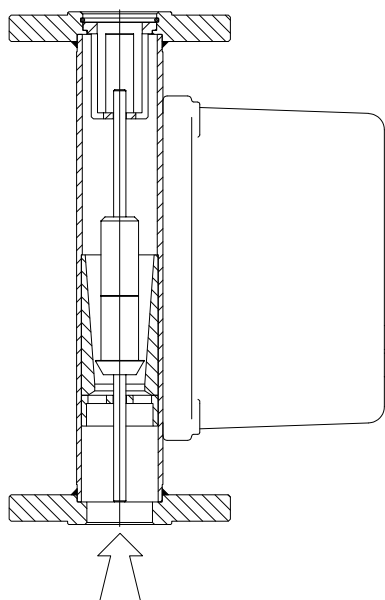


METALLIC VARIABLE AREA FLOWMETER

TMG Series



DESCRIPTION

The Metallic Variable Area Flowmeter TMG Series consists in a vertical metal **cone** with a guided **float** inside with an internal magnet. As flow increases, the float, in equilibrium between weight force, buoyancy force, and fluid thrust, moves to a higher position, in order to increase the fluid's passage surface.

Outside the cone, not in contact with the fluid, there's a housing containing a **dial** indicator magnetically coupled to the float, which mirrors its position.

The instrument's scale is customized for each fluid and calculated using its operating process data: density, temperature, and pressure.

FEATURES

- Cost-effective, direct measurement with no external power supply required
- Wide measurable flow ranges
- Suitable for gases and liquids, including viscous fluids
- Magnetic coupling overcomes limitations of glass flowmeters (corrosive or hazardous fluids, high temperatures and pressures)
- Replaceable float
- Easy installation and maintenance
- Complete production control fully integrated inside the company and highly competent local suppliers.
- Qualified welders and welding procedures compliant with ASME IX and EN ISO 15614.
- Completely customizable on client's needs thanks to the support of our technical and sales departments
- Over 60 years company experience with instruments installed worldwide

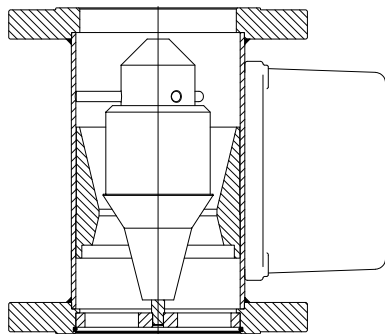
APPLICATIONS

- Chemical and petrochemical
- Oil & Gas On and Off-shore
- Power plants
- Water treatment

TECHNICAL SPECIFICATIONS

- Pressure rating up to ANSI2500, PN400
- Gaskets-free corrosion resistant design
- Accuracy $\pm 1.5\%$ full scale value, the value varies with the viscosity, above 5 cP
- Repeatability ± 0.2
- Fluid's viscosity up to 200 cP
- Measuring range ratio 1-10, scale length ~ 100 mm
- Fluid's temperature from -196 to $+400$ °C and over on request
- Ambient temperature from -40 to $+70$ °C and over on request
- Available in many materials, depending on the application
- Wide range of accessories





MODELS

Measurement ranges for Series TMG are defined in steps by model. Flow rates in the table refer to water and air at normal conditions; values for other fluids or conditions are calculated by Officine Orobiche based on operating temperature, pressure, and density. Variations in these parameters will compromise the instrument calibration.

Table B

CONNECTIONS Ømin	WATER		AIR		ΔP [mbar]
	CODE	FLOW RATE [L/h]	CODE	FLOW RATE [Nm ³ /h]	
15 (1/2")	A58	1.0 - 10	B58*	0.03 - 0.30	60
	A59	1.6 16	B59*	0.05 - 0.50	60
	A01	2.5 - 25	B01	0.08 - 0.80	50
	A02	4.0 - 40	B02	0.12 - 1.20	55
	A03	6.3 - 63	B03	0.2 - 2.0	55
	A04	10 - 100	B04	0.3 - 3.0	35
	A05	16 - 160	B05	0.5 - 5.0	35
	A06	25 - 250	B06	0.75 - 7.50	35
	A07	40 - 400	B07	1.2 - 12.0	30
	A08	63 - 630	B08	2 - 20	30
	A09	100 - 1'000	B09	3 - 30	35
25 (1")	A10	100 - 1'000	B10	3 - 30	40
	A11	160 - 1'600	B11	5 - 50	40
	A12	250 - 2'500	B12	7.5 - 75	45
	A13	400 - 4'000	B13	12 - 120	45
	A14	600 - 6'000			75
50 (2")	A15	630 - 6'300	B15	20 - 200	45
	A16	1'000 - 10'000	B16	30 - 300	40
	A17	1'600 - 16'000	B17	50 - 500	40
	A18	2'500 - 25'000			45
80 (3")	A19	2'500 - 25'000	B19	75 - 750	45
	A20	4'000 - 40'000	B20	120 - 1'200	45
	A21	6'300 - 63'000			80
100 (4")	A22	6'300 - 63'000			70
	A23	10'000 - 100'000			100

Instruments with the flow self-regulator can have connections with smaller diameters, see the relevant chapter.

*Supplied only with dampener

OTHER INSTRUMENTS

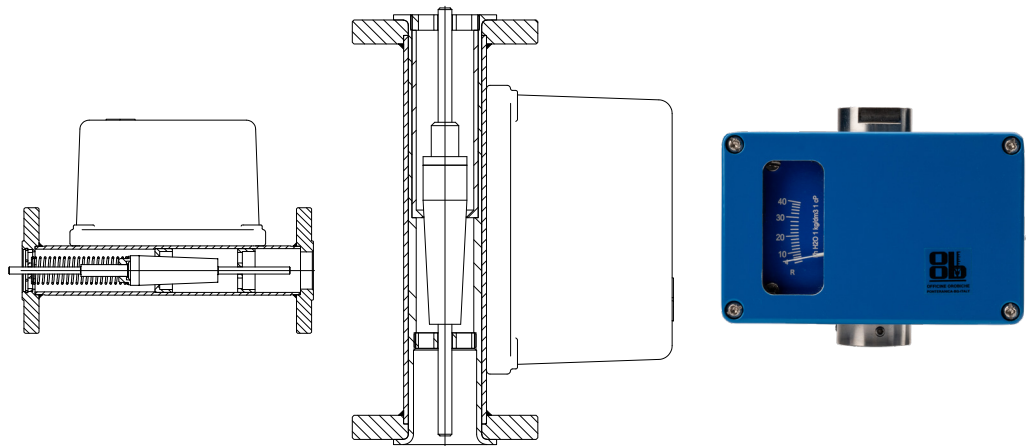
Since the Variable Area principle relies on gravity, the TMG Series (except RV/TMG version) is suitable only for upward vertical flow. The Metallic Flowmeter **TMO Series** replaces gravity with a spring force, making it suitable for horizontal installation.

For lower flow rate, the Metallic Variable Area Flowmeter **TMS Series** can measure down to 0.1 L/h of water or 3 NL/h of air.

For highly corrosive fluids, the Metallic Variable Area Flowmeter **TMN Series** has a simpler geometry that allows it to be manufactured in special materials, like titanium or nickel alloys), and it can even be PTFE-lined.

Officine Orobiche manufactures also transparent glass variable area flowmeters, which are more economical and allow visual fluid inspection.

For other types of flows gauges, Officine Orobiche manufacture a whole range of Primary Flow Elements that includes Orifice Plates, Orifice Plate Assemblies, Meter Runs, Flow Nozzles, Venturi Tubes, Venturi Cone Meters, Wedge Meters and Multiport Averaging Pitot Tubes.



TMO Series

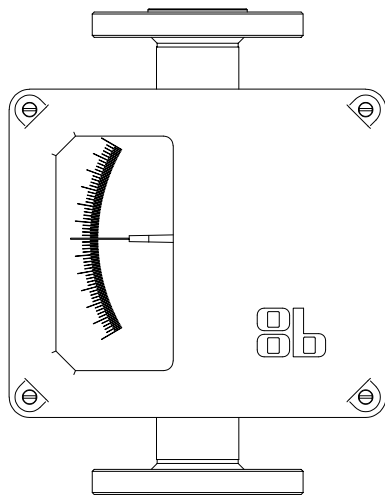
TMN Series

TMS Series

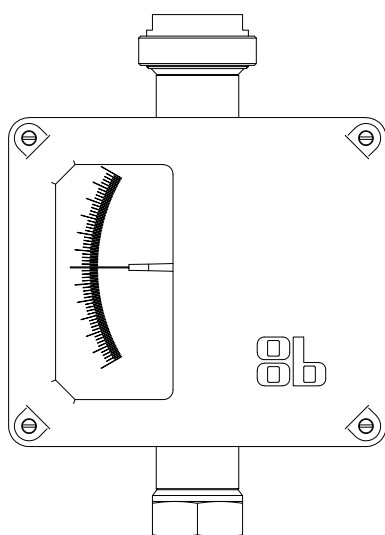
MATERIALS

Due to magnetic coupling, the instrument's body can only be made from non-ferromagnetic materials. The standard version is made of **dual-grade SS 316/316L**. On request it can be manufactured with the materials in the following table or more others.

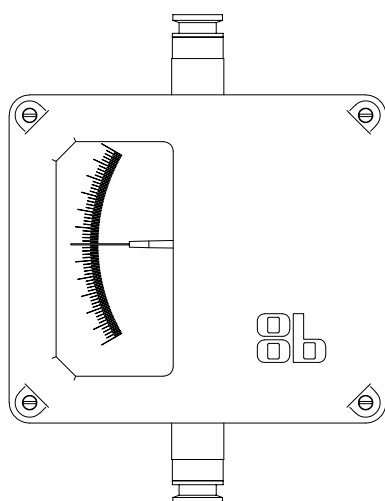
CODICE	MATERIALE
J o JL	SS 316/316L dual grade
HC	Alloy C276
MO	Alloy 400
825	Alloy 825
625	Alloy 625
20	Alloy 20
F44	Super aust. UNS S31254
TI	Titanio



Flanged



Threaded



Tri-Clamp

CONNECTIONS

The TMG Series Metallic Flowmeter can be supplied with the following process connections or others on request:

- **Flanged**
 - ANSI B16.5
 - EN 1092/1
- **Threaded**
 - NPT-F or NPT-M
 - GAS-F or GAS-M
- DIN 11851 (Hygienic)
- Tri-clamp (BS4825)

Table A

CODE	CONNECTIONS
A	Flanges ANSI
E	Flanges EN
U	Flanges UNI
D	DIN Hygienic
T	Tri-Clamp
G	Threads GAS-F
N	Threads NPT-F
X	Others

HOUSING

Instrument's housing is available in painted die-cast **aluminum** or **SS 316L**.

For versions with electrical accessories it's available in **IP66** version or **explosion-proof Ex d IP68** version for classified areas.

	ALLUMINIUM	SS316L
STANDARD IP66		
EXPLOSION-PROOF IP68 Ex d		

When electrical accessories are present, the housing has a PG11, 1/2" NPT, or ISO M20x1.5 entry. On request it can be supplied with an additional entry, reductions, or cable glands as accessories.

TRASMETTER

The TMG Series flowmeter can be equipped with a **4–20 mA**, Fieldbus, or Profibus transmitter inside the housing. The 4–20 mA analog signal can be overlaid with a HART digital signal. For classified areas, an intrinsically safe Ex i version is available.

A four digits LCD loop-powered **display** can be placed, on the instrument's scale, that shows the 4-20 mA signal value in percentage. This configuration combines the dial mechanical indication with the display analogic one.

The following table resume the various configurations:

Table D

CODE	TRASMITTER
T0	No transmitter
T1	Standard 4-20 mA
T2	4-20 mA Ex i
T3	4-20 mA HART 7
T4	4-20 mA HART 7 Ex i
TF	Foundation Fieldbus
TP	PROFIBUS

The code shows an additional “+D” if it comes with the Display.

SWITCHES

The TMG Series Flowmeter can be supplied with one or more bistable switches: **Reed type** (30 VDC 0.1 A) or **NAMUR type** (8 VDC 0.01 A).

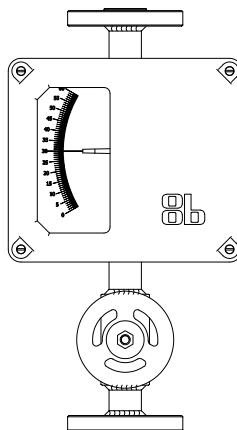
Table E

CODICE	INTERRUTTORE
C1	n°1 Reed
C2	n°2 Reed
C3	n°1 NAMUR
C4	n°2 NAMUR

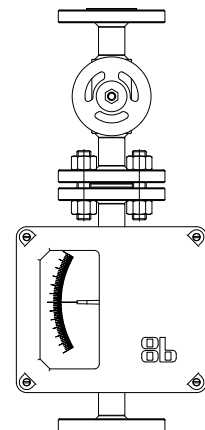
VALVES

The TMG Series flowmeter can be supplied with an **integrated inlet** needle or globe/needle valve.

On request the valve can be supplied in outlet position but not integral with the flowmeter's body, otherwise it wouldn't be possible to remove the float for maintenance.



Integral inlet valve



Mounted outlet valve

FLOW SELF-REGULATOR

The instrument can be manufactured with a flow self-regulator that maintains the flow constant in case of pressure variations.

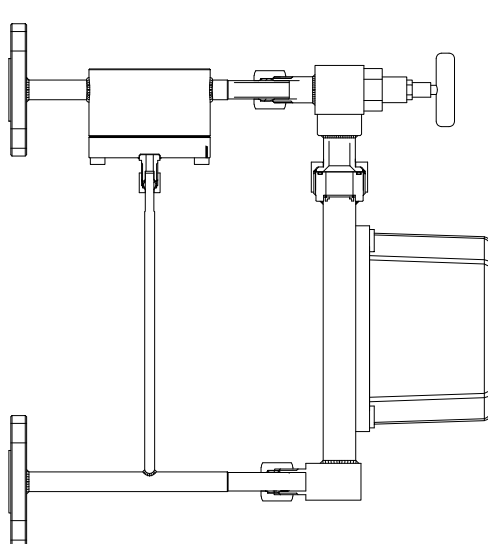
- Inlet regulator: variable inlet pressure, constant outlet (only for gas)
- Outlet regulator: constant inlet pressure, variable outlet (for both gas or liquid)

Three sizes are available based on instrument's flow rate.

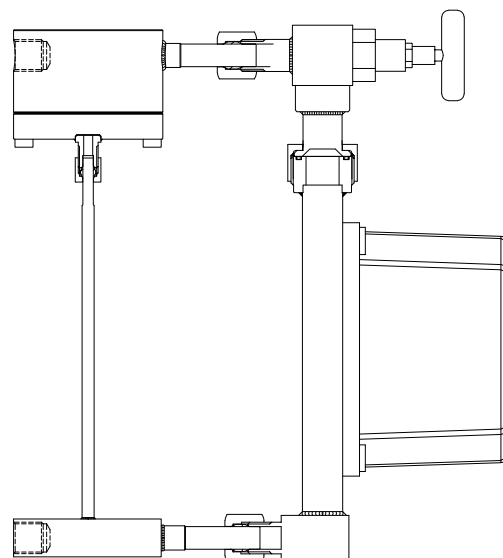
Table F

CODE	SELF-REGULATOR	CONNECTIONS Ømin	AIR MAX FLOW RATE
RPJU	Outlet Small	1/4"	3 Nm3/h
RPJE	Inlet Small		
RGJU	Outlet Medium	1/2"	20 Nm3/h
RGJE	Inlet Medium		
RXJU	Outlet Large	1/2"	120 Nm3/h
RXJE	Inlet Large		

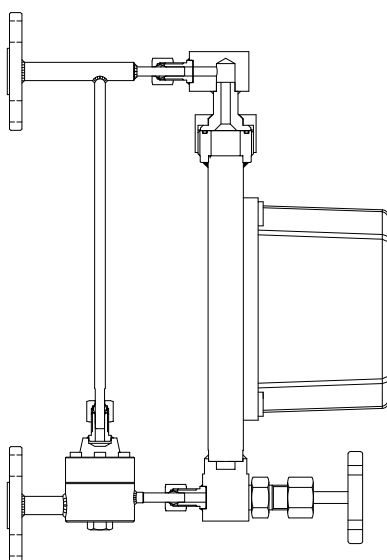
When the instrument mounts the Self-Regulator, the connections layout is Side-Side.



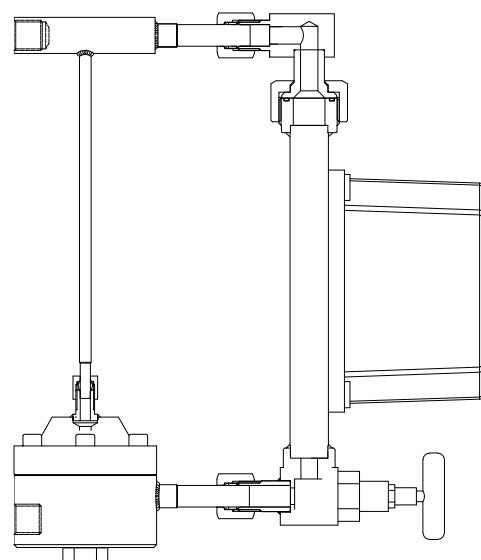
Flanged Outlet Self-Regulator



Threaded Outlet Self-Regulator



Flanged Inlet Self-Regulator



Threaded Inlet Self-Regulator

RV/TMG

For **high flows** or **large pipe** diameters, the TMG Series Flowmeter can be mounted as a derivated flowmeter on an RV Series diaphragm.

The diaphragm introduces a pressure drop proportional to the flow value. The flowmeter is connected to two diaphragm's pressure taps, and its float is positioned to a height proportionally to the pressure drop, showing the flow value with the coupled dial.

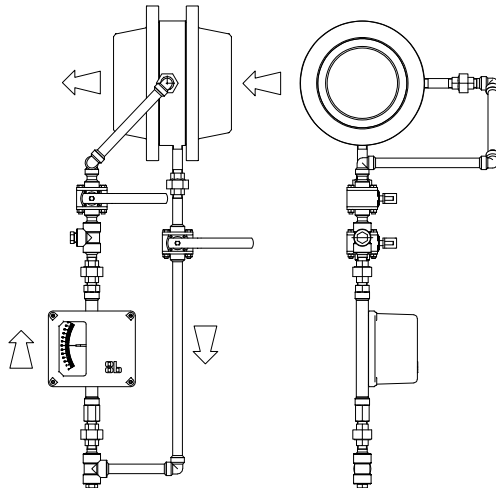
This combination is also available for horizontal or downward flow.

The diaphragm is available of carbon steel with an SS 316 plate or of other materials on request.

PIPELINE Ø	EXTERNAL DIAPHRAGM Ø	MAX WATER FLOW
100 (4")	162 mm	120 m3/h
125 (5")	192 mm	200 m3/h
150 (6")	218 mm	250 m3/h
200 (8")	273 mm	500 m3/h
250 (10")	328 mm	800 m3/h
300 (12")	375 mm	1000 m3/h
350 (14")	438 mm	1200 m3/h

The supply instrument can include only the flowmeter and the diaphragm or, on request, it can include:

- Shut-off valves
- A panel where mount the flowmeter
- Connections pipes kit



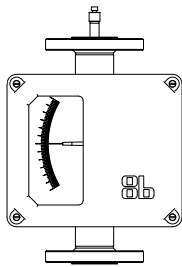
RV/TMG with all accessories



Panel mounted TMG with shut-off valves

OTHER ACCESSORIES AND VARIATIONS

- Double scale
- Electric, steam, or self-heating cable tracing
- Insulation
- High-temperature version up to 450 °C (higher on request)
- Full-penetration welds with WN flanges
- Dampener to reduce float oscillation with gas fluids
- Connections curves and reducers
- Custom panels per customer design
- Standard Officine Orobiche or customer coatings
- Surge protector for electrical parts



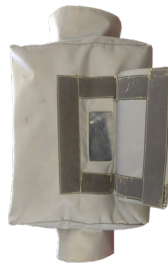
Dampener



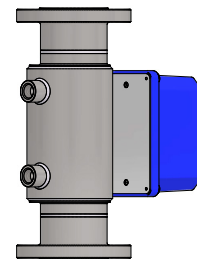
Outlet 90° curve



High temperature version



Cryogel insulation



Steam jacket tracing

APPROVALS

On request the following approvals are available:

- PED 2014/68 UE
- ATEX II 2G Ex h IIC/IIB Tx Gb, II 2d Ex h IIIC Tx Db
- IECEx Ex h IIC T4 Gb / Ex h IIIC T100°C Db
- NACE MR-0175 or MR-0103
- EAC CU TR 012: 1 Ex h IIC Tx Gb
- Pattern Approval and Poverka for Russia exportation

For electrical accessories:

- ATEX Ex d or i
- IECEx Ex d
- IECEx Ex h ib IIC T4 Gb / Ex h ib IIIC T100°C Db
- EAC Ex d or i
- IEC 61508 SIL 2
- IEC 60529:1989 IP66
- ECAS Ex for UAE exportation

SPARE PARTS

Our company database contains information about the instruments manufactured in 60 years, to request spare parts for an installed instrument state the F number written in the top-right of the tagplate:



The standard spare kit includes float, stopper and clipping, depending and they depend on the model (Table A).

MODEL CODE

TMG250	A	BB	CCC	DD	EE	FFFF	XX
	Connections type: Table A	Connections Ø min: Table B	Flow model: Table B	Transmitter: Table D	Switch: Table E	Self-regulator: Table F	Any possible variation

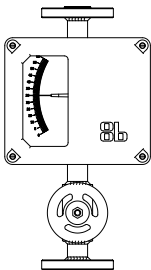
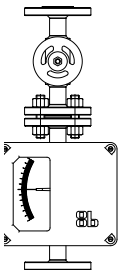
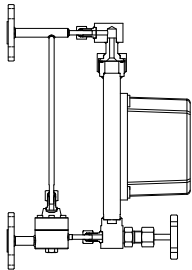
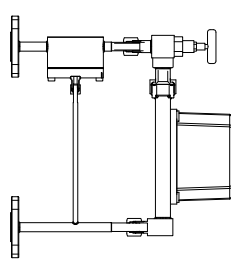
EE, FFFF, XX are present only when applicable.

Example: TMG250.A.15.A09.T0.RPJE.XX

To request a quotation please state:

- Fluid density
- Fluid type (liquid or gas)
 - For liquids: operating viscosity
 - For gas operating temperature and pressure
- Area classification (safe or classified)
- Design temperature and pressure
- Connection details (type, DN, rating)
- Material

For instruments with valves or self-regulators, the pressure should be measured as per the following table:

Inlet valve	Outlet valve	Inlet self-regulator	Outlet self-regulator
			
Outlet pressure	Inlet pressure	Outlet pressure	Inlet pressure

Our technical and commercial departments are available to discuss any variation or customization not mentioned in this catalogue.



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