



## RHM12L

### Standard 1 inch Coriolis Mass Flow Meter

#### Features

- Standard pressure ratings up to 790 bar (11458 psi)
- Temperature ratings from -196 to 350°C (-320 to 662°F)
- Mass flow uncertainty down to 0.12%
- Density uncertainty down to 0.5%
- Repeatability better than 0.05%
- Typical measuring ranges between 1 and 100 kg/min
- Accurately measure low flow rates down to 750 g/min
- Unique robust torsion driven oscillation system
- Rheonik **AnyPipeFit Commitment** brings you the possibility to get any custom process connection type and size for savings on installation costs. Compact design with minimal footprint
- Minimum pipe footprint versions available
- Approved for use in hazardous areas
- Stainless steel case
- Removable connection manifold version available for easy and efficient maintenance

#### Applications

- General Flow Control
- Additive Dosing
- Mixing
- Batching
- Package and Container Filling

#### Rheonik Sensor Benefits

- Torsion oscillator design assures a stable and drift free measurement with excellent signal to noise ratios
- Resilient to external noise and vibration
- Insensitive to pipe pressure changes
- Robust tube wall thickness provides increased operational safety in abrasive applications
- Corrosion resistant
- Long sensor life guaranteed due to low mechanical stresses in the meter mechanism
- No moving parts to wear or fail

## General Specification Overview

<b>Nominal Flow (<math>Q_{nom}</math>)*</b>	100 kg/min (220.5 lb/min)
<b>Minimum Flow (<math>Q_{min}</math>)*</b>	2 kg/min (4.4 lb/min)
<b>Serial Tube/ Single Path</b>	Flow rates $Q_{nom}$ and $Q_{min}$ will be 50% of the above listed parallel/dual tube version
<b>Operating Temperature</b>	Temperature range options cover applications from -196°C to 350°C (-320°F to 662°F)
<b>Pressure Ratings</b>	Up to 790 bar / 11458 psi - dependent upon material
<b>Electrical Connection</b>	Cable entry M25 x 1.5 (standard), M20 x 1.5, ½" NPT, ¾" NPT (optional) Max. cable length to remote RHE transmitter 100m / 330ft
<b>Sensor Enclosure Materials</b>	Stainless steel (standard), 316 stainless steel (optional) Epoxy coated aluminum terminal box (standard), 316 stainless steel terminal box (optional)
<b>Enclosure Type</b>	Protection class IP65 (standard); IP 66 / NEMA 4X (optional)
<b>Wetted Materials</b>	1.4571 (316Ti), 2.4602 (Alloy C22), Tantalum, 1.4410 (SuperDuplex) Seal material (manifold construction): PTFE Additional/customer specific materials available upon request
<b>Process Connections</b>	Nearly any - <b>the RHEONIK AnyPipeFit Commitment</b> . Consult factory for types/sizes not listed in this data sheet
<b>Pressure Rating Compliance</b>	Europe – PED: Sound Engineering Practice (SEP), Module A2, Module B3.2+C2
<b>Certifications and Approvals</b>	ATEX / IECEx Approvals for zone 0, 1, 2 (suitably rated RHE transmitter required) North American Approvals for Class I, Div. 1, Groups ABCD (suitably rated RHE transmitter required) American Bureau of Shipping (ABS) Product Type Approval for use on marine vessels
<b>Documentation, Testing and Inspection</b>	All sensors are hydro tested, calibrated and supplied with a traceable calibration certificate. Customized calibration and testing services available
<b>Project Documentation and QA, Services</b>	Rheonik offers a full set of services for large and complex engineering projects. Typical services offered are, but not limited to: <ul style="list-style-type: none"> <li>• Certificates of origin and conformity, mill certificates</li> <li>• Data books including WPAR, WQS, NDT, test &amp; quality plans, functional testing, calibration procedures, customized packing, factory acceptance etc.</li> <li>• Start up and commissioning services on/offshore</li> </ul>
<b>Options</b>	Enclosure heating for high temperature applications Cleaning for oxygen service Full service painting to project specifications – consult factory

\* At  $Q_{nom}$  pressure drop across a parallel tube sensor will be approximately 2 bar (29 psi) for H<sub>2</sub>O. Sensors can be operated at higher flow rates but pressure drop will be higher. Maximum recommended velocity (liquid) through the sensor is 15 m/s. Beyond this point, cavitation may occur.  $Q_{min}$  is the recommended lowest flow rate. Sensors will measure flow rates lower than  $Q_{min}$ , but uncertainty will increase beyond 0.5% of rate.

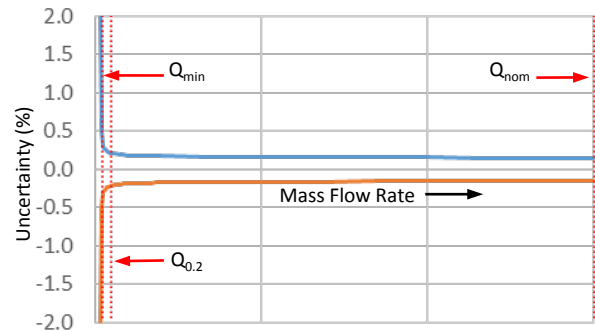
The flow rate specifications above relate to standard pressure parallel tube sensor versions. Models with higher pressure ratings have increased wall thickness and will have higher pressure drops/lower  $Q_{nom}$  values.

## Measurement Performance

### Standard Calibration

A	<b>0.5% Uncertainty</b> ±0.5% uncertainty between $Q_{nom}$ and $Q_{min}$
B	<b>0.2% Uncertainty</b> ±0.2% uncertainty between $Q_{nom}$ and $Q_{0.2}$

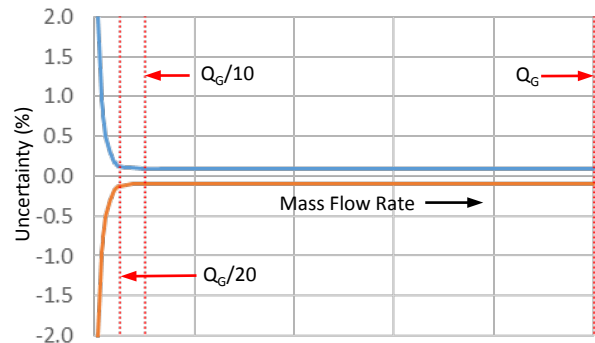
Higher pressure units may have lower  $Q_{nom}$  values due to reduced tube ID



### Goldline Calibration

G	<b>0.15% Uncertainty</b> ±0.15% uncertainty between $Q_G$ and $(Q_G/20)$
P	<b>0.12% Uncertainty</b> ±0.12% uncertainty between $Q_G$ and $(Q_G/10)$

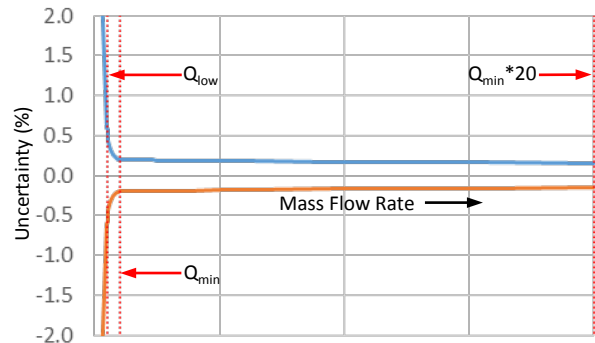
Only for sensors with standard temperature and pressure range  
Customized calibration services are available – consult factory



### Low Flow Calibration

C	<b>1:20 Turn Up Calibration</b> ±0.2% uncertainty between $Q_{min}$ and $(Q_{min} * 20)$
1	<b>Low Flow Optimized Calibration</b> ±0.2% uncertainty between $Q_{min}$ and $(Q_{min} * 20)$ and ±0.6% uncertainty between $Q_{min}$ and $Q_{low}$

Only for sensors with standard temperature and pressure range



$Q_{nom}$	100 kg/min (220.5 lb/min)
$Q_{min}$	2 kg/min (4.4 lb/min)
$Q_G$	75 kg/min (220.4 lb/min)
$Q_{0.2}$	5 kg/min (11.0 lb/min)
$Q_{low}$	1.5 kg/min (3.3 lb/min)

Select the calibration option (A,B,G,P,C,1) and include in the overall part number.  
For Serial Tube versions, the Q values above are halved.

### Flow Measurement Repeatability

Standard ± 0.1% of rate  
Goldline ± 0.05% of rate

### Temperature Performance

Better than ±1°C

### Density Calibration

N*	No Live Density Calibration
S	Standard +/- 0.01 kg/liter uncertainty between 500 and 1400 kg/m3
D	Enhanced +/- 0.005 kg/liter uncertainty between 500 and 1400 kg/m3

For live volumetric flow, S or D calibration must be included in the part number and the sensor must be operated by an RHE with live density capability.

\* Even with No Live Density Calibration, volumetric flow can still be calculated with an inferred density value based upon a manually entered norm density value and its temperature gradient.

### Calibration Reference Conditions

Performance statements relate to the following conditions:

- Water (for mass flow accuracy)
- Temperature: 18 to 24°C (66 to 76°F)
- Pressure at 1 to 3 barg (15 to 45 psig)
- RHM with standard temperature, material and pressure range

## Measurement Tube Pressure Ratings

The maximum pressure ( $P_{max}$ ) of a sensor is determined by its lowest rated part. The lowest rated part can be either the measurement tube ( $P_{max}$  indicated below), the construction type ( $P_{max}$  indicated in the Part Number Code section) or the process connection (for  $P_{max}$  see published standards or manufacturer information).

Pressure Code	Material Code	Material	Pmax				
			bar	psi	@	°C	°F
P1 (std.)	M1 (std.)	1.4571 (316Ti) UNS S31635	212	3075	@	50	122
			190	2756	@	120	248
			164	2379	@	210	410
			138	2002	@	350	662
	M3	2.4602 (Alloy C22) UNS N06022	292	4235	@	50	122
			258	3742	@	120	248
			220	3191	@	210	410
			184	2669	@	350	662
	M4*	Tantalum UNS R05200	44	638	@	50	122
			39	565	@	120	248
			36	522	@	210	410
	10**	1.4410 (Super Duplex) UNS S32750	507	7353	@	50	122
			444	6440	@	120	248
			402	5831	@	210	410
	62**	1.4462 (Duplex) UNS S31803	405	5874	@	50	122
			354	5134	@	120	248
310			4496	@	210	410	
P2	M1	1.4571 (316Ti) UNS S31635	331	4801	@	50	122
			296	4293	@	120	248
			255	3698	@	210	410
			215	3118	@	350	662
	M3	2.4602 (Alloy C22) UNS N06022	456	6614	@	50	122
			403	5845	@	120	248
			344	4989	@	210	410
			287	4163	@	350	662
	10**	1.4410 (Super Duplex) UNS S32750	790	11458	@	50	122
			693	10051	@	120	248
			626	9079	@	210	410
	62**	1.4462 (Duplex) UNS S31803	631	9152	@	50	122
553			8021	@	120	248	
484			7020	@	210	410	

\* Only with N1, NA, E2 temperature range (note max. operating temp. is 130°C) and PFO construction type (max. ANSI 300/PN40)

\*\*Only with N1, NA, E2 temperature range (note min. temp. is -40°C) and seal-less construction type

## Other Materials and Pressure Ratings

Higher pressure rated measurement tubes in the materials above may be possible. Other wetted materials (e.g. Inconel, Monel, 304 stainless steel, others) are also possible for chemical compatibility, lower pressure drop, abrasion allowance and other application specific requirements.

Contact factory with specification for assessment and availability.

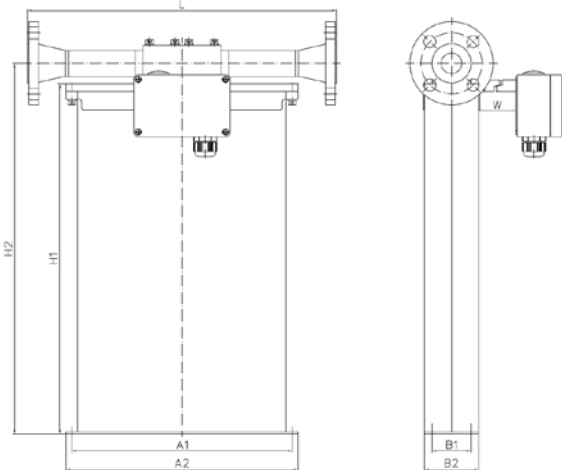
## Mechanical Construction

Sensors are manufactured with two internal measurement tubes arranged side by side. In parallel or dual path sensors (order code Pxx), these tubes are connected in parallel and the flowing fluid is split equally between them. In serial or single path sensors (order code Sxx), the internal tubes are connected end to end, creating a single path through which all fluid flows. Manifold designs have a removable inlet/outlet manifold block and utilize PTFE seals between the manifold and sensor body. In seal-less designs, the measurement tubes are continuous between the process connections and do not have seals. Manifold designs offer shorter delivery lead times and may have a lower pressure drop than seal-less designs for the same flow rate.

### Manifold design with seals - flange connections

PMO: parallel/dual path

SMO: serial/single path



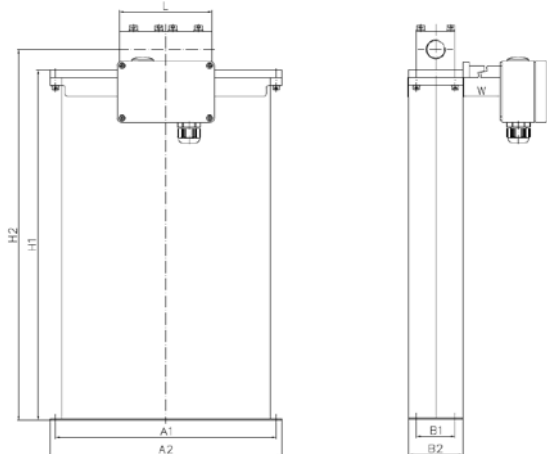
Process Connection	Dim. L	Dim. H2	Order Code
	mm / in	mm / in	
ANSI 1in 150# RF	400 / 15.75	481 / 18.94	A1
ANSI 1in 300# RF	400 / 15.75	481 / 18.94	A2
ANSI 1in 600# RF	400 / 15.75	481 / 18.94	A3
ANSI ½in 150# RF	400 / 15.75	481 / 18.94	A4
ANSI ½in 300# RF	400 / 15.75	481 / 18.94	A5
ANSI 1in 1500# RF	450 / 17.72	481 / 18.94	A6
ANSI 1in 1500# RTJ	450 / 17.72	481 / 18.94	R1
DIN DN25/PN40 Form C	400 / 15.75	481 / 18.94	D1
DIN DN25/PN100 Form E	400 / 15.75	481 / 18.94	D2
JIS B 2220 RF 10k 15A (½in)	400 / 15.75	481 / 18.94	J4
JIS B 2220 RF 20k 15A (½in)	400 / 15.75	481 / 18.94	J5

1. Manifold blocks are manufactured from 316Ti (1.4571) stainless steel

### Manifold design with seals - threaded connections

PMO: parallel/dual path

SMO: serial/single path



Process Connection	Dim. L	Dim. H2	Order Code
	mm / in	mm / in	
Female Thread G ¾"	120 / 4.72	481 / 18.94	G1
Female Thread ¾" NPT	120 / 4.72	481 / 18.94	N1

1. Manifold blocks are manufactured from 316Ti (1.4571) stainless steel

Dimensions	mm	in
A1	285	11.22
A2	300	11.81
B1	50	1.97
B2	70	2.76
H1	454	17.87
V	26	1.02

**Standard blue terminal box in Aluminum, size = 125 x 80 x 57 mm (4.92 x 3.15 x 2.24 in)**  
- optionally available with integral RHE45 transmitter

Optional SS 316 box, size = 100 x 100 x 61 mm (3.94 x 3.94 x 2.40 in)  
- only for remote transmitter

W = 0 mm (0 in) for Aluminum box and Temperature Range N1 and NA  
W = 30 mm (1.2 in) for SS 316 box and Temperature Range N1 and NA  
W = 150 mm (5.91 in) for all other Temperature Ranges

**NOTE:** Junction boxes are supplied with M25 x 1.5 cable entries as standard. M20 x 1.5, ½" NPT, ¾" NPT cable entries are optionally available and must be ordered separately.

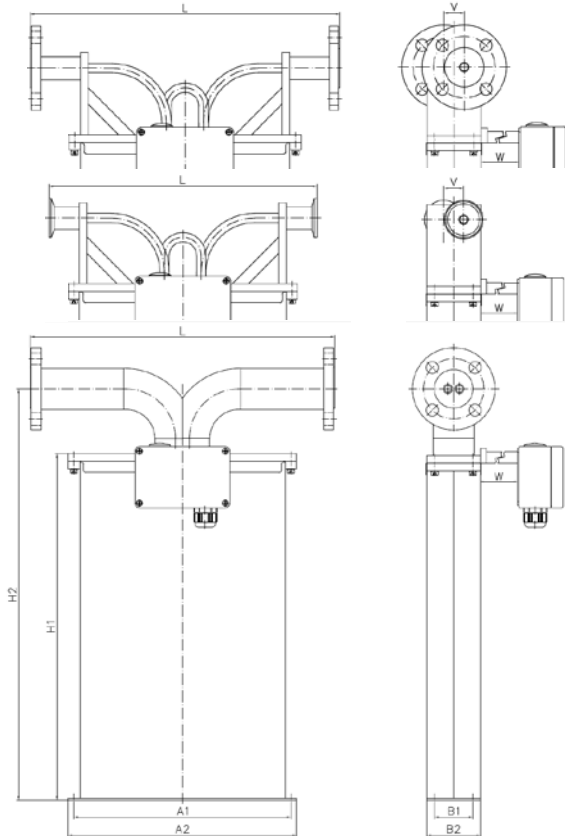
All dimensions are for standard products. For customization of face to face length and/or process connection types other than the ones listed on this page, please consult factory. Note that larger diameter flange process connections are always possible.

## Mechanical Construction (continued)

### Seal-less design with flange connections

SF0: serial/single path

PF0: parallel/dual path

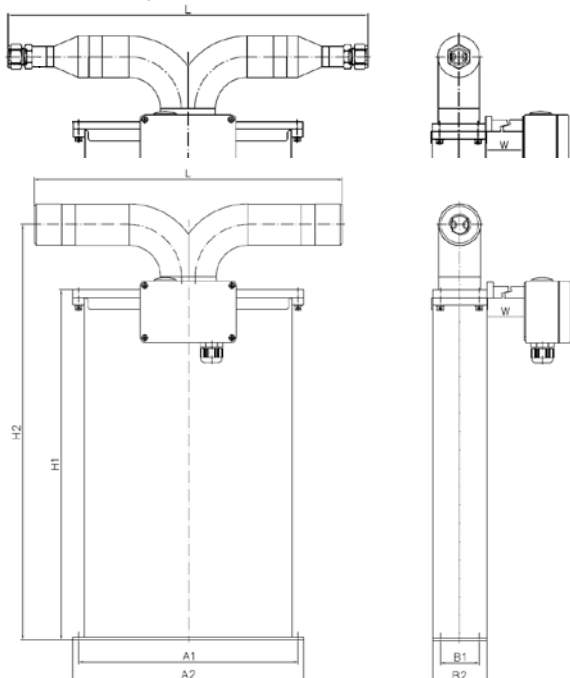


Process Connection	Dim. L	Dim. H2	Order Code
	mm / in	mm / in	
ANSI 1in 150# RF	400 / 15.75	540 / 21.26	A1
ANSI 1in 300# RF	400 / 15.75	540 / 21.26	A2
ANSI 1in 600# RF	400 / 15.75	540 / 21.26	A3
ANSI 1in 1500# RF	400 / 15.75	540 / 21.26	A6
ANSI 1in 1500# RTJ	400 / 15.75	540 / 21.26	R1
ANSI 1in 2500# RTJ	400 / 15.75	540 / 21.26	R2
DIN DN25/PN40 Form C	400 / 15.75	540 / 21.26	D1
DIN DN25/PN100 Form E	400 / 15.75	540 / 21.26	D2
DIN DN25/PN160 Form E	400 / 15.75	540 / 21.26	D4
JIS RF 10k 25A (1")	400 / 15.75	540 / 21.26	J1
JIS RF 20k 25A (1")	400 / 15.75	540 / 21.26	J2
Grayloc 1½" GR11 Hub	400 / 15.75	540 / 21.26	H3
Sanitary 1" Triclamp, DIN 32676 (only with SF0)	350 / 13.78	540 / 21.26	S0
Sanitary NW20, DIN 11851 (only with SF0)	350 / 13.78	540 / 21.26	S4

1. For hub connectors (e.g. Destec, Galperti, Grayloc, Techlok) or JIS flanges please consult factory
2. SF0 meters are constructed with offset inlet/outlet ports. Consideration should be given to the offset (dimension V) when planning installation
3. Pmax for sanitary fitting S0 is 17.2 bar (250 psi) @ 120°C (248°F)
4. Pmax for sanitary fitting S4 is 40 bar (580 psi) @ 120°C (248°F)
5. Meter will be supplied with a 1.4571 (316Ti) stainless steel backing flange and wetted material facing disc for some material selections (e.g. Tantalum)
6. Other dimensions on previous page

### Seal-less design with threaded or tube connections

PFT: parallel/dual path



Process Connection	Dim. L	Dim. H2	Order Code
	mm / in	mm / in	
Female Thread G ¾"	400 / 15.75	540 / 21.26	G1
Female Thread ¾" NPT	400 / 15.75	540 / 21.26	N1
Swagelok ¾" tube compression fitting (SS-1210-1-12W)	470 / 18.50	540 / 21.26	W1

1. Other dimensions on previous page

All dimensions are for standard products. For customization of face to face length and/or process connection types other than the ones listed on this page, please consult factory. Note that larger diameter flange process connections are always possible.

## RHM12L Part Number Code

### Temperature Range

- N1 -20 to +120°C (-4 to +248°F) (std.)
- NA -50 to +120°C (-58 to +248°F)
- E2 -50 to +210°C (-58 to +410°F) (For Tantalum sensors max. operating temp. 130°C/max design temp. +210°C)
- E3 -196 to +50°C (-320 to +122°F)
- H4 0 to +350°C (+32 to +662°F)

### Pressure Code for Pmax of Measuring Loops

See pressure ratings page for ratings and codes

### Construction Type (pmax @ 120°C (248°F))

- PM0 Parallel manifold, pmax = 290 bar (4206 psi) with thread, 214 bar (3103 psi) with flange
- SM0 Serial manifold, pmax = 260 bar (3770 psi) with thread, 214 bar (3103 psi) with flange
- PF0 Parallel path, seal-less
- SF0 Serial path, seal-less
- PFT Parallel path, seal-less for thread connection, pmax = 250 bar (3626 psi)

### Material of Wetted Parts

- M1 1.4571 (316Ti) (std.)
- M3 2.4602 (Alloy C22), seal-less construction types only
- M4 Tantalum, PF0 construction type only, max. ANSI 300/PN40
- XX Other materials, e.g. SuperDuplex, Monel are available upon request

### Process Connection

See mechanical construction pages for available connections and codes

### Terminal Box Selection

- JM Coated Alu. JB, M25 cable entry (options available)
- SM 1.4571 (316Ti) SS JB, M25 cable entry (options available)
- TM No JB. 2m Fixed / Integral Teflon Cable (for Haz install, consult factory)
- J5 Coated aluminum TB for integral RHE45, one or two M12 sockets

### Options Codes

- NN No options

See options listing for specific codes

### Hazardous Area Certifications

- NN Without Ex Approval
- A0 ATEX/IEC Approval Zone 0: Ex II 1G Ex ia IIC T1-T6 Ga
- A1 ATEX/IEC Approval Zone 1: Ex II 2G Ex ia IIC T1-T6 Gb
- CO CSA Approval USA-Canada Class I, Div. 1, Groups ABCD

### Pressure Design Compliance

- NN No specific design compliance required
- SE PED (SEP) for types xM0, xF0
- A2 PED Mod. A2 for type PFT if not unstable gas
- BC PED Mod. B3.2+C2 if SE, A2 do not apply
- CA CRN - Alberta Province Only
- CR CRN - All Provinces except Alberta

### Mass Flow, Density Calibration Selection

See performance page for code options

### Additional Manufacturing Instructions

See accessories page for code options





## Options and Accessories

RHM12L Part Number Option Codes	
H1	Hot oil/steam heating matrix for housing, DN15 PN40
H2	Hot oil/steam heating matrix for housing, ½" ANSI 150 RF
H3	Hot oil/steam heating matrix for housing, ½" ANSI 300 RF
P2	Housing purge connections - ½" NPT (2 pcs)
SB	Housing in 316 stainless steel
WH	Fully welded/sealed housing
DY	Dye penetrant inspection
XR	X-ray test – PFT, PM0 (flange), SM0 (flange) types only

*NOTE: when specifying a sensor with multiple part code options (i.e. SB and WH), separate each code with a comma in the part string (i.e. ...SB,WH...)*

Additional Manufacturing Instructions	
O	Oil/grease free cleaning
S	Marine packing

Cable Entry Options (order separately)	
ORHM-E1	½" NPT Terminal Box Cable Entry
ORHM-E2	M20 x 1.5 Terminal Box Cable Entry
ORHM-E3	¾" NPT Terminal Box Cable Entry

*Standard cable entry on terminal box is M25 x 1.5*



## Transmitter Range



Any Rheonik Mass Flow Transmitter model can be combined with any Rheonik Mass Flow Sensor to provide an overall mass flow measurement system to suit any requirement. Rheonik Coriolis transmitters are available in versions specifically designed for process, industrial and OEM applications. Together they offer a tremendous range of options for system designers and end users alike.

*See separate data sheet for the features of each transmitter style*

## About Rheonik

Rheonik has a single purpose: to design and manufacture the very best Coriolis meters available. Our research and engineering resources are dedicated to finding new and better ways to provide cost effective accurate mass flow solutions. Our manufacturing group care for each and every meter we produce from raw materials all the way to shipping and our service and support group are available to help you specify, integrate, start-up and maintain each and every Rheonik meter you have in service. Whether you own just one meter or have hundreds, you will never be just another customer to us. You are our valued business partner.

Need a specific configuration for your plant - don't compromise with a "standard" product from elsewhere that will add extra cost to your installation. If we can't configure it from our extensive product range, our exclusive **AnyPipeFit Commitment** can have your flow sensor customized with any size or type process connection you need.

No matter what control system you use as the backbone in your enterprise, with our **AnyInterface Commitment**, you can be sure that connection and communication will not be a problem. Alongside a wide variety of discrete analog or digital signal connections, we can also provide just about any network/bus interface available (for example: HART, ProfibusDP, ProfiNet, EtherCAT, PowerLink, EtherNet/IP, CAN, ....) with our RHE4x family of transmitters. Rheonik RHE4X transmitters can connect to your system – no headache and no conversion needed.