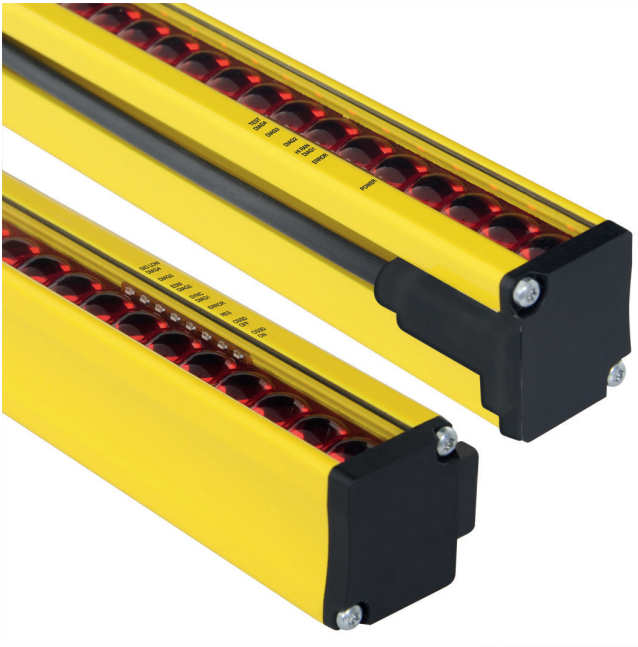


SEMGxxx

Type 4 Safety Light Curtain



Operating Instructions

Table of Contents

1.	Use for Intended Purpose	4
2.	Safety Precautions	4
3.	Notes Concerning the Operating Instructions	4
3.1.	Scope	4
3.2.	Utilized Abbreviations and Terms	4
3.3.	Utilized Symbols	5
4.	Technical Data	6
4.1.	Response Times	8
4.2.	Wiring Diagram	9
4.3.	Dimensional Drawings	9
4.3.1.	Safety Light Curtain	9
4.3.2.	ZEMX001 Mounting Bracket	11
4.3.3.	ZEMX002 Mounting Bracket	12
4.3.4.	ZEMZ001 Mounting System	12
4.4.	Control Panel	13
4.5.	Complementary Products (see catalog)	14
4.6.	Scope of Delivery	14
5.	Functions	14
5.1.	Range	14
5.2.	Safety Mode (automatic operation)	15
5.3.	Start-Up and Restart Inhibit	15
5.4.	Contactors Monitoring	16
5.5.	Signal Output	16
5.6.	Test Function	16
5.7.	Synchronization	17
6.	Installation and electrical connection	19
6.1.	Securing the Danger Zone	21
6.2.	Safety Clearance	22
6.2.1.	Safety Clearance for Vertical Approach to the Safety Field	22
6.2.2.	Safety Clearance for Horizontal Approach to the Safety Field	25
6.2.3.	Safety Clearance for Angular Approach to the Safety Field	26
6.3.	Clearance from Reflective Surfaces	26

6.4.	Installation	27
6.4.1.	Installation with ZEMX001 Mounting Bracket	28
6.4.2.	Installation with ZEMX002 Mounting Bracket	28
6.4.3.	Installation with ZEMZ001 Mounting System	29
6.5.	Multiple Systems	30
6.6.	Electrical Connection	31
6.6.1.	Default Settings	31
6.6.2.	Range	32
6.6.3.	Safety Mode (automatic operation)	33
6.6.4.	Start-Up and Restart Inhibit	35
6.6.5.	Contactor Monitoring	37
6.6.6.	Signal Output	39
6.6.7.	Test Function	40
6.7.	Optical Alignment	41
6.8.	Deflection Mirror 6.8	43
7.	Testing	44
7.1.	Testing Prior to Initial Start-Up	44
7.2.	Annual Inspection	45
7.3.		
	Important Instructions for Daily Inspection	46
8.	Diagnostics	48
8.1.	Required Action in Case of Error	48
8.2.	Display during Normal Operation	49
8.2.1.	Receiver	49
8.2.2.	Emitter	50
8.3.	Display in Case of Error	51
8.3.1.	Receiver	51
8.3.2.	Emitter	53
9.	Maintenance	54
10.	Shutdown	54
11.	Proper Disposal	54
12.	Initial Start-Up Checklist	55
13.	EC Declaration of Conformity	57

1. Use for Intended Purpose

This wenglor product is intended for use in accordance with the following functional principle:

Safety Light Curtain

The Safety Light Curtain monitors the safety field between the emitter and the receiver. If the safety field is interrupted by an obstruction, a switching command is triggered. This switching command either prevents initialization of a hazardous machine motion, or stops an action which has already been started.

Use of the Light Curtain is only permissible if:

- Hazardous motion can be stopped by electrical means using the light curtain's safety output
- Adequate detection of possible obstruction is assured with existing resolution
- Use of a type 4 Light Curtain with performance level PL e is permissible

2. Safety Precautions

- These instructions are an integral part of the product and must be kept on hand for the entire duration of its service life.
- Read the operating instructions carefully before using the product.
- Installation, initial start-up and maintenance of the product may only be carried out by qualified personnel.
- Tampering with or modifying the product is impermissible.
- 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. resulting from the use of cordless controllers on cranes, emission due to welding sparks or the effects of stroboscope lights).

3. Notes Concerning the Operating Instructions

3.1. Scope











These operating instructions are valid for the following products:

- SEMG4xx: sales kit consisting of Emitter and Receiver
- SEMG5xx: Emitter
- SEMG6xx: Receiver

3.2. Utilized Abbreviations and Terms

ESPE	Electro-sensitive protective equipment
SFH	Safety field height
EDM	External device monitoring (contactor monitoring)
RES	Restart inhibit
OSSD	Output signal switching device (safety output)

3.3. Utilized Symbols

	Important Note Malfunctioning or faults may occur in the case of nonobservance. Personal injury and/or damage to the machine may occur in the case of nonobservance.
	Cross reference
	Instructions for required action
	Standards Observe applicable standards and any relevant national regulations. Read detailed notes in the corresponding standard.
	Calculation
	Sample calculation
[abc]	Definition Explanation of a term or a function
	LED symbols Description of the status of a diagnostics LED LED is lit up continuously.
	The LED can have any status (lit up or off).
	LED blinks.
	LED is off.

4. Technical Data

Order No.	Emitter: SEMG531–SEMG542 Receiver: SEMG631–SEMG642	Emitter: SEMG512–SEMG522 Receiver: SEMG612–SEMG622
Optical Data		
Range	0.2...6 m	0.25...14 m
Safety field height	250...1811 mm	326...1827 mm
Resolution	14 mm	30 mm
Aperture angle	± 2.5°	
Emitter wavelength	Typically 630 nm	
Coated optics	Yes	
Resistance to extraneous light	10,000 lux	
Electrical Data		
Supply power	19.2 to 28.8 V DC (SELV, PELV power pack), it must be possible to bridge power failures of 20 ms or more (EN 60204-1) For US and Canada: Device to be supplied by a certified Class 2 power supply that complies with the requirements according to NEC and CEC.	
Fusing of supply voltage, inputs	Max. 2 A	
Power consumption, receiver (operating voltage = 24 V)	≤ 200 mA (without load)	
Power consumption, emitter (operating voltage = 24 V)	≤ 100 mA	
Internal fuse	2 A	
Temperature range	SFH ≤ 1061 mm: –25...55° C SFH > 1061 mm: –5...55° C	–25...55° C
Storage temperature	–25...60° C	
Relative humidity	≤ 95% (non-condensing)	
Vibration resistance	5 g (10 ... 55 Hz)	
Shock resistance	10 g/16 ms	
Signal output		
Signal output	Semiconductor, PNP	
Number of signal outputs	1	
Signal output switching current	≤ 100 mA	
Signal output voltage drop	≤ 2.5 V	
Safety outputs		
Safety outputs	Semiconductor, PNP	
Number of safety outputs	2	
Safety output switching current	≤ 300 mA	
Safety output leakage current	≤ 2 mA	
Voltage drop at safety output	≤ 2.3 V	
Max. voltage in off state	< 2 V	
Max. capacitive load	≤ 1 μF	

Order No.	Emitter: SEMG531–SEMG542 Receiver: SEMG631–SEMG642	Emitter: SEMG512–SEMG522 Receiver: SEMG612–SEMG622
Max. Inductive load	≤ 2.2 mH	
Test pulse width, rate	< 300 μs, typically 20 ms	
Restart time after reach-in	Typically 2 × response time	
Inputs		
Voltage range	–30...30 V DC	
Switching thresholds	LOW: < 5 V, < 2 mA HI: > 11 V, 6...30 mA	
Activation duration	0.1...4 s	
Acknowledgment input		
EDM response/drop-off time	350 ms	
Short-circuit proof	Yes	
Reversed polarity and overload proof	Yes	
Protection class	III	
Max. cable length	< 35 m/0.25 sq. mm < 50 m/0.34 sq. mm < 72 m/0.50 sq. mm	
Mechanical		
Housing material	Aluminum	
Protection	IP65, IP67	
Emitter connection	300 mm cable, 4/5-pin M12	
Emitter cable diameter	5 mm	
Receiver connection	300 mm cable, 8-pin M12	
Receiver cable diameter	6 mm	
Min. bending radius	5 × cable diameter (permanently laid) 10 × cable diameter (dynamic installation)	
Technical Safety Data		
ESPE type (EN 61496)	4	
Performance level (EN ISO 13849-1:2008)	Cat. 4 PL e	
Safety integrity level (EN 62061)	SIL cl 3	
PFHd	1,6 E-8 1/h	
Service life TM (EN ISO 13849-1:2008)	20 a	
Functions		
Finger protection	Yes	No
Hand protection	No	Yes
Safety mode	Yes	
Restart inhibit	Yes	
Contactors monitoring	Yes	

4.1. Response Times

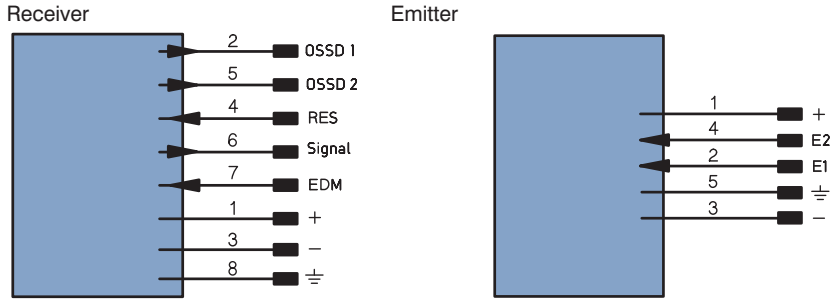
Resolution: 14 mm

Order Number	Response Time [ms]
SEMG631	7.6
SEMG632	8.3
SEMG633	9.9
SEMG634	11.6
SEMG635	13.2
SEMG636	14.9
SEMG637	16.5
SEMG638	18.2
SEMG639	19.8
SEMG640	21.5
SEMG641	23.1
SEMG642	24.8

Resolution: 30 mm

Order Number	Response Time [ms]
SEMG612	6.6
SEMG613	7.5
SEMG614	8.3
SEMG615	9.1
SEMG616	9.9
SEMG617	10.8
SEMG618	11.6
SEMG619	12.4
SEMG620	13.2
SEMG621	14.1
SEMG622	14.9

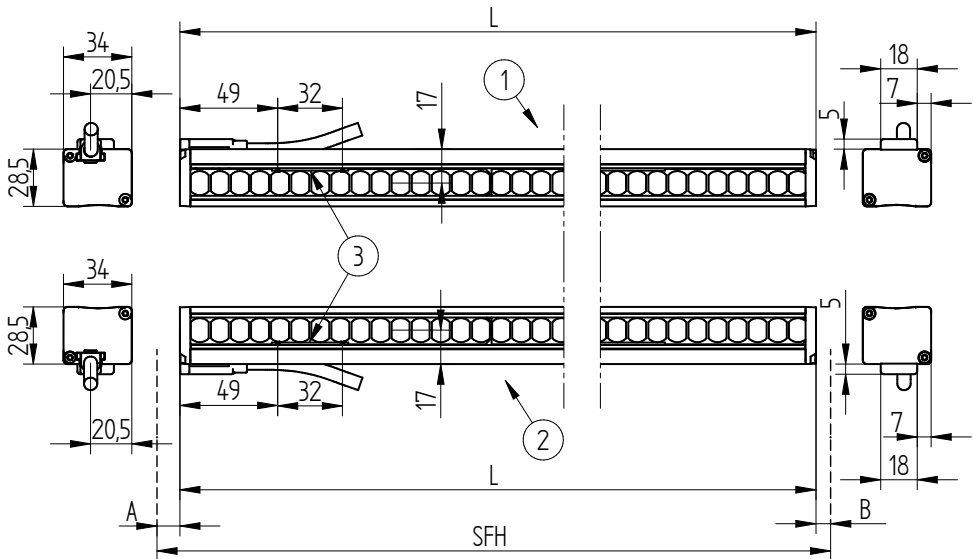
4.2. Wiring Diagram



+	+ supply power
-	0 V supply power
OSSD	Safety output
Signal	Signal output
⏏	Ground
RES	Acknowledgement input
EDM	Contact monitoring
E	Analog or digital input

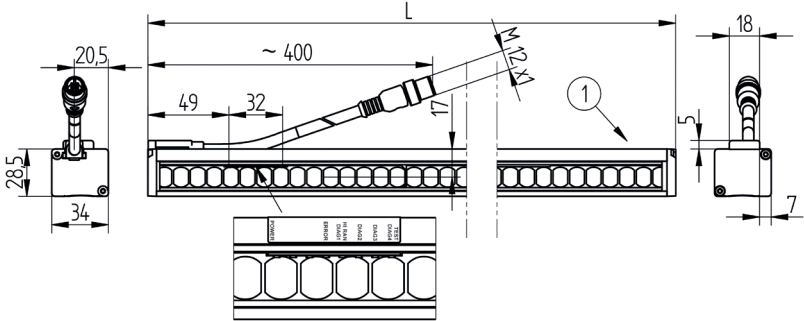
4.3. Dimensional Drawings

4.3.1. Safety Light Curtain

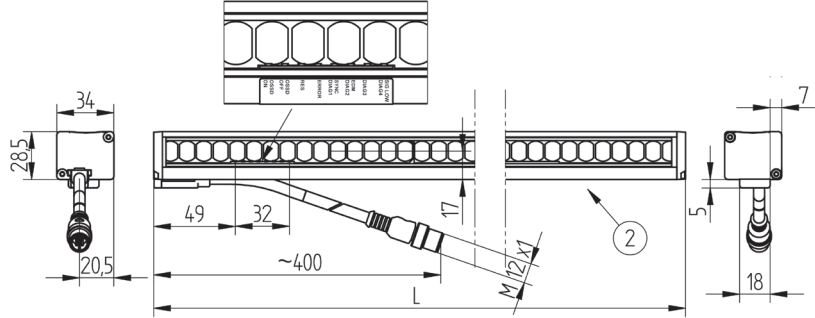


1 = emitter
 2 = receiver
 3 = control panel
 SFH = safety field height

Emitter Detail



Receiver Detail



Resolution: 14 mm

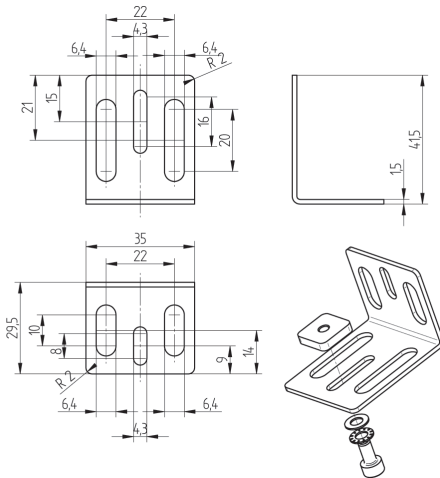
Order Number	SFH (mm)	L (mm)	A (mm)	B (mm)	Max. weight per sensor (kg)
SEMGx31	250	249	1	0	0,38
SEMGx32	310	309	1	0	0,53
SEMGx33	460	459	1	0	0,69
SEMGx34	610	609	1	0	0,84
SEMGx35	761	760	1	0	0,99
SEMGx36	911	910	1	0	1,15
SEMGx37	1061	1060	1	0	1,30
SEMGx38	1211	1210	1	0	1,45
SEMGx39	1361	1360	1	0	1,61
SEMGx40	1511	1510	1	0	1,76
SEMGx41	1661	1660	1	0	1,91
SEMGx42	1811	1810	1	0	2,07

Resolution: 30 mm

Order Number	SFH (mm)	L (mm)	A (mm)	B (mm)	Max. weight per sensor (kg)
SEMGx12	326	311	15	0	0,53
SEMGx13	486	461	15	10	0,69
SEMGx14	626	611	15	0	0,84
SEMGx15	787	762	15	10	0,99
SEMGx16	927	912	15	0	1,15
SEMGx17	1087	1062	15	10	1,30
SEMGx18	1227	1212	15	0	1,45
SEMGx19	1387	1362	15	10	1,61
SEMGx20	1527	1512	15	0	1,76
SEMGx21	1687	1662	15	10	1,91
SEMGx22	1827	1812	15	0	2,07

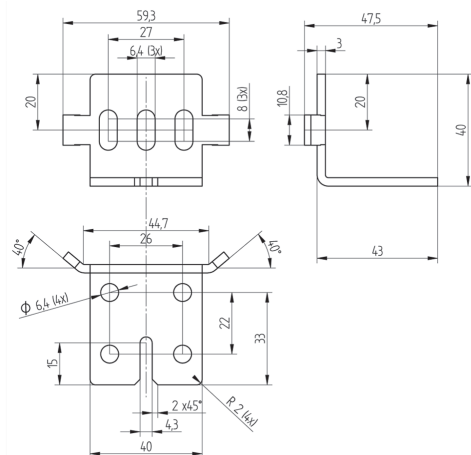
4.3.2. ZEMX001 Mounting Bracket

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



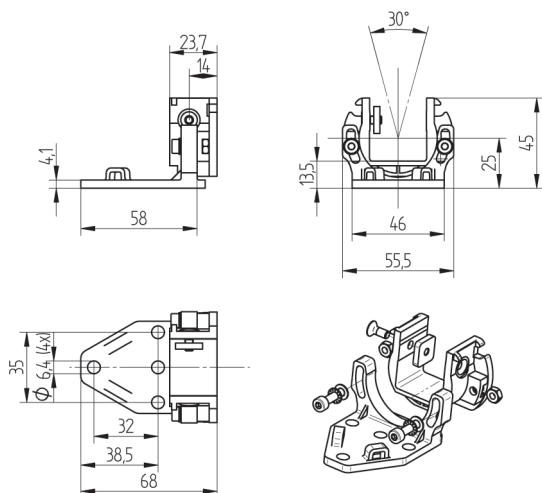
4.3.3. ZEMX002 Mounting Bracket

- For mounting in Protection Columns
- Scope of delivery: 2 pieces
- Including screws, washers and slot nuts



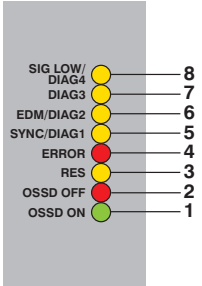
4.3.4. ZEMZ001 Mounting System

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

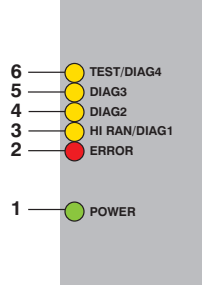


4.4. Control Panel

Receiver

	Display	Color	
8	Diagnostics 4/weak signal	YE	 <p>Diagram showing 8 LEDs for the Receiver control panel:</p> <ul style="list-style-type: none"> 8: SIG LOW/DIAG4 (Yellow) 7: DIAG3 (Yellow) 6: EDM/DIAG2 (Yellow) 5: SYNC/DIAG1 (Yellow) 4: ERROR (Red) 3: RES (Yellow) 2: OSSD OFF (Red) 1: OSSD ON (Green)
7	Diagnostics 3	YE	
6	Diagnostics 2/contactor monitoring	YE	
5	Diagnostics 1/synchronization	YE	
4	Error	RD	
3	Acknowledgment prompt	YE	
2	OSSD off	RD	
1	OSSD on	GN	

Emitter

	Display	Color	
6	Diagnostics 4/test	YE	 <p>Diagram showing 6 LEDs for the Emitter control panel:</p> <ul style="list-style-type: none"> 6: TEST/DIAG4 (Yellow) 5: DIAG3 (Yellow) 4: DIAG2 (Yellow) 3: HI RAN/DIAG1 (Yellow) 2: ERROR (Red) 1: POWER (Green)
5	Diagnostics 3	YE	
4	Diagnostics 2	YE	
3	Diagnose 1/high range	YE	
2	Error	RD	
1	Supply power	GN	

4.5. Complementary Products (see catalog)

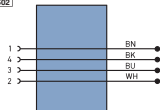
wenglor offers Connection Technology for field wiring.

Matching mounting technology no. **810** **790** **820**

Matching connection technology no. (emitter)

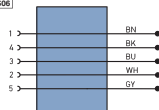
2

(S02)



35

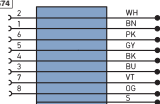
(S06)



Matching connection technology no. (receiver)

89

(S74)



Deflection Mirror Z2UG004

Protection Column with Deflection Mirror SZ000EU170NN01

Protection Column with Screening Grid SZ000EG170NN01

Safety Relay SG4-00VA000R2, SR4B3B01S, SR4D3B01S

4.6. Scope of Delivery

- Emitter and receiver with identical SFH
- Quick start
- Operating Instructions on CD
- Test rod matched to the resolution of the ESPE (Ø 14 mm – ZEMG003/Ø 30 mm – ZEMG004)
- Daily Inspection sticker
- Mounting bracket (ZEMX001)

5. Functions

Selectable functions are set up by means of corresponding wiring. (→ section 6.6 on page 31)

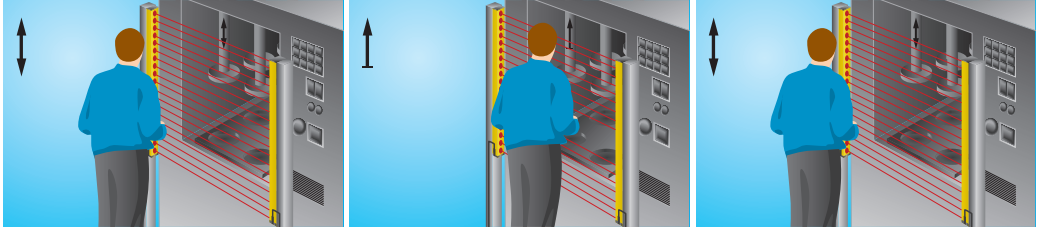
5.1. Range

- Range must be suitably adjusted for each respective application.
- The range setting is safety relevant.
- If it's set too high, bleed-over reflection may occur.

5.2. Safety Mode (automatic operation)

[abc]

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

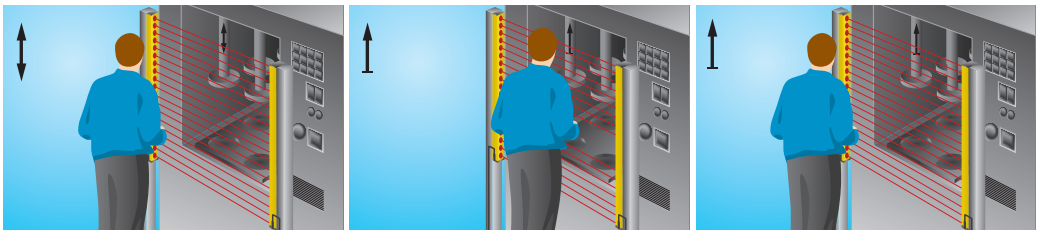


- Determine whether or not safety mode operation is permissible for the respective application.

5.3. Start-Up and Restart Inhibit

[abc]

- Start-up inhibit is activated along with the → restart inhibit function. When supply power is switched on (e.g. after a power failure), the safety outputs (OSSD) remain in the off state. Acknowledgement is accomplished by activating an acknowledgment key.
- Restart inhibit prevents a machine from starting back up automatically after the safety field has been penetrated. The machine can only be re-enabled by activating an acknowledgment key.



- The acknowledgment key must be mounted outside of the danger zone.
- The user must be able to see into the danger zone in an unobstructed fashion when activating the acknowledgment key.

5.4. Contactor Monitoring

[abc]

- Contactor monitoring is a function for which switching performance of the contacts at an external relay is dynamically monitored. The contacts must close fully within a specified period of time.
- Switching devices equipped with positively-driven NC contacts are a prerequisite for this function.

5.5. Signal Output

[abc]

- The signal output is a semiconductor output for auxiliary functions without safety monitoring.
- Additional read-out function: acknowledgment prompt

5.6. Test Function

[abc]

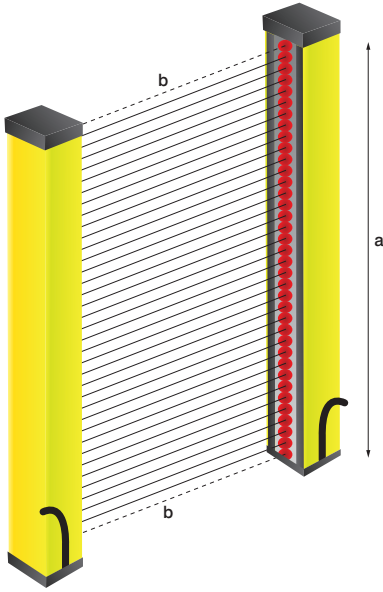
- If the test input is connected to plus, the transmission function is deactivated. The sensor can thus be tested for correct functioning. If the input is open or connected to minus, the transmission function is activated.



- The ESPE is self-testing. No external test is required.
- Max. valid test duration: < 150 ms
- A test duration of ≥ 150 ms results in a warning (→ section 8.2.2 on page 50)
- A test duration of > 10 s results in an error.

5.7. Synchronization

- The emitter and the receiver are synchronized by means of optical synchronization beams. These are the upper and lowermost beams.



a = safety field height
b = synchronization beams

2. Adjust the receiver (default status)

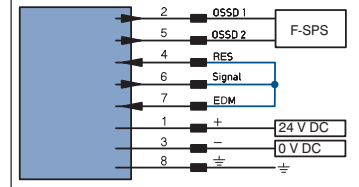
NOTE

The procedure must be executed
during initial start-up.

Prerequisite: default setting
(safety mode active)

Connect the receiver
Turn off the power supply

Safety mode without contactor monitoring



Connect to power supply

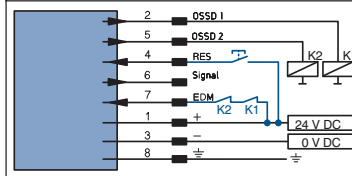
Does restart
inhibit or contactor
monitoring have to be
activated?

yes

Disconnect from power supply

no

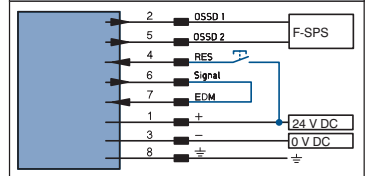
Wire contactor monitoring



Connect to power supply

Functions activated.
The receiver reboots.

Wire start-up and restart inhibit



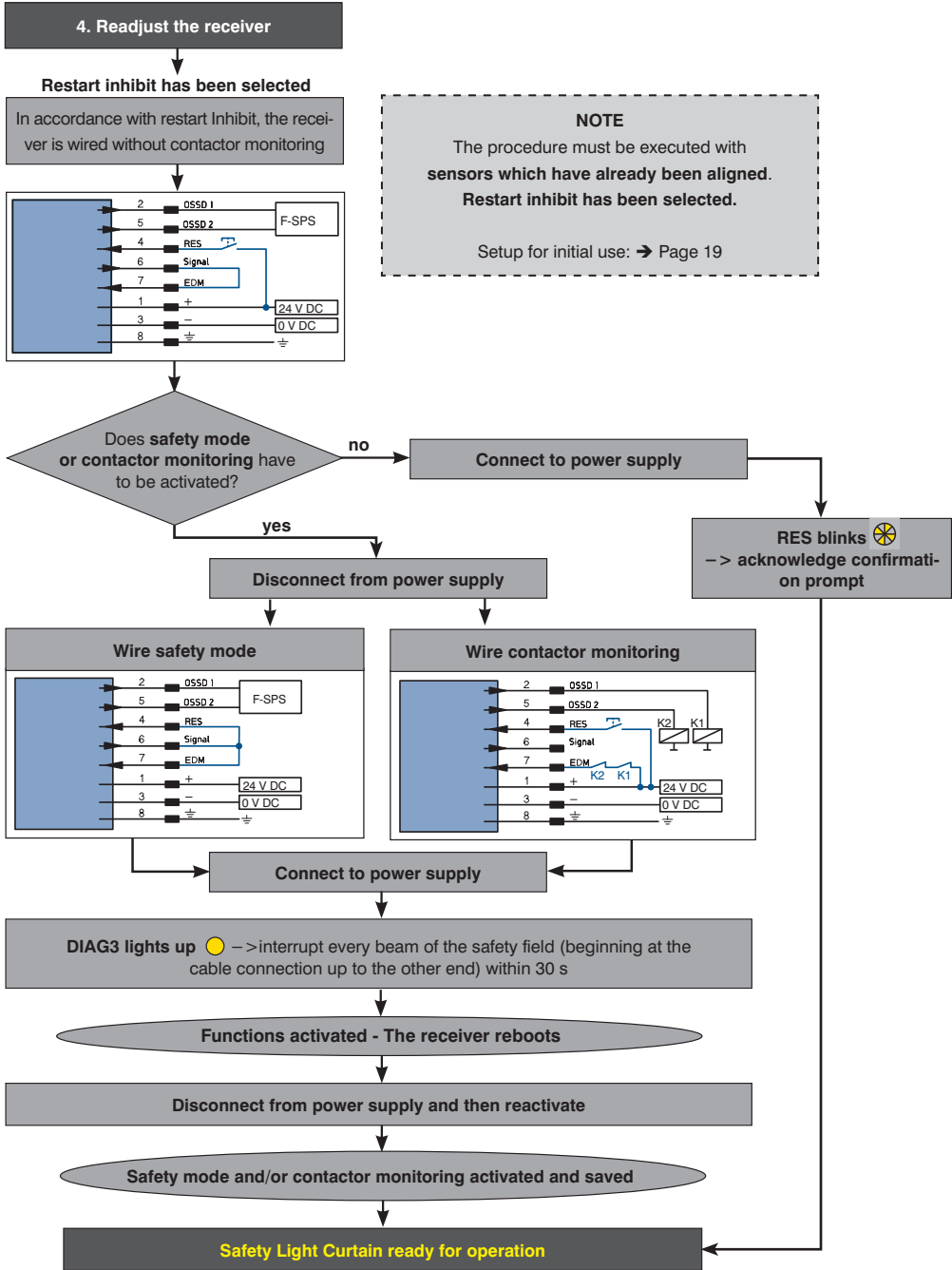
Connect to power supply

Functions activated.
The receiver reboots.

Safety Light Curtain ready for operation

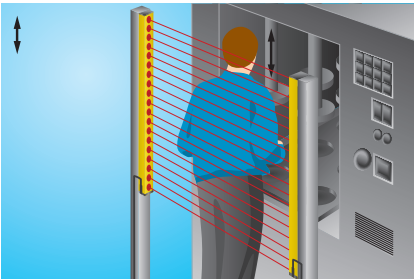
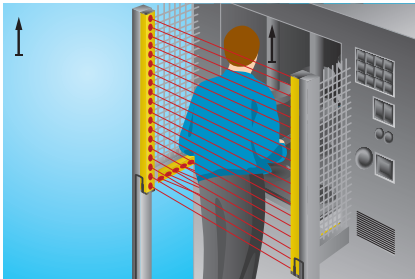
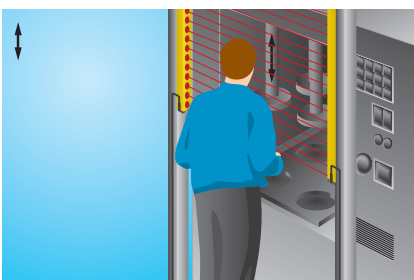
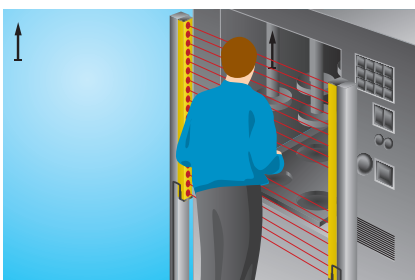
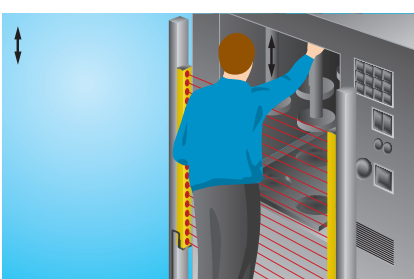
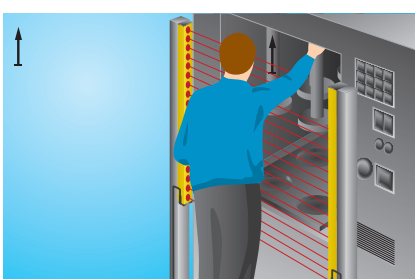
RES blinks 

-> acknowledge confirmation prompt



6.1. Securing the Danger Zone

- The danger zone must be secured either by means of the ESPE alone, or by means of the ESPE in combination with additional mechanical safety devices.
- Reaching around, over and/or under the safety field must be prevented.
- It must be impossible to approach the point of danger without passing through the safety field of the ESPE.
- The safety field is located between the point at which light is emitted at the emitter and the point at which light is received at the receiver.
- SFH of the respective ESPE: → section 4.3 on page 9

Incorrect	Correct
	 <p data-bbox="490 611 628 639">Side-Stepping</p>
	 <p data-bbox="512 906 605 959">Reaching Under</p>
	 <p data-bbox="490 1225 628 1254">Reaching Over</p>

6.2. Safety Clearance



EN ISO 13855 + EN ISO 13857

[abc]

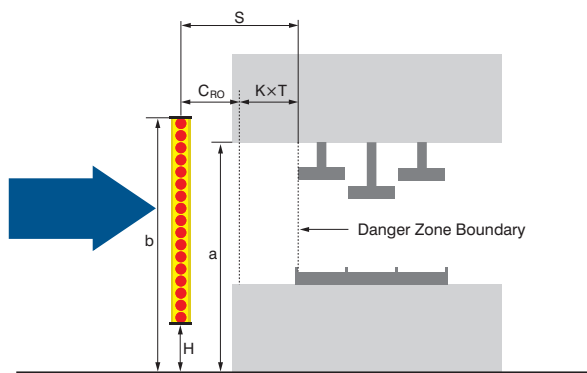
- Safety clearance is the minimum distance between the safety field of the ESPE and the danger zone.
- Safety clearance must be adhered to, in order to assure that the danger zone cannot be reached before hazardous motion is fully stopped.



$$S = (K \times T) + C_{RT} \text{ or } S = K \times (t_1 + t_2) + C_{RT}$$

- S [mm] = safety clearance measured from the danger zone to the safety field
 K [mm/s] = approach speed
 T [s] = total response time ($t_1 + t_2$)
 t_1 [s] = ESPE response time
 t_2 [s] = machine or process overtravel time (overtravel time is specified in the machine's documentation, or must be ascertained by means of measurement)
 C_{RT} [mm] = additional clearance depending upon resolution d with reference to reaching through the ESPE
 C_{RO} [mm] = additional clearance with reference to reaching over an ESPE
 d [mm] = resolution of the ESPE
 H [mm] = reference height, height of the safety field above the floor
 a [mm] = height of the danger zone
 b [mm] = height of the top edge of the safety field

6.2.1. Safety Clearance for Vertical Approach to the Safety Field



Observe reference height H .

$H \leq 300$ mm \rightarrow avoid danger of undetected access underneath the safety field.

$H < 200$ mm \rightarrow avoid danger of undetected access by children underneath the safety field.

Height of the uppermost beam ≥ 900 mm \rightarrow prevent danger of stepping over the safety field.



Resolution d	Margin C_{RT}	Approach speed K	Safety clearance S	Note
≥ 14 mm	$8 \times (d - 14$ mm) $C = 0$ mm (at $d = 14$ mm)	2000 mm/s (where $S \leq 500$ mm)	$S = (2000 \text{ m/s} \times T) + 8 \times (d - 14$ mm)	S may not be ≤ 100 mm
		1600 mm/s (where $S > 500$ mm)	$S = (1600 \text{ m/s} \times T) + 8 \times (d - 14$ mm)	
≥ 30 mm	$8 \times (d - 14$ mm) $C = 128$ mm (at $d = 30$ mm)	2000 mm/s (where $S \leq 500$ mm)	$S = (2000 \text{ m/s} \times T) + 8 \times (d - 14$ mm)	S may not be ≤ 150 mm
		1600 mm/s (where $S > 500$ mm)	$S = (1600 \text{ m/s} \times T) + 8 \times (d - 14$ mm)	

Prevent Reaching Over the Safety Field

Height of the danger zone a (mm)	Additional horizontal clearance C_{RO} to the danger zone [mm]											
2600	0	0	0	0	0	0	0	0	0	0	0	0
2500	400	400	350	300	300	300	300	300	250	150	100	0
2400	550	550	550	500	450	450	400	400	300	250	100	0
2200	800	750	750	700	650	650	600	550	400	250	0	0
2000	950	950	850	850	800	750	700	550	400	0	0	0
1800	1100	1100	950	950	850	800	750	550	0	0	0	0
1600	1150	1150	1100	1000	900	850	750	450	0	0	0	0
1400	1200	1200	1100	1000	900	850	650	0	0	0	0	0
1200	1200	1200	1100	1000	850	800	0	0	0	0	0	0
1000	1200	1150	1050	950	750	700	0	0	0	0	0	0
800	1150	1050	950	800	500	450	0	0	0	0	0	0
600	1050	950	750	550	0	0	0	0	0	0	0	0
400	900	700	0	0	0	0	0	0	0	0	0	0
200	600	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
Height b, top edge of the safety field (mm)												
	900	1000	1100	1200	1300	1400	1600	1800	2000	2200	2400	2600



- Safety field top-edge heights of less than 900 mm do not provide adequate protection against stepping around or over the safety field.
- Safety field bottom-edge heights of greater than 300 mm do not provide adequate protection against crawling under the safety field.

1	2	3
4	5	6
7	8	9

- ESPE response time t_1 = 10 ms
- ESPE resolution d = 30 mm
- Machine overtravel time t_2 = 250 ms
- Danger zone height a = 800 mm

Step 1: Calculate safety clearance for crawling under.

$$S_{RT} = 2000 \text{ mm/s} \times (t_1 + t_2) + C_{RT}$$

$$S_{RT} = 2000 \text{ mm/s} \times (0.25 \text{ s} + 0.01 \text{ s}) + 8 (30 \text{ mm} - 14 \text{ mm})$$

$$S_{RT} = 648 \text{ mm}$$

$$S_{RT} > 500 \text{ mm, and thus new calculation with } K = 1600 \text{ mm/s}$$

$$S_{RT} = 1600 \text{ mm/s} \times (0.25 \text{ s} + 0.01 \text{ s}) + 8 (30 \text{ mm} - 14 \text{ mm})$$

$$S_{RT} = 544 \text{ mm}$$

Step 2: Determine additional clearance C_{RO} .

$$S = (K \times T) + C$$

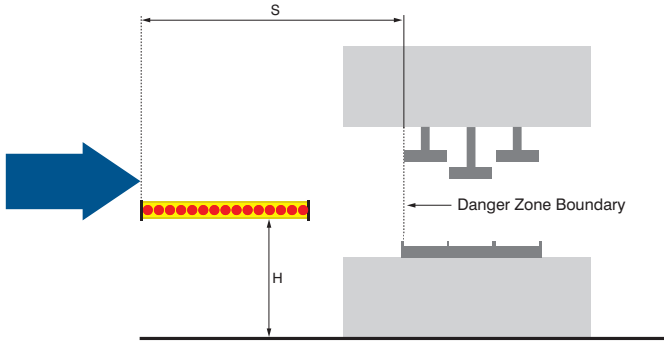
Equating $S_{R0} = S_{RT}$ results in $C_{RO} = C_{RT} = 128 \text{ mm}$

Find a = 800 mm in the table titled “Prevent Reaching Over the Safety Field” and take the next smaller value of $C_{RO} = 0 \text{ mm}$.

Step 3: Determine the height of the top edge of the ESPE safety field b.

Take the corresponding value from the table: b = 1600 mm.

6.2.2. Safety Clearance for Horizontal Approach to the Safety Field



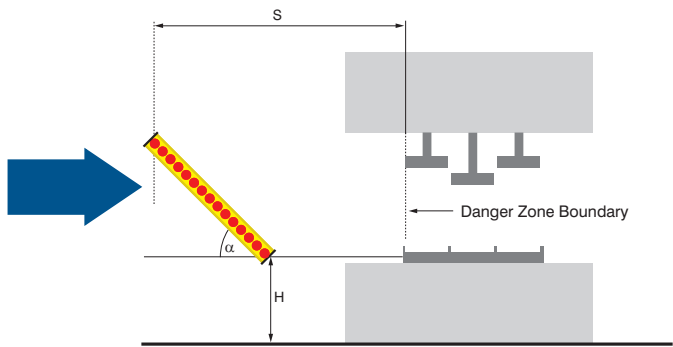
Reference height H	$200 \text{ mm} < H < 1000 \text{ mm}$	
Minimum height H_{\min}	$H_{\min} = 15 \times (d - 50 \text{ mm})$	$H \geq 0 \text{ mm}$
Margin C	$C = 1200 \text{ mm} - 0.4 \times H$ $C_{\min} \geq 850 \text{ mm}$	
Approach speed K	1600 mm/s	
Resulting resolution d	$d = (H/15) + 50 \text{ mm}$	Required resolution must be calculated for the specified height.
Safety clearance S	$S = (1600 \text{ mm/s} \times T) + (1200 \text{ mm} - 0.4 \times H)$	S may not be $\leq 850 \text{ mm}$. S is between the danger zone and the furthest beam of the sensor.

Example:

- ESPE response time = 10 ms
 - ESPE resolution = 14 mm
 - Machine over-travel time = 330 ms
 - Reference height = 500 mm
- $$S = 1600 \text{ mm/s} \times (0.33 \text{ s} + 0.01 \text{ s}) + 1200 \text{ mm} - (0.4 \times 500 \text{ mm})$$
- $$S = 1544 \text{ mm}$$
- Resultant resolution $d = (500 \text{ mm}/15) + 50 \text{ mm} = 83.3 \text{ mm}$

6.2.3. Safety Clearance for Angular Approach to the Safety Field

For applications where $5^{\circ} < \alpha < 85^{\circ}$



	$\alpha > 30^{\circ}$	$\alpha < 30^{\circ}$
Calculation based on	Vertical approach	Horizontal approach
Safety clearance refers to	Distance between the point of danger and the closest light beam	Distance between the point of danger and the furthest light beam
Note		<p>The height of the furthest light beam may not be $\leq 1000\text{ mm}$.</p> <p>The following applies to the closest light beam: $H = 15 \times (d - 50\text{ mm})$ and $d = H/15 + 50\text{ mm}$</p>

6.3. Clearance from Reflective Surfaces



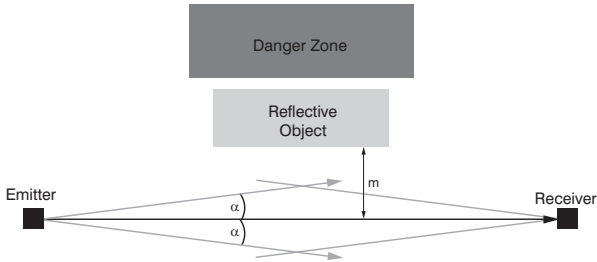
- Reflective surfaces located within the aperture angle between the emitter and the receiver may counteract the system's safety function.
- Minimum clearance (m) from reflective surfaces to the optical axis must be adhered to.



IEC 61496-2

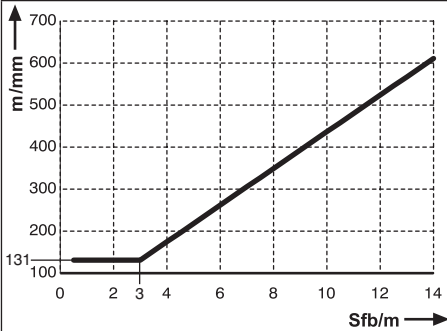


$$m = \tan \alpha \times \text{safety field width}$$



$$\alpha = 2.5^\circ$$

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



m/mm = minimum clearance [mm]

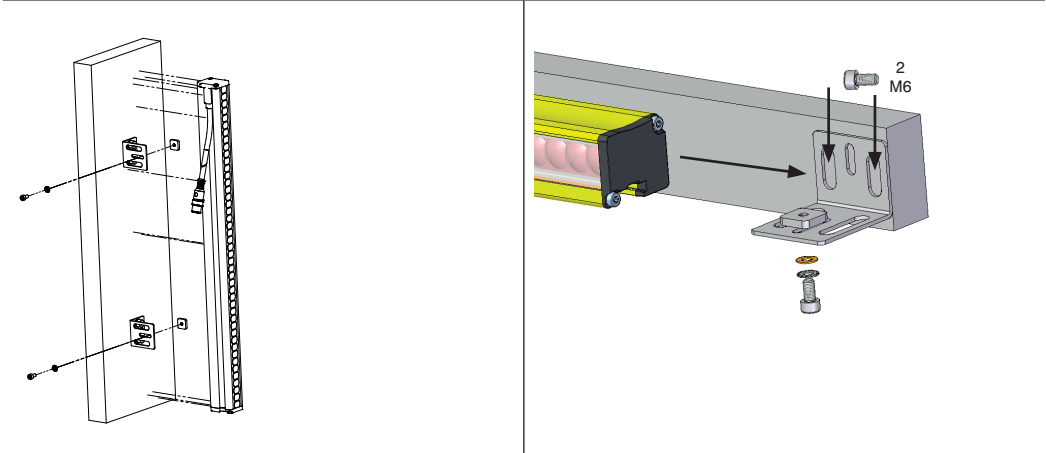
Sfb/m = distance from emitter to receiver [m]

6.4. Installation

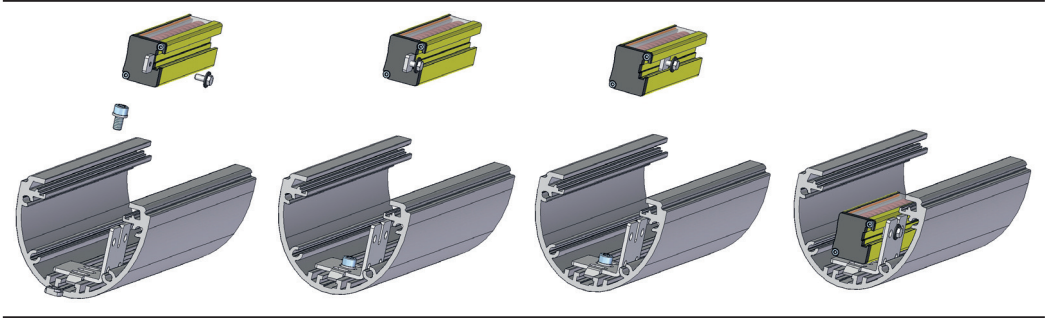


- Protect the sensor against mechanical influences.
- Install the sensor such that its installation position cannot be inadvertently changed.

6.4.1. Installation with ZEMX001 Mounting Bracket

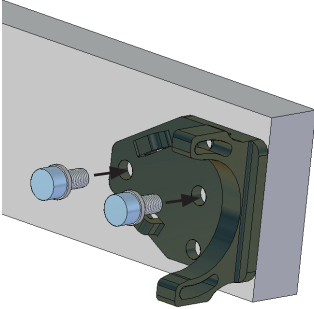


6.4.2. Installation with ZEMX002 Mounting Bracket

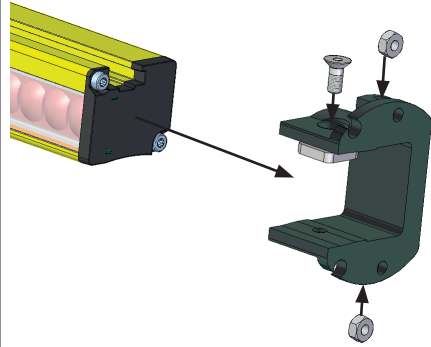


6.4.3. Installation with ZEMZ001 Mounting System

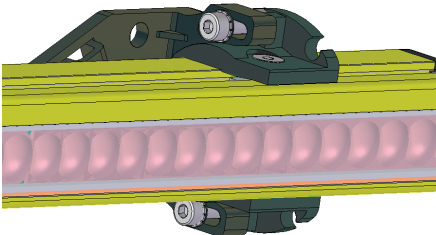
1) Install the wall mounting.



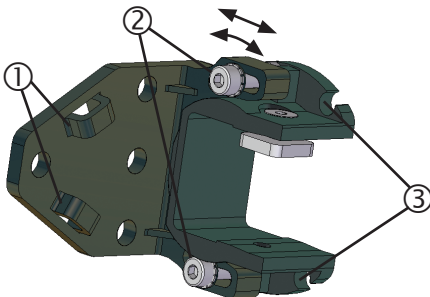
2) Attach the profile mounting.



3) Join the wall and profile mountings to each other.



4) Alignment



1 Securing the Cable

- The cable can be secured with cable ties.

2 Aligning the ESPE

- Slightly loosen the screws between the wall and profile mountings.
- Align the ESPE.
- Turn the ESPE in the axial direction.
- Adjust ESPE inclination.

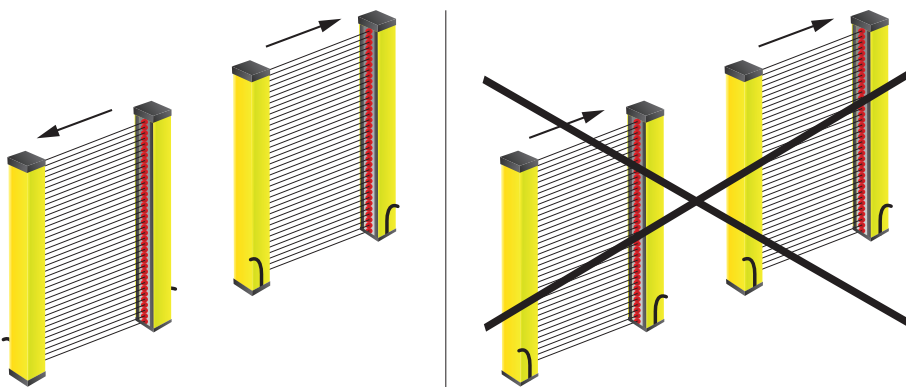
3 Securing the Cable

- The cable can be snapped into the openings.

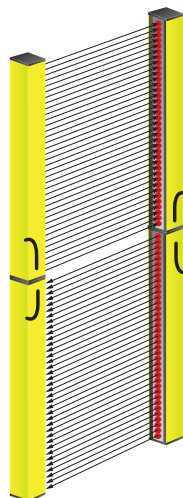
6.5. Multiple Systems



- Reciprocal influence of neighboring ESPEs may counteract the system's safety function.
- Only the light from the associated emitter may strike the receiver.
- Measures for the prevention of mutual influence in multiple systems:
 - Non-parallel arrangement (see figure)
 - Lateral clearance = $2 \times m$ (→ section 6.3 on page 26)
 - Screening (e.g. by means of partitions)



- In the case of Safety Light Curtains with hand protection, a consistent resolution of 30 mm, and thus an enlarged safety field can be achieved by arranging two sensors in a row. The following requirements must be adhered to:
 - Both sensors must have a resolution of 30 mm.
 - The sensors are positioned one on top of the other without any gap at the end of the device (cable connection).
 - The sensors are arranged non-parallel so that reciprocal influence is prevented.



6.6. Electrical Connection

- Both safety outputs, namely OSSD1 and OSSD2, are always incorporated into the machine's power circuit.
- Functional earth can be optionally connected.

6.6.1. Default Settings

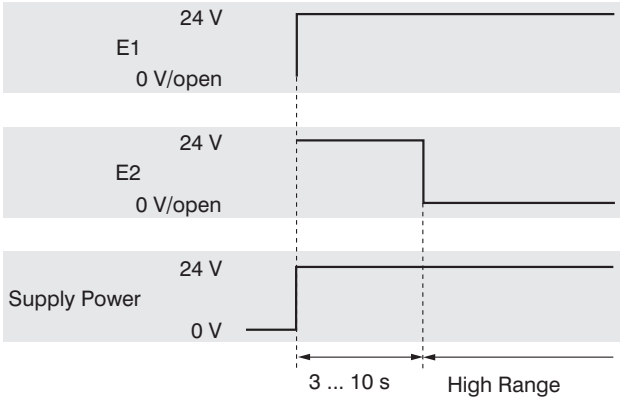
Device	Function	Default Setting
Receiver	Safety mode	Active (in the case of appropriate wiring)
	Start-up and restart inhibit	Inactive, is activated automatically by means of appropriate wiring
	Contactors monitoring	Inactive, is activated automatically by means of appropriate wiring
Emitter	Test function	Inactive, is activated when triggered during operation
	Range	High range (in the case of appropriate wiring)

6.6.2. Range

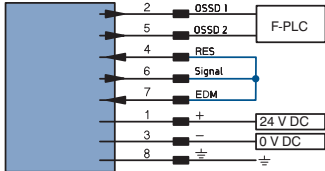
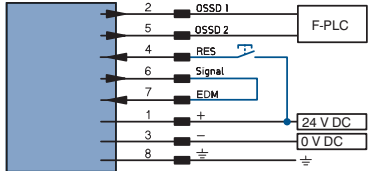


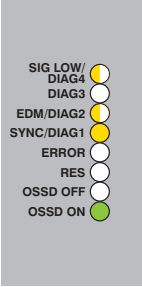
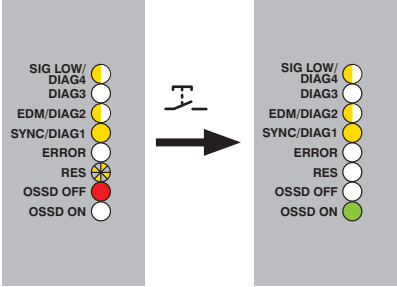





	Low Range	High range
Range at 14 mm	0.25...3.5 m	3...6 m
Range at 30 mm	0.25...6 m	5.5...14 m
Emitter wiring		
		E2 must be connected to 24 V for 3 to 10 seconds! (see timing diagram below)
Display at emitter		

Timing Diagrams

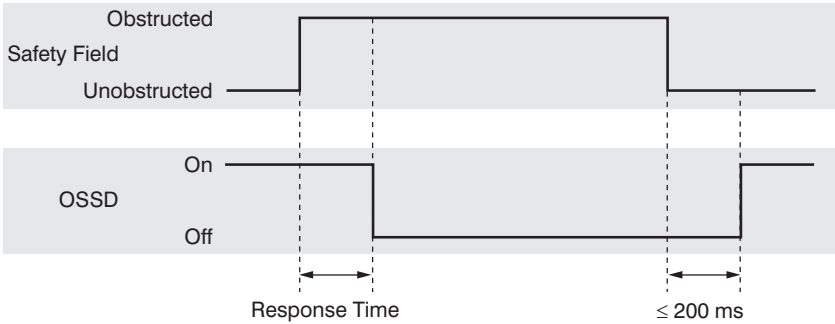
Setting range from low to high



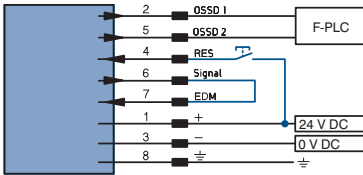

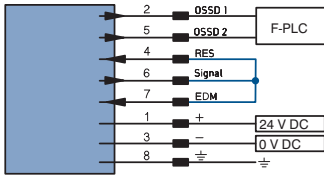


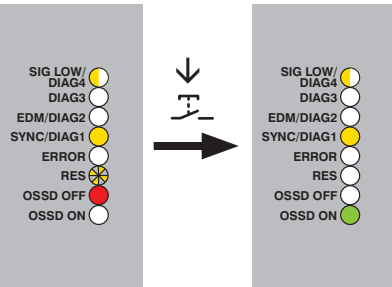
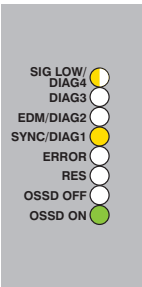





6.6.3. Safety Mode (automatic operation)

	Activation	Deactivation → Activation of Start-Up and Restart Inhibit
Receiver wiring	 <p>F-PLC = safety controller</p>	 <p>F-PLC = safety controller T = acknowledgement button</p>
	<ul style="list-style-type: none"> Wiring according to above diagram Wiring diagram without contactor monitoring DIAG3  Interrupt every beam of the safety field (from cable connection to other end) within 30 s Interruption of supply power 	<p>Rewiring for start-up and restart inhibit (→ section 6.6.4 on page 35)</p> <ul style="list-style-type: none"> DIAG3 on/safety field unobstructed, all beams detected
Display at receiver		
Note	<p>Depending on the selected functions and the status of the ESPE, the following displays may appear:</p> <ul style="list-style-type: none"> Contactor monitoring is active. EDM/DIAG2  Contactor monitoring is inactive. EDM/DIAG2  Ideally aligned SIG LOW/DIAG4  Weak signal SIG LOW/DIAG4  Beam interruption through the entire safety field is required – from the cable connection to other end. DIAG3  	

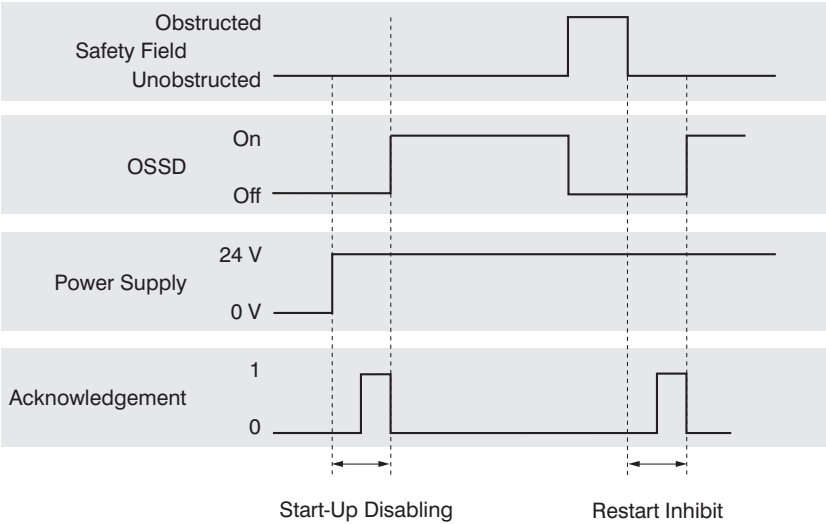
Timing Diagram



6.6.4. Start-Up and Restart Inhibit

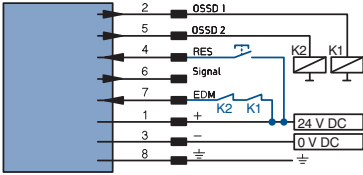
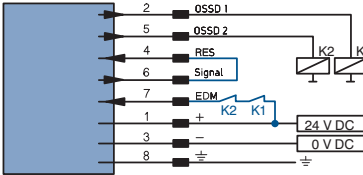

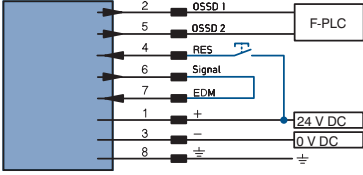
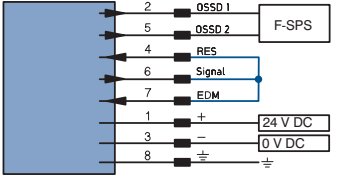



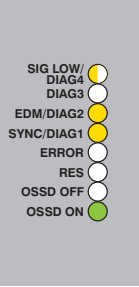
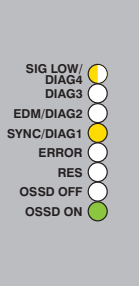
	Activation	Deactivation → Activation of the Safety Mode
Receiver wiring	 <p>F-PLC = safety controller  = acknowledgement button</p>	 <p>F-PLC = safety controller</p>
	<ul style="list-style-type: none"> • Wiring according to above diagram • Wiring diagram without contactor monitoring 	<ul style="list-style-type: none"> • Rewiring for safety mode operation (→ section 6.6.3 on page 33) • DIAG3 on/safety field unobstructed, all beams detected • DIAG3  Interrupt every beam of the safety field (from cable connection to other end) within 30 s • Interruption of supply power
Display at receiver		
Note	<p>Depending on the selected functions and the status of the ESPE, the following displays may appear:</p> <ul style="list-style-type: none"> • Contactor monitoring is active. EDM/DIAG2  • Contactor monitoring is inactive. EDM/DIAG2  • Ideally aligned SIG LOW/DIAG4  • Weak signal SIG LOW/DIAG4  • Beam interruption through the entire safety field is required – from the cable connection to other end. DIAG3  	

Timing Diagram



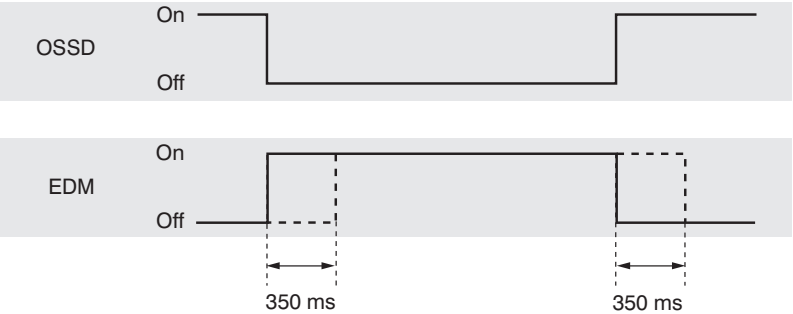
Activation duration: 0.1 to 4 s (see technical data)

6.6.5. Contactor Monitoring

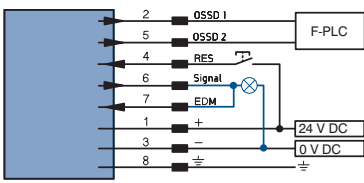


	Activation	Deactivation
Receiver wiring	<p>Wiring diagram with restart inhibit</p>  <p>Wiring diagram with safety mode</p>  <p> = acknowledgement button</p>	<p>Wiring diagram with restart inhibit</p>  <p>Wiring diagram with safety mode</p>  <p>F-PLC = safety controller  = acknowledgement button</p>
	Wiring according to above diagram	<ul style="list-style-type: none"> Wiring according to above diagram DIAG3 on/safety field unobstructed, all beams detected DIAG3  Interrupt every beam of the safety field (from cable connection to other end) within 30 s
Display at receiver		

Note	<p>Depending on the selected functions and the status of the ESPE, the following displays may appear:</p> <ul style="list-style-type: none">• Contactor monitoring is active. EDM/DIAG2 ● Contactor monitoring is inactive. EDM/DIAG2 ○• Ideally aligned SIG LOW/DIAG4 ○ Weak signal SIG LOW/DIAG4 ●• Beam interruption through the entire safety field is required – from the cable connection to other end. DIAG3 ●
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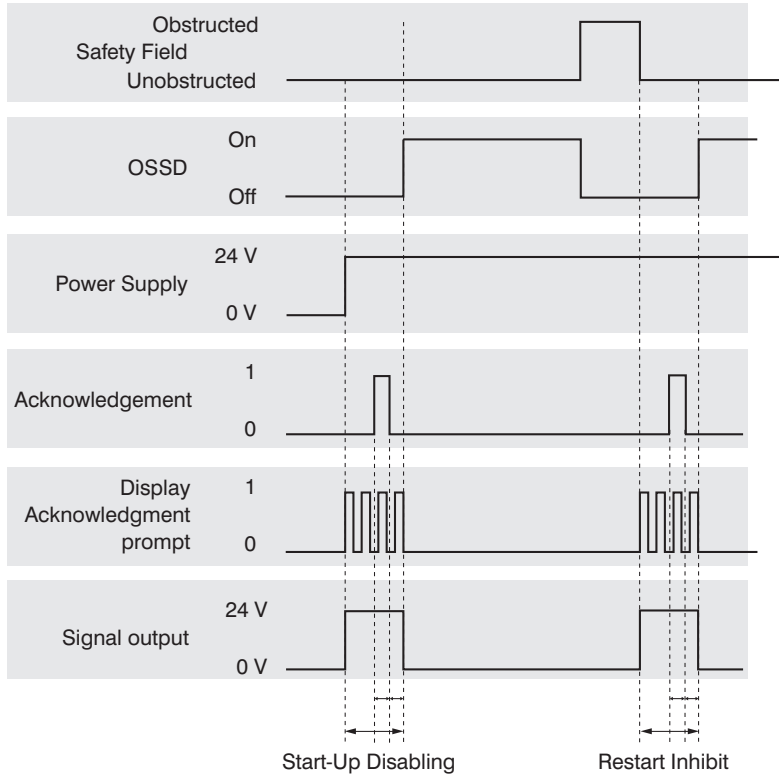
Timing Diagram



6.6.6. Signal Output

Activation	
Receiver wiring	 <p>F-PLC = safety controller  = acknowledgement button</p>
	<ul style="list-style-type: none"> • Wiring according to diagram • Wiring with restart inhibit, without contactor monitoring

Timing-Diagramm

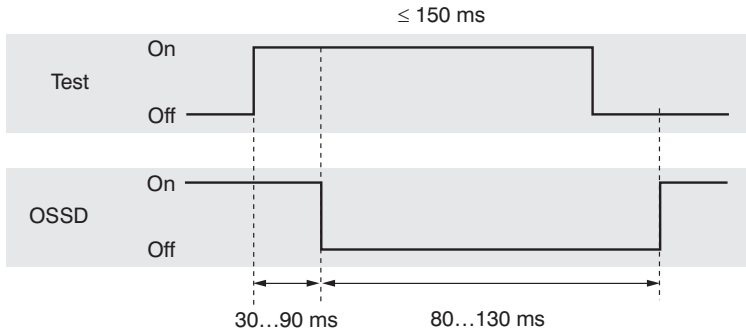


t_1 - Activation duration: 0,1...4 s t_2 - On-time: 30...120 ms

6.6.7. Test Function

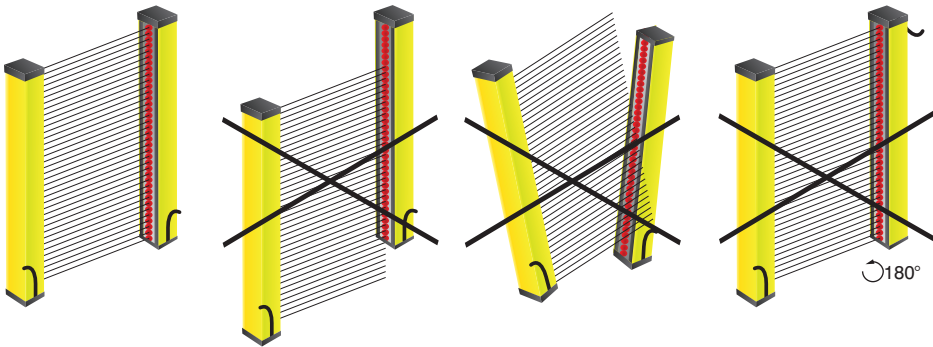
	Test with Low Range	Test with High Range
Emitter wiring	<div></div> <p>F-PLC = safety controller ⎓ = test pulse</p>	<div></div> <p>F-PLC = safety controller ⎓ = test pulse</p>
	<ul style="list-style-type: none">• Wiring according to diagram• Test pulse from an external monitoring device (S-PLC)	<ul style="list-style-type: none">• Wiring according to diagram• Test pulse from an external monitoring device (S-PLC)
Display at receiver	<div></div>	<div></div>
Note	<p>Depending on the selected functions and the status of the ESPE, the following displays may appear:</p> <ul style="list-style-type: none">• Contactor monitoring is active. EDM/DIAG2 ●• Contactor monitoring is inactive. EDM/DIAG2 ○• Ideally aligned SIG LOW/DIAG4 ○• Weak signal SIG LOW/DIAG4 ●• Beam interruption through the entire safety field is required – from the cable connection to other end. DIAG3 ●	

Timing Diagram

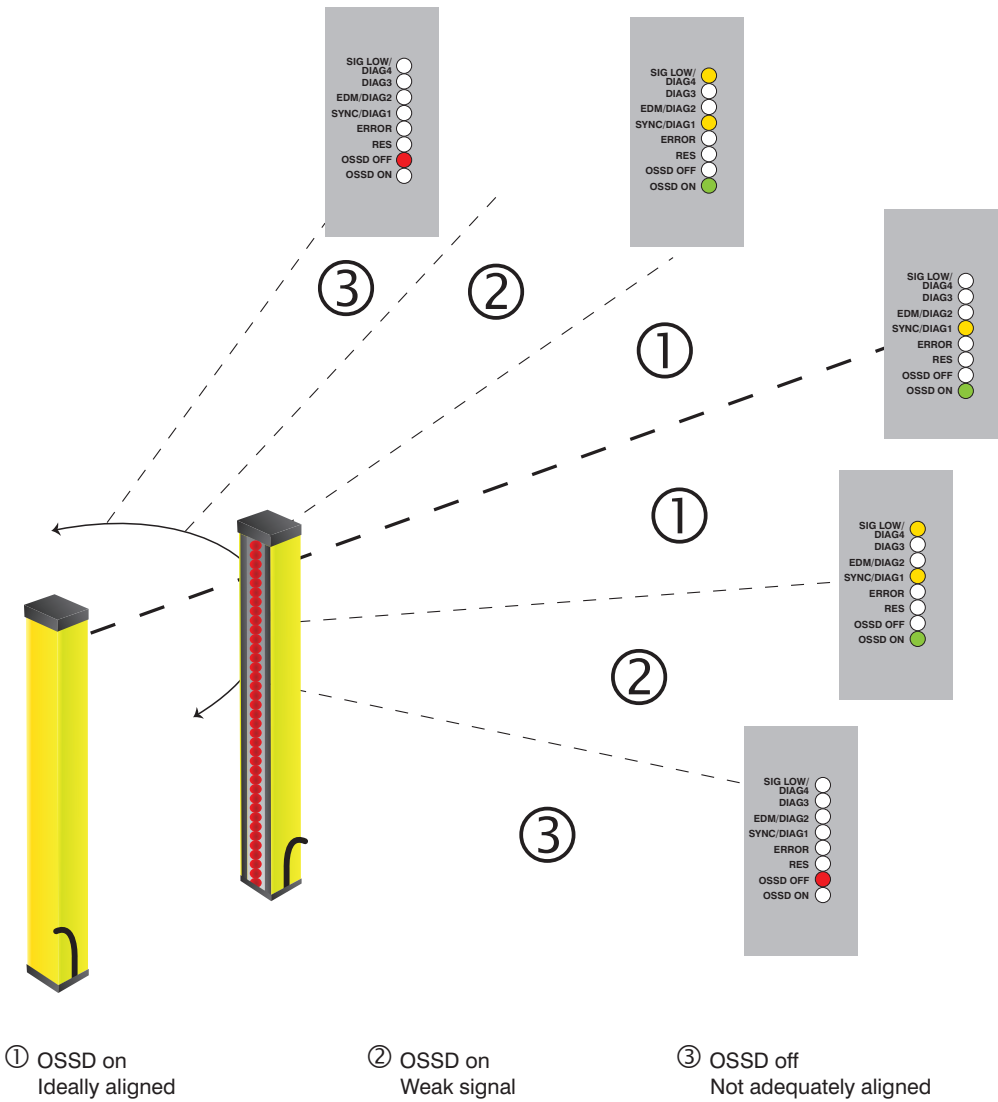


6.7. Optical Alignment

Preliminary adjustment:

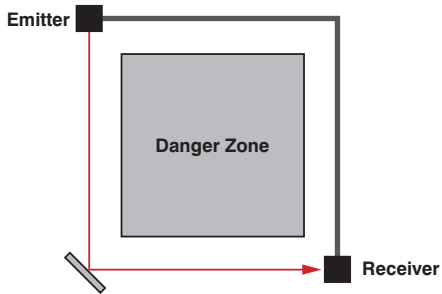


Alignment:



When the maximum range of the sensors is exploited, “SIG LOW/DIAG4” may appear at the display even if they are ideally aligned.
The illustration applies to safety mode without contactor monitoring.

6.8. Deflection Mirror 6.8



The range of possible applications can be significantly expanded through the use of a Deflection Mirror.

Deflection Mirrors are available in two different variants:

- Z2UGxxx without housing
- SZ000EUxxxNN01 with Protection Column

A danger zone can be secured at several sides using only one Safety Light Curtain with the help of wenglor Deflection Mirrors. Range is reduced by approximately 10% per mirror.

Further system components can be found in → section 4.5

7. Testing

7.1. Testing Prior to Initial Start-Up



- Inspection to assure that the ESPE has been correctly selected in accordance with local ordinances, and testing to assure that they provide the required protection when used for their intended purpose.

Execute testing:

- Prior to initial start-up
- After making changes to the machine
- After the machine has been shut down for a lengthy period of time
- After modifying or repairing the machine



- Observe regulations regarding the training of operating personnel by experts before they begin work.
- The company which operates the machine is responsible for training.

Testing

	Effectiveness of the ESPE must be assured in all operating modes which can be selected at the machine. <ul style="list-style-type: none">• Testing according to checklist (→ section 12 on page 55)
--	---



- Work at the machine must be immediately stopped if any impairment of the safety function is detected.
- If the safety function is impaired, test the effectiveness of the ESPE at the machine once again in accordance with the checklist (→ section 12 on page 55).

7.2. Annual Inspection



Inspection once a year or before expiration of deadlines specified by applicable national regulations

Inspection

	The machine has not undergone any changes or manipulations which might affect the safety system.
	The ESPE has not undergone any changes or manipulations which might affect the safety system.
	The ESPE is correctly connected to the machine.
	The machine's response time (including ESPE) has not increased in comparison with response time during initial start-up.
	Cables, plugs and mounting components must be in flawless condition.



- Work at the machine must be immediately stopped if any impairment of the safety function is detected.
- If the safety function is impaired, test the effectiveness of the ESPE at the machine once again in accordance with the checklist (→ section 12 on page 55).

7.3.

Important Instructions for Daily Inspection



Daily 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.

Inspection

	The ESPE may not demonstrate any visible damage.
	The lens cover may not be scratched or contaminated.
	It must be impossible to approach the danger zone without passing through the safety field of the ESPE.
	Cables, plugs and mounting components must be in flawless condition.

Testing the effectiveness of the ESPE:

- Testing may only be conducted when hazardous motion has been switched off.
- Testing must be conducted with a test rod, and not by reaching in with the hand.
- Test rod diameter: in accordance with ESPE resolution



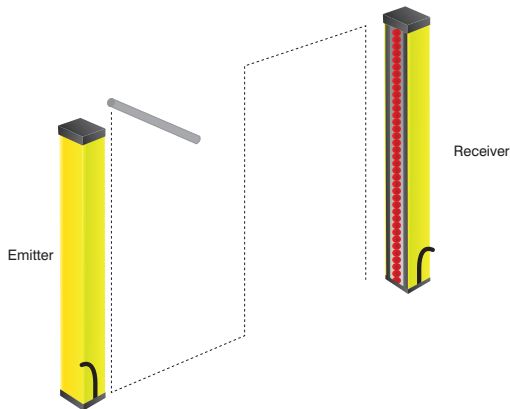
Testing the “automatic start-up function” (safety mode):

- The OSSD ON display must light up before testing is started.
- Pass the test rod through the entire safety field as shown in the figure.
- The OSSD OFF display must be lit up as long as the test rod is in the safety field.



Testing the “restart inhibit” function:

- The RES display must blink before testing is started.
- Pass the test rod through the safety field as shown in the figure.
- The OSSD OFF display must remain lit up as long as the test rod is in the safety field.
- The RES display may not light up as long as the test rod is in the safety field.



- Work at the machine must be immediately stopped if any impairment of the safety function is detected.
- Do not clean with solvents or cleansers which could damage the device.
- Attach the included sticker, “Important Instructions for Daily Inspection”, in direct proximity to the associated Safety Light Curtain

8. Diagnostics

8.1. Required Action in Case of Error



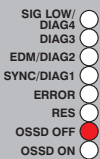
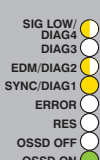
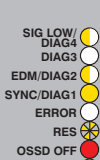

- Shut the machine down.
- Determine and eliminate the cause of error with the help of the diagnosis information.
- If the error cannot be eliminated, contact wenglor's support department.



- Do not operate in case of indeterminate malfunctioning.
- The machine must be shut down if the error cannot be unequivocally clarified or reliably eliminated.

8.2. Display during Normal Operation

8.2.1. Receiver

Anzeige	Beschreibung
	<ul style="list-style-type: none"> Receiver and emitter are not synchronized.
	<ul style="list-style-type: none"> OSSD is activated. Receiver and emitter are synchronized. Safety mode or start-up and restart inhibit is active. Contactor monitoring is active. EDM/DIAG2 ● Contactor monitoring is inactive. EDM/DIAG2 ○ Ideally aligned SIG LOW/DIAG4 ○ Weak signal SIG LOW/DIAG4 ●
	<ul style="list-style-type: none"> OSSD is off Receiver and emitter are synchronized. Start-up and restart inhibit is active. Acknowledgment prompt Contactor monitoring is active EDM/DIAG2 ● Contactor monitoring is inactive EDM/DIAG2 ○ Ideally aligned SIG LOW/DIAG4 ○ Weak signal SIG LOW/DIAG4 ●
	<ul style="list-style-type: none"> OSSD is off Beam interruption through the entire safety field is required – from the cable connection to other end. Contactor monitoring is active EDM/DIAG2 ● Contactor monitoring is inactive EDM/DIAG2 ○ Ideally aligned SIG LOW/DIAG4 ○ Weak signal SIG LOW/DIAG4 ● Receiver and emitter are synchronized. SIG LOW/DIAG1 ● Receiver and emitter are not synchronized. SIG LOW/DIAG1 ○





When the maximum range of the sensors is exploited, “SIG LOW/DIAG4” may appear at the display even if they are ideally aligned.



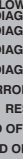



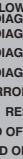



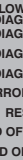



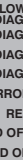

8.2.2. Emitter

Display	Description	Display	Description
<div><div><div>○ TEST/DIAG4</div><div>○ DIAG3</div><div>○ DIAG2</div><div>○ HI RAN/DIAG1</div><div>○ ERROR</div></div><div><div>● POWER</div></div></div>	<ul style="list-style-type: none">• Supply power on• Low range	<div><div><div>● TEST/DIAG4</div><div>○ DIAG3</div><div>○ DIAG2</div><div>○ HI RAN/DIAG1</div><div>○ ERROR</div></div><div><div>● POWER</div></div></div>	<ul style="list-style-type: none">• Supply power on• Low range• Test duration of 150 ms exceeded
<div><div><div>○ TEST/DIAG4</div><div>○ DIAG3</div><div>○ DIAG2</div><div>● HI RAN/DIAG1</div><div>○ ERROR</div></div><div><div>● POWER</div></div></div>	<ul style="list-style-type: none">• Supply power on• High range	<div><div><div>● TEST/DIAG4</div><div>○ DIAG3</div><div>○ DIAG2</div><div>● HI RAN/DIAG1</div><div>○ ERROR</div></div><div><div>● POWER</div></div></div>	<ul style="list-style-type: none">• Supply power on• High range• Test duration of 150 ms exceeded





8.3. Display in Case of Error

8.3.1. Receiver

Display	Description	Display	Description
SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON	<ul style="list-style-type: none"> • OSSD 2 short circuit to plus  <ul style="list-style-type: none"> • Eliminate short circuit to plus. 	SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON	<ul style="list-style-type: none"> • Contactor is not released. • Contacts are fused together.  <ul style="list-style-type: none"> • Inspect the contactor (connection and function).
SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON	<ul style="list-style-type: none"> • OSSD 2 short circuit to ground  <ul style="list-style-type: none"> • Eliminate short circuit to ground. 	SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON	<ul style="list-style-type: none"> • Invalid configuration Restart inhibit detected  <ul style="list-style-type: none"> • For safety mode operation, remove reset button and activate in accordance with → section 6.6.3 on page 33. • For start-up and restart inhibit, connect reset button correctly and activate in accordance with → section 6.6.3 on page 33.

<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • Contactor does not pick up.  <ul style="list-style-type: none"> • Inspect the contactor (connection and function). 	<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • Invalid configuration, contactor monitoring detected  <ul style="list-style-type: none"> • For contactor monitoring, connect contactor correctly and activate in accordance with → section 6.6.5 on page 37. • Without contactor monitoring: remove contactor and deactivate in accordance with → section 6.6.5 on page 37.
<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • OSSD 1 short circuit to plus  <ul style="list-style-type: none"> • Eliminate short circuit to plus. 	<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • Supply power overvoltage/undervoltage  <ul style="list-style-type: none"> • Provide for supply power within the specified limits.
<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • OSSD 1 short circuit to ground  <ul style="list-style-type: none"> • Eliminate short circuit to ground. 	<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • Internal error  <ul style="list-style-type: none"> • Restart the system. • If restart is not successful, contact wenglor's support department.
<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • Extraneous light/emitter  <ul style="list-style-type: none"> • Remove the interfering emitter. 	<p>SIG LOW/DIAG4 DIAG3 EDM/DIAG2 SYNC/DIAG1 ERROR RES OSSD OFF OSSD ON</p> 	<ul style="list-style-type: none"> • Configuration change not completed  <ul style="list-style-type: none"> • Repeat configuration

8.3.2. Emitter

Display	Description	Display	Description
<div><div>○ TEST/DIAG4</div><div>● DIAG3</div><div>○ DIAG2</div><div>○ HI RAN/DIAG1</div><div>● ERROR</div><div>○ POWER</div></div>	<ul style="list-style-type: none">Invalid range setting  <ul style="list-style-type: none">Set range to high or low.	<div><div>● TEST/DIAG4</div><div>○ DIAG3</div><div>○ DIAG2</div><div>○ HI RAN/DIAG1</div><div>● ERROR</div><div>○ POWER</div></div>	<ul style="list-style-type: none">Invalid range settingTest duration exceeded  <ul style="list-style-type: none">Set range to high or low.
<div><div>● TEST/DIAG4</div><div>● DIAG3</div><div>○ DIAG2</div><div>● HI RAN/DIAG1</div><div>● ERROR</div><div>○ POWER</div></div>	<ul style="list-style-type: none">Supply power overvoltage/un-dervoltage  <ul style="list-style-type: none">Provide for supply power within the specified limits.	<div><div>○ TEST/DIAG4</div><div>○ DIAG3</div><div>○ DIAG2</div><div>○ HI RAN/DIAG1</div><div>● ERROR</div><div>○ POWER</div></div>	<ul style="list-style-type: none">Internal error  <ul style="list-style-type: none">Restart the system.If restart is not successful, contact wenglor's support department.

9. Maintenance

This wenglor sensor is maintenance-free.

Instructions regarding annual (→ section 7.2 on page 45) and daily inspection (→ section 7.3 on page 46) must be adhered to.

10. Shutdown

The sensor must be disconnected from supply power for shutdown. The sensor neither contains nor gives off any environmentally harmful substances. It consumes only a minimum of energy and resources.

11. Proper Disposal

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

12. Initial Start-Up Checklist

- This checklist is intended to provide assistance during initial start-up.



- The checklist does not eliminate the need for testing before initial start-up or periodic tests conducted by appropriately trained personnel.

1 Standards and Directives, ESPE Selection		
Are the safety precautions based on the directives/standards which are applicable for the machine?	Yes	No
Are the utilized directives and standards listed in the declaration of conformity?	Yes	No
Is the safety device in compliance with the required PL (EN ISO 13849-1)/SILcl (EN 62061) from the risk assessment?	Yes	No
2 Safety Clearance		
Has safety clearance been calculated in accordance with the applicable standards?	Yes	No
Have the response time of the ESPE, the response time of any included safety evaluation unit, and machine over-travel time been taken into account in the calculation?	Yes	No
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?	Yes	No
Is required safety clearance between the point of danger and the safety field adhered to?	Yes	No
3 Access to the Point of Danger		
Is it only possible to access the point of danger via the ESPE's safety field?	Yes	No
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?	Yes	No
Have additional mechanical protective measures been installed which prevent reaching under, over or around the safety field, and are they protected against manipulation?	Yes	No
4 Installation		
Have the components of the ESPE been correctly attached and secured against loosening, shifting and rotation after alignment?	Yes	No
Is the external condition of the ESPE and all associated system components flawless?	Yes	No
Has the acknowledgement key for resetting the ESPE been correctly installed outside of the danger zone, and is it functional?	Yes	No
5 Incorporation into the Machine		
Have both OSSDs been incorporated into the downstream machine controls?	Yes	No
Have they been connected in accordance with the wiring diagrams?	Yes	No
Are the switching elements which are controlled by the ESPE (e.g. contactors, valves) monitored by EDM?	Yes	No
Have required protective measures against electric shock been effectively implemented?	Yes	No

6 Functionality		
Is the ESPE effective during the entire duration of the machine's hazardous motion?.	Yes	No
Is hazardous motion stopped when the ESPE is disconnected from supply power, and does the acknowledgment key have to be activated in order to reset the machine after supply power has been restored?	Yes	No
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?	Yes	No
Are the specified safety functions effective in all of the machine's operating modes?	Yes	No
Has the safety function been tested in accordance with the inspection instructions in the operating instructions?	Yes	No
Have the instructions for daily Inspection of the ESPE been attached such that they are plainly visible and legible for operating personnel.	Yes	No

13. EC Declaration of Conformity

EG Konformitätserklärung EC Declaration of Conformity



Name und Anschrift des Herstellers / Name and address of manufacturer:

wenglor sensoric GmbH
wenglor Straße 3
88069 Tett nang / GERMANY

Diese Erklärung gilt für die folgenden Produkte: This declaration applies to the following products:

SEMG4...
SEMG5...
SEMG6...

Wir bestätigen die Übereinstimmung mit den grundlegenden Anforderungen der Europäischen Richtlinien über die

We confirm compliance with the essential requirements of the European Directives

Elektromagnetische Verträglichkeit (2004/108/EG), / Electromagnetic compatibility (2004/108/EC), und Maschinen (2006/42/EG) / and Machinery (2006/42/EC)

Folgende Normen wurden angewandt:

The following standards have been used:

EN 61496-1:2013 (Type 4)
IEC 61496-2:2013 (Type 4)
EN 61508:2010 (parts 1-3, SIL 3)
EN 62061:2005+A1:2012 (SIL CL 3)

EN ISO 13849-1:2008 (Cat. 4, PL e)
EN 50178:1997
EN 61000-6-4:2007+A1:2011

Produkt-Beschreibung

Product description

Sicherheits-Lichtvorhang
Berührungslos wirkende Schutzeinrichtung
Sicherheits-Bauteil nach 2006/42/EG Anhang IV
Seriennummer: Lt. Typenschild

Safety Light Curtain
Electro-Sensitive Protective Equipment
Safety component per 2006/42/EC annex IV
Serial Number: See rating plate

Benannte Stelle / Zertifikat Nr.
TÜV SÜD Product Service GmbH
Ridlerstraße 65
D-80339 München

Notified Body / Certificate Nr.
NB Nr. 0123
Z10 14 06 40594 026

Dr. Alexander Ohl ist bevollmächtigt, die technischen Unterlagen zusammenzustellen.

Dr. Alexander Ohl is authorized to compile the technical documentation.

Diese Erklärung stellvertretend für den Hersteller wird abgegeben durch:

On account of the manufacturer, this declaration is given by:

Dr. Alexander Ohl

Leiter Forschung & Entwicklung / Head of Research & Development

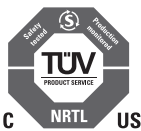
Tett nang, 17.07.2014
Ort / Place Datum / Date

i.v.
Unterschrift / Signature

EN



RoHS



Copy of the original operating instructions
Subject to change without notice