Satron VO (VOM, VOA, VOD, VOF)

Installation and Setting-Up Instructions Manual

SATRON instruments

Table of Contents

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

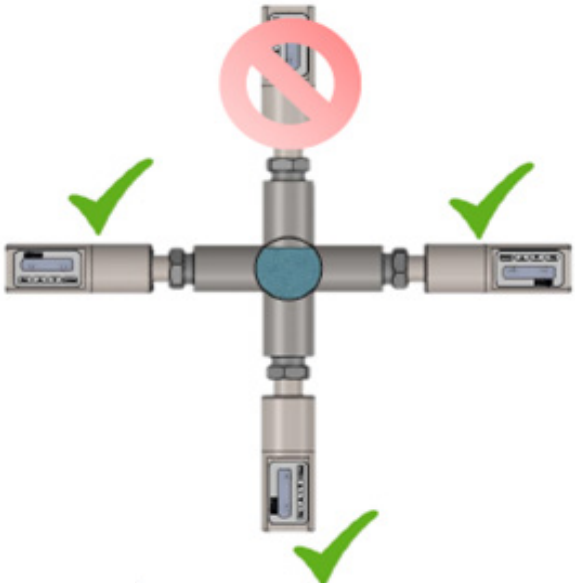
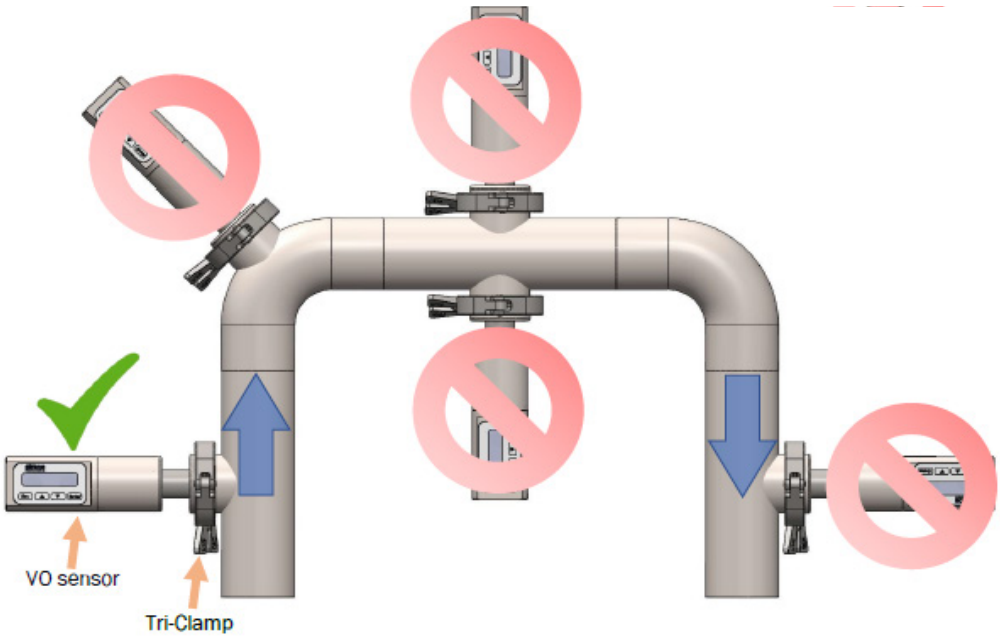


Figure 1-1 Recommended mounting positions

Figure 1-3 installation with PASVE mounting/service valve

Leak port must be pointed down.

Figure 1-4 Installation with process coupling



For optimal results, mount the analyzer in an upwords flow.
Do not install the analyzer on top or on the bottom of the pipe. There can be air or dirt infront of the measuring lens and give false results. Minimum distance from lens to pipe wall is 50 mm.

Figure 1-2 Basic mounting dimensions

1.1.1 Installing welded process couplings.
For 3A installations please go to page 5.

Mounting hole for coupling

- Make a Ø 45.5 mm (+0.5/-0.2 mm) hole in the tank wall or pipe, as shown in Figure 1-5.

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. 1-6. 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. 1-7 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!

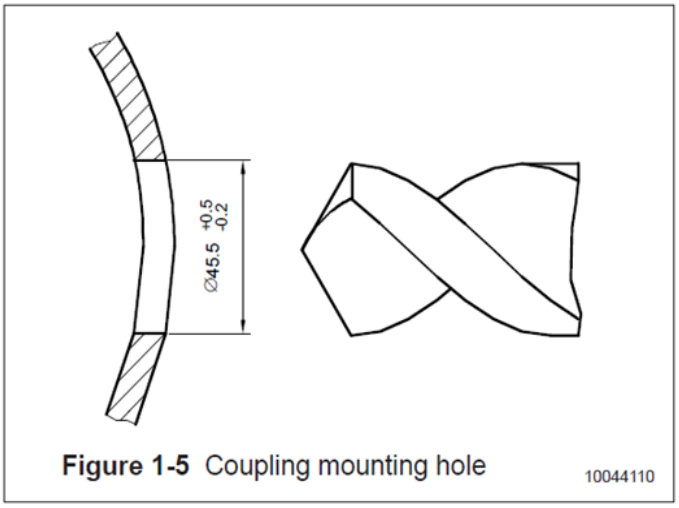


Figure 1-5 Coupling mounting hole 10044110

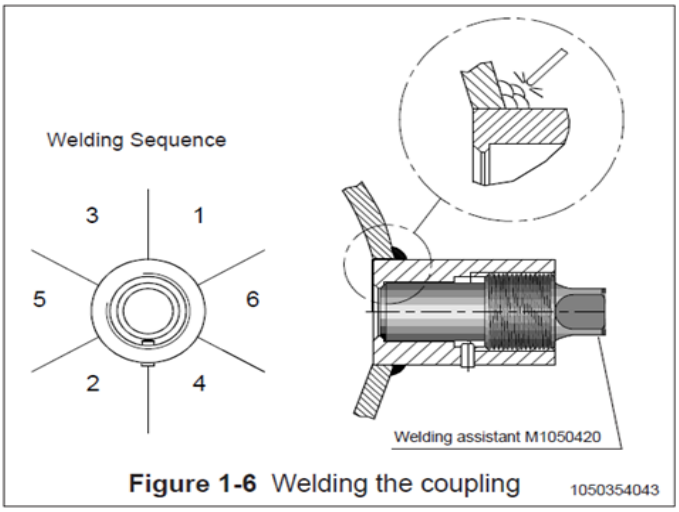


Figure 1-6 Welding the coupling 1050354043

1.1.2 Mounting the analyzer on the coupling

Procedure

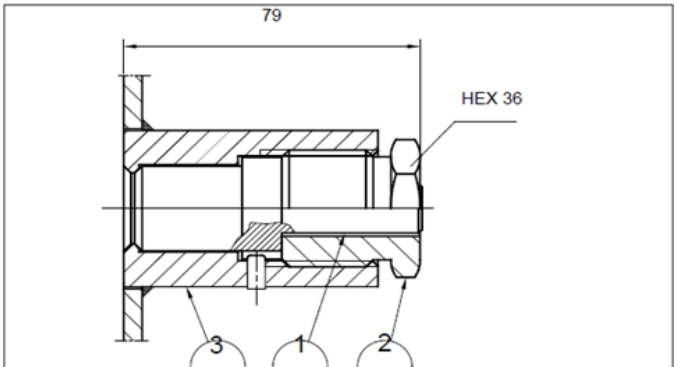
- Make sure that the coupling's sealing face is clean.
- Remove the orange protective plug from the analyzer head.

- Insert the analyzer **in a straight line** (Fig. 1-8) 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!



1 Shut-off plug, AISI316 (Order No. M550405)
2 Shut-off screw G1
3 G1 welded process coupling

Figure 1-7 Coupling shut-off plug 10044108

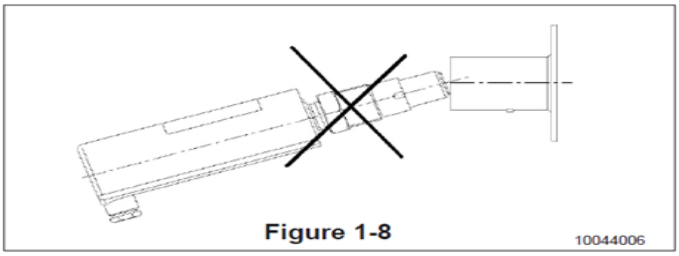


Figure 1-8 10044006

1.1.3 Instructions and spare parts that are according and within the 3-A appliance

3
46 - 04

Welding the coupling

All couplings that are according the 3-A appliance listed in the bottom of this page. These instructions apply to hygienic welded couplings; welding the G1 M548101A coupling is described here as an example.

• Place the coupling in the mounting hole as shown in Fig. 1-7. Make sure the leakage detection port is down. Then weld with several runs so to prevent the coupling's oval distortion and tightness problems. The inside welding must be cleaned, and polished with an end result of Ra <0,8

• The analyzer must be out of the coupling while the coupling is welded.You can use the shut-off plug shown in to shut the coupling.

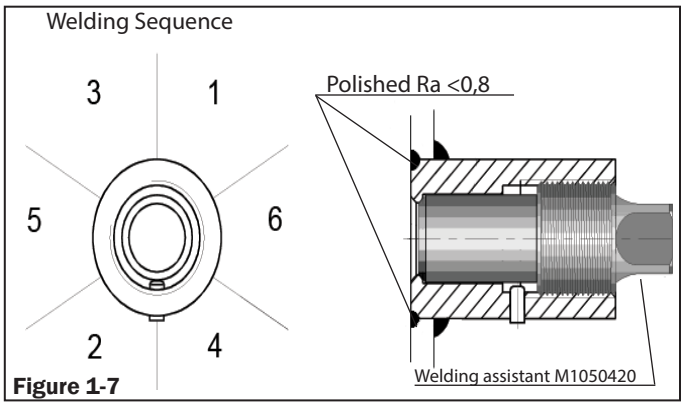


Figure 1-7

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!

Mounting the analyzer on the coupling

Procedure

• Make sure that the coupling's sealing face is clean.

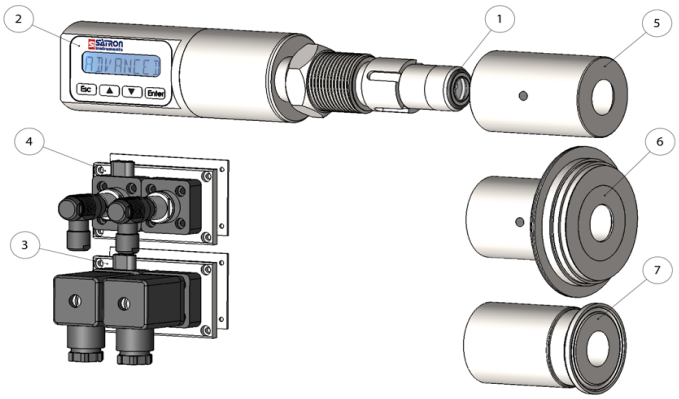
• Remove the orange protective plug from the analyzer head.

• Insert the analyzer **in a straight line** (Fig. 1-6) 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.

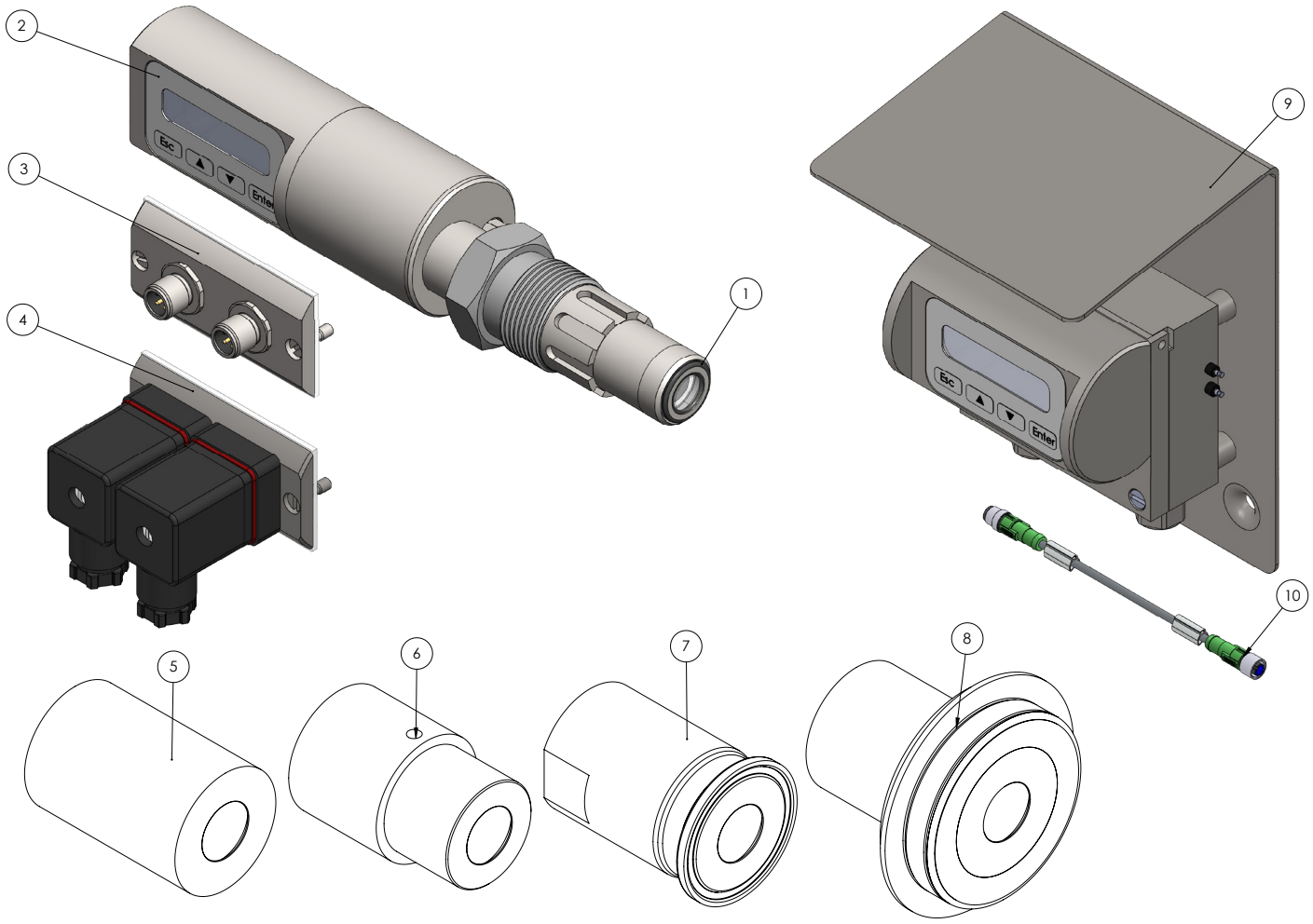
Do not use sealing tape etc. on threaded connection!



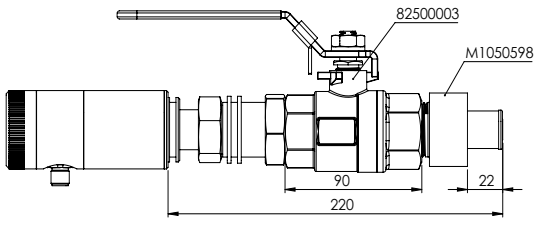
Spare parts

No.	Part name	Order code	Note
1	O-ring EPDM	80031720	3A 18-03 Class II (Do not exceed above 8% fat content).
1	O-ring FPM (Viton®)	80011720	3A 18-03 Class I
2	Sticker	T1325215	
3	Plug cover DIN43650	T1325003	
4	Plug cover M12	T1325005	
5	38/G1"Welding adapter	M1050577A	
5	45/G1"Welding adapter	M548101A	
6	Tuchenhagen / Varivent DN25	M1050090A	
6	Tuchenhagen / Varivent DN50	M1050091A	
6	Tuchenhagen / Varivent DN65,5	M1050092A	
7	Tri-clover 25/38 ISO2852	M1050206A	
7	Tri-clover 40/51 ISO2852	M1050222A	
7	Tri-clover 63.5 ISO2852	M1050224A	

1.1.4 Spare parts and couplings

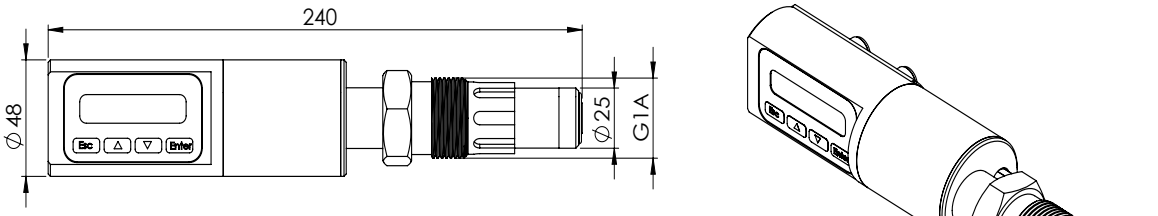


No.	Part name	Order code	Note
1	O-ring EPDM	80031720	3A 18-03 Class II (Do not exceed above 8% fat content).
1	O-ring FPM (Viton®)	80011720	3A 18-03 Class I
1	O-ring FFPM(Kalrez®)	80041717	3A 18-03 Class I
2	Sticker	T1325215	
3	Plug cover M12	T1325031	
4	Plug cover DIN43650 (old type)	T1325003-K48	
5	45/G1”Welding adapter	M548101	
6	38/G1”Welding adapter	M1050577	
7	Tri-clover 25/38 ISO2852	M1050206	
7	Tri-clover 40/51 ISO2852	M1050222	
7	Tri-clover 63.5 ISO2852	M1050224	
8	Tuchenhagen / Varivent DN25	M1050090	
8	Tuchenhagen / Varivent DN50	M1050091	
8	Tuchenhagen / Varivent DN65,5	M1050092	
9	Remote Display Unit RDU	T13250016	
10	L-Housing data cable 10m PVC	70000450	
10	L-Housing data cable 15m PVC	70000451	
10	Extension cable +10m PVC	70000460	
	FUSE for L-Housing	74212000	
	Seal for L-Housing display	80017226	

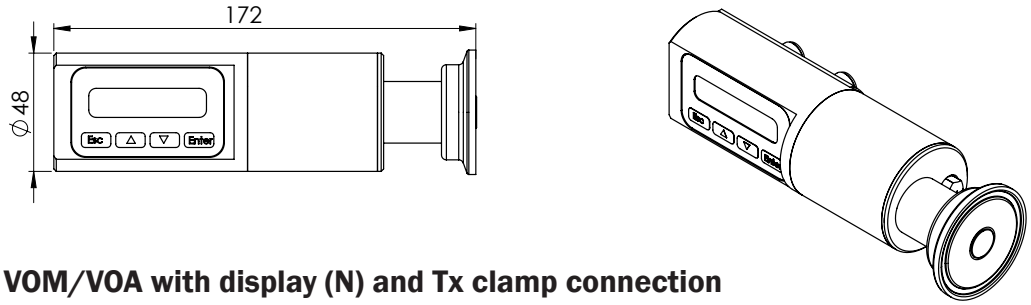


Ballvalve	82500003
Straight coupling for ballvalve	M1050598
15 degree coupling for ballvalve	M1050597

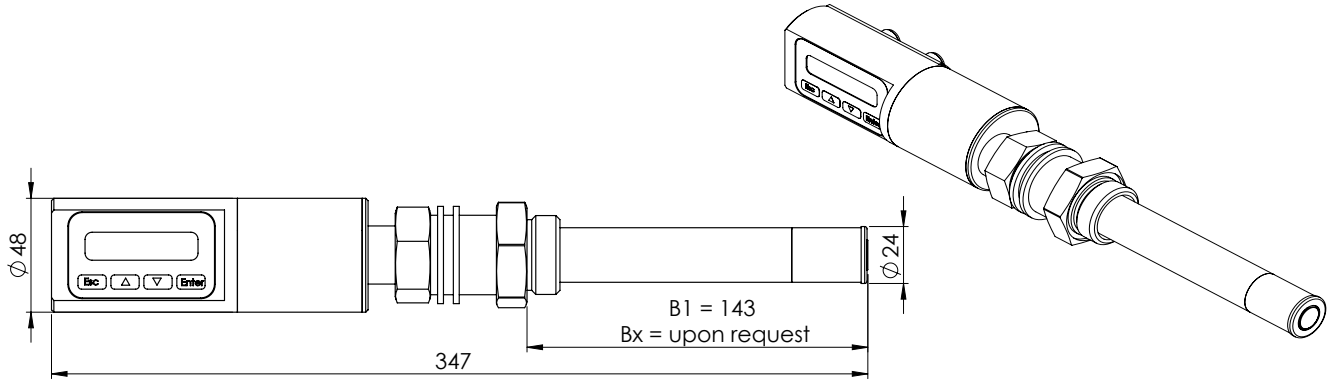
1.1.5 Dimensions and Housing types VOM/VOA (mm)



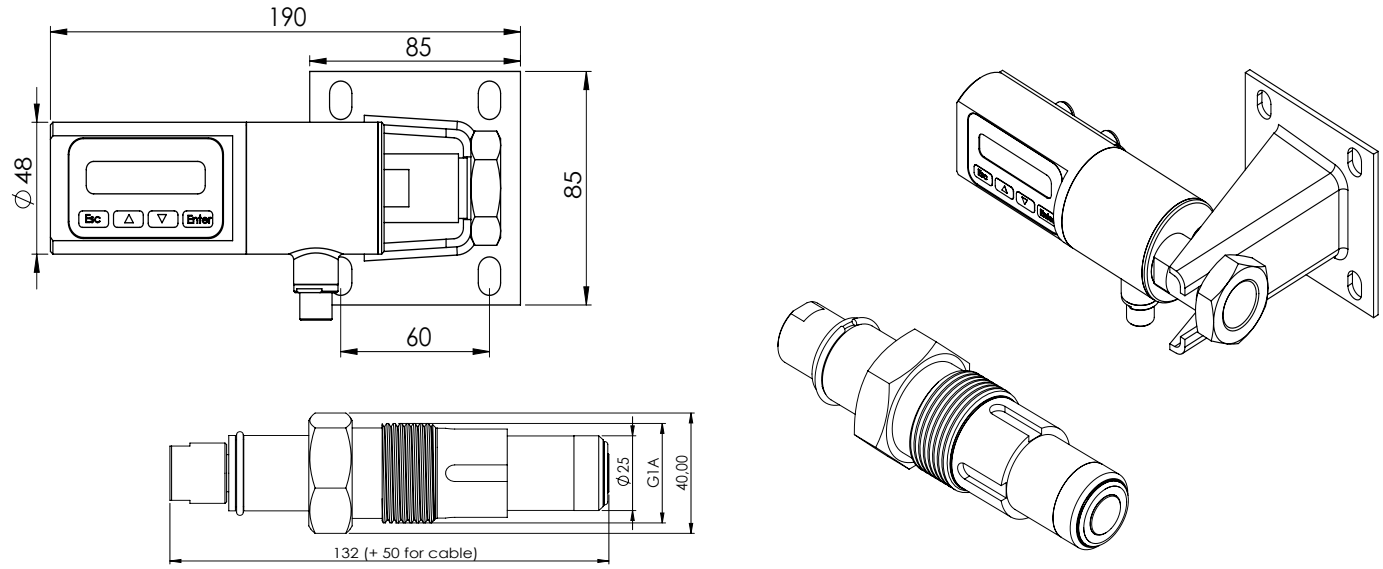
VOM/VOA with display (N) and G1 process connection



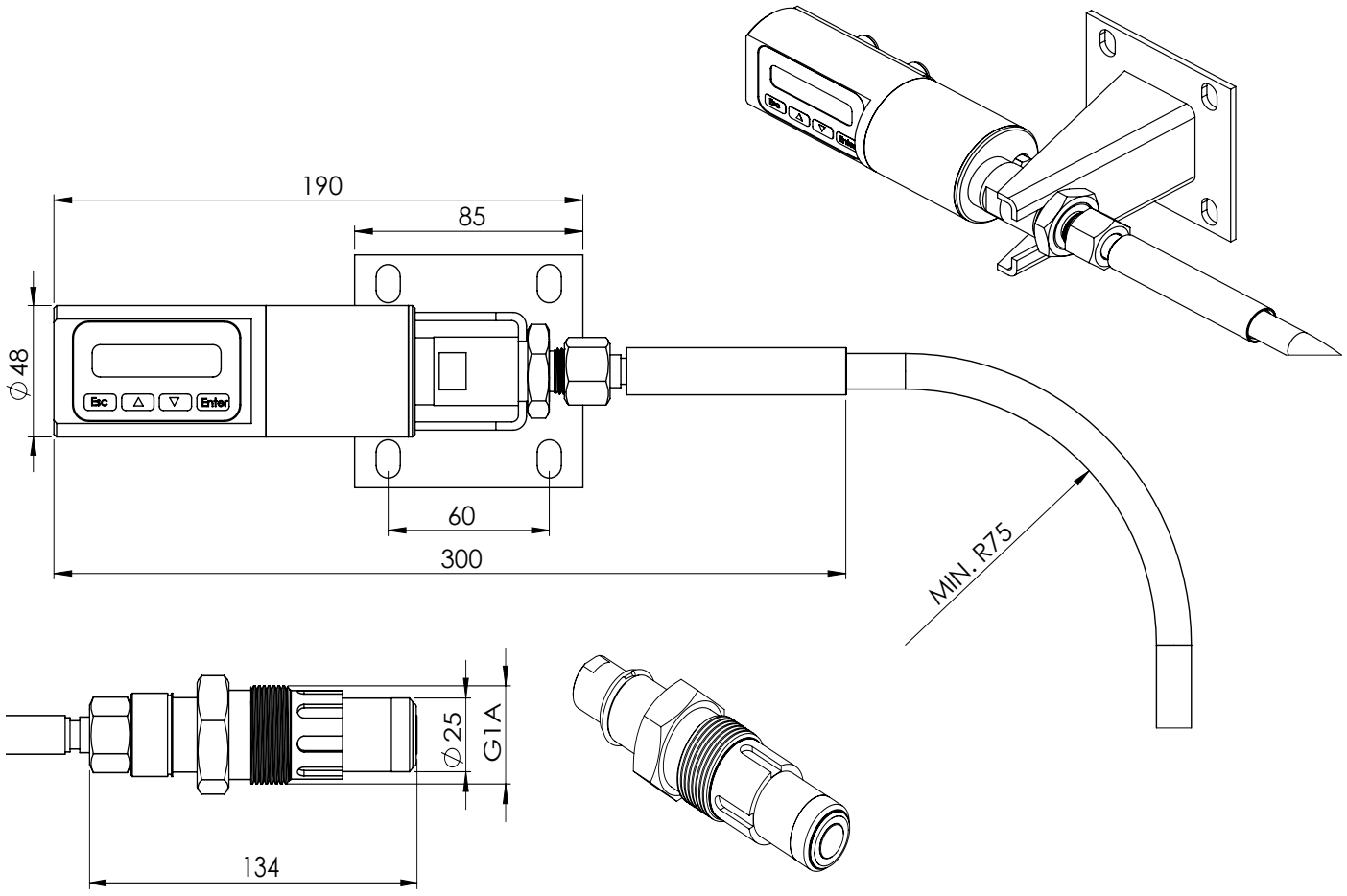
VOM/VOA with display (N) and Tx clamp connection



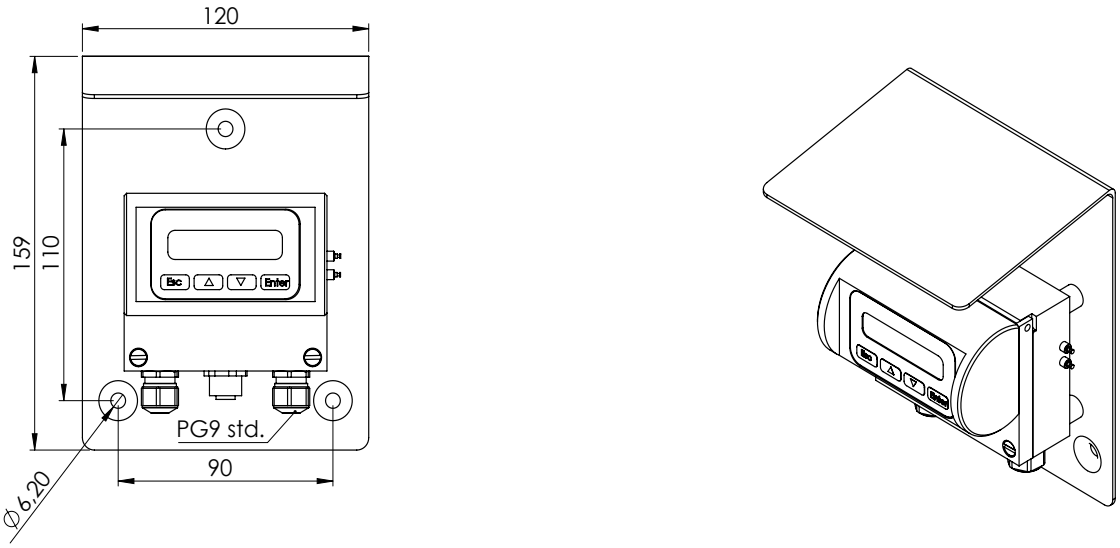
VOM/VOA with display (N) and B1 / BX ball valve insertion process connection



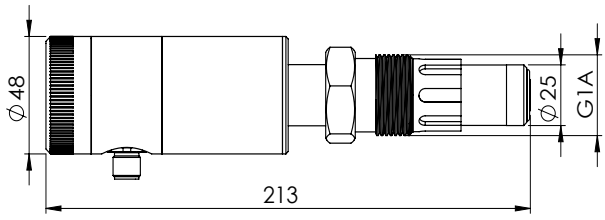
VOM/VOA with remote measuring probe and PVC M12 cable (NRT43)

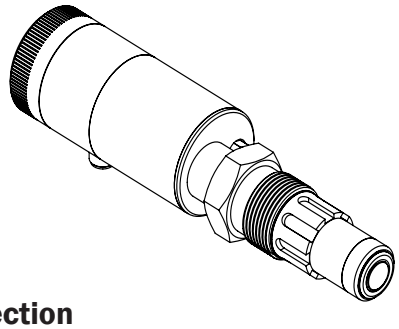


VOM/VOA with remote measuring probe and AISI or PUR hose (NRT2)

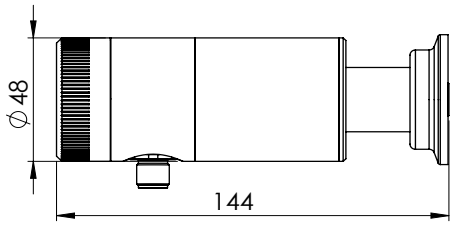


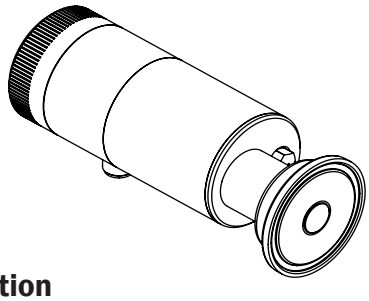
RDU - Remote Display Unit (L) T1325016



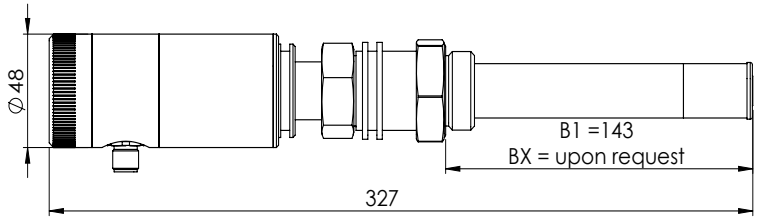


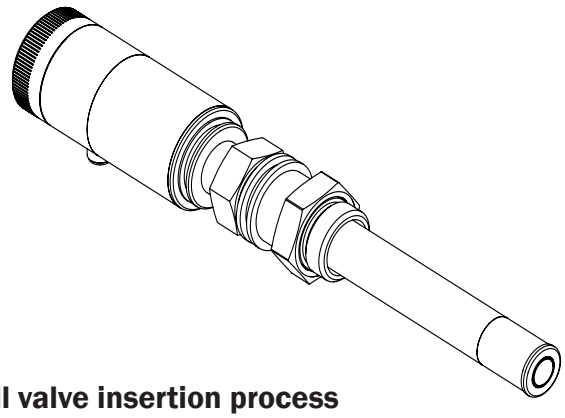
VOM/VOA without display (H) and G1 process connection





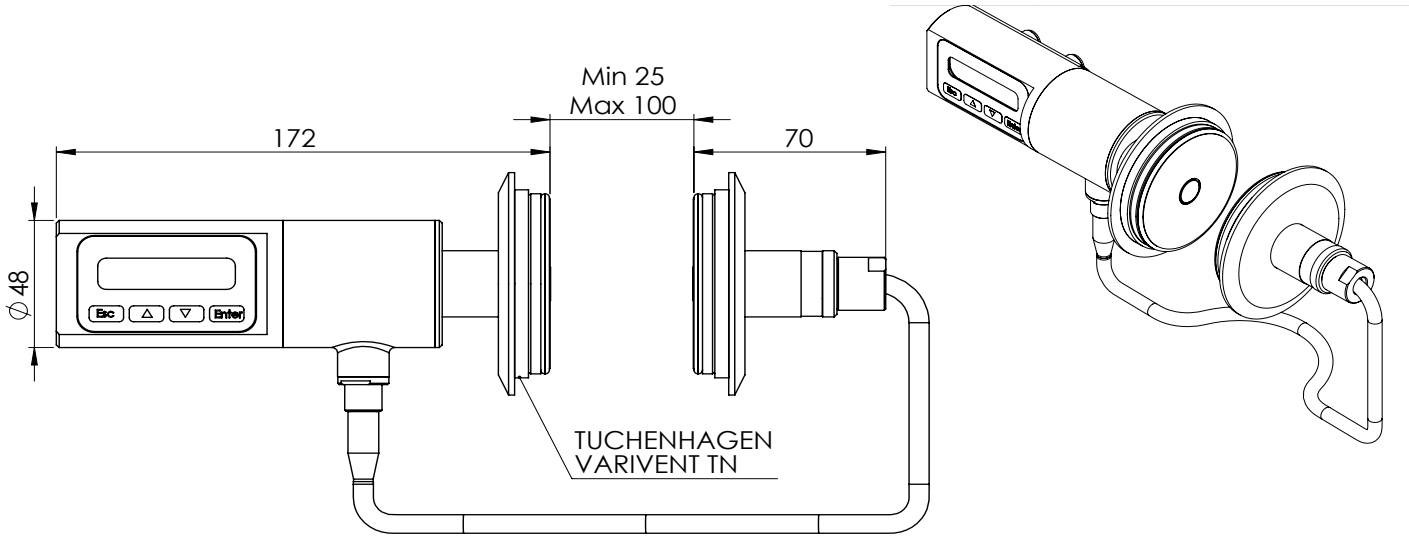
VOM/VOA without display (H) and TA, TB and TN clamp connection



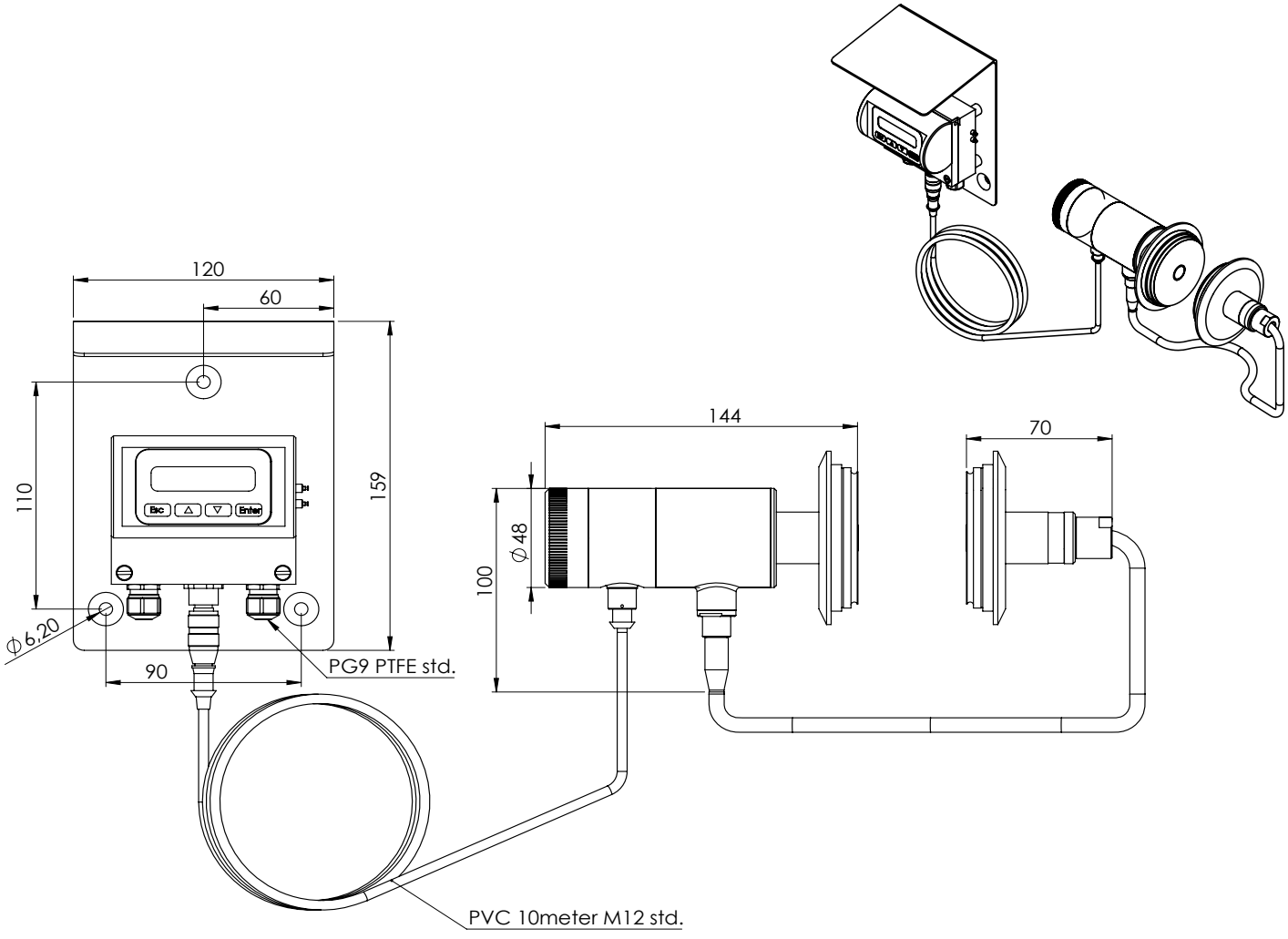


VOM/VOA without display (H) and B1 / BX retactable ball valve insertion process

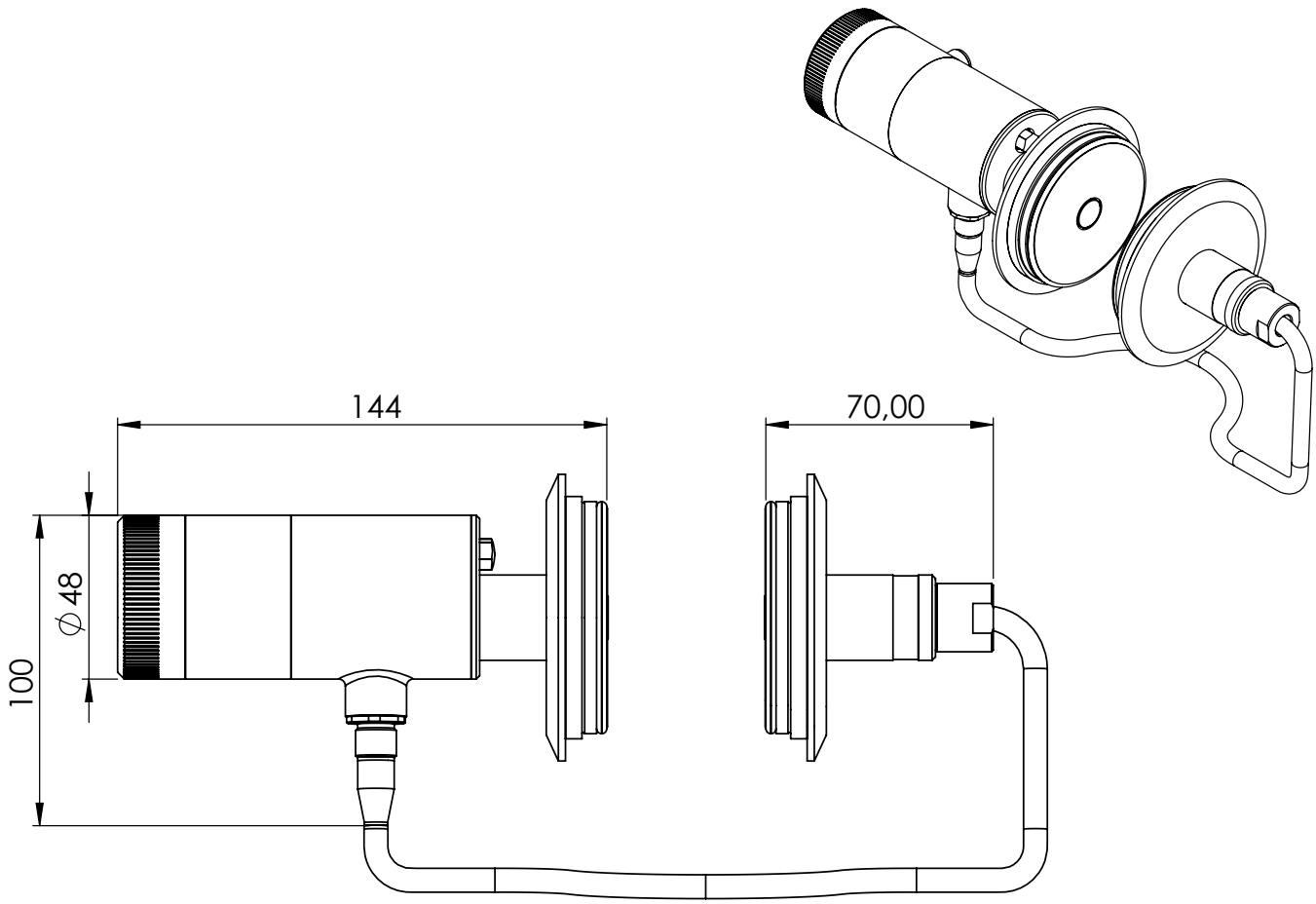
Dimensions and Housing types VOD (mm)



VOD with display and pushbuttons (N housing)



VOD with remote electronics housing with display (L housing)

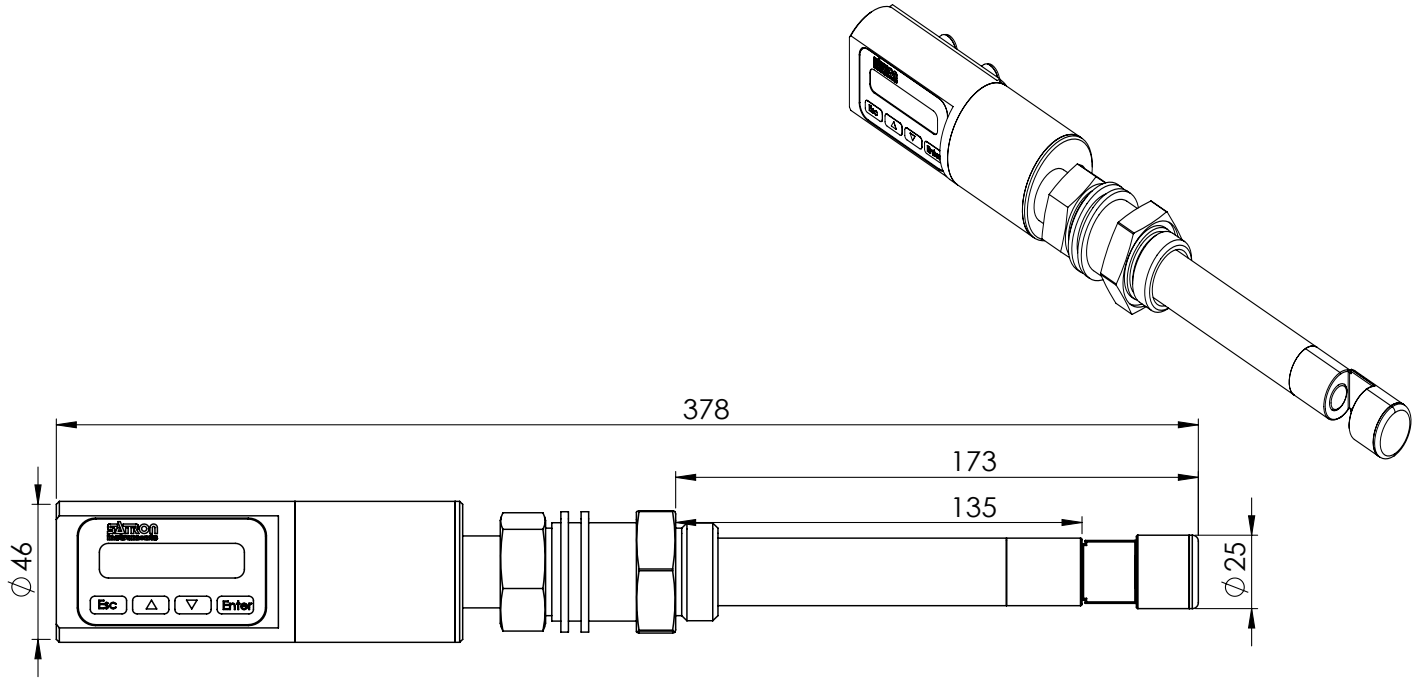


VOD with no display (H-housing)

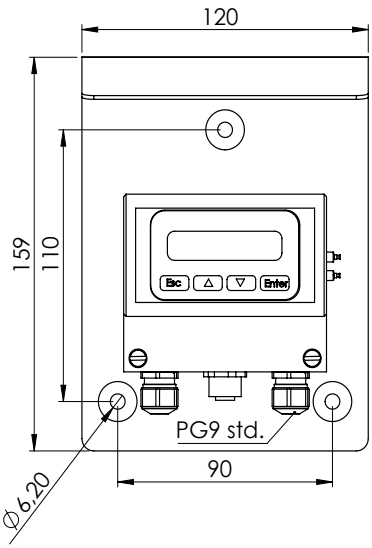
For easy installation the VOD is available with many different process connections. Such as:
DN50 PN40
DN100 PN40
Tri-Clamp DN38, DN51, DN63,5
Sandvik DN70 PN40
SMS38
SMS51
Tuchenhagen / Varivent

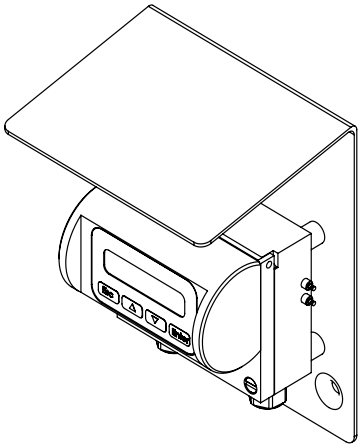
Contact Satron for other possibilities.

Dimensions and housing type VOF (mm)

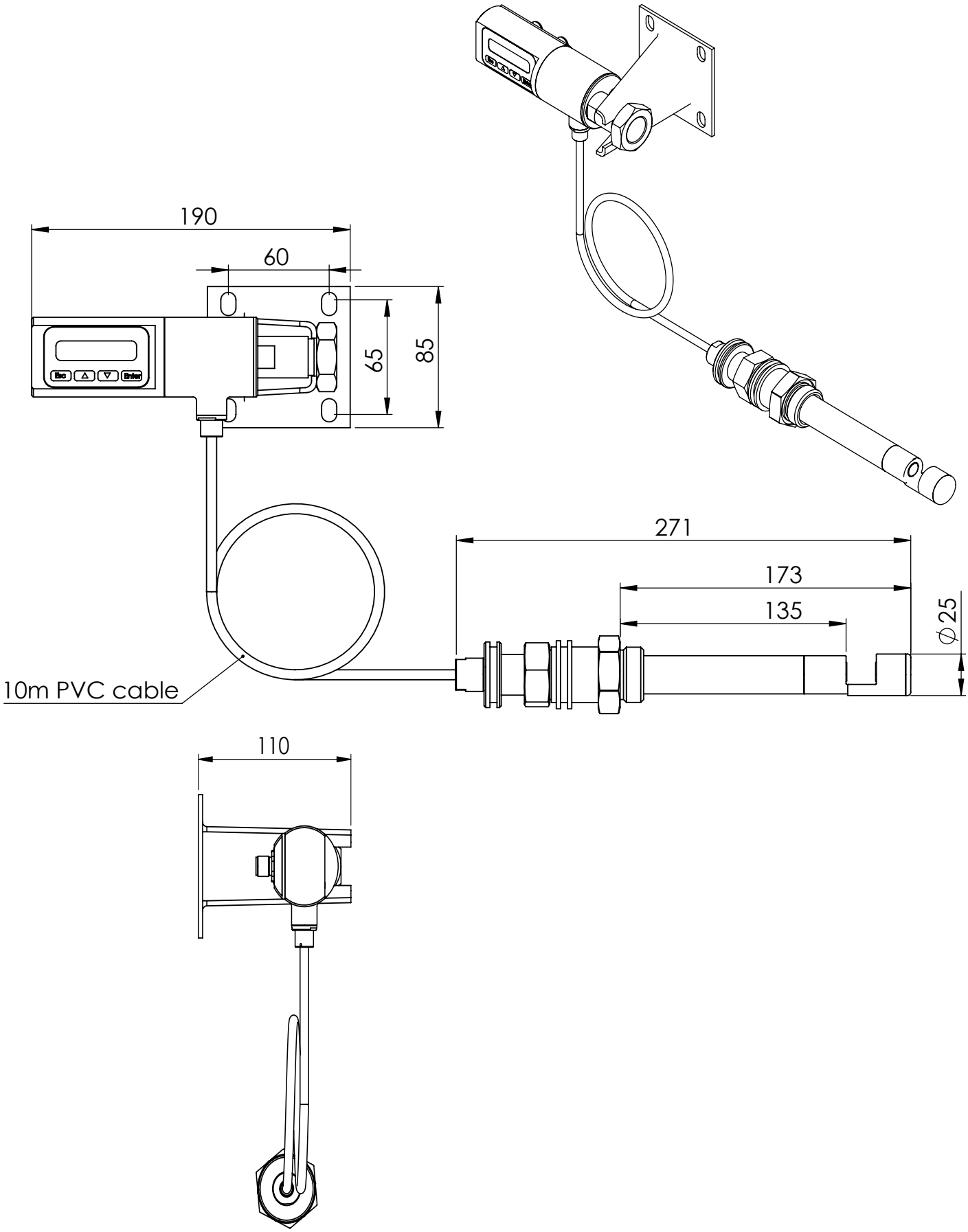


VOF B1 with display and pushbuttons (N housing)

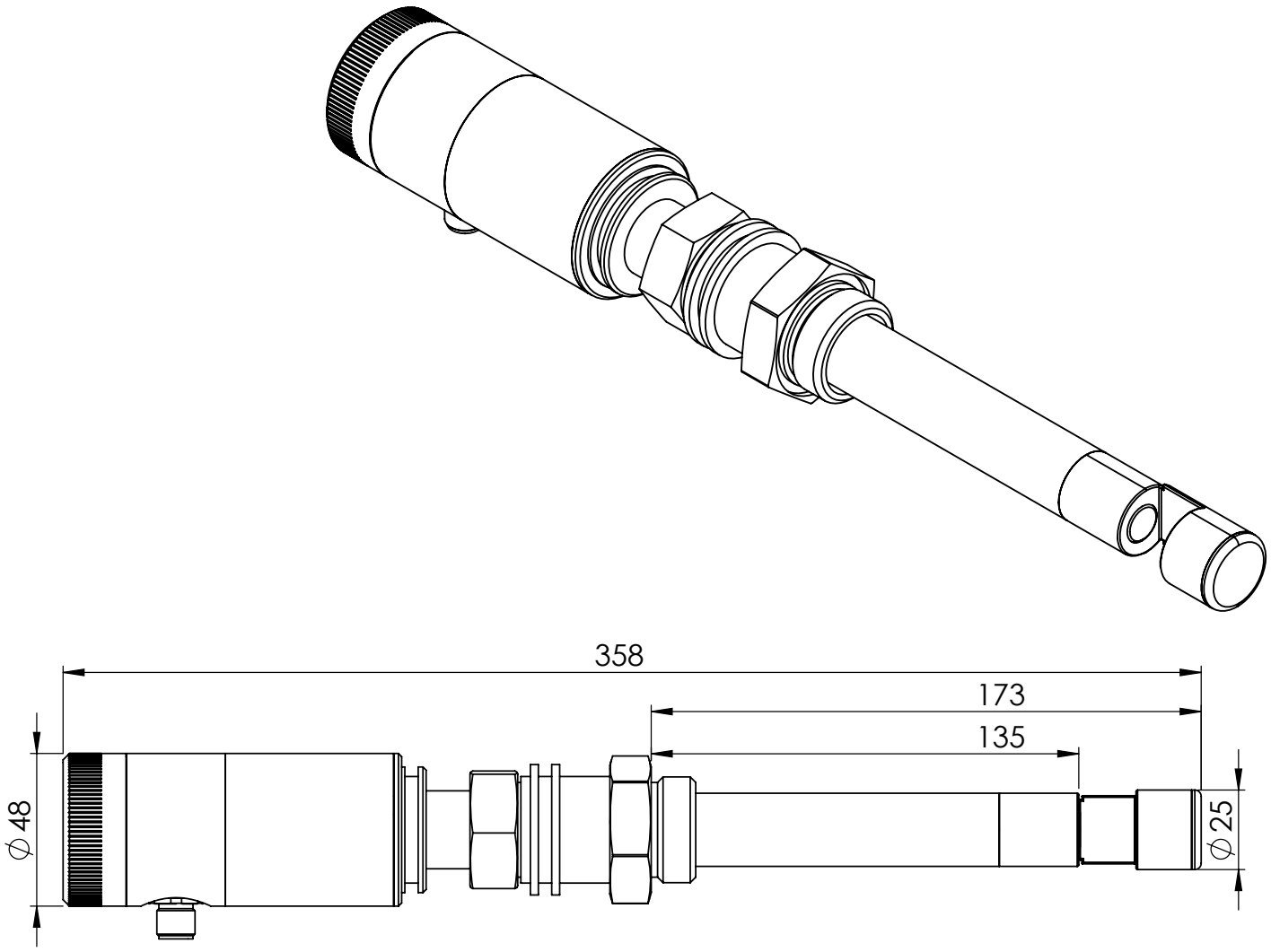




VOF with remote electronics housing with display (L housing)



VOF B1 with remote electronics NR housing



VOF B1 with no display or remote display (H or L housing)

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.

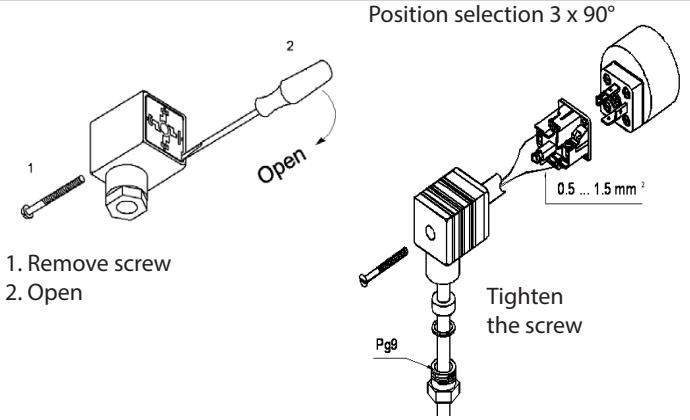
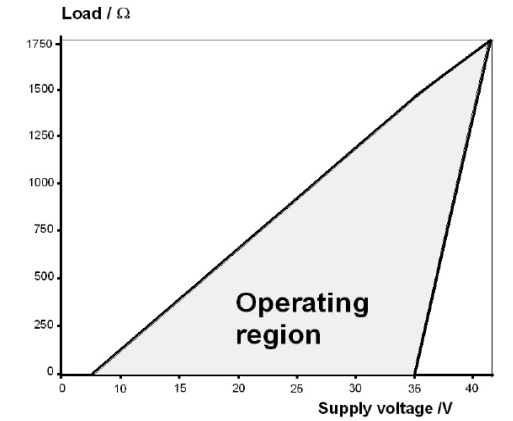


Figure 1-15 Removing the PLUG junction box



Min. load using HART® - communication 250 Ω

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

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

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

Figure 1-16

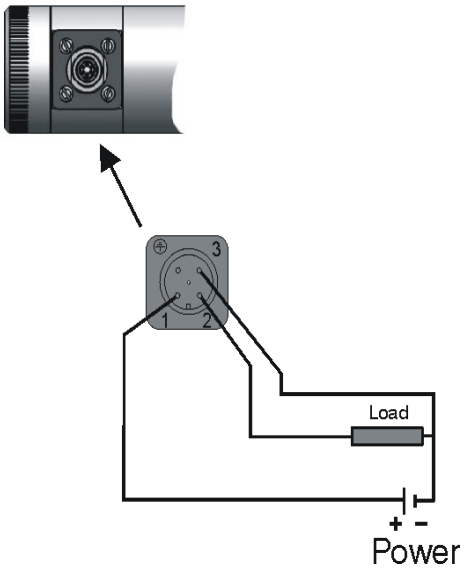


Figure 1-18a, housing with M12-connector, code **HT**

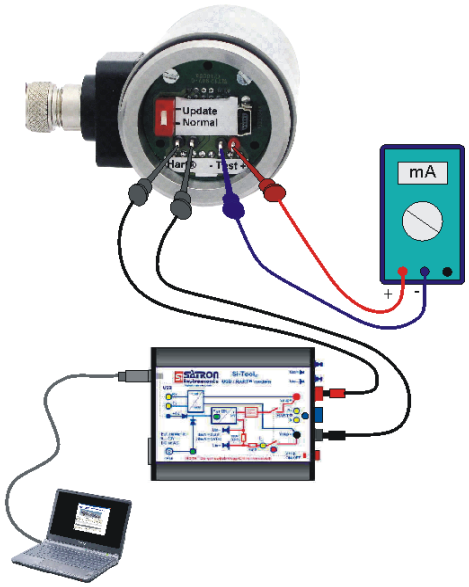


Figure 1-18c
Housing with PLUG DIN43650- and M12-connector, test connector box, code **HT & HS**

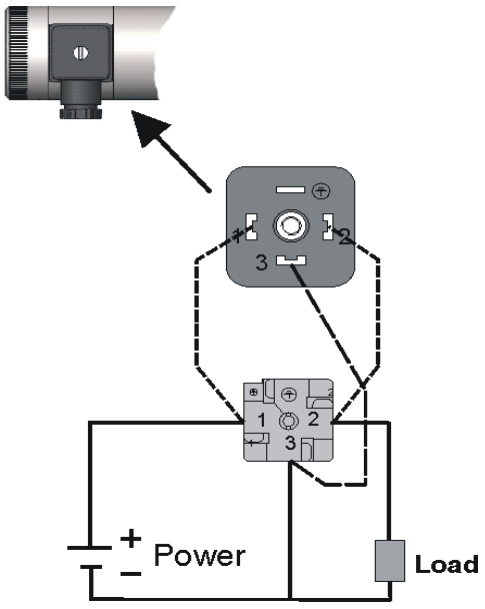
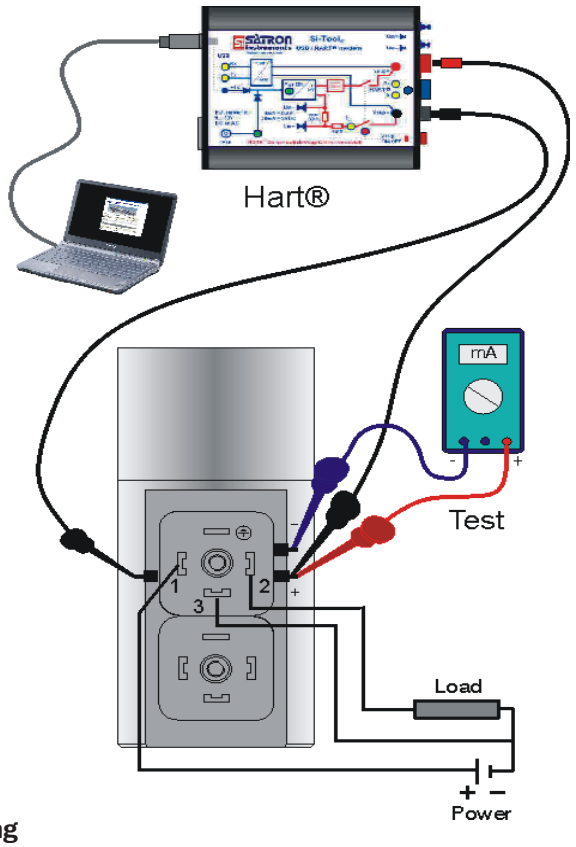
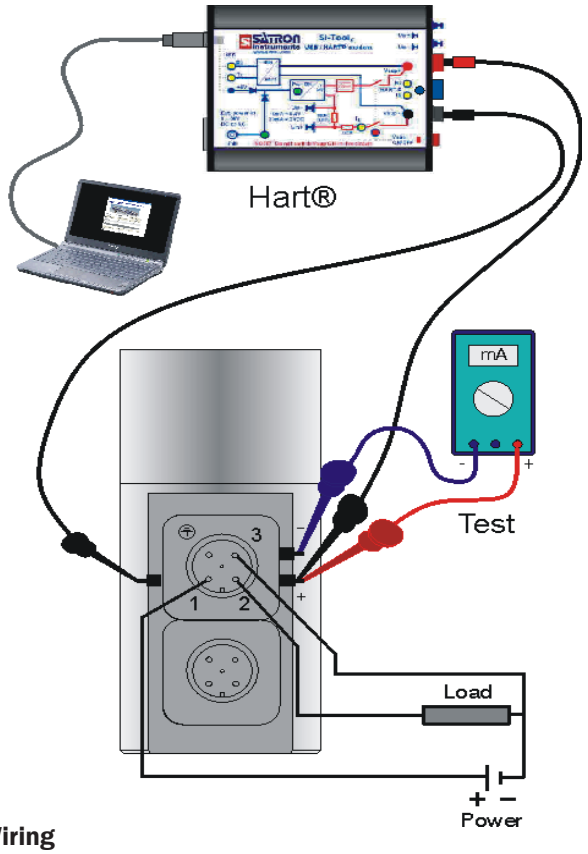


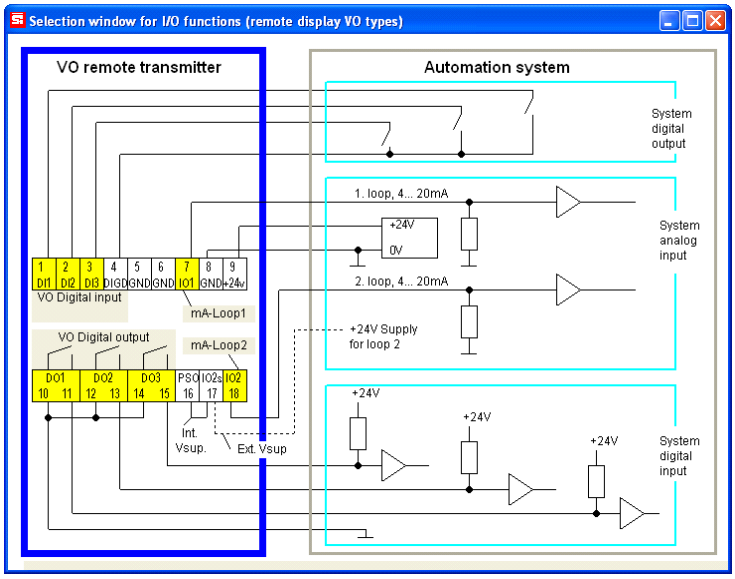
Figure 1-18b, housing with PLUG DIN43650-connector, code **HS**



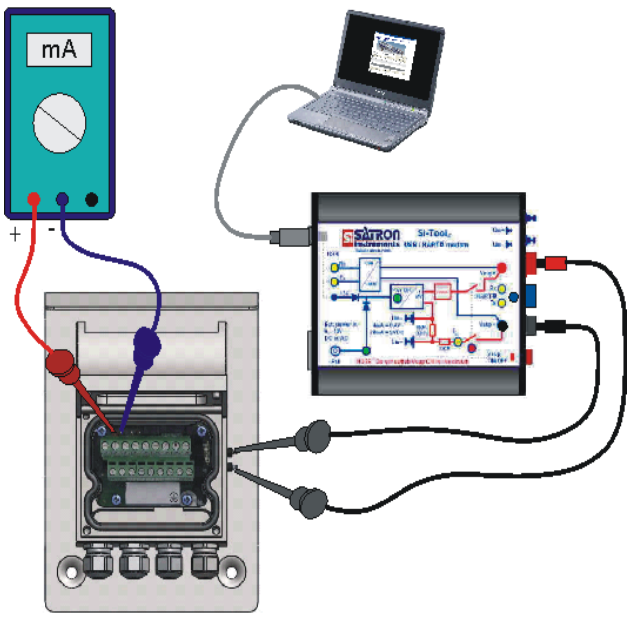
Wiring
Housing with display and PLUG DIN43650-connector, code **NS**



Wiring
Housing with display and M12-connector, code **NT**



Wiring
Remote electronics housing with display, code **L**



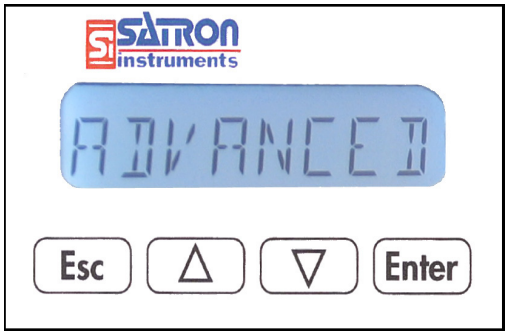
2. SETTING UP

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 and HART-modem.

2.2 Setting-up with local switches

The additional instruction of display menus is enclosed to this manual. See chapter 3



Housing with display, code N

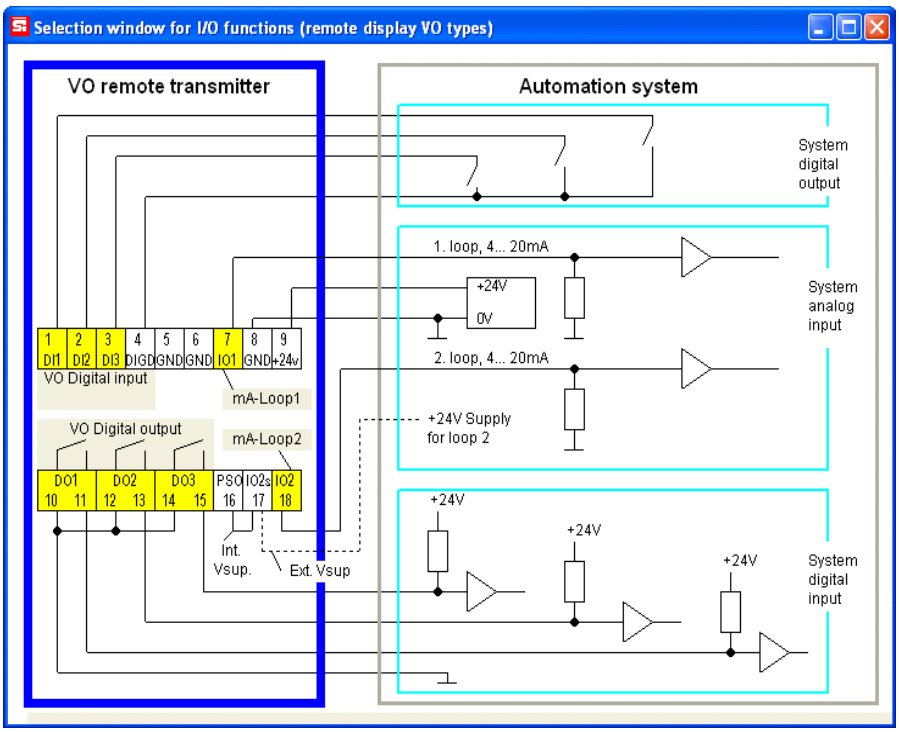
Keyboard :

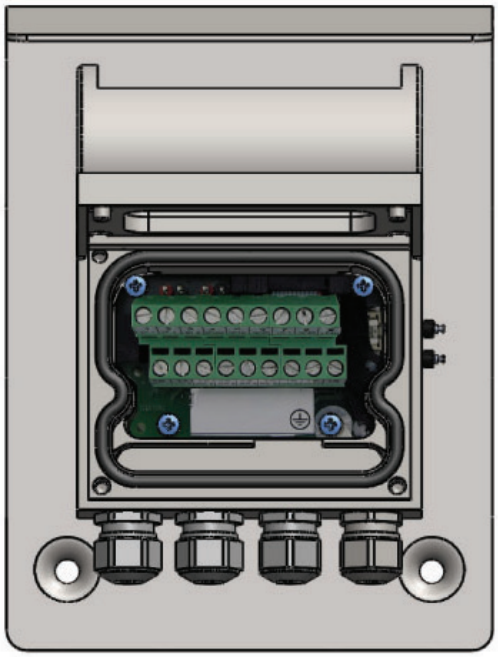
Esc = Press Esc move back towards the top of the main menu.
= Use the UP arrow key to move up on the current menu level or to increase the selected parameter value.
= Use the DOWN arrow key to move down on the current menu level or to decrease the selected parameter value.

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

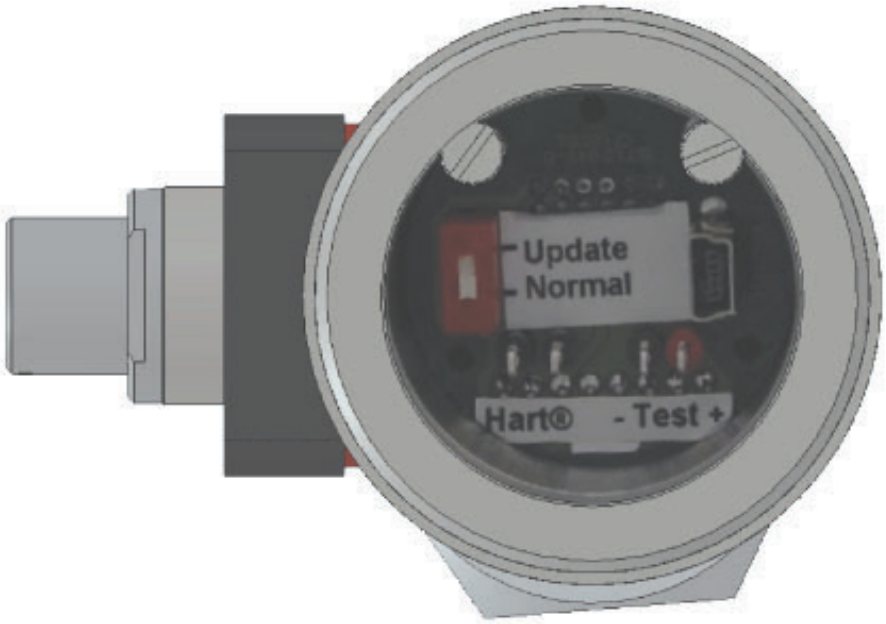
2.3 Setting up with VO remote unit

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.



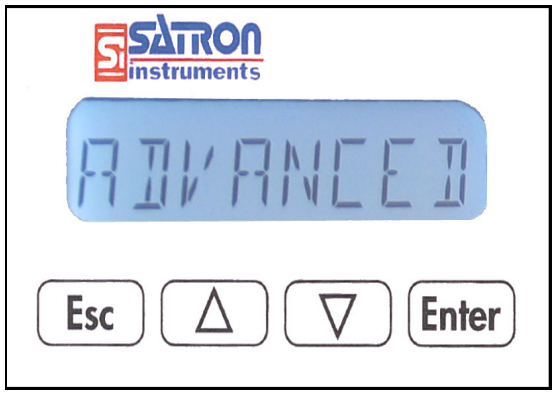


VO Remote Connections



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. 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.

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.	**ENTER:** Press ENTER to move to a lower level in a menu or to accept a command or parameter value. **ESC:** Press the ESC to move back towards the top of the main menu or cancel the current action.

3.1 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.
BIO3	the status of the digital input/output #3
BIO2	the status of the digital input/output #2
BIO1	the status of the digital input/output #1
E	the temperature of the electronics
S	the temperature of the sensor head
MA	the value of the first mA loop
MA2	the value of the second mA loop
%	the selected UNIT for the user calibrated information. (%).

3.2 Menu Structure

The VO analyzers is equipped with a display and with Firmware version O120601A or later, the menu is split in to a "BASIC", and "FULL" structure. You can see the current firmware version during startup for 1 second. Or go to "INFO">"VERSION">"CPU FW", in the "FULL" structure menu.

For a quick 2 point calibration, checking the sensor status, alarms, or setting up damping for the measurement, entering the "BASIC" structure will fulfill. For more advanced settings like language, in/out-put configuration, change of recipe, the "FULL" structure needs to be used.

4. DISPLAY SETUP

4.1 Setting up with "BASIC"

To enter the "BASIC" structure menu:
Press ESC shortly and 3 submenus are accessible

"CALIB" CALIB

This is the basic calibration mode. Here the 4mA and 20mA points can be changed. The result is always a linear 2 point calibration. You can change both 4mA and 20 mA, or only one of them. The analyzer needs to be teached to the new calibration, by means of having the corresponding liquid in front of the lens. The analyzer will inform that the calibration will be erased. Confirm by pressing Enter.

"# 4MA?" * 4 MA?

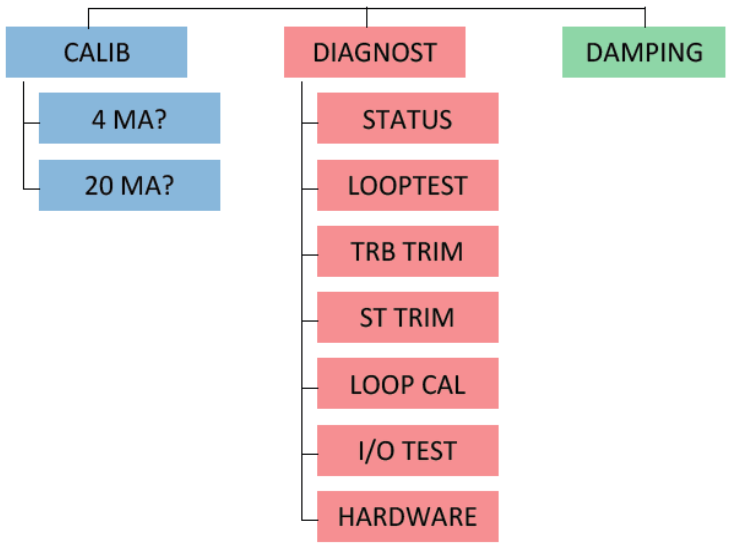
Now the analyzer is asking for the 4mA value. Insert the analyzer in the corresponding liquid, wait 5 seconds and press Enter.

"# 20MA?" * 20 MA?

Now the analyzer is asking for the 20 mA value. Insert the analyzer in the corresponding liquid, wait 5 seconds and press Enter.
By pressing ESC the value will be left the same, allowing to for example only change the 4 mA or only the 20mA. By pressing ESC for each value the calibration procedure will be canceled totally.

"DIAGNOST" DIAGNOST

(see 4.2.5 for more information)
STATUS
LOOPTEST
TRB TRIM
ST TRIM
LOOP CAL
I/O TEST
HARDWARE



"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.

4.2 Setting up with "Full"

Under the full menu are 6 submenus:
System configuration, Measurement configuration, Output configuration, I/O configuration, Info, and Diagnostics.
To enter these submenus press ESC for 3 seconds when in Measurement Values menu. See page 25.

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.

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 for example the date of the last calibration done.

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. The transmitter enters Multidrop mode when the polling address is set between 1 and 15. Whe the address is set to 0 (Default) the unit resumes in the normal live mA loop.
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.

DISPLAY: DISPLAY

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

BACKLGHT: 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.

PASSWORD: PASSWORD

From this menu you can set a password (0…999) for the transmitter. If a password has been specified, you cannot set any parameters or make any other settings on the transmitter 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 in contact with Satron Instruments Inc.

LANGUAGE: LANGUAGE

Select the Display language. ENGLISH, FRENCH, POLISH.

T UNIT:
Select transmitter's universal temperature unit. Available units are °C and °F.

4.2.2. 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. Cannot be changed.

LED CURR:
Transmitter's primary LED's current [%]. Cannot be changed.

UNIT: UNIT
Select transmitter's unit you want to show in the display as active recipe's Process Value.
FNU, FTU, NTU, %, mg/L*, ppm*
* only available in COD models.

4.2.3. OUTPCONF OUTPCONF

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

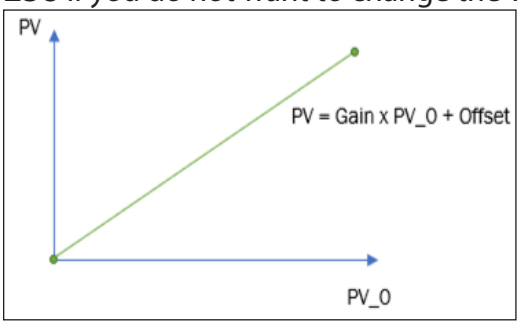
RECIPE: RECIPE
Up to 4 different recipes can be stored in the VO. The basic factory calibration is stored standard in Recipe 1. To perform a new calibration it is recomended to use a different recipe.

USER.PNTS: USERPNTS
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.
Please refer to the chapter CALIBRATION EXAMPLE of this manual to find more detailed information how to perform a full re-calibration.

USER MODE: USERMODE
Select the interpolation method between points.
INTERPL selects linear interpolation.
SPLINE selects spline interpolation.

OFFSET:
Offset value for the active recipe's Process Value trim. (Default 0). Set the new value and accept it with **ENTER** or press **ESC** if you do not want to change the value.

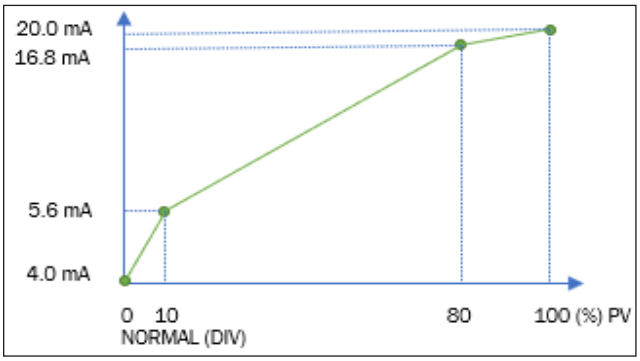
GAIN:
Gain value for the active recipe's Process Value trim. (Default 1)
Set the new value and accept it with **ENTER** or press **ESC** if you do not want to change the value.

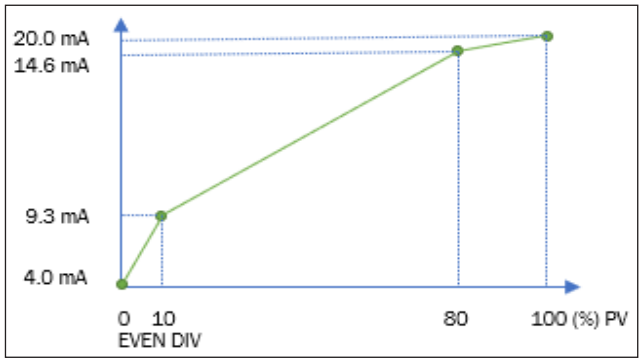


TEXT:
Menu for editing the Recipe name. Edit the name and accept it with **ENTER** or press **ESC** if you do not want to change the value.

UNIT: UNIT
Select transmitter's unit you want to show in the display as active recipe's Process Value.
FNU, FTU, NTU, %, mg/L*, ppm*
* only available in COD models.

MA MODE:
This option is only available with transmitter type VOA. Available mA modes are NORMAL (Default) and EVEN DIV.
EVEN DIV mode can be used for magnifying certain areas of the calibrated range if needed. An example comparing NORMAL and EVEN DIV mA modes:



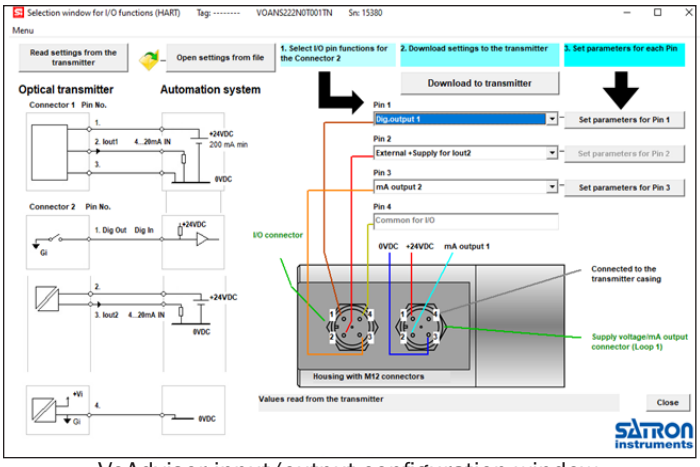


ALARMSET:
Submenu ALARMCURR shows the High and Low Alarm Current levels.
Submenu MODE allows user to select between three different pre-determined alarm current and current saturation configurations:

Mode:	Low Alarm	Lower Sat	Upper Sat	Upper Alarm
SATRON (Default)	3.7 mA	3.9 mA	20.5 mA	22.5 mA
NAMUR (NE 43)	3.6 mA	3.8 mA	20.5 mA	21.0 mA
4 - 20 MA	3.7 mA	4.0 mA	20.0 mA	22.5 mA

4.2.4. 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 VoAdvisor to alter these settings!



VoAdvisor 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.

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.

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. To enable the second miliamp loop select IO2.

IO2 SRC:
Select transmitter's 2nd mA loop's control source. Default control source is ST (Sensor Temperature).

IO2 LRV:
Lower Range Value (4mA) for the selected IO2 SRC. Default 0°C. Set the new value and accept it with **ENTER** or press **ESC** if you do not want to change the value.

IO2 URV:
Upper Range Value (20mA) for the selected IO2 SRC. Default 100°C. Set the new value and accept it with **ENTER** or press **ESC** if you do not want to change the value.

IO2 DAMP:
Time constant in seconds for the second output (IO2) 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.

4.2.5. INFO INFO

MANUFACTURER: MANUFCTR
Manufacturer's name (SATRON). Cannot be changed.

DEVICE TYPE: DEV TYPE
Product type code. Cannot be changed.

VERSION: 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.

ASSEMBLY NUM: ASSM NUM
The transmitter's assembly number. Cannot be changed.

SERIAL NUMBER: SER NUM
Serial number. Cannot be changed.

OPERATION TIME: OP TIME
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

AC HZ:
Local line voltage frequency. Used for optimizing noise cancellation.

4.2.6. DIAGNOSTICS DIAGNOST

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's mA loop and sensor temperature.

STATUS: 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: 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.

ST TRIM: ST 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).

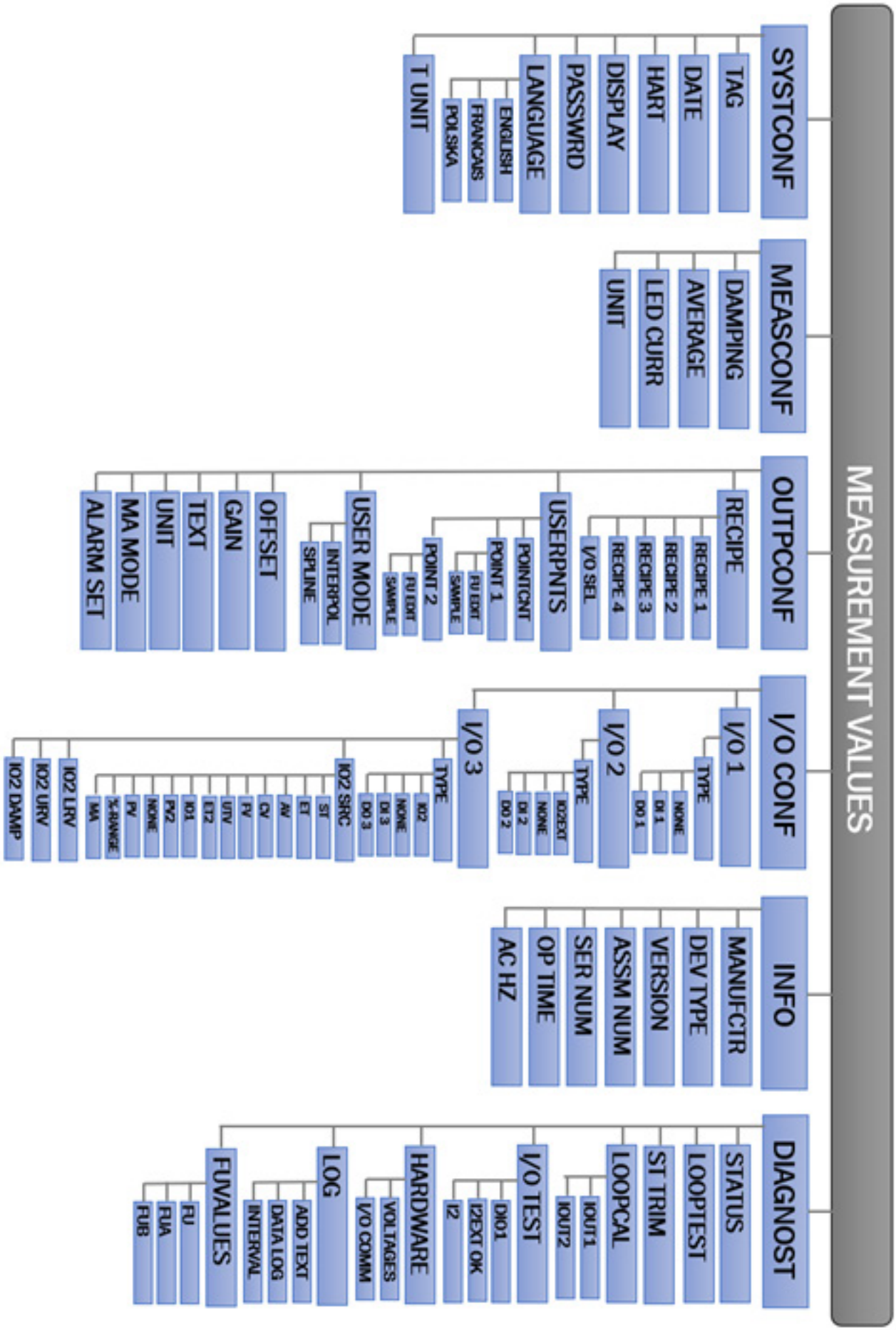
LOOPCALIBRATION: LOOPCAL
Here you can calibrate the current signal given by the transmitter. The first ENTER will switch the transmitter off from normal mode (AUTO OFF). The next ENTER will make the transmitter give out a signal which it assumes to be 4 mA. Use the UP/DOWN keys to change this value in 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.

I/O TEST:
Allows user to monitor the functionality of set I/O functions.

HARDWARE:
Submenu VOLTAGES displays transmitter's inner voltage levels.
Submenu I/O COMM is only available with Remote Display Unit (RDU). I/O COMM shows the status of transmitter's inner communication with RDU.

LOG:
Submenu ADD TEXT allows user to create and save a notification text to transmitter's inner data log with time stamp. This can be used later for example to separate different process phases when analyzing the data log. Edit the text and accept it with ENTER or press ESC if you do not want to change the value.
Submenu DATA LOG enables user to select between CYCLIC data logging (cycle time is determined in submenu INTERVAL) or DIG I/O. DIG I/O enables user to control data logging via digital input.
The factory default setting is CYCLIC and its INTERVAL setting depends on the transmitter type.

FUVALUES:
FU is short for Satron Factory Unit and can be used for diagnosing the primary measurement's status. FUA and FUB are only available with transmitter type VOA.


MEASUREMENT VALUES
SYSTCONF
TAG
DATE
HART
DISPLAY
PASSWRD
LANGUAGE
ENGLISH
FRANCAIS
POLSKA
T UNIT
MEASCONF
DAMPING
AVERAGE
LED CURR
UNIT
OUTPCONF
RECIPE
RECIPE 1
RECIPE 2
RECIPE 3
RECIPE 4
I/O SEL
USERPNTS
POINTCNT
POINT 1
FU EDIT
SAMPLE
POINT 2
FU EDIT
SAMPLE
USER MODE
INTERPOL
SPLINE
OFFSET
GAIN
TEXT
UNIT
MA MODE
ALARM SET
I/O CONF
I/O 1
TYPE
NONE
DI 1
DO 1
I/O 2
TYPE
IO2EXT
NONE
DI 2
DO 2
I/O 3
TYPE
IO2
NONE
DI 3
DO 3
IO2 SRC
ST
ET
AV
CV
FV
UTV
ET2
IO1
PV2
NONE
PV
%-RANGE
MA
IO2 LRV
IO2 URV
IO2 DAMP
INFO
MANUFCTR
DEV TYPE
VERSION
ASSM NUM
SER NUM
OP TIME
AC HZ
DIAGNOST
STATUS
LOOPTEST
ST TRIM
LOOPCAL
IOUT1
IOUT2
I/O TEST
DIO1
I2EXT OK
I2
HARDWARE
VOLTAGES
I/O COMM
LOG
ADD TEXT
DATA LOG
INTERVAL
FUVALUES
FU
FUA
FUB

5 CALIBRATION

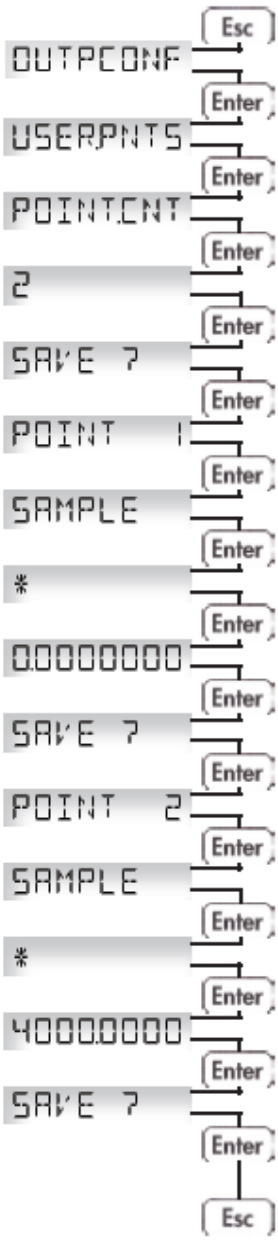
The VO series analyzer comes with a standard factory calibration.
There is space for 4 different calibrations, called recipe 1, 2, 3 and 4. Standard the factory calibration is stored in recipe 1. The different recipes can be renamed and also be enabled with the binairy inputs.
To change a calibration 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 measurment 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.

5.1 Calibration Examples

2 point calibration guide.

Press the ESC key for 3 seconds, to enter the "FULL" menu.



Use the up/down keys to enter the Output configuration window.

Use the up/down keys to enter the User Points selection.

Use the up/down keys to enter the point count selection.

Use the up/down keys to select how many points the calibration will have. In this example there are 2 calibration points. Point 1 equals 4mA and Point 2 equals 20mA. Press enter to save the settings. Use the up/down keys to calibrate Point 1 (4mA).

Use the up/down keys change between sample mode and edit. Use sample.
The analyzer will start showing the raw data on the display. Press enter when ready. Enter the display value corresponding to 4mA (0.0 in this example).

Press enter to save the first point of the calibration.

Use the up/down keys to calibrate Point 2 (4mA)

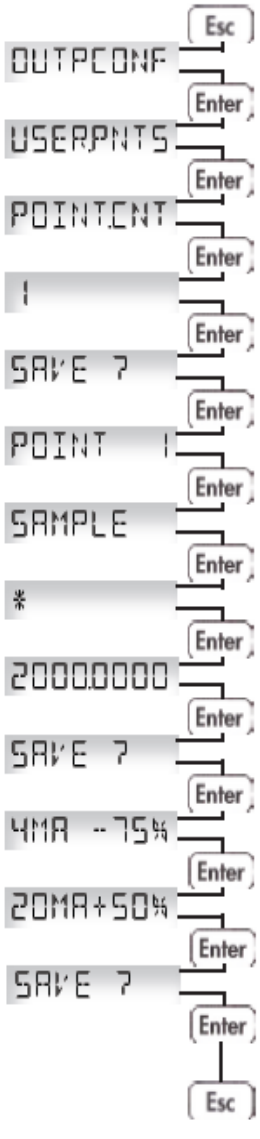
Use the up/down keys change between sample mode and edit. Use sample.
The analyzer will start showing the raw data on the display. Press enter when ready.
Enter the display value corresponding to 20mA (4000.0 in this example)

Press enter to save the second point of the calibration.
Press Esc until the measurements values show. This completes the 2 point calibration procedure.

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).
Calbration is 4mA=500 20mA=3000.

Press the ESC key for 3 seconds, to enter the "FULL" menu.



Use the up/down keys to enter the Output configuration window.

Use the up/down keys to enter the User Points selection.

Use the up/down keys to enter the point count selection.

Use the up/down keys to select how many points the calibration will have. In this example 1 calibration point.

Press enter to save the settings.

Use the up/down keys to calibrate Point 1 (center point.)

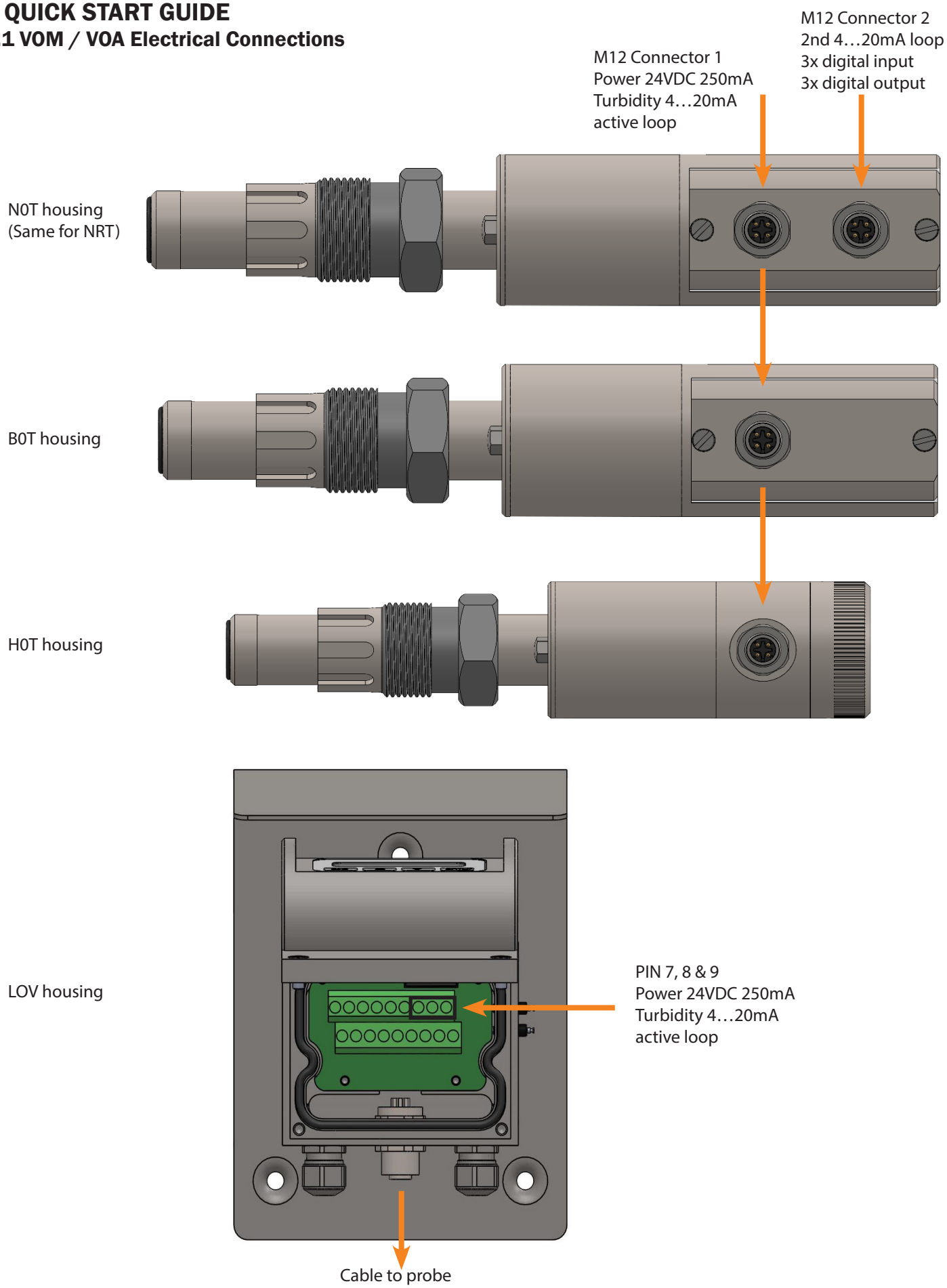
Use the up/down keys change between sample mode and edit. Use sample.
The analyzer will start showing the raw data on the display. Press enter when ready.
Enter the display value corresponding to the center point. (2000.0 in this example). Press enter to save the first point of the calibration.

Use the up/down keys to adjust the 4mA value. In this example -75% from center point. (500)
Use the up/down keys to adjust the 20mA value. In this example +50% from center point. (3000)
Press enter to save the second point of the calibration.

Press Esc until the measurements values show. This completes the 1 point calibration procedure.

6 QUICK START GUIDE

6.1 VOM / VOA Electrical Connections

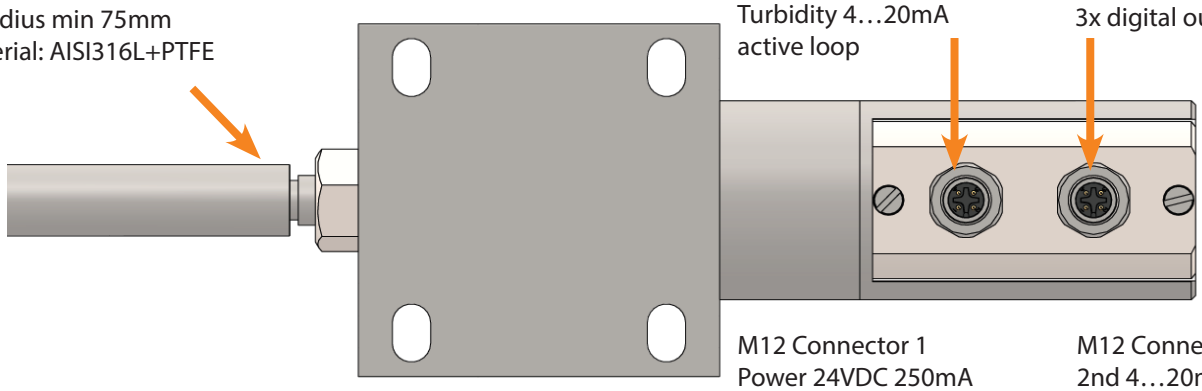


6.2 VOM NRT Electrical Connections

VOMxxxxNRT2xxxx
Sensor remote probe connector
Non-Removable, thread locked
Bending radius min 75mm
Cable material: AISI316L+PTFE

M12 Connector 1
Power 24VDC 200mA
Turbidity 4…20mA
active loop

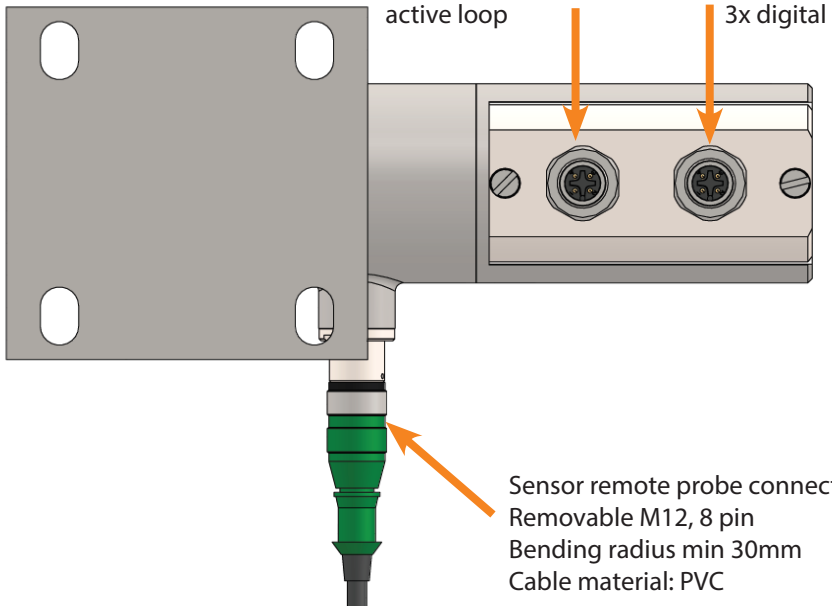
M12 Connector 2
2nd 4…20mA loop
3x digital input
3x digital output



VOMxxxxNRT4xxxx

M12 Connector 1
Power 24VDC 250mA
Turbidity 4…20mA
active loop

M12 Connector 2
2nd 4…20mA loop
3x digital input
3x digital output



Sensor remote probe connector
Removable M12, 8 pin
Bending radius min 30mm
Cable material: PVC

VOMNS221NRT427G1

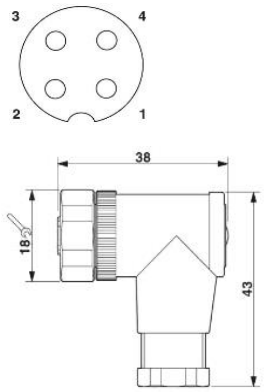
VOMNS221NRT217G1

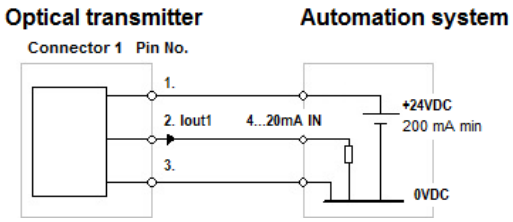
VOMNS224NRT217H1

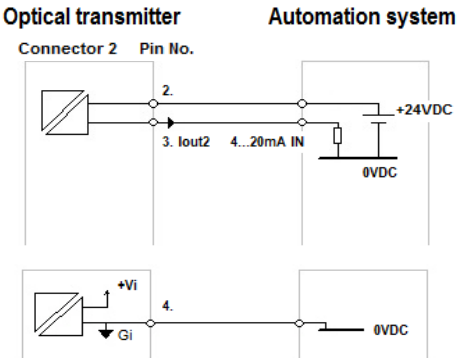
6.3 Electrical Requirements

24VDC 200mA
Cross section of wire 0.34mm2

Housing: B0T, H0T, HRT, N0T, NRT:

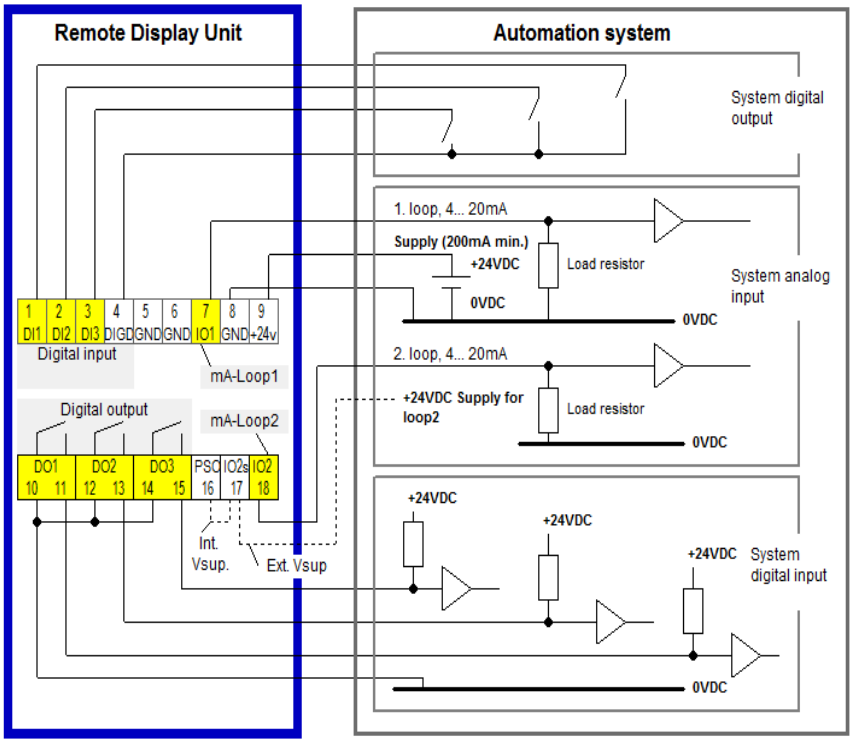






* Factory settings

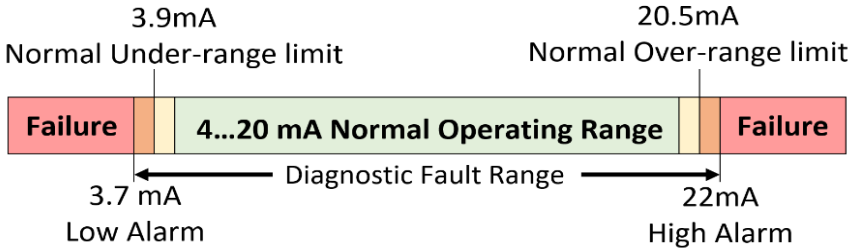
Housing: L0V:



I/O-connections

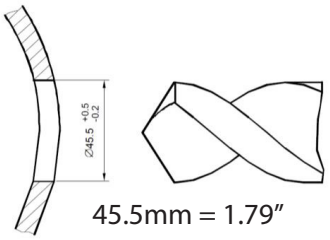
Current output1	Turbidity active
Range (Namur NE 043)	3.5...23 mA
Maximum load	600 Ω
Factory setting	4...20 mA
Switch outputs (up to 3 available)	
solid state relay,	grounding contact
Maximum voltage	35 V
Maximum current	50 mA
Maximum leakage current	10 µA
Switch inputs (up to 3 available)	
NC (no connection)	OFF
0...2 V	ON
Minimum values for switch in use	
Voltage	16 V
Current	4 mA
Leakage current	1 mA
Current output2	
Internal power supply	
Current output 2 has same ground as binary IO	
Maximum load	400 Ω
Range	3.5...23 mA
Factory setting	4...20 mA
External power supply	
Current output 2 is galvanically isolated	
Maximum supply voltage	35 VDC
Range	3.5...23 mA
Factory setting	4...20 mA
Maximum isolation voltage	100 VDC

Analog output signal according to NAMUR NE 043:



6.4 Installation Requirements VOMxxxxxxxxxxG1

Mounting recommendations:
- Minimum pipe diameter: 38mm (1.5")
- Process connection direction:
  - Vertical: upwards flow with leak detection port facing down.
  - Horizontal: on the bottom or side with leak detection port facing down.
- Cable entry direction: from below



45.5mm = 1.79"

Installing 45/G1" Hygienic Welding adapter M548101, refer to datasheet for welding instructions.
Tightening torque: 60 +/- 20 Nm
Replacement o-ring 17x20mm EPDM/FPM/FFPM
Do not put sealing tape or paste on the threaded connection.

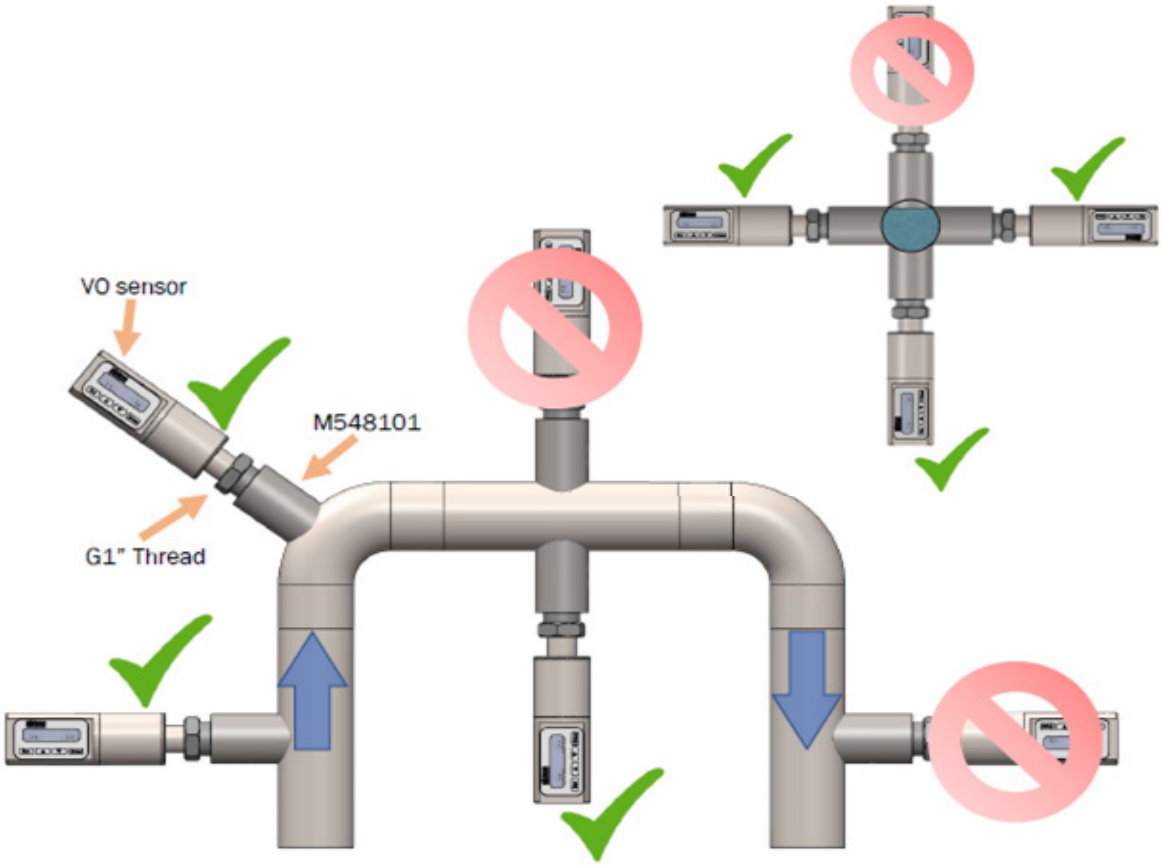
Hygienic installation VOM G1 with welding adapter in steel pipes/tanks.

Item number: M548101

Not hygienic installations can be equipped with the FLUSHING COUPLING, and optional flushing cabinet.

Item number: M1050021

Item number: M1050194-RT

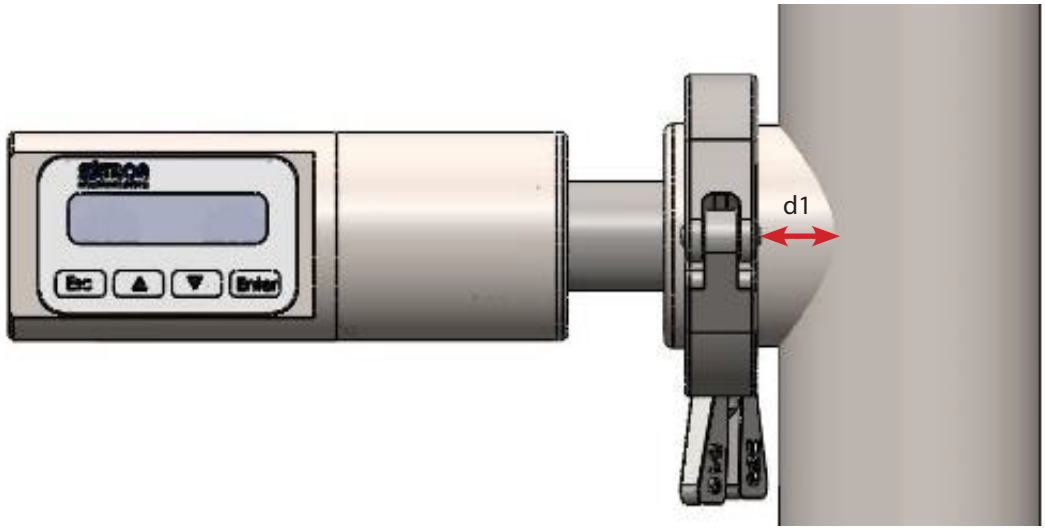


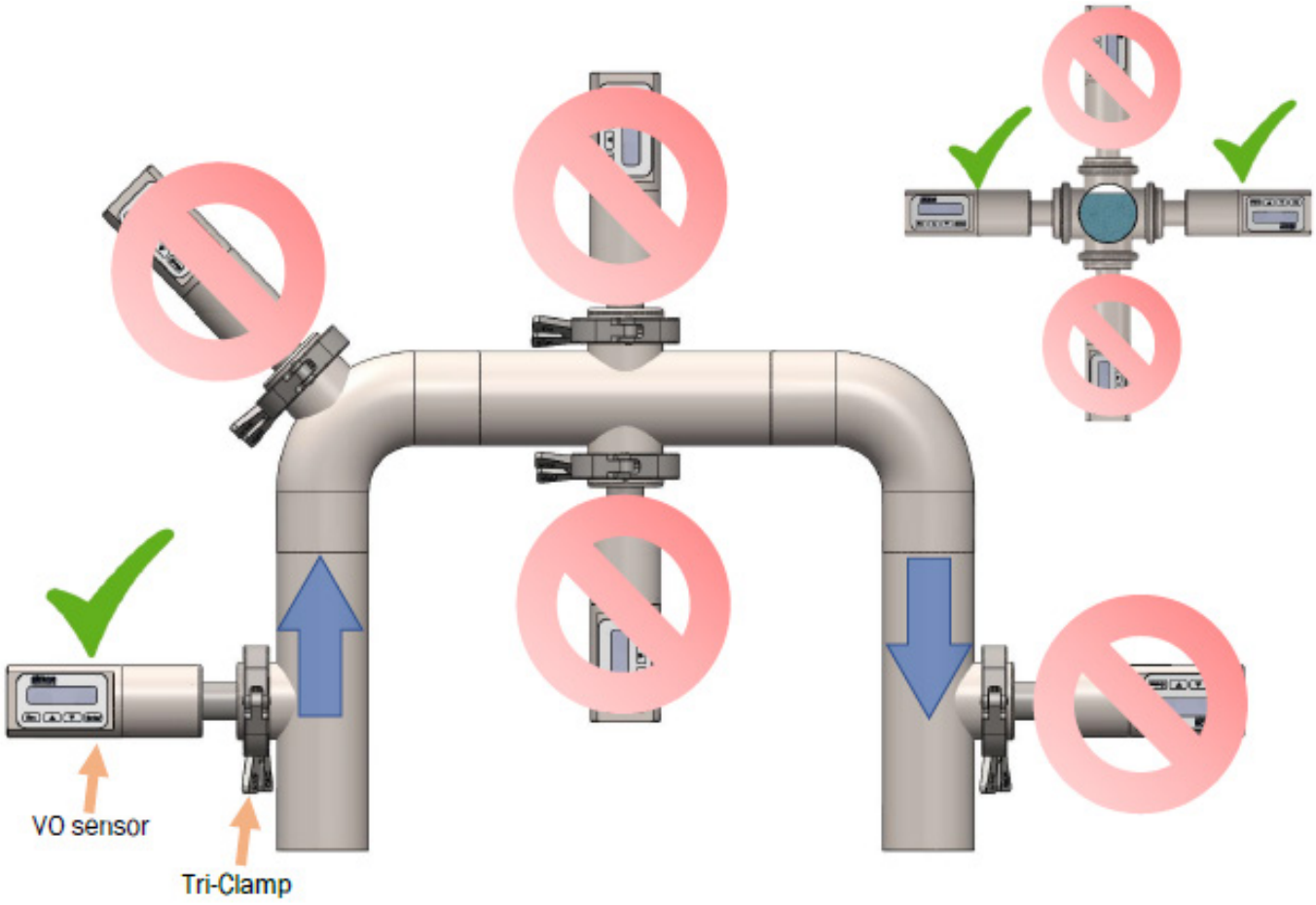
6.5 Installation Requirements for Clamp connection: VOMxxxxxxxxxxTA / TB / TN

Mounting recommendations:

Tri-Clamp connections are hygienic and easy to install but they can trap air that can cause a malfunction.

- Distance from sensor lens to inner pipe wall should be kept to a minimum "d1"
- Minimum pipe diameter: 38mm (1.5")
- Process connection direction:
  - Vertical: upwards flow
  - Horizontal: on the side
- Cable entry direction: from below



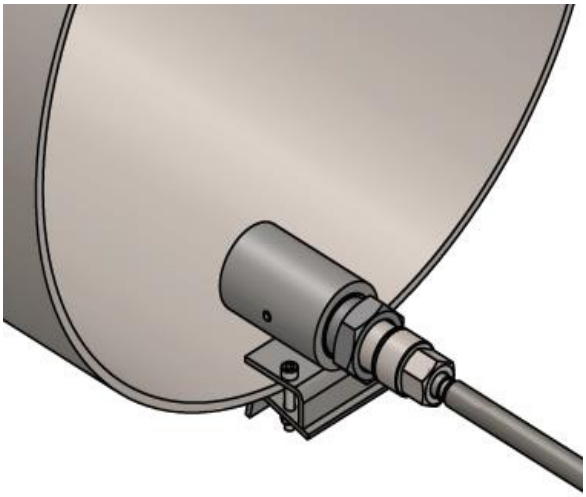


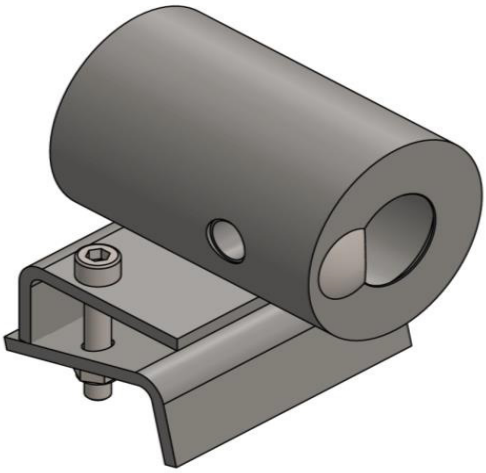
6.6 Installation examples VOM NRT

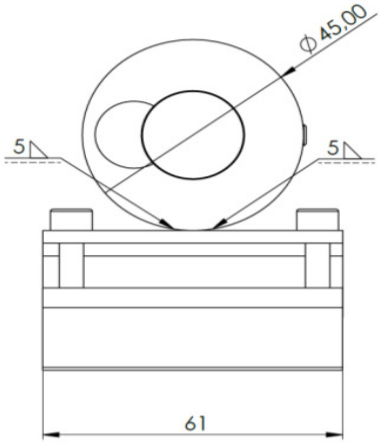
Installation example Clamp coupling for **VOMxxxxNRT2xxG1**

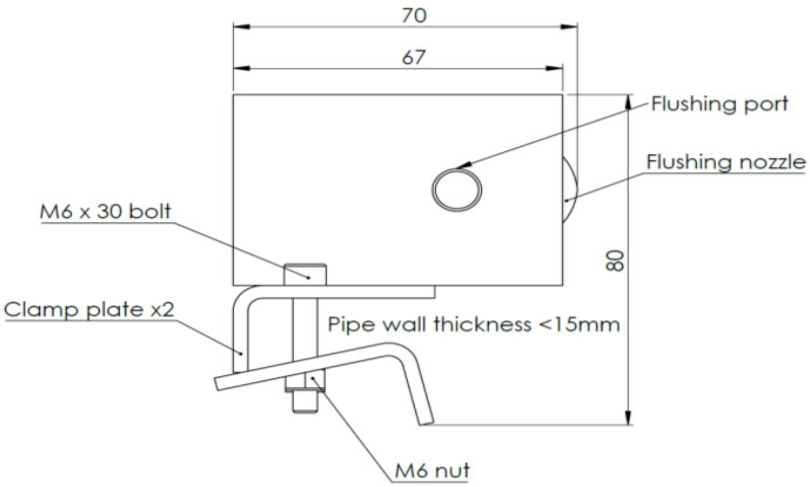
This coupling is intended to be installed on the outlet of a pipe,
Clamped on the pipe wall, the sensor will be facing the flow.

Item code: M1050186-FLUSH





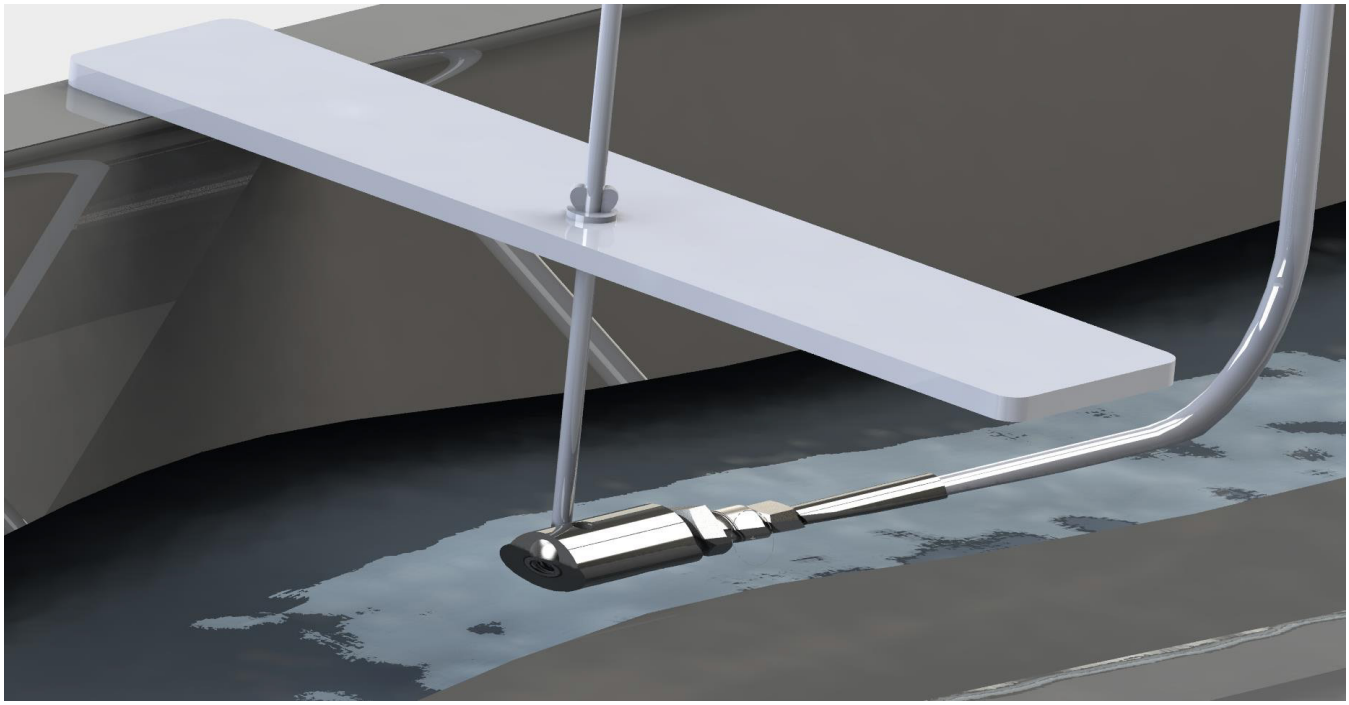


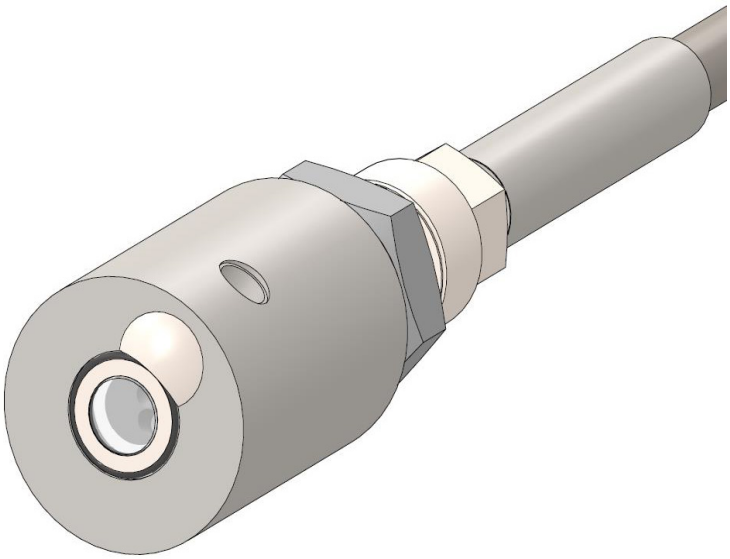


Installation example **V0MxxxxNRT2xxG1**

For drains, floor drains, wells, pits with submersible IP68 measuring head.
The optional flushing coupling can be easily welded to a thread bar and held in place.

Coupling order code: M1050021

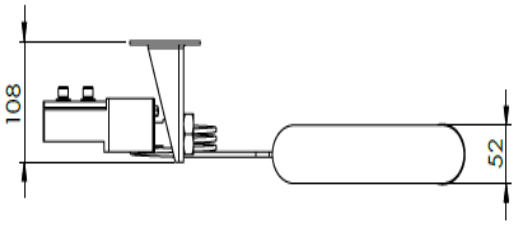


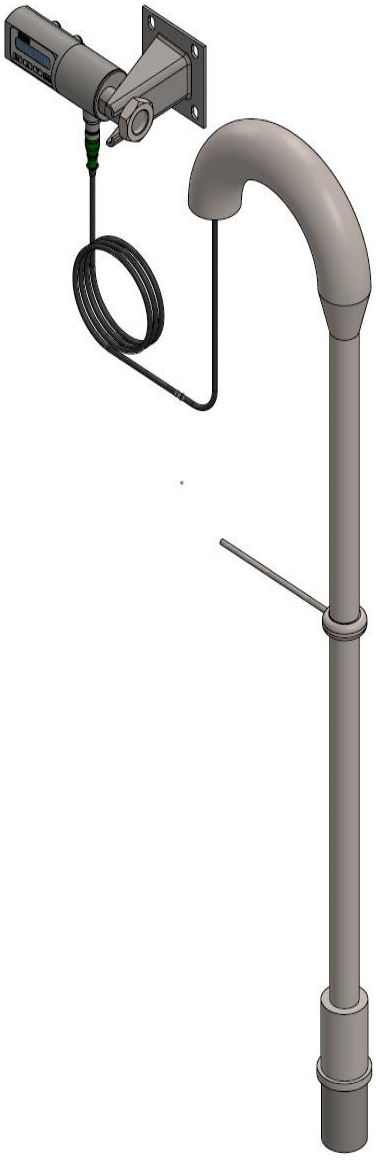


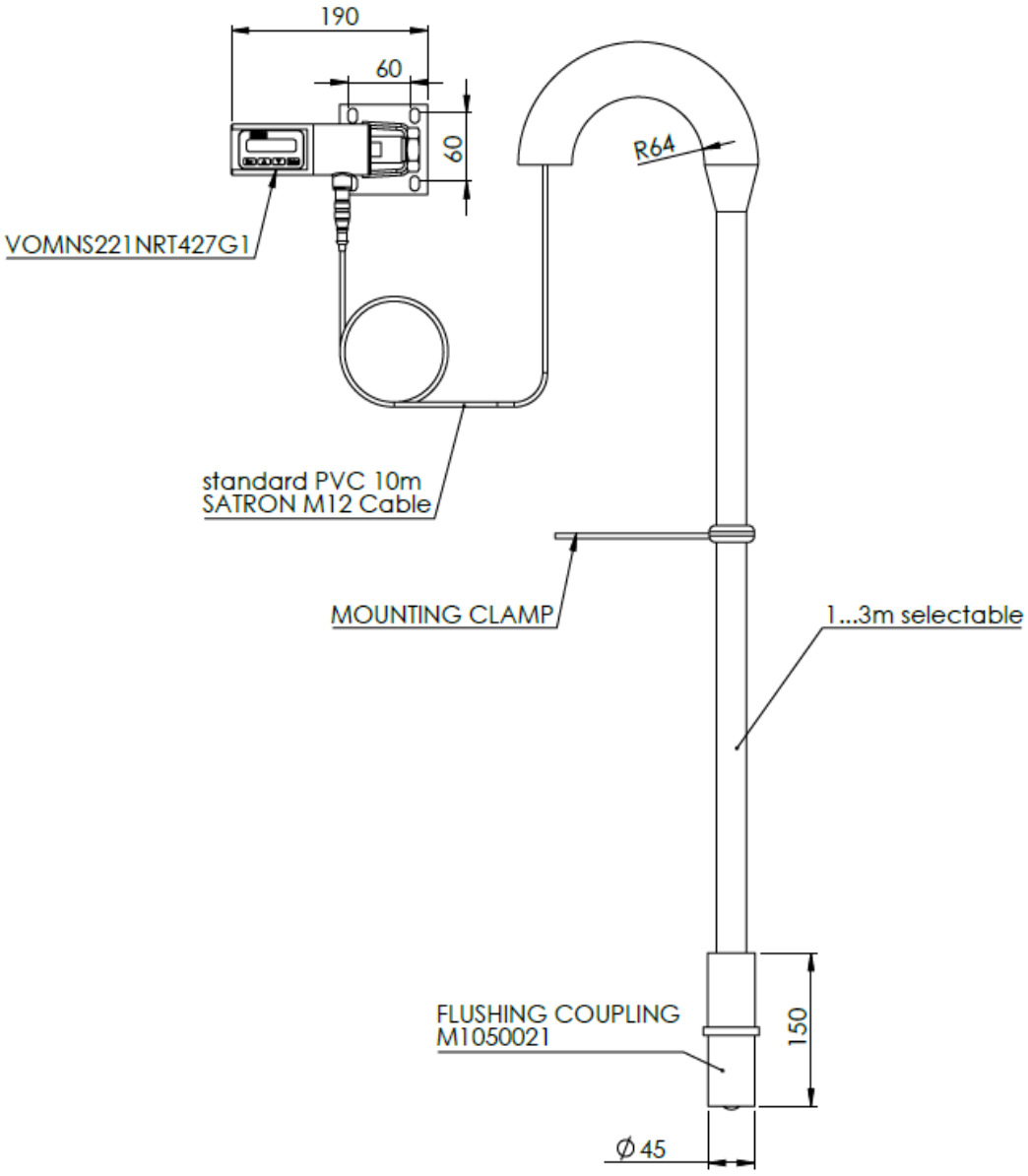
Installation example **VOMxxxxNRT4xxG1**

For big drains, floor drains, wells, pits etc.
We recommend to use the optional Pipe assembly.
The standard VOMxxxxxNRT4xxG1 is installed to the pipe assembly.
The pipe assembly is held in place by a clamp and mounted to a wall or bracket.

Pipe assembly order code: contact Satron



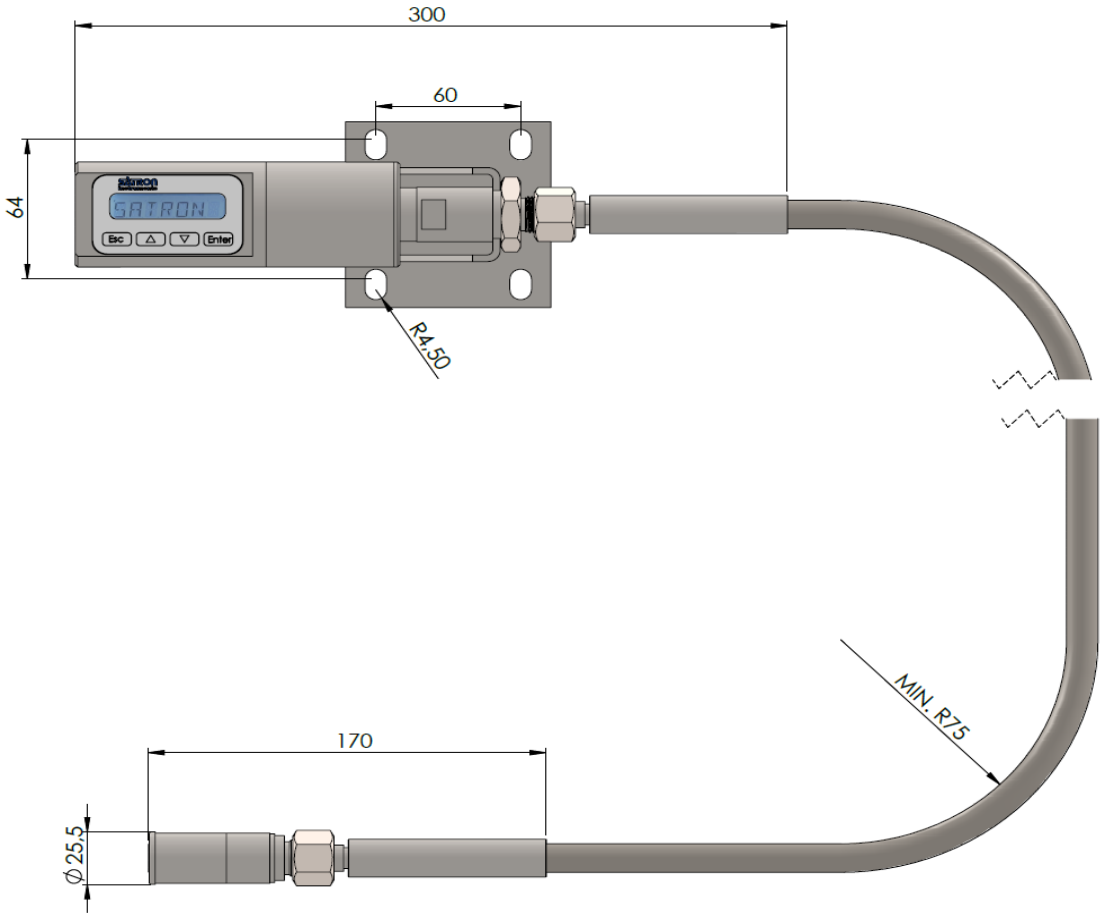




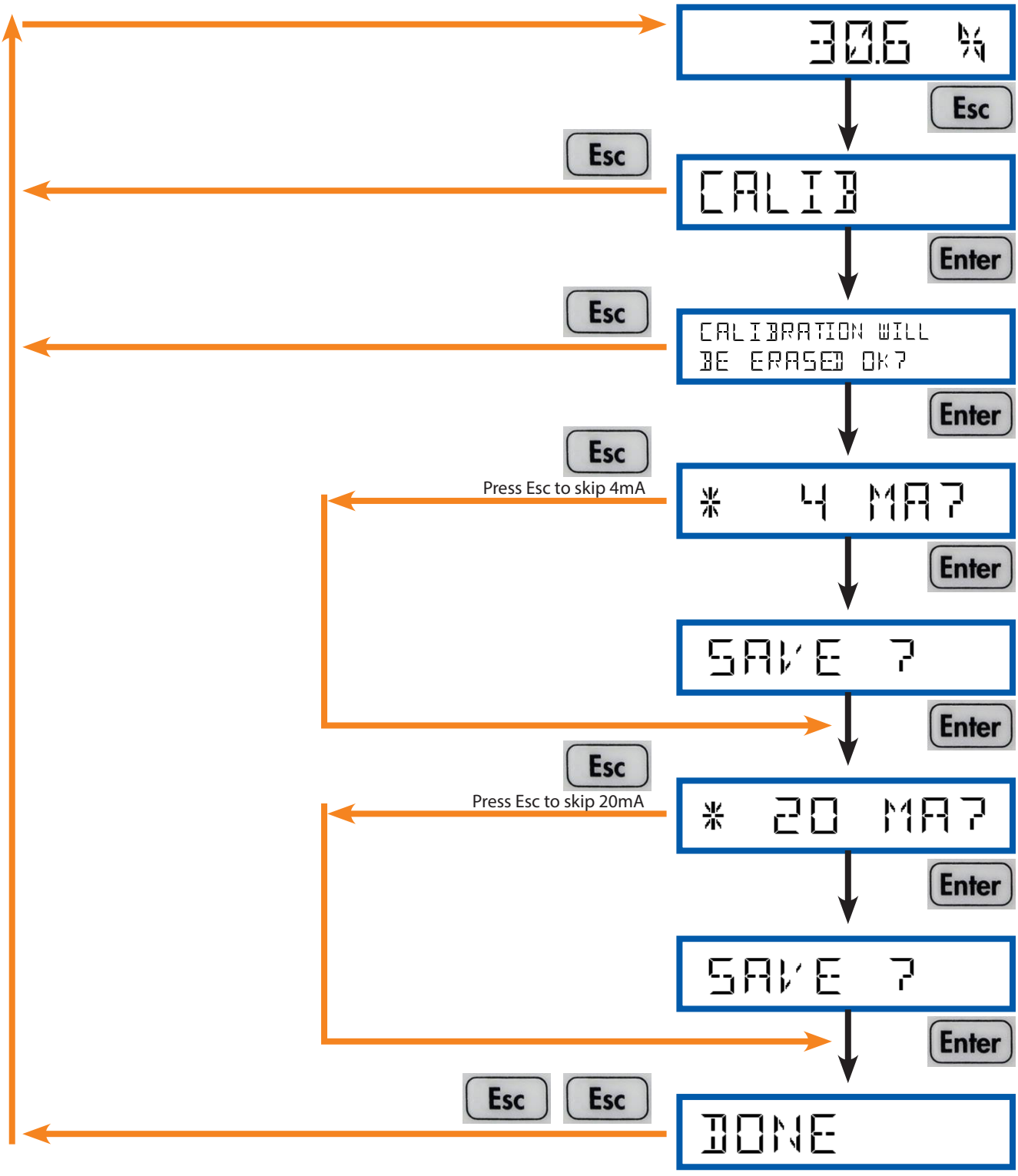
Dimensions in mm.

Installation example **V0MxxxxNRT2xxH1**

For small drains, floor drains and open tube collectors.
The sensor is dropped in the drain.
No flushing possible, so its important that lens is kept clean.



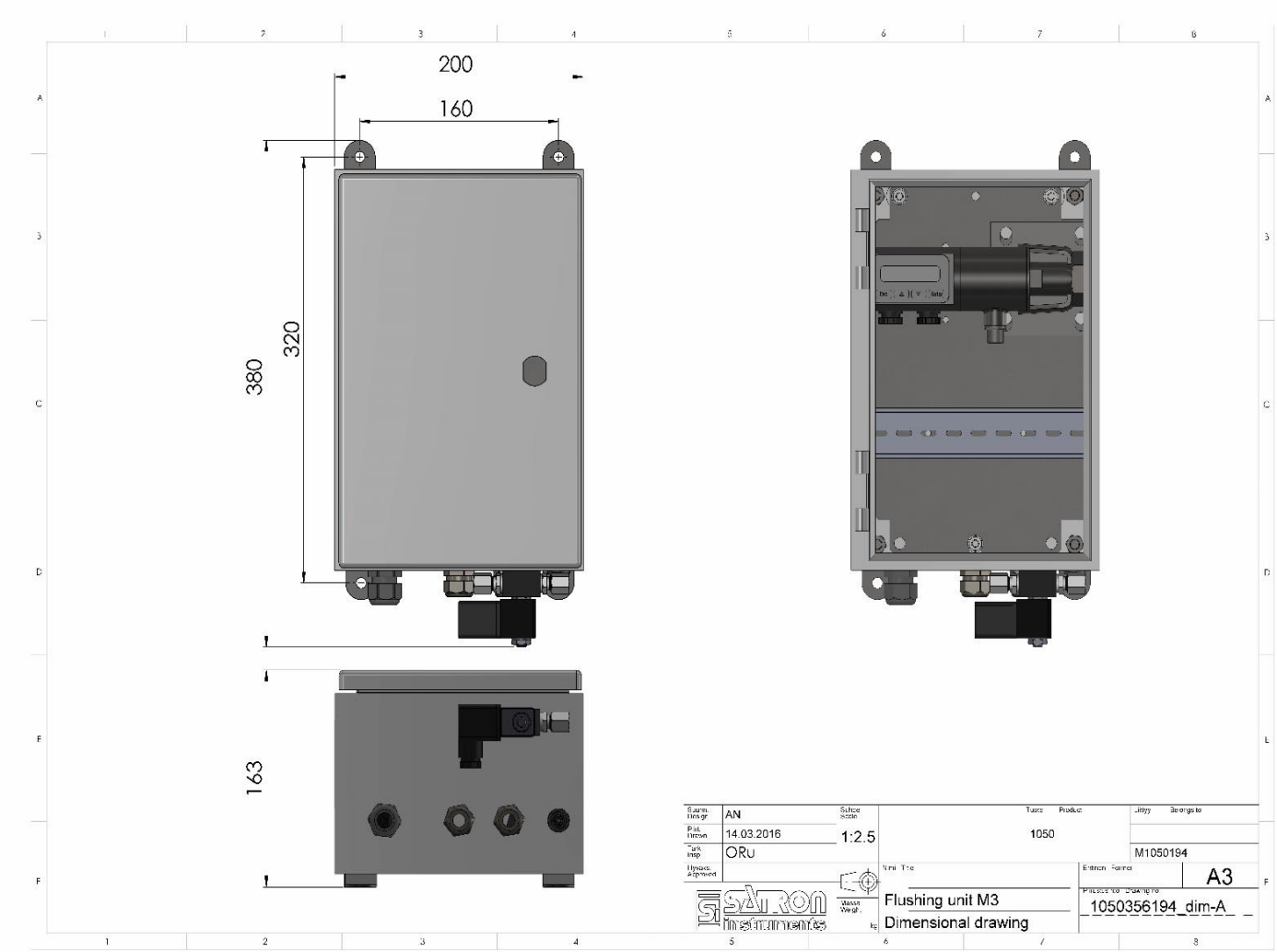
6.7 2 Point Calibration



7 FLUSHING UNIT M3 (M1050194) INSTRUCTIONS

These instructions only relate to the flushing settings of the sensor. For recalibration or other settings please read the manual.

1. Connect the sensor cable and transmitter cables to the display unit. Then fix the display unit to the mounting bracket.



2. Connect the supplied pneumatic hose to the flushing coupling and the other end to the solenoid valve. Take notice of the INLET and the OUTLET on the solenoid valve. The customer's own water / air supply is connected to the INLET, and the flushing coupling to the OUTLET. You are allowed to supply air or water to the solenoid valve. The maximum allowed pressure is 4 bars.

3. IMPORTANT:
If the automation system has its own load resistor, make sure to remove the already installed 250ohm load resistor from the flushing unit (if present between pins 7 and 10). Resistor is not included in every model version.

7.1 Changing the flushing parameters with the use of the VoAdvisor software

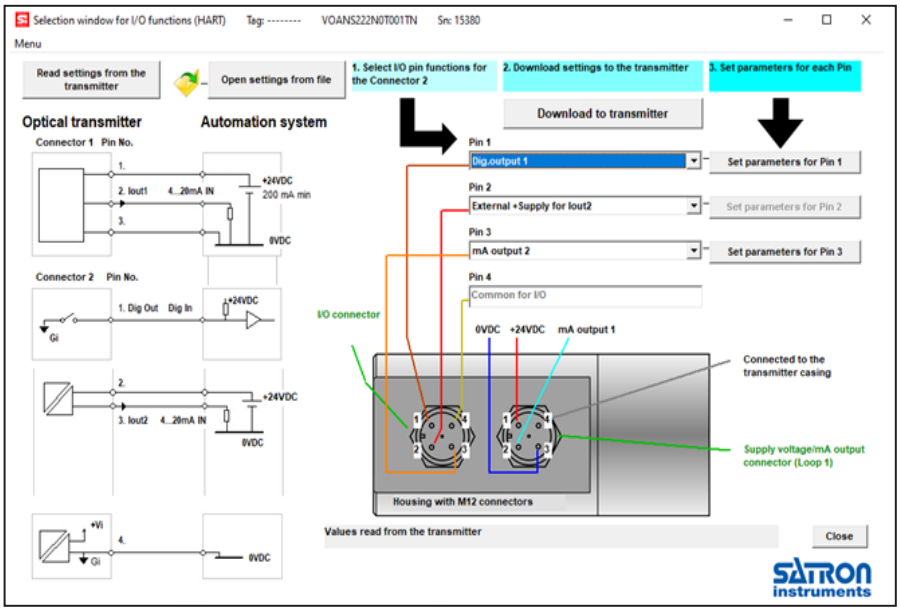
1. Connect the Hart modem to your computer and power supply

Connect the modem to the Flushing unit, pin7 and pin10, with the use of "alligator hooks" The polarity does not matter. Only make sure there is a load of 250ohm between them, otherwise the HART communication will not work. If the load resistor has been removed from the flushing unit during initial startup, connect to the corresponding load resistor within the automation system.

Connect the transmitter's supply voltage. The transmitter will perform an initial checkup and firmware check. The transmitter software version should be O101111A or later. In older versions flushing operation is not possible.

2. Start the VoAdvisor software. Check in the 'Start' window that the VoAdvisor software version is 115 or later. In older versions the flushing configuration is not supported.

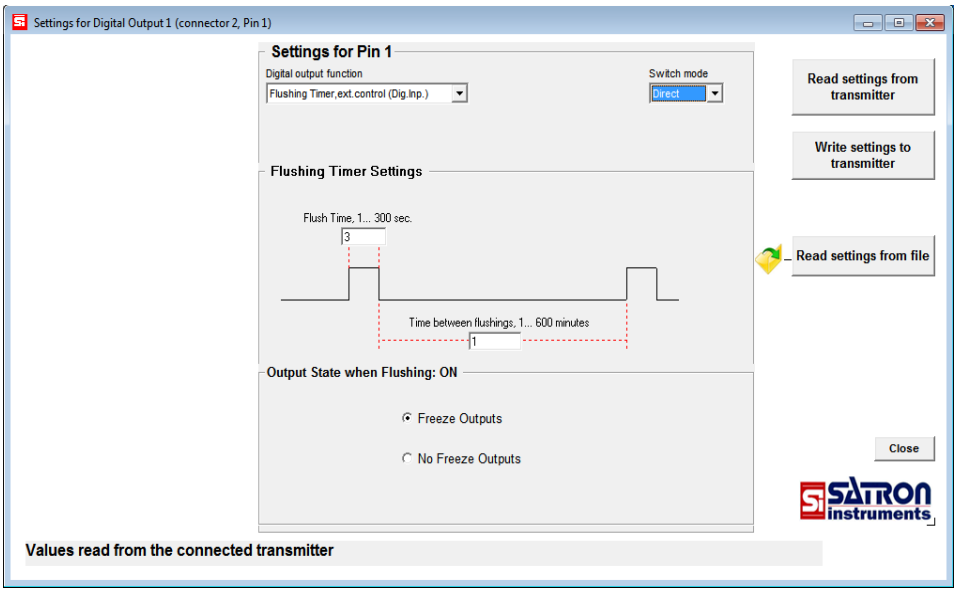
3. Click 'Start communication!' -> 'Configuration' -> 'Input / Output settings'.



4. The signal for the flushing unit is connected to pin 1 of the Optical transmitter's 2nd connector (I/O connector). Set pin 1 function to Dig.output 1.

5. Click 'Download to transmitter'.

6. Click on the 'Set parameters for Pin 1'-button



The function of the Digital output is set to be:
FLUSHING TIMER, EXT CONTROL (DIG.INP.)
This allows time based flushing and forced flushing, with the use of a digital input. (In this case the customer's automation system can force to engage flushing, regardless of the timer settings.)

Flushing timer settings:
Here the timings can be set for how long the flushing should take place, (standard 3 seconds). And the interval between the flushing cycles (Standard 1 minute).

Output State when flushing:
This will allow freezing the output signal of the optical transmitter while flushing. (Standard ON)

7.2 Changing the flushing parameters with the use of the VO/VC integrated display

Ensure that the transmitter is powered on and all cables are connected, see Appendix.

(For VO: press first "ESC" for 3 seconds to enter "SYSTCONF")
Select "I/O CONF" by pressing up/down buttons and press Enter.
To enter the settings of the first digital input / output pin go to "I/O 1" and press enter.

Here are the standard factory settings and info:

Parameter:	Select:	Info:
TYPE	DO1	Digital output 1
FUNCTION	FLSH OUT	Flush control output
SWITCH	DIRECT	Relay switching
ON DELAY	000	Delay for ON
OFF DELAY	000	Delay for OFF
OF TIMER	0000	Overfeed timer
FLSH MOD	AUTO	Flushing control mode
FLSH TIM	003	Flushing time (1…300 seconds)
FLSH INT	001	Flush time interval (1…600 minutes)
FLSH FRZ	YES*	Freezes the output while flushing

*With transmitter firmware O170208A.HEX or newer select "FLSH +00"
- Other options are "FLSH +01" – "FLSH +30" or "NO"
- e.g. "FLSH +05"-setting will freeze the mA output during the flushing time plus 5 extra seconds after the actual flushing time is over.

8 SI LOG ADVISOR - QUICK GUIDE

8.1 Introduction

SI Log Advisor is a tool for reading and analyzing log information stored in Satron devices.
At this time event and data log feature is implemented in Satron VO analyzers and fast pressure transmitters (V1K).

The main functions of the software are:

- Reading and modifying the logging configuration of the device
- Reading the log contents from device to PC
- Writing/reading the log contents to/from hard disk of the PC
- Exporting the log contents to text file
- Viewing the log contents in text and graphical formats

8.2 Installation

SI Log Advisor requires:

- VO analyzer (firmware 0100223A or later) or V1K pressure transmitter (firmware V111115A or later)
- PC with Windows XP, Windows Vista or Windows 7 operating system

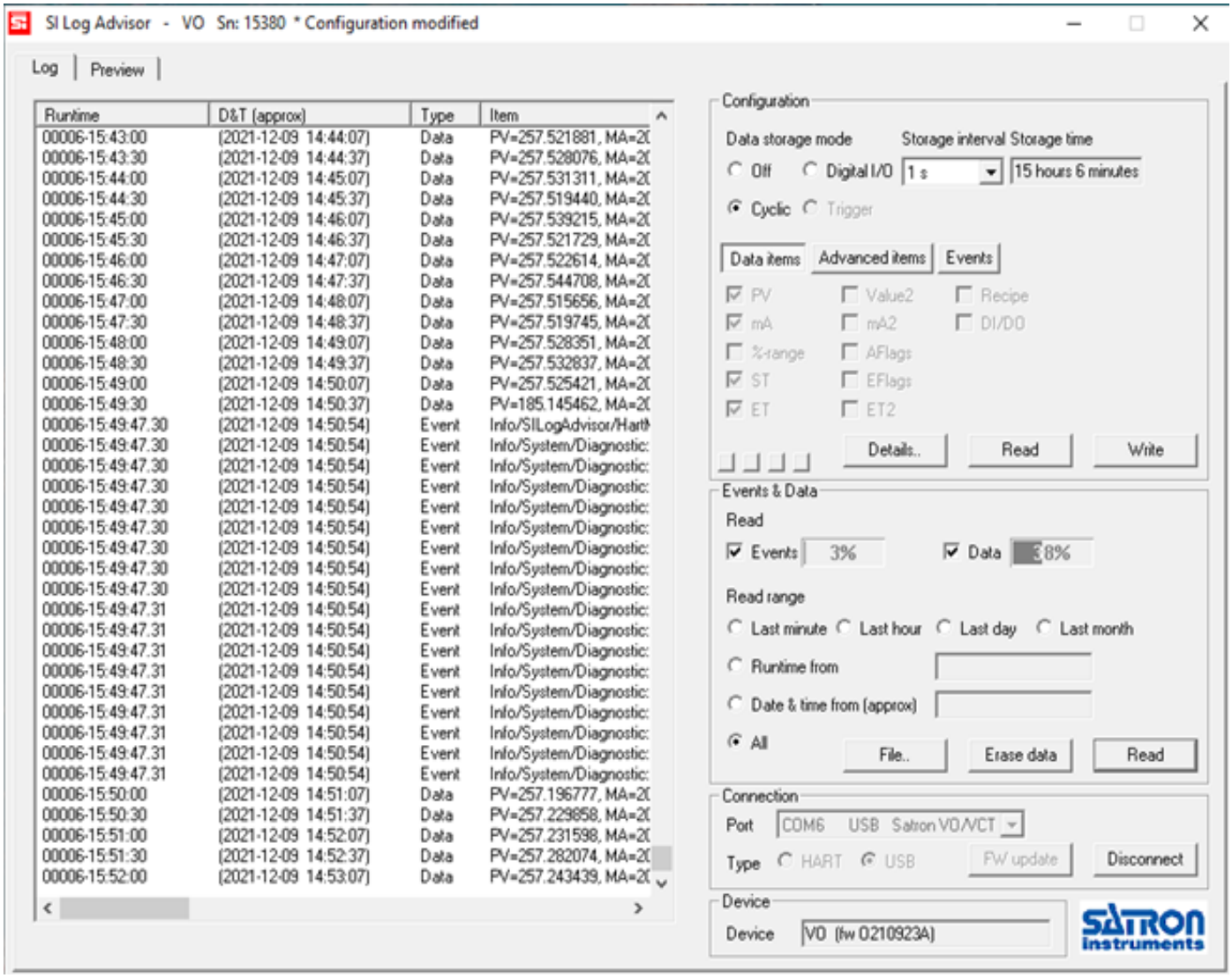
SI Log Advisor includes the following files:

SILogAdvisor.exe executable file
SILogAdvisor.ini program settings (automatically created)

SI Log Advisor does not require any actual installation.

SILogAdvisor.exe can simply be copied to a folder on the hard disk, or the software can be executed drectly from a USB memory stick.
SILogAdvisor.ini is created automatically to folder “C:\SILogAppData” (by default), or alternatively it can be located in the same folder as the executable file.

8.3 Log page



8.3.1 Making the connection

Make the connection to the device with the following steps

- Connect the device to the PC with a USB cable (with Standard-A and Mini-B plugs), or with HART
- Select the port (COM1..COM256) with ***Port*** selection box
- COM ports that are currently present in the system are shown with character "*", e.g. "COM1 *"
- Select USB or HART with ***Connection*** selection
- Note: HART communication is about 100 - 130 times slower than USB
- Connect with ***Connect*** button

If the device is found

- The log settings are automatically read from the device
- Various functions on the page are enabled
- Device type and firmware versions are shown on the ***Device*** line
- ***Connect*** button is replaced with ***Disconnect*** button.

If the device is not found, an error message is displayed.

8.3.2 Changing log settings

On the ***Configuration*** area of the ***Log*** page the logging settings of the device can be modified:

Data storage mode

- Cyclic (default): data logged cyclically (oldest data replaced with new)
- Digital I/O: data logging is enabled with digital input of the device
- Off: no data logging
- Trigger: (not yet available)

Storage interval

1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 30 min, 1 hour, 2 hour, 6 hour 12 hour, 1 day

Note: with device firmware versions 0120516A (VO) and later, this is “Medium speed” storage interval.

Storage time

Shows estimated data storage time with current log settings

Data items and Advanced items

- With device firmware versions **0120327A** (VO) and earlier
  - data items that will be logged can be selected here
- With device firmware versions **0120516A** (VO) and later
  - data items that will be logged are shown here
  - data item selection can be done in **Details** page, see **8.3.2.1 Details page.**
- Selectable items depend on the device type as follows

VO and V1K:

PV	PV (primary variable)
mA	output current
%-range	percent of range
ST	ST (sensor temperature)
ET	ET (electronics temperature)
AFlags	alarm flags
EFlags	error flags
Value2	variable 2
mA2	output current 2 (second loop)

VO only:

D1	D1 (D1 A/D value, LED ON)
D2	D2 (D2 A/D value, LED ON)
D1R	D1R (D1 A/D value, LED OFF)
D2R	D2R (D2 A/D value, LED OFF)
Raw	calculated raw value
Averaged	averaged value
Compensated	compensated value
Factory Trimmed	factory trimmed value
User Trimmed	user trimmed value
Filtered	filtered value
Recipe	active recipe index

ET2	ET2 (electronics temperature 2)
DI/DO	digital input and output states (bit 0=DI1, bit 1=DI2, bit 2=DI3, bit 3=DO1, bit 4=DO2, bit 5=DO3)

Firmware versions **0120516A** and later:

D3f	D3 (D3 A/D value, LED ON)
D4f	D4 (D4 A/D value, LED ON)
D5f	D5 (D5 A/D value, LED ON)
D3Rf	D3R (D3 A/D value, LED OFF)
D4Rf	D4R (D4 A/D value, LED OFF)
D5Rf	D5R (D5 A/D value, LED OFF)

V1K only:

P1 Raw	P1 (A/D value)
ST1 Raw	ST1 (A/D value)
P2 Raw	P2 (A/D value)
ST2 Raw	ST2 (A/D value)
P1	P1 (pressure 1)
P2	P2 (pressure 2)
P NoFilt	P (pressure, no filteration)
P	P (pressure)
ST1 NoFilt	ST1 (sensor temperature 1, no filteration)
ST2 NoFilt	ST2 (sensor temperature 2, no filteration)
ST2	ST2 (sensor temperature 2)

Events

Event types that will be logged can be selected here
(if the firmware supports the selection, otherwise selections are fixed)

Error	error
Warning	warning
Alarm	alarm
Start	start event (several Start events will be logged with every boot)
Config	configuration change
Diagnostic	diagnostic event
Digital I/O	change in digital I/O states
HART error	HART error (invalid HART message received)
RTC	real-time-clock event
Other	other event

Details...

Opens Details page (device firmware versions 0120516A (VO) and later only)

Read

Reads current log configuration (automatically performed with Connect)

Write

Writes modified log configuration to the device

Note: changes take effect immediately (no restart required)

8.3.2.1 Details page

On **Details** page (see below) the logged signals are selected.

Note: After having changed the log settings, they have to be written to the device with Write button on the Configuration section.

Data storage

Mode

- Cyclic (default): data logged cyclically (oldest data replaced with new)
- Digital I/O: data logging is enabled with digital input of the device
- Off: no data logging
- Trigger: (not yet available)

Trigger signal, Trigger direction, Trigger limit

Not yet available

Intervals

Slow, Medium

1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 30 min, 1 hour, 2 hour, 6 hour 12 hour, 1 day.

Fast

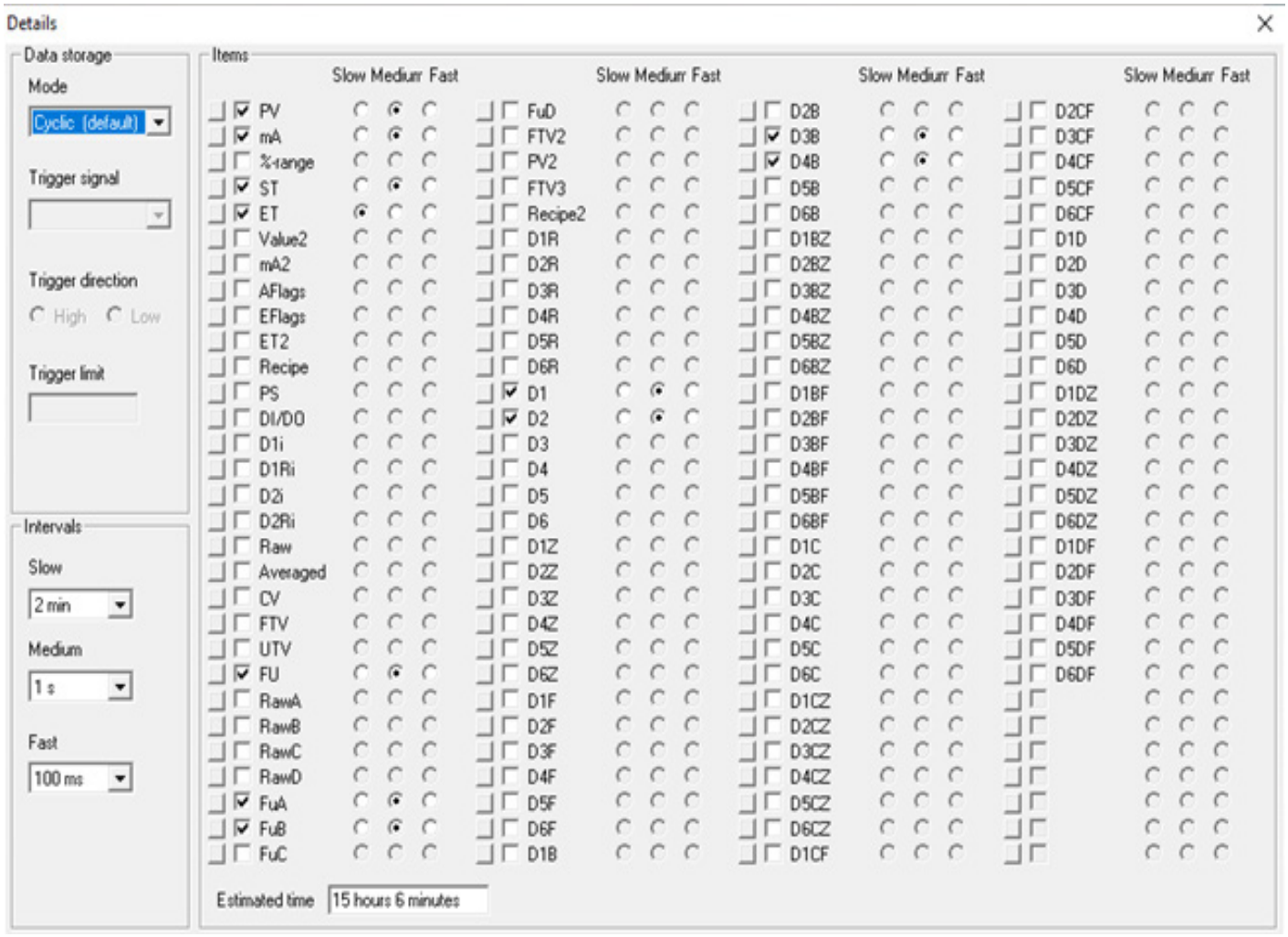
100 ms, 200 ms, 500 ms, 1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 30 min, 1 hour, 2 hour, 6 hour 12 hour, 1 day.

Items

- Logging for each item can either be disabled, Slow, Medium or Fast
- The maximum number of logged signals is 24
- The maximum number of logged signals with “Fast” interval is 8

Estimated time

Shows estimated data storage time with current log settings.



8.3.3. Reading events and data from the device

On the ***Events & Data*** area of the Log page, the settings with which the data from the device will be read, can be changed, and the reading of data can be started.

Read

Reads either events or data, or both.

Note: reading events/data using HART connection requires firmware version

- 0120327A or later (VO), or
- V120308A or later (V1K)

Events and Data

Read either events or data, or both (at least one has to be selected).

Note: it is recommended that events should always be read

(e.g. the RTC calculation does not work without reading the RTC events)

Usage gauges show the amount (as percent) of events and data flash memory that is currently in use

- 0 % = memory empty (or less than 1 % in use)
- 99 % = all memory in use (oldest items have been erased)
- value 100 % is never reached because there is always room for new items

Read range
Specifies the starting time after which the events/data are read

Last minute	events/data during the last minute
Last hour	events/data during the last hour
Last day	events/data during the last 24 hours
Last month	events/data during the last 31 days
Runtime from	events/data after specified runtime (runtime is the time in days, hours, minutes, seconds and tenths of a second, which is the device has been operational)
Date & time from	events/data after the specified date and time (if real-time-clock is active, then RTC events are used to calculate the time, otherwise the date and time is an approximation which assumes that the device has been operational without interruption)
All	all events/data

8.3.4. Erasing logged data from the device

Logged data can be erased from the device with **Erase data** button
Note: logged events can only be erased at the factory

8.3.5. Writing/reading events and data to/from files

The log data can be saved/read to/from files with the following functions using the ***Files..*** button

Open SI file (*.sif)	opens previously stored log data file (*.sif)
Save SI file (*.sif)	stores log data to file (*.sif = Satron Instruments file format)
Export data to text file	writes data to text file in CSV format (comma-separated values)
Export events to text file	writes events to text file in CSV format
Export data/events to text file	writes data and events to text file in CSV format

With the ***Export*** functions the log data can be exported for later analysis with other tools (e.g. Excel)
- the same decimal symbol (“,” or “.”) will be automatically used as in Windows
- semicolon (“;”) will be used as a separator

Note: it is recommended that after the events/data has been read from a device, it should be stored using the ***Save SI file (*.sif)*** function. This enables opening the stored events/data for later viewing in ***SI Log Advisor*** as well as exporting it later to a text file (a text file can not be opened in ***SI Log Advisor***).

8.3.6. Viewing events and data as a list

On the left hand side of the ***Log*** page, the events and data are shown as a list with the following columns:

Runtime	the time in days, hours, minutes and seconds (and hundreds of a second), which the device has been operational at the time of the logging
D&T (approx)	date and time (calculated using Runtime and RTC events) - if real-time-clock is active, then RTC events are used to calculate this time - otherwise the date and time is an approximation which assumes that the device has been operational without interruption

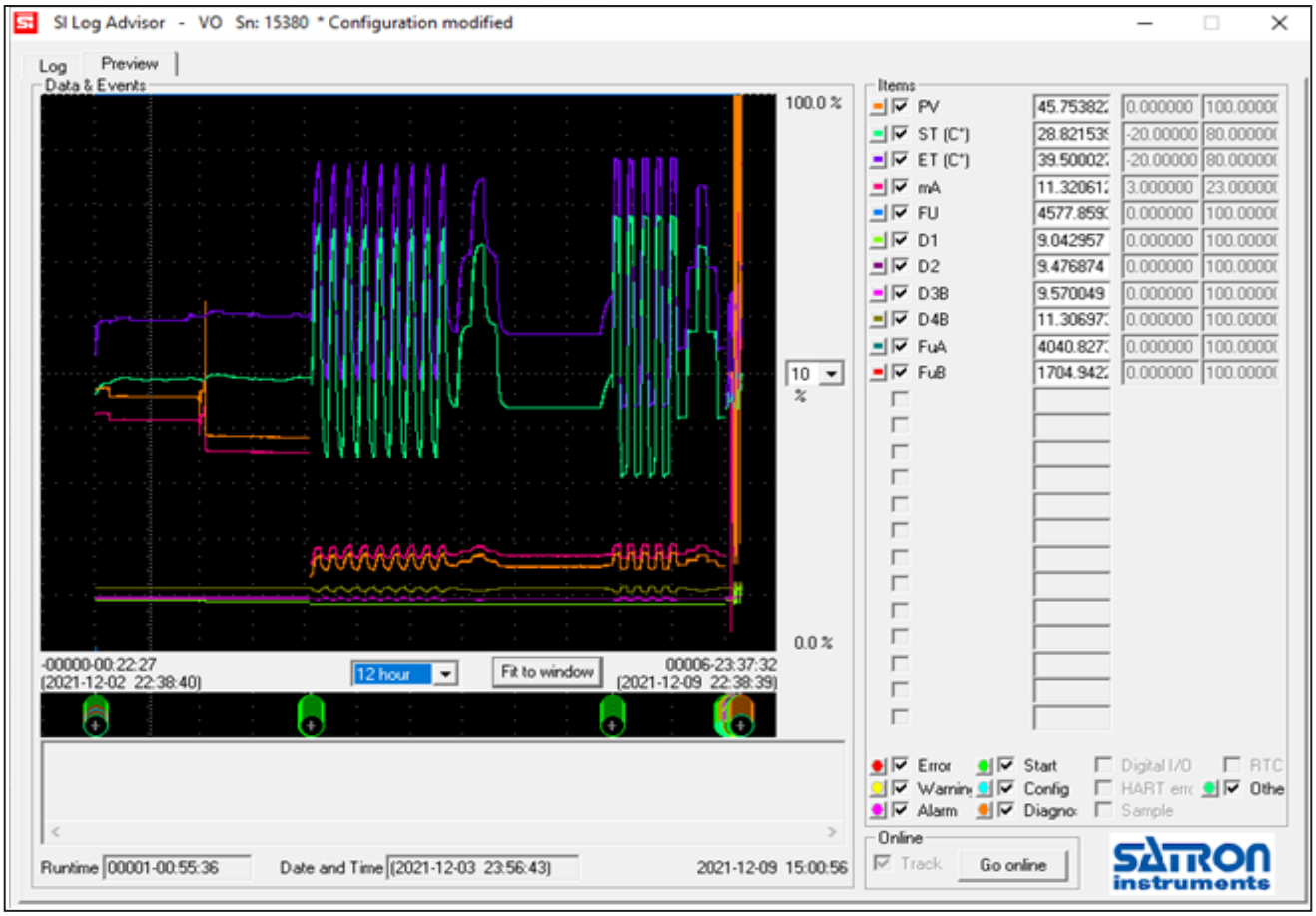
Note: if the date and time is an approximation, it is shown in parentheses

Type Event or Data

Item event/data item information as text

Note: activating an event/data on the Log page (by clicking the Runtime field) will place cursor on the Preview page to the time of that particular event/data item.

8.4 Preview page



8.4.1. Data items

- Data item values are shown in the upper left window as lines (0 % to 100 % range), with various colors
- When zoom in enough, individual measurement points are represented with tiny squares
- The upper right hand side of the page shows the numerical values of the items at the cursor position,
- With their respective colors
- Items that are not present in the log data are disabled (gray)
- items that are present in the log data can be hidden by unchecking the visibility checkbox for the item
- The 0 % and 100 % values for each item can be modified only when the checkbox is unchecked
  (Recipe and DI/DO items are shown only as numerical values)
- The active window can be moved up or down (with 10 % steps of the range)
- Range box selects the height of a grid square (not total height of the window) from the following values
  10 % (default), 5 %, 2 %, 1 %, 0.5 %, 0.2 %, 0.1 %, 0.05 %, 0.02 %, 0.01 %
- With **Fit to window** button the timescale can be adjusted automatically so that all events/data fits to the window

Data item ranges

The range of each data item can be modified automatically with the following functions
(press the color symbol to the left of the item name)

Fit range	fit the item data to 5.. 95 % of the preview window
Zoom range in	zoom the item data range in
Zoom range out	zoom the item data range out
Move diagram up	move diagram up on the display
Move diagram down	move diagram down on the display
Stack ALL diagrams	organize all data ranges so that they are displayed stacked one on top of the other
Save range	save automatically modified range
Save ALL ranges	save all automatically modified ranges

8.4.2. Events

- Events are shown in the lower left graphical window as circles, with various colors
- Events at the same position are stacked one above another ('+' sign on an event indicates that there are more events on that position than is possible to show on the window)
- The lower right hand side of the page shows the event types that can be selected to be visible, with their respective colors
- The event types that are not present in the log data are disabled (gray)
- Text window below the graphical window shows textual information of the event(s) at cursor position

8.4.3. Data items and Events

- The active windows can be moved with mouse left or right
- Time box selects the width of a grid square (not total width of the windows) from the following values
  1 s, 2 s, 5 s, 10 s, 30 s, 1 min, 2 min, 5 min, 10 min, 30 min, 1 hour, 2 hour, 6 hour 12 hour, 1 day, 2 days, 1 week

Note: when time box is active, the time can be zoomed in and out with mouse wheel (time box can be activated also by clicking on the graphical window).

8.4.4. Other functions

- ***Runtime*** shows the operating time of the device at the cursor position
- ***Date and Time*** shows the real-time-clock time at the cursor position
- Note: double-clicking on either of the graphical windows activates the Log page and displays the event or data item, which is closest to that cursor position
- Current time is shown on the bottom of the screen

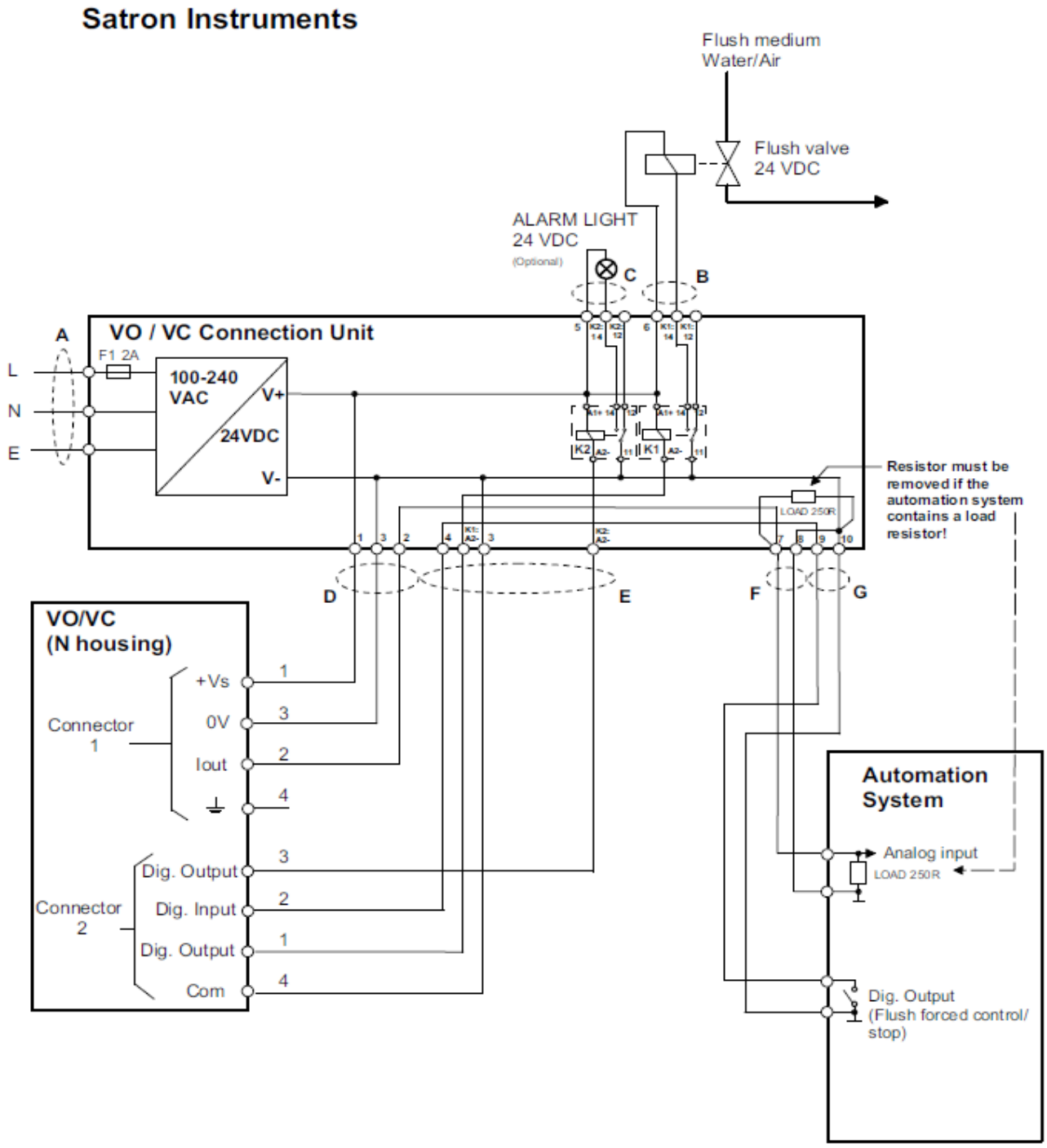
8.4.5. Online mode

Online mode can be entered with **Go online** button. In the online mode the event and data log items that the device is logging to the internal flash memory, are simultaneously written to the connected PC (via USB). Online mode can be exited with **Go offline** button.
When **Track** is enabled, the preview window and cursor are automatically moved to show the last log item (oscilloscope-like function). When **Track** is disabled, the user can freely move within the time space.

Note: Online mode is available only with USB, not HART.

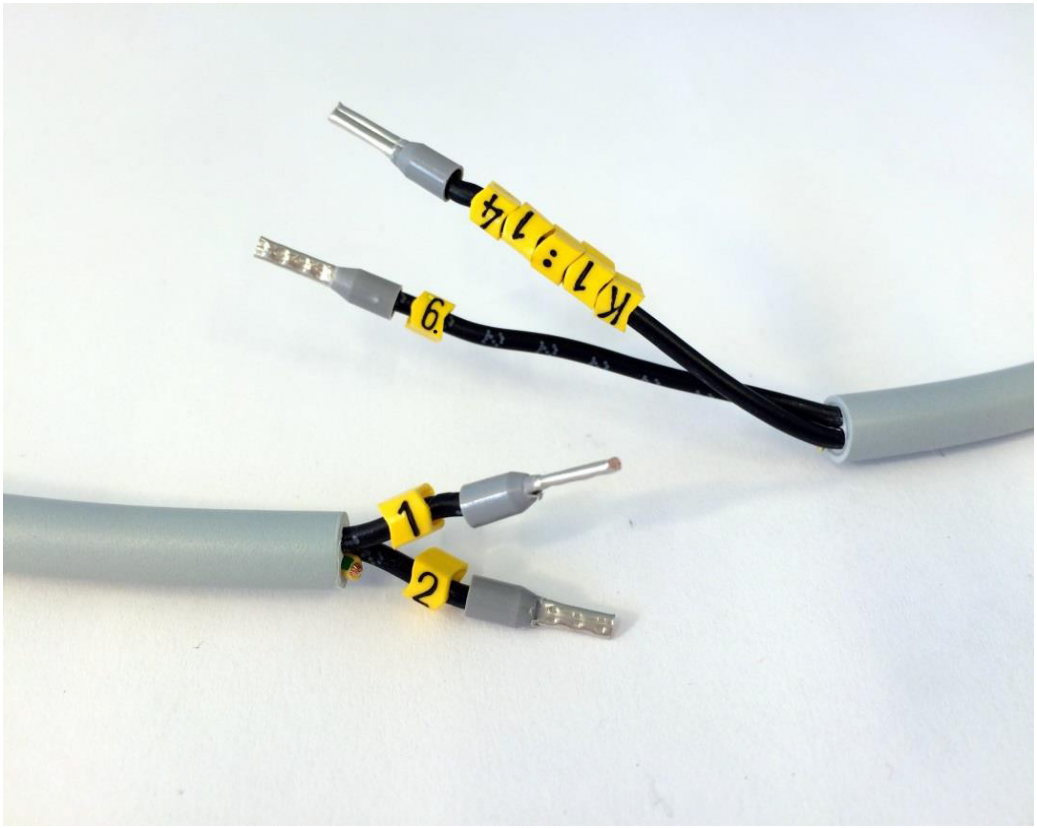
APPENDIX

M1050194

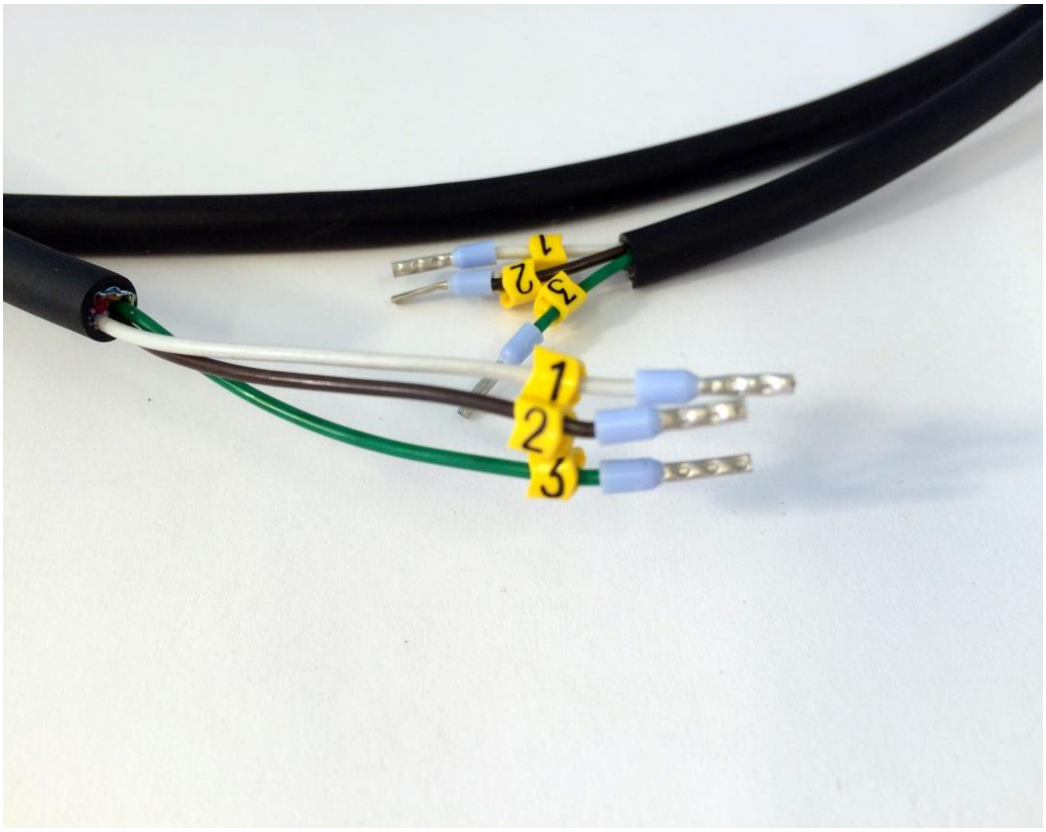


Satron Instruments	JKH
Title	M1050194 FLUSHING UNIT M3 WIRING VER 3.
File	M1050194
Date	29.04.2020

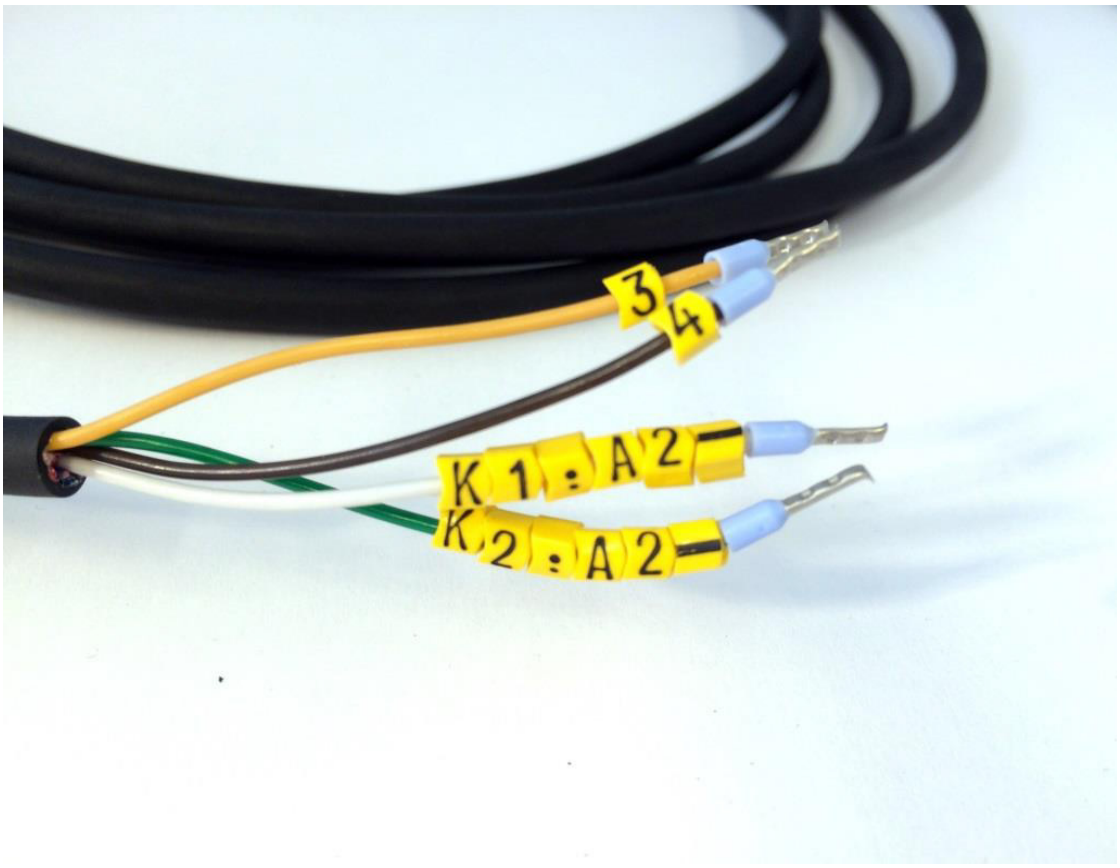
Flushing Unit, cables



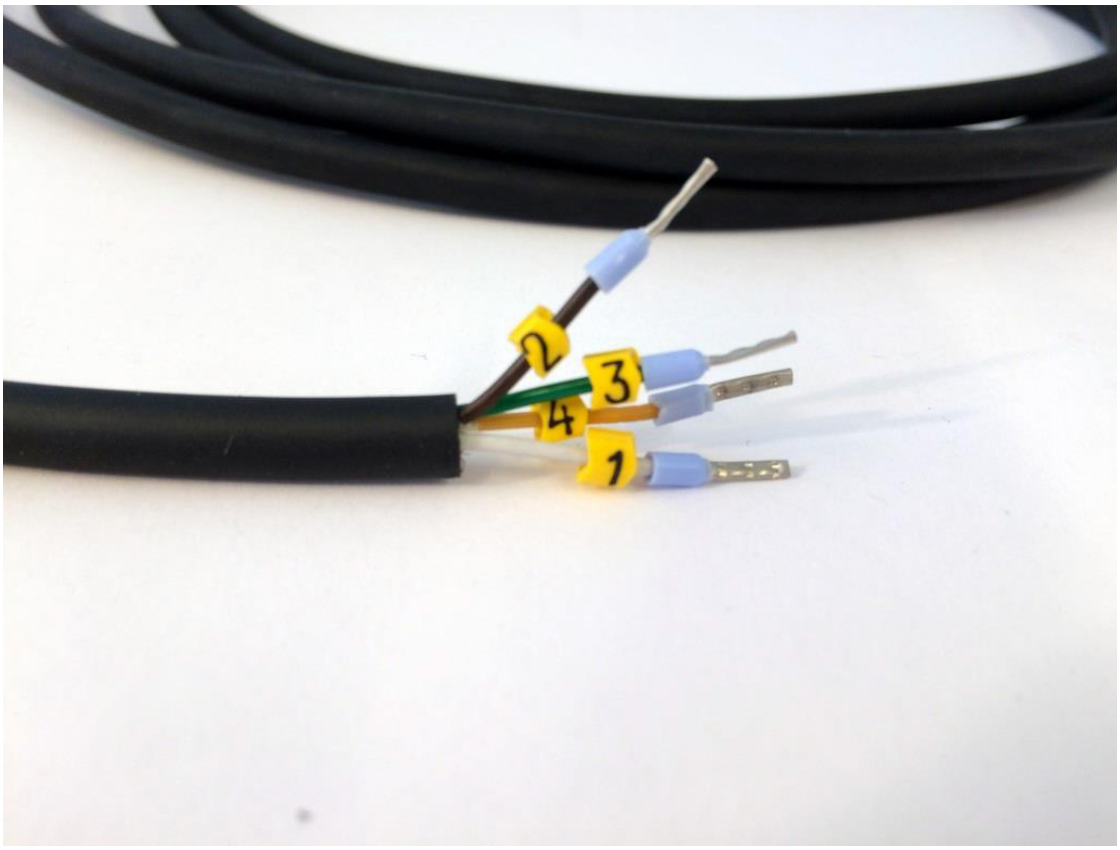
Picture 1. CABLE "B", Both ends.



Picture 2. CABLE "D", Both ends.



Picture 3. Cable "E", Flushing unit end.



Picture 4. Cable "E", Transmitter end.

NOTES