more than automation
safe automation

PSEN op4F/H-bm / PSEN op4F/H-sl/ PSEN op4F/H-b / PSEN op4F/H-m/ PSEN op4F/H-s

Safety light curtains with infrared beams

Type 4

Type 4

OPERATING MANUAL

▶ **A** Pilz Ges.m.b.H., 01 7986263-0, Fax: 01 7986264, E-Mail: pilz@pilz.at ▶ **AUS** Pilz Australia Industrial Automation LP., 03 95446300, Fax: 0395446311, E-Mail: safety@pilz.com.au ▶ **B** ▶ **L** Pilz Belgium, 09 3217570, Fax: 09 3217571, E-Mail: info@pilz.be ▶ **BR** Pilz do Brasil Sistemas Eletr¶nicosIndustriais Ltda., 11 4337-1241, Fax: 11 4337-1242, E-Mail: pilz@pilzbr.com.br ▶ **CH** Pilz Industrieelektronik GmbH, 062 88979-30, Fax: 062 88979-40,E-Mail: pilz@pilz.ch ▶ **DK** Pilz Skandinavien K/S, 74436332, Fax: 74436342, E-Mail: pilz@pilz.dk ▶ **E** Pilz Industrieelektronik S.L., 938497433, Fax:938497544, E-Mail: pilz@pilz.es ▶ **F** Pilz France Electronic, 03 88104000, Fax: 03 88108000, E-Mail: siege@pilz-france.fr ▶ **FIN** Pilz Skandinavien K/S, 09 27093700, Fax: 09 27093709, E-Mail: pilz.fi@pilz.dk ▶ **GB** Pilz Automation Technology, 01536 460766, Fax: 01536 460866, E-Mail: sales@pilz.co.uk ▶ **I** Pilz Italia Srl, 031 789511, Fax: 031 789555, E-Mail: info@pilz.it ▶ **IRL** Pilz Ireland Industrial Automation, 021 4346535, Fax: 021 4804994, E-Mail:sales@pilz.ie ▶ **J** Pilz Japan Co., Ltd., 045 471-2281, Fax: 045 471-2283, E-Mail: pilz@pilz.co.jp ▶ **MEX** Pilz de Mexico, S. de R.L. de C.V., 55 5572 1300,Fax: 55 5572 4194, E-Mail: info@mx.pilz.com ▶ **NL** Pilz Nederland, 0347 320477, Fax: 0347 320485, E-Mail: info@pilz.nl ▶ **NZ** Pilz New Zealand, 09-6345350, Fax: 09-6345350, E-Mail: t.catterson@pilz.co.nz ▶ **P** Pilz Industrieelektronik S.L., 229407594, Fax: 229407595, E-Mail: pilz@pilz.es ▶ **PRC** PilzChina Representative Office, 021 62493031, Fax: 021 62493036, E-Mail: sales@pilz.com.cn ▶ **ROK** Pilz Korea Office, 031 8159541, Fax: 031 8159542,E-Mail: info@pilzkorea.co.kr ▶ **SE** Pilz Skandinavien K/S, 0300 13990, Fax: 0300 30740, E-Mail: pilz.se@pilz.dk ▶ **TR** Pilz Elektronik Güvenlik Ürünleri veHizmetleri Tic. Ltd. ©Sti., 0224 2360180, Fax: 0224 2360184, E-Mail: pilz.tr@pilz.de ▶ **USA** Pilz Automation Safety L.P., 734 354-0272, Fax: 734 354-3355,E-Mail: info@pilzusa.com

▶ **WWW** www.pilz.com

▶ **D** Pilz GmbH & Co. KG, Sichere Automation, Felix-Wankel-Straβe 2, 73760 Ostfildern, Deutschland, +49 711 3409-0, Fax: +49 711 3409-133, E-Mail: pilz.gmbh@pilz.de

826003071 rev.A

English

OVERVIEW OF CONTENTS

1 GENERAL INFORMATION

1.1 General description of the safety light curtain

Safety light curtains from the PSENopt series are multibeam optoelectronic protection devices. They secure work areas in which operating personnel can come into contact with moving parts of machinery, robots and automated systems in general, which present a risk of physical injury.
The safety light curtains are designed as safe Type 4 systems for accident prevention in accordance with applicable international standards, in particular:

EN 61496-1: 2004	Safety of machinery: Electrosensitive protective equipment. Part 1: General requirements and tests.
prEN 61496-2: 1997	Safety of machinery - Electrosensitive protective equipment. Part 2: Particular requirements for equipment using active optoelectronic protective devices.

The device consists of an emitter (TX) and a receiver (RX) housed in robust aluminium profiles. It secures the protected area by generating an infrared protected field, which will detect an opaque object as soon as it enters the protected field.
Both the control and evaluation logic are located inside the two units; the electrical connection is made via M12 connectors, which are positioned underneath the profiles. The emitter (TX) and receiver (RX) are synchronised optically. This means the two units do not have to be connected directly to each other.
The infrared beams are controlled and monitored via a microprocessor, which provides the user with information about the operating status of the safety light curtain via LED indicators (see Ch. 7, *"Diagnostics"*).
Two yellow LEDs simplify the alignment of the two units during installation (see Ch. 5 "*Alignment*").
As soon as an object, a limb or the operator's body interrupts the beams sent by the emitter (TX), both outputs (OSSD) are immediately opened and the machine connected to the OSSD is stopped.

English

NB: ***This manual uses the following abbreviations as defined in the applicable standards:***

AOPD	***Active opto-electronic protective device***
ESPE	***Electrosensitive protective equipment***
MPCE	***Machine primary control element***
OSSD	***Output signal switching device (switching output)***
TX	***Transmitting device***
RX	***Receiving device***

Some sections or paragraphs in this manual contain information of particular importance to those using or setting up the device. These sections are highlighted using the following symbols:

Detailed notes and descriptions of specific features of the safety light curtains, designed to explain their operation more clearly.

Specific installation guidelines.

This warning must be heeded! It warns of a hazardous situation that could lead to serious injury and death and indicates preventive measures that can be taken.

This manual contains all the information required for the selection and operation of the safety light curtains.
Specialised knowledge of safety issues is required to integrate a safety light curtain correctly on power-driven machinery.

As this manual is unable to provide such information in full, please contact the technical service department at Pilz for any information about the operation of the safety light curtains and the safety regulations relating to correct installation (*see* Ch. 8, *"Regular checks and maintenance"*).

1.2 How to select a safety light curtain

- Resolution, depending on the part of the body requiring protection.

R = 14mm	Finger protection	Type 4
R = 30mm	Hand protection	Type 4

The resolution (R) of a device is understood to be the minimum size an opaque object must be in order to interrupt at least one of the beams that form the sensing area.
As shown in Fig. 1, the resolution depends exclusively on the geometrical properties of the lenses, the diameter and the centre distance; it is independent of the ambient and operating conditions of the safety light curtain.

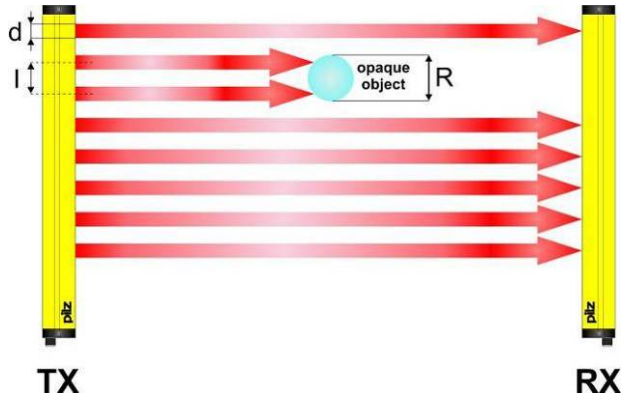


Fig. 1

The resolution can be calculated using the following formula:

R = l + d

- Height of protected field: Here it is important to distinguish between the “Height of the sensing area” and the “Height of the protected area” (Fig. 2).
  - The height of the sensing area is the distance between the upper limit of the first lens and the lower limit of the last lens.
  - The height of the protected area is the effective protected area, in which an opaque object whose size is greater than or equal to the resolution of the safety light curtain will safely interrupt the beam.

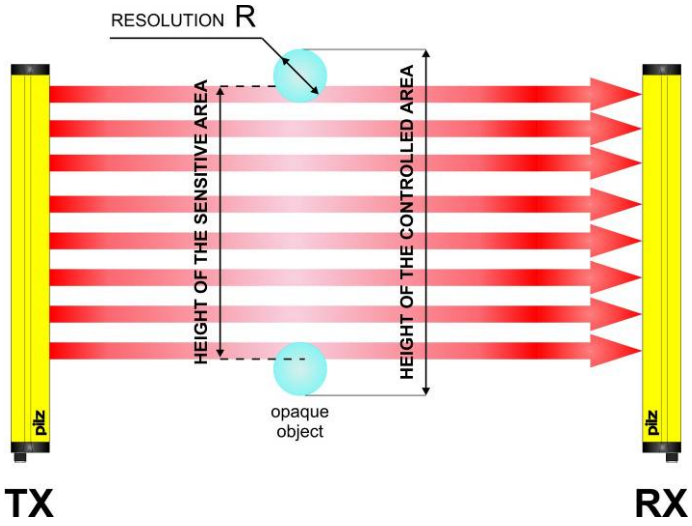


Fig. 2

- Safety distance: Great care must be taken when calculating the distance at which the safety light curtain should be positioned in relation to the hazardous machinery. (Please see Chapter *2, “Installation”,* for details of how to calculate the safety distance.)

1.3 Typical application areas

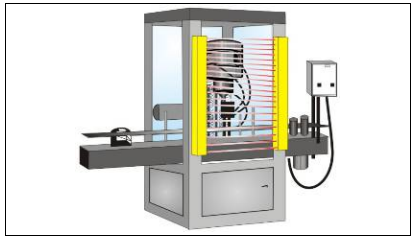
Safety light curtains can be used in all areas of automation where it is necessary to control and guard access to danger zones.

In particular they are used to stop the hazardous movement of mechanical parts on:

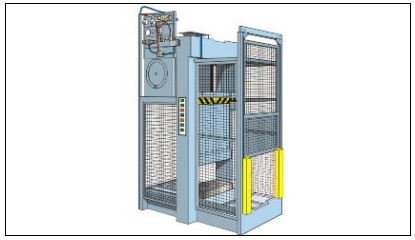
- Automatic machinery
- Packaging, handling and storage machinery
- Textile processing, woodworking and ceramic processing machinery
- Automatic or semi-automatic assembly lines
- Automated high-bay racking

With food industry applications, please contact customer services at Pilz to check whether the safety light curtain's housing material can withstand the chemical substances that may be used in the production process.

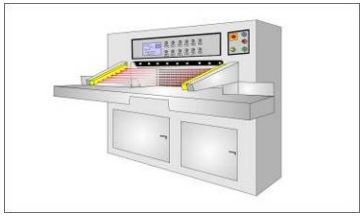
The following illustrations provide an overview of some of the main application areas:



Automatic packaging machines



Presses and punching machines



Folding and cutting machines

English

1.4 Safety information

For the proper, safe use of the safety light curtains, the following guidelines must be followed:

- It must be possible to control the machine stop electrically.
- The control system must be able to stop the hazardous machine movement immediately at any stage of the operating cycle.
- The safety light curtain and its respective electrical connections must be installed by qualified personnel, in line with the guidelines stated in the relevant chapters.
- The safety light curtain must be positioned in such a way that the danger zone cannot be accessed without interrupting the beams (see Chapter 2 *"Installation"*).
- Personnel working in the danger zone must be appropriately trained with regard to the operation of the safety light curtain.
- The test/reset button and the TEACH-IN button must be positioned outside the danger zone in such a way that operating personnel have a complete view of the danger zone during all reset or TEACH-IN operations.
- If the TEACH-IN button is pressed after the "timeout" time on power up or during operation, the safety light curtain will change to a "safety standstill" condition.
- If the floating blanking function is activated, this will be indicated via an LED display positioned in the transparent end cap at the top of the receiver unit.
- If the floating blanking function is activated, the minimum safety distance will need to be recalculated because this function reduces the actual resolution (*see Ch. 6 "Operating mode"*). To ensure the safety function is set correctly, you must follow the information given in section 2.2.1.

- The feedback loop monitoring function used to monitor the external contactors will only be active if the corresponding wire is connected to the device.
- Before switching on the safety light curtain, make sure you comply with the instructions regarding correct operation.

2 INSTALLATION

2.1 Precautionary measures when selecting and installing the device

- Make sure that the category guaranteed by the safety light curtain (Type 4) matches the risk assessment for the machinery that is to be monitored, as defined in the standard EN 954-1.
- The OSSD outputs on the safety light curtain must be used as machine stop devices and not as command devices (the machine must have its own START command).
- The dimensions of the smallest object to be detected must not be less than the resolution level of the device.
- The environment in which the safety light curtain is installed must comply with the technical details stated for the safety light curtain in Chapter 10, "*Technical details*".
- Avoid installing the device, particularly the receiver (RX), close to intense and/or flashing light sources.
- Avoid strong electromagnetic interference as this can adversely affect the proper operation of the device.
- Smoke, mist or dust within the operating environment can reduce the range of the safety light curtain by up to 50%.
- Sudden temperature fluctuations beyond freezing point can cause condensation to form on the surface of the lenses, adversely affecting the proper operation of the safety light curtain.
- Install and replace emitter and receiver only in pairs. Emitter and receiver have the same serial number.

2.2 General information on positioning the device

For effective protection it is necessary to proceed very carefully when positioning the device; in particular, the device must be installed in such a way that the danger zone cannot be accessed without interrupting the protected field.
To exclude the possibility of the machine being accessed from above or below (Fig. 3a), it is necessary to install a safety light curtain that is long enough to completely cover access to the danger zone (Fig. 3b).

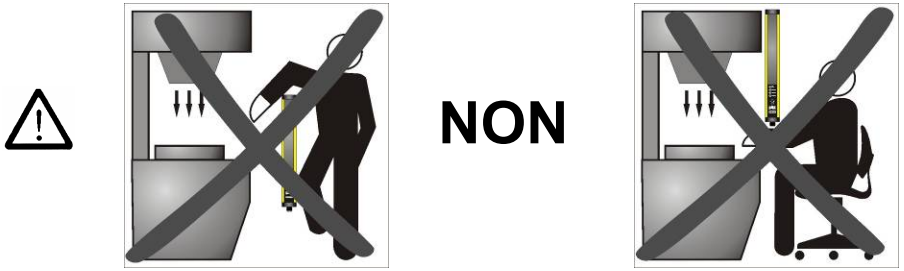


Fig. 3a

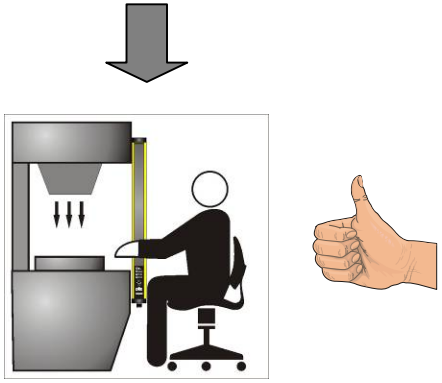


Fig. 3b

Also, under normal operating conditions, it must not be possible to start the machine until the operator is outside the danger zone.
If it is impossible to install the safety light curtain in immediate proximity to the danger zone, a second safety light curtain must be installed and aligned horizontally, to exclude access from the side, as shown in Fig. 4b.

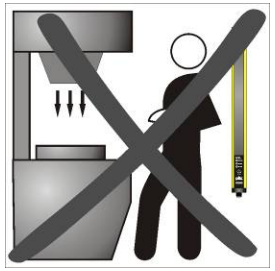


Fig. 4a

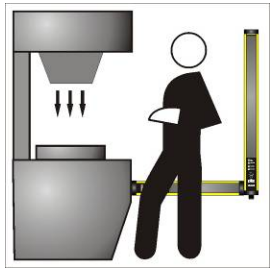


Fig. 4b

If the installation position of the safety light curtain still enables an operator to access the danger zone without detection, an additional mechanical barrier must be installed to prevent this.

2.2.1 Minimum safety distance

The safety distance of the safety light curtain should be such that the operator cannot reach the danger zone until the movement of the hazardous machine part has come to a standstill (see Fig. 5).
According to the standards EN 999, 775 and 294, this distance depends on four factors:

1. Reaction time of the safety light curtain (time it takes for the signal at the OSSD output to switch from High to Low once the beams have effectively been interrupted).
2. Machine's overrun time (time it takes for the machine to come to a standstill once the ESPE reaction time has elapsed).
3. Resolution of the safety light curtain.
4. Approach speed of the object requiring detection.

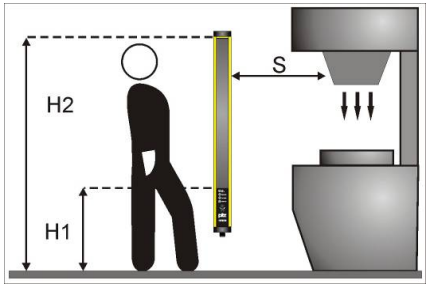


Fig. 5

The formula for calculating the safety distance is as follows:

$$S = K (t_1 + t_2) + C$$

where:

S = Minimum safety distance in mm between the protected field and the danger zone
K = The speed at which the object requiring detection (body or parts of the body) approaches the danger zone, in mm/s
$\mathbf{t_1}$ = Reaction time of the safety light curtain in seconds (Ch. 10 *"Technical details"*).
$\mathbf{t_2}$ = Machine's overrun time in seconds
D = Resolution of the safety light curtain.
C = **8 (d -14)** for a safety light curtain with a resolution ≤ 40mm
= **850 mm** for a safety light curtain with a resolution > 40mm

Please note: The value of K is:

2000 mm/s, if the value calculated for S is ≤ 500 mm,

1600 mm/s, if the value calculated for S is > 500 mm.

If it is possible to access the danger zone from above and below (Fig. 5) and the devices used have a resolution of >40 mm, the upper beam must be positioned at a height of 900 mm (H2), starting from the reference plane (e.g. base of the machine), and the lower beam must be positioned at a height of 300 mm (H1).

If the safety light curtain is to be installed horizontally (Fig. 6), the distance between the danger zone and the furthest optical beam must equal the value calculated using the following formula:

$$S = 1600 \text{ mm/s } (t_1 + t_2) + 1200 - 0.4\,H$$

where:

S = Minimum safety distance in mm between the protected field and the danger zone

$\mathbf{t_1}$ = Reaction time of the safety light curtain in seconds (Ch. 10 *"Technical details"*).

$\mathbf{t_2}$ = Machine's overrun time in seconds

H = Height of the beams above the floor. This height must always be less than 1000 mm.

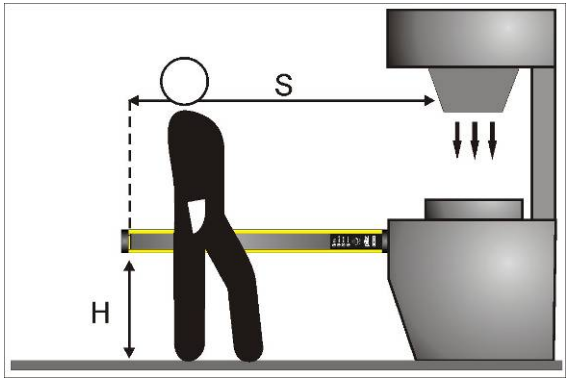


Fig. 6

Activating the floating blanking function reduces the actual resolution of the device. This means that the minimum safety distance will also change and will have to be recalculated.

The table below shows the actual resolution when 1, 2 or 3 beams are blanked, depending on the device resolution:

Device resolution	**Actual resolution with floating blanking**		
	1 beam	*2 beams*	*3 beams*
14 mm	21 mm	28 mm	35 mm
30 mm	48 mm	66 mm	84 mm

English

2.2.2 *Minimum distance from reflective surfaces*

Reflective surfaces close to the light beams emitted from the safety device (whether above, below or to the side), may cause passive reflections and adversely affect detection of the object within the protected field (Fig. 7).

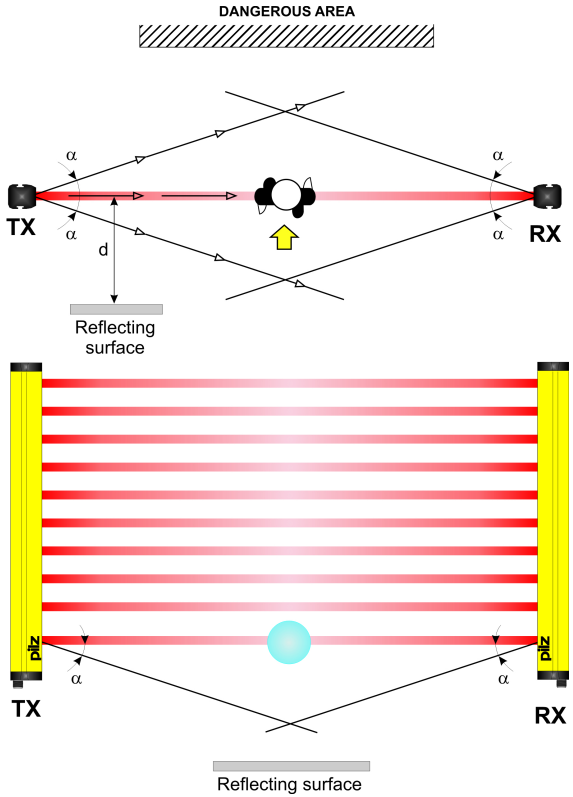


Fig. 7

Improper installation could mean that a protected field is interrupted without detection, resulting in serious injury.

So, when installing the device close to reflective surfaces (metal walls, floors, ceilings or workpieces), it is vital that the minimum distance in relation to reflective surfaces is maintained, as shown in the diagram in Fig. 8. This minimum distance depends on:

- The range between the emitter (TX) and receiver (RX)
- The maximum open angle of the light beams transmitted by the emitter (TX):
  5° for Type 4 ESPE (± 2.5° to light axis)

The values for the minimum distance in relation to the operating range can be taken from the illustration in Fig. 8.

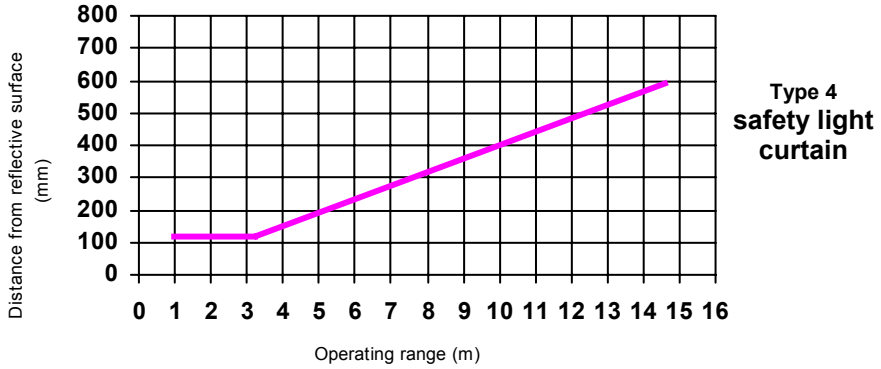


Fig. 8

2.2.3 Installing several adjacent safety light curtains

If it is necessary to install several safety light curtains in adjacent areas, you will need to ensure that the emitter (TX) on one device cannot interfere with the receiver (RX) on another. To prevent this, the devices will need to be installed conversely or must be separated via screening (opaque surface).
Fig. 9 gives an example of an installation that could lead to interference, plus two correct installations.

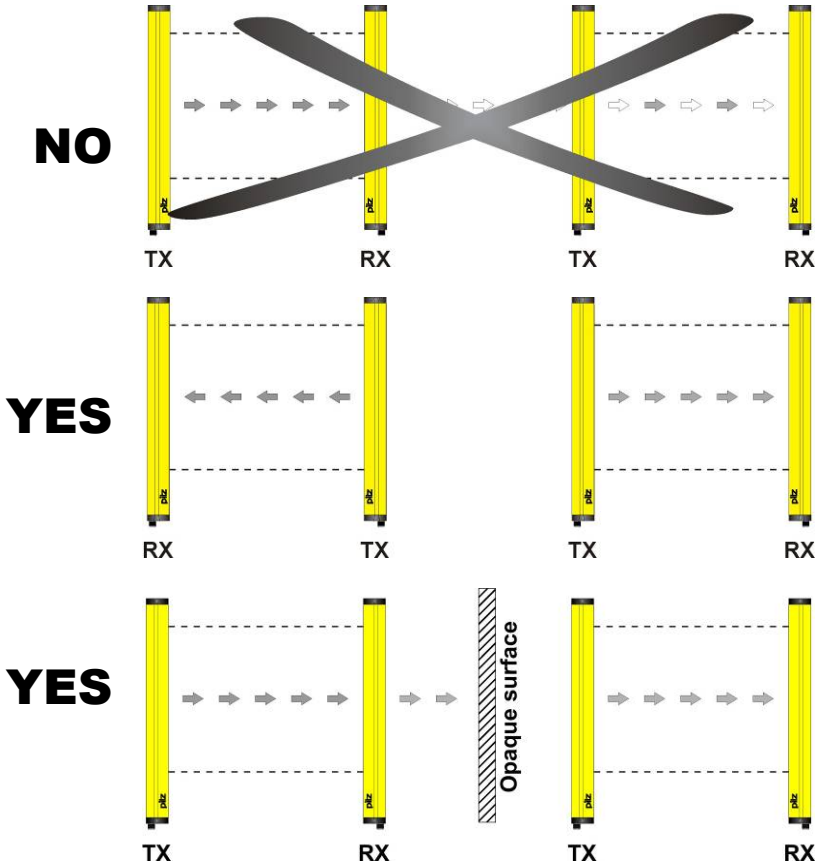


Fig. 9

2.2.4 Use of deviating mirrors

Deviating mirrors can be used to monitor danger zones where access is possible from various sides.
Fig. 10 illustrates a potential solution for monitoring three different access sides using two deviating mirrors positioned at an angle of 45° to the safety light curtain.

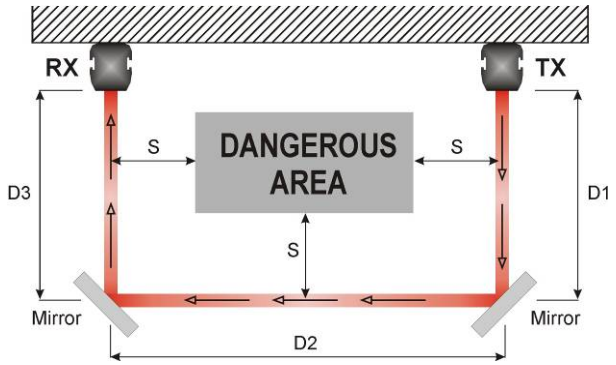


Fig. 10

Please note the following precautions to take when using deviating mirrors:
The alignment of the emitter (TX) and receiver (RX) is particularly critical when you use deviating mirrors; just a slight angular displacement of the mirror is enough to lose the alignment. This problem can be resolved by using a laser pointer, which is available as an accessory.
The minimum safety distance (S) must be maintained for each section of the safety light curtain.
Use of a deviating mirror reduces the effective operating range by about 15%. If two or more deviating mirrors are used, the range will be reduced still further (for more details please refer to the technical specifications for the specific mirror).
Never use more than three mirrors per device.
Any dust or dirt on the mirror's reflective surface will drastically reduce the operating range.

English

3 MECHANICAL ASSEMBLY

Fig. 11

The emitter (TX) and receiver (RX) must be assembled so that the respective optical surfaces are aligned in parallel and the connectors are positioned on the same side. The distance between the emitter (TX) and receiver (RX) must be within the operating range of the model you are using (see type label or Chapter 9, "*Technical details*").
Align the devices precisely, following the guidelines given in Chapter 5, "*Alignment*".
Use the supplied angle bracket to attach the device, as shown in Fig. 11.

Depending on the application, both rails may either be screwed on using the fixing bolts supplied or by using a rigid mounting bracket, as shown in Fig. 12.

Fig. 12

Rigid mounting brackets are suitable for installations that require no large mechanical adjustments during alignment. Adjustable brackets enable the units to be inclined by ± 5° and are available on request. Where applications are subject to particularly strong vibration we recommend the use of angle brackets with vibration dampers.

The drawing and table below indicate the recommended fixing points in relation to the length of the safety light curtain.

English

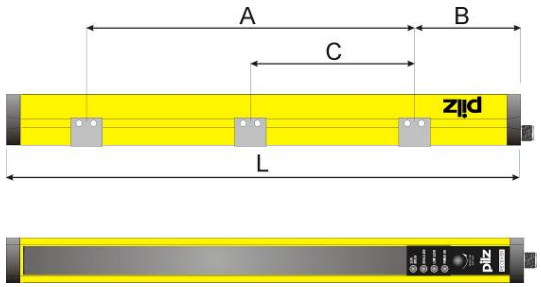


Fig. 13

MODEL	L (mm)	A (mm)	B (mm)	C (mm)
PSEN op4F-x-14/15-015 **PSEN op4H-x-30-015**	246	86	80	-
PSEN op4F-x-14/15-030 **PSEN op4H-x-30-030**	393	193	100	-
PSEN op4F-x-14/15-045 **PSEN op4H-x-30-045**	540	300	120	-
PSEN op4F-x-14/15-060 **PSEN op4H-x-30-060**	687	387	150	-
PSEN op4F-x-14/15-075 **PSEN op4H-x-30-075**	834	474	180	-
PSEN op4F-x-14/15-090 **PSEN op4H-x-30-090**	981	581	200	-
PSEN op4F-x-14/15-105 **PSEN op4H-x-30-105**	1128	688	220	-
PSEN op4F-x-14/15-120 **PSEN op4H-x-30-120**	1275	875	200	438
PSEN op4F-x-14/15-135 **PSEN op4H-x-30-135**	1422	1022	200	510
PSEN op4F-x-14/15-150 **PSEN op4H-x-30-150**	1569	1121	220	565
PSEN op4F-x-14/15-165 **PSEN op4H-x-30-165**	1716	1216	250	608

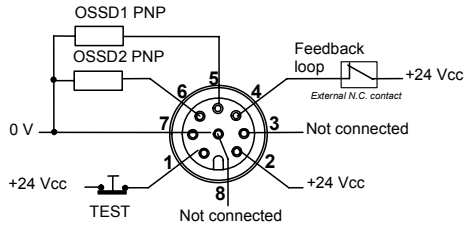
4 WIRING

4.1 Electrical connections

The electrical connections of the emitter (TX) and receiver (RX) are made via M12 connectors, which are located on the bottom of both units.

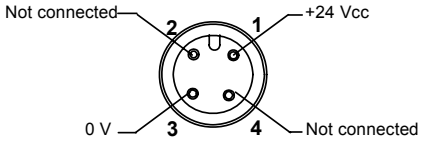
4.1.1 PSEN op4F/H-s (standard model)

RECEIVER (RX):
8-pin M12 connector



1 = white = TEST/RESET
2 = brown = +24 Vcc
3 = green = Not connected
4 = yellow = EDM
5 = grey = OSSD1
6 = pink = OSSD2
7 = blue = 0 V
8 = red = Not connected

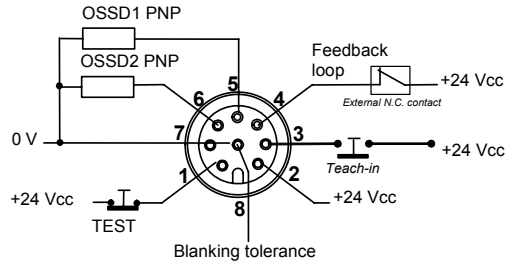
EMITTER (TX):
4-pin M12 connector



1 = brown = +24 Vcc
2 = white = Not connected
3 = blue = 0 V
4 = black = Not connected

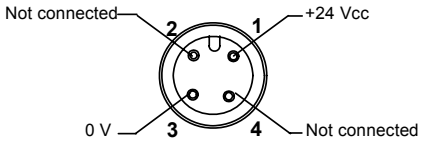
4.1.2 PSEN op4F/H-b (blanking model)

RECEIVER (RX):
8-pin M12 connector



1 = white = TEST/RESET
2 = brown = +24 Vcc
3 = green = TEACH-IN
4 = yellow = Feedback loop
5 = grey = OSSD1
6 = pink =OSSD2
7 = blue = 0 V
8 = red = Blanking tolerance

EMITTER (TX):
4-pin M12 connector



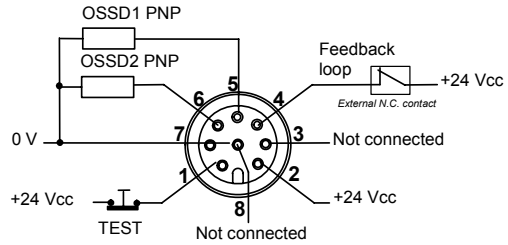
1 = brown = +24 Vcc
2 = white = Not connected
3 = blue = 0 V
4 = black = Not connected

English

4.1.3 PSEN op4F/H-m (cascading model: Master)

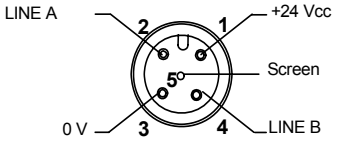
RECEIVER (RX):

8-pin M12 connector



1 = white = TEST/RESET
2 = brown = +24 Vcc
3 = green = Not connected
4 = yellow = Feedback loop
5 = grey = OSSD1
6 = pink = OSSD2
7 = blue = 0 V
8 = red = Not connected

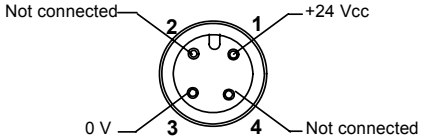
5-pin M12 connector



1 = brown = +24 Vcc
2 = white = LINE A
3 = blue = 0 V
4 = black = LINE B
5 = grey = Screening

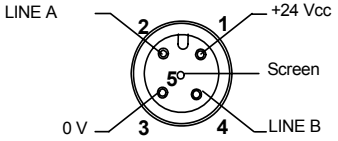
EMITTER (TX):

4-pin M12 connector



1 = brown = +24 Vcc
2 = white = Not connected
3 = blue = 0 V
4 = black = Not connected

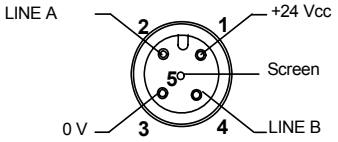
5-pin M12 connector



1 = brown = +24 Vcc
2 = white = LINE A
3 = blue = 0 V
4 = black = LINE B
5 = grey = Screening

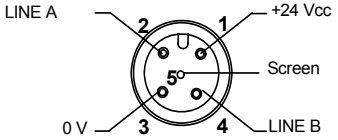
4.1.4 PSEN op4F/H sl (cascading model: Slave)

RECEIVER (RX):
5-pin M12 connector



1 = brown = +24 Vcc
2 = white = LINE A
3 = blue = 0 V
4 = black = LINE B
5 = grey = Screening

EMITTER (TX):
5-pin M12 connector

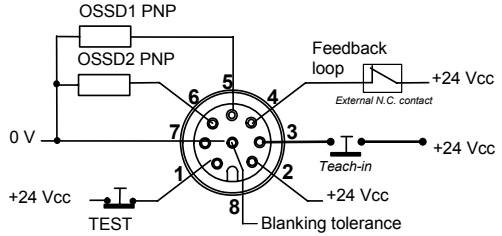


1 = brown = +24 Vcc
2 = white = LINE A
3 = blue = 0 V
4 = black = LINE B
5 = grey = Screening

English

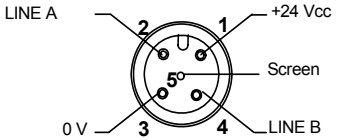
4.1.5 PSEN op4F/H-bm (blanking cascading model: Master)

RECEIVER (RX):
8-pin M12 connector



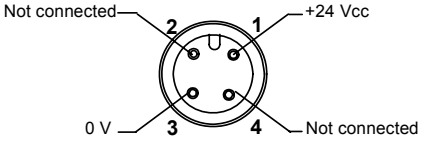
1 = white = TEST/RESET
2 = brown = +24 Vcc
3 = green = TEACH-IN
4 = yellow = Feedback loop
5 = grey = OSSD1
6 = pink = OSSD2
7 = blue = 0 V
8 = red = Blanking tolerance

5-pin M12 connector



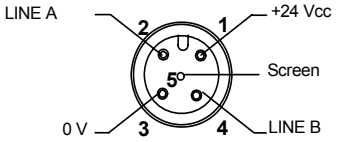
1 = brown = +24 Vcc
2 = white = LINE A
3 = blue = 0 V
4 = black = LINE B
5 = grey = Screening

EMITTER (TX):
4-pin M12 connector



1 = brown = +24 Vcc
2 = white = Not connected
3 = blue = 0 V
4 = black = Not connected

5-pin M12 connector



1 = brown = +24 Vcc
2 = white = LINE A
3 = blue = 0 V
4 = black = LINE B
5 = grey = Screening

4.2 Notes on wiring

To ensure the correct operation of the safety light curtain, please note the following:

- **Safe electrical isolation must be ensured for the external 24 V supply. Failure to do so could result in electric shock. The supply voltage must conform to EN 60950, 03/97, section 2.3, EN 60742, 9/95 or EN 50178, 10/97.**
- Emitter and receiver must be connected using shielded cables (accessories).
  Fig. 14 shows how to connect the emitter and receiver properly.

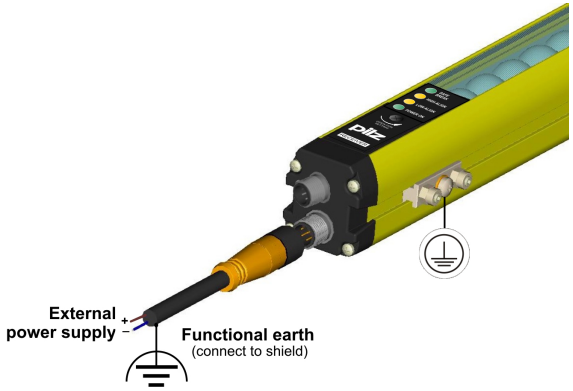


Fig. 14

- At the point where the cable enters the cabinet, connect the screen to the earth bar, without making a break in the cable. Use metal cable clamps which cover the screen over a wide surface area.
- Under no circumstances should the connection cables come into contact with or be laid in proximity to cables that generate strong electromagnetic interference (e.g.: motor feeds, inverters etc.); these could compromise the device's ability to function.
- Multicore cables may not be used to connect the outputs of more than one safety light curtain.
- The TEST/RESET input must be connected to the supply voltage on the ESPE via a button with a N/C contact. The test should be performed manually (by pressing the button) at least once a day in order to check the proper operation of the safety device.

English

- If the safety light curtain is started and there is no TEST/RESET input connected to 24Vcc, it will switch to a monitoring condition, in which the OSSD is not activated. In this case, set up the correct connections and restart the system to restore operation under normal safety conditions.
- The TEACH-IN input must be connected to the supply voltage on the safety light curtain via a button with a N/O contact. Make sure that the button is not operated on power up, otherwise the safety light curtain will change to a fault condition.
- The TEST/RESET and TEACH-IN button must be positioned in such a way that the operator has a clear view of the protected area when reset, test or TEACH-IN procedures are in progress (*see Ch. 6 "Operating mode"*).
- The input for monitoring external contactors (feedback loop) must be connected to 24 Vcc via a N/C contact before the safety light curtain is switched on.
  The monitoring function will not be activated if the input is not connected properly when the safety light curtain is switched on. In this case the safety light curtain will change to a fault condition.
- The device is already fitted with internal voltage and current limitation. We would advise against the use of other external components, even where this is permitted.

- Earthing: If evaluation devices are connected without safe separation, the safety light curtain must be operated in protection class 1. In this case, the emitter and receiver must be labelled with the protective earth symbol and must be earthed via the fastening kit. Both are supplied with the unit.

  Assembling the fastening kit:

  - Insert the slot nut (M4 x 0.7 mm tapped holes) into a groove on the safety light curtain.
  - Screw the two threaded pins (M4 x 14) into the external tapped holes.
  - Fix the screws firmly in place so that the cupped point on the threaded pin pierces the coating. This way contact will be made with the metal housing.
  - To prevent the threaded pin from working loose under heavy vibration, attach two self-locking M4 nuts to the threaded pins. Use a hexagonal wrench CH.7.
  - Attach the earth lead to the middle tapped hole using the lock washer (M4) and screw (M4).

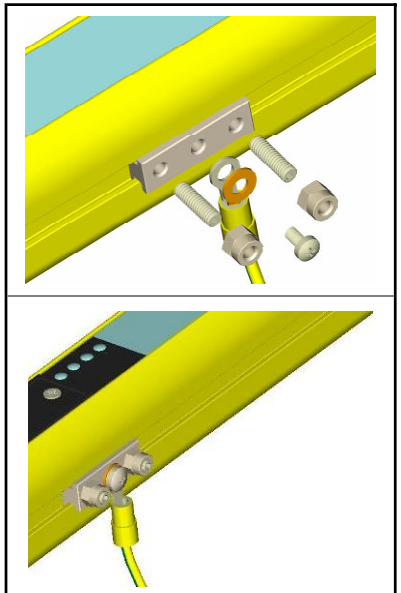


Fig.15

- Under no circumstances should safety contacts OSSD1 and OSSD2 be wired in series or parallel; however, both may be used separately (see Fig. 15).
  If one of these two configurations should be used by mistake, the safety light curtain will indicate an output malfunction (*see Ch. 7 "Diagnostic functions"*).
- Connect both OSSD outputs to the control element. If an OSSD output is not connected to the control element, this will have a negative effect on the safety level of the system in which the safety light curtain is used.

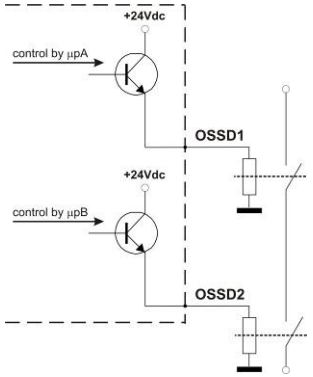


Fig. 16

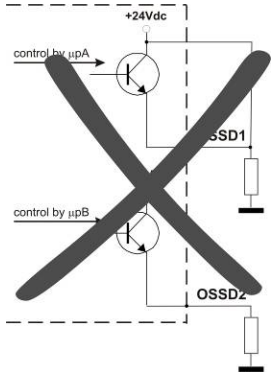


Fig. 17

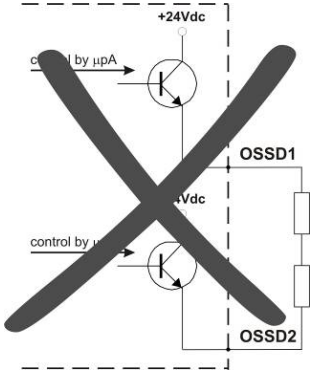


Fig. 18

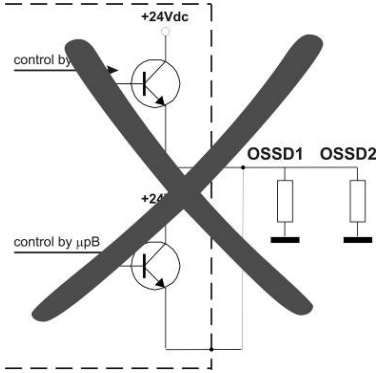


Fig. 19

5 ALIGNMENT

The emitter (TX) and receiver (RX) must be aligned to ensure the proper function of the device.
Perfect alignment is achieved when the optical axes of the first and last beam from the emitter (TX) meet the optical axes of the corresponding elements on the receiver (RX).
Two yellow LEDs on the receiver (RX), “HIGH ALIGN” and “LOW ALIGN”, simplify the alignment process.

5.1 Alignment instructions

Once the mechanical assembly and the electrical connections have been completed, the safety light curtain can be aligned as described below:

- Disconnect the power supply to the safety light curtain.
- Press the TEST/RESET button and keep it held down (opens the contact).
- Reconnect the power supply.
- You can now release the TEST/RESET button.
- On the emitter (TX), ensure that the green LED "POWER ON" and the yellow LED "SAFE" are lit. This confirms that the transmitter is operating correctly.
- Make sure that the status of the receiver is one of the following:
  - **BREAK Status:** Green LED "POWER ON" is lit and LED "SAFE/BREAK" lights up red (BREAK).
    -> The safety light curtain is not aligned correctly.
  - **SAFE Status:** Green LED "POWER ON" is lit and LED "SAFE/BREAK" lights up green. The yellow LEDs “HIGH ALIGN” and “LOW ALIGN” are lit.
    -> The safety light curtain is aligned correctly.

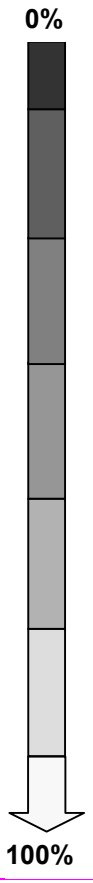
Follow the steps below to align the units:

- Hold the receiver (RX) steady and align the emitter (TX) so that the yellow “LOW ALIGN” LED lights up, confirming that the first lower beam has been aligned correctly.
- Rotate the emitter (TX) until the yellow “HIGH ALIGN” LED is also lit. The “SAFE/BREAK” LED switches from red (BREAK) to green (SAFE).

NOTE: Make sure that the “SAFE/BREAK” LED is constantly green.

- With a few small movements, define the area in which the “SAFE/BREAK” LED is constantly green; do this first with one unit and then with the other. Place both units in the centre of this area.
- Use the pins and/or mounting brackets to firmly secure both the units.
- Disconnect the power supply to the safety light curtain.
- Reconnect the power supply.
- Make sure that the green “POWER ON” LED on the receiver (RX) is lit (light beams are clear, “SAFE” operating status) and that this switches to red if just a single beam is interrupted (detected object, “BREAK” operating status).
- Perform this test using a cylindrical “test rod”, the diameter of which should correspond to the resolution of the device (14 mm, 20 mm, 30 mm or 35 mm). The test rod is available as an accessory.

NOTE: If you pass the test rod from top to bottom along the length of the whole sensing area, at any distance from either unit, the “SAFE/BREAK” LED must be constantly red. We recommend that you perform this test daily.

LED status		Degree of alignment
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Constant red* *Off* *Off* *Constant green*	
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Constant red* *Constant yellow* *Off* *Constant green*	
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Slow red flashes* *Constant yellow* *Constant yellow* *Constant yellow*	
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Quick red flashes* *Constant yellow* *Constant yellow* *Constant green*	
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Quick green flashes* *Constant yellow* *Constant yellow* *Constant green*	
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Slow green flashes* *Constant green* *Constant yellow* *Lit green*	
SAFE BREAK HIGH ALIGN LOW ALIGN POWER ON	*Constant green* *Constant yellow* *Constant yellow* *Constant green*	

English

5.2 Alignment within a cascading configuration

Within a cascading configuration, the LED does not indicate that the system is aligned until both Master and Slave have been aligned correctly.
It is not possible to identify whether it's the Master or Slave that is incorrectly aligned.
For this reason we recommend that the process is divided into two phases:

- **Alignment - Master:** Align the Master unit only at first. Connect the relevant electrical adapter instead of the Slave unit. Once the Master unit is aligned correctly, secure the Master and interrupt the current supply. Then replace the adapter with the Master/Slave connection cable.
- **Alignment - Slave:** Now align the Slave unit. As the Master is already aligned, you can be sure that the LEDs refer to the Slave's degree of alignment.

6 FUNCTIONS

6.1 Selecting the operating mode via DIP switches

On the front of the receiver (RX) there is a cover flap (Fig. 19), which is easy to open using a screwdriver and enables access to a row of DIP switches for the following configurations:

- Floating blanking
- Feedback loop monitoring function
- Manual/automatic reset

⚠ The device will not accept configuration changes during normal operation. A configuration change will only take effect once the device is reset.
Particular care should therefore be taken when setting the DIP switches.

Abb. 20

DIP-sw	FUNCTION	ON	OFF
1	Floating blanking	*See section 6.6*	
2	Floating blanking		
3	Feedback loop monitoring	Deactivated	Activated
4	Reset	Automatic	Manual

6.2 Standard configuration

The device is supplied with the following standard configuration:

MODEL	Feedback loop monitoring	Floating Blanking	Reset
Standard - Finger protection	Deactivated	-	Automatic
Standard - Hand protection	Deactivated	-	Automatic
Blanking - Finger protection	Deactivated	Deactivated	Automatic
Blanking - Hand protection	Deactivated	Deactivated	Automatic
Cascading - Finger protection	Deactivated	-	Automatic
Cascading - Hand protection	Deactivated	-	Automatic
Cascading & blanking Finger protection **	Deactivated	Deactivated	Automatic
Cascading & blanking Hand protection **	Deactivated	Deactivated	Automatic

English

6.3 Restart

If the beams between the emitter (TX) and receiver (RX) are interrupted by an opaque object, the OSSD outputs will switch and the safety contacts will open (“BREAK” operating status).
There are two different ways to restart normal mode (“SAFE” operating status):

- **Automatic reset:** After the protected field has been interrupted, the safety light curtain returns to its normal mode as soon as the detected object has been removed from the protected field.
- **Manual reset:** After the protected field has been interrupted, the safety light curtain does not return to its normal mode until the object has been removed from the protected field and the restart button (TEST/RESET button) has been operated for at least 0.5 s.

Timing diagram for manual reset (local or external activation of restart function)

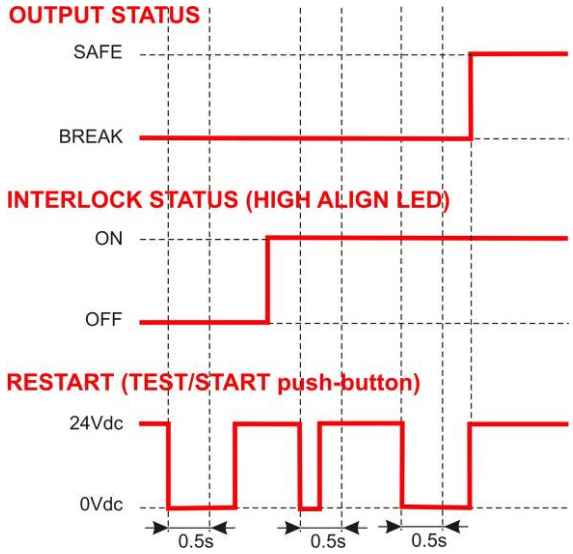


Fig. 21 shows the two operating modes:

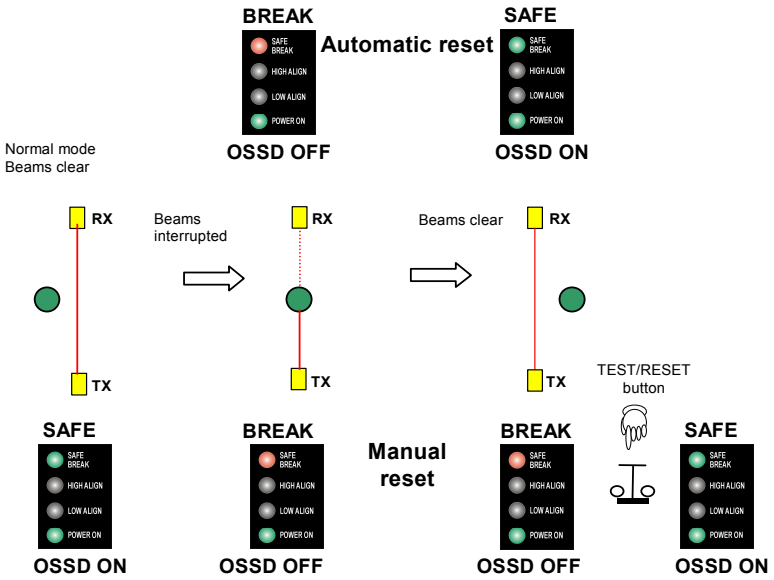
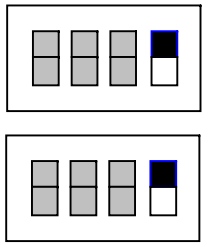


Fig. 21

Automatic or manual reset can be selected via the DIP switches on the receiver (RX).

- Automatic reset: Set position 4 on both DIP switches to ON
- Manual reset: Set position 4 on both DIP switches to OFF



NOTE: **DIP switches that are not used for this function are shown in grey in the diagram.**

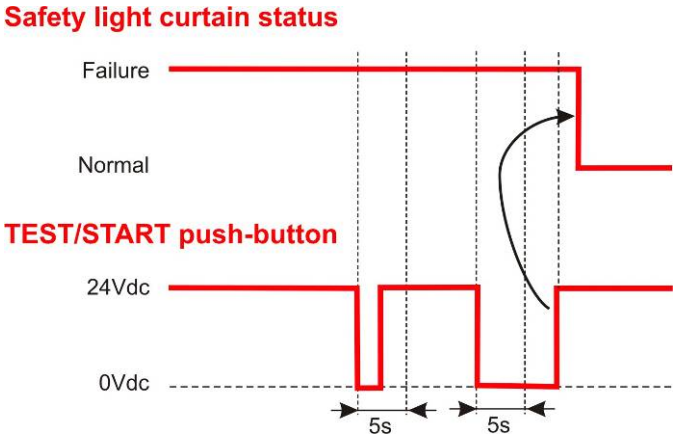
English

6.4 Reset function

The safety light curtain has a reset function which is used in the case of internal errors. To cancel the reset lock and restore the normal operating status, press the TEST/RESET button for at least 5 s.
Carry out the reset function in the following cases:

- Irregular output function
- Irregular optical function
- Irregular operation of the feedback loop monitoring function
- Irregular TEACH-IN blanking

Timing diagram for the reset function



6.5 Feedback loop monitoring function

The safety light curtain has a feedback loop for monitoring the externally connected contactors. The opening/closing of the electrical contacts is monitored by a N/C contact.

Activate the feedback loop monitoring function:
- Select the relevant DIP switches
- Connect the feedback loop input to a N/C contact with 24 Vcc on the device to be monitored.

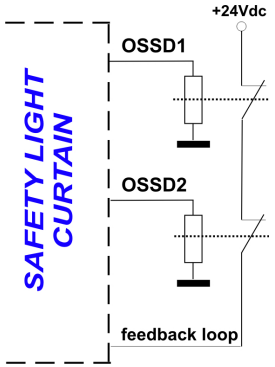
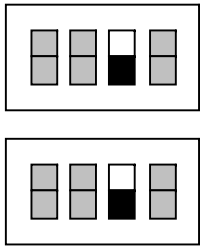


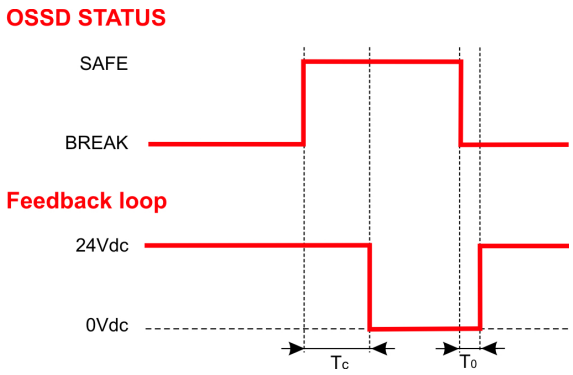
Fig. 22

The diagram on the right shows the correct layout of the DIP switches (DIP switch 3 OFF) to activate the feedback loop.



English

This function monitors the switching of the N/C contacts when the OSSD output status changes.



$T_C \leq$ 350 ms Time after which the feedback loop contacts open once the OSSD outputs switch from OFF-ON

$T_0 \leq$ 100 ms Time after which the feedback loop contacts close once the OSSD outputs switch from ON-OFF

Use control elements whose dynamics are compatible with the time constraints stated above.
If inappropriate devices are used, the safety light curtain may switch to a fault condition.
We recommend that this function is checked regularly.

6.6 Blanking function

(Only available on some models, please refer to Ch. 10, “List of available models”)

The blanking function is an optional function which allows an object that is larger than the detection capability of the ESPE to be inside the protected field without the OSSD outputs switching off.

There are two types of blanking function: Floating blanking and fixed blanking. These two function types can either be activated separately or simultaneously.

6.6.1 Floating blanking

The floating blanking function enables 1, 2 or 3 beams inside any area of the protected field to be blanked. The blanked area follows the position of a moved object. The detection capability of the other areas remains the same.
The number of beams for which the blanking function is available can be configured by operating DIP switches 1 and 2.

NOTE: The first beam from the top cannot be connected to the floating blanking function because it is used for synchronisation.

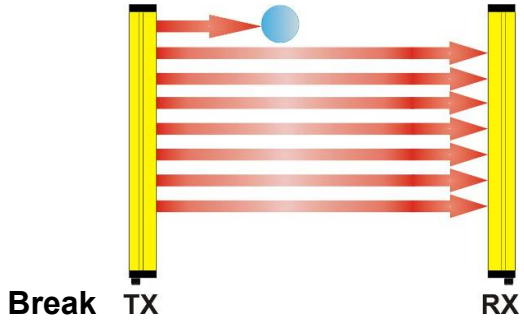
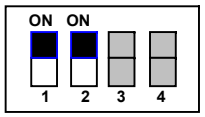


Fig. 23

Floating blanking OFF

	ON	ON	Floating blanking disabled

Changing the safety distance

Activating the floating blanking function reduces the actual resolution of the device. It will therefore be necessary to recalculate the safety distance based on the actual resolution of the device (*see table in section 2.2.1*).

Diameter of the blanked area

The following table specifies the maximum diameter an object may have when blanking 1, 2 or 3 beams, without the OSSD outputs switching off:

Number of blanked beams	**Diameter of the blanked area**	
	Finger protection	*Hand protection*
1	0 to 6.5 mm	0 to 18 mm
2	0 or 13 mm	0 or 36 mm
2	0 to 19.5 mm	0 to 54 mm

Blanking LED display

The activated floating blanking function is displayed via two LEDs located in the end cap at the top of the receiver unit.
The LEDs flash while the floating blanking function is active

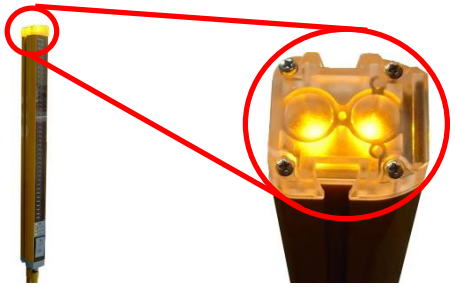
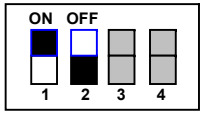


Fig. 24

LED display for floating blanking

Display LED	Status
 *Lit green* *Off* *Lit yellow* *Lit green*	The safety light curtain is switched on and the floating blanking function is active.
 *Lit green* *Flashing yellow* *Lit yellow* *Lit green*	The floating blanking function is active and an object is interrupting some of the beams in the protected field: the floating blanking function is in operation.

6.6.2 Floating blanking of 1 beam

	ON	OFF	Floating blanking enabled, 1 beam blanked All objects that interrupt more than 1 beam will be detected

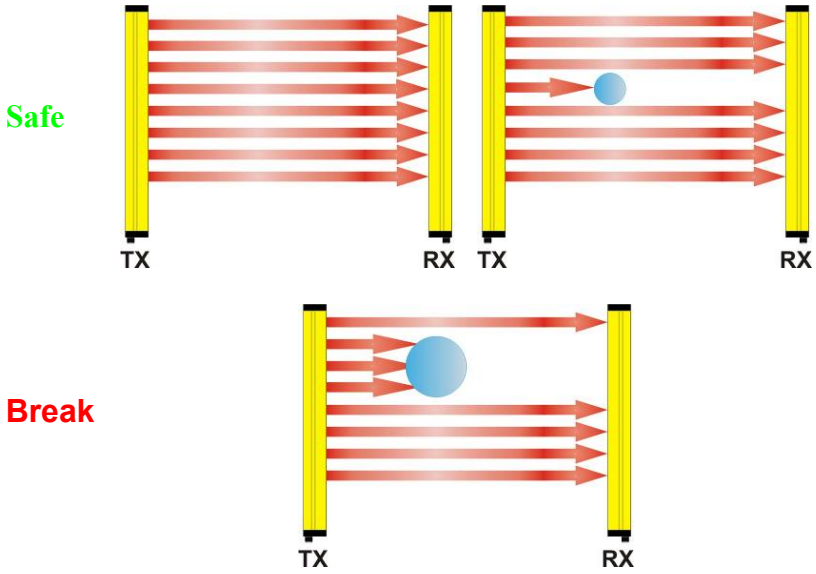
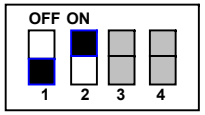


Fig. 25

6.6.3 Floating blanking of 2 beams

	OFF	ON	Floating blanking active, 2 adjacent beams blanked. All objects that interrupt a number of beams other than 2 will be detected.

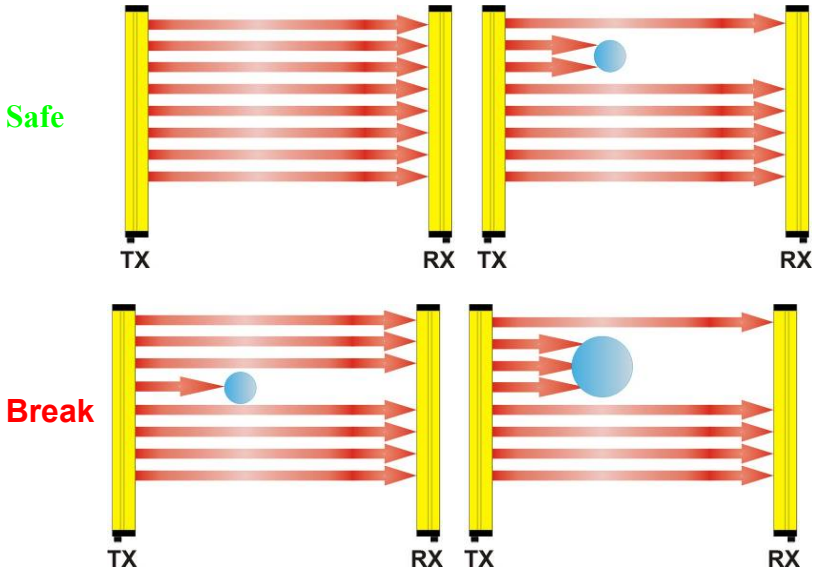
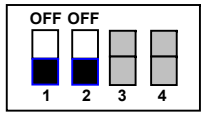


Fig. 26

NOTE: If the number of interrupted beams is higher or lower than 2, the OSSD outputs on the safety light curtain will be activated.

6.6.4 Floating blanking of up to 3 beams

	OFF	OFF	Floating blanking enabled, 1, 2 or 3 adjacent beams blanked. All objects that interrupt more than 3 beams will be detected.

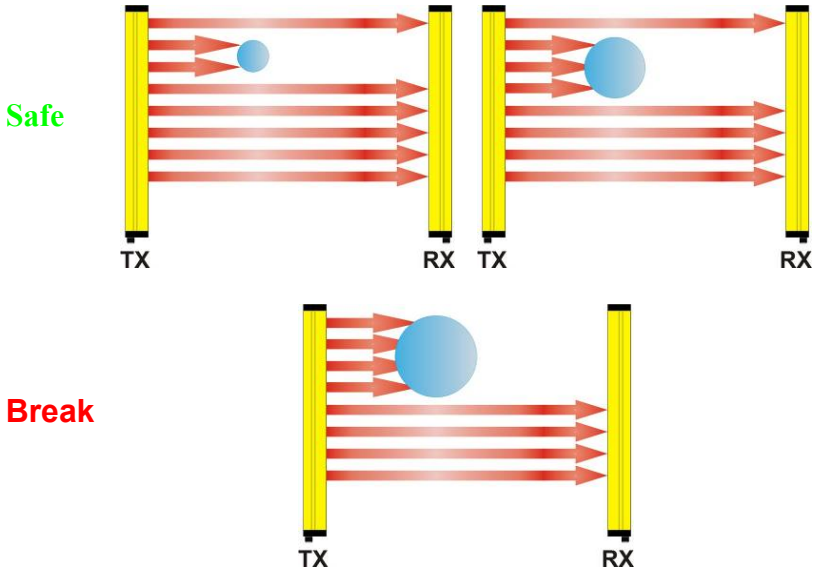


Fig. 27

NOTE: In this case, all objects that interrupt up to 3 beams will be accepted, including objects that only interrupt 1 or two beams.

English

6.6.5 Fixed blanking

The floating blanking function enables a predetermined area of the protected field to be blanked. The position of the blanked area does not change during operation.
With the fixed blanking function you will need to determine the position of the first relevant beam and the length of the area to be blanked.
This information is recorded by the safety light curtain via the TEACH-IN procedure:

- To start the TEACH-IN procedure the TEACH-IN button must be pressed for at least 3 seconds. The fact that the TEACH-IN procedure is enabled is displayed as follows:

Lit red

Off

Flashing yellow

Lit green

- Once the TEACH-IN procedure has been enabled, keep the button pressed down to define the blanking area.

- Define the blanking area by interrupting the beams to which the blanking function is to be assigned.
  During the TEACH-IN procedure make sure that the interrupted beams are adjoining because only one blanking area can be defined. If not, the system will switch to the fault condition: "Irregular blanking function".

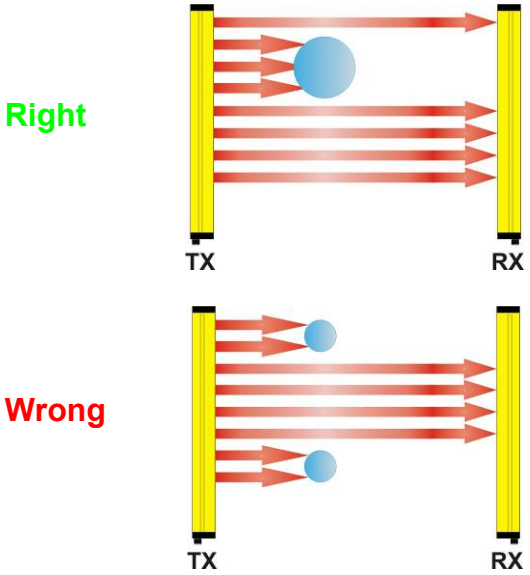


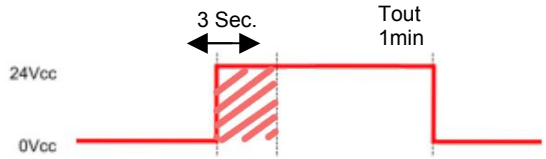
Fig. 28

- The TEACH-IN procedure is ended by releasing the button. The OSSD outputs switch on when the button is released.

NOTE: The first beam from the top cannot be connected to the fixed blanking function. When the button is released after the TEACH-IN procedure, if the first beam is interrupted the system will switch to the fault condition: “Irregular blanking function” (see table overleaf).

English

- The TEACH-IN procedure must be carried out within a minute. Once this time has elapsed the system will switch to the fault condition: “Irregular blanking function” (see table overleaf).



- The TEACH-IN procedure can be repeated several times during normal set-up mode.
- The information recorded during the TEACH-IN procedure will be stored once the device is shut down.
- There is no reset function for the TEACH-IN procedure that has been carried out. To reset the fixed blanking procedure, carry out the TEACH-IN procedure again and make sure that no beams are interrupted.
- There is no enable/disable function for fixed blanking. Fixed blanking can be deactivated temporarily by leaving Pin 3 (green) of the receiver's 8-pin M12 connector disconnected.

CAUTION: In contrast to floating blanking, the fixed blanking function is not displayed in any way on the safety light curtain. For this reason the following safety measures must be in place before the device is commissioned:

- **Warnings must be put up in the non-protected area to advise about the potential risk.**
- **Use covers/metal nets to prevent access to the danger zone via the blanking area.**

NOTE: In contrast to the floating blanking function, the blanked area defined by the TEACH-IN procedure must constantly be interrupted during operation. If the obstacle is removed from the blanking area, the safety light curtain will switch to the fault condition: "Irregular blanking function".

Display for "Irregular blanking function"

Display LED	Status
 *Off* *Flashing yellow* *Off* *Lit green*	Fault condition due to malfunctions in the TEACH-IN phase of fixed blanking. To restore the normal operating condition, press the TEST/RESET button for at least 5 seconds. A complete reset will delete the data from any TEACH-IN procedure that may have been undertaken.

Fixed blanking tolerance

In the stored blanking area a tolerance can be activated by applying a voltage of 24 VDC to pin 8 of the receiver's 8-pin M12 connector.
This tolerance enables the object to be displaced by one beam, above **or** below the stored blanking area.
It is particularly useful to activate the tolerance when the object within the blanking area is exposed to vibration and can therefore move.

NOTE: Do not activate the tolerance if the stored blanking area contains the second beam from the top, otherwise malfunctions may occur during operation.

English

6.7 Cascading function

(Only available on some models, please refer to Ch. 10, “List of available models”)

The cascading function can be used to connect pairs of light curtains in a cascading configuration.
The connected light curtain pairs are described as Master and Slave.
Only the Master has OSSD outputs and is responsible for controlling the output switching elements based on its own status and also that of the Slave's.
On blanking cascading models the blanking function is only available to the Master.
To establish the connection between Master and Slave, connect the emitter and receiver of the Master and Slave via the 5-pin M12 connector.

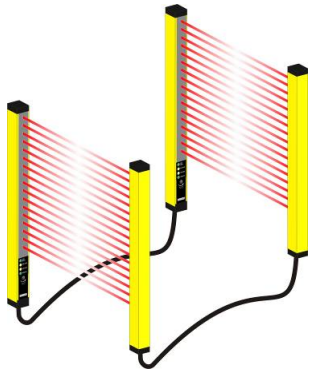


Fig. 29

The Master detects the Slave on power up, so the electrical connections must be made before the device is switched on.

Fig. 30

6.7.1 Stand-alone Master

The Master can be used independently from the Slave (but not the other way round).
In this case, connect the supplied electrical adapter to the 5-pin M12 connector provided for the Master/Slave connection.

7 DIAGNOSTICS

7.1 Function indicators

4 LEDs on the receiver (RX) and 2 LEDs on the emitter (TX) provide the user with information about the operating status of the safety light curtain (Fig. 31).

Fig. 31

The key to the LEDs on the receiver (RX) depends on the operating mode.

7.2 Error messages and diagnostics

The LEDs that display the function can also be used by operators to evaluate the main causes of an error.

RECEIVER:

LED status	Diagnostics	Checks and remedy
 *Flashing red* *Flashing yellow* *Flashing yellow* *Constant green*	Malfunction of the outputs	- Check the output connections. - Check the load on the outputs to make sure it complies with the specifications in the technical details.
 *Off* *Flashing yellow* *Flashing yellow* *Constant green*	Malfunction of the microprocessor	- Check the correct position of the DIP switches. - Switch the device off and then on again; if the fault persists, contact PILZ.
 *Off* *Off* *Flashing yellow* *Constant green*	Optical fault	- Check the alignment of emitter and receiver - Switch the device off and then on again; if the fault persists, contact PILZ.
 *Flashing red* *Off* *Flashing yellow* *Constant green*	Malfunction of the external control unit (function of the feedback loop monitoring test)	- Check the feedback loop monitoring connections - Check the compatibility of the external unit and the test times for feedback loop monitoring - Switch both devices off and then on again: If the problem persists, change the external unit.
 *Off* *Off* *Off* *Off*	Supply voltage error	- Check the supply voltage - If the fault persists, contact Pilz.
 *Off* *Off* *Off* *Constant green*	The supply voltage is outside the permitted range	- Check the supply voltage - If the fault persists, contact Pilz.
 *Off* *Flashing yellow* *Off* *Constant green*	Fault in the management of the blanking function	- Check the correct layout of the object stored in the TEACH-IN phase - Check that the TEACH-IN cable is not damaged.

English

LED status	Diagnostics	Checks and remedy
 *Flashing red* *Off* *Off* *Constant green*	Fault in the cascading configuration	Timeout for Master/Slave communication has elapsed Check the integrity of the connection between Master/Slave
 *Constant red* *Constant yellow* *Off* *Constant green*	Displays the interlock status	With manual reset: Indicates that one or more beams have been interrupted. The device will wait for the Test/Reset button to be pressed to resume normal operation.
 *Constant green* *Off* *Constant yellow* *Constant green*	Displays that the floating blanking function is enabled.	
 *Constant green* *Flashing yellow* *Flashing yellow* *Constant green*	Floating blanking display is running	Floating blanking is enabled and an object is obscuring some of the beams in the protected field: Floating blanking is in operation.
 *Constant red* *Off* *Flashing yellow* *Constant green*	Displays the TEACH-IN status	See page 43

EMITTER:

Defect	Cause	Checks and remedy
 *Flashing yellow* *Constant green*	Operational fault	- Check the supply voltage - If the display does not go out, contact Pilz.
 *Off* *Off*	Supply voltage error	- Check the supply voltage - If the display does not go out, contact Pilz.
 *Off* *Constant green*	The supply voltage is outside the permitted range	- Check the supply voltage - If the display does not go out, contact Pilz

8 REGULAR CHECKS AND MAINTENANCE

Qualified personnel must carry out the following checks regularly.
Ensure that:

- The “SAFE/BREAK” LED is constantly red when you pass the test rod from top to bottom along the length of the whole sensing area, at any distance from either unit.
- The safety light curtain switches to an OFF state when the test/reset button is operated (“SAFE/BREAK” LED lights up red - OSSD outputs open - monitored machine switches to a safe condition).
- The reaction time at a machine stop, incl. the reaction time of the safety light curtain and the machine overrun time, is within the limits defined through the calculation of the safety distance (see Chapter 2 “*Installation*”).
- The minimum safety distance between the danger zone and the protected field is in accordance with the details stated in Chapter 2 “*Installation*”.
- Nobody can access and remain in the danger zone between the safety light curtains and the hazardous machine parts.
- The danger zone cannot be accessed from any unprotected area.
- There is no visible damage to the safety light curtain and/or the external electrical connections.

We recommend a yearly inspection.

8.1 Maintenance

Safety light curtains require no particular maintenance, except for cleaning the optical covers. Moist cotton cloths should be used for cleaning.

We recommend that you do not use:

- **Alcohol or solvents,**
- **Cloths made of wool or synthetic material.**

8.2 General information and useful data

Safety devices are only beneficial if they are installed correctly, in accordance with the regulations.
If you find that you do not have the necessary expertise to install the safety devices correctly, please contact our technical support.

Electronic fuses protect the devices against short circuit. Once these have reacted you will need to disconnect the power supply for at least 20 seconds and rectify the short circuit. When you reconnect the power supply the fuses will have reset and the safety light curtain can automatically resume normal operation.

Faults that result in a power supply failure may cause the outputs to open temporarily, but do not adversely affect the safe operation of the safety light curtain.

Install and replace emitter and receiver only in pairs.
Emitter and receiver have the same serial number.
Guideline for repair: Always send both emitter **and** receiver for repair.
(During repair, both units are programmed with the current software version).

9 TECHNICAL DETAILS

Supply voltage	24 VDC ±20% (SELV/PELV)
Internal capacity	410 nF (Tx) / 430 nF (Rx)
Current consumption, emitter (TX)	Max. 55 mA / 1.5 W
Current consumption, receiver (RX)	Max. 125 mA (without load) / 3.75 W
Outputs:	2 PNP Max. short circuit stability: 1.4 A at 55°C Min: 1.1A at -10°C
Output current:	Max. 0.5 A / each output
Output voltage ON - min.:	Vdd –1 V
Output voltage OFF - max.	0.2 V
Capacitive load (pure)	Max. 80 nF at 25°C
Resistance load (pure)	Min. 56Ω at 24 Vcc
Leakage current	< 1 mA
Reaction time	*(See table: "Available models")*
Emitter, wavelength	Infra-red (880 nm)
Resolution	14 mm finger protection (PSEN opSB-4F) 30 mm hand protection (PSEN opSB-4H)
Operating range	0.2…6 m (resolution 14 mm), 0.2…15 m (resolution 30 mm)
Category	Type 4
Operating temperature	-10…+55 °C
Storage temperature	-25…+70 °C
Humidity	15 ... 95 % (non-condensing)
Protection class	Class 1 (see section 4.2 "*Wiring guideslines*", "Earthing" section)
Protection type	IP65 (EN 60529)
Ambient brightness	IEC-61496-2
Vibration	Amplitude 0.35 mm, frequency 10 ... 55 Hz, 20 sweeps for all axes; 1 octave/min., (EN 60068-2-6)
Shock resistance	16 ms (10 G) 1,000 shocks for all axes (EN 60068-2-29)
Reference standards	IEC 61496-1; IEC 61496-2
Housing material	Varnished aluminium (yellow RAL 1003)
Material of upper and lower cover	PC MAKROLON
Material for optics	PMMA
Connections	4-pin M12 connector on TX 8-pin M12 connector on RX 5-pin M12 connector (only on models with cascading function)
Cable runs Supply Master/Slave connection cable	 Max. 50 m* Max. 3 m (see section 12 "Accessories")
Weight	Max. 1.2 Kg / m per unit

* If a longer cable is used, you will need to make sure that the relevant specifications are met.

English

10 LIST OF AVAILABLE MODELS

MODEL	DESCR.	No. of beams	Resolution (mm)	Reaction time (ms)	Operating range (m)
PSEN op4F-bm-14-015	Finger protection MASTER BLANKING	21	**14**	21	**0.2….6**
PSEN op4F-bm-14-030		42		28	
PSEN op4F-bm-14-045		63		35	
PSEN op4F-bm-14-060		84		41	
PSEN op4F-bm-14-075		105		48	
PSEN op4F-bm-14-090		126		55	
PSEN op4F-bm-14-0105		147		62	
PSEN op4F-bm-14-0120		168		68	
PSEN op4H-bm-30-015	Hand protection MASTER BLANKING	8	**30**	16	**0.2…15**
PSEN op4H-bm-30-030		16		20	
PSEN op4H-bm-30-045		24		23	
PSEN op4H-bm-30-060		32		25	
PSEN op4H-bm-30-075		40		27	
PSEN op4H-bm-30-090		48		30	
PSEN op4H-bm-30-105		56		32	
PSEN op4H-bm-30-120		64		35	
PSEN op4H-bm-30-135		72		38	
PSEN op4H-bm-30-150		80		40	
PSEN op4H-bm-30-165		88		43	
PSEN op4F-sl-14-015	Finger protection SLAVE	21	**14**	21	**0.2….6**
PSEN op4F-sl-14-030		42		28	
PSEN op4F-sl-14-045		63		35	
PSEN op4F-sl-14-060		84		41	
PSEN op4F-sl-14-075		105		48	
PSEN op4F-sl-14-090		126		55	
PSEN op4F-sl-14-0105		147		62	
PSEN op4F-sl-14-0120		168		68	
PSEN op4H-sl-30-015	Hand protection SLAVE	8	**30**	16	**0.2…15**
PSEN op4H-sl-30-030		16		20	
PSEN op4H-sl-30-045		24		23	
PSEN op4H-sl-30-060		32		25	
PSEN op4H-sl-30-075		40		27	
PSEN op4H-sl-30-090		48		30	
PSEN op4H-sl-30-105		56		32	
PSEN op4H-sl-30-120		64		35	
PSEN op4H-sl-30-135		72		38	
PSEN op4H-sl-30-150		80		40	
PSEN op4H-sl-30-165		88		43	

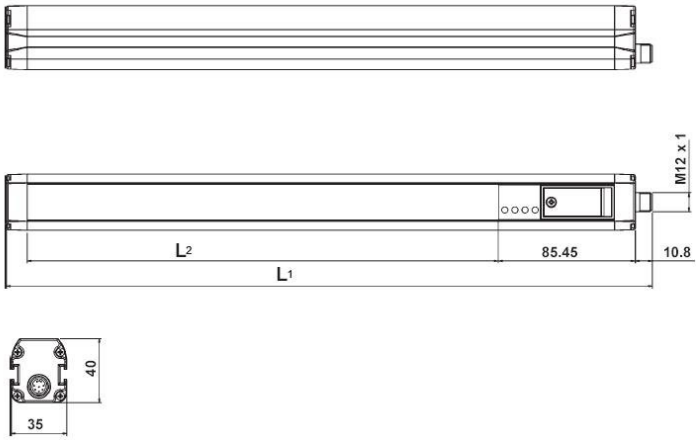
MODEL	DESCR.	No. of beams	Resolution *(mm)*	Reaction time *(ms)*	Operating range *(m)*
PSEN op4F-b-14-015	Finger protection BLANKING	21	**14**	21	**0.2….6**
PSEN op4F-b-14-030		42		28	
PSEN op4F-b-14-045		63		35	
PSEN op4F-b-14-060		84		41	
PSEN op4F-b-14-075		105		48	
PSEN op4F-b-14-090		126		55	
PSEN op4F-b-14-0105		147		62	
PSEN op4F-b-14-0120		168		68	
PSEN op4H-b-30-015	Hand protection BLANKING	8	**30**	16	**0.2…15**
PSEN op4H-b-30-030		16		20	
PSEN op4H-b-30-045		24		23	
PSEN op4H-b-30-060		32		25	
PSEN op4H-b-30-075		40		27	
PSEN op4H-b-30-090		48		30	
PSEN op4H-b-30-105		56		32	
PSEN op4H-b-30-120		64		35	
PSEN op4H-b-30-135		72		38	
PSEN op4H-b-30-150		80		40	
PSEN op4H-b-30-165		88		43	
PSEN op4F-m-14-015	Finger protection MASTER	21	**14**	21	**0.2….6**
PSEN op4F-m-14-030		42		28	
PSEN op4F-m-14-045		63		35	
PSEN op4F-m-14-060		84		41	
PSEN op4F-m-14-075		105		48	
PSEN op4F-m-14-090		126		55	
PSEN op4F-m-14-0105		147		62	
PSEN op4F-m-14-0120		168		68	
PSEN op4H-m-30-015	Hand protection MASTER	8	**30**	16	**0.2…15**
PSEN op4H-m-30-030		16		20	
PSEN op4H-m-30-045		24		23	
PSEN op4H-m-30-060		32		25	
PSEN op4H-m-30-075		40		27	
PSEN op4H-m-30-090		48		30	
PSEN op4H-m-30-105		56		32	
PSEN op4H-m-30-120		64		35	
PSEN op4H-m-30-135		72		38	
PSEN op4H-m-30-150		80		40	
PSEN op4H-m-30-165		88		43	

English

MODEL	DESCR.	No. of beams	Resolution *(mm)*	Reaction time *(ms)*	Operating range *(m)*
PSEN op4F-s-14-015	Finger protection Standard	21	**14**	14	**0.2….6**
PSEN op4F-s-14-030		42		18	
PSEN op4F-s-14-045		63		22	
PSEN op4F-s-14-060		84		26	
PSEN op4F-s-14-075		105		30	
PSEN op4F-s-14-090		126		34	
PSEN op4F-s-14-0105		147		38	
PSEN op4F-s-14-0120		168		41	
PSEN op4H-s-30-015	Hand protection Standard	8	**30**	12	**0.2…15**
PSEN op4H-s-30-030		16		13	
PSEN op4H-s-30-045		24		15	
PSEN op4H-s-30-060		32		16	
PSEN op4H-s-30-075		40		18	
PSEN op4H-s-30-090		48		19	
PSEN op4H-s-30-105		56		21	
PSEN op4H-s-30-120		64		22	
PSEN op4H-s-30-135		72		24	
PSEN op4H-s-30-150		80		25	
PSEN op4H-s-30-165		88		26	

11 OVERALL DIMENSIONS

All dimensions are stated in mm.



MODEL	L1 (mm)	L2 (mm)
PSEN op4F-x-14/15-015 **PSEN op4H-x-30-015**	256	147
PSEN op4F-x-14/15-030 **PSEN op4H-x-30-030**	403	294
PSEN op4F-x-14/15-045 **PSEN op4H-x-30-045**	550	441
PSEN op4F-x-14/15-060 **PSEN op4H-x-30-060**	697	588
PSEN op4F-x-14/15-075 **PSEN op4H-x-30-075**	844	735
PSEN op4F-x-14/15-090 **PSEN op4H-x-30-090**	991	882
PSEN op4F-x-14/15-105 **PSEN op4H-x-30-105**	1138	1029
PSEN op4F-x-14/15-120 **PSEN op4H-x-30-120**	1285	1176
PSEN op4H-x-30-135	1432	1323
PSEN op4H-x-30-150	1579	1470
PSEN op4H-x-30-165	1726	1617

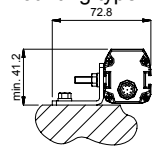
English

12 ACCESSORIES

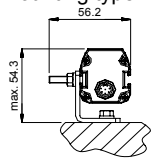
12.1 Mounting bracket

MODEL	DESCRIPTION
Bracket kit PSEN 4	(1) Bracket (4-part kit)
Bracket kit PSEN 4 anti vibr.	(2) Anti-vibration brackets (4-part kit)
Bracket kit PSEN 4 adjust.	(3) Adjustable brackets (4-part kit)

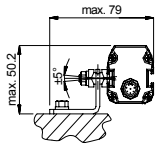
Mounting type A

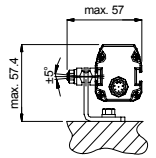


Mounting type B

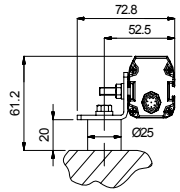


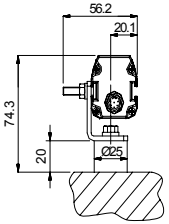
Standard mounting bracket (1)



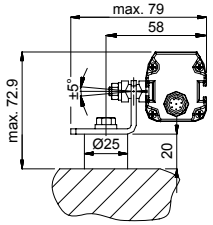


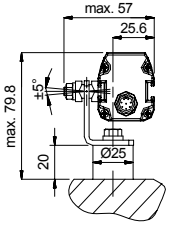
Standard mounting bracket + adjustable bracket (1 + 3)





Standard mounting bracket + anti-vibration bracket (1 +2)

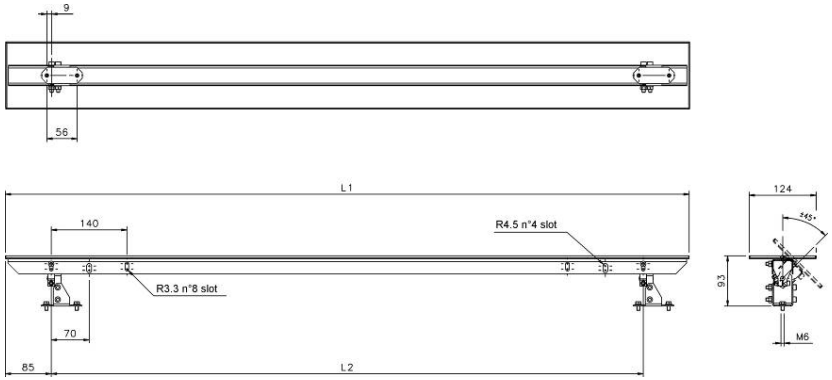




Standard bracket+adjustable bracket+anti-vibration bracket (1 + 2 + 3)

12.2 Deviating mirror

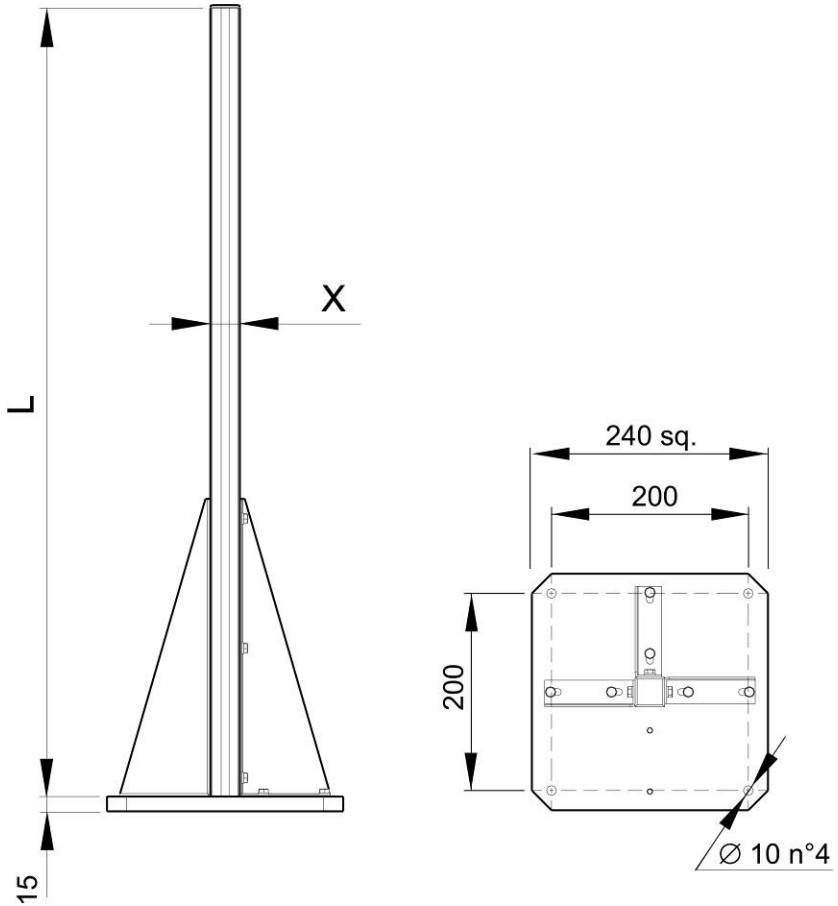
MODEL	DESCRIPTION	L_1 (mm)	L_2 (mm)
Mirror 550mm	Deviating mirror H= 550 mm	554	384
Mirror 700mm	Deviating mirror H= 700 mm	704	534
Mirror 900mm	Deviating mirror H= 900 mm	904	734
Mirror 1000mm	Deviating mirror H= 1000 mm	1004	834
Mirror 1270mm	Deviating mirror H= 1270 mm	1264	1094
Mirror 1600mm	Deviating mirror H= 1600 mm	1604	1434
Mirror 1800mm	Deviating mirror H= 1800 mm	1804	1634



English

12.3 Floor brackets

MODEL	DESCRIPTION	L (mm)	X (mm)
Stand 1000mm	Floor brackets H= 1000 mm	1000	30x30
Stand 1200mm	Floor brackets H= 1200 mm	1200	30x30
Stand 1500mm	Floor brackets H= 1500 mm	1500	45x45
Stand 1800mm	Floor brackets H= 1800 mm	1800	45x45



12.4 Laser pointer

The laser pointer in the PSEN op2/4 series is a valuable guide when aligning and installing the safety light curtains. The pointer can be moved along the light curtain profile to check the overall alignment of the safety light curtain.

MODEL	DESCRIPTION
LaserPointer for PSEN 4/2	Laser pointer for alignment

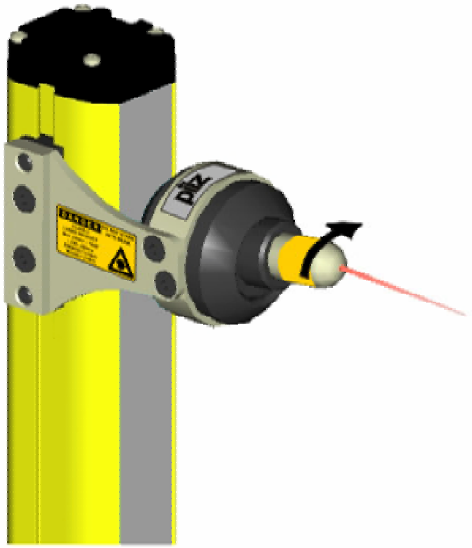


Fig. 32

English