

Technical Documentation

MHPS



● Content

Page 2:	Characteristics - Applications - Technical Data
Page 3:	Technical Data - Input Quantity - Output Quantity
Page 4:	Electrical Connection - Process Connection
Page 5:	4...20 mA Test Signal - External Operator's Control - Casing Rotation
Page 6:	Electronics Insert with Display - HART Communication
Page 7:	Dimensions - Definitions
Page 8:	Order Code

● Characteristics

Input:	overpressure (0,1 bar up to 1000 bar) / absolute pressure (0,25 bar up to 25 bar)
Output:	4...20 mA current loop (15...45 VDC), HART-protocol
Option:	additionally with limit contacts
Turn down:	up to 100:1
Accuracy:	<0,25% of sensor range (up to 0,25 bar: <0,5% of sensor range)
Indication:	LCD-display with backlighting
Configuration:	with keys and/or software
Enclosure for electronics:	diecast aluminum (protection class: 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 fields of application 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

Analogue:	4...20 mA, 2-wire, with superimposed communication signal (HART-protocol)
Signal range:	3,6...22,8 mA (on failure: 3,6 mA)
Option:	additionally with limit contacts

Performance

Accuracy:	<0,25% of sensor range (up to 0,25 bar: <0,5% of sensor range)
According BFSI:	<0,125% of sensor range (up to 0,25 bar: <0,25% of sensor range) 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 (BFSI) according IEC 61298-2
Non-repeatability:	<0,1% of nominal range
Stability:	<0,2% of span (1 year, at reference conditions)
Temperature range:	0...80°C (compensated, pressure sensor)
Temperature coefficient:	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

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

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 MΩ
Short circuit resistance:	permanent
Reverse voltage protection:	yes (no function, no damage)
Overvoltage protection:	500 V

Environmental Conditions

Temperature:	Operating: -20...70 °C / Ambient: -20...70 °C / Storing: -40...+85 °C Medium: -30...100 °C / -40...125 °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:	Casing electronics:	diecast aluminum
	Casing pressure sensor:	CrNi steel
	Wetted parts:	CrNi steel
	Product label:	stainless steel 1.4301
	Viewing glass:	laminated glass
	Internal transmission fluid:	synthetic oil
Process connection:	G1/2B / G1/4B / G1/4A / 1/2NPT / 1/4NPT / M20x1,5	
Dimensions:	see page 7	
Protection class:	IP65	
Weight:	approx. 1,7 kg	
Connection:	terminal screw (maximum 1,5 mm ²), via screwed cable gland M20x1,5	
Standards:	IEC 61000-4-3 / Pressure equipment directive 2014/68/EU	

● Input

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

Measurement ranges: 0,1 bar up to 1000 bar

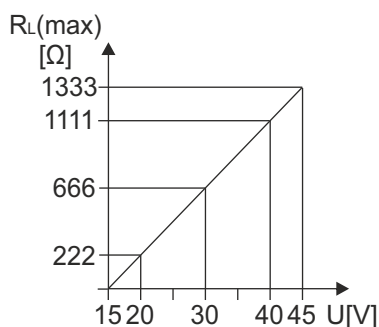
Pressure range	0,1	0,16	0,25	0,4	0,6	1	1,6	2,5
Over pressure safety	1	1,5	2	2	4	5	10	10
Burst pressure	2	2	2,4	2,4	4,8	6	12	12
Pressure range	4	6	10	16	25	40	60	100
Over pressure safety	17	35	35	50	50	80	120	200
Burst pressure	20,5	42	42	96	96	400	550	800
Pressure range	160	250	400	600	1000			
Over pressure 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: $R_{Lmax} = (U - 15 \text{ V}) / 0,0228 \text{ A}$



Voltage supply: 15...45 VDC

R_{Lmax} : maximum load resistance

U: Voltage supply

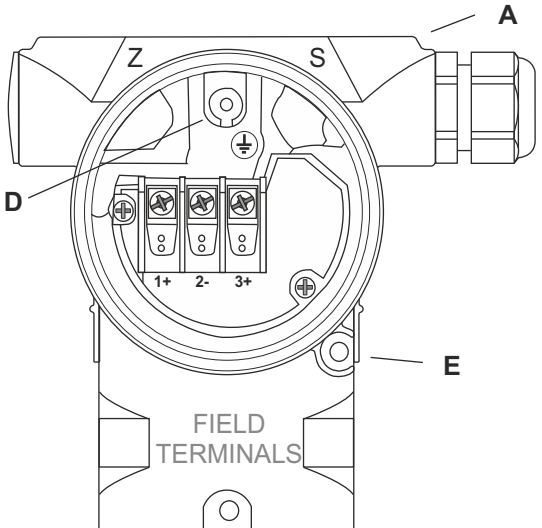
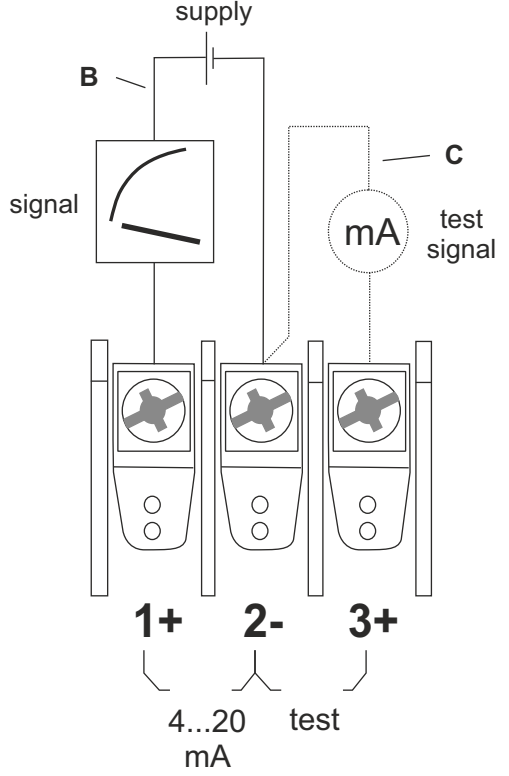
Please note: When using communication via a HART modem, a communication resistance of minimum 250 Ω has to be taken into account.

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

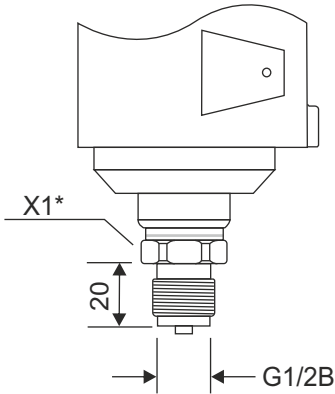
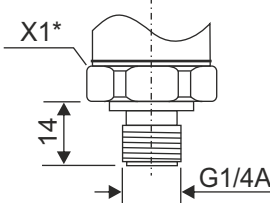
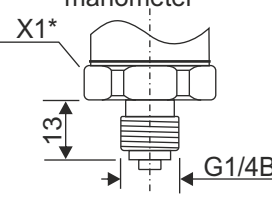
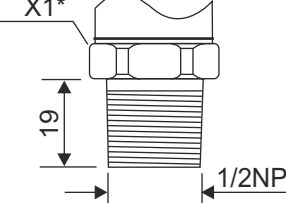
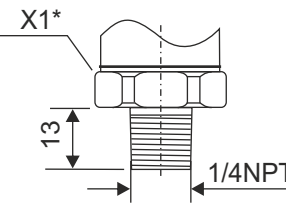
Read cycle time: HART commands all 200 ms.

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

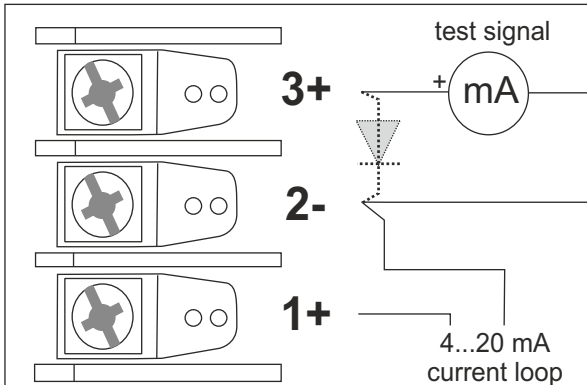
● Electrical Connection

	
<p>Electrical connection 4...20 mA HART</p> <p>A: Casing</p> <p>B: Voltage supply 15...45 VDC (1+ / 2-)</p> <p>C: 4...20 mA test signal between 2- and test point 3+</p> <p>D: Internal earthing</p> <p>E: External earthing</p>	
<p>The device has a protective system against overvoltage peaks, RF interferences and wrong polarity.</p> <p>Voltage supply: between 15 ...45 VDC</p> <p>Cable entry: screwed cable gland M20x1,5 (metal)</p> <p>Cable: outer diameter: 6...12 mm cross-sectional area: 0,5...1,5 mm² shielded and twisted 2-wire cable (recommended)</p> <p>Residual ripple: no influence on mA-signal up to 5% within nominal voltage range</p> <p>Influence supplied power: <0,005% of nominal range / 1V</p>	

● Process Connection

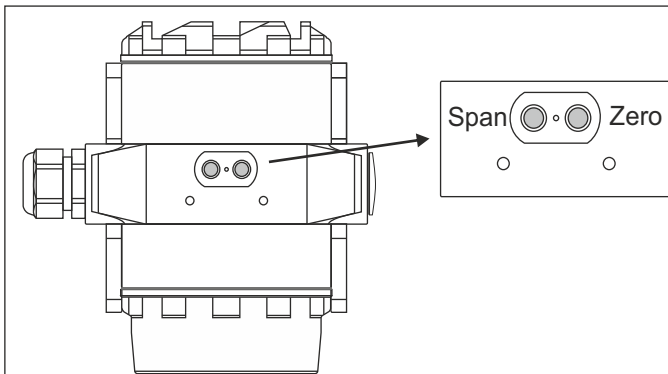
<p>G1/2 (EN837) manometer</p> 		<p>Pressure connection:</p> <p>G1/2B manometer (EN837)</p> <p>G1/4B manometer (EN837)</p> <p>G1/4A (DIN3852-E)</p> <p>M20x1,5</p> <p>1/2NPT</p> <p>1/4NPT</p> <p>Measuring membrane:</p> <p>NiCr-steel</p> <p>*X1: width across 27</p>	
<p>G1/4 (DIN 3852-E)</p> 	<p>G1/4 (EN837) manometer</p> 	<p>1/2NPT</p> 	<p>1/4NPT</p> 

● 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 product label there are 2 keys for easy configuration of zero and span. The keys are Hall effect devices and are completely separated from other parts of the casing.

Advantages:

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

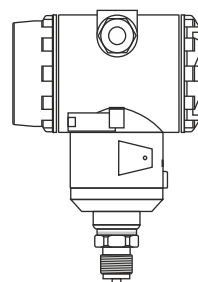
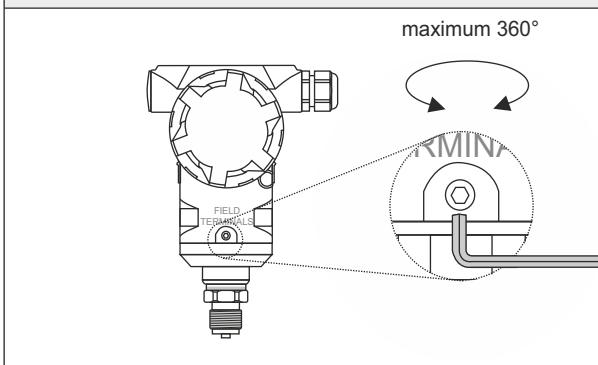
● Casing Rotation

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

Advantages:

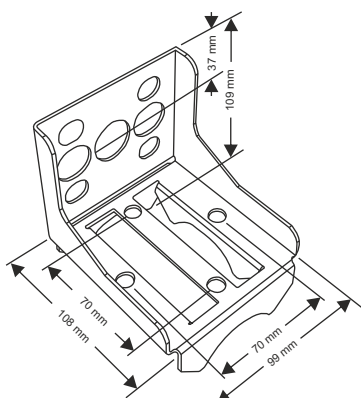
Good display readability

Device controls are easily approachable



Example: turning 90°

● Accessories



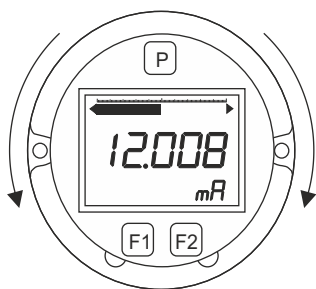
Wall / pipe mount:

Mount made of stainless steel for mounting the device on walls or pipes.

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

● Electronics Insert with Display

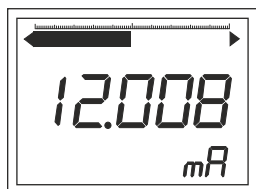
Display with key buttons for configuration



The display is rotatable by approx. 330°
 With all 3 operator's keys the following is configurable:

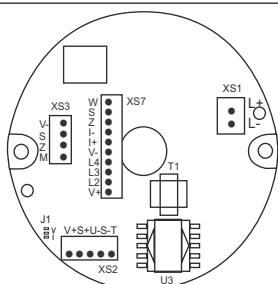
- Starting measuring value (reference pressure has to be supplied)
- Final measuring value (reference pressure has to be supplied)
- Zero offset compensation (compensation of position)
- Reset
- Starting measuring value (reranging without reference pressure)
- Final measuring value (reranging without 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 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 2000, Windows XP, Windows 7, Windows 8, Windows 10

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:

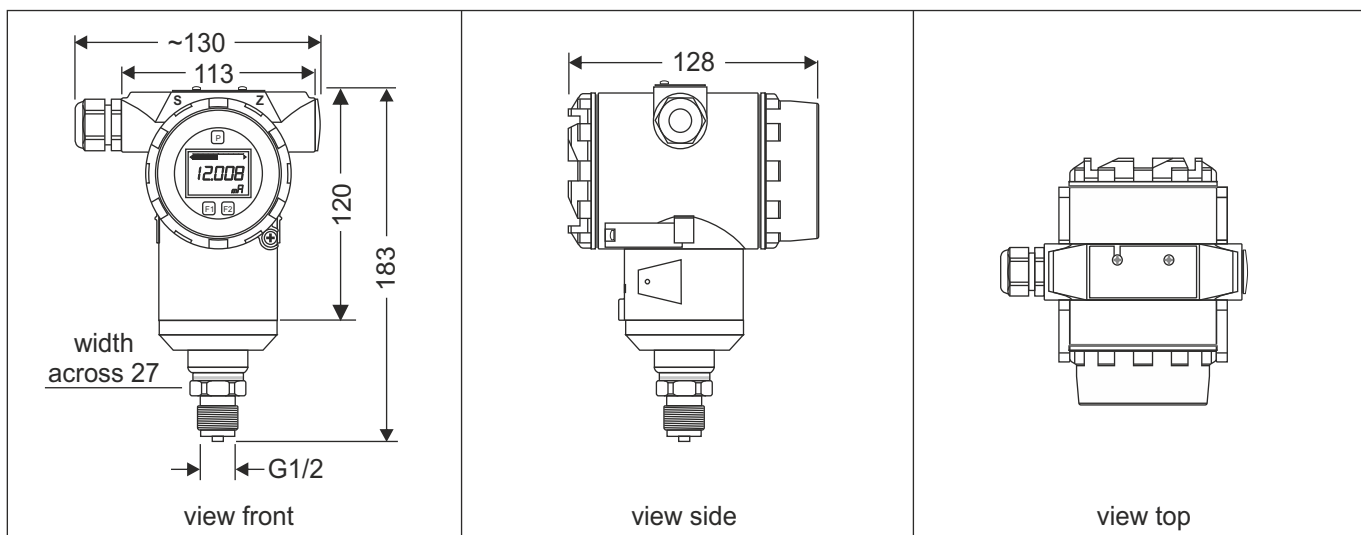
- HART interface (modem) with serial interface of a PC
- HART interface (modem) with USB interface of a PC
- Hand-held HART communicator

● Configuration with Software via HART Communication

The following settings are possible:

- | | |
|--|-----------------------------------|
| - Adjustment of output current | - Simulation of output current |
| - Configurable characteristic values:
limits of measuring range
filter function
linear / square root output signal for flow | unit for display
decimal-place |
| - HART address | - HART TAG number |
| - 2-point calibration (start and end of value) | - 6-point calibration |

● Dimensions (in mm)

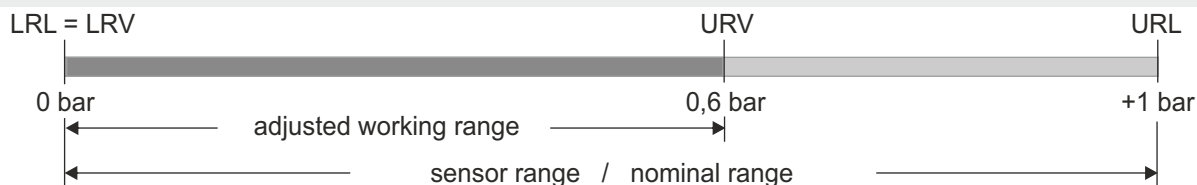


● Definitions

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

URL: upper range limit
URV: upper range value

Example 1

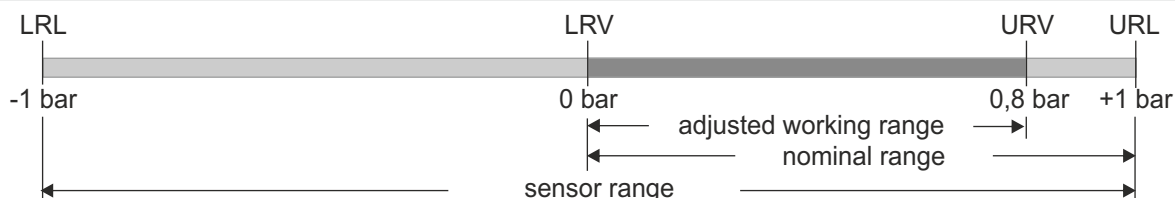


|LRV| < |URV|: lower range value (LRV) = 0 bar upper range value (URV) = 0,6 bar
upper range limit (URL) = 1 bar

Turn down: URL / |URV| = 1 bar / 0,6 bar Turn down = 1,66 : 1

Set span: URV - LRV = 0,6 bar - 0 bar set span = 0,6 bar
(adjusted) (The span is based on the zero point)

Example 2

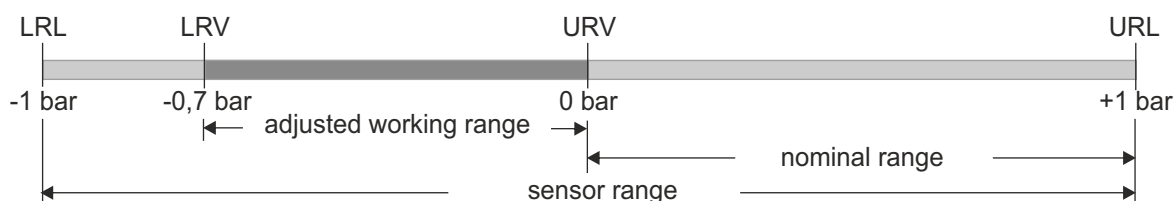


|LRV| < |URV| lower range value (LRV) = 0 bar upper range value (URV) = 0,8 bar
upper range limit (URL) = 1 bar mbar

Turn down: URL / |LRV| = 1 bar / 0,8 bar Turn down = 1,25 : 1

Set span: URV - LRV = 0,8 bar - 0 bar set span = 0,8 bar
(adjusted) (The span is based on the zero point)

Example 3



|LRV| > |URV| lower range value (LRV) = -0,7 bar upper range value (URV) = 0 bar
upper range limit (URL) = 1 bar

Turn down: URL / |LRV| = 1 bar / 0,7 bar Turn down = 1,43 : 1

Set span: URV - LRV = 0 bar - (-0,7 bar) set span = 0,7 bar
(adjusted) (The span is based on zero point)

● **Order Code**

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

Output:	4...20 mA (HART)	0									
	4...20 mA (HART), electronic limit contacts ¹⁾	1									
Kind of pressure: ²⁾	relative	0									
	absolute	1									
	relative (±)	2									
Pressure range: ³⁾	(please specify)		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⁾	1/4-18 NPT 1.4435 (316L)	0									
Temperature medium:	-30...+100 °C	0									
	-40...+125 °C	1									
Casing / connection:	diecast aluminum with screwed cable gland M20x1,5	0									
	like 0, with wall / pipe mount	1									
Configuration:	factory configuration ⁵⁾	0									
	customized configuration (please specify) ⁶⁾	1									
Other / accessories:	special model	0									
	HART Interface, USB, software	1									

1) For more details see the corresponding data sheet:

- MH-LVE for electronic limit contacts

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

When the MH-device is ordered with factory configuration this limiting value unit will have the following settings:

- Range of indication: 4,0...20,0

- Decimal point: XX.xx

- Stabilisation zero point: 2

- Limit value 1: reset value 11 mA / delay time: 0 s

- Limit value 2: reset value 16 mA / delay time: 0 s

- Calibration points: without

- Refresh display: 1 s

- Unit: without

- Limit value 1: trigger value 12 mA / delay time: 0 s

- Limit value2: trigger value 18 mA / delay time: 0 s

- Locking of programming: without

- TAG number: 0

6) Please select settings as per technical data. For values not given, factory settings will be used.