

# Датчики ультразвуковые LUC-M20

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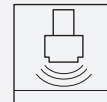
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# Ultrasonic Level Sensor LUC-M20



- Device for non-contact level measurement
- Measuring range up to 8 m in fluids
- Measuring range up to 3.5 m in bulk materials
- Quick and simple commissioning via menu-guided onsite operation with four-line display
- Optional remote display and operation (up to 20 m from transmitter)
- Integrated temperature sensor for automatic correction of the temperature dependent sound velocity

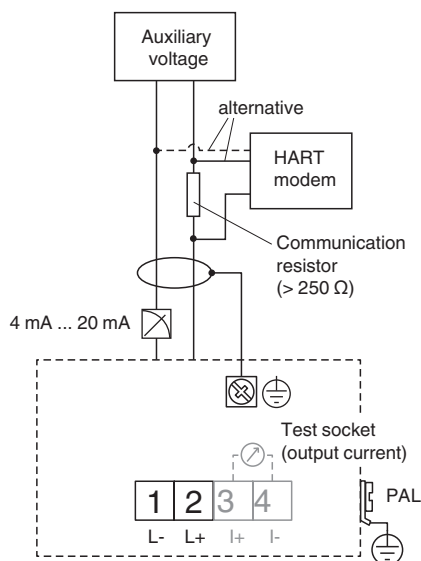


## Function

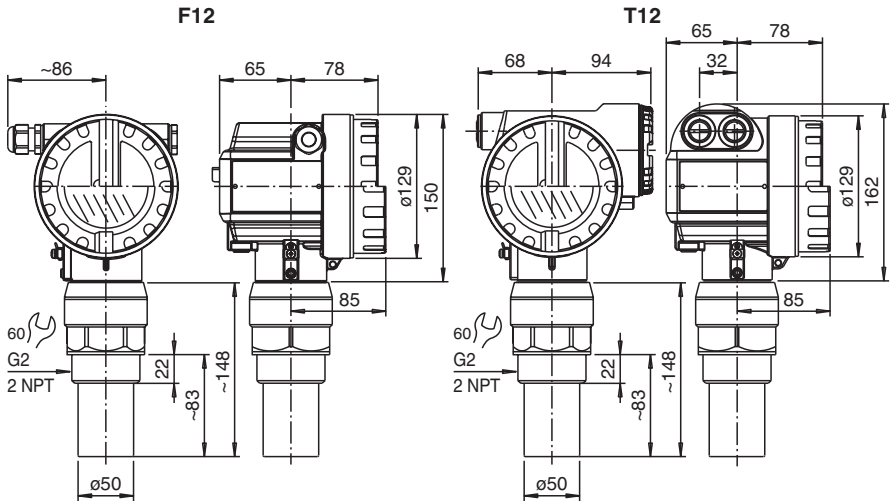
The LUC-M20 is a compact measuring device for continuous, non-contact level measurement. The maximum measuring range is 8 m in fluids and 3.5 m in bulk materials. By using the linearisation function, the device can also be used for flow measurements in open channels and measuring weirs. The system integration is ensured via HART (standard), 4 mA ... 20 mA.

## Connection

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



Dimensions



Technical Data

|                               |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General specifications</b> |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Measuring method              |                | The sensor of the device transmits ultrasonic pulses in the direction of the product surface. There, the ultrasonic pulses are reflected back and received by the sensor. The device 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, the device calculate the level. |
| Equipment architecture        |                | 4 ... 20 mA output with HART protocol                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Construction type             |                | compact device                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Series                        |                | LUC-M20                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Supply</b>                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Connection                    |                | 2-wire , 4 ... 20 mA , HART protocol , 14 ... 30 V DC                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Rated voltage                 | U <sub>r</sub> | 14 ... 30 V DC , 8 V DC at 20 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Ripple                        |                | 47 ... 125 Hz , U <sub>pp</sub> = 200 mV (measured at 500 Ω)                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Noise                         |                | 0.5 ... 10 kHz , U <sub>rms</sub> = 2.2 mV (measured at 500 Ω)                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Current consumption           |                | 3.6 ... 22 mA                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Power consumption             |                | 51 ... 800 mW                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Input</b>                  |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Measured variable             |                | distance between the sensor membrane and the product surface using the linearization function, the device calculate<br>- level in any units<br>- volume in any units<br>- flow across measuring weirs or open channels in any units                                                                                                                                                                                                                                                |
| Measurement range             |                | max. 8 m (26.2 foot) in fluids<br>max. 3.5 m (11.5 foot) in bulk materials                                                                                                                                                                                                                                                                                                                                                                                                         |
| Operating frequency           |                | approx. 50 kHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Blocking distance             |                | 0.35 m                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Output</b>                 |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Load                          |                | min. 250 Ω for HART communication                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Linearity                     |                | The linearization function of the device allows conversion of the measured value into any unit of length or volume. In open channels or measuring weirs, also a flow linearization is possible (calculation of the flow from the measured level).                                                                                                                                                                                                                                  |
| Output signal                 |                | 4 ... 20 mA with HART protocol                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Output damping                |                | 0 ... 255 s , freely selectable                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Signal on alarm               |                | error information can be accessed via the following interfaces:<br>- on-site display (error symbol, error code and plain text description)<br>- current output (configurable)<br>- digital interface                                                                                                                                                                                                                                                                               |
| <b>Directive conformity</b>   |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Electromagnetic compatibility |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Directive 2014/30/EU          |                | EN 61326-1:2006 , EN 61326-2-3:2006 , EN 61326-2-5:2006                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Low voltage                   |                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## Technical Data

|                                                                |  |                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Directive 2014/35/EU                                           |  | EN 61010-1:2001                                                                                                                                                                                                                                                                                                                           |
| <b>Conformity</b>                                              |  |                                                                                                                                                                                                                                                                                                                                           |
| Electromagnetic compatibility                                  |  | NE 21                                                                                                                                                                                                                                                                                                                                     |
| Degree of protection                                           |  | IEC 60529:2001                                                                                                                                                                                                                                                                                                                            |
| Vibration resistance                                           |  | EN 60068-2-64                                                                                                                                                                                                                                                                                                                             |
| Climate class                                                  |  | EN 60068-2-38 (test Z/AD) DIN/IEC 68 T2-30Db                                                                                                                                                                                                                                                                                              |
| Resistance to alternating temperature cycles                   |  | EN 60068-2-14                                                                                                                                                                                                                                                                                                                             |
| <b>Measurement accuracy</b>                                    |  |                                                                                                                                                                                                                                                                                                                                           |
| Reaction time                                                  |  | min. 2 s                                                                                                                                                                                                                                                                                                                                  |
| Reference operating conditions                                 |  | temperature = 20 °C (68 °F)<br>pressure = 1013 mbar <sub>abs</sub><br>humidity = 50 %<br>ideal reflective surface (e. g. calm, smooth fluid surface)<br>no interference reflections within signal beam<br>set application parameters:<br>- tank shape = flat ceiling<br>- medium property = liquid<br>- process conditions = calm surface |
| Measured value resolution                                      |  | 1 mm                                                                                                                                                                                                                                                                                                                                      |
| Measuring frequency                                            |  | max. 0.5 Hz                                                                                                                                                                                                                                                                                                                               |
| Maximum measured error                                         |  | typical specifications for reference operating conditions (include linearity, repeatability, and hysteresis):<br>± 2 mm (0.08 inch) or 0.2% of set measuring range (empty calibration) <sup>1)</sup><br><sup>1)</sup> whichever is greater                                                                                                |
| <b>Operating conditions</b>                                    |  |                                                                                                                                                                                                                                                                                                                                           |
| Installation conditions                                        |  | see technical information (TI)                                                                                                                                                                                                                                                                                                            |
| Ambient conditions                                             |  |                                                                                                                                                                                                                                                                                                                                           |
| Resistance to alternating temperature cycles                   |  | Nb test: +80 °C/- 40 °C (353 K/233 K), 1 K/min, 100 cycles                                                                                                                                                                                                                                                                                |
| Vibration resistance                                           |  | 20 ... 2000 Hz, 1 (m/s <sup>2</sup> )/Hz; 3 x 100 min                                                                                                                                                                                                                                                                                     |
| Process conditions                                             |  |                                                                                                                                                                                                                                                                                                                                           |
| Process temperature                                            |  | -40 ... 80 °C (-40 ... 176 °F)                                                                                                                                                                                                                                                                                                            |
| Process pressure (static pressure)                             |  | 0.7 ... 3 bar (10.2 ... 43.5 psi) , absolute pressure                                                                                                                                                                                                                                                                                     |
| <b>Ambient conditions</b>                                      |  |                                                                                                                                                                                                                                                                                                                                           |
| Ambient temperature                                            |  | -40 ... 80 °C (-40 ... 176 °F)<br>see technical information (TI)                                                                                                                                                                                                                                                                          |
| Storage temperature                                            |  | -40 ... 80 °C (-40 ... 176 °F)                                                                                                                                                                                                                                                                                                            |
| <b>Mechanical specifications</b>                               |  |                                                                                                                                                                                                                                                                                                                                           |
| Degree of protection                                           |  | with closed housing, tested according to<br>- IP68, NEMA 6P (24 h at 1.83 m under water surface)<br>- IP66, NEMA 4X<br>with open housing: IP20, NEMA 1 (also ingress protection of the display)                                                                                                                                           |
| Connection                                                     |  | cable gland M20x1.5<br>cable gland NPT1/2<br>cable gland G1/2                                                                                                                                                                                                                                                                             |
| Material                                                       |  | material in contact with process: sensor PVDF, seal EPDM<br>housing: aluminum, seawater resistant, chromated, powder-coated cover:<br>- aluminum, for version without on-site display<br>- inspection glass for version with on-site display                                                                                              |
| Mass                                                           |  | 2.6 kg                                                                                                                                                                                                                                                                                                                                    |
| Dimensions                                                     |  | see section dimensions                                                                                                                                                                                                                                                                                                                    |
| Process connection                                             |  | - cylindrical thread G1-1/2B, G2B to DIN/ISO 228/1<br>- conical thread NPT1-1/2, NPT2 to ANSI B 1.20.1<br>- flanges to EN 1092-1 from DN80, to ANSI B 16.5 from 3 inch, to JIS B 2238 (RF) from DN80<br>- mounting bracket LUC-Z17                                                                                                        |
| <b>Data for application in connection with hazardous areas</b> |  |                                                                                                                                                                                                                                                                                                                                           |
| EU-type examination certificate                                |  | see instruction manuals (SI)                                                                                                                                                                                                                                                                                                              |
| Directive conformity                                           |  |                                                                                                                                                                                                                                                                                                                                           |
| Directive 2014/34/EU                                           |  | EN 60079-0:2006 , EN 60079-1:2004 , EN 60079-7:2003 , EN 60079-11:2007 , EN 60079-18:2005 , EN 60079-26:2004 , EN 60079-27:2007 , EN 61241-0:2006 , EN 61241-1:2004+C11:2006                                                                                                                                                              |

Technical Data

|                                 |                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mechanical construction</b>  |                                                                                                                                                                                                                                                                                                                                                                                   |
| Construction type               | housing design:<br>- F12 housing with sealed terminal compartment for standard or EEx ia applications<br>- T12 housing with separate terminal compartment and flameproof encapsulation cover:<br>- version without on-site display<br>- version with on-site display (transparent cover), this version cannot be supplied together with the ATEX II 1/2D certificate              |
| <b>Indication and operation</b> |                                                                                                                                                                                                                                                                                                                                                                                   |
| Display elements                | display and operating module LUC-Z15 at the device                                                                                                                                                                                                                                                                                                                                |
| Control elements                | on-site operation:<br>- via 3 keys of the display and operating module<br>- via handheld terminal<br>remote control:<br>- operation with operating program (for communication variant HART)                                                                                                                                                                                       |
| <b>General information</b>      |                                                                                                                                                                                                                                                                                                                                                                                   |
| Supplementary documentation     | technical information (TI)<br>manuals, brief instructions (BA, KA)<br>instruction manuals (SI)<br>control drawings (ZD)                                                                                                                                                                                                                                                           |
| Supplementary information       |                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Accessories</b>              |                                                                                                                                                                                                                                                                                                                                                                                   |
| Designation                     | - LUC-Z19, mounting bracket<br>- LUC-Z2*, cantilever<br>- LUC-Z3*, mounting frame<br>- LUC-Z5*, wall bracket<br>- LUC-Z-A**N**, adapter flange with conical thread<br>- LUC-Z-F**G**, adapter flange with metrical thread<br>- LUC-Z15, display and operating module for on-site operation<br>- LUC-Z16, weather protection cover<br>- LUC-Z40-**1*, remote display and operation |

Type Code

This overview does not mark options which are mutually exclusive.  
 Option with \* = on request/in preparation.

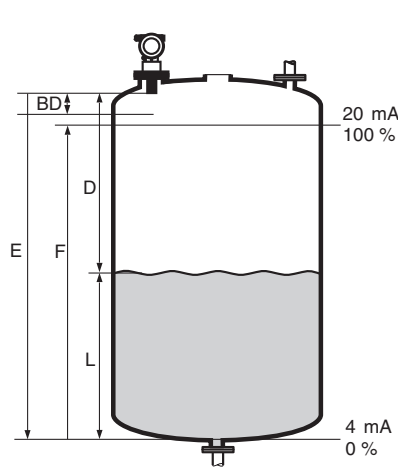
|            |   |                                                                                                       |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
|------------|---|-------------------------------------------------------------------------------------------------------|---|---|---|---|---|-----|-----|-----|---|---|---|-----|---|-----|
| L          | U | C                                                                                                     | - | M | 2 | 0 | - | (1) | (2) | (3) | - | I | H | (4) | - | (5) |
| <b>LUC</b> |   | <b>Device</b>                                                                                         |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| LUC        |   | Ultrasonic level sensor                                                                               |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>M20</b> |   | <b>Series</b>                                                                                         |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| M20        |   | Thread version                                                                                        |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>(1)</b> |   | <b>Process connection</b>                                                                             |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| G6         |   | Thread G2, DIN/ISO 228/1, plastic PVDF                                                                |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| N6         |   | Thread NPT2, ANSI, plastic PVDF                                                                       |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>(2)</b> |   | <b>Housing</b>                                                                                        |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| A1         |   | Aluminium housing F12, IP68, thread M20x1.5                                                           |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| A2         |   | Aluminium housing T12, IP68, coated, with separate terminal compartment                               |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| A4         |   | Aluminium housing T12, IP68, coated, with separate terminal compartment, overvoltage protection       |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>(3)</b> |   | <b>Cable entry</b>                                                                                    |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| 2          |   | Cable gland M20x1.5                                                                                   |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| 3          |   | Thread G1/2                                                                                           |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| 4          |   | Thread NPT1/2                                                                                         |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>IH</b>  |   | <b>Electrical output</b>                                                                              |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| IH         |   | 2-wire, 4 mA to 20 mA HART                                                                            |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>(4)</b> |   | <b>Display and operation</b>                                                                          |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| A          |   | * Prepared for remote display and operation, order remote display and operation as accessory LUC-Z40. |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| B          |   | without display and operating module                                                                  |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| D          |   | with display and operating module inclusive on-site operation, envelope curve display                 |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| <b>(5)</b> |   | <b>Approval</b>                                                                                       |   |   |   |   |   |     |     |     |   |   |   |     |   |     |
| NA         |   | Version for non-explosion-hazardous area                                                              |   |   |   |   |   |     |     |     |   |   |   |     |   |     |

## Type Code

| (5) | Approval                                                                          |
|-----|-----------------------------------------------------------------------------------|
| EX  | ATEX II 1/2G Ex ia IIC T6...T4 Ga/Gb<br>ATEX II 2G Ex ia IIC T6...T4 Gb           |
| ES  | ATEX II 1/2D Ex ta/tb IIIC T104°C Da/Db<br>ATEX II 2D Ex tb IIIC T95°C Db         |
| E2  | ATEX II 1/3D Ex ta/tc IIIC T104°C Da/Dc<br>ATEX II 3D Ex tc IIIC T95°C Dc         |
| SX  | ATEX II 1/2G Ex db [ia] IIC T6...T4 Ga/Gb<br>ATEX II 2G Ex db [ia] IIC T6...T4 Gb |
| S2  | ATEX II 3G Ex ec IIC T6...T4 Gc                                                   |
| 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.                      |

Application

Blocking distance

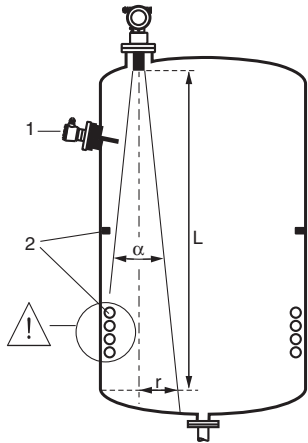


| BD                 | Max. range fluids | Max. range bulk materials |
|--------------------|-------------------|---------------------------|
| 0.35 m (13.8 inch) | 8 m (26.2 foot)   | 3.5 m (11.5 foot)         |

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

Emitting angle

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



| a   | L               | r                  |
|-----|-----------------|--------------------|
| 11° | 8 m (26.2 foot) | 0.77 m (30.3 inch) |

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Череповец (8202)49-02-64  
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