

Micro Motion™ Technical Overview and Specification Summary



Micro Motion products

Emerson’s world-leading Micro Motion Coriolis flow and density measurement devices have set the standard for superior measurement technology. Micro Motion offers the best measurement solutions for any process challenge.

Micro Motion advantages

Technology leadership

Micro Motion is committed to technology innovations that deliver the highest-performing solutions for your complex measurement challenges.

Widest breadth of products

Micro Motion has the widest range of flow and density measurement devices for virtually any process, application, or fluid. A wide variety of wetted materials, line sizes, and an extensive range of output options enable optimal system integration.

Unparalleled value

Benefit from expert field and technical application service and support made possible from more than one million meters installed worldwide and over 40 years of flow and density measurement experience.

Micro Motion Coriolis flow and density meters



- ELITE**
Peak performance Coriolis meter
- Ultimate real world performance
 - Best fit-for-application
 - Superior measurement confidence



- F-Series**
- High performance compact drainable Coriolis meter
 - Best flow and density measurement in a compact, drainable flow meter
 - Broadest range of application coverage
 - Superior reliability and safety



- T-Series**
Straight tube full-bore Coriolis meter
- Superior flow measurement in a single straight tube flow meter
 - Comprehensive hygienic application coverage
 - Superior reliability



R-Series

General purpose flow and density Coriolis meter

- Simple to install and easy to use Coriolis flow measurement
- Broadest range of application coverage
- Superior reliability



H-Series

Hygienic compact drainable Coriolis meter

- Best flow and density measurement in a compact hygienic flow meter
- Comprehensive hygienic application coverage
- Exceptional reliability and safety



LF-Series

Extreme low-flow Coriolis meter

- Highest precision miniaturized flow meter
- Scalable platform for the most demanding low-flow applications
- Superior reliability



CNG-Series

Compressed Natural Gas (CNG) Coriolis meter

- Specifically designed for both light and heavy duty vehicle dispensers
- Custody transfer approved
- Compact design with no moving parts, special mounting, or flow conditioning required



HPC-Series

Ultra-High Pressure Flowmeter

Global industry standard for ultra high pressure environments and hydrogen processing

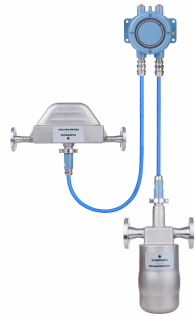
- Coriolis mass flow meters designed for high pressure environments up to 15,000 psi (1,034.21 bar), such as chemical injection for the oil and gas industry and hydrogen dispensing
- Micro Motion MVD™ Direct Connect™ technology for space and weight savings
- Variety of transmitter options provide multivariable outputs to accommodate any design requirements



TA-Series

Tantalum-Series Flow and Density Meters

- Ideal for handling corrosive fluids, such as acids and bases
- Exceptional reliability and safety



LNG-Series

Global industry standard for liquified natural gas dispensing system

- Provides total LNG mass balance by measuring both the liquid supply and return boil off gas
- Works along with the 820 dual core processor for a built in barrier and custody lockout switch
- Measures two Coriolis flow meters with a single electronic package

Flow and density meter specifications

Table 1: Application type

| Sensor | Continuous control | Batching / loading / blending | Custody transfer |
|------------|--------------------|-------------------------------|------------------|
| ELITE | • | • | • |
| F-Series | • | • | ◦ |
| T-Series | • | • | |
| R-Series | • | • | |
| H-Series | • | • | • |
| LF-Series | • | • | |
| CNG-Series | • | • | • |
| HPC-Series | • | • | |
| TA-Series | • | • | |
| LNG-Series | • | • | • |

• Supported on all models ◦ Supported on some models

Table 2: Measurement accuracy

| Sensor | Liquid mass flow | Liquid density | Liquid volume flow | Gas mass flow |
|----------|------------------|--|--------------------|---------------|
| ELITE | ±0.05% | ±0.2 kg/m ³ (±0.0002 g/cm ³) | ±0.05% | ±0.25% |
| F-Series | ±0.05% | ±0.5 kg/m ³ (±0.0005 g/cm ³) | ±0.05% | ±0.35% |
| T-Series | ±0.1% | ±0.5 kg/m ³ (±0.0005 g/cm ³) | ±0.15% | ±0.50% |

Table 2: Measurement accuracy (continued)

| Sensor | Liquid mass flow | Liquid density | Liquid volume flow | Gas mass flow |
|------------|------------------|---|--------------------|---------------|
| R-Series | ±0.40% | ±3 kg/m ³ (±0.003 g/cm ³) | ±0.40% | ±0.75% |
| H-Series | ±0.05% | ±0.5 kg/m ³ (±0.0005 g/cm ³) | ±0.05% | ±0.35% |
| LF-Series | ±0.50% | ±5 kg/m ³ (±0.005 g/cm ³) | | ±0.50% |
| CNG-Series | | n/a | n/a | ±0.50% |
| HPC-Series | ±0.1% | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.15% | ±0.50% |
| TA-Series | ±0.1% | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.10% | n/a |
| LNG-Series | ±0.5% | n/a | n/a | ±0.50% |

Table 3: Capabilities

| Sensor | Self-draining | Sanitary / hygienic | 2-phase flow / entrained gas | Smart Meter Verification | High temperature | High pressure | Cryogenic |
|------------|---------------|---------------------|------------------------------|--------------------------|------------------|---------------|-----------|
| ELITE | ◐ | ◐ | ● | ● | ◐ | ◐ | ◐ |
| F-Series | ● | | ● | ● | ◐ | ◐ | ◐ |
| T-Series | ● | ● | | ● | | | |
| R-Series | ● | | | ● | | ◐ | |
| H-Series | ● | ● | ● | ● | | | |
| LF-Series | | | | | | | |
| CNG-Series | ● | | | | | ● | |
| HPC-Series | ● | | | ● | | ● | |
| TA-Series | ◐ | | | ● | | | |
| LNG-Series | ● | | | | | | ● |

● Supported on all models ◐ Supported on some models

Table 4: Wetted materials

| Sensor | 300-Series stainless steel | Super Duplex | Nickel Alloy C22 | Titanium | Tantalum |
|----------|----------------------------|--------------|------------------|----------|----------|
| ELITE | ● | ◐ | ● | | |
| F-Series | ● | | ◐ | | |
| T-Series | | | | ● | |
| R-Series | ● | | | | |
| H-Series | ● | | | | |

Table 4: Wetted materials (continued)

| Sensor | 300-Series stainless steel | Super Duplex | Nickel Alloy C22 | Titanium | Tantalum |
|--|----------------------------|--------------|------------------|----------|----------|
| LF-Series | • | | | | |
| CNG-Series | • | | | | |
| HPC-Series | • | | ◦ | | |
| TA-Series | | | | | • |
| LNG-Series | • | | | | |
| • Supported on all models ◦ Supported on some models | | | | | |

Table 5: Fits nominal line sizes

| Sensor | Inches | Millimeters |
|------------|------------|-------------|
| ELITE | 1/14 - 14 | 1 - 350 |
| F-Series | 1/4 - 4 | 8 - 100 |
| T-Series | 1/4 - 2 | 8 - 50 |
| R-Series | 1/4 - 3 | 8 - 80 |
| H-Series | 1/4 - 4 | 8 - 100 |
| LF-Series | 1/32 - 1/4 | 0.8 - 8 |
| CNG-Series | 1/2 - 3/4 | 15 - 20 |
| HPC-Series | 1/10 - 3/4 | 3 - 20 |
| TA-Series | 1/10 - 3 | 3 - 80 |
| LNG-Series | 1/4 - 1 | 6 - 25 |

Micro Motion transmitters and controllers



5700

Advanced field-mount transmitter

- Integral and remote mount options
- Wide variety of I/O and application capabilities to fit your needs
- Large graphical display
- Real time data logging and storage
- Smart Meter Verification Professional enables non-uniform coating detection, installation verification, multiphase diagnostic, and flow range diagnostic
- Available with full stainless steel housing for harsh environments



4200

2-wire transmitter

- Integral and remote mount options
- Compact, 2-wire transmitter design saves electrical cost for use on integrated systems and skids
- Large graphical display
- Certified for SIL2 and SIL3 Safety applications per IEC 61508



1500/2500

Compact control-room transmitter

- DIN rail mount with flexible installation options
- Wide variety of I/O and application capabilities to fit your needs



1700/2700

Versatile field-mount transmitter

- Integral and remote mount options
- Wide variety of I/O and application capabilities to fit your needs
- Available with full stainless steel housing for harsh environments



2400S

Compact integral transmitter

- Simple I/O options
- Offers powerful diagnostics like Smart Meter Verification in a condensed form factor
- Hygienic, stainless steel housing available



3300

Rack/panel mount discrete controller

3500

Rack/panel mount transmitter with discrete controller



3350

Field mount discrete controller

3700

Field mount transmitter with discrete controller



EtherNet I/P Module

- Access all process variables and diagnostics
- Simple EtherNet integration and retrofit



- FMT
 Compact filling and dosing transmitter
- Easy-to-clean, hygienic design that enables SIP/CIP
 - Highest accuracy and fast response time

Transmitter and controller specifications

Output variables

| Transmitter | Mass / volume flow | Net product content / flow (optional) ⁽¹⁾ | Temperature | Density | Concentration (optional) |
|-------------|--------------------|--|-------------|---------|--------------------------|
| 1500 | • | | | | |
| 1700 | • | | | | |
| 2400S | • | • | • | • | • |
| 2500 | • | • | • | • | • |
| 2700 | • | • | • | • | • |
| 3300 | | | | | |
| 3350 | | | | | |
| 3500 | • | • | • | • | • |
| 3700 | • | • | • | • | • |
| 4200 | • | • | • | • | • |
| 5700 | • | • | • | • | • |
| FMT | • | | • | • | |

• Supported on all models

(1) Flow rate of product based on concentration. For example, in a dissolved sugar solution, the measurement is the flow rate of the sugar alone, and in a net oil application, the measurement is water alone or oil alone.

Local display

| Transmitter | 2-line | Graphical |
|-------------|--------|-----------|
| 1500 | | |
| 1700 | • | |
| 2400S | • | |
| 2500 | | |
| 2700 | • | |
| 3300 | | • |
| 3350 | | • |
| 3500 | | • |
| 3700 | | • |

| Transmitter | 2-line | Graphical |
|---------------------------|--------|-----------|
| 4200 | | • |
| 5700 | | • |
| FMT | | |
| • Supported on all models | | |

Power

| Transmitter | AC | DC | Loop powered (2-wire) |
|----------------------------|----|----|-----------------------|
| 1500 | | • | |
| 1700 | • | • | |
| 2400S | • | • | |
| 2500 | | • | |
| 2700 | • | • | |
| 3300 | • | • | |
| 3350 | • | • | |
| 3500 | • | • | |
| 3700 | • | • | |
| 4200 | | | • |
| 5700 | • | • | |
| FMT | | • | |
| • Supported on all models. | | | |

Outputs

| Transmitter | 4–20 mA | 10 kHz pulse | Discrete | HART® (1) | Modbus® | FOUNDATION™ fieldbus | DeviceNet™ | PROFIBUS-PA | PROFIBUS-DP |
|-------------|---------|--------------|----------|-----------|---------|----------------------|------------|-------------|-------------|
| 1500 | • | • | • | • | • | | | | |
| 1700 | • | • | • | • | • | | | | |
| 2400S | • | • | • | • | | | • | | • |
| 2500 | • | • | • | • | • | | | | |
| 2700 | • | • | • | • | • | • | | • | |
| 3300 | | | • | | • | | | | |
| 3350 | | | • | | • | | | | |
| 3500 | • | • | • | • | • | | | | |
| 3700 | • | • | • | • | • | | | | |
| 4200 | • | • | • | • | | | | | |
| 5700 | • | • | • | • | • | • | | • | |

| Transmitter | 4–20 mA | 10 kHz pulse | Discrete | HART® (1) | Modbus® | FOUNDATION™ fieldbus | DeviceNet™ | PROFIBUS- PA | PROFIBUS- DP |
|-------------|---------|--------------|----------|-----------|---------|-------------------------|------------|-----------------|-----------------|
| FMT | • | • | • | | • | | | | • |

• Supported on all models, although some combinations may be unavailable.

(1) HART or WirelessHART®

Ethernet outputs

| Transmitter | EtherNet/IP(1) | PROFINET | Modbus TCP |
|-------------|----------------|----------|------------|
| 1500 | ◦ | | |
| 1700 | ◦ | | |
| 2400S | | | |
| 2500 | • | | |
| 2700 | ◦ | | |
| 3300 | | | |
| 3350 | | | |
| 3500 | • | | |
| 3700 | • | | |
| 4200 | | | |
| 5700 | • | • | • |
| FMT | | | |

• Supported on all models ◦ Supported on some models

(1) Integrated in the 5700 transmitter, or with the use of the Micro Motion EtherNet/IP module.

Inputs

| Transmitter | 10 kHz pulse | Discrete | 4–20 mA | HART(1) | 4-wire remote sensor | 9-wire remote sensor |
|-------------|--------------|----------|---------|---------|----------------------|----------------------|
| 1500 | | | | • | • | • |
| 1700 | | | | • | • | • |
| 2400S | | • | | • | | |
| 2500 | | • | | • | • | • |
| 2700 | | • | | • | • | • |
| 3300 | • | • | | | | |
| 3350 | • | • | | | | |
| 3500 | | • | | • | • | • |
| 3700 | | • | | • | • | • |
| 4200 | | | | • | | • |
| 5700 | | • | • | • | • | • |

| Transmitter | 10 kHz pulse | Discrete | 4–20 mA | HART ⁽¹⁾ | 4-wire remote sensor | 9-wire remote sensor |
|---|--------------|----------|---------|---------------------|----------------------|----------------------|
| FMT | | • | | | | |
| • Supported on all models, although some combinations may be unavailable. | | | | | | |

(1) HART or WirelessHART

Transmitter and sensor pairing

| Sensor | 1500/2500 | 1700/2700 | 2200S | 2400S | 3000 | 4200 | 5700 | FMT |
|----------------------|-----------|-----------|-------|-------|------|------|------------------|--|
| ELITE | • | • | • | • | • | • | • | CMFS only |
| ELITE high capacity | • | • | | • | • | | • | |
| F-Series | • | • | • | • | • | • | • | 0.25 in (6 mm) 0.5 in (13 mm) 1 in (25 mm) |
| H-Series | • | • | • | • | • | • | • | 0.25 in (6 mm) 0.5 in (13 mm) 1 in (25 mm) |
| R-Series | • | • | | • | • | • | • | |
| T-Series | • | • | | • | • | • | • | |
| TA-Series (Tantalum) | | | | | | | • ⁽¹⁾ | |
| CNG050 | • | • | | | • | | | |
| HPC-Series | • | • | • | • | | • | • | |

(1) Remote 5700.

A sensor and transmitter compatibility list is also available at www.emerson.com/en-us/automation/brands/micro-motion/charts.

Mounting

| Transmitter | Integral – field aluminum | Integral – field stainless steel | Remote – field aluminum | Remote – field stainless steel | Remote – control room | Remote – rack / panel mount |
|-------------|---------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------|-----------------------------|
| 1500 | | | | | • | |
| 1700 | • | | • | • | | |
| 2400S | • | • | | | | |
| 2500 | | | | | • | |
| 2700 | • | | • | • | | |
| 3300 | | | | | • | • |
| 3350 | | | • | | | |
| 3500 | | | | | • | • |
| 3700 | | | • | | | |
| 4200 | • | | • | | | |
| 5700 | • | | • | • | | |

| Transmitter | Integral – field aluminum | Integral – field stainless steel | Remote – field aluminum | Remote – field stainless steel | Remote – control room | Remote – rack / panel mount |
|---|---------------------------|----------------------------------|-------------------------|--------------------------------|-----------------------|-----------------------------|
| FMT | | • | | | | |
| • Supported on all models, although some combinations may be unavailable. | | | | | | |

Special application type

| Transmitter | Batch controller | Custody transfer | 2-phase flow / entrained gas | Filling & dosing | Smart Meter Verification | SIS certified |
|---------------------------|------------------|------------------|------------------------------|------------------|--------------------------|---------------|
| 1500 | | | • | • | • | |
| 1700 | | | • | | • | • |
| 2400S | | | • | | • | |
| 2500 | | | • | | • | |
| 2700 | | • | • | | • | • |
| 3300 | • | • | | | | |
| 3350 | • | • | | | | |
| 3500 | • | • | • | | • | |
| 3700 | • | • | • | | • | |
| 4200 | | | | | • | • |
| 5700 | • | • | • | | • | • |
| FMT | | | | • | | |
| • Supported on all models | | | | | | |

Hazardous approvals

| Transmitter | C1D1 | C1D2 | Zone 1 | Zone 2 |
|-------------|------|------------------|--------|--------|
| 1500 | | • ⁽¹⁾ | | • |
| 1700 | • | • | • | • |
| 2400S | | • | | • |
| 2500 | | • ⁽¹⁾ | | • |
| 2700 | • | • | • | • |
| 3300 | | • ⁽¹⁾ | | |
| 3350 | | • | • | • |
| 3500 | | • ⁽¹⁾ | | |
| 3700 | | • | • | • |
| 4200 | • | • | • | • |
| 5700 | • | • | • | • |

| Transmitter | C1D1 | C1D2 | Zone 1 | Zone 2 |
|---------------------------|------|------|--------|--------|
| FMT | | • | | • |
| • Supported on all models | | | | |


(1) When installed in a suitable enclosure.

Smart Meter Verification

Smart Meter Verification works with the following sensors:

- CMFS
- CMF
- F-Series
- H-Series
- R-Series
- T-Series
- TA-Series
- HPC-Series

Table 6: Smart Meter Verification capabilities

|  | Basic | Professional | |
|--|--|--|------------------------|
| | Included | Licensed | 90-day trial, licensed |
| Sensor compatibility ⁽¹⁾ | CMFS, CMF, F, H, R, T, TA, and HPC | | |
| Transmitter compatibility ⁽¹⁾ | Direct Connect, 1500, 1700, 2400S, 2500, 2700, Series 3000, 4200, 5700 | Direct Connect, 1500, 1700, 2400S, 2500, 2700, Series 3000, 4200 | 5700 |
| Calibration coefficients audit | • | • | • |
| Zero audit | • | • | • |
| Electronics verification | • | • | • |
| Automatic test scheduler | • | • | • |
| History of previous 20 results | | • | • |
| Verification report | | • ⁽²⁾ | • ⁽²⁾ |
| Non-uniform coating diagnostic | | | • |
| Multiphase diagnostic | | | • ⁽³⁾ |
| Flow range diagnostic | | | • ⁽³⁾ |

(1) Enhanced core processor only.

(2) To generate a test report (for a report to exist), the test host must be ProLink III Basic or Professional, web page (Ethernet devices), or AMS SMV SNAP-ON. To generate previous test reports (for previous reports to exist), the test host must have been ProLink III Basic or Professional, and the same PC that ran the test must be used. You can view results for all tests that are in the PC database.

(3) 24-hour historical visualization using ProLink III Professional.

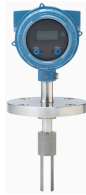
Micro Motion density and viscosity meters



CDM

Peak performance precision density meter

- Accredited, traceable density measurement
- Superior multi-variable I/O, meter health, and application capabilities
- Installation flexibility and compatibility



FDM

Direct insertion density meter

- Rugged, accurate density, temperature, and concentration measurement
- Superior multi-variable I/O, meter health, and application capabilities
- Installation flexibility and compatibility



FVM

High performance multi-variable viscosity meter

- Rugged, accurate multi-variable measurement
- Superior multi-variable I/O, meter health, and application capabilities
- Installation flexibility and compatibility



HFVM

High performance multi-variable viscosity meter

- World-wide marine-approved design for aggressive environments
- Durable Diamond-Like Carbon (DLC) coating that is resistant to friction, chemicals, impact, and mechanical damage



GDM

Fiscal gas density meter

- Accredited, traceable density measurement
- Superior multi-variable I/O, meter health, and application capabilities
- Installation flexibility and compatibility



SGM

Gas specific gravity and gas energy meter

- Precision gas specific gravity measurement
- Superior multi-variable I/O, meter health, and application capabilities
- installation flexibility and compatibility

Density meter specifications

Table 7: Application type for liquid meters

| Meter | Continuous control | Batching / loading / blending | Custody transfer | High consistency slurry | Viscosity control | Combustion control |
|-------|--------------------|-------------------------------|------------------|-------------------------|-------------------|--------------------|
| CDM | • | • | • | | | |
| FDM | • | • | | • | | |
| FVM | • | • | | | • | • |
| HFVM | • | • | | | • | • |

• Supported on all models

Table 8: Application type for gas meters

| Meter | Continuous control | Batching / loading / blending | Custody transfer | Combustion control |
|-------|--------------------|-------------------------------|------------------|--------------------|
| GDM | • | • | • | • |
| SGM | • | • | • | • |

• Supported on all models

Table 9: Measurement accuracy for liquid meters

| Meter | Liquid & slurry density ⁽¹⁾ | Liquid & slurry velocity | Liquid viscosity |
|-------|---|--------------------------|---|
| CDM | ±0.1 kg/m ³ (±0.0001 g/cm ³) | Available as diagnostic | |
| FDM | ±1 kg/m ³ (±0.001 g/cm ³) | | |
| FVM | ±1 kg/m ³ (±0.001 g/cm ³) | | ±0.2 cP for 0.5-10 cP range 1% full scale above 10 cP |
| HFVM | ±1 kg/m ³ (±0.001 g/cm ³) | | ±0.2 cP for 0.5-10 cP range 1% full scale above 10 cP |

(1) Accuracy specifications shown are best possible. Specific models, options, or process/operating conditions may result in a less accurate specifications.

Table 10: Measurement accuracy for gas meters

| Meter | Gas density or gas-specific gravity |
|-------|--|
| GDM | ±0.1% or ±0.15% of density reading |
| SGM | Up to 0.1% of specific gravity reading |

Table 11: Capabilities of liquid meters

| Meter | Self-draining | Velocity indication | Known Density Verification | High pressure |
|-------|---------------|---------------------|----------------------------|---------------|
| CDM | • | • | • | • |
| FDM | • | | • | • |
| FVM | • | | • | • |

Table 11: Capabilities of liquid meters (continued)

| Meter | Self-draining | Velocity indication | Known Density Verification | High pressure |
|--|---------------|---------------------|----------------------------|---------------|
| HFVM | • | | • | • |
| • Supported on all models ◦ Supported on some models | | | | |

Table 12: Capabilities of gas meters

| Meter | High pressure | Known Density Verification |
|--|---------------|----------------------------|
| GDM | • | • |
| SGM | ◦ | • |
| • Supported on all models ◦ Supported on some models | | |

Table 13: Wetted materials for liquid meters

| Meter | 300 series stainless steel | Nickel alloy C22 | Titanium | Zirconium |
|--|----------------------------|------------------|----------|-----------|
| CDM | • | • | | |
| FDM | • | • | • | • |
| FVM | • | | | |
| HFVM | • | | | |
| • Supported on all models ◦ Supported on some models | | | | |

Table 14: Wetted materials for gas meters

| Meter | 300 series stainless steel | Aluminum | Ni-span-C |
|--|----------------------------|----------|-----------|
| GDM | • | | • |
| SGM | • | • | • |
| • Supported on all models ◦ Supported on some models | | | |

Table 15: Outputs for liquid meters

| Meter | Time Period Signal | Analog | HART / wireless HART | RS-485 Modbus | 2-line display | FOUNDATION fieldbus |
|--|--------------------|--------|----------------------|---------------|----------------|---------------------|
| CDM | ◦ | ◦ | ◦ | ◦ | ◦ | ◦ |
| FDM | ◦ | • | • | • | ◦ | ◦ |
| FVM | | • | • | • | ◦ | ◦ |
| HFVM | | • | • | • | ◦ | |
| • Supported on all models ◦ Supported on some models | | | | | | |

Table 16: Outputs for gas meters

| Meter | Time Period Signal | Analog | HART / wireless HART | RS-485 Modbus | 2-line display | FOUNDATION fieldbus |
|-------|--------------------|--------|----------------------|---------------|----------------|---------------------|
| GDM | ◦ | ◦ | ◦ | ◦ | ◦ | ◦ |
| SGM | ● | ● | ● | ● | ● | ◦ |

● Supported on all models ◦ Supported on some models

Table 17: Output variables for liquid meters

| Model | Density | Temperature | Concentration | Velocity | Viscosity / referred viscosity | Mass / net product flow |
|-------|---------|-------------|---------------|----------|--------------------------------|-------------------------|
| CDM | ● | ● | ● | ● | | |
| FDM | ● | ● | ● | | | ● ⁽¹⁾ |
| FVM | ● | ● | ● | | ● | ● ⁽¹⁾ |
| HFVM | ● | ● | ● | | ● | |

● Supported on all models

(1) When connected to a volumetric flowmeter

Table 18: Output variables for gas meters

| Model | Density | Temperature | Concentration | Gas specific gravity / BTU / Wobbe index | Mass / net product flow |
|-------|---------|-------------|---------------|--|-------------------------|
| GDM | ● | ● | ● | ● | ● ⁽¹⁾ |
| SGM | | ● | ● | ● | ● ⁽¹⁾ |

● Supported on all models

(1) When connected to a volumetric flowmeter

Table 19: Mounting for liquid meters

| Meter | Integral-field |
|-------|----------------|
| CDM | ● |
| FDM | ● |
| FVM | ● |
| HFVM | ● |

● Supported on all models

Table 20: Gas meter mounting

| Meter | Integral-field |
|-------|----------------|
| GDM | ● |
| SGM | ● |

● Supported on all models

Table 21: Hazardous area approvals for liquid meters

| Meter | ATEX / IECEx IIC Zone 1 | ATEX / IECEx IIC Zone 2 | CSA C-US C1D1 | CSA C-US C1D2 |
|-------|-------------------------|-------------------------|---------------|---------------|
| CDM | ◦ | ● | ◦ | ● |
| FDM | ◦ | ● | ◦ | ● |
| FVM | ◦ | ● | ◦ | ● |
| HFVM | ◦ | ● | ◦ | ● |

● Supported on all models ◦ Supported on some models

Table 22: Hazardous area approvals for gas meters

| Meter | ATEX / IECEx IIC Zone 1 | ATEX / IECEx IIC Zone 2 | CSA C-US C1D1 | CSA C-US C1D2 |
|-------|-------------------------|-------------------------|---------------|---------------|
| GDM | ● | | ● | |
| SGM | ● | | ● | |

● Supported on all models

Table 23: Nominal sizes for liquid meters

| Meter | Inches | Millimeters |
|-------|-------------|--------------|
| CDM | 1 | 25 |
| FDM | 1 or larger | 25 or larger |
| FVM | 1 or larger | 25 or larger |
| HFVM | 1 or larger | 25 or larger |

Table 24: Nominal sizes for gas meters

| Meter | Inches | Millimeters |
|-------|---------------|-------------|
| GDM | 1/4 or larger | 6 or larger |
| SGM | 1/4 or larger | 6 or larger |

Performance specifications

Reference operating conditions

For determining the performance capabilities of our meters, the following conditions were observed/used:

- Water at 68 °F (20.0 °C) to 77 °F (25.0 °C) and 14.5 psig (1.000 barg) to 29 psig (2.00 barg)
- Air and Natural Gas at 68 °F (20.0 °C) to 77 °F (25.0 °C) and 500 psig (34.47 barg) to 1,450 psig (99.97 barg)
- Accuracy is verified by industry leading accredited calibration stands according to ISO 17025

Accuracy and repeatability on liquids and slurries

| Sensor | Accuracy ⁽¹⁾ | | Mass/volume flow repeatability |
|------------|--------------------------|----------------------------|--------------------------------|
| | Mass flow ⁽²⁾ | Volume flow ⁽²⁾ | |
| ELITE | ±0.05% | ±0.05% | ±0.025% |
| F-Series | ±0.05% | ±0.05% | ±0.025% |
| HPC-Series | ±0.20% | ±0.20% | ±0.10% |
| H-Series | ±0.05% | ±0.05% | ±0.025% |
| LF-Series | ±0.50% | ±0.50% | ±0.05% |
| LNG-Series | ±0.50% | n/a | ±0.25% |
| R-Series | ±0.40% | ±0.4% | ±0.20% |
| TA-Series | ±0.10% | ±0.10% | ±0.05% |
| T-Series | ±0.15% | ±0.25% | ±0.05% |

- (1) Flow rate accuracies are base percentages. For total accuracy see [Measurement accuracy for liquid meters](#). Stated accuracy includes the combined effects of repeatability, linearity, and hysteresis.
 (2) Flow rate accuracies may vary with calibration option selected. Consult the sensor Product Data Sheet for details.

Accuracy and repeatability on gases

| Sensor | Accuracy ⁽¹⁾ | Repeatability |
|------------|-------------------------|-------------------------------|
| CNG-Series | ±0.50% of rate | ±0.25% of rate |
| ELITE | ±0.25% of rate | ±0.20% of rate |
| F-Series | ±0.35% of rate | ±0.25% of rate |
| HPC-Series | ±0.50% of rate | ±0.25% of rate |
| H-Series | ±0.35% of rate | ±0.25% of rate |
| LF-Series | ±0.50% of rate | ±0.05% of rate ⁽²⁾ |
| LNG-Series | ±0.50% of rate | ±0.25% of rate |
| R-Series | ±0.75% of rate | ±0.5% of rate |
| T-Series | ±0.50% of rate | ±0.05% of rate |

- (1) Flow accuracies are base percentages. For total accuracy see [Table 10](#). Stated accuracy includes the combined effects of repeatability, linearity, and hysteresis.
 (2) ±0.05% of rate or 1/2[(zero stability/flow rate) x 100]% of flow rate, whichever is greater.

Liquid flow rates

| Family | Model | Nominal line size | | Maximum flow rate | | | |
|--------|---------|-------------------|------|-------------------|---------|--------|--------|
| | | inch | mm | lb/min | gal/min | kg/h | l/h |
| CDM | CDM100 | 1 | DN25 | 625 | 75 | 17,000 | 17,000 |
| ELITE | CMFS007 | 1/12 | DN1 | 1.50 | 0.180 | 40.9 | 40.9 |
| | CMFS010 | 1/10 | DN2 | 4.03 | 0.484 | 110 | 110 |

| Family | Model | Nominal line size | | Maximum flow rate | | | |
|----------------|---------|--|-------|-------------------|---------|-----------|-----------|
| | | inch | mm | lb/min | gal/min | kg/h | l/h |
| | CMFS015 | 1/6 | DN3 | 12.1 | 1.45 | 330 | 330 |
| | CMFS025 | 1/4 | DN6 | 77.0 | 9.23 | 2,100 | 2,100 |
| | CMFS040 | 3/8 | DN10 | 170 | 20.4 | 4,640 | 4,640 |
| | CMFS050 | 1/2 | DN15 | 250 | 30.0 | 6,820 | 6,820 |
| | CMFS075 | 3/4 | DN20 | 460 | 55.2 | 12,500 | 12,500 |
| | CMFS100 | 1 | DN25 | 950 | 114 | 25,900 | 25,900 |
| | CMFS150 | 1 1/2 | DN40 | 1,980 | 237 | 54,000 | 54,000 |
| | CMF010 | 1/10 | DN2 | 3.96 | 0.475 | 108 | 108 |
| | CMF025 | 1/4 | DN6 | 79.9 | 9.58 | 2,180 | 2,180 |
| | CMF050 | 1/2 | DN15 | 249 | 29.9 | 6,800 | 6,800 |
| | CMF100 | 1 | DN25 | 997 | 120 | 27,200 | 27,200 |
| | CMF200 | 2 | DN50 | 3,190 | 383 | 87,100 | 87,100 |
| | CMF300 | 3 | DN80 | 9,970 | 1,200 | 272,000 | 272,000 |
| | CMF350 | 4 | DN100 | 15,000 | 1,800 | 409,000 | 409,000 |
| | CMF400 | 6 | DN150 | 20,000 | 2,400 | 545,000 | 545,000 |
| | CMFH2C | 8 | DN200 | 54,000 | 6,440 | 1,470,000 | 1,470,000 |
| | CMFH3C | 10 | DN250 | 94,000 | 11,227 | 2,550,000 | 2,550,000 |
| | CMFH4C | 12 | DN300 | 120,000 | 14,350 | 3,266,000 | 3,266,000 |
| F-Series | F025 | 1/4 | DN6 | 100 | 12 | 2,720 | 2,720 |
| | F050 | 1/2 | DN15 | 300 | 36 | 8,160 | 8,160 |
| | F100 | 1 | DN25 | 1,200 | 144 | 32,650 | 32,650 |
| | F200 | 2 | DN50 | 3,200 | 384 | 87,100 | 87,100 |
| | F300 | 3 | DN80 | 8,744 | 1,047 | 238,499 | 238,499 |
| | F400 | 4 | DN100 | 16,000 | 1,916 | 436,000 | 436,000 |
| FDM, FVM, HFVM | | Line sizes and flow rates are installation-dependent. Contact your sales representative. | | | | | |
| HPC-Series | HPC010 | 1/8 | DN6 | 8.8 | 0.22 | 240 | 240 |
| | HPC015 | 1/8 | DN6 | 18.5 | 2.26 | 504 | 504 |
| H-Series | H025 | 1/4 | DN6 | 76 | 9 | 2,068 | 2,068 |
| | H050 | 1/2 | DN15 | 180 | 22 | 4,900 | 4,900 |
| | H100 | 1 | DN25 | 820 | 98 | 22,320 | 22,320 |
| | H200 | 2 | DN50 | 2,350 | 282 | 63,960 | 63,960 |
| | H300 | 3 | DN80 | 8,744 | 1,047 | 238,499 | 238,499 |
| | H400 | 4 | DN100 | 16,000 | 1,916 | 436,000 | 436,000 |

| Family | Model | Nominal line size | | Maximum flow rate | | | |
|------------|---------|-------------------|------|-------------------|---------|---------|---------|
| | | inch | mm | lb/min | gal/min | kg/h | l/h |
| LF-Series | LF2M | 1/32 | DN1 | 0.014 | 0.0017 | 0.38 | 0.38 |
| | LF3M | 1/16 | DN2 | 0.037 | 0.0043 | 1.00 | 1.00 |
| | LF4M | 1/8 | DN3 | 0.992 | 0.119 | 27.00 | 27.00 |
| LNG-Series | LNGM10S | 1 | DN25 | 661 | 18,000 | n/a | n/a |
| R-Series | R025 | 1/4 | DN6 | 100 | 12 | 2,720 | 2,720 |
| | R050 | 1/2 | DN15 | 300 | 36 | 8,160 | 8,160 |
| | R100 | 1 | DN25 | 1,200 | 144 | 32,650 | 32,650 |
| | R200 | 2 | DN50 | 3,200 | 384 | 87,100 | 87,100 |
| | R300 | 3 | DN80 | 8,744 | 1,047 | 238,499 | 238,499 |
| T-Series | T025 | 1/4 | DN6 | 25 | 3 | 680 | 680 |
| | T050 | 1/2 | DN15 | 140 | 17 | 3,800 | 3,800 |
| | T075 | 3/4 | DN20 | 500 | 60 | 14,000 | 14,000 |
| | T100 | 1 | DN25 | 1,100 | 132 | 30,000 | 30,000 |
| | T150 | 1 1/2 | DN40 | 3,200 | 384 | 87,000 | 87,000 |
| TA-Series | TA010T | 1/10 | DN6 | 12.9 | 1.5 | 350 | 350 |
| | TA025T | 1/4 | DN8 | 44.1 | 5.3 | 1,200 | 1,200 |
| | TA050T | 1/2 | DN15 | 110.2 | 13.2 | 3,000 | 3,000 |
| | TA075T | 3/4 | DN20 | 220.5 | 26.5 | 6,000 | 6,000 |
| | TA100T | 1 | DN25 | 661.4 | 79.4 | 18,000 | 18,000 |
| | TA200T | 2 | DN50 | 1102.3 | 132.3 | 30,000 | 30,000 |
| | TA300T | 3 | DN80 | 2,939.5 | 352.2 | 80,000 | 80,000 |

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 [Discover Flow Measurement Sizing and Selection Tool](#) for detailed information regarding performance and sizing of the meters.

Gas flow rates for Coriolis meters (except T-Series)

Use the following equation to determine general recommendations on nominal and maximum gas mass flow rates:

$$X_{(gas)} = \%M * \rho_{(gas)} * VOS * \frac{1}{4} \pi * D^2 * 2 \text{ (for sensors with dual-tube design)}$$

- $\dot{m}_{(gas)}$ Gas mass flow rate
- $\%M$ Use Mach number “0.2” for calculating typical nominal rate; use Mach number “0.3” for calculating maximum recommended rate. When Mach Numbers are above 0.3, most gas flows become compressible and significant increases in pressure drop may occur regardless of measurement device.
- $\rho_{(gas)}$ Gas density at operating conditions
- VOS Velocity of Sound of the measured gas
- D Internal diameter of the measuring tube

Note

Gas maximum flow rate can never be greater than the maximum liquid rate. Assume that the lower of the two rates is applicable.

Gas flow rates for T-Series meters

| Model | Mass | | Volume | |
|-------|--------|--------|--------|--------------------|
| | lb/min | kg/h | SCFM | Nm ³ /h |
| T025 | 2.8 | 76 | 64 | 100 |
| T050 | 20 | 540 | 460 | 780 |
| T075 | 75 | 2,000 | 1,700 | 2,800 |
| T100 | 160 | 4,300 | 3,700 | 6,300 |
| T150 | 400 | 10,000 | 9,500 | 16,000 |

Standard (SCFM) reference conditions for natural gas with molecular weight of 17 are 14.7 psig (1.014 barg) and 60 °F (15.6 °C).

Gas flow rates for GDM and SGM

| Meter | SCFM | Nm ³ /h | l/h |
|-------|--------|--------------------|-----|
| GDM | 0.0059 | 0.01 | 10 |
| SGM | 0.0412 | 0.07 | 70 |

Standard (SCFM) reference conditions are 14.7 psig (1.014 barg) and 60 °F (15.6 °C).

Liquid density accuracy and repeatability

Note

Meters not listed in the liquid density table are not designed to measure liquid density.

| Family | Accuracy | Repeatability |
|----------|---|---|
| CDM | ±0.1 kg/m ³ (±0.0001 g/cm ³) | ±0.02 kg/m ³ (±0.00002 g/cm ³) |
| ELITE | ±0.2 kg/m ³ (±0.0002 g/cm ³) | ±0.1 kg/m ³ (±0.0001 g/cm ³) |
| FDM | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.1 kg/m ³ (±0.0001 g/cm ³) |
| F-Series | ±0.5 kg/m ³ (±0.0005 g/cm ³) | ±0.2 kg/m ³ (±0.0002 g/cm ³) |

| Family | Accuracy | Repeatability |
|------------|---|---|
| FVM | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.1 kg/m ³ (±0.0001 g/cm ³) |
| HFVM | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.1 kg/m ³ (±0.0001 g/cm ³) |
| HPC-Series | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.5 kg/m ³ (±0.0005 g/cm ³) |
| H-Series | ±0.5 kg/m ³ (±0.0005 g/cm ³) | ±0.2 kg/m ³ (±0.0002 g/cm ³) |
| LF-Series | ±5 kg/m ³ (±0.005 g/cm ³) | ±2 kg/m ³ (±0.002 g/cm ³) |
| R-Series | ±3 kg/m ³ (±0.003 g/cm ³) | ±1.5 kg/m ³ (±0.0015 g/cm ³) |
| TA-Series | ±1 kg/m ³ (±0.001 g/cm ³) | ±0.5 kg/m ³ (±0.0005 g/cm ³) |
| T-Series | ±2 kg/m ³ (±0.002 g/cm ³) | ±0.5 kg/m ³ (±0.0005 g/cm ³) |

Gas density/specific gravity accuracy and repeatability

Note

Meters not listed in the gas density/specific gravity table are not designed to measure gas density/specific gravity.

| Meter | Accuracy | Repeatability |
|-------|------------------|------------------|
| GDM | ±0.1% of reading | 0.02% of reading |
| SGM | Up to ±0.1% | 0.02% of reading |

Temperature accuracy

| Family | Temperature accuracy |
|------------|---|
| CDM | BS1904 Class, DIN 43760 Class A (±0.15 +0.002 x Temp C) |
| ELITE | 1°C ±0.5% of reading |
| FDM | BS1904 Class, DIN 43760 Class B (±0.30 + 0.005T) |
| F-Series | 1°C ±0.5% of reading |
| FVM | BS1904 Class, DIN 43760 Class B (±0.30 + 0.005T) |
| GDM | IEC60751 Class A C= (±0.15 + 0.002T) RTD |
| HFVM | BS1904 Class, DIN 43760 Class B (±0.30 + 0.005T) |
| HPC-Series | 1°C ±0.5% of reading |
| H-Series | 1°C ±0.5% of reading |
| LF-Series | ±0.5 C |
| LNG-Series | ±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) |
| R-Series | 1°C ±0.5% of reading |
| SGM | IEC60751 Class A C= (±0.15 + 0.002T) RTD |
| TA-Series | ±1.5 °C ±0.5% of reading |

| Family | Temperature accuracy |
|----------|----------------------|
| T-Series | 1°C ±0.5% of reading |

Viscosity accuracy and repeatability

| Meter | Viscosity calibrated range | Maximum viscosity operating range | Accuracy | Repeatability |
|-------|----------------------------|--|--|-----------------|
| FVM | 0.5 to 12,500 cP | 0.5 to 20,000 cP (using up to four calibrated ranges) | ±0.2 cP over the 0.5-10 cP range, and then 1% full scale of the operating calibrated range | 0.5% of reading |
| HFVM | 0.5 to 100 cP | 0.5 to 100 cP (using up to two calibrated ranges) | ±0.2 cP over the 0.5-10 cP range, and then 1% full scale of the operating calibrated range | 0.5% of reading |

Temperature rating

| Family | Model | Temperature ⁽¹⁾ |
|------------------|------------------------------------|--------------------------------------|
| CNG-Series | CNG050 | -40 °F (-40 °C) to 257 °F (125 °C) |
| ELITE | Standard models | -400 °F (-240 °C) to 400 °F (204 °C) |
| | High-temperature models | -58 °F (-50 °C) to 662 °F (350 °C) |
| | CMFS models | -58 °F (-50 °C) to 400 °F (204 °C) |
| | Super Duplex models ⁽²⁾ | -40 °F (-40 °C) to 400 °F (204 °C) |
| F-Series | Standard models | -148 °F (-100 °C) to 400 °F (204 °C) |
| | High-temperature models | -40 °F (-40 °C) to 662 °F (350 °C) |
| HPC-Series | HPC010 | -58 °F (-50 °C) to 257 °F (125 °C) |
| | HPC015 | -50.8 °F (-46 °C) to 392 °F (200 °C) |
| H-Series | All models | -148 °F (-100 °C) to 400 °F (204 °C) |
| LF-Series | All models | 32 °F (0 °C) to -149 °F (-101 °C) |
| LNG-Series | All models | -320 °F (-196 °C) to 140 °F (60 °C) |
| R-Series | All models | -58 °F (-50 °C) to 302 °F (150 °C) |
| T-Series | All models | -60 °F (-51 °C) to 302 °F (150 °C) |
| TA-Series | All models | -40 °F (-40 °C) to 356 °F (180 °C) |
| CDM/FDM/FVM/HFVM | All models | -58 °F (-50 °C) to 392 °F (200 °C) |
| GDM | | 0 °F (-18 °C) to 257 °F (125 °C) |
| SGM | | 0 °F (-18 °C) to 122 °F (50 °C) |

(1) Temperature rating may be affected by electronics, hazardous area classification, and/or ambient temperature.

(2) Applications between 350 °F (177 °C) and 400 °F (204 °C) must be approved by Micro Motion metallurgy.

Process pressure ratings

Sensor maximum working pressure reflects the highest possible pressure rating for a given meter. Selection of process fitting as well as environmental and process fluid temperatures may reduce this maximum rating. Refer to the technical data sheet or contact the factory directly for detailed sensor pressure rating charts with corresponding de ratings for specific process fittings over a range of temperatures.

All sensors comply with ASME B31.3 piping code and council directive 97/23/EC of 29 May 1997 on Pressure Equipment.

Sensor maximum working pressure

| Family | Model | Wetted material | Pressure |
|------------|---|--|--|
| CNG-Series | CNG050 | Stainless steel | 5,000 psig (344.74 barg) |
| ELITE | Standard models | Stainless steel | 1,450 psig (99.97 barg) - 1,812 psig (124.93 barg) ⁽¹⁾ |
| | | Nickel alloy C22 (N06022) | 2,465 psig (169.96 barg) - 3,626 psig (250.00 barg) |
| | CMFS010P CMFS010H CMFS015P CMFS015H CMF010P | Nickel alloy C22 (N06022) ⁽²⁾ | 6,000 psig (413.69 barg) |
| | CMF400P | Nickel alloy C22 (N06022) | 2,973 psig (204.98 barg) |
| | CMFHC2Y CMFHC3Y | Super Duplex | 2,320 psig (159.96 barg) |
| F-Series | Standard models | Stainless steel | 1,450 psig (99.97 barg) |
| | | Nickel alloy C22 (N06022) | 2,160 psig (148.93 barg) |
| | F025P | Stainless steel | 2,320 psig (159.96 barg) |
| | F050P | Stainless steel | 5,000 psig (344.74 barg) |
| HPC-Series | HPC010P ⁽³⁾ | Nickel alloy C22 (N06022) | 15,000 psig (1,034.21 barg) |
| | HPC015M | Stainless steel | 6,991 psi (482.01 bar) |
| | HPC015N | Stainless steel | 13,960 psi (962.51 bar) |
| | HPC015P | Stainless steel | 15,374 psi (1,060.00 bar) |
| H-Series | All models | Stainless steel | 1,450 psig (99.97 barg) |
| LF-Series | All models | Stainless steel | 1,450 psig (99.97 barg) |
| LNG-Series | All models | Stainless steel | 725.2 psig (50.001 barg) |
| R-Series | All models | Stainless steel | 1,450 psig (99.97 barg) |
| T-Series | All models | Titanium | 1,450 psig (99.97 barg) |
| TA-Series | TA010T | Tantalum | 2,245 psig (154.79 barg) |
| | TA025T | Tantalum | 1,142 psig (78.74 barg) |
| | TA050T | Tantalum | 852 psig (58.74 barg) |
| | TA075T | Tantalum | 1,432 psig (98.73 barg) |
| | TA100T | Tantalum | 920 psig (63.43 barg) |
| | TA200T | Tantalum | 687 psig (47.37 barg) |
| | TA300T | Tantalum | 983 psig (68 barg) |

| Family | Model | Wetted material | Pressure |
|--------|------------|---|--------------------------------------|
| CDM | CDM100M | Stainless steel | 1,450 psig (99.97 barg) |
| | CDM100P | Nickel alloy C22 (N06022) | 3,600 psig (248.21 barg) |
| GDM | | Stainless steel | 3,625 psig (249.93 barg) |
| FDM | Short stem | Stainless steel, nickel alloy C22 (N06022), titanium, zirconium | 3,000 psig (206.84 barg) |
| | | Long stem | 1,450 psig (99.97 barg) |
| FVM | Short stem | Stainless steel | 3,000 psig (206.84 barg) |
| | Long stem | Stainless steel | 1,450 psig (99.97 barg) |
| HFVM | Short stem | Stainless steel | 3,000 psig (206.84 barg) |
| SGM | | Ni-Span-C | 145 psig (10.00 barg) ⁽⁴⁾ |

- (1) This range covers most of the pressure ratings for ELITE stainless steel meters. For a comprehensive list, see Micro Motion ELITE Coriolis Flow and Density Meters Product Data Sheet
- (2) Models CMF010P, CMFS010P, CMFS015P, and CMF400P have nickel alloy C22 (N06022) tubes and stainless steel fittings.
- (3) ETO H2 meter is 316L stainless steel material with standard helium leakage test procedure.
- (4) When the Sample Conditioning System is selected with a pressure regulator, the inlet pressure can be greater, up to 1,450 psig (99.97 barg) on some options.

For more information: www.emerson.com

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