



► PSEN op2S PSEN op4S

PILZ
THE SPIRIT OF SAFETY

Operating Manual-1001182-EN-09
- PSEN sensor technology



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1 Introduction

1.1 Validity of documentation

This documentation is valid for the product PSEN op2/4S. It is valid until new documentation is published.

This operating manual explains the function and operation, describes the installation and provides guidelines on how to connect the product.

1.2 Using the documentation

This document is intended for instruction. Only install and commission the product if you have read and understood this document. The document should be retained for future reference.

1.3 Definition of symbols

Information that is particularly important is identified as follows:



DANGER!

This warning must be heeded! It warns of a hazardous situation that poses an immediate threat of serious injury and death and indicates preventive measures that can be taken.



WARNING!

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.



CAUTION!

This refers to a hazard that can lead to a less serious or minor injury plus material damage, and also provides information on preventive measures that can be taken.



NOTICE

This describes a situation in which the product or devices could be damaged and also provides information on preventive measures that can be taken. It also highlights areas within the text that are of particular importance.



INFORMATION

This gives advice on applications and provides information on special features.

2 Safety

2.1 Intended use

The safety light barrier is an optoelectronic protective device. It is used to safeguard access areas, danger points or danger zones.

The safety light barrier meets the requirements of EN 61496-1 and IEC 61496-2 only in conjunction with their approved evaluation devices. Only connect the safety light barrier to the evaluation devices listed under [Connection to evaluation devices](#)  11].

2.2 Safety regulations

2.2.1 Safety assessment

Before using a device, a safety assessment in accordance with the Machinery Directive is required.

The product meets the functional safety requirements in accordance with EN ISO 13849 and EN IEC 62061 only in conjunction with their approved evaluation devices (see [Connection to evaluation devices](#)  11]). However, this does not guarantee the functional safety of the overall plant/machine. To achieve the relevant safety level of the overall plant/machine's required safety functions, each safety function needs to be considered separately.

2.2.2 Use of qualified personnel

The products may only be assembled, installed, programmed, commissioned, operated, de-commissioned and maintained by persons who are competent to do so.

A competent person is a qualified and knowledgeable person who, because of their training, experience and current professional activity, has the specialist knowledge required. In order to inspect, assess and handle products, devices, systems, plant and machinery, this person must be familiar with the state of the art and the applicable national, European and international laws, directives and standards.

It is the company's responsibility only to employ personnel who

- ▶ Are familiar with the basic regulations concerning health and safety / accident prevention,
- ▶ Have read and understood the information provided in the section entitled Safety
- ▶ Have a good knowledge of the generic and specialist standards applicable to the specific application.

2.2.3 Warranty and liability

All claims to warranty and liability will be rendered invalid if

- ▶ The product was used contrary to the purpose for which it is intended,
- ▶ Damage can be attributed to not having followed the guidelines in the manual,
- ▶ Operating personnel are not suitably qualified,
- ▶ Any type of modification has been made (e.g. exchanging components on the PCB boards, soldering work etc.).

2.2.4 Disposal

- ▶ In safety-related applications, please comply with the mission time T_M in the safety-related characteristic data.
- ▶ When decommissioning, please comply with local regulations regarding the disposal of electronic devices (e.g. Electrical and Electronic Equipment Act).

2.3 For your safety



- ▶ The following applies for PSEN op4S-1-2: **Laser protection class 1 in accordance with EN 60825-1**
- ▶ Do not remove the protective cap until you are just about to connect the device.

3

Unit features

PSEN op2S-1-1, PSEN op4S-1-1

- ▶ Type 2 or Type 4
- ▶ Infrared sensor
- ▶ Test pulse input
- ▶ LED display for
 - Status of the outputs (red, receiver)
 - Stability of the receive signal (green, receiver)
 - Operating status (green, transmitter)
- ▶ Operating range: 0 ... 8 m

PSEN op4S-1-2

- ▶ Type 4
- ▶ Laser sensor
- ▶ Test pulse input
- ▶ LED display for
 - Status of the outputs (red, receiver)
 - Stability of the receive signal (green, receiver)
 - Operating status (green, transmitter)
- ▶ Operating range: 0 ... 40 m

4 Function description

The safety light barriers are electrosensitive protective equipment and safeguard the danger zone by means of a light beam between the transmitter and receiver. When the light beam between the transmitter and receiver is broken, the output is switched off.

A function test can be carried out on the transmitter and receiver through a test pulse input on the transmitter. The test pulse signal simulates short interruptions of the light beam. If a fault is detected, the OSSDs switch to the OFF state.

5 Environmental conditions

- ▶ Install the safety light barrier in an environment that corresponds to the environmental data provided in the Technical details.
- ▶ Do not install the safety light barrier close to particularly intense or flashing light sources; this applies in particular to the receiver.
- ▶ The transmitter from one safety light curtain or safety light barrier must not interfere with the receiver from another safety light curtain or safety light barrier.
- ▶ The transmitters and receivers from two different safety light barriers must not be synchronised.
- ▶ Avoid strong electromagnetic interference when operating the safety light barrier.
- ▶ When operating the safety light barrier, avoid strong smoke, mist and dust formation that would reduce the safety light barrier's operating range.

6 Wiring

6.1 Terminal assignment


NOTICE

The colour marking for the connection lead only applies for the cable that Pilz supplies as an accessory.

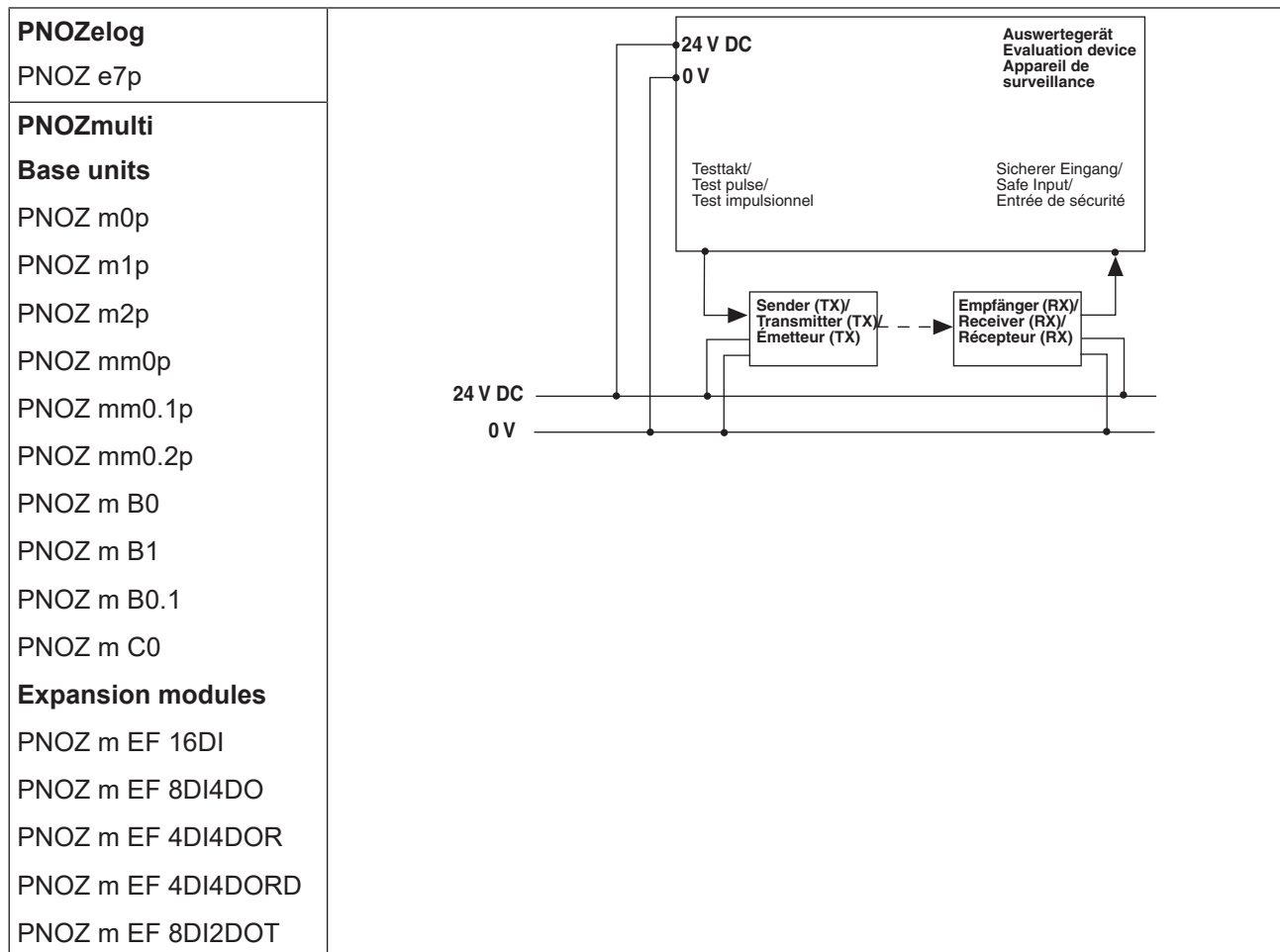
Receiver Assignment of the 4-pin M12 male connector		PIN 1: 2: 3: 4:	Function +20 ... 30 VDC n. c. 0 V Output	Cable colour Brown White Blue Black
Transmitter Assignment of the 4-pin M12 male connector		PIN 1: 2: 3: 4:	Function +20 ... 30 VDC n. c. 0 V Test	Cable colour Brown White Blue Black

6.2 Connection to evaluation devices



INFORMATION

The information on the connection and the wiring given in the operating manual for the evaluation device must be followed.



Reaction time of safety light barrier + evaluation device:

- ▶ When operated with PNOZmulti: <30 ms
- ▶ When operated with PSS: 2x set minimum scan time
- ▶ When operated with PNOZelog: <35 ms

7

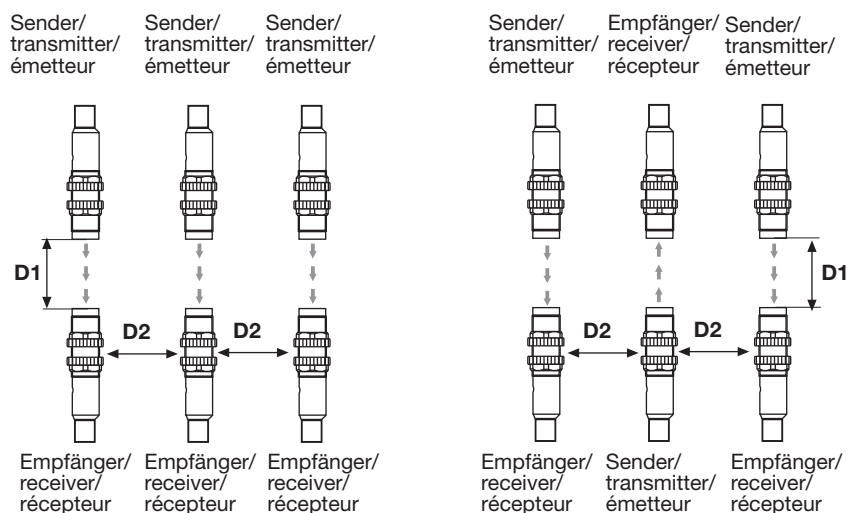
Installation

- ▶ The cable connections of the transmitter and receiver must be carried in separate cables over the whole signal path.
- ▶ The transmitter and receiver should be installed with the optical surfaces positioned opposite each other in parallel. The distance between the transmitter and receiver must be within the range of the respective model.
- ▶ The device must be installed in a way that it cannot be defeated.
- ▶ The distance between the safety light barrier and the nearest danger zone must be large enough for the hazardous movement to come to a standstill before the operator can reach the danger zone. All access directions must be considered in the process. This minimum distance is calculated in accordance with EN 999, "Approach speed of parts of the body for the positioning of safety devices".
- ▶ Deviating mirrors can be used to monitor danger zones where access is possible from various sides.
- ▶ When installing several safety devices side by side, please note that the transmitter of one device must not interfere with the receiver of another device. Install the devices so that they are separated via shielding or ensure that the minimum distances are maintained (see Tables).

**INFORMATION**

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).



7.1 Minimum distance: Receivers on one side

7.1.1 PSEN op2S-1-1/PSEN op4S-1-1

Distance between transmitter and receiver (D1)	Distance between two light barriers (D2)	
	PSEN op2S-1-1	PSEN op4S-1-1
2 m	0.4 m	0.16 m
4 m	0.68 m	0.23 m
6 m	0.84 m	0.32 m
8 m	0.9 m	0.44 m

7.1.2 PSEN op4S-1-2

Distance between transmitter and receiver (D1)	Distance between two light barriers (D2)
10 m	0.08 m
20 m	0.12 m
30 m	0.12 m
40 m	0.14 m

7.2 Minimum distance: Transmitters and receivers on opposite sides

7.2.1 PSEN op2S-1-1/PSEN op4S-1-1

Distance between transmitter and receiver (D1)	Distance between two light barriers (D2)	
	PSEN op2S-1-1	PSEN op4S-1-1
2 m	0.2 m	0.08 m
4 m	0.34 m	0.13 m
6 m	0.42 m	0.16 m
8 m	0.45 m	0.22 m

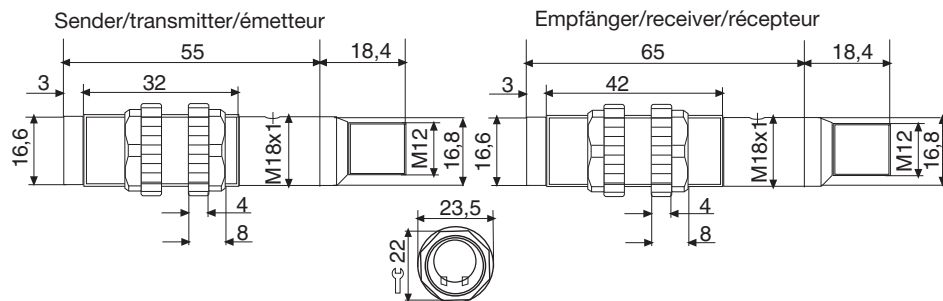
7.2.2 PSEN op4S-1-2

Distance between transmitter and receiver (D1)	Distance between two light barriers (D2)
10 m	0.04 m
20 m	0.06 m
30 m	0.06 m
40 m	0.07 m

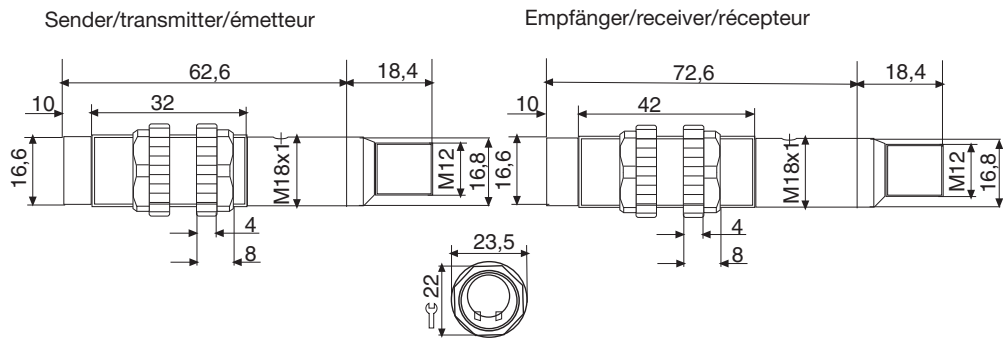
The function of the safety light barrier can be tested with a test rod with 18 mm diameter.

8 Dimensions

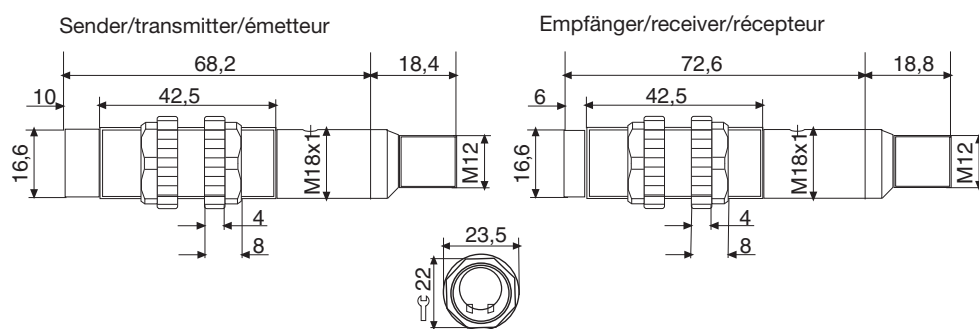
PSEN op2S-1-1



PSEN op4S-1-1



PSEN op4S-1-2



9 Technical details

General	630380	630381	630382
Certifications	CE, EAC, TÜV, cULus Listed	CE, EAC, TÜV, cULus Listed	CE, EAC, TÜV, cULus Listed
ESPE type	2	4	4
Sensor's mode of operation	Infrared	Infrared	Laser
Resolution			
Protection type	Object	Object	Object
Operating range	0,0 - 8,0 m	0,0 - 8,0 m	0,0 - 40,0 m
Electrical data	630380	630381	630382
Supply voltage			
Voltage	20 - 30 V	20 - 30 V	20 - 30 V
Kind	DC	DC	DC
Protection class	2	2	2
Optical data	630380	630381	630382
Used wavelength range	880 nm	880 nm	650 nm
No. of beams	1	1	1
Times	630380	630381	630382
Response time t1	1 ms	1 ms	0,33 ms
Environmental data	630380	630381	630382
Ambient temperature			
Temperature range	-25 - 55 °C	-25 - 55 °C	-10 - 50 °C
Storage temperature			
Temperature range	-25 - 70 °C	-25 - 70 °C	-25 - 70 °C
Climatic suitability			
in accordance with the standard	EN 60068-2-3	EN 60068-2-3	EN 60068-2-3
Humidity	95 % r. h. at 40 °C	95 % r. h. at 40 °C	95 % r. h. at 40 °C
Condensation during operation	Not permitted	Not permitted	Not permitted
Vibration			
in accordance with the standard	EN 60068-2-6	EN 60068-2-6	EN 60068-2-6
Frequency	10 - 55 Hz	10 - 55 Hz	10 - 55 Hz
Amplitude	0,5 mm	0,5 mm	0,5 mm
Shock stress			
Acceleration	30g	30g	30g
Duration	11 ms	11 ms	11 ms
in accordance with the standard	EN 60068-2-27	EN 60068-2-27	EN 60068-2-27
Protection type			
Housing	IP67	IP67	IP67
Mechanical data	630380	630381	630382
Connection type	M12, 4-pin	M12, 4-pin	M12, 4-pin

Mechanical data	630380	630381	630382
Connection type			
Receiver	M12, 4-pin male connector	M12, 4-pin male connector	M12, 4-pin male connector
Transmitter	M12, 4-pin male connector	M12, 4-pin male connector	M12, 4-pin male connector
Material			
Top	ABS UL 94 V0	ABS UL 94 V0	ABS UL 94 V0
Dimensions			
Depth	55 mm	62,6 mm	68,2 mm
Weight	39 g	44 g	47 g

Where standards are undated, the 2023-05 latest editions shall apply.

9.1 Safety characteristic data

► PNOZelog with type 2 safety sensor				
Description	Type	Order no.	Safety features	
Safety sensor	PSEN op2S-1-1	630380	Cat 2, PL c, SIL 1	
Control unit	PNOZ e7p	774197 784197	PFD PFHD	3.43×10^{-9} $3.72 \times 10^{-9} [1/h]$

► PNOZelog with type 4 safety sensor				
Description	Type	Order no.	Safety features	
Safety sensor	PSEN op4S-1-1	630381	Cat 4, PL e, SIL 3	
Safety sensor	PSEN op4S-1-2	630382	Cat 4, PL e, SIL 3	
Control unit	PNOZ e7p	774197 784197	PFD PFHD	3.43×10^{-9} $3.72 \times 10^{-9} [1/h]$

► PNOZmulti with type 2 safety sensor				
Description	Type	Order no.	Safety features	
Safety sensor	PSEN op2S-1-1	630380	Cat 2, PL c, SIL 1	
Control unit	PNOZ m0p PNOZ m1p PNOZ m2p PNOZ mm0p PNOZ mm0.1p PNOZ mm0.2p	773110 773100 773120 772000 772001 772002	PFD PFH	2.21×10^{-5} $2.50 \times 10^{-10} [1/h]$

► PNOZmulti with type 4 safety sensor				
Description	Type	Order no.	Safety features	
Safety sensor	PSEN op4S-1-1	630381	Cat 4, PL e, SIL 3	
Safety sensor	PSEN op4S-1-2	630382	Cat 4, PL e, SIL 3	
Control unit	PNOZ m0p PNOZ m1p PNOZ m2p PNOZ mm0p PNOZ mm0.1p PNOZ mm0.2p	773110 773100 773120 772000 772001 772002	PFD PFH	2.21×10^{-5} $2.50 \times 10^{-10} [1/h]$

► PNOZmulti2 with type 2 safety sensor				
Description	Type	Order no.	Safety features	
Safety sensor	PSEN op2S-1-1	630380	Cat 2, PL c, SIL 1	
Control unit	PNOZ m B0 PNOZ m B0.1	772100 772104	PFD PFH _D	$3,40E-05$ $3,85E-10 [1/h]$
Control unit	PNOZ m C0	772105	PFD PFH _D	$6,85E-05$ $7,75E-10 [1/h]$
Control unit	PNOZ m B1 PNOZ m B1 Burner	772101 772102	PFD PFH _D	With expansion module
Expansion module	PNOZ m EF 16DI PNOZ m EF 8DI4DO PNOZ m EF 8DI4DOT PNOZ m EF 4DI4DOR PNOZ m EF 4DI4-DORD	772140 772142 772144 772143 772145	PFD PFH	$1,86E-05$ $2,10E-10 [1/h]$

► PNOZmulti2 with type 4 safety sensor				
Description	Type	Order no.	Safety features	
Safety sensor	PSEN op4S-1-1	630381	Cat 4, PL e, SIL 3	
Safety sensor	PSEN op4S-1-2	630382	Cat 4, PL e, SIL 3	
Control unit	PNOZ m B0	772100	PFD	3,40E-05
	PNOZ m B0.1	772104	PFH _D	3,85E-10 [1/h]
Control unit	PNOZ m C0	772105	PFD	6,85E-05
			PFH _D	7,75E-10 [1/h]
Control unit	PNOZ m B1	772101	PFD	With expansion module
	PNOZ m B1 Burner	772102	PFH _D	
Expansion module	PNOZ m EF 16DI	772140	PFD	1,86E-05
	PNOZ m EF 8DI4DO	772142	PFH	2,10E-10 [1/h]
	PNOZ m EF 8DI4DOT	772144		
	PNOZ m EF 4DI4DOR	772143		
	PNOZ m EF 4DI4-DORD	772145		

10 Order reference

Product type	Features	Connection type	Order no.
PSEN op2S-1-1	Type 2, infrared sensor	4-pin M12 male connector	630380
PSEN op4S-1-1	Type 4, infrared sensor	4-pin M12 male connector	630381
PSEN op4S-1-2	Type 4, laser sensor	4-pin M12 male connector	630382

11 **EC declaration of conformity**

This product/these products meet the requirements of the directive 2006/42/EC on machinery of the European Parliament and of the Council. The complete EC Declaration of Conformity is available on the Internet at www.pilz.com/downloads.

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Support

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