


EUCHNER

Operating Instructions

Field Evaluation Unit
CES-FD-AP-... (Unicode/Multicode)

EN

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1. About this document

1.1. Scope

This document is valid for all CES-FD-AP-... version 1.0.X.





These operating instructions, the document *Safety information* and any available data sheet form the complete user information for your device.

| | |
|---|--|
|  | <p>Important!</p> <p>Make sure to use the operating instructions valid for your product version. Please contact the EUCHNER support team if you have any questions.</p> |
|---|--|

1.2. Target group





Design engineers and installation planners for safety devices on machines, as well as setup and servicing staff possessing special expertise in handling safety components.


1.3. Key to symbols

| Symbol/depiction | Meaning |
|--|---|
|  | Printed document |
|  | Document is available for download at www.euchner.com |
|  DANGER WARNING CAUTION | <p>Safety precautions</p> <p>Danger of death or severe injuries</p> <p>Warning about possible injuries</p> <p>Caution slight injuries possible</p> |
|  NOTICE Important! | <p>Notice about possible device damage</p> <p>Important information</p> |
| Tip | Useful information |

1.4. Supplementary documents

The overall documentation for this device consists of the following documents:

| Document title (document number) | Contents | |
|-------------------------------------|---|---|
| Safety information (2525460) | Basic safety information |  |
| Operating instructions (2116267) | (this document) |  |
| Declaration of conformity | Declaration of conformity |  |
| Possibly available data sheet | Item-specific information about deviations or additions |  |

| | |
|---|---|
|  | <p>Important!</p> <p>Always read all documents to gain a complete overview of safe installation, setup and use of the device. The documents can be downloaded from www.euchner.com. Simply enter the document number or the order number in the search box.</p> |
|---|---|

2. Correct use

Field evaluation units series CES-FD-AP-... are used to evaluate safety-related signals from EUCHNER read heads in the field. The system can form an interlocking device without guard locking (type 4). The system meets the requirements according to EN IEC 60947-5-3. Devices with unicode evaluation possess a high coding level, devices with multicode evaluation possess a low coding level.

The system consists of field evaluation unit, read head and actuator.

In combination with a movable guard and the machine control, this system prevents dangerous machine functions from occurring while the guard is open. A stop command is triggered if the guard is opened during the dangerous machine function.

This means:

- › Starting commands that cause a dangerous machine function must become active only when the guard is closed.
- › Opening the guard triggers a stop command.
- › Closing a guard must not cause automatic starting of a dangerous machine function. A separate start command must be issued. For exceptions, refer to EN 12100 or relevant C-standards.

Before use, a risk assessment must be performed on the machine, e.g. according to the following standards:

- › EN ISO 13849-1
- › EN ISO 12100
- › EN IEC 62061

Correct use includes observing the relevant requirements for installation and operation, e.g. according to the following standards:

- › EN ISO 13849-1
- › EN ISO 14119
- › EN IEC 60204-1

The following components can be connected to the field evaluation unit CES-FD-AP-...:

- › CES read heads
- › CKS key adapters

For further information, refer to the operating instructions of the corresponding component and to *Table 1: Possible combinations for CES components on page 6*.



Important!

- › The user is responsible for the proper integration of the device into a safe overall system. For this purpose, the overall system must be validated, e.g. in accordance with EN ISO 13849-2.
- › Correct use requires observing the permissible operating parameters (see chapter 12. *Technical data on page 18*).
- › If a data sheet is included with the product, the information on the data sheet applies.
- › It is only allowed to use components that are permissible in accordance with the table below.

Table 1: Possible combinations for CES components

| Field evaluation unit | Read head | Actuator | |
|-----------------------|------------------------|----------------------|---|
| | | CES-A-BMB 077791 | CKS-A-BK1... |
| CES-FD-AP-U... | CES-A-LMN-SC 077790 | ● | |
| | CKS-A-L1B-SC | | ● |
| CES-FD-AP-M... | CES-A-LMN-SC 077790 | ● | |
| | CKS-A-L1B-SC | | Important: Key adapter CKS must not be used as a lockout bar in combination with multicode evaluation. |
| Key to symbols | ● | Combination possible | |

3. Description of the safety function

Devices from this series feature the following safety functions:

The following applies in combination with read heads without guard locking (CES read heads):



Monitoring of the position of a guard (interlocking device according to EN ISO 14119)

- › Safety function:
 - In combination with read head CES-A-LMN-SC: The safety outputs are switched off when the guard is open.
 - In combination with key adapter CKS-A-L...: Safe detection of a key belonging to the system and checking the associated key code. The safety outputs are switched on if the key is valid.
- › Safety characteristics: category, Performance Level, PFH_D (see chapter 12. *Technical data on page 18*).

4. Exclusion of liability and warranty

In case of failure to comply with the conditions for correct use stated above, or if the safety regulations are not followed, or if any servicing is not performed as required, liability will be excluded and the warranty void.

5. General safety precautions

| | |
|---|--|
|  | <p>WARNING</p> <p>Danger to life due to improper installation or due to bypassing (tampering). Safety components fulfill a personnel protection function.</p> <ul style="list-style-type: none"> › Safety components must not be bypassed, turned away, removed or otherwise rendered ineffective. On this topic pay attention in particular to the measures for reducing the possibility of bypassing according to EN ISO 14119:2013, section 7. › The switching operation must be triggered only by actuators designated for this purpose. › Prevent bypassing by means of replacement actuators (only for multicode evaluation). For this purpose, restrict access to actuators and to keys for releases, for example. › Mounting, electrical connection and setup only by authorized personnel possessing the following knowledge: <ul style="list-style-type: none"> - specialist knowledge in handling safety components - knowledge about the applicable EMC regulations - knowledge about the applicable regulations on operational safety and accident prevention. |
|  | <p>Important!</p> <p>Prior to use, read the operating instructions and keep these in a safe place. Ensure the operating instructions are always available during mounting, setup and servicing. For this reason you should archive a printed copy of the operating instructions. You can download the operating instructions from www.euchner.com.</p> |

6. Function

The safety system consists of three components:

- › Coded actuator
- › Read head
- › Field evaluation unit

1 read head can be connected to the field evaluation unit.

Each actuator is supplied with a unique electronic code. The code in an actuator cannot be reprogrammed.

Whether the device learns the complete actuator code (unicode) or not (multicode) depends on the respective version.

- › **Devices with unicode evaluation:** The actuator must be assigned to the safety switch by a teach-in operation so that it is detected by the system. This unambiguous assignment ensures a particularly high level of protection against tampering. The system thus possesses a high coding level.
- › **Devices with multicode evaluation:** Unlike systems with unicode evaluation, on multicode devices a specific code is not requested but instead it is only checked whether the actuator is of a type that can be detected by the system (multicode evaluation). There is no exact comparison of the actuator code with the taught-in code in the safety switch (unicode evaluation). The system possesses a low coding level.

The read head is fastened to the fixed part of the guard and is connected to the field evaluation unit via a two-core screened cable (plug X2, H1/H2 and SH).

The actuator fastened to the movable part of the guard is moved towards the read head by closing the door. When the operating distance is reached, power is supplied to the actuator by the read head by induction and data can be transferred.

If a permissible code is detected, the safety outputs are switched on.

The safety outputs are switched off when the guard is opened.

In the event of a fault in the safety switch, the safety outputs are switched off and the DIA LED illuminates red. The occurrence of faults is detected at the latest on the next demand to close the safety outputs (e.g. on starting).

6.1. Door monitoring output OD (optional)

The door monitoring output is switched on as soon as a valid actuator is detected in the actuating range.

6.2. Limit-range monitoring

If the safety door with the actuator should settle over time, the actuator can drift out of the read head actuating range. The device recognizes this situation and indicates that the actuator is in the limit range by flashing the STATE LED. This allows the safety door to be readjusted in time. Also refer to the system status tables in chapters 10 and 11.

7. Mounting



NOTICE

Device damage due to improper installation or unsuitable ambient conditions.

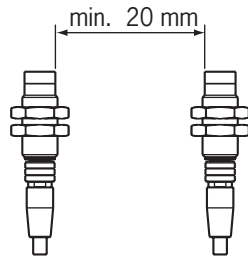
- › Read heads and actuators must not be used as a mechanical end stop.
- › Observe EN ISO 14119:2013, sections 5.2 and 5.3, for information about mounting the safety switch and the actuator.
- › Observe EN ISO 14119:2013, section 7, for information about reducing the possibilities for bypassing an interlocking device.



Important!

- › From the assured release distance S_{ar} , the safety outputs are safely shut down.
- › When mounting several read heads/actuators, observe the stipulated minimum distance to avoid mutual interference.




- For CES-A-LMN $s_{min} = 20 \text{ mm}$






Note the following points:

- › Actuator and read head must be fitted so that:
 - the front faces are at the minimum assured operating distance $0.8 \times S_{ao}$ or closer when the guard is closed (see section *Actuating ranges*). To avoid entering the area of possible side lobes, a minimum distance is to be maintained in case of a side approach direction. See section *Typical actuating range* for the related actuator.
 - a hazard is excluded until the assured release distance (S_{ar}) is reached when the guard is open.
 - the actuator is positively mounted on the guard, e.g. by using safety screws.
 - they cannot be removed or tampered with using simple means.
- › Pay attention to the maximum tightening torque for the field evaluation unit mountings of 1 Nm.

8. Electrical connection

| | |
|---|---|
|  | <p>WARNING</p> <p>In the event of a fault, loss of the safety function due to incorrect connection.</p> <ul style="list-style-type: none"> › Monitoring outputs must not be used as safety outputs. › Lay the connecting cables with protection to prevent the risk of short circuits. |
|  | <p>CAUTION</p> <p>Risk of damage to equipment or malfunctions as a result of incorrect connection.</p> <ul style="list-style-type: none"> › The device generates its own clock signal on the output lines FO1A/FO1B. A downstream control system must tolerate these test pulses, which may last up to 0.3 ms. No test pulses are output when the safety outputs are switched off. › The inputs on a connected evaluation unit must be positive switching, as the two outputs on the safety switch deliver a level of +24 V in the switched-on state. › All the electrical connections must either be isolated from the mains supply by a safety transformer according to IEC 61558-2-6 with limited output voltage in the event of a fault, or by other equivalent insulation measures (PELV). › All electrical outputs must have an adequate protective circuit for inductive loads. The outputs must be protected with a free-wheeling diode for this purpose. Varistors and RC interference suppression units must not be used. › Power devices which are a powerful source of interference must be installed in a separate location away from the input and output circuits for signal processing. The cable routing for safety circuits should be as far away as possible from the cables of the power circuits. › To avoid EMC interference, the physical environmental and operating conditions at the installation site of the device must comply with the requirements according to the standard EN 60204-1:2006 (EMC). › Please pay attention to any interference fields from devices such as frequency converters or induction heating systems. Observe the EMC instructions in the manuals from the respective manufacturer. |
|  | <p>Important!</p> <p>If the device does not appear to function when operating voltage is applied (e.g. green STATE LED does not flash), the safety switch must be returned unopened to the manufacturer.</p> |

8.1. Notes about

| | |
|---|--|
|  | <p>Important!</p> <ul style="list-style-type: none"> › For use and application as per the requirements of ¹⁾ a power supply with the feature “for use in class 2 circuits” must be used. Alternative solutions must comply with the following requirements: This device shall be used with a suitable isolating source in conjunction with a fuse in accordance with UL248. This fuse must be designed for max. 3.3 A and must be integrated into the 30 V DC voltage section. › For use and application as per the requirements of ¹⁾ a connecting cable listed under UL category code CYJV2 must be used. <p><small>1) Note on the scope of the UL approval: only for applications as per NFPA 79 (Industrial Machinery). The devices have been tested as per the requirements of UL508 and CSA/ C22.2 no. 14 (protection against electric shock and fire).</small></p> |
|---|--|

8.2. Safety in case of faults

- › The operating voltage U_B is reverse polarity protected.
- › The safety outputs are short circuit-proof.
- › A short circuit between the safety outputs is detected by the switch.
- › A short circuit in the cable can be excluded by laying the cable with protection.

8.3. Fuse protection for power supply

The power supply must be provided with fuse protection depending on the number of switches and the current required for the outputs. The following rules apply:

Max. current consumption of an individual switch I_{max}

$$I_{max} = I_{UB} + I_{OD} + I_{F01A+F01B}$$

I_{UB} = Switch operating current (45 mA)

I_{OD} = Load current of monitoring output (max. 50 mA)

$I_{F01A+F01B}$ = Load current of safety outputs F01A + F01B (2 x max. 150 mA)

8.4. Requirements for connecting cables



CAUTION

Risk of damage to equipment or malfunctions as a result of incorrect connecting cables.

- › Use connection components and connecting cables from EUCHNER.
- › If other connection components are used, the requirements in the following table apply. EUCHNER provides no warranty for safe function in case of failure to comply with these requirements.
- › The connecting cable for the field evaluation unit must not be longer than 180 m in total.
- › The connecting cable from the field evaluation unit to the read head is only allowed to be extended with the aid of the extension piece (order no. 115464).
- › The read head cable must not be longer than 0.7 m in total.

Observe the following requirements with respect to the connecting cables:

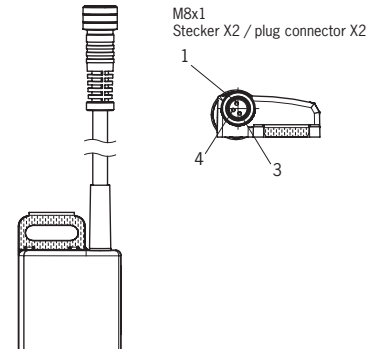
| Parameter | Value | | Unit |
|-------------------------|---------------|---------------|-----------------|
| | M12/5-pin | | |
| Recommended cable type | LIYY 5 x 0.25 | LIYY 5 x 0.34 | mm ² |
| Cable | 5 x 0.25 | 5 x 0.34 | mm ² |
| Cable resistance R max. | 78 | 58 | Ω/km |
| Inductance L max. | 0.64 | 0.53 | mH/km |
| Capacitance C max. | 60 | 100 | nF/km |

8.5. Connector assignment of field evaluation unit CES-FD-AP-...

8.5.1. Connection for the read head (M8, 3-pin)

| Pin | Designation | Description | Conductor coloring |
|-----|-------------|-------------|--------------------|
| 1 | H1 | Data line | BN |
| 3 | H2 | Data line | WH |
| 4 | SH | Shield | - |

The switch has a permanently connected piece of cable approx. 200 mm long. With the aid of an extension piece (order no. 115464) the read head connection can be extended to max. 700 mm.



8.5.2. Device connection for the field evaluation unit with M12 plug connector, 5-pin

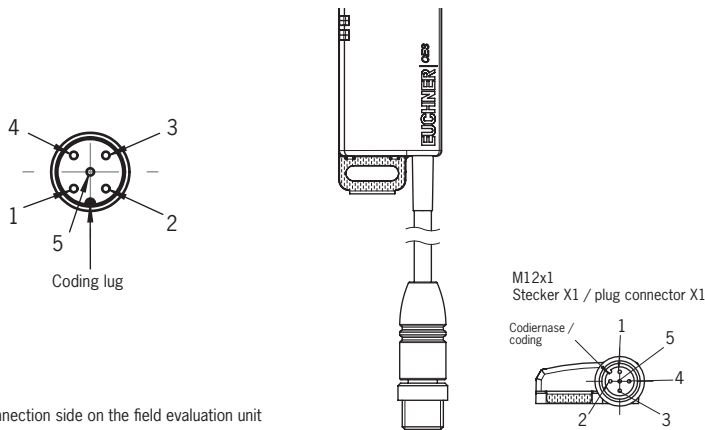


Fig. 1: Connector assignment, connecting cable for the field evaluation unit with M12 plug connector

| Pin | | Designation | Description | Conductor coloring |
|-------|----------------------|-------------|------------------------------|--------------------|
| 5-pin | 5-pin Pin 5 not used | | | |
| 1 | 1 | UB | Power supply, DC 24 V | BN |
| 2 | 2 | FO1A | Safety output, channel A | WH |
| 3 | 3 | 0 V | Ground, DC 0 V | BU |
| 4 | 4 | FO1B | Safety output, channel B | BK |
| 5 | - | OD | Monitoring output (optional) | GY |

8.6. Connection



WARNING

- In the event of a fault, loss of the safety function due to incorrect connection.
- › To ensure safety, both safety outputs (FO1A and FO1B) must always be evaluated.
 - › Single-channel use of the safety outputs leads to a loss of the category in accordance with EN ISO 13849-1.



Important!

- › The subsystem CES-FD-AP complies with PL e in accordance with EN 13849-1. To integrate the subsystem in a category 3 or 4 structure, it is necessary to monitor the downstream load (the feedback loop must be monitored).
- › These examples show only an excerpt that is relevant for connection of the CES system. The example illustrated here does not show complete system planning. The user is responsible for safe integration into the overall system. Detailed application examples can be found at www.euchner.com. Simply enter the order number of your switch in the search box. All available connection examples for the device can be found in "Downloads."

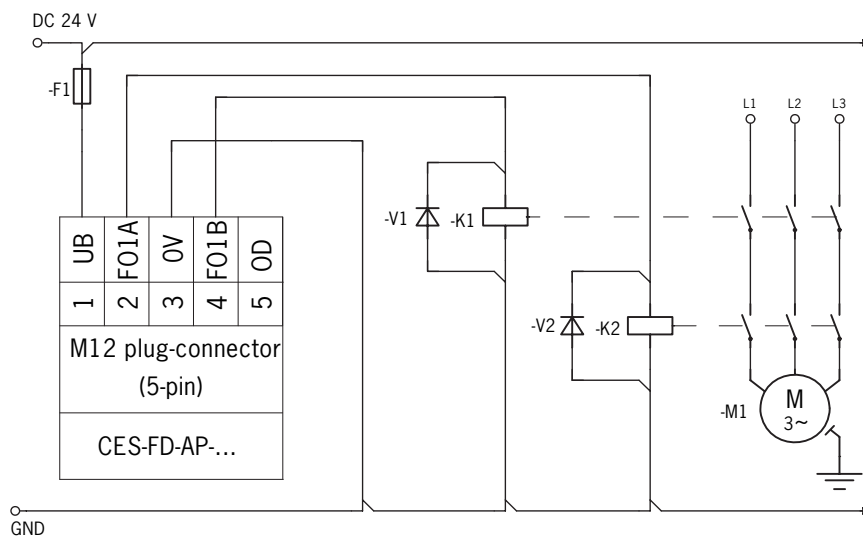


Fig. 2: Connection example CES-FD-AP...

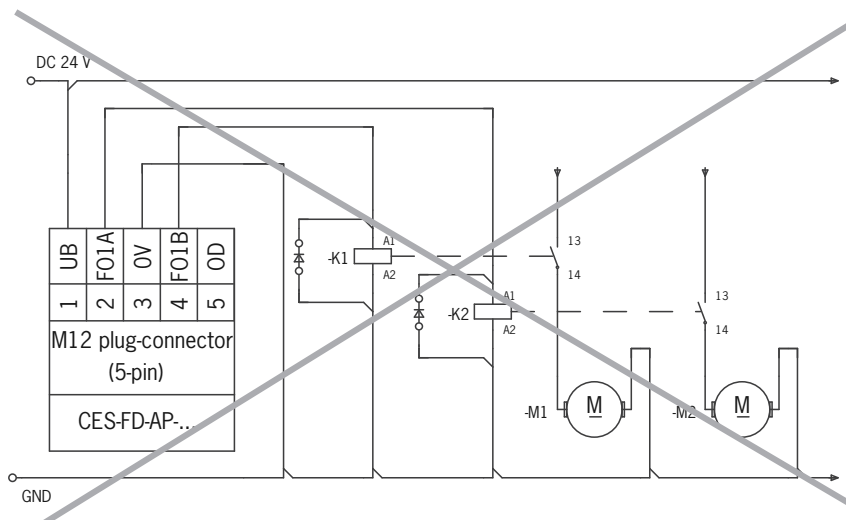


Fig. 3: Example of incorrect connection

8.7. Notes on operation with safe control systems

Observe the following guidelines for connection to safe control systems:

- › Use a common power supply for the control system and the connected safety switches.
- › The device tolerates voltage interruptions on UB of up to 5 ms. Tap the supply voltage directly from the power supply unit. If the power supply is connected to a terminal of a safe control system, this output must provide sufficient electrical current.
- › The safety outputs (FO1A and FO1B) can be connected to the safe inputs of a control system. Prerequisite: the input must be suitable for pulsed safety signals (OSSD signals, e.g. from light grids). The control system must tolerate test pulses on the input signals. This normally can be set up by parameter assignment in the control system. Observe the notes of the control system manufacturer. For the test-pulse duration of your safety switch, please refer to chapter 12. *Technical data on page 18.*

A detailed example of connecting and setting the parameters of the control system is available for many devices at www.euchner.com, in the area *Download/Applications/CES*. The features of the respective device are dealt with there in greater detail.

8.8. Devices for direct connection to IP65 field modules

The version CES-FD-AP-...-SB-... (M12, 5-pin; pin 5 not used) is optimized for connection to decentralized peripheral systems with M12 plug connector, such as the ET200pro series from Siemens. The devices are parameterized and connected like an OSSD (e.g. like light curtains).

The 5-pin M12 plug connector can be connected directly to the socket of an IP67 field module (e.g. ET200pro) using a connecting cable. If flying leads are used, connection to IP20 input and output modules (e.g. ET200SP) is naturally also possible.



Important!

Observe the following notes prior to connection:

- › Parameter assignment must be performed for the input/output modules (see application example at www.euchner.com, in the area *Download/Applications/CES*).
- › Additionally observe notes from the control system manufacturer where necessary.

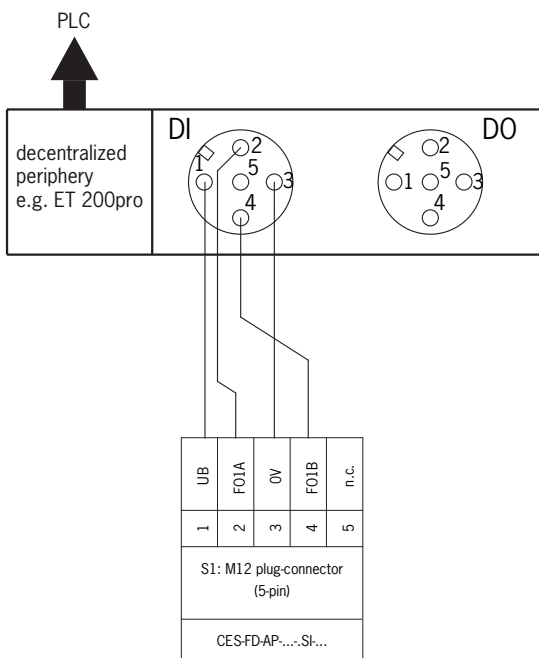


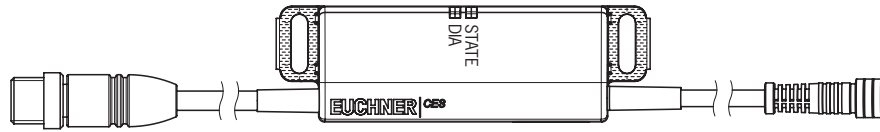
Fig. 4: Connection example for version for connection to decentralized peripheral systems

9. Setup

9.1. LED displays

A detailed description of the signal functions can be found in the system status tables in chapters 10 and 11.

| LED | Color |
|-------|-------|
| STATE | green |
| DIA | red |



9.2. Teach-in function for actuator (only for unicode evaluation)

The actuator must be allocated to the safety switch using a teach-in function before the system forms a functional unit.

During a teach-in operation, the safety outputs and the monitoring output OD are switched off, i.e. the system is in the safe state.



Important!

- › The teach-in operation may be performed only if the device functions flawlessly. The red DIA LED must not be illuminated.
- › The safety switch disables the code of the preceding device if teach-in is carried out for a new actuator. Teach-in is not possible again immediately for this device if a new teach-in operation is carried out. The disabled code is enabled again in the safety switch only after a third code has been taught-in.
- › The safety switch can be operated only with the last actuator taught-in.
- › After starting, the device remains in teach-in standby state for 3 min. If no new actuator is detected in this time, the device changes to normal operation. If the switch detects the actuator that was most recently taught-in when in the teach-in standby state, this state is ended immediately and the switch changes to normal operation.
- › If the actuator to be taught-in is in the actuating range for less than 60 s, it will not be activated and the most recently taught-in actuator will remain saved.

9.2.1. Preparing device for the teach-in operation and teaching-in actuator

1. Apply operating voltage to the safety switch.
 - ➔ A self-test is performed for approx. 0.5 s. After this, the STATE LED flashes cyclically three times and signals that it is in teach-in standby state.
Teach-in standby state remains active for approx. 3 minutes.
2. Move new actuator to the read head (observe distance $< S_{a0}$).
 - ➔ Teach-in operation starts, green STATE LED flashes (approx. 1 Hz). During the teach-in operation, the safety switch checks whether the actuator is a disabled actuator. Provided this is not the case, the teach-in operation is completed after approx. 60 seconds, and the green STATE LED goes out. The new code has now been stored, and the old code is disabled.
3. To activate the new actuator code from the teach-in operation in the safety switch, the operating voltage to the safety switch must then be switched off for min. 3 seconds.

9.3. Commissioning (multicode only)

1. Apply operating voltage to the device.
 - ➔ The green STATE LED flashes briefly, and a self-test is performed.
After this, the LED flashes cyclically one time and signals that it is in standby state.
2. Move actuator to the read head (observe distance $< S_{a0}$).
 - ➔ The green STATE LED illuminates continuously and indicates the detection of the actuator.

If the green STATE LED is flashing in fast flashing sequences, the actuator is in the limit range. In this case, the guard must be re-adjusted such that the actuator is completely in the read area.

9.4. Functional check



WARNING

Danger of fatal injury as a result of faults in installation and the functional check.

- › Before carrying out the functional check, make sure that there are no persons in the danger area.
- › Observe the valid accident prevention regulations.















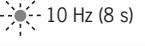

9.4.1. Electrical function test

After installation and any fault, the safety function must be fully checked. Proceed as follows:

1. Switch on operating voltage.
 - ➔ The machine must not start automatically.
 - ➔ The safety switch carries out a self-test. The green STATE LED then flashes at regular intervals.
2. Close all guards.
 - ➔ The machine must not start automatically.
 - ➔ The green STATE LED illuminates continuously.
3. Enable operation in the control system.
4. Open the guard.
 - › The machine must switch off and it must not be possible to start it as long as the guard is open.
 - › The green STATE LED flashes at regular intervals.

Repeat steps 2 - 4 for each guard.

10. System status table for unicode version

| Operating mode | Actuator/door position | Safety outputs F01A and F01B | LED indicator, output | | State |
|-------------------------|------------------------|------------------------------|---|---|---|
| | | | STATE (green) | DIA (red) | |
| Normal operation | closed | on |  | ○ | Normal operation, door closed |
| | closed | on |  flashes quickly 2 Hz | ○ | Normal operation, door closed, actuator in the limit range → Re-adjust door |
| | open | off |  1 x | ○ | Normal operation, door open, no actuator taught |
| | open | off |  2 x | ○ | No actuator taught, teach-in operation not completed successfully |
| Teach-in standby | open | off |  3 x | ○ | Door open, device is ready for teach-in for another actuator (only short time after power-up) |
| Setup | closed | off |  1 Hz | ○ | Teach-in operation |
| | X | off | ○ | ○ | Positive acknowledgment after completion of teach-in operation |
| Fault display | X | off | ○ |  | Fault on the power supply (e.g. shut-off pulse duration for pulsed power supply too long) |
| | closed | off |  3 x |  | Defective actuator (e.g. error in code or code not readable) |
| | X | off |  4 x |  | Output fault (e.g. short circuits, loss of switching ability) |
| | X | off |  5 x |  | Internal fault (e.g. component fault, data error) |
| Key to symbols | | | ○ | LED not illuminated | |
| | | |  | LED illuminated | |
| | | |  10 Hz (8 s) | LED flashes for 8 seconds at 10 Hz | |
| | | |  3 x | LED flashes three times, and this is then repeated | |
| | | | X | Any state | |

After the cause has been remedied, faults can generally be reset by opening and closing the guard. If the fault is still displayed afterward, briefly interrupt the power supply. Please contact the manufacturer if the fault could not be reset after restarting.



Important!

If you do not find the displayed device status in the system status table, this indicates an internal device fault. In this case, you should contact the manufacturer.

11. System status table for multicode version

| Operating mode | Actuator/door position | Safety outputs FO1A and FO1B | LED indicator, output | | State |
|------------------|------------------------|------------------------------|-----------------------|-----------|---|
| | | | STATE (green) | DIA (red) | |
| Normal operation | closed | on | | ○ | Normal operation, door closed |
| | closed | on | flashes quickly 2 Hz | ○ | Normal operation, door closed, actuator in the limit range → Re-adjust door |
| | open | off | 1 x | ○ | Normal operation, door open |
| Fault display | X | off | ○ | | Fault on the power supply (e.g. shut-off pulse duration for pulsed power supply too long) |
| | closed | off | 3 x | | Defective actuator (e.g. error in code or code not readable) |
| | X | off | 4 x | | Output fault (e.g. short circuits, loss of switching ability) |
| | X | off | 5 x | | Internal fault (e.g. component fault, data error) |

| | | |
|----------------|-------------|--|
| Key to symbols | ○ | LED not illuminated |
| | | LED illuminated |
| | 10 Hz (8 s) | LED flashes for 8 seconds at 10 Hz |
| | 3 x | LED flashes three times, and this is then repeated |
| | X | Any state |

After the cause has been remedied, faults can generally be reset by opening and closing the guard. If the fault is still displayed afterward, briefly interrupt the power supply. Please contact the manufacturer if the fault could not be reset after restarting.



Important!

If you do not find the displayed device status in the system status table, this indicates an internal device fault. In this case, you should contact the manufacturer.

12. Technical data



NOTICE

If a data sheet is available for the product, the information on the data sheet applies.

12.1. Technical data for field evaluation unit CES-FD-AP-.-USI-115534 / 119865

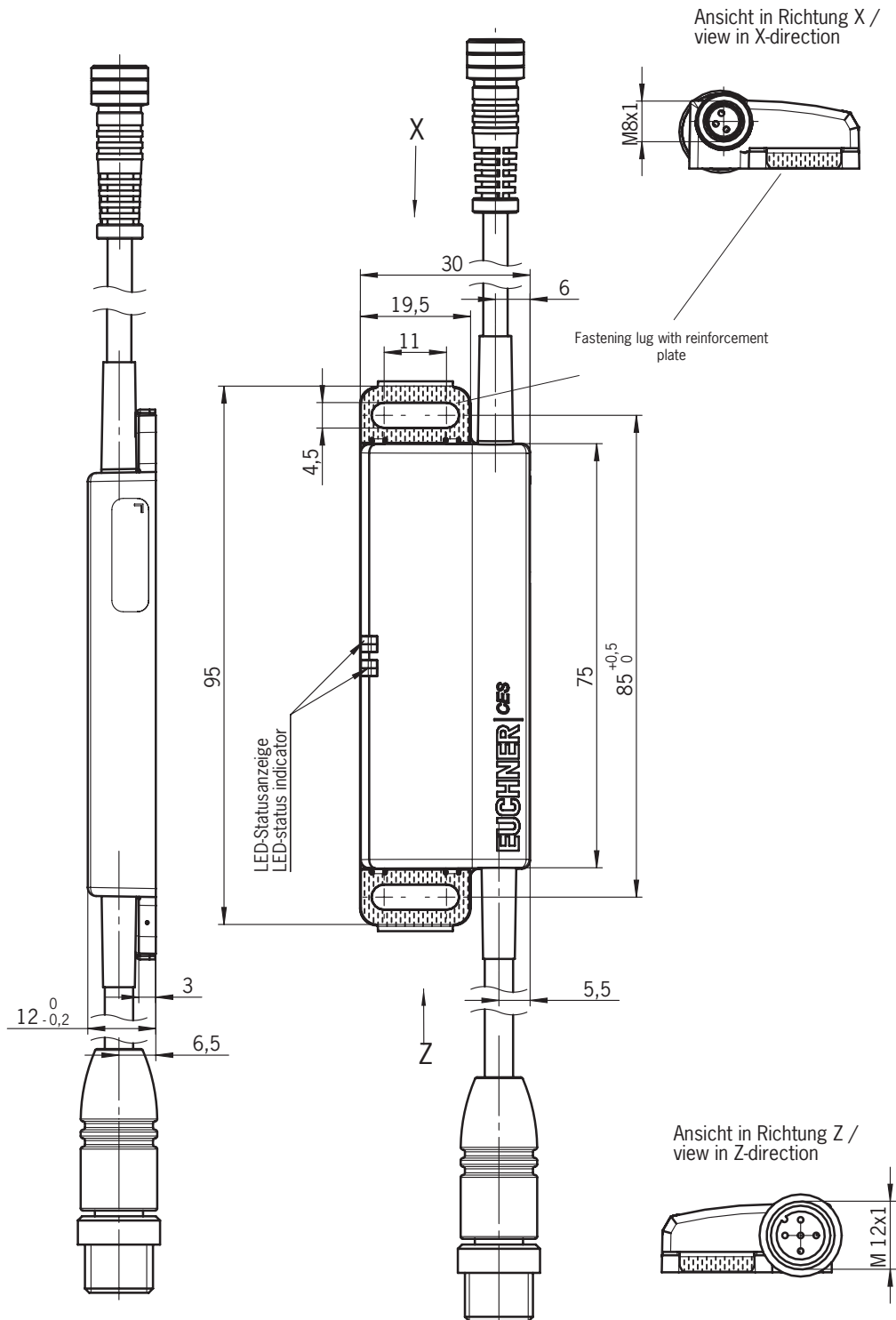
Dimension drawing

Connecting cable PUR for read head with M8 plug connector


Length of cable piece: 200 mm

Connecting cable PUR with M12 plug connector

Length of cable piece: 1,000 mm



Technical data

| Parameter | Value | | | Unit |
|--|--|------|--------|-------|
| | min. | typ. | max. | |
| Housing material | PBT plastic | | | |
| Dimensions | 95 x 30 x 12 | | | mm |
| Weight | 0.096 | | | kg |
| Ambient temperature at $U_B = DC\ 24\ V$ | | | | °C |
| - With connecting cable with M12 plug connector | | | | |
| - Connecting cable laid rigidly | - 20 | - | + 65 | |
| - Connecting cable movable | - 5 | - | + 65 | |
| Degree of protection | IP65/IP67 | | | |
| Safety class | III | | | |
| Degree of contamination | 3 | | | |
| Installation position | Any | | | |
| Connection | | | | |
| - Evaluation | Connecting cable PUR with plug connector M12x1, 5-pin | | | |
| - Read head | Connecting cable PUR with plug connector M8x1, 3-pin | | | |
| Operating voltage U_B (reverse polarity protected, regulated, residual ripple < 5%) ¹⁾ | 24 ± 15% (PELV) | | | V DC |
| For the approval acc. to  the following applies | Operation only with UL Class 2 power supply, or equivalent measure | | | |
| Current consumption (no load on outputs) | - | - | 45 | mA |
| External fuse (operating voltage) | 0.25 | - | 8 | A |
| Safety outputs F01A/F01B | Semiconductor outputs, p-switching, short circuit-proof | | | |
| - Output voltage $U(F01A)/U(F01B)$ ²⁾ | | | | V DC |
| HIGH U(F01A) | $U_B - 1.5$ | - | U_B | |
| HIGH U(F01B) | | | | |
| LOW U(F01A)/U(F01B) | 0 | | 1 | |
| Switching current per safety output | 1 | - | 150 | mA |
| Utilization category | DC-13 24 V 150 mA Caution: outputs must be protected with a free-wheeling diode in case of inductive loads. | | | |
| Off-state current I_r | - | - | ≤ 0.25 | mA |
| Monitoring output OD | Semiconductor output p-switching, short circuit-proof | | | |
| - Output voltage | $0.8 \times U_B$ | - | U_B | V DC |
| - Max. load | - | - | 50 | mA |
| Rated insulation voltage U_i | 75 | | | V |
| Rated impulse withstand voltage U_{imp} | 1.5 | | | kV |
| Conditional short-circuit current | 100 | | | A |
| Shock and vibration resistance | Acc. to EN IEC 60947-5-2 | | | |
| Switching frequency | - | - | 1 | Hz |
| Repeat accuracy R | ≤ 10 | | | % |
| EMC protection requirements | acc. to EN IEC EN 60947-5-3 | | | |
| Ready delay | - | 0.5 | - | s |
| Risk time | - | - | 260 | ms |
| Turn-on time | - | - | 400 | ms |
| Discrepancy time | - | - | 10 | ms |
| Test pulse duration ³⁾ | 0.3 | | | ms |
| Test pulse interval | 100 | | | ms |
| Reliability values acc. to EN ISO 13849-1 | | | | |
| Category | 4 | | | |
| Performance Level | PL e | | | |
| PFH_D | $4.5 \times 10^{-9} / h$ | | | |
| Mission time | 20 | | | years |

1) The device tolerates voltage interruptions of up to 5 ms.

2) Values at a switching current of 50 mA without taking into account the cable lengths.

3) Applies to a load with $C < 30\ nF$ and $R < 20\ k\Omega$.

12.1.1. Typical system times

Please refer to the technical data for the exact values.

Ready delay: After switch-on, the device carries out a self-test. The system is ready for operation only after this time.

Turn-on time of safety outputs: The max. reaction time t_{on} is the time from the moment when the actuator is in the actuating range to the moment when the safety outputs switch on.

Risk time according to EN 60947-5-3: If an actuator moves outside the actuating range, the safety outputs (FO1A and FO1B) are switched off after the risk time at the latest.

Discrepancy time: The safety outputs (FO1A and FO1B) switch with a slight time offset. They have the same signal state no later than after the discrepancy time.

Test pulses at the safety outputs: The device generates its own test pulses on the safety outputs (FO1A and FO1B). A downstream control system must tolerate these test pulses.

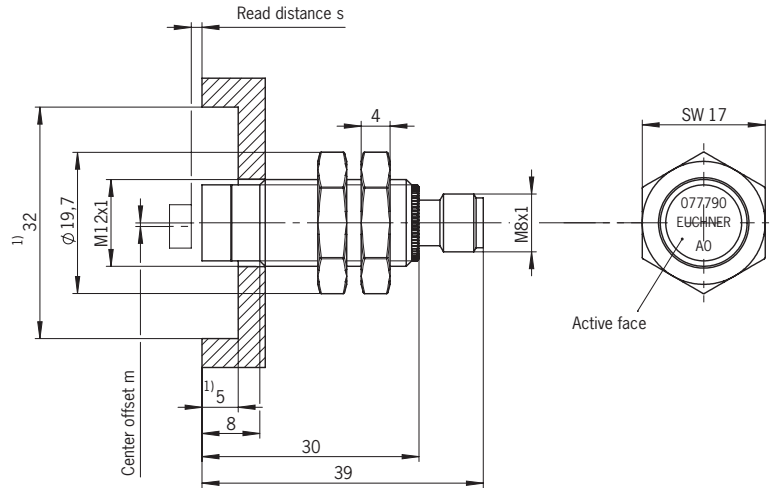
This can usually be set up in the control systems by parameter assignment. If parameter assignment is not possible for your control system or if shorter test pulses are required, please contact our support organization.

The test pulses are output only if the safety outputs are switched on.

12.2. Technical data for read head CES-A-LMN-SC

- › Cylindrical design M12
- › M8 plug connector

Dimension drawing



1) Clear zone (area of the active face without metal housing)

Technical data

| Parameter | Value | | | Unit |
|--|---|------|------|------|
| | min. | typ. | max. | |
| Housing material | Nickel-plated CuZn housing sleeve Plastic PBT GF20 cap | | | |
| Dimensions | M12 x 1, length 39 | | | mm |
| Weight | 0.2 | | | kg |
| Ambient temperature | -25 | - | +85 | °C |
| Ambient pressure (only of active face in installed condition) | - | - | 10 | bar |
| Degree of protection | IP67/IP69/IP69K | | | |
| Installation position | Any | | | |
| Method of operation | inductive | | | |
| Power supply | Via evaluation unit | | | |
| In combination with actuator CES-A-BMB on field evaluation unit CES-FD-AP-.01-... | | | | |
| Assured release distance S_{ar} | - | - | 10 | mm |
| Actuating range for center offset $m = 0$ ¹⁾ | | | | |
| - Operating distance | - | 5 | - | |
| - Assured operating distance S_{a0} | 3.4 | - | - | |
| - Switching hysteresis | 0.05 | 0.2 | - | |
| Connection | M8 plug connector, 3-pin | | | |
| Connecting cable | - | - | 0.7 | m |

1) These values apply to surface installation of the read head in steel.

Typical actuating range

(only in combination with field evaluation unit CES-FD-AP--01-... and actuator CES-A-BMB)

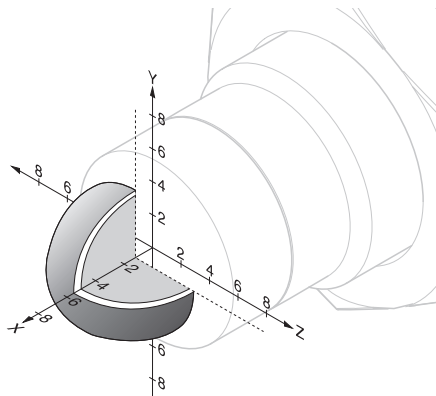


Fig. 5: Typical actuating range



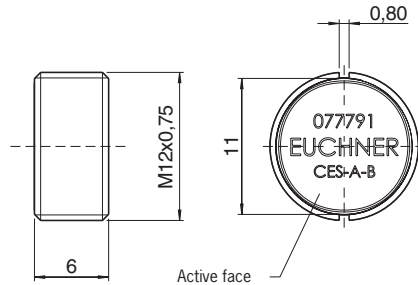
NOTICE

- › A minimum distance of $s = 1.2 \text{ mm}$ must be maintained.
- › The read distance may vary depending on the installation situation

12.3. Actuator CES-A-BMB

- › Cylindrical design M12 x 0.75
- › In combination with read head CES-A-LMN-SC

Dimension drawing



NOTICE

- › The actuator can be screwed into the M12 x 0.75 thread provided with the aid of an insertion tool (order no. 037662).
- › Flush installation of the actuator in steel is permissible.

Technical data

| Parameter | Value | | | Unit |
|-----------------------|--------------------------------|------|------|------|
| | min. | typ. | max. | |
| Housing material | Stainless steel | | | |
| Dimensions | M12 x 0.75, depth 6 | | | mm |
| Weight | 0.002 | | | kg |
| Ambient temperature | -25 | - | +85 | °C |
| Degree of protection | IP67/IP69/IP69K | | | |
| Installation position | Active face opposite read head | | | |
| Power supply | Inductive via read head | | | |

13. Ordering information and accessories



Tip!

Suitable accessories, e.g. cables or assembly material, can be found at www.euchner.com. To order, enter the order number of your item in the search box and open the item view. Accessories that can be combined with the item are listed in *Accessories*.

14. Inspection and service



WARNING

Loss of the safety function because of damage to the device.
In case of damage, the related safety component must be replaced. The replacement of individual parts in a safety component is not permitted.

Regular inspection of the following is necessary to ensure trouble-free long-term operation:

- › Check the switching function (see chapter 9.4. *Functional check on page 15*)
- › Check the secure mounting of the devices and the connections
- › Check for contamination
- › Check for sealing of the plug connector on the safety switch
- › Check for loose cable connections on the plug connector
- › Check the release distance

No servicing is required. Repairs to the device are only allowed to be made by the manufacturer.



NOTICE

The year of manufacture can be seen in the lower right corner of the type label.

15. Service

If servicing is required, please contact:

EUCHNER GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen

Service telephone:

+49 711 7597-500

E-mail:

support@euchner.de

Internet:

www.euchner.com

16. Declaration of conformity

The product complies with the requirements according to Machinery Directive 2006/42/EC.

The EU declaration of conformity can be found at www.euchner.com. Enter the order number of your device in the search box. The document is available under *Downloads*.

Euchner GmbH + Co. KG
Kohlhammerstraße 16
70771 Leinfelden-Echterdingen
info@euchner.de
www.euchner.com

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(Translation of the original operating instructions)

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