

# SATRON VV Pressure Transmitter

**SATRON VV pressure transmitter** belongs to V-transmitter family. The series V transmitters have both analog and smart properties. SATRON VV is used for 0-1.4 kPa...0-0.5 MPa ranges. It is a 2-wire transmitter with HART® standard communication.

SATRON VV pressure transmitter is suitable for liquid level measurements in ground, rock and ships' tanks, and in open channels.

SATRON VV pressure transmitter can be used in corrosive conditions and to measure contaminating liquids. Possible foam on the surface of the measured liquid does not disturb the measurement. SATRON VV does not require compressed air supply.

The transmitter's sensor is piezoresistive. The rangeability is 50:1 for type VV5.



## TECHNICAL SPECIFICATIONS

### Measuring range and span

See Selection Chart.

### Zero and Span adjustment

Zero elevation: Calibrated span is freely selectable on the specified range depending from the desired option. This can be made by using extern control shafts (analog option), keyboard (display option) or HART®275/375 communicator.

### Damping

Time constant is continuously adjustable 0.01 to 60 s.

### Temperature limits

Process: -10 to +125 °C

Ambient: -30 to +80 °C

Shipping and storage: -40 to +80 °C.

Operating temperature of display:

0 to +50°C (does not affect operation of the transmitter)

Equipment cabinet is recommended for extremely demanding conditions.

### Pressure limits

Min. and max. process pressure: See the appended tables.

**Output** 2-wire (2W), 4-20 mA, user selectable for linear, square root, inverted signal or the transfer function (16 points)specified by the user

### Supply voltage and permissible load

See the load capacity diagram;

4-20 mA output: 12-35 VDC.

**Humidity limits** 0-100 % RH; freezing of condensed water is not allowed in reference pressure channels.

## PERFORMANCE SPECIFICATIONS

Tested in accordance with IEC 60770: Reference conditions, specified span, no range elevation,AISI316L diaphragm, silicone oil fill.

### Accuracy

- ±0.05 % of calibrated span (span 1:1-5:1 /max.range).
- On the measuring ranges 5:1- 50:1:

$\pm[0.01+0.012 \times (\frac{\text{max.span}}{\text{calibrated span}})]\%$  of calibrated span (incl. nonlinearity, hysteresis and repeatability)

### Long-term stability

±0.1 % of max. span per 12 months

### Temperature effect on compensated temperature ranges

Zero and span shift: ±0.15 % of max.span

### Mounting position effect

Zero error <0.32 kPa, which can be calibrated out.

### Vibration effect (IEC 68-2-6: FC):

±0.1 % of measuring range/

2 g/10 to 2000 Hz

4 g/10 to 100 Hz

### Power supply effect

<±0.01 % of calibrated span per volt.

### Insulation test voltage

500 V rms 50 Hz.

## CONSTRUCTION AND CALIBRATION

### Materials

Diaphragm <sup>1)</sup>: AISI316L (EN 1.4435), Hast. C276 (EN 2.4819) or Tantalum.

Sensing element <sup>1)</sup>: AISI316, PTFE/ AISI316 or PVC

Other materials: SIS2343

**Fill fluid** Silicone oil or inert oil.

### Housing with PLUG connector, codes H and T

Housing: AISI316/303

Seals: Viton® and NBR

TEST jacks: MS358Sn/PVDF,

protected with silicone rubber shield.

PLUG connector: PA6-GF30 jacket,

Silicone rubber seal, AISI316 retaining

screw.

### Housing with junction box/terminal strip, codes M and N

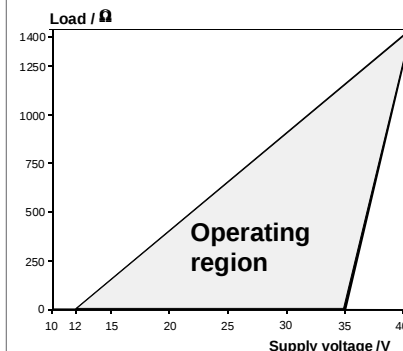
Housing: AISI303/316; Seals: Nitrile

and Viton®; Nameplates: Polyester

### Connection cable between sensing element and housing

(code L and K):

PTFE hose with AISI316 braiding.



Min. load using HART® - communication 250 Ω

$R_{max} = \frac{\text{Supply voltage} - 12 \text{ V}}{I_{max}}$

$I_{max} = 20.5 \text{ mA using HART®-communication}$

$I_{max} = 23 \text{ mA (when the alarm current 22.5 mA is on)}$

**Supply voltage for transmitter without intrinsic safety (not ATEX)**

**Equipment cabinet** Rittal AE1380, Steel cabinet with polyester paint.

**Enclosure class:** IP66.

### Calibration

For customer-specified range with 1 s. damping. (If range is not specified, transmitter is calibrated for maximum range.)

### Electrical connections

Housing with PLUG connector, codes H and T:

PLUG connector, connector type DIN 43650 model AF; Pg9 gland for cable; wire cross-section 0.5 to 1.5 mm<sup>2</sup>.

Housing with junction box/terminal strip, codes M and N:

M20x1.5, 1/2-NPT inlet; screw terminals for 0.5 to 2.5 mm<sup>2</sup> wires.

<sup>1)</sup> Parts in contact with process medium

| Pressure limits               |                        |                | Minimum process pressure                                      |                                                               |           |
|-------------------------------|------------------------|----------------|---------------------------------------------------------------|---------------------------------------------------------------|-----------|
| Maximum process pressure, MPa |                        |                | Minimum process pressure for different fill fluids (kPa,abs.) |                                                               |           |
| Transmitter type              | Max. overload pressure | Pressure class | T <sub>proc.</sub> °C                                         | Minimum process pressure for different fill fluids (kPa,abs.) |           |
|                               |                        |                |                                                               | DC200 100 cSt                                                 | Inert oil |
| VV...3                        | 0.2                    | PN40           | 20                                                            | 5                                                             | 8         |
| VV...4                        | 0.3                    | PN40           | 40                                                            | 8                                                             | 10        |
| VV...5                        | 1.5                    | PN40           | 80                                                            | 16                                                            | 28        |

## Process connections

DN50PN40, DN80PN40, ANSI2" 150 lbs/300 lbs, ANSI3" 150 lbs/300 lbs; clamp mounting on angle bracket (see INSTALLATION)

## Weight (kg):

- VVF 2.2 kg
- VVP 8.7 kg
- VVH 9.2 kg
- + 1 kg/m with PVC protective tube
- and 3 kg/m with AISI316 protective tube.

## Product Certifications

### European Directive Information

#### Electro Magnetic Compatibility (EMC directive 2004/108/EC)

All pressure transmitters

#### Atex Directive (94/9/EC)

Satron Instruments Inc. complies with the ATEX Directive.

#### European Pressure Equipment Directive (PED) (97/23/EC)

All Pressure Transmitters :  
- Sound Engineering Practice

## Hazardous Locations Certifications

### European Certifications

ATEX Intrinsic Safety

Certification No. : DNV-2007-OSL-ATEX- 1346X

Ex II 1 GD T135°C EEx ia II C T4 -20°C ≤ Tamb ≤ 50°C

Ex II 2 GD T135°C EEx ia II C T4 -20°C ≤ Tamb ≤ 50°C

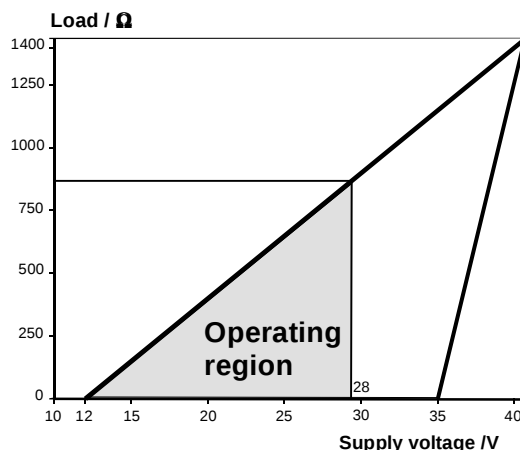
## Input Parameters :

$U_i = 28 \text{ V}$   
 $I_i = 93 \text{ mA}$   
 $P_i = 0.651 \text{ W}$   
 $C_i = 5 \text{ nF}$   
 $L_i = 0.2 \text{ mH}$

### Special Conditions for Safe Use (X) :

The enclosure with plastic window and the plastic DIN43650 connector must not be installed in potentially explosive atmosphere requiring category 1 apparatus.

The non-conducting surface of the sensor element may be charged by the flow of non-conducting media, so there may be electrostatic hazard with IIC-gases. These units should be marked 2 GD. The equipment shall be installed and connected according to the manufacturers instructions.



Min. load using HART® - communication 250  $\Omega$

$$R_{\max} = \frac{\text{Supply voltage} - 12 \text{ V}}{I_{\max}}$$

$I_{\max} = 20.5 \text{ mA}$  using HART®-communication

$I_{\max} = 23 \text{ mA}$  (when the alarm current 22,5 mA is on)

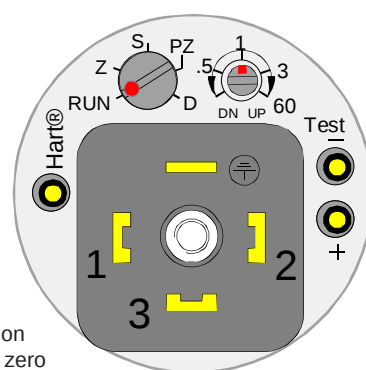
**Supply voltage for transmitter  
with certified intrinsic safety (ATEX)**



Keyboard :

- Esc** = Press **Esc** to move back towards the top of the main menu.
- ▲** = Use the UP arrow key to move up on the current menu level or to increase the selected parameter value.
- ▼** = Use the DOWN arrow key to move down on the current menu level or to decrease the selected parameter value.
- Enter** = Press **Enter** to move to a lower level in a menu or to accept a command or parameter value.

**Housing with display, code N**

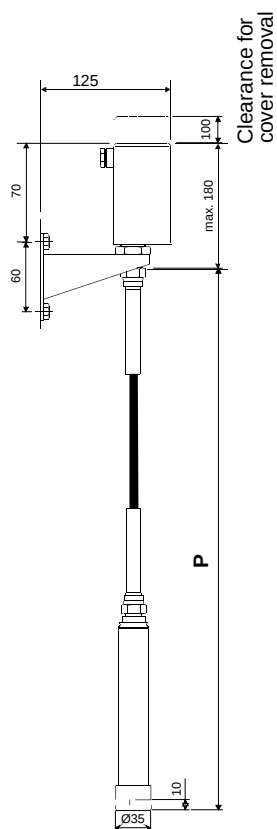


Use of selector switch :

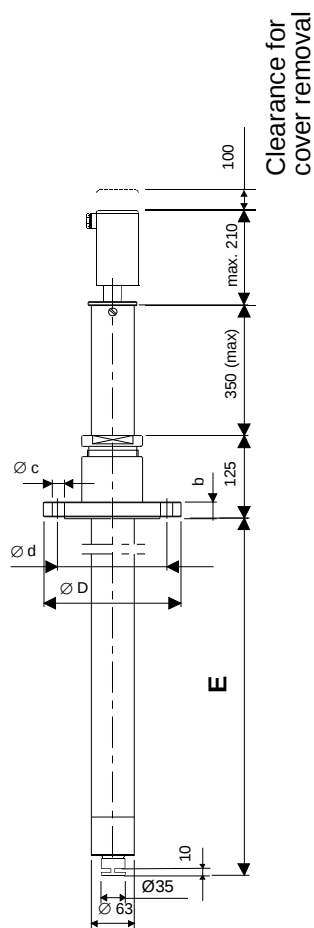
- RUN** = Working position
- PZ** = Process value zero
- D** = Damping adjustment
- S** = Span adjustment
- Z** = Zero adjustment
- DN** = Down
- UP** = Up

**Housing with PLUG connector, code T**

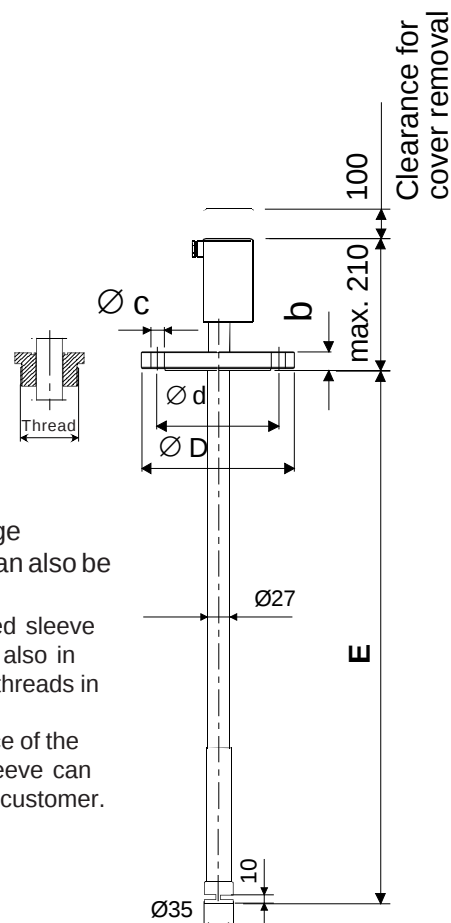
## Dimensional drawings (drawings in mm)



Type VVF

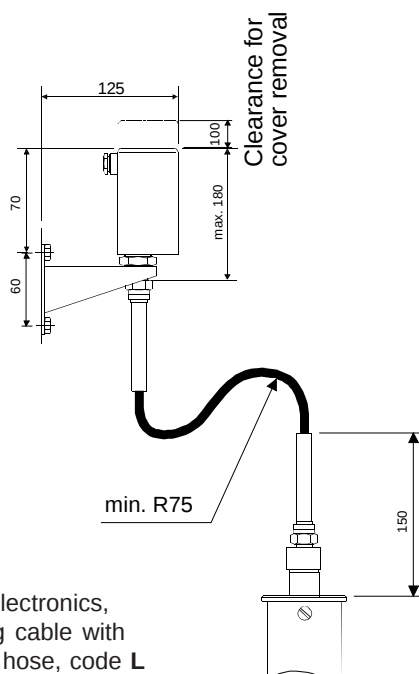


Type VVP

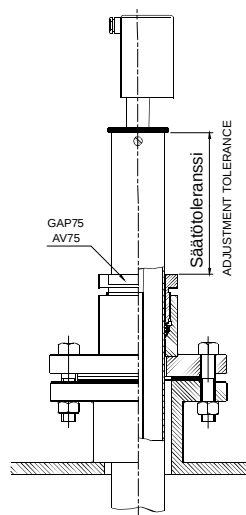


Type VVH

Instead of the flange threaded sleeve can also be used.  
Flange and threaded sleeve is possible to have also in VVF type. See the threads in selection chart.  
In VVF type the place of the flange/ threaded sleeve can be changed by the customer.



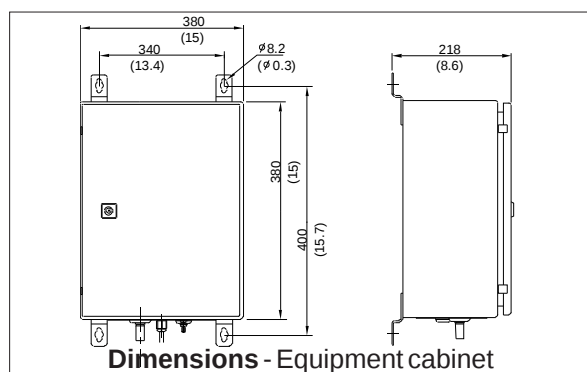
Remote electronics, connecting cable with protection hose, code L (for transmitter types VVP and VVH)



Flange mounting with adjustment facility, type VVP

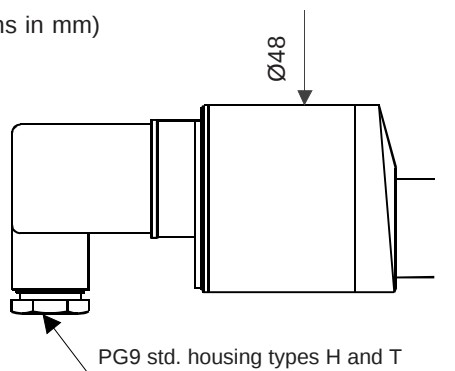
| Type | P/m  |      | E/m  |      |
|------|------|------|------|------|
|      | min. | max. | min. | max. |
| VVF  | 1.0  | 20.0 | -    | -    |
| VVP  | -    | -    | 1.0  | 5.5  |
| VVH  | -    | -    | 1.0  | 5.5  |

| Flange      | Code | ØD  | Ød    | Øc   | b  |
|-------------|------|-----|-------|------|----|
| DN50 PN40   | DB   | 165 | 125   | 4x18 | 20 |
| DN80 PN40   | DC   | 200 | 160   | 8x18 | 24 |
| ANSI2"150lb | AC   | 152 | 120.6 | 4x20 | 23 |
| ANSI2"300lb | AD   | 165 | 127   | 8x20 | 25 |
| ANSI3"150lb | AE   | 191 | 152.4 | 4x20 | 26 |
| ANSI3"300lb | AF   | 210 | 168.3 | 8x23 | 31 |

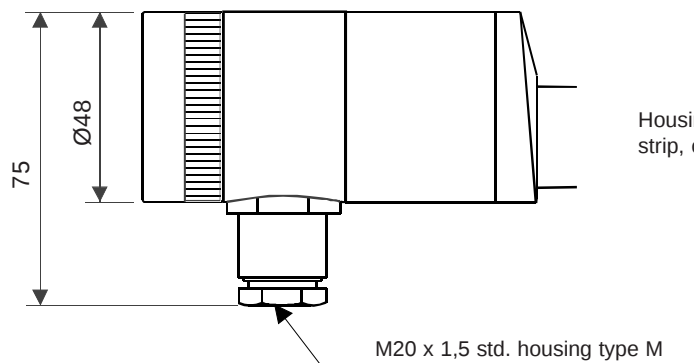


Dimensions - Equipment cabinet

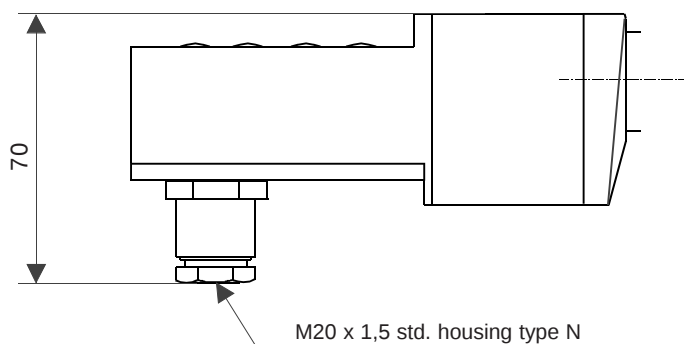
**Dimensional drawings** (dimensions in mm)



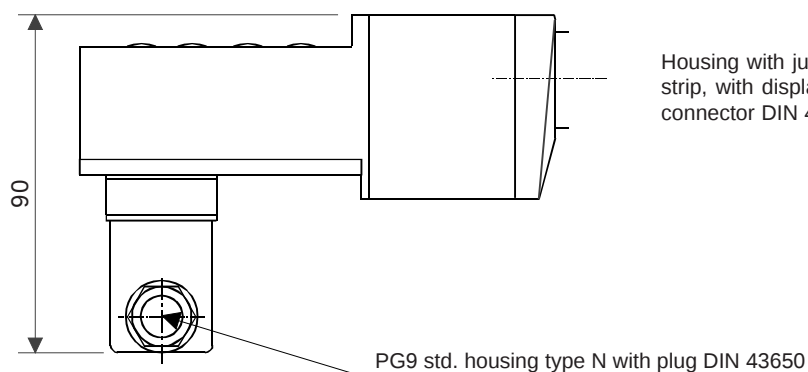
Housing with plug-connector, DIN 43650, codes H and T



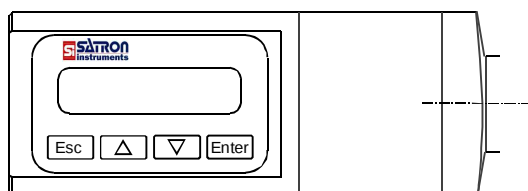
Housing with junction box/terminal strip, code M



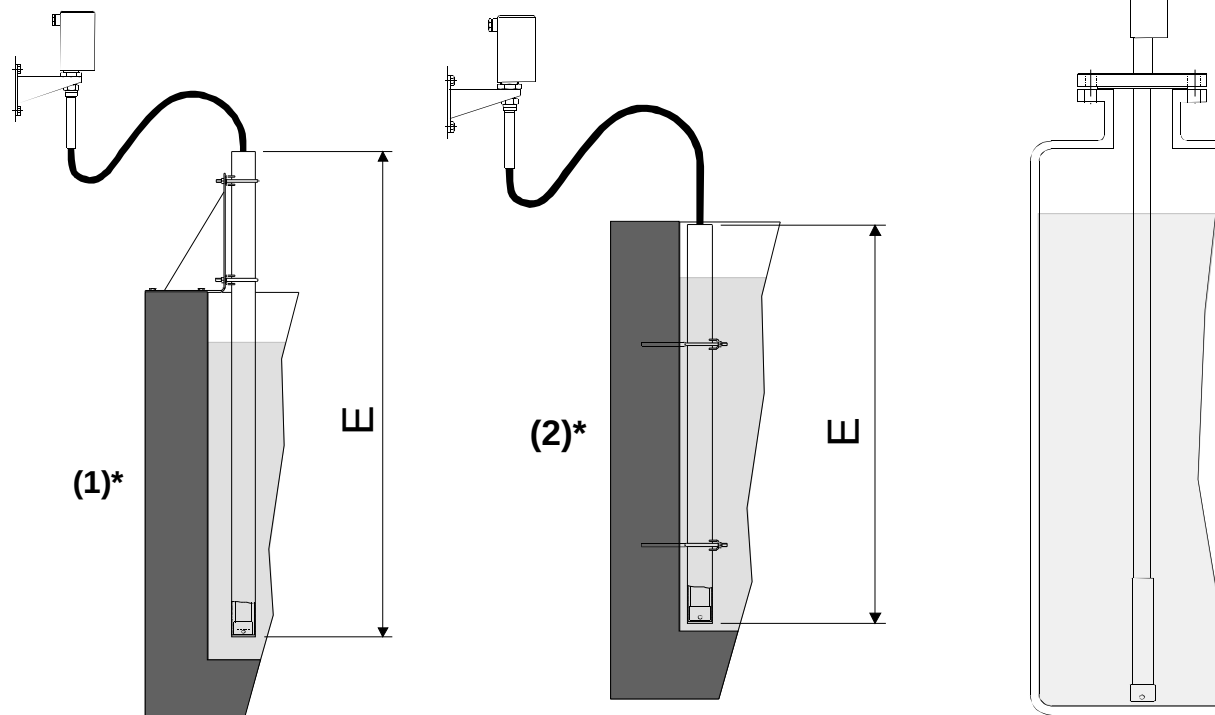
Housing with junction box/terminal strip, with display, code N



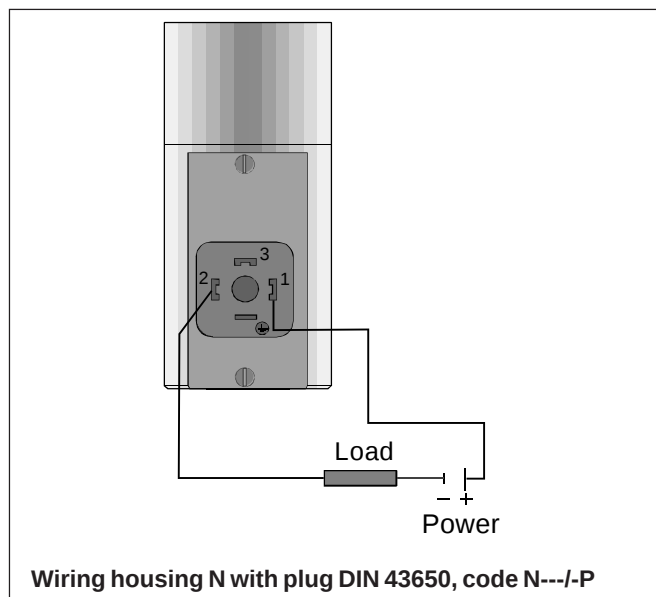
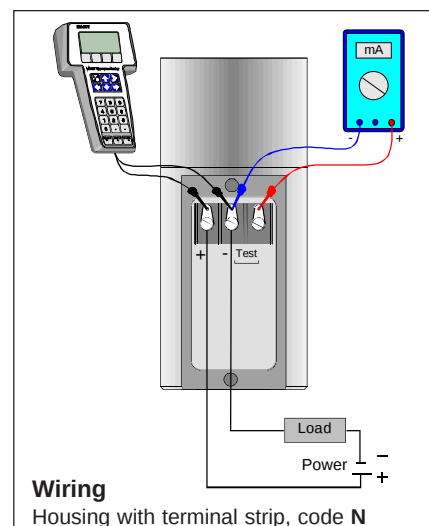
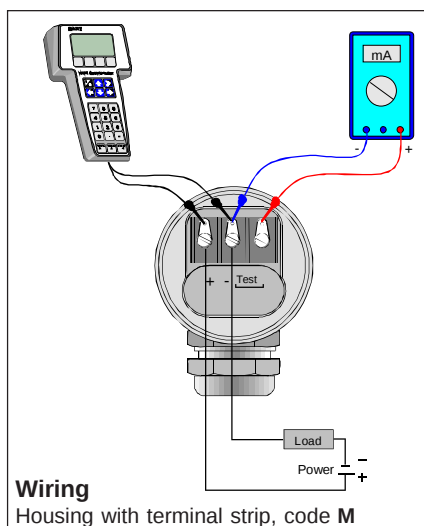
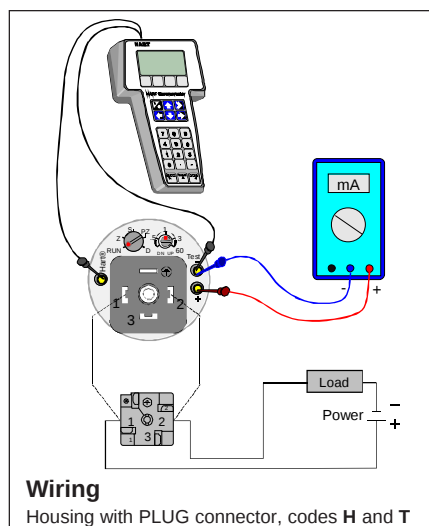
Housing with junction box/terminal strip, with display and plug-connector DIN 43650, code N--- /-P



## Installation methods



\*) See the selection table "Other mounting accessories"



## Selection Chart

|                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |                                              |                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------------------------------------------------|
| <b>Transmitter types</b>                                                                                                                                                                                                                                                                 |                                                                                                                                                                      |                                              |                                                  |
| VVF                                                                                                                                                                                                                                                                                      | Flexible PTFE hose (PTFE/AISI316 braiding)                                                                                                                           |                                              |                                                  |
| VVP                                                                                                                                                                                                                                                                                      | PVC hose/Flange                                                                                                                                                      |                                              |                                                  |
| VVH                                                                                                                                                                                                                                                                                      | AISI316L hose/Flange (Fixed mounting tube)                                                                                                                           |                                              |                                                  |
| <b>Adjustability</b>                                                                                                                                                                                                                                                                     | <b>Span, min.</b>                                                                                                                                                    | <b>Span, max.</b>                            | <b>Measuring range</b>                           |
| 3                                                                                                                                                                                                                                                                                        | 1.4kPa (14 mbar)                                                                                                                                                     | 35 kPa (350 mbar)                            | -35...+35 kPa (-350...350 mbar)                  |
| 4                                                                                                                                                                                                                                                                                        | 4kPa (40 mbar)                                                                                                                                                       | 100 kPa (1000 mbar)                          | -100...+100 kPa (-1000...1000 mbar)              |
| 5                                                                                                                                                                                                                                                                                        | 10 kPa (100 mbar)                                                                                                                                                    | 500 kPa (5000 mbar)                          | -100...+500 kPa (-1000...5000 mbar)              |
| <b>Output</b>                                                                                                                                                                                                                                                                            | S 4-20mA DC/HART® -protocol                                                                                                                                          |                                              |                                                  |
| <b>Flange or thread</b>                                                                                                                                                                                                                                                                  | 0 no flange or thread<br>AD ANSI 2" 300 lbs<br>GB G2A                                                                                                                | DB DN50 PN40<br>AE ANSI 3" 150 lbs<br>GC G1A | DC DN80 PN40<br>AF ANSI 3" 300lbs<br>NA 1½ - NPT |
|                                                                                                                                                                                                                                                                                          | AC ANSI 2" 150lbs<br>GA G1½A<br>NB 2 - NPT                                                                                                                           |                                              |                                                  |
| <b>Wetted materials</b>                                                                                                                                                                                                                                                                  | <b>Flange</b>                                                                                                                                                        | <b>Diaphragm</b>                             | <b>Extension</b>                                 |
| Code                                                                                                                                                                                                                                                                                     | Material                                                                                                                                                             | Code                                         | Material                                         |
| 2                                                                                                                                                                                                                                                                                        | AISI316L                                                                                                                                                             | 2                                            | AISI316L/317L                                    |
| 3                                                                                                                                                                                                                                                                                        | Hast.C 276                                                                                                                                                           | 3                                            | Hast.C 276 (*)                                   |
|                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      | 5                                            | Tantalum (*)                                     |
|                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |                                              | (type VVF=PTFE/AISI316)                          |
|                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |                                              | (type VVP=PVC)                                   |
|                                                                                                                                                                                                                                                                                          |                                                                                                                                                                      |                                              | (type VVH=AISI316)                               |
| <b>Fill fluid</b>                                                                                                                                                                                                                                                                        | S Silicone oil G Inert oil                                                                                                                                           |                                              |                                                  |
| <b>Housing type</b>                                                                                                                                                                                                                                                                      |                                                                                                                                                                      |                                              |                                                  |
| H Housing with PLUG-connector, DIN43650, no display, inlet PG9                                                                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| T Housing with PLUG-connector with manual adjust, DIN43650, no display, inlet PG9, (no ATEX)                                                                                                                                                                                             |                                                                                                                                                                      |                                              |                                                  |
| M Housing with junction box/terminal strip, no display, inlet M20x1,5                                                                                                                                                                                                                    |                                                                                                                                                                      |                                              |                                                  |
| N Housing with junction box/terminal strip, with display, inlet M20x1,5                                                                                                                                                                                                                  |                                                                                                                                                                      |                                              |                                                  |
| C Transmitter with equipment cabinet (for transmitter type VVF and for special electronics)                                                                                                                                                                                              |                                                                                                                                                                      |                                              |                                                  |
| D Transmitter with equipment cabinet + heating element (for type VVF and for special electronics)                                                                                                                                                                                        |                                                                                                                                                                      |                                              |                                                  |
| <b>Explosion proof</b>                                                                                                                                                                                                                                                                   | 0 No explosion proof classification 1 Atex Intrinsic Safety,  II 1 GD T135°C (**) |                                              |                                                  |
| <b>Length P of PTFE/AISI316 hose between sensing element and housing</b><br>(specify for transmitter type VVF)                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| P10 1.0 m hose                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| P25 2.5 m hose                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| ... P200 20.0 m hose                                                                                                                                                                                                                                                                     |                                                                                                                                                                      |                                              |                                                  |
| <b>Length E of mounting/protective tube</b> (specify for transmitter type VVP and VVH<br>also with the type VVF if the protective tube is used)                                                                                                                                          |                                                                                                                                                                      |                                              |                                                  |
| E10 1.0 m hose                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| E15 1.5 m hose                                                                                                                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| ... E55 5.5 m hose                                                                                                                                                                                                                                                                       |                                                                                                                                                                      |                                              |                                                  |
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| <b>Other mounting accessories</b>                                                                                                                                                                                                                                                        | 0 No mounting accessories<br>1 Mounting bracket/Clamps/Protective tube<br>2 Clamps/Protective tube                                                                   |                                              |                                                  |
| <b>Special size of electrical inlet</b>                                                                                                                                                                                                                                                  |                                                                                                                                                                      |                                              |                                                  |
| N 1/2NPT                                                                                                                                                                                                                                                                                 | G Pg13.5                                                                                                                                                             | P Plug DIN 43650                             |                                                  |
| <b>Special features</b>                                                                                                                                                                                                                                                                  |                                                                                                                                                                      |                                              |                                                  |
| <b>Special electronics</b> (specify only if housing connected with hose to sensing element)<br>for transmitter types VVP and VVH                                                                                                                                                         |                                                                                                                                                                      |                                              |                                                  |
| - connecting cable with protection hose                                                                                                                                                                                                                                                  |                                                                                                                                                                      |                                              |                                                  |
| L Hose protected with PTFE/AISI316 braiding, straight                                                                                                                                                                                                                                    |                                                                                                                                                                      |                                              |                                                  |
| K Hose protected with PTFE/AISI316 braiding, angle of 90°                                                                                                                                                                                                                                |                                                                                                                                                                      |                                              |                                                  |
| <b>Length of cable between sensing element and housing</b><br>(specify only if housing connected with cable to sensing element)                                                                                                                                                          |                                                                                                                                                                      |                                              |                                                  |
| 2 2 m cable 3 3 m cable etc. (max. 10 m)                                                                                                                                                                                                                                                 |                                                                                                                                                                      |                                              |                                                  |
| <b>Mounting parts for remote electronics for Ø51 mm tube</b>                                                                                                                                                                                                                             |                                                                                                                                                                      |                                              |                                                  |
| 0 No mounting parts 1 Mounting parts                                                                                                                                                                                                                                                     |                                                                                                                                                                      |                                              |                                                  |
| <b>Documentation</b>                                                                                                                                                                                                                                                                     |                                                                                                                                                                      |                                              |                                                  |
| <b>Calibration Certificate</b>                                                                                                                                                                                                                                                           |                                                                                                                                                                      | AE English                                   |                                                  |
| <b>Installation and Operating Instructions</b>                                                                                                                                                                                                                                           |                                                                                                                                                                      | IE English IF Finnish                        |                                                  |
| <b>Material Certificates</b>                                                                                                                                                                                                                                                             |                                                                                                                                                                      |                                              |                                                  |
| 0 No material certificate                                                                                                                                                                                                                                                                |                                                                                                                                                                      |                                              |                                                  |
| MC1 Raw materials certificate without appendices, in accordance with SFS-EN 10204-2.1 (DIN 50049-2.1) standard                                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |
| MC2 Raw materials certificate for wetted parts with appendices, in accordance with SFS-EN 10204-2.2 (DIN 50049-2.2) standard                                                                                                                                                             |                                                                                                                                                                      |                                              |                                                  |
| MC3 Raw materials certificate for wetted parts with appendices, in accordance with SFS-EN 10204-3.1B (DIN 50049-3.1B) standard                                                                                                                                                           |                                                                                                                                                                      |                                              |                                                  |

We reserve the right for technical modifications without prior notice.  
HART® is a registered trademark of HART Communication Foundation.  
Hastelloy® is the registered trademark of Haynes International.  
Teflon® is the registered trademark of E.I. du Pont de Nemours & Co.  
Viton® is the registered trademark of DuPont Dow Elastomers.



(\*) = not for range 3

(\*\*) = Housing H and N :  II 2 GD T135°C  
ATEX transmitters with display are the model without membrane key.