

## Product Data Sheet

PS-00566, Rev. G

April 2013

# Micro Motion® LF-Series Low Flow Sensor and Transmitter

Micro Motion® LF-Series meters are the smallest Coriolis meters on the market, with a form factor the size of a handheld organizer.



### Highest precision from a miniaturized flow meter

- Patented optical sensing system delivers unparalleled sensitivity and stability
- Palm-sized form factor is ideal for tight spaces

### Scalable platform that solves challenges in the most demanding low-flow applications

- Three sizes are available, with the smallest capable of measuring flow rates down to 1 g/h
- High-speed DSP for accuracy under the toughest conditions

### Superior reliability

- No moving parts to wear or replace minimizes maintenance for long-term reliability
- Rugged construction for durability in the lab or in the field

ELITE® Peak performance Coriolis meter

F-Series High performance compact drainable Coriolis meter

H-Series Hygienic compact drainable Coriolis meter

T-Series Straight tube full-bore Coriolis meter

R-Series General purpose flow-only Coriolis meter

LF-Series Extreme low-flow Coriolis meter



# Micro Motion® LF-Series flowmeters

Micro Motion® LF-Series meters are the smallest Coriolis meters available on the market. With a footprint the size of a handheld organizer, you can fit this meter into any tight space for your low-flow needs.

Not only is the footprint small – so are the flow rates. With a range of 0.002 to 59.5 lb/hr (0.001 to 27 kg/h), you can measure mass or volume flow for drops of liquid or gas.

Like other Micro Motion meters, the LF-Series offers all the benefits of Coriolis:

- High accuracy, for a quicker ROI
- No moving parts, for reduced maintenance costs and downtime
- Direct measurement of mass, volume, temperature, and density for reduced instrumentation requirements
- Measurements unaffected by changing fluid properties, for no special installation requirements or manual calculations

## Applications

Micro Motion LF-Series meters are ideal for many low-flow applications, including flavoring, fragrances, and catalysts. LF-Series meters are designed to meet the demanding low-flow needs of a wide variety of industries such as chemical, petrochemical, life sciences, food and beverage, and oil and gas.

## LF-Series transmitters with MVD™

LF-Series transmitters are specially designed to work with LF-Series sensors on your low-flow applications. LF-Series transmitters incorporate MVD technology – an innovative, multivariable, digital signal processing capability. MVD technology:

- Improves ease of use with an easy-to-use display
- Reduces downtime with enhanced diagnostics
- Lowers your flowmetering costs with a 4-wire connection.

Transmitter features include:

- Milliampere and frequency/pulse outputs
- Transmitter and process control functions in a single device
- Field-mount or DIN rail mount transmitter
- Optional NEMA enclosures (field-mount transmitters only)
- Optional filling and dosing application software

## Make your process more profitable

Micro Motion LF-Series sensors and transmitters can be installed as part of a HART® Bell 202 multidrop network, a Modbus® RS-485 digital communications network, or a FOUNDATION™ fieldbus system.

All transmitters support Emerson Process Management's PlantWeb® field-based architecture, which uses the power of intelligent, interoperable field devices to improve plant performance.

Micro Motion is known worldwide for increasing plant efficiency, production, and profitability. More than 500,000 Micro Motion meters are installed and working in processes just like yours.

# Sensor specifications

## Liquid flow rates

|                    |      | Mass  |       | Volume <sup>(1)</sup> |       |
|--------------------|------|-------|-------|-----------------------|-------|
|                    |      | lb/hr | kg/h  | gal/hr                | l/h   |
| Maximum flow range | LF2M | 0.84  | 0.38  | 0.10                  | 0.38  |
|                    | LF3M | 2.21  | 1.00  | 0.26                  | 1.00  |
|                    | LF4M | 69.54 | 27.00 | 7.13                  | 27.00 |

(1) Volume measurement is based on a process-fluid density of 1 g/cm<sup>3</sup> (1000 kg/m<sup>3</sup>). For fluids with density other than 1 g/cm<sup>3</sup>, the volumetric flow rate equals the maximum mass flow rate divided by the fluid's density.

## Gas flow rates

Flow rates that produce approximately 14.5 psid (1.0 bar) pressure drop on air at 70 °F (21.1 °C) and 500 psi (35 bar)

|                    |      | Mass  |       | Volume |        |
|--------------------|------|-------|-------|--------|--------|
|                    |      | lb/hr | kg/h  | SCFH   | SCCM   |
| Typical flow range | LF2M | 0.227 | 0.103 | 3.034  | 1432   |
|                    | LF3M | 0.893 | 0.405 | 11.86  | 5595   |
|                    | LF4M | 8.026 | 3.640 | 106.7  | 50,350 |

## Liquid and gas performance

|                                   |          |                                                                                                                                                                    |
|-----------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mass flow accuracy <sup>(1)</sup> | Standard | $\pm 1.0\%$ of rate or $\pm \left[ \left( \frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater              |
|                                   | Optional | $\pm 0.5\%$ of rate or $\pm \left[ \left( \frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater              |
| Mass flow repeatability           |          | $\pm 0.05\%$ of rate or $\pm \frac{1}{2} \left[ \left( \frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater |

(1) Stated flow accuracy includes the combined effects of repeatability, linearity, and hysteresis. All specifications for liquids are based on reference conditions of water at 70 °F (21.1 °C).

# Sensor specifications *continued*

## Liquid and gas performance *continued*

|                                   |                                      |                                                                                                                                                                    |             |
|-----------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <b>Mass flow reproducibility</b>  |                                      | $\pm 0.05\%$ of rate or $\pm \frac{1}{2} \left[ \left( \frac{\text{zero stability}}{\text{flow rate}} \right) \times 100 \right] \%$ of rate, whichever is greater |             |
| <b>Zero stability</b>             |                                      | <b>lb/hr</b>                                                                                                                                                       | <b>kg/h</b> |
|                                   | LF2M                                 | 0.0003                                                                                                                                                             | 0.00013     |
|                                   | LF3M                                 | 0.0022                                                                                                                                                             | 0.00100     |
|                                   | LF4M                                 | 0.0088                                                                                                                                                             | 0.00400     |
| <b>Density</b>                    | Range <sup>(1)</sup>                 | 0 to 0.3 g/cm <sup>3</sup> (gas) and 0.5 to 2.0 g/cm <sup>3</sup> (liquid)                                                                                         |             |
|                                   | Accuracy <sup>(2)</sup> —liquid only | $\pm 0.005$ g/cm <sup>3</sup>                                                                                                                                      |             |
|                                   | Repeatability—liquid only            | $\pm 0.002$ g/cm <sup>3</sup>                                                                                                                                      |             |
| <b>Temperature</b>                | Ambient and process                  | 0 to 65 °C (32 to 149 °F)                                                                                                                                          |             |
|                                   | Accuracy                             | $\pm 0.5$ °C ( $\pm 1.0$ °F)                                                                                                                                       |             |
| <b>Maximum operating pressure</b> | Standard                             | 35 bar (500 psi)                                                                                                                                                   |             |
|                                   | Optional                             | 100 bar (1500 psi)                                                                                                                                                 |             |

(1) Contact factory for applications with fluid density between 0.3 and 0.5 g/cm<sup>3</sup>.

(2) At temperatures other than 70 °F (21.1 °C), you can expect an additional density error of approximately 0.0005 g/cm<sup>3</sup> per °C.

## Hazardous area classifications

|             |                                                                                                                                                                                                                   |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CSA</b>  | Class I Division 2 Groups A, B, C, D<br>Class II Division 2 Groups F and G<br>Class III Division 2                                                                                                                |
| <b>ATEX</b> |   II 3 G EEx nA II T4<br>II 3 D IP65 T135°C |

# Sensor specifications *continued*

## Materials of construction

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|                                            |                                                                           |
|--------------------------------------------|---------------------------------------------------------------------------|
| <b>Wetted parts</b>                        | 316/316L stainless steel                                                  |
| <b>Optional filter components (wetted)</b> | 302 and 316 stainless steel                                               |
| <b>Process seals</b>                       | Viton <sup>®</sup> fluoroelastomer <sup>(1)</sup> , Buna, Kalrez, or EPDM |
| <b>Housing</b>                             | Polyurethane-painted aluminum                                             |

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(1) Viton is a registered trademark of DuPont Performance Elastomers.

## Physical specifications

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|                        |              |
|------------------------|--------------|
| <b>Weight</b>          | 4 lbs (2 kg) |
| <b>Shipping weight</b> | 5 lbs (2 kg) |

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## Dimensions

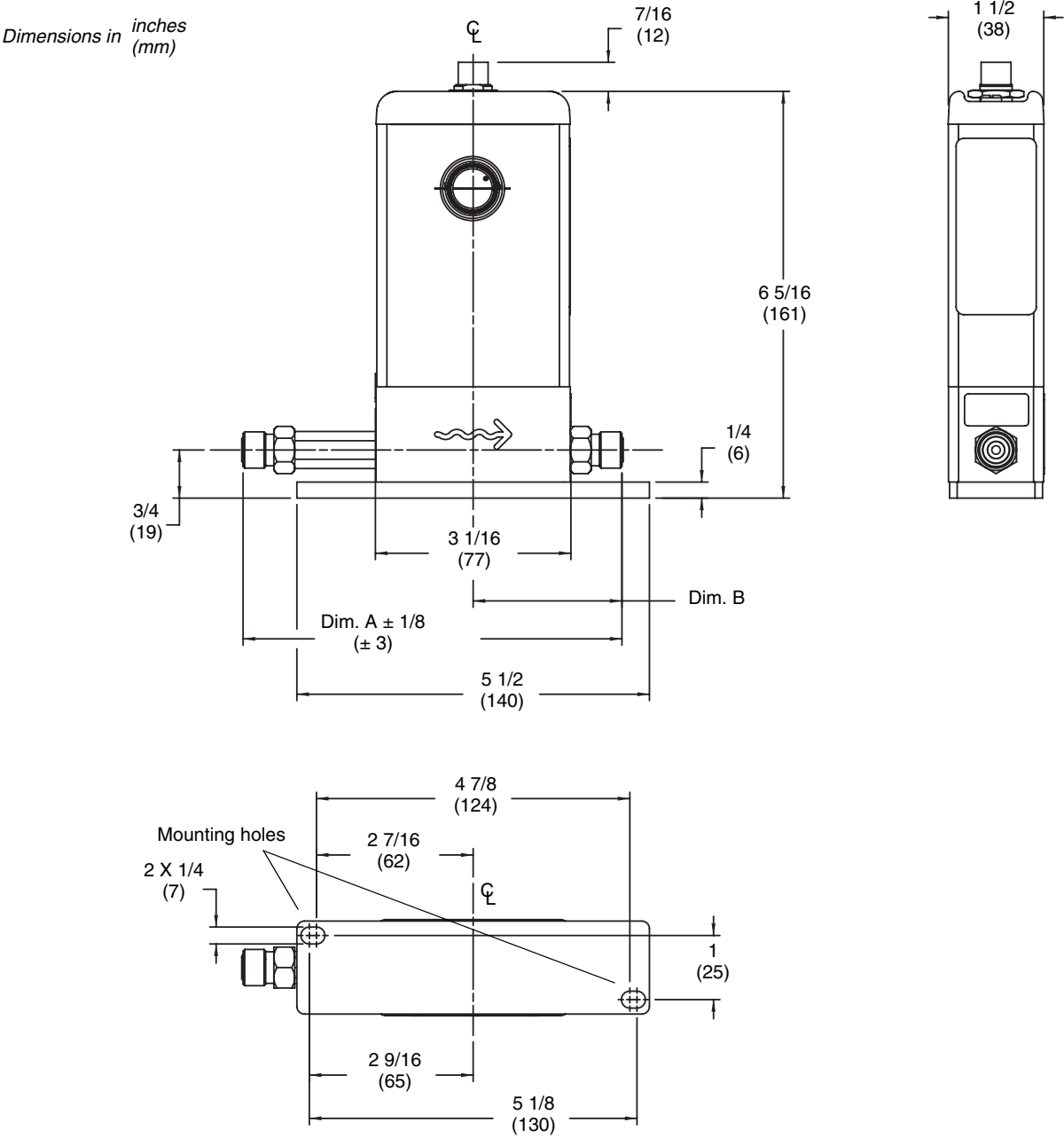
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| <b>Model</b> | <b>Fitting options</b>         | <b>Fitting code</b> | <b>Dim. A with filter<br/>inches (mm)</b> | <b>Dim. A without filter<br/>inches (mm)</b> | <b>Dim. B<br/>inches (mm)</b> |
|--------------|--------------------------------|---------------------|-------------------------------------------|----------------------------------------------|-------------------------------|
| All          | 1/4" tube compression fittings | 324                 | 6 1/4 (158)                               | 5 (126)                                      | 2 1/2 (63)                    |
|              | 1/8" tube compression fittings | 328                 | 5 15/16 (151)                             | 4 11/16 (119)                                | 2 5/16 (59)                   |
|              | 1/8" VCR                       | 327                 | 5 11/16 (144)                             | 4 3/8 (112)                                  | 2 3/16 (56)                   |
|              | 1/4" VCR                       | 322                 | 6 3/8 (162)                               | 5 1/8 (129)                                  | 2 9/16 (65)                   |
|              | 1/4" VCO                       | 323                 | 5 7/8 (149)                               | 4 5/8 (117)                                  | 2 5/16 (59)                   |
|              | 6 mm tube compression fittings | 325                 | 6 1/4 (158)                               | 5 (126)                                      | 2 1/2 (63)                    |

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# Sensor specifications *continued*

## Dimensions *continued*



# Transmitter specifications

## Transmitter outputs

|                                                       | Field mount                                | DIN rail mount                                               |
|-------------------------------------------------------|--------------------------------------------|--------------------------------------------------------------|
| 1 mA output, 1 frequency/pulse output                 | Mounting and outputs codes 1 and 3 (FM AN) | Mounting and outputs code 2 (DIN AN)                         |
| 2 mA outputs, 1 frequency/pulse output (configurable) | Mounting and outputs code 4 (FM CIO)       | Mounting and outputs code 5 (DIN CIO)                        |
| 1 mA output, 1 or 2 discrete outputs                  | —                                          | Mounting and outputs code 8 (filling and dosing application) |
| FOUNDATION fieldbus                                   | Mounting and outputs code 6 (FM FB)        | (Not available)                                              |

## Transmitters with configurable I/O

The field-mount and DIN rail transmitters (mounting and outputs codes 4 and 5, with configurable I/O), are designed to increase transmitter flexibility and reduce the number of transmitter variations required in inventory.

The table below shows the various configuration options that can be produced with the configurable I/O output option. All transmitters ship with the default process variable assignment, but can be configured in the field.

| Channel | Terminals   |          | Configuration option                           | Default process variable assignment | Power                                   |
|---------|-------------|----------|------------------------------------------------|-------------------------------------|-----------------------------------------|
|         | Field mount | DIN rail |                                                |                                     |                                         |
| A       | 1 & 2       | 21 & 22  | mA output 1 (with Bell 202 HART)               | Mass flow                           | Internal (active)                       |
| B       | 3 & 4       | 23 & 24  | mA output 2 (default)                          | Density                             | Internal (active)                       |
|         |             |          | Frequency output (FO) <sup>(1)</sup>           | Mass flow                           | Internal (active) or external (passive) |
|         |             |          | Discrete output 1 (DO1)                        | Fwd/Rev                             |                                         |
| C       | 5 & 6       | 31 & 32  | Frequency output (FO) (default) <sup>(1)</sup> | Mass flow                           | Internal (active) or external (passive) |
|         |             |          | Discrete output 2 (DO2)                        | Flow switch                         |                                         |
|         |             |          | Discrete input (DI)                            | None                                |                                         |

(1) When configured for two FOs (dual pulse), FO2 is generated from the same FO signal sent to the first FO. FO2 is electrically isolated but not independent.

# Transmitter specifications *continued*

## Transmitters with FOUNDATION fieldbus

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|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fieldbus software functionality</b>        | FOUNDATION fieldbus software is designed to permit remote testing and configuration of the transmitter using the DeltaV™ Fieldbus Configuration Tool, or other FOUNDATION fieldbus compliant hosts. The Coriolis sensor signal is channelled through the flowmeter to the control room and the FOUNDATION fieldbus configuration device.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Transducer blocks</b>                      | <p>Transducer blocks hold data from the Coriolis sensor, including process variables, configuration, calibration, and diagnostics.</p> <p>The transmitter provides up to seven transducer blocks:</p> <ul style="list-style-type: none"><li>• Measurement For process variables</li><li>• Calibration For calibration information</li><li>• Diagnostic For diagnosing problems and running diagnostic tests (including the new in-situ meter verification procedure, if the transmitter is paired with an enhanced core processor)</li><li>• Device Information For data such as sensor type</li><li>• Local Display For configuring the transmitter display</li><li>• API For petroleum measurement calculations using API MPMS Chapter 11.1</li><li>• Enhanced Density For complex density and concentration calculations (e.g., %HFCS, SG60/60)</li></ul> |
| <b>Resource block</b>                         | The resource block contains physical device information, including available memory, manufacturer identification, type of device, and features.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Analog input function blocks</b>           | The Analog Input (AI) function block processes the measurement from the Coriolis sensor and makes it available to other function blocks. It also allows filtering, alarm handling, and engineering unit changes. Each of the four AI blocks can be assigned to one of 20 available variables.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Analog output block</b>                    | The AO function block assigns an output value to a field device through a specified channel. The block supports mode control, signal status calculation, and simulation. The AO block can report either pressure from an external pressure source or temperature from an external temperature source.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Proportional integral derivative block</b> | The optional proportional integral derivative (PID) function block combines all the necessary logic to perform proportional/integral/derivative control. The block supports mode control, signal scaling and limiting, feed forward control, override tracking, alarm limit detection, and signal status propagation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Integrator block</b>                       | The integrator block provides functionality for the transmitter totalizers. The flow variable (mass or volume) can be selected and reset.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Diagnostics and service</b>                | <p>The transmitter automatically performs continuous self diagnostics. Using the Diagnostic transducer block, the user can perform on-line testing of the transmitter and sensor. Diagnostics are event driven and do not require polling for access.</p> <p>The transmitter also supports meter fingerprinting, which allows you to capture device-level snapshots of your meter performance.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

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# Transmitter specifications *continued*

## Field mount

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|                         |                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical specifications | Housing                      | Polyurethane-painted cast aluminum, NEMA 4X (IP 67)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                         | Weight                       | With display: 3.6 kg (8 lb)<br>Without display: 3.2 kg (7 lb)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                         | Mounting and cabling         | Transmitters include a mounting bracket. Hardware for installing the transmitter on the mounting bracket is included. The transmitter can be rotated on the mounting bracket 360° in 90° increments. Cable with a pre-installed Eurofast connector can be purchased in lengths up to 1000 ft (300 m).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                         | Interface/display (optional) | Segmented 2-line LCD display with optical controls and flowmeter-status LED is standard. <ul style="list-style-type: none"><li>• LCD line 1 lists the process variable.</li><li>• LCD line 2 lists engineering unit of measure.</li></ul> Non-glare tempered glass lens.<br>Available in both backlit and non-backlit versions. Display is suitable for hazardous area installation. To facilitate various mounting orientations, the display can be rotated on the transmitter 360° in 90° increments.<br>Display controls feature optical switches that are operated through the glass with a red LED for visual feedback to confirm when a “button” is pressed.<br>Display functions: <ul style="list-style-type: none"><li>• View process variables</li><li>• Start, stop, and reset totalizers</li><li>• View and acknowledge alarms</li><li>• Off-line (where applicable):<ul style="list-style-type: none"><li>- Zero flowmeter</li><li>- Simulate outputs</li><li>- Change measurement units</li><li>- Configure outputs</li><li>- Set RS-485 communications options</li></ul></li></ul> |
|                         | Status light                 | Three-color LED status light on display panel indicates flowmeter condition at a glance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

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# Transmitter specifications *continued*

## Field mount *continued*

|                               |                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical connections</b> | Input and output connections                  | <p>One (mounting and outputs codes 6 and 7), two (mounting and outputs codes 1 and 3), or three (mounting and outputs code 4) pairs of wiring terminals for transmitter outputs</p> <p>Screw terminals accept one or two solid conductors, 14 to 12 AWG (2.5 to 4.0 mm<sup>2</sup>); or one or two stranded conductors, 22 to 14 AWG (0.34 to 2.5 mm<sup>2</sup>)</p>                                                                                                                               |
|                               | Power connections                             | <p>One pair of wiring terminals accepts AC or DC power</p> <p>One internal ground lug for power-supply ground wiring</p> <p>Screw terminals accept one or two solid conductors, 14 to 12 AWG (2.5 to 4.0 mm<sup>2</sup>); or one or two stranded conductors, 22 to 14 AWG (0.34 to 2.5 mm<sup>2</sup>)</p>                                                                                                                                                                                          |
|                               | Service port connection                       | Two clips for temporary connection to the service port                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                               | Sensor connection                             | <p>Two pairs of terminals for the 4-wire connection to the sensor</p> <ul style="list-style-type: none"> <li>• One pair is used for the RS-485 connection to the sensor</li> <li>• One pair is used to supply power to the sensor</li> </ul> <p>Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 2.5 mm<sup>2</sup>)</p>                                                                                                                                                   |
| <b>Input/output signals</b>   | All transmitters                              | One 4-wire sensor signal input connection with ground                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                               | Mounting and outputs code 1 or 3 (1 mA, 1 FO) | <p>One active 4–20mA output</p> <ul style="list-style-type: none"> <li>• Not intrinsically safe</li> <li>• Isolated to ±50 VDC from all other outputs and earth ground</li> <li>• Maximum load limit: 820 ohms</li> <li>• Flow-only transmitter can report mass flow or volume flow</li> <li>• Multivariable transmitter can report mass flow, volume flow, density, temperature, or drive gain</li> <li>• Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)</li> </ul> |

# Transmitter specifications *continued*

## Field mount *continued*

Mounting and outputs code 4  
(2 mA, 1 FO configurable,  
multivariable transmitter only)

- One active or passive frequency/pulse output
- Not intrinsically safe
- Can report mass flow or volume flow, which can be used to indicate flow rate or total
- Flow-only transmitter: frequency output reports the same flow variable as the mA output
- Multivariable transmitter: frequency output is independent of the mA output
- Scalable to 10,000 Hz
- Maximum output of +24 VDC  $\pm 3\%$  with a 2.2 kohm internal pull-up resistor
- Output is linear with flow rate to 12,500 Hz

- One or two active 4–20 mA outputs
- Not intrinsically safe
- Isolated to  $\pm 50$  VDC from all other outputs and earth ground
- Maximum load limit:
  - mA1: 820 ohms
  - mA2: 420 ohms
- Can report mass flow, volume flow, density, temperature, or drive gain
- Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)

- One active or passive frequency/pulse output
- Not intrinsically safe
- Can report mass flow or volume flow, which can be used to indicate flow rate or total
- Scalable to 10,000 Hz
- Power:
  - Internal (active): +15 VDC  $\pm 3\%$  with a 2.2 kohm internal pull-up resistor
  - External (passive): +30 VDC maximum, +24 VDC typical, sinking up to 500 mA at 30 VDC.
- Output is linear with flow rate to 12,500 Hz

- One or two active or passive discrete outputs
- Not intrinsically safe
- Can report five discrete events: flow switch, forward/reverse flow, calibration in progress, or fault
- Power:
  - Internal (active): +15 VDC  $\pm 3\%$  with a 2.2 kohm internal pull-up resistor
  - External (passive): +30 VDC maximum, +24 VDC typical, sinking up to 500 mA at 30 VDC

# Transmitter specifications *continued*

## Field mount *continued*

|                               |                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |                                                   | <p>One discrete input</p> <ul style="list-style-type: none"> <li>• Can be configured for internal or external power</li> <li>• Not intrinsically safe</li> <li>• Power           <ul style="list-style-type: none"> <li>- Internal (active): +15 VDC, 7 mA maximum source current</li> <li>- External (passive): +3 to 30 VDC maximum</li> </ul> </li> <li>• Can start/stop totals and inventories, reset all totals, reset mass total, reset volume total, start sensor zero, or initiate multiple actions</li> </ul> |
|                               | Mounting and outputs code 6 (FOUNDATION fieldbus) | <p>One FOUNDATION fieldbus H1 output</p> <p>Manchester-encoded digital signal conforms to IEC 1158-2. Intrinsically safe with an intrinsically safe power supply.</p> <p>Transmitter fieldbus circuit is passive, and draws power from the fieldbus segment. Current draw from the fieldbus segment is 11.5 mA.</p>                                                                                                                                                                                                    |
| <b>Digital communications</b> | All transmitters                                  | <p>One service port can be used for temporary connection only</p> <p>Uses RS-485 Modbus signal, 38.4 kilobaud, one stop bit, no parity</p>                                                                                                                                                                                                                                                                                                                                                                             |
|                               | Mounting and outputs code 1, 3, or 4              | <p>HART Bell 202 signal is superimposed on the primary milliamp output, and is available for host system interface:</p> <ul style="list-style-type: none"> <li>• Frequency: 1.2 and 2.2 kHz</li> <li>• Amplitude: to 1.0 mA</li> <li>• 1200 baud</li> <li>• Requires 250 to 600 ohms resistance</li> </ul>                                                                                                                                                                                                             |
|                               | Mounting and outputs code 1 or 3                  | <p>One RS-485 output can be used for direct connection to a HART or Modbus host system. Modbus communications supports 7-bit or 8-bit protocol (default: 8-bit), 1200 to 38,400 baud (default: 9600), one or two stop bits (default: one), and odd, even, or no parity (default: odd). Configuration can be changed using Micro Motion® ProLink® II software.</p>                                                                                                                                                      |
|                               | Mounting and outputs code 6 (FOUNDATION fieldbus) | <p>Transmitters are registered with the Fieldbus Foundation, and conform to the FOUNDATION fieldbus H1 protocol specification.</p> <p>FNICO: Field device in compliance with EN 60079-27:2006 and IEC 60079-27:2005-04</p>                                                                                                                                                                                                                                                                                             |

# Transmitter specifications *continued*

## Field mount *continued*

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|                              |                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                              |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Power supply</b>          | Self-switching AC/DC input, automatically recognizes supply voltage.<br>Complies with low voltage directive 2006/95/EC per EN 61010-1 (IEC 61010-1) with amendment 2. Installation (Overvoltage) Category II, Pollution Degree 2.<br>The transmitter fieldbus circuit is passive, and draws its power from the fieldbus segment. Current draw from the fieldbus segment is 11.5 mA. |                                                                                                                                                                                                                                                                                                                              |
|                              | AC power                                                                                                                                                                                                                                                                                                                                                                            | 85 to 265 VAC, 50/60 Hz, 6 watts typical, 11 watts maximum                                                                                                                                                                                                                                                                   |
|                              | DC power                                                                                                                                                                                                                                                                                                                                                                            | 18 to 100 VDC, 6 watts typical, 11 watts maximum<br>At startup, transmitter power source must provide a minimum of 1.5 amperes of short-term current at a minimum of 18 volts at the transmitter's power input terminals.<br>Minimum 22 VDC with 1000 feet of 18 AWG (300 meters of 0.8 mm <sup>2</sup> ) power supply cable |
|                              | Fuse                                                                                                                                                                                                                                                                                                                                                                                | IEC 127-1.25 fuse, slow blow                                                                                                                                                                                                                                                                                                 |
| <b>Environmental limits</b>  | Ambient temperature limits                                                                                                                                                                                                                                                                                                                                                          | Operating and storage: -40 to +140 °F (-40 to +60 °C)<br>Display responsiveness decreases and display may become difficult to read below -4 °F (-20 °C). Above 131 °F (55 °C), some darkening of the display might occur.<br>ATEX requires limiting ambient temperature to below 131 °F (55 °C).                             |
|                              | Humidity limits                                                                                                                                                                                                                                                                                                                                                                     | 5 to 95% relative humidity, non-condensing at 140 °F (60 °C)                                                                                                                                                                                                                                                                 |
|                              | Vibration limits                                                                                                                                                                                                                                                                                                                                                                    | Meets IEC68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0 g.                                                                                                                                                                                                                                                    |
| <b>Environmental effects</b> | EMI effects                                                                                                                                                                                                                                                                                                                                                                         | Complies with NAMUR NE21 (August 1998 German and May 1999 English).<br>Meets EMC directive 89/336/EEC per EN 50081-2 (August 1993) and EN50082-2 (March 1995) and EN 61326 Industrial.                                                                                                                                       |
|                              | Ambient temperature effect                                                                                                                                                                                                                                                                                                                                                          | On analog outputs ±0.005% of span per °C                                                                                                                                                                                                                                                                                     |

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# Transmitter specifications *continued*

## Field mount *continued*

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|--------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hazardous area classifications | CSA  | Class I Division 2 Groups A, B, C, D<br>Class II Division 2 Groups F and G<br>Class III Division 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                | ATEX | <p>Output option codes 1, 3, or 4:<br/>With display:<br/>  II 3 G EEx nC IIB+H2 T6<br/>II 3 D IP66/IP67 T65°C</p> <p>Without display or with optional display cover:<br/>  II 3 G EEx nC IIC T6<br/>II 3 D IP66/IP67 T65°C</p> <p>Output option codes 6:<br/>With display:<br/>  II 3 G EEx nC [L] IIB+H2 T6<br/>II 3 D IP66/IP67 T65°C</p> <p>Without display or with optional display cover:<br/>  II 3 G EEx nC [L] IIC T6<br/>II 3 D IP66/IP67 T65°C</p> |

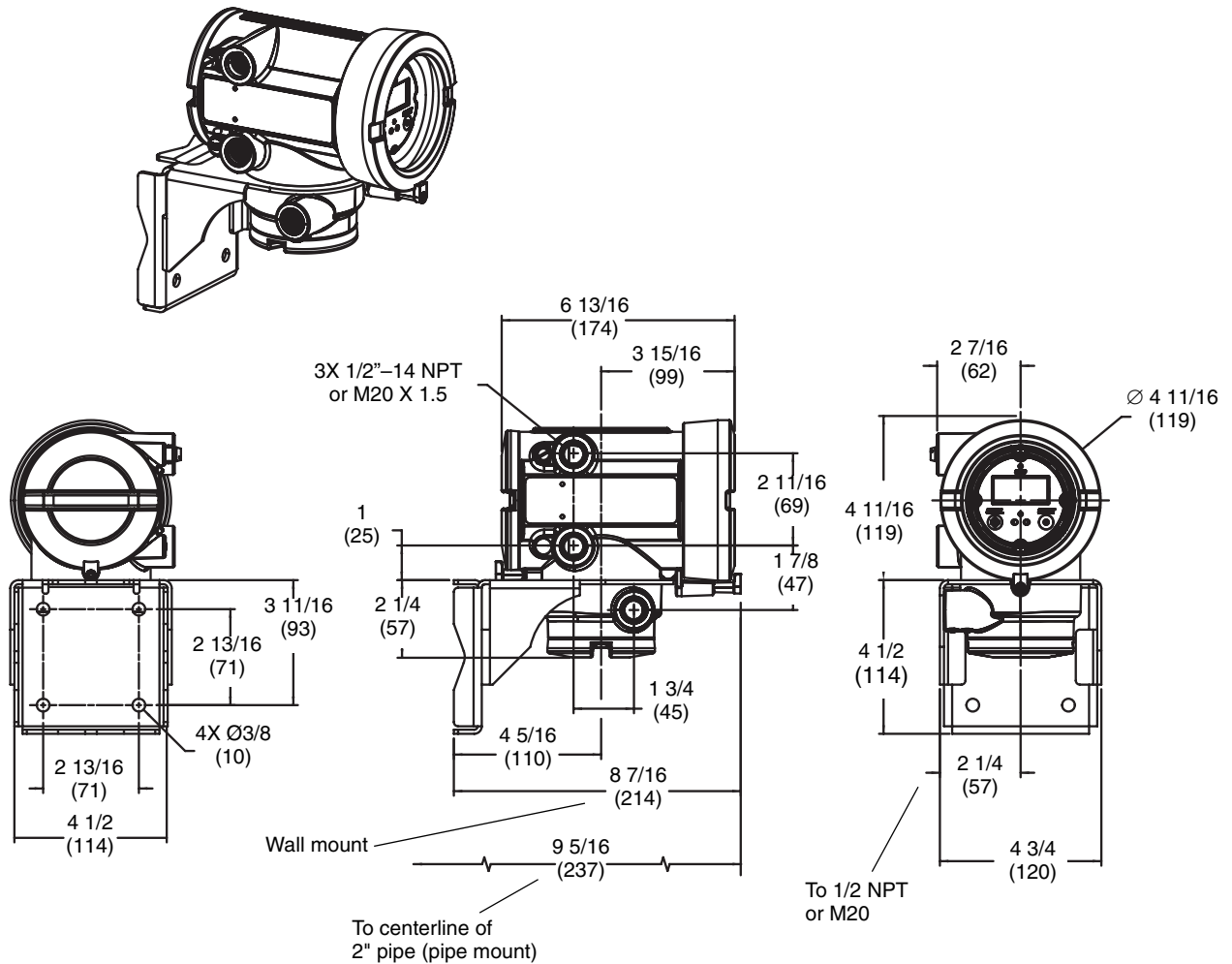
# Transmitter specifications *continued*

## Field mount *continued*

### Dimensions

With display

Dimensions in *inches*  
(mm)

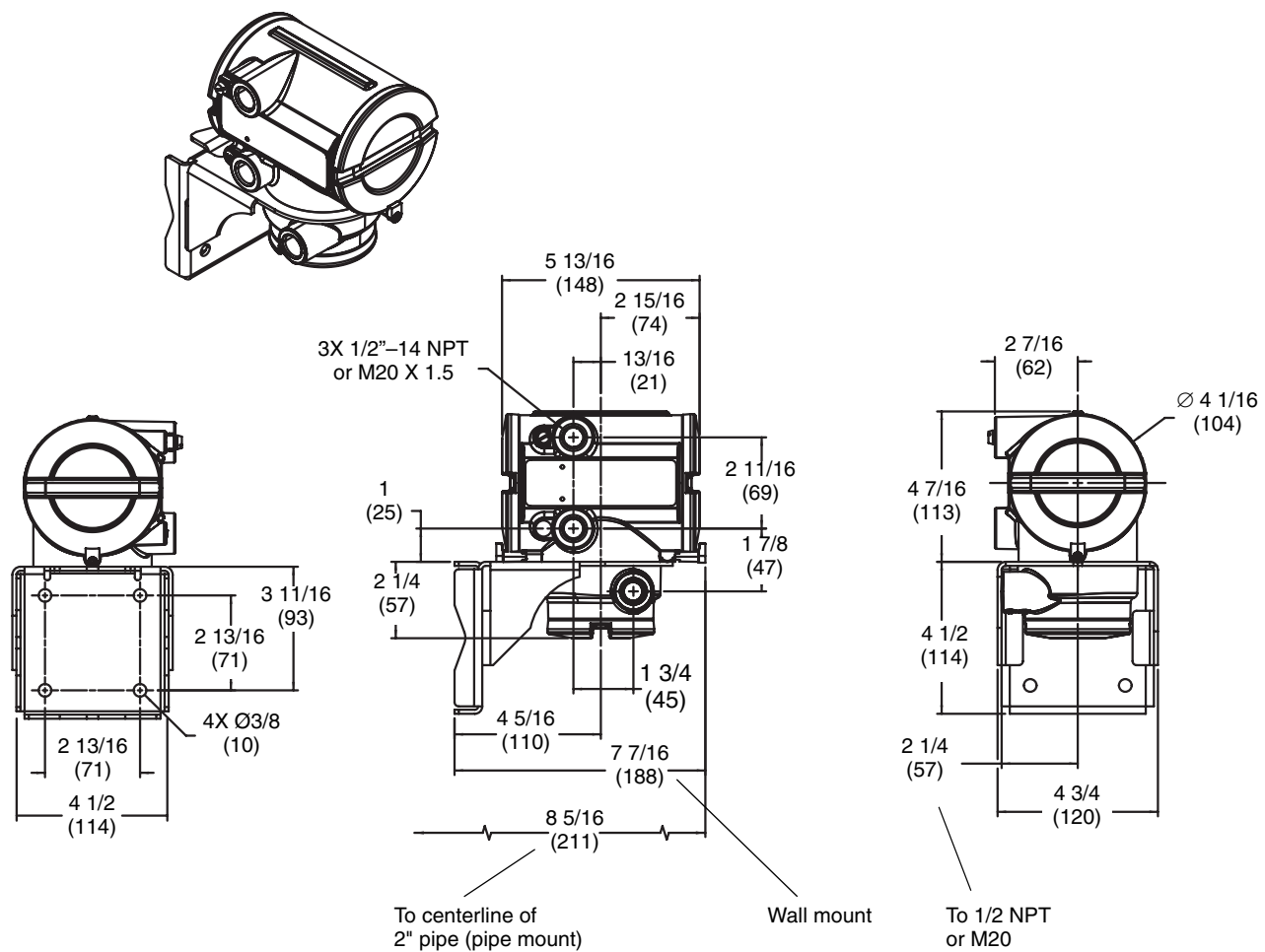


## Transmitter specifications *continued*

### Field mount *continued*

Without display

Dimensions in inches  
(mm)



# Transmitter specifications *continued*

## DIN rail mount

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|                                |                      |                                                                                                                                                                                                    |
|--------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Physical specifications</b> | Housing              | Polyamide PA 6.6                                                                                                                                                                                   |
|                                | Weight               | 0.52 lbs (0.24 kg)                                                                                                                                                                                 |
|                                | Mounting and cabling | DIN rail transmitters are mounted on a 35 mm rail. The rail must be grounded.<br>Cable with a pre-installed Eurofast connector can be purchased in lengths up to 1000 ft (300 m).                  |
|                                | Status LED           | Three-color LED status light on face of transmitter indicates flowmeter condition at a glance, using a solid green, yellow or red light. Zero in progress is indicated by a flashing yellow light. |
|                                | Zero button          | A zero button on the face of the transmitter can be used to start the transmitter zero process.                                                                                                    |

---

|                               |                              |                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical connections</b> | Input and output connections | Three pairs of wiring terminals for transmitter outputs<br>One pair of terminals for digital communications (Modbus/RS-485)<br>Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 3.5 mm <sup>2</sup> )                                                                                                            |
|                               | Power connections            | Two pairs of terminals <ul style="list-style-type: none"><li>• Either pair accepts DC power</li><li>• The remaining pair is used for making a jumper connection to a second transmitter</li></ul> Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 3.5 mm <sup>2</sup> )                                         |
|                               | Sensor connection            | The transmitter has two pairs for the 4-wire connection to the sensor <ul style="list-style-type: none"><li>• One pair is used for the RS-485 connection to the sensor</li><li>• One pair is used to supply power to the sensor</li></ul> Plug connectors accept stranded or solid conductors, 24 to 12 AWG (0.2 to 3.5 mm <sup>2</sup> ) |

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# Transmitter specifications *continued*

## DIN rail mount *continued*

| Input/output signals | All transmitters                                                                            | One 4-wire sensor signal input connection with ground                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                      | Mounting and outputs code 2<br>(1 mA, 1 FO)                                                 | <p>One active 4–20mA output</p> <ul style="list-style-type: none"> <li>• Not intrinsically safe</li> <li>• Isolated to <math>\pm 50</math> VDC from all other outputs and earth ground</li> <li>• Maximum load limit: 820 ohms</li> <li>• Can report mass flow or volume flow</li> <li>• Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)</li> </ul> <p>One active or passive frequency/pulse output</p> <ul style="list-style-type: none"> <li>• Not intrinsically safe</li> <li>• Can report mass flow or volume flow, which can be used to indicate flow rate or total</li> <li>• Frequency output reports the same flow variable as the mA output</li> <li>• Scalable to 10,000 Hz</li> <li>• Maximum output of +15 VDC <math>\pm 3\%</math> with 2.2 kohm internal pull-up resistor</li> <li>• Output is linear with flow rate to 12,500 Hz</li> </ul>                                                                                                                                                                                                                |
|                      | Mounting and outputs code 5<br>(2 mA, 1 FO configurable,<br>multivariable transmitter only) | <p>One or two active 4–20 mA outputs</p> <ul style="list-style-type: none"> <li>• Not intrinsically safe</li> <li>• Isolated to <math>\pm 50</math> VDC from all other outputs and earth ground</li> <li>• Maximum load limit: <ul style="list-style-type: none"> <li>- mA1: 820 ohms</li> <li>- mA2: 420 ohms</li> </ul> </li> <li>• Can report mass flow, volume flow, density, temperature, or drive gain</li> <li>• Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)</li> </ul> <p>One active or passive frequency/pulse output</p> <ul style="list-style-type: none"> <li>• Not intrinsically safe</li> <li>• Can report mass flow or volume flow, which can be used to indicate flow rate or total</li> <li>• Scalable to 10,000 Hz</li> <li>• Power: <ul style="list-style-type: none"> <li>- Internal (active): +15 VDC <math>\pm 3\%</math> with 2.2 kohm internal pull-up resistor</li> <li>- External (passive): +30 VDC maximum, 24 VDC typical, sinking up to 500 mA at 30 VDC</li> </ul> </li> <li>• Output is linear with flow rate to 12,500 Hz</li> </ul> |

# Transmitter specifications *continued*

## DIN rail mount *continued*

Mounting and outputs code 8  
(1 mA, 1 or 2 discrete outputs,  
1 discrete input)

One or two active or passive discrete outputs

- Not intrinsically safe
- Can report five discrete events: flow switch, forward/reverse flow, calibration in progress, or fault
- Power:
  - Internal (active): +15 VDC  $\pm 3\%$  with 2.2 kohm internal pull-up resistor
  - External (passive): +30 VDC maximum, +24 VDC typical, sinking up to 500 mA at 30 VDC
- Maximum sink capability: 500 mA

One discrete input

- Can be configured for internal or external power
- Not intrinsically safe
- Power:
  - Internal: +15 VDC, 7 mA maximum source current
  - External: +3 to 30 VDC maximum
- Can start/stop totals and inventories, reset all totals, reset mass total, reset volume total, start sensor zero, or initiate multiple actions

One active 4–20 mA output

- Not intrinsically safe
- Isolated to  $\pm 50$  VDC from all other outputs and earth ground
- Maximum load limit: 600  $\Omega$
- Can report mass flow or volume flow, or can control a two-position discrete valve or three-position analog valve
- Output is linear with process from 3.8 to 20.5 mA, per NAMUR NE43 (June 1994)

One or two discrete outputs

- Channels B and C can be configured as discrete outputs
- Can report fill in progress or fault, or can control discrete valve
- Maximum sink capability is 500 mA
- Configurable for internal or external power:
  - Internally powered to 15 VDC  $\pm 3\%$ , internal 2.2 k $\Omega$  pull-up, or
  - Externally powered 3–30 VDC max., sinking up to 500 mA at 30 VDC maximum

# Transmitter specifications *continued*

## DIN rail mount *continued*

|                               |                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                               |                                                                                                                                                                                                                                                                            | <p>One discrete input</p> <ul style="list-style-type: none"> <li>• Channel C can be configured as a discrete input</li> <li>• Configurable for internal or external power</li> <li>• Can be used to begin fill, end fill, pause fill, resume fill, reset fill total, reset mass total, reset volume total, or reset all totals (includes fill total)</li> </ul>                        |
| <b>Digital communications</b> | All transmitters                                                                                                                                                                                                                                                           | <p>One pair of terminals supports Modbus/RS485 signal or SP (service port) mode. HART/Bell 202 signal is superimposed on the primary mA output, and is available for host system interface</p> <ul style="list-style-type: none"> <li>• Frequency: 1.2 and 2.2 kHz</li> <li>• Amplitude: to 1.0 mA</li> <li>• 1200 baud</li> <li>• Requires 250 to 600 ohms load resistance</li> </ul> |
| <b>Power supply</b>           | <p>Transmitter's power supply:</p> <ul style="list-style-type: none"> <li>• Requires DC power</li> <li>• Meets Installation (Overvoltage) Category II, Pollution Degree 2 requirements</li> <li>• Contains an IEC 1.6A slow blow fuse</li> </ul> <p>Power requirements</p> | <p>Minimum 19.2 to 28.8 VDC, 6.3 watts</p> <p>At startup, transmitter power source must provide a minimum of 1.0 amperes of short-term current per transmitter</p> <p>Length and conductor diameter of the power cable must be sized to provide 19.2 VDC minimum at the power terminals, at a load current of 330 mA</p>                                                               |
| <b>Environmental limits</b>   | <p>Ambient temperature limits</p> <p>Humidity limits</p> <p>Vibration limits</p>                                                                                                                                                                                           | <p>Operating: –40 to +131 °F (–40 to +55 °C)<br/>Storage: –40 to +185 °F (–40 to +85 °C)<br/>If temperature is above 113 °F (45 °C) and you are mounting multiple transmitters, they must be mounted at least 8.5 mm apart.</p> <p>5 to 95% relative humidity, non-condensing at 140 °F (60 °C)</p> <p>Meets IEC68.2.6, endurance sweep, 5 to 2000 Hz, 50 sweep cycles at 1.0g.</p>    |

# Transmitter specifications *continued*

## DIN rail mount *continued*

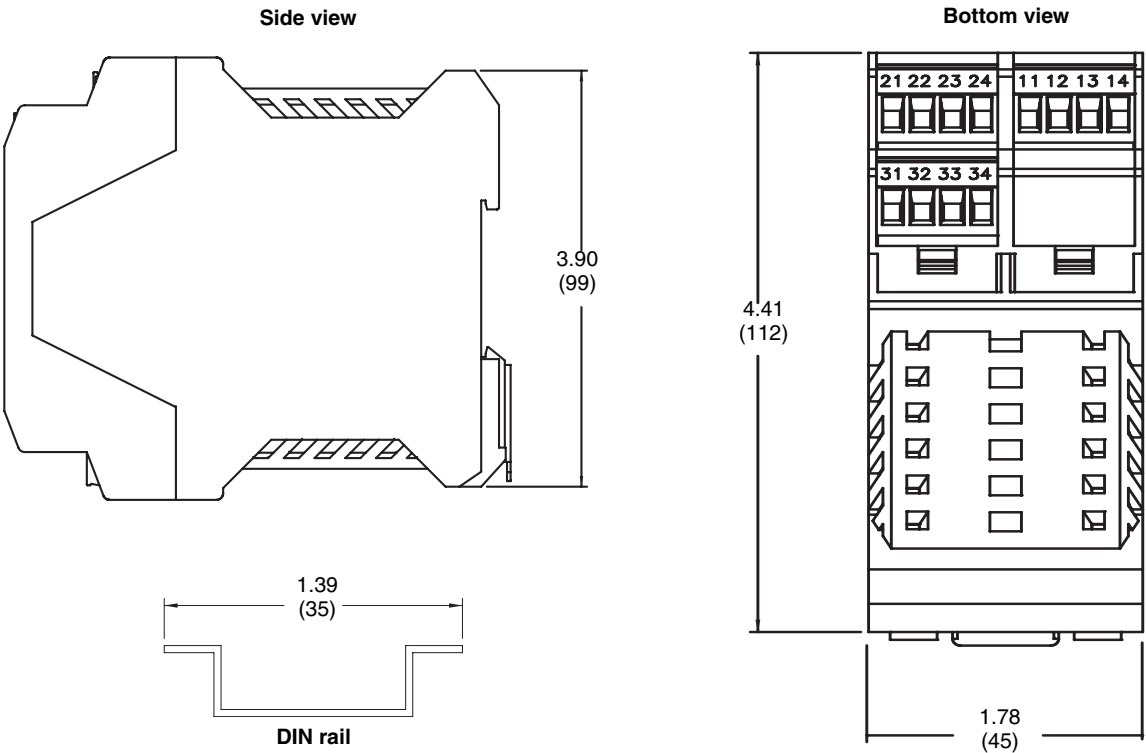
|                                       |                            |                                                                                                                                                                                          |
|---------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmental effects</b>          | EMI effects                | Complies with NAMUR NE21 (August 1998 German and May 1999 English).<br>Meets EMC directive 89/336/EEC per EN 50081-2 (August 1993), EN 50082-2 (March 1995), and EN 61326 Industrial.    |
|                                       | Ambient temperature effect | On analog outputs $\pm 0.005\%$ of span per °C                                                                                                                                           |
| <b>Hazardous area classifications</b> | CSA                        | Class I Division 2 Groups A, B, C, D<br>Class II Division 2 Groups F and G<br>Class III Division 2                                                                                       |
|                                       | ATEX                       | Transmitter has no ATEX classification, and should be installed only in safe areas.<br>Transmitter outputs are acceptable for connecting to a sensor (II 3G EEx nA) in a hazardous area. |

# Ordering information

## DIN rail mount *continued*

### Dimensions

Dimensions in *inches*  
*(mm)*



# Ordering information

## Sensor

| Code                   | Product description                                                                            |
|------------------------|------------------------------------------------------------------------------------------------|
| LF2M                   | Micro Motion Coriolis Low Flow sensor, 316L stainless steel                                    |
| LF3M                   | Micro Motion Coriolis Low Flow sensor, 316L stainless steel                                    |
| LF4M                   | Micro Motion Coriolis Low Flow sensor, 316L stainless steel                                    |
| Code                   | Process connection                                                                             |
| 324                    | 1/4" tube compression fittings                                                                 |
| 328                    | 1/8" tube compression fittings                                                                 |
| 327                    | 1/8" VCR                                                                                       |
| 322                    | 1/4" VCR                                                                                       |
| 323                    | 1/4" VCO                                                                                       |
| 325                    | 6 mm tube compression fittings                                                                 |
| 998 <sup>(1)</sup>     | ETO fittings                                                                                   |
| Code                   | Surface finish                                                                                 |
| 1                      | 32 Ra (0.8 µm)                                                                                 |
| Code                   | Pressure rating                                                                                |
| 1                      | 35 bar (500 psi)                                                                               |
| 2                      | 100 bar (1500 psi)                                                                             |
| Code                   | O-rings                                                                                        |
| K                      | Kalrez                                                                                         |
| V                      | Viton                                                                                          |
| B                      | Buna                                                                                           |
| E                      | EPDM                                                                                           |
| Code                   | Electronics interface                                                                          |
| F                      | 4-wire integrated core processor for remote mount transmitters (field-mount or DIN rail mount) |
| G                      | 4-wire integrated core processor for direct host connection                                    |
| Code                   | Approvals                                                                                      |
| M                      | Micro Motion standard (no approval)                                                            |
| A <sup>(2)</sup>       | CSA (U.S.A. and Canada)                                                                        |
| L <sup>(2)</sup>       | ATEX — Equipment Category 3 (Zone 2)                                                           |
| Code                   | Language                                                                                       |
| E                      | English manuals                                                                                |
| Code                   | Filters                                                                                        |
| A <sup>(3)</sup>       | None                                                                                           |
| B <sup>(4)</sup>       | 10 Micron                                                                                      |
| C <sup>(3)</sup>       | 20 Micron                                                                                      |
| D <sup>(3)</sup>       | 30 Micron                                                                                      |
| E <sup>(3)</sup>       | 40 Micron                                                                                      |
| F <sup>(4)</sup>       | 1 Micron                                                                                       |
| Code                   | Calibration options                                                                            |
| A                      | 0.5% factory calibration                                                                       |
| Z                      | No special calibration (1%)                                                                    |
| Continued on next page |                                                                                                |

## Ordering information *continued*

### Sensor *continued*

| Code                                               | Measurement application software    |
|----------------------------------------------------|-------------------------------------|
| Z                                                  | No measurement application software |
| Code                                               | Factory options                     |
| Z                                                  | Standard product                    |
| X                                                  | ETO product                         |
| Typical model number: LF4M 324 1 1 V F M E B Z Z Z |                                     |

(1) Requires factory option X.

(2) Electronics interface code F only.

(3) Not available for Model LF2M.

(4) B or F required for Model LF2M.

### Transmitter

| Code                   | Product description                                                                       |
|------------------------|-------------------------------------------------------------------------------------------|
| LFT <sup>(1)</sup>     | Micro Motion Coriolis Low Flow transmitter for use with LF-Series sensors                 |
| Code                   | Mounting and outputs                                                                      |
| 1                      | 1 mA/1 FO flow-only 4-wire field mount transmitter                                        |
| 2                      | 1 mA/1 FO flow-only 4-wire DIN rail mount transmitter                                     |
| 3                      | 1 mA/1 FO multivariable 4-wire field mount transmitter                                    |
| 4                      | 2 mA/1 FO configurable multivariable 4-wire field mount transmitter                       |
| 5                      | 2 mA/1 FO configurable multivariable 4-wire DIN rail mount transmitter                    |
| 6                      | FOUNDATION fieldbus 4-wire field mount transmitter with standard fieldbus function blocks |
| 8 <sup>(2)</sup>       | 1 mA/2 DO/RS485 4-wire DIN rail mount transmitter with filling and dosing application     |
| Code                   | Display                                                                                   |
| 1 <sup>(3)</sup>       | Dual line display for process variables and totalizer reset                               |
| 2 <sup>(3)</sup>       | Backlit dual line display for process variables and totalizer reset                       |
| 3                      | No display                                                                                |
| Code                   | Conduit connections                                                                       |
| A <sup>(4)</sup>       | None                                                                                      |
| B <sup>(3)</sup>       | 1/2" No gland                                                                             |
| C <sup>(3)</sup>       | 1/2" Brass/nickel cable gland                                                             |
| D <sup>(3)</sup>       | 1/2" Stainless steel cable gland                                                          |
| E <sup>(3)</sup>       | M20 — no gland                                                                            |
| F <sup>(3)</sup>       | M20 — brass/nickel cable gland                                                            |
| G <sup>(3)</sup>       | M20 — stainless steel cable gland                                                         |
| Code                   | Approvals                                                                                 |
| M                      | Micro Motion standard (no approval)                                                       |
| A                      | CSA (U.S.A. and Canada)                                                                   |
| L <sup>(3)</sup>       | ATEX — Equipment Category 3 (Zone 2)                                                      |
| Code                   | Language                                                                                  |
| E                      | English manuals                                                                           |
| Continued on next page |                                                                                           |

# Ordering information *continued*

## Transmitter *continued*

| Code                                      | Software options                                                             |
|-------------------------------------------|------------------------------------------------------------------------------|
| B <sup>(2)</sup>                          | Filling and dosing application                                               |
| Z                                         | Reserved for future use                                                      |
| Code                                      | Software options 2                                                           |
| A <sup>(5)</sup>                          | Regulatory control suite: standard fieldbus function blocks plus 1 PID block |
| Z                                         | No software options 2                                                        |
| Code                                      | Factory options                                                              |
| Z                                         | Standard product                                                             |
| X                                         | ETO product                                                                  |
| Typical model number: LFT 1 3 A A E Z Z Z |                                                                              |

- (1) This transmitter is specially designed to interface with an LF-Series sensor. LF-Series sensors are compatible only with this specific transmitter; they are not compatible with standard Micro Motion transmitters. Likewise, this transmitter is not compatible with standard Micro Motion sensors.
- (2) Software option code B and mounting and output option 8 must be selected together.
- (3) Not available with mounting and outputs code 2 or 5.
- (4) Mounting and outputs codes 2 and 5 only.
- (5) Mounting and outputs code 6 only.

## Cable

| Model                              | PVC insulation                                                |
|------------------------------------|---------------------------------------------------------------|
| CLFTS <sup>(1)</sup>               | 4-wire shielded cable with Eurofast connector; braided shield |
| Code                               | Cable options                                                 |
| ZZ                                 | Future expansion                                              |
| Code                               | Cable options                                                 |
| 010                                | 6.5 ft (2 m)                                                  |
| 015                                | 20 ft (6 m)                                                   |
| 050                                | 50 feet (16 m)                                                |
| 250                                | 200 ft (60 m)                                                 |
| 500                                | 500 ft (150 m)                                                |
| Typical model number: CLFTS ZZ 050 |                                                               |

- (1) 6.5 ft (2 m) of cable with Eurofast connector ships at no charge with every LF-Series sensor. Order additional cable or longer cable as required.





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