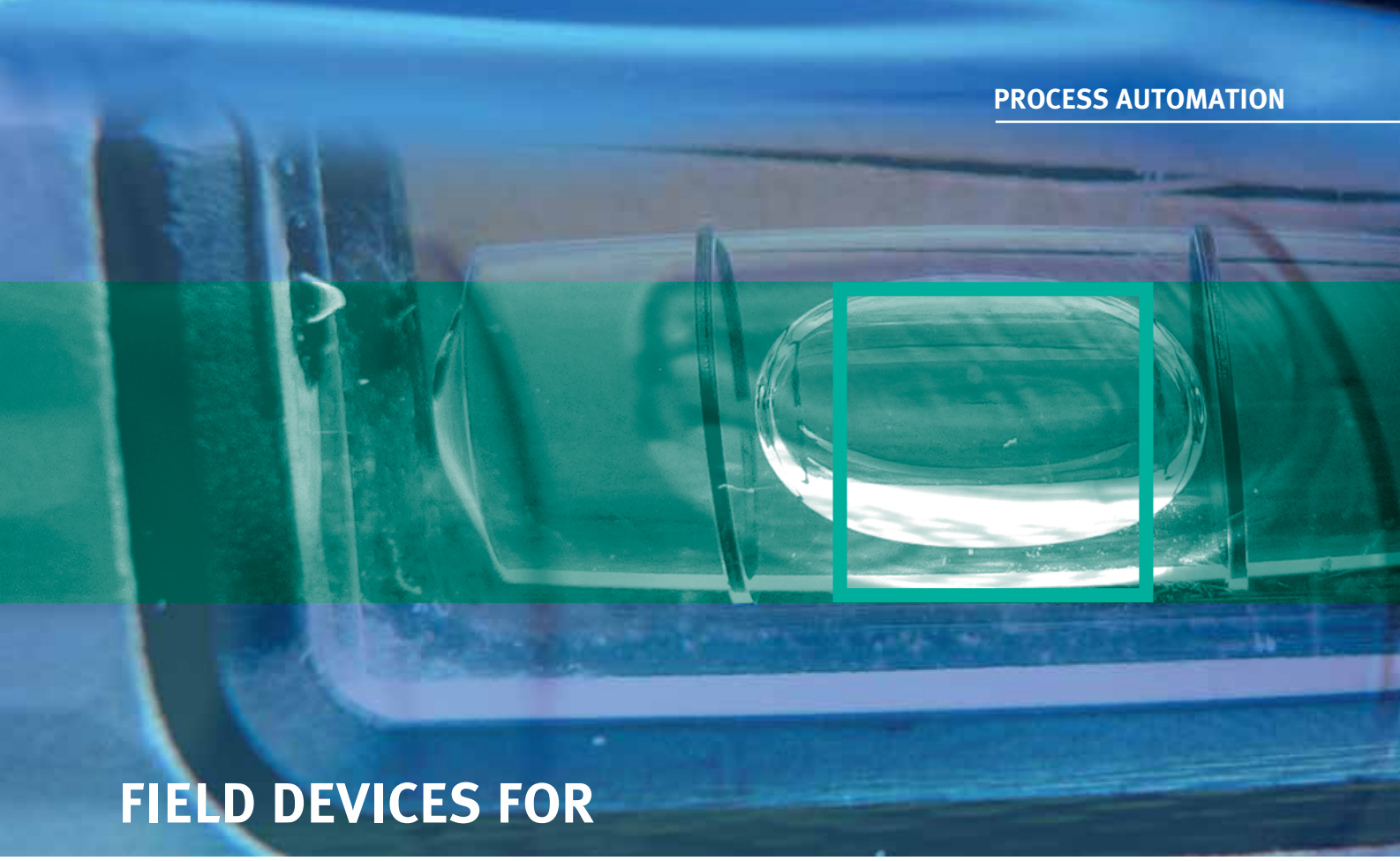


FIELD DEVICES FOR PROCESS AUTOMATION

PEPPERL+FUCHS
PROTECTING YOUR PROCESS

THE SUCESS STORY OF PEPPERL+FUCHS

1945	Walter Pepperl and Ludwig Fuchs lay the foundation of Pepperl+Fuchs: The opening of a radio repair shop
1948	Manufacture of transformers
1958	Development and production of the first inductive proximity switch
1973	The first foreign subsidiary is formed in England
1979	Pepperl+Fuchs commences production in Singapore
1988	Michael Fuchs and Claus Michael take over the management of the company and Pepperl+Fuchs becomes a limited liability company
1991	Split into Factory Automation and Process Automation divisions, new product group level control through a company acquisition
1996	The purchase of another company establishes the encoder business
1997	New production facilities open at Veszprem/Hungary
2000	Expansion of the Factory Automation activities with the purchase of Visolux GmbH and the Microswitch and Photoswitch interests from Honeywell; at the same time the Process Automation sector is expanded by the takeover of ELCON
2000	Start of manufacture at Bintan/Indonesia
2003	Takeover of the purge and pressurization systems from Bebco Industries EPS in the USA
2004	New Data Matrix Code product range obtained through the acquisition of Omnitron AG and the Position Encoding System, also due to an acquisition
2005	Expansion of the Systems & Solutions business area within the Process Automation division aided by the acquisition of EXTEC
2006	Pepperl+Fuchs acquires Intrinsic Safety Instrumentation business from Cooper Crouse-Hinds GmbH

Pepperl+Fuchs will continue this policy of growth.



One company, two divisions

PRODUCT AREAS FACTORY AUTOMATION

- Binary and analog sensors in various technologies
  - Inductive and capacitive sensors
  - Magnetic sensors
  - Ultrasonic sensors
  - Photoelectric sensors
  - Vision sensors
- Incremental and absolute value rotary encoders
- Counters and secondary switching devices
- RFID Identification systems
- Data Matrix Identification systems
- AS-Interface
- WCS

BRANCHES FACTORY AUTOMATION

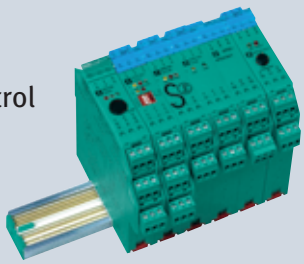
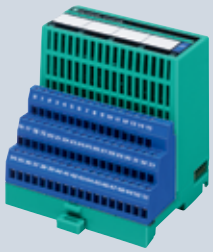
- Machine & Plant Engineering
- Print, Paper and Finishing
- Material Handling
- Packaging Industry
- Automotive Industry
- Doors, Gates and Elevators
- Chemical Apparatus
- Commercial vehicles
- Textile Machines




PRODUCT AREAS PROCESS AUTOMATION

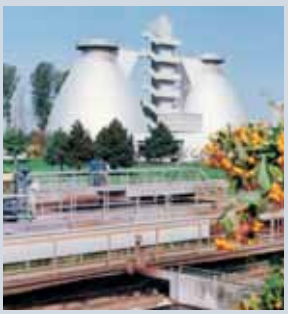
- Signal conditioners
- Intrinsically safe interface components
- Remote process interface
- Intrinsically safe fieldbus solutions
- Level control sensors
- Operating systems for hazardous areas
- Purge/Pressurization enclosure systems
- Process measuring and control systems engineering at the interface level
- Ex-protection training



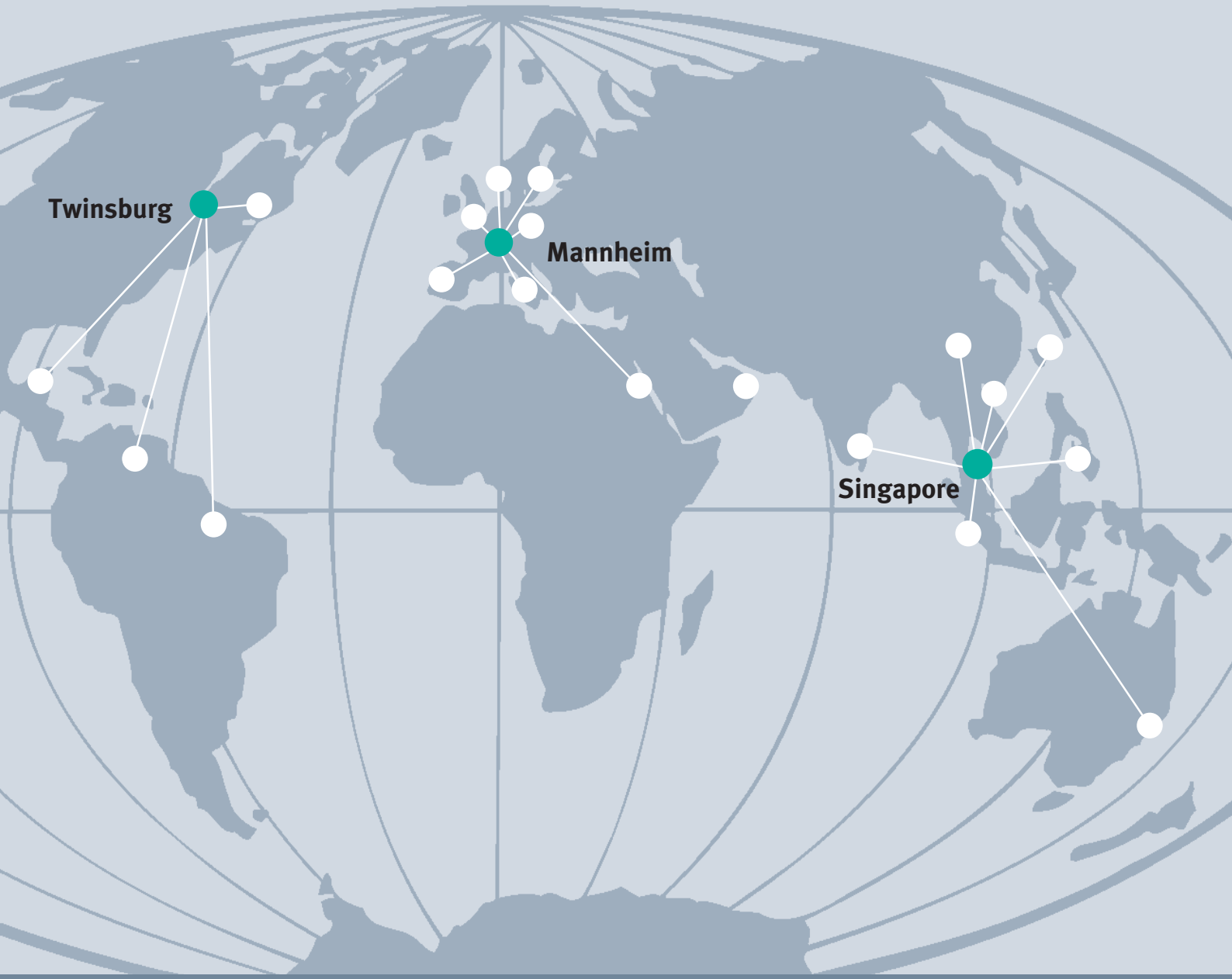



BRANCHES PROCESS AUTOMATION

- Chemical Industry, Pharmaceutics
- Oil, Gas and Petrochemical Industry
- Industrial and communal waste water technology
- Energy Production
- Engineering consultant for Process Automation




WORLDWIDE PRESENCE



WE ARE RIGHT THERE – WHERE OUR CUSTOMERS ARE…

The three centers of excellence are the focal points of the global presence of Pepperl+Fuchs

Mannheim
Mannheim is the traditional headquarters of Pepperl+Fuchs and the center of excellence focusing on engineering. More than 600 specialists support the activities of this principal Pepperl+Fuchs location.

Twinsburg
Since 1983, Twinsburg/Ohio has been the headquarters for the American market. 200 employees on site develop specific solutions for the American customers of Pepperl+Fuchs.

Singapore
More than 550 employees are engaged in the Singapore center of excellence of Pepperl+Fuchs. Since 1979, all activities associated with the Asiatic economic area have been controlled from Singapore. This region is becoming of increasing importance due to the growth market in China.

We create markets
The global presence of Pepperl+Fuchs:

- Technology centers with their own development groups in Berlin, Tuttlingen and Sulbiate/Italy offer customers specific solutions. Furthermore the locations operate highly flexible production in small batch sizes.
- The production facilities in Hungary and Indonesia are equipped for series production in large quantities.
- The worldwide sales network guarantees that we are close to our customers and enforces Pepperl+Fuchs to react swiftly and competently to customer requirements. You are in need of contact addresses of our sales partners?
  Please try the internet at www.pepperl-fuchs.com/company/presence.

PEPPERL+FUCHS

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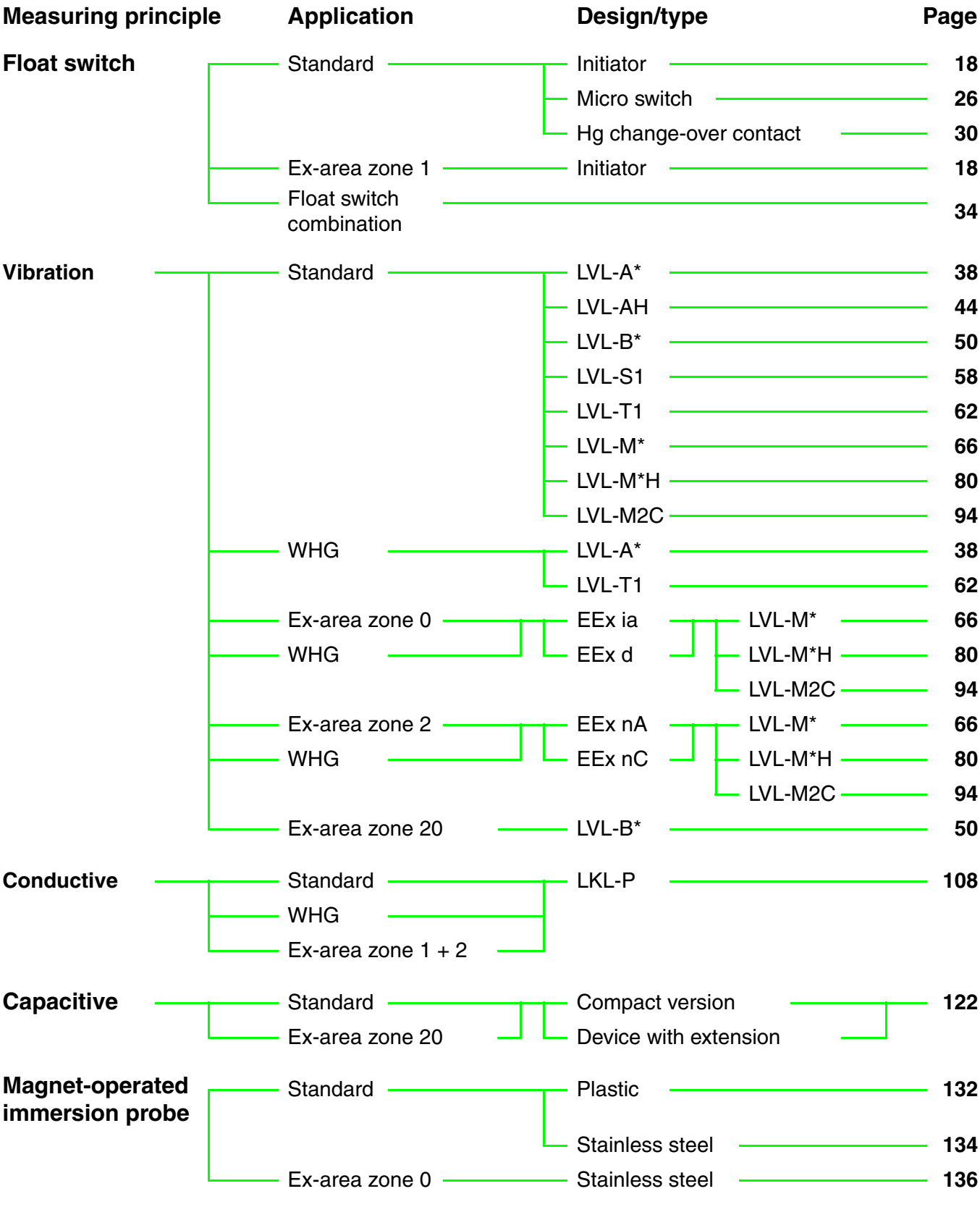
Limit value detection



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Continuous level measurement

Measuring principle	Application	Design/type	Page
Magnet-operated immersion probe	Standard	Plastic	**142**
		Stainless steel	**144**
	Ex-area zone 0	Stainless steel	**146**
Hydrostatic	Standard	LHC-M**	**150**
	Ex-area zone 0	PPC-M**	**164**
	Ex-area zone 1 + 2	Level probe	**178**
	Ex-area zone 21 + 22	LHC-M40	**150**
		PPC-M**	**164**
Ultrasonic	Standard	LUC4	**186**
		LUC-M**	**190**
	Ex-area zone 0 + 1	LUC-M**	**190**
	Ex-area zone 2		
	Ex-area zone 21 + 22		
Guided microwave	Standard	LTC	**202**
	WHG	LTC	**202**
	WHG	LTC	**202**
	Ex-area zone 0 + 1		
	Ex-area zone 22		
	Ex-area zone 21 + 22	LTC	**202**

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4 steps to a suitable level measuring method

Find the suitable measuring method for your application in 4 steps:

1. step **Measuring task**

2. step **Measuring principle**

3. step **Range of applications**

4. step **System construction**

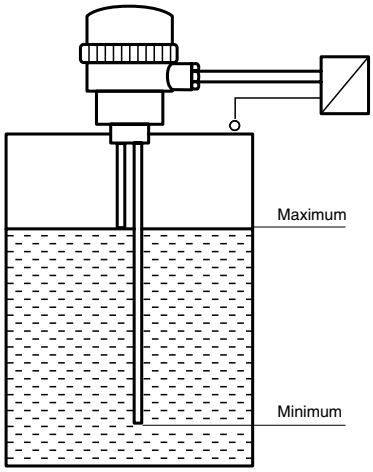
---

1. Measuring task

Limit value detection

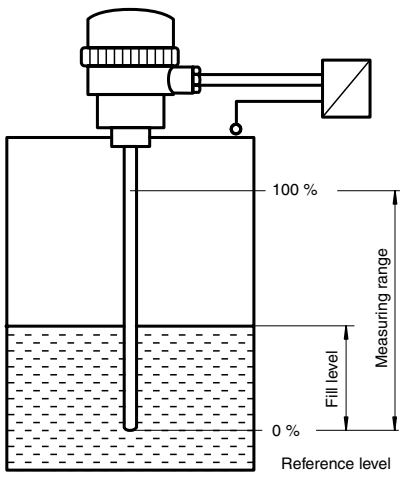
Limit value switches signal whether the medium being monitored has reached, risen above, or fallen below, a set level (VDI/VDE Directive 3519) based on its installation height.

Examples: overflow/dry-run protection,
minimum-maximum control
overspill protection



Continuous level measurement

Measuring sensors detect the current fill level. This is done by determining the distance from the surface of the medium to the preset reference level. Continuous level measurement allows usage evaluation, loss control, and above all, precise process control (VDI/VDE Directive 3519).



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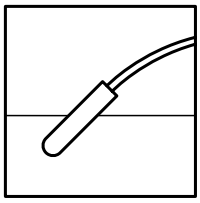
2. Measuring principle

Limit value detection

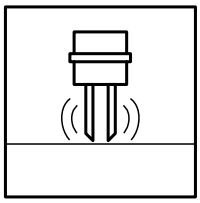
Float switch



Float switches are used for simple limit value detection in liquids. Due to the higher density of the liquid, the float switch floats on the liquid surface.

The float switch is secured by means of its cable fastener at a level suitable for the given application. The switching process is triggered by the rocking movements of the sensor. Initiators and micro switches are used as switching elements.

Vibration

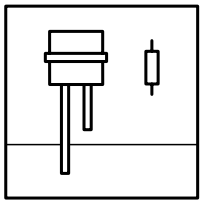


The piezoelectrically activated vibration of a vibrating fork is damped when the fork comes into contact with the medium.

Using this change, an electronic system determines the switching signal.

The function is independent of fluctuations in the physical properties of the medium.

Conductive

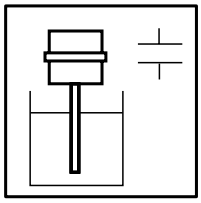


The conductivity of the liquid medium may vary within a wide range. Once the liquid reaches the fill limit determined from the installation height of the electrode, the medium closes the DC-free alternating current circuit between the two electrodes (or between the container wall and an electrode).

A switching signal is produced from the sudden increase in current consumption.
Combustible liquids such as fuels, oils and solvents are non-conductive and cannot be measured by this measuring principle. Acids, lyes and solutions containing water are conductive and are detected very well.

Aggressive liquids can be detected without problems using probes made from highly-resistant materials.

Capacitive

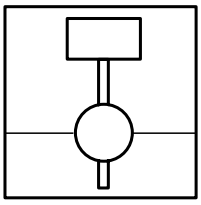


An insulated metal probe mounted in a metal container forms a capacitor together with the metal wall whose capacitance continually increases as the medium level increases.

Hence, for capacitive measurements a medium with a constant permittivity is required.

The simple and robust construction (as rod or rope sensor) allows level measurement of liquids, granular solids, conductive and non-conductive media.

Magnet-operated immersion probe



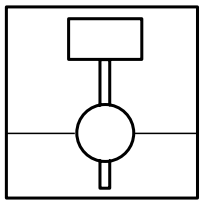
Magnet-operated immersion probes are used in clean liquids, such as e. g. solvents or oils. The float, guided by a probe tube, floats on the liquid surface.

By means of its magnetic field, the ring magnet built into the float activates the reed contacts installed in the guide pipe. These are switched when the float is located in the appropriate position.

The reed contacts are designed as normally closed, normally open or change-over contact switches. The measurement is independent of the electrical properties of the liquid, as well as the pressure, temperature and density.

Continuous level measurement

Magnet-operated immersion probe



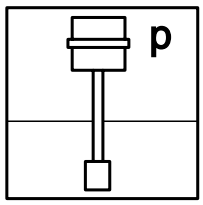
A float moves along a vertical guide tube.

The permanent magnet fixed in the float switches the contacts of a reed contact resistor chain. This resistor chain acts as a voltage divider and provides the voltage values corresponding to the medium level.

The resolution is dependent on the number of contacts used.

The measurement is independent of the electrical properties of the filling material, as well as the pressure, temperature and density.

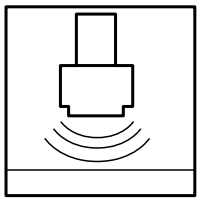
Hydrostatic



The pressure in a liquid increases with increased filling height. This hydrostatic pressure is transmitted to the measuring cell via a stainless steel diaphragm.

Foam, build-up, fluctuating electrical properties of the liquid and the container design do not affect the measurement values.

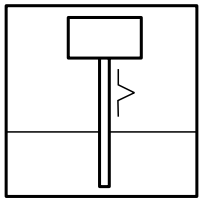
Ultrasonic



The level height is calculated from the time it takes for ultrasonic pulses to travel from the sensor to the surface of the medium and back.

Chemical and physical properties of the medium do not influence the measurement result. Therefore, aggressive and abrasive, viscous and adhesive media can be measured without problems.

Guided microwave



The system is based on the reflection of an electromagnetic pulse that is directed on a sensor rod/cable and reflected by filling material. The electronics integrated into the sensor determines the filling state from the echo time of the pulse and shows this in the display.

The electromagnetic pulse is sent out, reflected on the filling material and received again. The echo time of the pulse is proportional to the distance from the surface of the medium.

The measurement procedure and the accuracy of the measurement depend significantly on pressure, temperature, vapour, dust, foam, viscosity, conductivity and pH value.

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3. Range of applications

In addition to pressure and process temperature, properties of the medium such as "water contamination" or "flammability", determine which standards, laws and ordinances are to be applied.

The degree of danger, and thus the expenditure for protective measures, increases from simple measuring systems for non-water-contaminating and non-flammable media up to expensive devices for water-contaminating, flammable media.

Classification are as follows:

Standard: These are devices and systems which do not require special arrangements.

WHG: The German Water Resources Law (Wasserhaushaltsgesetz WHG) requires design approval or a mark of conformity when using protective devices for systems which store water-contaminating media. According to the system ordinances (VAwS), overspill prevention systems require a general design approval given by the German Institute for Structural Engineering (Deutsches Institut für Bautechnik DIBt). For systems based on Commercial Regulation § 24, see notes on Ex zone 0.

Ex-area:

Zone 0: In this most dangerous zone, only devices are allowed that have been certified and posses a certificate of conformity or test certificate from the German Federal Physical and Technical Institute (Physikalisch-Technische-Bundesanstalt Braunschweig PTB).

Zone 1, 2: In Germany, many standard devices can be used in these zones, if their power supplies and evaluation units are **intrinsically safe** according to DIN EN 50020.
For this, the supplied electrical energy must remain below the ignition power of the explosion group IIA, IIB, IIC.

ATEX: If devices have been approved in accordance with Regulation 94/9/EC (ATEX), then Device Category 1 refers to use in zones 0 or 20.

For further information about intrinsic safety please refer to the manual "Explosion protection".

4. System construction for limit value detection and continuous level measurement

The system construction is the complete measuring system consisting of the selected measuring sensor (level detector) and the required signal conditioning components.

A detailed description of the possible system constructions appear on the data sheets of the individual level measuring devices.

Information for the selection of suitable level sensors for limit value detection or continuous level measurement

Company:		Responsible person: Department: Tel.-No.: Fax-No.:
Plant, operation, key words:		
Type of control	**limit value detection** O maximum O minimum O linked switching points as min-max-control	**continuous level measurement** O continuous measurement O continuous measurement with limit value detection
Do you need devices in explosion proof version?	O yes, Ex-area zone: O no	temp.-class:
Do you need certified overspill preventions?	O in acc. with WHG for non flammable liquids O no	
Which measuring principle would you prefer?	**limit value detection** O float switches O vibration O conductive O capacitive O magnet-operated immersion probe	**continuous level measurement** O hydrostatic O magnet-operated immersion probe O ultrasonic O guided microwave
Vessel	shape: connection piece for the probe: coating of the inside walls:	material: level: height of level limit:
Explanations for the vessel type:		
Operating pressure in the vessel: Operating temperature in the vessel:	max.: bar max.: °C	min.: bar min.: °C
Medium name:	O liquid O flammable O non-flammable O adhesive O coating	O solid (bulk material) O density: O bulk material: O concentration: O viscosity:
Conductive medium?	O yes O no	conductance:
If known, dielectric constant:		
Which of the following materials are resistant against the medium?	O stainless steel 1.4571 O Hastelloy B/C O titanium O tantalum	O PP O PTFE
Which supply voltage is available:	O V AC	O V DC
Type of signal conditioning	O standard casing O eurocard	

Please insert a sketch of the vessel including the switching points and the connection piece of the probe.

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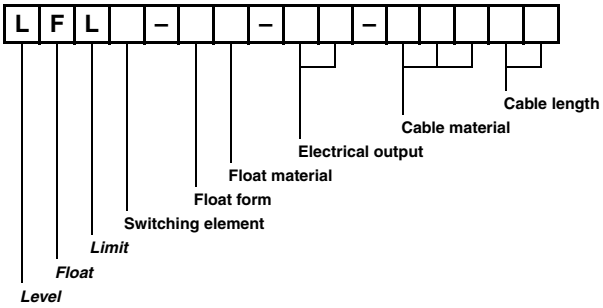
Type code of float switches

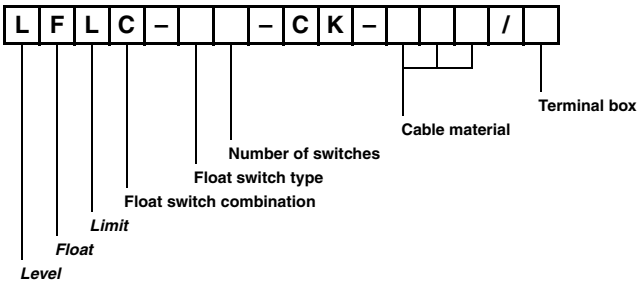
The figure below shows the used characters and numbers of the float switches type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the float switches.

Product group LFL



Product group LFLC



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Float switch, ball LFL*-BK-**-*****
Float switch, sleeve LFL*-CK-**-*****

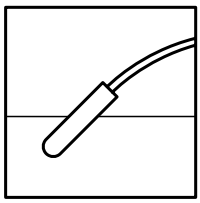
The float switch consists of a float body with a built-in switching element and a connection cable.

The switching element switches when it crosses the horizontal position in either direction.

The following mercury-free switching elements are available:

Initiators, small operation balls with inductive position detection, micro switches with operation ball.

Mercury-change-over contacts are still available.



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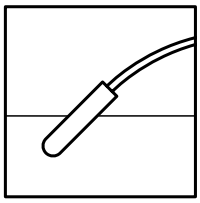
Float switch

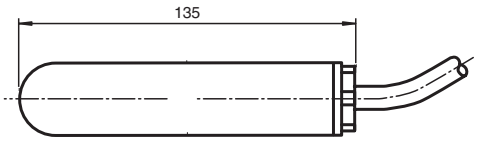
LFL1-**-N



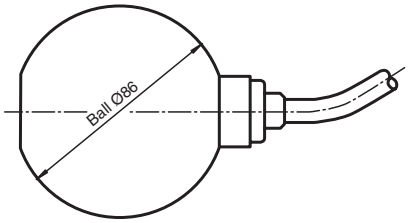
Features

- Switching element: floating switch with initiator, **mercury-free**
- Electrical connections in acc. with NAMUR for hazardous area
- Limit value detection for fluids
- Sleeve design: small diameter, mounting through G1 tap hole possible
- Ball design: high buoyancy

Dimensions



Sleeve design LFL1-CK-N



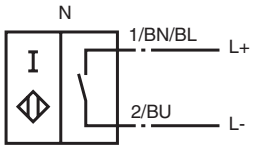
Ball design LFL1-BK-N

Function

The initiator (normally open contact) is integrated in a PP float and is activated in the event of deviations from the horizontal position. The switching ball in the float, which moves along an axis, activates the switching event in the initiator inductively. The switch output provided by the initiator is a switch signal in accordance with EN 60947-5-6 (NAMUR).

Electrical connection

Cable colours
brown or black = L+
blue = L-



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Application	
Description	inductive proximity switch with switching ball
Function and system design	
Equipment architecture	A measuring system consists of a float switch LFL1-**-N and a transformer isolated barrier, e. g. KFD2-SR2-Ex1.W.
Auxiliary energy	
Supply voltage	8.2 V ± 2 V
Current consumption	< 1.0 mA unswitched (de-energised at the bottom), > 2.2 mA switched (floated up at the top)
Reverse polarity protection	yes
Operating conditions	
Mounting conditions	
Installation instructions	range of application and minimum length between mounting and float: - PVC version: ≥ 50 mm (2 in), preferred for water, waste water, slightly aggressive liquids - PUR version: ≥ 100 mm (4 in), preferred for fuels, heating oils, oily fluids - CSM/CM version: ≥ 100 mm (4 in), preferred for many acids and lyes mounting: - The float switch is mounted either from sidewards through a cable gland ≥ G1A into the vessel or - by means of a counter weight or rods (e. g. float switch assembly) from the top. - The pivot of the cable should always be horizontal.
Process conditions	
Process temperature	-20 ... 70 °C (253 ... 343 K)
Process pressure (static pressure)	sleeve design: ≤ 3 bar at 20 °C (293 K) ball design: ≤ 2 bar at 20 °C (293 K)
Density	sleeve design: ≥ 0.8 g/cm^3 ball design: ≥ 0.6 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	sleeve design: LFL1-CK-N-PVC3, LFL1-CK-N-PUR3, LFL1-CK-N-CSM3 ball design: LFL1-BK-N-PVC3, LFL1-BK-N-PUR3, LFL1-BK-N-CSM3
Material	float: PP (polypropylene) cable: - PVC version: PVC cable, highly flexible (2 x 0.75 mm^2) - PUR version: PUR cable, highly flexible (2 x 0.50 mm^2) - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (2 x 0.75 mm^2))
Switching point	switch angle: upper switching point +12°, lower switching point -12°, measured against the horizontal
Certificates and approvals	
Ex approval	TÜV 99 ATEX 1407, for additional certificates see www.pepperl-fuchs.com
Type of protection	Ex II 2G EEx ia IIB T5
General information	
Directive conformity	
Directive 89/336/EC (EMC)	EN 60947-5-2, EN 60947-5-2 A1
Directive 94/9 EC (ATEX)	EN 50014, EN 50020
Conformity	
Protection degree	EN 60529
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Accessories

- LFL-Z231, counter nut, G1A, PVC
- LFL-Z32, counter weight, grey cast iron with plastic coating (Polycarbonate)
- LFL-Z33, counter weight, grey cast iron with ECTFE coating (Halar)

- LFL-Z131, cable gland G1A, PVC
- LFL-Z132, cable gland G1A, brass
- LFL-Z161, cable gland G2A, PVC
- LFL-Z431, cable gland 1 NPT, PVC
- LFL-Z432, cable gland 1 NPT, brass
- LFL-Z461, cable gland 2 NPT, PVC

Note

Users should take appropriate precautions when using accessories in potentially hazardous areas!

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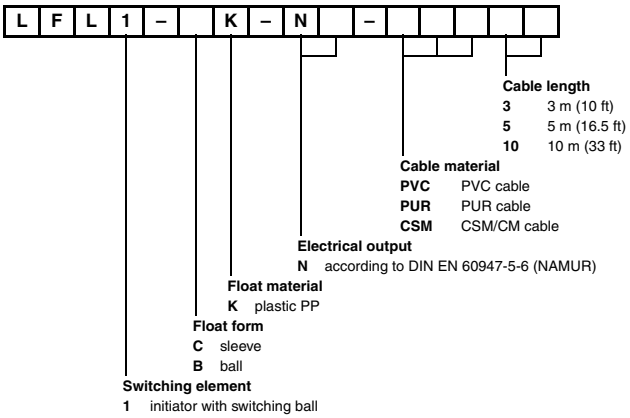
Type code/model number



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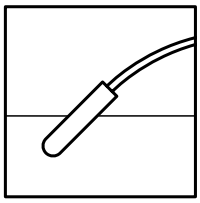
Float switch

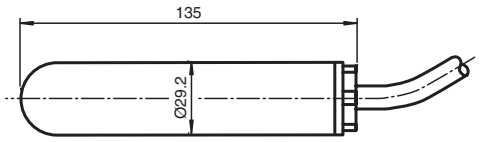
LFL1-**-Z*



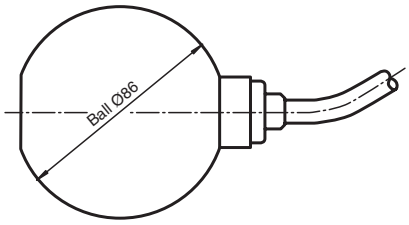
Features

- Switching element: floating switch with initiator, **mercury-free**
- Electrical connections 2-wire, 6 V DC ... 60 V DC
- Limit value detection for fluids
- Sleeve design: small diameter, mounting through G1 tap hole possible
- Ball design: high buoyancy

Dimensions



Sleeve design LFL1-CK-Z*



Ball design LFL1-BK-Z*

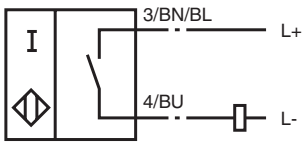
Function

The initiator is integrated in a PP float and is activated in the event of deviations from the horizontal position. The switching ball in the float, which moves along an axis, activates the switching event in the initiator inductively. The switch output provided by the initiator is a mechanical contact (6 V DC ... 60 V DC).

Electrical connection

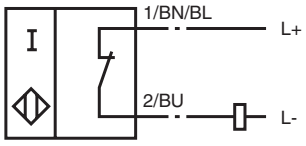
Cable colours
brown or black = L+
blue = L-

Z0



Z0 floating up closing

Z1



Z1 floating up opening

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Application	
Description	inductive proximity switch with switching ball Z0 = floating up closing, normally open Z1 = floating up opening, normally closed
Function and system design	
Equipment architecture	A measuring system consists of a float switch LFL1-**-Z* and a load switched in series.
Auxiliary energy	
Supply voltage	6 ... 60 V DC
Current consumption	4 ... 100 mA
Voltage drop	approx. 4.7 V at 100 mA
No-load supply current	0.73 mA
Reverse polarity protection	yes
Short-circuit protection	no
Operating conditions	
Mounting conditions	
Installation instructions	range of application and minimum length between mounting and float: - PVC version: ≥ 50 mm (2 in), preferred for water, waste water, slightly aggressive liquids - PUR version: ≥ 100 mm (4 in), preferred for fuels, heating oils, oily fluids - CSM/CM version: ≥ 100 mm (4 in), preferred for many acids and lyes mounting: - The float switch is mounted either from sidewards through a cable gland ≥ G1A into the vessel or - by means of a counter weight or rods (e. g. float switch assembly) from the top. - The pivot of the cable should always be horizontal.
Process conditions	
Process temperature	PVC version: 5 ... 70 °C (278 ... 343 K) PUR version: -20 ... 70 °C (253 ... 343 K) CSM/CM version: -20 ... 70 °C (253 ... 343 K)
Process pressure (static pressure)	sleeve design: ≤ 3 bar at 20 °C (293 K) ball design: ≤2 bar at 20 °C (293 K)
Density	sleeve design: ≥ 0.8 g/cm^3 ball design: ≥ 0.6 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	sleeve design: LFL1-CK-Z*-PVC3, LFL1-CK-Z*-PVC5, LFL1-CK-Z*-CSM10 ball design: LFL1-BK-Z*-PVC5, LFL1-BK-Z*-CSM5
Material	float: PP (polypropylene) cable: - PVC version: PVC cable, highly flexible (2 x 0.75 mm^2) - PUR version: PUR cable, highly flexible (2 x 0.50 mm^2) - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (2 x 0.75 mm^2))
Switching point	switch angle: upper switching point +12°, lower switching point -12°, measured against the horizontal
General information	
Directive conformity	
Directive 89/336/EC (EMC)	EN 60947-5-2, EN 60947-5-2 A1
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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Accessories

- LFL-Z231, counter nut, G1A, PVC
- LFL-Z32, counter weight, grey cast iron with plastic coating (Polycarbonate)
- LFL-Z33, counter weight, grey cast iron with ECTFE coating (Halar)

- LFL-Z131, cable gland G1A, PVC
- LFL-Z132, cable gland G1A, brass
- LFL-Z161, cable gland G2A, PVC
- LFL-Z431, cable gland 1 NPT, PVC
- LFL-Z432, cable gland 1 NPT, brass
- LFL-Z461, cable gland 2 NPT, PVC

Type code/model number

L	F	L	1	–		K	–			–					

Switching element
1 initiator with switching ball

Float form
C sleeve
B ball

Float material
K plastic PP

Electrical output
Z0 normally open 24 V DC
Z1 normally closed 24 V DC

Cable material
PVC PVC cable
PUR PUR cable
CSM CSM/CM cable

Cable length
3 3 m (10 ft)
5 5 m (16.5 ft)
10 10 m (33 ft)

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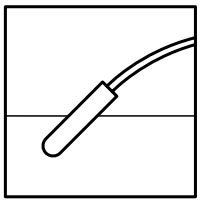
Float switch

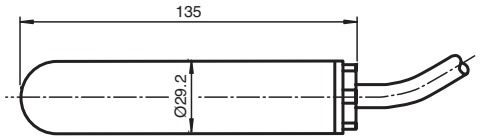
LFL2-**-U



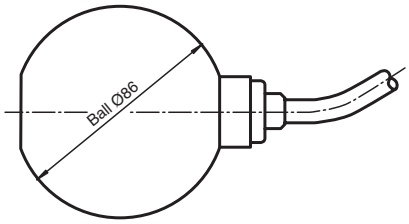
Features

- Switching element: micro switch, **mercury-free**
- Limit value detection for fluids
- Sleeve design: small diameter, mounting through G1 tap hole possible
- Ball design: high buoyancy

Dimensions



Sleeve design LFL2-CK-U



Ball design LFL2-BK-U

Function

The microswitch (change-over contact) is integrated in a PP float and is activated in the event of deviations from the horizontal position. The switching ball in the float, which moves along an axis, activates the microswitch.

Electrical connection

Cable colours		when potential-free
black-brown	=	contact open
black-blue	=	contact closed

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Application	
Description	micro switch with switching ball, change-over contact
Function and system design	
Equipment architecture	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements.
Auxiliary energy	
Supply voltage	max. 250 V AC, 150 V DC
Current consumption	max. 3 (1) A
Operating conditions	
Mounting conditions	
Installation instructions	range of application and minimum length between mounting and float: - PVC version: ≥ 50 mm (2 in), preferred for water, waste water, slightly aggressive liquids - PUR version: ≥ 100 mm (4 in), preferred for fuels, heating oils, oily fluids - CSM/CM version: ≥ 100 mm (4 in), preferred for many acids and lyes mounting: - The float switch is mounted either from sidewards through a cable gland ≥ G1A into the vessel or - by means of a counter weight or rods (e. g. float switch assembly) from the top. - The pivot of the cable should always be horizontal.
Process conditions	
Process temperature	PVC version: 5 ... 70 °C (278 ... 343 K) PUR version: 5 ... 70 °C (278 ... 343 K) CSM/CM version: -20 ... 90 °C (253 ... 363 K)
Process pressure (static pressure)	sleeve design: ≤ 3 bar at 20 °C (293 K) ball design: ≤2 bar at 20 °C (293 K)
Density	sleeve design: ≥ 0.8 g/cm^3 ball design: ≥ 0.6 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	sleeve design: LFL2-CK-U-PVC3, LFL2-CK-U-PUR3, LFL2-CK-U-CSM3 ball design: LFL2-BK-U-PVC3, LFL2-BK-U-PUR3, LFL2-BK-U-CSM3
Material	float: PP (polypropylene) cable: - PVC version: PVC cable, highly flexible (3 x 0.75 mm^2) - PUR version: PUR cable, highly flexible (3 x 0.50 mm^2) - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (3 x 0.75 mm^2))
Switching point	switch angle: upper switching point +25° (± 10°), lower switching point -14° (± 6°), measured against the horizontal
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 50178
Directive 89/336/EC (EMC)	EN 60947-5-2, EN 60947-5-2 A1
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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Accessories

- LFL-Z231, counter nut, G1A, PVC
- LFL-Z32, counter weight, grey cast iron with plastic coating (Polycarbonate)
- LFL-Z33, counter weight, grey cast iron with ECTFE coating (Halar)

- LFL-Z131, cable gland G1A, PVC
- LFL-Z132, cable gland G1A, brass
- LFL-Z161, cable gland G2A, PVC
- LFL-Z431, cable gland 1 NPT, PVC
- LFL-Z432, cable gland 1 NPT, brass
- LFL-Z461, cable gland 2 NPT, PVC

Type code/model number

L	F	L	2	–		K	–	U		–					

Switching element
2 microswitch with switching ball

Float form
C sleeve
B ball

Float material
K plastic PP

Electrical output
U change-over contact 250 V AC, 150 V DC

Cable material
PVC PVC cable
PUR PUR cable
CSM CSM cable

Cable length
3 3 m (10 ft)
5 5 m (16.5 ft)
10 10 m (33 ft)

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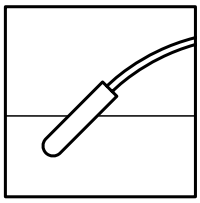
Float switch

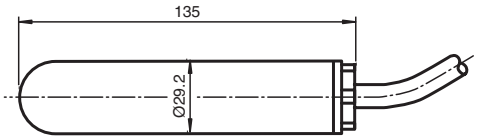
LFL3-**-U



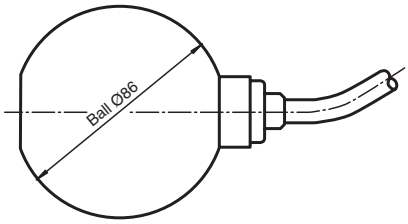
Features

- Switching element: mercury (Hg) change over contact
- Limit value detection for fluids
- Sleeve design: small diameter, mounting through G1 tap hole possible
- Ball design: high buoyancy

Dimensions



Sleeve design LFL3-CK-U



Ball design LFL3-BK-U

Function

The mercury (Hg) mechanical contact (change-over contact) is encapsulated in the PP float and is activated in the event of deviations from the horizontal position.

Electrical connection

Cable colours		when potential-free
black-brown	=	contact open
black-blue	=	contact closed

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Application	
Description	mercury (Hg) change-over contact
Function and system design	
Equipment architecture	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements.
Auxiliary energy	
Supply voltage	max. 250 V AC, 150 V DC
Current consumption	max. 4 A
Operating conditions	
Mounting conditions	
Installation instructions	range of application and minimum length between mounting and float: - PVC version: ≥ 50 mm (2 in), preferred for water, waste water, slightly aggressive liquids - PUR version: ≥ 100 mm (4 in), preferred for fuels, heating oils, oily fluids - CSM/CM version: ≥ 100 mm (4 in), preferred for many acids and lyes mounting: - The float switch is mounted either from sidewards through a cable gland ≥ G1A into the vessel or - by means of a counter weight or rods (e. g. float switch assembly) from the top. - The pivot of the cable should always be horizontal.
Process conditions	
Process temperature	PVC version: 5 ... 70 °C (278 ... 343 K) PUR version: 5 ... 70 °C (278 ... 343 K) CSM/CM version: -20 ... 90 °C (253 ... 363 K)
Process pressure (static pressure)	sleeve design: ≤ 3 bar at 20 °C (293 K) ball design: ≤ 2 bar at 20 °C (293 K)
Density	sleeve design: ≥ 0.8 g/cm^3 ball design: ≥ 0.6 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	sleeve design: LFL3-CK-U-PVC3, LFL3-CK-U-PUR3, LFL3-CK-U-CSM3 ball design: LFL3-BK-U-PVC3, LFL3-BK-U-PUR3, LFL3-BK-U-CSM3
Material	float: PP (polypropylene) cable: - PVC version: PVC cable, highly flexible (3 x 0.75 mm^2) - PUR version: PUR cable, highly flexible (3 x 0.50 mm^2) - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (3 x 0.75 mm^2))
Switching point	switch angle: upper switching point +5°, lower switching point -5°, measured against the horizontal
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 50178
Directive 89/336/EC (EMC)	EN 60947-5-2, EN 60947-5-2 A1
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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Accessories

- LFL-Z231, counter nut, G1A, PVC
- LFL-Z32, counter weight, grey cast iron with plastic coating (Polycarbonate)
- LFL-Z33, counter weight, grey cast iron with ECTFE coating (Halar)

- LFL-Z131, cable gland G1A, PVC
- LFL-Z132, cable gland G1A, brass
- LFL-Z161, cable gland G2A, PVC
- LFL-Z431, cable gland 1 NPT, PVC
- LFL-Z432, cable gland 1 NPT, brass
- LFL-Z461, cable gland 2 NPT, PVC

Type code/model number

L	F	L	3	–		K	–	U		–					

Switching element
3 mercury (Hg) change-over contact with switching ball

Float form
C sleeve
B ball

Float material
K plastic PP

Electrical output
U change-over contact 250 V AC, 150 V DC

Cable material
PVC PVC cable
PUR PUR cable
CSM CSM cable

Cable length
3 3 m (10 ft)
5 5 m (16.5 ft)
10 10 m (33 ft)

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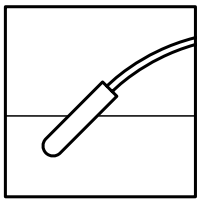
Float switch

LFLC

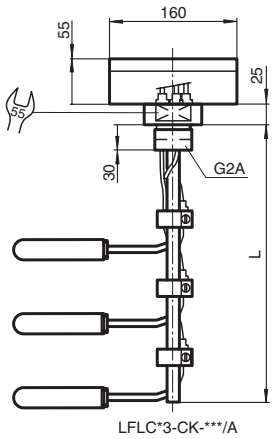


Features

- Full adjustable float switch combination for up to 5 float switches
- Position of the switch points adjustable by the customer
- Various float switch types possible
- CSM cable for aggressive acids and lyes

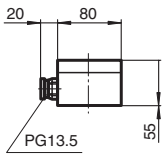
Dimensions

Terminal box type A



LFLC*3-CK-***/A

Terminal box type B



When placing your order, please specify the length (L) of the guide tube, which can be cropped by the user if necessary.

Function

This PVC float switch assembly permits the fixing lengths for the float fixing and fixing heights to be modified as required if changes in the operating circumstances require other switching points.

Electrical connection

The electrical connection is depending on the float switch versions. Information for electrical connections can be found in the datasheets of float switches.

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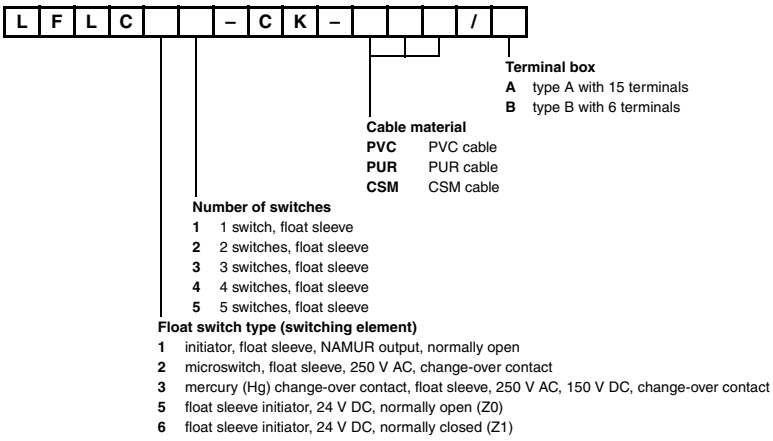
Application	
Description	switching element: LFL1: floating up closing, normally open LFL2: micro switch with switching ball, change-over contact LFL3: mercury (Hg) change-over contact
Function and system design	
Equipment architecture	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements.
Auxiliary energy	
Supply voltage	LFL1: 8 V, acc. EN 60947-5-6 (NAMUR) LFL2: max. 250 V AC LFL3: max. 250 V AC, 150 V DC
Current consumption	LFL2: max. 3 (1) A LFL3: max. 4 A
Operating conditions	
Mounting conditions	
Installation instructions	range of application and minimum length between mounting and float: - PVC version: ≥ 50 mm (2 in), preferred for water, waste water, slightly aggressive liquids - PUR version: ≥ 100 mm (4 in), preferred for fuels, heating oils, oily fluids - CSM/CM version: ≥ 100 mm (4 in), preferred for many acids and lyes Float switches are fastened onto the lower end of the guide pipe in the factory. The position of the switch points required for the application must be adjusted by the user by moving the fastening rings (in some cases, it may be necessary to shorten the float switch wire).
Process conditions	
Process temperature	-10 ... 70 °C (263 ... 343 K), depending on the used cable
Process pressure (static pressure)	≤ 1 bar at 20 °C (293 K)
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Construction type	sleeve
Dimensions	guide tube: Ø16 mm (0.6 in), L_{max} = 3000 mm (10 ft)
Material	float: PP (polypropylene) guide tube: PVC process connection: PVC ring fastener and clamping screw: PVC
Process connection	G2A thread with 5 PG9-cable entries
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	LFL1-**-W*, LFL2-**-U, LFL3-**-U: EN 50178
Directive 89/336/EC (EMC)	EN 60947-5-2, EN 60947-5-2 A1
Directive 94/9 EC (ATEX)	LFL1-**-N: EN 50014, EN 50020
Conformity	
Protection degree	EN 60529
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Type code/model number

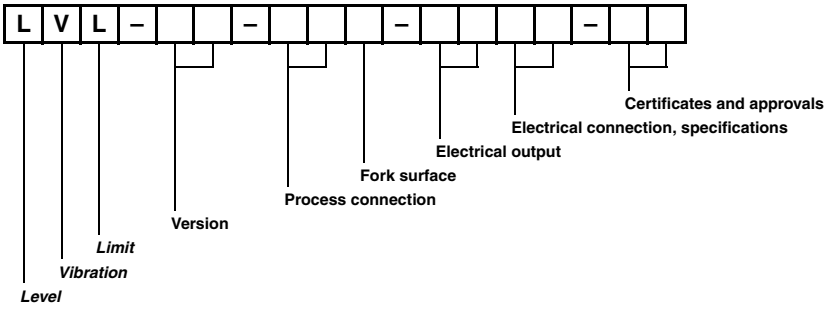


Type code of vibration limit switches

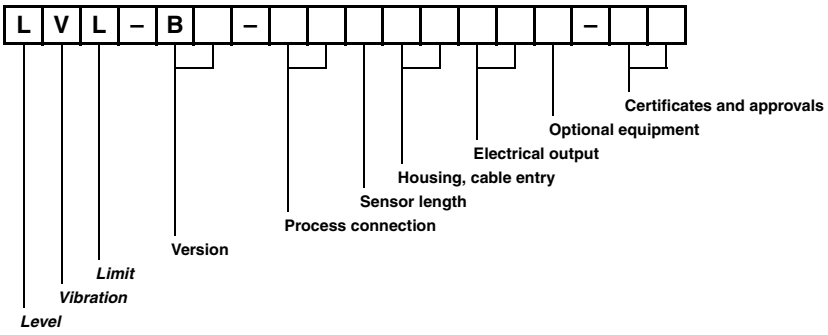
The figure below shows the used characters and numbers of the vibration limit switches type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the vibration limit switches.

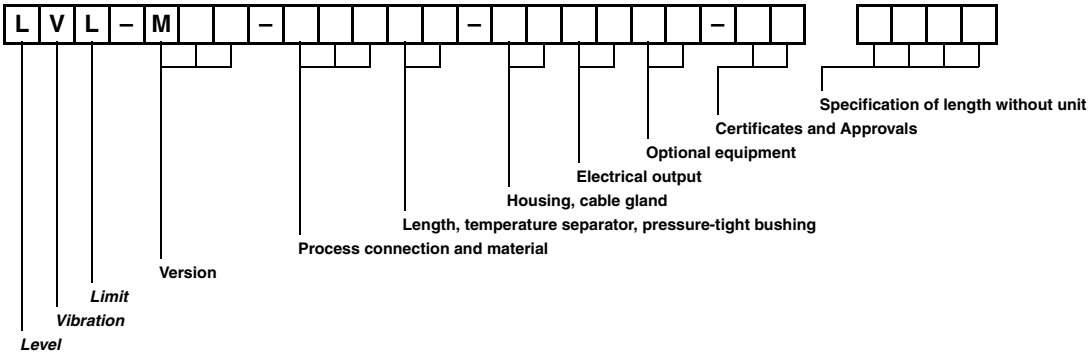
Product group Vibracon LVL-**



Product group Vibracon LVL-B*



Product group Vibracon LVL-M**



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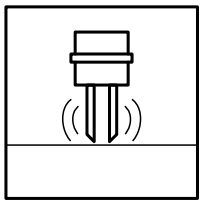
Vibration limit switch Vibracon LVL-A5

The two paddles of a vibrating fork are actuated using a piezoelectric source.

In air the vibrating fork vibrates at its resonance frequency.

When it is immersed in rising liquid, the frequency and amplitude of the vibration is reduced. The change is evaluated electronically and produces the switching signal.



Contents

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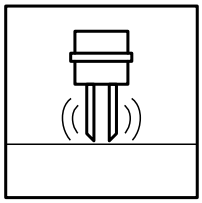
Vibration limit switch

LVL-A*

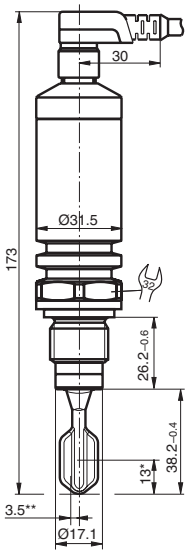


Features

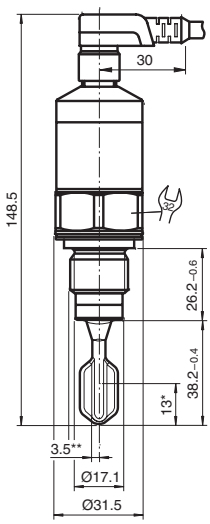
- Level limit switch for liquids
- External test option using test magnet
- On-site function control using external LED display
- Large selection of process connections for hassle-free installation in existing systems
- Easy to install even at points difficult to access due to compact design
- Rugged stainless steel housing
- Suitable for medium temperatures up to 150 °C (423 K)
- Cost-saving plug connections

Dimensions

LVL-A5-V1



LVL-A1-V1



Additional dimensions see section dimensions.

* Switch point for vertical installation
** Switch point for horizontal installation
Switch points at densitiy 0.7 g/cm³, 23 °C (296 K), 0 bar

Function

The Vibracon LVL-A* is a level limit switch for all kinds of fluids and is used in tanks, containers and pipelines. It is used in cleaning and filtering systems and coolant and lubricant tanks as an overspill protection or as a pump protector.

The LVL-A* is ideal for applications which previously used float switches and conductive, capacitive and optical sensors.

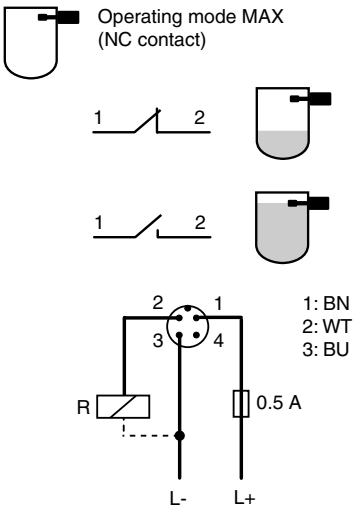
It also works in applications which are unsuitable for these measuring methods due to conductivity, build-ups, turbulence, flows or air bubbles.

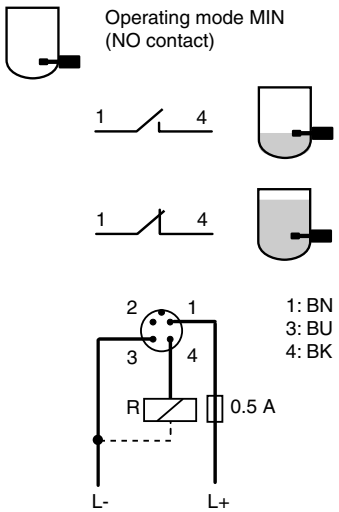
The LVL-A* is not suitable for hazardous areas and areas where the medium temperature is above 150 °C (423 K).

For hygienic areas the use of LVL-AH is recommended.

Electrical connection

Example: connection E5 (three-wire DC connection) with V1 connector M12 x 1
Other connection types see section electrical connections.





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Application	
Function principle	The tuning fork is brought to its resonance frequency by means of a piezoelectric drive. If the tuning fork is covered by liquid, this frequency changes. The electronics monitor the resonance frequency and indicate whether the tuning fork is freely vibrating or is covered by liquid.
Input characteristics	
Measured variable	density
Measurement range	min. 0.7 g/cm^3, other density (e. g. 0.5 g/cm^3) settings on request
Output characteristics	
Fail safe mode	minimum/maximum closed circuit safety The level limit switch can be connected in two operating modes, depending on the operating mode selected (MAX or MIN safety). The level limit switch will switch off safely in the event of a fault (e. g. if the power supply line is interrupted). MAX = maximum fail-safe mode: The level limit switch keeps the electronic switch closed as long as the fluid level is below the fork. example application: overspill protection MIN = minimum fail-safe mode: The level limit switch keeps the electronic switch closed as long as the fork is immersed in fluid. example application: dry running protection of pumps The electronic switch opens if the limit is reached, if a fault occurs or in the event of a power failure.
Auxiliary energy	
Electrical connection	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements. output B3: version AS-Interface output E5: version DC-PNP with M12 x 1 connector or valve connector output WA: version AC with valve connector
Supply voltage	output B3: 24.5 ... 31 V DC (AS-Interface) output E5: 10 ... 35 V DC output WA: 19 ... 253 V AC, 50/60 Hz
Power consumption	output B3: < 825 mW output E5: < 825 mW output WA: < 810 mW
Current consumption	output B3: < 25 mA output E5: < 15 mA output WA: < 3.8 mA
Residual ripple	output E5: 5 V_{pp} at 0 ... 400 Hz
Performance characteristics	
Reference operating conditions	ambient temperature: 23 °C (296 K), process pressure: 1 bar, medium: water, medium density: 1, medium temperature: 23 °C (296 K), installation from above/vertical, density setting: > 0.7 g/cm^3
Measured value resolution	< 0.5 mm
Measuring frequency	approx. 1100 Hz in air
Maximum measured error	13 mm ± 1 mm
Non-repeatability	± 0.5 mm
Hysteresis	3 mm ± 0.5 mm
Influence of ambient temperature	negligible
Influence of medium temperature	-29.6 x 10^{-3} mm/°C
Influence of medium pressure	-55.2 x 10^{-3} mm/bar
Switching time	when covering the sensor approx. 0.5 s, when uncovering the sensor approx. 1.0 s other switching times on request
Settling time	< 2 s
Operating conditions	
Mounting conditions	
Installation position	see section mounting position
Ambient conditions	
Ambient temperature	outputs E5, WA: -40 ... 70 °C (233 ... 343 K) output B3: -25 ... 70 °C (248 ... 343 K)
Ambient temperature limits	version LVL-A5: - derating from 90 °C (363 K) process temperature: reduction to max. 50 °C (323 K) ambient - derating from 90 °C (363 K) process temperature: reduction to max. 150 mA relay switching capacity version LVL-A1: - derating from 80 °C (353 K) process temperature: reduction to max. 50 °C (323 K) ambient - derating from 80 °C (353 K) process temperature: reduction to max. 150 mA relay switching capacity
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Overvoltage protection	overvoltage category III
Process conditions	
Medium temperature	version LVL-A5: -40 ... 150 °C (233 ... 423 K), see ambient temperature limit version LVL-A1: -40 ... 100 °C (233 ... 273 K), see ambient temperature limit
Process pressure (static pressure)	-1 ... 40 bar
State of aggregation	liquid
Density	min. 0.7 g/cm^3, other density setting on request

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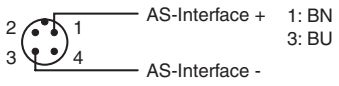
Viscosity	max. 10000 mm^2/s (10000 cSt)
Gas content	stagnant mineral water
Mechanical specifications	
Protection degree	IP65 with valve connector IP66/67 with M12 x 1 connector PPSU (plastic)
Mechanical construction	
Versions	LVL-A1: version for process temperatures up to 100 °C (373 K) LVL-A5: version for process temperatures up to 150 °C (423 K)
Dimensions	LVL-A1-V1: diameter 31.5 mm (1.24 in), length 148.5 mm (5.8 in) LVL-A1-P*: diameter 40 mm (1.57 in), length 161 mm (6.3 in) LVL-A1-PS: diameter 40 mm (1.57 in), length 155 mm (6.1 in) LVL-A5-V1: diameter 31.5 mm (1.24 in), length 173 mm (6.8 in) LVL-A5-P*: diameter 40 mm (1.57 in), length 185.5 mm (7.3 in) LVL-A5-PS: diameter 40 mm (1.57 in), length 179.5 mm (7.1 in)
Mass	LVL-A1: approx. 210 g LVL-A5: approx. 270 g
Material	vibration fork, process connection and housing: Edelstahl 1.4435/316L connection: PSU
Surface quality	R_a < 3.2 µm/80 grit
Process connection	- cylindrical thread G½A, G¾A, G1A to DIN ISO 228/1 - conical thread R½, R¾ to DIN 2999, part 1 - conical thread ½ NPT, ¾ NPT to ANSI B 1.20.1
Electrical connection	electrical connection V1: pinning according to EN 60947-5-2 electrical connection P*: valve plug, cross section max. 1.5 mm^2 (AWG 16), diameter 6 ... 9 mm (0.24 ... 0.35 in) electrical connection PS: QUICKON valve plug, cross section 0.34 ... 0.75 mm^2, diameter 3.5 ... 6.5 mm (0.14 ... 0.26 in)
Indication and operation	
Display elements	The LED display is on the connection side of the LVL-A*. green LED: indication of ready to operate red LED: fault indication, mode indication yellow LED: mode indication (B3)
Programming	AS-Interface profile S-3.A.E The address is defaulted to 0 (hex). It is changeable via the bus master or programming unit. Parameter bits (P0 ... P3) are not used.
Function test	function test with test magnet: Put the testing magnet to the mark of nameplate, the vibration fork reacts with the test magnet as in the case of covering with fluid. outputs E5, WA: on testing, the current state of the electronic switch is reversed output B3: on testing, D0 is inverted
Certificates and approvals	
Application	The general authorisation by the board of suveyors must be obtained for the site of installation. It is accessible together with the technical description and the certificate from Pepperl+Fuchs.
Overspill protection	Z-65.11-314 (overspill protection in acc. with WHG) Z-65.40-315 (leak detection system)
Marine approval	German Lloyd (GL), approval number: 42855-02HH
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	output WA: EN 50178
Directive 89/336/EC (EMC)	outputs E5, WA: emitted interference to EN 61326, CLASS B equipment interference immunity to EN 61326, annex A (industrial sector) output B3: EN 50295
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Interface	output B: AS-Interface profile S-3.A.1 as per EN 50295 (limit switch)
Vibration resistance	EN 60068-2-64
Shock and impact resistance	EN 60068-2-27, 30 g
Supplementary documentation	technical information TI364O operating instructions KA213O operating instructions KA141O weld-in adapter G1 (LVL-Z101) operating instructions KA142O weld-in adapter G¾ (LVL-Z100) operating instructions KA186O valve connector PG11 approval ZE247O overspill protection in acc. with WHG (Z-65.11-314) approval ZE248O leak detection system (Z-65.40-315)
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Electrical connection

Output B3 (AS-Interface) (only with V1 connector M12 x 1 available)

Two-wire connection for separate switching unit



Programming instruction AS-Interface profile: S-3.A.E
The address is defaulted to 0 (hex). It is changeable via the bus master or programming unit.

Data bit:

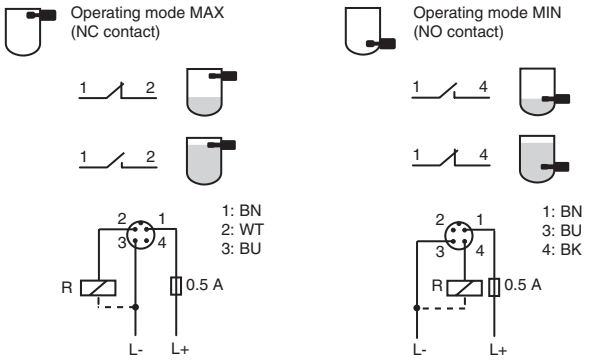
D0:1 Sensor covered	D1:1 State = OK
D0:0 Sensor free	D1:0 State = error
D2 and D3 are not used.	

Parameter bits (P0 ... P3) are not used.

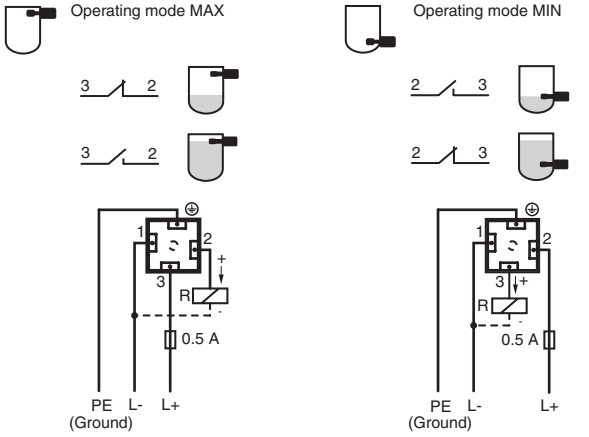
Output E5

Three-wire DC connection, switching the load via transistor (PNP) and separate connection

V1 connector M12 x 1



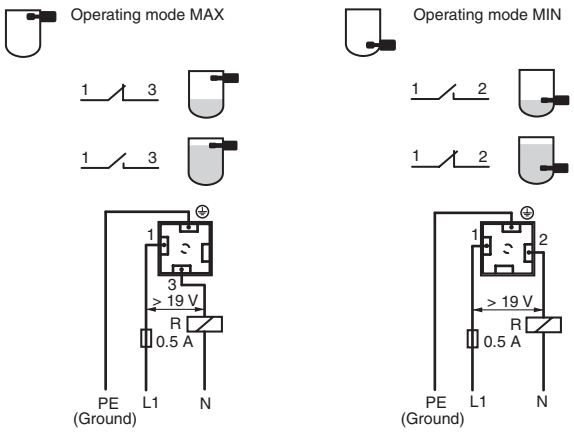
Valve plug



Output WA

Two-wire AC connection

Valve plug



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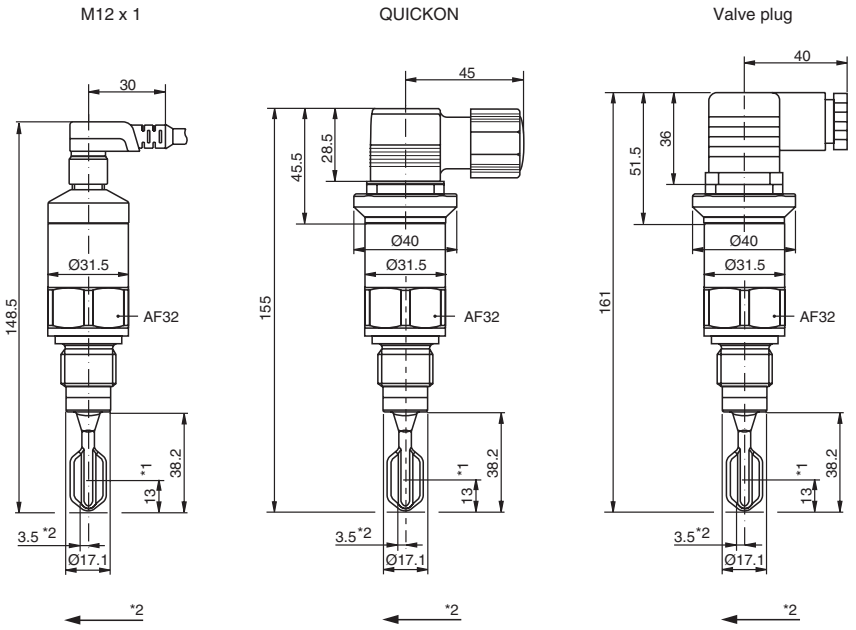
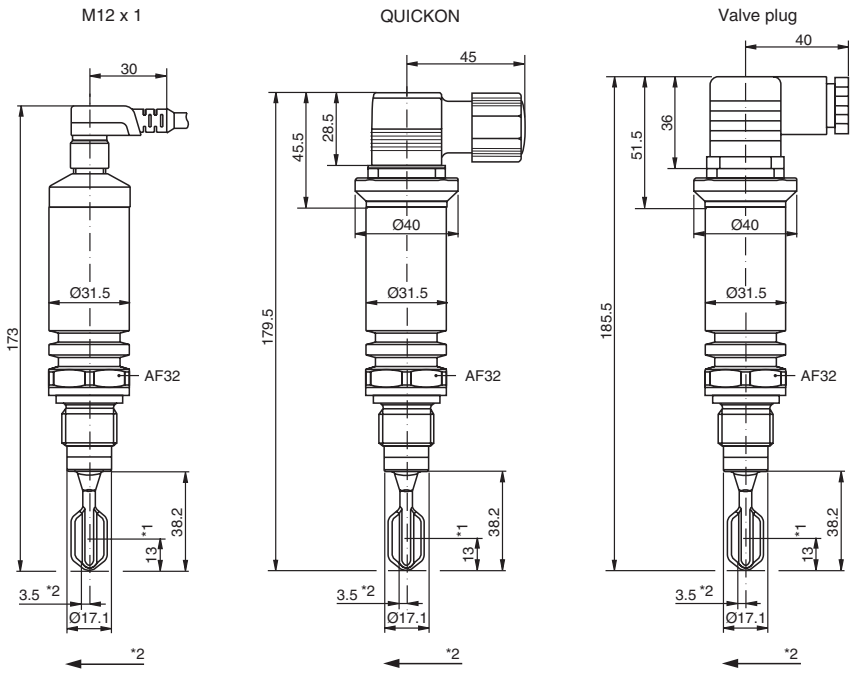
Dimensions

Version A1



Version A5



*1 Switch point with vertical installation
*2 Switch point with horizontal installation; the level increases in the direction of the arrow

Switch points at: density 1/23 °C (296 K)/0 bar

Dimensions of the process connections see technical information.

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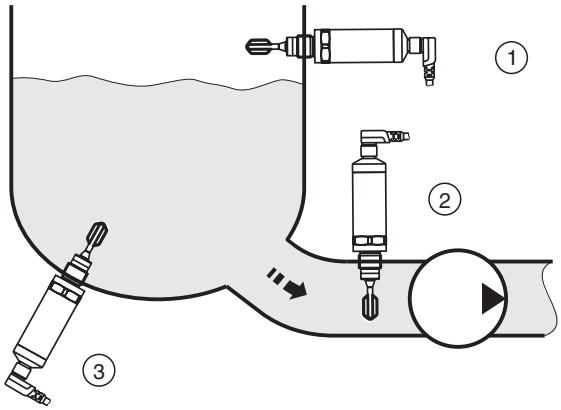
Mounting position

The level limit switch can be installed in any position in a container or pipe. The formation of foam does not impair its function.



Example 1: overfill protection or top level detection
Example 2: dry running protection for pump
Example 3: lower level detection

Accessories

- LVL-Z65, socket wrench AF32
- LVL-Z100, welding sleeve G¾ for flush mounting for process connection G2
- LVL-Z101, welding sleeve G1 for flush mounting for process connection G4
- M12 x 1 connector without LEDs

Type code/model number

L	V	L	–	A		–			S	–					–		

Approvals
CG CSA general purpose
WH overspill protection WHG

Electrical connection
PG valve plug PG11, ISO 4400, IP65
PN valve plug ½ NPT, ISO 4400, IP65
PS valve plug with QUICKON connection
V1 connector V1, M12 x 1, IP67

Electrical output
B3 AS-Interface bus
E5 DC, PNP 3-wire
WA AC, 2-wire

Fork surface
S standard surface, R_a < 3.2 µm

Process connection
G1 G½A, DIN ISO 228/1, 1.4435/316L
G2 G¾A with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
G3 G1A, DIN ISO 228/1, 1.4435/316L
G4 G1A with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
N1 ½ NPT, ANSI B 1.20.1, 1.4435/316L
N2 ¾ NPT, ANSI B 1.20.1, 1.4435/316L
R1 R½, DIN 2999, 1.4435/316L
R2 R¾, DIN 2999, 1.4435/316L

Process temperature
1 up to 100 °C (373 K)
5 up to 150 °C (423 K)

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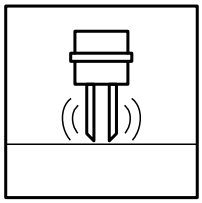
Vibration limit switch

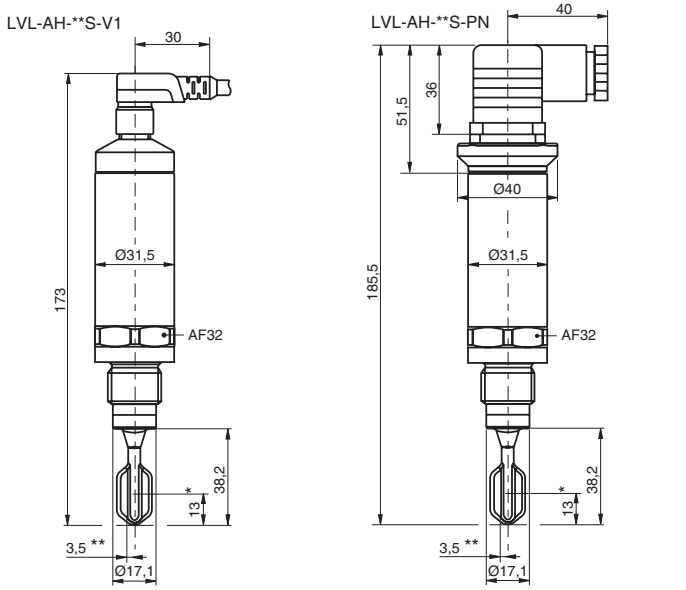
LVL-AH



Features

- Level limit switch in hygienic version for liquids
- External test option using test magnet
- On-site function control using external LED display
- Large selection of process connections for hassle-free installation in existing systems
- Easy to install even at points difficult to access due to compact design
- Rugged stainless steel housing
- Suitable for medium temperatures up to 150 °C (423 K)
- Cost-saving plug connections

Dimensions



Additional dimensions see section dimensions.

* Switch point for vertical installation
** Switch point for horizontal installation
Switch points at densitiy 1 g/cm³, 23 °C (296 K), 0 bar

Function

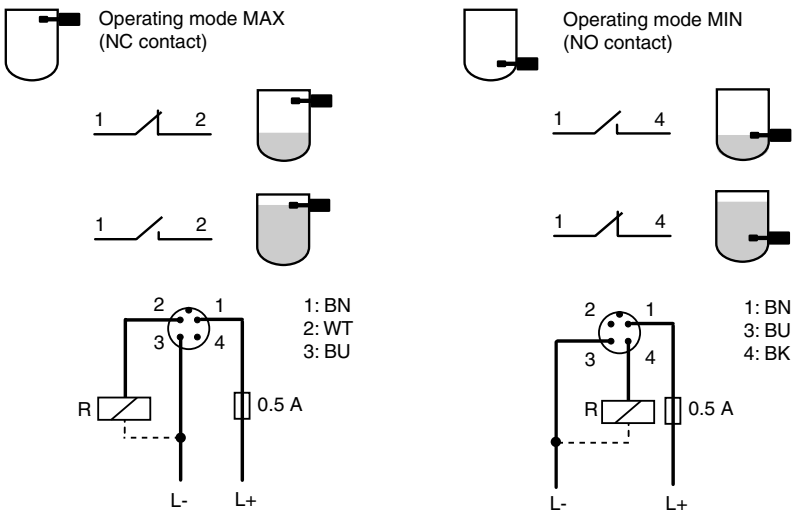
The Vibracon LVL-AH is a level limit switch for liquids in storage tanks, agitators and pipes which have to meet particularly high hygiene standards internally and externally.

It is used in particular in areas where other measurement methods would probably fail: e. g. in the event of viscosity, build-up, turbulences, flows, air bubbles, rash temperature change when cleaning.

The Vibracon LVL-AH is a hygienic version for fluid temperatures up to 150 °C (423 K).

Electrical connection

Example: connection E5 (three-wire DC connection) with V1 connector M12 x 1
Other connection types see section electrical connections.



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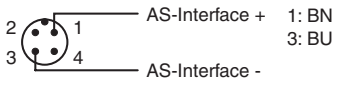
Application	
Function principle	The tuning fork is brought to its resonance frequency by means of a piezoelectric drive. If the tuning fork is covered by liquid, this frequency changes. The electronics monitor the resonance frequency and indicate whether the tuning fork is freely vibrating or is covered by liquid.
Input characteristics	
Measured variable	density
Measurement range	min. 0.7 g/cm^3, other density (e. g. 0.5 g/cm^3) settings on request
Output characteristics	
Fail safe mode	minimum/maximum closed circuit safety The level limit switch can be connected in two operating modes, depending on the operating mode selected (MAX or MIN safety). The level limit switch will switch off safely in the event of a fault (e. g. if the power supply line is interrupted). MAX = maximum fail-safe mode: The level limit switch keeps the electronic switch closed as long as the fluid level is below the fork. example application: overspill protection MIN = minimum fail-safe mode: The level limit switch keeps the electronic switch closed as long as the fork is immersed in fluid. example application: dry running protection of pumps The electronic switch opens if the limit is reached, if a fault occurs or in the event of a power failure.
Auxiliary energy	
Electrical connection	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements. output B3: version AS-Interface output E5: version DC-PNP with M12 x 1 connector or valve connector output WA: version AC with valve connector
Supply voltage	output B3: 24.5 ... 31 V DC (AS-Interface) output E5: 10 ... 35 V DC output WA: 19 ... 253 V AC, 50/60 Hz
Power consumption	output B3: < 825 mW output E5: < 825 mW output WA: < 810 mW
Current consumption	output B3: < 25 mA output E5: < 15 mA output WA: < 3.8 mA
Residual ripple	output E5: 5 V_{pp} at 0 ... 400 Hz
Performance characteristics	
Reference operating conditions	ambient temperature: 23 °C (296 K), process pressure: 1 bar, medium: water, medium density: 1, medium temperature: 23 °C (296 K), installation from above/vertical, density setting: > 0.7 g/cm^3
Measured value resolution	< 0.5 mm
Measuring frequency	approx. 1100 Hz in air
Maximum measured error	13 mm ± 1 mm
Non-repeatability	± 0.5 mm
Hysteresis	3 mm ± 0.5 mm
Influence of ambient temperature	negligible
Influence of medium temperature	-29.6 x 10^{-3} mm/°C
Influence of medium pressure	-55.2 x 10^{-3} mm/bar
Switching time	when covering the sensor approx. 0.5 s, when uncovering the sensor approx. 1.0 s other switching times on request
Settling time	< 2 s
Operating conditions	
Mounting conditions	
Installation position	see section mounting position
Ambient conditions	
Ambient temperature	outputs E5, WA: -40 ... 70 °C (233 ... 343 K) output B3: -25 ... 70 °C (248 ... 343 K)
Ambient temperature limits	derating from 90 °C (363 K) process temperature: reduction to max. 50 °C (323 K) ambient derating from 90 °C (363 K) process temperature: reduction to max. 150 mA relay switching capacity
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Overvoltage protection	overvoltage category III
Process conditions	
Medium temperature	-40 ... 150 °C (233 ... 423 K), see ambient temperature limit
Process pressure (static pressure)	-1 ... 40 bar
State of aggregation	liquid
Density	min. 0.7 g/cm^3, other density setting on request
Viscosity	max. 10000 mm^2/s (10000 cSt)
Gas content	stagnant mineral water
Solid contents	< Ø5 mm
Mechanical specifications	

Protection degree	IP65 with valve connector IP66/67 with M12 x 1 connector PPSU (plastic) IP66/68 with M12 x 1 connector 1.4435/316L, IP69K with accessory 52018763 (signalling via connector with LEDs)
Mechanical construction	
Dimensions	LVL-AH-V1: diameter 31.5 mm (1.24 in), length 173 mm (6.8 in) LVL-AH-P*: diameter 40 mm (1.57 in), length 185.5 mm (7.3 in) LVL-AH-PS: diameter 40 mm (1.57 in), length 179.5 mm (7.1 in)
Mass	approx. 300 g
Material	vibration fork, process connection and housing: Edelstahl 1.4435/316L connection: PSU
Surface quality	R_a < 1.5 µm/120 grit
Process connection	- cylindrical thread G½A, G¾A, G1A to DIN ISO 228/1 - conical thread R½, R¾ to DIN 2999, part 1 - conical thread ½ NPT, ¾ NPT to ANSI B 1.20.1 - Triclamp 1½", 2" to ISO 2852 - flush-mounted with welding adapter 1", sensor can be positioned - screw pipe connection DN25, DN32, DN40 to DIN 1185
Electrical connection	electrical connection V1: pinning according to EN 60947-5-2 electrical connection P*: valve plug, cross section max. 1.5 mm^2 (AWG 16), diameter 6 ... 9 mm (0.24 ... 0.35 in) electrical connection PS: QUICKON valve plug, cross section 0.34 ... 0.75 mm^2, diameter 3.5 ... 6.5 mm (0.14 ... 0.26 in)
Indication and operation	
Display elements	the LED display is on the connection side of the LVL-A* green LED: indication of ready to operate red LED: fault indication, mode indication yellow LED: mode indication (B3)
Programming	AS-Interface profile S-3.A.E The address is defaulted to 0 (hex). It is changeable via the bus master or programming unit. Parameter bits (P0 ... P3) are not used.
Function test	function test with test magnet: Put the testing magnet to the mark of nameplate, the vibration fork reacts with the test magnet as in the case of covering with fluid. outputs E5, WA: on testing, the current state of the electronic switch is reversed output B3: on testing, D0 is inverted
Certificates and approvals	
Application	The general authorisation by the board of suveyors must be obtained for the site of installation. It is accessible together with the technical description and the certificate from Pepperl+Fuchs.
Sanitary compatibility	EHEDG, see process connections
Marine approval	German Lloyd (GL), approval number: 42855-02HH
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	output WA: EN 50178
Directive 89/336/EC (EMC)	outputs E5, WA: emitted interference to EN 61326, CLASS B equipment interference immunity to EN 61326, annex A (industrial sector) output B3: EN 50295
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Interface	output B: AS-Interface profile S-3.A.1 as per EN 50295 (limit switch)
Vibration resistance	EN 60068-2-64
Shock and impact resistance	EN 60068-2-27, 30 g
Supplementary documentation	technical information TI379O operating instructions KA214O operating instructions KA141O weld-in adapter G1 (LVL-Z101) operating instructions KA142O weld-in adapter G¾ (LVL-Z100) operating instructions KA186O valve connector PG11
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Electrical connection

Output B3 (AS-Interface) (only with V1 connector M12 x 1 available)

Two-wire connection for separate switching unit



Programming instruction AS-Interface profile: S-3.A.E
The address is defaulted to 0 (hex). It is changeable via the bus master or programming unit.

Data bit:

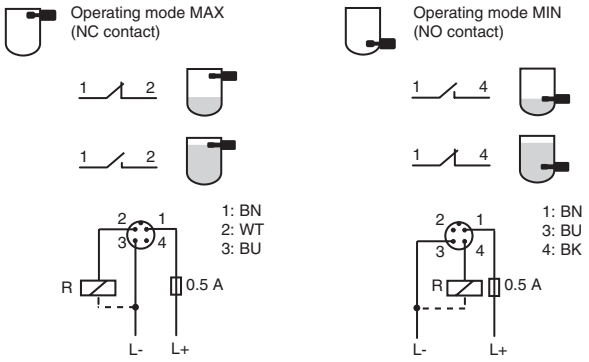
D0:1 Sensor covered	D1:1 State = OK
D0:0 Sensor free	D1:0 State = error
D2 and D3 are not used.	

Parameter bits (P0 ... P3) are not used.

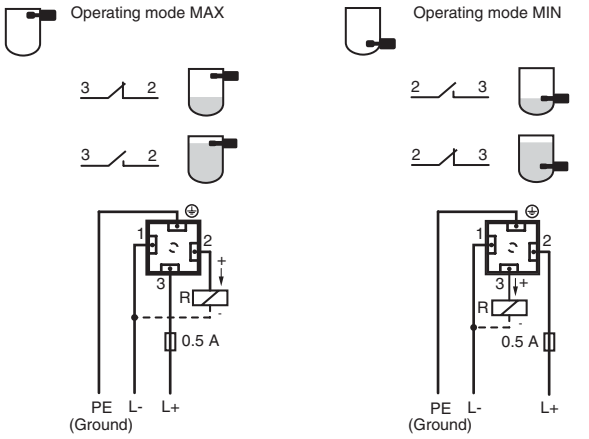
Output E5

Three-wire DC connection, switching the load via transistor (PNP) and separate connection

V1 connector M12 x 1



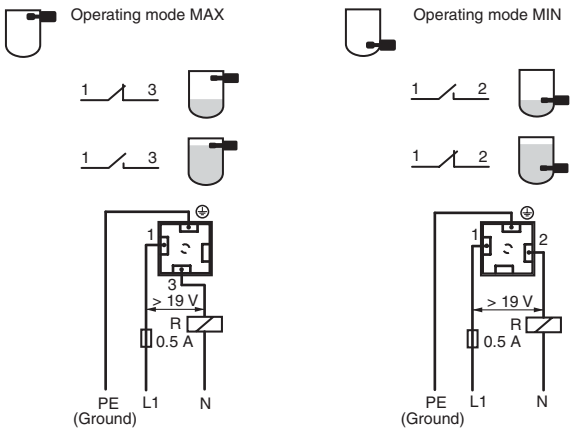
Valve plug



Output WA

Two-wire AC connection

Valve plug



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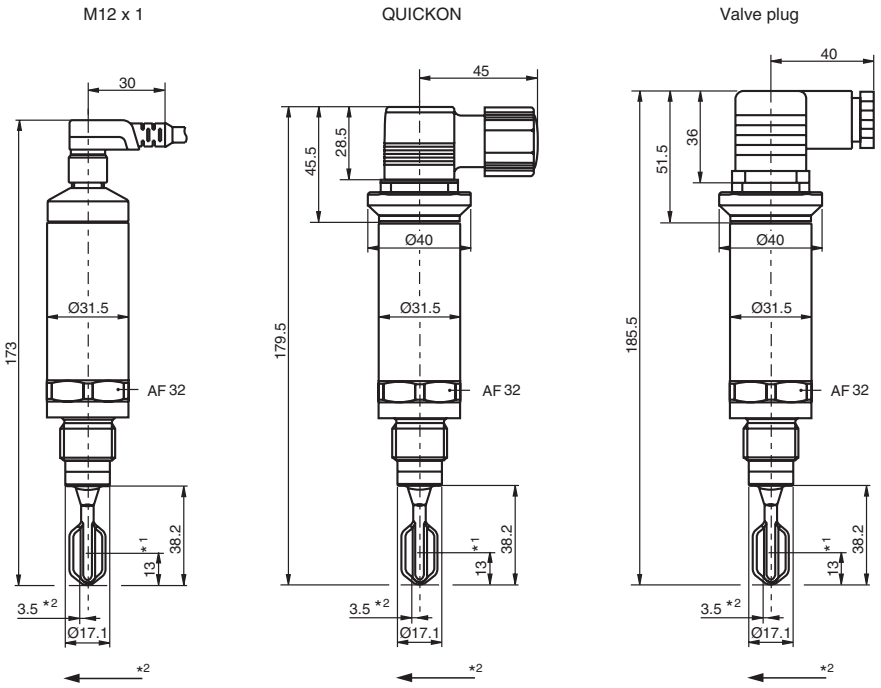
Dimensions



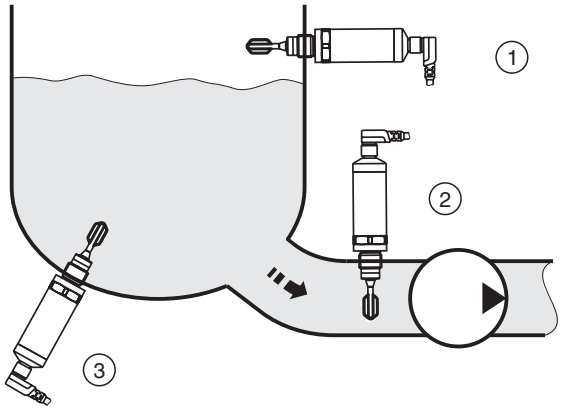
*1 Switch point with vertical installation
*2 Switch point with horizontal installation; the level increases in the direction of the arrow

Switch points at: density 1/23 °C (296 K)/0 bar

Dimensions of process connections see technical information.

Mounting position

The level limit switch can be installed in any position in a container or pipe. The formation of foam does not impair its function.



Example 1: overfill protection or top level detection
Example 2: dry running protection for pump
Example 3: lower level detection

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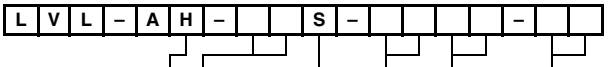
Accessories

- LVL-Z65, socket wrench AF32
- LVL-Z67, coupling nut for process connection S1 or welding neck LVL-Z103
- LVL-Z100, welding sleeve G¾ for flush mounting for process connection G2
- LVL-Z101, welding sleeve G1 for flush mounting for process connection G4
- LVL-Z103, welding neck or flush-mounted installation and sealing with process connection S1, sensor can be aligned
- M12 x 1 connector with LEDs
- M12 x 1 connector without LEDs

Type code/model number



Approvals
NA without approval
CG CSA general purpose

Electrical connection
PG valve plug PG11, ISO 4400, IP65
PK connector M12 x 1, IP69K
PN valve plug ½ NPT, ISO 4400, IP65
PS valve plug with QUICKON connection
V1 connector V1, M12 x 1, IP67

Electrical output
B3 AS-interface bus
E5 DC, PNP 3-wire
WA AC, 2-wire

Fork surface
S standard surface, R_a < 1.5 µm

Process connection
G1 G½A, DIN ISO 228/1, 1.4435/316L
G2 G¾A with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
G3 G1A with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
N1 ½ NPT, ANSI B 1.20.1, 1.4435/316L
N2 ¾ NPT, ANSI B 1.20.1, 1.4435/316L
R1 R½ DIN 2999, 1.4435/316L
R2 R¾ DIN 2999, 1.4435/316L
T5 1½", DN25-38, Triclamp ISO 2852, 1.4435/316L
T6 2", DN40-51, Triclamp ISO 2852, 1.4435/316L
S1 1", flush mounted for welding adaptor, 1.4435/316L, welding adaptor accessory
R4 DN25 PN40, screw pipe connection DIN 1185, 1.4435/316L
R5 DN32 PN40, screw pipe connection DIN 1185, 1.4435/316L
R6 DN40 PN40, screw pipe connection DIN 1185, 1.4435/316L

Version
H hygienic version

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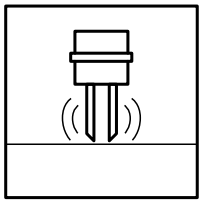
Vibration limit switch

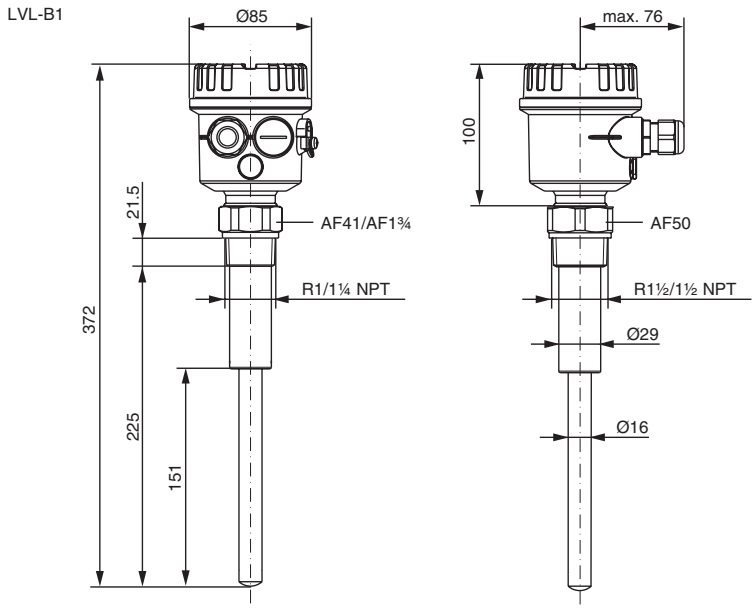
LVL-B*



Features

- Level limit switch for bulk solids
- No calibration: easy commissioning (plug and play)
- Insensitive to build-up: maintenance-free operation
- No mechanically moving parts: no wear, long operating life
- Sensor material stainless steel: hardly any abrasion even with building materials
- F16 plastic housing with cover with sight glass: switch status visible from outside
- F18 aluminium housing also available
- Insensitive to external vibration and flow noises

Dimensions



Additional dimensions see section dimensions.

Function

Vibracon LVL-B* is a robust level limit switch for silos with fine-grained or coarse-grained, non-fluidised bulk solids.

The various designs means the device has a wide range of applications. Certificates are also available for use in dust incendive hazard areas.

LVL-B1: compact design (250 mm (10 in)) as vibrating rod for installation in any direction

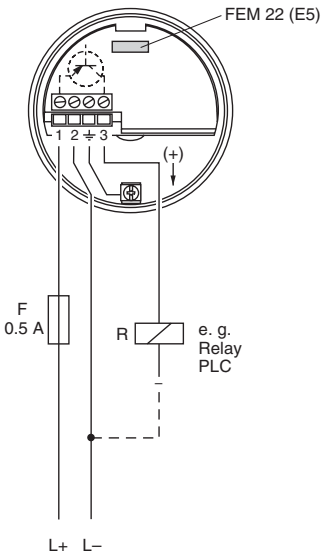
LVL-B2: vibrating rod with extension pipe (500 mm/1000 mm/1500 mm/20 in/40 in/60 in) for installation in any direction

Typical applications:
cereals, coffee beans, sugar, animal feed, rice, detergents, dye powder, chalk, gypsum, cement, sand, plastic granules

Electrical connection

Connection FEM 22 (E5) 3-wire DC connection (example)

- preferably for use with memory programmable controls (PLC), DI modules as per EN 61131-2
- positive signal at the electronics switch output (PNP)
- Output blocked at level limit.



Other connection types see section electrical connection.

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Application	
Function principle	A piezoelectric drive excites the vibrating rod of Vibracon LVL-B* to its resonance frequency. If medium covers the vibrating rod, the rod's vibrating amplitude changes (the vibration is damped). Vibracons electronics compare the actual amplitude with a target value and indicates whether the vibrating rod is vibrating freely or whether it is covered by medium.
Function and system design	
Equipment architecture	The measuring system consists of: - Vibracon LVL-B1 or LVL-B2 with FEM22 (E5) or FEM24 (WA) electronic insert - a supply point and - the connected control systems, switching units, signalling systems (e. g. lamps, horns, PCS, PLC, etc.)
Input characteristics	
Measured variable	level (according to the mounting location and the overall length)
Measurement range	The measuring range depends on the mounting location of Vibracon LVL-B* and the length of the pipe extension selected. The pipe extension is available in the following lengths: 500 mm, 1000 mm, 1500 mm, 20 in, 40 in, 60 in.
Input signal	probe covered - small amplitude probe not covered - large amplitude
Output characteristics	
Signal on alarm	electronic insert FEM22 (E5): output signal on power failure or in the event of device failure - < 100 µA electronic insert FEM24 (WA): output signal in event of power failure - relay de-energised
Fail safe mode	minimum/maximum quiescent current safety can be switched at electronic insert. MAX = maximum safety: When the vibrating rod is covered, the output switches in the direction of the signal on alarm. Used for overspill protection for example. MIN = minimum safety: When the vibrating rod becomes exposed, the output switches in the direction of the signal on alarm. Used for empty running protection for example.
Switch behaviour	binary
Switch-on response	When switching on the power supply the output is set to "signal on alarm". After a maximum of 3 s it switches to the correct output signal.
Load	electronic insert FEM22 (E5): - load switched via transistor and separate PNP connection - load current: max. 45 V (cyclical overload and short-circuit protection), continuous max. 350 mA - residual current: < 100 µA (for blocked transistor) - capacitive load: max. 0.5 µF for 45 V, max. 1.0 µF for 24 V - residual voltage: < 3 V (for transistor switched through) electronic insert FEM24 (WA): - loads switched via 2 floating change-over contacts - version AC: I max. 6 A, U max. 253 V; P max. 1500 VA, cos Φ= 1, P max. 750 VA, cos Φ> 0.7 - version DC: I max. 6 A to 30 V, I max. 0.2 A to 125 V - the following applies when connecting a functional extra-low voltage circuit with double insulation as per IEC 1010: sum of voltages of relay output and power supply max. 300 V
Electrical isolation	electronic insert FEM22 (E5): between sensor and power supply electronic insert FEM24 (WA): between sensor, power supply and load
Auxiliary energy	
Supply voltage	electronic insert FEM22 (E5): 10 ... 45 V DC electronic insert FEM24 (WA): 19 ... 253 V AC, 50/60 Hz or 19 ... 55 V DC
Power consumption	electronic insert FEM22 (E5): max. 0.68 W electronic insert FEM 24 (WA): max. 1.3 W
Current consumption	electronic insert FEM22 (E5): max. 15 mA
Residual ripple	electronic insert FEM22 (E5): max. 5 V, 0 ... 400 Hz
Reverse polarity protection	separation voltage 2.2 kV
Performance characteristics	
Measuring frequency	700 ... 800 Hz
Switching time	when covering the sensor approx. 0.5 s, when uncovering the sensor approx. 1.0 s
Operating conditions	
Mounting conditions	
Installation position	see section mounting position
Ambient conditions	
Ambient temperature	-40 ... 70 °C (233 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Overvoltage protection	overvoltage category III
Process conditions	
Process temperature	-40 ... 150 °C (233 ... 423 K)
Medium pressure limits	-1 ... 25 bar max. working pressure 25 bar, burst pressure 100 bar
Thermal shock resistance	max. 120 K
State of aggregation	solids
Solid contents	≤ Ø25 mm

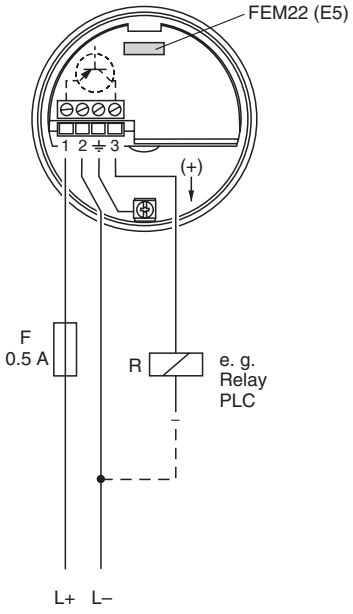
Bulk density	≥ 200 g/l, not fluidised
Mechanical specifications	
Protection degree	IP66/IP67, Nema 4x
Mechanical construction	
Versions	LVL-B1: compact version LVL-B2: version with pipe extension
Dimensions	LVL-B1: diameter max. 85 mm (3.3 in), length 372 mm (14.6 in) LVL-B2: diameter max. 85 mm (3.3 in), length 160 mm (6.3 in) + x (x = 500 mm, 1000 mm, 1500 mm, 20 in, 40 in, 60 in)
Mass	LVL-B1/LVL-B2 with F16 housing, FEM24 (WA) and R1 thread: - compact = approx. 1.0 kg - 500 mm (20 in) = approx. 1.3 kg - 1000 mm (40 in) = approx. 2.0 kg - 1500 mm (60 in) = approx. 2.6 kg
Material	F16 housing: PTB-FR, cover with transparent glass made of PA12, EPDM cover seal F18 housing: aluminium EN-AC-AlSi10Mg, plastic coated cover seal: EPDM process connections, sensor: stainless steel 1.4435/316L
Process connection	- tapered thread R1, R1½ acc. to DIN 2999 - tapered thread 1¼-11½ NPT, 1½-11½ NPT acc. to ANSI B 1.20.1
Electrical connection	cable connection M20 x 1.5, ½ NPT, G½
Indication and operation	
Display elements	electronic insert FEM22 (E5): - one green LED: operation - one yellow LED: electronic switch closed electronic insert FEM 24(WA): one green LED: - operation - one yellow LED: contact closed (relay energised)
Operating elements	switch for safety mode - MAX - overspill protection - MIN - dry running protection switch for bulk density/density setting - 400 g/l (high bulk density) - 200 g/l (low bulk density)
Additional functions	detection of solids under water The system does not detect coverage by liquids similar to water.
Certificates and approvals	
Ex approval	KEMA 06 ATEX 0055, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/3D T+19K IP66
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)
Directive 94/9 EC (ATEX)	EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a
Vibration resistance	EN 60068-2-64, 0.01 g^2/Hz
Shock and impact resistance	EN 60068-2-27, 30 g
Supplementary documentation	technical information TI389O operating instructions KA227O operating instructions KA237O high pressure sliding sleeve R1½ (LVL-Z200), 1½-11½ NPT (LVL-Z201) operating instructions KA238O sliding sleeve for unpressurised operation R1½ (LVL-Z202), 1½-11½ NPT (LVL-Z203) safety information SI300O (KEMA 06 ATEX 0055)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Electrical connection

Electronic insert FEM22 (E5)

Three-wire DC connection

- preferred in conjunction with programmable logic controllers (PLC), DI modules as per EN 61131-2
- positive signal at electronics switch output (PNP)
- Output blocked at level limit.



U ⎓ 10 V ... 45 V (DC)

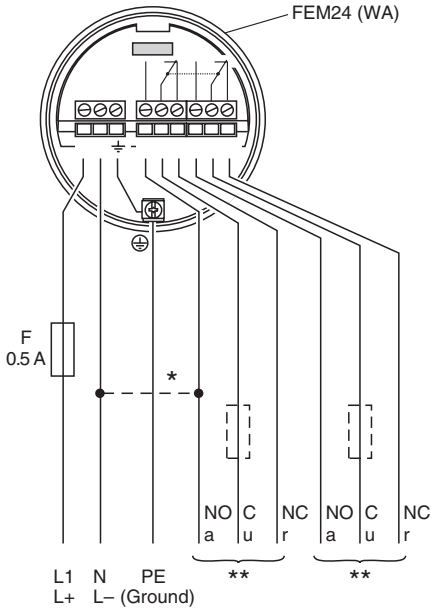
Electronic insert FEM24 (WA)

Universal current connection with relay output

- Power supply:
  Please note the different voltage ranges for AC and DC.
- When connecting a device with high inductance, provide a spark arrester to protect the relay contact.
  A fine-wire fuse (depending on the load connected) protects the relay contact in the event of a short-circuit. Both relay contacts switch simultaneously.
  DPDT (double pole double throw)

* When jumpered, the relay output works with NPN logic.

** see "Connectable load"



U ≂ 19 V ... 253 V (AC) U ⎓ 19 V ... 55 V (DC)

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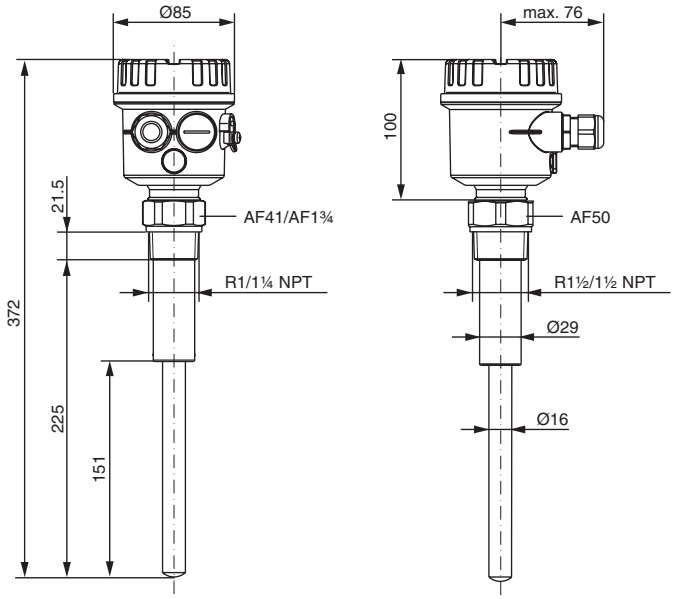
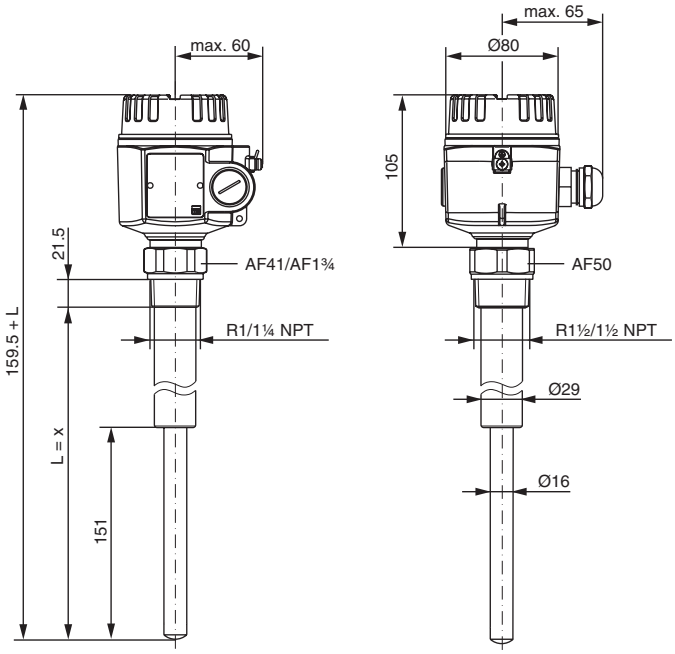
Dimensions

Version LVL-B1 compact version



Version LVL-B2 version with pipe extension



x = 500 mm,1000 mm,1500 mm, 20 in, 40 in, 60 in

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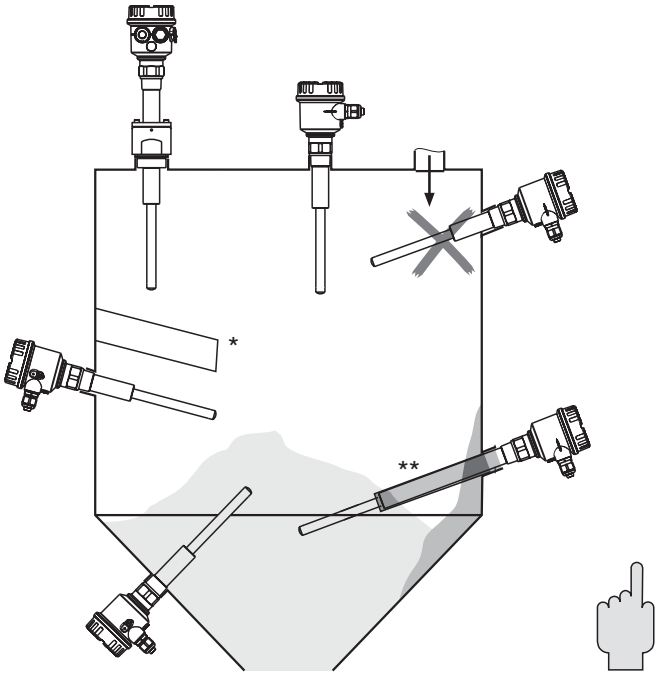
Mounting position



Horizontal installation/vertical installation
* with protective cover (to be provided by customer)
** with protecting tube (to be provided by customer)

Accessories

- LVL-Z200, high pressure sliding sleeve R1½, DIN 2999
- LVL-Z201, high pressure sliding sleeve 1½-11½ NPT, ANSI B 1.20.1
- LVL-Z202, sliding sleeve for unpressurised container R1½, DIN 2999
- LVL-Z203, sliding sleeve for unpressurised container 1½-11½ NPT, ANSI B 1.20.1

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Type code/model number

Product structure LVL-B1

L	V	L	–	B	1	–			–					A	–		

Certificates
NA version for non-hazardous areas
EX Ⓔx II 1/3D
FS FM, DIP + CSA DIP, Cl. II, III, Div. 1 + 2, Gr. E–G
CG CSA, General Purpose

Optional equipment
A with optional equipment

Electrical output
E5 FEM22, PNP 3-wire, 10 V DC ... 45 V DC
WA FEM24, relay, DPDT, 19 V AC ... 253 V AC, 19 V DC ... 55 V DC

Housing, cable entry
A6 aluminium housing F18, IP66/IP67, Nema 4x, cable gland M20
A7 aluminium housing F18, IP66/IP67, Nema 4x, ¾ NPT
A8 aluminium housing F18, IP66/IP67, Nema 4x, entry G½A
C polyester housing F16, IP66/IP67, Nema 4x, cable gland M20
Q polyester housing F16, IP66/IP67, Nema 4x, ½ NPT
P polyester housing F16, IP66/IP67, Nema 4x, entry G½A

Process connection
N3 1¼ NPT, ANSI B 1.20.1, 1.4435/316L
N5 1½ NPT, ANSI B 1.20.1, 1.4435/316L
R3 R1, DIN 2999, 1.4435/316L
R5 R1½, DIN 2999, 1.4435/316L
XX special version

Design
B1 compact design

Product structure LVL-B2

L	V	L	–	B	2	–								A	–		

Certificates
NA version for non-hazardous areas
EX Ⓔx II 1/3D
FS FM, DIP + CSA DIP, Cl. II, III, Div. 1 + 2, Gr. E–G
CG CSA, General Purpose

Optional equipment
A with optional equipment

Electrical output
E5 FEM22, PNP 3-wire, 10 V DC ... 45 V DC
WA FEM24, relay, DPDT, 19 V AC ... 253 V AC, 19 V DC ... 55 V DC

Housing, cable entry
A6 aluminium housing F18, IP66/IP67, Nema 4x, cable gland M20
A7 aluminium housing F18, IP66/IP67, Nema 4x, ¾ NPT
A8 aluminium housing F18, IP66/IP67, Nema 4x, entry G½A
C polyester housing F16, IP66/IP67, Nema 4x, cable gland M20
Q polyester housing F16, IP66/IP67, Nema 4x, ½ NPT
P polyester housing F16, IP66/IP67, Nema 4x, entry G½A

Sensor length
2 500 mm
3 1000 mm
4 1500 mm
6 20 in
7 40 in
8 60 in

Process connection
N3 1¼ NPT, ANSI B 1.20.1, 1.4435/316L
N5 1½ NPT, ANSI B 1.20.1, 1.4435/316L
R3 R1, DIN 2999, 1.4435/316L
R5 R1½, DIN 2999, 1.4435/316L
XX special version

Design
B2 extended design (500 mm/20 in ... 1500 mm/60 in)

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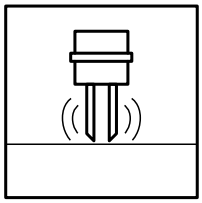
Vibration limit switch

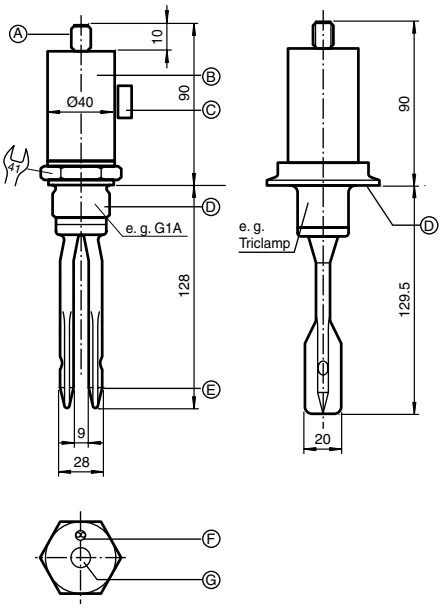
LVL-S1



Features

- Level limit switch in hygienic version for liquids
- External test option using test magnet
- On-site function control using external LED display
- Especially used in systems where other measuring principles cannot be used, e. g. for pastes, build-up, turbulence, liquid flow, gas bubbles and rapid temperature variations when cleaning
- Due to its compact construction, it can be directly connected to a miniature contactor, magnet operated valve or programmable logic control (PLC)
- Rugged stainless steel housing

Dimensions



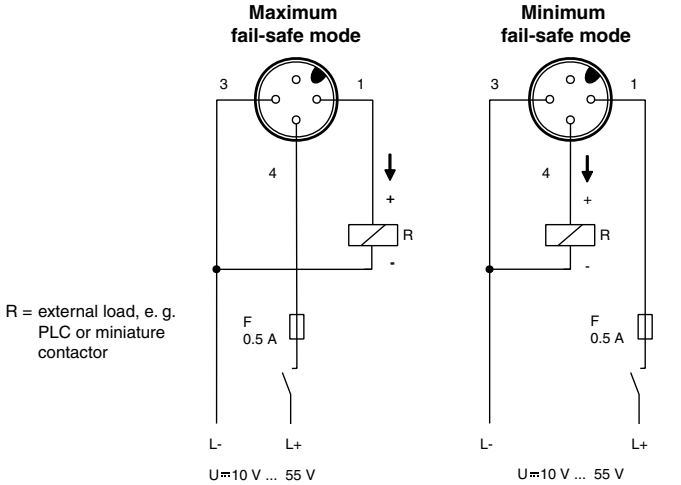
A) Electrical connection via a circular device connector M12 x 1 (ignition protection class IP66/68)
B) Welded housing made of corrosion resistant steel
C) The switching function can be checked from outside the vessel using a magnet (mounted directly on the housing)
D) Process connection versions, all made of corrosion resistant steel
E) Vibration fork made of solid corrosion resistant steel
F) Red light-emitting diode for switch indicator "circuit cut off"
G) Green light-emitting diode "ready to operate"

Function

The symmetrical vibrating probe vibrates at its resonance frequency. If it is submerged in liquid, this frequency changes, and the electronics activate the switching transistor on the PNP output.

The Vibracon LVL-S1 can be operated in minimum or maximum closed circuit safety, i. e. the switching transistor closes in the case of obtaining the limit level, by fault and by power failure.

Electrical connection



R = external load, e. g. PLC or miniature contactor

Electrical connection depends on the protective circuit

No protective grounding connection, protection against indirect contact in accordance with EN 60204-1 or EN 61010-1

Viewed from the pin of the plug connector.

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Application	
Description	level limit switch for application in storage tank, stirring container and pipeline with liquids
Output characteristics	
Signal on alarm	output locked
Fail safe mode	minimum/maximum closed circuit safety, determined by the way of connection
Switching time	when covering the sensor approx. 0.5 s, when uncovering the sensor approx. 1.0 s
Load	load switched via PNP transistor - transient: (1 s) max. 1 A, max. 55 V (pulsed overload and short-circut protection) - continuous: max. 350 mA, max. 0.5 µF at 55 V, max. 1.0 µF at 24 V - residual voltage < 3 V (with closed transistor) - residual current < 100 µA (with open transistor)
Auxiliary energy	
Electrical connection	output E5: 3-wire DC connection, positive signal on the sensor switch output (PNP)
Supply voltage	10 ... 55 V DC
Current consumption	max. 15 mA
Residual ripple	max. 1.7 V, 0 ... 400 Hz
Reverse polarity protection	yes
Performance characteristics	
Hysteresis	approx. 4 mm with vertical mounting
Operating conditions	
Mounting conditions	
Installation position	any position
Ambient conditions	
Ambient temperature	-40 ... 70 °C (233 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Process conditions	
Medium temperature	-40 ... 150 °C (233 ... 423 K)
Process pressure (static pressure)	-1 ... 40 bar
Density	min. 0.7 g/cm^3
Viscosity	up to 10000 mm^2/s
Mechanical specifications	
Protection degree	IP66/68 (24 h, 1.5 m), when using the corrct connector
Mechanical construction	
Construction type	compact device
Versions	see type code
Dimensions	see dimensions
Mass	approx. 500 g
Material	process connection and vibration fork: stainless steel 1.4571/316Ti housing: stainless steel 1.4404/316L, welded plug connector: stainless steel 1.4571/316Ti viewing windows for LEDs: glass
Surface quality	high polished: R_a < 0.5 µm/240 grit polished: R_a < 1.5 µm/120 grit standard: R_a < 3.2 µm/80 grit
Process connection	- conical thread 1 NPT in acc. with ANSI B 1.20.1 - cylindrical thread G1A in acc. with DIN ISO 228/1 with flat seal 33 x 39 in acc. with DIN 7603 - flush mounted version for welding adapter in acc. with company standard - Triclamp 1½", 2" acc. to ISO 2852 - dairy coupling DN 50 in acc. with DIN 1185 The specified limits for temperature and pressure apply in each case to the limit switch with special process connection. Also note the limits for the seal and clamping ring used!
Electrical connection	plug connector M12 x 1, 4-pin (without protective earthing connection)
Indication and operation	
Display elements	The LED display is on the connection side of the LVL-S1. green LED: indication of ready to operate red LED: switch indication circuit cut off
Function test	function test with test magnet: Put the testing magnet to the shown location (see graph). The vibration fork reacts with the test magnet as in the case of covering with fluid.
General information	
Directive conformity	
Directive 89/336/EC (EMC)	emitted interference to EN 50081-1 and EN 61326, class B equipment interference immunity to EN 50082-2 (field strength 10 V/m) and EN 61326, annex A (industrial sector)
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a

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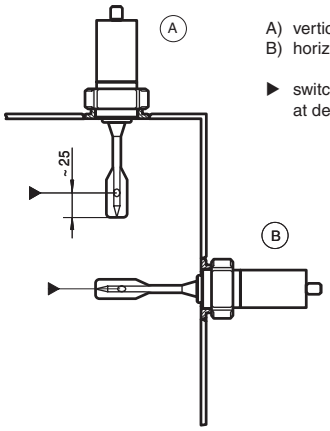
Supplementary documentation	operating instructions KA081O operating instructions KA032O weld-in adapter G1A (LVL-Z70) operating instructions KA151O sliding sleeve for unpressurised operation G1A, 1 NPT (LVL-Z120, LVL-Z122) operating instructions KA153O high pressure sliding sleeve G1A, 1 NPT (LVL-Z124, LVL-Z125, LVL-Z128, LVL-Z129) operating instructions electrical connection LVL-S1
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

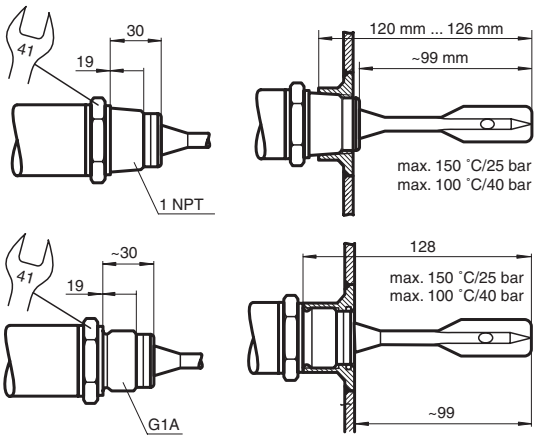
Mounting position



A) vertical installation
B) horizontal installation

▶ switching point depending on the installation direction at density 0.7 g/cm³

Dimensions process connections



Process connection N3 = 1 NPT

Process connection G3 = G1A

Mounting accessories: welding adapter (without vibrating fork alignment) with FPM O-ring (Viton) LVL-Z70

Process connection flush mounted

Accessories

- LVL-Z15, test magnet
- LVL-Z64, socket spanner
- LVL-Z70, welding bushing for vessels G1, viton sealing
- LVL-Z120, sliding sleeve for unpressurised operation G1A
- LVL-Z122, sliding sleeve for unpressurised operation 1 NPT
- LVL-Z124, high pressure sliding sleeve G1A
- LVL-Z125, high pressure sliding sleeve G1A
- LVL-Z128, high pressure sliding sleeve 1 NPT
- LVL-Z129, high pressure sliding sleeve 1 NPT
- V1-G, mating connector, straight
- V1-G-2M-PVC, mating connector, straight, with 2 m (6.6 ft) cable
- V1-W, mating connector, 90° angled
- V1-W-2M-PVC, mating connector, 90° angled, with 2 m (6.6 ft) cable

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Type code/model number

L	V	L	–	S	1	–				–	E	5	V	1	–	N	A

Approvals
NA no approval

Special features
V1 connector M12 x 1; V1

Electrical output
E5 10 V DC ... 55 V DC, PNP, 3-wire

Fork surface
S standard surface, R_a < 3.2 µm
O polished version, R_a < 1.5 µm
G high-polished version, R_a < 0.5 µm

Process connection
G3 G1A BSP, DIN ISO 228/1, 1.4571/316Ti
N3 1 NPT, ANSI B 1.20.1, 1.4571/316Ti
M7 DN50, sanitary coupling DIN 1185, 1.4571/316Ti
S1 flush mounted for welding sleeve, 1.4571/316Ti
T5 1½", Triclamp ISO 2852, 1.4571/316Ti
T6 2", Triclamp ISO 2852, 1.4571/316Ti

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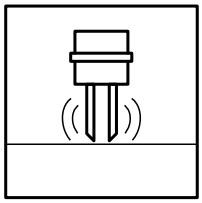
Vibration limit switch

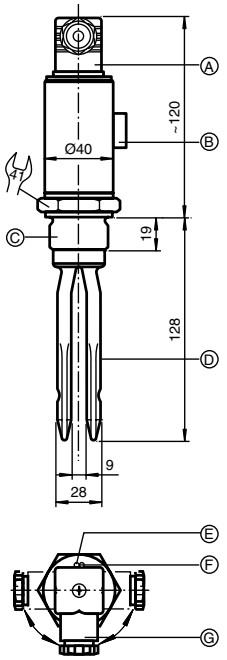
LVL-T1



Features

- Level limit switch for liquids
- External test option using test magnet
- On-site function control using external LED display
- Easy to install even at points difficult to access due to compact design
- Due to its compact construction, it can be directly connected to a miniature contactor, magnet operated valve or programmable logic control (PLC)
- Rugged stainless steel housing
- Cost-saving plug connections

Dimensions



A) PG11 cable gland (IP65/IP67)
B) Test magnet
C) G1A (cylindrical), 1 NPT (conical), R 1 (conical), made of corrosion resistant steel
D) Vibration fork made of heavy duty corrosion resistant steel
E) Green light-emitting diode "ready to operate"
F) Red light-emitting diode for switch indicator "circuit cut off"
G) The connector housing can be mounted at a 90˚ angle.

LVL-T1-**S-**PG-**

Function

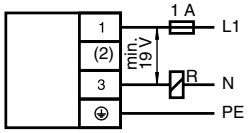
The symmetrical vibrating probe vibrates at its resonance frequency. If it is submerged in liquid, this resonance frequency changes, and the electronics activate an electronic switch.

The Vibracon LVL-T1 can be operated in minimum or maximum closed circuit safety, i. e. the electronic switch closes by obtaining the limit level, by fault and by power failure.

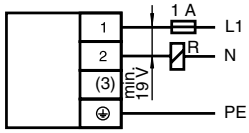
Electrical connection

Connection output WA

Maximum fail-safe mode



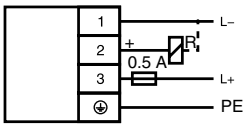
Minimum fail-safe mode



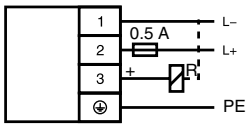
Connection output E5

R = external

Maximum



Minimum



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Application	
Description	level limit switch for application in storage tank, stirring container and pipeline with liquids
Output characteristics	
Signal on alarm	output locked
Fail safe mode	minimum/maximum closed circuit safety, determined by the way of connection
Switching time	when covering the sensor approx. 0.5 s, when uncovering the sensor approx. 1.0 s
Load	output WA (load switched across thyristor directly in power supply circuit): - transient (40 ms): max. 1.5 A, max. 375 VA at 250 V or max. 36 VA at 24 V (not short- circuit proof) - continuous: max. 87 VA at 250 V, max. 8.4 VA at 24 V; min. 2.5 VA at 250 V (10 mA), min. 0.5 VA at 24 V (20 mA) - residual current max. 4 mA with blocked thyristor output E5 (the load is switched via a transistor and a separate connection): - transient (1 s): max. 1 A, max. 55 V (overload and short-circuit protection) - continuous: max. 350 mA max. 0.5 µF at 55 V, max. 1 µF at 24 V - residual voltage < 3 V (with closed transistor) - residual current < 100 µA (with open transistor)
Auxiliary energy	
Electrical connection	output WA: Always connect the LVL-T1 in series with a load! Take into account the voltage drop via the LVL-T1 when switched in circuit and the residual current when isolated (see technical data, output) and, for low supply voltages, take into account the voltage drop via the load, in order to ensure that the terminal voltage on the LVL-T1 does not fall below the permissible value. output E5: Should be used in conjunction with programmable logic controllers (PLC), positive signal on the sensor switch output (PNP). The protective circuit is implemented in the connection.
Supply voltage	output WA: 19 ... 253 V AC, 50/60 Hz, output E5: 10 ... 55 V DC
Current consumption	output WA: max. 4 mA (stand by), output E5: max. 15 mA
Residual ripple	output E5: max. 1.7 V, 0 ... 400 Hz
Voltage drop	output WA: max. 12 V
Reverse polarity protection	yes
Performance characteristics	
Hysteresis	approx. 4 mm with vertical mounting
Operating conditions	
Mounting conditions	
Installation position	any position
Ambient conditions	
Ambient temperature	-40 ... 70 °C (233 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Process conditions	
Medium temperature	-40 ... 150 °C (233 ... 423 K)
Process pressure (static pressure)	-1 ... 40 bar
Density	min. 0.7 g/cm^3
Viscosity	max. 10000 mm^2/s (10000 cSt)
Mechanical specifications	
Protection degree	IP65/IP67 with connector (cable gland PG11)
Mechanical construction	
Construction type	compact device
Versions	- LVL-T1-G3S-E5PG-NA, process connection G1, 10 ... 55 V DC, PNP 3-wire, connector PG11 - LVL-T1-G3S-E5PG-WH, process connection G1, 10 ... 55 V DC, PNP 3-wire, connector PG11, overspill protection WHG - LVL-T1-G3S-WAPG-WH, process connection G1, 19 ... 253 V AC, 3-wire, connector PG11, overspill protection WHG All above-mentioned versions are also available with thread 1 NPT.
Dimensions	see dimensions
Mass	approx. 450 g
Material	process connection and vibration fork: stainless steel 1.4571/316Ti housing: stainless steel 1.4404/316L housing cover: PPSU connector: PA plug seal: elastomer flat seal ring for process connection G1A: elastomer fibre, asbestos-free, unaffected by oils, solvents, vapour, weak acids and alkalis
Surface quality	R_a < 3.2 µm/80 grit
Process connection	- cylindrical thread G1A in acc. with DIN ISO 228/1 with flat seal 33 x 39 in acc. with DIN 7603 - conical thread 1 NPT in acc. with ANSI B 1.20.1 - conical thread R1 in acc. with DIN 2999, part 1
Electrical connection	4-pin plug connection in acc. with DIN 43650-A, ISO 4400 with cable gland PG11, for cable diameter 6 ... 9 mm (0.24 ... 0.35 in), max. conductor cross section 1.5 mm^2

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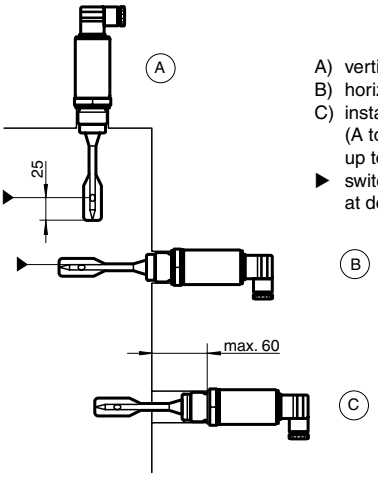
Indication and operation	
Display elements	The LED display is on the connection side of the LVL-S1. green LED: indication of ready to operate red LED: switch indication circuit cut off
Function test	function test with test magnet: Put the testing magnet to the shown location (see graph). The vibration fork reacts with the test magnet as in the case of covering with fluid.
Certificates and approvals	
Overspill protection	Z-65.11-302 (overspill protection in acc. with WHG)
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	output WA: EN 50178
Directive 89/336/EC (EMC)	emitted interference to EN 50081-1 and EN 61326, class B equipment interference immunity to EN 50082-2 (field strength 10 V/m) and EN 61326, annex A (industrial sector)
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a
Supplementary documentation	operating instructions KA035O operating instructions KA032O weld-in adapter G1A (LVL-Z70) operating instructions KA151O sliding sleeve for unpressurised operation G1A, 1 NPT (LVL-Z120, LVL-Z122) operating instructions KA153O high pressure sliding sleeve G1A, 1 NPT (LVL-Z124, LVL-Z125, LVL-Z128, LVL-Z129) approval ZE186O overspill protection in acc. with WHG (Z-65.11-302)
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Mounting position



A) vertical installation
B) horizontal installation
C) installation in 1" nozzles
(A to C for the entire viscosity range
up to 10000 mm²/s)
▶ switching point depending on the installation direction
at density 0.7 g/cm³

Accessories

- LVL-Z15, test magnet
- LVL-Z64, socket spanner
- LVL-Z70, welding bushing for vessels G1, viton sealing
- LVL-Z120, sliding sleeve for unpressurised operation G1A
- LVL-Z122, sliding sleeve for unpressurised operation 1 NPT
- LVL-Z124, high pressure sliding sleeve G1A
- LVL-Z125, high pressure sliding sleeve G1A
- LVL-Z128, high pressure sliding sleeve 1 NPT
- LVL-Z129, high pressure sliding sleeve 1 NPT

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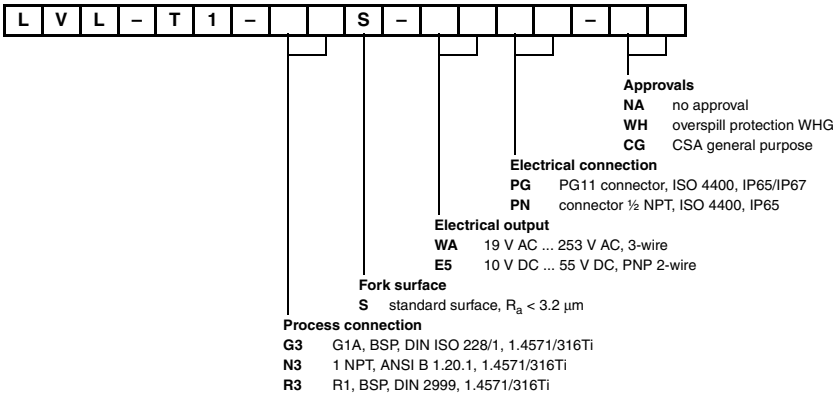
Type code/model number



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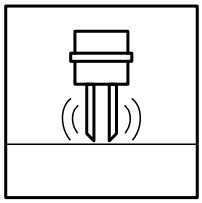
Vibration limit switch

LVL-M*

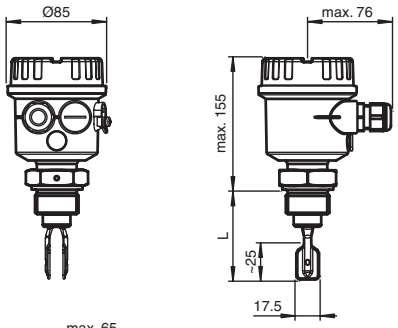


Features

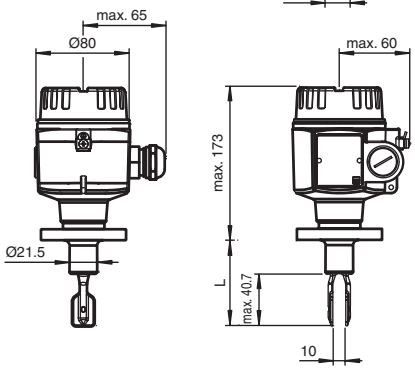
- Level limit switch for liquids
- Large number of process connections to choose from: universal usage
- Wide variety of electronic modules: the right connection for every process control system
- No calibration: quick and low-cost start-up
- No mechanically moving parts: maintenance-free, no wear, long operating life
- Monitoring of the vibrating fork for damage: guaranteed function
- PROFIBUS PA protocol: commissioning and maintenance quick and easy
- Up to SIL2 acc. to IEC 61508

Dimensions

Vibracon LVL-M* with plastic housing and process connection G**



Vibracon LVL-M* with aluminium housing and process connection with flange



Additional dimensions see section dimensions.
Length L see process connections.

Function

The Vibracon is a level limit switch for use in all liquids.

- for temperature of -50 °C (223 K) to +150 °C (423 K)
- for pressures up to 64 bar
- for viscosities up to 10000 mm²/s
- for densities up to 0.5 g/cm³ or 0.7 g/cm³ (other settings available on request)

The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or build-up, the Vibracon is thus the ideal substitute for float switches.

The compact version is ideal for mounting in pipes (LVL-M1). In addition there is a version with extension tube up to 6 m (20 ft) (LVL-M2).

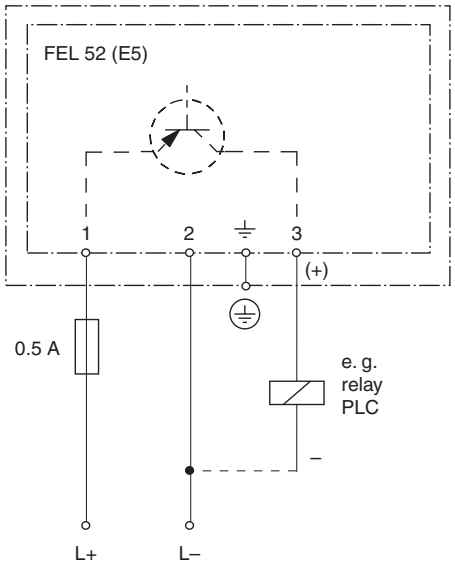
High corrosion-resistant Alloy C4 (2.4610) is available for the vibration fork and process connection for applications in very aggressive liquids.

EEx ia, EEx de and EEx d protection enable it to be used in hazardous areas.

Electrical connection

Connection FEL 52 (E5) 3-wire DC connection (example)

- preferably for use with memory programmable controls (PLC)
- positive signal at the switch output of the electronics (PNP)
- Output blocked on reaching limit level.
- also in compact housing with plug connection available



Other connection types see section electrical connection.

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Application	
Function principle	limit detection maximum or minimum detection in tanks or pipelines containing all types of liquids including use in explosion hazardous areas
Function and system design	
Measuring principle	The forks of the sensors vibrate at their intrinsic frequency, this frequency is reduced when covered with liquid. The change in frequency then activates the limit switch.
Input characteristics	
Measured variable	limit level (limit value)
Measurement range	LVL-M1: depends on mounting point LVL-M2: depends on mounting point and pipe extension up to 6000 mm (20 ft)
Medium density	adjustment on the electronic insert > 0.5 g/cm^3 or > 0.7 g/cm^3 (other on request)
Output characteristics	
Fail safe mode	switch-over for minimum/maximum residual current safety on electronic insert MAX = maximum safety: The output switches to the power fail response when the fork is covered. for use with overspill protection for example MIN = minimum safety: The output switches to the power fail response when the fork is exposed. for use with dry running protection for example
Switching time	when fork is covered: approx. 0.5 s, when fork is exposed: approx. 1.0 s (other switching times on request) additionally configurable for PROFIBUS PA (electronic insert FEL50A (PA)): 0.5 ... 60 s
Switch-on response	when switching on the power supply the output assumes the alarm signal, after max. 3 s it assumes the correct switching mode
Auxiliary energy	
Supply voltage	electronic insert FEL50A (PA): 9 ... 32 V DC electronic insert FEL51 (AC): 253 V AC, 50/60 Hz electronic insert FEL52 (E5): 10 ... 55 V DC electronic insert FEL54 (WA): 19 ... 253 V AC, 50/60 Hz or 19 ... 55 V DC electronic insert FEL55 (SI): 11 ... 36 V DC, PLC electronic insert FEL56 (N1), FEL58 (N2): isolating amplifier acc. to EN 60947-5-6 (NAMUR)
Connecting cable	electronic inserts: cross section max. 2.5 mm^2, strand in ferrule in acc. to DIN 46228 protective earth in housing: cross section max. 2.5 mm^2 external equipotential bonding connection on housing: cross section 4 mm^2
Power consumption	electronic insert FEL52 (E5): max. 0.83 W electronic insert FEL54 (WA): max. 1.3 W
Current consumption	electronic insert FEL52 (E5): max. 15 mA
Performance characteristics	
Reference operating conditions	ambient temperature: 23 °C (296 K), medium temperature: 23 °C (296 K), product density: 1 g/cm^3 (water), viscosity: 1 mm^2/s, medium pressure p_e: 0 bar, sensor mounting: vertical from above, density switch: to > 0.7 g/cm^3
Maximum measured error	max. ± 1 mm, specified by mounting position
Non-repeatability	0.1 mm
Hysteresis	approx. 2 mm (0.08 in)
Influence of medium density	max. +4.8 ... -3.5 mm (+0.19 ... -0.14 in) (0.5 ... 1.5 g/cm^3)
Influence of medium temperature	max. +1.4 ... -2.8 mm (+0.05 ... -0.11 in) (-40 ... +150 °C (233 ... 423 K))
Influence of medium pressure	max. 0 ... -2.5 mm (0 ... -0.1 in) (-1 ... 64 bar)
Operating conditions	
Mounting conditions	
Installation position	LVL-M1: any position LVL-M2: with short pipe (up to 500 mm (19.7 in)) any position, with long pipe vertical
Ambient conditions	
Ambient temperature	-50 ... 70 °C (223 ... 343 K), function with reduced data values see section ambient temperature
Storage temperature	-50 ... 80 °C (223 ... 353 K)
Overvoltage protection	electronic insert FEL51 (AC), electronic insert FEL52 (E5), electronic insert FEL54 (WA), electronic insert FEL55 (SI): overvoltage category III
Process conditions	
Medium temperature	-50 ... 150 °C (223 ... 423 K), for exceptions see process connections
Medium pressure	p_e = -1 ... 64 bar over the entire temperature range, exceptions see process connections
Test pressure	max. 100 bar (1.5 times the medium pressure p_e), no function during test pressure, burst pressure of diaphragm 200 bar
Thermal shock resistance	max. 120 °C/s (max. 120 K/s)
State of aggregation	liquid
Density	min. 0.5 g/cm^3 (compact housing 0.7 g/cm^3), other density settings on request
Viscosity	max. 10000 mm^2/s (max. 10000 cSt)
Solid contents	max. Ø 5 mm
Mechanical specifications	

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Protection degree	polyester, steel and aluminium housing: IP66/IP67 compact housing: - IP65 with valve connector PG11 or ½ NPT - IP66/IP68 with M12 x 1 connector without LEDs (1.4435/316L) - IP69K with M12 x 1 connector1 with LEDs (1.4435/316L)
Mechanical construction	
Construction type	LVL-M1: compact design LVL-M2: version with extension tube
Dimensions	housing: diameter max. 85 mm (3.3 in), height max. 173 mm (6.8 in) temperature separator, pressure-tight bushing: additional length L 140 mm (5.5 in) process connection: length L 66.5 ... 80 mm (2.6 ... 3.1 in) extension: any length L from 148 ... 6000 mm (6 in ... 20 ft), depending on the process connection extension: length type II, for vertical installation from above same switching point as Vibracon LVL1, LVL2 vibration fork: width 17.5 mm (0.7 in), fork width 10 mm (0.4 in), length 25 mm (1 in)
Mass	600 g, basic weight: compact sensor, electronic insert, stainless steel housing, process connection G2*, additional weight is dependent on extension tube, housing and process connection
Additional weight	process connections: - A3* 1000 g, A4* 1200 g, A5* 1500 g, A6* 2400 g, A72 4800 g, A81 4900 g, A82 6800 g, A91 7000 g, A92 11.5 kg, A93 17.3 kg - C45 1400 g, C51 1200 g, C71 1600 g, C75 3200 g, C95 5900 g, CA3 5600 g - D45 1400 g, D51 1200 g, D71 1600 g, D75 3200 g, D7A 300 g, D7D 300 g, D95 5900 g, DA3 5600 g - F45 1400 g, F51 1200 g, F55 2000 g, F61 1400 g, F65 2400 g, F71 1600 g, F75 3200 g, F7F 2600 g, F81 2400 g, F85 4300 g, F93 4800 g, F95 5900 g, FA3 5600 g, FA5 7500 g - G3* 200 g - J13 no information, J16 no information, J17 1700 g, J19 no information, J1A no information, J1C 1700 g - N3* 200 g, N75 2900 g - R3* 200 g - T51 no information, T61 100 g length, spacers, bushings: - B* 900 g/m, C* 2300 g/100 in - D* 100 g - I* 600 g - J* 900 g/m and 600 g, K* 2300 g/100 in and 600 g - L*, Q* 700 g - R* 900 g/m and 700 g, S* 2300 g/100 in and 700 g - T* 800 g
Material	wetted parts: - process connection and extension pipe: 1.4435/316L or 2.4610/Alloy C4 - vibration fork: 1.4435/316L or 2.4610/Alloy C4 - flat seal for process connection G2* or G3*: elastomer fibre, asbestos-free housings: - polyester housing: PBT-FR with PBT-FR cover or with PA12 cover with sight glass, cover seal: EPDM - stainless steel housing: 1.4301/304, cover seal: silicone - aluminium housing: EN-AC-AlSi10Mg, plastic-coated, cover seal: EPDM - compact housing with valve connector or M12 connector: 1.4435/316L cable gland: polyamide or brass, nickel-plated temperature spacer: 1.4435/316L pressure-tight bushing: 1.4435/316L
Surface quality	R_a < 3.2 µm/80 grit: length, spacer, bushings *A, *B, *E
Switching point	see section switch point
Process connection	- cylindrical thread G¾A, G1A to DIN ISO 228/1 with flat seal to DIN 7603 - conical thread R¾, R1 to DIN 2999, part 1 - conical thread ¾ -14 NPT, 1 - 11½ NPT to ANSI B 1.20.1 - flush-mounted with welding sleeve to factory standard (G¾A, G1A) - flush-mounted with welding neck to factory standard (1"), sensor can be positioned - Triclamp 1½", 2" to ISO 2852 - flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1", to JIS B 2238 (RF) from DN25 for additional information see type code
Indication and operation	
Display elements	electronic inserts: - electronic inserts FEL50 A (PA), FEL58 (N2): green LED, yellow LED - electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): green LED, red LED compact housings: compact housing with valve connector - electronic version FEL51 (AC), FEL52 (E5): green LED, red LED - electronic version FEL58 (N2): green LED, yellow LED compact housing with M12 x 1 round connector without LEDs - electronic version FEL52 (E5): green LED, yellow LED, red LED - electronic version FEL58 (N2): green LED, yellow LED compact housing with M12 x 1 round connector with LEDs - electronic version FEL52 (E5): green LED, two yellow LEDs

Operating elements	electronic insert FEL50A (PA): 8 switches for device address setting electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): two switches for fail-safe mode and density change electronic insert FEL58 (N2): two switches for fail-safe mode and density change and one test button interrupts lead
Function test	compact housing: function test with test magnet electronic versions FEL51 (AC), FEL52 (E5) and FEL58 (N2): During the test, the current state of the electronic switch is reversed.
Certificates and approvals	
Ex approval	KEMA 01 ATEX 1089, KEMA 01 ATEX 1147 X, KEMA 01 ATEX 2117, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 and ⟨Ex⟩ II 1/2D T80°C (KEMA 01 ATEX 1089) ⟨Ex⟩ II 1G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X) ⟨Ex⟩ II 1/2G EEx d IIC T3 ... T6 or EEx d IIB T3 ... T6 (KEMA 01 ATEX 2117) ⟨Ex⟩ II 3G EEx nA/nC II T6 and ⟨Ex⟩ II 3D T85°C
SIL classification	up to SIL2 acc. to IEC 61508
Overspill protection	Z-65.11-306 (overspill protection in acc. with WHG)
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector) If the fork tines are joined together on account of build-up, the useful signal is attenuated to such an extent that the original EMC values can no longer be completely observed (EN 61000-4-3 electromagnetic fields, EN 61000-4-6 HF coupling).
Directive 94/9 EC (ATEX)	EN 50014, EN 50018, EN 500020, EN 500021, EN 50284, EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a
Vibration resistance	EN 60068-2-6, 10 ... 50 Hz, 0.15 mm, 100 cycles
Supplementary documentation	technical information TI328O operating instructions KA143O (LVL-M*) operating instructions KA220O (LVL-M** with compact housing) operating instructions BA141O (electronic insert FEL50A (PA)) operating instructions KA140O weld-in socket G1 (LVL-Z102) operating instructions KA141O weld-in adapter G1 (LVL-Z101) operating instructions KA142O weld-in adapter G¾ (LVL-Z100) operating instructions KA151O sliding sleeve for unpressurised operation G1A, 1 NPT (LVL-Z120, LVL-Z122) operating instructions KA152O sliding sleeve for unpressurised operation G1½A, 1½ NPT (LVL-Z121, LVL-Z123) operating instructions KA153O high pressure sliding sleeve G1A, 1 NPT (LVL-Z124, LVL-Z125, LVL-Z128, LVL-Z129) operating instructions KA154O high pressure sliding sleeve G1A, 1 NPT (LVL-Z126, LVL-Z127, LVL-Z130, LVL-Z131) safety information SI031O (KEMA 01 ATEX 2117) safety information SI063O (KEMA 01 ATEX 1089) safety information SI064O (KEMA 01 ATEX 1147 X) safety information SI154O (KEMA 01 ATEX 1089), PROFIBUS PA version safety information SI159O (KEMA 01 ATEX 11147 X), PROFIBUS PA version safety information SI182O (⟨Ex⟩ II 3G EEx nA/nC II T6 and ⟨Ex⟩ II 3D T85°C) approval ZE233O overspill protection acc. to WHG (Z-65.11-306) FM installation drawing ZD041O CSA control drawing ZD042O
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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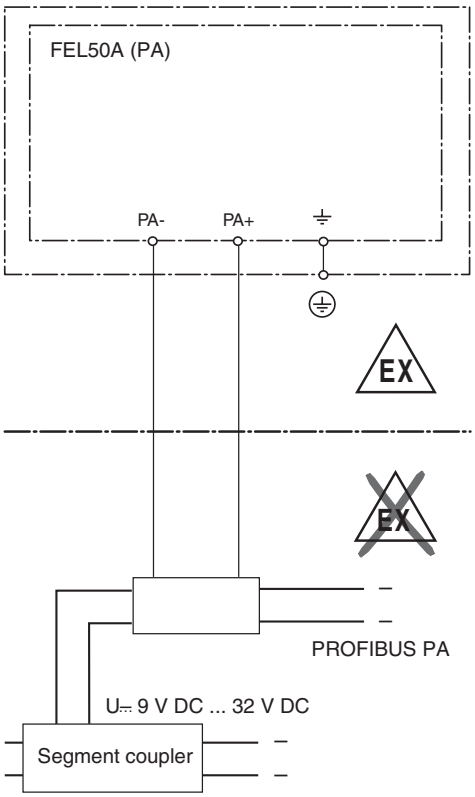
Electrical connection

Electronic insert FEL50A (PA)

Two-wire connection for power supply and data transfer for connecting to PROFIBUS PA

Additional functions:

- Digital communication enables the representation, reading and editing of the following parameters: fork frequency, switch-on frequency, switch-off frequency, switch-on time and switch-off time, status, measured value, density switch.
- Matrix locking possible.
- Switch to WHG mode possible (WHG approval).
- You can also visit www.profibus.com for more information.



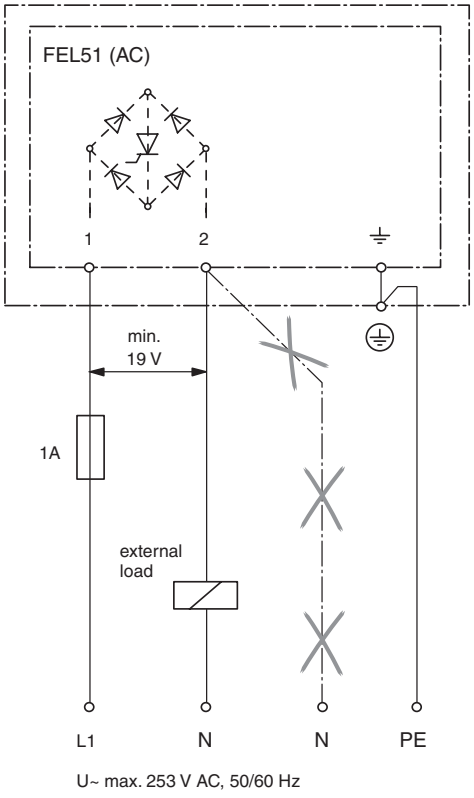
Electronic insert FEL51 (AC)

Two-wire AC connection

Always connect in series with a load!

Check the following:

- the residual current in blocked state (up to 3.8 mA)
- that for low voltage
  - The voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
  - The voltage drop across the electronics when switched through is observed (up to 12 V).
- that a relay cannot de-energise with holding power below 3.8 mA
  If this is the case, a resistor should be connected parallel to the relay (RC module available on request).
- When selecting the relay, pay attention to the holding power/rated power (see connectable load).



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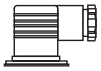
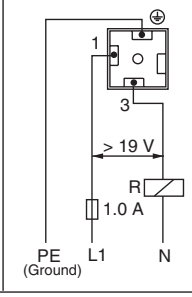
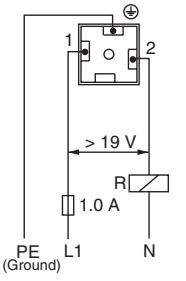
Electrical connection

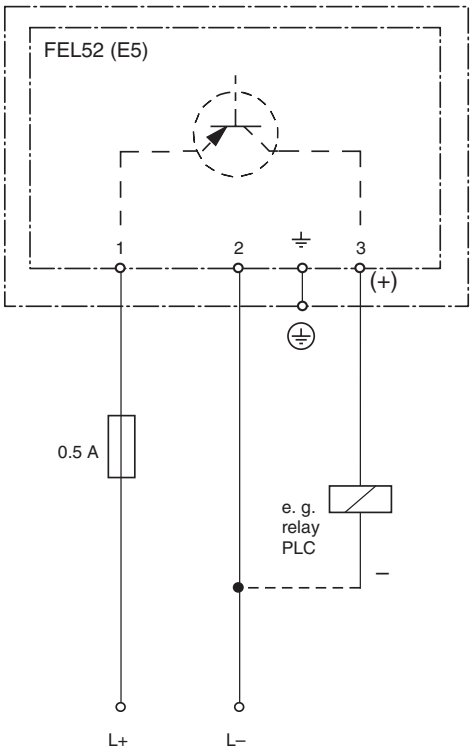
Electronic FEL51 (AC) in compact housing

Connection	MAX	MIN
Housing C2 (½ NPT) or Housing C6 (PG11) 		

Electronic insert FEL52 (E5)

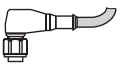
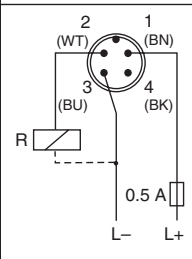
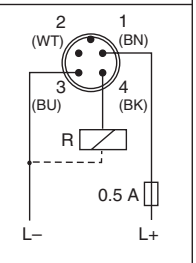
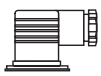
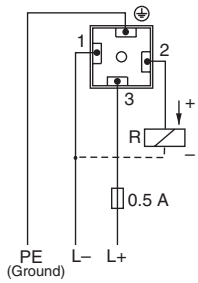
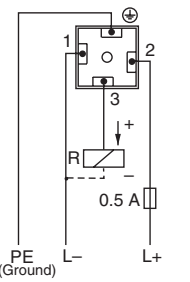
Three-wire DC connection

- preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2.
- positive signal at switching output of the electronics (PNP)
- Output blocked on reaching limit.



$U_{\sim}$ 10 V DC … 55 V DC

Electronic FEL52 (E5) in compact housing

Connection	MAX	MIN
Housing C4 (M12 x 1), connector with LEDs  Housing C4 (M12 x 1), connector without LEDs 		
Housing C2 (½ NPT) or Housing C6 (PG11) 		

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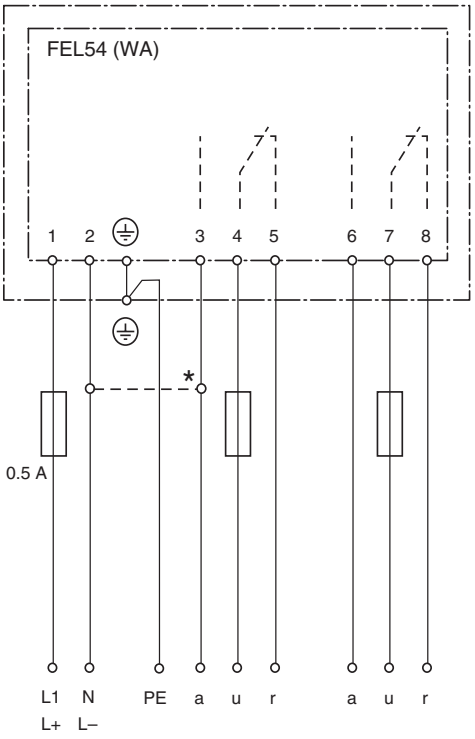
Electrical connection

Electronic insert FEL54 (WA)

Universal current connection with relay output

- Power supply:
  Please note the different voltage ranges for AC and DC.
- Output:
  When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact.
  A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting.
  Both relay contacts switch simultaneously.

* When jumpered, the relay output works with NPN logic.

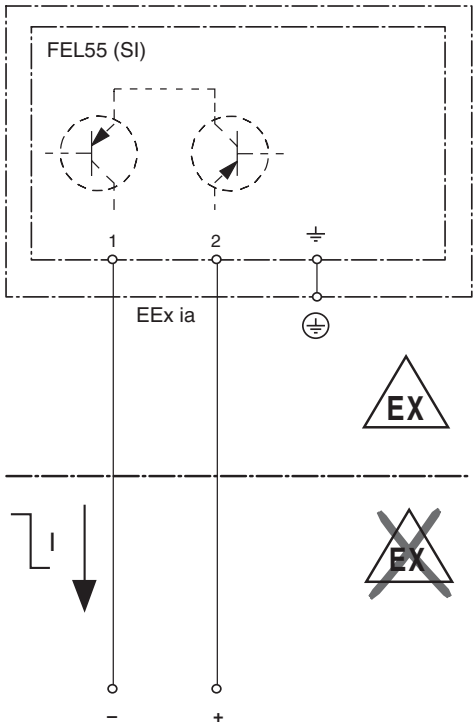


U~ 19 V AC … 253 V AC, 50/60 Hz
U– 19 V DC … 55 V DC

Electronic insert FEL55 (SI)

Two-wire connection for separate switching unit

- for connecting to programmable logic controllers (PLC) for example, AI module 4 mA ... 20 mA to EN 61131-2
- Output signal jump from high to low current on limit **(H-L edge)**



U⎓ 11 V DC … 36 V DC
e. g. PLC

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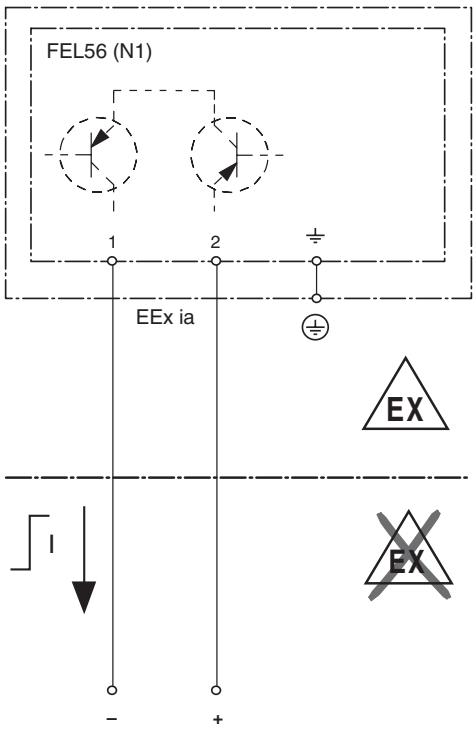
Electrical connection

Electronic insert FEL56 (N1)

Two-wire connection for separate switching unit

- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from low to high current on limit **(L-H edge)**

Connecting to multiplexer: set clock time to min. 2 s.



Isolated switch amplifiers
according to IEC 60947-5-6 (NAMUR)

Electronic insert FEL58 (N2)

Two-wire connection for separate switching unit

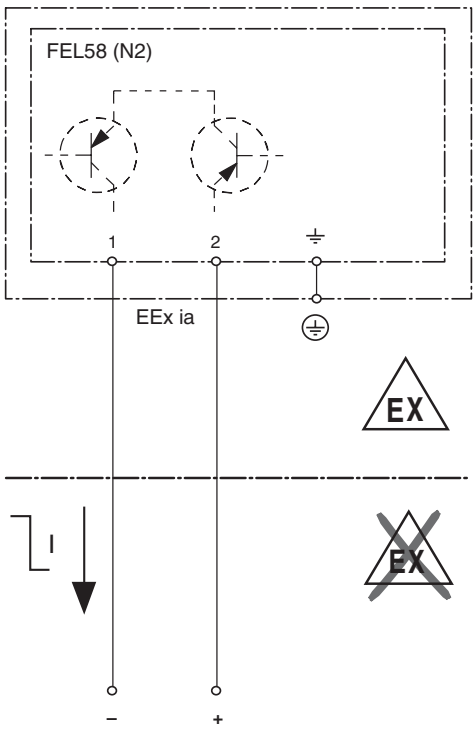
- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. Isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from high to low current on limit **(H-L edge)**

Additional function:
Test key on the electronic insert. Pressing the key breaks the connection to the isolating amplifier.

Connecting to multiplexer: set clock time to min. 2 s.

Note

For Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.



Isolated switch amplifiers
according to IEC 60947-5-6 (NAMUR)

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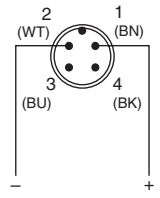
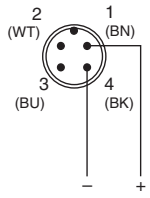
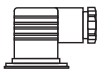
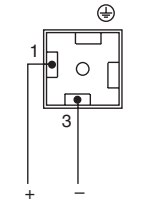
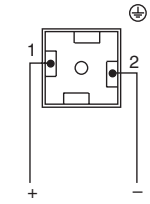
Electrical connection

Electronic FEL58 (N2) in compact housing

Connection	MAX	MIN
Housing C4 (M12 x 1), connector with LEDs 		
Housing C4 (M12 x 1), connector without LEDs 		
Housing C2 (½ NPT) or Housing C4 (PG11) 		

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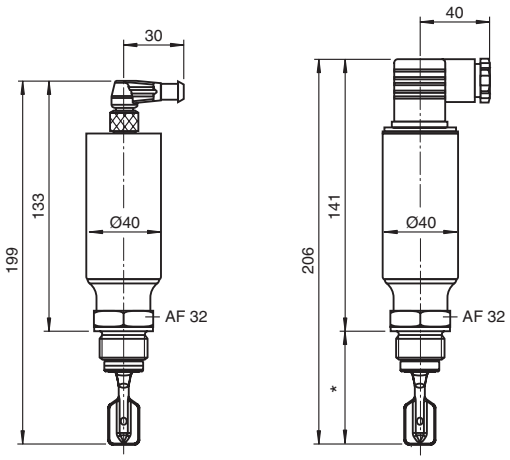
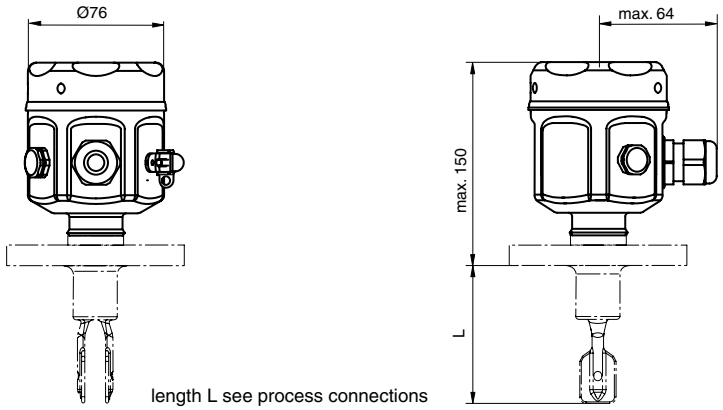
Dimensions

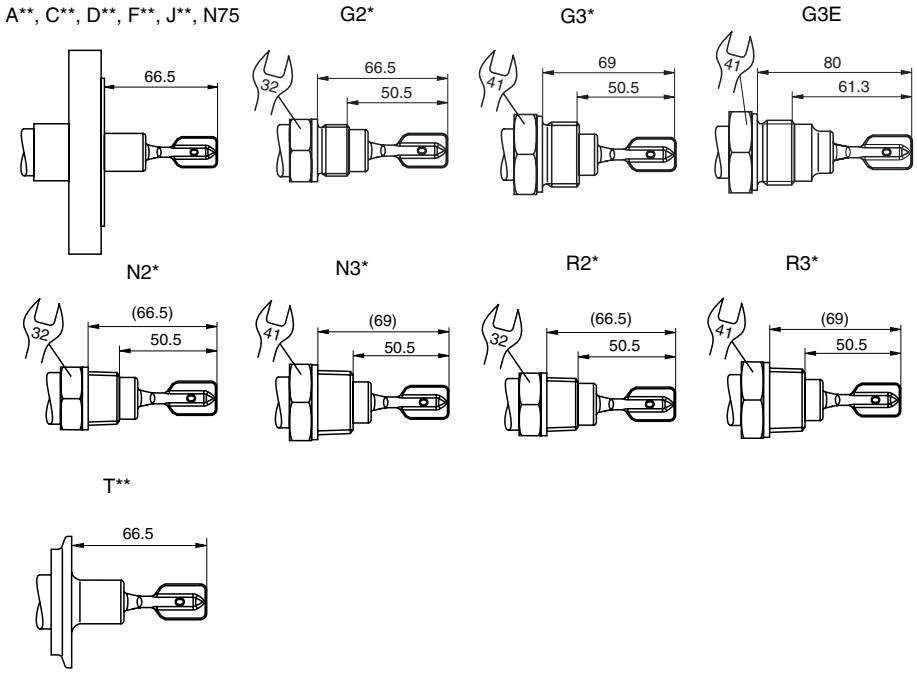
Compact housing C*



Stainless steel housing E*



Process connections



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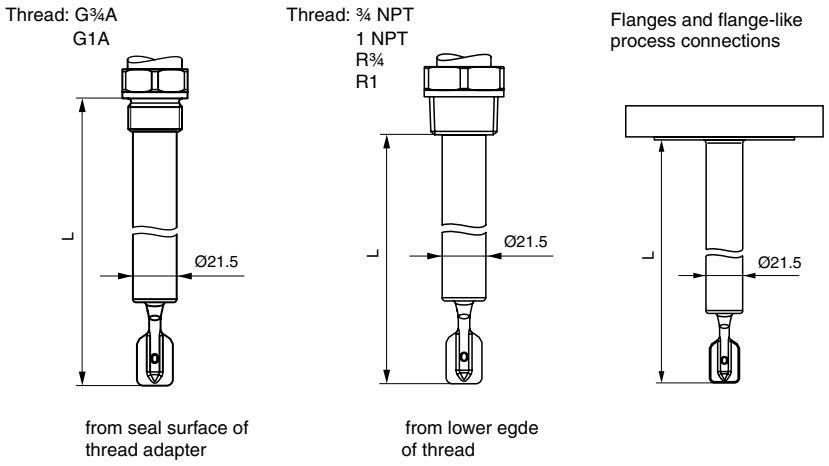
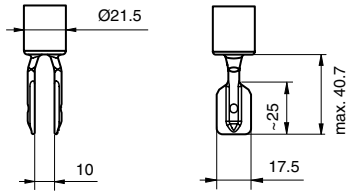
Dimensions

Extension tube

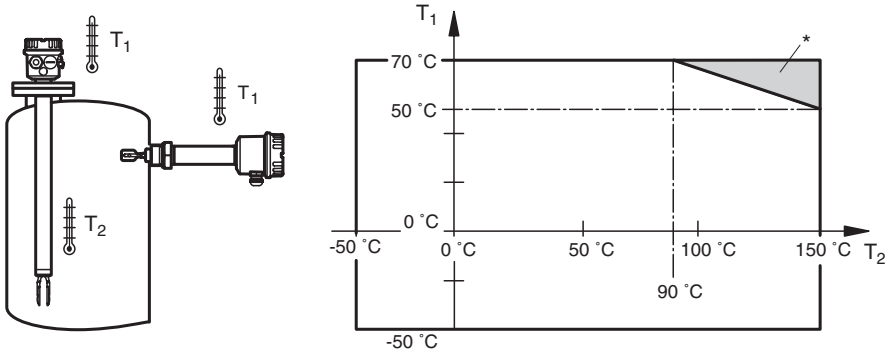


Vibration fork



Ambient temperature

Permissible ambient temperature T_1 at the housing depends on the product temperature T_2 in the vessel:



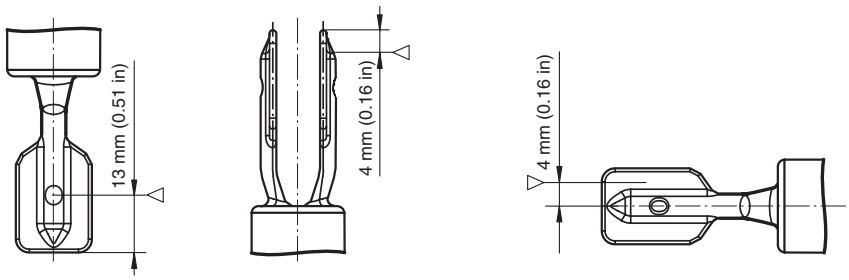
* additional temperature range for sensors with a temperature separator or pressure-tight bushing

Switch point

Switch point ▷ on the sensor depend on the mounting position, with reference to water, density 1 g/cm³, 23 °C (296 K), p_e 0 bar.

Note:

The switch points of the Vibracon LVL-M2C are at other positions to those of the previous versions LVL1, LVL2.



Mounting from above | Mounting from below | Mounting from the side

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Accessories

Welding sleeves

- LVL-Z100, welding sleeve G¾ for flush mounting for process connection G21
- LVL-Z101, welding sleeve G1 for flush mounting for process connection G3E
- LVL-Z102, welding sleeve G1 for flush mounting for process connection G3E

Flanges

- LVL-Z105, lap joint round flange DN50 PN40 form A with G1 thread for process connection G31
- LVL-Z106, lap joint round flange ANSI 2" with G1 thread for process connection G31
- LVL-Z107, lap joint square flange with G1 thread for process connection G31

Sliding sleeves

- LVL-Z120, sliding sleeve for unpressurised operation G1A
- LVL-Z121, sliding sleeve for unpressurised operation G1½A
- LVL-Z122, sliding sleeve for unpressurised operation 1 NPT
- LVL-Z123, sliding sleeve for unpressurised operation 1½ NPT
- LVL-Z124, high pressure sliding sleeve G1A
- LVL-Z125, high pressure sliding sleeve G1A, Alloy C4/2.4610
- LVL-Z126, high pressure sliding sleeve G1½A
- LVL-Z127, high pressure sliding sleeve G1½A, Alloy C4/2.4610
- LVL-Z128, high pressure sliding sleeve 1 NPT
- LVL-Z129, high pressure sliding sleeve 1 NPT, Alloy C4/2.4610
- LVL-Z130, high pressure sliding sleeve 1½ NPT
- LVL-Z131, high pressure sliding sleeve 1½ NPT, Alloy C4/2.4610

Further accessories

- LVL-Z108, cover with glass sight glass for stainless steel housing E*
- LVL-Z109, cover with PC sight glass for stainless steel housing E*
- LVL-Z110, transparent cover for polyester housing P*
- V1-G, mating connector, straight
- V1-W, mating connector, 90° angled

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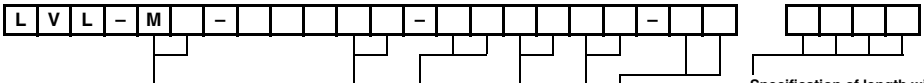
Type code/model number



Specification of length without unit for design M2

Certificates

NA	for non-hazardous areas
WH	WHG overspill protection
E1	Ex II 1G EEx ia IIC T6
E2	Ex II 1/2G EEx ia IIC T6
E3	Ex II 1/2G EEx d IIC T6
EA	Ex II 1G EEx ia IIC T6, WHG
EB	Ex II 1/2G EEx ia IIC T6, WHG
EC	Ex II 1/2G EEx d IIC T6, WHG
EN	Ex II 3G EEx nC IIC T6, WHG
EM	Ex II 3G EEx nA IIC T6, WHG
FI	FM, IS, Cl I, II, III, Div1, Group A–G
FN	FM, NI, Cl I, Div2, Group A–D
FX	FM, XP, Cl I, II, III, Div1, Group A–G
CG	CSA, General Purpose
CI	CSA, IS, Cl I, II, III, Div1, Group A–G
CX	CSA, XP, Cl I, II, III, Div1, Group A–G

Optional equipment

NA	without optional equipment
Z3	3.1.B material, wetted parts 1.4435, inspection certificate to EN 10204

Electronic insert

PA	FEL50 A, PROFIBUS PA
AC	FEL51, contactless 2-wire switch, 19 V AC ... 253 V AC
E5	FEL52, PNP 3-wire, 10 V DC ... 55 V DC
WA	FEL54, potential-free change-over contact, DPDT, 19 V AC ... 253 V AC, 19 V DC ... 55 V DC
SI	FEL55, 8/16 mA, 11 V DC ... 36 V DC
N1	FEL56, NAMUR, L-H edge
N2	FEL58, NAMUR with push button, H-L edge

Housing, cable entry

A1	aluminium housing, IP66, cable gland M20
A2	aluminium housing, Nema 4x, ¾ NPT
A3	aluminium housing, IP66, entry G½A
A4	aluminium housing, IP66, plug connector M12 x 1
A5	aluminium housing, IP66, PA plug connector M12 x 1
C2	compact housing, Nema 4x, ½ NPT plug connector, 1.4435/316L
C4	compact housing, IP66, plug connector M12 x 1, 1.4435/316L
C6	compact housing, IP66, PG11 plug connector, 1.4435/316L
E1	stainless steel housing, IP66, cable gland M20
E2	stainless steel housing, Nema 4x, ½ NPT
E3	stainless steel housing, IP66, entry G½A
E4	stainless steel housing, IP66, plug connector M12 x 1
E5	stainless steel housing, IP66, PA plug connector M12 x 1
P1	polyester housing, IP66, cable gland M20
P2	polyester housing, Nema 4x, ½ NPT
P3	polyester housing, IP66, entry G½A
P4	polyester housing, IP66, plug connector M12 x 1
P5	polyester housing, IP66, PA plug connector M12 x 1

Length, temperature spacer, pressure-tight bushing

design M1	**AA**	66 mm/2.6 in, R_a < 3.2 µm/80 grit
design M1	**IA**	66 mm/2.6 in, R_a < 3.2 µm/80 grit, with temperature spacer
design M1	**QA**	66 mm/2.6 in, R_a < 3.2 µm/80 grit, with pressure-tight bushing
design M2	**BB**	mm L 1.4435/316L, R_a < 3.2 mm/80 grit
design M2	**BE**	mm L 2.4610/Alloy C4, R_a < 3.2 mm/80 grit
design M2	**CB**	in L 1.4435/316L, R_a < 3.2 mm/80 grit
design M2	**CE**	in L 2.4610/Alloy C4, R_a < 3.2 mm/80 grit
design M2	**DB**	special length L II, 1.4435/316L, R_a < 3.2 mm/80 grit, switch point = Vibracon compact
design M2	**DE**	special length L II, 2.4610/Alloy C4, R_a < 3.2 mm/80 grit, switch point = Vibracon compact
design M2	**JB**	mm L 1.4435/316L, with temperature spacer
design M2	**JE**	mm L 2.4610/Alloy C4, with temperature spacer
design M2	**KB**	in L 1.4435/316L, with temperature spacer
design M2	**KE**	in L 2.4610/Alloy C4, with temperature spacer
design M2	**LB**	special length L II, 1.4435/316L, with temperature spacer, switch point = Vibracon compact
design M2	**LE**	special length L II, 2.4610/Alloy C4, with temperature spacer, switch point = Vibracon compact
design M2	**RB**	mm L 1.4435/316L, with pressure-tight bushing
design M2	**RE**	mm L 2.4610/Alloy C4, with pressure-tight bushing
design M2	**SB**	in L 1.4435/316L, with pressure-tight bushing
design M2	**SE**	in L 2.4610/Alloy C4, with pressure-tight bushing
design M2	**TB**	special length L II, 1.4435/316L, with pressure-tight bushing, switch point = Vibracon compact
design M2	**TE**	special length L II, 2.4610/Alloy C4, with pressure-tight bushing, switch point = Vibracon compact

Design

M1	compact design
M2	extended design (148 mm/6 in ... 6,000 mm/20 ft)

Continued on next page.

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Type code/model number

L	V	L	–	M		–						–						–		

Process connection and material

A31	1", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A41	1¼", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A42	1¼", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A51	1½", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A52	1½", ANSI B 16.5, 350 lbs RF, 1.4435/316L	design M2
A61	2", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A6C	2", ANSI B 16.5, 150 lbs RF, Alloy C4, platinised	
A62	2", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A63	2", ANSI B 16.5, 600 lbs RF, 1.4435/316L	design M2
A72	2½", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A81	3", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A82	3", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A91	4", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A92	4", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A93	4", ANSI B 16.5, 600 lbs RF, 1.4435/316L	design M2
F45	DN25 PN40, EN 1092-1 form B, 1.4435/316L	
F51	DN32 PN6, EN 1092-1 form B, 1.4435/316L	
F55	DN32 PN40, EN 1092-1 form B, 1.4435/316L	
F61	DN40 PN6, EN 1092-1 form B, 1.4435/316L	
F65	DN40 PN40, EN 1092-1 form B, 1.4435/316L	
F71	DN50 PN6, EN 1092-1 form B, 1.4435/316L	
F75	DN50 PN40, EN 1092-1 form B, 1.4435/316L	
F81	DN65 PN6, EN 1092-1 form B, 1.4435/316L	
F85	DN65 PN40, EN 1092-1 form B, 1.4435/316L	
F93	DN80 PN16, EN 1092-1 form B, 1.4435/316L	
F95	DN80 PN40, EN 1092-1 form B, 1.4435/316L	
FA3	DN100 PN16, EN 1092-1 form B, 1.4435/316L	
FA5	DN100 PN40, EN 1092-1 form B, 1.4435/316L	
D45	DN25 PN40, EN 1092-1 form C, 1.4435/316L, sealing strip	
C45	DN25 PN40, EN 1092-1 form C, 2.4610/Alloy C4, platinised	
D51	DN32 PN6, EN 1092-1 form C, 1.4435/316L, sealing strip	
C51	DN32 PN6, EN 1092-1 form C, 2.4610/Alloy C4, platinised	
D71	DN50 PN6, EN 1092-1 form C, 1.4435/316L, sealing strip	
C71	DN50 PN6, EN 1092-1 form C, 2.4610/Alloy C4, platinised	
D75	DN50 PN40, EN 1092-1 form C,1.4435/316L, sealing strip	
C75	DN50 PN40, EN 1092-1 form C, 2.4610/Alloy C4, platinised	
D95	DN80 PN40, EN 1092-1 form C, 1.4435/316L, sealing strip	
C95	DN80 PN40, EN 1092-1 form C, 2.4610/Alloy C4, platinised	
DA3	DN100 PN16, EN 1092-1 form C, 1.4435/316L, sealing strip	
CA3	DN100 PN16, EN 1092-1 form C, 2.4610/Alloy C4, platinised	
F7F	DN50 PN40, EN 1092-1, spring, 1.4435/316L	
R21	R¾ BSP, DIN 2999, 1.4435/316L	
R2C	R¾ BSP, DIN 2999, 2.4610/Alloy C4, platinised	
R31	R1 BSP, DIN 2999, 1.4435/316L	
R3C	R1 BSP, DIN 2999, 2.4610/Alloy C4	
N21	¾ NPT, ANSI B 1.20.1, 1.4435/316L	
N2C	¾ NPT, ANSI B 1.20.1, 2.4610/Alloy C4	
N31	1 NPT, ANSI B 1.20.1, 1.4435/316L	
N3C	1 NPT, ANSI B 1.20.1, 2.4610/Alloy C4	
G21	G¾, DIN ISO 228/1, BSP, 1.4435/316L, mounting for welded sleeve	design M1
G2C	G¾, DIN ISO 228/1, BSP, 2.4610/Alloy C4	
G31	G1, DIN ISO 228/1, BSP, 1.4435/316L	
G3C	G1, DIN ISO 228/1, BSP, 2.4610/Alloy C4	
G3E	G1, DIN ISO 228/1, BSP, 1.4435/316L, mounting for welded sleeve	
J13	10K 25A, JIS B 2238 (RF), 1.4435/316L	
J16	10K 40A, JIS B 2238 (RF), 1.4435/316L	
J17	10K 50A, JIS B 2238 (RF), 1.4435/316L	
J1C	10K 50A, JIS B 2238 (RF), 2.4610/Alloy C4, platinised	
J19	10K 80A, JIS B 2238 (RF), 1.4435/316L	
J1A	10K 100A, JIS B 2238 (RF), 1.4435/316L	
N75	DN50 PN40, EN 1092-1, groove, 1.4435/316L	
T51	1½", DN25-38, Triclamp ISO 2852, 1.4435/316L	
T61	2", DN40-51, Triclamp ISO 2852, 1.4435/316L	
XXX	special version	

Design

M1	compact design
M2	extended design (148 mm/6 in ... 6,000 mm/20 ft)

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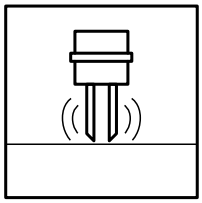
Vibration limit switch

LVL-M*H

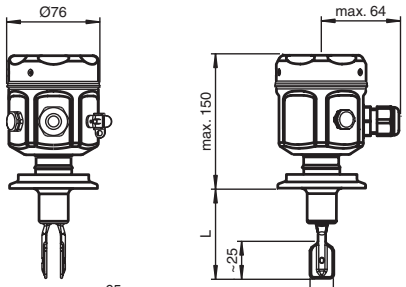


Features

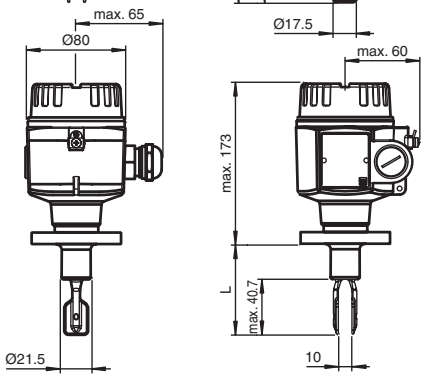
- Level limit switch in hygienic version for liquids
- Large number of process connections to choose from: universal usage
- Wide variety of electronic modules: the right connection for every process control system
- No calibration: quick and low-cost start-up
- No mechanically moving parts: maintenance-free, no wear, long operating life
- Monitoring of the vibrating fork for damage: guaranteed function
- PROFIBUS PA protocol: commissioning and maintenance quick and easy
- Process connections acc. to EHEDG
- Up to SIL2 acc. to IEC 61508

Dimensions

Vibracon LVL-M*H with stainless steel housing and process connection T**



Vibracon LVL-M*H with aluminium housing and process connection with flange



Additional dimensions see section dimensions.
Length L see process connections.

Function

The Vibracon is a level limit switch for use in all liquids

- for temperature of -50 °C (223 K) to +150 °C (423 K)
- for pressures up to 64 bar
- for viscosities up to 10000 mm²/s
- for densities up to 0.5 g/cm³ or 0.7 g/cm³ (other settings available on request)

The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or build-up, the Vibracon is thus the ideal replacement for float switches.

The compact version is ideal for mounting in pipes (LVL-M1H). In addition there is a version with extension tube up to 6 m (20 ft) (LVL-M2H).

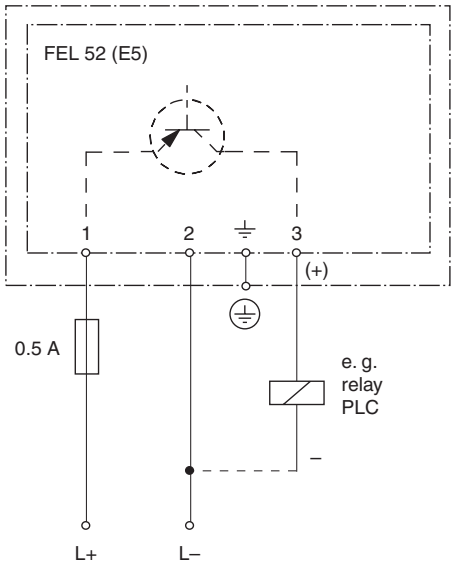
With polished fork and easy-to-clean process connections and housings is the level limit switch usable for food and pharmaceutical applications.

Instruments with protection EEx ia and EEx d are available for use in explosion hazardous areas.

Electrical connection

Connection FEL 52 (E5) 3-wire DC connection (example)

- preferably for use with memory programmable controls (PLC)
- positive signal at the switch output of the electronics (PNP)
- Output blocked on reaching limit level.
- also in compact housing with plug connection available



Other connection types see section electrical connection.

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Application	
Function principle	limit detection maximum or minimum detection in tanks or pipelines containing all types of liquids including use in explosion hazardous areas and in foodstuff and pharmaceutical industries
Function and system design	
Measuring principle	The forks of the sensors vibrate at their intrinsic frequency, this frequency is reduced when covered with liquid. The change in frequency then activates the limit switch.
Input characteristics	
Measured variable	limit level (limit value)
Measurement range	LVL-M1H: depends on mounting point LVL-M2H: depends on mounting point and pipe extension up to 6000 mm (20 ft)
Medium density	adjustment on the electronic insert > 0.5 g/cm^3 or > 0.7 g/cm^3 (other on request)
Output characteristics	
Fail safe mode	switch-over for minimum/maximum residual current safety on electronic insert MAX = maximum safety: The output switches to the power fail response when the fork is covered. for use with overspill protection for example MIN = minimum safety: The output switches to the power fail response when the fork is exposed. for use with dry running protection for example
Switching time	when fork is covered: approx. 0.5 s, when fork is exposed: approx. 1.0 s (other switching times on request) additionally configurable for PROFIBUS PA (electronic insert FEL50A (PA)): 0.5 ... 60 s
Switch-on response	when switching on the power supply the output assumes the alarm signal, after max. 3 s it assumes the correct switching mode
Auxiliary energy	
Supply voltage	electronic insert FEL50A (PA): 9 ... 32 V DC electronic insert FEL51 (AC): 253 V AC, 50/60 Hz electronic insert FEL52 (E5): 10 ... 55 V DC electronic insert FEL54 (WA): 19 ... 253 V AC, 50/60 Hz or 19 ... 55 V DC electronic insert FEL55 (SI): 11 ... 36 V DC, PLC electronic insert FEL56 (N1), FEL58 (N2): isolating amplifier acc. to EN 60947-5-6 (NAMUR)
Connecting cable	electronic inserts: cross section max. 2.5 mm^2, strand in ferrule in acc. to DIN 46228 protective earth in housing: cross section max. 2.5 mm^2 external equipotential bonding connection on housing: cross section 4 mm^2
Power consumption	electronic insert FEL52 (E5): max. 0.83 W electronic insert FEL54 (WA): max. 1.3 W
Current consumption	electronic insert FEL52 (E5): max. 15 mA
Performance characteristics	
Reference operating conditions	ambient temperature: 23 °C (296 K), medium temperature: 23 °C (296 K), product density: 1 g/cm^3 (water), viscosity: 1 mm^2/s, medium pressure p_e: 0 bar, sensor mounting: vertical from above, density switch: to > 0.7 g/cm^3
Maximum measured error	max. ± 1 mm, specified by mounting position
Non-repeatability	0.1 mm
Hysteresis	approx. 2 mm
Influence of medium density	max. +4.8 ... -3.5 mm (+0.19 ... -0.14 in) (0.5 ... 1.5 g/cm^3)
Influence of medium temperature	max. +1.4 ... -2.8 mm (+0.05 ... -0.11 in) (-40 ... +150 °C (233 ... 423 K))
Influence of medium pressure	max. 0 ... -2.5 mm (0 ... -0.1 in) (-1 ... 64 bar)
Operating conditions	
Mounting conditions	
Installation position	LVL-M1H: any position LVL-M2H: with short pipe (up to 500 mm (19.7 in)) any position, with long pipe vertical
Ambient conditions	
Ambient temperature	-50 ... 70 °C (223 ... 343 K), function with reduced data values see section ambient temperature
Storage temperature	-50 ... 80 °C (223 ... 353 K)
Overvoltage protection	electronic insert FEL51 (AC), electronic insert FEL52 (E5), electronic insert FEL54 (WA), electronic insert FEL55 (SI): overvoltage category III
Process conditions	
Medium temperature	-50 ... 150 °C (223 ... 423 K), for exceptions see process connections
Medium pressure	p_e = -1 ... 64 bar over the entire temperature range, exceptions see process connections
Test pressure	max. 100 bar (1.5 times the medium pressure p_e), no function during test pressure, burst pressure of diaphragm 200 bar
Thermal shock resistance	max. 120 °C/s (max. 120 K/s)
State of aggregation	liquid
Density	min. 0.5 g/cm^3 (compact housing 0.7 g/cm^3), other density settings on request
Viscosity	max. 10000 mm^2/s (max. 10000 cSt)
Solid contents	max. Ø 5 mm
Mechanical specifications	

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Protection degree	polyester, steel and aluminium housing: IP66/IP67 compact housing: - IP65 with valve connector PG11 or ½ NPT - IP66/IP68 with M12 x 1 connector without LEDs (1.4435/316L) - IP69K with M12 x 1 connector1 with LEDs (1.4435/316L)
Mechanical construction	
Construction type	LVL-M1H: compact design LVL-M2H: version with extension tube
Dimensions	housing: diameter max. 85 mm (3.3 in), height max. 173 mm (6.8 in) temperature separator, pressure-tight bushing: additional length L 140 mm (5.5 in) process connection: length L 55.5 ... 80 mm (2.2 ... 3.1 in) extension: any length L from 148 ... 6000 mm (6 in ... 20 ft), depending on the process connection extension: length type II, for vertical installation from above same switching point as Vibracon LVL1, LVL2 vibration fork: width 17.5 mm (0.7 in), fork width 10 mm (0.4 in), length 25 mm (1 in)
Mass	700 g, basic weight: compact sensor, electronic insert, stainless steel housing, process connection G2*, additional weight is dependent on extension tube, housing and process connection
Additional weight	process connections: - A31 1000 g, A41 1200 g, A51 1500 g, A6* 2400 g, A72 4800 g, A81 4900 g, A82 6800 g, A91 7000 g, A92 11.5 kg - D75 3200 g, D95 5900 g, DA3 5600 g, D7A 300 g, D7D 300 g - F45 1400 g, F51 1200 g, F55 2000 g, F61 1400 g, F65 2400 g, F71 1600 g, F75 3200 g, F81 2400 g, F85 4300 g, F93 4800 g, F95 5900 g, FA3 5600 g, FA5 7500 g - G3E 200 g - R*R no information - S13 300 g, S61 200 g, SV1 no information - T51 no information, T61 100 g length, spacers, bushings: - B* 900 g/m, C* 2300 g/100 in - D* 100 g - I* 600 g - J* 900 g/m and 600 g, K* 2300 g/100 in and 600 g - L*, Q* 700 g - R* 900 g/m and 700 g, S* 2300 g/100 in and 700 g - T* 800 g
Material	wetted parts: - process connection and extension pipe: 1.4435/316L or 2.4610/Alloy C4 - vibration fork: 1.4435/316L or 2.4610/Alloy C4 - flat seal for process connection G2* or G3*: elastomer fibre, asbestos-free housings: - polyester housing: PBT-FR with PBT-FR cover or with PA12 cover with sight glass, cover seal: EPDM - stainless steel housing: 1.4301/304, cover seal: silicone - aluminium housing: EN-AC-AlSi10Mg, plastic-coated, cover seal: EPDM - compact housing with valve connector or M12 connector: 1.4435/316L cable gland: polyamide or brass, nickel-plated temperature spacer: 1.4435/316L pressure-tight bushing: 1.4435/316L
Surface quality	R_a < 1.5 µm/120 grit: length, spacer, bushings *C R_a < 0.3 µm/320 grit: length, spacer, bushings *D
Switching point	see section switch point
Process connection	- cylindrical thread G¾A, G1A to DIN ISO 228/1 with flat seal to DIN 7603 - flush-mounted with welding sleeve to factory standard (G¾A, G1A) - flush-mounted with welding neck to factory standard (1"), sensor can be positioned - Triclamp 1½", 2" to ISO 2852 - threaded pipe joint DN32, DN40, DN50 to DIN 1185 - aseptic connection DN50 to DIN 11864-1 form A for pipe DIN 11850 - SMS connection 2" (DN51) - DRD flange, 65 mm - Varivent® DN50 (50/40) to factory standard Tuchenhagen - flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1"
Indication and operation	
Display elements	electronic inserts: - electronic inserts FEL50 A (PA), FEL58 (N2): green LED, yellow LED - electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): green LED, red LED compact housings: compact housing with valve connector - electronic version FEL51 (AC), FEL52 (E5): green LED, red LED - electronic version FEL58 (N2): green LED, yellow LED compact housing with M12 x 1 round connector without LEDs - electronic version FEL52 (E5): green LED, yellow LED, red LED - electronic version FEL58 (N2): green LED, yellow LED compact housing with M12 x 1 round connector with LEDs - electronic version FEL52 (E5): green LED, two yellow LEDs

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Operating elements	electronic insert FEL50A (PA): 8 switches for device address setting electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): two switches for fail-safe mode and density change electronic insert FEL58 (N2): two switches for fail-safe mode and density change and one test button interrupts lead
Function test	compact housing: function test with test magnet electronic versions FEL51 (AC), FEL52 (E5) and FEL58 (N2): During the test, the current state of the electronic switch is reversed.
Certificates and approvals	
Ex approval	KEMA 01 ATEX 1089, KEMA 01 ATEX 1147 X, KEMA 01 ATEX 2117, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 and ⟨Ex⟩ II 1/2D T80°C (KEMA 01 ATEX 1089) ⟨Ex⟩ II 1G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X) ⟨Ex⟩ II 1/2G EEx d IIC T3 ... T6 or EEx d IIB T3 ... T6 (KEMA 01 ATEX 2117) ⟨Ex⟩ II 3G EEx nA/nC II T6 and ⟨Ex⟩ II 3D T85°C
SIL classification	up to SIL2 acc. to IEC 61508
Overspill protection	Z-65.11-306 (overspill protection in acc. with WHG)
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector) If the fork tines are joined together on account of build-up, the useful signal is attenuated to such an extent that the original EMC values can no longer be completely observed (EN 61000-4-3 electromagnetic fields, EN 61000-4-6 HF coupling).
Directive 94/9 EC (ATEX)	EN 50014, EN 50018, EN 500020, EN 500021, EN 50284, EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a
Vibration resistance	EN 60068-2-6, 10 ... 50 Hz, 0.15 mm, 100 cycles
Supplementary documentation	technical information TI328O operating instructions KA144O (LVL-M*H) operating instructions KA220O (LVL-M** with compact housing) operating instructions BA141O (electronic insert FEL50A (PA)) operating instructions KA140O weld-in socket G1 (LVL-Z102) operating instructions KA141O weld-in adapter G1 (LVL-Z101) operating instructions KA142O weld-in adapter G¾ (LVL-Z100) operating instructions KA151O sliding sleeve for unpressurised operation G1A, 1 NPT (LVL-Z120, LVL-Z122) operating instructions KA152O sliding sleeve for unpressurised operation G1½A, 1½ NPT (LVL-Z121, LVL-Z123) operating instructions KA153O high pressure sliding sleeve G1A, 1 NPT (LVL-Z124, LVL-Z125, LVL-Z128, LVL-Z129) operating instructions KA154O high pressure sliding sleeve G1A, 1 NPT (LVL-Z126, LVL-Z127, LVL-Z130, LVL-Z131) safety information SI031O (KEMA 01 ATEX 2117) safety information SI063O (KEMA 01 ATEX 1089) safety information SI064O (KEMA 01 ATEX 1147 X) safety information SI154O (KEMA 01 ATEX 1089), PROFIBUS PA version safety information SI159O (KEMA 01 ATEX 11147 X), PROFIBUS PA version safety information SI182O (⟨Ex⟩ II 3G EEx nA/nC II T6 and ⟨Ex⟩ II 3D T85°C) approval ZE233O overspill protection acc. to WHG (Z-65.11-306) FM installation drawing ZD041O CSA control drawing ZD042O
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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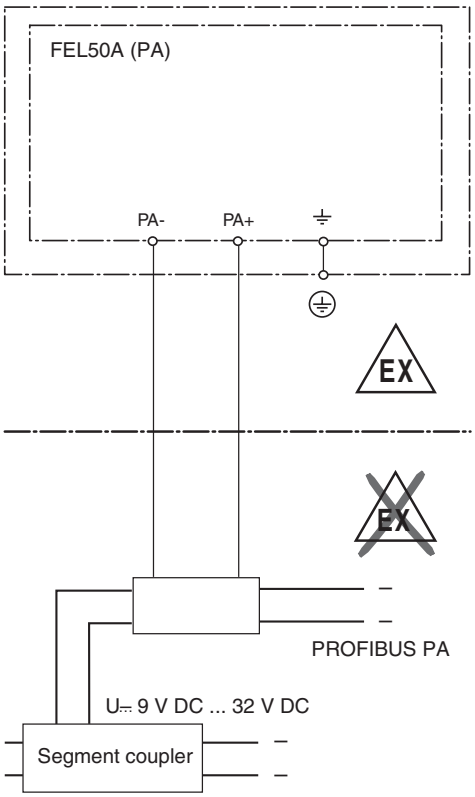
Electrical connection

Electronic insert FEL50A (PA)

Two-wire connection for power supply and data transfer for connecting to PROFIBUS PA

Additional functions:

- Digital communication enables the representation, reading and editing of the following parameters: fork frequency, switch-on frequency, switch-off frequency, switch-on time and switch-off time, status, measured value, density switch.
- Matrix locking possible.
- Switch to WHG mode possible (WHG approval).
- You can also visit www.profibus.com for more information.



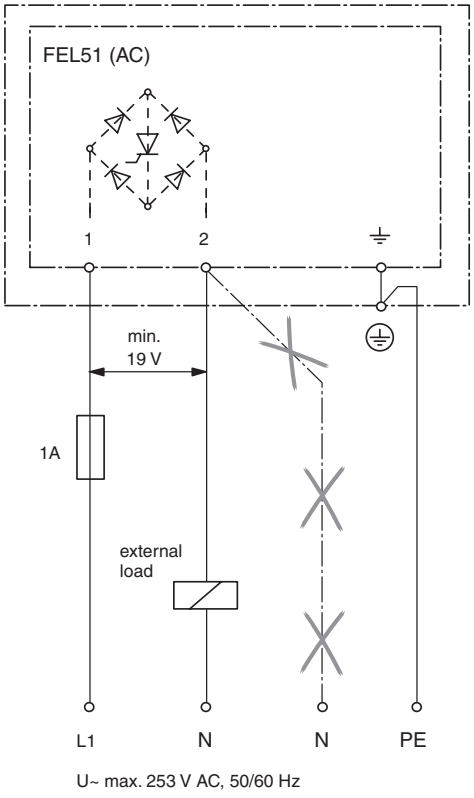
Electronic insert FEL51 (AC)

Two-wire AC connection

Always connect in series with a load!

Check the following:

- the residual current in blocked state (up to 3.8 mA)
- that for low voltage
  - The voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
  - The voltage drop across the electronics when switched through is observed (up to 12 V).
- that a relay cannot de-energise with holding power below 3.8 mA
  If this is the case, a resistor should be connected parallel to the relay (RC module available on request).
- When selecting the relay, pay attention to the holding power/rated power (see connectable load).



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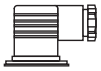
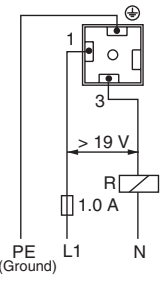
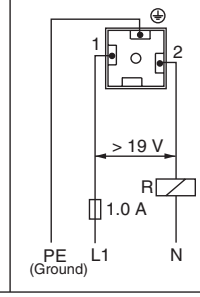
Electrical connection

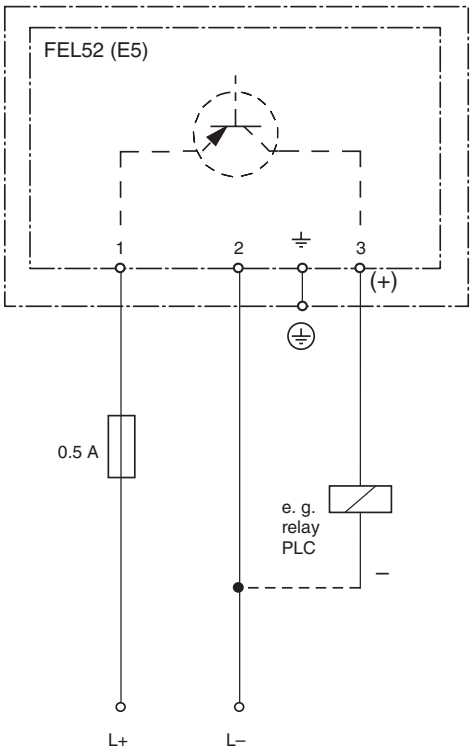
Electronic FEL51 (AC) in compact housing

Connection	MAX	MIN
Housing C2 (½ NPT) or Housing C6 (PG11) 		

Electronic insert FEL52 (E5)

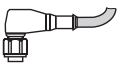
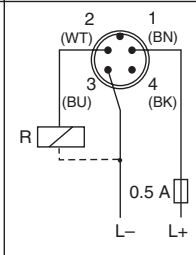
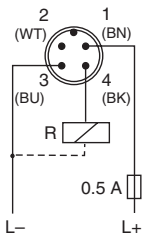
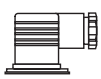
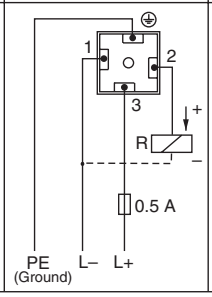
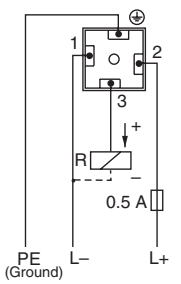
Three-wire DC connection

- preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2.
- positive signal at switching output of the electronics (PNP)
- Output blocked on reaching limit.



$U_{\sim}$ 10 V DC … 55 V DC

Electronic FEL52 (E5) in compact housing

Connection	MAX	MIN
Housing C4 (M12 x 1), connector with LEDs  Housing C4 (M12 x 1), connector without LEDs 		
Housing C2 (½ NPT) or Housing C6 (PG11) 		

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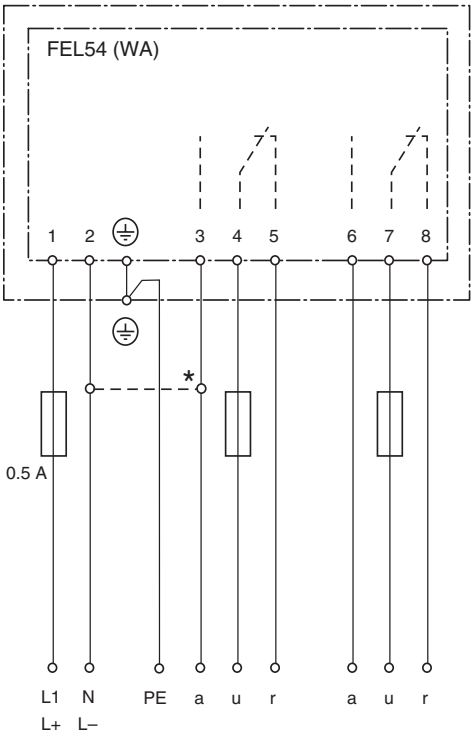
Electrical connection

Electronic insert FEL54 (WA)

Universal current connection with relay output

- Power supply:
  Please note the different voltage ranges for AC and DC.
- Output:
  When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact.
  A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting.
  Both relay contacts switch simultaneously.

* When jumpered, the relay output works with NPN logic.

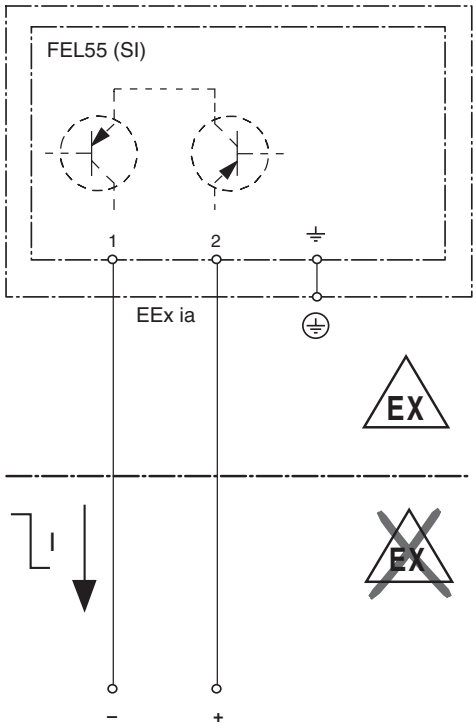


U~ 19 V AC … 253 V AC, 50/60 Hz
U– 19 V DC … 55 V DC

Electronic insert FEL55 (SI)

Two-wire connection for separate switching unit

- for connecting to programmable logic controllers (PLC) for example, AI module 4 mA ... 20 mA to EN 61131-2
- Output signal jump from high to low current on limit **(H-L edge)**



U⎓ 11 V DC … 36 V DC
e. g. PLC

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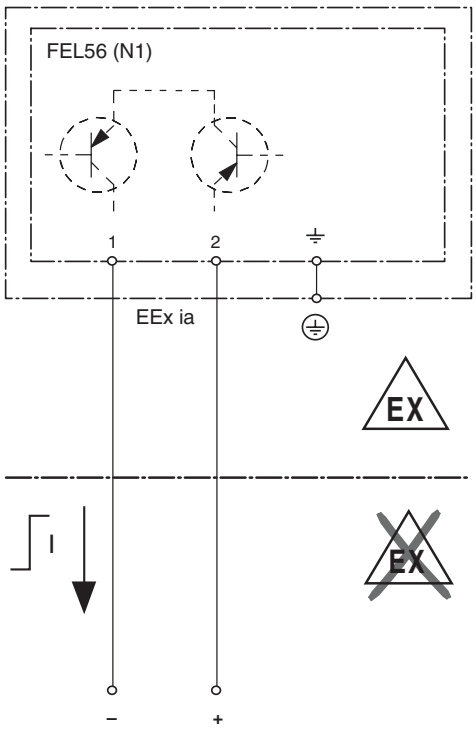
Electrical connection

Electronic insert FEL56 (N1)

Two-wire connection for separate switching unit

- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from low to high current on limit **(L-H edge)**

Connecting to multiplexer: set clock time to min. 2 s.



Isolated switch amplifiers
according to IEC 60947-5-6 (NAMUR)

Electronic insert FEL58 (N2)

Two-wire connection for separate switching unit

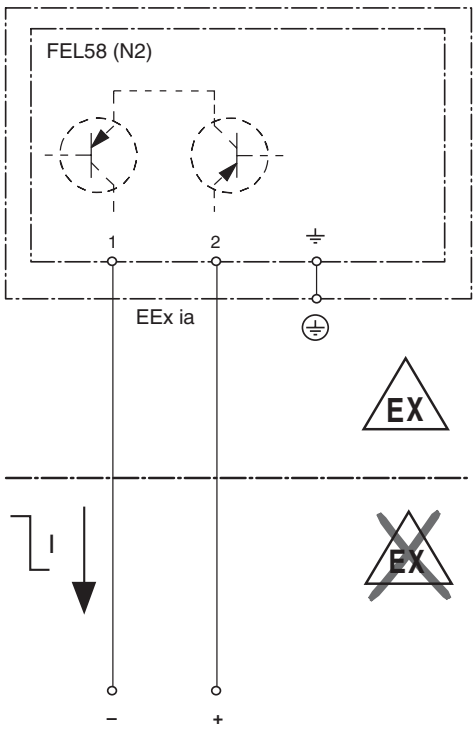
- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. Isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from high to low current on limit **(H-L edge)**

Additional function:
Test key on the electronic insert. Pressing the key breaks the connection to the isolating amplifier.

Connecting to multiplexer: set clock time to min. 2 s.

Note

For Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.



Isolated switch amplifiers
according to IEC 60947-5-6 (NAMUR)

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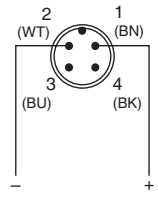
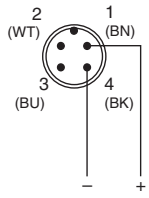
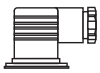
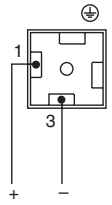
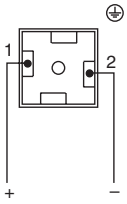
Electrical connection

Electronic FEL58 (N2) in compact housing

Connection	MAX	MIN
Housing C4 (M12 x 1), connector with LEDs 		
Housing C4 (M12 x 1), connector without LEDs 		
Housing C2 (½ NPT) or Housing C4 (PG11) 		

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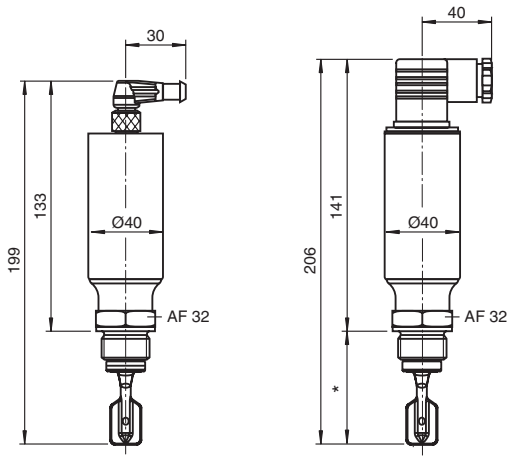
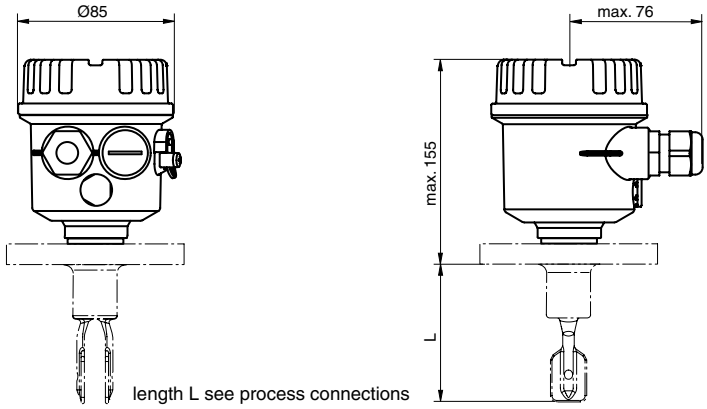
Dimensions

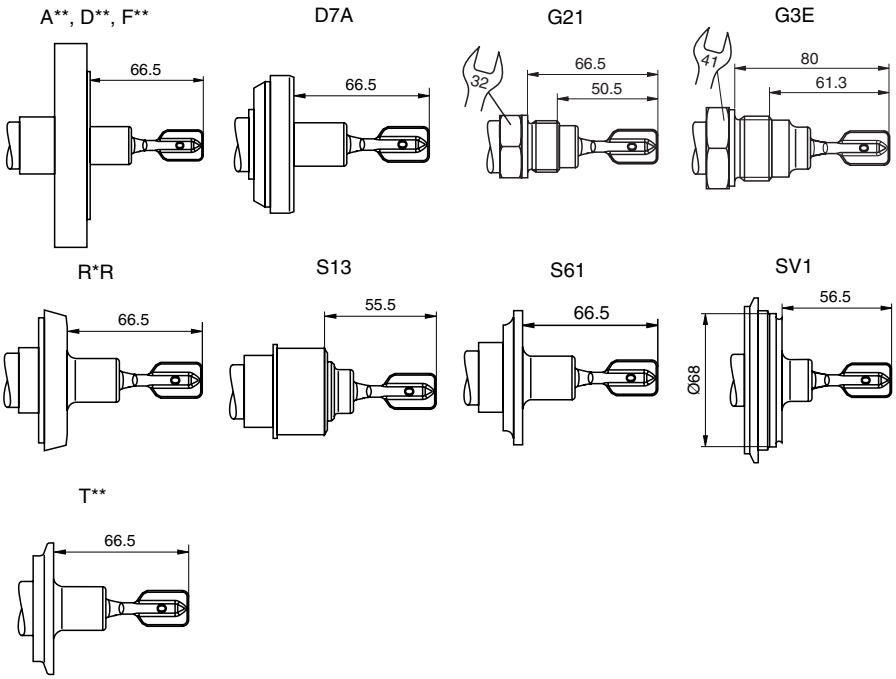
Compact housing C*



Plastic housing P*



Process connections



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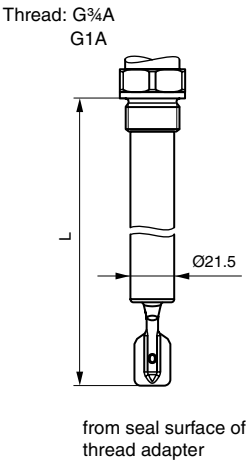
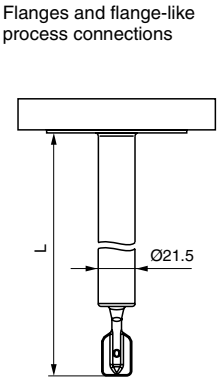
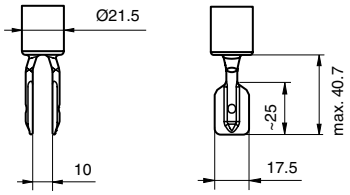
Dimensions

Extension tube



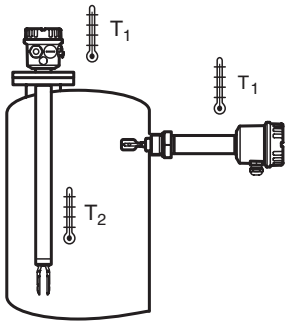


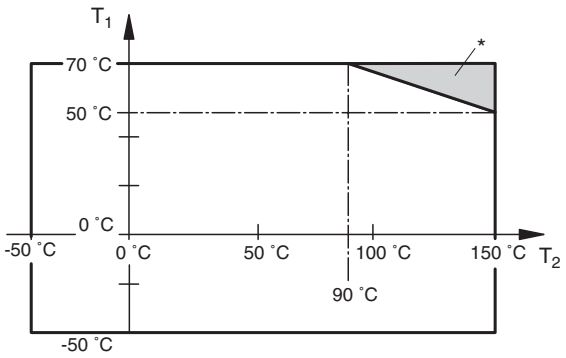
Vibration fork



Ambient temperature

Permissible ambient temperature T_1 at the housing depends on the product temperature T_2 in the vessel:





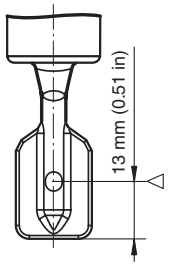
* additional temperature range for sensors with a temperature separator or pressure-tight bushing

Switch point

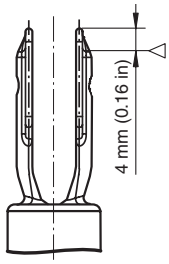
Switch point ▷ on the sensor depend on the mounting position, with reference to water, density 1 g/cm³, 23 °C (296 K), p_e 0 bar.

Note:

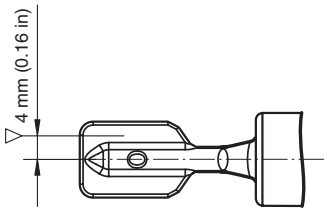
The switch points of the Vibracon LVL-M2C are at other positions to those of the previous versions LVL1, LVL2.



Mounting from above



Mounting from below



Mounting from the side

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Accessories

Welding sleeves

- LVL-Z100, welding sleeve G¾ for flush mounting for process connection G21
- LVL-Z101, welding sleeve G1 for flush mounting for process connection G3E
- LVL-Z102, welding sleeve G1 for flush mounting for process connection G3E
- LVL-Z103, welding adapter G1 for flush mounting for process connection S13
- LVL-Z104, DRD welding flange for flush mounting for process connection D7D

Further accessories

- LVL-Z108, cover with glass sight glass for stainless steel housing E*
- LVL-Z109, cover with PC sight glass for stainless steel housing E*
- LVL-Z110, transparent cover for polyester housing P*
- V1-G, mating connector, straight
- V1-W, mating connector, 90° angled

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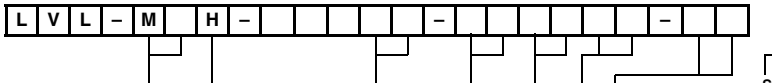
Type code/model number



Specification of length without unit version M2

Certificates

NA	for non-hazardous areas
WH	WHG overspill protection
E1	II 1G EEx ia IIC T6
E2	II 1/2G EEx ia IIC T6
E3	II 1/2G EEx d IIC T6
EA	II 1G EEx ia IIC T6, WHG
EB	II 1/2G EEx ia IIC T6, WHG
EC	II 1/2G EEx d IIC T6, WHG
EN	II 3G EEx nC IIC T6, WHG
EM	II 3G EEx nA IIC T6, WHG
FI	FM, IS, CI I, II, III, Div1, Group A–G
FN	FM, NI, CI I, Div2, Group A–D
FX	FM, XP, CI I, II, III, Div1, Group A–G
CG	CSA, General Purpose
CI	CSA, IS, CI I, II, III, Div1, Group A–G
CX	CSA, XP, CI I, II, III, Div1, Group A–G

Optional equipment

NA	without optional equipment
Z3	3.1.B material, wetted parts 1.4435, inspection certificate to EN 10204

Electronic insert

PA	FEL50A, PROFIBUS PA
AC	FEL51, contactless 2-wire switch, 19 V AC ... 253 V AC
E5	FEL52, PNP 3-wire, 10 V DC ... 55 V DC
WA	FEL54, potential-free change-over contact, DPDT, 19 V AC ... 253 V AC, 19 V DC ... 55 V DC
SI	FEL55, 8/16 mA, 11 V DC ... 36 V DC
N1	FEL56, NAMUR, L-H edge
N2	FEL58, NAMUR with push button, H-L edge

Housing, cable entry

A1	aluminium housing, IP66, cable gland M20
A2	aluminium housing, Nema 4x, ¾ NPT
A3	aluminium housing, IP66, entry G½A
A4	aluminium housing, IP66, plug connector M12 x 1
A5	aluminium housing, IP66, PA plug connector M12 x 1
C2	compact housing, Nema 4x, ½ NPT plug connector, 1.4435/316L
C4	compact housing, IP66, plug connector M12 x 1, 1.4435/316L
C6	compact housing, IP66, PG11 plug connector, 1.4435/316L
E1	stainless steel housing, IP66, cable gland M20
E2	stainless steel housing, Nema 4x, ½ NPT
E3	stainless steel housing, IP66, entry G½A
E4	stainless steel housing, IP66, plug connector M12 x 1
E5	stainless steel housing, IP66, PA plug connector M12 x 1
P1	polyester housing, IP66, cable gland M20
P2	polyester housing, Nema 4x, ½ NPT
P3	polyester housing, IP66, entry G½A
P4	polyester housing, IP66, plug connector M12 x 1
P5	polyester housing, IP66, PA plug connector M12 x 1

Length, temperature spacer, pressure-tight bushing

design M1	**AC**	66 mm/2,6 in, R_a < 1.5 µm/120 grit
design M1	**AD**	66 mm/2,6 in, R_a < 0.3 µm/320 grit/3 A
design M1	**IC**	66 mm/2,6 in, R_a < 1.5 µm/120 grit, with temperature spacer
design M1	**ID**	66 mm/2,6 in, R_a < 0.3 µm/320 grit, with temperature spacer
design M1	**QC**	66 mm/2,6 in, R_a < 1.5 µm/120 grit, with pressure-tight bushing
design M1	**QD**	66 mm/2,6 in, R_a < 0.3 µm/320 grit/3 A, with pressure-tight bushing
design M2	**BC**	mm L, R_a < 1.5 µm/120 grit
design M2	**BD**	mm L, R_a < 0.3 µm/320 grit/3 A
design M2	**CC**	in L, R_a < 1.5 µm/120 grit
design M2	**CD**	in L, R_a < 0.3 µm/320 grit/3 A
design M2	**DC**	special length L II, R_a < 1.5 µm/120 grit, switch point = Vibracon compact
design M2	**DD**	special length L II, R_a < 0.3 µm/320 grit/3 A, switch point = Vibracon compact
design M2	**JC**	mm L, R_a < 1.5 µm/120 grit, with temperature spacer
design M2	**JD**	mm L, R_a < 0.3 µm/320 grit/3 A, with temperature spacer
design M2	**KC**	in L, R_a < 1.5 µm/120 grit, with temperature spacer
design M2	**KD**	in L, R_a < 0.3 µm/320 grit/3 A, with temperature spacer
design M2	**LC**	special length L II, R_a < 1.5 µm/120 grit, with temperature spacer, switch point = Vibracon compact
design M2	**LD**	special length L II, R_a < 0.3 µm/320 grit/3 A, with temperature spacer, switch point = Vibracon compact
design M2	**RC**	mm L, R_a < 1.5 µm/120 grit, with pressure-tight bushing
design M2	**RD**	mm L, R_a < 0.3 µm/320 grit/3 A, with pressure-tight bushing
design M2	**SC**	in L, R_a < 1.5 µm/120 grit, with pressure-tight bushing
design M2	**SD**	in L, R_a < 0.3 µm/320 grit/3 A, with pressure-tight bushing
design M2	**TC**	special length L II, R_a < 1.5 µm/120 grit, with pressure-tight bushing, switch point = Vibracon compact
design M2	**TD**	special length L II, R_a < 0.3 µm/320 grit/3 A, with pressure-tight bushing, switch point = Vibracon compact

Design

H	hygienic version

Design

M1	compact version
M2	extended version (148 mm/6 in ... 6,000 mm/20 ft)

Continued on next page.

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Type code/model number

L	V	L	–	M		H	–					–						–					

Process connection and material

A31	1", ANSI B 16.5, 150lbs RF, 1.4435/316L	
A41	1¼", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A51	1½", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A61	2", ANSI B 16.5, 150 lbs RF, 1.4435/316L	
A62	2", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A72	2½", ANSI B 16.5, 300 lbs RF, 1.4435/316L	design M2
A81	3", ANSI B 16.5, 150lbs RF, 1.4435/316L	
A82	3", ANSI B 16.5, 300lbs RF, 1.4435/316L	design M2
A91	4", ANSI B 16.5, 150lbs RF, 1.4435/316L	
A92	4", ANSI B 16.5, 300lbs RF, 1.4435/316L	design M2
F45	DN25 PN40, EN 1092-1 Form B, 1.4435/316L	
F51	DN32 PN6, EN 1092-1 Form B, 1.4435/316L	
F55	DN32 PN40, EN 1092-1 Form B, 1.4435/316L	
F61	DN40 PN6, EN 1092-1 Form B, 1.4435/316L	
F65	DN40 PN40, EN 1092-1 Form B, 1.4435/316L	
F71	DN50 PN6, EN 1092-1 Form B, 1.4435/316L	
F75	DN50 PN40, EN 1092-1 Form B, 1.4435/316L	
F81	DN65 PN6, EN 1092-1 Form B, 1.4435/316L	
F85	DN65 PN40, EN 1092-1 Form B, 1.4435/316L	
F93	DN80 PN16, EN 1092-1 Form B, 1.4435/316L	
F95	DN80 PN40, EN 1092-1 Form B, 1.4435/316L	
FA3	DN100 PN16, EN 1092-1 Form B, 1.4435/316L	
FA5	DN100 PN40, EN 1092-1 Form B, 1.4435/316L	
D75	DN50 PN40, EN 1092-1 Form C, 1.4435/316L, sealing strip	
D95	DN80 PN40, EN 1092-1 Form C,1.4435/316L, sealing strip	
DA3	DN100 PN16, EN 1092-1 Form C, 1.4435/316L, sealing strip	
S13	flush-mounted for welding adapter 1", 1.4435	
G21	G¾, DIN ISO 228/1, BSP, 1.4435/316L, mounting for welding adapter	design M1
G3E	G1A, DIN ISO 228/1, BSP, 1.4435/316L, mounting for welding adapter	
D7A	DN50, aseptic coupler DIN11864, 1.4435	
J13	10K 25A, JIS B 2238 (RF), 1.4435/316L	
J16	10K 40A, JIS B 2238 (RF), 1.4435/316L	
J17	10K 50A, JIS B 2238 (RF), 1.4435/316L	
J19	10K 80A, JIS B 2238 (RF), 1.4435/316L	
J1A	10K 100A, JIS B 2238 (RF), 1.4435/316L	
R5R	DN32 PN25, sanitary coupling DIN 11851, 1.4435/316L	
R6R	DN40 PN25, sanitary coupling DIN 11851, 1.4435/316L	
R7R	DN50 PN25, sanitary coupling DIN 11851, 1.4435/316L	
D7D	DRD, 65 mm, 1.4435/316L	
T51	1½", DN25-38, Triclamp ISO 2852, 1.4435/316L	
T61	2", DN40-51, Triclamp ISO 2852, 1.4435/316L	
S61	2", SMS, PN25, 1.4435/316L	
SV1	Varivent, DN65-162 PN10, 1.4435/316L	
XXX	special version	

Design

H	hygienic version

Design

M1	compact design
M2	extended design (148 mm/6 in ... 6,000 mm/20 ft)

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Vibration limit switch

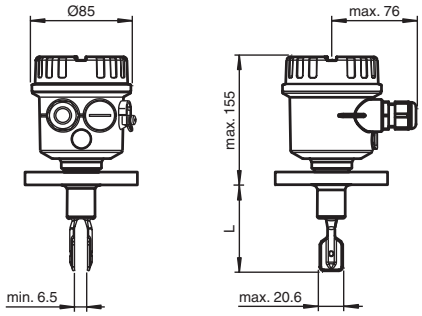
LVL-M2C

Features

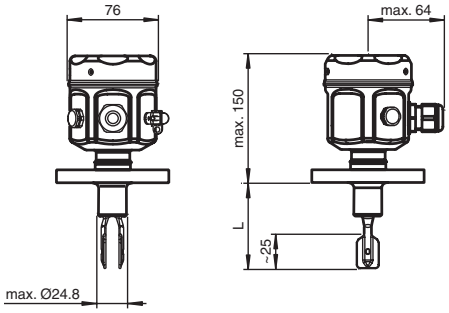
- Level limit switch for liquids
- Corrosion resistant coating (HALAR): ideal suited for the process
- Large number of process connections to choose from: universal usage
- Wide variety of electronic modules: the right connection for every process control system
- No calibration: quick and low-cost start-up
- No mechanically moving parts: maintenance-free, no wear, long operating life
- Monitoring of the vibrating fork for damage: guaranteed function
- PROFIBUS PA protocol: commissioning and maintenance quick and easy
- Up to SIL2 acc. to IEC 61508

Dimensions

Vibracon LVL-M2C with plastic housing and process connection with flange



Vibracon LVL-M2C with stainless steel housing and process connection with flange



Additional dimensions see section dimensions.
Length L see process connections.

Function

The Vibracon is a level limit switch for use in all liquids

- for temperature of -50 °C (223 K) to +120 °C (393 K)
- for pressures up to 40 bar
- for viscosities up to 10000 mm²/s
- for density up to 0.5 g/cm³ (other settings available on request)

The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or build-up, the Vibracon is thus the ideal replacement for float switches.

The coating of all sensor wetted parts (process connections, extension pipe and vibration fork) is made of synthetic material to ensure it can be used for highly aggressive liquids.

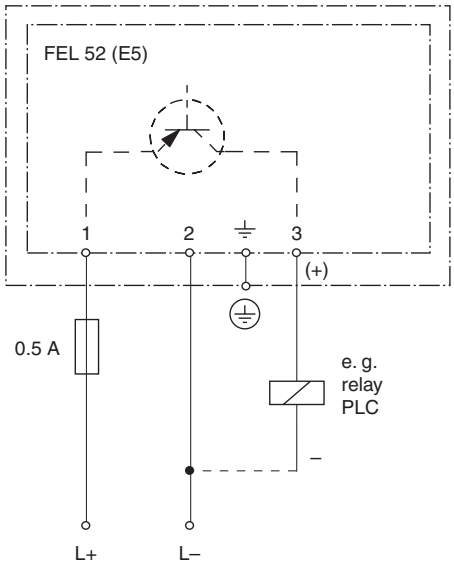
The level limit switch is available with extension tube up to 6 m (20 ft).

Instruments with protection EEx ia and EEx d are available for use in explosion hazardous areas.

Electrical connection

Connection FEL 52 (E5) 3-wire DC connection (example)

- preferably for use with memory programmable controls (PLC)
- positive signal at the switch output of the electronics (PNP)
- Output blocked on reaching limit level.
- also in compact housing with plug connection available



Other connection types see section electrical connection.

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Application	
Function principle	limit detection Maximum or minimum detection in tanks or pipelines containing all types of liquids including use in explosion hazardous areas. Particularly suited to very aggressive liquids thanks to high degree of corrosion protection.
Function and system design	
Measuring principle	The forks of the sensors vibrate at their intrinsic frequency, this frequency is reduced when covered with liquid. The change in frequency then activates the limit switch.
Input characteristics	
Measured variable	limit level (limit value)
Measurement range	depends on mounting point and pipe extension up to 6000 mm (20 ft)
Medium density	adjustment on the electronic insert > 0.5 g/cm^3 (other on request)
Output characteristics	
Fail safe mode	switch-over for minimum/maximum residual current safety on electronic insert MAX = maximum safety: The output switches to the power fail response when the fork is covered. for use with overspill protection for example MIN = minimum safety: The output switches to the power fail response when the fork is exposed. for use with dry running protection for example
Switching time	when fork is covered: approx. 0.5 s, when fork is exposed: approx. 1.0 s (other switching times on request) additionally configurable for PROFIBUS PA (electronic insert FEL50A (PA)): 0.5 ... 60 s
Switch-on response	when switching on the power supply the output assumes the alarm signal, after max. 3 s it assumes the correct switching mode
Auxiliary energy	
Supply voltage	electronic insert FEL50A (PA): 9 ... 32 V DC electronic insert FEL51 (AC): 253 V AC, 50/60 Hz electronic insert FEL52 (E5): 10 ... 55 V DC electronic insert FEL54 (WA): 19 ... 253 V AC, 50/60 Hz or 19 ... 55 V DC electronic insert FEL55 (SI): 11 ... 36 V DC, PLC electronic insert FEL56 (N1), FEL58 (N2): isolating amplifier acc. to EN 60947-5-6 (NAMUR)
Connecting cable	electronic inserts: cross section max. 2.5 mm^2, strand in ferrule in acc. to DIN 46228 protective earth in housing: cross section max. 2.5 mm^2 external equipotential bonding connection on housing: cross section 4 mm^2
Power consumption	electronic insert FEL52 (E5): max. 0.83 W electronic insert FEL54 (WA): max. 1.3 W
Current consumption	electronic insert FEL52 (E5): max. 15 mA
Performance characteristics	
Reference operating conditions	ambient temperature: 23 °C (296 K), medium temperature: 23 °C (296 K), product density: 1 g/cm^3 (water), viscosity: 1 mm^2/s, medium pressure p_e: 0 bar, sensor mounting: vertical from above, density switch: to > 0.7 g/cm^3
Maximum measured error	max. ± 1 mm, specified by mounting position
Non-repeatability	0.1 mm
Hysteresis	approx. 2 mm
Influence of medium density	max. +4.8 ... -3.5 mm (+0.19 ... -0.14 in) (0.5 ... 1.5 g/cm^3)
Influence of medium temperature	max. 1.4 ... -2.8 mm (-40 ... +120 °C (233 ... 393 K))
Influence of medium pressure	max. 0 ... -2 mm (0 ... 40 bar)
Operating conditions	
Mounting conditions	
Installation position	with short pipe (up to 500 mm (19.7 in)) any position, with long pipe vertical
Ambient conditions	
Ambient temperature	-50 ... 70 °C (223 ... 343 K), function with reduced data values see section ambient temperature
Storage temperature	-50 ... 80 °C (223 ... 353 K)
Overvoltage protection	electronic insert FEL51 (AC), electronic insert FEL52 (E5), electronic insert FEL54 (WA), electronic insert FEL55 (SI): overvoltage category III
Process conditions	
Medium temperature	-50 ... 120 °C (223 ... 393 K), for exceptions see process connections
Medium pressure	p_e = -1 ... 40 bar over the entire temperature range, exceptions see process connections
Test pressure	max. 100 bar (1.5 times the medium pressure p_e), no function during test pressure, burst pressure of diaphragm 200 bar
Pressure surge	max. 20 bar/s
Thermal shock resistance	max. 120 °C/s
State of aggregation	liquid
Density	min. 0.5 g/cm^3, other density settings on request
Viscosity	max. 10000 mm^2/s
Solid contents	max. Ø 5 mm
Mechanical specifications	
Protection degree	polyester, steel and aluminium housing: IP66/IP67

Mechanical construction	
Construction type	LVL-M2C: with extension tube, coated with ECTFE
Dimensions	housing: diameter max. 85 mm (3.3 in), height max. 173 mm (6.8 in) temperature separator, pressure-tight bushing: additional length L 140 mm (5.5 in) process connection: length L min. 115 (4.5 in) extension: any length L from 148 ... 6000 mm (6 in ... 20 ft) extension: length type II, for vertical installation from above same switching point as Vibracon LVL2 vibration fork: width 20.6 mm (0.81 in), fork width 6.5 mm (0.25 in), length 25 mm (1 in)
Mass	800 g, basic weight: compact version (length type II), electronic insert, plastic housing, without flange, additional weight is dependent on extension tube, housing and process connection
Additional weight	process connection: - A3H 1000 g, A5H 1500 g, A6H 2400 g, A6I 3200 g, A8H 4900 g - H35 1400 g, H65 2400 g, H71 1600 g, H75 3200 g, H95 5900 g, HA3 5600 g - J1H 1700 g length, spacer, bushings: - BK* 900 g/m - CK* 2300 g/100 in - DKA 100 g, DKB 700 g, DKC 800 g
Material	wetted parts: - process connection and extension pipe: 1.4435/316L with ECTFE coating - vibration fork: 1.4435/316L with ECTFE coating housings: - polyester housing: PBT-FR with PBT-FR cover or with PA12 cover with sight glass, cover seal: EPDM - stainless steel housing: 1.4301/304, cover seal: silicone - aluminium housing: EN-AC-AlSi10Mg, plastic-coated, cover seal: EPDM cable gland: polyamide or brass, nickel-plated temperature spacer: 1.4435/316L pressure-tight bushing: 1.4435/316L
Surface quality	R_a < 3.2 µm/80 grit: length, spacer, bushings B**, C**, D**
Switching point	see section switch point
Process connection	flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1", to JIS B 2238 (RF) from DN50 for additional information see type code
Indication and operation	
Display elements	electronic inserts: - electronic inserts FEL50 A (PA), FEL58 (N2): green LED, yellow LED - electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): green LED, red LED
Operating elements	electronic insert FEL50A (PA): 8 switches for device address setting electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): two switches for fail-safe mode and density change electronic insert FEL58 (N2): two switches for fail-safe mode and density change and one test button interrupts lead
Certificates and approvals	
Ex approval	KEMA 01 ATEX 1089, KEMA 01 ATEX 1147 X, KEMA 01 ATEX 1148 X, KEMA 01 ATEX 2117, KEMA 01 ATEX 2118 X, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 and ⟨Ex⟩ II 1/2D T80°C (KEMA 01 ATEX 1089) ⟨Ex⟩ II 1G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X) ⟨Ex⟩ II 1/2G EEx ia IIC T3 ... T6 (KEMA 01 ATEX 1148 X) ⟨Ex⟩ II 1/2G EEx d IIC T3 ... T6 or EEx d IIB T3 ... T6 (KEMA 01 ATEX 2117) ⟨Ex⟩ II 1/2G EEx d IIC T3 ... T6 (KEMA 01 ATEX 2118 X) ⟨Ex⟩ II 3G EEx nA/nC II T6 and ⟨Ex⟩ II 3D T85°C
SIL classification	up to SIL2 acc. to IEC 61508
Overspill protection	Z-65.11-306 (overspill protection in acc. with WHG)
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector) If the fork tines are joined together on account of build-up, the useful signal is attenuated to such an extent that the original EMC values can no longer be completely observed (EN 61000-4-3 electromagnetic fields, EN 61000-4-6 HF coupling).
Directive 94/9 EC (ATEX)	EN 50014, EN 50018, EN 500020, EN 500021, EN 50284, EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a
Vibration resistance	EN 60068-2-6, 10 ... 50 Hz, 0.15 mm, 100 cycles

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Supplementary documentation	technical information TI347O operating instructions KA162O (LVL-M2C) operating instructions BA141O (electronic insert FEL50A (PA)) safety information SI031O (KEMA 01 ATEX 2117) safety information SI063O (KEMA 01 ATEX 1089) safety information SI064O (KEMA 01 ATEX 1147 X) safety information SI113O (KEMA 01 ATEX 1148 X) safety information SI114O (KEMA 01 ATEX 2118 X) safety information SI154O (KEMA 01 ATEX 1089), PROFIBUS PA version safety information SI158O (KEMA 01 ATEX 1148 X), PROFIBUS PA version safety information SI159O (KEMA 01 ATEX 1147 X), PROFIBUS PA version safety information SI182O (⟨Ex⟩ II 3G EEx nA/nC II T6 and ⟨Ex⟩ II 3D T85°C) approval ZE233O overspill protection acc. to WHG (Z-65.11-306)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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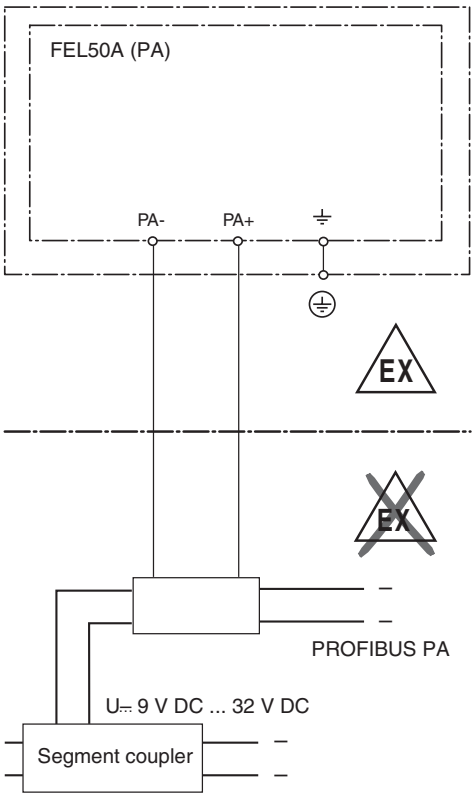
Electrical connection

Electronic insert FEL50A (PA)

Two-wire connection for power supply and data transfer for connecting to PROFIBUS PA

Additional functions:

- Digital communication enables the representation, reading and editing of the following parameters: fork frequency, switch-on frequency, switch-off frequency, switch-on time and switch-off time, status, measured value, density switch.
- Matrix locking possible.
- Switch to WHG mode possible (WHG approval).
- You can also visit www.profibus.com for more information.



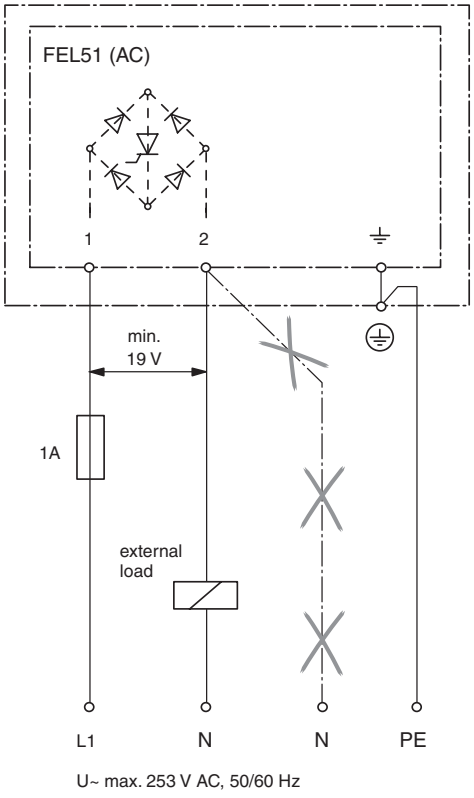
Electronic insert FEL51 (AC)

Two-wire AC connection

Always connect in series with a load!

Check the following:

- the residual current in blocked state (up to 3.8 mA)
- that for low voltage
  - The voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
  - The voltage drop across the electronics when switched through is observed (up to 12 V).
- that a relay cannot de-energise with holding power below 3.8 mA
  If this is the case, a resistor should be connected parallel to the relay (RC module available on request).
- When selecting the relay, pay attention to the holding power/rated power (see connectable load).



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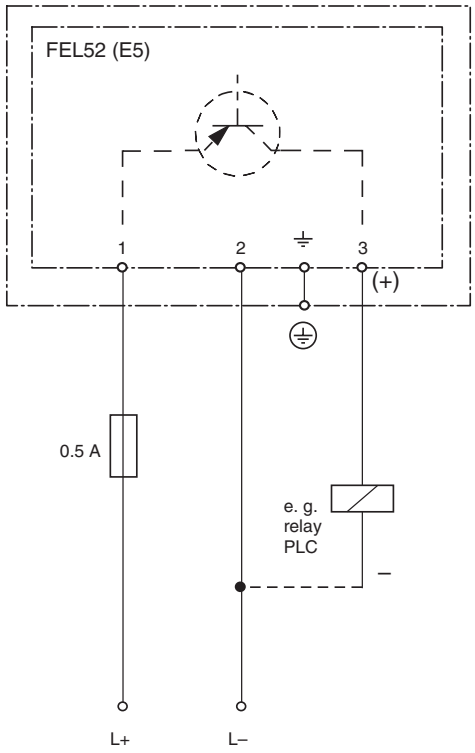
Electrical connection

Electronic insert FEL52 (E5)

Three-wire DC connection

- preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2.
- positive signal at switching output of the electronics (PNP)
- Output blocked on reaching limit.



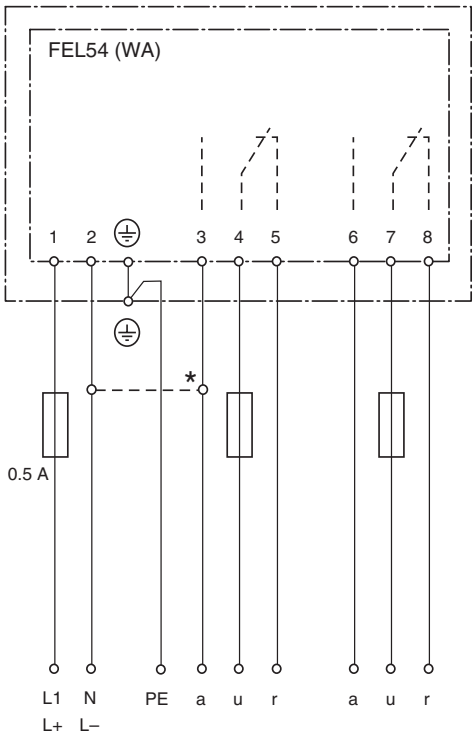
$U_{\text{⎓}}$ 10 V DC … 55 V DC

Electronic insert FEL54 (WA)

Universal current connection with relay output

- Power supply:
  Please note the different voltage ranges for AC and DC.
- Output:
  When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact.
  A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting.
  Both relay contacts switch simultaneously.

* When jumpered, the relay output works with NPN logic.



U~ 19 V AC … 253 V AC, 50/60 Hz
U– 19 V DC … 55 V DC

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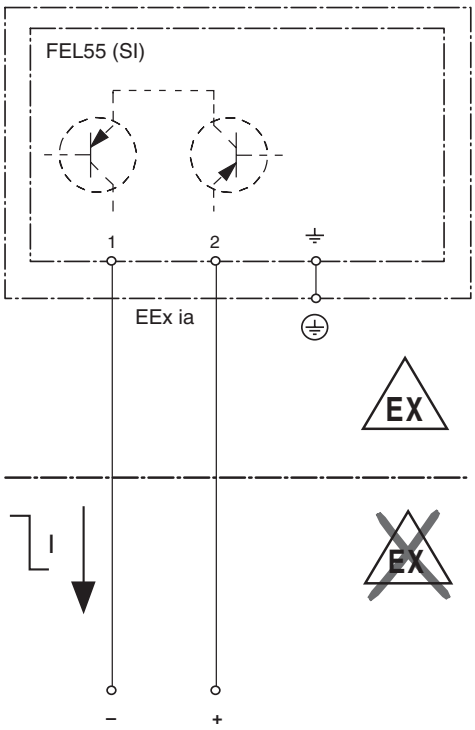
Electrical connection

Electronic insert FEL55 (SI)

Two-wire connection for separate switching unit

- for connecting to programmable logic controllers (PLC) for example, AI module 4 mA ... 20 mA to EN 61131-2
- Output signal jump from high to low current on limit **(H-L edge)**



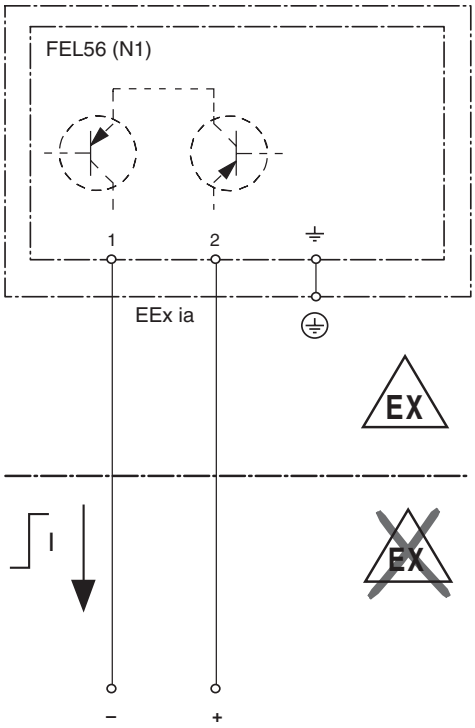
$U_{\overline{\overline{\ }}}$ 11 V DC … 36 V DC
e. g. PLC

Electronic insert FEL56 (N1)

Two-wire connection for separate switching unit

- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from low to high current on limit **(L-H edge)**

Connecting to multiplexer: set clock time to min. 2 s.



Isolated switch amplifiers
according to IEC 60947-5-6 (NAMUR)

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Electrical connection

Electronic insert FEL58 (N2)

Two-wire connection for separate switching unit

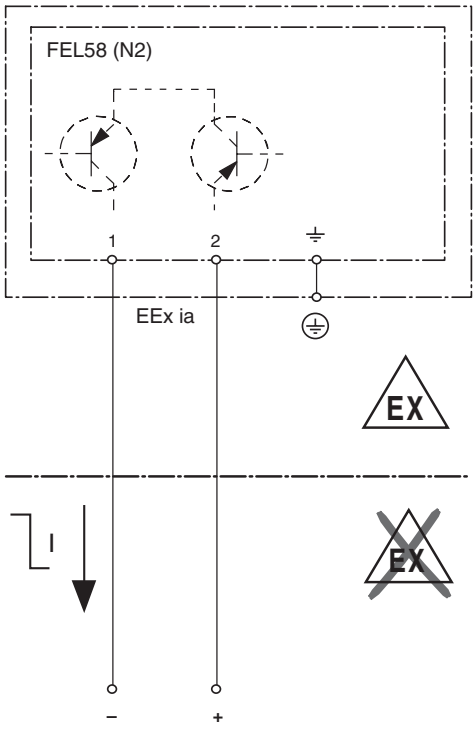
- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. Isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from high to low current on limit **(H-L edge)**

Additional function:
Test key on the electronic insert. Pressing the key breaks the connection to the isolating amplifier.

Connecting to multiplexer: set clock time to min. 2 s.

Note

For Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.



Isolated switch amplifiers
according to IEC 60947-5-6 (NAMUR)

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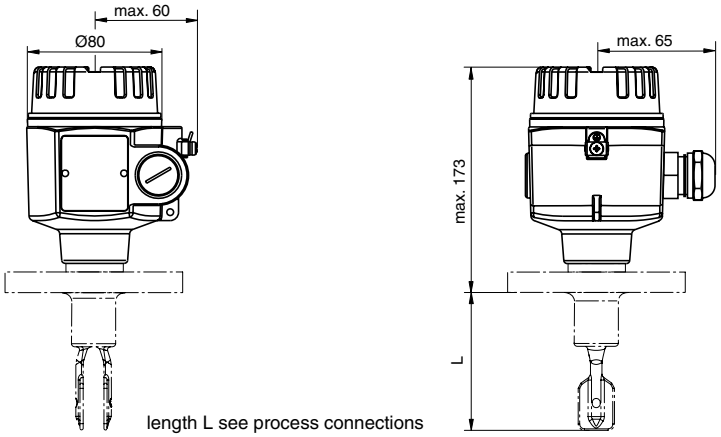
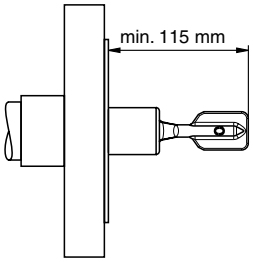
Dimensions

Aluminium housing A*



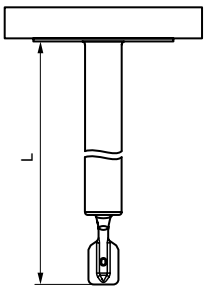
Process connections

A**, J**, H**

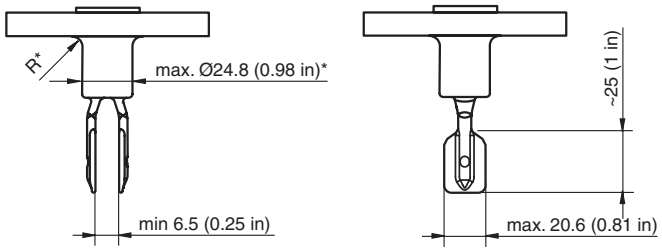


Extension tube

Flanges and flange-like process connections



Vibration fork



*The following applies to DN25/ANSI 1":
max. pipe diameter 24.2 mm (0.95 in)
radius R max. 4 mm (0.16 in)
This is important when selecting the counter flange!

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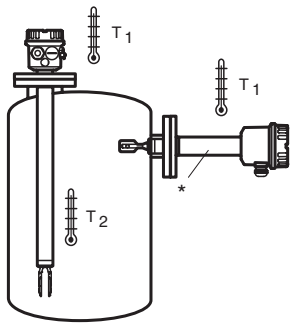
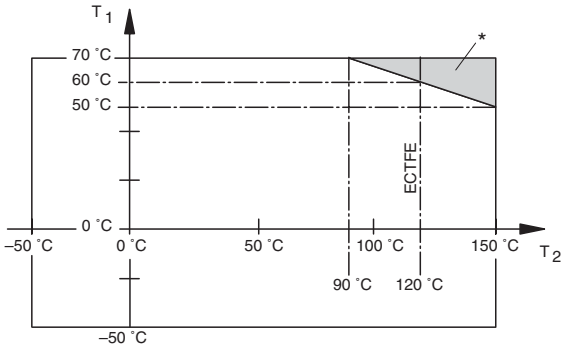
Ambient temperature

Permissible ambient temperature T_1 at the housing depends on the product temperature T_2 in the vessel:





* additional temperature range for sensors with a temperature separator or pressure-tight bushing

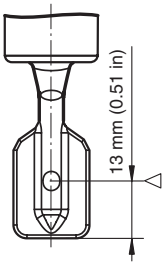
The temperature difference between the process side and the ambient side (T2 – T1) of the flange may not exceed max. 60 °C (333 K). For this reason, the flange may have to be included in the tank insulation if necessary.

Switch point

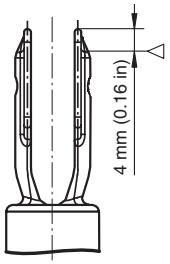
Switch point ▷ on the sensor depend on the mounting position, with reference to water, density 1 g/cm³, 23 °C (296 K), p_e 0 bar.

Note:

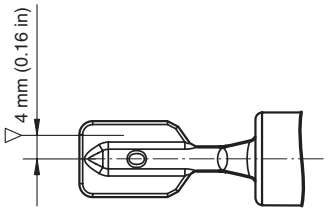
The switch points of the Vibracon LVL-M2C are at other positions to those of the previous version LVL2.



Mounting from above



Mounting from below



Mounting from the side

Accessories

- V1-G, mating connector, straight
- V1-W, mating connector, 90° angled

Type code/model number

L V L – M 2 C – [ ] [ ] [ ] [ ] [ ] [ ] – [ ] [ ] [ ] [ ] [ ] [ ] – [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Specification of length without unit

Certificates
- **NA** for non-hazardous areas
- **WH** WHG overspill protection
- **EF** Ex II 1/2G EEx ia IIB T6, WHG
- **EG** Ex II 1/2G EEx d IIB T6, WHG
- **EI** Ex II 1/2G EEx ia IIC T6, WHG
- **EK** Ex II 1/2G EEx d IIC T6, WHG
- **EM** Ex II 3G EEx nA IIC T6, WHG
- **EN** Ex II 3G EEx nC IIC T6, WHG
- **FI** FM, IS, CI I, II, III, Div1, Group A–G
- **FN** FM, NI, CI I, Div2, Group A–D
- **FX** FM, XP, CI I, II, III, Div1, Group A–G
- **CG** CSA, General Purpose
- **CI** CSA, IS, CI I, II, III, Div1, Group A–G
- **CX** CSA, XP, CI I, II, III, Div1, Group A–G

Optional equipment
- **NA** without optional equipment
- **TD** special version

Electrical output
- **PA** FEL50A, PROFIBUS PA
- **AC** FEL51, contactless 2-wire switch, 19 V ... 253 V AC
- **E5** FEL52, PNP 3-wire, 10 V ... 55 V DC
- **WA** FEL54, potential-free change-over contact, DPDT, 19 V ... 253 V AC, 19 V ... 55 V DC
- **SI** FEL55, 8/16 mA, 11 V ... 36 V DC
- **N1** FEL56, NAMUR, L-H edge
- **N2** FEL58, NAMUR with push button, H-L edge

Housing, cable entry
- **A1** aluminium housing, IP66, cable gland M20
- **A2** aluminium housing, Nema, 4x ¾ NPT
- **A3** aluminium housing, IP66, entry G½A
- **A4** aluminium housing, IP66, plug connector M12 x 1
- **A5** aluminium housing, IP66, PA plug connector M12 x 1
- **E1** stainless steel housing, IP66, cable gland M20
- **E2** stainless steel housing, Nema 4x ½ NPT
- **E3** stainless steel housing, IP66, entry G½A
- **E4** stainless steel housing, IP66, plug connector M12 x 1
- **E5** stainless steel housing, IP66, PA plug connector M12 x 1
- **P1** polyester housing, IP66, cable gland M20
- **P2** polyester housing, Nema 4x ½ NPT
- **P3** polyester housing, IP66, entry G½A
- **P4** polyester housing, IP66, plug connector M12 x 1
- **P5** polyester housing, IP66, PA plug connector M12 x 1

Temperature spacer, pressure-tight bushing
- **A** without
- **B** temperature spacer
- **C** pressure-tight bushing

Length, material extension pipe
- **BK** in mm L, ECTFE
- **CK** in inch L, ECTFE
- **DK** special length L II, ECTFE, switching point = Vibracon compact

Process connection and material
- **A3H** 1", ANSI B 16.5, 150 lbs RF, ECTFE
- **A5H** 1½", ANSI B 16.5, 150 lbs RF, ECTFE
- **A6H** 2", ANSI B 16.5, 150 lbs RF, ECTFE
- **A6I** 2", ANSI B 16.5, 300 lbs RF, ECTFE
- **A8H** 3", ANSI B 16.5, 150 lbs RF, ECTFE
- **H35** DN25 PN40, EN 1092-1 Form B, ECTFE
- **H55** DN32 PN40, EN 1092-1 Form B, ECTFE
- **H65** DN40 PN40, EN 1092-1 Form B, ECTFE
- **H71** DN50 PN6, EN 1092-1 Form B, ECTFE
- **H75** DN50 PN40, EN 1092-1 Form B, ECTFE
- **H95** DN80 PN40, EN 1092-1 Form B, ECTFE
- **HA3** DN100 PN16, EN 1092-1 Form B, ECTFE
- **J1H** 10 K 50, JIS B 2238 (RF), ECTFE
- **XXX** special version

Design
- **M2** extended design (148 mm/6 in ... 6,000 mm/20 ft)

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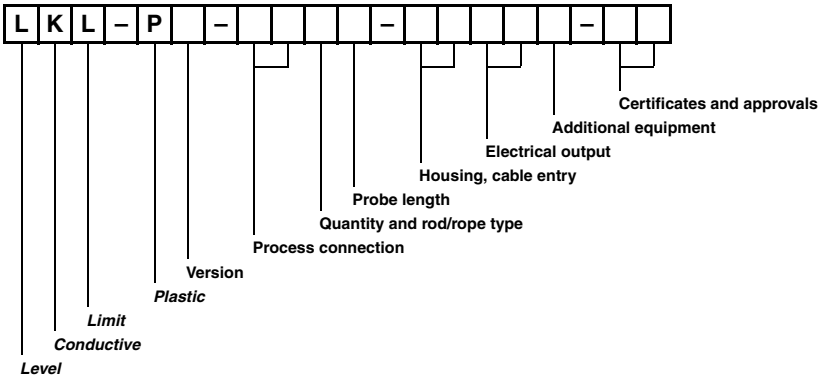
Type code of conductive limit switches

The figure below shows the used characters and numbers of the conductive limit switches type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the conductive limit switches.

Product group LKL-P*



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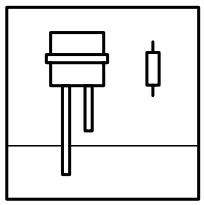
Conductive limit switch LKL-P1

Two electrodes are installed above the surface of a conductive liquid which is to be monitored. If the liquid level rises to the point where both electrodes are in contact with the liquid, the current circuit of a connected relay is completed via the two electrodes and the liquid, causing a switching signal to be activated.



The minimum conductivity of the liquid must be 10 µS/cm. These conditions are fulfilled by practically all conductive liquids, such as water, acids and lyes, with the exception of pure solvents.

If several switching points are needed, the corresponding multiple electrodes should be used.

In order to avoid electrical effects in the liquid, a DC-free alternating current is used for measuring. This is generated by an electrode relay or a converter.

Interfacial level detection can be easily and economically realised with this measuring method. Particularly with oil and petrol separators, the limit value between the water and the non-conductive liquid is easy to detect.

Contents

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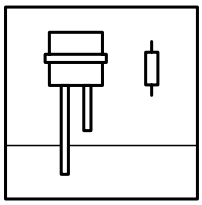
Conductive limit switch

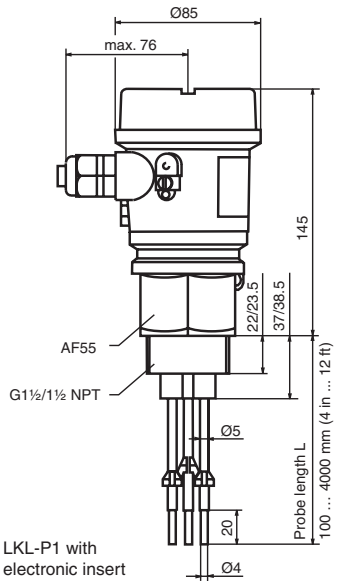
LKL-P*



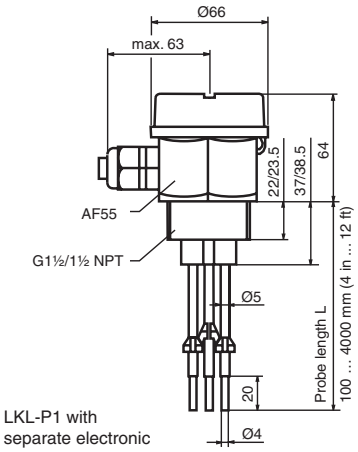
Features

- Level limit switch for conductive liquids
- Detect up to five level limits with one probe
- Flexible instrumentation
- No moving parts in the tank
- No calibration: quick and low-cost start-up
- Option between rod or rope version for optimum adaptation to the application
- Two-point control and additional maximum and minimum detection
- Approval as overfill protection and leak detection system

Dimensions



LKL-P1 with electronic insert



LKL-P1 with separate electronic

Additional dimensions see section dimensions.

When placing your order, please specify the length (L) of the electrode rod. The electrode rod can be cropped by the user if necessary.

Function

The LKL-P sensor is used in conductive liquids (as of 10 µs/cm) for determining level limits.

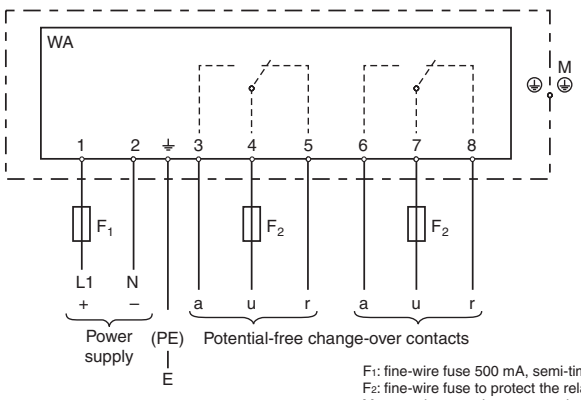
Depending on the number of measuring points (up to 5 rods or ropes), measuring tasks such as overspill protection, dry running protection, two-point control of pumps or multiple point detection can be implemented for an existing process connection.

- Flexible instrumentation: with built-in electronic insert, either transistor or relay output for 2 or 3 rod/rope probes and for connection to a separate transmitter power supply unit
- No calibration required: standard setting for the most common conductive liquids
- No moving parts in the tank: long service life and reliable operation with no wear or blockages

Electrical connection

Example:
Output WA (FEW54), compact instrument version, AC/DC connection with relay output

Relay contact circuit for load
The connected load is switched via potential-free relay contacts (change-over contact). In the event of a level alarm or a power failure, the relay contacts break the connections between terminals 3 and 4 and terminals 6 and 7. The relays always switch simultaneously.



F1: fine-wire fuse 500 mA, semi-time lag
F2: fine-wire fuse to protect the relay contact, load-dependent
M: ground connection to protective earth (PE)
E: grounding (functional earth optional)

Other connection types see section electrical connection.

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Function and system design	
Measuring principle	An alternating voltage exists between the rod probes in an empty tank. As soon as the conductive liquid in the tank creates a connection between the ground probe rod and, for example, the maximum probe rod, a measurable current flows and the LKL-P* switches. With level limit detection, the LKL-P* switches back as soon as the liquid clears the maximum probe. With two-point control, the LKL-P* does not switch back until the max and min probe is cleared. Using alternating voltage prevents corrosion of the probe rods and electrolytic destruction of the product. The material used for the tank walls is not important for measurement because the system is designed as a closed potential-free circuit between the probe rods and the electronics. There is absolutely no danger if the probe rods are touched during operation.
Equipment architecture	probe with integrated electronic insert (compact instrument version) probe without integrated electronic insert (separate instrument version) for one or two point detection respectively, see section measuring system
Input characteristics	
Measured variable	resistance change between two conductors caused by the presence or absence of a conductive product.
Measurement range	The measuring range is dependent on the mounting location of the probes. Rod probes can have a max. length of 4000 mm (13 ft) and rope probes up to 15000 mm (49 ft).
Input signal	probes covered - A measurable current is flowing between the probes. probes uncovered - There is no measurable current flowing between the probes.
Output characteristics	
Output signal	see section electrical connection
Measurement range	A total of four measuring ranges (100 Ω, 1 kΩ, 10 kΩ, 100 kΩ) can be set via two DIL switches (SENS). The setting on delivery is 100 kΩ
Signal on alarm	output E5 (FEW52): in the event of a power failure or a damaged probe: < 100 µA. output WA (FEW54): output signal in the event of a power failure or a damaged probe: relay de-energised.
Fail safe mode	Selecting the correct fail-safe mode ensures that the relay always runs in quiescent current fail-safe. - maximum fail-safe: The relay de-energises when the switch point is exceeded (probe covered), a fault occurs or the power supply fails. - minimum fail-safe: The relay de-energises when the switch point is undershot (probe uncovered), a fault occurs or the power supply fails.
Load	output E5 (FEW52): The load is switched via a transistor (PNP). cycled overload and short-circuit protection, continuous ≤200 mA (short-circuit proof), residual voltage at transistor at I_{max} < 2.9 V output WA (FEW54): Loads are switched via 2 potential-free change-over contacts. I~ max. 4 A, U~ max. 253 V P~ max. 1000 VA, cos Φ= 1, P~ max. 700 VA, cos Φ> 0.7 I- max. 4 A to 30 V, I- max. 0.2 A to 150 V. When connecting a functional extra-low voltage circuit with double insulation in accordance with IEC 1010: The sum of the relay output and power supply voltages is max. 300 V. output N1 (FEW58): refer to data sheet of the connected isolating amplifier acc. to NAMUR (IEC 60947-5-6)
Switching delay	A switching delay of 2.0 s can be activated or deactivated via a DIL switch. If the switching delay is set to 0 s, the device switches after approx. 0.3 s.
Electrical isolation	output WA (FEW54): All input channels, output channels and relay contacts are galvanically isolated from each other.
Lead monitoring	For probes without an electronic insert, an additional printed circuit board must be installed in the housing, which enables cable monitoring. It is always switched or connected between rod/rope 1 and 2. Note! When using switching units (transmitters) that do not support cable monitoring, these must be removed.
Auxiliary energy	
Electrical connection	see section electrical connection
Supply voltage	output E5 (FEW52): supply voltage 10.8 ... 45 V DC load connection: open collector; PNP switching voltage: max. 45 V output WA (FEW54): supply voltage 20 ... 55 V DC or 20 ... 253 V AC, 50/60 Hz peak inrush current: max. 2 A, max. 400 µs output: two potential-free change-over contacts output N1 (FEW58): refer to data sheet of the connected isolating amplifier acc. to NAMUR (IEC 60947-5-6)
Power consumption	output E5 (FEW52): P < 1.1 W output WA (FEW54): P < 2.0 W
Current consumption	output E5 (FEW52): I < 25 mA (without load) output WA (FEW54): 60 mA
Reverse polarity protection	output E5 (FEW52)
Contact loading	output WA (FEW54): 253 V AC/4 A; 30 V DC/4 A; 150 V/0.2 A
Signal on alarm	output N1 (FEW58): output signal with damaged sensor < 1 mA
Performance characteristics	
Reference operating conditions	ambient temperature: 23 °C (296 K), medium temperature: 23 °C (296 K), medium viscosity: medium must release the probe again (drain off), medium pressure pe: 0 bar, probe installation: vertically from above

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Maximum measured error	± 10 % at 0.1 ... 100 kΩ ± 5 % at 1 ... 10 kΩ
Non-repeatability	± 5 % at 0.1 ... 100 kΩ ± 1 % at 1 ... 10 kΩ
Hysteresis	-10 % for the max probe, in reference to the switch point, Δs function deactivated
Influence of ambient temperature	< 0.05 %/K
Switching time	< 3 s
Operating conditions	
Mounting conditions	
Mounting location	The rod and rope probes are mounted predominantly in tanks made of plastic or metal.
Mounting examples	see section example applications
Ambient conditions	
Ambient temperature	-40 ... 70 °C (233 ... 343 K) -40 ... 60 °C (233 ... 333 K) for output N1 (FEW58)
Storage temperature	-40 ... 80 °C (233 ... 353 K)
Climate class	tropicalised
Shock resistance	practical test
Vibration resistance	20 ... 2000 Hz, 1 $(m/s^2)^2$/Hz
Electromagnetic compatibility	Use for separate-instrumented probes a screened cable between the probe and the switching unit.
Process conditions	
Medium temperature	-40 ... 100 °C (233 ... 373 K)
Medium pressure	-1 ... 10 bar
Conductivity	≥ 10 µS
Mechanical specifications	
Protection degree	IP66
Mechanical construction	
Construction type	LKL-P1: rod version LKL-P2: rope version
Dimensions	LKL-P1: - housing: max. Ø85 mm (3.3 in), height max. 145 mm (5.7 in) - rod: length 100 ... 4000 mm (4 in ... 13 ft) LKL-P2: - housing: max. Ø85 mm (3.3 in), height max. 145 mm (5.7 in) - rope: length 250 ... 15000 mm (10 in ... 49 ft)
Mass	separate instrument version: - rod, 1 m (3 ft) long, LKL-P1 with 2, 3 or 5 rods (415 g/530 g/760 g) - rope, 1 m (3 ft) long, LKL-P2 with 2, 3 or 5 ropes (390 g/470 g/640 g) compact instrument version: - rod, 1 m (3 ft) long, LKL-P1 with 2 or 3 rods (600 g/720 g) - rope, 1 m (3 ft) long, LKL-P2 with 2 or 3 ropes (710 g/800 g)
Material	probes: - rods: rod 1.4404/316L, insulation: PP - ropes: rope 1.4571/316Ti, insulation FEP, weight 1.4435/316L housing: - output NA (separate instrument version): housing PPS, cover PBT - output E5/WA/N1 (compact instrument version): housing PBT, cover PBT, adapter PBT process connections: PPS
Process connection	- cylindrical thread G1½A to DIN ISO 228/1 - conical thread 1½ NPT to ANSI B 1.20.1
Probe	rod probes: compact instrument version 2 or 3 rods, separate instrument version 2, 3 or 5 rods - diameter without insulation: Ø4 mm (0.16 in) - rod length: 100 ... 4000 mm (4 in ... 13 ft) - thickness of insulation: 0.5 mm (0.02 in) - length of non-insulated area (tip of rod): 20 mm (0.8 in) - extraction forces (parallel probe rod): 1000 N rope probes: compact instrument version 2 or 3 ropes, separate instrument version 2, 3 or 5 ropes - diameter without insulation: Ø1 mm (0.04 in) - rope length: 250 ... 15000 mm (10 in ... 49 ft) - thickness of insulation: 0.75 mm (0.03 in) - weight length: 100 mm (4 in) (not insulated) - weight diameter: Ø10 mm (0.4 in) - extraction forces (parallel probe rope): 500 N
Electrical connection	cable connection M20 x 1.5, ½ NPT, G½
Indication and operation	

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Display elements	separate instrument version: dependent on the connected switching unit compact instrument version: - one red light emitting diode: fault message, switching status - one green light emitting diode: operation Note for output E5 (FEW52) and output WA (FEW54) If the probe is covered and the red LED flashes continuously, the next more sensitive measuring range has to be set. This ensures a safe switch point even if the conductivity of the medium varies slightly.
Operating elements	- one DIL switch for min/max position - one DIL switch for 0 s or 2 s switching delay - two DIL switches for setting the measuring ranges 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ
Certificates and approvals	
Ex approval	TÜV 03 ATEX 2295, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 2G EEx ia/ib IIC T6 (TÜV 03 ATEX 2295) ⟨Ex⟩ II 3G or nC [L] IIC T6
Overspill protection	Z-65.13-378 (overspill protection in acc. with WHG) Z-65.40-379 (leak detection system)
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)
Directive 94/9 EC (ATEX)	EN 50014, EN 50020
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38
Vibration resistance	EN 60068-2-64
Supplementary documentation	operating instructions KA203O (LKL-P* without electronic insert) operating instructions KA204O (LKL-P* with integrated electronic insert) safety information SI230O (TÜV 03 ATEX 2295) safety information SI226O (⟨Ex⟩ II 3G EEx nA [L] IIC T6 or nC [L]) approval ZE043O overspill protection acc. to WHG (Z-65.13-378) approval ZE257O leak detection system (Z-65.40-379)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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Electrical connection

**Output WA (FEW54)
compact instrument version**

Relay contact circuit for load:

The connected load is switched via potential-free relay contacts (change-over contact).

In the event of a level alarm or a power failure, the relay contacts break the connections between terminals 3 and 4 and terminals 6 and 7. The relays always switch simultaneously

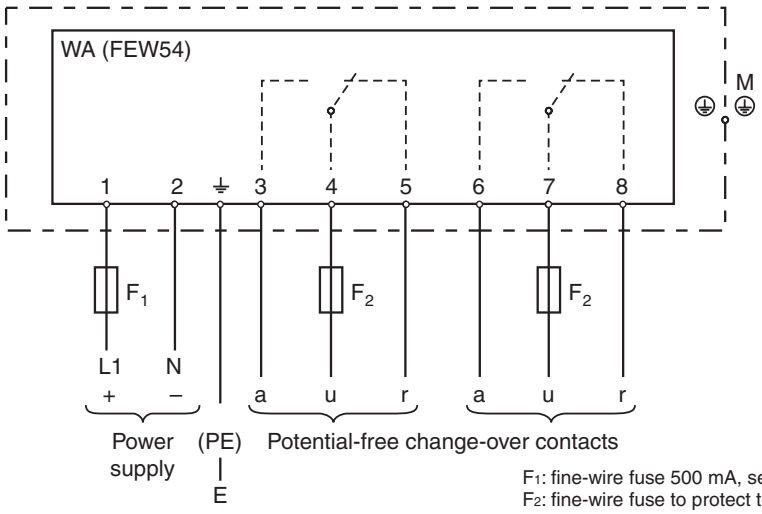
Protection against voltage peaks and short-circuits:

When connecting a device with high inductance, fit a spark barrier to protect the relay contact. A fine-wire fuse (load-dependent) can protect the relay contact in the event of a short-circuit.

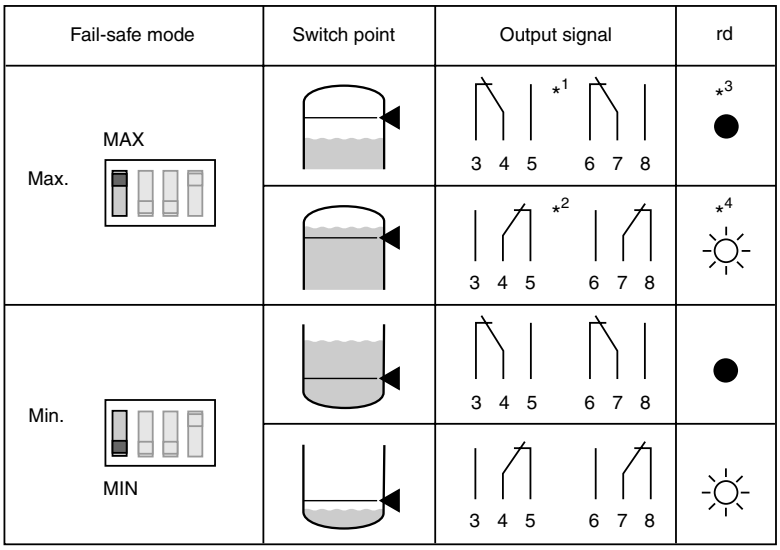
Output signal:

When connecting a device with high inductance, a spark barrier must be fitted to protect the relay contact. A fine-wire fuse (load-dependent) protects the relay contact in the event of a short-circuit. Both relay contacts switch simultaneously.

If the probe is covered and the red LED flashes continuously, the next more sensitive measuring range has to be set. This ensures a safe switch point even if the conductivity of the medium varies slightly.



F1: fine-wire fuse 500 mA, semi-time lag
F2: fine-wire fuse to protect the relay contact, load-dependent
M: ground connection to protective earth (PE)
E: grounding (functional earth optional)



*1 = relay energised; *2 relay de-energised; *3 LED not lit; *4 LED lit

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Electrical connection

Output E5 (FEW52)
compact instrument version

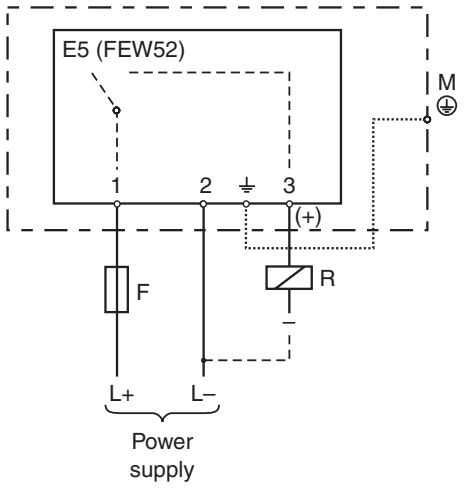
Transistor circuit for load:

The load connected to terminal 3 is switched by a transistor, contactless and therefore without bouncing.

In normal switching status, terminal 3 has a positive signal. The transistor is blocked in the event of a level alarm or a power failure.

Protection against voltage peaks:

When connecting a device with high inductance, always connect a voltage limiter.



F: fine-wire fuse 500 mA, semi-time lag
M: ground connection to protective earth

Output signal:

Preferred in conjunction with programmable logic controllers (PLC). Positive signal at the switch output of the electronics (PNP).The output is blocked after the level limit is reached.

If the probe is covered and the red LED flashes continuously, the next more sensitive measuring range has to be set. This ensures a safe switch point even if the conductivity of the medium varies slightly.

Fail-safe mode	Switch point	Output signal	rd
Max. MAX		*1 L+ 1 I_L 3	*3 ●
		*2 1 < 100 µA 3	*4 ☼
Min. MIN		L+ 1 I_L 3	●
		+ 1 < 100 µA 3	☼

*1 = load current (connected); *2 residual current (disconnected); *3 LED not lit; *4 LED lit

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Electrical connection

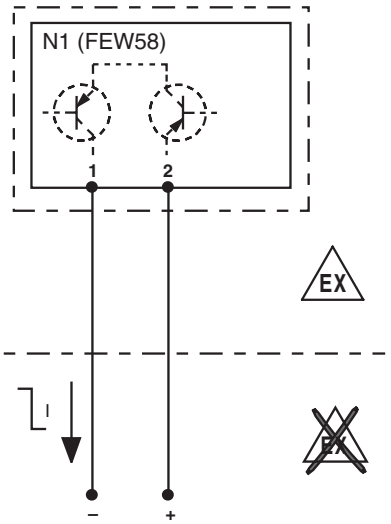
Output N1 (FEW58)
compact instrument version

To be used with isolating amplifiers acc. to NAMUR (IEC 60947-5-6):

Output signal jump from high to low current on limit (H-L edge).

Signal transmission on a two-wire line: H-L edge 2.2 mA ... 6.5 mA/ 0.4 mA ... 1.0 mA

When using a multiplex the cycle time must be set to a minimum of 2 s.



IEC 60947-5-6 (NAMUR)

Output signal:

For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6)

Fail-safe mode	Level	Output signal	LEDs green	LEDs yellow
Max.		+ 2.2 mA … 6.5 mA 2 → 1	☼	☼
		+ 0.4 mA … 1.0 mA 2 → 1	☼	●
Min.		+ 2.2 mA … 6.5 mA 2 → 1	☼	☼
		+ 0.4 mA … 1.0 mA 2 → 1	☼	●

☼ = lit ☼ = flashes ● = unlit

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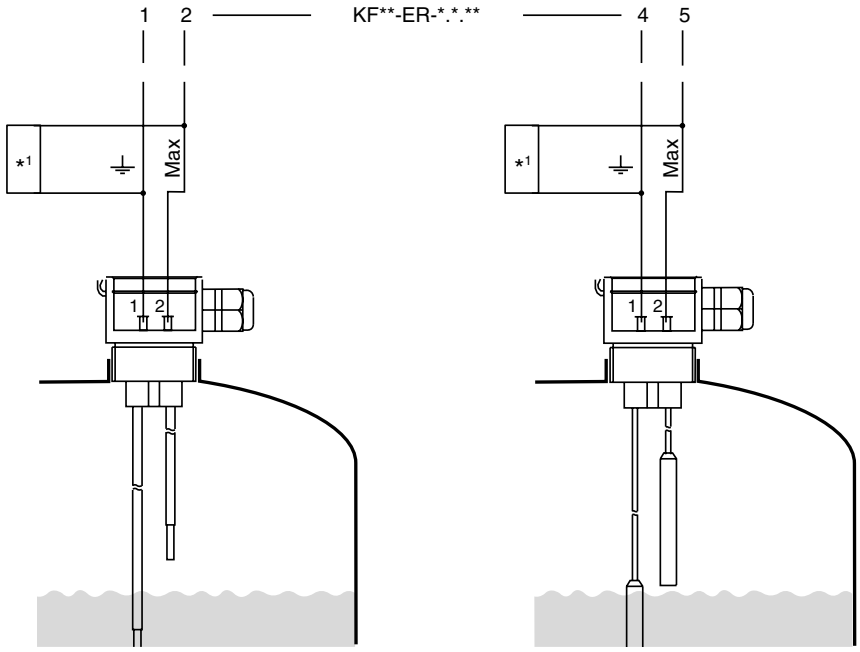
Electrical connection

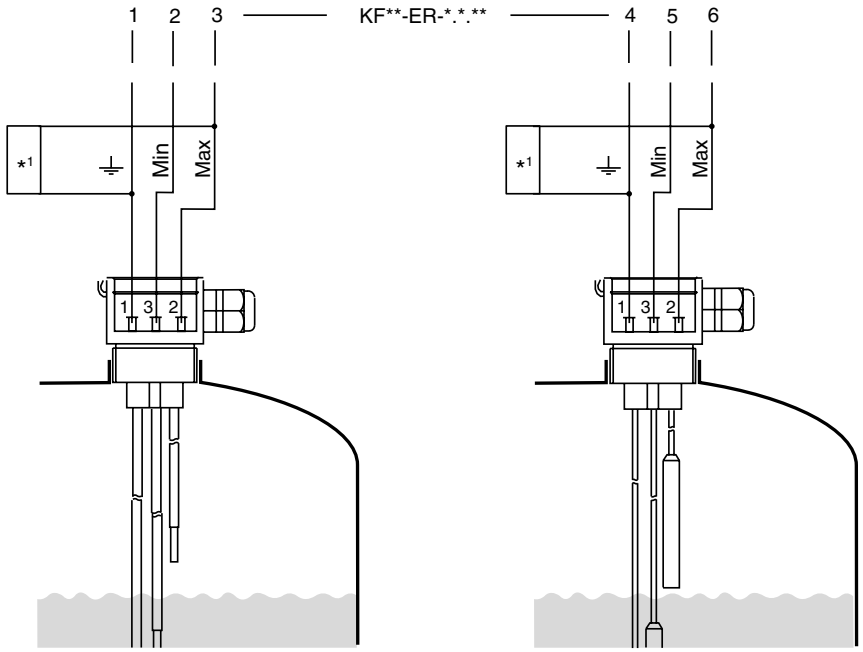
Output NA
separate instrument version

Separate instrumentation for 2-rod or 2-rope probes with cable monitoring



*1 Printed circuit board for cable monitoring
The power supply and evaluation are provided by switching units.

Separate instrumentation for 3-rod or 3-rope probes with cable monitoring

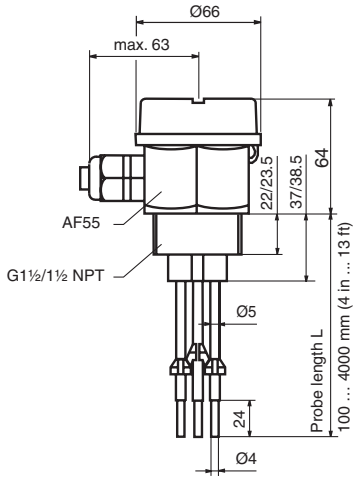


*1 Printed circuit board for cable monitoring
The power supply and evaluation are provided by switching units.

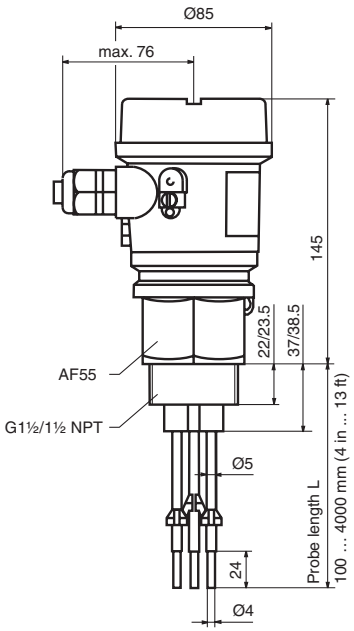
Dimensions

Version LKL-P1 Rod version

LKL-P1 with separate electronic

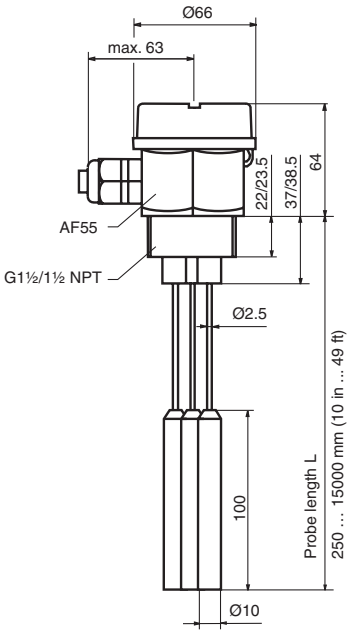


LKL-P1 with electronic insert

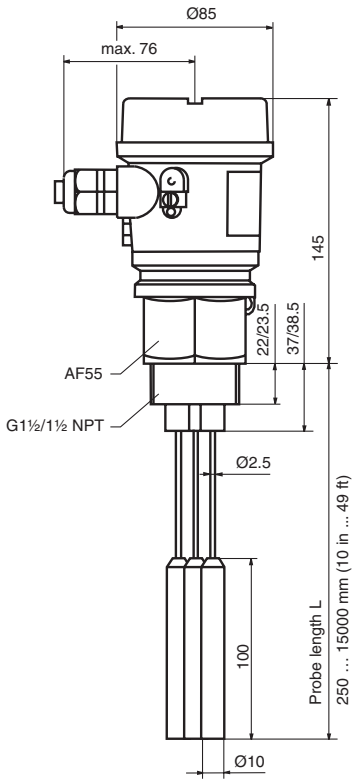


Version LKL-P2 Rope version

LKL-P2 with separate electronic



LKL-P2 with electronic insert



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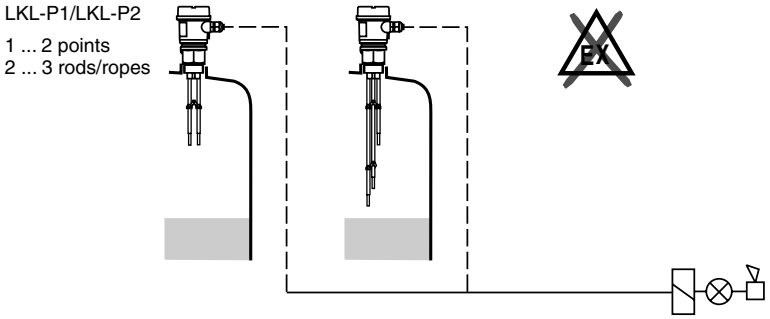
Measuring system

Probes with integrated electronic insert (compact instrument version)

The measuring system consists of:

- LKL-P1, LKL-P2 with two/three rods or ropes and an electronic insert
- Control units, switches or signal transmitters, e. g. process control systems PLC, relays, etc.

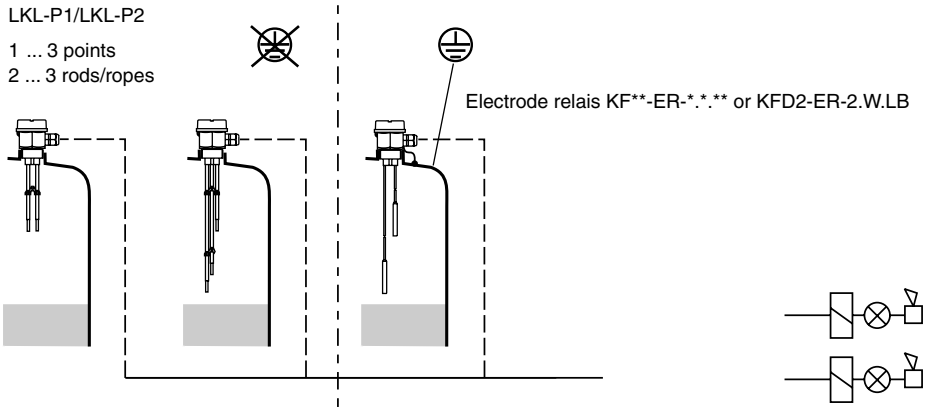


Switch point independent of the tank material.

Probes without integrated electronic insert (separate instrument version)

The measuring system consists of:

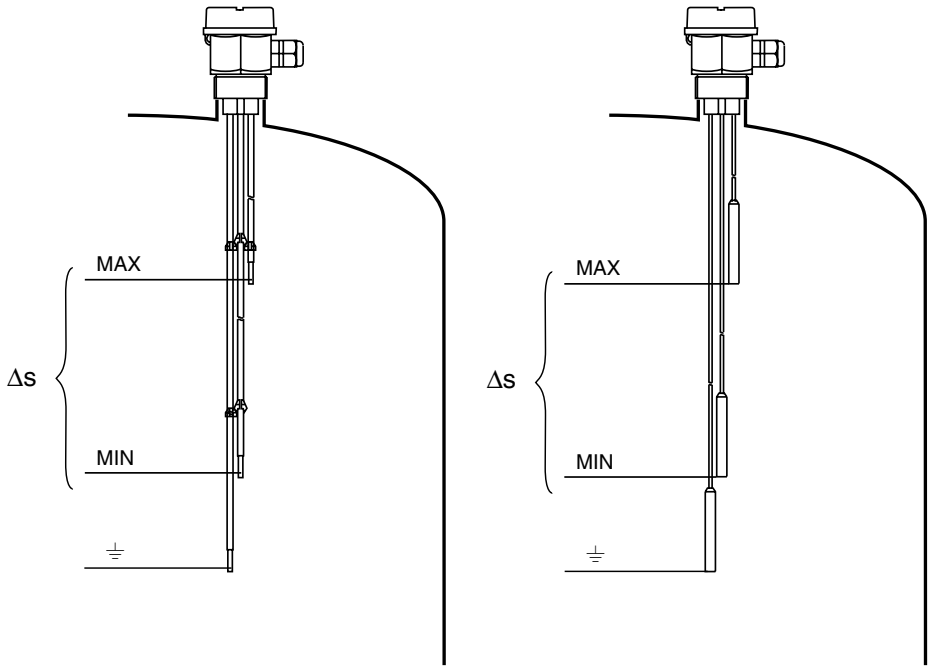
- LKL-P1, LKL-P2 with two/three rods or ropes
- Electrode relais KF**-ER-*.*.**
- Control units, switches or signal transmitters, e. g. process control systems PLC, relays, etc.



Switch points dependent of the tank material.

Example applications

Level limit detection (standard applications)



Two-point control (Δs) e. g. pump control

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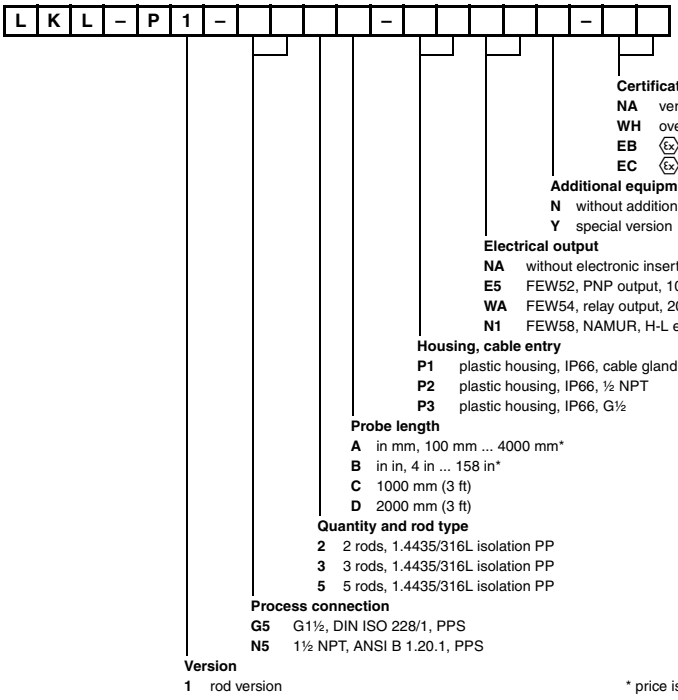
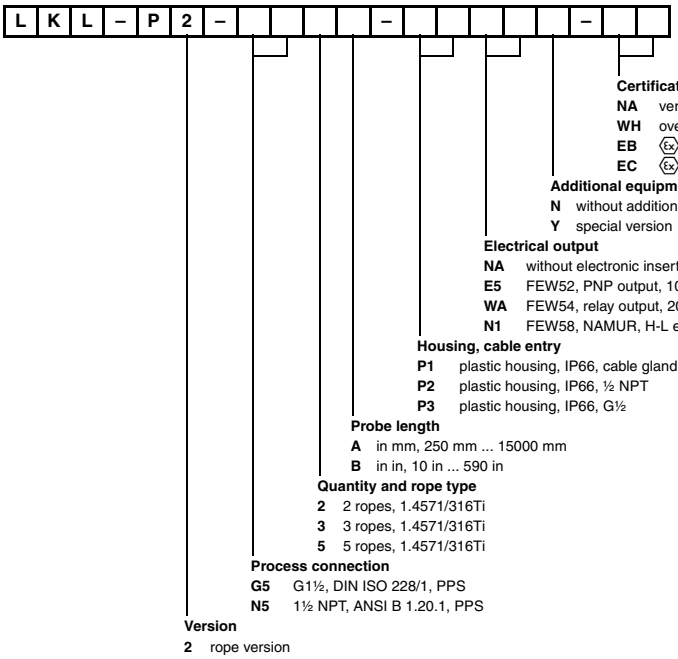
Accessories

- LKL-Z10, lock nut G1½, AF60
- LZ-1204, mounting bracket G1½

Type code/model number





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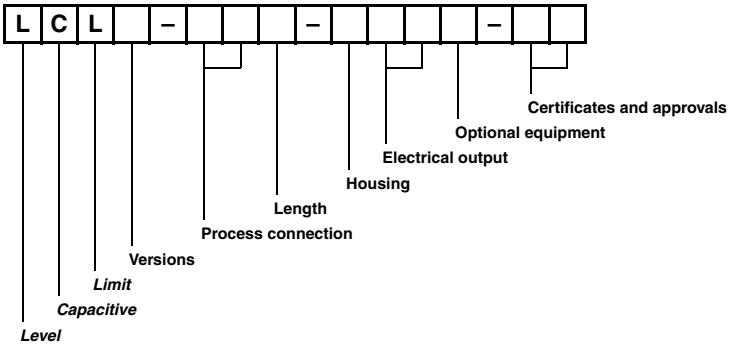
Type code of capacitive limit switches

The figure below shows the used characters and numbers of the capacitive limit switches type code.

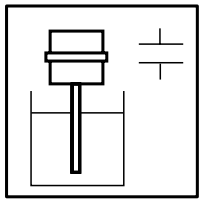
Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the capacitive limit switches.

Product group LCL*



Capacitive limit switch LCL1

The metal container wall and measuring sensor form the two electrodes of a capacitor. The capacitance changes as the level increases due to the dielectric constant ε_r of the medium.



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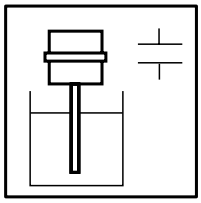
Capacitive limit switch

LCL*

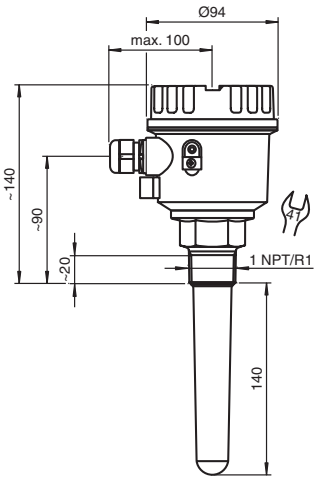


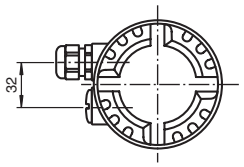
Features

- Complete unit consisting of the probe and electronic insert
- Integrated active build-up compensation: exact switch point, even when strong build-up
- Mechanically rugged: no wearing parts, long operating life, maintenance-free
- Rope probe of the LCL2 can be shortened for optimum matching to the measuring point
- ATEX approval for zone 20 (dust)

Dimensions

LCL1, compact version with rod probe





Additional dimensions see section dimensions.

Function

The capacitive limit switch is designed for limit detection of light bulk solids, e. g. grain products, flour, milk powder, animal feed, cement, chalk or plaster.

Versions:

- LCL1 with 140 mm (5.5 in) rod probe, for bulk solids and liquids
- LCL2 with rope probe up to 6 m (20 ft), for bulk solids
- Relay output (potential-free change-over contact) with AC or DC connection
- PNP output with 3-wire DC connection

Electrical connection

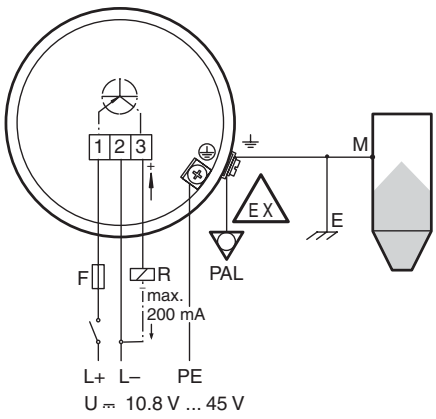
Connection type E5, 3-wire DC connection (example)

3-wire DC connection

F: Fine-wire fuse, 500 mA
R: connected load, e. g. PLC, DCS, relay
M: Connection to ground, silo or metal parts silo
E: Grounding

The LCL is protected against reverse polarity. In case of mixing up the connections, the green LED does not illuminate "ready to operate".

PE-connection and PAL-connection for LCL1 are unnecessary.



Other connection types see section electrical connection.

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Application	
Function principle	limit detection maximum or minimum detection in silos with all types of solid granulates, even in dust explosion hazardous areas
Function and system design	
Measuring principle	A metal plate at the end of the probe, within the insulation, and the surroundings (e. g. the silo walls) combine to form the two electrodes of a capacitor. If the probe is covered or free of material, then the capacitance changes and the LCL switches.
Input characteristics	
Measured variable	limit level (limit value)
Measurement range	LCL1: dielectric constant ≥ 1.6 LCL2: dielectric constant ≥ 1.5
Medium	bulk solids, grain size max. 30 mm (1.2 in), density min. 200 g/l, dielectric constant ≥ 1.6
Output characteristics	
Output signal	connection E5: switching PNP, I_{max} = 200 mA - overload and short circuit protection - residual voltage at transistor at I_{max} < 2.9 V connection WA: contact change-over, potential-free - U_{max} = 253 V - I_{max} = 4 A (AC) - P_{max} = 1000 VA, cos Φ= 1, P_{max} = 500 VA, cos Φ> 0.7
Signal on alarm	connection E5: < 100 µA connection WA: relay de-energised
Fail safe mode	minimum/maximum quiescent current safety can be switched at electronic insert connection E5 with PNP output: maximum fail-safe mode: The switch output is blocked when the probe is covered or the power supply fails. minimum fail-safe mode: The switch output is blocked when the probe is free or the power supply fails. connection WA with relay output (potential-free change-over contact): maximum fail-safe mode: The relay is de-energised when the probe is covered or the power supply fails. minimum fail-safe mode: The relay is de-energised when the probe is free or the power supply fails.
Switching time	LCL1: approx. 0.5 s when covering and uncovering LCL2: approx. 0.8 s when covering and uncovering
Switch-on response	LCL1: correct switching after max. 1.5 s LCL2: correct switching after max. 2 s
Auxiliary energy	
Electrical connection	see section electrical connection
Supply voltage	electrical connection E5: 10.8 ... 45 V DC, short-term pulse on 55 V DC electrical connection WA: 20 ... 235 V AC, 50/60 Hz or 20 ... 55 V DC
Connecting cable	terminal connection: lace max. 1.5 mm^2 in end splice, wire max. 2.5 mm^2
Current consumption	electrical connection E5: max. 30 mA, reverse-polarity-proof electrical connection WA: max. 130 mA
Performance characteristics	
Reference operating conditions	vessel type: plastic vessel, ambient temperature: 23 °C (296 K), medium temperature: 23 °C (296 K) medium pressure p_e: 0 bar, medium: dielectric constant = 2.6, conductivity: < 1 µS sensitivity setting: C
Hysteresis	LCL1: horizontal 4 mm (0.16 in), vertical 7 mm (0.28 in) LCL2: vertical 5 mm (0.2 in)
Long-term drift	LCL1: horizontal 3 mm (0.12 in), vertical 6 mm (0.24 in) LCL2: vertical 6 mm (0.24 in)
Influence of medium temperature	depending on the filling material
Operating conditions	
Mounting conditions	
Installation position	LCL1: optional LCL2: vertically down Note the angle of the material mounds and the outlet funnel when determining the mounting point or probe length. The limit switch switches when the probe tip is covered by a few centimetres of material or when it is free material flow should not be directed at the probe.
Mounting location	The capacitive limit switch can be installed in silos made of different materials (e. g. metal, plastic, concrete).
Ambient conditions	
Ambient temperature	-40 ... 70 °C (233 ... 343 K) (-40 ... 60 °C (233 ... 333 K), dust-Ex version) see section temperature ranges
Ambient temperature limits	-40 ... 80 °C (-40 ... 60 °C (233 ... 333 K), dust-Ex version) see section temperature ranges, grey background
Storage temperature	-40 ... 80 °C (233 ... 353 K)
Shock resistance	probe: 7J
Overvoltage protection	overvoltage category III

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Process conditions	
Process temperature	LCL1: -40 ... 120 °C (233 ... 393 K) (-40 ... 80 °C (233 ... 353 K), dust-Ex version) LCL2: -20 ... 70 °C (253 ... 343 K) see section temperature ranges
Process temperature limits	LCL1: -40 ... 130 °C (233 ... 403 K) (-40 ... 80 °C (233 ... 353 K), dust-Ex version) LCL2: -40 ... 80 °C (233 ... 353 K) see section temperature ranges, grey background
Medium pressure limits	LCL1: -1 ... 25 bar LCL2: -1 ... 6 bar
Mechanical specifications	
Protection degree	IP66
Mechanical construction	
Construction type	LCL1: compact version with rod probe LCL2: compact version with rope probe
Dimensions	housing: LCL1 Ø94 x 140 mm (3.7 x 5.5 in), LCL2 Ø94 x 145 mm (3.7 x 5.7 in) process connections: see section dimensions probe: LCL1 length 140 mm (5.5 in), LCL2 length 500 ... 6000 mm (1.7 ... 20 ft)
Mass	LCL1: 560 g LCL2: 1230 g (basic weight for 500 mm probe length)
Material	housing: PBT-FR with cover in PBT-FR or with transparent cover in PA12, seal of cover: EPDM cable gland: polyamide or brass, nickel-plated wetted parts: - rod probe: PPS polyphenylenesulphide (glass fibre content 40 %) - rope probe: armoured steel with HD-PE coating - other probe components: PPS polyphenylenesulphide (glass fibre content 40 %)
Mechanical loading	LCL1: flexural strength 1400 N (at probe tip) LCL2: tensile strength max. 3000 N up to 40 °C (313 K), max. 2800 N at 80 °C (353 K)
Switching point	sensor switch points depend on the mounting location, in relation to the reference operating conditions LCL1: horizontal centre of probe -5 mm (-0.2 in), vertical 40 mm (1.6 in) above tip of the probe LCL2: vertical 35 mm (1.4 in) above tip of the probe
Process connection	- conical thread R1, R1½ to DIN 2999, part 1 - conical thread 1 NPT, 1½ NPT to ANSI B 1.20.1
Indication and operation	
Display elements	green LED: standby indication red LED: switch status indication
Operating elements	switch on electronic insert - switching between minimum and maximum fail-safe mode - sensitivity setting (depends on the dielectric constant and build-up). A sensitivity adjustment is normally not required.
Certificates and approvals	
Ex approval	LCL1: DMT 01 ATEX E 122, LCL2: KEMA 01 ATEX 1149, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/3D IP66 T97°C (DMT 01 ATEX E122) ⟨Ex⟩ II 1/3D [EEx ia] IIB T97°C (KEMA 01 ATEX 1149)
Overspill protection	LCL1: Z-65.13-313 (overspill protection in acc. with WHG)
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38, fig. 2a
Vibration resistance	EN 60068-2-64, 20 ... 2000 Hz, spectral rate of velocity 0.5, 100 min per axis
Supplementary documentation	technical information TI-LCL operating instructions KA093O (LCL1) operating instructions KA094O optimising performance (LCL1) operating instructions KA098O adapter for LCL1 (LCL-Z11, LCL-Z12) operating instructions KA099O transparent cover (LCL-Z10) operating instructions KA155O (LCL2) operating instructions KA156O fail-safe mode (LCL2) operating instructions KA157O rope shortening for LCL2 (LCL-Z14) safety information SI092O (LCL2, KEMA 01 ATEX 1149) safety information SI011O (LCL1, DMT 01 ATEX E 122) approval ZE232O overspill protection (Z-65.13-313)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Electrical connection

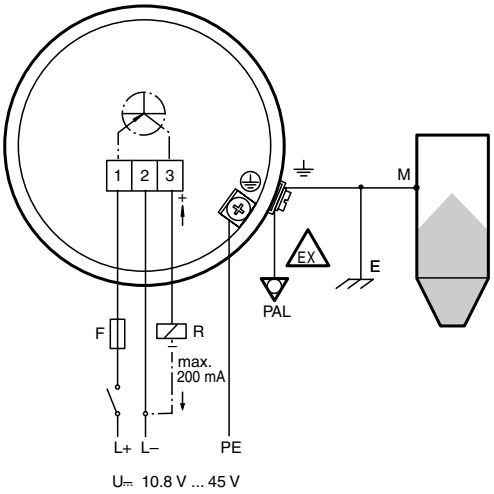
Electronic insert E5

3-wire DC connection

F: fine-wire fuse, 500 mA
R: connected load, e. g. PLC, DCS, relay
M: connection to ground, silo or metal parts silo
E: grounding

The LCL is protected against reverse polarity. In case of mixing up the connections, the green LED does not illuminate "ready to operate".

PE-connection and PAL-connection for LCL1 are unnecessary.

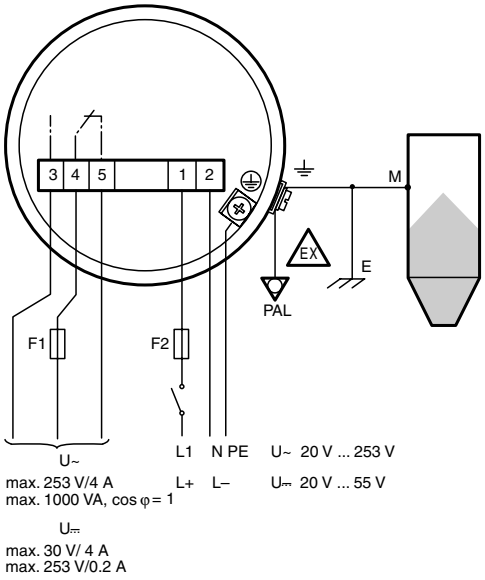


Electronic insert WA

AC/DC connection with relay output

F1: fine-wire fuse for the protection of the relay contact, dependent on the connected load
F2: fine-wire fuse, 500 mA
M: connection to ground, silo or metal parts silo
E: grounding

PE-connection and PAL-connection for LCL1 are unnecessary.



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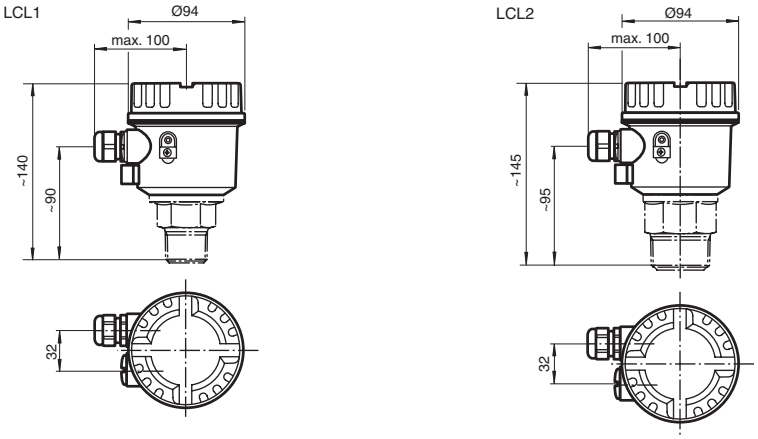
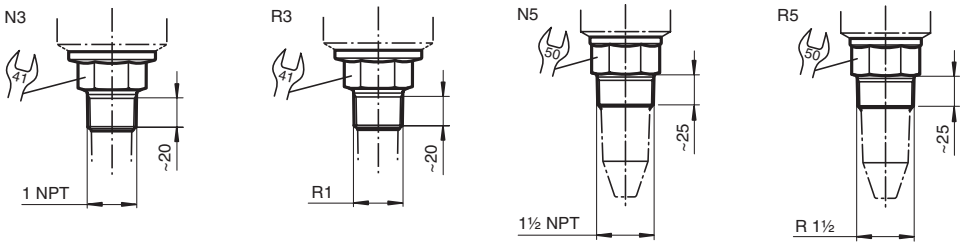
Dimensions

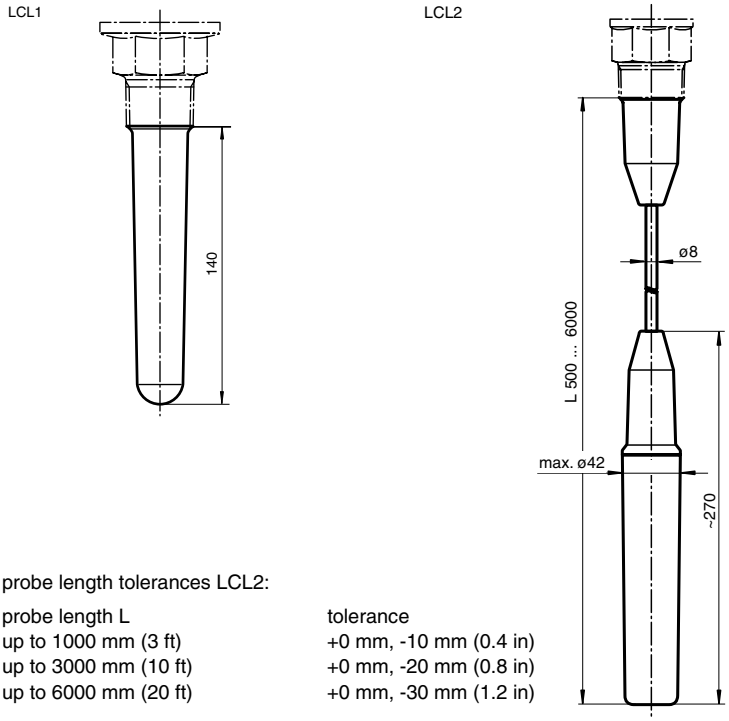
Housing



Process connections



Probe length



probe length tolerances LCL2:

probe length L	tolerance
up to 1000 mm (3 ft)	+0 mm, -10 mm (0.4 in)
up to 3000 mm (10 ft)	+0 mm, -20 mm (0.8 in)
up to 6000 mm (20 ft)	+0 mm, -30 mm (1.2 in)

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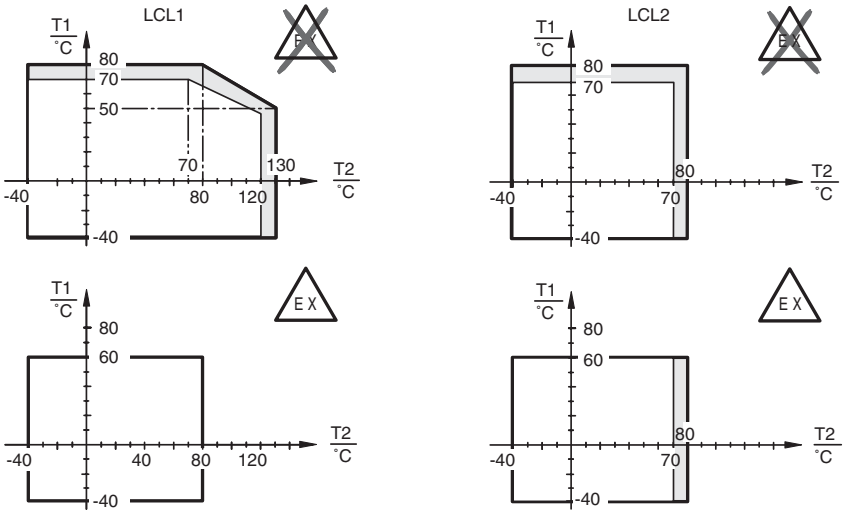
Temperature ranges

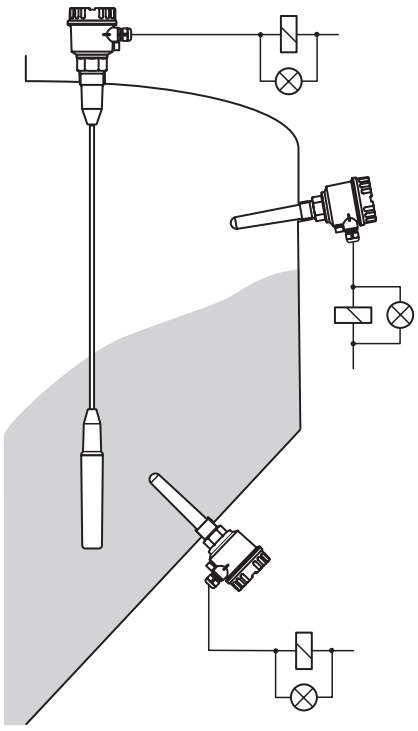
T1 = ambient temperature range
T2 = process temperature range



Measuring system

The capacitive limit switch LCL is an electronic switch.
The complete measuring system consists of:

- the limit switch LCL1 or LCL2
- a voltage supply and
- the connected controllers, switching units, signal transmitters (e. g. lamps, horns, DCS, PLC, etc.)



Accessories

- LCL-Z10, transparent cover for polyester housing
- LCL-Z11, adapter for process connection R3 (R1½)
- LCL-Z12, adapter for process connection R3 (G1½)
- LCL-Z13, adapter for process connection N3 (1¼ NPT)
- LCL-Z14, rope shortening set for limit switch LCL2
- LCL-Z15, adapter for process connection N3 (1¼ NPT)

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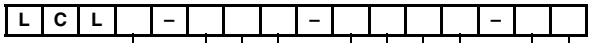
Type code/model number



Certificates
- **NA** version for non-explosion hazardous areas
- **EX** Ex II 1/3D, zone 20
- **WH** WHG overspill protection — LCL1 only
- **FS** FM, DIP, Cl. II, III, Gr. E - G, T5
- **CS** CSA, DIP, Cl. II, Gr. E - G, Cl. III
- **CG** CSA General Purpose

Optional equipment
- **N** without optional equipment
- **D** with transparent cover

Electronical output
- **E5** PNP, 10.8 V DC ... 45 V DC
- **WA** potential-free change-over contact, relay 20 V AC ... 253 V AC/20 V DC ... 55 V DC

Housing
- **C** polyester housing F14, IP66, ½ NPT
- **P** polyester housing F14, IP66, M20 x 1.5
- **Q** polyester housing F14, IP66, G½

Length and material
- **K** 140 mm (5.5 in), compact version, PPS (Polyphenylensulphide) — LCL1 only
- **3** 1500 mm (5 ft), steel, HD-PE coated — LCL2 only
- **4** 2500 mm (8 ft), steel, HD-PE coated — LCL2 only
- **6** 6000 mm (20 ft), steel, HD-PE coated — LCL2 only

Process connection
- **R3** R1, DIN 2999
- **N3** 1 NPT, ANSI B 1.20.1
- **R5** R1½, DIN 2999
- **N5** 1½ NPT, ANSI B 1.20.1

Versions
- **1** compact version
- **2** rod probe with extension

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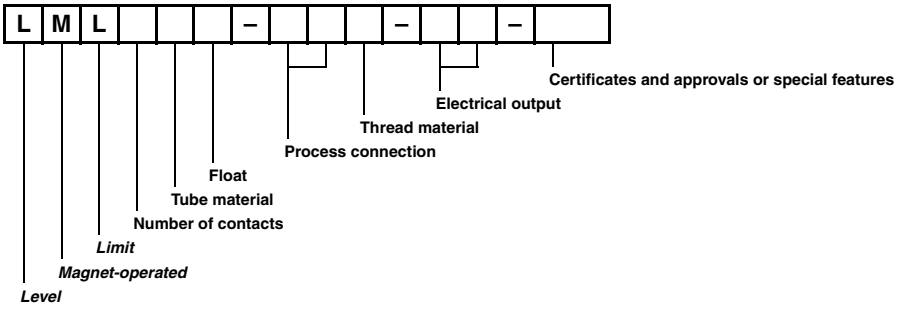
Type code of limit value magnet-operated immersion probes

The figure below shows the used characters and numbers of the limit value magnet-operated immersion probes type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the limit value magnet-operated immersion probes.

Product group LML



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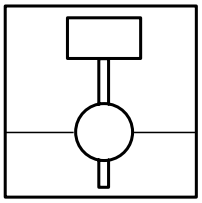
Limit value magnet-operated immersion probes are designed for use in clean fluids, such as water, solvents, oils an fuels. Various versions are available depending on the fluids.

- Plastic for aggressive acids and lyes.
- Stainless steel for water, oils etc.
- Stainless steel in Ex version for flammable fluids such as fuels, solvents, alcohols.

To give the reed contact a bi-stable switching characteristic, the magnet-operated immersion probe with 3 contacts has 2 floats and corresponding adjustment rings.



Limit value magnet-operated immersion probe LML3S2-G5S-DO-Ex

Contents

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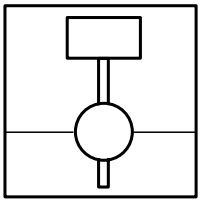
Limit value immersion probe

LML-P

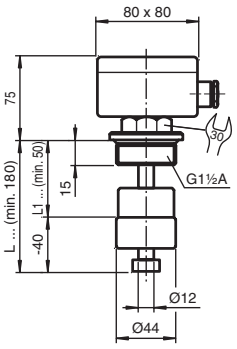


CE

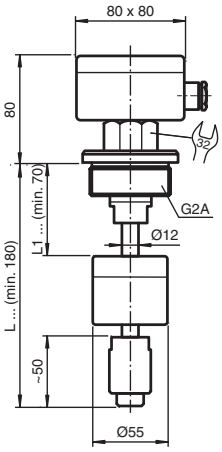
Features

- Limit value detection in liquids
- Media contacting parts of plastic
- Mounting without de-mounting of the float (G5 and G6)

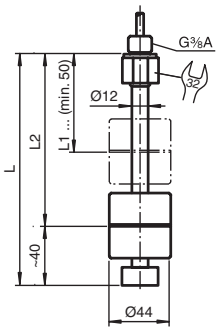
Dimensions



LML*P7-G5P-DW



LML*D5-G6D-DW



Minimum distance between L1 and L2 - 80 mm

LML*P7-G1P-DW-****

⚠ When placing your order specify the location of the contacts.
The pipe length L will be accordingly amended corresponding to the bottom of contact location.

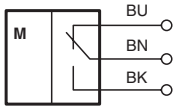
Function

A ring magnet integrated in the float activates the contacts inside the probe tube via its magnetic field. If the probe strays outside the range of the mechanical contact, it reverts to the output status.

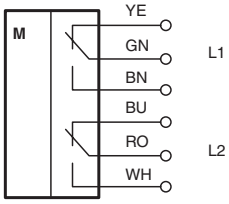
The skipping of switching points caused by abrupt level changes can be avoided using snap-on set collars on the probe tube. The same set collars are also used for latching contact operation.

Electrical connection

1 contact



2 contacts



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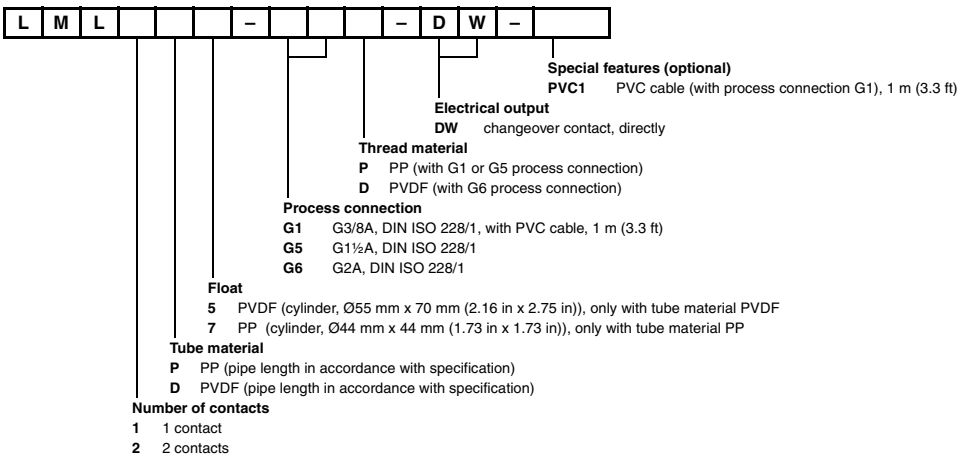
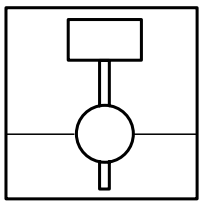
Application	
Description	ring magnet as switching element in the float, reed contact, change-over contact number of contacts: - version LML1: 1 contact - version LML2: 2 contacts
Auxiliary energy	
Electrical connection	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements.
Supply voltage	250 V AC/DC
Power consumption	40 VA
Current consumption	1 A
Operating conditions	
Ambient conditions	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)
Process conditions	
Process temperature	version PP: -20 ... 80 °C (253 ... 353 K) version PVDF: -20 ... 100 °C (253 ... 373 K)
Process pressure (static pressure)	≤ 3 bar
Density	≥ 0.8 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	float Ø44 mm (1.73 in), PP, thread G5, terminal box - LML1P7-G5P-DW, LML2P7-G5P-DW float Ø55 mm (2.16 in), PVDF, thread G6, terminal box - LML1D5-G6D-DW, LML2D5-G6D-DW float Ø44 mm (1.73 in), PP, thread G1, cable connector 1 m (3.3 ft) - LML1P7-G1P-DW-PVC1, LML2P7-G1P-DW-PVC1
Dimensions	float: - version PP: cylinder Ø44 mm (1.73 in), height 44 mm (1.73 in) - version PVDF: cylinder Ø55 mm (2.16 in), height 70 mm (2.75 in) guide tube: Ø12 mm (0.47 in), max. length 500 mm (1.65 ft) terminal box: 80 x 80 x 55 mm (3.15 x 3.15 x 2.16 in)
Material	float, guide tube, process connection: - version PP: PP (polypropylene) - version PVDF: PVDF (polyvinylidenfluoride) connection cable: PVC terminal box: polyester
Switching point	distance min. 80 mm
Process connection	cylindrical thread G3/8A, G1½A, G2A to DIN ISO 228/1
Electrical connection	version LML: terminal box, max. 9 terminals version LML-PVC1: connection cable 1 m (3.3 ft), 0.75 mm^2
General information	
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Type code/model number



Limit value immersion probe

LML-S

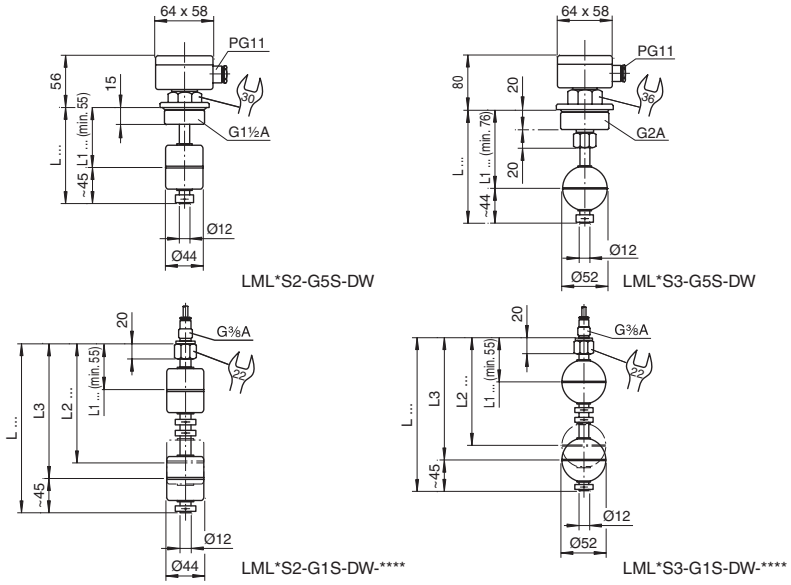


CE

Features

- Limit value detection in liquids
- Media contacting parts of stainless steel
- Mounting without de-mounting of the float (G5 and G6)

Dimensions



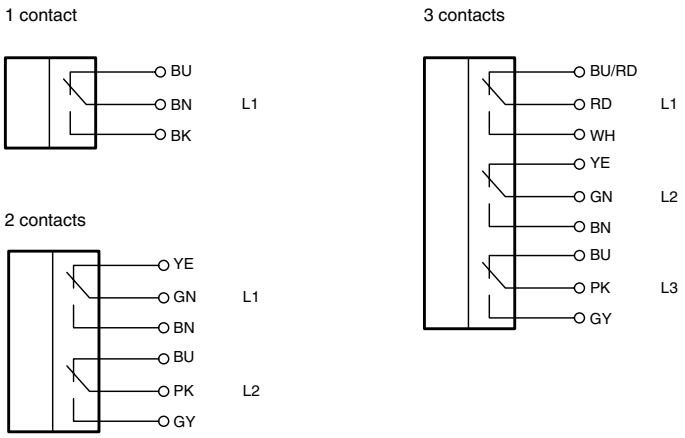
When placing your order, please specify the location of the contacts. The pipe length L will be accordingly amended corresponding to the bottom of contact location. If you are using 3 contacts, please note: minimum distance between L1 and L2 - 100 mm and between L2 and L3 - 20 mm.

Function

A ring magnet integrated in the float activates the contacts inside the probe tube via its magnetic field. If the probe strays outside the range of the mechanical contact, it reverts to the output status.

The skipping of switching points caused by abrupt level changes can be avoided using snap-on set collars on the probe tube. The same set collars are also used for latching contact operation.

Electrical connection



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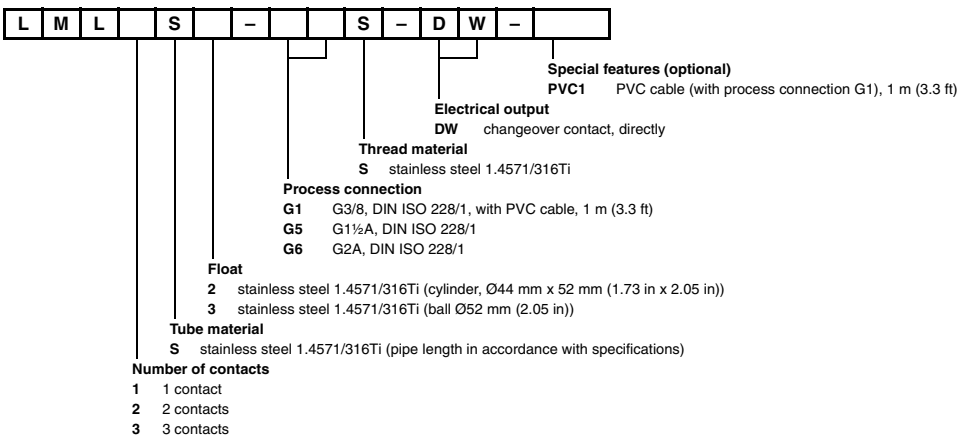
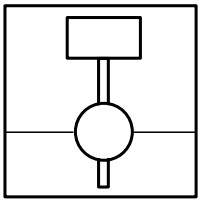
Application	
Description	ring magnet as switching element in the float, reed contact, change-over contact number of contacts: - version LML1: 1 contact - version LML2: 2 contacts - version LML3: 3 contacts
Auxiliary energy	
Electrical connection	This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements.
Supply voltage	250 V AC/DC
Power consumption	40 VA
Current consumption	1 A
Operating conditions	
Ambient conditions	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)
Process conditions	
Process temperature	version LML: -20 ... 150 °C (253 ... 423 K) version LML-PVC1: -20 ... 90 °C (253 ... 363 K)
Process pressure (static pressure)	≤ 25 bar
Density	version S2: ≥ 0.8 g/cm^3 version S3: ≥ 0.7 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	float Ø44 mm (1.73 in), thread G5, terminal box - LML1S2-G5S-DW, LML2S2-G5S-DW, LML3S2-G5S-DW float Ø52 mm (2.05 in), thread G6, terminal box - LML1S3-G6S-DW, LML2S3-G6S-DW, LML3S3-G6S-DW float Ø44 mm (1.73 in), thread G1, cable connector 1 m (3.3 ft) - LML1S2-G1S-DW-PVC1, LML2S2-G1S-DW-PVC1, LML3S2-G1S-DW-PVC1 float Ø52 mm (2.05 in), thread G1, cable connector 1 m (3.3 ft) - LML1S3-G1S-DW-PVC1, LML2S3-G1S-DW-PVC1, LML3S3-G1S-DW-PVC1
Dimensions	float: - version S2: cylinder Ø44 mm (1.73 in), height 52 mm (2.05 in) - version S3: ball Ø52 mm (2.05 in) guide tube: Ø12 mm (0.47 in), max. length 3 m (10 ft) terminal box: 64 x 58 x 55 mm (2.52 x 2.28 x 2.16 in)
Material	float, guide tube, process connection: stainless steel 1.4571/316Ti connection cable: PVC terminal box: aluminium die-casting
Switching point	L1 ... L2 ≥ 100 mm (3.93 in) L2 ... L3 ≥ 20 mm (0.78 in)
Process connection	cylindrical thread G3/8A, G1½A, G2A to DIN ISO 228/1
Electrical connection	version LML: terminal box, max. 9 terminals version LML-PVC1: connection cable 1 m (3.3 ft), 0.75 mm^2
General information	
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Type code/model number



Limit value immersion probe

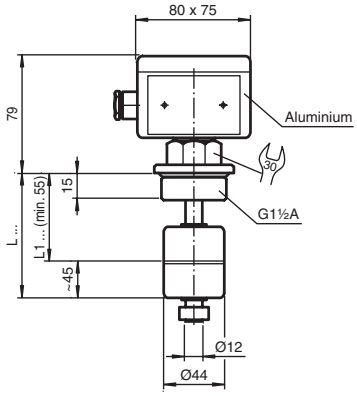
LML-Ex



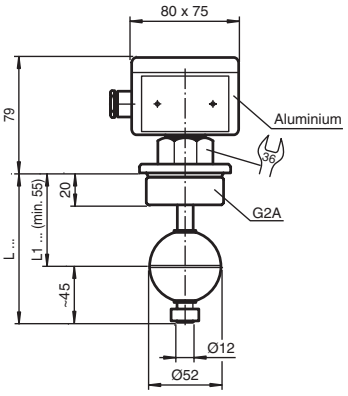
Features

- Approved for hazardous areas zone 0
- Limit value detection in liquids
- Media contacting parts of stainless steel
- Mounting without de-mounting of the float

Dimensions



LML*S2-G5S-**-Ex



LML*S3-G6S-**-Ex

When placing your order, please specify the location of the contacts. The pipe length L will be accordingly amended corresponding to the bottom of contact location. If you are using 3 contacts, please note: minimum distance between L1 and L2 - 100 mm and between L2 and L3 - 20 mm.

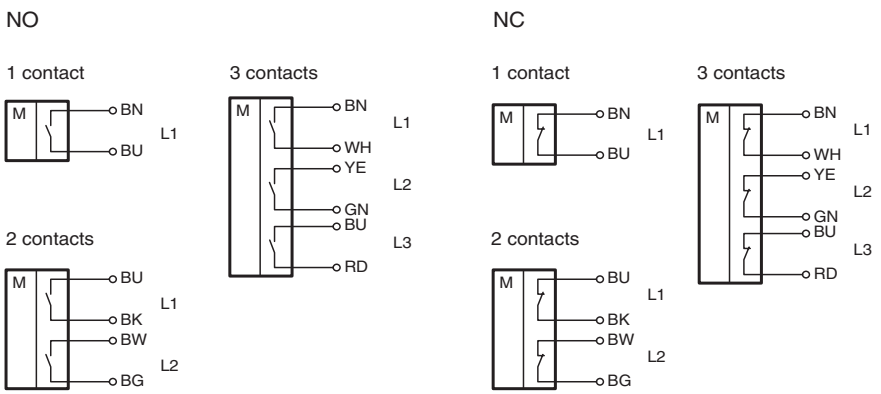
Function

A ring magnet integrated in the float activates the contacts inside the probe tube via its magnetic field. If the probe strays outside the range of the mechanical contact, it reverts to the output status.

The skipping of switching points caused by abrupt level changes can be avoided using snap-on set collars on the probe tube. The same set collars are also used for latching contact operation.

If used in hazardous areas, the requirements of the certificate of conformity should be observed.

Electrical connection



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Application	
Description	ring magnet as switching element in the float, reed contact number of contacts: - version LML1: 1 contact - version LML2: 2 contacts - version LML3: 3 contacts switching function: - version DO: with rising level: normally closed - version DS: with rising level: normally open
Function and system design	
Equipment architecture	A measuring system consists of a magnet-operated immersion probe LML*S*-**S-**-Ex and a (up to 3) transformer isolated barrier with certified intrinsically safe circuit, for example KFD2-SR2-Ex1.W.
Operating conditions	
Ambient conditions	
Ambient temperature	terminal box: -50 ... 60 °C (223 ... 333 K)
Process conditions	
Process temperature	for T6: ≤ 80 °C (353 K) for T5: ≤ 95 °C (368 K) for T4: ≤ 130 °C (403 K) for T3: ≤ 180 °C (453 K)
Process pressure (static pressure)	≤ 25 bar
Density	version S2: ≥ 0.8 g/cm^3 version S3: ≥ 0.7 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	float Ø44 mm (1.73 in), normally closed, thread G5 - LML1S2-G5S-DO-Ex, LML2S2-G5S-DO-Ex, LML3S2-G5S-DO-Ex float Ø44 mm (1.73 in), normally open, thread G5 - LML1S2-G5S-DS-Ex, LML2S2-G5S-DS-Ex, LML3S2-G5S-DS-Ex float Ø52 mm (2.05 in), normally closed, thread G6 - LML1S3-G6S-DO-Ex, LML2S3-G6S-DO-Ex, LML3S3-G6S-DO-Ex float Ø52 mm (2.05 in), normally open, thread G6 - LML1S3-G6S-DS-Ex, LML2S3-G6S-DS-Ex, LML3S3-G6S-DS-Ex
Dimensions	float: - version S2: cylinder Ø44 mm (1.73 in), height 52 mm (2.05 in) - version S3: ball Ø52 mm (2.05 in) guide tube: Ø12 mm (0.47 in), max. length 3 m (10 ft) terminal box: 80 x 75 x 57 mm (3.15 x 2.95 x 2.24 in)
Material	float, guide tube, process connection: stainless steel 1.4571/316Ti terminal box: aluminium die-casting
Switching point	position of the contacts min. 45 mm (1.77 in) across the pipe end
Process connection	cylindrical thread G1½A, G2A to DIN ISO 228/1
Electrical connection	max. 6 terminals, max. 2.5 mm^2
Certificates and approvals	
Ex approval	KEMA 03 ATEX 1496 X, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/2G EEx ia IIC T3 ... T6
General information	
Directive conformity	
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50284
Conformity	
Protection degree	EN 60529
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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Type code/model number

L	M	L		S		–			S	–			–	E	x

Certificates and approvals
Ex ⟨Ex⟩ II 1/2G EEx ia IIC T3 ... T6

Electrical output
DO normally closed, directly
DS normally open, directly

Thread material
S stainless steel 1.4571/316Ti

Process connection
G5 G1½A, DIN ISO 228/1
G6 G2A, DIN ISO 228/1

Float
2 stainless steel 1.4571/316Ti (cylinder, Ø44 mm x 52 mm (1.73 in x 2.05 in))
3 stainless steel 1.4571/316Ti (ball Ø52 mm (2.05 in))

Tube material
S stainless steel 1.4571/316Ti (pipe length in accordance with specifications)

Number of contacts
1 1 contact
2 2 contacts
3 3 contacts

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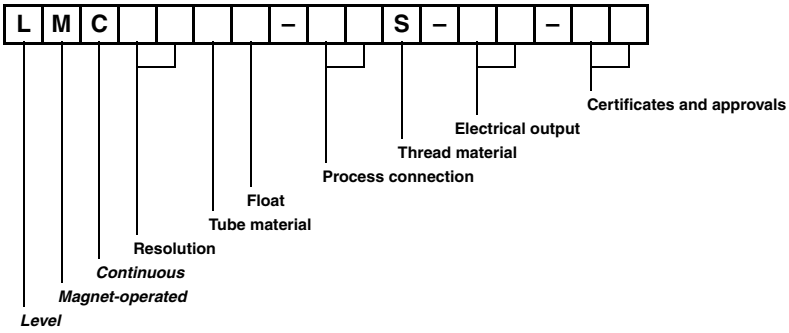
Type code of continuous magnet-operated immersion probes

The figure below shows the used characters and numbers of the continuous magnet-operated immersion probes type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the continuous magnet-operated immersion probes.

Product group LMC



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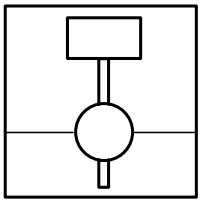
The permanent magnet located inside the float actuates the reed switches inside the guide tube.

When actuated, these reed switches switch between a series of resistors in the guide tube, thus changing the total resistance quasi-continuously, depending on the resolution.

In addition to the 3-wire potentiometer circuit, 4 mA ... 20 mA and 2-wire PLM signals are also available as electrical outputs.



Continuous magnet-operated immersion probe LMC8S3-G6S-I-Ex

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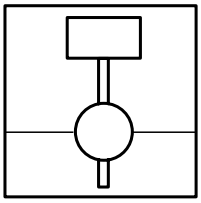
Continuous immersion probe

LMC-P

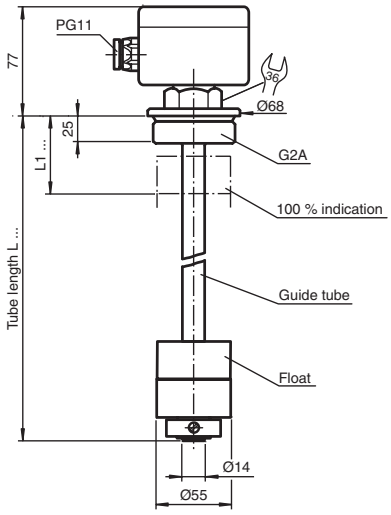


CE

Features

- Resolution 10 mm (0.4 in)
- Sensor for continuous level measurement in liquids
- Media contacting parts of plastic
- Mounting without de-mounting of the float

Dimensions



LMC****-G6*-O4

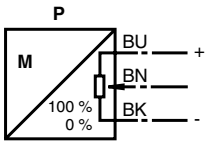
When placing your order, please specify the tube length (L).

Function

A ring magnet integrated in the float activates a reed contact resistance chain inside the probe tube via its magnetic field.

If the level changes, the resistance chain changes its total resistance by closing the contact at the float level. The resistance is converted into a standardised output signal by the isolated transformer. This output signal is proportional to the level of the measured medium.

Electrical connection



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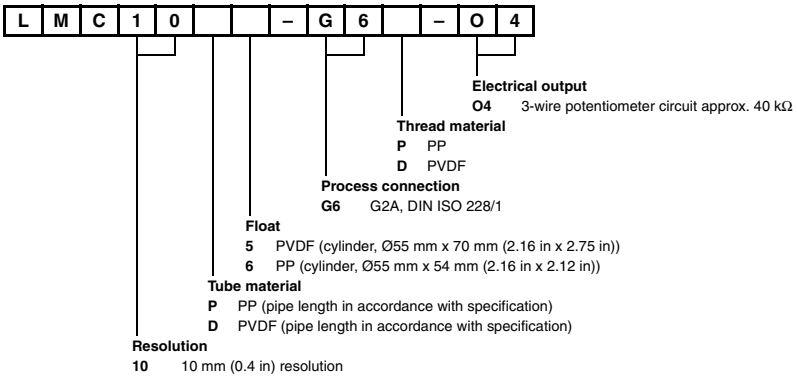
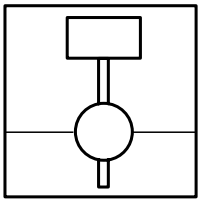
Application	
Description	sensor for continuous level measurement in liquids
Function and system design	
Equipment architecture	A measuring system consists of a magnet-operated immersion probe LMC****-G6*-O4 and an isolated transformer KFD2-PT2-Ex1.
Auxiliary energy	
Electrical connection	3-wire-potentiometer connection approx. 40 kΩ for connection to an isolated transformer
Performance characteristics	
Accuracy	resolution: 10 mm (0.4 in)
Operating conditions	
Ambient conditions	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)
Process conditions	
Process temperature	version PP: -20 ... 80 °C (253 ... 353 K) version PVDF: -20 ... 100 °C (253 ... 373 K)
Process pressure (static pressure)	≤ 3 bar at 20 °C (293 K)
Density	≥ 0.8 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Versions	LMC10P6-G6P-O4 LMC10D5-G6D-O4
Dimensions	float: - version PP: cylinder Ø55 mm (2.16 in), height 54 mm (2.12 in) - version PVDF: cylinder Ø55 mm (2.16 in), height 70 mm (2.76 in) guide tube: Ø14 mm (0.47 in), max. length 3 m (10 ft) terminal box: 80 x 80 x 55 mm (3.15 x 3.15 x 2.17 in)
Material	float, guide tube, process connection: - version PP: PP (polypropylene) - version PVDF: PVDF (polyvinylidenfluoride) terminal box: polyester
Process connection	cylindrical thread G2A to DIN ISO 228/1
Electrical connection	3 terminals, max. 2.5 mm^2
General information	
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Type code/model number



Continuous immersion probe

LMC-S

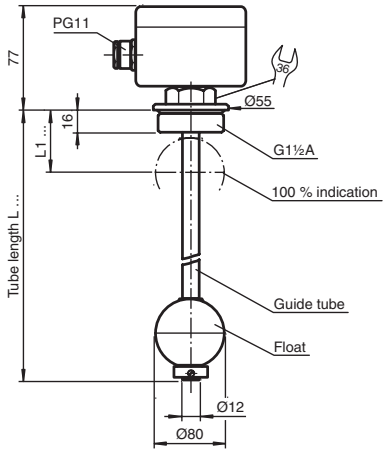


CE

Features

- Resolution 5 mm (0.2 in) or 15 mm (0.6 in)
- Sensor for continuous level measurement in liquids
- Media contacting parts of stainless steel
- Mounting without de-mounting of the float

Dimensions



LMC**S*-G2S-**

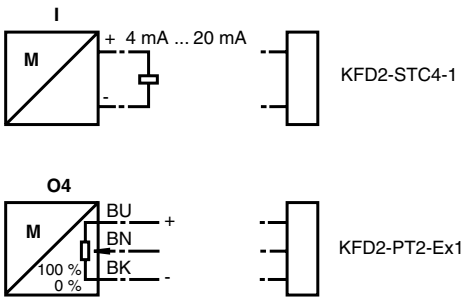
When placing your order, please specify the tube length (L).

Function

A ring magnet integrated in the float activates a reed contact resistance chain inside the probe tube via its magnetic field.

If the level changes, the resistance chain changes its total resistance by closing the contact at the float level. The resistance is converted into a standardised output signal by the isolated transformer. This output signal is proportional to the level of the measured medium.

Electrical connection



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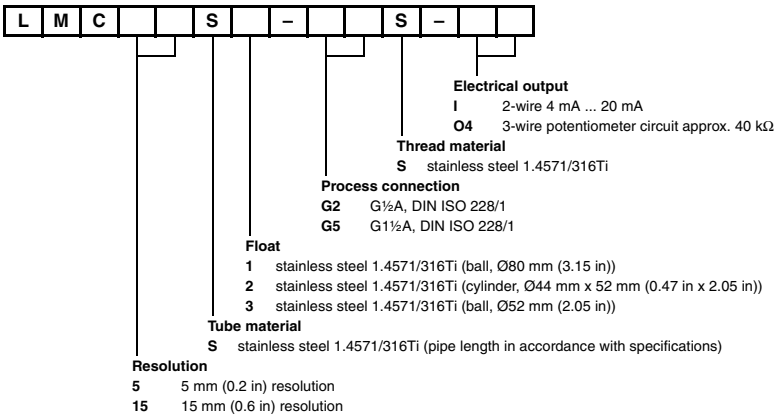
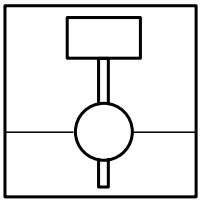
Application	
Description	sensor for continuous level measurement in liquids
Function and system design	
Equipment architecture	A measuring system consists of a magnet-operated immersion probe LMC****-***-I with built-in converter and a transmitter power supply KFD2-STC4-Ex.1 or of a magnet-operated immersion probe LMC****-***-O4 and an isolated transformer KFD2-PT2-Ex1.
Auxiliary energy	
Electrical connection	version I: 2-wire connection 4 ... 20 mA version O4: 3-wire-potentiometer connection approx. 40 kΩ for connection to an isolated transformer
Performance characteristics	
Accuracy	resolution: - version LMC5: 5 mm (0.2 in) - version LMC15: 15 mm (0.6 in)
Operating conditions	
Ambient conditions	
Ambient temperature	-20 ... 70 °C (253 ... 343 K)
Process conditions	
Process temperature	-20 ... 120 °C (253 ... 393 K)
Process pressure (static pressure)	≤ 16 bar
Density	version S1: ≥ 0.6 g/cm^3 version S2: ≥ 0.8 g/cm^3 version S3: ≥ 0.7 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Dimensions	float: - version S1: ball Ø80 mm (3.15 in) - version S2: cylinder Ø44 mm (1.73 in), height 52 mm (2.05 in) - version S3: ball Ø52 mm (2.05 in) guide tube: - version LMC5: Ø14 mm (0.55 in), max. length 3 m (10 ft) - version LMC15: Ø12 mm (0.47 in), max. length 3 m (10 ft) terminal box: 64 x 58 x 55 mm (2.52 x 2.28 x 2.16 in)
Material	float, guide tube, process connection: stainless steel 1.4571/316Ti terminal box: aluminium die-casting
Process connection	cylindrical thread G½A, G1½A to DIN ISO 228/1
Electrical connection	version I: 2 terminals, max. 2.5 mm^2 version O4: 3 terminals, max. 2.5 mm^2
General information	
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Type code/model number



Continuous immersion probe

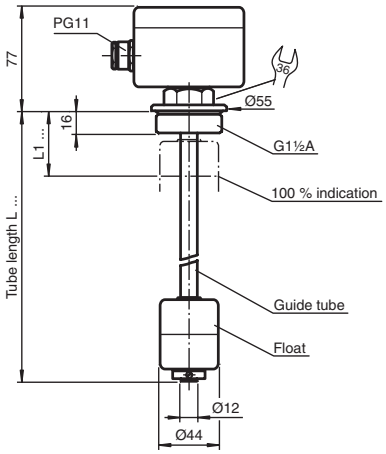
LMC-Ex



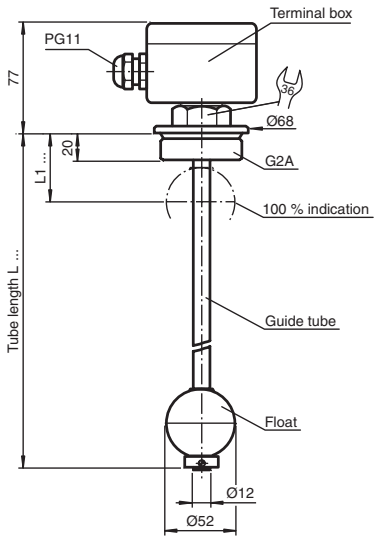
Features

- Resolution 5 mm (0.2 in) or 15 mm (0.6 in)
- Approved for hazardous areas zone 0
- Sensor for continuous level measurement in liquids
- Media contacting parts of stainless steel
- Mounting without de-mounting of the float

Dimensions



LMC**S*-G5S-**-Ex



LMC**S*-G6S-**-Ex

When placing your order, specify the length (L) of the guide tube.

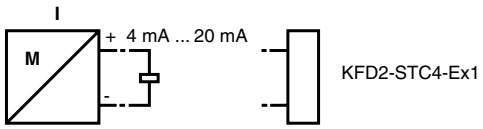
Function

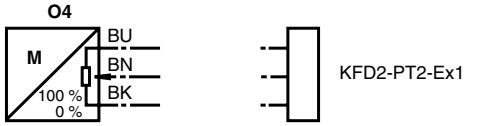
A ring magnet integrated in the float activates a reed contact resistance chain inside the probe tube via its magnetic field.

If the level changes, the resistance chain changes its total resistance by closing the contact at the float level. The resistance is converted into a standardised output signal for interface units by the electronic transformer in the terminal housing or an isolated transformer. This output signal is proportional to the level of the measured medium.

If used in hazardous areas, the requirements of the certificate of conformity, approval or test certificate should be observed.

Electrical connection





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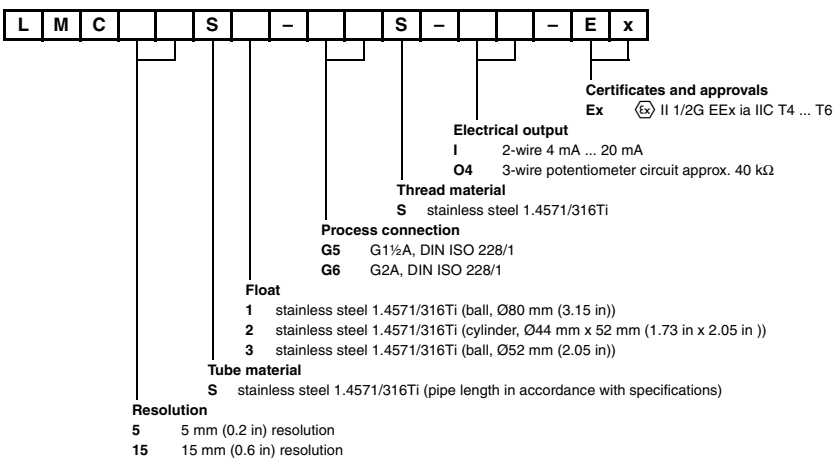
Application	
Description	sensor for continuous level measurement in liquids
Function and system design	
Equipment architecture	A measuring system consists of a magnet-operated immersion probe LMC****-***-I-Ex with built-in converter and a transmitter power supply KFD2-STC4-Ex.1 or of a magnet-operated immersion probe LMC****-***-O4-Ex and an isolated transformer KFD2-PT2-Ex1.
Auxiliary energy	
Electrical connection	version I: 2-wire connection 4 ... 20 mA version O4: 3-wire-potentiometer connection approx. 40 kΩ
Performance characteristics	
Accuracy	resolution: - version LMC5: 5 mm (0.2 in) - version LMC15: 15 mm (0.6 in)
Operating conditions	
Ambient conditions	
Ambient temperature	terminal box: -50 ... 60 °C (223 ... 333 K)
Process conditions	
Process temperature	for T6: ≤ 50 °C (323 K) for T5: ≤ 65 °C (338 K) for T4: ≤ 100 °C (373 K)
Process pressure (static pressure)	≤ 16 bar
Density	version S1: ≥ 0.6 g/cm^3 version S2: ≥ 0.8 g/cm^3 version S3: ≥ 0.7 g/cm^3
Mechanical specifications	
Protection degree	IP68
Mechanical construction	
Dimensions	float: - version S1: ball Ø80 mm (3.15 in) - version S2: cylinder Ø44 mm (1.73 in), height 52 mm (2.05 in) - version S3: ball Ø52 mm (2.05 in) guide tube: - version LMC5: Ø14 mm (0.55 in), max. length 3 m (10 ft) - version LMC15: Ø12 mm (0.47 in), max. length 3 m (10 ft) terminal box: 80 x 75 x 57 mm (3.15 x 2.95 x 2.24 in)
Material	float, guide tube, process connection: stainless steel 1.4571/316Ti terminal box: aluminium die-casting
Process connection	cylindrical thread G1½A, G2A to DIN ISO 228/1
Electrical connection	version I: 2 terminals, max. 2.5 mm^2 version O4: 3 terminals, max. 2.5 mm^2
Certificates and approvals	
Ex approval	KEMA 03 ATEX 1497 X, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/2G EEx ia IIC T4 ... T6
General information	
Directive conformity	
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50284
Conformity	
Protection degree	EN 60529
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Type code/model number

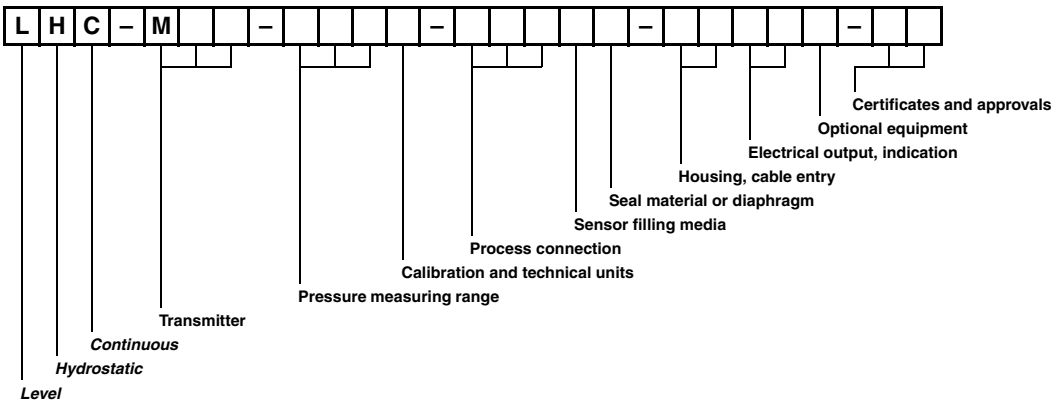


Type code of hydrostatic pressure sensors

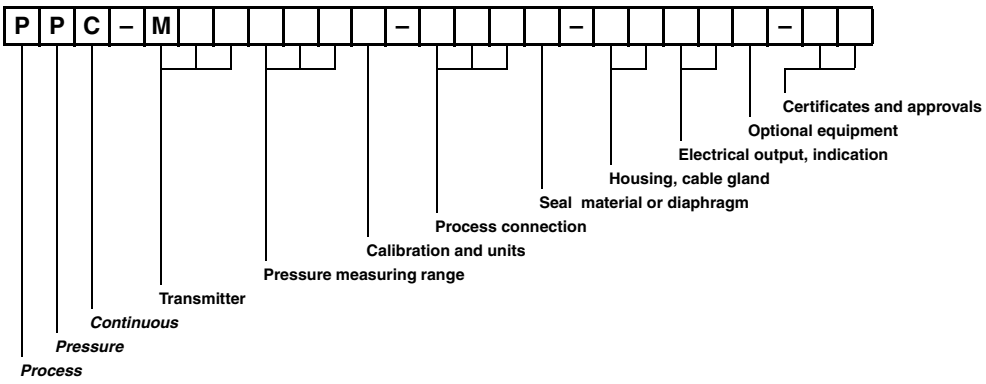
The figure below shows the used characters and numbers of the hydrostatic pressure sensors type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the hydrostatic pressure sensors/process pressure transmitters.

Product group Barcon LHC-M** (hydrostatic pressure sensors)



Product group Barcon PPC-M** (process pressure transmitter)



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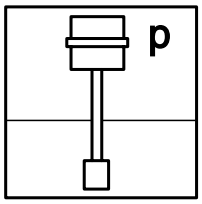
The fill level h of a liquid can be determined by the hydrostatic pressure p if the density ρ is known:

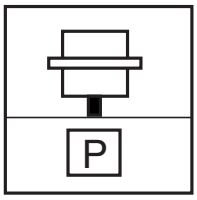
$$h = \frac{p}{\rho \cdot g}$$, where g = 9.81 m/s^2.



The piezoresistive measuring cell is coupled to a measuring liquid via a stainless steel isolation membrane and a diaphragm seal.

The output signal of the measuring cell is converted via a signal conditioner into a:

- 4 mA ... 20 mA analogue signal or
- pulse-length-modulated current pulse (PLM)



The pressure sensors are available in the following versions:

- externally mounted type,
- rod type,
- suspended type.

Hydrostatic pressure sensor Barcon LHC-M20

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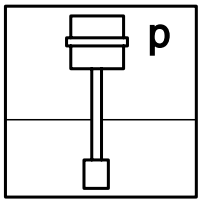
Hydrostatic pressure sensor

LHC-M**

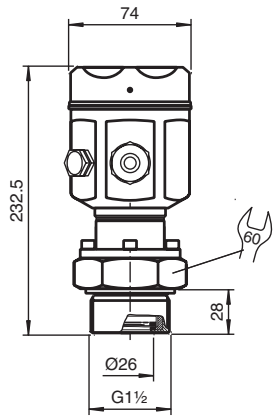


Features

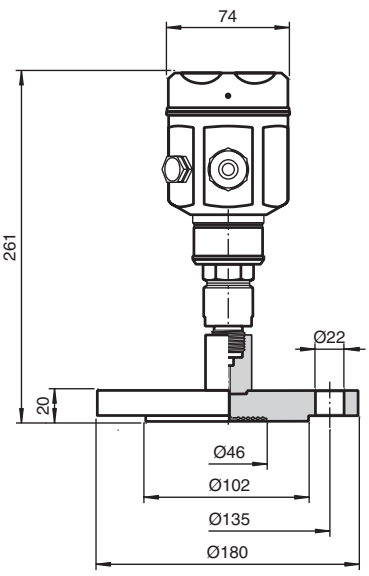
- Hydrostatic pressure sensor for gases, vapours, liquids and dusts
- High accuracy of measurement
- Housing fulfils the special hygienic requirements of the foodstuff and pharmaceutical industries
- Large number of process connections to choose from: universal usage
- Dry capacitive ceramic sensor up to 40 bar
- Piezoresistive metal sensor for measuring ranges up to 400 bar
- Wide variety of electronic modules: the right connection for every process control system
- Process connections acc. to EHEDG
- Up to SIL2 acc. to IEC 61508

Dimensions

LHC-M20 with process connection G51



LHC-M40 with process connection F76



Additional dimensions see section dimensions.

Function

The hydrostatic pressure sensor LHC-M** measure absolute and relative pressure in gases, vapours, liquids and dusts.

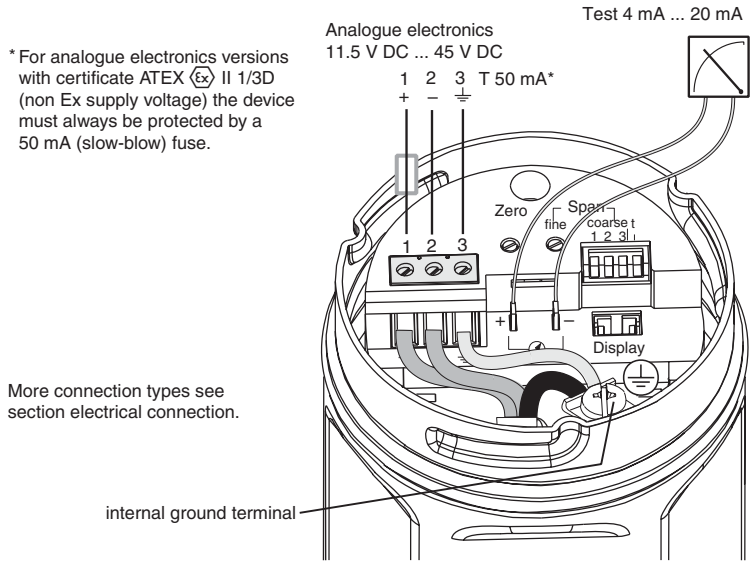
The sensor can be used in all process engineering areas. The modular design of the BARCON pressure transmitter enables it to be used in all industrial environments. All process connections are available as hygienic connections, threaded connections, separators and flanges.

A characteristic material or a special connection method depending on the process have to be used, for example,

- mounting without dead volume for special hygienic applications
- flush mounted installation for solidified or crystallising media
- special material for aggressive media

Electrical connection

Connection I2/IB analogue electronic (example)



* For analogue electronics versions with certificate ATEX Ex II 1/3D (non Ex supply voltage) the device must always be protected by a 50 mA (slow-blow) fuse.

More connection types see section electrical connection.

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Application	
Function principle	sensor for absolute and relative pressure measuring in gases, vapours, liquids and dusts ceramic sensor (LHC-M20) The pressure causes a slight deflection of the ceramic diaphragm of the sensor. The change in the capacitance is proportional to the pressure and is measured by the electrodes of the ceramic sensor, volume of chamber: approx. 2 mm^3. metal sensor (LHC-M40) The process pressure acting on the metallic separating diaphragm of the sensor is transmitted via a fill liquid to a resistance bridge. The change in the output voltage of the bridge is proportional to the pressure and is then measured, volume of chamber: smaller than 1 mm^3.
Function and system design	
Equipment architecture	- with analogue electronics I2/IB 4 ... 20 mA and auxiliary energy, e. g. via transmitter power pack, calibration across potentiometer for lower range value and upper range value, optionally analogue display for measuring value indication - with HART electronics IA/IH with current output 4 ... 20 mA, HART communication signal and auxiliary energy, e. g. via transmitter power pack, calibration via two keys on the device, handheld terminal or PC with operating program, optional digital display for measured variable indication - with PROFIBUS PA electronics PA/PB with digital communication signal PROFIBUS PA and segment coupler for connection to PLC or PC with operating program, optional digital display for measured variable indication
Input characteristics	
Measured variable	absolute or relative pressure
Measurement range	see section measuring range
Output characteristics	
Output signal	analogue electronics I2/IB: 4 ... 20 mA HART electronics IA/IH: 4 ... 20 mA with HART protocol PROFIBUS PA electronics PA/PB: digital communication signal
Signal range	analogue electronics I2/IB and HART electronics IA/IH: 3.8 ... 20.5 mA
Signal on alarm	analogue electronics I2/IB: signal overrun > 20.5 mA or signal underrun < 3.6 mA HART electronics IA/IH: optional 3.6 mA, 22 mA or last current value will be hold PROFIBUS PA electronics PA/PB: can be set in the analog input block, options: last good value (factory setting), FSAFE value, wrong value
Response time	PROFIBUS PA: cyclic: approx. 10 ms per request, acyclic: < 50 ms
Output damping	analogue electronics I2/IB: - directly on device using DIP switches, switch position "On" = 2 s, "Off" = 0 s HART electronics IA/IH: - directly on device using DIP switches, switch position "On" = set value, "Off" = 0 s - with handheld terminal or using operating program: 0 ... 40 s - factory setting: 2 s PROFIBUS PA electronics PA/PB: - with handheld terminal or using operating program: 0 ... 40 s - factory setting: 0.0 s
Load	analogue electronics I2/IB and HART electronics IA/IH: - max. 1522 Ω at power supply 11.5 ... 45 V DC for devices for non-hazardous areas, 1/3D, EEx d, EEx nA, FM XP, FM DIP, CSA XP and CSA dust-Ex - max. 840 Ω at power supply 11.5 ... 30 V DC for EEx ia, 1D, 1/2D, 1/2G, FM IS and CSA IS
Resolution	analogue electronics I2/IB: - current output < 1 µA, onsite display 30 segments HART electronics IA/IH: - current output typ. 1 µA, max. 6 µA, onsite display 28 segments, display value with resolution 1 per thousand PROFIBUS PA electronics PA/PB: - onsite display 28 segments, display value with resolution 1 per thousand
Read cycles	HART commands: on average 3 to 4 per s PROFIBUS PA: cyclic: on average 100/s, acyclic: on average 20/s
Cycle time	PROFIBUS PA: - The cycle time in a bus segment in cyclic data communication depends on the number of devices, the segment coupler used and the internal PLC cycle time. - The minimum cycle time is approx. 20 ms per device.
Auxiliary energy	
Electrical connection	connection cable: - shielded, twisted pair two-wire cable - terminals for wire cross-sections 0.14 ... 2.5 mm^2 - cable outer diameter: 5 ... 9 mm (0.2 ... 0.35 in) M12 plug Harting plug (Han7D)
Supply voltage	analogue electronics I2/IB: 11.5 ... 45 V DC HART electronics IA/IH: 11.5 ... 45 V DC PROFIBUS PA electronics PA/PB: 9 ... 32 V DC Version for hazardous area see safety information.
Current consumption	PROFIBUS PA electronics PA/PB: 11 mA ± 1 mA

Residual ripple	analogue electronics I2/IB and HART electronics IA/IH: - without influence on 4 ... 20 mA signal up to ± 5 % residual ripple within the permitted voltage range (acc. to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)) - with HART handheld terminal: max. ripple (measured at 500 Ω) 47 ... 125 Hz: U_{pp} = 200 mV, max. noise (measured at 500 Ω) 500 ... 10 kHz: U_{eff} = 2.2 mV
Performance characteristics	
Reference operating conditions	- as per IEC 60770 - ambient temperature range T_{amb} = constant, in range: 21 ... 33 °C (294 ... 307 K) - humidity = constant, in range: 20 ... 80 % relative humidity - ambient pressure p_{amb} = constant, in range: 860 ... 1060 mbar - position of measuring cell = constant, in range: horizontal ± 1° - input of Low Sensor Calibration and High Sensor Calibration for lower range value and upper range value - membrane material ceramic (aluminium oxide ceramic) or stainless steel 1.4435/316L - filling oil: mineral oil - supply voltage: 24 V DC ± 3 V DC - load for HART: 250 Ω - Turn down: 1:1 to 10:1
Maximum measured error	± 0.2 % of set span, optional ± 0.1 % non-linearity of set span
Long-term drift	with reference to the span ± 0.1 % per year, ± 0.25 % per 3 years
Influence of vibrations	without any effects up to 5 ... 15 Hz: ± 4 mm (0.16 in) 15 ... 150 Hz: 2 g 150 ... 2000 Hz: 1 g
Rise time	analogue electronics I2/IB: 60 ms HART electronics IA/IH: 220 ms PROFIBUS PA electronics PA/PB: 220 ms
Warming-up time	analogue electronics I2/IB: 200 ms HART electronics IA/IH: 1 s PROFIBUS PA electronics PA/PB: 1 s
Adjustment time	analogue electronics I2/IB: 180 ms HART electronics IA/IH: 600 ms PROFIBUS PA electronics PA/PB: 600 ms
Operating conditions	
Mounting conditions	
Installation position	any position, zero point shift due to position can be corrected see technical information
Ambient conditions	
Ambient temperature	-40 ... 85 °C (233 ... 358 K) onsite display with analogue electronics I2/IB: -30 ... 80 °C (243 ... 353 K) onsite display with HART electronics IA/IH or PROFIBUS PA electronics PA/PB: -25 ... 70 °C (248 ... 343 K) Lower temperatures minimise the display speed.
Storage temperature	-40 ... 100 °C (233 ... 373 K) onsite display: -40 ... 80 °C (233 ... 353 K)
Climate class	4K4H, air temperature: -20 ... 55 °C (253 ... 328 K), relative humidity: 4 ... 100 %, condensation possible
Electromagnetic compatibility	- maximum deviation: < 0.5 % of span - maximum deviation for 100 mbar sensors: < 1.25 % of span - In the event of surge influence (EN 61000-4-5), deviations greater than the specified measured error can occur briefly. - All measurements were performed with a Turn down = 1:1.
Process conditions	
Medium temperature	LHC-M20: -40 ... 125 °C (233 ... 398 K), up to 150 °C (423 K) for 1 hour LHC-M40: up to 350 °C (623 K)
Medium pressure limits	see section measuring range
Overload resistance	LHC-M20: up to 40 times the nominal pressure (max. 60 bar) LHC-M40: up to 4 times the nominal pressure (max. 600 bar)
Mechanical specifications	
Protection degree	IP66 for devices with cable gland, cable entry IP68 for devices with assembled cable or M12 plug
Mechanical construction	
Construction type	LHC-M20: version with ceramic sensor LHC-M40: version with metal sensor
Dimensions	housings: stainless steel housing 74 x 97 mm (2.9 x 3.8 in), aluminium housing 74 x 117 mm (2.9 x 4.6 in), length depends on process connection and cover process connections see section dimensions
Mass	LHC-M20: stainless steel 1.8 kg, aluminium 2.1 kg LHC-M40: 1.5 ... 16.8 kg, depends from process connection

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Material	housing: - stainless steel 1.4404/316L or cast aluminium housing with protective polyester based powder coating nameplates: - stainless steel housing: engraved on housing with laser - aluminium housing: 1.4301/304) process connections (in contact with the medium): - stainless steel 1.4435/316L process diaphragm (in contact with the medium): - LHC-M20: Al_2O_3 aluminium oxide ceramic (FDA listed), 96 %, extremely clean 99.9 % - LHC-M40: stainless steel 1.4435/316L, Hastelloy C276, tantalum, PTFE folio 0.09 mm on 1.4435/316L (not for vacuum), PTFE folio 0.25 mm on 1.4435/316L (not for vacuum) seals: - FKM Viton (also in versions grease-free and for oxygen use), NBR, FFKM Kalrez, FFKM Chemraz, EPDM O-ring for cover sealing: - stainless steel housing: silicone - aluminium housing: NBR mounting accessories for pipe and wall mounting: - stainless steel 1.4301/304 measurement cell: - LHC-M20: without oil filling, dry sensor, - LHC-M40: oil filling: optional silicone oil, vegetable oil, glycerine, high temperature oil, fluorolube grease-free for oxygen use capillary: - 1.4571/316Ti protective hose for capillary: - 1.4301/304
Surface quality	standard surface roughness of parts in contact with the medium $R_a \leq 0.8$ µm, reduces surface roughness on request.
Process connection	- cylindrical thread G1A, G1½A, G2A to DIN ISO 228/1 with flat seal to DIN 7603 - conical thread 1 NPT, 1½ NPT, 2 NPT to ANSI B 1.20.1 - Triclamp 2" to ISO 2852 - threaded pipe joint DN40 and DN50 to DIN 1185 - aseptic connection DN40 and DN50 to DIN 11864-1 form A for pipe DIN 11850 - SMS connection 1½" and 2" - Varivent® D = 68 mm (2.7 in) for pipes DN40 ... DN125 to factory standard Tuchenhagen - DRD flange, D = 65 mm (2.6 in) - APV inline PN40 - flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1", optional with Halar or PVDF coating or tubus for additional information see type code
Electrical connection	housing *1: cable gland M20 x 1.5 housing *2: cable gland ½ NPT housing *3: cable gland G½ housing *4: Harting plug (Han7D) housing *5: M12 x 1 plug housing *6: assembled cable with pressure compensation, 5 m (197 in)
Indication and operation	
Display elements	analogue electronics I2/IB: - The analogue display gives the current pressure value related to the measuring range in the form of a bar graph (30 segments). HART electronics IA/IH: - The digital display gives the pressure in the form of a four-digit number. The appropriate current value from 4 ... 20 mA is shown as a bar graph (28 segments) underneath. PROFIBUS PA electronics PA/PB: - The digital display gives the pressure in the form of a four-digit number. The digital display shows the current pressure value in the form of a bar graph (28 segments). display resolution: - analogue display: bar graph, 1 segment equals 3.33 % of the set span - digital display: 0.1 %, bar graph, 1 segment equals 3.57 % of the set span
Operating elements	analogue electronics I2/IB: - operation directly at the measuring point with one potentiometer each for lower range value and upper range value - a three-step range switch - as well as an on/off switch for damping HART electronics IA/IH with HART protocol: operation mode at the measuring point via - two push buttons for lower range value and upper range value as well as an on/off switch for damping - the handheld terminal at any point along the 4 ... 20 mA line - a PC with operating program PROFIBUS PA electronics PA/PB: operation mode via - two keys for lower-range value and upper-range value - using a PC with operating program
Certificates and approvals	
Ex approval	DMT 02 ATEX E 137, DMT 02 ATEX E 138, for additional certificates see www.pepperl-fuchs.com

Type of protection	⟨Ex⟩ II 1G EEx ia IIC T4/T6 (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/2G EEx ia IIC T4/T6 (DMT 02 ATEX E 137) ⟨Ex⟩ II 2G EEx ia IIC T4/T6 (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/2D IP66 T50/82°C (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/2D IP66 T85°C (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/3D IP66 T110°C (DMT 02 ATEX E 138) ⟨Ex⟩ II 3 G EEx nA II T5
SIL classification	up to SIL2 acc. to IEC 61508
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50021, EN 50284, EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60721-3-4
Supplementary documentation	technical information LHC-M operating instructions BA200O (version with analogue electronics) operating instructions BA201O (version with HART electronics) operating instructions BA222O (version with PROFIBUS PA electronics) operating instructions KA224O M12 plug with new PIN assignment operating instructions KA525O welded nozzle (LHC-Z21, LHC-Z23, LHC-Z24, LHC-Z25) safety information SI038O (DMT 02 ATEX E 137) safety information SI039O (DMT 02 ATEX E 137) safety information SI040O (DMT 02 ATEX E 138) safety information SI052O (⟨Ex⟩ II3 G EEx nA II T5) safety information SI096O (DMT 02 ATEX E 137), PROFIBUS PA version safety information SI097O (DMT 02 ATEX E 137), PROFIBUS PA version safety information SI098O (DMT 02 ATEX E 138), PROFIBUS PA version FM control drawing ZD039O (version with HART electronics) CSA control drawing ZD040O (version with HART electronics) CSA control drawing ZD051O (version with PROFIBUS PA electronics) FM control drawing ZD052O (version with PROFIBUS PA electronics)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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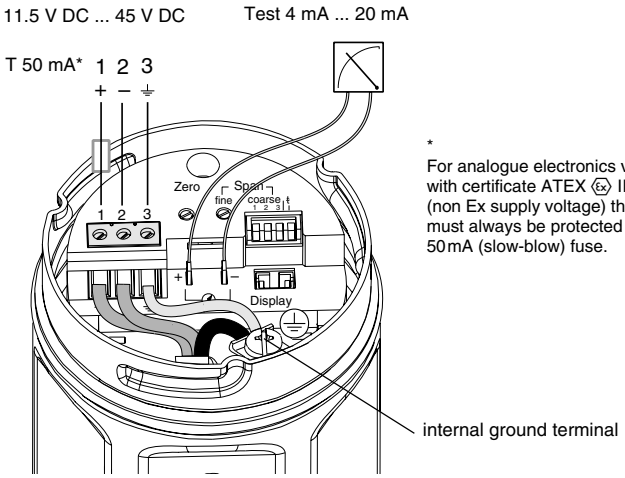
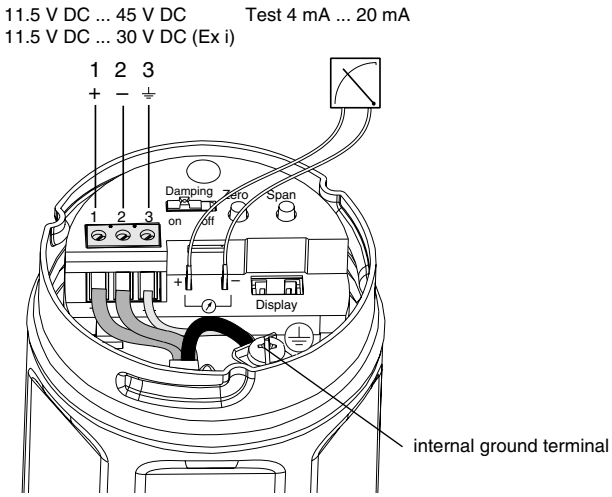
Electrical connection

Connection I2/IB with analogue electronics

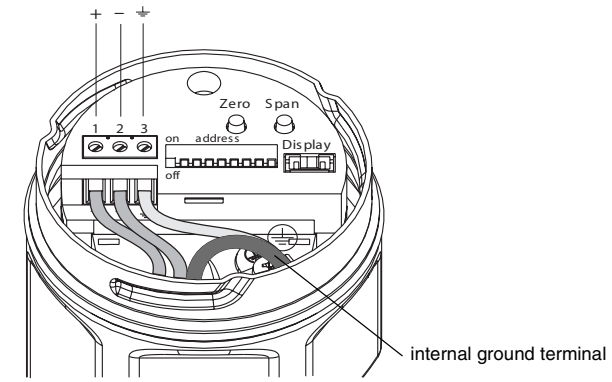


*
For analogue electronics versions with certificate ATEX ⟨Ex⟩ II 1/3D (non Ex supply voltage) the device must always be protected by a 50 mA (slow-blow) fuse.

Connection IA/IH with HART electronics



Connection PA/PB with PROFIBUS PA electronics



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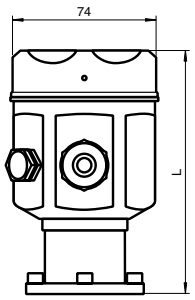
Dimensions

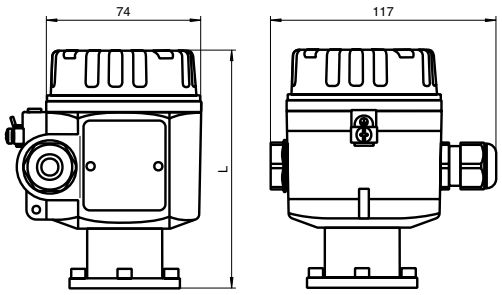
Housing LHC-M20

Measure L depends on process connection and lid.

LHC-M20 E*



LHC-M20 A*

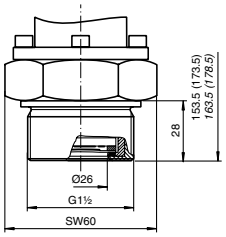


Process connections with threads

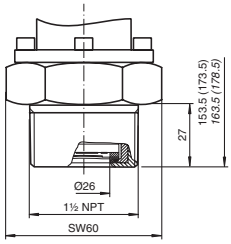
Values in brackets apply for housings with raised cover.

Values in italics apply to devices with an aluminium housing.

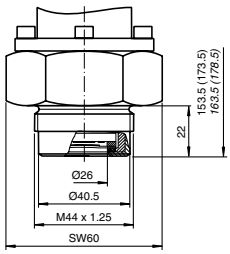
G51, G1½



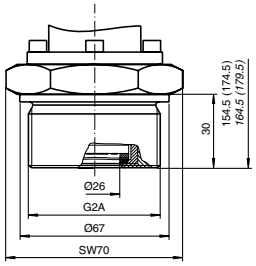
N51, 1½ NPT



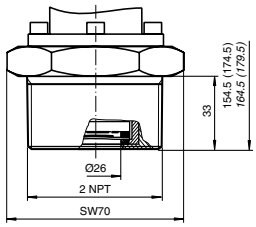
MM1, M44 x 1.25



G61, G2

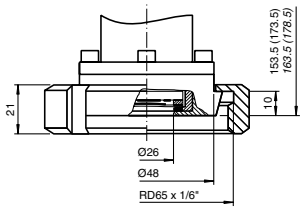


N61, 2 NPT

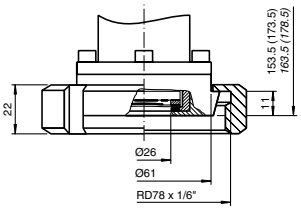


Process connections with sanitary couplings

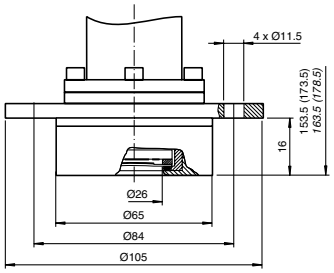
M65, dairy coupling DN40, DIN 11851



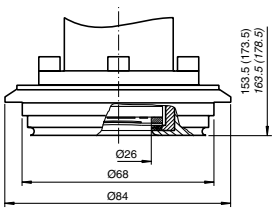
M75, dairy coupling DN50, DIN 11851



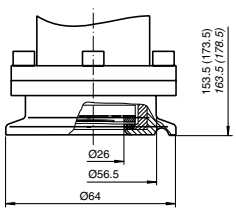
DR1, DRD, D = 65 mm



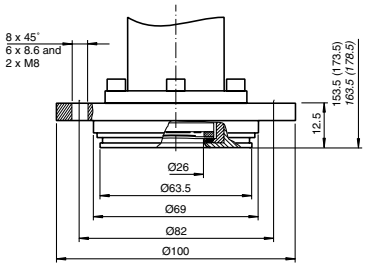
V11, Varivent for pipes, D = 65 mm



T65, Triclamp 2"



SP6, APV-Inline



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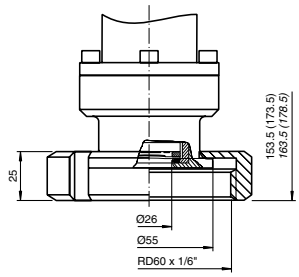
Dimensions

Process connections with sanitary couplings

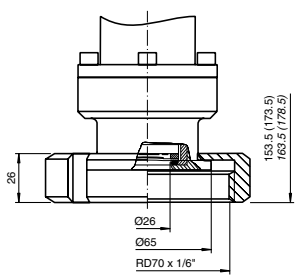
Values in brackets apply for housings with raised cover.

Values in italics apply to devices with an aluminium housing.

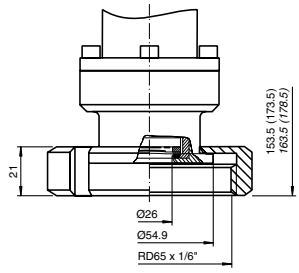
S55, SMS 1 1/2", PN40



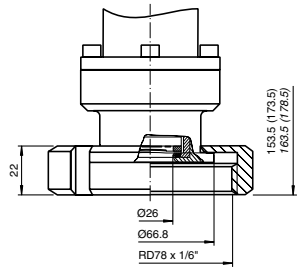
S65, SMS 1 1/2", PN40



SA6, DN40, aseptic, DIN 11864-1-A

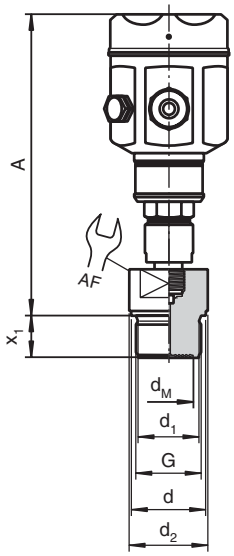


SA7, DN50, aseptic, DIN 11864-1-A

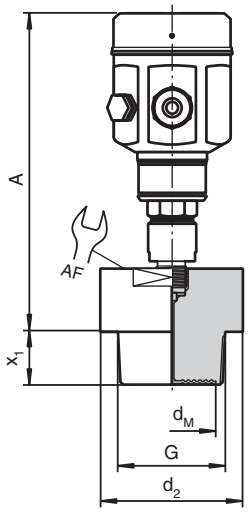


Housing and process connections with threads LHC-M40

Process connection G**



Process connection N**



Process connection	Threads							Housing	
	threads	diameter	diameter	diameter	thread length	key distance	diaphragm diameter	installation height stainless steel	installation height aluminium
		d_1	d	d_2	x_1	AF	d_M	max. A	max. A
	in	mm	mm	mm	mm	mm	mm	mm	mm
G31	G1	29	39	39	21	41	28	231.5	236.5
G51	G1½	44	55	58	30	41	38	232.5	237.5
G61	G2	56	68	78	30	60	46	237.5	242.5
N31	1 NPT	-	-	-	23	41	23	235.5	240.5
N51	1½ NPT	-	-	52	30	46	32	233.5	238.5
N61	2 NPT	-	-	78	30	65	36	233.5	238.5

Process connections with flange

see type code

Measuring range

LHC-M20				LHC-M40			
pressure type	meas. limits in bar	min. span in bar	overload in bar	pressure type	meas. limits in bar	min. span in bar	overload in bar
gauge pressure	0 ... 0.1	0.01	4	rel. pressure	0 ... 1	0.1	4
gauge pressure	0 ... 0.4	0.04	8	rel. pressure	0 ... 4	0.4	16
gauge pressure	0 ... 1	0.1	10	rel. pressure	0 ... 10	1	40
gauge pressure	0 ... 4	0.4	25	rel. pressure	0 ... 40*	4	160
gauge pressure	0 ... 10	1	40	rel. pressure	0 ... 100*	10	400
gauge pressure	0 ... 40	4	60	rel. pressure	0 ... 400*	40	600
gauge pressure	-0.1 ... 0.1	0.02	4	rel. pressure	-1 ... 1	0.2	4
gauge pressure	-0.4 ... 0.4	0.08	8	rel. pressure	-1 ... 4	0.5	16
gauge pressure	-1 ... 1	0.2	10	rel. pressure	-1 ... 10	1.1	40
gauge pressure	-1 ... 4	0.5	25				
gauge pressure	-1 ... 10	1.1	40				
abs. pressure	0 ... 0.4	0.04	8	abs. pressure	0 ... 1	0.1	4
abs. pressure	0 ... 1	0.1	10	abs. pressure	0 ... 4	0.4	16
abs. pressure	0 ... 4	0.4	25	abs. pressure	0 ... 10	1	40
abs. pressure	0 ... 10	1	40	abs. pressure	0 ... 40	4	160
abs. pressure	0 ... 40	4	60	abs. pressure	0 ... 100	10	400
				abs. pressure	0 ... 400	40	600

*absolute pressure sensors

The given overload will apply for the sensor. Please note the permissible maximum gauge pressure of the diaphragm seals.

Vacuum resistance: up to 10 $mbar_{abs}$

Accessories

- LHC-Z10, transparent cover with glass for intrinsically safe units
- LHC-Z11, transparent cover with polycarbonate for standard units
- LHC-Z12, transparent cover with glass for intrinsically safe units
- LHC-Z21, dummy for pressure sensors G1A
- LHC-Z23, welded nozzle G1A
- LHC-Z24, welded nozzle G1½A
- LHC-Z25, dummy for pressure sensors G1½A
- LHC-Z30, set for wall and pipe mounting LHC-M20
- LHC-Z31, set for wall and pipe mounting LHC-M40
- LHC-Z40, digital display for electrical outputs IA and PB
- LHC-Z41, analogue display for electrical output IB

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Type code/model number

L H C – M 2 0 [ ] [ ] [ ] [ ] – [ ] [ ] [ ] [ ] – [ ] [ ] [ ] [ ] [ ] – [ ] [ ]

Certificates
- **NA** for safe areas
- **EX** Ⓔx II 1/2G EEx ia IIC T6
- **E1** Ⓔx II 2G EEx ia IIC T6
- **E2** Ⓔx II 3G EEx nA IIC T5
- **CG** CSA General Purpose
- **C1** CSA IS (suitable for Div. 2), Cl. I, II, III, Div. 1, Group A-G
- **FM** FM IS, Cl. I, II, III, NI, Div. 1, Group A-G

Optional equipment
- **N** without optional equipment
- **Z** 3.1.B material, wetted parts 1.4435/316L, inspection certificate to EN10204

Electrical output, indication
- **NA** without electronics/without display
- **I2** 4 mA ... 20 mA, analogue electronics
- **IB** 4 mA ... 20 mA, analogue electronics with display 0 % ... 100 % bar
- **IH** 4 mA ... 20 mA, SMART electronics, HART protocol
- **IA** 4 mA ... 20 mA, SMART electronics, HART protocol with display quadruple and 0 % ... 100 % bar
- **PA** PROFIBUS PA electronics P3.0. in the PNO certification process
- **PB** PROFIBUS PA electronics P3.0 with four-character display and 0 % ... 100 % bar, in the PNO certification process

Housing, cable entry
- **E1** stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66
- **E2** stainless steel housing 1.4404/316L, ½ NPT entry, IP66
- **E3** stainless steel housing 1.4404/316L, G½ entry, IP66
- **E4** stainless steel housing 1.4404/316L, Harting plug, IP65
- **E5** stainless steel housing 1.4404/316L, M12 x 1 plug, metal, IP68
- **E6** stainless steel housing 1.4404/316L, cable IP68 with atmospheric pressure compensation
- **A1** aluminium housing, M20 x 1.5 thread, IP66
- **A2** aluminium housing, ½ NPT entry, IP66
- **A3** aluminium housing, G½ entry, IP66
- **A4** aluminium housing, Harting plug, IP65
- **A5** aluminium housing, M12 x 1 plug, metal, IP68
- **A6** aluminium housing 1.4404/316L, cable IP68 with atmospheric pressure compensation

Seal, diaphragm
- **1** FKM Viton sensor sealing
- **2** NBR sensor sealing
- **4** EPDM sensor sealing
- **7** Kalrez sensor sealing
- **A** FKM Viton sealing, oil and grease free
- **C** Chemraz sensor sealing

Calibration and technical units
- **1** 0.2 %, calibration in sensor limits: mbar/bar
- **2** 0.2 %, calibration in sensor limits: kPa/MPa
- **3** 0.2 %, calibration in sensor limits: mm/mH_2O
- **4** 0.2 %, calibration in sensor limits: inH_2O/ftH_2O
- **5** 0.2 %, calibration in sensor limits: kgf/cm^2
- **6** 0.2 %, calibration in sensor limits: psi
- **B** 0.2 %, calibrated from ... to ..., technical unit ...
- **C** 0.1 %, calibrated from ... to ..., technical unit ...

Pressure measuring range
- **R1A** 0 mbar ... 100 mbar gauge sensor, 10 kPa, 1.5 psig/400 in H_2O, overload 40-fold
- **R1D** 0 mbar ... 400 mbar gauge sensor, 40 kPa, 6 psig/160 in H_2O, overload 15-fold
- **R2A** 0 bar ... 1 bar gauge sensor, 100 kPa, 15 psig/400 in H_2O, overload 10-fold
- **R2D** 0 bar ... 4 bar gauge sensor, 400 kPa, 60 psig, overload six-fold
- **R3A** 0 bar ... 10 bar gauge sensor, 1 MPa, 150 psig, overload quadruple
- **R3D** 0 bar ... 40 bar gauge sensor, 4 MPa, 600 psig, overload 1.5-fold
- **N1A** -100 mbar ... 100 mbar sensor, -10 kPa ... 10 kPa, -40 in ... 40 in H_2O, overload 40-fold
- **N1D** -400 mbar ... 400 mbar sensor, -40 kPa ... 40 kPa, -6 psig ... 6 psig, overload 15-fold
- **N2A** -1 bar ... 1 bar sensor, -100 kPa ... 100 kPa, -15 psig ... 15 psig, overload 10-fold
- **N2D** -1 bar ... 4 bar sensor, -100 kPa ... 400 kPa, -15 psig ... 60 psig, overload 6-fold
- **N3A** -1 bar ... 10 bar sensor, -0.1 MPa ... 1 MPa, -15 psig ... 150 psig, overload quadruple
- **A1D** 0 mbar ... 400 mbar absolute pressure sensor, 10 kPa, 6 psia, overload 15-fold
- **A2A** 0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psia, overload 10-fold
- **A2D** 0 bar... 4 bar absolute pressure sensor, 400 kPa, 60 psia, overload 6-fold
- **A3A** 0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psia, overload quadruple
- **A3D** 0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psia, overload 1.5-fold

Transmitter
- **M20** ceramic sensor

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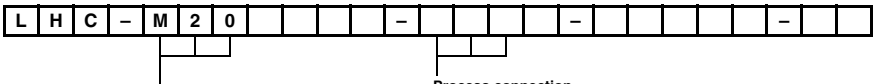
Type code/model number



Process connection

G51	G1½A, DIN ISO 228/1, 1.4435/316L, sealing not changeable
N51	1½ NPT, ANSI B 1.20.1, 1.4435/316L, sealing not changeable
G61	G2A, DIN ISO 228/1, 1.4435/316L
N61	2 NPT, ANSI B 1.20.1, 1.4435/316L
MM1	M44 x 1.25, DIN 13, 1.4435/316L
T65	2", DN40-51, Triclamp ISO 2852, 1.4435/316L
S55	1½", SMS, PN40, 1.4435/316L
S65	2", SMS, PN40, 1.4435/316L
M65	DN40, PN40, dairy DIN 11851, 1.4435/316L
M75	DN50, PN40, dairy DIN 11851, 1.4435/316L
SA6	DN40, aseptic connection DIN11864, 1.4435/316L
SA7	DN50, aseptic connection DIN11864, 1.4435/316L
SP6	PN40, APV-Inline, 1.4435/316L
V11	Varivent D = 68 mm (2.72 in) for pipes DN40 ... DN125, 1.4435/316L
DR1	DRD flange, D = 65 mm, 1.4435/316L
F75	DN50, PN25/40, EN 1092-1, 1.4435/316L
F95	DN80, PN25/40, EN 1092-1, 1.4435/316L
H75	DN50, PN25/40, EN 1092-1, 1.4435/316L with Halar coating
H95	DN80, PN25/40, EN 1092-1, 1.4435/316L with Halar coating
A51	ANSI 1½", ANSI B 16.5, 150 lbs, 1.4435/316L
A52	ANSI 1½", ANSI B 16.5, 300 lbs, 1.4435/316L
A61	ANSI 2", ANSI B 16.5, 150 lbs, 1.4435/316L
A62	ANSI 2", ANSI B 16.5, 300 lbs, 1.4435/316L
A81	ANSI 3", ANSI B 16.5, 150 lbs, 1.4435/316L
A82	ANSI 3", ANSI B 16.5, 300 lbs, 1.4435/316L
A91	ANSI 4", ANSI B 16.5, 150 lbs, 1.4435/316L
A92	ANSI 4", ANSI B 16.5, 300 lbs, 1.4435/316L
H21	ANSI 2", ANSI B 16.5, 150 lbs, 1.4435/316L with Halar coating
H31	ANSI 3", ANSI B 16.5, 150 lbs, 1.4435/316L with Halar coating
H41	ANSI 4", ANSI B 16.5, 150 lbs, 1.4435/316L with Halar coating
P21	ANSI 2", ANSI B 16.5, 150 lbs, 1.4435/316L with PVDF coating
P31	ANSI 3", ANSI B 16.5, 150 lbs, 1.4435/316L with PVDF coating
S1M	Weld spud 75 mm (3 in), 1.4435/316L
XXX	special version

Transmitter

M20	ceramic sensor

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Type code/model number

L	H	C	–	M	4	0					–						–						–		

Certificates
- **NA** for safe areas
- **EX** Ⓔx II 1/2G EEx ia IIC T6
- **E1** Ⓔx II 2G EEx ia IIC T6
- **E2** Ⓔx II 3G EEx nA IIC T5
- **CD** CSA, Cl. I, II, III, Div. 1, Group E-G (dust Ex), Cl. I, Div. 2, Group A-D
- **CG** CSA General Purpose
- **C1** CSA IS (suitable for Div. 2), Cl. I, II, III, Div. 1, Group A-G
- **FM** FM IS, Cl. I, II, III, NI, Div. 1, Group A-G
- **FD** FM DIP, Cl. I, II, III, Div. 1, Group E-G
- **SX** Ⓔx II 1/2D EEx ia IIC T6
- **S2** Ⓔx II 1/3D

Optional equipment
- **N** without optional equipment
- **M** with mounting bracket for wall and pipe mounting
- **Z** 3.1.B material, wetted parts 1.4435/316L, inspection certificate to EN10204

Electrical output, indication
- **NA** without electronics/without display
- **I2** 4 mA ... 20 mA, analogue electronics
- **IB** 4 mA ... 20 mA, analogue electronics with display 0 % ... 100 % bar
- **IH** 4 mA ... 20 mA, SMART electronics, HART protocol
- **IA** 4 mA ... 20 mA, SMART electronics, HART protocol with display quadruple and 0 % ... 100 % bar
- **PA** PROFIBUS PA electronics P3.0. in the PNO certification process
- **PB** PROFIBUS PA electronics P3.0 with four-character display and 0 % ... 100 % bar, in the PNO certification process

Housing, cable entry
- **E1** stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66
- **E2** stainless steel housing 1.4404/316L, ½ NPT entry, IP66
- **E3** stainless steel housing 1.4404/316L, G½ entry, IP66
- **E4** stainless steel housing 1.4404/316L, Harting plug, IP65
- **E5** stainless steel housing 1.4404/316L, M12 x 1 plug, metal, IP68
- **E6** stainless steel housing 1.4404/316L, cable IP68 with atmospheric pressure compensation
- **A1** aluminium housing, M20 x 1.5 thread, IP66
- **A2** aluminium housing, ½ NPT entry, IP66
- **A3** aluminium housing, G½ entry, IP66
- **A4** aluminium housing, Harting plug, IP65
- **A5** aluminium housing, M12 x 1 plug, metal, IP68
- **A6** aluminium housing 1.4404/316L, cable IP68 with atmospheric pressure compensation

Seal, diaphragm
- **1** diaphragm seal 1.4435
- **2** diaphragm seal Hastelloy C276
- **5** diaphragm seal Tantal
- **7** PTFE foil 0.09 mm on stainless steel diaphragm 1.4435/316L, not for vacuum
- **9** PTFE foil 0.25 mm on stainless steel diaphragm 1.4435/316L, not for vacuum

Sensor filling media
- **A** silicone oil, direct coupling
- **D** vegetable oil, direct coupling
- **E** glycerine, direct coupling
- **G** high temperature oil, temperature decoupling 100 mm (3.9 in)
- **H** ... m capillary with high temperature oil
- **J** ... m capillary with silicone oil
- **K** 1 m (39.4 in) capillary with high temperature oil
- **N** FLUROLUBE grease free for oxygen applications max. 60 °C (333 K)/120 bar

Calibration and technical units
- **1** 0.2 %, calibration in sensor limits: mbar/bar
- **2** 0.2 %, calibration in sensor limits: kPa/MPa
- **3** 0.2 %, calibration in sensor limits: mm/mH_2O
- **4** 0.2 %, calibration in sensor limits: inH_2O/ftH_2O
- **5** 0.2 %, calibration in sensor limits: kgf/cm^2
- **6** 0.2 %, calibration in sensor limits: psi
- **B** 0.2 %, calibrated from ... to ..., technical unit ...

Pressure measuring range
- **R2A** 0 bar ... 1 bar gauge sensor, 100 kPa, 15 psig/400 in H_2O, overload quadruple
- **R2D** 0 bar ... 4 bar gauge sensor, 400 kPa, 60 psig, overload quadruple
- **R3A** 0 bar ... 10 bar gauge sensor, 1 MPa, 150 psig, overload quadruple
- **R3D** 0 bar ... 40 bar gauge sensor, 4 MPa, 600 psig, overload quadruple
- **R4A** 0 bar ... 100 bar gauge sensor, 10 MPa, 1500 psig, overload quadruple
- **R4D** 0 bar ... 400 bar gauge sensor, 40 MPa, 6000 psig, overload 1.5-fold
- **N2A** -1 bar ... 1 bar sensor, -100 kPa ... 100 kPa, -15 psig ... 15 psig, overload quadruple
- **N2D** -1 bar ... 4 bar sensor, -100 kPa ... 400 kPa, -15 psig ... 60 psig, overload quadruple
- **N3A** -1 bar ... 10 bar sensor, -0.1 MPa ... 1 MPa, -15 psig ... 150 psig, overload quadruple
- **A2A** 0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psia, overload quadruple
- **A2D** 0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psia, overload quadruple
- **A3A** 0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psia, overload quadruple
- **A3D** 0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psia, overload quadruple
- **A4A** 0 bar ... 100 bar absolute pressure sensor, 10 MPa, 1500 psia, overload quadruple
- **A4D** 0 bar ... 400 bar absolute pressure sensor, 40 MPa, 6000 psia, overload 1.5-fold

Transmitter
- **M40** metal sensor, piezoresistive

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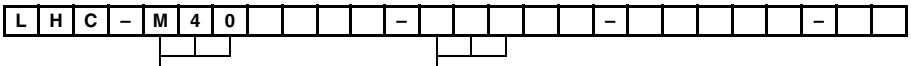
Type code/model number



Process connection

G31	G1A, DIN ISO 228/1, 1.4435/316L
G51	G1½A, DIN ISO 228/1, 1.4435/316L
G61	G2A, DIN ISO 228/1, 1.4435/316L
N31	1 NPT, ANSI B 1.20.1, 1.4435/316L
N52	1½ NPT, ANSI B 1.20.1, 1.4435/316L
N61	2 NPT, ANSI B 1.20.1, 1.4435/316L
T1G	G½A, DIN ISO 228/1, 1.4435/316L, separator
T1N	½ NPT, ANSI B 1.20.1, 1.4435/316L, separator
F34	DN25, PN250, EN 1092-1, 1.4435/316L
F35	DN25, PN10/40, EN 1092-1, 1.4435/316L
F38	DN25, PN64/160, EN 1092-1, 1.4435/316L
F3A	DN25, PN400, EN 1092-1, 1.4435/316L
F70	DN50, PN400, EN 1092-1, 1.4435/316L
F75	DN50, PN10/40, EN 1092-1, 1.4435/316L
F76	DN50, PN64, EN 1092-1, 1.4435/316L
F78	DN50, PN100/160, EN 1092-1, 1.4435/316L
F79	DN50, PN250, EN 1092-1, 1.4435/316L
F7A	DN50, PN10/40 with tubus 50 mm (2 in), EN 1092-1, 1.4435/316L
F7B	DN50, PN10/40 with tubus 100 mm (4 in), EN 1092-1, 1.4435/316L
F7C	DN50, PN10/40 with tubus 200 mm (8 in), EN 1092-1, 1.4435/316L
F9A	DN80, PN10/40 with tubus 50 mm (2 in), EN 1092-1, 1.4435/316L
F9B	DN80, PN10/40 with tubus 100 mm (4 in), EN 1092-1, 1.4435/316L
F9C	DN50, PN10/40 with tubus 200 mm (8 in), EN 1092-1, 1.4435/316L
A31	1", ANSI B 16.5, 150 lbs, 1.4435/316L
A32	1", ANSI B 16.5, 300 lbs, 1.4435/316L
A33	1", ANSI B 16.5, 400 lbs/600 lbs, 1.4435/316L
A37	1", ANSI B 16.5, 900 lbs/1500 lbs, 1.4435/316L
A39	1", ANSI B 16.5, 2500 lbs, 1.4435/316L
A61	2", ANSI B 16.5, 150 lbs, 1.4435/316L
A62	2", ANSI B 16.5, 300 lbs, 1.4435/316L
A63	2", ANSI B 16.5, 400 lbs/600 lbs, 1.4435/316L
A67	2", ANSI B 16.5, 900 lbs/1500 lbs, 1.4435/316L
A69	2", ANSI B 16.5, 2500 lbs, 1.4435/316L
A81	3", ANSI B 16.5, 150 lbs, 1.4435/316L
A82	3", ANSI B 16.5, 300 lbs, 1.4435/316L
A91	4", ANSI B 16.5, 150 lbs, 1.4435/316L
A92	4", ANSI B 16.5, 300 lbs, 1.4435/316L
A6A	2", with tubus 2", ANSI B 16.5, 150 lbs, 1.4435/316L
A6B	2", with tubus 4", ANSI B 16.5, 150 lbs, 1.4435/316L
A6C	2", with tubus 6", ANSI B 16.5, 150 lbs, 1.4435/316L
A8A	3", with tubus 2", ANSI B 16.5, 150 lbs, 1.4435/316L
A8B	3", with tubus 4", ANSI B 16.5, 150 lbs, 1.4435/316L
A8C	3", with tubus 6", ANSI B 16.5, 150 lbs, 1.4435/316L
A9A	4", with tubus 2", ANSI B 16.5, 150 lbs, 1.4435/316L
A9B	4", with tubus 4", ANSI B 16.5, 150 lbs, 1.4435/316L
A9C	4", with tubus 6", ANSI B 16.5, 150 lbs, 1.4435/316L
XXX	special version

Transmitter

M40	metal sensor, piezoresistive

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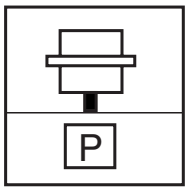
Process pressure transmitter

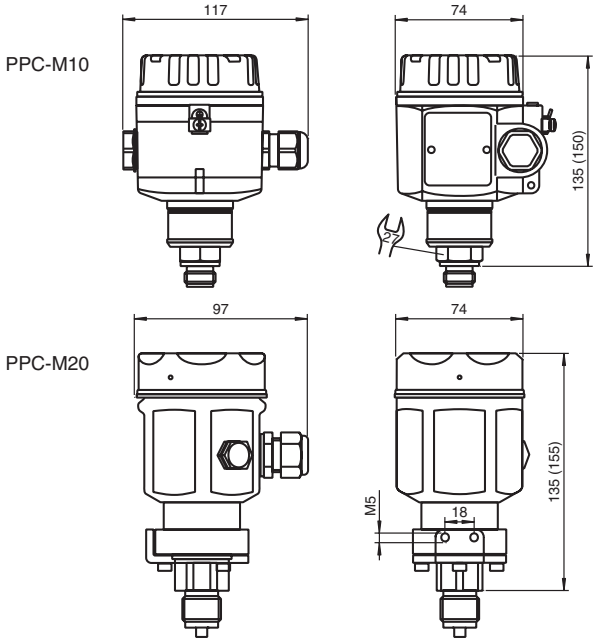
PPC-M**



Features

- Process pressure sensor for gases, vapours, liquids and dusts
- High accuracy of measurement
- Housing fulfils the special hygienic requirements of the foodstuff and pharmaceutical industries
- Large number of process connections to choose from: universal usage
- Dry capacitive ceramic sensor up to 40 bar
- Piezoresistive metal sensor for measuring ranges up to 400 bar
- Wide variety of electronic modules: the right connection for every process control system
- Process connections acc. to EHEDG
- Up to SIL2 acc. to IEC 61508

Dimensions



The values in brackets apply for housings with raised cover.

Additional dimensions see section dimensions.

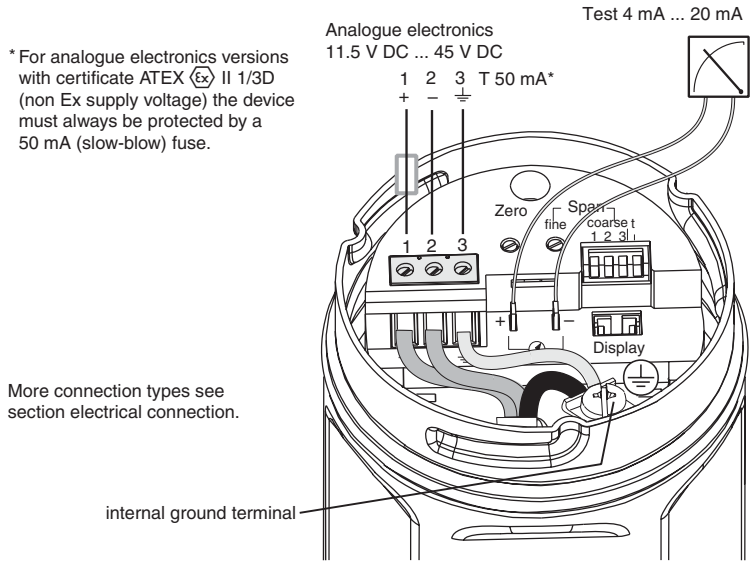
Function

The process pressure sensor PPC-M** measure absolute and relative pressure in gases, vapours, liquids and dusts.

The sensor can be used in all process engineering areas. The modular design of the BARCON pressure transmitter enables it to be used in all industrial environments. All process connections are available as hygienic connections, threaded connections, separators and flanges.

Electrical connection

Connection I2/IB analogue electronic (example)



* For analogue electronics versions with certificate ATEX Ex II 1/3D (non Ex supply voltage) the device must always be protected by a 50 mA (slow-blow) fuse.

More connection types see section electrical connection.

internal ground terminal

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Application	
Function principle	sensor for absolute and relative pressure measuring in gases, vapours, liquids and dusts metal sensor (PPC-M10) The process pressure acting on the metallic separating diaphragm of the sensor is transmitted via a fill liquid to a resistance bridge. The change in the output voltage of the bridge is proportional to the pressure and is then measured, volume of chamber: smaller than 1 mm^3. ceramic sensor (PPC-M20) The pressure causes a slight deflection of the ceramic diaphragm of the sensor. The change in the capacitance is proportional to the pressure and is measured by the electrodes of the ceramic sensor, volume of chamber: approx. 2 mm^3.
Function and system design	
Equipment architecture	- with analogue electronics I2/IB 4 ... 20 mA and auxiliary energy, e. g. via transmitter power pack, calibration across potentiometer for lower range value and upper range value, optionally analogue display for measuring value indication - with HART electronics IA/IH with current output 4 ... 20 mA, HART communication signal and auxiliary energy, e. g. via transmitter power pack, calibration via two keys on the device, handheld terminal or PC with operating program, optional digital display for measured variable indication - with PROFIBUS PA electronics PA/PB with digital communication signal PROFIBUS PA and segment coupler for connection to PLC or PC with operating program, optional digital display for measured variable indication
Input characteristics	
Measured variable	absolute or relative pressure
Measurement range	see section measuring range
Output characteristics	
Output signal	analogue electronics I2/IB: 4 ... 20 mA HART electronics IA/IH: 4 ... 20 mA with HART protocol PROFIBUS PA electronics PA/PB: digital communication signal
Signal range	analogue electronics I2/IB and HART electronics IA/IH: 3.8 ... 20.5 mA
Signal on alarm	analogue electronics I2/IB: signal overrun > 20.5 mA or signal underrun < 3.6 mA HART electronics IA/IH: optional 3.6 mA, 22 mA or last current value will be hold PROFIBUS PA electronics PA/PB: can be set in the analog input block, options: last good value (factory setting), FSAFE value, wrong value
Response time	PROFIBUS PA: cyclic: approx. 10 ms per request, acyclic: < 50 ms
Output damping	analogue electronics I2/IB: - directly on device using DIP switches, switch position "On" = 2 s, "Off" = 0 s HART electronics IA/IH: - directly on device using DIP switches, switch position "On" = set value, "Off" = 0 s - with handheld terminal or using operating program: 0 ... 40 s - factory setting: 2 s PROFIBUS PA electronics PA/PB: - with handheld terminal or using operating program: 0 ... 40 s - factory setting: 0.0 s
Load	analogue electronics I2/IB and HART electronics IA/IH: - max. 1522 Ω at power supply 11.5 ... 45 V DC for devices for non-hazardous areas, 1/3D, EEx d, EEx nA, FM XP, FM DIP, CSA XP and CSA dust-Ex - max. 840 Ω at power supply 11.5 ... 30 V DC for EEx ia, 1D, 1/2D, 1/2G, FM IS and CSA IS
Resolution	analogue electronics I2/IB: - current output < 1 µA, onsite display 30 segments HART electronics IA/IH: - current output typ. 1 µA, max. 6 µA, onsite display 28 segments, display value with resolution 1 per thousand PROFIBUS PA electronics PA/PB: - onsite display 28 segments, display value with resolution 1 per thousand
Read cycles	HART commands: on average 3 to 4 per s PROFIBUS PA: cyclic: on average 100/s, acyclic: on average 20/s
Cycle time	PROFIBUS PA: - The cycle time in a bus segment in cyclic data communication depends on the number of devices, the segment coupler used and the internal PLC cycle time. - The minimum cycle time is approx. 20 ms per device.
Auxiliary energy	
Electrical connection	connection cable: - shielded, twisted pair two-wire cable - terminals for wire cross-sections 0.14 ... 2.5 mm^2 - cable outer diameter: 5 ... 9 mm (0.2 ... 0.35 in) M12 plug Harting plug (Han7D)
Supply voltage	analogue electronics I2/IB: 11.5 ... 45 V DC HART electronics IA/IH: 11.5 ... 45 V DC PROFIBUS PA electronics PA/PB: 9 ... 32 V DC Version for hazardous area see safety information.
Current consumption	PROFIBUS PA electronics PA/PB: 11 mA ± 1 mA

Residual ripple	analogue electronics I2/IB and HART electronics IA/IH: - without influence on 4 ... 20 mA signal up to ± 5 % residual ripple within the permitted voltage range (according to HART hardware specification HCF_SPEC-54 (DIN IEC 60381-1)) - with HART handheld terminal: max. ripple (measured at 500 Ω) 47 ... 125 Hz: U_{pp} = 200 mV, max. noise (measured at 500 Ω) 500 ... 10 kHz: U_{eff} = 2.2 mV
Performance characteristics	
Reference operating conditions	- as per IEC 60770 - ambient temperature range T_{amb} = constant, in range: 21 ... 33 °C (294 ... 307 K) - humidity = constant, in range: 20 ... 80 % relative humidity - ambient pressure p_{amb} = constant, in range: 860 ... 1060 mbar - position of measuring cell = constant, in range: horizontal ± 1° - input of Low Sensor Calibration and High Sensor Calibration for lower range value and upper range value - membrane material ceramic (aluminium oxide ceramic) or stainless steel 1.4435/316L - filling oil: mineral oil - supply voltage: 24 V DC ± 3 V DC - load for HART: 250 Ω - Turn down: 1:1 to 10:1
Maximum measured error	± 0.2 % of set span, optional ± 0.1 % non-linearity of set span
Long-term drift	with reference to the span ± 0.1 % per year, ± 0.25 % per 3 years
Influence of vibrations	without any effects up to 5 ... 15 Hz: ± 4 mm (0.16 in) 15 ... 150 Hz: 2 g 150 ... 2000 Hz: 1 g
Rise time	analogue electronics I2/IB: 60 ms HART electronics IA/IH: 220 ms PROFIBUS PA electronics PA/PB: 220 ms
Warming-up time	analogue electronics I2/IB: 200 ms HART electronics IA/IH: 1 s PROFIBUS PA electronics PA/PB: 1 s
Adjustment time	analogue electronics I2/IB: 180 ms HART electronics IA/IH: 600 ms PROFIBUS PA electronics PA/PB: 600 ms
Operating conditions	
Mounting conditions	
Installation position	any position, zero point shift due to position can be corrected see technical information
Ambient conditions	
Ambient temperature	-40 ... 85 °C (233 ... 358 K) onsite display with analogue electronics I2/IB: -30 ... 80 °C (243 ... 353 K) onsite display with HART electronics IA/IH or PROFIBUS PA electronics PA/PB: -25 ... 70 °C (248 ... 343 K) Lower temperatures minimise the display speed.
Storage temperature	-40 ... 100 °C (233 ... 373 K) onsite display: -40 ... 80 °C (233 ... 353 K)
Climate class	4K4H, air temperature: -20 ... 55 °C (253 ... 328 K), relative humidity: 4 ... 100 %, condensation possible
Electromagnetic compatibility	- maximum deviation: < 0.5 % of span - maximum deviation for 100 mbar sensors: < 1.25 % of span - In the event of surge influence (EN 61000-4-5), deviations greater than the specified measured error can occur briefly. - All measurements were performed with a Turn down = 1:1.
Process conditions	
Medium temperature	-40 ... 100 °C (233 ... 373 K)
Medium pressure limits	see section measuring range
Overload resistance	PPC-M10: up to 4 times the nominal pressure (max. 600 bar) PPC-M20: up to 40 times the nominal pressure (max. 60 bar)
Mechanical specifications	
Protection degree	IP66 for devices with cable gland, cable entry IP68 for devices with assembled cable or M12 plug
Mechanical construction	
Construction type	PPC-M10: version with metal sensor PPC-M20: version with ceramic sensor
Dimensions	housings: stainless steel housing 74 x 97 mm (2.9 x 3.8 in), aluminium housing 74 x 117 mm (2.9 x 4.6 in), length depends on process connection and cover process connections see section dimensions
Mass	PPC-M10: stainless steel 0.9 kg, aluminium 1.2 kg PPC-M20: stainless steel 1.4 kg, aluminium 1.6 kg

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Material	housing: - stainless steel 1.4404/316L or cast aluminium housing with protective polyester based powder coating nameplates: - stainless steel housing: engraved on housing with laser - aluminium housing: 1.4301/304 process connections (in contact with the medium): - PPC-M10: stainless steel 1.4435/316L - PPC-M20: 1.4435/316L or 2.4819 (Hastelloy C276) slotted nuts: - stainless steel 1.4307/304L) process diaphragm (in contact with the medium): - PPC-M10: stainless steel 1.4435/316L, Hastelloy C276, tantalum, PTFE folio 0.09 mm on 1.4435/316L (not for vacuum), PTFE folio 0.25 mm on 1.4435/316L (not for vacuum) - PPC-M20: Al_2O_3 aluminium oxide ceramic (FDA listed), 96 %, extremely clean 99.9 % seals: - FKM Viton (also in versions grease-free and for oxygen use), NBR, FFKM Kalrez, FFKM Chemraz, EPDM O-ring for cover sealing: - stainless steel housing: silicone - aluminium housing: NBR mounting accessories for pipe and wall mounting: - stainless steel 1.4301/304 measurement cell: - PPC-M10: oil filling: optional mineral oil, inert oil (Voltalef) for oxygen use or vegetable oil - PPC-M20: without oil filling, dry sensor capillary: - 1.4571/316Ti protective hose for capillary: - 1.4301/304
Surface quality	standard surface roughness of parts in contact with the medium $R_a \leq 0.8$ µm, reduces surface roughness on request.
Process connection	PPC-M10: - cylindrical thread G½A to EN 837 and JIS B0202 - cylindrical thread M20 x 1,5 to EN 837 - conical thread ½ MNPT or ½ FNPT to ANSI - conical thread R½A to JIS B0203 PPC-M20: - cylindrical thread G½A to EN 837 - cylindrical thread G½A with bore 11.4 mm (0.45 in) to DIN ISO 228 - cylindrical thread G½A G¼ (female) to DIN ISO 228 - cylindrical thread M20 x 1.5 with bore 3 mm (0.12 in) to EN 837 - conical thread ½ MNPT with bore 11.4 mm (0.45 in) to ANSI - conical thread ½ MNPT ¼ FNPT to ANSI - cylindrical thread G½A to JIS B0202 - conical thread R½A to JIS B0203
Electrical connection	housing *1: cable gland M20 x 1.5 housing *2: cable gland ½ NPT housing *3: cable gland G½ housing *4: Harting plug (Han7D) housing *5: M12 x 1 plug housing *6: assembled cable with pressure compensation, 5 m (197 in)
Indication and operation	
Display elements	analogue electronics I2/IB: - The analogue display gives the current pressure value related to the measuring range in the form of a bar graph (30 segments). HART electronics IA/IH: - The digital display gives the pressure in the form of a four-digit number. The appropriate current value from 4 ... 20 mA is shown as a bar graph (28 segments) underneath. PROFIBUS PA electronics PA/PB: - The digital display gives the pressure in the form of a four-digit number. The digital display shows the current pressure value in the form of a bar graph (28 segments). display resolution: - analogue display: bar graph, 1 segment equals 3.33 % of the set span - digital display: 0.1 %, bar graph, 1 segment equals 3.57 % of the set span
Operating elements	analogue electronics I2/IB: - operation directly at the measuring point with one potentiometer each for lower range value and upper range value - a three-step range switch - as well as an on/off switch for damping HART electronics IA/IH with HART protocol: operation mode at the measuring point via - two push buttons for lower range value and upper range value as well as an on/off switch for damping - the handheld terminal at any point along the 4 ... 20 mA line - a PC with operating program PROFIBUS PA electronics PA/PB: operation mode via - two keys for lower-range value and upper-range value - using a PC with operating program
Certificates and approvals	

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Ex approval	DMT 02 ATEX E 137, DMT 02 ATEX E 138, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1G EEx ia IIC T4/T6 (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/2G EEx ia IIC T4/T6 (DMT 02 ATEX E 137) ⟨Ex⟩ II 2G EEx ia IIC T4/T6 (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/2D IP66 T50/82°C (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/2D IP66 T85°C (DMT 02 ATEX E 137) ⟨Ex⟩ II 1/3D IP66 T110°C (DMT 02 ATEX E 138) ⟨Ex⟩ II 3 G EEx nA II T5
SIL classification	up to SIL2 acc. to IEC 61508
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50021, EN 50284, EN 50281-1-1
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60721-3-4
Supplementary documentation	technical information PPC-M operating instructions BA200O (version with analogue electronics) operating instructions BA201O (version with HART electronics) operating instructions BA222O (version with PROFIBUS PA electronics) operating instructions KA224O M12 plug with new PIN assignment operating instructions KA525O welded nozzle (LHC-Z20, LHC-Z21, LHC-Z22, LHC-Z23) safety information SI038O (DMT 02 ATEX E 137) safety information SI039O (DMT 02 ATEX E 137) safety information SI040O (DMT 02 ATEX E 138) safety information SI052O (⟨Ex⟩ II3 G EEx nA II T5) safety information SI096O (DMT 02 ATEX E 137), PROFIBUS PA version safety information SI097O (DMT 02 ATEX E 137), PROFIBUS PA version safety information SI098O (DMT 02 ATEX E 138), PROFIBUS PA version FM control drawing ZD039O (version with HART electronics) CSA control drawing ZD040O (version with HART electronics) CSA control drawing ZD051O (version with PROFIBUS PA electronics) FM control drawing ZD052O (version with PROFIBUS PA electronics)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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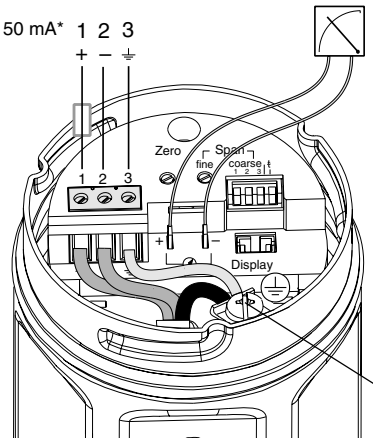
Electrical connection

Connection I2/IB with analogue electronics

11.5 V DC ... 45 V DC Test 4 mA ... 20 mA

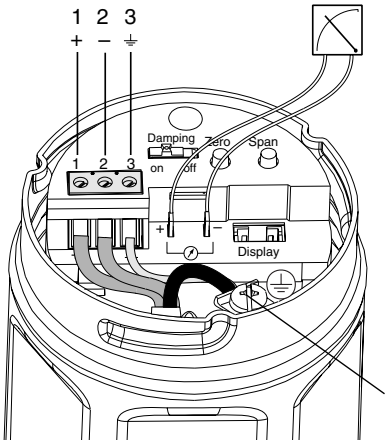
T 50 mA*



* For analogue electronics versions with certificate ATEX ⟨Ex⟩ II 1/3D (non Ex supply voltage) the device must always be protected by a 50 mA (slow-blow) fuse.

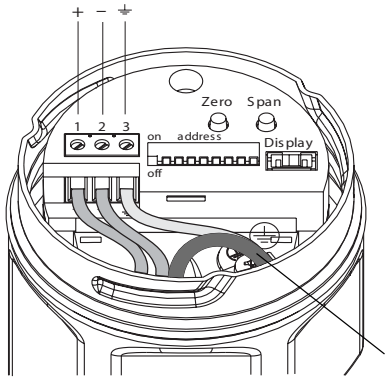
Connection IA/IH with HART electronics

11.5 V DC ... 45 V DC Test 4 mA ... 20 mA
11.5 V DC ... 30 V DC (Ex i)



Connection PA/PB with PROFIBUS PA electronics

9 V DC ... 32 V DC
9 V DC ... 24 V DC (Ex i)



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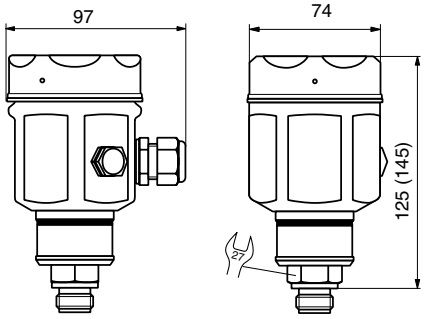
Dimensions

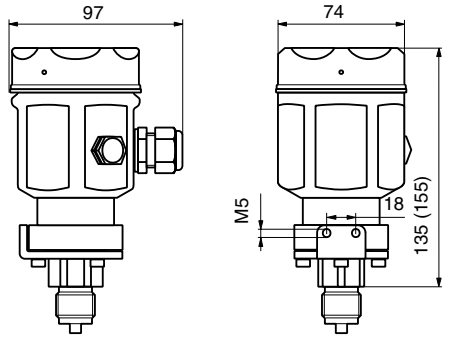
Housings

The values in brackets apply for housings with raised cover.

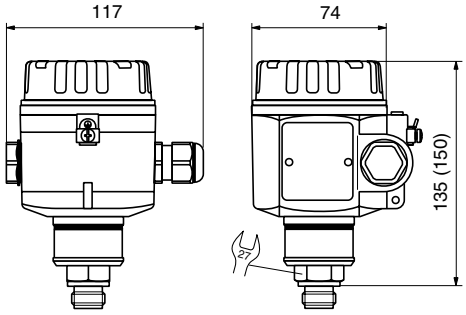
PPC-M10 E*



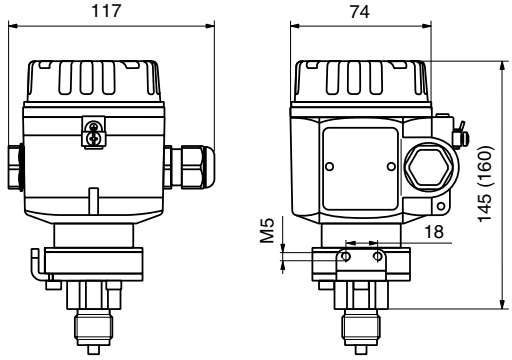
PPC-M20 E*



PPC-M10 A*

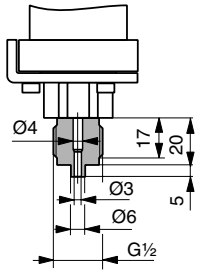


PPC-M20 A*

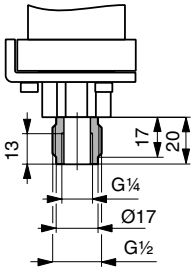


Process connections for PPC-M20

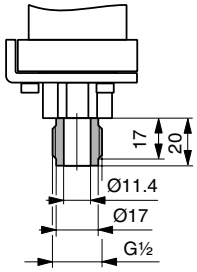
G11, G1C, G½ external



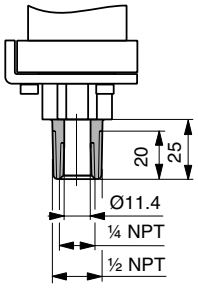
G14, G½ external, G¼ internal



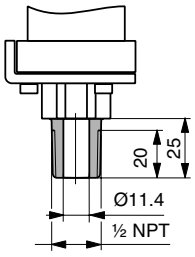
G1M, G½ external, Ø11.4 mm (0.45 in) internal



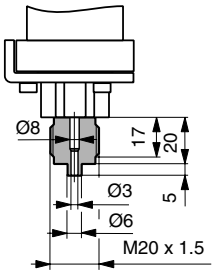
N14, N1C, ½ NPT external, ¼ NPT internal



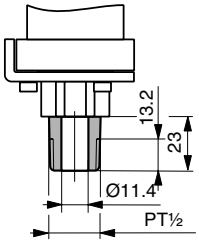
N1M, ½ NPT external, Ø11.4 mm (0.45 in) internal



M21, M20 x 1.5 external

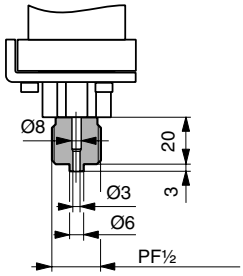


J12, PT½ external, Ø11.4 mm (0.45 in) internal



JIS B 0203-1982

J11, PF½ external,



JIS B 0202-1982

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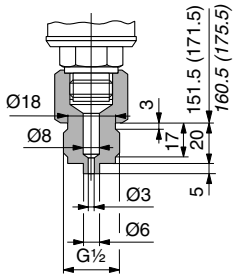
Process connections for PPC-M10

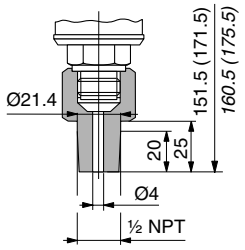
Values in brackets apply for housings with raised cover.

Values in italics apply to devices with an aluminium housing.

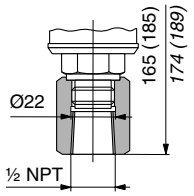
G1G, G½ external



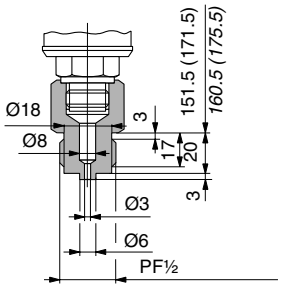
N1A, ½ NPT external



N1I, ½ NPT internal

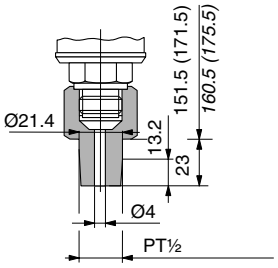


J11, PF½ external



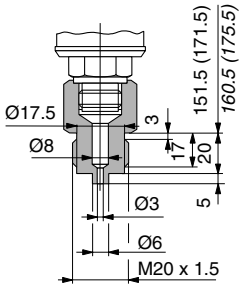
JIS B 0202-1982

J12, PT½ external



JIS B 0203-1982

M21, M20 x 1.5, external



Process connections

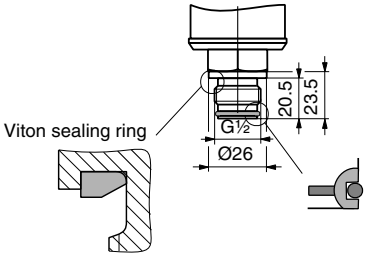
Pressure sensor dummy:

Pepperl+Fuchs offers a pressure sensor dummy for the welding nozzle order no. LHC-Z22.

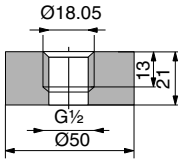
This aids heat removal during welding and prevents nozzles warping during welding.

Order no. LHC-Z20

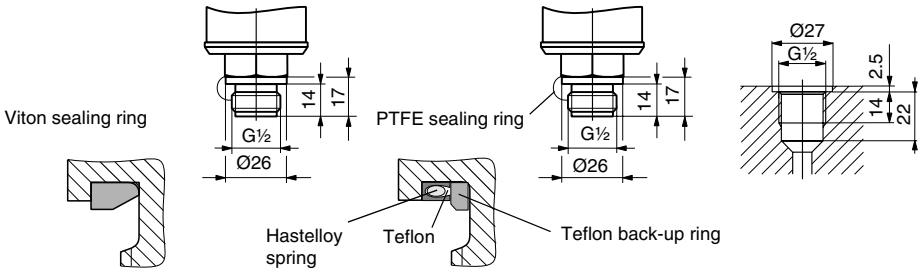
G1O, G½ external with O-ring for welding nozzles



Welding nozzles
order no. LHC-Z22



G1F, G½ external
screw-in bolt DIN 3852-E-G½



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Measuring range

PPC-M20				PPC-M10			
pressure type	meas. limits in bar	min. span in bar	overload in bar	pressure type	meas. limits in bar	min. span in bar	overload in bar
gauge pressure	0 ... 0.1	0.01	4	rel. pressure	0 ... 1	0.1	4
gauge pressure	0 ... 0.4	0.04	8	rel. pressure	0 ... 4	0.4	16
gauge pressure	0 ... 1	0.1	10	rel. pressure	0 ... 10	1	40
gauge pressure	0 ... 4	0.4	25	rel. pressure	0 ... 40*	4	160
gauge pressure	0 ... 10	1	40	rel. pressure	0 ... 100*	10	400
gauge pressure	0 ... 40	4	60	rel. pressure	0 ... 400*	40	600
gauge pressure	-0.1 ... 0.1	0.02	4	rel. pressure	-1 ... 1	0.2	4
gauge pressure	-0.4 ... 0.4	0.08	8	rel. pressure	-1 ... 4	0.5	16
gauge pressure	-1 ... 1	0.2	10	rel. pressure	-1 ... 10	1.1	40
gauge pressure	-1 ... 4	0.5	25				
gauge pressure	-1 ... 10	1.1	40				
abs. pressure	0 ... 0.4	0.04	8	abs. pressure	0 ... 1	0.1	4
abs. pressure	0 ... 1	0.1	10	abs. pressure	0 ... 4	0.4	16
abs. pressure	0 ... 4	0.4	25	abs. pressure	0 ... 10	1	40
abs. pressure	0 ... 10	1	40	abs. pressure	0 ... 40	4	160
abs. pressure	0 ... 40	4	60	abs. pressure	0 ... 100	10	400
				abs. pressure	0 ... 400	40	600

*absolute pressure sensors

The given overload will apply for the sensor. Please note the permissible maximum gauge pressure of the diaphragm seals.

Vacuum resistance:
- PPC-M20
  – for sensors with nominal values 0.1 bar: up to 0.7 bar_{abs}
  – for all other sensors: up to 0 bar_{abs}
- PPC-M10
  – up to 10 $mbar_{abs}$

Accessories

- LHC-Z10, cover with glass window for intrinsically safe units
- LHC-Z11, cover with glass window of polycarbonate for standard units
- LHC-Z12, cover with glass window for intrinsically safe units
- LHC-Z20, dummy for pressure sensors G½A
- LHC-Z21, dummy for pressure sensors G1A
- LHC-Z22, welded nozzle G½A
- LHC-Z23, welded nozzle G1A
- LHC-Z30, set for wall and pipe mounting PPC-M20
- LHC-Z30, set for wall and pipe mounting PPC-M10
- LHC-Z40, digital display for electrical outputs IA and PB
- LHC-Z41, analogue display for electrical output IB

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Type code/model number

P	P	C	–	M	1	0					–					–						–		

Certificates

NA	for safe areas
EX	Ⓔx II 1/2G EEx ia IIC T6
E1	Ⓔx II 2G EEx ia IIC T6
E2	Ⓔx II 3G EEx nA IIC T5
CD	CSA, Cl. I, II, III, Div. 1, Group E-G (dust Ex), Cl. I, Div. 2, Group A-D
CG	CSA General Purpose
C1	CSA IS (suitable for Div. 2), Cl. I, II, III, Div. 1, Group A-G
FM	FM IS, Cl. I, II, III, NI, Div. 1, Group A-G
FD	FM DIP, Cl. I, II, III, Div. 1, Group E-G
SX	Ⓔx II 1/2D EEx ia IIC T6
S2	Ⓔx II 1/3D

Optional equipment

N	without optional equipment
M	with mounting bracket for wall and pipe mounting
Z	3.1.B material, wetted parts 1.4435/316L, inspection certificate to EN10204

Electrical output, indication

NA	without electronics/without display
I2	4 mA ... 20 mA, analogue electronics
IB	4 mA ... 20 mA, analogue electronics with display 0 % ... 100 % bar
IH	4 mA ... 20 mA, SMART electronics, HART protocol
IA	4 mA ... 20 mA, SMART electronics, HART protocol with display quadruple and 0 % ... 100 % bar
PA	PROFIBUS PA electronics P3.0. in the PNO certification process
PB	PROFIBUS PA electronics P3.0 with four-character display and 0 % ... 100 % bar, in the PNO certification process

Housing, cable entry

E1	stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66
E2	stainless steel housing 1.4404/316L, ½ NPT entry, IP66
E3	stainless steel housing 1.4404/316L, G½ entry, IP66
E4	stainless steel housing 1.4404/316L, Harting plug, IP65
E5	stainless steel housing 1.4404/316L, M12 x 1 plug, metal, IP68
E6	stainless steel housing 1.4404/316L, cable IP68 with atmospheric pressure compensation
A1	aluminium housing, M20 x 1.5 thread, IP66
A2	aluminium housing, ½ NPT entry, IP66
A3	aluminium housing, G½ entry, IP66
A4	aluminium housing, Harting plug, IP65
A5	aluminium housing, M12 x 1 plug, metal, IP68
A6	aluminium housing 1.4404/316L, cable IP68 with atmospheric pressure compensation

Seal, diaphragm

1	diaphragm 1.4435/316L, Viton, mineral oil
2	diaphragm 1.4435/316L, Viton, inert oil, oil and grease free
A	diaphragm 1.4435/316L, welded, mineral oil
C	diaphragm 1.4435/316L, welded, inert oil, max. 60 °C (333 K)/120 bar
D	diaphragm 1.4435/316L, welded, inert oil, oil and grease free
F	diaphragm 1.4435/316L, NBR, mineral oil (FDA)
H	diaphragm 1.4435/316L, FKM Viton, mineral oil (FDA)
P	diaphragm 1.4435/316L, PTFE and Hastelloy C, mineral oil

Process connection

G1F	G½A, EN 837, flush mounted diaphragm
G1G	G½A, EN 837, internal diaphragm
G1O	G½A, DIN ISO 228, flush mounted with O-ring, for welding nozzles (with vegetable oil only)
N1A	½ NPT external, ANSI, internal diaphragm
N1I	½ NPT internal, ANSI, internal diaphragm
J11	PF½ external, JIS B 0202, internal diaphragm
J12	PT½ external, JIS B 0203, internal diaphragm
M21	M20 x 1.5 external, EN 837, internal diaphragm
XXX	special version

Calibration and units

1	0.2 %, calibration in sensor limits: mbar/bar
2	0.2 %, calibration in sensor limits: kPa/MPa
3	0.2 %, calibration in sensor limits: mm/mH_2O
4	0.2 %, calibration in sensor limits: inH_2O/ftH_2O
5	0.2 %, calibration in sensor limits: kgf/cm^2
6	0.2 %, calibration in sensor limits: psi
B	0.2 %, calibrated from ... to ..., technical unit ...
C	0.1 %, calibrated from ... to ..., technical unit ...

Pressure range

R2A	0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig/400 in H_2O, overload quadruple
R2D	0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psig, overload quadruple
R3A	0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psig, overload quadruple
R3D	0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psig, overload quadruple
R4A	0 bar ... 100 bar absolute pressure sensor, 10 MPa, 1500 psig, overload quadruple
R4D	0 bar ... 400 bar absolute pressure sensor, 40 MPa, 6000 psig, overload 1.5-fold
N2A	-1 bar ... 1 bar sensor, -100 kPa ... 100 kPa, -15 psig ...15 psig, overload quadruple
N2D	-1 bar ... 4 bar sensor, -100 kPa ... 400 kPa, -15 psig ... 60 psig, overload quadruple
N3A	-1 bar ... 10 bar sensor, -0.1 MPa ... 1 MPa, -15 psig ... 150 psig, overload quadruple
A2A	0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psia, overload quadruple
A2D	0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psia, overload quadruple
A3A	0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psia, overload quadruple
A3D	0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psia, overload quadruple
A4A	0 bar ... 100 bar absolute pressure sensor, 10 MPa, 1500 psia, overload quadruple
A4D	0 bar ... 400 bar absolute pressure sensor, 40 MPa, 6000 psia, overload 1.5-fold

Transmitter

M10	metal sensor, piezoresistive

Type code/model number

P	P	C	–	M	2	0					–					–						–		

Certificates

NA	for safe areas
EX	⟨Ex⟩ II 1/2G EEx ia IIC T6
E1	⟨Ex⟩ II 2G EEx ia IIC T6
E2	⟨Ex⟩ II 3G EEx nA IIC T5
CD	CSA, Cl. I, II, III, Div. 1, Group E-G (dust Ex), Cl. I, Div. 2, Group A-D
CG	CSA General Purpose
C1	CSA IS (suitable for Div. 2), Cl. I, II, III, Div. 1, Group A-G
FM	FM IS, Cl. I, II, III, NI, Div. 1, Group A-G
FD	FM DIP, Cl. I, II, III, Div. 1, Group E-G
SX	⟨Ex⟩ II 1/2D EEx ia IIC T6
S2	⟨Ex⟩ II 1/3D

Optional equipment

N	without optional equipment
M	with mounting bracket for wall and pipe mounting
Z	3.1.B material, wetted parts 1.4435/316L, inspection certificate to EN10204

Electrical output, indication

NA	without electronics/without indication
I2	4 mA ... 20 mA, analogue electronics
IB	4 mA ... 20 mA, analogue electronics with display 0 % ... 100 % bar
IH	4 mA ... 20 mA, SMART electronics, HART protocol
IA	4 mA ... 20 mA, SMART electronics, HART protocol with display quadruple and 0 % ... 100 % bar
PA	PROFIBUS PA electronics P3.0, in the PNO certification process
PB	PROFIBUS PA electronics P3.0 with four-character display and 0 % ... 100 % bar, in the PNO certification process

Housing, cable entry

E1	stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66
E2	stainless steel housing 1.4404/316L, ½ NPT entry, IP66
E3	stainless steel housing 1.4404/316L, G½ entry, IP66
E4	stainless steel housing 1.4404/316L, Harting plug, IP65
E5	stainless steel housing 1.4404/316L, M12 x 1 plug, metal, IP68
E6	stainless steel housing 1.4404/316L, cable IP68 with atmospheric pressure compensation
A1	aluminium housing, M20 x 1.5 thread, IP66
A2	aluminium housing, ½ NPT entry, IP66
A3	aluminium housing, G½ entry, IP66
A4	aluminium housing, Harting plug, IP65
A5	aluminium housing, M12 x 1 plug, metal, IP68
A6	aluminium housing 1.4404/316L, cable IP68 with atmospheric pressure compensation

Seal, diaphragm

1	FKM Viton sensor sealing
2	NBR sensor sealing
4	EPDM sensor sealing
6	FKM Viton sealing, for oxygen application, grease free, to max. 60 °C (333 K)
7	Kalrez sensor sealing
A	FKM Viton sealing, oil and grease free
C	Chemraz sensor sealing

Process connection

G11	G½A, EN 837, 1.4435/316L
G1C	G½A, EN 837, Hastelloy C
G14	G½A, G¼ internal, DIN ISO 228, 1.4435/316L
G1M	G½A, 11.4 mm (0.45 in) internal, DIN ISO 228, 1.4435/316L
N14	½ NPT external, ¼ NPT internal, ANSI, 1.4435/316L
N1C	½ NPT external, ¼ NPT internal, ANSI, Hastelloy C
N1M	½ NPT external, 11.4 mm (0.45 in) internal, ANSI, 1.4435/316L
J11	PF ½ external, JIS B 0202, 1.4435/316L
J12	PT ½ external, JIS B 0203, 1.4435/316L
M21	M20 x 1.5 external, EN 837, 1.4435/316L
XXX	special version

Calibration and technical units

1	0.2 %, calibration in sensor limits: mbar/bar
2	0.2 %, calibration in sensor limits: kPa/MPa
3	0.2 %, calibration in sensor limits: mm/mH_2O
4	0.2 %, calibration in sensor limits: inH_2O/ftH_2O
5	0.2 %, calibration in sensor limits: kgf/cm^2
6	0.2 %, calibration in sensor limits: psi
B	0.2 %, calibrated from ... to ..., technical unit ...
C	0.1 %, calibrated from ... to ..., technical unit ...

Pressure range

R1A	0 mbar ... 100 mbar absolute pressure sensor, 10 kPa, 1.5 psig/40 in H_2O, overload 40-fold
R1D	0 mbar ... 400 mbar absolute pressure sensor, 40 kPa, 6 psig/160 in H_2O, overload 15-fold
R2A	0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig/400 in H_2O, overload 10-fold
R2D	0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psig, overload 6-fold
R3A	0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psig, overload quadruple
R3D	0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psig, overload 1.5-fold
N1A	-100 mbar ... 100 mbar sensor, -10 kPa ... 10 kPa, -40 in ... 40 in H_2O, overload 40-fold
N1D	-400 mbar ... 400 mbar sensor, -40 kPa ... 40 kPa, -6 psig ... 6 psig, overload 15-fold
N2A	-1 bar ... 1 bar sensor, -100 kPa ... 100 kPa, -15 psig ... 15 psig, overload 10-fold
N2D	-1 bar ... 4 bar sensor, -100 kPa ... 400 kPa, -15 psig ... 60 psig, overload 6-fold
N3A	-1 bar ... 10 bar sensor, -0.1 MPa ... 1 MPa, -15 psig ... 150 psig, overload quadruple
A1D	0 mbar ... 400 mbar absolute pressure sensor, 40 kPa, 6 psia, overload 15-fold
A2A	0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psia, overload 10-fold
A2D	0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psia, overload 6-fold
A3A	0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psia, overload quadruple
A3D	0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psia, overload 1.5-fold

Transmitter

M20	ceramic sensor

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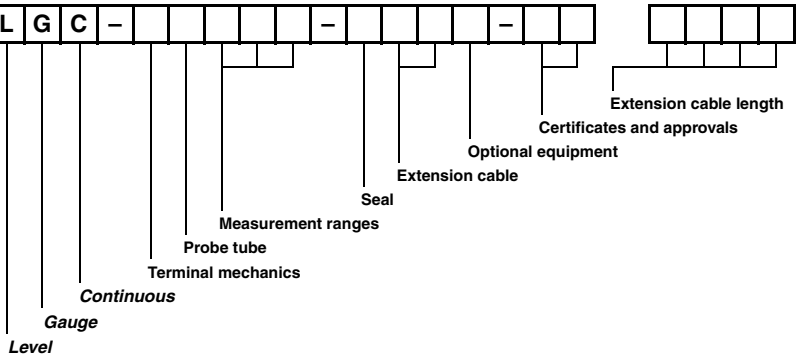
Type code of level probes

The figure below shows the used characters and numbers of the level probes type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the level probes.

Product group LGC

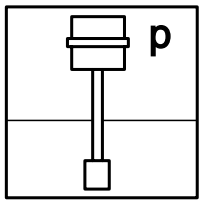


Level probe LGC

The level probe is used for hydrostatic level control, for level measuring and for temperature control (optional) of fresh, drinking and waste water.

The pressure acts directly on the rugged ceramic measuring cell (dry measuring cell) of the level probe LGC and causes it to move by about max. 0.005 mm.

The effects of air pressure on the liquid surface are transferred via a pressure compensating tube through the extension cable to the rear of the ceramic membrane and compensated. Pressure-dependent changes in capacitance caused by membrane movement are measured at the electrodes of the ceramic carrier. The electronics convert the movement into a pressure-proportional signal which is linear to the medium level.



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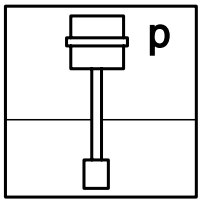
Level probe

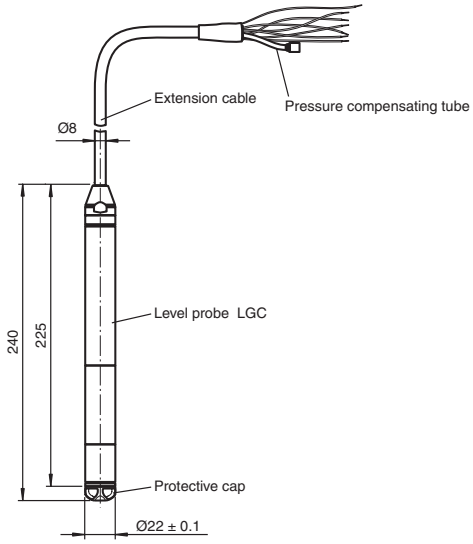
LGC



Features

- Hydrostatic pressure sensor for level measuring of water
- Measuring ranges: 0 bar ... 0.1 bar to 0 bar ... 20 bar
- High-precision and long-term stability ceramic measuring cell
- High mechanical resistance to overload and aggressive media
- Permanent hermetically sealed level probe
- Electronics comprising 4 mA ... 20 mA output signal and integrated overvoltage protection
- Simultaneous level and temperature measuring by optional integrated temperature probe Pt100
- KTW and NSF drinking water approval

Dimensions



Function

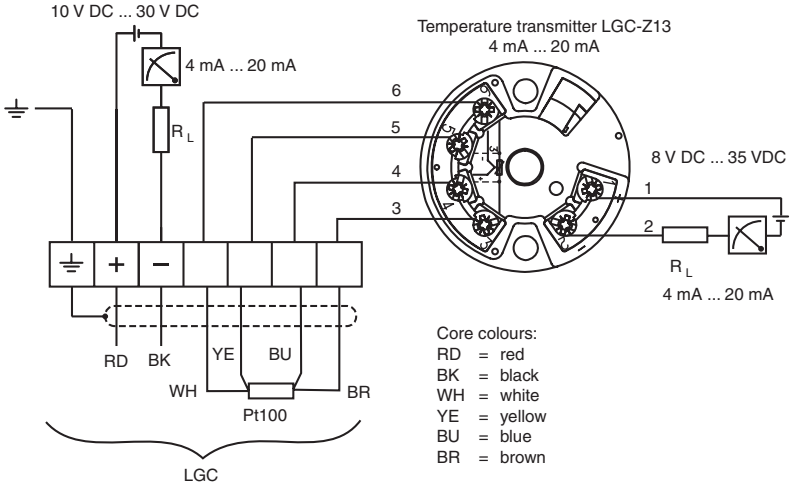
The level probe LGC is a hydrostatic pressure sensor for measuring the level. One outstanding feature of these level probe is their mechanical and electrical durability. The embedded electronics, a heavy-duty conical cable seal and a 2-filter system guarantee a perfect seal resistant to any climatic conditions.

Highly accurate ceramic pressure sensors with longterm stability guarantee reliable and secure filling level measurement. With an external diameter of 22 mm (0.9 in), integrated temperature sensor and extensive drinking water certificates, the level probe is ideally suited for fresh water and drinking water applications. The front-flush ceramic measuring cell also allows reliable applications of the level probe in wastewater.

With extensive measurement accessories, like display, power supply and evaluation device, solutions for all typical applications in fresh water and wastewater are guaranteed.

Electrical connection

Example: level probe LGC with Pt100 and temperature transmitter LGC-Z13 (4 mA ... 20 mA)



Other connection types see section electrical connections.

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Application	
Function principle	hydrostatic level control level measuring and temperature control (optional) of freshwater drinking water and wastewater
Function and system design	
Measuring principle	Level control with ceramic measuring cell (dry measuring cell). The pressure acts directly on the rugged ceramic membrane of the LGC level probe and causes it to move by about max. 0.005 mm. The effects of air pressure on the liquid surface are transferred via a pressure compensating tube through the extension cable to the rear of the ceramic membrane and compensated. Pressure-dependent changes in capacitance caused by membrane movement are measured at the electrodes of the ceramic carrier. The electronics convert the movement into a pressure-proportional signal which is linear to the medium level.
Equipment architecture	The measuring system consists of a LGC level probe and a SMART transmitter power supply (e. g. KFD2-STC4-Ex1) with a supply voltage between 10 ... 30 V DC.
Input characteristics	
Measured variable	LGC: hydrostatic pressure of a liquid Pt100 (optional): temperature of a liquid temperature transmitter (optional): temperature
Measurement range	LGC: - nine fixed pressure measuring ranges in bar, see ordering information - customer-specific measuring ranges, factory-calibrated Pt100 (optional): temperature measurement from -10 ... 70 °C (263 ... 343 K)
Input signal	LGC: change in capacitance Pt100 (optional): change in resistance temperature transmitter (optional): Pt100 resistance signal, 4-wire
Output characteristics	
Output signal	LGC: 4 ... 20 mA for hydrostatic pressure measured value, two-wire Pt100 (optional): temperature-dependent resistance of Pt100 temperature transmitter (optional): 4 ... 20 mA for temperature measured value, two-wire
Load	LGC, Pt100 (optional): $R_{total} \leq (U_b - 10\ V)/0.0225\ A - 2 \times 0.09\ \Omega/m \times l - R_{add}$ temperature transmitter (optional): $R_{total} \leq (U_b - 8\ V)/0.025\ A - R_{add}$ - R_{total} = max. load resistance [Ω] - R_{add} = additional resistances such as resistance of evaluating device and/or display instrument, line resistance [Ω] - U_b = supply voltage [V] - l = simple length of extension cable [m] (cable resistance per wire ≤ 0.09 Ω/m)
Auxiliary energy	
Electrical connection	Reverse voltage protection is integrated in LGC level probe and in the temperature transmitter LGC-Z13 changing the polarities has no impact on operation. The cable must end in a dry room. For installation outside, use the terminal housing (IP66/IP67) with GORE-TEX® filter from Pepperl+Fuchs.
Supply voltage	LGC: 10 ... 30 V DC, EEx nA and EEx ia: 10 ... 30 V DC Pt100 (optional): 10 ... 30 V DC, EEx nA: 10 ... 30 V DC temperature transmitter (optional): 8 ... 35 V DC
Connecting cable	LGC: - commercially available instrument cable - terminals, terminal housing LGC: 0.08 ... 2.5 mm^2 Pt100 (optional): - If the Pt100 signal is directly connected to a display and/or evaluation unit, we recommend the use of a shielded cable. temperature transmitter (optional): - connection transmitter: max. 1.75 mm^2 extension cable: - total outer diameter: 8.0 mm ± 0.25 mm (0.315 in ± 0.0098 in) - LGC: 3 x 0.227 mm^2 and pressure compensation tube with Teflon filter - Pt100 (optional): 7 x 0.227 mm^2 and pressure compensation tube with Teflon filter - pressure compensation tube with Teflon filter: outer diameter Ø2.5 mm (0.098 in), internal diameter Ø1.5 mm (0.059 in)
Power consumption	LGC, Pt100 (optional): ≤ 0.675 W at 30 V DC temperature transmitter (optional): ≤ 0.875 W at 35 V DC
Current consumption	LGC: max. ≤ 22.5 mA, min. ≥ 3.5 mA Pt100 (optional): ≤ 0.6 mA temperature transmitter (optional): Pt100 via temperature transmitter ≤ 0.6 mA
Residual ripple	LGC, Pt100 (optional): without influence for 4 ... 20 mA signal up to ± 5 % residual ripple within the permitted voltage range temperature transmitter (optional): $U_{pp} \geq 5\ V$ at $U_b \geq 13\ V$, $f_{max} = 1\ kHz$
Performance characteristics	
Reference operating conditions	LGC, Pt100 (optional): acc. to DIN EN 60770, T_{amb} = 25 °C (296 K) temperature transmitter (optional): calibration temperature 23 °C ± 5 K (296 K ± 5 K)
Accuracy	LGC: non-linearity including hysteresis and non-repeatability as per DIN EN 60770: ± 0.2 % of upper range value (URV) Pt100 (optional): max. ± 0.7 K (class B to DIN EN 60751) temperature transmitter (optional): ± 0.2 K, with Pt100: max. ± 0.9 K
Long-term drift	LGC, Pt100 (optional): ± 0.1 % of upper range value (URL) per year temperature transmitter (optional): ± 0.1 K per year

Influence of medium temperature	- thermal change in zero signal and output span for typical temperature range 0 ... 30 °C (273 ... 303 K): ± 0.4 % (± 0.5 %)* of the measuring span - thermal change in zero signal and output span for the total medium temperature range -10 ... 70 °C (263 ... 343 K): ± 1.0 % (± 1.5 %)* of the measuring span (Pt100) - temperature coefficient (TK) in zero signal and output span: 0.15 %/10 K (0.3 %/10 K)* of the measuring span (Pt100 and temperature transmitter) *specifications for sensors 0.1 bar and 0.6 bar
Rise time	LGC: 80 ms, Pt100 (optional): 160 s
Warming-up time	LGC, Pt100 (optional): 20 ms, temperature transmitter (optional): 4 s
Adjustment time	LGC: 150 ms, Pt100 (optional): 300 s
Operating conditions	
Mounting conditions	
Installation position	vertical from above
Ambient conditions	
Ambient temperature	LGC, Pt100 (optional): -10 ... 70 °C (263 ... 343 K) = medium temperature temperature transmitter (optional): -40 ... 85 °C (233 ... 358 K)
Storage temperature	LGC, Pt100 (optional): -40 ... 80 °C (233 ... 353 K) temperature transmitter (optional): -40 ... 100 °C (233 ... 373 K)
Electromagnetic compatibility	LGC, Pt100 (optional): maximum deviation < 0.5 % of span
Overvoltage protection	LGC, Pt100 (optional): integrated overvoltage protection to EN 61000-4-5 ≤ 1.2 kV, install overvoltage protection ≥ 1.2 kV, external if necessary temperature transmitter (optional): install overvoltage protection, external if necessary
Process conditions	
Medium temperature	LGC, Pt100 (optional): -10 ... 70 °C (263 ... 343 K), for Ex devices see safety information temperature transmitter (optional): -40 ... 85 °C (233 ... 358 K) = ambient temperature, install temperature transmitter outside medium
Medium temperature limits	LGC, Pt100 (optional): -20 ... 70 °C (253 ... 343 K) You may operate the LGC in this temperature range. The specification can then be exceeded, e. g. measuring accuracy, see also DIN 16086.
Mechanical specifications	
Protection degree	LGC, Pt100 (optional): IP68, permanently hermetically sealed, optional terminal box IP66/IP67 temperature transmitter (optional): IP00, moisture condensation permissible, when mounted in the optional terminal boxes IP66/IP67
Mechanical construction	
Construction type	rod probe
Dimensions	level probe LGC: Ø22 x 240 mm (Ø0.9 x 9.5 in) terminal housing LGC-Z11: 120 x 80 x 55 mm (4.7 x 3.15 x 2.2 in) temperature transmitter LGC-Z13: Ø44 x 21 mm (1.7 x 0.8 in) extension cable: 10 m (33 ft), 20 m (66 ft) or any length, can be cropped - max. free suspended length (mechanical stability under load): 1000 m (3294 ft) - max. length for non-Ex and EEx nA IIC T6, see section load - max. length for EEx ia IIC T6: see related safety information (SI)
Mass	level probe LGC: 290 g terminal box LGC-Z11: 235 g temperature transmitter LGC-Z13: 40 g extension cable PE: 52 g/m extension cable FEP: 108 g/m suspension clamp LGC-Z10: 170 g extension cable mounting screw LGC-Z14: 770 g extension cable mounting screw LGC-Z16: 724 g
Material	level probe LGC: 1.4435/316L process ceramic: Al_2O_3 aluminium oxide ceramic seal (internal): EPDM or Viton protective cap: PE-HD (high-density polyethylene) terminal box LGC-Z11: PC (polycarbonate) temperature transmitter LGC-Z13: housing PC (polycarbonate) extension cable PE: insulation PE (polyethylene), copper wires, twisted extension cable FEP: insulation FEP (fluorinated ethylene propylene), copper wires, twisted suspension clamp LGC-Z10: 1.4404/316L and glass fibre reinforced PA (polyamide) extension cable mounting screw LGC-Z14: 1.4301/304 extension cable mounting screw LGC-Z16: 1.4301/304 additional weight LGC-Z12: 1.4404/316L
Mechanical loading	extension cable: - minimum bending radius: 120 mm (4.7 in) - tensile strength: min. 950 N - cable extraction force: ≥ 450 N - PE: approved for use with drinking water - resistance to UV light - cable resistance per wire: ≤ 0.09 Ω/m
Electrical connection	3 terminals in terminal housing as standard 4 terminals in block, accessories LGC-Z15 for conductor cross section 0.08 ... 2.5 mm^2
Certificates and approvals	

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Ex approval	TÜV 01 ATEX 1749, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 2G EEx ia IIC T6 (TÜV 01 ATEX 1749) ⟨Ex⟩ II 3G EEx nA II T6
Drinking water approval	KTW certificate and NSF approval
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50021
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Supplementary documentation	technical information TI-LGC operating instructions BA231O operating instructions SD126O (use in the drinking water sector) safety information SI131O (TÜV 01 ATEX 1749) safety information SI132O (⟨Ex⟩ II 3G EEx nA II T6) FM control drawing ZD063O CSA control drawing ZD064O
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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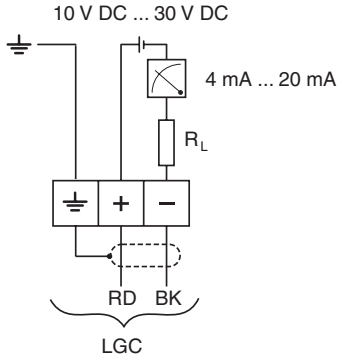
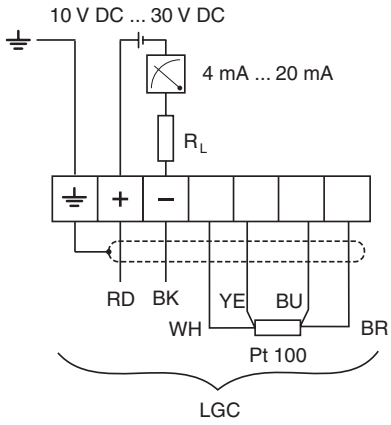
Electrical connection

Level probe LGC, standard, optional equipment N/2



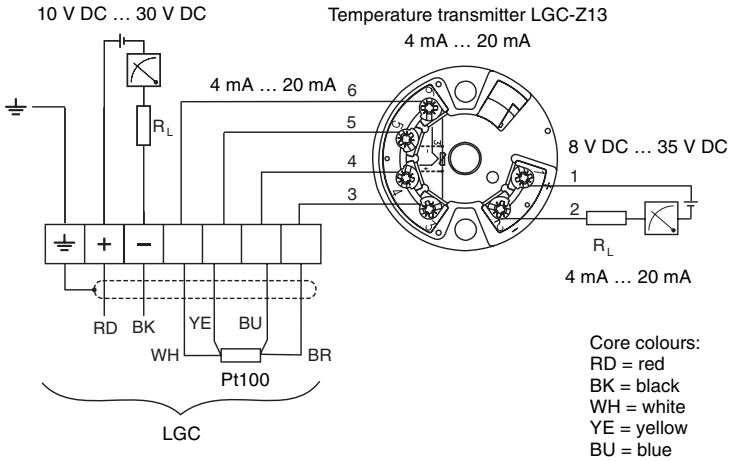
Core colours:
RD = red
BK = black

Level probe LGC with Pt100, optional equipment 1/3



Core colours:
RD = red
BK = black
WH = white
YE = yellow
BU = blue
BR = brown

Level probe LGC with Pt100 and temperature transmitter LGC-Z13 (4 mA … 20 mA), optional equipment 4



Core colours:
RD = red
BK = black
WH = white
YE = yellow
BU = blue
BR = brown

Accessories

- LGC-Z10, mounting clamp A for simple mounting of the level probe LGC
- LGC-Z11, terminal housing (IP65/IP67) with GORE-TEX® filter with 3 built-in terminals, the terminal housing is suitable for the installation of a temperature transmitter (LGC-Z13) or for 4 other terminals (LGC-Z15)
- LGC-Z12, additional weight
  these additional weights are used to prevent the lateral buoyancy (measuring error) or to simplify a lower in a guide tube
- LGC-Z13, temperature transmitter 2-wire for level probe LGC, -20 °C ... 80 °C (253 K ... 353 K)
- LGC-Z14, cable mounting screw G with cylindrical threading G1½A for simple mounting of the level probe LGC and for locking the extension cable
- LGC-Z15, terminal block with 4 terminals for LGC with optional equipment 3 with terminal housing LGC-Z11, suitable for conductor cross section 0.08 ... 2.5 mm²
- LGC-Z16, cable mounting screw N with tapered thread 1½ NPT for simple mounting of the level probe LGC and for locking the extension cable

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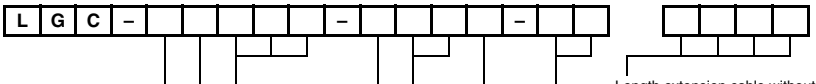
Type code/model number



Length extension cable without unit

Certificates
- **NA** no approval
- **EX** Ex II 2G, EEx ia IIC T6
- **E3** Ex II 3G, EEx nA IIC T6
- **F1** FM, Cl. I, Div. 1, Group A - D, IS
- **C1** CSA, Cl. I, Div. 1, Group A - D, IS
- **CG** CSA General Purpose

Optional equipment
- **N** without optional equipment
- **1** with integrated Pt100 temperature probe (4-wire)
- **2** terminal box with filter
- **3** pressure sensor with Pt100, 4-wire and terminal housing with filter (IP65/IP67)
- **4** pressure sensor with Pt100, -20 °C ... +80 °C, temperature transmitter 4 mA .. 20 mA (2-wire), in terminal housing with filter (IP65/IP67)

Extension cable
- **XM** in m, PE extension cable, can be cropped
- **2A** 10 m (33 ft), PE extension cable, can be cropped
- **2C** 20 m (66 ft), PE extension cable, can be cropped
- **CM** in m, FEP extension cable, can be cropped
- **3A** 10 m (33 ft), FEP extension cable, can be cropped
- **3C** 20 m (66 ft), FEP extension cable, can be cropped

Seal
- **1** Viton measurement cell sealing
- **2** EPDM measurement cell sealing

Measurement ranges
- **R1A** 0 bar ... 0.1 bar
- **R1C** 0 bar ... 0.2 bar
- **R1D** 0 bar ... 0.4 bar
- **R1E** 0 bar ... 0.6 bar
- **R2A** 0 bar ... 1.0 bar
- **R2C** 0 bar ... 2.0 bar
- **R2D** 0 bar ... 4.0 bar
- **R3A** 0 bar ... 10.0 bar
- **R3C** 0 bar ... 20.0 bar
- **XXX** set in accordance with customer specification

Probe tube
- **S** Ø22 mm (0.9 in), stainless steel 1.4435/316L
- **T** Ø22 mm (0.9 in)stainless steel 1.4435/316L with drinking water approval

Terminal mechanics
- **K** without mechanical connection
- **A** tension clamp, 1.4435/316L
- **G** extension cable mounting screw G1½, 1.4301/304
- **N** extension cable mounting screw 1½ NPT, 1.4301/304

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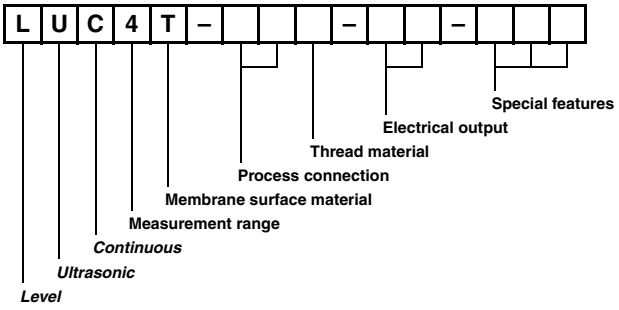
Type code of ultrasonic level sensors

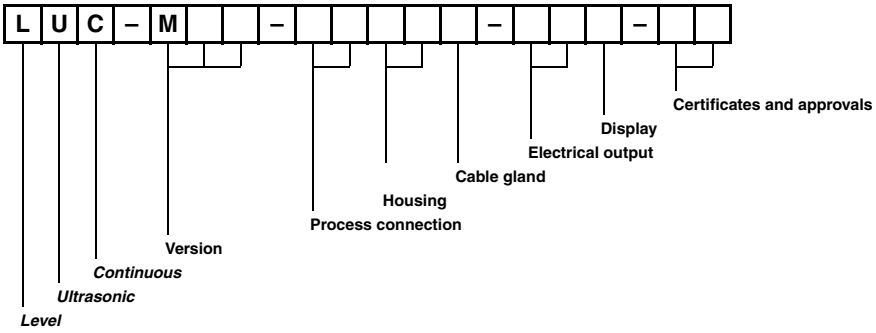
The figure below shows the used characters and numbers of the ultrasonic level sensors type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the ultrasonic level sensors.

Product group LUC4



Product group LUC-M**



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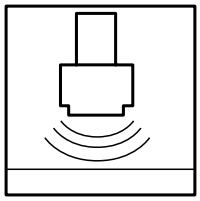
Ultrasonic level sensor LUC-M20

This continuous level measurement is based on the travel time of ultrasonic pulses to the surface of the medium and back.

When installing the sensor, the typical block distance has to be considered.

Rough liquid surfaces and the changed angle during filling and emptying granulated solids influence the reflection of the ultrasonic pulses and may impact the measurement.



Contents

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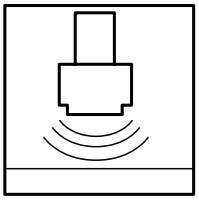
Ultrasonic level sensor

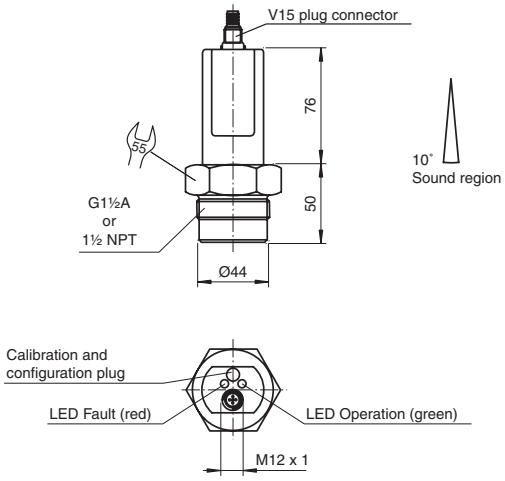
LUC4



Features

- Active fixed target suppression
- Temperature compensation
- 12 Bit D/A transducer
- Compact design
- Plug connection
- Function monitoring
- Fail-safe behaviour in the event of no echo
- Output signal 4 mA ... 20 mA/ 0 V ... 10 V
- Simple calibration

Dimensions



Function

The LUC4 ultrasonic sensor is especially designed to measure the fill level of liquids. With its Teflon-coated surface, the sensor is outstandingly suited for use with corrosive liquids. The masking of fixed objects permits the sensor to be deployed in locations in which struts or other internal structures extend into the measuring field.

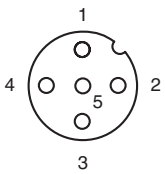
Sensors of the LUC4 series feature a 4 mA ... 20 mA current and 0 V ... 10 V voltage output as standard. The outputs have fail-safe behaviour in the event of a fault.

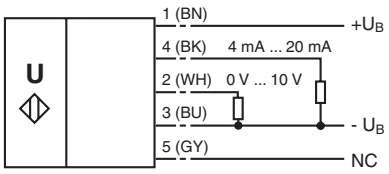
The ultrasonic converter sends out an acoustic pulse. This pulse is reflected by the contents of the container and registered by the converter after traveling the measuring distance. A microprocessor evaluates the echo signals and determines the fill level.

Sources of interference such as weld seams, fixed installations, etc. are suppressed reliably via the masking of fixed objects. Changes of the ultrasonic speed caused by changing temperatures are compensated.

Electrical connection

Connector V15





Core colours in accordance with EN 60947-5-2.

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Application	
Description	device for sending and evaluation of ultrasonic pulse reflection
Function and system design	
Equipment architecture	A measuring system consists of an ultrasonic level sensor LUC4 and a display unit DA5 or a power supply, but can also be connected directly to a PLC.
Input characteristics	
Measurement range	0.3 ... 4 m (1 ... 13 ft), for liquids
Output characteristics	
Output signal	analog output: 4 ... 20 mA, $R_L \leq 500\ \Omega$, error ≥ 21 mA voltage output: 0 ... 10 V, $R_L \geq 1\ k\Omega$, error ≥ 10.5 V
Auxiliary energy	
Supply voltage	20 ... 30 V DC (3-wire)
Power consumption	≤ 1200 mW
Residual ripple	± 10 $\%_{pp}$
Performance characteristics	
Resolution	2 mm
Accuracy	0.5 % of upper limit of measuring range
Operating conditions	
Mounting conditions	
Installation instructions	Choose the installation direction in such a way that the sound direction is at right angles to the liquid surface.
Ambient conditions	
Ambient temperature	-25 ... 70 °C (248 ... 343 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Process conditions	
Process temperature	-25 ... 70 °C (248 ... 343 K)
Process pressure (static pressure)	atmospheric
Mechanical specifications	
Protection degree	IP65
Mechanical construction	
Dimensions	Ø44 x 126 mm (1.7 x 5 in)
Mass	220 g
Material	housing: PBT membrane surface: PTFE process connection: version S: stainless steel 1.4571/316Ti version P: polypropylene
Process connection	- cylindrical thread G1½A to DIN ISO 228/1 - conical thread 1½ NPT to ANSI B 1.20.1
Electrical connection	V15 - connector (M12 x 1), 5 pin
Indication and operation	
Display elements	operating mode: LED, green fault: LED, red, 2 Hz flashing
Operating elements	calibration and configuration plug position: A1: empty calibration, E2/E3: TEACH-IN/fixed target suppression, A2: full calibration, T: operation
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 50178
Directive 89/336/EC (EMC)	EN 60947-5-2
Conformity	
Protection degree	EN 60529
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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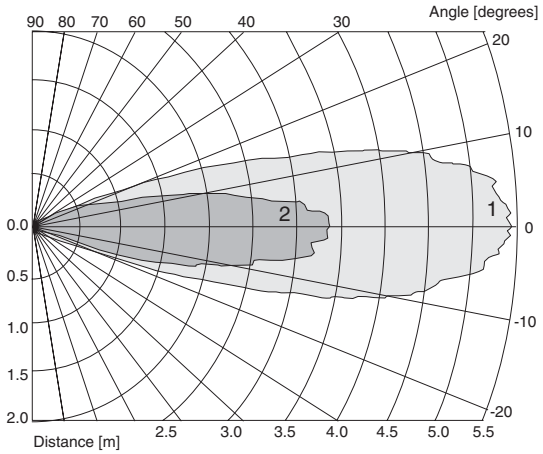
Compensation

Compensation (not installed)	Compensation (installed)	Plug position
1. Empty TEACH-IN simulation of 0 % level (wait 15 s)	1. Empty TEACH-IN approach 0 % level in container (wait 15 s)	T
Accept empty value Empty value accepted (red LED flashing) Empty TEACH-IN complete	Accept empty value Empty value accepted (red LED flashing) Empty TEACH-IN complete	A1 A1 T
2. Full TEACH-IN simulation of 100 % level (wait 15 s)	2. Full TEACH-IN approach 100 % level in container (wait 15 s)	T
Accept full value Full value accepted (red LED flashing) Full TEACH-IN complete	Accept full value Full value accepted (red LED flashing) Full TEACH-IN complete	A2 A2 T
TEACH-IN complete	TEACH-IN complete	T

Characteristic response curve



Curve 1: flat plate 100 mm x 100 mm
Curve 2: round bar, Ø 25 mm

Accessories

- LUC4-Z30-G2V, external temperature probe, G½A
- LUC4-Z30-N2V, external temperature probe, ½ NPT
- V15-G-2M-PVC, cable box, straight, 2 m (6.6 ft) cable, PVC
- V15-W-2M-PVC, cable box, 90° angle, 2 m (6.6 ft) cable, PVC
- UC-30GM-PROG, extension cable for TEACH-IN

Type code/model number

L	U	C	4	T	–				–	I	U	–	V	1	5

Special features
V15 V15 connector

Electronic output
IU 4 mA ... 20 mA and 0 V ... 10 V

Threading material
S stainless steel 1.4571/316Ti
P PP

Process connection
G5 G1½ A, DIN SO 228/1
N5 1½ NPT, ANSI B 1.20.1

Material membrane surface
T PTFE

Measuring range
4 0.3 m ... 4 m (1 ft ... 6.6 ft)

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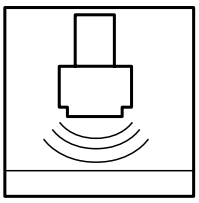
Ultrasonic level sensor

LUC-M**

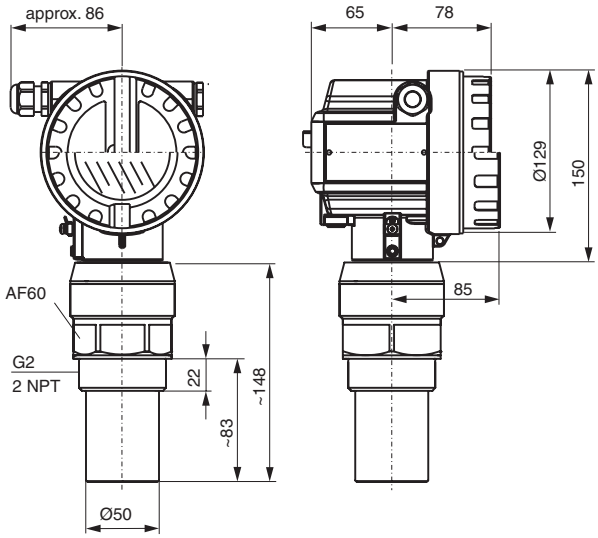


Features

- Quick and simple commissioning via menu-guided onsite operation with four-line display
- Envelope curves on the on-site display for simple diagnosis
- Linearisation function (up to 32 points) for conversion of the measured value into any unit of length, volume or flow rate
- Non-contact measurement method minimises service requirements
- Optional remote display and operation (up to 20 m from transmitter)
- Integrated temperature sensor for automatic correction of the temperature dependent sound velocity

Dimensions

LUC-M20 with F12 housing
and process connection 2"



Additional dimensions
see section dimensions.

Function

The LUC-M** is a compact measuring device for continuous, non-contact level measurement. Depending on the sensor, the measuring range is up to 15 m in fluids and up to 7 m in bulk solids. By using the linearisation function, the LUC-M** can also be used for flow measurements in open channels and measuring weirs.

The system integration is ensured via

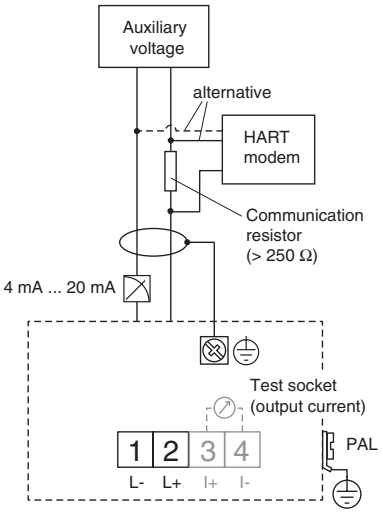
- HART (standard), 4 mA ... 20 mA,
- PROFIBUS PA and
- FOUNDATION Fieldbus.

The maximum measuring range with

- LUC-M10: 5 m (16.4 ft) in fluids and 2 m (6.6 ft) in bulk materials,
- LUC-M20: 8 m (26.2 ft) in fluids and 3,5 m (11.5 ft) in bulk materials,
- LUC-M30: 15 m (49.2 ft) in fluids and 7 m (23 ft) in bulk materials,
- LUC-M40: 10 m (32.8 ft) in fluids and 5 m (16.4 ft) in bulk materials.

Electrical connection

Connection IH, 4 mA ... 20 mA with HART, 2-wire (example)



Other connection types see section
electrical connection.

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Function and system design	
Measuring principle	The sensor of the LUC-M** transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The LUC-M** measures the time between pulse transmission and reception. The instrument uses the time (and the velocity of sound) to calculate the distance between the sensor membrane and the product surface. As the device knows the empty distance from a user entry, it can calculate the level.
Equipment architecture	4 ... 20 mA output with HART protocol, system integration via PROFIBUS PA or FOUNDATION Fieldbus
Input characteristics	
Measured variable	distance between the sensor membrane and the product surface using the linearisation function, the device calculate - level in any units - volume in any units - flow across measuring weirs or open channels in any units
Measurement range	LUC-M10: 5 m (16.4 ft) in fluids and 2 m (6.6 ft) in bulk materials LUC-M20: 8 m (26.2 ft) in fluids and 3,5 m (11.5 ft) in bulk materials LUC-M30: 15 m (49.2 ft) in fluids and 7 m (23 ft) in bulk materials LUC-M40: 10 m (32.8 ft) in fluids and 5 m (16.4 ft) in bulk materials
Blocking distance	LUC-M10: 0.25 m (0.8 ft) LUC-M20: 0.35 m (1 ft) LUC-M30: 0.6 m (2 ft) LUC-M40: 0.4 m (1.3 ft)
Operating frequency	LUC-M10: approx. 70 kHz LUC-M20: approx. 50 kHz LUC-M30: approx. 35 kHz LUC-M40: approx. 42 kHz
Output characteristics	
Output signal	according to the instrument version: - 4 ... 20 mA with HART protocol - PROFIBUS PA - FOUNDATION Fieldbus (FF)
Signal on alarm	error information can be accessed via the following interfaces: - on-site display (error symbol, error code and plain text description) - current output (configurable) - digital interface
Output damping	0 ... 255 s, freely selectable
Load	minimum load for HART communication: 250 Ω
Linearisation	The linearisation function of the LUC-M** allows conversion of the measured value into any unit of length or volume. In open channels or measuring weirs, also a flow linearistion is possible (calculation of the flow from the measured level).
Auxiliary energy	
Electrical connection	terminal compartment: In the F12 housing, the terminals are located underneath the housing cover, in the T12 housing, they are under the cover of the separate terminal compartment. cable gland: M20 x 1.5 (recommended cable diameter 6 ... 10 mm (0.24 ... 0.4 in)) cable entry G1/2 or 1/2 NPT fieldbus plug connector: M12 plug connector (PROFIBUS PA plug), 7/8" plug connector (FOUNDATION Fieldbus plug)
Supply voltage	2-wire HART (standard): - current consumption 4 ... 20 mA - min. terminal voltage 14 V (at 4 mA), 8 V (at 20 mA) - max. terminal voltage 36 V 4-wire HART: - DC version: voltage 10.5 ... 32 V, max. load 600 Ω - AC version: 90 ... 253 V, max. load 600 Ω PROFIBUS PA and FOUNDATION Fieldbus: 9 ... 32 V DC for additional information see technical information
Power consumption	2-wire: 51 ... 800 mW 4-wire AC: max. 4 VA 4-wire DC, LUC-M10/LUC-M20: 330 ... 830 mW 4-wire DC, LUC-M30/LUC-M40: 0.6 ... 1 W
Current consumption	2-wire devices: - HART: 3.6 ... 22 mA - PROFIBUS PA: max. 13 mA - FOUNDATION Fieldbus: max. 15 mA
Ripple	HART: 47 ... 125 Hz, U_{pp} = 200 mV (measured at 500 Ω)
Noise	HART: 0.5 ... 10 kHz, U_{rms} = 2.2 mV (measured at 500 Ω)
Electrical isolation	With 4-wire devices, the evaluation electronics and mains voltage are galvanically isolated from each other.
Terminal assignment	see section electrical connection
Performance characteristics	
Response time	depends on the parameter settings (min. 0.5 s for 4-wire devices, min. 2 s for 2-wire devices)

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Ultrasonic level sensor LUC-M**

Technical data

Reference operating conditions	temperature = 20 °C (293 K) pressure = 1013 $mbar_{abs}$ humidity = 50 % ideal reflective surface (e. g. calm, smooth fluid surface) no interference reflections within signal beam set application parameters: - tank shape = flat ceiling - medium property = liquid - process conditions = calm surface
Measured value resolution	LUC-M10, LUC-M20: 1 mm (0.04 in) LUC-M30, LUC-M40: 2 mm (0.08 mm)
Measuring frequency	2-wire devices: max. 0.5 Hz 4-wire devices: max. 2 Hz dependent on the type of device and the parameter settings
Maximum measured error	typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis): LUC-M10, LUC-M20: ± 2 mm (0.08 in) or 0.2% of set measuring range (empty calibration)[1)] LUC-M30,LUC-M40: ± 4 mm (0.16 in) or 0.2% of set measuring range (empty calibration)[1)] [1)] whichever is greater
Operating conditions	
Mounting conditions	see technical information
Ambient conditions	
Ambient temperature	-40 ... 80 °C (233 ... 353 K), for additional information see technical information
Storage temperature	-40 ... 80 °C (233 ... 353 K)
Resistance to alternating temperature cycles	Nb test: +80 °C/- 40 °C (353 K/233 K), 1 K/min, 100 cycles
Vibration resistance	20 ... 2000 Hz, 1 $(m/s^2)^2/Hz$; 3 x 100 min
Process conditions	
Process temperature	-40 ... 80 °C (233 ... 353 K) (233 ... 353 K), a temperature sensor is integrated in the sensor for correction of the temperature-dependent time-of-flight
Process pressure (static pressure)	LUC-M10, LUC-M20: 0.7 ... 3 bar_{abs} LUC-M30, LUC-M40: 0.7 ... 2.5 bar_{abs}
Mechanical specifications	
Protection degree	with closed housing, tested according to - IP68, Nema 6p (24 h at 1.83 m under water surface) - IP66, Nema 4x with open housing: IP20, Nema 1 (also ingress protection of the display)
Mechanical construction	
Construction type	housing design: - F12 housing with sealed terminal compartment for standard or EEx ia applications - T12 housing with separate terminal compartment and explosion proof encapsulation cover: - version without on-site display - version with on-site display (transparent cover), this version cannot be supplied together with the ATEX II 1/2D certificate
Dimensions	see section dimensions
Mass	LUC-M10: approx. 2.5 kg LUC-M20: approx. 2.6 kg LUC-M30: approx. 3.5 kg LUC-M40: approx. 3 kg
Material	material in contact with process: - LUC-M10, LUC-M20: sensor PVDF, seal EPDM - LUC-M30: sensor UP and stainless steel 1.4571/316Ti, seal EPDM, flange PP or stainless steel 1.4571/316Ti - LUC-M40: sensor PVDF, seal Viton or EPDM, flange PP, PVDF or stainless steel 1.4535/316L housing: - aluminium, seawater resistant, chromed, powder-coated cover: - aluminium, for version without on-site display - inspection glass for version with on-site display
Process connection	- cylindrical thread G1½B, G2B to DIN ISO 228/1 - conical thread 1½ NPT, 2 NPT to ANSI B 1.20.1 - flanges to EN 1092-1 from DN80, to ANSI B 16.5 from 3", to JIS B 2238 (RF) from DN80 - mounting bracket LUC-Z17
Electrical connection	cable gland M20 x 1.5 cable gland ½ NPT cable gland G½ PROFIBUS PA plug M12 x 1 FOUNDATION Fieldbus plug 7/8"
Indication and operation	
Display elements	LCD module VU331 at the device

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Operating elements	on-site operation: - via 3 keys of the LCD module VU331 - via handheld terminal remote control: - operation with operating program (for communication variants HART or PROFIBUS-PA) - operation with NI-FBUS configurator (only FOUNDATION Fieldbus)
Certificates and approvals	
Ex approval	KEMA 05 ATEX 1111, KEMA 05 ATEX 1112, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1/2G or II 2G EEx ia IIC T6 (KEMA 05 ATEX 1111) ⟨Ex⟩ II 1/2G or II 2G EEx d [ia] IIC T6 (KEMA 05 ATEX 1111) ⟨Ex⟩ II 1/2G or II 2G EEx em [ia] IIC T6 (KEMA 05 ATEX 1111) ⟨Ex⟩ II 1/2D or II 2D or II 1/3D or II 3D T115°C or T100°C or T95°C (KEMA 05 ATEX 1111) ⟨Ex⟩ II 1/2D or II 2D or II 1/3D or II 3D T115°C or T83°C or T84°C or T86°C (KEMA 05 ATEX 1112) ⟨Ex⟩ II 3G EEX nA II T6
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010-1
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector) A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communication signal (HART).
Directive 94/9 EC (ATEX)	EN 50014, EN 50018, EN 50019, EN 50020, EN 50028, EN 50281-1-1, EN 50284
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068-2-38 (test Z/AD) DIN/IEC 68 T2-30Db
Vibration resistance	EN 60068-2-64
Resistance to alternating temperature cycles	EN 60068-2-14
Supplementary documentation	technical information TI365O short instructions KA183O (can be found under the device housing cover) operating instructions KA191O (connection LUC-M**) operating instructions BA237O (4 ... 20 mA, HART devices) operating instructions BA238O (PROFIBUS PA devices) operating instructions BA239O (FOUNDATION Fieldbus devices) operating instructions BA240O (description of device functions) safety information SI174O (KEMA 05 ATEX 1111), HART version safety information SI175O (KEMA 05 ATEX 1111), PROFIBUS PA and FOUNDATION Fieldbus safety information SI176O (KEMA 05 ATEX 1111) safety information SI177O (KEMA 05 ATEX 1112), HART version safety information SI178O (KEMA 05 ATEX 1112), PROFIBUS PA and FOUNDATION Fieldbus safety information SI179O (⟨Ex⟩ II 3G EEX nA II T6) safety information SI180O (KEMA 05 ATEX 1111) safety information SI224O (KEMA 05 ATEX 1111), HART version safety information SI225O (KEMA 05 ATEX 1111), PROFIBUS PA and FOUNDATION Fieldbus safety information SI259O (KEMA 05 ATEX 1111), HART version FM control drawing ZD096O (HART devices, F12 housing) FM control drawing ZD097O (PROFIBUS PA and FOUNDATION Fieldbus devices) FM control drawing ZD098O (T12 housing) FM control drawing ZD139O (HART devices, T12-OVP housing) FM control drawing ZD140O (PROFIBUS PA and FOUNDATION Fieldbus devices, T12-OVP housing) CSA control drawing ZD088O (HART devices, F12 housing) CSA control drawing ZD099O (PROFIBUS PA and FOUNDATION Fieldbus devices) CSA control drawing ZD100O (T12 housing) CSA control drawing ZD101O (HART devices, T12 housing) CSA control drawing ZD102O (PROFIBUS PA and FOUNDATION Fieldbus devices)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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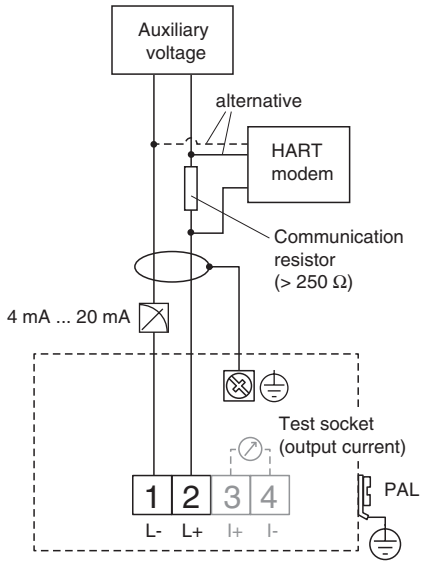
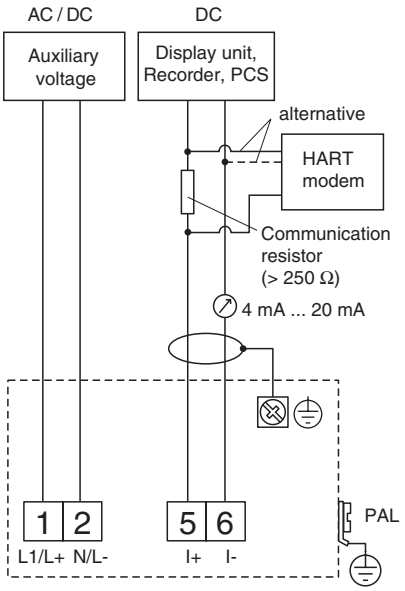
Electrical connection

Connection IH
4 mA ... 20 mA with HART, 2-wire

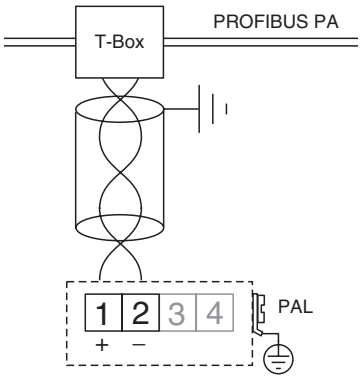


Connection AH, DH
4 mA ... 20 mA with HART, active, 4-wire

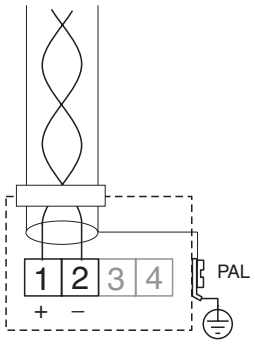


- Connect the connecting line to the screw terminals (line cross-sections of 0.5 mm... 2.5 mm) in the terminal compartment.
- Use 2-wire twisted pair cable with screen for the connection.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device.

Connection PA
PROFIBUS PA



Connection FF
FOUNDATION Fieldbus



The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. Please use 2-wire twisted pair cable with screen.

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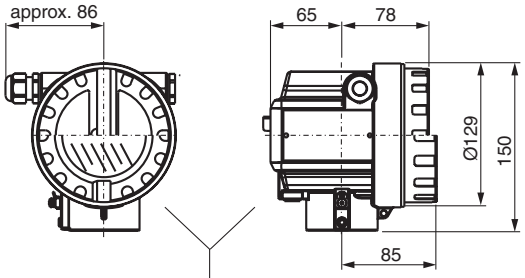
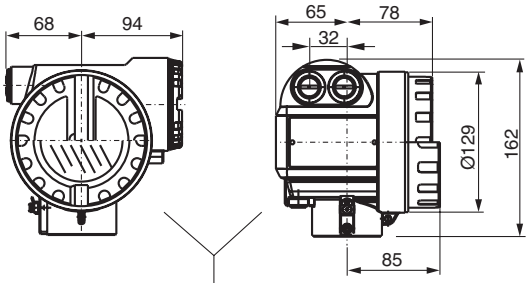
Dimensions

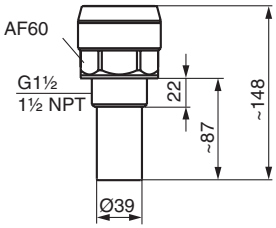
Housing F12



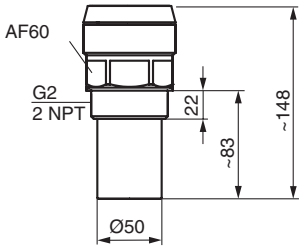
Housing T12



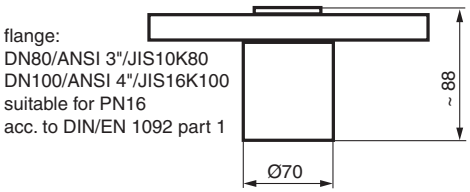
LUC-M10



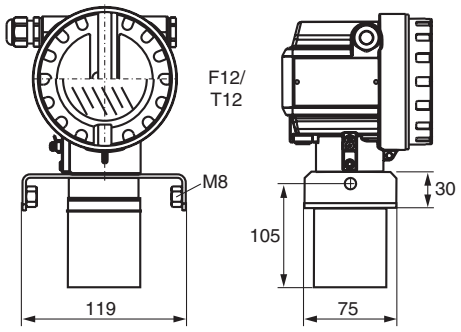
LUC-M20



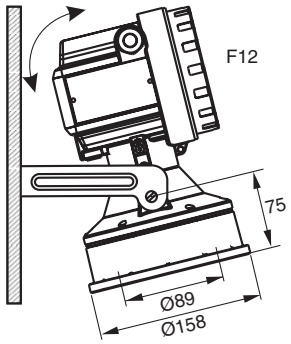
LUC-M40 with universal flange



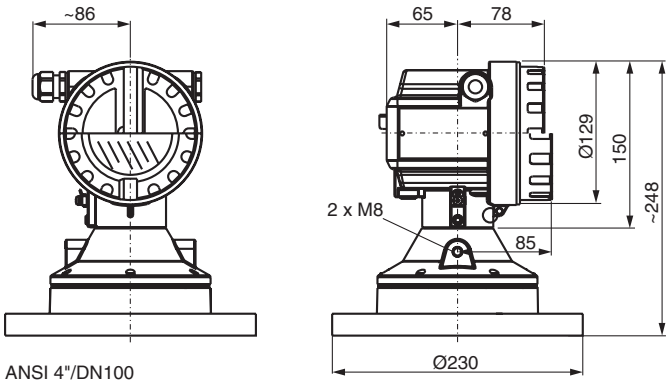
LUC-M40 with mounting bracket



LUC-M30 with mounting bracket

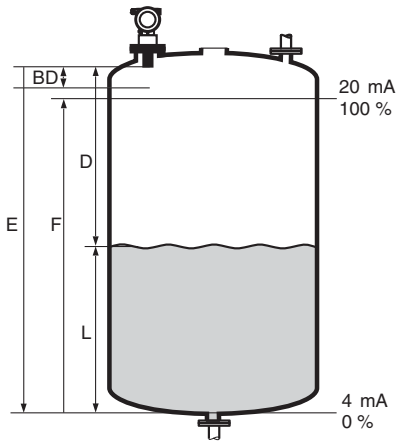


LUC-M30 with universal slip-on flange



ANSI 4"/DN100
Alternatively, a separate flange can be used.

Blocking distance

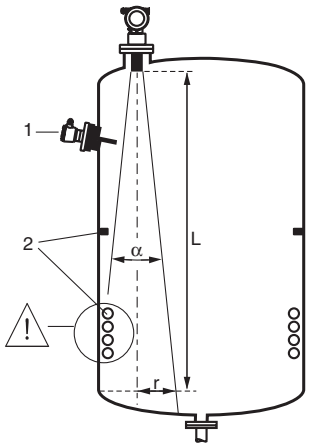


Sensor	BD	Max. range fluids	Max. range bulk materials
LUC-M10	0.25 m (9.8 in)	5 m (16.4 ft)	2 m (6.6 ft)
LUC-M20	0.35 m (13.8 in)	8 m (26.2 ft)	3.5 m (11.5 ft)
LUC-M30	0.6 m (23.6 in)	15 m (49.2 ft)	7 m (23 ft)
LUC-M40	0.4 m (15.7 in)	10 m (32.8 ft)	5 m (16.4 ft)

E: empty distance
F: span (full distance)
D: distance from sensor membrane - product surface
L: level
BD: blocking distance

Emitting angle

To estimate the detection range, use the 3 dB emitting angle α. Make sure that equipment (1) such as limit switches, temperature sensors, etc. are not located within the emitting angle α. In particular, symmetrical equipment (2) such as heating coils, baffles etc. can influence measurement.



Sensor	α	L	r
LUC-M10	11°	5 m (16.4 ft)	0.48 m (18.9 in)
LUC-M20	11°	8 m (26.2 ft)	0.77 m (30.3 in)
LUC-M30	6°	15 m (49.2 ft)	0.79 m (31.1 in)
LUC-M40	11°	10 m (32.8 ft)	0.96 m (37.8 in)

Accessories

Mounting accessories
- LUC-Z17, mounting bracket for LUC-M30, LUC-M40
- LUC-Z18, mounting bracket for LUC-M10
- LUC-Z19, mounting bracket for LUC-M20
- LUC-Z2*, cantilever for LUC-M10, LUC-M20
- LUC-Z3*, mounting frame
- LUC-Z5*, wall bracket

Flanges
- LUC-Z-***, universal slip-on flange for LUC-M30
- LUC-Z-A**N**, adapter flange with conical thread for LUC-M10, LUC-M20
- LUC-Z-F**G**, adapter flange with metrical thread for LUC-M10, LUC-M20

Further accessories
- LUC-Z15, display and operating module VU331 for on-site operation
- LUC-Z16, weather protection cover
- LUC-Z40-**1*, remote display

for additional information see technical information

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Type code/model number

Product structure LUC-M10

L	U	C	–	M	1	0	–						–				–		

Certificate
- **NA** version for non-explosion hazardous areas
- **EX** Ⓔx II 1/2G EEx ia IIC T6
- **ES** Ⓔx II 1/2D, aluminium cover
- **E2** Ⓔx II 1/3D
- **SX** Ⓔx II 1/2G EEx d (ia) IIC T6
- **S2** Ⓔx II 3G EEx nA II T6
- **F1** FM IS, Cl. I/II/III, Div.1 Group A-G, N.I .Cl. I, Div.2
- **F2** FM XP, Cl. I/II/III, Div. 1, Group A-G
- **CG** CSA, General Purpose
- **C1** CSA IS, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.
- **C2** CSA XP, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.

Display
- **A** * prepared for remote display, order display as accessory LUC-Z40
- **B** without display
- **D** with display VU331 inclusive on-site operation, envelope curve display

Electrical output
- **AH** 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
- **DH** 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
- **FF** 2-wire, FOUNDATION Fieldbus
- **IH** 2-wire, 4 mA ... 20 mA, HART
- **PA** 2-wire, PROFIBUS PA

Cable entry
- **2** cable gland M20 x 1.5
- **3** thread G½
- **4** thread ½ NPT
- **5** connector M12, PROFIBUS PA
- **6** connector 7/8", FOUNDATION Fieldbus

Housing
- **A1** aluminium housing F12, IP68, thread M20 x 1.5
- **A2** aluminium housing T12, IP68, coated, with separate terminal compartment
- **A4** aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection

Prozess connection
- **G5** G1½B, ISO 228/1, PVDF
- **N5** 1½ NPT, ANSI B 1.20.1, PVDF

* in preparation

Product structure LUC-M20

L	U	C	–	M	2	0	–						–				–		

Certificate
- **NA** version for non-explosion hazardous areas
- **EX** Ⓔx II 1/2G EEx ia IIC T6
- **ES** Ⓔx II 1/2D, aluminium cover
- **E2** Ⓔx II 1/3D
- **SX** Ⓔx II 1/2G EEx d (ia) IIC T6
- **S2** Ⓔx II 3G EEx nA II T6
- **F1** FM IS, Cl. I/II/III, Div.1 Group A-G, N.I .Cl. I, Div.2
- **F2** FM XP, Cl. I/II/III, Div. 1, Group A-G
- **CG** CSA, General Purpose
- **C1** CSA IS, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.
- **C2** CSA XP, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.

Display
- **A** * prepared for remote display, order display as accessory LUC-Z40
- **B** without display
- **D** with display VU331 inclusive on-site operation, envelope curve display

Electrical output
- **AH** 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
- **DH** 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
- **FF** 2-wire, FOUNDATION Fieldbus
- **IH** 2-wire, 4 mA ... 20 mA, HART
- **PA** 2-wire, PROFIBUS PA

Cable entry
- **2** cable gland M20 x 1,5
- **3** thread G½
- **4** thread ½ NPT
- **5** connector M12, PROFIBUS PA
- **6** connector 7/8", FOUNDATION Fieldbus

Housing
- **A1** aluminium housing F12, IP68, thread M20 x 1.5
- **A2** aluminium housing T12, IP68, coated, with separate terminal compartment
- **A4** aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection

Prozess connection
- **G6** G2B, ISO 228/1, PVDF
- **N6** 2 NPT, ANSI B 1.20.1, PVDF

* in preparation

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Type code/model number

Product structure LUC-M30

L U C – M 3 0 – | | | | | – | | | | – | | |

Certificate
- **NA** version for non-explosion hazardous areas
- **ES** Ex II 1/2D, aluminium cover
- **E2** Ex II 1/3D
- **FM** FM DIP, Cl. II, Div.1 Group E-G, N.I .Cl. I, Div.2
- **CG** CSA, General Purpose
- **CS** CSA DIP, Cl. II, Div. 1, Group E-G, N.I .Cl. I, Div.2

Display
- **A** * prepared for remote display, order display as accessory LUC-Z40
- **B** without display
- **D** with display VU331 inclusive on-site operation, envelope curve display

Electrical output
- **AH** 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
- **DH** 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
- **FF** 2-wire, FOUNDATION Fieldbus
- **PA** 2-wire, PROFIBUS PA

Cable entry
- **2** cable gland M20 x 1,5
- **3** thread G½
- **4** thread ½ NPT
- **5** connector M12, PROFIBUS PA
- **6** connector 7/8", FOUNDATION Fieldbus

Housing
- **A1** aluminium housing F12, IP68, thread M20 x 1.5

Prozess connection
- **FA** universal flange DN100/ANSI 4"/JIS16K100, PP
- **FS** universal flange DN100/ANSI 4"/JIS16K100, 1.4571/316Ti
- **FK** without slip-on flange, without mounting bracket, customer mounting equipment
- **FM** with mounting bracket LUC-Z17

* in preparation

Product structure LUC-M40

L U C – M 4 0 – | | | | | – | | | | | | – | | |

Certificate
- **NA** version for non-explosion hazardous areas
- **EX** Ex II 1/2G EEx ia IIC T6
- **ES** Ex II 1/2D, aluminium cover
- **E2** Ex II 1/3D
- **SX** Ex II 1/2G EEx d (ia) IIC T6
- **S2** Ex II 3G EEx nA II T6
- **F1** FM IS, Cl. I/II/III, Div.1 Group A-G, N.I .Cl. I, Div.2
- **F2** FM XP, Cl. I/II/III, Div. 1, Group A-G
- **CG** CSA, General Purpose
- **C1** CSA IS, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.
- **C2** CSA XP, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.

Additional option
- **A** basic version

Sealing sensor/flange
- **2** Viton
- **3** EPDM

Display
- **A** * prepared for remote display, order display as accessory LUC-Z40
- **B** without display
- **D** with display VU331 inclusive on-site operation, envelope curve display

Electrical output
- **AH** 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
- **DH** 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
- **FF** 2-wire, FOUNDATION Fieldbus
- **IH** 2-wire, 4 mA ... 20 mA, HART
- **PA** 2-wire, PROFIBUS PA

Cable entry
- **2** cable gland M20 x 1.5
- **3** thread G½
- **4** thread ½ NPT
- **5** connector M12, PROFIBUS PA
- **6** connector 7/8", FOUNDATION Fieldbus

Housing
- **A1** aluminium housing F12, IP68, thread M20 x 1.5
- **A2** aluminium housing T12, IP68, coated, with separate terminal compartment
- **A4** aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection

Process connection; max. 3 bar abs/44 psia, hole circle PN16/150 lbs/10K
- **P** universal flange DN80/ANSI 3"/JIS10K80, PP
- **Q** universal flange DN80/ANSI 3"/JIS10K80, PVDF
- **S** universal flange DN80/ANSI 3"/JIS10K80, 1.4535/316L
- **T** universal flange DN100/ANSI 4"/JIS16K100, PP
- **U** universal flange DN100/ANSI 4"/JIS16K100, PVDF
- **V** universal flange DN100/ANSI 4"/JIS16K100, 1.4535/316L
- **M** mounting bracket LUC-Z17

* in preparation

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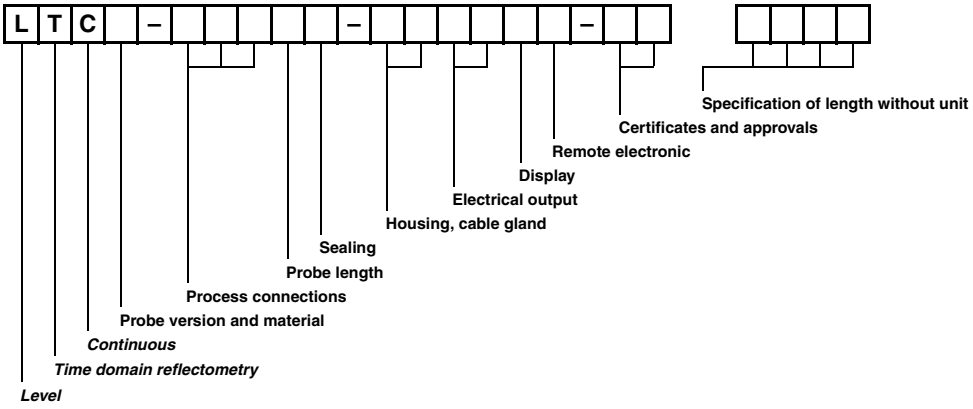
Type code of guided microwave

The figure below shows the used characters and numbers of the guided microwaves type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the guided microwaves.

Product group Pulscon LTC*



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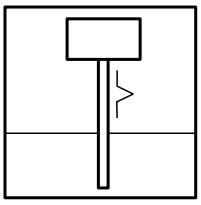
Guided microwave Pulscon LTC* with coax probe

This continuous level measurement for liquids and bulk solids is based on the propagation time measurement of microwave pulses according to the principle of time domain reflectometry (TDR), which are guided along a rod or a rope.

A high-frequency pulse is guided along a single conductor, the sensor rod, and reflected by the medium surface. The interface electronics determines the level of the bulk material from the propagation time of the pulse.

To a great extent the measuring principle is independent of process influences such as pressure, temperature or moving surfaces.



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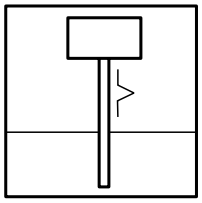
LTC*

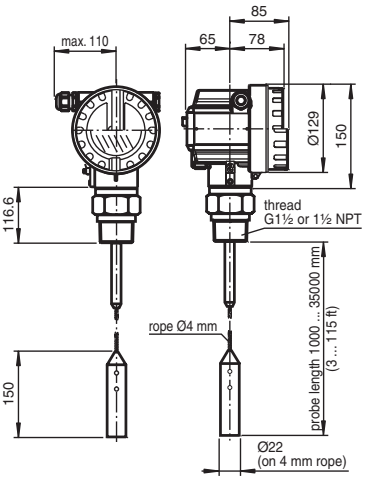


Features

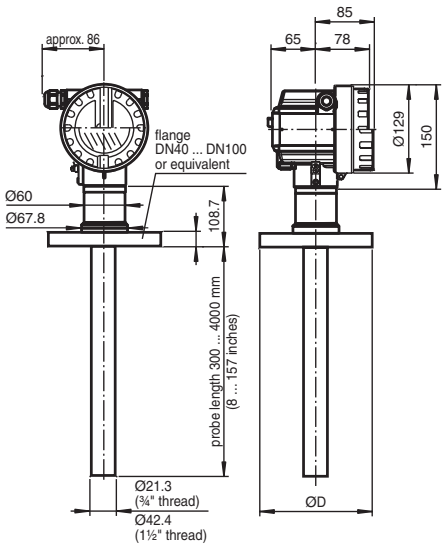
- Measurement independent of density, temperature and dust
- Measurement also possible with foam on the surface
- Simple, menu-guided on-site operation with four-line plain text display
- On-site envelope curve on the display for easy diagnosis
- Easy operation, diagnosis and measuring point documentation with the supplied operating program
- Optional remote display and operation
- With coax probes the measurement is completely independent of internals in the tank and of the installation in the nozzle
- Up to SIL2 acc. to IEC 61508

Dimensions

Pulscon LTC
compact version with rope probe



Pulscon LTC
compact version with coax probe



Additional dimensions see section dimensions.

Function

The Pulscon LTC performs continuous level measurement of powdery to granular bulk solids e. g. plastic granulate and liquids.

Probes are available with threaded process connections from ¾" and flanges from DN40/1½":

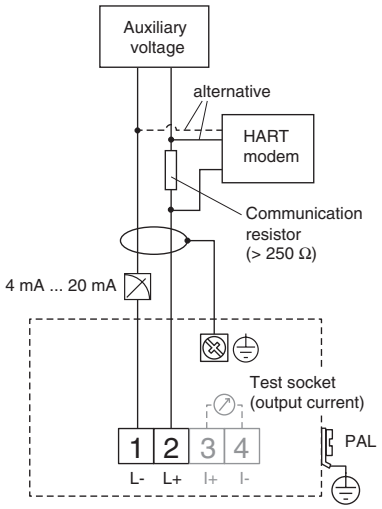
- Rope probes, above all for measurement in bulk solids, measuring range up to 35 m/1378 in
- Rod probes, above all for liquids
- Coax probes, for liquids

The following interfaces are available for system integration:

- HART (standard), 4 mA ... 20 mA
- PROFIBUS PA
- FOUNDATION Fieldbus

Electrical connection

Example: 2-wire connection IH
More connection types see section electrical connections.



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Application	
Function principle	The Pulscon LTC is a transmitter for continuous level measurement in powdery to granular bulk solids and liquids. The distance from the reference point (process connection of the measuring device) to the product surface is measured. High-frequency pulses are injected to a probe and led along the probe. The pulses are reflected by the product surface, received by the electronic evaluation unit and converted into level information.
Function and system design	
Measuring principle	The Pulscon LTC is a measuring system that functions according to the time-of-flight method. The distance from the reference point (process connection of the measuring device) to the product surface is measured.
Equipment architecture	The Pulscon LTC is usable as single measuring cell or integrated in PROFIBUS PA or FOUNDATION Fieldbus systems.
Input characteristics	
Measured variable	distance between a reference point and a reflective surface (e. g. medium surface)
Measurement range	max. 35 m (115 ft), dependent on the medium, the probe type and the probe length - rod probe 6 mm: 0.3 ... 2 m (1 ... 6.6 ft) - rod probe 16 mm/coax probe: 0.3 ... 4 m (1 ... 13.2 ft) - rope probe: 1 ... 35 m (3 ... 115 ft) for details see technical information
Blocking distance	The upper blocking distance (= UB) is the minimum distance from the reference point of the measurement (mounting flange) to the maximum level. The lower blocking distance (= LB) is the range of the probe from the lower edge calculated upwards, in which exact measurement is not possible. The utilisable measuring range amounts between lower blocking distance and upper blocking distance the empty distance value and the measuring range value can be tuned independent from it. - rod probe 6 mm: 0.2 m (8 in) - rod probe 16 mm: 0.2 m (8 in) - coax probe: 0 m - rope probe: 0.2 m (8 in) for details see technical information
Measuring conditions	used frequency spectrum: 0.1 ... 1.5 GHz
Output characteristics	
Output signal	4 ... 20 mA with HART protocol PROFIBUS PA FOUNDATION Fieldbus (FF)
Signal on alarm	error information can be accessed via the following interfaces: - local display with error symbol, plain text display - current output - digital interface
Linearisation	The Pulscon LTC linearisation function enables conversion of the measured value into any desired length or volume unit, mass or %. Linearisation tables for volume calculation in cylindrical tanks are pre-programmed. Any other table from up to 32 value pairs can be input manually or semi-automatically.
Auxiliary energy	
Electrical connection	connection IH: 4 ... 20 mA with HART, 2-wire connection AH: 4 ... 20 mA with HART, 4-wire active, AC version connection DH: 4 ... 20 mA with HART, 4-wire active, DC version connection PA: PROFIBUS PA connection FF: FOUNDATION Fieldbus
Supply voltage	connection IH: 7.5 ... 36 V DC; Ex version: 7.5 ... 30 V DC connection AH: 90 ... 253 V AC connection DH: 10.5 ... 32 V DC
Power consumption	60 ... 900 mW
Current consumption	connection AH: approx. 3 ... 6 mA connection DH: approx. 100 mA connection PA: max. 11 mA connection FF: max. 15 mA
Overvoltage protection	If there is the risk of differences in potential forming when installing the Pulscon LTC to measure the level of flammable liquids, the device can be fitted with a T12 housing and integrated overvoltage protection (600 V gas tube surge arrester), see ordering information. This overvoltage protection meets the requirements of DIN EN 60079-14, test standard 60060-1, and also protects the device (10 kA, impulse 8/20 µs).
Residual ripple	connection IH: HART residual ripple $U_{pp} \leq 200$ mV connection DH: HART residual ripple $U_{pp} \leq 2$ V, voltage incl. ripple within the permitted voltage (10.5 ... 32 V)
Terminal assignment	see section electrical connection
Load	connections IH, AH, DH: > 250 Ω
Performance characteristics	
Resolution	digital: 1mm (0.04 in) analogue: 0.03 % of measuring range
Response time	The reaction time depends on the configuration, shortest time: - 2-wire electronics: 1 s - 4-wire electronics: 0.7 s

Reference operating conditions	temperature = 20 °C (293 K) ± 5 K pressure = 1013 $mbar_{abs}$ (14.7 psi) ± 20 mbar (0.3 psi) relative humidity (air) = 65 % ± 20 % reflection factor ≥ 0.8 (surface of water for coax probe, metal plate for rod and rope probe with min. 1 m (39.4 in) Ø) flange for rod or rope probe ≥ 30 cm (11.8 in) Ø distance to obstructions ≥ 1 m (39.4 in)
Maximum measured error	typical statements for reference conditions: DIN EN 61298-2, percentage of the span. output: sum of non-linearity, non-repeatability and hysteresis digital - measuring range: up to 10 m (30 ft): ± 3 mm (0.12 in), > 10 m (30 ft): ± 0.03 % - for PA coated rope measuring range: up to 5 m (15 ft): ± 5 mm (0.2 in), > 5 m (15 ft): ± 0.1 % analogue ± 0.06 % output: offset/zero digital ± 4 mm (0.16 in) analogue ± 0.03 % If the reference conditions are not met, the offset/zero arising from the mounting situation may be up to ± 12 mm (0.47 in). This additional offset/zero can be compensated for by entering a correction ("offset" function) during commissioning.
Influence of ambient temperature	The measurements are carried out in accordance with EN 61298-3. digital output (HART, PROFIBUSPA, FOUNDATION Fieldbus): LTC, average TK: 0.6 mm/10 K, max. ± 3.5 mm (0.14 in) over the entire temperature range -40 ... 80 °C (233 ... 353 K) 2-wire, current output (additional error, in reference to the span of 16 mA): - zero point (4 mA), average TK: 0.032 %/10 K, max. 0.35 % over the entire temperature range -40 ... 80 °C (233 ... 353 K) - span (20 mA), average TK: 0.05%/10 K, max. 0.5 % over the entire temperature range -40 ... 80 °C (233 ... 353 K) 4-wire, current output (additional error, in reference to the span of 16 mA): - zero point (4 mA), average TK: 0.02 %/10 K, max. 0.29 % over the entire temperature range -40 ... 80 °C (233 ... 353 K) - span (20 mA), average TK: 0.06 %/10 K, max. 0.89 % over the entire temperature range -40 ... 80 °C (233 ... 353 K)
Operating conditions	
Mounting conditions	for details see technical information
Ambient conditions	
Ambient temperature	-40 ... 80 °C (233 ... 353 K), for details see technical information
Ambient temperature limits	For process connection temperatures above 80 °C (353 K), the allowed ambient temperature at the housing is reduced. for details see technical information
Storage temperature	-40 ... 80 °C (233 ... 353 K)
Process conditions	
Process temperature	The maximum permitted temperature at the process connection is determined by the O-ring version ordered: O-ring material - FKM (Viton): -30 ... 150 °C (243 ... 423 K) - EPDM: -40 ... 120 °C (233 ... 393 K) - FFKM (Kalrez): -5 ... 150 °C (268 ... 423 K)
Process pressure limits (overpressure)	-1 ... 40 bar
Dielectric constant	with coax probe: DC ≥ 1.4, rod and rope probe: DC ≥ 1.6
Mechanical specifications	
Protection degree	with closed housing tested according to - IP68, NEMA 6p (24 h at 1.83 m (72 in) under water) - IP66, NEMA 4x with open housing: IP20, NEMA 1 (also degree of protection of display) Caution! Degree of protection IP68 NEMA 6p applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in.
Mechanical construction	
Construction type	housing F12 with sealed terminal compartment for standard or EEx ia applications housing T12 with separate terminal compartment and explosion proof encapsulation
Versions	LTC1 with 4 mm (0.16 in) rope probe LTC2 with 16 mm (0.6 in) rod probe LTC3 with 6 mm (0.24 in) rod probe LTC4 with coax probe LTC5 with 6 mm (0.24 in) rope probe LTC8 with 6 mm (0.24 in) rope probe, PA coated

Dimensions	housing: - housing F12: 174 x 150 x 143 mm (6.8 x 6 x 5.6 in) - housing T12: 194 x 162 x 143 mm (7.6 x 6.4 x 5.6 in) distance sleeve: diameter 60 mm (2.36 in), height 400 mm (15.7 in) remote electronic: length 3000 mm (9.9 ft) process connections: length 61 ... 281.6 mm (2.4 ... 11.1 in) probes: - 4 mm (0.16 in) and 6 mm (0.24 in) rope probe: length 1000 ... 35000 mm (3 ... 115 ft) - 6 mm (0.24 in) rod probe: length 300 ... 2000 mm (1 ... 6.6 ft) - 16 mm (0.6 in) rod probe: length 300 ... 4000 mm (1 ... 13.2 ft) - coax probe: diameter 42.4 mm (1.67 in), length 300 ... 4000 mm (1 ... 13.2 ft) see section dimensions
Mass	housing F12 or T12: approx. 4000 g 4 mm (0.16 in) rope probe: approx. 100 g/m 6 mm (0.24 in) rod or rope probe: approx. 200 g/m 16 mm (0.63 in) rod probe: approx. 1600 g/m coax probe: approx. 3500 g/m process connections: depending on the design
Material	housing: aluminium (AlSi10Mg), seawater resistant, chromed, powder-coated transparent window: glass process connection: 1.4435/316L, 1.4462 rope: 1.4401/316 rod and coax pipe: 1.4435/316L weight: 1.4435/316L
Process connection	- flanges to ANSI B 16.5 1½" ... 8", 150 lbs/300 lbs, RF - flanges to EN 1092-1 DN40 PN25/40 ... DN200 PN10/16, Form C, sealing strip - cylindrical threads G¾, G1½, BSP, to DIN ISO 228/1 - conical threads ¾ NPT, 1½ NPT to ANSI B 1.20.1
Electrical connection	connection AH, DH, IH: cable gland: M20 x 1.5 (EEx d version only with cable entry), cable entry: G½ or ½ NPT connection PA: M12 plug connection FF: 7/8" plug
Indication and operation	
Display elements	LCD module VU331 at the device
Operating elements	on-site operation: - via 3 keys of the LCD module VU331 - via handheld terminal remote control: - operation with operating program (for communication variants HART or PROFIBUS-PA) - operation with NI-FBUS configurator (only FOUNDATION Fieldbus)
Certificates and approvals	
Ex approval	KEMA 02 ATEX 1254, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 2G EEx em [ia] IIC T6 ⟨Ex⟩ II 1/2G II EEx ia IIC T6 with WHG ⟨Ex⟩ II 1/2G EEx d [ia] IIC T6 ⟨Ex⟩ II 1/2G, II 1/3D EEx ia IIC T6 ⟨Ex⟩ II 1/2G, II 1/3D EEx ia IIC T6 with WHG ⟨Ex⟩ II 1/2G EEx ia IIC T6 ⟨Ex⟩ II 1/3D transparent cover, dust-Ex ⟨Ex⟩ II 1/2D aluminium cover, dust-Ex
SIL classification	up to SIL2 acc. to IEC 61508, for 4 ... 20 mA output
Overspill protection	Z-65.16-368 (overspill protection in acc. with WHG)
Telecommunications	Complies with part 15 of the FCC rules for an unintentional radiator. All probes meet the requirements for a class A digital device (commercial, industrial or business environment). Coax probes and probes mounted in closed metallic vessels also meet the requirement for a class B digital device (residential environment).
General information	
Directive conformity	
Directive 73/23/EEC (Low Voltage Directive)	EN 61010
Directive 89/336/EC (EMC)	When installing the probes in metal and concrete tanks and when using a coax probe: - interference emission to EN 61326, Electrical Equipment Class B - interference immunity to EN 61326, Annex A (Industrial area) The measured value can be affected by strong electromagnetic fields when installing rod and rope probes without a shielding/metallic wall, e. g. plastic, and in wooden silos. - interference emission to EN 61326, Electrical Equipment Class A - interference immunity: the measured value can be affected by strong electromagnetic fields
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	EN 60529
Climate class	EN 60068, part 2-38 (test Z/AD)
Vibration resistance	EN 60068-2-64/IEC 68-2-64: 20 ... 2000 Hz, 1 $(m/s^2)^2/Hz$

Supplementary documentation	technical information TI358O short instructions KA189O (can be found under the device housing cover) operating instructions BA242O (4 ... 20 mA, HART devices) operating instructions BA243O (PROFIBUS PA devices) operating instructions BA244O (FOUNDATION Fieldbus devices) operating instructions BA245O (description of device functions) operating instructions KA137O (protective hood LTC-Z01) operating instructions KA195O (centering disc LTC-Z30) operating instructions KA196O (flange with horn adapter LTC-Z20) operating instructions KA197O (insulating sleeve LTC-Z50-*0) operating instructions KA549O (exchange of display VU311) operating instructions KA575O (exchange of a rope or rod probe) safety information SI164O (HART devices) safety information SI165O (PROFIBUS PA and FOUNDATION Fieldbus devices) safety information SI166O (PROFIBUS PA and FOUNDATION Fieldbus devices) safety information SI167O safety information SI168O (HART devices) safety information SI172O safety information SI173O safety information SI211O (HART devices) safety information SI212O (PROFIBUS PA- and FOUNDATION Fieldbus devices) safety information SI213O safety information SI214O (HART devices) safety information SI215O (HART devices) safety information SI216O (PROFIBUS PA- and FOUNDATION Fieldbus devices) safety information SI217O approval ZE256O overspill protection acc. to WHG (Z-65.16-368) FM control drawing ZD075O (HART devices, F12 housing) FM control drawing ZD076O (PROFIBUS PA- and FOUNDATION Fieldbus devices, F12 housing) FM control drawing ZD077O (T12 housing) FM control drawing ZD077O (F12 housing) CSA control drawing ZD080O (HART devices, F12 housing) CSA control drawing ZD081O (PROFIBUS PA- and FOUNDATION Fieldbus devices, F12 housing) CSA control drawing ZD082O (T12 housing) CSA control drawing ZD083O (F12 housing)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

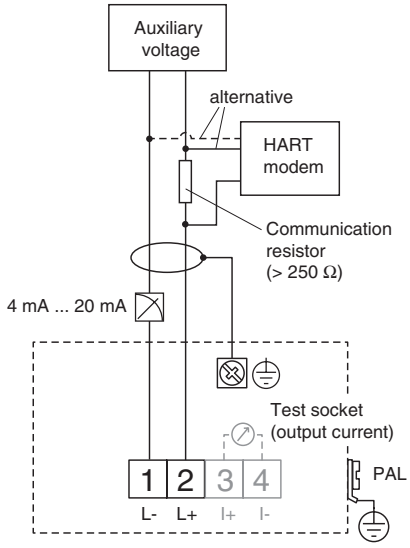
Electrical connections

Connection IH, 2-wire connection with HART (DC)

4 mA ... 20 mA with HART, 2-wire

Cable specification:

A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communications signal (HART).



Connection AH, 4-wire connection with HART (AC), Connection DH, 4-wire connection with HART (DC)

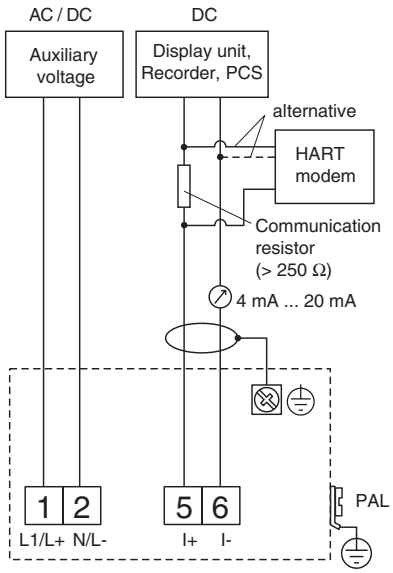
4 mA ... 20 mA with HART, 4-wire active

Cable specification:

A standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communications signal (HART).

Note!

If 4-wire for dust-Ex-applications is used, the current output is intrinsically save.

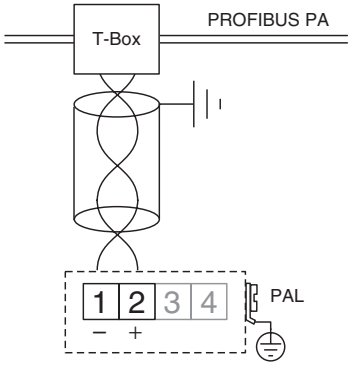


Connection PA, PROFIBUS PA

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. For further information on the network structure and earthing and for further bus system components such as bus cables, see the relevant documentation, e. g. the PNO guideline.

Cable specification:

Use a twisted, screened two-wire cable, preferably cable type A.

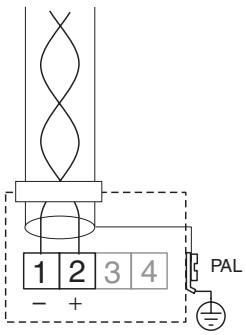


Connection FF, FOUNDATION Fieldbus

The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the auxiliary energy. For further information on the network structure and earthing and for further bus system components such as bus cables, see the relevant documentation, e. g. the FOUNDATION Fieldbus guideline.

Cable specification:

Use a twisted, screened two-wire cable, preferably cable type A.



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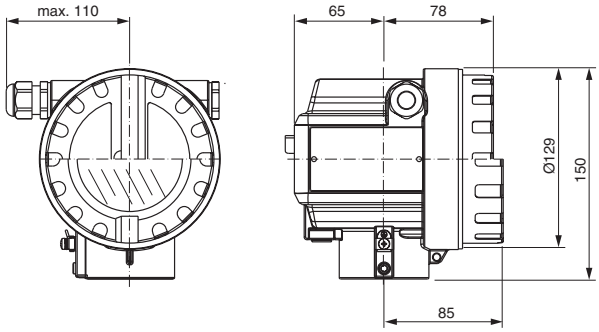
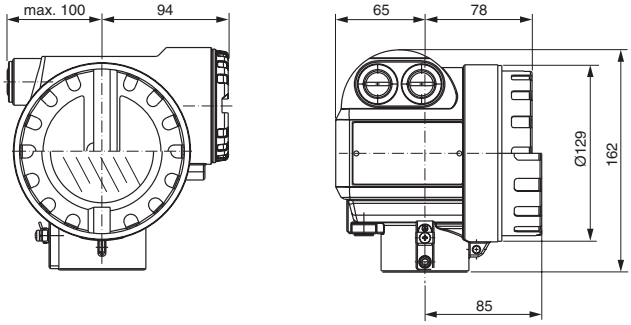
Dimensions

Housing dimensions

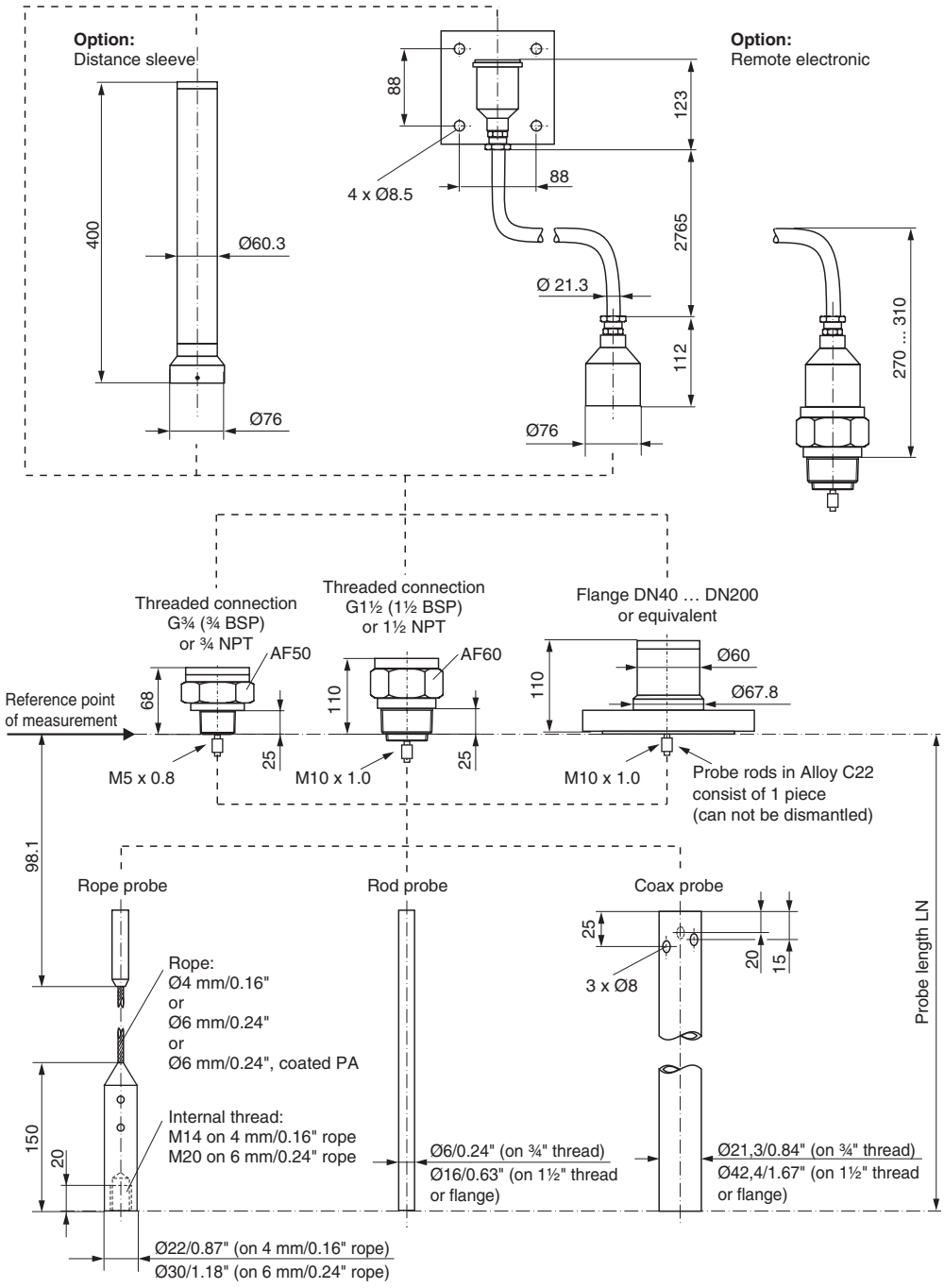
Housing A*, type F12, aluminium



Housing T*, type T12, aluminium



Dimensions process connections, probes



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Accessories

- LTC-Z-D**G5S, adapter flange with metrical thread
- LTC-Z-A**N5S, adapter flange with conical thread
- LTC-Z01, weather protection cover
- LTC-Z02, operating and display module VU331
- LTC-Z20-*0, flange with horn adapter
- LTC-Z30-***, extension rod/centering
- LTC-Z40-**1*, remote display
- LTC-Z50-*0, mounting kit isolated

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Type code/model number

L T C [ ] – [ ] [ ] [ ] [ ] [ ] – [ ] [ ] [ ] [ ] [ ] [ ] – [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Specification of length without unit

Certificates
- **NA** version for non-hazardous area
- **WH** overspill protection WHG
- **C1** CSA IS, Cl. I, II, III, Div. 1, group A-D, G and coal dust, N.I.
- **C2** CSA XP, Cl. I, II, III, Div. 1, group A-D, G and coal dust, N.I.
- **CG** CSA General Purpose
- **CS** CSA DIP, Cl. II, Div. 1, group G and coal dust, N.I.
- **E1** Ex II 2G EEx em[ia] IIC T6
- **EA** Ex II 1/2G II EEx ia IIC T6 with WHG
- **ED** Ex II 1/2G EEx d[ia] IIC T6
- **ES** Ex II 1/2G, II 1/3D EEx ia IIC T6
- **EW** Ex II 1/2G, II 1/3D EEx ia IIC T6 with WHG
- **EX** Ex II 1/2G EEx ia IIC T6
- **F1** FM IS, Cl. I, II, III, Div. 1, group A-G, N.I.
- **F2** FM XP, Cl. I, II, III, Div. 1, group A-G
- **FM** FM DIP, Cl. II, Div. 1, group E-G, N.I.
- **S2** Ex II 1/3D transparent cover, dust
- **SX** Ex II 1/2D alumium cover, dust-Ex

Remote electronic
- **1** standard, compact version
- **2** distance sleeve for electronics, 400 mm (15.7 in)
- **3** remote electronic, cable 3 m (10 ft)

Display
- **A** * prepared for remote display, order display as accessory LTC-Z40-**1*
- **B** without display
- **D** with display VU331 including on-site operation

Electrical output
- **IH** 2-wire, HART 4 mA ... 20 mA
- **PA** 2-wire, PROFIBUS PA
- **FF** 2-wire, FOUNDATION Fieldbus
- **AH** 4-wire, 90 V AC ... 250 V AC, HART 4 mA ... 20 mA
- **DH** 4-wire, 10.5 V DC ... 32 V DC, HART 4 mA ... 20 mA

Housing, cable entry
- **A1** Aluminium housing F12, IP68, M20 gland
- **A2** Aluminium housing F12, IP68, ½ NPT entry
- **A3** Aluminium housing F12, IP68, G½ entry
- **A4** Aluminium housing F12, IP68, PROFIBUS PA M12 x 1 plug
- **A5** Aluminium housing F12, IP68, connector 7/8"
- **T1** Aluminium housing T12, IP68, M20 gland
- **T2** Aluminium housing T12, IP68, ½ NPT entry
- **T3** Aluminium housing T12, IP68, G½ entry
- **T4** Aluminium housing T12, IP68, PROFIBUS PA M12 x 1 plug
- **T5** Aluminium housing T12, IP68, connector 7/8"

Sealing
- **2** VITON O-ring
- **3** EPDM O-ring
- **4** KALREZ O-ring

Probe length
- **A** rope Ø4 mm, length in mm, 1000 mm ... 35000 mm, 1.4401/316
- **B** rope Ø6 mm, length in mm, 1000 mm ... 35000 mm, 1.4401/316
- **C** rope Ø1/6", length in in, 40 in ... 1378 in, 1.4401/316
- **D** rope Ø1/4", length in in, 40 in ... 1378 in, 1.4401/316
- **E** rope Ø6 mm, length in mm, 1000 mm ... 35000 mm, 1.4301/304, coated PA
- **F** rope Ø1/4", length in in, 40 in ... 1378 in, 1.4301/304, coated PA
- **K** rod probe Ø16 mm (0.6 in), length in mm, 300 mm ... 4000 mm, 1.4435/316L
- **L** coax probe, length in mm, 300 mm ... 4000 mm, 1.4435/316L
- **M** rod probe Ø16 mm (0.6 in), length in in, 8 in ... 157 in, 1.4435/316L
- **N** coax probe, length in in, 8 in ... 157 in, 1.4435/316L
- **P** rod probe Ø6 mm (0.24 in), length in mm, 300 mm ... 2000 mm, 1.4435/316L
- **R** rod probe Ø6 mm (0.24 in), length in in, 8 in ... 80 in, 1.4435/316L

Process connections
- **A51** 1½", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **A52** 1½", ANSI B 16.5, 300 lbs RF, 1.4435/316L
- **A61** 2", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **A62** 2", ANSI B 16.5, 300 lbs RF, 1.4435/316L
- **A81** 3", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **A82** 3", ANSI B 16.5, 300 lbs RF, 1.4435/316L
- **A91** 4", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **A92** 4", ANSI B 16.5, 300 lbs RF, 1.4435/316L
- **AA1** 6", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **AB1** 8", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **D65** DN40 PN25/40, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **D75** DN50 PN25/40, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **D93** DN80 PN10/16, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **D95** DN80 PN25/40, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **DA3** DN100 PN10/16, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **DA5** DN100 PN25/40, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **DC3** DN150 PN10/16, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **DE3** DN200 PN10/16, EN 1092-1 Form B1, 1.4435/316L, sealing strip
- **G21** G¾, DIN ISO 228/1, BSP, 1.4435/316L
- **G51** G1½, DIN ISO 228/1, BSP, 1.4435/316L
- **N21** ¾ NPT, ANSI B 1.20.1, 1.4435/316L
- **N51** 1½ NPT, ANSI B 1.20.1, 1.4435/316L
- **XXX** special version

Probe version
- **1** rope probe Ø4 mm/1/6", 1.4401/304, predominantly liquids
- **2** rod probe Ø16 mm (0.6 in), 1.4435/316L, predominantly liquids
- **3** rod probe Ø6 mm (0.24 in), 1.4435/316L with short block distance, liquids
- **4** coax probe, 1.4435/316L, liquids
- **5** rope probe Ø6 mm/¼", 1.4401/304, predominantly solids
- **8** rope probe Ø6 mm/¼", 1.4401/304, coated PA, solids, T_{max} = 100 °C (373 K)

* in preparation

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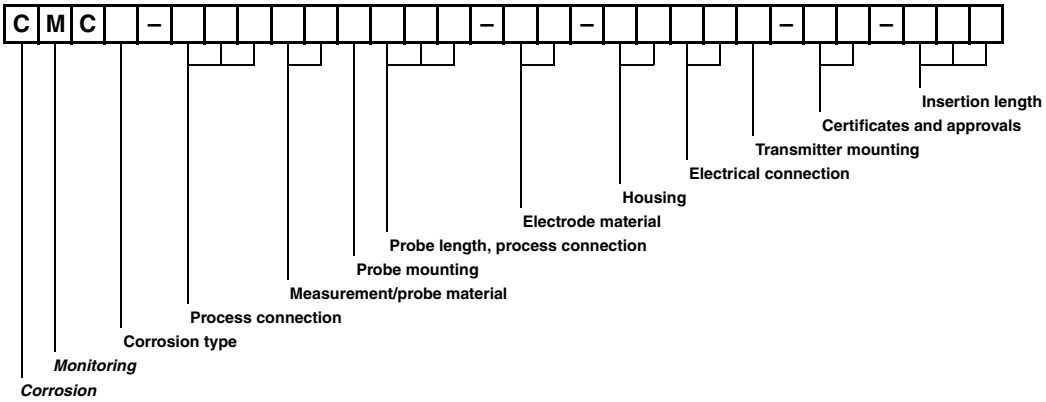
Type code of corrosion monitoring

The figure below shows the used characters and numbers of the corrosion monitoring type code.

Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets of the corrosion monitoring.

Product group CorrTran CMC*



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Corrosion monitoring CorrTran CMC*

The CorrTran instrument utilises state-of-the-art algorithms and data analysis techniques to accurately measure corrosion rate or pitting.

Harmonic distortion analysis (HDA) is applied to improve the performance of the industry accepted linear polarisation resistance (LPR) technique used to measure corrosion rate. To further enhance the performance, an application specific Stern Geary variable (B value) can be stored in the transmitter. During the 7-minute measurement cycle, CorrTran also performs an automated electrochemical noise (ECN) measurement, which in combination with the corrosion rate data can provide a measurement of localised corrosion (pitting).

At the completion of each measurement cycle, the respective corrosion rate or pitting value in the form of a 4 mA ... 20 mA/HART signal is produced and made available to the plant personnel.

Contents

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Corrosion monitoring

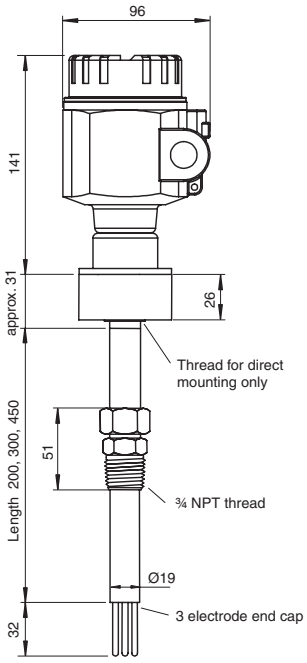
CMC*

Features

- On-line corrosion monitoring
- 2-wire, 4 mA ... 20 mA transmitter, HART interface
- General or localised corrosion (pitting) monitoring
- Maximum process pressure up to 102 bar (1500 psi)
- Custom configuration

Dimensions

CorrTran CMC with adjustable stainless steel probe



Additional dimensions see section dimensions.

Function

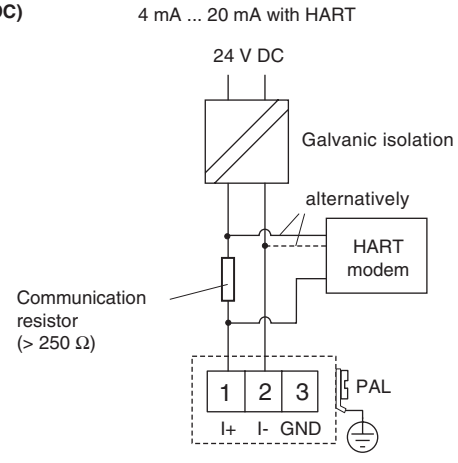
The CorrTran CMC* is a compact, 4 mA ... 20 mA corrosion transmitter used to detect general or localized corrosion in a wide range of industries.

The transmitter measures the corrosion rate in mil/year or mm/year and outputs a pitting factor in the range of 0 ... 1. The readings are taken in real time and are updated every 7 minutes.

The CorrTran CMC* utilizes state-of-the-art algorithms and data analysis techniques to accurately measure corrosion rate or pitting. Harmonic distortion analysis (HDA) is applied to improve the performance of the industry accepted linear polarization resistance (LPR) technique used to measure corrosion rate.

Electrical connection

2-wire connection with HART (DC)



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Supply	
Rated voltage	9 ... 30 V DC
Electrical specifications	
Nominal voltage U_o	min. 9 V DC at max. loop current 2-wire (4 ... 20 mA)
Linearity	0.0015 % non linear
Output	
Output rated operating current	high alarm: 22.5 mA, low alarm current: 3.7 mA
Transfer characteristics	
Resolution	17 Bit
Input characteristics	
Measured variable	Corrosion, update time 7.2 min (fixed)
Auxiliary energy	
Electrical connection	4 ... 20 mA with HART, 2-wire
Connectable load	max. load at 24 V DC: 680 Ω with high alarm/750 Ω without high alarm
Operating conditions	
Ambient conditions	
Ambient temperature	-40 ... 70 °C (253 ... 343 K)
Process conditions	
Process temperature	stainless steel probe: - direct mounting: max. 121 °C (394 K) - remote mounting: max. 260 °C (533 K) epoxy glass probe: max. 65 °C (338 K)
Process pressure (static pressure)	stainless steel probe: max. 102 bar (1500 psi) epoxy glass probe: max. 7 bar (100 psi)
Flow	max. 6.1 m/s (20 fps)
Mechanical specifications	
Protection degree	IP66, NEMA 4x
Mechanical construction	
Mass	approx. 500 g
Material	housing: aluminium process connections: stainless steel 1.4401/316 or nylon probes: stainless steel 1.4401/316 or epoxy glass, fill material epoxy end cap seal: glass or epoxy electrode material see section references to type code, table 1
Process connection	stainless steel probe: - conical thread ¾ NPT acc. to ANSI B 1.20.1 - flanges 1", 2" acc. to ANSI B 16.5 epoxy glas probe: conical nylon thread ¾ NPT acc. to ANSI B 1.20.1
Electrical connection	conical thread ¾ NPT to ANSI B 1.20.1
Indication and operation	
Operating elements	HART electronics with HART protocol: operation via a PC with operating program
Configuration	The adjustments and scaling can be done using a handheld terminal or the operating software. general corrosion rate: - range: min. 20 mils/year, max. 400 mils/year, default 40 mils/year - Zero/span adjustments available with HART. localised corrosion (pitting) factor: - default: 0.001 ... 1.0 - low pitting: 0.001 ... 0.01 - average pitting: 0.01 ... 0.1 - high pitting: 0.1 ... 1.0
Factory setting	B value (Stern Geary value): 25.6 mV K value (corrosion constant): 11800 (2e- in reaction)
Certificates and approvals	
Ex approval	LCIE 05 ATEX 6097X, for additional certificates see www.pepperl-fuchs.com
Type of protection	⟨Ex⟩ II 1G EEx ia IIC T4
General information	
Directive conformity	
Directive 94/9 EC (ATEX)	EN 50014, EN 50020, EN 50284
Conformity	
Protection degree	EN 60529
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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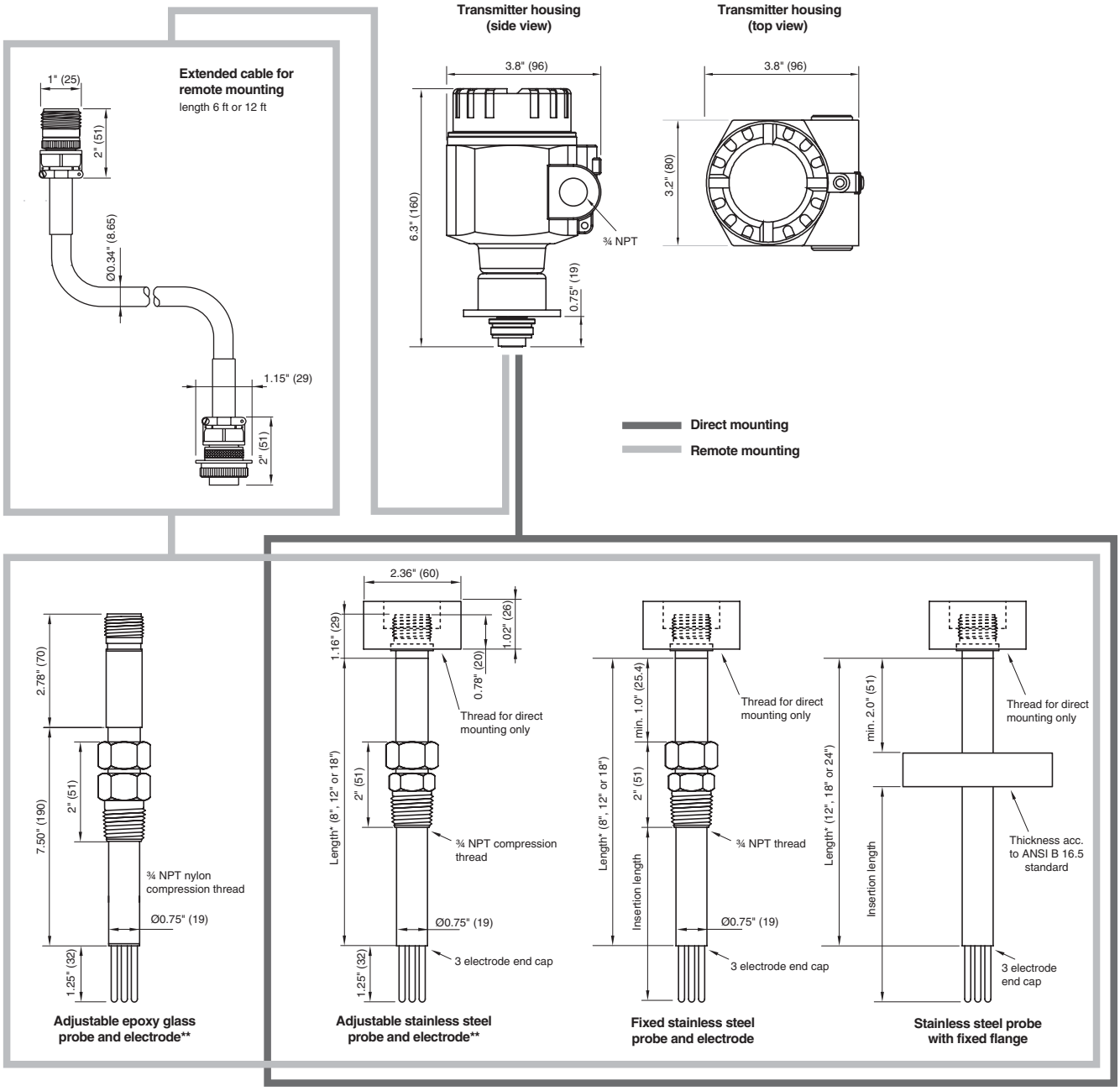
Dimensions



* Standard lengths are 8", 12", 18" and 24“. Other lengths are available in increments of 0.5" or 10 mm. Minimum length is 7" or 170 mm and the maximum length is 30" or 770 mm. Insertion lengths for fixed probes are specified in 0.2" or 5 mm increments.

** All adjustable probes include a safety retaining bracket which must be used in all pressurized applications.

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References to type code

Key number electrode material	UNS number	Electrode material	K value
0A	G10180	1018 carbon steel	11597.63
0B	K03005	A53 carbon steel, class B	11583.07
0C	S30400	1.4301/304	11334.57
0D	S30403	1.4307/304L	11342.80
0E	S31600	1.4401/316	11513.39
0F	S31603	1.4404/316L	11519.53
0G	N08020	Carpenter 20Cb3	11595.52
0H	N04400	Monel 400	11077.87
0I	C71500	CDA 715 Cu/Ni70/30	11337.86
0J	C11000	CDA 110 ETP 99.9Cu	11686.71
0K	C70600	CDA 706 Cu/Ni90/10	11513.44
0L	C68700	CDA 867 Aluminium brass	12411.53
0M	C44300	CDA 443 ARS AD brass	12324.74
0N	A91100	Aluminium 1100	10940.96
0O	A92024	Aluminium 2024	11400.51
0P	R50400	Titan GR2	8644.02
0Q	N10276	Hastelloy C-276	11666.48

Other materials are available upon request.

Table 1: Electrode material vs. K value

Key number probe mounting	Probe type	Mounting	Process connection	Probe material
A	Standard	direct mounting	fixed	stainless steel
B	Standard	remote mounting	fixed	stainless steel
C	Standard	direct mounting	adjustable	stainless steel
D	Standard	remote mounting	adjustable	stainless steel
E	retractable*	remote mounting	adjustable	stainless steel
F	special*	-	-	-

*Please contact Pepperl+Fuchs.

Table 2: Probe selection

Accessories

- HART accessories
  - KFD2-HMM-16, 16-channel MUX master
  - KFD0-HMS-16, 16-channel slave
  - HIS2700, 32-channel MUX
  - US-HI-311, HART/RS 232 interface
  - US-HI-321, HART/USB interface

Please contact Pepperl+Fuchs for termination board selection.

- Control devices
  - KFD2-STC4-1, 1-channel SMART transmitter power supply
  - KFD2-STC4-1.2O, 1-channel SMART transmitter power supply, 1 input, 2 outputs
  - KFD2-STC4-Ex1, 1-channel SMART transmitter power supply
  - KFD2-STC4-Ex2, 2-channel SMART transmitter power supply
  - KFD2-STC4-Ex1.2O, 1-channel SMART transmitter power supply, 1 input, 2 outputs
  - KFU8-CRG-1.D, 1-channel transmitter supply isolator 4 mA ... 20 mA
  - KFU8-CRG-Ex1.D, 1-channel transmitter supply isolator 4 mA ... 20 mA
- Overvoltage protection
  - K-LB-1.30, 1-channel overvoltage protection for DIN rail mounting
  - K-LB-2.30, 2-channel overvoltage protection for DIN rail mounting
  - FN-LB-I, 1-channel overvoltage protection for screw mounting for field mounting
  - P-LB-1, 1-channel overvoltage protection, plug-in terminal module
  - P-LB-2, 2-channel overvoltage protection, plug-in terminal module
- CMC-PMB-01, wall or pipe mounting bracket for remote mounted transmitters
- PW2-BASIC, CorrTran interface demo software on CD-ROM

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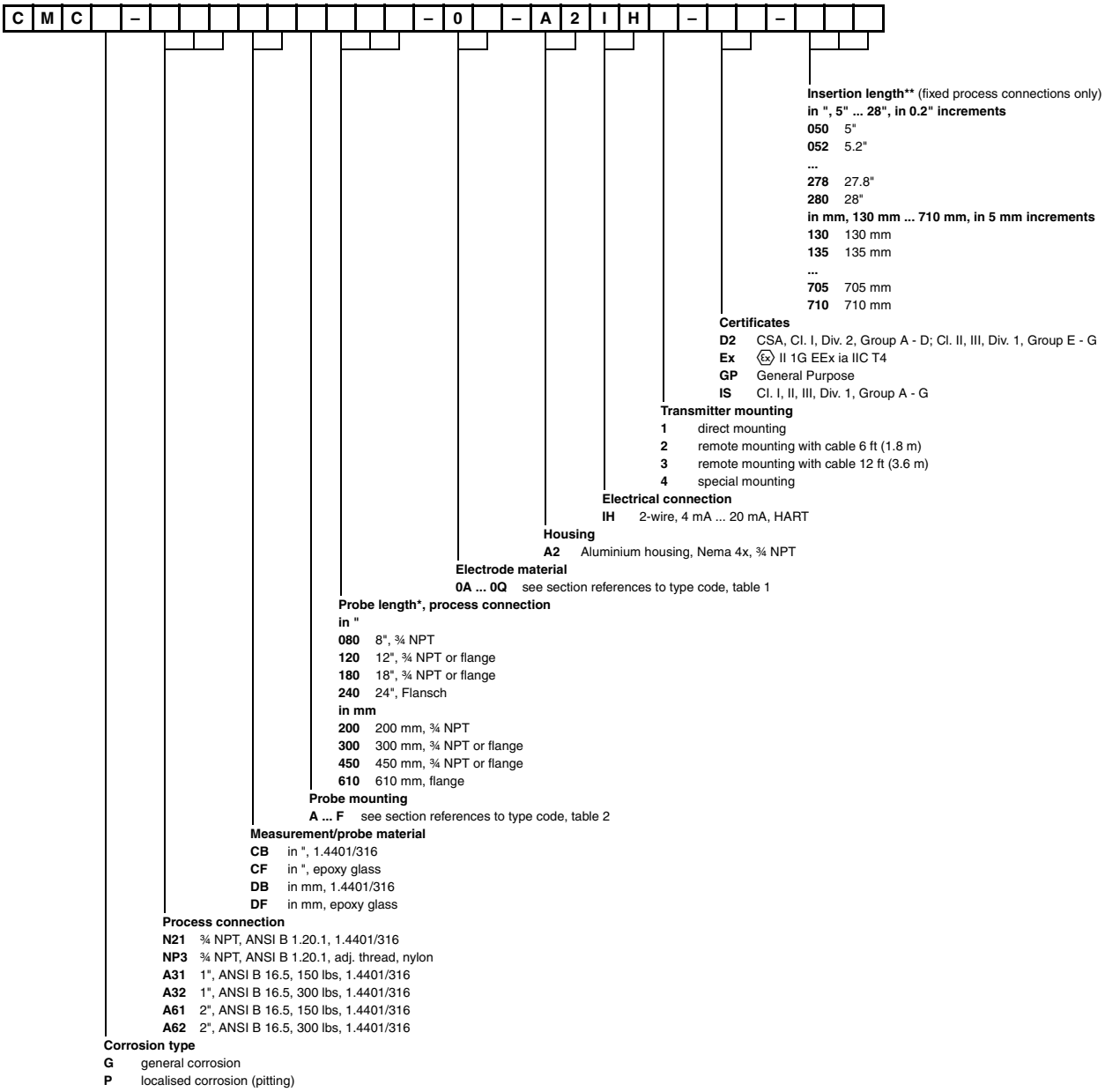
Type code/model number



* Probe length does not include 1.25" standard electrode length.
** This information is required for all fixed probes. Insertion length includes 1.25" standard electrode length.

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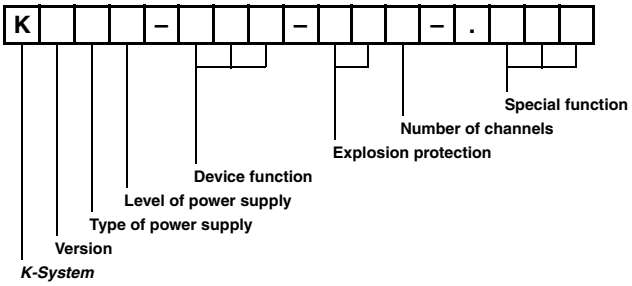
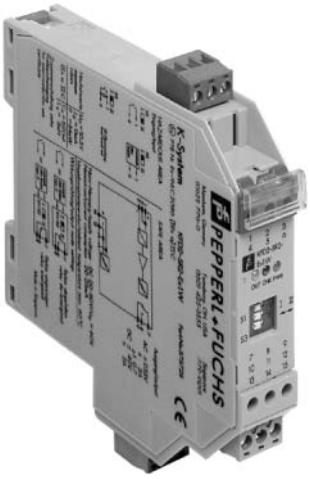
Type code of level signal conditioning electronics

The figure below shows the used characters and numbers of the level signal conditioning electronics type code.
Not all characters and numbers can be combined. The possible combinations are shown on the according data sheets.

Product group interface units





In order to prepare a standardised measurement signal for the various level sensors, the proper interface electronics are required.

In general, a distinction is made between limit value and continuous level control.

Depending on the specific application, these interface electronics are approved for use in Ex areas as well as for overspill protection acc. to WHG.

The complete product selection for interface electronics you will find in the catalogue "DIN-Rail housing".

All information for the approvals and certifications please find at www.pepperl-fuchs.com.

Transformer isolated barrier KFD2-SR2-Ex1.W

Contents

- 1-channel
- Relay for conductive limit value detection
- Adjustable sensitivity
- Measuring circuit in acc. with VDE 0100 part 410 "Funktionskleinspannung"
- Minimum/maximum control
- Open/closed circuit current principle switchable
- EMC acc. to NAMUR NE 21
- This model replaces KHA6-ER-1.* and HR-122620

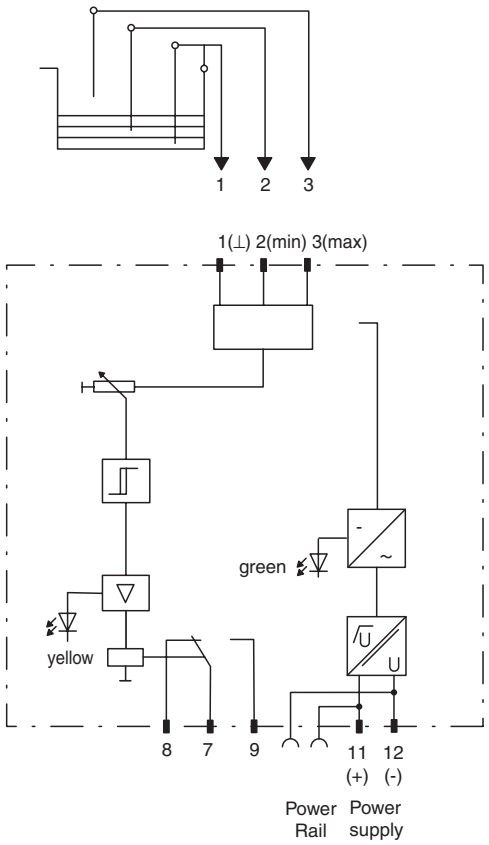
24 V DC
KFD2-ER-1.5
24 V DC
KFD2-ER-1.6

Function

The relays provide the AC measuring voltage for the electrodes and react with a small alternating current after the electrodes get in contact with the medium.

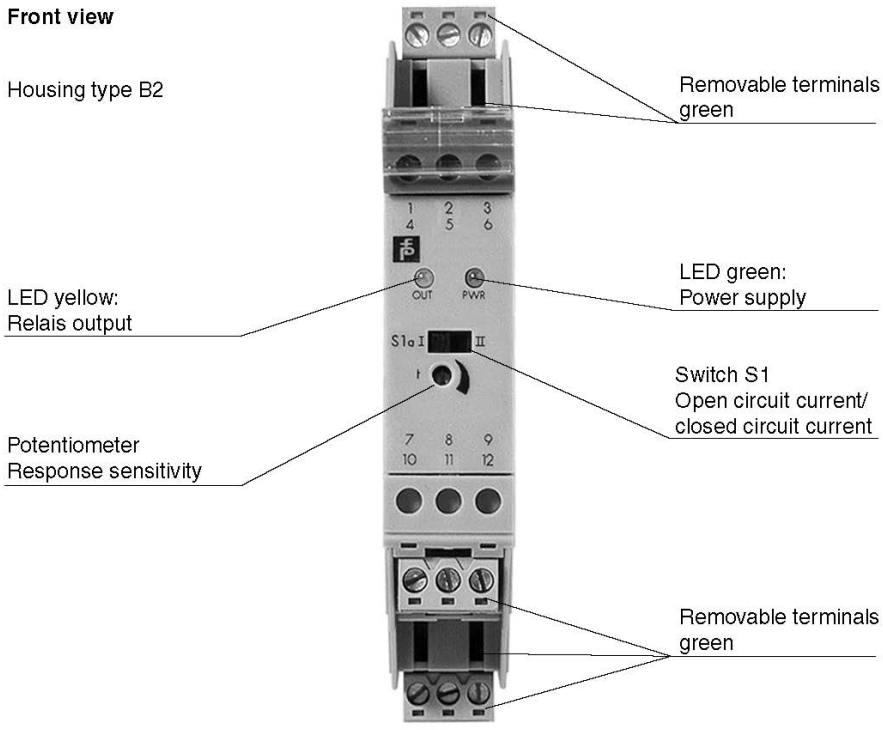
The switching amplifiers are voltage and temperature stabilised and guarantee a defined switching characteristics. An electronic holding contact allows a minimum maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

Connection



Composition

Front view



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	KFD2-ER-1.5	KFD2-ER-1.6
Supply		
Connection	Power Rail or terminals 11+, 12-	
Rated voltage	20 ... 30 V DC	
Input		
Connection	terminals 1 (mass), 2 (min), 3 (max)	terminals 1 (mass), 2 (min), 3 (max)
Open-circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3
Response sensitivity	1 ... 30 kΩ, adjustable via potentiometer (20 turns)	5 ... 150 kΩ, adjustable via potentiometer (20 turns)
Output		
Connection	terminals 7, 8, 9	
Output	1 changeover contact	
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load	
Energised/de-energised delay	approx. 1 s/approx. 1 s	
Electrical isolation		
Input/output	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}	
Input/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}	
Output/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}	
Directive conformity		
Electromagnetic compatibility		
Directive 89/336/EC	EN 61326, EN 50081-2	
Conformity		
Insulation coordination	EN 50178	
Electrical isolation	EN 50178	
Electromagnetic compatibility	NE 21	
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	
Mechanical specifications		
Protection degree	IP20	
Connection	screw connection, max. 2.5 mm^2	
Mass	approx. 110 g	
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)	
Mounting	Power Rail or pull-out latches using for screw mounting	
Indication and operation		
Operating elements	switch S1 position I open circuit current: In the open circuit current principle, the relay becomes active when the limit is reached. position II closed circuit current: In closed circuit current principle, the relay is activated when power is applied. The relay is deactivated when the limit is reached.	
General information		
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.	

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

- 1-channel
- Relay for conductive limit value detection
- Adjustable sensitivity
- Measuring circuit in acc. with VDE 0100 part 410 "Funktionskleinspannung"
- Minimum/maximum control
- Open/closed circuit current principle switchable
- EMC acc. to NAMUR NE 21
- This model replaces KHA6-ER-1.* and HR-122620

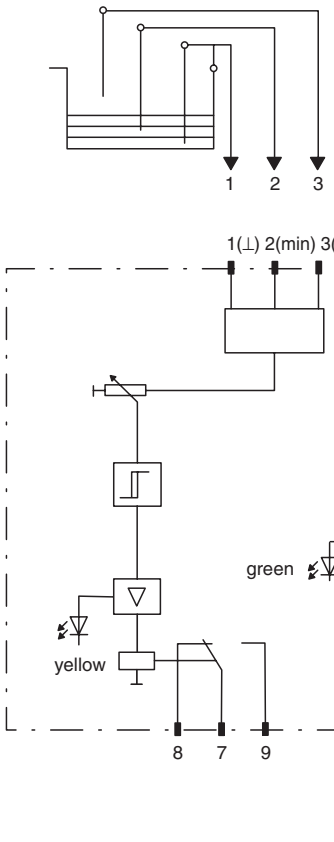
115 V AC
KFA5-ER-1.5
115 V AC
KFA5-ER-1.6
230 V AC
KFA6-ER-1.5
230 V AC
KFA6-ER-1.6

Function

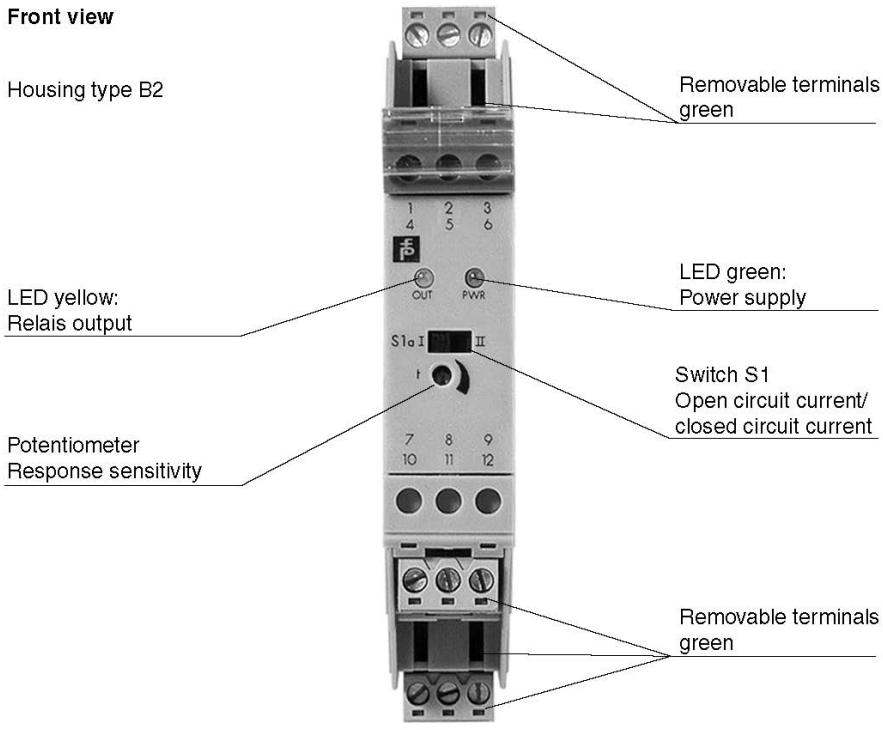
The relays provide the AC measuring voltage for the electrodes and react with a small alternating current after the electrodes get in contact with the medium.

The switching amplifiers are voltage and temperature stabilised and guarantee a defined switching characteristics. An electronic holding contact allows a minimum maximum control. Since the conductance of the media may vary, the relay response sensitivity is adjustable.

Connection



Composition



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	KFA5-ER-1.5	KFA5-ER-1.6	KFA6-ER-1.5	KFA6-ER-1.6
Supply				
Connection	terminals 11 (L1), 12 (N)			
Rated voltage	103.5 ... 126 V AC, 45 ... 65 Hz		207 ... 253 V AC, 45 ... 65 Hz	
Power consumption	approx. 0.8 W			
Input				
Connection	terminals 1 (mass), 2 (min), 3 (max)			
Open-circuit voltage/short-circuit current	approx. 10 V AC (approx. 1 Hz)/approx. 5 mA			
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3			
Response sensitivity	1 ... 30 kΩ, adjustable via potentiometer (20 turns)	5 ... 150 kΩ, adjustable via potentiometer (20 turns)	1 ... 30 kΩ, adjustable via potentiometer (20 turns)	5 ... 150 kΩ, adjustable via potentiometer (20 turns)
Output				
Connection	terminals 7, 8, 9			
Output	1 changeover contact			
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load			
Energised/de-energised delay	approx. 1 s/approx. 1 s			
Electrical isolation				
Input/output	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}			
Input/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}			
Output/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}			
Directive conformity				
Electromagnetic compatibility				
Directive 89/336/EC	EN 61326, EN 50081-2			
Conformity				
Insulation coordination	EN 50178			
Electrical isolation	EN 50178			
Electromagnetic compatibility	NE 21			
Protection degree	IEC 60529			
Ambient conditions				
Ambient temperature	-20 ... 60 °C (253 ... 333 K)			
Mechanical specifications				
Protection degree	IP20			
Connection	screw connection, max. 2.5 mm^2			
Mass	approx. 110 g			
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)			
Mounting	pull-out latches using for screw mounting			
Indication and operation				
Operating elements	switch S1 position I open circuit current: In the open circuit current principle, the relay becomes active when the limit is reached. position II closed circuit current: In closed circuit current principle, the relay is activated when power is applied. The relay is deactivated when the limit is reached.			
General information				
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.			

- 1-channel
- Relay for conductive limit value detection
- Minimum/maximum control
- On/off control system
- Open/closed circuit current principle switchable
- LB monitoring
- EMC acc. to NAMUR NE 21
- LB collective error message via Power Rail

24 V DC
KFD2-ER-1.W.LB
115 V AC
KFA5-ER-1.W.LB
230 V AC
KFA6-ER-1.W.LB

Function

The relays provide the AC measuring voltage for the electrodes and react with a small alternating current after the electrodes get in contact with the medium.

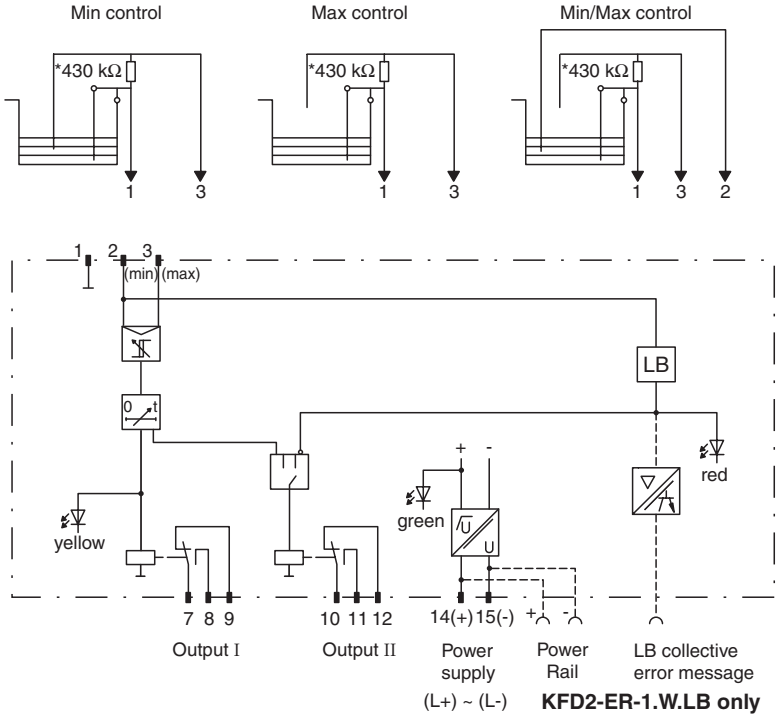
The switching amplifiers are voltage and temperature stabilised and guarantee a defined switching characteristics. The electrode relay can be used as on/off control and as minimum/maximum control. The input signal is damped to compensate oscillations and prevent the relays from uncontrolled switching. The time constant for damping can be adjusted between 0.5 s and 10 s via DIP switches.

The device is equipped with lead breakage monitoring (current free relay in event of failure). For this purpose, the enclosed 430 kΩ resistance must be switched between the maximum and reference electrode. This function can be deactivated with DIP switches.

When using LB monitoring, the second relay output serves as fault signal output. When deactivating the LB monitoring, the second relay output is following the first relay output.

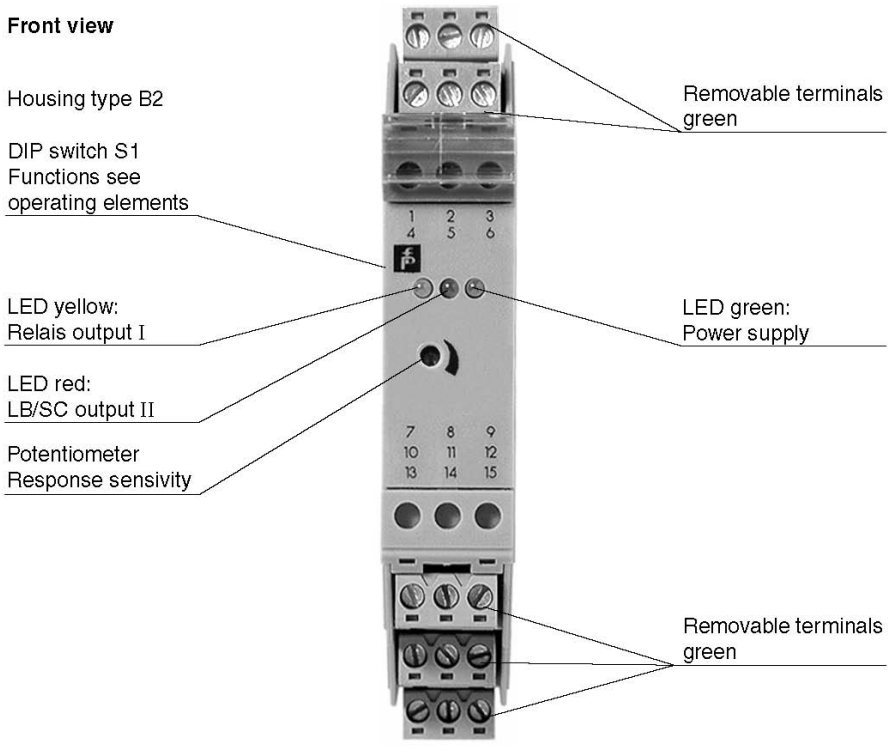
DC-powered units offer a collective error message via Power Rail.

Connection



*Resistor inevitably by activated lead breakage monitoring.

Composition



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	KFD2-ER-1.W.LB	KFA5-ER-1.W.LB	KFA6-ER-1.W.LB
Supply			
Connection	Power Rail or terminals 14+, 15-	terminals 14, 15	terminals 14, 15
Rated voltage	20 ... 30 V DC	103.5 ... 126 V AC, 45 ... 65 Hz	207 ... 253 V AC, 45 ... 65 Hz
Rated current	30 ... 40 mA	12 mA	≤7 mA
Power consumption	-	< 1.2 W	< 1.2 W
Input			
Connection	terminals 1 (mass), 2 (min), 3 (max)		
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3		
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer		
Output			
Connection	terminals 7, 8, 9; 10, 11, 12		
Switch power	max. 192 W, 2000 VA		
Output	relay		
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load		
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s		
Electrical isolation			
Input/output	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Input/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Output/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Directive conformity			
Electromagnetic compatibility			
Directive 89/336/EC	EN 61326, EN 50081-2		
Conformity			
Insulation coordination	EN 50178		
Electrical isolation	EN 50178		
Electromagnetic compatibility	NE 21		
Protection degree	IEC 60529		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (253 ... 333 K)		
Mechanical specifications			
Protection degree	IP20		
Connection	screw connection, max. 2.5 mm^2		
Mass	approx. 150 g		
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)		
Mounting	Power Rail or pull-out latches using for screw mounting	pull-out latches using for screw mounting	pull-out latches using for screw mounting
General information			
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.		

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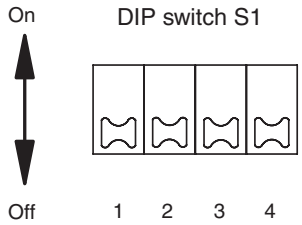
Operating elements

DIP switch function on side of device



DIP switch S1	Position	Function
1	Off On	open circuit current closed circuit current
2	Off On	LB deactivated LB activated

DIP switch 3	DIP switch 4	Time constant for signal damping
Off Off	Off On	0.5 s 2 s
On On	Off On	5 s 10 s

- Open circuit current principle: In open circuit current principle the relay becomes active when the limit is reached.
- Closed circuit current principle: In closed circuit current principle, the relay is activated when power is applied. The relay is deactivated when the limit is reached.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

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- 1-channel
- Relay for conductive limit value detection
- Minimum/maximum control
- On/off control system
- Open/closed circuit current principle switchable
- LB monitoring
- EMC acc. to NAMUR NE 21
- LB collective error message via Power Rail

24 V DC
KFD2-ER-Ex1.W.LB
115 V AC
KFA5-ER-Ex1.W.LB
230 V AC
KFA6-ER-Ex1.W.LB

Function

The relays provide the AC measuring voltage for the electrodes and react with a small alternating current after the electrodes get in contact with the medium.

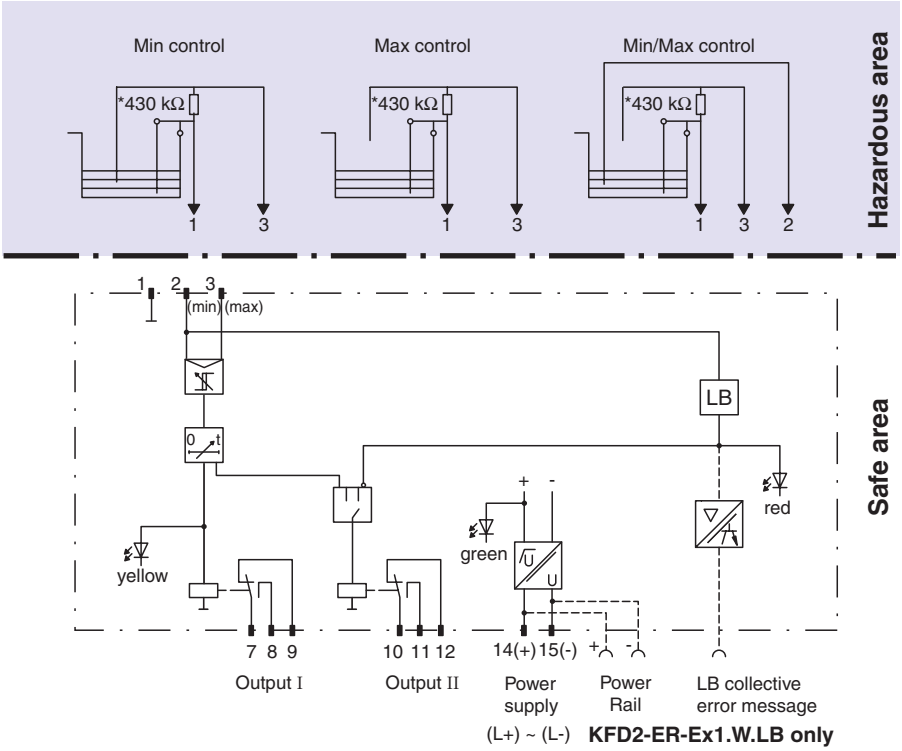
The switching amplifiers are voltage and temperature stabilised and guarantee a defined switching characteristics. The electrode relay can be used as on/off control and as minimum/maximum control. The input signal is damped to compensate oscillations and prevent the relays from uncontrolled switching. The time constant for damping can be adjusted between 0.5 s and 10 s via DIP switches.

The device is equipped with lead breakage monitoring (current free relay in event of failure). For this purpose, the enclosed 430 kΩ resistance must be switched between the maximum and reference electrode. This function can be deactivated with DIP switches.

When using LB monitoring, the second relay output serves as fault signal output. When deactivating the LB monitoring, the second relay output is following the first relay output.

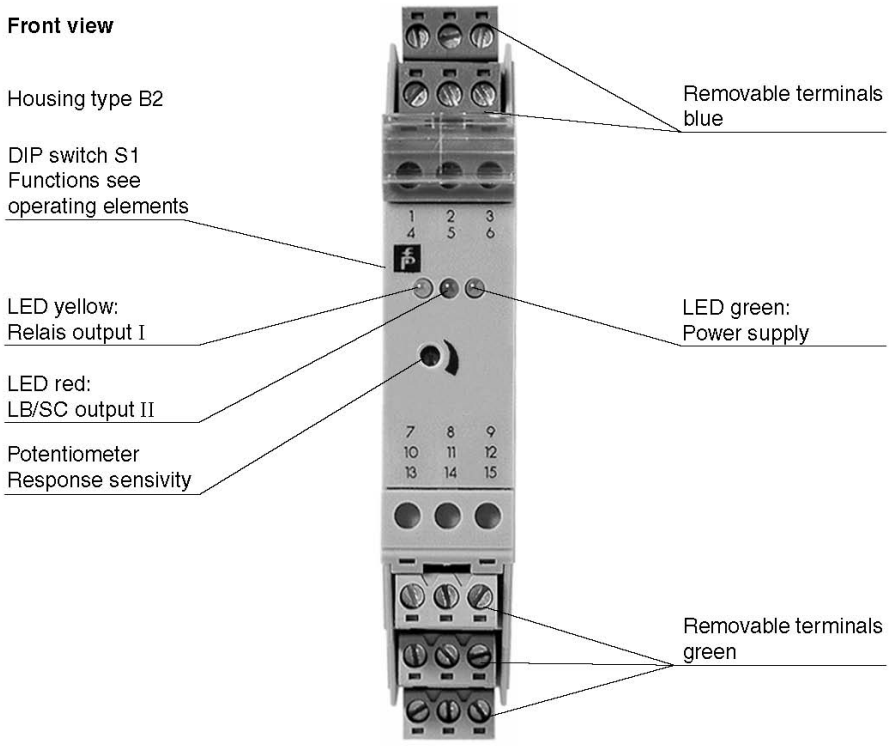
DC-powered units offer a collective error message via Power Rail.

Connection



*Resistor inevitably by activated lead breakage monitoring.

Composition



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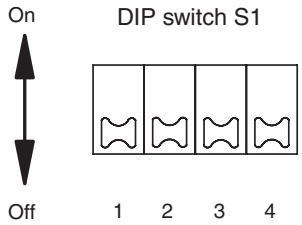
	KFD2-ER-Ex1.W.LB	KFA5-ER-Ex1.W.LB	KFA6-ER-Ex1.W.LB
Supply			
Connection	Power Rail or terminals 14+, 15-	terminals 14, 15	terminals 14, 15
Rated voltage	20 ... 30 V DC	103.5 ... 126 V AC, 45 ... 65 Hz	207 ... 253 V AC, 45 ... 65 Hz
Rated current	30 ... 40 mA	12 mA	≤7 mA
Power consumption	-	< 1.2 W	< 1.2 W
Input			
Connection	terminals 1 (mass), 2 (min), 3 (max)		
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3		
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer		
Output			
Connection	terminals 7, 8, 9; 10, 11, 12		
Switch power	max. 192 W, 2000 VA		
Output	signal; relay		
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s		
Electrical isolation			
Output/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Directive conformity			
Electromagnetic compatibility			
Directive 89/336/EC	EN 61326, EN 50081-2		
Conformity			
Insulation coordination	EN 50178		
Electrical isolation	EN 50178		
Electromagnetic compatibility	NE 21		
Protection degree	IEC 60529		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (253 ... 333 K)		
Mechanical specifications			
Protection degree	IP20		
Connection	screw connection, max. 2.5 mm^2		
Mass	approx. 150 g		
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)		
Mounting	Power Rail or pull-out latches using for screw mounting	pull-out latches using for screw mounting	pull-out latches using for screw mounting
Data for application in conjunction with hazardous areas			
EC-Type Examination Certificate	DMT 00 ATEX E 033, for additional certificates see www.pepperl-fuchs.com	DMT 00 ATEX E 032, for additional certificates see www.pepperl-fuchs.com	DMT 00 ATEX E 032, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]	⟨Ex⟩ II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]	⟨Ex⟩ II (1)G [EEx ia] IIC [circuit(s) in zone 0/1/2]
Input	[EEx ia] IIC	[EEx ia] IIC	[EEx ia] IIC
Voltage U_o	10 V	10 V	10 V
Current I_o	2.5 mA	2.5 mA	2.5 mA
Power P_o	6 mW	6 mW	6 mW
Supply			
Safety maximum voltage U_m	40 V DC (Attention! U_m is no rated voltage.)	265 V AC/150 V AC (Attention! U_m is no rated voltage.)	265 V AC/150 V AC (Attention! U_m is no rated voltage.)
Output			
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load		
Electrical isolation			
Input/output	safe electrical isolation acc. to EN 50020, voltage peak value 375 V		
Input/power supply	safe electrical isolation acc. to EN 50020, voltage peak value 375 V		
Directive conformity			
Directive 94/9 EC	EN 50014, EN 50020, EN 50284		
General information			
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.		

Operating elements

DIP switch function on side of device



DIP switch S1	Position	Function
1	Off On	open circuit current closed circuit current
2	Off On	LB deactivated LB activated

DIP switch 3	DIP switch 4	Time constant for signal damping
Off Off	Off On	0.5 s 2 s
On On	Off On	5 s 10 s

- Open circuit current principle: In open circuit current principle the relay becomes active when the limit is reached.
- Closed circuit current principle: In closed circuit current principle, the relay is activated when power is applied. The relay is deactivated when the limit is reached.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

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- 2-channel
- Relay for conductive limit value detection
- Minimum/maximum control
- On/off control system
- Open/closed circuit current principle switchable
- LB monitoring
- EMC acc. to NAMUR NE 21
- LB collective error message via Power Rail

24 V DC
KFD2-ER-2.W.LB
115 V AC
KFA5-ER-2.W.LB
230 V AC
KFA6-ER-2.W.LB

Function

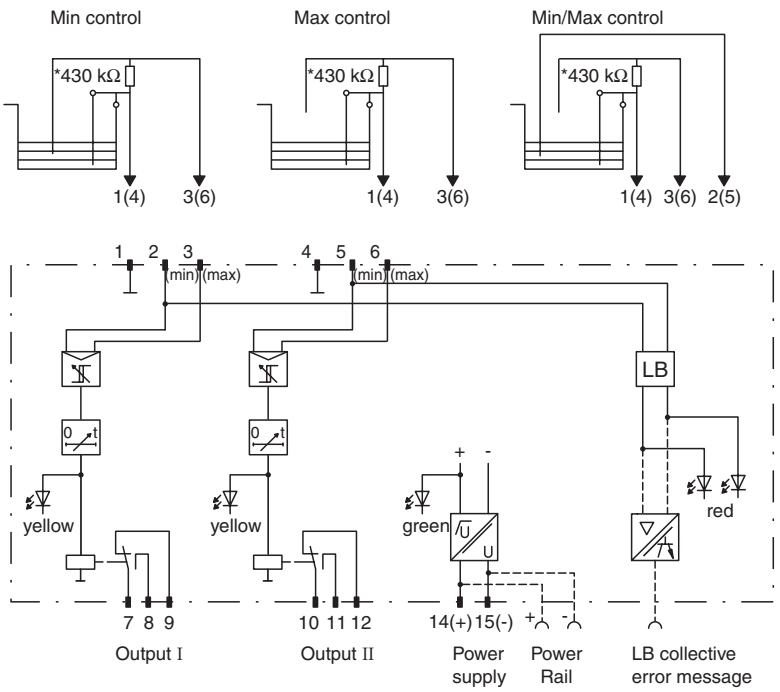
The relays provide the AC measuring voltage for the electrodes and react with a small alternating current after the electrodes get in contact with the medium.

The switching amplifiers are voltage and temperature stabilised and guarantee a defined switching characteristics. The electrode relay can be used as on/off control and as minimum/maximum control. The input signal is damped to compensate oscillations and prevent the relays from uncontrolled switching. The time constant for damping can be adjusted between 0.5 s and 10 s via DIP switches.

The device is equipped with lead breakage monitoring (current free relay in event of failure). For this purpose, the enclosed 430 kΩ resistance must be switched between the maximum and reference electrode. This function can be deactivated with DIP switches.

DC-powered units offer a combined error signal via Power Rail.

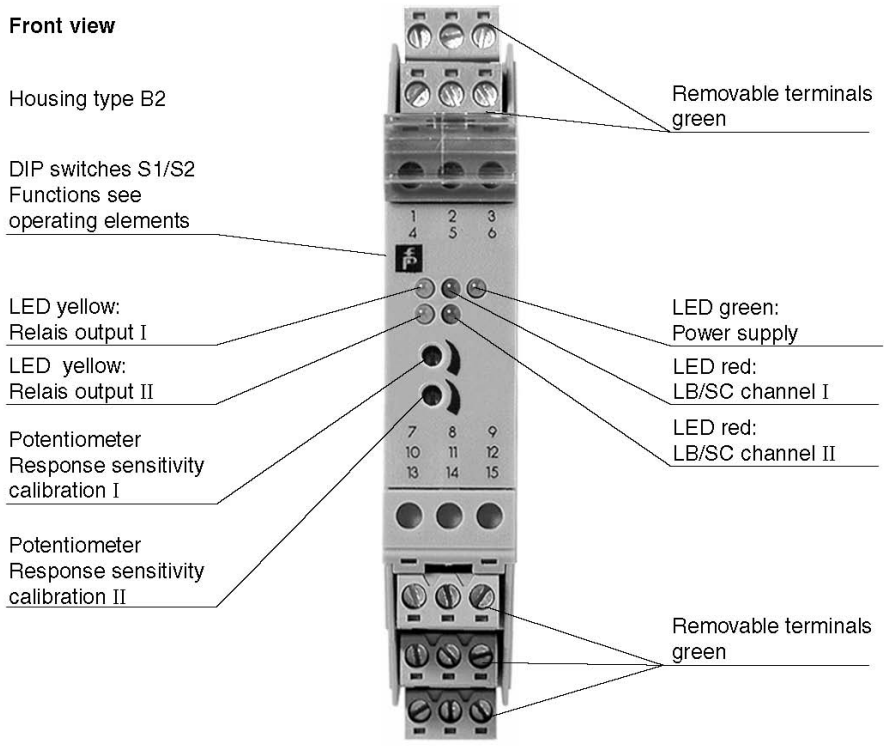
Connection



KFD2-ER-2.W.LB only

(2. channel in clips)
*Resistor inevitably by activated lead breakage monitoring.

Composition



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	KFD2-ER-2.W.LB	KFA5-ER-2.W.LB	KFA6-ER-2.W.LB
Supply			
Connection	Power Rail or terminals 14+, 15-	terminals 14, 15	terminals 14, 15
Rated voltage	20 ... 30 V DC	103.5 ... 126 V AC, 45 ... 65 Hz	207 ... 253 V AC, 45 ... 65 Hz
Rated current	30 ... 40 mA	12 mA	≤7 mA
Power consumption	-	< 1.2 W	< 1.2 W
Input			
Connection	terminals 1 (mass), 2 (min), 3 (max)		
Control input	min./max. control system: terminals 1, 2, 3 on/off control system: terminals 1, 3		
Response sensitivity	1 ... 150 kΩ, adjustable via potentiometer		
Output			
Connection	terminals 7, 8, 9; 10, 11, 12		
Switch power	max. 192 W, 2000 VA		
Output	relay		
Contact loading	253 V AC/2 A/cos Φ> 0.7; 40 V DC/2 A resistive load		
Time constant for signal damping	0.5 s, 2 s, 5 s, 10 s		
Electrical isolation			
Input/output	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Input/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Output/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}		
Directive conformity			
Electromagnetic compatibility			
Directive 89/336/EC	EN 61326, EN 50081-2		
Conformity			
Insulation coordination	EN 50178		
Electrical isolation	EN 50178		
Electromagnetic compatibility	NE 21		
Protection degree	IEC 60529		
Ambient conditions			
Ambient temperature	-20 ... 60 °C (253 ... 333 K)		
Mechanical specifications			
Protection degree	IP20		
Connection	screw connection, max. 2.5 mm^2		
Mass	approx. 150 g		
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)		
Mounting	Power Rail or pull-out latches using for screw mounting	pull-out latches using for screw mounting	pull-out latches using for screw mounting
General information			
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.		

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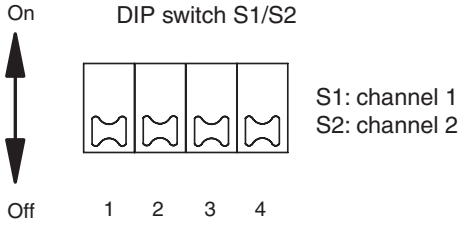
Operating elements

DIP switches function on side of device



DIP switch S1/S2	Position	Function
1	Off On	open circuit current closed circuit current
2	Off On	LB deactivated LB activated

DIP switch 3	DIP switch 4	Time constant for signal damping
Off Off	Off On	0.5 s 2 s
On On	Off On	5 s 10 s

- Open circuit current principle: In open circuit current principle the relay becomes active when the limit is reached.
- Closed circuit current principle: In closed circuit current principle, the relay is activated when power is applied. The relay is deactivated when the limit is reached.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

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- 1-channel
- 24 V DC supply voltage
- 2 switching points operate on 2 output relays (changeover contacts) or limit value 1 actuates both output relays (DIP switch S1.6 in ON position)
- Measuring sockets for switching point (limit value) and actual value
- High/low alarm settable
- Mode of operation adjustable
- Hysteresis 0 % ... 60 % of measuring range, adjustable
- EMC acc. to NAMUR NE 21

KFD2-GS-1.2W

Function

The KFD2-GS-1.2W is a trip amplifier for 2 independently adjustable limit values. Input, output and power supply are galvanically isolated from each other.

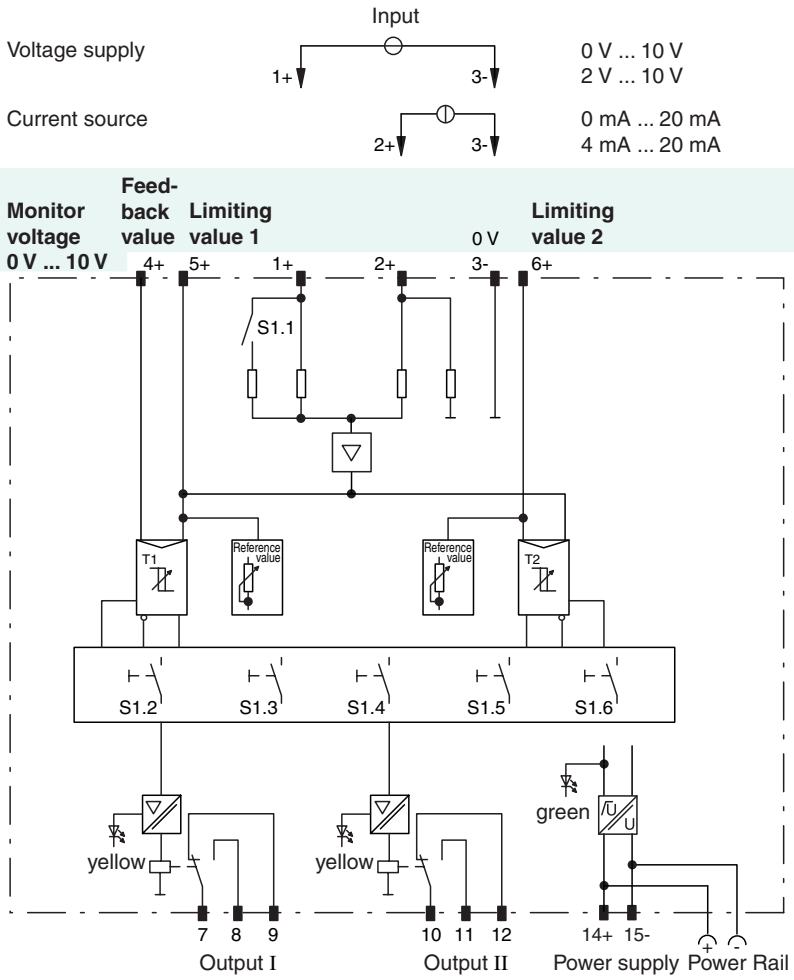
The trip amplifier converts the electrical unit signals 0/4 mA ... 20 mA, 0/1 V ... 5 V, 0/2 V ... 10 V into a proportional internal voltage. A comparator compares this internal voltage with the two preset reference values. The hysteresis, the operating mode of the relay outputs and the type of alarm (high or low) is selectable for each switch point.

High alarm indicates that the status of the relay has changed when the calibrated limit is exceeded. This status changes when a lower value is not met. The difference of both values represents the hysteresis which can be adjusted on the front panel. In a low alarm condition, the alarm signal occurs when the limit value is not met.

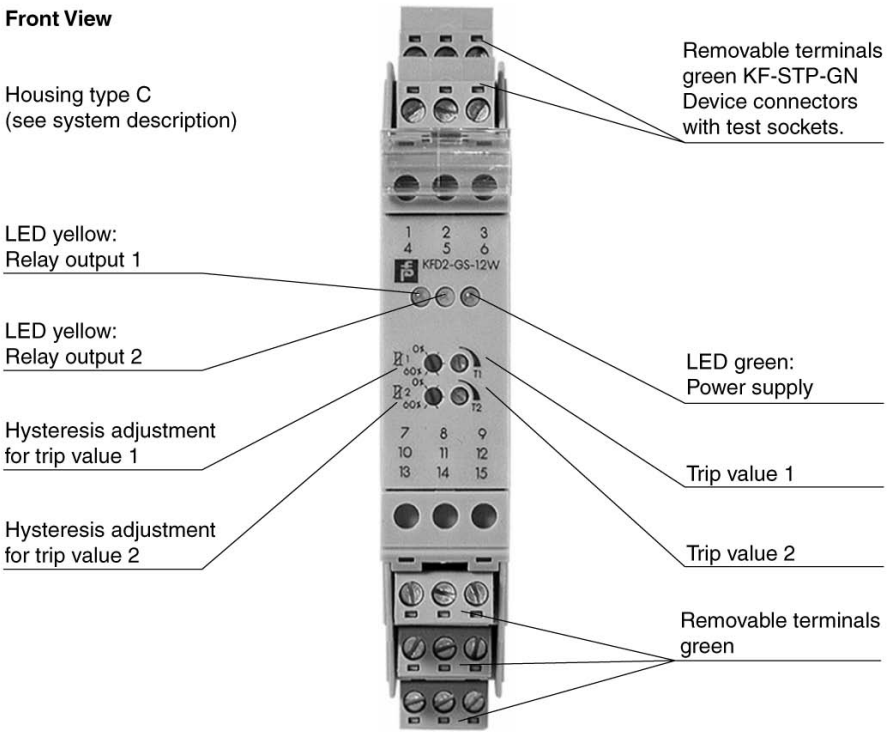
The trip amplifier is adjustable by means of a selector switch and potentiometers.

A monitoring voltage of 0 V ... 10 V can be used via the 2 mm test sockets for the adjustment of the device (limit value, hysteresis). It is possible in this way to adjust the device during operation or without a measurement signal at the input.

Connection



Composition



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Supply	
Connection	Power Rail or terminals 14+, 15-
Rated voltage	20 ... 30 V DC
Rated current	75 mA
Power loss	1 W
Power consumption	2.25 W (typ. 1.68 W)
Input	
Measurement range	terminals 1+, 3-; voltage: 0/1 ... 5 V; 50 kΩ or 0/2 ... 10 V; 100 kΩ terminals 2+, 3-; current: 0/4 ... 20 mA; 50 Ω
Output	
Output I	limit value: terminals 7, 8, 9
Output II	limit value: terminals 10, 11, 12
Contact loading	250 V AC/5 A/1250 VA; 125 V DC/5 A/150 W
Transfer characteristics	
Deviation	≤ 0.5 %
Influence of ambient temperature	0.01 %/K of adjusted limit value
Input delay	100 ms
Electrical isolation	
Input/output	safe isolation acc. to DIN VDE 0106, rated insulation voltage 253 V_{eff}
Input/power supply	function insulation acc. to DIN EN 50178, rated insulation voltage 50 V_{eff}
Output/power supply	safe isolation acc. to DIN VDE 0106, rated insulation voltage 253 V_{eff}
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EC	EN 50081-2, EN 50082-2
Conformity	
Insulation coordination	EN 50178
Electrical isolation	EN 50178
Electromagnetic compatibility	NE 21
Protection degree	IEC 60529
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)

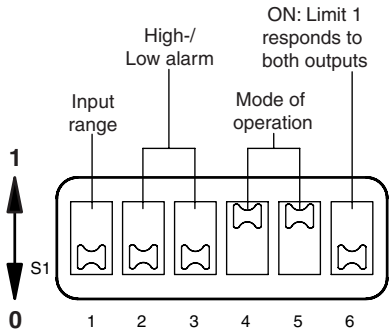
Supplementary information

Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

DIP switch function on the side of device

Delivery status of S1 DIP switch



Switch	Position	Function
S1.1	0	0/2 V ... 10 V input range
	1	0/1 V ... 5 V input range
S1.2	0	Low alarm output I
	1	High alarm output I
S1.3	0	Low alarm output II
	1	High alarm output II
S1.4	0	Relays open in alarm state output I
	1	Relays closed on alarm state output I
S1.5	0	Relays open in alarm state output II
	1	Relays closed on alarm state output II
S1.6	0	Output I independent of output II
	1	Limit 1 responds to both outputs

Adjustment instructions
The following applies to the 0 mA ... 20 mA, 0 V ... 5 V, 0 V ... 10 V unit input signals:

1. Connect a voltmeter to terminals 5+, 3- for limit 1 or to terminals 6+, 3- for limit 2. 10 V represent 100 %, 0 V represent 0 % of the input measurement range.
2. The switch point for limit 1 or limit 2 are set with potentiometers T1 or T2.

Example:

Input signal 0 V ... 5 V
Switch point 2.5 V

2.5 V represent 50 % of the input measurement range. The voltage between terminals 5+, 3- or 6+, 3- should then be adjusted to 5 V (represent 50 %).

The following applies to the 4 mA ... 20 mA, 1 V ... 5 V, 2 V ... 10 V unit input signals:

1. Connect a voltmeter to terminals 5+, 3- for limit 1 or to terminals 6+, 3- for limit 2. 10 V represent 100 % , 2 V represent 0 % of the input measurement range.
2. The switch point for limit 1 or limit 2 are set with potentiometers T1 or T2.
   The selected switch point (SP) represents y % of the input measurement range.
   y = (SP - lower input value)/(upper input value - lower input value)
   The limit value (LV) is calculated using the following formula: LV = (y x 8 V) + 2 V

Example:

Input signal 4 mA ... 20 mA
Switch point (SP) 12 mA

y = (12 mA - 4 mA)/(20 mA - 4 mA), y = 50 %
LV = (50 % x 8 V) + 2 V, LV = 6 V

12 mA represent 50 % of the input measurement range. The voltage (LV) between terminals 5+, 3- or 6+, 3- should be adjusted to 6 V (represent 50 %).

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Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

- 1-channel
- Galvanically isolated output
- 24 V DC supply voltage
- SMART capable up to 7.5 kHz (-3 dB)
- EMC acc. to NAMUR NE 21
- Up to SIL2 acc. to IEC 61508

Input 0/4 mA ... 20 mA
Output 0/4 mA ... 20 mA

KFD2-STC4-1

Function

SMART transmitter power supplies provide a 2- or 3-wire SMART transmitter and transfer the analogue values.

Digital signals may be superimposed on the analogue values, which will transferred bidirectionally. Handheld terminals should be connected as shown in the block diagram.

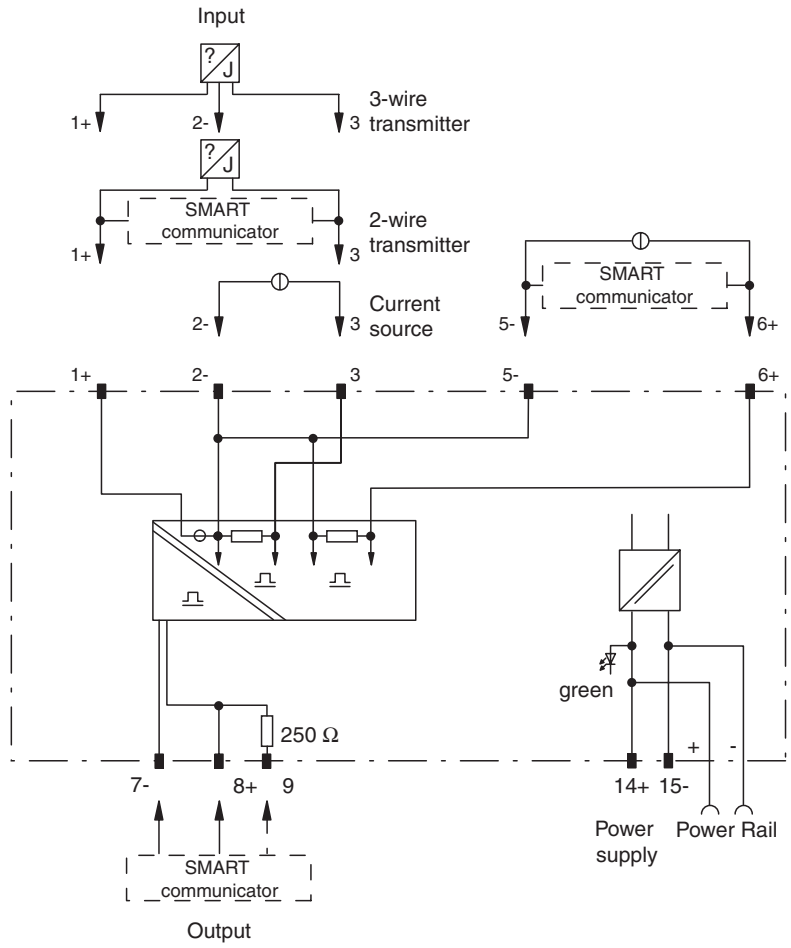
An internal resistor at terminal 9 is available, which may be used to increase the AC impedance for the HART signal.

SMART transmitter power supplies are delivered with terminal type KF-STP-**. Jacks are integrated in these terminals for the connection of the handheld units.

Application

- Power supply for SMART transmitters and transfer of the measurement current to the output
- for the transfer of a current source
- suited for the following SMART systems:
  ABB, Endress+Hauser, Emerson, Fuji, Smar, VEGA, Yokogawa

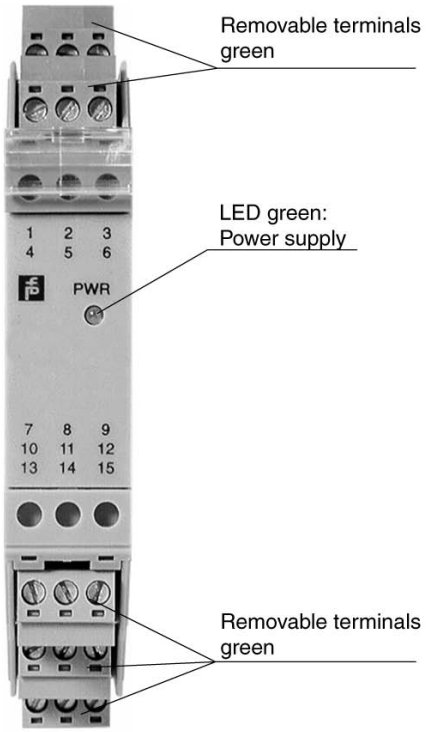
Connection



Composition

Front view

Housing type B2
(see system description)



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Supply	
Connection	Power Rail or terminals 14+, 15-
Rated voltage	20 ... 35 V DC
Ripple	within the supply tolerance
Power consumption	1.9 W
Input	
Connection	terminals 1+, 2-, 3 or 5-, 6+
Input signal	0/4 ... 20 mA
Input resistance	≤ 64 Ω terminals 2-, 3
Available voltage	≥ 16 V at 20 mA, terminals 1+, 3
Output	
Connection	terminals 7-, 8+, 9
Load	0 ... 800 Ω
Output signal	0/4 ... 20 mA (overload > 25mA)
Ripple	≤ 50 μA_{eff}
Transfer characteristics	
Deviation	at 20 °C (293 K), 4 ... 20 mA ≤ 20 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature	≤ 20 ppm/K
Frequency range	bandwidth at 0.5 V_{pp}-signal 0 ... 7.5 kHz (-3 dB) bandwidth at 0.5 V_{pp}-signal 0.3 ... 7.5 kHz (-3 dB)
Electrical isolation	
Input/output	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}
Input/power supply	basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}
Output/power supply	basic insulation acc. to EN 50178, rated insulation voltage of 50 V AC
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EC	EN 61326, EN 50081-2
Conformity	
Electrical isolation	EN 50178
Electromagnetic compatibility	NE 21
Protection degree	IEC 60529
Input	EN 60947-5-6
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)
General information	
Supplementary information	Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

- 1-channel
- Device installation permissible in zone 2
- Input EEx ia IIC; U_o = 25.4 V
- Galvanically isolated output
- 24 V DC supply voltage
- SMART capable up to 7.5 kHz (-3 dB)
- EMC acc. to NAMUR NE 21
- Up to SIL2 acc. to IEC 61508

Input 0/4 mA ... 20 mA
Output 0/4 mA ... 20 mA

KFD2-STC4-Ex1

Function

SMART transmitter power supplies provide a 2- or 3-wire SMART transmitter and transfer the analogue values.

Digital signals may be superimposed on the analogue values, which will transferred bidirectionally. Handheld terminals should be connected as shown in the block diagram.

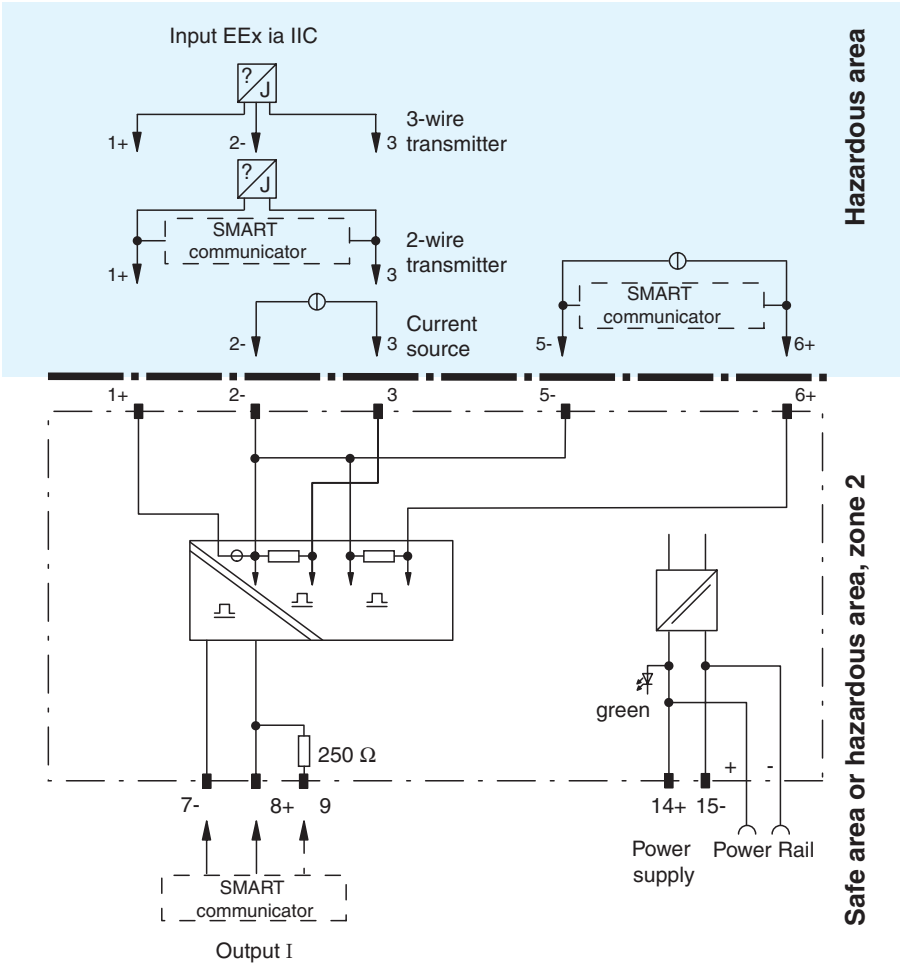
An internal resistor at terminal 9 is available, which may be used to increase the AC impedance for the HART signal.

SMART transmitter power supplies are delivered with terminal type KF-STP-**. Jacks are integrated in these terminals for the connection of the handheld units.

Application

- Power supply for SMART transmitters and transfer of the measurement signal to the output
- for the transfer of a current source to the safe area
- suitable for the following SMART systems:
  ABB, Endress+Hauser, Emerson, Fuji, Smar, VEGA, Yokogawa

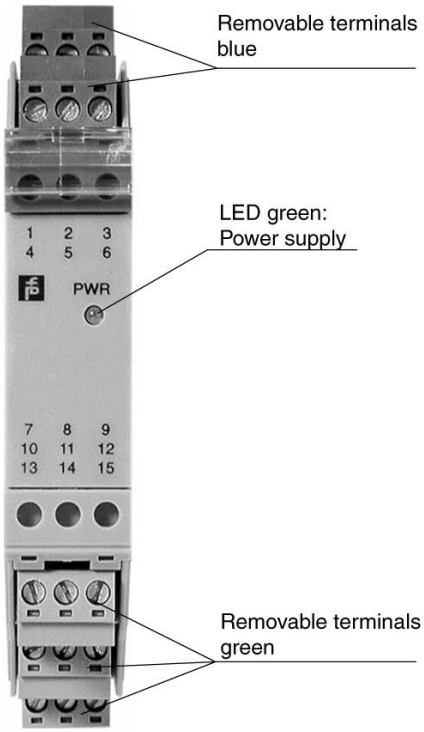
Connection



Composition

Front view

Housing type B2
(see system description)



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Supply		
Connection		Power Rail or terminals 14+, 15-
Rated voltage		20 ... 35 V DC
Ripple		within the supply tolerance
Power consumption		1.9 W
Input		
Connection		terminals 1+, 2-, 3 or 5-, 6+
Input signal		0/4 ... 20 mA
Input resistance		≤ 64 Ω terminals 2-, 3; ≤ 500 Ω terminals 1+, 3 (250 Ω load)
Available voltage		≥ 16 V at 20 mA terminals 1+, 3
Output		
Connection		terminals 7-, 8+, 9
Load		0 ... 800 Ω
Output signal		0/4 ... 20 mA (overload > 25mA)
Ripple		≤ 50 μA_{rms}
Transfer characteristics		
Deviation		at 20 °C (293 K), 4 ... 20 mA ≤ 10 µA incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage
Influence of ambient temperature		0.25 µA/°C
Frequency range		hazardous area into the safe area: bandwidth with 0.5 V_{pp}-signal 0 ... 7.5 kHz (-3 dB) safe area into the hazardous area: bandwidth with 0.5 V_{pp}-signal 0.3 ... 7.5 kHz (-3 dB)
Rise time		20 µs
Electrical isolation		
Output/power supply		basic insulation acc. to EN 50178, rated insulation voltage of 50 V AC
Directive conformity		
Electromagnetic compatibility		
Directive 89/336/EC		EN 61326, EN 50081-2
Conformity		
Electromagnetic compatibility		NE 21
Protection degree		IEC 60529
Ambient conditions		
Ambient temperature		-20 ... 60 °C (253 ... 333 K)
Mechanical specifications		
Protection degree		IP20
Mass		approx. 200 g
Dimensions		20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate		BAS 99 ATEX 7060, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection		⟨Ex⟩ II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C) [circuit(s) in zone 0/1/2]
Input		EEx ia IIC
Supply		
Safety maximum voltage U_m		250 V (Attention! The rated voltage can be lower.)
Equipment		terminals 1+, 3-
Voltage	U_i	30 V
Current	I_i	115 mA
Voltage	U_o	25.4 V
Current	I_o	86.8 mA
Power	P_o	551 mW
Internal capacitance	C_i	12 nF
Internal inductance	L_i	0 mH
Equipment		terminals 2-, 3
Current I_o/Current I_i		74 mA/115 mA
Current	I_i	115 mA
Voltage	U_o	3.5 V
Current	I_o	74 mA
Power	P_o	64 mW
Equipment		terminals 1+, 2/3-
Voltage	U_o	25.4 V
Current	I_o	115 mA
Power	P_o	584 mW
Equipment		terminals 5-, 6+
Voltage	U_i	30 V
Current	I_i	115 mA

Voltage	U_o	8.7 V
Current	I_o	0 mA
Output		
Safety maximum voltage U_m		250 V (Attention! The rated voltage can be lower.)
Statement of conformity		TÜV 99 ATEX 1499 X, observe statement of conformity
Group, category, type of protection, temperature classification		⟨Ex⟩ II 3G EEx nA II T4 [device in zone 2]
Electrical isolation		
Input/output		safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Input/power supply		safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Directive conformity		
Directive 94/9 EC		EN 50014, EN 50020, EN 50021
General information		
Supplementary information		EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

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- 1-channel
- Input EEx ia IIC
- 24 V DC supply voltage
- Current or voltage output
- Accuracy 0.05 %
- EMC acc. to NAMUR NE 21

KFD2-PT2-Ex1**

Replacement device for KFD2-PT-Ex1
Attention: output polarity now 7-, 8+

Function

The KFD2-PT2-Ex1 supplies power to the potentiometers in the hazardous area.

The loop voltages are transmitted.

The KFD2-PT2-Ex1 is available with current and voltage outputs (terminals 7 and 8).

It can be operated in the 3-, 4- or 5-wire mode with the potentiometer.

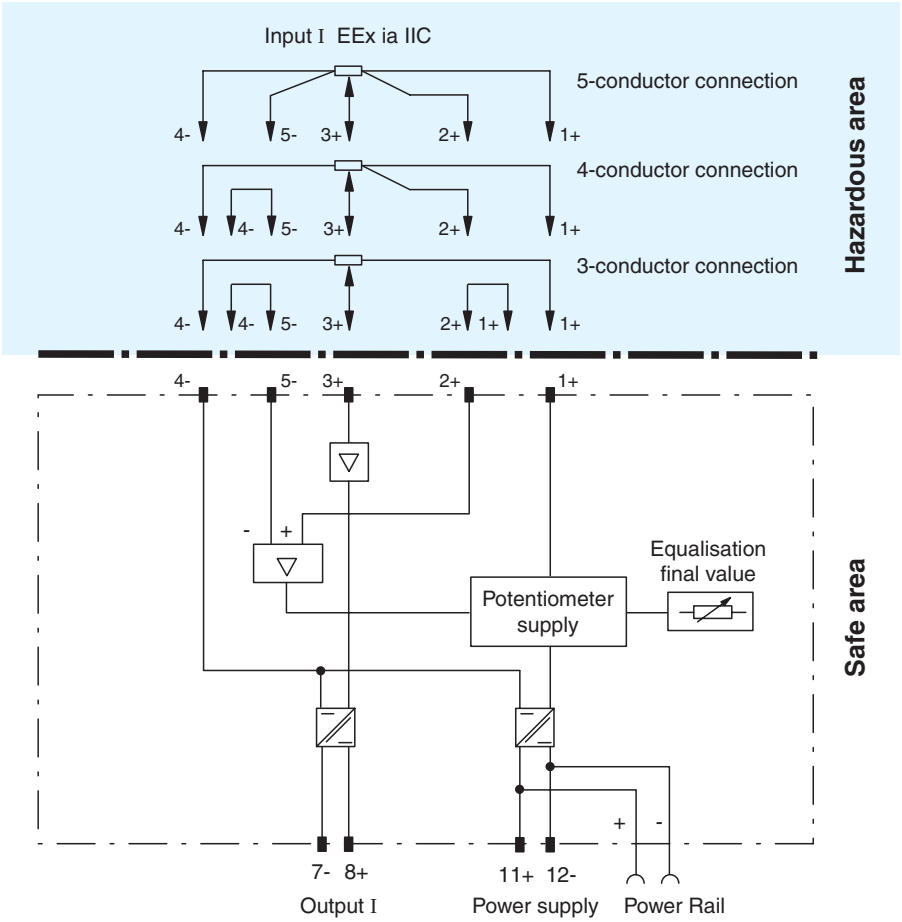
In the 5-wire mode of operation, the potentiometer voltage is measured at terminals 2 and 5 and automatically readjusted. For a 4-wire connection on the KFD2-PT2-Ex1, terminals 4- and 5- are bridged. With the resistance adjustment on the front housing panel, it is possible to adjust the final value. For potentiometer resistances greater than 1 kΩ, the potentiometer can be used to compensate for lead resistances up to 5 % of the potentiometer value. For potentiometer values in a range of 800 Ω up to 1 kΩ the adjustment value is 50 Ω. During adjustment, the potentiometer is set to 100 % of its value and the output signal is adjusted to 100 % of the required value. This adjustment can be repeated setting the potentiometer to 0 %.

Terminals 4 and 5 as well as 1 and 2 must be bridged for a 3-wire connection to the potentiometer.

Application

Because of the high transfer accuracy, the unit is well suited for precise path or positioning requirements per potentiometer, reference element, etc.

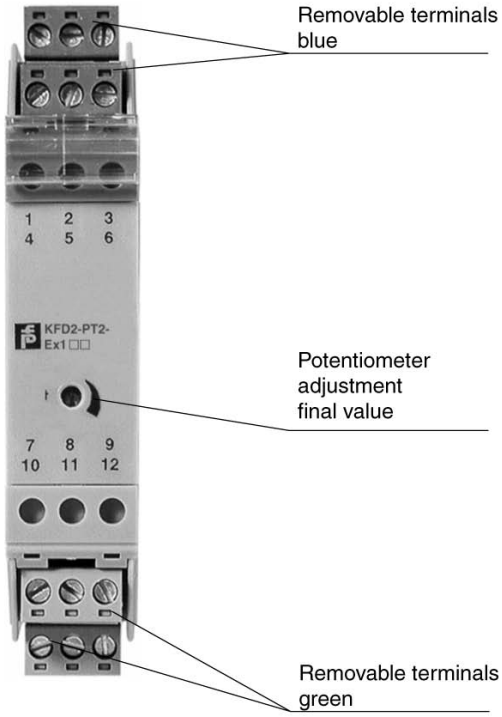
Connection



Composition

Front View

Housing type A4
(see system description)



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Supply	
Connection	Power Rail or terminals 11+, 12-
Rated voltage	20 ... 35 V DC
Ripple	within the supply tolerance
Power loss	0.5 W
Power consumption	0.6 W for voltage output; 1.3 W
Input	
Connection	terminals 4-, 5-, 3+, 2+, 1+
Lead resistance	≤ 50 Ω at potentiometer resistance ≤ 1 kΩ; 5 % of the potentiometer resistance at ≥ 1 kΩ (can be equalised by user)
Potentiometer resistance	≥ 800 Ω
Potentiometer voltage	approx. 4.7 V
Output	
Voltage output	0/1 ... 5 V or 0/2 ... 10 V
Connection	terminals 7-, 8+
Current output	0/4 ... 20 mA; load ≤ 1 kΩ
Output resistance	≤ 30 Ω
Transfer characteristics	
Deviation	
Linearity	≤ ± 5 mV in case of voltage output/≤ ± 10 µA in case of current output
Influence of ambient temperature	≤ 5 mV/K in case of voltage output/≤ 1 µA in case of current output
Rise time	10 to 90 % ≤ 8 ms; 10 to 90 % within 1 % of span ≤ 25 ms
Electrical isolation	
Output/power supply	basic insulation acc. to EN 50178, rated insulation voltage of 50 V AC
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EC	EN 50081-2, EN 50082-2, IEC 801-6 intensity level 2
Conformity	
Insulation coordination	EN 50178
Electrical isolation	EN 50178
Electromagnetic compatibility	NE 21
Protection degree	IEC 60529
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 120 g
Dimensions	20 x 107 x 115 mm (0.8 x 4.2 x 4.5 in)
Data for application in conjunction with hazardous areas	
EC-Type Examination Certificate	BAS 00 ATEX 7171, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection	⟨Ex⟩ II (1)GD [EEx ia] IIC (-20 °C ≤ T_{amb} ≤ 60 °C)
Voltage U_o	10.4 V
Current I_o	31.4 mA
Power P_o	82 mW
Supply	
Safety maximum voltage U_m	250 V (Attention! The rated voltage can be lower.)
Output	
Safety maximum voltage U_m	250 V (Attention! The rated voltage can be lower.)
Electrical isolation	
Input/output	safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Input/power supply	safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Directive conformity	
Directive 94/9 EC	EN 50014, EN 50020

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

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Notes

The KFD2-PT2-Ex1 is available with various output options.

Model number	Output	Model number	Output	Model number	Output
KFD2-PT2-Ex1	0 V ... 10 V	KFD2-PT2-Ex1-2	2 V ... 10 V	KFD2-PT2-Ex1-4	0 mA ... 20 mA
KFD2-PT2-Ex1-1	0 V ... 5 V	KFD2-PT2-Ex1-3	1 V ... 5 V	KFD2-PT2-Ex1-5	4 mA ... 20 mA

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

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- 2-channel
- 90 V AC to 253 V AC wide range power pack
- Input for contacts, PNP/NPN sensors or push-pull output stages
- 2-channel switching amplifier with 1 changeover contact each
- Selectable min/max control (bistable control)
- Signal doubling: one input is switching both relay outputs (not for min/max control)
- Reversible mode of operation
- Both channels separate adjustable

KFA6-SR-2.3L

Function

The sensor amplifier transmits digital signals, optionally from 3-wire sensors or from sensors with push-pull outputs.

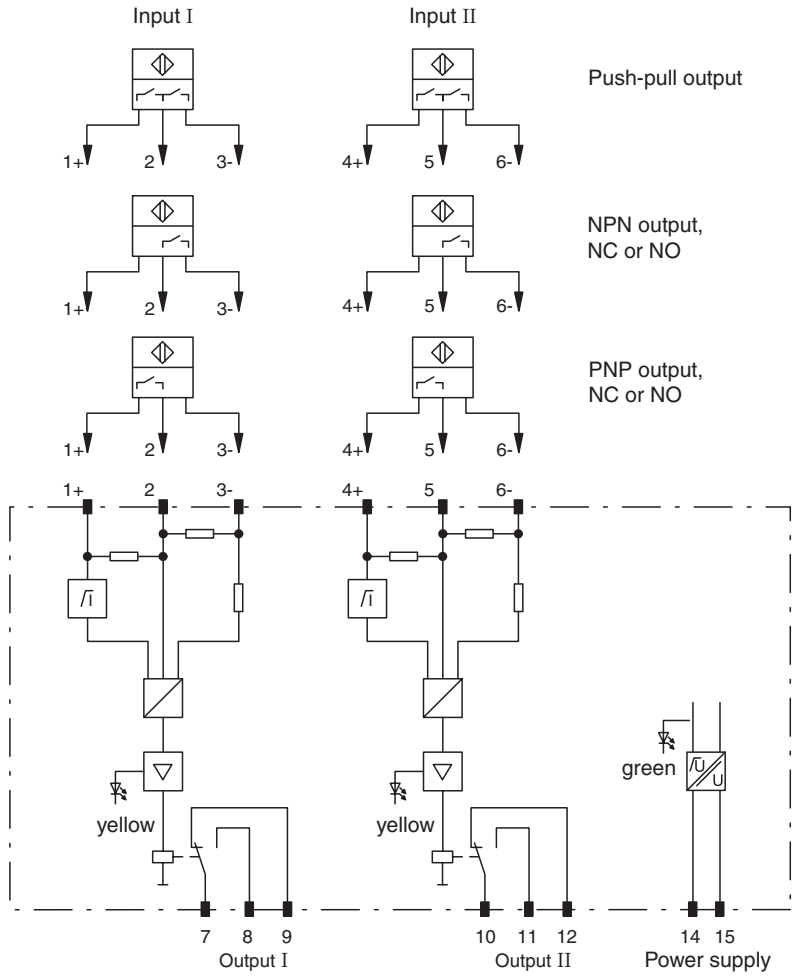
The selectable bistable operating behaviour (for min/max control) allows the use for a two point regulation, e. g. to control a level.

Signal doubling:
Jumper terminals 2 and 5, one input is switching both relay outputs (not for min/max control).

Application

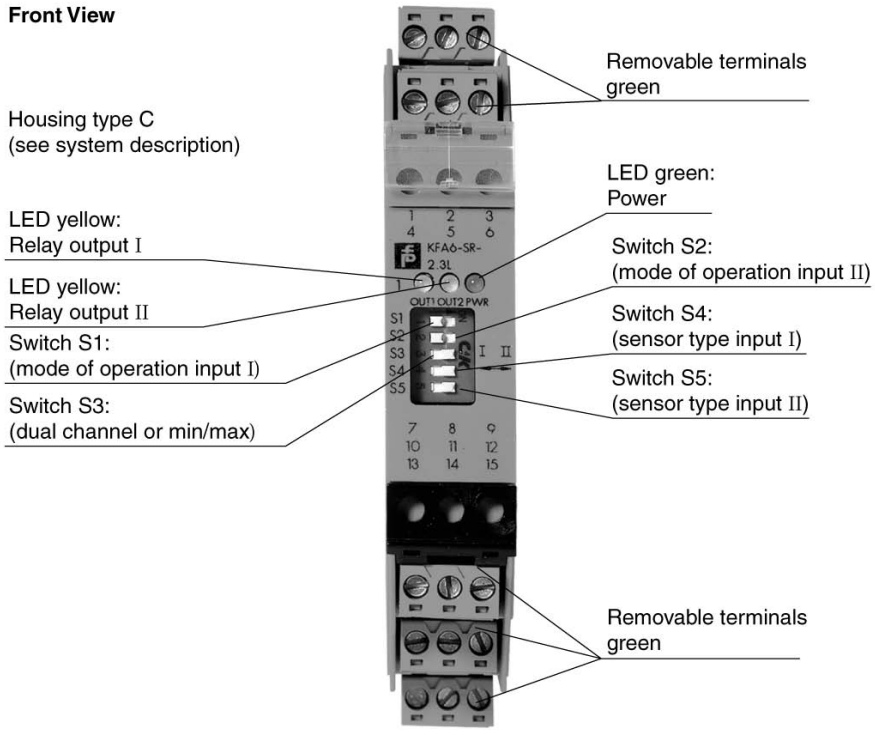
- Pump control for filling or emptying of vessels (control signal from the level sensors)
- Direction control for opening and closing of sluices and gates (control signal from the end position sensors)
- Two-point control (min/max control) with storage of status (control signal from the min/max senors)
- Dual channel switching amplifier with 24 V/100 mA sensor supply and relay output as change-over contact

Connection



Composition

Front View



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Supply	
Connection	terminals 14, 15
Rated voltage	90 ... 253 V AC, 45 ... 65 Hz
Rated current	≤ 150 mA
Power loss	2.5 W
Power consumption	≤ 7 W
Input	
Connection	Input I: terminals 1+, 2, 3-; Input II: terminals 4+, 5, 6-
Rated values	22 ... 24 V DC/100 mA, see notes
Short-circuit current	110 mA
Output	
Connection	output I: terminals 7, 8, 9 output II: terminals 10, 11, 12
Output I and II	
Contact loading	250 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energised/de-energised delay	max. 6 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	≤ 10 Hz
Electrical isolation	
Input/output	safe electrical isolation per EN 50178, voltage peak value 253 V
Input/power supply	safe electrical isolation per EN 50178, voltage peak value 253 V
Output/power supply	safe electrical isolation per EN 50178, voltage peak value 253 V
Output/output	basic insulation acc. to EN 50178, rated insulation voltage 253 V_{eff}
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EC	EN 50081-2, EN 50082-2
Conformity	
Electrical isolation	EN 50178
Electromagnetic compatibility	NE 21
Protection degree	IEC 60529
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)

Supplementary information

Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

Function

The isolated amplifier has two inputs and two relay outputs (change-over contact) and is usable either as dual channel isolated amplifier or as two-point control (min/max control).
The inputs are designed in a way, that the signals of sensors which have PNP or NPN output transistors as well as push-pull outputs, can be processed. In the case of sensors with push-pull outputs the switches S4 or S5 have to be set to position I. For sensors with PNP or NPN output transistors, the switches S4 or S5 have to be set to position II. The operating behaviour of the sensor can be selected: NO S1/S2 in position I; NC S1/S2 in position II.

Dual channel switching amplifier for binary sensors or contacts

With this function (S3 in position I) contact or sensor signals from the input are transmitted to the relay output.

Parallel operation (1 input, 2 outputs)
A signal duplication can be realized by the following measures:

- Jumper terminal 2 to terminal 5.
- One sensor to input I or II.

Two-point control (min/max control) with storage of status

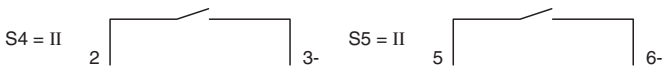
On this setting (S3 in position II) the information from the two inputs is combined.
When the supply voltage is switched on, relay 1 is energised until input 2 is activated (reset input). Input 1 works as an set input.

Truth table (min/max control)

Conditions	Inputs		Outputs relay I and II
	E I	E II	
Activation of the supply voltage	not activated	not activated	relay energised
	activated	not activated	relay energised
	activated	activated	relay de-energised
Normal operation	activated	transition: not activated/activated	relay de-energising
	transition: activated/not activated	not activated	relay energising

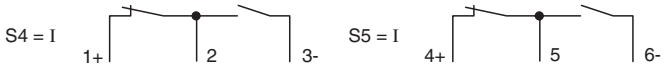
Sensor connection

NPN output/contact



PNP output/contact

Push-pull output



Function of the DIP switches

Function	Switch function	Switch/position
Operating behaviour of the sensor input	input 1 is activated if sensor 1 is closed	S1/I
	input 1 is activated if sensor 1 is open	S1/II
	input 2 is activated if sensor 2 is closed	S2/I
	input 2 is activated if sensor 2 is open	S2/II
Dual channel or min/max	dual channel independent	S3/I
	min/max function with storage of the status	S3/II
Sensor type	input 1: push-pull output stage, NO	S4/I
	input 1: PNP/NPN, NO	S4/II
	input 2: push-pull output stage, NO	S5/I
	input 2: PNP/NPN, NO	S5/II

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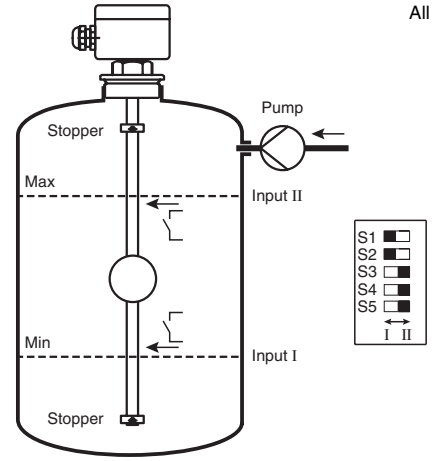
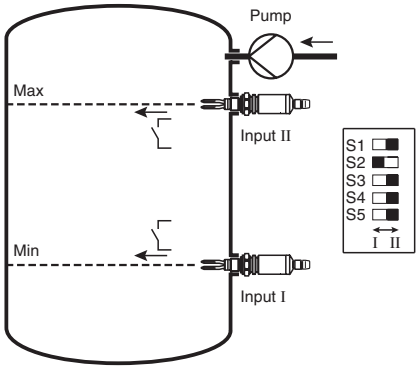
Example 1: filling of a vessel (two-point level control, S3 in position II)

Min contact or min sensor is connected to input 1 (set), max contact or max sensor is connected to input 2 (reset). Dip switch S1 and S2 are on position I. A filling pump is connected to output 1 or 2 (terminals 7/8 or 10/11).

All data refer to NO sensors.



with limit value immersion probe



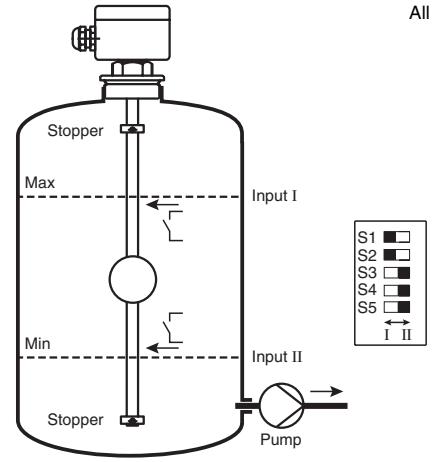
with vibration limit switch

When the supply voltage of the KFA6-SR-2.3L is switched on, the pump will also switched on as long as the Max contact is not activated. During operation the pump is switched off as soon as the level has reached max position. If the level reach min position, the pump is switched on. If the KFA6-SR-2.3L has no power supply, the pump is switched off.

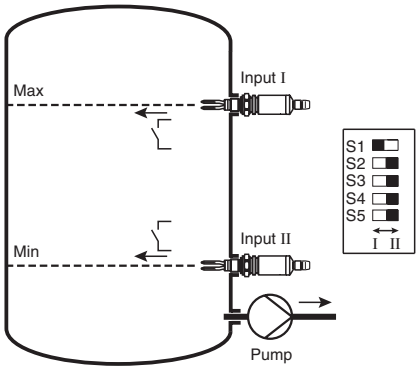
Example 2: emptying of a vessel (two-point level control, S3 in position II)

Max contact or max sensor is connected to input 1 (set), min contact or min sensor is connected to input 2 (reset). Dip switch S1 and S2 are set to position I. An emptying pump is connected to output 1 or 2 (terminals 7/9 or 10/12.

All data refer to NO sensors.



with limit value immersion probe



with vibration limit switch

When the supply voltage of the KFA6-SR-2.3L is switched on, the pump will also switched on, if max contact is activated. During operation the pump is switched off as soon as the level has reached min position. If the level reach max position, the pump switched on. If the KFA6-SR-2.3L has no power supply, the pump is switched on.

Comments:

1. NO with push-pull output stage means that the closing contact or transistor is connected to terminal 2 and 3 (5 and 6).
   NC with push-pull output stage means that the opening contact or transistor is connected to terminal 2 and 3 (5 and 6).
2. In dip switch position S3/I (dual channel, independent) an output relay is activated if the corresponding input is activated.

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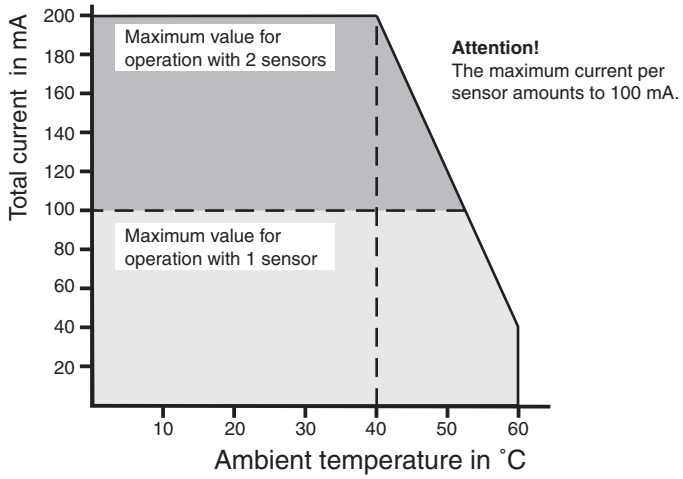
Derating of the sensor currents in dependence of the ambient temperature

The maximum value of the sensor currents is controlled by a thermal overload protection of the device.

Attention

The device determines its ambient temperature and limits the sensor currents accordingly (see figure). An inadmissibly high ambient temperature can limit the function of the sensors.



Attention!
The maximum current per sensor amounts to 100 mA.

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- 1-channel
- Control circuit EEx ia IIC
- Reversible mode of operation
- 1 relay output with 1 changeover contact
- EMC acc. to NAMUR NE 21
- LB/SC monitoring
- LB/SC collective error message via Power Rail
- Up to SIL2 acc. to IEC 61508

KFD2-SR2-Ex1.W

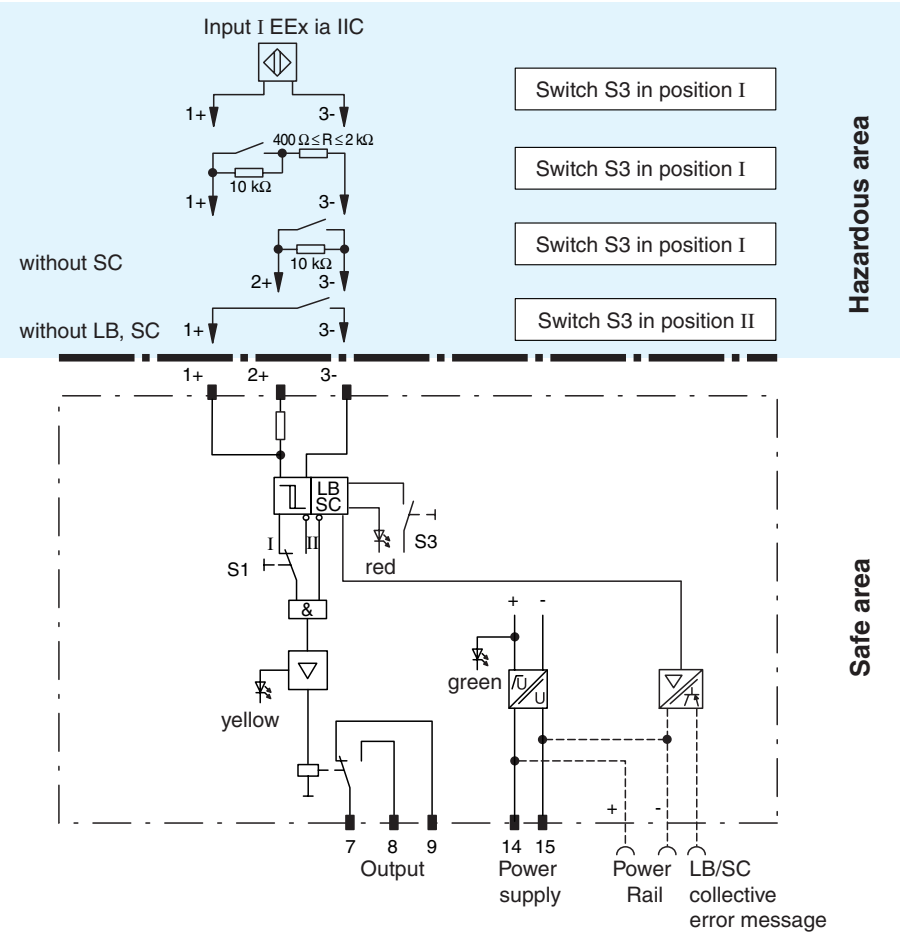
Function

The transformer isolated barrier transfers digital signals from the hazardous area. Sensors per EN 60947-5-6 (NAMUR) and mechanical contacts may be used as alarms. Control circuits are monitored for lead breakage (LB) and short circuit (SC). The external faults are indicated according to NAMUR NE44 by a red flashing LED.

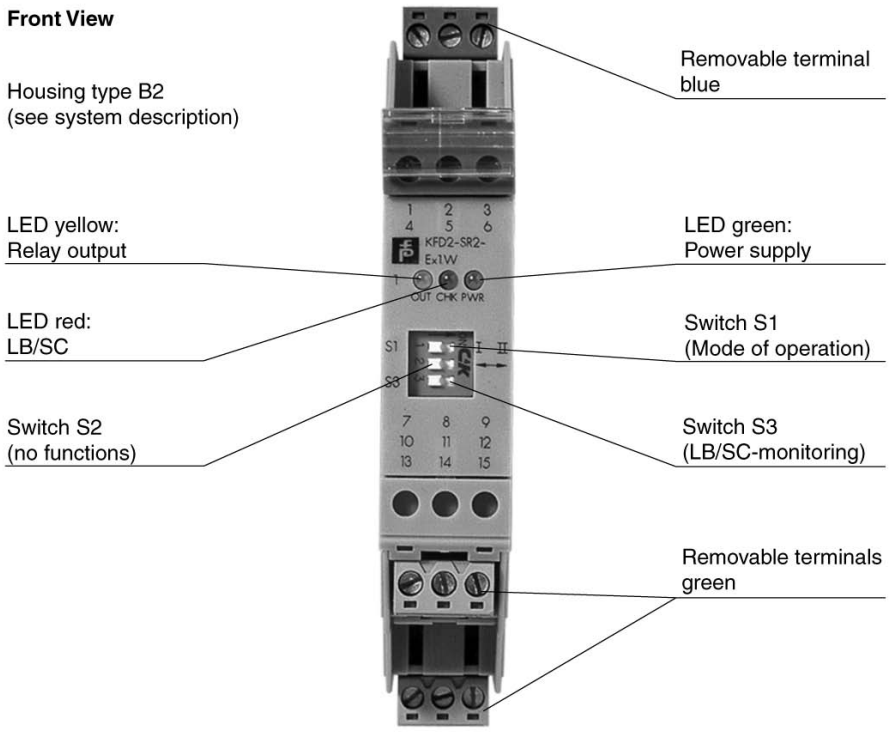
For type KFD2-SR2-Ex1.W, an LB/SC collective error message is in addition transferred through the Power Rail to the power feed module.

The intrinsically safe input is per EN 50020 safely isolated from the output and the power supply. The relay output is in accordance with IEC 61140 safely isolated from the power supply.

Connection



Composition



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Supply	
Connection	Power Rail or terminals 14+, 15-
Rated voltage	20 ... 30 V DC
Ripple	≤ 10 %
Rated current	≤ 30 mA
Power loss	0.7 W
Power consumption	< 0.9 W
Input	
Connection	terminals 1+, 2+, 3-
Rated values	acc. to EN 60947-5-6 (NAMUR), see system description for electrical data
Open-circuit voltage/short-circuit current	approx. 8 V DC/approx. 8 mA
Switching point/Switching hysteresis	1.2 ... 2.1 mA/approx. 0.2 mA
Pulse/Pause ratio	≥ 20 ms/≥ 20 ms
Lead monitoring	breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output	
Connection	terminals 7, 8, 9
Output	signal; relay
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Minimum switch current	2 mA/24 V DC
Energised/de-energised delay	approx. 20 ms/approx. 20 ms
Mechanical life	10^7 switching cycles
Transfer characteristics	
Switching frequency	< 10 Hz
Electrical isolation	
Output/power supply	reinforced insulation acc. to IEC 61140, rated insulation voltage 300 V_{eff}
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EC	EN 61326
Low voltage	
Directive 73/23/EEC	IEC 62103
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	IEC 60529
Protection against electric shock	IEC 61140
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Mechanical specifications	
Protection degree	IP20
Mass	approx. 150 g
Dimensions	20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)
Data for application in conjunction with hazardous areas	
EC-Type Examination Certificate	PTB 00 ATEX 2080, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection	⟨Ex⟩ II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Input	EEx ia IIC
Voltage U_o	10.5 V
Current I_o	13 mA
Power P_o	34 mW (linear characteristic)
Supply	
Safety maximum voltage U_m	253 V AC/125 V DC (Attention! U_m is no rated voltage.)
Output	
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Safety maximum voltage U_m	253 V AC (Attention! The rated voltage can be lower.)
Statement of conformity	Pepperl+Fuchs
Group, category, type of protection	⟨Ex⟩ II (3)G (EEx nL) IIC X [circuit(s) in zone 2]
Input	[EEx nL] IIC
Voltage U_o	10.5 V
Current I_o	13 mA
Power P_o	34 mW (linear characteristic)
Output	
Contact loading	253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Statement of conformity	TÜV 99 ATEX 1493 X, observe statement of conformity

Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G EEx nAC IIC T4 [device in zone 2]
Output	
Contact loading	50 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Electrical isolation	
Input/output	safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Input/power supply	safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Directive conformity	
Directive 94/9 EC	EN 50014, EN 50020, EN 50021

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Accessories

Power Rail PR-03
Power Rail UPR-03
Power feed module KFD2-EB2...

Using Power Rail PR-03 or UPR-03 the devices are supplied with 24 V DC by means of the power feed modules. If no Power Rails are used, power supply of the individual devices is possible directly via their device terminals.

Each power feed module is used for fusing and monitoring groups with up to 100 individual devices. The Power Rail PR-03 is an inset component for the DIN rail. The Power Rail UPR-03 is a complete unit consisting of the electrical inset and an aluminium profile rail 35 mm x 15 mm x 2000 mm. To make electrical contact, the devices are simply engaged.

The Power Rail must not be fed via the device terminals of the individual devices!

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- 2-channel
- Control circuit EEx ia IIC
- Reversible mode of operation
- Bistable
- 1 signal output with 2 changeover contacts
- EMC acc. to NAMUR NE 21
- LB/SC monitoring

230 V AC

KFA6-SR2-Ex2.W.IR

Function

The separation switching amplifier behaves in a bistable manner. It is set by an active signal on input I and is reset by an active signal on input II. The mode of operation of inputs I and II can be programmed. An active signal can be generated if the corresponding sensor is damped or if it is not damped. Both inputs are intrinsically safe, and there are two relays available on the output with one changeover contact each (the relays switch simultaneously).

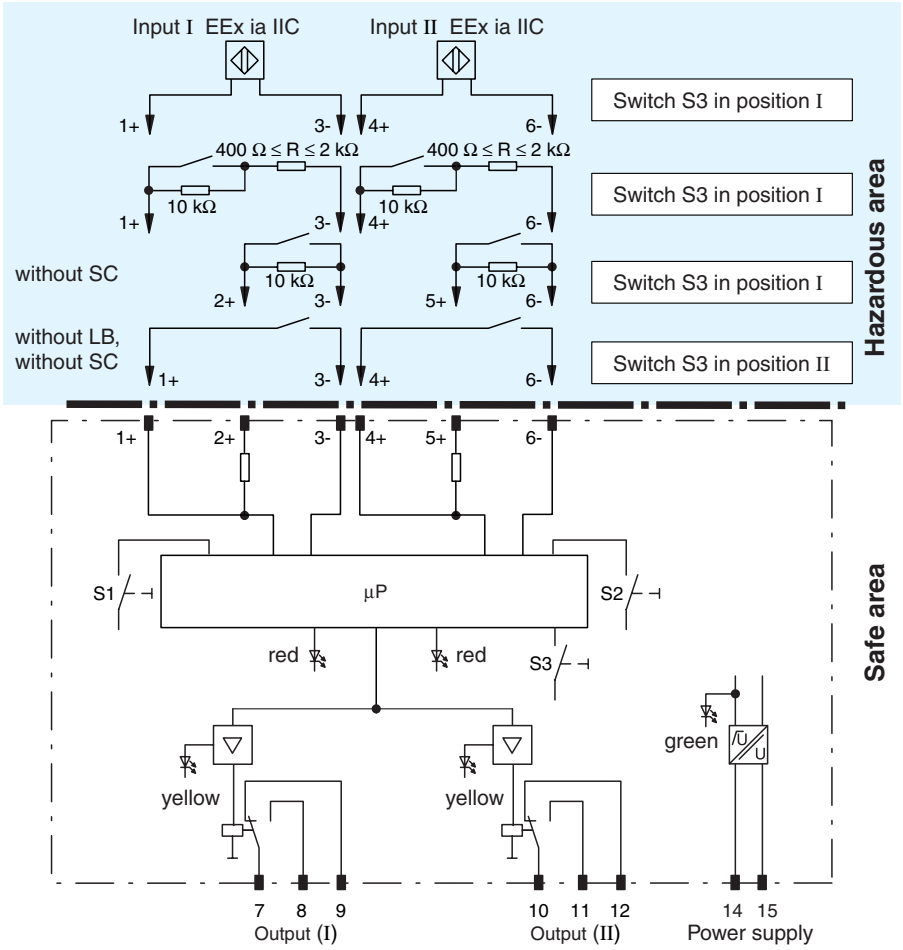
During commissioning, the output relays are switched until an active signal on input II resets them. The mode of operation for input I can be selected with switch S1, while the mode of operation for input II can be selected with switch S2.

Monitoring for a line break opens the output relay if a lead break or short circuit is detected in the control circuit. Switch S3 (de-)activates monitoring for lead break or short circuit.

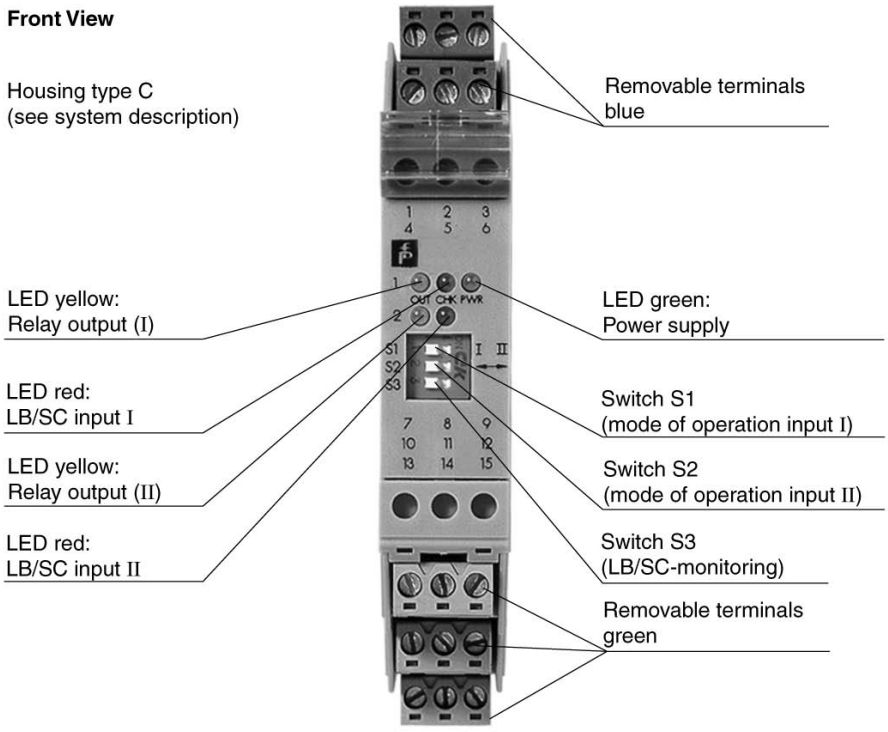
Application

Two-point controller or filling level controller for minimum/maximum control

Connection



Composition



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Supply		
Connection		terminals 14, 15
Rated voltage		207 ... 253 V AC, 45 ... 65 Hz
Power consumption		≤ 1.5 W
Input		
Connection		terminals 1+, 2+, 3-; 4+, 5+, 6-
Rated values		acc. to EN 60947-5-6 (NAMUR)
Open-circuit voltage/short-circuit current		approx. 8 V DC/approx. 8 mA
Pulse/Pause ratio		≥ 10 ms/≥ 10 ms
Lead monitoring		breakage I ≤ 0.1 mA, short-circuit I > 6 mA
Output		
Connection		output I: terminals 7, 8, 9; output II: terminals 10, 11, 12
Output I and II		signal; relay
Contact loading		253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Energised/de-energised delay		approx. 20 ms/approx. 20 ms
Mechanical life		10^7 switching cycles
Transfer characteristics		
Switching frequency		≤ 10 Hz
Electrical isolation		
Output/power supply		safe isolation acc. to DIN VDE 0106, rated insulation voltage 253 V_{eff}
Output/output		basic insulation acc. to EN 50178, rated insulation voltage 253 V_{eff}
Directive conformity		
Electromagnetic compatibility		
Directive 89/336/EC		EN 61326, EN 50081-2
Conformity		
Electrical isolation		EN 50178
Electromagnetic compatibility		NE 21
Protection degree		IEC 60529
Ambient conditions		
Ambient temperature		-20 ... 60 °C (253 ... 333 K)
Mechanical specifications		
Protection degree		IP20
Mass		approx. 150 g
Dimensions		20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate		PTB 00 ATEX 2081, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection		⟨Ex⟩ II (1)GD [EEx ia] IIC [circuit(s) in zone 0/1/2]
Input		EEx ia IIC
Voltage	U_o	10.6 V
Current	I_o	19.1 mA
Power	P_o	51 mW (linear characteristic)
Supply		
Safety maximum voltage U_m		253 V AC/126.5 V AC (Attention! U_m is no rated voltage.)
Output		
Contact loading		253 V AC/2 A/cos Φ> 0.7; 126.5 V AC/4 A/cos Φ> 0.7; 40 V DC/2 A resistive load
Safety maximum voltage U_m		253 V AC (Attention! The rated voltage can be lower.)
Electrical isolation		
Input/input		not available
Input/output		safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Input/power supply		safe electrical isolation acc. to EN 50020, voltage peak value 375 V
Directive conformity		
Directive 94/9 EC		EN 50014, EN 50020

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

Function of the DIP switches

Switch	Position	Function
S1: Mode of operation Input I	I	Input I active, whenever connected sensor damped
	II	Input I active, whenever connected sensor undamped
S2: Mode of operation Input II	I	Input II active, whenever connected sensor damped
	II	Input II active, whenever connected sensor undamped
S3: LB/SC control	I	LB/SC monitoring active
	II	No LB/SC monitoring

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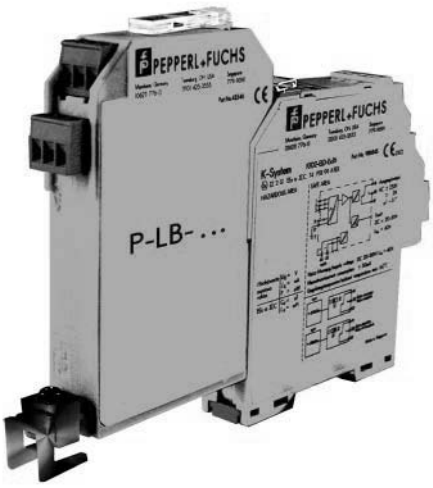

Lightning protection barrier P-LB

Overvoltage diverters are used as modules positioned upstream in the circuit from the corresponding electrical equipment. They make it possible to protect against overvoltages originating from various causes (lightening strikes, switching processes, etc.). This is achieved by diverting the transient current and limiting the voltage throughout the duration of the overvoltage surge.

The complete product selection for lightning protection barriers you will find in the catalogue "DIN-Rail housing".

All information for the approvals and certifications please find at www.pepperl-fuchs.com.

Contents

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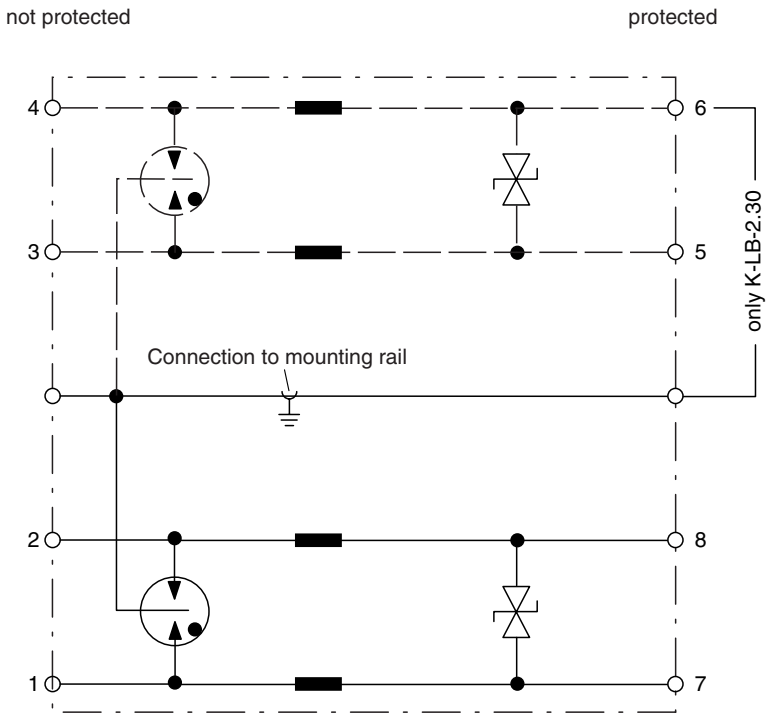
- 2- or 4-wire protection
- For non-insulated measurement and control circuits
- Also for intrinsically safe control circuits EEx ia IIC
- Fulfils requirements to 500 V insulation to earth, housing components and other intrinsically safe circuits
- Installation directly in the hazardous area for protecting the field devices
- Discharge current 10 kA
- Grounding as simple as snapping onto the DIN mounting rail
- Uninterruptable operation (auto reset)

2-wire protection
K-LB-1.30
4-wire protection
K-LB-2.30

Application

With the application of a K-LB-..., field devices and processing units are effectively protected against overvoltages of various origins (i. e. lightning stroke, switching impulse, etc.). Two galvanically isolated circuits can be protected, thus 2 x 2 wires.

Connection



Composition

Front View

Housing type Z1
(see system description)

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	K-LB-1.30	K-LB-2.30
Supply		
Connection	terminals 7, 8; 1, 2	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Ground insulation	500 V breakdown voltage	500 V breakdown voltage
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 100 g	
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 00 ATEX 2176X, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 2(1)G EEx ia IIC T6	
Voltage U_i	30 V	
Current I_i	250 mA	
Maximum leakage current	10 kA (8/20 µs) per core according to IEC 60-2	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistance	≤ 0.3 Ω per conductor	
Bandwidth	≥ 40 kHz	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020	

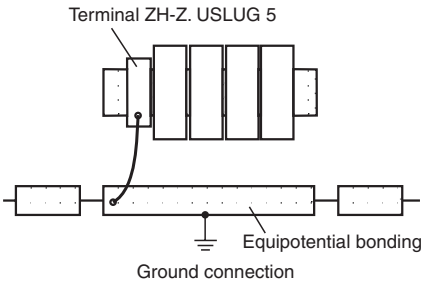
Supplementary information

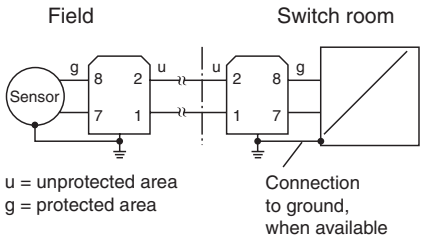
EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

Surge protectors must always be connected to a solid effective ground (large cross sections, short wiring). This is the basic requirement for an effective protection.

Example installations





CE

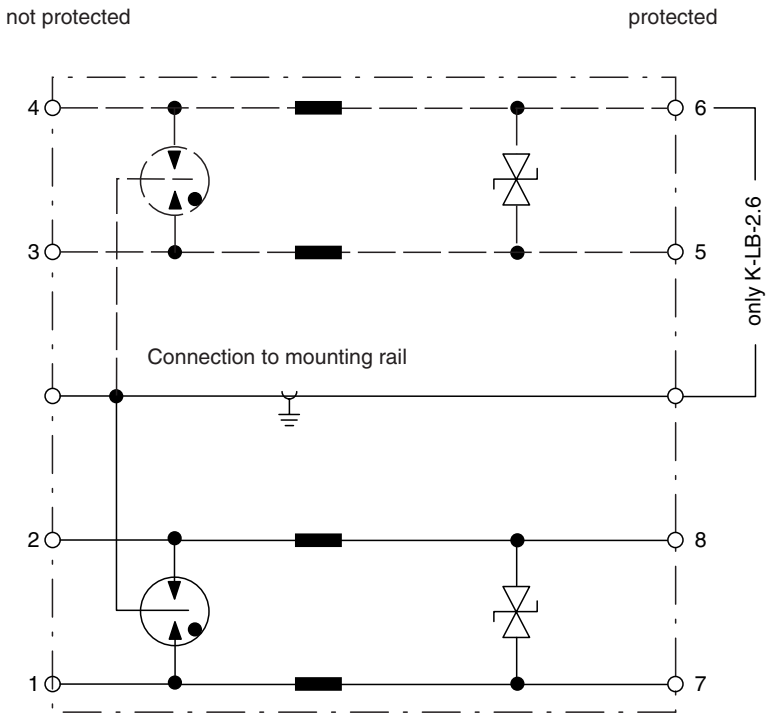
- 2- or 4-wire protection
- For insulated C&I circuits up to 6 V
- Also for intrinsically safe control circuits EEx ia IIC
- Fulfils requirements to 500 V insulation to earth, housing components and other intrinsically safe circuits
- Installation directly in the hazardous area for protecting the field devices
- Discharge current 10 kA
- Grounding as simple as snapping onto the DIN mounting rail
- Uninterruptable operation (auto reset)

2-wire protection
K-LB-1.6
4-wire protection
K-LB-2.6

Application

With the application of a K-LB-..., field devices and processing units are effectively protected against overvoltages of various origins (i. e. lightning stroke, switching impulse, etc.). Two galvanically isolated circuits can be protected, thus 2 x 2 wires.

Connection



Composition

Front View

Housing type Z1
(see system description)

Date of issue 09/22/06 – Catalog Field Devices

	K-LB-1.6	K-LB-2.6
Supply		
Connection	terminals 7, 8; 1, 2	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 6 V	≤ 6 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 10 µA	≤ 10 µA
On-state voltage	≤ 12 V	≤ 12 V
Ground insulation	500 V breakdown voltage	500 V breakdown voltage
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 100 g	
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 00 ATEX 2176X, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 2(1)G EEx ia IIC T6	
Voltage U_i	6 V	
Current I_i	250 mA	
Maximum leakage current	10 kA (8/20 µs) per core according to IEC 60-2	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistance	≤ 0.3 Ω per conductor	
Bandwidth	≥ 40 kHz	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020	

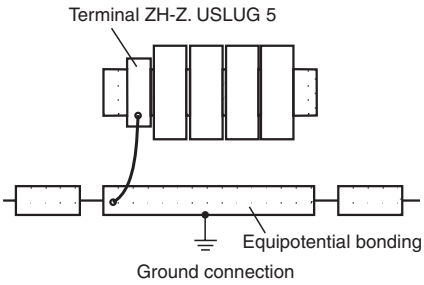
Supplementary information

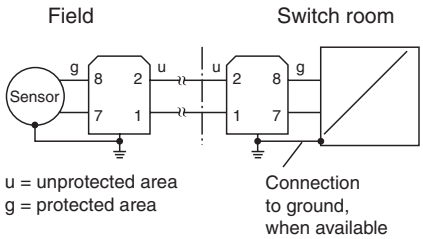
EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

Surge protectors must always be connected to a solid effective ground (large cross sections, short wiring). This is the basic requirement for an effective protection.

Example installations





CE

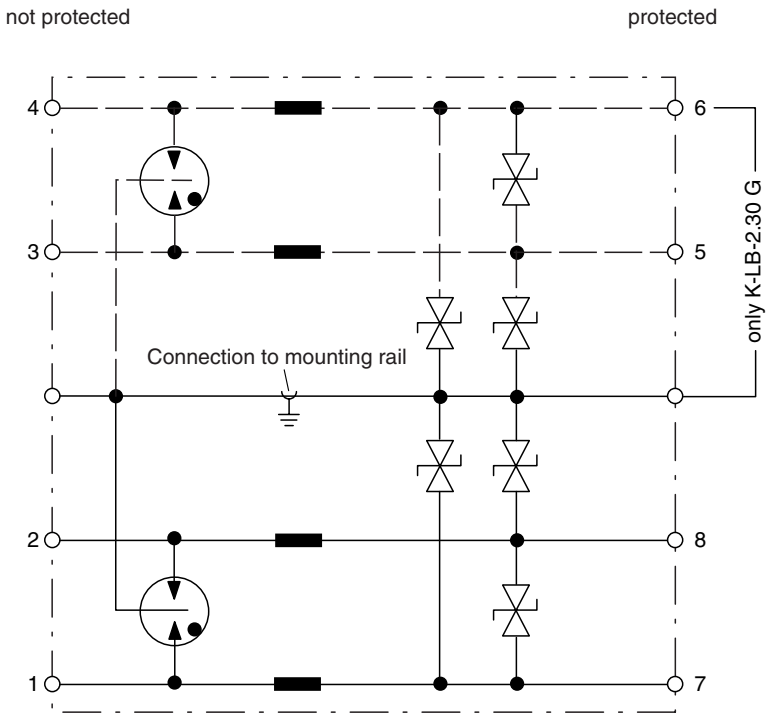
- 2- or 4-wire protection
- For non-insulated C&I circuits up to 30 V
- Also for intrinsically safe control circuits EEx ia IIC
- Installation directly in the hazardous area for protecting the field devices
- Discharge current 10 kA
- Grounding as simple as snapping onto the DIN mounting rail
- Uninterruptable operation (auto reset)

2-wire protection
K-LB-1.30G
4-wire protection
K-LB-2.30G

Application

With the application of a K-LB-..., field devices and processing units are effectively protected against overvoltages of various origins (i. e. lightning stroke, switching impulse, etc.). Two galvanically isolated circuits can be protected, thus 2 x 2 wires.

Connection



Composition

Front View

Housing type Z1
(see system description)

Date of issue 09/22/06 – Catalog Field Devices

	K-LB-1.30G	K-LB-2.30G
Supply		
Connection	terminals 7, 8; 1, 2	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 100 g	
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 00 ATEX 2176X, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 2(1)G EEx ia IIC T6	
Voltage U_i	30 V	
Current I_i	250 mA	
Maximum leakage current	10 kA (8/20 µs) per core according to IEC 60-2	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistance	≤ 0.3 Ω per conductor	
Bandwidth	≥ 40 kHz	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020	

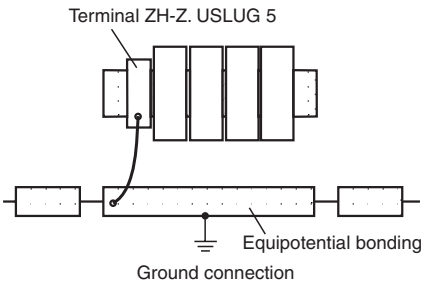
Supplementary information

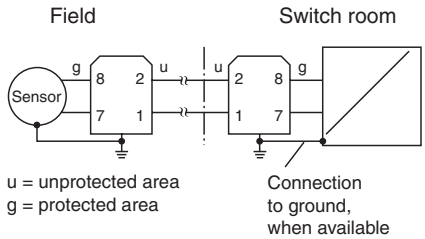
EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is the basic requirement for an effective protection.

Example installations





CE

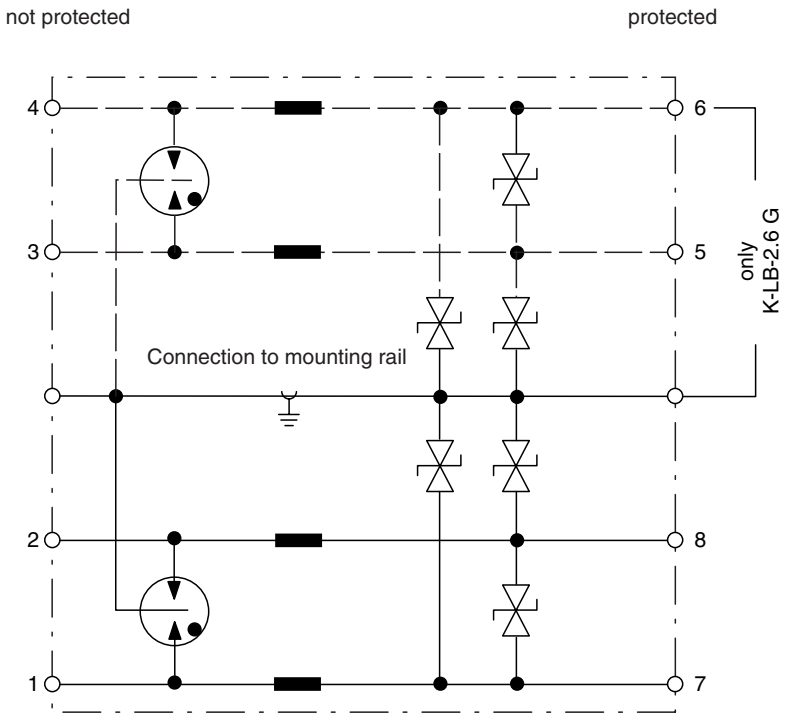
- 2- or 4-wire protection
- For non-insulated C&I circuits up to 6 V
- Also for intrinsically safe control circuits EEx ia IIC
- Installation directly in the hazardous area for protecting the field devices
- Discharge current 10 kA
- Grounding as simple as snapping onto the DIN mounting rail
- Uninterruptable operation (auto reset)

2-wire protection
K-LB-1.6G
4-wire protection
K-LB-2.6G

Application

With the application of a K-LB-..., field devices and processing units are effectively protected against overvoltages of various origins (i. e. lightning stroke, switching impulse, etc.). Two galvanically isolated circuits can be protected, thus 2 x 2 wires.

Connection



Composition

Front View

Housing type Z1
(see system description)

Date of issue 09/22/06 – Catalog Field Devices

	K-LB-1.6G	K-LB-2.6G
Supply		
Connection	terminals 7, 8; 1, 2	terminals 1, 2; 7, 8/3, 4; 5, 6
Rated voltage	≤ 6 V	≤ 6 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 12 V	≤ 12 V
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 100 g	
Dimensions	12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 00 ATEX 2176X, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 2(1)G EEx ia IIC T6	
Voltage U_i	6 V	
Current I_i	250 mA	
Maximum leakage current	10 kA (8/20 µs) per core according to IEC 60-2	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistance	≤ 0.3 Ω per conductor	
Bandwidth	≥ 40 kHz	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020	

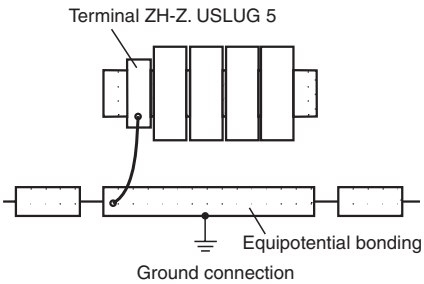
Supplementary information

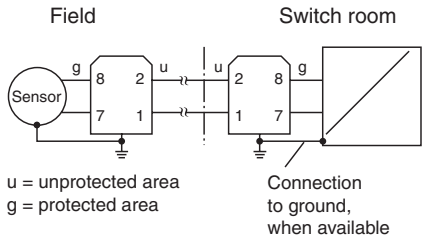
EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is the basic requirement for an effective protection.

Example installations





CE

- 2-wire protection
- For insulated C&I circuits
- Fulfils requirements to 500 V insulation to earth, housing components and other intrinsically safe circuits
- Installation directly in the hazardous area for protecting the field devices
- Discharge current 10 kA
- Simple installation in the free cable gland on the field device
- Uninterruptable operation (auto reset)

M20 x 1.5 thread
FS-LB-I
PG13.5 thread
FP-LB-I
½ NPT thread
FN-LB-I

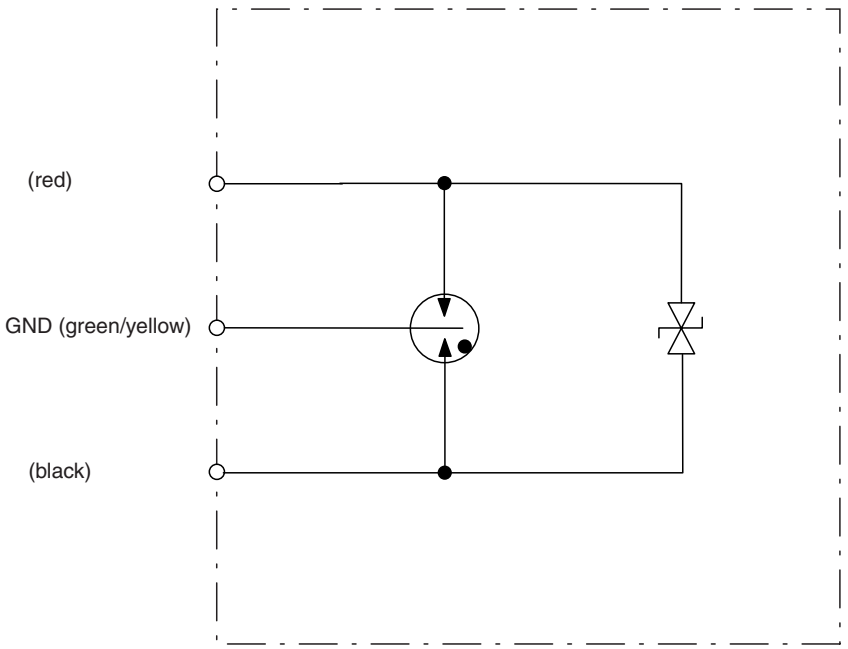
Function

By using an F*-LB-I, field devices and control interface units are safely protected from voltage surges due to e. g. flash of lightning, switching processes etc.).

This is accomplished by the derivation of the higher current to ground and a voltage limit during the high level pulse.

The continuous current capacity of the circuit that is to be protected must not exceed the rated operational current.

Connection



Composition

Date of issue 09/22/06 – Catalog Field Devices

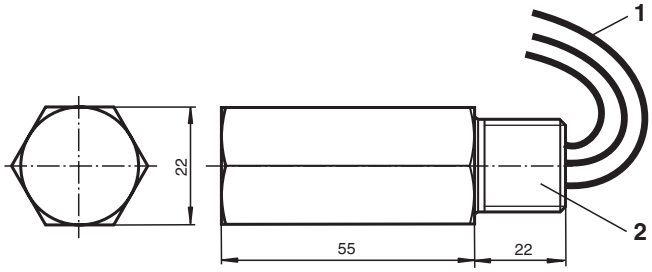
Supply	
Rated voltage	≤ 48 V
Rated current	≤ 250 mA
Leakage current	≤ 5 µA
On-state voltage	≤ 85 V
Ground insulation	≥ 500 V breakdown voltage
Conformity	
Protection degree	IEC 60529
Ambient conditions	
Ambient temperature	-30 ... 60 °C (243 ... 333 K) for Ex application, please observe EC-Type Examination Certificate
Mechanical specifications	
Protection degree	IP20
Mass	approx. 200 g
Dimensions	AF22 x 77 mm (0.9 x 3 in)
Data for application in conjunction with hazardous areas	
EC-Type Examination Certificate	PTB 00 ATEX 2175, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection, temperature classification	⟨Ex⟩ II 2G EEx ia IIC T6
Voltage U_i	50 V
Maximum leakage current	10 kA (8/20 µs) per core according to IEC 60-2
Nominal response time	
Symmetrical	1 ns
Asymmetric	100 ns
Bandwidth	≥ 40 kHz
Directive conformity	
Directive 94/9 EC	EN 50014, EN 50020

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes

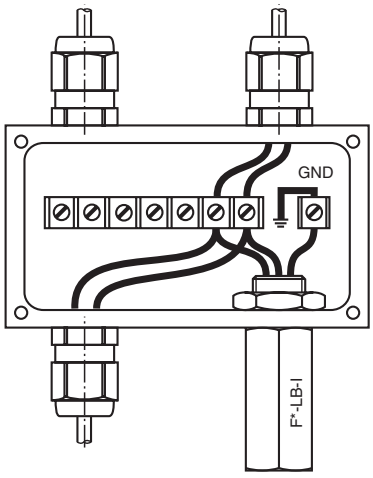
Surge protectors must always be connected to a solid ground (large cross sections, short wiring). This is the basic requirement for an effective protection.



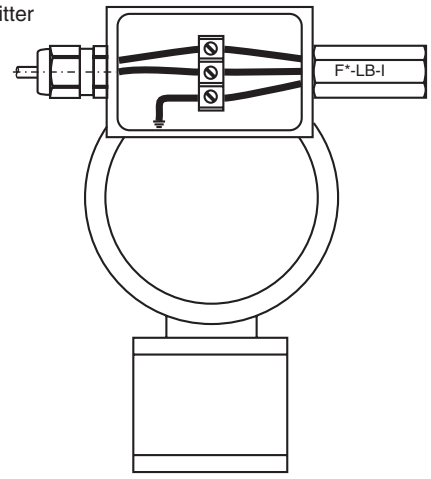
1 Cable cross sectional area 1.0 mm
Cable length 400 mm
2 FP-LB-I: PG13.5 thread
FS-LB-I: M20 x 1.5 thread
FN-LB-I: ½ NPT thread

Examples:

Terminal box



Transmitter



- 2- or 4-wire protection
- For analogue and binary MSR-circuits
- Suitable for intrinsically safe control current circuits EEx ia IIC
- Discharge current 10 kA
- Simple grounding via busbar
- Uninterruptable operation (auto reset)

P-LB-1.A.13
P-LB-2.A.1346

Function

The P-LB is optimised for the devices of the K-series.

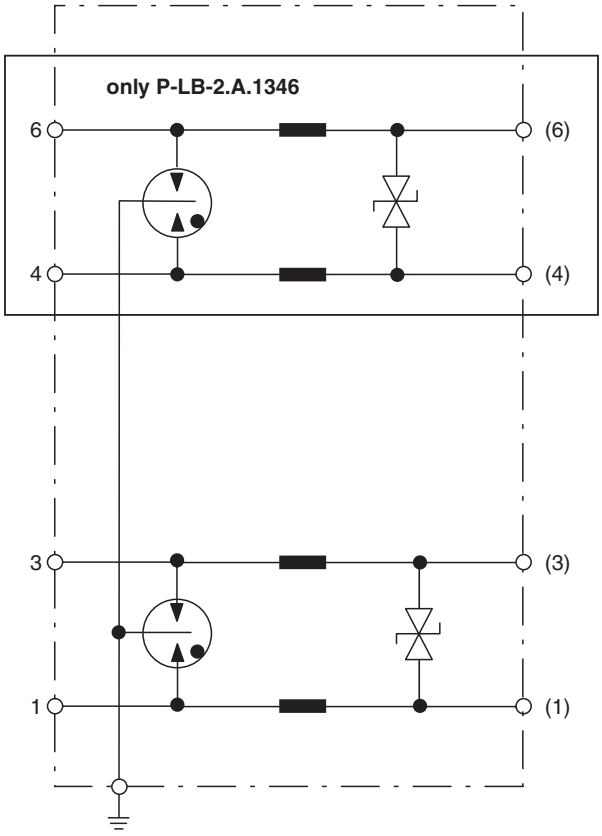
By simple snapping onto the standard K-modules, these are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.).

This is accomplished by diverting the destructive surge current to ground and limiting the voltage during the high level pulses.

The P-LB-*.* allows the protection of 1 up to 2 galvanically isolated circuits.

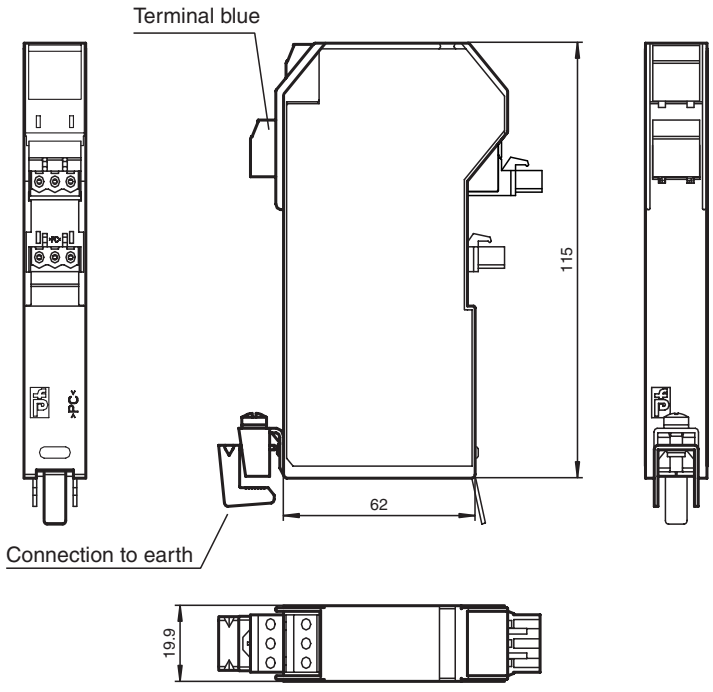
The end digits of the P-LB designation correspond to the protected terminals of the respective K-device.

Connection



Connection to busbar

Composition



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	P-LB-1.A.13	P-LB-2.A.1346
Signal lines		
Connection	terminals 1, 3	terminals 1, 3; 4, 6
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage	≤ 500 V breakdown voltage
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-20 ... 60 °C (253 ... 333 K)	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 70 g	
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 02 ATEX 2044, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC	
Voltage U_o	≤ 30 V	
Current I_i	≤ 250 mA	
Power P_o	≤ 1.3 W	
Maximum leakage current	10 kA (8/20 µs) per conductor	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistor	≤ 0.5 Ω per wire	
Bandwidth	≥ 40 kHz	
Declaration of conformity	Pepperl+Fuchs	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G EEx nA II T6	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020, EN 50021	

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Note

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is a basic requirement for an effective protection.

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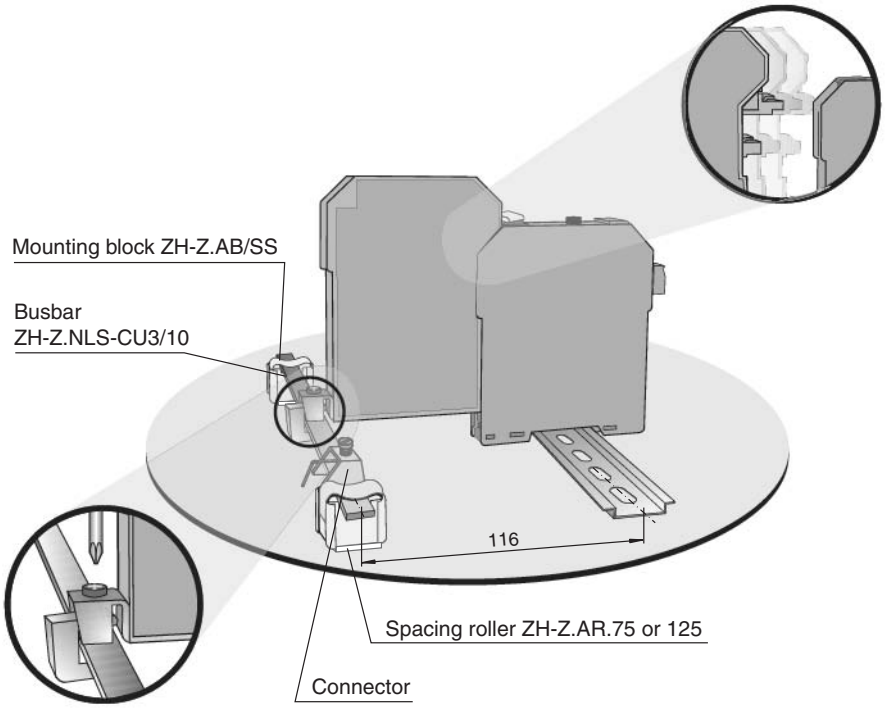
Accessories

- Busbar ZH-Z.NLS-Cu3/10
- Spacing roller ZH-Z.AR.75 for PR 03 or ZH-Z.AR.125 for UPR 03
- Connector ZH-Z.AK16
- Mounting block ZH-Z.AB/SS



Keep the drilling distance of 116 mm between center mounting rail and center grounding bar.

Date of issue 09/22/06 – Catalog Field Devices

CE

- 2- or 4-wire protection
- For analogue and binary MSR-circuits
- Suitable for intrinsically safe control current circuits EEx ia IIC
- Discharge current 10 kA
- Simple grounding via busbar
- Uninterruptable operation (auto reset)

P-LB-1.B.12
P-LB-2.B.1245

Function

The P-LB is optimised for the devices of the K-series.

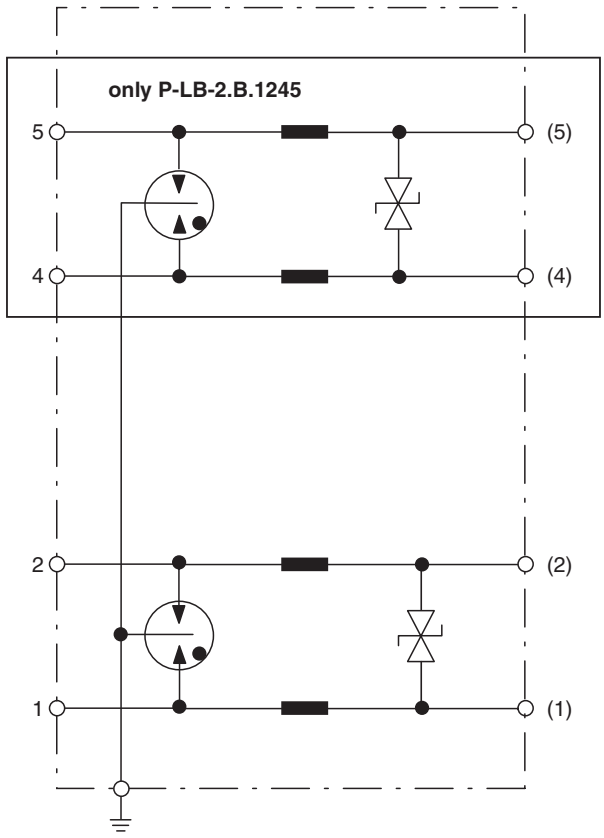
By simple snapping onto the standard K-modules, these are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.).

This is accomplished by diverting the destructive surge current to ground and limiting the voltage during the high level pulses.

The P-LB-*.* allows the protection of 1 up to 2 galvanically isolated circuits.

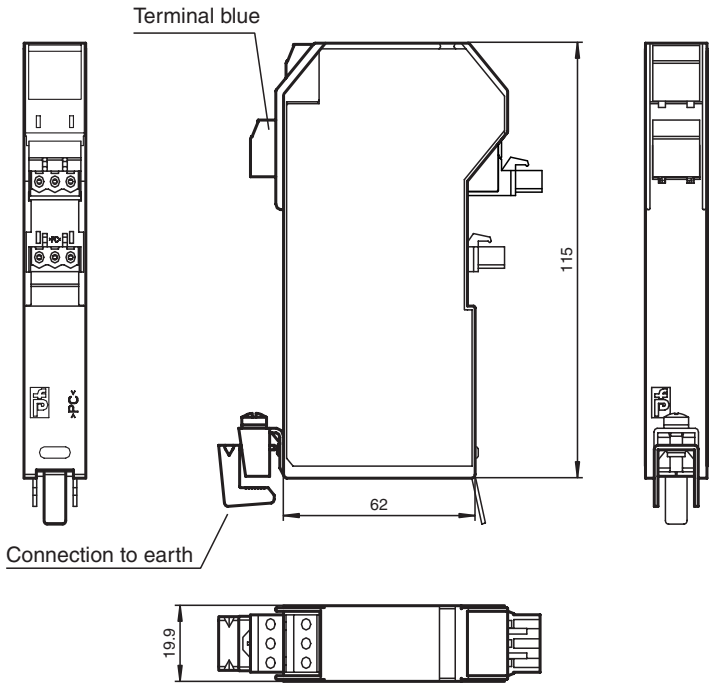
The end digits of the P-LB designation correspond to the protected terminals of the respective K-device.

Connection



Connection to busbar

Composition



Date of issue 09/22/06 – Catalog Field Devices

	P-LB-1.B.12	P-LB-2.B.1245
Signal lines		
Connection	terminals 1, 2	terminals 1, 2; 4, 5
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage	≤ 500 V breakdown voltage
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 60 °C (243 ... 333 K)	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 70 g	
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 02 ATEX 2044, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC	
Voltage U_o	≤ 30 V	
Current I_i	≤ 250 mA	
Power P_o	≤ 1.3 W	
Maximum leakage current	10 kA (8/20 µs) per conductor	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistor	≤ 0.5 Ω per wire	
Bandwidth	≥ 40 kHz	
Declaration of conformity	Pepperl+Fuchs	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G EEx nA II T6	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020, EN 50021	

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

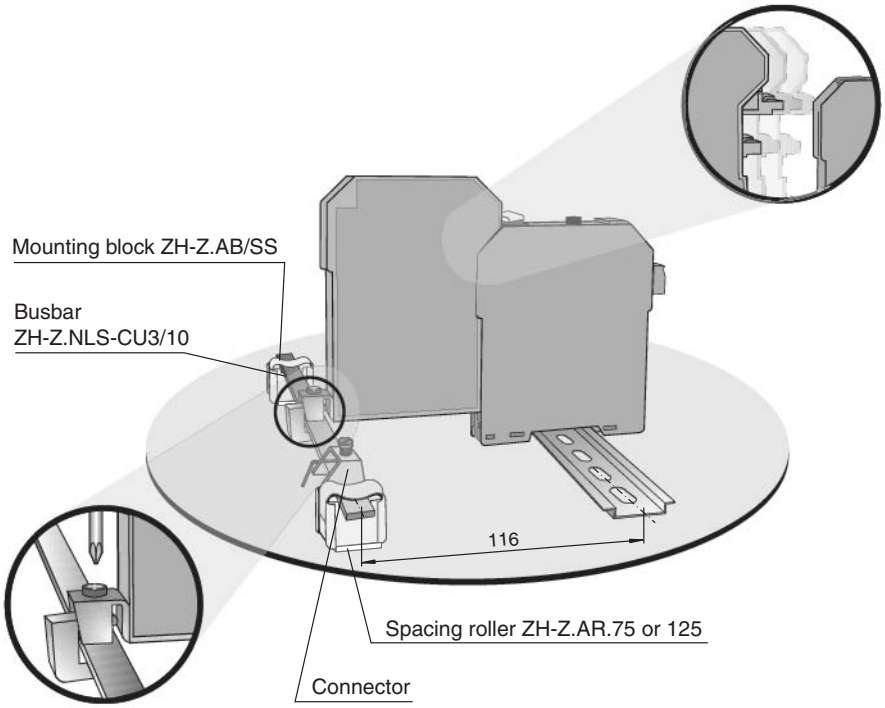
Note

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is a basic requirement for an effective protection.

Date of issue 09/22/06 – Catalog Field Devices

Accessories

- Busbar ZH-Z.NLS-Cu3/10
- Spacing roller ZH-Z.AR.75 for PR 03 or ZH-Z.AR.125 for UPR 03
- Connector ZH-Z.AK16
- Mounting block ZH-Z.AB/SS



Keep the drilling distance of 116 mm between center mounting rail and center grounding bar.

Date of issue 09/22/06 – Catalog Field Devices

- 3- or 6-wire protection
- For analogue and binary MSR-circuits
- Suitable for intrinsically safe control current circuits EEx ia IIC
- Discharge current 10 kA
- Simple grounding via busbar
- Uninterruptable operation (auto reset)

P-LB-1.C.123
P-LB-2.D.123456

Function

The P-LB is optimised for the devices of the K-series.

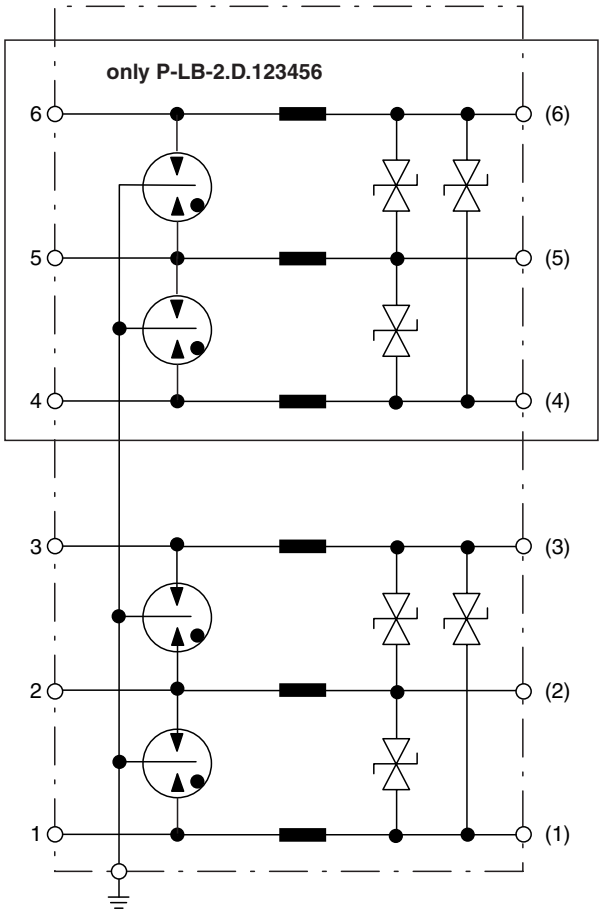
By simple snapping onto the standard K-modules, these are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.).

This is accomplished by diverting the destructive surge current to ground and limiting the voltage during the high level pulses.

The P-LB-*.* allows the protection of 1 up to 2 galvanically isolated circuits.

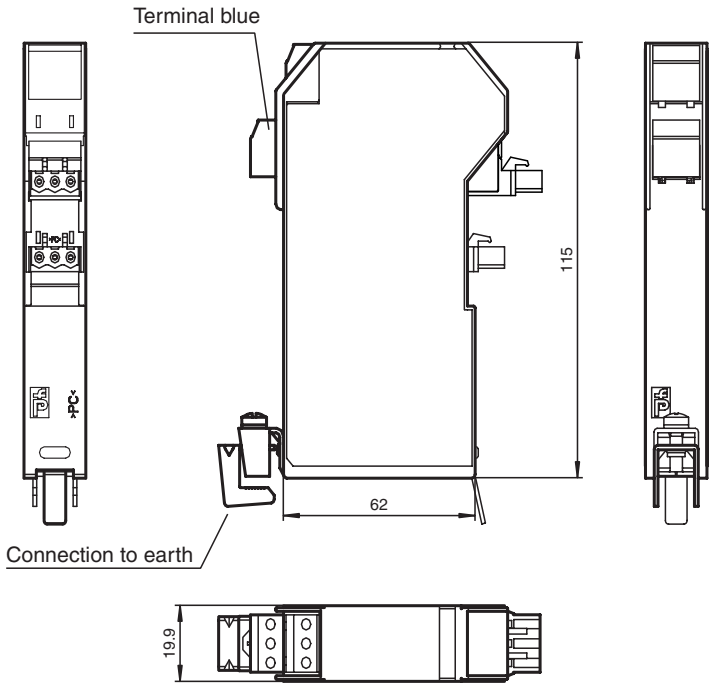
The end digits of the P-LB designation correspond to the protected terminals of the respective K-device.

Connection



Connection to busbar

Composition



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	P-LB-1.C.123	P-LB-2.D.123456
Signal lines		
Connection	terminals 1, 2, 3	terminals 1, 2, 3; 4, 5, 6
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage	≤ 500 V breakdown voltage
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 60 °C (243 ... 333 K)	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 70 g	
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 02 ATEX 2044, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC	
Voltage U_o	≤ 30 V	
Current I_i	≤ 250 mA	
Power P_o	≤ 1.3 W	
Maximum leakage current	10 kA (8/20 µs) per conductor	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistor	≤ 0.5 Ω per wire	
Bandwidth	≥ 40 kHz	
Declaration of conformity	Pepperl+Fuchs	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G EEx nA II T6	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020, EN 50021	

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Note

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is a basic requirement for an effective protection.

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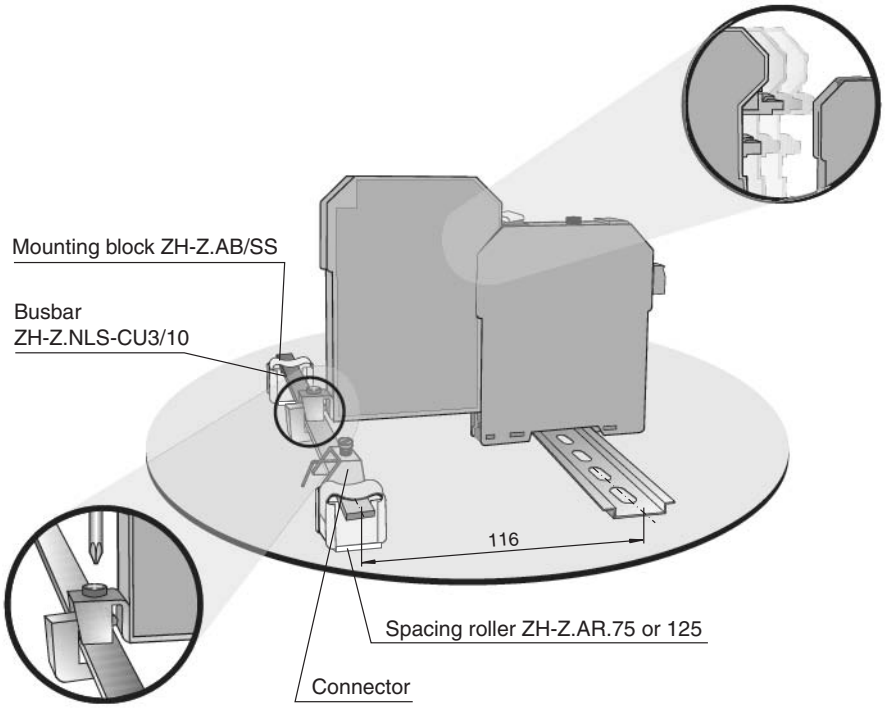
Accessories

- Busbar ZH-Z.NLS-Cu3/10
- Spacing roller ZH-Z.AR.75 for PR 03 or ZH-Z.AR.125 for UPR 03
- Connector ZH-Z.AK16
- Mounting block ZH-Z.AB/SS



Keep the drilling distance of 116 mm between center mounting rail and center grounding bar.

Date of issue 09/22/06 – Catalog Field Devices

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CE

- 2- or 4-wire protection
- For analogue and binary MSR-circuits
- Suitable for intrinsically safe control current circuits EEx ia IIC
- Discharge current 10 kA
- Simple grounding via busbar
- Uninterruptable operation (auto reset)

P-LB-1.E.23
P-LB-2.C.2356

Function

The P-LB is optimised for the devices of the K-series.

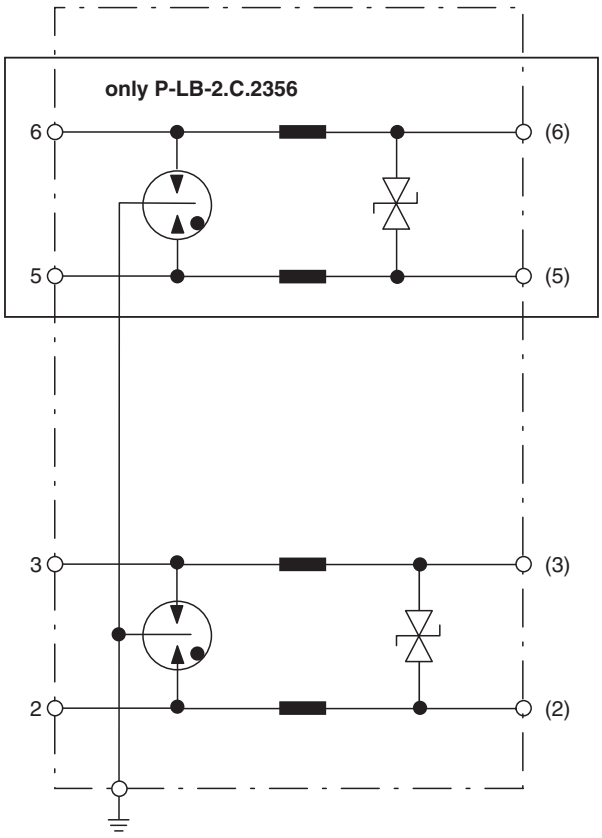
By simple snapping onto the standard K-modules, these are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.).

This is accomplished by diverting the destructive surge current to ground and limiting the voltage during the high level pulses.

The P-LB-*.* allows the protection of 1 up to 2 galvanically isolated circuits.

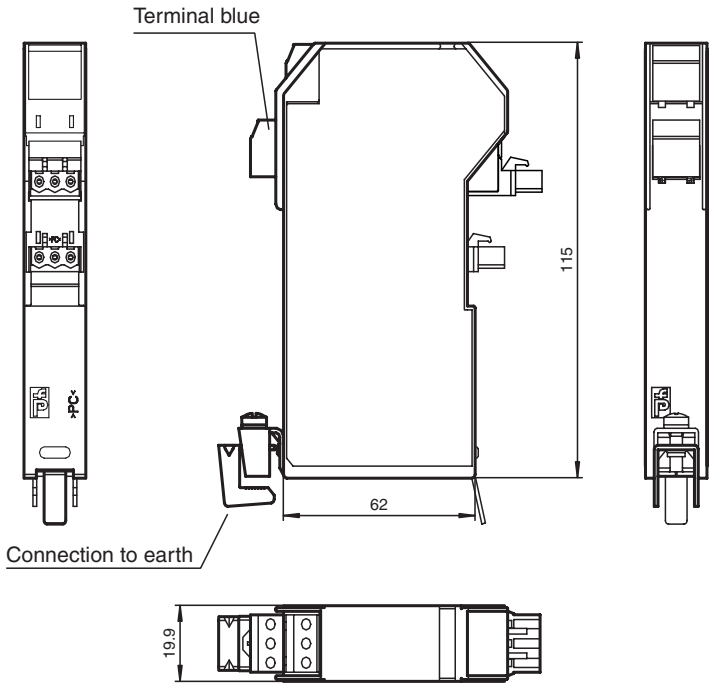
The end digits of the P-LB designation correspond to the protected terminals of the respective K-device.

Connection



Connection to busbar

Composition



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	P-LB-1.E.23	P-LB-2.C.2356
Signal lines		
Connection	terminals 2, 3	terminals 2, 3; 5, 6
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage	≤ 500 V breakdown voltage
Input		
Number of channels	1	2
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 60 °C (243 ... 333 K)	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 70 g	
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 02 ATEX 2044, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC	
Voltage U_o	≤ 30 V	
Current I_i	≤ 250 mA	
Power P_o	≤ 1.3 W	
Maximum leakage current	10 kA (8/20 µs) per conductor	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistor	≤ 0.5 Ω per wire	
Bandwidth	≥ 40 kHz	
Declaration of conformity	Pepperl+Fuchs	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G EEx nA II T6	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020, EN 50021	

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Note

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is a basic requirement for an effective protection.

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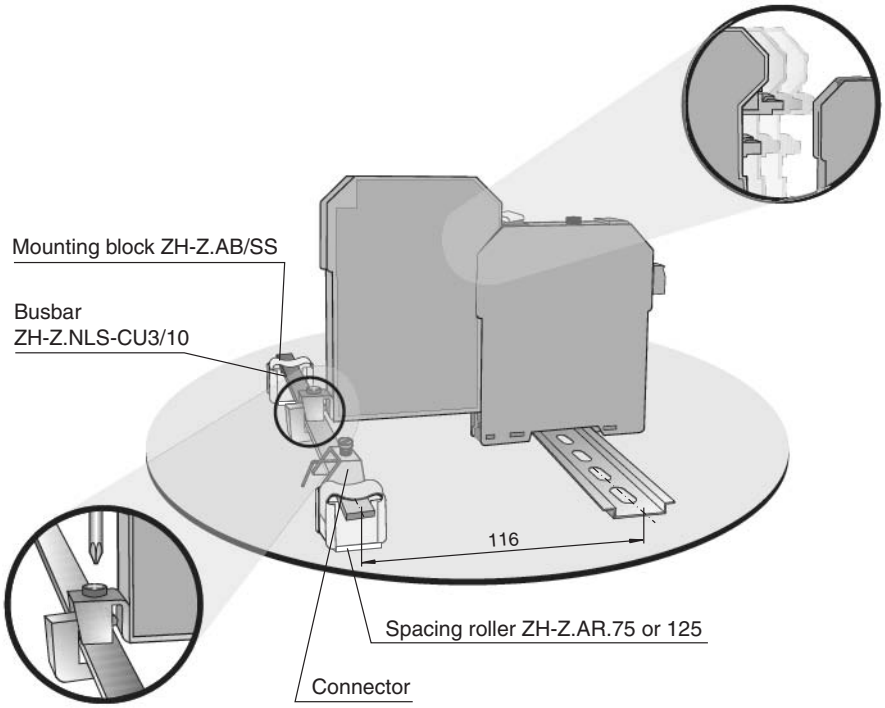
Accessories

- Busbar ZH-Z.NLS-Cu3/10
- Spacing roller ZH-Z.AR.75 for PR 03 or ZH-Z.AR.125 for UPR 03
- Connector ZH-Z.AK16
- Mounting block ZH-Z.AB/SS



Keep the drilling distance of 116 mm between center mounting rail and center grounding bar.

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Date of issue 09/22/06 – Catalog Field Devices

- 4-wire protection
- For analogue and binary MSR-circuits
- Suitable for intrinsically safe control current circuits EEx ia IIC
- Discharge current 10 kA
- Simple grounding via busbar
- Uninterruptable operation (auto reset)

P-LB-1.D.1234
P-LB-1.F.1236

Function

The P-LB is optimised for the devices of the K-series.

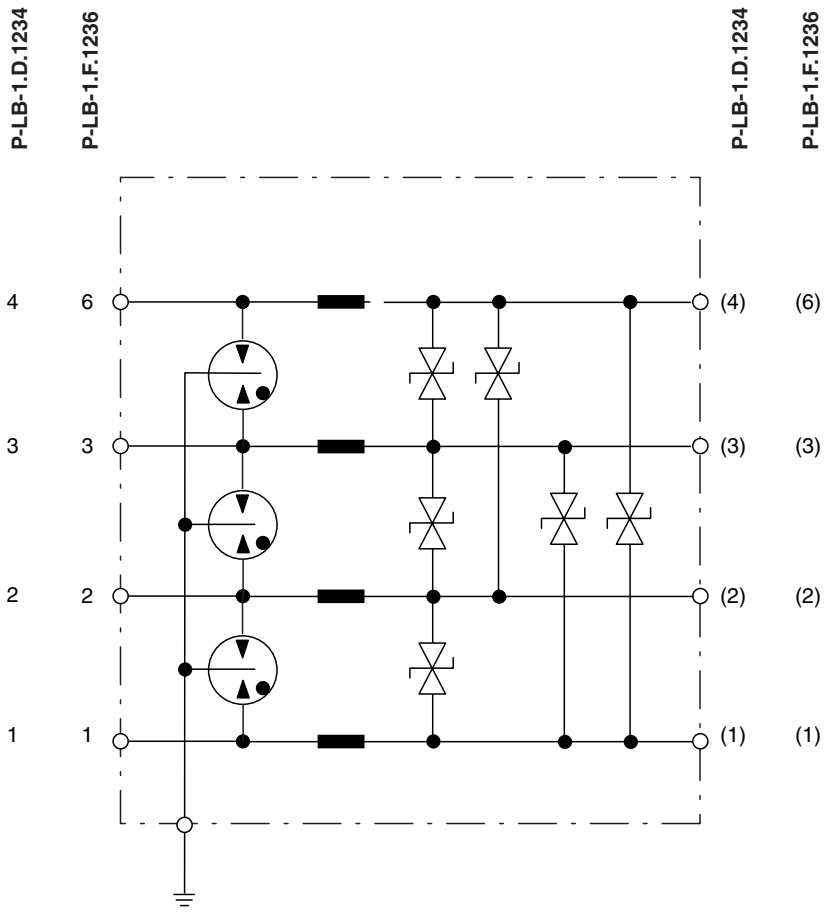
By simple snapping onto the standard K-modules, these are safely protected against voltage surges of different origin (e. g. lightning stroke, switching impulse, etc.).

This is accomplished by diverting the destructive surge current to ground and limiting the voltage during the high level pulses.

The P-LB-*.* allows the protection of 1 galvanically isolated circuit.

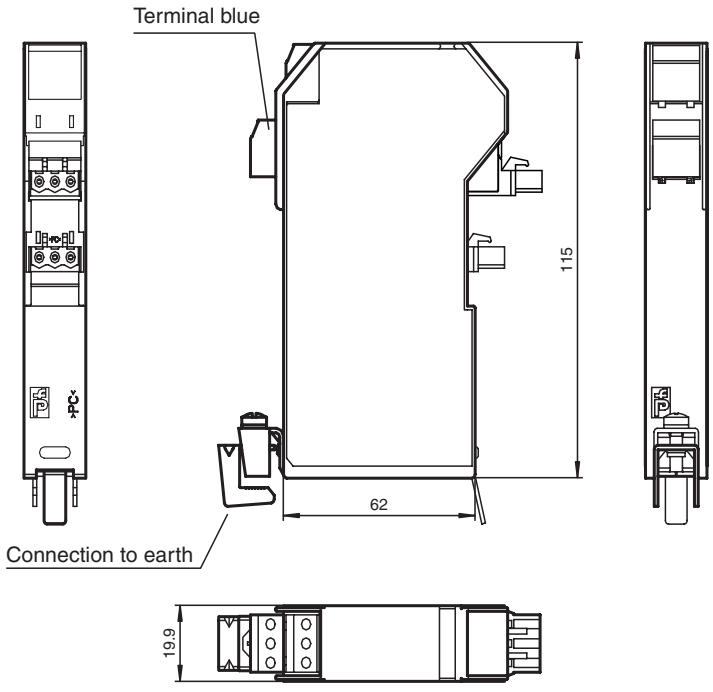
The end digits of the P-LB designation correspond to the protected terminals of the respective K-device.

Connection



Connection to busbar

Composition



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	P-LB-1.D.1234	P-LB-1.F.1236
Signal lines		
Connection	terminals 1, 2, 3, 4	terminals 1, 2, 3, 6
Rated voltage	≤ 30 V	≤ 30 V
Rated current	≤ 250 mA	≤ 250 mA
Leakage current	≤ 5 µA	≤ 5 µA
On-state voltage	≤ 45 V	≤ 45 V
Ground insulation	≤ 500 V breakdown voltage	≤ 500 V breakdown voltage
Input		
Number of channels	1	
Conformity		
Protection degree	IEC 60529	
Ambient conditions		
Ambient temperature	-30 ... 60 °C (243 ... 333 K)	
Mechanical specifications		
Protection degree	IP20	
Mass	approx. 70 g	
Dimensions	20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)	
Data for application in conjunction with hazardous areas		
EC-Type Examination Certificate	PTB 02 ATEX 2044, for additional certificates see www.pepperl-fuchs.com	
Group, category, type of protection	⟨Ex⟩ II (1)G [EEx ia] IIC	
Voltage U_o	≤ 30 V	
Current I_i	≤ 250 mA	
Power P_o	≤ 1.3 W	
Maximum leakage current	10 kA (8/20 µs) per conductor	
Nominal response time		
Symmetrical	1 ns	
Asymmetric	100 ns	
Series resistor	≤ 0.5 Ω per wire	
Bandwidth	≥ 40 kHz	
Declaration of conformity	Pepperl+Fuchs	
Group, category, type of protection, temperature classification	⟨Ex⟩ II 3G EEx nA II T6	
Directive conformity		
Directive 94/9 EC	EN 50014, EN 50020, EN 50021	

Supplementary information

EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Note

Surge protectors must always be connected to a solid and effective ground (large cross sections, short wiring). This is a basic requirement for an effective protection.

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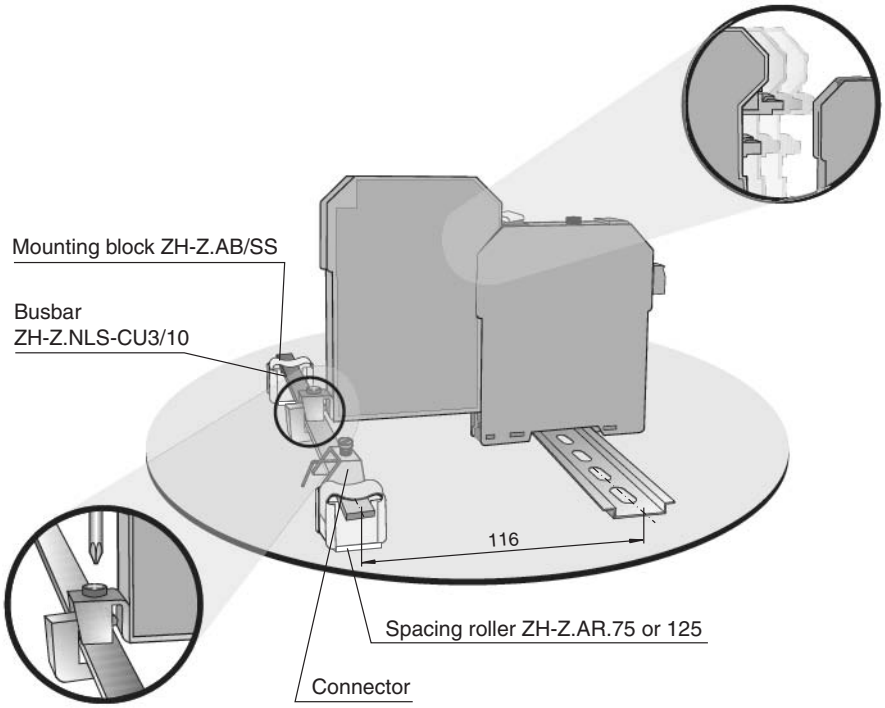
Accessories

- Busbar ZH-Z.NLS-Cu3/10
- Spacing roller ZH-Z.AR.75 for PR 03 or ZH-Z.AR.125 for UPR 03
- Connector ZH-Z.AK16
- Mounting block ZH-Z.AB/SS



Keep the drilling distance of 116 mm between center mounting rail and center grounding bar.

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CE

Model number

DA5-IU-2K-C
DA5-IU-2K-V

Features

- 2 adjustable limit values
- 2 relay outputs
- Operation via keypad
- Programmable characteristics
- Resetting the outputs, automatic, manual or with external signal
- Connection via plug-in screw terminals
- Auxiliary power output for sensors (Only DA5-IU-2K-V)
- Protection degree IP65 in accordance with DIN EN 60529 (front only)
- Shock resistance in accordance with DIN EN 60068-2-27
- Vibration resistance in accordance with DIN EN 60068-2-6
- System hum suppression

Technical data

	DA5-IU-2K-C	DA5-IU-2K-V
General specifications		
Pre-selection	2-fold	
Data storage	10^6 storage cycles or 10 years, EEPROM	
Programming	keypad-driven menu	
UL File Number	E225084	
Indicators/operating means		
Type	7-segment LED display, red	
Number of decades	5	
Display value	digit height 14.2 mm	
Pre-selection	digit height 14.2 mm	
Key interlock	with "high"-level at terminal "KEY"	
Display interval	-19999 ... 99999	
Decimal point	freely adjustable	
Resolution	14 Bit	
Scale factor	via characteristic curve with up to 24 value pairs	
Reset	manually or external	
Electrical specifications		
Operating voltage	10 ... 30 V DC	90 ... 260 V AC
Power consumption P_o	2 W	7 VA
Input		
Impedance	> 1 MΩ for voltage measurement < 50 Ω for current measurement	
Analogue voltage input	0 ... 10 V/2 ... 10 V DC, -10 ... 10 V DC	
Analogue current input	0 ... 20 mA/4 ... 20 mA	
Output		
Relay	2 x 250 V AC/300 V DC, 3 A, changeover contact	2 x 250 V AC/300 V DC, 3 A, changeover contact
Sensor supply	-	24 V DC, 100 mA
Ambient conditions		
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	
Storage temperature	-25 ... 70 °C (248 ... 343 K)	
Relative humidity	≤ 80 % (non-condensing)	
Mechanical specifications		
Connection	8-pin and 11 pin connectors with plug-in screw terminals	
Mass	220 g	
Dimensions	96 mm x 48 mm x 90 mm	
Mounting	mounting frame with latch fastener	

Notes

The DA5-IU-2K-... permits a simple visual inspection by operating and maintenance personnel. It converts the analogue sensor output signal into a readable form for this purpose. Depending on the task or setting, 4 mA ... 20 mA or 0 % ... 100 % values can be displayed.

Scope of delivery:

- Process control unit DA5-IU-2K-*
- Screw terminals
  1 RM 5.08 8-pole terminal for power supply and outputs
  1 RM 3.81 11-pole terminal for measuring and control inputs
- Clamp clip
- Seal
- 1 sheet of adhesive symbols

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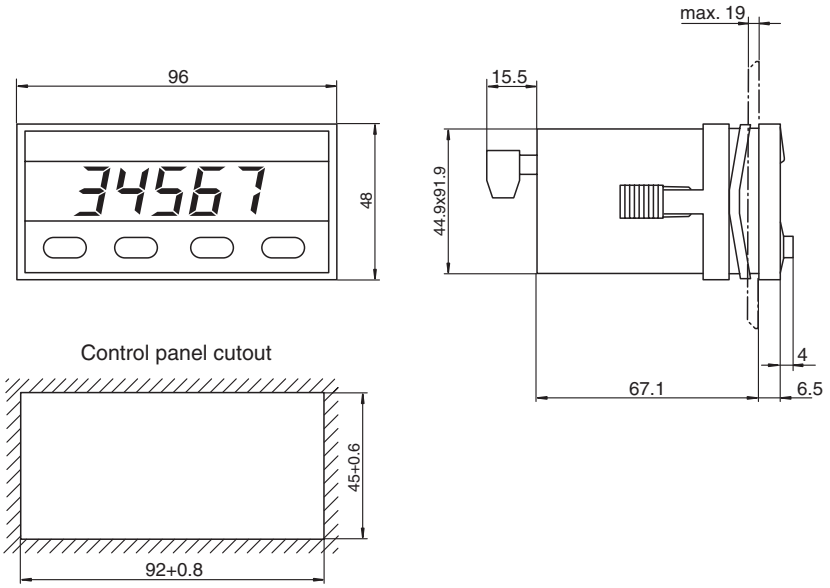
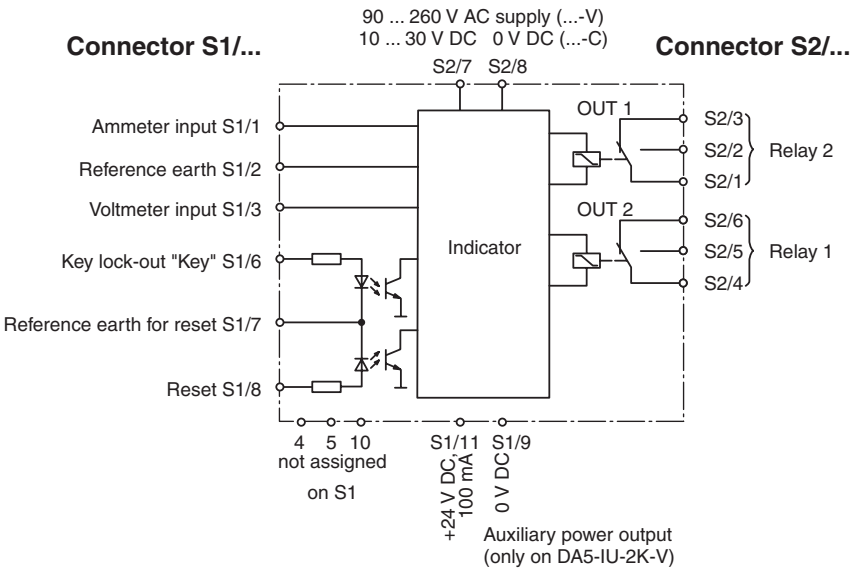
Dimensions



Electrical connection



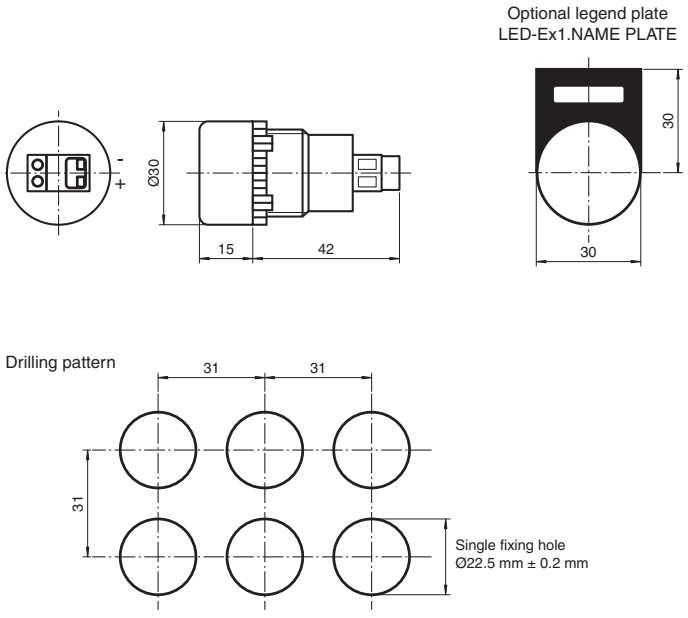
LED cluster lamp

LED-Ex1.*

Features

- Intrinsically safe EEx ia IIC T4
- Protection degree IP65 (front)
- Protection degree IP20 (rear)
- Low current, max. 22 mA

Dimensions



Function

The LED cluster lamp provides reliable visual status indication. A group of high efficiency light emitting diodes are mounted behind a coloured diffuser to produce a bright, uniform output.

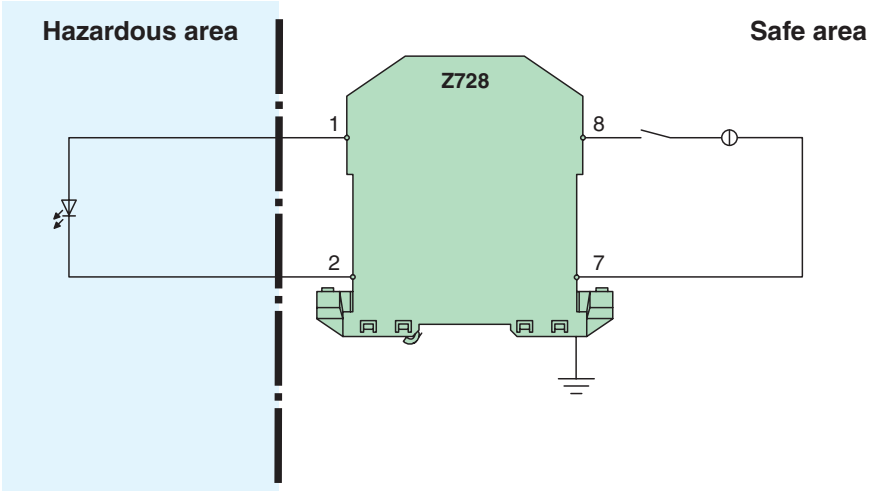
All models contain a 20 mA current regulator which maintains constant brilliance, provides protection against excess voltages and enables to comply with common system design rules.

Two lamps may be powered from a single IIC intrinsically safe source, and up to four lamps from a IIB source.

IP65 sealing of the lens and the joint between the lamp and the panel makes the LED-Ex1.* ideal for installation in areas which will be hosed, washed or splashed.

Mounting is via a single standard 22.5 mm (0.9 inches) diameter hole. The lamp housing , fixing nut and terminals have a maximum diameter of 30 mm (1.2 inches) which permits a very high packing density on the panel. To aid identification from the rear of the panel, the model number and suffix which identifies the colour are marked on the lamp body close to the terminals.

Electrical connection



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Supply	
Rated voltage	14 ... 30 V DC
Rated current	18 ... 22 mA
Output	
Mechanical life	10^5 h
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EC	EN 61326, EN 50081-2
Conformity	
Electromagnetic compatibility	NE 21
Protection degree	IEC 60529
Ambient conditions	
Ambient temperature	-20 ... 60 °C (253 ... 333 K)
Storage temperature	-40 ... 85 °C (233 ... 358 K)
Relative humidity	5 ... 95 %, non-condensing
Mechanical specifications	
Protection degree	IP65 (front), IP20 (rear)
Connection	screw terminals for 1.5 mm^2
Material	housing: polyamid 6.6 lens: polycarbonat
Mass	18 g
Dimensions	Ø30 x 57 mm (1.2 x 2.2 in)
Mechanical construction	
Versions	LED-Ex1.A: yellow LED LED-Ex1.B: blue LED LED-Ex1.G: green LED LED-Ex1.R: red LED LED-Ex1.W: white LED
Data for application in conjunction with hazardous areas	
EC-Type Examination Certificate	BSA 01 ATEX 1062 X (firm BEKA)
Group, category, type of protection	⟨Ex⟩ II 1G EEx ia IIC T4 [circuit(s) in zone 0/1/2]
Voltage U_o	30 V DC
Power P_o	max. 1.3 W, see also section installation
Supply	
Safety maximum voltage U_m	60 V (Attention! The rated voltage is lower.)
Directive conformity	
Directive 94/9 EC	EN 50014, EN 50020, EN 50284
General information	
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Installation

One or two LED-Ex1.* lamps may be powered by any certified Zener barrier or solenoid driver with output parameters within the following limits:

- voltage U_o: 30 V DC
- power P_o: 1.3 W at 40 °C (313 K); 1.2 W at 60 °C (333 K)
- gas groups IIA, IIB or IIC

e. g. 28 V, 300 Ω with a Zener barrier (Typ Z 728) or a solenoid driver (KFD2-SD-Ex1.**, KFD2-SL2-Ex*.*)

Up to three LED-Ex1.* lamps may be powered in an ambient temperature up to 40 °C (313 K) by a solenoid driver with output parameters within the following limits:

- voltage U_o: 30 V DC
- power P_o: 1.3 W at 40 °C (313 K)
- gas groups IIA or IIB

Accessories

Legend plate LED-Ex1.NAME PLATE

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Control unit FA6-PCU300A-Ex.O14

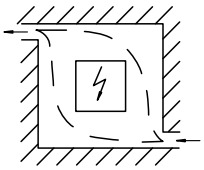
The EEx p pressurising system is an Ex protection class which allows to use non-Ex-approved devices in Ex-areas up to zone 1 in a cost efficient way.

A pressurising system consists of a control unit with integrated pressure monitor, solenoid valve and a pressurising housing.

Contents

Overview

Function:



A pressurised enclosure system consists of the components **control unit with integrated pressure monitor, solenoid operated valve** as well as a **housing** which contains the actual apparatus. Air or an inert gas such as nitrogen is fed into the enclosure housing, thus producing a non-explosive atmosphere so that any ignition sources present cannot trigger an explosion. The control unit, in conjunction with the pressure switch, monitors the circulation process and the pressure; when purging is complete, it allows the electrical apparatus to be switched on. If the pressurised enclosure is opened, the pressure is released and the control unit isolates the apparatus mounted in it from the power supply.

Pressurised enclosures can be divided into two types, depending on the application:

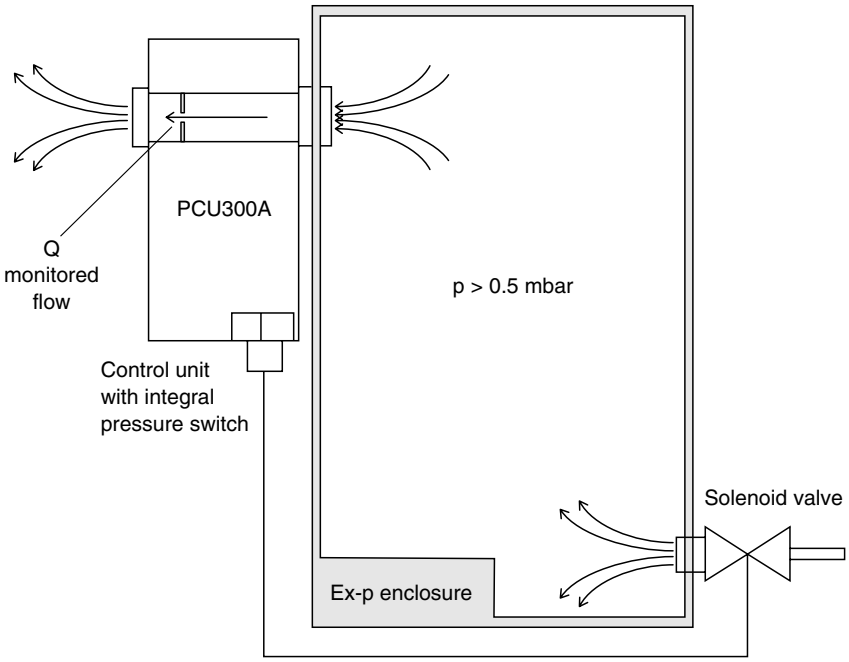
- Leakage compensation
- Constant purging circulation

Leakage compensation: After circulating a defined quantity of inert gas, as specified in EN 50016, the housing is hermetically sealed on the outlet side. Possible leaks are compensated by feeding in inert gas. This ensures minimum consumption of the inert gas.

Constant purging (dilution): After pre-circulation, purging continues with a reduced quantity of air. This method is used with internal gas sources (e. g. analytical devices) in order to achieve a dilution of the gas mixture below the lower explosion ignition limit to achieve a non-explosive concentration. A further effect is the reduction of a possible temperature rise within the housing due to the heat given off by the device.

If internal gas sources are present ("Containment System") it is preferable to use nitrogen as the ignition-inhibiting gas.

General design of a pressurised enclosure system:



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Selection table

The following types of purging and operation can be achieved with the components supplied by Pepperl+Fuchs:

Purging

with a digital valve
After purging with a large nozzle cross-section the valve closes. A mechanically adjustable bypass guarantees the minimum pressure necessary for operation.

with a proportional valve
The **PCU300A** control unit (with integrated pressure monitor) adjusts the pressure in the housing to the programmed target value and records the gas discharge volume.

Time dependent process
A programmable **fixed purging period** determines the purge gas quantity as a function of the selected nozzle size and admission pressure, at the same time monitoring the pressure inside the housing.

In the standard process up to now, the quantity of inert gas consumed is substantially **in excess** of the minimum required for adequate operational safety and availability.

Cumulative process
The volumetric flow at the housing outlet is measured and **cumulated**. When the programmed **purge gas quantity** is reached, purging is terminated.

In contrast to the time dependent process, the amount of surplus gas in the integration process is considerably **reduced**. Other benefits are:

- **cost saving**, as the purge gas quantity is exactly equal to the prescribed quantity,
- **no overloading** of pressure sensitive components such as seals, viewing windows, membrane keypads etc., since a defined pressure is guaranteed.

Operating mode

Constant purging
This operating mode with an increased consumption of inert gas is selected if the apparatus mounted in the housing (e. g. an analytical device) itself generates an explosive atmosphere which must be diluted, or if the apparatus requires additional cooling.

Preferred solenoid valves: PV 321 or PV 322 proportional valve

Leakage compensation
The pressure and flow control equipment which regulates the inlet pressure guarantees that only sufficient purge gas to compensate for the leakage rate passes through the proportional valve.

Advantages:

- minimum inert gas usage,
- low flow noise,
- automatic correction of increased leakage rate due to ageing.

Preferred solenoid valves: PV 321 or PV 322 proportional valve

Choice of control unit orifice meter and solenoid valve nozzle diameter

Digital valve: The purging volume required by EN 50016 and the desired purging period determine the purge gas flow (in litres/hour) at the solenoid valve. In the middle section of the table, below, select a volumetric flow rate corresponding to the available admission pressure, which is greater than the pre-determined value, taking leakage losses from the housing into account. The diameter of the digital valve nozzle and the control unit orifice meter will be found on the same line, in the right and left-hand columns.

Proportional valve: Experience has shown that a control unit with a 14 mm orifice meter covers a broad range of applications (preferred type).

PCU 300A orifice meter Ø [mm]	Purge gas volumetric flow [litres/hour] at solenoid valve							Digital valve nozzles Ø [mm]
6	1100	1350	1560	1750	1908	2063	2203	1
10	2495	3017	3485	3827	4302	4608	4921	1.5
14	4349	5328	6149	6869	7513	8107	8654	2
18	9634	11772	13532	15070	16448	-	-	3
	1.5	2	2.5	3	3.5	4	4.5	
	Purge gas admission pressure [bar]							

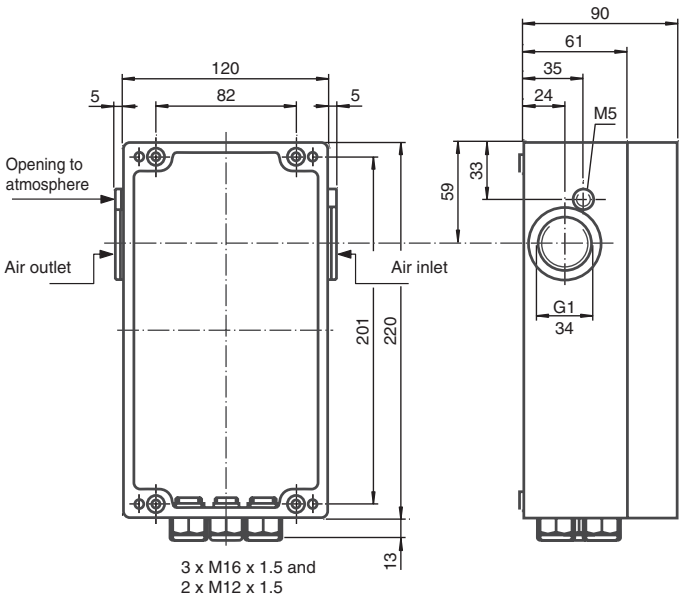
Pressure control unit

F**-PCU300A-Ex.O**

Features

- Compact design
- Easy installation
- Economical purging method
- High safety standard
- LCD indication of operating status
- Menu driven programming

Dimensions

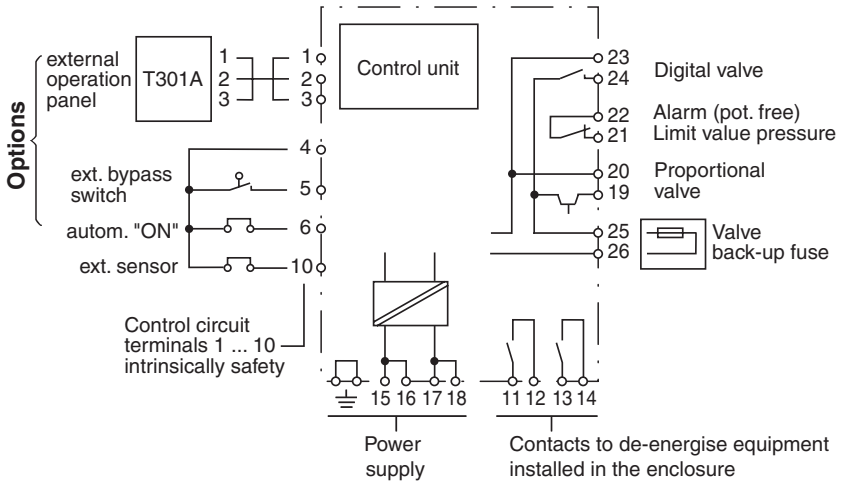


Function

The pressure control unit with integrated pressure switch monitor the purge-gas pressure and throughput. Operating modes and parameters can be programmed and called-up with 4 keys. They are displayed in an 8-character LC display.

Optimum adaptation to the application is provided by the choice of orifice meters.

Electrical connection



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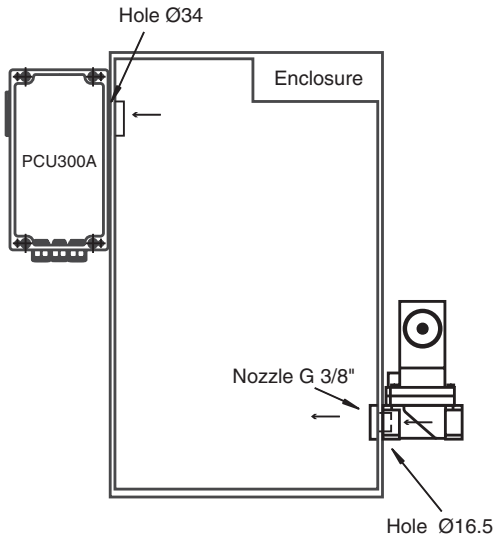
	FD2-PCU300A-Ex.O**	FA5-PCU300A-Ex.O**	FA6-PCU300A-Ex.O**
Supply			
Rated voltage	24 V DC	115 V AC, 48 ... 62 Hz	230 V AC, 48 ... 62 Hz
Power consumption	approx. 2.5 VA		
Conformity			
Protection degree	IEC 60529		
Input characteristics			
Measurement range	pressure measurement range 0 ... 18 mbar volumetric flow measurement range depends on the orifice size		
Operating conditions			
Mounting conditions	inside or outside the enclosure Back-up fuse for solenoid valve in the control unit must be ordered separately (see selection table in data sheet PCU-F-Ex.****MA).		
Ambient conditions			
Ambient temperature	-20 ... 45 °C (253 ... 318 K) at T6 -20 ... 60 °C (253 ... 333 K) at T4		
Mechanical specifications			
Protection degree	IP65 (without consideration of the air outlet opening)		
Material	aluminium, lacquer-coated		
Dimensions	220 x 120 x 90 mm (8.7 x 4.7 x 3.5 in)		
Data for application in conjunction with hazardous areas			
EC-Type Examination Certificate	DMT 00 ATEX E 004 X, for additional certificates see www.pepperl-fuchs.com		
Group, category, type of protection	⟨Ex⟩ II 2G EEx em [ib] [p] IIC T6 (-20 °C ≤ T_{amb} ≤ 45 °C) ⟨Ex⟩ II 2G EEx em [ib] [p] IIC T4 (-20 °C ≤ T_{amb} ≤ 60 °C) ⟨Ex⟩ II 2D Ex tD [ibD] [pD] IP65 T70°C (-20 °C ≤ T_{amb} ≤ 60 °C)		
Supply			
Safety maximum voltage U_m	253 V (Attention! U_m is no rated voltage.)		
Output			
Contact loading	250 V AC/5 A/cos Φ> 0.7/30 V DC/5 A/150 W		
Directive conformity			
Directive 94/9 EC	EN 50014, EN 50016, EN 50019, EN 50020, EN 50028, EN 954-1, IEC 61241-0, IEC 61241-1, IEC 61241-11		
General information			
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.		

Mounting example

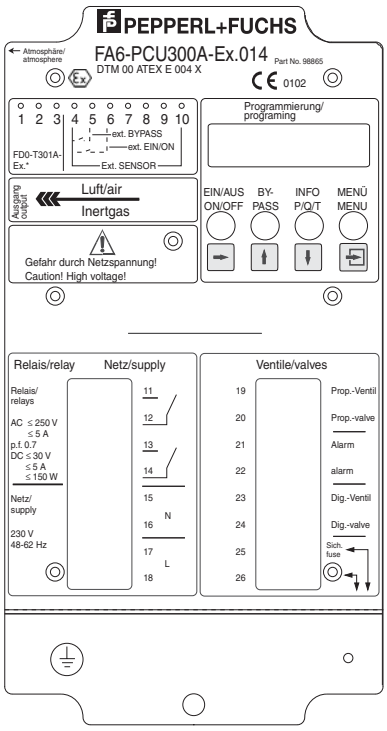
External mounting



Type code/model number

	Control unit	**F * * PCU300A-Ex.O * ***		
Operating voltage	230 V AC	A 6		
	115 V AC	A 5		
	24 V DC	D 2		
				Minimum flow (l/s)
Orifice*	6 mm		6	0.15
	10 mm		10	0.35
	14 mm (preferred type).....		14	0.85
	18 mm		18	1.25

*See the operating instruction for selection assistance.



Type code

FU*-PV32*-Ex

Features

- Minimal purging gas consumption
- High level of operating safety
- Low flow noise
- Defined overpressure during purging

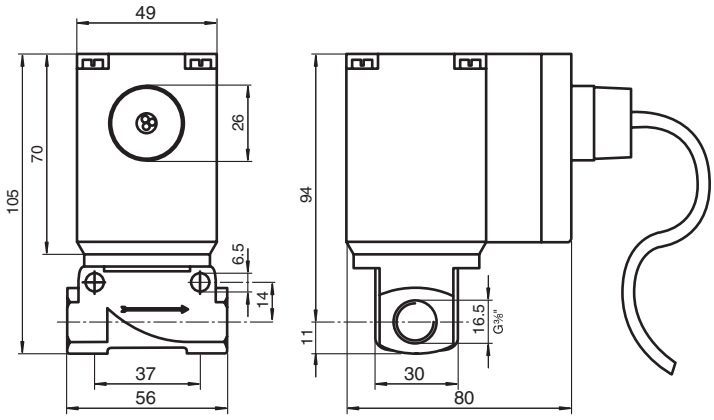
Function

The valve functions as an actuator for the pressurising system. It admits only sufficient purge gas to compensate for leakage losses from the housing.

The defined pressure during purging ensures that pressure-sensitive components such as membrane keypads or viewing windows are not overloaded.

The valve can be installed inside or outside the enclosure.

Dimensions



Technical data

	FU2-PV32*-Ex	FU5-PV32*-Ex	FU6-PV32*-Ex
Supply			
Rated voltage	24 V DC	115 V AC	230 V AC
Operating conditions			
Process conditions			
Process pressure (static pressure)	F**-PV321-Ex: 0 ... 7 bar F**-PV322-Ex: 0 ... 3.5 bar		
Mechanical specifications			
Protection degree	IP65		
Connection	cable, length 3 m		
Dimensions	56 x 80 x 105 mm (2.2 x 3.1 x 4.1 in)		
Data for application in conjunction with hazardous areas			
EC-Type Examination Certificate	PTB 00 ATEX 2202 X (firm Bürkert)		
Group, category, type of protection	⟨Ex⟩ II 2G EEx m II T4 or T6 ⟨Ex⟩ II 2G EEx em II T4 or T6		
Directive conformity			
Directive 94/9 EC	EN 50014, EN 50019, EN 50028		
General information			
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.		

Type code/model number

Proportional valve **F * * PV32 * -Ex**

Operating voltage
230 V AC..... U 6
115 V AC..... U 5
24 V DC..... U 2

Enclosure volume
< 300 ltr. (NW 4) 1
> 300 ltr. (NW 6) 2*

* for use with orifice 18 mm

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Type code

FD0-T301A-Ex.*

Features

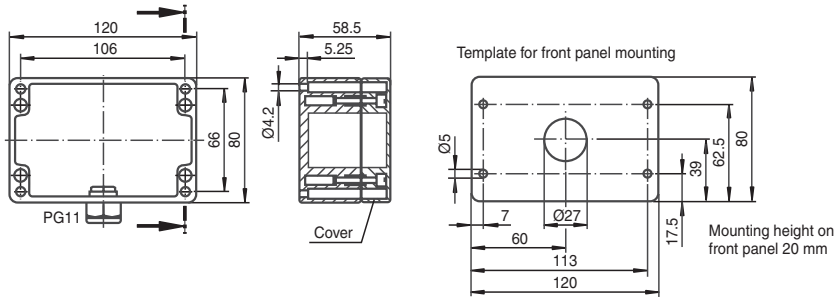
- Intelligent operation panel
- Operating and error messages

Function

The control panel is used primarily when the PCU300A control unit is installed in the pressurised housing.

It permits the operation and call of all operating parameters.

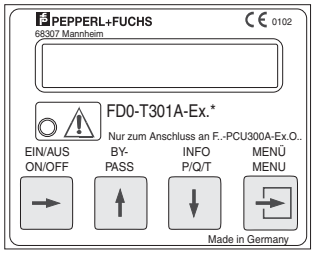
Dimensions



Technical data

Operating conditions	
Mounting conditions	
Installation position	type F: front panel mounting (mounting height 20 mm (0.8 in)) type H: housing
Ambient conditions	
Ambient temperature	-20 ... 40 °C (253 ... 313 K)
Mechanical specifications	
Protection degree	IP65 (with housing)
Dimensions	58.5 x 80 x 120 mm (2.3 x 3.15 x 4.7 in)
Data for application in conjunction with hazardous areas	
EC-Type Examination Certificate	DMT 00 ATEX E 004 X, for additional certificates see www.pepperl-fuchs.com
Group, category, type of protection	Ex II 2G EEx ib IIC T6 ($T_{amb} \leq$ 40 °C) Ex II 2D Ex ibD T80°C ($T_{amb} \leq$ 40 °C)
Supply	
Safety maximum voltage U_m	253 V (Attention! U_m is no rated voltage.)
Output	
Contact loading	250 V AC/5 A/cos Φ> 0.7/30 V DC/5 A/150 W
Directive conformity	
Directive 94/9 EC	EN 50014, EN 50016, EN 50019, EN 50020, EN 50028, EN 954-1, IEC 61241-0, IEC 61241-1, IEC 61241-11
General information	
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Notes



When the bypass button is pressed, the operating safety instructions must be complied with (e. g. presentation of a fire permit).

Operation panel FD0-T301A-Ex.*

Front panel mounted ..... F
Housing IP65 . ..... H

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Type code

PCU-F-Ex.**MA

Features

- Integrated in the control unit

Function

- The fuse is integrated in the control unit. It must be selected acc. to type (DV/PV) and operating voltage and ordered separately.
- Maximum fusing values when using other solenoid valves:
  - 230 V AC 200 mA
  - 115 V AC 315 mA
  - 24 V DC 2000 mA

Technical data

Electrical specifications	
Current	see type code

Type code/model number

Back-up fuse for solenoid valves **PCU-F-Ex. * * * * MA**

	DV	PV	
80 mA	230 V		80
100 mA			100
160 mA	115 V		160
200 mA		230 V	200
315 mA			315
400 mA		115 V	400
630 mA	24 V		630
1000 mA			1000
1600 mA		24 V	1600
2000 mA			2000

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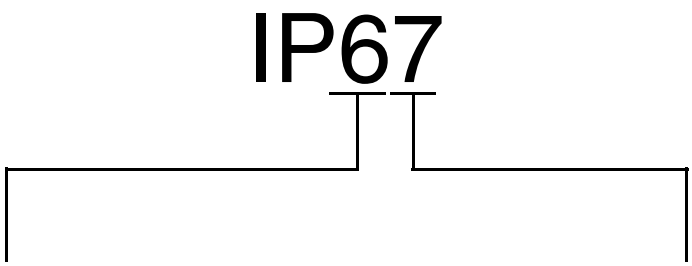
Protection provided by housings (DIN VDE 0470 part 1, IEC 60529)



Protection against contact and foreign bodies		Degree of protection against water	
0	Not protected	0	Not protected
1	Protected against solid foreign bodies with a size and diameter of 50 mm (2 in) and above Protected against contact with hazardous components with the backs of the hand	1	Protected against dripping water
2	Protected against solid foreign bodies with a size and diameter of 12.5 mm (0.5 in) and above Protected against contact with hazardous components with fingers	2	Protected against dripping water, when housing is tilted up to 15°
3	Protected against solid foreign bodies with a size and diameter of 2.5 mm (0.1 in) and above Protected against contact with hazardous components with a tool	3	Protected against sprayed water
4	Protected against solid foreign bodies with a size and diameter of 1.0 mm (0.04 in) and above Protected against contact with hazardous components with a wire	4	Protected against splash water
		4K	Protected against splash water with increased pressure
5	Protection from dust Protected against contact with hazardous components with a wire	5	Protected against water jets
6	Dust tight Protected against contact with hazardous components with a wire	6	Protected against strong water jets with increased pressure
		6K	Protected against strong water jets
		7	Protected against temporary submersion in water
		8	Protected against continuous submersion in water
		9K	Protected against water on high pressure cleaning or vapour stream cleaning

Notes:

Wherever a code number is not required, the letter "X" must be used in its place.

Devices having a second digit of 7 or 8 do not need to fulfil the requirements of the second digits 5 or 6, thus, if the device fulfils both degree 6 and 7 against water, a double description must be used (e. g. IPX6/IPX7).

The conditions of Pepperl+Fuchs GmbH for IPX8 are:

- 1 m water column above the test subject
- 24 h operation under water with cyclical damping and amplification under rated load
- cycle time 2 h
- water temperature = room temperature ± 5 °C (± 5 K)

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Introduction to explosion protection through intrinsic safety

When introducing electrical equipment in a hazardous area, extensive regulations must be observed that are subdivided into European (EU) and national requirements.

The European standards define the general specifications and the detailed guidelines for methods of protection against explosion. The national requirements primarily contain the installation criteria.

Electrical instruments for explosion groups I and II, as well as the T1 ... T6 temperature classifications, are grouped in DIN EN 50014 (see "Division of Hazards, Ignition Hazards due to Sparks and Hot Surfaces" in the following table). DIN EN 50020 presents categories, design and test specifications and type identification of intrinsically safe apparatus. Approvals for electrical instruments that are used in explosive environments are regulated by EG-Ex-Framework guidelines 76/117/EWG and guideline 94/9/EG.

The intrinsic safety method of explosion protection always relates to intrinsically safe circuitry that comprises an intrinsically safe apparatus, an appropriate electrical power source and the connecting cables. In intrinsically safe circuits, an explosive environment cannot be ignited by sparking or a thermal effect when operating normally under prescribed fault conditions. In an intrinsically safe circuit for category ia, 2 calculable faults (see definition EN 50020) must not cause an ignition and in category ib only 1 such fault is permissible. Limiting the power supply, total inductance and total capacitance within the intrinsically safe circuitry is the basic principle of the intrinsically safe explosion protection method.

The project manager or user has to compare the permissible internal limit values for intrinsically safe electrical apparatus with the permissible connection values of the associated electrical apparatus, in accordance with the following table:

Intrinsically safe apparatus and cable	Demonstration of intrinsic safety	Associated apparatus
U_i	$\geq$	U_o
I_i	$\geq$	I_o
P_i	$\geq$	P_o
$L_i + L_c$	$\leq$	L_o
$C_i + C_c$	$\leq$	C_o

These limit values are obtained from the prototype test certificate. The comparison of the limit values satisfies the requirement of DIN EN 60079-14 with regard to the demonstration of intrinsic safety. When installing complex intrinsically safe circuitry with more than one item of associated electrical apparatus, a calculated demonstration of intrinsic safety has to be carried out and this must then be referenced back to the explosion limit curves for DIN EN 50020 or to the tables that these curves represent.

In this case all the active associated electrical apparatus are combined in one complex associated electrical apparatus. "Active" refers to any apparatus that can provide power to the intrinsically safe circuit under normal or malfunctioning operating conditions.

For the intrinsically safe connection terminals of this complex apparatus, the effective values for

- the maximum output voltage U_o,
- the maximum output current I_o,
- the maximum output power P_o,

are calculated as follows, depending on the combined circuitry of the individual associated apparatus:

For parallel circuits:

- I_o from the sum of the individual currents,
- U_o from the maximum value of the individual voltages.

For series connection:

- I_o from the maximum value of the individual currents,
- U_o from the sum of the individual voltages.

The individual values are taken from the certificates of conformity. The maximum output power is calculated from the following formula for assigned apparatus with linear current-voltage output characteristics:

$$P_o = 1/4 \times U_o \times I_o$$

Based on the calculated maximum value, the intrinsic safety has to be checked using the ignition limit curves. DIN EN 60079-14 references limitations (PTB report W39 is to be used for associated apparatus with non-linear current-voltage characteristics) and safety factors.

In addition to this demonstration of intrinsic safety, the integrity of the intrinsically safe circuitry must also be assured against the ingress of energy from other electrical power sources. If both requirements are fulfilled, a safe power limit within the circuitry will not be exceeded, even if there is an interruption, a short circuit or grounding of the circuitry (EN 60079-14). A detailed description of "Explosion protection through intrinsic safety" can be found in the manual of the same name.

The previously valid national specifications will be replaced in the future by the following European standards:

EN 1127-1	Machine safety/combustion and explosion protection (zone 0; 1; 2 for gas and steam/ zone 20; 21; 22 for dust)
EN 60079-10	Installation of electrical systems in potentially explosive areas (division into areas)
EN 60079-14	Installation of electrical systems in potentially explosive areas (installation specification)

Explosion protection through intrinsic safety

The following table compares important general guidelines for explosion protection as applied in the European Union and North America.

<table>
<tr><td></td><td>European Union</td><td>North America</td></tr>
<tr><td>Classification of hazards</td><td>Explosive mixture in
Group I: mines susceptible to firedamp
Group II: other areas outside of mines</td><td>Explosive mixtures of air and
CLASS I: Gases and vapours
CLASS II: Dusts
CLASS III: Fibres</td></tr>
<tr><td>Ignition due to sparks</td><td>Grouping of the ignition protection methods of intrinsic safety/flame proof enclosure, as well as ignition protection method "u", in respect of the minimum ignition current/limit gap and in accordance with the minimum ignition energy of representative gases:
Group I Methane
Group IIA Propane
IIB Ethylene
IIC Hydrogen, Acetylene</td><td>Sub-division of the class according to ignition energy:
CLASS I Group A Acetylene
B Hydrogen
C Ethylene
D Methane
CLASS II Group E Metal dusts
F Coal dusts
G Grain dusts
CLASS III No grouping</td></tr>
<tr><td>Ignition hazards due to hot surfaces</td><td colspan="2">Division into temperature classes in accordance with IEC 60079-8 for maximum surface temperatures with an ambient temperature of 40 °C, under fault conditions:
T1 ≤ 450 °C T2 ≤ 300 °C T3 ≤ 200 °C T4 ≤ 135 °C T5 ≤ 100 °C T6 ≤ 85 °C</td></tr>
<tr><td rowspan="3">Division of hazardous areas</td><td colspan="2">The following are subdivided according to the probability of the occurrence of a dangerous explosive atmosphere:</td></tr>
<tr><td>For gases, vapours, mists: (EN 1127-1)
Zone 0 constant or long term
Zone 1 occasionally
Zone 2 seldom and short term
for dusts: (EN 1127-1)
Zone 20 constant or long term or frequently
21 occasionally
22 short term or accumulation or layers of dust</td><td>for gases and dusts:
Division 1
Division 1
Division 2</td></tr>
<tr><td colspan="2">Note (see IEC 60079-10): constant or long term corresponds to > 1000 h/year, occasionally corresponds to 10...1000 h/year, seldom or short term corresp. to < 10 h/year</td></tr>
<tr><td rowspan="2">Safety characteristics</td><td colspan="2">The characteristics of flammable gases and vapours as a basis for classification in respect of ignition energy and temperature/flashpoint are contained in:</td></tr>
<tr><td>DIN EN 50014: 1997 appendix A
BS 5345, part 1</td><td>NFPA 497 M
CSA No. C22-1</td></tr>
<tr><td>Approval authorities (named locations in accordance with Directive 94/9/EC)</td><td>PTB Physikalisch-Technische Bundesanstalt
DMT (old) Deutsche Montan Technologie
EXAM (new) BBG Prüf- und Zertifizier-GmbH
BASEEFA British Approvals Service for Electrical Equipment in Flammable Atmospheres
TÜV TÜV Nord Cert GmbH & Co. KG
and others</td><td>UL Underwriters Laboratories, USA
FM Factory Mutual Research, USA
CSA Canadian Standards Association</td></tr>
<tr><td>Installation requirements</td><td>EN 60079-14 (VDE 0165, part 1) for explosive gas environments
EN 50281-1-2 (VDE 0165, part 2) for environments with flammable dust and other EC-wide and national (for example ExVo) requirements</td><td>NFPA 70 National Electrical Code Art. 500
NFPA 70 National Electrical Code Art. 505
NFPA 493 Standard for Intrinsically safe operations ...</td></tr>
</table>

SIL classification acc. to IEC/EN 61508

Interface modules

Model	Function	Loop architecture	Remark
		simple (1oo1)	
ED2-STC4-**2	SMART transmitter power supply	SIL2	exida report
ED2-VM-Ex*.3**	Solenoid driver	SIL2	exida report
EG*-***	Isolated switch amplifier	SIL2	exida report
HiD2025/2026 (SK)	SMART transmitter power supply	SIL2	exida report
HiD2029/2030 (SK)	SMART transmitter power supply	SIL2	exida report
HiD2033/2034	Isolated repeater	SIL2	exida report, loop powered
HiD2037/2038	Isolated repeater	SIL2	exida report
HiD2821/2822/2824	Isolated switch amplifier	SIL2	exida report
HiD2842/2844	Isolated switch amplifier	SIL2	exida report
HiD2871/2872	Solenoid driver	SIL2	exida report, optional loop powered
HiD2875/2876	Solenoid driver	SIL2	exida report, optional loop powered
HiD2881	Solenoid driver	SIL2	exida report, optional loop powered
K***-SH-Ex1	Isolated switch amplifier	SIL3	exida report
KCD0-SD-Ex1.1245	Solenoid driver	SIL3	exida-report, loop powered
KCD2-SCD-Ex1	SMART repeater	SIL2	exida-report
KCD2-SR-***.**	Isolated switch amplifier	SIL2	exida-report
KCD2-STC-Ex1	SMART transmitter power supply	SIL2	exida-report
KF**-CRG-***.*	Transmitter supply isolator	SIL2	exida report, with trip value function
KF**-DWB-***.*	Rotational speed controller	SIL2	exida report
KF**-GUT-***.*	Temperature converter with limit value	SIL2	exida report
KF**-SOT2-***.**	Isolated switch amplifier	SIL2	exida report
KF**-SR2-***.**.**	Isolated switch amplifier	SIL2	exida report
KF**-UFC-***.*	Frequency current converter	SIL2	exida report
KFD0-CS-***.***	Isolated repeater	SIL2	exida report, loop powered
KFD0-HMS-16	Multiplexer slave	SIL3	exida report, loop powered
KFD0-RO-***	Relay module	SIL2	exida calculation
KFD0-RSH-1	Relay module	SIL3	exida report, loop powered
KFD0-SCS-***.**	SMART repeater	SIL2	exida report, loop powered
KFD2-CD*-***.**-**	Isolated repeater	SIL2	exida report
KFD2-HMM-16	Multiplexer master	SIL3	exida report
KFD2-SCD*-***.**	SMART repeater	SIL2	exida report
KFD2-SD-***.****	Solenoid driver	SIL3	exida report, loop powered
KFD2-SL-***.**	Solenoid driver	SIL3	exida report
KFD2-SL2-***.**	Solenoid driver	SIL2	exida report
KFD2-SL-4	Solenoid driver	SIL2	exida report
KFD2-SR2-**2.W.SM	Standstill controller	SIL2	exida report
KFD2-ST2-***.**	Isolated switch amplifier	SIL2	exida report
KFD2-STC4-***.**	SMART transmitter power supply	SIL2	exida report
KFD2-STV4-***.**	SMART transmitter power supply	SIL2	exida report
Mux2700	Multiplexer	SIL3	exida report
P-LB-***	Lightning-protection barrier	SIL3	exida calculation

Field devices

Model	Function	Loop architecture	Remark
		simple (1oo1)	
LHC-M20/M40	Hydrostatic pressure sensor	SIL2	Declaration of conformity
LTC***	Guided microwave	SIL2	Declaration of conformity
LVL-M* with FEL51 ... FEL58	Vibration limit switch	SIL2	Declaration of conformity
NCB2-12GM35-N0	Inductive initiator	SIL2	exida report
NCB2-V3-N0	Inductive initiator	SIL2	exida report
NCB5-18GM40-N0	Inductive initiator	SIL2	exida report
NCN3-F25*-SN4***	Inductive safety initiator	SIL3	exida report
NCN3-F31K-N4-V1-V1	Inductive initiator	SIL2	exida report
NCN3-F31-N4-K-K	Inductive initiator	SIL2	exida report
NCN4-12GM35-N0	Inductive initiator	SIL2	exida report
NCN4-V3-N0	Inductive initiator	SIL2	exida report
NCN8-18GM40-N0	Inductive initiator	SIL2	exida report
NJ10-30GK-SN***	Inductive safety initiator	SIL3	exida report
NJ15-30GK-SN***	Inductive safety initiator	SIL3	exida report
NJ15S+U*+N***	Inductive safety initiator	SIL3	exida report
NJ20S+U*+N***	Inductive safety initiator	SIL3	exida report
NJ2-11-SN***	Inductive safety initiator	SIL3	exida report
NJ2-11-SN-G***	Inductive safety initiator	SIL3	exida report
NJ2-12GK-SN***	Inductive safety initiator	SIL3	exida report
NJ3-18GK-S1N***	Inductive safety initiator	SIL3	exida report
NJ40-FP-SN***	Inductive safety initiator	SIL3	exida report
NJ4-12GK-SN***	Inductive safety initiator	SIL3	exida report
NJ5-18GK-SN***	Inductive safety initiator	SIL3	exida report
NJ5-30GK-S1N***	Inductive safety initiator	SIL3	exida report
NJ6-22-SN***	Inductive safety initiator	SIL3	exida report
NJ6-22-SN-G***	Inductive safety initiator	SIL3	exida report
NJ6S1+U*+N1***	Inductive safety initiator	SIL3	exida report
NJ8-18GK-SN***	Inductive safety initiator	SIL3	exida report
PPC-M10/M20	Process pressure transmitter	SIL2	Declaration of conformity
SC3,5-N0	Inductive initiator	SIL2	exida report
SJ2-N	Inductive initiator	SIL2	exida report
SJ2-S1N***	Inductive safety initiator	SIL3	exida report
SJ2-SN***	Inductive safety initiator	SIL3	exida report
SJ3,5-N	Inductive initiator	SIL2	exida report
SJ3,5-S1N***	Inductive safety initiator	SIL3	exida report
SJ3,5-SN***	Inductive safety initiator	SIL3	exida report

Application sheet corrosion monitoring CorrTran

Submitted by: _____ Date: _____

Company: _____ Application number: _____

Contact name: _____

Address: _____ Telephone: _____

_____ Telefax: _____

City, State zip: _____ E-mail: _____

General application information

Pipe/vessel material: _____

Material to be monitored: _____

Medium: _____

Process temperature: _____ Ambient temperature: _____

Process pressure: _____

Area classification (explosive): _____

Type of protection: ☐ Non-hazardous ☐ Intrinsic safety ☐ Division 2 ☐ Explosion proof

Probe configuration

Type of monitoring: ☐ General corrosion ☐ Localised corrosion (pitting)

Scale of units: ☐ mpy, mils per year (standard)** ☐ mm per year

Housing mounting: ☐ Direct mounting Remote mounting ☐ 6 ft ☐ 12 ft

Total length in ": _____ Fixed insertion length in ": _____

Process connection: ☐ ¾ NPT Flange ☐ ANSI 1" ☐ ANSI 2"

Probe material: ☐ 1.4401/316 ☐ Epoxy glass ☐ Other: _____

Material end cap seal: ☐ Glass (standard) ☐ Kalrez ☐ Epoxy

Alarm configuration*: Low: = 3.7 mA High: = 22.5 mA

☐ Low/auto reset ☐ Low/manual reset

☐ High/auto reset ☐ High/manual reset

☐ Alarm off (standard)

Lower range value LRV: _____ (standard 0 mpy) Upper range value URV: _____ (standard 40 mpy)

Model number

C	M	C		–									–	0		–	A	2	I	H		–			–			

Configuration data (internal use only)*

General corrosion or pitting: _____ B value: _____

PV Units: _____ A Elec Area: _____

LRV: _____ K Comp Prop: _____

URV: _____ Meas Mode: _____

Damping: _____ 0.1 s Firmware: _____

Alarm Config: _____ Method: _____

Filter Freq: _____

CorrTran serial number: _____ Transmitter/HART ID: _____

Probe: _____ Element: _____

CO number: _____ MO number: _____

Part number: _____

* only for general corrosion probe

** 1 mil = 1/1000"

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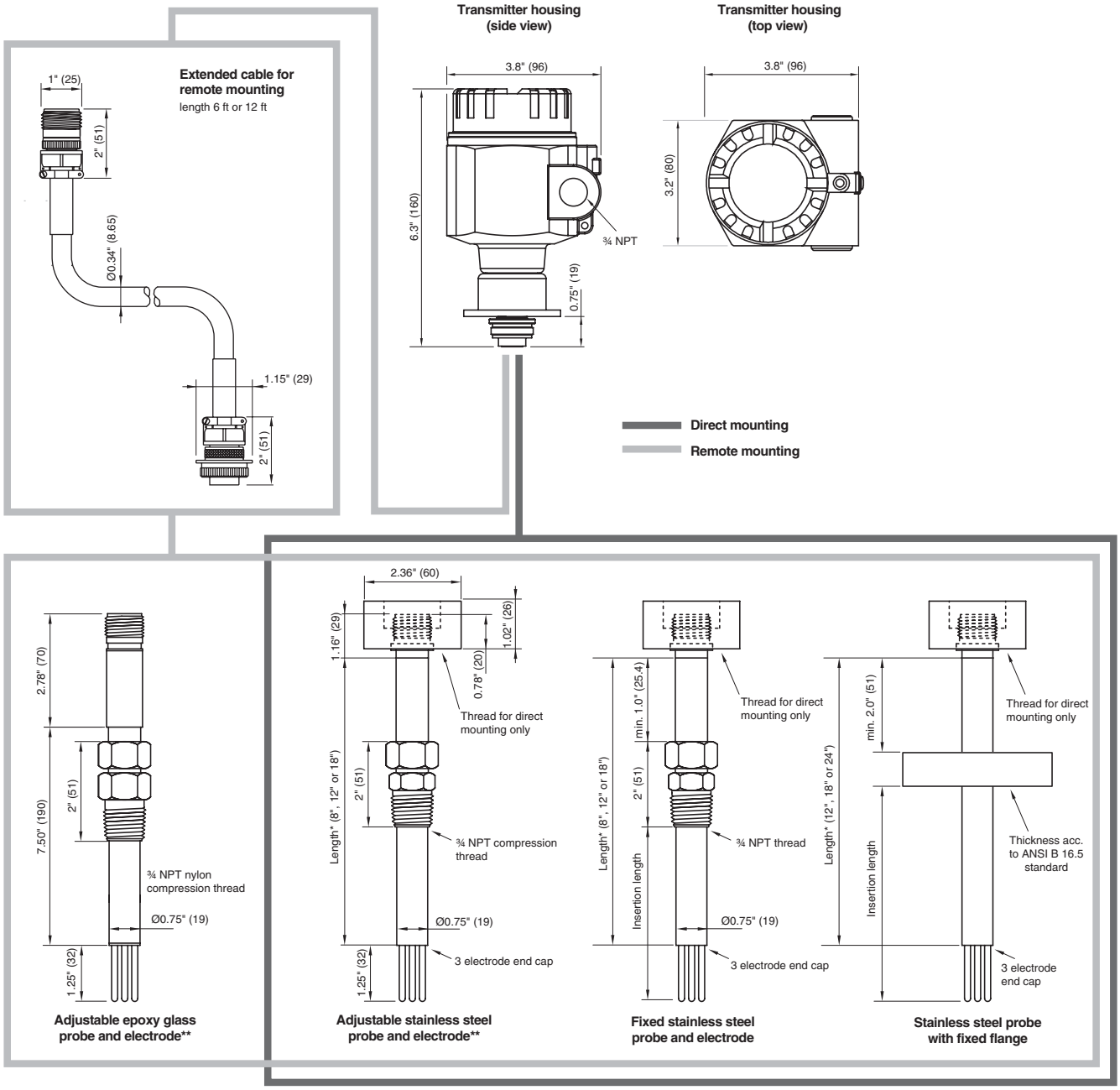
This application sheet is intended to be used with the data sheet and instruction manual as an aid in specifying the corrosion monitoring CorrTran CMC*. This application sheet can be included with your order for custom configuration of your CorrTran. Only include the front page, this page is not required.

Below are the dimensions of the probe, the probe length, and the fixed and insertion length.



A

AS-i bus: actuator sensor interface: 1 master and 62 slaves. 4 bit bidirectional transfer on a 2-wire conductor, 100 m.

B

BPG-ÜS: construction and test principles for overspill protection systems.

Brass: CuZn alloy

C

CENELEC: within the scope of the European Community, the CENELEC (European Committee for Electrotechnical Standardisation) develops harmonised regulations for the design and testing of electrical apparatus for hazardous areas.

Conditions for conductive measurement: minimum conductivity of approx. 10 µS/cm.

Conductive limit value detection: analysis of the measuring current which flows between two electrodes via a conductive medium.

Conductivity: a measure of the ability of a material to conduct electrical current.

Continuous level measurement: determination of the current fill height in a measuring range.

Converter: a plug-in module in the terminal box of the measuring sensor

CSM: chlorosulfonated polyethylene, widely resistant to acids, lyes and many solvents.

D

DIBt: German Institute for Structural Engineering in Berlin (earlier: IfBt)

Dielectric constant ε_r: material constant. It represents how many times more than in vacuum the medium increases the capacity of a capacitor.

DIN: German Institute for Standards

DMT: German Mining and Exploration Institute (earlier BVS)

E

ECTFE: thermoplastic fluoroplastics, resistant to most industrial acids, lyes and solvents.

Electrodes: mostly rod type electrodes with different coatings, diameters and lengths for conductive, capacitive measurement.

Electrode relay: a current flow between the electrodes when coming into contact with a conductive liquid activates the relay.

Electronical converter: → converter

Elex V: German ordinance on electrical apparatus used in potentially explosive atmospheres

Ex area/Ex zone: areas of an installation (container, pipe, surroundings of discharge valves, etc.) in which a combustible medium can produce an explosive mixture with atmospheric oxygen (see section Ex i).

Explosion protection (Ex): In areas where potentially explosive atmospheres are present, all components of the measuring system must have the corresponding approval.

H

Hastelloy B: = 2.4617 = NiMo28

Hastelloy C: = 2.4610 = NiMo16Cr16Ti

Hydrostatic level measurement: determination of the fill height via the liquid pressure; conditions: constant density

Hypalon: → CSM

I

Initiator: → proximity switch

K

Kalrez: Perfluorelastomer (sealing material)

L

Level measurement: → continuous level measurement

Limit value detection: measurement of whether a medium has reached or exceeded a fixed filling height.

M

Measuring circuit: Produced by applying a small measuring AC voltage to the electrodes, supplied from the electrode relay or transformer.

Measuring sensor: detector, proximity switch, sensor

Min/Max control: the output signal changes as the maximum is reached. This status is maintained until the level drops below the minimum level. At that moment the output signal is reset. Min/Max control is used frequently for pump automation.

N

NAMUR: standard committee for measurement and control techniques. Among others the committee defined EN 60947-5-6[1] which rules the energy balance of the electrical equipment.

O

Open circuit: via the potential free changeover contacts of a relay switched circuit (AC/DC).

OSS/WHG: water contaminating, non combustible liquids

OSS/VbF: water contaminating and combustible liquids

Overspill prevention system (OSS): A device which triggers an alarm when water contaminating liquids threaten to overflow from a container.

1 EN 60947-5-6 (also IEC 60947-5-6) is identical to EN 50227 and corresponds to DIN 19234.

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P

PA: polyamide, resistant to oils, greases and most solvents

PE: polyethylene, resistant to diluted acids and lyes, most solvents, alcohol, benzine, water, greases and oils.

Permanence: manufacturers offer permanence lists for various materials. The preconditions listed must be exactly observed.
Our experts will be happy to give you information concerning special problems. Pepperl+Fuchs has the experience necessary for solving most problems.

PP: polypropylene, resistant to acids, lyes, greases, oils and solvents

Process connection:
screw fitting G*A, e. g. G1¼A, cylindrical threading in accordance with DIN ISO 228/I
Screw fitting * NPT, e. g. 1 NPT, conical threading in accordance with ANSI B 1.20.1

Proximity switch: reacts to approaching objects with an electrical switching signal

PrZV: Testing mark ordinance

PTB/PTBP: polybutyleneterephthalate

PTB: German Federal Physical Technical Institute Braunschweig

PTFE: polytetrafluor ethylene, highly resistant to all chemicals

PUR: polyurethane, widely resistant to fuels, fuel oils and liquids containing oil

PVC: polyvinyl chloride, preferred for water, contaminated water, slightly aggressive liquids

PVDF: polyvinylidenfluoride, very resistant to oils and greases, acids and lyes resistant to solvents

R

Responsive sensitivity: selectable range in which the current flow (between electrodes in contact with the liquid) produces a switching signal.

S

Screw fitting: → process connection

Sensitivity: → response sensitivity

T

Transformer isolated barrier: The relay responds to defined current changes in accordance with EN 6094-5-6 (NAMUR), e. g. KFD2-SR2-Ex1.W

TÜV: A technical surveying association in Germany

U

Ultrasonic: acoustic waves within the non audible range, for US-Sensors frequencies between 50 kHz and 500 kHz are used.

V

VAwS: German ordinance for installations which store water-contaminating substances

VDE: Association of German Electrical Engineers

Viton: fluorocaoutchouc (fluorine-containing polymer)

W

WHG (German water resources law): the use of overspill prevention systems is prescribed in § 19 of the german water resources law and the applicable state ordinances concerning installations which store, drain and transport water contaminating substances (VAwS). Such an overspill prevention system must posses the respective approval.

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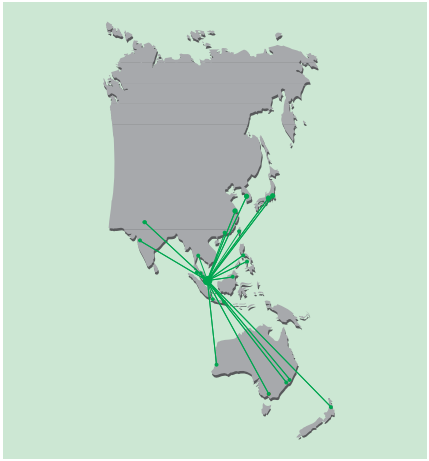

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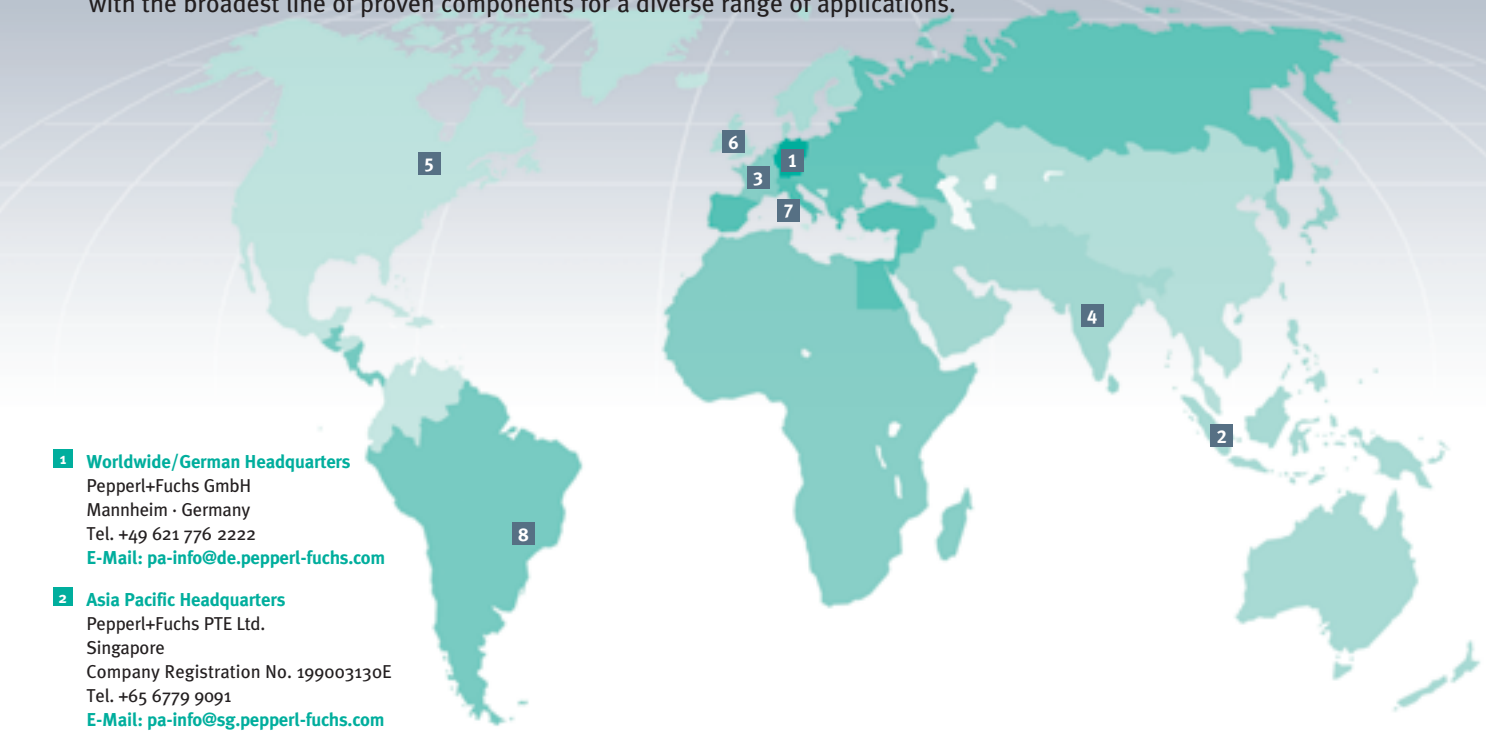

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