



RHM 80

High Flow Coriolis Mass Flow Meter

Terminal Transfer / Asphalt, Bitumen and other High Temperature Fluids / Viscous Fluid / Barge, Ship, Rail Car and Truck Filing





Features

- Typical measuring range up to 8000 kg/min (17636.98 lb/min)
- Pressure ratings up to 341 bar (4946 psi)
- Temperature ratings from -196 to +250 °C (-320 to +482 °F)
- Mass flow uncertainty down to 0.1 %
- Repeatability down to 0.05 %
- 4 kHz measurement updates and response time of less than 10 ms when used with RHE 40 Series transmitters
- Accurately measure flow rates down to 100 kg/min
- The Rheonik **AnyPipeFit Commitment** provides custom process connection type and size flexibility on any meter to suit your existing plant, saving time and expense on installation costs
- Approved for use in hazardous areas
- SS 304 Stainless steel enclosure, SS 316L optional
- Integral and remote transmitter versions available

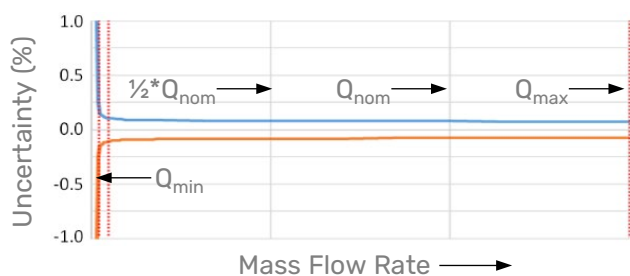
General Specification Overview

Nominal Flow (Q_{nom})*	5000 kg/min (11023 lb/min)
Maximum Flow (Q_{max})*	8000 kg/min (17637 lb/min)
Typical Minimum Flow (Q_{min})*	100 kg/min (176 lb/min)
Operating Temperature	Fluid temperature range options cover applications from -196°C to +250°C (-320°F to +482°F). For integral transmitter versions please refer to transmitter datasheet
Ambient Temperature	-50°C to 80°C (-58°F to 176°F)
Pressure Ratings	Up to 341 bar / 4946 psi - dependent upon material
Electrical Connection Sensor w/o Integral Transmitter	M20 x 1.5 standard cable entry for JM, SM terminal box versions Optional entries available : ½" NPT or M25 x 1.5 (only for SM) or ¾" NPT (only for SM) Max. cable length to remote RHE transmitter 100 m / 328 ft
Sensor Enclosure Materials	Stainless steel 304 (standard), SS 316L (optional) Coated aluminum terminal box, SS 316L terminal box (optional)
Enclosure Type	Protection class IP66 (IP66 is mostly equivalent to NEMA 4X) with Standard Temperature Range (Option N1 / NA); IP65 (IP65 is better than NEMA 4) with Temperature Ranges E2, E3, H4, H5 with recommended insulation (details see manual)
Wetted Materials	Flow tubes SS 316Ti, SuperDuplex or Alloy C22 Additional/customer specific materials available upon request
Process Connections	Nearly any – the Rheonik AnyPipeFit Commitment . Consult factory for types/sizes not listed in this data sheet on the Mechanical Construction pages
Pressure Rating Compliance	Europe – PED: Pressure Equipment Directive
Certifications and Approvals	ATEX / IECEx Approvals for Zone 0, 1 (details see page 10) North American Approvals Class I, Div. 1, 2, Gr. A,B,C,D, Zone 0, 1, 2 Custody transfer approval (OIML R117) American Bureau of Shipping (ABS) DNV approval for marine applications
Testing and Inspection	All sensors are hydro tested, calibrated and supplied with a traceable calibration certificate. Customized calibration and testing services are available
Project Documentation and QA, Services	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"> • Certificates of origin and conformity, mill certificates • Data books including WPS-WPQR, WQS, NDT, test & quality plans, functional testing, calibration procedures, customized packing, factory acceptance etc. • Painting to project specification • Start up and commissioning services on/offshore
Options	Enclosure heating for high temperature applications Cleaning for oxygen service , ... For more consult factory

* At Q_{nom} pressure drop across a parallel tube sensor will be approximately 0.4 bar (6 psi) for H₂O. Sensors can be operated at higher flow rates up to Q_{max} but pressure drop will be higher. Typical Minimum Flow Q_{min} is the recommended lowest flow rate for an accurate measurement. Sensors will measure flow rates lower than Q_{min} but uncertainty will increase beyond 1% of rate.

The flow rate specifications above relate to standard pressure, parallel tube, manifold sensor versions. Models with higher pressure ratings have increased wall thickness and will have higher pressure drops.

Calibration Options



Order Code	General Accuracy Calibration
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A	Standard - 0.20 % Uncertainty
B	Premium - 0.15 % Uncertainty

Order Code	High Accuracy Calibration
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G	Premium Plus - 0.10 % Uncertainty
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Order Code	Focused Calibration
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1	0.10 % Low Flow Calibration* <i>Requires RHE 40 Series transmitter</i>
X	Customized Calibration** Consult factory

* Low flow calibration focuses on the range from $\frac{1}{2}Q_{nom}$ downwards to lower flow rates than on other calibrations. Often used for low pressure gas or very viscous liquids

** Customized calibration uses specific calibration points according to customer requirements

Reference conditions:
18-24°C Water @ 1-3 bar

Order Code	Density Calibration / Performance (Liquid)
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N	No Density Calibration
S	Standard ± 0.001 kg/l Uncertainty
D	Enhanced ± 0.0005 kg/l Uncertainty Requires High Accuracy or Focused Calibration Option

Uncertainties and flow measurement turn-down

The turn down capability from Q_{nom} of the flow sensor is driven mainly by its zero point stability. At the very low end of the measuring range the uncertainty (u) is dominated by zero point stability.

- Zero point stability of a standard sensor with General Accuracy Calibration is: 1 kg/min (2.21 lbs/min).
- Zero point stability of a Gold Line sensor with High Accuracy or Focused Calibration is 0.8 kg/min (1.76 lbs/min).
- For flow $Q \geq ZP \text{ stability} / (\text{Base Calibration uncertainty}/100) \rightarrow u = \text{calibration uncertainty}$
- For flow $Q < ZP \text{ stability} / (\text{Base Calibration uncertainty}/100) \rightarrow u = (\text{zero stability}/Q) * 100$

Uncertainties from environmental and process conditions

If sensors are not zeroed at operating conditions, minor additional uncertainties can arise from elevated temperatures and pressures:

- ± 0.000306 % of maximum flow per °C
- ± 0.0001 % of maximum flow per bar.

Process temperature effect on density:

- Additional uncertainty of ± 0.000088 g/cm³ per °C difference from calibration temperature with standard density calibration
- Additional uncertainty of ± 0.000009 g/cm³ per °C difference from calibration temperature with enhanced density calibration.
- This effect can be mitigated by a simple field density adjustment at operating conditions.

Process pressure effect on mass flow:

The effect of pressure on flow measurement is 0.02 % of rate per bar. Compensation is possible by pressure sensor input (analog input or digital write) or manual value entry into the transmitter.

Process pressure effect on density:

- The effect of pressure on density measurement is 0.0002 g/cm³ per bar. Compensation is possible by pressure sensor input (analog input or digital write) or manual value entry into the transmitter.

Premium Plus, Ultimate, Low Flow and Enhanced Density Calibration are only available in SS 316 material, P1 lower pressure and N1 temperature range.

Applying Premium Plus calibration to higher pressure, special materials and/or non-standard temperature models will show higher zero uncertainties (up to 3 times higher than standard sensor).

Flow Measurement Repeatability

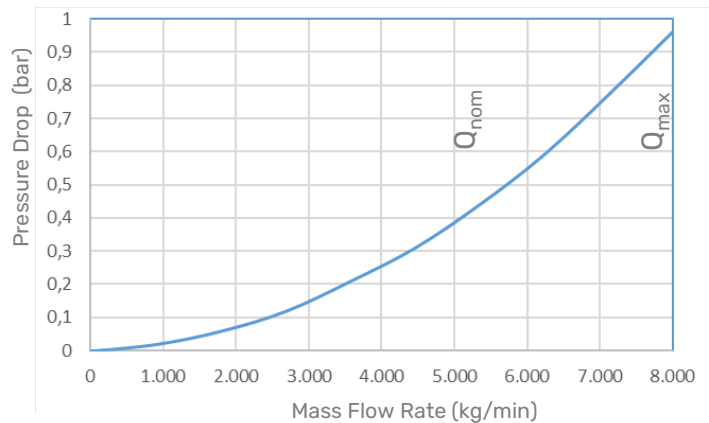
Standard Sensors ± 0.1 % of rate
Gold Line Sensors ± 0.05 % of rate

Temperature Measurement

Better than ± 1 °C

Pressure Drop

Every Coriolis flow sensor generates pressure drop across its inlet and outlet when in use. The amount of pressure drop generated is mainly a function of the flow velocity within its tubes and the flowing viscosity of the stream.



0 – 8000 kg/min water, sensor with P1 pressure rating.
Higher viscosities create higher pressure drop

Measurement Tube Materials and 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} see table to the right), the connection block/manifold (p_{max} indicated in the mechanical construction section) or the process connection (for p_{max} see published standards or manufacturer information).

Order Code	Material	50°C / 122°F	120°C / 248°F	210°C / 410°F	350°C / 662°F
P1	SS 316Ti (standard)	104 1508	93 1349	80 1160	67 972
P1	Alloy C22	146 2117	130 1885	110 1595	92 1334
P2	SuperDuplex*	258 3742	242 3510	210 3046	n/a
P3	SuperDuplex*	341 4946	299 4337	270 3916	n/a

* Note minimum operating temperature for SuperDuplex stainless steel is -40 °C

Units: bar / psi

Other Materials

Other wetted materials may be possible for chemical compatibility, lower pressure drop, abrasion allowance, other application specific requirements. Rheonik can provide nearly any material for the wetted parts.
Contact factory with specification for assessment and availability.

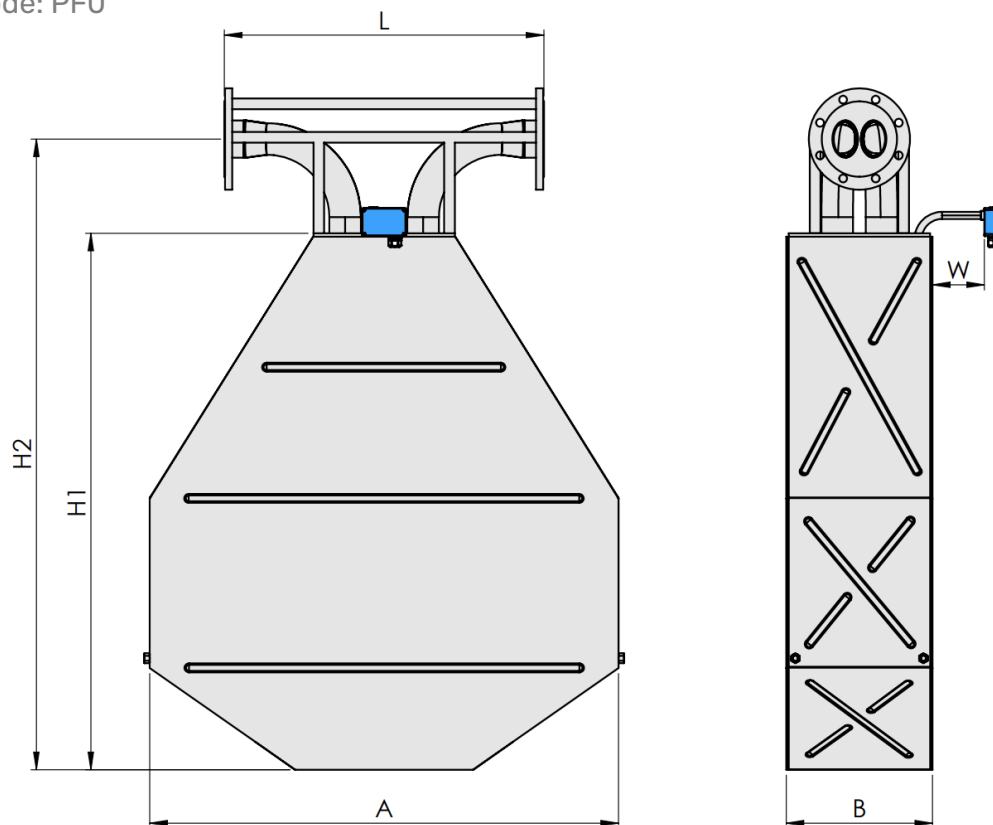
Mechanical Construction

Sensors are manufactured with two internal measurement tubes arranged side by side. In parallel or dual path sensors, these tubes are connected in parallel, and the flowing fluid is split equally between them. In sealless designs, the measurement tubes are continuous between the process connections and do not have seals.

Sealless design with flanged process connections

Parallel tube / dual measurement path

Order Code: PF0



PF0 Process Connection	Dim. L mm / in	Order Code
ANSI 6" 150# RF/SF	900 / 35.43	A1
ANSI 6" 300# RF/SF	900 / 35.43	A2
ANSI 6" 600# RF/SF	900 / 35.43	A3
ANSI 6" 1500# RTJ	900 / 35.43	R1
ANSI 6" 2500# RTJ	900 / 35.43	R2
DIN DN150/PN16 Form B1	900 / 35.43	D0
DIN DN150/PN40 Form B1	900 / 35.43	D1
DIN DN150/PN100 Form B2	900 / 35.43	D2

PF0 Dimensions	mm	in
A	1320	51.97
B	403	15.87
H1	1505	59.25
H2	1775	69.88
W	150	5.91

Weights and Shipping Dimensions

- Approx. weight with 6" 150# flanges: ~380 kg / 838 lb
- Shipping in wooden crate as per ISPM 1: ~220 x 160 x 90 cm (87 x 63 x 36 in)
- Gross weight with RHE28, packing: ~550 kg / 1213 lb

Note

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. The tolerance of the process connections is ± 3 mm.

Electrical connection to transmitter compatibility

Electrical connection option selections are compatible with the transmitter range according to the following table. Note that economical blind front versions of some transmitters are available where displays and keypads are not required. The wide range of Rheonik sensors and transmitters provide tremendous options for system designers and end users alike.

Sensor Connection Options	Order Code							
		JM	SM	S9	TM	J5	J9	
	RHE 21	✓	✓	—	✓	—	—	
	RHE 26	✓	✓	—	✓	—	—	
	RHE 27	✓	✓	—	✓	—	—	
	RHE 28	✓	✓	—	✓	—	—	
	RHE 42	✓	✓	—	✓	—	—	
	RHE 45	—	—	—	—	✓	—	
	RHE 46	✓	✓	—	✓	—	—	
	RHE 49	—	—	✓	—	—	✓	

RHM 80 Part Number Code

Temperature Range

- N1 -20 to +120°C (-4 to +248°F)
- NA -50 to +120°C (-58 to +248°F)
- E2 -50 to +210°C (-58 to +410°F)
- E3 -196 to +50°C (-320 to +122°F)
- H4 -20 to +250°C (-4 to +482°F) - design +350°C (+662°F)

Pressure Code for p_{max} of Measuring Loops

See pressure rating page 5 for ratings and codes

Construction Type - p_{max} indications refer to 120°C / 248°F

- PFO Parallel tube, sealless - only with flange

Material of Wetted Parts

- M1 316Ti / EN 1.4571 / UNS S31635
- M3 Alloy C22 / EN 2.4602 / UNS N06022

Process Connection

See mechanical construction pages for available connections and codes

Electrical Connection to Transmitter

- JM Terminal Box coated Aluminum - M20 x 1.5 cable entry, see Accessories for others - not with Haz. Area A0
- J5 Alu Box ready for integrated RHE45 - temperature restrictions apply - only Haz. Area NN
- SM Terminal Box in SS316 - M20 x 1.5 cable entry, see Accessories for others
- TM Integral PTFE Cable to RHE, 2m - not with H4, A0. C0 only with N1, NA

Options Codes

See options listing for specific codes

Hazardous Area Certifications (details see page 10)

- NN Without Ex Approval
- A1 ATEX/IECEX Approvals Zone 1 - requires suitably rated RHE
- A0 ATEX/IECEX Approvals Zone 0 - requires Elec. Conn. SM, suitably rated RHE
- C0 CSA Approval US-Canada Class I, Div. 1 / Zone 0, Gas IIC - requires suitably rated RHE

Pressure Design Compliance

- NN Rheonik standard design based on EN codes (no PED - not for sales into EU)
- PE Conformity according to the Pressure Equipment Directive (PED)

Performance Certification

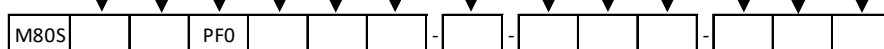
- NN No Performance Certification
- R7 Custody transfer certification for liquids OIML R117 - requires RHE4x

Mass Flow, Density Calibration Selection

See performance page 4 for code options

Manufacturing Instruction Codes

See instructions listing for specific codes (next page)



Options Codes

Order Codes	
NN	Without Option
H1	Heating for Housing, Steam - Connection DN25 PN40
H2	Heating for Housing, Steam - Connection 1" ANSI 150 RF
H3	Heating for Housing, Steam - Connection 1" ANSI 300 RF
SB	Housing and base plate in SS 316 - check with factory for lead time
T1	Terminal box with cable entry upwards/gas installation

List multiple options in the sensor part number in the same order as the above list

Manufacturing Instructions

Order Code	
N	No additional manufacturing instructions
O	Special Cleaning, fat free
S	Sea-worthy packing



List multiple options in the sensor part number in the same order as the above list

Options

Order Code ORHM-...	
E1	Terminal box prepared for ½" NPT cable entry
E2	Terminal box prepared for M25 x 1.5 cable entry - <i>only with electrical connection SM</i>
E3	Terminal box prepared for ¾" NPT cable entry - <i>only with electrical connection SM</i>
E5	Terminal box prepared for M20 x 1.5 cable gland in SS 316L (<i>only with electrical connection SM</i>)
E6	Terminal box prepared for ½" NPT cable entry in SS 316L (<i>only with electrical connection SM</i>)
TP	Separate TAG Plate in Stainless Steel (TAG Information only)
TC	Type Label in Stainless Steel (TAG and all other label information)

Standard cable entry on JM, SM terminal box is M20 x 1.5. Cable entry on PM terminal box is always M16 x 1.5

Hazardous Area Certifications

Order Code	Zone / Division	Approval	Labeling
A1	Zone 1	ATEX IECEX	 II 2G Ex ib IIC T6...T1 Gb Ex ib IIC T6...T1 Gb
A0	Zone 0	ATEX IECEX	 II 1G Ex ia IIC T6...T1 Ga Ex ia IIC T6...T1 Ga
C0	Div 1, Zone 0	USA Canada	Class I, Div 1, Groups A, B, C and D T6...T1; Class I, Zone 0, AEx ia IIC T6...T1 Ga, Ex ia IIC T6...T1 Ga



About Rheonik

Rheonik has but one 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 that provide value to our customers. 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 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 and versatile product range, our exclusive **AnyPipeFit Commitment** can have your flow sensor customized with any size/type of process connection and face to face dimension 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 and 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 RHE 40 Series family of transmitters. Rheonik RHE 40 Series transmitters can connect to your system – no headache and no conversion needed.

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