FIELD DEVICES FOR
PROCESS AUTOMATION

PEPPERL+FUCHS
PROTECTING YOUR PROCESS
With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V." including the supplementary clause: "Extended reservation of title".

We at Pepperl+Fuchs recognise a duty to make a contribution to the future. For this reason, this printed matter is produced on paper bleached without the use of chlorine.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1945</td>
<td>Walter Pepperl and Ludwig Fuchs lay the foundation of Pepperl+Fuchs: The opening of a radio repair shop</td>
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<tr>
<td>1948</td>
<td>Manufacture of transformers</td>
</tr>
<tr>
<td>1958</td>
<td>Development and production of the first inductive proximity switch</td>
</tr>
<tr>
<td>1973</td>
<td>The first foreign subsidiary is formed in England</td>
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<td>1979</td>
<td>Pepperl+Fuchs commences production in Singapore</td>
</tr>
<tr>
<td>1988</td>
<td>Michael Fuchs and Claus Michael take over the management of the company and Pepperl+Fuchs becomes a limited liability company</td>
</tr>
<tr>
<td>1991</td>
<td>Split into Factory Automation and Process Automation divisions, new product group level control through a company acquisition</td>
</tr>
<tr>
<td>1996</td>
<td>The purchase of another company establishes the encoder business</td>
</tr>
<tr>
<td>1997</td>
<td>New production facilities open at Veszprem/Hungary</td>
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<td>2000</td>
<td>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</td>
</tr>
<tr>
<td>2000</td>
<td>Start of manufacture at Bintan/Indonesia</td>
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<td>2003</td>
<td>Takeover of the purge and pressurization systems from Bebco Industries EPS in the USA</td>
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<tr>
<td>2004</td>
<td>New Data Matrix Code product range obtained through the acquisition of Omnitron AG and the Position Encoding System, also due to an acquisition</td>
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<tr>
<td>2005</td>
<td>Expansion of the Systems &amp; Solutions business area within the Process Automation division aided by the acquisition of EXTEC</td>
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<tr>
<td>2006</td>
<td>Pepperl+Fuchs acquires Intrinsic Safety Instrumentation business from Cooper Crouse-Hinds GmbH</td>
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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
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.
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# Overview of all level measuring methods

## Limit value detection

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Overview of all level measuring methods

Continuous level measurement

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<td></td>
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<td>Level probe</td>
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<td>Ex-area zone 21 + 22</td>
<td>LHC-M40</td>
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<td>PPC-M**</td>
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<td>Ultrasonic</td>
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<tr>
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<td>Ex-area zone 0 + 1</td>
<td>LTC</td>
<td>202</td>
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<tr>
<td></td>
<td>Ex-area zone 22</td>
<td>LTC</td>
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<tr>
<td></td>
<td>Ex-area zone 21 + 22</td>
<td>LTC</td>
<td>202</td>
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</tbody>
</table>
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).
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.
4 steps to a suitable level measuring method

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.
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 possess 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.
# Questionnaire level control

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

<table>
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<th>Company:</th>
<th>Responsible person:</th>
</tr>
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<tr>
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<table>
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<th>Plant, operation, key words:</th>
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### Type of control

<table>
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<tr>
<th>Type of control</th>
<th>limit value detection</th>
<th>continuous level measurement</th>
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<tr>
<td></td>
<td>O maximum</td>
<td>O continuous measurement</td>
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<tr>
<td></td>
<td>O minimum</td>
<td>O continuous measurement</td>
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<tr>
<td></td>
<td>O linked switching points as min-max-control</td>
<td>O continuous measurement with limit value detection</td>
</tr>
</tbody>
</table>

### Do you need devices in explosion proof version?

- O yes, Ex-area zone: temp.-class:
- O no

### Do you need certified overspill preventions?

- O in acc. with WHG for non flammable liquids:
- O no

### Which measuring principle would you prefer?

<table>
<thead>
<tr>
<th>Type of control</th>
<th>limit value detection</th>
<th>continuous level measurement</th>
</tr>
</thead>
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<td>O hydrostatic</td>
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<td>O magnet-operated immersion probe</td>
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<td></td>
<td>O conductive</td>
<td>O ultrasonic</td>
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<tr>
<td></td>
<td>O capacitive</td>
<td>O guided microwave</td>
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### Continuous level measurement

<table>
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<th>Type of control</th>
<th>limit value detection</th>
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</tr>
<tr>
<td></td>
<td>O magnet-operated immersion probe</td>
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</table>

### Vessel

<table>
<thead>
<tr>
<th>Vessel</th>
<th>shape:</th>
<th>connection piece for the probe:</th>
<th>material:</th>
<th>level:</th>
<th>height of level limit:</th>
</tr>
</thead>
</table>

### Operating pressure in the vessel:

- max.: bar
- min.: bar

### Operating temperature in the vessel:

- max.: °C
- 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

### If known, dielectric constant:

- O stainless steel 1.4571
- O Hastelloy B/C
- O titanium
- O tantalum
- O Ti
- 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**

```
L F L - - -
```

- Limit
- Float
- Level
- Cable length
- Electrical output
- Float material
- Switching element

**Product group LFLC**

```
L F L C - - C K - -
```

- Limit
- Float
- Level
- Number of switches
- Float switch type
- Float switch combination
- Cable material
- Terminal box
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.

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

**LFL1-**-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).

**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

**Electrical connection**

Cable colours

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

1/BN/BL

2/BU

L+ L-

**Dimensions**

- Sleeve design LFL1-CK-N
- Ball design LFL1-BK-N
## Technical data

### Float switch LFL1-**-N

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
<th>inductive proximity switch with switching ball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function and system design</td>
<td>Equipment architecture</td>
<td>A measuring system consists of a float switch LFL1-**-N and a transformer isolated barrier, e.g. KFD2-SR2-Ex1.W.</td>
</tr>
<tr>
<td>Auxiliary energy</td>
<td>Supply voltage</td>
<td>8.2 V ± 2 V</td>
</tr>
<tr>
<td></td>
<td>Current consumption</td>
<td>&lt; 1.0 mA unswitched (de-energised at the bottom), &gt; 2.2 mA switched (floated up at the top)</td>
</tr>
<tr>
<td>Auxiliary energy</td>
<td>Reverse polarity protection</td>
<td>yes</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>Mounting conditions</td>
<td>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.</td>
</tr>
<tr>
<td>Process conditions</td>
<td>Process temperature</td>
<td>-20 ... 70 °C (253 ... 343 K)</td>
</tr>
<tr>
<td></td>
<td>Process pressure (static pressure)</td>
<td>sleeve design: ≤ 3 bar at 20 °C (293 K) ball design: ≤ 2 bar at 20 °C (293 K)</td>
</tr>
<tr>
<td>Density</td>
<td>sleeve design: ≥ 0.8 g/cm³ ball design: ≥ 0.6 g/cm³</td>
<td></td>
</tr>
<tr>
<td>Mechanical specifications</td>
<td>Protection degree</td>
<td>IP68</td>
</tr>
<tr>
<td>Material</td>
<td>float: PP (polypropylene) cable: - PVC version: PVC cable, highly flexible (2 x 0.75 mm²) - PUR version: PUR cable, highly flexible (2 x 0.50 mm²) - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (2 x 0.75 mm²))</td>
<td></td>
</tr>
<tr>
<td>Switching point</td>
<td>switch angle: upper switching point +12°, lower switching point -12°, measured against the horizontal</td>
<td></td>
</tr>
<tr>
<td>Certificates and approvals</td>
<td>Ex approval</td>
<td>TÜV 99 ATEX 1407, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
<tr>
<td>Type of protection</td>
<td>II 2G Ex ia IIB T5</td>
<td></td>
</tr>
</tbody>
</table>

### 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.
Float switch
LFL1-**-N

Technical data

**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)

### Note

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

### Float switch

**Type code/model number**

<table>
<thead>
<tr>
<th>L</th>
<th>F</th>
<th>L</th>
<th>-</th>
<th>K</th>
<th>N</th>
<th>-</th>
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<tbody>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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

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

- **Electrical output**
  - N according to DIN EN 60947-5-6 (NAMUR)

- **Float material**
  - K plastic PP

- **Float form**
  - C sleeve

- **Switching element**
  - B ball

  1. Initiator with switching ball
**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

**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**

<table>
<thead>
<tr>
<th>Cable colours</th>
<th>Z0</th>
<th>Z1</th>
</tr>
</thead>
<tbody>
<tr>
<td>brown or black</td>
<td>L+</td>
<td>L+</td>
</tr>
<tr>
<td>blue</td>
<td>L-</td>
<td>L-</td>
</tr>
</tbody>
</table>

3/BN/BL                      | L+                  | Z0 floating up closing

4/BU                         | L-                  |

1/BN/BL                      | L+                  | Z1 floating up opening

2/BU                         | L-                  |
## Technical data

### Float switch

**LFL1-**-**Z***

### 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/cm³
- Ball design: ≥ 0.6 g/cm³

### 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 mm²)
  - PUR version: PUR cable, highly flexible (2 x 0.50 mm²)
  - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (2 x 0.75 mm²))

**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.
Float switch
LFL1-**-Z*

Technical data

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)

Type code/model number

<table>
<thead>
<tr>
<th>LFL1</th>
<th>K</th>
<th>Cable length</th>
<th>Cable material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>3 m (10 ft)</td>
<td>PVC cable</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>5 m (16.5 ft)</td>
<td>PVC cable</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>10 m (33 ft)</td>
<td>PVC cable</td>
</tr>
</tbody>
</table>

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

Float material
- K plastic PP

Float form
- C sleeve
- B ball

Switching element
- 1 initiator with switching ball
<table>
<thead>
<tr>
<th>Float switch</th>
<th>LFL1-**-Z*</th>
</tr>
</thead>
</table>

### Technical data

- **Hydrostatic pressure sensors**
- **Continuous immersion probes**
- **Limit value immersion probes**
- **Capacitive limit switches**
- **Conductive limit switches**
- **Vibration limit switches**
- **Float switches**
**Float switch**

**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

**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
  - black-brown = contact open
  - black-blue = contact closed

**Dimensions**
- Sleeve design LFL2-CK-U
- Ball design LFL2-BK-U

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## Technical data

### 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**

<table>
<thead>
<tr>
<th>Installation instructions</th>
<th>PVC version: ≥ 50 mm (2 in), preferred for water, waste water, slightly aggressive liquids</th>
<th>PUR version: ≥ 100 mm (4 in), preferred for fuels, heating oils, oily fluids</th>
<th>CSM/CM version: ≥ 100 mm (4 in), preferred for many acids and lyes mounting:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- The float switch is mounted either from sidewards through a cable gland ≥ G1A into the vessel or</td>
<td>- by means of a counter weight or rods (e.g. float switch assembly) from the top.</td>
<td>- The pivot of the cable should always be horizontal.</td>
</tr>
<tr>
<td></td>
<td>- by means of a counter weight or rods (e.g. float switch assembly) from the top.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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/cm³
- ball design: ≥ 0.6 g/cm³

### 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 cable, highly flexible (3 x 0.75 mm²)
- PUR cable, highly flexible (3 x 0.50 mm²)
- CSM/CM cable (chlorinated polyethylene, (3 x 0.75 mm²))

**Switching point**
- switch angle: upper switching point +25° (± 10°), lower switching point -14° (± 6°), 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.
Float switch
LFL2-**-U

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

<table>
<thead>
<tr>
<th>L</th>
<th>F</th>
<th>L</th>
<th>2</th>
<th>-</th>
<th>K</th>
<th>-</th>
<th>U</th>
<th>-</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
</tbody>
</table>

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

Cable material
- PVC
- PUR
- CSM

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

Float material
- K plastic PP

Float form
- C sleeve
- B ball

Switching element
- 2 microswitch with switching ball
<table>
<thead>
<tr>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Float switches</td>
</tr>
<tr>
<td>Vibration limit switches</td>
</tr>
<tr>
<td>Conductive limit switches</td>
</tr>
<tr>
<td>Capacitive limit switches</td>
</tr>
<tr>
<td>Limit value immersion probes</td>
</tr>
<tr>
<td>Continuous immersion probes</td>
</tr>
<tr>
<td>Hydrostatic pressure sensors</td>
</tr>
</tbody>
</table>
Float switch

Dimensions

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.

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

Electrical connection

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

### 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**
- 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/cm³
- ball design: ≥ 0.6 g/cm³

### 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 mm²)
  - PUR version: PUR cable, highly flexible (3 x 0.50 mm²)
  - CSM/CM version: CSM/CM cable (chlorinated polyethylene, (3 x 0.75 mm²))

**Switching point**
switch angle: upper switching point +5°, lower switching point -5°, 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.
Float switch
LFL3-**-U

## Accessories
- LFL-Z31, 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

<table>
<thead>
<tr>
<th>L</th>
<th>F</th>
<th>L</th>
<th>3</th>
<th>K</th>
<th>U</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable length</td>
<td>3 m (10 ft)</td>
<td>5 m (16.5 ft)</td>
<td>10 m (33 ft)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable material</td>
<td>PVC, PVC cable</td>
<td>PUR, PUR cable</td>
<td>CSM, CSM cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical output</td>
<td>Float material</td>
<td>K, plastic PP</td>
<td>K, plastic PP</td>
<td>U, change-over contact 250 V AC, 150 V DC</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Float form</td>
<td>C, sleeve</td>
<td>B, ball</td>
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<tr>
<td>Switching element</td>
<td>3, mercury (Hg), change-over contact with switching ball</td>
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<tr>
<td>Technical data</td>
<td>Float switch</td>
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<td></td>
<td>LFL3-**-U</td>
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</tbody>
</table>

- **Float switches**
- **Vibration limit switches**
- **Conductive limit switches**
- **Capacitive limit switches**
- **Limit value immersion probes**
- **Continuous immersion probes**
- **Hydrostatic pressure sensors**
Float switch

LFLC

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.

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

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.

Dimensions

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

**Application**

**Description**
- 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

**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**
  - 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**

**Terminal box**
- A type A with 15 terminals
- B type B with 6 terminals

**Cable material**
- PVC cable
- PUR cable
- CSM cable

**Number of switches**
- 1 switch, float sleeve
- 2 switches, float sleeve
- 3 switches, float sleeve
- 4 switches, float sleeve
- 5 switches, float sleeve

**Float switch type (switching element)**
- 1 float switch, float sleeve, NAMUR output, normally open
- 1 microswitch, float sleeve, 250 V AC, change-over contact
- 1 mercury (Hg) change-over contact, float sleeve, 250 V AC, 150 V DC, change-over contact
- 1 float switch, 24 V DC, normally open (Z0)
- 1 float switch, 24 V DC, normally closed (Z1)
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-**

- **L** - **V** - **L** - **-** - **-** - **-** -
- Limit
- Vibration
- Level
- Version
- Process connection
- Fork surface
- Electrical connection, specifications
- Certificates and approvals

Product group Vibracon LVL-B*

- **L** - **V** - **B** - **-** - **-** - **-** -
- Limit
- Vibration
- Level
- Version
- Process connection
- Optional equipment
- Housing, cable entry
- Sensor length
- Electrical output
- Certificates and approvals

Product group Vibracon LVL-M**

- **L** - **V** - **L** - **M** - **-** - **-** - **-** - **-** - **-**
- Limit
- Vibration
- Level
- Version
- Process connection and material
- Length, temperature separator, pressure-tight bushing
- Heating, cable gland
- Electrical output
- Optional equipment
- Certificates and Approvals
- Specification of length without unit

Subject to reasonable modifications due to technical advances.
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.

Vibration limit switch Vibracon LVL-A5

Contents

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<td>Vibration limit switch Vibracon LVL-M*H, hygienic version</td>
<td>80</td>
</tr>
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<td>Vibration limit switch Vibracon LVL-M2C, with coating</td>
<td>94</td>
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</table>
**Vibration limit switch**

**LVL-A***

- 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

**Features**

**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.
## Technical data

### Vibration limit switch LVL-A*

### 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

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>min. 0.7 g/cm³, other density (e.g. 0.5 g/cm³) settings on request</td>
</tr>
</tbody>
</table>

### Output characteristics

**Fail safe mode**
- **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)

**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**
- output B3: 24.5 ... 31 V DC (AS-Interface)
- output E5: version DC-PNP with M12 x 1 connector or valve connector
- output WA: version AC with valve connector

**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

**Auxiliary energy**
- **Auxiliary energy**
- This device may be used with any sequential circuit, as long as the circuit can support the electrical circuit values of the switching elements.

**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/cm³

**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

**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

**Storage temperature**
- -40 ... 85 °C (223 ... 358 K)

### 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/cm³, other density setting on request
## Vibration limit switch

### LVL-A*

#### Technical data

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viscosity</strong></td>
<td>max. 10000 mm²/s (10000 cSt)</td>
</tr>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td>IP65 with valve connector</td>
</tr>
<tr>
<td><strong>Protection degree</strong></td>
<td>IP66/67 with M12 x 1 connector PPSU (plastic)</td>
</tr>
</tbody>
</table>

#### Float switches

<table>
<thead>
<tr>
<th><strong>Limit value</strong></th>
<th><strong>immersion probes</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viscosity</strong></td>
<td>max. 10000 mm²/s (10000 cSt)</td>
</tr>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

#### Conductive limit switches

<table>
<thead>
<tr>
<th><strong>Conductive limit switches</strong></th>
<th><strong>Capacitive limit switches</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viscosity</strong></td>
<td>max. 10000 mm²/s (10000 cSt)</td>
</tr>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

#### Capacitive limit switches

<table>
<thead>
<tr>
<th><strong>Hydrostatic pressure sensors</strong></th>
<th><strong>Viscosity</strong></th>
<th>max. 10000 mm²/s (10000 cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas content</strong></td>
<td></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

#### Mechanical specifications

- **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

#### Mechanical construction

- **Protection degree**
  - IP65 with valve connector
  - IP66/67 with M12 x 1 connector PPSU (plastic)

#### Vibration limit switches

<table>
<thead>
<tr>
<th><strong>Float switches</strong></th>
<th><strong>Conductive limit switches</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Viscosity</strong></td>
<td>max. 10000 mm²/s (10000 cSt)</td>
</tr>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

#### Continuous immersion probes

<table>
<thead>
<tr>
<th><strong>Viscosity</strong></th>
<th>max. 10000 mm²/s (10000 cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

#### Limit value immersion probes

<table>
<thead>
<tr>
<th><strong>Viscosity</strong></th>
<th>max. 10000 mm²/s (10000 cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

#### Hydrostatic pressure sensors

<table>
<thead>
<tr>
<th><strong>Viscosity</strong></th>
<th>max. 10000 mm²/s (10000 cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas content</strong></td>
<td>stagnant mineral water</td>
</tr>
</tbody>
</table>

## 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 surveyors 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**
  - 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
- Directive 93/68/EC (EMC) (Low Voltage Directive)
  - output B: AS-Interface profile S-3.A.1 as per EN 50295 (limit switch)
  - output WA: EN 50178

**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 T1364O
- operating instructions KA213O
- operating instructions KA1410F weld-in adapter G1 (LVL-Z101)
- operating instructions KA1420F weld-in adapter G¾ (LVL-Z100)
- operating instructions KA1800F 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](http://www.pepperl-fuchs.com).
Technical data

Vibration limit switch
LVL-A*

Electrical connection

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

Two-wire connection for separate switching unit


The address is defaulted to 0 (hex). It is changeable via the bus master or programming unit.

Data bit:

<table>
<thead>
<tr>
<th>D0:1 Sensor covered</th>
<th>D1:1 State = OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0:0 Sensor free</td>
<td>D1:0 State = error</td>
</tr>
<tr>
<td>D2 and D3 are not used.</td>
<td></td>
</tr>
</tbody>
</table>

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

Output E5

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

Output WA

Two-wire AC connection

V1 connector M12 x 1

Operating mode MAX (NC contact)

Operating mode MIN (NO contact)

Valve plug

Operating mode MAX

Operating mode MIN

Valve plug

Operating mode MAX

Operating mode MIN
**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.
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

<table>
<thead>
<tr>
<th>L</th>
<th>V</th>
<th>L</th>
<th>A</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
</table>

- 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, Ra < 3.2 µm
- Process connection
  - G1: G1A, DIN ISO 228/1, 1.4435/316L
  - G2: G1A 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)
**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

**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.
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/cm³, other density (e. g. 0.5 g/cm³) 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 Vpp 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/cm³
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
Setting 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/cm³, other density setting on request
Viscosity max. 10000 mm²/s (10000 cSt)
Gas content stagnant mineral water
Solid contents < Ø5 mm

Mechanical specifications
<table>
<thead>
<tr>
<th>Vibration limit switch LVL-AH</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection degree</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>Mechanical construction</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>approx. 300 g</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>vibration fork, process connection and housing: Edelstahl 1.4435/316L connection: PSU</td>
</tr>
<tr>
<td><strong>Surface quality</strong></td>
<td>$R_a &lt; 1.5 \text{ \mu m/120 grit}$</td>
</tr>
<tr>
<td><strong>Process connection</strong></td>
<td>- 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 ½&quot;, ¾&quot; to ISO 2852 - flush-mounted with welding adapter 1&quot;, sensor can be positioned - screw pipe connection DN25, DN32, DN40 to DIN 1185</td>
</tr>
<tr>
<td><strong>Electrical connection</strong></td>
<td>electrical connection V1: pinning according to EN 60947-5-2 electrical connection P*: valve plug, cross section max. 1.5 mm² (AWG 16), diameter 6 ... 9 mm (0.24 ... 0.35 in) electrical connection PS: QUICKON valve plug, cross section 0.34 ... 0.75 mm², diameter 3.5 ... 6.5 mm (0.14 ... 0.26 in)</td>
</tr>
<tr>
<td><strong>Indication and operation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Display elements</strong></td>
<td>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)</td>
</tr>
<tr>
<td><strong>Programming</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Function test</strong></td>
<td>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</td>
</tr>
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<td><strong>Certificates and approvals</strong></td>
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</tr>
<tr>
<td><strong>Sanitary compatibility</strong></td>
<td>EHEDG, see process connections</td>
</tr>
<tr>
<td><strong>Marine approval</strong></td>
<td>German Lloyd (GL), approval number: 42855-02HH</td>
</tr>
<tr>
<td><strong>General information</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td>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 KA1410 weld-in adapter G1 (LVL-Z101) operating instructions KA1420 weld-in adapter G½ (LVL-Z100) operating instructions KA1860 valve connector PG11</td>
</tr>
<tr>
<td><strong>Supplementary information</strong></td>
<td>Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>.</td>
</tr>
</tbody>
</table>
Technical data

Electrical connection

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

Two-wire connection for separate switching unit

The address is defaulted to 0 (hex). It is changeable via the bus master or programming unit.

Data bit:

<table>
<thead>
<tr>
<th>D0:0</th>
<th>Sensor free</th>
<th>D1:0</th>
<th>State = error</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0:1</td>
<td>Sensor covered</td>
<td>D1:1</td>
<td>State = OK</td>
</tr>
</tbody>
</table>

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

Output E5

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

Output WA

Two-wire AC connection

Valve plug

Operating mode MAX Operating mode MIN

V1 connector M12 x 1

Operating mode MAX (NC contact) Operating mode MIN (NO contact)

0.5 A 0.5 A

0.5 A 0.5 A
Vibration limit switch
LVL-AH

Dimensions

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

Mounting position

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

Dimensions of process connections see technical information.
## Technical data

### Vibration limit switch

**LVL-AH**

### 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

<table>
<thead>
<tr>
<th>Type code/model number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVL-AH - S - H - - - -</td>
<td>Accessory code</td>
</tr>
</tbody>
</table>

#### Approvals
- NA: without approval
- CS: CSA general purpose
- 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
- ES: DC, PNP, 3-wire
- WA: AC, 2-wire

#### Fork surface
- S: standard surface, Ra < 1.5 µm

#### Process connection
- G1: G½A, DIN ISO 228/1, 1.4435/316L
- G2: G½A with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
- G3: G½A with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
- N1: ½ NPT, ANSI B 1.20.1, 1.4435/316L
- N2: ½ NPT, ANSI B 1.20.1, 1.4435/316L
- R1: R½, DIN 2999, 1.4435/316L
- R2: R½ 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 1186, 1.4435/316L
- R5: DN32 PN40, screw pipe connection DIN 1186, 1.4435/316L
- R6: DN40 PN40, screw pipe connection DIN 1186, 1.4435/316L

#### Version
- H: hygienic version
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

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

Dimensions

Additional dimensions see section dimensions.

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.
# Vibration Limit Switch

**LVL-B**

## Technical Data

<table>
<thead>
<tr>
<th>Application</th>
<th>Vibration limit switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function principle</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function and System Design</th>
<th>Float switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment architecture</td>
<td>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.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Characteristics</th>
<th>Conductive limit switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured variable</td>
<td>level (according to the mounting location and the overall length)</td>
</tr>
<tr>
<td>Measurement range</td>
<td>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.</td>
</tr>
<tr>
<td>Input signal</td>
<td>probe covered - small amplitude probe not covered - large amplitude</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Characteristics</th>
<th>Capacitive limit switches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal on alarm</td>
<td>electronic insert FEM22 (E5): output signal on power failure or in the event of device failure - &lt; 100 µA electronic insert FEM24 (WA): output signal in event of power failure - relay de-energised</td>
</tr>
<tr>
<td>Fail safe mode</td>
<td>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.</td>
</tr>
<tr>
<td>Switch behaviour</td>
<td>binary</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Auxiliary Energy</th>
<th>Limit Value Immersion Probes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>electronic insert FEM22 (E5): 10 ... 45 V DC electronic insert FEM24 (WA): 19 ... 253 V AC, 50/60 Hz or 19 ... 55 V DC</td>
</tr>
<tr>
<td>Power consumption</td>
<td>electronic insert FEM22 (E5): max. 0.68 W electronic insert FEM24 (WA): max. 1.3 W</td>
</tr>
<tr>
<td>Current consumption</td>
<td>electronic insert FEM22 (E5): max. 15 mA</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>electronic insert FEM22 (E5): max. 5 V, 0 ... 400 Hz</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>separation voltage 2.2 kV</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance Characteristics</th>
<th>Continuous Immersion Probes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring frequency</td>
<td>700 ... 800 Hz</td>
</tr>
<tr>
<td>Switching time</td>
<td>when covering the sensor approx. 0.5 s, when uncovering the sensor approx. 1.0 s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating Conditions</th>
<th>Hydrostatic Pressure Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mounting conditions</td>
<td>Installation position see section mounting position</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>Ambient temperature -40 ... 70 °C (233 ... 343 K) Storage temperature -40 ... 85 °C (233 ... 358 K)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>overvoltage category III</td>
</tr>
<tr>
<td>Process conditions</td>
<td>Process temperature -40 ... 150 °C (233 ... 423 K) Medium pressure limits -1 ... 25 bar max. working pressure 25 bar, burst pressure 100 bar</td>
</tr>
<tr>
<td>Thermal shock resistance</td>
<td>max. 120 K</td>
</tr>
<tr>
<td>State of aggregation</td>
<td>solids</td>
</tr>
<tr>
<td>Solid contents</td>
<td>≤ 0.025 mm</td>
</tr>
</tbody>
</table>
## Vibration limit switch

**LVL-B**

### Technical data

<table>
<thead>
<tr>
<th>Bulk density</th>
<th>≥ 200 g/l, not fluidised</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical specifications</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP66/IP67, Nema 4x</td>
</tr>
<tr>
<td>Mechanical construction</td>
<td></td>
</tr>
</tbody>
</table>
| 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 (ES):  
- 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 |
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 g²/Hz  
Shock and impact resistance EN 60068-2-27, 30 g |
| Supplementary documentation | technical information T1380O  
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. |
# Technical data

## Vibration limit switch

### LVL-B*

### 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.

**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"

### Diagrams

- FEM22 (E5)
- FEM24 (WA)
Vibration limit switch
LVL-B*

Technical data

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
**Vibration limit switch**

**LVL-B***

### Technical data

- **Float switches**
- **Vibration limit switches**
- **Conductive limit switches**
- **Capacitive limit switches**
- **Continuous immersion probes**
- **Hydrostatic pressure sensors**

### 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 1½-11⅛ NPT, ANSI B 1.20.1
- LVL-Z202, sliding sleeve for unpressurised container  R1½, DIN 2999
- LVL-Z203, sliding sleeve for unpressurised container 1½-11⅛ NPT, ANSI B 1.20.1
## Vibration limit switch

### LVL-B*

### Technical data

#### Type code/model number

**Product structure LVL-B1**

<table>
<thead>
<tr>
<th>L</th>
<th>V</th>
<th>L</th>
<th>B</th>
<th>–</th>
<th>1</th>
<th>–</th>
<th>–</th>
<th>–</th>
<th>A</th>
<th>–</th>
</tr>
</thead>
</table>

- **Certificates**
  - NA: version for non-hazardous areas
  - EX: I I 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: FEM34, 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, % NPT
  - A8: aluminium housing F18, IP66/IP67, Nema 4x, entry G3/4A
  - C: polyester housing F16, IP66/IP67, Nema 4x, cable gland M20
  - Q: polyester housing F16, IP66/IP67, Nema 4x, % NPT
  - P: polyester housing F16, IP66/IP67, Nema 4x, entry G3/4A

- **Process connection**
  - N3: 1/2 NPT, ANSI B 1.20.1, 1.4435/316L
  - N5: 1% 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**

<table>
<thead>
<tr>
<th>L</th>
<th>V</th>
<th>L</th>
<th>B</th>
<th>–</th>
<th>2</th>
<th>–</th>
<th>–</th>
<th>–</th>
<th>A</th>
<th>–</th>
</tr>
</thead>
</table>

- **Certificates**
  - NA: version for non-hazardous areas
  - EX: I I 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: FEM34, 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, % NPT
  - A8: aluminium housing F18, IP66/IP67, Nema 4x, entry G3/4A
  - C: polyester housing F16, IP66/IP67, Nema 4x, cable gland M20
  - Q: polyester housing F16, IP66/IP67, Nema 4x, % NPT
  - P: polyester housing F16, IP66/IP67, Nema 4x, entry G3/4A

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

- **Process connection**
  - N3: 1/2 NPT, ANSI B 1.20.1, 1.4435/316L
  - N5: 1% 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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<th>Technical data</th>
<th>Vibration limit switch LVL-B*</th>
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<tr>
<td><strong>Vibration limit switches</strong></td>
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<tr>
<td><strong>Conductive limit switches</strong></td>
<td></td>
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<tr>
<td><strong>Capacitive limit switches</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Limit value immersion probes</strong></td>
<td></td>
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<tr>
<td><strong>Continuous immersion probes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hydrostatic pressure sensors</strong></td>
<td></td>
</tr>
</tbody>
</table>
Vibration limit switch

**Dimensions**

- **LVL-S1**

**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.

**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

**Electrical connection**

- Maximum fail-safe mode
- Minimum fail-safe mode

- 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.

Subject to reasonable modifications due to technical advances.
### 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-circuit protection)
- continuous: max. 350 mA, max. 0.5 \( \mu F \) at 55 V, max. 1.0 \( \mu F \) at 24 V
- residual voltage < 3 V (with closed transistor)
- residual current < 100 \( \mu A \) (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**
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/cm³

**Viscosity**
up to 10000 mm²/s

### Mechanical specifications
**Protection degree**
IP66/68 (24 h, 1.5 m), when using the correct 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: \( R_a < 0.5 \mu m/240 \) grit
polished: \( R_a < 1.5 \mu m/120 \) grit
standard: \( R_a < 3.2 \mu m/80 \) 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 89/396/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
Vibration limit switch
LVL-S1

Technical data

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

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

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
# Technical data

## Vibration limit switch

<table>
<thead>
<tr>
<th>LVL-S1</th>
<th>E5V1NA</th>
</tr>
</thead>
</table>

### Approvals
- No approval

### Special features
- V1 connector M12 x 1; V1

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

### Fork surface
- Standard surface, Ra < 3.2 µm
- Polished version, Ra < 1.5 µm
- High-polished version, Ra < 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** DNS5, 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
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

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

Maximum

Minimum

R = external

Subject to reasonable modifications due to technical advances.

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### Technical data

#### 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. 1.5 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/cm³

- **Viscosity**: max. 10000 mm²/s (10000 cSt)

#### Mechanical specifications

**Protection degree**: IP65/IP67 with connector (cable gland PG11)

**Construction type**: compact device

**Versions**

- LVL-T1-G3S-E5PG-NA, process connection G1, 10 ... 55 V DC, PNP 3-wire, connector PG11, overspill protection WHG
- 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

- **Mass**: approx. 450 g

- **Material**
  - process connection and vibration fork: stainless steel 1.4571/316Ti
  - housing: stainless steel 1.4404/316L
  - 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**: Rₐ < 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 mm²
## Vibration limit switch
### LVL-T1

### Technical data

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<th>Indication and operation</th>
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<td><strong>Display elements</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Function test</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

### Certificates and approvals

| Overspill protection     | Z-65.11-302 (overspill protection in acc. with WHG) |

### General information

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<tr>
<td>Directive 89/336/EC (EMC)</td>
<td>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)</td>
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<td>Electromagnetic compatibility</td>
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<tr>
<td>Protection degree</td>
<td>EN 60529</td>
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<tr>
<td>Climate class</td>
<td>EN 60068, part 2-38, fig. 2a</td>
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</table>

### 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-Z126, 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
### Technical data

| Type code/model number | L | V | L | T | 1 | S | | |
|------------------------|--|--|--|--|--|--|--|

#### Approvals
- NA: no approval
- WH: overspill protection WHG
- CG: CSA general purpose

#### Electrical connection
- PG: PG11 connector, ISO 4400, IP65/IP67
- PN: connector ¾ NPT, ISO 4400, IP65

#### Electrical output
- WA: 19 V AC ... 253 V AC, 3-wire
- ES: 10 V DC ... 55 V DC, PNP 2-wire

#### Fork surface
- S: standard surface, $R_a < 3.2 \mu m$

#### Process connection
- G3: G1A, BSP, DIN ISO 228/1, 1.4571/316Ti
- N3: 1 NPT, ANSI B 1.20.1, 1.4571/316Ti
- R3: R1, BSP, DIN 2999, 1.4571/316Ti
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

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

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.
## Technical data

### Vibration limit switch

**LVL-M**

### 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 |
| 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 (ES): 10 ... 55 V DC electronic insert FEL54 (WA): 10 ... 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 (ES): max. 0.83 W electronic insert FEL54 (WA): max. 1.3 W electronic insert FEL55 (SI): isolating amplifier acc. to EN 60947-5-6 (NAMUR) |

### 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 | 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 (ES), 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
## Technical data

### 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, A7* 4800 g, A8* 4900 g, A82 6800 g, A91 7000 g, A92 11.5 kg, A93 17.3 kg
  - A45 1400 g, C51 1200 g, C71 1600 g, C75 3200 g, C95 5900 g, CA3 5600 g
  - D45 1400 g, DS1 1200 g, DS71 1600 g, DS75 3200 g, D7A 300 g, D7D 300 g, D95 5900 g, DA3 5600 g
  - FS1 1200 g, FS5 2000 g, FS6 1400 g, FS65 2400 g, FS71 1600 g, FS75 3200 g, FS7F 2600 g, FS81 2400 g, FS85 4300 g, FS93 4800 g, FS95 5900 g, FS95 2400 g, FS95 4300 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
- - TS1 no information, TS61 100 g
- length, spacers, bushings:
  - B* 900 g/m, C* 2300 g/100 in
  - D* 100 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

### 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 R¼, R1 to DIN 2999, part 1
- conical thread ¥-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 FEL50 A (PA), FEL58 (N2): green LED, yellow LED
  - electronic inserts FEL51 (AC), FEL52 (ES), FEL54 (WA), FEL56 (SI), FEL56 (N1); green LED, red LED compact housings:
  - compact housing with valve connector
  - electronic version FEL51 (AC), FEL52 (ES): 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 (ES): 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 (ES): green LED, two yellow LEDs
### Technical data

#### Operating elements
- Electronic insert FEL50A (PA): 8 switches for device address setting
- Electronic inserts FEL51 (AC), FEL52 (ES), 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
- II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1089)
- II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X)
- II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 2117)
- II 3G EEx nA/nC II T6 and III 3D T85°C

#### SIL classification
- Up to SIL2 acc. to IEC 61508

#### Overspill protection
- Z-65.11-306 (overspill protection in acc. with WHG)

### Vibration limit switch

**LVL-M**

### Operating instructions
- **Operating elements**
  - Electronic insert FEL50A (PA): 8 switches for device address setting
  - Electronic inserts FEL51 (AC), FEL52 (ES), 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**
  - II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1089)
  - II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X)
  - II 1/2G EEx ia IIC T3 ... T6 or EEx ia IIB T3 ... T6 (KEMA 01 ATEX 2117)
  - II 3G EEx nA/nC II T6 and III 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
- **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 50020, EN 50021, EN 50284, EN 50281-1-1

#### Conformity
- **EMC**
  - 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**
  - Technical information T3328O
  - 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 G½ (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 (II 3G EEx nA/nC II T6 and III 3D T85°C)
  - Approval ZE233O overspill protection acc. to WHG (Z-65.11-306)
  - FM installation drawing Z00410
  - 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.


### 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).
Electrical connection

Electronic FEL51 (AC) in compact housing

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.

Electronic FEL52 (E5) in compact housing
Vibration limit switch
LVL-M*

**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.

![Diagram of FEL54 (WA)]

**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)

![Diagram of FEL55 (SI)]
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.

![Diagram of FEL56 (N1)](image)

**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.

![Diagram of FEL58 (N2)](image)
Vibration limit switch
LVL-M*

Technical data

Electrical connection

Electronic FEL58 (N2) in compact housing

<table>
<thead>
<tr>
<th>Connection</th>
<th>MAX</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing C4 (M12 x 1), connector with LEDs</td>
<td>2 (WT)</td>
<td>1 (BN)</td>
</tr>
<tr>
<td>Housing C4 (M12 x 1), connector without LEDs</td>
<td>3 (BU)</td>
<td>4 (BK)</td>
</tr>
<tr>
<td>Housing C2 (½ NPT) or Housing C4 (PG11)</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

---

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
Technical data

Vibration limit switch
LVL-M*

Dimensions

Compartment housing C*

Stainless steel housing E*

Process connections


G2*

G3*

G3E

N2*

N3*

R2*

R3*

T**
Vibration limit switch
LVL-M*

**Technical data**

### Dimensions

**Extension tube**

- Thread: G¾A
- G1A

**Vibration fork**

- Ø21.5

### 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 points depend on the mounting position, with reference to water, density 1 g/cm³, 23 °C (296 K), $p_0$ 0 bar.

**Note:**

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

Technical data

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
## Technical data

### Float switches
- **Vibration limit switch**
  - **Type code/model number**: Vibration limit switch LVL-M*
  - **Technical data**

<table>
<thead>
<tr>
<th>Float switches</th>
<th>Conductive limit switches</th>
<th>Capacitive limit switches</th>
<th>Pressure sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration limit switches</td>
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<tr>
<td>Conductive limit switches</td>
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<td></td>
<td></td>
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<tr>
<td>Capacitive limit switches</td>
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<tr>
<td>Limit value immersion probes</td>
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<tr>
<td>Continuous immersion probes</td>
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<tr>
<td>Hydrostatic pressure sensors</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Technical specifications

- **Specifications of length without unit for design M2**
  
### Optional equipment

- **Certifications**
  - NA for non-hazardous areas
  - WH WHG overspill protection
  - E1 II 1G Ex ia IIC T6
  - E2 II 1/2G Ex ia IIC T6
  - E3 II 1/2G Ex d IIC T6
  - EA II 1G Ex ia IIC T6, WHG
  - EB II 1/2G Ex d IIC T6, WHG
  - EM II 3G Ex nA IIC T6, WHG
  - FI FM, IS, CI I, II, III, Div1, Group A–G
  - FN FM, NI, CI I, Div1, Group A–D
  - FX FM, XP, CI I, II, 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

### Electronic insert

- **Electronic insert**
  - PA FEL50 A, PROFIBUS PA
  - AC FEL51, contactless 2-wire switch, 19 V AC ... 253 V AC
  - ES 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

### Housing, cable entry

- **Housing, cable entry**
  - A1 aluminium housing, IP66, cable gland M20
  - A2 aluminium housing, Nema 4x, % NPT
  - A3 aluminium housing, IP66, entry G3/4
  - A4 aluminium housing, IP66, plug connector M12 x 1
  - A5 aluminium housing, IP66, plug connector M12 x 1
  - A6 compact housing, IP66, cable gland M20
  - A7 stainless steel housing, IP66, cable gland M20
  - A8 stainless steel housing, Nema 4x, % NPT
  - A9 stainless steel housing, IP66, entry G3/4
  - A10 stainless steel housing, M12 x 1
  - P1 polyester housing, IP66, cable gland M20
  - P2 polyester housing, Nema 4x, % NPT
  - P3 polyester housing, IP66, entry G3/4
  - P4 polyester housing, IP66, plug connector M12 x 1

### Length, temperature spacer, pressure-tight bushing

- **Design**
  - M1 Compact design
  - M2 Extended design (148 mm/6 in ... 6,000 mm/20 ft)

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<table>
<thead>
<tr>
<th>Type code/model number</th>
<th>L</th>
<th>V</th>
<th>L</th>
</tr>
</thead>
</table>

### Technical data

**Vibration limit switch**

**LVL-M**

#### Process connection and material

<table>
<thead>
<tr>
<th>Design</th>
<th>M1</th>
<th>M2</th>
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<tbody>
<tr>
<td></td>
<td>compact</td>
<td>extended (148 mm/6 in ... 6,000 mm/20 ft)</td>
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#### Design

<table>
<thead>
<tr>
<th>Code</th>
<th>Notes</th>
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<tbody>
<tr>
<td>N1</td>
<td>1 NPT, ANSI B 1.20.1, 1.4435/316L</td>
</tr>
<tr>
<td>N2C</td>
<td>1 NPT, ANSI B 1.20.1, 2.4610/Alloy C4</td>
</tr>
<tr>
<td>G21</td>
<td>G1, DIN ISO 228/1, BSP, 1.4435/316L</td>
</tr>
<tr>
<td>G2C</td>
<td>G1, DIN ISO 228/1, BSP, 2.4610/Alloy C4</td>
</tr>
<tr>
<td>G31</td>
<td>G1, DIN ISO 228/1, BSP, 1.4435/316L</td>
</tr>
<tr>
<td>G3C</td>
<td>G1, DIN ISO 228/1, BSP, 2.4610/Alloy C4</td>
</tr>
<tr>
<td>J13</td>
<td>10K 25A, JIS B 2238 (RF), 1.4435/316L</td>
</tr>
<tr>
<td>J16</td>
<td>10K 40A, JIS B 2238 (RF), 1.4435/316L</td>
</tr>
<tr>
<td>J17</td>
<td>10K 50A, JIS B 2238 (RF), 1.4435/316L</td>
</tr>
<tr>
<td>J1C</td>
<td>10K 50A, JIS B 2238 (RF), 2.4610/Alloy C4, platinised</td>
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<tr>
<td>J19</td>
<td>10K 80A, JIS B 2238 (RF), 1.4435/316L</td>
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<tr>
<td>J1A</td>
<td>10K 100A, JIS B 2238 (RF), 1.4435/316L</td>
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<tr>
<td>N75</td>
<td>DN50 PN40, EN 1092-1, groove, 1.4435/316L</td>
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<tr>
<td>T51</td>
<td>DN50-38, Triclamp ISO 2852, 1.4435/316L</td>
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<tr>
<td>T61</td>
<td>2&quot;, DN40-51, Triclamp ISO 2852, 1.4435/316L</td>
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<tr>
<td>XXX</td>
<td>special version</td>
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#### Type code/model number

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<thead>
<tr>
<th>L</th>
<th>V</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
</table>

#### Float switches

- **Conductive limit switches**
- **Capacitive limit switches**
- **Limit value immersion probes**
- **Continuous immersion probes**
- **Hydrostatic pressure sensors**

#### Design

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

#### Code

- **A31** 1", ANSI B 16.5, 150 lbs RF, 1.4435/316L
- **A41** 1½", 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
- **A6C** 2", ANSI B 16.5, 150 lbs RF, Alloy C4, platinised
- **A62** 2", ANSI B 16.5, 300 lbs RF, 1.4435/316L
- **A72** 2½", 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
- **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** DN52 PN40, EN 1092-1, form C, 1.4435/316L, sealing strip
- **C51** DN52 PN6, EN 1092-1, form C, 2.4610/Alloy C4, platinised
- **A71** 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
- **A75** 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
- **FA3** DN100 PN16, EN 1092-1, form C, 2.4610/Alloy C4, platinised
- **FA5** DN100 PN40, EN 1092-1, form C, 2.4610/Alloy C4, platinised
- **R21** R1/2 BSP, DIN 2999, 1.4435/316L
- **R2C** R1/2 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
- **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

#### Date of issue

- 09/22/06

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**Vibration limit switch**

**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 (ES) 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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**Technical data**

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<thead>
<tr>
<th><strong>Vibration limit switch</strong></th>
<th><strong>LVL-M*H</strong></th>
</tr>
</thead>
</table>

**Application**
- **Function principle**: limit detection
- **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.

**Function and system design**
- **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/cm³ or > 0.7 g/cm³ (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.
  - **MIN = minimum safety**: The output switches to the power fail response when the fork is exposed.
- **Switching time**: when fork is covered: approx. 0.5 s, when fork is exposed: approx. 1.0 s (other switching times on request)
  - **MAX = maximum safety**: The output switches to the power fail response when the fork is covered.
  - **MIN = minimum safety**: The output switches to the power fail response when the fork is exposed.
- **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 (ES): 10 ... 55 V DC
  - electronic insert FEL54 (WA): 19 ... 293 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 mm², strand in ferrule in acc. to DIN 46228
  - protective earth in housing: cross section max. 2.5 mm²
- **Power consumption**
  - electronic insert FEL52 (ES): max. 0.83 W
  - electronic insert FEL54 (WA): max. 1.3 W
- **Current consumption**
  - electronic insert FEL52 (ES): max. 15 mA

**Performance characteristics**
- **Reference operating conditions**
  - ambient temperature: 23 °C (296 K), medium temperature: 23 °C (296 K),
  - product density: 1 g/cm³ (water), viscosity: 1 mm²/s, medium pressure pe: 0 bar,
  - sensor mounting: vertical from above, density switch: to > 0.7 g/cm³
  - 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/cm³)
  - 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)

**Operational 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 (ES), 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**: pe = -1 ... 64 bar over the entire temperature range, exceptions see process connections
- **Test pressure**: max. 100 bar (1.5 times the medium pressure pe), 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/cm³ (compact housing 0.7 g/cm³), other density settings on request
- **Viscosity**: max. 10000 mm²/s (max. 10000 cSt)
- **Solid contents**: max. Ø 5 mm

**Mechanical specifications**
<table>
<thead>
<tr>
<th>Vibration limit switch</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LVL-M*H</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Protection degree**
- Polyester, steel and aluminium housing: IP66/IP67
  - IP66 with valve connector PG11 or ½ NPT
  - IP66/IP68 with M12 x 1 connector without LEDs (1.4435/316L)
  - IP69K with M12 x 1 connector 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
- 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*, O* 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
- 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
- Compact housing with valve connector or M12 connector: 1.4435/316L
- Temperature spacer: 1.4435/316L
- Pressure-tight bushing: 1.4435/316L

**Surface quality**
- Ra < 1.5 µm/120 grit: length, spacer, bushings°C
- Ra < 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
    - Electronic version FEL52 (E5): green LED, two yellow LEDs

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### Technical data

**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

**Function test**
- compact housing: function test with test magnet
- electronic versions FELS1 (AC), FELS2 (E5) and FELS8 (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**
- ☑ II 1/2G Ex ia IIC T3 ... T6 and ☑ II 1/2D T80°C (KEMA 01 ATEX 1089)
- ☑ II 1G Ex ia IIC T3 ... T6 or Ex ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X)
- ☑ II 1G Ex d IIC T3 ... T6 or Ex d IIB T3 ... T6 (KEMA 01 ATEX 2117)
- ☑ II 3G Ex nA/nC II T6 and ☑ 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**
- 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 50200, 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 Tl3280d
    - operating instructions KA2200 (LVL-M** with compact housing)
    - operating instructions BA1410 (electronic insert FEL50A (PA))
    - operating instructions KA1400 weld-in socket G1 (LVL-Z102)
    - operating instructions KA1410 weld-in adapter G1 (LVL-Z101)
    - operating instructions KA1420 weld-in adapter G¾ (LVL-Z100)
    - operating instructions KA1510 sliding sleeve for unpressurised operation G1, 1 NPT (LVL-Z120, LVL-Z122)
    - operating instructions KA1520 sliding sleeve for unpressurised operation G1¾, 1¾ NPT (LVL-Z121, LVL-Z123)
    - operating instructions KA1530 high pressure sliding sleeve G1, 1 NPT (LVL-Z124, LVL-Z125, LVL-Z128, LVL-Z129)
    - operating instructions KA1540 high pressure sliding sleeve G1, 1 NPT (LVL-Z126, LVL-Z127, LVL-Z130, LVL-Z131)
    - safety information SI0310 (KEMA 01 ATEX 2117)
    - safety information SI0630 (KEMA 01 ATEX 1089)
    - safety information SI0640 (KEMA 01 ATEX 1147 X)
    - safety information SI1540 (KEMA 01 ATEX 1089), PROFIBUS PA version
    - safety information SI1590 (KEMA 01 ATEX 1147 X), PROFIBUS PA version
    - safety information SI1820 (KEMA 01 ATEX 1147 X), PROFIBUS PA version
  - approval ZE2330 overspill protection acc. to WHG (Z-65.11-306)
  - FM installation drawing ZD0410
  - CSA control drawing ZD0420

---

**Vibration limit switch LVL-M*H**

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**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 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).
Electrical connection

Electronic FEL51 (AC) in compact housing

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.

Electronic FEL52 (E5) in compact housing
Vibration limit switch
LVL-M*H

Technical data

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.

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)
**Technical data**

**Vibration limit switch**

**LVL-M**

### 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.

![Diagram of FEL56 (N1) electronic insert]

**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.
Vibration limit switch
LVL-M*H

Technical data

Electrical connection

Electronic FEL58 (N2) in compact housing

<table>
<thead>
<tr>
<th>Connection</th>
<th>MAX</th>
<th>MIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing C4 (M12 x 1), connector with LEDs</td>
<td>2 (WT) - 1 (BN)</td>
<td>2 (WT) - 1 (BN)</td>
</tr>
<tr>
<td>Housing C4 (M12 x 1), connector without LEDs</td>
<td>3 (BU) - 4 (BK)</td>
<td>- +</td>
</tr>
<tr>
<td>Housing C2 (1/2 NPT) or Housing C4 (PG11)</td>
<td>1 - 3 +</td>
<td>1 - 2 -</td>
</tr>
</tbody>
</table>
Technical data

Vibration limit switch
LVL-M*H

Dimensions

Compact housing C*

Plastic housing P*

Process connections

Float switches

Vibration limit switches

Conductive limit switches

Capacitive limit switches

Limit value immersion probes

Continuous immersion probes

Hydrostatic pressure sensors
Vibration limit switch
LVL-M*H

Technical data

Dimensions

Extension tube

Thread: G½A
G1A

Flanges and flange-like process connections

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), $p_0$ 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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Technical data

Vibration limit switch
LVL-M*H

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
## Technical data

### Type code/model number

<table>
<thead>
<tr>
<th>L</th>
<th>V</th>
<th>L</th>
<th>M</th>
<th>H</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
</table>

**Specification of length without unit version M2**

### Certificates
- **NA** for non-hazardous areas
- **WH** WHG overfill protection
- **E1** 1G EEx ia IIC T6
- **E2** 1G EEx ia IIC T6
- **E3** 1G EEx ia IIC T6
- **EA** 1G EEx ia IIC T6, WHG
- **EB** 1G EEx ia IIC T6, WHG
- **EC** 1G EEx ia IIC T6, WHG
- **EN** 3G EEx nC IIC T6, WHG
- **EM** 3G EEx ia IIC T6, WHG
- **FI** FM, IIB, II, III, Div1, Group A–G
- **FN** FM, H1, I, Div2, Group A–D
- **FX** FM, XP, I, II, III, Div1, Group A–G
- **CG** CSA, General Purpose
- **CI** CSA, IS, I, II, III, Div1, Group A–G
- **CX** CSA, XP, I, II, III, Div1, Group A–G

### Optional equipment
- **Z2** 3.1.8 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
- **BI** 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, ½ 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
- **C1** 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, pressure, tightness-bushing

<table>
<thead>
<tr>
<th>Design</th>
<th>AC</th>
<th>66 mm/2.6 in, ( R_x = 1.5 \mu m/120 ) grit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>AD</td>
<td>66 mm/2.6 in, ( R_x = 0.3 \mu m/300 ) grit/3 A</td>
</tr>
<tr>
<td>Design</td>
<td>IC</td>
<td>66 mm/2.6 in, ( R_x = 1.5 \mu m/120 ) grit, with temperature spacer</td>
</tr>
<tr>
<td>Design</td>
<td>ID</td>
<td>66 mm/2.6 in, ( R_x = 0.3 \mu m/300 ) grit, with temperature spacer</td>
</tr>
<tr>
<td>Design</td>
<td>QC</td>
<td>66 mm/2.6 in, ( R_x = 1.5 \mu m/120 ) grit, with pressure-tight bushing</td>
</tr>
<tr>
<td>Design</td>
<td>QD</td>
<td>66 mm/2.6 in, ( R_x = 0.3 \mu m/300 ) grit/3 A, with pressure-tight bushing</td>
</tr>
<tr>
<td>Design</td>
<td>BC</td>
<td>( R_x = 1.5 \mu m/120 ) grit</td>
</tr>
<tr>
<td>Design</td>
<td>BD</td>
<td>( R_x = 0.3 \mu m/300 ) grit/3 A</td>
</tr>
<tr>
<td>Design</td>
<td>CC</td>
<td>in L, ( R_x = 1.5 \mu m/120 ) grit</td>
</tr>
<tr>
<td>Design</td>
<td>CD</td>
<td>in L, ( R_x = 0.3 \mu m/300 ) grit/3 A</td>
</tr>
<tr>
<td>Design</td>
<td>DC</td>
<td>special length ( L_x, R_x = 1.5 \mu m/120 ) grit, switch point = Vibracon compact</td>
</tr>
<tr>
<td>Design</td>
<td>DD</td>
<td>special length ( L_x, R_x = 0.3 \mu m/300 ) grit/3 A, switch point = Vibracon compact</td>
</tr>
<tr>
<td>Design</td>
<td>JC</td>
<td>( R_x = 1.5 \mu m/120 ) grit, with temperature spacer</td>
</tr>
<tr>
<td>Design</td>
<td>JD</td>
<td>( R_x = 0.3 \mu m/300 ) grit/3 A, with temperature spacer</td>
</tr>
<tr>
<td>Design</td>
<td>KC</td>
<td>in L, ( R_x = 1.5 \mu m/120 ) grit, with temperature spacer</td>
</tr>
<tr>
<td>Design</td>
<td>KD</td>
<td>in L, ( R_x = 0.3 \mu m/300 ) grit/3 A, with temperature spacer</td>
</tr>
<tr>
<td>Design</td>
<td>LC</td>
<td>special length ( L_x, R_x = 1.5 \mu m/120 ) grit, with temperature spacer, switch point = Vibracon compact</td>
</tr>
<tr>
<td>Design</td>
<td>LD</td>
<td>special length ( L_x, R_x = 0.3 \mu m/300 ) grit/3 A, with temperature spacer, switch point = Vibracon compact</td>
</tr>
<tr>
<td>Design</td>
<td>RC</td>
<td>( R_x = 1.5 \mu m/120 ) grit, with pressure-tight bushing</td>
</tr>
<tr>
<td>Design</td>
<td>RD</td>
<td>( R_x = 0.3 \mu m/300 ) grit/3 A, with pressure-tight bushing</td>
</tr>
<tr>
<td>Design</td>
<td>SC</td>
<td>in L, ( R_x = 1.5 \mu m/120 ) grit, with pressure-tight bushing</td>
</tr>
<tr>
<td>Design</td>
<td>SD</td>
<td>in L, ( R_x = 0.3 \mu m/300 ) grit/3 A, with pressure-tight bushing</td>
</tr>
<tr>
<td>Design</td>
<td>TC</td>
<td>special length ( L_x, R_x = 1.5 \mu m/120 ) grit, with pressure-tight bushing, switch point = Vibracon compact</td>
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<tr>
<td>Design</td>
<td>TD</td>
<td>special length ( L_x, R_x = 0.3 \mu m/300 ) grit/3 A, with pressure-tight bushing, switch point = Vibracon compact</td>
</tr>
</tbody>
</table>

### Design
- **M1** compact version
- **M2** extended version (148 mm/6 in ... 6,000 mm/20 ft) Continued on next page.

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Date of issue 09/22/06 – Catalog Field Devices
## Technical data

### Vibration limit switch

**LVL-M**

### Float switches

<table>
<thead>
<tr>
<th>Type code/model number</th>
<th>Process connection and material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A31</td>
<td>1&quot;, ANSI B 16.5, 150 lbs RF, 1.4435/316L</td>
</tr>
<tr>
<td>A41</td>
<td>1⅛&quot;, ANSI B 16.5, 150 lbs RF, 1.4435/316L</td>
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<tr>
<td>A51</td>
<td>1½&quot;, ANSI B 16.5, 150 lbs RF, 1.4435/316L</td>
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<td>A61</td>
<td>2&quot;, ANSI B 16.5, 150 lbs RF, 1.4435/316L</td>
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<td>A82</td>
<td>2&quot;, ANSI B 16.5, 300 lbs RF, 1.4435/316L</td>
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<td>A72</td>
<td>2⅛&quot;, ANSI B 16.5, 300 lbs RF, 1.4435/316L</td>
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<td>A81</td>
<td>3&quot;, ANSI B 16.5, 150 lbs RF, 1.4435/316L</td>
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<td>A82</td>
<td>3&quot;, ANSI B 16.5, 300 lbs RF, 1.4435/316L</td>
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<td>A91</td>
<td>4&quot;, ANSI B 16.5, 150 lbs RF, 1.4435/316L</td>
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<tr>
<td>A92</td>
<td>4&quot;, ANSI B 16.5, 300 lbs RF, 1.4435/316L</td>
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<tr>
<td>F45</td>
<td>DN25 PN40, EN 1092-1 Form B, 1.4435/316L</td>
</tr>
<tr>
<td>F51</td>
<td>DN32 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<td>F55</td>
<td>DN32 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<tr>
<td>F61</td>
<td>DN40 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<td>F65</td>
<td>DN40 PN6, EN 1092-1 Form B, 1.4435/316L</td>
</tr>
<tr>
<td>F71</td>
<td>DN50 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<td>F75</td>
<td>DN50 PN40, EN 1092-1 Form C, 1.4435/316L</td>
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<td>F81</td>
<td>DN65 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<tr>
<td>F85</td>
<td>DN65 PN6, EN 1092-1 Form B, 1.4435/316L</td>
</tr>
<tr>
<td>F91</td>
<td>DN80 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<tr>
<td>F95</td>
<td>DN80 PN40, EN 1092-1 Form C, 1.4435/316L</td>
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<td>F10</td>
<td>DN100 PN6, EN 1092-1 Form B, 1.4435/316L</td>
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<td>F105</td>
<td>DN100 PN40, EN 1092-1 Form B, 1.4435/316L</td>
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<tr>
<td>D75</td>
<td>DN50 PN40, EN 1092-1 Form C, 1.4435/316L, sealing strip</td>
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<tr>
<td>D95</td>
<td>DN80 PN40, EN 1092-1 Form C, 1.4435/316L, sealing strip</td>
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<tr>
<td>S13</td>
<td>flush-mounted for welding adapter 1&quot;, 1.4435</td>
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<tr>
<td>G21</td>
<td>G/¾, DIN ISO 228/1, BSP, 1.4435/316L, mounting for welding adapter</td>
</tr>
<tr>
<td>G3E</td>
<td>G1A, DIN ISO 228/1, BSP, 1.4435/316L, mounting for welding adapter</td>
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<tr>
<td>J13</td>
<td>10K 25A, JIS B 2238 (RF), 1.4435/316L</td>
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<tr>
<td>J16</td>
<td>10K 40A, JIS B 2238 (RF), 1.4435/316L</td>
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<td>J17</td>
<td>10K 50A, JIS B 2238 (RF), 1.4435/316L</td>
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<tr>
<td>J19</td>
<td>10K 80A, JIS B 2238 (RF), 1.4435/316L</td>
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<td>10K 100A, JIS B 2238 (RF), 1.4435/316L</td>
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<td>R5R</td>
<td>DN32 PN25, sanitary coupling DIN 11851, 1.4435/316L</td>
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<tr>
<td>R6R</td>
<td>DN40 PN25, sanitary coupling DIN 11851, 1.4435/316L</td>
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<tr>
<td>R7R</td>
<td>DN50 PN25, sanitary coupling DIN 11851, 1.4435/316L</td>
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<td>D7D</td>
<td>DRD, 65 mm, 1.4435/316L</td>
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<td>T51</td>
<td>1½&quot;, DN25-38, Triclamp ISO 2852, 1.4435/316L</td>
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<tr>
<td>T51</td>
<td>2&quot;, DN40-51, Triclamp ISO 2852, 1.4435/316L</td>
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<tr>
<td>S61</td>
<td>2&quot;, SMS PN25, 1.4435/316L</td>
</tr>
<tr>
<td>SV1</td>
<td>Varivent, DN65-182 PN10, 1.4435/316L</td>
</tr>
</tbody>
</table>

### Design

- **H**: hygienic version
  - **M1**: compact design
  - **M2**: extended design (148 mm/6 in ... 6,000 mm/20 ft)
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
- PROFINET protocol: commissioning and maintenance quick and easy
- Up to SIL2 acc. to IEC 61508

**Dimensions**

![Dimensions diagram]

- Vibracor LVL-M2C with plastic housing and process connection with flange
- Vibracor LVL-M2C with stainless steel housing and process connection with flange

**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 (ES) 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.
### 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/cm³ (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): 235 V AC, 50/60 Hz
- Electronic insert FEL52 (ES): 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 mm², strand in ferrule in acc. to DIN 46228
- Protective earth in housing: cross section max. 2.5 mm²
- External equipotential bonding connection on housing: cross section 4 mm²

Power consumption
- Electronic insert FEL52 (ES): max. 0.83 W
- Electronic insert FEL54 (WA): max. 1.3 W

### Performance characteristics

Reference operating conditions
- Ambient temperature: 23 °C (296 K), Medium temperature: 23 °C (296 K),
- Product density: 1 g/cm³ (water), Viscosity: 1 mm²/s, Medium pressure pe: 0 bar,
- Sensor mounting: vertical from above, Density switch: to > 0.7 g/cm³

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/cm³)

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 (ES), 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: Pₑ = -1 ... 40 bar over the entire temperature range, Exceptions see process connections
- Test pressure: Max. 100 bar (1.5 times the medium pressure Pₑ), 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/cm³, Other density settings on request
- Viscosity: Max. 10000 mm²/s
- Solid contents: Max. Ø 5 mm

### Mechanical specifications

Protection degree
- Polyester, steel and aluminium housing: IP66/IP67
### Vibration limit switch
#### LVL-M2C

**Technical data**

<table>
<thead>
<tr>
<th>Mechanical construction</th>
<th>Construction type</th>
<th>LVL-M2C: with extension tube, coated with ECTFE</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>housing: diameter max. 85 mm (3.3 in), height max. 173 mm (6.8 in)</td>
<td>Temperature separator, pressure-tight bushing: additional length L 140 mm (5.5 in)</td>
<td>Process connection: length L min. 115 (4.5 in)</td>
</tr>
<tr>
<td></td>
<td>extension: any length L from 148 ... 6000 mm (6 in ... 20 ft)</td>
<td>Extension: length type II, for vertical installation from above same switching point as Vibracon LVL2</td>
<td></td>
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<tr>
<td></td>
<td>vibration fork: width 20.6 mm (0.81 in), fork width 6.5 mm (0.25 in), length 25 mm (1 in)</td>
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<tr>
<td></td>
<td>Mass</td>
<td>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</td>
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<tr>
<td></td>
<td>Additional weight</td>
<td>process connection:</td>
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<tr>
<td></td>
<td>- A3H 1000 g, ASH 1500 g, A6H 2400 g, A6I 3200 g, A8H 4900 g</td>
<td>- H35 1400 g, H65 2400 g, H71 1600 g, H75 3200 g, H95 5900 g, HA3 5600 g</td>
<td>- J1H 1700 g</td>
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<tr>
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<td>- length, spacer, bushings:</td>
<td>- BK* 900 g/m</td>
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<tr>
<td></td>
<td>- CK* 2300 g/100 in</td>
<td>- DKA 100 g, DKB 700 g, DKC 800 g</td>
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<tr>
<td></td>
<td>Material</td>
<td>wetted parts:</td>
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<tr>
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<td>- process connection and extension pipe: 1.4435/316L with ECTFE coating</td>
<td>- vibration fork: 1.4435/316L with ECTFE coating</td>
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<tr>
<td></td>
<td>- housings:</td>
<td>- polyester housing: PBT-FR with PBT-FR cover or with PA12 cover with sight glass, cover seal: EPDM</td>
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<tr>
<td></td>
<td>- stainless steel housing: 1.4301/304, cover seal: silicone</td>
<td>- aluminium housing: EN-AC-AISi10Mg, plastic-coated, cover seal: EPDM</td>
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<tr>
<td></td>
<td>- temperature spacer: 1.4435/316L</td>
<td>cable gland: polyamide or brass, nickel-plated</td>
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<tr>
<td></td>
<td>- pressure-tight bushing: 1.4435/316L</td>
<td>temperature</td>
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<td></td>
<td>Surface quality</td>
<td>Ra &lt; 3.2 µm/80 grit: length, spacer, bushings B**, C**, D**</td>
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<tr>
<td></td>
<td>Switching point</td>
<td>see section switch point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indication and operation</td>
<td>flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1&quot;, to JIS B 2238 (RF) from DN50</td>
<td>for additional information see type code</td>
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<tr>
<td></td>
<td>Display elements</td>
<td>electronic inserts:</td>
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</tr>
<tr>
<td></td>
<td>- electronic inserts FEL50 A (PA), FEL58 (N2): green LED, yellow LED</td>
<td>- electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): green LED, red LED</td>
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<td>Operating elements</td>
<td>electronic insert FEL50A (PA): 8 switches for device address setting</td>
<td></td>
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<tr>
<td></td>
<td>- electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): two switches for fail-safe mode and density change</td>
<td>electronic insert FEL58 (N2): two switches for fail-safe mode and density change and one test button</td>
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</tr>
<tr>
<td></td>
<td>Certificates and approvals</td>
<td>Ex approval</td>
<td>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 <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
<tr>
<td></td>
<td>Type of protection</td>
<td>Type of protection</td>
<td>Ø II 1/2G Ex ia IIC T3 ... T6 or Ex ia IIC T3 ... T6 and Ø II 1/2D T80°C (KEMA 01 ATEX 1089)</td>
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<td>- II 12G Ex ia IIC T3 ... T6 or Ex ia IIB T3 ... T6 (KEMA 01 ATEX 1147 X)</td>
<td>- II 1/2G Ex ia IIC T3 ... T6 or Ex ia IIB T3 ... T6 (KEMA 01 ATEX 1148 X)</td>
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<tr>
<td></td>
<td>- II 12G Ex ia IIC T3 ... T6 or Ex ia IIB T3 ... T6 (KEMA 01 ATEX 1286 X)</td>
<td>- II 12G Ex ia IIC T3 ... T6 or Ex ia IIB T3 ... T6 (KEMA 01 ATEX 2117)</td>
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<td>- SIIL classification</td>
<td>up to SIIL2 acc. to IEC 61508</td>
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<td>Overspill protection</td>
<td>Z-65.11-306 (overspill protection in acc. with WHG)</td>
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<td>General information</td>
<td>Directive conformity</td>
<td>EN 61010-1</td>
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<tr>
<td></td>
<td>Directive 73/23/EEC (Low Voltage Directive)</td>
<td>emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector)</td>
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<tr>
<td></td>
<td>Directive 89/336/EC (EMC)</td>
<td>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).</td>
<td></td>
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<td></td>
<td>Directive 94/9 EC (ATEX)</td>
<td>Directive 94/9 EC (ATEX)</td>
<td>EN 50014, EN 50018, EN 500020, EN 50021, EN 50284, EN 50281-1-1</td>
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<td>Conformity</td>
<td>Electromagnetic compatibility</td>
<td>NE 21</td>
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<td>Protection degree</td>
<td>Protection degree</td>
<td>EN 60529</td>
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<td>Climate class</td>
<td>Climate class</td>
<td>EN 60068, part 2-38, fig. 2a</td>
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<tr>
<td></td>
<td>Vibration resistance</td>
<td>Vibration resistance</td>
<td>EN 60068-2-6, 10 ... 50 Hz, 0.15 mm, 100 cycles</td>
</tr>
</tbody>
</table>
## Technical data

### Vibration limit switch

**LVL-M2C**

| 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 (□ II 3G Ex nA/nC II T6 and □ III D T85°C)  
approval ZE233O overspill protection acc. to WHG (Z-65.11-306) |
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<tbody>
<tr>
<td>Supplementary information</td>
<td>EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>.</td>
</tr>
</tbody>
</table>
**Technical data**

### Vibration limit switch

**LVL-M2C**

#### 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).
Technical data

Vibration limit switch
LVL-M2C

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.

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.
Vibration limit switch
LVL-M2C

Technical data

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)

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.
**Technical data**

**Vibration limit switch**

**LVL-M2C**

---

### 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.

---

**Electrical connection**

**Isolated switch amplifiers according to IEC 60947-5-6 (NAMUR)**
Vibration limit switch
LVL-M2C

Technical data

Dimensions

Aluminium housing A*

Process connections

Extension tube

Vibration fork

Float switches

Conductive limit switches

Capacitive limit switches

Hydrostatic pressure sensors

Limit value immersion probes

Continuous immersion probes

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany

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Ambient temperature

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

$$\text{Temperature difference } (T_2 - T_1) \text{ may not exceed max. 60 °C (333 K).}$$

Switch point

Switch point $Z$ on the sensor depend on the mounting position, with reference to water, density $1 \text{ g/cm}^3$, $23$ °C $(296 \text{ K})$, $p_e 0$ bar.

Note:

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

Accessories

- V1-G, mating connector, straight
- V1-W, mating connector, 90° angled
# Vibration limit switch

**LVL-M2C**

## Technical data

### Type code/model number

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVL-M2C</td>
<td>-</td>
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</table>

### Certificates

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>for non-hazardous areas</td>
</tr>
<tr>
<td>WH</td>
<td>WHG overspill protection</td>
</tr>
<tr>
<td>EF</td>
<td>II 1/2G EEx ia IIB T6, WHG</td>
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<tr>
<td>EG</td>
<td>II 1/2G EEx d IIB T6, WHG</td>
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<td>EJ</td>
<td>II 1/2G EEx xa IC T6, WHG</td>
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<td>FM, IS, CI I, II, III, Div1, Group A–G</td>
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### Electrical output

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<th>Description</th>
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<tbody>
<tr>
<td>PA</td>
<td>FELS5A, PROFIBUS PA</td>
</tr>
<tr>
<td>AC</td>
<td>FELS51, contactless 2-wire switch, 19 V ... 253 V AC</td>
</tr>
<tr>
<td>ES</td>
<td>FELS52, PNP-3-wire, 10 V ... 55 V DC</td>
</tr>
<tr>
<td>WA</td>
<td>FELS54, potential-free change-over contact, DPDT, 19 V ... 253 V AC, 19 V ... 55 V DC</td>
</tr>
<tr>
<td>SI</td>
<td>FELS55, 8/16 ma, 11 V ... 36 V DC</td>
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<tr>
<td>N1</td>
<td>FELS56, NAMUR, L–H edge</td>
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</tbody>
</table>

### Housing, cable entry

<table>
<thead>
<tr>
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<th>Description</th>
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<tbody>
<tr>
<td>A1</td>
<td>aluminium housing, IP66, cable gland M20</td>
</tr>
<tr>
<td>A2</td>
<td>aluminium housing, Nema, 4 x ½ NPT</td>
</tr>
<tr>
<td>A3</td>
<td>aluminium housing, IP66, entry G1A</td>
</tr>
<tr>
<td>A4</td>
<td>aluminium housing, IP66, plug connector M12 x 1</td>
</tr>
<tr>
<td>A5</td>
<td>aluminium housing, IP66, PA plug connector M12 x 1</td>
</tr>
<tr>
<td>E1</td>
<td>stainless steel housing, IP66, cable gland M20</td>
</tr>
<tr>
<td>E2</td>
<td>stainless steel housing, Nema 4 x ½ NPT</td>
</tr>
<tr>
<td>E3</td>
<td>stainless steel housing, IP66, entry G1A</td>
</tr>
<tr>
<td>E4</td>
<td>stainless steel housing, IP66, plug connector M12 x 1</td>
</tr>
<tr>
<td>E5</td>
<td>stainless steel housing, IP66, PA plug connector M12 x 1</td>
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<tr>
<td>P1</td>
<td>polyester housing, IP66, cable gland M20</td>
</tr>
<tr>
<td>P2</td>
<td>polyester housing, Nema 4 x ½ NPT</td>
</tr>
<tr>
<td>P3</td>
<td>polyester housing, IP66, entry G1A</td>
</tr>
<tr>
<td>P4</td>
<td>polyester housing, IP66, plug connector M12 x 1</td>
</tr>
<tr>
<td>P5</td>
<td>polyester housing, IP66, PA plug connector M12 x 1</td>
</tr>
</tbody>
</table>

### Temperature spacer, pressure-tight bushing

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>without</td>
</tr>
<tr>
<td>B</td>
<td>temperature spacer</td>
</tr>
<tr>
<td>C</td>
<td>pressure-tight bushing</td>
</tr>
</tbody>
</table>

### Length, material extension pipe

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BK</td>
<td>in mm, ECTFE</td>
</tr>
<tr>
<td>CK</td>
<td>in inch, ECTFE</td>
</tr>
<tr>
<td>DK</td>
<td>special length L II, ECTFE, switching point = Vibracon compact</td>
</tr>
</tbody>
</table>

### Process connection and material

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3H</td>
<td>1&quot;, ANSI B 16.5, 150 lbs RF, ECTFE</td>
</tr>
<tr>
<td>A5H</td>
<td>1½&quot;, ANSI B 16.5, 150 lbs RF, ECTFE</td>
</tr>
<tr>
<td>A6H</td>
<td>2&quot;, ANSI B 16.5, 150 lbs RF, ECTFE</td>
</tr>
<tr>
<td>A8H</td>
<td>3&quot;, ANSI B 16.5, 150 lbs RF, ECTFE</td>
</tr>
<tr>
<td>H3S</td>
<td>DN25 PN40, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>H5S</td>
<td>DN32 PN40, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>H6S</td>
<td>DN40 PN40, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>H7S</td>
<td>DN50 PN60, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>H75</td>
<td>DN50 PN40, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>H95</td>
<td>DN80 PN40, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>HA3</td>
<td>DN100 PN16, EN 1092-1 Form B, ECTFE</td>
</tr>
<tr>
<td>J1H</td>
<td>10 K 50, JIS B 2238 (RF), ECTFE</td>
</tr>
</tbody>
</table>

### Design

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M2</td>
<td>extended design (148 mm/6 in ... 6,000 mm/20 ft)</td>
</tr>
</tbody>
</table>

---

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Data of issue 09/22/06 - Catalog Field Devices
<table>
<thead>
<tr>
<th>Technical data</th>
<th>Vibration limit switch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LVL-M2C</td>
</tr>
</tbody>
</table>

- **Float switches**
- **Conductive limit switches**
- **Capacitive limit switches**
- **Limit value immersion probes**
- **Continuous immersion probes**
- **Hydrostatic pressure sensors**
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^*

<table>
<thead>
<tr>
<th>L</th>
<th>K</th>
<th>L – P –</th>
<th>–</th>
<th>–</th>
</tr>
</thead>
</table>

Certificates and approvals
Additional equipment
Housing, cable entry
Probe length
Quantity and rod/rope type
Process connection
Version
Plastic
Limit
Conductive
Level

Limit value immersion probes
Continuous immersion probes
Hydrostatic pressure sensors
Capacitive limit switches
Conductive limit switches
Vibration limit switches
Float switches
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.
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

Additional dimensions see section dimensions.

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.
Technical data

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 limit level 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 > 0.7
output: two potential-Free change-over contacts.

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 μA.
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
## Conductive limit switch

### LKL-P*

<table>
<thead>
<tr>
<th>Technical data</th>
<th>Maximum measured error</th>
<th>± 10 % at 0.1 ... 100 kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-repeatability</td>
<td>± 5 % at 0.1 ... 100 kΩ</td>
<td></td>
</tr>
<tr>
<td>Hysteresis</td>
<td>-10 % for the max probe, in reference to the switch point, Δs function deactivated</td>
<td></td>
</tr>
<tr>
<td>Influence of ambient temperature</td>
<td>&lt; 0.05 %/K</td>
<td></td>
</tr>
<tr>
<td>Switching time</td>
<td>&lt; 3 s</td>
<td></td>
</tr>
</tbody>
</table>

### Operating conditions

#### Mounting conditions

Mounting location: The rod and rope probes are mounted predominantly in tanks made of plastic or metal.

#### 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/s²)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

#### 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, G/ô
## Technical data

**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 II 2G Ex ia/ib IIC T6 (TÜV 03 ATEX 2295)
- II 3G or nC [L] IIC T6

**Generals information**
- Directive conformity
  - 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 SI2300 (TÜV 03 ATEX 2295)
- safety information SI2260 (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.
Conductive limit switch
LKL-P

**Technical data**

**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, fix 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.

<table>
<thead>
<tr>
<th>Fail-safe mode</th>
<th>Switch point</th>
<th>Output signal</th>
<th>rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAX</td>
<td>3 4 5 6 7 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MIN</td>
<td>3 4 5 6 7 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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.

<table>
<thead>
<tr>
<th>Fail-safe mode</th>
<th>Switch point</th>
<th>Output signal</th>
<th>rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max.</td>
<td><img src="image" alt="Max Diagram" /></td>
<td><img src="image" alt="Output Signal Diagram" /></td>
<td><img src="image" alt="rd Diagram" /></td>
</tr>
<tr>
<td>Min.</td>
<td><img src="image" alt="Min Diagram" /></td>
<td><img src="image" alt="Output Signal Diagram" /></td>
<td><img src="image" alt="rd Diagram" /></td>
</tr>
</tbody>
</table>

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

F: fine-wire fuse 500 mA, semi-time lag
M: ground connection to protective earth
Conductive limit switch LKL-P*

Technical data

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.

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

<table>
<thead>
<tr>
<th>Fail-safe mode</th>
<th>Level</th>
<th>Output signal</th>
<th>LEDs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2.2 mA ... 6.5 mA</td>
<td>green</td>
</tr>
<tr>
<td>Max.</td>
<td></td>
<td>+ 2.2 mA ... 6.5 mA</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 0.4 mA ... 1.0 mA</td>
<td>1</td>
</tr>
<tr>
<td>Min.</td>
<td></td>
<td>+ 2.2 mA ... 6.5 mA</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 0.4 mA ... 1.0 mA</td>
<td>1</td>
</tr>
</tbody>
</table>

- = lit
- = flashes
- = unlit
Electrical connection

Output NA
separate instrument version

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

![Diagram 1](image1)

*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

![Diagram 2](image2)

*1 Printed circuit board for cable monitoring
The power supply and evaluation are provided by switching units.
Conductive limit switch
LKL-P*

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

Technical data
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.

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.

Example applications

Level limit detection (standard applications)

Two-point control (Δs) e.g. pump control
Conductive limit switch  
**LKL-P*  

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

### Technical data

#### Type code/model number

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>K</td>
<td>L</td>
<td>P</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Certificates and approvals
- **NA**: version for non-explosion hazardous area
- **WH**: overspill protection WHG with leakage approval
- **EB**: II 2G Ex ia IIB/IIC T5 ... T6, WHG
- **EC**: II 3G Ex nA/nC (L) IIC T6, WHG

#### Additional equipment
- **N**: without additional equipment
- **Y**: special version

#### Electrical output
- **NA**: without electronic insert (separate instrument version)
- **E5**: FEW52, PNP output, 10.8 V DC ... 45V DC (compact instrument version)
- **WA**: FEW54, relay output, 20 V AC ... 253 V AC (compact instrument version)
- **N1**: FEW58, NAMUR, H-L edge (compact instrument version)

#### Housing, cable entry
- **P1**: plastic housing, IP66, cable gland M20 x 1.5
- **P2**: plastic housing, IP66, ½ NPT
- **P3**: plastic housing, IP66, G½

#### Probe length
- **A**: in mm, 100 mm ... 4000 mm*
- **B**: in in, 4 in ... 158 in*
- **C**: 1000 mm (3 ft)
- **D**: 2000 mm (3 ft)

#### Quantity and rod type
- 2 rods, 1.4435/316L isolation PP
- 3 rods, 1.4435/316L isolation PP
- 5 rods, 1.4435/316L isolation PP

#### Process connection
- **G5**: G1½, DIN ISO 228/1, PPS
- **N5**: ½ NPT, ANSI B 1.20.1, PPS

#### Version
- **1**: rod version
- *price is independent from length*

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>K</td>
<td>L</td>
<td>P</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Certificates and approvals
- **NA**: version for non-explosion hazardous area
- **WH**: overspill protection WHG with leakage approval
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- **EC**: II 3G Ex nA/nC (L) IIC T6, WHG

#### Additional equipment
- **N**: without additional equipment
- **Y**: special version

#### Electrical output
- **NA**: without electronic insert (separate instrument version)
- **E5**: FEW52, PNP output, 10.8 V DC ... 45V DC (compact instrument version)
- **WA**: FEW54, relay output, 20 V AC ... 253 V AC (compact instrument version)
- **N1**: FEW58, NAMUR, H-L edge (compact instrument version)

#### Housing, cable entry
- **P1**: plastic housing, IP66, cable gland M20 x 1.5
- **P2**: plastic housing, IP66, ½ NPT
- **P3**: plastic housing, IP66, G½

#### Probe length
- **A**: in mm, 250 mm ... 15000 mm
- **B**: in in, 10 in ... 590 in

#### Quantity and rope type
- 2 ropes, 1.4571/316Ti
- 3 ropes, 1.4571/316Ti
- 5 ropes, 1.4571/316Ti

#### Process connection
- **G5**: G1½, DIN ISO 228/1, PPS
- **N5**: ½ NPT, ANSI B 1.20.1, PPS

#### Version
- **1**: rope version

*price is independent from length*
<table>
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<tr>
<th>Technical data</th>
<th>Conductive limit switch</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>LKL-P*</td>
</tr>
</tbody>
</table>

- Float switches
- Vibration limit switches
- Conductive limit switches
- Capacitive limit switches
- Limit value immersion probes
- Continuous immersion probes
- Hydrostatic pressure sensors
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*

![Type code diagram]
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 $\varepsilon_r$ of the medium.
Capacitive limit switch

**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)

**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

**Dimensions**
LCL1, compact version with rod probe

Additional dimensions see section dimensions.

**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.
## Technical data

### Capacitive limit switch

**LCL**

### 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, \( I_{\text{max}} = 200 \ mA \)
- Overload and short circuit protection
- Residual voltage at transistor at \( I_{\text{max}} < 2.9 \ V \)
- Connection WA: Contact change-over, potential-free
  - \( U_{\text{max}} = 253 \ V \)
  - \( I_{\text{max}} = 1000 \ VA \), \( \cos \varphi = 1 \), \( P_{\text{max}} = 500 \ VA \), \( \cos \varphi > 0.7 \)

**Signal on alarm**
- Connection E5: < 100 \( \mu A \)
- 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 relay is de-energised when the probe is covered 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 mm² in end splice, wire max. 2.5 mm²

**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 \( p_{\text{m}} = 0 \) bar, medium: Dielectric constant = 2.6, Conductivity: < 1 \( \mu \)S
- 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

### 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

**Temperature**
- Ambient temperature: -40...70 °C (233...343 K)
- Ambient temperature limits: -40...80 °C (233...333 K), dust-Ex version

**Storage temperature**
- -40...80 °C (233...353 K)

**Shock resistance**
- Probe: 7 J

**Overvoltage protection**
- Overvoltage category III
Capacitive limit switch
LCL*

Technical data

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)

- 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)

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

Display elements

- Green LED: standby indication
- Red LED: switch status indication

Switching elements

- 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

- Type of protection
  - LCL1: II 1/3D IP66 T97°C (DMT 01 ATEX E122)
  - LCL2: II 1/3D [Ex 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
  - EN 61010-1
  - Directive 89/336/EC (EMC)
  - EN 61326, class B equipment
  - 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 TIL-LCL
- Operating instructions KA093O (LCL1)
- Operating instructions KA094O (LCL2)
- Operating instructions KA098O (transparent cover (LCL-Z10))
- Operating instructions KA155O (LCL2)
- Operating instructions KA156O (safe mode (LCL2))
- Operating instructions KA157O (rope shortening for LCL2 (LCL-Z14))
- Safety information S1092O (LCL2, KEMA 01 ATEX 1149)
- Safety information S1011O (LCL1, DMT 01 ATEX E 122)

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.
Technical data

Capacitive limit switch LCL*

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.
Capacitive limit switch
LCL*

Technical data

Dimensions

Housing

Process connections

Probe length

probe length tolerances LCL2:

<table>
<thead>
<tr>
<th>Probe length L</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 1000 mm (3 ft)</td>
<td>+0 mm, -10 mm (0.4 in)</td>
</tr>
<tr>
<td>up to 3000 mm (10 ft)</td>
<td>+0 mm, -20 mm (0.8 in)</td>
</tr>
<tr>
<td>up to 6000 mm (20 ft)</td>
<td>+0 mm, -30 mm (1.2 in)</td>
</tr>
</tbody>
</table>
**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)
## Capacitive limit switch

**LCL***

### Technical data

<table>
<thead>
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<td><strong>Type code/model number</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Certificates</strong></td>
<td></td>
</tr>
<tr>
<td>NA</td>
<td>version for non-explosion hazardous areas</td>
</tr>
<tr>
<td>EX</td>
<td>II 1GD, zone 20</td>
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<tr>
<td>WH</td>
<td>WHG overspill protection</td>
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<tr>
<td>FS</td>
<td>FM, DIP, CI. II, III, Gr. E - G, TS</td>
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<tr>
<td>CS</td>
<td>CSA, DIP, CI. II, Gr. E - G, CI. III</td>
</tr>
<tr>
<td>CG</td>
<td>CSA General Purpose</td>
</tr>
<tr>
<td><strong>Technical data</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Optional equipment</strong></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>without optional equipment</td>
</tr>
<tr>
<td>D</td>
<td>with transparent cover</td>
</tr>
<tr>
<td><strong>Electronical output</strong></td>
<td></td>
</tr>
<tr>
<td>E5</td>
<td>PNP, 10.8 V DC ... 45 V DC</td>
</tr>
<tr>
<td>WA</td>
<td>potential-free change-over contact, relay 20 V AC ... 253 V AC/20 V DC ... 55 V DC</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>polyester housing F14, IP66, ½ NPT</td>
</tr>
<tr>
<td>P</td>
<td>polyester housing F14, IP66, M20 x 1.5</td>
</tr>
<tr>
<td>Q</td>
<td>polyester housing F14, IP66, G½</td>
</tr>
<tr>
<td><strong>Length and material</strong></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>140 mm (5.5 in), compact version, PPS (Polyphenylensulphide)</td>
</tr>
<tr>
<td>3</td>
<td>1500 mm (5 ft), steel, HD-PE coated</td>
</tr>
<tr>
<td>4</td>
<td>2500 mm (8 ft), steel, HD-PE coated</td>
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<tr>
<td>6</td>
<td>6000 mm (20 ft), steel, HD-PE coated</td>
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<tr>
<td><strong>Process connection</strong></td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>R1, DIN 3999</td>
</tr>
<tr>
<td>R5</td>
<td>R1½, DIN 3999</td>
</tr>
<tr>
<td><strong>Versions</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>compact version</td>
</tr>
<tr>
<td>2</td>
<td>rod probe with extension</td>
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<tr>
<td>Technical data</td>
<td></td>
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<tr>
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<tr>
<td>Capacitive limit switches</td>
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<td>Conductive limit switches</td>
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<td>Float switches</td>
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<tr>
<td>Continuous immersion probes</td>
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<tr>
<td>Limit value immersion probes</td>
<td></td>
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<tr>
<td>Hydrostatic pressure sensors</td>
<td></td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>L</th>
<th>M</th>
<th>L</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Float</td>
<td>Thread material</td>
<td>Process connection</td>
<td>Electrical output</td>
<td>Certificates and approvals or special features</td>
<td>Magnet-operated</td>
</tr>
<tr>
<td>Tube material</td>
<td>Number of contacts</td>
<td>Limit</td>
<td>Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Product group LML

Certificates and approvals or special features

Electrical output

Process connection

Thread material

Tube material

Number of contacts

Limit

Magnet-operated

Level

Float

<table>
<thead>
<tr>
<th>L</th>
<th>M</th>
<th>L</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
</table>
Limit value magnet-operated immersion probes

Limit value magnet-operated immersion probes are designed for use in clean fluids, such as water, solvents, oils and 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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</thead>
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</tr>
<tr>
<td>Limit value magnet-operated immersion probe LML-Stainless steel</td>
<td>134</td>
</tr>
<tr>
<td>Limit value magnet-operated immersion probe LML-Ex</td>
<td>136</td>
</tr>
</tbody>
</table>
Limit value immersion probe

LML-P

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

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
## Technical data

### 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/cm³**

### 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)

### Material
- **float, guide tube, process connection**
  - version PP: PP (polypropylene)
  - version PVDF: PVDF (polyvinylidenfluoride)

### 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 mm²

### 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

#### LML-P

<table>
<thead>
<tr>
<th>L</th>
<th>M</th>
<th>L</th>
<th>D</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>contact</td>
<td>2</td>
<td>2 contacts</td>
</tr>
</tbody>
</table>
Limit value immersion probe

### LML-S

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

#### Features

#### Dimensions

![Dimensions Diagram]

#### 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

- BU
- BN
- BK

2 contacts

- YE
- GN
- BU
- BN

3 contacts

- BU/RD
- RD
- WH
- YE
- GN
- BN
- BU
- PK
- GY

⚠️ 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.
## Technical data

### 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/cm³
- Version S3: ≥ 0.7 g/cm³

### 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
  - LML1S3-G5S-DW, LML2S3-G5S-DW, LML3S3-G5S-DW

**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 mm²

### 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

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<th>S</th>
<th>D</th>
<th>W</th>
</tr>
</thead>
</table>

**Special features (optional)**
- PVC cable (with process connection G1), 1 m (3.3 ft)

**Electrical output**
- Changeover contact, directly

**Thread material**
- Stainless steel 1.4571/316Ti

**Process connection**
- G3/8, DIN ISO 228/1, with PVC cable, 1 m (3.3 ft)
- G1, G1½A, G2A, DIN ISO 228/1

**Float**
- Stainless steel 1.4571/316Ti (cylinder, Ø44 mm x 52 mm (1.73 in x 2.05 in))
- Stainless steel 1.4571/316Ti (ball Ø52 mm (2.05 in))

**Number of contacts**
- 1 contact
- 2 contacts
- 3 contacts
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

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

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.
**Technical data**

### Limit value immersion probe

**LML-Ex**

#### 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

#### 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.

#### Function and system design

**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/cm³
- version S3: ≥ 0.7 g/cm³

#### 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

**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 mm²

#### Certificates and approvals

**Ex approval**
KEMA 03 ATEX 1496 X, for additional certificates see www.pepperl-fuchs.com

**Type of protection**

| 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.
## Type code/model number

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<th>S –</th>
<th>S –</th>
<th>–</th>
<th>E</th>
<th>x</th>
</tr>
</thead>
</table>

- **Certificates and approvals**: Ex
- **Electrical output**: DO, normally closed; DS, normally open
- **Thread material**: 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**: Stainless steel 1.4571/316Ti (pipe length in accordance with specifications)

### Number of contacts
- 1 contact
- 2 contacts
- 3 contacts
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<tbody>
<tr>
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</tbody>
</table>

- Float switches
- Vibration limit switches
- Conductive limit switches
- Capacitive limit switches
- Limit value immersion probes
- Continuous immersion probes
- Hydrostatic pressure sensors
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**

![Diagram of type code]

- **Certificates and approvals**
- **Electrical output**
- **Thread material**
- **Process connection**
- **Resolution**
- **Continuous**
- **Magnet-operated**
- **Level**
- **Float**
- **Tube material**

- **LMC**
- **S**
- **-**

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Continuous magnet-operated immersion probes

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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</table>
Continuous immersion probe

**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

**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.

**Dimensions**

**Electrical connection**

When placing your order, please specify the tube length (L).
## 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/cm³

## 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 (polyvinylidenefluoride)
terminal box: polyester

**Process connection:**
- cylindrical thread G2A to DIN ISO 228/1

**Electrical connection:**
- 3 terminals, max. 2.5 mm²

## 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

```
LMC1O-G6-O4
```

**Electrical output:** O4 3-wire potentiometer circuit approx. 40 kΩ

**Thread material:**
- P PP
- D PVDF

**Process connection:** G2A, DIN ISO 228/1

**Float:**
- 5 PVDF (cylinder, Ø55 mm x 70 mm (2.16 in x 2.75 in))
- 6 PP (cylinder, Ø55 mm x 54 mm (2.16 in x 2.12 in))

**Tube material:**
- P PP (pipe length in accordance with specification)
- D PVDF (pipe length in accordance with specification)

**Resolution:**
- 10 mm (0.4 in) resolution
Continuous immersion probe

LMC-S

- 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

Features

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

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

#### 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

#### 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**
  - **Electrical connection**
    - version I: 2 terminals, max. 2.5 mm²
    - version O4: 3 terminals, max. 2.5 mm²

#### 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

- **Electrical output**
  - version I: 2-wire 4 mA ... 20 mA
  - version O4: 3-wire-potentiometer circuit approx. 40 kΩ
- **Thread material**
  - stainless steel 1.4571/316Ti
- **Process connection**
  - G2: G½A, DIN ISO 228/1
  - G5: G1½A, DIN ISO 228/1
- **Float**
  - stainless steel 1.4571/316Ti (ball, Ø80 mm (3.15 in))
  - stainless steel 1.4571/316Ti (cylinder, Ø44 mm x 52 mm (0.47 in x 2.05 in))
  - stainless steel 1.4571/316Ti (ball, Ø52 mm (2.05 in))
- **Tube material**
  - stainless steel 1.4571/316Ti (pipe length in accordance with specifications)
- **Resolution**
  - 5 mm (0.2 in) resolution
  - 15 mm (0.6 in) resolution
Continuous immersion probe

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

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

When placing your order, specify the length (L) of the guide tube.
### 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-PTC4-Ex1 or of a magnet-operated immersion probe LMC****-***-O4-Ex and an isolated transformer KFD2-P2T-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/cm³

version S2: ≥ 0.8 g/cm³

version S3: ≥ 0.7 g/cm³

### 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 mm²

version O4: 3 terminals, max. 2.5 mm²

**Certificates and approvals**

Ex approval KEMA 03 ATEX 1497 X, for additional certificates see www.pepperl-fuchs.com

**Type of protection**

II 1/2G Ex ia IIC T4 ... T6

**General information**

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

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<tr>
<td>Certificates and approvals  Ex</td>
<td>II 1/2G Ex ia IIC T4 ... T6</td>
<td>Electrical output  I</td>
<td>2-wire 4 mA ... 20 mA</td>
<td>O4</td>
<td>3-wire potentiometer circuit approx. 40 kΩ</td>
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<td>Process connection</td>
<td>G5</td>
<td>G1½A, DIN ISO 228/1</td>
<td>G6</td>
<td>G2A, DIN ISO 228/1</td>
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<td>Tube material</td>
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<tr>
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</table>
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)

![Diagram of type code LHC-M](image)

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

![Diagram of type code PPC-M](image)
The fill level \( h \) of a liquid can be determined by the hydrostatic pressure \( p \) if the density \( \rho \) is known:

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

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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<tr>
<td>Process pressure transmitter Barcon PPC-M**</td>
<td>164</td>
</tr>
</tbody>
</table>
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

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/I8 analogue electronic (example)

Analogue electronics
11.5 V DC ... 45 V DC
Test 4 mA ... 20 mA
1 + 2 – 3 50 mA*

* For analogue electronics versions with certificate ATEX 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.
## Technical data

### 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 mm³.
- 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 mm³.

### 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), FSsafe 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 mm²
  - 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

**Current consumption**
- PROFIBUS PA electronics PA/PB: 11 mA ± 1 mA
Hydrostatic pressure sensor

**LHC-M**

### Residual ripple

- **Technical data**
  - 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_{pp} = 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

**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)

- **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
<table>
<thead>
<tr>
<th>Technical data</th>
<th>Hydrostatic pressure sensor LHC-M**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Material</strong></td>
<td><strong>h</strong>ousing:</td>
</tr>
<tr>
<td></td>
<td>- stainless steel 1.4404/316L or cast aluminium housing with protective polyester based powder coating</td>
</tr>
<tr>
<td></td>
<td>- stainless steel housing: engraved on housing with laser</td>
</tr>
<tr>
<td></td>
<td>- aluminium housing: 1.4301/304</td>
</tr>
<tr>
<td></td>
<td><strong>n</strong>ameplates:</td>
</tr>
<tr>
<td></td>
<td>- stainless steel housing: silicone</td>
</tr>
<tr>
<td></td>
<td>- aluminium housing: NBR</td>
</tr>
<tr>
<td></td>
<td><strong>m</strong>ounting accessories for pipe and wall mounting:</td>
</tr>
<tr>
<td></td>
<td>- stainless steel 1.4301/304</td>
</tr>
<tr>
<td></td>
<td><strong>d</strong>iaphragm (in contact with the medium):</td>
</tr>
<tr>
<td></td>
<td>- LHC-M20: Al2O3 aluminium oxide ceramic (FDA listed), 96 %, extremely clean 99.9 %</td>
</tr>
<tr>
<td></td>
<td>- 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)</td>
</tr>
<tr>
<td></td>
<td><strong>s</strong>eals:</td>
</tr>
<tr>
<td></td>
<td>- FKM Viton (also in versions grease-free and for oxygen use), NBR, FFKM Kairez, FFKM Chemraz, EPDM</td>
</tr>
<tr>
<td></td>
<td>- 0-ring for cover sealing:</td>
</tr>
<tr>
<td></td>
<td>- stainless steel housing: silicone</td>
</tr>
<tr>
<td></td>
<td>- aluminium housing: NBR</td>
</tr>
<tr>
<td></td>
<td><strong>r</strong>ecordings:</td>
</tr>
<tr>
<td></td>
<td>- 1.4571/316Ti</td>
</tr>
<tr>
<td></td>
<td><strong>t</strong>able quality standard surface roughness of parts in contact with the medium Rₐ ≤ 0.8 µm, reduces surface roughness on request.</td>
</tr>
<tr>
<td><strong>Process connection</strong></td>
<td><strong>P</strong>rocess connection:</td>
</tr>
<tr>
<td></td>
<td>- cylindrical thread G1A, G1½A, G2A to DIN ISO 228/1 with flat seal to DIN 7603</td>
</tr>
<tr>
<td></td>
<td>- conical thread 1 NPT, 1½ NPT, 2 NPT to ANSI B 1.20.1</td>
</tr>
<tr>
<td></td>
<td>- Triclamp 2&quot; to ISO 2952</td>
</tr>
<tr>
<td></td>
<td>- threaded pipe joint DN40 and DN50 to DIN 1185</td>
</tr>
<tr>
<td></td>
<td>- aseptic connection DN40 and DN50 to DIN 11864-1 form A for pipe DIN 11850</td>
</tr>
<tr>
<td></td>
<td>- SMS connection 1½&quot; and 2&quot;</td>
</tr>
<tr>
<td></td>
<td>- Varivent® D = 68 mm (2.7 in) for pipes DN40 ... DN125 to factory standard Tuchenhagen</td>
</tr>
<tr>
<td></td>
<td>- DRD flange, D = 65 mm (2.6 in)</td>
</tr>
<tr>
<td></td>
<td>- APV inline PN40</td>
</tr>
<tr>
<td></td>
<td>- flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1&quot;, optional with Halar or PVDF coating or tubing for additional information see type code</td>
</tr>
<tr>
<td><strong>Electrical connection</strong></td>
<td><strong>E</strong>lectrical connection:</td>
</tr>
<tr>
<td></td>
<td>- housing *1: cable gland M20 x 1.5</td>
</tr>
<tr>
<td></td>
<td>- housing *2: cable gland ½ NPT</td>
</tr>
<tr>
<td></td>
<td>- housing *3: cable gland G½</td>
</tr>
<tr>
<td></td>
<td>- housing *4: Harting plug (Han7D)</td>
</tr>
<tr>
<td></td>
<td>- housing *5: M12 x 1 plug</td>
</tr>
<tr>
<td></td>
<td>- housing *6: assembled cable with pressure compensation, 5 m (197 in)</td>
</tr>
<tr>
<td><strong>Indication and operation</strong></td>
<td><strong>I</strong>ndication and operation:</td>
</tr>
<tr>
<td></td>
<td><strong>D</strong>isplay elements analogue electronics I2/IB:</td>
</tr>
<tr>
<td></td>
<td>- The analogue display gives the current pressure value related to the measuring range in the form of a bar graph (30 segments).</td>
</tr>
<tr>
<td></td>
<td>- HART electronics IA/IH:</td>
</tr>
<tr>
<td></td>
<td>- 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.</td>
</tr>
<tr>
<td></td>
<td>- PROFIBUS PA electronics PA/PB:</td>
</tr>
<tr>
<td></td>
<td>- 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).</td>
</tr>
<tr>
<td></td>
<td><strong>D</strong>isplay resolution:</td>
</tr>
<tr>
<td></td>
<td>- analogue display: bar graph, 1 segment equals 3.33 % of the set span</td>
</tr>
<tr>
<td></td>
<td>- digital display: 0.1 %, bar graph, 1 segment equals 3.57 % of the set span</td>
</tr>
<tr>
<td></td>
<td><strong>O</strong>perating elements analogue electronics I2/IB:</td>
</tr>
<tr>
<td></td>
<td>- operation directly at the measuring point with one potentiometer each for lower range value and upper range value</td>
</tr>
<tr>
<td></td>
<td>- a three-step range switch</td>
</tr>
<tr>
<td></td>
<td>- as well as an on/off switch for damping</td>
</tr>
<tr>
<td></td>
<td>- HART electronics IA/IH with HART protocol: operation mode at the measuring point via</td>
</tr>
<tr>
<td></td>
<td>- two push buttons for lower range value and upper range value as well as an on/off switch for damping</td>
</tr>
<tr>
<td></td>
<td>- the handheld terminal at any point along the 4 ... 20 mA line</td>
</tr>
<tr>
<td></td>
<td>- a PC with operating program</td>
</tr>
<tr>
<td></td>
<td>- PROFIBUS PA electronics PA/PB: operation mode via</td>
</tr>
<tr>
<td></td>
<td>- two keys for lower-range value and upper-range value</td>
</tr>
<tr>
<td></td>
<td>- using a PC with operating program</td>
</tr>
<tr>
<td><strong>Certificates and approvals</strong></td>
<td><strong>C</strong>ertificates and approvals</td>
</tr>
<tr>
<td></td>
<td><strong>E</strong>x approval</td>
</tr>
<tr>
<td></td>
<td>DMT 02 ATEX E 137, DMT 02 ATEX E 138, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
</tbody>
</table>
### Hydrostatic pressure sensor

**LHC-M**

**Technical data**

<table>
<thead>
<tr>
<th>Type of protection</th>
</tr>
</thead>
</table>
| II 1G EEx ia IIC T4/T6 (DMT 02 ATEX E 137)  
| II 2G EEx ia IIC T4/T6 (DMT 02 ATEX E 137)  
| II 1/2D IP66 T85°C (DMT 02 ATEX E 137)  
| II 1/3D IP66 T110°C (DMT 02 ATEX E 138)  
| II 3 G EEx na II T5  

**SIL classification**

up to SIL2 acc. to IEC 61508

### General information

**Directive conformity**

  - 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
- 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 KA252O 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 (II3 G EEx na II T5)
- safety information SI069O (DMT 02 ATEX E 137), PROFIBUS PA version
- safety information SI079O (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)
- FM 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.
### Hydrostatic pressure sensor

**LHC-M**

#### Technical data

**Electrical connection**

**Connection I2/IB with analogue electronics**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Test 4 mA ... 20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.5 V DC ... 45 V DC</td>
<td></td>
</tr>
<tr>
<td>T 50 mA*</td>
<td></td>
</tr>
</tbody>
</table>

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

![Connection I2/IB diagram]

**Connection IA/IH with HART electronics**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Test 4 mA ... 20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.5 V DC ... 45 V DC</td>
<td></td>
</tr>
<tr>
<td>11.5 V DC ... 30 V DC (Ex i)</td>
<td></td>
</tr>
</tbody>
</table>

![Connection IA/IH diagram]

**Connection PA/PB with PROFIBUS PA electronics**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Test 4 mA ... 20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 V DC ... 32 V DC</td>
<td></td>
</tr>
<tr>
<td>9 V DC ... 24 V DC (Ex i)</td>
<td></td>
</tr>
</tbody>
</table>

![Connection PA/PB diagram]
## Dimensions

### Housing LHC-M20

Measure L depends on process connection and lid.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHC-M20 E*</td>
<td>74</td>
</tr>
<tr>
<td>LHC-M20 A*</td>
<td>97</td>
</tr>
</tbody>
</table>

### Process connections with threads

Values in brackets apply for housings with raised cover.

Values in italics apply to devices with an aluminium housing.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>G51, G1½</td>
<td>L117</td>
</tr>
<tr>
<td>N51, ½ NPT</td>
<td>L74</td>
</tr>
<tr>
<td>MM1, M44 x 1.25</td>
<td>L117</td>
</tr>
</tbody>
</table>

### Process connections with sanitary couplings

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5, dairy coupling</td>
<td>L153.5 (173.5)</td>
</tr>
<tr>
<td>M75, dairy coupling</td>
<td>L154.5 (174.5)</td>
</tr>
<tr>
<td>DR1, DRD, D = 65 mm</td>
<td>L153.5 (173.5)</td>
</tr>
</tbody>
</table>

### Limit value immersion probes

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>V11, VariVent for pipes, D = 65 mm</td>
<td>L84</td>
</tr>
<tr>
<td>T65, 'Tricomp 2'</td>
<td>L82</td>
</tr>
<tr>
<td>SP6, APV INLINE</td>
<td>L82</td>
</tr>
</tbody>
</table>

### Technical data

- **Dimensions**
  - Housing LHC-M20
- **Process connections with threads**
  - Values in brackets apply for housings with raised cover.
  - Values in italics apply to devices with an aluminium housing.
- **Process connections with sanitary couplings**
  - M5, dairy coupling
  - M75, dairy coupling
  - DR1, DRD, D = 65 mm
- **Limit value immersion probes**
  - V11, VariVent for pipes, D = 65 mm
  - T65, 'Tricomp 2'
  - SP6, APV INLINE

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Technical data

Hydrostatic pressure sensor
LHC-M**

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.

Housing and process connections with threads LHC-M40

<table>
<thead>
<tr>
<th>Process connection</th>
<th>Threads</th>
<th>Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>d, d1,</td>
<td>installation height</td>
</tr>
<tr>
<td></td>
<td>d2, x1,</td>
<td>stainless steel</td>
</tr>
<tr>
<td></td>
<td>AF, dM,</td>
<td>installation height</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aluminium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>max. A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>max. A</td>
</tr>
<tr>
<td>G31</td>
<td>29</td>
<td>231.5</td>
</tr>
<tr>
<td></td>
<td>39</td>
<td>236.5</td>
</tr>
<tr>
<td>G51</td>
<td>44</td>
<td>232.5</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>237.5</td>
</tr>
<tr>
<td>G61</td>
<td>56</td>
<td>237.5</td>
</tr>
<tr>
<td></td>
<td>68</td>
<td>242.5</td>
</tr>
<tr>
<td>N31</td>
<td>1 NPT</td>
<td>233.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>238.5</td>
</tr>
<tr>
<td>N51</td>
<td>1½ NPT</td>
<td>233.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>238.5</td>
</tr>
<tr>
<td>N61</td>
<td>2 NPT</td>
<td>233.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>238.5</td>
</tr>
</tbody>
</table>

Process connections with flange

see type code
Hydrostatic pressure sensor
LHC-M**

Measuring range

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

*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
Hydrostatic pressure sensor
LHC-M**

### Type code/model number

| L | H | C | - | M | 2  | 0 | - | - | - | - | - |

### Technical data

#### Certificates
- NA for safe areas
- EX E1 G Ex ia IIC T6
- E1 E2 G Ex ia 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, 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 % ...
- 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: mmHg/H2O
- 4 0.2 %, calibration in sensor limits: inHg/ftH2O
- 5 0.2 %, calibration in sensor limits: kgf/cm2
- 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 psi/400 in H2O, overload 40-fold |
| R1D | 0 mbar ... 400 mbar gauge sensor, 40 kPa, 6 psi/160 in H2O, overload 15-fold |
| R2A | 0 bar ... 100 bar gauge sensor, 1000 kPa, 15 psig/400 in H2O, overload 15-fold |
| R2D | 0 bar ... 400 bar gauge sensor, 400 kPa, 60 psig, overload sex-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 H2O, overload 40-fold |
| N1D | -400 mbar ... 400 mbar sensor, -40 kPa ... 40 kPa, -6 psi ... 6 psi, 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 |
| N3D | 0 mbar ... 400 mbar absolute pressure sensor, 10 kPa, 6 psi, overload 15-fold |
| A1A | 0 mbar ... 400 mbar absolute pressure sensor, 40 kPa, 6 psi, overload 15-fold |
| A1D | 0 mbar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig, overload 10-fold |
| A2A | 0 mbar ... 1 bar absolute pressure sensor, 100 kPa, 15 psia, overload 10-fold |
| A2D | 0 mbar ... 4 bar absolute pressure sensor, 400 kPa, 60 psia, overload 6-fold |
| A3A | 0 mbar ... 10 bar absolute pressure sensor, 1 MPa, 150 psig, overload quadruple |
| A3D | 0 mbar ... 40 bar absolute pressure sensor, 4 MPa, 600 psia, overload 1.5-fold |

#### Transmitter
- M20 ceramic sensor

Continued on next page.
## Hydrostatic pressure sensor
### LHC-M**

<table>
<thead>
<tr>
<th>Type code/model number</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process connection</td>
<td></td>
</tr>
<tr>
<td>G51</td>
<td>G11/1A, DIN ISO 228/1, 1.4435/316L, sealing not changeable</td>
</tr>
<tr>
<td>N51</td>
<td>1½ NPT, ANSI B 1.20.1, 1.4435/316L, sealing not changeable</td>
</tr>
<tr>
<td>G61</td>
<td>G3A, DIN ISO 228/1, 1.4435/316L</td>
</tr>
<tr>
<td>N61</td>
<td>2 NPT, ANSI B 1.20.1, 1.4435/316L</td>
</tr>
<tr>
<td>MM1</td>
<td>M4 x 1.25, DIN 13, 1.4435/316L</td>
</tr>
<tr>
<td>T65</td>
<td>2&quot;, DN40, Trilamp ISO 2853, 1.4435/316L</td>
</tr>
<tr>
<td>S55</td>
<td>1½&quot;, SMS, PN40, 1.4435/316L</td>
</tr>
<tr>
<td>S65</td>
<td>2&quot;, SMS, PN40, 1.4435/316L</td>
</tr>
<tr>
<td>M65</td>
<td>DN40, PN40, dairy DN 11861, 1.4435/316L</td>
</tr>
<tr>
<td>M75</td>
<td>DN50, PN40, dairy DN 11861, 1.4435/316L</td>
</tr>
<tr>
<td>SA6</td>
<td>DN40, aseptic connection DN11864, 1.4435/316L</td>
</tr>
<tr>
<td>SA7</td>
<td>DN50, aseptic connection DN11864, 1.4435/316L</td>
</tr>
<tr>
<td>SP6</td>
<td>PN40, APV-Inline, 1.4435/316L</td>
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<tr>
<td>V11</td>
<td>Varivent D = 68 mm (2.72 in) for pipes DN40 ... DN125, 1.4435/316L</td>
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<tr>
<td>DR1</td>
<td>DRD flange, D = 66 mm, 1.4435/316L</td>
</tr>
<tr>
<td>DR7</td>
<td>DRD flange, D = 42 mm, 1.4435/316L</td>
</tr>
<tr>
<td>F75</td>
<td>DN50, PN25/40, EN 1092-1, 1.4435/316L</td>
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<td>F95</td>
<td>DN60, PN25/40, EN 1092-1, 1.4435/316L</td>
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<tr>
<td>H75</td>
<td>DN50, PN25/40, EN 1092-1, 1.4435/316L with Halar coating</td>
</tr>
<tr>
<td>H95</td>
<td>DN60, PN25/40, EN 1092-1, 1.4435/316L with Halar coating</td>
</tr>
<tr>
<td>A51</td>
<td>ANSI 1½&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L</td>
</tr>
<tr>
<td>A52</td>
<td>ANSI 1½&quot;, ANSI B 16.5, 300 lbs, 1.4435/316L</td>
</tr>
<tr>
<td>A61</td>
<td>ANSI 2&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L</td>
</tr>
<tr>
<td>A62</td>
<td>ANSI 2&quot;, ANSI B 16.5, 300 lbs, 1.4435/316L</td>
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<td>A82</td>
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<td>A91</td>
<td>ANSI 4&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L</td>
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<td>ANSI 4&quot;, ANSI B 16.5, 300 lbs, 1.4435/316L</td>
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<td>H21</td>
<td>ANSI 2&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L with Halar coating</td>
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<td>H31</td>
<td>ANSI 3&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L with Halar coating</td>
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<tr>
<td>H41</td>
<td>ANSI 4&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L with Halar coating</td>
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<tr>
<td>P21</td>
<td>ANSI 2&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L with PVDF coating</td>
</tr>
<tr>
<td>P31</td>
<td>ANSI 3&quot;, ANSI B 16.5, 150 lbs, 1.4435/316L with PVDF coating</td>
</tr>
<tr>
<td>S1M</td>
<td>Weld spud 75 mm (3 in), 1.4435/316L</td>
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<tr>
<td>XXX</td>
<td>special version</td>
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**Transmitter**

M20 - ceramic sensor
## Technical data

### Hydrostatic pressure sensor

**Type code/model number**

<table>
<thead>
<tr>
<th>Type code/model number</th>
</tr>
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<tbody>
<tr>
<td>L H C – M 4 0</td>
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</tbody>
</table>

#### Certificates

<table>
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<tr>
<th>NA for safe areas</th>
<th>EX II 1G Ex ia IIC T4</th>
<th>E1 II 2G Ex ia IIC T6</th>
<th>E2 II 3G Ex ia IIC T5</th>
<th>CD CSA Cl. I, II, III Div. 1, Group E-G (dust Ex), Cl. I Div. 2, Group A-D</th>
<th>CG CSA General Purpose</th>
<th>C1 CSA IS (suitable for Div. 2), Cl. I, II, III, Div. 1, Group A-G</th>
<th>FM FM/Ex, Cl. I, II, III, NI, Div. 1, Group A-G</th>
<th>FD FM/DIP, Cl. I, II, III, Div. 1, Group E-G</th>
<th>SX II 1GD Ex ia IIC T6</th>
</tr>
</thead>
</table>

#### Optional equipment

<table>
<thead>
<tr>
<th>N without optional equipment</th>
<th>M with mounting bracket for wall and pipe mounting</th>
</tr>
</thead>
</table>

#### Electrical output, indication

<table>
<thead>
<tr>
<th>4 mA ... 20 mA, analogue electronics</th>
<th>4 mA ... 20 mA, SMART electronics, HART protocol</th>
<th>4 mA ... 20 mA, SMART electronics, HART protocol with display</th>
<th>4 mA ... 20 mA, SMART electronics, HART protocol with display quadruple and 0 % ... 100 % bar</th>
</tr>
</thead>
</table>

#### Housing, cable entry

<table>
<thead>
<tr>
<th>E1 stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66</th>
<th>E2 stainless steel housing 1.4404/316L, 1/2NPT, IP65</th>
<th>E3 stainless steel housing 1.4404/316L, GI1 entry, IP66</th>
<th>E4 stainless steel housing 1.4404/316L, Harting plug, IP65</th>
</tr>
</thead>
</table>

#### Seal, diaphragm

<table>
<thead>
<tr>
<th>1 diaphragm seal 1.4435</th>
<th>2 diaphragm seal Hastelloy C276</th>
</tr>
</thead>
</table>

#### Sensor filling media

<table>
<thead>
<tr>
<th>A silicone oil, direct coupling</th>
<th>B vegetable oil, direct coupling</th>
<th>C gycrine, direct coupling</th>
<th>D high temperature oil, temperature decoupling 100 mm (3.9 in)</th>
</tr>
</thead>
</table>

#### Calibration and technical units

<table>
<thead>
<tr>
<th>1 0.2 %, calibration in sensor limits: mbar/bar</th>
<th>2 0.2 %, calibration in sensor limits: kPa/Mpa</th>
<th>3 0.2 %, calibration in sensor limits: mH2O/mbar</th>
<th>4 0.2 %, calibration in sensor limits: inH2O/inH2O</th>
</tr>
</thead>
</table>

#### Pressure measuring range

<table>
<thead>
<tr>
<th>R2A 0 bar ... 1 bar gauge sensor, 100 kPa, 15 psi, 400 in H2O, overload quadruple</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2D 0 bar ... 4 bar gauge sensor, 400 kPa, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>R3A 0 bar ... 10 bar gauge sensor, 1 MPa, 150 psi, overload quadruple</td>
</tr>
<tr>
<td>R3D 0 bar ... 40 bar gauge sensor, 4 MPa, 600 psi, overload quadruple</td>
</tr>
<tr>
<td>R4A 0 bar ... 100 bar gauge sensor, 10 MPa, 1500 psi, overload quadruple</td>
</tr>
<tr>
<td>R4D 0 bar ... 400 bar gauge sensor, 40 MPa, 6000 psi, overload 1.5-fold</td>
</tr>
<tr>
<td>N2A -1 bar ... 1 bar sensor, -100 kPa ... 100 kPa, -15 psi ... 15 psi, overload quadruple</td>
</tr>
<tr>
<td>N2D -1 bar ... 4 bar sensor, -100 kPa ... 400 kPa, -15 psi ... 60 psi, overload quadruple</td>
</tr>
<tr>
<td>N3A -1 bar ... 10 bar sensor, -100 kPa ... 1 MPa, -15 psi ... 150 psi, overload quadruple</td>
</tr>
<tr>
<td>N3D -1 bar ... 10 bar sensor, -100 kPa ... 1 MPa, -15 psi ... 150 psi, overload quadruple</td>
</tr>
<tr>
<td>A2D 0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>A2A 0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psi, overload quadruple</td>
</tr>
<tr>
<td>A3D 0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psi, overload quadruple</td>
</tr>
<tr>
<td>A4D 0 bar ... 100 bar absolute pressure sensor, 10 MPa, 1500 psi, overload quadruple</td>
</tr>
</tbody>
</table>

#### Transmitter

| M40 metal sensor, piezoresistive |

---

**Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany**
<table>
<thead>
<tr>
<th>Type code/model number</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LHC-M</strong></td>
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</tr>
<tr>
<td><strong>Hydrostatic pressure sensor</strong></td>
<td></td>
</tr>
<tr>
<td><strong>LHC-M</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Float switches</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vibration limit switches</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Conductive limit switches</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Capacitive limit switches</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Limit value immersion probes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Continuous immersion probes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hydrostatic pressure sensors</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Transmitter</strong></td>
<td></td>
</tr>
<tr>
<td>M40</td>
<td>metal sensor, piezoresistive</td>
</tr>
</tbody>
</table>

**Process connection**
- LHC40: G1A, DIN ISO 228/1, 1.4435/316L
- LHC20: G1A, DIN ISO 228/1, 1.4435/316L
- LHC10: G1A, DIN ISO 228/1, 1.4435/316L
- LHC05: G1A, DIN ISO 228/1, 1.4435/316L
- LHC03: G1A, DIN ISO 228/1, 1.4435/316L
- LHC02: G1A, DIN ISO 228/1, 1.4435/316L
- LHC01: G1A, DIN ISO 228/1, 1.4435/316L
- LHC00: G1A, DIN ISO 228/1, 1.4435/316L

**Transmitter**
- M40: metal sensor, piezoresistive
<table>
<thead>
<tr>
<th>Technical data</th>
<th>Hydrostatic pressure sensor LHC-M**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Float switches</td>
</tr>
<tr>
<td></td>
<td>Vibration limit switches</td>
</tr>
<tr>
<td></td>
<td>Conductive limit switches</td>
</tr>
<tr>
<td></td>
<td>Capacitive limit switches</td>
</tr>
<tr>
<td></td>
<td>Limit value immersion probes</td>
</tr>
<tr>
<td></td>
<td>Continuous immersion probes</td>
</tr>
<tr>
<td></td>
<td>Hydrostatic pressure sensors</td>
</tr>
</tbody>
</table>
Process pressure sensor PPC-M**

- Process pressure sensor for gases, vapours, liquids and dusts
- High accuracy of measurement
- Housing fulfills 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

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/I8 analogue electronic (example)

Analogue electronics
11.5 V DC ... 45 V DC
1 2 T 50 mA*

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

Test 4 mA ... 20 mA

More connection types see section electrical connection.
### 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 mm³.
- 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 mm³.

### 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 PROFINET PA electronics PA/PB with digital communication signal PROFINBUS 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

### Output characteristics

**Output signal**
- analogue electronics I2/IB: 4 ... 20 mA
- HART electronics IA/IH: 4 ... 20 mA with HART protocol
- PROFINBUS 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 held
- PROFINBUS 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
  - 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
- PROFINBUS 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
  - PROFINBUS 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 mm²
  - 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
- PROFINBUS PA electronics PA/PB: 9 ... 32 V DC

**Current consumption**
- PROFIBUS PA electronics PA/PB: 11 mA ± 1 mA
### Process pressure transmitter
**PPC-M**

**Technical data**

| 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; 125 Hz; U_{IR} = 200 mV; max. noise (measured at 500 Ω; 500 ... 10 kHz; U_{IR} = 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 (aluminum oxide ceramic) or stainless steel 1.4436/316L  
- 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  
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. |
| 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 |

Subject to reasonable modifications due to technical advances.

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### Technical data

**Process pressure transmitter**

<table>
<thead>
<tr>
<th>Material</th>
<th>Process pressure transmitter PPC-M**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing:</td>
<td>stainless steel 1.4404/316L or cast aluminium housing with protective polyester based powder coating</td>
</tr>
<tr>
<td>Nameplates:</td>
<td>stainless steel housing: engraved on housing with laser</td>
</tr>
<tr>
<td></td>
<td>aluminium housing: 1.4301/304</td>
</tr>
<tr>
<td>Process connections (with the medium):</td>
<td>PPC-M10: stainless steel 1.4435/316L</td>
</tr>
<tr>
<td></td>
<td>PPC-M20: 1.4435/316L or 2.4819 (Hastelloy C276)</td>
</tr>
<tr>
<td></td>
<td>slotted nuts:</td>
</tr>
<tr>
<td></td>
<td>stainless steel 1.4307/304L</td>
</tr>
<tr>
<td>Process diaphragm (in contact with the medium):</td>
<td>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)</td>
</tr>
<tr>
<td></td>
<td>PPC-M20: Al2O3 aluminium oxide ceramic (FDA listed), 96 %, extremely clean 99.9 %</td>
</tr>
<tr>
<td></td>
<td>seals:</td>
</tr>
<tr>
<td></td>
<td>FKM Viton (also in versions grease-free and for oxygen use), NBR, FFKM Kalrez, FFKM Chemraz, EPDM</td>
</tr>
<tr>
<td>O-ring for cover sealing:</td>
<td>stainless steel housing: silicone</td>
</tr>
<tr>
<td></td>
<td>aluminium housing: NBR</td>
</tr>
<tr>
<td>Mounting accessories for pipe and wall mounting:</td>
<td>stainless steel 1.4301/304</td>
</tr>
<tr>
<td>Measurement cell:</td>
<td>PPC-M10: oil filling: optional mineral oil, inert oil (Voltalef) for oxygen use or vegetable oil</td>
</tr>
<tr>
<td></td>
<td>PPC-M20: without oil filling, dry sensor</td>
</tr>
<tr>
<td>Capillary:</td>
<td>1.4571/316Ti</td>
</tr>
<tr>
<td>Protective hose for capillary:</td>
<td>1.4301/304</td>
</tr>
</tbody>
</table>
| Surface quality standard surface roughness of parts in contact with the medium R
\[ \leq 0.8 \mu m \], 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 |
  - 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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Process pressure transmitter
PPC-M**

Technical data

Ex approval
DMT 02 ATEX E 137, DMT 02 ATEX E 138, for additional certificates see www.pepperl-fuchs.com

Type of protection
- II 1G Ex ia IIC T4/T6 (DMT 02 ATEX E 137)
- II 1/2G Ex ia IIC T4/T6 (DMT 02 ATEX E 137)
- II 2G Ex ia IIC T4/T6 (DMT 02 ATEX E 137)
- II 1/2D IP66 T85°C (DMT 02 ATEX E 137)
- II 1/3D IP66 T110°C (DMT 02 ATEX E 138)
- II 3 G EEx nA II T5

SIL classification
up to SIL2 acc. to IEC 61508

General information

Ex approval
DMT 02 ATEX E 137, DMT 02 ATEX E 138, for additional certificates see www.pepperl-fuchs.com

Type of protection
- II 1G Ex ia IIC T4/T6 (DMT 02 ATEX E 137)
- II 1/2G Ex ia IIC T4/T6 (DMT 02 ATEX E 137)
- II 2G Ex ia IIC T4/T6 (DMT 02 ATEX E 137)
- II 1/2D IP66 T85°C (DMT 02 ATEX E 137)
- II 1/3D IP66 T110°C (DMT 02 ATEX E 138)
- II 3 G EEx nA II T5

SIL classification
up to SIL2 acc. to IEC 61508

General information

Directive conformity
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 BA2000 (version with analogue electronics)
operating instructions BA2220 (version with PROFIBUS PA electronics)
operating instructions KA2240 M12 plug with new PIN assignment
operating instructions KA5250 welded nozzle (LHC-Z20, LHC-Z21, LHC-Z22, LHC-Z23)
safety information SI0380 (DMT 02 ATEX E 137)
safety information SI0390 (DMT 02 ATEX E 137)
safety information SI0400 (DMT 02 ATEX E 138)
safety information SI0520 (II3 G EEx nA II T5)
safety information SI0960 (DMT 02 ATEX E 137), PROFIBUS PA version
safety information SI0970 (DMT 02 ATEX E 137), PROFIBUS PA version
safety information SI0980 (DMT 02 ATEX E 138), PROFIBUS PA version
FM control drawing ZD0380 (version with HART electronics)
CSA control drawing ZD0400 (version with HART electronics)
CSA control drawing ZD0510 (version with PROFIBUS PA electronics)
FM control drawing ZD0520 (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.
Process pressure transmitter
PPC-M**

Technical data

Electrical connection

Connection I2/IB with analogue electronics

Connection IA/IH with HART electronics

Connection PA/PB with PROFIBUS PA electronics

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

Internal ground terminal
Process pressure transmitter
PPC-M**

Dimensions

Housings
The values in brackets apply for housings with raised cover.

Process connections for PPC-M20

PPC-M10 E*  
PPC-M10 A*  
PPC-M20 E*  
PPC-M20 A*

Technical data

Float switches

Conductive limit switches

Capacitive limit switches

Limit value immersion probes

Continuous immersion probes

Hydrostatic pressure sensors

Subject to reasonable modifications due to technical advances.

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## Technical data

### Process connections for PPC-M10

Values in brackets apply for housings with raised cover.

Values in italics apply to devices with an aluminium housing.

<table>
<thead>
<tr>
<th>Process connections</th>
<th>G1G, G½ external</th>
<th>N1A, ½ NPT external</th>
<th>N1I, ½ NPT internal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ø18</td>
<td>Ø21.4</td>
<td>Ø18.5</td>
</tr>
<tr>
<td></td>
<td>Ø8</td>
<td>Ø21.4</td>
<td>Ø15.5 (171.5)</td>
</tr>
<tr>
<td></td>
<td>Ø3</td>
<td>Ø4</td>
<td>Ø3 (PT½)</td>
</tr>
<tr>
<td></td>
<td>Ø6</td>
<td>Ø4</td>
<td>Ø6 (PT½)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2.5</td>
<td>2.5</td>
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<td>25</td>
<td>25</td>
</tr>
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<td></td>
<td>5</td>
<td>20</td>
<td>20</td>
</tr>
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<td>20</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

### 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 |
| G½ external screw-in bolt DIN 3852-E-G½ |

### Floating switches

<table>
<thead>
<tr>
<th>JIS B 0202-1982</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø8, Ø3, Ø6</td>
</tr>
<tr>
<td>G½, G½, G½, G½</td>
</tr>
</tbody>
</table>

### Vibration limit switches

<table>
<thead>
<tr>
<th>JIS B 0203-1982</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø6, Ø3, Ø8</td>
</tr>
<tr>
<td>G½, G½, G½, G½</td>
</tr>
</tbody>
</table>

### Conductive limit switches

<table>
<thead>
<tr>
<th>G½, G½, G½, G½</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø3, Ø8, Ø6</td>
</tr>
</tbody>
</table>

### Capacitive limit switches

<table>
<thead>
<tr>
<th>G½, G½, G½, G½</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø3, Ø8, Ø6</td>
</tr>
</tbody>
</table>

### Limit value immersion probes

<table>
<thead>
<tr>
<th>G½, G½, G½, G½</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø3, Ø8, Ø6</td>
</tr>
</tbody>
</table>

### Continuous immersion probes

<table>
<thead>
<tr>
<th>G½, G½, G½, G½</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø3, Ø8, Ø6</td>
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</tbody>
</table>

### Hydrostatic pressure sensors

<table>
<thead>
<tr>
<th>G½, G½, G½, G½</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø18, Ø3, Ø8, Ø6</td>
</tr>
</tbody>
</table>

---

Order no. LHC-Z22

Viton sealing ring

O-ring 14 x 1.78

Viton or NBR

PTFE sealing ring

Hastelloy spring

Teflon

Teflon back-up ring
Process pressure transmitter
PPC-M**

**Measuring range**

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

*absolute pressure sensors

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

Vacuum resistance:
- for sensors with nominal values 0.1 bar: up to 0.7 bar$_{abs}$
- for all other sensors: up to 0 bar$_{abs}$

**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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### Technical data

#### Type code/model number

<table>
<thead>
<tr>
<th>PPC – M10</th>
</tr>
</thead>
</table>

#### Electrical output, indication

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mA ... 20 mA, SMART electronics, HART protocol</td>
<td>with display</td>
</tr>
<tr>
<td>4 mA ... 20 mA, analogue electronics with display 0 % ... 100 % bar</td>
<td>without electronics/without display</td>
</tr>
</tbody>
</table>

#### Pressure range

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 2 bar absolute pressure sensor, 200 kPa, 30 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 3 bar absolute pressure sensor, 300 kPa, 45 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 5 bar absolute pressure sensor, 500 kPa, 75 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 6 bar absolute pressure sensor, 600 kPa, 90 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 7 bar absolute pressure sensor, 700 kPa, 105 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 8 bar absolute pressure sensor, 800 kPa, 120 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 9 bar absolute pressure sensor, 900 kPa, 135 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
<tr>
<td>0 bar ... 10 bar absolute pressure sensor, 1000 kPa, 150 psig, overload quadruple</td>
<td>400 bar, 60 psi, overload quadruple</td>
</tr>
</tbody>
</table>

#### Seal, diaphragm

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1F</td>
<td>O/IA, EN 837, flush mounted diaphragm</td>
</tr>
<tr>
<td>G1G</td>
<td>O/IA, DIN ISO 228, flush mounted with O-ring, for welding nozzles (with vegetable oil only)</td>
</tr>
</tbody>
</table>

#### Process connection

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20 x 1.5 thread</td>
<td>1/2 NPT entry, IP66</td>
</tr>
<tr>
<td>M20 x 1.5 thread, metal</td>
<td>1/2 NPT entry, IP66</td>
</tr>
<tr>
<td>M20 x 1.5 thread, metal, IP68</td>
<td>1/2 NPT entry, IP68</td>
</tr>
<tr>
<td>M20 x 1.5 thread</td>
<td>1/2 NPT entry, IP66</td>
</tr>
</tbody>
</table>

#### Process pressure transmitter

**PPM**

### Process pressure transmitter

**PPC-M**

#### Certificates

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX</td>
<td>I 2G Ex ia IIC T6</td>
</tr>
<tr>
<td>E1</td>
<td>I 2G Ex ia IIC T6</td>
</tr>
<tr>
<td>E2</td>
<td>I 2G Ex ia IIC T6</td>
</tr>
<tr>
<td>CD</td>
<td>CSA, I, II, III, Div. 1, Group E-G (dust Ex), Div. 1, Group A-G</td>
</tr>
<tr>
<td>CG</td>
<td>CSA General Purpose</td>
</tr>
<tr>
<td>C1</td>
<td>CSA III (suitable for Div. 2), I, II, III, Div. 1, Group A-G</td>
</tr>
<tr>
<td>FM</td>
<td>I 2G Ex ia IIC T6</td>
</tr>
<tr>
<td>FD</td>
<td>FM DIP, I, II, III, Div. 1, Group E-G</td>
</tr>
<tr>
<td>SX</td>
<td>I 2G Ex ia IIC T6</td>
</tr>
</tbody>
</table>

#### Housing, cable entry

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66</td>
</tr>
<tr>
<td>E2</td>
<td>stainless steel housing 1.4404/316L, 1/2 NPT entry, IP66</td>
</tr>
<tr>
<td>E3</td>
<td>stainless steel housing 1.4404/316L, G1/4 entry, IP66</td>
</tr>
<tr>
<td>E4</td>
<td>stainless steel housing 1.4404/316L, Harting plug, IP66</td>
</tr>
<tr>
<td>E5</td>
<td>stainless steel housing 1.4404/316L, M12 x 1 plug, metal, IP68</td>
</tr>
<tr>
<td>E6</td>
<td>stainless steel housing 1.4404/316L, cable IP68 with atmospheric pressure compensation</td>
</tr>
<tr>
<td>A1</td>
<td>aluminium housing, M20 x 1.5 thread, IP66</td>
</tr>
<tr>
<td>A2</td>
<td>aluminium housing, 1/2 NPT entry, IP66</td>
</tr>
<tr>
<td>A3</td>
<td>aluminium housing, G1/4 entry, IP66</td>
</tr>
<tr>
<td>A4</td>
<td>aluminium housing, Harting plug, IP66</td>
</tr>
<tr>
<td>A5</td>
<td>aluminium housing, M12 x 1 plug, metal, IP68</td>
</tr>
<tr>
<td>A6</td>
<td>aluminium housing 1.4404/316L, cable IP68 with atmospheric pressure compensation</td>
</tr>
</tbody>
</table>

#### Seal, diaphragm

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>diaphragm 1.4435/316L, Viton, mineral oil</td>
</tr>
<tr>
<td>2</td>
<td>diaphragm 1.4435/316L, Viton, inert oil, oil and grease free</td>
</tr>
<tr>
<td>A</td>
<td>diaphragm 1.4435/316L, welded, mineral oil</td>
</tr>
<tr>
<td>C</td>
<td>diaphragm 1.4435/316L, welded, inert oil, max. 60 °C (333 K)/120 bar</td>
</tr>
<tr>
<td>D</td>
<td>diaphragm 1.4435/316L, welded, inert oil, oil and grease free</td>
</tr>
<tr>
<td>F</td>
<td>diaphragm 1.4435/316L, NBR, mineral oil (FDA)</td>
</tr>
<tr>
<td>H</td>
<td>diaphragm 1.4435/316L, FKM Viton, mineral oil (FDA)</td>
</tr>
<tr>
<td>P</td>
<td>diaphragm 1.4435/316L, PTFE and Hastelloy C, mineral oil</td>
</tr>
</tbody>
</table>

#### Calibration and units

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2 %, calibration in sensor limits: mbar/bar</td>
</tr>
<tr>
<td>2</td>
<td>0.2 %, calibration in sensor limits: kPa/MPa</td>
</tr>
<tr>
<td>3</td>
<td>0.2 %, calibration in sensor limits: mm/H₂O</td>
</tr>
<tr>
<td>4</td>
<td>0.2 %, calibration in sensor limits: in/H₂O</td>
</tr>
<tr>
<td>5</td>
<td>0.2 %, calibration in sensor limits: kgf/cm²</td>
</tr>
<tr>
<td>6</td>
<td>0.2 %, calibration in sensor limits: psi</td>
</tr>
</tbody>
</table>

#### Pressure range

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2A</td>
<td>0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig, overload quadruple</td>
</tr>
<tr>
<td>R2D</td>
<td>0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psig, overload quadruple</td>
</tr>
<tr>
<td>R3A</td>
<td>0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psig, overload quadruple</td>
</tr>
<tr>
<td>R3D</td>
<td>0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psig, overload quadruple</td>
</tr>
<tr>
<td>R4A</td>
<td>0 bar ... 100 bar absolute pressure sensor, 10 MPa, 1500 psig, overload quadruple</td>
</tr>
<tr>
<td>R4D</td>
<td>0 bar ... 400 bar absolute pressure sensor, 400 MPa, 6000 psig, overload 1.5-fold</td>
</tr>
<tr>
<td>N2A</td>
<td>-1 bar ... -1 bar sensor, -100 kPa, -15 psig, overload quadruple</td>
</tr>
<tr>
<td>N2D</td>
<td>-1 bar ... -4 bar sensor, -100 kPa, -15 psig, overload quadruple</td>
</tr>
<tr>
<td>N3A</td>
<td>-1 bar ... -10 bar sensor, -1 MPa, -150 psig, overload quadruple</td>
</tr>
<tr>
<td>N3D</td>
<td>-1 bar ... -40 bar sensor, -1 MPa, -600 psig, overload quadruple</td>
</tr>
<tr>
<td>A2A</td>
<td>0 bar ... 100 bar absolute pressure sensor, 1000 kPa, 15 psia, overload quadruple</td>
</tr>
<tr>
<td>A2D</td>
<td>0 bar ... 40 bar absolute pressure sensor, 400 kPa, 60 psig, overload quadruple</td>
</tr>
<tr>
<td>A3A</td>
<td>0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psia, overload quadruple</td>
</tr>
<tr>
<td>A3D</td>
<td>0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psig, overload quadruple</td>
</tr>
<tr>
<td>A4A</td>
<td>0 bar ... 100 bar absolute pressure sensor, 10 MPa, 1500 psia, overload quadruple</td>
</tr>
<tr>
<td>A4D</td>
<td>0 bar ... 400 bar absolute pressure sensor, 400 MPa, 6000 psia, overload 1.5-fold</td>
</tr>
</tbody>
</table>

#### Transmitter

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M10</td>
<td>metal sensor, piezoresistive</td>
</tr>
</tbody>
</table>
### Technical data

#### Type code/model number

| P | P | C | - | M | 2 | 0 | - | - | - | - | - |

#### Certificates
- **NA** for safe areas
- **EX** II 1/2G Ex ia IIC T6
- **E1** II 2G Ex ia IIC T6
- **E2** II 3G Ex ia IIC T6

#### Technical data

<table>
<thead>
<tr>
<th>Housing, cable entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1 stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66</td>
</tr>
<tr>
<td>E2 stainless steel housing 1.4404/316L, M20 x 1.5 thread, IP66</td>
</tr>
<tr>
<td>E3 stainless steel housing 1.4404/316L, 0 % entry, IP66</td>
</tr>
<tr>
<td>E4 stainless steel housing 1.4404/316L, Harting plug, IP65</td>
</tr>
<tr>
<td>E5 stainless steel housing 1.4404/316L, M12 x 1 plug, metal, IP68</td>
</tr>
<tr>
<td>E6 stainless steel housing 1.4404/316L, cable IP68 with atmospheric pressure compensation</td>
</tr>
<tr>
<td>A1 aluminium housing, M20 x 1.5 thread, IP66</td>
</tr>
<tr>
<td>A2 aluminium housing, ½ NPT entry, IP66</td>
</tr>
<tr>
<td>A3 aluminium housing, 0 % entry, IP66</td>
</tr>
<tr>
<td>A4 aluminium housing, Harting plug, IP65</td>
</tr>
<tr>
<td>A5 aluminium housing, M12 x 1 plug, metal, IP68</td>
</tr>
<tr>
<td>A6 aluminium housing 1.4404/316L, cable IP68 with atmospheric pressure compensation</td>
</tr>
</tbody>
</table>

#### Electrical output, indication
- **I2** 4 mA ... 20 mA, analogue electronics
- **I3** 4 mA ... 20 mA, analogue electronics with display 0 % ... 100 % bar
- **I4** 4 mA ... 20 mA, SMART electronics, HART protocol
- **IA** 4 mA ... 20 mA, SMART electronics, HART protocol with display and 0 % ... 100 % bar

#### Optional equipment
- **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

#### Steel, diaphragm
- **1** FKM Vton sensor sealing
- **2** NBR sensor sealing
- **3** EPDM sensor sealing
- **6** FKM Vton sealing, for oxygen application, grease free, to max. 60 °C (333 K)
- **7** Kalrez sensor sealing
- **A** FKM Vton sealing, o4 and grease free
- **C** Chemraz sensor sealing

#### Process connection
- **G11** G1/4B, EN 837, 1.4435/316L
- **G1C** G1/4C, EN 837
- **G14** G1/4C, 0 % internal, DIN ISO 228, 1.4435/316L
- **G1M** G1/4B, 11.4 mm (0.45 in) internal, DIN ISO 228, 1.4435/316L
- **N14** ¼ NPT external, ¼ NPT internal, ANSI, 1.4435/316L
- **N1C** ¼ NPT external, ¼ NPT internal, ANSI, Hastelloy C
- **N1M** ¼ NPT external, 11.4 mm (0.45 in) internal, ANSI, 1.4435/316L
- **J11** FF ¼ external, JIS B 0002, 1.4435/316L
- **J12** FT ¼ external, JIS B 0003, 1.4435/316L
- **M21** M20 x 1.5 external, EN 837, 1.4435/316L

#### Special version
- **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/H2O
- **4** 0.2 %, calibration in sensor limits: in/H2O
- **5** 0.2 %, calibration in sensor limits: kg/cm²
- **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 H2O, overload 40-fold
- **R1D** 0 mbar ... 400 mbar absolute pressure sensor, 40 kPa, 6 psig/160 in H2O, overload 15-fold
- **R2A** 0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig/40 in H2O, 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
- **R4A** 0 bar ... 100 mbar sensor, -10 kPa ... 10 kPa, -100 in H2O, overload 40-fold
- **R4D** 0 bar ... 400 mbar sensor, -40 kPa ... 40 kPa, -6 psig ... 6 psig, overload 15-fold
- **R5A** -1 bar ... 1 bar sensor, -100 kPa ... 100 kPa, -15 psig ... 15 psig, overload 10-fold
- **R5D** -1 bar ... 4 bar sensor, -400 kPa ... -400 kPa, -60 psig ... -60 psig, overload 6-fold
- **R6A** -1 bar ... 10 bar sensor, -1 MPa ... 1 MPa, -150 psig ... 150 psig, overload quadruple
- **R6D** -1 bar ... 40 bar sensor, -4 MPa ... -4 MPa, -600 psig ... -600 psig, overload 1.5-fold
- **A1D** 0 mbar ... 400 mbar absolute pressure sensor, 40 kPa, 6 psig, overload quadruple
- **A2A** 0 bar ... 1 bar absolute pressure sensor, 100 kPa, 15 psig, overload 10-fold
- **A2D** 0 bar ... 4 bar absolute pressure sensor, 400 kPa, 60 psig, overload 6-fold
- **A3A** 0 bar ... 10 bar absolute pressure sensor, 1 MPa, 150 psig, overload quadruple
- **A3D** 0 bar ... 40 bar absolute pressure sensor, 4 MPa, 600 psig, overload 1.5-fold

#### Transmitter
- **M20** ceramic sensor

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Date of issue: 08/02/2006 - Catalog Field Devices
<table>
<thead>
<tr>
<th>Float switches</th>
<th>Vibration limit switches</th>
<th>Conductive limit switches</th>
<th>Capacitive limit switches</th>
<th>Limit value immersion probes</th>
<th>Continuous immersion probes</th>
<th>Hydrostatic pressure sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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

![Diagram showing level probe type code](image-url)
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.
Level probe

Function

The level probe LGC is a hydrostatic pressure sensor for measuring the level. One outstanding feature of these level probes 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 long-term 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.

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

Electrical connection

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

<table>
<thead>
<tr>
<th>Application</th>
<th>Level probe LGC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Function principle</strong></td>
<td>hydrostatic level control</td>
</tr>
<tr>
<td></td>
<td>level measuring and temperature control (optional) of freshwater drinking water and wastewater</td>
</tr>
<tr>
<td><strong>Function and system design</strong></td>
<td></td>
</tr>
<tr>
<td>Measuring principle</td>
<td>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.</td>
</tr>
<tr>
<td><strong>Equipment architecture</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Input characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Measured variable</td>
<td>LGC: hydrostatic pressure of a liquid</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): temperature of a liquid</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): temperature</td>
</tr>
<tr>
<td>Measurement range</td>
<td>LGC:</td>
</tr>
<tr>
<td></td>
<td>- nine fixed pressure measuring ranges in bar, see ordering information</td>
</tr>
<tr>
<td></td>
<td>- customer-specific measuring ranges, factory-calibrated</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): temperature measurement from -10 ... 70 °C (263 ... 343 K)</td>
</tr>
<tr>
<td>Input signal</td>
<td>LGC: change in capacitance</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): change in resistance</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): Pt100 resistance signal, 4-wire</td>
</tr>
<tr>
<td><strong>Output characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Output signal</td>
<td>LGC: 4 ... 20 mA for hydrostatic pressure measured value, two-wire</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): temperature-dependent resistance of Pt100</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): 4 ... 20 mA for temperature measured value, two-wire</td>
</tr>
<tr>
<td>Load</td>
<td>LGC, Pt100 (optional):</td>
</tr>
<tr>
<td></td>
<td>( R_{\text{total}} = \frac{(U_b - 10 \text{ V})}{0.0225 \text{ A}} - 2 \times 0.09 \frac{\Omega}{\text{m} \times l} - R_{\text{add}} )</td>
</tr>
<tr>
<td></td>
<td>( R_{\text{total}} = \frac{(U_b - 8 \text{ V})}{0.025 \text{ A}} - R_{\text{add}} )</td>
</tr>
<tr>
<td></td>
<td>- ( R_{\text{add}} ) = additional resistances such as resistance of evaluating device and/or display instrument, line resistance [( \Omega )]</td>
</tr>
<tr>
<td></td>
<td>- ( U_b ) = supply voltage [V]</td>
</tr>
<tr>
<td></td>
<td>- ( l ) = simple length of extension cable [m] (cable resistance per wire ( \leq 0.09 \Omega \text{m} ))</td>
</tr>
<tr>
<td><strong>Auxiliary energy</strong></td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>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.</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>LGC: 10 ... 30 V DC, EEx nA and EEx ia: 10 ... 30 V DC</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): 10 ... 30 V DC, EEx nA: 10 ... 30 V DC</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): 8 ... 35 V DC</td>
</tr>
<tr>
<td>Connecting cable</td>
<td>LGC:</td>
</tr>
<tr>
<td></td>
<td>- commercially available instrument cable</td>
</tr>
<tr>
<td></td>
<td>- terminals, terminal housing LGC: 0.08 ... 2.5 mm²</td>
</tr>
<tr>
<td></td>
<td>- if the Pt100 signal is directly connected to a display and/or evaluation unit, we recommend the use of a shielded cable.</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional):</td>
</tr>
<tr>
<td></td>
<td>- connection transmitter: max. 1.75 mm²</td>
</tr>
<tr>
<td></td>
<td>- extension cable:</td>
</tr>
<tr>
<td></td>
<td>- total outer diameter: 8.0 mm ± 0.25 mm (0.315 in ± 0.0098 in)</td>
</tr>
<tr>
<td></td>
<td>- LGC: 3 x 0.227 mm² and pressure compensation tube with Teflon filter</td>
</tr>
<tr>
<td></td>
<td>- Pt100 (optional): 7 x 0.227 mm² and pressure compensation tube with Teflon filter</td>
</tr>
<tr>
<td></td>
<td>- pressure compensation tube with Teflon filter: outer diameter Ø2.5 mm (0.098 in), internal diameter Ø1.5 mm (0.059 in)</td>
</tr>
<tr>
<td>Power consumption</td>
<td>LGC, Pt100 (optional): ( \leq 0.675 \text{ W at 30 V DC} )</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): ( \leq 0.875 \text{ W at 35 V DC} )</td>
</tr>
<tr>
<td>Current consumption</td>
<td>LGC: max. ( \leq 22.5 \text{ mA}, \min. \leq 3.5 \text{ mA} )</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): ( \leq 0.6 \text{ mA} )</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): Pt100 via measuring system ( \leq 0.6 \text{ mA} )</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>LGC, Pt100 (optional): without influence for 4 ... 20 mA signal up to ± 5 % residual ripple within the permitted voltage range</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): ( U_{\text{pp}} \geq 5 \text{ V at } U_b \geq 13 \text{ V}, f_{\text{max}} = 1 \text{ kHz} )</td>
</tr>
<tr>
<td><strong>Performance characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Reference operating conditions</td>
<td>LGC, Pt100 (optional): acc. to DIN EN 60770, ( T_{\text{amb}} = 25 \text{ °C} )</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): calibration temperature 23 °C ± 5 K (296 K ± 5 K)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>LGC: non-linearity including hysteresis and non-repeatability as per DIN EN 60770: ± 0.2 % of upper range value (URV)</td>
</tr>
<tr>
<td></td>
<td>Pt100 (optional): max. ± 0.7 K (class B to DIN EN 60751)</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): ± 0.2 K, with Pt100: max. ± 0.9 K</td>
</tr>
<tr>
<td>Long-term drift</td>
<td>LGC, Pt100 (optional): ± 0.1 % of upper range value (URL) per year</td>
</tr>
<tr>
<td></td>
<td>temperature transmitter (optional): ± 0.1 K per year</td>
</tr>
</tbody>
</table>

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## Level probe LGC

### Technical data

| 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)  |
| 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 (0.9 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 ExEx nA IIC T6, see section load  
                               | - max. length for ExEx 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: Al2O3 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  
<pre><code>                           | 4 terminals in block, accessoies LGC-Z15 for conductor cross section 0.08 ... 2.5 mm²  |
</code></pre>
<p>| <strong>Certificates and approvals</strong> |  |</p>
<table>
<thead>
<tr>
<th>Ex approval</th>
<th>TÜV 01 ATEX 1749, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of protection</td>
<td>• II 2G Ex ia IIC T6 (TÜV 01 ATEX 1749)</td>
</tr>
<tr>
<td></td>
<td>• II 3G Ex nA II T6</td>
</tr>
<tr>
<td>Drinking water approval</td>
<td>KTW certificate and NSF approval</td>
</tr>
<tr>
<td>General information</td>
<td></td>
</tr>
<tr>
<td>Directive conformity</td>
<td></td>
</tr>
<tr>
<td>Directive 89/336/EC (EMC)</td>
<td>emitted interference to EN 61326, class B equipment</td>
</tr>
<tr>
<td></td>
<td>interference immunity to EN 61326, annex A (industrial sector)</td>
</tr>
<tr>
<td>Directive 94/9 EC (ATEX)</td>
<td>EN 50014, EN 50020, EN 50021</td>
</tr>
<tr>
<td>Conformity</td>
<td></td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>NE 21</td>
</tr>
<tr>
<td>Protection degree</td>
<td>EN 60529</td>
</tr>
<tr>
<td>Supplementary documentation</td>
<td>technical information Ti-LGC</td>
</tr>
<tr>
<td></td>
<td>operating instructions BA231O</td>
</tr>
<tr>
<td></td>
<td>operating instructions SD126O (use in the drinking water sector)</td>
</tr>
<tr>
<td></td>
<td>safety information SI131O (TÜV 01 ATEX 1749)</td>
</tr>
<tr>
<td></td>
<td>safety information SI132O (II 3G Ex nA II T6)</td>
</tr>
<tr>
<td></td>
<td>FM control drawing ZD063O</td>
</tr>
<tr>
<td></td>
<td>CSA control drawing ZD064O</td>
</tr>
<tr>
<td>Supplementary information</td>
<td>EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>.</td>
</tr>
</tbody>
</table>
Level probe LGC

Technical data

Electrical connection

Level probe LGC, standard, optional equipment N/2

Level probe LGC with Pt100, optional equipment 1/3

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

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
### Type code/model number

| L | G | C | - | - | - | - |

Length extension cable without unit

### Certificates

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>no approval</td>
</tr>
<tr>
<td>EX</td>
<td>II 2G, Ex ia IIC T6</td>
</tr>
<tr>
<td>E3</td>
<td>II 3G, Ex ia IIC T6</td>
</tr>
<tr>
<td>F1</td>
<td>FM, Cl. I, Div. 1, Group A - D, IS</td>
</tr>
<tr>
<td>C1</td>
<td>CSA, CI, I, Div. 1, Group A - D, IS</td>
</tr>
<tr>
<td>CG</td>
<td>CSA General Purpose</td>
</tr>
</tbody>
</table>

### Optional equipment

- **N**: without optional equipment
- **1**: with integrated Pt100 temperature probe (4-wires)
- **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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>XM</td>
<td>m, PE extension cable, can be cropped</td>
</tr>
<tr>
<td>2A</td>
<td>10 m (33 ft), PE extension cable, can be cropped</td>
</tr>
<tr>
<td>2C</td>
<td>20 m (66 ft), PE extension cable, can be cropped</td>
</tr>
<tr>
<td>CM</td>
<td>m, FEP extension cable, can be cropped</td>
</tr>
<tr>
<td>3A</td>
<td>10 m (33 ft), FEP extension cable, can be cropped</td>
</tr>
<tr>
<td>3C</td>
<td>20 m (66 ft), FEP extension cable, can be cropped</td>
</tr>
</tbody>
</table>

### 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
- **R1F**: 0 bar ... 0.8 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**: Ø 22 mm (0.9 in), stainless steel 1.4435/316L
- **T**: Ø 22 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 G1\(\frac{1}{2}\), 1.4301/304
- **N**: extension cable mounting screw 1\(\frac{1}{2}\) NPT, 1.4301/304
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**
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.
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.
<table>
<thead>
<tr>
<th>Application</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>device for sending and evaluating of ultrasonic pulse reflection</td>
</tr>
<tr>
<td><strong>Function and system design</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Input characteristics</strong></td>
<td>Measurement range: 0.3 ... 4 m (1 ... 13 ft), for liquids</td>
</tr>
<tr>
<td><strong>Output characteristics</strong></td>
<td>Output signal: analog output: 4 ... 20 mA, $R_L \leq 500 , \Omega$, error $\geq 21 , mA$ and voltage output: 0 ... 10 V, $R_L \geq 1 , k\Omega$, error $\geq 10.5 , V$.</td>
</tr>
<tr>
<td><strong>Auxiliary energy</strong></td>
<td>Supply voltage: 20 ... 30 V DC (3-wire), Power consumption: $\leq 1200 , mW$, Residual ripple: $\pm 10 %_{pp}$.</td>
</tr>
<tr>
<td><strong>Performance characteristics</strong></td>
<td>Resolution: 2 mm, Accuracy: 0.5 % of upper limit of measuring range</td>
</tr>
<tr>
<td><strong>Operating conditions</strong></td>
<td>Mounting conditions: Installation instructions: Choose the installation direction in such a way that the sound direction is at right angles to the liquid surface.</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td>Ambient temperature: -25 ... 70 °C (248 ... 343 K), Storage temperature: -40 ... 85 °C (233 ... 358 K).</td>
</tr>
<tr>
<td><strong>Process conditions</strong></td>
<td>Process temperature: -25 ... 70 °C (248 ... 343 K), Process pressure (static pressure): atmospheric.</td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td>Protection degree: IP65, 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.</td>
</tr>
<tr>
<td><strong>Process connection</strong></td>
<td>- cylindrical thread G1½A to DIN ISO 228/1, - conical thread 1½ NPT to ANSI B 1.20.1.</td>
</tr>
<tr>
<td><strong>Electrical connection</strong></td>
<td>V15 - connector (M12 x 1), 5 pin.</td>
</tr>
</tbody>
</table>
### Technical data

#### Ultrasonic level sensor

**LUC4**

#### Compensation

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

#### Characteristic response curve

![Characteristic response curve](image)

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

<table>
<thead>
<tr>
<th>L</th>
<th>U</th>
<th>C</th>
<th>T</th>
<th>I</th>
<th>V</th>
<th>1</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Special features: V15
- Electronic output: 4 mA ... 20 mA and 0 V ... 10 V
- Threading material: stainless steel 1.4571/316Ti
- Process connection: G½ A, DIN ISO 228/1
- PS: 1½ NPT, ANSI B 1.20.1
- Material membrane surface: TFE
- Measuring range: 0.3 m ... 4 m (1 ft ... 13.1 ft)
<table>
<thead>
<tr>
<th>Technical data</th>
<th>Ultrasonic level sensor LUC4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasonic level sensors</td>
<td>GUIDED MICROWAVE</td>
</tr>
<tr>
<td>Guided microwave</td>
<td>LEVEL SIGNAL CONDITIONING ELECTRONICS</td>
</tr>
<tr>
<td>Level control accessories</td>
<td>PRESSURIZED ENCLOSURE SYSTEM</td>
</tr>
</tbody>
</table>
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

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 ... 20mA,
- 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)

Dimensions
LUC-M20 with F12 housing and process connection 2”

Additional dimensions see section dimensions.

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

### 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 calculates:
- 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 linearisation 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

**Power consumption**
- 2-wire: 51 ... 800 mW
- 4-wire AC: max. 4 VA
- 4-wire DC: LUC-M10/LUC-M20: 330 ... 830 mW
- LUC-M30/LUC-M40: 0.8 ... 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, \( U_{pp} = 200 \text{ mV} \) (measured at 500 Ω)

**Noise**
HART: 0.5 ... 10 kHz, \( U_{rms} = 2.2 \text{ mV} \) (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)
### Ultrasonic level sensor

**LUC-M**

<table>
<thead>
<tr>
<th>Reference operating conditions</th>
<th>temperature = 20 °C (293 K)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pressure = 1013 mbar(_\text{abs})</td>
</tr>
<tr>
<td></td>
<td>humidity = 50 %</td>
</tr>
<tr>
<td>ideal reflective surface (e.g., calm, smooth fluid surface)</td>
<td>no interference reflections within signal beam</td>
</tr>
<tr>
<td>set application parameters:</td>
<td>- tank shape = flat ceiling</td>
</tr>
<tr>
<td>- medium property = liquid</td>
<td>- process conditions = calm surface</td>
</tr>
<tr>
<td>Measured value resolution</td>
<td>LUC-M10, LUC-M20: 1 mm (0.04 in)</td>
</tr>
<tr>
<td>LUC-M30, LUC-M40: 2 mm (0.08 mm)</td>
<td></td>
</tr>
<tr>
<td>Measuring frequency</td>
<td>2-wire devices: max. 0.5 Hz</td>
</tr>
<tr>
<td>4-wire devices: max. 2 Hz</td>
<td></td>
</tr>
<tr>
<td>Maximum measured error</td>
<td>typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis):</td>
</tr>
<tr>
<td>LUC-M10, LUC-M20: ± 2 mm (0.08 in) or 0.2% of set measuring range (empty calibration)(^1)</td>
<td></td>
</tr>
<tr>
<td>LUC-M30, LUC-M40: ± 4 mm (0.16 in) or 0.2% of set measuring range (empty calibration)(^1)</td>
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</tr>
<tr>
<td>(^1) whichever is greater</td>
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### Technical data

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<th>Measuring frequency</th>
<th>Operating conditions</th>
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<td>2-wire devices: max. 0.5 Hz</td>
<td>Mounting conditions</td>
</tr>
<tr>
<td>4-wire devices: max. 2 Hz</td>
<td></td>
</tr>
<tr>
<td>Maximum measured error</td>
<td>Ambient conditions</td>
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<td>(^1) whichever is greater</td>
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### Measuring frequency

- Ambient conditions
- Storage temperature
- Resistance to alternating temperature cycles
- Vibration resistance
- Process conditions
- Process temperature
- Process pressure (static pressure)

### Mechanical specifications

- Protection degree
- Mechanical construction
- Dimensions
- Mass
- Material
- Process connection
- Electrical connection
- Indication and operation

### Display elements

- LCD module VU331 at the device
Technical data

Ultrasonic level sensor
LUC-M**

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
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<th>Description</th>
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<td>(KEMA 05 ATEX 1111)</td>
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</tr>
<tr>
<td>G2 II 1/2D or II 2D or II 1/3D or II 3D T115°C or T100°C or T95°C</td>
<td>(KEMA 05 ATEX 1111)</td>
</tr>
<tr>
<td>G2 II 1/2D or II 2D or II 1/3D or II 3D T115°C or T83°C or T84°C or T86°C</td>
<td>(KEMA 05 ATEX 1112)</td>
</tr>
<tr>
<td>G2 II 3G EEEx nA II T6</td>
<td></td>
</tr>
</tbody>
</table>

General information

Directive conformity
  - EN 61010-1
- Directive 89/336/EEC (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

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 SI1760 (KEMA 05 ATEX 1111)
- safety information SI177O (KEMA 05 ATEX 1112), HART version
- safety information SI1780 (KEMA 05 ATEX 1112), PROFIBUS PA and FOUNDATION Fieldbus
- safety information SI1790 (G2 II 3G EEEx nA II T6)
- safety information SI1800 (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.
Electrical connection

**Connection IH**
4 mA ... 20 mA with HART, 2-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 AH, DH**
4 mA ... 20 mA with HART, active, 4-wire

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.
Ultrasonic level sensor
LUC-M**

Technical data

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

- Subject to reasonable modifications due to technical advances.
- Copyright Pepperl+Fuchs, Printed in Germany

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### Technical data

#### Blocking distance

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

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 $\alpha$. Make sure that equipment (1) such as limit switches, temperature sensors, etc. are not located within the emitting angle $\alpha$. In particular, symmetrical equipment (2) such as heating coils, baffles etc. can influence measurement.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>$\alpha$</th>
<th>L (m)</th>
<th>r (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUC-M10</td>
<td>11(^\circ)</td>
<td>5 m (16.4 ft)</td>
<td>0.48 m (18.9 in)</td>
</tr>
<tr>
<td>LUC-M20</td>
<td>11(^\circ)</td>
<td>8 m (26.2 ft)</td>
<td>0.77 m (30.3 in)</td>
</tr>
<tr>
<td>LUC-M30</td>
<td>6(^\circ)</td>
<td>15 m (49.2 ft)</td>
<td>0.79 m (31.1 in)</td>
</tr>
<tr>
<td>LUC-M40</td>
<td>11(^\circ)</td>
<td>10 m (32.8 ft)</td>
<td>0.98 m (37.8 in)</td>
</tr>
</tbody>
</table>

Emitting angle $\alpha$ is defined as the angle at which the emitting signal power is reduced by 3 dB.

#### 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.
### Technical data

#### Ultrasonic level sensor

**LUC-M**

### Type code/model number

#### Product structure LUC-M10

<table>
<thead>
<tr>
<th>L</th>
<th>U</th>
<th>C</th>
<th>M</th>
<th>1</th>
<th>0</th>
<th>–</th>
<th>–</th>
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<table>
<thead>
<tr>
<th>Certificate</th>
<th>NA version for non-explosion hazardous areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>EX</td>
<td>II 1/2G EEx ia IIC T6</td>
</tr>
<tr>
<td>E5</td>
<td>II 1/2D, aluminium cover</td>
</tr>
<tr>
<td>E2</td>
<td>II 1/3D</td>
</tr>
<tr>
<td>SX</td>
<td>II 1/2G EEx d (a) IC T6</td>
</tr>
<tr>
<td>S2</td>
<td>II 3G EEx nA II T6</td>
</tr>
<tr>
<td>F1</td>
<td>FM IS, Cl. III/III, Div. 1 Group A-G, N.J.CI. I, Div.2</td>
</tr>
<tr>
<td>F2</td>
<td>FM XP, Cl. III/III, Div. 1, Group A-G</td>
</tr>
<tr>
<td>C5</td>
<td>CSA, General Purpose</td>
</tr>
<tr>
<td>C1</td>
<td>CSA IS, Cl. III/III, Div. 1, Group A-O, G + coal dust, N.J.</td>
</tr>
<tr>
<td>C2</td>
<td>CSA XP, Cl. III/III, Div. 1, Group A-D, G + coal dust, N.I.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Display</th>
<th>A * prepared for remote display, order display as accessory LUC-Z40</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B without display</td>
</tr>
<tr>
<td></td>
<td>D with display VU331 inclusive on-site operation, envelope curve display</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical output</th>
<th>AH 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DH 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART</td>
</tr>
<tr>
<td></td>
<td>FF 2-wire, FOUNDATION Fieldbus</td>
</tr>
<tr>
<td></td>
<td>IH 2-wire, 4 mA ... 20 mA, HART</td>
</tr>
<tr>
<td></td>
<td>PA 2-wire, PROFIBUS PA</td>
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<table>
<thead>
<tr>
<th>Cable entry</th>
<th>2 cable gland M20 x 1.5</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>3 thread G½</td>
</tr>
<tr>
<td></td>
<td>4 thread ½ NPT</td>
</tr>
<tr>
<td></td>
<td>5 connector M12, PROFIBUS PA</td>
</tr>
<tr>
<td></td>
<td>6 connector 78&quot;, FOUNDATION Fieldbus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Housing</th>
<th>A1 aluminium housing F12, IP68, thread M20 x 1.5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A2 aluminium housing T12, IP68, coated, with separate terminal compartment</td>
</tr>
<tr>
<td></td>
<td>A4 aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection</td>
</tr>
</tbody>
</table>

### Product structure LUC-M20

<table>
<thead>
<tr>
<th>L</th>
<th>U</th>
<th>C</th>
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<th>2</th>
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### Data of issue

09/22/06 – Catalog Field Devices
Ultrasonic level sensor

**LUC-M**

### Technical data

#### Type code/model number

<table>
<thead>
<tr>
<th>L U C – M 3 0 –</th>
<th>–</th>
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<th>–</th>
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</table>

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

**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

**Process connection**
- FA universal flange DN100/ANSI 4/3/316/100, PP
- FS universal flange DN100/ANSI 4/3/316/100, 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

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<th>L U C – M 4 0 –</th>
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</thead>
</table>

**Certificate**
- NA version for non-explosion hazardous areas
- EX II 1/2D EEx ia IIC T6
- ES II 1/3D
- SX II 1/2D EEx d (ia) IIC T6
- S2 II 3G EEx nA II T6
- F1 FM IS, Cl. IIIW, Div.1 Group A-G, N.I., Cl. I, Div.2
- F2 FM XP, Cl. IIIW, Div. 1, Group A-G
- C1 CSA IS, Cl. IIIW, Div. 1, Group A-D, G + coal dust, N.I.
- C2 CSA XP, Cl. IIIW, 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
- FH 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 3/3/316/100, PP
- Q universal flange DN80/ANSI 3/3/316/100, PVDF
- S universal flange DN80/ANSI 3/3/316/100, 1.4555/316L
- T universal flange DN100/ANSI 4/4/316/100, PP
- U universal flange DN100/ANSI 4/4/316/100, PVDF
- V universal flange DN100/ANSI 4/4/316/100, 1.4555/316L
- 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*

![Type code diagram]

- **Specifications of length without unit**
- **Remote electronic**
- **Display**
- **Electrical output**
- **Housing, cable gland**
- **Certification and approvals**

- **Sealing**
- **Process connections**
- **Probe length**
- **Probe version and material**
- **Continuous**
- **Time domain reflectometry**
- **Level**
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.

Guided microwave Pulscon LTC* with coax probe

Contents

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Guided microwave

Ultrasonic

Level signal conditioning electronics

Level control accessories

Pressurised enclosure system
## Guided microwave

### 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

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<th>Probe Type</th>
<th>Dimensions</th>
<th>Accessories</th>
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<td>LTC compact rope probe</td>
<td>Ø22</td>
<td>Ø21.3</td>
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<tr>
<td>LTC compact coax probe</td>
<td>Ø42.4</td>
<td>Ø60</td>
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</table>

### 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.
## Technical data

### 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: 1 mm (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 (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, PROFINET, 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 Ex 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
### Technical data

#### Dimensions
- **housing:**
  - F12: 174 x 150 x 143 mm (6.8 x 6 x 5.6 in)
  - 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 ... 3500 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 (0.6 in) rod probe:** approx. 1600 g/m
- **coax probe:** approx. 3500 g/m
- **process connections:** depending on the design

#### Material
- **housing:** aluminium (AISi10Mg), 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**
  - \( 2G \text{ EEx } \text{ em ia } \text{ IIC T6} \)
  - \( 1/2G \text{ EEx ia IC T6 with WHG} \)
  - \( 1/2G \text{ EEx d ia IC T6} \)
  - \( 1/2G, 1/2D \text{ EEx ia IC T6} \)
  - \( 1/2G, 1/3D \text{ EEx ia IC T6} \)
  - \( 1/2G, 1/3D \text{ transparent cover, dust-Ex} \)
  - \( 1/2D \text{ aluminium cover, dust-Ex} \)
- **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**
    - 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 2-8 (test Z/AD)
  - **Vibration resistance**
    - EN 60068-2-64/IEC 68-2-64; 20 ... 2000 Hz, 1 (m/s²)²/Hz
### Guided microwave

**LTC**

**Technical data**

- Technical information T1358O
- 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 safe.

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.
**Guided microwave LTC**

### Technical data

---

**Dimensions**

#### Housing dimensions
- **Housing A**, type F12, aluminium
- **Housing T**, type T12, aluminium

#### Dimensions process connections, probes

**Option:** Distance sleeve

**Option:** Remote electronic

**Threaded connection G** 1/2 (1/2 BSP) or 1/4 NPT

**Threaded connection G** 1/2 (1/2 BSP) or 1/4 NPT

**Flange DN40 … DN200** or equivalent

**Probe rods in Alloy C22** consist of 1 piece (can not be dismantled)

**Rope probe:**
- Ø4 mm/0.16"
- Ø6 mm/0.24"
- Ø6 mm/0.24", coated PA

**Internal thread:**
- M14 on 4 mm/0.16" rope
- M20 on 6 mm/0.24" rope

**Rod probe:**
- Ø6/0.24" (on 1/4" thread)
- Ø16/0.63" (on 1/2" thread or flange)

**Coax probe:**
- Ø21,3/0.84" (on 1/2" thread)
- Ø42,4/1.67" (on 1/2" thread or flange)

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Subject to reasonable modifications due to technical advances.

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Date of issue 09/22/06 – Catalog Field Devices

## 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
Guided microwave LTC*
Technical data

Guided microwave

LTC*

Ultrasonic level sensors

Guided microwave

Corrosion monitoring

Level signal conditioning electronics

Level control accessories

Pressurised enclosure system
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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<tr>
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<th>M</th>
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```

- Insertion length
- Certificates and approvals
- Transmitter mounting
- Electrical connection
- Housing
- Probe length, process connection
- Electrical connection
- Probe mounting
- Measurement/probe material
- Process connection
- Corrosion type
- Monitoring

Corrosion
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.

Corrosion monitoring CorrTran CMC*

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### Corrosion monitoring

**CMC**

- **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.

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

### Dimensions

**CorrTran CMC with adjustable stainless steel probe**

**Function**

2-wire, 4 mA ... 20 mA transmitter, HART interface

**Electrical connection**

- 2-wire connection with HART (DC)
- 4 mA ... 20 mA with HART

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**Subject to reasonable modifications due to technical advances.**

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## Technical data

<table>
<thead>
<tr>
<th>Supply</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>9 ... 30 V DC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal voltage $U_0$</td>
<td>min. 9 V DC at max. current 2-wire (4 ... 20 mA)</td>
</tr>
<tr>
<td>Linearity</td>
<td>0.0015 % non linear</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Output rated operating current</td>
<td>high alarm: 22.5 mA, low alarm current: 3.7 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transfer characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>17 Bit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured variable</td>
<td>Corrosion, update time 7.2 min (fixed)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Auxiliary energy</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical connection</td>
<td>4 ... 20 mA with HART, 2-wire</td>
</tr>
</tbody>
</table>

| Connectable load         | max. load at 24 V DC: 680 Ω with high alarm/750 Ω without high alarm |

<table>
<thead>
<tr>
<th>Operating conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient conditions</td>
<td>-40 ... 70 °C (253 ... 343 K)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Process temperature</td>
<td>stainless steel probe:</td>
</tr>
<tr>
<td></td>
<td>- direct mounting: max. 121 °C (394 K)</td>
</tr>
<tr>
<td></td>
<td>- remote mounting: max. 260 °C (533 K)</td>
</tr>
<tr>
<td></td>
<td>epoxy glass probe: max. 65 °C (338 K)</td>
</tr>
</tbody>
</table>

| 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) |

<table>
<thead>
<tr>
<th>Mechanical specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection degree</td>
<td>IP66, NEMA 4x</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical construction</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>approx. 500 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>housing: aluminium</td>
<td></td>
</tr>
<tr>
<td>process connections:</td>
<td>stainless steel 1.4401/316 or nylon</td>
</tr>
<tr>
<td>end cap seal:</td>
<td>glass or epoxy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process connection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>stainless steel probe:</td>
<td></td>
</tr>
<tr>
<td>- conical thread ¾ NPT acc. to ANSI B 1.20.1</td>
<td></td>
</tr>
<tr>
<td>- flanges 1&quot;, 2&quot; acc. to ANSI B 16.5</td>
<td></td>
</tr>
<tr>
<td>epoxy glass probe:</td>
<td>conical nylon thread ¾ NPT acc. to ANSI B 1.20.1</td>
</tr>
</tbody>
</table>

| Electrical connection     | conical thread ¾ NPT to ANSI B 1.20.1 |

<table>
<thead>
<tr>
<th>Indication and operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating elements</td>
<td>HART electronics with HART protocol: operation via a PC with operating program</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Configuration</th>
<th>The adjustments and scaling can be done using a handheld terminal or the operating software. general corrosion rate:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- range: min. 20 mils/year, max. 400 mils/year, default 40 mils/year</td>
</tr>
<tr>
<td></td>
<td>- Zero/span adjustments available with HART.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Certificate and approvals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex approval</td>
<td>LCIE 05 ATEX 6097X, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Directive conformity</td>
<td>Directive 94/9 EC (ATEX)</td>
</tr>
<tr>
<td></td>
<td>EN 50014, EN 50020, EN 50284</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conformity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection degree</td>
<td>EN 60529</td>
</tr>
</tbody>
</table>

| 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. |
Corrosion monitoring
CMC*

Technical data

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.
Corrosion monitoring
CMC*

Technical data

Table 1: Electrode material vs. K value

<table>
<thead>
<tr>
<th>Key number electrode material</th>
<th>UNS number</th>
<th>Electrode material</th>
<th>K value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0A</td>
<td>G10180</td>
<td>1018 carbon steel</td>
<td>11597.63</td>
</tr>
<tr>
<td>0B</td>
<td>K03005</td>
<td>A53 carbon steel, class B</td>
<td>11583.07</td>
</tr>
<tr>
<td>0C</td>
<td>S30400</td>
<td>1.4301/304</td>
<td>11343.57</td>
</tr>
<tr>
<td>0D</td>
<td>S30403</td>
<td>1.4307/304L</td>
<td>11342.80</td>
</tr>
<tr>
<td>0E</td>
<td>S31600</td>
<td>1.4401/316</td>
<td>11513.39</td>
</tr>
<tr>
<td>0F</td>
<td>S31603</td>
<td>1.4404/316L</td>
<td>11519.53</td>
</tr>
<tr>
<td>0G</td>
<td>N08020</td>
<td>Carpenter 20Cb3</td>
<td>11595.52</td>
</tr>
<tr>
<td>0H</td>
<td>N04400</td>
<td>Monel 400</td>
<td>11077.87</td>
</tr>
<tr>
<td>0I</td>
<td>C71500</td>
<td>CDA 715 CuNi70/30</td>
<td>11337.36</td>
</tr>
<tr>
<td>0J</td>
<td>C11000</td>
<td>CDA 110 ETP 99.9Cu</td>
<td>11686.71</td>
</tr>
<tr>
<td>0K</td>
<td>C70600</td>
<td>CDA 706 CuNi90/10</td>
<td>11513.44</td>
</tr>
<tr>
<td>0L</td>
<td>C68700</td>
<td>CDA 867 Aluminium brass</td>
<td>12411.53</td>
</tr>
<tr>
<td>0M</td>
<td>C44300</td>
<td>CDA 443 ARS AD brass</td>
<td>12324.74</td>
</tr>
<tr>
<td>0N</td>
<td>A91100</td>
<td>Aluminium 1100</td>
<td>10940.96</td>
</tr>
<tr>
<td>0O</td>
<td>A92024</td>
<td>Aluminium 2024</td>
<td>11400.51</td>
</tr>
<tr>
<td>0P</td>
<td>R50400</td>
<td>Titan GR2</td>
<td>8644.02</td>
</tr>
<tr>
<td>0Q</td>
<td>N10276</td>
<td>Hastelloy C-276</td>
<td>11666.48</td>
</tr>
</tbody>
</table>

Other materials are available upon request.

Table 2: Probe selection

<table>
<thead>
<tr>
<th>Key number probe mounting</th>
<th>Probe type</th>
<th>Mounting</th>
<th>Process connection</th>
<th>Probe material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Standard</td>
<td>direct mounting</td>
<td>fixed</td>
<td>stainless steel</td>
</tr>
<tr>
<td>B</td>
<td>Standard</td>
<td>remote mounting</td>
<td>fixed</td>
<td>stainless steel</td>
</tr>
<tr>
<td>C</td>
<td>Standard</td>
<td>direct mounting</td>
<td>adjustable</td>
<td>stainless steel</td>
</tr>
<tr>
<td>D</td>
<td>Standard</td>
<td>remote mounting</td>
<td>adjustable</td>
<td>stainless steel</td>
</tr>
<tr>
<td>E</td>
<td>retractable*</td>
<td>remote mounting</td>
<td>adjustable</td>
<td>stainless steel</td>
</tr>
<tr>
<td>F</td>
<td>special*</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

*Please contact Pepperl+Fuchs.

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-1, 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
## Technical data

### Type code/model number

<table>
<thead>
<tr>
<th>C</th>
<th>M</th>
<th>C</th>
<th>-</th>
<th>-</th>
<th>0</th>
<th>-</th>
<th>A</th>
<th>Z</th>
<th>I</th>
<th>H</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
</table>

Insertion length** (fixed process connections only)
- in " 5'0" ... 28" in 0.2" increments
  - 050 0.0" 052 5.2"
  - 278 27.8"
- in mm, 130 mm ... 710 mm, in 5 mm increments
  - 130 130 mm
  - 135 135 mm
  - 705 705 mm
  - 710 710 mm

### Certificates
- CSA, CI, I, Div. 2, Group A-D; CI, II, III, Div. 1, Group E-G
- II 1G Ex ia IIC T4
- General Purpose

### Transmitter mounting
- 1 direct mounting
- 2 remote mounting with cable 6 ft (1.8 m)
- 3 remote mounting with cable 12 ft (3.6 m)
- 4 special mounting

### Electrical connection
- 2-wire, 4 mA ... 20 mA, HART

### Housing
- 2-wire, 4 mA ... 20 mA, HART

### Electrode material
- Aluminium housing, Nema 4x, % NPT

### Measurement/probe material
- in "
  - CB 1.4401/316
  - CF epoxy glass
  - DB 1.4401/316
  - DF epoxy glass
- in mm
  - N21 1.4401/316
  - NP3 150 lbs, 1.4401/316
  - A31 150 lbs, 1.4401/316
  - A32 150 lbs, 1.4401/316
  - A61 150 lbs, 1.4401/316
  - A62 150 lbs, 1.4401/316

### Process connection
- 1. USA ANSI B 1.20.1, 1.4401/316
- 300 lbs, 1.4401/316
- 300 lbs, 1.4401/316
- 300 lbs, 1.4401/316
- 300 lbs, 1.4401/316
- 300 lbs, 1.4401/316
- 300 lbs, 1.4401/316
- 300 lbs, 1.4401/316

### Corrosion type
- G general corrosion
- P localised corrosion (pitting)

---

* 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.
<table>
<thead>
<tr>
<th>Technical data</th>
<th>Corrosion monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CMC*</td>
</tr>
<tr>
<td>Ultrasonic</td>
<td>level sensors</td>
</tr>
<tr>
<td>Guided microwave</td>
<td>Level signal conditioning electronics</td>
</tr>
<tr>
<td>Level control accessories</td>
<td>Pressurised enclosure system</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>K</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device function</td>
<td>Number of channels</td>
<td>Special function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of power supply</td>
<td>Explosion protection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Version</td>
<td>Type of power supply</td>
<td>K-System</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Product group interface units

Ultrasonic level sensors
Guided microwave
Corrosion monitoring
Level signal conditioning electronics
Level control accessories
Pressurised enclosure system
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
Electrode relay

KFD2-ER-1.*

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.

Composition

Front view

Housing type B2

Removable terminals green

LED yellow: Relay switch output

Potentiometer Response sensitivity

LED green: Power supply

Switch S1 Open circuit current/ closed circuit current

Removable terminals green

Connection

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

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### Technical data

<table>
<thead>
<tr>
<th></th>
<th>KFD2-ER-1.5</th>
<th>KFD2-ER-1.6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Power Rail or terminals 11+, 12-</td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>20 … 30 V DC</td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
</tr>
<tr>
<td>Open-circuit voltage/short-circuit current</td>
<td>approx. 10 V AC (approx. 1 Hz)/approx. 5 mA</td>
<td>approx. 10 V AC (approx. 1 Hz)/approx. 5 mA</td>
</tr>
<tr>
<td>Control input</td>
<td>min./max. control system: terminals 1, 2, 3</td>
<td>min./max. control system: terminals 1, 3</td>
</tr>
<tr>
<td>Response sensitivity</td>
<td>1 ... 30 kΩ adjustable via potentiometer (20 turns)</td>
<td>5 ... 150 kΩ adjustable via potentiometer (20 turns)</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 7, 8, 9</td>
<td></td>
</tr>
<tr>
<td>Contact loading</td>
<td>253 V AC/2 A/cos Φ&gt; 0.7; 40 V DC/2 A resistive load</td>
<td></td>
</tr>
<tr>
<td>Energised/de-energised delay</td>
<td>approx. 1 s/approx. 1 s</td>
<td></td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V_{eff}</td>
</tr>
<tr>
<td><strong>Directive conformity</strong></td>
<td>EN 61326, EN 50081-2</td>
<td></td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation coordination</td>
<td>EN 50178</td>
<td></td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>EN 50178</td>
<td></td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>NE 21</td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 ... 60 °C (253 ... 333 K)</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>screw connection, max. 2.5 mm²</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 110 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Power Rail or pull-out latches using for screw mounting</td>
<td></td>
</tr>
<tr>
<td><strong>Indication and operation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating elements</td>
<td>switch S1</td>
<td></td>
</tr>
<tr>
<td>position I open circuit current: In the open circuit current principle, the relay becomes active when the limit is reached.</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>General information</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary information</td>
<td>Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
<td></td>
</tr>
</tbody>
</table>

### 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!**
Electrode relay

**KFA*-ER-1.***

- 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
- KFA5-ER-1.6

**230 V AC**
- KFA6-ER-1.5
- 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**

**Front view**

- Housing type B2
- Removable terminals green
- LED green: Power supply
- Switch S1: Open circuit current/ closed circuit current
- Potentiometer: Response sensitivity
- Removable terminals green
## Technical data

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

- 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.

Composition

Front view

Housing type B2
DIP switch S1
Functions see
operating elements

LED yellow:
Relais output I

LED red:
LB/SC output II

Potentiometer
Response sensitivity

Removable terminals
green

Removable terminals
green

LED green:
Power supply
Power supply

(L+) ~ (L-)

Output I

Output II

Power supply

KFD2-ER-1.W.LB only

*Resistor inevitably by activated lead breakage monitoring.
### Technical data

<table>
<thead>
<tr>
<th>KFD2-ER-1.W.LB</th>
<th>KFA5-ER-1.W.LB</th>
<th>KFA6-ER-1.W.LB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Power Rail or terminals 14+, 15-</td>
<td>terminals 14, 15</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>20 ... 30 V DC</td>
<td>103.5 ... 126 V AC, 45 ... 65 Hz</td>
</tr>
<tr>
<td>Rated current</td>
<td>30 ... 40 mA</td>
<td>12 mA</td>
</tr>
<tr>
<td>Power consumption</td>
<td>-</td>
<td>&lt; 1.2 W</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
<td></td>
</tr>
<tr>
<td>Control input</td>
<td>min./max. control system: terminals 1, 2, 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>on/off control system: terminals 1, 3</td>
<td></td>
</tr>
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<td>Response sensitivity</td>
<td>1 ... 150 kΩ adjustable via potentiometer</td>
<td></td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 7, 8, 9, 10, 11, 12</td>
<td></td>
</tr>
<tr>
<td>Switch power</td>
<td>max. 192 W, 2000 VA</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>relay</td>
<td></td>
</tr>
<tr>
<td>Contact loading</td>
<td>253 V AC/2 A/cos Φ &gt; 0.7; 40 V DC/2 A resistive load</td>
<td></td>
</tr>
<tr>
<td>Time constant for signal damping</td>
<td>0.5 s, 2 s, 5 s, 10 s</td>
<td></td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input/output</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Input/power supply</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Output/power supply</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
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<td>EN 50178</td>
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</tr>
<tr>
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<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>screw connection, max. 2.5 mm&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 150 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
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<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Power Rail or pull-out latches using for screw mounting</td>
<td>pull-out latches using for screw mounting</td>
</tr>
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<td><strong>General information</strong></td>
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<td></td>
</tr>
</tbody>
</table>
Operating elements

DIP switch function on side of device

<table>
<thead>
<tr>
<th>DIP switch S1</th>
<th>Position</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Off</td>
<td>open circuit current</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>closed circuit current</td>
</tr>
<tr>
<td>2</td>
<td>Off</td>
<td>LB deactivated</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>LB activated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIP switch 3</th>
<th>DIP switch 4</th>
<th>Time constant for signal damping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>0.5 s</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>2 s</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>5 s</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>10 s</td>
</tr>
</tbody>
</table>

- 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!
<table>
<thead>
<tr>
<th>Technical data</th>
<th>KF**-ER-1.W.LB</th>
</tr>
</thead>
</table>

**Ultrasonic level sensors**
- Guided microwave
- Corrosion monitoring

**Level signal conditioning electronics**

**Level control accessories**

**Pressurised enclosure system**

Date of issue: 09/22/06  –  Catalog Field Devices
**Electrode relay**

### 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

- Min control
- Max control
- Min/Max control

### Composition

- Front view
- Housing type B2
- DIP switch S1
- Functions see operating elements

- LED yellow: Relais output I
- LED red: LB/SC output II
- Potentiometer Response sensitivity

---

*Resistor inevitably by activated lead breakage monitoring.*
## Technical data

<table>
<thead>
<tr>
<th>Supply</th>
<th>KFD2-ER-Ex1.W.LB</th>
<th>KFA5-ER-Ex1.W.LB</th>
<th>KFA6-ER-Ex1.W.LB</th>
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</thead>
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<tr>
<td><strong>Connection</strong></td>
<td>Power Rail or terminals 14+, 15-</td>
<td>terminals 14, 15</td>
<td>terminals 14, 15</td>
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<tr>
<td><strong>Rated voltage</strong></td>
<td>20 ... 30 V DC</td>
<td>103.5 ... 126 V AC, 45 ... 65 Hz</td>
<td>207 ... 253 V AC, 45 ... 65 Hz</td>
</tr>
<tr>
<td><strong>Rated current</strong></td>
<td>30 ... 40 mA</td>
<td>12 mA</td>
<td>≤ 7 mA</td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td>-</td>
<td>&lt; 1.2 W</td>
<td>&lt; 1.2 W</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
<td>min./max. control system: terminals 1, 2, 3</td>
<td>on/off control system: terminals 1, 3</td>
</tr>
<tr>
<td><strong>Response sensitivity</strong></td>
<td>1 ... 150 kΩ, adjustable via potentiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>terminals 7, 8, 9, 10, 11, 12</td>
<td>max. 192 W, 2000 VA</td>
<td></td>
</tr>
<tr>
<td><strong>Switch power</strong></td>
<td>signal; relay</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Time constant for signal damping</strong></td>
<td>0.5 s, 2 s, 5 s, 10 s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Electrical isolation

- **Output/power supply**: basic insulation according to EN 50178, rated insulation voltage 253 V<sub>eff</sub>
- **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<sup>2</sup>
- **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

### 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
  - Group, category, type of protection: II (1) G [EEx ia] IIC [circuit(s) in zone 0/1/2]
  - **Input**: [EEx ia] IIC
  - **Voltage**: U<sub>0</sub> 10 V
  - **Current**: I<sub>0</sub> 2.5 mA
  - **Power**: P<sub>0</sub> 6 mW
  - **Supply**: Safety maximum voltage U<sub>m</sub> 40 V DC (Attention! U<sub>m</sub> is no rated voltage.)
  - **Output**: 265 V AC/150 V AC (Attention! U<sub>m</sub> is no rated voltage.)
- **Contact loading**: 253 V AC/2 A/cos Φ > 0.7; 40 V DC/2 A resistive load
- **Electrical isolation**: safe electrical isolation acc. to EN 50020, voltage peak value 375 V
- **Input/output**: safe electrical isolation acc. to EN 50020, voltage peak value 375 V
- **Directive conformity**: Directive 94/9 EC
  - **EN 50014, EN 50284**
- **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.
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...**

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Technical data

Date of issue 09/22/06 – Catalog Field Devices

Ultrasonic level sensors
Guided microwave
Corrosion monitoring
Level signal conditioning electronics
Level control accessories
Pressurised enclosure system
Electrode relay

**KF**-ER-2.W.LB

**Connection**

- 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.

**Composition**

- LED yellow: Power supply
- LED red: LB/SC channel I
- LED red: LB/SC channel II
- Potentiometer: Response sensitivity calibration
- Potentiometer: Response sensitivity calibration II
- DIP switches S1/S2
- Functions see operating elements
- Housing type B2
- Removable terminals green
- 2-channel in clips

*Resistor inevitably by activated lead breakage monitoring.
# Technical data

<table>
<thead>
<tr>
<th></th>
<th>KFD2-ER-2.WLB</th>
<th>KFA5-ER-2.WLB</th>
<th>KFA6-ER-2.WLB</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>Power Rail or terminals 14+, 15-</td>
<td>terminals 14, 15</td>
<td>terminals 14, 15</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>20 ... 30 V DC</td>
<td>103.5 ... 126 V AC, 45 ... 65 Hz</td>
<td>207 ... 253 V AC, 45 ... 65 Hz</td>
</tr>
<tr>
<td>Rated current</td>
<td>30 ... 40 mA</td>
<td>12 mA</td>
<td>≤ 7 mA</td>
</tr>
<tr>
<td>Power consumption</td>
<td>-</td>
<td>&lt; 1.2 W</td>
<td>&lt; 1.2 W</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 1 (mass), 2 (min), 3 (max)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control input</td>
<td>min./max. control system: terminals 1, 2, 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>on/off control system: terminals 1, 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response sensitivity</td>
<td>1 ... 150 kΩ, adjustable via potentiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 7, 8, 9, 10, 11, 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch power</td>
<td>max. 192 W, 2000 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>relay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact loading</td>
<td>253 V AC/2 A/Φ&gt; 0.7; 40 V DC/2 A resistive load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time constant for signal damping</td>
<td>0.5 s, 2 s, 5 s, 10 s</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electrical isolation</strong></td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
</tr>
<tr>
<td>Input/output</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
</tr>
<tr>
<td>Input/power supply</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
</tr>
<tr>
<td>Output/power supply</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V&lt;sub&gt;eff&lt;/sub&gt;</td>
</tr>
<tr>
<td><strong>Electromagnetic compatibility</strong></td>
<td>Directive 89/336/EC</td>
<td>EN 61326, EN 50081-2</td>
<td></td>
</tr>
<tr>
<td>Conformity</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>NE 21</td>
</tr>
<tr>
<td>Insulation coordination</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>NE 21</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Insulation coordination</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Electromagnetic</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Compatibility</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Protection degree</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Ambient conditions</td>
<td>EN 50178</td>
<td>EN 50178</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Temperature</td>
<td>-20 ... 60 °C (253 ... 333 K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td>IP20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>screw connection, max. 2.5 mm²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 150 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>20 x 119 x 115 mm (0.8 x 4.6 x 4.5 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Power Rail or pull-out latches using for screw mounting</td>
<td>pull-out latches using for screw mounting</td>
<td>pull-out latches using for screw mounting</td>
</tr>
<tr>
<td><strong>General information</strong></td>
<td>Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Operating elements

DIP switches function on side of device

<table>
<thead>
<tr>
<th>DIP switch S1/S2</th>
<th>Position</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1: channel 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2: channel 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Off</td>
<td>open circuit current</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>closed circuit current</td>
</tr>
<tr>
<td>2</td>
<td>Off</td>
<td>LB deactivated</td>
</tr>
<tr>
<td></td>
<td>On</td>
<td>LB activated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIP switch 3</th>
<th>DIP switch 4</th>
<th>Time constant for signal damping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>Off</td>
<td>0.5 s</td>
</tr>
<tr>
<td>Off</td>
<td>On</td>
<td>2 s</td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>5 s</td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>10 s</td>
</tr>
</tbody>
</table>

- 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!
<table>
<thead>
<tr>
<th>Technical data</th>
<th>KF**-ER-2.W.LB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of issue</td>
<td>09/22/06</td>
</tr>
<tr>
<td>– Catalog</td>
<td></td>
</tr>
<tr>
<td>Field Devices</td>
<td></td>
</tr>
</tbody>
</table>

**Ultrasonic level sensors**

**Guided microwave**

**Corrosion monitoring**

**Level signal conditioning electronics**

**Level control accessories**

**Pressurized enclosure system**
Current/voltage trip amplifier

**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.

### Composition

#### Front View

- LED yellow: Relay output 1
- LED yellow: Relay output 2
- Hysteresis adjustment for trip value 1
- Hysteresis adjustment for trip value 2
- Removable terminals green KF-STR-GN Device connectors with test sockets.

#### Connection

- Voltage supply
  - Input: 0 V ... 10 V
  - 2 V ... 10 V

- Current source
  - 0 mA ... 20 mA
  - 4 mA ... 20 mA

#### Diagram

The diagram shows the connection between the trip amplifier, input, output, and power supply, including test sockets and adjustment options.
## Technical data

### Supply

<table>
<thead>
<tr>
<th>Connection</th>
<th>Power Rail or terminals 14+, 15-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>20 ... 30 V DC</td>
</tr>
<tr>
<td>Rated current</td>
<td>75 mA</td>
</tr>
<tr>
<td>Power loss</td>
<td>1 W</td>
</tr>
<tr>
<td>Power consumption</td>
<td>2.25 W (typ. 1.68 W)</td>
</tr>
</tbody>
</table>

### 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<sub>eff</sub>
- **Input/power supply**: function isolation acc. to DIN EN 50178, rated insulation voltage 50 V<sub>eff</sub>
- **Output/power supply**: safe isolation acc. to DIN VDE 0106, rated insulation voltage 253 V<sub>eff</sub>

### Directive conformity

- **Electromagnetic compatibility**: Directive 89/336/EC
  - EN 50081-2, EN 50082-2
- **Insulation coordination**: EN 50178
- **Electrical isolation**: EN 50178
- **Electromagnetic compatibility**: NE 21
- **Protection degree**: IEC 60529

### Conformity

- **Ambient conditions**: -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

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

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.

\[ y = \left( \frac{SP - \text{lower input value}}{\text{upper input value} - \text{lower input value}} \right) \]

The limit value (LV) is calculated using the following formula:

\[ LV = \left( y \times 8 \text{ V} \right) + 2 \text{ V} \]

Example:

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

\[ y = \left( \frac{12 \text{ mA} - 4 \text{ mA}}{20 \text{ mA} - 4 \text{ mA}} \right), y = 50 \% \]

\[ LV = \left( 50 \% \times 8 \text{ V} \right) + 2 \text{ V}, LV = 6 \text{ V} \]

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 %).
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!
SMART transmitter power supply
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

![Diagrams showing the connection and composition of the SMART transmitter power supply](image-url)
## Technical data

### Supply

<table>
<thead>
<tr>
<th>Connection</th>
<th>Power Rail or terminals 14+, 15-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>20 ... 35 V DC</td>
</tr>
<tr>
<td>Ripple</td>
<td>within the supply tolerance</td>
</tr>
<tr>
<td>Power consumption</td>
<td>1.9 W</td>
</tr>
</tbody>
</table>

### Input

<table>
<thead>
<tr>
<th>Connection</th>
<th>terminals 1+, 2-, 3 or 5-, 6+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input signal</td>
<td>0/4 ... 20 mA</td>
</tr>
<tr>
<td>Input resistance</td>
<td>≤ 64 Ω terminals 2-, 3</td>
</tr>
<tr>
<td>Available voltage</td>
<td>≥ 16 V at 20 mA, terminals 1+, 3</td>
</tr>
</tbody>
</table>

### Output

<table>
<thead>
<tr>
<th>Connection</th>
<th>terminals 7-, 8+, 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>0 ... 800 Ω</td>
</tr>
<tr>
<td>Output signal</td>
<td>0/4 ... 20 mA (overload &gt; 25mA)</td>
</tr>
<tr>
<td>Ripple</td>
<td>≤ 50 µAeff</td>
</tr>
</tbody>
</table>

### Transfer characteristics

<table>
<thead>
<tr>
<th>Deviation</th>
<th>at 20 °C (293 K), 4 ... 20 mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ripple</td>
<td>≤ 20 ppm/K incl. calibration, linearity, hysteresis, loads and fluctuations of supply voltage</td>
</tr>
</tbody>
</table>

### Electrical isolation

<table>
<thead>
<tr>
<th>Input/output</th>
<th>basic insulation according to EN 50178, rated insulation voltage 253 V eff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input/power supply</td>
<td>basic insulation according to EN 50178, rated insulation voltage 253 V eff</td>
</tr>
<tr>
<td>Output/power supply</td>
<td>basic insulation acc. to EN 50178, rated insulation voltage of 50 V AC</td>
</tr>
</tbody>
</table>

### Directive conformity

<table>
<thead>
<tr>
<th>Electromagnetic compatibility</th>
<th>Directive 89/336/EC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conformity</td>
<td>EN 61326, EN 50081-2</td>
</tr>
<tr>
<td>Electrical isolation</td>
<td>EN 50178</td>
</tr>
<tr>
<td>Electromagnetic compatibility</td>
<td>NE 21</td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
</tr>
<tr>
<td>Input</td>
<td>EN 60947-5-6</td>
</tr>
</tbody>
</table>

### Ambient conditions

| 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.

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The Power Rail must not be fed via the device terminals of the individual devices!
SMART transmitter power supply

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

**Composition**

**Connection**

Input EEx ia IIC

SMART communicator

3-wire transmitter

Output

250 Ω

Front view

Housing type B2 (see system description)

Removable terminals blue

LED green: Power supply

Removable terminals green

Date of issue 09/22/06 - Catalog Field Devices

Subject to reasonable modifications due to technical advances.
### Technical data

**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<sub>rms</sub>

**Transfer characteristics**
- **Deviation**: at 20 °C (293 K), 4 ... 20 mA
- **Influence of ambient temperature**: 0.25 μA/°C
- **Frequency range**: hazardous area into the safe area: bandwidth with 0.5 V<sub>pp</sub>-signal 0 ... 7.5 kHz (-3 dB)
  safe area into the hazardous area: bandwidth with 0.5 V<sub>pp</sub>-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)
- **Protection degree**: IP20

**Mechanical specifications**
- **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**

**Supply**
- **Safety maximum voltage U<sub>m</sub>**: 250 V (Attention! The rated voltage can be lower.)

**Equipment**
- **terminals 1+, 3-**
  - **Voltage U<sub>i</sub>**: 30 V
  - **Current I<sub>i</sub>**: 115 mA
  - **Voltage U<sub>o</sub>**: 25.4 V
  - **Current I<sub>o</sub>**: 86.8 mA
  - **Power P<sub>o</sub>**: 551 mW
  - **Internal capacitance C<sub>i</sub>**: 12 nF
  - **Internal inductance L<sub>i</sub>**: 0 mH

**Equipment**
- **terminals 2-, 3**
  - **Current I<sub>o</sub>/Current I<sub>i</sub>**: 74 mA/115 mA
  - **Voltage U<sub>o</sub>**: 3.5 V
  - **Current I<sub>o</sub>**: 74 mA
  - **Power P<sub>o</sub>**: 64 mW

**Equipment**
- **terminals 1+, 2/3-**
  - **Voltage U<sub>o</sub>**: 25.4 V
  - **Current I<sub>o</sub>**: 115 mA
  - **Power P<sub>o</sub>**: 584 mW

**Equipment**
- **terminals 5-, 6+**
  - **Voltage U<sub>i</sub>**: 30 V
  - **Current I<sub>i</sub>**: 115 mA
### Technical data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (U_o)</td>
<td>8.7 V</td>
</tr>
<tr>
<td>Current (I_o)</td>
<td>0 mA</td>
</tr>
</tbody>
</table>

#### 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: 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!**
## Technical data

<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasonic level sensors</td>
<td></td>
</tr>
<tr>
<td>Guided microwave</td>
<td></td>
</tr>
<tr>
<td>Corrosion monitoring</td>
<td></td>
</tr>
<tr>
<td>Level signal conditioning</td>
<td>electronics</td>
</tr>
<tr>
<td>Level control accessories</td>
<td></td>
</tr>
<tr>
<td>Pressurised enclosure system</td>
<td></td>
</tr>
</tbody>
</table>
**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.
## Technical data

### 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
- **Directives conformity**
  - **Electromagnetic compatibility**: Directive 89/336/EC, EN 50081-2, EN 50082-2, IEC 801-6 intensity level 2
  - **Insulation coordination**: EN 50178
  - **Electromagnetic compatibility**: NE 21

### 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**: § II (1)GD [EEEx ia] IIC (-20 °C ≤ Tamb ≤ 60 °C)
- **Voltage**: U₀ = 10.4 V
- **Current**: I₀ = 31.4 mA
- **Power**: P₀ = 82 mW

### 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

The KFD2-PT2-Ex1 is available with various output options.

<table>
<thead>
<tr>
<th>Model number</th>
<th>Output</th>
<th>Model number</th>
<th>Output</th>
<th>Model number</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>KFD2-PT2-Ex1-1</td>
<td>0 V ... 5 V</td>
<td>KFD2-PT2-Ex1-2</td>
<td>2 V ... 10 V</td>
<td>KFD2-PT2-Ex1-4</td>
<td>0 mA ... 20 mA</td>
</tr>
<tr>
<td>KFD2-PT2-Ex1-1</td>
<td>0 V ... 5 V</td>
<td>KFD2-PT2-Ex1-3</td>
<td>1 V ... 5 V</td>
<td>KFD2-PT2-Ex1-5</td>
<td>4 mA ... 20 mA</td>
</tr>
</tbody>
</table>

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!
Isolated switch amplifier

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 sensors)
- Dual channel switching amplifier with 24 V/100 mA sensor supply and relay output as change-over contact

Composition

Front View

- Housing type C (see system description)
- LED green: Power
- LED yellow: Relay output I
- LED yellow: Relay output II
- Switch S2: (mode of operation input II)
- Switch S4: (sensor type input I)
- Switch S5: (sensor type input II)
- Switch S3: (dual channel or min/max)

Connection

Input I

- 1+ 2 3-

Input II

- 1+ 2 3-

Push-pull output

- 4+ 5 6-

NPN output, NC or NO

- 1+ 2 3-

PNP output, NC or NO

- 4+ 5 6-

Output I

- 7 8 9

Output II

- 10 11 12

Power supply

- 14 15

Subject to reasonable modifications due to technical advances.

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## Technical data

### Supply

<table>
<thead>
<tr>
<th>Connection</th>
<th>terminals 14, 15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>90 ... 253 V AC, 45 ... 65 Hz</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 150 mA</td>
</tr>
<tr>
<td>Power loss</td>
<td>2.5 W</td>
</tr>
<tr>
<td>Power consumption</td>
<td>≤ 7 W</td>
</tr>
</tbody>
</table>

### 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 |
| 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)

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Inputs</th>
<th>Outputs relay I and II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation of the supply voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>not activated</td>
<td>not activated</td>
<td>relay energised</td>
</tr>
<tr>
<td>activated</td>
<td>not activated</td>
<td>relay energised</td>
</tr>
<tr>
<td>activated</td>
<td>activated</td>
<td>relay de-energised</td>
</tr>
<tr>
<td>Normal operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>activated</td>
<td>transition: not activated/activated</td>
<td>relay de-energising</td>
</tr>
<tr>
<td>transition: activated/not activated</td>
<td>not activated</td>
<td>relay energising</td>
</tr>
</tbody>
</table>

Sensor connection

Function of the DIP switches

<table>
<thead>
<tr>
<th>Function</th>
<th>Switch function</th>
<th>Switch/position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating behaviour of the sensor input</td>
<td>input 1 is activated if sensor 1 is closed</td>
<td>S1/I</td>
</tr>
<tr>
<td>input 1 is activated if sensor 1 is open</td>
<td>S1/II</td>
<td></td>
</tr>
<tr>
<td>input 2 is activated if sensor 2 is closed</td>
<td>S2/I</td>
<td></td>
</tr>
<tr>
<td>input 2 is activated if sensor 2 is open</td>
<td>S2/II</td>
<td></td>
</tr>
<tr>
<td>Dual channel or min/max</td>
<td>dual channel independent</td>
<td>S3/I</td>
</tr>
<tr>
<td>min/max function with storage of the status</td>
<td>S3/II</td>
<td></td>
</tr>
<tr>
<td>Sensor type</td>
<td>input 1: push-pull output stage, NO</td>
<td>S4/I</td>
</tr>
<tr>
<td>input 1: PNP/NPN, NO</td>
<td>S4/II</td>
<td></td>
</tr>
<tr>
<td>input 2: push-pull output stage, NO</td>
<td>S5/I</td>
<td></td>
</tr>
<tr>
<td>input 2: PNP/NPN, NO</td>
<td>S5/II</td>
<td></td>
</tr>
</tbody>
</table>
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).

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).

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.
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.

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

<table>
<thead>
<tr>
<th>Ambient temperature in °C</th>
<th>Total current in mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>200</td>
</tr>
<tr>
<td>20</td>
<td>180</td>
</tr>
<tr>
<td>30</td>
<td>160</td>
</tr>
<tr>
<td>40</td>
<td>140</td>
</tr>
<tr>
<td>50</td>
<td>120</td>
</tr>
<tr>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>90</td>
<td>40</td>
</tr>
<tr>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>110</td>
<td></td>
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<tr>
<td>120</td>
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<td>140</td>
<td></td>
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<tr>
<td>150</td>
<td></td>
</tr>
<tr>
<td>160</td>
<td></td>
</tr>
<tr>
<td>170</td>
<td></td>
</tr>
<tr>
<td>180</td>
<td></td>
</tr>
<tr>
<td>190</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

Attention!
The maximum current per sensor amounts to 100 mA.

Maximum value for operation with 1 sensor

Maximum value for operation with 2 sensors
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.

Composition

Front View

Housing type B2
(see system description)

LED yellow:
Relay output

LED red:
LB/SC

LED green:
Power supply

Switch S1
(Mode of operation)

Switch S3
(LB/SC-monitoring)

Removable terminal blue

Removable terminals green
### Technical data

**Supply**

<table>
<thead>
<tr>
<th>Connection</th>
<th>Power Rail or terminals 14+, 15-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated voltage</td>
<td>20 ... 30 V DC</td>
</tr>
<tr>
<td>Ripple</td>
<td>≤ 10 %</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 30 mA</td>
</tr>
<tr>
<td>Power loss</td>
<td>0.7 W</td>
</tr>
<tr>
<td>Power consumption</td>
<td>&lt; 0.9 W</td>
</tr>
</tbody>
</table>

**Input**

<table>
<thead>
<tr>
<th>Connection</th>
<th>terminals 1+, 2+, 3-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated values</td>
<td>acc. to EN 60947-5-6 (NAMUR), see system description for electrical data</td>
</tr>
<tr>
<td>Open-circuit voltage/short-circuit current</td>
<td>approx. 8 V DC/approx. 8 mA</td>
</tr>
<tr>
<td>Switching point/switching hysteresis</td>
<td>1.2 ... 2.1 mA/approx. 0.2 mA</td>
</tr>
<tr>
<td>Pulse/Pause ratio</td>
<td>≥ 20 ms/≥ 20 ms</td>
</tr>
<tr>
<td>Lead monitoring</td>
<td>breakage I ≤ 0.1 mA, short-circuit I &gt; 6 mA</td>
</tr>
</tbody>
</table>

**Output**

<table>
<thead>
<tr>
<th>Connection</th>
<th>terminals 7, 8, 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signal; relay</td>
<td></td>
</tr>
<tr>
<td>Contact loading</td>
<td>253 V AC/2 A/cos Φ &gt; 0.7; 126.5 V AC/4 A/cos Φ &gt; 0.7; 40 V DC/2 A resistive load</td>
</tr>
<tr>
<td>Minimum switch current</td>
<td>2 mA/24 V DC</td>
</tr>
<tr>
<td>Energised/de-energised delay</td>
<td>approx. 20 ms/approx. 20 ms</td>
</tr>
<tr>
<td>Mechanical life</td>
<td>10^7 switching cycles</td>
</tr>
</tbody>
</table>

**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
- Conformity: Directive 73/23/EEC 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

- **Input**
  - Group, category, type of protection: [Ex ia IIC] [circuit(s) in zone 0/1/2]
  - 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 |

#### Statement of conformity

| 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 ia IIC] [circuit(s) in zone 0/2] |

| 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 |
Technical data

KFD2-SR2-Ex1.W

Group, category, type of protection, temperature classification
II 3G Ex nAC IIC T4 [device in zone 2]

Output
Contact loading
50 V AC/4 A/\(\cos \Phi > 0.7\); 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!
**Isolated switch amplifier**

**KFA6-SR2-Ex2.W.IR**

**Output:** relay

---

### Connection

<table>
<thead>
<tr>
<th>Input I</th>
<th>EEx ia IIC</th>
<th>Input II</th>
<th>EEx ia IIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+</td>
<td></td>
<td>4+</td>
<td></td>
</tr>
<tr>
<td>2+</td>
<td></td>
<td>5+</td>
<td></td>
</tr>
<tr>
<td>3-</td>
<td></td>
<td>6-</td>
<td></td>
</tr>
</tbody>
</table>

- **Switch S3 in position I**
- **Switch S3 in position II**

---

### Composition

**Front View**

- Removable terminals blue
- LED yellow: Relay output (I)
- LED red: LB/SC input I
- LED yellow: Relay output (II)
- LED red: LB/SC input II
- LED green: Power supply
- Switch S1 (mode of operation input I)
- Switch S2 (mode of operation input II)
- Switch S3 (LB/SC-monitoring)

---

**Application**

Two-point controller or filling level controller for minimum/maximum control

---

**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.

---

**230 V AC**

KFA6-SR2-Ex2.W.IR

---

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Pepperl+Fuchs Group • Tel.: Germany +49-621-776-0 • USA +1-330-4253555 • Singapore +65-67-799091 • Internet www.pepperl-fuchs.com
**Technical data**

### 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
- **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**: 10⁷ 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: 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/output 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

<table>
<thead>
<tr>
<th>Switch</th>
<th>Position</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1: Mode of operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input I active,</td>
<td>I</td>
<td>Input I active, whenever connected sensor damped</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>Input I active, whenever connected sensor undamped</td>
</tr>
<tr>
<td>S2: Mode of operation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input II active,</td>
<td>I</td>
<td>Input II active, whenever connected sensor damped</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>Input II active, whenever connected sensor undamped</td>
</tr>
<tr>
<td>S3: LB/SC control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LB/SC monitoring</td>
<td>I</td>
<td>LB/SC monitoring active</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>No LB/SC monitoring</td>
</tr>
</tbody>
</table>
Level control accessories

Ultrasonic level sensors
Guided microwave
Corrosion monitoring
Level signal conditioning electronics
Pressurised enclosure system
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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- Lightning protection barrier K-LB-*.30G ............................................................ 272
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Overvoltage suppressor (lightning-protection barrier)  

K-LB-*.30

Composition

Front View

Housing type Z1
(see system description)

Connection

- 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.
Technical data

<table>
<thead>
<tr>
<th></th>
<th>K-LB-1.30</th>
<th>K-LB-2.30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 7, 8; 1, 2</td>
<td>terminals 1, 2; 7, 8/3, 4; 5, 6</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>≤ 30 V</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 250 mA</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>≤ 5 µA</td>
<td>≤ 5 µA</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>≤ 45 V</td>
<td>≤ 45 V</td>
</tr>
<tr>
<td>Ground insulation</td>
<td>500 V breakdown voltage</td>
<td>500 V breakdown voltage</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 100 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)</td>
<td></td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC-Type Examination Certificate</td>
<td>PTB 00 ATEX 2176X, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
<td></td>
</tr>
<tr>
<td>Group, category, type of protection, temperature classification</td>
<td>II 2(1)G EEx ia IIC T6</td>
<td></td>
</tr>
<tr>
<td>Voltage ( U_i )</td>
<td>30 V</td>
<td></td>
</tr>
<tr>
<td>Current ( I_i )</td>
<td>250 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum leakage current</td>
<td>10 kA (8/20 µs) per core according to IEC 60-2</td>
<td></td>
</tr>
<tr>
<td>Nominal response time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symmetrical</td>
<td>1 ns</td>
<td></td>
</tr>
<tr>
<td>Asymmetric</td>
<td>100 ns</td>
<td></td>
</tr>
<tr>
<td>Series resistance</td>
<td>≤ 0.3 Ω per conductor</td>
<td></td>
</tr>
<tr>
<td>Bandwidth</td>
<td>≥ 40 kHz</td>
<td></td>
</tr>
<tr>
<td>Directive conformity</td>
<td>Directive 94/9 EC</td>
<td>EN 50014, EN 50020</td>
</tr>
</tbody>
</table>

**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**

![Example installations diagram]
Overvoltage suppressor (lightning-protection barrier)  

K-LB-*6

**Connection**

- 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.

**Composition**

Front View

Housing type Z1
(see system description)
## Technical data

### Supply

<table>
<thead>
<tr>
<th></th>
<th>K-LB-1.6</th>
<th>K-LB-2.6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection</strong></td>
<td>terminals 7, 8; 1, 2</td>
<td>terminals 1, 2; 7, 8/3, 4; 5, 6</td>
</tr>
<tr>
<td><strong>Rated voltage</strong></td>
<td>≤ 6 V</td>
<td>≤ 6 V</td>
</tr>
<tr>
<td><strong>Rated current</strong></td>
<td>≤ 250 mA</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td><strong>Leakage current</strong></td>
<td>≤ 10 µA</td>
<td>≤ 10 µA</td>
</tr>
<tr>
<td><strong>On-state voltage</strong></td>
<td>≤ 12 V</td>
<td>≤ 12 V</td>
</tr>
<tr>
<td><strong>Ground insulation</strong></td>
<td>500 V breakdown voltage</td>
<td>500 V breakdown voltage</td>
</tr>
</tbody>
</table>

### Input

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of channels</strong></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

### Conformity

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection degree</strong></td>
<td>IEC 60529</td>
</tr>
</tbody>
</table>

### Ambient conditions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas</td>
</tr>
</tbody>
</table>

### Mechanical specifications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection degree</strong></td>
<td>IP20</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>approx. 100 g</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)</td>
</tr>
</tbody>
</table>

### Data for application in conjunction with hazardous areas

<p>| | |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EC-Type Examination Certificate</strong></td>
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</tr>
<tr>
<td><strong>Group, category, type of protection, temperature classification</strong></td>
<td>¬ II 2(1)G EEx ia IIC T6</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>6 V</td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>250 mA</td>
</tr>
<tr>
<td><strong>Maximum leakage current</strong></td>
<td>10 kA (8/20 µs) per core according to IEC 60-2</td>
</tr>
<tr>
<td><strong>Nominal response time</strong></td>
<td>1 ns</td>
</tr>
<tr>
<td><strong>Asymmetric</strong></td>
<td>100 ns</td>
</tr>
<tr>
<td><strong>Series resistance</strong></td>
<td>≤ 0.3 Ω per conductor</td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>≥ 40 kHz</td>
</tr>
<tr>
<td><strong>Directive conformity</strong></td>
<td>Directive 94/9 EC</td>
</tr>
<tr>
<td></td>
<td>EN 50014, EN 50020</td>
</tr>
</tbody>
</table>

### 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

![Diagram of terminal ZH-Z USLUG 5 and equipotential bonding](image)

![Diagram of field switch room and connection to ground](image)
Overvoltage suppressor (lightning-protection barrier)  K-LB-*.30G

Connection

not protected

protected

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.

Composition

Front View

Housing type Z1
(see system description)
Technical data

<table>
<thead>
<tr>
<th></th>
<th>K-LB-1.30G</th>
<th>K-LB-2.30G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 7, 8; 1, 2</td>
<td>terminals 1, 2; 7, 8/3, 4; 5, 6</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>≤ 30 V</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 250 mA</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>≤ 5 µA</td>
<td>≤ 5 µA</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>≤ 45 V</td>
<td>≤ 45 V</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
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<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IE 60529</td>
<td></td>
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<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
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<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 100 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)</td>
<td></td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
<td>PTB 00 ATEX 2176X, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
<tr>
<td>Voltage $U_i$</td>
<td>30 V</td>
<td></td>
</tr>
<tr>
<td>Current $I_i$</td>
<td>250 mA</td>
<td></td>
</tr>
<tr>
<td>Maximum leakage current</td>
<td>10 kA (8/20 µs) per core according to IEC 60-2</td>
<td></td>
</tr>
<tr>
<td>Nominal response time</td>
<td>Symmetrical 1 ns</td>
<td>Asymmetric 100 ns</td>
</tr>
<tr>
<td>Series resistance</td>
<td>≤ 0.3 Ω per conductor</td>
<td></td>
</tr>
<tr>
<td>Bandwidth</td>
<td>≥ 40 kHz</td>
<td></td>
</tr>
<tr>
<td>Directive conformity</td>
<td>Directive 94/9 EC</td>
<td>EN 50014, EN 50020</td>
</tr>
</tbody>
</table>

**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**

[Diagram of Example installations]
Overvoltage suppressor (lightning-protection barrier) K-LB-*.6G

Connection

- 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.

Composition

Front View

Housing type Z1
(see system description)
Technical data

<table>
<thead>
<tr>
<th>K-LB-1.6G</th>
<th>K-LB-2.6G</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 7, 8; 1, 2</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>≤ 6 V</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>≤ 5 µA</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>≤ 12 V</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-30 ... 80 °C (243 ... 353 K) for applications in safe areas, -30 ... 60 °C (243 ... 333 K) for applications in hazardous areas</td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 100 g</td>
</tr>
<tr>
<td>Dimensions</td>
<td>12.5 x 114 x 110 mm (0.5 x 4.5 x 4.3 in)</td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
</tr>
<tr>
<td>EC-Type Examination Certificate</td>
<td>PTB 00 ATEX 2176X, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
<tr>
<td>Group, category, type of protection, temperature classification</td>
<td>II 2(1)G EEx ia IIC T6</td>
</tr>
<tr>
<td>Voltage U_i</td>
<td>6 V</td>
</tr>
<tr>
<td>Current I_i</td>
<td>250 mA</td>
</tr>
<tr>
<td>Maximum leakage current</td>
<td>10 kA (8/20 µs) per core according to IEC 60-2</td>
</tr>
<tr>
<td><strong>Nominal response time</strong></td>
<td></td>
</tr>
<tr>
<td>Symmetrical</td>
<td>1 ns</td>
</tr>
<tr>
<td>Asymmetric</td>
<td>100 ns</td>
</tr>
<tr>
<td>Series resistance</td>
<td>≤ 0.3 Ω per conductor</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>≥ 40 kHz</td>
</tr>
<tr>
<td>Directive conformity</td>
<td>Directive 94/9 EC</td>
</tr>
<tr>
<td></td>
<td>EN 50014, EN 50020</td>
</tr>
</tbody>
</table>

**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**

![Example installations diagram](image-url)
Overvoltage suppressor (lightning-protection barrier) F*-LB-I

- 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.

Composition

Connection

FS-LB-I
PG13.5 thread
FP-LB-I
½ NPT thread
FN-LB-I
Technical data

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: II 2G Ex ia IIC T6
- Voltage: Uᵢ: 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.

Examples:
1. Cable cross sectional area 1.0 mm²
2. Cable length 400 mm
3. FP-LB-I: PG13.5 thread
4. FS-LB-I: M20 x 1.5 thread
5. FN-LB-I: ½ NPT thread

Terminal box
- Transmitter

1. Cable cross sectional area 1.0 mm²
2. Cable length 400 mm
3. FP-LB-I: PG13.5 thread
4. FS-LB-I: M20 x 1.5 thread
5. FN-LB-I: ½ NPT thread
Overvoltage suppressor (lightning-protection barrier)  

**P-LB-*.*.A.13**

**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.

**Composition**

- 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**
## Technical data

### Signal lines

<table>
<thead>
<tr>
<th></th>
<th>P-LB-1.A.13</th>
<th>P-LB-2.A.1346</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection</strong></td>
<td>terminals 1, 3</td>
<td>terminals 1, 3, 4, 6</td>
</tr>
<tr>
<td><strong>Rated voltage</strong></td>
<td>≤ 30 V</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td><strong>Rated current</strong></td>
<td>≤ 250 mA</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td><strong>Leakage current</strong></td>
<td>≤ 5 μA</td>
<td>≤ 5 μA</td>
</tr>
<tr>
<td><strong>On-state voltage</strong></td>
<td>≤ 45 V</td>
<td>≤ 45 V</td>
</tr>
<tr>
<td><strong>Ground insulation</strong></td>
<td>≤ 500 V breakdown voltage</td>
<td>≤ 500 V breakdown voltage</td>
</tr>
</tbody>
</table>

### Input

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of channels</strong></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### Conformity

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection degree</strong></td>
<td>IEC 60529</td>
<td></td>
</tr>
</tbody>
</table>

### Ambient conditions

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>-20 ... 60 °C (253 ... 333 K)</td>
<td></td>
</tr>
</tbody>
</table>

### Mechanical specifications

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protection degree</strong></td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>approx. 0.07 g</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)</td>
<td></td>
</tr>
</tbody>
</table>

### Data for application in conjunction with hazardous areas

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EC-Type Examination Certificate</strong></td>
<td>PTB 02 ATEX 2044, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
<td></td>
</tr>
<tr>
<td><strong>Group, category, type of protection</strong></td>
<td>II (1)G [EEx ia] IIC</td>
<td></td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>U_o</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td><strong>Current</strong></td>
<td>I_i</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td><strong>Power</strong></td>
<td>P_o</td>
<td>≤ 1.3 W</td>
</tr>
<tr>
<td><strong>Maximum leakage current</strong></td>
<td>10 kA (8/20 μs) per conductor</td>
<td></td>
</tr>
<tr>
<td><strong>Nominal response time</strong></td>
<td>Symmetrical 1 ns</td>
<td>Asymmetrical 100 ns</td>
</tr>
<tr>
<td><strong>Series resistor</strong></td>
<td>≤ 0.5 Ω per wire</td>
<td></td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>≥ 40 kHz</td>
<td></td>
</tr>
<tr>
<td><strong>Declaration of conformity</strong></td>
<td>Pepperl+Fuchs</td>
<td></td>
</tr>
<tr>
<td><strong>Group, category, type of protection, temperature classification</strong></td>
<td>II 3G EEx nA II T6</td>
<td></td>
</tr>
<tr>
<td><strong>Directive conformity</strong></td>
<td>Directive 94/9 EC</td>
<td>EN 50014, EN 50020, EN 50021</td>
</tr>
</tbody>
</table>

### 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.
Keep the drilling distance of 116 mm between center mounting rail and center grounding bar.
Overvoltage suppressor (lightning-protection barrier) **P-LB-*.B.12**

**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-*.B.12 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.

**Composition**

- 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**

![Connection diagram](connection.png)

Connection to busbar

Terminal blue

Connection to earth

![Diagram dimensions](dimensions.png)

- 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)
### Technical data

<table>
<thead>
<tr>
<th>Signal lines</th>
<th>P-LB-1.B.12</th>
<th>P-LB-2.B.1245</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>terminals 1, 2</td>
<td>terminals 1, 2; 4, 5</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>≤ 30 V</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 250 mA</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>≤ 5 µA</td>
<td>≤ 5 µA</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>≤ 45 V</td>
<td>≤ 45 V</td>
</tr>
<tr>
<td>Ground insulation</td>
<td>≤ 500 V breakdown voltage</td>
<td>≤ 500 V breakdown voltage</td>
</tr>
</tbody>
</table>

### 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 | 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

| Group, category, type of protection, temperature classification | Pepperl+Fuchs 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.
### 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.

![Diagram](image)

**Diagram Notes**
- Mounting block ZH-Z.AB/SS
- Busbar ZH-Z.NLS-CU3/10
- Spacing roller ZH-Z.AR.75 or 125
- Connector ZH-Z.AK16

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Overvoltage suppressor (lightning-protection barrier)

P-LB-*.*.123***

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.

Composition

- 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

Connection
### Technical data

<table>
<thead>
<tr>
<th></th>
<th>P-LB-1.C.123</th>
<th>P-LB-2.D.123456</th>
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</thead>
<tbody>
<tr>
<td><strong>Signal lines</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 1, 2, 3</td>
<td>terminals 1, 2, 3, 4, 5, 6</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>≤ 30 V</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 250 mA</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>≤ 5 µA</td>
<td>≤ 5 µA</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>≤ 45 V</td>
<td>≤ 45 V</td>
</tr>
<tr>
<td>Ground insulation</td>
<td>≤ 500 V breakdown voltage</td>
<td>≤ 500 V breakdown voltage</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-30 ... 60 °C (243 ... 333 K)</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 70 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)</td>
<td></td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
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</tr>
<tr>
<td>EC-Type Examination Certificate</td>
<td>PTB 02 ATEX 2044, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
<td></td>
</tr>
<tr>
<td>Group, category, type of protection</td>
<td>II (1)G [EEx ia] IIC</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>U_o ≤ 30 V</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>I_i ≤ 250 mA</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>P_o ≤ 1.3 W</td>
<td></td>
</tr>
<tr>
<td>Maximum leakage current</td>
<td>10 kA (8/20 µs) per conductor</td>
<td></td>
</tr>
<tr>
<td>Nominal response time</td>
<td>1 ns</td>
<td></td>
</tr>
<tr>
<td>Symmetrical</td>
<td>1 ns</td>
<td></td>
</tr>
<tr>
<td>Asymmetric</td>
<td>100 ns</td>
<td></td>
</tr>
<tr>
<td>Series resistor</td>
<td>≤ 0.5 Ω per wire</td>
<td></td>
</tr>
<tr>
<td>Bandwidth</td>
<td>≥ 40 kHz</td>
<td></td>
</tr>
<tr>
<td>Declaration of conformity</td>
<td>Pepperl+Fuchs</td>
<td></td>
</tr>
<tr>
<td>Group, category, type of protection, temperature classification</td>
<td>II 3G EEx nA II T6</td>
<td></td>
</tr>
<tr>
<td>Directive conformity</td>
<td>Directive 94/9 EC</td>
<td>EN 50014, EN 50020, EN 50021</td>
</tr>
</tbody>
</table>

### 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.
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.
Overvoltage suppressor (lightning-protection barrier)  

P-LB-*.23**

**Connection**

- 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-*.23** 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.

**Composition**

- Connection to earth
- Terminal blue
## Technical data

<table>
<thead>
<tr>
<th>P-LB-1.E.23</th>
<th>P-LB-2.C.2356</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Signal lines</strong></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>terminals 2, 3</td>
</tr>
<tr>
<td>Rated voltage</td>
<td>≤ 30 V</td>
</tr>
<tr>
<td>Rated current</td>
<td>≤ 250 mA</td>
</tr>
<tr>
<td>Leakage current</td>
<td>≤ 5 µA</td>
</tr>
<tr>
<td>On-state voltage</td>
<td>≤ 45 V</td>
</tr>
<tr>
<td>Ground insulation</td>
<td>≤ 500 V breakdown voltage</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
</tr>
<tr>
<td>Number of channels</td>
<td>1</td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-30 ... 60 °C (243 ... 333 K)</td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP20</td>
</tr>
<tr>
<td>Mass</td>
<td>approx. 70 g</td>
</tr>
<tr>
<td>Dimensions</td>
<td>20 x 62 x 115 mm (0.8 x 2.4 x 4.5 in)</td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
</tr>
<tr>
<td>EC-Type Examination Certificate</td>
<td>PTB 02 ATEX 2044, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
</tr>
<tr>
<td>Group, category, type of protection</td>
<td>II (1)G [EEx ia] IIC</td>
</tr>
<tr>
<td>Voltage</td>
<td>U₀ ≤ 30 V</td>
</tr>
<tr>
<td>Current</td>
<td>I₁ ≤ 250 mA</td>
</tr>
<tr>
<td>Power</td>
<td>P₀ ≤ 1.3 W</td>
</tr>
<tr>
<td>Maximum leakage current</td>
<td>10 kA (8/20 µs) per conductor</td>
</tr>
<tr>
<td>Nominal response time</td>
<td>Symmetrical 1 ns</td>
</tr>
<tr>
<td></td>
<td>Asymmetric 100 ns</td>
</tr>
<tr>
<td></td>
<td>Series resistor ≤ 0.5 Ω per wire</td>
</tr>
<tr>
<td></td>
<td>Bandwidth ≥ 40 kHz</td>
</tr>
<tr>
<td>Declaration of conformity</td>
<td>Pepperl+Fuchs</td>
</tr>
<tr>
<td>Group, category, type of protection, temperature classification</td>
<td>II 3G EEx nA II T6</td>
</tr>
<tr>
<td><strong>Directive conformity</strong></td>
<td>Directive 94/9 EC</td>
</tr>
</tbody>
</table>

## 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.
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.
Overvoltage suppressor (lightning-protection barrier)

- 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.

**Composition**

Connection to busbar

Terminal blue

Connection to earth

**Connection**

---

*Note: The image contains diagrams and technical specifications related to the overvoltage suppressor (lightning-protection barrier).*
Technical data

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 | II (1)G [EEx ia] IIC |
Voltage | U₀ ≤ 30 V |
Current | I₀ ≤ 250 mA |
Power | P₀ ≤ 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 | II 3G EEx nA II T6 |
Directive conformity | Directive 94/9 EC |
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.
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.
Technical data

Pressurised enclosure system  Level control accessories  Level signal conditioning electronics  Corrosion monitoring  Guided microwave  Ultrasonic level sensors
## Technical data

<table>
<thead>
<tr>
<th>Feature</th>
<th>DA5-IU-2K-C</th>
<th>DA5-IU-2K-V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-selection</td>
<td>2-fold</td>
<td></td>
</tr>
<tr>
<td>Data storage</td>
<td>10^6 storage cycles or 10 years, EEPROM</td>
<td></td>
</tr>
<tr>
<td>Programming</td>
<td>keypad-driven menu</td>
<td></td>
</tr>
<tr>
<td>UL File Number</td>
<td>E225084</td>
<td></td>
</tr>
<tr>
<td><strong>Indicators/operating means</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>7-segment LED display, red</td>
<td></td>
</tr>
<tr>
<td>Number of decades</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Display value</td>
<td>digit height 14.2 mm</td>
<td></td>
</tr>
<tr>
<td>Pre-selection</td>
<td>digit height 14.2 mm</td>
<td></td>
</tr>
<tr>
<td>Key interlock</td>
<td>with “high”-level at terminal “KEY”</td>
<td></td>
</tr>
<tr>
<td>Display interval</td>
<td>-19999 ... 99999</td>
<td></td>
</tr>
<tr>
<td>Decimal point</td>
<td>freely adjustable</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>14 Bit</td>
<td></td>
</tr>
<tr>
<td>Scale factor</td>
<td>via characteristic curve with up to 24 value pairs</td>
<td></td>
</tr>
<tr>
<td>Reset</td>
<td>manually or external</td>
<td></td>
</tr>
<tr>
<td><strong>Electrical specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating voltage</td>
<td>10 ... 30 V DC</td>
<td>90 ... 260 V AC</td>
</tr>
<tr>
<td>Power consumption P_o</td>
<td>2 W</td>
<td>7 VA</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impedance</td>
<td>&gt; 1 MΩ for voltage measurement</td>
<td>&lt; 50 Ω for current measurement</td>
</tr>
<tr>
<td>Analogue voltage input</td>
<td>0 ... 10 V/2 ... 10 V DC, -10 ... 10 V DC</td>
<td></td>
</tr>
<tr>
<td>Analogue current input</td>
<td>0 ... 20 mA/4 ... 20 mA</td>
<td></td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay</td>
<td>2 x 250 V AC/300 V DC, 3 A, changeover contact</td>
<td>2 x 250 V AC/300 V DC, 3 A, changeover contact</td>
</tr>
<tr>
<td>Sensor supply</td>
<td>-</td>
<td>24 V DC, 100 mA</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-10 ... 50 °C (263 ... 323 K)</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-25 ... 70 °C (248 ... 343 K)</td>
<td></td>
</tr>
<tr>
<td>Relative humidity</td>
<td>≤ 80 % (non-condensing)</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>8-pin and 11 pin connectors with plug-in screw terminals</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>220 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>96 mm x 48 mm x 90 mm</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>mounting frame with latch fastener</td>
<td></td>
</tr>
</tbody>
</table>

## 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

## 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
**Process control and indication equipment**

**Dimensions**

![Control panel cutout diagram]

**Electrical connection**

**Connector S1/...**
- Ammeter input S1/1
- Reference earth S1/2
- Voltmeter input S1/3
- Key lock-out “Key” S1/6
- Reference earth for reset S1/7
- Reset S1/8

**Connector S2/...**
- OUT 1 S2/3
- Relay 2 S2/4
- OUT 2 S2/5
- Relay 1 S2/6
- S2/1
- S2/2
- S2/7
- S2/8

- 90 ... 260 V AC supply (...-V)
- 10 ... 30 V DC  0 V DC (...-C)
- +24 V DC, 0 V DC
- Auxiliary power output (only on DA5-IU-2K-V)
- 45+0.6
- 92+0.8
- 44.9x91.9
- 67.1 6.5
- max. 19

---

**Notes:**
- Subject to reasonable modifications due to technical advances.
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**Page:** 299
**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

**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**

**Dimensions**

- Single fixing hole Ø22.5 mm ± 0.2 mm
- Drilling pattern
  - Ø30
  - 15
  - 42
- Optional legend plate LED-Ex1.NAME PLATE

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Date of issue 09/22/06  –  Catalog Field  Devices
### Technical data

<table>
<thead>
<tr>
<th>Supply</th>
<th></th>
<th>LED cluster lamp LED-Ex1.*</th>
</tr>
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<tbody>
<tr>
<td>Rated voltage</td>
<td>14 ... 30 V DC</td>
<td></td>
</tr>
<tr>
<td>Rated current</td>
<td>18 ... 22 mA</td>
<td></td>
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<table>
<thead>
<tr>
<th>Output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical life</td>
<td>$10^5$ h</td>
<td></td>
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<table>
<thead>
<tr>
<th>Directive conformity</th>
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</thead>
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<thead>
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<th>Conformity</th>
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<th></th>
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<tr>
<td>Electromagnetic compatibility</td>
<td>NE 21</td>
<td></td>
</tr>
<tr>
<td>Ambient conditions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 ... 60 °C (253 ... 333 K)</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 ... 85 °C (233 ... 358 K)</td>
<td></td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 ... 95 %, non-condensing</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Mechanical specifications</th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection degree</td>
<td>IP65 (front), IP20 (rear)</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>screw terminals for 1.5 mm²</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>housing: polyamid 6.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>lens: polycarbonate</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>18 g</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>Ø30 x 57 mm (1.2 x 2.2 in)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical construction</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Versions</td>
<td>LED-Ex1.A: yellow LED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LED-Ex1.B: blue LED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LED-Ex1.G: green LED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LED-Ex1.R: red LED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LED-Ex1.W: white LED</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data for application in conjunction with hazardous areas</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EC-Type Examination Certificate</td>
<td>BSA 01 ATEX 1062 X (firm BEKA)</td>
<td></td>
</tr>
<tr>
<td>Group, category, type of protection</td>
<td>II 1G Ex ia IIC T4 [circuit(s) in zone 0/1/2]</td>
<td></td>
</tr>
<tr>
<td>Voltage $U_o$</td>
<td>30 V DC</td>
<td></td>
</tr>
<tr>
<td>Power $P_o$</td>
<td>max. 1.3 W, see also section installation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Installation</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>One or two LED-Ex1.* lamps may be powered by any certified Zener barrier or solenoid driver with output parameters within the following limits:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• voltage $U_o$: 30 V DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• power $P_o$: 1.3 W at 40 °C (313 K); 1.2 W at 60 °C (333 K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• gas groups IIA, IIB or IIC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• e. g. 28 V, 300 Ω with a Zener barrier (Typ Z 728) or a solenoid driver (KFD2-SD-Ex1,**, KFD2-SL2-Ex*.*)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>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:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• voltage $U_o$: 30 V DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• power $P_o$: 1.3 W at 40 °C (313 K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• gas groups IIA or IIB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Accessories</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Legend plate LED-Ex1.NAME PLATE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pressurised enclosure system acc. to EN 50016

Ultrasonic level sensors
Guided microwave
Corrosion monitoring
Level signal conditioning electronics
Level control accessories
Pressurised enclosure system

Subject to reasonable modifications due to technical advances.
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Pressurised enclosure system acc. to EN 50016

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.

Control unit FA6-PCU300A-Ex.O14

Contents

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Selection table .......................................................... 305
Control unit F**-PCU300A-Ex.O** .................................. 306
Solenoid valves FU*PV32*-Ex ........................................... 309
Operation panel FD0-T301A-Ex.* .................................... 310
Back-up fuses PCU-F-Ex.****MA ...................................... 311
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:**
Selection table

The following types of purging and operation can be achieved with the components supplied by Pepperl+Fuchs:

<table>
<thead>
<tr>
<th>Purging with a digital valve</th>
<th>Purging with a proportional valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>After purging with a large nozzle cross-section the valve closes. A mechanically adjustable bypass guarantees the minimum pressure necessary for operation.</td>
<td>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.</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>PCU 300A orifice meter Ø [mm]</th>
<th>Purge gas volumetric flow [litres/hour] at solenoid valve</th>
<th>Digital valve nozzles Ø [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 1100 1350 1560 1750 1908 2063 2203</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
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

### 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

---

**Ultrasonic level sensors**

**Guided microwave**

**Corrosion monitoring**

**Level signal conditioning electronics**

**Level control accessories**

**Pressurised enclosure system**
### Pressure control unit

<table>
<thead>
<tr>
<th>Model</th>
<th>FD2-PCU300A-Ex.O**</th>
<th>FA5-PCU300A-Ex.O**</th>
<th>FA6-PCU300A-Ex.O**</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated voltage</td>
<td>24 V DC</td>
<td>115 V AC, 48 ... 62 Hz</td>
<td>230 V AC, 48 ... 62 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>approx. 2.5 VA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conformity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IEC 60529</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Input characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement range</td>
<td>pressure measurement range 0 ... 18 mbar</td>
<td>volumetric flow measurement range depends on the orifice size</td>
<td></td>
</tr>
<tr>
<td><strong>Operating conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting conditions</td>
<td>inside or outside the enclosure</td>
<td>Back-up fuse for solenoid valve in the control unit must be ordered separately (see selection table in data sheet PCU-F-Ex.****MA).</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>-20 ... 45 °C (253 ... 318 K) at T6</td>
<td>-20 ... 60 °C (253 ... 333 K) at T4</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP65 (without consideration of the air outlet opening)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>aluminium, lacquer-coated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>220 x 120 x 90 mm (8.7 x 4.7 x 3.5 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC-Type Examination Certificate</td>
<td>DMT 00 ATEX E 004 X, for additional certificates see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group, category, type of protection</td>
<td>(\text{II} 2\text{G} \text{EEx em [ib] [p]} \text{IIC T6} (-20 °C} \leq \text{T}_{\text{amb}} \leq 45 °C))</td>
<td>(\text{II} 2\text{G} \text{EEx em [ib] [p]} \text{IIC T4} (-20 °C} \leq \text{T}_{\text{amb}} \leq 60 °C))</td>
<td>(\text{II} 2\text{D Ex tD [ibD] [pD]} \text{IP65 T70°C} (-20 °C} \leq \text{T}_{\text{amb}} \leq 60 °C))</td>
</tr>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety maximum voltage (U_m)</td>
<td>253 V (Attention! (U_m) is no rated voltage.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact loading</td>
<td>250 V AC/5 A/cos (\phi &gt; 0.7/30 V DC/5 A/150 W)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Directive conformity</strong></td>
<td></td>
<td></td>
<td>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</td>
</tr>
<tr>
<td><strong>General information</strong></td>
<td></td>
<td></td>
<td>Supplementary information EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>.</td>
</tr>
</tbody>
</table>

### Mounting example

**External mounting**

![Mounting example diagram](image_url)
Pressure control unit
F**-PCU300A-Ex.O**

**Technical data**

**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)
- 6 mm .......... 6 0.15  
- 10 mm .......... 10 0.35  
- 14 mm (preferred type) .......... 14 0.85  
- 18 mm .......... 18 1.25  

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.

---

Subject to reasonable modifications due to technical advances. Copyright Pepperl+Fuchs, Printed in Germany
**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.

---

**Technical data**

<table>
<thead>
<tr>
<th></th>
<th>FU2-PV32*-Ex</th>
<th>FU5-PV32*-Ex</th>
<th>FU6-PV32*-Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated voltage</td>
<td>24 V DC</td>
<td>115 V AC</td>
<td>230 V AC</td>
</tr>
<tr>
<td><strong>Operating conditions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process pressure (static pressure)</td>
<td>F**-PV321-Ex: 0 ... 7 bar</td>
<td>F**-PV322-Ex: 0 ... 3.5 bar</td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical specifications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection degree</td>
<td>IP65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td>cable, length 3 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>56 x 80 x 105 mm (2.2 x 3.1 x 4.1 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data for application in conjunction with hazardous areas</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC-Type Examination Certificate</td>
<td>PTB 00 ATEX 2202 X (firm Bürkert)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group, category, type of protection</td>
<td>II 2G EEx m II T4 or T6</td>
<td>II 2G EEx em II T4 or T6</td>
<td></td>
</tr>
<tr>
<td>Directive conformity</td>
<td>Directive 94/9 EC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directive 50014, EN 50019, EN 50028</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General information</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplementary information</td>
<td>EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a>.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Type code/model number**

<table>
<thead>
<tr>
<th>Proportional valve</th>
<th>F ** PV32 * -Ex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating voltage</td>
<td>230 V AC.........U 6</td>
</tr>
<tr>
<td></td>
<td>115 V AC.........U 5</td>
</tr>
<tr>
<td></td>
<td>24 V DC..........U 2</td>
</tr>
<tr>
<td>Enclosure volume</td>
<td>&lt; 300 ltr. (NW 4)</td>
</tr>
<tr>
<td></td>
<td>&gt; 300 ltr. (NW 6)</td>
</tr>
</tbody>
</table>

* for use with orifice 18 mm
FD0-T301A-Ex.*

Operation panel

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.

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
- II 2G EEx ib IIC T6 (Tamb ≤ 40 °C)
- II 2D Ex ibD T80°C (Tamb ≤ 40 °C)

Supply
Safety maximum voltage $U_{\text{m}}$
253 V (Attention! $U_{\text{m}}$ is no rated voltage.)

Output
Contact loading
250 V AC/5 A/cos $\Phi$ > 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
Back-up fuse for solenoid valves

Technical data

Type code/model number

<table>
<thead>
<tr>
<th>Type code/model number</th>
<th>Back-up fuse for solenoid valves</th>
<th>PCU-F-Ex.****MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>DV</td>
<td>PV</td>
</tr>
<tr>
<td>80 mA</td>
<td>230 V</td>
<td></td>
</tr>
<tr>
<td>100 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160 mA</td>
<td>115 V</td>
<td></td>
</tr>
<tr>
<td>200 mA</td>
<td>230 V</td>
<td></td>
</tr>
<tr>
<td>315 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>400 mA</td>
<td>115 V</td>
<td></td>
</tr>
<tr>
<td>630 mA</td>
<td>24 V</td>
<td></td>
</tr>
<tr>
<td>1000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600 mA</td>
<td>24 V</td>
<td></td>
</tr>
<tr>
<td>2000 mA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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
### Contents

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<th></th>
<th>Page</th>
</tr>
</thead>
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<td>314</td>
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<tr>
<td>Explosion protection through intrinsic safety</td>
<td>315</td>
</tr>
<tr>
<td>SIL classification acc. to IEC/EN 61508</td>
<td>318</td>
</tr>
<tr>
<td>Application sheet corrosion monitoring CorrTran</td>
<td>320</td>
</tr>
<tr>
<td>Glossary</td>
<td>322</td>
</tr>
<tr>
<td>List of types</td>
<td>336</td>
</tr>
</tbody>
</table>
### Housing protection class

### Protection provided by housings
(DIN VDE 0470 part 1, IEC 60529)

#### IP67

<table>
<thead>
<tr>
<th>Protection against contact and foreign bodies</th>
<th>Degree of protection against water</th>
</tr>
</thead>
<tbody>
<tr>
<td>0    Not protected</td>
<td>0 Not protected</td>
</tr>
<tr>
<td>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</td>
<td>1 Protected against dripping water</td>
</tr>
<tr>
<td>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</td>
<td>2 Protected against dripping water, when housing is tilted up to 15°</td>
</tr>
<tr>
<td>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</td>
<td>3 Protected against sprayed water</td>
</tr>
<tr>
<td>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</td>
<td>4 Protected against splash water</td>
</tr>
<tr>
<td>4K   Protected against splash water with increased pressure</td>
<td></td>
</tr>
<tr>
<td>5    Protection from dust Protected against contact with hazardous components with a wire</td>
<td>5 Protected against water jets</td>
</tr>
<tr>
<td>6    Dust tight Protected against contact with hazardous components with a wire</td>
<td>6 Protected against strong water jets with increased pressure</td>
</tr>
<tr>
<td>6K   Protected against strong water jets</td>
<td></td>
</tr>
<tr>
<td>7    Protected against temporary submersion in water</td>
<td></td>
</tr>
<tr>
<td>8    Protected against continuous submersion in water</td>
<td></td>
</tr>
<tr>
<td>9K   Protected against water on high pressure cleaning or vapour stream cleaning</td>
<td></td>
</tr>
</tbody>
</table>

#### 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)
Introduction to explosion protection through intrinsic safety

When introducing electrical equipment in a hazardous area, extensive regulations must be observed that are subdivided into Europe (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:

<table>
<thead>
<tr>
<th>Intrinsically safe apparatus and cable</th>
<th>Demonstration of intrinsic safety</th>
<th>Associated apparatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>U_i</td>
<td>≥</td>
<td>U_o</td>
</tr>
<tr>
<td>I_i</td>
<td>≥</td>
<td>I_o</td>
</tr>
<tr>
<td>P_i</td>
<td>≥</td>
<td>P_o</td>
</tr>
<tr>
<td>L_i + L_c</td>
<td>≤</td>
<td>L_o</td>
</tr>
<tr>
<td>C_i + C_c</td>
<td>≤</td>
<td>C_o</td>
</tr>
</tbody>
</table>

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 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>
<thead>
<tr>
<th>Classification of hazards</th>
<th>European Union</th>
<th>North America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive mixture in</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Group I:</strong> mines susceptible to</td>
<td></td>
<td>Class I: Gases and vapours</td>
</tr>
<tr>
<td>firedamp</td>
<td></td>
<td><strong>Class II:</strong> Dusts</td>
</tr>
<tr>
<td><strong>Group II:</strong> other areas outside</td>
<td></td>
<td><strong>Class III:</strong> Fibres</td>
</tr>
<tr>
<td>of mines</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Ignition due to sparks             |                                                      |                                                    |
| Grouping of the ignition protection|                                                      | Sub-division of the class according to ignition    |
| methods of intrinsic safety/flame  |                                                      | energy:                                           |
| proof enclosure, as well as        |                                                      | **Class I Group A Acetylene                       |
| ignition protection method “u”,     |                                                      | **B Hydrogen                                       |
| in respect of the minimum ignition  |                                                      | **C Ethylene                                      |
| current/limit gap and in accordance|                                                      | **D Methane                                        |
| with the minimum ignition energy of |                                                      | **E Metal dusts                                     |
| representative gases:              |                                                      | **F Coal dusts                                     |
| **Group I** Methane                 |                                                      | **G Grain dusts                                    |
| **Group IIA** Propane               |                                                      |                                                  |
| **IIB** Ethylene                    |                                                      |                                                  |
| **IIC** Hydrogen, Acetylene         |                                                      |                                                  |

| Sub-division of the class according |                                                      |                                                    |
| to ignition energy:                 |                                                      |                                                    |
| **CLASS I** Group A Acetylene       |                                                      |                                                    |
| **CLASS II** Group E Metal dusts     |                                                      |                                                    |
| **CLASS III**                      |                                                      |                                                    |

| Ignition hazards due to hot         |                                                      |                                                    |
| surfaces                           |                                                      |                                                    |
| 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 |                                                      |                                                    |

| Division of hazardous areas         |                                                      |                                                    |
| The following are subdivided        |                                                      |                                                    |
| according to the probability of the |                                                      |                                                    |
| occurrence of a dangerous           |                                                      |                                                    |
| explosive atmosphere:               |                                                      |                                                    |
| 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                            |                                                      |                                                    |
| **Zone 21** occasionally              |                                                      |                                                    |
| **Zone 22** short term or accumulation|                                                      |                                                    |
| or layers of dust                     |                                                      |                                                    |

| Safety characteristics              |                                                      |                                                    |
| The characteristics of flammable    |                                                      |                                                    |
| gases and vapours as a basis for     |                                                      |                                                    |
| classification in respect of         |                                                      |                                                    |
| ignition energy and temperature/flashpoint are contained in: |                                                      |                                                    |
| DIN EN 50014: 1997 appendix A        |                                                      |                                                    |
| BS 5345, part 1                      |                                                      |                                                    |
| NFPA 497 M                            |                                                      |                                                    |
| CSA No. C22-1                         |                                                      |                                                    |

| Approval authorities (named locations |                                                      |                                                    |
| with Directive 94/9/EC)              |                                                      |                                                    |
| PTB                                 |                                                      |                                                    |
| DMT (old)                           |                                                      |                                                    |
| EXAM (new)                          |                                                      |                                                    |
| BASEEFA                             |                                                      |                                                    |
| TÜV                                 |                                                      |                                                    |
| and others                           |                                                      |                                                    |
| TÜV Nord Cert GmbH & Co. KG          |                                                      |                                                    |
| TÜV Nord Cert GmbH & Co. KG          |                                                      |                                                    |
| and others                           |                                                      |                                                    |

| Installation requirements           |                                                      |                                                    |
| 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     |                                                      |                                                    |
| NFPA 70                              |                                                      |                                                    |
| NFPA 70                              |                                                      |                                                    |
| NFPA 493                             |                                                      |                                                    |
| National Electrical Code Art. 500    |                                                      |                                                    |
| National Electrical Code Art. 505    |                                                      |                                                    |
| Standard for Intrinsically safe     |                                                      |                                                    |
| operations ...                       |                                                      |                                                    |
Explosion protection through intrinsic safety
### Interface modules

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# SIL classification acc. to IEC/EN 61508

## Field devices

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# Application sheet corrosion monitoring CorrTran

Submitted by: ___________________________ Date: ___________________________

Company: ___________________________ Application number: ___________________________

Contact name: ___________________________ Address: ___________________________

City, State zip: ___________________________ Telephone: ___________________________

Fax: ___________________________ 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  
- ANSI 1”  
- ANSI 2”

Probe material:  
- 1.4401/316  
- Epoxy glass  
- Kalrez  
- Epoxy

Material end cap seal:  
- Glass (standard)  
- 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: ___________________________  
Method: ___________________________

Alarm Config: ___________________________  
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”
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.

- **Extended cable for remote mounting**
  - Length 6 ft or 12 ft

- **Adjustable epoxy glass probe and electrode**
  - Ø0.75” (19)
  - 2.36” (60)

- **Adjustable stainless steel probe and electrode**
  - Ø0.75” (19)
  - 2.36” (60)

- **Fixed stainless steel probe and electrode**
  - Ø0.75” (19)
  - 2.36” (60)

- **Stainless steel probe with fixed flange**
  - Ø0.75” (19)
  - 2.36” (60)

**Dimensions**
- **Transmitter housing (side view)**
  - 3.8” (95)
- **Transmitter housing (top view)**
  - 3.8” (95)

**Thread for direct mounting only**

**Thickness acc. to ANSI B 16.5 standard**
Glossary

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 \( \varepsilon_r \): 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: \( \rightarrow \) 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: \( = 2.4617 = \text{NiMo28} \)

 Hastelloy C: \( = 2.4610 = \text{NiMo16Cr16Ti} \)

Hydrostatic level measurement: determination of the fill height via the liquid pressure; conditions: constant density

Hypalon: \( \rightarrow \) CSM

I

Initiator: \( \rightarrow \) proximity switch

K

Kalrez: Perfluorelastomer (sealing material)

L

Level measurement: \( \rightarrow \) 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.
Glossary

**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:** polyvinylidenefluoride, 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:** fluorocauoutchouc (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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<td>Pepperl+Fuchs AB</td>
<td>+46-303-246070</td>
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Anguilla
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Telephone +1-787-752-2370
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