

SATRON VOM Turbidity and solids sensor for food and Biopharma

BA201
rev. 1.2
18-08-2019

The SATRON VO analyzer allows savings to be obtained in process industries such as:

- Transition monitoring for startup, changeovers and shut-down
- CIP return line monitoring
- Automation of yeast harvesting in breweries
- Integrity monitoring of filters

The transmitter uses fully flat front process side flushing and communicates via 4...20mA and digitally using the HART® protocol.



TECHNICAL SPECIFICATIONS

Measuring range

0...300 000NTU equivalent

Calibration

The transmitter is factory calibrated at 4mA = water, 20mA = 2% fat cow milk, 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

Temperature limits

Ambient: -30 to +80 °C
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) 200mA

Humidity limits 0-100 % RH

CONSTRUCTION

Materials:

Sensing element ¹⁾: 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 mm².

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 mm².

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

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 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

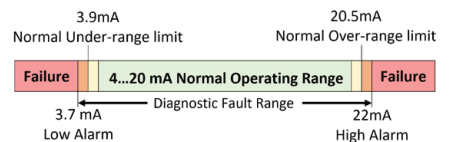
- With G1 connecting thread
- Tri-Clamp 25/38 and 40/51
- Tuchenhangen Type "N"
- 1" retractable "B1"

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



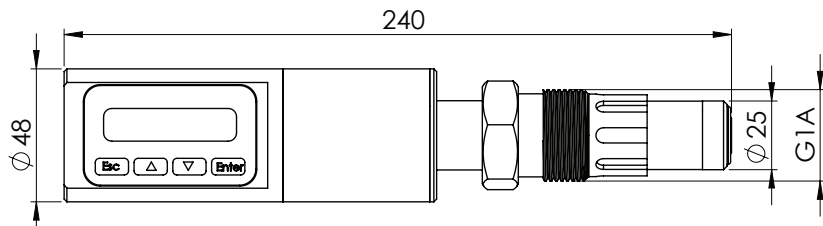
UL 61010-1, 3rd Ed. Rev May 11, 2012
CAN/CSA C22.2 No. 61010-1-12, Ed. 3
EMC directive 2004/108/EC

- EN 61326-1:2005

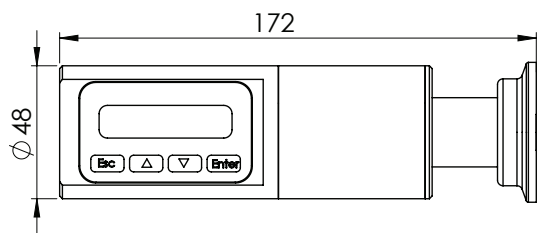
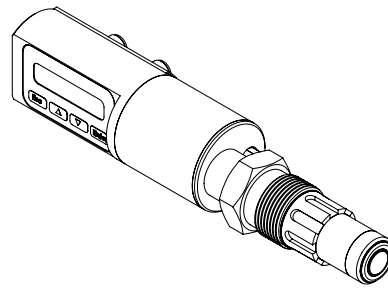
¹⁾ Parts in contact with process medium compliant to FDA

SATRON VO Turbidity and solids content sensor

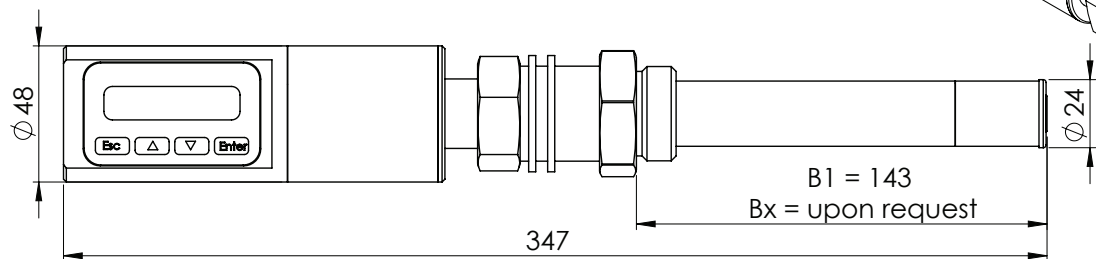
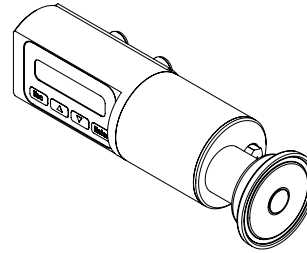
Dimensions and Housing types VOM (mm)



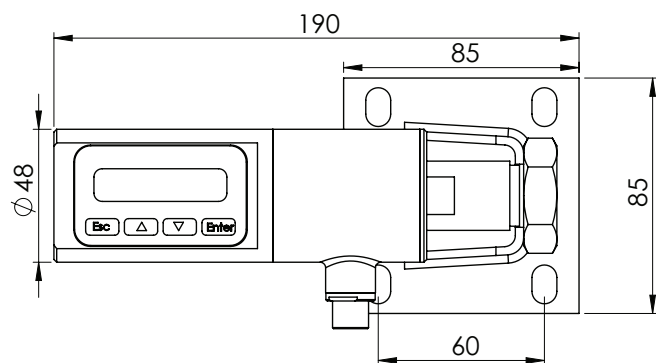
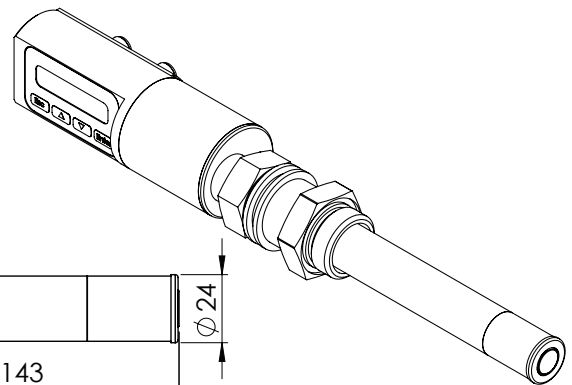
VOM with display (N) and G1 process connection



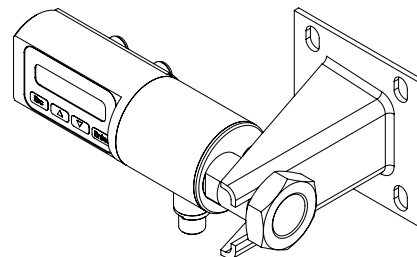
VOM with display (N) and Tx clamp connection



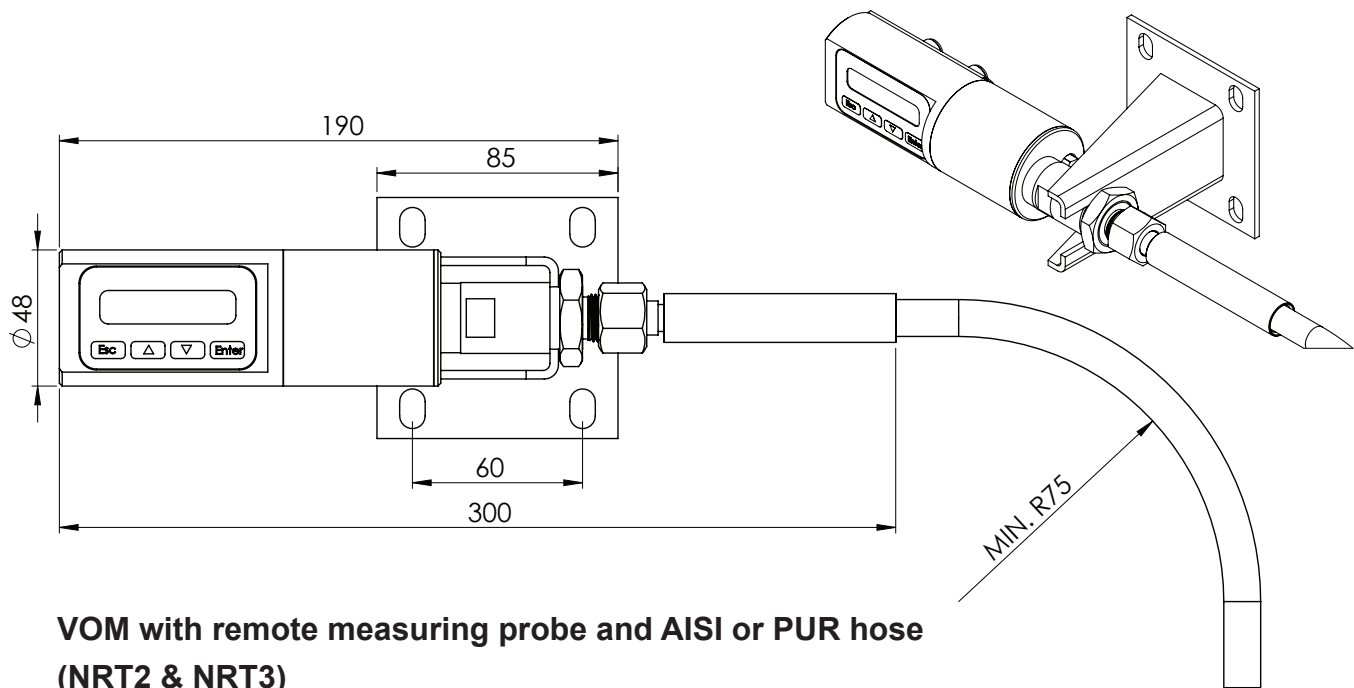
VOM with display (N) and B1 / BX ball valve insertion process connection



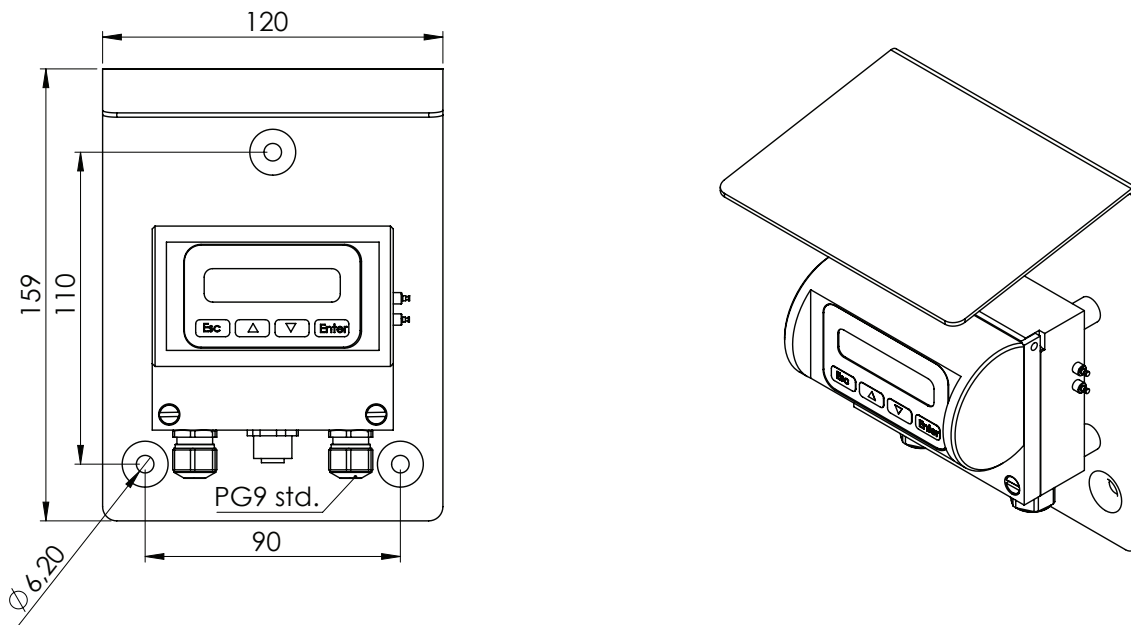
VOM with remote measuring probe and PVC or PUR M12 cable (NRT43 & NRT12)



SATRON VO Turbidity and solids content sensor

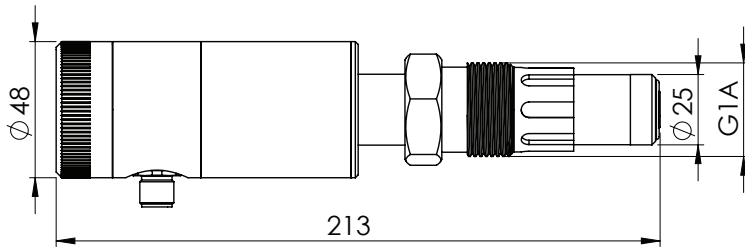


VOM with remote measuring probe and AISI or PUR hose (NRT2 & NRT3)

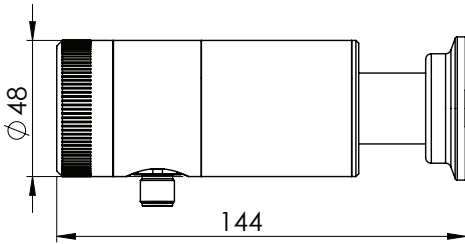
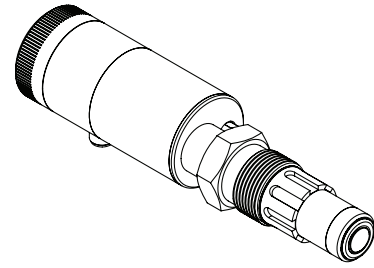


Remote electronics housing with display (L) T1325016

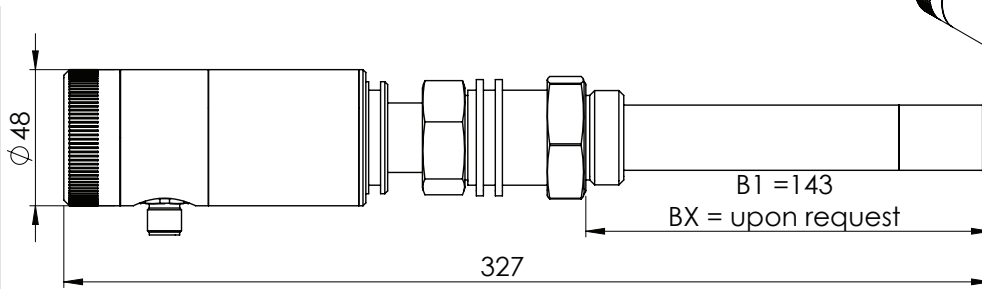
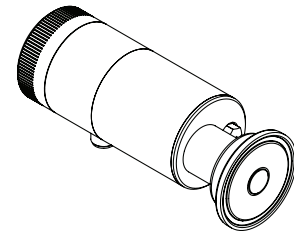
SATRON VO Turbidity and solids content sensor



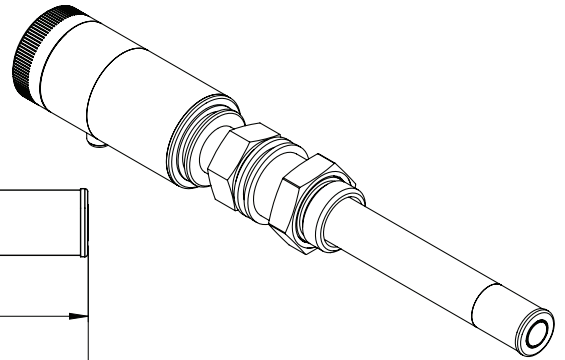
VOM with no display (H) and G1 process connection



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

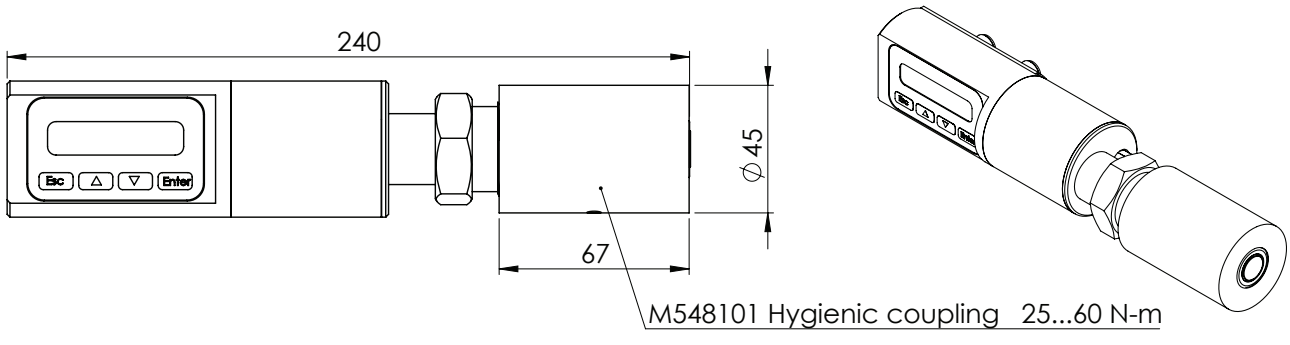


VOM with no display (H) and B1 / BX retractable ball valve insertion process

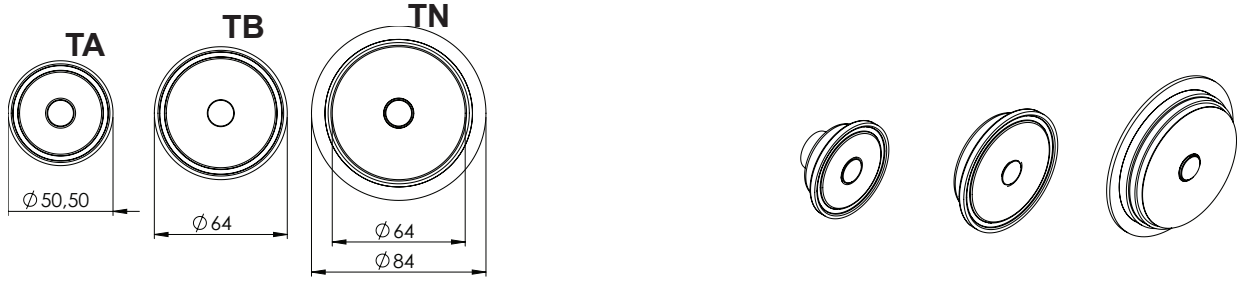


SATRON VO Turbidity and solids content sensor

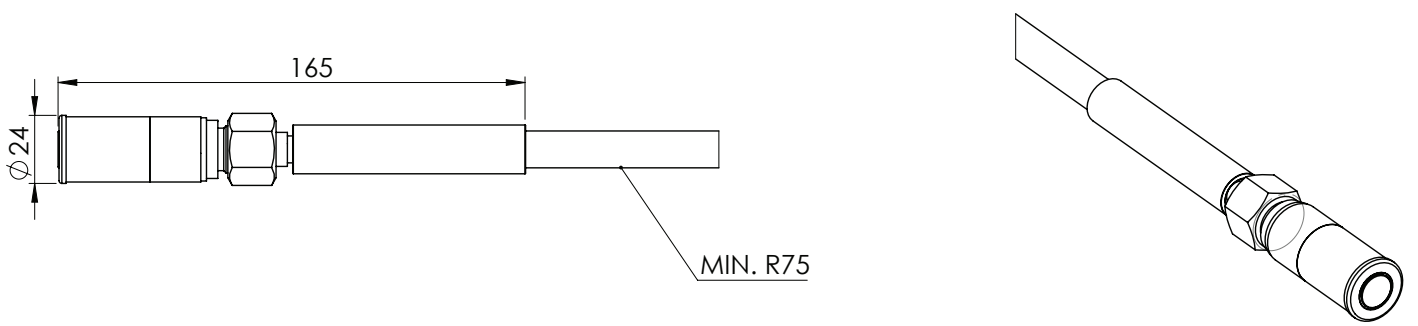
Process connection details



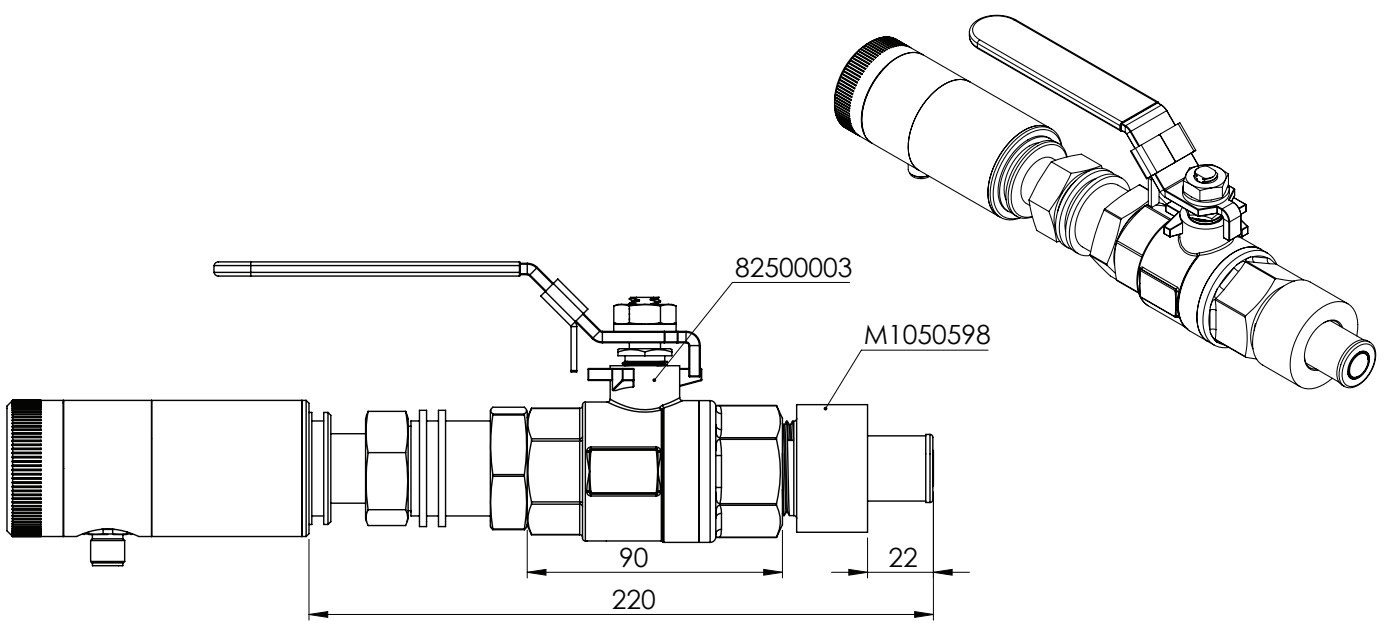
VOM G1 connected to M548101 hygienic coupling. (Flush mounted) EHEDG, 3A



VOM with Tri-clover TA, TB (ISO 2852) and Tuchenhagen TN process connection



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



VOM B1 connected to Ball valve 8250000 and M1050598 coupling

SATRON VO Turbidity and solids content analyzer

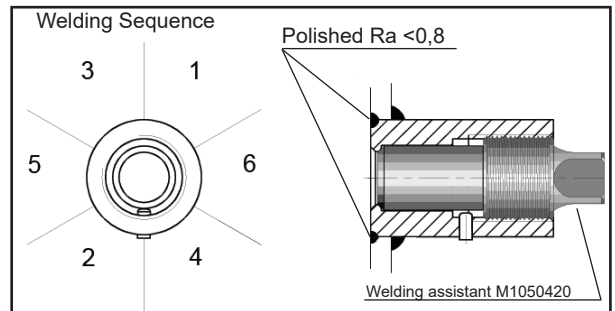
Instructions and spare parts that are according and within the 3-A appliance



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 ± 20 Nm torque.

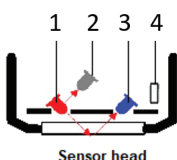
Do not use sealing tape etc. on threaded connection!

VOM measurement principle:

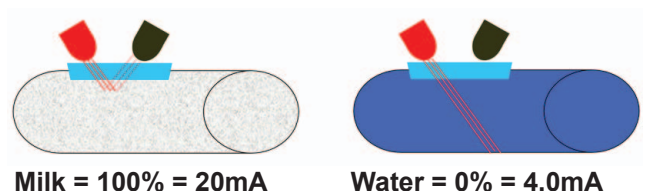
Backcattering with selectable wavelenth lightsource LED (see selection chart)

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.

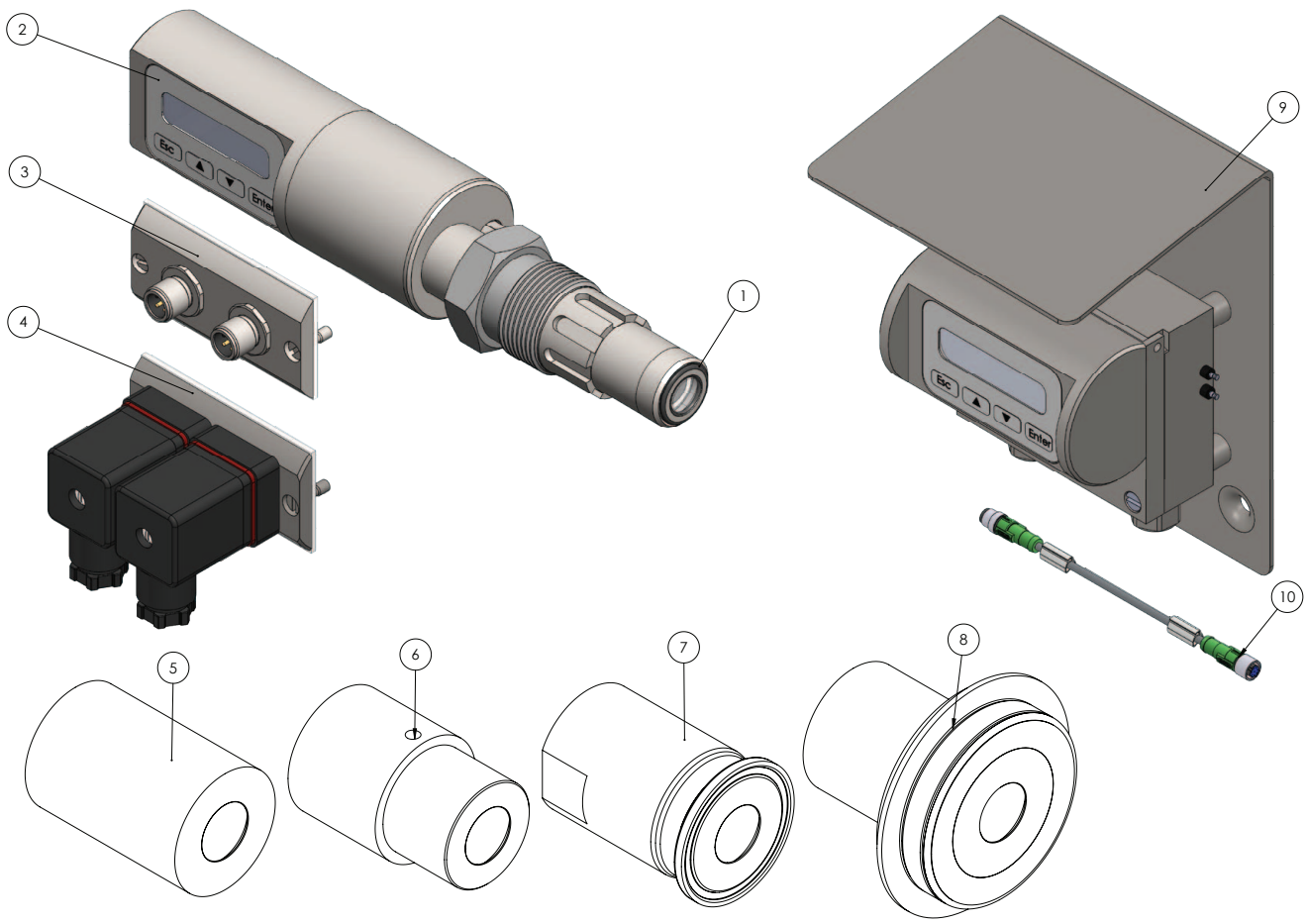


- 1 LED
- 2 Reference detector
- 3 Turbidity detector
- 4 PT100 Temperature probe



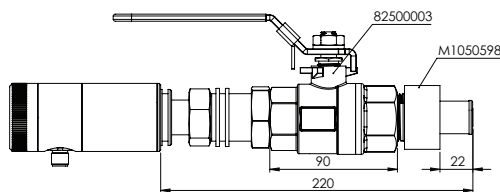
SATRON VO Turbidity and solids content sensor

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	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 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

Adjustability VOM	Span, min 0...1000 NTU	Span, max 0...300 000 NTU		
Process temperature limits	N Normal version -5...+100 °C (120 °C for 10 minutes)	H(**) High temperature -5...+140 °C (160 °C for 30 minutes)		
Output	S 4-20mA DC/HART® for 50Hz (Europe)	J 4-20mA DC/HART® for 60Hz (USA / Japan)		
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	B Housing with display and pushbuttons			
	N Housing with display and pushbuttons, 2mA outputs, 3 bin in/outputs			
	H Housing with, no 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	S DIN43650 with PG9, IP66			
	T M12, IP67			
	V PG9 (always with L housing), IP66			
Cable Material	0 No VOD, L or R selected			
	1 PUR cable.			
	2(*) AISI316L braided PTFE hose.			
	3 Steel reinforced PUR hose.			
	4 PVC cable (std.)			
Cable length	0 No VOD or L, R option selected			
	1 5 M.	3 15 M. (PUR std.)	5 25 M.	
	2 10 M. (PVC std.)	4 20 M.	...	
Light source	6 640nm	8 950nm		
	7 880nm	9 IR+	*others available on request	
Process connections				
	G1 Standard G1A thread + Oring			
	TA Tri-Clover 25/38 (ISO 2852)			
	TB Tri-Clover 40/51 (ISO 2852)			
	TN Tuchenhagen "N" type DN50			
	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
 ** 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

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