

# SATRON VO Turbidity and solids content sensor

**SATRON VO turbidity and solids content analyzer** is suitable for the measurement of different liquids. Savings can be obtained by using SATRON VO analyzer in process industries, e.g. the use of clean water can be minimized, the time used for the cleaning (CIP) will be shortened, the use of the end product (in dairy applications: milk) and the use of cleaning materials needed in the process can be optimized. The transmitter communicates digitally using the HART® protocol.



## TECHNICAL SPECIFICATIONS

### Measuring range and span

See Selection Chart.

### Zero and Span adjustment

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

### Damping

- Time constant is continuously adjustable 0.01 to 60 s.

### Repeatability

- 0.1% from maximum span.

### Temperature limits

Ambient: -30 to +80 °C  
Process: -30 to + 100 °C / + 150 °C  
Shipping and storage: -40 to +80 °C.

### Output 3-wire (3W), 4-20 mA

### Supply voltage

Nominal 24 VDC, (21,6 - 27,6V)

### Humidity limits 0-100 % RH

### EMC directive 2004/108/EC

- EN 61326-1:2005

### CONSTRUCTION

#### Materials:

Sensing element <sup>1)</sup>: AISI316L, Duplex (EN. 1.4462), Hast. C276/C22, or Titanium Gr2.

Surface quality: Polished Ra <0,8µm  
Lens: quartz glass, Safir glass or PC plastic

Coupling <sup>1)</sup>: AISI316L, Duplex (EN 1.4462), Hast.C276 or Titanium Gr2  
Other sensing element materials: AISI316, SIS 2343.

### Pressure class:

- PN40  
- Test pressure -1 to 30 bar

### Housing with display,

codes **N0S** & **N0T**:

Housing: AISI303/316, Seals: Nitrile-rubber and Viton®,  
Nameplates: Polyester

### Housing with M12 connector, code

**H0T**: Housing: AISI303/316, Seals: Viton® and NBR.

### Housing with PLUG DIN 43650 connector, code **H0S**:

Housing: AISI303/316, Seals: Viton® and NBR.

PLUG connector: PA6-GF30 jacket, Silicone rubber seal, AISI316 retaining screw.

### Connection hose between sensing element and housing

Codes **L** and **R** :

PUR signal cable or hose protected with PTFE/AISI316 braiding

### Calibration

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

### Electrical connections

Housing with PLUG connector, code **H0S**:

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

Housing with M12 connector, code **H0T**:  
M12 plug connector

Housing with display, code **N0S**:

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

Housing with display, code **N0T**:

M12 plug connector

### I/O-connections

#### bout1-3

Relay, grounding contact

Maximum voltage 35 V  
Maximum current 50 mA  
Maximum leakage current 10 µA

#### bin1-3

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 output1

Range 3.5...23 mA  
Maximum load 600 Ω  
Factory setting 4...20 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 load, See picture below  
Maximum isolation voltage 100 VDC

### Process connections

- With G1 connecting thread  
- Tri-Clamp 25/38 and 40/51

**Protection class:** See Selection chart.

### Weight

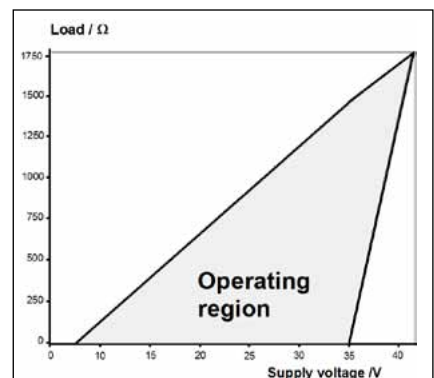
Housing with PLUG DIN43650 connector (**H0T**): 0.9 kg

Housing with M12 connector (**H0S**): 0.9 kg

Housing with display (**N0S** & **N0T**): 1.3 kg

Remote Housing (**L**): 2.5 kg

Remote sensor (**R**): 2.5 kg



Min. load using HART®-communication 250 R

$$R \text{ max} = \frac{\text{Supply voltage} - 5 \text{ V}}{I \text{ max}}$$

I max = 20,5 mA

I max = 22,5 mA

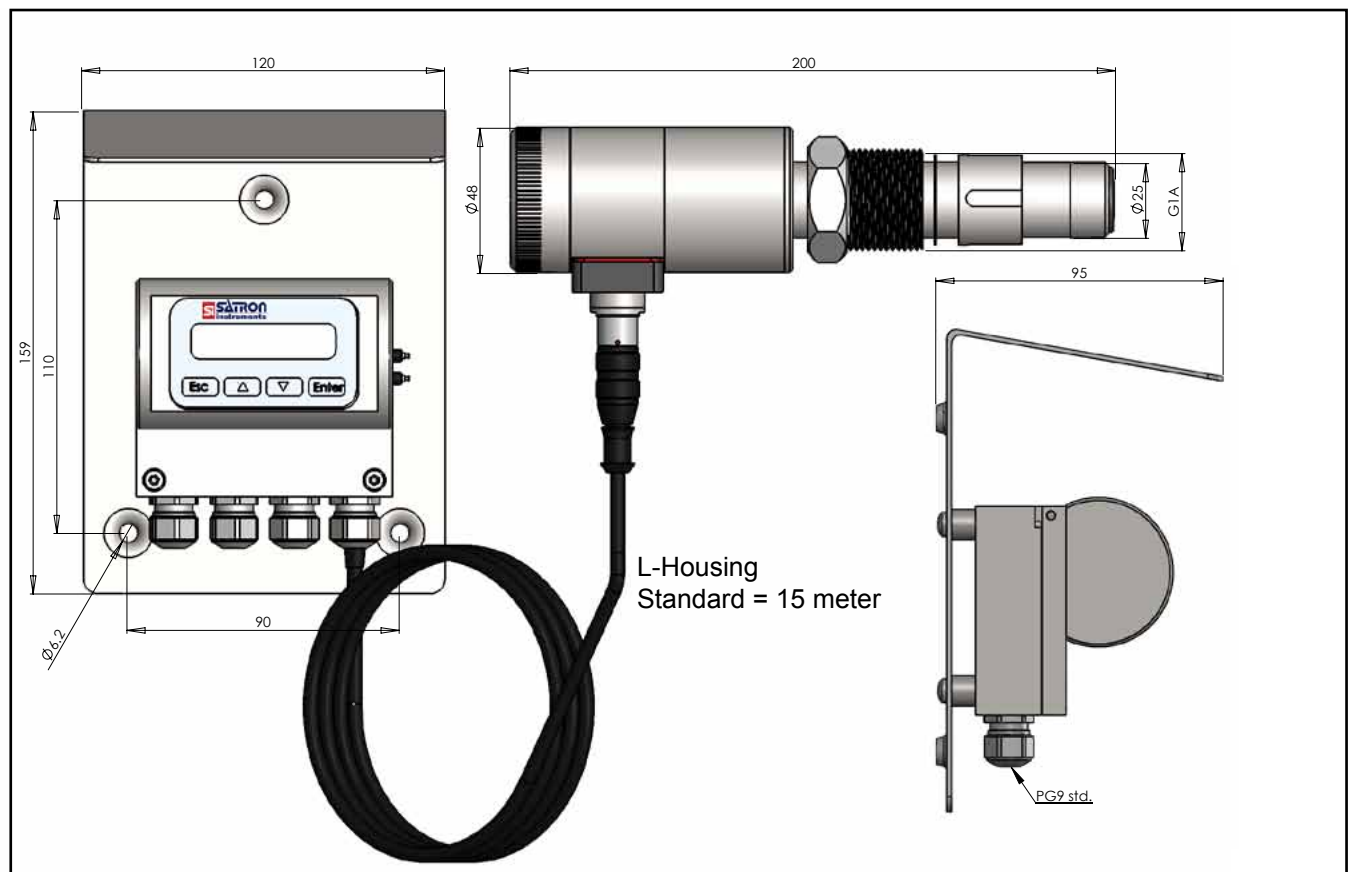
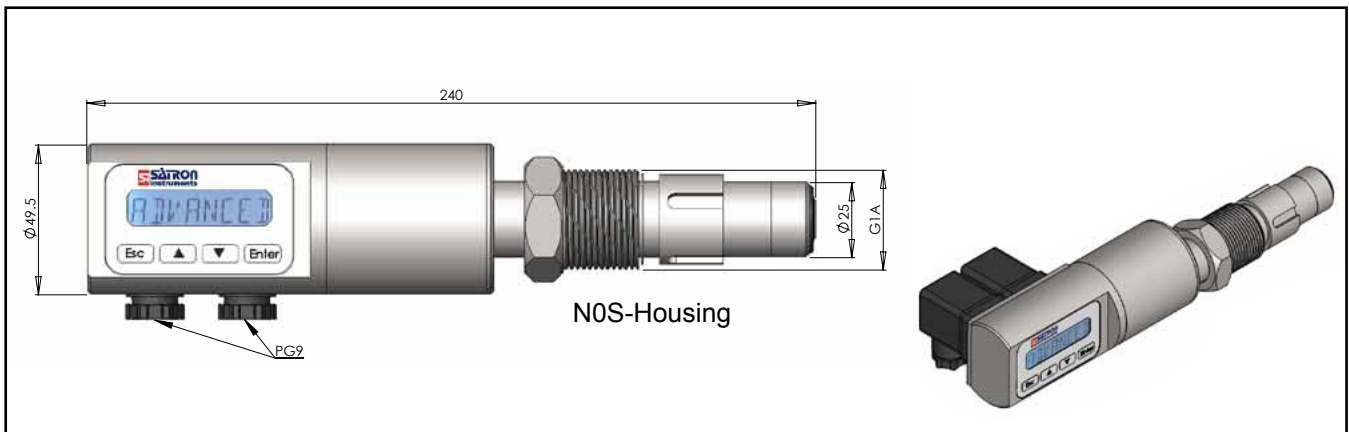
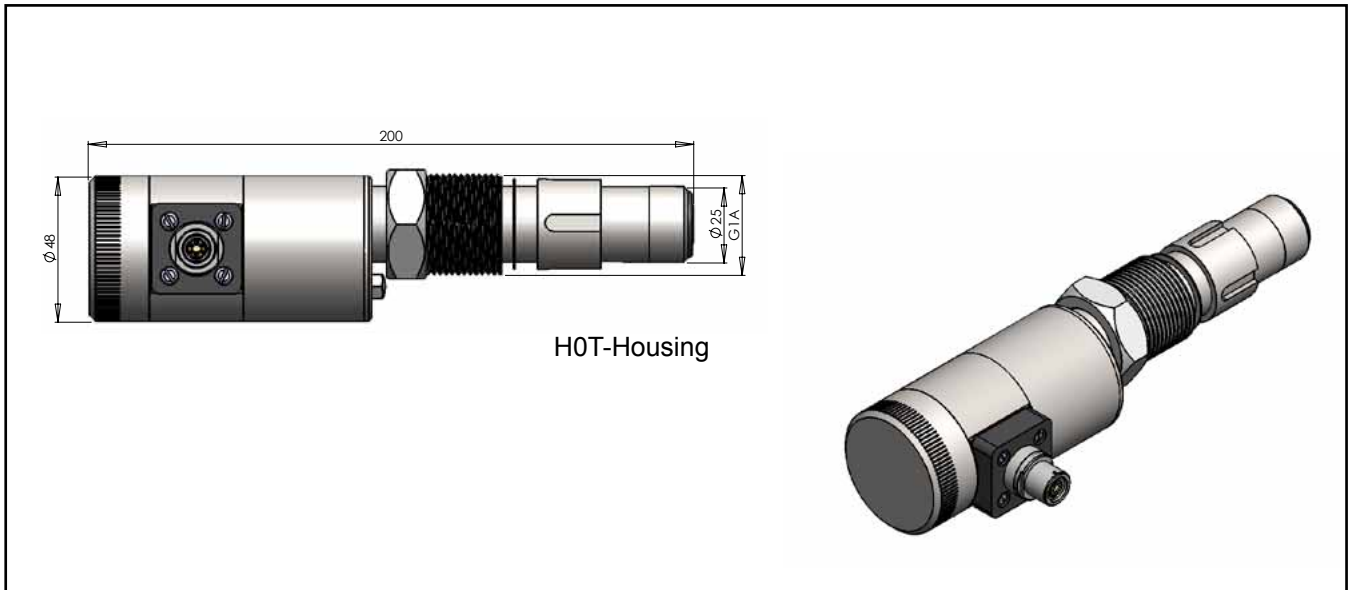
(when the alarm current 22,5 mA is on)

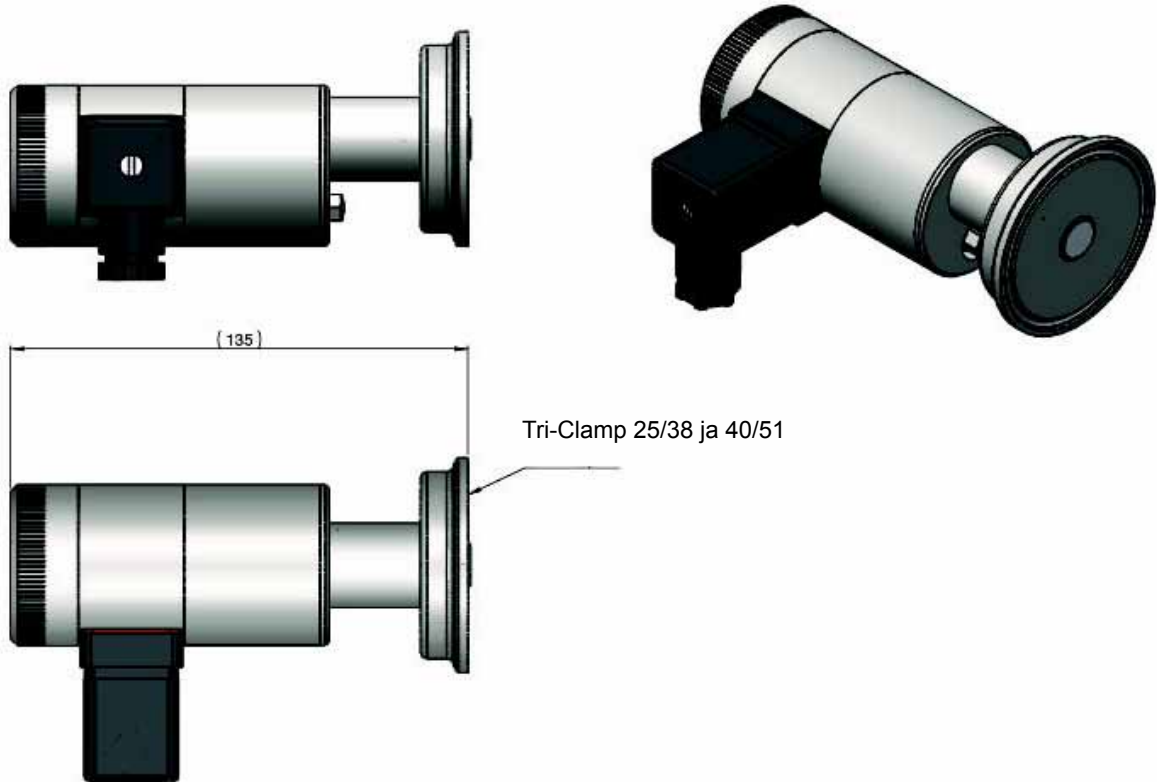
Current output 2

External power supply

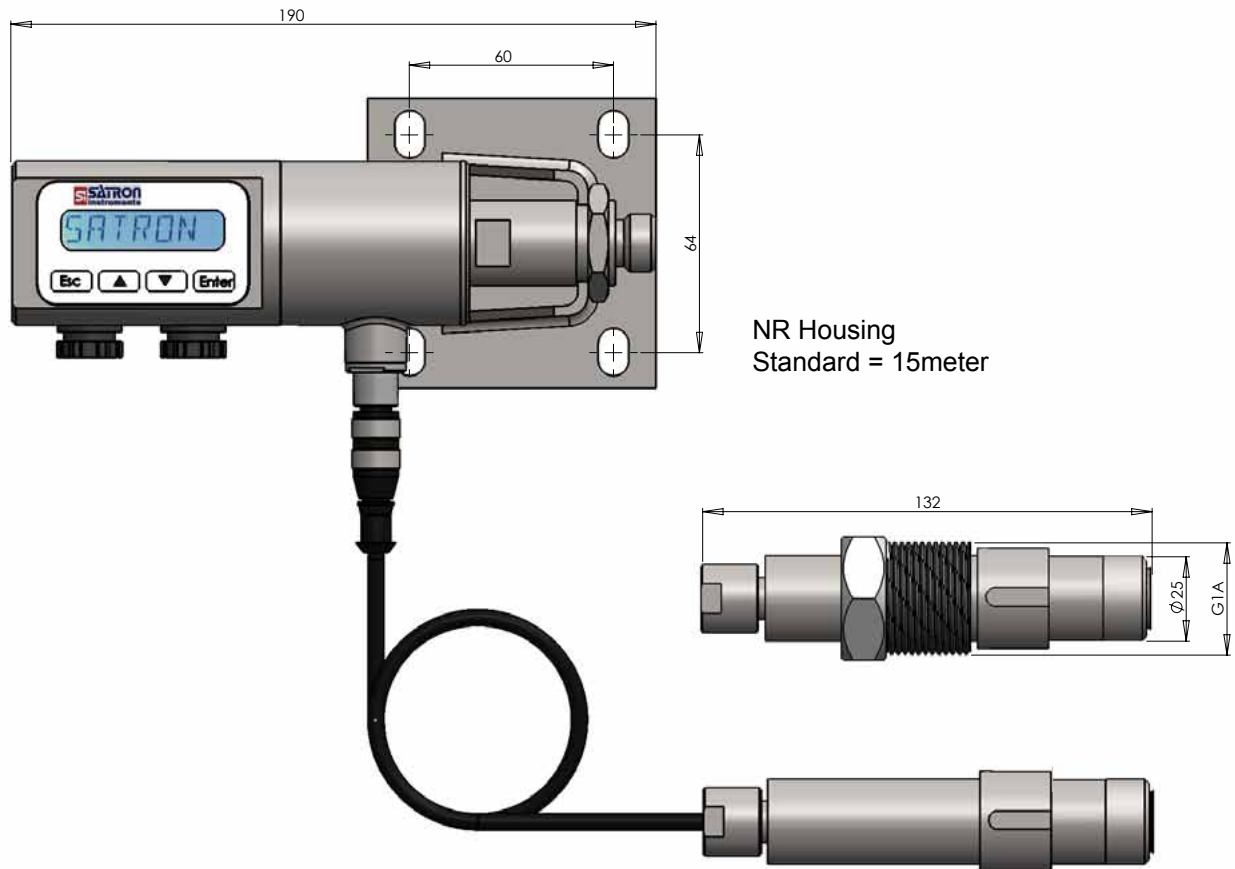
<sup>1)</sup> Parts in contact with process medium

## Dimensions and Housing types VOM



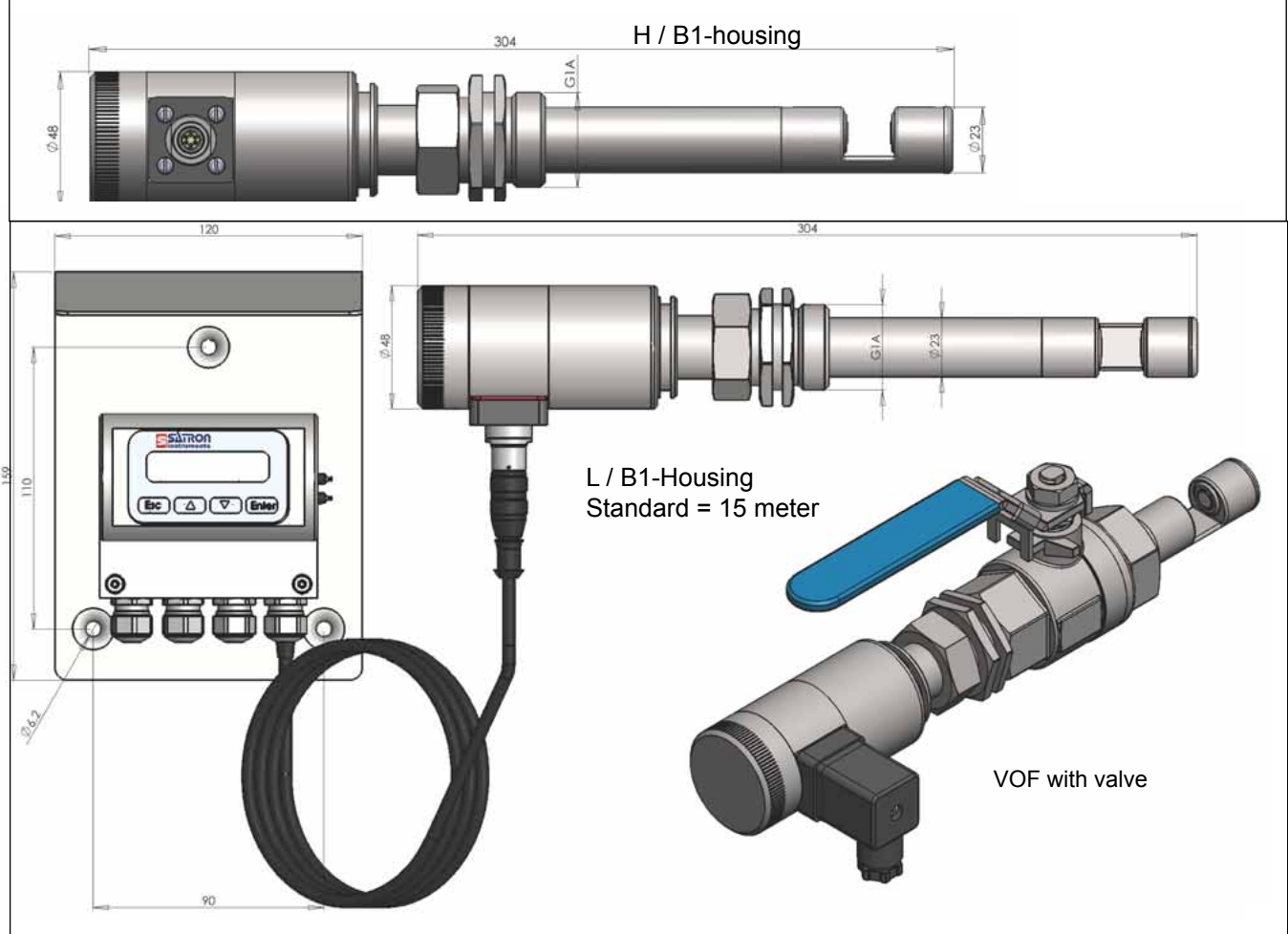


VOM with Tri-Clamp process connections, codes TA and TB

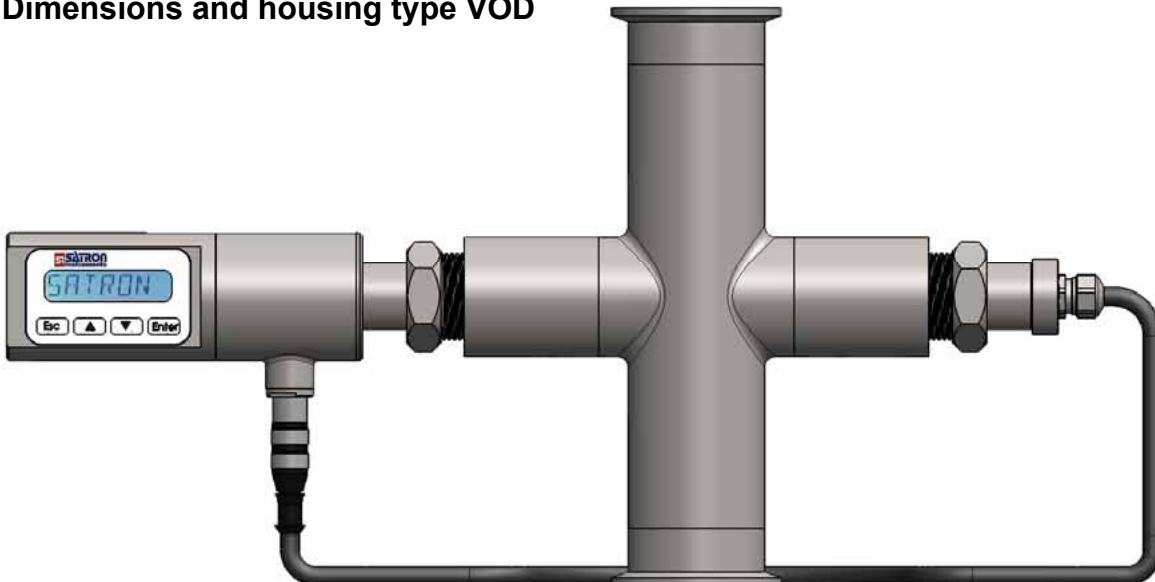


VOM with remote sensor, housing type code R

## Dimensions and housing type VOF



## Dimensions and housing type VOD



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

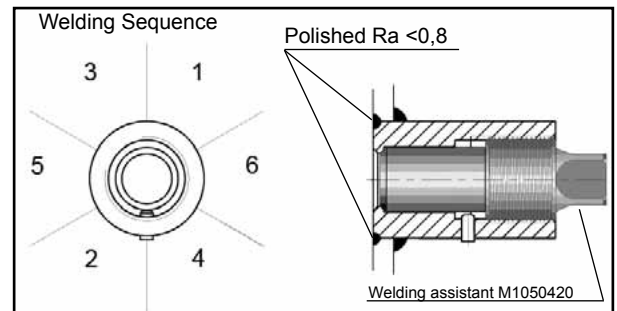
## Instructions and spare parts that are according and within the 3-A appliance



### Welding the coupling

These instructions apply to hygienic 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. 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 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!



### Mounting the analyzer on the coupling

#### Procedure

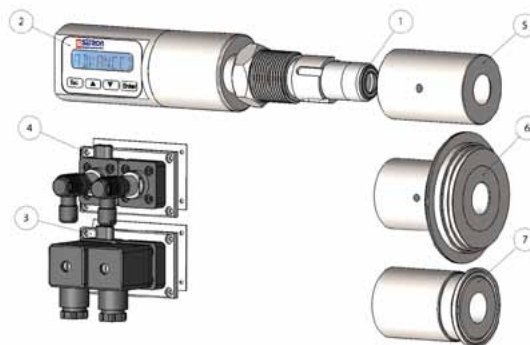
- Make sure that the coupling's sealing face is clean.
- Remove the orange protective plug from the analyzer head.
- Insert the analyzer **in a straight line** into the coupling, so that the guide groove on the transmitter aligns with the stop pin on the coupling. The analyzer settles into position when 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!**

### 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
1	O-ring FFPM(Kalrez®)	80041717	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	

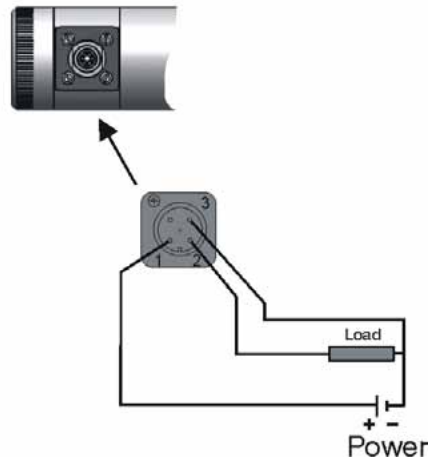




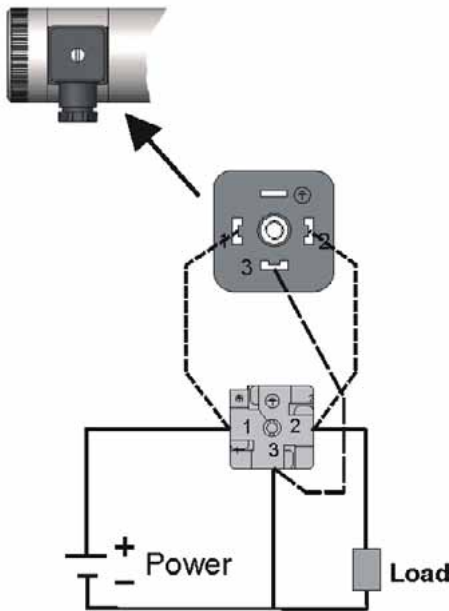
**Housing with display, code N**

Keyboard :

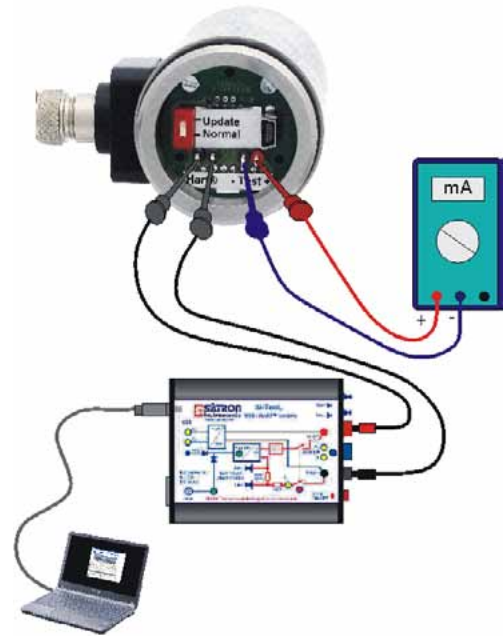
- Esc = Press **Esc** move back towards the top of the main menu.
- ▲ = Use the **UP** arrow key to move up on the current menu level or to increase the selected parameter value.
- ▼ = Use the **DOWN** arrow key to move down on the current menu level or to decrease the selected parameter value.
- Enter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



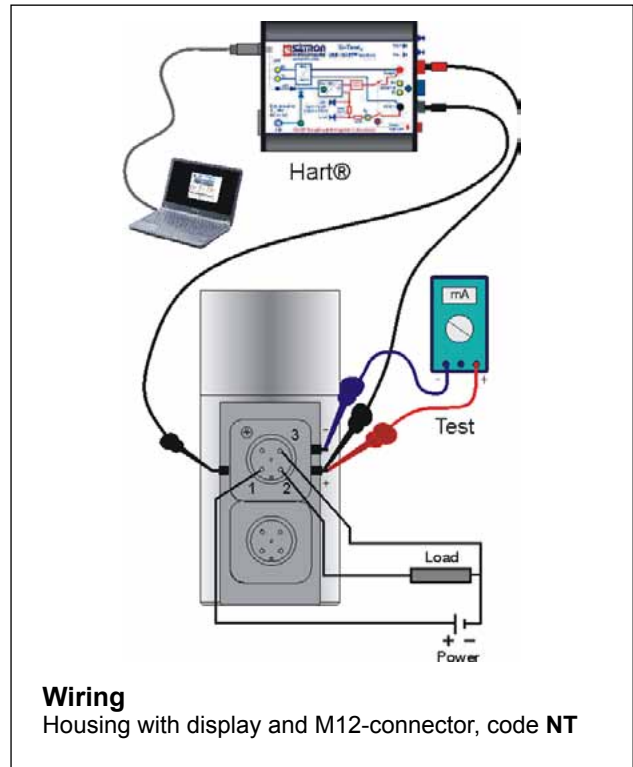
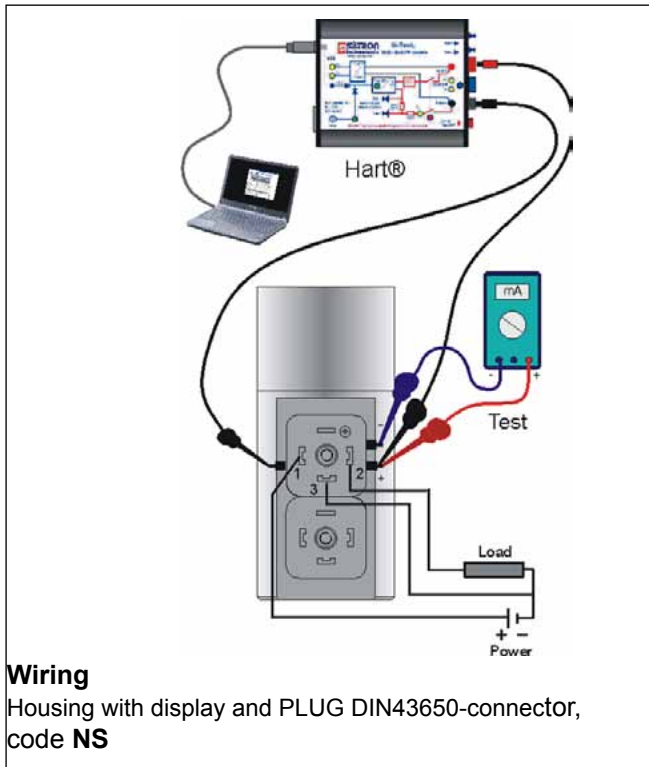
**Wiring**  
Housing with M12-connector, code HT



**Wiring**  
Housing with PLUG DIN43650-connector, code HS



**Wiring**  
Housing with PLUG DIN43650- and M12-connector, test connector box, code HT & HS



Select pin/function for configuration: click yellow label

To select functions for each I/O pin: click yellow label in the picture

Open settings from file

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

## Selection Chart

<b>Adjustability</b>	<b>Span, min</b>	<b>Span, max</b>		
VOM	1000 FTU	5000 FTU		
VOF(*)	50 FTU	1500 FTU		
VOD	50 FTU	1500 FTU		
<b>Process temperature limits</b>		<b>N</b>	Normal version -30...+100 °C	
		<b>H(**)</b>	High temperature -30...+150 °C	
<b>Output</b>	<b>S</b>	4-20mA DC/HART®		
<b>Material of wetted parts</b>	<b>Body</b>	<b>Lens</b>	<b>Seal</b>	<b>3A 18-03</b>
	2 AISI316L	2 Sapphire glass	1(***) EPDM	Class II
	3 Hast. C 276	4 Spinel	2 FPM (Viton®)	Class I
	6 Titanium Gr2		3 FFPM (Kalrez®)	Class I
	8 Duplex (En 1.4462)			
E Peek				
<b>Housing type</b>		<b>N</b>	Housing with display and pushbuttons	
		<b>H</b>	Housing with, no display, (only one mA output)	
		<b>L</b>	Remote electronics housing with display	
<b>Probe type</b>		<b>0</b>	No remote probe	
		<b>R</b>	Remote measuring probe (not available with L housing), IP68	
<b>Connection type</b>		<b>S</b>	DIN43650 with PG9, IP66	
		<b>T</b>	M12, IP67	
		<b>V</b>	PG9 (always with L housing), IP66	
<b>Cable Material</b>		<b>0</b>	No VOD, L or R selected	
		<b>1</b>	PUR cable.	
		<b>2(*)</b>	AISI316L braided PTFE hose.	
		<b>3</b>	Steel reinforced PUR hose.	
		<b>4</b>	PVC cable	
<b>Cable length</b>		<b>0</b>	No L or R option selected	
		<b>1</b>	5 M.	
		<b>2</b>	10 M.	
		<b>3</b>	15 M. (std.)	
		<b>4</b>	20 M.	
		<b>5</b>	25 M.	
		<b>...</b>		
<b>Light source</b>		<b>2</b>	365nm	
		<b>3</b>	460nm	
		<b>4</b>	540nm	
		<b>5</b>	580nm	
		<b>6</b>	640nm	
		<b>7</b>	780nm	
		<b>8</b>	950nm	
<b>Process connections</b>				
<b>G1</b> Standard G1A thread + Oring				
<b>TA</b> Tri-Clamp 25/38 (ISO 2852)				
<b>TB</b> Tri-Clamp 40/51 (ISO 2852)				
<b>TN</b> Tuchenhagen "N" type DN50				
<b>HX(*)</b> Fixed mounting tube, (specify length)				
<b>B1(*)</b> G1A ball valve insertion. Extension 19cm diameter ø 24mm				
<b>BX(*)</b> G1A ball valve insertion. Extension by request diameter ø 24mm				



<b>Documentation</b>	
<b>Calibration certificate</b>	<b>AE</b> English
<b>Installation and operating instructions</b> <b>IE</b> English <b>IF</b> Finnish <b>FR</b> French	
<b>Material certificates</b>	
<b>0</b>	No material certificate
<b>MC1</b>	Raw material certificate without appendices, in accordance with SFS-EN 10204-2.1 (DIN 50049-2.1) standard
<b>MC2</b>	Raw material certificate for wetted parts, in accordance with SFS-EN 10204-2.2 (DIN 50049-2.2) standard
<b>MC3</b>	Raw material certificate for wetted parts, in accordance with SFS-EN 10204-3.1 B (DIN 50049-3.1 B) standard

\* Not EHEDG certified & Not within the 3A approval  
 \*\* Only in combination with Quartz, Sapphire lens and Kalrez Seals. And only 880nm