SATRON®

LUMINA™ VOM

Turbidity Optical Sensor

www.satron.com

#LookCloser

SATRON VOM Turbidity and solids sensor for Food and Biopharma

The Satron VOM optical sensor works according the backscattering principle with the use of LED technology. The Hygienic approved sensor receives the scattered light back from the process media. This makes the Satron VO ideal for measuring white liquid applications in the dairy industry. For example, measuring during the start and the end of CIP cycles will give real-time information on the amount of milk and water currently in the process. This will prevent wasting valuable amounts of water, milk, time, chemicals, and of course energy. All with the use of one sensor. Additionally, the VOM sensor is ideal for transition monitoring, heat exchanger contamination control and dairy wastewater applications.

TECHNICAL SPECIFICATIONS

Measuring range
0 ... 300 000NTU equivalent

Calibration
The sensor 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
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
Display operating range: 0 to +50 °C (Does not affect operation of the sensor)

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

Supply voltage
Nominal 24 VDC, (21.6 - 27.6V) 200mA

Humidity limits
0-100% RH

Pressure class
PN25

EMC directive 2014/30/EC
- EN 61326-1: 2021

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

Housing with display, code **N, B**
Housing: AISI303/316
Seals: Nitrile rubber and FPM
Nameplates: Polyester
Display window: Polycarbonate

Housing without display, code **H**
Housing: AISI303/316
Seals: FPM 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
Display window: Polycarbonate

Electrical connections
Housing code **H, B**
1x M12 plug connector
Housing with display, code **N**
2x M12 plug connector
Remote electronics housing with display code **L**
PG9 gland for cable;
Conductor cross section: max 2.5 mm²

I/O-connections

Current output1	Turbidity active
Range (NAMUR NE 043)	3.5...23 mA
Maximum load	600 Ω
Factory setting	3.7...22.5 mA*

Switch outputs
Housing **N**: 1 output
Housing **L**: 3 outputs
Solid state relay, grounding contact

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

Switch inputs
Housing **N**: 1 input
Housing **L**: 3 inputs

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
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

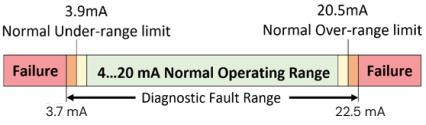
Protection class
IP66, IP67 and IP68
See Selection chart.

Weight

Housing without display **(H)**:	0.9 kg
Housing with display **(B)**:	1.3 kg
Housing with display **(N)**:	1.3 kg
Remote housing **(L)**:	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

*



[1)] Parts in contact with the process medium are FDA compliant.

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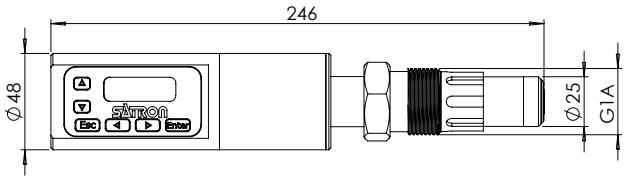
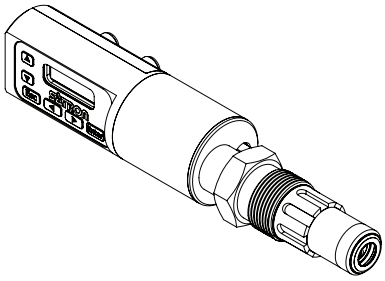
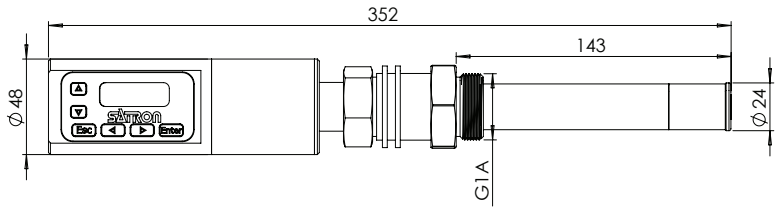
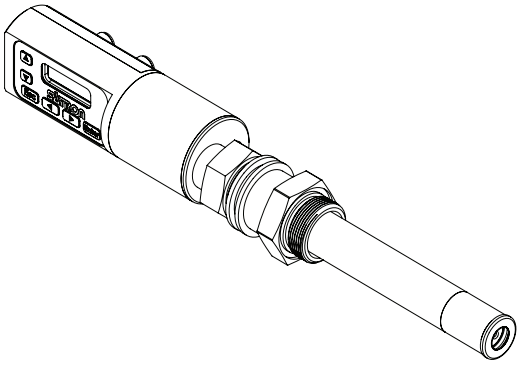
Dimensions and housing types VOM (mm)



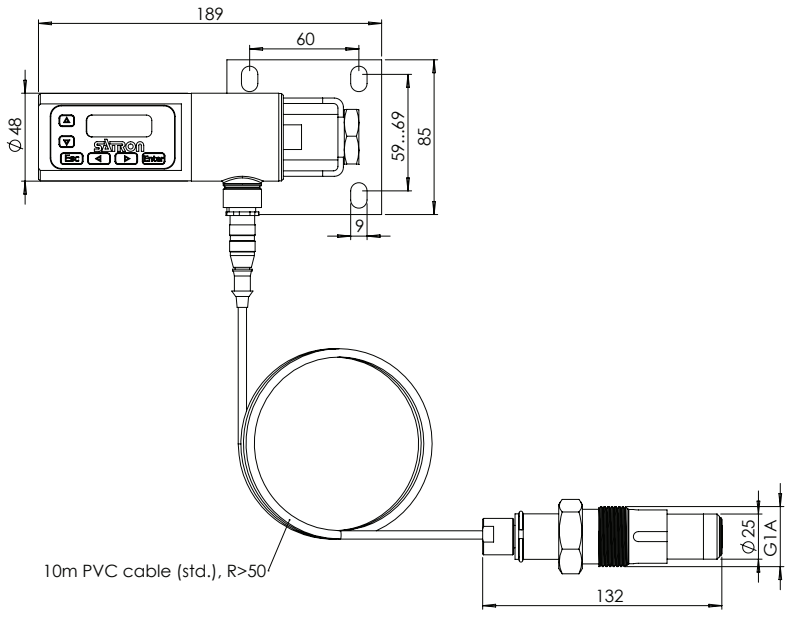


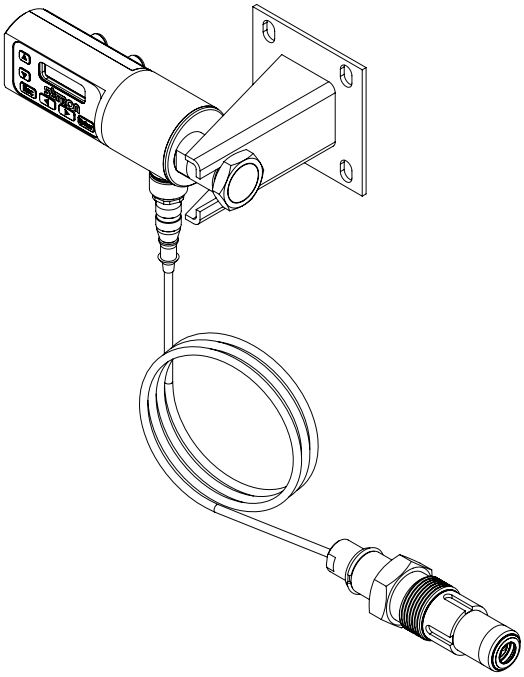
VOM with display (N) and G1 process connection



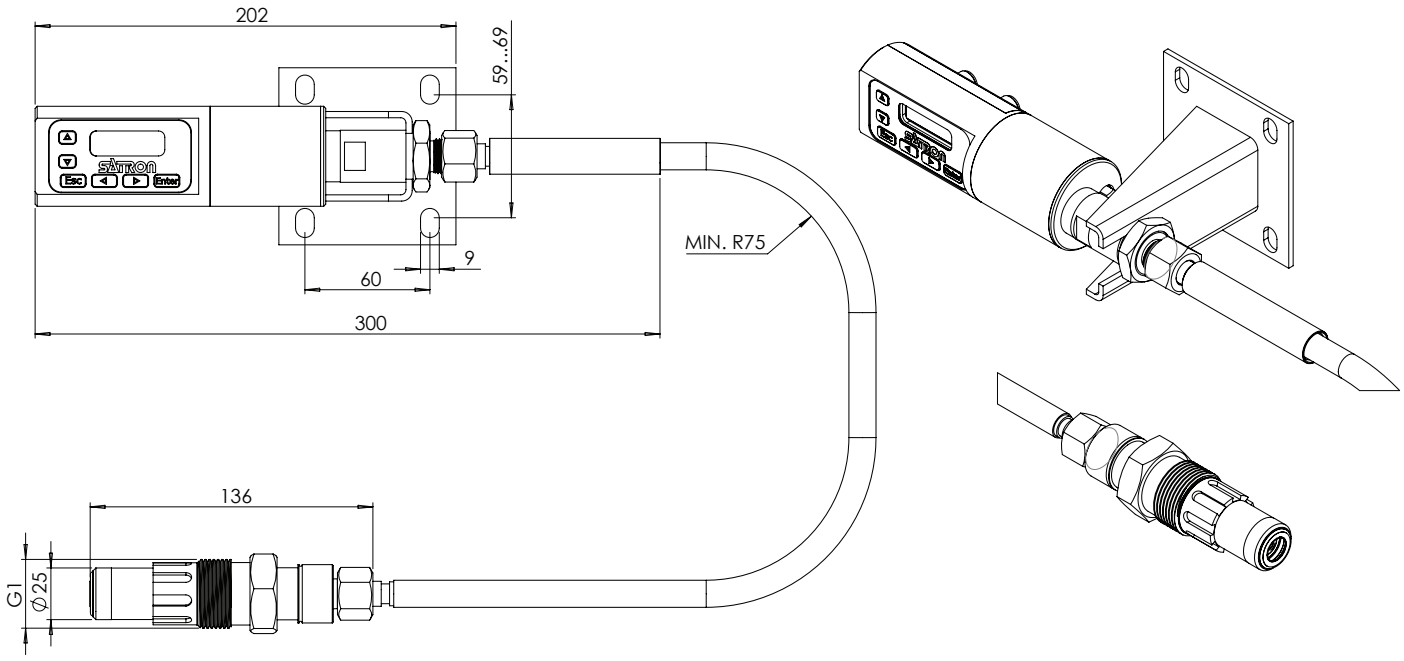


VOM with display (N) and B1 / BX ball valve insertion process connection

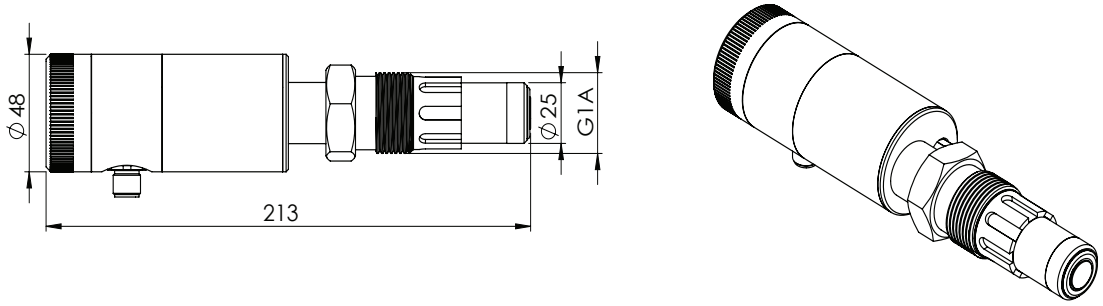




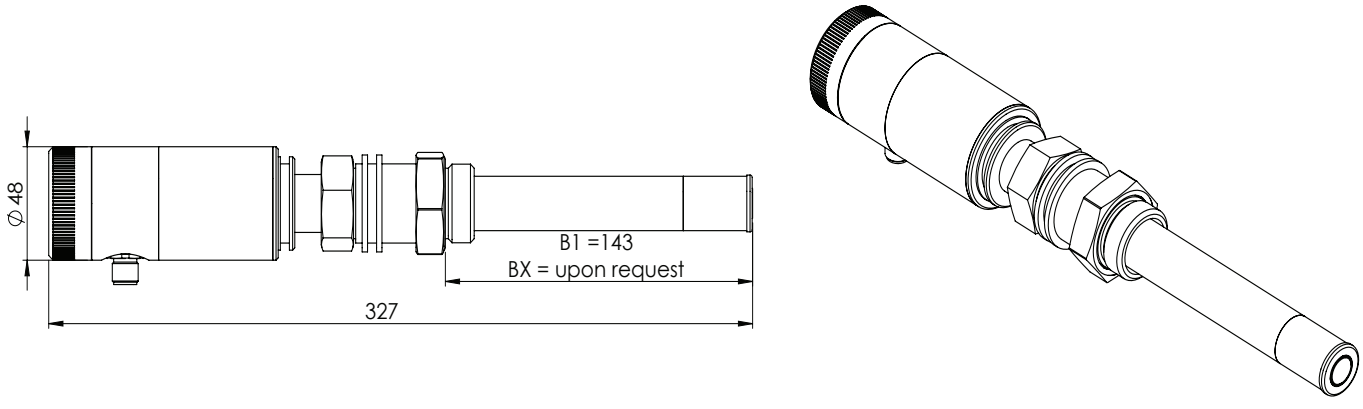
VOM with remote measuring probe and PVC M12 cable (NRT4)



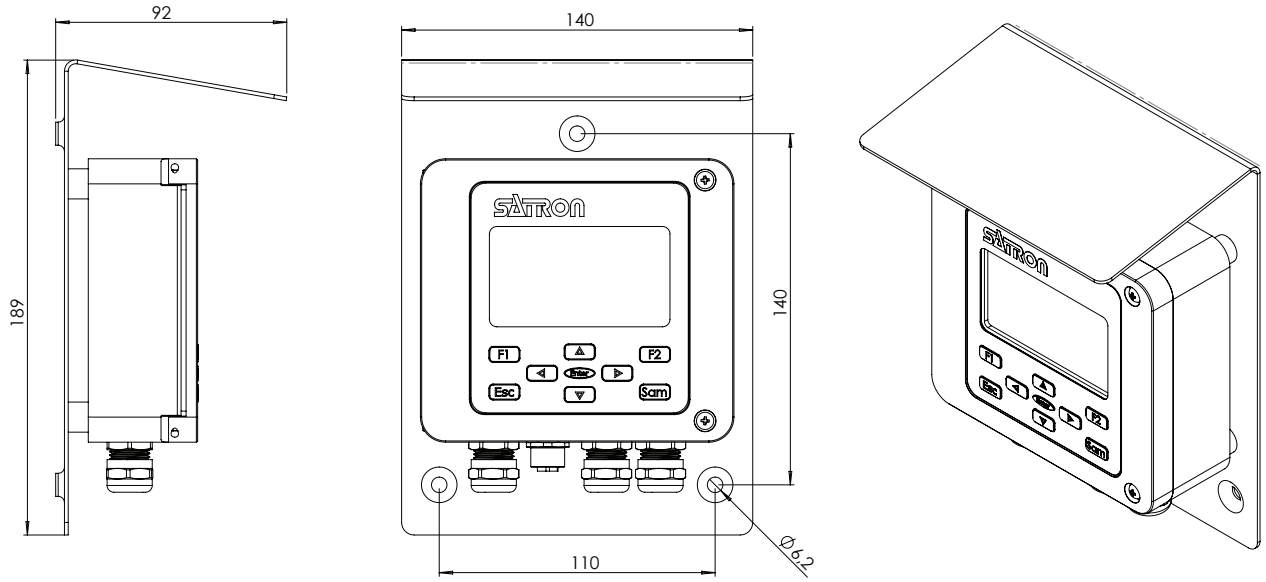
VOM with remote measuring probe and AISI hose (NRT2)



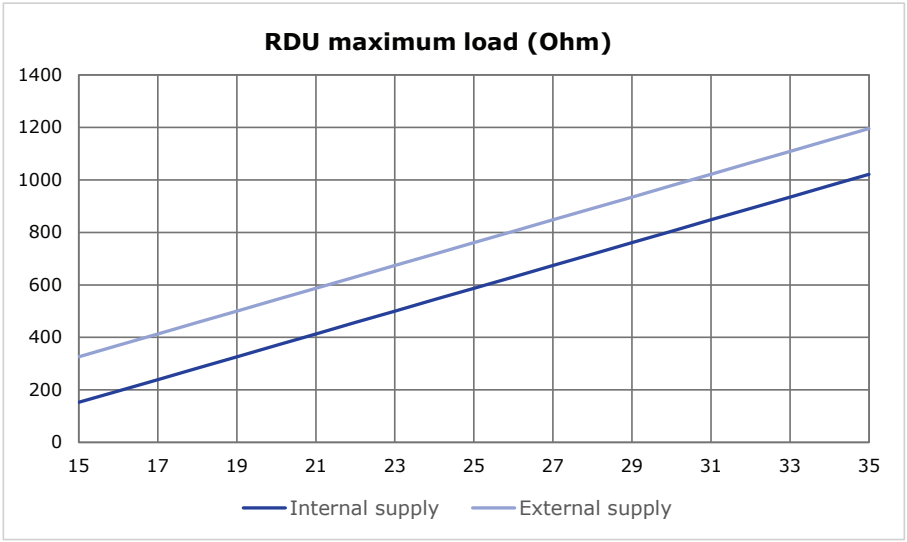
VOM without display (H) and G1 process connection



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



RDU - Remote Display Unit (L) T1370009



Flushing Cabinet

Automated sensor flushing in process.
Remote electronics in the device enclosure.
Compatible with housing type N and probe type R with display (NRT).

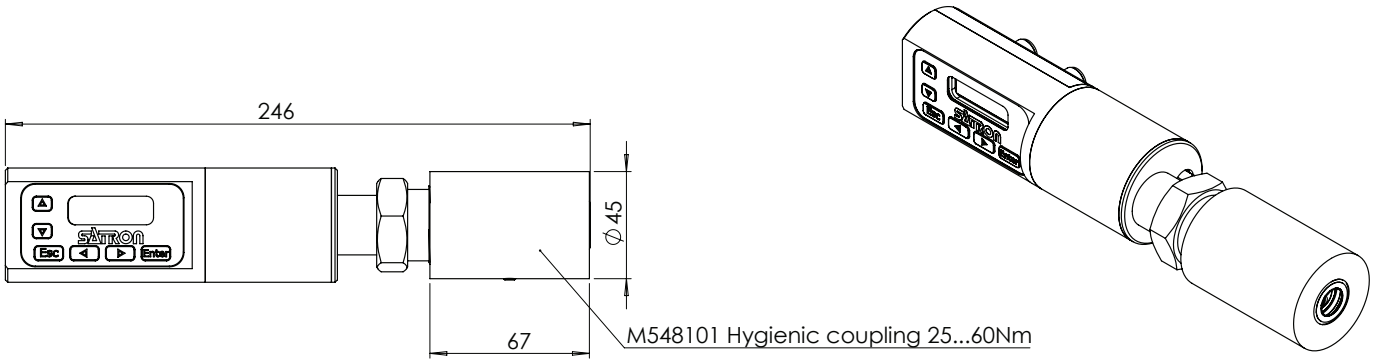
Product code: **M1370192**, for PVC cable type 4.
Product code: **M1370192-NRT5**, for AISI316L braided PTFE removable hose able type 5.

Flushing couplings:

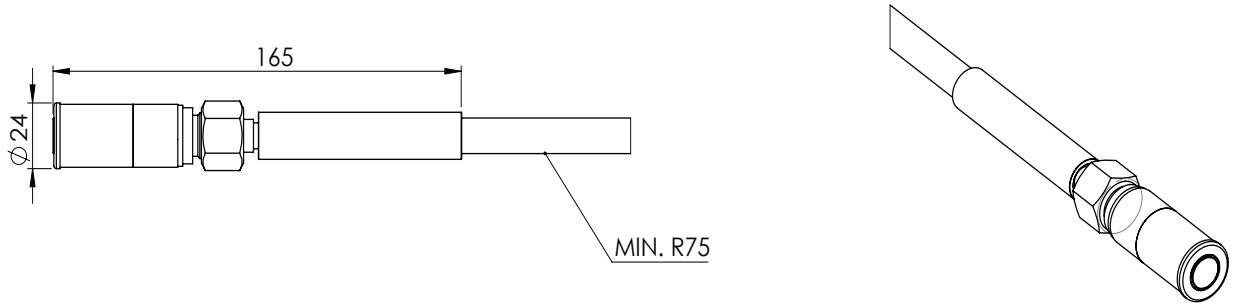
M1050021

M1050102

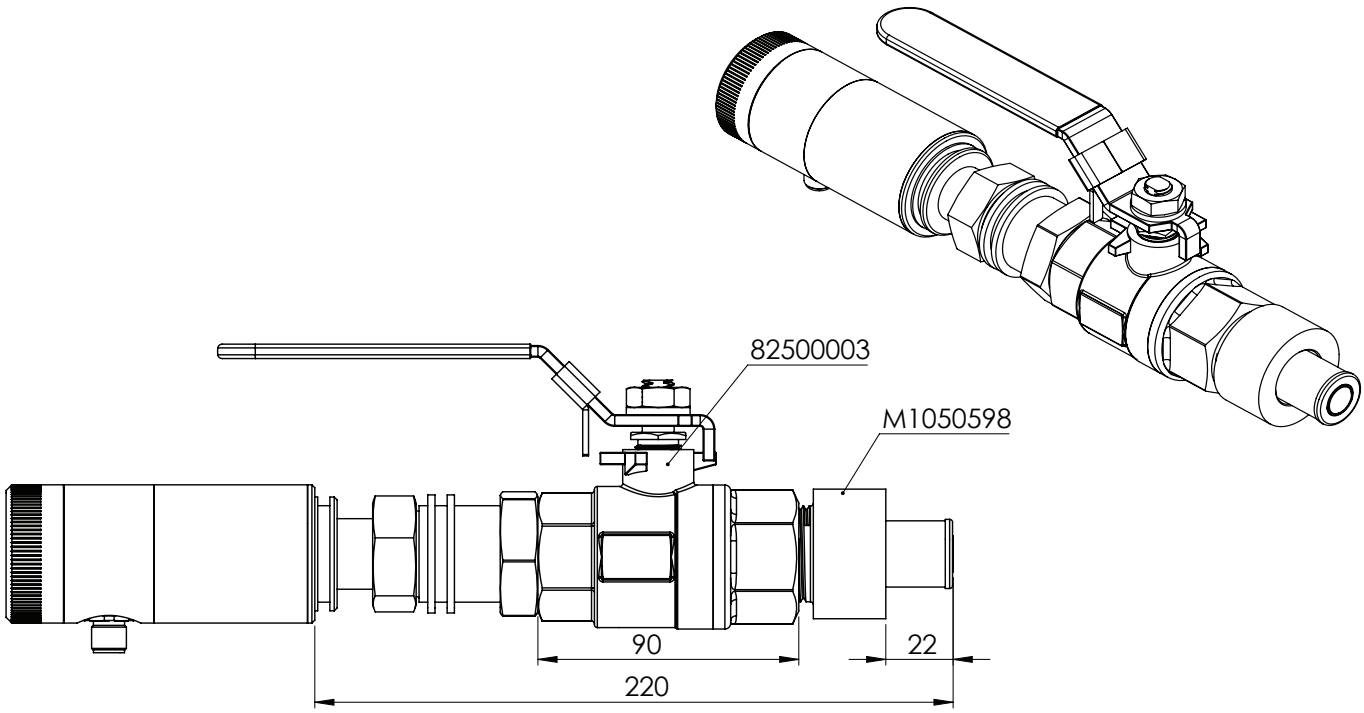
Process connection details



VOM G1 connected to M548101 3A hygienic coupling (flush mounted).



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



VOM B1 connected to ball valve 82500003 and M1050598 coupling

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

46-04

Welding the coupling

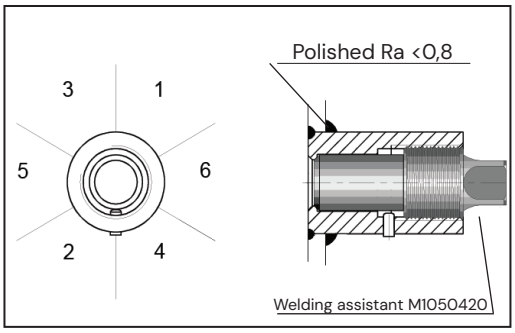
These instructions apply to hygienic welded couplings; welding the G1 standard coupling is described here as an example.

• 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.

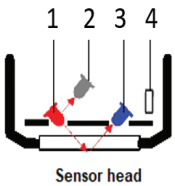
When inserting the sensor, be careful not to damage the edge of the lens on the edges of the coupling or on the end of the stop pin!

• 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.

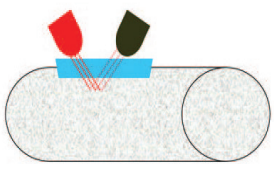
Do not use sealing tape etc. on threaded connection!

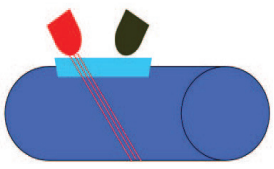
VOM measurement principle:

Backscattering with selectable wavelength light source 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 photo-detectors is 20 years minimum.



1 LED
2 Reference detector
3 Turbidity detector
4 Temperature sensor





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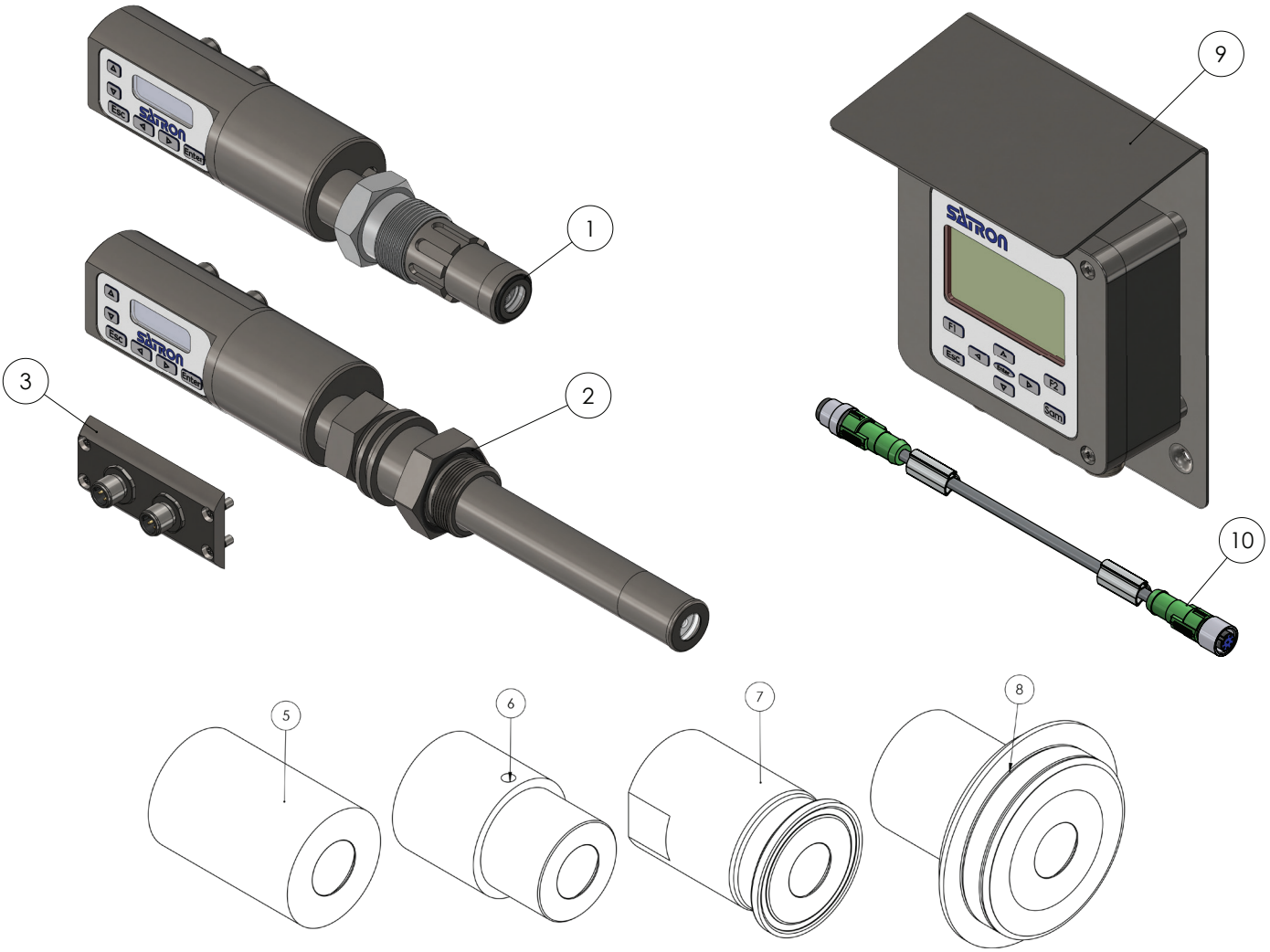
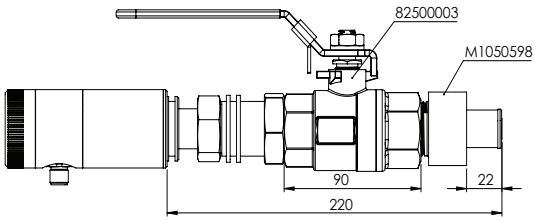
Spare Parts VOM



No.	Part name	Order code	Note
1	O-ring EPDM	80031721	3A 18-03 Class II (Do not exceed above 8% fat content)
1	O-ring FPM	80011721	3A 18-03 Class I
1	O-ring FFPM	800417020	3A 18-03 Class I
2	O-ring EPDM	80033426	
2	O-ring FFPM	800434626	
3	Plug cover M12*	T1370011	
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*	T1370009	
10	L-Housing data cable 10m PVC*	70000600	
10	L-Housing data cable 15m PVC*	70000601	
	Bracket remote probe electronics	T1050009	



Ball valve	82500003
Straight G1 coupling for ball valve	M1050598
15° G1 coupling for ball valve	M1050597

*Compatible with M3 model sensors. For older generations with 4 button displays (M1 and M2), please contact Satron.

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SELECTION CHART

Adjustability	Span, min	Span, max
VOM	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[1]	High temperature -5...+140 °C (23 ...284°F) (160 °C (320°F) for 30 minutes)

Output

S	4-20mA DC/HART® for 50Hz (Europe)	**T**[2]	4-20mA DC/HART® + IO-Link for 50Hz
J	4-20mA DC/HART® for 60Hz (USA / Japan)	**K**[2]	4-20mA DC/HART® + IO-Link for 60Hz

Material of wetted parts

Body		Lens		Seal FEP +		3A 18-03
2	AISI316L	**2**	Sapphire	**1**[3]	EPDM	Class II
3	Hastelloy® C276	**4**	Spinel	**2**	FPM	Class I
6	Titanium Gr2			**3**	FFPM	Class I
8	Duplex (EN 1.4462)					

Housing type

B	Housing with display and push buttons, 1mA output
N	Housing with display and push buttons, 2mA outputs, binary in/output
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[4]	AISI316L braided PTFE fixed hose
4	PVC cable (std.)
5[4,5]	AISI316L braided PTFE removable hose Extension 10m PVC cable available (code: 70000600)

Cable length

0	No L or R option selected
2	10 meters (std.)
3	15 meters

Light source

6	640nm	**7**	880nm

Process connections

G1	Standard G1A thread + O-ring
H1[4]	Fixed mounting tube (see H1 picture)
HX[4]	Fixed mounting tube (specify)
B1[4]	G1A ball valve insertion. Special extension length.
BX[4]	G1A ball valve insertion. Extension on request.

Example code

VOM	N	5	221	N	0	T	0	0	6	G1

Documentation

Material certificates

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
MC3-3A	Raw material certificate for wetted parts, in accordance with SFS-EN 10204-3.1 B (DIN 50049-3.1 B) standard + 3A approval

1) **3A approval in combination only with FFPM**
2) **IO-link only with N housing type, but binary in/output not applicable. Not compatible with flushing cabinet.**
3) **Do not exceed above 8% fat content process media**
4) **Not within 3A approval**
5) **Use only together with M1370192-NRT5 cabinet**

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: 2021

46-04 800029 EC 1935/2004

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