

Technical documentation

MHTT



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● Characteristics

Input: resistance thermometer, thermocouple, resistance (potentiometer), voltage (mV)

Output: 4...20 mA current loop, HART-protocol Option: additional 2 electronic limit value contacts

Accuracy: 0,08%, 0,1%, 0,2% / 0,2...2 K, 0,1...7,5 ohms, 10...50 μ V

Degree of protection: IP65

Supply: current loop 15...45 VDC

Configuration: with software

Enclosure: rotating up to 360°

Material enclosure: diecast aluminium

Indication: LCD-display with backlighting

● Applications

The transmitter is suitable to measure temperatures (resistance thermometer, thermocouple), resistance and voltage. With a software for visualization it is possible to adjust all parameters. Typical areas of use are industry and process engineering.

● Technical data

Input

Resistance thermometer: Pt100 / Pt500 / Pt1000 / Cu50 / CU100 / Ni100 / Ni500 / Ni1000

Resistance: Linear resistance source (potentiometer)

Thermocouple: Type B (PtRh30-PtRh6) Type E (NiCr-CuNi)
Type J (Fe-CuNi) Type K (NiCr-Ni)
Type N (NiCrSi-NiSi) Type R (PtRh13-Pt)
Type S (PtRh10-Pt) Type (Cu-CuNi)

Voltage: Linear millivolt source

Range of input signals see page 4

Output

Analog: 4...20 mA, 2-wire, with superimposed communication signal (HART-protocol)

optionally: 2 electronic limit value contacts

Signal range: 3,8...20,8 mA

Failure: signal 3,8 mA

$R_{Lmax} = (U - 15 \text{ V}) / 0,0208 \text{ A}$

R_{Lmax} : maximum load resistance

U: voltage supply

Voltage supply: 15...45 VDC

Transmission behaviour: temperature-linear, resistance-linear, voltage-linear

Galvanical insulation: 2 kV AC (input / output)

Accuracy

Measuring accuracy: 0,08...0,12% of range
0,2...2 K
0,1...7,5 ohms
10...50 μ V

more details see page 6

Stability: $\pm 0,05\%$ / 1 year

Rise-delay time: 5 s

Cycle time, update: 0,25 s

Damping: 200 ms (without consideration of electronic damping)

Filter adjustment: 0...160 μ A

Resolution: 0,3 μ A

Self stabilization: 0...2 %

Response time: 1 s

Influence of environment: negligible

Influence load, voltage supply: negligible

● Technical data (continued)

Display

Visible range:	32,5x22,5 mm
Indication:	5-digits 7-segments, 8 mm height 8-digits 14-segments, 5 mm height Bargraph with resolution 2%
Range:	-19999...99999

Supply

Voltage:	15...45 VDC (current loop)
Insulation resistance:	>250 MOhm
Short circuit-proof:	Permanent
Reverse battery protection:	Yes (no destruction, no funtion)
Overvoltage protection:	500V

Environmental conditions

Operating temperature:	-20...70°C
Ambient temperature:	-20...70°C
Storing temperature:	-40...+100°C
Humidity:	5...98% relative humidity
Shock and vibration resistance:	4 g / 2...150 Hz according to IEC 60028-26
EMC:	Immunity and emission acording to IEC 61000-4-3

Mechanics

Material:	Enclosure ektronics:	Diecast aluminium
	Adaptor for mounting:	Aluminium anodized
	Nipple for mounting:	Stainless steel
	Type plate:	Stainless steel 1.4301
	Viewing glass:	Laminated glas
Dimensions:	See page 7	
Protection:	Degree IP 65	
Weight:	Approx. 1,3 kg	
Connection:	Terminal screw (maximum 1,5 mm ²) via screwed cable gland M20x1,5	

● Input

Measurand: temperature (transmission behaviour linear to temperature)
resistance
voltage

Measuring ranges: dependent on sensor or input signal (see table below)

Input	Type	Working range	Working range smallest
Resistance thermometer	Pt100	-200...850 °C (-328...1652 °F)	10 °C (18 °F)
	Pt500	-200...250 °C (-328...482 °F)	10 °C (18 °F)
	Pt1000	-200...250 °C (-328...482 °F)	10 °C (18 °F)
	Cu50	-50...150 °C (-58...302 °F)	10 °C (18 °F)
	Cu100	-50...150 °C (-58...302 °F)	10 °C (18 °F)
	Ni100	-60...180 °C (-76...356 °F)	10 °C (18 °F)
	Ni500	-60...180 °C (-76...356 °F)	10 °C (18 °F)
	Ni1000	-60 °C... (-76...302 °F)	10 °C (18 °F)
Resistance source	resistance (ohms)	0...400 ohms	10 ohms
		0...2000 ohms	100 ohms
		0...10000 ohms	100 ohms
Thermocouple	B (PtRh30-PtRh6)*	0...1820 °C (32...3308 °F)	500 °C (900 °F)
	E (NiCr-CuNi)	-270...1000 °C (-454...1832 °F)	50 °C (90 °F)
	J (Fe-CuNi)	-210 °C...1200 (-346...2192 °F)	50 °C (90 °F)
	K (NiCr-Ni)	-270...1372 °C (-454...2501 °F)	50 °C (90 °F)
	N (NiCrSi-NiSi)	-270...1300°C (-454...2372 °F)	50 °C (90 °F)
	R (PtRh13-Pt)	-50...1768 °C (-58...3214,4 °F)	500 °C (900 °F)
	S (PtRh10-Pt)	-50...1768 °C (-58...3214,4 °F)	500 °C (900 °F)
T (Cu-CuNi)	-270...400 °C (-454...752 °F)	50 °C (90 °F)	
Millivolt source	millivolt	-6...21 mV	2 mV
		-10...75 mV	5 mV
		-100...100 mV	5 mV
		-250...250 mV	5 mV
		-500...500 mV	10 mV
		-1000...1000 mV	20 mV
		0...200 mV	10 mV
		0...1000 mV	10 MV
		0...2000 mV	20 mV

Resistance thermometer Ni100, Ni500, Ni1000: $\alpha = 5000 \text{ ppm / K}$ or 6180 ppm / K

All resistance thermometer for 2-, 3- or 4-wire connection

Sensor current for resistance thermometer: 0,5 mA

*High measuring error increase for temperatures below 300 °C (572 °F)

● Output

Output signal: 4...20 mA, 2-wire, with superimposed communication signal for HART protocol

Signal range: 3,8...20,8 mA

Load: $R_{L,max} = (U - 15 \text{ V}) / 0,0208 \text{ A}$

$R_{L,max}$: maximum load resistance, U: Voltage supply, Voltage supply: 15...45 VDC

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

Resolution: current output: 16 bit

Indication: adjustable (factory setting: 0...100%)

Read cycle time: HART commands all 200 ms.

Filter: continuously adjustable from 0 to 160 μA via electronic insert inside the device, hand-held equipment or PC-software. Factory configuration: 0 μA

Error: falling below range: linear drop to 3,8 mA
exceeding above range: linear rise to 20,8 mA
sensor break, open circuit: 3,8 mA

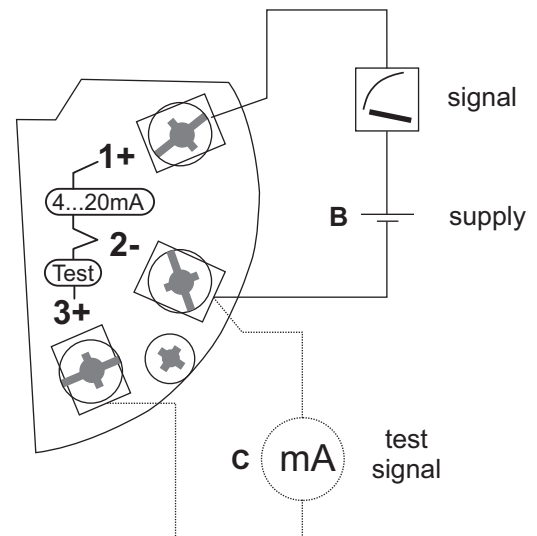
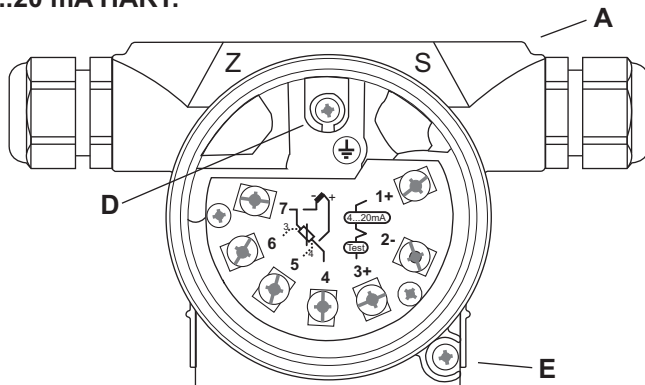
Linearization- and transmission behaviour: linear to temperature, voltage and resistance

Galvanical insulation: $U = 2 \text{ kV AC}$ (input / output)

Rise delay time: <5 s

● Electrical connection

4...20 mA HART:



Electrical connection 4...20 mA HART

A: Enclosure

B: Voltage supply 15...45 VDC

C: 4...20 mA test signal between - and test point

D: Internal earthing

E: External earthing

Thermocouple	Resistance (potentiometer), resistance thermometer		
	2-wire	3-wire	4-wire

The device has a protective system against overvoltage peaks, RF interferences and wrong polarity.

Voltage supply: between 15 ...45 VDC

Cable entry: screwed cable gland 2x M20x1,5 (metal)

Cabel: outer diameter: 6...12 mm

cross-sectional area: 0,5...1,5 mm²

shielded and twisted 2-wire cable (recommended)

Residual ripple: no influence on mA-signal up to 5% within nominal voltage range

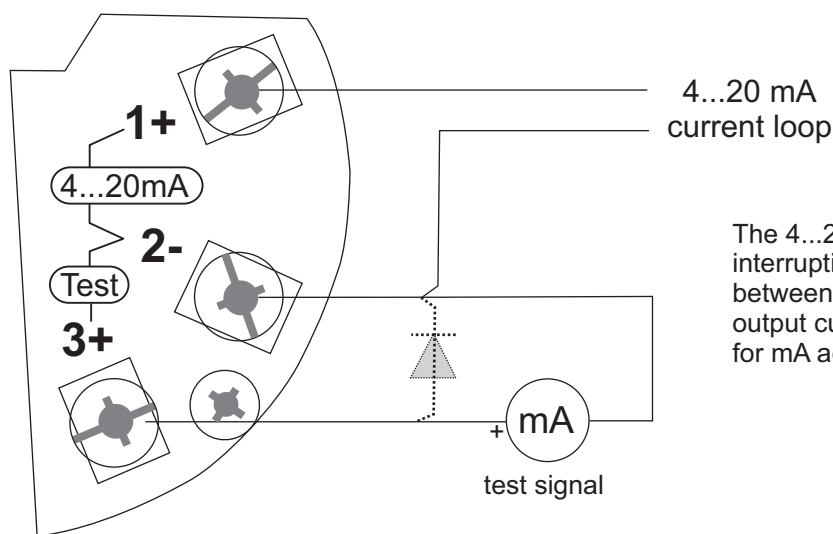
● Measuring accuracy

Response time: 1 s
Reference conditions: Calibration temperature 23 °C (73,4 °F) ±5K
Long-term stability: <0,05% / year
Influences: influence of load, voltage supply, environment: negligible
Maximum error of measurement:

Input	Type	Measuring accuracy
Resistance thermometer	Pt100, Ni100	0,2K or 0,08%
	Pt500, Ni500	0,5K or 0,2%
	Pt1000, Ni1000	0,3K or 0,12%
	Cu50	0,2K or 0,08%
	Cu100	0,3K or 0,12%
Thermocouple	K, J, T, E	typisch 0,5K or 0,08%
	N	typisch 1,0K or 0,08%
	S, B, R	typisch 2,0K or 0,08%
Resistance source	0...400 Ohm	±0,1 Ohm or 0,08%
	0...2000 Ohm	±1,5 Ohm or 0,12%
	0...10000 Ohm	±7,5 Ohm or 0,20%
Millivolt source	-6..21 mV	±10µV or 0,08%
	-10..75 mV / -100...250 mV / -250...250 mV	±20µV or 0,08%
	-500..500 mV / 0...1000 mV	±30µV or 0,08%
	--1000..1000 mV / 0...2000 mV	±50µV or 0,08%
	-0..200 mV	±20µV or 0,08%

Eigenstabilisierung: 0...2%
Filtereinstellung: 0...160 µA
Auflösung: 0,3 µA

● 4...20 mA test signal



The 4...20 mA test can be measured without interruption of the low-potential circuit between terminal 3(+) and terminal 2(-). The output current is measured with an ammeter for mA across a diode in the output circuit.

● HART Communication

HART tool:

The HART-Tool is a graphical user interface with menu-driven program for configuration. It can be used for putting into operation, configuration, analysis of signals, data backup and documentation of the device.
 Operating systems: Windows XP, Windows 7 and 8.1

Functions:

- Configuration of the devices in on-line operation
- Linearization of characteristic curve
- Loading and storing the devices data (upload / download)
- Documentation of the measuring point

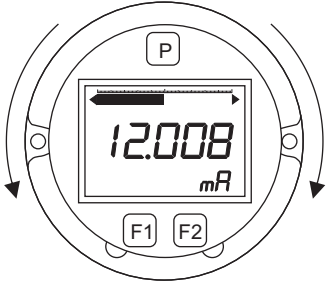
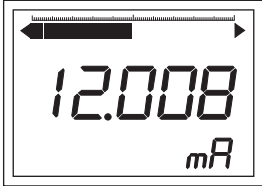
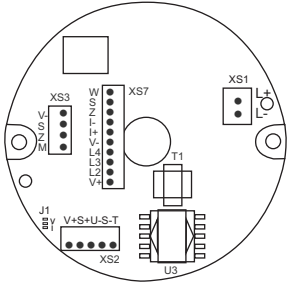
Possible HART devices to use:

- Interface serial port, interface USB port, hand-held HART communicator

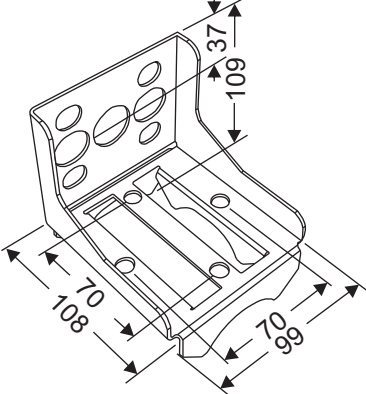
The following settings are possible:

- Adjustment of output current
- Simulation of output current
- Limits of measuring range
- Unit for display
- Filter function
- Decimal-place
- HART address
- HART TAG number
- 6-point calibration
- 2-point calibration (start and end of value)

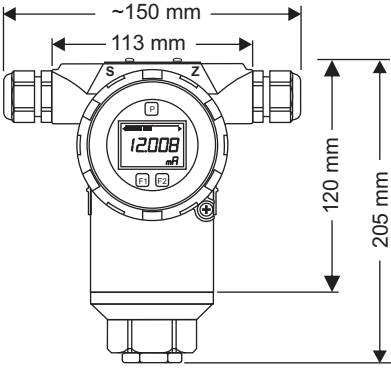
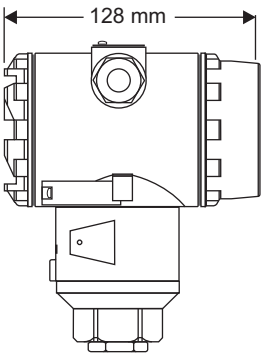
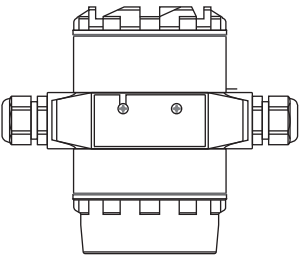
● Electronic display with insert

	<p>Display for indication The display is rotatable for approx. 330° The 3 operator's keys have no function</p>
	<p>Display</p> <ul style="list-style-type: none"> - Visible range 32,5x22,5 mm - 5-digits 7-segment line, 8 mm high (-19999...99999) - 8-digits 14-segment line, 5 mm high - Bargraph with resolution 2%
	<p>Electronics</p> <ul style="list-style-type: none"> - XS1 voltage supply 15...45 V - XS2 connection sensor - XS7 display

● Wall- and tube mounting

 <p>Dimensions in mm</p>	<p>Holder made of stainless steel for mounting the device on walls or tubes is supplied with the device.</p> <p>Supplied parts: holder, fixing clamp with nuts and washers.</p>
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● Dimensions in mm

 <p>view front</p>	 <p>view side</p>	 <p>view top</p>
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