

# SEFBxxx

Multi-Beam Safety Light Array



## Operating Instructions

Translation of the Original Operating Instruction  
Subject to technical changes  
Available as PDF file only  
Revision level: 03/07/2025  
Doc. No.: 1038510-01  
Version 1.2.0  
[www.wenglor.com](http://www.wenglor.com)

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# 1. General

## 1.1 Information Concerning these Instructions

- These instructions apply to the following multi-beam Safety Light Arrays:
  - SEFB
  - SEFB muting
  - For the exact order designation, see “16.3 Order Notes” on page 158
- They make it possible to use the product safely and efficiently.
- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Local accident prevention regulations and national occupational health and safety directives must be observed.
- The product is subject to further technical development, and thus the information contained in these operating instructions may also be subject to change.

The current version can be found at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.



### NOTE!

The operating instructions must be read carefully before using the product and must be kept on hand for later reference.

## 1.2 Target Group

- These operating instructions are aimed at developers, planners, installers, owners and machine operators who want to safeguard their systems with safety technology from wenglor sensoric GmbH (referred to in the following as “wenglor”).
- The instructions are also aimed at qualified specialist personnel, who are commissioning the SEFB multi-beam Safety Light Array for the first time, maintaining it or integrating it in a machine with accessories and additional products where applicable.

## 1.3 Explanations of Symbols

- Safety precautions and warnings are emphasized by means of symbols and attention-getting words.
- Safe use of the product is only possible if these safety precautions and warnings are adhered to.

The safety precautions and warnings are laid out in accordance with the following principle:



### ATTENTION-GETTING WORD!

#### Type and source of danger!

Possible consequences in the event that the hazard is disregarded.

- Measures for averting the hazard.

The meanings of the attention-getting words, as well as the scope of the associated hazards, are listed below:

|                                                                                  |                                                                                                                                           |
|----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>DANGER!</b><br>This word indicates a hazard with a high degree of risk which, if not avoided, results in death or severe injury.       |
|  | <b>WARNING!</b><br>This word indicates a hazard with a medium degree of risk which, if not avoided, may result in death or severe injury. |
|  | <b>CAUTION!</b><br>This word indicates a hazard with a low degree of risk which, if not avoided, may result in minor or moderate injury.  |
|  | <b>ATTENTION!</b><br>This word draws attention to a potentially hazardous situation which, if not avoided, may result in property damage. |
|  | <b>NOTE!</b><br>A note draws attention to useful tips and suggestions, as well as information regarding efficient, error-free use.        |

### 1.4 Limitation of Liability

- The product has been developed in consideration of the current state-of-the-art, as well as applicable standards and guidelines. Subject to change without notice.
- A valid declaration of conformity can be found at [www.wenglor.com](http://www.wenglor.com) in the product’s separate download area.
- wenglor excludes all liability in the event of:
  - Non-compliance with the instructions,
  - Installation errors,
  - Use of the product for purposes other than those intended,
  - Use by untrained personnel,
  - Use of unapproved spare parts and accessories,
  - Unapproved modification of products.

These operating instructions do not imply any guarantee from wenglor with regard to the described procedures or specific product characteristics.  
wenglor assumes no liability for printing errors or other inaccuracies contained in these operating instructions, unless wenglor was verifiably aware of such errors at the point in time at which the operating instructions were prepared.

### 1.5 Copyrights

- The contents of these instructions are protected by copyright law.
- All rights are reserved by wenglor.
- Commercial reproduction or any other commercial use of the provided content and information, in particular graphics and images, is not permitted without previous written consent from wenglor.

## 2. For Your Safety

### 2.1 Use for Intended Purpose

**The product is based on the following functional principle:**

#### **Safety light arrays**

The light array monitors the safety field between the transmitter and the receiver. If the safety field is penetrated by an object, a switching command is triggered. This switching command may prevent initialization of a hazardous machine motion, or may stop an action which has already been started.

As part of an overall system, the task of this product is to carry out safety-related functions. The correct overall function must be ensured by the system or machine manufacturer, however.

#### **Use of this ESPE is only permissible if:**

- The hazardous motion can be stopped electrically by the safety outputs of the ESPE.
- The safety clearance between the ESPE and a hazardous machine motion is complied with at all times.
- Additional mechanical safety equipment is installed so that the safety field must be passed through to access hazardous machine parts.
- Care is taken during installation to ensure that the personnel always remain inside the monitored zone for machine operation.
- Regular safety inspections are carried out.
- Adequate detection of possible obstructions is assured with the existing number of beams.
- The use of a light array, type 4 / Performance Level PL e / SIL 3, was deemed permissible following an extensive risk analysis.

#### **This product can be used in the following industry sectors:**

- |                                   |                            |
|-----------------------------------|----------------------------|
| • Special machinery manufacturing | • Automotive industry      |
| • Pharmaceuticals industry        | • Woodworking industry     |
| • Electronics industry            | • Printing industry        |
| • Chemicals industry              | • Raw materials extraction |
| • Heavy machinery manufacturing   | • Food industry            |
| • Clothing industry               | • Consumer goods industry  |
| • Glass industry                  | • Aviation industry        |
| • Agriculture industry            | • Paper industry           |
| • Logistics                       | • Packaging industry       |
| • Plastics industry               | • Construction industry    |
| • Steel industry                  | • Other                    |
| • Alternative energy              |                            |

## 2.2 Use for Other than the Intended Purpose

- The product is not suitable for use in potentially explosive atmospheres.
- The product may only be used with accessories supplied or approved by wenglor, or in combination with products approved by wenglor. A list of approved accessories and combination products can be accessed at [www.wenglor.com](http://www.wenglor.com) on the product detail page.
- The product is not suitable for use in outdoor weather.



### **DANGER!**

#### **Risk of personal injury or property damage in case of use for other than the intended purpose!**

Use for other than the intended purpose may lead to hazardous situations.

- Observe instructions regarding use for intended purpose.
- 

## 2.3 Personnel Qualifications

- Suitable technical training is a prerequisite.
- In-house electronics training is essential.
- Trained personnel who use the product must have uninterrupted access to the operating instructions.



### **DANGER!**

#### **Risk of personal injury or property damage in case of incorrect initial start-up, operation and maintenance!**

Personal injury and damage to equipment may occur.

- Adequate training and qualification of personnel.
- 

## 2.4 Modification of Products



### **DANGER!**

#### **Risk of personal injury or property damage if the product is modified!**

Personal injury and damage to equipment may occur. Non-observance may result in loss of the CE mark and the guarantee may be rendered null and void.

- Modification of the product is impermissible.
-

## 2.5 Important Safety Precautions

### 2.5.1 Important Safety Precautions for Machine Manufacturers

---

#### **DANGER!**

##### **Risk of safety device failure**

**If this warning is not observed, body parts and people to be protected may not be detected.**



- The national directives and safety regulations resulting from this application (e.g. accident prevention) must be observed.
  - A risk assessment must be carried out.
  - Depending on the application, a check must be carried out to determine whether additional protective measures are required.
  - The safety light array and associated components must not be tampered with or modified.
  - Light curtains must not influence each other. Different beam codings can be used where required (see [“7.1 Positioning the ESPE” on page 84](#)).
  - No repair work may be carried out on the device and its components. An incorrect repair could render the protection function ineffective.
- 

### 2.5.2 Important Safety Precautions for Machine Operators

---

#### **DANGER!**

##### **Risk of safety device failure**

**If this warning is not observed, body parts and people to be protected may not be detected.**



- If changes are made to the electrical integration in the machine control or the mechanical installation of the safety light array, a new risk assessment must be carried out.
  - The safety light array and associated components must not be tampered with or modified.
  - No repair work may be carried out on the device and its components. An incorrect repair could render the protection function ineffective.
- 

## 2.6 General Safety Precautions

#### **NOTE!**



- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- In the event of possible changes, the respectively current version of the operating instructions can be accessed at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.
- Read the operating instructions carefully before using the product.
- The sensor must be protected against contamination and mechanical influences.
- Additional measures may be necessary in order to assure that the ESPE does not fail in a dangerous fashion due to other types of light which are used in a special application (e.g. emission due to welding sparks or the effects of stroboscope lights) (EN 61496-2, Para. 7ff).



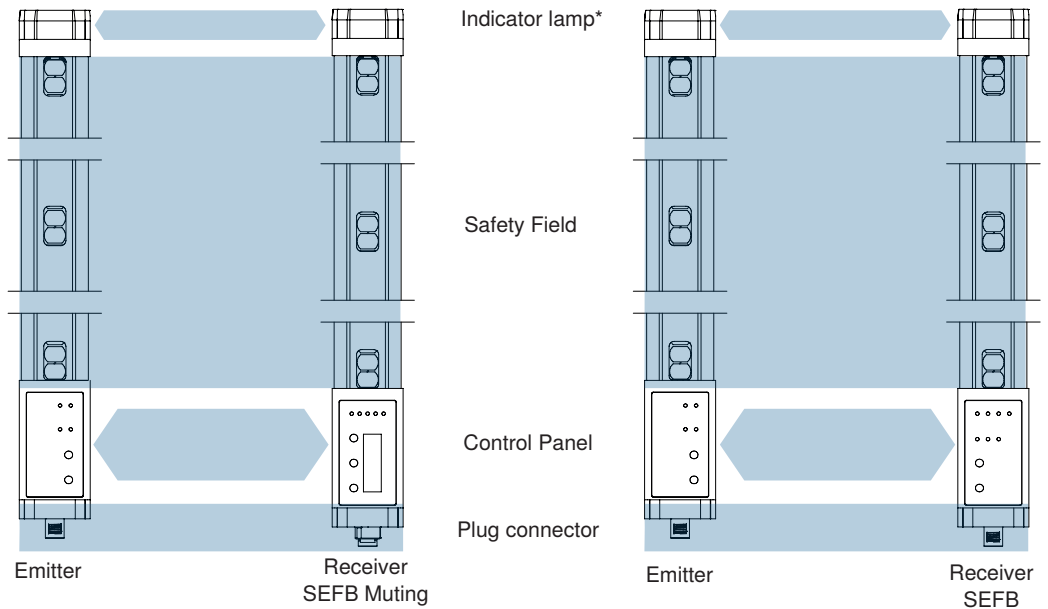
2.7 Approvals and IP Protection



3. Product Description

The SEFB safety light array is a piece of electro-sensitive protective equipment (ESPE) used to safeguard danger points, danger zones and accesses to machines. The ESPE monitors the safety field between the emitter and the receiver. When an object penetrates the safety field and one or multiple beams are interrupted, a switch command is triggered on both safety outputs. Together with the downstream evaluation, this prevents a hazardous motion from being initiated or interrupts an action that has already been initiated.

The ESPE consists of the following components:



\* Indicator lamp with SEFB muting receivers only

Figure 1: Product structure

This product has the following properties:

- ESPE type 4, per EN 61496-1
- PL e per EN ISO 13849-1 and SIL 3 per EN 61508
- Body protection: 2-, 3-, or 4-beam
- 0.5 m to 50 m range
- Visible red light
- Muting function (with SEFB muting)
  - Cross muting
  - Two sensor linear muting
  - Four sensor linear muting (with sequence/time monitoring)
  - Different, adjustable muting functions
- Restart inhibit and safety operating mode (automatic restart)
- Contactor monitoring (monitoring of external switching elements)
- Cascading (with SEFB muting)
- Integrated indicator lamp (with SEFB muting)
- Alphanumeric display (16-segment, 4-digit) (with SEFB muting)
- Memory card (microSD) (with SEFB muting)
- IO-Link 1.1 interface (not safety-related)



**NOTE!**

The performance characteristics differ depending on the device type, see [“5.2.1 Functions Overview” on page 44](#).

## 4. Technical Data

### 4.1 General Technical Data

For US and Canada: Device to be supplied by a certified Class 2 power supply that complies with the requirements according NEC and CEC.

|          | Order no. SEFB muting         | Order no. SEFB                |
|----------|-------------------------------|-------------------------------|
| Emitter  | SEFB512<br>SEFB513<br>SEFB514 | SEFB512<br>SEFB513<br>SEFB514 |
| Receiver | SEFB612<br>SEFB613<br>SEFB614 | SEFB622<br>SEFB623<br>SEFB624 |
| Set      | SEFB412<br>SEFB413<br>SEFB414 | SEFB422<br>SEFB423<br>SEFB424 |

#### Optical data

|                                                  |                                                                               |
|--------------------------------------------------|-------------------------------------------------------------------------------|
| Number of beams                                  | SEFB412/SEFB422: 2<br>SEFB413/SEFB423: 3<br>SEFB414/SEFB424: 4                |
| Beam distance                                    | SEFB412/SEFB422: 500 mm<br>SEFB413/SEFB423: 400 mm<br>SEFB414/SEFB424: 300 mm |
| Range                                            | 0.5 m...50 m                                                                  |
| Aperture angle                                   | ± 2.5°                                                                        |
| Wavelength emitter                               | typ. 630 nm                                                                   |
| Coated optics:                                   | Yes                                                                           |
| Ambient light immunity<br>(for continuous light) | 10,000 Lux                                                                    |

#### Electrical data

|                                                         |                                                                                                                                           |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Response time                                           | See <a href="#">section 4.2, page 17</a>                                                                                                  |
| Processing time muting signals                          | 95 ms                                                                                                                                     |
| Supply voltage                                          | 19.2...28.8 V DC (24 V DC +/-20 %)<br>(SELV-, PELV power supply unit), it must be possible to bridge power failures of 20 ms (EN 60204-1) |
| Safeguarding the supply voltage,<br>inputs              | max. 2 A                                                                                                                                  |
| Current consumption<br>(U <sub>b</sub> = 24 V) receiver | ≤ 350 mA (without load)                                                                                                                   |
| Current consumption<br>(U <sub>b</sub> = 24 V) emitter  | ≤ 100 mA                                                                                                                                  |
| Internal fuse                                           | 2 A                                                                                                                                       |
| Temperature range*                                      | -30...55 °C                                                                                                                               |
| Storage temperature                                     | -30...70 °C                                                                                                                               |
| Relative humidity                                       | ≤ 95 %, non-condensing                                                                                                                    |
| Vibration resistance                                    | 5 g (10 to 55 Hz)                                                                                                                         |
| Shock resistance                                        | 10 g/16 ms                                                                                                                                |
| Short-circuit proof                                     | Yes                                                                                                                                       |
| Reverse polarity protected and<br>overload-proof        | Yes                                                                                                                                       |

|                                            | Order no. SEFB muting                                                           | Order no. SEFB                         |
|--------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------|
| Protection class                           | III                                                                             |                                        |
| Max. cable length**                        | < 35 m/0.25 mm²<br>< 50 m/0.34 mm²<br>< 72 m/0.50 mm²                           |                                        |
| Safety outputs OSSD                        |                                                                                 |                                        |
| Safety outputs OSSD                        | PNP semiconductor                                                               |                                        |
| Number of safety outputs                   | 2                                                                               |                                        |
| Switching current safety output            | ≤ 300 mA                                                                        |                                        |
| Leakage current safety output              | ≤ 2 mA                                                                          |                                        |
| Voltage drop at safety output              | ≤ 2.3 V                                                                         |                                        |
| Max. voltage in off state                  | < 2 V                                                                           |                                        |
| Max. capacitive load                       | ≤ 1 µF                                                                          |                                        |
| Max. inductive load                        | ≤ 2.2 mH                                                                        |                                        |
| Test pulse width, rate                     | <300 µs; typ. 20 ms                                                             |                                        |
| Restart time after intervention            | typ. 2×response time                                                            |                                        |
| Signal output                              |                                                                                 |                                        |
| Signal output                              | IO-Link interface (C/Q)                                                         |                                        |
| Number of signal outputs                   | 1                                                                               |                                        |
| Switching current signal output            | ≤ 100 mA                                                                        |                                        |
| Voltage drop signal output                 | <3 V                                                                            |                                        |
| Inputs                                     |                                                                                 |                                        |
| Voltage range                              | –30...30 V DC SELV / PELV                                                       |                                        |
| Switching thresholds                       | Low: < 5 V; < 2 mA                      High: > 11 V; 6...30 mA                 |                                        |
| Mechanical data                            |                                                                                 |                                        |
| Housing material                           | Aluminum                                                                        |                                        |
| Degree of protection                       | IP65, IP67                                                                      |                                        |
| Connection type emitter                    | M12 plug, 5-pin                                                                 |                                        |
| Connection type receiver                   | M12 plug, 8-pin (system connection)<br>M12 socket, 8-pin (extension connection) | M12 plug, 8-pin<br>(system connection) |
| Technical safety data                      |                                                                                 |                                        |
| ESPE type (EN 61496)                       | 4                                                                               |                                        |
| Performance level<br>(EN ISO 13849-1:2015) | Cat. 4 PL e                                                                     |                                        |
| Safety integrity level (EN 61508)          | SIL 3                                                                           |                                        |
| PFHd*                                      | ≤ 1.8 * 10 <sup>-8</sup>                                                        |                                        |
| MTTFd                                      | > 100a                                                                          |                                        |
| Mission time TM<br>(EN ISO 13849-1:2015)   | 20 years                                                                        |                                        |

\* The values apply for operating altitudes of up to 2,000 m above sea level.  
 For operating altitudes between 2,000 m and 4,000 m, the following values in the table below apply:

| Operating altitude above sea level | Max. ambient temperature during operation | PFHd value   |
|------------------------------------|-------------------------------------------|--------------|
| > 2.000 m ... ≤ 3.000 m            | +50° C                                    | ≤ 2,1× 10-08 |
| > 3.000 m ... ≤ 4.000 m            | +45° C                                    | ≤ 2,1× 10-08 |



**NOTE!**

Use at altitudes above 4,000 m is not permitted.

\*\* The max. cable length must also be complied with for receivers in a cascade.

|                       | SEFB muting | SEFB |
|-----------------------|-------------|------|
| <b>Functions</b>      |             |      |
| Body protection       | Yes         |      |
| Safety operating mode | Yes         |      |
| Restart inhibit       | Yes         |      |
| Contactors monitoring | Yes         |      |
| Muting                | Yes         | No   |
| Cascading             | Yes         | No   |

The following table specifies the tightening torques of the plugs and mounting options in order to assure compliant, error-free operation:

| Connection type | Tightening torque (Nm) |
|-----------------|------------------------|
| M12             | 0.4                    |

4.2 Response Times

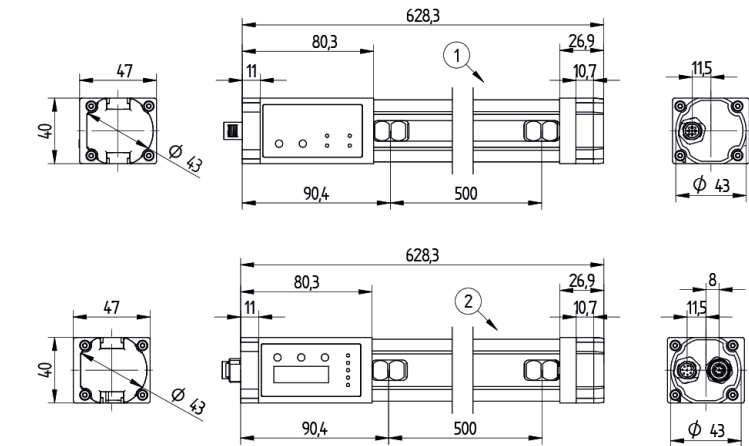
| SEFB muting | SEFB    | Beam distance [mm] | Number of beams | Response time [ms] |
|-------------|---------|--------------------|-----------------|--------------------|
| SEFB412     | SEFB422 | 500                | 2               | 15.0               |
| SEFB413     | SEFB423 | 400                | 3               | 15.0               |
| SEFB414     | SEFB424 | 300                | 4               | 15.0               |

4.3 Weight Tables

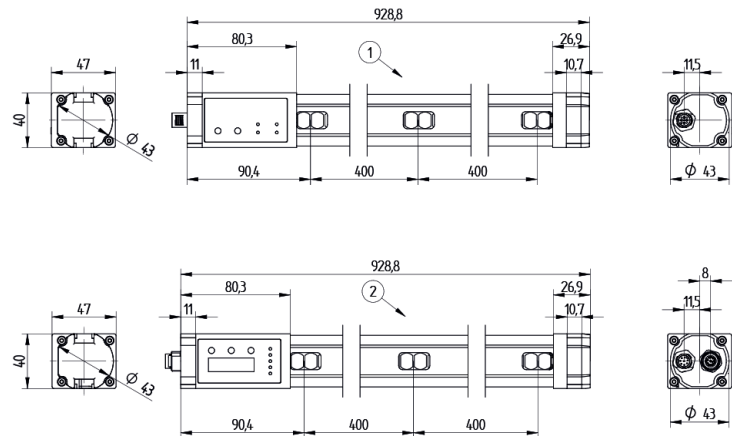
| SEFB muting | SEFB    | Beam distance [mm] | Number of beams | Max. weight per component [kg] |
|-------------|---------|--------------------|-----------------|--------------------------------|
| SEFB412     | SEFB422 | 500                | 2               | 1.22                           |
| SEFB413     | SEFB423 | 400                | 3               | 1.79                           |
| SEFB414     | SEFB424 | 300                | 4               | 2.00                           |

4.4 Housing Dimensions Safety Light Array

4.4.1 SEFB Muting

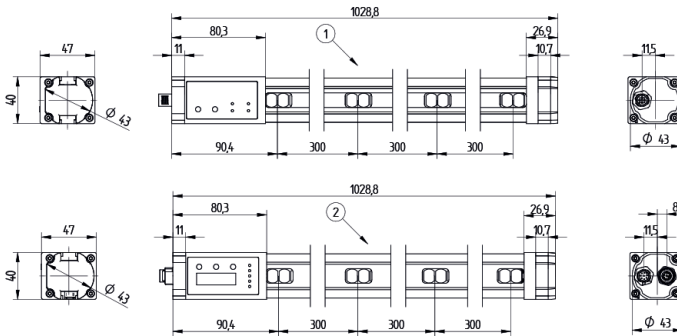


Drawing 1: SEFB412 (2 beams, 500 mm)



Drawing 2: SEFB413 (3 beams, 400 mm)

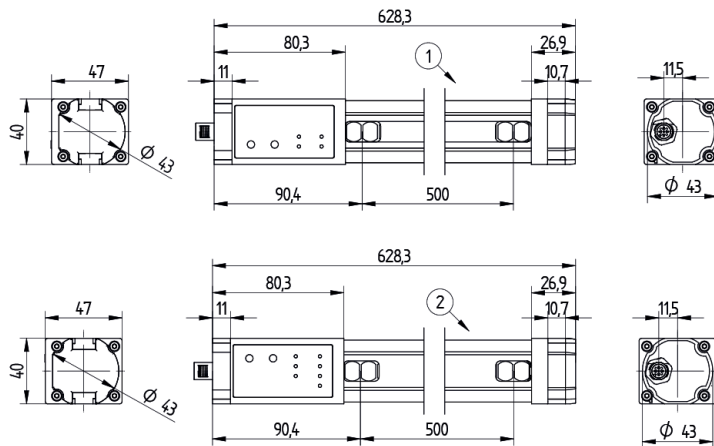
- 1 = Emitter
- 2 = Receiver



Drawing 3: SEFB414 (4 beams, 300 mm)

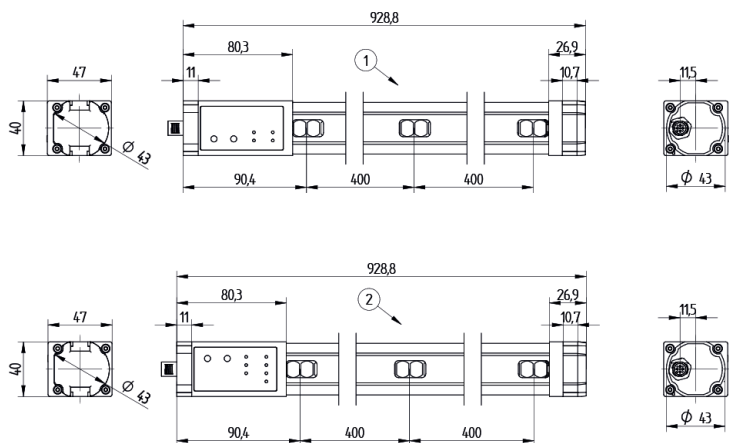
Overall housing dimensions: 1=Emitter, 2=Receiver

#### 4.4.2 SEFB

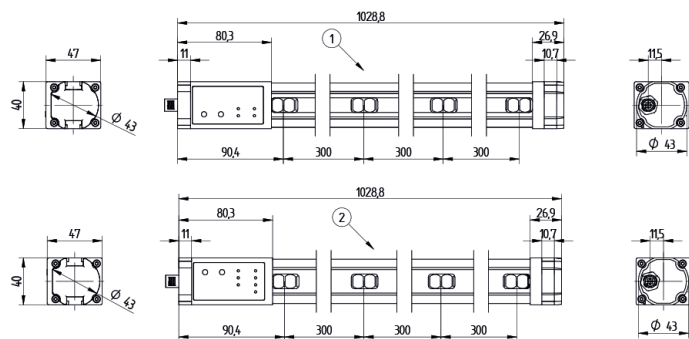


Drawing 4: SEFB422 (2 beams, 500 mm)

1 = Emitter  
2 = Receiver



Drawing 5: SEFB423 (3 beams, 400 mm)



Drawing 6: SEFB424 (4 beams, 300 mm)

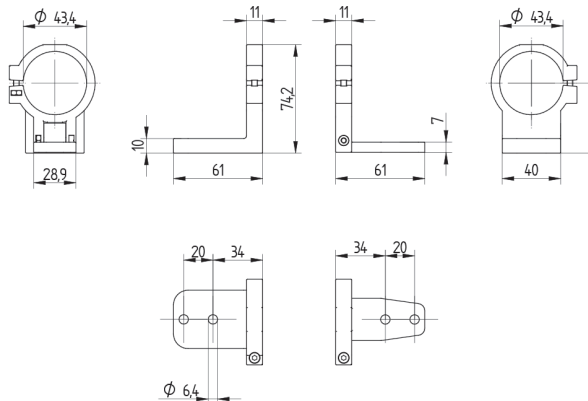
- 1 = Emitter
- 2 = Receiver



## 4.5 Housing Dimensions, Mounting Technology

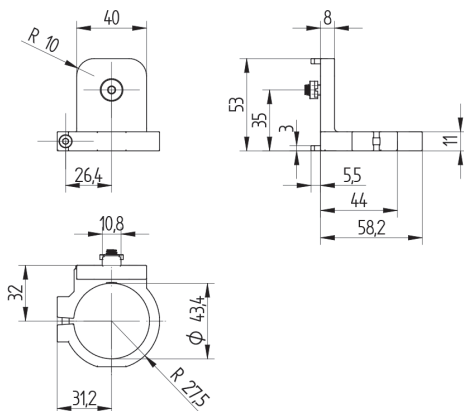
### Mounting bracket ZEFX001

- For attachment to the ends (top/bottom) of the ESPE
- Scope of delivery: 1 piece
- Including screws and washers



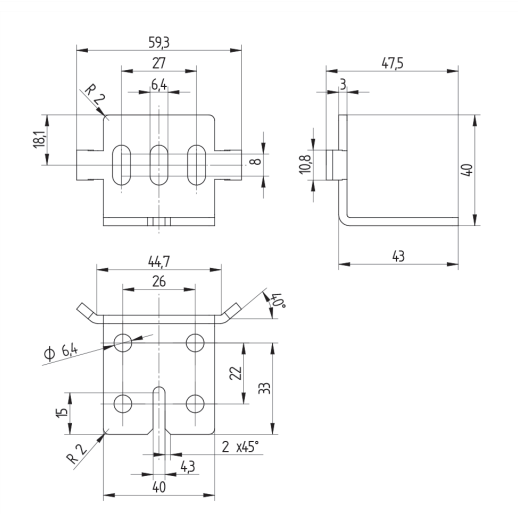
### Mounting bracket ZEFX002

- For attachment to the ends (top/bottom) of the ESPE
- Installation in protection column Z2SSxxx
- Scope of delivery: 2 pieces
- Including screws, washers and slot nut



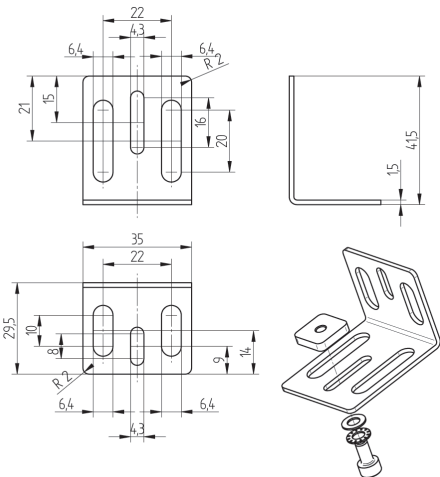
**Mounting bracket ZEFX003**

- For attachment to the profile at the side of the ESPE
- Installation in protection column Z2SSxxx
- Scope of delivery: 2 pieces
- Including screws, washers and slot nut



**Mounting bracket ZEMX001**

- For wall/profile mounting
- Scope of delivery: 2 pieces
- Including screws, washers and slot nuts

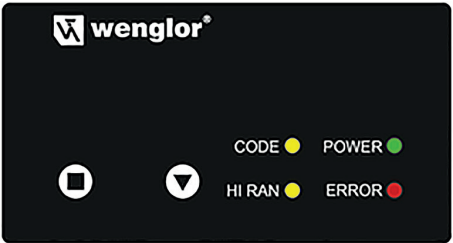


## 4.6 Control Panel

The different operating and parametrization states of emitters and receivers are shown via the LEDs and the segment display (receivers SEFB muting only).

### 4.6.1 Control Panel Emitter

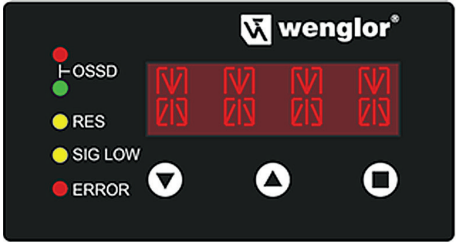
| LEDs    |                      |        |      |
|---------|----------------------|--------|------|
| Display |                      | Color  |      |
| 1       | Power Supply voltage | Green  | (GN) |
| 2       | CODE Beam coding     | Yellow | (YE) |
| 3       | HI RAN High Range    | Yellow | (YE) |
| 4       | ERROR Error          | Red    | (RD) |



| Input elements |  |           |  |
|----------------|--|-----------|--|
| Apply          |  | Menu down |  |

### 4.6.2 Control Panel Receiver SEFB Muting

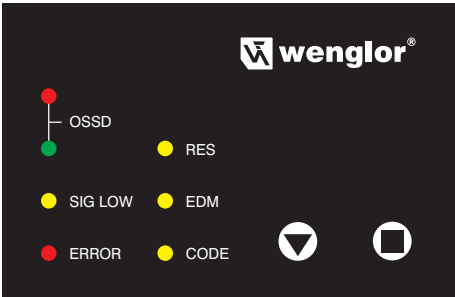
| LEDs    |                              |        |      |
|---------|------------------------------|--------|------|
| Display |                              | Color  |      |
| 1       | OSSD                         | Red    | (RD) |
| 2       | Switching state OSSDs        | Green  | (GN) |
| 3       | RES confirmation requirement | Yellow | (YE) |
| 4       | SIG LOW Weak signal          | Yellow | (YE) |
| 5       | ERROR Error                  | Red    | (RD) |



| Display element            |       | Input elements |         |       |
|----------------------------|-------|----------------|---------|-------|
| Display                    | Color | Menu down      | Menu up | Apply |
| 4-digit 16-segment display | Red   |                |         |       |

4.6.3 Control Panel Receiver SEFB

| LEDs    |                                 |        |      |
|---------|---------------------------------|--------|------|
| Display |                                 | Color  |      |
| 1       | OSSD                            | Red    | (RD) |
| 2       | Switching state OSSDs           | Green  | (GN) |
| 3       | SIG LOW<br>Weak signal          | Yellow | (YE) |
| 4       | ERROR<br>Error                  | Red    | (RD) |
| 5       | RES confirmation<br>requirement | Yellow | (YE) |
| 6       | EDM<br>Contactor monitoring     | Yellow | (YE) |
| 7       | CODE<br>Beam coding             | Yellow | (YE) |



4.7 Scope of Delivery

- The SEFB4xx (set) consists of the following components:
- Emitter (SEFB5xx) and receiver (SEFB6xx) with the same number of beams
  - Quick-start guide
  - CD operating instructions
  - Test rod Ø 30 mm – ZEMG004
  - Label “regular inspections”
  - Mounting bracket (ZEFX001)

4.8 System Overview



4.9 Accessory Products

4.9.1 Mounting Elements

| Order no.                      | Figure                                                                            | Material        | Assembly note                                                                                                                               |
|--------------------------------|-----------------------------------------------------------------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| ZEFX001<br>(scope of delivery) |  | Plastic PA      | <ul style="list-style-type: none"><li>• Mounting on ends (top/bottom) of the ESPE</li></ul>                                                 |
| ZEFX002                        |  | Plastic PA      | <ul style="list-style-type: none"><li>• Mounting on ends (top/bottom) of the ESPE</li><li>• Installation in safety column Z2SSxxx</li></ul> |
| ZEFX003                        |  | Stainless steel | <ul style="list-style-type: none"><li>• Mounting on the side profile of the ESPE</li><li>• Installation in safety column Z2SSxxx</li></ul>  |
| ZEMX001                        |  | Stainless steel | <ul style="list-style-type: none"><li>• Mounting on the side profile of the ESPE</li></ul>                                                  |

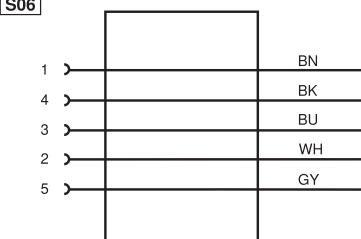
4.9.2 Connection Lines

| M12×1; 8-pin (PUR) |      |                                                                                     |                                                                                                    |
|--------------------|------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|                    |      | Angle plug                                                                          | Straight plug                                                                                      |
| <div>S74</div>     |      |  | <div>S74</div>  |
| <div>89</div>      |      |                                                                                     |                                                                                                    |
| Receiver           | 2 m  | ZAS89R202                                                                           | <br>ZAS89R201  |
|                    | 5 m  | ZAS89R502                                                                           | ZAS89R501                                                                                          |
|                    | 10 m | ZAS89R602                                                                           | ZAS89R601                                                                                          |
|                    | 20 m | —                                                                                   | ZAS89R701                                                                                          |

| M12×1; 5-pin (PUR) |      |                                                                                                                                                                                                                                                                                                                                                         |                                                                                    |  |
|--------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--|
|                    |      | Straight plug                                                                                                                                                                                                                                                                                                                                           |                                                                                    |  |
| S06                |      | <div>S06</div> <div><div><div>1</div><div>4</div><div>3</div><div>2</div><div>5</div></div><div><div></div><div></div><div></div><div></div><div></div></div><div><div>BN</div><div>BK</div><div>BU</div><div>WH</div><div>GY</div></div></div> <td rowspan="2"></td> |  |  |
| 35                 |      |                                                                                                                                                                                                                                                                                                                                                         |                                                                                    |  |
| Emitter            | 5 m  |                                                                                                                                                                                                                                                                                                                                                         | ZAS35R501                                                                          |  |
|                    | 10 m |                                                                                                                                                                                                                                                                                                                                                         | ZC4L001                                                                            |  |

| M12×1; 5-pin (PVC) |     |                                                                                   |                                                                                   |                                                                                    |
|--------------------|-----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                    |     | Angle plug                                                                        | Straight plug                                                                     |                                                                                    |
| S06                |     |  |  |  |
| 35                 |     |                                                                                   |                                                                                   |                                                                                    |
| Emitter            | 3 m | S35W-3M                                                                           |                                                                                   |                                                                                    |
|                    | 5 m | S35W-5M                                                                           |                                                                                   |                                                                                    |

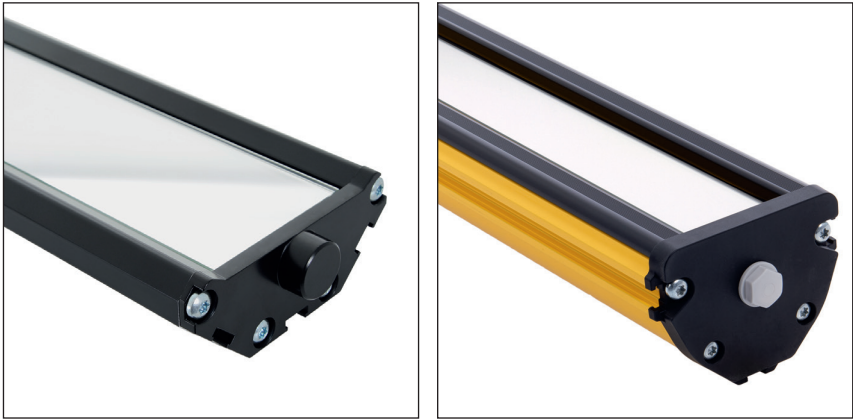
4.9.3 Connection Cables

| M12×1; 8-pin (PVC)              |  |                                                                                     |                                                                                                     |
|---------------------------------|--|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                                 |  | Straight plug                                                                       |                                                                                                     |
| <div>S18</div> <div>8888s</div> |  |  | <div>S06</div>  |
| Receiver (cascading)            |  | 2 m<br>PUR                                                                          | BG88SG88V2-2M                                                                                       |

4.9.4 Safety Relays

| Order number  | Use                         |
|---------------|-----------------------------|
| SG4-00VA000R2 | Basic module                |
| SR4B3B01S     | Basic module                |
| SR4D3B01S     | Basic module with off-delay |
| SR4E4D01S     | Add-on module               |

4.9.5 Path-Folding Mirrors



Possible applications can be significantly expanded through the use of a path-folding mirror. The wenglor path-folding mirror can therefore secure a danger zone from several sides with just one ESPE.

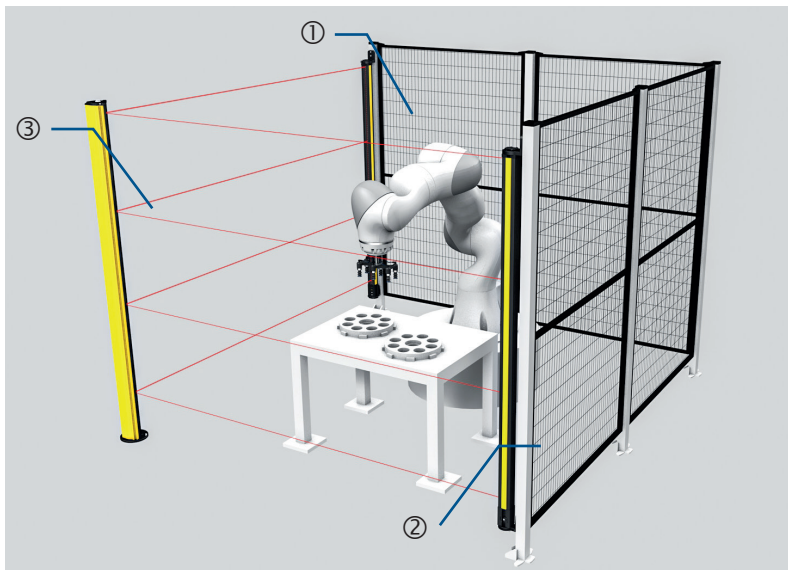


**NOTE!**  
The range of the ESPE is reduced by approximately 10% per utilized mirror.

| Order number                                  | Mirror length | Housing material | Mounting                     |
|-----------------------------------------------|---------------|------------------|------------------------------|
| <b>Path-folding mirror</b>                    |               |                  |                              |
| Z2UG001                                       | 80 mm         | Aluminum         | BEF-SET-33, ZEMX001, ZEMX002 |
| Z2UG002                                       | 750 mm        | Aluminum         | BEF-SET-33, ZEMX001, ZEMX002 |
| Z2UG003                                       | 1350 mm       | Aluminum         | BEF-SET-33, ZEMX001, ZEMX002 |
| Z2UG004                                       | 1900 mm       | Aluminum         | BEF-SET-33, ZEMX001, ZEMX002 |
| <b>Safety column with path-folding mirror</b> |               |                  |                              |
| Z2SU001                                       | 1252 mm       | Aluminum         | ZMBSZ001, ZMBSZ002           |
| Z2SU002                                       | 1703 mm       | Aluminum         | ZMBSZ001, ZMBSZ002           |
| Z2SU003                                       | 1830 mm       | Aluminum         | ZMBSZ001, ZMBSZ002           |

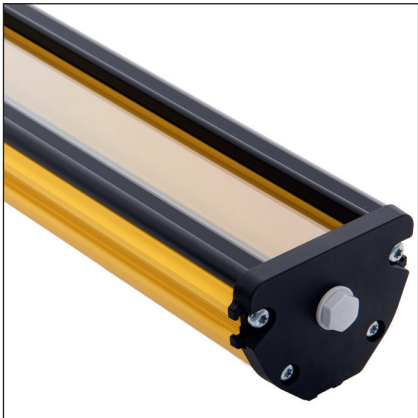


## Application example



- 1 Emitter
- 2 Receiver
- 3 Safety column with path-folding mirror Z2SU00x

### 4.9.6 Safety Columns



- The safety columns enable ESPE to be used in tough environments and protect them from mechanical damage.
- The muting booms Z2MGxxx (see [section 4.9.9, page 32](#)) can also be mounted on the safety columns.
- Floor or wall fastening is possible depending on the mounting used.

| Order number                       | Installation space | Housing material | Material protective disc |
|------------------------------------|--------------------|------------------|--------------------------|
| Safety column with protective disc |                    |                  |                          |
| Z2SS001                            | 1252 mm            | Aluminum         | Polycarbonate            |
| Z2SS002                            | 1703 mm            | Aluminum         | Polycarbonate            |
| Z2SS003                            | 2153 mm            | Aluminum         | Polycarbonate            |
| Safety column for muting           |                    |                  |                          |
| Z2SM001                            | 1252 mm            | Aluminum         | -                        |
| Z2SM002                            | 1703 mm            | Aluminum         | -                        |
| Z2SM003                            | 2153 mm            | Aluminum         | -                        |
| Required mounting                  |                    |                  |                          |
| ZMBSZ001                           | Floor mounting     | Aluminum         | -                        |
| ZMBSZ002                           | Wall mounting      | Stainless steel  | -                        |

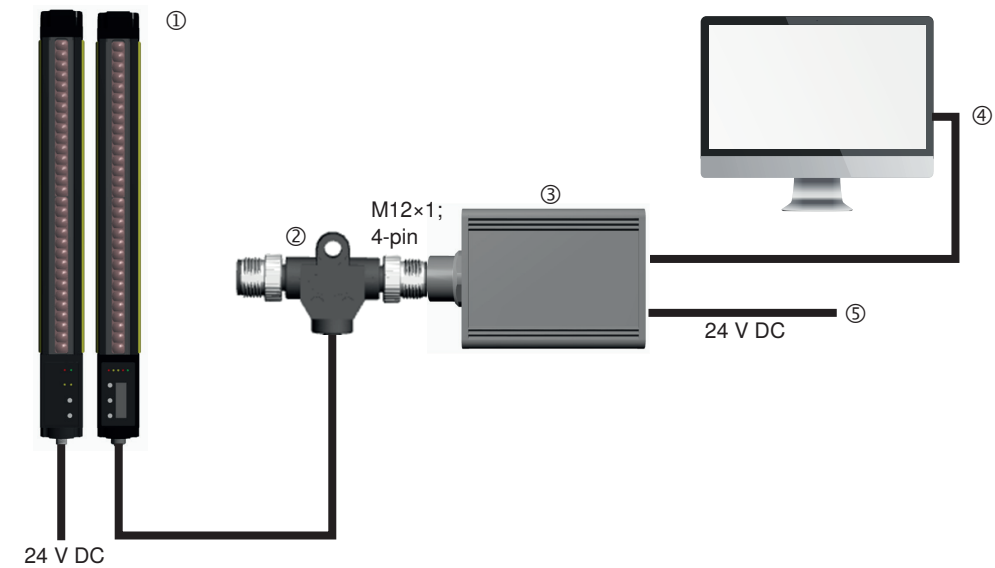
4.9.7 IO-Link Master

| Order number | Interface             |
|--------------|-----------------------|
| EFBL001      | USB                   |
| EFBL003      | USB                   |
| EP0L001      | ProfiNet, Ethernet/IP |
| ZAI72AN01    | Profibus              |

4.9.8 T-Plug ZC7G001 (IO-Link Signal)

Connecting the T-plug to the receiver and connecting an IO-Link master EFBL003, enables the IO-Link connection of the device to be used. This guarantees the IO-Link signal extraction and enables the wTeach2 software to be used.

PC connection:



- ① SEFG / SEFB receiver (IO-Link device)
- ② Connection cable ZC7G001
- ③ IO-Link master EFBL003
- ④ PC with USB port
- ⑤ Power supply for the IO-Link master

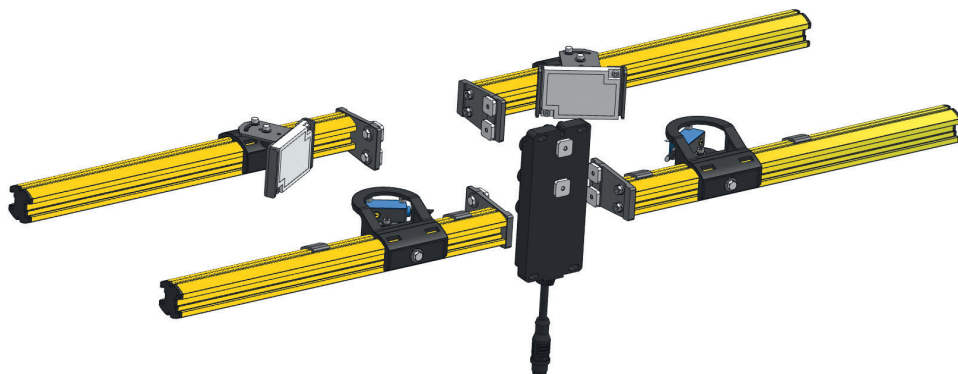
### 4.9.9 Muting Boom

- The wenglor muting sets enable quick initial start-up of muting solutions.
- The sets contain all required components, pre-assembled on muting booms for implementing standard muting solutions.
- The retro-reflex sensors P1KL020 are used as muting sensors, together with the reflector RE6040BA.
- Connection equipment and mounting technology in the required quantities are included.

The following muting sets are available:

- Z2MG001: Cross-muting (2 sensors)
- Z2MG002: Two sensor linear muting (2 sensors)
- Z2MG003: Four sensor linear muting (4 sensors)

#### Z2MG001



#### Z2MG002



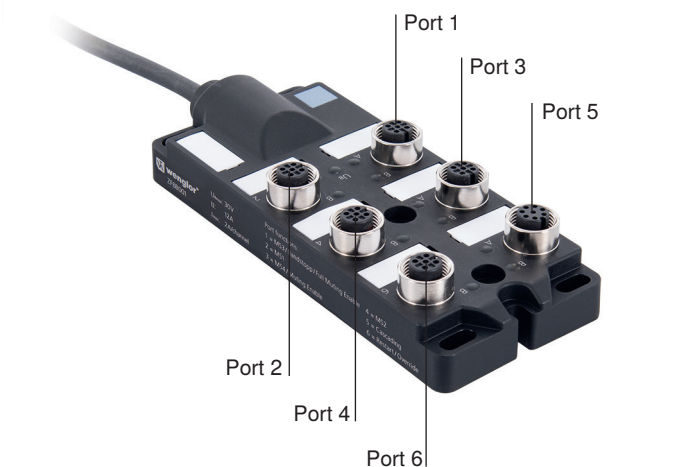


Further information can be found in the operating instructions for the muting sets.

#### 4.9.10 Muting Connection Box ZFBB001

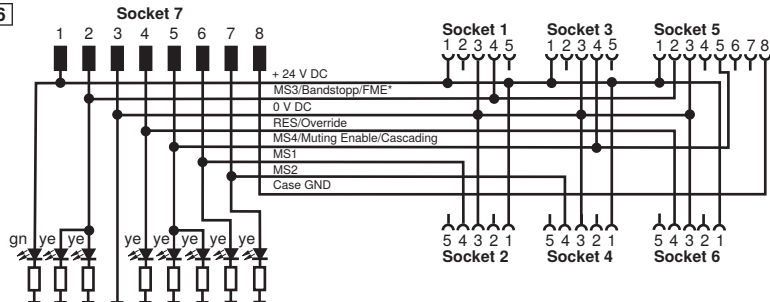
The muting connection box ZFBB001 is connected to the extension connection of the ESPE. The following functions can be implemented with the relevant parametrization of the ESPE:

- Confirmation of restart inhibit and override (connection of a button)
- Cascading (two sensor muting and cascading are possible at the same time)
- Two sensor muting
- Four sensor muting
- Belt stop
- Muting enable
- Full Muting Enable



| Port             | Connection             | Use                                     |
|------------------|------------------------|-----------------------------------------|
| 1                | M12×1, 5-pin           | MS3, belt stop/Full Muting Enable       |
| 2                | M12×1, 5-pin           | MS1                                     |
| 3                | M12×1, 5-pin           | MS4, Muting Enable                      |
| 4                | M12×1, 5-pin           | MS2                                     |
| 5                | M12×1, 8-pin           | Cascading                               |
| 6                | M12×1, 5-pin           | RES, override                           |
| Connection cable | Cable1 m, M12×1, 8-pin | Connection to extension connection ESPE |

Further information can be found in the operating instructions for the ZFBB001.



### NOTE!



- Cross-connections between muting signals must be prevented via protected routing of cables. For further information, refer to EN ISO 13849-2, table D.4.
- All connections must be sealed with cables or blanking plugs (to retain the IP degree of protection).

## 4.9.11 Laser Alignment Tool Z98G001

Further information can be found in the operating instructions for the Z98G001.

## 4.9.12 LED Light Strips Z99G001

Further information can be found in the operating instructions for the Z99G001.

## 4.9.13 microSD Card

A microSD card can be used for easy duplication of configurations. The microSD card can be used as described in [section 5.2.5.6.1, page 79](#).

## 4.9.14 Parametrization Software wTeach2

The wenglor software wTeach2 can be used for easy parametrization and status monitoring. The connection takes place via the IO-Link master EFBL003.

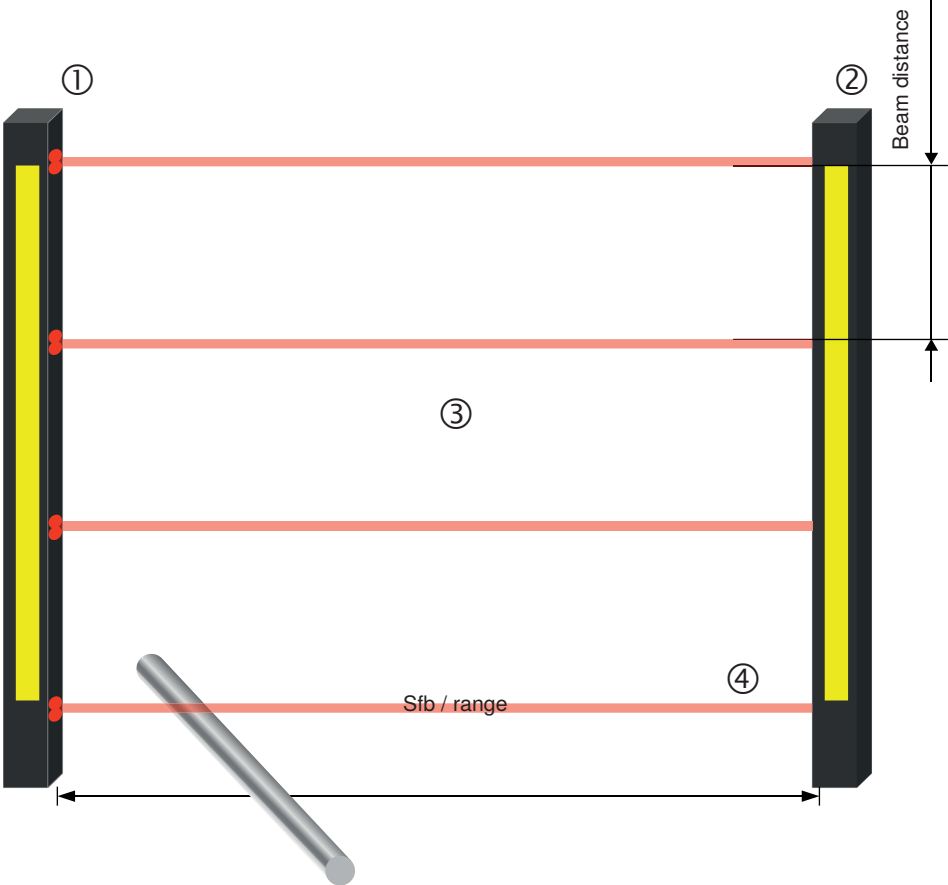
Further information can be found in the operating instructions for the DNNF005.

# 5. Project Engineering

This chapter contains important information for correct integration of the ESPE in the machine.

## 5.1 Engineering

### 5.1.1 Safety Field



- ① = emitter
- ② = receiver
- ③ = safety field
- ④ = beam
- Sfb = safety field width



### **Safety field**

The safety field is the area of the ESPE where an object (e.g. person or object) is detected according to the resolution / number of beams.

### **Safety field width**

The safety field width is the clearance between the emitter and receiver. The safety field width must not change during operation.

### **Beam distance**

Distance between the individual beams of a → light array from the center of a beam to the center of the next beam.

### **Range**

The range is the mechanically usable distance between the emitter and receiver. Using path-folding mirrors reduces the range.

## **5.1.2 Securing the Danger Zone**

The danger zone must be secured by means of the ESPE alone, or by means of the ESPE in combination with additional mechanical safety devices.

Reaching round the sides, over or underneath must be prevented.

The danger zone may only be accessible via the ESPE's safety field.

All properties of the safety field (see [section 5.1.1, page 36](#)) must be taken into account. The exact values can be found in the technical data (see [section 4, page 15](#)).



### **DANGER!**

#### **Risk of personal injury or property damage in case of non-compliance!**

The system's safety function is disabled.

Personal injury and damage to equipment may occur.

- The danger zone must be secured as outlined in the instructions.
-

5.1.3 Safety Clearance

5.1.3.1 General Information

The safety clearance is the minimum distance between the safety field of an ESPE and the danger zone. It's task is to prevent the danger zone from being reached before the hazardous motion is completed. In accordance with ISO 13855, the safety clearance is influenced by the following factors:

- Stopping time of the machine (time from the triggering of the sensor to the completion of the hazardous motion)
- Response time of the entire safety equipment (ESPE, machine, downstream safety evaluation)
- Approach speed

5.1.3.2 Calculating the Safety Clearance

 The general formula for calculating the safety clearance S is:

$S = (K \times T) + C$    or    $S = K \times (t_1 + t_2 + t_3) + C$

| S [mm]    | Safety clearance, measured from the danger zone to the safety field   |
|-----------|-----------------------------------------------------------------------|
| K [mm/s]  | Approach speed                                                        |
| C         | Additional clearance depending upon beam clearance / resolution in mm |
| T [s]     | Total response time ( $t_1 + t_2$ )                                   |
| T [s]     | Total response time<br>$T = (t_1 + t_2 + t_3)$                        |
| $t_1$ [s] | Response time of the ESPE                                             |
| $t_2$ [s] | Response time of the safety switching device                          |
| $t_3$ [s] | Machine over-travel time                                              |

**Sample calculation:**  
An ESPE with 3 beams and 400 mm beam distance (SEFB423) is to be used for protection. The required safety clearance must be calculated.

- |                                                   |       |   |        |
|---------------------------------------------------|-------|---|--------|
| • Response time of the ESPE                       | $t_1$ | = | 15 ms  |
| • Over-travel time of the safety switching device | $t_2$ | = | 15 ms  |
| • Machine over-travel time                        | $t_3$ | = | 300 ms |

**Calculate safety clearance**  
 $S = 1,600 \text{ mm/s} \times (t_1 + t_2 + t_3) + C$   
 $S = 1,600 \text{ mm/s} \times (0.015 \text{ s} + 0.015 \text{ s} + 0.3 \text{ s}) + 850 \text{ mm}$   
 $S = 1,378 \text{ mm}$

Calculating the safety clearance for reaching over S<sub>RO</sub>

If it is possible to reach over or under the safety field, the safety clearance S<sub>RO</sub> (safety clearance for access over the safety field) must be calculated.

$\sqrt{x^2}$

$S_{RO} = K \times T + C_{RO}$

|                    |                                                                                                                |
|--------------------|----------------------------------------------------------------------------------------------------------------|
| S <sub>RO</sub>    | Safety clearance for access over the safety field<br>RO = Reach over                                           |
| K                  | Approach speed with vertical safety field<br>K = 2000 mm/s<br>K = 1600 mm/s (if SRO > 500 mm)                  |
| T [s]              | Total response time<br>T = (t <sub>1</sub> + t <sub>2</sub> + t <sub>3</sub> )                                 |
| t <sub>1</sub> [s] | Response time of the ESPE                                                                                      |
| t <sub>2</sub> [s] | Response time of the safety switching device                                                                   |
| t <sub>3</sub> [s] | Machine over-travel time                                                                                       |
| C <sub>RO</sub>    | Margin for access over the safety field status<br>Value in accordance with table from EN ISO 13855 (see below) |

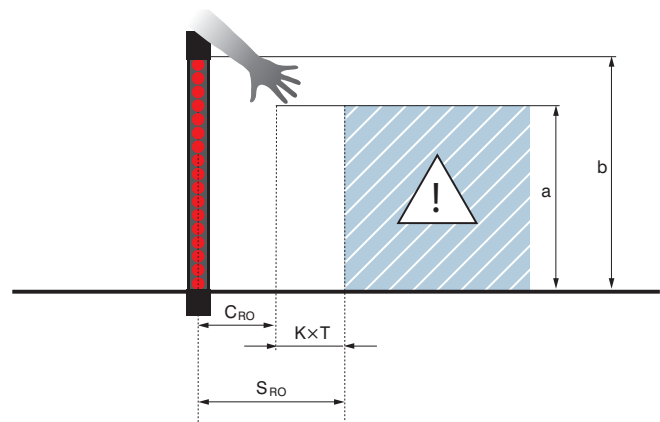


Figure 2: Relationship between C<sub>RO</sub> and S<sub>RO</sub>

- a [mm] = height of the danger zone
- b [mm] = height of the top edge of the safety field
- H [mm] = reference height, height of the safety field above ground

| <b>a [mm]</b><br>Height of the danger zone | <b>C<sub>RO</sub> [mm]</b> Additional horizontal clearance from the danger zone |      |      |      |
|--------------------------------------------|---------------------------------------------------------------------------------|------|------|------|
| 2600                                       | 0                                                                               | 0    | 0    | 0    |
| 2500                                       | 400                                                                             | 400  | 350  | 300  |
| 2400                                       | 550                                                                             | 550  | 550  | 500  |
| 2200                                       | 800                                                                             | 750  | 750  | 700  |
| 2000                                       | 950                                                                             | 950  | 850  | 850  |
| 1800                                       | 1100                                                                            | 1100 | 950  | 950  |
| 1600                                       | 1150                                                                            | 1150 | 1100 | 1000 |
| 1400                                       | 1200                                                                            | 1200 | 1100 | 1000 |
| 1200                                       | 1200                                                                            | 1200 | 1100 | 1000 |
| 1000                                       | 1200                                                                            | 1150 | 1050 | 950  |
| 800                                        | 1150                                                                            | 1050 | 950  | 800  |
| 600                                        | 1050                                                                            | 950  | 750  | 550  |
| 400                                        | 900                                                                             | 700  | 0    | 0    |
| 200                                        | 600                                                                             | 0    | 0    | 0    |
| 0                                          | 0                                                                               | 0    | 0    | 0    |
|                                            | <b>b [mm]</b> Height of the top edge of the safety field                        |      |      |      |
|                                            | 900                                                                             | 1000 | 1100 | 1200 |

In accordance with EN ISO 13855, the following minimum and maximum heights must be observed.

| Number of beams | Beam distance in mm | Height above reference level in mm |
|-----------------|---------------------|------------------------------------|
| 4               | 300 mm              | 300 / 600 / 900 / 1,200            |
| 3               | 400 mm              | 300 / 700 / 1,100                  |
| 2               | 500 mm              | 400 / 900                          |

#### NOTE!

- If the actual values for a and b are between the values in the table, the next highest value from the table must be selected.
- A top safety field edge of under 900 mm does not provide adequate protection against bypassing or crossing over.
- A bottom safety field edge of over 300 mm does not provide adequate protection against crawling through.



Procedure when working with table (8.2.2):

| Required | b                                                                                            | $S \rightarrow C_{RO}$                                                                                 | a                                                                                           |
|----------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Known    | $a, S \rightarrow C_{RO}$                                                                    | a, b                                                                                                   | $S \rightarrow C_{RO}, b$                                                                   |
| 1.       | In the left column, search the row with the known value <b>a</b>                             | Select the next smallest <b>b</b> -value                                                               | Select the next smallest <b>b</b> -value                                                    |
| 2.       | In the relevant row, search the column with the next highest value for <b>C<sub>RO</sub></b> | In the relevant column, search the row with the next highest value for <b>a</b>                        | In the relevant column, search the row with the next lowest value for <b>C<sub>RO</sub></b> |
| 3.       | At the bottom end of the column, you will find the relevant value for <b>b</b>               | At the point of intersection between row and column, you will find the value for <b>C<sub>RO</sub></b> | In this row, go to the left column. Here, you will find the value for <b>a</b> .            |



**DANGER!**  
**Risk of personal injury or property damage in case of non-compliance with the safety field specifications!**  
The system's safety function is disabled.  
Personal injury and damage to equipment may occur.

- Observe the safety field specifications!

Sample calculation:

An ESPE with 3 beams and 400 mm beam distance (SEFB423) is to be used for protection. The required safety clearance must be calculated.

- Response time of the ESPE
  - Over-travel time of the safety switching device
  - Machine over-travel time
  - Height of the danger zone
  - Reference height
  - Height of the safety field above ground
- t1 = 15 ms
  - t2 = 15 ms
  - t3 = 300 ms
  - a = 1,600 mm
  - H = 300 mm
  - b = 1,100 mm (SFH + H)

**Step 1: Calculate safety clearance**

$S = 1,600 \text{ mm/s} \times (t_1 + t_2 + t_3) + C$   
 $S = 1,600 \text{ mm/s} \times (0.015 \text{ s} + 0.015 \text{ s} + 0.3 \text{ s}) + 850 \text{ mm}$   
 $S = 1,378 \text{ mm}$

**Step 2: Determine the additional clearance  $C_{RO}$ .**

- Find height a in table:           → here: a = 1,600mm
- Find height b in table:           → here: a = 1,100mm
- Take the value for  $C_{RO}$  from the intersection point of the two axes:   → here:  $C_{RO} = 1,100\text{mm}$

**Step 3: Calculate the safety clearance  $S_{RO}$  for reaching over**

$S = 1,600 \text{ mm/s} \times (t_1 + t_2 + t_3) + C_{RO}$   
 $S = 1,600 \text{ mm/s} \times (0.015 \text{ s} + 0.015 \text{ s} + 0.3 \text{ s}) + 1,100 \text{ mm}$   
 $S = 1,628 \text{ mm}$

**5.1.4 Minimum Clearance to Reflective Surfaces**

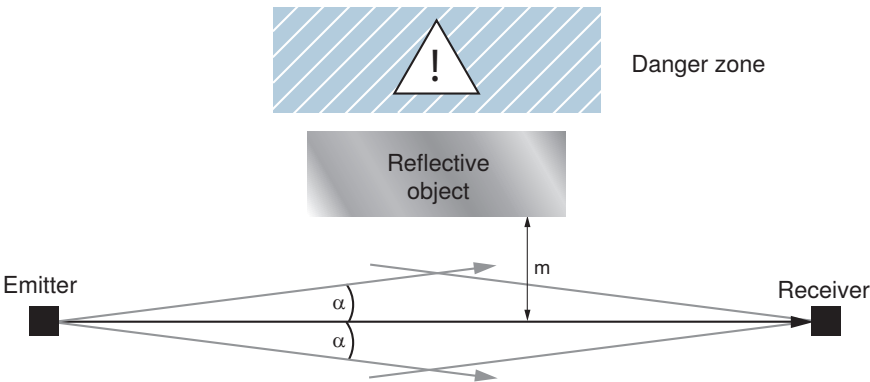
**DANGER!**  
**Risk of personal injury or property damage with reflective surfaces within the aperture angle between the emitter and receiver!**



The system's safety function is disabled.  
Personal injury and damage to equipment may occur.  
• Minimum clearance (m) from reflective surfaces to the optical axis must be adhered to.

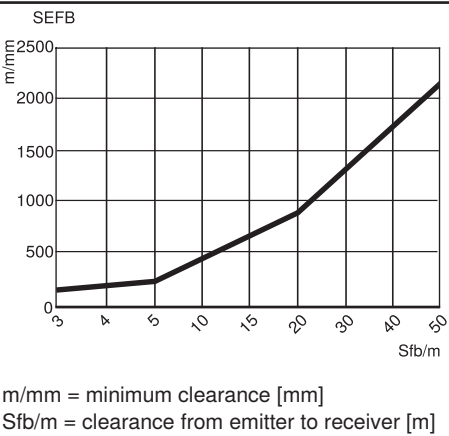


$m = \tan \alpha \times \text{clearance from emitter to receiver}$   
 $m = \tan 2.5^\circ \times \text{clearance from emitter to receiver}$



The minimum clearance from reflective surfaces must be calculated depending on the distance between the emitter and receiver with an aperture angle of  $\pm 2.5^\circ$ .

| Distance between the emitter and receiver [m] | Minimum clearance m [mm] |
|-----------------------------------------------|--------------------------|
| 0.25 ... 3.0                                  | 131                      |
| 4                                             | 175                      |
| 5                                             | 218                      |
| 10                                            | 437                      |
| 15                                            | 655                      |
| 20                                            | 873                      |
| 30                                            | 1,310                    |
| 40                                            | 1,746                    |
| 50                                            | 2,183                    |



## 5.2 Functions

This section contains important information on the functions of the ESPE and their usage

### 5.2.1 Functions Overview

Detailed descriptions of the individual functions can be found in the following sections.

|                                                 | Section                            | SEFB Muting | SEFB        |
|-------------------------------------------------|------------------------------------|-------------|-------------|
| <b>Operational functions</b>                    |                                    |             |             |
| Safety operating mode / automatic restart       | <a href="#">Section 5.2.3.1</a>    | X           | X           |
| Restart inhibit (RES)                           | <a href="#">Section 5.2.3.2</a>    | X           | X           |
| Contactors monitoring (EDM)                     | <a href="#">Section 5.2.3.3</a>    | X           | X           |
| Beam coding                                     | <a href="#">Section 5.2.3.4</a>    | X           | X           |
| Cascading                                       | <a href="#">Section 5.2.3.6</a>    | X           | X           |
| Range switching                                 | <a href="#">Section 5.2.3.6.4</a>  | X           | X           |
| <b>Muting functions</b>                         |                                    |             |             |
| Cross muting                                    | <a href="#">Section 5.2.4.3</a>    | X           | —           |
| Two sensor linear muting                        | <a href="#">Section 5.2.4.4</a>    | X           | —           |
| Four sensor linear muting (sequence monitoring) | <a href="#">Section 5.2.4.5</a>    | X           | —           |
| Four sensor linear muting (time monitoring)     | <a href="#">Section 5.2.4.6</a>    | X           | —           |
| Adjustable muting duration                      | <a href="#">Section 5.2.4.7.2</a>  | X           | —           |
| Belt stop signal                                | <a href="#">Section 5.2.4.7.3</a>  | X           | —           |
| Muting enable                                   | <a href="#">Section 5.2.4.7.4</a>  | X           | —           |
| Direction setting                               | <a href="#">Section 5.2.4.7.5</a>  | X           | —           |
| Muting end through clearing of the ESPE         | <a href="#">Section 5.2.4.7.6</a>  | X           | —           |
| Partial muting                                  | <a href="#">Section 5.2.4.7.7</a>  | X           | —           |
| Full Muting Enable                              | <a href="#">Section 5.2.4.7.8</a>  | X           | —           |
| Gap suppression                                 | <a href="#">Section 5.2.4.7.9</a>  | X           | —           |
| Override                                        | <a href="#">Section 5.2.4.7.10</a> | X           | —           |
| <b>Non-safety-related functions</b>             |                                    |             |             |
| Display setting (segment display)               | <a href="#">Section 5.2.5.2</a>    | X           | —           |
| Signal output                                   | <a href="#">Section 5.2.5.3</a>    | X           | X           |
| Integrated indicator lamp                       | <a href="#">Section 5.2.5.4</a>    | X           | —           |
| Alignment aid (signal strength)                 | <a href="#">Section 5.2.5.5</a>    | X           | —           |
| microSD memory card                             | <a href="#">Section 5.2.5.6</a>    | X           | —           |
| Password protection                             | <a href="#">Section 5.2.5.7</a>    | X           | X (IO-Link) |
| IO-Link 1.1 interface                           | <a href="#">Section 5.2.5.8</a>    | X           | X           |

X = function included

— = function not included



5.2.2 Combinable Functions

|                                           | Safety operating mode / automatic restart | Start-up disabling and restart inhibit | Contactor monitoring | Beam coding | Cascading | Muting (complete)        | Partial muting | Full resolution |
|-------------------------------------------|-------------------------------------------|----------------------------------------|----------------------|-------------|-----------|--------------------------|----------------|-----------------|
| Safety operating mode / automatic restart |                                           |                                        |                      |             |           |                          |                |                 |
| Start-up disabling and restart inhibit    | <input type="checkbox"/>                  |                                        |                      |             |           |                          |                |                 |
| Contactor monitoring                      | ■                                         | ■                                      |                      |             |           |                          |                |                 |
| Beam coding                               | ■                                         | ■                                      | ■                    |             |           |                          |                |                 |
| Cascading                                 | ■                                         | ■                                      | ■                    | ■           |           |                          |                |                 |
| Muting (complete)                         | <input type="checkbox"/>                  | ■                                      | ■                    | ■           | ⊙         |                          |                |                 |
| Partial muting                            | <input type="checkbox"/>                  | ■                                      | ■                    | ■           | ⊙         | <input type="checkbox"/> |                |                 |
| Full resolution                           | ■                                         | ■                                      | ■                    | ■           | ■         | ■                        | ■              |                 |

- Permitted
- ☐ Not permitted
- ⊙ Two sensor muting: combinable  
Four sensor muting: not combinable

## 5.2.3 Operational Functions

### 5.2.3.1 Safety Operating Mode (Automatic Restart)

In this operating mode, the switching outputs are disabled when the safety field is penetrated. The switching outputs are automatically enabled after interruption of the safety field is ended.

A check must be carried out to determine whether safety operating mode is permitted for the application.



#### **WARNING!**

- Start-up disabling and restart inhibit is required for access protection.
  - Operating the ESPE with automatic restart is only permitted in exceptional cases and in specific conditions.
- 

Note that:



The safety operating mode is parametrized on the receiver.

If the restart inhibit (RES) is deactivated, safety operating mode is activated automatically.

### 5.2.3.2 Start-Up Disabling and Restart Inhibit (RES)

- Once the safety field is penetrated, this operating mode prevents the machine from restarting automatically by ensuring that the OSSDs remain in off state.
- This status is retained even when the supply voltage is switched on again (e.g. after a power failure).
- The OSSDs are only enabled again when an acknowledgment key is pressed.

#### **NOTE!**



- The acknowledgment key must be located outside the danger zone.
- From the location of the acknowledgment key, the operator must have a clear view of the danger zone to ensure a safe restart.
- Depending on the constellation of the ESPE, a restart inhibit (prevents start-up after an error or safety field penetration) or start inhibit (prevents start-up after switch-on) can be displayed for the machine.

---

#### **DANGER!**

##### **Risk of fatal injury due to unintentional start and restart!**



- It is important to ensure that the acknowledgment key can not be actuated from inside the danger zone.
  - Ensure that there is no-one in the danger zone before releasing the start-up disabling and restart inhibit.
  - The ESPE can not check whether the machine control has start-up disabling and restart inhibit.
-

Note that:



- The restart inhibit (RES) is parametrized on the receiver.
- Enable via the signal sequence (RES input) 0 → 1 → 0
- The 1-signal must last for 0.1 s...4 s.
- If the restart inhibit is deactivated, safety operating mode / automatic restart is activated automatically.

### 5.2.3.3 Contactor Monitoring (EDM)

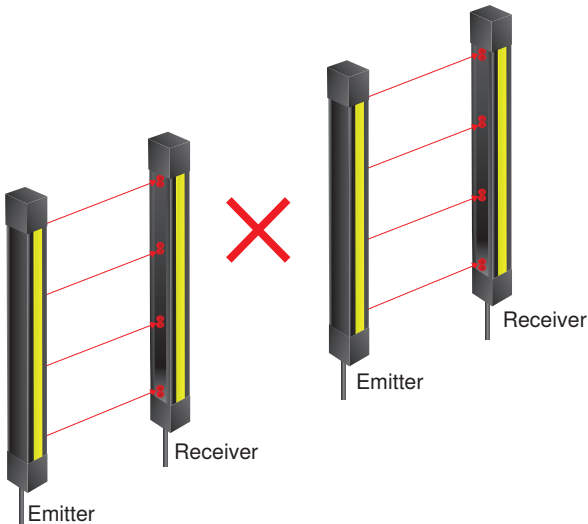
- The contactor monitoring carries out dynamic monitoring of the switching behavior of externally connected NC contacts.
- After every switch-on and switch-off process of the OSSDs, the feedback signal must have the correct switching status within the specified time.
- This enables malfunctions on the contactors (e.g. welding of the contacts) to be detected.



- The contactor monitoring (RES) is parametrized on the receiver.
- If the connected contactors do not switch in the expected time, the ESPE switches to safe state (OSSD OFF, ERROR).
- This function only works in a safety-related way if the contactor has positive-guided NC contacts.

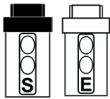
### 5.2.3.4 Beam Coding

- To avoid mutual interference, it is important to ensure that, for systems in close proximity to each other, a receiver is only reached by the light from the corresponding emitter.
- If this cannot be prevented through mechanical shielding or through the installation (see [“7.1 Positioning the ESPE” on page 84](#)), beam coding can help here.
- If the beam coding is parametrized on the emitter and receiver, the receiver can differentiate between beams from its designated emitter and beams from other emitters.



Note that:

- The receiver only detects beams which correspond to its code.
- The first and the last beam in the safety field act as synchronization beams. One synchronization beam is sufficient for the receiver to assign the coding and to synchronize the emitter and receiver.



- The beam coding is parametrized on the emitter and receiver.
- There is a choice between coding ON and coding OFF.
- The setting for matched emitters and receivers must be identical (both coding ON or both coding OFF).

5.2.3.5 Range

- The range is the mechanically usable distance between the emitter and receiver.
- In order to prevent potential oversteering with short working distances and to limit the aperture angle, it must be possible to set the range.
- The setting takes place on the emitter.



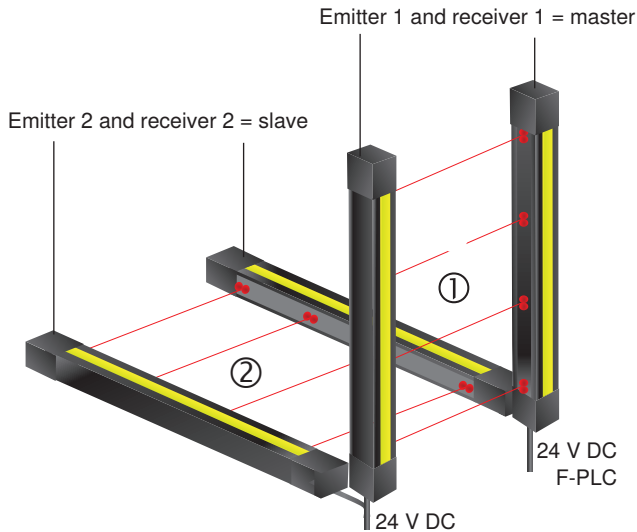
**DANGER!**

- The range must be set to suit the safety field width in the application to rule out ESPE malfunctions.
- An incorrectly set range poses a risk to persons or the machine.

| Range | High (delivery state) | Low          |
|-------|-----------------------|--------------|
| 50 m  | 13 ... 50 m           | 0.5 ... 15 m |

### 5.2.3.6 Cascading

- ESPE can be connected so that they all drive a single safety output in order to monitor several safety fields simultaneously.
- The fact that the safety fields of several ESPE drive a shared safety output simplifies the connection to the machine control.
- Cascaded ESPE demonstrate the same performance characteristics as a single ESPE.
- Cascading can be used to secure adjacent danger zones (e.g. protection against side-stepping).



Note that:



- The cascading is parametrized on the receiver.
- The terms 'Master' or 'Slave' are used to differentiate between the components:
  - Master – component with direct connection to the machine control
  - Slave – components with connection to the master
- Every SEFB device can take on the role of the master or the slave.

Conditions:

- **No more than 3 sensors can be cascaded together.**
- **The response time is extended by the response time of the upstream receiver with each downstream receiver** (see example below).
- If mutual interference between the beam paths is possible, the sensors must be coded (see [“5.2.3.4 Beam Coding” on page 47](#)).
- Individual settings on an ESPE only apply for the relevant system. But switching off an ESPE always impacts the shared safety output.
- **The function types contactor monitoring and restart inhibit may only be parametrized on the master.**

Example for determining the response time:

- Cascading of 2× SEFB424
- Response time  $t_{\text{Master}} = 15 \text{ ms}$
- Response time  $t_{\text{Slave}} = 15 \text{ ms}$
- Response time  $t_{\text{Casc}} = t_{\text{Master}} + t_{\text{Slave}} = 15 \text{ ms} + 15 \text{ ms}$
- Response time  $t_{\text{Master}} = 30 \text{ ms}$

#### 5.2.3.6.1 Cascading via Extension Connection of the ESPE

Multiple SEFB sensors can be cascaded easily via the receiver extension connection.

The following setup is required:

- The receiver MASTER is connected to the machine control via the **system connection**.
- The receiver MASTER is connected to the **system connection** of the receiver SLAVE via the **extension connection** (connection cable M12 8-pin).
- All emitters in the cascade must be connected separately to the supply voltage (connection cable M12 4/5-pin).

For details on the electrical connection, see [“16.2.3 Connection Examples Cascading” on page 156](#).

#### 5.2.3.6.2 Cascading via Muting Connection Box ZFBB001

If muting and cascading are to take place at the same time, this can be achieved easily via the connection box ZFBB001.

The following setup is required:

- The receiver MASTER is connected to the machine control via the **system connection**.
- The receiver MASTER is connected to the connection box ZFBB001 via the **extension connection**.
- The receiver SLAVE is connected to Port 5 of the connection box via the **system connection** with a M12 8-pin connection cable.
- All emitters in the cascade must be connected separately to the supply voltage (connection cable M12 4/5-pin).

For details on the electrical connection, see [“16.2.3 Connection Examples Cascading” on page 156](#).

#### 5.2.3.6.3 Cascading of Other Safety Sensors with OSSD Outputs

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**WARNING!**

- Cascading safety sensors with OSSD outputs is not permitted.
  - If these sensors are used, incorrect signals may impair the safety function.
- 

#### 5.2.3.6.4 Cascading of Contact-based Safety Components

---



**WARNING!**

- Contact-based safety circuits (e.g. emergency stop switches or mechanical door switches) may not be cascaded with the ESPE.
  - If these sensors are used, incorrect signals may impair the safety function.
-

### 5.2.4 Muting

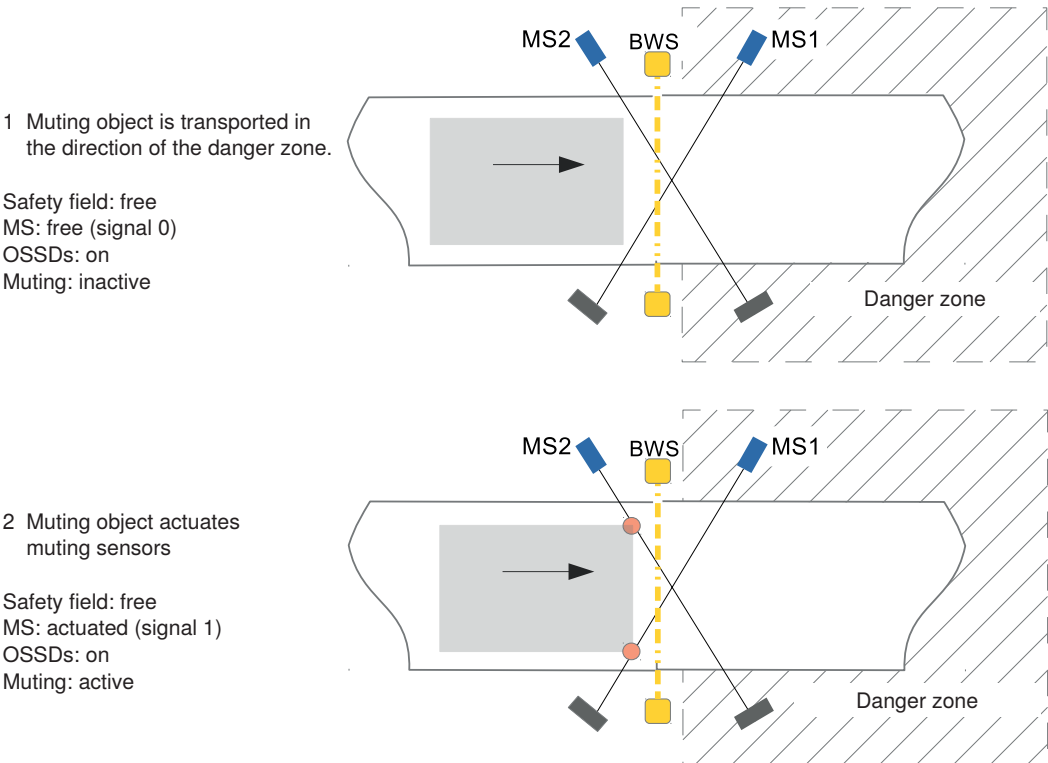
Muting is a function that safely bridges the ESPE for a short time so that objects can be moved through the safety field without the OSSDs switching off. The muting cycle is activated as soon as the responsible sensors detect an object. When arranging them, it is therefore important to ensure that the muting cycle can not be triggered by a person. We differentiate between linear muting and cross muting. With a linear arrangement, several sensors are arranged one behind the other. With cross muting, two sensors are arranged so that their beams cross.

Additional signals, for example from muting sensors or a PLC, are required to activate the muting function. This means that the ESPE can check that the muting takes place correctly and guarantee that a person entering the danger zone is still reliably detected.

The basic requirements for starting a valid muting sequence are:

- OSSDs in ON state (safety field of the ESPE free)
- Muting sensors in OFF state (no object detected)

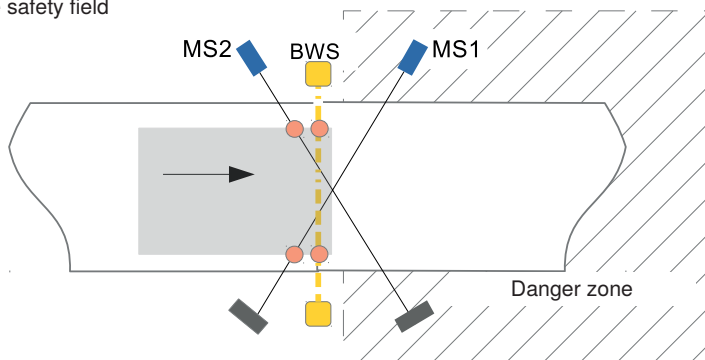
#### General muting process





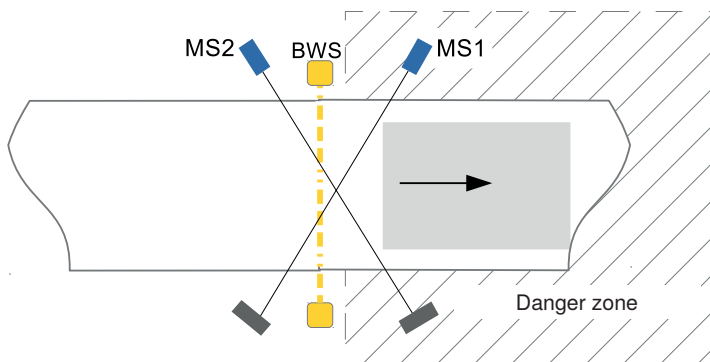
### 3 Muting object moves through the safety field

Safety field: interrupted  
MS: actuated (signal 1)  
OSSDs: on  
Muting: active



### 4 Muting object moves into the danger zone and frees ESPE and MS.

Safety field: free  
MS: free (signal 0)  
OSSDs: on  
Muting: inactive



#### **DANGER!**



- The muting must be triggered by at least two independent signals.
- The use of software-controlled signals (e.g. PLC) is permitted if at least one signal comes from another source (e.g. from a sensor).

#### **NOTE!**



- For easy initial start-up, wenglor offers muting sets (Z2MGxxx), which can be mounted directly on the ESPE or the safety column Z2SSxxx.
- Further details are available in the standard IEC 62046.

### 5.2.4.1 Muting Signals

Muting signals are for

- Detecting the material (object) to be transported
- Forwarding the detection signal to the ESPE to activate muting
- Detecting the removal of the object
- Forwarding the free signal to the ESPE to deactivate muting

Muting signals can be generated, for example, by:

- Optical sensors, e.g.:
  - Retro-reflex sensors
  - Through-beam sensors
  - Reflex sensors
- Inductive sensors
- Signals from the software (e.g. control)



#### NOTE!

- When using connection box ZFBB001, the output of the muting sensor must be on Pin 4.
- Please note the following switching characteristics when using optical sensors:
  - Through-beam sensor: dark switching (normally closed) (PNP NC)
  - Reflex sensor: light switching (normally open) (PNP NO)
  - Retro-reflex sensor: dark switching (normally closed) (PNP NC)



#### DANGER!

- A muting signal must not be connected to multiple inputs. Each signal must only be assigned to one input.
- The user must take suitable measures (see EN ISO 13849-2, Tab. D.4) to prevent cross-connection between muting signals.



#### DANGER!

- When mounting the MS, ensure that people are still reliably detected by the ESPE and that they can not initiate or carry out a valid muting sequence.
- The formula listed for the relevant muting types must be used for calculating the minimal clearance.



#### ATTENTION!

When mounting the MS, ensure that the material is detected correctly. The actual means of transport (e.g. pallet) should not be detected.



#### NOTE!

- The suitable MS should be chosen depending on the properties of the material to be detected. For metal objects, for example, it is advisable to use inductive sensors.
- The correct parametrization must be observed depending on the sensor type used. For reflex sensors with background suppression, for example, the sensor must be configured so that the object is detected at an adequate distance from the safety field of the ESPE, while larger distances are suppressed.

### 5.2.4.2 Muting Visualization

- The receivers have an integrated illuminated cap (see “5.2.5.4 Integrated Indicator Lamp” on page 77), which shows the muting status.
- A continuous white light signals an active muting sequence.
- It is also possible to connect an external muting lamp on the signal output.

### 5.2.4.3 Cross Muting

Cross muting enables an object to be transported in or out of the danger zone. For this, two muting sensors are arranged so that their beams cross. The **point of intersection is within the danger zone**.

The distances a and b represent the distances between the muting object and a separating safeguard (fence). They must be designed so that no-one can enter the danger zone unnoticed while the muting object is passing through the ESPE.

A sample arrangement with retro-reflex sensors is shown in Figure 3.

As soon as MS1 and MS2 have been activated, the muting function is active. The actuation sequence of the sensors is unimportant here. MS1 and MS2 must be activated by a muting object within 4 s. They may also switch at the same time.

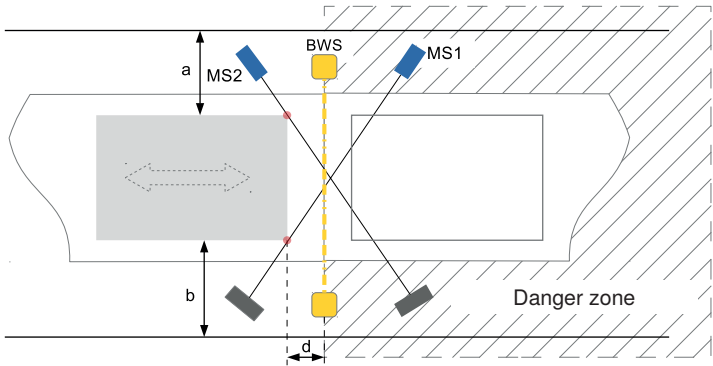


Figure 3: Arrangement cross-muting with retro-reflex sensors

Calculating the minimum distance



$$d \geq v \times (t_{ESPE} + t_{MS})$$

|                       |                                                                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d [m]                 | Minimum distance between the detection points of the MS and the safety field of the ESPE (see <a href="#">Figure 3</a> )                                                                      |
| v [m/s]               | Speed of the material on the conveyor line                                                                                                                                                    |
| t <sub>ESPE</sub> [s] | Processing time muting signals<br>Is the time required by the ESPE for processing all muting signals. The value can be found in the technical data ( <a href="#">section 4.1, page 15</a> ) . |
| t <sub>MS</sub> [s]   | Response time MS                                                                                                                                                                              |

ATTENTION!



- The calculated distance value does not refer to the intersection point of MS1 and MS2, but to the detection point of the sensor on the object.
- The distance of the intersection point of the MS from the safety field of the ESPE must be less than 200 mm and must be **within the danger zone**. It must be kept as small as possible.
- To prevent manipulation with the feet, the intersection point of the MS **must be at the height of the lowest beam of the ESPE or higher**.
- MS1 and MS2 should be mounted at **different heights** where possible to make manipulation more difficult.

Example:

- Belt speed
  - Processing time muting signals
  - Response time MS
- $$v = 0.5 \frac{m}{s}$$
$$t_{ESPE} = 95 \text{ ms}$$
$$t_{MS} = 1 \text{ ms}$$



$$d \geq v \times (t_{ESPE} + t_{MS}) = 0.5 \frac{m}{s} \times (0.095 + 0.001)s = 0.048 \text{ m}$$

The minimum distance of the two detection points on the object from the ESPE safety field is 48 mm. Depending on the width of the muting object, the two sensors must be positioned under the following conditions:

- MS1 and MS2 detect the object at a minimum distance of d = 48 mm
- The intersection point of MS1 and MS2 is located as close as possible to the safety field of the ESPE, but no more than 200 mm away.

Valid muting sequence:

|                  | Action                                                            | Comments                                                          |
|------------------|-------------------------------------------------------------------|-------------------------------------------------------------------|
| 1. Muting start  | MS1 and MS2 are activated                                         | Both sensors must be activated within a time frame of 4 seconds   |
| 2. Muting active | MS1 and MS2, penetration of the safety field                      | The safety field is interrupted, the OSSDs remain in the ON state |
| 3. Muting end    | MS1 or MS2 are inactive or the maximum muting duration is reached |                                                                   |

Signal path

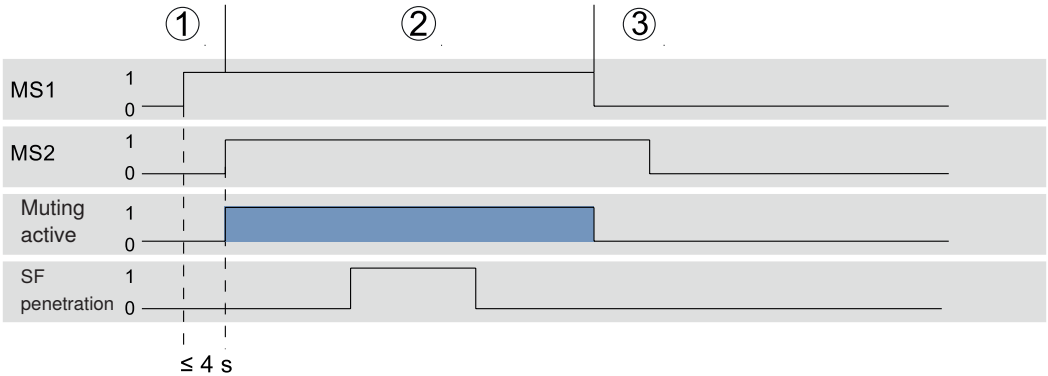


Figure 4: Signal path during cross-muting



- NOTE!**
- The safety can be increased further by positioning the MS at different heights, as their fields of view do not cross at points in this case.
  - If the function “Muting end through clearing of the ESPE” is activated, the muting sequence ends as soon as the safety field is free again.
  - The “Gap suppression” function can increase the availability of the system by accepting signal interruptions of < 250 ms on the muting sensors.

5.2.4.4 Two Sensor Linear Muting

The two sensor linear muting enables the user to transport an object out of the danger zone. The two MS are located within the danger zone, so that it is not possible to activate the muting from outside the danger zone.

Muting is active as soon as MS1 and MS2 are activated. MS1 must be activated first, followed by MS2 within 4 seconds. The order must be observed here.

The distances a and b represent the distances between the muting object and a separating safeguard (fence). They must be designed so that no-one can enter the danger zone unnoticed while the muting object is passing through the ESPE.

A sample arrangement of the sensors is shown in the following figure .

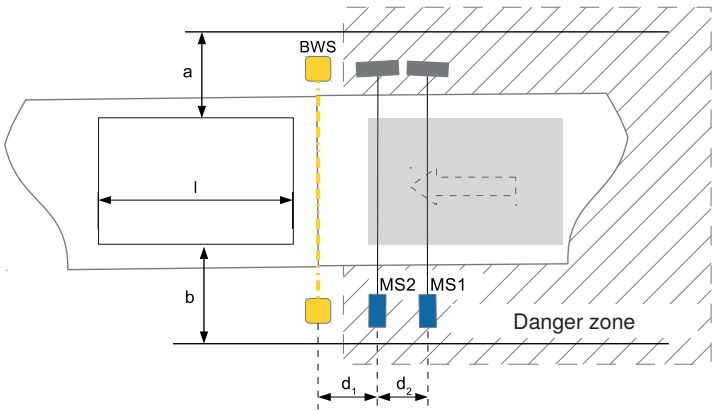


Figure 5: Arrangement two sensor linear muting

Calculating the minimum distance

$\sqrt{x^2}$   $d_{12} \geq v \times (t_{ESPE} + t_{MS})$

|                |                                                                                                                                                                                               |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $d_1$ [m]      | Minimum distance between MS2 and safety field of the ESPE (see <a href="#">Figure 5</a> )                                                                                                     |
| $d_2$ [m]      | Minimum distance between MS1 and MS2 (see <a href="#">Figure 5</a> )                                                                                                                          |
| $v$ [m/s]      | Speed of the material on the conveyor line                                                                                                                                                    |
| $t_{ESPE}$ [s] | Processing time muting signals<br>Is the time required by the ESPE for processing all muting signals. The value can be found in the technical data ( <a href="#">section 4.1, page 15</a> ) . |
| $t_{MS}$ [s]   | Response time MS                                                                                                                                                                              |
| $a, b$         | Distances                                                                                                                                                                                     |



**NOTE!**  
In order to carry out a valid muting sequence, the object must have at least the length  $l$  (with  $l = d_1 + d_2$ ).

Example:

- Belt speed
  - Processing time muting signals
  - Response time MS
- $$v = 0.5 \frac{\text{m}}{\text{s}}$$
$$t_{\text{ESPE}} = 95 \text{ ms}$$
$$t_{\text{MS}} = 11 \text{ ms}$$

$d_{1/2} \geq v \times (t_{\text{ESPE}} + t_{\text{MS}}) = 0.5 \frac{\text{m}}{\text{s}} \times (0.095 + 0.011) \text{s} = 0.048 \text{ m}$

The minimum distance between the two MS and the distance of the MS2 to the safety field of the ESPE is 48 mm. Accordingly, the muting object must have a minimum length of 96 mm.

Valid muting sequence:

|                  | Action                                                                                                                          | Comments                                                           |
|------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1. Muting start  | MS1 is activated first, followed by MS2.                                                                                        | Both sensors must be activated within a time frame of 4 seconds.   |
| 2. Muting active | MS1 and MS2 active.<br>Penetration of the safety field (muting object passes through ESPE).                                     | The safety field is interrupted, the OSSDs remain in the ON state. |
| 3. Muting active | MS1 or MS2 are inactive.                                                                                                        | Muting remains active.                                             |
| 4. Muting end    | MS1 or MS2 are inactive for longer than 4 seconds.<br>The safety field is cleared again.<br>Maximum muting duration is reached. | Depending on which status is reached first.                        |

Signal path:

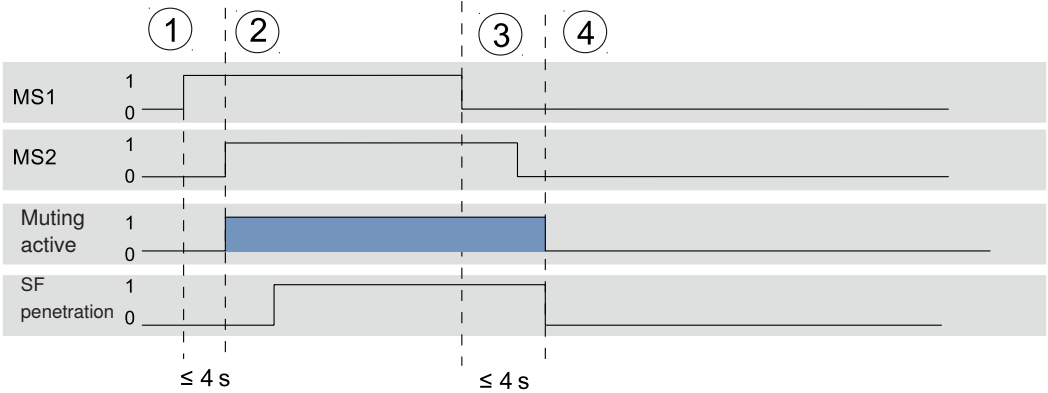


Figure 6: Signal path with two sensor linear muting

5.2.4.5 Four Sensor Linear Muting with Sequence Monitoring

The four sensor linear muting with sequence monitoring enables the user to transport an object into or out of the danger zone. Two MS are located inside and two MS are located outside the danger zone.

The distances a and b represent the distances between the muting object and a separating safeguard (fence). They must be designed so that no-one can enter the danger zone unnoticed while the muting is activated. The separating safeguard must therefore be installed directly behind the ESPE to prevent bypassing.

NOTE!

- The four sensor linear muting with sequence monitoring checks the correct activation sequence of the MS. MS1 or MS4 must be activated first. MS2 or MS3 must then be activated depending on which of the sensors was approached.
- The “direction setting” function can be used to restrict the permissible direction of the object transport to one direction.
- The four sensor linear muting with sequence monitoring does not use time monitoring when activating the individual MS. A time restriction is only possible via the maximum muting duration MMD.
- If the function “Muting end through clearing of the ESPE” is activated, the muting sequence ends as soon as the safety field is free again.
- The “Gap suppression” function can increase the availability of the system by accepting signal interruptions of less than 250 ms on the MS.
- Due to the lack of time monitoring, this function should only be used if no other muting type is suitable.



For better understanding, the scenario of material movement into the danger zone is outlined below (Figure 7). If the object is to be transported out of the danger zone, the designation MS1 should be replaced with MS4, MS2 with MS3, etc.

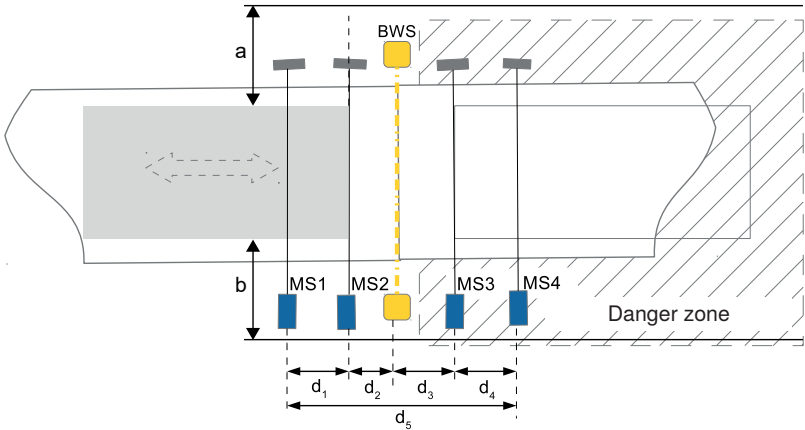


Figure 7: Arrangement four sensor linear muting with sequence monitoring



Calculating the minimum distance



$$d_{1/2/3/4} \geq v \times (t_{ESPE} + t_{MS})$$

|                       |                                                                                                                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d <sub>1</sub> [m]    | Minimum distance between MS1 and MS2 (see figure 8)                                                                                                                         |
| d <sub>2</sub> [m]    | Minimum distance between MS2 and safety field of the ESPE (see figure 17)                                                                                                   |
| d <sub>3</sub> [m]    | Minimum distance between the safety field of the ESPE and MS3 (see figure 17)                                                                                               |
| d <sub>4</sub> [m]    | Minimum distance between MS3 and MS4 (see figure 17)                                                                                                                        |
| d <sub>5</sub> [m]    | Size of the muting range (see figure 17)                                                                                                                                    |
| v [m/s]               | Speed of the material on the conveyor line                                                                                                                                  |
| t <sub>ESPE</sub> [s] | Processing time muting signals<br>Is the time required by the ESPE for processing all muting signals. The value can be found in the technical data (section 4.1, page 15) . |
| t <sub>MS</sub> [s]   | Response time MS                                                                                                                                                            |
| a, b                  | Distances                                                                                                                                                                   |



**NOTE!**

- The muting object must be at least long enough that all 4 MS are triggered at the same time during the muting sequence. This parameter is indicated by the value d<sub>5</sub>.



**ATTENTION!**

- The distance d<sub>5</sub> must be at least 500 mm.
- To reduce the risk of unintentional triggering of the MS, the distance d<sub>1</sub> and d<sub>4</sub> must be at least 250 mm.
- To make it more difficult to bypass the safety devices, the distances d<sub>2</sub> and d<sub>3</sub> must be max. 200 mm each.

Example:

- Belt speed
  - Processing time muting signals
  - Response time MS
- $$v = 0.5 \frac{m}{s}$$
$$t_{ESPE} = 95 \text{ ms}$$
$$t_{MS} = 1 \text{ ms}$$



$$d_{1/2/3/4} \geq v \times (t_{ESPE} + t_{MS}) = 0.5 \frac{m}{s} \times (0.095 + 0.001)s = 0.048 \text{ m}$$

Based on this calculation, each of the MS should be mounted at least 48 mm apart. The following minimum distances apply, however, due to the restrictions outlined above:

- d<sub>1</sub>: 250 mm
  - d<sub>2</sub>: 48 mm
  - d<sub>3</sub>: 48 mm
  - d<sub>4</sub>: 250 mm
  - d<sub>5</sub>: 596 mm
- The muting object must have a minimum length of 596 mm.

Valid muting sequence:

|                  | Action                                                                                  | Comments                                                           |
|------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| 1. Muting start  | MS1 is activated first, followed by MS2.                                                |                                                                    |
| 2. Muting active | MS1 and MS2 active, penetration of the safety field (muting object moves through ESPE). | The safety field is interrupted, the OSSDs remain in the ON state. |
| 3. Muting active | MS1, MS2, penetration of the safety field and MS3 active.                               | Muting remains active.                                             |
| 4. Muting active | MS1, MS2, penetration of the safety field, MS3 and MS4 active.                          |                                                                    |
| 5. Muting active | MS2, penetration of the safety field, MS3 and MS4 active.                               | MS1 has become inactive.                                           |
| 6. Muting active | Penetration of the safety field, MS3 and MS4 active.                                    | MS2 has become inactive.                                           |
| 7. Muting active | MS3 and MS4 active.                                                                     | Safety field is cleared again.                                     |
| 8. Muting end    | MS3 or MS4 are inactive or the maximum muting duration is reached                       |                                                                    |

Signal path

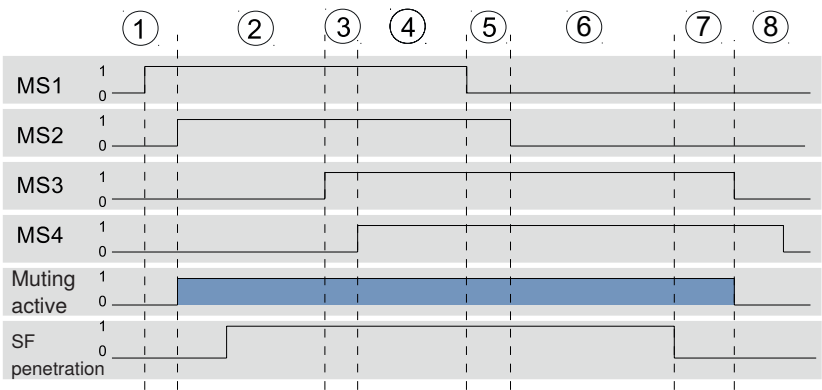


Figure 8: Signal path for the four sensor linear muting with sequence monitoring

5.2.4.6 Four Sensor Linear Muting with Time Monitoring

The four sensor linear muting with time monitoring enables an object to be transported into or out of the danger zone. Two MS are located inside and two MS are located outside the danger zone.

The distances a and b represent the distances between the muting object and a separating safeguard (fence). They must be designed so that no-one can enter the danger zone unnoticed while the muting is activated. The contact-based safeguard must therefore be installed directly behind the ESPE to prevent bypassing.

NOTE!

- The four sensor linear muting with time monitoring checks the correct activation sequence of the MS and the time required.
- Depending on which MS is activated first, the following MS must also be activated within 4 s. (Transport into the danger zone: MS1 → MS2; transport out of the danger zone: MS4 → MS3)
- The “direction setting” function can also be used to restrict the permissible direction of the object transport to one direction.
- If the function “Muting end through clearing of the ESPE” is activated, the muting sequence ends as soon as the safety field is free again.
- The “Gap suppression” function can increase the availability of the system by accepting signal interruptions of less than 250 ms on the MS.

For better understanding, the scenario of material movement into the danger zone is outlined below (see Figure 9). If the object is to be transported out of the danger zone, the designation MS1 should be replaced with MS4, MS2 with MS3, etc.

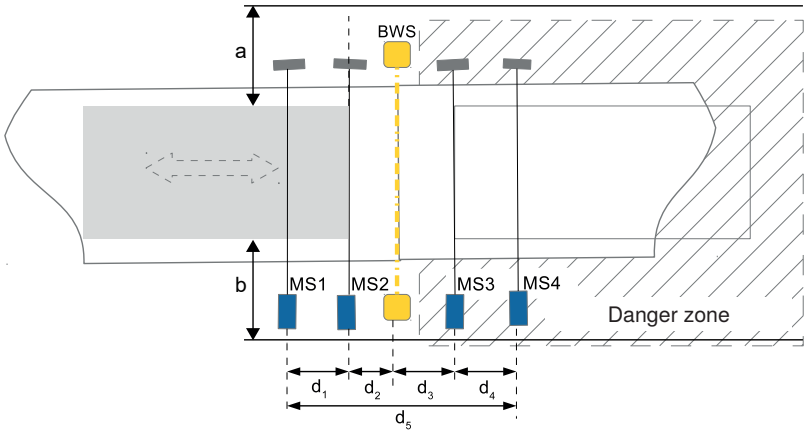


Figure 9: Arrangement four sensor linear muting with time monitoring

Calculating the minimum distance



$$d_{1/2/3/4} \geq v \times (t_{ESPE} + t_{MS})$$

|                       |                                                                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d <sub>1</sub> [m]    | Minimum distance between MS1 and MS2 (see <a href="#">Figure 9</a> )                                                                                                                          |
| d <sub>2</sub> [m]    | Minimum distance between MS2 and safety field of the ESPE (see <a href="#">Figure 9</a> )                                                                                                     |
| d <sub>3</sub> [m]    | Minimum distance between the safety field of the ESPE and MS3 (see <a href="#">Figure 9</a> )                                                                                                 |
| d <sub>4</sub> [m]    | Minimum distance between MS3 and MS4 (see <a href="#">Figure 9</a> )                                                                                                                          |
| d <sub>5</sub> [m]    | Size of the muting range (see <a href="#">Figure 9</a> )                                                                                                                                      |
| v [m/s]               | Speed of the material through the safety field                                                                                                                                                |
| t <sub>ESPE</sub> [s] | Processing time muting signals<br>Is the time required by the ESPE for processing all muting signals. The value can be found in the technical data ( <a href="#">section 4.1, page 15</a> ) . |
| t <sub>MS</sub> [s]   | Response time MS                                                                                                                                                                              |
| a, b                  | Distances                                                                                                                                                                                     |



**NOTE!**  
The length of the transported object must correspond at least to the distance from the first MS to the last MS. This parameter is indicated by the value d<sub>5</sub>.



**ATTENTION!**

- The distance d<sub>5</sub> must be at least 500 mm.
- To reduce the risk of unintentional triggering of the muting sensors, the distance d<sub>1</sub> and d<sub>4</sub> must be at least 250 mm. The two distances do not have to be identical.
- To make it more difficult to bypass the safety devices, the distances d<sub>2</sub> and d<sub>3</sub> must be max. 200 mm each.
- The MS must be positioned so that they detect the object and not the pallet or the transport unit.

Example:

- Belt speed
  - Processing time muting signals
  - Response time MS
- $$v = 0.5 \frac{m}{s}$$
$$t_{ESPE} = 95 \text{ ms}$$
$$t_{MS} = 1 \text{ ms}$$



$$d_{1/2/3/4} \geq v \times (t_{ESPE} + t_{MS}) = 0.5 \frac{m}{s} \times (0.095 + 0.001)s = 0.048 \text{ m}$$

Based on this calculation, each of the MS should be mounted at least 40 mm apart. The following minimum distances apply, however, due to the restrictions outlined above:

- d<sub>1</sub>: 250 mm
  - d<sub>2</sub>: 48 mm
  - d<sub>3</sub>: 48 mm
  - d<sub>4</sub>: 250 mm
  - d<sub>5</sub>: 596 mm
- The muting object must have a minimum length of 596 mm.

Valid muting sequence:

|                  | Action                                                             | Comments                                                           |
|------------------|--------------------------------------------------------------------|--------------------------------------------------------------------|
| 1. Muting start  | MS1 → MS2 are active                                               | Both sensors must be activated within a time frame of 4 seconds.   |
| 2. Muting active | MS1 → MS2 are active → penetration of the safety field             | The safety field is interrupted, the OSSDs remain in the ON state. |
| 3. Muting active | MS1 → MS2 → penetration of the safety field → MS3 active           | Muting remains active.                                             |
| 4. Muting active | MS1 → MS2 → penetration of the safety field → MS3 → MS4 are active | MS3 and MS4 must be activated within a time frame of 4 seconds.    |
| 5. Muting end    | MS3 or MS4 are inactive or the maximum muting duration is reached. |                                                                    |

Signal path

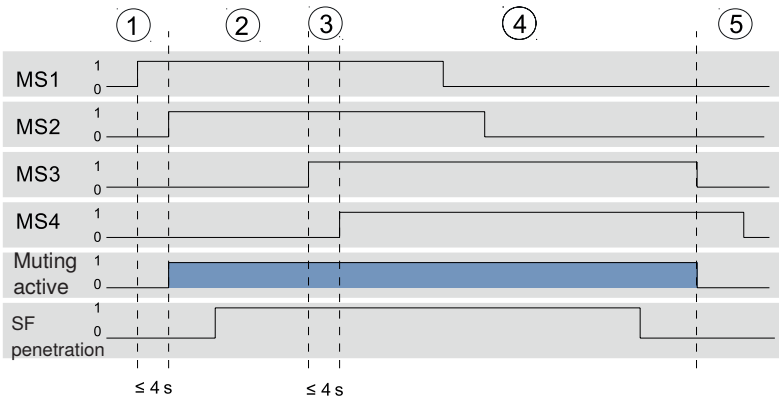


Figure 10: Signal path for the four sensor linear muting with time monitoring

5.2.4.7 Muting Functions

5.2.4.7.1 Combinable Muting Functions

| Signal input and configuration                     |     |     |     |     |          |               |           |                    | Parameters configuration |                   |                                 |                 |
|----------------------------------------------------|-----|-----|-----|-----|----------|---------------|-----------|--------------------|--------------------------|-------------------|---------------------------------|-----------------|
| Muting types                                       | MS1 | MS2 | MS3 | MS4 | Override | Muting enable | Belt stop | Full muting enable | Partial Muting           | Direction setting | End due to clearing of the ESPE | Gap suppression |
| Cross muting                                       | X   | X   | –   | –   | X        | X             | 0         | 0                  | X                        | –                 | X                               | X               |
| Two sensor linear muting                           | X   | X   | –   | –   | X        | X             | 0         | 0                  | X                        | –                 | X*                              | X               |
| four sensor linear muting with sequence monitoring | X   | X   | X   | X   | X        | –             | –         | –                  | X                        | X                 | X                               | X               |
| four sensor linear muting with time monitoring     | X   | X   | X   | X   | X        | –             | –         | –                  | X                        | X                 | X                               | X               |

X : Additional function may be used  
0 : Additional function may be used, but not at the same time as the other marked functions  
– : Additional function may not be used  
\* : Function is activated automatically by the operating mode



**NOTE!**  
All muting functions are parametrized on the receiver. The parametrization can take place via the control panel or IO-Link.

5.2.4.7.2 Muting Duration

The maximum duration of a valid muting sequence is time-restricted to help prevent manipulation. Once the maximum muting duration MMD has expired (300 seconds or 8 hours depending on the parametrization), the muting is ended automatically and the safety function is active again.

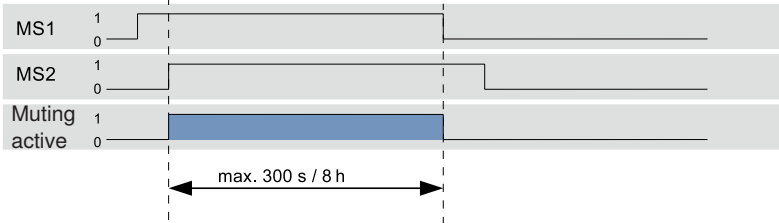


Figure 11: Muting duration using cross-muting as an example

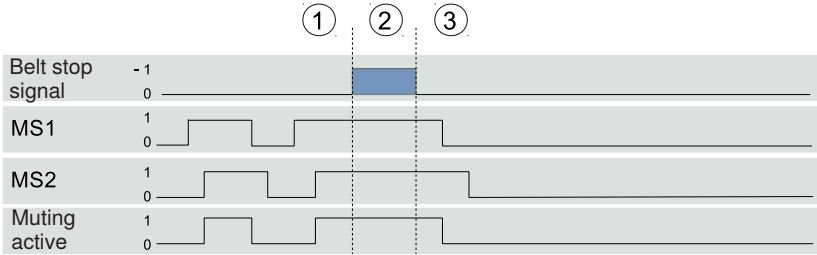
5.2.4.7.3 Belt Stop Signal

The parameterizable “belt stop signal” function enables a high system availability for applications where the conveyor belt is stopped operationally. It stops the muting sequence temporarily. To this end, if there is an active signal on the “belt stop signal” input, the timers that monitor the initiation and maintenance of the muting sequence are paused. If the signal changes to 0, the muting sequence is continued and the timers continue to count.

Procedure for interrupting the muting sequence

|    |                                | Condition               | Comment                                                   |
|----|--------------------------------|-------------------------|-----------------------------------------------------------|
| 1. | Normal muting sequence         | “Belt stop signal” on 0 | Muting sequence is carried out normally                   |
| 2. | Muting sequence is interrupted | “Belt stop signal” on 1 | Timers for monitoring the muting sequence are interrupted |
| 3. | Normal muting sequence         | “Belt stop signal” on 0 | Timers continue to count. Muting sequence is continued    |

Sample signal sequence using cross-muting as an example:



Safety during belt stop:

To make it more difficult to bypass the ESPE with the belt stop function active, the following actions cause the muting to be canceled:

- Changes to the safety field status (penetration → no penetration or no penetration → penetration) and
- Changes to muting signals

This means that the muting remains active during existing penetration (e.g. pallet interrupts ESPE), but a change in the safety field status with the belt at a standstill causes the muting to be canceled, as it is assumed that a person is trying to bypass the ESPE.

3 s seconds after the belt stop signal, the ESPE continues monitoring the MS.

NOTE!



- The maximum duration of an active belt stop signal is 8 h. After this time, the muting sequence is continued automatically.
- The belt stop function must also be configured on the ESPE. Otherwise, the “belt stop signal” input is not taken into account.
- For information on status messages, see [section 13.3, page 143](#).

5.2.4.7.4 Muting Enable

The “Muting Enable” function is intended to provide added safety for the user when working with muting. If the function is activated during parametrization, the “Muting Enable” input is evaluated. The muting can now be enabled or blocked using the external Muting Enable signal. If the Muting Enable input is active, muting is initiated with a valid muting sequence. If the Muting Enable input is inactive, the muting function is blocked and can not be initiated.

Sample process for activating the muting

|    |                            | Condition                                                | Comment                                                                                                                                                              |
|----|----------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. | Muting enable is activated | Function is activated in the parametrization             | Basic requirement for using the function                                                                                                                             |
| 2. | Muting inactive            | “Muting Enable” input is activated by an external signal | –                                                                                                                                                                    |
| 3. | Muting inactive            | “Muting Enable” input is active and MS1 is active        | –                                                                                                                                                                    |
| 4. | Muting active              | MS1 and MS2 are active                                   | “Muting Enable” signal may only become inactive if muting becomes active. From this point, the input is no longer taken into account during the active muting cycle. |

The figure shows a valid signal path as an example.

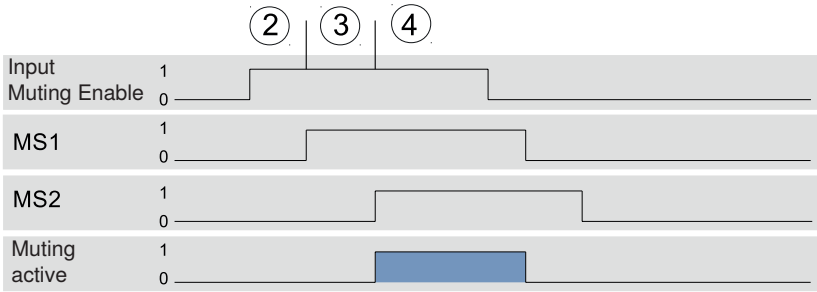


Figure 12: Signal path Full Muting Enable



**NOTE!**  
If the “Muting Enable” function is activated in the parametrization, the “Muting Enable” input must be active at the latest by the start of a valid muting sequence.



5.2.4.7.5 Direction Setting (Only for four sensor Muting)

This function increases the safety during muting by specifying and checking the sequence of the activation and deactivation of the MS. If an object passes through the safety field in a direction other than the one defined, the muting cycle is not initiated.

Setting options

| Setting     | Condition                                   |
|-------------|---------------------------------------------|
| Direction A | MS1 or MS2 are activated before MS3 or MS4. |
| Direction B | MS4 or MS3 are activated before MS2 or MS1. |
| Deactivated | No direction specification                  |

NOTE!



- This function is only relevant for muting types where it is possible to differentiate between the direction of transport (see [section 5.2.4.5, page 60](#) and [section 5.2.4.6, page 63](#)).
- If the direction specification is deactivated, a cycle must be run through completely before a muting cycle can be started in the opposite direction. If a change in direction takes place while a muting cycle is in progress, this is likely to violate a time or sequence condition. If the safety field is penetrated during this process, this can cause the OSSDs to switch off.

5.2.4.7.6 Muting End Through Clearing of the ESPE

The “Muting End Through Clearing of the ESPE” function enables the muting to be deactivated as soon as an object has been transported out of the safety field of the ESPE. This shortens the muting time and improves safety.

A sample signal sequence based on cross-muting is shown in the following figure.

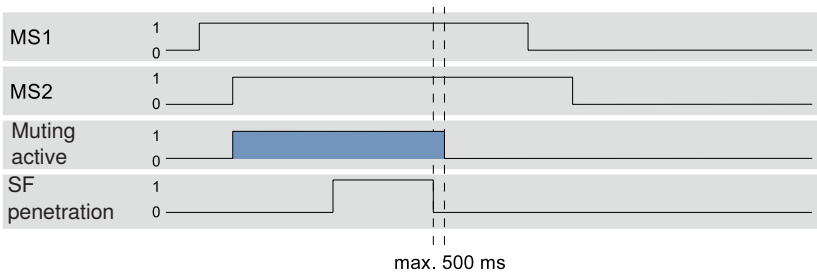


Figure 13: Signal path muting end through clearing of the ESPE

NOTE!



- Ending the muting after the ESPE are cleared takes place with a time delay of max. 500 ms.
- With two sensor linear muting, the “Muting End Through Clearing of the ESPE” function is activated automatically. It can be parametrized with the other muting types.

#### 5.2.4.7.7 Partial Muting

The “Partial Muting” function can be used to secure the danger zone even more effectively. With this approach, only part of the ESPE (e.g. at object height) is hidden within a valid muting sequence, while the other light beams remain permanently active and cause the OSSDs to be switched off if interrupted.

##### ① Area 1

The beam is exempted from the muting.  
This beam of the ESPE is permanently active independently from the muting sequence.

##### ② Area 2

Area is muting-relevant.  
Here, the beams of the ESPE are bridged depending on the muting sequence.

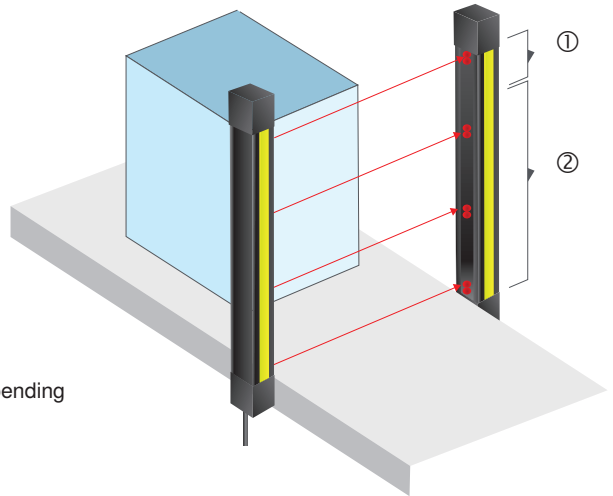


Figure 14: Partial muting

#### NOTE!

- Area 2 (muting area) can be taught-in by transporting the object into the safety field and teaching in the number of hidden beams.
- Area 2 consists of cumulated beams. For the muting, the area between the first and the last defined beam is activated.
- If area 1 is penetrated during an active muting sequence, the muting is ended.
- With the additional function “Full Muting Enable” ([section 5.2.4.7.8, page 71](#)) muting can be extended to the entire safety field. This means that a single object with a greater height can be transported through the safety field.



5.2.4.7.8 Full Muting Enable

For applications where the object height varies, the muting can be extended to the total safety height of the ESPE at specific times with the “Full Muting Enable” function. This function should only be used if “Partial Muting” was activated beforehand.

Usage condition

|    | Condition                                                                   | Comment                                                                                                            |
|----|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| 1. | “Full Muting_Enable” is parametrized.                                       | Basic requirement for activating the function.                                                                     |
| 2. | Signal_Full-Muting_Enable, MS1 and MS2 are not active.                      |                                                                                                                    |
| 3. | Signal_Full-Muting_Enable becomes active, MS1 and MS2 are inactive.         | The signal Signal Full-Muting_Enable must be active until both muting signals are applied and muting is activated. |
| 4. | MS1 and MS2 become active within 30 seconds and muting is therefore active. |                                                                                                                    |

The following figure shows the signal path for the individual steps.

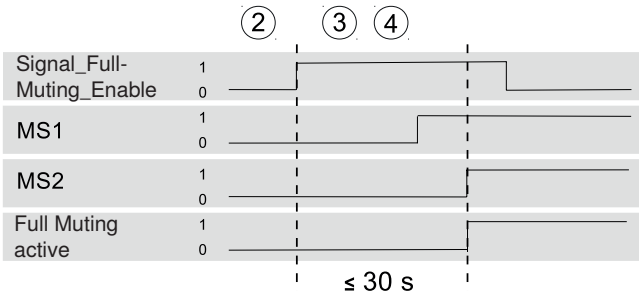


Figure 15: Valid signal sequence for activating Full Muting Enable

NOTE!



- The activation of the “Full Muting Enable” function via a valid signal sequence causes the following muting cycle to take place over the entire height of the ESPE. It does not initiate a muting cycle itself, however.
- Once the muting cycle is complete, the function is no longer active and the usage conditions must be repeated for another “Full Muting”.
- The “Full Muting Enable” function uses the same input as the “Belt Stop” function.

5.2.4.7.9 Gap Suppression

For transport items with gaps, brief interruptions in the muting signal are to be expected. The “gap suppression” function ensures that a brief interruption in the detection does not result in the muting being terminated. If the function is activated, interruptions of up to 250 ms are accepted in the signal from a MS.



**DANGER!**

- The “gap suppression” delays the termination of the muting by 250 ms.
- The user must ensure that, despite the set off-delay, no person can enter the danger zone.

5.2.4.7.10 Override

In some cases, a valid muting sequence can be interrupted due to the conveyor belt stopping, for example. In this case, the object stops and prevents a valid muting sequence from being carried out. The Override function enables the object to be transported out of the muting area despite the safety field being penetrated.

Usage condition

|    |                            | Condition                                                                                                                                                                         | Comment                                                                      |
|----|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| 1. | Condition for override     | Override function is parametrized. A penetration of the safety field is detected and at least 1 MS is active.                                                                     | With two sensor L-muting, the status of the MS is not taken into account.    |
| 2. | Override is request-<br>ed | Valid signal sequence on the “Over-<br>ride” input                                                                                                                                | See below <a href="#">Figure 16</a>                                          |
| 3. | Active override            | “Override” input is active and at least 1 MS is active and penetration of the safety field is detected.                                                                           | –                                                                            |
| 4. | Override ended             | <ul style="list-style-type: none"><li>• “Override” input inactive or</li><li>• Safety field free and no MS active or</li><li>• Maximum override duration exceed-<br/>ed</li></ul> | Depending on which status is reached first. Maximum override duration: 150 s |

The following figure shows a sample signal sequence during override.

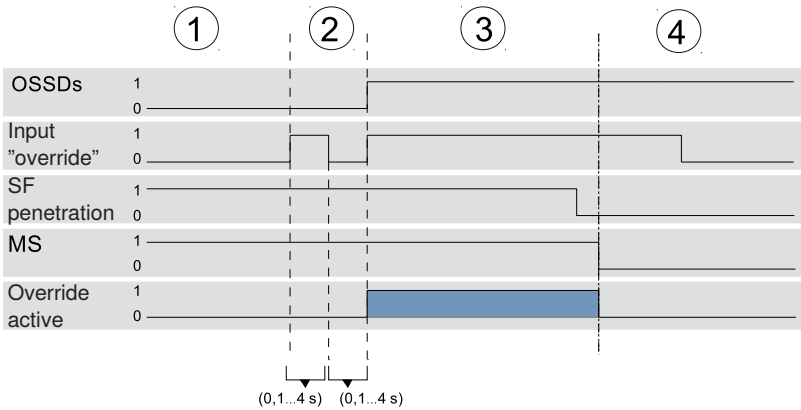


Figure 16: Signal sequence with override



**DANGER!**

- There must be no persons in the danger zone during override.
- The entire danger zone must be clearly visible by the operator during the override.



**NOTE!**

- While the override is active, the illuminated cap of the ESPE flashes white with 1 Hz.
- Irrespective of the operating mode "Restart inhibit", the OSSDs also remain in the ON state when the safety field is freed and override is ended.

## 5.2.5 Non-Safety-Related Functions

### 5.2.5.1 Measuring Function

- Different measuring functions can be used on the device for controlling system parts, for example. This enables muting parts to be measured or their size checked, among other things.
- The recorded process data can be accessed via IO-Link.

The following values (see following figure) can be determined via the measuring function:

- First blocked beam
  - Abb. FBB: First Beam Blocked
  - Shows the position of the first blocked beam (as viewed from the control panel).
  - If the safety field is free: FBB = 0
- Last blocked beam
  - Abb. LBB: Last Beam Blocked
  - Shows the position of the last blocked beam (as viewed from the control panel).
  - If the safety field is free: LBB = 0
- Number of blocked beams
  - Abb. NBB: Numbers of Beams Blocked
  - The total number of blocked beams in the safety field (including multiple objects)
- Number of cumulated blocked beams (biggest group: NCBB)
  - Abb. NCBB: Numbers of Cumulated Beams Blocked
  - Total number of blocked beams of the largest object
- Number of objects (NOBJ)
  - Abb. NOBJ: Numbers of Objects
  - Number of objects in the safety field

Example of the measuring function

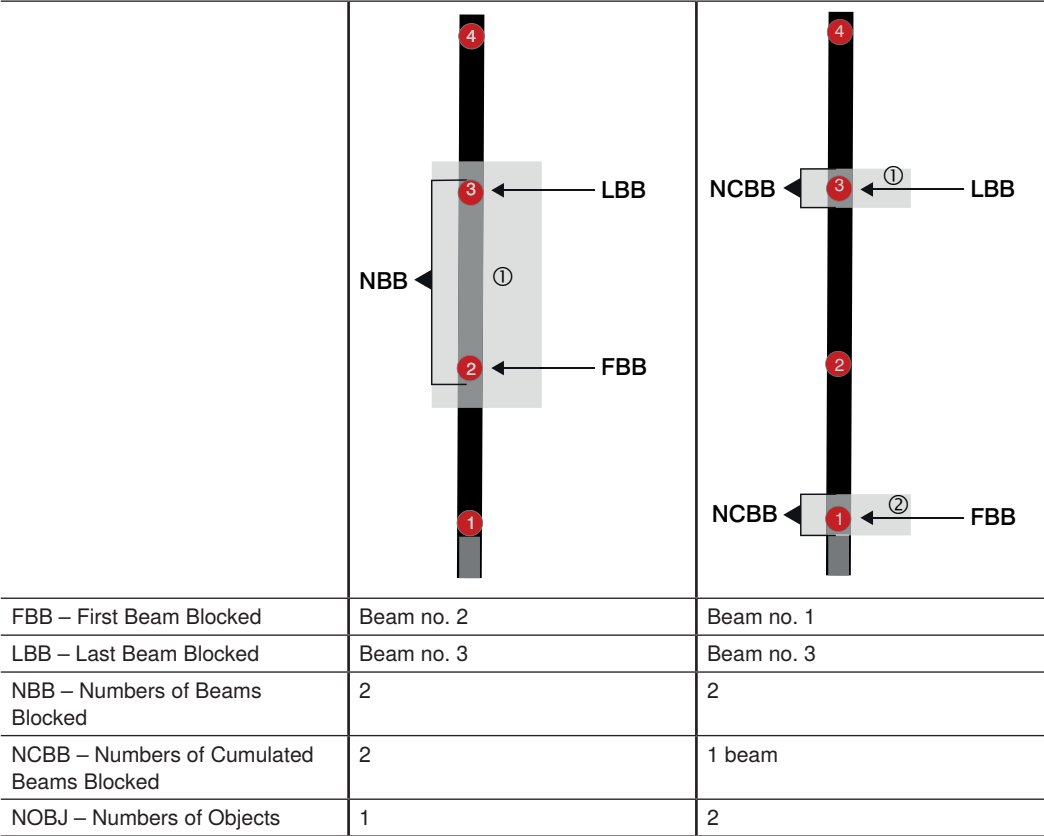


Figure 17: Values of the measuring function



**NOTE!**

- The measuring function is dependent on the parametrized operating modes and functions. This means that objects, which do not result in a shutdown (e.g. blanking, reduced resolution), are included in the measurement.
- If the receiver is not in synchronous run (e.g. emitter not in operation, safety field completely blocked, error state,...), the value 255 is output for all measurements.

5.2.5.2 Display Settings

- The display setting can be adjusted so that it does not interfere during operation (e.g. at manual work stations).
- The following settings can be selected:

|                                  | Standard                          | Energy saving mode                             |
|----------------------------------|-----------------------------------|------------------------------------------------|
| LEDs                             | Always active according to status | Always active according to status              |
| Activation segment display       | Automatic                         | Any key pressed or change via a status message |
| Display duration segment display | Permanent                         | 30 s                                           |
| Selection                        | Via parameter configuration       | Default settings                               |

5.2.5.3 Signal Output

- Pin 6 of the IO-Link output is on the system connection of the receiver. If IO-Link communication is not active, this output can be used as a digital PNP output (signal output).
- The following functions can be assigned to the signal output:



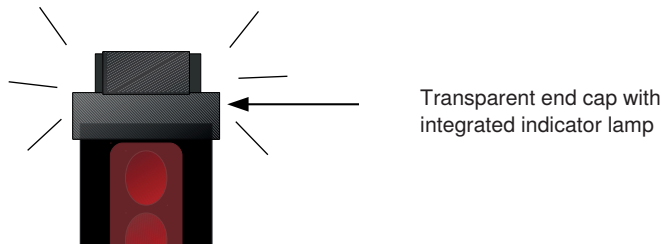
**ATTENTION!**  
On the receiver of the ESPE, Pin 6 (IO-Link output) is not suitable for safety-related use.

| Function                                | Signal active                                                                          | Signal inactive                                                                                                                                                                                    |
|-----------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Acknowledgment prompt (default setting) | Acknowledgment required (e.g. following safety field penetration with restart inhibit) | No acknowledgment (e.g. with automatic restart)                                                                                                                                                    |
| OSSD switching states                   | OSSDs ON                                                                               | OSSDs OFF                                                                                                                                                                                          |
| Muting status                           | Muting active                                                                          | No muting active                                                                                                                                                                                   |
| Contamination warning                   | Contamination or weak signal                                                           | Good signal strength                                                                                                                                                                               |
| Synchronous run                         | Receiver is in synchronous run                                                         | Receiver is not in synchronous run, e.g. because: <ul style="list-style-type: none"><li>• Safety field is fully covered</li><li>• Incorrect alignment</li><li>• Emitter not in operation</li></ul> |
| Ready state                             | ESPE ready for operation                                                               | ESPE is ready state                                                                                                                                                                                |
| Off                                     | Output is deactivated                                                                  |                                                                                                                                                                                                    |



5.2.5.4 Integrated Indicator Lamp

- The receiver of the ESPE has a transparent end cap with integrated indicator lamp.
- Depending on the parameter configuration and sensor, the different status of the ESPE is shown depending on the situation. The integrated indicator lamp is not monitored. This means that an indicator lamp failure has no impact on the function of the ESPE.
- The display of the OSSD status can be deactivated if the display clashes with other indicator displays within the system.
- The muting status display can not be deactivated.



| Setting options        | Status ESPE                | Display indicator lamp |          |  |
|------------------------|----------------------------|------------------------|----------|--|
| Muting status          | Active                     | White                  | Constant |  |
|                        | Override active            | White                  | Flashing |  |
|                        | Inactive                   | Off                    | Constant |  |
| OSSD and muting status | OSSD on – muting active    | White                  | Constant |  |
|                        | Override active            | White                  | Flashing |  |
|                        | OSSD on – muting inactive  | Green                  | Constant |  |
|                        | OSSD off – muting inactive | Red                    | Constant |  |

5.2.5.5 Signal Strength Display

- After the ESPE is switched on, the signal strength is displayed on the receiver for 30 s.
- Display for an unlimited period of time is also possible during parameters configuration.
- For details on the display, see [section 10.3, page 128](#).

5.2.5.6 Memory Function

- The ESPE can be expanded with a microSD memory card (complementary accessories), which can be read and written on.
- This enables a parameter configuration to be transferred from the memory card to the ESPE and a parameter configuration for a ESPE to be saved on the memory card.

NOTE!



The main advantages of the memory function are:

- Easy exchange of parameters,
- Duplication of series parameter configurations,
- Quick transfer of parameters when a device is replaced,
- Archiving configuration files via the PC.

This makes the following scenarios possible for the user:

| Procedure | Build a series machine                                                                 | Initial start-up of the series machine with PC                                                | Initial start-up of the series machine                                                        | Light curtain is faulty                                       |
|-----------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Step 1    | File with parameter configuration for the ESPE is saved on the PC file system          | Parameter configuration of an ESPE takes place via the control panel and is saved on the card | Parameter configuration of an ESPE takes place via the control panel and is saved on the card | The (written) memory card is removed from the faulty ESPE     |
| Step 2    | The parameter configuration is transferred to all memory cards                         | The memory card is removed                                                                    | The memory card is removed                                                                    | The memory card is inserted in the new product                |
| Step 3    | The memory card is inserted in all ESPE and the parameter configuration is transferred | File with parameter configuration for the ESPE is saved on the PC file system                 | The memory card is inserted in all other ESPE and the parameter configuration is transferred  | The parameter configuration is transferred to the new product |
| Step 4    |                                                                                        | The parameter configuration is duplicated on memory cards for all ESPE (via PC)               |                                                                                               |                                                               |
| Step 5    |                                                                                        | The memory card is inserted in all ESPE and the parameter configuration is transferred        |                                                                                               |                                                               |

#### 5.2.5.6.1 Access to the Memory Card

- The access to the memory card is located on the right side of the control panel for the receiver (see Fig.).
- The slot can accept memory cards in microSD format.
- The memory card is protected by a screwed-on swivel cover.
- This cover can be loosened and screwed down again with a screwdriver (Torx, size TX10).
- Permissible tightening torque: 0,4 Nm
- The swivel cover must be sealed correctly to guarantee the IP degree of protection and to prevent the cover or the memory card from being lost.
- To remove the card, release the lock by pressing lightly on the card, e.g. with a finger nail.
- When inserting the card in the slot, ensure that it engages again.



Figure 18: Access to the memory card on the ESPE receiver

#### 5.2.5.6.2 Suitable Memory Cards

- Supported memory card types: microSD
- Supported memory capacity: max. 8 GB
- File system: type FAT32
- The microSD card can be removed/replaced at any time (without impairing operation)
- Preferred type (wenglor order no.): ZNNG013

#### 5.2.5.6.3 File System

The following instructions must be followed to guarantee successful use of the microSD card:

- Every ESPE type has its own file with clear designation.
- The file name has the following structure: [Order number receiver].hex (e.g. SEFB612.hex)
- The designation must not be changed (e.g. SEFB612\_V1.hex), as it can otherwise no longer be read in by the ESPE.
- If a configuration is written on the memory card by the ESPE, an existing file with the same designation is overwritten.
- The contents of the file itself can not be read and must not be changed.
- The ESPE can not search through folder structures. The desired file must therefore always be located on the top level of the folder. Sub-folders may be created, but are not taken into account by the ESPE.

- The ESPE (e.g. SEFB412) always saves the file in the top level of the microSD card.

| Name                                                                                         | Type        |
|----------------------------------------------------------------------------------------------|-------------|
|  Machine1_SF1 | File folder |
|  Machine1_SF2 | File folder |
|  SEFG631      | HEX file    |
|  SEFG632      | HEX file    |

- Multiple files from different ESPE (e.g.: SEFB412.hex, SEFB413.hex) can be saved in the parent folder.
- The relevant ESPE (e.g. SEFB412) only uses the file with the name assigned to it (e.g: SEFB412.hex).
- The subfolders may also contain files with the same name (e.g.: SEFB412.hex). These are not taken into account by the ESPE (e.g. SEFB412).

### 5.2.5.7 Password Protection

- The password protection prevents unauthorized and unintentional changes to the ESPE.
- The parameters of the ESPE may only be configured by authorized personnel. The authorized personnel are also responsible for maintaining the safety function.
- The receiver of the ESPE is protected with a 4-digit password.
- The password can be changed by the user (value range 0000 – 9999). If the password is changed, it must be adequately protected.
- In delivery state, the password is: 0000
- Parameter configuration is only possible after the password has been entered.

The password protection function divides the operation into two user levels:

| Designation         | Worker       | Admin                             |
|---------------------|--------------|-----------------------------------|
| Authorization       | Read access  | Read and write access             |
| Setting options     | None         | Changing parameter configurations |
| Password protection | Not required | Password input required           |

### 5.2.5.8 IO-Link Interface (C/Q)

IO-Link is a standardized communication system for connecting intelligent sensors and actuators to an automation system. This takes place via a point-to-point connection.

The IO-Link interface in the SEFB has the following function for the user:

- Saving and reading out parameter data in the ESPE.
- Querying the ESPE status.

At the request of the master (Wake-Up Request, WURQ), the sensor switches to IO-Link mode (communication mode).

If the IO-Link interface is not used for communication, it has the following functions:

- With the receiver, always as a signal output (see [“5.2.5.3 Signal Output” on page 76](#))
- With the emitter, as a digital input (without function).



#### ATTENTION!

- The IO-Link interface is not safety-related.
  - This means that both OSSDs must always be connected in the safety circuit during operation (see [section 8, page 89](#)).
- 



#### NOTE!

- Settings (e.g. range) can be read out by the IO-Link master via the IO-Link parameters or sent to connected IO-Link products. All parameters are set via the software of the IO-Link master.
- Data (e.g. switching statuses, receive signals) of IO-Link products is transferred cyclically to the IO-Link master via the IO-Link process data.
- IO-Link sensors are connected to the IO-Link master. It provides an interface to the higher-level control and controls the communication with the connected IO-Link products.

## 6. Transport and Storage

### 6.1 Transport

- Upon receipt of shipment, inspect the goods for damage in transit.
- In the case of damage, conditionally accept the package and notify the manufacturer of the damage.
- Then return the device, making reference to damage in transit.

### 6.2 Storage

The following points must be taken into consideration with regard to storage:

- Do not store the product outdoors.
- Store the product in a dry, dust-free place.
- Protect the product against mechanical impacts.
- Protect the product against exposure to direct sunlight.



#### **ATTENTION!**

#### **Risk of property damage in case of improper storage!**

The product may be damaged.

- Comply with storage instructions.
-

## 7. Installation

---

### **DANGER!**

#### **Hazardous machine state**

##### **Failure to comply poses risk of fatal injury!**



- No hazardous motions must be possible during installation, electrical connection and initial start-up.
  - It is important to ensure that the OSSDs of the ESPE have no impact on the machine during installation, electrical connection and initial start-up.
- 

### **DANGER!**

#### **Risk of safety device failure**

##### **If this warning is not observed, body parts and people to be protected may not be detected.**



In order to ensure that the safety light array fulfills its safety function reliably, the following requirements must be met through structural measures:

- It must not be possible to reach over, reach under, reach around or move the ESPE.
  - The arrangement of the emitter and receiver must ensure that persons or body parts are reliably detected if they enter the danger zone.
  - If it is possible for persons to be located between the safety field and the danger area, additional safety measures must be implemented (e.g. restart inhibit).
  - When installing the ESPE, it must be taken into account that the safety field width must not change when the ESPE is active.
  - Only mounting elements recommended by wenglor may be used for installation.
- 

### **DANGER!**

#### **Risk of safety device failure**

##### **Persons or body parts may not be detected or not detected in time if the instruction is not followed.**



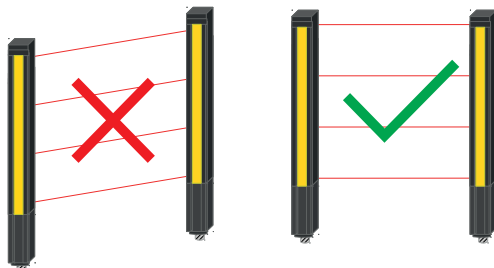
- The danger zone must be secured so that it is not possible to reach over, reach under, reach around or side-step.
  - Observe the calculated minimum distances for the ESPE.
-

## 7.1 Positioning the ESPE

The following points must be observed when aligning the ESPE:

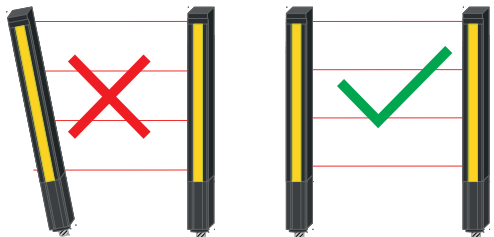
### Same mounting height

- The emitter and receiver must be mounted parallel to each other and at the same mounting height.



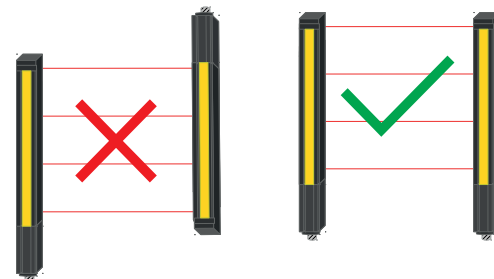
### Parallel alignment

- The emitter and receiver must be mounted so that a rectangular safety field is formed.



### Same alignment in relation to each other

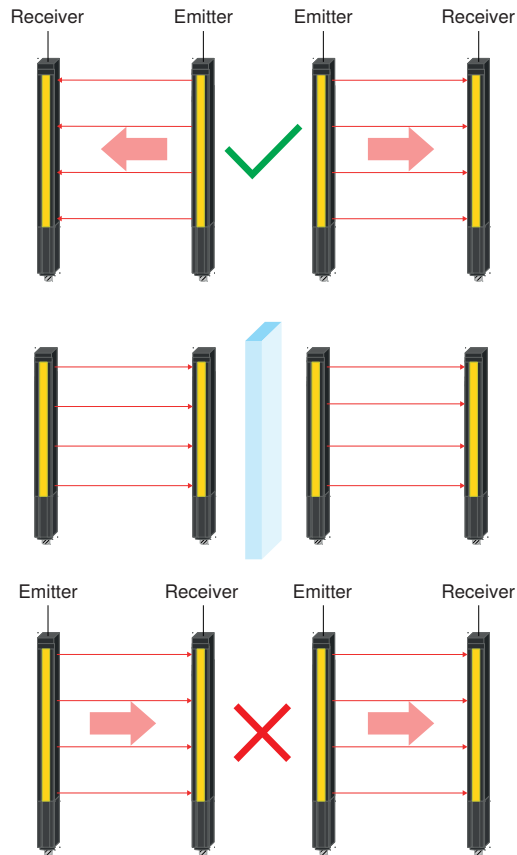
- The plug connectors of the emitter and receiver must point in the same direction.
- They must not be installed turned 180° away from each other.





Multiple systems must not influence each other

- 
- With multiple systems, it is important to ensure that a receiver is only reached by the light from the corresponding emitter.
- This can be guaranteed with the following measures:
  - Anti-parallel arrangement (see Fig.)
  - Shielding (e.g. with dividing walls, see Fig.)
  - Minimum distance at the side =  $2 \times m$  (see “5.1.4 Minimum Clearance to Reflective Surfaces” on page 42)
  - Different beam coding
- (see “5.2.3.4 Beam Coding” on page 47)



## 7.2 Installation with Mounting Bracket

- Protect the product from contamination during installation.
- Observe all applicable electrical and mechanical regulations, standards, and safety rules.
- Protect the product against mechanical influences.
- Make sure that the sensor is mounted in a mechanically secure fashion.
- Specified torque values must be complied with (see [“4.1 General Technical Data” on page 15](#)).
- Use suitable mounting technology in order to ensure correct installation (see [“4.5 Housing Dimensions, Mounting Technology” on page 21](#)).



### ATTENTION!

#### **Risk of property damage in case of improper installation!**

The product may be damaged.

- Comply with installation instructions.
- 

### 7.2.1 Installation with Mounting Bracket ZEFX001

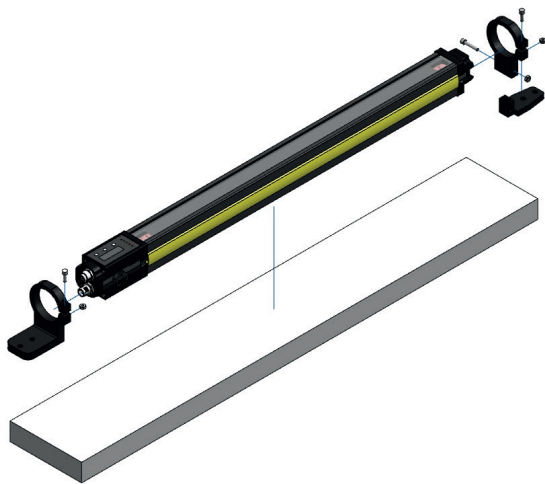


Figure 19: Installation with ZEFX001

7.2.2 Installation with Mounting Bracket ZEFX002

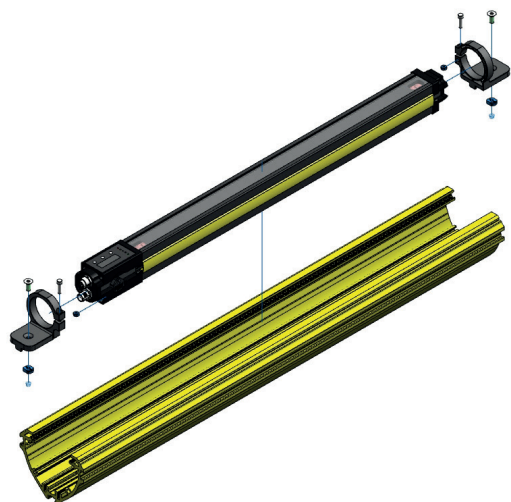


Figure 20: Installation with ZEFX002

7.2.3 Installation with Mounting Bracket ZEFX003

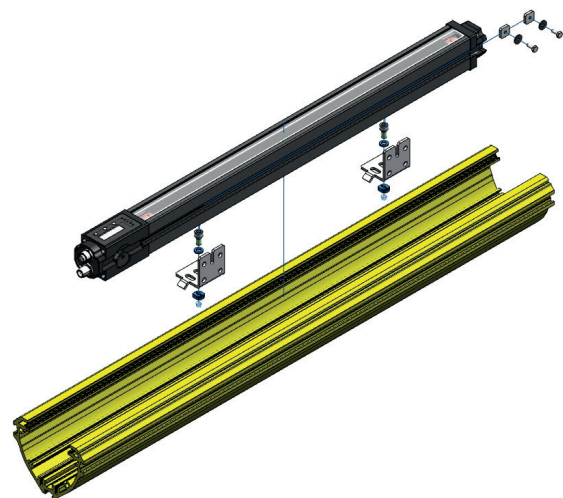


Figure 21: Installation with ZEFX003

## 7.2.4 Installation with Mounting Bracket ZEMX001

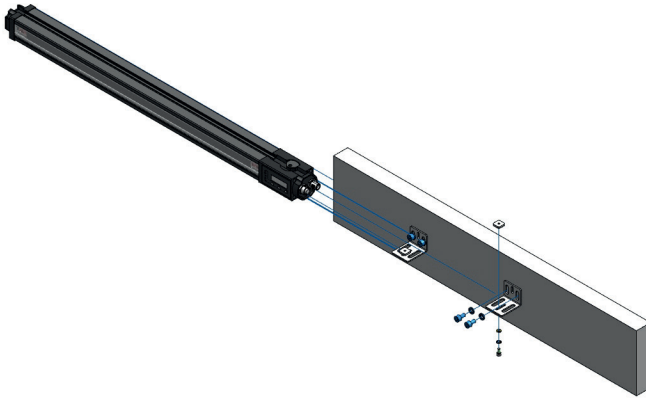


Figure 22: Installation with ZEMX001

## 7.2.5 Warning Strips

- Both the emitter and the receiver of the ESPE have a yellow warning strip in a side groove.
- If mounting is to take place over the side groove (see [section 7.2.2, page 87](#), [section 7.2.3, page 87](#), [section 7.2.4, page 88](#)), it may be positioned on the wrong side depending on the installation situation.
- To remove the warning strip or to mount it on the opposite side, proceed as follows:
  - Position a small screwdriver at the end of the warning strip and lever it carefully out of the groove.
  - When removing, ensure that no components of the ESPE are damaged to guarantee correct function.
  - To mount the warning strip, position it on the bottom end of the groove and click it in until it has engaged over the entire length of the safety field.
- During this process, ensure that the profile, control panel, indicator lamp or glass are not damaged mechanically.



Figure 23: Yellow warning strip

# 8. Electrical Connection

**DANGER!**  
**Hazardous machine state**



**Failure to comply poses risk of fatal injury!**

- No hazardous motions must be possible during installation, electrical connection and initial start-up.
- It is important to ensure that the OSSDs of the ESPE have no impact on the machine during installation, electrical connection and initial start-up.

**DANGER!**  
**Risk of safety device failure**



**Failure to comply poses risk of fatal injury!**

- Disconnect the machine from the power supply while carrying out the electrical installation! The machine could start up unintentionally while you are connecting the sensors.
- Both OSSD must be incorporated separately in the machine work circuit. They must not be connected with each other, as signal reliability cannot be guaranteed in this case.
- The downstream safe control must be able to process both OSSD signals separately.



**NOTE!**  
Functional earth can be optionally connected.

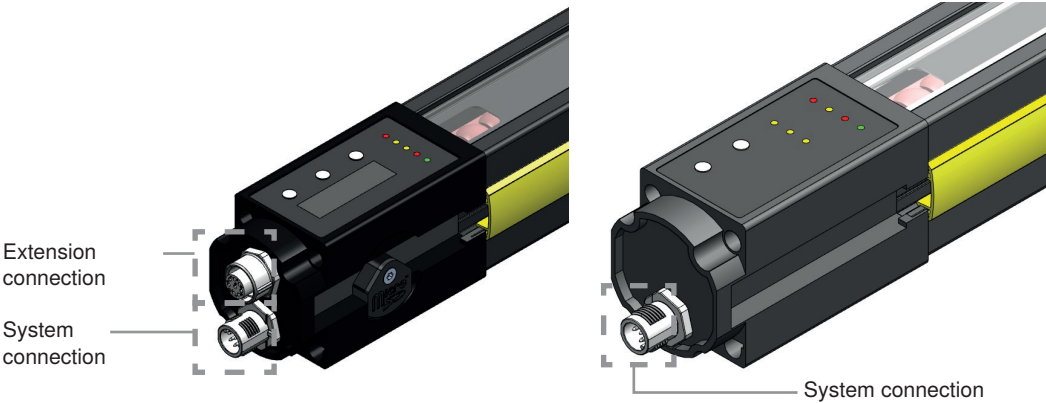
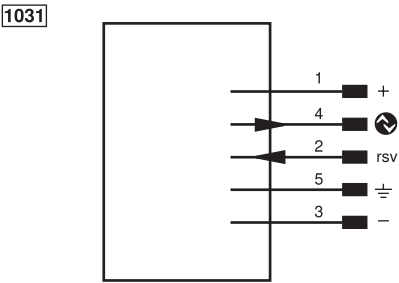
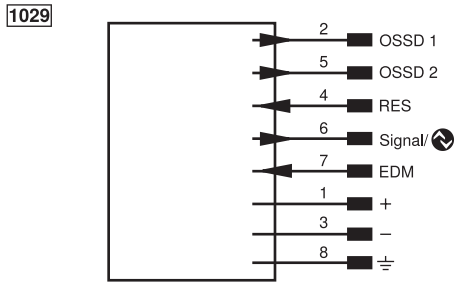


Figure 24: Connection assignment receiver SEFB muting

System connection

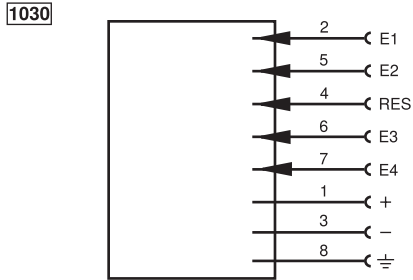
Receiver

Emitter



Extension connection (only with SEFB muting)

Receiver



- E1 (MS3 / belt stop / Full Muting Enable)
- E2 (MS4 / Muting Enable)
- E3 (MS1)
- E4 (MS2)
- RES / Override



**NOTE!**  
Pin 1 and Pin 3 on the extension connection are only intended for supplying muting sensors or cascaded receivers (see EN 61496-1, Paragraph 7 a).

The inputs of the extension connection have the following assignment with muting connection box ZFBB001:

| Input                       | Input E1                                               | Input E2                        | Input E3      | Input E4      | Input E5                        |
|-----------------------------|--------------------------------------------------------|---------------------------------|---------------|---------------|---------------------------------|
| Function                    | MS3 / MS3 / belt stop / Full Muting Enable / cascading | MS4 / Muting Enable / cascading | MS1           | MS2           | RES / override                  |
| Port connection box ZFBB001 | Port 1                                                 | Port 3                          | Port 2        | Port 4        | Port 6                          |
| Cross muting                | Belt stop* or Full Muting Enable*                      | Muting enable*                  | Muting sensor | Muting sensor | Acknowledgment RES and override |
| two sensor linear muting    | Belt stop* or Full Muting Enable*                      | Muting enable*                  | Muting sensor | Muting sensor | Acknowledgment RES and override |
| four sensor linear muting   | Muting sensor                                          | Muting sensor                   | Muting sensor | Muting sensor | Acknowledgment RES and override |

\*optional

Legend

|                                                                                    |                                            |
|------------------------------------------------------------------------------------|--------------------------------------------|
| +                                                                                  | Supply Voltage +                           |
| —                                                                                  | Supply Voltage 0 V                         |
| ~                                                                                  | Supply Voltage (AC Voltage)                |
| A                                                                                  | Switching Output (NO)                      |
| Ä                                                                                  | Switching Output (NC)                      |
| V                                                                                  | Contamination/Error Output (NO)            |
| ∇                                                                                  | Contamination/Error Output (NC)            |
| E                                                                                  | Input (analog or digital)                  |
| T                                                                                  | Teach Input                                |
| Z                                                                                  | Time Delay (activation)                    |
| S                                                                                  | Shielding                                  |
| RxD                                                                                | Interface Receive Path                     |
| TxD                                                                                | Interface Send Path                        |
| RDY                                                                                | Ready                                      |
| GND                                                                                | Ground                                     |
| CL                                                                                 | Clock                                      |
| E/A                                                                                | Output/Input programmable                  |
|  | IO-Link                                    |
| PoE                                                                                | Power over Ethernet                        |
| IN                                                                                 | Safety Input                               |
| QSSD                                                                               | Safety Output                              |
| Signal                                                                             | Signal Output                              |
| BL_D +/-                                                                           | Ethernet Gigabit bidirect. data line (A-D) |
| ENa <sup>EN5422</sup>                                                              | Encoder 0-pulse 0-0̄ (TTL)                 |

|        |                                |
|--------|--------------------------------|
| PT     | Platinum measuring resistor    |
| nc     | not connected                  |
| U      | Test Input                     |
| Ü      | Test Input inverted            |
| W      | Trigger Input                  |
| W—     | Ground for the Trigger Input   |
| O      | Analog Output                  |
| O—     | Ground for the Analog Output   |
| BZ     | Block Discharge                |
| AwV    | Valve Output                   |
| a      | Valve Control Output +         |
| b      | Valve Control Output 0 V       |
| SY     | Synchronization                |
| SY—    | Ground for the Synchronization |
| E+     | Receiver-Line                  |
| S+     | Emitter-Line                   |
| ±      | Grounding                      |
| SnR    | Switching Distance Reduction   |
| Rx +/- | Ethernet Receive Path          |
| Tx +/- | Ethernet Send Path             |
| Bus    | Interfaces-Bus A(+)/B(-)       |
| La     | Emitted Light disengageable    |
| Mag    | Magnet activation              |
| RES    | Input confirmation             |
| EDM    | Contactor Monitoring           |

|                                    |                     |
|------------------------------------|---------------------|
| EN <sup>AR5422</sup>               | Encoder A/Ä (TTL)   |
| EN <sup>BR5422</sup>               | Encoder B/B̄ (TTL)  |
| ENa                                | Encoder A           |
| ENb                                | Encoder B           |
| A <sub>MIN</sub>                   | Digital output MIN  |
| A <sub>MAX</sub>                   | Digital output MAX  |
| A <sub>OK</sub>                    | Digital output OK   |
| SY In                              | Synchronization In  |
| SY OUT                             | Synchronization OUT |
| OLt                                | Brightness output   |
| M                                  | Maintenance         |
| rsv                                | reserved            |
| Wire Colors according to IEC 60757 |                     |
| BK                                 | Black               |
| BN                                 | Brown               |
| RD                                 | Red                 |
| OG                                 | Orange              |
| YE                                 | Yellow              |
| GN                                 | Green               |
| BU                                 | Blue                |
| VT                                 | Violet              |
| GY                                 | Grey                |
| WH                                 | White               |
| PK                                 | Pink                |
| GNYE                               | Green/Yellow        |

# 9. Parameters Configuration

## 9.1 General

The parameters configuration of the ESPE can be carried out via:

- Keys on the emitter (see [section 9.3, page 92](#)) and receiver (see [section 9.4, page 95](#))
- IO-Link interface (see [section 9.6, page 121](#))

The following applies invariably:

- Parameter configuration is only possible after the password has been entered.
- The parameter configuration on the sensor has priority over parameter configuration via IO-Link.
- The OSSDs are off during parameter configuration.
- If no key input or input via the IO-Link interface is registered for 300 s, the sensor switches to safe state.
- The last selected setting resets contradictory settings.



**NOTE!**

- Changes to the configuration may only be made by authorized personnel.
- The required password must be managed with suitable security.



**DANGER!**

After changing the parameterization, the function of the ESPE must be checked, see [Section 10.4](#).

## 9.2 Preparation of the Parametrization

Before carrying out a new parameter configuration for an ESPE, the following preparations must be made:

- All new settings (e.g. contactor monitoring, range, beam coding, ...) must be planned and documented beforehand.
- A check must be carried out to ensure correct mounting and electrical connection of the ESPE.

## 9.3 Parametrization of the Emitter

The parameter configuration directly on the sensor takes place via the push buttons on the control panel.

| Emitter   |       |
|-----------|-------|
| Menu down | Apply |
|           |       |



**NOTE!**

If the parameter configuration is interrupted (e.g. due to an interruption in the power supply), this causes the newly selected settings to be lost. In this case, the most recently saved settings are active.



9.3.1 Default Settings

| Function    | Default settings |
|-------------|------------------|
| Beam coding | Coding OFF       |
| Range       | High Range       |

9.3.2 Calling up the Menu (User Level “Admin”)

- The configuration menu can be called up from the RUN mode, as well as from error mode.
- To prevent unintentional parameter configurations, the call-up of the configuration menu is divided into the following steps:
  1. Press and hold the “Menu down” key (⏮) until the red “ERROR” LED goes out. (approx. 2 s)
  2. Release the key and wait until the red “ERROR” LED lights up again. (approx. 2 s)
  3. As soon as the red “ERROR” LED lights up, press and hold the “Menu down” key (⏮) again until the red “ERROR” LED goes out. (approx. 2 s)
  4. Once the button is released, the settings will be called up (see [section 9.3.4, page 94](#)).

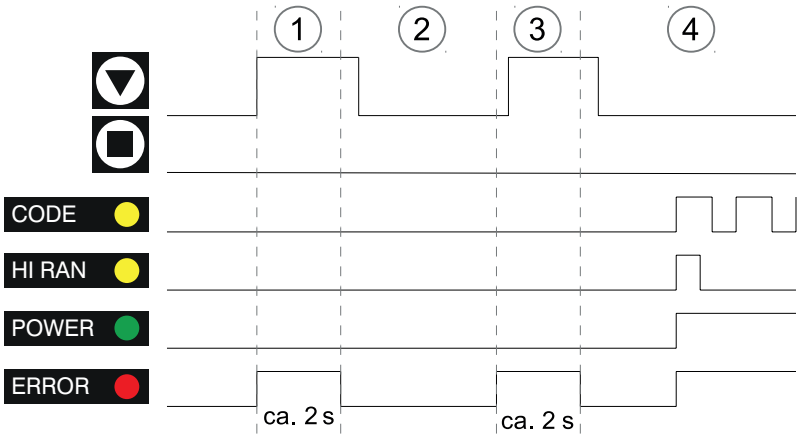
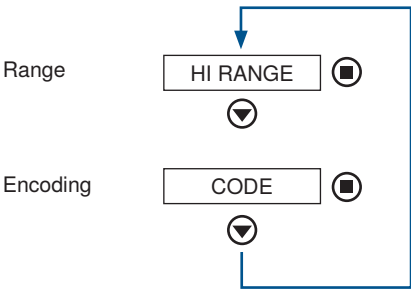


Figure 25: Timing diagram emitter for calling up the menu

9.3.3 Menu Structure

The menu is laid out as follows:



9.3.4 Parametrization of the Range and Coding

- The “Menu down” key (▼) can be used to switch between the two settings (range/coding).
- The “Apply” key (■) changes the setting within the menu item:
  - Range: Switch between low range and high range
  - Coding: Switch between coding ON and coding OFF
- The current set parameter configuration is indicated by different flashing frequencies:

|          | Display during parameter configuration         | Meaning    | Display during operation |
|----------|------------------------------------------------|------------|--------------------------|
| HI RANGE | Flashing, duty cycle 15 %<br>LED on<br>LED off | Low Range  | HI RAN                   |
|          | Flashing, duty cycle 85 %<br>LED on<br>LED off | High Range | HI RAN                   |
| CODE     | Flashing, duty cycle 15 %<br>LED on<br>LED off | Coding OFF | CODE                     |
|          | Flashing, duty cycle 85 %<br>LED on<br>LED off | Coding ON  | CODE                     |

- To apply the settings, both keys ([menu down ▼] and [apply ■]) must be pressed at the same time until the red “ERROR” LED goes out (approx. 2 s).
- By way of acknowledgment, all LEDs light up at the same time before the final setting is shown according to the status displays (section 11.1, page 131).
- If no acknowledgment takes place, the settings are dismissed and the most recent saved setting is applied again.

**NOTE!**

- When setting the beam coding, the parameters must be configured on both the emitter and receiver (see [section 9.5.4, page 102](#)).
- To deactivate the beam coding, it must be deactivated on both the emitter and receiver (see [section 9.5.4, page 102](#)).

## 9.4 Parametrization of the receiver with basic function (without display)

The parameter configuration directly on the sensor takes place via the push buttons on the control panel.

| Receiver  |       |
|-----------|-------|
| Menu down | Apply |
|           |       |

**NOTE!**

- If the parameter configuration is interrupted (e.g. due to an interruption in the power supply), this causes the newly selected settings to be lost. In this case, the most recently saved settings are active.
- If parameters configuration is started from an error state, all settings are reset (see [section 9.4.1, page 95](#)).

### 9.4.1 Default Settings

| Function              | Default settings |
|-----------------------|------------------|
| Restart inhibit       | Off              |
| Contacting monitoring | Off              |
| Beam coding           | Coding OFF       |

### 9.4.2 Calling up the Menu (User Level “Admin”)

- The configuration menu can be called up from the RUN mode, as well as from error mode.
- To prevent unintentional parameter configurations, the call-up of the configuration menu is divided into the following steps:

1. Press and hold the “Menu down” key () until the red “ERROR” LED goes out. (approx. 2 s)
2. Release the key and wait until the red “ERROR” LED lights up again. (approx. 2 s)
3. As soon as the red “ERROR” LED lights up, press and hold the “Menu down” key () again until the red “ERROR” LED goes out. (approx. 2 s)
4. Once the button is released, the settings will be called up (see [section 9.3.4, page 94](#)).

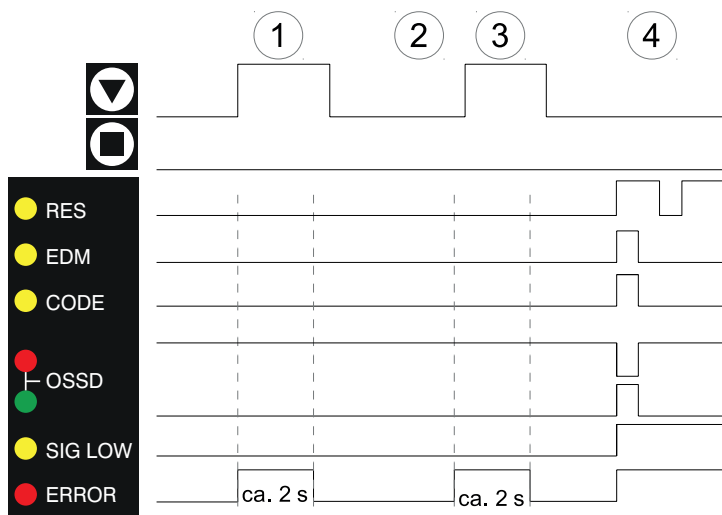
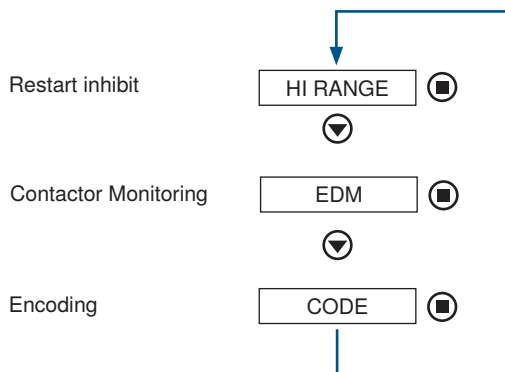


Figure 26: Timing diagram receiver for calling up the menu

### 9.4.3 Menu Structure

The menu is laid out as follows:



9.4.4 Parametrization of the Restart Inhibit, Contactor Monitoring and Coding

- The “Menu down” key (⏮) can be used to switch between the settings.
- The “Apply” key (⏹) changes the setting within the menu item:
  - Restart inhibit: Switch between restart inhibit and contactor monitoring
  - Contactor monitoring: Switch between contactor monitoring ON and contactor monitoring OFF
  - Coding: Switch between coding ON and coding OFF
- The current set parameter configuration is indicated by different flashing frequencies:

|      | Display during parameter configuration                                                                                            | Meaning                                           | Display during operation                                                                |
|------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------|
| RES  | Flashing, duty cycle 15 %<br>LED on<br>LED off   | Restart inhibit OFF<br>(safety operating mode ON) | RES    |
|      | Flashing, duty cycle 85 %<br>LED on<br>LED off   | Restart inhibit ON                                | RES    |
| EDM  | Flashing, duty cycle 15 %<br>LED on<br>LED off   | Contactor monitoring OFF                          | EDM    |
|      | Flashing, duty cycle 85 %<br>LED on<br>LED off   | Contactor monitoring ON                           | EDM    |
| CODE | Flashing, duty cycle 15 %<br>LED on<br>LED off   | Coding OFF                                        | CODE   |
|      | Flashing, duty cycle 85 %<br>LED on<br>LED off  | Coding ON                                         | CODE  |

- To apply the settings, both keys (⏮ and ⏹) must be pressed at the same time until the red “ERROR” LED goes out (approx. 2 s).
- By way of acknowledgment, all LEDs light up at the same time before the final setting is shown according to the status displays (section 11.1.1, page 131).
- If no acknowledgment takes place, the settings are dismissed and the most recent saved setting is applied again.

NOTE!



- When setting the beam coding, the parameters must be configured on both the emitter and receiver (see section 9.5.4, page 102).
- To deactivate the beam coding, it must be deactivated on both the emitter and receiver (see section 9.5.4, page 102).

## 9.5 Parametrization of the receiver with muting (with display)

The parameter configuration directly on the sensor takes place via the push buttons on the control panel.

| Receiver                                                                          |                                                                                   |                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Menu down                                                                         | Menu up                                                                           | Apply                                                                             |
|  |  |  |

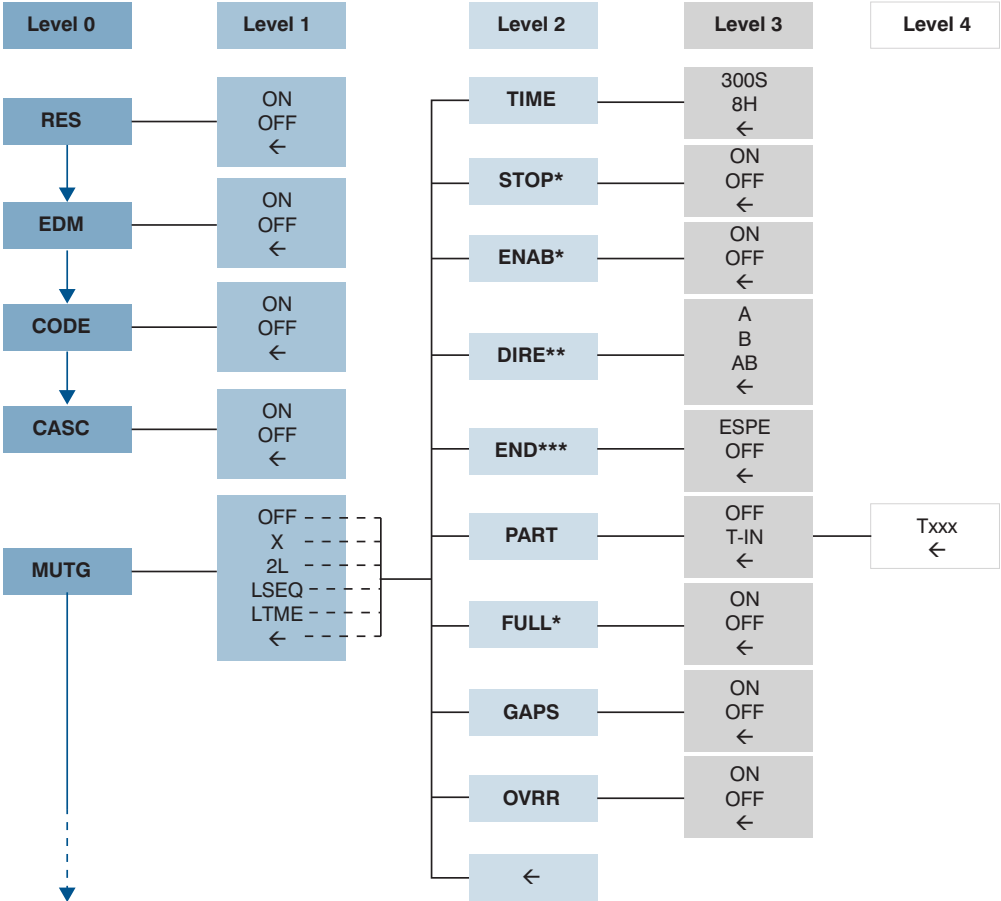
**NOTE!**



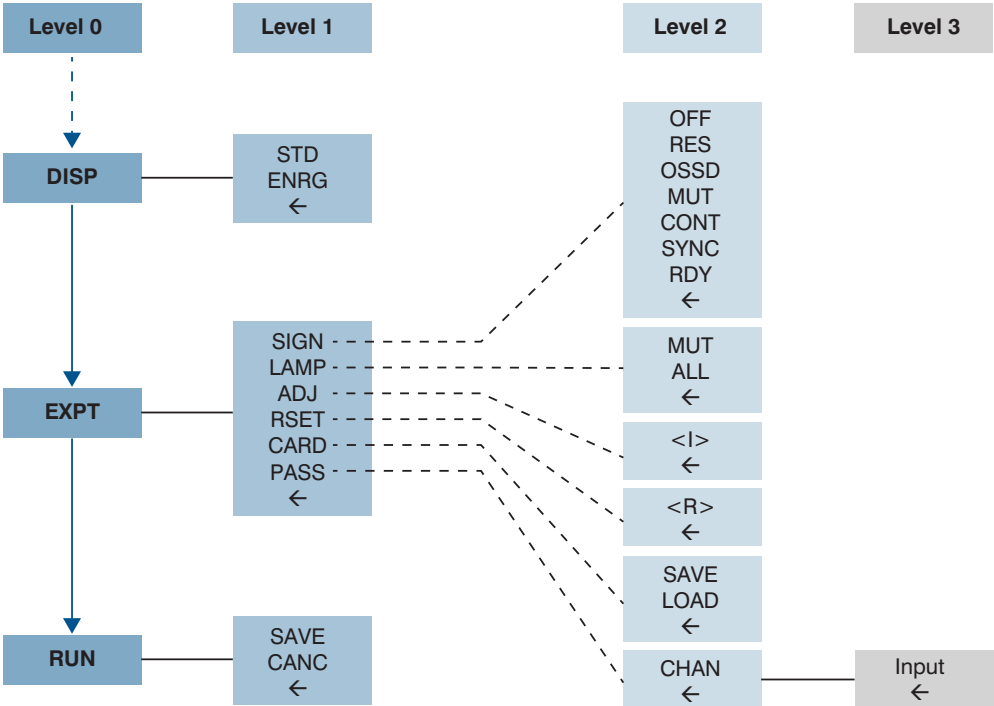
- If the parameter configuration is interrupted (e.g. due to an interruption in the power supply), this causes the newly selected settings to be lost. In this case, the most recently saved settings are active.
- To save changes to the parameter configuration permanently, the save function (see [section 9.4.12, page 151](#)) must be used to write them to the device memory via RUN → SAVE. Otherwise, the changes will be lost when the device is restarted.

### 9.5.1 Default Settings

| Function                                  | Default settings                                |
|-------------------------------------------|-------------------------------------------------|
| Restart inhibit                           | Off (safety operating mode / automatic restart) |
| Contactor Monitoring                      | Off                                             |
| Beam coding                               | Off                                             |
| Cascading                                 | Off                                             |
| Muting                                    | Off                                             |
| When muting is activated:                 |                                                 |
| • Muting duration                         | 300 s                                           |
| • Belt stop function                      | Off                                             |
| • Muting enable                           | Off                                             |
| • Direction setting                       | Off                                             |
| • Muting end through clearing of the ESPE | Off                                             |
| • Partial muting                          | Off                                             |
| • Full Muting Enable                      | Off                                             |
| • Gap suppression                         | Off                                             |
| • Override                                | Off                                             |
| Display and expert menu:                  |                                                 |
| Display                                   | Energy saving mode                              |
| Signal output                             | Acknowledgment prompt restart inhibit           |
| Indicator lamp                            | Muting                                          |
| Password protection                       | Active, 0000                                    |



|             |                       |             |                                                 |             |                                      |             |                                      |
|-------------|-----------------------|-------------|-------------------------------------------------|-------------|--------------------------------------|-------------|--------------------------------------|
| <b>RES</b>  | Restart inhibit       | <b>X</b>    | Cross muting                                    | <b>TIME</b> | Muting duration                      | <b>300S</b> | 300 seconds                          |
| <b>EDM</b>  | Contactors monitoring | <b>2L</b>   | Two sensor linear muting                        | <b>STOP</b> | Belt stop                            | <b>8H</b>   | 8 hours                              |
| <b>CODE</b> | Beam coding           | <b>LSEQ</b> | four sensor linear muting (sequence monitoring) | <b>ENAB</b> | Muting enable                        | <b>A</b>    | Direction setting A                  |
| <b>CASC</b> | Cascading             | <b>LTME</b> | four sensor linear muting (time monitoring)     | <b>DIRE</b> | Direction settings                   | <b>B</b>    | Direction setting B                  |
| <b>MUTG</b> | Muting                |             |                                                 | <b>END</b>  | End of muting upon clearing the ESPE | <b>ESPE</b> | End of muting upon clearing the ESPE |
|             |                       |             |                                                 | <b>PART</b> | Partial muting                       | <b>T-IN</b> | Teach-in                             |
|             |                       |             |                                                 | <b>FULL</b> | Full Muting Enable                   |             |                                      |
|             |                       |             |                                                 | <b>GAPS</b> | Gap suppression                      | <b>Txxx</b> | Value display Teach-in               |
|             |                       |             |                                                 | <b>OVRR</b> | Override                             |             |                                      |
| <b>ON</b>   | Switch on             | *           | Not with LSEQ and LTME                          |             |                                      |             |                                      |
| <b>OFF</b>  | Switch off            | **          | Not with X and 2L                               |             |                                      |             |                                      |
| <b>←</b>    | Back                  | ***         | Not with 2L                                     |             |                                      |             |                                      |

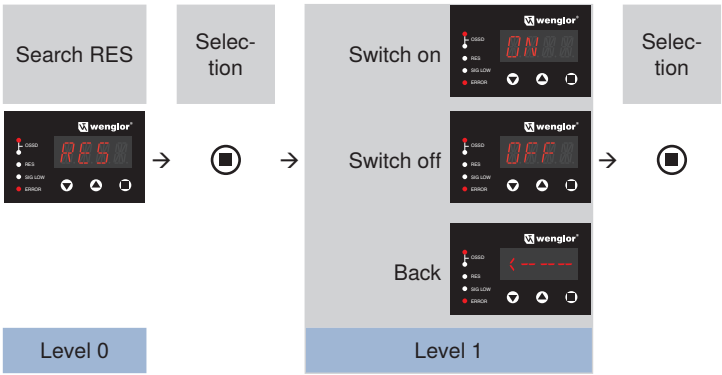


|             |             |             |                                            |                  |                                                         |
|-------------|-------------|-------------|--------------------------------------------|------------------|---------------------------------------------------------|
| <b>DISP</b> | Display     | <b>STD</b>  | Standard                                   | <b>RES</b>       | Acknowledgment prompt                                   |
| <b>EXPT</b> | Expert Menu | <b>ENRG</b> | Energy saving mode                         | <b>OSSD</b>      | OSSD                                                    |
| <b>RUN</b>  | Run         | <b>SIGN</b> | Signal output                              | <b>MUT</b>       | Muting active                                           |
|             |             | <b>LAMP</b> | Indicator lamp                             | <b>CONT</b>      | Weak signal/contamination                               |
|             |             | <b>ADJ</b>  | Signal strength display                    | <b>SYNC</b>      | Synchronization run                                     |
|             |             | <b>RSET</b> | Reset to default settings                  | <b>RDY</b>       | Ready state                                             |
|             |             | <b>CARD</b> | Access microSD                             | <b>ALL</b>       | Muting- + OSSD display                                  |
|             |             | <b>PASS</b> | Set password                               | <b>&lt;I&gt;</b> | Intensity                                               |
|             |             | <b>SAVE</b> | Save parameter configuration on the device | <b>&lt;R&gt;</b> | Reset                                                   |
|             |             | <b>CANC</b> | Reject changes                             | <b>SAVE</b>      | Save device parameter configuration to memory card      |
| <b>OFF</b>  | Switch off  |             |                                            | <b>LOAD</b>      | Copy parameter configuration from memory card to device |
| <b>←</b>    | Back        |             |                                            | <b>CHAN</b>      | Changing password                                       |



### 9.5.2 Parametrization of the Restart Inhibit (RES)

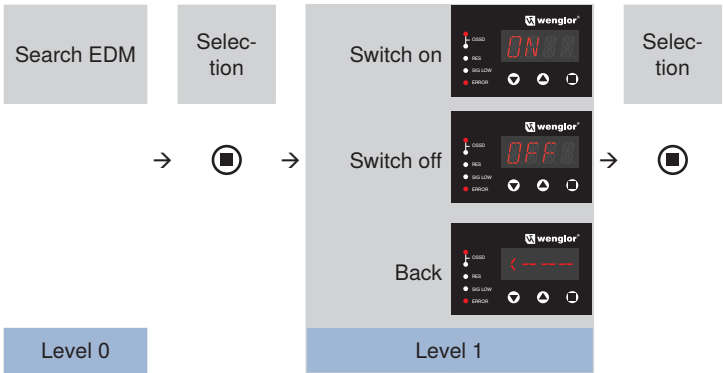
- For more information on the restart inhibit function, see Section “5.2.3.2 Start-Up Disabling and Restart Inhibit (RES)” on page 46.
- The following steps are used for activation or deactivation:



- Acknowledge the RES mode by pressing the key
- Choose from “ON”, “OFF” and “<— —” using the or key.  
The parameters to be selected are shown flashing.
- Acknowledge the selection by pressing the key.
- A selected parameter is displayed for approx. 2 s, before the display switches back to the upstream level.

### 9.5.3 Parametrization of the Contactor Monitoring (EDM)

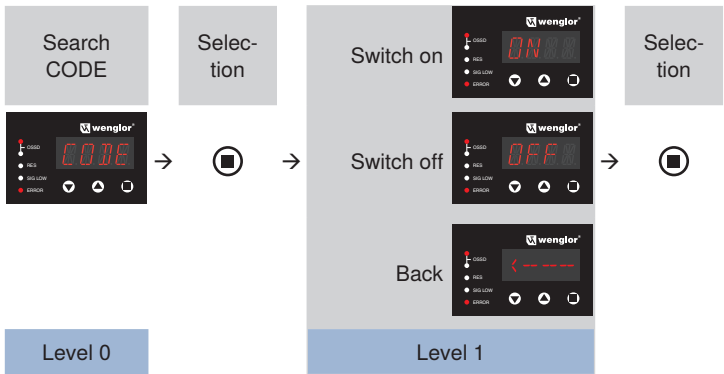
- For more information on the contactor monitoring function, see section 5.2.3.3, page 53.
- The following steps are used for activation or deactivation:



1. Acknowledge the EDM mode by pressing the  key
2. Choose from "ON", "OFF" and "<---" using the  or  key.  
The parameters to be selected are shown flashing.
3. Acknowledge the selection by pressing the  key.
4. A selected parameter is displayed for approx. 2 s, before the display switches back to the upstream level.

### 9.5.4 Parametrization of the Beam Coding (CODE)

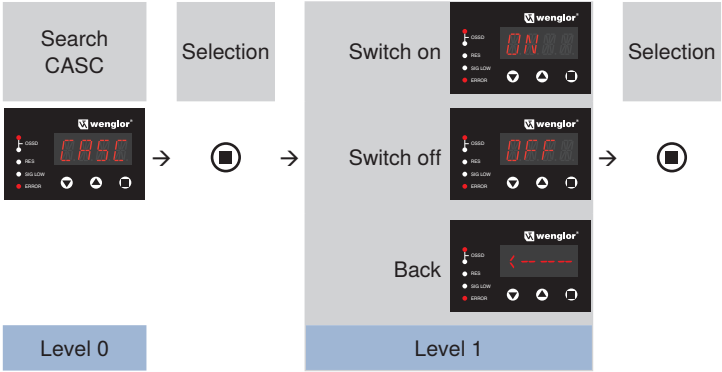
- For more information on the beam coding function, see [section 5.2.3.4, page 53](#).
- If beam coding is used in combination with blanking operating modes and partial muting, beam coding must first be taught in. Blanking or muting objects can then be taught in during an additional parameters configuration procedure.
- The following steps are used for activation or deactivation:



1. Acknowledge the CODE mode by pressing the  key
2. Choose from "ON", "OFF" and "<---" using the  or  key.  
The parameters to be selected are shown flashing.
3. Acknowledge the selection by pressing the  key.
4. A selected parameter is displayed for approx. 2 s, before the display switches back to the upstream level.

### 9.5.5 Parametrization Cascading (CASC)

- For more information on the cascading function, see [section 5.2.3.6, page 49](#).
- The following steps are used for activation or deactivation:



1. Acknowledge the CASC mode by pressing the key.
2. Choose from "ON", "OFF" and "<---" using the or key.  
The parameters to be selected are shown flashing.
3. Acknowledge the selection by pressing the key.
4. A selected parameter is displayed for approx. 2 s, before the display switches back to the upstream level.

**NOTE!**

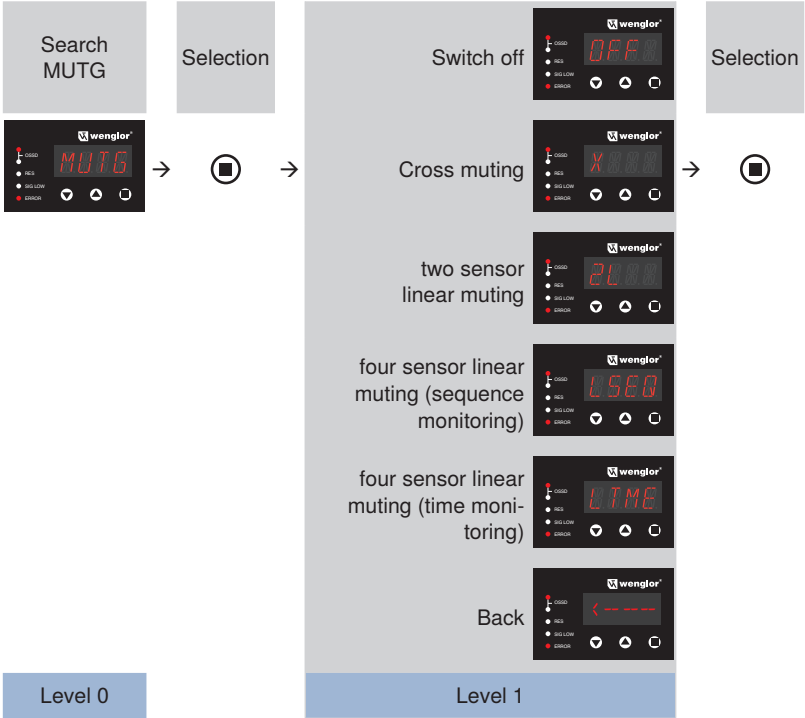
Activating the cascading function deactivates:

- four sensor linear muting,
- Muting enable,
- Belt stop,
- Full Muting Enable.



### 9.5.6 Parametrization Muting (MUTG)

- For more information on the muting function, see [section 5.2.4, page 52](#).
- The following steps are used for activation or deactivation:



1. Acknowledge the MUTG mode by pressing the  key
2. Choose from "OFF", "X", "2L", "LSEQ", "LTME" and "<---" using the  or  key.  
The parameters to be selected are shown flashing.
3. Acknowledge the selection by pressing the  key.
4. A selected parameter is displayed for approx. 2 s, before the display switches to the next level.

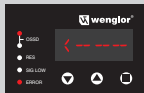
The parameter configuration of the different muting functions is described in more detail in the following sections.



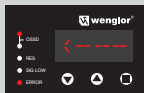
**NOTE!**  
If muting is activated (regardless of the selected muting type), restart inhibit RES is activated automatically.

9.5.6.1 Parametrization Cross Muting (X)

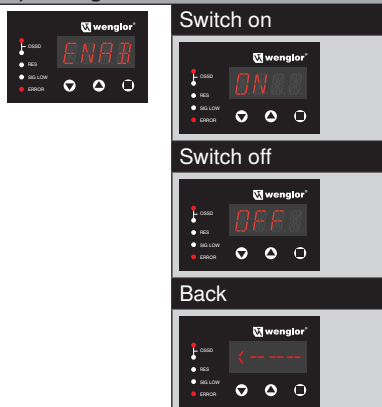
- For general information on the cross muting function, see [section 5.2.4.3, page 55](#).
- All settings under the muting function must be carried out in one go. If the cross muting menu item is called up again, the parameter configurations must be set again for the desired options.
- The following selection options are available for cross muting:

| a) Timeout / muting duration                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | <div>300 sec:</div>  <ul style="list-style-type: none"><li>• There is a time limit on the maximum duration of an active muting sequence. There are two values to choose from.<ul style="list-style-type: none"><li>– 300S: Muting duration max. 300 s</li><li>– 8H: Muting duration max. 8h</li></ul></li><li>• For more information on the “muting duration” function, see <a href="#">section 5.2.4.7.2, page 66</a>.</li></ul> |
| <div>8 hours</div>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <div>Back</div>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

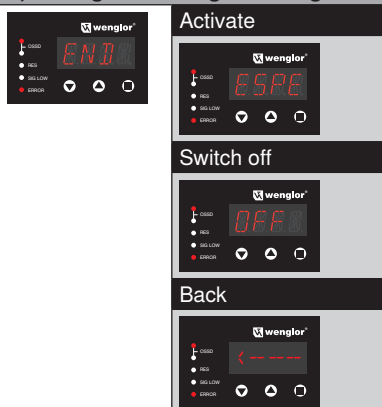
| b) Belt stop                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | <div>Switch on</div>  <ul style="list-style-type: none"><li>• The “belt stop” function stops the monitored muting counter for as long as a valid signal is present. This means that the muting duration can be extended in the event of process-related malfunctions.<ul style="list-style-type: none"><li>– ON: Belt stop activated</li><li>– OFF belt stop deactivated</li></ul></li><li>• For more information on the “belt stop” function, see <a href="#">section 5.2.4.7.3, page 67</a></li></ul> |
| <div>Switch off</div>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <div>Back</div>        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

### c) Muting enable



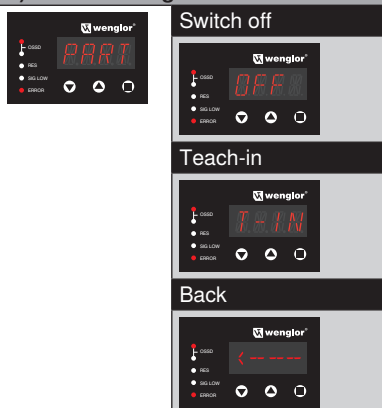
- The muting can be enabled or blocked using the external Muting Enable signal.
  - ON: Muting enable activated. The input is evaluated and is required for initiating muting.
  - OFF: Muting enable input deactivated. The input is not evaluated. Muting can be initiated via a valid sequence.
- For more information on the “Muting Enable” function, see [section 5.2.4.7.4, page 68](#).

### d) Muting end through clearing of the ESPE



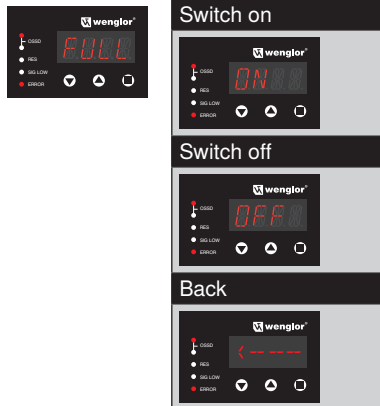
- The “Muting end through clearing of the ESPE” function determines which signal initiates the end of the muting process.
  - ESPE: Muting is ended immediately after the safety field is freed.
  - OFF: Muting is ended once the valid sequence (MS or set time) is complete
- For more information on the “Muting end through clearing of the ESPE” function, see [section 5.2.4.7.6, page 69](#).

### e) Partial muting



- The “partial muting” function limits the impact of muting to a partial area of the safety field.
  - OFF: No partial muting.
  - T-IN: Teach-in the relevant muting area.
    - To do this, move an object of the desired size into the safety field.
    - The display T000 shows the number of beams currently blocked (e.g. T004 → 4 beams)
    - 1 beam is automatically added to the actual object size at the ends of the area to increase the availability through potential tolerances.
    - If no beam was blocked during the teach process, the parameter configuration is not applied.
- For more information on the “partial muting” function, see [section 5.2.4.7.7, page 70](#).

## f) Full Muting Enable



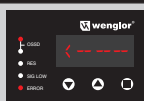
Switch on



Switch off

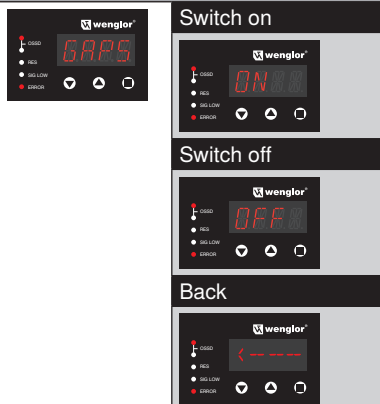


Back

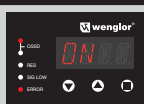


- The “Full Muting Enable” function is suitable for use, in conjunction with “partial muting”, for applications where the object height varies.
  - ON: Partial muting is lifted when a signal is applied and muting acts on the entire safety field height.
  - OFF: Partial muting is active without changes to the safety field height.
- This function should only be used if “Partial Muting” was activated beforehand.
- For more information on the “Full Muting Enable” function, see [section 5.2.4.7.8, page 71](#).

## g) Gap suppression



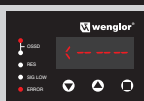
Switch on



Switch off

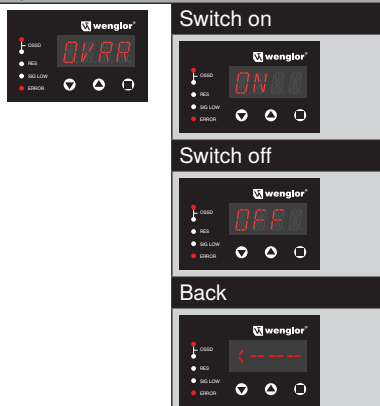


Back



- For transport items with gaps, brief interruptions in the muting signal are to be expected. The “gap suppression” function prevents this from ending the muting function.
  - ON: The muting signals (MS1...MS4) are delayed by 250ms.
  - OFF: No muting signal delay
- For more information on the “gap suppression” function, see [section 5.2.4.7.9, page 72](#).

## h) Override



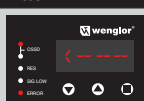
Switch on



Switch off



Back



- The “override” function enables the OSSDs to be enabled if a penetration of the safety field is detected and the muting sequence is not valid.
- This can be necessary if a valid muting sequence is interrupted (due to a conveyor belt stop, for example).
  - ON: Override activated.
  - OFF: Override deactivated.
- For more information on the “override” function, see [section 5.2.4.7.10, page 72](#).

## NOTE!

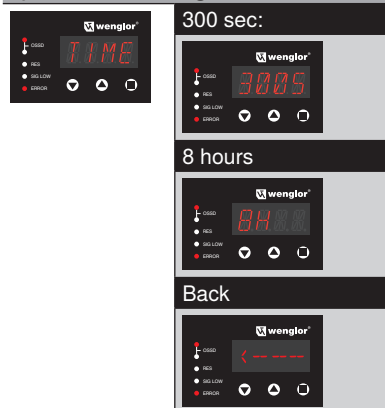
- Activating the cross muting function deactivates:
  - Two sensor linear muting,
  - four sensor linear muting,
  - Direction setting
- Activating belt stop deactivates Full Muting Enable.
- Activating Full Muting Enable also deactivates belt stop.



### 9.5.6.2 Parametrization Two Sensor Linear Muting (2L)

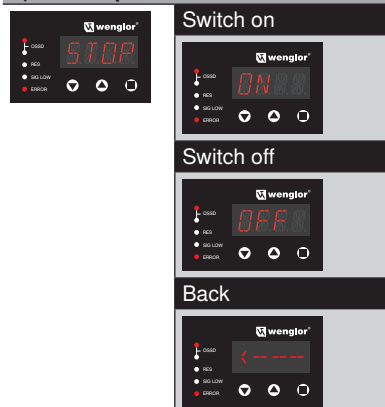
- For general information on the two sensor linear muting function, see [section 5.2.4.4, page 58](#).
- All settings under the muting function must be carried out in one go. If the two sensor linear muting menu item is called up again, the parameter configurations must be set again for the desired options.
- The following selection options are available for two sensor linear muting:

#### a) Timeout / muting duration



- There is a time limit on the maximum duration of an active muting sequence. There are two values to choose from.
  - 300S: Muting duration max. 300 s
  - 8H: Muting duration max. 8h
- For more information on the “muting duration” function, see [section 5.2.4.7.2, page 66](#).

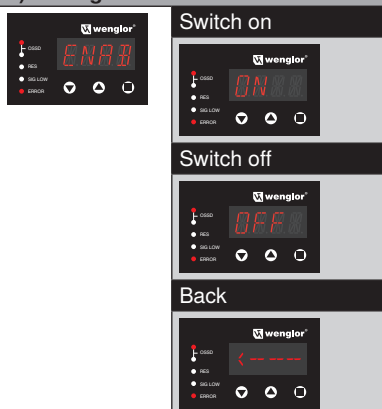
#### b) Belt stop



- The “belt stop” function stops the monitored muting counter for as long as a valid signal is present. This means that the muting duration can be extended in the event of process-related malfunctions.
  - ON: Belt stop activated
  - OFF belt stop deactivated
- For more information on the “belt stop” function, see [section 5.2.4.7.3, page 67](#).



### c) Muting enable



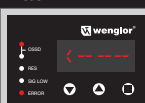
Switch on



Switch off

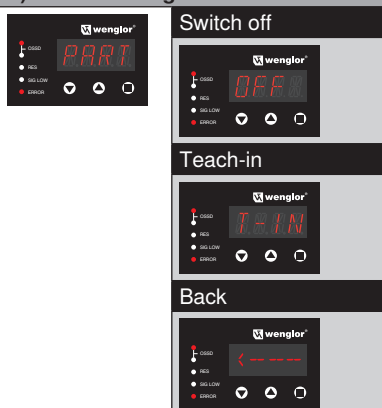


Back



- The muting can be enabled or blocked using the external Muting Enable signal.
  - ON: Muting enable activated. The input is evaluated and is required for initiating muting.
  - OFF: Muting enable input deactivated. The input is not evaluated. Muting can be initiated via a valid sequence.
- For more information on the “Muting Enable” function, see [section 5.2.4.7.4, page 68](#).

### d) Partial muting



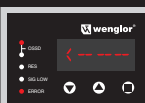
Switch off



Teach-in

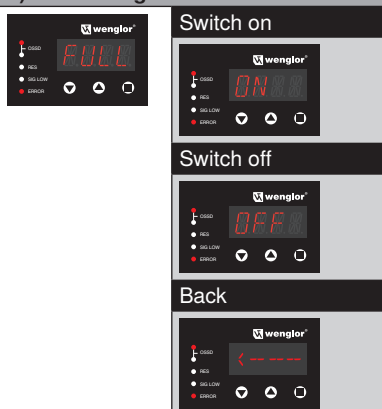


Back



- The “partial muting” function limits the impact of muting to a partial area of the safety field.
  - OFF: No partial muting.
  - T-IN: Teach-in the relevant muting area.
    - To do this, move an object of the desired size into the safety field
- The display T000 shows the number of beams currently blocked (e.g. T004 → 4 beams)
- 1 beam is automatically added to the actual object size at the ends of the area to increase the availability through potential tolerances.
- If no beam was blocked during the teach process, the parameter configuration is not applied.
- For more information on the “partial muting” function, see [section 5.2.4.7.7, page 70](#).

### e) Full Muting Enable



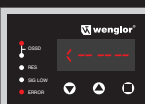
Switch on



Switch off

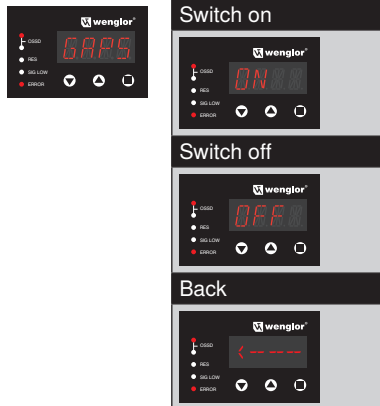


Back



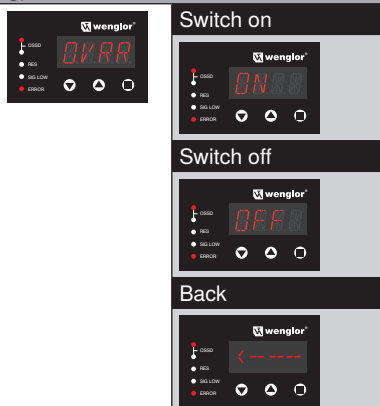
- The “Full Muting Enable” function is suitable for use, in conjunction with “partial muting”, for applications where the object height varies.
  - ON: Partial muting is lifted when a signal is applied and muting acts on the entire safety field height.
  - OFF: Partial muting is active without changes to the safety field height.
- This function should only be used if “Partial Muting” was activated beforehand.
- For more information on the “Full Muting Enable” function, see [section 5.2.4.7.8, page 71](#).

## f) Gap suppression



- For transport items with gaps, brief interruptions in the muting signal are to be expected. The “gap suppression” function prevents this from ending the muting function.
  - ON: The muting signals (MS1...MS4) are delayed by 250 ms.
  - OFF: No muting signal delay
- For more information on the “gap suppression” function, see [section 5.2.4.7.9, page 72](#).

## g) Override



- The “override” function enables a stopped object to be removed from the muting area.
- This can be necessary if a valid muting sequence is interrupted (due to a conveyor belt stop, for example).
  - ON: Override activated.
  - OFF: Override deactivated.
- For more information on the “override” function, see [section 5.2.4.7.10, page 72](#).

### NOTE!

- Activating the two sensor linear muting function deactivates:
  - Cross muting
  - Four sensor linear muting,
  - Direction setting,
  - Muting end through ESPE
- Activating belt stop deactivates Full Muting Enable.

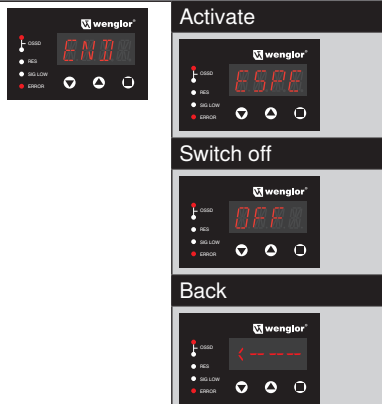


- For general information on four sensor linear muting with sequence monitoring, see [section 5.2.4.5, page 60](#) , or [section 5.2.4.6, page 63](#) for four sensor linear muting with time monitoring.
- All settings under the muting function must be carried out in one go. If the four sensor linear muting menu item is called up again, the parameter configurations must be set again for the desired options.
- The following selection options are available for four sensor linear muting:

- There is a time limit on the maximum duration of an active muting sequence. There are two values to choose from.
  - 300S: Muting duration max. 300 s
  - 8H: Muting duration max. 8 h
- For more information on the “muting duration” function, see [section 5.2.4.7.2, page 66](#).

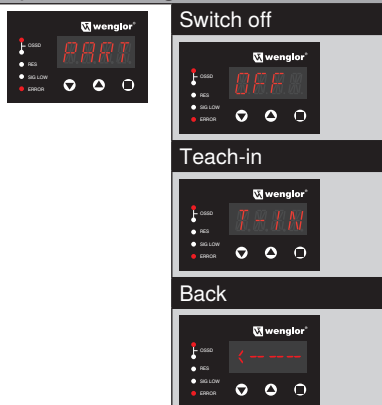
- The “direction setting” function specifies and checks the permissible activation sequence of the muting signals.
- If an object passes through the safety field in a direction other than the one defined, the muting cycle is not initiated.
  - A: unidirectional – only direction A is permitted (MS1 / MS2 before MS3 / MS4)
  - B: unidirectional – only direction B is permitted (MS4 / MS3 before MS2 / MS1)
  - AB: bidirectional – both directions are permitted
- For more information on the “direction setting” function, see [section 5.2.4.7.5, page 69](#).

### c) Muting end through clearing of the ESPE



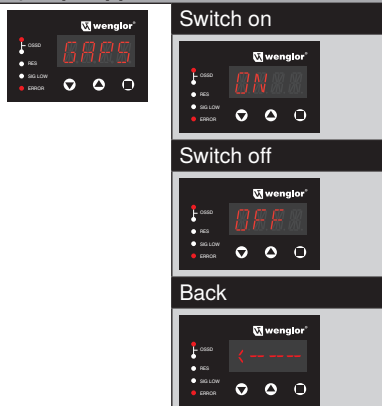
- The “Muting end through clearing of the ESPE” function determines which signal initiates the end of the muting process.
  - ESPE: Muting is ended immediately after the safety field is cleared.
  - OFF: Muting is ended once the valid sequence (MS or set time) is complete
- For more information on the “Muting end through clearing of the ESPE” function, see [section 5.2.4.7.6, page 69](#).

### d) Partial muting



- The “partial muting” function limits the impact of muting to a partial area of the safety field.
  - OFF: No partial muting.
  - T-IN: Teach-in the relevant muting area.
    - To do this, move an object of the desired size into the safety field.
    - The display T000 shows the number of beams currently blocked (e.g. T004 → 4 beams)
    - 1 beam is automatically added to the actual object size at the ends of the area to increase the availability through potential tolerances.
    - If no beam was blocked during the teach process, the parameter configuration is not applied.
- For more information on the “partial muting” function, see [section 5.2.4.7.7, page 70](#).

### e) Gap suppression



- For transport items with gaps, brief interruptions in the muting signal are to be expected. The “gap suppression” function prevents this from ending the muting function.
  - ON: The muting signals (MS1...MS4) are delayed by 250 ms.
  - OFF: No muting signal delay
- For more information on the “gap suppression” function, see [section 5.2.4.7.9, page 72](#).

## f) Override



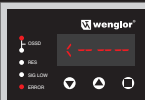
### Switch on



### Switch off



### Back



- The “override” function enables a stopped object to be removed from the muting area.
- This can be necessary if a valid muting sequence is interrupted (due to a conveyor belt stop, for example).
  - ON: Override activated.
  - OFF: Override deactivated.
- For more information on the “override” function, see [section 5.2.4.7.10, page 72](#).

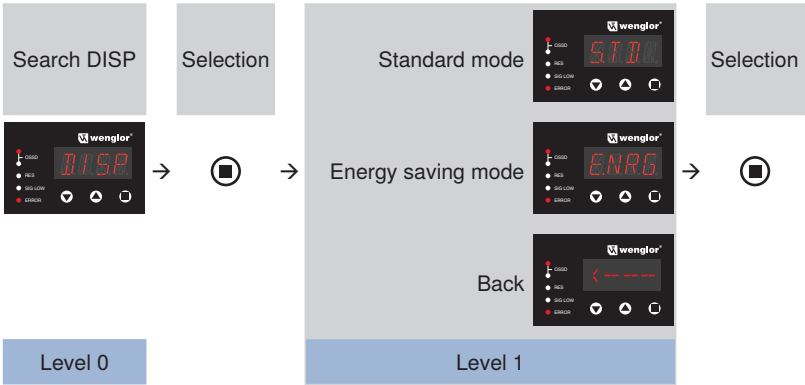
## NOTE!

- Activating the four sensor linear muting function deactivates:
  - Cross muting,
  - two sensor linear muting,
  - Muting enable,
  - Belt stop,
  - Full Muting Enable.



### 9.5.7 Setting the Display (DISP)

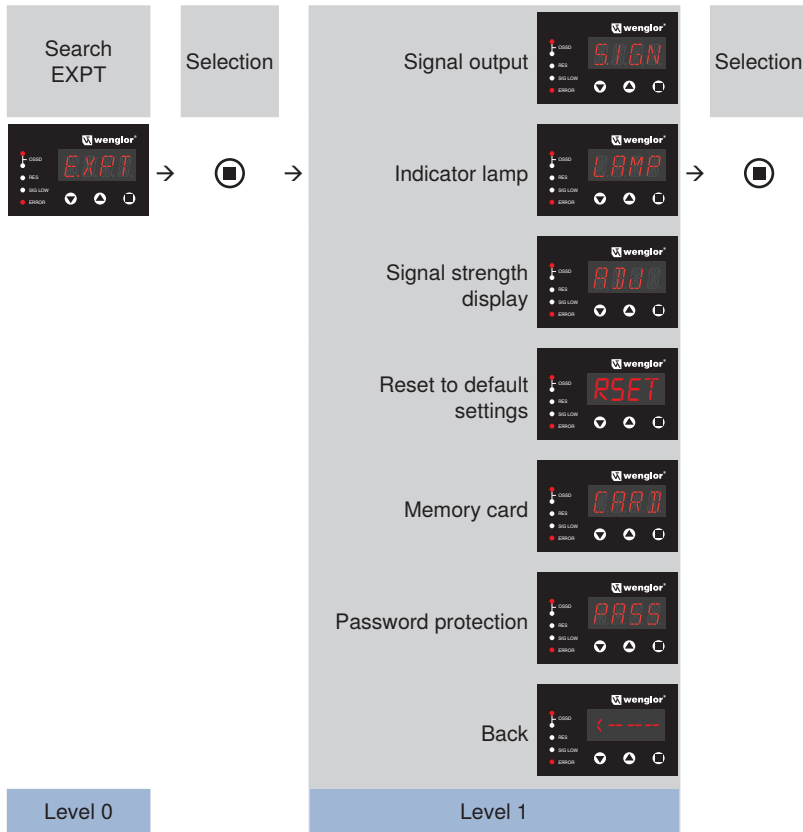
- The display can be operated in either standard mode or energy saving mode.
- The setting is carried out in the following steps:



1. Acknowledge the DISP mode by pressing the  key
2. Choose from "STD", "ENRG" and "<---" using the  or  key.  
The parameters to be selected are shown flashing.
3. Acknowledge the selection by pressing the  key.
4. A selected parameter is displayed for approx. 2 s, before the display switches back to the upstream level.

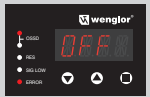
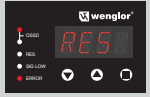
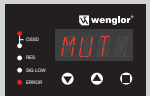
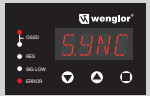
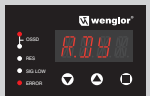
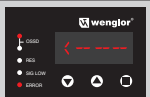
## 9.5.8 Expert Menu (EXPT)

- Advanced settings can be made in the expert menu.
- The setting is carried out in the following steps:



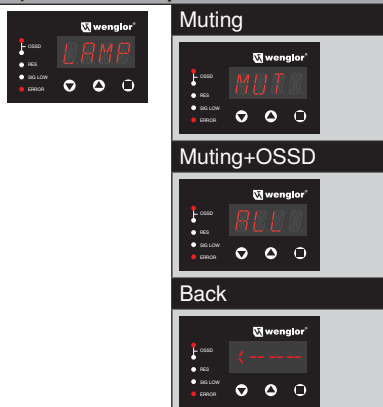
1. Acknowledge the EXPT mode by pressing the  key
2. Choose from "SIGN", "LAMP", "ADJ", "RSET", "CARD", "PASS" and "<---" using the  or  key.  
The parameters to be selected are shown flashing.
3. Acknowledge the selection by pressing the  key.
4. A selected parameter is displayed for approx. 2 s, before the display switches to the next level.

The parameter configuration of the different expert settings is described in the following table:

| a) Signal output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <div>Deactivate</div>  <div>Acknowledgment prompt</div>  <div>OSSD</div>  <div>Muting</div>  <div>Weak signal/ Contamination</div>  <div>Synchronous run</div>  <div>Ready for operation</div>  <div>Back</div>  |
| <ul style="list-style-type: none"><li>• Pin 6 of the IO-Link output is on the system connection of the receiver. If IO-Link communication is not active, this output can alternatively be used as a signal output.<ul style="list-style-type: none"><li>– OFF: Output deactivated</li><li>– RES: Acknowledgment prompt</li><li>– OSSD: OSSD switching states</li><li>– MUT: Muting status</li><li>– CONT: Contamination warning</li><li>– SYNC: Synchronous run</li><li>– RDY: Signals that the ESPE is ready for operation.</li></ul></li><li>• For more information on the signal output, see <a href="#">section 5.2.5.3, page 76</a>.</li></ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

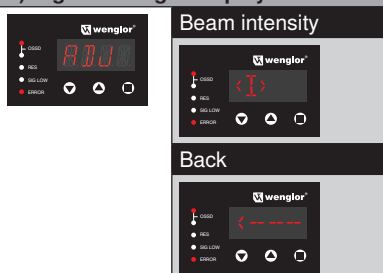


## b) Indicator lamp



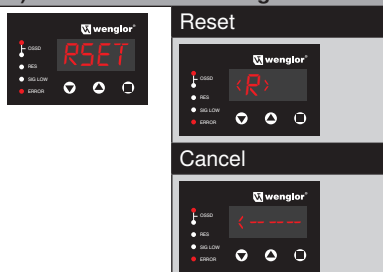
- The parameters for the integrated indicator lamp function can be configured by selecting LAMP.
  - MUT: Muting state display
  - ALL: Muting and OSSD state displa.
- For more information on the indicator lamp, see [section 5.2.5.4, page 77](#).

## c) Signal strength display



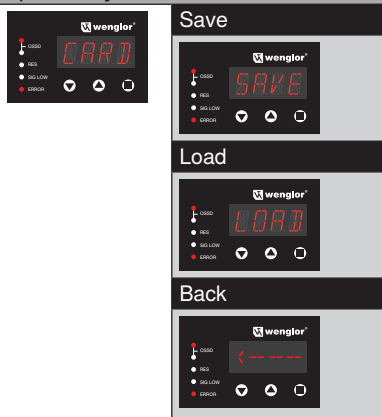
- <I> stands for signal strength intensity.
- The setting can be canceled via “<— — —”. After the ESPE is switched on, the signal strength is displayed for 30 s as standard.
- For more information on the signal strength, see [section 5.2.5.5, page 77](#).

## d) Reset to default setting / reset



- Selecting “RSET” takes the user to the reset menu.
  - <R>: Reset to default setting
  - The reset process can be canceled via “<— — —”.
- For more information on the default setting, see [section 9.4.1, page 95](#).

## e) Memory card

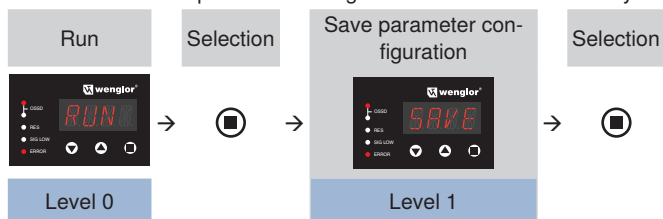


- If a memory card is inserted, the following options are available:
  - **SAVE:** Saves the parameter configuration most recently saved in the sensor memory to the memory card (see [section 9.5.9, page 120](#)).  
→ **ATTENTION:** It is not the current set parameter configuration that is saved!
  - **LOAD:** The parameter configuration for the memory card is written to the sensor memory.  
→ **ATTENTION:** A loaded parameter configuration must first be saved in the device memory (see [section 9.5.9, page 120](#)).
- The correct procedure for using the memory card is outlined below.
- Warning messages may appear when accessing the SD card (see [section 13.3.4, page 147](#)).
- For more information on the memory card, see [section 5.2.5.6, page 78](#).

## Save

- The most recent parameter configurations saved in the sensor memory are saved to the memory card using the following steps:

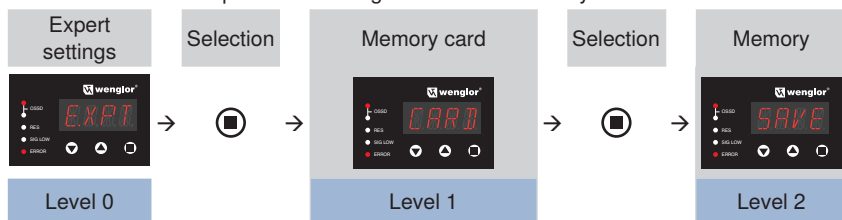
1. Save the desired parameter configuration in the sensor memory:



2. ESPE carries out a restart.

3. Select the menu again.

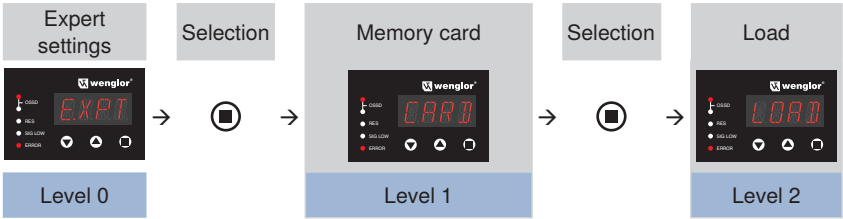
4. Transfer the sensor parameter configuration to the memory card:



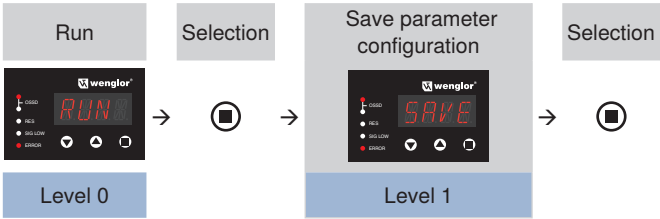
**Load**

- The parameter configuration saved on the memory card is loaded using the following steps:

1. Load the parameter configuration from the memory card:



2. Save the loaded parameter configuration to the sensor memory:



3. ESPE carries out a restart.

**f) Password protection**

Wenglor device screen showing 'PASS'.

**Change PW**

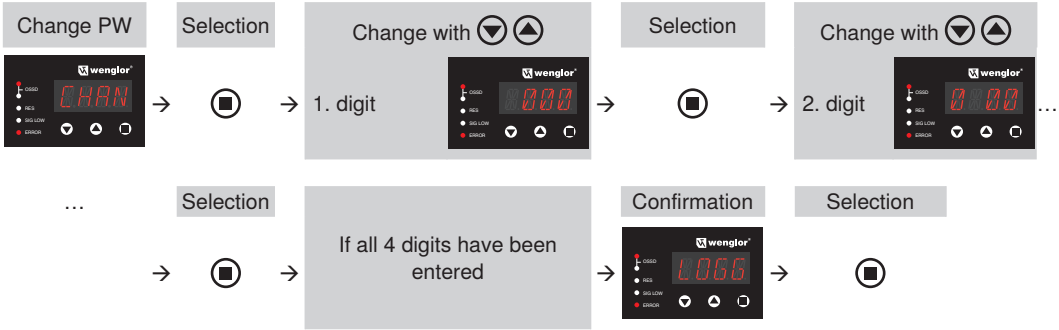
Wenglor device screen showing 'CHAN'.

**Back**

Wenglor device screen showing password input.

- This setting can be used to change the current valid password.
- The correct procedure for changing the password is outlined below.
- For more information on password protection, see [section 5.2.5.7, page 80](#).

To change the password, proceed as follows:

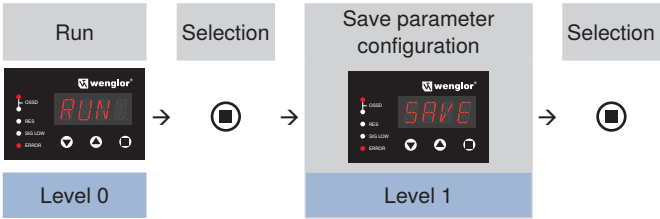


9.5.9 Saving the Configuration and Restart (RUN)



**NOTE!**  
Changes to the sensor parameter configuration are only saved if the selected parameter configuration was saved via the menu selection “Run” → “Save”. Otherwise, the changes will be lost when the sensor is restarted.

To save the parameter configuration, proceed as follows:



- 1. Acknowledge the RUN mode by pressing the key
- 2. Choose from “SAVE”, “CANC” and “<---” using the or key.
- 3. Acknowledge the selection by pressing the key.
- 4. “SAVE” writes the current parameter configuration to the sensor memory.  
“CANC” cancels the saving process.
- 5. The ESPE carries out a restart after both a save and cancel action.  
The restart is indicated by a moving segment in the 4th digit.

## 9.6 Parametrization via the IO-Link Interface

### 9.6.1 Requirements and Framework Conditions

The following requirements must be met to parametrize the ESPE via IO-Link:

- The system connection of the ESPE is connected to the IO-Link master via the T-plug (order number ZC7G001).
- The IO-Link master is equipped with the latest software version.
- The current IODD (device description file) for the ESPE used is present and available in the master.
- Master and ESPE are connected with each other (online).



**NOTE!**

The latest versions of the software, IODD and the interface protocol are available on the wenglor homepage in the download area for the product.

If the connection is successful, the following operating displays are shown during the parameter configuration via IO-Link (see [section 11.1.1, page 131](#) and [section 11.1.2, page 132](#)):

**Emitter**

| Display |        | External parametrization |
|---------|--------|--------------------------|
| 1       | Power  | LED lit                  |
| 2       | CODE   | LED off                  |
| 3       | HI RAN | LED off                  |
| 4       | ERROR  | LED blinks               |

**Receiver (SEFB muting)**

| Display |                       | External parametrization |
|---------|-----------------------|--------------------------|
| 1       | OSSD 1 (LED 1, red)   | LED lit                  |
|         | OSSD 2 (LED 2, green) | LED off                  |
| 2       | RES                   | LED off                  |
| 3       | SIG LOW               | LED off                  |
| 4       | ERROR                 | LED blinks               |

**Receiver (SEFB basic)**

| Display |                       | External parametrization |
|---------|-----------------------|--------------------------|
| 1       | OSSD 1 (LED 1, red)   | LED lit                  |
|         | OSSD 2 (LED 2, green) | LED off                  |
| 2       | SIG LOW               | LED off                  |
| 3       | ERROR                 | LED flashes              |
| 4       | RES                   | LED off                  |
| 5       | EDM                   | LED off                  |
| 6       | CODE                  | LED off                  |

Segment display:



Digit 1    Digit 2    Digit 3    Digit 4



**NOTE!**

The parameter configuration on the control panel (see [section 9.3, page 92](#), [section 9.4, page 95](#)) always has priority over setting via IO-Link.

## 9.6.2 Process Data

The following process data is output cyclically by the ESPE:

| Process data                         | Description                                                                                                                                                     |                                                                                                                                   |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| OutputState                          | Output status of the ESPE<br>8 bit encrypted                                                                                                                    |                                                                                                                                   |
| InputState                           | Status of the inputs (RES, EDM, MS1–MS4, cascading)<br>8 bit encrypted                                                                                          |                                                                                                                                   |
|                                      | <b>Parameter set A</b><br><b>Measuring function</b><br>(see <a href="#">section 5.2.5.1, page 74</a> )                                                          | <b>Parameter set B</b><br><b>Muting</b><br>(see <a href="#">section 5.2.4, page 52</a> )                                          |
| A:LBB /<br>B:SensorTime<br>S1-S2*    | Last blocked beam LBB<br>0 – no beam blocked<br>1...x – beam number (from the control panel)<br>255 – receiver not in synchronous run                           | Time for status change between MS1–MS2<br>0...250 in 0.1 s                                                                        |
| A:FBB /<br>B:SensorTime<br>S3-S4*    | First blocked beam FBB<br>0 – no beam blocked<br>1...x – beam number (from the control panel)<br>255 – receiver not in synchronous run                          | Time for status change between MS3–MS4<br>0...250 in 0.1 s                                                                        |
| A:NBB /<br>B:MutingTime<br>HighByte* | Number of blocked beams NBB<br>0 – no beam blocked<br>255 – receiver not in synchronous run                                                                     | Muting duration<br>0...28800 in s<br>65535 – muting is not active                                                                 |
| A:NCBB /<br>B:MutingTime<br>LowByte* | Number of cumulated blocked beams (biggest group) NCBB<br>0 – no beam blocked<br>255 – receiver not in synchronous run                                          |                                                                                                                                   |
| A:NOBJ /<br>B:MutingState*           | Number of objects NOBJ<br>255 – receiver not in synchronous run                                                                                                 | 0 – no status message / not active<br>1...n – numerical value of the muting codes (see <a href="#">section 13.3.3, page 146</a> ) |
| Device State                         | 0 - no errors<br>1 - parametrization on the device<br>2 - parametrization via IO-Link<br>10...255 - error codes (see <a href="#">section 13.3.2, page 143</a> ) |                                                                                                                                   |

\* Parameter set B only available with SEFB muting

## 9.6.3 Parameter Data

### NOTE!



- To prevent impermissible or unintentional changes to the ESPE, a password must be entered to carry out a parameter configuration (see [section 5.2.5.7, page 80](#))
- Setting parameter data requires user level "Admin".
- There is only one password for the ESPE, regardless of whether the setting takes place on the control panel or via IO-Link.

The following parameters can be set and/or read:

| Device settings              |                                                                                           |
|------------------------------|-------------------------------------------------------------------------------------------|
| Block device access          | Block parameter settings via IO-Link (regardless of the password)                         |
| PasswordParamEntry           | 4-digit password must be entered to start the parameter configuration                     |
| ParamEnd                     | This parameter must be set and saved to apply the parameter in the memory of the ESPE     |
| PasswordChange               | Change the password                                                                       |
| Ident                        | Information on the parameter set of the ESPE                                              |
| Basic settings               |                                                                                           |
| Function Mode                | Beam coding, RES, EDM, cascading                                                          |
| Muting settings*             | Selection of the muting type and setting of the muting parameters                         |
| Teach-in settings*           |                                                                                           |
| Param.TeachIn*               | Start and end of the teach process<br>relevant for: Partial muting                        |
| Paramt.TeachIn.<br>Value*    | Number of taught-in beams<br>255 – error (e.g. both synchronization beams covered)        |
| Display settings*            |                                                                                           |
| Display.Mode*                | Standard or energy saving mode                                                            |
| Display-Advanced-<br>Screen* | The current display on the 4-digit segment display on the receiver is shown               |
| Expert settings              |                                                                                           |
| SignalOutput                 | Parameter configuration of the signal output function with inactive IO-Link communication |
| Lamp                         | Parameter configuration of the indicator lamp function                                    |
| AdjustSignal                 | Display the signal strength<br>0 – no synchronization<br>1...4 – signal strength level    |
| FactoryReset                 | Reset to default settings                                                                 |
| SD-Card                      | Save or load from the microSD card                                                        |
| IO-Link process data         | Choose from parameter set A or B (process data)                                           |
| Beam settings                |                                                                                           |
| Beam.Mode                    | Parametrized safety field status (saved in ESPE)                                          |
| Beam.State                   | Current safety field status                                                               |
| Diagnosis                    |                                                                                           |
| ErrorCode                    | Display of the relevant error code (see <a href="#">section 13.3.2, page 143</a> )        |

\* only available with SEFB muting



**NOTE!**

- Due to the different dependencies between the functions, it is not possible to make block changes to parameters. **This means that each parameter must be written individually to the ESPE.**
- When changing a parameter, the data should be loaded again so that all changes are visible for any other parameters (marked in color depending on the master).
- For examples of parameter configuration, see [section 9.6.4, page 125](#).

## 9.6.4 Example for Setting the Parameter Data

### Example: Cross muting is to be parametrized

Starting point:

- ESPE parameter configuration as per delivery state
- ESPE is positioned and installed correctly with the correct electrical connection
- Cross muting with muting end through ESPE is to be parametrized

#### 1. Password entry

- PasswordParamEntry: "0000" (current password) → "write"
- ESPE enters parametrization mode (see above for operating display)
- Parameters can be changed and saved

#### 2. Set muting type

- Change muting mode from "No" to "X" → write
- Right-click → reload or update by other means
- Dependencies are shown (e.g. RestartInhibit changes from "False" to "True")

#### 3. Carry out other muting settings

- Set "End" (muting end through clearing of the ESPE) to "true" → write

#### 4. Write parameters to ESPE

- Set ParamEnd to "Save and Restart" → write

#### 5. Restart ESPE

- ESPE restarts automatically and the parameter configuration is applied
- The ESPE then switches to normal operation (due to the set RES, the RES-LED flashes on the receiver and the OSSDs are switched).

The following procedure must be followed for changing the parameter configuration via IO-Link

1. Reset memory parameters, as block writing is not possible
  - ParamEnd “Save + Restart” → delete or update
2. Password entry
  - PasswordParamEntry: “0000” (current password) → “write”.
  - ESPE enters parametrization mode (see above for operating display)
  - Parameters can now be changed and saved.
3. Carry out changes and save as outlined above.

### **9.6.5 Data Storage**

- For functional safety reasons, the devices have no data storage function.
- All parameters are saved in the ESPE or can be saved on the microSD card.

## 10. Initial Start-Up

---

### **DANGER!**

#### **Hazardous machine state**



- No hazardous motions must be possible on the machine during installation, electrical connection and initial start-up.
  - It is important to ensure that the OSSDs of the ESPE have no impact on the machine during installation, electrical connection and initial start-up.
- 

### **DANGER!**

#### **Risk of safety device failure**



- Before the initial start-up of the machine, ensure that it has been checked and approved by a qualified person.
  - The machine may only be commissioned with functioning ESPE.
- 

## 10.1 Overview

The following requirements must be met to start the initial start-up:

- The project engineering has been completed successfully (see [section 5, page 36](#))
- The installation has been completed successfully (see [section 7, page 83](#))
- The electrical connection has been completed successfully (see [section 8, page 89](#))
- The parameter configuration has been completed successfully (see [section 9, page 92](#))
- For operating modes and functions involving teach-in processes, the parameter configuration can only take place following switch-on and alignment.

The initial start-up is divided into the following steps:

- Switch on the ESPE
- Align the ESPE
- Check the parameter configuration
- Check for initial start-up

## 10.2 Switching On

Procedure:

- Switch on the power supply
- The emitter and receiver are initialized automatically
- All LEDs (for emitter and receiver) light up briefly at the same time.
- Following the initialization, the following operating displays can be read off:

Emitter

- Current parameter configuration (see [section 11.1.1, page 131](#))

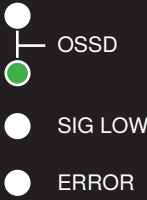
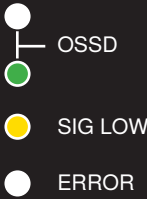
Receiver

- LEDs: Status indicators (see [section 11.1.2, page 132](#))
- Segment display:
  - Signal strength for 30 s after switch-on (see [section 5.2.5.5, page 77](#))
  - SYNC item following successful synchronization
  - Warning messages where applicable (see [section 13.3.1, page 143](#))

### 10.3 Aligning the Emitter and Receiver

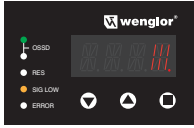
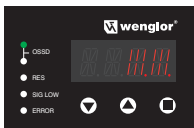
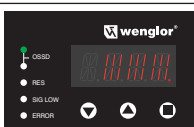
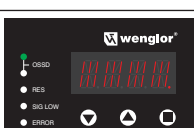
#### Alignment display for SEFB

- The alignment quality is indicated by LED SIG LOW for easy alignment of emitter and receiver.
- This display is also available in normal operation and lights up with the relevant alignment.

| Display                                                                           | Meaning    | Explanation                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Optimal    | <ul style="list-style-type: none"><li>• Signal strength is very good</li><li>• Synchronization complete</li><li>• OSSDs can be activated</li></ul><br><ul style="list-style-type: none"><li>• The optimal alignment for high process reliability has been achieved.</li></ul> |
|   | Weak       | Signal strength is weak.<br>Synchronization complete<br>LED SIG LOW lights up<br>OSSDs can be activated<br>→ Improve the alignment to avoid unintentional switching due to contamination, for example.                                                                        |
|  | Inadequate | <ul style="list-style-type: none"><li>• Receiver detects no emitter beams.</li><li>• No synchronization possible</li><li>• OSSDs are not activated</li></ul><br>→ Alignment must be improved to commission the ESPE.                                                          |

Alignment display for SEFB muting

- The signal strength is shown on the segment display for easy alignment of the emitter and receiver.
- This feature is active automatically for 30 s after switch-on.
- During parameters configuration, the display can be shown for a lengthy period of time (up through timeout) (see [section 9.5.8, page 115](#)).
- The signal strength should be as high as possible to ensure safe operation and avoid unnecessary process interruptions.
- The signal strength display is divided into five levels:

| Display                                                                            | Meaning   | Explanation                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Too weak  | <ul style="list-style-type: none"><li>• Receiver not detecting any emitter beams</li><li>• No synchronization possible</li><li>• OSSDs are not activated</li></ul> → Alignment must be improved to commission the ESPE.                                                                                             |
|    | Weak      | <ul style="list-style-type: none"><li>• Signal strength is weak.</li><li>• Synchronization complete (SYNC point)</li><li>• LED SIG LOW lights up</li><li>• OSSDs can be activated</li></ul> → Improve the alignment to avoid unintentional switching due to contamination, for example.                             |
|    | Medium    | <ul style="list-style-type: none"><li>• Signal strength is adequate with a small reserve for changes (e.g. contamination, alignment)</li><li>• Synchronization complete (SYNC point)</li><li>• OSSDs can be activated</li></ul> → If possible, improve the alignment further to achieve higher process reliability. |
|   | Good      | <ul style="list-style-type: none"><li>• Signal strength is good with a medium reserve for changes (e.g. contamination, alignment)</li><li>• Synchronization complete (SYNC point)</li><li>• OSSDs can be activated</li></ul> → If possible, improve the alignment further to achieve higher process reliability.    |
|  | Very good | <ul style="list-style-type: none"><li>• Signal strength is very good</li><li>• Synchronization complete (SYNC point)</li><li>• OSSDs can be activated</li></ul> The optimal alignment for high process reliability has been achieved.                                                                               |

Procedure

1. Installation has been carried out correctly (see [section 7, page 83](#)).
2. Alignment takes place with a free safety field while monitoring the LEDs and segment display.
3. Loosen the mounting so that the ESPE can only just be moved.
4. Align the emitter and receiver until the highest possible signal strength is shown.
5. Tighten the mounting so that the ESPE can no longer be adjusted. The tightening torques for the different mounting components must be observed.

**NOTE!**

wenglor offers a suitable laser alignment tool Z98G001 to make a reliable alignment easier even with large distances (see [section 4.9.11, page 35](#)).

## 10.4 Check for initial start-up

- The described tests are intended to confirm compliance with national / international safety regulations.

**NOTE!**

- Regulations governing operator induction by specialist personnel must be observed before work is commenced.
- The company which operates the machine is responsible for training.
- For initial start-up, a test body with 14 or 30 mm depending on the resolution of the ESPE must be used for initial start-up. For applications with reduced resolution, test bodies with 24 or 34 mm can also be used for initial start-up. (see EN 61496-1, Para. 7f)

- First of all, a check must be carried out to determine whether the ESPE has been chosen correctly according to the local regulations and whether it offers the necessary protection when used as intended.
- The effectiveness of the ESPE in all operating modes available on the machine must then be checked.
- The check takes place according to the checklist for initial start-up (see [section 16.1.1, page 148](#))

The check must be carried out in the following cases:

- Before the initial start-up,
- **After changes to the ESPE parameterization,**
- After changes have been made on the machine,
- After extended machine downtimes,
- Following modifications or repairs on the machine.

---

**DANGER!**

- It is important to ensure that no-one is endangered during initial start-up of the machine. There must be no persons located in the danger zone.
  - Work on the machine must be immediately stopped if any impairment of the safety function is detected. Once the situation has been resolved, the effectiveness of the ESPE must be checked again according to the checklist (see [section 16.1.1, page 148](#)).
-

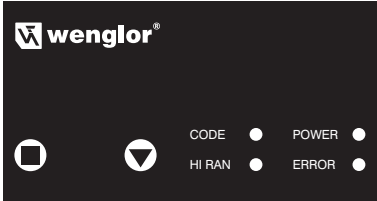
# 11. Operation

## 11.1 Operating Display

- Information on the status of the ESPE is output via the operating displays.
- For diagnostic information for the ESPE, see [section 13, page 141](#).
- Status and diagnostic information can also be read out for IO-Link. Relevant information can be found in the interface protocol of the ESPE.

### 11.1.1 Operating Displays Emitter

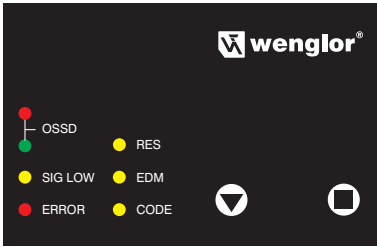
The following status displays can be read off in normal operation:



| Display |                        |         |                                                                                            | Explanation     |
|---------|------------------------|---------|--------------------------------------------------------------------------------------------|-----------------|
| 1       | Power                  | LED off |  POWER    | Sensor is off   |
|         |                        | LED lit |                                                                                            | Sensor is on    |
| 2       | CODE                   | LED off |  CODE     | Coding OFF      |
|         |                        | LED lit |                                                                                            | Coding ON       |
| 3       | HI RAN<br>(High Range) | LED off |  HI RAN | Low range       |
|         |                        | LED lit |                                                                                            | High range      |
| 4       | ERROR                  | LED off |  ERROR  | no errors       |
|         |                        | LED lit |                                                                                            | Active error(s) |

11.1.2 Control Panel Receiver SEFB

The following status displays can be read off in normal operation:



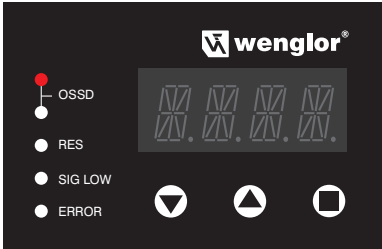
LEDs

| Display |         |                         |                                                                                           | Explanation                                                                                                                             |
|---------|---------|-------------------------|-------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1       | OSSD    | LED 1 lit,<br>LED 2 off |  OSSD    | The OSSDs are in OFF state.                                                                                                             |
|         |         | LED 1 off,<br>LED 2 lit |  OSSD    | The OSSDs are in ON state.                                                                                                              |
| 2       | SIG LOW | LED off                 |  SIG LOW | All beams are detected according to the selected operating mode, no beam has a weak signal. With OSSDs OFF, SIG LOW is also always OFF. |
|         |         | LED lit                 |  SIG LOW | All beams are detected according to the selected operating mode, but at least one beam has a weak signal.                               |
| 3       | ERROR   | LED off                 |  ERROR | No active errors                                                                                                                        |
|         |         | LED lit                 |  ERROR | Active error(s)                                                                                                                         |
| 4       | RES     | LED off                 |  RES   | No acknowledgment required                                                                                                              |
|         |         | LED blinks              |  RES   | Restart inhibit set, OSSDs off, no penetration detected, no acknowledgment signal detected.                                             |
|         | EDM     | LED off                 |                                                                                           | Contactors monitoring OFF                                                                                                               |
|         |         | LED lit                 |                                                                                           | Contactors monitoring ON                                                                                                                |
|         | CODE    | LED off                 |                                                                                           | Coding OFF                                                                                                                              |
|         |         | LED lit                 |                                                                                           | Coding ON                                                                                                                               |



11.1.3 Operating Displays Receiver SEFB Muting

The following status displays can be read off in normal operation:



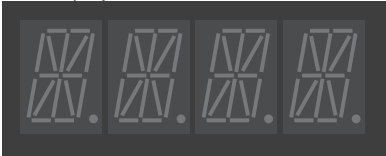
| Display |         |                         |                                                                                             | Explanation                                                                                               |
|---------|---------|-------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| 1       | OSSD    | LED 1 lit,<br>LED 2 off |  OSSD      | The OSSDs are in OFF state                                                                                |
|         |         | LED 1 off,<br>LED 2 lit |  OSSD      | The OSSDs are in ON state                                                                                 |
| 2       | RES     | LED off                 |  RES       | No acknowledgment required                                                                                |
|         |         | LED blinks              |  RES       | Restart inhibit set, OSSDs off, no penetration detected, no acknowledgment signal detected.               |
| 3       | SIG LOW | LED off                 |  SIG LOW   | All beams are detected according to the selected operating mode, no beam has a weak signal.               |
|         |         | LED lit                 |  SIG LOW | All beams are detected according to the selected operating mode, but at least one beam has a weak signal. |
| 4       | ERROR   | LED off                 |  ERROR   | No active errors.                                                                                         |
|         |         | LED lit                 |  ERROR   | Active error(s).                                                                                          |

Segment display

The following information is shown in the segment display:

- Signal strength for 30 s after switch-on (see [section 5.2.5.5, page 77](#))
- SYNC item following successful synchronization
- Display of the active inputs during muting
- Display of muting messages (see [section 13.3.3, page 146](#))
- Warning messages where applicable (see [section 13.3.1, page 143](#))

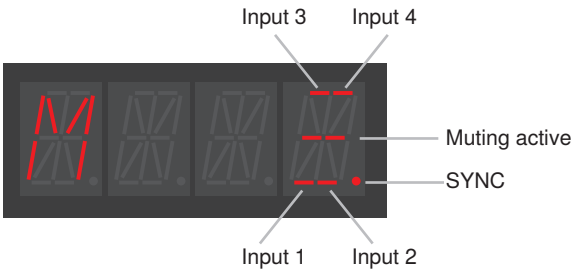
The display is laid out as follows:



Digit 1      Digit 2      Digit 3      Digit 4

Status displays for muting

- If muting is parametrized, information on the current muting sequence and diagnostic information can be read off the segment display.
- This information is shown as follows:



- The following rules apply:
  - M in the first **M** indicates that a muting error is present. The meaning of the error is indicated by a code in the following digits.
  - The fourth digit shows the current muting status.
- For explanations of the diagnostic codes, see [section 13.3.3, page 146](#).

| Meaning of the displays in the fourth digit |                                           |  |                          |
|---------------------------------------------|-------------------------------------------|--|--------------------------|
|                                             | E1 (MS3 / belt stop / Full Muting Enable) |  | E2 (MS4 / muting enable) |
|                                             | E3 (MS1)                                  |  | E4 (MS2)                 |
|                                             | Muting active                             |  |                          |

| Examples:                                                                        |                                                                                                                                                                              |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Signal is applied on E1 and E2, muting is active.<br>E.g.: Active four sensor muting, where the object is activating two MS                                                  |
|  | Signal is applied on E3 and E4.<br>E.g.: Cross muting was deactivated due to clearing of the ESPE (parametrized in ESPE), even though the object is still activating two MS. |
|  | Signal is applied on E1, E2, E3 and E4, muting is active.<br>E.g.: active four sensor muting, where the object is activating all four MS                                     |
|  | Signal is applied on E1 and E4, muting is active.<br>E.g.: two sensor muting is active and a belt stop signal is applied. The object activates MS2.                          |

## 11.2 Calling Up the Current Parametrization (“Worker” User Level)

- The operator can query the current parameter configuration of the ESPE during operation without entering a password.
- The following procedure must be followed here:

### Emitter

- The current parameter configuration can be read off via the LED displays.
- For more information on the operating displays, see [section 11.1.1, page 131](#).

### Receiver (SEFB)

- The current parameter configuration can be read off via the LED displays.
- For more information on the operating displays, see [section 11.1.2, page 132](#).

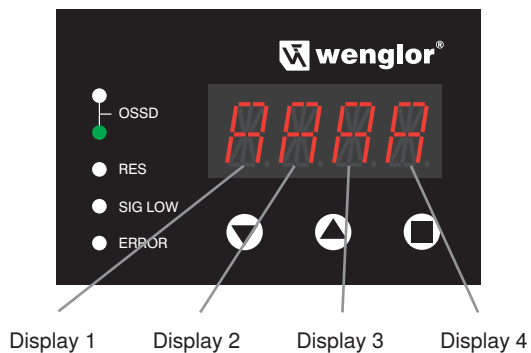
### Receiver (SEFB muting)

The current parameter configuration can be called up from the RUN mode, as well as from error mode.

The settings are called up as follows:

- Press and hold the “apply” key (■) for approx. 2 s.
- The SIG LOW-LED provides visual feedback. When the apply key is pressed, it will light up for approx. 2 seconds. The button can be released after the light goes out.
- Release the key.
- The current setting in the main menu is shown (for details of the structure, see [section 9.3.3, page 94](#)).
- The push buttons (menu down, menu up) can be used to navigate within the main menu.
- Use the apply key (■) to make the desired menu selection and switch to the subordinate menu level (for details on the navigation, see [section 9.4, page 95](#)).

For more information on the control panel, see [section 11.1.3, page 133](#).



| Display 1<br>Operating functions | Restart inhibit | Contacteur monitoring | Cascading | Beam coding |
|----------------------------------|-----------------|-----------------------|-----------|-------------|
| As displayed in the<br>menu tree | RES             | EDM                   | CASC      | CODE        |
| A                                | ✗               | ✗                     | ✗         | ✗           |
| B                                | ✓               | ✗                     | ✗         | ✗           |
| C                                | ✗               | ✓                     | ✗         | ✗           |
| D                                | ✓               | ✓                     | ✗         | ✗           |
| E                                | ✗               | ✗                     | ✓         | ✗           |
| F                                | ✓               | ✗                     | ✓         | ✗           |
| G                                | ✗               | ✓                     | ✓         | ✗           |
| H                                | ✓               | ✓                     | ✓         | ✗           |
| J                                | ✗               | ✗                     | ✗         | ✓           |
| K                                | ✓               | ✗                     | ✗         | ✓           |
| L                                | ✗               | ✓                     | ✗         | ✓           |
| N                                | ✓               | ✓                     | ✗         | ✓           |
| P                                | ✗               | ✗                     | ✓         | ✓           |
| R                                | ✓               | ✗                     | ✓         | ✓           |
| S                                | ✗               | ✓                     | ✓         | ✓           |
| T                                | ✓               | ✓                     | ✓         | ✓           |

| Display 2<br>Operating<br>mode                    | Full resolution | Fix blanking | Fix blanking<br>with edge toler-<br>ance | Reduced resolution<br>The resolution is<br>reduced by ... | Float blanking<br>The tolerance between<br>the minimum and maxi-<br>mum object size is ... |
|---------------------------------------------------|-----------------|--------------|------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------|
| As displayed<br>in the menu<br>tree under<br>BLNK | BLNK OFF        | FIX          | FIXT                                     | REDU                                                      | FLB                                                                                        |
| A                                                 | ✓               | ✗            | ✗                                        | ✗                                                         | ✗                                                                                          |
| B                                                 | ✗               | ✓            | ✗                                        | ✗                                                         | ✗                                                                                          |
| C                                                 | ✗               | ✗            | ✓                                        | ✗                                                         | ✗                                                                                          |
| D                                                 | ✗               | ✗            | ✗                                        | ✓ - 1 beam                                                | ✗                                                                                          |
| E                                                 | ✗               | ✗            | ✗                                        | ✓ - 2 beams                                               | ✗                                                                                          |
| F                                                 | ✗               | ✗            | ✗                                        | ✓ - 3 beams                                               | ✗                                                                                          |
| G                                                 | ✗               | ✗            | ✗                                        | ✓ - 4 beams                                               | ✗                                                                                          |
| H                                                 | ✗               | ✗            | ✗                                        | ✓ - 5 beams                                               | ✗                                                                                          |
| J                                                 | ✗               | ✗            | ✗                                        | ✓ - 6 beams                                               | ✗                                                                                          |
| K                                                 | ✗               | ✗            | ✗                                        | ✓ - 7 beams                                               | ✗                                                                                          |
| L                                                 | ✗               | ✗            | ✗                                        | ✓ - 8 beams                                               | ✗                                                                                          |
| N                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 0 beams                                                                                |
| P                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 1 beam                                                                                 |
| R                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 2 beams                                                                                |
| S                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 3 beams                                                                                |
| T                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 4 beams                                                                                |
| U                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 5 beams                                                                                |
| V                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 6 beams                                                                                |
| X                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 7 beams                                                                                |
| Y                                                 | ✗               | ✗            | ✗                                        | ✗                                                         | ✓ - 8 beams                                                                                |

| Display 3<br>Muting mode function        | Muting mode function |                        |                                                 |                                             | Muting options                         |                        |                    |
|------------------------------------------|----------------------|------------------------|-------------------------------------------------|---------------------------------------------|----------------------------------------|------------------------|--------------------|
|                                          | Cross muting         | 2-sensor linear muting | 4-sensor linear muting with sequence monitoring | 4-sensor linear muting with time monitoring | Maximum long muting duration (8 hours) | Muting enable function | Belt stop function |
| As displayed in the menu tree under MUTG | X                    | 2L                     | LSEQ                                            | LTME                                        | TIME                                   | ENAB                   | STOP               |
| A                                        | x                    | x                      | x                                               | x                                           | x                                      | x                      | x                  |
| B                                        | ✓                    | x                      | x                                               | x                                           | x                                      | x                      | x                  |
| C                                        | ✓                    | x                      | x                                               | x                                           | ✓                                      | x                      | x                  |
| D                                        | ✓                    | x                      | x                                               | x                                           | x                                      | ✓                      | x                  |
| E                                        | ✓                    | x                      | x                                               | x                                           | ✓                                      | ✓                      | x                  |
| F                                        | ✓                    | x                      | x                                               | x                                           | x                                      | x                      | ✓                  |
| G                                        | ✓                    | x                      | x                                               | x                                           | ✓                                      | x                      | ✓                  |
| H                                        | ✓                    | x                      | x                                               | x                                           | x                                      | ✓                      | ✓                  |
| J                                        | ✓                    | x                      | x                                               | x                                           | x                                      | ✓                      | ✓                  |
| K                                        | x                    | ✓                      | x                                               | x                                           | x                                      | x                      | x                  |
| L                                        | x                    | ✓                      | x                                               | x                                           | ✓                                      | x                      | x                  |
| N                                        | x                    | ✓                      | x                                               | x                                           | x                                      | ✓                      | x                  |
| P                                        | x                    | ✓                      | x                                               | x                                           | ✓                                      | ✓                      | x                  |
| R                                        | x                    | ✓                      | x                                               | x                                           | x                                      | x                      | ✓                  |
| S                                        | x                    | ✓                      | x                                               | x                                           | ✓                                      | x                      | ✓                  |
| T                                        | x                    | ✓                      | x                                               | x                                           | x                                      | ✓                      | ✓                  |
| U                                        | x                    | ✓                      | x                                               | x                                           | ✓                                      | ✓                      | ✓                  |
| V                                        | x                    | x                      | ✓                                               | x                                           | x                                      | x                      | x                  |
| X                                        | x                    | x                      | ✓                                               | x                                           | ✓                                      | x                      | ✓                  |
| Y                                        | x                    | x                      | x                                               | ✓                                           | x                                      | x                      | x                  |
| Z                                        | x                    | x                      | x                                               | ✓                                           | ✓                                      | x                      | ✓                  |

| Display 4 – Further muting options       | Partial muting | Gap suppression | Muting end through clearing of the ESPE | Override function |
|------------------------------------------|----------------|-----------------|-----------------------------------------|-------------------|
| As displayed in the menu tree under MUTG | PART           | GAPS            | END                                     | OVRR              |
| A                                        | x              | x               | x                                       | x                 |
| B                                        | ✓              | x               | x                                       | x                 |
| C                                        | x              | ✓               | x                                       | x                 |
| D                                        | ✓              | ✓               | x                                       | x                 |
| E                                        | x              | x               | ✓                                       | x                 |
| F                                        | ✓              | x               | ✓                                       | x                 |
| G                                        | x              | ✓               | ✓                                       | x                 |
| H                                        | ✓              | ✓               | ✓                                       | x                 |
| J                                        | x              | x               | x                                       | ✓                 |
| K                                        | ✓              | x               | x                                       | ✓                 |
| L                                        | x              | ✓               | x                                       | ✓                 |
| N                                        | ✓              | ✓               | x                                       | ✓                 |
| P                                        | x              | x               | ✓                                       | ✓                 |
| R                                        | ✓              | x               | ✓                                       | ✓                 |
| S                                        | x              | ✓               | ✓                                       | ✓                 |
| T                                        | ✓              | ✓               | ✓                                       | ✓                 |

## 12. Servicing

---



### **DANGER!**

#### **Risk of safety device failure!**

- No repairs may be carried out on the ESPE.
  - No changes or manipulations may be carried out on the ESPE.
- 

### 12.1 Maintenance



#### **NOTE!**

- **This wenglor sensor is maintenance-free.**
- The instructions for the annual (see [section 12.4, page 140](#)) and regular inspection (see [section 12.3, page 140](#)), as well as cleaning (see [section 12.2, page 139](#)) must be observed.

### 12.2 Cleaning



#### **NOTE!**

- The panes of the ESPE must be clean at all times. They must be free from contamination, scratches or roughening.
  - Contamination of any kind has a direct impact on the signal strength of the ESPE and may result in malfunctions.
- 
- The panes may only be cleaned with the supply voltage disconnected.
  - It is advisable to clean the panes regularly. The frequency of the cleaning depends on the level of contamination on the system.
  - Cleaning takes place with a clean, soft and damp (to prevent electrostatic charge) cloth, without putting any pressure on the pane.
  - Do not clean the ESPE with solvents or cleaning agents which could damage the device (aggressive, abrasive, scratching).
  - To guarantee good and lasting legibility of the segment display, the same cleaning measures are recommended as for the panes.
  - After cleaning, check the function of the safety device (see [section 12.3, page 140](#))

## 12.3 Regular Inspections

- The described checks are intended to confirm compliance with national / international safety regulations.



### NOTE!

- Regulations governing operator induction by specialist personnel must be observed before work is commenced.
- The company which operates the machine is responsible for training.

- Regular inspections must be conducted by a person who has been authorized and engaged to do so by the company which operates the machine when work begins, and whenever a new shift is started.
- The check takes place according to the regular inspection checklist (see [section 16.1.3, page 150](#))



### DANGER!

- Work on the machine must be immediately stopped if any impairment of the safety function is detected.
- Once the situation has been resolved, the effectiveness of the ESPE must be checked again according to the checklist for initial start-up (see [section 16.1.1, page 148](#)).



### NOTE!

- The supplied sticker "Instructions for regular inspection" must be mounted in a clearly visible location close to the relevant ESPE.
- Do not clean the ESPE with solvents or cleaning agents which could damage the device (aggressive, abrasive, scratching) (see [section 12.2, page 139](#)).

## 12.4 Annual Inspection

- The described tests are intended to confirm compliance with national / international safety regulations.



### NOTE!

- Regulations governing operator induction by specialist personnel must be observed before work is commenced.
- The company which operates the machine is responsible for training.

- The inspection must be carried out annually or within the required deadlines according to the valid national regulations.
- The check takes place according to the annual inspection checklist (see [section 16.1.2, page 149](#))



### DANGER!

- Work on the machine must be immediately stopped if any impairment of the safety function is detected.
- Once the situation has been resolved, the effectiveness of the ESPE must be checked again according to the checklist for initial start-up (see [section 16.1.1, page 148](#)).



# 13. Diagnosis

## 13.1 Performance in Case of Fault



**NOTE!**

- Shut down the machine.
- Analyze and remedy the cause of the error based on the diagnosis information (see [section 13.2, page 141](#)).
- If the error cannot be eliminated, contact wenglor’s support department (see the wenglor homepage for contact details).



**DANGER!**

**Risk of personal injury or property damage in case of non-compliance!**

The system’s safety function is disabled. Personal injury and damage to equipment may occur.

- Do not operate in case of indeterminate malfunction.
- The machine must be shut down if the error cannot be definitively explained or properly eliminated.
- Required action as specified in case of fault.

## 13.2 Error Indicators

### 13.2.1 Error Indicator on the Emitter

| Display |        | Error                                                                               |         |                                                                                                                                                                               |         |                                                             |         |
|---------|--------|-------------------------------------------------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-------------------------------------------------------------|---------|
|         |        | Parametrization not complete (timeout)                                              |         | Internal error                                                                                                                                                                |         | Over/undervoltage                                           |         |
| 1       | Power  | POWER                                                                               | LED off | POWER                                                                                                                                                                         | LED off | POWER                                                       | LED lit |
| 2       | CODE   | CODE                                                                                | LED lit | CODE                                                                                                                                                                          | LED off | CODE                                                        | LED off |
| 3       | HI RAN | HI RAN                                                                              | LED lit | HI RAN                                                                                                                                                                        | LED off | HI RAN                                                      | LED off |
| 4       | ERROR  | ERROR                                                                               | LED lit | ERROR                                                                                                                                                                         | LED lit | ERROR                                                       | LED lit |
| Action  |        | • Carry out parametrization in accordance with <a href="#">section 9.3, page 92</a> |         | • Restart system<br>• Carry out parametrization in accordance with <a href="#">section 9.3, page 92</a><br>• Contact the wenglor support department if the error occurs again |         | • Make supply voltage available within the specified limits |         |

### 13.2.2 Error Indicator on the Receiver SEFB

| Error                                                      | Display                                                                                           |                                                                                                   |                                                                                                    |                                                                                                      | Action                                                                                                                                         |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | RES                                                                                               | EDM                                                                                               | CODE                                                                                               | ERROR                                                                                                |                                                                                                                                                |
| Parametrization not complete (timeout)                     |  RES<br>LED lit  |  EDM<br>LED lit  |  CODE<br>LED lit  |  ER-ROR<br>LED lit  | <ul style="list-style-type: none"><li>Carry out parametrization in accordance with <a href="#">section 9.3, page 92</a></li></ul>              |
| Internal error                                             |  RES<br>LED off  |  EDM<br>LED off  |  CODE<br>LED off  |  ER-ROR<br>LED lit  |                                                                                                                                                |
| Error ambient light                                        |  RES<br>LED off  |  EDM<br>LED off  |  CODE<br>LED lit  |  ER-ROR<br>LED lit  | <ul style="list-style-type: none"><li>Remove the interfering emitter</li><li>Check for and remove any other extraneous light sources</li></ul> |
| Error OSSD1                                                |  RES<br>LED lit  |  EDM<br>LED lit  |  CODE<br>LED off  |  ER-ROR<br>LED lit  |                                                                                                                                                |
| Error OSSD2                                                |  RES<br>LED lit  |  EDM<br>LED off  |  CODE<br>LED lit  |  ER-ROR<br>LED lit  | <ul style="list-style-type: none"><li>Resolve short to positive or short to ground</li></ul>                                                   |
| Error contactor monitoring – contactor does not activate   |  RES<br>LED off  |  EDM<br>LED lit  |  CODE<br>LED off  |  ER-ROR<br>LED lit  |                                                                                                                                                |
| Error contactor monitoring – contactor does not deactivate |  RES<br>LED off  |  EDM<br>LED lit  |  CODE<br>LED lit  |  ER-ROR<br>LED lit  | <ul style="list-style-type: none"><li>Check the contactor function</li><li>Configure the EDM parameters correctly</li></ul>                    |
| Over/undervoltage                                          |  RES<br>LED lit |  EDM<br>LED off |  CODE<br>LED off |  ER-ROR<br>LED lit |                                                                                                                                                |

### 13.2.3 Error Indicator on the Receiver SEFB Muting

| Display |                               | Error                                                                                                                                                                           |                    |
|---------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
|         |                               | According to the diagnosis code in the segment display (see <a href="#">section 13.3, page 143</a> ).                                                                           |                    |
| 1       | OSSD 1 (red)<br>OSSD2 (green) |  OSSD<br> | LED lit<br>LED off |
| 2       | RES                           |  RES                                                                                         | LED off            |
| 3       | SIG LOW                       |  SIG LOW                                                                                     | LED off            |
| 4       | ERROR                         |  ERROR                                                                                       | LED lit            |
| Action  |                               | According to the relevant diagnosis code ( <a href="#">section 13.3, page 143</a> ).                                                                                            |                    |

### 13.3 Diagnosis Codes on the Receiver SEFB Muting

- A precise analysis of the current status of the ESPE is possible via the code on the 4-digit segment display on the receiver.
- The following overviews describe the codes and measures for removing errors.

#### 13.3.1 Codes for Information and Warnings

| Code                                                                             | Status         | Description/cause                                                    | Measures                         |
|----------------------------------------------------------------------------------|----------------|----------------------------------------------------------------------|----------------------------------|
| WED                                                                              | Only initially | Contactor monitoring signal present, but EDM function is not active. | Parametrize contactor monitoring |
|  | Always         | Synchronous run (parallel to other displays)                         | Not required                     |
|  | Always         | Status display of the inputs                                         | Not required                     |
|  | Always         | Status display muting                                                | Not required                     |

#### 13.3.2 Codes for General Errors

| Code               | Affected components | Status                        | Description/cause                                                    | Measures                                                  |
|--------------------|---------------------|-------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------|
| 002                | Emitter / receiver  | Temporary, restarts after 2 s | Parameter configuration request from normal operation and error mode |                                                           |
| 003                | Emitter / receiver  | Temporary, restarts after 2 s | Parameter configuration request from normal operation and error mode |                                                           |
| Application errors |                     |                               |                                                                      |                                                           |
| E 010              | Emitter / receiver  | Temporary, restarts after 2 s | Supply voltage too low                                               | Make supply voltage available within the specified limits |
| E 011              | Emitter / receiver  | Temporary, restarts after 2 s | Supply voltage too low                                               | Make supply voltage available within the specified limits |
| E 012              | Emitter / receiver  | Permanent                     | Supply voltage too high                                              | Make supply voltage available within the specified limits |

|       |                    |           |                                                                                                                                                                       |                                                                                                                                    |
|-------|--------------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| E 013 | Emitter / receiver | Permanent | Supply voltage too high                                                                                                                                               | Make supply voltage available within the specified limits                                                                          |
| E 020 | Receiver           | Permanent | OSSD A: Short to positive/ capacity too high                                                                                                                          | Resolve short to positive                                                                                                          |
| E 021 | Receiver           | Permanent | OSSD A: Short to positive/ capacity too high                                                                                                                          | Resolve short to positive                                                                                                          |
| E 022 | Receiver           | Permanent | OSSD A: Short to ground/overload                                                                                                                                      | Resolve short to ground                                                                                                            |
| E 023 | Receiver           | Permanent | OSSD A: Short to ground/overload                                                                                                                                      | Resolve short to ground                                                                                                            |
| E 024 | Receiver           | Permanent | OSSD B: Short to positive/ capacity too high                                                                                                                          | Resolve short to positive                                                                                                          |
| E 025 | Receiver           | Permanent | OSSD B: Short to positive/ capacity too high                                                                                                                          | Resolve short to positive                                                                                                          |
| E 026 | Receiver           | Permanent | OSSD B: Short to ground/overload                                                                                                                                      | Resolve short to ground                                                                                                            |
| E 027 | Receiver           | Permanent | OSSD B: Short to ground/overload                                                                                                                                      | Resolve short to ground                                                                                                            |
| E 028 | Receiver           | Permanent | Slave inputs: Different switching status                                                                                                                              | Check slave connection, inconsistent signals                                                                                       |
| E 029 | Receiver           | Permanent | Slave inputs: Different switching status                                                                                                                              | Check slave connection, inconsistent signals                                                                                       |
| E 030 | Receiver           | Permanent | <ul style="list-style-type: none"> <li>• Contactor short to positive</li> <li>• Contactor does not deactivate</li> <li>• Incorrect parameter configuration</li> </ul> | <ul style="list-style-type: none"> <li>• Check the contactor function</li> <li>• Configure the EDM parameters correctly</li> </ul> |
| E 031 | Receiver           | Permanent | <ul style="list-style-type: none"> <li>• Contactor short to positive</li> <li>• Contactor does not deactivate</li> <li>• Incorrect parameter configuration</li> </ul> | <ul style="list-style-type: none"> <li>• Check the contactor function</li> <li>• Configure the EDM parameters correctly</li> </ul> |
| E 032 | Receiver           | Permanent | <ul style="list-style-type: none"> <li>• Contactor short to ground</li> <li>• Contactor does not activate</li> <li>• Incorrect parameter configuration</li> </ul>     | <ul style="list-style-type: none"> <li>• Check the contactor function</li> <li>• Configure the EDM parameters correctly</li> </ul> |
| E 033 | Receiver           | Permanent | <ul style="list-style-type: none"> <li>• Contactor short to ground</li> <li>• Contactor does not activate</li> <li>• Incorrect parameter configuration</li> </ul>     | <ul style="list-style-type: none"> <li>• Check the contactor function</li> <li>• Configure the EDM parameters correctly</li> </ul> |
| E 040 | Receiver           | Permanent | Ambient Light: Emitter of the same type detected                                                                                                                      | Remove the interfering emitter                                                                                                     |

|                        |                    |           |                                                                                                                                                               |                                                                                                                                                                                           |
|------------------------|--------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| E 041                  | Receiver           | Permanent | Ambient Light: Emitter of the same type detected                                                                                                              | Remove the interfering emitter                                                                                                                                                            |
| E 042                  | Receiver           | Permanent | Ambient light: Potential other cause                                                                                                                          | Check for and remove any other extraneous light sources                                                                                                                                   |
| E 043                  | Receiver           | Permanent | Ambient light: Potential other cause                                                                                                                          | Check for and remove any other extraneous light sources                                                                                                                                   |
| E 050                  | Emitter / receiver | Permanent | Parametrization not complete                                                                                                                                  | Repeat parametrization                                                                                                                                                                    |
| E 051                  | Emitter / receiver | Permanent | Parametrization not complete                                                                                                                                  | Repeat parametrization                                                                                                                                                                    |
| E 052                  | Receiver           | Permanent | Safety Field: <ul style="list-style-type: none"> <li>• Monitored blanking</li> <li>• Object too small</li> <li>• Incorrect parameter configuration</li> </ul> | <ul style="list-style-type: none"> <li>• Check blanking objects</li> <li>• Repeat parametrization</li> </ul>                                                                              |
| E 053                  | Receiver           | Permanent | Safety Field: <ul style="list-style-type: none"> <li>• Monitored blanking</li> <li>• Object too small</li> <li>• Incorrect parameter configuration</li> </ul> | <ul style="list-style-type: none"> <li>• Check blanking objects</li> <li>• Repeat parametrization</li> </ul>                                                                              |
| E 054                  | Receiver           | Permanent | Safety Field: <ul style="list-style-type: none"> <li>• Monitored blanking</li> <li>• Object too small</li> </ul>                                              | <ul style="list-style-type: none"> <li>• Check blanking objects</li> <li>• Repeat parametrization</li> </ul>                                                                              |
| E 055                  | Receiver           | Permanent | Safety Field: <ul style="list-style-type: none"> <li>• Monitored blanking</li> <li>• Object too small</li> </ul>                                              | <ul style="list-style-type: none"> <li>• Check blanking objects</li> <li>• Repeat parametrization</li> </ul>                                                                              |
| <b>Internal errors</b> |                    |           |                                                                                                                                                               |                                                                                                                                                                                           |
| E 1xx<br>E 2xx         | Emitter / receiver | Permanent | • Internal error                                                                                                                                              | <ul style="list-style-type: none"> <li>• Disconnect the power supply and restart the ESPE.</li> <li>• If this error occurs repeatedly, contact the wenglor support department.</li> </ul> |
| E126                   | Receiver           | Permanent | • SD card present but file is damaged                                                                                                                         | • Write SD card again and insert and load in ESPE                                                                                                                                         |
| E127                   | Receiver           | Permanent | • SD card present but file is damaged                                                                                                                         | • Write SD card again and insert and load in ESPE                                                                                                                                         |

### 13.3.3 Codes for Muting Errors

- The following codes are displayed until a muting cycle is initiated.
- The first message to occur is always shown.

| Code | Description/cause                                                                            | Measures                                                                                                                                                           |
|------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| M50  | Runtime error muting                                                                         | Restart muting and check the sequence.                                                                                                                             |
| M53  | Time exceeded when initiating muting                                                         |                                                                                                                                                                    |
| M54  | Time exceeded when initiating the second sensor pair muting                                  | Restart muting and check the sequence.<br>Adjust muting (type, positioning MS, muting signals) if necessary.                                                       |
| M55  | Signal 1 was present, but was withdrawn without a follow-up signal.                          |                                                                                                                                                                    |
| M56  | Signal sequence for initiating muting incorrect (for linear muting with sequence monitoring) |                                                                                                                                                                    |
| M57  | Incorrect order when activating the muting signals (1st/2nd signal switched)                 |                                                                                                                                                                    |
| M58  | Incorrect order when activating the muting signals (2nd/3rd signal switched)                 |                                                                                                                                                                    |
| M59  | Incorrect order when activating the muting signals (3rd/4th signal switched)                 |                                                                                                                                                                    |
| M60  | Incorrect order during deactivation 1st signal                                               |                                                                                                                                                                    |
| M61  | Incorrect order during deactivation 2nd signal                                               |                                                                                                                                                                    |
| M62  | Incorrect signal sequence when ending muting (signal switches incorrectly from 0 -> 1)       |                                                                                                                                                                    |
| M63  | MUTING_ENABLE timeout                                                                        | Apply Muting Enable signal for less than 300 s                                                                                                                     |
| M64  | MUTING_ENABLE was on 0 before the muting condition was valid                                 | Apply the Muting Enable signal until the muting conditions are fulfilled                                                                                           |
| M65  | Muting timeout                                                                               | <ul style="list-style-type: none"> <li>• Check the muting setup</li> <li>• Adjust muting properties (type, positioning MS, muting signals) if necessary</li> </ul> |
| M66  | The safety field was occupied when muting was deactivated                                    | <ul style="list-style-type: none"> <li>• Check the muting setup</li> <li>• Adjust muting properties (type, positioning MS, muting signals) if necessary</li> </ul> |
| M67  | Penetration of the safety field before muting was activated                                  | <ul style="list-style-type: none"> <li>• Check the muting setup</li> <li>• Adjust muting properties (type, positioning MS, muting signals) if necessary</li> </ul> |
| M75  | Change to the safety field status while belt stop active                                     | Check the "belt stop" function and rule out manipulation                                                                                                           |
| M76  | Muting sensor signals changed while belt stop active                                         | Check the "belt stop" function and rule out manipulation                                                                                                           |
| M77  | Belt stop timeout                                                                            | Apply belt stop signal for less than 8 h                                                                                                                           |

|     |                                                                                                                                                      |                                                                                                        |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| M80 | Penetration into non-blocked beam during active partial muting.                                                                                      | Check the parameter configuration for partial muting and adjust if necessary                           |
| M81 | OSSDs are off as a result of a slave device switching off                                                                                            | If the OSSDs of the slave device are switched off, the muting process is canceled on the master device |
| M90 | Override timeout: Max. time for static override request exceeded (is shown for as long as the override request is applied, i.e. the key is pressed). | End override requests. Generate new override request if necessary.                                     |

### 13.3.4 Codes when Accessing the Memory Card

| Code | Description/cause                                                                                           | Measures                                                                |
|------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| WSD0 | No microSD card present                                                                                     | Insert a MicroSD card in the designated memory card slot                |
| WSD1 | No file corresponding to the ESPE present on the microSD card. Read/write access error on the microSD card. | Check the contents of the microSD card and save a new file if necessary |

## 14. Decommissioning

- The sensor must be disconnected from supply power for decommissioning.
- The ESPE neither contains nor gives off any environmentally harmful substances. It consumes minimum amounts of energy and resources.

## 15. Proper Disposal

- wenglor sensoric GmbH does not accept the return of unusable or irreparable devices.
- Respectively valid national waste disposal regulations apply to product disposal.

# 16. Appendix

## 16.1 Checklists

### 16.1.1 Checklist Initial Start-up



**NOTE!**

- This checklist is intended to provide assistance during initial start-up.
- This checklist does not replace the checks before initial start-up, nor the regular checks on the part of specialized personnel.

| Standards and guidelines; selecting the ESPE                                                                                                                                                                        | Yes | No |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| Are the safety rules for the machine based on applicable standards and guidelines?                                                                                                                                  |     |    |
| Are the standards and directives used included in the EU declaration of conformity for the machine?                                                                                                                 |     |    |
| Does the safety device correspond to the required PL (EN ISO 13849-1) / SIL (EN 61508) from the risk assessment?                                                                                                    |     |    |
| Safety Clearance                                                                                                                                                                                                    | Yes | No |
| Was the safety clearance calculated according to applicable standards?                                                                                                                                              |     |    |
| Was the response time of the ESPE, the response time of any safety evaluation unit used and the over-travel time of the machine taken into account in the calculation?                                              |     |    |
| Has machine over-travel time been measured, specified, documented (at the machine and/or in the machine's documentation) and adapted to the ESPE installation setup.                                                |     |    |
| Has the safety clearance between the point of danger and the safety field been adhered to?                                                                                                                          |     |    |
| Access to the point of danger                                                                                                                                                                                       | Yes | No |
| Is it only possible to access the point of danger via the ESPE's safety field?                                                                                                                                      |     |    |
| Is it assured that persons are unable to remain within the danger zone unprotected (e.g. by means of mechanical protection against side-stepping), and are the implemented measures protected against manipulation? |     |    |
| Have additional mechanical protective measures been installed which prevent reaching under, over or around the safety field, and are they protected against manipulation?                                           |     |    |
| Installation                                                                                                                                                                                                        | Yes | No |
| Have the components of the ESPE been correctly attached and secured against loosening, shifting and rotation after adjustment?                                                                                      |     |    |
| Is the external condition of the ESPE and all associated system components flawless?                                                                                                                                |     |    |
| Has the acknowledgment key for resetting the ESPE been correctly installed outside of the danger zone, and is it functional?                                                                                        |     |    |
| Incorporation into the machine                                                                                                                                                                                      | Yes | No |
| Are both OSSDs incorporated in the downstream machine control?                                                                                                                                                      |     |    |
| Does the incorporation match the circuit diagrams?                                                                                                                                                                  |     |    |
| Are the switching elements which are controlled by the ESPE (e.g. contactors, valves) monitored by EDM?                                                                                                             |     |    |
| Have the required safety measures to protect against electric shock been implemented effectively?                                                                                                                   |     |    |



| Functionality                                                                                                                                                                                            | Yes | No |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| Is the ESPE effective during the entire duration of the machine's hazardous motion?                                                                                                                      |     |    |
| When the ESPE is disconnected from the supply voltage, is the hazardous motion stopped and does the acknowledgment key need to be pressed to reset the machine after the supply voltage is restored?     |     |    |
| If a hazardous state has been initialized, is it stopped when the ESPE is switched off, if the operating mode or any of the function types are changed, or if switching to another safety device occurs? |     |    |
| Are the specified safety functions functional in every operating mode of the machine?                                                                                                                    |     |    |
| Has the safety function been tested in accordance with the inspection instructions in the operating instructions?                                                                                        |     |    |
| Are the instructions for the regular inspection of the ESPE legible and mounted in a clearly visible position?                                                                                           |     |    |

#### **DANGER!**



- Work on the machine must be immediately stopped if any impairment of the safety function is detected.
- Once the situation has been resolved, the effectiveness of the ESPE must be checked again according to the checklist for initial start-up (see [section 16.1.1, page 148](#)).

### **16.1.2 Checklist Annual Inspection**

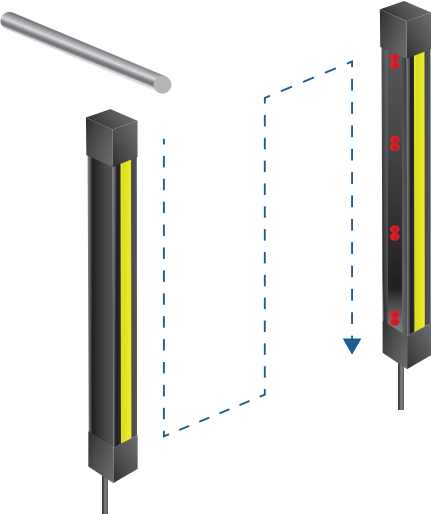
|                                                                                                                     | Yes | No |
|---------------------------------------------------------------------------------------------------------------------|-----|----|
| Have any changes or manipulations been carried out on the machine, which could have an impact on the safety system? |     |    |
| Have any changes or manipulations been carried out on the ESPE, which could have an impact on the safety system?    |     |    |
| The ESPE is connected correctly to the machine.                                                                     |     |    |
| Has the response time of the machine (incl. ESPE) increased compared with the initial start-up?                     |     |    |
| Cables, plugs and mounting are in flawless condition.                                                               |     |    |

#### **DANGER!**



- Work on the machine must be immediately stopped if any impairment of the safety function is detected.
- Once the situation has been resolved, the effectiveness of the ESPE must be checked again according to the checklist for initial start-up (see [section 16.1.1, page 148](#)).

16.1.3 Regular inspection checklist

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes | No |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| The ESPE is free from visible damage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |    |
| The lens cover is not scratched or contaminated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |    |
| The danger zone is only be accessible via the ESPE's safety field.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |    |
| Cables, plugs and mounting are in flawless condition.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |    |
| Checking the effectiveness of the ESPE: <ul style="list-style-type: none"><li>• The check may only be conducted if the hazardous motion has been switched off.</li><li>• Testing must be conducted with a test rod, and not by reaching in with the hand.</li><li>• Test rod diameter: in accordance with ESPE resolution</li></ul>                                                                                                                                                                                |     |    |
| Checking the "safety operating mode (automatic start-up)" function: <ul style="list-style-type: none"><li>• The OSSD ON display must light up before testing is started.</li><li>• Pass the test rod through the entire safety field as shown in the figure.</li><li>• The OSSD OFF display must be lit up as long as the test rod is in the safety field.</li></ul>                                                                                                                                               |     |    |
| Testing the "restart inhibit" function: <ul style="list-style-type: none"><li>• The RES display must flash before testing is started.</li><li>• Pass the test rod through the safety field as shown in the figure.</li><li>• The OSSD OFF display must be lit up as long as the test rod is in the safety field.</li><li>• The RES display may not light up as long as the test rod is in the safety field.</li></ul> <div></div> |     |    |

**DANGER!**



- Work on the machine must be immediately stopped if any impairment of the safety function is detected.
- Once the situation has been resolved, the effectiveness of the ESPE must be checked again according to the checklist for initial start-up (see [section 16.1.1, page 148](#)).

### 16.2.1 Connection Example Start-Up Disabling and Restart Inhibit

- Start-up disabling and restart inhibit RES via ESPE
- No contactor monitoring EDM
- Connection to safety relay SR4B3B01S

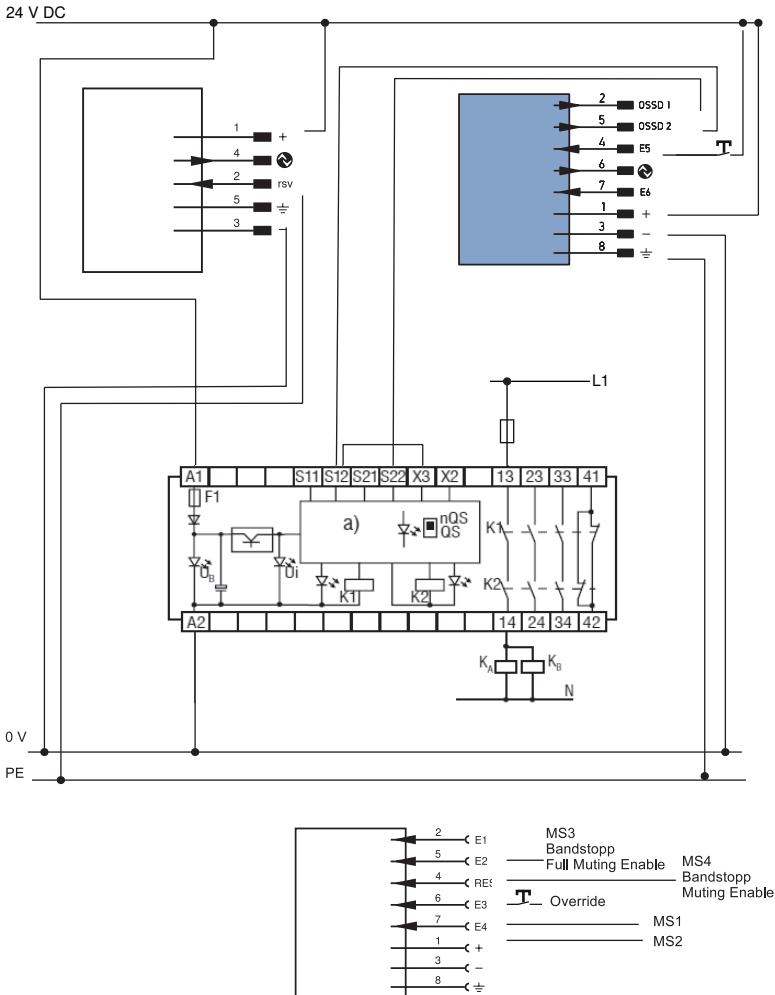
### 16.2.2 Connection Examples Muting

- Start-up disabling and restart inhibit RES via ESPE
- Connection to safety relay SR4B3B01S
- Connection of the necessary muting components via the extension connection



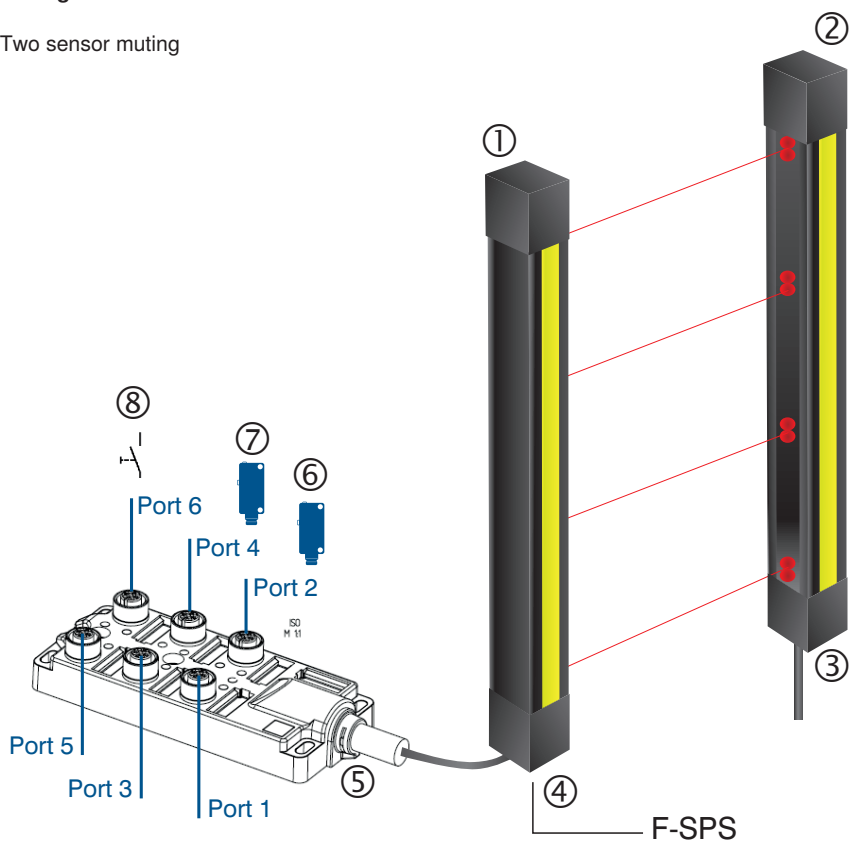
**NOTE!**

Quick electrical connection of the muting components is possible via the muting sets (incl. connection box ZFBB001).



### Muting with connection box ZFBB001

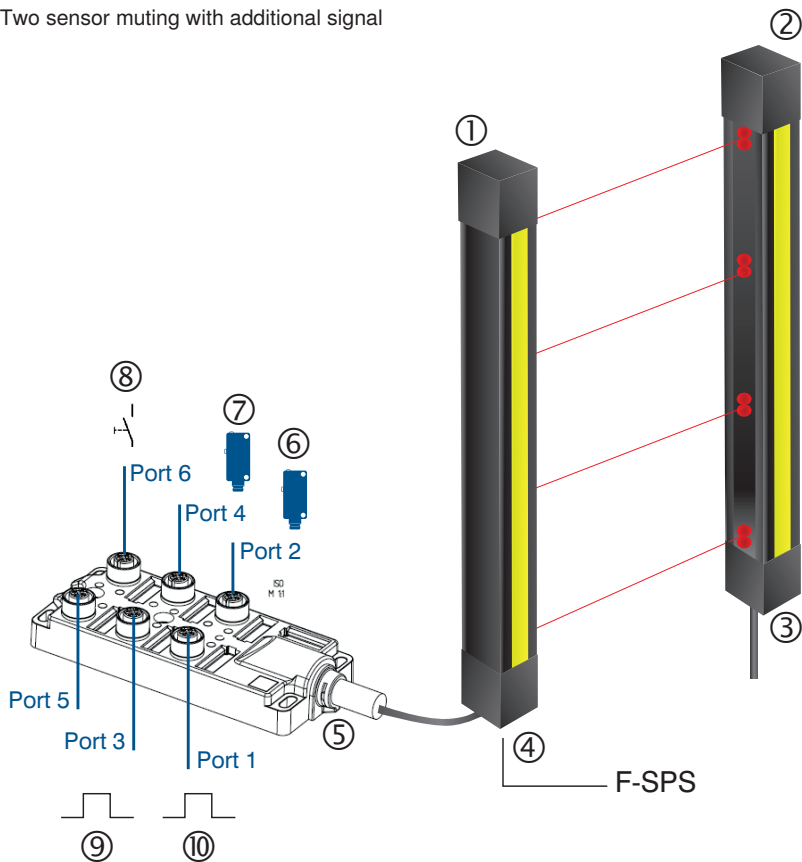
## Two sensor muting



|   |                                                      |
|---|------------------------------------------------------|
| 1 | Receiver SEFBxxx                                     |
| 2 | Emitter SEFBxxx                                      |
| 3 | Connection line M12×1; 4/5-pin                       |
| 4 | Connection line M12×1; 8-pin                         |
| 5 | ZFBB001 Connection Box                               |
| 6 | MS with connection cable on M12×1; 4/5-pin           |
| 7 | MS with connection cable on M12×1; 4/5-pin           |
| 8 | Override key with connection cable on M12×1; 4/5-pin |

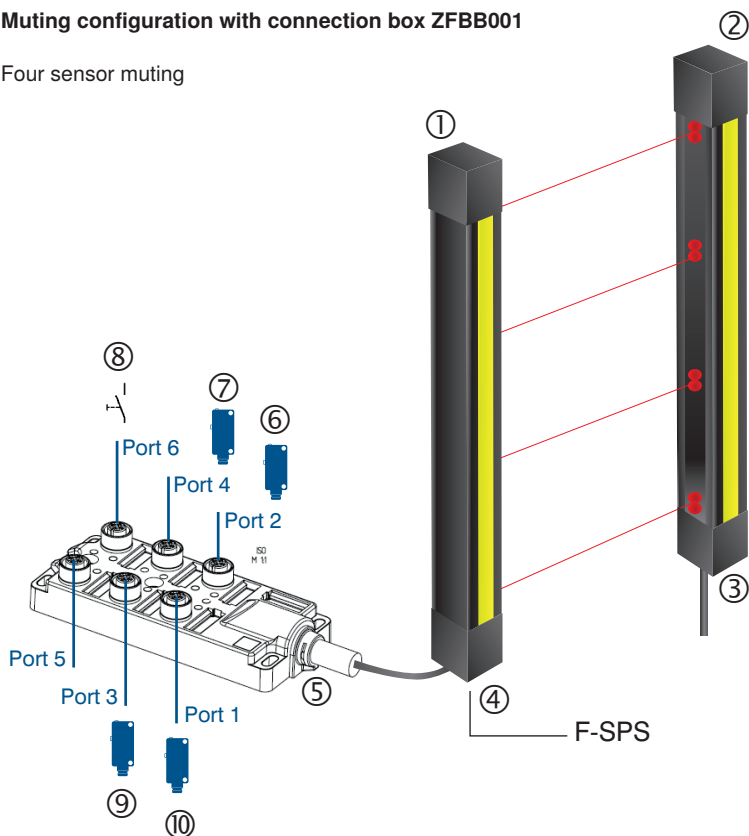
## Muting configuration with connection box ZFBB001

## Two sensor muting with additional signal



|    |                                                              |
|----|--------------------------------------------------------------|
| 1  | Receiver SEFBxxx                                             |
| 2  | Emitter SEFBxxx                                              |
| 3  | Connection line M12×1; 4/5-pin                               |
| 4  | Connection line M12×1; 8-pin                                 |
| 5  | ZFBB001 Connection Box                                       |
| 6  | MS with connection cable on M12×1; 4/5-pin                   |
| 7  | MS with connection cable on M12×1; 4/5-pin                   |
| 8  | Override key with connection cable on M12×1; 4/5-pin         |
| 9  | Muting enable signal with connection cable on M12×1; 4/5-pin |
| 10 | Belt stop signal connection cable on M12×1; 4/5-pin          |

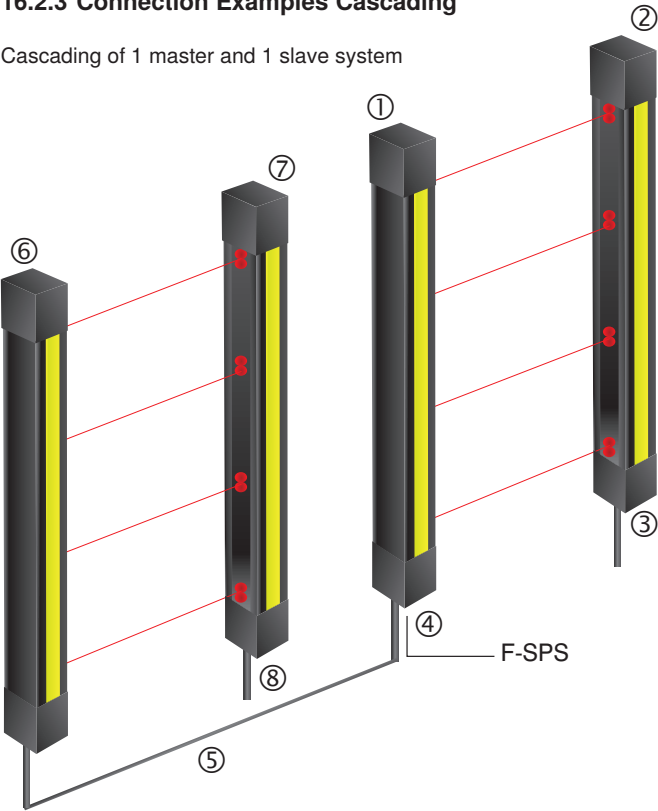
## Four sensor muting



|    |                                                      |
|----|------------------------------------------------------|
| 1  | Receiver SEFBxxx                                     |
| 2  | Emitter SEFBxxx                                      |
| 3  | Connection line M12×1; 4/5-pin                       |
| 4  | Connection line M12×1; 8-pin                         |
| 5  | ZFBB001 Connection Box                               |
| 6  | MS with connection cable on M12×1; 4/5-pin           |
| 7  | MS with connection cable on M12×1; 4/5-pin           |
| 8  | Override key with connection cable on M12×1; 4/5-pin |
| 9  | MS with connection cable on M12×1; 4/5-pin           |
| 10 | MS with connection cable on M12×1; 4/5-pin           |

16.2.3 Connection Examples Cascading

Cascading of 1 master and 1 slave system



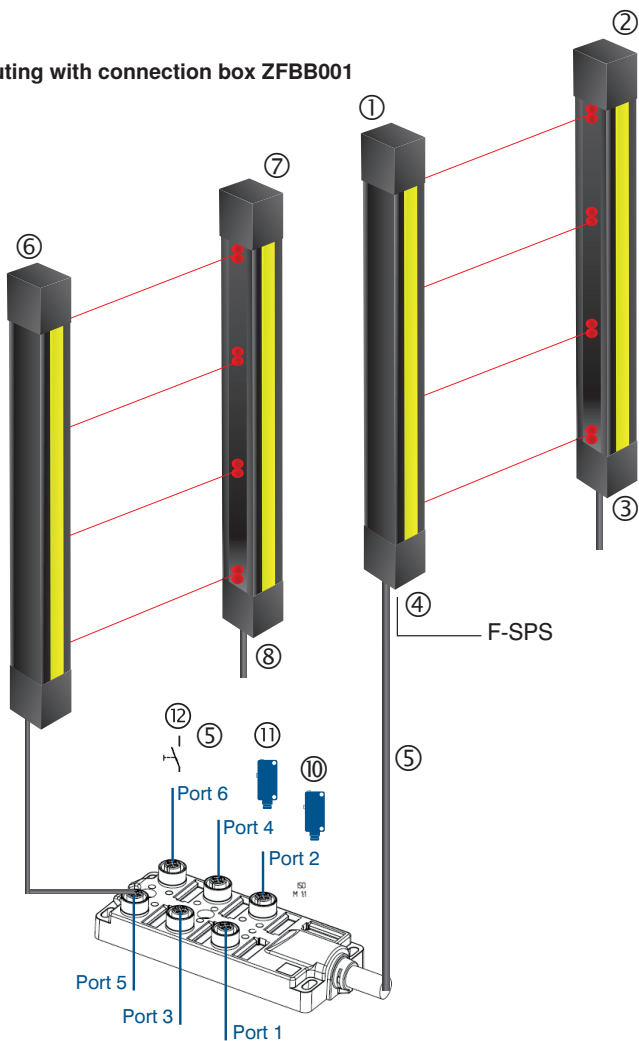
|   |                                |
|---|--------------------------------|
| 1 | Receiver SEFBxxx MASTER        |
| 2 | Emitter SEFBxxx MASTER         |
| 3 | Connection line M12×1; 4/5-pin |
| 4 | Connection line M12×1; 8-pin   |
| 5 | Connection cable BG88SG88V2-2M |
| 6 | Receiver SEFBxxx SLAVE         |
| 7 | Emitter SEFBxxx SLAVE          |
| 8 | Connection line M12×1; 4/5-pin |



**NOTE!**  
The cascading function can be used in conjunction with muting via connection box ZFBB001.



Cascading and muting with connection box ZFBB001



|    |                                                      |
|----|------------------------------------------------------|
| 1  | Receiver SEFBxxx MASTER                              |
| 2  | Emitter SEFBxxx MASTER                               |
| 3  | Connection line M12×1; 4/5-pin                       |
| 4  | Connection line M12×1; 8-pin                         |
| 5  | ZFBB001 Connection Box                               |
| 6  | Receiver SEFBxxx SLAVE                               |
| 7  | Emitter SEFBxxx SLAVE                                |
| 8  | Connection line M12×1; 4/5-pin                       |
| 9  | Connection cable BG88SG88V2-2M                       |
| 10 | MS with connection cable on M12×1; 4/5-pin           |
| 11 | MS with connection cable on M12×1; 4/5-pin           |
| 12 | Override key with connection cable on M12×1; 4/5-pin |

### 16.3 Order Notes

The operating instructions apply for the following sensors.

#### SEFB

| Number of beams | Beam distance [mm] | Set     | Emitter | Receiver |
|-----------------|--------------------|---------|---------|----------|
| 2               | 500                | SEFB422 | SEFB512 | SEFB622  |
| 3               | 400                | SEFB423 | SEFB513 | SEFB623  |
| 4               | 300                | SEFB424 | SEFB514 | SEFB624  |

#### SEFB Muting

| Number of beams | Beam distance [mm] | Set     | Emitter | Receiver |
|-----------------|--------------------|---------|---------|----------|
| 2               | 500                | SEFB412 | SEFB512 | SEFB612  |
| 3               | 400                | SEFB413 | SEFB513 | SEFB613  |
| 4               | 300                | SEFB414 | SEFB514 | SEFB614  |

### 16.4 EU Declaration of Conformity

The EU declaration of conformity can be found on our website at [www.wenglor.com](http://www.wenglor.com) in the product's separate download area.

### 16.5 Index of Changes

| Version | Date       | Description / change                                                                                                                                                                                                                                  |
|---------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0.1   | 07.08.2019 | First version                                                                                                                                                                                                                                         |
| 1.0.2   | 06.11.2019 | Revision                                                                                                                                                                                                                                              |
| 1.1.0   | 09.06.2021 | Additions to chapters “4.1 General Technical Data” on page 15, “4.9.8 T-Plug ZC7G001 (IO-Link Signal)” on page 31, “4.9.10 Muting Connection Box ZFBB001” on page 34, “11.2 Calling Up the Current Parametrization (“Worker” User Level)” on page 135 |
| 1.2.0   | 03.07.2025 | Additions to chapters “9.1 General” on page 92, “10.4 Check for initial start-up” on page 130, UKCA, SIL (EN 61508)                                                                                                                                   |
|         |            |                                                                                                                                                                                                                                                       |

## 16.6 Index of Abbreviations

| Version          | Description / change                                                |
|------------------|---------------------------------------------------------------------|
| a                | Height of the danger zone                                           |
| b                | Height of the top edge of the safety field                          |
| ESPE             | Electro-sensitive protective equipment                              |
| C                | Margin for the safety clearance                                     |
| C <sub>RO</sub>  | Margin for the safety clearance for access over the safety field    |
| C <sub>RT</sub>  | Margin for the safety clearance for access through the safety field |
| d                | Resolution of the ESPE or minimum distance for muting structures    |
| EDM              | External Device Monitoring (contactor monitoring)                   |
| FBB              | First Beam Blocked                                                  |
| H                | Height of the safety field above the floor                          |
| H <sub>min</sub> | Minimum permissible mounting height                                 |
| IODD             | IO-Link device description file                                     |
| K                | Approach speed                                                      |
| LBB              | Last Beam Blocked                                                   |
| m                | Minimum clearance to reflective surfaces                            |
| MS               | Muting sensor                                                       |
| MS1              | Muting Sensor 1 (same for MS2, MS3, MS4)                            |
| MMD              | Muting duration                                                     |
| NBB              | Numbers of Beams Blocked                                            |
| NCBB             | Numbers of Cumulated Beams Blocked                                  |
| NC               | Normally Closed (NC contact)                                        |
| NO               | Normally Open (NO contact)                                          |
| NOBJ             | Number of Objects                                                   |
| OSSD             | Output Signal Switching Device Safe switching output of the ESPE    |
| PL               | Performance Level                                                   |
| RES              | Restart Inhibit                                                     |
| S                | Safety clearance                                                    |
| S <sub>RO</sub>  | Safety clearance for access over the safety field                   |
| S <sub>RT</sub>  | Safety clearance for access through the safety field                |
| Sfb              | Safety field width                                                  |
| SFH              | Safety field height                                                 |
| SIL              | Safety Integrity Level                                              |

|            |                                              |
|------------|----------------------------------------------|
| F-PLC      | Failsafe control                             |
| T          | Total response time                          |
| $t_1$      | Response time of the ESPE                    |
| $t_2$      | Response time of the safety switching device |
| $t_3$      | Response time of the machine                 |
| $t_{ESPE}$ | ESPE processing time of all signals          |
| $t_{MS}$   | Response time of the muting sensors          |

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