

# S-MEUS Ultrasonic Sensor HART

## Ultrasonic Sensor (HART)

## S-MEUS

**Characteristics**

1500 - LEVEL - DISTANCE - MODULAR - ECONOMIC



- 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:	Typ 49-40: 100 ms Typ 49-160: 130 ms Typ 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 its two configurable limit value contacts and the integrated display, the ultrasonic sensor is also suitable for applications with higher requirements.



# S-MEUS Ultrasonic Sensor HART

## ● Technical Data (Continued)

### Performance (Continued)

Measuring amplifier:	Accuracy:	0,3% of range
	Resolution:	16 Bit
	Filter setting:	0...99 s
	Transmission behaviour:	linear with distance
	Measuring rate:	10 measurements / s
Adjustment:	keys on display / via software (HART communication)	
	Turn-on delay time:	<5 s
	Response time:	20 ms
Indicator / limit values:	Resolution:	-9999...9999 digit
	Error of measurement:	±0,2% of range, ±1 digit
	Temperature drift:	100 ppm/K

### 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) Option: 2x PNP or NPN (30 VDC, 1000 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 Option: PA6 / PVC / POM
	Body:	PBT Gf30
Weight:	Head of display:	Polycarbonate (makrolon)
	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

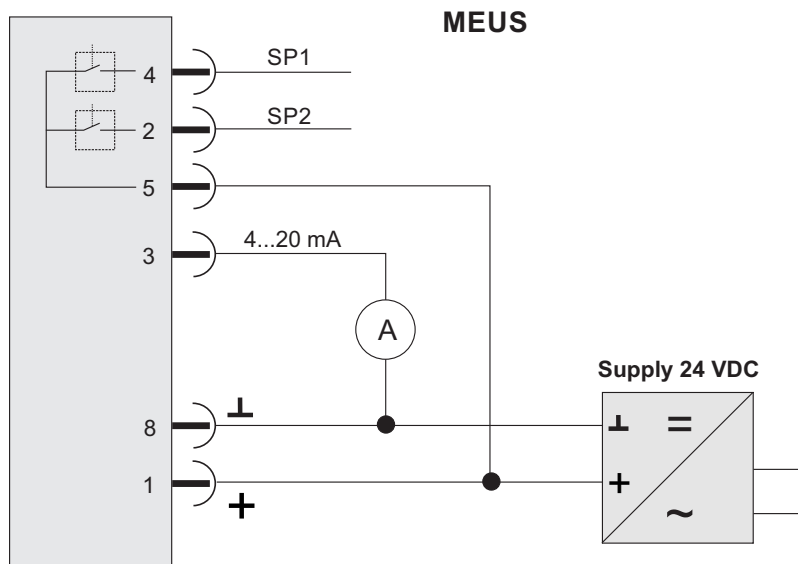
Measuring amplifier:	Measuring range start (LRV) / Measuring range end (URV) / Adjustment, simulation of output current / Filter function / Linear output signal / HART address / 2-point calibration
Display:	range of indication / time of indication / decimal point / units / stabilisation of zero point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

# S-MEUS Ultrasonic Sensor HART

● **Electrical Connection**

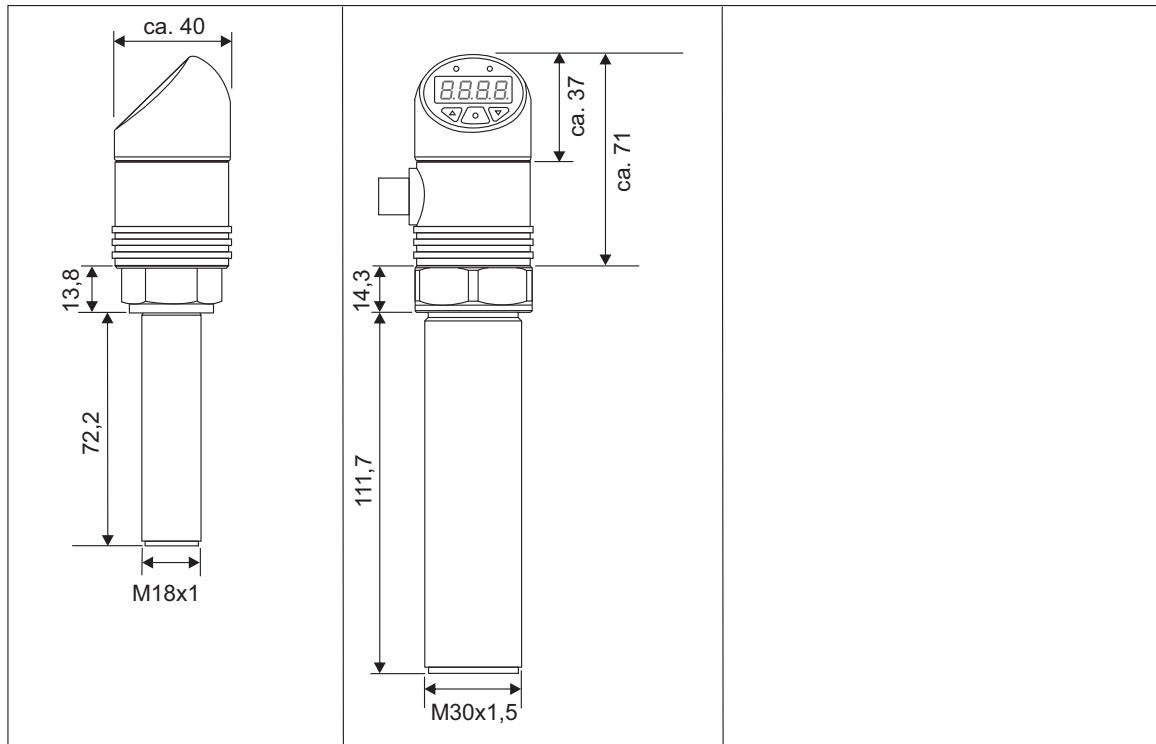
Assignment plug M12x1, 8-pole				
4...20 mA HART  <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">+</div> <div style="border: 1px solid black; padding: 2px;">-</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="border: 1px solid black; padding: 2px;">3</div> <div style="border: 1px solid black; padding: 2px;">8</div> </div>	Electrical limit value contacts  	Supply  <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 2px;">+</div> <div style="border: 1px solid black; padding: 2px;">-</div> </div> <div style="display: flex; justify-content: space-around; margin-top: 5px;"> <div style="border: 1px solid black; padding: 2px;">1</div> <div style="border: 1px solid black; padding: 2px;">8</div> </div>		

**Electrical Connection (Example)**



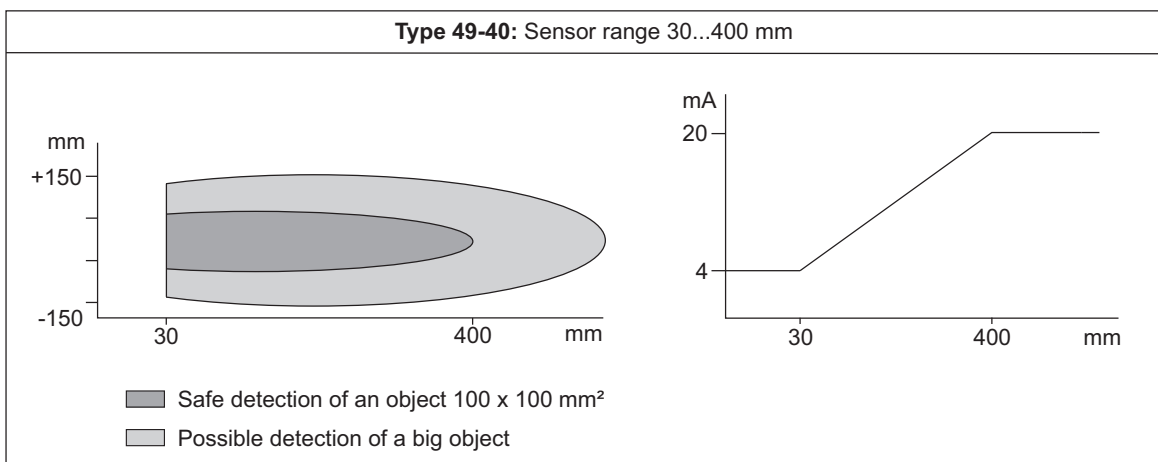
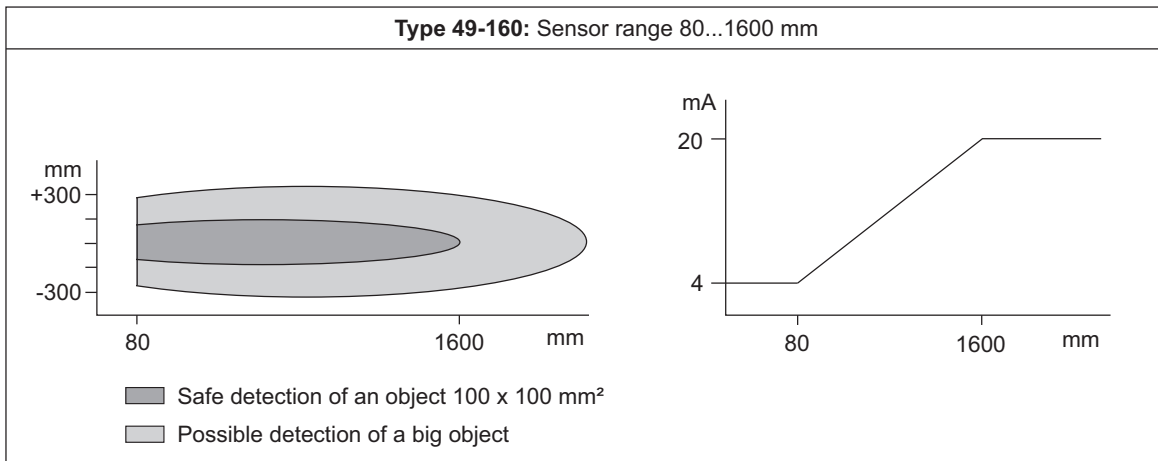
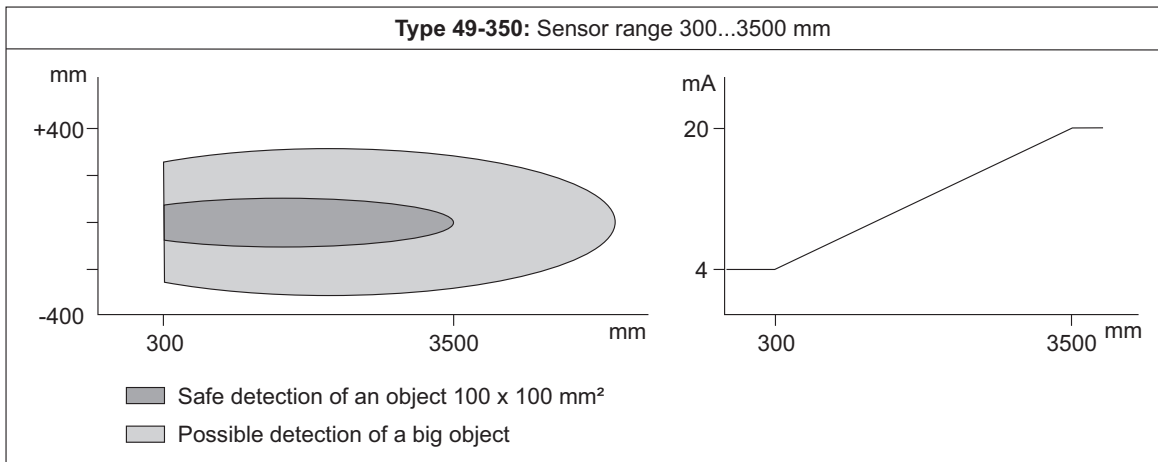
# S-MEUS Ultrasonic Sensor HART

● *Dimensions (in mm)*



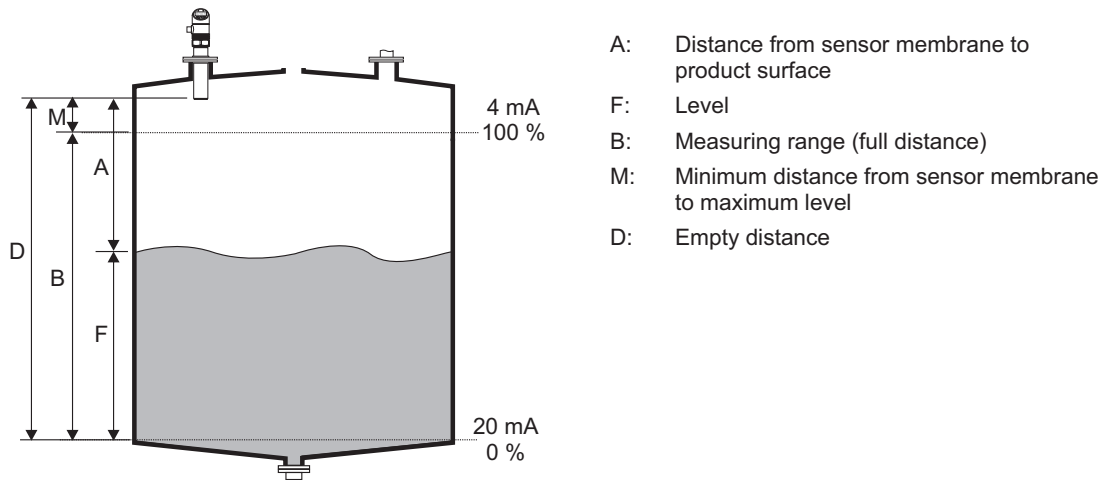
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● **Diagrams of Ultrasonic Sensors**



# S-MEUS Ultrasonic Sensor HART

## ● Ultrasonic Measuring Principle (Example Level Measuring)



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.

$$A = c \text{ (velocity of sound)} \times t/2$$

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

$$F = D - A$$

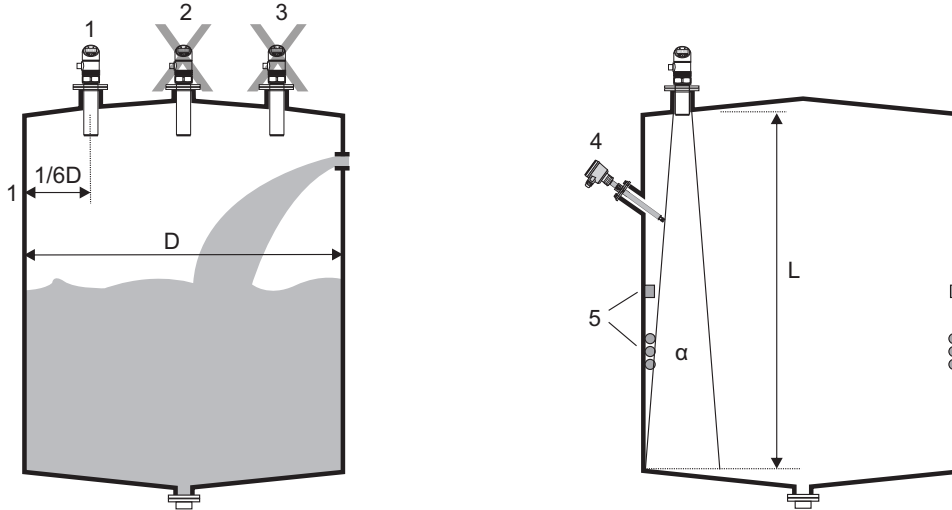
A possible change in the velocity of sound, which is caused by a temperature change, is compensated by an integrated temperature sensor.

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.

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● **Tips for Mounting**

**Example: Conditions for Level Measurements**



D = Tank diameter

L = max. coverage

$\alpha$  = Emitting angle of the sensor

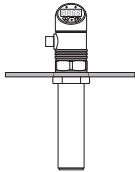
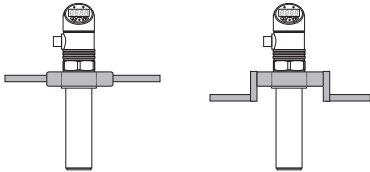
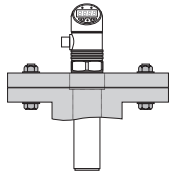
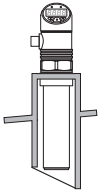
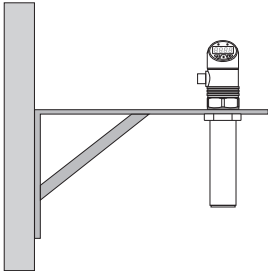
Do not mount the sensor in the middle of the tank (2). Advantageous is a distance between sensor and the tank wall of 1/6 of the tank diameter (1).

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**

<p>Mounting with counter nut</p> 	<p>Mounting with sleeve</p> 	<p>Mounting with adaptor flange</p> 
<p>Mounting with connecting piece</p> 	<p>Mounting with mounting bracket</p> 	

# S-MEUS Ultrasonic Sensor HART

● **Order Code**



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

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%  
Limit value 2: switch point 80%, reset point 60%

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**

● **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.

Operating systems: Windows 2000, XP, Windows 7, 8.1 and 10.

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.