

**Technical documentation****MHDS****● Content**

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## ● Characteristics

- Input:	differential pressure (Measuring range: 75 mbar up to 420 bar)
- Output:	4...20 mA current loop (15...45 VDC), HART-protocol
Option:	additionally with limit value contacts / PROFIBUS / EtherCat / Modbus / PWM
- Turn down:	up to 100:1
- Accuracy:	0,075%, 0,1, 0,2% of range (URL, LRL)
- Indication:	LCD-display with backlighting
- Configuration:	with keys and/or software
- Material enclosure:	diecast aluminium (degree of protection: IP65)
- Process connection:	1/4-18 NTP (pressurized parts: stainless steel 1.4435)

## ● Applications

The pressure sensor is suitable to measure differential pressure. From this can be derived: flow rate (volumetric- and mass flow) and level (level, volume, mass). Typical areas of use are chemical industry and process engineering.

## ● Technical data

### Input

Differential pressure: 75 mbar / 400 mbar / 2 bar / 7 bar / 21 bar / 70 bar / 200 bar / 420 bar  
Static pressure: 30...420 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: additionally with limit value contacts / PROFIBUS / EtherCat / Modbus / PWM

### Accuracy

Type 75 mbar: 0,1% of FS up to turn down 5:1  
 $\pm(0,1+0,01*URL/URV)$  for turn down 5:1 to 50:1  
Types 400 mbar / 2 bar / 7 bar / 21 bar / 70 bar: 0,075% of FS up to turn down 10:1  
 $\pm(0,0751+0,00751*URL/URV)$  for turn down 10:1 to 100:1  
Types 200 bar / 420bar: 0,2% of FS up to turn down 10:1  
 $\pm(0,2+0,01*URL/URV)$  for turn down 10:1 to 100:1  
Influences: static pressure: zero:  $\pm 0,1\%/70$  bar - range:  $\pm 0,2\%/70$  bar  
supply:  $< 0,005\%$  of nominal range/1V  
vibration:  $< 0,01\%$  of nominal range/g at 200 Hz  
fitting position: zero drift, to compensate  
span drift: without  
temperature:  $< 0,45\%/55^{\circ}\text{C}$   
Stability:  $\pm 0,1\%$  of nominal range / 1 year

### Settings

Rise-delay time: 5 s  
Cycle time, update: 0,25 s  
Damping: 200 ms (without consideration of electronic damping)  
Filter adjustment: 0...160 $\mu\text{A}$

### Display

Visible range: 32,5x22,5 mm  
Indication: 5-digits 7-segments, 8 mm height / 8-digits 14-segments, 5 mm height 7 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 function)  
Overvoltage protection: 500V

### Environmental conditions

Operating temperature:  $-20...70^{\circ}\text{C}$   
Ambient temperature:  $-20...70^{\circ}\text{C}$   
Temperature medium:  $-40...104^{\circ}\text{C}$   
Storing temperature:  $-40...+85^{\circ}\text{C}$   
Humidity: 5...98% relative humidity

## ● Technical data (continued)

### Mechanics

#### Material:

Enclosure electronics: diecast aluminium  
 Measuring membrane: stainless steel 1.4435 / option:Hastelloy  
 Ventilating valve, joint pieces: stainless steel 1.4435  
 O-ring in contact with medium: Viton (FKM, FPM)  
 Flange screws: plain carbon steel, zinc coated  
 Type plate: stainless steel 1.4301  
 viewing glass: laminated glass

Process connection: 1/4-18 NPT

Dimensions: see page 7

Protection: degree IP 65

Weight: approx. 3,8 kg

Connection: terminal screw (maximum 1,5 mm<sup>2</sup>), via screwed cable gland M20x1,5

Principle of measurement: capacitive

Standards: IEC 61000-4-3 / Pressure equipment directive 97/23/EG

## ● Input

**Measurand:** differential pressure  
 derived from this: flow rate (volumetric- and mass flow)  
 level (level, volume, mass)

**Measuring ranges:** 75 mbar up to 420 bar

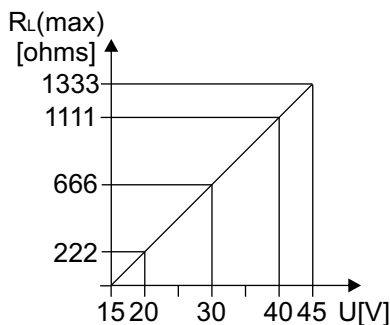
nominal range [mbar]	range limit lower (LRL) [mbar]	range limit upper (URL) [mbar]	working range smallest adjustable [mbar]	overload [bar]
75	-75	+75	1,5	130
400	-400	+400	4	130
2000	-2000	+2000	20	130
7000	-7000	+7000	70	130
21000	-21000	+21000	210	130
70000	-70000	+70000	700	125% of range
200000	-200000	+200000	2000	125% of range
420000	-420000	+420000	4200	115% of range

## ● 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

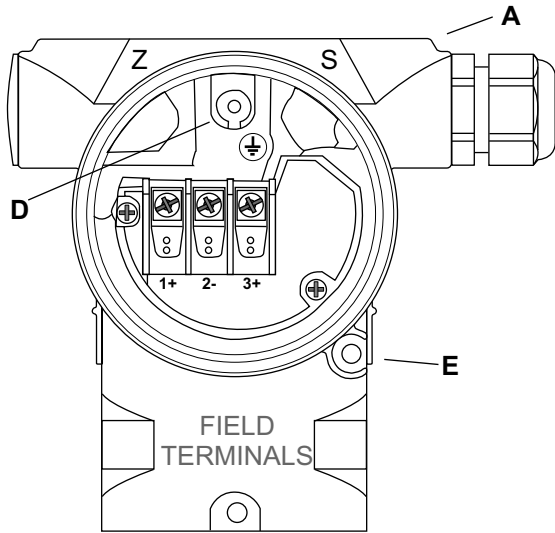
Please note: When using communication via a HART modem, a communication resistance of minimum 250 ohms has to be taken into account.

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

**Read cycle time:** HART commands all 200 ms.

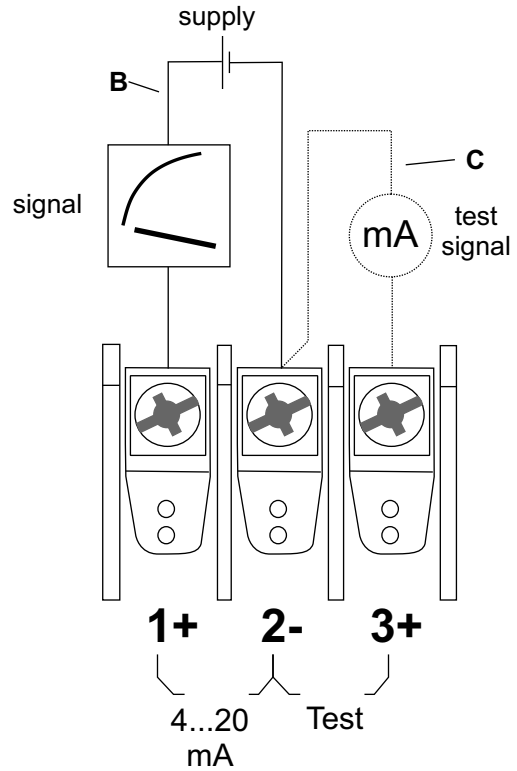
**Damping:** continuously adjustable from 0 to 160  $\mu\text{A}$  via electronic insert inside the device, hand-held equipment or PC-software. Factory configuration: 0  $\mu\text{A}$

## ● Electrical connection



### 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

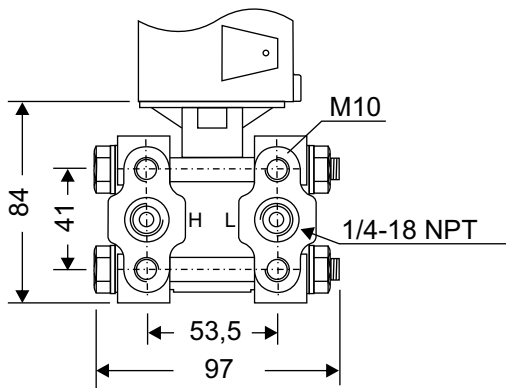
Cable entry: screwed cable gland M20x1,5 (metal)

Cabel: outer diameter: 6...12 mm  
cross-sectional area: 0,5...1,5 mm<sup>2</sup>  
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



### Pressure connection:

1/4-18 NPT AISI 316L (1.4435)

### Measuring membrane:

stainless steel 1.4435

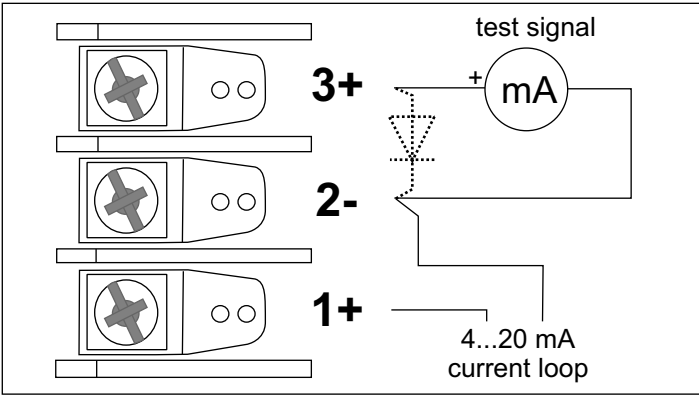
### Mounting:

M10

### Supplied accessories:

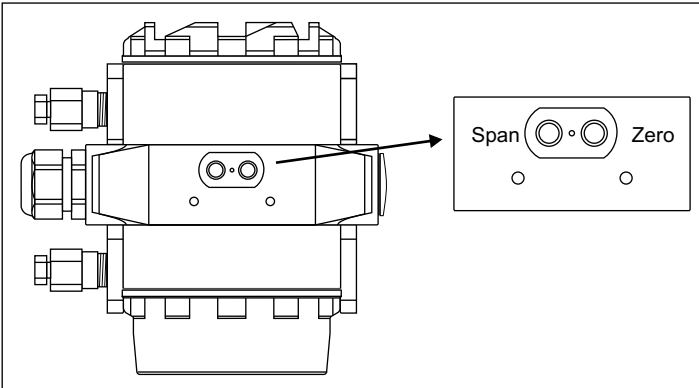
2 ventilating valves AISI 316L (1.4435)

● **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 separated from other parts of the enclosure.

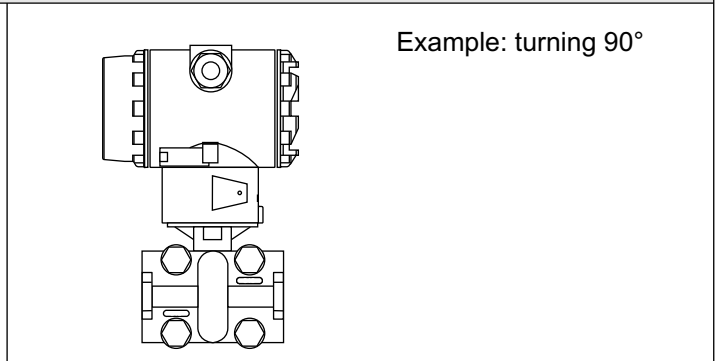
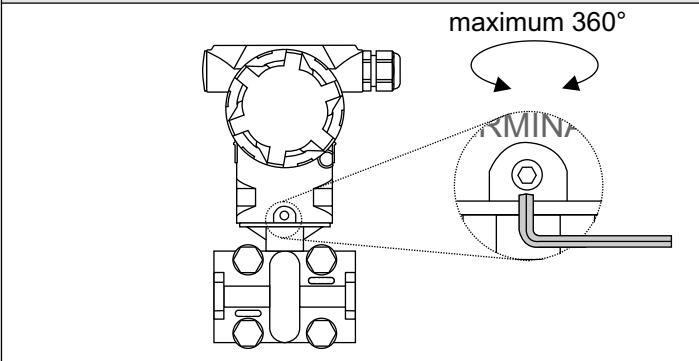
Advantages:

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

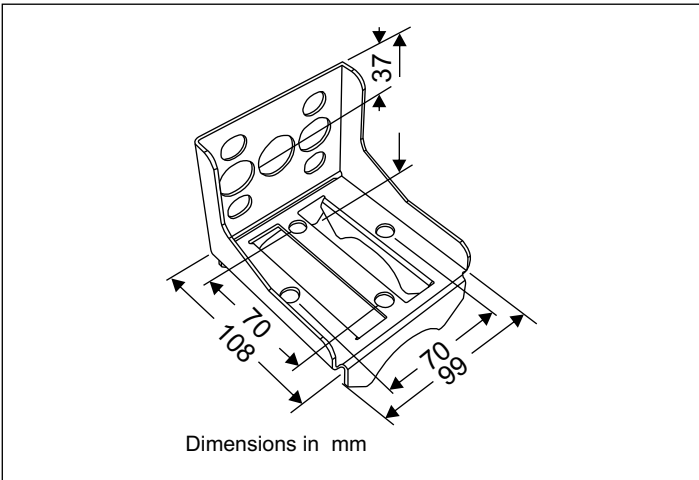
● **Rotating of enclosure**

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

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



● **Wall- and tube mounting**



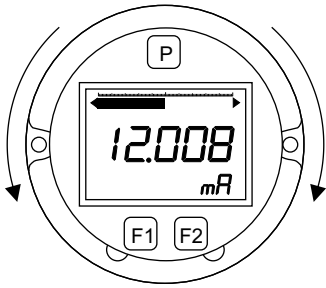
Holder made of steel (zinc coated) for mounting the device on walls or tubes is supplied with the device.

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

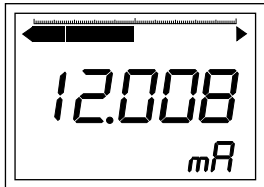


The display is rotatable for approx. 330°

With 3 operator's keys is configurable:

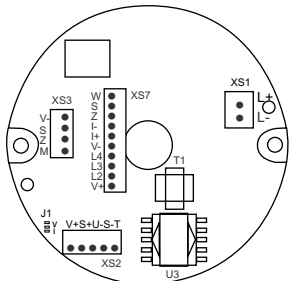
- Starting measuring value (reference pressure has to be supplied)
- Final measuring value (reference pressure has to be supplied)
- Zero offset compensation (compensation of position)
- Reset
- Starting measuring value (reranging without reference pressure)
- Final measuring value (reranging without 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 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

### 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:<br>limits of measuring range<br>filter function<br>linear / square root output signal for flow | unit for display<br>decimal-place |
| - HART address   | - HART TAG number                 |
| - 2-point calibration (start and end of value)   | - 6-point calibration             |



● **Ordering code**

**H D X X X X X X - X X X**

<b>Output:</b>	4...20 mA (HART)	0																		
	4...20 mA (HART), electrical limit contacts <sup>1)</sup>	1																		
	4...20 mA (HART), limit contacts relays <sup>1)</sup>	2																		
	4...20 mA (HART), PROFIBUS <sup>1)</sup>	3																		
	4...20 mA (HART), Modbus <sup>1)</sup>	4																		
	4...20 mA (HART), EtherCat <sup>1)</sup>	5																		
	4...20 mA (HART), PWM <sup>1)</sup>	6																		
<b>Enclosure:</b>	standard <sup>2)</sup>	0																		
<b>Δ P-range:</b>	0...75 mbar (turn down 50:1)	0																		
	0...400 mbar (turn down 100:1)	1																		
	0...2 bar (turn down 100:1)	2																		
	0...7 bar (turn down 100:1)	3																		
	0...21 bar (turn down 100:1)	4																		
	0...70 bar (turn down 100:1)	5																		
	0...200 bar (turn down 100:1)	6																		
	0...420 bar (turn down 100:1)	7																		
<b>Membrane:</b>	stainless steel 1.4435	0																		
	Hastelloy (on request)	1																		
<b>Process connection:</b>	1/4-18 NPT 1.4435 (316L)	0																		
<b>Seal:</b>	Viton (FKM)	0																		
<b>Configuration:</b>	factory configuration with output signal linear <sup>3)</sup>	0																		
	customized configuration (please indicate) <sup>4)</sup>	1																		
	factory configuration with square root output signal <sup>3)</sup>	2																		
<b>Options:</b>	without	0																		
	holder for wall- / tube mounting, stainless steel (additional price) <sup>5)</sup>	1																		
<b>Other / accessories:</b>	special model	0																		
	HART interface, USB, software	1																		
	HART interface, RS232, software	2																		

- 1) For more details see the corresponding data sheet:
- MH-LVE for electrical limit value contacts
  - MH-LVR for limit value contacts with relays
  - MH-PRO for interface PROFIBUS
  - MH-MOD for interface Modbus
  - MH-ETH for interface EtherCat
  - MH-PWM for interface pulse-width modulation (PWM)
- 2) enclosure made of diecast aluminium with scewed cable gland M20x1,5
- 3) 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
- 4) the possibilities of the technical data can be selected. In case of not given values the details of factory-set are used.
- 5) as standard the differential pressure transmitter is supplied with a holder made of steel (zinc coated). For an additional price a holder made of stainless steel can be selected