

Ultrasonic Level Sensor LUC-M**

Compact transmitters for non-contact level measurement of fluids, pastes and coarse bulk materials



Application

- Continuous, non-contact level measurement in fluids, pastes, sullages and coarse bulk materials
- Flow measurement in open channels and measuring weirs
- System integration via:
 - HART (standard), 4 mA ... 20mA
 - PROFIBUS PA
- Maximum measuring range:
 - LUC-M10:
 - 5 m (16.4 ft) in fluids
 - 2 m (6.6 ft) in bulk materials
 - LUC-M20:
 - 8 m (26.2 ft) in fluids
 - 3,5 m (11.5 ft) in bulk materials
 - LUC-M30:
 - 15 m (49.2 ft) in fluids
 - 7 m (23 ft) in bulk materials
 - LUC-M40:
 - 10 m (32.8 ft) in fluids
 - 5 m (16.4 ft) in bulk materials

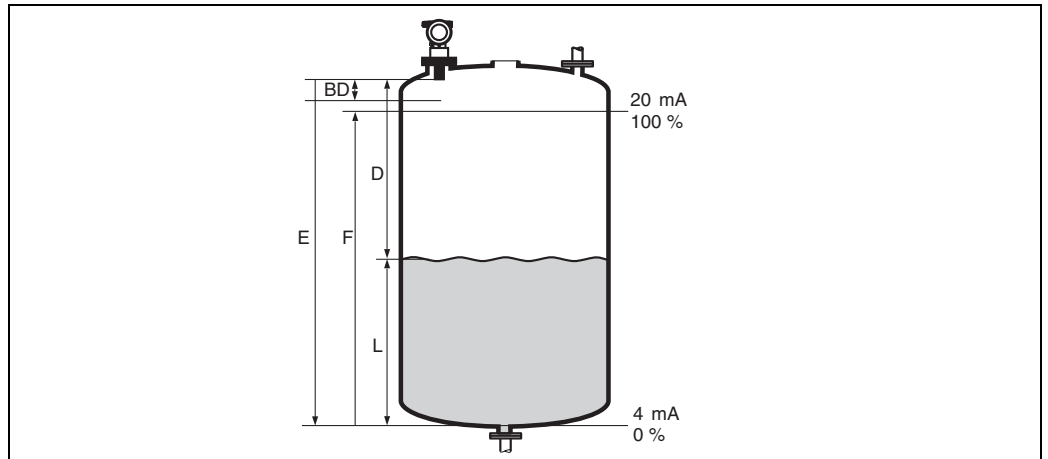
Features

- Quick and simple commissioning via menu-guided on-site operation with four-line plain text display
- Envelope curves on the on-site display for simple diagnosis
- Suitable for explosion hazardous areas (Gas-Ex, Dust-Ex)
- Linearisation function (up to 32 points) for conversion of the measured value into any unit of length, volume or flow rate
- Non-contact measurement method minimizes service requirements
- Optional remote display and operation (up to 20 m from transmitter)
- Installation possible from thread G1½ or 1½ NPT upwards
- Integrated temperature sensor for automatic correction of the temperature dependent sound velocity

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Function and system design

Measuring principle



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

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

Time-of-flight method

The sensor of the LUC-M** transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The LUC-M** measures the time *t* between pulse transmission and reception. The instrument uses the time *t* (and the velocity of sound *c*) to calculate the distance *D* between the sensor membrane and the product surface:

$$D = c \times t/2$$

As the device knows the empty distance *E* from a user entry, it can calculate the level as follows:

$$L = E - D$$

An integrated temperature sensor compensates for changes in the velocity of sound caused by temperature changes.

Interference echo suppression

The interference echo suppression feature on the LUC-M** ensures that interference echoes (e. g. from edges, welded joints and installations) are not interpreted as a level echo.

Calibration

Enter the empty distance *E* and the span *F* to calibrate the device.

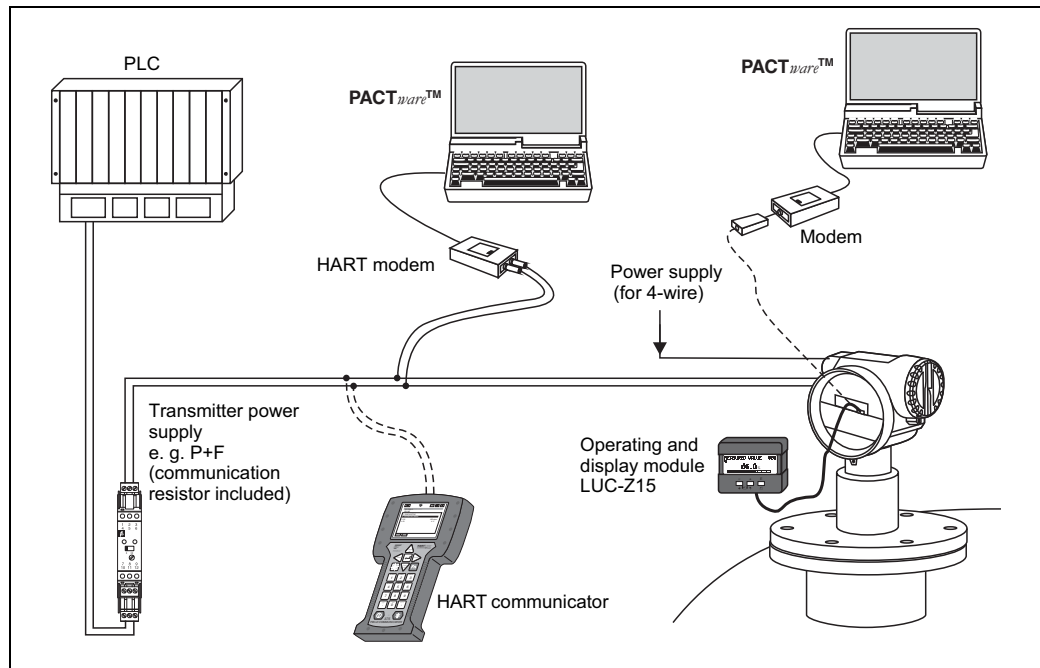
Blocking distance

Span *F* may not extend into the blocking distance *BD*. Level echoes from the blocking distance cannot be evaluated due to the transient characteristics of the sensor.

Equipment architecture

4 mA ... 20 mA output with HART protocol

The complete measuring system consists of:



If the HART communication resistor is not built into the supply unit, it is necessary to insert a communication resistor of 250 Ω into the 2-wire line.

On-site operation

- with display and operating module LUC-Z15
- with a Personal Computer, a modem and the operating software **PACTware™**

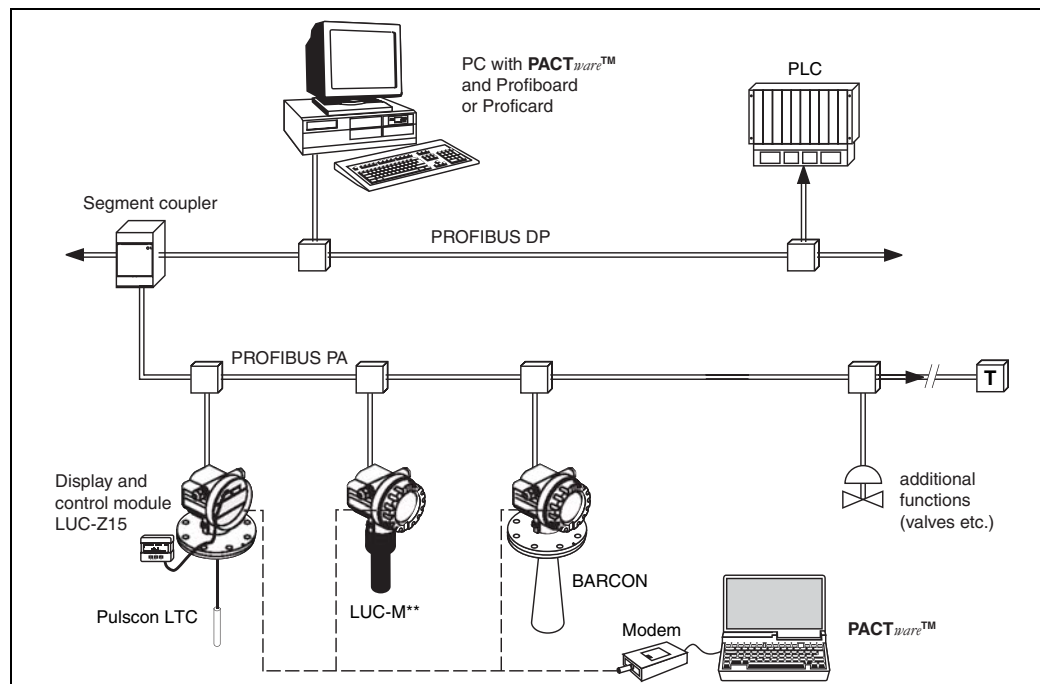
Remote operation

- with HART handheld terminal
- with a Personal Computer, a HART modem and the operating software **PACTware™**

System integration using PROFIBUS PA

A maximum of 32 transmitters (8 if mounted in an explosion hazardous location EEx ia IIC according to FISCO-model) can be connected to the bus. The segment coupler provides the operating voltage to the bus. Both on-site as well as remote operation are possible.

For detailed information on the PROFIBUS PA standard refer to the standards EN 50170/ DIN 19245 (PROFIBUS PA) and EN 50020 (FISCO model).



Input

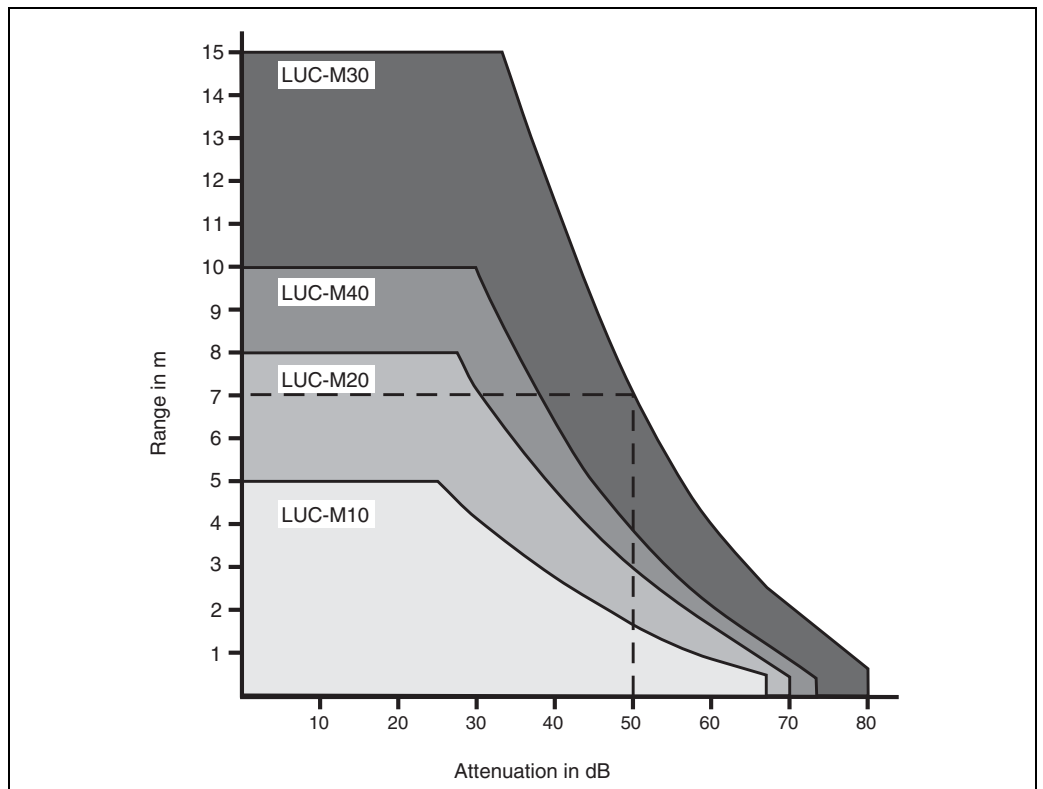
Measured variable The distance D between the sensor membrane and the product surface is measured. Using the linearisation function, the device uses D to calculate:

- level L in any units
- volume V in any units
- flow Q across measuring weirs or open channels in any units

Measuring range The measuring range is limited by the range of a sensor. The sensor range is, in turn, dependent on the operating conditions. To estimate the actual range, proceed as follows (see also the calculation example):

1. Determine which of the influences shown in the following table are appropriate for your process.
2. Add the corresponding attenuation values.
3. From the total attenuation, use the diagram to calculate the range.

Fluid surface	Attenuation
calm	0 dB
waves	5 dB ... 10 dB
strong turbulence (e. g. stirrers)	10 dB ... 20 dB
foaming	ask Pepperl+Fuchs
Bulk material surface	Attenuation
hard, rough (e. g. rubble)	40 dB
soft (e. g. peat, dust-covered clinker)	40 dB ... 60 dB
Dust	Attenuation
no dust formation	0 dB
little dust formation	5 dB
heavy dust formation	5 dB ... 20 dB
Filling curtain in detection range	Attenuation
none	0 dB
small quantities	5 dB ... 10 dB
large quantities	10 dB ... 40 dB
Temperature difference between sensor and product surface	Attenuation
to 20 °C (293 K)	0 dB
to 40 °C (313 K)	5 dB ... 10 dB
to 80 °C (353 K)	10 dB ... 20 dB



Example (for LUC-M30)

For typical solid applications, a certain amount of dust coverage is normally present. Therefore, the following range results from the table and the diagram.

- Dust-covered rubble approx. 50 dB
- No dust development 0 dB
- No filling curtain in detection range 0 dB
- Temperature difference < 20 K $\frac{0 \text{ dB}}{\text{approx. 50 dB}}$ → range approx. 7 m (23 ft)

These measuring conditions have been taken into account during the calculation of the maximum measuring range in solid applications.

Operating frequency

Sensor	Operating frequency
LUC-M10	approx. 70 kHz
LUC-M20	approx. 50 kHz
LUC-M30	approx. 35 kHz
LUC-M40	approx. 42 kHz

Output

Output signal

according to the instrument version ordered:

- 4 mA ... 20 mA with HART protocol
- PROFIBUS PA

Signal on alarm

Error information can be accessed via the following interfaces:

- on-site display (error symbol, error code and plain text description)
- current output (configurable)
- digital interface

Load HART

Minimum load for HART communication: 250 Ω

Output damping

freely selectable, 0 s ... 255 s

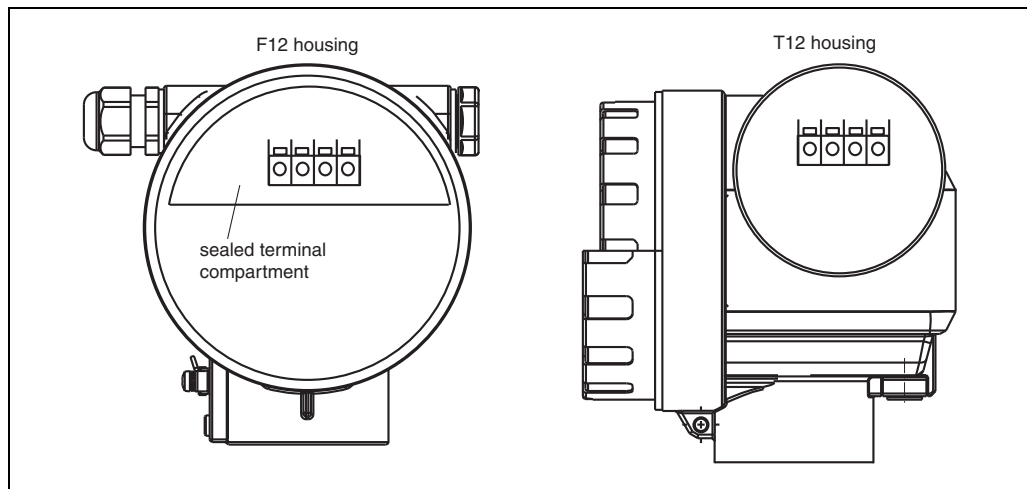
Linearisation

The linearisation function of the LUC-M** allows conversion of the measured value into any unit of length or volume. In open channels or measuring weirs, also a flow linearisation is possible (calculation of the flow from the measured level). The linearisation table for calculating the volume in an horizontal cylindrical tank is preprogrammed. You can also enter any number of other tables containing up to 32 value pairs either manually or semi-automatically (by filling the vessel under controlled conditions).

Auxiliary energy

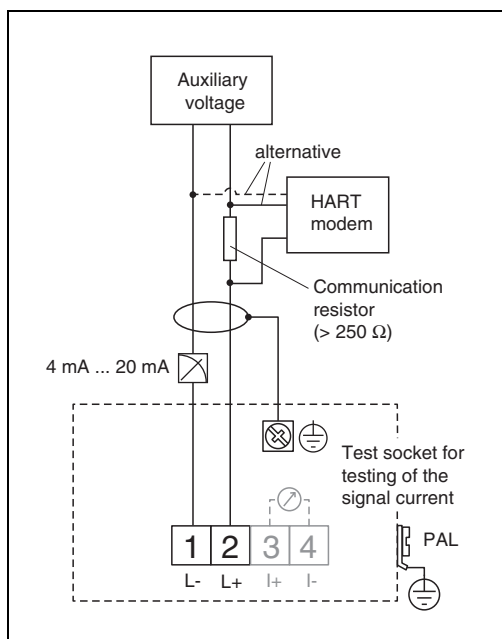
Terminal compartment

In the F12 housing, the terminals are located underneath the housing cover. In the T12 housing, they are under the cover of the separate terminal compartment.

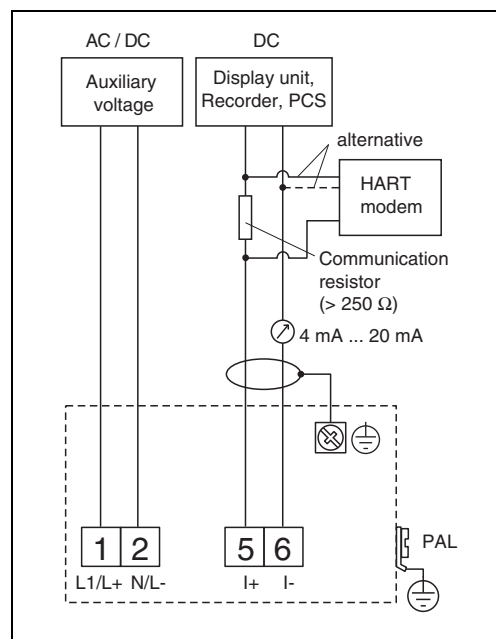


Terminal assignment

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

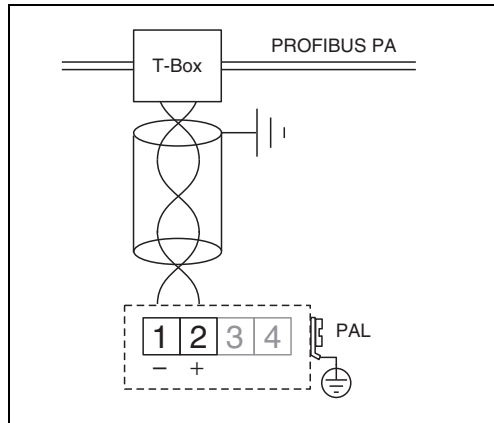


4 mA ... 20 mA with HART, active, 4-wire



- Connect the connecting line to the screw terminals (line cross-sections of 0.5 mm ... 2.5 mm (0.02 in ... 0.1 in)) in the terminal compartment.
- Use 2-wire twisted pair cable with screen for the connection.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device.

PROFIBUS PA



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

Fieldbus plug connector

For the versions with fieldbus plug connector, the signal line can be connected without opening the housing.

Pin assignment of the M12 plug connector (PROFIBUS PA plug)

	Pin	Meaning
	1	Ground
	2	Signal +
	3	Signal -
	4	not connected

Supply voltage

HART, 2-wire

The following values are the voltages across the terminals directly at the instrument:

Version	Current consumption	Terminal voltage minimum	Terminal voltage maximum
2-wire HART	standard	4 mA	14 V
		20 mA	8 V
	EEx ia	4 mA	14 V
		20 mA	8 V
	EEx d	4 mA	14 V
		20 mA	11 V
fixed current, adjustable, e. g. for solar power operation (measured value via HART)	standard	11 mA	10 V
	EEx ia	11 mA	10 V
fixed current for HART multidrop mode	standard	4 mA ¹⁾	14 V
	EEx ia	4 mA ¹⁾	14 V

¹⁾ Start-up current 11 mA

HART, 4-wire

Version	Voltage	Max. load
DC	10.5 V ... 32 V	600 Ω
AC 50/60 Hz	90 V ... 253 V	600 Ω

Cable entry	<ul style="list-style-type: none"> • cable gland: M20 x 1.5 (recommended cable diameter 6 mm ... 10 mm (0.24 in ... 0.4 in)) • cable entry G½ or ½ NPT • PROFIBUS PA M12 plug 										
Terminals	Cable cross section 0.5 mm ² ... 2.5 mm ² (20 AWG ... 14 AWG)										
Power consumption	<table border="1"> <thead> <tr> <th>Version</th> <th>Power consumption</th> </tr> </thead> <tbody> <tr> <td>2-wire</td> <td>51 mW ... 800 mW</td> </tr> <tr> <td>4-wire AC</td> <td>max. 4 VA</td> </tr> <tr> <td>4-wire DC; LUC-M10/LUC-M20</td> <td>330 mW ... 830 mW</td> </tr> <tr> <td>4-wire DC; LUC-M30/LUC-M40</td> <td>600 mW ... 1 W</td> </tr> </tbody> </table>	Version	Power consumption	2-wire	51 mW ... 800 mW	4-wire AC	max. 4 VA	4-wire DC; LUC-M10/LUC-M20	330 mW ... 830 mW	4-wire DC; LUC-M30/LUC-M40	600 mW ... 1 W
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Current consumption (2-wire instruments)	<table border="1"> <thead> <tr> <th>Communication</th> <th>Current consumption</th> </tr> </thead> <tbody> <tr> <td>HART</td> <td>3.6 mA ... 22 mA</td> </tr> <tr> <td>PROFIBUS PA</td> <td>max. 13 mA</td> </tr> </tbody> </table>	Communication	Current consumption	HART	3.6 mA ... 22 mA	PROFIBUS PA	max. 13 mA				
Communication	Current consumption										
HART	3.6 mA ... 22 mA										
PROFIBUS PA	max. 13 mA										
HART ripple	47 Hz ...125 Hz: $U_{pp} = 200 \text{ mV}$ (measured at 500 Ω)										
Max. noise HART	500 Hz ...10 kHz: $U_{rms} = 2.2 \text{ mV}$ (measured at 500 Ω)										
Galvanic isolation	With 4-wire devices, the evaluation electronics and mains voltage are galvanically isolated from each other.										

Performance characteristics

Reaction time

The reaction time depends on the parameter settings. The minimum values are:

- 2-wire devices (LUC-M10, LUC-M20, LUC-M40): min. 2 s
- 2-wire devices (LUC-M30 – PROFIBUS PA): min. 2 s
- 4-wire devices (LUC-M10, LUC-M20, LUC-M30, LUC-M40): min. 0.5 s

Reference operating conditions

- temperature = +20 °C (293 K)
- pressure = 1013 mbar abs.
- humidity = 50 %
- ideal reflective surface (e. g. calm, smooth fluid surface)
- no interference reflections within signal beam
- set application parameters:
 - tank shape = flat ceiling
 - medium property = liquid
 - process conditions = calm surface

Measured value resolution

Sensor	Measured value resolution
LUC-M10	1 mm (0.04 in)
LUC-M20	1 mm (0.04 in)
LUC-M30	2 mm (0.08 in)
LUC-M40	2 mm (0.08 in)

Pulse frequency

- 2-wire devices (LUC-M10, LUC-M20, LUC-M40): max. 0.5 Hz
- 2-wire devices (LUC-M30 – PROFIBUS PA): max. 0.5 Hz
- 4-wire devices (LUC-M10, LUC-M20, LUC-M30, LUC-M40): max. 2 Hz

The exact values are dependent on the type of device and the parameter settings.

Measuring error

Typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis):

Sensor	Measuring error
LUC-M10	± 2 mm (0.08 in) or 0.2% of set measuring range (empty calibration) ¹⁾
LUC-M20	± 2 mm (0.08 in) or 0.2% of set measuring range (empty calibration) ¹⁾
LUC-M30	± 4 mm (0.16 in) or 0.2% of set measuring range (empty calibration) ¹⁾
LUC-M40	± 4 mm (0.16 in) or 0.2% of set measuring range (empty calibration) ¹⁾

¹⁾ whichever is greater

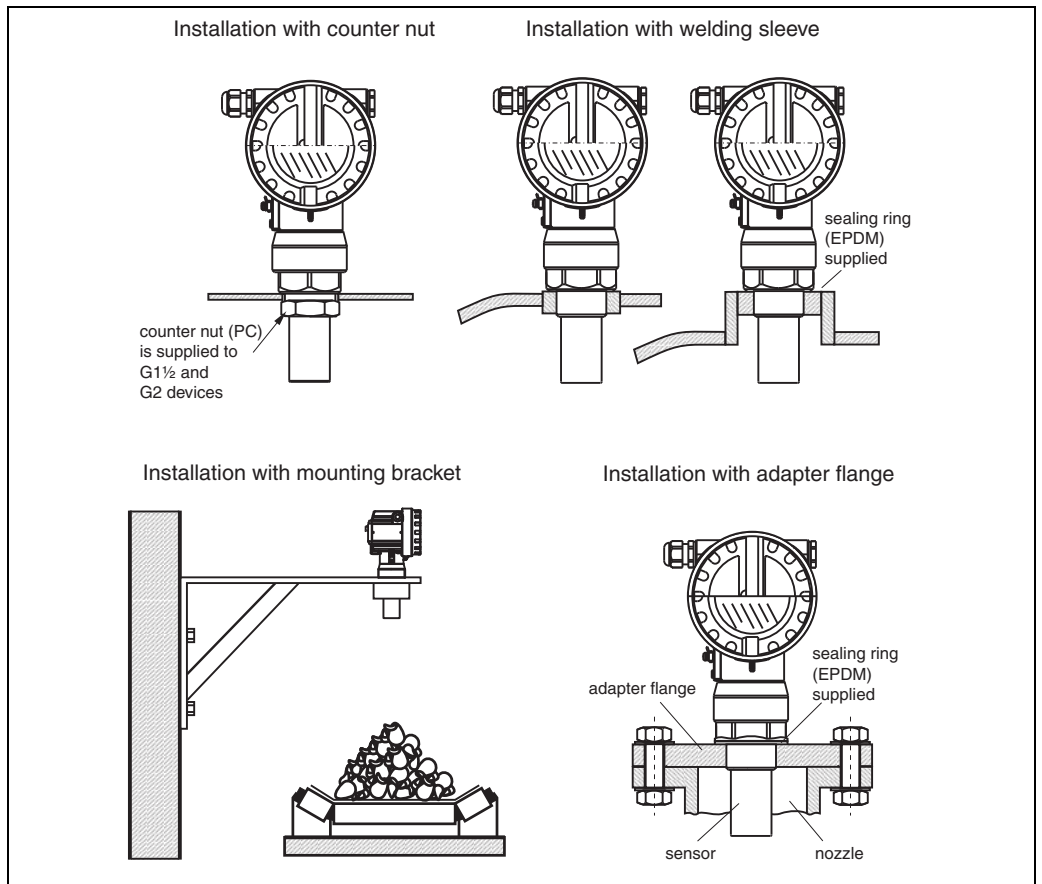
Influence of the vapour pressure

The vapor pressure at 20 °C (293 K) gives a hint on the accuracy of the ultrasonic level measurement. If the vapor pressure at 20 °C (293 K) is below 50 mbar, ultrasonic level measurement is possible with a very high accuracy. This is valid for water, aqueous solutions, water-solid-solutions, dilute acids (hydrochloric acid, sulfuric acid, ...), dilute bases (caustic soda, ...), oils, greases, slurries, pastes, ...

High vapor pressures or outgassing media (ethanol, acetone, ammonia, ...) can influence the accuracy. If conditions like these are present, please contact the Pepperl+Fuchs support.

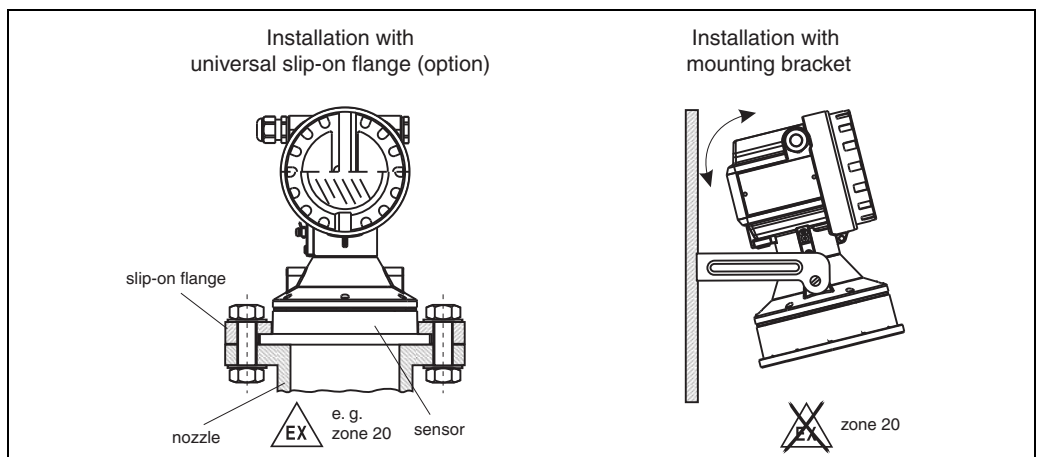
Installation conditions

Installation variants LUC-M10, LUC-M20

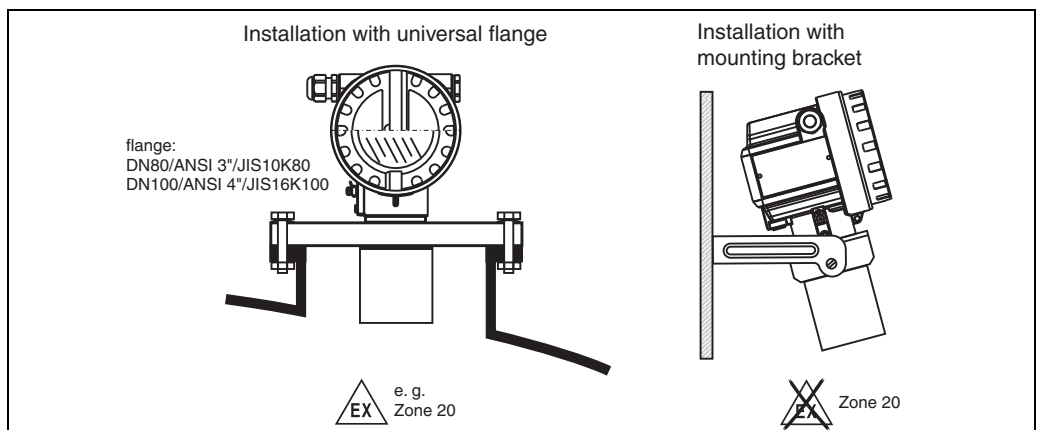


For installation bracket or adapter flange see section "Accessories".

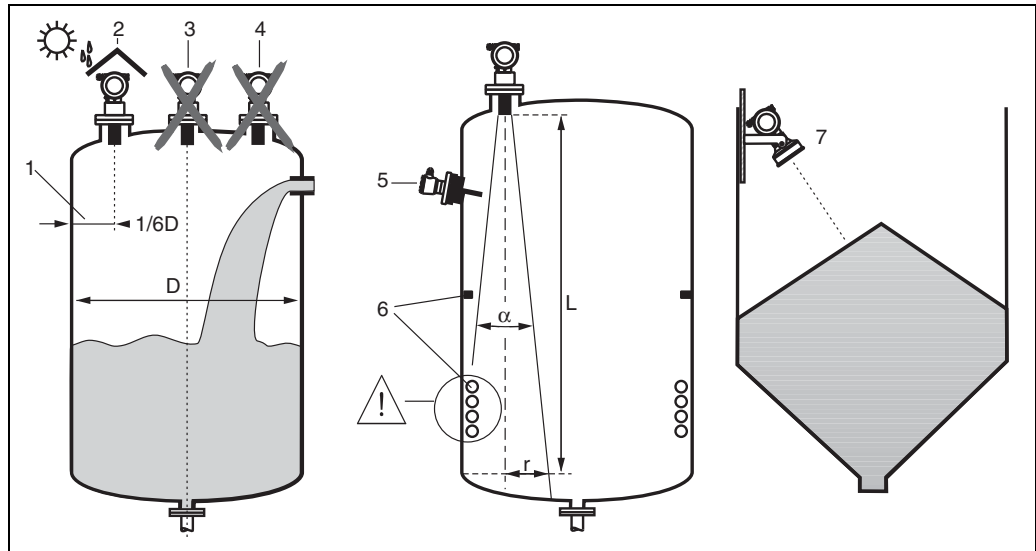
Installation variants LUC-M30



Installation variants LUC-M40



Installation conditions for level measurements

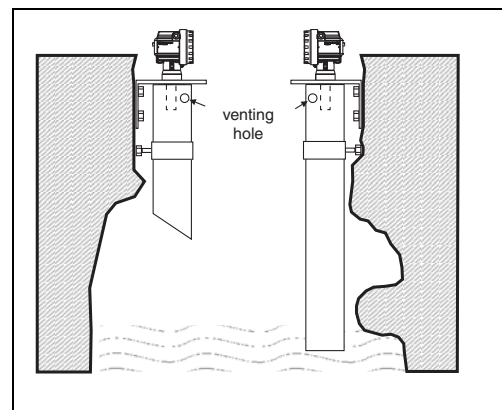


- Do not install the sensor in the middle of the tank (3). We recommend leaving a distance between the sensor and the tank wall (1) measuring 1/6 of the tank diameter.
- Use a protective cover, in order to protect the device from direct sun or rain (2).
- Avoid measurements through the filling curtain (4).
- Make sure that equipment (5) such as limit switches, temperature sensors, etc. are not located within the emitting angle α . In particular, symmetrical equipment (6) such as heating coils, baffles etc. can influence measurement.
- Align the sensor so that it is vertical to the product surface (7).
- Never install two ultrasonic measuring devices in a tank, as the two signals may affect each other.
- To estimate the detection range, use the 3 dB emitting angle α :

Sensor	α	L_{\max}	r_{\max}
LUC-M10	11°	5 m (16.4 ft)	0.48 m (18.9 in)
LUC-M20	11°	8 m (26.2 ft)	0.77 m (30.3 in)
LUC-M30	6°	15 m (49.2 ft)	0.79 m (31.1 in)
LUC-M40	9°	10 m (32.8 ft)	0.96 m (37.8 in)

Installation in narrow shafts

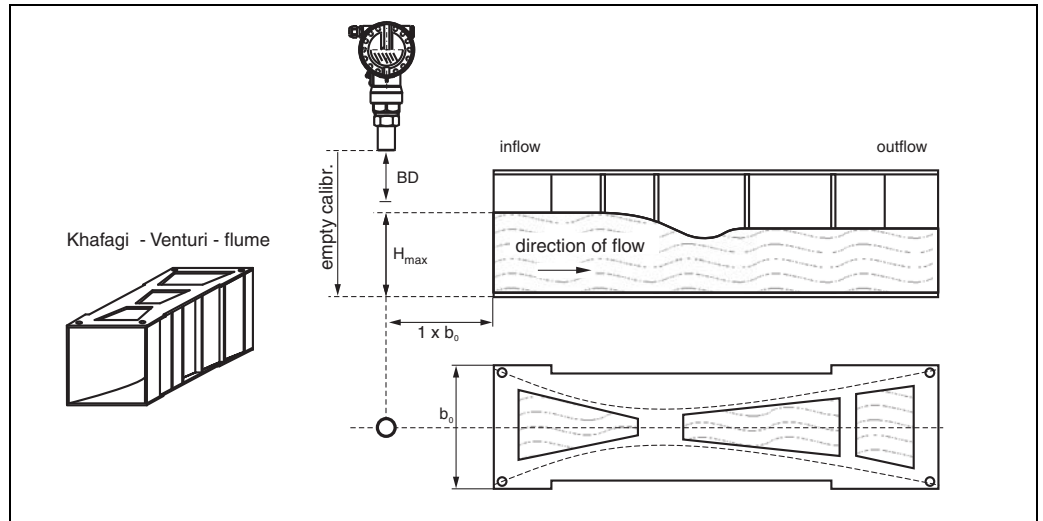
In narrow shafts with strong interference echoes, we recommend using an ultrasound guide pipe (e. g. PE or PVC wastewater pipe) with a minimum diameter of 100 mm (3.9 in). Make sure that the pipe is not soiled by accumulated dirt. If necessary, clean the pipe at regular intervals.



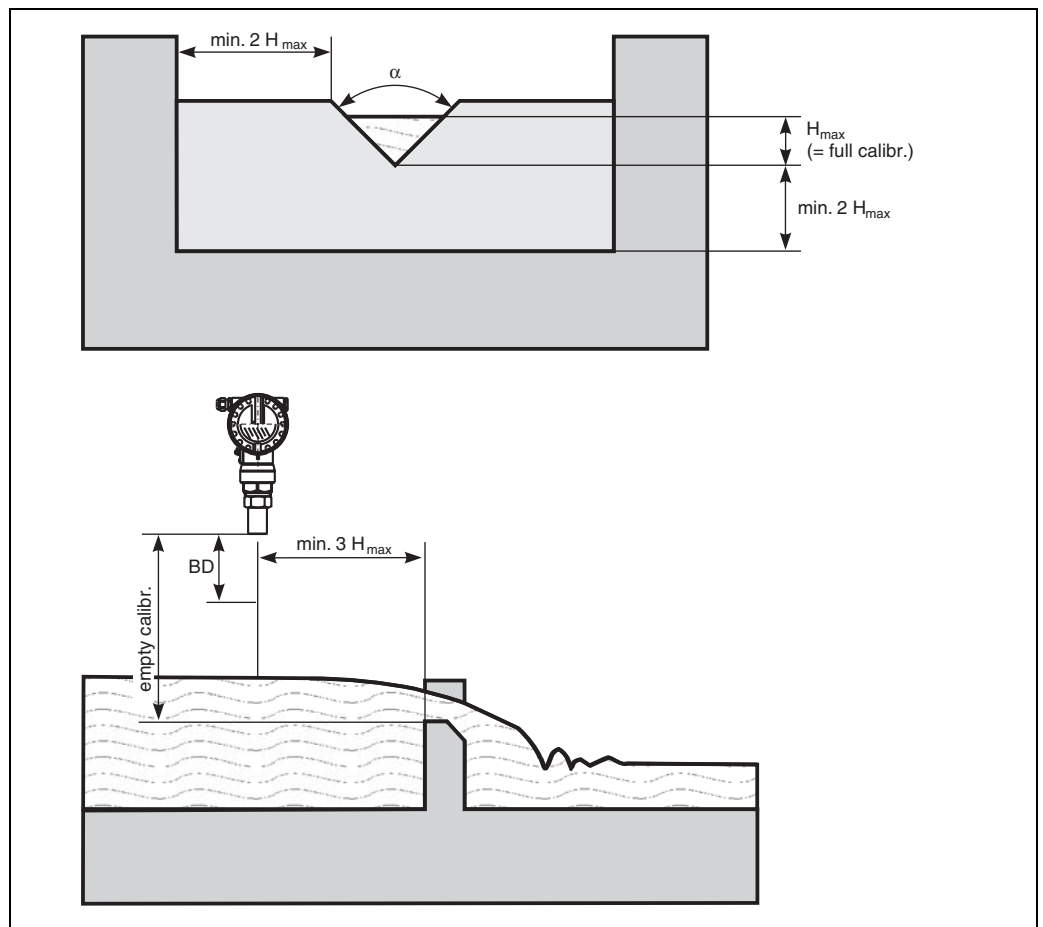
Installation conditions for flow measurements

- Install the LUC-M** at the inflow side, as close above the maximum water level H_{max} as possible (take into account the blocking distance BD).
- Position the LUC-M** in the middle of the channel or weir.
- Align the sensor membrane parallel to the water surface.
- Keep to the installation distance of the channel or weir.
- You can enter the "Flow to Level" linearisation curve ("Q/h curve") using via the on-site display.

Example: Khafagi-Venturi flume

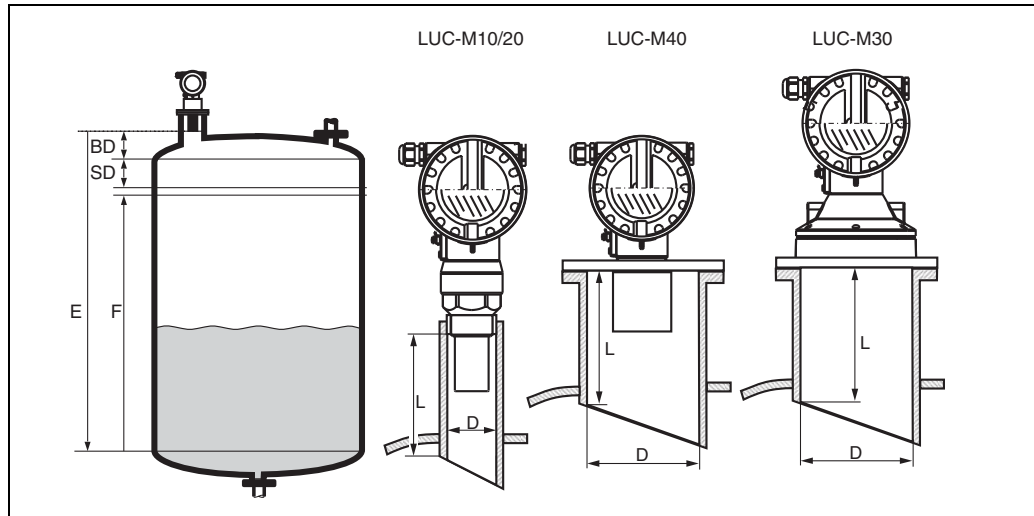


Example: Triangular weir



Blocking distance, nozzle installation

Install the LUC-M** at a height so that the blocking distance BD is not undershot, even at maximum fill level. Use a pipe nozzle if you cannot maintain the blocking distance in any other way. The interior of the nozzle must be smooth and may not contain any edges or welded joints. In particular, there should be no burr on the inside of the tank side nozzle end. Note the specified limits for nozzle diameter and length. To minimise disturbing factors, we recommend an angled socket edge (ideally 45°).



BD: blocking distance; **SD:** safety distance; **E:** empty calibration; **F:** full calibration (span); **D:** nozzle diameter; **L:** nozzle length

Nozzle diameter D	Maximum nozzle length L			
	LUC-M10	LUC-M20	LUC-M30	LUC-M40
DN50/2"	80 mm			
DN80/3"	240 mm	240 mm		250 mm
DN100/4"	300 mm	300 mm	300 mm	300 mm
DN150/6"	400 mm	400 mm	300 mm	400 mm
DN200/8"	400 mm	400 mm	300 mm	400 mm
DN250/10"	400 mm	400 mm	300 mm	400 mm
DN300/12"	400 mm	400 mm	300 mm	400 mm
Emitting angle α	11°	11°	6°	9°
Blocking distance	0.25 m	0.35 m	0.6 m	0.4 m
Max. range in liquids	5 m	8 m	15 m	10 m
Max. range in solids	2 m	3,5 m	7 m	5 m



Caution!

If the blocking distance is undershot, it may cause device malfunction.



Note!

In order to prevent the level from entering the blocking distance, you can specify a safety distance (SD). If the level is within this safety distance, the LUC-M** outputs a warning or alarm message.

Ambient conditions

Ambient temperature -40 °C ... +80 °C (233 K ... 353 K)
 The functionality of the LC display becomes restricted at $T_u < -20\text{ °C}$ (253 K) and $T_u > +60\text{ °C}$ (333 K).
 If the device is operated outdoors in strong sunlight, you should use a protective cover.

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

Resistance to alternating temperature cycles to EN 60068-2-14; Nb test: +80 °C/-40 °C (353 K/233 K), 1 K/min, 100 cycles

Climate class EN 60068-2-38 (test Z/AD) DIN/IEC 68 T2-30Db

Ingress protection

- with closed housing, tested according to
 - IP68, NEMA 6P (24h at 1.83m under water surface)
 - IP66, NEMA 4x
- with open housing: IP20, NEMA 1 (also ingress protection of the display)



Caution!

Degree of protection IP68 NEMA 6P applies for M12 PROFIBUS PA plugs only when the PROFIBUS cable is plugged in.

Vibration resistance EN 60068-2-64/IEC 68-2-64: 20 Hz ... 2000 Hz, 1 $((\text{m/s}^2)^2/\text{Hz})$; 3 x 100 min

Electromagnetic compatibility (EMC)

- interference emission to EN 61326, Equipment Class B.
- interference immunity to EN 61326, appendix A (industrial) and NAMUR recommendation NE 21 (EMC).
- a standard installation cable is sufficient if only the analogue signal is used. Use a screened cable when working with a superimposed communication signal (HART).

Process conditions

Process temperature -40 °C ... +80 °C (233 K ... 353 K)
 A temperature sensor is integrated in the sensor for correction for the temperature-dependent time-of-flight.

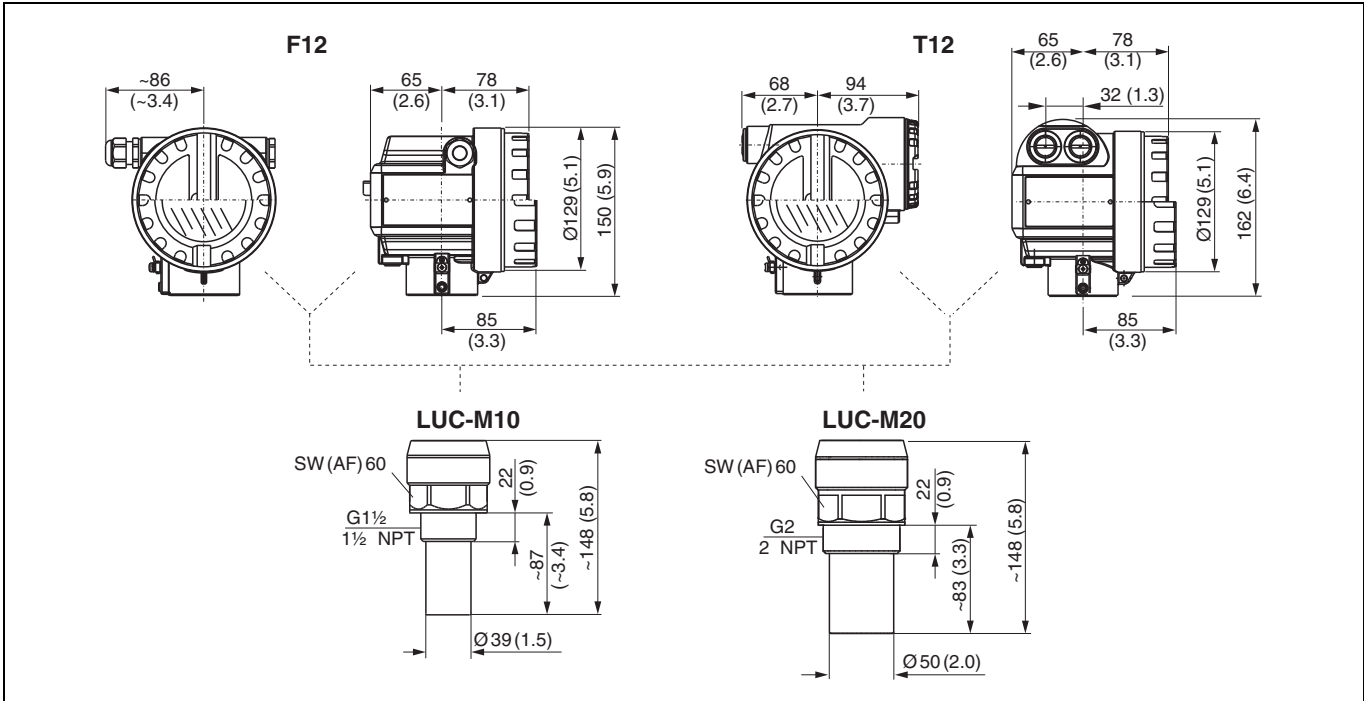
Process pressure

- LUC-M10/LUC-M20: 0.7 bar ... 3 bar abs.
- LUC-M30/LUC-M40: 0.7 bar ... 2.5 bar abs.

Mechanical construction

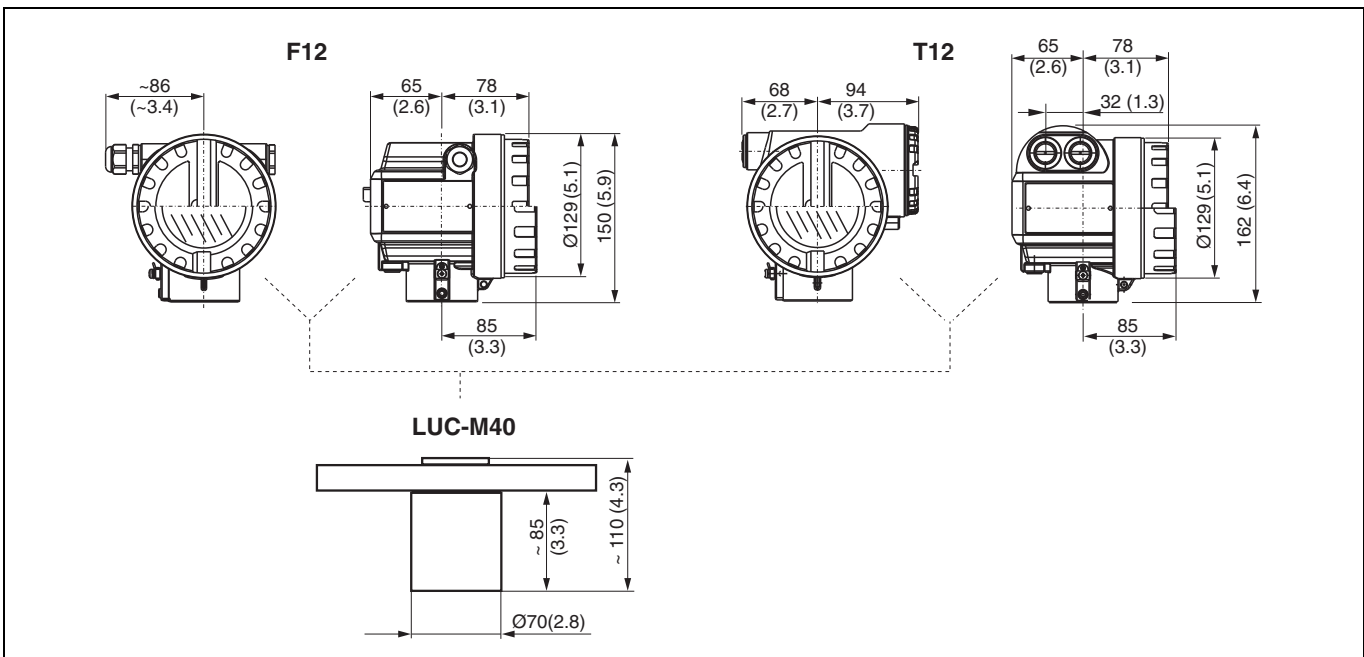
Design, dimensions

LUC-M10, LUC-M20



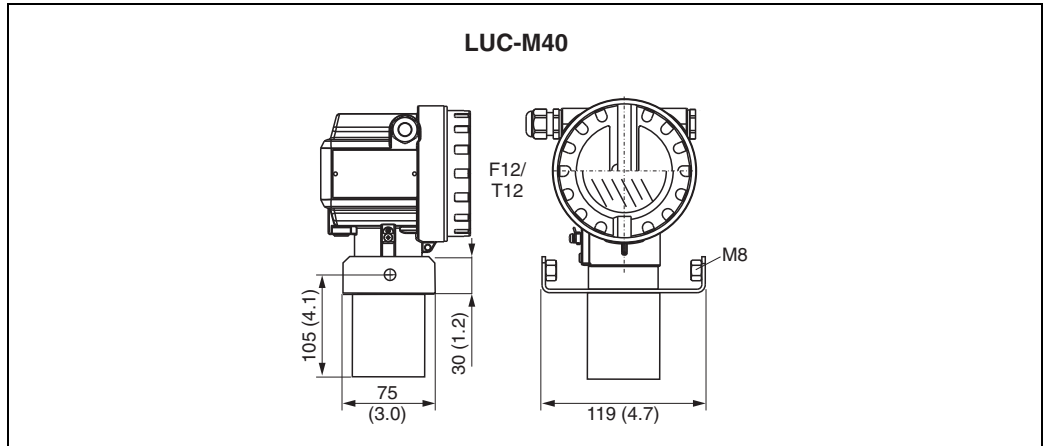
Dimensions in mm (inch)

LUC-M40 with slip-on flange



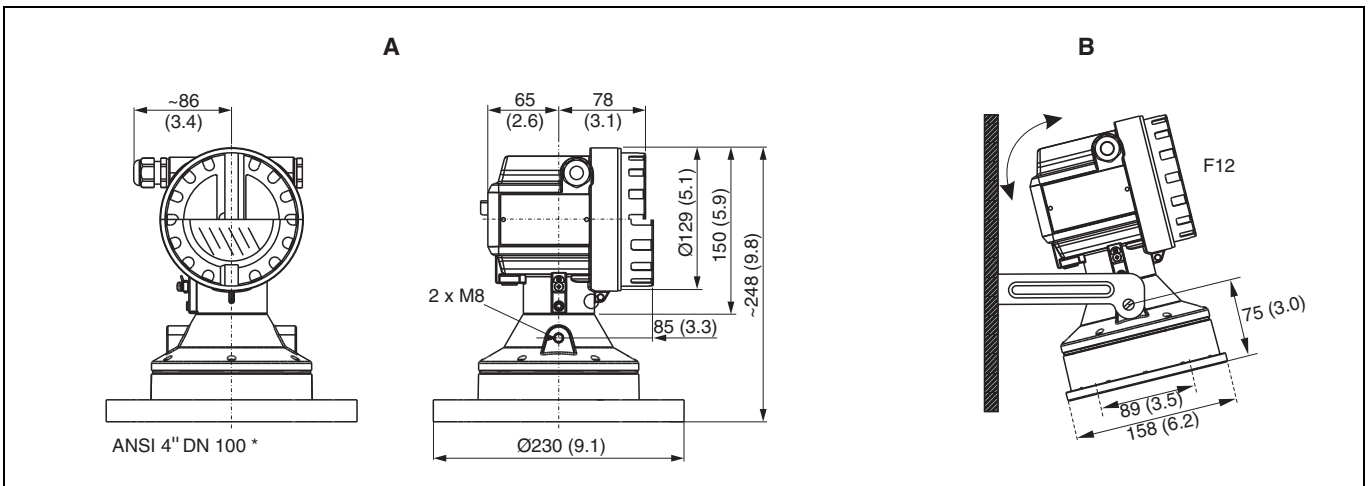
Dimensions in mm (inch)

LUC-M40 with mounting bracket



Dimensions in mm (inch)

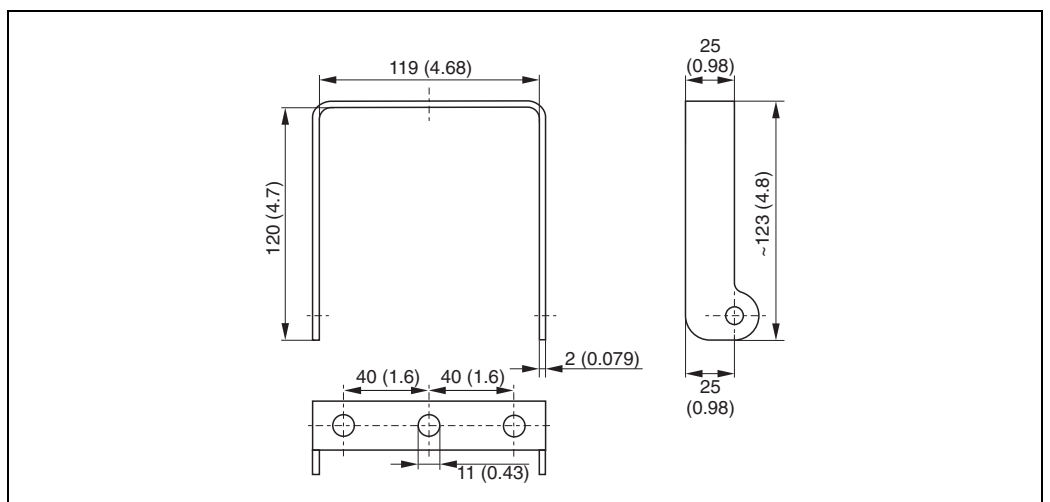
LUC-M30



Dimensions in mm (inch)

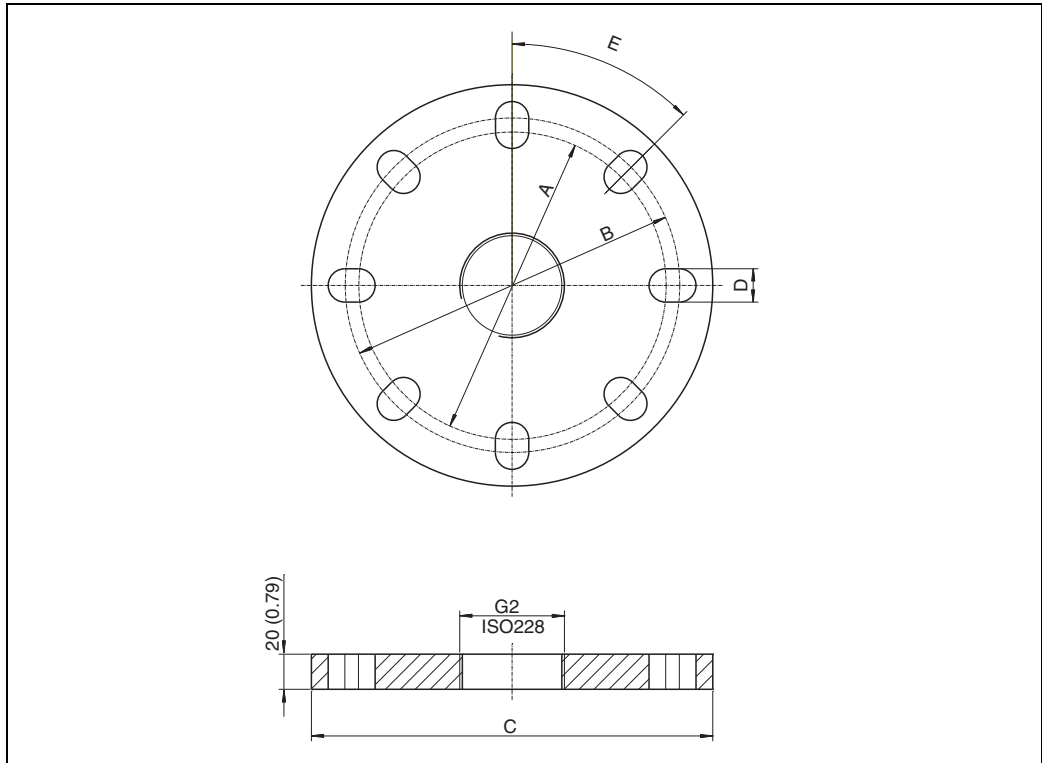
A: with slip-on flange, B: with mounting bracket

Mounting bracket for LUC-M30 and LUC-M40



Dimensions in mm (inch)

Flanges for LUC-M40



Dimensions in mm (inch)

Suitable for	A	B	C	D	E	Number of boreholes
3" 150lbs/DN80 PN16/10K 80	150 mm (5.91")	160 mm (6.30")	200 mm (7.87")	19 mm (0.75")	45°	8
4" 150 lbs/DN100 PN16/10K 100	175 mm (6.90")	190,5 mm (7.50")	228,6 mm (9.00")	19 mm (0.75")	45°	8
6" 150 lbs/DN150 PN16/10 K 150	240 mm (9.45")	241,3 mm (9.50")	285 mm (11.22")	23 mm (0.91")	45°	8
8" 150 lbs	298,5 mm (11.75")	298,5 mm (11.75")	342,9 mm (13.50")	22,5 mm (0.89")	45°	8
DN200 PN16/10 K 200	290 mm (11.42")	295 mm (11.61")	340 mm (13.39")	23 mm (0.91")	30°	12

Weight

Sensor	Weight
LUC-M10	approx. 2.5 kg
LUC-M20	approx. 2.6 kg
LUC-M30	approx. 3.5 kg
LUC-M40	approx. 3 kg

Housing design

Types of housings

- F12 housing with sealed terminal compartment for standard or EEx ia applications
- T12 housing with separate terminal compartment and explosion proof encapsulation

Material

Aluminium, seawater resistant, chromed, powder-coated

Cover

- Aluminium, for version without on-site display.
- Inspection glass for version with on-site display. This version cannot be supplied together with the ATEX II 1/2 D certificate.

Process connection, sealing material, sensor material

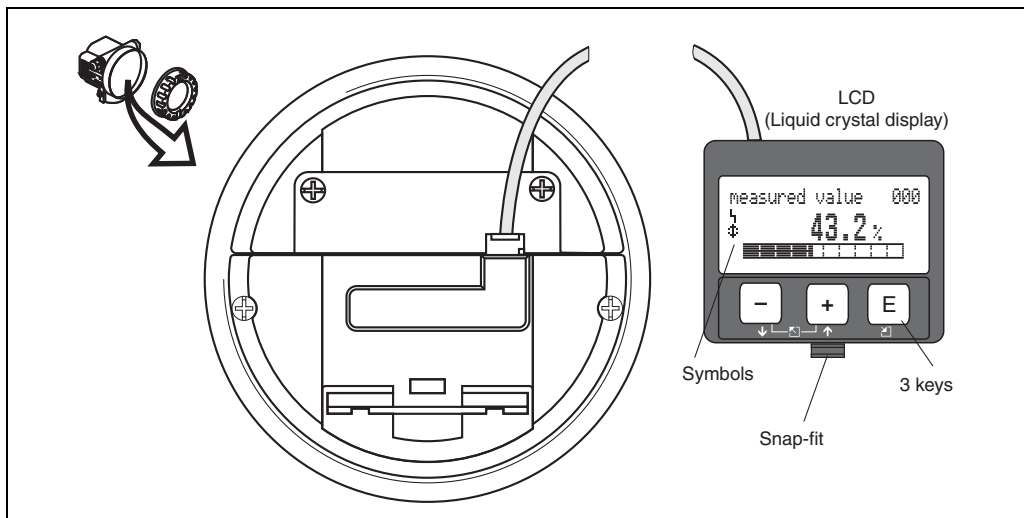
Sensor	Process connection	Material in contact with process
LUC-M10	<ul style="list-style-type: none"> • thread G1½ • thread 1½ NPT - 11.5 	sensor: PVDF seal: EPDM
LUC-M20	<ul style="list-style-type: none"> • thread G2 • thread 2 NPT - 11.5 	sensor: PVDF seal: EPDM
LUC-M30	<ul style="list-style-type: none"> • universal flange DN 100/ANSI 4"/JIS 16K100 • mounting bracket 	sensor: UP and stainless steel 1.4571 (316Ti) seal: EPDM flange: PP or stainless steel 1.4571 (316Ti)
LUC-M40	<ul style="list-style-type: none"> • universal flange DN 80/ANSI 3"/JIS 10K 80 • universal flange DN 100/ANSI 4"/JIS 16K100 • mounting bracket 	sensor: PVDF seal: Viton or EPDM flange: PP, PVDF or stainless steel 1.4535 or 1.4404 (316L) ¹⁾





¹⁾ Pepperl+Fuchs supplies DIN/EN flanges made of stainless steel AISI 316L with the material number 1.4435 or 1.4404. With regard to their temperature stability properties, the materials 1.4435 and 1.4404 are grouped under 13E0 in EN 1092-1, table 18. The chemical composition of the two materials can be identical.

Human interface















Display and operating elements

The LCD module LUC-Z15 for display and operation is located beneath the housing cover. The measured value is legible through the glass in the cover. Open the cover to operate the device.



Symbol in display				
	continous	flashing	Communication	Security locking
Meaning	Alarm	Warning	Communication	Security locking

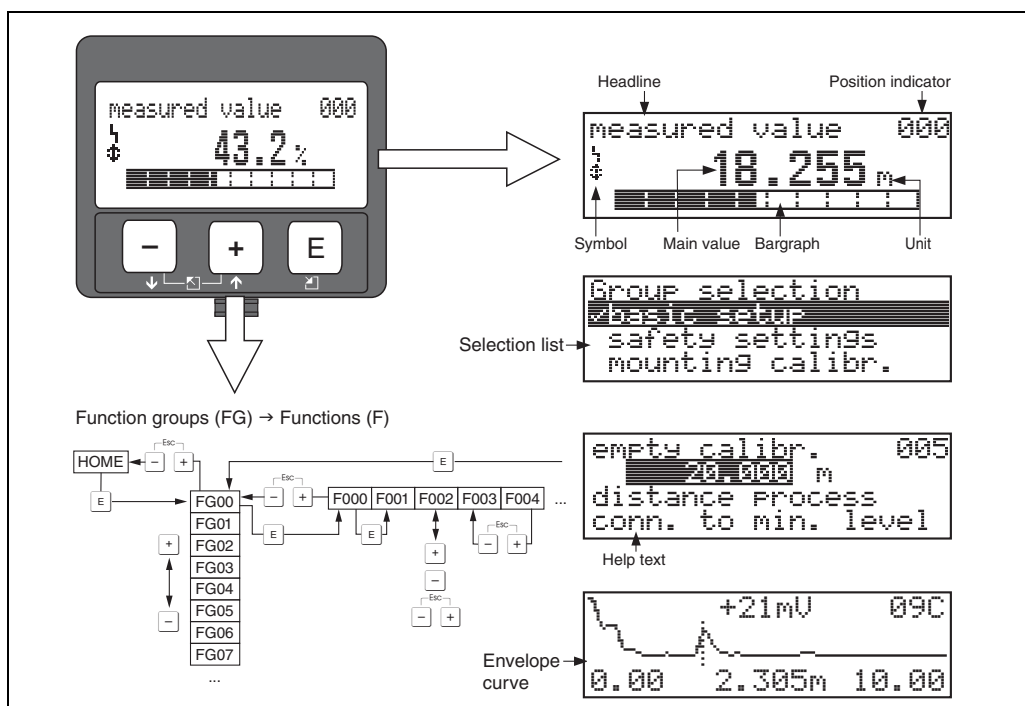
Function of the keys

Key(s)	Meaning
 or 	Navigate upwards in the selection list. Edit numeric value within a function.
 or 	Navigate downwards in the selection list. Edit numeric value within a function.
 or 	Navigate to the left within a function group.
	Navigate to the right within a function group, confirmation.
 and  or  and 	Contrast settings of the LCD.
 and  and 	Hardware lock/unlock After a hardware lock, an operation of the instrument via display or communication is not possible! The hardware can only be unlocked via the display. An unlock parameter must be entered to do so.

On-site operation

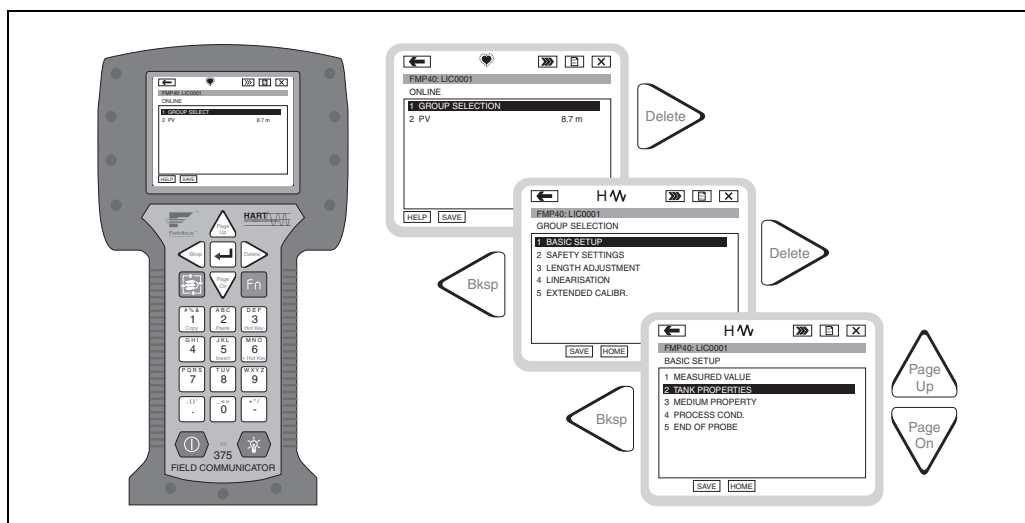
Operation with LUC-Z15

The LC-Display LUC-Z15 allows configuration via 3 keys directly at the instrument. All device functions can be set through a menu system. The menu consists of function groups and functions. Within a function, application parameters can be read or adjusted. The user is guided through a complete configuration procedure.



Operation with the handheld terminal 375

On devices with HART communication, you can also access the menu using the handheld terminal 375.



Note!
For more information of HART handheld terminal, see the relevant operating manual, which is inside the device bag.

Remote control

Operation with PACT_{ware}TM (for communication variants HART or PROFIBUS PA)

PACT_{ware}TM is an operating software with graphical support (MS Windows) for intelligent transmitters with the communication protocols HART and PROFIBUS PA.

PACT_{ware}TM supports the following functions:

- online configuration of transmitters
- loading and saving of instrument data (upload/download)
- orderly visualisation of measured values and limit values
- display and recording of measured values with a line recorder

It is not possible to display envelope curves with PACT_{ware}TM. To display them, please use the supplied program.

Connections:

- HART with HART modem (available as accessory)
- PROFIBUS PA

Certificates and approvals

CE mark

The measuring system meets the legal requirements of the EC-guidelines. Pepperl+Fuchs confirms the instrument passing the required tests by attaching the CE-mark.

Ex approval

The available certificates are listed in the ordering information. Note the associated safety instructions (SI) and control or installation drawings (ZD).

External standards and guidelines

EN 60529

Protection class of housing (IP code)

EN 61326

Electromagnetic compatibility (EMC requirements)

NAMUR

Standards committee for measurement and control in the chemical industry

Ordering information

Product structure LUC-M10

LUC-M10- - - - -

<p>Certificate NA version for non-explosion hazardous areas EX II 1/2 G EEx ia IIC T6 ES II 1/2 D, aluminium cover E2 II 1/3 D SX II 1/2 G EEx d (ia) IIC T6 S2 II 3G EEx nA II T6 F1 FM IS, Cl. I/II/III, Div.1 Group A-G, N.I. Cl. I, Div.2 F2 FM XP, Cl. I/II/III, Div. 1, Group A-G CG CSA, General Purpose C1 CSA IS, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I. C2 CSA XP, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.</p> <p>Display A * prepared for remote display, order display as accessory LUC-Z40 B without display D with display LUC-Z15 inclusive on-site operation, envelope curve display</p> <p>Electrical output AH 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART DH 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART PA 2-wire, PROFIBUS PA IH 2-wire, 4 mA ... 20 mA, HART</p> <p>Cable entry 2 cable gland M20 x 1.5 3 thread G½ 4 thread ½ NPT 5 connector M12, PROFIBUS PA</p> <p>Housing A1 aluminium housing F12, IP68, thread M20 x 1.5 A2 aluminium housing T12, IP68, coated, with separate terminal compartment A4 aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection</p> <p>Process connection G5 thread G1½B, ISO 228, PVDF N5 thread 1½ NPT, ANSI, PVDF</p>	<p>* in preparation</p>
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Product structure LUC-M20

LUC-M20- - - - -

<p>Certificate NA version for non-explosion hazardous areas EX II 1/2 G EEx ia IIC T6 ES II 1/2 D, aluminium cover E2 II 1/3 D SX II 1/2 G EEx d (ia) IIC T6 S2 II 3G EEx nA II T6 F1 FM IS, Cl. I/II/III, Div.1 Group A-G, N.I. Cl. I, Div.2 F2 FM XP, Cl. I/II/III, Div. 1, Group A-G CG CSA, General Purpose C1 CSA IS, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I. C2 CSA XP, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.</p> <p>Display A * prepared for remote display, order display as accessory LUC-Z40 B without display D with display LUC-Z15 inclusive on-site operation, envelope curve display</p> <p>Electrical output AH 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART DH 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART PA 2-wire, PROFIBUS PA IH 2-wire, 4 mA ... 20 mA, HART</p> <p>Cable entry 2 cable gland M20 x 1,5 3 thread G½ 4 thread ½ NPT 5 connector M12, PROFIBUS PA</p> <p>Housing A1 aluminium housing F12, IP68, thread M20 x 1.5 A2 aluminium housing T12, IP68, coated, with separate terminal compartment A4 aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection</p> <p>Process connection G6 thread G2B, ISO 228, PVDF N6 thread 2 NPT, ANSI, PVDF</p>	<p>* in preparation</p>
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Product structure
LUC-M30

LUC-M30- - - - -

- Certificate**
 - NA version for non-explosion hazardous areas
 - ES II 1/2 D, aluminium cover
 - E2 II 1/3 D
 - FM FM DIP, Cl. II, Div.1 Group E-G, N.I. Cl. I, Div.2
 - CG CSA, General Purpose
 - CS CSA DIP, Cl. II, Div. 1, Group E-G, N.I. Cl. I, Div.2
- Display**
 - A * prepared for remote display, order display as accessory LUC-Z40
 - B without display
 - D with display LUC-Z15 inclusive on-site operation, envelope curve display
- Electrical output**
 - AH 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
 - DH 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
 - PA 2-wire, PROFIBUS PA
- Cable entry**
 - 2 cable gland M20 x 1,5
 - 3 thread G½
 - 4 thread ½ NPT
 - 5 connector M12, PROFIBUS PA
- Housing**
 - A1 aluminium housing F12, IP68, thread M20 x 1.5
- Process connection**
 - FA universal flange DN100/ANSI 4"/JIS16K100, PP
 - FS universal flange DN100/ANSI 4"/JIS16K100, 316Ti
 - FK without slip-on flange, without mounting bracket, customer mounting equipment
 - FM with mounting bracket LUC-Z17

* in preparation

Product structure
LUC-M40

LUC-M40- - - - -

- Certificate**
 - NA version for non-explosion hazardous areas
 - EX II 1/2 G EEx ia IIC T6
 - SX II 1/2 G EEx d (ia) IIC T6
 - S2 II 3G EEx nA II T6
 - F1 FM IS, Cl. I/II/III, Div.1 Group A-G, N.I. Cl. I, Div.2
 - F2 FM XP, Cl. I/II/III, Div. 1, Group A-G
 - CG CSA, General Purpose
 - C1 CSA IS, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.
 - C2 CSA XP, Cl. I/II/III, Div. 1, Group A-D, G + coal dust, N.I.
- Additional option**
 - A basic version
- Sealing sensor/flange**
 - 2 Viton
 - 3 EPDM
- Display**
 - A * prepared for remote display, order display as accessory LUC-Z40
 - B without display
 - D with display LUC-Z15 inclusive on-site operation, envelope curve display
- Electrical output**
 - AH 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
 - DH 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
 - PA 2-wire, PROFIBUS PA
 - IH 2-wire, 4 mA ... 20 mA, HART
- Cable entry**
 - 2 cable gland M20 x 1.5
 - 3 thread G½
 - 4 thread ½ NPT
 - 5 connector M12, PROFIBUS PA
- Housing**
 - A1 aluminium housing F12, IP68, thread M20 x 1.5
 - A2 aluminium housing T12, IP68, coated, with separate terminal compartment
 - A4 aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection
- Process connection; max. 3 bar abs/44 psia, hole circle PN16/150 lbs/10K**
 - P universal flange DN80/ANSI 3"/JIS10K80, PP
 - Q universal flange DN80/ANSI 3"/JIS10K80, PVDF
 - S universal flange DN80/ANSI 3"/JIS10K80, 316L
 - T universal flange DN100/ANSI 4"/JIS16K100, PP
 - U universal flange DN100/ANSI 4"/JIS16K100, PVDF
 - V universal flange DN100/ANSI 4"/JIS16K100, 316L
 - M mounting bracket LUC-Z17

* in preparation

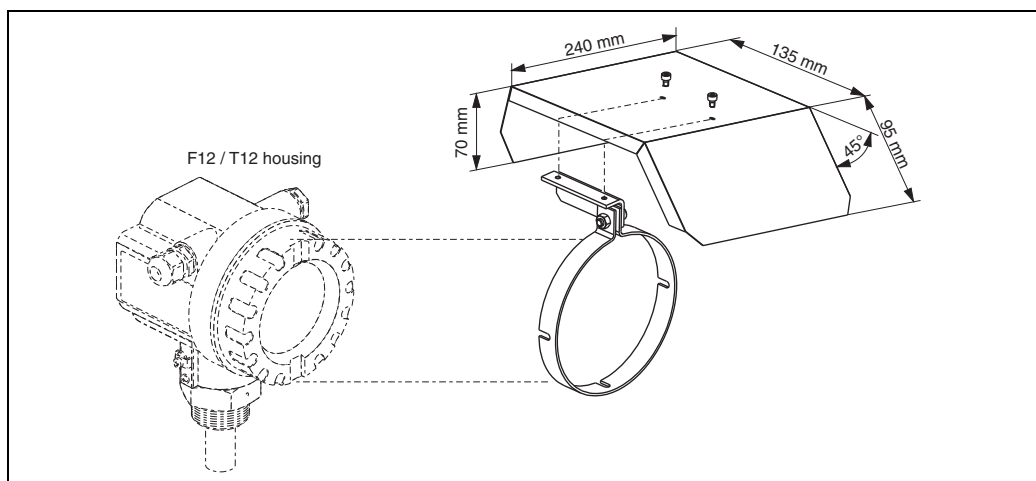
Scope of delivery

- instrument according to the version ordered
- operating manual according to the communication version
- for certified instrument versions: safety instructions, control or Installation drawings
- for LUC-M10-G5**/LUC-M20-G6**: counter nut (PC)
- for LUC-M10/LUC-M20: sealing ring (EPDM)
- for gland M20x1.5: (The cable glands are mounted on delivery.)
 - 1 cable gland for 2-wire instruments
 - 2 cable glands for 4-wire instruments

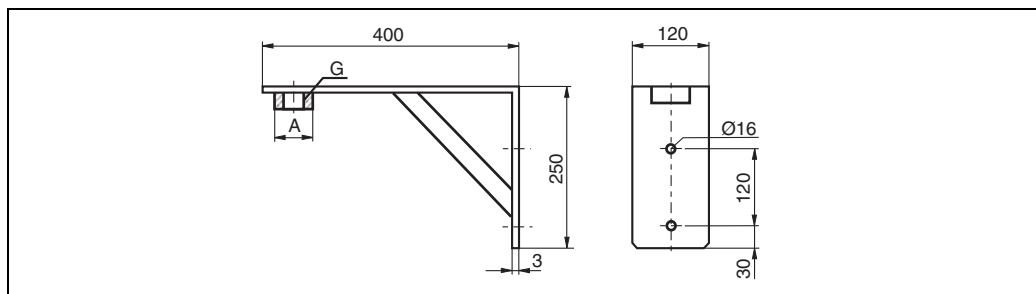
Accessories

Weather protection cover

A Weather protection cover made of stainless steel is recommended for outdoor mounting (LUC-Z16). The shipment includes the protective cover and tension clamp.



Mounting bracket for LUC-M10/LUC-M20

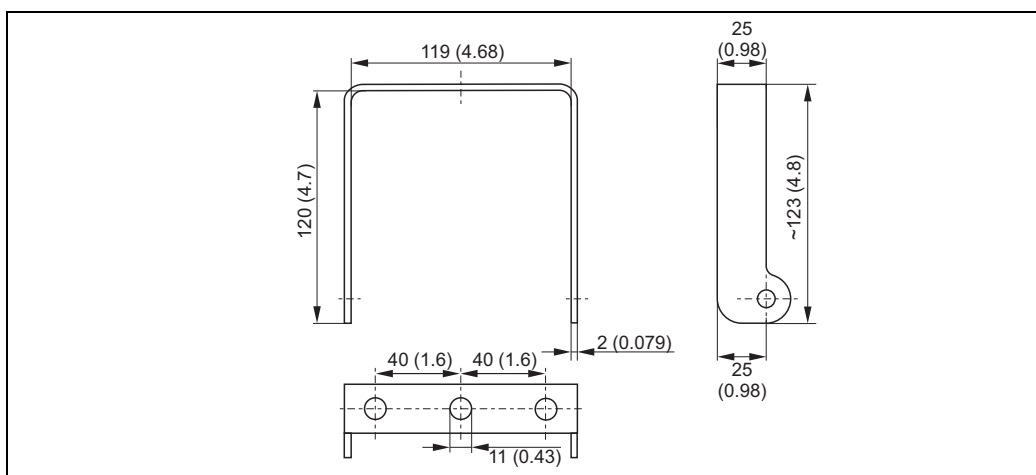


For sensor	Material	Order code
LUC-M10-G5***-***-*** (G1½)	stainless steel 1.4301 (304)	LUC-Z18
LUC-M20-G6***-***-*** (G2)	stainless steel 1.4301 (304)	LUC-Z19

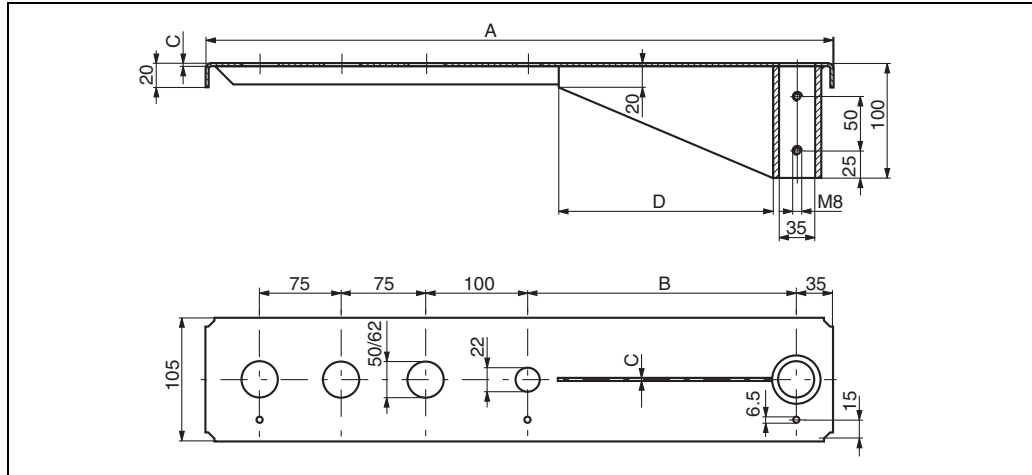
The mounting bracket is suited for 1½ NPT and 2 NPT as well.

Mounting bracket for LUC-M30/LUC-M40

Mounting bracket for mounting of LUC-M30/LUC-M40 (LUC-Z17)



Cantilever



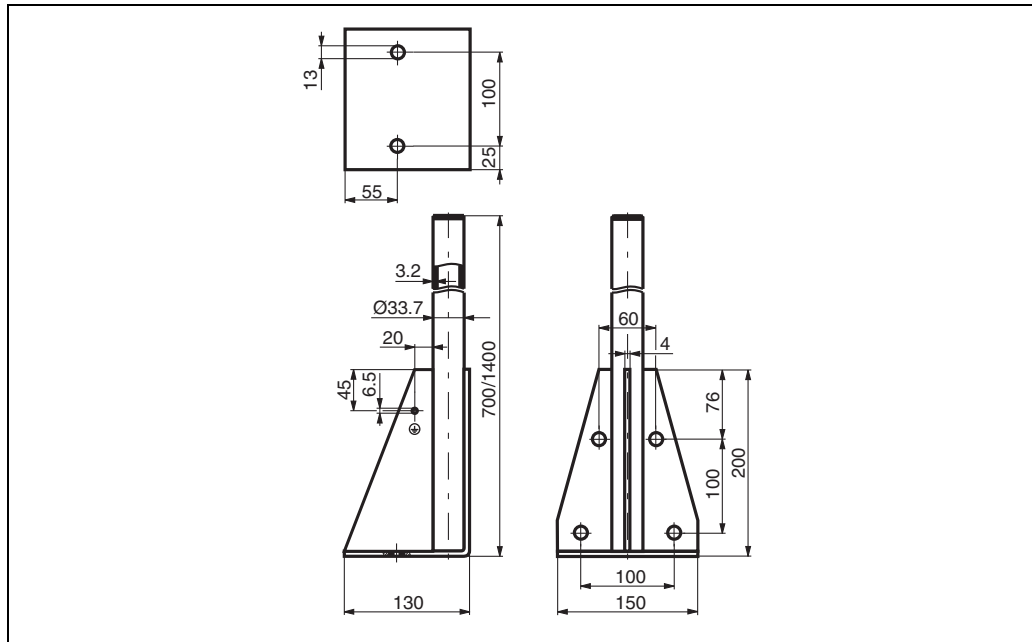
A	B	C	D	For sensor	Material	Order code
585 mm (23 in)	250 mm (9.8 in)	2 mm (0.08 in)	200 mm (7.9 in)	LUC-M10	stainless steel 1.4571 (316Ti)	LUC-Z20
					galv. steel	LUC-Z21
				LUC-M20	stainless steel 1.4571 (316Ti)	LUC-Z22
					galv. steel	LUC-Z23
1085 mm (42.7 in)	750 mm (29.5 in)	3 mm (0.12 in)	300 mm (11.8 in)	LUC-M10	stainless steel 1.4571 (316Ti)	LUC-Z24
					galv. steel	LUC-Z25
				LUC-M20	stainless steel 1.4571 (316Ti)	LUC-Z26
					galv. steel	LUC-Z27

- The 50 mm (2 in) or 62 mm (2.4 in) orifices serve for the mounting of the LUC-M10 or LUC-M20 sensor, respectively.
- The 22 mm (0.9 in) orifice may be used for an additional sensor.

For the assembly of the cantilever can be used:

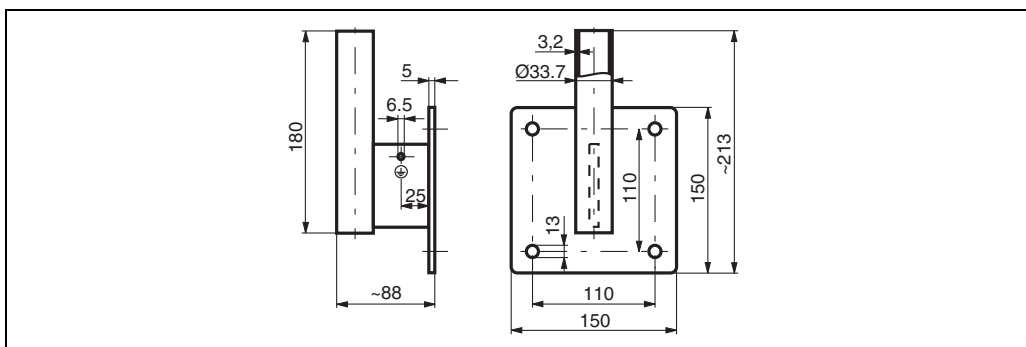
- a mounting frame, see page 26.
- a wall bracket, see page 27

Mounting frame



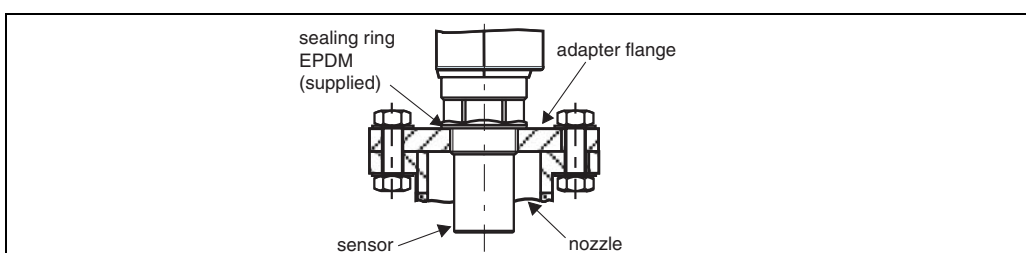
Height	Material	Order code
700 mm (27.6 in)	galv. steel	LUC-Z30
700 mm (27.6 in)	stainless steel 1.4571 (316Ti)	LUC-Z31
1400 mm (55.1 in)	galv. steel	LUC-Z32
1400 mm (55.1 in)	stainless steel 1.4571 (316Ti)	LUC-Z33

Wall bracket



Material	Order code
galv. steel	LUC-Z50
stainless steel 1.4571 (316Ti)	LUC-Z51

Adapter flange for
LUC-M10/LUC-M20



Version with metrical thread

Process connection	
F73	DN50 PN16
F93	DN80 PN16
FA3	DN100 PN16
XXX	other process connections
Sensor thread	
G5	G1½, ISO 228
G6	G2, ISO 228
Material	
S	stainless steel 1.4435 (316L)
P	PPs (Polypropylene)
LUC-Z-	product designation

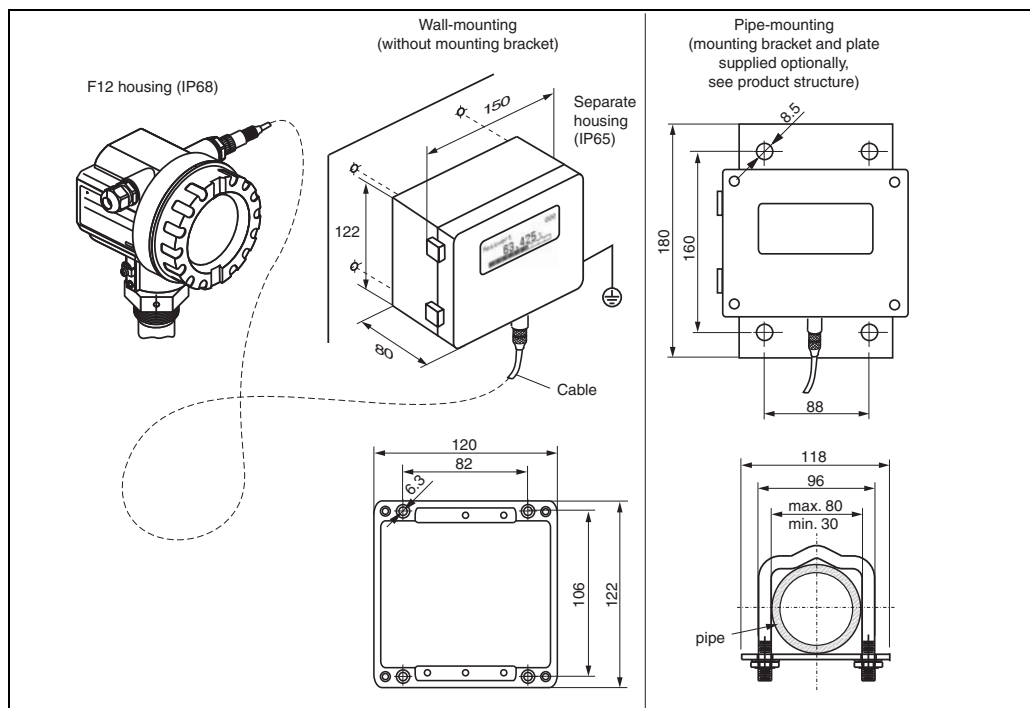
Version with conical thread

Process connection	
A61	ANSI 2", 150 psi
A81	ANSI 3", 150 psi
A91	ANSI 4", 150 psi
XXX	other process connections
Sensor thread	
5	1½ NPT - 11.5
6	2 NPT- 11.5
Material	
2	stainless steel 1.4435 (316L)
7	PPs (Polypropylene)
LUC-Z-	product designation

Universal slip-on flange for LUC-M30

	Prozess connection
FA3	DN100 PN16
A91	ANSI 4", 150 psi
J20	JIS16K100
	Material
P	PPS (Polypropylen), max. 1,5 bar abs.
L	steel, varnished
S	stainless steel 1.4571 (316Ti)
LUC-Z-	product designation

Remote display



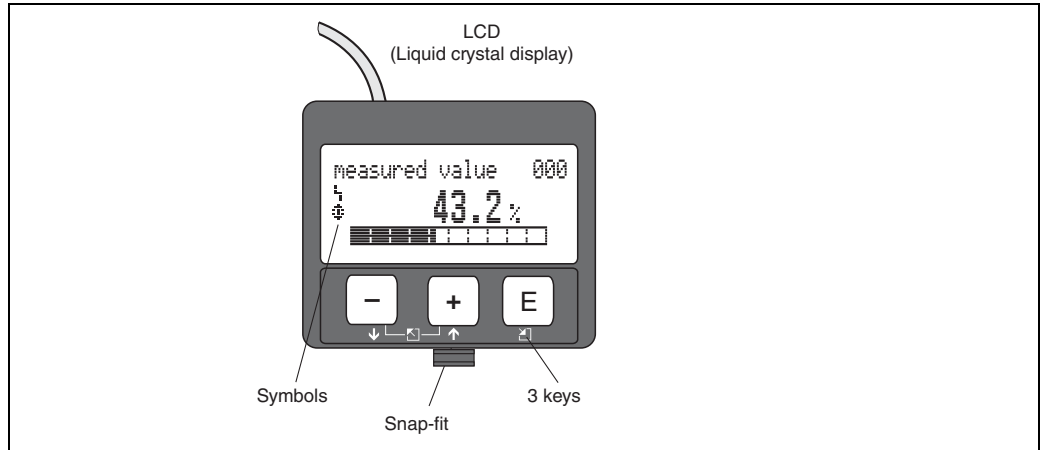
Technical data

Max. cable length	20 m (65 ft) (fixed length with connection plug)
Temperature range	-30 °C...+70 °C (243 K ... 343 K)
Degree of protection	IP65/IP67 (housing), IP68 (cable) acc. to EN 60529
Material for housing	housing: aluminium AL Si 12, cable glands: nickle plated brass
Dimensions (H x B x T)	122 mm x 150 mm x 80 mm/4.8 in x 5.9 in x 3.2 in

Variant	Order code
Remote display with on-site operation, cable 20 m (65 ft)	LUC-Z40-NA1A
Remote display with on-site operation, cable 20 m (65 ft), with mounting bracket 2"	LUC-Z40-NA1B
Remote display with on-site operation, cable 20 m (65 ft), 2G EEx ia, 3D	LUC-Z40-EX1A
Remote display with on-site operation, cable 20 m (65 ft), with mounting bracket 2", 2G EEx ia, 3D	LUC-Z40-EX1B

**Display and operating
module LUC-Z15**

LC display for on-site operation of LUC-M** (LUC-Z15)



Service adapter

for communication with **PACT_{ware}**TM, on request

Profiboard

to connect a PC to the PROFIBUS

Proficard

to connect a Laptop to the PROFIBUS

Supplementary documentation

Operating manual

Depending on the communication variant ordered, the following operating manuals are supplied with the device:

Communication	Operating manual
4 mA ... 20mA, HART	BA 237O
PROFIBUS PA	BA 238O

These instructions describe the installation and first commissioning of the LUC-M**. From the operating menu, all functions are included, which are required for standard measurement tasks. Additional functions are **not** contained in the manual.

Description of device functions

BA 240O

This contains a detailed description of **all** the functions of the LUC-M** and is valid for all communication variants. This document is located on the supplied documentation CD-ROM in the form of a pdf file. It is also available on the Internet at www.pepperl-fuchs.com.

Short instructions

KA 183O

can be found under the device housing cover.

The most important menu functions are summarised on this sheet. It is intended primarily as a memory jogger for users who are familiar with the operating concept of Pepperl+Fuchs time-of-flight instruments.

Safety Instructions

The following safety instructions are supplied with ATEX-certified device versions. If the devices are used in explosive areas, comply with all the specifications in these safety instructions.

Version	Certificate	Communication	Housing	Safety information
LUC-M10-**A1*-IH*-EX LUC-M20-**A1*-IH*-EX LUC-M40-*A1*-IH***-EX	⊕ II 1/2 G bzw. II 2 G EEx ia II C T6	HART, 2-wire	F12	SI 1740
LUC-M10-**A4*-IH*-EX LUC-M20-**A4*-IH*-EX LUC-M40-*A4*-IH***-EX	⊕ II 1/2 G bzw. II 2 G EEx ia II C T6	HART, 2-wire	T12 with overvoltage protection	SI 2240
LUC-M10-**A1*-PA*-EX LUC-M20-**A1*-PA*-EX LUC-M20-**A1*-PA*-EX	⊕ II 1/2 G bzw. II 2 G EEx ia II C T6	PROFIBUS PA	F12	SI 1750
LUC-M10-**A4*-PA*-EX LUC-M20-**A4*-PA*-EX LUC-M20-**A4*-PA*-EX	⊕ II 1/2 G bzw. II 2 G EEx ia II C T6	PROFIBUS PA	T12 with overvoltage protection	SI 2250
LUC-M10-**A2*-IH*-SX LUC-M10-**A2*-PA*-SX LUC-M20-**A2*-IH*-SX LUC-M20-**A2*-PA*-SX LUC-M40-*A2*-IH***-SX LUC-M40-*A2*-PA***-SX	⊕ II 1/2 G bzw. II 2 G EEx d [ia] II C T6	<ul style="list-style-type: none"> HART, 2-wire PROFIBUS PA 	T12	SI 1760
LUC-M10-*****-S2 LUC-M20-*****-S2 LUC-M40-*****-S2	⊕ II 3G EEx nA II T6	<ul style="list-style-type: none"> HART, 2-wire HART, 4-wire, AC HART, 4-wire, DC PROFIBUS PA 	<ul style="list-style-type: none"> F12 T12 T12 with overvoltage protection 	SI 1790
LUC-M10-**A1*-IH*-ES LUC-M10-**A1*-PA*-ES LUC-M10-**A1*-IH*-E2 LUC-M10-**A1*-PA*-E2 LUC-M20-**A1*-IH*-ES LUC-M20-**A1*-PA*-ES LUC-M20-**A1*-IH*-E2 LUC-M20-**A1*-PA*-E2 LUC-M40-*A1*-IH***-ES LUC-M40-*A1*-PA***-ES LUC-M40-*A1*-IH***-E2 LUC-M40-*A1*-PA***-E2	<ul style="list-style-type: none"> ⊕ II 1/2 D ⊕ II 1/3 D 	<ul style="list-style-type: none"> HART, 2-wire PROFIBUS PA 	<ul style="list-style-type: none"> F12 T12 	SI 1800
LUC-M10-**A1*-AH*-ES LUC-M10-**A1*-DH*-ES LUC-M10-**A1*-AH*-E2 LUC-M10-**A1*-DH*-E2 LUC-M20-**A1*-AH*-ES LUC-M20-**A1*-DH*-ES LUC-M20-**A1*-AH*-E2 LUC-M20-**A1*-DH*-E2 LUC-M40-*A1*-AH***-ES LUC-M40-*A1*-DH***-ES LUC-M40-*A1*-AH***-E2 LUC-M40-*A1*-DH***-E2	<ul style="list-style-type: none"> ⊕ II 1/2 D ⊕ II 1/3 D 	<ul style="list-style-type: none"> HART, 4-wire, AC HART, 4-wire, DC 	F12	SI 2590
LUC-M30-**A1*-DH*-ES LUC-M30-**A1*-AH*-ES LUC-M30-**A1*-DH*-E2 LUC-M30-**A1*-AH*-E2	<ul style="list-style-type: none"> ⊕ II 1/2 D bzw. II 2 D ⊕ II 1/3 D bzw. II 3 D 	<ul style="list-style-type: none"> HART, 4-wire, AC HART, 4-wire, DC 	F12	SI 1770
LUC-M30-**A1*-PA*-ES LUC-M30-**A1*-PA*-E2	<ul style="list-style-type: none"> ⊕ II 1/2 D bzw. II 2 D ⊕ II 1/3 D bzw. II 3 D 	PROFIBUS PA	F12	SI 1780

**Control drawings/
installation drawings**

The following control or installation drawings are supplied with the FM and CSA certified device versions:

Version	Certificate	Communication	Housing	Control or installation drawing
LUC-M10-**A1*-IH*-F1 LUC-M20-**A1*-IH*-F1 LUC-M40-*A1*-IH***-F1	FM IS	HART, 2-wire	F12	ZD 0960
LUC-M10-**A1*-PA*-F1 LUC-M20-**A1*-PA*-F1 LUC-M40-*A1*-PA***-F1	FM IS	PROFIBUS PA	F12	ZD 0970
LUC-M10-**A4*-IH*-F1 LUC-M20-**A4*-IH*-F1 LUC-M40-*A4*-IH***-F1	FM IS	HART, 2-wire	T12 with overvoltage protection	ZD 1390
LUC-M10-**A4*-PA*-F1 LUC-M20-**A4*-PA*-F1 LUC-M40-*A4*-PA***-F1	FM IS	PROFIBUS PA	T12 with overvoltage protection	ZD 1400
LUC-M10-**A2*-IH*-F2 LUC-M10-**A2*-PA*-F2 LUC-M20-**A2*-IH*-F2 LUC-M20-**A2*-PA*-F2 LUC-M40-*A2*-IH***-F2 LUC-M40-*A2*-PA***-F2	FM XP	<ul style="list-style-type: none"> • HART, 2-wire • PROFIBUS PA 	T12	ZD 0980
LUC-M10-**A1*-IH*-C1 LUC-M20-**A1*-IH*-C1 LUC-M40-*A1*-IH***-C1	CSA IS	HART, 2-wire	F12	ZD 0880
LUC-M10-**A1*-PA*-C1 LUC-M20-**A1*-PA*-C1 LUC-M40-*A1*-PA***-C1	CSA IS	PROFIBUS PA	F12	ZD 0990
LUC-M10-**A4*-IH*-C1 LUC-M20-**A4*-IH*-C1 LUC-M40-*A4*-IH***-C1	CSA IS	HART, 2-wire	T12 with overvoltage protection	ZD 1010
LUC-M10-**A4*-PA*-C1 LUC-M20-**A4*-PA*-C1 LUC-M40-*A4*-PA***-C1	CSA IS	PROFIBUS PA	T12 with overvoltage protection	ZD 1020
LUC-M10-**A2*-IH*-C2 LUC-M10-**A2*-PA*-C2 LUC-M20-**A2*-IH*-C2 LUC-M20-**A2*-PA*-C2 LUC-M40-*A2*-IH***-C2 LUC-M40-*A2*-PA***-C2	CSA XP	<ul style="list-style-type: none"> • HART, 2-wire • PROFIBUS PA 	T12	ZD 1000

With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V." including the supplementary clause: "Erweiterter Eigentumsvorbehalt".

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DOCT-0805F

185414
01/2010