

## Installation and Setting-Up Instructions Spare Parts List



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### DOCUMENTS

Technical Specifications: BPdT750

Installation and Setting-Up Instructions: BPdT750AV

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Hastelloy® is the registered trademark of Haynes International.  
Teflon® is the registered trademark of E.I. du Pont de Nemours & Co



**Satron Instruments Inc.**

P.O.Box 22, FIN-33901 Tampere, Finland  
Tel.int. +358 207 464 800, Telefax +358 207 464 801  
www.satron.com, e-mail: info@satron.com

## 1 INSTALLATION

### 1.1 Mechanical installation

#### 1.1.1 Impulse piping

The process material and the transmitter's location with respect to the process pipe determine how the impulse piping will be installed (Fig. 1-1a).

For **liquid and steam** pressure measurements it is preferable to mount the transmitter below the orifice plate (Fig. 1-1a). This will prevent the formation of unwanted gas bubbles in the impulse piping.

In many cases accessibility determines the transmitter's location. As a result the transmitter cannot always be mounted at the best possible location in terms of measurement. For liquid and steam pressure measurements you may have to mount the transmitter above the process pipe, in which case it is recommendable to provide the pipeline with air locks (Fig. 1-1b).

Steam should not be admitted to the transmitter's sensing element. Condensate pots are not necessary since the volumetric displacement of the sensor is quite small.

For **gas** pressure measurements (Fig. 1-1c) the transmitter should be mounted above the process pipe. This will eliminate unwanted effects of condensate.

For measuring the pressure of **sedimenting liquids** and for density measurements we recommend the use of purge water when necessary. It can be connected in place of the vent valve on the transmitter's measuring chamber or to the impulse pipeline (Fig. 1-1e and 1-1g).

A transmitter with a hydraulic pressure seal can be used for **liquid level** and **density** measurements (Fig. 1-1d). The capillary tubes are connected to 1/4NPT threads or welded at the factory, depending on the type of the pressure seal.

Gas and any air dissolved in the fluid are evacuated from the seal fluid when filling the capillaries.

**Do not open the capillary connections when installing the transmitter!**

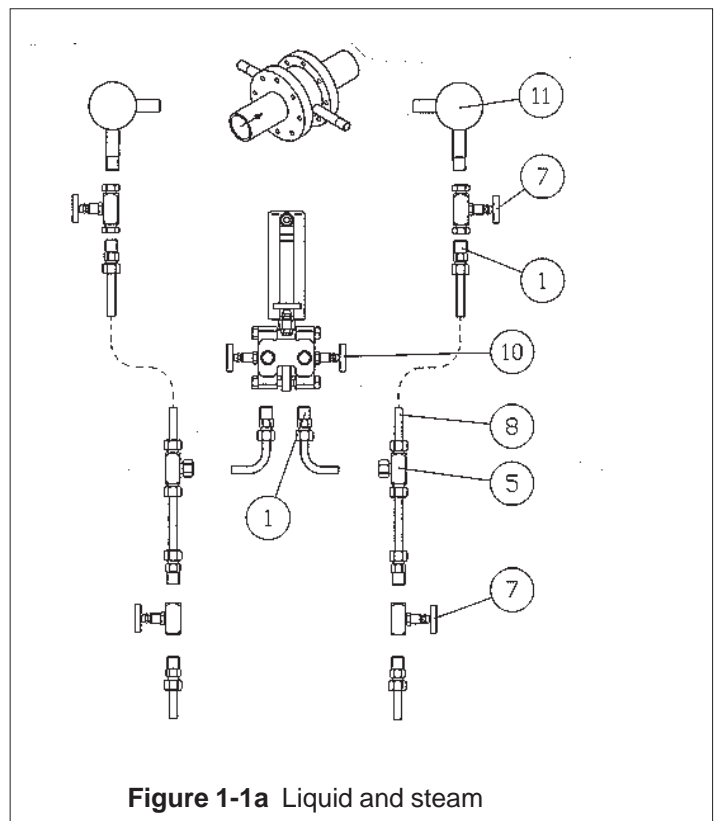
Any opened assemblies have to be sent to the manufacturer for refilling.

**Table for Figure 1-1, Pipe fittings**

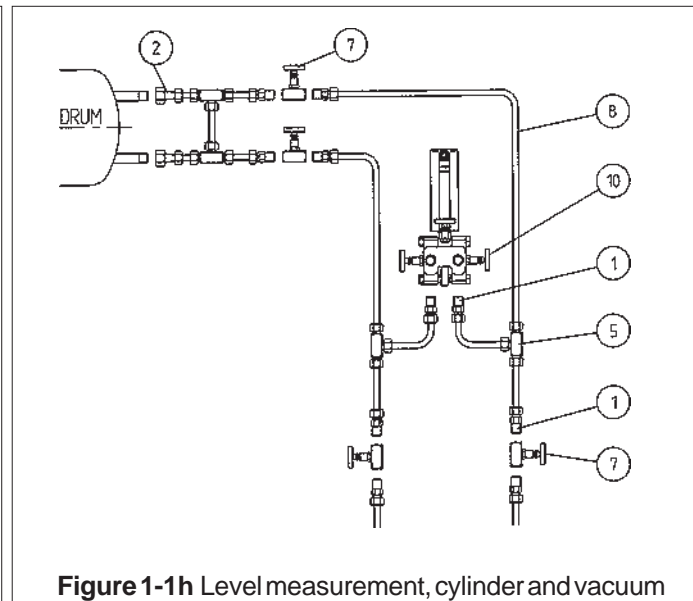
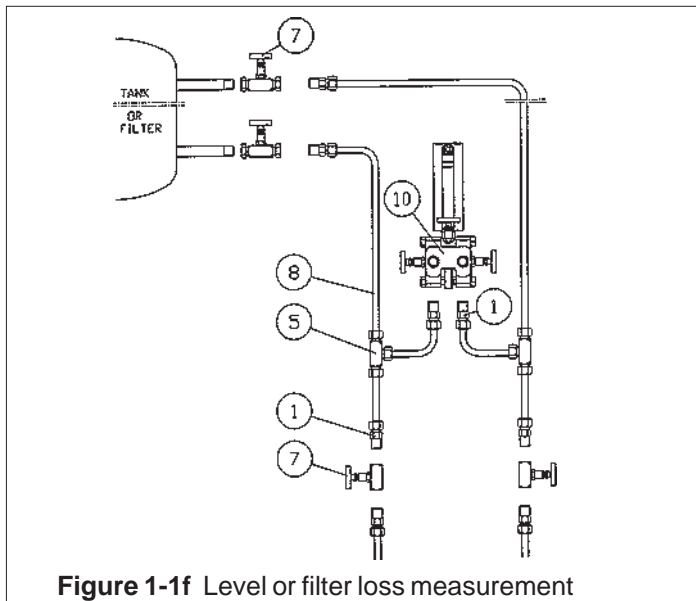
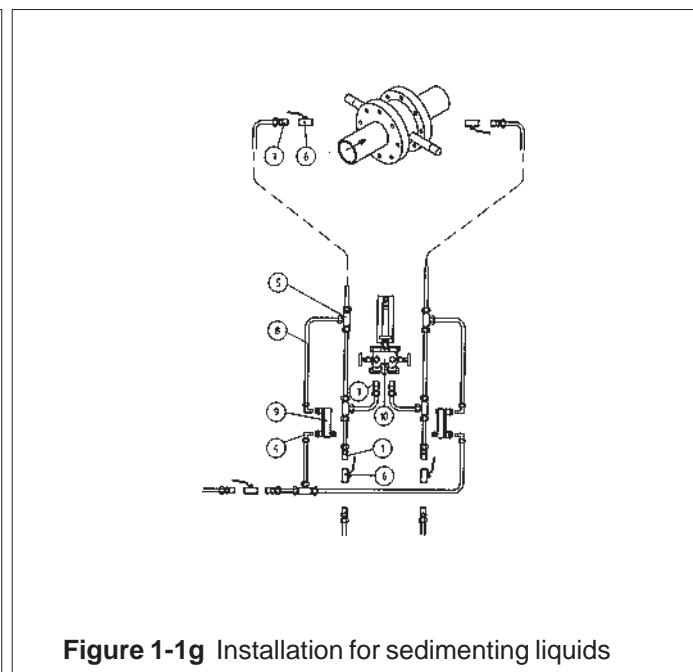
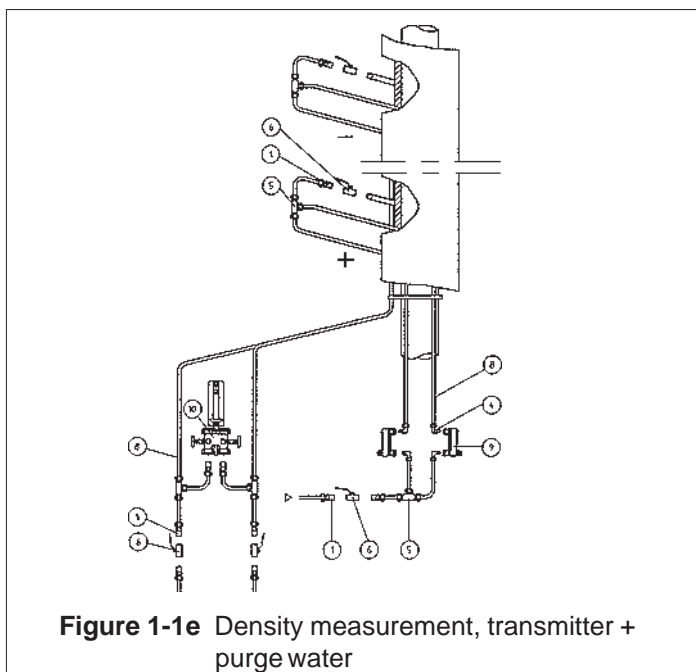
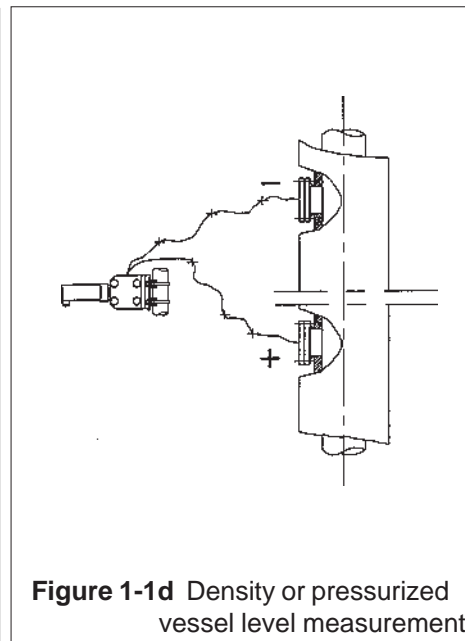
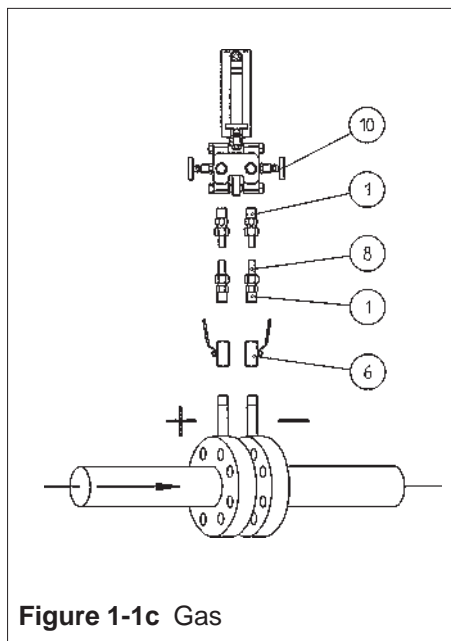
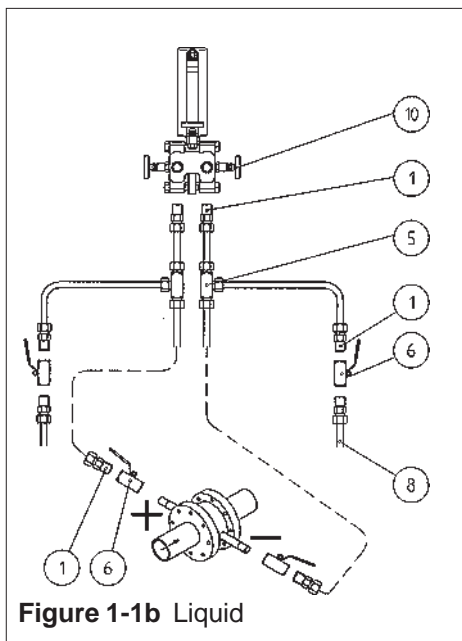
1. Stud coupling Ø12 mm / G1/2 male
2. Stud coupling Ø12 mm / G1/2 female
4. Elbow Ø12 mm / G1/4 male
5. T-fitting Ø12 mm
6. Ball valve G1/2
7. Needle valve G1/2
8. Pipe 12 x 1 calibrated
9. Needle valve rotameter
10. 3-stem mounting valve
11. Condensate pot

**NOTE!**

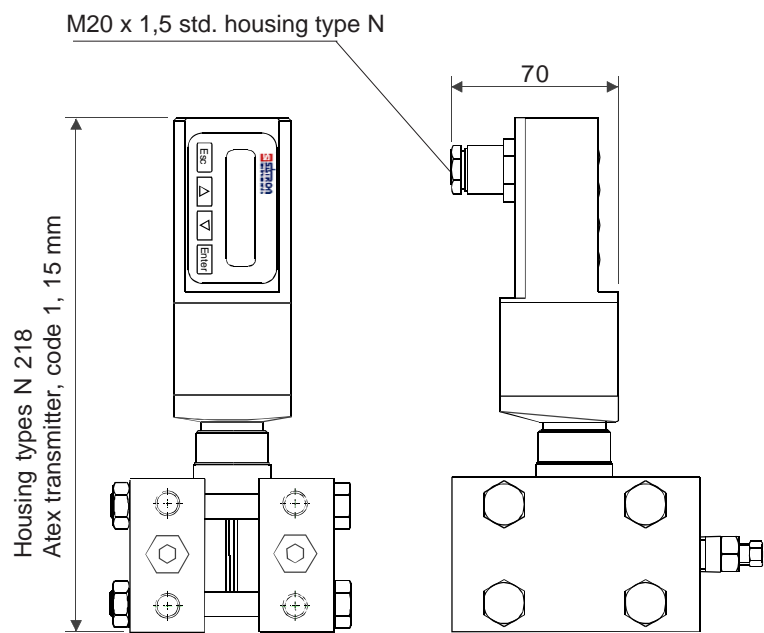
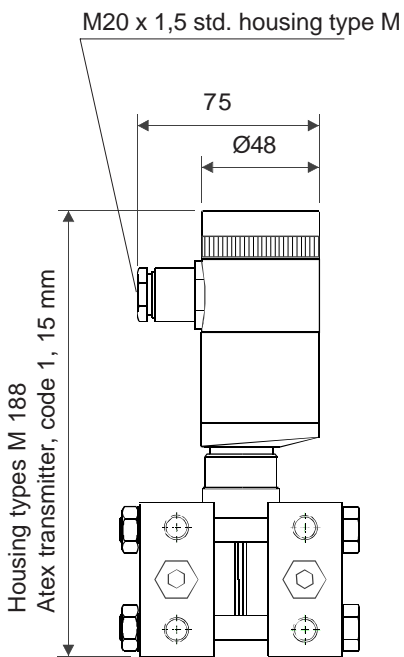
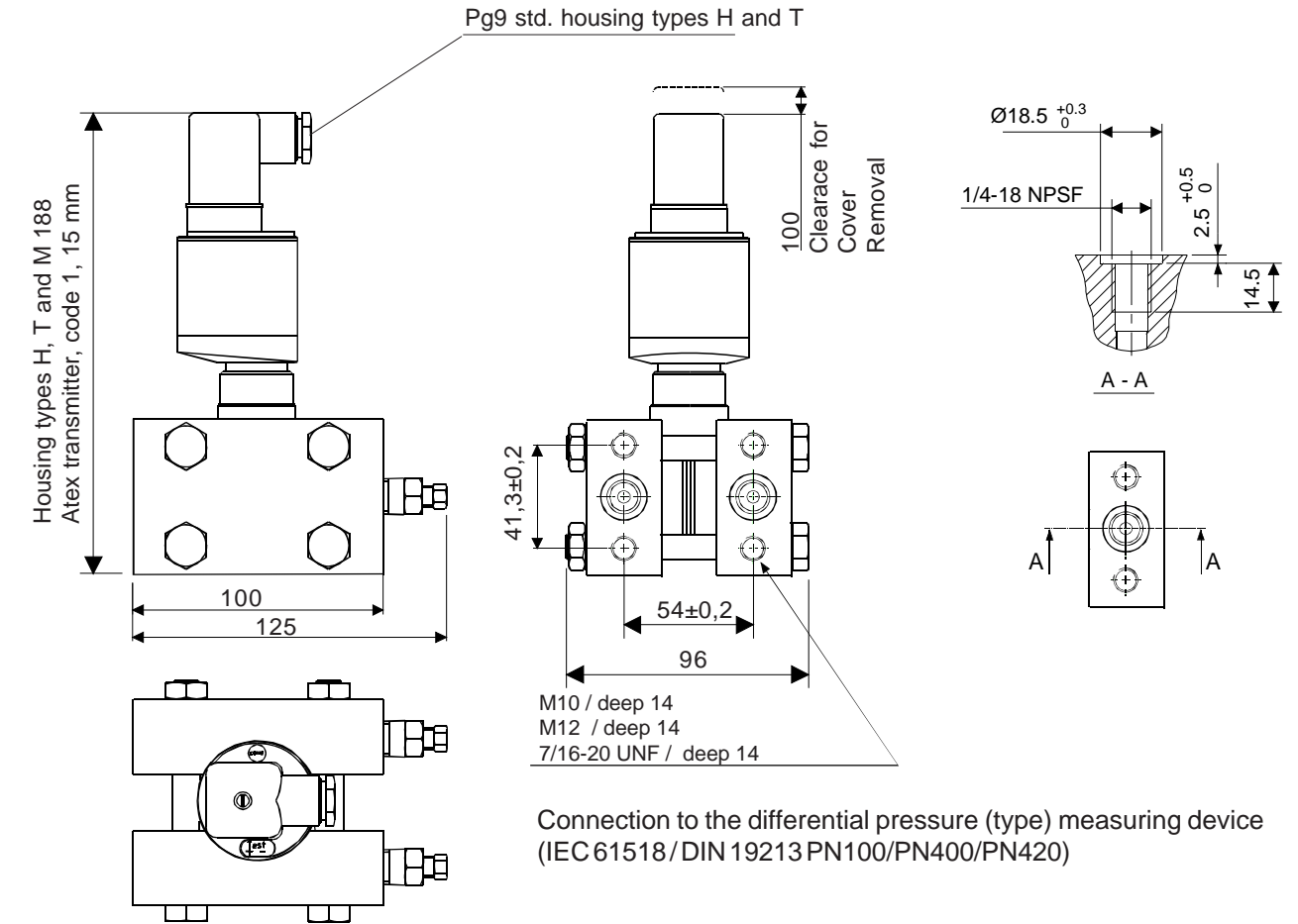
Materials, fittings and seals must be chosen to withstand the pressure and temperature conditions as well as corrosive and chemical effects prevailing at the operating site.



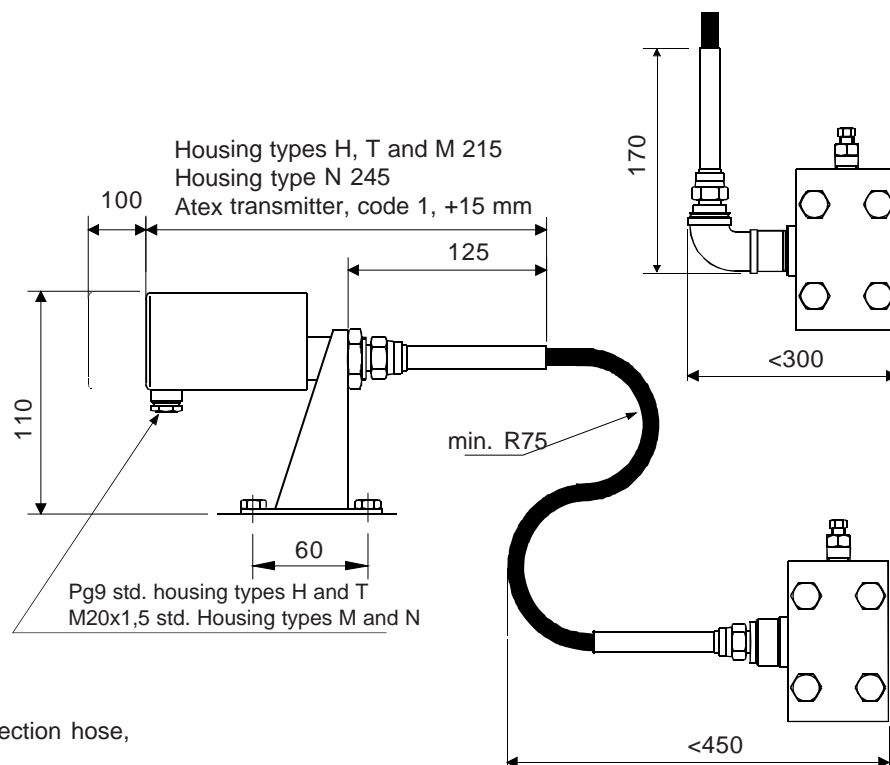
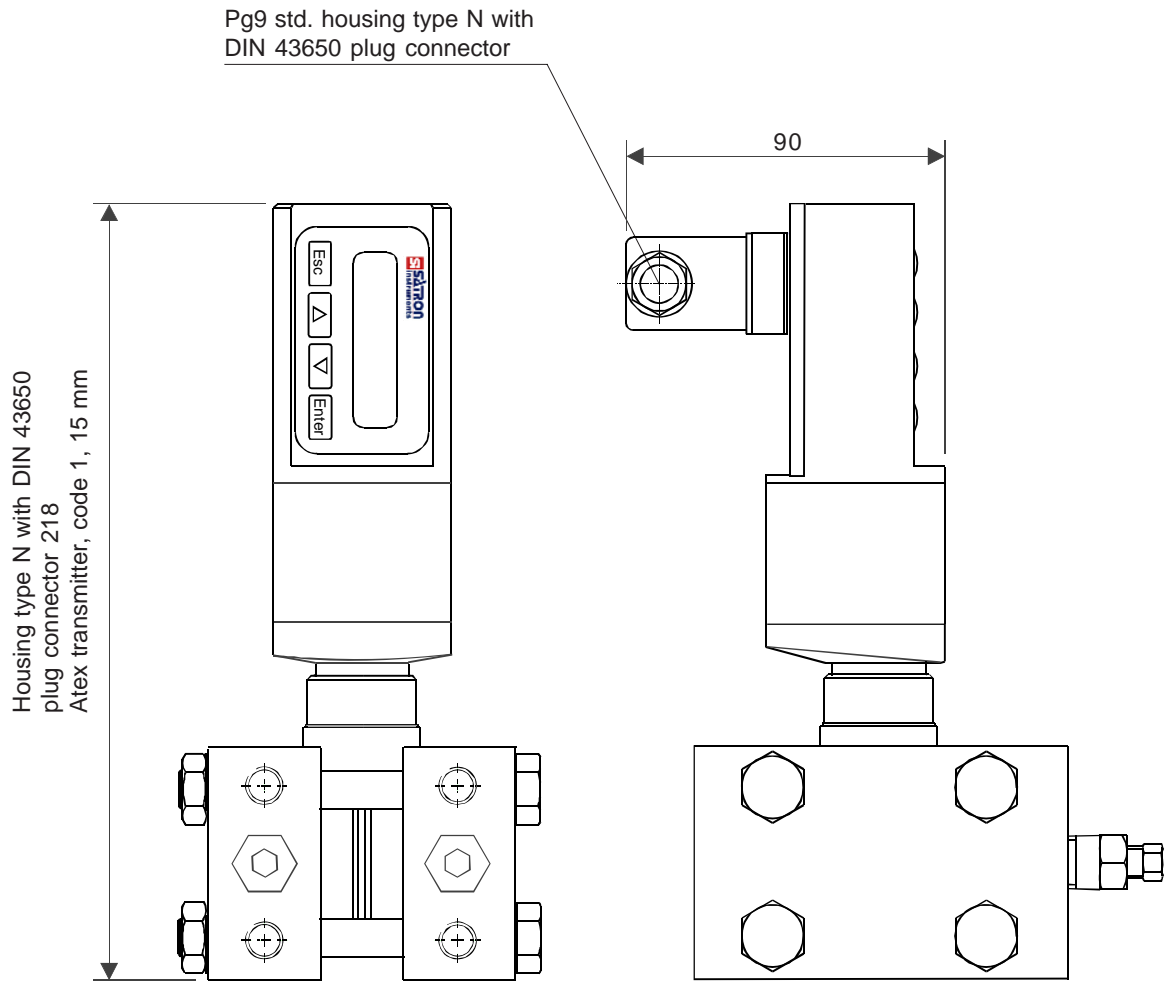
**Figure 1-1a** Liquid and steam



**Dimensions** (in mm)



**Dimensions** (in mm)



Remote electronics,  
connecting cable with protection hose,  
codes L and K

## 1.1.2 Recommended mounting positions

A differential pressure transmitter's operating environment is often quite demanding in terms of the measurement conditions. For example, the transmitter should be mounted so that the effects of temperature variations will be as small as possible. Different mechanical stresses, such as vibration, should also be avoided as far as possible.

Direct mounting on the pipe at the measuring point or wall mounting are the possible alternatives for gage pressure and absolute pressure measurement.

## 1.1.3 Mounting valves

A mounting valve can be used for mounting a differential pressure transmitter. The valve serves as both isolating valve and mounting base for the transmitter. This method simplifies the connection and disconnection of the transmitter to/from the process.

## 1.1.4 Mounting brackets

When using a separate isolating valve or flange adapters and two-way valves the transmitter is mounted with a bracket (Fig. 1-4a) on wall or support pipe.

The angle mounting bracket (Fig. 1-4b) provides the best position for venting and sediment removal. Process connections and vent valves are then at the top and bottom of the measuring chambers.

The transmitter body can be rotated on the flanges for the most suitable mounting position. The mounting position (horizontal/vertical) will have a slight effect on the zero point, depending on the transmitter's range. For this reason the zero setting should be checked after installation.

## 1.1.5 Hydraulic pressure seal

Hydraulic pressure seals are used in applications where the transmitter's wetted parts have to be isolated from the process medium. Such isolation may be necessitated by the process medium's corrosive properties, toxicity, high temperature, sedimentation, crystallization, etc.

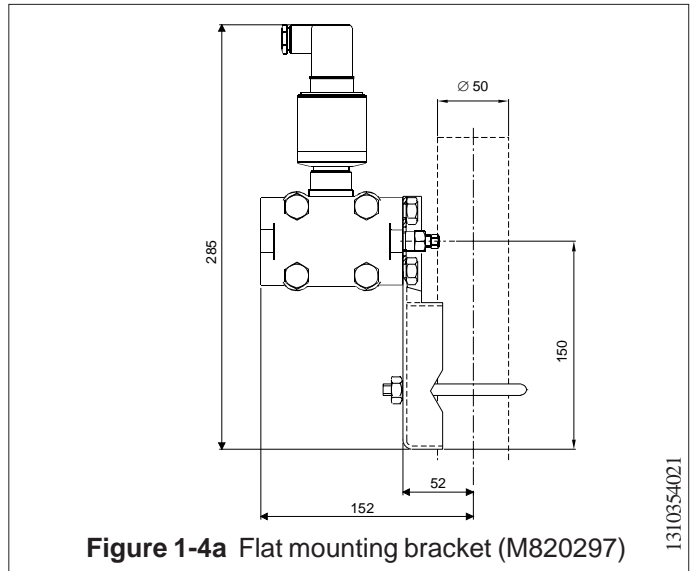


Figure 1-4a Flat mounting bracket (M820297)

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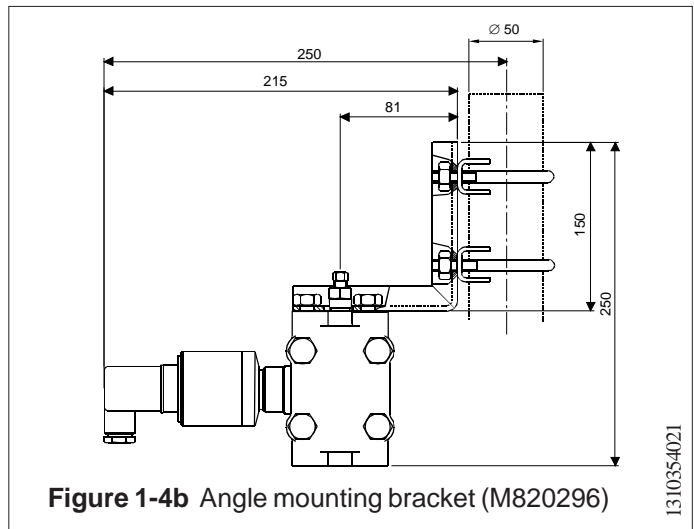


Figure 1-4b Angle mounting bracket (M820296)

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FLANGE	ØD	b
DN40 PN100	170	26
DN50 PN40	165	20
DN80 PN40	200	24
DN100 PN40	235	24
ANSI2" 150 lbs	152	23
ANSI2" 300 lbs	165	25
ANSI3" 150 lbs	191	26
ANSI3" 300 lbs	210	31
ANSI4" 150 lbs	229	26
ANSI4" 300 lbs	254	34

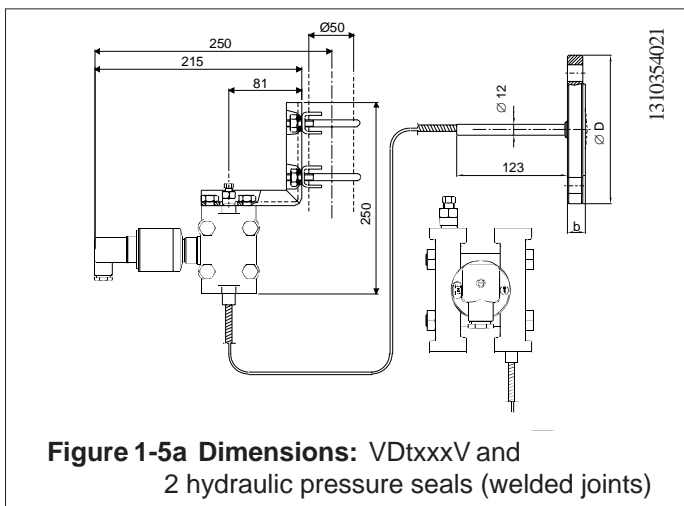


Figure 1-5a Dimensions: VDtxxxV and 2 hydraulic pressure seals (welded joints)

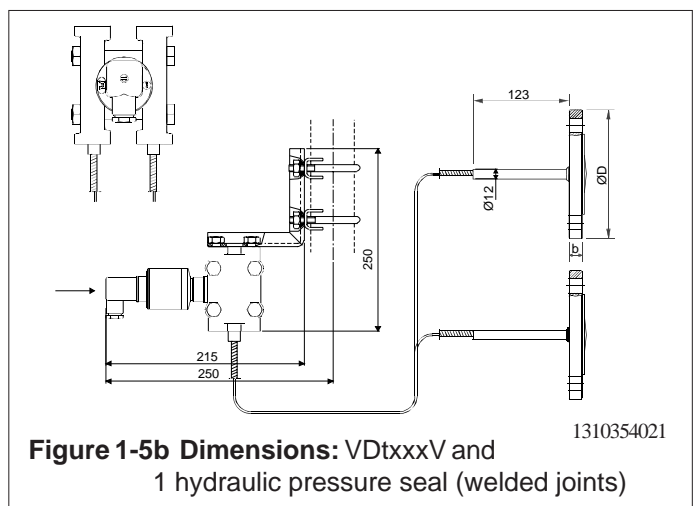


Figure 1-5b Dimensions: VDtxxxV and 1 hydraulic pressure seal (welded joints)

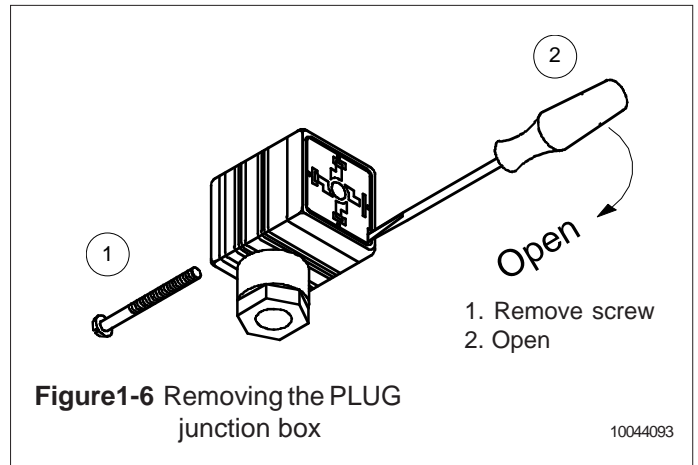
## 1.2 Electrical connections

Supply voltage and load of the transmitter according to the figure 1-7.

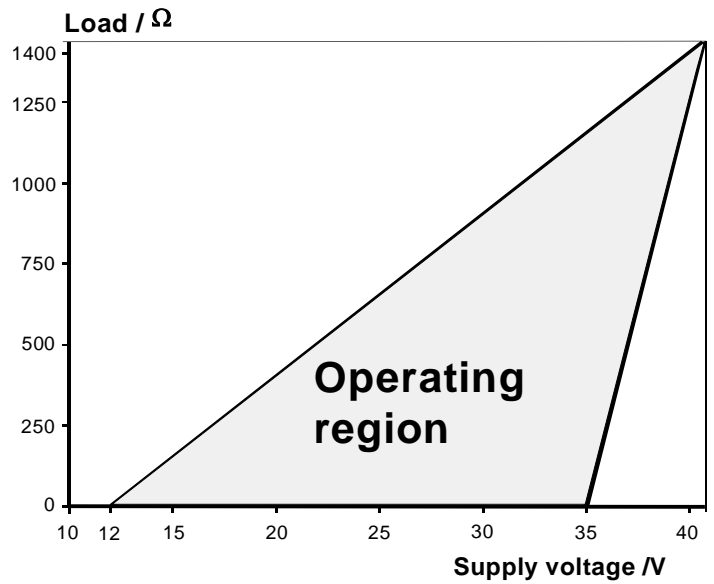
We recommend shielded twisted-pair cable as signal cable.

The signal cable should not be installed near high-voltage cables, large motors or frequency converters.

The shield of the cable is grounded at the power supply end or according to the recommendations of the manufacturer of the used control system.



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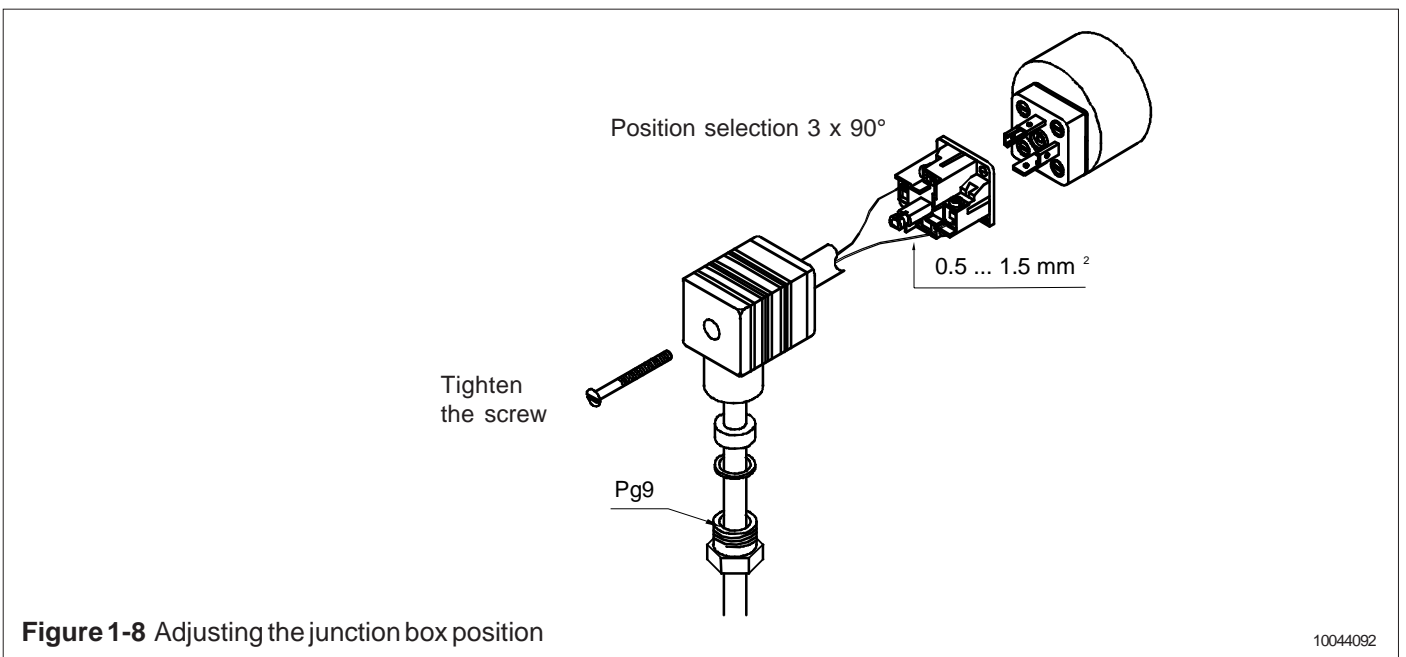
Min. load using HART® - communication 250 Ω

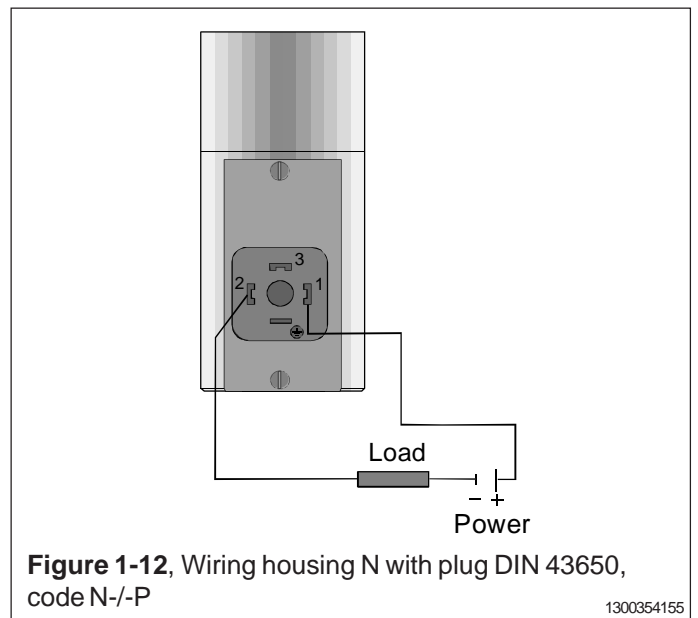
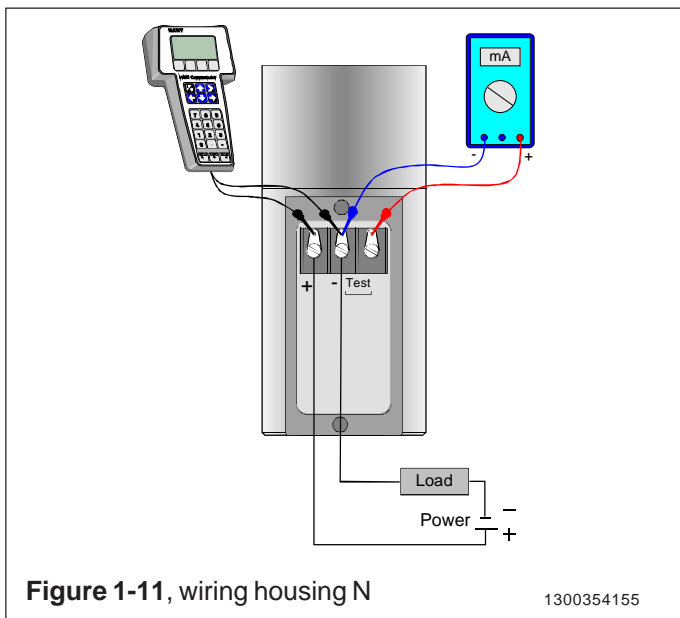
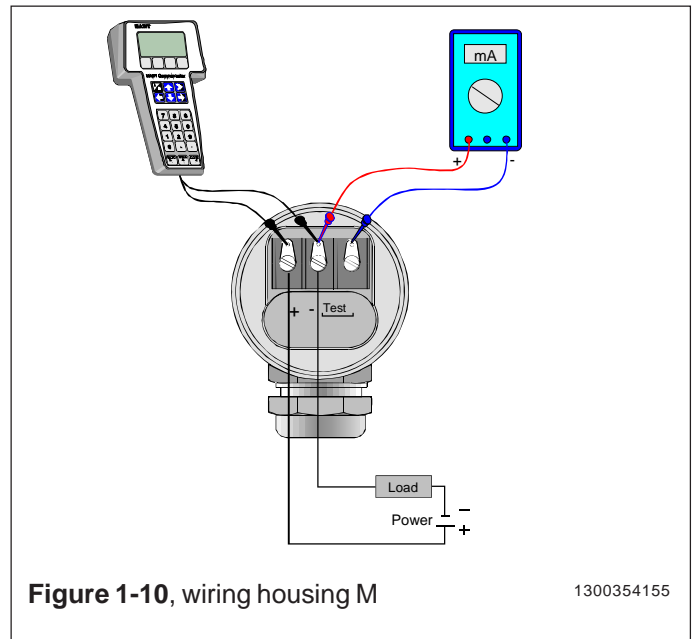
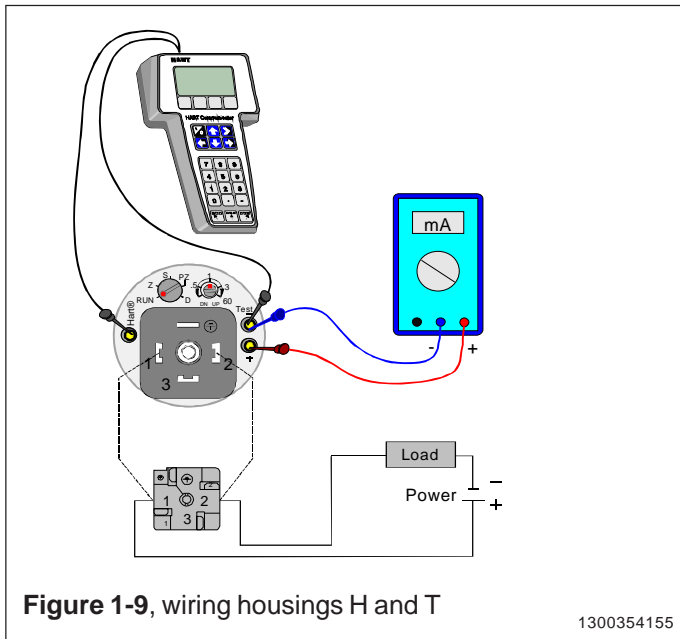
$$R_{\max} = \frac{\text{Supply voltage} - 12 \text{ V}}{I_{\max}}$$

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

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

**Figure 1-7** Supply voltage and load capacity





## 2 SETTING UP

Setting up is dependent on type of user interface and loaded description **VALMET** or **SATRON**.

Also must be noted that when the older **VALMET** description is in use then the transmitter must be configured so that it can operate with the old **VALMET** description.

The change from description to another is made by writing to **MESSAGE**-field either. **VALMET** or **SATRON** (Note, capital letters and dot in front).

After writing the message the new description will be activated by switching transmitter's power **OFF** and **ON** again.



## 2 SETTING UP

### 2.1 Using the 275 user interface

#### Operation keys

The six operation keys are located above the alphanumeric keyboard:

The ON/OFF key (**I/O**) switches the user interface on and off. When you switch the user interface on, it starts looking for a HART® transmitter connected to it. If the transmitter is not found, the message **“No Device Found. Press OK”** will be displayed.

The **ONLINE** menu is displayed when the user interface finds the transmitter.

(**^**) This key allows you to move upwards in menus and scroll lists forwards.

(**v**) This key allows you to move downwards in menus and scroll lists backwards.

(**<**) This two-function key allows you to move the cursor to the left and to go back to a previous menu.

(**>**) This two-function key allows you to move the cursor to the right and to select a menu option.

(**>>>**) The quick-selection key will start the user interface and display the quick-selection menu. You can define the desired menu as quick-selection menu.

#### Function keys

With function keys F1, F2, F3 and F4 you can perform the program functions displayed above each function key. When you move in the software menus, the functions of these keys will change in accordance with the currently selected menu.

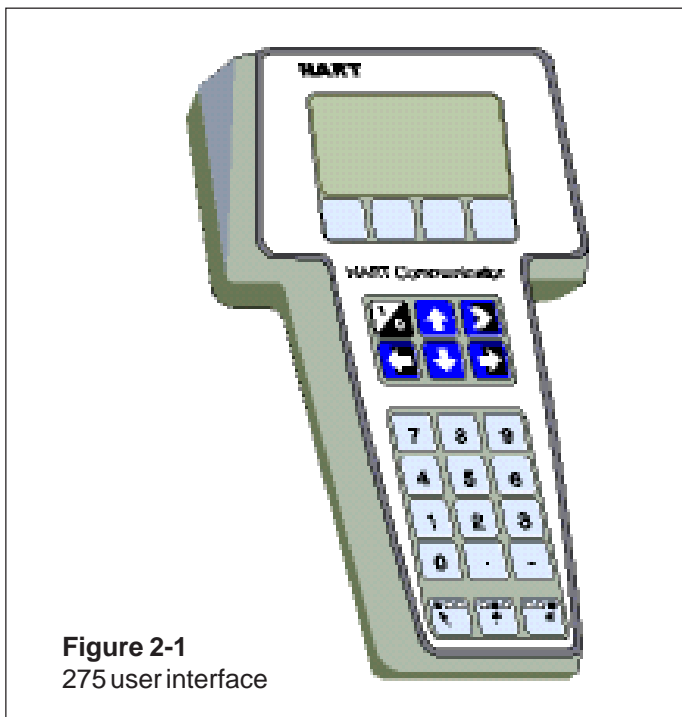


Figure 2-1  
275 user interface

### 2.2 Setting up through HART® 275 user interface

After installing and connecting the transmitter, connect the user interface to the transmitter. The following menu is displayed:

- 1 Measurement
- 2 Configuration
- 3 Information
- 4 Diagnostics

To change the measuring range, unit damping time constant to output mode (linear/square-root), select **Configuration**.

The following menu is then displayed:

- 1 Range values
- 2 Detailed config

To change the measuring range, select **Range values**.

The selection displays the following menu:

- 1 LRV (lower range value)
- 2 URV (upper range value)
- 3 LSL (lower sensor limit)
- 4 USL (upper sensor limit)
- 5 Min span (minimum span)
- 6 Apply values

To change the measurement unit, damping time constant or output mode, select **Detailed config** from the **Configuration** menu.

The selection displays the following menu:

- 1 Damping
- 2 Pres. unit
- 3 Tempr. unit
- 4 Alarm current
- 5 Write protect
- 6 Lin. func
- 7 Diff EI status
- 8 Burst mode
- 9 Burst option
- Poll addr
- Tag
- User function
- User funct. setup

After these activities or if the transmitter is supplied with the ready configuration you must correct a zero error of the transmitter in a final installation position.

Press **Diagnostics** and **PV Zero calibr.**

The selection displays the following menu: **Give correct value for Zero pressure in ...**

The current zero point will be shown in display and the final zero error correction can be done.

## 2.3 Using the 375 user interface



Figure 2-2  
375 user interface

The following menu is then displayed:

- 1 **Measurement**
- 2 **Configuration**
- 3 **Information**
- 4 **Diagnostics**
- 5 **Review**

To change the measurement unit, damping time constant or output mod, select **Configuration**.

The following menu is then displayed:

- 1 **Range values**
- 2 **Output**
- 3 **Transfer function**
- 4 **General setup**

To change the measurement unit, select **Range values**.

The following menu is then displayed:

- 1 **LRV**
- 2 **URV**
- 3 **LSL**
- 4 **USL**
- 5 **Min span**
- 6 **Apply values**

To change the damping time constant, select **Output** from the **Configuration** menu.

The following menu is then displayed:

- 1 **Damping**
- 2 **Alarm current**

To change the output mode, select **Transfer function** from the **Configuration** menu.

The following menu is then displayed:

- 1 **Lin. func**
- 2 **User function data**

After these activities or if the transmitter is supplied with the ready configuration you must correct a zero error of the transmitter in a final installation position.

The First press **Diagnostics** and then **Sensor trim** and then **Zero trim**

The following text is then displayed : *WARN-Loop be removed from automatic control*

The final zero error correction can be done to select **ABORT** or **OK** on the display .

## 2.4 Setting up through HART® 375 user interface and SATRON description

After installing and connecting the transmitter, connect the user interface to the transmitter. The following menu is displayed: **Main menu**. To select the **HART Application**.

## 2.5 Setting-up with Satron-pAdvisor Service Software

When you will have available all the operations of the Smart transmitter, we recommend the use of Satron-pAdvisor Service Software and Satron SI-Tool<sub>e</sub> USB-Hart-modem in setting-up.

**Test connections for configuration and pressure/ output current values checking and calibration and for SENSOR TRIM function**

### Recommended equipment for calibration

Satron-pAdvisor service software for SATRON Smart transmitter (can be loaded free of charge from [www.satron.com](http://www.satron.com))

PC: operating system Win-98, Windows 2000 or Windows XP)

DMM: Digital multimeter, basic DCV accuracy better than 0,01 % of reading (for example Fluke 8840A, Keithley 2000)

Cal. pressure generation and measurement device (accuracy better than 0,03 % of reading)

USB-Hart modem, Satron SI Tool<sub>e</sub>, order no: **M1330001**

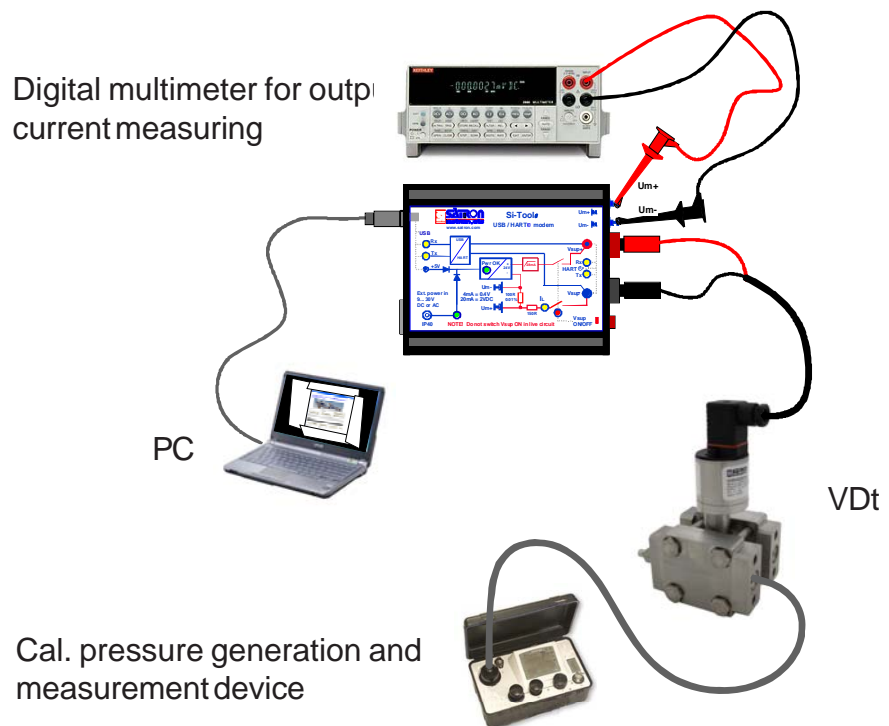


Figure 2-3 Calibration connections window

## 2.6 Setting-up with local switches

The additional instruction of display menus is enclosed to this manual.



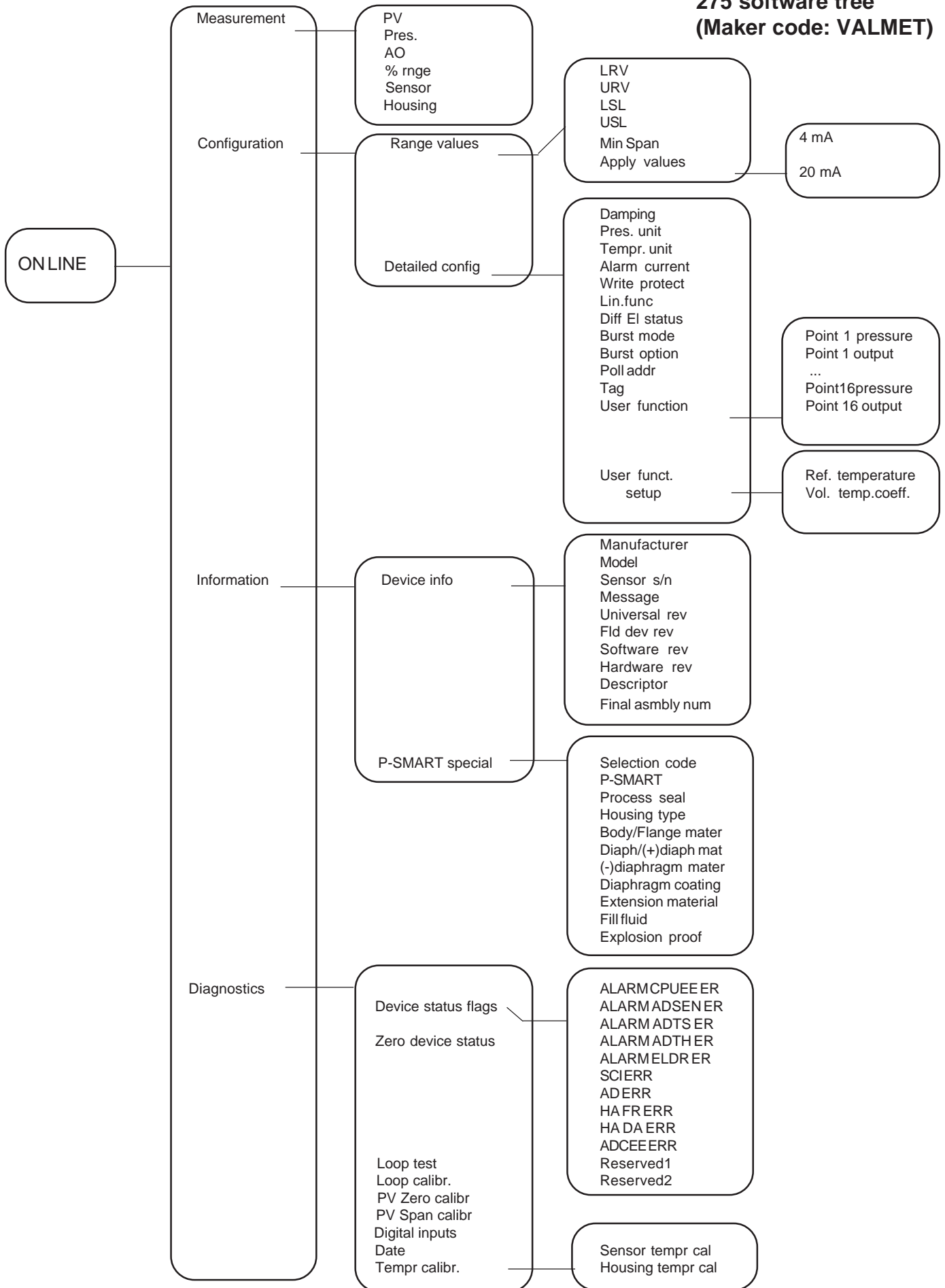
Keyboard :

- Esc = Press **Esc** 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.

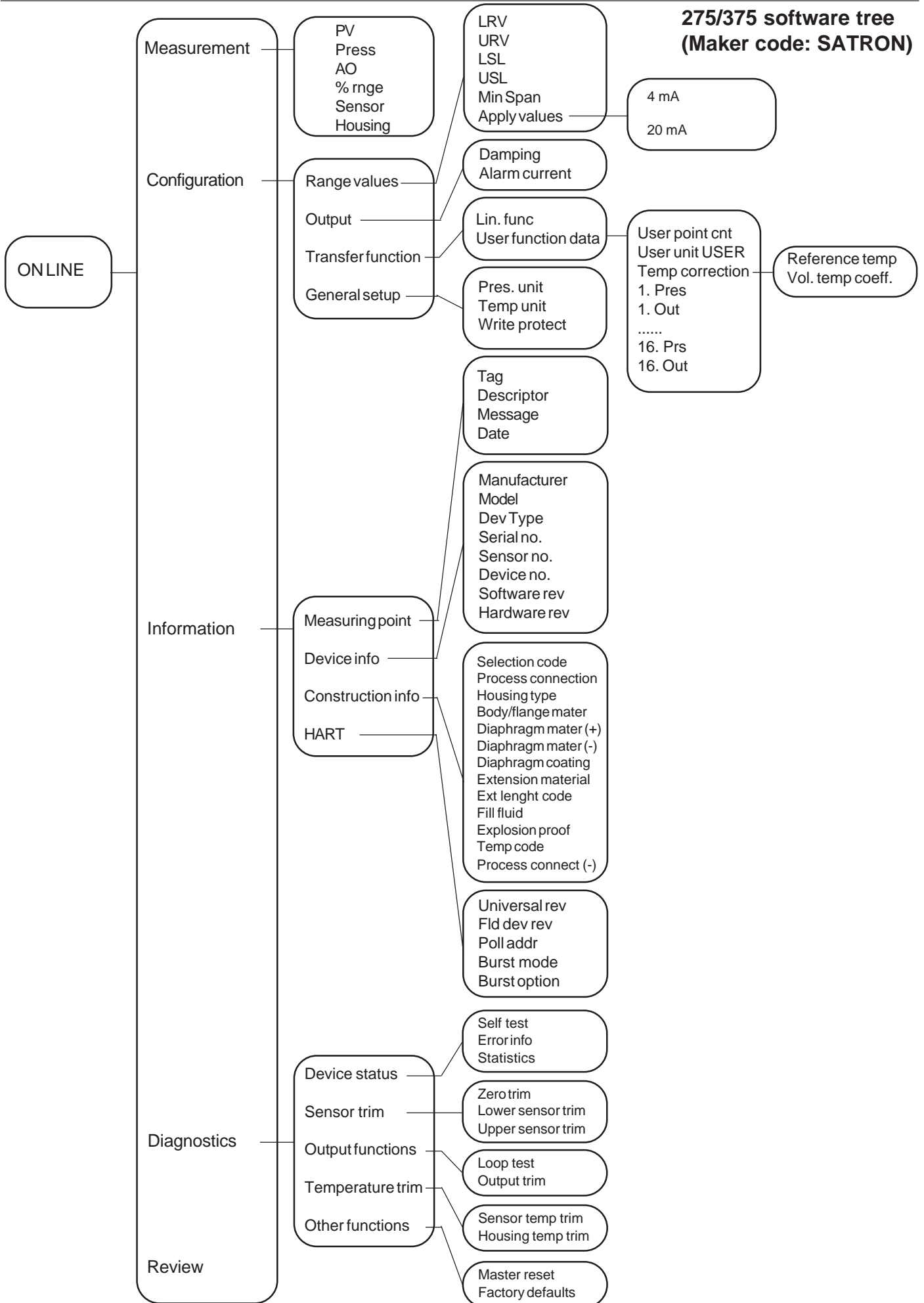
Figure 2-4 VDt differential pressure transmitter with display

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## 275 software tree (Maker code: VALMET)



## 275/375 software tree (Maker code: SATRON)



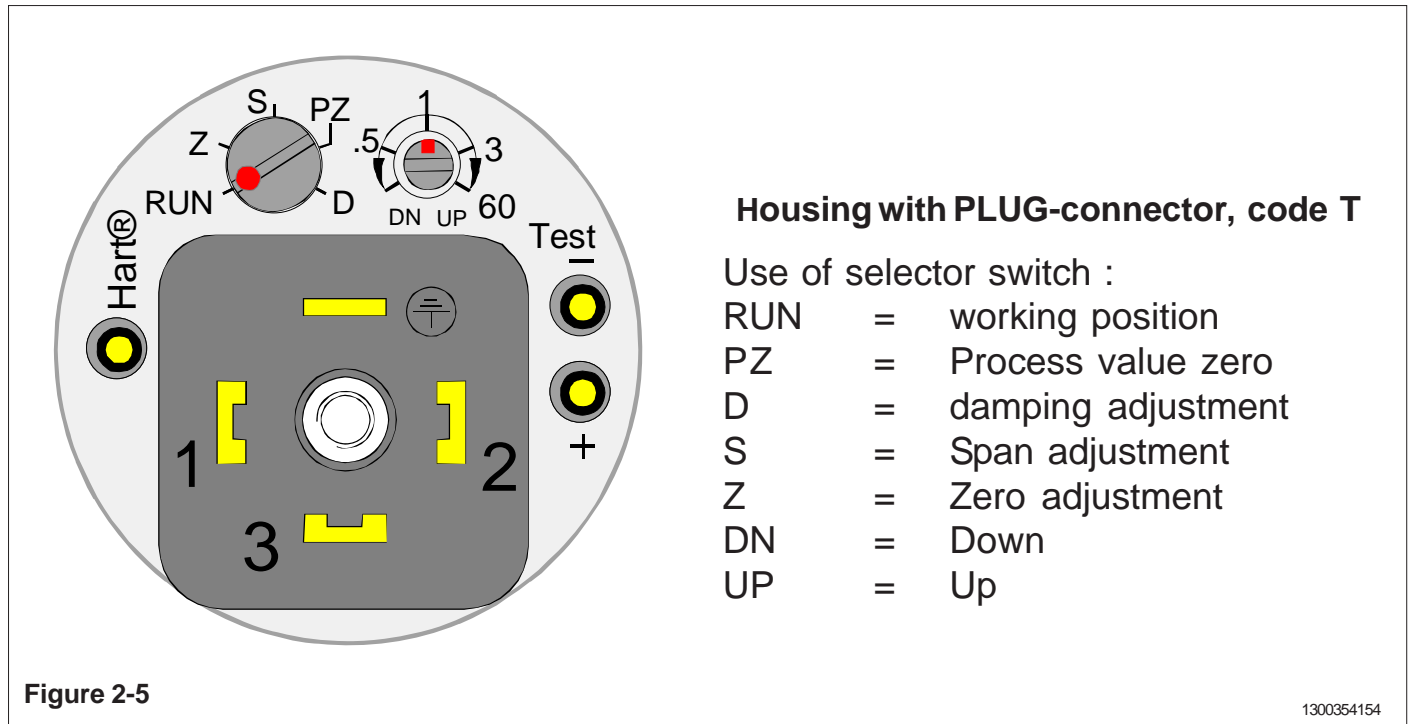
## 2.7 Set-up calibration, housing code T (with manual adjuster)

The transmitter is factory-calibrated, with 1 sec. electrical damping, for the range specified in the order. If range is not specified, the transmitter will be calibrated for the maximum range.

Zero and Span adjusters are at the end of the housing, under protective rubber shield. TEST jacks are also under protective rubber shield. Figure 2-5: housing T with PLUG connector

### Checkout procedure

- See that the ripple on the supply voltage does not exceed  $2.5 V_{pp}$  on 0-1000 Hz frequency range.
- Check the nameplate for the factory-calibrated range and zero suppression/elevation.
- If necessary, readjust the zero.
- Please see guide for zeroing from 3.3. calibration example.



## 3 CALIBRATION

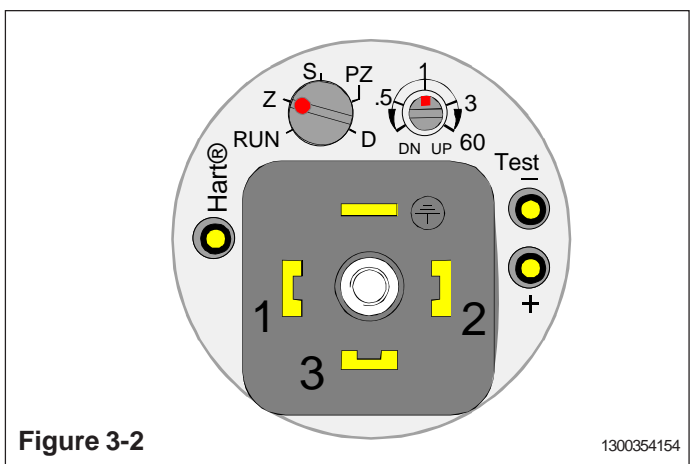
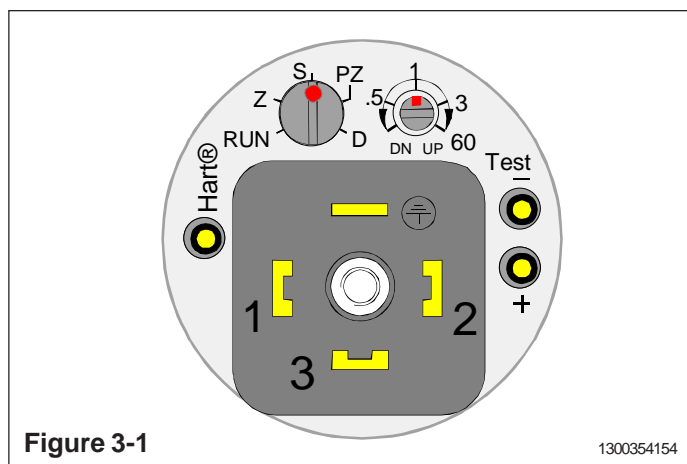
### 3.1 Adjustability

Maximum span is 25 times the minimum span for SATRON VDt transmitter

Span adjustments is made from outside the housing, under the protective rubber shield (figure 3-1).

### Zero suppression and elevation

Maximum zero suppression is 86 % of max.span, and maximum zero elevation is 100 % of max. span. Zero adjustments is made from outside the housing, under the protective rubber shield (figure 3-2).



## Measuring range

The lower and upper range-values cannot differ from zero by more than the maximum span.

For example, range 4 transmitter whose measuring range is 0-4/100 kPa cannot be adjusted to measure 100...104 kPa pressure, because maximum span is 100 kPa.

## 3.2 Damping

If pulsation occurs in the measured pressure, it can be damped with the damping trimmer position D under the protective rubber shield on the housing.

The transmitter is factory-calibrated with minimum electrical damping.

To increase the damping, turn the trimmer clockwise.

Adjusting the damping does not affect the transmitter's other calibration.

Damping adjustment :

1. Turn the selector switch from RUN to position D
2. Turn the regulating switch about  $\pm 20^\circ$  so damping adjustment is activated.
3. Turn the regulating switch to desired value of damping. 0 s on the left side, 60 s in the right side.
4. Turn the selector switch from position D to position RUN.

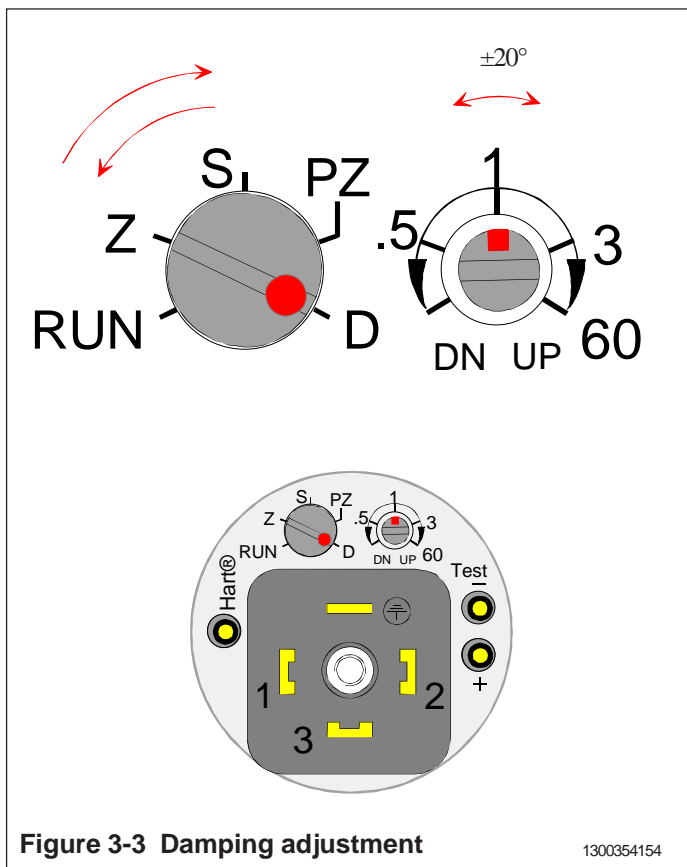


Figure 3-3 Damping adjustment

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## 3.3 Calibration examples

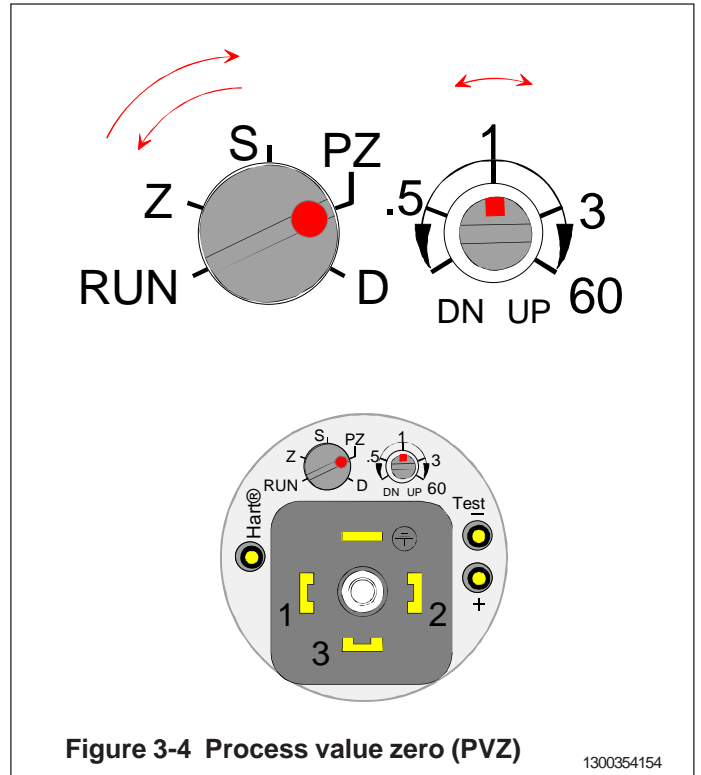


Figure 3-4 Process value zero (PVZ)

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First step is process value zero :

1. Turn the selector switch from position RUN to position PZ.
2. PV ZERO is done when the damping trimmer is turned once to both edges at least for 1 sec.
3. Turn the selector switch from position PZ to position RUN.

The maximum correction during one calibration time is limited to 5 % of the sensor maximum range.

All the changes made using the PZ-function can be recalled by turning the calibration trimmer to both edges three times (reset factory settings).

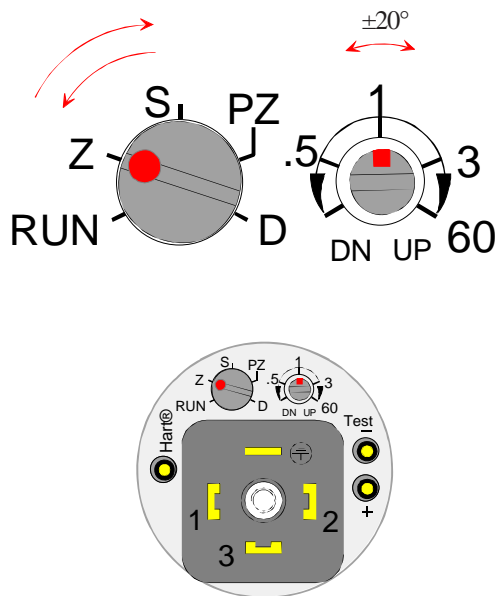


Figure 3-5 Set the lower range-value

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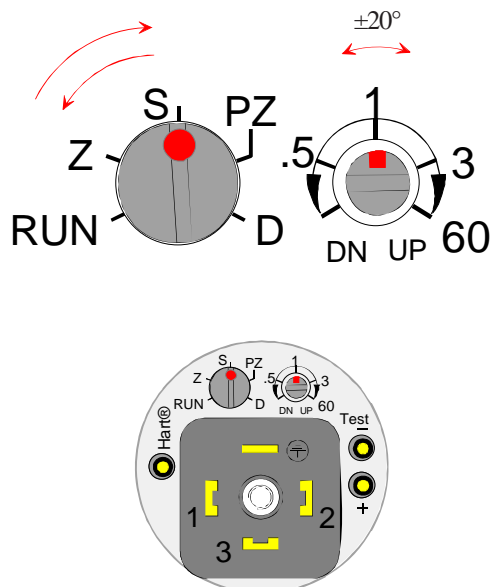


Figure 3-6 Set the upper range-value

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Measuring range: 0...500 kPa (range 5 transmitter).  
Span: 500 kPa

### Procedure

- Apply zero pressure.
- 1. Turn the selector switch from position RUN to position Z.
- 2. Turn the regulating switch about  $\pm 20^\circ$  so adjustment is activated.
- 3. Turn the regulating switch to a point where output is closest to 4 mA. (adjustment range on fine adjustment range is  $\pm 0.75\%$  of span and speed of adjustment is  $\pm 2.5\%$  of span / s)
- 4. Turn the selector switch from position Z to position RUN.
  
- Apply full-span pressure.
- 1. Turn the selector switch from position RUN to position S.
- 2. Turn the regulating switch about  $\pm 20^\circ$  so adjustment is activated.
- 3. Turn the regulating switch to a point where output is closest to 20 mA. (adjustment range on fine adjustment range is  $\pm 0.75\%$  of span and speed of adjustment is  $\pm 2.5\%$  of span / s)
- 4. Turn the selector switch from position S to position RUN.
  
- Apply zero pressure.
- Repeat the adjustments to achieve the desired accuracy.

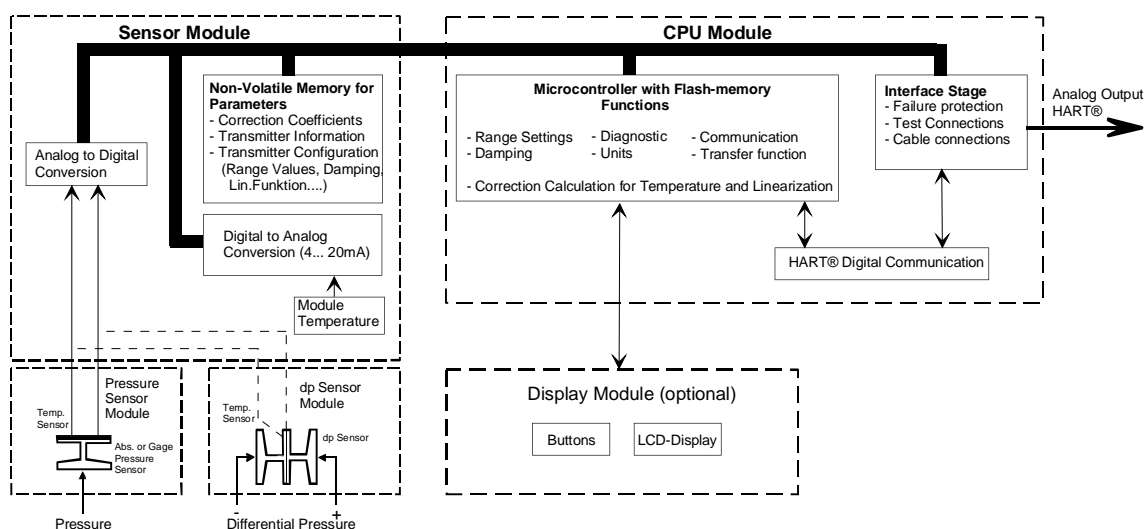


Figure 4-1 Functional construction of the SATRON VDt differential pressure transmitter

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## 4. CONSTRUCTION AND OPERATION

### Sensor Module

The piezoresistive sensor, which has a silicone oil fill, is isolated from the process with a diaphragm. Sensor pressure and temperature are measured with a 24-bit AD converter. Linearity and temperature effects are digitally corrected with an internal microprocessor connected to the sensor module.

The **sensor** converts pressure to electrical signal. The conversion is carried out through a Wheatstone bridge supplied with direct current. The elastic displacement produced in the bridge by the pressure causes bridge unbalance which is measured as a DC voltage signal.

**Compensation** includes temperature compensation and linearization. Each sensor is calibrated individually through a resistance network connection. The temperature information required by compensation is derived from a temperature measuring element located by the Wheatstone bridge.

### Electronics Module

The electronics module converts the process pressure signal from the sensor module to 4-20 mA output signal. The conversion can be made in linear, square root or inverted mode, or it can be done through user-selectable pressure/output point pairs (2-16 points).

Transmitters provided with own display (code **N**) is equipped with operating keys that allow you to define the transmitter's all functions.

The active functions required for **signal shaping** are in a customized IC which is divided into two sub-blocks: amplifier block and standard-signal shaping block. The standard-signal shaping block also includes zero, span and damping adjustments.

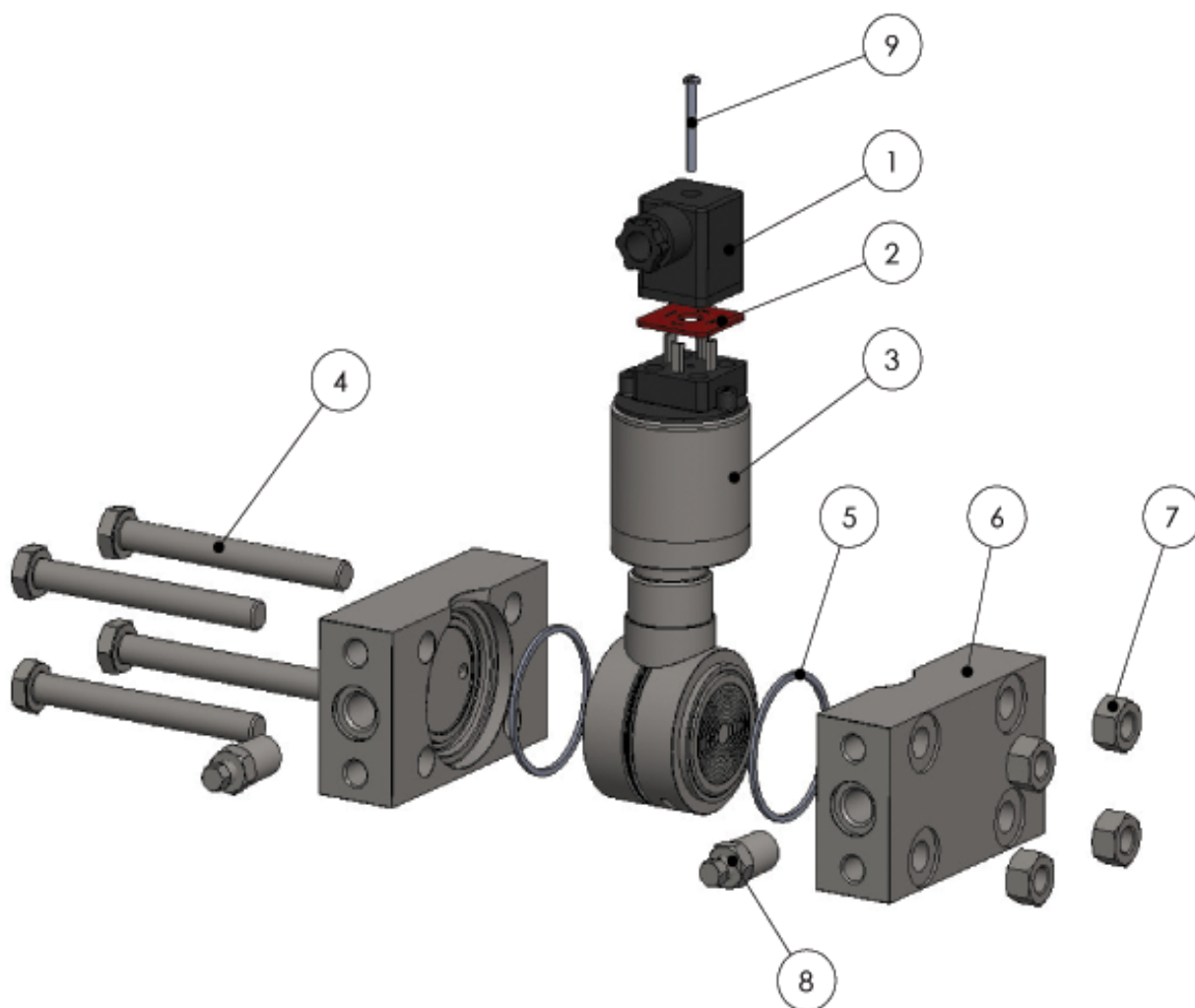
The **interface stage** includes failure protections to ensure the transmitter's operation and nonfailure in possible failure conditions. This stage also includes the TEST and cable connections

## 5. PARTS LIST

When ordering spares, please quote this document's number BPdT750AV and date 15.2.2013, the name and

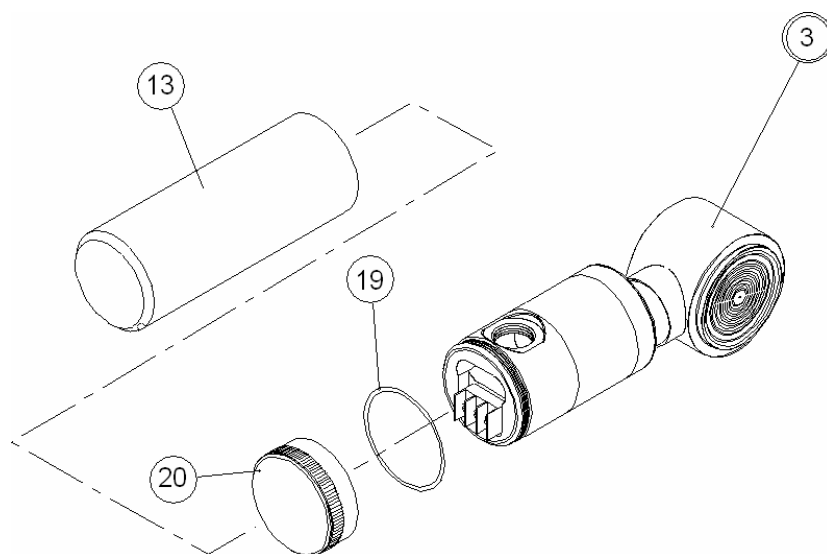
order number of the required part, and the transmitter's serial number. Parts indicated with asterisk (\*) as well as screws, nuts and seals (packings) are spare parts.

Number	Name	Order number	Number	Name	Order number
* 1	Wiring box GDM3009, DIN43650	72900111	* 13	Protection cup, housing H, M and T	T1300295
2	Seal GDM3-17, silicone	72900116	* 13	Protection cup, housing N	T1300400
3	Sensing element		* 15	Mounting clamp	T544953
4	Hex bolt, M10x90 DIN931 A4	54228190	* 16	Support plate	T543223
	Hex bolt, M10x90 DIN931 8.8 Zne (PN420)	54228191	17	Hex nut M8 SFS2067 A4	56022800
5	Seal 46/50x1.7 PTFE	T1310219	* 18	Mounting bracket S	T1050009
* 6	Flange (PN420, M10)	T1310217	19	O-ring, 42x2 FPM (Viton®)	80013800
	Flange (PN400, M12)	T1310217-M12	* 20	Cover M	T1300256
7	Hex nut, M10 SFS2067 A4	56022810	21	Seal, Silicone rubber	T1300387
	Hex nut, M10 SFS2067 m 8.8 Zne (PN420)	56022817	* 22	Back plate V	T1300391
* 8	Vent/drain valve, ¼-NPT	T531873	23	Fastening screw, M4	T1325347
9	Cylinder-head screw S M3x35 SFS2179A4	51723053			



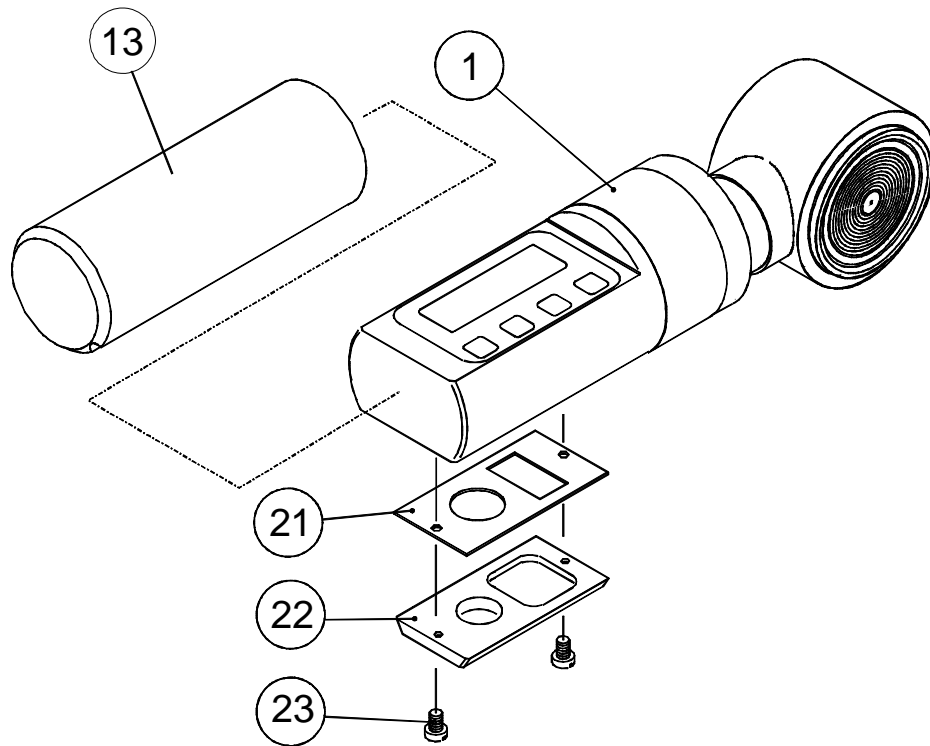
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**Figure 5-1** Parts list:  
Enclosure H and T, housing with PLUG connector



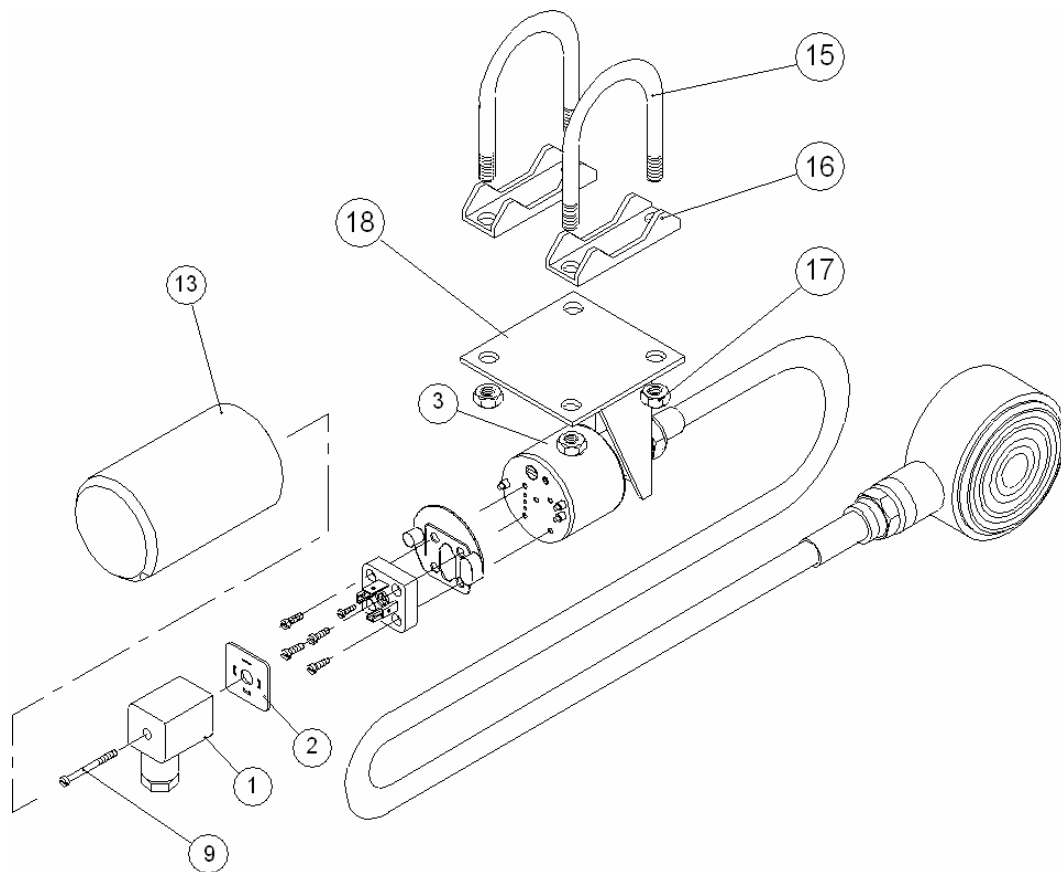
**Figure 5-2** Parts list:  
Enclosure M, housing with junction box

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**Figure 5-3** Parts list:  
Enclosure N, housing with display



**Figure 5-4** Parts list:  
Enclosure with remote electronics

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**Satron Instruments Inc.**

[www.satron.com](http://www.satron.com)

P.O.Box 22, FIN-33901 Tampere, Finland

Tel.int. +358 207 464 800, Telefax +358 207 464 801