

The **SATRON VOA Dual wavelength turbidity and solids content analyzer** is suitable for the measurement of different liquids. Savings can be obtained by using SATRON VOA 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

0...300 000NTU equivalent

### Calibration

The transmitter is factory calibrated at 4mA = water, 20mA = 35% fat cream, freely adjustable with pushbuttons or Hart® modem.

### Damping

Time constant adjustable 0.01 to 60 s.

### Repeatability

- 0.1% from maximum span.

### Response time

0.1s (with less than 0.1s damping)

0...1 000 NTU	0.25% ±50 NTU offset
1 000...10 000 NTU	1%
10 000...300 000 NTU	5%

### Unit selection

%, NTU, FNU, FTU, mg/L, g/dm<sup>3</sup>, PPM

### Temperature limits

Ambient: -30 to +80 °C  
Display operating range: 0 to +50 °C  
(Does not affect operation of the transmitter)

Process N type: -5 to +100 °C  
(120 °C for 10min)  
Process H type: -5 to +140 °C  
(160 °C for 30 min)  
Shipping and storage: -40 to +80 °C

### Output 3-wire (3W), 4-20 mA NAMUR NE43

### Supply voltage

Nominal 24 VDC, (21,6 - 27,6V) 250mA

### 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: Sapphire or Spinel ceramic

### Pressure class:

- PN40  
- Test pressure -1 to 250 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** :

PVC signal cable or hose protected with PTFE/AISI316 braiding

### 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

Current output1	Turbidity active
Range (Namur NE 043)	3.5...23 mA
Maximum load	600 Ω
Factory setting	4...20 mA

### binary output 1-3

Relay, grounding contact

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

### binary input 1-3

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 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

### Process connections

- With G1 connecting thread
- Tri-Clamp 25/38 and 40/51
- Tuchenhangen Type "N"
- 1" retractable "B1"

### Protection class: IP66, IP67 and IP68

See Selection chart.

### Weight

Housing with PLUG DIN43650

connector (**H0T**): 0.9 kg

Housing with M12

connector (**H0S**): 0.9 kg

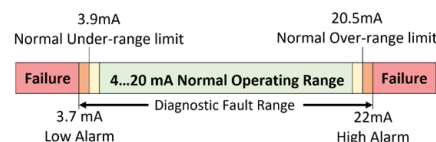
Housing with display

(**N0S & N0T**): 1.3 kg

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

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

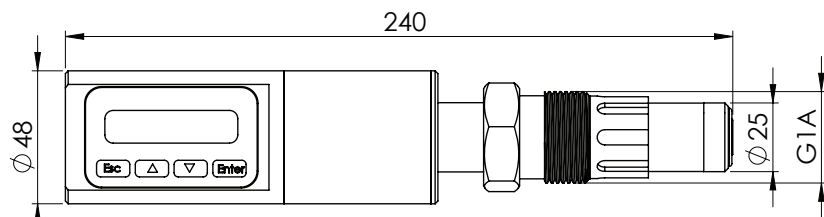
Min. load using HART®-communication 250 Ω



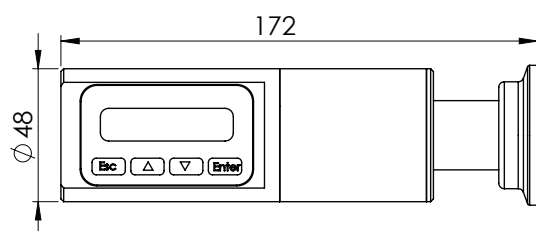
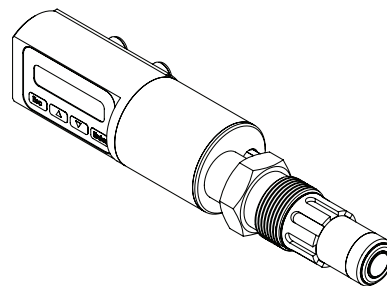
UL 61010-1, 3rd Ed. Rev May 11. 2012  
CAN/CSA C22.2 No. 61010-1-12, Ed. 3  
EMC directive 2004/108/EC  
- EN 61326-1:2005  
<sup>1)</sup> Parts in contact with process medium compliant to FDA

# SATRON VOA Turbidity and solids content sensor

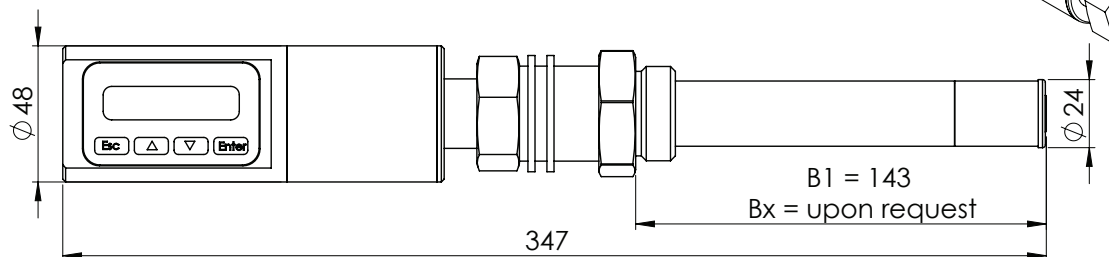
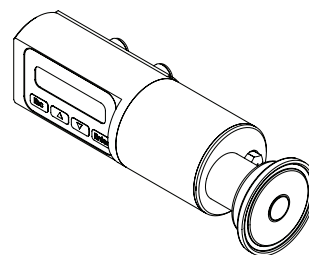
## Dimensions and Housing types VOA (mm)



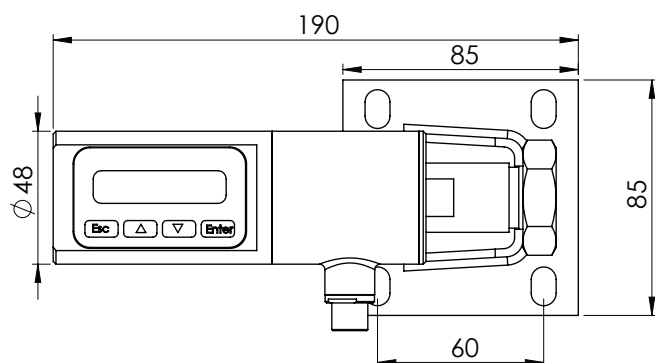
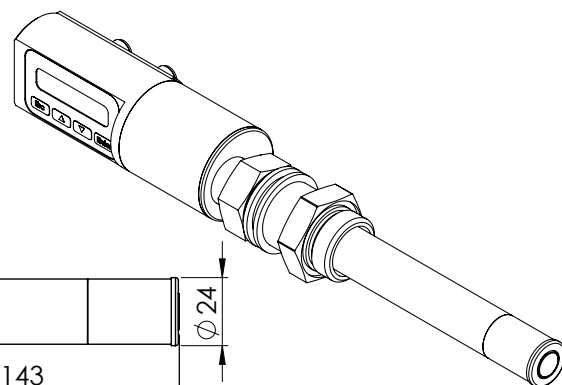
**VOA with display (N) and G1 process connection**



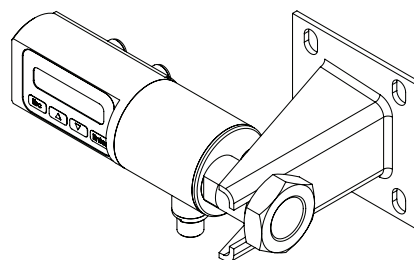
**VOA with display (N) and Tx clamp connection**



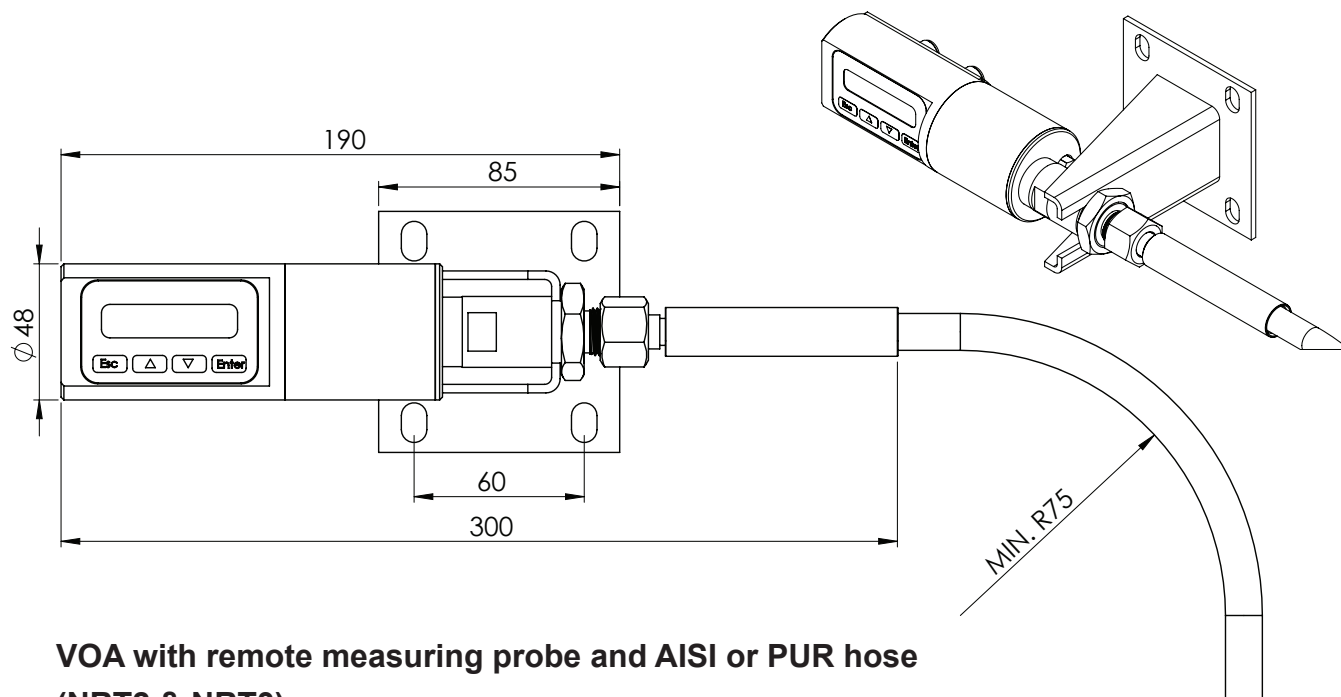
**VOA with display (N) and B1 / BX ball valve insertion process connection**



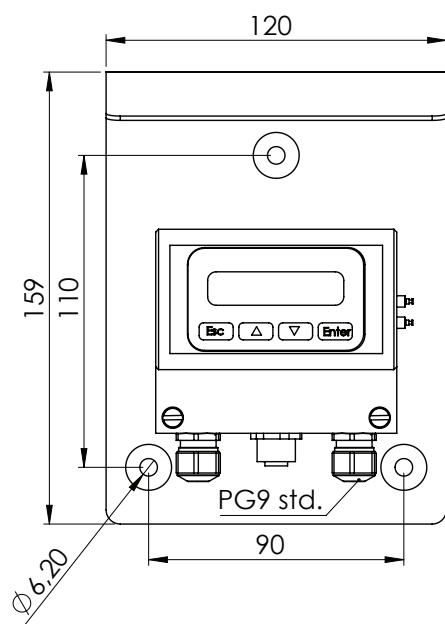
**VOA with remote measuring probe and PVC or PUR M12 cable  
(NRT43 & NRT12)**



## SATRON VOA Turbidity and solids content sensor

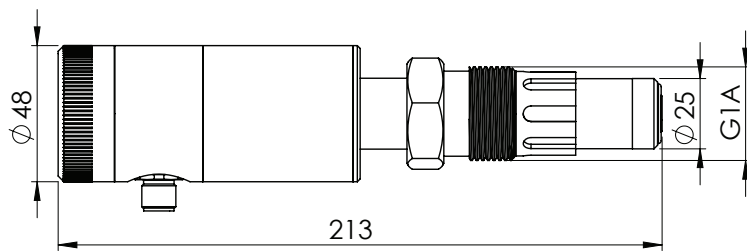


VOA with remote measuring probe and AISI or PUR hose  
(NRT2 & NRT3)

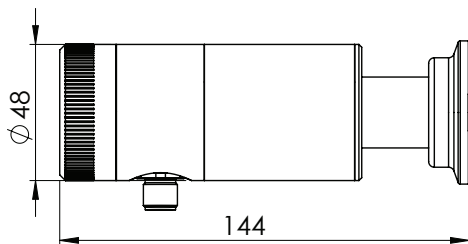
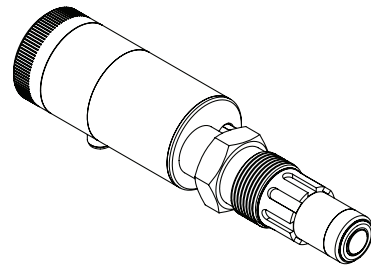


Remote electronics housing with display (L) T1325016

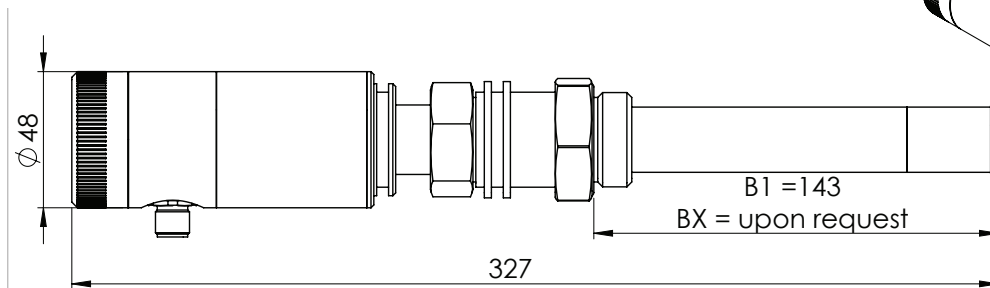
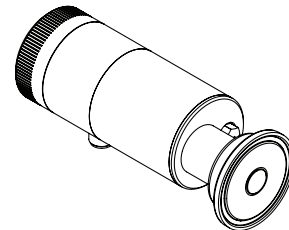
# SATRON VOA Turbidity and solids content sensor



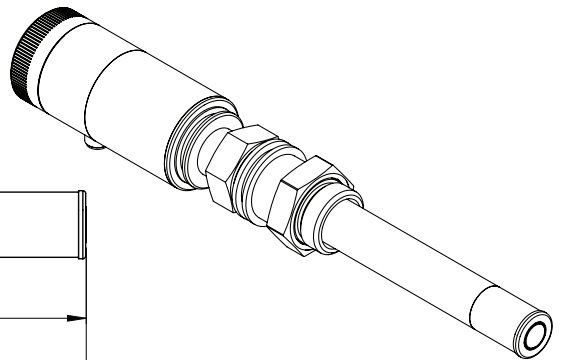
**VOA with no display (H) and G1 process connection**



**VOA with no display (H) and TA, TB and TN clamp connection**

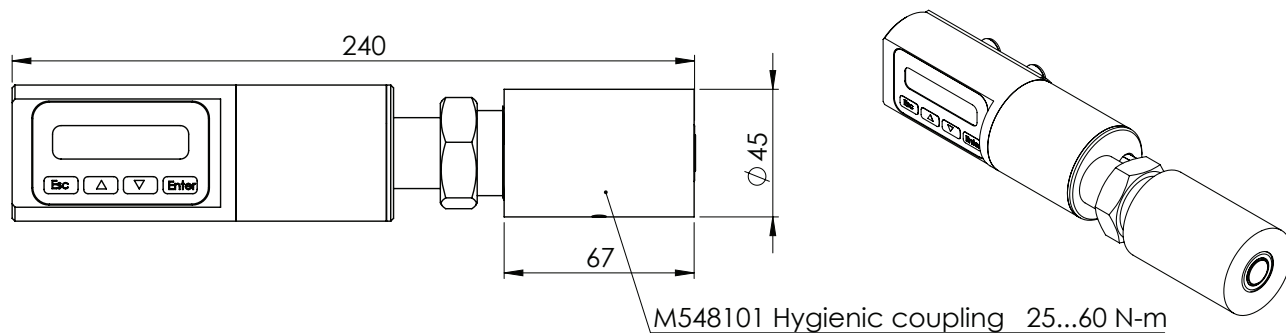


**VOA with no display (H) and B1 / BX retractable ball valve insertion process**



# SATRON VOA Turbidity and solids content sensor

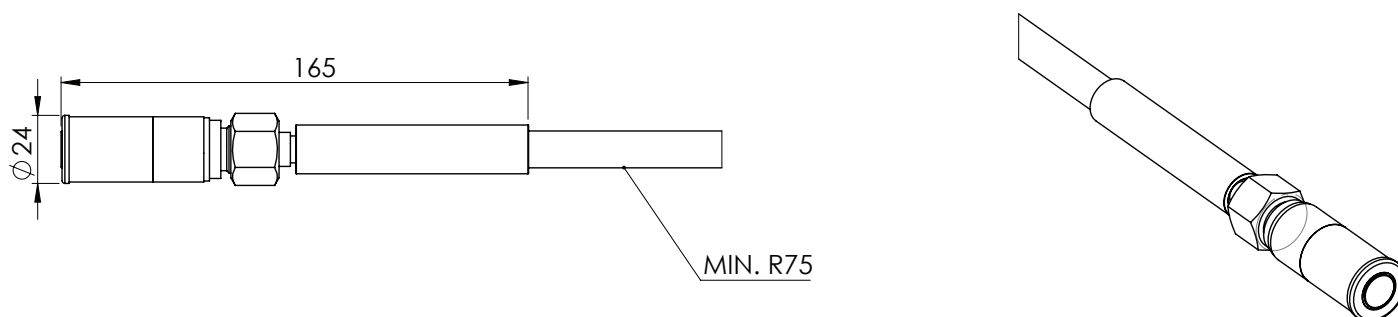
## Process connection details



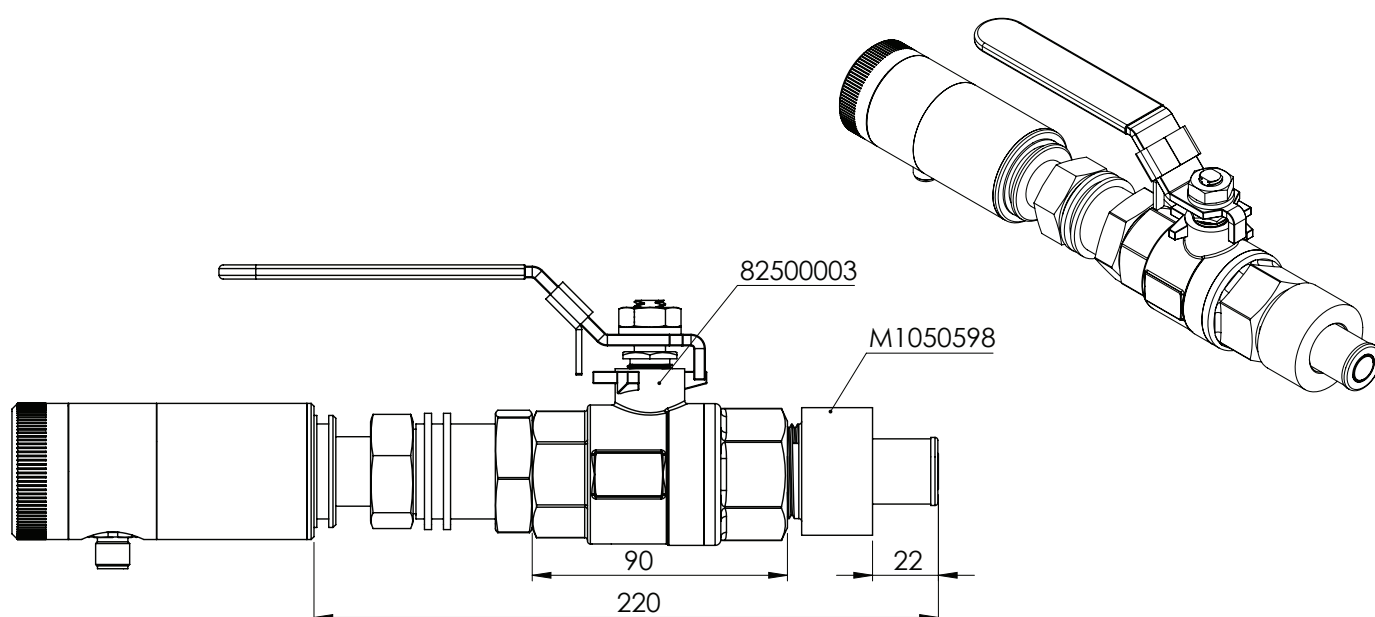
## VOA G1 connected to M548101 hygienic coupling. (Flush mounted) EHEDG, 3A



## VOA with Tri-clover TA, TB (ISO 2852) and Tuchenhausen TN process connection



## VOA with H1 fixed mounting tube process connection and AISI316L hose, "21.H1"



## VOA B1 connected to Ball valve 8250000 and M1050598 coupling

# SATRON VO Turbidity and solids content analyzer

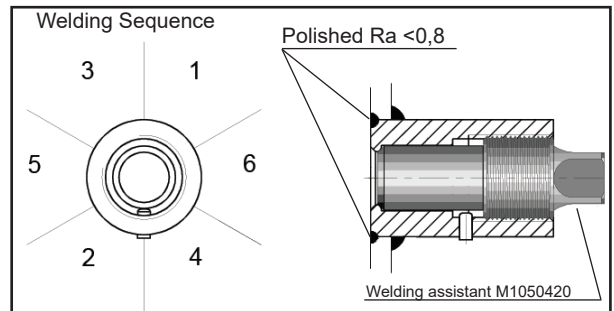
## Instructions and spare parts that are according and within the 3-A appliance



### 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  $60 \pm 20$  Nm torque.

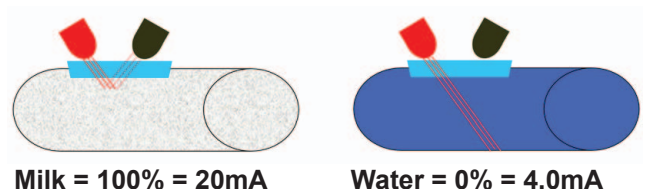
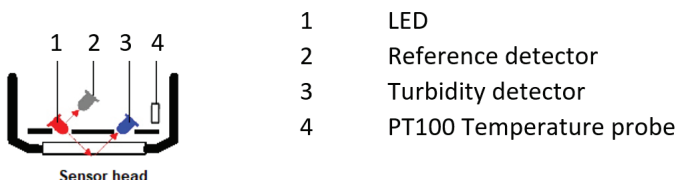
**Do not use sealing tape etc. on threaded connection!**

### VOA measurement principle:

Backcattering with RED and Infrared wavelenth lightsource LED's

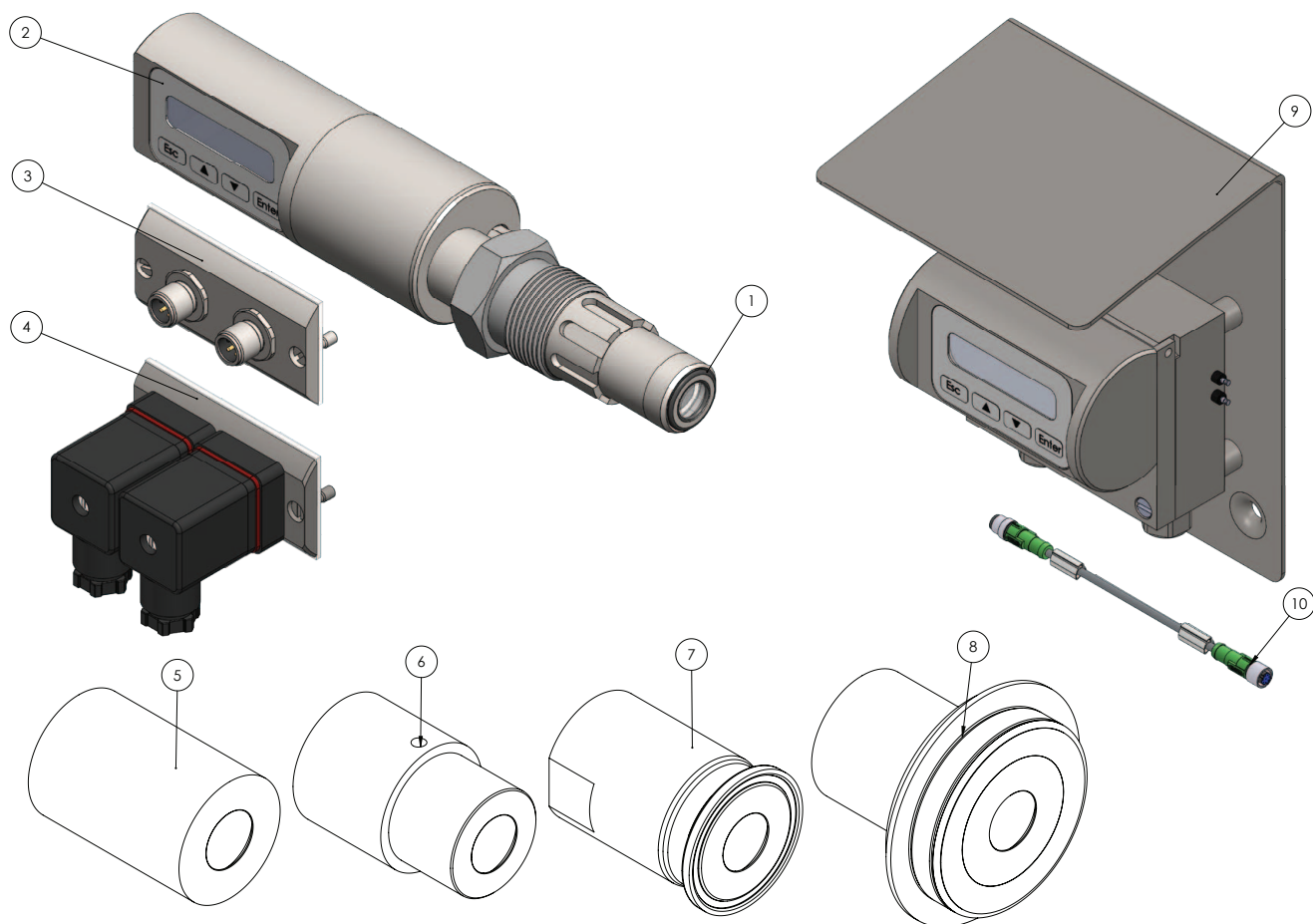
The light source is fully compensated for aging, temperature, and ambient light changes due to the high duty cycle measurement (up to 100 measurements per second).

The lifetime for the optical LED's and photodetectors is 20 years minimum. Illustration below shows only the principle for 1 light source. The sensor has 2 LED's and 4 detectors in total.



# SATRON VO Turbidity and solids content sensor

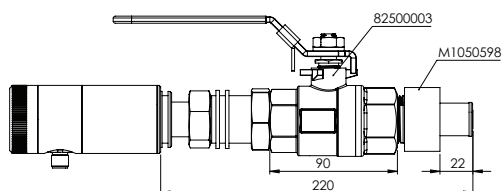
## Spare-parts VOM G1



No.	Part name	Order code
1	O-ring EPDM	80031720
1	O-ring FPM (Viton®)	80011720
1	O-ring FFPM(Kalrez®)	80041717
2	Sticker	T1325215
3	Plug cover M12	T1325031
4	Plug cover DIN43650	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	Tuchenhausen / Varivent DN25	M1050090
8	Tuchenhausen / Varivent DN50	M1050091
8	Tuchenhausen / Varivent DN65,5	M1050092
9	Remote Display Unit RDU	T13250016
10	L-Housing data cable 10m PVC	70000450
10	L-Housing data cable 15m PUR	70000440
	FUSE for L-Housing	74212000
	Seal for L-Housing display	80017226
	Bracket remote probe electronics	T1050009

### Note

3A 18-03 Class II (Do not exceed above 8% fat content).  
 3A 18-03 Class I  
 3A 18-03 Class I



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

Mounting bracket for R probe type: T1050009



## Selection Chart

<b>Adjustability</b> VOA	<b>Span, min</b> 0...1000 NTU	<b>Span, max</b> 0...300 000 NTU																									
<b>Process temperature limits</b> <b>N</b> Normal version -5...+100 °C (120 °C for 10 minutes) <b>H(**)</b> High temperature -5...+140 °C (160 °C for 30 minutes)																											
<b>Output</b> <b>S</b> 4-20mA DC/HART® for 50Hz (Europe) <b>J</b> 4-20mA DC/HART® for 60Hz (USA / Japan)																											
<table border="1"> <tr> <td rowspan="5"><b>Material of wetted parts</b></td> <td><b>Body</b></td> <td><b>Lens</b></td> <td><b>Seal</b></td> <td><b>3A 18-03</b></td> </tr> <tr> <td><b>2</b> AISI316L</td> <td><b>2</b> Sapphire</td> <td><b>1(***)</b> EPDM</td> <td><b>Class II</b></td> </tr> <tr> <td><b>3</b> Hast. C 276</td> <td><b>4</b> Spinel</td> <td><b>2</b> FPM (Viton®)</td> <td><b>Class I</b></td> </tr> <tr> <td><b>6</b> Titanium Gr2</td> <td></td> <td><b>3</b> FPM (Kalrez®)</td> <td><b>Class I</b></td> </tr> <tr> <td><b>8</b> Duplex (EN 1.4462)</td> <td></td> <td><b>4 (*)</b> PTFE (Teflon)</td> <td></td> </tr> <tr> <td><b>9</b> Peek</td> <td></td> <td></td> <td></td> </tr> </table>			<b>Material of wetted parts</b>	<b>Body</b>	<b>Lens</b>	<b>Seal</b>	<b>3A 18-03</b>	<b>2</b> AISI316L	<b>2</b> Sapphire	<b>1(***)</b> EPDM	<b>Class II</b>	<b>3</b> Hast. C 276	<b>4</b> Spinel	<b>2</b> FPM (Viton®)	<b>Class I</b>	<b>6</b> Titanium Gr2		<b>3</b> FPM (Kalrez®)	<b>Class I</b>	<b>8</b> Duplex (EN 1.4462)		<b>4 (*)</b> PTFE (Teflon)		<b>9</b> Peek			
<b>Material of wetted parts</b>	<b>Body</b>	<b>Lens</b>		<b>Seal</b>	<b>3A 18-03</b>																						
	<b>2</b> AISI316L	<b>2</b> Sapphire		<b>1(***)</b> EPDM	<b>Class II</b>																						
	<b>3</b> Hast. C 276	<b>4</b> Spinel		<b>2</b> FPM (Viton®)	<b>Class I</b>																						
	<b>6</b> Titanium Gr2			<b>3</b> FPM (Kalrez®)	<b>Class I</b>																						
	<b>8</b> Duplex (EN 1.4462)		<b>4 (*)</b> PTFE (Teflon)																								
<b>9</b> Peek																											
<b>Housing type</b> <b>B</b> Housing with display and pushbuttons <b>N</b> Housing with display and pushbuttons, 2mA outputs, 3 bin in/outputs <b>H</b> Housing with, no display, <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 (std.)																											
<b>Cable length</b> <b>0</b> No VOD or L, R option selected <b>1</b> 5 M. <b>3</b> 15 M. (PUR std.) <b>5</b> 25 M. <b>2</b> 10 M. (PVC std.) <b>4</b> 20 M. ...																											
<b>Light source</b> <b>1</b> RED & IR																											
<b>Process connections</b> <b>G1</b> Standard G1A thread + Oring <b>TA</b> Tri-Clover 25/38 (ISO 2852) <b>TB</b> Tri-Clover 40/51 (ISO 2852) <b>TN</b> Tuchenhausen "N" type DN50 <b>H1</b> Fixed mounting tube, (see H1 picture) <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 on request																											



### Documentation

**Calibration certificate** **AE** English

**Installation and operating instructions** **IE** English **IF** Finnish **FR** French

### Material certificates

- 0** No material certificate  
**MC1** Raw material certificate without appendices, in accordance with SFS-EN 10204-2.1 (DIN 50049-2.1) standard  
**MC2** Raw material certificate for wetted parts, in accordance with SFS-EN 10204-2.2 (DIN 50049-2.2) standard  
**MC3** 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

\*\*\* Do not exceed above 8% fat content.



UL 61010-1, 3rd Ed. Rev May 11. 2012  
 CAN/CSA C22.2 No. 61010-1-12, Ed. 3  
 EMC directive 2004/108/EC  
 - EN 61326-1:2005  
 1) Parts in contact with process medium  
 compliant to FDA

We reserve the right for technical modifications without prior notice.

HART is the registered trademark of HART Communication Foundation.  
 Pasve is the registered trademark of Satron Instruments Inc.  
 Hastelloy is the registered trademark of Haynes International.  
 Viton is the registered trademark of DuPont Down Elastomer.  
 3-A is a registered mark owned and administered by 3-A SSI.