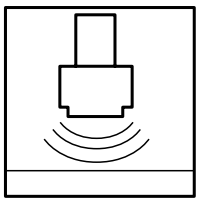
Ultrasonic level sensor

LUC-M**

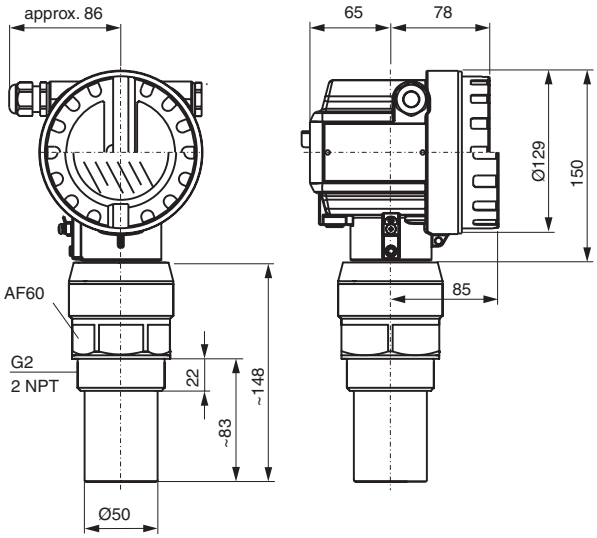


Features

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

Dimensions

LUC-M20 with F12 housing
and process connection 2"



Additional dimensions
see section dimensions.

Function

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

The system integration is ensured via

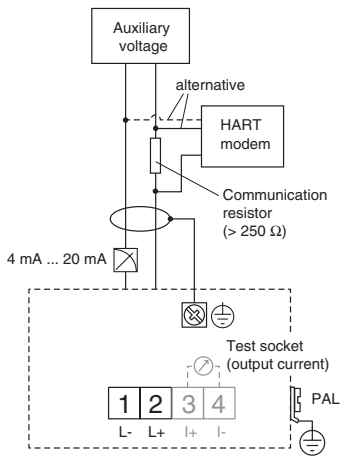
- HART (standard), 4 mA ... 20 mA,
- PROFIBUS PA and
- FOUNDATION Fieldbus.

The maximum measuring range with

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

Electrical connection

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



Other connection types see section
electrical connection.

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

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Reference operating contditions	temperature = +20 °C (293 K) pressure = 1013 mbar abs. humidity = 50 % ideal reflective surface (e. g. calm, smooth fluid surface) no interference reflections within signal beam set application parameters: - tank shape = flat ceiling - medium property = liquid - process conditions = calm surface
Measured value resolution	LUC-M10, LUC-M20: 1 mm (0.04 in) LUC-M30, LUC-M40: 2 mm (0.08 mm)
Measuring frequency	2-wire devices: max. 0.5 Hz 4-wire devices: max. 2 Hz dependent on the type of device and the parameter settings
Maximum measured error	typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis): LUC-M10, LUC-M20: ± 2 mm (0.08 in) or 0.2% of set measuring range (empty calibration)[1)] LUC-M30,LUC-M40: ± 4 mm (0.16 in) or 0.2% of set measuring range (empty calibration)[1)] [1)] whichever is greater
Operating conditions	
Mounting conditions	see Technical Information
Ambient conditions	
Ambient temperature	-40 ... 80 °C (233 ... 353 K) , for additional information see Technical Information
Storage temperature	-40 ... 80 °C (233 ... 353 K)
Resistance to alternating temperature cycles	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
Vibration resistance	EN 60068-2-64/IEC 68-2-64: 20 ... 2000 Hz, 1 $(m/s^2)^2$/Hz; 3 x 100 min
Process conditions	
Process temperature	-40 ... 80 °C (233 ... 353 K), a temperature sensor is integrated in the sensor for correction of the temperature-dependent time-of-flight
Process pressure (static pressure)	LUC-M10, LUC-M20: 0.7 ... 3 bar abs. LUC-M30, LUC-M40: 0.7 ... 2.5 bar abs.
Mechanical specifications	
Protection degree	with closed housing, tested according to - IP68, NEMA 6P (24 h at 1.83 m under water surface) - IP66, NEMA 4x with open housing: IP20, NEMA 1 (also ingress protection of the display)
Mechanical construction	
Construction type	housing design: - F12 housing with sealed terminal compartment for standard or EEx ia applications - T12 housing with separate terminal compartment and explosionproof encapsulation cover: - version without on-site display - version with on-site display (transparent cover), this version cannot be supplied together with the ATEX II 1/2 D certificate
Dimensions	see section Dimensions
Weight	LUC-M10: approx. 2.5 kg LUC-M20: approx. 2.6 kg LUC-M30: approx. 3.5 kg LUC-M40: approx. 3 kg
Material	material in contact with process: - LUC-M10, LUC-M20: sensor PVDF, seal EPDM - LUC-M30: sensor UP and stainless steel 1.4571 (316Ti), seal EPDM, flange PP or stainless steel 1.4571 (316Ti) - LUC-M40: sensor PVDF, seal Viton or EPDM, flange PP, PVDF or stainless steel 1.4535 (316L) housing: - aluminium, seawater resistant, chromed, powder-coated cover: - aluminium, for version without on-site display - inspection glass for version with on-site display
Process connection	see type code
Indication and operation	
Display elements	LCD module VU331 at the device
Operating elements	on-site operation: - via 3 keys of the LCD module VU331 - via handheld terminal remote control: - operation with PACT*ware*™ (for communication variants HART or PROFIBUS-PA) - operation with NI-FBUS configurator (only FOUNDATION Field bus)
General information	
Directive conformity	

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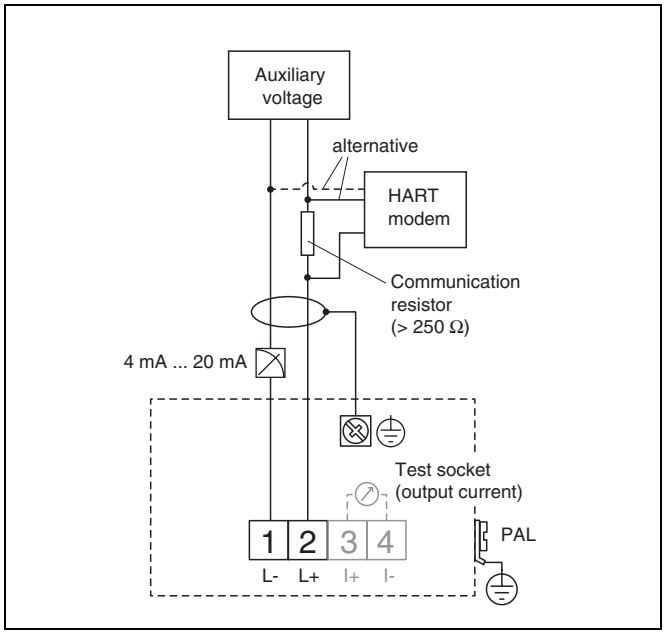
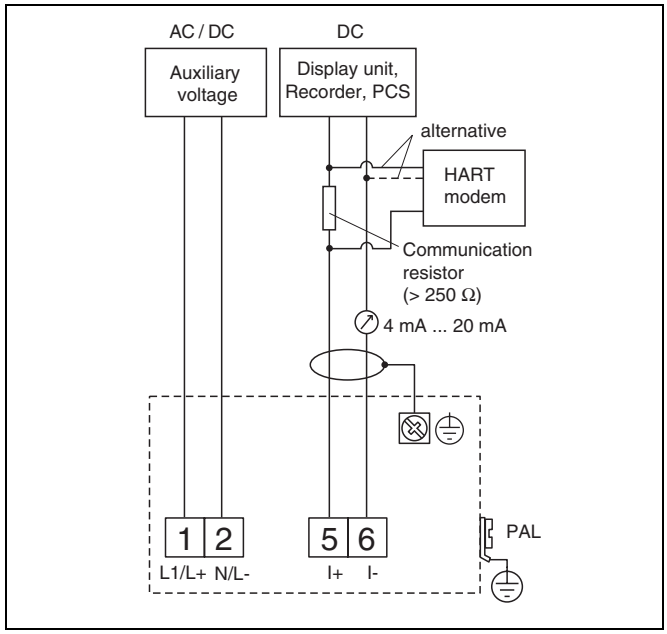
Directive 89/336/EC (EMC)	emitted interference to EN 61326, class B equipment interference immunity to EN 61326, annex A (industrial sector) and NAMUR EMC recommendation (NE 21) a standard installation cable is sufficient if only the analogue signal is used, use a screened cable when working with a superimposed communication signal (HART)
Directive 94/9 EC (ATEX)	in preparation
Supplementary documentation	technical information TI 365O operating instructions BA 237O (4 ... 20 mA, HART devices) operating instructions BA 238O (PROFIBUS PA devices) operating instructions BA 239O (FOUNDATION Fieldbus devices) operating instructions BA 240O (description of device functions) short instructions KA 183O (can be found under the device housing cover)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity and instructions have to be observed. For information see www.pepperl-fuchs.com.

Electrical connection

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

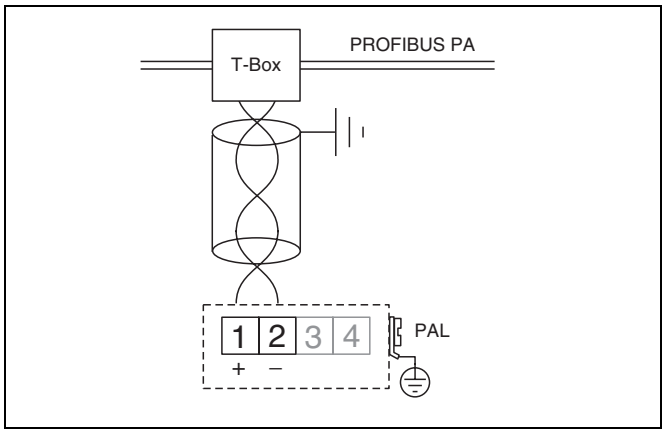


Connection AH, DH
4 mA ... 20 mA with HART, active, 4-wire

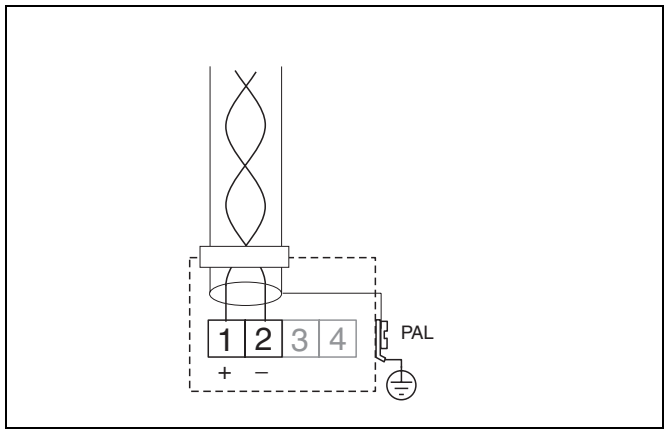


- Connect the connecting line to the screw terminals (line cross-sections of 0.5 mm... 2.5mm) in the terminal compartment.
- Use 2-wire twisted pair cable with screen for the connection.
- Protective circuitry against reverse polarity, RFI and over-voltage peaks is built into the device.

Connection PA
PROFIBUS PA



Connection FF
FOUNDATION Fieldbus



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

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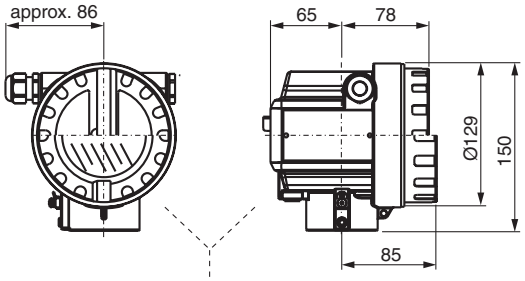
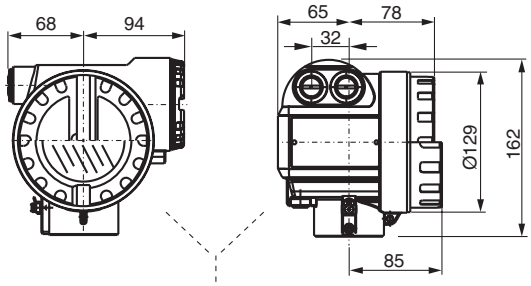
Dimensions

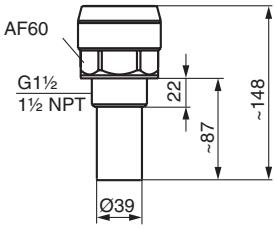
Housing F12



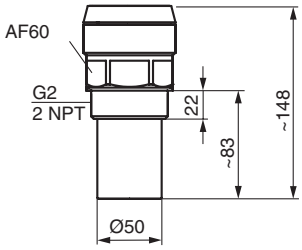
Housing T12



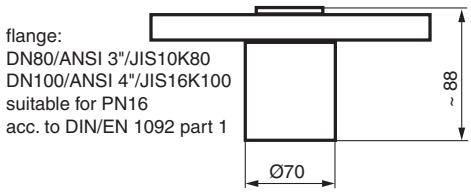
LUC-M10



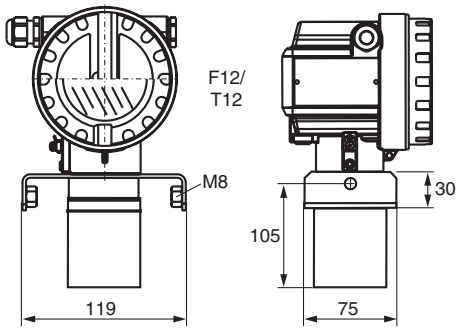
LUC-M20



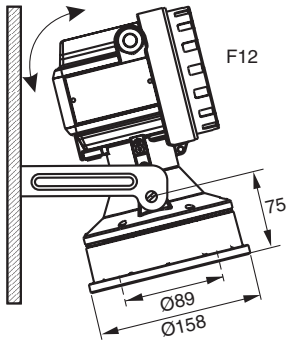
LUC-M40 with universal flange



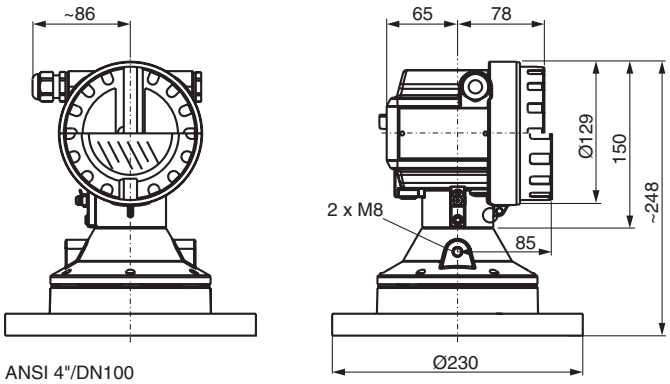
LUC-M40 with mounting bracket



LUC-M30 with mounting bracket



LUC-M30 with universal slip-on flange



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

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Accessories

Mounting accessories

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

Flanges

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

Further accessories

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

for additional information see Technical Information

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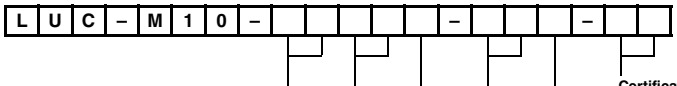
Type code/model number

Product structure LUC-M10



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

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

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

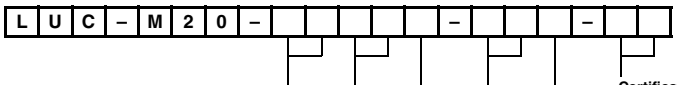
Cable entry
- **2** cable gland M20 x 1.5
- **3** thread G½
- **4** thread ½ NPT
- **5** connector M12, PROFIBUS PA
- **6** connector 7/8", FOUNDATION Fieldbus

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

Prozess connection
- **G5** thread G1½B, ISO 228, PVDF
- **N5** thread 1½ NPT, ANSI, PVDF

* in preparation

Product structure LUC-M20



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

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

Electrical output
- **AH** 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
- **DH** 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
- **FF** 2-wire, FOUNDATION Fieldbus
- **PA** 2-wire, PROFIBUS PA
- **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
- **6** connector 7/8", FOUNDATION Fieldbus

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

Prozess connection
- **G6** thread G2B, ISO 228, PVDF
- **N6** thread 2 NPT, ANSI, PVDF

* in preparation

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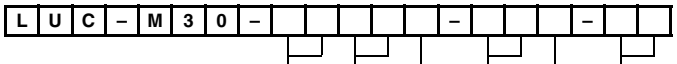
Type code/model number

Product structure LUC-M30



Certificate
- **NA** version for non-explosion hazardous areas
- **ES** ⟨Ex⟩ II 1/2 D, aluminium cover
- **E2** ⟨Ex⟩ 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 VU331 inclusive on-site operation, envelope curve display

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

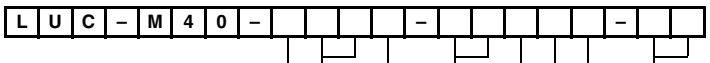
Cable entry
- **2** cable gland M20 x 1,5
- **3** thread G½
- **4** thread ½ NPT
- **5** connector M12, PROFIBUS PA
- **6** connector 7/8", FOUNDATION Fieldbus

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

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

* in preparation

Product structure LUC-M40



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

Additional option
- **A** basic version

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

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

Electrical output
- **AH** 4-wire, 90 V AC ... 250 V AC, 4 mA ... 20 mA, HART
- **DH** 4-wire, 10.5 V DC ... 32 V DC, 4 mA ... 20 mA, HART
- **FF** 2-wire, FOUNDATION Fieldbus
- **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
- **6** connector 7/8", FOUNDATION Fieldbus

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

Process connection; max. 3 bar abs/44 psia, hole circle PN16/150 lbs/10K
- **P** universal flange DN80/ANSI 3"/JIS10K80, PP
- **Q** universal flange DN80/ANSI 3"/JIS10K80, PVDF
- **S** universal flange DN80/ANSI 3"/JIS10K80, 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

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