

**FLOW METERS**  
**CORIOLIS MASS RHM**



# Coriolis Mass Flow - RHM

## Key Applications

Coriolis mass meters manufactured by Metroval use this physical to measure directly by mass the flow of liquids or gases, with no need for compensation of pressure, viscosity or density.

They meet the specification of the most varied processes, in the measurement of liquids and gases in petrochemical, chemical, oil, pharmaceutical, food, paint and varnish industries, and other industrial segments.

Several options of materials and constructions allow their application in a wide range of processes including drum filling, process control, and tank truck loading. Their model is approved by Inmetro for fiscal measurement and custody transfer.



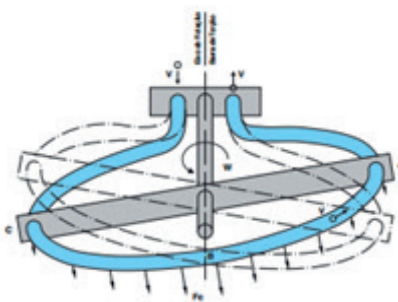
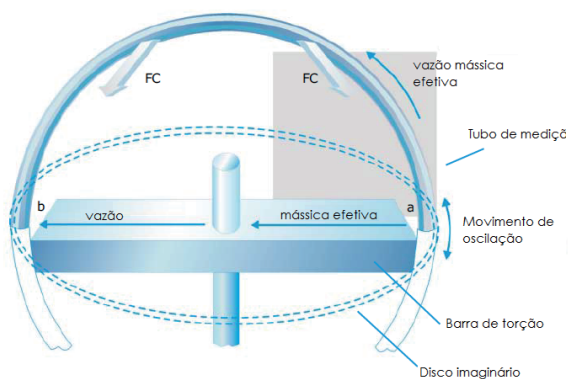
## Working Principle

Metroval Sensor basically consists of 2 loops or pairs of tubes, conveniently bent and assembled in parallel and connected to the line crossed by the fluid to be measured through a Connection Block. At the inlet of the Connection Block, the main flow is separated into two parallel partial flows that travel uniformly through the pair of tubes and are joined again at the outlet.

The tubes, together with the two transverse rods and torsion bars, form a system capable of oscillating, when electronically excited through the exciter coils, with a natural vibration frequency, just like a tuning fork. At the end of the semicircle formed by the tubes are two induction coils. These coils convert the induced mechanical oscillation in the system into electrical oscillation by generating two sine waves proportional to the angular velocity from one tube to the other.

The Coriolis effect is clearly shown every time a body moves over a moving system. In the figure below, the moving body is represented by a drop of fluid and the system by the pair of tubes. The study of the radial velocity variation- $V_{rad}$  is performed by projecting the velocity  $V$  of a particle onto an imaginary disk, attached to the Loop, perpendicular to the axis of rotation (torsion bar).

This section of tube represents the "Rotational Reference System" in which the fluid particles move, changing their position in relation to the system's axis of rotation. The radial or relative velocity of a fluid particle varies with its distance from the axis of rotation, i.e., it is zero at points A and C and maximum at point B. The motion of the fluid particles traveling through the pair of tubes, arising from the oscillatory motion induced by the exciter coils, results in the emergence of Coriolis forces, perpendicular to the planes containing the pair of tubes, in sections AB and BC, oriented according to the right-hand rule, and of which intensity is determined by the equation:



$$\vec{F}_c = -2 m f (\vec{W} * \vec{V})$$

$m f$  = fluid mass in motion;

$\vec{W}$  = Angular velocity of the tubes around the axis of rotation;

$\vec{V}$  = fluid velocity in the system;

## Constructive characteristics

- Approved for transfer of custody according to INMETRO/DIMEL Ordinance N° 221 of December 9, 2005;

- Approved for use in explosive atmospheres;

## Technical specifications

Sensors	RHM type	Temperature	Temperature Class
Normal temperature	NT	-20 to + 120°C	T4 to T6
Intermediate temperature	ET	-45 to + 210°C	T4 to T6
High temperature	HIT	0 to +350°C	
Marking	- Ex [ia] IIC T6/T5/T4/T3 Ga; - NCC 15.0131 X Certificate; (marking valid only for NT and ET versions).		

## Construction materials

Pair of tubes	Normal	Stainless Steel (AISI 316Ti)
	Special	Stainless Steel (AISI 304) Hastelloy B2, C4, C276, e C22 Monel 400 Tantalum Titanium
Connection block	AISI 316 (other materials on request)	
Protection box	Stainless Steel DIN 1.4301 (AISI 304)	

## Special constructions

### RHM for food industry application (only upon request)

- Tube Configuration: Parallel;
- Sensor with sanitary connections (Tri-Clamp, SMS, etc);
- Watted parts with roughness on request;

### RHM for products that require trace heating

- Sensor with heating trace on the block and housing;
- Allows the measurement of temperature-controlled fluids;

## Compatible converters



The MTM-01 electronic transmitter can be used together with Metroval mass flow meters with remote of full installation.

## Measurement Performance

Model	Range of normal measurement <sup>2</sup>		Nominal flow rate	Maximum <sup>5</sup> Pressures Permissible	Process Connections	
	Parallel tubes (kg/min)	Serial tubes (kg/min)	Parallel tubes (kg/min)	For temperatures up to 38°C (bar)	Threaded <sup>1</sup>	Flanged
RHM015 <sup>3</sup>	0,004-0,6 <sup>4</sup>	0,002-0,3	0,6	300 (400)	R 1/4"	DN15 / 1/2"
RHM03	0,1-5	0,05-2,5	5	300 (150)	R 1/4"	DN15 / 1/2"
RHM04	0,2-10	0,1-5	10	150 (250)	R 1/4"	DN15 / 1/2"
RHM06	0,5-25	0,25-12,5	20	250 (380)	R 1/2"	DN25 / 1"
RHM08	1-50	0,5-25	50	250 (280)	R 1/2"	DN25 / 1"
RHM12	2-100	1-50	75	150 (180)	R 3/4"	DN25 / 1"
RHM15	4-200	2-100	150	100 (140)	R 3/4"	DN25 / 1"
RHM20	6-300	3-150	300	100	R 1"	DN50 / 2"
RHM30	12-600	6-300	500	100 (190)	R 1 1/2"	DN50 / 2"
RHM40	30-1500	15-750	1250	100 (180)	-	DN80 / 3"
RHM60	60-3000	30-1500	2500	100 (135)	-	DN100 / 4"
RHM80	160-8000	80-4000	5000	100 (130)	-	DN150 / 6"
RHM100	240-25000	-	10000	40	-	DN200 / 8"
RHM160	500-25000	-	23000	40	-	DN300 / 12"

(1) NPT threads available upon request.

(2) Only for standard meters. /Special ranges upon request.

(3) Models RHM 007 and 01 replaced with RHM 015.

(4) Special calibration: Parallel 0,0002-06 (kg/min).

(5) Pressure in parentheses refers to special meter versions. Upon request.

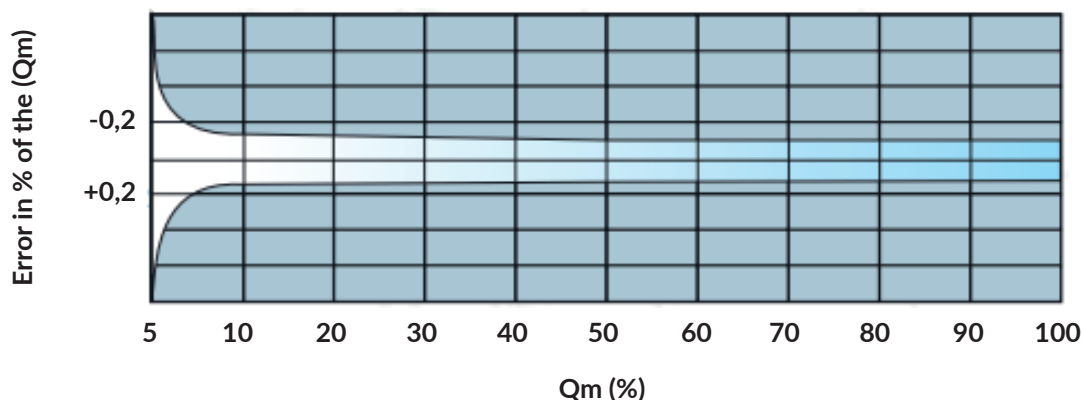
(6) Version with serial tubes upon request.

Performance			
Standard Calibration		Special Calibration	
Range of 1:20	< ± 0,2% of the measured value	Range of 1:20	< ± 0,2% of the measured value
Range of 1:50	< ± 0,5% of the measured value	Range of 1:50	< ± 0,5% of the measured value

Repeatability: better than ±0,05% of the measured value.

Accuracy and Repeatability (reference conditions, including zero drift): H2O, 1 bar, 20°C - It is possible to perform calibration and fine tuning at the customer's flow rate, even at low flow rates.

## Typical error curve







PARENT COMPANY NOVA ODESSA - SP



AFFILIATE IN MACAÉ - RJ



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