

Radar Level Meters with Guided Wave (Principle TDR)

FEATURES

- Suited to continuous level measurement of various liquid, bulk solids, mush and pasty materials.
- Quick view measured values on the display
- Universal use, direct mounting into hoppers, silos, tanks, sumps etc.
- Variants with stainless steel rod or rope electrode
- Measuring range up to 40m
- Possibility of using in explosive areas (version Xi, XiT), or in flammable dust areas (Xd, XdT)
- Current output (4-20 mA), HART® protocol

The MLR 70 Level Transmitters provide accurate level measurement in some of industry's most difficult level applications. The electronic module transmits very short electrical pulses (0.5 ns), which are linked to a wire transmission line (measuring electrode). The pulse propagates along the electrode in the form of electromagnetic wave toward the level surface, where it is partly reflected and the reflected component is returned to the receiving module of the electronics. The 'time of flight' of electromagnetic wave and the instant distance to the surface level is calculated. According to the level height, the output is calculated and the measured value is displayed.

Radar level meters are resistant against changes in the atmosphere (pressure, temperature, dust, steam) and to changes in medium parameters (change in dielectric constant, conductivity).

Variants of Sensors

MLR -70_-12 Fully coated stainless steel rod electrode (FEP Teflon®), for level measurement of aggressive liquids and drinks. Maximum electrode length 2 m.

MLR -70_-32 Fully coated stainless steel rope electrode (FEP Teflon®) and coated weight (PTFE), for level measurement of aggressive liquids and very pure liquids. Maximum electrode length 12 m.



BASIC TECHNICAL DATA

| | |
|--|---|
| Supply voltage MLR-70N-__ | 18 ... 36 V DC |
| Output | 4 ... 20 mA, HART® |
| Current consumption | 4 ... 20 mA / max. 22 mA |
| Basic error ¹⁾ (for reference reflector) - MLR-70_-20 in area 0,1 – 0,2 m / 0,2 – 2,0 m / 2,0 – 40 m- other types in area 0,1 – 0,2 m / 0,2 – 2,0 m / 2,0 – 40 m | ± 5 mm / ± 3 mm / ± 2 mm ± 10 mm / ± 4 mm / ± 2 mm |
| Resolution | 1 mm |
| Maximal length of measuring electrode MLR-70_-11 (12) MLR-70_-32 | 2 m 12 m |
| Dead zone ²⁾ - for measur. sensitivity - low, medium, user (1 - 4) - high, user (5) - user (6, 7) - user (8) | 100 / 0 mm ³⁾ 150 / 50 mm ³⁾ 200 / 50 mm ³⁾ 250 / 50 mm ³⁾ |
| Electrical parameters for variants Xi (XiT) – max. internal values | U _i =30 V DC; I _i =132 mA; P _i =0,99W; C _i =370 nF; L _i =0,9 mH |
| Measurement sensitivity (8 degrees) | low (1) - medium (3) - high (5) - user (1 - 8) |
| Failure indication (echo loss, internal failure) | Adjustable in modes: 3,75 mA, 4 mA, 20 mA, 22 mA, LAST ⁴⁾ |
| Damping | 1 .. 99 s |
| Warm up time | cca 60 s |
| Internal resistance / Electric strength (Electrode - Housing) | 10 kΩ |
| Coupling capacity / Electric strength (Housing - Supply leads) | 5 nF / 500 V AC |
| Maximal current output load resistance for U = 24 V DC U = 22 V DC U = 20 V DC | R _{max} = 270 Ω ⁵⁾ R _{max} = 180 Ω R _{max} = 90 Ω |
| Maximum tensile strength of the rope electrode | 1400 kg |
| Protection class | IP67 |
| Process connection | screwing with thread G1" |
| Recommended cable | PVC 2 x 0,75 mm ² |
| Weight (without electrode) | cca 0,5 kg (1 kg variant NT, XiT) |

- 1) Error is larger at the beginning and end of the rod or rope electrode. More detailed informations can be found in the instruction manual.
- 2) Dead zone = Blind zone = Blocking distance
- 3) The length of dead zone at the beginnig / at the end of the electrode. (The length of dead zone is 110 mm at the end of rope electrode.)
- 4) Level meter displays last measured value.
- 5) Including 250R resistor in case of HART connection.

BASIC TECHNICAL DATA

| | |
|---|-----------------|
| Type of display | LED |
| Resolution | 128 x 64 pixels |
| Height of digits / Number of display digits of measured values | 9 mm / 5 digits |
| Colour of display | Yellow |
| Type of buttons | Membrane |
| Ambient temperature range | -30 ... +70°C |
| Weight | 46 g |

BASIC TECHNICAL DATA

| Sensor part | Variants | Standard material |
|---------------------|----------------------------|--|
| Lid | All types | Aluminium with powder coating |
| Glass | All types | Polycarbonate |
| Body | All types | Aluminium with powder coating |
| Housing with thread | All types | St. Steel W. Nr. 1.4571 (AISI 316 Ti) |
| Electrode | MLR-70_-12 MLR-70_-32 | St. Steel W. Nr. 1.4301 (AISI 304) St. Steel W. Nr. 1.4404 (AISI 316 L) |
| Electrode coating | GMLR-70_-12 GMLR-70_-32 | FEP (TEFLON) FEP (TEFLON) |
| Display module | MLR-70_-30 | POM |

Device Classification (according to EN 60079-10-1 and EN 60079-10-2)

| | |
|----------------------|---|
| MLR-70N | Performance for non-explosive areas |
| MLR-70NT | High temperature performance for non-Ex areas (max. 200°C) |
| MLR-70Xi(XiT) | Performance for explosive areas (gases or vapour) ⊕ II 1/2 G Ex ia IIB T6 Ga/Gb with ISSU ¹⁾ electrode part zone 0, housing zone 1 |
| MLR-70Xd(XdT) | Performance for flammable dust areas ⊕ II 1 D Ex ta IIIC T85°C...T300°C Da (current), ⊕ II 1 D Ex ta IIIC T100°C...T300°C Da(Modbus), whole level meter zone20 |

¹⁾ Intrinsically safe supply unit (for example: Dinel IRU-420).

Temperature and pressure resistivity (performance N, Xi)

| Variants / Performance | Temperature tp | Temperature tm | Temperature ta | Max. operation pressure for temp. tp | |
|------------------------|-----------------|------------------|-----------------|--------------------------------------|---------|
| | | | | to 30°C | to 30°C |
| MLR-70_-11(12) | -40°C ... +85°C | -40°C ... +200°C | -30°C ... +70°C | 4 MPa | 2,5 MPa |
| MLR-70_-32 | -40°C ... +85°C | -40°C ... +130°C | -30°C ... +70°C | 1 MPa | 0,5 MPa |

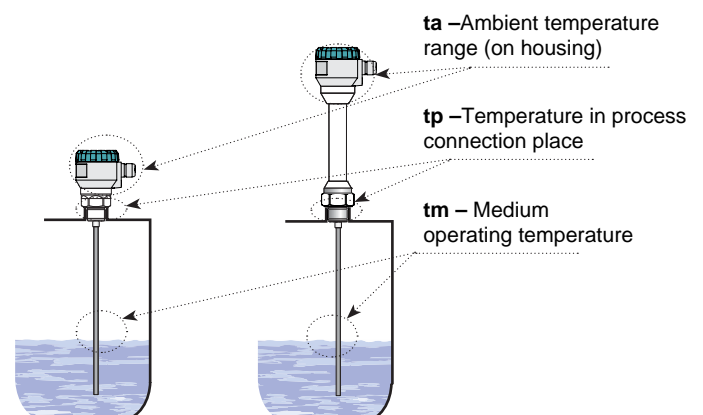
Temperature resistivity (performance NT, XiT)

| Variants / Performance | Temperature tp | Temperature tm | Temperature ta |
|------------------------|------------------|------------------|-----------------|
| MLR-70_-11(12) | 40°C ... +200°C | -40°C ... +200°C | -30°C ... +70°C |
| MLR-70_T-32 | -40°C ... +130°C | -40°C ... +130°C | -30°C ... +70°C |

Note: For correct function of the level meter must not be exceeded any of the temperature range (tp, tm or ta).

Pressure resistivity (performance NT, XiT)

| Variants / Performance | Max. operation pressure for temp. tp | | | | |
|------------------------|--------------------------------------|---------|----------|----------|----------|
| | to 30°C | to 85°C | to 130°C | to 160°C | to 200°C |
| MLR-70_-11(12) | 4 MPa | 2,5 MPa | 2 MPa | 1,5 MPa | 0,3 MPa |
| MLR-70_-32 | 1 MPa | 0,5 MPa | 0,1 MPa | - | - |



maximal temperatures for performance xi(xit) category 1/2g

| temp. class | temperature tp | temperature tm | temperature ta |
|-------------|------------------|------------------|-----------------|
| T5 | -40°C ... +90°C | -40°C ... +98°C | -30°C ... +70°C |
| T4 | 40°C ... +125°C | -40°C ... +133°C | -30°C ... +70°C |
| T3 | -40°C ... +190°C | -40°C ... +198°C | -30°C ... +70°C |
| T2 | -40°C ... +200°C | -40°C ... +298°C | -30°C ... +70°C |
| T1 | -40°C ... +200°C | -40°C ... +300°C | -30°C ... +70°C |

Device surface temperature for performance xd(xdt) category 1d

| Part of level meter | Device Surface Temperature |
|--|--|
| electrode MLR-70_--_l MLR-70_--_M | medium temp. tm +5°C medium temp. tm +10°C |
| housing, electronic part MLR-70_--_l MLR-70_--_M | temperature tp +15°C temperature ta +15°C temperature tp +30°C temperature ta +30°C |

The maximum allowable temperature of the medium, process connection and ambient temperature depends in MLR-70Xi (XiT) at the desired temperature class (see tab. Maximum temperatures for the performance Xi (XiT) category 1/2G and tab.). The temperature value can not be exceeded, because the hot surface of the device could cause ignition of an explosive or flammable atmosphere. At the same time can not exceed the maximum temperature for the different variants of the electrodes (Table of temperature durability).

Installation

Install the level meter into the upper lid of the tank or reservoir using a welding flange or fastening nut.

The min. distance to install the level meter into a lid or a ceiling of a tank from the metal tank wall is 300 mm and from the nonmetal tank wall is 500 mm (except MLR-70_-20).

If installed in an open channel (sumps, reservoirs, etc.), install the level meter as closest as you can to the maximum level expected. Rope electrode level meter must untangle and then can be inserted into the tank.

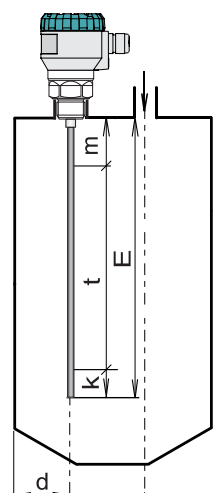
In case any visible defects are discovered, the manufacturer or reseller of this equipment must be contacted immediately.

Installation and recommendations

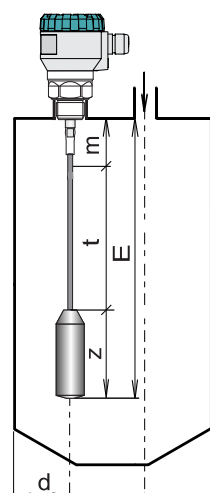
We recommend to keep the specified distances from the tank wall. Otherwise, the level meter install as far as possible from the walls, to the middle between the wall and the vertical inlet.

The minimum distance of measuring electrodes from the bottom of the tank is not specified. In case that could occur touching of the electrodes with the bottom of the tank, it is necessary that the electrode was fixedly attached to the tank bottom (the connection may be conductive or non-conductive

$$E = m + t + k$$



$$E = m + t + z$$



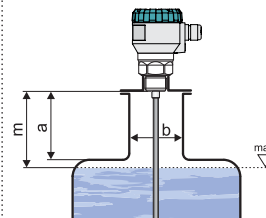
| type of wall | d (without ref. tube) | d (with ref. tube) |
|--------------|--------------------------|-----------------------|
| metal | ≥ 300 mm | any distance |
| non-metal | ≥ 500 mm | any distance |

E – The length of rope electrode
t – Measuring range
m – Dead zone on the beginning of electrode
k – Dead zone on the end of electrode
z – The length of weight (110 mm)
d – The distance from the tank wall (see Table)

Valid for :
all type

For correct measurement it is important to avoid installation in the high neck. For short neck are recommended dimensional parameters:

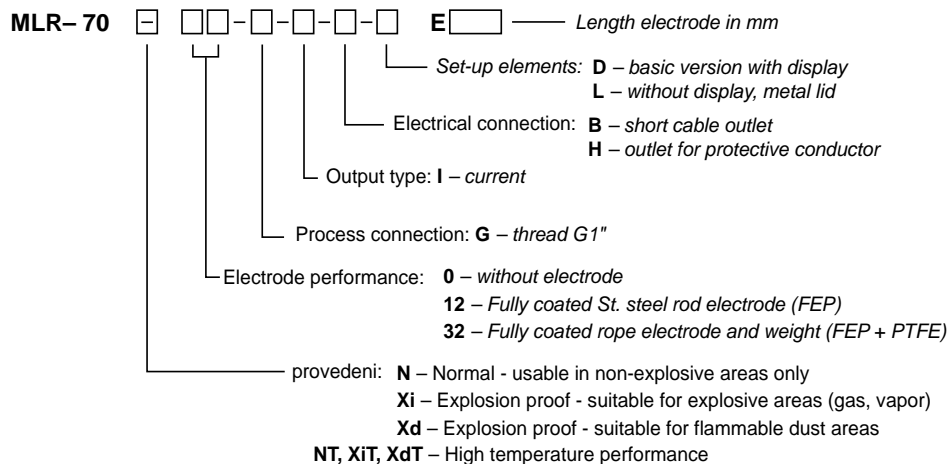
- $a \leq b$
- $b \geq 50 \text{ mm}$
- a – Neck height
- b – Neck width



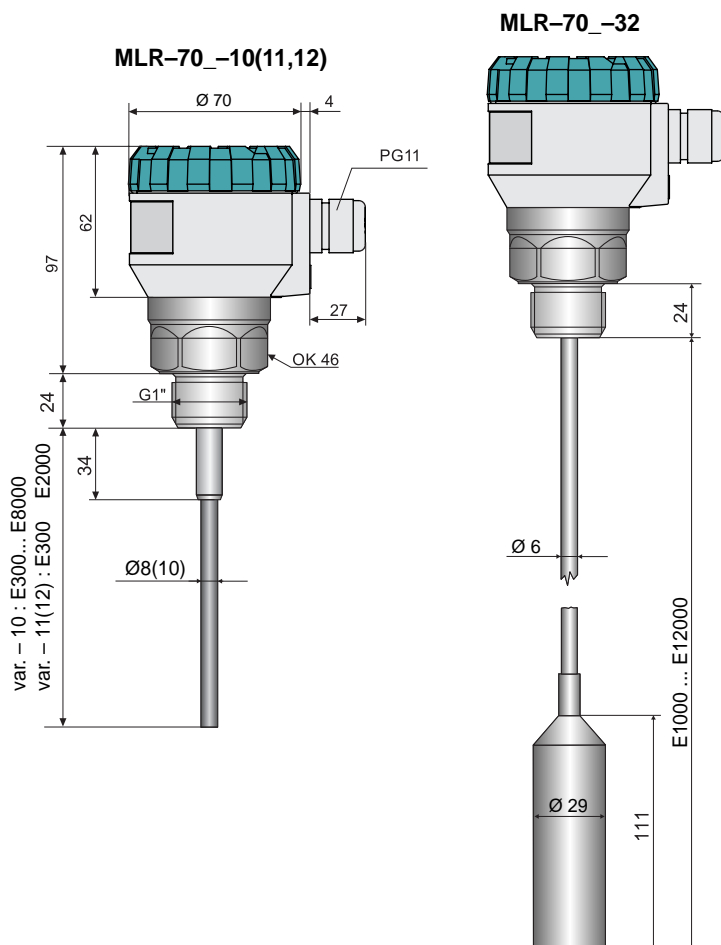
If you can not eliminate all interference, which could affect the measurement of level, it is recommended to use the procedure "TEACHING" (see Instruction manual). This procedure sets the level meter to mode, which suppresses false reflections.

Valid for :
all types
except MLR-70_-20

Order Code



Dimensional Drawings



Installation

Standard – included in the price of the level meter

- 1 pc. of seal (asbestos free)

Optional - for extra charge

- Fixing Stainless steel nuts NPT/G1"
- Steel or Stainless steel welding flange ON-G1", NN-G1"
- Other seals (PTFE, Al, etc.)

Safety, protection, compatibility and explosion proof

The level meter MLR-70 is equipped with protection against reverse polarity and output current overload. Protection against dangerous contact is secured by low safety voltage that complies with EN 33 2000-4-41. Electromagnetic compatibility according to EN 55022/B, EN 61326/Z1 and EN 61000-4-2 to 6.

The explosion proof of MLR-70Xi (XiT) is ensured by compliance with the following standards: EN 60079-0: 2007; EN 60079-11: 2007 and BS EN 60079-26: 2007. Explosion proof of MLR-70Xi (XiT) is proven by FTZÚ-AO 210 Ostrava-Radvanice: certificate No: FTZÚ 13 ATEX 0212X

Special conditions for safe use of variant MLR-70Xi

Level meters MLR-70Xi (XiT) are designed for connection to intrinsically safe circuits with galvanic isolation. If you use the device without galvanic isolation (Zener barriers) it is necessary to offset a potential between the sensor and the grounding point of the barriers.