Technical documentation

MHDS

Content

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
±(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
±(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
±(0,2+0,01*URL/URV) for turn down 10:1 to 100:1
Influences: static pressure: zero: ±0,1%/70 bar - range: ±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°C
Stability: ±0,1% of nominal range / 1 year

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 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 funtion)
Overvoltage protection: 500V

Environmental conditions

Operating temperature: -20...70°C
Ambient temperature: -20...70°C
Temperature medium: -40...104°C
Storing temperature:-40...+85°C
Humidity: 5...98% relative humidity

Technical data (continued)

Mechanics

Material:
- Enclosure ektronics: 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 glas

Process connection: 1/4-18 NPT
Dimensions: see page 7
Protection: degreeIP 65
Weight: approx. 3,8 kg
Connection: terminal screw (maximum 1,5 mm²), via srewed cable gland M20x1,5
Principle of measurement: capacitive
Standards: IEC 61000-4-3 / Pressure equipment directive 97/23/EG

Input

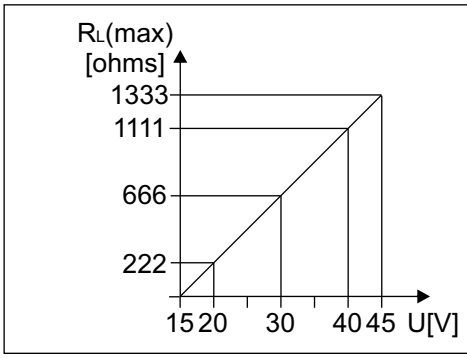
Measurand: differential pressure
derived from this: flow rate (volumetric- and mass flow)
level (level, volume, mass)

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

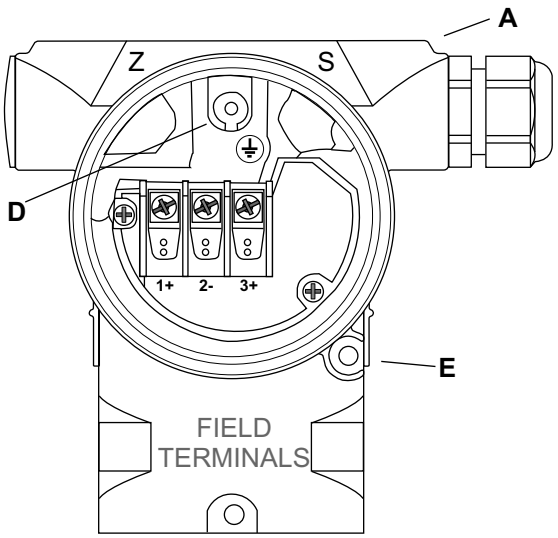
Output signal: 4...20 mA, 2-wire connection
with superimposed communication signal for HART protocol
Signal range: 3,6...22,8 mA
Load: R_{Lmax} = (U - 15 V) / 0,0228 A



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.

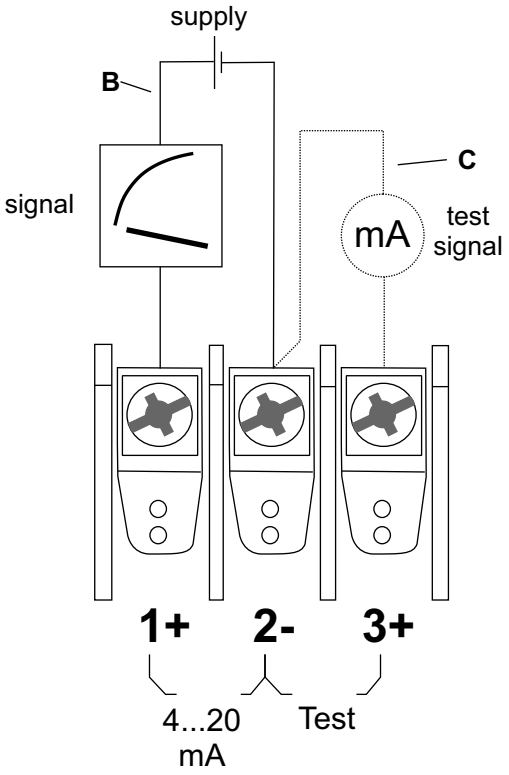
Resolution: current output: 16 bit
indication: adjustable (factory setting: 0...100%)
Read cycle time: HART commands all 200 ms.
Damping: continuously adjustable from 0 to 160 µA via electronic insert inside the device, hand-held equipment or PC-software. Factory configuration: 0 µA

Electrical connection



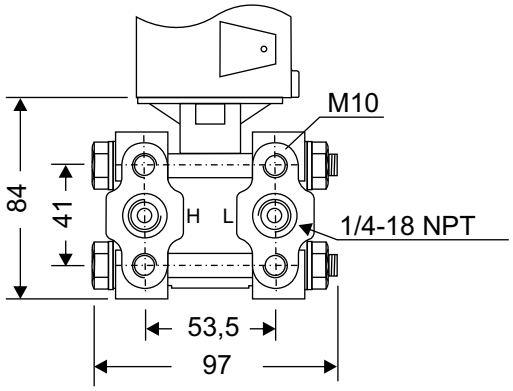
Electrical connection 4...20 mA HART

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



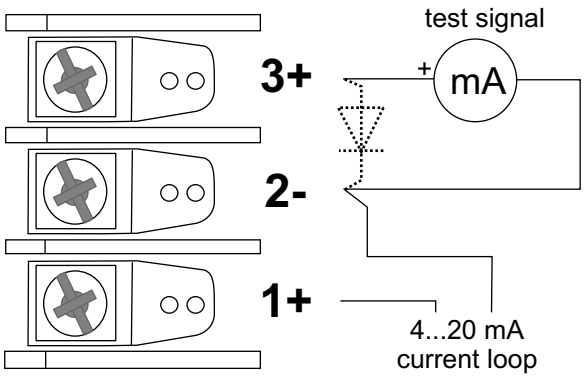
Pressure connection:
1/4-18 NPT AISI 316L (1.4435)

Measuring membrane:
stainless steel 1.4435

Mounting:
M10

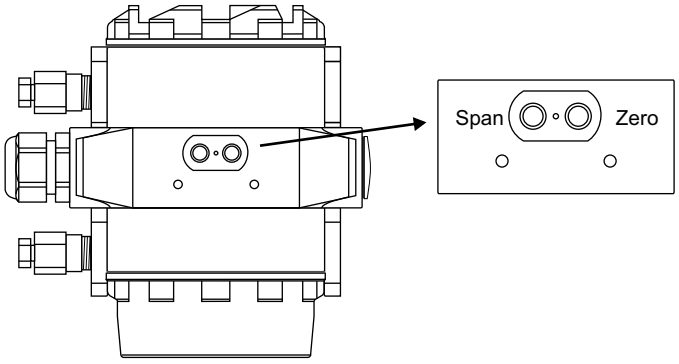
Supplied accessories:
2 ventilating valves AISI 316L (1.4435)

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

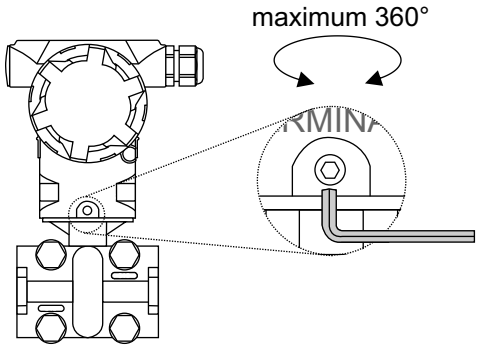


Below the type plate there are 2 key button for easy configuration of zero and span. The keys are Hall effect devices and are completely seperated from other parts of the enclosure.

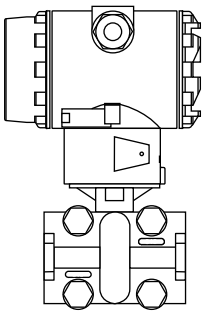
Advatages:
- Protection against environmental influence
- without wear
- ease of operation

Rotating of enclosure

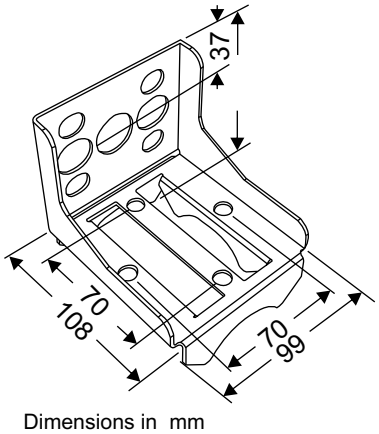
After unscrewing the M6 Allen screw the enclosure can be rotated up to 360°.
Advatages:
Good reading of the display
Operator's controls of the device are easy approachable



Example: turning 90°



Wall- and tube mounting



Dimensions in mm

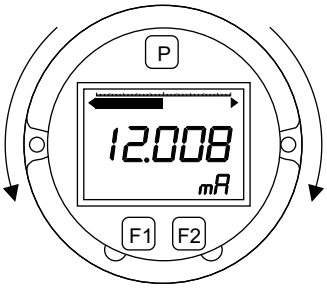
Holder made of steel (zinc coated) for mounting the device on walls or tubes is supplied with the device.

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

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

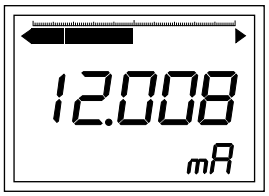
Electronic insert with display

Display with key buttons for configuration



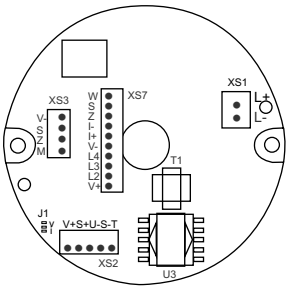
The display is rotatable for approx. 330°
With 3 operator's keys is configurable:
- Starting measuring value (reference pressure has to be supplied)
- Final measuring value (reference pressure has to be supplied)
- Zero offset compensation (compensation of position)
- Reset
- Starting measuring value (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 progam 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:

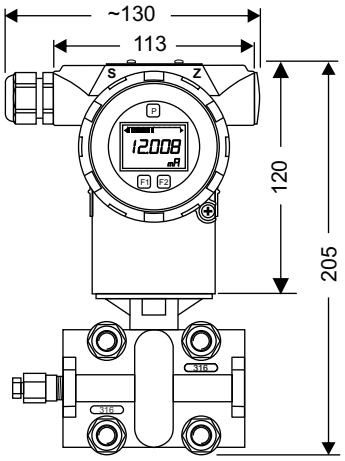
- HART interface (modem) with serial interface of a PC
- HART interface (modem) with USB interface of a PC
- Hand-held HART communicator

Configuration with software via HART communication

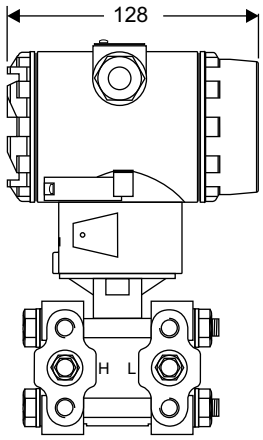
The following settings are possible:

- Adjustment of output current	- Simulation of output current
- Configurable characteristic values: 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

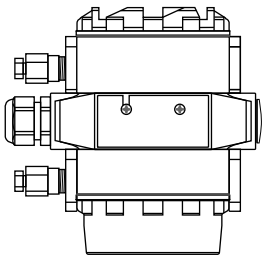
Dimensions in mm



view front



view side

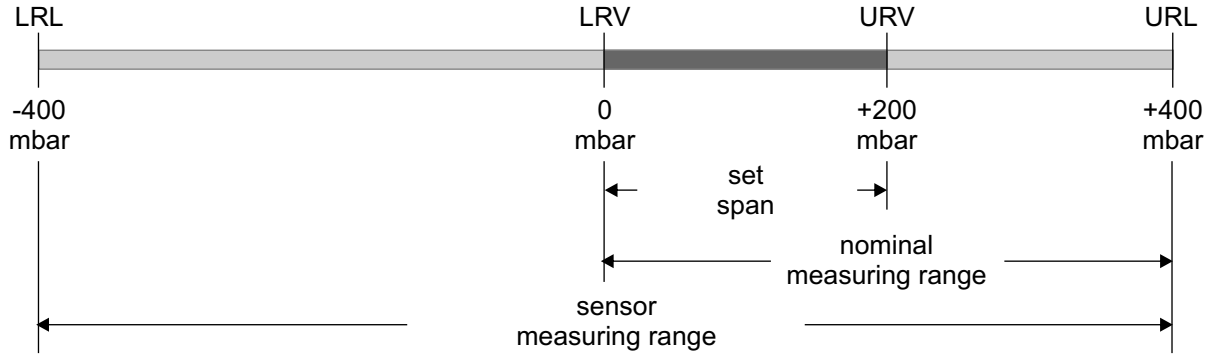

view top

Definitions

LRL: lower range limit
LRV: lower range value

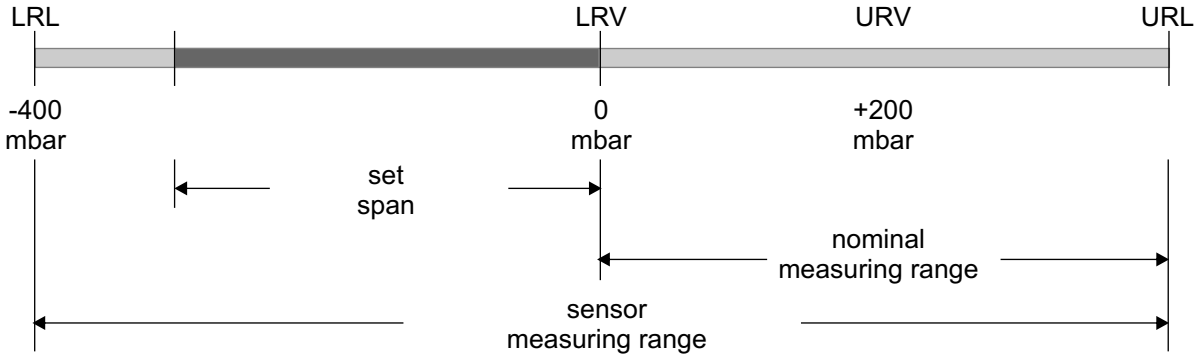
URL: upper range limit
URV: upper range value

Example 1



|LRV| < |URV|	lower range value (LRV) = 0 mbar upper range limit (URL) = 400 mbar	upper range value (URV) = 200 mbar
Turn down:	URL / |URV| = 400 mbar / 200 mbar	Turn down = 2 : 1
Set span:	URV - LRV = 200 mbar - 0 mbar (The span is based on the zero point)	set span = 200 mbar

Example 2



|LRV| > |URV|	lower range value (LRV) = -300 mbar upper range limit (URL) = 400 mbar	upper range value (URV) = 0 mbar
Turn down:	URL / |LRV| = 400 mbar / 300 mbar	Turn down = 1,33 : 1
Set span	URV - LRV = 0 mbar - (-300 mbar) (The span is based on zero point)	set span = 300 mbar

Ordering code

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

Output:	4...20 mA (HART)	0
	4...20 mA (HART), electronical limit contacts[1)]	1
	4...20 mA (HART), limit contacts relays[1)]	2
	4...20 mA (HART), PROFIBUS[1)]	3
	4...20 mA (HART), Modbus[1)]	4
	4...20 mA (HART), EtherCat[1)]	5
	4...20 mA (HART), PMW[1)]	6
Enclosure:	standard[2)]	0
ΔP-range:	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
Membrane:	stainless steel 1.4435	0
	Hastelloy (on request)	1
Process connection:	1/4-18 NPT 1.4435 (316L)	0
Seal:	Viton **(**FKM)	0
Configuration:	factory configuration with output signal linear[3)]	0
	customized configuration (please indicate)[4)]	1
	factory configuration with square root output signal[3)]	2
Options:	without	0
	holder for wall- / tube mounting, stainless steel (additional price)[5)]	1
Other / accessories:	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 electronical 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