

Installation and Setting-Up Instructions Spare Parts List



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DOCUMENTS

Technical Specifications: BA200

Installation and Setting-Up Instructions: BA200AV

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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, info@satron.com

SATRON VO Turbidity and solids content analyzer

1. INSTALLATION

1.1 Mechanical installation

Mounting recommendations: Fig. 1-1

- Process connection direction: horizontal
- Cable entry direction: from below
- Connector coupling direction, calibration direction: horizontal
- Process flow: Upwards

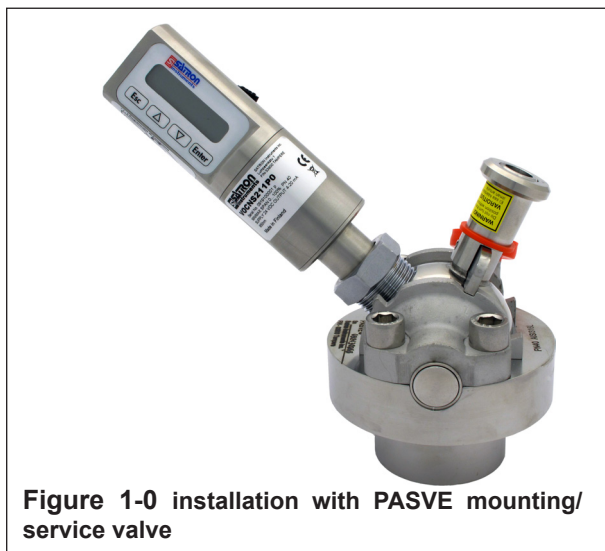


Figure 1-0 installation with PASVE mounting/ service valve

installation with process coupling



Figure 1-1 Recommended mounting positions

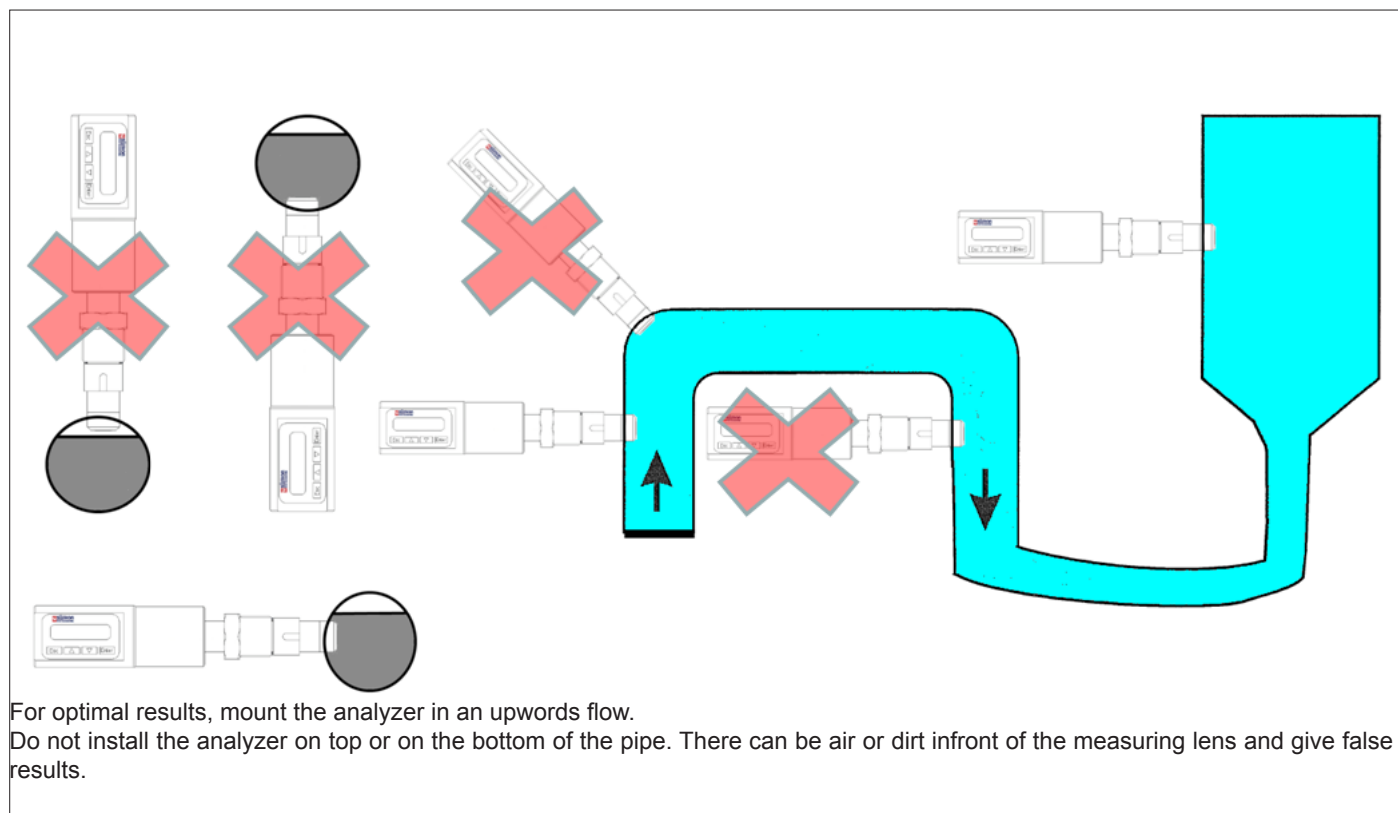
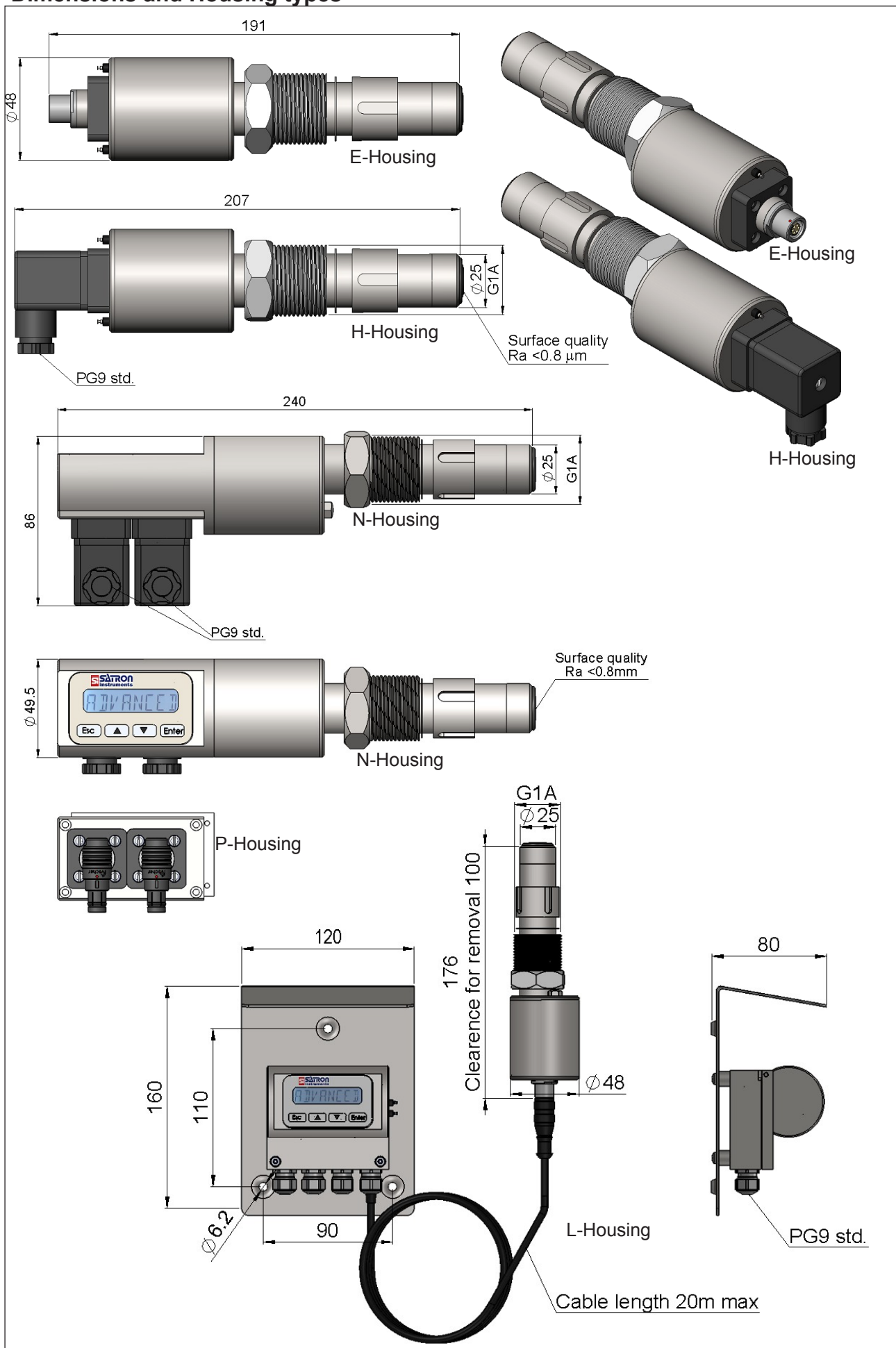


Figure 1-2 Basic mounting dimensions

SATRON VO Turbidity and solids content analyzer

Dimensions and Housing types



SATRON VO Turbidity and solids content analyzer

1.1.1 Installing welded process couplings

Mounting hole for coupling

- Make a $\varnothing 45.5$ mm (+0.5/-0.2 mm) hole in the tank wall or pipe, as shown in Figure 1-3.

Welding the coupling

These instructions apply to all welded couplings; welding the G1 standard coupling is described here as an example.

- Place the coupling in the mounting hole as shown in Fig. 1-4. Then weld with several runs so as to prevent the coupling's oval distortion and tightness problems.
- The analyzer must be **out of the coupling** while the coupling is welded. You can use the shut-off plug shown in Fig. 1-5 to shut the coupling. The plug protects the coupling's sealing face and permits the starting of the process without the transmitter.
- It is always recommendable to use the welding assistant (M1050450) while welding the coupling to prevent any distortions due to heat.
- Do not make weld grounding via any analyzer's body!

1.1.2 Mounting the analyzer on the coupling

Procedure

- Make sure that the coupling's sealing face is clean.
- Remove the orange protective plug from the analyzer head.

- Insert the analyzer **in a straight line** into the coupling, so that the guide groove on the transmitter aligns with the stop pin on the coupling. The analyzer settles into position when the groove and pin are aligned, and will be prevented from rotating in the coupling.

When inserting the analyzer, be careful not to damage the edge of the lens on the edges of the coupling or on the end of the stop pin!

- Lock the transmitter in position by screwing the hex nut fully home. Finger tightness is sufficient to tighten the sealing faces. However, we recommend final tightening with a tool to eliminate the effect of vibration and other such factors. Apply 60 ± 20 Nm torque.

Do not use sealing tape etc. on threaded connection!

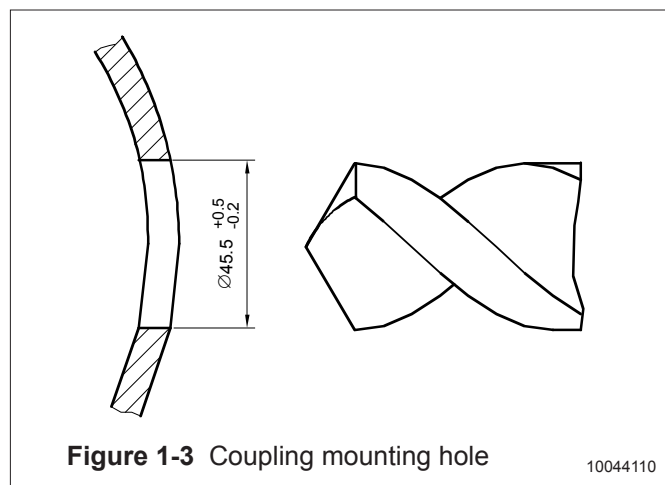


Figure 1-3 Coupling mounting hole

10044110

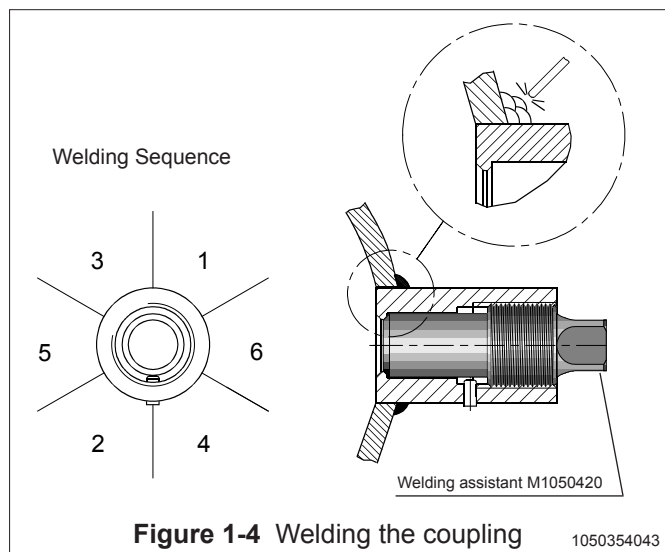


Figure 1-4 Welding the coupling

1050354043

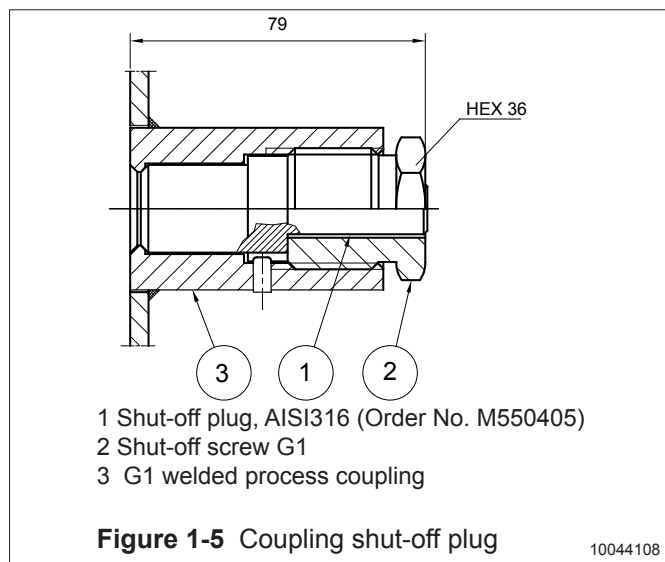


Figure 1-5 Coupling shut-off plug

10044108

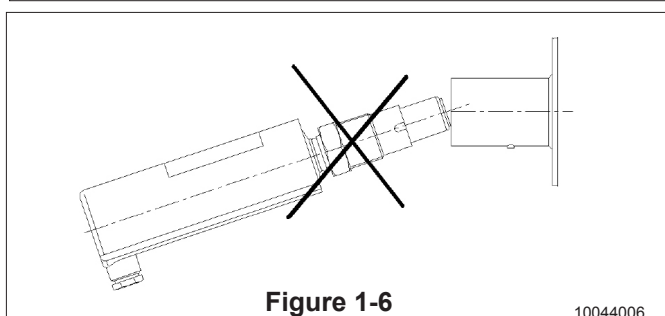
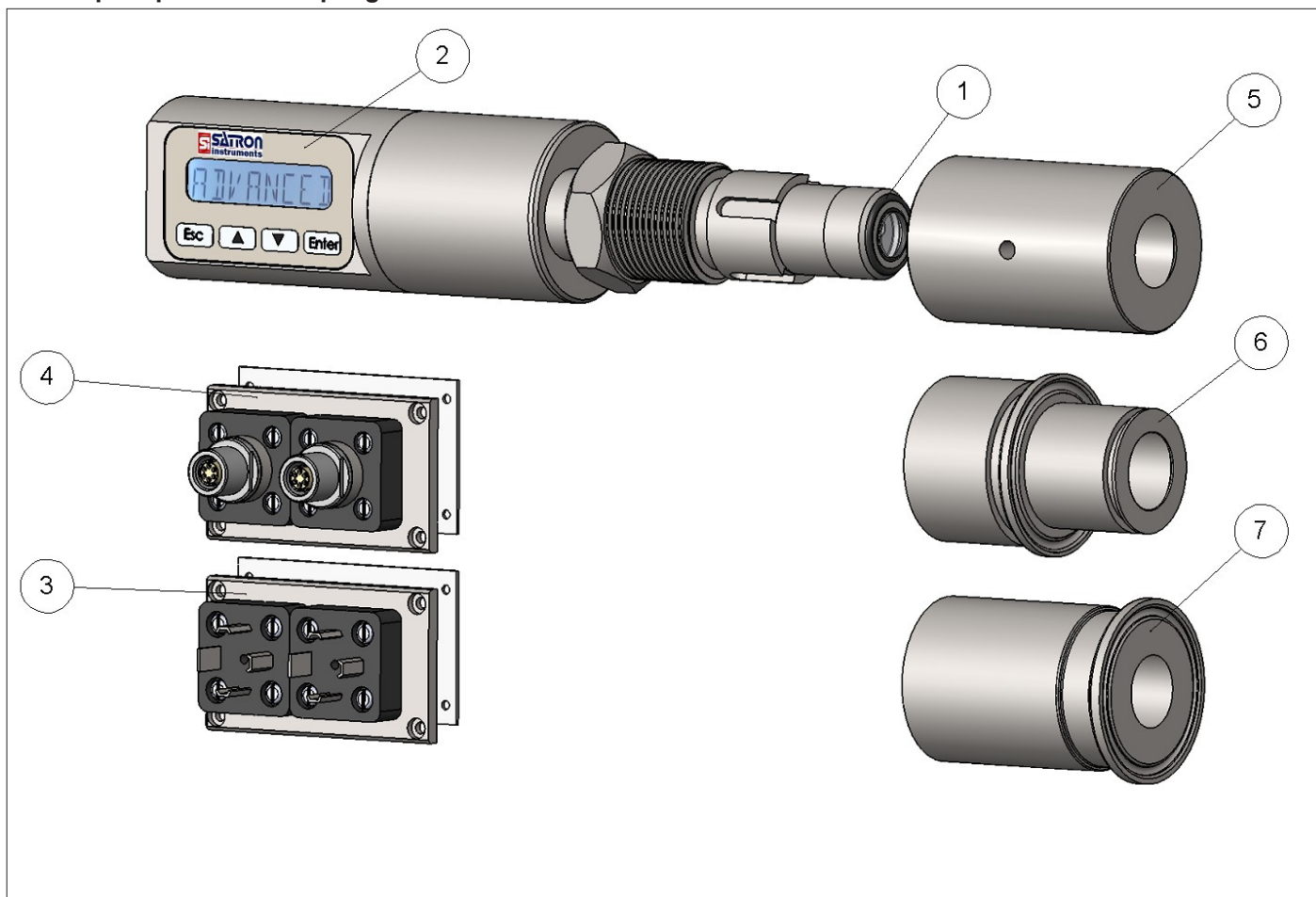


Figure 1-6

10044006

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1.1.3 Spare parts and couplings



Part Number	Part name	Satron Order Number
1	O-ring (EPDM)	80031720
1	O-ring (FPM)	80011720
2	Sticker	T1325215
3	Plug connector DIN43650	T1325003
4	M12 connector	T1325005
5	Hygienic coupling	M548101
6	Tri-clamp 38	M1325229
7	Tri-clamp 38 ISO2852	M1050206
7	Tri-clamp 40 ISO2852	M1050222
7	Tri-clamp 51 ISO2852	M1050223
7	Tri-clamp 63.5 ISO2852	M1050224

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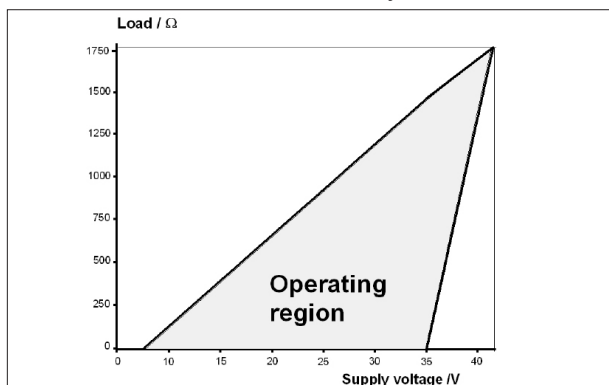
1.2 Electrical connections

Supply voltage and load of the transmitter according to the figure 1-16.

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.



Min. load using HART® - communication 250 Ω

$$R_{max} = \frac{\text{Supply voltage} - 5 \text{ V}}{I_{max}}$$

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

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

Figure 1-16 Supply voltage and load capacity

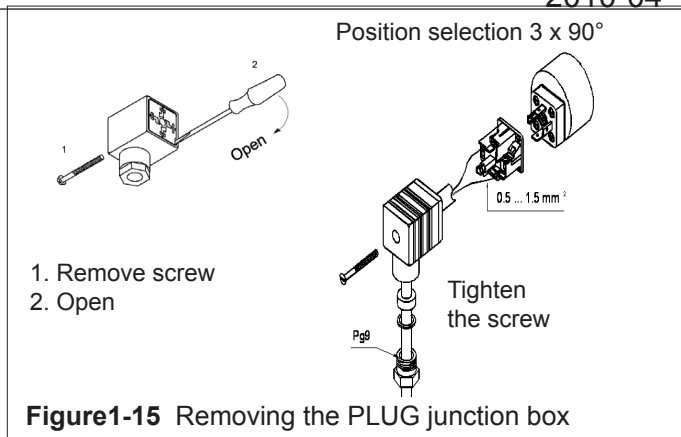


Figure1-15 Removing the PLUG junction box

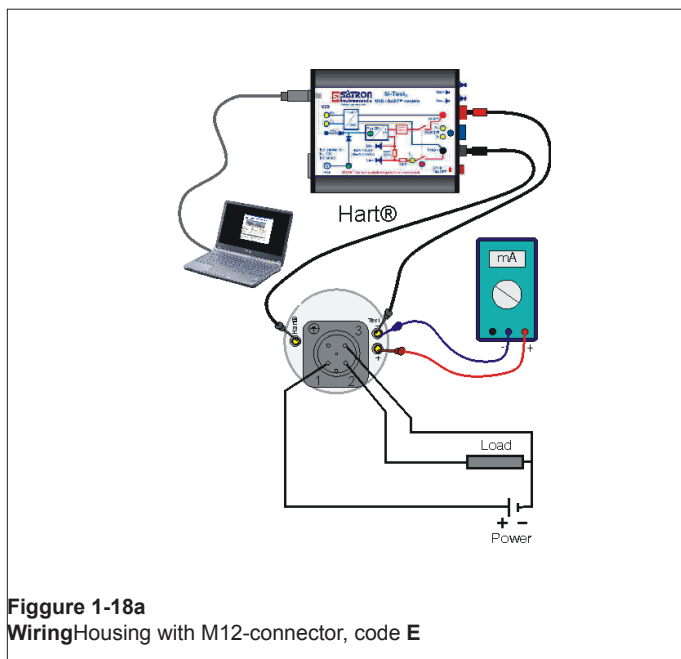


Figure 1-18a WiringHousing with M12-connector, code E

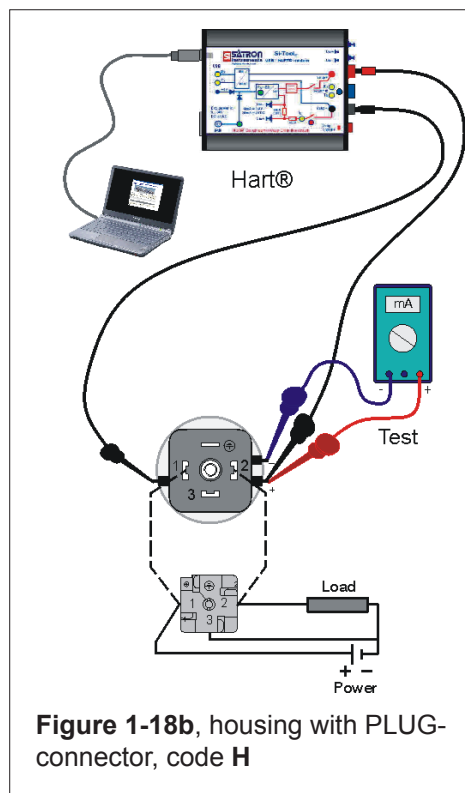


Figure 1-18b, housing with PLUG-connector, code H

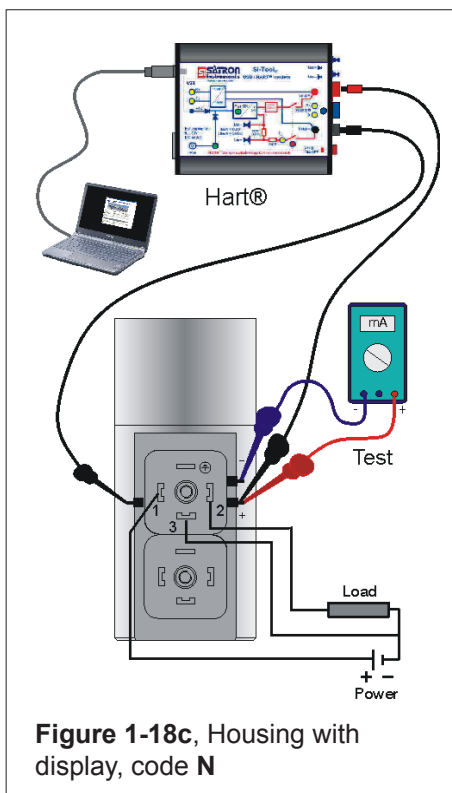


Figure 1-18c, Housing with display, code N

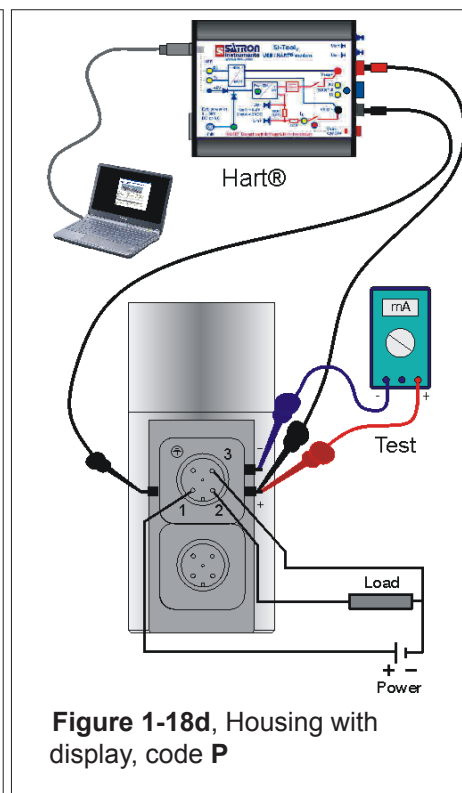


Figure 1-18d, Housing with display, code P

2.1 Setting-up with Satron-VoAdvisor Service Software

When you want to have all the operations of the Smart transmitter, we recommend the use of Satron-VOadvisor Service Software program. Satron Instruments Inc. will deliver you the program, HART-modem and HP-2133 Mini Note PC according the order.

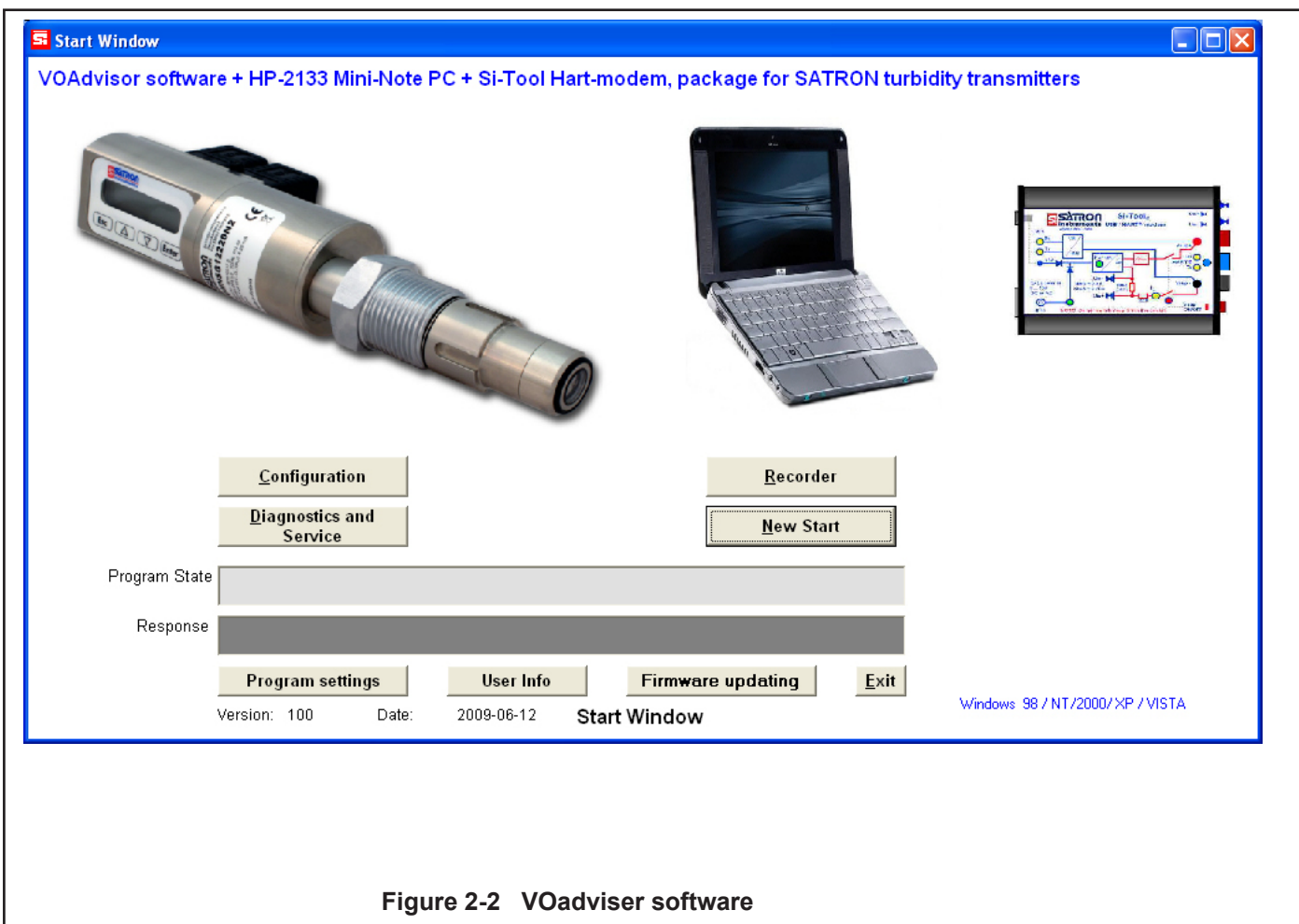
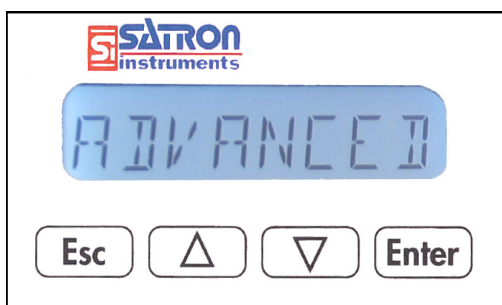


Figure 2-2 VOadvisor software

2.2 Setting-up with local switches

The additional instruction of display menus is enclosed to this manual. See chapter 4



Housing with display, code N

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 2-3 VO pressure transmitter with display

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2.3 Setting up with VO remote unit.

The Satron VO remote can be provided with a wall box which is capable of having a 20m cable between the Sensing unit and the Display unit. Inside the Display unit is a terminal where up to 3 binary inputs, 3 relay outputs and 2 analog milliamp loops can be connected. All connections can be used simultaneously. The signal cable between the Display unit and Sensing unit should not be installed near high-voltage cables, large motors or frequency converters.

The diagram, titled "Selection window for I/O functions (remote display VO types)", illustrates the wiring between a "VO remote transmitter" and an "Automation system".

- VO remote transmitter terminals:**
 - VO Digital input: 1 (D1), 2 (D2), 3 (D3), 4 (DIG), 5 (GND), 6 (GND), 7 (I01), 8 (GND), 9 (+24V).
 - VO Digital output: 10 (D01), 11 (D02), 12 (D03), 13, 14, 15.
 - mA-outputs: 16 (PS), 17 (I02), 18 (I02).
 - Other: Int. Vsup., Ext. Vsup.
- Automation system connections:**
 - System digital output: Connected to transmitter terminals 1, 2, 3, 4, 5, 6, 7, 8, 9.
 - System analog input: Two loops, each 4...20mA, connected to transmitter terminals 16, 17, 18.
 - System digital input: Connected to transmitter terminals 10, 11, 12, 13, 14, 15.

Accompanying the diagram is a photograph of the physical terminal block on the automation system, showing the internal wiring and terminal positions.

VO Remote Connections

The photograph shows the internal components of the sensing element. A dipswitch is labeled "Update Normal". Below it, a USB port is labeled "Hart® - Test +".

VO Sensing connections.
 Inside the Sensing element is a dipswitch and a USB port. This is only used for updating the firmware.
DO NOT USE THE USB PORT UNLESS THERE NEEDS TO BE A NEW FIRMWARE INSTALLED.

3 Set-up Calibration.

The VO series analyzer comes with a standard factory calibration.

There is space for 4 different calibrations, called recipe 1, 2, 3 and 4. Standard the factory calibration is stored in recipe 1. The different recipes can be renamed and also be enabled with the binary inputs.

To change a calibration Satron recommends to use the "VoAdvisor" software. It is also possible to change the calibration with the use of the sensors own user interface.

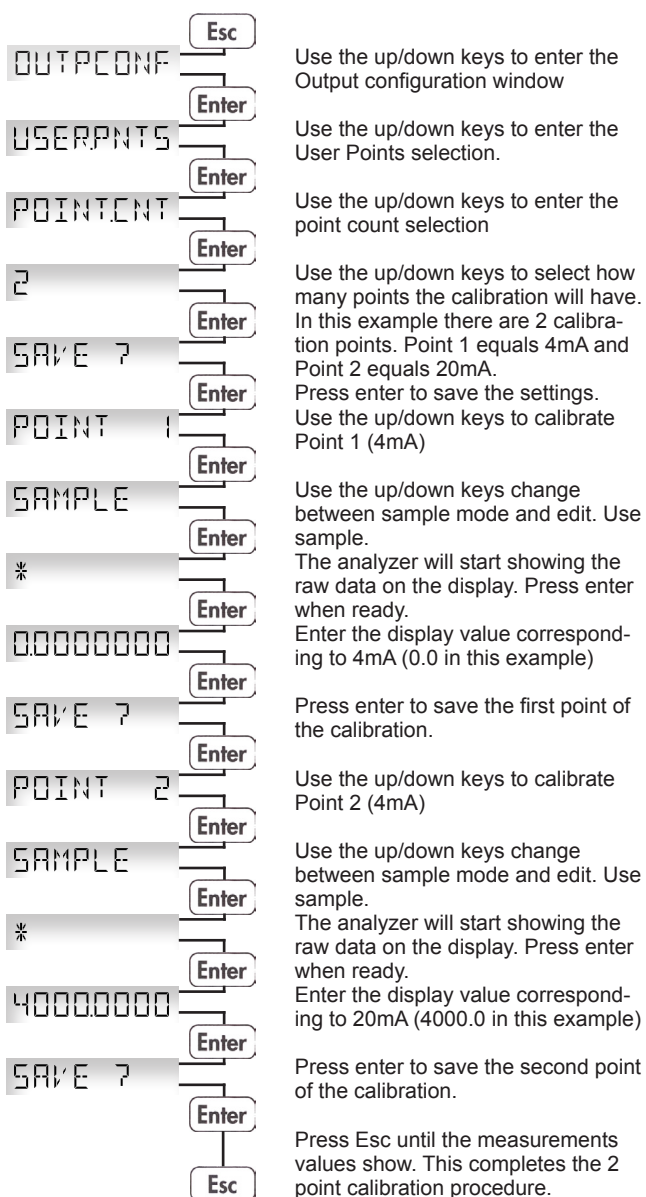
Change recipe.

The current enabled recipe is shown with the down arrow when the normal user value (in measurement values) is shown.

To enable a different recipe go to **OUTPCONF** and **RECIPE**

Here you can choose between 1, 2, 3 and 4. Press enter to save.

2 point calibration guide.



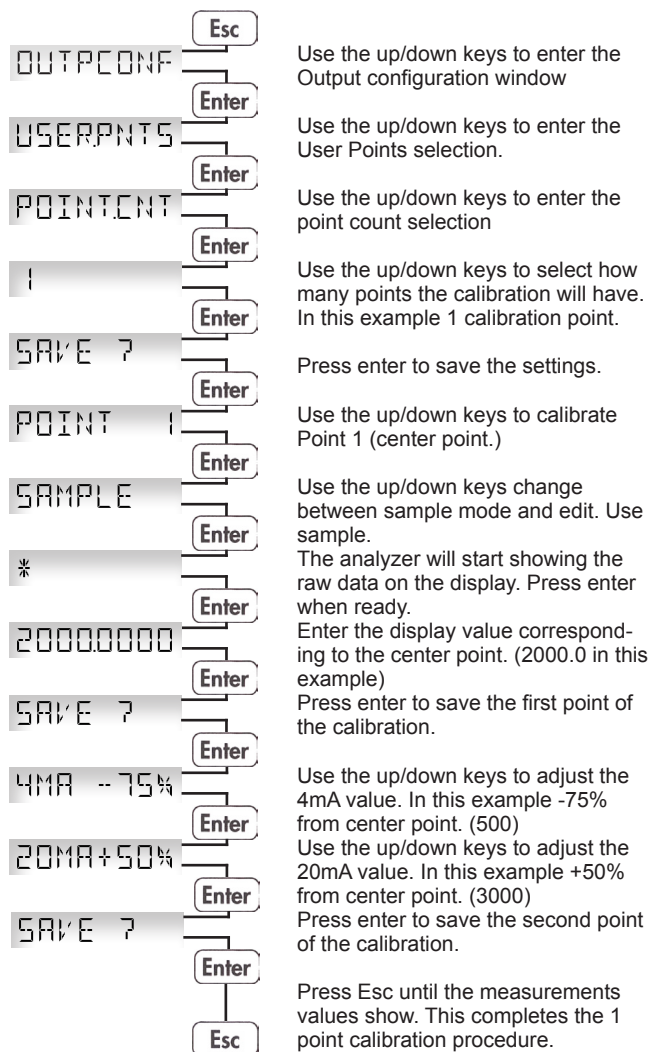
1 point calibration guide.

The unit is calibrated with 1 known sample. This is the Center point. In this example the Center point is equal to 2000.

The 4mA value is selected as -75% from the center point (500).

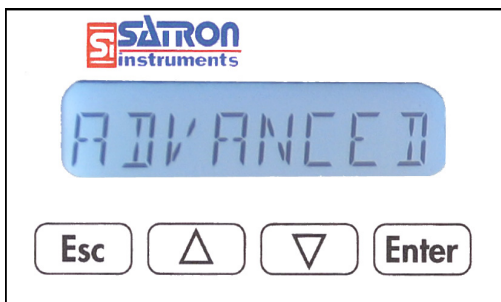
The 20mA value is selected as +50% from the center point (3000).

Calibration is 4mA=500 20mA=3000.



4. USER GUIDE FOR MENUS

The user interface for the series VO analyzers, housing option N, consists of display and operating keys. Among other things, the user interface allows you to set process variables in the desired units on the display and to configure the analyzer e.g. by setting the lower and upper range-values. In addition, you can perform diagnostic routines and view device information through the user interface.



The 8-character liquid crystal display (LCD) with backlight allows you to display information with letters and numbers.

OPERATING KEYS:

With the UP/DOWN arrow keys and the ENTER and ESC you can move in the menus.

ENTER:

Press ENTER to move to a lower level in a menu or to accept a command or parameter value.

UP:

Use the UP arrow key to move up on the current menu level or to increase the selected parameter value.

DOWN:

Use the DOWN arrow key to move down on the current menu level or to decrease the selected parameter value.

ESC:

Press the ESC to move back towards the top of the main menu or cancel the current action.

4.1 MEASUREMENTS VALUES MENU:

When the analyzer is powered up, it immediately shows the MEASUREMENT VALUES. Use the UP/DOWN keys to move in the menu. The menu does not have any variables adjustable by the user.

Pressing DOWN shows you the following parameters in order.

U	the user calibrated information.
DI03	the status of the digital input/output #3
DI02	the status of the digital input/output #2
DI01	the status of the digital input/output #1
E	the temperature of the electronics
S	the temperature of the sensor head
MA1	the value of the first mA loop
MA2	the value of the second mA loop
UNIT	the selected UNIT for the user calibrated information. (%)

4.2 SUBMENUS:

Under the main menu are 6 submenus: System configuration, Measurement configuration, Output-configuration, Info, Diagnostics and Advanced. To enter these submenus press ESC. See page 15.

4.2.1 SYSTEM CONFIGURATION **SYSTCONF**

(configure parameters that have an effect on the system like e.g. language and date.)

TAG: TAG

Tag code. You can enter free-format text one character at a time. When you select this option with **ENTER** the cursor will be at the left. Select characters with **ENTER** (to the right) and **ESC** (to the left). You can view the selectable characters one character at a time with the **UP/DOWN** keys until the desired character is found. When the cursor is at the right edge you can go back to the **SYSTCONF** menu either by accepting the new tag code with **ENTER** or by pressing exiting without changing the tag code by pressing the **ESC** key when asked to accept your entry. Apostrophe indicates the cursor position; at point, however, the cursor will disappear. A great deal of special characters are available besides letters and numbers.

FACTORY: FACTORY

Restore Factory settings. After entering this menu you will get a warning message that the configurations will be lost after this point. To cancel the procedure press **ESC**.

PASSWORD: PASSWORD

From this menu you can set a password (0...999) for the analyzer. If a password has been specified, you cannot set any parameters or make any other settings on the analyzer unless you enter the correct ID number in this menu. Password is not in use when **PASSWORD** is 000 after reset. You enter the **PASSWORD** in the same way as **TAG**. **PASSWORD** will be on when you define a value between 1 and 999. If you forget password get on to Satron Instruments Inc.

DISPLAY: DISPLAY

In this menu you can select the looks in which the display will be read.

BACKLIGHT: Select the intensity of the backlighting from **OFF, LOW, MEDIUM** and **HIGH**.

ANGLE: lets you select the angle of the text.

NORMAL: From left to right. Transmitter mounted horizontally with process connection directed to the right.

ROTATED: Rotates the text 180 degrees from **NORMAL**.

HART: HART

Select this function with the **UP/DOWN[↑↓]** keys. In menus 1-3 you select the content of the burst message. You can view the available selections with the **UP/DOWN[↑↓]** keys. Available options:

In menu 1 (PV): Transmitter sends process value PV to system.

In menu 2 (PERCEN%): Transmitter sends process variable's value in per cent of specified measuring range to master.

In menu 3 (PVS/CURR): Transmitter sends all process variables and current signal's value.

In menu 5 (POLL ADR): Select the transmitter's Hart® address. The address can be set between 0 and 15. Address 0 defines current loop, in which case the transmitter will operate in two-wire system. The procedure is the same as described above.

In menu 6 (BURST ON/OFF): Select the Burst mode. First define the process variable sent by the transmitter from menus 1-3. The procedure is the same as described above.

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DATE: DATE

From this menu you can set the date DD.MM.YYYY. You enter the DATE in the same way as TAG. The calendar year can be selected from between 1900 and 2155. This date can be example the date of the last calibration done.

LANGUAGE: LANGUAGE

Select the Display language.
 FINNISH, ENGLISH, SWEDISH, GERMAN, DUTCH, FRENCH.

5.2.2 MEASCONF: MEASCONF

(configure parameters that have an effect on the measurement.)

DAMPING: DAMPING

Time constant, in seconds for output damping. The range is 0.000s to 60s. Set the value with the **UP/DOWN** keys and accept it with **ENTER** or press **ESC** if you do not want to change the value.

AVERAGE: AVERAGE

Time constant in Hz for averaging the output. The range is 1Hz to 50Hz. Set the value with the **UP/DOWN** keys and accept it with **ENTER** or press **ESC** if you do not want to change the value.

UNIT: UNIT

Here you can select what unit you want to show in the display as process value.

FNU, FTU, NTU, %, mg/L*, ppm*

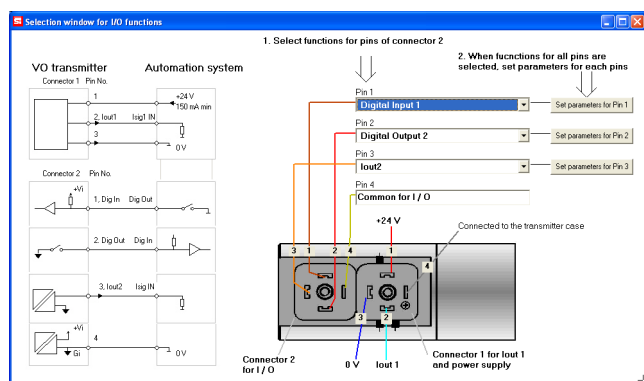
* only available in COD models.

LED CURR: Select the maximum amount of current that the LED is using in percentages.

5.2.3 I/O CONF: I/O CONF

(configure parameters that have an effect on the INPUT and OUTPUT relays).

Satron highly recommends the use of the software package VOadviser to alter these settings!



VoAdviser input / output configuration window

I/O 1: I/O 1

Settings menu for input / output PIN #1.

TYPE: TYPE

Select the function. When "NONE" is selected it will be off. To use it as a digital input, select DIN1. For digital output select DOUT1.

OF TIMER: OF TIMER

Overfeed timer limits the time that the digital output can be continuously in ON state.

The time can be selected in seconds in the range of 1...60000s. By default the overfeed timer is not used.

Note: overfeed timer does not function if digital output is overridden by HOLD function, when performing a I/O test in the DIAG-NOST menu or with HART CPU Control/ DOOverride.

OF DELAY: OF DELAY

Off delays can be used to delay digital output state from ON > OFF transitions. The time can be selected in seconds in the range of 0...300s. By default the off delay is not used.

ON DELAY: ON DELAY

On delays can be used to delay digital output state from OFF > ON transitions. The time can be selected in seconds in the range of 0...300s. By default the off delay is not used.

DEADBAND: DEADBAND

Select the deadband area. In this area the state will not change to prevent fast ON/OFF switching. By default this area is 0.

LO VALUE: LO VALUE

Enter the lower limit value for the state transition of the digital output

HI VALUE: HI VALUE

Enter the upper limit value for the state transition of the digital output

SWITCH: SWITCH

Change the direction of the transition change of the digital output

SOURCE: SOURCE

Select the source to which the digital output will change its state.

PV is the process value selected by the user. (value which is behind "U" on the display).

MA is the 1st current loop

ST is the sensor temperature located 5 millimeter behind the optical lens

RANGE-% this will show a 0 to 100 % value correlating to 4...20mA.

FUNCTION: FUNCTION

HI LIMIT the digital output will change its state depending on the HI VALUE

LO LIMIT the digital output will change its state depending on the LO VALUE

HILO LIMIT the digital output will change its state depending on the HI and LO VALUE

ERROR AL the digital output will change its state when there is an error

WARNG AL the digital output will change its state when there is a warning

ERWNG AL the digital output will change its state when there is a error and/or warning

HOLD when the digital input is ON the whole unit will be in a hold until the input is OFF.

NONE no function.

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I/O 2: I/O 2

Settings menu for input or output PIN #2.

TYPE: TYPE

When "NONE" is selected it will be off. To use it as a digital input, select DIN2. For digital output select DOUT2. When the second current loop is used with an external power supply this needs to be set at IO2EXT.

OF TIMER: OF TIMER

Overfeed timer limits the time that the digital output can be continuously in ON state.
 The time can be selected in seconds in the range of 1...60000s.
 By default the overfeed timer is not used.
 Note: overfeed timer does not function if digital output is overridden by HOLD function, when performing a I/O test in the DIAG-NOST menu or with HART CPU Control/ DOOverride.

OF DELAY: OF DELAY

Off delays can be used to delay digital output state from ON > OFF transitions. The time can be selected in seconds in the range of 0...300s. By default the off delay is not used.

ON DELAY: ON DELAY

On delays can be used to delay digital output state from OFF > ON transitions. The time can be selected in seconds in the range of 0...300s. By default the off delay is not used.

DEADBAND: DEADBAND

Select the deadband area. In this area the state will not change to prevent fast ON/OFF switching. By default this area is 0.

LO VALUE: LO VALUE

Enter the lower limit value for the state transition of the digital output

HI VALUE: HI VALUE

Enter the upper limit value for the state transition of the digital output

SWITCH: SWITCH

Change the direction of the transition change of the digital output

SOURCE: SOURCE

Select the source to which the digital output will change its state.
 PV is the process value selected by the user. (value which is behind "U" on the display).
 MA is the 1st current loop
 ST is the sensor temperature located 5 millimeter behind the optical lens
 RANGE-% this will show a 0 to 100 % value correlating to 4...20mA.

FUNCTION: FUNCTION

HI LIMIT the digital output will change its state depending on the HI VALUE
 LO LIMIT the digital output will change its state depending on the LO VALUE
 HILO LIMIT the digital output will change its state depending on the HI and LO VALUE
 ERROR AL the digital output will change its state when there is an error
 WARNG AL the digital output will change its state when there is a warning
 ERWNG AL the digital output will change its state when there is a error and/or warning
 HOLD when the digital input is ON the whole unit will be in a hold until the input is OFF.
 NONE no function.

I/O 3: I/O 3

Settings menu for input or output PIN #3.

TYPE: TYPE

When "NONE" is selected it will be off. To use it as a digital input, select DIN3. For digital output select DOUT3. The enable the second milliamp loop select IO2.

OF TIMER: OF TIMER

Overfeed timer limits the time that the digital output can be continuously in ON state.
 The time can be selected in seconds in the range of 1...60000s.
 By default the overfeed timer is not used.
 Note: overfeed timer does not function if digital output is overridden by HOLD function, when performing a I/O test in the DIAG-NOST menu or with HART CPU Control/ DOOverride.

OF DELAY: OF DELAY

Off delays can be used to delay digital output state from ON > OFF transitions. The time can be selected in seconds in the range of 0...300s. By default the off delay is not used.

ON DELAY: ON DELAY

On delays can be used to delay digital output state from OFF > ON transitions. The time can be selected in seconds in the range of 0...300s. By default the off delay is not used.

DEADBAND: DEADBAND

Select the deadband area. In this area the state will not change to prevent fast ON/OFF switching. By default this area is 0.

LO VALUE: LO VALUE

Enter the lower limit value for the state transition of the digital output

HI VALUE: HI VALUE

Enter the upper limit value for the state transition of the digital output

SWITCH: SWITCH

Change the direction of the transition change of the digital output

SOURCE: SOURCE

Select the source to which the digital output will change its state.
 PV is the process value selected by the user. (value which is behind "U" on the display).
 MA is the 1st current loop
 ST is the sensor temperature located 5 millimeter behind the optical lens
 RANGE-% this will show a 0 to 100 % value correlating to 4...20mA.

FUNCTION: FUNCTION

HI LIMIT the digital output will change its state depending on the HI VALUE
 LO LIMIT the digital output will change its state depending on the LO VALUE
 HILO LIMIT the digital output will change its state depending on the HI and LO VALUE
 ERROR AL the digital output will change its state when there is an error
 WARNG AL the digital output will change its state when there is a warning
 ERWNG AL the digital output will change its state when there is a error and/or warning
 HOLD when the digital input is ON the whole unit will be in a hold until the input is OFF.
 NONE no function.

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5.2.4. OUTPCONF

(configure parameters that have an effect on the output current loops). Change the recipe and perform new calibrations.

RECIPE

Upto 4 different recipe's can be stored in the VO. The basic factory calibration is stored standard in Recipe 1.

To perform a new calibration its recommended to use a different recipe.

LIN FUNC:

Change the transfer function between USER and LINEAR. LINEAR is the standard linear transfer function using lower and upper range values. (LRV & URV)

This transfer function is used for scaling mA, it does NOT change the process value PV. The user point table is not in use.

USER is the default transfer function, in which the process value PV can be changed using 2...16 calibration point pairs.

USER.PNTS:

With the LIN FUNC selected as USER, the number of points is selected with the counter.

POINT.CNT Point counter for selecting the amount of calibration points. 1...16.

POINT 1...16 By selecting SAMPLE for the corresponding point, a realtime measurement will start and when the user presses "ENTER" the unit will average the sample currently measuring and save this for the current point number. The first point corresponds to 4mA output and the last point corresponds to 20mA output.

By using the edit function the user is able to alter the raw Please refer to the chapter CALIBRATION EXAMPLE of this manual to find more detailed information how to perform a full re-calibration.

USER MODE:

Select the interpolation method between points.

- INTERPL selects linear interpolation.
- SPLINE selects spline interpolation.

5.2.4. INFO:

MANUFACTURER:

Manufacturer's name. (SATRON) Cannot be changed.

OPERATION TIME:

The value of the operation time save at 1 hour intervals. When the value of the counter is < 100 hours so value save 1-minute intervals. The value of the operation time counter on the display :

- HH :MM :SS when the value of counter is <100 hours
- HHHH : MM when the value of counter is <100000 hours
- HHHHHHHH when the value of counter is ≥100000 hours

SERIAL NUMBER:

Serial number. Cannot be changed.

ASSEMBLY NUM:

The analyzers assembly number. Press ENTER to select this item. Press ESC to exit. For instance, assembly number 0901 shows that the transmitter was made in week 01 of the year 2009.

VERSION:

Version numbers of the transmitter's electronics and software. Press ENTER to select this item. Press ESC to exit. With the UP/DOWN keys you can select either CPU HW, CPU SW, ADC HW, ADC SW or MAN REV (manual revision) revision number

or CPU ID-number from this submenu.

DEVICE TYPE:

Product type code. Cannot be changed.

5.2.5. DIAGNOSTICS:

(This submenu allows you to examine the transmitter's internal errors and faults, to set the transmitter to give out a fixed current, and to calibrate the transmitter.)

STATUS:

Here you can display and reset accumulated errors one at a time. The text OK will be displayed if there are no errors. Possible error messages (alarm means a serious fault/error that also puts the current signal in fault status and makes the display blink)

LOOPTEST:

The transmitter can be set to give out a fixed current signal for testing the mA output. The first ENTER will switch the transmitter off from normal mode (AUTO OFF), the second ENTER will set it for 4 mA output, and the third ENTER for 20 mA output. The next ENTER after that will give default value 12 mA, which can be changed as desired with the UP/DOWN keys. The last ENTER will switch the transmitter back to normal mode (AUTO ON). The purpose of this test is to test the accuracy of the transmitter's current output with a reference meter.

LOOPCALIBRATION:

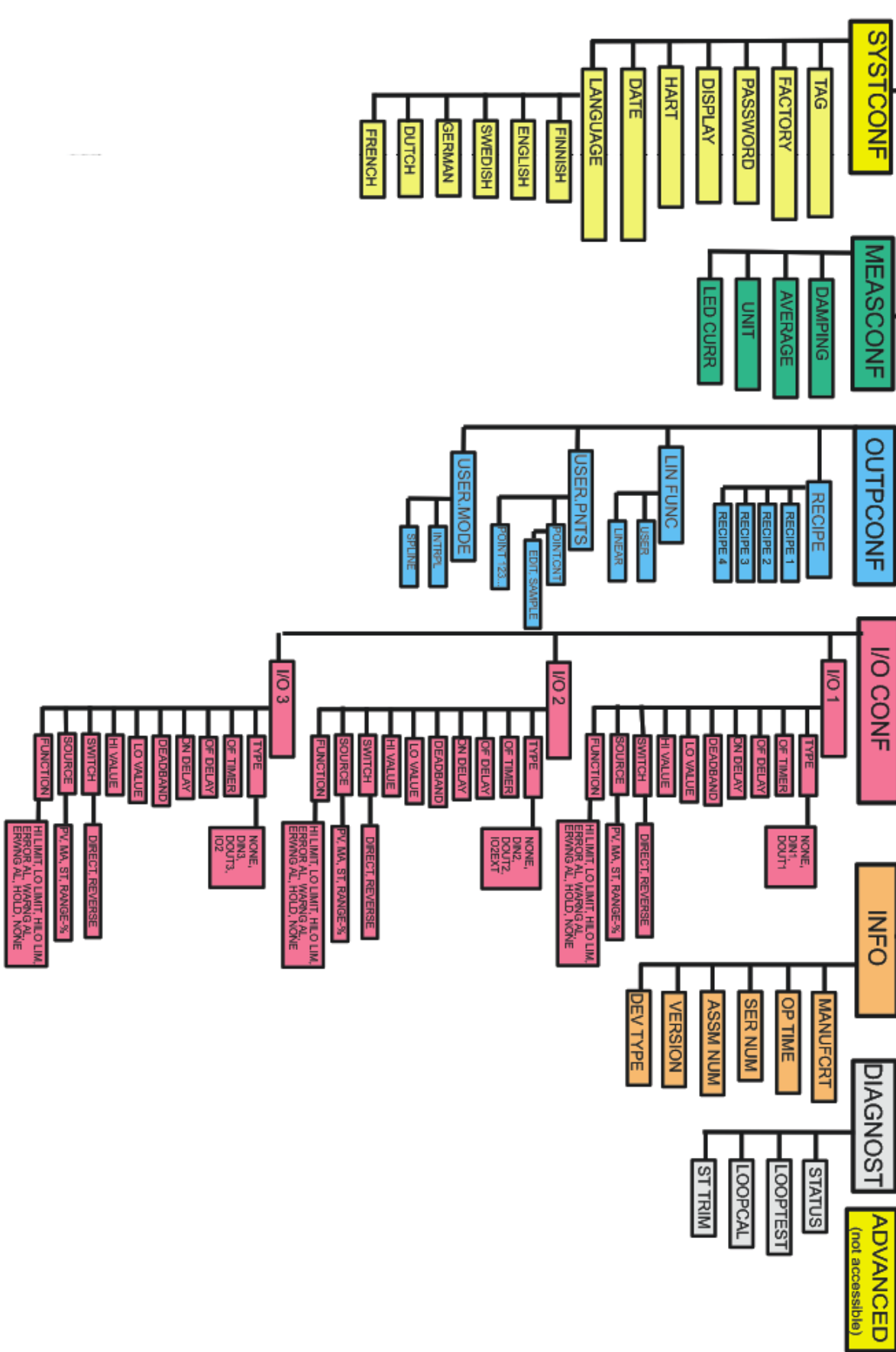
Here you can calibrate the current signal given by the transmitter. The first ENTER will switch the transmitter off from normal mode (AUTO OFF). The next ENTER will make the transmitter give out a signal which it assumes to be 4 mA. Use the UP/DOWN keys to change this value in accordance with the reading on the reference meter. Then press ENTER for 20 mA output, which you must also set in accordance with the reference meter. Press ENTER to accept the new reading.

Note: Use a sufficiently accurate reference meter.

SENSOR TEMPERATURE TRIM:

Sensor Temperature Trim. Here you are able to calibrate the temperature probe which is placed in the head of the analyzer. (Maximum by 10 degrees.)

MEASUREMENT VALUES





MEETS THE COUNCIL OF THE EUROPEAN UNION DIRECTIVE
89/336/EEC FOR ELECTROMAGNETIC COMPATIBILITY
REQUIREMENTS.



Satron Instruments Inc.

www.satron.com

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

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