

Micro Motion[®] HPC010P Ultra High Pressure Flowmeter

Global industry standard for ultra high pressure environments



- A Coriolis mass flow meter designed for high pressure environments up to 15,000 psi (1,034 bar), such as chemical injection for the oil and gas industry, hydrogen application
- Micro Motion MVD™ Direct Connect™ technology for space and weight savings
- Variety of transmitter options provide multivariable outputs to accommodate any design requirements
- Compact design with no moving parts, no special mounting, or flow conditioning required

Micro Motion HPC010P Ultra High Pressure Flowmeter

Micro Motion HPC010P meters are specifically designed to meet the challenges of ultra high pressure environments. The meter's increased range allows customers the flexibility to use the sensor for liquid applications where pressure range measurements are critical.

Coriolis meters

Coriolis meters offer dramatic benefits over traditional volumetric measurement technologies. Coriolis meters:

- Deliver accurate and repeatable process data over a wide range of flow rates and process conditions.
- Provide direct inline measurement of mass flow and density, and also measure volume flow and temperature—all from a single device.
- Have no moving parts, so maintenance costs are minimal.
- Have no requirements for flow conditioning or straight pipe runs, so installation is simplified and less expensive.
- Provide advanced diagnostic tools for both the meter and the process

HPC010P meters

Micro Motion HPC010P meters feature integral transmitters, making them easy to install. Offered with 1700, 2200, 2400, 2700, and 5700 transmitters with MVD™ technology, you can choose single or multivariable output configurations with milliamp, pulse, dual pulse, digital outputs, and an integral display.

Micro Motion MVD Direct Connect™ technology makes Coriolis flowmeters from Micro Motion the best choice for high pressure applications that can benefit from MVD Direct Connect technology, which allows sensors to communicate directly with Modbus. This technology makes transmitters unnecessary in applications that have weight and space limitations.

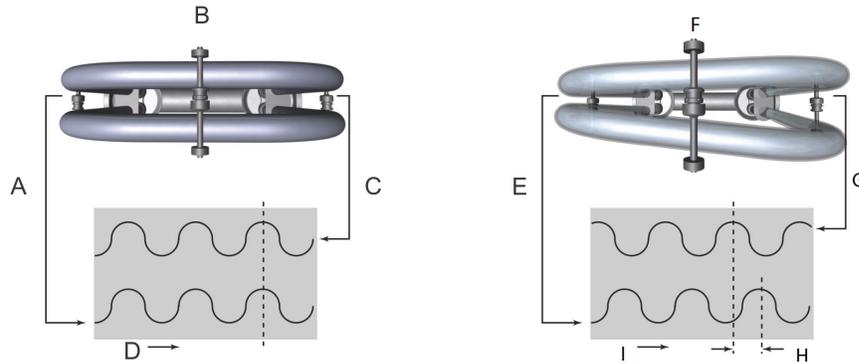
Measurement principles

As a practical application of the Coriolis effect, the Coriolis mass flow meter operating principle involves inducing a vibration of the flow tube through which the fluid passes. The vibration, though it is not completely circular, provides the rotating reference frame which gives rise to the Coriolis effect. While specific methods vary according to the design of the flow meter, sensors monitor and analyze changes in frequency, phase shift, and amplitude of the vibrating flow tubes. The changes observed represent the mass flow rate and density of the fluid.

Mass flow measurement

The measuring tubes are forced to oscillate producing a sine wave. At zero flow, the two tubes vibrate in phase with each other. When flow is introduced, the Coriolis forces cause the tubes to twist resulting in a phase shift. The time difference between the waves is measured and is directly proportional to the mass flow rate.

Watch this video to learn more about how a Coriolis flow meter measures mass flow and density (click the link and select **View Videos**): <https://www.emerson.com/en-us/automation/measurement-instrumentation/flow-measurement/coriolis-flow-meters>.



- A. Inlet pickoff displacement
- B. No flow
- C. Outlet pickoff displacement
- D. Time
- E. Inlet pickoff displacement
- F. With flow
- G. Outlet pickoff displacement
- H. Time difference
- I. Time

Performance specifications

Standard reference conditions are water at 68 °F (20 °C) to 77 °F (25 °C) and 14.5 psig (1 barg) to 29 psig (2 barg). Accuracy is based on industry leading accredited calibration stands according to ISO 17025.

Accuracy and repeatability on liquids, gases, and slurries

Stated performance is at standard reference conditions.

Performance	Specification
Mass flow accuracy	±0.20% of rate
Mass flow repeatability	±0.10% of rate
Volume flow accuracy	±0.20% of rate
Volume flow repeatability	±0.10% of rate
Gas accuracy	0.5% of rate
Gas repeatability	0.25% of rate
Density accuracy	±0.005 g/cc (±5 kg/m ³)
Density repeatability	±0.0025 g/cc (±2.5 kg/m ³)
Temperature accuracy	±1 °C ±0.5% of reading
Temperature repeatability	±0.2 °C

Liquid flow rates

Nominal flow rate

Micro Motion has adopted the term nominal flow rate, which is the flow rate at which water at reference conditions causes approximately 14.5 psig (1 barg) of pressure drop across the meter.

Mass flow rates

Model	Nominal flow rate		Maximum flow rate	
	lbm/min	kg/h	lbm/min	kg/h
HPC010P	1.8	50	8.8	240

Volume flow rates

Model	Nominal flow rate		Maximum flow rate	
	gal/min	l/h	gal/min	l/h
HPC010P	0.22	50	1.05	240

Gas flow rates

When selecting sensors for gas applications, pressure drop through the sensor is dependent upon operating temperature, pressure, and fluid composition. Therefore, when selecting a sensor for any particular gas application, it is highly recommended that each sensor be sized using the Sizing and Selection Tool at www.emerson.com/flowmeasurement.

The following table indicates mass flow rates that produce approximately 380 psi (26 bar) pressure drop on natural gas with a molecular weight of 19.5 at 60 °F (16 °C) and 10,150 psig (700 barg).

Model	Mass		Volume	
	lb/min	kg/h	SCFM	Nm ³ /h
HPC010P	9	250	200	340

Note

Standard (SCFM) reference conditions for natural gas with molecular weight of 17 are 14.7 psig (1.014 barg) and 60 °F (16 °C).

Zero stability

Zero stability is used when the flow rate approaches the low end of the flow range where the meter accuracy begins to deviate from the stated accuracy rating, as depicted in the turndown section. When operating at flow rates where meter accuracy begins to deviate from the stated accuracy rating, accuracy is governed by the formula: accuracy = (zero stability/flow rate) x 100%. Repeatability is similarly affected by low flow conditions.

Model	lbm/min	kg/h
HPC010P	.002	0.05

Operating conditions: Environmental

Vibration limits — vibration broadband random

- 5 to 1,000 Hz; 1.25E-4 g²/Hz per IEC 60068-2-64
- Total: 0.35g RMS

Vibration isolation should be used in installations above 0.35 g RMS or for applications requiring Lloyd’s approval.

Vibration isolation clamps are available as a spare part. For more information about mounting a sensor in high vibration environments, contact Micro Motion.

Temperature limits

Component	Limit
Process fluid temperature	-58 °F (-50 °C) to 257 °F (125 °C)
Ambient temperature	-40 °F (-40 °C) to 140 °F (60 °C)

Note

- The electronics cannot be operated where the ambient temperature is below -40 °F (-40 °C) or above 140 °F (60 °C). If a sensor is to be used where the ambient temperature is outside of the range permissible for the electronics, the electronics must be remotely located where the ambient temperature is within the permissible range.
- Temperature limits may be further restricted by hazardous area approvals. Refer to the hazardous area approvals documentation shipped with the sensor or available at www.emerson.com/flowmeasurement.

Operating conditions: Process

Process temperature effect

- For mass flow measurement, process temperature effect is defined as the change in sensor flow accuracy due to process temperature change away from the calibration temperature. Temperature effect can be minimized by zeroing at the process conditions.
- For density measurement, process temperature effect is defined as the change in sensor density accuracy due to process temperature change away from the calibration temperature.

Component	Rating
Mass flow accuracy	±0.00175% of maximum flow rate per °C
Density accuracy	±0.001 g/cm ³ per °C

Process pressure effect

Process pressure effect is defined as the change in sensor flow and density accuracy due to process pressure change away from the calibration pressure.

Component	Specification
Mass flow accuracy	No effect up to maximum pressure rating
Density accuracy	No effect up to maximum pressure rating

Sensor maximum working pressure

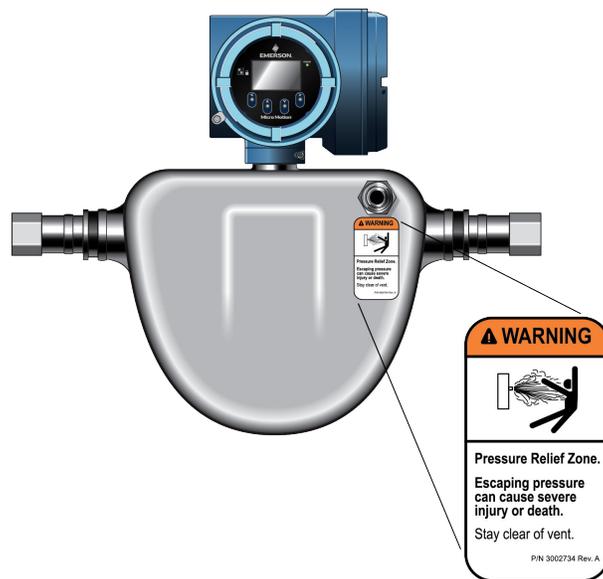
Component	Rating
All wetted components	15,000 psi (1,034 bar) at operating temperature ETO H2 meter is 6,354 psi (438 bar) at operating temperature
Case	115 psig (8 barg) with rupture disk

HPC010P sensors comply with the high pressure piping requirements of ASME B31.3 Process Piping Code and the European Pressure Equipment Directive 2014/68/14 EU (PED).

Pressure relief

The HPC010P has a rupture disk installed on the case as a standard option. Rupture disks are meant to vent process fluid from the sensor case in the unlikely event of a flow tube breach. Some users connect a pipeline to the rupture disk to help contain escaping process fluid. If the rupture disk is activated by a tube breach, the seal in the rupture disk will be broken, and the Coriolis meter should be removed from service.

The rupture disk is located as follows on the HPC010P, and the warning tag shown is placed next to it.



Personnel must stay clear of the rupture disk pressure relief area. High-pressure fluid escaping from the sensor can cause severe injury or death.

The HPC010P is available without a rupture disk if required. For details, contact Micro Motion.

Hazardous area classifications

Approvals and certifications

Type	Approval or certification
CSA and CSA C-US	Class I, Div. 1, Groups A, B, C, and D Class I, Div. 2, Groups A, B, C, and D Class II, Div. 1, Groups E, F, and G Dual Seal

Type	Approval or certification
ATEX Zone 1 ⁽¹⁾	 II 2 G Ex ib IIC T6/T5/T4...T1 Gb II 2 D Ex ib IIIC T* °C Db IP66/IP67 ⁽¹⁾
ATEX Zone 2 ^{(1)>}	 II 3 G Ex nA IIC T5/T4...T1 Gc II 3 D Ex tc IIIC T* °C Dc IP66/IP67 ^{(1)>}
IECEX Zone 1 ^{(1)>}	Ex ib IIC T6/T5/T4...T1 Gb Ex ib IIIC T* °C Db IP66/IP67 ^{(1)>}
IECEX Zone 2 ^{(1)>}	Ex nA IIC T5/T4...T1 Gc Ex tc IIIC T* °C Dc IP66/IP 67 ^{(1)>}
Ingress Protection Rating	IP 66/67 for sensors and transmitters
NEPSI Zone 1	Ex ib IIB + H ₂ /IIC T1-T6 Gb Ex ibD 21 T80-T163.7
NEPSI Zone 2	Ex nA IIC T1-T5 Gc Ex tD A22 IP66/IP67 T95 °C.-T163.7 °C
EMC effects	Complies with EMC directive 2014/30/EU per EN 61326 Industrial
Complies with NAMUR NE 021 (09.05.2012)	

(1) Dust approval available only upon request

Note

- Approvals shown are for the HPC010P meter configured with 2200, 2400, and 5700 transmitters. Meters with integral electronics may have more restrictive approvals. Refer to the Product Data Sheet for each transmitter for details.
- When a meter is ordered with hazardous area approvals, detailed information is shipped along with the product.
- More information about hazardous approvals, including detailed specifications and temperature graphs for all meter configurations is available on the HPC010P product page at www.emerson.com/flowmeasurement.

Industry standards

Type	Standard
Pressure vessel standards	<ul style="list-style-type: none"> ■ Pressure Equipment Directive (PED) 2014/68/EU ■ Product complies with the high-pressure piping requirements of ASME B31.3, Chapter IX.

Marine approval classifications

Marine approval	Country
Det Norske Veritas- Germanischer Lloyd	Norway-Germany
Bureau Veritas	France

Transmitter interface

HPC010P meters are highly customizable to provide a configuration that is tailor-fit to specific applications.

Robust transmitter offerings allow a multitude of mounting options:

- Compact mounting integral to the sensor
- Field mount variants for harsh conditions
- Compact control room DIN rail packages for optimal locating in a control cabinet
- Two-wire transmitter to save on wiring installation cost
- Stainless steel transmitter options for off-shore applications

HPC010P meters are available with an expansive selection of input and output connectivity options including the following:

- 4-20 mA
- HART™
- WirelessHART™
- EtherNet/IP
- FOUNDATION™ fieldbus
- PROFIBUS
- Modbus®
- Other protocols may be available on request

Physical specifications

Materials of construction

General corrosion guidelines do not account for cyclical stress, and therefore should not be relied upon when choosing a wetted material for your HPC010P meter. For material compatibility information, refer to the *Micro Motion Corrosion Guide* available at www.emerson.com/flowmeasurement.

Wetted parts

Model	Wetted parts
HPC010P	Nickel alloy N06022 ETO H2 meter is 316L material with standard helium leakage test procedure

Non-wetted part material options

Component	Enclosure rating	316L/CF-3Mstainless steel	Polyurethane-painted aluminum
Sensor housing	NEMA 4X (IP66/67)	•	•
Core processor housing	NEMA 4X (IP66/67)	•	•
Junction box housing	IP66/67	•	•
2200 transmitter housing	NEMA 4X (IP66/67)	•	•
2400 transmitter housing	NEMA 4X (IP66/67)	•	•

Component	Enclosure rating	316L/CF-3Mstainless steel	Polyurethane-painted aluminum
5700 transmitter housing	NEMA 4X (IP66/67)	•	•

Weight

Model	Sensor weight
HPC010P with 316L stainless steel case	19 lb (8.6 kg)

Note

- Weight specifications are based upon 9/16-inch autoclave connections.
- Insulation jackets, steam kits, and paint options are also available.

Process connections

The process connections are 9/16-inch medium pressure autoclave compatible fittings, as well as other options available per request.

Dimensions

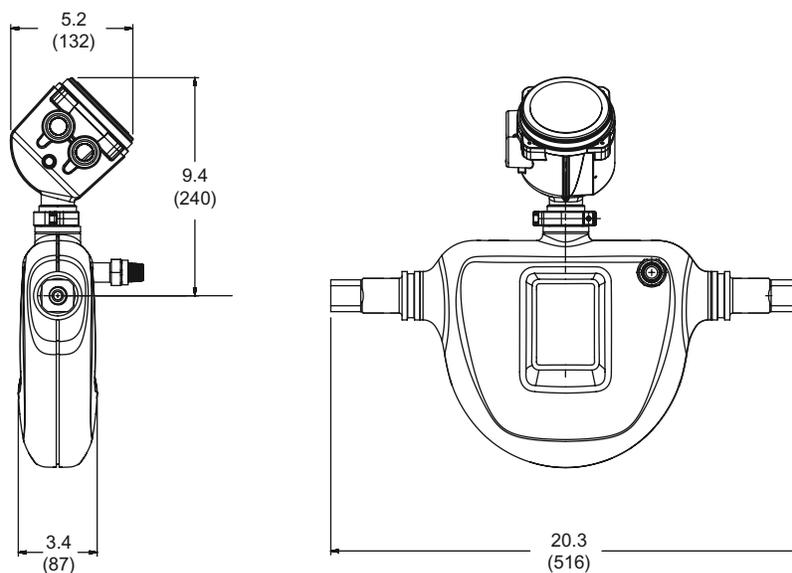
Complete and detailed dimensional drawings can be found through the product link in our online store at www.emerson.com/flowmeasurement.

Note

- Dimensions ±0.118 in (±3.00 mm) apply only to face to face - other dimensions are nominal
- Representative of a sensor fitted with 9/16-inch medium pressure autoclave compatible fittings
- These dimensions apply to only one electronic interface option — others are available

Dimensions for the HPC010P meter

See the transmitter PDS for the transmitter dimensions. All dimensions are ±0.118 in (±3.00 mm).



All dimensions ± 1/8 in. (3 mm)

Ordering information

Sensor base model

Code	Case option
HPC010P	Micro Motion Coriolis 15,000 psi (1,034 bar) 0.1 in (3 mm) high pressure meter in N06022 nickel alloy

Process connections

Code	Description
C60	9/16-inch Autoclave compatible; alloy C22
E39	9/16-inch Autoclave compatible; 316L stainless steel
999 ⁽¹⁾	ETO process connection

(1) Requires X Factory option.

Case options

Code	Case option
D	316L stainless steel case with rupture disk Disk material is N06022 nickel alloy

Electronics interface

Code	Electronics interface
0	Integral mount 2400S transmitter
1	Extended integral mount 2400S transmitter
2	4-wire polyurethane-painted aluminum integral enhanced core processor for remote mount transmitters
3	4-wire stainless steel integral enhanced core processor for remote mount transmitters
4	4-wire extended polyurethane-painted aluminum enhanced core processor for remote mount transmitters
5	4-wire extended stainless steel enhanced core processor for remote mount transmitters
6 ⁽¹⁾	MVD Solo; polyurethane-painted aluminum integral enhanced core processor (for OEMs)
7 (1)	MVD Solo; stainless steel integral enhanced core processor (for OEMs)
8 (1)	MVD Solo; extended mount polyurethane-painted aluminum integral enhanced core processor (for OEMs)
9 (1)	MVD Solo; extended mount stainless steel enhanced core processor (for OEMs)
R	9-wire polyurethane-painted aluminum J-box
H	9-wire extended mount polyurethane-painted aluminum J-box
S	9-wire 316L stainless steel J-box
T	9-wire extended mount 316L stainless steel J-box
J	Integral mount 2200S transmitter

Code	Electronics interface
U	Extended integral mount 2200S transmitter
F	Integral mount 5700 transmitter

(1) When electronics interface 6, 7, 8, or 9 is ordered with approval A, Z, or I, the MVD Direct Connect TMI.S. barrier is supplied.

Conduit connections (1)

Code	Conduit connection
Electronics interface codes 2, 3, 4, 5, 6, 7, 8, 9	
B	.5 in NPT — no gland
E	M20 — no gland
F	Brass/nickel cable gland - cable diameter 0.335 in (8.5 mm) to 0.394 in (10.0 mm)
G	Stainless steel cable gland - cable diameter 0.335 in (8.5 mm) to 0.394 in (10.0 mm)
Electronics interface codes R, H, S, T	
A	.75 in NPT - no gland
H	Brass nickel cable gland
J	Stainless steel cable gland
Electronics interface codes 0, 1, F, J, U	
A	No gland

Approvals

Code	Approval
Electronics interface codes 0, 1	
M	Micro Motion Standard (no approval)
N	No approval with PED compliance
2	CSA (US and Canada): Class I, Division 2, Groups A, B, C, D
V	ATEX - Equipment Category 3 (Zone 2) / PED compliant
3	IECEX Zone 2
4	NEPSI Zone 2
Electronics interface code F, J, U	
M	Micro Motion Standard (no approval)
N	No approval with PED compliance
A	CSA (US and Canada): Class I, Division 1, Groups A, B, C, D
Z	ATEX - Equipment Category 2 (Zone 1)
I	IECEX Zone 1
2	CSA (US and Canada): Class I, Division 2, Groups A, B, C, D
V	ATEX - Equipment Category 3 (Zone 2)
3	IECEX Zone 2

(1) For electronics interface code 'I' the inlet and outlet conduit openings are one.

Code	Approval
P	NEPSI Zone 1
4	NEPSI Zone 2
Electronics interface codes 2, 3, 4, 5, R, H, S, T	
M	Micro Motion Standard (no approval)
N	No approval with PED compliance
A	CSA (US and Canada): Class I, Division 1, Groups C and D
Z	ATEX - Equipment Category 2 (Zone 1) / PED compliant
I	IECEX Zone 1
2	CSA (US and Canada): Class I, Division 2, Groups A, B, C, D
V	ATEX - Equipment Category 3 (Zone 2) / PED compliant
3	IECEX Zone 2
P	NEPSI Zone 1
Electronics interface codes 6, 7, 8, 9 (MVD Solo or MVD Solo with MVD Direct Connect TM I.S. Barrier)	
M	Micro Motion Standard (no approval, no barrier included)
N	Micro Motion Standard / PED compliant (no approval, no barrier included)
A	CSA (US and Canada): Class I, Division 1, Groups C and D
Z	ATEX - Equipment Category 2 (Zone 1) / PED compliant
I	IECEX Zone 1
P	NEPSI Zone 1

Languages

Code	Language option
Transmitter display language English	
A	Danish CE requirements document and English installation manual
C	Czech installation manual
D	Dutch CE requirements document and English installation manual
E	English installation manual
F	French installation manual
G	German installation manual
H	Finnish CE requirements document and English installation manual
I	Italian installation manual
J	Japanese installation manual
M	Chinese installation manual
N	Norwegian CE requirements document and English installation manual
O	Polish installation manual
P	Portuguese installation manual

Code	Language option
S	Spanish installation manual
W	Swedish CE requirements document and English installation manual
B	Hungarian CE requirements document and English installation manual
K	Slovak CE requirements document and English installation manual
T	Estonian CE requirements document and English installation manual
U	Greek CE requirements document and English installation manual
L	Latvian CE requirements document and English installation manual
V	Lithuanian CE requirements document and English installation manual
Y	Slovenian CE requirements document and English installation manual

Future option 1

Code	Future option 1
Z	Reserved for future use

Calibration options

Code	Calibration option
Z	±0.20% mass flow and ±0.005 g/cc density calibration (±0.20% volume flow)

Measurement application software

Code	Measurement application software
Z	No measurement application software

Factory options

Code	Factory option
Z	Standard product
X	ETO product

Certificates, tests, calibrations, and services

These option codes can be added to the end of the model code if needed, but no code is required when none of these options is selected.

Note

There may be additional options or limitations depending on total meter configuration. Contact a sales representative before making your final selections.

Material quality examination tests and certificates

Select any from this group.

Code	Factory option
MC	Material inspection certificate 3.1 (supplier lot traceability per EN 10204)

Code	Factory option
NC	NACE certificate 2.1 (MR0175 and MR0103)
NS	Certificate of Compliance Certificate 2.1 to NORSOK requirements for material, fabrication, examination, and testing

Radiographic testing

Select only one from this group.

Code	Factory option
RE	X-ray package 3.1 (radiographic examination certificate; weld map; radiographic inspection NDE qualification)
RT	X-ray package 3.1 (radiographic examination certificate with digital image; weld map; radiographic inspection NDE qualification)

Pressure testing

Code	Factory option
HT	Hydrostatic test certificate 3.1

Dye penetrant examination

Code	Factory option
D1	Dye Penetrant Test Package 3.1 (Sensor only; liquid dye penetration NDE qualification)

Weld examination

Code	Factory option
WP	Weld procedure package (weld map, weld procedure specification, weld procedure qualification record, welder performance qualification)

Positive material testing

Code	Factory option
PM	Positive Material Test Certificate 3.1 (without carbon content)

Special cleaning

Code	Factory option
O2	Declaration of compliance oxygen service 2.1

Metrology compliance

Code	Factory option
GR	Russian metrology calibration verification certificate

Accredited calibration

Code	Factory option
IC	ISO17025 accredited calibration and certificates (9 points total)

Special calibration options

Select either none, CV, or CV with one of the additional verification point options.

Note

For all special calibration options, the minimum flow rate for any verification point is 5% of sensor nominal flow rate.

Code	Factory option
CV	Custom verification (alter original verification points)
01	Add 1 additional verification point
02	Add 2 additional verification point
03	Add 3 additional verification point
06	Add up to 6 additional verification points
08	Add up to 8 additional verification points
16	Add up to 16 additional verification points

Sensor completion options

Select any from this group.

Code	Factory option
WG	Witness general
SP	Special packaging

Instrument tagging

Code	Factory option
TG	Instrument tagging - customer information required (max. 24 characters)

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