Satron VOA

Dual wavelength Turbidity and solids content sensor

SATRON instruments

SATRON VOA Dual wavelength Turbidity and solids content sensor

The SATRON VOA Dual wavelenght turbidity and solids content sensor is suitable for the measurement of different liquids. Savings can be obtained by using SATRON VOA sensor 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 sensor communicates digitally using the HART® protocol.

TECHNICAL SPECIFICATIONS

Measuring range
0 ... 300 000NTU equivalent

Calibration
The sensor 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)

Accuracy

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/dm3, PPM, or custom text

Temperature limits
Ambient: -30 to +80 °C (-22 ...176 °F)
Process N type: -5 to +100 °C (23 ...212 °F)
(120 °C for 10 min) (248 °F)
Process H type: -5 to +140 °C (23 ...284 °F)
(160 °C for 30 min) (320 °F)
Shipping & storage: -40 to +80 °C
(-40 ...176 °F)
Display operating range: 0 to +50 °C
(Does not affect operation of the sensor)

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

Supply voltage
Nominal 24 VDC, (21.6 - 27.6V) 250mA

Humidity limits 0-100% RH

Pressure class:
- PN40
- Test pressure -1 to 250 bar (-14.5 to 3625.94 PSI)

EMC directive 2014/30/EC
- EN 61326-1: 2013

CONSTRUCTION
Materials:
Sensing element [1]: AISI316L, PEEK, Duplex (EN. 1.4462), Hast. C276/C22, or Titanium Gr2.
Surface quality: Polished Ra <0.8µm
Lens: Sapphire or Spinel ceramic
Seal: EPDM, FPM, FFPM, FEP/PTFE

Housing with display, code **N**:
Housing: AISI303/316
Seals: Nitrilerubber and Viton®
Nameplates: Polyester

Housing without display, code **H**:
Housing: AISI303/316
Seals: Viton® and NBR
Nameplates: Polyester

Connection hose between sensing element and housing (RDU) code **L**:
PVC signal cable or hose protected with PTFE/AISI316 braiding
Nameplates: Polyester

Electrical connections
Housing without display code **H**:
1x M12 plug connector
Housing with display, code **N**:
2x 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

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

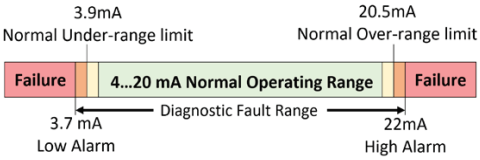
Process connections
- With G1 connecting thread
- Tri-Clamp 25/38 and 40/51

Protection class: IP66, IP67 and IP68
See Selection chart.

Weight

Housing without **(H)**:	0.9 kg
Housing with Display **(N)**:	1.3 kg
Remote Housing **(L)**:	2.5 kg
Remote sensor **(R)**:	2.5 kg

Output signal according to NAMUR NE043 Signal Level for the failure information of Digital Transmitters.
Min. load using HART®-communication 250 Ω

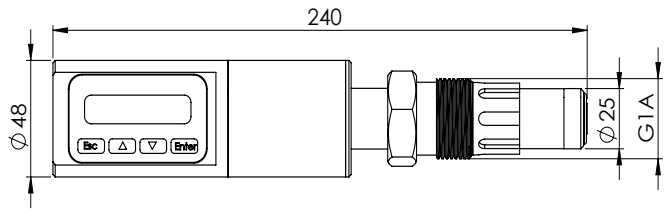


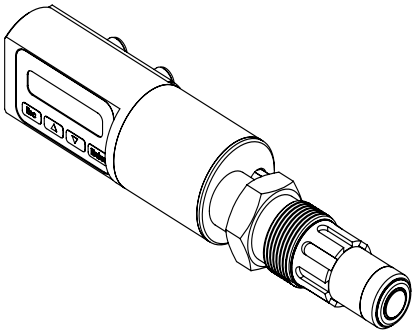
UL 61010-1, 3rd Ed. Rev May 11. 2012
CAN/CSA C22.2 No. 61010-1-12, Ed. 3

[1] Parts in contact with process medium compliant to FDA

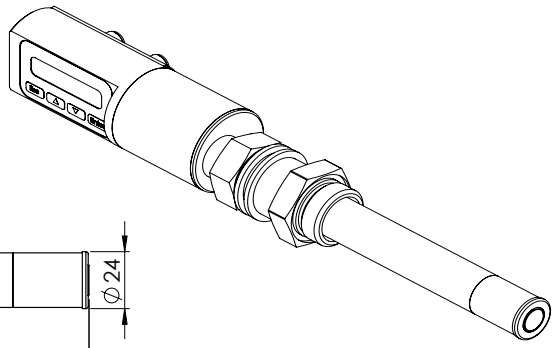
Satron Instruments Inc., FI-33960 Pirkkala, Finland
Tel. +358 207 464 800, www.satron.com

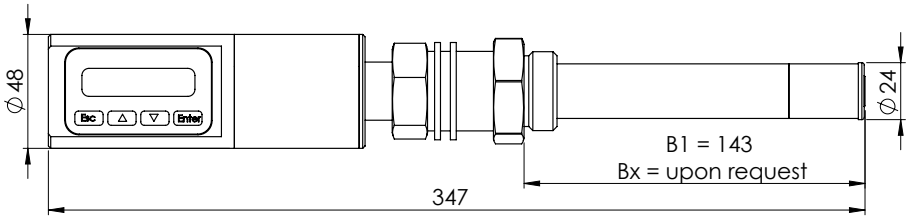
Dimensions and Housing types VOA (mm)



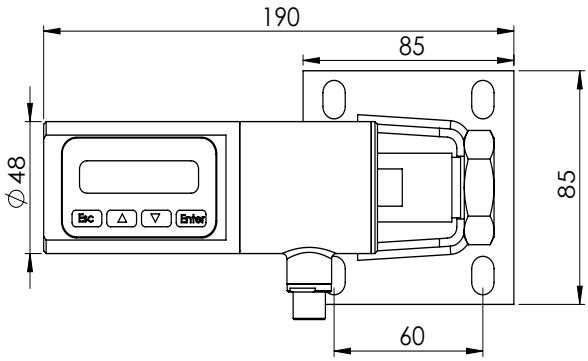


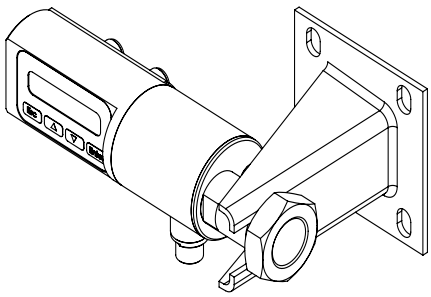
VOA with display (N) and G1 process connection

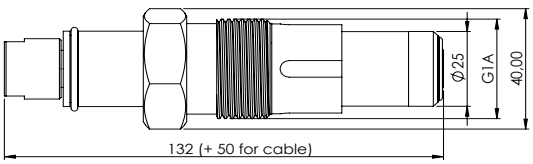


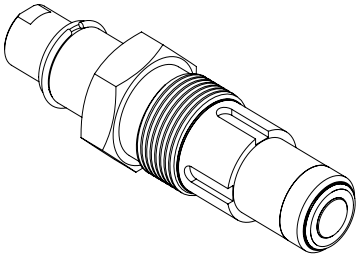


VOA with display (N) and B1 / BX ball valve insertion process connection

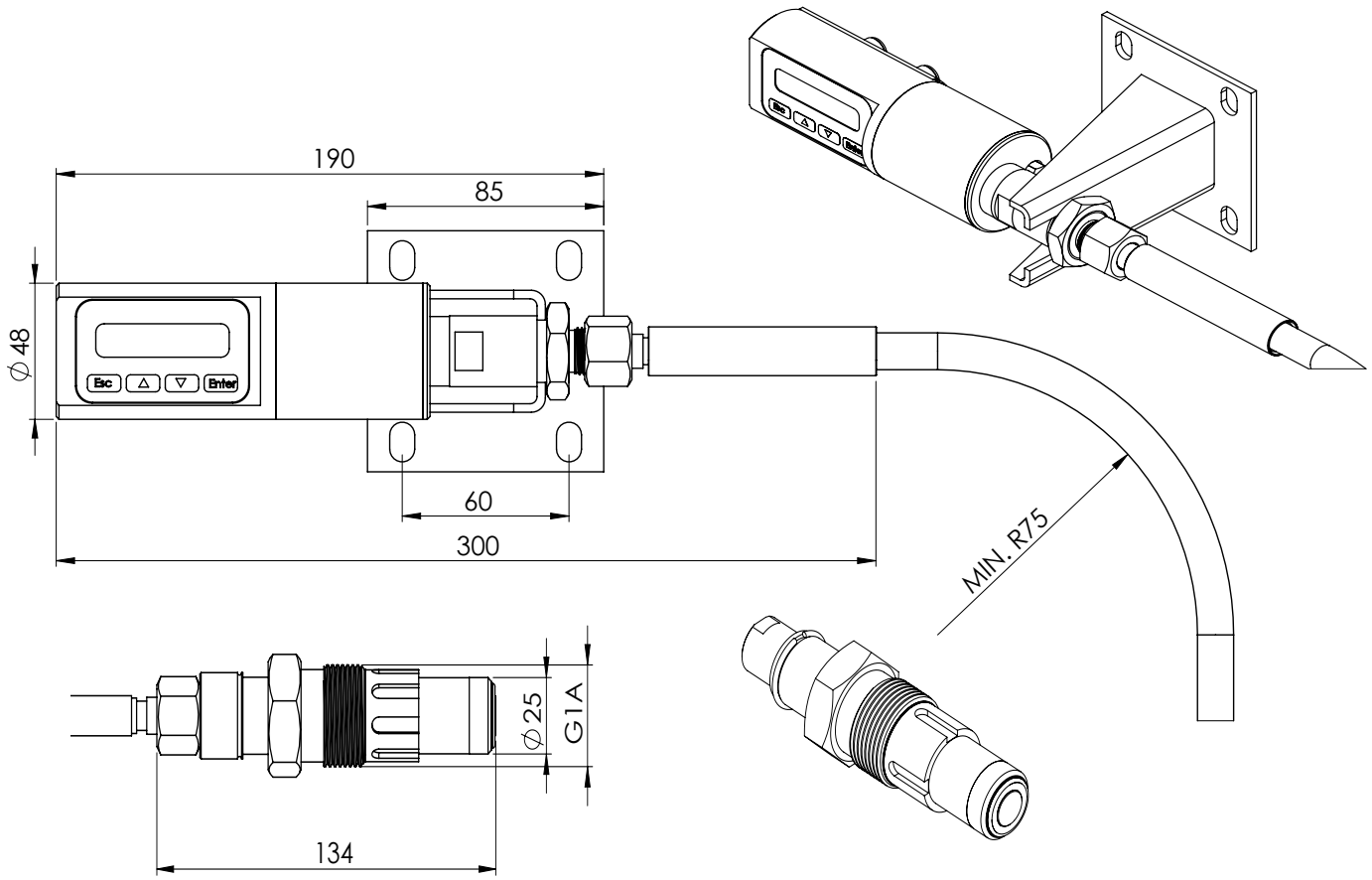




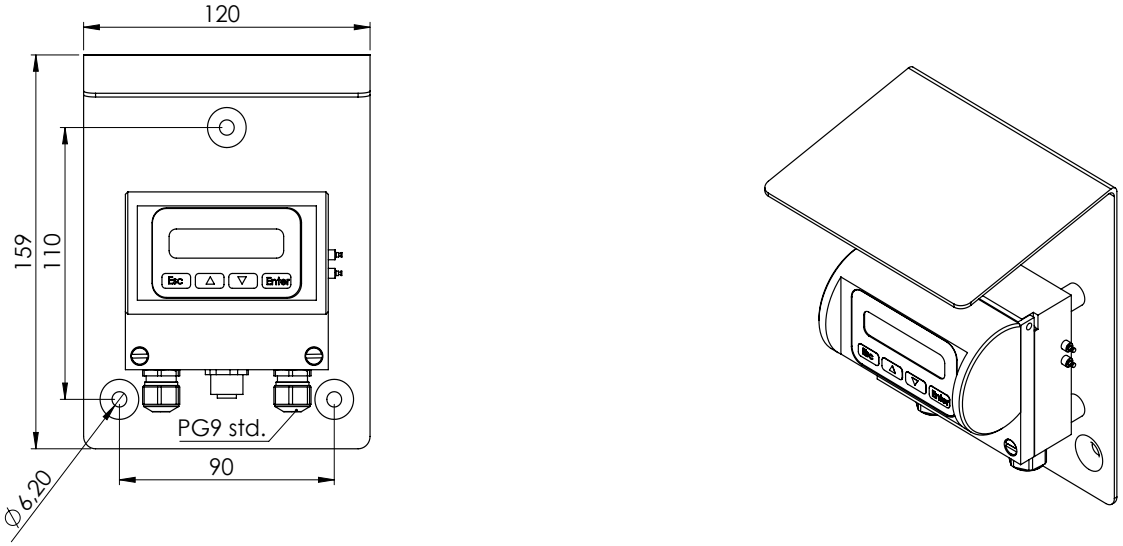




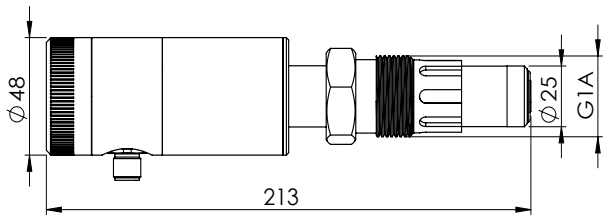
VOA with remote measuring probe and PVC M12 cable (NRT4)

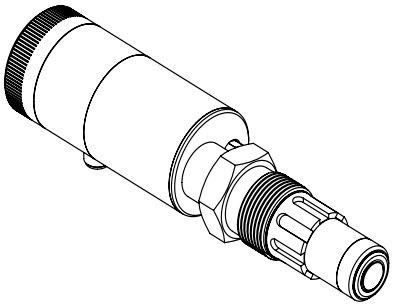


VOA with remote measuring probe and AISI or PUR hose (NRT2)

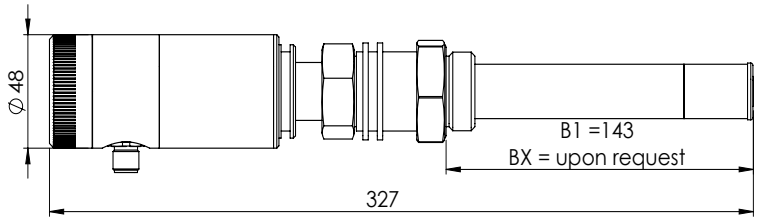


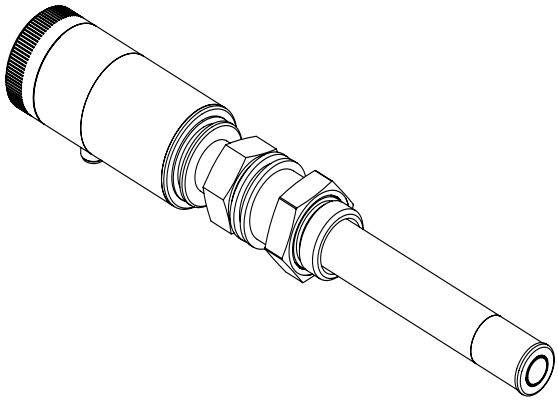
RDU - Remote Display Unit (L) T1325016





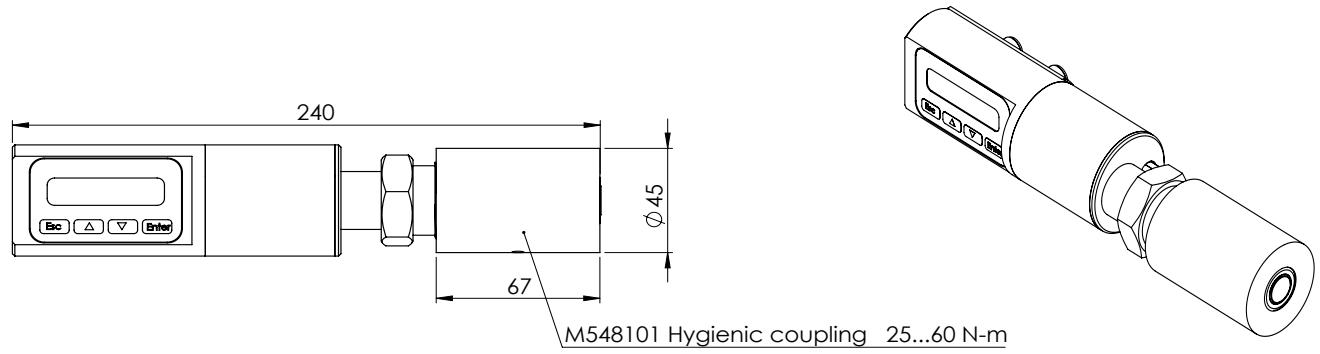
VOA without display (H) and G1 process connection



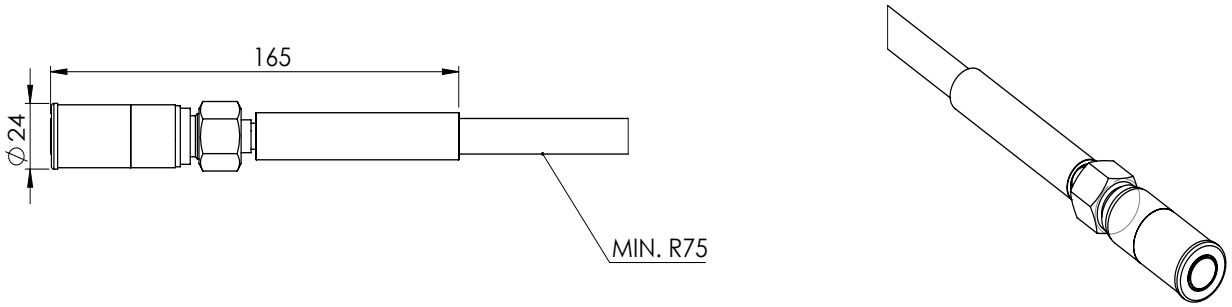


VOA without display (H) and B1 / BX retactable ball valve insertion process

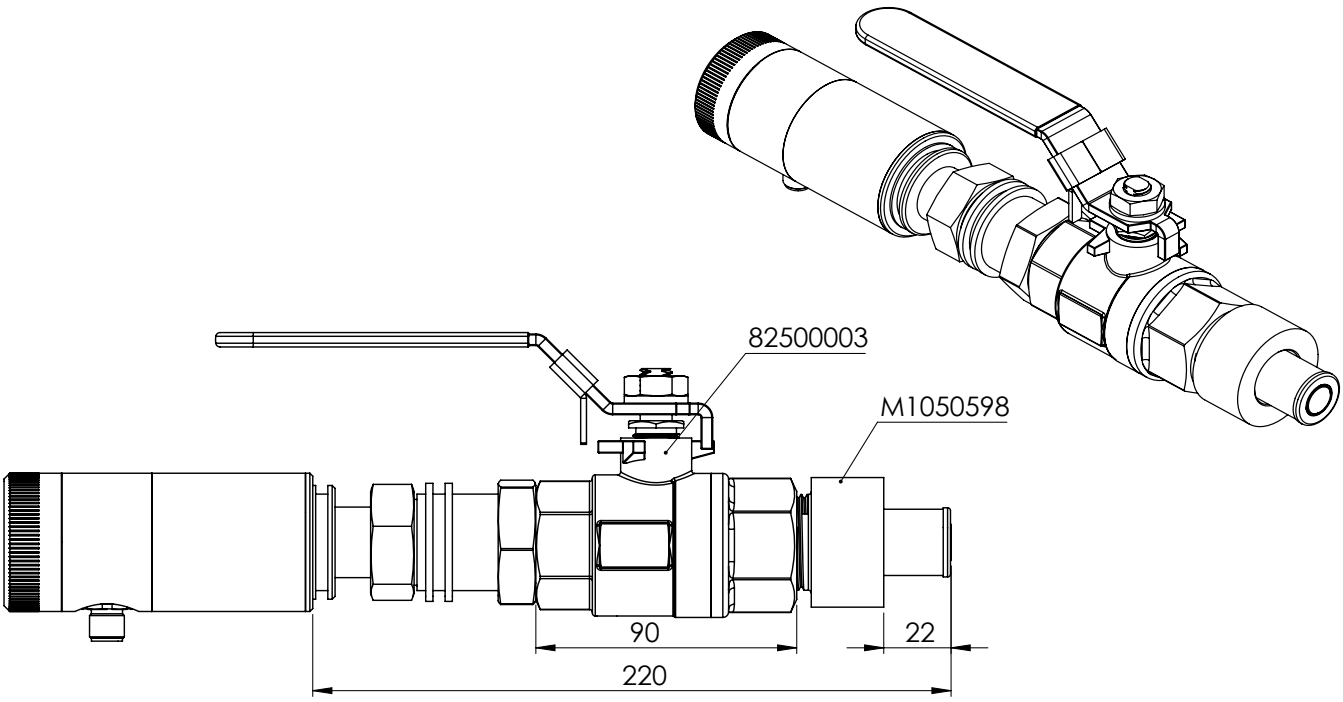
Process connection details



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



VOA with H1 fixed mounting tube process connection and AISI316L hose, “21.H1”



VOA B1 connected to Ball valve 82500003 and M1050598 coupling

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

3-A
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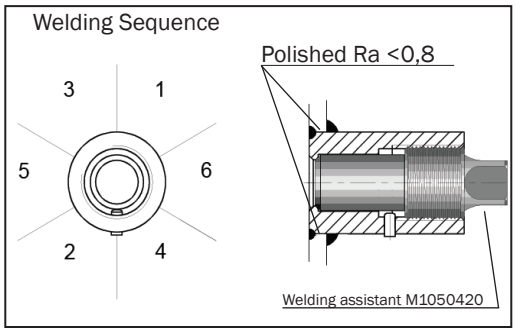
Welding the coupling

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. 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 sensor must be **out of the coupling** while the coupling is welded.You can use the shut-off plug to shut the coupling. The plug protects the coupling's sealing face and permits the starting of the process without the sensor.
- It is always recommendable to use the welding assistant (M1050420) while welding the coupling to prevent any distortions due to heat.
- Do not make weld grounding via any sensor's body!



Mounting the sensor on the coupling

Procedure

- Make sure that the coupling's sealing face is clean.
- Remove the orange protective plug from the sensor head.
- Insert the sensor **in a straight line** into the coupling, so that the guide groove on the sensor aligns with the stop pin on the coupling. The sensor settles into position when the groove and pin are aligned, and will be prevented from rotating in the coupling.

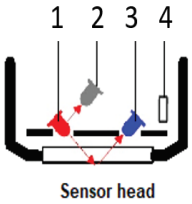
When inserting the sensor, be careful not to damage the edge of the lens on the edges of the coupling or on the end of the stop pin!

- Lock the sensor 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.

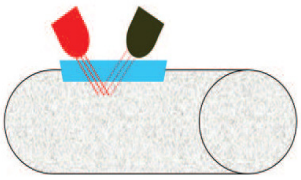
Do not use sealing tape etc. on threaded connection!

VOA measurement principle:

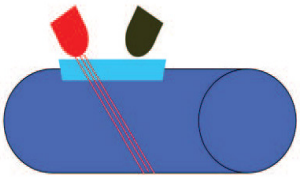
Backscattering with RED and Infrared wavelenght light source LED´s.
The light source is fully compensated for aging, temperature, and ambient light changes due to the high duty cycle measurement (up to 100 measurements per second).
The lifetime for the optical LED and photodetectors is 20 years minimum. Illustration below shows only the principle for 1 light source. The sensor has 2 LED´s and 4 detectors in total.



1	LED
2	Reference detector
3	Turbidity detector
4	PT100 Temperature probe

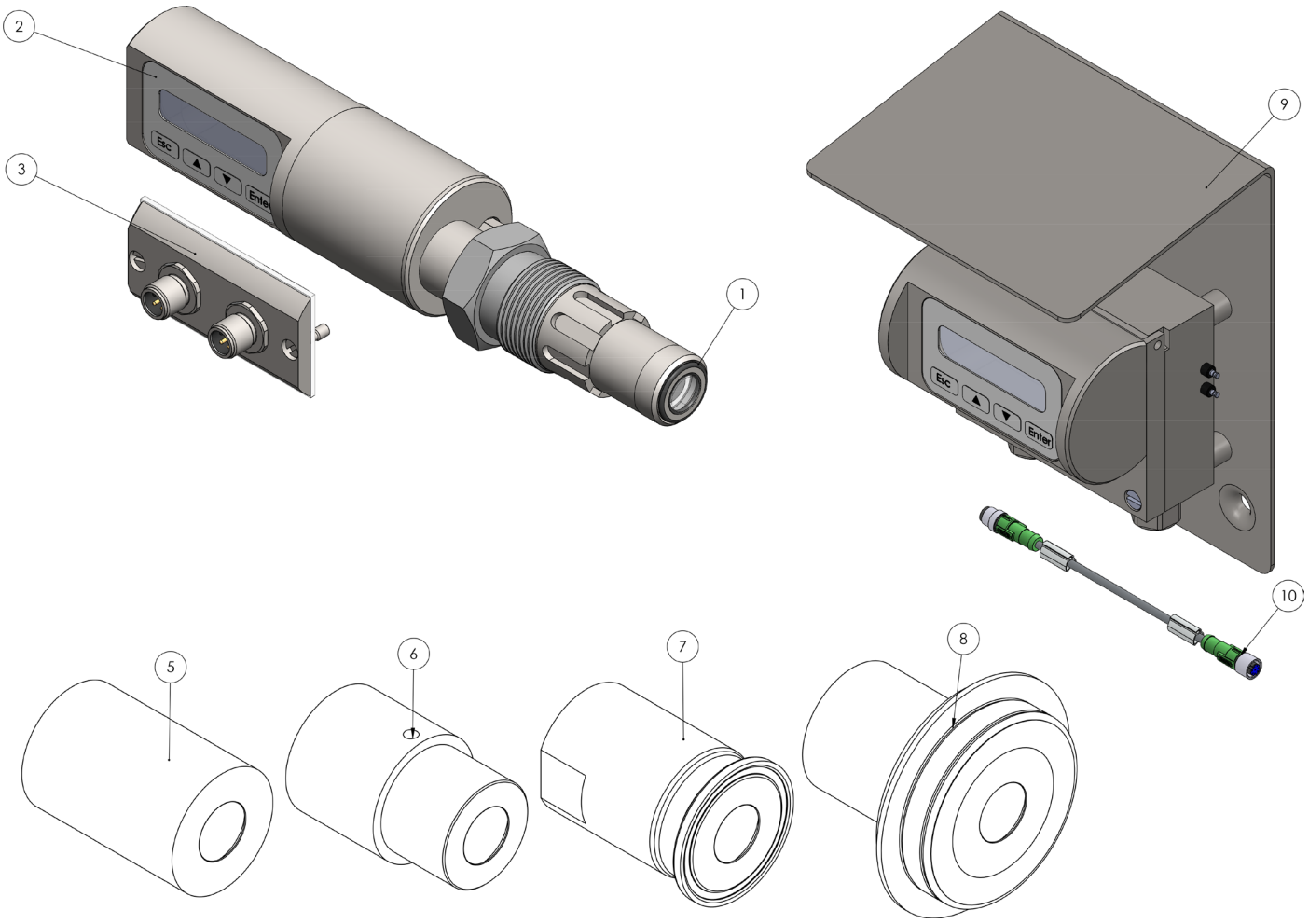


Milk = 100% = 20mA

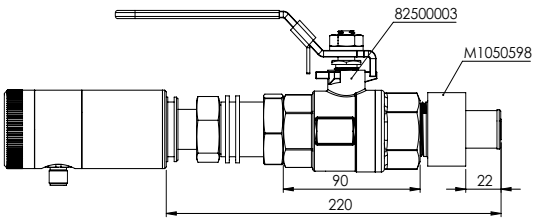


Water = 0% = 4.0mA

Spare-parts VOA G1



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	
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	
	Bracket remote probe electronics	T1050009	



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

SATRON VOA Dual wavelength Turbidity and solids content sensor

Selection Chart

Adjustability	Span, min	Span, max
VOA	0... 1000 NTU	0... 300 000 NTU

Process temperature limits
- **N** Normal version -5...+100 °C (23 ...212°F) (120 °C (248°F) for 10 minutes)
- **H**(**) High temperature -5...+140 °C (23 ...284°F) (160 °C (320°F) for 30 minutes)

Output
- **S** 4-20mA DC/HART® for 50Hz (Europe)
- **J** 4-20mA DC/HART® for 60Hz (USA / Japan)
- **L** 4-20mA + PRIME for 50Hz
- **C** 4-20mA + PRIME for 60Hz

Material of wetted parts

Body		Lens	Seal		3A 18-03
2	AISI316L	**2** Sapphire	**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)		**4**(****)	PTFE (Teflon)	
9(****)	Peek				

Housing type
- **N** Housing with display and pushbuttons, 2mA outputs, 3 bin in/outputs
- **H** Housing without display
- **L** Remote electronics housing with display

Probe type
- **0** No remote probe
- **R** Remote measuring probe (not available with L housing), IP68

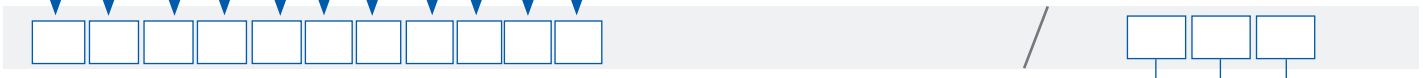
Connection type
- **T** M12, IP67
- **V** PG9 (always with L housing), IP66

Cable Material
- **0** No L or R option selected
- **2**(*) AISI316L braided PTFE hose
- **3** Steel reinforced PUR hose
- **4** PVC cable (std.)

Cable length
- **0** No L or R option selected
- **1** 5 M
- **2** 10 M (PVC std.)
- **3** 15 M
- **4** 20 M

Light source
- **1** RED & IR

Process connections
- **G1** Standard G1A thread + Oring
- **H1**(*) Fixed mounting tube (see H1 picture)
- **HX**(*) Fixed mounting tube (specify length)
- **B1**(*) G1A ball valve insertion. Extension 19cm diameter ø 24mm
- **BX**(*) 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**
** **For EHEDG & 3A in combination with Kalrez Seals**
*** **Do not exceed above 8% fat content process media**
**** **Only 3A certification**

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UL 61010-1, 3rd Ed. Rev May 11. 2012
CAN/CSA C22.2 No. 61010-1-12, Ed. 3
EMC directive 2014/30/EC
- EN 61326-1:2013

1) Parts in contact with process medium compliant to FDA

We reserve the right for technical modifications without prior notice.

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