**Characteristics**

- **Input:** Ultrasonic echo
- **Ranges:** 30...400 mm up to 300...3500 mm
- **Output:** 4...20 mA (HART), 3-wire system
- **Voltage supply:** 24 VDC ±10%
- **Accuracy:** see technical details
- **Process connection:** M30x1,5 / M18x1
- **Electrical connection:** M12 male, 8-pole
- **Temperature range:** -15...+70 °C (operating temperature)
- **Limit value contacts:** 2 electronically (NPN / PNP)
- **Adjustment:** keys / software
- **Material:** Standard: stainless steel / Option: synthetic

**Technical Data**

**Input**

- **Signal:** Ultrasonic echo
- **Ranges:**
  - Type 49-40: 30...400 mm (minimum range: 30 mm)
  - Type 49-160: 80...1600 mm (minimum range: 800 mm)
  - Type 49-350: 300...3500 mm (minimum range: 300 mm)

**Attention:** Plastic as material option can cause deviations from the listed ranges.

**Emitting angle:** 8°

**Output**

- **Current signal:** 4...20 mA with superimposed communication signal HART, 3-wire system
- **Current range:** 3,8...20,5 mA
- **Signal on error:**
  - 3,6 mA (sensor short circuit, underflow)
  - 21 mA (sensor break, sensor open circuit, overflow)

**Performance**

- **Ultrasonic sensor:**
  - **Linearity deviation:** Type 49-40: <0,3%
    Type 49-160: <0,5%
    Type 49-350: <0,5%
  - **Repeatability:**
    Type 49-40: ±1 mm, ±0,2%
    Type 49-160: ±2 mm, ±0,2%
    Type 49-350: ±2 mm, ±0,4%
  - **Temperature compensation:** available
  - **Response time t90:**
    Type 49-40: 100 ms
    Type 49-160: 130 ms
    Type 49-350: 700 ms
  - **Reference temperature:** 25 °C

**Applications**

The MEUS is suitable for distance and level measurement, belt tension control or presence recognition. With it’s two configurable limit value contacts and the integrated display, the ultrasonic sensor is also suitable for applications with higher requirements.
### Technical Data (Continued)

#### Performance (Continued)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring amplifier:</td>
<td>Accuracy: 0.3% of range</td>
</tr>
<tr>
<td>Resolution:</td>
<td>16 Bit</td>
</tr>
<tr>
<td>Filter setting:</td>
<td>0...99 s</td>
</tr>
<tr>
<td>Transmission behaviour:</td>
<td>linear with distance</td>
</tr>
<tr>
<td>Measuring rate:</td>
<td>10 measurements / s</td>
</tr>
<tr>
<td>Adjustment:</td>
<td>keys on display / via software (HART communication)</td>
</tr>
<tr>
<td>Turn-on delay time:</td>
<td>&lt;5 s</td>
</tr>
<tr>
<td>Response time:</td>
<td>20 ms</td>
</tr>
<tr>
<td>Indicator / limit values:</td>
<td>Resolution: -9999...9999 digit</td>
</tr>
<tr>
<td>Error of measurement:</td>
<td>±0.2% of range, ±1 digit</td>
</tr>
<tr>
<td>Temperature drift:</td>
<td>100 ppm/K</td>
</tr>
</tbody>
</table>

#### Indication

- **Display:** 7 segment, 8.5 mm, red, 4 digits, representation mirror-inverted 180° possible
- **Head of display:** rotatable approx. 330°
- **Memory:** minimum / maximum values
- **Indication:** - measuring value - unit of measurement - control menu
- **Decimal point:** automatically or manually, dependent on measuring range / unit

#### Limit Contacts

- **Electronically:** 2x PNP or NPN (30 VDC, 200 mA)
- **Indication:** 1 LED red for each limit value
- **Voltage across:** <1 V
- **Settings:** with 3 keys (TouchM-Technology)
- **Setting range:** switch point and hysteresis: any value within measuring range
- **Switching delay:** 0.0...999.9 s
- **Failsafe function:** adjustable
- **Galvanical insulation:** switching outputs are separated from measuring amplifier

#### Supply

- **Voltage:** 24 VDC ±10%
- **Current consumption:** <70 mA (without limit value contacts)
- **Reverse battery protection:** available (no function, no damage)

#### Ambient Conditions

- **Temperature:**
  - Operating range: -15...+70 °C
  - Sensing head: -15...+70 °C
  - Storing: -15...+70 °C
- **Water, water vapour:** 50 °C maximum at Sensing head

#### Mechanics

- **Dimensions:** see page 4
- **Process connection:**
  - Type 49-40, Typ 49-160: M18x1
  - Type 49-350: M30x1.5
- **Electrical connection:** M12 male, 8-pole
- **Material:**
  - Process connection: Standard: stainless steel 1.4571
  - Body: PBT GF30
  - Head of display: Polycarbonate (makrolon)
- **Weight:**
  - Type 49-350: stainless steel: ca. 240 g / synthetic: ca. 180 g
  - Type 49-200: stainless steel: ca. n/a g / synthetic: ca. n/a g
  - Type 49-40: stainless steel: ca. n/a g / synthetic: ca. n/a g
- **Fitting position:** any (avoid deposition on sound exit area)
- **System pressure:** 10 bar maximum
- **Protection of device:**
  - Ingress protection: Electronics at least IP 65
  - Process connection IP 67
  - PCB: potted by parts

#### Programmable Features

- **Measuring amplifier:** Measuring range start (LRV) / Measuring range end (URV) / Adjustment, simulation of output current / Filter function / Linear output signal / HART address / 2-point calibration
- **Display:** range of indication / time of indication / decimal point / units / stabilisation of zero point / locking of programming / calibration points / TAG number
### Electrical Connection

<table>
<thead>
<tr>
<th>4...20 mA HART</th>
<th>Electronical limit value contacts</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 3 8</td>
<td>2 4 5</td>
<td>+ 1 8</td>
</tr>
</tbody>
</table>

#### Electrical Connection (Example)

![Electrical Connection Diagram](image_url)

- **MEUS**
  - SP1
  - SP2
  - 4...20 mA
  - Supply 24 VDC
**Dimensions (in mm)**

- **M18x1**: 13.8, 72.2
- **M30x1.5**: 14.3, 111.7

- **Ultrasonic Sensor (HART)**
Diagrams of Ultrasonic Sensors

**Type 49-350:** Sensor range 300...3500 mm

- Safe detection of an object 100 x 100 mm²
- Possible detection of a big object

**Type 49-160:** Sensor range 80...1600 mm

- Safe detection of an object 100 x 100 mm²
- Possible detection of a big object

**Type 49-40:** Sensor range 30...400 mm

- Safe detection of an object 100 x 100 mm²
- Possible detection of a big object
Principle of the signal transit time:
The sensor of the MEUS transmits ultrasonic pulses in the direction of the product surface. There the ultrasonic pulses are reflected back and received by the sensor. The MEUS measures the time (t) between pulse transmission and reception. By means of the velocity of sound the distance between the sensor membrane and the product surface is calculated.

\[ A = c \times \frac{t}{2} \]

The empty distance (D) is known, so that the level can be calculated.

\[ F = D - A \]

A possible change in the velocity of sound, which is caused by a temperature change, is compensated by an integrated temperature sensor.

Minimum distance M: in this range the sensor cannot carry out distance measurements, because the level echos cannot be evaluated due to the transient characteristics of the sensor.
**Tips for Mounting**

**Example: Conditions for Level Measurements**

Do not mount the sensor in the middle of the tank (2). Advantageous is a distance between sensor and the tank wall of 1/6 of the tank diameter (1).

Avoid measurements through the filling curtain (3).

Things built in such as temperature sensors should not be within the emitting angle of the ultrasonic sensor (4).

In particular symmetrical equipment such as heating coils or baffles (5) can influence measurement.

It is only allowed to use always one sensor in one tank as otherwise two signals may affect each other.

**Example: Mounting Variants**

<table>
<thead>
<tr>
<th>Mounting with counter nut</th>
<th>Mounting with sleeve</th>
<th>Mounting with adaptor flange</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting with connecting piece</th>
<th>Mounting with mounting bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4.png" alt="Image" /></td>
<td><img src="image5.png" alt="Image" /></td>
</tr>
</tbody>
</table>

\[D = \text{Tank diameter} \quad L = \text{max. coverage} \quad \alpha = \text{Emitting angle of the sensor}\]
## Ultrasonic Sensor (HART)

**Order Code**

<table>
<thead>
<tr>
<th>Input:</th>
<th>Ultrasonic echo</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range:</td>
<td>30...400 mm (M18x1)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>80...1600 mm (M18x1)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>300...3500 mm (M30x1.5)</td>
<td>2</td>
</tr>
<tr>
<td>Material process connection:</td>
<td>Stainless steel 1.4571 (Standard)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Synthetic material PA6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Synthetic material PVC</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Synthetic material POM</td>
<td>4</td>
</tr>
<tr>
<td>Limit value contacts:</td>
<td>2x PNP, 30 VDC, 200 mA (Standard)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1x PNP, 30 VDC, 200 mA</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Without</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>2x NPN, 30 VDC, 200 mA</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1x NPN, 30 VDC, 200 mA</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2x PNP, 30 VDC, 1000 mA</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>1x PNP, 30 VDC, 1000 mA</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>2x NPN, 30 VDC, 1000 mA</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>1x NPN, 30 VDC, 1000 mA</td>
<td>8</td>
</tr>
<tr>
<td>Electrical connection:</td>
<td>M12, 8-pole</td>
<td>2</td>
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<tr>
<td>Configuration:</td>
<td>Factory setting</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Customized (to specify)</td>
<td>2</td>
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<tr>
<td>Special model:</td>
<td>No</td>
<td>0</td>
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<tr>
<td></td>
<td>Yes (to specify)</td>
<td>1</td>
</tr>
</tbody>
</table>

1) Maximum measuring range (LRL...URL) / Customized measuring range (LRV...URV) = maximum measuring range / Filter (damping) 0,1 s / Limit value 1: switch point 40%, reset point 20%

2) Details according to the technical data. Not given values get the factory configuration.

### Accessories:

**DEV-HM**: Interface HART, USB, software

Order No.: **01310-00220**

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**HART Communication**

The HART-Tool is a graphical menu-driven program. It can be used for putting into operation, configuration, analysis of signals, data backup and documentation of the device.


Connection via HART interface (modem) with USB interface of a PC or hand-held HART communicator

Possible settings are:

- Adjustment of output current
- Limits of nominal measuring range (URL, LRL)
- Limits of measuring range (LRV, URV)
- 10-point calibration (linearization)
- Simulation of output current
- Linear output signal
- 2-point calibration
- Filter function
- HART address

**Please note:** When using communication via a HART modem, a communication resistance of 250 Ω has to be taken into account.