Installation and Setting-Up Instructions
Spare Parts List

Contents:

DOCUMENTS
Technical Specifications: BLV820
Installation and Setting-Up Instructions: BLV820AV

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1 INSTALLATION

1.1 Mechanical installation

Figure 1-1
Recommended mounting position
- Calibration direction and PLUG connector's coupling direction: horizontal
- Cable entry direction: from below
- Process connection direction: horizontal
- The UP arrow on flange should point upwards

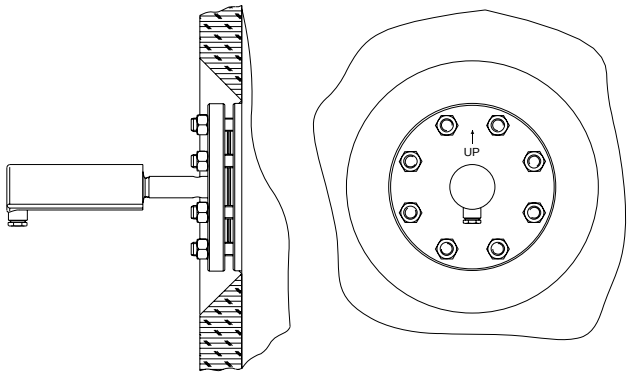

Figure 1-1 10044087

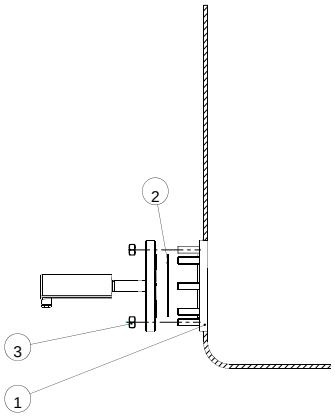

Figure 1-2 Mounting accessories 1004354088

General

Flange-mounted transmitter is installed directly on the side of a tank. As a result the measurement conditions may be quite demanding. As far as possible, however, the location of the transmitter should be such that the effects of temperature variations will be as small as possible. Mechanical stresses, such as vibration, should also be avoided as far as possible.

The installation should be such that the operating temperature of the transmitter's electronics will not exceed +80°C. For example, the tank must be insulated if necessary (see Fig. 1-1). Sufficient space should be provided around the transmitter to ensure free circulation of air.

Table for Figure 1-2: Mounting accessories

1. Flange coupling DN80
2. Sealing plate DN80 [1)]
3. Nut

NOTE! The materials for the mountings should be chosen to withstand the ambient and process conditions.

[1)] The pickling of the pipework and tank should be taken into account when choosing the sealing materials. The materials should resist any absorption of the pickling material in the seal. E.g. Viton is recommended.

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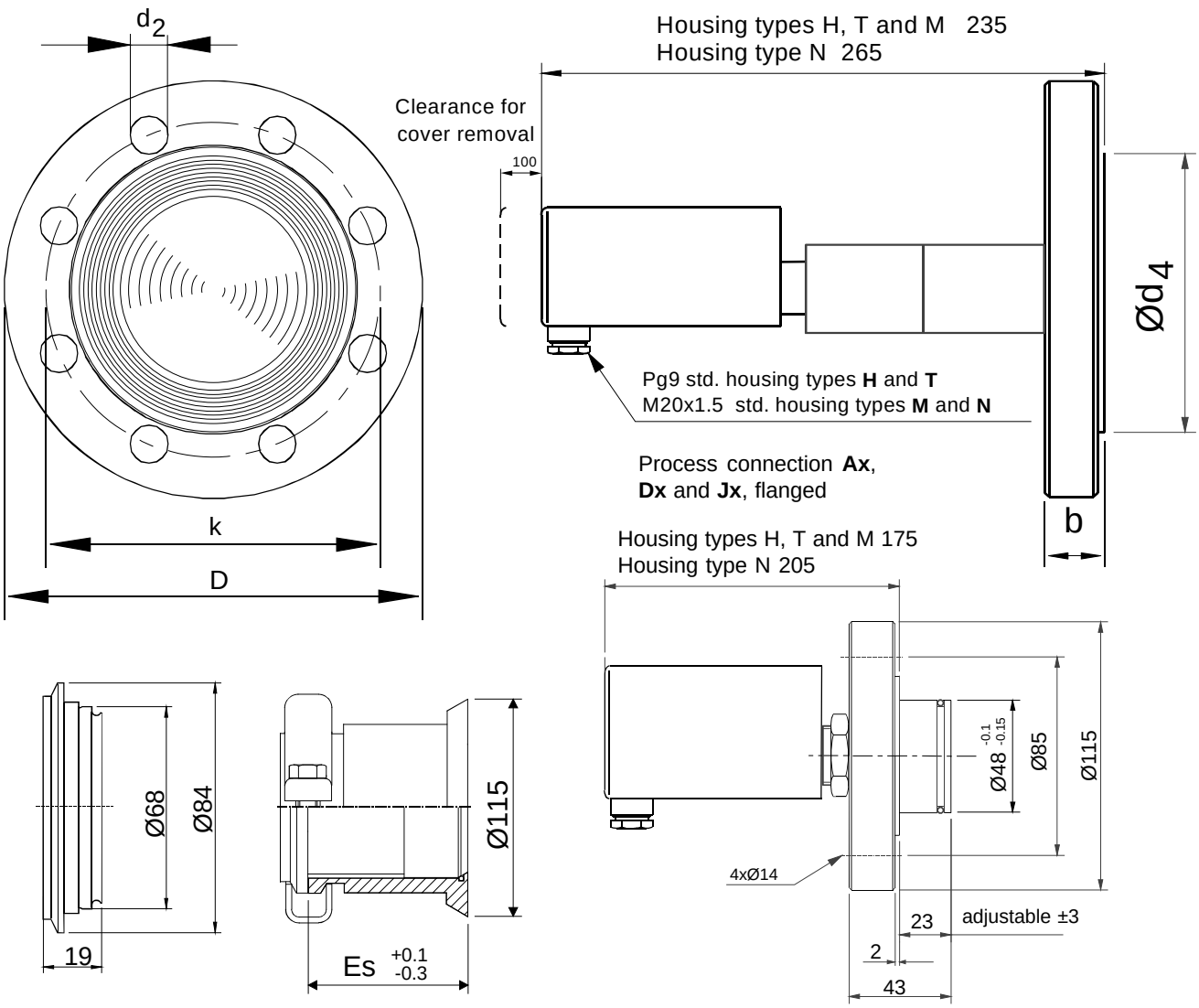
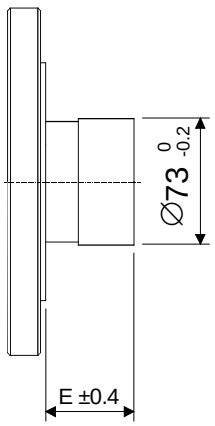


Process connection **UA**
- Tuchenhagen DN50/40 (Varivent)

Process connection **SA**
- Sandvik-clamp

Process connections **DA**, DN25 PN40 flange with extension, process temperature max. +125°C



Code	E +0.4 -0.4	Es +0.3 -0.2
0	0	-
1	23	-
2	51	54,5
4	102	105
6	152	156

Process connection **Ax**, **Dx** and **Jx**
- with extension

Dimensions of flanges

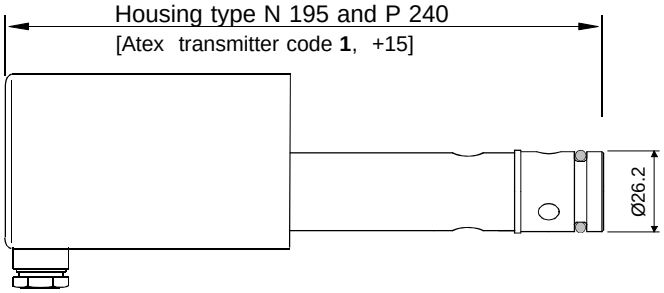
FLANGE SIZE	Flange dimens.			Holes			Exten.
	b	D	Ød4	Kpl	d2	k	Ød -0.2
ISO DN25 PN40	18	115	68	4	14	85	48
ISO DN50 PN40	20	165	102	4	18	125	51
ISO DN80 PN40	24	200	138	8	18	160	73
ISO DN100 PN40	24	235	162	8	22	190	73
ANSI 1" 150 lbs	15	108	51	4	16	79.4	-
ANSI 1" 300 lbs	18	124	51	4	20	88.9	-
ANSI 2" 150 lbs	23	152	92	4	20	120.6	51
ANSI 2" 300 lbs	25	165	92	8	20	127	51
ANSI 3" 150 lbs	26	191	127	4	20	152.4	73
ANSI 3" 300 lbs	31	210	127	8	23	168.3	73
ANSI 4" 150 lbs	26	229	157	8	20	190.5	73
ANSI 4" 300 lbs	34	254	157	8	23	200	73
JIS 10K-50	16	155	96	4	19	120	51
JIS 40K-50	26	165	105	8	19	130	51
JIS 10K-80	18	185	126	8	19	150	73
JIS 40K-80	32	210	140	8	23	170	73
JIS 10K-100	18	210	151	8	19	175	73
JIS 40K-100	36	250	165	8	25	205	73

Figure 1-3a Dimensional drawings (dimensions in mm)

SATRON VL pressure transmitter

Dimensional drawings (dimensions in mm)

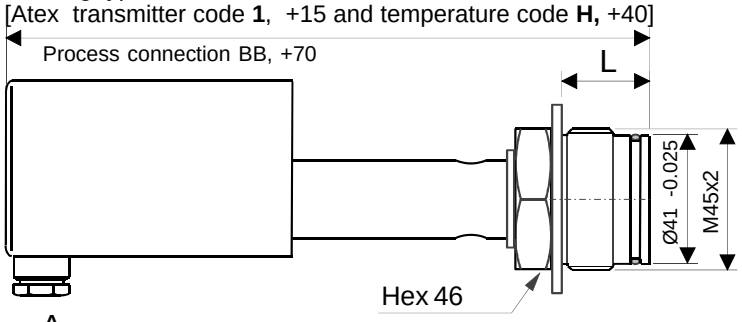
Housing types H, T and M 165
Housing type N 195 and P 240
[Atex transmitter code **1**, +15]

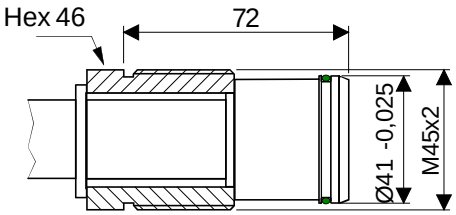


Process connection **PA**
- PMC 1"

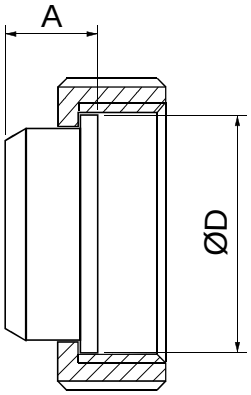
BA - extension code	L
0	28,5
2	51
3	72
4	102

Housing types H, T and M 160
Housing type N 190 and P 235
[Atex transmitter code **1**, +15 and temperature code **H,** +40]



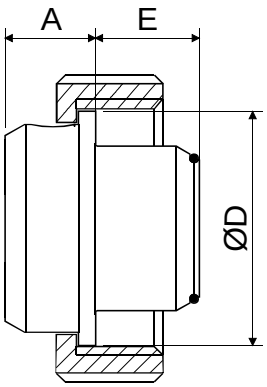


Process connection **BB**
- M45x2



Process connection **BA**
- M45x2

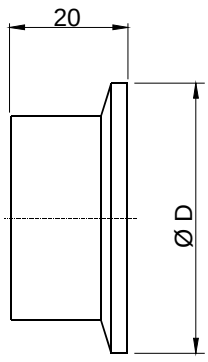
Process connection **VA** and **VB**
- SMS38 and SMS51



Process connection **WA** and **WB**
- SMS-SI38 and SMS-SI51

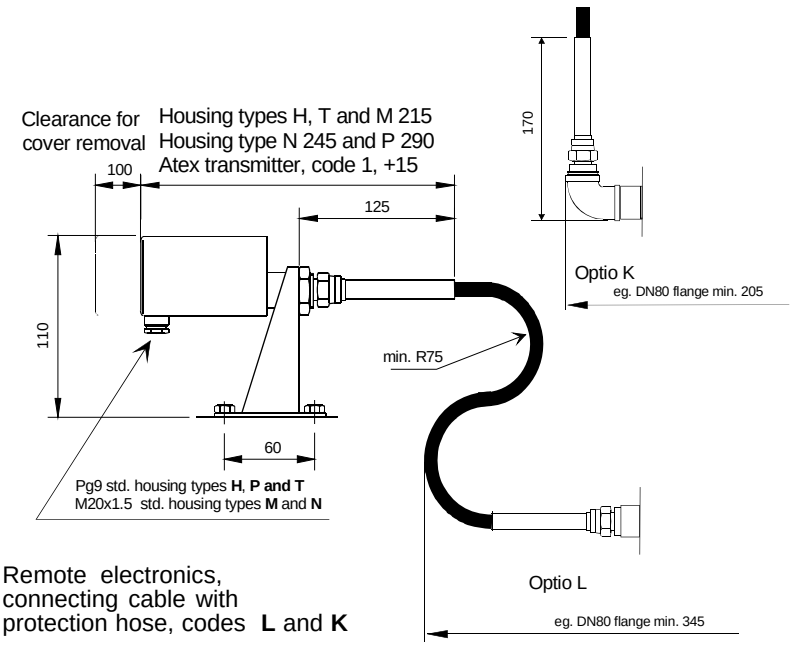
Size	Dimensions		Thread
	ØD	A	
38	54	21	Rd 60 x 1/6
51	64	23	Rd 70 x 1/6

Size	Dimensions			Thread
	ØD	A	E	
SI38	54	21	24	Rd 60 x 1/6
SI51	64	23	27	Rd 70 x 1/6



Process connection **TA**, **TB** and **TC**
- Tri-clamp DN38 ... 63.5

DN	ØD
38	50,5
51	64
63,5	77,5

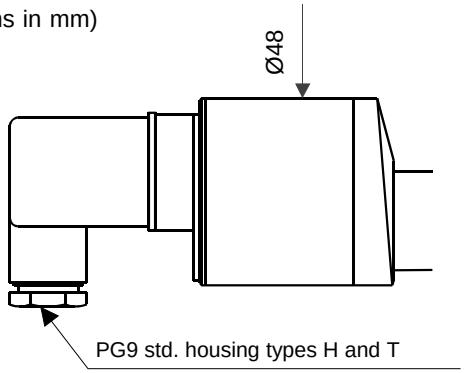


Remote electronics, connecting cable with protection hose, codes **L** and **K**

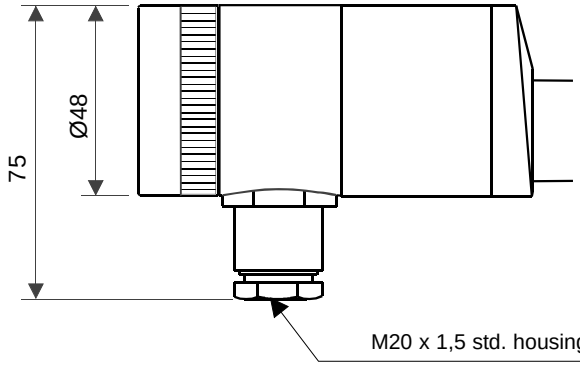
Figure 1-3b Dimensional drawings (dimensions in mm)

SATRON VL pressure transmitter

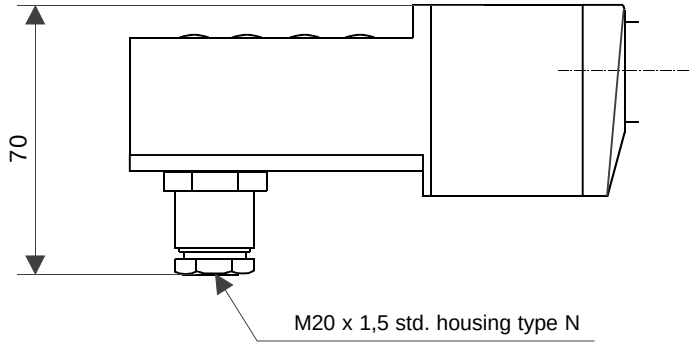
Dimensional drawings (dimensions in mm)



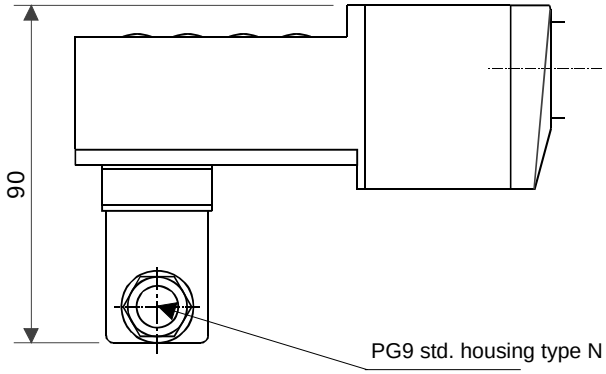
Housing with plug-connector, DIN 43650, codes H and T



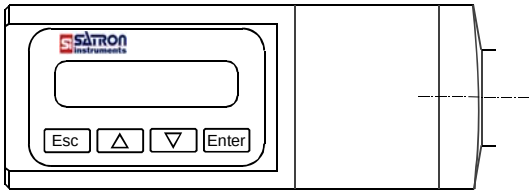
Housing with junction box/terminal strip, code M



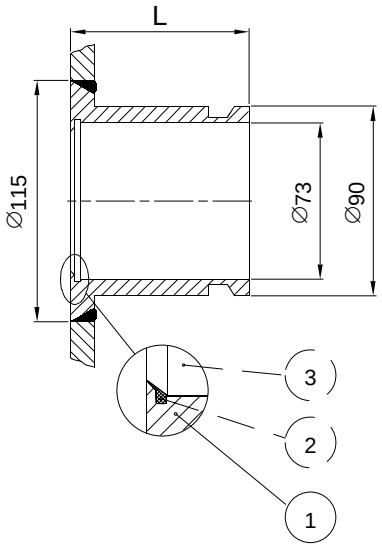
Housing with junction box/terminal strip, with display, code N



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



SATRON VL pressure transmitter with Sandvik-Clamp:



Coupling length **L** :
Code 2 = 53 mm
Code 4 = 104 mm
Code 6 = 155 mm

When welding the coupling, avoid ovalling or straining the bevelled sealing joint (e.g. several rounds with small run; blanking plug can be used during welding to prevent ovalling of the coupling).

Figure 1-4 Welded Sandvik coupling

1. Welded Sandvik coupling DN70 PN40
2. Seal EPDM (Order no. T1051205)
   Options: FPM (Order no. T1051204)
   PTFE (Order no. T1051203)
3. SATRON VL transmitter with Sandvik process connection

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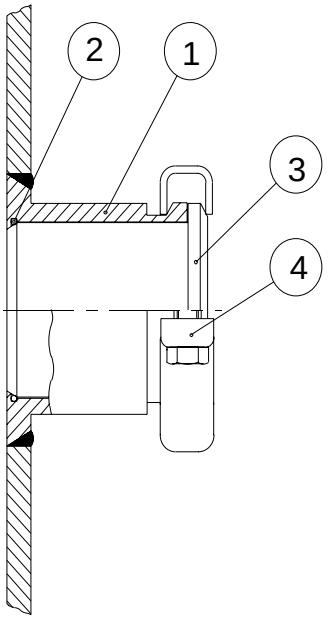


Figure 1-5 Sandvik blanking plug

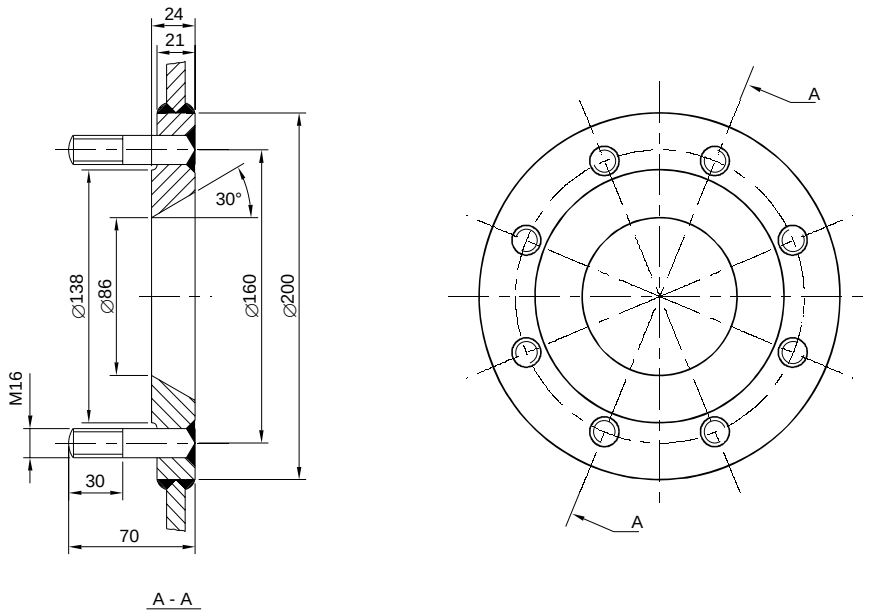
1. Welded Sandvik coupling DN70 PN40
2. Seal EPDM (Order no. T1051205)
3. Blanking plug (T549804)
4. Sandvik clamp DN70 PN40 (V82220000)

10034029

SATRON VL pressure transmitter with flange:

The transmitter is mounted on DN80 PN40 flange coupling (counterflange) (Fig. 1-6). The connection dimensions are specified in ISO2082 and ISO2123 Standards.

Transmitters with ANSI 3" 150 lbs or 300 lbs process connection are also available.



Order no. M546606,
incl. Hex nuts M16 and seal

Figure 1-6 Flange coupling (counterflange)

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SATRON VL pressure transmitter with Tri-Clamp :

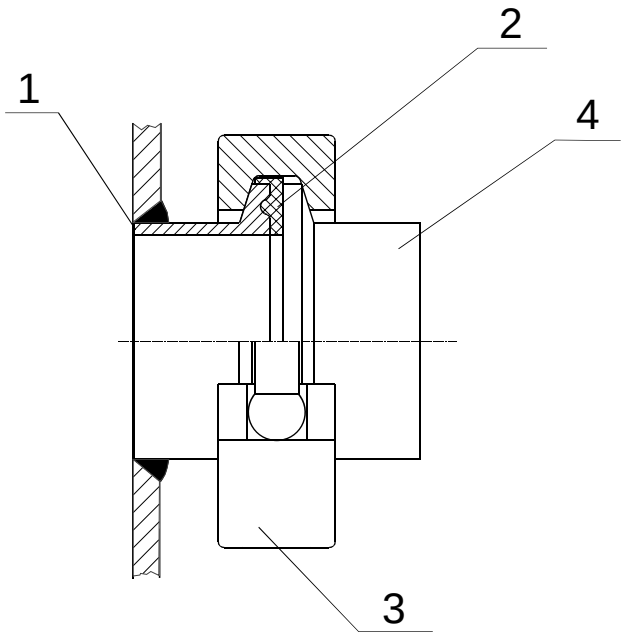

Figure 1-7 Welded Tri-Clamp coupling

1. Welded Tri-Clamp coupling
2. Seal EPDM
3. Tri-Clamp
3. SATRON VL transmitter with Tri-Clamp

When welding the coupling, avoid ovalling or straining the sealing joint (e.g. several rounds with small

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SATRON VL pressure transmitter with M45x2 connection:

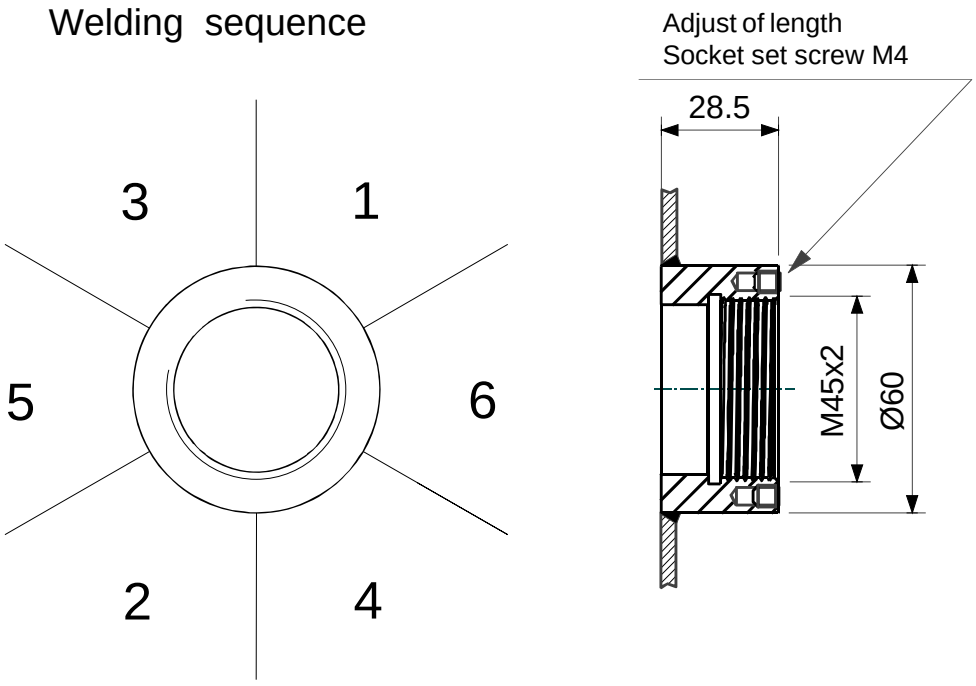

Figure 1-8 Welding the coupling M45x2

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SATRON VL pressure transmitter with BA3 and BB connection:

For process connections **BA3** and **BB**
1. Transmitter in measuring
2. Transmitter can be checked, changed, calibrated or the transmitter diaphragm can be flushed

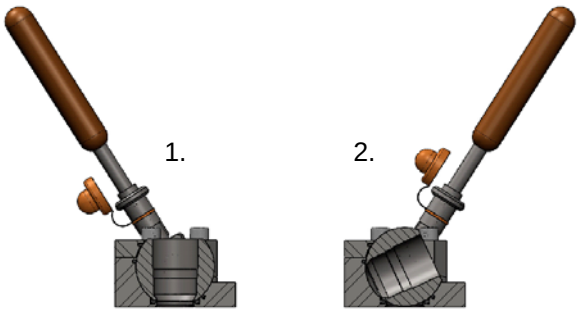


Figure 1-9 Pasve Ba working position

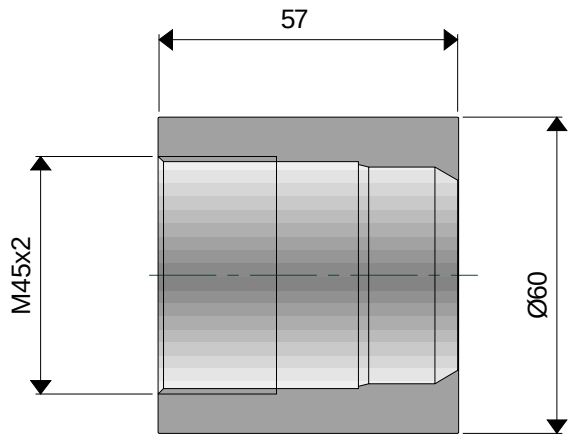


Figure 1-12 **Coupling BB M45x2**, for process connection **BB**, order code **M1050474** (Welding assistant, code M1050473)

SATRON VL pressure transmitter with SMS connection:

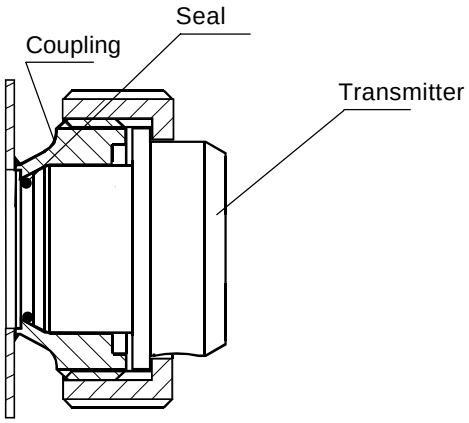


Figure 1-10 Mountig type **SMS-SI**

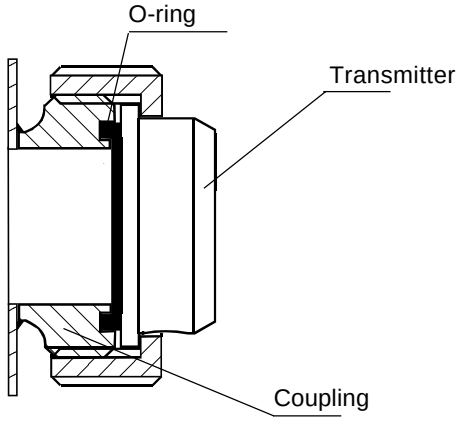
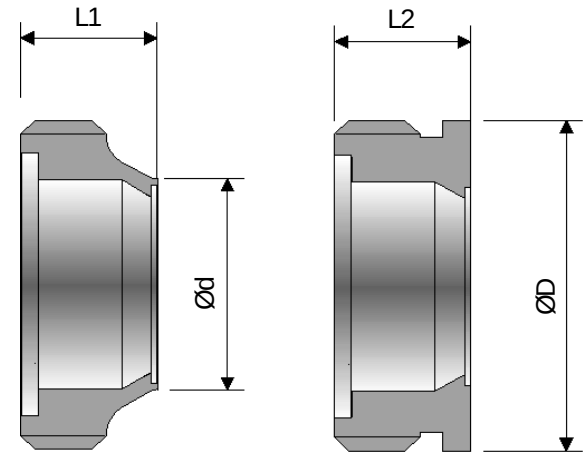


Figure 1-11 Mounting type **SMS**

SMS-SI couplings :



for pipe for vessel

Size	Dimensions				Thread
	L1	Ød	L2	ØD	
38	27	38,5	24	60	Rd 60 x 1/6
51	30	51	25	70	Rd 70 x 1/6

Figure 1-13 Mounting dimension type **SMS-SI**

1.2 Electrical connections

Supply voltage and load of the transmitter according to the figure 1-15.

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.

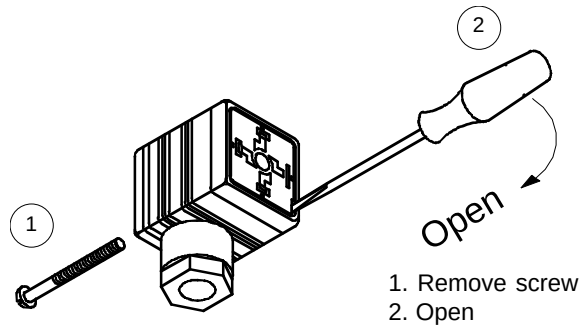


Figure1-14 Removing the PLUG junction box

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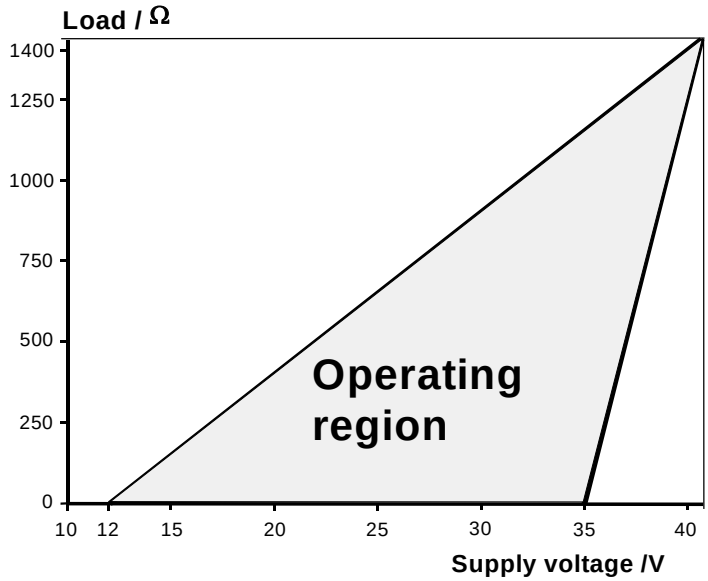

Min. load using HART® - communication 250 Ω

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

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

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

Figure 1-15 Supply voltage and load capacity

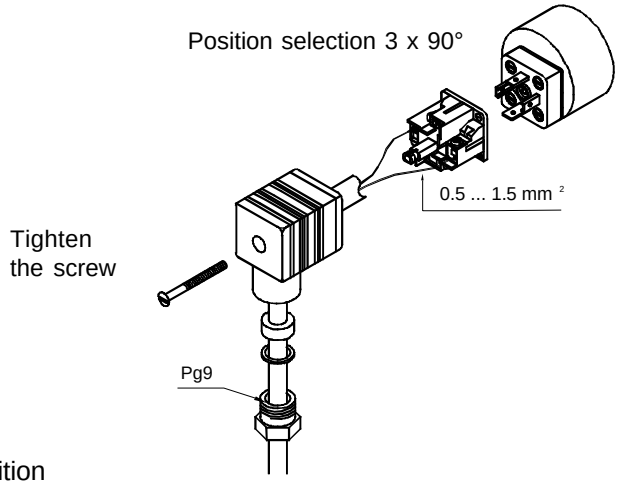

Figure 1-16 Adjusting the junction box position

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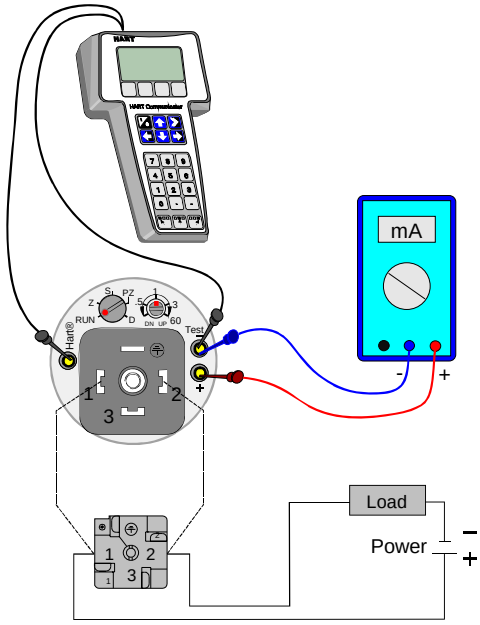

Figure 1-17, wiring housings H and T

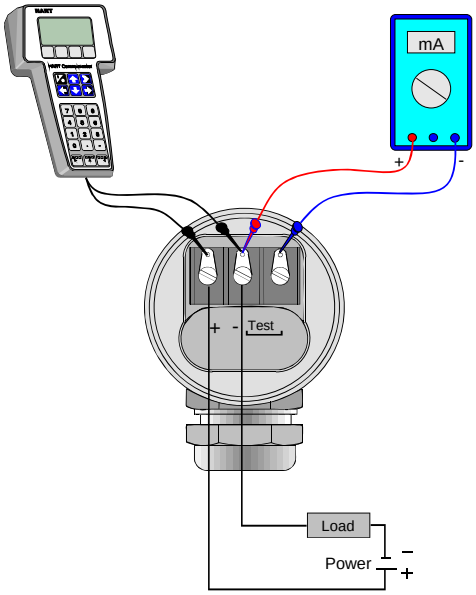

Figure 1-18, wiring housing M

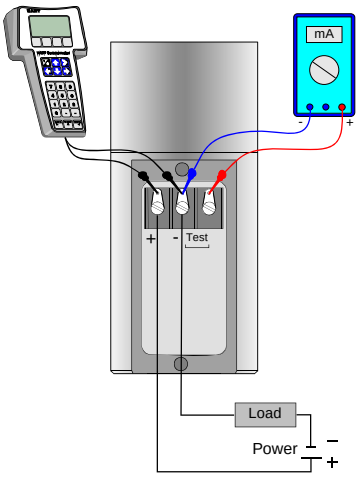

Figure 1-19, wiring housing N

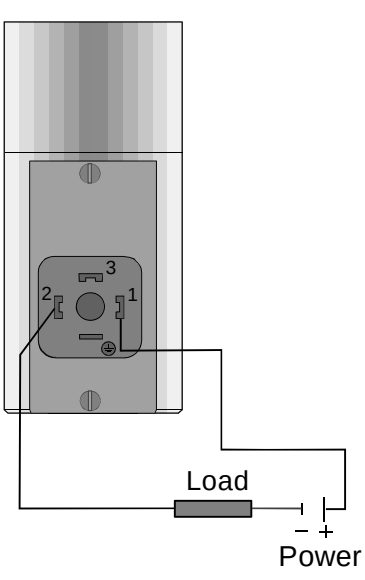

Figure 1-20, wiring housing N with DIN 43650 plug-connector, code **N** --/-/ **P**

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.

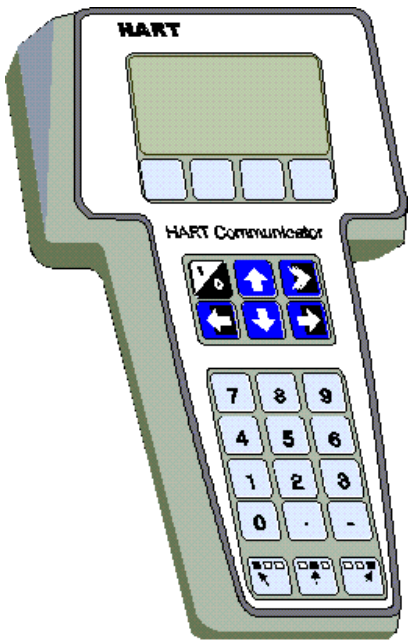

Figure 2-1
275 user interface

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 El 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

2.4 Setting up through HART® 375 user interface

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.**

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 Tranfer 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 .

2.5 Setting up with SATRON pAdvisor -Software

If you want to use all the features of the VT*e* Smart transmitter, we recommend the use of SATRON pAdvisor - Software and SATRON SI-Tool*e* USB-HART® modem.

Test connections for checking and changing the configuration values and calibrating pressure and current signals including *SENSOR TRIM* operation

Recommended equipment for calibration:

SATRON-pAdvisor software for SATRON Smart transmitter downloadable free of charge at www.satron.com

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

DVM: Digital voltage meter, accuracy better than 0,01 % of reading (for example Fluke 8840A or Keithley 2000)

Pressure generator (accuracy better than 0.03 % of reading)

USB-HART® modem, SATRON Si-Tool*e*, order code: **M1330001**

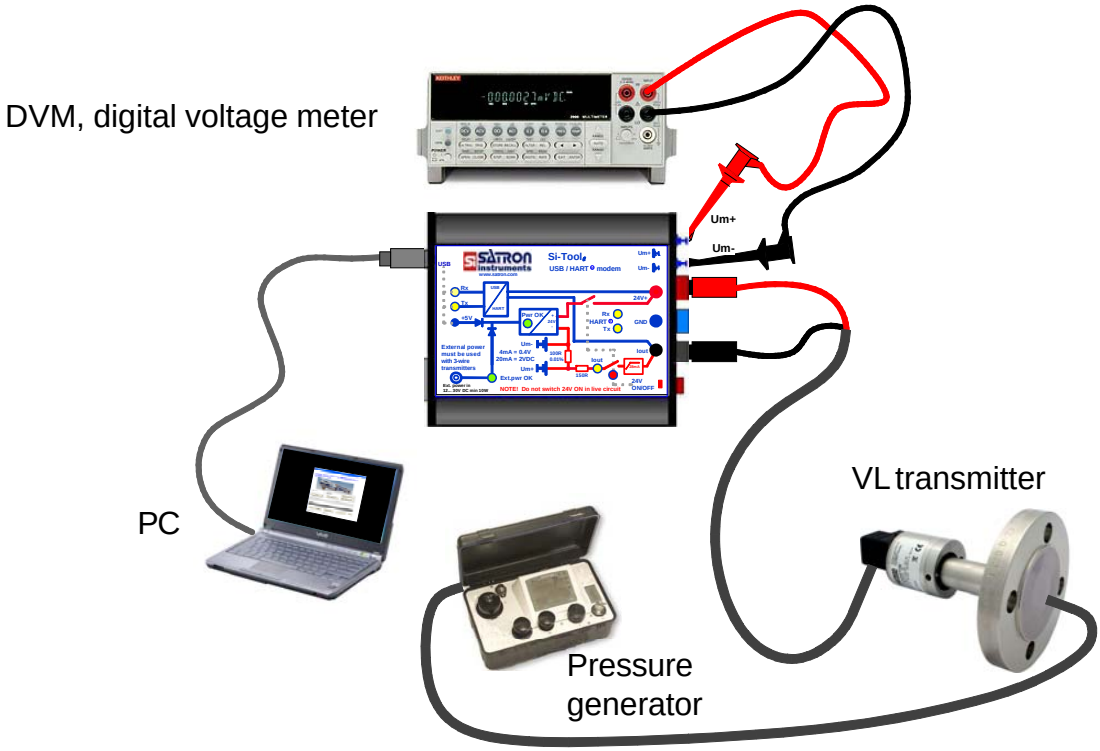

Figure 2-3 Calibration connections window

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 VL pressure transmitter with display

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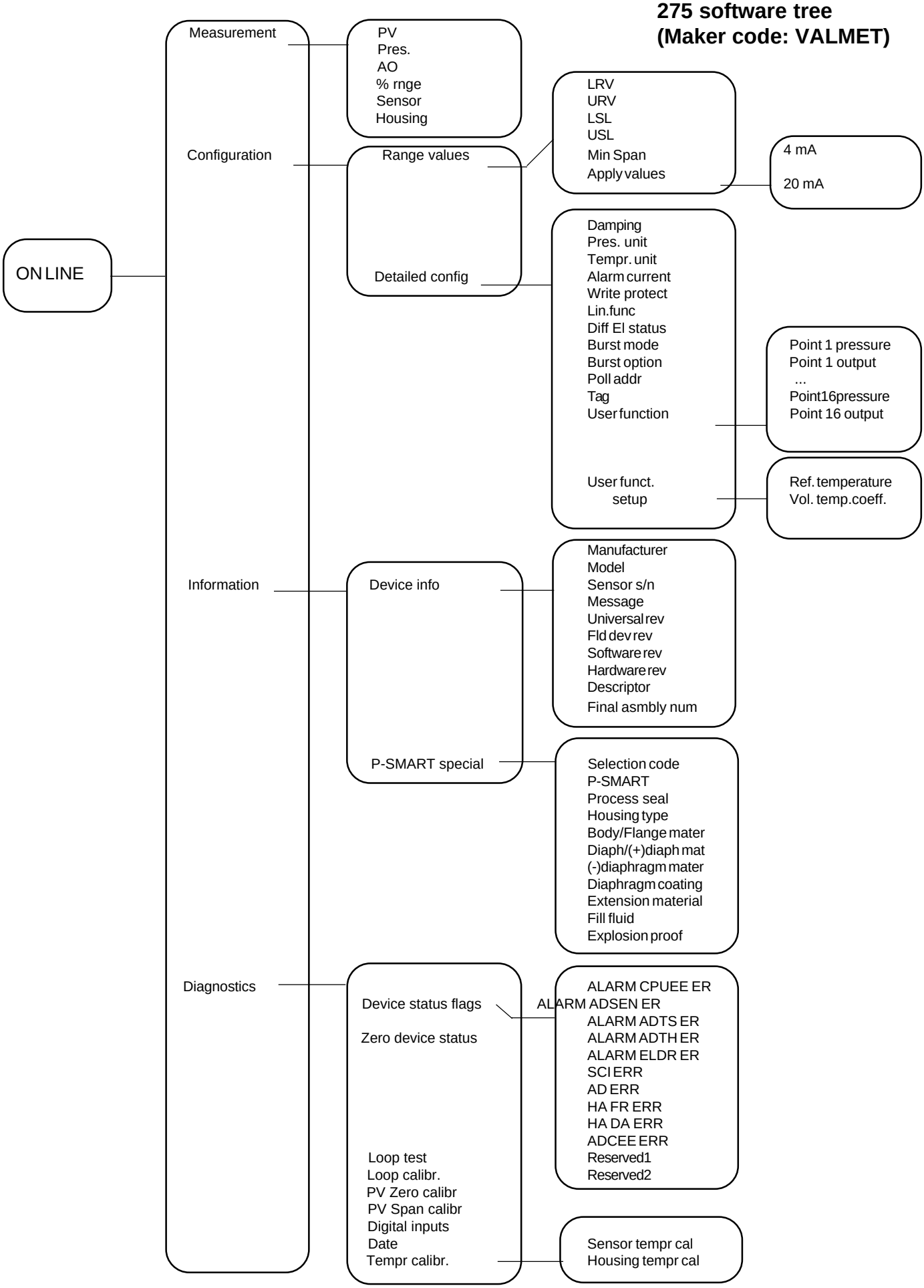
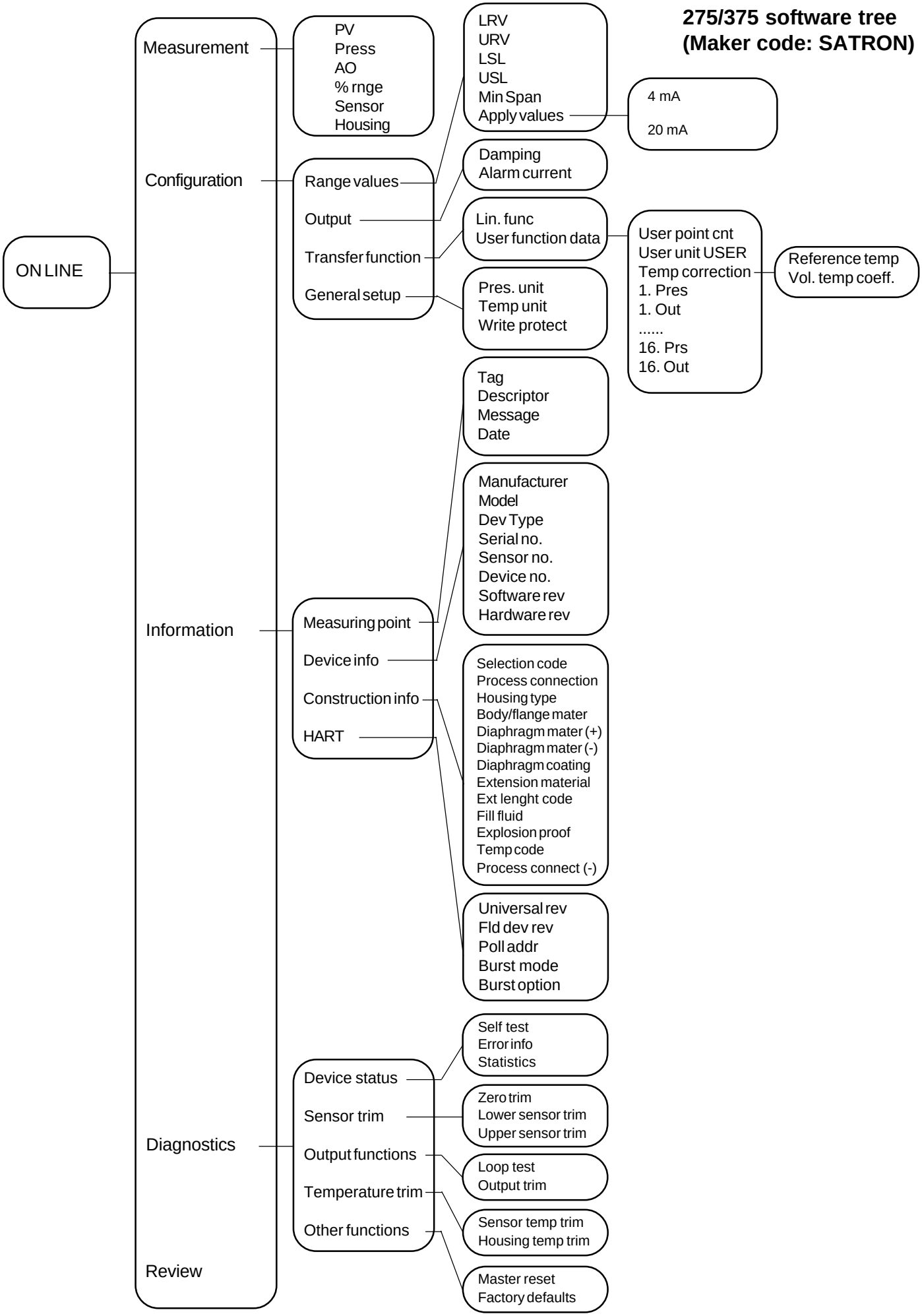
275 software tree
(Maker code: VALMET)



275/375 software tree
(Maker code: SATRON)

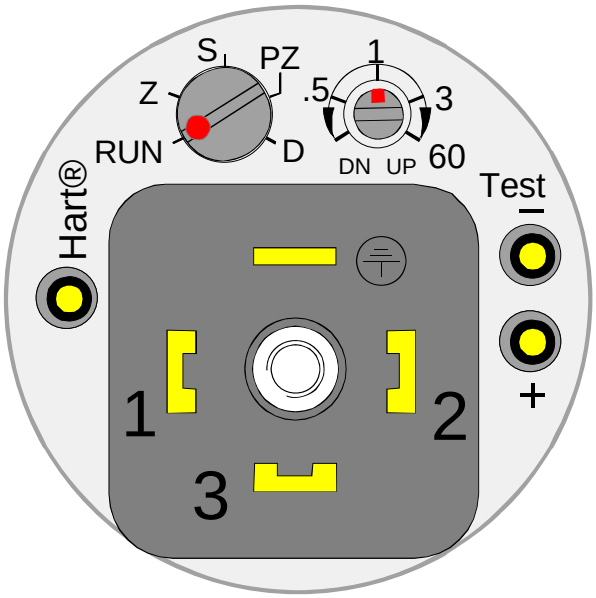


2.7 Set-up calibration, housing code T (with manual adjuster)

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 necessay, readjust the zero.



Housing with PLUG-connector, code T

Use of selector switch :

RUN	=	working position
PZ	=	Process value zero
D	=	damping adjustment
S	=	Span adjustment
Z	=	Zero adjustment
DN	=	Down
UP	=	Up

Figure 2-5

1300354154

3 CALIBRATION

3.1 Adjustability

Maximum span is 25 times the minimum span for SATRON VL 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).

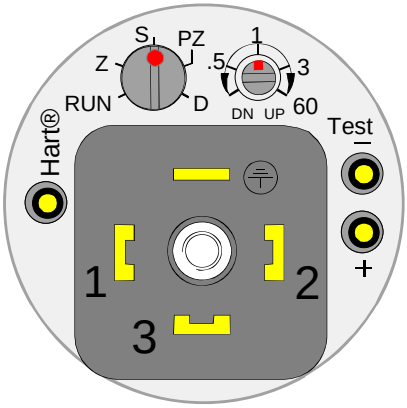


Figure 3-1

1300354154

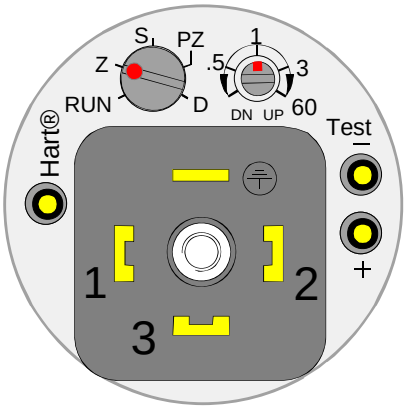


Figure 3-2

1300354154

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 shiled on the housing.

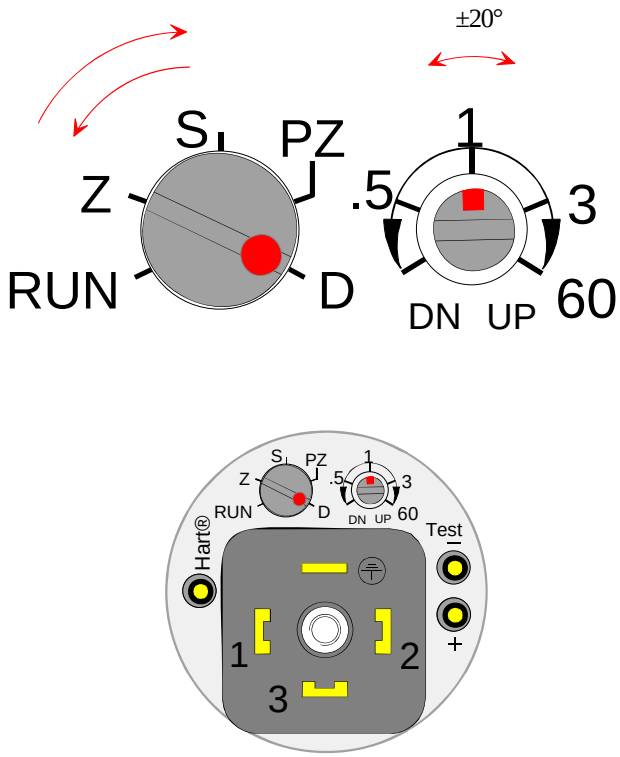


Figure 3-3 Damping adjustment 1300354154

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 ±20° so damping adjustment is activated. Turn the regulating switch to desired value of damping. 0 s on the left side, 60 s in the right side.
3. Turn the selector switch from position D to position RUN.

3.3 Calibration examples

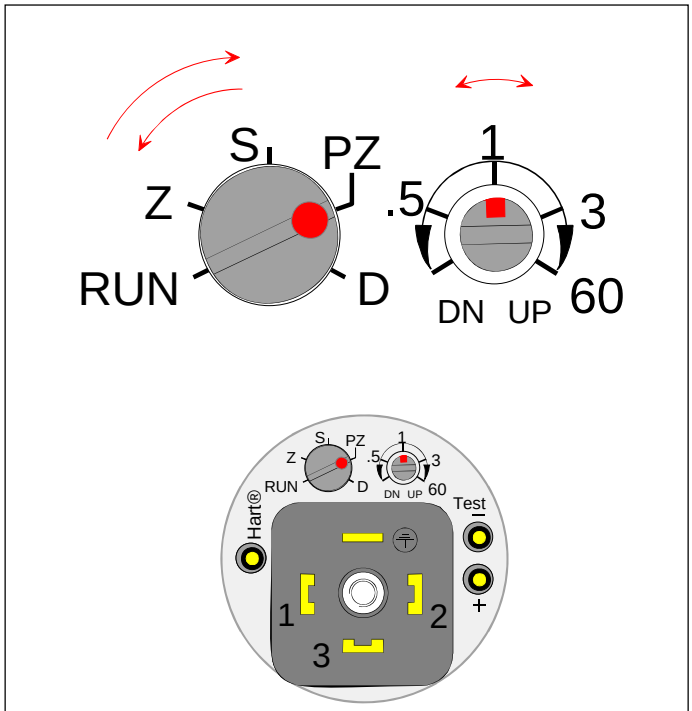
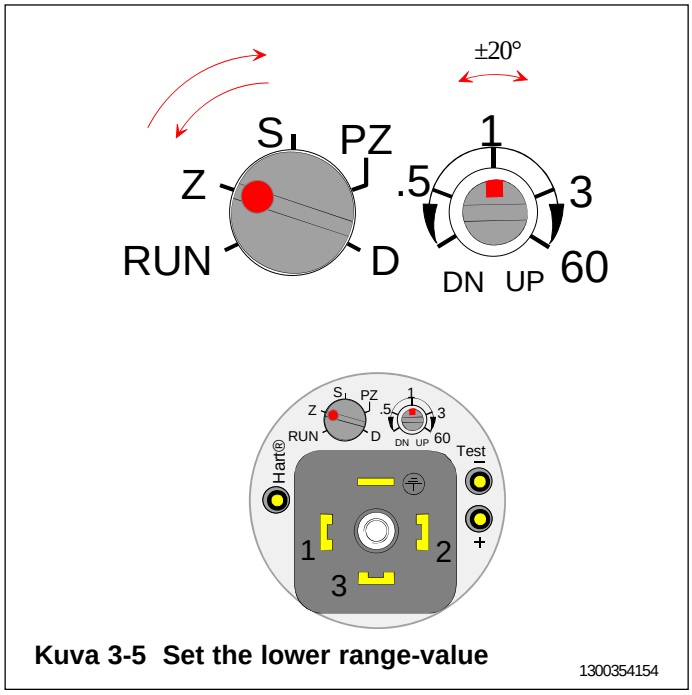
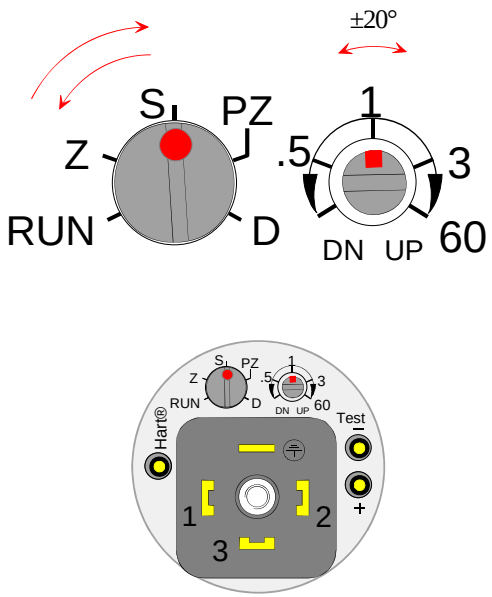


Figure 3-4 Process value zero (PZ) 1300354154

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.



Kuva 3-5 Set the lower range-value 1300354154



Kuva 3-6 Set the upper range-value

Measuring range: 0...300 kPa (range 5 transmitter).
Span: 300 kPa

Procedure

- Apply zero pressure.
1. Turn the selector switch from position RUN to position Z.
2. Turn the regulating switch about ±20° 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 ±0.75% of span and speed of adjustment is ±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 ±20° 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 ±0.75% of span and speed of adjustment is ±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.

3.4 Liquid level measurement

Open tank

Liquid level measurement with pressure transmitter is based on the measurement of the liquid's static pressure. Static pressure does not depend on the shape or volume of the vessel. It can be calculated by multiplying the liquid's density by the liquid level and acceleration of gravity:

$$p = \rho h g$$

where p = static pressure
ρ = density
h = height of liquid level
g = acceleration of gravity

The pressure acting on the flange diaphragm is thus directly proportional to the height of the liquid level, and the transmitter can be calibrated to measure liquid level.

The lower limit of the liquid level is normally above the transmitter. This is taken into account through zero suppression.
h_1 = difference between maximum and minimum height of measured level (2.5 m)

h_2 = level's minimum height from transmitter (1.5 m)

ρ =density of measured liquid (950 kg/m^3)

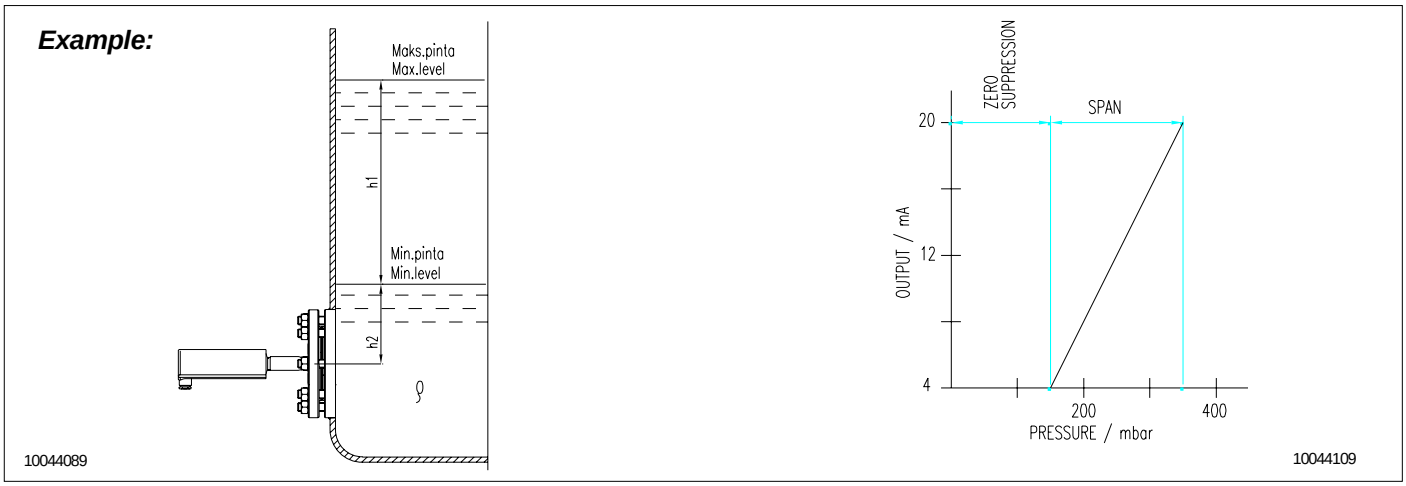
g = acceleration of gravity (9.81 m/s^2)

Span (p_1) and zero suppression (p_2)will then be as follows:

$p_1 = h_1 \rho g$ = (2.5 m) (950 kg/m^3) (9.81 m/s^2) = 23.3 kPa

$p_2 = h_2 \rho g$ = (1.5 m) (950 kg/m^3) (9.81 m/s^2) = 14.0 kPa

Measuring range = p_2...(p_2 + p_1) = 14 kPa...37.3 kPa
(140 mbar...373 mbar)



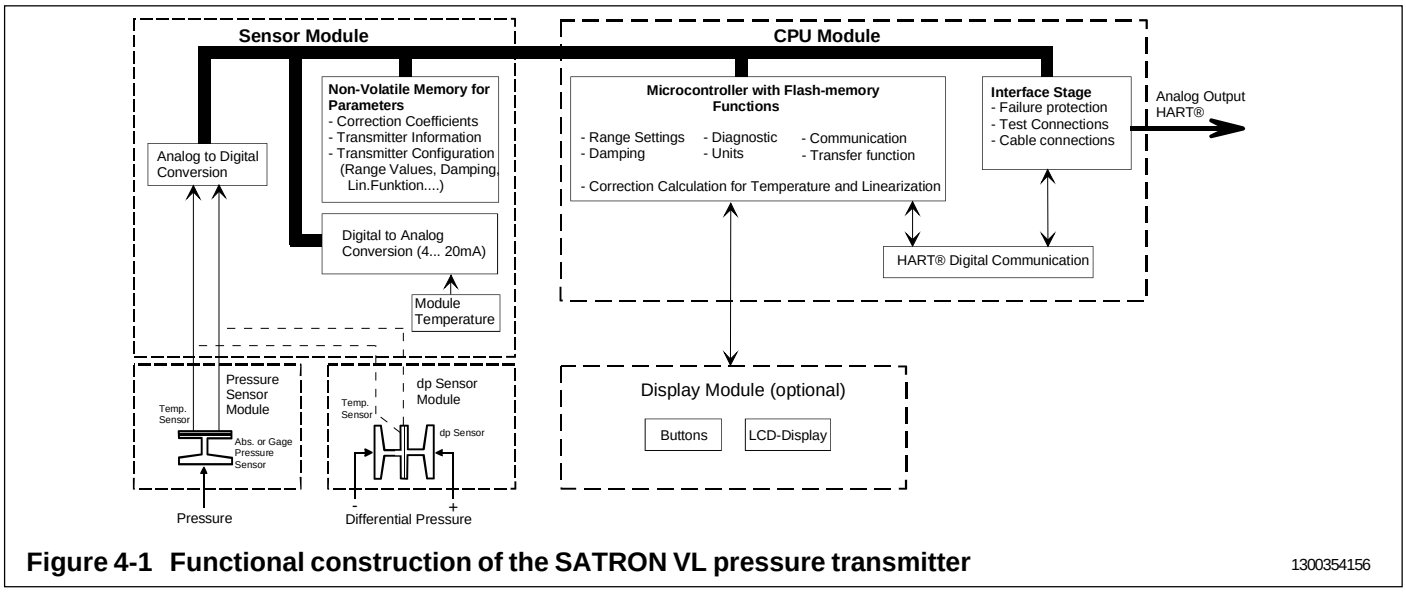


Figure 4-1 Functional construction of the SATRON VL pressure transmitter

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 BLV820AV 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.

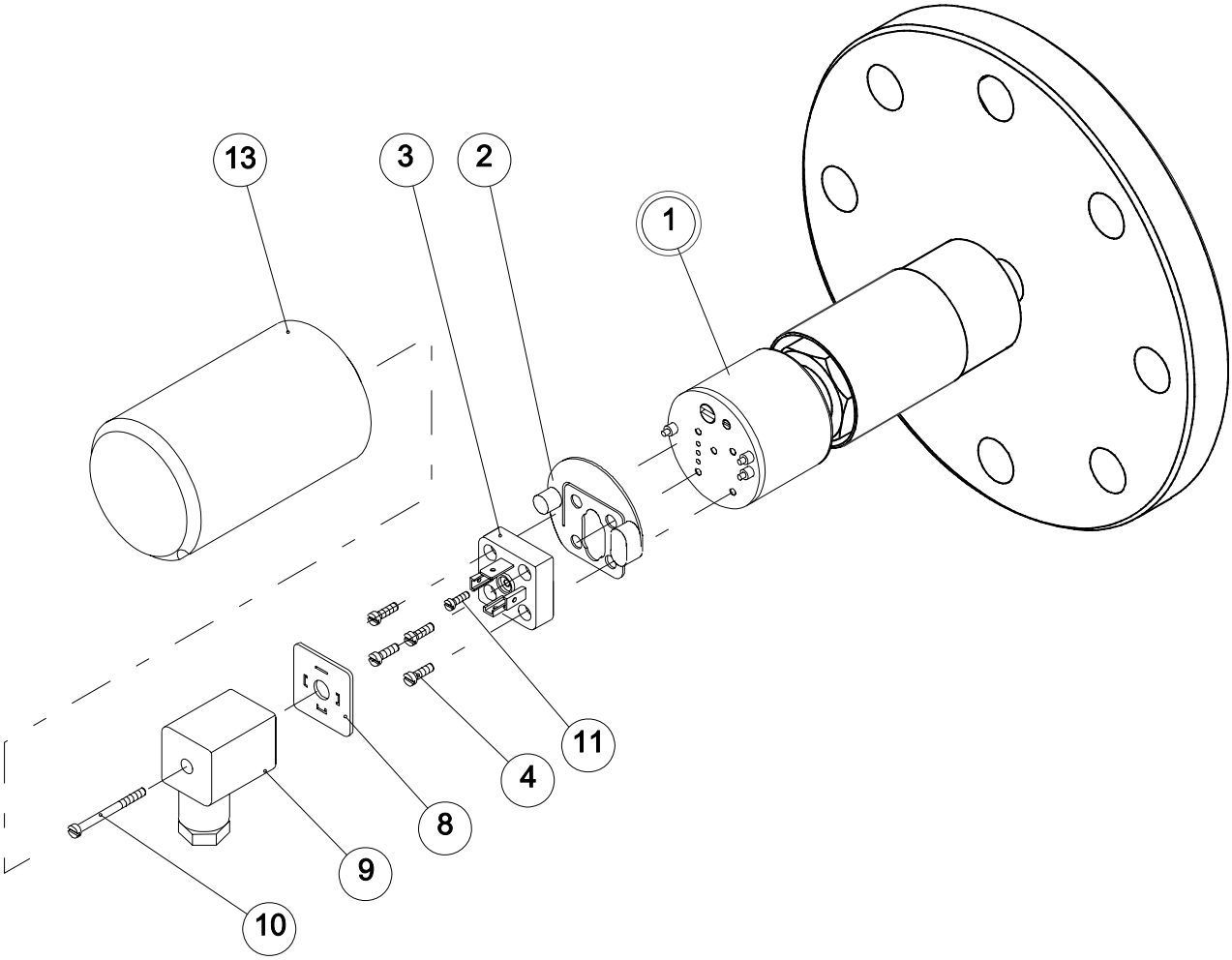


Figure 5-1 Parts list: VL with flange process connection and enclosure codes **H** and **T**

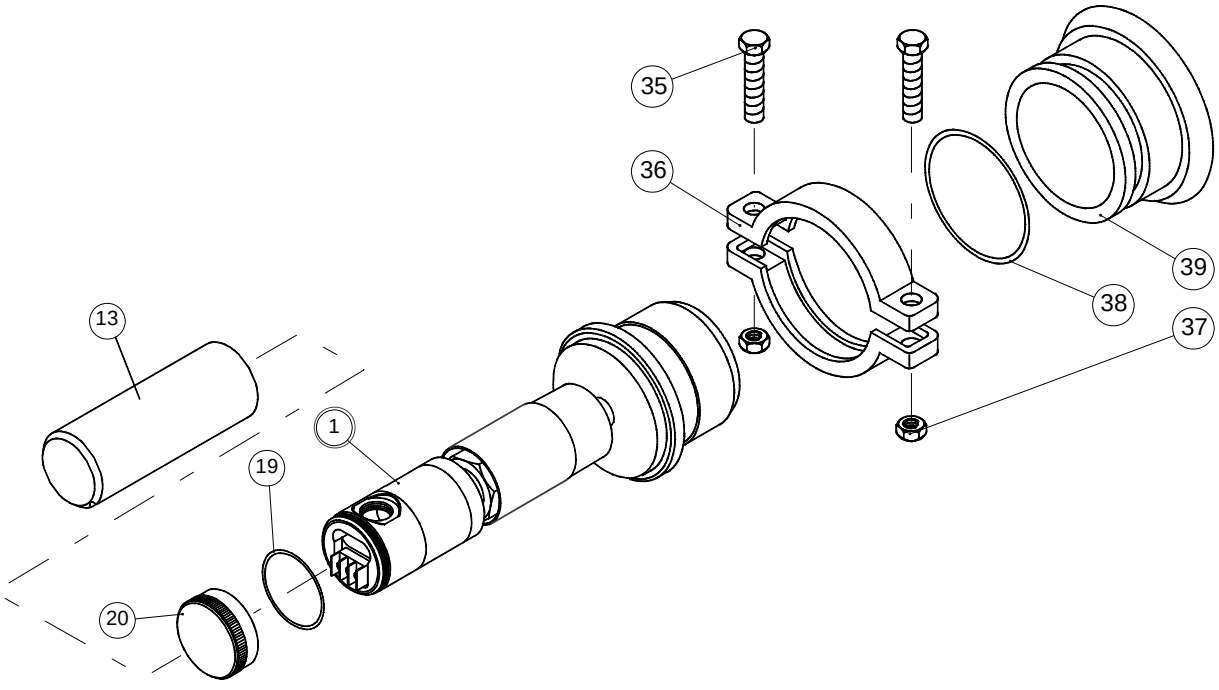


Figure 5-2 Parts list: VL with Sandvik-clamp process connection and enclosure code **M**

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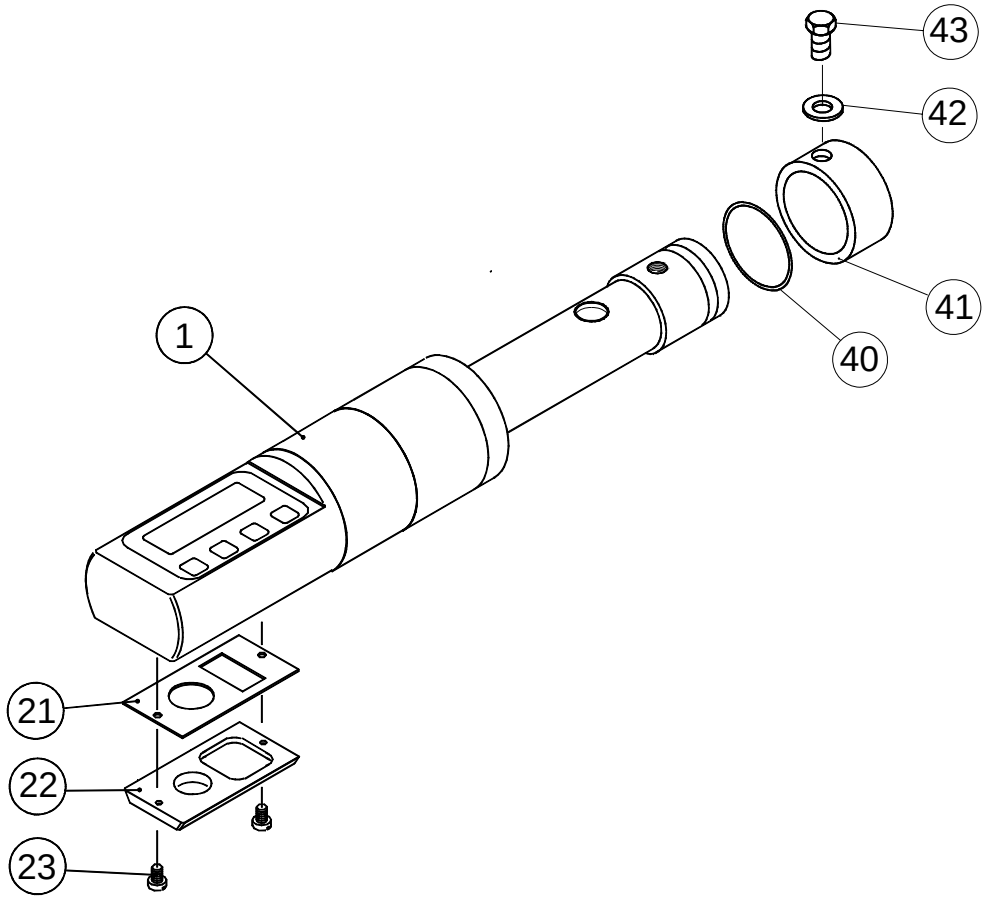

Figure 5-3 Parts list: VL with PMC 1" process connection and enclosure code **N** (display)

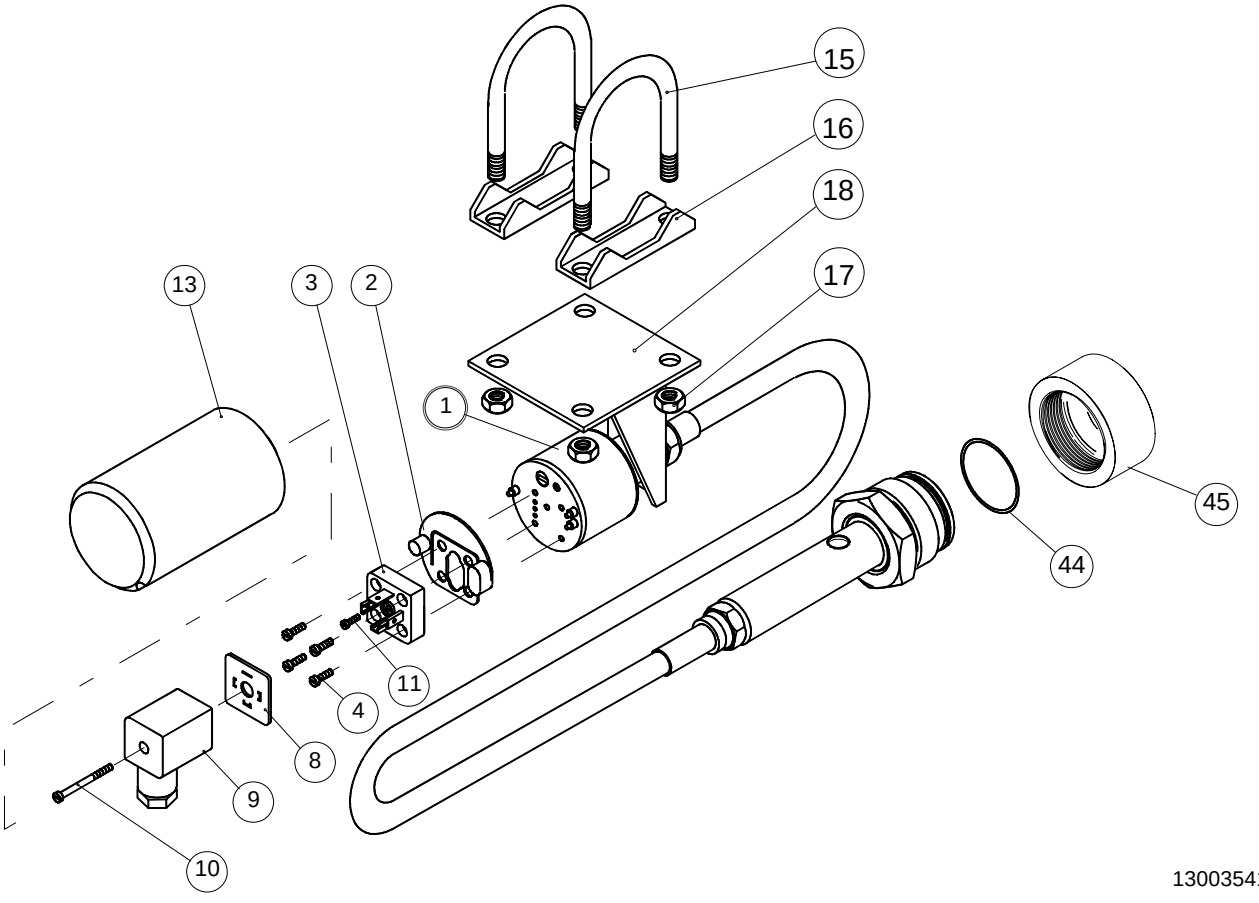

Figure 5-4 Parts list: VL with M45x2 process connection and remote electronics

Number	Name	Order number
1	Sensing element	
2	Seal	T1300207
* 3	Device plug DIN43650	72900114
4	Cylinder-head screw M3 x 10 SFS2179 Zne	51603021
7	O-ring 20 x 2 ,Viton (PTFE)	80012500 (80550847)
8	Seal GDM3-17,silicone	72900116
* 9	Wiring box GDM3009, DIN43650	72900111
10	Cylinder-head screw S M3 x 35 SFS2179 A4	51723053
11	Cylinder-head screw S M3 x 4 VSM 13302 Zne	51613009
* 13	Protection cup, housing H, M and T	T1300295
	Protection cup, housing N	T1300400
* 15	Mounting clamp	T544953
* 16	Support plate	T543223
17	Hex nut M8 SFS2067 A4	56022800
* 18	Mounting bracket S	T1050009
19	O-ring, 42x2 FPM (Viton®)	80013800

Number	Name	Order number
* 20	Cover M	T1300256
21	Seal, Silicone rubber	T1300387
* 22	Back plate V	T1300391
23	Fastening screw M4	T1325347
35	Hex bolt, M10 x 40 SFS2064 m A4	54228140
* 36	Mounting clamp NS70/76.1-SFS 2333	82220000
37	Hex nut M10 SFS 2067 A4	56022810
38	Seal EPDM	T1051205
38	Seal FPM (Viton®)	T1051204
38	Seal PTFE	T1051203
* 39	Coupling Sandvik 53 mm	T547290
* 39	Coupling Sandvik 104 mm	T547291
* 39	Coupling Sandvik 155 mm	T547292
40	O-ring 18.64 x 3.53 FPM	8001186353
* 41	Coupling PMC1"	M1050300
* 42	Washer 8.4 A4 DIN125	50002630
43	Hex screw M8x12 A4	54228010
44	O-ring 34.6x2.62 FPM	80013460
* 45	Coupling M45x2, adjusting O-ring 41.2x3 FPM	M1050459 800141230

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