinSAFE Reliability

BECKHOFF

CERTIFICATE

No.   Z10 15 03 62386 031

Product Service

Holder of Certificate:	**Beckhoff Automation GmbH & Co. KG** Hülshorstweg 20 33415 Verl GERMANY
Factory(ies):	62386
Certification Mark:	
Product:	**Safety components**
Model(s):	**EP 1908**

Parameters:

Supply voltage:	24VDC (-15%/+20%)
Power dissipation:	3W
Protection class:	IP65, IP66, IP67

Tested according to:

2006/42/EC
EN 61508-1:2010 (SIL1-3)
EN 61508-2:2010 (SIL1-3)
EN 61508-3:2010 (SIL1-3)
EN ISO 13849-1:2008 (Cat 4, PL e)

The product was tested on a voluntary basis and complies with the essential requirements. The certification mark shown above can be affixed on the product. It is not permitted to alter the certification mark in any way. In addition the certification holder must not transfer the certificate to third parties. See also notes overleaf.

Test report no.:	BV84305T
Valid until:	2020-03-03

Date,   2015-03-04   (Günter Greil)

584379

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