



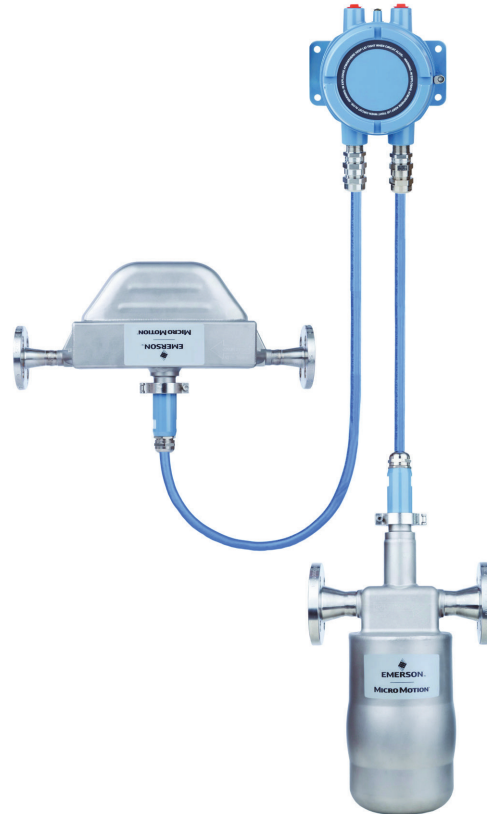
PRODUCT DATASHEET

www.high-accuracy.com

Micro Motion® LNG Series Meters

Global industry standard for liquefied natural gas metering

- A complete, dedicated Coriolis meter solution for LNG dispensing
- Meets regulatory requirements and custody transfer standards
- Simplified architecture improves reliability and reduces installation costs
- Powerful data log and diagnostics to increase measurement confidence
- Dedicated digital design for LNG dispensing to optimize zeroing challenges



Micro Motion® LNG Series Meters

Micro Motion® LNG series meters are specifically designed for the LNG industry to meet the challenges of measuring under cryogenic conditions. The meter’s dedicated design provides an exceptional combination of accuracy, reliability, and value.

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 with a remote dual core processor.
- 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.

LNG series meters

The LNG series meter was specifically designed for the LNG dispensing industry to meet the challenges of dispensing under cryogenic conditions.

Micro Motion LNG series meters are targeted for LNG filling and reclaiming process. Multi-electronic options are offered to meet requirements for different explosion approvals.

Powerful functions such as security lockout switch, data log, and diagnostics follow stringent regulations and increase the measurement confidence under challenging process conditions.

Measurement principles

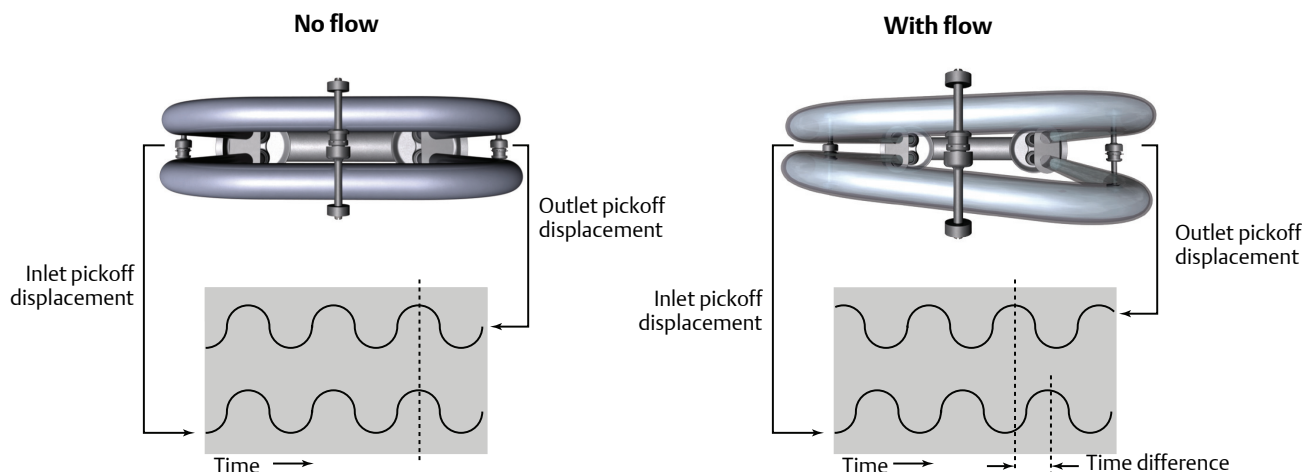
As a practical application of the Coriolis effect, the Coriolis mass flow meter operating principle involves inducing a vibration of the flow tube through which the fluid passes. The vibration, though it is not completely circular, provides the rotating reference frame which gives rise to the Coriolis 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.

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Density measurement

The measurement tubes vibrate at their natural frequency. A change in the mass of the fluid contained inside the tubes causes a corresponding change to the tubes natural frequency. The frequency change of the tube is used to calculate density of the fluid.

Temperature measurement

Temperature is a measured variable that is available as an output. The temperature is also used as an internal variable that allows the sensor to compensate for temperature influences on Young's Modulus of Elasticity.

LNG dispensing

Micro Motion LNG Series meters used with dispensing stations are routinely verified (proved) against a gravimetric standard, the highest performance rating possible. Both filling and reclaiming process can be measured to fit for different types of control logic.

Weights and Measures configuration lockout

For applications that require Weights and Measures approval for legal trade (for example, public LNG stations), the LNG series meter offers a lockout physical switch. The remote dual core processor ships with a security lockout switch to support Weights and Measures configuration lockout. The configuration lockout allows the core process to be changed from operating (secure) mode to configuration mode and back again using the security switch. The core processor will register flow only when in the operating (secure) mode. The core processor will allow configuration changes and zeroing of the meter when in configuration mode. The performance of the LNG flow meter is not affected by configuration lockout, and the flow meter meets batch and accuracy specifications with standard features.

Performance specifications

Typical LNG dispensing conditions

For determining the performance capabilities of our meters, the typical batch/dispensing flow conditions are defined as follows:

- Batch time no less than three minutes.
- Flow through LNGM10S is no less than 20kg/min and flow through LINGS06S is no less than 2kg/min.
- Fluid is liquid nitrogen or LNG.

Accuracy

Performance Specifications	LINGS06	LNGM10
Batch fluid type	LNG (gas return)	LNG (filling)
Batch accuracy	±0.5% of batch	±0.5% of batch
Temperature accuracy	±1.0 °C ±0.5% of reading (process temperature range –100 °C to +60 °C) ±1.0 °C ±1.0% of reading (process temperature range –196 °C to –100 °C)	

Flow Rates

Nominal Flow rate

Micro Motion has adopted the term nominal flow rate, which is the flow rate at which liquefied natural gas at -169 °C temperature conditions cause approximately 1 barg of pressure drop across the meter.

Model	Nominal line size		Nominal flow rate	Maximum flow rate	Turndown from maximum flow rate ⁽¹⁾
	in.	mm	kg/h	kg/h	
LINGS06	1/4"	DN6	900	1800	15:1
LNGM10	1"	DN25	11400	18000	15:1

(1) Micro Motion recommends that the flowmeter be used within the specified turndown flow range for the highest accuracy performance.

Gas Flow rate

When selecting sensors for gas applications, pressure drop through the sensor is dependent upon operating temperature, pressure, and fluid composition.

The table below shows the flow rates that produce approximately 1 barg pressure drop on air at reference conditions.

Model	Mass (kg/h)	Volume (Nm ³ /h)
LINGS06	51	40

Notes

- Normal reference conditions are 1.013 barg and 0 °C.
- Flow rate based on air at 34 barg and 20 °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 below. When operating at flow rates where meter accuracy begins to deviate from the stated accuracy rating, accuracy is governed by the formula: $\text{accuracy} = (\text{zero stability} / \text{flow rate}) \times 100\%$. Repeatability is similarly affected by low flow conditions.

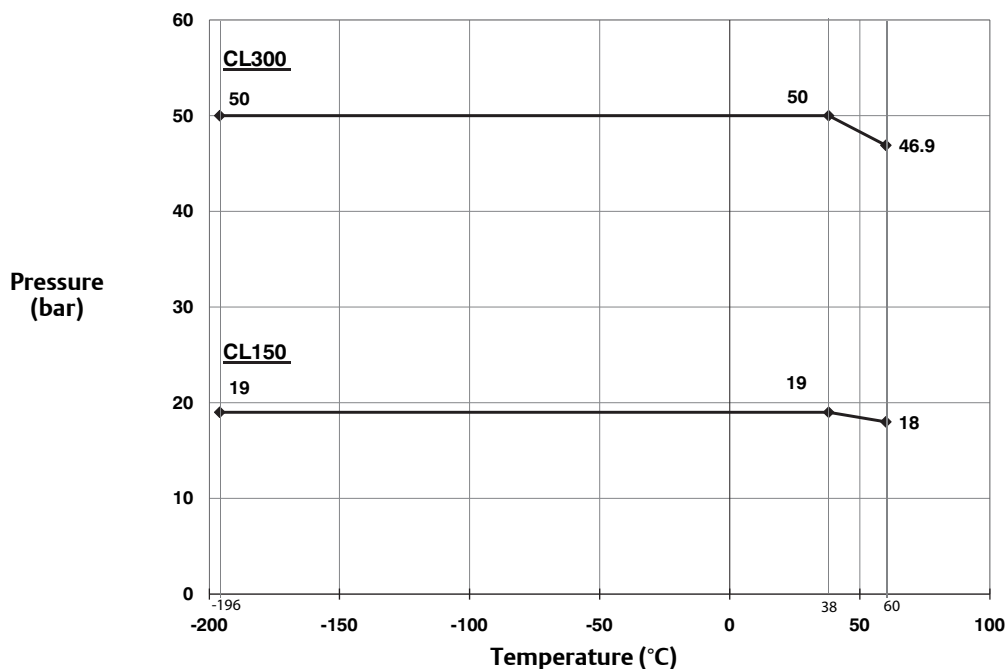
	LNGS06	LNGM10
Performance specification	kg/h	kg/h
Zero stability	0.6	6

Process pressure ratings

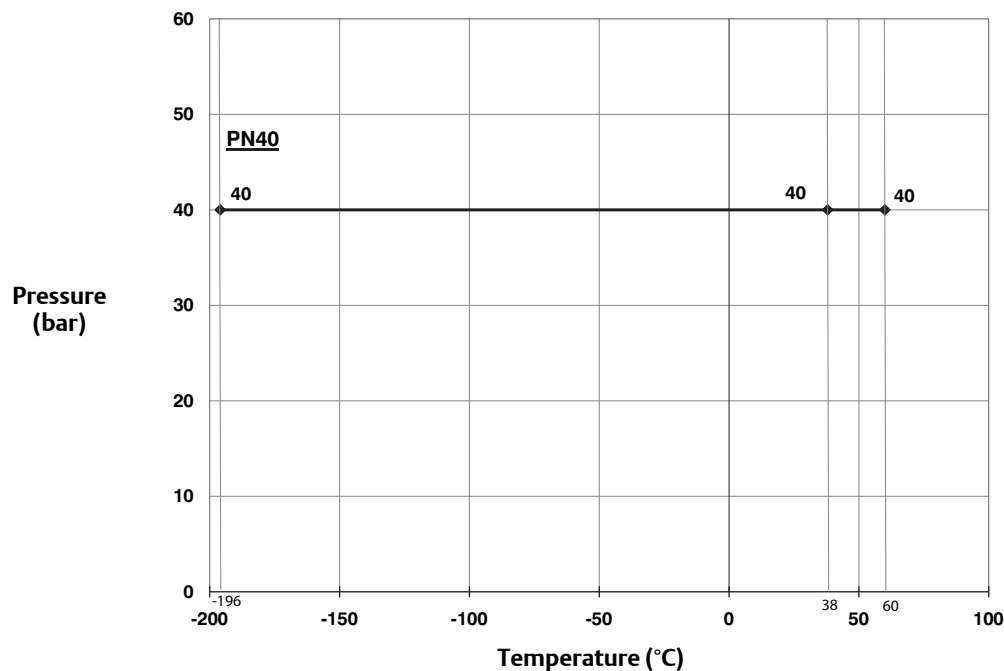
Sensor maximum working pressure for all models

Component	barg
Combined sensor and process fitting	50

Sensor pressure and temperature rating with ASME B16.5 F316/316L weld neck flange



Sensor pressure and temperature rating with EN 1092-1 PN40 F316/316L weld neck flange



Electronics interface

Dual Core Processor

The electronic interface code is “D”.

Electrical connections

Connection	Description
Output connections	Not intrinsically safe type: ■ One pair of wiring terminals for RS-485 signal cable connection
Power connection	■ One pair of wiring terminals accepts 24V DC power
Sensor connection	Intrinsically safe type: ■ Two 9-wire connection channel between sensor and electrical parts ■ One internal ground terminal for 9-wire cable shield ground
Service port connection	■ Two clips for temporary connection to the service port
Grounding	■ One external ground terminal for electronics housing ground wiring ■ One internal ground lug for RS-485 cable or power cable shield ground if needed

Note

Each screw terminal connection accepts one or two solid conductors, 14 to 12 AWG (2.5 to 4.0 mm²) or one or two stranded conductors, 22 to 14AWG (0.34 to 2.5 mm²).

Digital communications

Channel	Description
Modbus / RS-485	■ Accepts data rates 4800, 9600, 19200, and 38400 baud. ■ One physical port dedicated to different sensors via different address.

Power supply

Type	Description
DC power	■ 18 to 30 DVC, 3 watts typical, 5 watts maximum ■ Minimum 28 VDC with 300 meters of 1 mm² power-supply cable ■ At startup, power source must provide a minimum of 0.5 amperes of short term current at a minimum of 18 volts at the electrical parts power input terminals ■ The maximum steady state current is 0.2A

Enhanced Core Processor with MVD Direct Connect I.S. Barrier

The electronic interface code is “I”.

MVD direct connect I.S. barrier electrical connections

Connection	Description
Output connections	Not intrinsically safe type: ■ One pair of wiring terminals for RS-485 signal cable connection
Power connection	■ One pair of wiring terminals accepts 24V DC power
Enhanced core processor connection	Intrinsically safe type: ■ One 4-wire connection to enhanced core processor

Note

Each screw terminal connection accepts one or two solid conductors, 14 to 12 AWG (2.5 to 4.0 mm²) or one or two stranded conductors, 22 to 14 AEWG (0.34 to 2.5 mm²).

Digital communications

Channel	Description
Modbus / RS-485	■ Accepts data rates 4800,9600,19200,and 38400 baud

MVD direct connect I.S. barrier power supply

Type	Description
DC power	■ 24VDC $\pm$ 20%, 3.5 watts maximum ■ Minimum 21 VDC with 150 meters of 1 mm² power-supply cable ■ At startup, power source must provide a minimum of 0.2 amperes of short term current at a minimum of 19.2 volts at the electrical parts power input terminals ■ The maximum steady state current is 0.15A

Note

Additional information on the Enhanced core processor connection is available at www.micromotion.cn.

Operating conditions: environmental

Temperature limits

Component	Limit
Process fluid temperature	–320 to +140 °F (–196 to +60 °C)
Ambient temperature	–40 to +140 °F (–40 to +60 °C)

Notes

- Temperature limits may be further restricted by hazardous area approvals.
- The storage temperature of the meter is –40 to +85 °C.

Process temperature effect

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

Model	Mass flow rate (% of maximum rate) per °C
LNGS06	±0.00175
LNGM10	±0.00175

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. This effect can be corrected by dynamic pressure input or a fixed meter factor. See the installation manual for proper setup and configuration.

Model	Liquid or gas flow rate (% of rate) per barg
LNGS06	N/A
LNGM10	–0.016

Vibration limits

Meets IEC 68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0g.

Humidity limits

5 to 95% relative humidity, non-condensing at 60 °C.

Meter approvals and certifications

Approvals and certifications

Type	Model	Liquid or Gas	Approval or certification (typical)
NEPSI	LNGS06	Gas (Zone 1)	Ex ib IIC T6 Gb
	LNGM10	Gas (Zone 1)	Ex ib IIB T5/T6 Gb
	Electrical parts (dual-core processor)	Gas (Zone 1)	Ex db [ib] IIB/IIC T6 Gb
Ingress Protection Rating	All models		IP 66/67 for sensors and transmitters IP50 for MVD barrier tightness enclosure IP20 for MVD barrier tightness terminal
EMI effects	All models		Complies with EMC directive 2004/108/EC per EN 61326 Industrial Complies with NAMUR NE-21 (09.05.2012)

Notes

- When a meter is ordered with hazardous area approvals the approved flameproof cable glands must be used. 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 LNG product page at the Micro Motion web site (www.micromotion.cn).

Industry standards

Type	Standard
Weights and Measures for custody transfer applications:	■ MID OIML R117, R81, and R137

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 Micro Motion meter. For material compatibility information, refer to the *Micro Motion Corrosion Guide*.

Components	Specifications	
Wetted Parts ⁽¹⁾	Wetted Parts	316L stainless steel
Housing	Sensor	304L stainless steel
	Electronic parts	Polyurethane-painted aluminum
Cable gland entrances	Inlets	Two 3/4" NPT female conduit ports for 9-wire connection to LNG sensors
	Outlets	Two 1/2"—14 NPT or M20 × 1.5 female conduit ports for outputs and power supply
Mounting	Remote mounting options	

(1) General corrosion guides do not account for cyclical stress, and therefore should not be relied upon when choosing a wetted material for your Micro Motion meter. Please refer to the Micro Motion corrosion guide for material compatibility information.

Weight

Weights provided are the weight of the meter with EN1092-1 PN40 F316/316L weld neck flanges not including electrical parts and 9-wire cable.

Model	Description	Weight
LNGS06	Sensor	4.6 kg
LNGM10	Sensor	7.9 kg
Dual core processor	Electrical parts	2.9 kg
Remote enhanced core processor	Electrical parts	2.2 kg

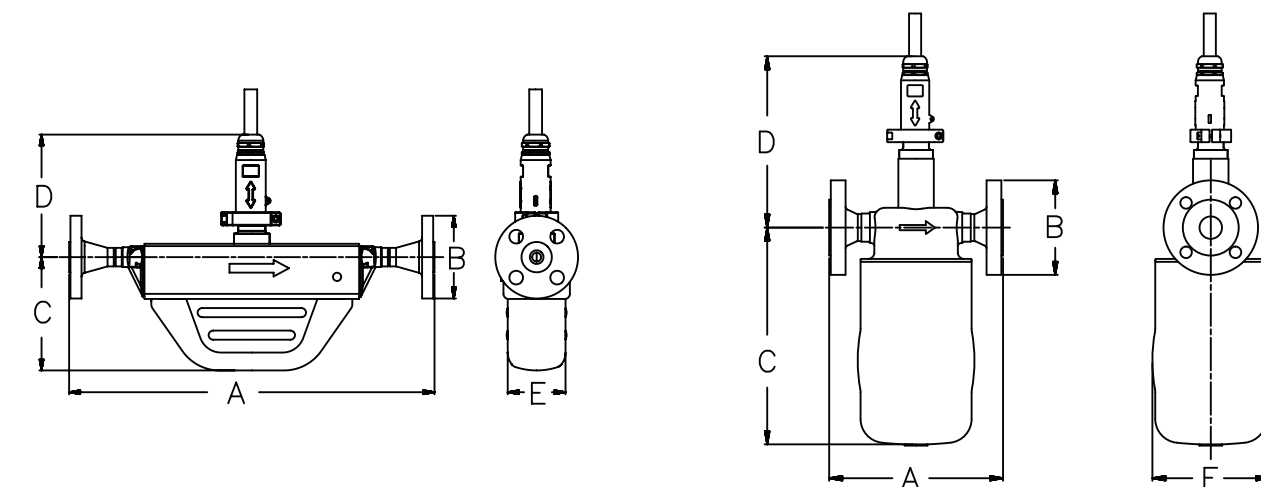
Dimensions

These dimensional drawings are intended to provide a basic guideline for sizing and planning.

Note

- Dimensions in inch (mm)
- All dimensions ± 0.125 inch (±3 mm)

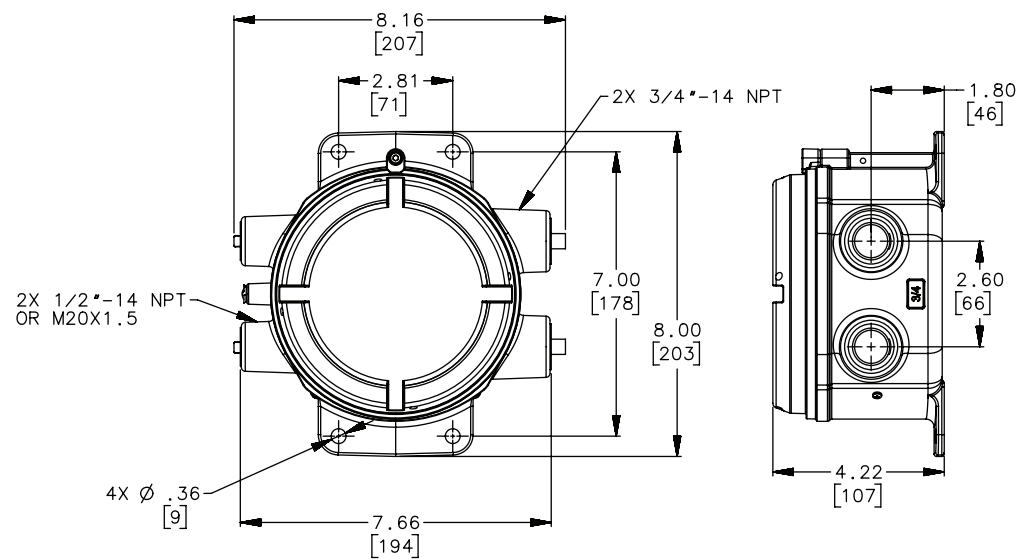
Sensor dimensions



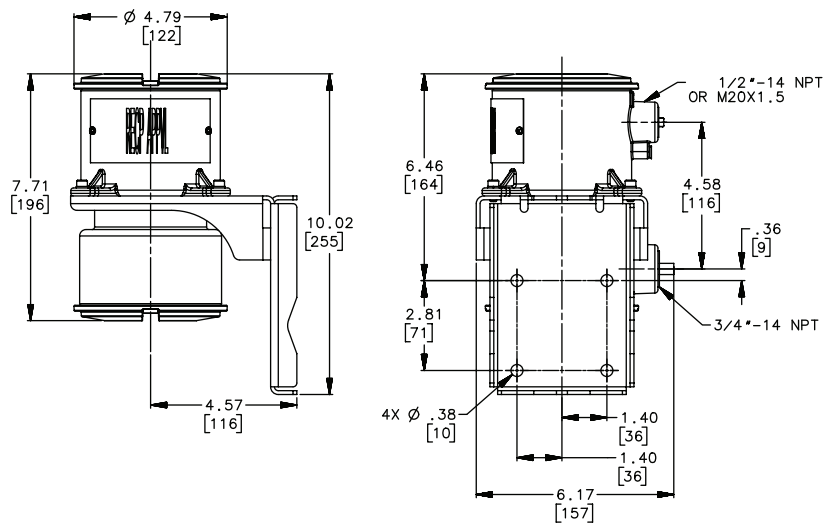
Model	No. of flow tubes	C		D		E		A	B
		inch	mm	inch	mm	inch	mm		
LNGS06	2	5.13	130	5.55	141	2.72	69	For dimensions A and B see "Process Connections" on page 14.	
LNGM10	2	10.45	265	8.21	208	5.60	142		

Cable type	Minimum bending radius			
	Static (no load) condition		Dynamic load condition	
	inch	mm	inch	mm
Jacketed cable	3.13	80	6.25	159
Shielded cable	4.25	108	8.50	216

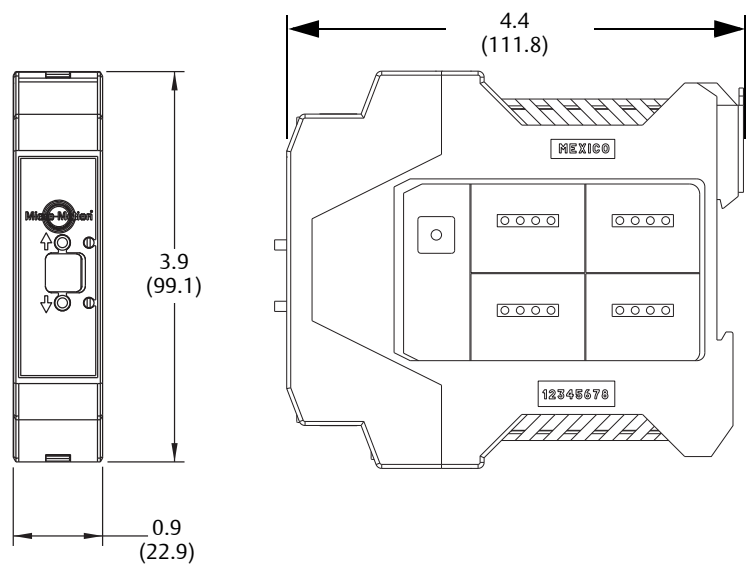
Dual core processor electronics housing



Enhanced core processor electronics housing



I.S. Barrier dimension



Ordering information

Product code structure

LNG	M10S	179	N	P	D	R	E	PA	M	Z	Z	N	Z
Base Model	Line size and material	Process connection	Case	Sensor combination	Electronics interface	Housing & mounting	Conduit	Approval	Language	Software	Future option 1	Cable	Factory

Sensor base model with line size and material

Code	Case option
LNGS06S	Micro Motion Coriolis LNG sensor for gas return; 1/4-inch; cryogenic; 316L stainless steel
LNGM10S	Micro Motion Coriolis LNG sensor for filling; 1-inch; cryogenic; 316L stainless steel

Process connections

Model LNGS06

Code	Process connections						Dim "A"		Dim "B"	
							inch	mm	inch	mm
176	DN15	PN40	EN1092-1	F316/F316L	Weld neck flange	Type B1	15.24	387	3.74	95
113	1/2-inch	CL150	ASME B16.5	F316/F316L	Weld neck flange	Raised face	15.98	406	3.50	89
114	1/2-inch	CL300	ASME B16.5	F316/F316L	Weld neck flange	Raised face	16.38	416	3.75	95
999	ETO (Engineering to Order)									

Model LNGM10

Code	Process connections						Dim "A"		Dim "B"	
							inch	mm	inch	mm
179	DN25	PN40	EN1092-1	F316/F316L	Weld neck flange	Type B1	8.31	211	4.53	115
328	1-inch	CL150	ASME B16.5	F316/F316L	Weld neck flange	Raised face	9.25	235	4.25	108
329	1-inch	CL300	ASME B16.5	F316/F316L	Weld neck flange	Raised face	9.75	248	4.88	124
999	ETO (Engineering to Order)									

Case options

Code	Case option
N	Standard case

Sensor combination

Code	Sensor combination
P	LNGS06 and LNGM10 are paired; only available with electronics interface code D
Z	Standalone sensor

Electronics interface

Code	Electronics interface
D	Dual core processor
I	Enhanced core processor for direct host connection (with I.S. barrier)
N	Spare sensor, no electronics

Electronics housing and mounting

Code	Electronics housing and mounting
R	Remote mount electronics; polyurethane-painted aluminum

Conduit connections⁽¹⁾

Code	Conduit connection
B	Inlet: two conduit openings 3/4-inch NPT, no gland; Outlet: two conduit openings, 1/2-inch NPT, no gland
E	Inlet: two conduit openings 3/4 inch NPT, no gland; Outlet: two conduit openings, M20 — no gland
N	Spare sensor, no electronics

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

Approvals

Code	Approval
MA	Micro Motion Standard (no approval)
PA	NEPSI — Equipment Category 2 (Zone 1)

Languages

Code	Language option
E	English installation manual
M	Chinese installation manual

Software

Code	Software options
Z	Default custody transfer and configuration modes
N	Weights and Measures custody transfer—NTEP
O	Weights and Measures custody transfer—OIML

Future option 1

Code	Future option 1
Z	Reserved for future use

Cable

Code	Cable options
N	Standard jacketed cable
S	Shielded cable

Factory

Code	Factory option
Z	Standard product

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	Temperature Measurement		Flow Measurement
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www.high-accuracy.com

Emerson Automation Solutions Americas

7070 Winchester Circle
Boulder, Colorado USA 80301
www.MicroMotion.com
www.Rosemount.com
T: +1 800 522 6277
T: +1 (303) 527 5200
F: +1 (303) 530 8459

Mexico T: 52 55 5809 5300
Argentina T: 54 11 4837 7000
Brazil T: 55 15 3413 8000
Venezuela T: 58 26 1300 8100
Chile T: 56 2 2928 4800

Emerson Automation Solutions Europe/Middle East

Central & Eastern Europe T: +41 41 7686 111
Dubai T: +971 4 811 8100
Abu Dhabi T: +971 2 697 2000
France T: 0800 917 901
Germany T: 0800 182 5347
Italy T: 8008 77334
The Netherlands T: +31 (0) 70 413 6666
Belgium T: +32 2 716 77 11
Spain T: +34 913 586 000
U.K. T: 0870 240 1978
Russia/CIS T: +7 495 981 9811

Emerson Automation Solutions Asia Pacific

Australia T: (61) 3 9721 0200
China T: (86) 21 2892 9000
India T: (91) 22 6662 0566
Japan T: (81) 3 5769 6803
South Korea T: (82) 2 3438 4600
Singapore T: (65) 6 777 8211

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