Instruction Manual

FOS03

Optoelectronic Level Switch for Industrial Applications

PKP Prozessmesstechnik GmbH
Borsigstraße 24
D-65205 Wiesbaden-Nordenstadt
Tel.: ++49-(0)6122-7055-0
Fax: ++49-(0)6122-7055-50
Email: info@pkp.de www pkp.de

Table of Contents

Safety Information....2
Design and function....4
Commissioning, operation....4
Mounting instructions....5
Electrical connection....6
Faults....7
Maintenance and cleaning....8
Dismounting, return and disposal....8

Safety Information

General Instructions

To ensure safe operation, the device should only be operated according to the specifications in the instruction manual. The requisite Health & Safety regulations for a given application must also be observed. This statement also applies to the use of accessories.
Every person who is commissioned with the initiation or operation of this device must have read and understood the operating instructions and in particular the safety instructions!
The work safety instructions in this manual as well as the safety, accident prevention and environmental protection regulations generally valid for the work area must be observed.

The liability of the manufacturer expires in the event of damage due to improper use, non-observance of this operating manual, use of insufficiently qualified personnel and unauthorized modification of the device.

Proper Usage

The optoelectronic level switches of the FOS03 series are used to monitor the level of liquid media that do not attack the materials used.

Any other use of the device is unauthorised and outside the scope of application.
In particular, applications in which shock loads occur (for example, pulsed operation) should be discussed and checked in advance with our technical staff.

The series FOS03 level switch devices should not be deployed as the sole agents to prevent dangerous conditions occurring in plant or machinery. Machinery and plant need to be designed in such a manner that faulty conditions and malfunctions do not arise that could pose a safety risk for operators.

The liquids must not be heavily contaminated or contain coarse particles and must not have a tendency to crystallise. It must be ensured that the materials of the switch that come into contact with the medium are sufficiently resistant to the medium to be monitored. Not suitable for dispersion, abrasive liquids, highly viscous media and paints.
Avoid impact loads (dropping, hitting, etc.) on the glass tip!

Dangerous substances

For dangerous media such as e.g. Oxygen, Acetylene, flammable or toxic substances as well as refrigeration systems, compressors, etc. must comply with the relevant regulations beyond the general rules.

Qualified Personnel

The FOS03 devices may only be installed by trained, qualified personnel who are able to mount the devices correctly. Qualified personnel are persons, who are familiar with assembling, installation, placing in service and operating these devices and who are suitably trained and qualified.

Inward Monitoring

Please check directly after delivery the device for any transport damages and deficiencies. Additional with reference to the accompanying delivery note the number of parts must be checked.
Claims for replacement or goods which relate to transport damage can only be considered valid if the delivery company is notified without delay.

Responsibility of the operator

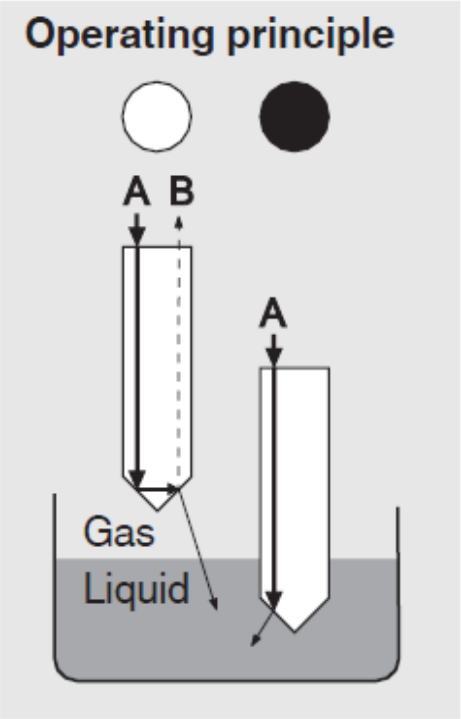
The instrument is used in the industrial sector. The operator is therefore responsible for legal obligations regarding safety at work.
The safety instructions within these operating instructions, as well as the safety, accident prevention and environmental protection regulations for the application area must be maintained.

To ensure safe working on the instrument, the operating company must ensure

- that the operating personnel are regularly instructed in all topics regarding work safety, first aid and environmental protection and know the operating instructions and in particular, the safety instructions contained therein.
- that the instrument is suitable for the particular application in accordance with its intended use.

Design and function

This optoelectronic level switch is used for the detection of limit levels in liquids. The measuring principle is independent of refractive index, density, conductivity and dielectric constant. The switches consist of an infrared LED and a phototransistor. The light of the LED is directed into a prism. So long as the sensor tip of the prism is in the gaseous phase, the light is reflected within the prism to the receiver. When the liquid reaches the glass tip, part of the light is refracted into the liquid and only a part of it is reflected into the prism. With the optional trimmer the sensitivity of the LED receiver can be adjusted for different liquids or foam.
The optoelectronic level switches are suitable for liquids such as oils, water, distilled water, aqueous media and for foam detection (with trimmer option).
The integrated switch electronics offers an automatic adjustment so that there is a wide field of application. For the output, there is a PNP transistor switching output.



Commissioning, operation

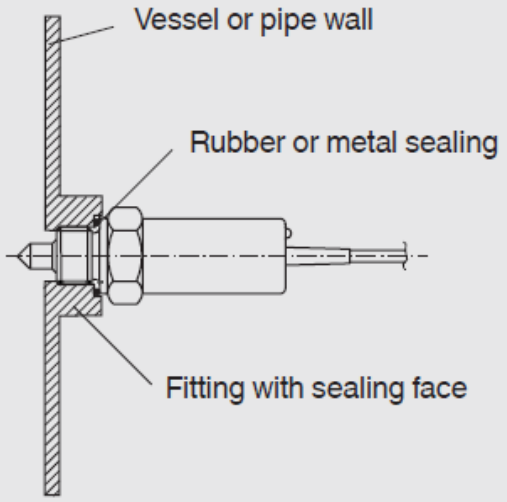
When unpacking the switch, check all components for any external damage. Prior to installation, a functional check can also be carried out. For this, the instrument should be connected temporarily and the glass prism dipped in and out of a glass of liquid to test it.

Mounting

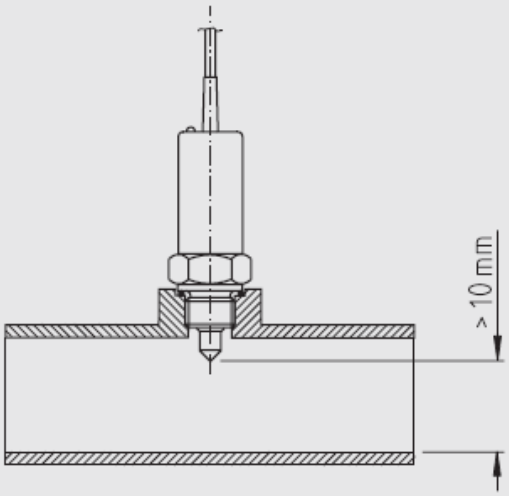
- Before installation, it must be ensured that the mounting hole and the fixing device for the switches in the vessel are correct in size and dimension.
- Mount the switch, pressure-sealed, into the process connection.
- The glass tip must protrude into the vessel.
- Following installation, the glass tip should have a distance of at least 10 mm to the opposite wall. This minimum clearance can vary dependent upon the geometry and surface finish of the wall.
  Note: With electropolished pipes, the minimum distance to the opposite surface must be 20 mm.

Mounting instructions

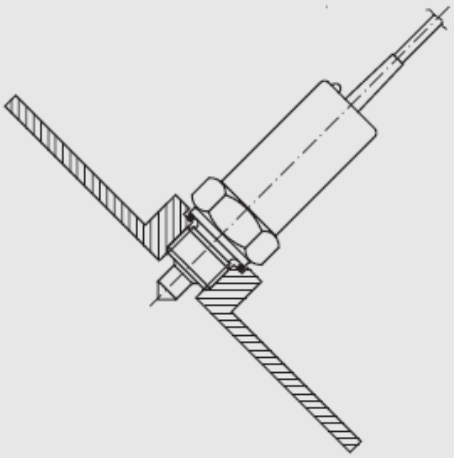
Horizontal installation



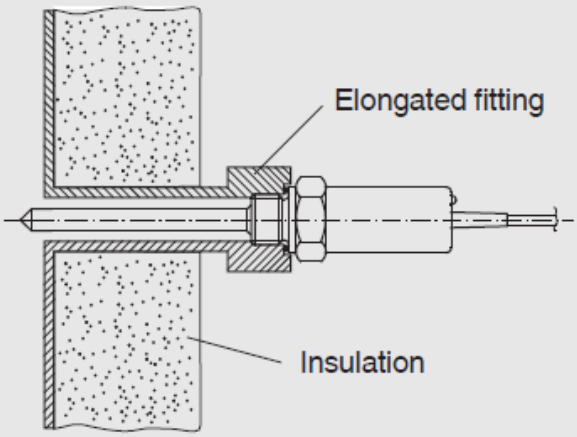
Vertical installation



Angled installation



Installation in elongated fitting



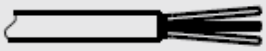
For horizontal installation in a fitting and installation from the bottom, make sure there is a drainage inclination in order to avoid residual liquid in the fitting/pipe and, with that, the resulting faulty detection of the media.

Electrical connection

Attention:
Before connecting the device electrically, make sure that the supply voltage matches the required voltage and that the supply voltage is switched off.

The instrument must be grounded via the process connection.

The correct connection diagram can be found on the product label and must be observed.

Cable assignment		
	BN	U+
	WH	U-
	GN	SP

Assignment, M12 x 1 circular connector		
	1	U+
	3	U-
	4	SP

Assignment, angular connector per EN 175301-803 A		
	1	U+
	2	U-
	3	SP

Legend

SP	Switch point
U+	Positive power supply
U-	Negative power supply
WH	White
BN	Brown
GN	Green

Faults

The following table contains the most frequent causes of faults and the necessary countermeasures.

Faults	Causes	Measures
No function	Failure in power supply	Measure voltage, check cable or plug connection
Despite a change in level, no alteration in the display and no switching of the output	Glass tip dirty	Clean the glass tip (introduce service intervals)
	Glass tip too close to an opposite surface	Increase the distance, change the mounting location
	Glass tip defective	Replace instrument
	Liquid in the fitting cannot run out	Check installation
Instrument responds inversely	Wrong switching function (normally open, normally closed)	Replace instrument / match to control
Instrument obviously does not respond or responds too slowly on a change of level	Switching delay	Use an instrument with suitable switching delay

Caution:
Physical injuries and damage to property and the environment

- If faults cannot be eliminated by means of the listed measures, the instrument must be taken out of operation immediately.
- Ensure that there is no longer any pressure present and protect against being put into operation accidentally.
- Contact the manufacturer.
- If a return is needed, please follow the instructions given in chapter “Return”.

Maintenance and cleaning

Maintenance:

When used properly, the optoelectronic level switches work maintenance-free. They must be subjected to visual inspection within the context of regular servicing, however, and included in the vessel pressure test.
Repairs must only be carried out by the manufacturer.

Cleaning:

CAUTION:
Physical injuries and damage to property and the environment

Improper cleaning may lead to physical injuries and damage to property and the environment. Residual media in the dismounted instrument can result in a risk to persons, the environment and equipment.
Rinse or clean the removed instrument.
Sufficient precautionary measures must be taken.

1. Prior to cleaning, properly disconnect the instrument from the process and the power supply.
2. Clean the instrument carefully with a moist cloth.
3. Electrical connections must not come into contact with moisture!

Damage to property
Improper cleaning may lead to damage to the instrument!

- Do not use any aggressive cleaning agents.
- Do not use any hard, pointed or abrasive objects for cleaning.

Dismounting, return and disposal

- Only disconnect the measuring instrument once the system has been depressurised and the power disconnected! If necessary, the measuring line must have strain relief.
- Wash or clean the dismounted switch before returning it, in order to protect personnel and the environment from exposure to residual media.
- Incorrect disposal can put the environment at risk. Dispose of instrument components and packaging materials in an environmentally compatible way and in accordance with the countryspecific waste disposal regulations.

FOS03

Optoelectronic Level Switch For Industrial Applications

FOS03.S
Standard-Version

- **for liquids**
- **Standard version and high temperature and high pressure version**
- **Small and compact, no moving parts**
- **Easy installation, can be installed in any position**
- **Visual indication of the switching status**
- **Low maintenance effort**
- **max. Druck: 25 bar (FOS03.S)**
  50 bar (FOS03.T)
- **max. temperature: 100 °C (FOS03.S)**
  170 °C (FOS03.T)

FOS03.T
High-temperature and high-pressure version

Description:

The FOS03 optoelectronic level switches are used to monitor the level of liquids. The sensor contains an infrared LED and a light receiver.
The light from the LED is directed into a prism that forms the tip of the sensor. As long as the tip is not immersed in liquid, the light is reflected within the prism to the receiver. If the liquid in the container rises and surrounds the tip, the light is refracted by the liquid and no longer or only weakly reaches the receiver, which reacts to this change and initiates a switching process.
The switching status can be read directly on the sensor (LED, with high temperature variant only as an option).

Typical applications:

The area of application for optoelectronic level indicators is the detection of limit values in a variety of liquids. The advantage here is that the measuring method is largely independent of physical variables such as refractive index, colour, density, dielectric constant or conductivity. The very compact design guarantees minimum space requirements, enabling measurement in very small volumes. The fact that it can be installed in any position and the high pressure and temperature ranges offer a wide range of applications.

PKP Prozessmesstechnik GmbH
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info@pkp.de • www.pkp.de

20250414
Subject to technical changes

Version: FOS03.S - Standard

Technical Data:

max. pressure:	0 ... 25 bar
max. media temperature:	-30 °C … +100 °C
max. ambient temperature:	-25 °C ... +70 °C
Materials:	
Light guide:	Borosilicate glass, fixed with silicone adhesive (Option: Fixed with epoxy resin)
Case (G 1/2“):	Stainless steel 1.4571 (316 Ti)
Case (G 3/8“):	Stainless steel 1.4305 (303)
Case (M12x1):	Stainless steel 1.4305 (303)
Process connections:	G 1/2 male, G 3/8 male, M12x1 male
Measurement accuracy	≤ ±2 mm
Mounting position:	as required
Indication of switching status:	1 LED
Minimum distance from the glass tip to an opposite surface:	>10 mm > 20 mm if electropolished
Weight:	appr. 115 g + 25 g/m cable length

Electrical Data:

Power supply:	12...32 V_{DC}
max. current supply:	40 mA
Electrical connection:	
PUR, PVC cable:	cable length: 2 m or special length diameter: 3 x 0,25 mm² cable end: cut to length
circular connector:	M8x1 (3-pin)
Output signal:	PNP transistor, protected against reverse polarity, 200 mA switching current
Switching function:	Normally open (closed in medium) or normally closed (open in medium)
Number of switch points:	1
Response time:	0,5 s (Switching delay up to 7 s on request)
Minimum distance from the glass tip to an opposite surface:	>10 mm > 20 mm if electropolished
Protection class:	IP65

Order Code:

Order number:	**FOS03.S**	**1.**	**1.**	**R.**	**0.**	**0**

Optoelectronic Level Switch Standard version

Process connection:
1 = G 1/2 male (standard)
2 = G 3/8 male
3 = M12x1 male

Switching function:
1 = in medium closed (n.o.)
2 = in medium open (n.c.)

Electrical connection:
R = circular connector M8x1, 3-pin
P = cable PUR
V = cable PVC

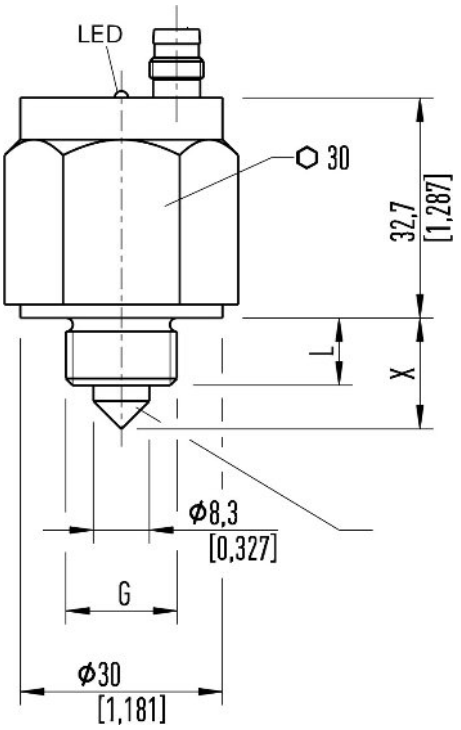
Cable length:
0 = (if circular connector)
2 = 2 m (standard)
S = special length (please specify in plain text)

Options:
0 = without
1 = with trimmer (Adjustable responsiveness (trimmer) for other liquids and foaming media
9 = please specify in plain text

Accessory:

SM08: M8x1 connector plug with PVC cable

Dimensions:



Process connection G	X	L
G 3/8 male	17 mm	10 mm
M12x1 male	17 mm	10 mm
G ½ male	27 mm	20 mm

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Version: FOS03.T
High Temperature and high pressure version

Technical Data:

max. pressure:	0 ... 25 bar
max. media temperature:	-40 °C … +170 °C
max. ambient temperature:	-30 °C ... +80 °C
Materials:	
Light guide:	Borosilicate glass, fixed with epoxy resin
Case:	Stainless steel 1.4305 (303)
Process connection:	Stainless steel 1.4571 (316 Ti)
Process connections:	G 1/2 male, M16x 1,5 male
Measurement accuracy	≤ ±2 mm
Mounting position:	as required
Indication of switching status:	1 red LED (only with option trimmer)
Minimum distance from the glass tip to an opposite surface:	>10 mm > 20 mm if electropolished
Weight:	appr. 170 g + 25 g/m cable length

Electrical Data:

Power supply:	12...32 V_{DC}
max. current supply:	40 mA
Electrical connection:	
PUR, PVC cable:	cable length: 2 m or special length diameter: 3 x 0,25 mm² cable end: cut to length
circular connector:	M12x1 (4-pin)
angled plug:	acc. to EN 175301-803 A
Output signal:	PNP transistor, protected against reverse polarity, 200 mA switching current
Switching function:	Normally open (closed in medium) or normally closed (open in medium)
Number of switch points:	1
Response time:	0,5 s (Switching delay up to 7 s on request)
Responsiveness:	Preset for the detection of aqueous media and oils
with trimmer and LED (option):	Adjustable responsiveness (trimmer) for other liquids and foaming media
Minimum distance from the glass tip to an opposite surface:	>10 mm > 20 mm if electropolished
Protection class:	IP65

Order Code:

Order number:	FOS03.T	1.	1.	M.	0.	0

Optoelectronic Level Switch
High temperature and high pressure version

Process connection:
1 = G 1/2 male
4 = M16 x 1,5 male

Switching function:
1 = in medium closed (n.o.)
2 = in medium open (n.c.)

Electrical connection:
M = circular connector M12x1, 4-pin
W = angled plug EN 175301-803 A, 3-pin
P = cable PUR
V = cable PVC

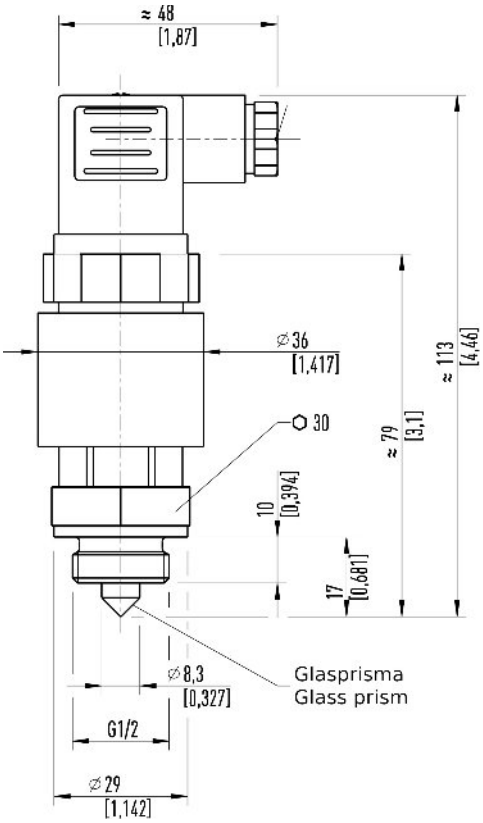
Cable length:
0 = (if circular connector or angled plug)
2 = 2 m (standard)
S = special length (please specify in plain text)

Options:
0 = without
1 = with trimmer (adjustable responsiveness (trimmer) for other liquids and foaming media and LED status indication
9 = please specify in plain text

Accessory:

SM12: M12x1 connector plug with PVC cable

Dimensions:



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