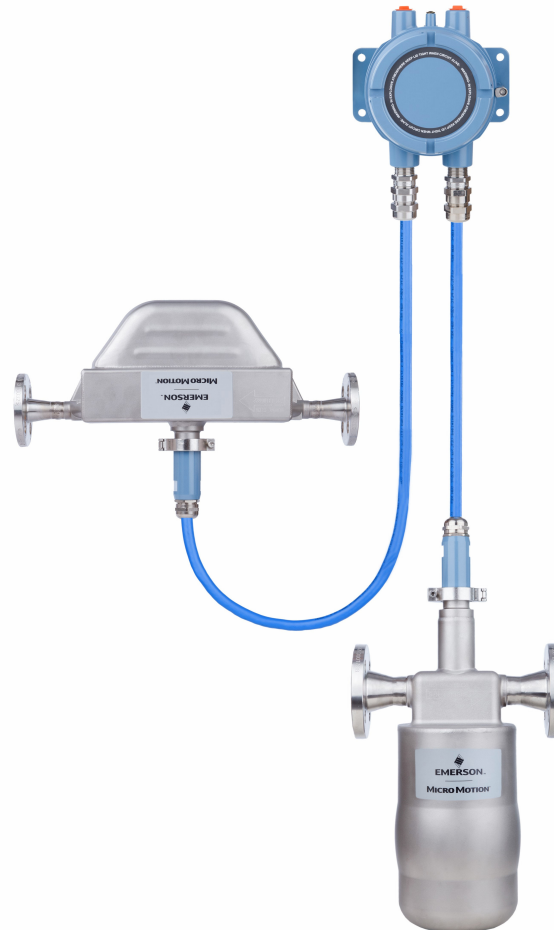


Micro Motion™ LNG Series Meters

Global industry standard for liquified 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

Micro Motion LNG Series meters

LNG 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, 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

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

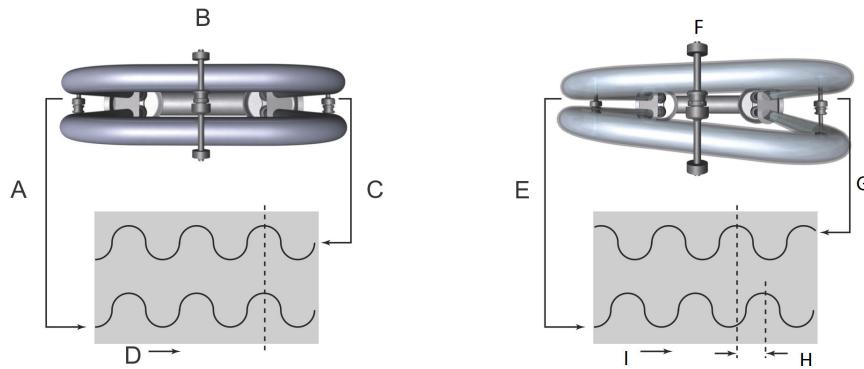
Powerful functions such as a security lockout switch, data log, data logging capabilities, and diagnostics follow stringent regulations and increase the measurement confidence under challenging process conditions.

Measurement principles

As a practical application of the Coriolis effect, the Coriolis mass flowmeter 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 flowmeter, sensors monitor and analyze changes in frequency, phase shift, and amplitude of the vibrating flow tubes. The changes observed represent the mass flow rate 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.



- 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

Temperature measurement

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

LNG dispensing

Micro Motion LNG meters used in 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 & Measures configuration lockout

The LNG meter offers a lockout physical switch for applications that require Weights & Measures approval for legal trade, for example, public LNG stations. The remote dual core processor ships with a security lockout switch to support Weights & 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 flowmeter is not affected by configuration lockout, and the flowmeter 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 20 kg/min and flow through LINGS06S is no less than 4.2 kg/min.
- Fluid is liquid nitrogen or LNG.

Accuracy

Performance Specifications	LINGS06S	LNGM10S
Batch fluid type	LNG (gas)	LNG (liquid)
Batch accuracy	±0.5% of batch	±0.5% of batch
Repeatability	±0.25% of batch	±0.25% 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 a temperature of -161.5 °C causes approximately 14.5 psig (1 barg) of pressure drop across the meter.

Model	Nominal line size	Nominal flow rate	Maximum flow rate	Turndown from maximum flow rate ⁽¹⁾
	mm	kg/h	kg/h	
LINGS06S	DN6	900	1800	15:1
LNGM10S	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 produces approximately 14.5 psig (1 barg) pressure drop on air at reference conditions.

Model	Mass (kg/h)	Volume (Nm ³ /h)
LINGS06S	51	40

Note

- Normal reference conditions are 14.6923 psig (1.01 barg) and 0 °C.
- Flow rate based on air at 493 psig (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. 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.

Performance specification	LNGS06S	LNGM10S
	kg/h	kg/h
Zero stability	0.6	6

Process pressure ratings

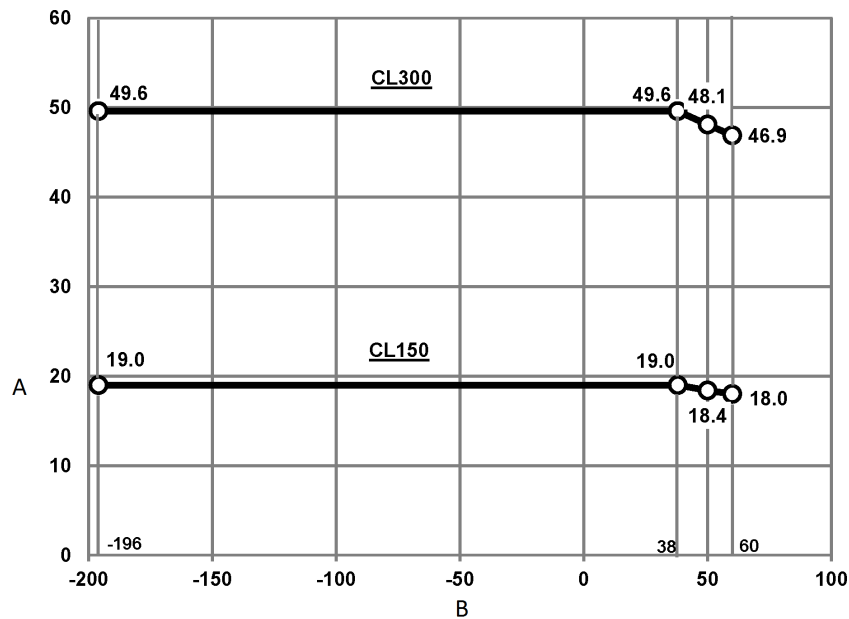
Sensor maximum working pressure reflects the highest possible rating for a given sensor. Process connection type and environmental and process fluid temperatures may reduce the maximum rating.

All sensors comply with ASME B31.3 process piping code and Council Directive 97/23/ EC of 29 May 1997 on pressure equipment.

Sensor maximum working pressure for all models

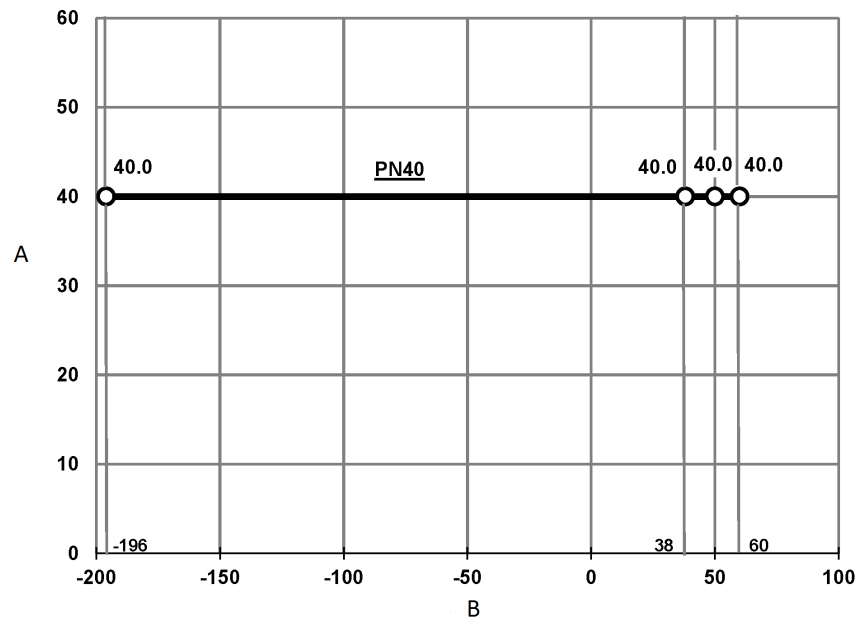
Component	Pressure
Combined sensor and process fitting	725.2 psig (50 barg)

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



- A. Pressure (bar)
- B. Temperature (°C)

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



- A. Pressure (bar)
- B. Temperature (°C)

Operating conditions: Environmental

Temperature limits

Component	Limit
Process fluid temperature	-196 to +60 °C
Ambient temperature	-40 to +60 °C

Note

- 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.
- The storage temperature of the meter is -40 to +85 °C.

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.

Operating conditions: Process

Process temperature effect

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

Model	Mass flow rate (% of maximum mass flow rate) per °C
LNGS06S	±0.00175
LNGM10S	±0.00175

Process pressure effect


Process pressure effect is defined as the change in sensor flow due to process pressure change away from the calibration pressure. This effect can be corrected by dynamic pressure input or a fixed meter factor. Refer to the calibration sheet for the specific meter pressure compensation coefficient. If no pressure compensation coefficient is provided, use the typical values listed in the table below.

Refer to the installation manual for proper setup and configuration.

Model	Liquid or gas flow rate (% of rate per barg)
LNGS06S	N/A
LNGM10S	-0.016

Hazardous area classifications

Approvals and certifications

Type	Model	Approval or certification (typical)	
ATEX	LNGS06S		II 1/2G Ex ib IIC T6 Ga/Gb II 2D Ex ib IIIC T*°C Db IP66/IP67
	LNGM10S		II 1/2G Ex ib IIB T6...T4 Ga/Gb II 2D Ex ib IIIC T*°C Db IP66/IP67
	Dual enhanced 820 core processor		II 2 G Ex db [ib] IIB/IIC T6 Gb II 2 D Ex tb [ib] IIIC T75°C Db III 3(2) G Ex nA [ib Gb] IIB/IIC T6 Gc III 3(2) D Ex tc [ib Db] IIIC T85°C Dc
	Remote 800C core processor		II 2G Ex ib IIB/IIC T5 Gb II 2D Ex ib IIIC T75°C DB IP66
EAC	LNGS06	Ga/Gb Ex ib IIC T6 X Ex ib IIIC T*°C Db X IP66/IP67	

Type	Model	Approval or certification (typical)
	LNGM10S	Ga/Gb Ex ib IIB T6...T4 X Ex ib IIIC T*°C Db X IP66/IP67
	Dual enhanced 820 core processor	1 Ex db [ib] IIB/IIC T6 Gb X Ex tb [ib] IIIC T75°C Db X 2 Ex nA [ib Gb] IIB/IIC T6 Gc X Ex tc [ib Db] IIIC T85°C Dc X
	Remote 800C core processor	1 Ex ib IIB/IIC T5 Gb
IECEX	LNGS06S	Ex ib IIC T6 Ga/Gb Ex ib IIIC T*°C Db
	LNGM10S	Ex ib IIB T6...T4 Ga/Gb Ex ib IIIC T*°C Db
	Dual enhanced 820 core processor	Ex db [ib] IIB/IIC T6 Gb Ex tb [ib] IIIC T75°C Db Ex nA [ib Gb] IIB/IIC T6 Gc Ex tc [ib Db] IIIC T85°C Dc
	Remote 800C core processor	Ex ib IIB/IIC T5 Gb
NEPSI	LNGS06S	Ex ib IIC T6 Gb
	LNGM10S	Ex ib IIB T5/T6 Gb
	Dual enhanced 820 core processor	Ex d [ib] IIB/IIC T6 Gb Ex tD [ibD] A21 IP66/67 T75 °C
Ingress Protection Rating	All models	IP 66/67 for sensors and transmitters IP50 for MVD™ barrier tightness enclosure IP20 for MVD barrier tightness terminal
	Dual enhanced 820 core processor	NEMA Type 4X for enclosure IP66/IP67
	Remote 800C core processor	NEMA Type 4 for enclosure IP66
EMI effects	All models	Complies with EMC directive 2004/108/EC per EN 61326 Industrial Complies with NAMUR NE-21 (09.05.2012)
CSA	LNGS06/LNGM10	Class I, Division 1, Groups A, B, C, and D T6 Class II, Division 1, Groups E, F, and G T85 Class I, Division 2, Groups A, B, C and D T6 Class II, Division 2, Groups F and G T85
	Dual enhanced 820 core processor	Class I, Division 1, Groups A, B, C, and D T6 Class II, Division 1, Groups E, F, and G T61.9°C Class I, Division 2, Groups A, B, C, and D T6 Class II, Division 2, Groups F and G T61.9°C

Type	Model	Approval or certification (typical)
	Remote 800C core processor	IS: Class I, Division 1, Groups A, B, C, and D NI: Class I, Division 2, Groups A, B, C, and D DUST: Class II, Division 1 & 2, Groups E, F, and G

Note

- 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 www.emerson.com/flowmeasurement.

Industry standards

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

Transmitter interface

Dual enhanced 820 core processor

The electronic interface code is “D”.

Dual enhanced 820 core processor 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: <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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, 2.5 to 4.0 mm² or one or two stranded conductors, 0.34 to 2.5 mm².

Dual enhanced 820 core processor digital communications

Channel	Description
Modbus / RS-485	<ul style="list-style-type: none"> Accepts data rates 4800, 9600, 19200, and 38400 baud. One physical port dedicated to different sensors via different address.

Dual enhanced 820 core processor power supply

Type	Description
DC power	<ul style="list-style-type: none"> ■ 18 to 30 VDC, 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

Remote 800C core processor with MVD Direct Connect™ I. S. barrier

The electronic interface code is “I”.

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
Remote 800C 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, 2.5 to 4.0 mm² or one or two stranded conductors, 0.34 to 2.5 mm².

800C digital communications

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

I. S. barrier power supply

Type	Description
DC power	<ul style="list-style-type: none"> ■ 24 VDC ±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 remote 800C core processor connection is available at www.emerson.com.

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, see the *Micro Motion Corrosion Guide*.

Components	Specifications	
LNGS06S / M10S sensor ⁽¹⁾	Wetted Parts	316L stainless steel
Housing	Sensor	304L stainless steel
	820 core processor / remote 800C core processor	Polyurethane-painted aluminum
Cable gland entrances	Inlets	One 19 mm NPT female conduit/gland connection for 9-wire connection to LNG sensors
	Outlets	One 12.7 mm – 14 NPT or M20 × 1.5 female conduit/gland connection for outputs and power supply
Mounting options 800C and 820	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. See 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	Weight
LNGS06S sensor	4.6 kg
LNGM10S sensor	7.9 kg
Dual enhanced 820 core processor	2.9 kg
Remote 800C core processor	2.2 kg

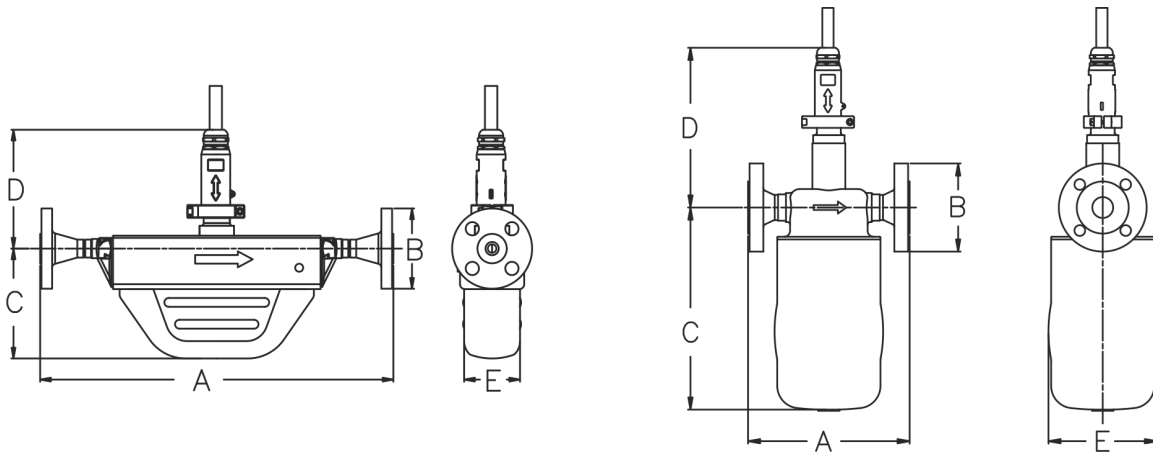
Dimensions

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

Note

- Complete and detailed dimensional drawings can be found through the product drawings link at www.emerson.com/flowmeasurement.
- Dimensions ±3 mm apply only to face to face - other dimensions are nominal

Sensor dimensions



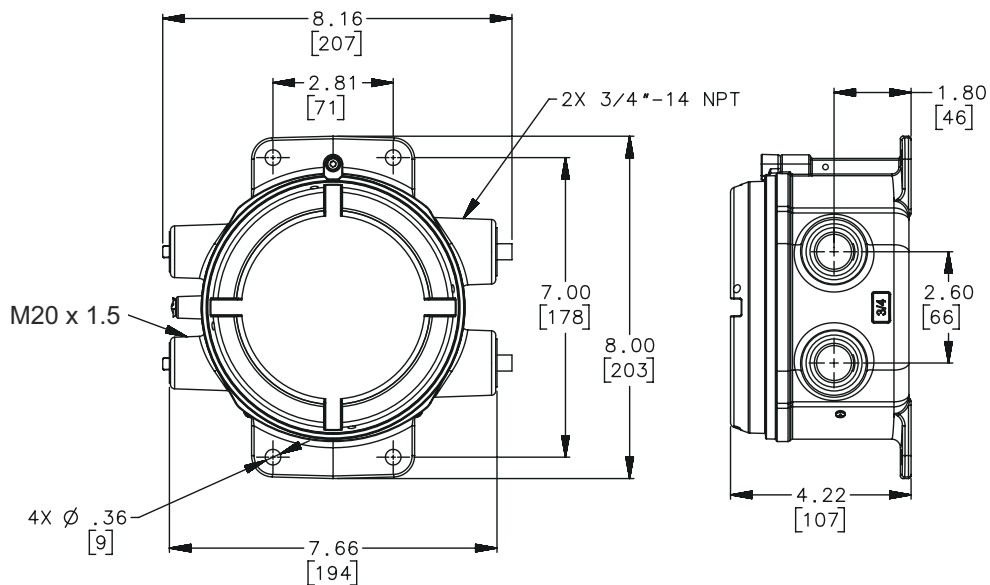
Note

The LNGM10S is on the right and the LNGS06S is on the left.

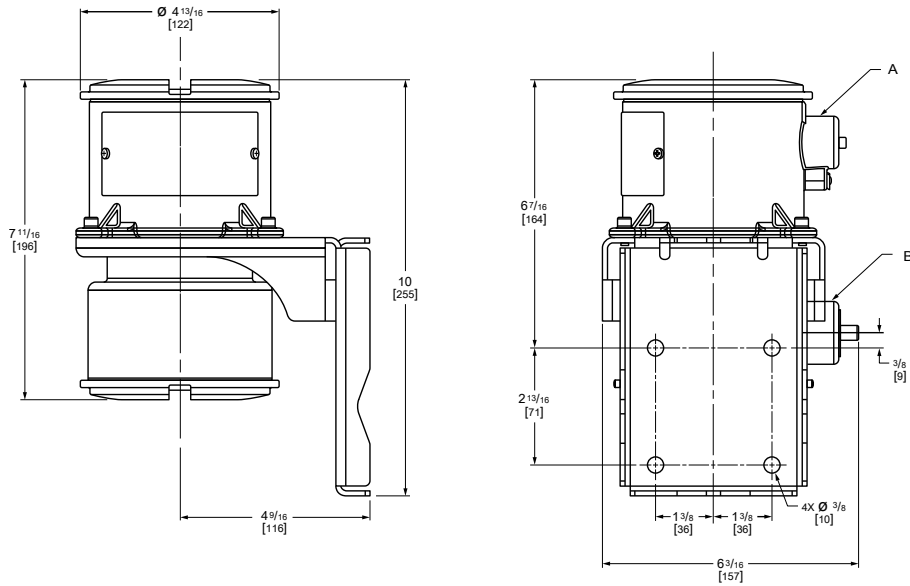
Model	No. of flow tubes	C	D	E	A	B
LNGS06S	2	130 mm	141 mm	69 mm	For dimensions A and B see Process connections – LNGS06S and Process connections – LNGM10S .	
LNGM10S	2	265 mm	208 mm	142 mm		

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

Dual enhanced 820 core processor housing

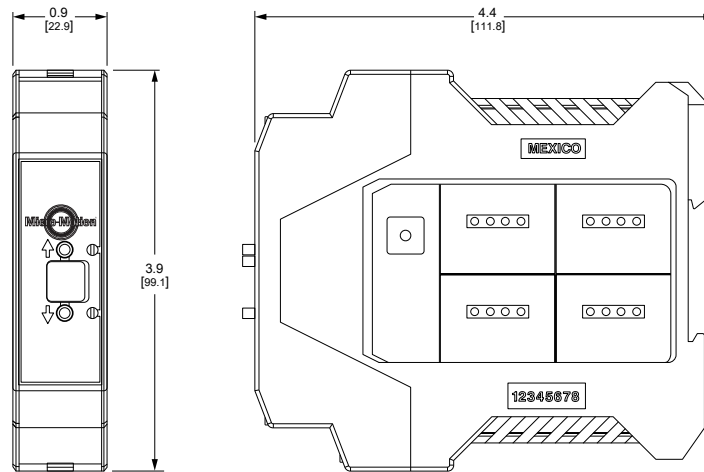


Remote 800C core processor electronics housing



- A. M20 x 1.5 female screw
- B. 19 mm female screw

I.S. barrier dimension



Ordering information

Product code structure

LNG	M10S	179	N	P	D	R	E	PA	M	Z	Z	N	Z
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Code	Description
LNG	Sensor base model
M10S	Line size and material
179	Process connection
N	Case option
P	Sensor combination
D	Electronic interface
R	Housing and mounting
E	Conduit connection
PA	Approval
M	Language
Z	Software
Z	Future option 1
N	Cable
Z	Factory

Sensor base model with line size and material

Code	Sensor base model, line size, and material
LNGS06S	Micro Motion Coriolis LNG sensor for gas return; 6.4 mm; cryogenic; 316L stainless steel
LNGM10S	Micro Motion Coriolis LNG sensor for filling; 25.4 mm; cryogenic; 316L stainless steel

Process connections — LNGS06S

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	.5 in	CL150	ASME B16.5	F316/F316L	Weld neck flange	Raised face	15.98	406	3.50	89
114	.5 in	CL300	ASME B16.5	F316/F316L	Weld neck flange	Raised face	16.38	416	3.75	95
999	ETO (Engineering to Order) Requires X factory option									

Process connections — LNGM10S

Code	Process connections						Dim A		Dim B	
							inch	mm	inch	mm
179	DN25	PN40	EN1092-1	F316/F316L	Weld neck flange	Type B1	8.26	210	4.53	115
328	1 in	CL150	ASME B16.5	F316/F316L	Weld neck flange	Raised face	9.25	235	4.25	108
329	1 in	CL300	ASME B16.5	F316/F316L	Weld neck flange	Raised face	9.75	248	4.88	124
999	ETO (Engineering to Order) Requires X factory option									

Case options

Code	Case option
N	Standard case

Sensor combination

Code	Sensor combination
P	LNGS06S and LNGM10S are paired Only available with electronics interface code D; not available with conduit connections N
Z	Standalone sensor For LNGS06S, not available with Electronics code D

Electronics interface

Code	Electronics interface
D	Enhanced dual 820 core processor Not available with conduit connection N
I	Remote 800C core processor with IS barrier Not available with conduit connection N
N	Spare sensor, no electronics Only available with conduit connection N and software option Z

Electronics housing and mounting

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

Conduit connections

For electronics interface code I, the inlet and outlet conduit openings are one.

Code	Conduit connection
B	Inlet: two conduit openings 19 mm NPT, no gland; Outlet: two conduit openings, 12.7 mm NPT, no gland
E	Inlet: two conduit openings 19 mm NPT, no gland; Outlet: two conduit openings, M20 — no gland

Code	Conduit connection
N	Spare sensor, no electronics

Approvals

Code	Approval
AA	CSA (US and Canada)
FA	ATEX - Equipment Category 2 (Zone 1)
MA	Micro Motion Standard (no approval without CE/EAC markings)
NA	Micro Motion Standard / PED compliant (with CE/EAC markings)
PA	NEPSI – Equipment Category 2 (Zone 1)
R1	EAC Zone 1 – Hazardous Area Approval

Languages

Code	Language option
E	English installation manual
F	French installation manual
G	German installation manual
I	Italian installation manual
J	Japanese installation manual
M	Chinese installation manual
P	Polish installation manual
Q	Korean installation manual
S	Spanish installation manual

Software

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

Future option 1

Code	Future option 1
Z	Reserved for future use

Cable

Code	Cable options
N	Standard jacketed cable

Code	Cable options
S	Shielded cable

Factory

Code	Factory option
Z	Standard product

Certificates, tests, calibrations, and services

These options are not required; all are optional. If needed, add these option codes to the end of the model code, but no code is required.

Note

Depending on the total meter configuration, there may be additional options or limitations. Contact a sales representative before making final selections.

Code	Factory option
CS	CCS certification
EV	Liquid nitrogen performance validation (three times for one flow point) The EV code is only available for the model LNGM10S.
Special calibration options (Select none, CV, or CV with one of the additional verification point options)	
CV	Custom verification (alter original verification points)
01	Add 1 additional verification point
02	Add 2 additional verification points
03	Add 3 additional verification points

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