



## RHM40L

### Coriolis Mass Flow Meter for Demanding Applications

#### Features

- Standard pressure ratings up to 433 bar (6280 psi)
- Temperature ratings from -196 to 350°C (-320 to 662°F)
- Mass flow uncertainty down to 0.15%
- Density uncertainty down to 0.0025 kg/liter
- Repeatability better than 0.05%
- Typical measuring ranges between 1500 and 15 kg/min
- Accurately measure low flow rates down to 12.5 kg/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
- Approved for use in hazardous areas
- Stainless steel case

#### Applications

- General Flow Control
- Plant Balance
- Terminal Transfer
- High Temperature Fluids
- Viscous Fluids
- Mixing, Blending, Batching
- Barge, Ship, Rail Car and Truck 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>	1500 kg/min (3307 lb/min)
<b>Minimum Flow (<math>Q_{min}</math>)*</b>	30 kg/min (66.2 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>	Fluid from -196°C to 350°C (-320°F to 662°F), see options in Part Number Code Ambient from -50°C to 80°C (-58°F to 176°F), optional up to 210°C (410°F)
<b>Pressure Ratings</b>	Up to 433 bar / 6280 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 30m / 98ft
<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) 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: 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 1.5 bar (21 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 may increase beyond 0.5% of rate.

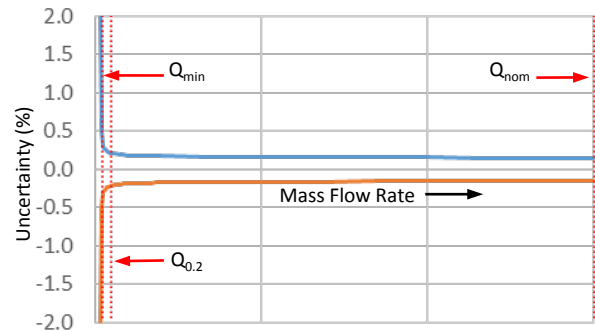
These flow rate and pressure drop statements relate to standard pressure parallel tube sensor versions. Models with higher pressure ratings have increased wall thickness and will have higher pressure drops and lower  $Q_{nom}$  values.

## 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 $Q_{0.2}$

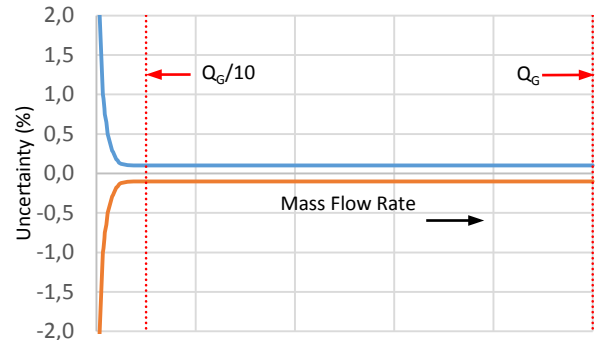
Higher pressure units may have lower  $Q_{nom}$  values due to reduced tube ID



### Goldline Calibration

G	<b>0.15% Uncertainty</b> ±0.15% uncertainty between $Q_G$ and $(Q_G/10)$
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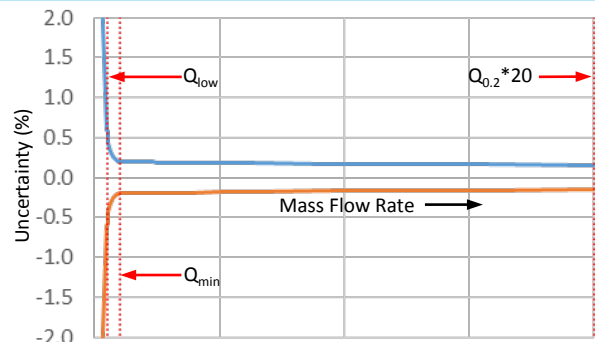
Only for sensors with standard temperature and pressure range  
Customized calibration services are available – consult factory



### Low Flow Calibration

2	<b>Low Flow Optimized Calibration</b> ±0.2% uncertainty between $Q_{0.2}$ and $(Q_{0.2} * 20)$ ±0.5% uncertainty between $Q_{min}$ and $Q_{0.2}$ ±0.6% uncertainty between $Q_{min}$ and $Q_{low}$
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Only for sensors with standard temperature and pressure range



$Q_{nom}$	1500 kg/min (1653 lb/min)
$Q_{min}$	30 kg/min (33.1 lb/min)
$Q_G$	1000 kg/min (1323 lb/min)
$Q_{0.2}$	60 kg/min (77.2 lb/min)
$Q_{low}$	25 kg/min (22 lb/min)

Select the calibration option (A,B,G,2) required 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 +/- 0.005 kg/liter uncertainty between 500 and 1400 kg/m3
D	Enhanced +/- 0.0025 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	164	2379	@	50	122
			147	2132	@	120	248
			127	1842	@	210	410
			107	1552	@	350	662
	M3	2.4602 (Alloy C22) UNS N06022	253	3669	@	50	122
			224	3249	@	120	248
			191	2770	@	210	410
			159	2306	@	350	662
	M4*	Tantalum UNS R05200	44	638	@	50	122
			39	565	@	120	248
			36	522	@	210	410
	62**	1.4462 (Duplex) UNS S31803	265	3844	@	50	122
			232	3365	@	120	248
			203	2944	@	210	410
	10**	1.4410 (Super Duplex) UNS S32750	332	4815	@	50	122
			291	4221	@	120	248
263			3814	@	210	410	
P2	M1	1.4571 (316Ti) UNS S31635	257	3727	@	50	122
			230	3336	@	120	248
			199	2886	@	210	410
			167	2422	@	350	662
	10**	1.4410 (Super Duplex) UNS S32750	433	6280	@	50	122
			380	5511	@	120	248
			343	4975	@	210	410
	62**	1.4462 (Duplex) UNS S31803	346	5018	@	50	122
			303	4395	@	120	248
			265	3844	@	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

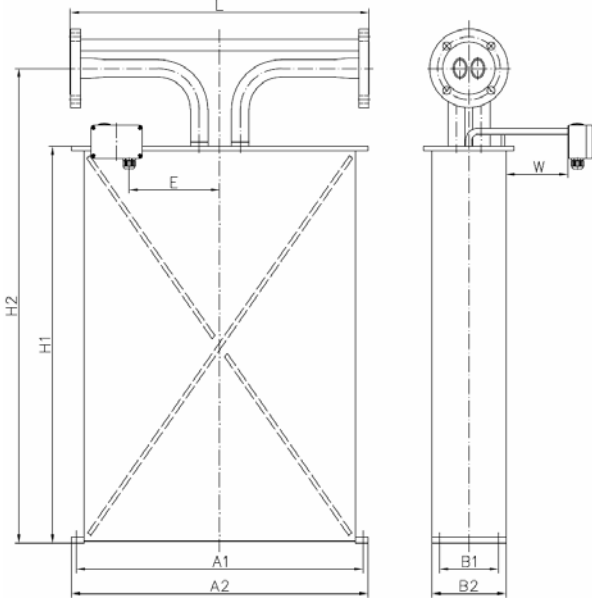
Higher pressure rated measurement tubes in the materials above may be possible. Other wetted materials (e.g. Inconel, Monel, 304 stainless steel, others) are also possible for chemical compatibility, lower pressure drop, abrasion allowance and other application specific requirements.

Contact factory with specification for assessment and availability.

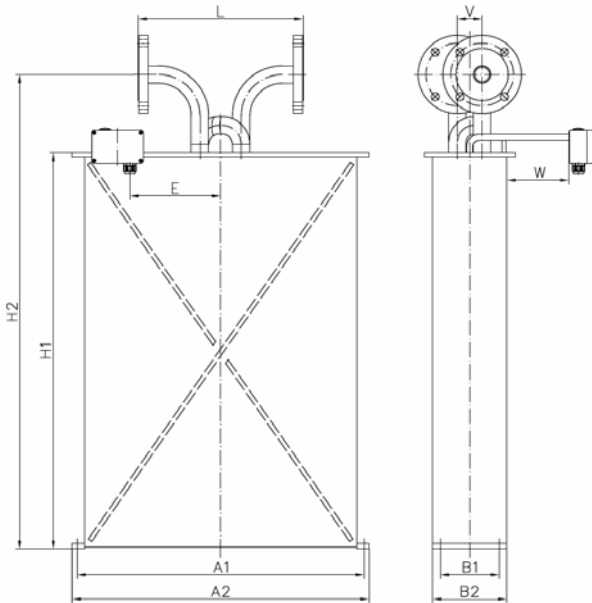
## Mechanical Construction

### Seal-less design

PFO: parallel/dual path



SFO: serial/single path



Process Connection		Dim. L	Dim. H2	Order Code
		mm / in	mm / in	
ANSI 3" 150#RF	PFO	725 / 28.54	1153 / 45.39	A1
ANSI 3" 300#RF	PFO	725 / 28.54	1153 / 45.39	A2
ANSI 3" 600#RF	PFO	725 / 28.54	1153 / 45.39	A3
ANSI 3" 900#RTJ	PFO	725 / 28.54	1153 / 45.39	A6
ANSI 3" 1500#RTJ	PFO	725 / 28.54	1153 / 45.39	R6
ANSI 3" 2500#RTJ	PFO	725 / 28.54	1153 / 45.39	R3
DIN DN80/PN40	PFO	725 / 28.54	1153 / 45.39	D1
DIN DN80/PN100	PFO	725 / 28.54	1153 / 45.39	D2
DIN DN80/PN320	PFO	725 / 28.54	1153 / 45.39	D9
JIS RF 10k 80A (3")	PFO	725 / 28.54	1153 / 45.39	J1
JIS RF 20k 80A (3")	PFO	725 / 28.54	1153 / 45.39	J2
Sanitary 2in Triclamp, DIN 32676	SFO	300 / 11.81	1153 / 45.39	S1
Sanitary NW50, DIN 11851	SFO	300 / 11.81	1153 / 45.39	S2

1. For hub connectors (e.g. Destec, Galperti, Grayloc, Techlok) please consult factory
2. SFO meters are constructed with offset inlet/outlet ports. Consideration should be given to the offset (dimension V) when planning installation
3. Listed ANSI, DIN, JIS flanges are also available for SFO serial construction
4. Pmax for sanitary fitting S1 is 17.2 bar (250 psi) @ 120°C (248°F)
5. Pmax for sanitary fitting S2 is 25 bar (363 psi) @ 120°C (248°F)
6. 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)

Dimensions	mm	in
A1	696	27.40
A2	720	28.35
B1	143	5.63
B2	180	7.09
H1	963	37.91
V	60	2.36
E	250	9.84
W	150	5.91

**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

*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.*

## RHM40L 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)

See pressure ratings page for ratings and codes

### Construction Type

- PFO Parallel path, seal-less
- SFO Serial path, seal-less

### Material of Wetted Parts

- M1 1.4571 (SS 316Ti) (std.)
- M3 2.4602 (Alloy C22), seal-less construction types only
- M4 Tantalum, PFO construction type only, max. ANSI 300 / PN 40
- XX Other materials, e.g. (Super)Duplex are available upon request

### Process Connection

See mechanical construction pages for available connections and codes

### Terminal Box Selection

- JM Coated aluminum TB, M25 cable entry (options available)
- SM SS 316 TB, M25 cable entry (options available)
- TM No TB. 2m fixed / integral PTFE cable to RHE
- 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
- C0 CSA Approval USA-Canada Class I, Div. 1, Groups ABCD

### Pressure Design Compliance

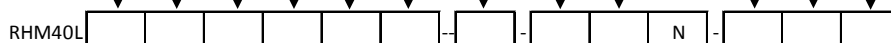
- NN No specific design compliance required
- A2 PED [Europe] module A2 - unless unstable gas
- BC PED [Europe] module B3.2+C2 - if A2 does not apply
- CA CRN [Canada] - Alberta province
- CR CRN [Canada] - all other provinces

### Mass Flow, Density Calibration Selection

See performance page for code options

### Additional Manufacturing Instructions

- N None
- O Oil/grease free cleaning
- S Marine packing



## Options and Accessories

RHM40L Part Number Option Codes	
H1	Hot oil/steam heating matrix for housing, DN25 PN40
H2	Hot oil/steam heating matrix for housing, 1" ANSI 150 RF
H3	Hot oil/steam heating matrix for housing, 1" ANSI 300 RF
P2	Housing purge connections - ½" NPT (2 pcs)
SB	Housing in 316 stainless steel
DY	Dye penetrant inspection
XR	X-ray test

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

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.