Technical dokumentation

Modular temperature transmitter

MHTT

Content:

Characteristics

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

Output: 4...20 mA current loop, HART-protocol   Supply: current loop 15...45 VDC

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

Degree of protection: IP65   Indication: LCD-display with backlighting

Configuration: with software   Enclosure: rotating up to 360°

Material enclosure: diecast aluminium   Electronics and connection in different chambers

Galvanical insulation between input / output

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. Typial areas of use arl industry and process engineering.

Technical data

Eingang

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 sourcer

Range of input signals see page 3

Output

Analog: 4...20 mA, 2-wire, with superimposed communication signal (HART-protocol)
Signal range: 3,8...20,8 mA
Failure: signal 3,8 mA

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

    R_{Lmax}: maximum load resistance
    U: voltage supply
    voltage supply: 15...45 VDC
Linearization, transmission behaviour:
      temperature-linear
      resistance-linear
      voltage-linear
Galvanical insulation (input / output) 2 kV AC

Accuracy

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

    more details see page 5

Stability: ±0,05% / 1 year
Rise-delay time: 5 s
Cycle time, update: 0,25 s
Damping: 200 ms (without concideration of electronic damping
Filter adjustment: 0...160µA
Resolution: 0,3 µA
Self stabilization: 0...2 %
Response time: 1 s
Influence environment: negligible
Influence load: negligible
Influence voltage supply: negligible

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
Electromagnetic compatibility: immunity and emission acording to IEC 61000-4-3:1995

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: degreeIP 65
Weight: approx. 1,3 kg
Connection: terminal screw (maximum 1,5 mm²) 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 rage 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: α = 5000 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_{Lmax} = (U - 15 V) / 0,0208 A

R_{Lmax}: maximum load resistance, U: Voltage supply, Voltage supply: 15...45 VDC
Please note: When using communication via a HART modem, a comunication 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 kV AC (input / output)
Rise delay time:	<5 s

Output

4...20 mA HART:
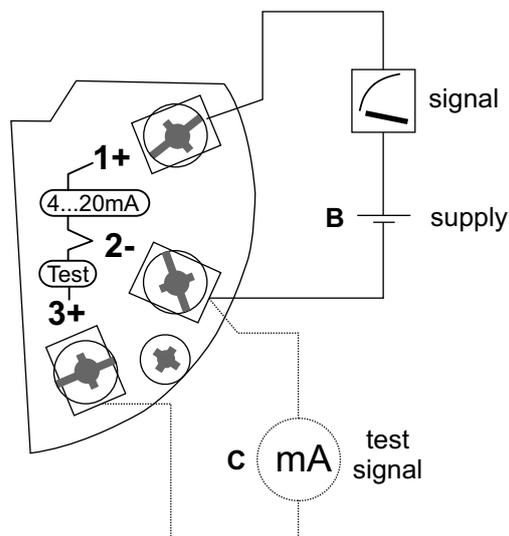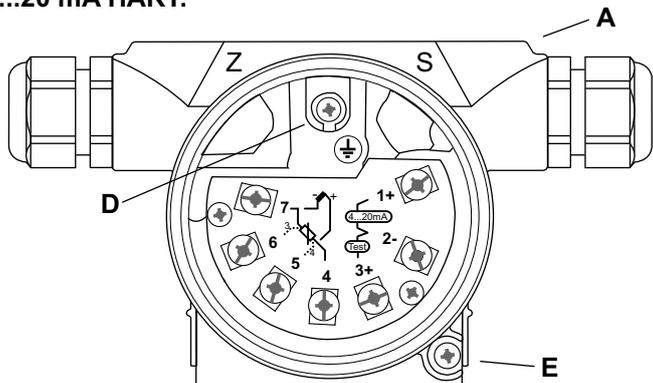
Electrical connection 4...20 mA HART

A: Enclosure
B: Voltage supply 15...45 VDC
C: 4...20 mA test signal between - and test point
D: Internal earthing
E: External earthing

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
Influenses: influence of load, voltage supply, environment: negligible

Maximum error of measurement:

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

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

4...20 mA test signal
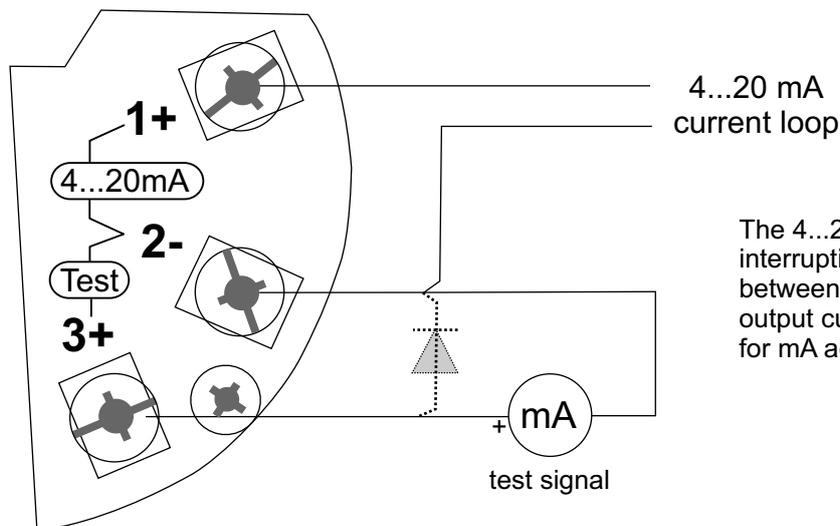
4...20 mA
current loop

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.

Wall- and tube mounting
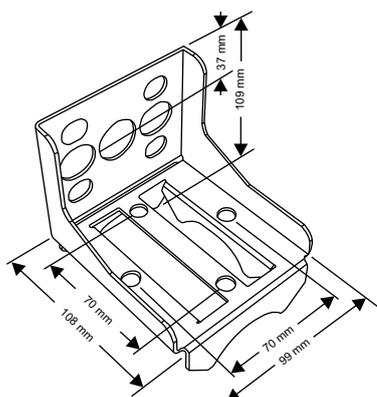
Holder made of steel (zinc coated) for mounting the device on walls or tubes is supplied with the device.

Supplied parts: holder, fixing clamp with nuts and washers.

The holder made of stainless steel can be selected as an option (additional price).
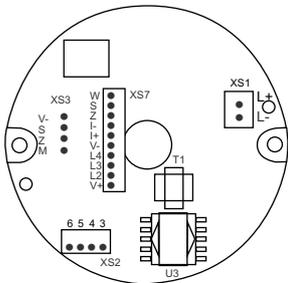
Electronic insert with display

Display with key buttons for configuration
The display is rotatable for approx. 330°
The 3 operator's keys are without function

Display
- 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%

Electronics
- XS1 voltage supply 15...45 V
- XS2 connection sensor
- XS7 display

HART Communication

HART tool:
The HART-Tool is a graphical user interface for the MH series with menu-driven progam for configuration. It can be used for putting into operation, configuration, analysis of signals, data backup and documentation of the device. Operating systems: Windows2000, Windows XP
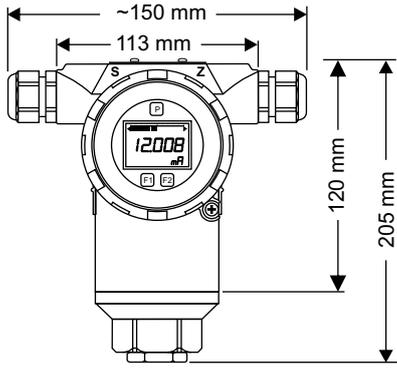
Functions:
- Configuration of the devices in on-line operation
- Loading and storing the devices data (upload / download)
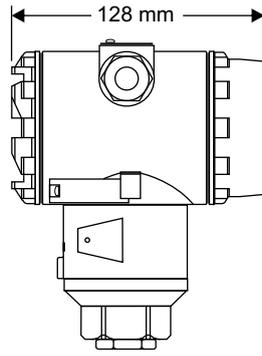- Documentation of the measuring point

Possible HART devices to use:
- HART interface (modem) with serial interface of a PC
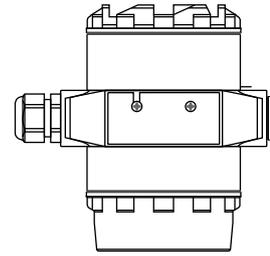- HART interface (modem) with USB interface of a PC
- Hand-held HART communicator

Dimensions

view front

view side

view top

Ordering code

```
H  M  X  X  X  X  X  X  -  X  X  X
```

Output:	4...20 mA (HART)	0
Enclosure / electr. connection:	diecast aluminium	0
Screwed cable gland:	2x M20x1,5 metal	0
Configuration:	without (factory configuration)* with (please indicate)**	0 1
Options:	without holder for wall/tube stainless steel (additional price)***	0 1
Other / accessories:	special model HART interface, USB, software HART interface, RS232, software	0 1 2

*Sensor: Pt100 / Type: 3-wire / Measuring range: 0...150 °C / Offset: without / Filter: 0 / Self stability: without / damping: without / decimal point: X.X / display mode: 100% / TAG: without / Descriptor: without

**the possibilities of the technical data can be selected. In case of not given values the details of factory-set are used.

***as standard the differential pressure transmitter is supplied with a holder made steel (zinc coated). For an additional price a holder made of stainless steel can be selected

Customized parameter

Thermocouple:

Type B ☐   Type E ☐   Type J ☐   Type K ☐   Type N ☐   Type R ☐
Type S ☐   Type T ☐

Resistance thermometer:

Pt100 ☐   Pt500 ☐   Pt1000 ☐   Cu50 ☐   Cu100 ☐   Ni100 ☐
Ni500 ☐   Ni1000 ☐
2-wire ☐   3-wire ☐   4-wire ☐

Resistance souce (potentiometer):

0...400 ohms ☐   0...2000 ohms ☐   0...10000 ohms ☐
2-wire ☐   3-wire ☐   4-wire ☐

Millivolt source:

-6...21 mV ☐   -10...75 mV ☐   -100...100 mV ☐
-250...250 mV ☐   -500...500 mV ☐   -1000...1000 MV ☐
0...200 MV ☐   0...1000 mV ☐   0...2000 mV ☐

Measuring range:

Lower value ☐☐☐☐☐ , ☐   Upper value ☐☐☐☐☐ , ☐

Unit:
°C ☐   °F ☐   K ☐   ohms ☐   mV ☐

Optional configuration:

Offset ☐☐☐ , ☐   Filter ☐☐☐ , ☐ µA

Self stabilization ☐ , ☐☐ %   Damping ☐☐☐ , ☐

Decimal point X ☐   X,X ☐   X,XX ☐   X,XXX ☐

Display mA ☐   % ☐   PV ☐

Information:

TAG ☐☐☐☐☐☐☐   Descriptor ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐