

**Data Sheet****MHDS****● Content**

Page 2: Characteristics - Applications - Technical Data

Page 3: Input Quantity - Output Quantity

Page 4: Electrical Connection - Process Connection

Page 5: 4...20 mA Test Signal - External Control - Casing Rotation - Mounting

Page 6: Electronics Insert with Display - HART Communication

Page 7: Dimensions - Definitions

Page 8: Order Code

## ● **Characteristics**

- Input:	differential pressure (measuring range: 10 mbar up to 100 bar)
- Output:	4...20 mA current loop (15...45 VDC), HART-protocol
Option:	additionally with limit value contacts
- Turn down:	up to 100:1
- Accuracy:	0,075%, 0,1% of range (URL, LRL)
- Indication:	LCD-display with backlighting
- Configuration:	with keys and/or software
- Material casing:	diecast aluminum (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:	10 mbar / 60 mbar / 400 mbar / 2,5 bar / 20 bar / 100 bar
Static pressure:	160 bar / 400 bar (see pressure table, data sheet page 3)

### **Output**

Analog:	4...20 mA, 2-wire, with superimposed communication signal (HART-protocol)
Signal range:	3,6...22,8 mA
Fault:	Signal 3,6 mA

### **Accuracy**

Type 10 mbar / 60 mbar:	
0,1% of terminal value up to a range spread of 5:1	
$\pm(0,1+0,01*URL/URV)$ at a range spread of 5:1 up to 50:1	
Types 400 mbar / 2,5 bar / 20 bar / 100 bar:	
0,075% of terminal value up to a range spread of 10:1	
$\pm(0,0751+0,00751*URL/URV)$ at range spread 10:1 up to 100:1	
Influences:	
Static pressure:	Zero point: $\pm 0,1\%/70$ 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 point offset, compensable
Range shift:	without
Temperature:	$<0,45\%/55^{\circ}\text{C}$
Stability:	$\pm 0,1\%$ of nominal range / 1 year

### **Settings**

Switch-on delay:	5 s
Cycle time, update:	0,25 s
Damping:	200 ms (without consideration for electronics damping)
Filter setting:	0...160 $\mu\text{A}$

### **Display**

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

### **Supply**

Voltage:	15...45 VDC (current loop)
Insulation resistance:	$>250$ M $\Omega$
Short-circuit strength:	Permanent
Reverse voltage protection:	Yes (no function, no damage)
Overvoltage protection:	500V

### **Environmental Conditions**

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

## ● Technical Data (Continued)

### Mechanics

#### Material:

Electronics casing:	Diecast aluminum
Measuring membrane:	Stainless steel 1.4435 / Option: Hastelloy
Vent / drain valve:	Stainless steel 1.4435
Joint pieces:	Stainless steel 1.4435
O-ring in contact with medium:	Viton (FKM, FPM)
Flange screws:	unalloyed, zinc-coated steel
Product label:	Stainless steel 1.4301
Sight glass:	Laminated safety glass

Process connection: 1/4-18 NPT

Dimensions: see page 7

Protection class: IP65

Weight: approx. 3,8 kg

Connection: Terminal screws (max. 1,5 mm<sup>2</sup>) via M20x1,5 cable gland

Measuring principle: Capacitive

Standards: IEC 61000-4-3 / pressure equipment directive 2014/68/EU

## ● Input

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

**Measuring ranges:** 10 mbar up to 100 bar

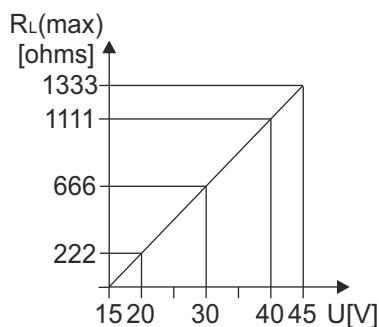
nominal range [mbar]	range limit lower (LRL) [mbar]	range limit upper (URL) [mbar]	working range smallest adjustable [mbar]	overload limit [bar]
10	-10	+10	0,2	160
60	-60	+60	0,6	160
400	-400	+400	4	160
2500	-2500	+2500	25	160
20000	-20000	+20000	200	400
100000	-100000	+100000	1000	400

## ● 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

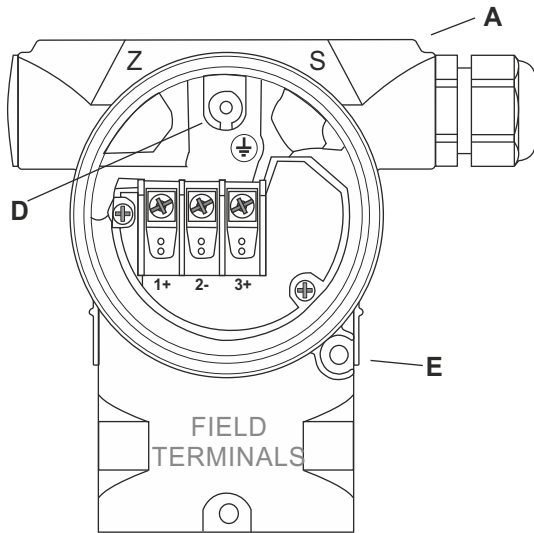
Please note: When using communication via a HART modem, a communication resistance of minimum 250 ohms has to be taken into account.

**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 electronics insert inside the device, handheld equipment or PC-software. Factory configuration: 0  $\mu\text{A}$

## ● Electrical Connection



Electrical connection 4...20 mA HART

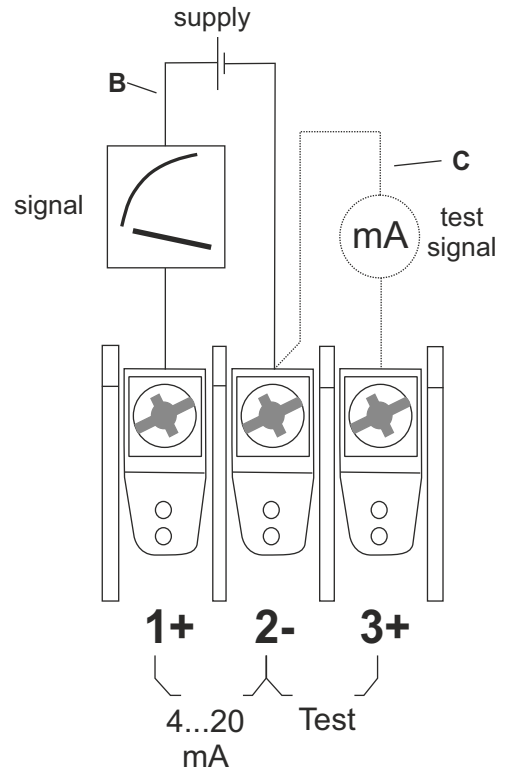
A: Casing

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)

Cable: outer diameter: 6...12 mm

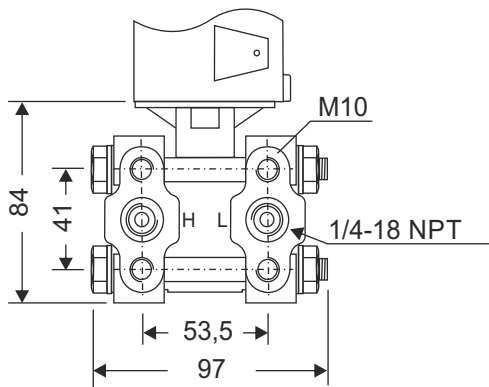
cross-sectional area: 0,5...1,5 mm<sup>2</sup>

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

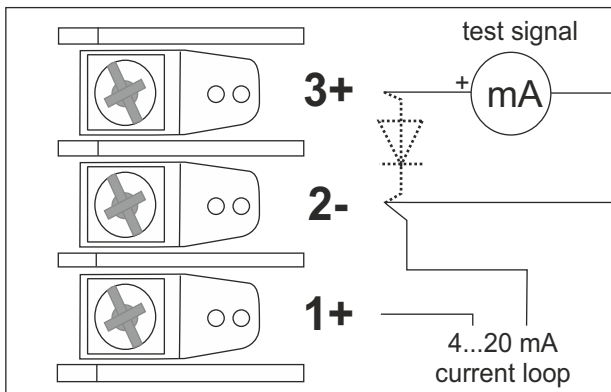
**Mounting:**

M10

**Supplied accessories:**

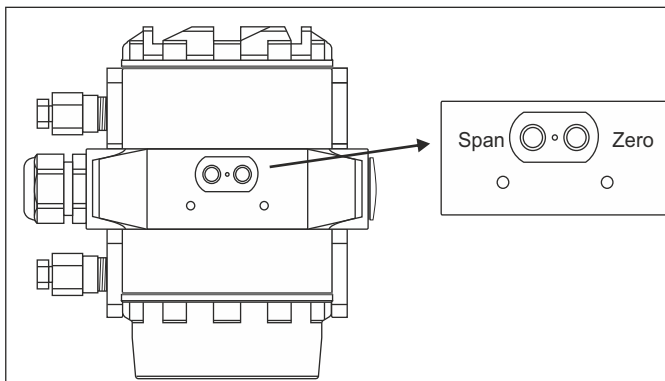
2 ventilating valves AISI 316L (1.4435)

## ● 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 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 casing.

Advantages:

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

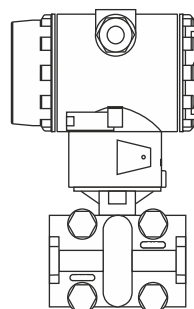
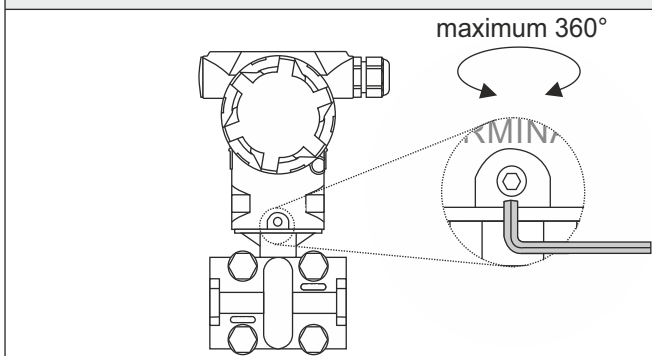
## ● Casing Rotation

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

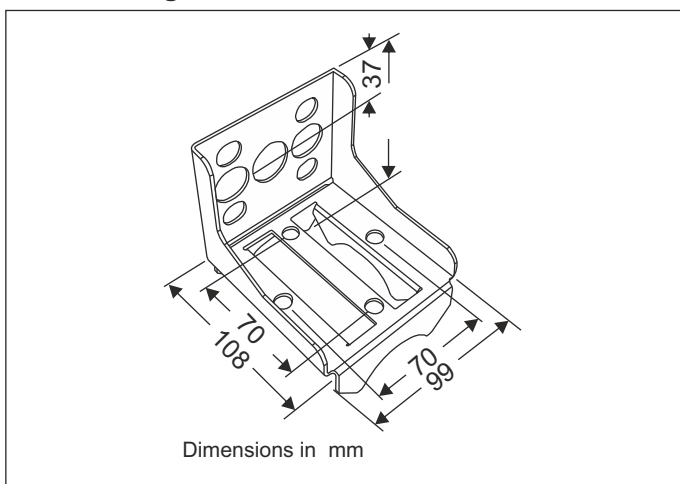
**Advantages:**

Good display readability

External controls are easily approachable for the operator



## ● Mounting

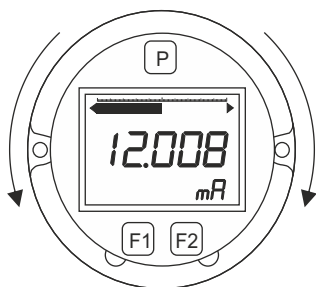


A stainless steel wall mount for mounting the device on walls or tubes is supplied with the device.

Supplied parts: Wall mount, fixing clamp with nuts and washers.

## ● Electronics Insert with Display

### Display with key buttons for configuration

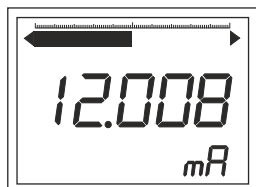


The display is rotatable up to approx. 330°

With all 3 operator keys the following is configurable:

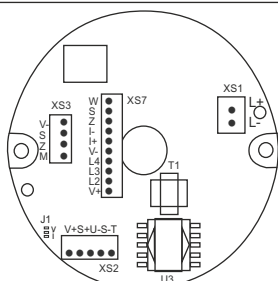
- Starting measuring value (reference pressure has to be supplied)
- Final measuring value (reference pressure has to be supplied)
- Zero offset compensation (compensation of position)
- Reset
- Starting measuring value (reranging without reference pressure)
- Final measuring value (reranging without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

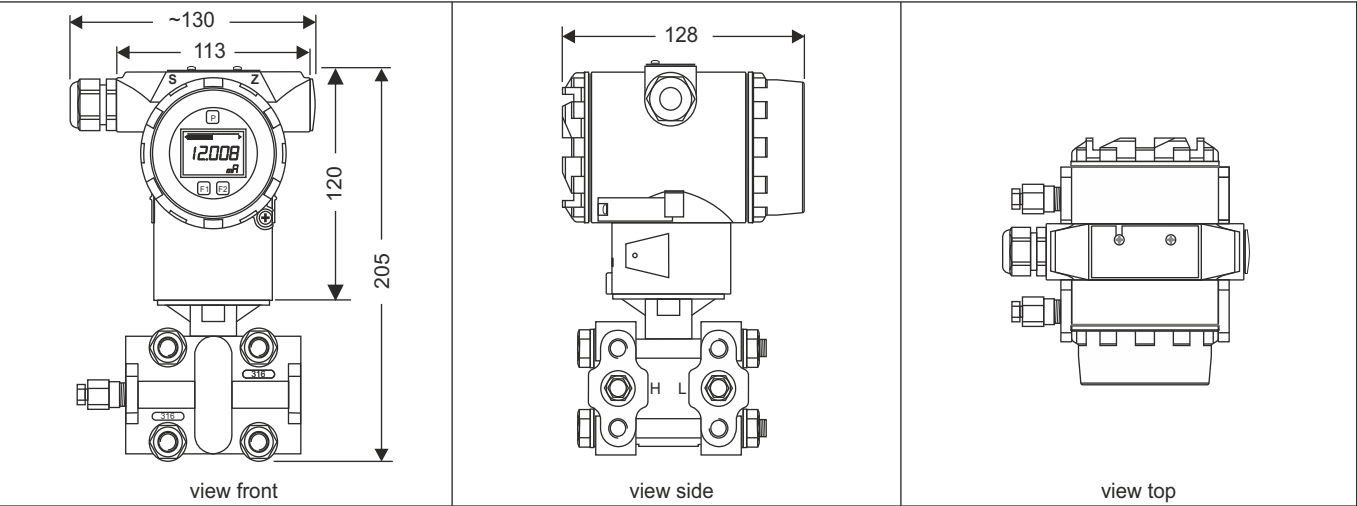
- HART interface (modem) with serial interface of a PC
- HART interface (modem) with USB interface of a PC
- Hand-held HART communicator

## ● Software Communication 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             |

● **Dimensions (in mm)**



● **Definitions**

LRL: lower range limit LRV: lower range value		URL: upper range limit URV: upper range value	
Example 1			
<b> LRV  &lt;  URV </b>		lower range value (LRV) = 0 mbar upper range limit (URL) = 400 mbar	
		upper range value (URV) = 200 mbar	
<b>Turn down:</b>		URL /  URV  = 400 mbar / 200 mbar Turn down = 2 : 1	
<b>Set span:</b>		URV - LRV = 200 mbar - 0 mbar (The span is based on the zero point) set span = 200 mbar	
Example 2			
<b> LRV  &gt;  URV </b>		lower range value (LRV) = -300 mbar upper range limit (URL) = 400 mbar	
		upper range value (URV) = 0 mbar	
<b>Turn down:</b>		URL /  LRV  = 400 mbar / 300 mbar Turn down = 1,33 : 1	
<b>Set span</b>		URV - LRV = 0 mbar - (-300 mbar) (The span is based on zero point) set span = 300 mbar	

H	D	X	X	X	X	X	X	-	X	X	X
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<b>Output:</b>	4...20 mA (HART)	0									
	4...20 mA (HART), electronic limit contacts <sup>1)</sup>	1									
<b>Casing:</b>	standard <sup>2)</sup>	0									
<b>Δ P-range:</b>	0...10 mbar (turn down 50:1)	6									
	0...60 mbar (turn down 100:1)	7									
	0...400 mbar (turn down 100:1)	8									
	0...2,5 bar (turn down 100:1)	9									
	0...20 bar (turn down 100:1)	A									
	0...100 bar (turn down 100:1)	B									
<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>Holder for wall / tube:</b>	Made of stainless steel	1									
<b>Other / accessories:</b>	special model	0									
	HART interface, USB, software	1									

1) For more details see the corresponding data sheet:

- MH-LVE for electronic limit value contacts

2) Casing made of diecast aluminium with screwed 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) Please select settings as per technical data. For values not given, factory settings will be used.