

# Pressure Transmitter LHCR-51, LHCS-51

## Hydrostatic Level Measurement

### Pressure transmitter with hydrostatic measuring cell, Condensate-resistant



#### Application

The device is used for the following measuring tasks:

- Hydrostatic pressure measurement in liquids and paste-like media in all areas of process engineering, process measuring technology, pharmaceuticals and the food industry
- Level, volume or mass measurements in liquids

#### Your benefits

- Very good reproducibility and long-term stability
- Maximum plant safety provided by one-of-a-kind, condensate-proofed hydrostatic measuring cell
- High reference accuracy:  $\pm 0.2\%$ , optionally  $\pm 0.1\%$
- Turn down 100:1
- Standardized platform for differential pressure, hydrostatics, and pressure
- Simple, fast commissioning through a user interface designed for real-world applications
- Used for process pressure monitoring up to SIL2, certified to IEC 61508 Edition 2.0 and IEC 61511 by TÜV NORD
- Usage in drinking water: KTW, NSF

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<b>Document Information</b> .....	<b>5</b>	<b>Installation</b> .....	<b>24</b>
Symbols Used .....	5	General Installation Instructions .....	24
Terms and Abbreviations .....	7	Supplementary Installation Instructions .....	24
<b>Function and System Design</b> .....	<b>8</b>	Wall and Pipe Mounting .....	25
Device Selection .....	8	"Separate Housing" Version .....	25
Measuring Principle .....	9	Oxygen Applications .....	26
Level Measurement in closed Tanks with Pressure Overlay .....	10	PWIS Cleaning .....	26
Density Measurement .....	11	Applications with Hydrogen .....	26
Level Measurement with Automatic Density Correction (with Media Changing in the Tank) .....	11	Special Measuring Cells for Acids, Alkalis or Sea Water .....	26
Electrical Differential Pressure Measurement with Gauge Pressure Sensors .....	12	<b>Environment</b> .....	<b>27</b>
Communication Protocol .....	12	Ambient Temperature Range .....	27
<b>Input</b> .....	<b>13</b>	Storage Temperature Range .....	27
Measured Variable .....	13	Climate Class .....	27
Measuring Range .....	13	Degree of Protection .....	27
<b>Output</b> .....	<b>14</b>	Vibration Resistance .....	27
Output Signal .....	14	Electromagnetic Compatibility .....	27
Signal Range 4 mA to 20 mA HART .....	14	<b>Process</b> .....	<b>28</b>
Signal on Alarm .....	14	Process Temperature Range .....	28
Load 4 mA to 20 mA HART .....	14	Lateral Load LHCR-51 (static) .....	28
Dead Time, Time Constant .....	14	Pressure Specifications .....	28
Dynamic Behavior: Current Output .....	15	<b>Mechanical Construction</b> .....	<b>29</b>
Dynamic Behavior: HART .....	15	Device Height .....	29
Dynamic Behavior: PROFIBUS PA .....	15	F31 Aluminum Housing Dimensions .....	29
Damping .....	15	F15 Stainless Steel Housing Dimensions (hygienic) .....	29
Firmware Version .....	15	Process Connections Threaded Connection .....	30
Galvanic Isolation .....	15	Process Connections EN/DIN Flanges .....	31
Protocol-specific Data .....	16	Process Connections ASME Flanges .....	32
<b>Power Supply</b> .....	<b>17</b>	Process Connections LHCR-51 (Rod Version) .....	33
Terminal Assignment .....	17	Process Connections LHCS-51 (Cable Version) .....	35
Supply Voltage .....	18	Wall and Pipe Mounting with "Separate Housing" Version .....	37
Current Consumption .....	18	Materials not in Contact with Process .....	40
Electrical Connection .....	18	Materials in Contact with Process .....	43
Terminals .....	18	<b>Operability</b> .....	<b>45</b>
Cable Entry .....	18	Operating Concept .....	45
Connector .....	19	Onsite Operation .....	45
Cable Specification .....	20	Operating Languages .....	46
Start-up Current HART .....	20	Remote Operation .....	47
Residual Ripple .....	20	Hardware and Software for Onsite and Remote Operation .....	47
Influence of Power Supply .....	20	System Integration .....	47
Overvoltage Protection (optional) .....	21	<b>Certificates and Approvals</b> .....	<b>48</b>
<b>Performance Characteristics</b> .....	<b>22</b>	CE Mark .....	48
Reference Operating Conditions .....	22	Ex Approvals .....	48
Influence of Orientation .....	22	Functional Safety SIL .....	48
Calibration Position .....	22	Overfill Protection .....	48
Resolution .....	22	Pressure Equipment Directive (PED) .....	48
Reference Accuracy .....	22	Marine Approval .....	48
Thermal Change in the Zero Output and the Output Span .....	23	Other Standards and Guidelines .....	48
Total Performance .....	23	Drinking Water Approval .....	48
Long-term Stability .....	23	Classification of Process .....	48
Total Error .....	23		
Warm-up Period .....	23		

<b>Ordering Information</b> .....	<b>49</b>	<b>Supplementary Documentation</b> .....	<b>58</b>
<b>Configuration Data Sheet</b> .....	<b>55</b>	Technical Information .....	58
Level .....	55	Operating Instructions .....	58
Pressure .....	56	Brief Operating Instructions .....	58
<b>Accessories</b> .....	<b>57</b>	Functional Safety Manual (SIL) .....	58
M12 connector .....	57	Safety Instructions .....	58
Mounting Bracket for Wall and Pipe Mounting .....	57	Installation/Control Drawings .....	58
Welding Necks and Weld-in Tool Flanges .....	57	Overfill Protection .....	58
		<b>Registered Trademarks</b> .....	<b>59</b>
		HART® .....	59
		PROFIBUS® .....	59






## Document Information

### Symbols Used






### Safety symbols

Symbol	Meaning
 P0011189-EN	<b>DANGER!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 P0011190-EN	<b>WARNING!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 P0011191-EN	<b>CAUTION!</b> This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 P0011192-EN	<b>NOTE!</b> This symbol contains information on procedures and other facts which do not result in personal injury.





### Electrical symbols

Symbol	Meaning
 P0011197	<b>Direct current</b> A terminal to which DC voltage is applied or through which direct current flows.
 P0011198	<b>Alternating current</b> A terminal to which alternating voltage (sine-wave) is applied or through which alternating current flows.
 P0011200	<b>Ground connection</b> A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system.
 P0011199	<b>Protective ground connection</b> A terminal which must be connected to ground prior to establishing any other connections.
 P0011201	<b>Equipotential connection</b> A connection that has to be connected to the plant grounding system: This may be a potential equalization line or a star grounding system depending on national or company codes of practice



### Tool symbols

Symbol	Meaning
 P0013442	Phillips head screwdriver
 P0011220	Flat-blade screwdriver
 P0011219	Phillips head screwdriver
 P0011221	Allen screw
 P0011222	Hexagon wrench

### Symbols for certain types of information

Symbol	Meaning
 P0011182	<b>Allowed</b> Indicates procedures, processes or actions that are allowed.
 P0011183	<b>Preferred</b> Indicates procedures, processes or actions that are preferred.
 P0011184	<b>Forbidden</b> Indicates procedures, processes or actions that are forbidden.
 P0011193	<b>Tip</b> Indicates additional information.

### Symbols in graphics

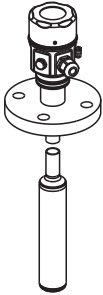
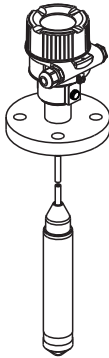
Symbol	Meaning
1, 2, 3, ...	Numbering for main items
1., 2., 3. ...	Series of steps
A, B, C, ...	Views
A-A, B-B, C-C, ...	Sections
 P0011187	<b>Hazardous area</b> Indicates a hazardous area.
 P0011188	<b>Safe area (non-hazardous area)</b> Indicates a non-hazardous location.

Terms and Abbreviations

Symbol	Explanation
MWP	The MWP (maximum working pressure) for the measuring device depends on the lowest-rated element, with regard to pressure, of the selected components, i. e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure-temperature dependence also. For the relevant standards and additional notes, see page 28.
OPL	The OPL (over pressure limit = sensor overload limit) for the sensor depends on the lowest-rated element, with regard to pressure, of the selected components, i.e. the process connection has to be taken into consideration in addition to the measuring cell. Pay attention to the pressure-temperature dependence also. For the relevant standards and additional notes, see page 28.
LRL	Lower range limit
URL	Upper range limit
LRV	Lower range value
URV	Upper range value
TD	Turn down
<p><b>Case 1:</b></p> <ul style="list-style-type: none"> <li>• <math>  \text{Lower range value (LRV)}   \leq   \text{Upper range value (URV)}  </math></li> </ul> <p>Example:</p> <ul style="list-style-type: none"> <li>• Lower range value (LRV) = 0 mbar</li> <li>• Upper range value (URV) = 40 mbar (0.6 psi)</li> <li>• Nominal value (URL) = 400 mbar (6 psi)</li> </ul> <p>Turn down:</p> <ul style="list-style-type: none"> <li>• <math>\text{TD} = \text{URL} /  \text{URV}  = 10:1</math></li> </ul> <p>Set span:</p> <ul style="list-style-type: none"> <li>• <math>\text{URV} - \text{LRV} = 40 \text{ mbar (0.6 psi)}</math></li> </ul> <p>This span is based on the zero point.</p>	<p>Example: 400 mbar (6 psi) measuring cell</p>
<p><b>Case 2:</b></p> <ul style="list-style-type: none"> <li>• <math>  \text{Lower range value (LRV)}   \geq   \text{Upper range value (URV)}  </math></li> </ul> <p>Example:</p> <ul style="list-style-type: none"> <li>• Lower range value (LRV) = -200 mbar (3 psi)</li> <li>• Upper range value (URV) = 0 bar</li> <li>• Nominal value (URL) = 400 mbar (6 psi)</li> </ul> <p>Turn down:</p> <ul style="list-style-type: none"> <li>• <math>\text{TD} = \text{URL} /  \text{URV}  = 2:1</math></li> </ul> <p>Set span:</p> <ul style="list-style-type: none"> <li>• <math>\text{URV} - \text{LRV} = 200 \text{ mbar (3 psi)}</math></li> </ul> <p>This span is based on the zero point.</p>	<p>Example: 400 mbar (6 psi) measuring cell</p> <ol style="list-style-type: none"> <li>1 Set span</li> <li>2 Span based on zero point</li> <li>3 Nominal value <math>\hat{=}</math> upper range limit (URL)</li> <li>4 Nominal measuring range</li> <li>5 Sensor measuring range</li> </ol>

## Function and System Design

### Device Selection

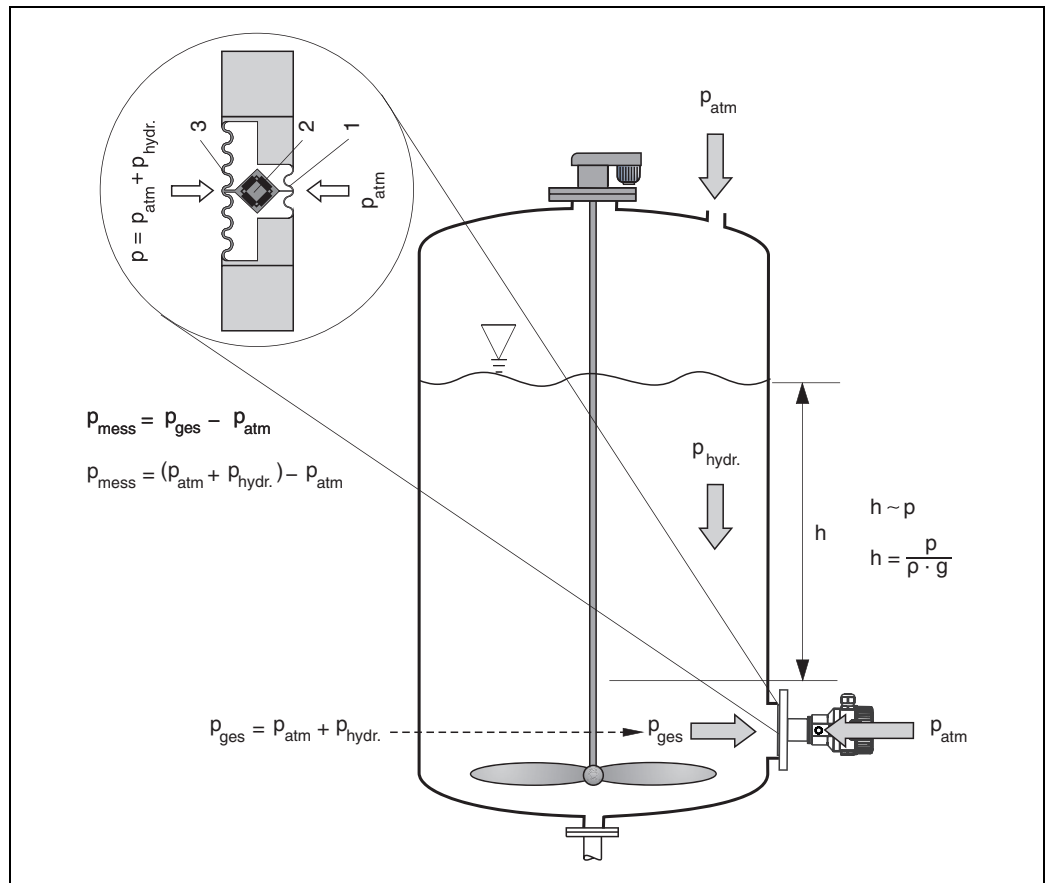
	LHCR-51  <b>Rod version</b>	LHCS-51  <b>Cable version</b>
Field of application	<ul style="list-style-type: none"> <li>• Level measurement</li> <li>• Pressure measurement</li> </ul>	
Industries	Food, pharmaceuticals, chemicals	
Process connections	<ul style="list-style-type: none"> <li>• Thread</li> <li>• Flanges</li> </ul>	
Measuring ranges	from -0.1 bar to +0.1 bar (-1.5 psi to +1.5 psi) to -1 bar to +10 bar (-15 psi to 150 psi)	
OPL	Max. 40 bar (600 psi)	
Process temperature range	-10 °C to +85 °C (+14 °F to +185 °F)	With PE cable: -10 °C to +70 °C (+14 °F to +158 °F) With FEP cable: -10 °C to +80 °C (+14 °F to +176 °F)
Ambient temperature range	<ul style="list-style-type: none"> <li>• Without LCD display: -40 °C to +85 °C (-40 °F to +185 °F)</li> <li>• With LCD display: -20 °C to +70 °C (-4 °F to +158 °F) (extended temperature application range (-40 °C to +85 °C (-40 °F to +185 °F)) with restrictions in optical properties such as display speed and contrast)</li> <li>• Separate housing: -20 °C to +60 °C (-4 °F to +140 °F)</li> </ul>	
Reference accuracy	0.2 % (option 0.1 %) depends on the measuring range, see page 22	
Supply voltage	<ul style="list-style-type: none"> <li>• 11.5 V DC to 45 V DC (versions with plug-in connection 35 V DC)</li> <li>• For intrinsically safe device versions: 11.5 V DC to 30 V DC</li> </ul>	
Output	4 mA to 20 mA with superimposed HART protocol or PROFIBUS PA	
Options	<ul style="list-style-type: none"> <li>• Gold/rhodium-coated process isolating diaphragm</li> <li>• 3.1 inspection certificate</li> <li>• Specific firmware versions</li> <li>• Initial device settings can be ordered</li> <li>• Separate housing</li> </ul>	
Specialties	<ul style="list-style-type: none"> <li>• Absolute resistance to condensate thanks to hermetically sealed hydrostatic cell</li> <li>• Maximum flexibility thanks to modular design</li> <li>• Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops</li> </ul>	

### Universal application

- Modular probe program to ensure optimum process adaptation
- Rod and cable extension: installation from above, i. e. easy to retrofit ground tanks, no additional opening in the tank floor



### Measuring Principle



Hydrostatic level measurement and measuring principle

- 1 Rear isolating membrane of the hydrostatic measuring cell
- 2 Measuring element
- 3 Process isolating diaphragm
- g Gravitational acceleration
- h Level height
- $p_{\text{ges}}$  Total pressure = hydrostatic pressure + atmospheric pressure
- $p_{\text{atm}}$  Atmospheric pressure
- $p_{\text{hydr.}}$  Hydrostatic pressure
- $p_{\text{mess}}$  Measured pressure in the measuring cell = hydrostatic pressure
- $\rho$  Density of the medium

Due to its weight, a liquid column creates hydrostatic pressure. If the density is constant, the hydrostatic pressure depends solely on the height  $h$  of the liquid column.

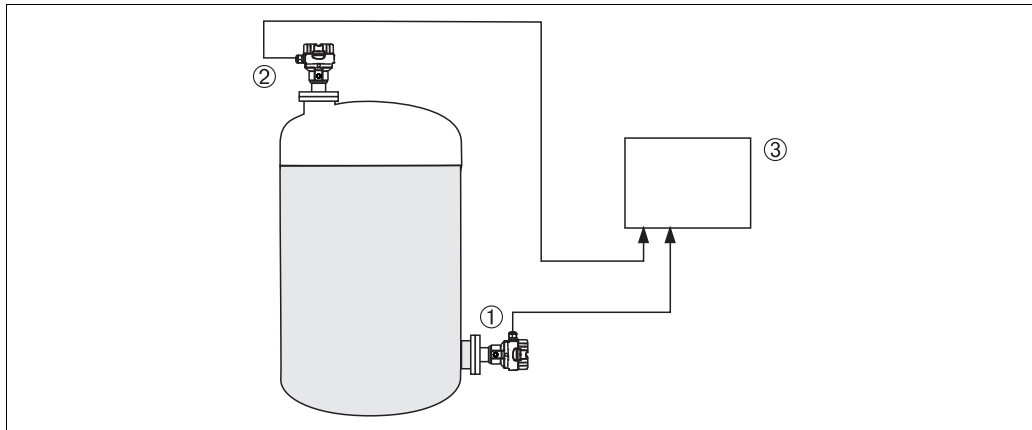
The hydrostatic measuring cell, which works on the principle of the gauge pressure sensor, constitutes the core of the pressure transmitter. In contrast to conventional gauge pressure sensors, the precision measuring element (2) in the hydrostatic measuring cell is absolutely protected, situated between the process isolating diaphragm (3) and the rear isolating membrane (1). Thanks to this hermetic sealing of the measuring element, the hydrostatic measuring cell is absolutely insensitive to condensate/condensation and aggressive gases. The pressure applied is transferred from the process isolating diaphragm to the measuring element by means of an oil without any loss in pressure.

The electronics can compensate any measuring errors resulting from fluctuations in temperature with these measured temperature values.

A linearization function with max. 32 points, based on a table entered either manually or semi-automatically, can be activated locally or remotely. This function facilitates measurement in engineering units, and provides a linear output signal for spherical and horizontal cylindrical tanks, and vessels with a conical outlet.

### Level Measurement in closed Tanks with Pressure Overlay

You can determine the differential pressure in tanks with pressure overlay using two pressure transmitters. The pressure measured values of the two probes are sent to a signal processing unit such as Pepperl+Fuchs RMA or a PLC. The signal processing unit or PLC determines the difference in pressure and uses this to calculate the level and the density where necessary.



Level measurement in a closed tank with pressure overlay

- 1 Probe 1 measures the total pressure (hydrostatic pressure and top pressure)
- 2 Probe 2 measures the top pressure
- 3 Signal processing unit determines the difference in pressure and uses this to calculate the level

#### NOTICE

##### Measured errors can occur.

Large measured errors can occur if the ratio of the level to the top pressure is  $> 1:6$ . This does not affect reproducibility.

- When selecting the pressure transmitter probes, make sure you select measuring ranges that are sufficiently wide (→ see example).

##### Example:

- Max. hydrostatic pressure = 600 mbar (9 psi)
- Max. top pressure (probe 2) = 300 mbar (4.5 psi)
- Max. total pressure, measured with probe 1 = 300 mbar (4.5 psi) + 600 mbar (9 psi) = 900 mbar (13.5 psi)
  - Measuring cell to be selected: 0 to 1200 mbar (0 to 18 psi)
- Max. pressure, measured with probe 2: 300 mbar (4.5 psi)
  - Measuring cell to be selected: 0 mbar to 400 mbar (0 to 6 psi)

#### NOTICE

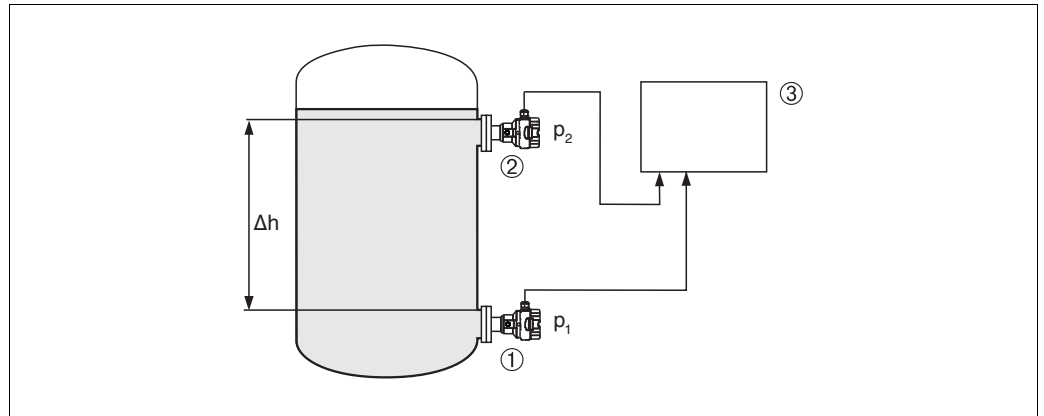
##### Possibility of probe 2 flooding during differential pressure measurement.

Measured errors can occur.

- When installing, make sure that probe 2 cannot be flooded.

### Density Measurement

You can measure the density in tanks with pressure overlay using two pressure transmitters and a signal processing unit or a PLC. The signal processing unit or the PLC calculates the density from the known distance  $\Delta h$  between the two probes and the two measured values  $p_1$  and  $p_2$ .

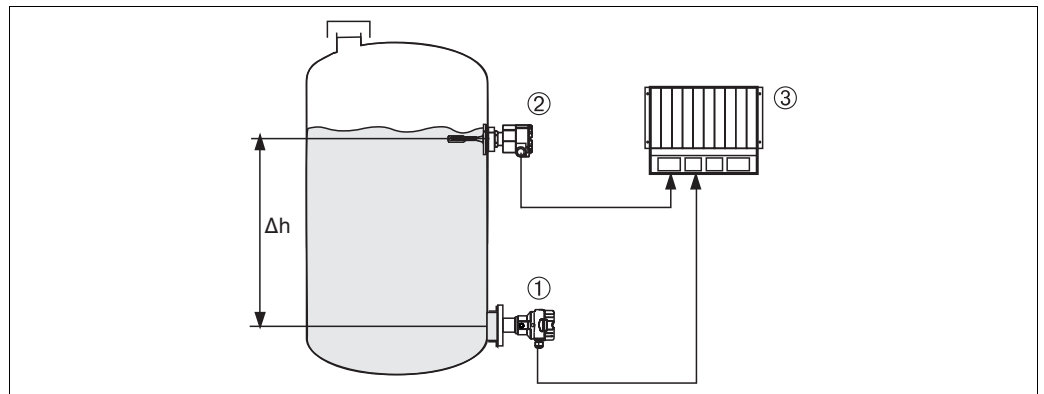


Level measurement in a closed tank with pressure overlay

- 1 Pressure transmitter determines pressure measured value  $p_1$
- 2 Pressure transmitter determines pressure measured value  $p_2$
- 3 Signal processing unit determines the density from the two measured values  $p_1$  and  $p_2$  and the distance  $\Delta h$

### Level Measurement with Automatic Density Correction (with Media Changing in the Tank)

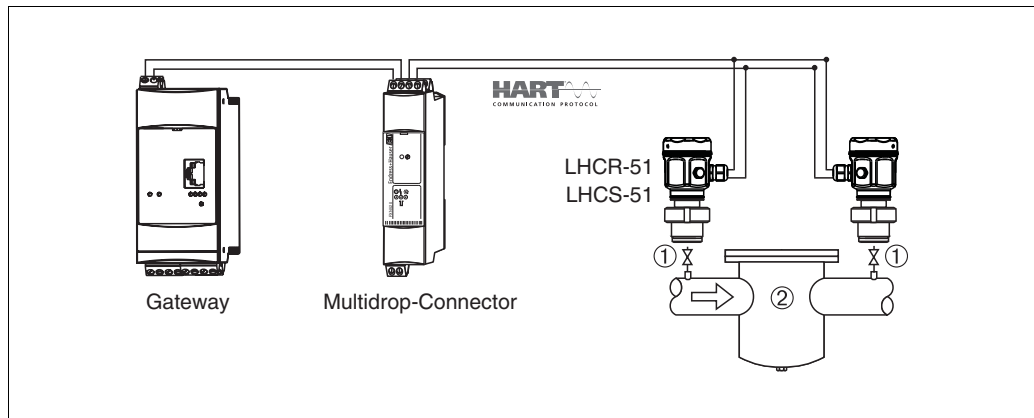
Level measurement with automatic density correction is possible in conjunction with a limit switch and a PLC. The limit switch always switches at the same level. In the switch point, the signal processing unit determines the corrected density from the pressure of the pressure transmitter currently measured and the known distance between the pressure transmitter and the limit switch. The signal processing unit then calculates the level from the new density and the measured pressure of the pressure transmitter.



Level measurement with automatic density correction

- 1 Pressure transmitter
- 2 Vibration limit switch
- 3 PLC

### Electrical Differential Pressure Measurement with Gauge Pressure Sensors



- 1 Shut-off valves  
2 e. g. filter

In the example given, two pressure transmitters (each with a gauge pressure sensor) are interconnected. The pressure difference can thus be measured using two independent pressure transmitters.



**WARNING** If using intrinsically safe devices, strict compliance with the rules for interconnecting intrinsically safe circuits as stipulated in IEC 60079-14 (proof of intrinsic safety) is mandatory.

### Communication Protocol

- 4 mA to 20 mA with HART communication protocol
- PROFIBUS PA
  - The Pepperl+Fuchs devices meet the requirements of the FISCO model.
  - Due to the low current consumption of  $11 \text{ mA} \pm 1 \text{ mA}$ , the following number of devices can be operated on one bus segment if installing as per FISCO:
    - up to 8 pressure transmitters for Ex ia, CSA IS and FM IS applications
    - up to 31 pressure transmitters for all other applications, e. g. in non-hazardous areas, Ex nA, etc.

Further information on PROFIBUS PA can be found in the PNO Guideline.

## Input

**Measured Variable** Hydrostatic pressure

### Measuring Range

Nominal value	Range limit		Smallest calibratable span (preset at the factory) <sup>1</sup>	MWP	OPL	Vacuum resistance <sup>2</sup>  Synthetic oil/ Inert oil [bar (psi)]	Option <sup>3</sup>
	lower (LRL) <sup>4</sup>	upper (URL)					
[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	[bar (psi)]	
0.1 (1.5)	-0.1 (-1.5)	+0.1 (+1.5)	0.01 (0.15)	2.7 (40.5)	4 (60)	0.01/0.04 (0.145/0.6)	1
0.4 (6)	-0.4 (-6)	+0.4 (+6)	0.02 (0.3)	5.3 (79.5)	8 (120)		2
1.2 (18)	-1 (-15)	+1.2 (+18)	0.06 (1)	16 (240)	24 (360)		3
4 (60)	-1 (-15)	+4 (+60)	0.2 (3)	16 (240)	24 (360)		4
10 (150)	-1 (-15)	+10 (+150)	0.5 (7.5)	27 (405)	40 (600)		5

<sup>1</sup> Factory calibration Turn down: max 20:1, higher on request.

<sup>2</sup> The vacuum resistance applies to the measuring cell at reference conditions.

<sup>3</sup> Ordering designation, feature "Sensor range", see page 49 ff

<sup>4</sup> By default, the device is set to a lower range limit of 0 bar. Please specify in the order if the lower range limit is to be set to a different default value.

## Output

### Output Signal

- 4 mA to 20 mA with superimposed digital communication protocol HART 6.0, 2-wire
- Digital communication signal PROFIBUS PA (Profile 3.02)

Output	Option <sup>1</sup>
4 mA to 20mA HART	H
PROFIBUS PA	P

<sup>1</sup> Ordering designation, feature "Output", see page 49 ff

### Signal Range

3.8 mA to 20.5 mA

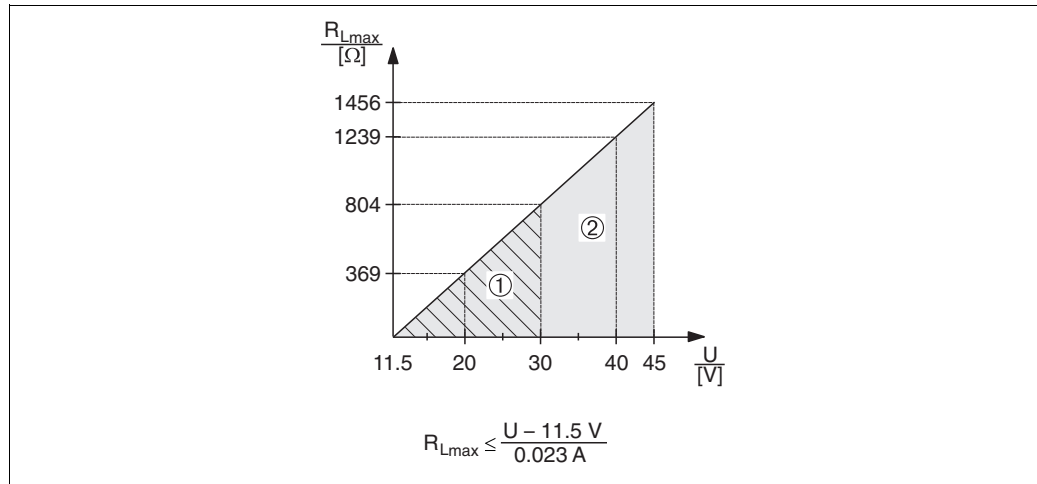
### 4 mA to 20 mA HART

### Signal on Alarm

As per NAMUR NE43

- 4 mA to 20 mA HART, Options:
  - Max. alarm: can be set from 21 mA to 23 mA (factory setting: 22 mA)
  - Hold measured value: last measured value is held
  - Min. alarm: 3.6 mA
- PROFIBUS PA: can be set in the Analog Input block, Options: Last Valid Out Value (factory setting), Fail-safe Value, Status Bad

### Load 4 mA to 20 mA HART



Load diagram

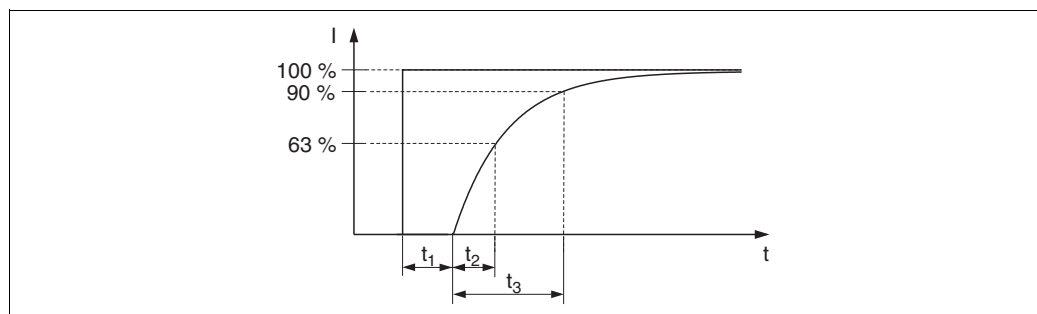
- 1 Power supply 11.5 V DC to 30 V DC for intrinsically safe device versions
- 2 Power supply 11.5 V DC to 45 V DC (versions with plug-in connector 35 V DC) for other types of protection and for uncertified device versions

$R_{Lmax}$  Maximum load resistance  
U Supply voltage



When operating via a handheld terminal or via a PC with an operating program, a minimum communication resistance of 250 Ω must be taken into account.

### Dead Time, Time Constant



Presentation of the dead time and the time constant

### Dynamic Behavior: Current Output

	Device	Dead time (t <sub>1</sub> ) [ms]	Time constant T63 (= t <sub>2</sub> ) [ms]	Time constant T90 (= t <sub>3</sub> ) [ms]
max.	LHCR-51 LHCS-51	500	250	–

### Dynamic Behavior: HART

	Device	Dead time (t <sub>1</sub> ) [ms]	Dead time (t <sub>1</sub> ) [ms] + Time constant T63 (= t <sub>2</sub> ) [ms]	Dead time (t <sub>1</sub> ) [ms] + Time constant T90 (= t <sub>3</sub> ) [ms]
min.	LHCR-51	660	910	–
max.	LHCS-51	1460	1710	–

#### Reading cycle

- Acyclic: max. 3/s, typical 1/s (depends on command # and number of preambles)
- Cyclic (Burst): max. 3/s, typical 2/s

The pressure transmitter commands the BURST MODE function for cyclic value transmission via the HART communication protocol

#### Cycle time (Update time)

Cyclic (Burst): min. 300 ms

#### Response time

- Acyclic: min. 330 ms, typical 590 ms (depends on command # and number of preambles)
- Cyclic (Burst): min. 160 ms, typical 350 ms (depends on command # and number of preambles)

### Dynamic Behavior: PROFIBUS PA

	Device	Dead time (t <sub>1</sub> ) [ms]	Dead time (t <sub>1</sub> ) [ms] + Time constant T63 (= t <sub>2</sub> ) [ms]	Dead time (t <sub>1</sub> ) [ms] + Time constant T90 (= t <sub>3</sub> ) [ms]
min.	LHCR-51	535	785	–
max.	LHCS-51	1635	1885	–

#### Reading cycle

- Cyclic: max. 30/s, typical 1/s (dependent on the number and type of function blocks used in a closed-control loop)
- Acyclic: typical 25/s

#### Cycle time (Update time)

min. 100 ms

The cycle time in a bus segment in cyclic data communication depends on the number of devices, on the segment coupler used and on the internal PLC cycle time.

#### Response time

- Cyclic: approx. 8 to 13 ms (depends on Min. Slave Interval)
- Acyclic: approx. 23 to 35 ms (depends on Min. Slave Interval)

### Damping

A damping affects all outputs (output signal, display).

- Via on-site display, handheld terminal or PC with operating program, continuous from 0 s to 999 s
- Via DIP-switch on the electronic insert, switch position "on" (= set value) and "off" (= damping switched off)
- Factory setting: 2 s

### Firmware Version

Designation	Option <sup>1</sup>
01.00.zz, PROFIBUS PA, DevRev01	M
01.00.zz, HART, DevRev01	N

<sup>1</sup> Ordering designation, feature "Firmware version", see page 49 ff

### Galvanic isolation

The devices have a galvanic isolation between electronic and probe.

### Protocol-specific Data HART

Manufacturer ID	17 (0x11)
Device Type Code	0x35
Device Revision	01 (01 hex) - SW version 01.00.zz
HART specification	6
DD Revision	<ul style="list-style-type: none"> <li>• 01 (Dutch)</li> <li>• 02 (Russian)</li> </ul>
Device description files (DTM, DD)	Information and files can be found: <ul style="list-style-type: none"> <li>• <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></li> <li>• <a href="http://www.hartcomm.org">www.hartcomm.org</a></li> </ul>
HART load	min. 250 Ω
HART device variables	The measured values can be freely assigned to the device variables: Measured values for PV (primary variable) <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Level</li> <li>• Tank content</li> </ul> Measured values for SV, TV (second and third variable) <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Level</li> </ul> Measured values for QV (fourth variable) <ul style="list-style-type: none"> <li>• Temperature</li> </ul>
Supported functions	<ul style="list-style-type: none"> <li>• Burst mode</li> <li>• Additional Transmitter Status</li> <li>• Device Locking</li> <li>• Alternative operating modes</li> </ul>

### PROFIBUS PA

Manufacturer ID	93 (5D hex)
Ident number	0x0E3C hex
Profile version	3.02 <ul style="list-style-type: none"> <li>• SW version 01.00.zz</li> </ul>
GSD Revision	5
DD Revision	1
GSD File	Information and files can be found: <ul style="list-style-type: none"> <li>• <a href="http://www.pepperl-fuchs.com">www.pepperl-fuchs.com</a></li> <li>• <a href="http://www.profibus.org">www.profibus.org</a></li> </ul>
DD Files	
Output values	Measured values for PV (via Analog Input Function Block) <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Flow</li> <li>• Level</li> <li>• Tank content</li> </ul> Measured values for SV <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Temperature</li> </ul>
Input values	Input value sent from PLC, can be shown on display
Supported functions	<ul style="list-style-type: none"> <li>• Identification &amp; Maintenance Simple device identification via control system and nameplate</li> <li>• Condensed status <sup>1</sup></li> <li>• Automatic ident number adaptation</li> <li>• Device locking: The device can be locked by hardware or software.</li> </ul>

<sup>1</sup> Only with Profile Version 3.02



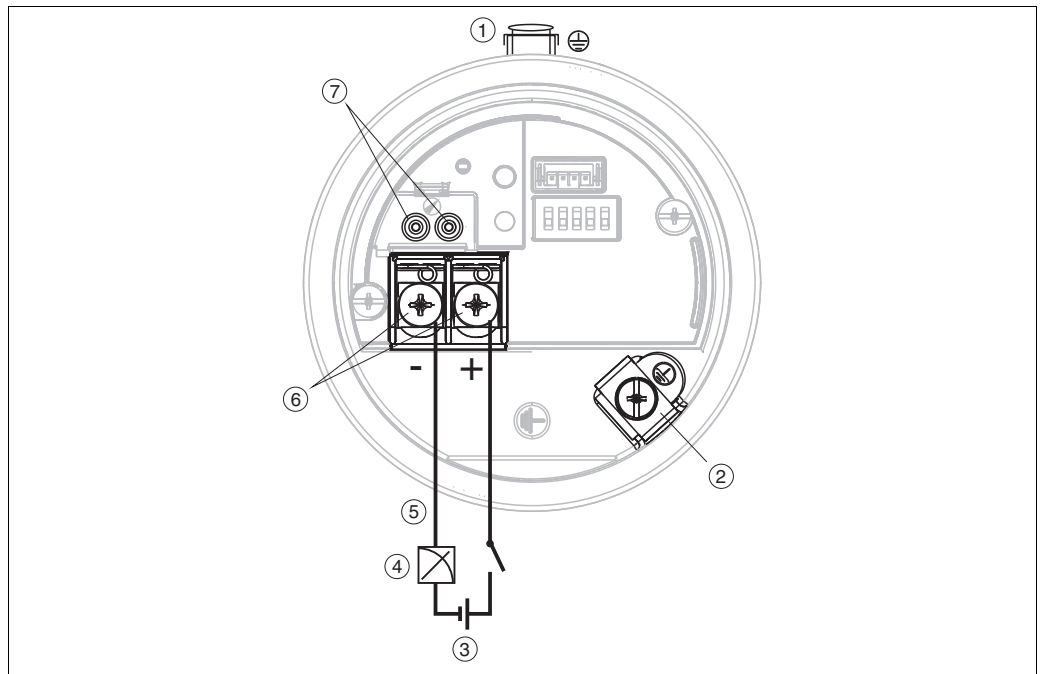
## Power Supply

**⚠ WARNING**

**Incorrect connection can limit electrical safety!**

- When using the measuring device in hazardous areas, installation must comply with the corresponding national standards and regulations and the Safety Instructions or Installation or Control Drawings (see page 58, sections "Safety Instructions" and "Installation/Control Drawings").
- All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is provided with all Ex-systems as standard (see page 58, sections "Safety Instructions" and "Installation/Control Drawings").
- According to IEC/EN 61010 a suitable disconnecter has to be installed for the device
- HART: Overvoltage protection HAW569-DA2B for the non-hazardous area, ATEX II 2 (1) Ex ia IIC and IEC Ex ia can be ordered as an option (see page 49 ff, "Ordering Information").
- Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed.
- The digital communication signal is transmitted to the bus via a 2-wire connection. The bus also provides the power supply.

### Terminal Assignment



**Electrical connection**

- |   |  |
|---|--|
| 1 | External grounding terminal  |
| 2 | Internal grounding terminal  |
| 3 | Supply voltage, see page 18  |
| 4 | 4 mA to 20 mA for HART devices   |
| 5 | For HART devices: With a handheld terminal, all the parameters can be configured anywhere along the bus line via menu operation. |
| 6 | Terminals  |
| 7 | For HART devices: test terminals, see section "Taking 4 mA to 20 mA test signal"   |

### Supply Voltage

#### 4 mA to 20 mA HART

Type of protection	Supply voltage
Intrinsically safe	11,5 V DC ... 30 V DC
<ul style="list-style-type: none"> <li>Other types of protection</li> <li>Devices without certificate</li> </ul>	11,5 V DC ... 45 V DC (versions with plug-in connection 35 V DC)

#### Taking 4 mA to 20 mA test signal

A 4 mA to 20 mA test signal may be measured via the test terminals without interrupting the measurement.

#### PROFIBUS PA

Version for non-hazardous areas: 9 V DC to 32 V DC

### Current Consumption

PROFIBUS PA: 11 mA ± 1 mA, switch-on current corresponds to IEC 61158-2, Clause 21

### Electrical Connection

Cable entry	Option <sup>1</sup>
Gland M20, IP66/68 NEMA4X/6P	A
Thread G1/2, IP66/68 NEMA4X/6P	C
Thread NPT1/2, IP66/68 NEMA4X/6P	D
Connector M12, IP66/68 NEMA4X/6P	I
Connector 7/8 in, IP66/68 NEMA4X/6P	M
Connector Han7D, 90deg., IP65	P
Valve connector ISO4400 M16, IP64	V

<sup>1</sup> Ordering designation, feature "Electrical connection", see page 49 ff

#### PROFIBUS PA

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

### Terminals

For wire cross-sections of 0.5 mm<sup>2</sup> to 2.5 mm<sup>2</sup> (20 AWG to 14 AWG)

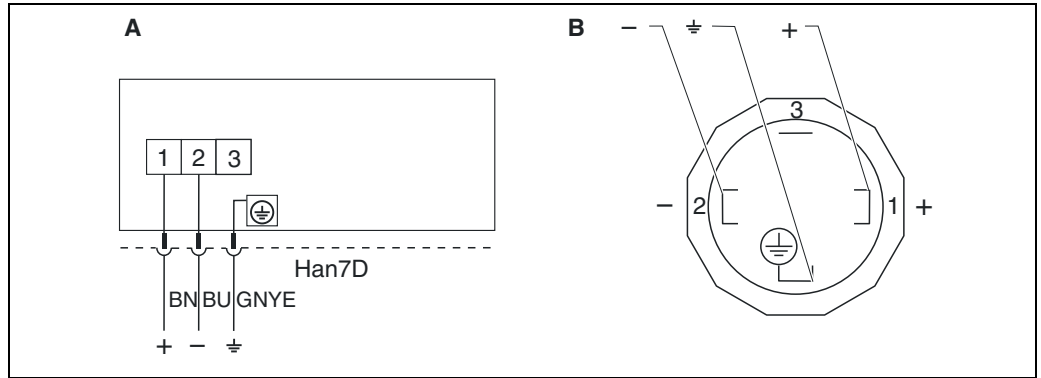
### Cable Entry

Approval	Type	Clamping area
Standard, CSA GP ATEX II1/2G or II2G Ex ia, IEC Ex ia Ga/Gb or Ex ia Gb, FM/ CSA IS	Plastic M20x1.5	5 mm to 10 mm (0.2 in to 0.39 in)
ATEX II1/2D Ex t, II1/2GD Ex ia, II3G Ex nA, IEC Ex t Da/Db	Metal M20x1.5 (Ex e)	7 mm to 10.5 mm (0.28 in to 0.41 in)

For other technical data, see the housing section page 29 ff.

Connector

Devices with valve connector

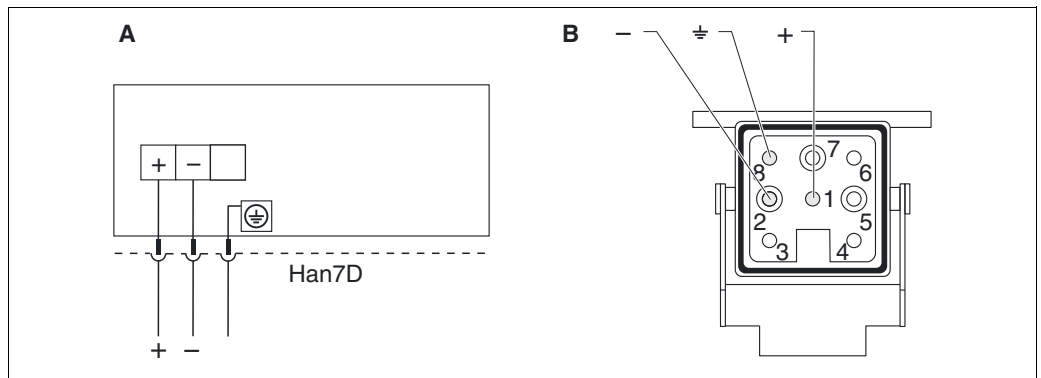


BN = brown, BU = blue, GNYE = green/yellow

A: electrical connection for devices with a valve connector  
B: view of the connector at the device

Material: PA 6.6

Devices with Harting plug Han7D

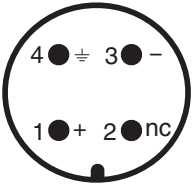


A: electrical connection for devices with Harting plug Han7D  
B: view of the plug connector at the device

Material: CuZn, gold-plated contacts of plug-in jack and connector

### Devices with M12 plug

PIN assignment for M12 connector

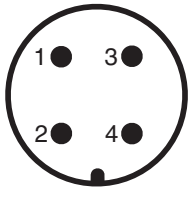
	PIN	Meaning
	1	Signal +
	2	Not assigned
	3	Signal -
	4	Earth

Pepperl+Fuchs offers the following accessories for devices with an M12 plug:

- Plug-in jack M 12x1, straight
  - Material: body PA; coupling nut CuZn, nickel-plated
  - Degree of protection (fully locked): IP66/67
- Plug-in jack M 12x1, elbowed
  - Material: body PBT/PA; coupling nut GD-Zn, nickel-plated
  - Degree of protection (fully locked): IP66/67
- Cable 4 x 0.34 mm<sup>2</sup> (20 AWG) with M12 socket, elbowed, screw plug, length 5 m (16 ft)
  - Material: body PUR; coupling nut CuSn/Ni; cable PVC
  - Degree of protection (fully locked): IP66/67

### Devices with 7/8 in plug

PIN assignment for 7/8 in

	PIN	Meaning
	1	Signal -
	2	Signal +
	3	Shield
	4	Not assigned

- External thread: 7/8-16 UNC
  - Material: housing/body CuZn, nickel-plated
  - Protection: IP66/68

### Cable Specification

#### HART

- Pepperl+Fuchs recommends using twisted, shielded two-wire cables.
- Cable outer diameter depends on the used cable gland

#### PROFIBUS PA

Use a twisted, shielded two-wire cable, preferably cable type A



For further information on the cable specifications, see the PNO Guideline 2.092 "PROFIBUS PA User and Installation Guideline" and IEC 61158-2 (MBP).

### Start-up Current HART

12 mA or 22 mA (selectable)

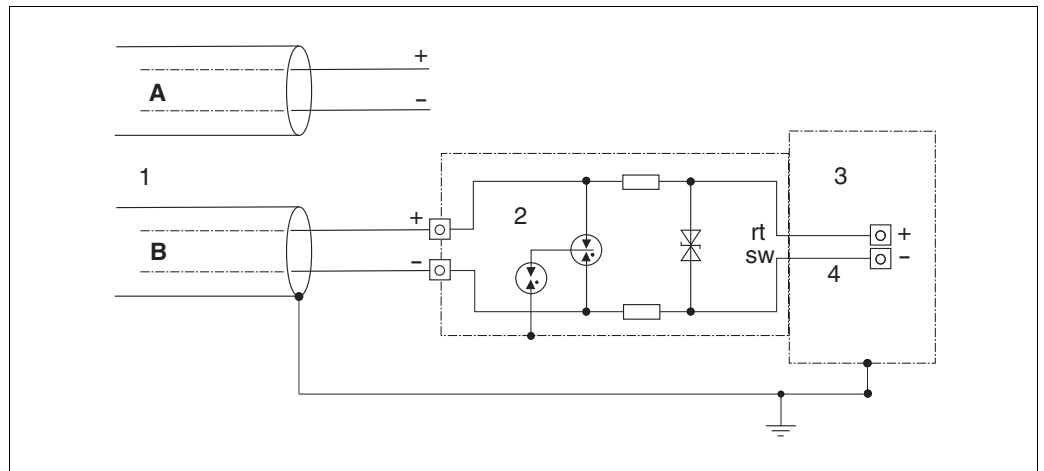
### Residual Ripple

No influence on 4 mA to 20 mA signal up to  $\pm 5\%$  residual ripple within the permitted voltage range [according to HART hardware specification HCF\_SPEC-54 (DIN IEC 60381-1)]

**Influence of Power Supply**  $\leq 0.001\%$  of URL/1 V

## Overvoltage Protection (optional)

The device can be fitted with overvoltage protection. The overvoltage protection is mounted at the factory on the housing thread (M20x1.5) for the cable gland and is approx. 70 mm (2.76 in) in length (take additional length into account when installing). The device is connected as illustrated in the following graphic.



- A Without direct shield grounding
- B With direct shield grounding
- 1 Incoming connection cable
- 2 Overvoltage protection
- 3 Unit to be protected
- 4 Connection cable

## Performance Characteristics

### Reference Operating Conditions

- As per IEC 60770
- Ambient temperature  $T_A$  = constant, in the range of: +21 °C to +33 °C (+70 °F to 91 °F)
- Humidity  $\varphi$  = constant, in the range of: 5 % to 80 % RH
- Ambient pressure  $p_A$  = constant, in the range of: 860 mbar to 1060 mbar (12.47 psi to 15.37 psi)
- Position of the measuring cell: constant, in range: vertically  $\pm 1^\circ$
- Input of LOW SENSOR TRIM and HIGH SENSOR TRIM for lower range value and upper range value
- Span based on zero point
- Material of the process isolating diaphragm: Alloy C276 (2.4819) and Alloy C276 (2.4819) with coating (AuRh or AuPt)
- Measuring cell material (meter body): Alloy C276 (2.4819), 316L (1.4435)
- Filling oil: synthetic oil (FDA)/inert oil
- Supply voltage: 24 V DC  $\pm$  3 V DC
- Load with HART: 250  $\Omega$

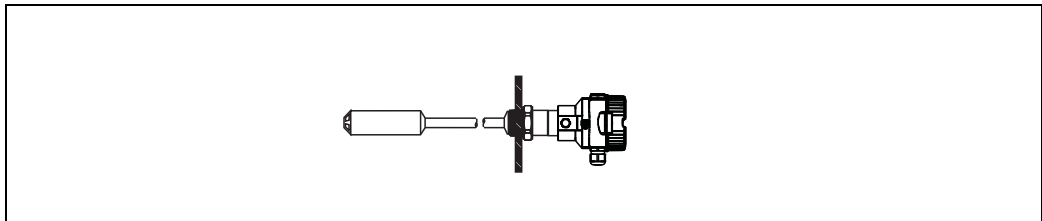
### Influence of Orientation

- < 2.3 mbar (0.0345 psi) when using synthetic oil (FDA)
- < 5 mbar (0.075 psi) when using inert oil



Position-dependent zero point shift can be corrected.  
see section "General Installation Instructions", page 24

### Calibration Position



To minimize the effect of the orientation (e. g. in the case of vertical device installation), position offset is preset at the factory.

### Resolution

- Current output: 1  $\mu$ A
- Display: can be set (factory setting: presentation of the maximum accuracy of the transmitter)

### Reference Accuracy

The reference accuracy comprises the non-linearity according to limit point setting, hysteresis and non-reproducibility as per IEC 60770. The data refer to the calibrated span.

Reference accuracy in % of the calibrated span			
Measuring cell	TD	"Standard" option <sup>1</sup>	"Platinum" option <sup>1</sup>
0.1 bar (1.5 psi)	<ul style="list-style-type: none"> <li>• TD 1:1 to TD 2:1</li> <li>• TD &gt; 2:1 to TD 4:1</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.2</li> <li>• &lt; 0.1 x TD</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.15</li> <li>• &lt; 0.075 x TD</li> </ul>
0.4 bar (6 psi)	<ul style="list-style-type: none"> <li>• TD 1:1 to TD 4:1</li> <li>• TD &gt; 4:1 to TD 10:1</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.2</li> <li>• &lt; 0.05 x TD</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.15</li> <li>• &lt; 0.0375 x TD</li> </ul>
1.2 bar (18 psi)	<ul style="list-style-type: none"> <li>• TD 1:1 to TD 2:1</li> <li>• TD &gt; 2:1 to TD 12:1</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.2</li> <li>• &lt; 0.1 x TD</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.1</li> <li>• &lt; 0.05 x TD</li> </ul>
4 bar (60 psi)	<ul style="list-style-type: none"> <li>• TD 1:1 to TD 4:1</li> <li>• TD &gt; 4:1 to TD 20:1</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.2</li> <li>• &lt; 0.05 x TD</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.1</li> <li>• &lt; 0.025 x TD</li> </ul>
10 bar (150 psi)	<ul style="list-style-type: none"> <li>• TD 1:1 to TD 2.5:1</li> <li>• TD &gt; 2.5:1 to TD 20:1</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.2</li> <li>• &lt; 0.08 x TD</li> </ul>	<ul style="list-style-type: none"> <li>• &lt; 0.1</li> <li>• &lt; 0.04 x TD</li> </ul>

<sup>1</sup> Ordering designation, feature "Reference accuracy", see page 49 ff

### Thermal Change in the Zero Output and the Output Span

Version	Measuring cell	-10 °C to +60 °C (+14 °F to +140 °F)	60 °C to °C85 °C (140 °F to 185 °F)
		% of the calibrated span	
LHCR-51/LHCS-51 snap-on	0.1 bar (1.5 psi)	< (0.32 + 0.30 x TD)	< (0.34 + 0.40 x TD)
LHCR-51/LHCS-51 welded	0.1 bar (1.5 psi)	< (0.32 + 0.50 x TD)	< (0.34 + 0.60 x TD)
LHCR-51/LHCS-51	0.4 bar (6 psi)	< (0.31 + 0.25 x TD)	< (0.32 + 0.30 x TD)
	1.2 bar (18 psi), 4 bar (60 psi), 10 bar (150 psi)	< (0.31 + 0.10 x TD)	< (0.32 + 0.15 x TD)

### Total Performance

The "Total performance" specification comprises the non-linearity including hysteresis, non-reproducibility as well as the thermal change in the zero point.

Total performance in % of the URL				
Version	Measuring cell	-10 °C to +60 °C (+14 °F to +140 °F)	60 °C to °C85 °C (140 °F to 185 °F)	85 °C to °C100 °C (185 °F to 212 °F)
LHCR-51/LHCS-51 snap-on	0.1 bar (1.5 psi)	< 0.35	< 0.45	< 0.6
LHCR-51/LHCS-51 welded	0.1 bar (1.5 psi)	< 0.8	< 1	< 1.4
LHCR-51/LHCS-51	0.4 bar (6 psi)	< 0.35	< 0.45	< 0.6
	1.2 bar (18 psi), 4 bar (60 psi), 10 bar (150 psi)	< 0.15	< 0.2	< 0.25

### Long-term Stability

Measuring cell	Long-term stability [%]
0.1 bar (1.4 psi)	<ul style="list-style-type: none"> <li>&lt; 0.18 of the upper range limit (URL)/year</li> <li>&lt; 0.45 of the upper range limit (URL)/5 years</li> </ul>
0.4 bar (6 psi) 1.2 bar (18 psi)	<ul style="list-style-type: none"> <li>&lt; 0.1 of the upper range limit (URL)/year</li> <li>&lt; 0.25 of the upper range limit (URL)/5 years</li> </ul>
4 bar (60 psi) 10 bar (150 psi)	<ul style="list-style-type: none"> <li>&lt; 0.05 of the upper range limit (URL)/year</li> <li>&lt; 0.125 of the upper range limit (URL)/5 years</li> </ul>

### Total Error

The total error comprises the long-term stability and the total performance:

Measuring cell	% of the URL/year (in the permitted temperature range)
0.1 bar (1.5 psi)	<ul style="list-style-type: none"> <li>Snap-on: ±0.63</li> <li>Welded: ±1.0</li> </ul>
0.4 bar (6 psi)	±0.61
1.2 bar (18 psi)	±0.27
4 bar (60 psi), 10 bar (150 psi)	±0.25

### Warm-up Period

- 4 mA to 20 mA HART: ≤ 8 s
- PROFIBUS PA: ≤ 8 s

## Installation

### General Installation Instructions

- The position-dependent zero point shift can be corrected:
  - directly at the device via an operating key
  - directly at the device via operating keys on the display
  - via digital communication if the cover is not open

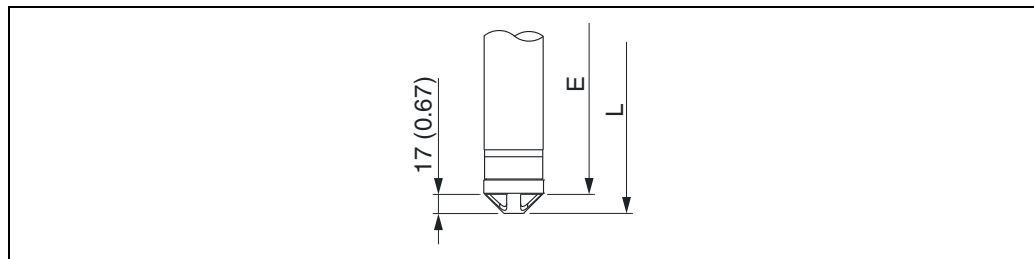
#### **⚠ WARNING**

#### **Risk of explosion!**

In hazardous areas, comply strictly with the safety instructions when the housing cover is closed and open.

- The local display can be rotated in 90° stages.
- When mounting rod and cable versions, make sure that the probe head is located at a point as free as possible from flow. To protect the probe from impact resulting from lateral movement, mount the probe in a guide tube (preferably made of plastic) or secure it with a clamping fixture.
- In the case of devices for hazardous areas, comply strictly with the safety instructions when the housing cover is open.
- The length of the extension cable or the probe rod is based on the planned level zero point. The height of the protective cap must be taken into consideration when designing the layout of the measuring point. The level zero point (E) corresponds to the position of the process isolating diaphragm.
 

Level zero point = E; top of the probe = L.



### Supplementary Installation Instructions

#### **Process isolating diaphragm**

- Do not clean or touch process isolating diaphragms with hard or pointed objects.
- The process isolating diaphragm in the rod and cable version is protected against mechanical damage by a plastic cap.

#### **Seal**

- Devices with a G 1-1/2 thread:
 

When screwing the device into the tank, the flat seal has to be positioned on the sealing surface of the process connection. To avoid additional strain on the process isolating diaphragm, the thread should never be sealed with hemp or similar materials.
- Devices with NPT threads:
  - Wrap Teflon tape around the thread to seal it.
  - Tighten the device at the hexagonal bolt only. Do not turn the device at the housing.
  - Do not overtighten the thread when screwing in the screw. Max. torque: 20 Nm to 30 Nm (14.75 lbf ft to 22.13 lbf ft)

#### **Sealing the probe housing**

Moisture must not penetrate the housing when mounting the device, establishing the electrical connection and during operation.

- Always firmly tighten the housing cover and the cable entries.
- Lubricant is provided on the O-ring seal in the housing cover and on the thread of the aluminum cover. To ensure that the cover seals tight, any lubricant which has been removed must be replaced. Use silicone grease or graphite paste as the lubricant. Mineral oil-based grease can destroy the O-ring.



## PE cable length > 300 m (984 ft)

- Two suspension clamps must be used for PE cables longer than 300 meters (984 ft).

## Cable length tolerances LHCS-51

- Cable length < 5 m (16 ft): up to -35 mm (-1.38 in)
- Cable length 5 m to 10 m (16ft to 33 ft): up to -75 mm (-2.95 in)
- Cable length 10 m to 100 m (33 ft to 328 ft): up to -100 mm (-3.94 in)

## Rod length tolerances LHCR-51

- Rod length < 4000 mm (157 in): up to -4 mm (-0.16 in)

## Wall and Pipe Mounting

For installing the device on pipes or walls, Pepperl+Fuchs provides a mounting bracket which is included in the scope of supply or can be ordered as a separate accessory.

For the dimensions, see page 37.

## "Separate Housing" Version

With the "separate housing" version, you are able to mount the housing with the electronics insert at a distance from the measuring point. This allows for trouble-free measurement:

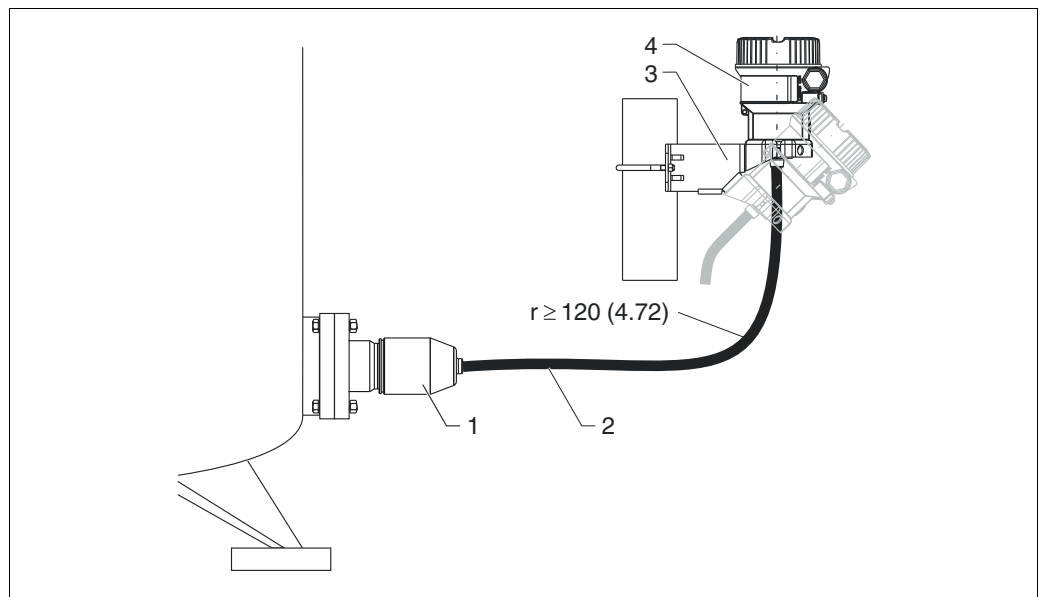
- Under particularly difficult measuring conditions (at installation locations that are cramped or difficult to access)
- If rapid cleaning of the measuring point is required
- If the measuring point is exposed to vibrations

You can choose between different cable versions:

- PE (2 m (6.6 ft), 5 m (16 ft) and 10 m (33 ft))
- FEP (5 m (16 ft)).

Ordering designation, feature "Separate housing", see page 46 ff

For the dimensions, see page 37.



Engineering unit mm (in)

- 1 Process connection with sensor - see the following section for the degrees of protection
- 2 Cable, both ends are fitted with a socket
- 3 Mounting bracket provided, suitable for pipe and wall mounting (for pipes from 1-1/4 in up to 2 in diameter)
- 4 Housing with electronic insert, see page 29 ff

In the case of the "separate housing" version, the sensor is delivered with the process connection and cable ready mounted. The housing and a mounting bracket are enclosed as separate units. The cable is provided with a socket at both ends. These sockets are simply connected to the housing and the sensor.

Degree of protection for the process connection and sensor with the use of

- FEP cable:
  - IP69K
  - IP66 NEMA 4/6P
  - IP68 (1.83 mH<sub>2</sub>O for 24 h) NEMA 4/6P
- PE cable:
  - IP66 NEMA 4/6P
  - IP68 (1.83 mH<sub>2</sub>O for 24 h) NEMA 4/6P

Technical data of the PE and FEP cable:

- Minimum bending radius: 120 mm (4.72 in)
- Cable extraction force: max. 450 N (101 lbf)
- Resistance to UV light

Use in hazardous area:

- Intrinsically safe installations (Ex ia/IS)
- FM/CSA IS: for Div.1 installation only

## Oxygen Applications

Oxygen and other gases can react explosively to oils, grease and plastics. As a result, the following are some of the precautions that must be taken:

- All components of the system, such as measuring devices, must be cleaned in accordance with the BAM (DIN 19247) requirements.
- Depending on the materials used, a certain maximum temperature and maximum pressure must not be exceeded for oxygen applications. The maximum temperature  $T_{max}$  for oxygen applications is 60° C (140° F).

The devices suitable for gaseous oxygen applications are listed in the following table with the specification  $p_{max}$ .

Order code for devices <sup>1</sup> cleaned for oxygen applications	$p_{max}$ for oxygen applications
LHCR-51	<ul style="list-style-type: none"> <li>• Depends on the lowest-rated element, with regard to pressure, of the selected components: over pressure limit (OPL) of the sensor or process connection (1.5 x PN) <sup>2</sup></li> <li>• Depends on filling oil <sup>3</sup></li> <li>• Depends on seal material</li> </ul>

<sup>1</sup> Only device, not accessory or enclosed accessory.

<sup>2</sup> see "Measuring Range" section (page 13) and "Mechanical Construction" section (page 29).

<sup>3</sup> Oxygen applications possible with FKM seal and inert oil.

## PWIS Cleaning

Special cleaning of the transmitter to remove paint-wetting substances, for use in paint shops for example. The stability of the materials used must be checked before using them in the medium. The protective cap of the process isolating diaphragm must be removed if necessary.

## Applications with Hydrogen

With regard to materials in which hydrogen formation takes place (e. g. digested sludge), hydrogen atoms can diffuse through the metal process isolating diaphragm. This can result in incorrect measurement results. Pepperl+Fuchs offers process isolating diaphragms with a gold/rhodium coating for such instances. Ordering designation, feature "Material of the process isolating diaphragm", option 5, see page 49 ff.

**NOTICE** To reduce the formation of hydrogen, you should not use galvanized assemblies.

## Special Measuring Cells for Acids, Alkalis or Sea Water

For acids, alkalis or sea water, Pepperl+Fuchs offers process isolating diaphragms with a gold/platinum coating. Ordering designation, feature "Material of the process isolating diaphragm", option 6, see page 49 ff.

**NOTICE** With temperature exposure (up to 85 °C (185 °F)) there is an additional zero point deviation of 1.1 mbar (0.0165 psi).

## Environment

### Ambient Temperature Range

Version	LHCR-51	LHCS-51
Without LCD display	-40 °C to +85 °C (-40 °F to +185 °F)	With PE cable: -40 °C to +70 °C (-40 °F to +158 °F) With FEP cable: -40 °C to +80 °C (-40 °F to +176 °F)
With LCD display <sup>1</sup>	-20 °C to +70 °C (-4 °F to +158 °F)	
With M12 plug, elbowed	-25 °C to +85 °C (-13 °F to +185 °F)	With PE cable: -25 °C to +70 °C (-13 °F to +158 °F) With FEP cable: -25 °C to +80 °C (-13 °F to +176 °F)
With separate housing (PE and FEP cable)	-20 °C to +60 °C (-4 °F to +140 °F)	

<sup>1</sup> Extended temperature application range (-40 °C to +85 °C (-40 °F to +185 °F)) with restrictions in optical properties such as display speed and contrast

### Storage Temperature Range

Version	LHCR-51	LHCS-51
Without LCD display	-40 °C to +90 °C (-40 °F to +194 °F)	With PE cable: -40 °C to +70 °C (-40 °F to +158 °F) With FEP cable: -40 °C to +80 °C (-40 °F to +176 °F)
With LCD display	-40 °C to +85 °C (-40 °F to +185 °F)	
With M12 plug, elbowed	-25 °C to +90 °C (-13 °F to +194 °F)	With PE cable: -25 °C to +70 °C (-13 °F to +158 °F) With FEP cable: -25 °C to +80 °C (-13 °F to +176 °F)
With separate housing and FEP cable	-20 °C to +60 °C (-4 °F to +140 °F)	

### Climate Class

Class 4K4H (air temperature: -20 °C to +55 °C (-4 °F to +131 °F), relative humidity: 4 % to 100 %) satisfied as per DIN EN 60721-3-4 (condensation possible)

### Degree of Protection

- F31 housing (feature "Housing", option I, J): IP 68 (1.83 mH<sub>2</sub>O for 24 h)
- Ordering designation, feature "Electrical connection", see page 49 ff.
- Separate housing, see page 25)

### Vibration Resistance

Device/accessory	Test standard	Vibration resistance
LHCS-51	GL VI-7-2 <ul style="list-style-type: none"> <li>• Part 7: Guidelines for the Performance of Type Approvals</li> <li>• Chapter 2: Test Requirements for Electrical/Electronic Equipment and Systems</li> </ul>	Guaranteed for: 5 Hz to 25 Hz: ±1.6 mm (0.06 in); 25 Hz to 100 Hz: 4 g in all 3 planes
LHCS-51 with mounting bracket	IEC 61298-3	Guaranteed for: 10 Hz to 60 Hz: ±0.15 mm (0.01 in); 60 Hz to 500 Hz: 2 g in all 3 planes
LHCR-51	IEC 60068-2-6	Guaranteed for: 10 Hz to 60 Hz: ±0.075 mm (0.003 in); 60 Hz to 150 Hz: 1 g in all 3 planes

### Electromagnetic Compatibility

- Electromagnetic compatibility as per all the relevant requirements of the EN 61326 series and NAMUR Recommendation EMC (NE21). Details can be found in the Declaration of Conformity (in the Download area of "www.pepperl-fuchs.com").
- Max. deviation during EMC tests < 0.5% of the span
- All tests were performed with full measurement range (TD 1:1).

## Process

### Process Temperature Range

LHCR-51	LHCS-51
-10 °C to +85 °C (+14 °F to +185 °F)	With PE cable: -10 °C to +70 °C (-14 °F to 158 °F) With FEP cable: -10 °C to +80 °C (-14 °F to 176 °F)
Min. process temperature when using the KALREZ seal: -3 °C (27 °F)	

### Lateral Load LHCR-51 (static)

≤ 30 Nm

### Pressure Specifications



**The maximum pressure for the measuring device depends on the lowest-rated element with regard to pressure. See "Measuring Range" section (page 13) and "Mechanical Construction" section (page 29).**

- Only operate the measuring device within the prescribed limits!
- The MWP (maximum working pressure) is specified on the nameplate. This value refers to a reference temperature of +20° C (68° F) or 100° F (38° C) for ANSI flanges and may be applied to the device for an unlimited time. Pay attention to pressure-temperature dependencies.
- Please refer to the following standards for pressure values permitted at higher temperatures:
  - EN 1092-1: 2001 Tab. 18<sup>1</sup>
  - ASME B 16.5a – 1998 Tab. 2-2.2 F316
  - ASME B 16.5a – 1998 Tab. 2.3.8 N10276
  - JIS B 2220.
- The MWP applies for the temperature ranges indicated in the "Ambient Temperature Limits" section and "Process Temperature Limits" section.
- The test pressure corresponds to the over pressure limit of the device (OPL = 1.5 x MWP) and may be applied for only a limited time period in order to avoid permanent damage.
- The Pressure Equipment Directive (EC Directive 97/23/EC) uses the abbreviation "PS". The abbreviation "PS" corresponds to the MWP (maximum working pressure) of the measuring device.
- In the case of sensor range and process connection combinations where the OPL (over pressure limit) of the process connection is smaller than the nominal value of the sensor, the device is set at the factory, at the very maximum, to the OPL value of the process connection. If you want to use the entire sensor range, select a process connection with a higher OPL value (1.5 x PN; PN = MWP).
- In oxygen applications, the values for  $p_{max}$  and  $T_{max}$  for oxygen applications as per "Oxygen Applications" section (page 26) may not be exceeded.

<sup>1</sup> With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

## Mechanical Construction

### Device Height

The device height is calculated from

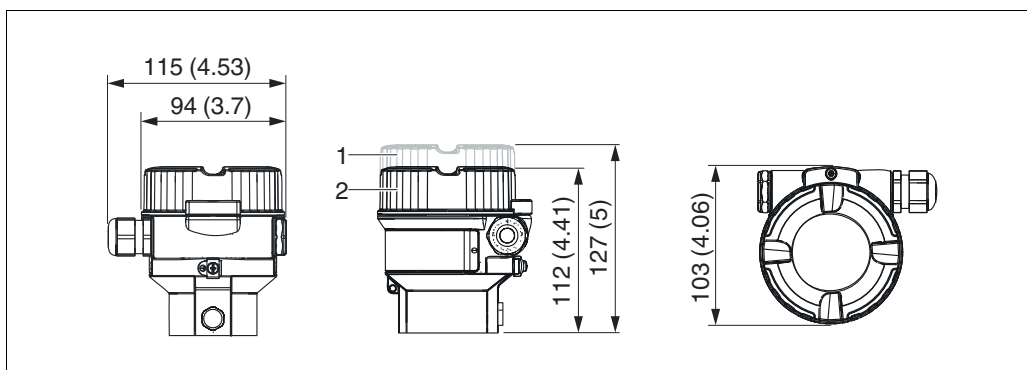
- the height of the housing and
- the height of the individual process connection.

The individual heights of the components are listed in the following sections. To calculate the device height simply add up the individual heights of the components. Where applicable also take into consideration the installation distance (space that is used to install the device).

You can use the following table for this purpose:

Section	Page	Height
Housing height	see page 29	
Process connections	see page 30	
Installation distance		
Device height		

### F31 Aluminum Housing Dimensions



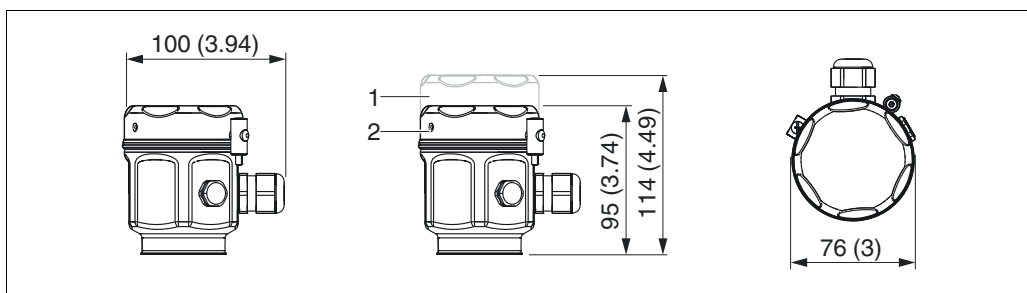
Engineering unit mm (in)  
Front view, left-hand side view, top view

- 1 Cover with viewing window
- 2 Cover without viewing window

Material	Weight kg (lbs)		Option <sup>1</sup>
	with display	without display	
Aluminium	1.1 (2.43)	1.0 (2.21)	I
Aluminum with glass viewing window			J

<sup>1</sup> Ordering designation, feature "Housing", see page 49 ff

### F15 Stainless Steel Housing Dimensions (hygienic)



Engineering unit mm (in)  
Front view, left-hand side view, top view

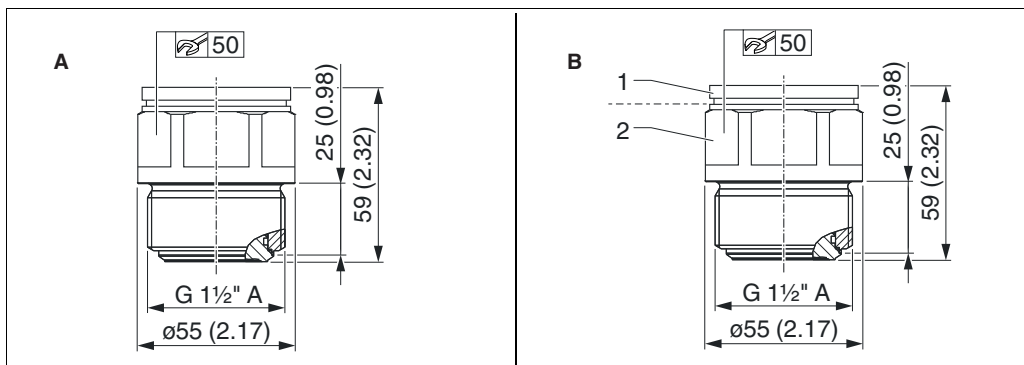
- 1 Cover with viewing window
- 2 Cover without viewing window

Material	Weight kg (lbs)		Option <sup>1</sup>
	with display	without display	
Stainless steel	1.1 (2.43)	1.0 (2.21)	Q
Stainless steel with glass viewing window			R
Stainless steel with plastic viewing window			S

<sup>1</sup> Ordering designation, feature "Housing", see page 49 ff

### Process Connections Threaded Connection

#### Threaded connection ISO 228

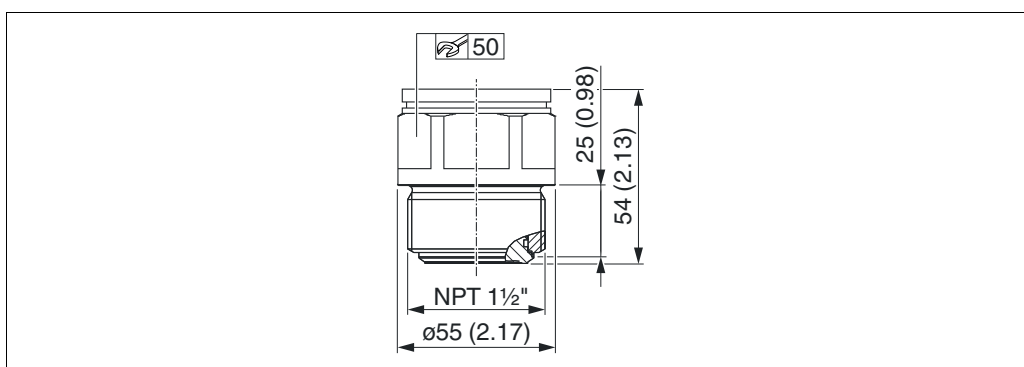


Engineering unit mm (in)

Position	Designation	Material	Weight kg (lbs)	Option <sup>1</sup>
A	Thread ISO228 G1-1/2	AISI 316L (1.4435)	0.8 (1.76)	D
B	Thread ISO228 G1-1/2	<ul style="list-style-type: none"> <li>1: top section AISI 316L (1.4435)</li> <li>2: bottom section Alloy C276 (2.4819)</li> </ul>		I

<sup>1</sup> Ordering designation, feature „Process connection“, see page 49 ff

#### Threaded connection NPT



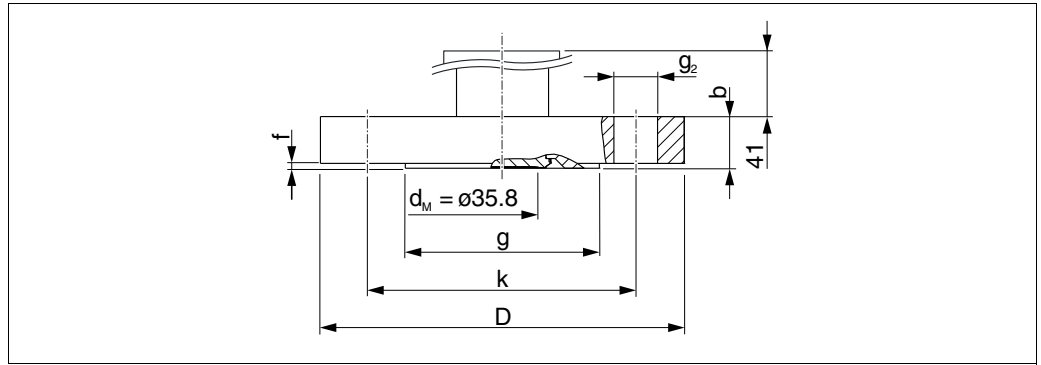
Engineering unit mm (in)

Designation	Material	Weight kg (lbs)	Option <sup>1</sup>
Thread ANSI 1-1/2 MNPT	AISI 316L (1.4435)	0.8 (1.76)	E

<sup>1</sup> Ordering designation, feature „Process connection“, see page 49 ff

### Process Connections EN/DIN Flanges

### Connection dimensions as per EN 1092-1/DIN 2527



Engineering unit in mm

Flange <sup>1</sup>								Boltholes			Weight	Option <sup>2</sup>
Material <sup>3</sup>	Nominal diameter	Nominal pressure	Shape <sup>4</sup>	Diameter D [mm]	Thickness b [mm]	Diameter of raised face g [mm]	Height of raised face f [mm]	Quantity	Diameter g <sub>2</sub> [mm]	Hole circle k [mm]		
AISI 316L	DN40	PN10/16	B1 (C)	150	18	88	2	4	18	110	3.05 (6.72)	F
AISI 316L	DN50	PN10/16	B1 (C)	165	18	102	2	4	18	125	3.75 (8.27)	G
AISI 316L	DN80	PN10/16	B1 (C)	200	20	138	2	8	18	160	5.55 (12.24)	J
AISI 316L	DN100	PN10/16	B1 (C)	220	20	158	2	8	18	180	6.75 (14.88)	H

<sup>1</sup> The roughness of the surface in contact with the medium, including the sealing surface of the flanges, is <math>R\_a 0.8 \mu\text{m}</math> (31.5  $\mu\text{in}</math>). Lower surface roughness available on request.$

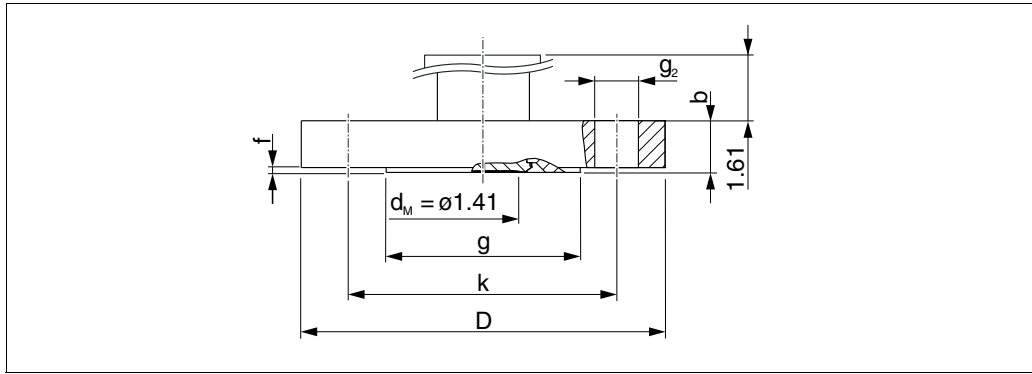
<sup>2</sup> Ordering designation, feature "Process connection", see page 49 ff

<sup>3</sup> Pepperl+Fuchs supplies DIN/EN stainless steel flanges as per AISI 316L (DIN/ EN material number 1.4404 or 14435). With regard to their stability-temperature property, the materials 1.4404 and 1.4435 are grouped together under 13E0 in EN 1092-1: 2001 Tab.18. The chemical composition of the two materials can be identical.

<sup>4</sup> Designation as per DIN 2526 in brackets

### Process Connections ASME Flanges

Connection dimensions as per ANSI B 16.5, raised face RF



Engineering unit in in

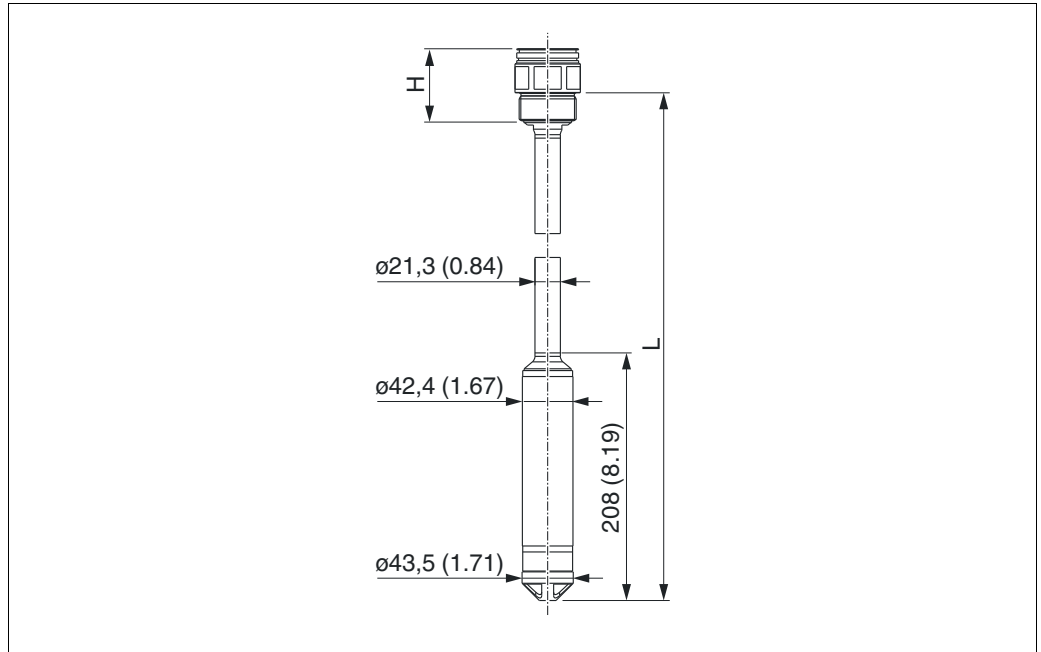
Flange <sup>1</sup>							Boltholes			Weight	Option <sup>2</sup>
Material <sup>3</sup>	Nominal diameter	Class	Diameter	Thickness	Diameter of raised face	Height of raised face	Quantity	Diameter	Hole circle		
	[in]	[lb./sq in]	D [in] [mm]	b [in] [mm]	g [in] [mm]	f [in] [mm]		g <sub>2</sub> [in] [mm]	k [in] [mm]	[kg (lbs)]	
AISI 316/316L	2	150	6 152.4	0.75 19.1	3.62 91.9	0.06 1.6	4	0.75 19.1	4.75 120.7	3.45 (7.61)	A
AISI 316/316L	3	150	7.5 190.5	0.94 23.9	5 127	0.06 1.6	4	0.75 19.1	6 152.4	6.16 (13.56)	B
AISI 316/316L	4	150	9 228.6	0.94 23.9	6.19 157.2	0.06 1.6	8	0.75 19.1	7.5 190.5	8.25 (18.19)	C

- <sup>1</sup> The roughness of the surface in contact with the medium, including the sealing surface of the flanges, is <math>R\_a < 0.8 \mu\text{m}</math> (31.5  $\mu\text{in}</math>). Lower surface roughness available on request.$
- <sup>2</sup> Ordering designation, feature "Process connection", see page 49 ff
- <sup>3</sup> Combination of AISI 316 for required pressure resistance and AISI 316L for required chemical resistance (dual rated)



Process Connections  
LHCR-51 (Rod Version)

Threaded connection ISO 228 and NPT

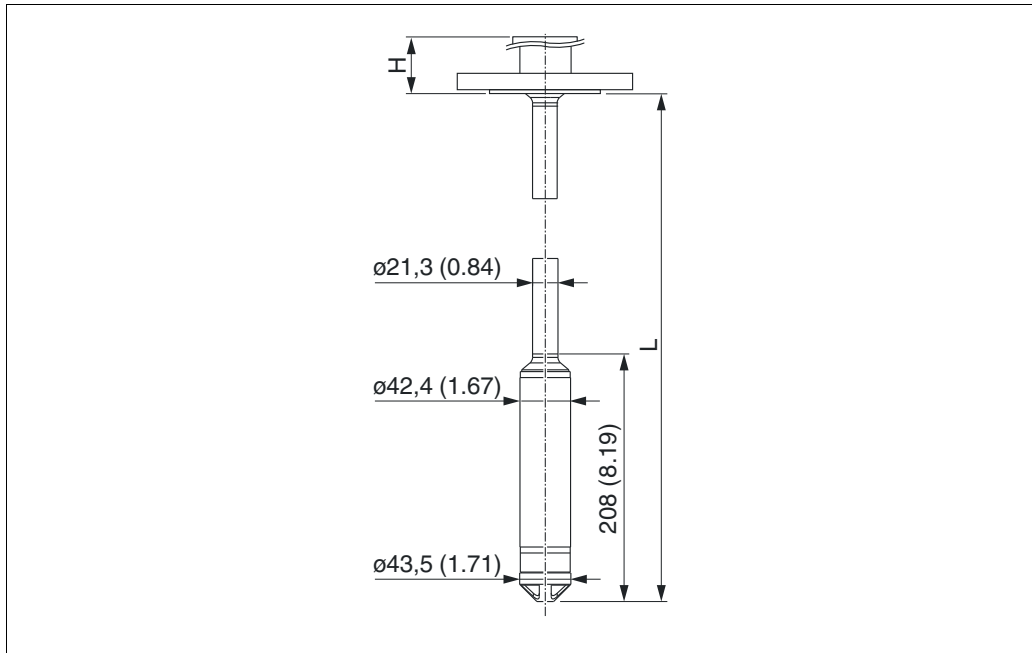


Engineering unit mm (in)

L Probe length L = 0.4 m to 4 m (1.3 ft to 13 ft), ordering designation, feature "Probe connection", see page 49 ff  
H For dimensions of process connections see page 30 ff

Process connection incl. sensor	Weight
Housing weight	see page 29 ff
Process connection weight	see page 30 ff
Pipe incl. cable	0.77 kg/m (1.70 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	1.65 kg (3.64 lbs)
Flange connection incl. measuring cell tube and sensor, without a flange	-
Total weight of device	

EN/DIN and ANSI flanges



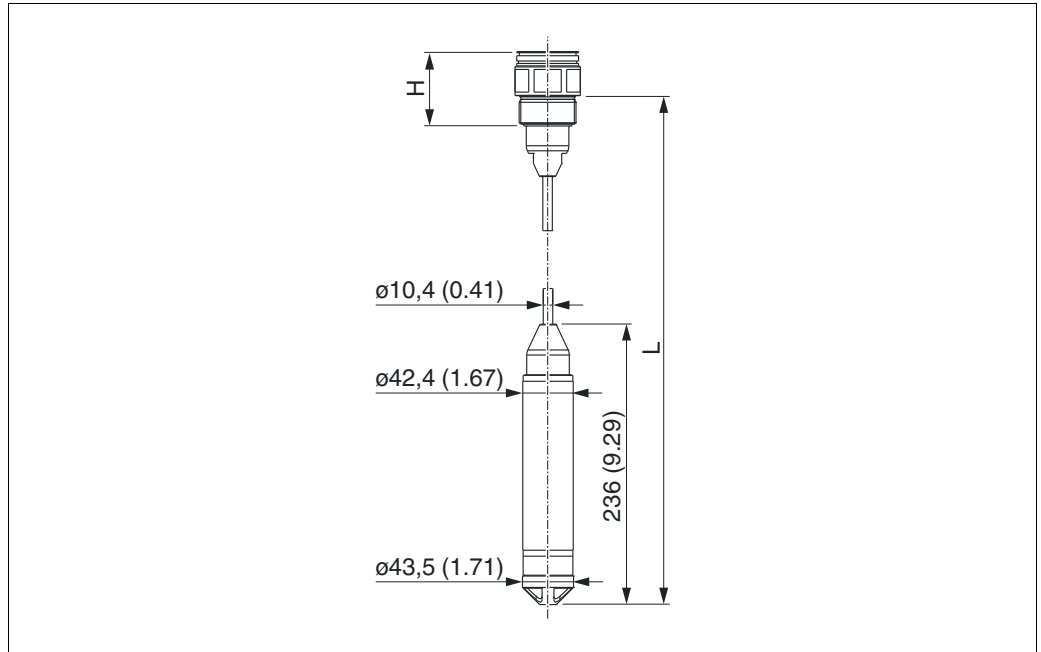
Engineering unit mm (in)

L Probe length L = 0.4 m to 4 m (1.3 ft to 13 ft), ordering designation, feature "Probe connection", see page 49 ff  
H For dimensions of process connections see page 30 ff

Process connection incl. sensor	Weight
Housing weight	see page 29 ff
Process connection weight	see page 30 ff
Pipe incl. cable	0.77 kg/m (1.70 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	-
Flange connection incl. measuring cell tube and sensor, without a flange	1.3 kg (2.87 lbs)
Total weight of device	

Process Connections  
LHCS-51 (Cable Version)

Threaded connection ISO 228 and NPT

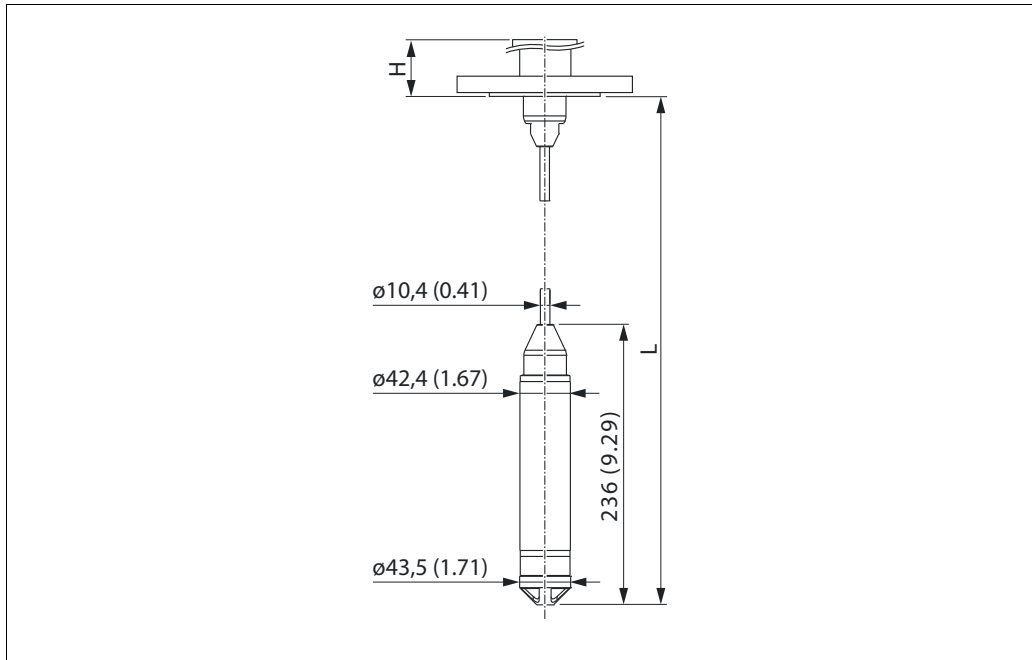


Engineering unit mm (in)

L Probe length L = 0.4 m to 4 m (1.3 ft to 13 ft), ordering designation, feature "Probe connection", see page 49 ff  
H For dimensions of process connections see page 30 ff

Process connection incl. sensor	Weight
Housing weight	see page 29 ff
Process connection weight	see page 30 ff
PE cable	0.13 kg/m (0.28 lbs/3.3 ft)
FEP cable	0.18 kg/m (0.40 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	1.65 kg (3.64 lbs)
Flange connection incl. measuring cell tube and sensor, without a flange	–
Total weight of device	

EN/DIN and ANSI flanges

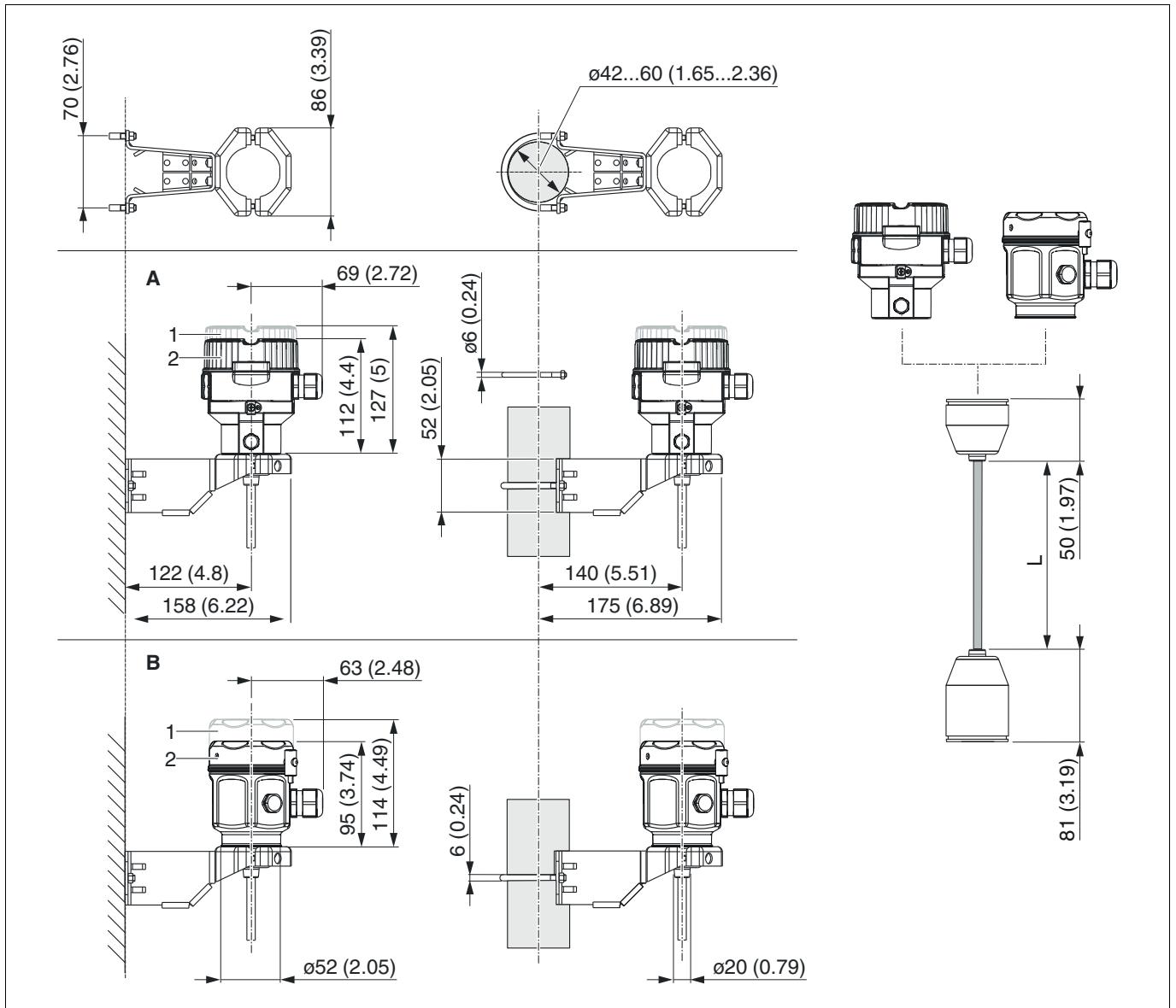


Engineering unit mm (in)

L Probe length L = 0.4 m to 4 m (1.3 ft to 13 ft), ordering designation, feature "Probe connection", see page 49 ff  
H For dimensions of process connections see page 30 ff

Process connection incl. sensor	Weight
Housing weight	see page 29 ff
Process connection weight	see page 30 ff
PE cable	0.13 kg/m (0.28 lbs/3.3 ft)
FEP cable	0.18 kg/m (0.40 lbs/3.3 ft)
Threaded connection incl. measuring cell tube and sensor	-
Flange connection incl. measuring cell tube and sensor, without a flange	1.3 kg (2.87 lbs)
Total weight of device	

### Wall and Pipe Mounting with "Separate Housing" Version



Engineering unit mm (in)

- L PE cable 2 m (6.6 ft), 5 m (16 ft) or 10 m (33 ft). FEP cable 5 m (16 ft)
- 1 Housing cover with viewing window
- 2 Housing cover without viewing window

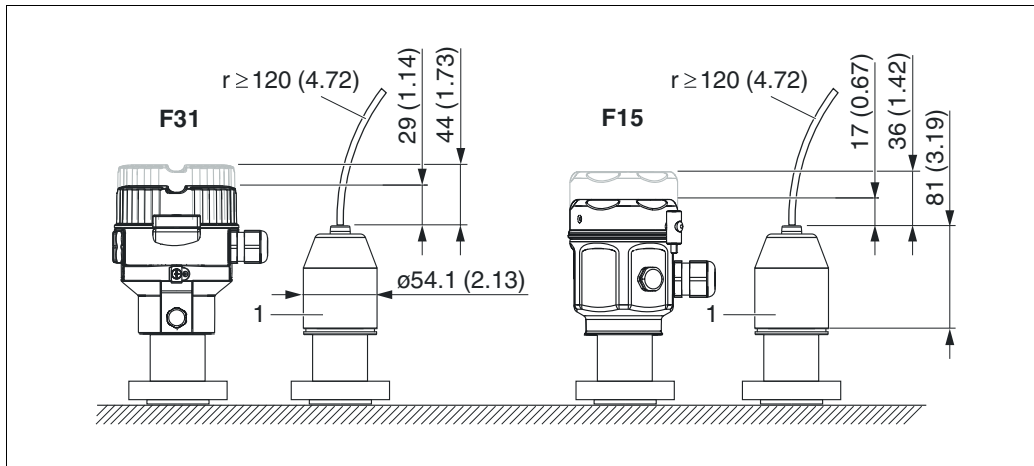
Position	Designation	Weight kg (lbs)		Option <sup>1</sup>
		Housing (F31 or F15)	Mounting bracket	
A	Dimensions with F31 housing	see page 29	0.5 (1.1)	6, 7, 8, 9
B	Dimensions with F15 housing			

<sup>1</sup> Ordering designation, feature "Separate housing", see page 49 ff

Also available for order as a separate accessory.

**Reduction in installation height**

If the separate housing is used, the mounting height of the process connection is reduced compared to the dimensions of the standard version.

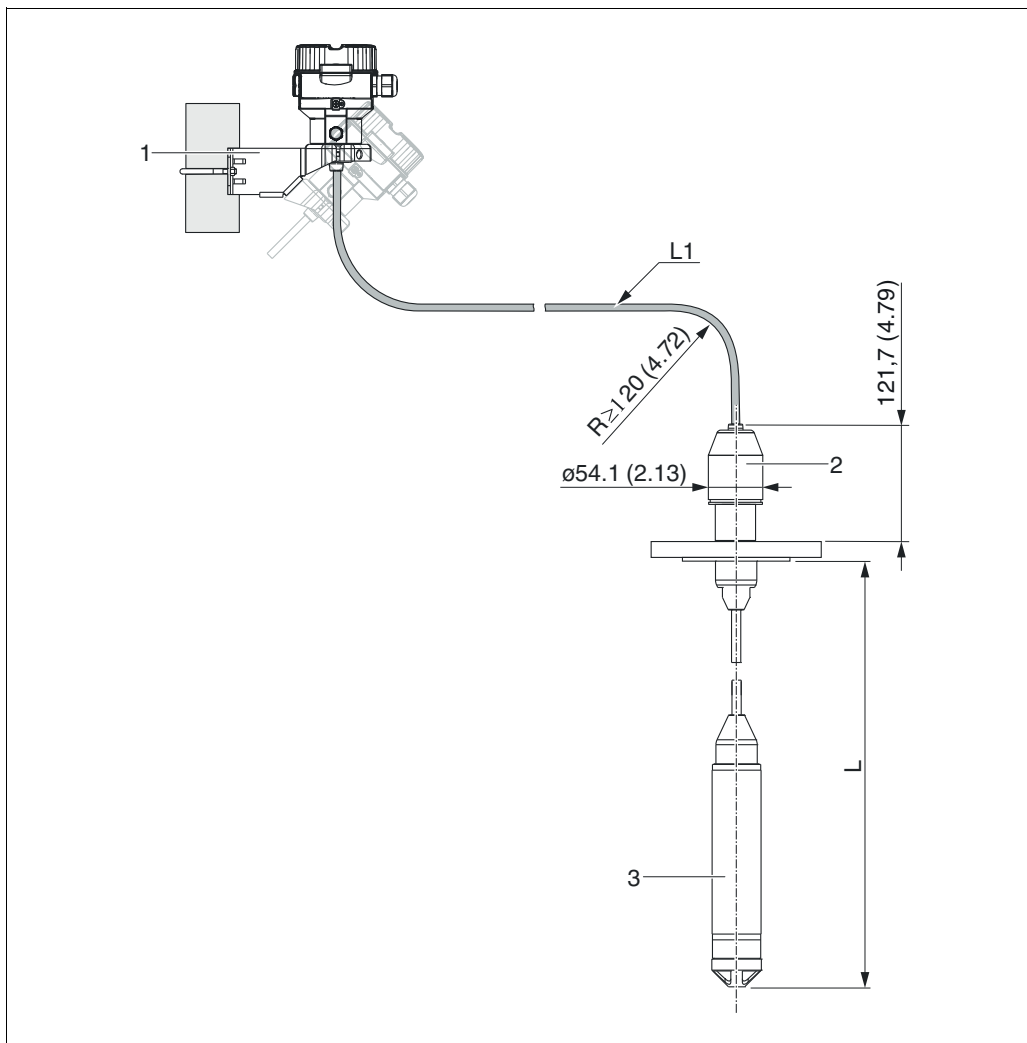


Engineering unit mm (in)

1 Process connection adapter.

A minimum bending radius ( $r$ ) of 120 mm (4.72 in) must be observed for the cable.

Example for a "Separate housing" version



Engineering unit mm (in)

Connecting cable with process connection adapter and mounting bracket, here shown with an LHCS-51

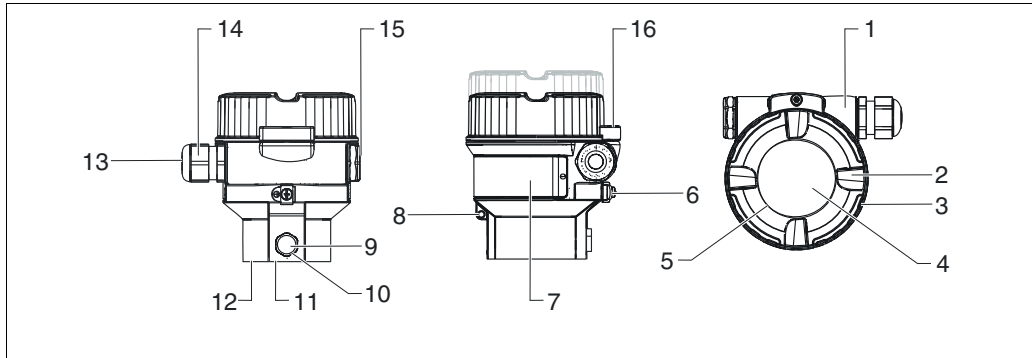
- 1 Mounting bracket for pipe and wall mounting (for pipes from 1-1/4 in up to 2 in diameter)
- 2 Process connection adapter
- 3 Measuring cell tube
- L1 PE cable = 2 m (6.6 ft), 5 m (16 ft) or 10 m (33 ft)  
FEP cable = 5 m (16 ft)
- L Probe length = 0.5 m to 400 m (1.6 ft to 1312 ft)

Process connection incl. sensor	Weight
Separate housing <sup>1</sup>	Weight of housing (see page 29 ff) + 0.65 kg (1.43 lbs)
Process connection adapter	0.4 kg (0.88 lbs)
Mounting bracket	0.2 kg (0.44 lbs)
Pipe bend incl. cable entry	0.65 kg (1.43 lbs)
PE cable 2 m (6.6 ft)	0.16 kg (0.35 lbs)
PE cable 5 m (16 ft)	0.32 kg (0.71 lbs)
Total weight of device	

<sup>1</sup> Ordering designation, feature "Separate housing", see page 49 ff

### Materials not in Contact with Process

### F31 housing

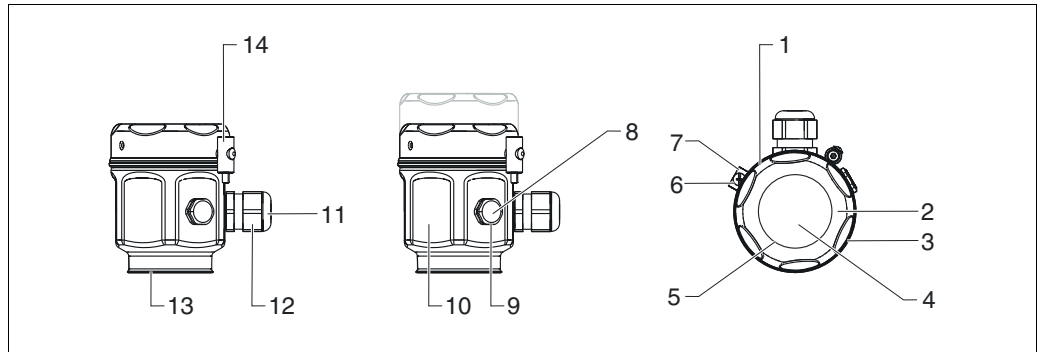


Front view, left-hand side view, top view

Position	Component part	Material
1	F31 housing (I, J)	Die-cast aluminum with protective powder-coating on polyester base
2	Cover	Die-cast aluminum with protective powder-coating on polyester base
3	Cover seal	EPDM
4	Sight glass	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	External ground terminal	AISI 304 (1.4301)
7	Nameplates	Plastic film
8	Attachment for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
9	Pressure compensation filter	PA6 GF10
10	Pressure compensation filter, O-ring	VMQ or EPDM
11	Sealing ring	EPDM
12	Snap ring	PC Plastic
13	Seal of cable gland and blind plug	EPDM/NBR
14	Cable gland	Polyamide (PA) or CuZn nickel-plated
15	Blind plug	PBT-GF30 FR for dust ignition-proof, Ex d, FM XP and CSA XP: AISI 316L (1.4435)
16	Cover clamp	Clamp AISI 316L (1.4435), screw A4



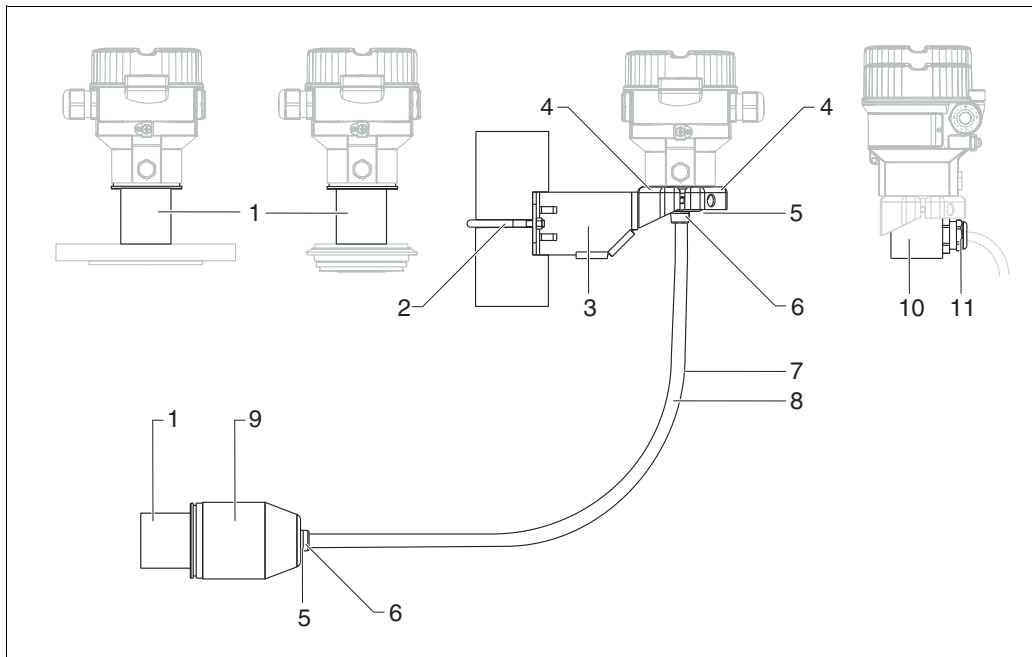
F15 housing



Front view, left-hand side view, top view

Position	Component part	Material
1	F15 housing (Q, R, S)	AISI 316L (1.4404)
2	Cover	
3	Cover seal	Silicone with PTFE coating
4	Sight glass for non-hazardous area, ATEX Ex ia, NEPSI Zone 0/1 Ex ia, IECEx Zone 0/1 Ex ia, FM NI, FM IS, CSA IS	Polycarbonate (PC)
4	Sight glass for ATEX 1/2 D, ATEX 1/3 D, ATEX 1 GD, ATEX 1/2 GD, ATEX 3 G, FM DIP, CSA dust ignition-proof	Mineral glass
5	Sight glass seal	Silicone (VMQ)
6	External ground terminal	AISI 304 (1.4301)
7	Attachment for tie-on label	AISI 304 (1.4301)/ AISI 316 (1.4401)
8	Pressure compensation filter	PA6 GF10
9	Pressure compensation filter, O-ring	VMQ or EPDM
10	Nameplates	lasered
11	Cable gland	Polyamide (PA), for dust ignition-proof: CuZn nickel-plated
12	Seal of cable gland and blind plug	NBR/Silicone/EPDM
13	Sealing ring	EPDM
14	Screw	A4-50

Connecting parts



Position	Component part	Material
1	Connection between the housing and process connection	AISI 316L (1.4404)
2	Mounting bracket	Bracket AISI 304 (1.4301), AISI 304L (1.4306)
3		Screw and nuts A2-70
4		Half-shells: AISI 304L (1.4306)
5	Seal for cable from separate housing	FKM, EPDM
6	Gland for cable from separate housing: Screws:	AISI 316L (1.4404) A2
7	PE cable for separate housing	Abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
8	FEP cable for separate housing	Abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
9	Process connection adapter for separate housing	AISI 316L (1.4404)
10	Housing adapter	AISI 316L (1.4404)
11	Cable gland: Sealing insert: O-ring:	CuZn nickel-plated TPE-V NBR

Fill fluid

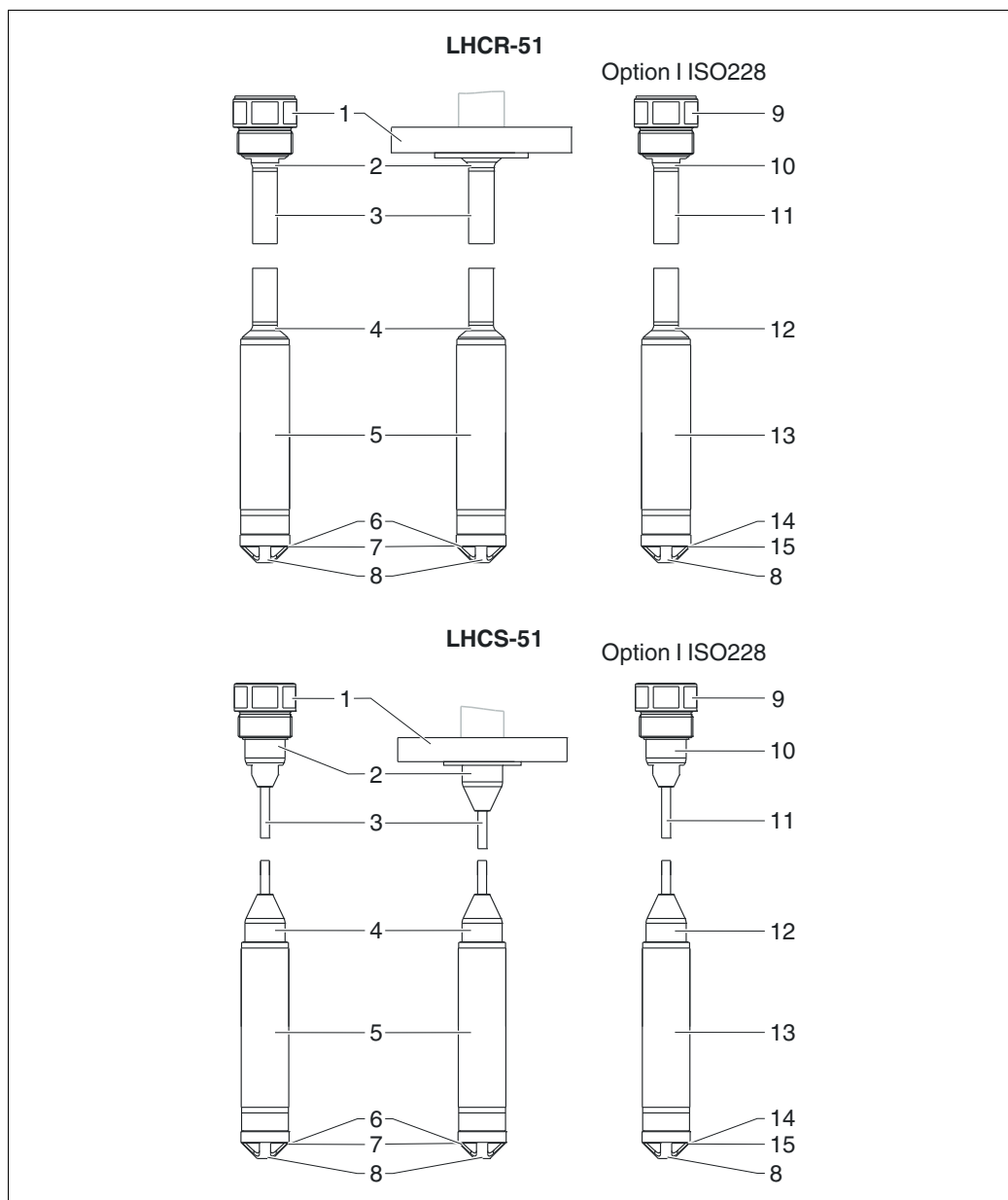
Designation	Option <sup>1</sup>
Inert oil	2
Synthetic oil polyalphaolefin FDA 21 CFR 178.3570, NSF H1	3

<sup>1</sup> Ordering designation, feature "Fill fluid", see page 49 ff

### Materials in Contact with Process



The wetted device components are listed in the "Mechanical Construction" (page 29 ff) and "Ordering Information" (page 49 ff) sections.



Position	Component part	Material
1	Process connection	see page 33 ff
2	Socket	AISI 316L (1.4404) or Alloy C4 (2.4610)
3	Rod	AISI 316L (1.4435) or Alloy C4 (2.4610)
	PE cable	Abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated film; insulated with polyethylene (PE-LD), black/blue; copper wires, twisted, UV-resistant
	PE cable (with drinking water approval)	Abrasion-proof cable with strain-relief Dynema members; shielded using aluminum-coated film; insulated with polyethylene (PE-LD), black; copper wires, twisted, UV-resistant
	FEP cable	Abrasion-proof cable; shielded using galvanized steel wire netting; insulated with fluorinated ethylene propylene (FEP), black; copper wires, twisted, UV-resistant
4	Socket	AISI 316L (1.4404) or Alloy C4 (2.4610)
5	Probe tube	AISI 316L (1.4404) or Alloy C22 (2.4602)
6	Process isolating diaphragm and meter body	see page 49 ff
7	Seals	see page 49 ff
8	Protection cap	PPO
9	Process connection	Alloy C276 (2.4819)
10	Socket	Alloy C4 (2.4610)

Position	Component part	Material
11	Rod	Alloy C4 (2.4610)
12	Socket	Alloy C4 (2.4610)
13	Probe tube	Alloy C22 (2.4602)
14	Process isolating diaphragm and meter body	see page 49 ff
15	Seals	see page 49 ff
16	Suspension clamp	AISI 316L (1.4404)
17	Clamping jaw	PA-GF

### DIN/EN flanges

Pepperl+Fuchs supplies DIN/EN flanges made of stainless steel AISI 316L as per material numbers 1.4435 or 1.4404. With regard to their stability-temperature property, the materials 1.4435 and 1.4404 are grouped together under 13EO in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical.

### Process isolating diaphragm

Material	Option <sup>1</sup>
Alloy C	4
Rhodium > Gold > AlloyC	5
Platin > Gold > AlloyC	6

<sup>1</sup> Ordering designation, feature "Material of the process isolating diaphragm", see page 49 ff

### Seals

Designation	Option <sup>1</sup>
FKM Viton	1
EPDM	4
Kalrez 6375	7
None, welded measuring cell	U

<sup>1</sup> Ordering designation, feature "Seal", see page 49 ff

### TSE Certificate of Suitability (Transmissible Spongiform Encephalopathy)

The following applies to all process wetted device components:

- They do not contain any materials derived from animals.
- No auxiliaries or operating materials derived from animals are used in production or processing.

## Operability

### Operating Concept

#### Operator-oriented menu structure for user-specific tasks

- Commissioning
- Operation
- Diagnostics
- Expert level

#### Quick and safe commissioning

Guided menus for applications

#### Reliable operation

- Onsite operation possible in several languages
- Standardized operation at the device and in the operating tools
- Parameters relating to measured values can be locked/unlocked using the device's write protection switch, using the device software or via remote control.

#### Efficient diagnostics increase measurement availability

- Remedial measures are integrated in plain text
- Diverse simulation options

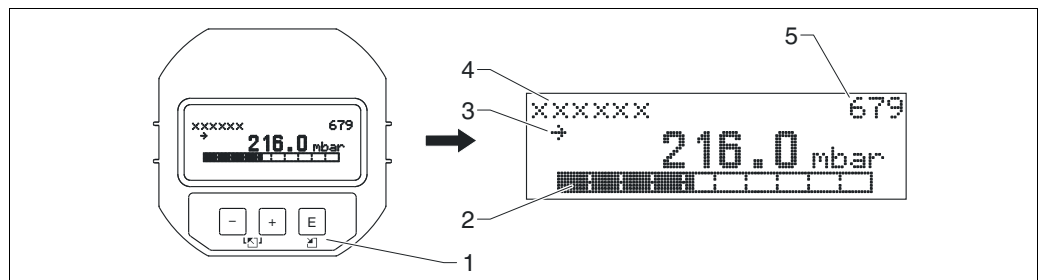
### Onsite Operation

#### Local display (optional)

A 4-line liquid crystal display (LCD) is used for display and operation. The local display shows measured values, dialog texts as well as fault and notice messages in plain text, thereby supporting the user at every stage of operation. The liquid crystal display of the device can be turned in 90° stages. Depending on the orientation of the device, this makes it easy to operate the device and read the measured values.

Functions:

- 8-digit measured value display including sign and decimal point, bar graph for 4 mA to 20 mA HART as current display; or for PROFIBUS PA as graphic display of the standardized value of the AI Block.
- Simple and complete menu guidance as parameters are split into several levels and groups
- Each parameter is given a 3-digit ID number for easy navigation
- Possibility of configuring the display to suit individual requirements and preferences, such as language, alternating display, contrast setting, display of other measured values such as sensor temperature etc.
- Comprehensive diagnostic functions (fault and warning message etc.)

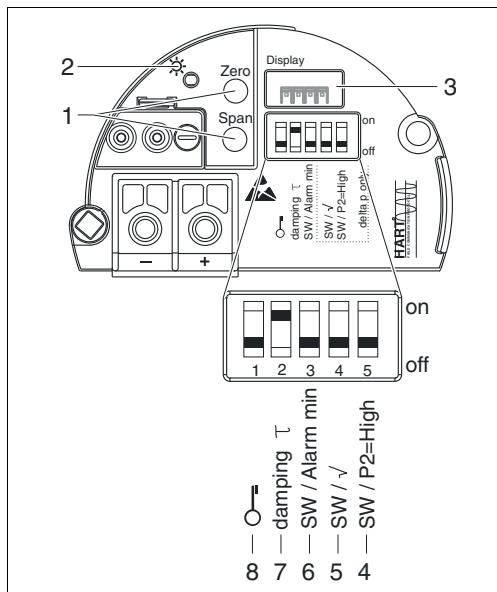


- 1 Operating keys
- 2 Bar graph
- 3 Symbol
- 4 Header
- 5 Parameter ID number

Ordering designation, feature "Display, operation", see page 49 ff

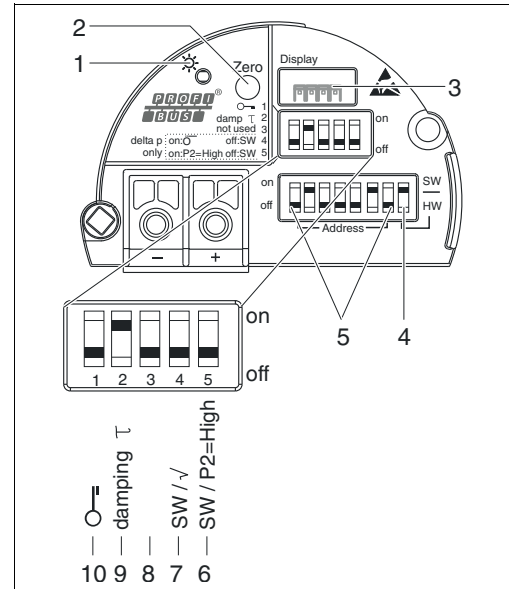
Function	Operation via display	
	HART	PROFIBUS PA
Position adjustment (zero point correction)	X	X
Setting lower range value and upper range value - reference pressure present at the device	X	X
Device reset	X	X
Locking and unlocking parameters relevant to the measured value	X	X
Value acceptance indicated by the green LED	-	-
Switching damping on and off	X	X

## Operating keys and elements located on the electronic insert



HART electronic insert

- 1 Operating keys for lower range value (zero) and upper range value (span)
- 2 Green LED to indicate successful operation
- 3 Slot for optional local display
- 4 DIP switch
- 5 DIP switch
- 6 DIP switch for alarm current SW/Alarm Min (3.6 mA)
- 7 DIP switch for switching damping on/off
- 8 DIP switch for locking/unlocking parameters relevant to the measured value



PROFIBUS PA electronic insert

- 1 Green LED to indicate successful operation
- 2 Operating key for position zero adjustment or reset (Zero)
- 3 Slot for optional local display
- 4 DIP switch for bus address SW/HW
- 5 DIP switch for hardware address
- 6 DIP switch
- 7 DIP switch
- 8 Not used
- 9 DIP switch for switching damping on/off
- 10 DIP switch for locking/unlocking parameters relevant to the measured value

Ordering designation, feature "Display, operation", see page 49 ff

Function	Operation with operating keys and operating elements on the electronic insert	
	HART	PROFIBUS PA
Position adjustment (zero point correction)	X	X
Setting lower range value and upper range value – reference pressure present at the device	X	–
Device reset	X	X
Locking and unlocking parameters relevant to the measured value	X	X
Value acceptance indicated by the green LED	X	X
Switching damping on and off	X	X

## Operating Languages

You can also choose another language in addition to the standard language "English":

Designation	Option <sup>1</sup>
English	A
German	B
French	C
Spanish	D
Italian	E
Chinese simplified	K
Japanese	L

<sup>1</sup> Ordering designation, feature "Additional operation language", see page 49 ff

### Remote Operation

All software parameters are accessible depending on the position of the write protection switch on the device.

#### HART

Remote operation via:

- PACTware™
- Field communication

#### PROFIBUS PA

Remote operation via:

- Profiboard: For connecting a PC to PROFIBUS
- Proficard: For connecting a laptop to PROFIBUS

### Hardware and Software for Onsite and Remote Operation

#### Field communication

Compact, flexible and robust industry handheld terminal for remote parametrization and measured value inspection via the HART current output (4 mA to 20 mA).

#### PACTware™

PACTware™ based on FDT technology. With PACTware™, you can configure all Pepperl+Fuchs devices as well as devices from other manufacturers that support the FDT standard.

The software supports the following functions:

- Configuration of transmitters in offline and online mode
- Loading and saving device data (upload/download)
- Documentation of the measuring point

Connection options:

- HART via field communication and the USB port on a computer
- PROFIBUS PA via segment coupler and PROFIBUS interface card

For further information see [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

### System Integration

The device can be given a tag name (max. 8 alphanumeric characters).

Designation	Option <sup>1</sup>
Measuring point (TAG), see additional specification	O
Bus address, see additional specification	P

<sup>1</sup> Ordering designation, feature "Identification", see page 49 ff

## Certificates and Approvals

<b>CE Mark</b>	The device meets the legal requirements of the relevant EC directives. Pepperl+Fuchs confirms that the device has been successfully tested by applying the CE mark.
<b>Ex Approvals</b>	<ul style="list-style-type: none"> <li>• ATEX</li> <li>• FM</li> <li>• CSA</li> <li>• Also combinations of different approvals</li> </ul> <p>All explosion protection data are given in separate documentation which is available upon request. The Ex documentation is supplied as standard with all devices approved for use in explosion hazardous areas.</p> <p>"Safety Instructions" section and "Installation/Control Drawings" section, see page 58 ff</p>
<b>Functional Safety SIL</b>	The pressure transmitter with 4 mA to 20 mA output signal has been developed to assessed and certified by TÜV NORD CERT as per IEC 61508 Edition 2.0 and IEC 61511. These devices can be used to monitor the process level and pressure up to SIL2. For a detailed description of the safety functions, settings and functional safety data, see the "Safety Integrity Level" manual.
<b>Overfill Protection</b>	WHG: see document ZE002750
<b>Pressure Equipment Directive (PED)</b>	The devices correspond to Article 3 (3) of the EC directive 97/23/EC (Pressure Equipment Directive) and has been designed and manufactured according to good engineering practice.
<b>Marine Approval</b>	<ul style="list-style-type: none"> <li>• GL (German Lloyd)</li> </ul>
<b>Other Standards and Guidelines</b>	<p><b>DIN EN 60770 (IEC 60770):</b> Transmitters for use in industrial process control systems Part 1: Methods for inspection and routine testing</p> <p><b>DIN 16086:</b> Electrical pressure measuring instruments, pressure sensors, pressure transmitters, pressure measuring instruments, concepts, specifications on data sheets</p> <p><b>EN 61326 series:</b> EMC product family standard for electrical equipment for measurement, control and laboratory use.</p>
<b>Drinking Water Approval</b>	<ul style="list-style-type: none"> <li>• KTW certificate</li> <li>• NSF 61 approval</li> <li>• ACS approval</li> </ul>
<b>Classification of Process</b>	<p><b>Classification of process sealing between electrical systems and (flammable or combustible) process fluids in accordance with ANSI/ISA 12.27.01</b></p> <p>Pepperl+Fuchs instruments are designed according to ANSI/ISA 12.27.01 either as single seal or dual seal devices with annunciation, allowing the user to waive the use and save the cost of installing external secondary process seals in the conduit as required by the process sealing sections of ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These instruments comply with the North-American installation practice and provide a very safe and cost-saving installation for pressurized applications with hazardous fluids.</p> <p>Further information can be found in the control drawings of the relevant devices.</p>



## Ordering Information

### Ordering Designation

option with \* = in preparation

Device	
LHCR-51	Pressure transmitter with hydrostatic measuring cell
Sensor range	
Sensors for gauge pressure	
1	100 mbar/10 kPa/1.5 psi gauge, 1 m H <sub>2</sub> O/3 foot H <sub>2</sub> O/40 inch H <sub>2</sub> O overload: 4 bar/400 kPa/60 psi
2	400 mbar/40 kPa/6 psi gauge, 4 m H <sub>2</sub> O/13 foot H <sub>2</sub> O/160 inch H <sub>2</sub> O overload: 8 bar/800 kPa/120 psi
3	1.2 bar/120 kPa/18 psi gauge, 12 m H <sub>2</sub> O/40 foot H <sub>2</sub> O/480 inch H <sub>2</sub> O overload: 24 bar/2.4 MPA/350 psi
4	4 bar/400 kPa/60 psi gauge, 40 m H <sub>2</sub> O/133 foot H <sub>2</sub> O/1600 inch H <sub>2</sub> O overload: 24 bar/2.4 MPA/350 psi
5	10 bar/1 Mpa/150 psi gauge, 100 m H <sub>2</sub> O/333 foot H <sub>2</sub> O/4000 inch H <sub>2</sub> O overload: 40 bar/4 MPA/600 psi
X	Special version
Calibration; unit	
1	Sensor range; mbar/bar
2	Sensor range; kPa/MPa
3	Sensor range; mm/m H <sub>2</sub> O
4	Sensor range; in H <sub>2</sub> O/ft H <sub>2</sub> O
5	Sensor range; psi
A	Sensor range; %
J	Customized pressure (see additional specification)
K	Customized level (see additional specification)
Y	Special version
Reference accuracy	
D	Platinum
G	Standard
Y	Special version
Process connection	
A	2 in 150 lbs RF, 316/316L, flange ANSI B16.5
B	3 in 150 lbs RF, 316/316L, flange ANSI B16.5
C	4 in 150 lbs RF, 316/316L, flange ANSI B16.5
F	DN40 PN10/16 B1, 316L, flange EN1092-1
G	DN50 PN10/16 B1, 316L, flange EN1092-1
J	DN80 PN10/16 B1, 316L, flange EN1092-1
H	DN100 PN10/16 B1, 316L, flange EN1092-1
I	Thread ISO228 G1-1/2, 316L, flush-mounted
D	Thread ISO228 G1-1/2, AlloyC, flush-mounted
E	Thread ANSI MNPT1-1/2, 316L, flush-mounted
X	Special version
Probe connection	
0	... mm, rod, 316L, 400 mm to 4000 mm
1	... mm, rod, AlloyC, 400 mm to 4000 mm
5	... in, rod, 316L, 16 in to 160 in
6	... in, rod, AlloyC, 16 in to 160 in
Material of the process isolating diaphragm	
4	Process isolating diaphragm and body AlloyC
5	Process isolating diaphragm and body AlloyC, coating gold > rhodium
6	Process isolating diaphragm and body AlloyC, coating gold > platinum
X	Special version
Fill fluid	
2	Inert oil
3	Synthetic oil, FDA
9	Special version

Seal	
1	FKM Viton
4	EPDM
7	Kalrez 6375
U	None, welded measuring cell
Housing	
I	Aluminum housing F31
J	Aluminum housing F31; glass window
Q	Stainless steel housing F15, hygienic version
R	Stainless steel housing F15, hygienic version; glass window
S	Stainless steel housing F15, hygienic version; plastic window
Y	Special version
Output	
H	4 mA to 20 mA SMART electronics, HART protocol
P	PROFIBUS-PA P3.0
9	Special version
Electrical connection	
A	Gland M20, IP66/68 NEMA4X/6P
C	Thread G1/2, IP66/68 NEMA4X/6P
D	Thread NPT1/2, IP66/68 NEMA4X/6P
I	Connector M12, IP66/68 NEMA4X/6P
M	Connector 7/8 in, IP66/68 NEMA4X/6P
P	Connector Han7D, 90deg., IP65
V	Valve connector ISO4400 M16, IP64
Y	Special version
Display, operation	
1	LCD, push buttons on display electronics
2	W/o LCD, push buttons on electronics
9	Special version
Approval	
CD	CSA C/US Cl. II,III Div. 1 Gr. E-G, US: Zone 21,22
CG	CSA General Purpose
CU	CSA C/US IS Cl. I,II,III Div. 1 Gr. A-G, CSA C/US IS Cl. I Div. 2 Gr. A-D, Ex ia, C: Zone 0,1,2/US: Zone 0,1,2,20,21,22
E1	ATEX II 2G Ex ia IIC T6
E2	ATEX II 3G Ex nA IIC T6
E3	ATEX II 3G Ex ic IIC T6
ES	ATEX II 1/2D Ex t IIIC
EX	ATEX II 1/2G Ex ia IIC T6
FD	FM DIP Cl. II,III Div. 1 Gr. E-G, Zone 21,22
FM	FM IS Cl. I,II,III Div. 1 Gr. A-G, AEx ia, FM NI Cl. I Div. 2 Gr. A-D, FM IS: Zone 0,1,2,20,21,22/FM NI: Zone 2
FN	FM NI Cl. I Div. 2 Gr. A-D, Zone 2
I1	IEC Ex ia IIC T6 Ga/Gb + Ex ia IIIC Da/Db
IA	IEC Ex ia IIC T6 Ga/Gb
ID	IEC Ex t IIIC Da/Db
IE	IEC Ex ic IIC T6 Gc
NA	For non-hazardous areas
SX	ATEX II 1/2G Ex ia IIC T6 + ATEX II 1/2D Ex iaD

### Options

option with \* = in preparation

no option = 0

Additional operation language	
A	English
B	German
C	French

D	Spanish
E	Italian
K	Chinese simplified
L	Japanese
<b>Calibration</b>	
1	Factory calibration certificate, 5-point
<b>Service (multiple selection possible)</b>	
F	Oil and grease removed (only device, not accessory or enclosed accessory)
<b>Test, certificate (multiple selection possible)</b>	
3	Material certification, metallic parts in contact with medium, EN 10204-3.1 inspection certificate
<b>Other approvals (multiple selection possible)</b>	
H	SIL
J	GL marine certificate
W	WHG overfill prevention
<b>Separate housing (multiple selection possible)</b>	
6	Cable PE, 2 m/80 in and housing mounting bracket, wall/pipe, 304
7	Cable PE, 5 m/200 in and housing mounting bracket, wall/pipe, 304
8	Cable PE, 10 m/400 in and housing mounting bracket, wall/pipe, 304
9	Cable FEP, 5 m/200 in IP69K and housing mounting bracket, wall/pipe, 304
<b>Firmware version</b>	
M	01.00.zz, PROFIBUS PA, DevRev01
N	01.00.zz, HART, DevRev01
<b>Identification (multiple selection possible)</b>	
O	Measuring point (TAG), see additional specification
P	Bus address, see additional specification

### Ordering Designation

option with \* = in preparation

Device	
LHCS-51	Pressure transmitter with hydrostatic measuring cell
Sensor range	
Sensors for gauge pressure	
1	100 mbar/10 kPa/1.5 psi gauge, 1 m H <sub>2</sub> O/3 foot H <sub>2</sub> O/40 inch H <sub>2</sub> O overload: 4 bar/400 kPa/60 psi
2	400 mbar/40 kPa/6 psi gauge, 4 m H <sub>2</sub> O/13 foot H <sub>2</sub> O/160 inch H <sub>2</sub> O overload: 8 bar/800 kPa/120 psi
3	1.2 bar/120 kPa/18 psi gauge, 12 m H <sub>2</sub> O/40 foot H <sub>2</sub> O/480 inch H <sub>2</sub> O overload: 24 bar/2.4 MPA/350 psi
4	4 bar/400 kPa/60 psi gauge, 40 m H <sub>2</sub> O/133 foot H <sub>2</sub> O/1600 inch H <sub>2</sub> O overload: 24 bar/2.4 MPA/350 psi
5	10 bar/1 Mpa/150 psi gauge, 100 m H <sub>2</sub> O/333 foot H <sub>2</sub> O/4000 inch H <sub>2</sub> O overload: 40 bar/4 MPA/600 psi
X	Special version
Calibration; unit	
1	Sensor range; mbar/bar
2	Sensor range; kPa/MPa
3	Sensor range; mm/m H <sub>2</sub> O
4	Sensor range; in H <sub>2</sub> O/ft H <sub>2</sub> O
5	Sensor range; psi
A	Sensor range; %
J	Customized pressure (see additional specification)
K	Customized level (see additional specification)
Y	Special version
Reference accuracy	
D	Platinum
G	Standard
Y	Special version
Process connection	
A	2 in 150 lbs RF, 316/316L, flange ANSI B16.5
B	3 in 150 lbs RF, 316/316L, flange ANSI B16.5
C	4 in 150 lbs RF, 316/316L, flange ANSI B16.5
F	DN40 PN10/16 B1, 316L, flange EN1092-1
G	DN50 PN10/16 B1, 316L, flange EN1092-1
J	DN80 PN10/16 B1, 316L, flange EN1092-1
H	DN100 PN10/16 B1, 316L, flange EN1092-1
I	Thread ISO228 G1-1/2, 316L, flush-mounted
D	Thread ISO228 G1-1/2, AlloyC, flush-mounted
E	Thread ANSI MNPT1-1/2, 316L, flush-mounted
X	Special version
Probe connection	
A	... mm, cable, PE, 500 mm to 400.000 mm
B	... in, cable, PE, 20 in to 15.748 in
C	... mm, cable, FEP, 500 mm to 400.000 mm
D	... in, cable, FEP, 20 in to 15.748 in
Material of the process isolating diaphragm	
4	Process isolating diaphragm and body AlloyC
5	Process isolating diaphragm and body AlloyC, coating gold > rhodium
6	Process isolating diaphragm and body AlloyC, coating gold > platinum
X	Special version
Fill fluid	
2	Inert oil
3	Synthetic oil, FDA
9	Special version
Seal	

1	FKM Viton
4	EPDM
7	Kalrez 6375
U	None, welded measuring cell
<b>Housing</b>	
I	Aluminum housing F31
J	Aluminum housing F31; glass window
Q	Stainless steel housing F15, hygienic version
R	Stainless steel housing F15, hygienic version; glass window
S	Stainless steel housing F15, hygienic version; plastic window
Y	Special version
<b>Output</b>	
H	4 mA to 20 mA SMART electronics, HART protocol
P	PROFIBUS-PA, P3.0
9	Special version
<b>Electrical connection</b>	
A	Gland M20, IP66/68 NEMA4X/6P
C	Thread G1/2, IP66/68 NEMA4X/6P
D	Thread NPT1/2, IP66/68 NEMA4X/6P
I	Connector M12, IP66/68 NEMA4X/6P
M	Connector 7/8 in, IP66/68 NEMA4X/6P
P	Connector Han7D, 90deg., IP65
V	Valve connector ISO4400 M16, IP64
Y	Special version
<b>Display, operation</b>	
1	LCD, push buttons on display electronics
2	W/o LCD, push buttons on electronics
9	Special version
<b>Approval</b>	
CU	CSA C/US IS Cl. I,II,III Div. 1 Gr. A-G, CSA C/US IS Cl. I Div. 2 Gr. A-D, Ex ia, C: Zone 0,1,2/US: Zone 0,1,2,20,21,22
CG	CSA General Purpose
E1	ATEX II 2G Ex ia IIC T6
E2	ATEX II 3G Ex nA IIC T6
E3	ATEX II 3G Ex ic IIC T6
EX	ATEX II 1/2G Ex ia IIC T6
FE	FM IS Cl. I Div. 1 Gr. A-D, AEx ia, Zone 0, 1, 2
IA	IEC Ex ia IIC T6 Ga/Gb
IE	IEC Ex ic IIC T6 Gc
NA	For non-hazardous areas

### Options

option with \* = in preparation

no option = 0

<b>Additional operation language</b>	
A	English
B	German
C	French
D	Spanish
E	Italian
K	Chinese simplified
L	Japanese
<b>Calibration</b>	
1	Factory calibration certificate, 5-point
<b>Service (multiple selection possible)</b>	
F	Oil and grease removed
<b>Test, certificate (multiple selection possible)</b>	

3	Material certification, metallic parts in contact with medium, EN 10204-3.1 inspection certificate
<b>Other approvals (multiple selection possible)</b>	
H	SIL
J	GL marine certificate
W	WHG overfill prevention
<b>Separate housing (multiple selection possible)</b>	
6	Cable PE, 2 m/80 in and housing mounting bracket, wall/pipe, 304
7	Cable PE, 5 m/200 in and housing mounting bracket, wall/pipe, 304
8	Cable PE, 10 m/400 in and housing mounting bracket, wall/pipe, 304
9	Cable FEP, 5 m/200 in IP69K and housing mounting bracket, wall/pipe, 304
<b>Firmware version</b>	
M	01.00.zz, PROFIBUS PA, DevRev01
N	01.00.zz, HART, DevRev01
<b>Identification (multiple selection possible)</b>	
O	Measuring point (TAG), see additional specification
P	Bus address, see additional specification

### Configuration Data Sheet

**Level**                                      The following configuration data sheet has to be filled in and included with the order if the version "K" has been selected in feature "Calibration; unit" in the product structure.

Pressure Engineering Unit		Output Unit (Scaled unit)				
<input type="checkbox"/> mbar	<input type="checkbox"/> mmH <sub>2</sub> O	<input type="checkbox"/> mmHg				
<input type="checkbox"/> bar	<input type="checkbox"/> mH <sub>2</sub> O	<input type="checkbox"/> kgf/cm <sup>2</sup>	<input type="checkbox"/> Pa	<input type="checkbox"/> kPa	<input type="checkbox"/> MPa	
<input type="checkbox"/> psi	<input type="checkbox"/> inH <sub>2</sub> O					

Mass	Length	Volume	Volume	Percent
<input type="checkbox"/> kg	<input type="checkbox"/> m	<input type="checkbox"/> l	<input type="checkbox"/> gal	<input type="checkbox"/> %
<input type="checkbox"/> t	<input type="checkbox"/> dm	<input type="checkbox"/> hl	<input type="checkbox"/> lgal	
<input type="checkbox"/> lb	<input type="checkbox"/> cm	<input type="checkbox"/> m <sup>3</sup>		
	<input type="checkbox"/> mm	<input type="checkbox"/> ft <sup>3</sup>		
	<input type="checkbox"/> ft	<input type="checkbox"/> in <sup>3</sup>		
	<input type="checkbox"/> inch			

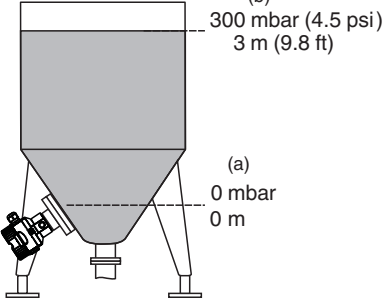
Empty pressure [a]: \_\_\_\_\_  
 Low pressure value (empty) [pres. eng. unit]

Full pressure [b]: \_\_\_\_\_  
 High pressure value (full) [pres. eng. unit]

Empty calibration [a]: \_\_\_\_\_  
 Low level value (empty) [Scaled Unit]

Full calibration [b]: \_\_\_\_\_  
 High level value (full) [Scaled Unit]

**Example**



### Display Information

- |  |   |
|--|---|
| <b>1st Value Display <sup>1</sup></b><br><input type="checkbox"/> Main Value | <b>2nd Value Display <sup>1</sup></b><br><input type="checkbox"/> none (Default)<br><input type="checkbox"/> Main Value [%]<br><input type="checkbox"/> Pressure<br><input type="checkbox"/> Current [mA] (HART only)<br><input type="checkbox"/> Temperature |
|--|---|

<sup>1</sup> Depending on sensor and communication variant

### Damping

Damping: \_\_\_\_\_ sec (Default 2 sec)

**Pressure**

The following configuration data sheet has to be filled in and included with the order if the version "J" has been selected in feature "Calibration; unit" in the product structure.

Pressure Engineering Unit	
<input type="checkbox"/> mbar	<input type="checkbox"/> mmH <sub>2</sub> O
<input type="checkbox"/> bar	<input type="checkbox"/> mHg
<input type="checkbox"/> psi	<input type="checkbox"/> inH <sub>2</sub> O
<input type="checkbox"/> Pa	<input type="checkbox"/> kPa
<input type="checkbox"/> MPa	<input type="checkbox"/> kgf/cm <sup>2</sup>
Calibration Range/Output	
Low range value (LRV): _____	[pressure engineering unit]
Upper range value (URV): _____	[pressure engineering unit]
Display Information	
1st Value Display <sup>1</sup>	2nd Value Display <sup>1</sup>
<input type="checkbox"/> Main Value	<input type="checkbox"/> none (Default)
	<input type="checkbox"/> Main Value [%]
	<input type="checkbox"/> Pressure
	<input type="checkbox"/> Current [mA] (HART only)
	<input type="checkbox"/> Temperature
<sup>1</sup> Depending on sensor and communication variant	
Damping	
Damping: _____	sec (Default 2 sec)



Smallest calibratable span (preset at the factory), see page 13 ff.

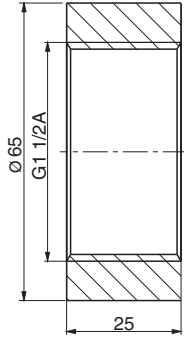


## Accessories

M12 Connector see page 20 ff

Mounting Bracket for Wall and Pipe Mounting see page 25 ff

Welding Necks and Weld-in Tool Flanges

	
<b>Type</b>	<b>G1-1/2, flush mounted</b>
Material	316L
Order	
LHCR-51	X
LHCS-51	X
	<b>Weld-in tool adapters</b>
Material	brass
LHCR-51	X
LHCS-51	X

## Supplementary Documentation

**Technical Information** • LHC-M51, PPC-M51: TI00436O/98/EN

**Operating Instructions** • 4 mA to 20 mA HART: BA00382O/98/EN  
• PROFIBUS PA: BA00383O/98/EN

**Brief Operating Instructions** • 4 mA to 20 mA HART: KA01033O/98/EN  
• PROFIBUS PA: KA01034O/98/EN

**Functional Safety Manual (SIL)** 4 mA ... 20 mA HART: SD00347O/98/EN

### Safety Instructions

Authorities	Version in the order code	Approval	Category	Type	Electronics	Documentation
ATEX	EX	Ex ia IIC	II 1/2 G	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00474O/98
	ES	Ex t IIC	II 1/2 D	LHCR-51	4 mA to 20 mA HART PROFIBUS PA	SI00475O/98
	E2	Ex nA	II 3 G	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00477O/98
	E1	Ex ia IIC	II 2 G	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00474O/98
	E3	Ex ic IIC	II 3 G	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00494O/98
	SX	Ex ia IIC Ex ia IIC	II 1/2 G II 1/2 D	LHCR-51	4 mA to 20 mA HART PROFIBUS PA	SI00476O/98

Authorities	Version in the order code	Approval	Category	Type	Electronics	Documentation
IECEX	IA	Ex ia IIC	Ga/Gb	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00478O/98
	IC	Ex ia IIC	Gb	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00478O/98
	ID	Ex t IIIC	Da/Db	LHCR-51	4 mA to 20 mA HART PROFIBUS PA	SI00479O/98
	IE	Ex ic IIC	Gc	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00493O/98
	I1	Ex ia IIC Ex ia IIC	Ga/Gb Da/Db	LHCR-51	4 mA to 20 mA HART PROFIBUS PA	SI00480O/98

### Installation/Control Drawings

Authorities	Version in the order code	Approval	Type	Electronics	Documentation
FM	FM	FM IS Cl. I, II, III Div. 1 Gr. A-G, AEx ia, Zone 0, 1, 2, 20, 21, 22	LHCR-51	4 mA to 20 mA HART PROFIBUS PA	SI00566O/98
	FD	FM DIP Cl. II, III Div. 1 Gr. E-G, Zone 21,22	LHCR-51	4 mA to 20 mA HART	
CSA	CU	C/US IS Cl. I, II, III Div. 1 Gr. A-G, C/US IS Cl. I Div. 2 Gr. A-D, Ex ia C: Zone 0, 1, 2 US: Zone 0, 1, 2, 20, 21, 22	LHCR-51, LHCS-51	4 mA to 20 mA HART PROFIBUS PA	SI00560O/98
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