

Micro Motion® Model CNG050 Compressed Natural Gas Flowmeters

Global industry standard for compressed natural gas metering

- A single-meter solution specifically designed for use in both light and heavy duty vehicle dispensers
- AGA 11-approved for the fiscal transfer of CNG
- Micro Motion MVD™ Direct Connect™ technology for transmitter-less integration into dispenser head electronics
- Variety of transmitter options provide multi-variable outputs to accommodate any dispenser design requirements
- Compact design with no moving parts, no special mounting or flow conditioning required



MICRO MOTION™


EMERSON™
Process Management

Micro Motion® Model CNG050 Compressed Natural Gas Flowmeters

Micro Motion® Model CNG050 meters are specifically designed for the CNG industry to meet the challenges of measuring compressed natural gas. The meter’s increased rangeability allows customers the flexibility to use the sensor for automobile or light- or heavy-duty vehicle dispenser designs.

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

Model CNG050 meters

The CNG050 meter was specifically designed for the CNG industry to meet the challenges of measuring compressed natural gas. The meter’s increased rangeability allows customers the flexibility to use the sensor for automobile or light- or heavy-duty vehicle dispenser designs.

Micro Motion CNG050 meters feature integral transmitters, making them easy to install. Offered with Series 1000 and 2000 transmitters with MVD technology, customers can choose either single or multivariable output configurations with milliamp, pulse, dual pulse, digital outputs, and an integral display.

Micro Motion MVD™ Direct Connect™ technology is making Coriolis flowmeters from Micro Motion even more suitable for CNG applications. OEMs can benefit from MVD Direct Connect technology, which allows smart sensors to communicate directly with dispenser head electronics via Modbus—no transmitter is required!

Contents

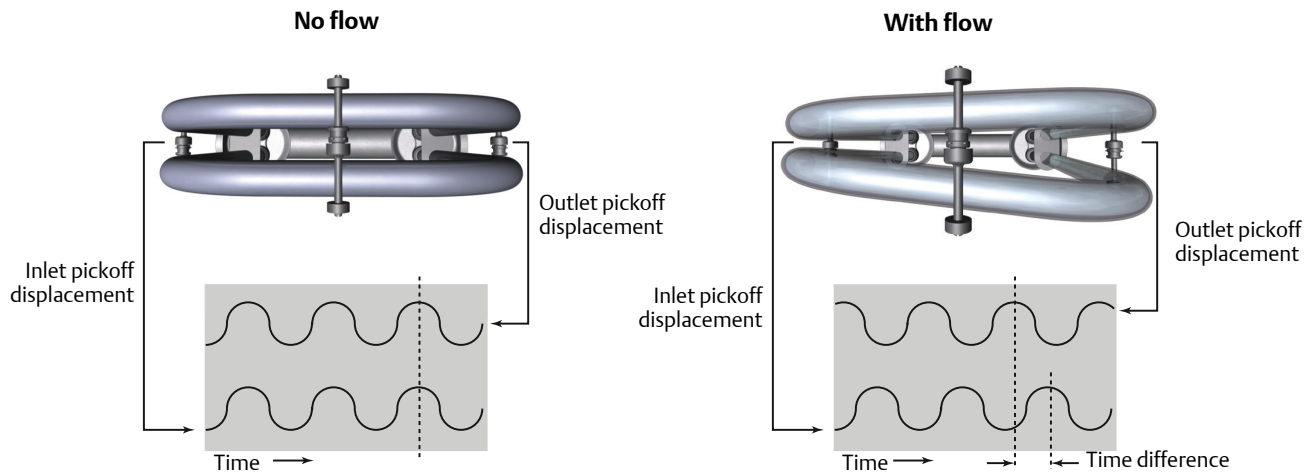
| | | | |
|--|---|--|---|
| Measurement principles | 3 | Pressure Relief | 6 |
| Vehicle filling | 3 | Meter approvals and certifications | 6 |
| Weights and measures configuration lockout | 3 | Transmitter interface | 7 |
| Performance specifications | 4 | Physical specifications | 7 |
| Operating conditions: Environmental | 5 | Ordering information | 9 |

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.



Vehicle filling

Because of its clean combustion, CNG is increasingly used as a vehicle fuel in many parts of the world. Micro Motion CNG050 meters used in dispenser stations are routinely verified (proved) against a gravimetric standard, the highest performance rating possible. In addition, the CNG050 meter can be used as a Master Meter standard, thus providing increased safety and eliminating cumbersome scale setup and venting of gas.

Weights and measures configuration lockout

For applications that require weights and measures approval for legal trade (i.e., public CNG stations), the weights and measures configuration lockout software option for Model 2500 and 2700 transmitters should be ordered with the CNG050 sensor. The configuration lockout software option allows the transmitter to be changed from operating (secure) mode to configuration mode (and back again) using ProLink® II software. The transmitter will register flow only when in the operating (secure) mode. The transmitter will allow configuration changes and zeroing of the meter only when in configuration mode.

When the configuration lockout option is ordered, a means is provided for physically sealing the transmitter housing.

The configuration lockout software option may not be required by certain world area weights and measures authorities. The performance of the CNG050 sensor is not affected by configuration lockout, and the sensor meets batch and accuracy specifications with standard features.

Performance specifications

Typical CNG batch/dispensing conditions

For determining the performance capabilities of our meters, the typical batch/dispensing conditions are defined as those where the flow rate is greater than 4 lbs/min (109 kg/hr).

Accuracy and repeatability

| Performance Specifications | Value |
|-------------------------------|-----------------|
| Batch accuracy ⁽¹⁾ | ±0.50% of batch |
| Repeatability | ±0.25% of rate |

(1) In terms of percent of total batch delivered on CNG.

Flow range

| Performance specification | All models | | Standard Volume ⁽¹⁾ | |
|---------------------------|------------|----------|--------------------------------|---------------------|
| | lb/min | kg/min | SCFM | Nm ³ /hr |
| Flow range | 2 to 220 | 1 to 100 | 40 to 4444 | 68 to 7550 |

(1) CNG with SG= 0.66 at 60 °F (15.5 °C) and 14.73 psia (1bara).

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: accuracy = (zero stability/flow rate) x 100%. Repeatability is similarly affected by low flow conditions.

| Performance specification | All models | | Standard Volume ⁽¹⁾ | |
|---------------------------|------------|--------|--------------------------------|---------------------|
| | lb/min | kg/min | SCFM | Nm ³ /hr |
| Zero stability | 0.02 | 0.009 | 18 | 8 |

(1) CNG with SG= 0.66 at 60 °F (15.5 °C) and 14.73 psia (1bara).

Process pressure ratings

Sensor maximum working pressure reflects the highest possible pressure rating for a given sensor with the process fitting as indicated. Fittings are rated to 5000 psi (345 bar)—the Union SWG type fitting according to ASME B31.3, and the SAE fitting according to SAE J1453.

The sensor complies with council directive 97/23/EC of 29 May 1997 on Pressure Equipment. There is no pressure derating due to process temperature.

The case was designed to protect the sensor components, but it is not rated for pressure containment. For added safety, the sensor has a pressure relief feature to evacuate the case in the unlikely event of a loss of primary containment.

Sensor maximum working pressure for all models

| Component | Rating | |
|---|--------|------|
| | psig | barg |
| Flow tube | 5,000 | 345 |
| Combined sensor and process fitting | 5,000 | 345 |
| Union to NPT adapter piece ⁽¹⁾ | 4,600 | 317 |

(1) Pressure rating of the additional adapter piece (#12 O-ring face seal to female NPT) that is provided with process connection option 239.

Operating conditions: Environmental

Vibration limits

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

Temperature limits

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

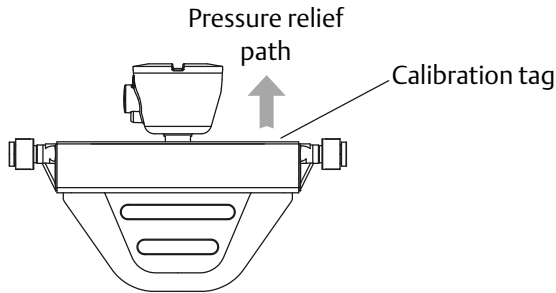
Notes

- In all cases, 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 from the Micro Motion web site (www.micromotion.com).

Pressure Relief

The sensor has a pressure relief feature to evacuate the case in the unlikely event of a loss of primary containment.

- The pressure relief feature is located underneath the calibration tag.



- The sensor must be oriented so that personnel and equipment will not be exposed to escaping pressurized discharge along the pressure relief path.
- If the pressure relief feature is activated by a loss of primary containment, the calibration tag will release from the case.

Meter approvals and certifications

Approvals and certifications

| Type | Approval or certification (typical) | |
|---------------------------|--|--|
| CSA and CSA C-US | Class I, Div. 1, Groups C and D | |
| CSA (Canada only) | Class I, Div. 2, Groups A, B, C, and D Class II, Div. 1, Groups E, F, and G | |
| ATEX | | II 2 G Ex ib IIB/IIC T1-T5 II 2 D Ex ib IIIC T*°C Db IP65 NOTE: the H300 is Ex ib IIB; only with approval option code 6 it is Ex ib IIC. |
| IECEX | Ex ib IIC T1-T5 | |
| NEPSI | Ex ib IIC T1-T5 | |
| Ingress Protection Rating | IP 66/67 for sensors and transmitters | |
| EMC effects | Complies with EMC directive 2004/108/EC per EN 61326 Industrial | |
| | Complies with NAMUR NE-21 (09.05.2012) | |

Notes

- Approvals shown are for model CNG050 meter configured with a model 2400S transmitter. 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 CNG050 product page at the Micro Motion web site (www.micromotion.com).

Industry standards

| Type | Standard |
|---|---|
| Weights and Measures for custody transfer applications: | <ul style="list-style-type: none"> ■ National Type Evaluation Program (NTEP) ■ PTB ■ NMI ■ Pattern approval ■ SIRIM ■ Ministry of Consumer Affairs ■ Ufficio Metrico Italiano ■ INMETRO |
| Industry standards and commercial approvals | <ul style="list-style-type: none"> ■ Pressure Equipment Directive (PED) ■ Canadian Registration Number (CRN) ■ Dual Seal ■ SIL2 and SIL3 safety certifications |

Transmitter interface

A Micro Motion flowmeter system is 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
- Specific fit-for-purpose solutions for two-wire connectivity or filling and dosing machinery integration

Model CNG050 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 Micro Motion meter. Please refer to the [Micro Motion Corrosion Guide](#) for material compatibility information.

Wetted part materials

| Model | All models 316L stainless steel | Sensor weight | |
|--------|------------------------------------|---------------|----|
| | | lb | kg |
| CNG025 | • | 13 | 6 |

Notes

- Weight specifications are based upon Swagelok compatible #12 VCO fitting flange and do not include electronics.
- Heat jackets and steam kits are also available.

Non-wetted part materials

| Component | Enclosure rating | 316L/CF-3M stainless steel | Polyurethane-painted aluminum |
|-------------------------------------|-------------------|----------------------------|-------------------------------|
| Sensor housing | — | | |
| Core processor housing | NEMA 4X (IP66/67) | • | • |
| Junction box housing | NEMA 4X (IP66) | • | • |
| Model 1700/2700 transmitter housing | NEMA 4X (IP66) | • | • |
| Model 3700 transmitter housing | NEMA 4X (IP66/67) | | • |
| Model 2400S transmitter housing | NEMA 4X (IP66/67) | • | • |
| Model 2200S transmitter housing | NEMA 4X (IP66/67) | • | • |

Flanges

| Sensor type | Flange types |
|-------------|--|
| CNG050 | <ul style="list-style-type: none"> ■ 3/4-inch NPT female Swagelok compatible size 12 VCO fitting ■ Swagelok compatible size 12 VCO union fitting ■ Union size 12 SAE fitting (universal thread) |

Note

For flange compatibility, please refer to the Online Store Sizing and Selection Tool at the Micro Motion web site (www.micromotion.com).

Dimensions

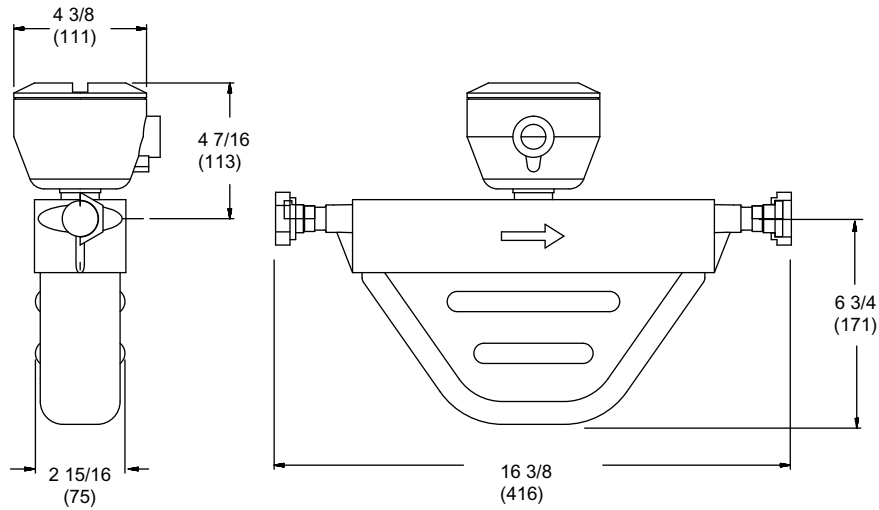
These dimensional drawings are intended to provide a basic guideline for sizing and planning. They are representative of a sensor fitted with a Swagelok compatible size 12 VCO fitting and integral core processor.

Complete and detailed dimensional drawings can be found through the product link in our online store (www.micromotion.com/onlinestore).

Note:

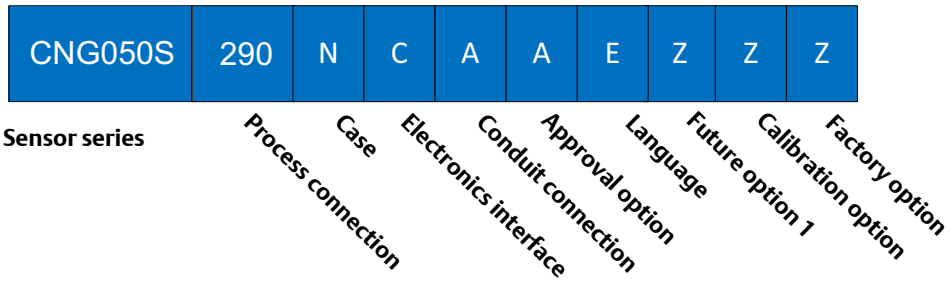
- All dimensions $\pm 1/8$ inch (± 3 mm)
- Representative of a sensor fitted with a Swagelok compatible size 12 VCO fitting and integral core processor.

Example dimensions for all models



Ordering information

Product code structure



Sensor base model

| Code | Case option |
|---------|---|
| CNG050S | Micro Motion Coriolis CNG-Series sensor; 1/2-inch; 316L stainless steel |

Process connections

| Code ⁽¹⁾ | Description |
|---------------------|--|
| 239 | 3/4-inch NPT female Swagelok compatible size 12 VCO fitting 3/4-inch NPT female adapter O-ring face seal adapter rated to 4600 psi (317 bar) |
| 290 | Swagelok compatible size 12 VCO union fitting; ready for face seal O-ring (not included) |
| 291 | Union size 12 SAE fitting (universal thread); ready for face seal O-ring (not included) |

(1) Fittings listed here are standard options. Other types of fittings are available. Contact your local Micro Motion representative.

Case options

| Code | Case option |
|------|---------------|
| N | Standard case |

Electronics interface

| Code | Electronics interface |
|------------------|--|
| Q | 4-wire polyurethane-painted aluminum integral core processor for remote mount transmitters |
| A | 4-wire stainless steel integral core processor for remote mount transmitters |
| C | For integrally mounted 1700/2700 transmitter |
| W ⁽¹⁾ | Polyurethane-painted aluminum integral core processor for MVD Direct Connect installation |
| D ⁽¹⁾ | Stainless steel integral core processor for MVD Direct Connect installation |

(1) When electronics interface W or D is ordered with approval codes C, A, Z, I, or P, an MVD Direct Connect I.S. barrier is supplied. No barrier is supplied when ordered with approval codes M or N.

Conduit connections

| Code | Conduit connection |
|------|---|
| | Electronics interface codes Q, A, W and D |
| B | 1/2-inch NPT — no gland |
| E | M20 — no gland |
| F | Brass/nickel cable gland (cable diameter 0.335 to 0.394 inches [8.5 to 10.0 mm]) |
| G | Stainless steel cable gland (cable diameter 0.335 to 0.394 inches [8.5 to 10.0 mm]) |
| | Electronics interface code C (Integrally mounted 1700/2700) |
| B | No gland |

Approvals

| Code | Approval |
|------|--|
| M | Micro Motion Standard (no approval) |
| N | Micro Motion Standard / PED compliant |
| C | CSA (Canada only) |
| A | CSA C-US (U.S.A. and Canada) |
| Z | ATEX – Equipment Category 2 (Zone 1) / PED compliant |
| I | IECEX – Zone 1 |
| P | NEPSI; Available only with language code M (Chinese). |
| G | Country Specific Approval – Requires a selection from the Approvals section of the ‘Certificate, Tests, Calibrations and Services’ model code option |

Languages

| Code | Language option |
|------|--|
| 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 |

Languages *(Continued)*

| Code | Language option <i>(Continued)</i> |
|------|---|
| P | Portuguese installation manual |
| 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 |

Future option 2

| Code | Calibration option |
|------|-------------------------|
| Z | Reserved for future use |

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) |
| NC | NACE certificate 2.1 (MR0175 and MR0103) |

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 |

Weld examination

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

Special cleaning

| Code | Factory option |
|------|--|
| O2 | Declaration of compliance oxygen service 2.1 |

Metrology compliance

| Code | Factory option |
|------|---|
| GR | Russian GOST 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 |

Country specific approvals

Select one from the following if approval code G is selected.

| Code | Factory option |
|-------------|---|
| R1 | EAC Zone 1 – Hazardous Approval ⁽¹⁾⁽²⁾ |
| B1 | INMETRO Zone 1 – Hazardous Approval ⁽¹⁾⁽²⁾ |

(1) Only available with approval code G.

(2) Not available with electronics code 0,1, K, or L.