Technical documentation

Modular pressure transmitter

MHPS

Content:

Characteristics

Input: overpressure (range: 0,1 bar up to 1000 bar) / absolute pressure (range: 0,25 bar up to 25 bar)
Output: 4...20 mA current loop, HART-protocol, with turn-down up to 100:1
Optional: 4...20 mA current loop, HART-protocol, with 2 electronical limit value contacts
Accuracy: <0,25% of sensor range (up to 0,25 bar: <0,5% of sensor range)
Supply: current loop 15...45 VDC
Indication: LCD-display with backlighting
Configuration: with keys and/or software
Enclosure for electronics: diecast aluminium (degree of protection: IP65)
Process connection: G1/2B / G1/4B / G1/4A / 1/2NPT / 1/4NPT / M20x1,5 (pressurized parts: NiCr steel)

Applications

The pressure sensor is suitable to measure overpressure (negative, positive) and absolute pressure. From overpressure can be derived: level (level, volume, mass). Typical areas of use are chemical industry and process engineering.

Technical data

Input

Overpressure: 0,1 / 0,16 / 0,25 / 0,4 / 0,6 / 1 / 2,5 / 4 / 6 / 10 / 16 / 25 / 40 / 60 / 100 / 250 / 400 / 600 / 1000 bar
Absolute pressure: 0,25 / 0,4 / 0,6 / 1 / 2,5 / 4 / 6 / 10 / 16 / 25 bar

Output

Analog: 4...20 mA, 2-wire, with superimposed communication signal (HART-protocol)
Signal range:3,6...22,8 mA / Failure: signal 3,6 mA
Option: 4...20 mA current loop HART with 2 electronical limit value contacts

Accuracy

<0,25% of sensor range (up to 0,25 bar: <0,5% of sensor range), according BFSL: <0,125% / <0,25%
(including non-linearity, hysteresis, non-repeatability, zero point and full scale error (according to IEC 61298-2)
Influences: supply: <0,005% of nominal range/1V
vibration: <0,01% of nominal range/g at 200 Hz
Response time 10...90%: <1ms (<10 ms at medium temperature <-30°C for nominal ranges up to 25 bar)
Non-linearity: <0,2% of nominal range (BFSL) according IEC 61298-2
Non-repeatability: <0,1% of nominal range
Stability: <0,2% of span (1 year, at reference conditions)
Compensated temperature range (pressure sensor: 0...80°C
Temperature coefficient (TC) within compensated range
Mean TC of zero: <0,2% of nominal range / 10 K (<0,4% for ranges <0,25 bar)
Mean TC of range: <0,2% of nominal range / 10 K

Settings

Rise-delay time: 5 s
Cycle time, update: 0,25 s
Damping: 200 ms (without concideration of electronic damping)
Filter adjustment: 0...160µA

Display

Visible range: 32,5x22,5 mm
Indication: 5-digits 7-segments, 8 mm / 8-digits 14-segments, 5 mm / 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
Temperature medium: -30...100°C / -40...125°C
Storing temperature:-40...+85°C
Humidity: 5...98% relative humidity
Shock resistance:1000 g according IEC 60068-2-27 (mechanical shock)
Vibration resistance: 20 g according IEC 60068-2-6 (vibration at resonance)

Technical data (continued)

Mechanics

Material:
- Enclosure ektronics: diecast aluminium
- Enclosure pressure sensor: CrNi steel
- Wetted parts: CrNi steel
- Type plate: stainless steel 1.4301
- Viewing glass: laminated glass
- Internal transmission fluid: syntetic oil

Process connection: G1/2B / G1/4B / G1/4A / 1/2NPT / 1/4NPT / M20x1,5
Dimensions: see page 7
Protection: degree IP 65
Weight: approx. 1,7 kg
Connection: terminal screw (maximum 1,5 mm²), via srewed cable gland M20x1,5
Standards: IEC 61000-4-3 / Pressure equipment directive 97/23/EG

Measurand: overpressure (positive, negative), absolute pressure
derived from this: level (level, volume, mass)

Measuring ranges: 0,1 bar up to 1000 bar

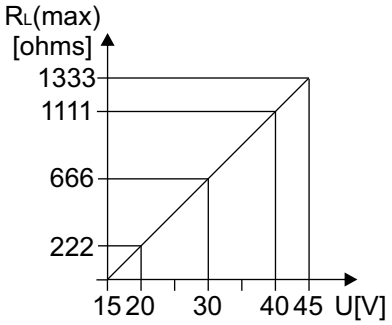
Pressure range	0,1	0,16	0,25	0,4	0,6	1	1,6	2,5
Over pressure safety	1	1,5	2	2	4	5	10	10
Burst pressure	2	2	2,4	2,4	4,8	6	12	12
Pressure range	4	6	10	16	25	40	60	100
Over pressure safety	17	35	35	50	50	80	120	200
Burst pressure	20,5	42	42	96	96	400	550	800
Pressure range	160	250	400	600	1000			
Over pressure safety	320	500	800	1200	1500			
Burst pressure	800	1250	1300	1800	3000			

Output

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

Signal range: 3,6...22,8 mA

Load: R_{Lmax} = (U - 15 V) / 0,0228 A



Voltage supply: 15...45 VDC

R_{Lmax}: maximum load resistance
U: Voltage supply

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

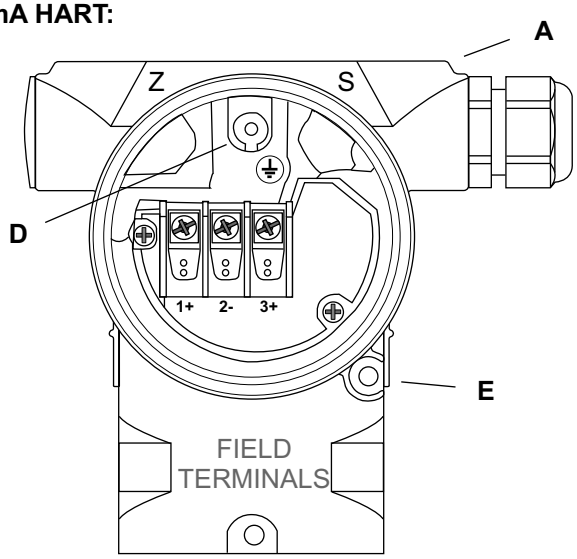
Resolution: current output: 16 bit
indication: adjustable (factory setting: 0...100%)

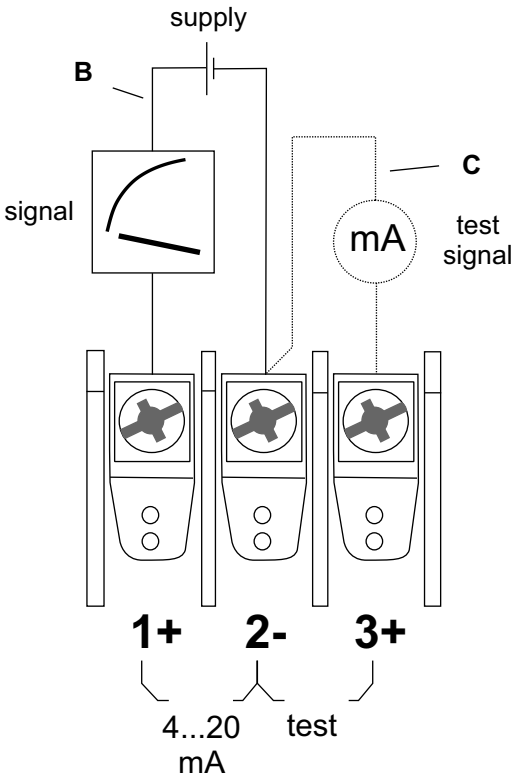
Read cycle time: HART commands all 200 ms.

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

Electrical connection

4...20 mA HART:





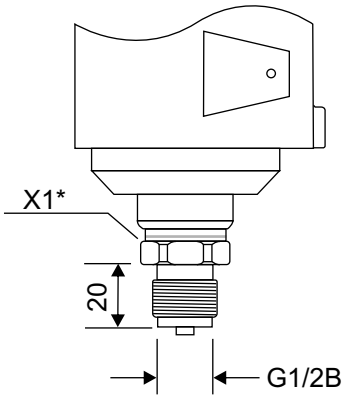
Electrical connection 4...20 mA HART

A: Enclosure
B: Voltage supply 15...45 VDC (1+ / 2-)
C: 4...20 mA test signal between 2- and test point 3+
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 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
Influence supplied power: <0,005% of nominal range / 1V

Process connection

G1/2 (EN837) manometer

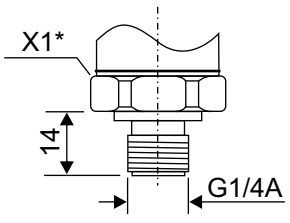


Pressure connetion:

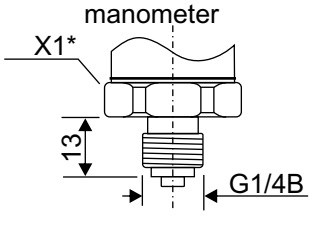
G1/2B manometer (EN837)	/	G1/4B manometer (EN837)
G1/4A (DIN3852-E)	/	M20x1,5
1/2NPT	/	1/4NPT

Measuring membrane:
NiCr-steel

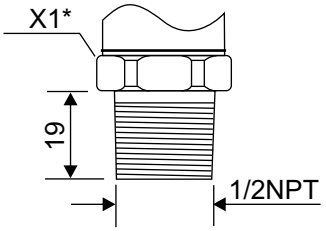
G1/4 (DIN 3852-E)



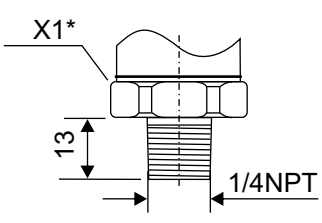
G1/4 (EN837) manometer



1/2NPT

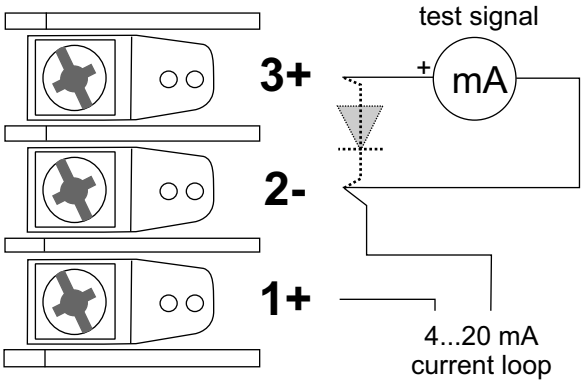


1/4NPT



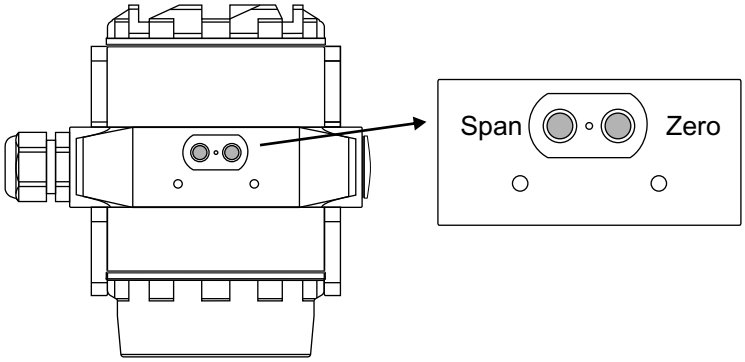
*X1: width across 27

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.

External operator's control



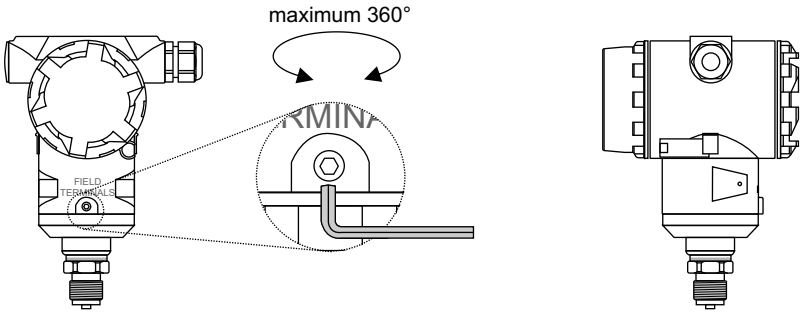
Below the type plate there are 2 key button for easy configuration of zero and span. The keys are Hall effect devices and are completely seperated from other parts of the enclosure.

Advatages:
- Protection against environmental influence
- without wear
- ease of operation

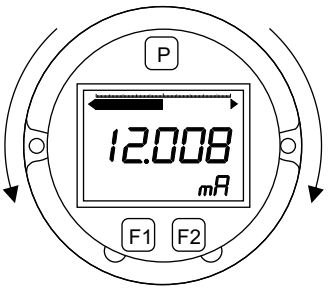
Rotating of enclosure

After unscrewing the M6 Allen screw the enclosure can be rotated up to 360°.

Advatages:
Good reading of the display
Operator's controls of the device are easy approachable



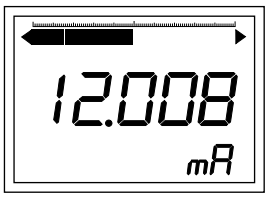
Electronic insert with display



Display with key buttons for configuration

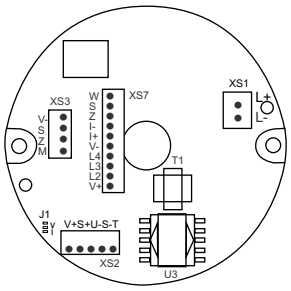
The display is rotatable for approx. 330°
With 3 operator's keys is configurable:

- Starting measuring value (reference pressure has to be supplied)
- Final measuring value (reference pressure has to be supplied)
- Zero offset compensation (compensation of position)
- Reset
- Starting measuring value (reranging without reference pressure)
- Final measuring value (reranging without reference pressure)
- Damping
- Unit (mA, mbar, %)
- Fixed current output



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
- XS3 external keys
- XS7 display
- J1 solder bridge to select sensor supply

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:

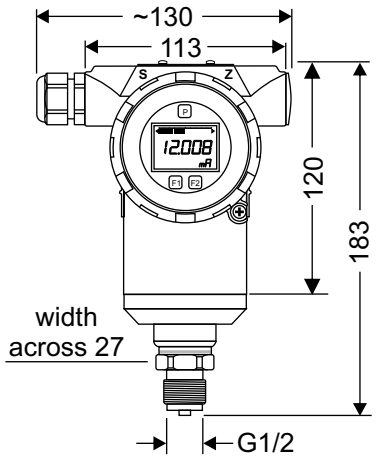
- Configuration of the devices in on-line operation
- Loading and storing the devices data (upload / download)
- Linearization of characteristic curve
- Documentation of the measuring point

Possible HART devices to use:

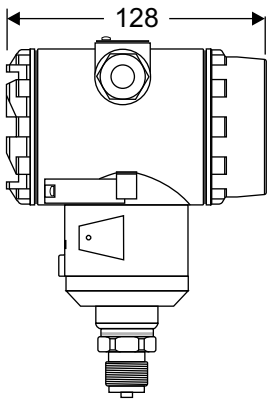
- HART interface (modem) with serial interface of a PC
- HART interface (modem) with USB interface of a PC
- Hand-held HART communicator

Possibilities of HART configuration

Dimensions

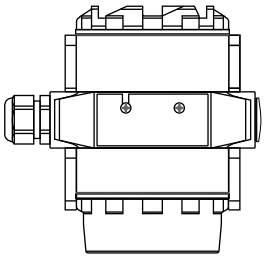


view front



view side

Dimensions in mm



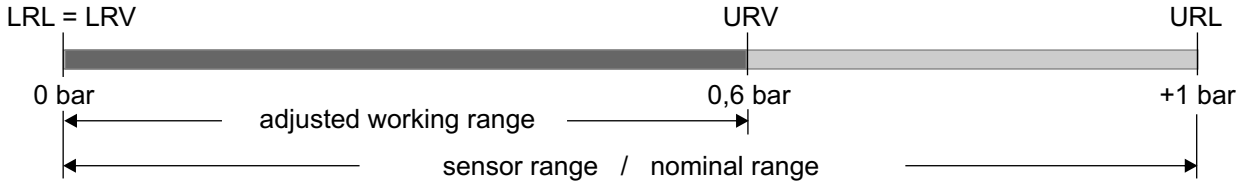
view top

Definitions

LRL: lower range limit
LRV: lower range value
TD: turn down

URL: upper range limit
URV: upper range value

Example 1



|LRV| < |URV|:	lower range value (LRV) = 0 bar upper range limit (URL) = 1 bar	upper range value (URV) = 0,6 bar
Turn down:	URL / |URV| = 1 bar / 0,6 bar	Turn down = 1,66 : 1
Set span: (adjusted)	URV - LRV = 0,6 bar - 0 bar (The span is based on the zero point)	set span = 0,6 bar

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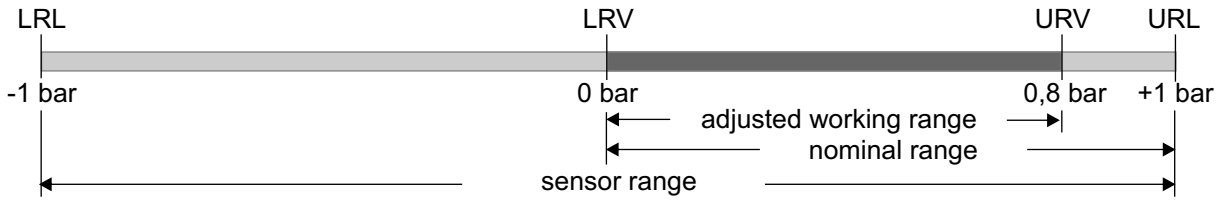
Example 2



|LRV| < |URV|	lower range value (LRV) = 0 bar upper range limit (URL) = 1 bar mbar	upper range value (URV) = 0,8 bar
Turn down:	URL / |LRV| = 1 bar / 0,8 bar	Turn down = 1,25 : 1
Set span: (adjusted)	URV - LRV = 0,8 bar - 0 bar (The span is based on the zero point)	set span = 0,8 bar

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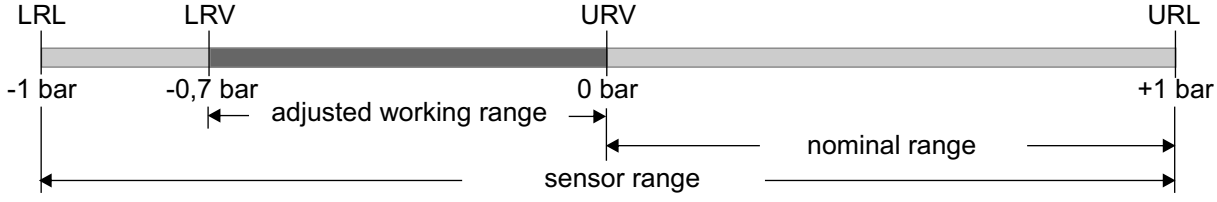
Example 3



|LRV| > |URV|	lower range value (LRV) = -0,7 bar upper range limit (URL) = 1 bar	upper range value (URV) = 0 bar
Turn down:	URL / |LRV| = 1 bar / 0,7 bar	Turn down = 1,43 : 1
Set span (adjusted)	URV - LRV = 0 bar - (-0,7 bar) (The span is based on zero point)	set span = 0,7 bar

Ordering code

H	P	X	X	X	X	X	X	-	X	X	X

Output:	4...20 mA (HART)	0
	4...20 mA (HART), limit contacts[1]	1
Kind of pressure:[2]	relative	0
	absolute	1
	relative (±)	2
Pressure range:[3]	(please indicate)	X
Process connection:	G 1/2 (EN 837), manometer	0
	G 1/4 (EN 837), manometer	1
	G 1/4 (DIN 3852 E)	2
	1/2 NPT	3
	1/4 NPT	4
	M20x1,5	5
Material process connection:[4]	CrNi steell	0
Temperature medium:	-30...+100°C	0
	-40...+125°C	1
Enclosure / connection:	diecast aluminium with srewed cable gland M20x1,5	0
Configuration:	without (factory configuration)[5]	0
	with (please indicate)[6]	1
Other / accessories:	special model	0
	HART interface, USB, software	1
	HART interface, RS232, software	2

1) 2 electronical limit value contacts, open collector (36 VDC, 150 mA) (see data sheet MH-CULO)

2) relative: positive overpressure, negative overpressure (subatmospheric pressure)
relative (±): above and below the prevailing atmospheric pressure

3) Coding for X (pressure ranges), given in bar:
relative pressure: 0 = 0...0,1 / 1 = 0...0,16 / 2 = =...0,25 / 3 = 0...0,4 / 4 = 0...0,6 / 5 = 0...1 / 6 = 0...1,6 / 7 = 0...2,5 / 8 = 0...4 / 9 = 0...6 / A = 0...10 / B = 0...16 / C = 0...25 / D = 0...40 / E = 0...60 / F = 0...100 / G = 0...160 / H = 0...250 / I = 0...400 / J = 0...600 / K = 0...1000 / L = -1...0
absolute pressure: 2 = =...0,25 / 3 = 0...0,4 / 4 = 0...0,6 / 5 = 0...1 / 6 = 0...1,6 / 7 = 0...2,5 / 8 = 0...4 / 9 = 0...6 / A = 0...10 / B = 0...16 / C = 0...25 /
relative pressure (±): M = -1...+1

4) Material in contact with medium: CrNi steel

5) zero: 4,000 mA / span: 20,000 mA / zero offset compensation: without / turn down: without / calibration points: 2 / damping: without / display mode: 100% / output on alarm: 3,6 mA / fixed output: without

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