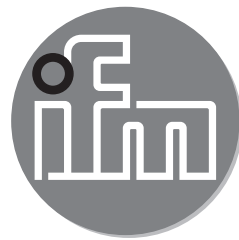


ifm electronic



Original operating instructions
Safe AS-i module

AS interface

AC507S

UK

80006151/01 07/2016



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1 Preliminary note

The instructions are part of the unit. They are intended for authorised persons according to the EMC, Low Voltage and Machinery Directive and safety regulations. The instructions contain information about the correct handling of the product. Read the instructions before use to familiarise yourself with operating conditions, installation and operation.

Follow the safety instructions.

1.1 Key to the symbols

► Request for action

● LED on

○ LED off

⊗ LED flashes

⊛ LED flashes quickly

 Important note

 **WARNING**

Warning of dangers which may lead to death or serious irreversible injuries.

2 Safety instructions

- Follow the operating instructions.
- In case of non-observance of notes or standards, especially when tampering with and/or modifying the unit, any liability and warranty is excluded.
- The unit must be installed, connected and put into operation by a qualified electrician trained in safety technology.
- The applicable technical standards for the corresponding application must be complied with.
- For installation the requirements according to EN 60204 must be observed.
- In case of malfunction of the unit please contact the manufacturer. Tampering with the unit is not allowed.
- Disconnect the unit externally before handling it. Also disconnect any independently supplied relay load circuits.
- After installation of the system perform a complete function check.
- Only use the unit under the specified operating conditions (→ chapter 13 Technical data). In case of special operating conditions please contact the manufacturer.
- In case of any questions please contact the safety authorities in your own country.

WARNING

In case of improper handling of the product, the safety and physical integrity of persons and machinery cannot be guaranteed.

Death or serious irreversible injuries may result.

- ▶ Note all remarks on installation and handling given in these instructions.
- ▶ The unit must only be used under the specified operating conditions and in accordance with use as prescribed.

2.1 Safety-related requirements regarding the application

It must be ensured that the safety requirements of the respective application correspond to the requirements stated in these instructions.

Observe the following requirements:

- ▶ Adhere to ISO 14119 for interlocking devices associated with guards.
- ▶ Adhere to the specified operating conditions (→ Chapter 13 Technical data).
Use of the unit in the vicinity of chemical and biological media as well as ionising radiation is not permitted.
- ▶ In case of faults within the unit which result in the defined safe state: Take measures to maintain the safe state when the complete control system continues to be operated.
- ▶ Replace damaged units.

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3 Items supplied

1 safe AS-i Modul AC507S,

1 original operating instructions AC507S, Ident number 80006151/01.

If one of the above-mentioned components is missing or damaged, please contact one of the ifm branch offices.

4 Functions and features

The safe AS-i module detects safety-related switching states of an ESPE (electro-sensitive protective equipment) with two self-testing semiconductor outputs (OSSD), e.g. fail-safe inductive sensors, safe light grids, safe light curtains, etc. For this purpose a code table is transferred via the AS-i system with 8 x 4 bits which is evaluated by the safety monitor (e. g. AC001S ... AC004S, AC031S, AC032S, AC041S).

The safety function of the unit is achieved by the normally closed operation (input disconnected = safe state).

The unit can be used in applications up to Performance Level e, category 4 to EN ISO 13849-1 and SILCL 3 to EN 62061.



Depending on the safety components used the complete safety system can also be classified for a lower Performance Level PL or Safety Integrity Level SILCL!

5 Function and electrical connection

Please also refer to all information in the description of the configuration software (e.g. E7040S, E7050S) and the operating instructions of the safety monitor.

The above documents provide all required instructions concerning installation, configuration, operation and maintenance of the AS-i Safety at Work system.

Information on the parameterizable safety functions of the safe AS-i module can be found in the chapter "Monitoring devices" of the configuration software manual.



The products described here are designed to be components of a safety-oriented machine or control system. A complete safety-related system normally includes sensors, evaluation units, signalling components and concepts for safe switch-off. It is the responsibility of each manufacturer of a machine or installation to ensure a correct functioning of the whole system. The manufacturer of the safe AS-i module, his subsidiaries and affiliates are not in a position to evaluate all of the characteristics of a given machine or product not designed by him.

The manufacturer accepts no liability for any recommendation that may be implied or stated herein.

The warranty contained in the contract of sale is the sole warranty. Any statements contained herein do not create new warranties or modify existing ones.

The complete description of the configuration software, the operating instructions of the AS-i safety monitor and the operating instructions of the safe AS-i module must be taken into account!



Maintenance requirement

A minimum of one testing per year is compulsory by a demand on the safety function.

- ▶ Test both inputs individually.

6 Installation

- ▶ Carefully place the yellow flat cable (e.g. E74000) in the lower part.

To maintain the indicated protection rating IP 67

- ▶ Cover the unused sockets with protective caps (E73004)*.
- ▶ Cover the addressing interface using the supplied protective cap.
- ▶ Tighten all connected M12 connectors and protective caps, tightening torque 0.6...0.8 Nm.
- ▶ Use the flat cable seal (E70413)* if the module is at the end of the cable line.

*to be ordered separately

WARNING

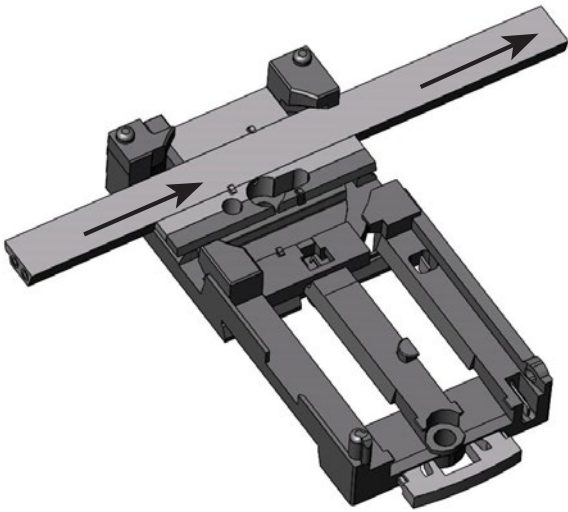
Non-observance of the installation instructions (e.g. non-observance of the tightening torque) can lead to a loss of the protection rating and consequently to the loss of the safety function.

Death or serious irreversible injuries may result.

- ▶ Note all remarks on installation and handling given in these instructions.
- ▶ The unit must only be used under the specified operating conditions and in accordance with use as prescribed.

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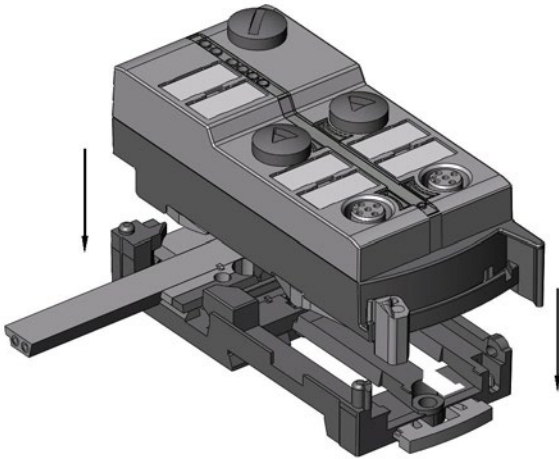
1



Alignment of the flat cable on delivery

Carefully place the yellow AS-i flat cable into the profile slot.

2

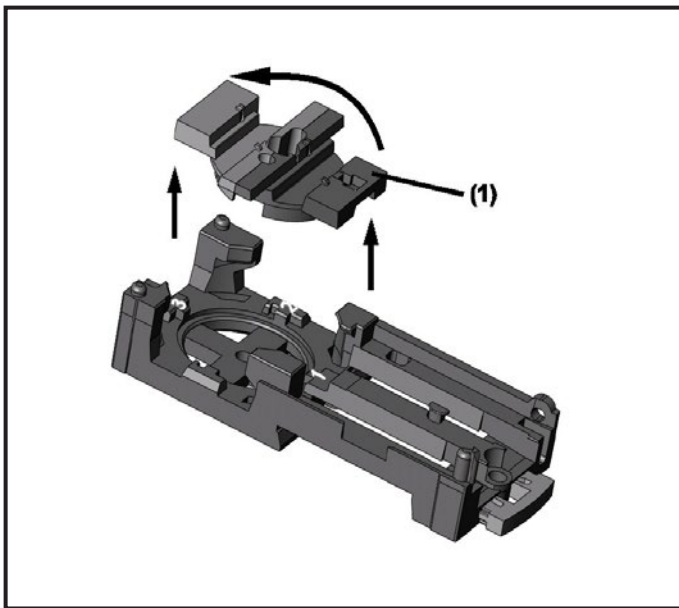


Mount the upper part.

3

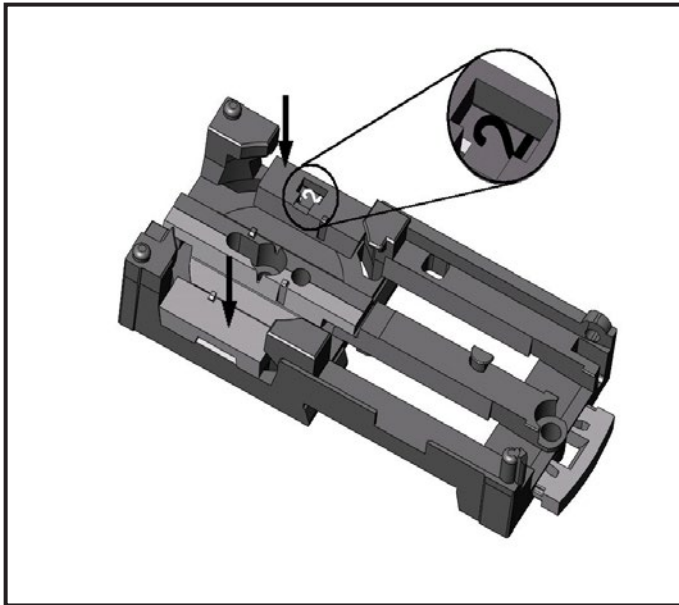


Lock the unit.

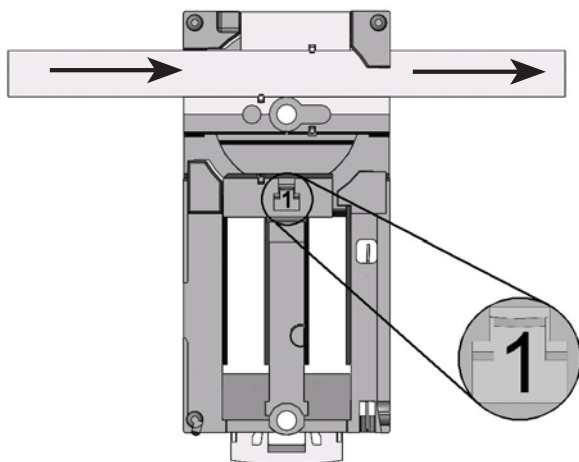


With the supplied lower part the flat cable can be aligned in three directions.

For the requested direction place the flat cable guide (1) accordingly.



A

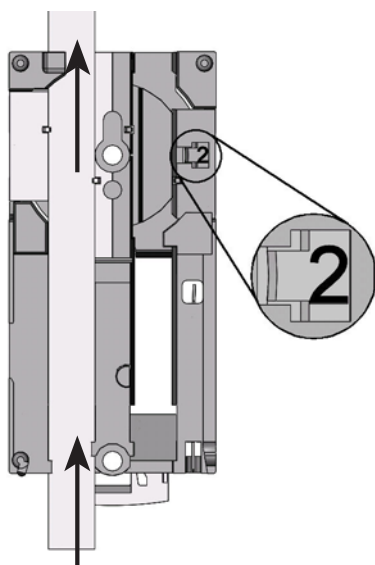


Settings at the lower part

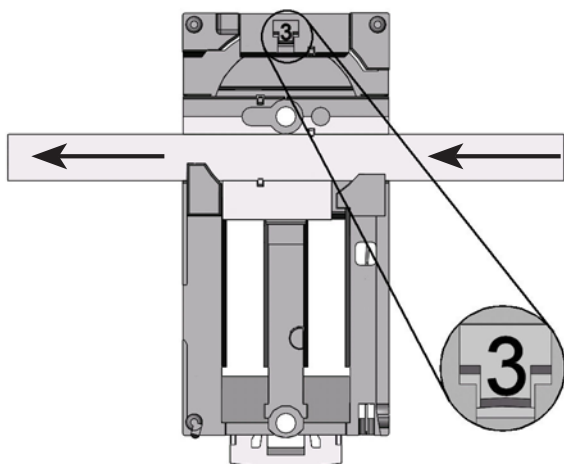
Select position 1, 2 or 3 depending on the required flat cable alignment (→).

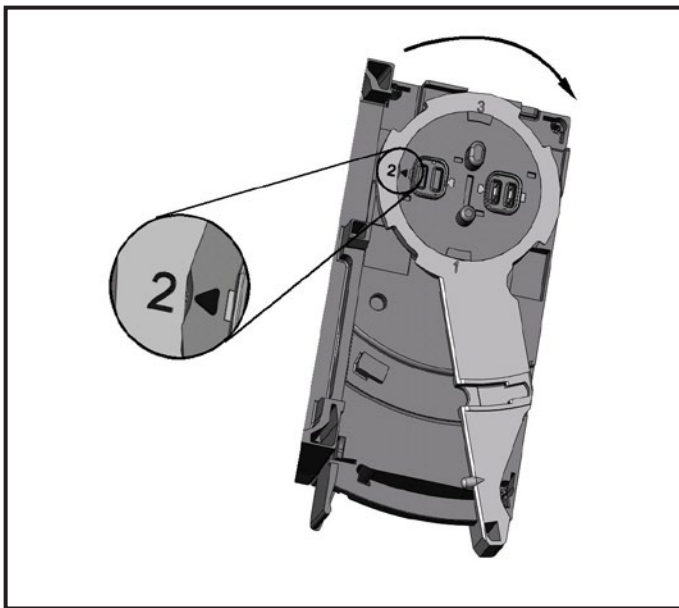
A = factory setting

B



C



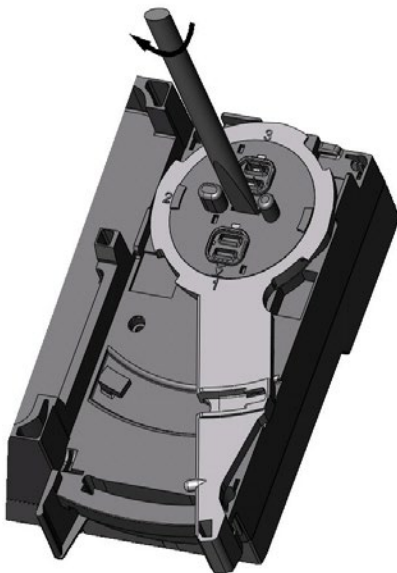


Settings at the upper part

Then set the selected position at the upper part. To do so, turn the triangle to the corresponding number (figures D1 and D2).

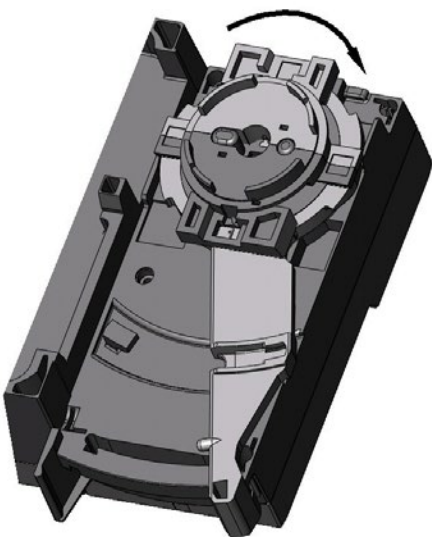
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D1



Use a tool, e.g. a screwdriver (figure D1) or the yellow / black flat cable guide (figure D2).

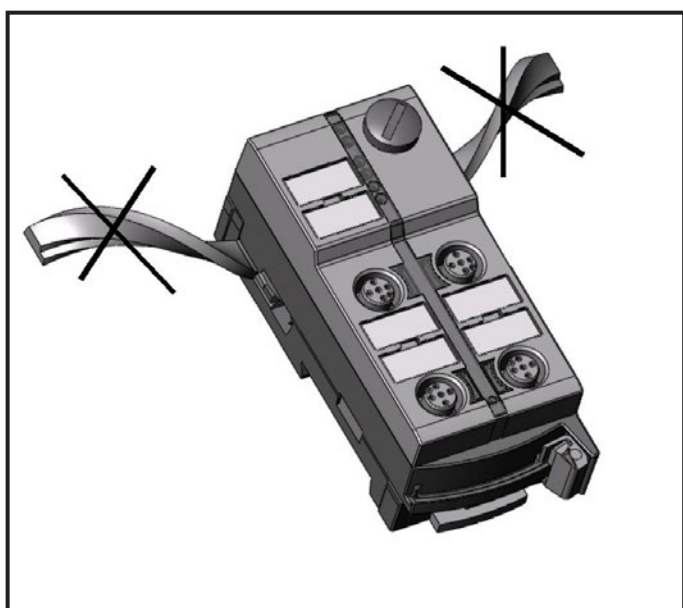
D2



Open the unit

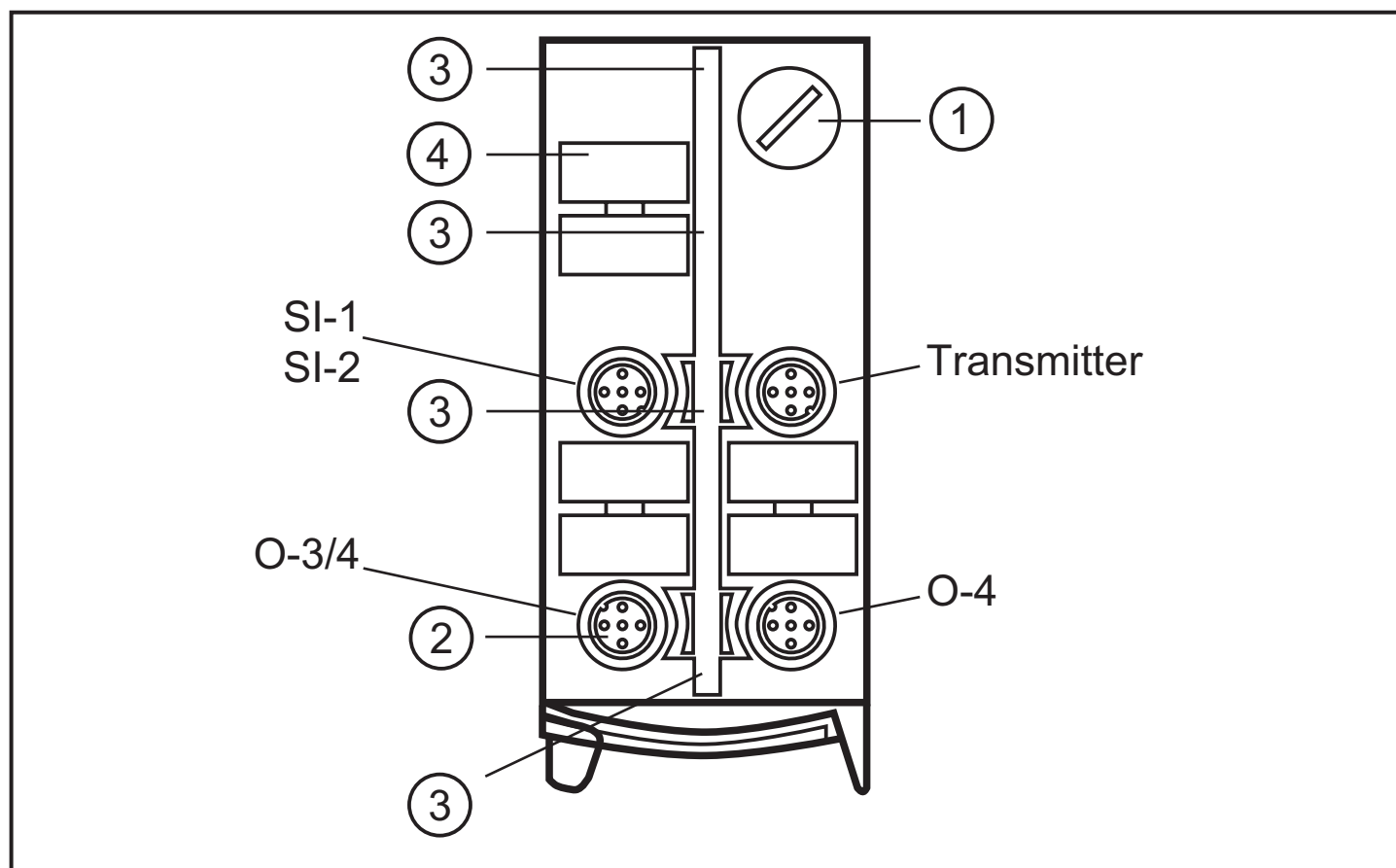


Open the unit using a tool as shown (e.g. screwdriver).



Take care in laying the AS-i flat cable, it should be laid straight for about 15 cm.

7 Operating and display elements



- 1: Addressing interface
- 2: 4 M12 sockets
- 3: LEDs
- 4: Labels

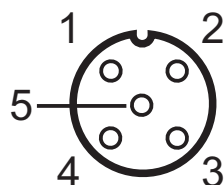
8 Electrical connection

- Disconnect power. Also disconnect any independently supplied relay load circuits.



Do **not** connect inputs and outputs to an external potential.

8.1 Pin configuration



Socket 1 (receiver)		Socket 3 (transmitter)	
M12 socket	Pin	M12 socket	Pin
Supply +24 V	1	Supply +24 V	1
OSSD2	2	0 V	2
Supply 0 V	3	Supply 0 V	3
OSSD1	4	Supply + 24 V test	4
FE	5	FE	5

Socket 2		Socket 4	
M12 socket	Pin	M12 socket	Pin
n.c. (not connected)	1	n.c. (not connected)	1
O-4	2	n.c. (not connected)	2
Supply 0 V	3	Supply 0 V	3
O-3	4	O-4	4
n.c. (not connected)	5	n.c. (not connected)	5

The pin connection of the "transmitter" socket on the module allows the protected area width of an ESPE (electro-sensitive protective equipment) to be set to "range high".

The configuration signal on the AS-i module for setting the protected area width is not safety-related.

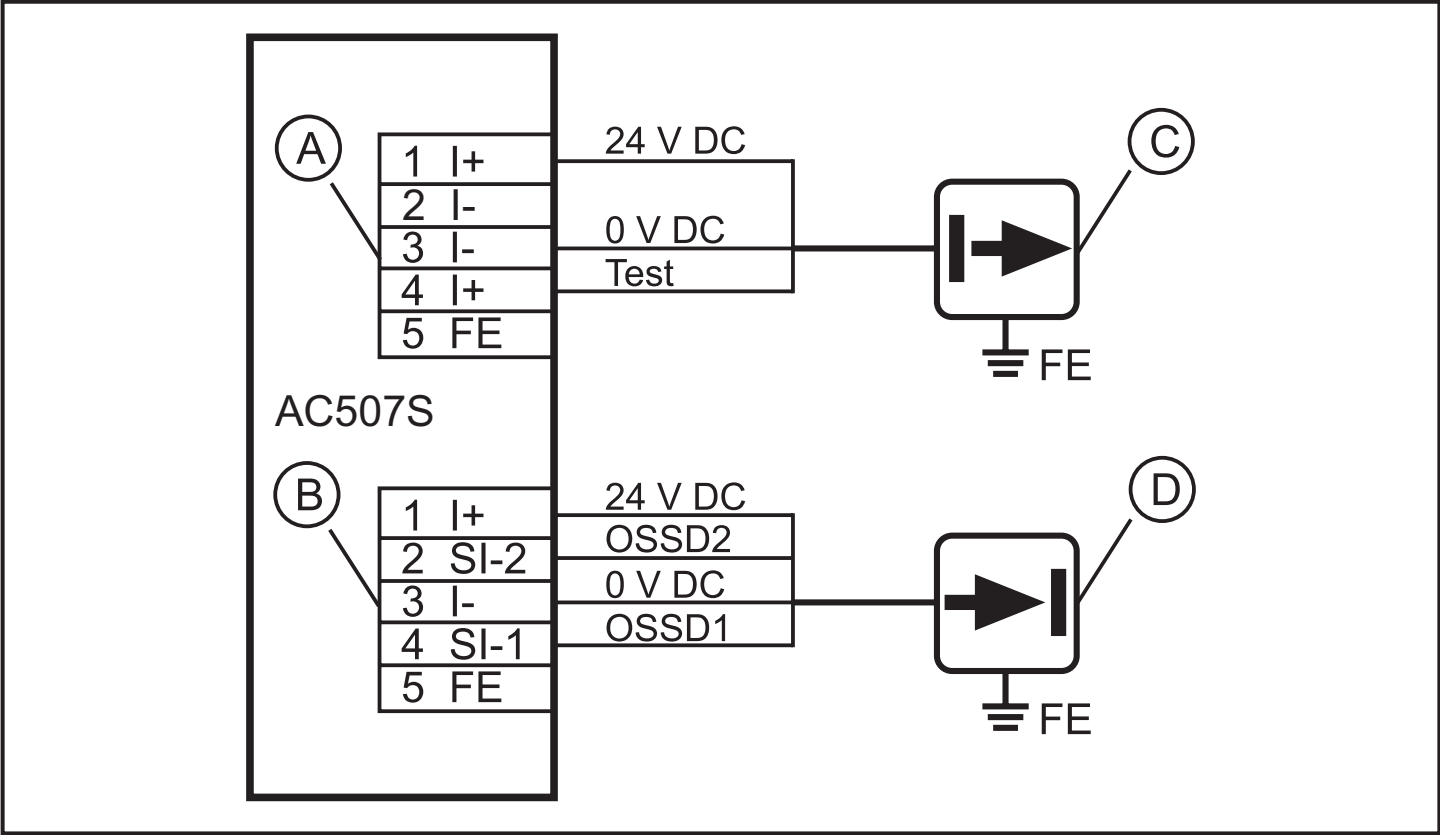
If the protected area width is to be set to "range low", use an EY3092 adapter cable which can be ordered separately.

ESPE receivers usually have an 8-pole M12 connector.

Use an adapter cable for connection to a 5-pole M12 socket. The EY3090 adapter cable which can be ordered separately is rated for the automatic operating mode of the ESPE.

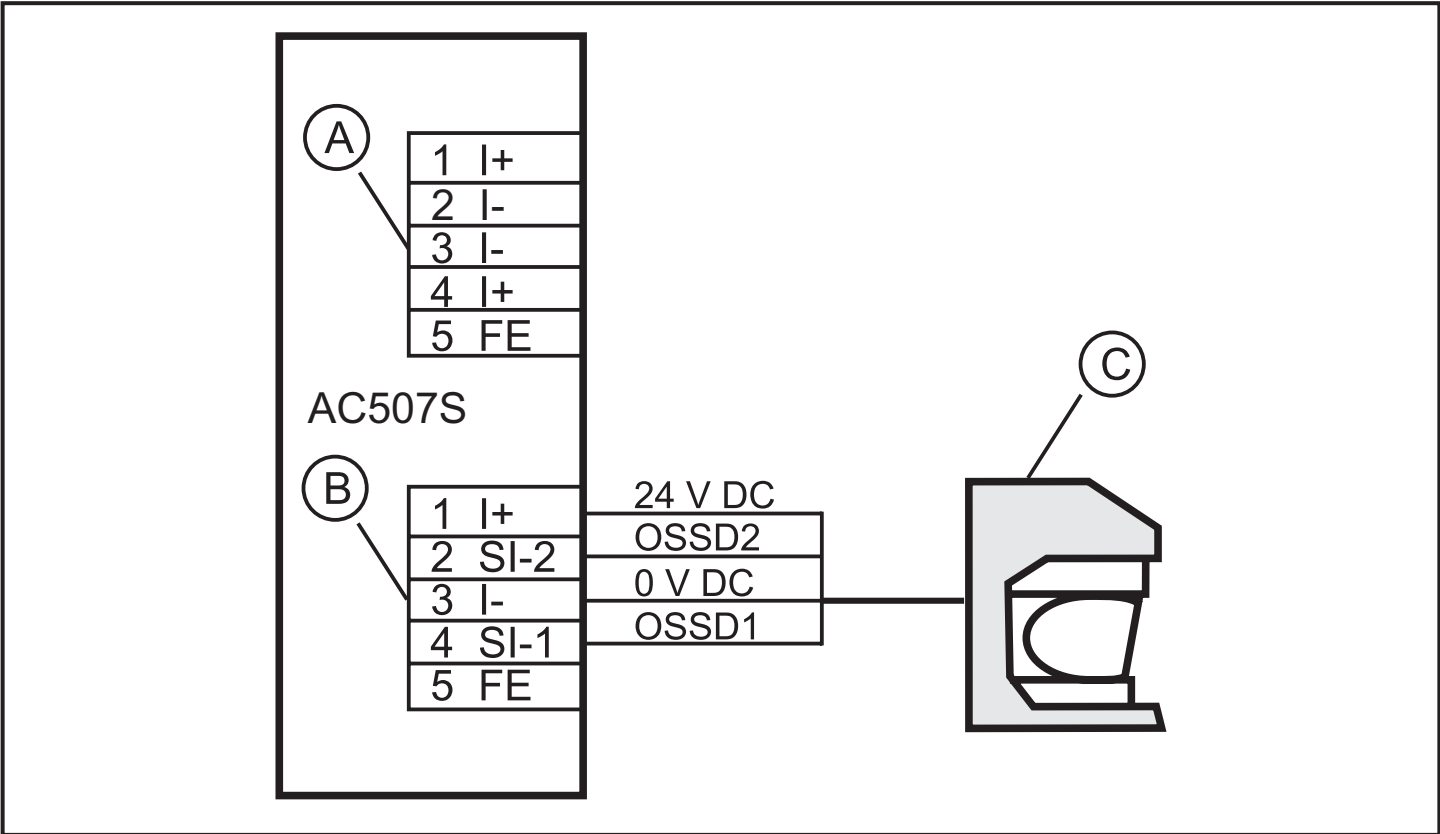
9 Wiring examples

Connection of light barriers and light curtains to AC507S



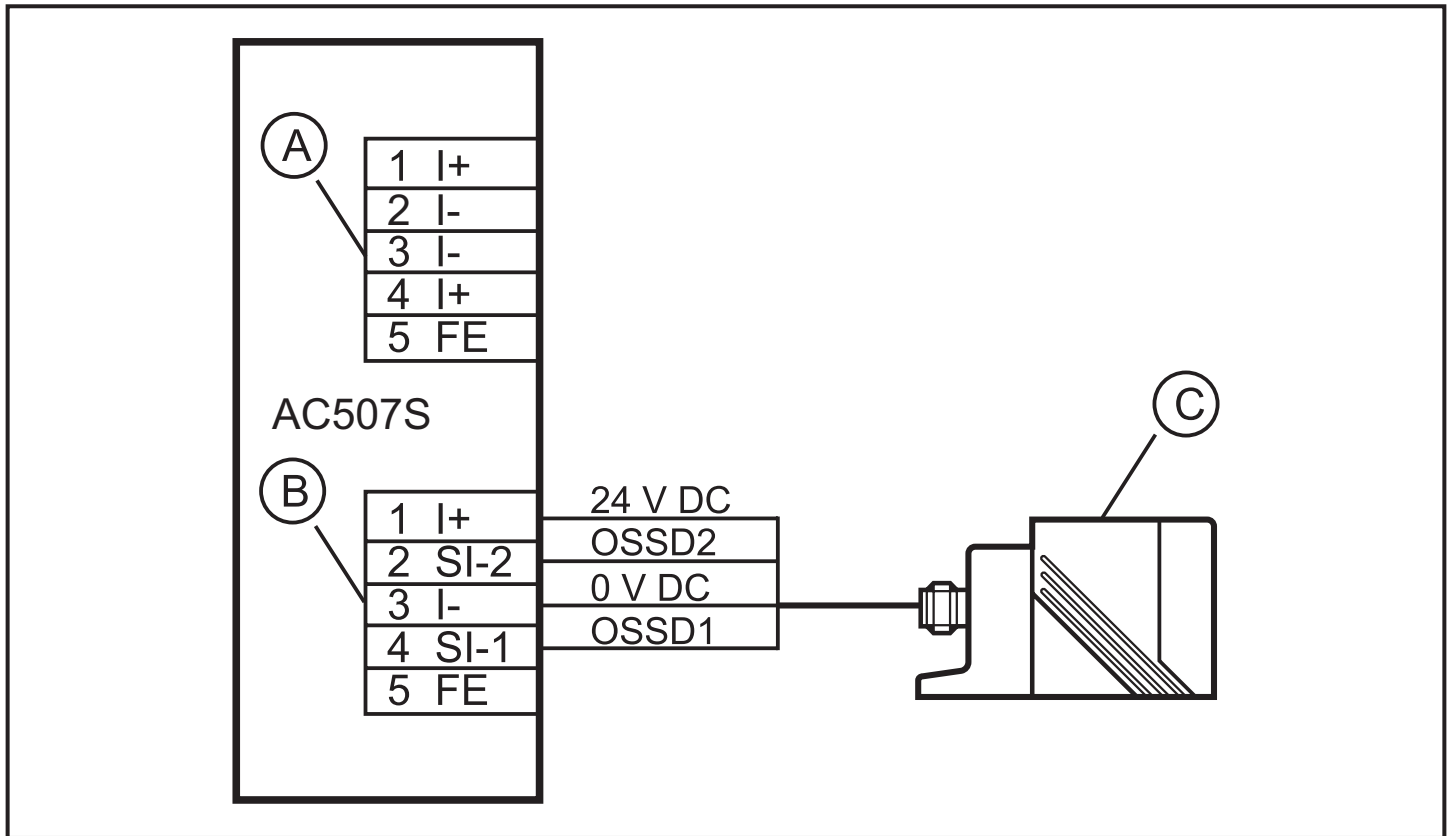
A: socket 3 / B: socket 1 / C: transmitter / D: receiver

Connection of a laser scanner to AC507S



A: socket 3 / B: socket 1 / C: laser scanner

Connection of a fail-safe inductive sensor to AC507S



A: socket 3; B: socket 1; C: fail-safe inductive sensor, e.g. GM701S

9.1 Electronic contacts

The safe inputs correspond to type 2 digital inputs of EN 61131-2.

The independent switching contacts are connected via the SI-1/2 socket.

The device supports the connection of fail-safe electronic sensors with 2 OSSD outputs. The duration of the switch-off test pulses of electronic sensors must not be longer than 1 ms.



A safe separation must be ensured between the external LED and the normally closed contact. In the configuration software for the safety monitor the monitoring modules can be used as **dual-channel positively guided module**, **dual-channel dependent module** and dual-channel dependent module with filtering.

Do not connect any of the pins to an external potential since they are electrically connected to the AS-i cable.

Note: The wiring influences the achievable Performance Level PL or the Safety Integrity Level SILCL.

The requirements for Performance Level d according to EN ISO 13849-1 are met. Performance Level e according to EN ISO 13849-1 can be reached if both

outputs of the protective equipment feature cross-fault monitoring. If the protective equipment does not provide this feature, the cabling between the contacts to be monitored and the module must be selected in a way to exclude cross faults between the wires (see EN ISO 13849-2).

10 Addressing

The module can be addressed via the addressing unit AC1154.

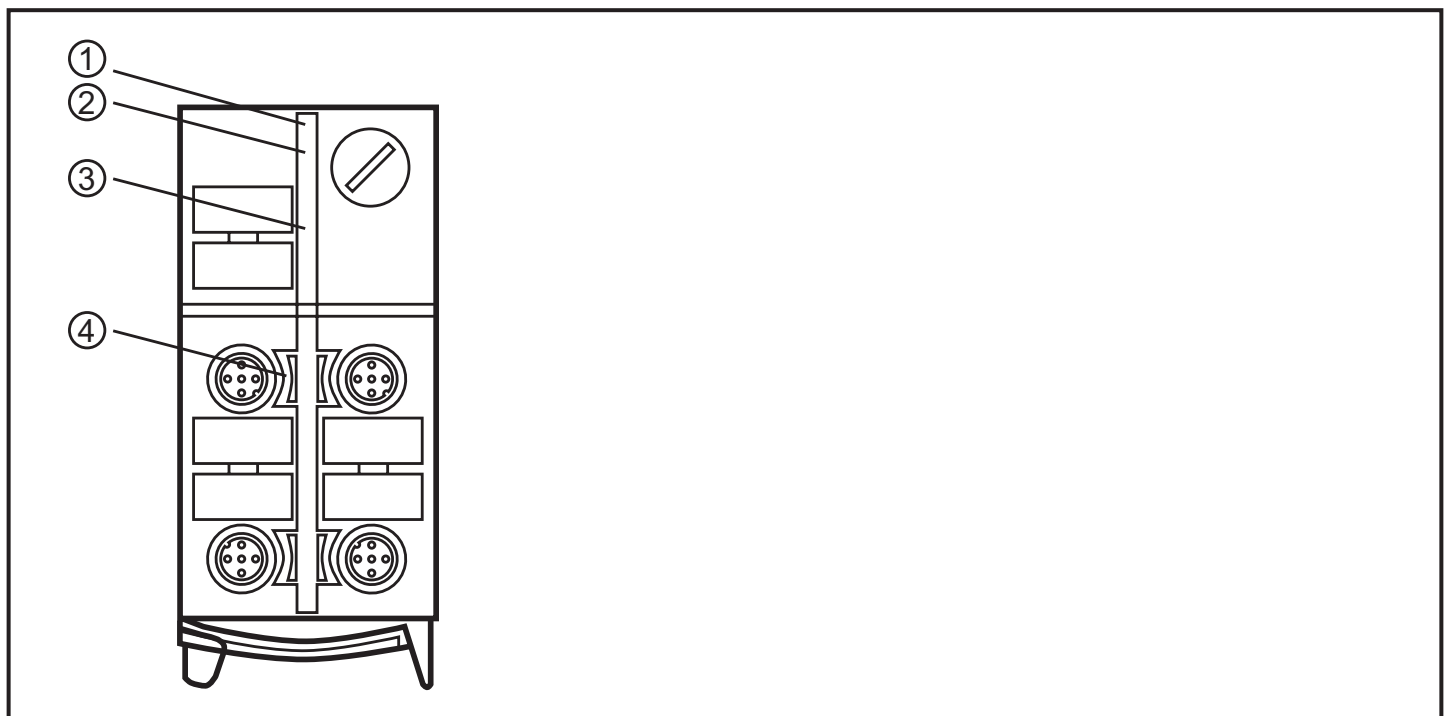
► Assign a free address between 1 and 31, on delivery the address is 0.

When mounted and wired the module can be addressed with the addressing cable (E70213) via the integrated addressing interface.

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11 Operation

Avoid build-up of dirt and dust on the upper and lower parts so that the locking mechanism is not affected.



- 1: LED green PWR
- 2: LED red FAULT
- 3: Output LEDs O1...O4
LED red O1, O2 alarm LEDs
LED yellow O3, O4 signal output
- 4: LEDs yellow, inputs

LED designation	LED status / colour	Operating status
FAULT	⊗ Red	Peripheral fault, e.g. overload or short circuit of the sensor supply
	● Red	AS-i communication error, slave does not participate in the "normal" exchange of data, e.g. slave address 0
PWR	○ Green ● Green	No voltage Voltage supply OK
Alarm O1, O2	● Red	Alarm output Logic state of the alarm LED outputs O1 and O2
Signal output O3, O4	● Yellow	Signal output Logic state of the signal outputs O3 and O4
Input	○ Yellow ● Yellow	Safety contact opened Safety contact closed



LED indications are no safe information.

Overload and short circuit of the input supply are signalled to the AS-i master (version 2.1) via the "periphery fault" flag in the status register.

11.1 Data bits

Data bit	D3	D2	D1	D0
Input	SI-2	SI-2	SI-1	SI-1
Output	Output O-4	Output O-3	LED alarm O-2	LED alarm O-1

The output bits D0...D3 are intended for signalling. Bits D0 and D1 have effect on the red alarm LEDs on the front panel (O-1, O-2) and can be used for signalling directly on the module.

Bits D2 and D3 have effect on the switching outputs O-3 and O-4 and can be used for external alarm LEDs, e.g. muting function blocks.

WARNING

Safe separation between the safety-related NC contact circuit and the connections of the external alarm LED must be guaranteed!

Death or serious irreversible injuries may result.

- Note all remarks on installation and handling given in these instructions.
- The unit must only be used under the specified operating conditions and in accordance with use as prescribed.

UK

Activated input channel	Bit sequence D3-D0
SI-1	XX00
SI-2	00XX
SI-1 and SI-2	0000
None	XXXX

Activated alarm output	Bit sequence D3-D0
O-1	XXX1
O-2	XX1X

Activated output channel	Bit sequence D3-D0
O-3	X1XX
O-4	1XXX

X = random

The code words 0000, XX00 and 00XX cause the AS-i safety monitor to bring the installation into the safe state.

For more details on the effect of the data bits on the transmission sequence refer to the configuration software manual ASIMON (see the chapter "Monitoring devices").

11.2 Parameters

This module allows the current module parameters to be read and informs which of the two switching contacts to be connected was opened during the demand on the safety function.

i However, this parameter information is not part of the safe AS-i transmission, the parameter information is thus to be treated as non-safe data transmission and must in no case be linked with any safety functions nor evaluated!

Assignment of the parameter bits

Parameter bit	P0	P1	P2	P3
Switching contact socket	SI-1	SI-2	not connected	not connected

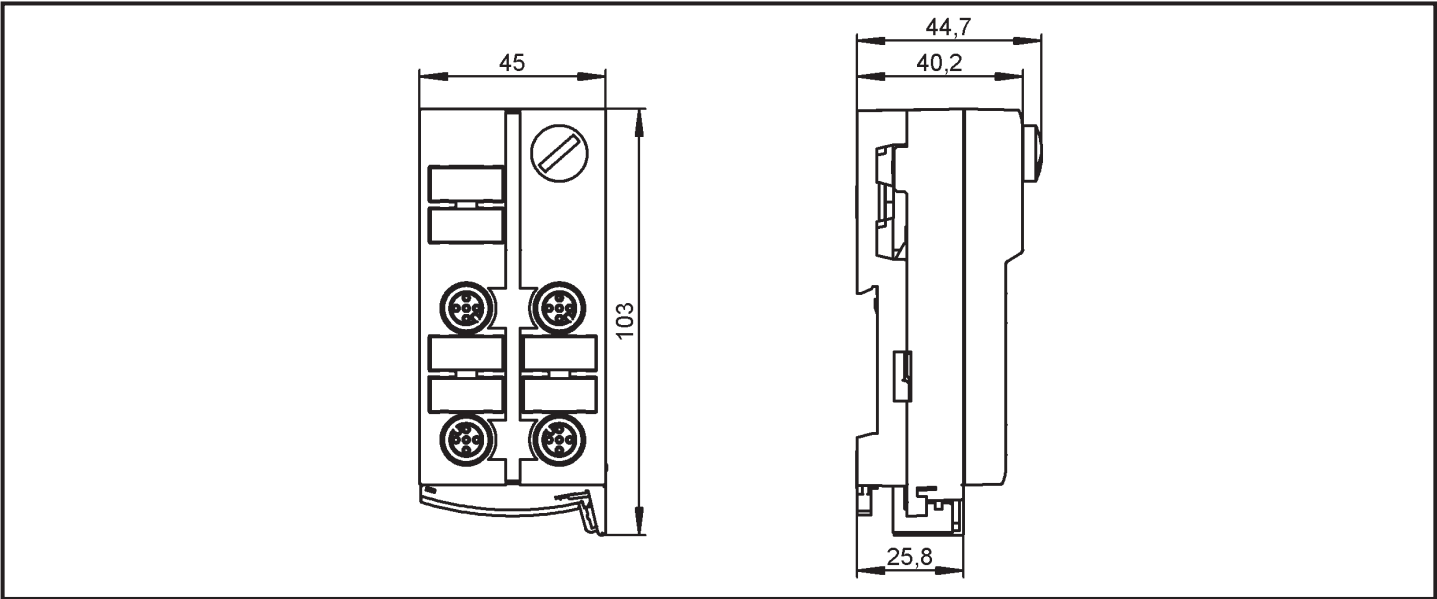
Meaning of the logic states P0...P3

- 1: Contact closed
- 0: Contact open

11.3 Response times

The response time of the safe AS-i module for a safety request is max. 10 ms. For the calculation of the response time of the complete system the response times of the other components also have to be added (mechanical contacts, safety monitor and external relays or contactors possibly connected to the safety monitor output).

12 Scale drawing



13 Technical data

AC507S	
2 safe inputs / 2 non-safe LED outputs / 2 non-safe outputs	
Operating voltage	26.5...31.6 V DC
Current consumption	≤ 280 mA
Inputs	
Circuits	DC PNP
Voltage supply	via AS-i (19,2...30 V DC)
Short-circuit detection	yes
Input current	typ. 8 mA
Cross-fault monitoring	no
LED outputs	
Supply via AS-i	yes
Integrated watchdog	yes
Signal outputs	
Electrically isolated	no
Short-circuit protection	yes
Integrated watchdog	yes
Current rating per output	50 mA
Voltage supply	via AS-i
Voltage range	24 V DC (18...28,8 V DC)
Current rating per module	200 mA
Utilisation category	DC-12
Ambient temperature (without switched outputs)	-25 ... +55 °C
Ambient temperature (with switched outputs)	-25 ... +40 °C
LED function display	
Operation / fault / function	green / red / yellow
Protection	IP 67

UK

AS-Interface / extended addressing mode possible	Version 2.11 and 3.0 / no
AS-i profile	S-7.B.E
I/O configuration / ID code	7 [hex] / B.E [hex]
AS-i certificate	in preparation
Maximum number of safety modules per master	31
Housing materials	PA
Housing dimensions	103 x 45 x 44.7 mm (H x W x D)
Cable length between module and electronic contacts	≤ 10 m

13.1 Safety classification

Characteristics	Value
Mission time T	20 years
Performance Level PL	PL e*)
SILCL	SILCL3 *)
*) PL e, SILCL 3 only if the fault exclusions described in the manual are used (→ chapter 9.1 Electronic contacts).	
PFH (PFH _D)	2,33 E-11 (1/h)

- These calculations were made on the basis of an ambient temperature of 40 °C.
- The PFH and MTTFd values of the other components, especially of the AS-i safety monitor, can be found in the corresponding documentation.

14 Troubleshooting

The LEDs of the safe AS-i module indicate faulty operating states (→ chapter 11 Operation).

15 Maintenance, repair and disposal

If used correctly no maintenance and repair measures are necessary.

Only the manufacturer is allowed to repair the unit.

After use dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.

16 Terms and abbreviations

PL	Performance level	Capability of safety-related parts to perform a safety function under predictable conditions to fulfil the expected risk reduction.
PFH (PFH _D)	P robability of (dangerous) F ailure per H our	Probability of (dangerous) Failure per Hour
SILCL	Safety Integrity Level claim limit	(according to IEC 62061)
ESPE		Electro-sensitive protective equipment

UK

17 Approvals / certificates

- EC Declaration of Conformity
- TÜV Rheinland
- AS-Interface
- UL (cULus)

The unit shall be supplied via an appropriate class 2 source such that the supply class requirements in accordance with UL 508 are met.

18 Accessories (optional)

EY3090 - Adapter cable straight, for connection of safety light curtains / safety light grids with OSSD for receiver, configured for automatic operation, 8 poles, M12 to 5 poles M12.

EY3092 - Adapter cable straight, for connection of safety light curtains / safety light grids with OSSD for transmitter, configured for "short range".