

# Micro Motion® Gas Density Meters

## Fiscal gas density meter

### Precision gas density measurement

- Fast-response, direct gas density measurement that is compliant with AGA 3 and ISO 5167
- Accuracy up to  $\pm 0.1\%$  of reading over a range of 1–400 kg/m<sup>3</sup>
- Superior application performance via traceable calibrations

### Superior multi-variable I/O, meter health, and application capabilities

- Hazardous-area approved, head-mounted transmitter that supports local configuration and display
- Internal diagnostics for fast verification of meter health and status
- Application-specific factory configurations ensure fit-for-purpose operation

### Installation flexibility and compatibility

- Unaffected by process or gas composition variations using proven Ni-Span-C vibrating cylinder technology
- Supports multiple protocols for connection to DCS, PLC, and flow computers
- Full backwards compatibility for Micro Motion 7812 gas density meters
- Optional stainless steel transmitter housing for corrosion resistance in harsh environments



Compact Density Meter

Peak performance  
precision density meter

Fork Density Meter

Direct insertion  
density meter**Gas Density Meter****Fiscal gas  
density meter**

Specific Gravity Meter

Gas specific gravity  
meter

Fork Viscosity Meter

High performance multi-variable  
viscosity meter

Heavy Fuel Viscosity Meter

Multi-variable marine and power  
HFO viscosity meter

MICRO MOTION™

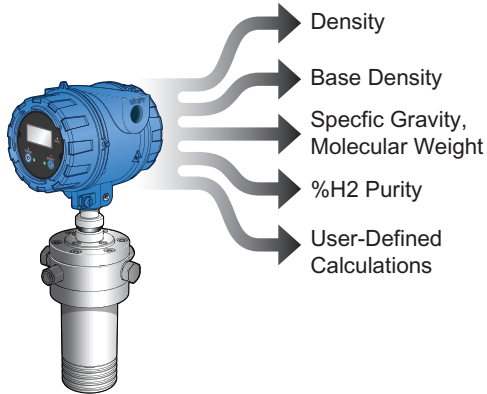

  
EMERSON™

# Micro Motion® Gas Density Meters

Micro Motion® gas density meters use proven Ni-Span-C vibrating cylinder technology to provide fast-response, precision gas density measurement over a wide operating range. These rugged meters are designed for the fiscal and custody transfer metering of high-value products such as natural gas, fuel gas, and hydrogen at temperatures up to 125 °C (257 °F) and pressures up to 250 bar (3625 psi).

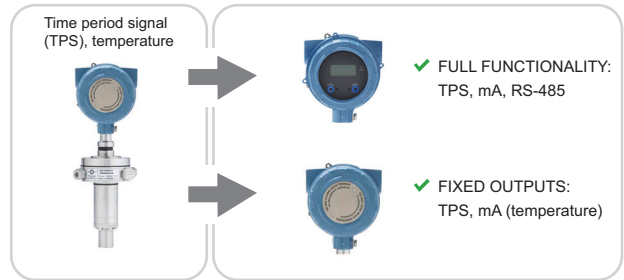
## Application configurations

Allows you to preselect an application-specific configuration for your meter from a wide range of options.



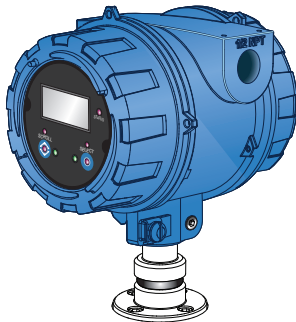
## Retrofit capabilities

Full backwards compatibility that provides the same form and fit as the Micro Motion 7812 gas density meter.



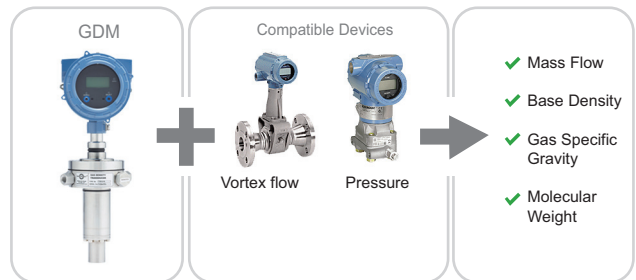
## Integral transmitter

Supports Time Period Signal (TPS), 2-wire TPS, Analog (4-20 mA), HART, WirelessHART®, and Modbus RS-485 communications.



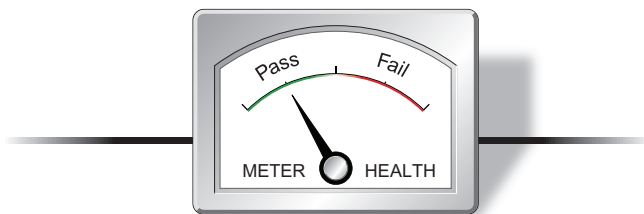
## Interconnectivity

Integral HART I/O allows direct input of external temperature, pressure, and flow measurements for enhanced measurements.



## Meter diagnostics

Ensure measurement health through known density verification (KDV) and other meter and installation diagnostic capabilities.

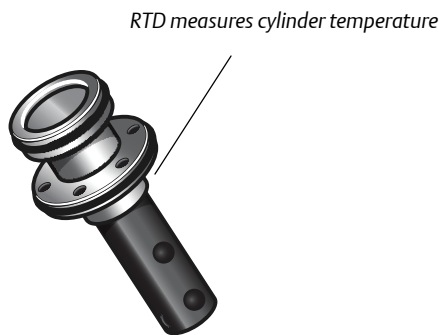
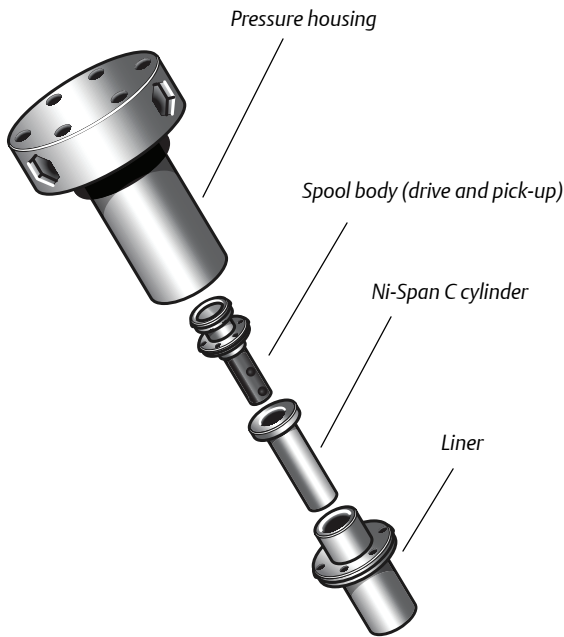


## Certifications and standards

Calibrations and compliance with domestic and international standards.

✓	ATEX, CSA, IECEx
✓	AGA3, ISO 5167
✓	HART, WirelessHART, Modbus
✓	NAMUR, NACE

# Operating principle



## Cylinder vibration

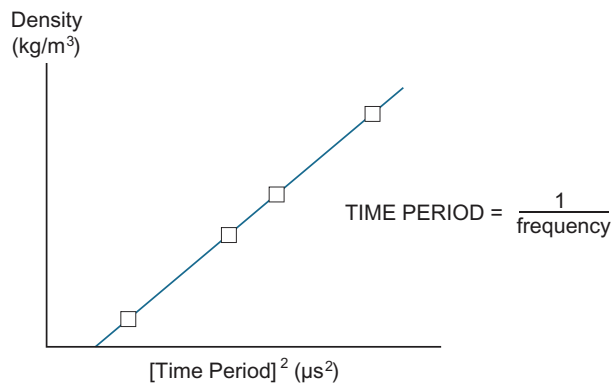
- A Ni-Span C cylinder is mounted inside a pressure-retaining assembly containing the process gas.
- The Ni-Span C cylinder is vibrated electro-magnetically at its natural frequency.
- The natural frequency of the cylinder changes with the density of the surrounding gas.

## Temperature measurement

- A class 'A' RTD measures the temperature.
- Micro Motion transmitters use this reading to optimize performance over a wide range of process conditions.

## Density calibration

- Micro Motion transmitters accurately measure time period.
- Measured time periods are converted into density readings using meter calibration coefficients.
- Minimum of 12 calibration points ensures optimum meter performance.



# Performance specifications

## Density measurement

Specification	Value	
Density range	1–400 kg/m <sup>3</sup>	0.001–0.4 g/cm <sup>3</sup>
Accuracy	<ul style="list-style-type: none"> <li>■ Argon: ±0.1% of reading</li> <li>■ Nitrogen: ±0.1% of reading</li> <li>■ Natural gas, ethylene: ±0.15% of reading</li> </ul>	
Repeatability	±0.02% of reading	
Maximum operating pressure	200 bar	2900 psi
Process gas	Must be dry, dust free, and compatible with Ni-Span C 902, 316L stainless steel, Stycast catalyst 11, and Invar/Radiometal	

## Temperature measurement

Specification	Value		
Temperature range	Standard model <sup>(1)</sup>	–20 °C to +85 °C	–4 °F to +185 °F
	High-temperature model	–20 °C to +125 °C	–4 °F to +257 °F
Temperature coefficient	0.001 kg/m <sup>3</sup> per °C	0.000001 g/cm <sup>3</sup> per °F	
Integral temperature measurement	<ul style="list-style-type: none"> <li>■ Technology: 100 Ω RTD</li> <li>■ Accuracy: BS1904 Class, DIN 43760 Class A</li> </ul>		

(1) Or, as limited by the dew point of the gas. See sensor temperature rating code A.

# Transmitter specifications

## Available transmitter versions

Application	Transmitter version <sup>(1)</sup>	Output channels		
		A	B	C
<ul style="list-style-type: none"> <li>■ General purpose measurement</li> <li>■ DCS/PLC connection</li> </ul>	Analog	4–20 mA + HART	4–20 mA	Modbus/RS-485
<ul style="list-style-type: none"> <li>■ General purpose measurement with output switch</li> </ul>	Discrete	4–20 mA + HART	Discrete output	Modbus/RS-485
<ul style="list-style-type: none"> <li>■ Fiscal/Custody Transfer</li> <li>■ Flow Computer connection</li> </ul>	Time Period Signal (TPS)	4–20 mA + HART	Time Period Signal (TPS)	Modbus/RS-485
	Fixed	4–20 mA (temperature)	Time period signal (TPS)	Disabled
	2-wire Time Period Signal (TPS) <sup>(2)</sup>	Disabled	4-wire 100Ω, RTD	

(1) For more information on the transmitter outputs and ordering codes, see the product ordering information.

(2) For the 2-wire transmitter version, TPS is superimposed on power lines.

## Local display

Design	Features
Physical	<ul style="list-style-type: none"> <li>■ Segmented two-line LCD screen.</li> <li>■ Can be rotated on transmitter, in 90-degree increments, for ease of viewing.</li> <li>■ Suitable for hazardous area operation.</li> <li>■ Optical switch controls for hazardous area configuration and display.</li> <li>■ Glass lens.</li> <li>■ Three-color LED indicates meter and alert status.</li> </ul>
Functions	<ul style="list-style-type: none"> <li>■ View process variables.</li> <li>■ View and acknowledge alerts.</li> <li>■ Configure mA and RS-485 outputs.</li> <li>■ Supports Known Density Verification (KDV).</li> <li>■ Supports multiple languages.</li> </ul>

## Process measurement variables

Variables	Value
Standard	<ul style="list-style-type: none"> <li>■ Density</li> <li>■ Temperature</li> <li>■ Drive gain</li> <li>■ External temperature input</li> <li>■ External pressure input</li> <li>■ User-defined calculation output</li> </ul>
Derived	<p>The derived output variables vary, depending on the application configuration of the meter.</p> <ul style="list-style-type: none"> <li>■ Density at reference conditions</li> <li>■ Molecular weight</li> </ul>
Derived (when external device connected)	<ul style="list-style-type: none"> <li>■ Mass flow</li> <li>■ Base density</li> </ul>

## Additional communication options

The following communications accessories are purchased separately from the meter.

Type	Description
WirelessHART <sup>®</sup>	Wireless HART is available via the THUM adapter
HART <sup>®</sup> Tri-Loop	Three additional 4–20 mA outputs are available via connection to a HART Tri-Loop

## Hazardous area approvals

Ambient and process temperature limits are defined by temperature graphs for each meter and electronics interface option. Detailed approval specifications, including temperature graphs for all meter configurations, can be found at the Micro Motion web site (at [www.micromotion.com](http://www.micromotion.com)).

Type	Description
ATEX	<b>With display:</b> <ul style="list-style-type: none"> <li>■ II 2G Ex ia IIC T4 Gb (–40 °C to +65 °C)</li> </ul> <b>Without display:</b> <ul style="list-style-type: none"> <li>■ II 2G Ex ia IIC T6 Gb (–40 °C to +65 °C<sup>(1)</sup>)</li> </ul>
CSA C-US	<ul style="list-style-type: none"> <li>■ Class I, Division I, Groups A, B, C &amp; D</li> <li>■ Class II, Division I, Groups E, F, &amp; G</li> </ul>
IECEX	<b>With display:</b> <ul style="list-style-type: none"> <li>■ Ex ia IIC T4 Ga (–40 °C to +65 °C)</li> </ul> <b>Without display:</b> <ul style="list-style-type: none"> <li>■ Ex ia IIC T6 Ga (–40 °C to +65 °C<sup>(1)</sup>)</li> </ul>

(1) Maximum ambient temperature of the 2-wire TPS transmitter version is 75 °C (167 °F).

## Environmental specifications

Type	Rating
Electromagnetic compatibility	All versions conform to the latest international standards for EMC, and are compliant with EN 61326
Humidity limits	5 to 95% relative humidity, non-condensing at 140 °F (60 °C)
Ingress protection rating	<ul style="list-style-type: none"> <li>■ IP66/67, NEMA4 aluminum housing</li> <li>■ NEMA4X stainless steel housing</li> </ul>

## Physical specifications

### Mechanical specifications

Type	Description
Process gas connection	1/4-inch NPT female
Integral filters	<ul style="list-style-type: none"> <li>■ Inlet: 2 micron</li> <li>■ Outlet: 90 micron</li> </ul>

## Materials of construction

Pressure-retaining wetted parts	
Interior liner	UNS S17400
Pressure housing	316L stainless steel
O-Rings	Viton
Non-pressure-retaining wetted parts	
Cylinder	Ni-Span C
Spool body	Stycast catalyst 11, Invar/Radiometal
Non-wetted part materials	
Transmitter housing	Polyurethane-painted aluminum or 316L stainless steel

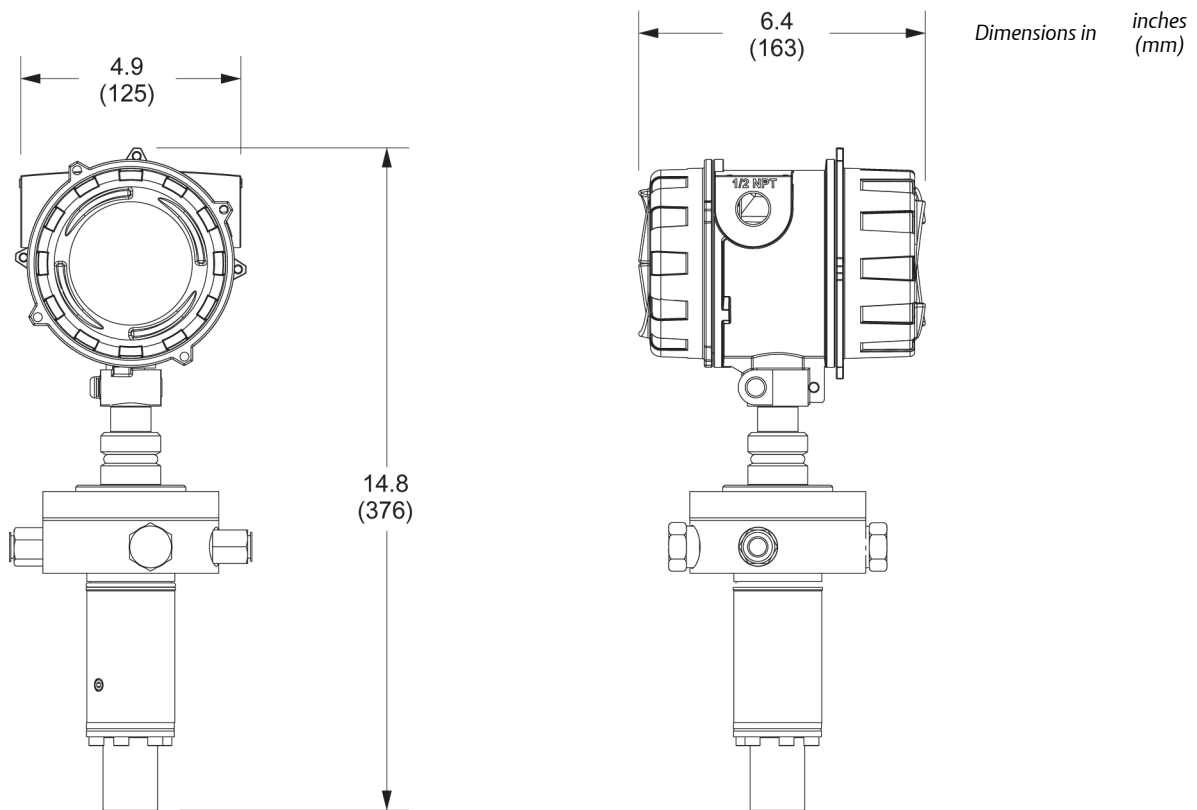
## Weight

Weight with aluminum housing	Weight with stainless steel housing
Approximately 11 lbs (5 kg)	Approximately 17 lbs (8 kg)

## Dimensions

These dimensional drawings are intended to provide a basic guideline for sizing and planning. Complete and detailed dimensional drawings can be found through the product drawings link in our online store ([www.micromotion.com/onlinestore](http://www.micromotion.com/onlinestore)).

Figure 1: Gas density meter dimensions

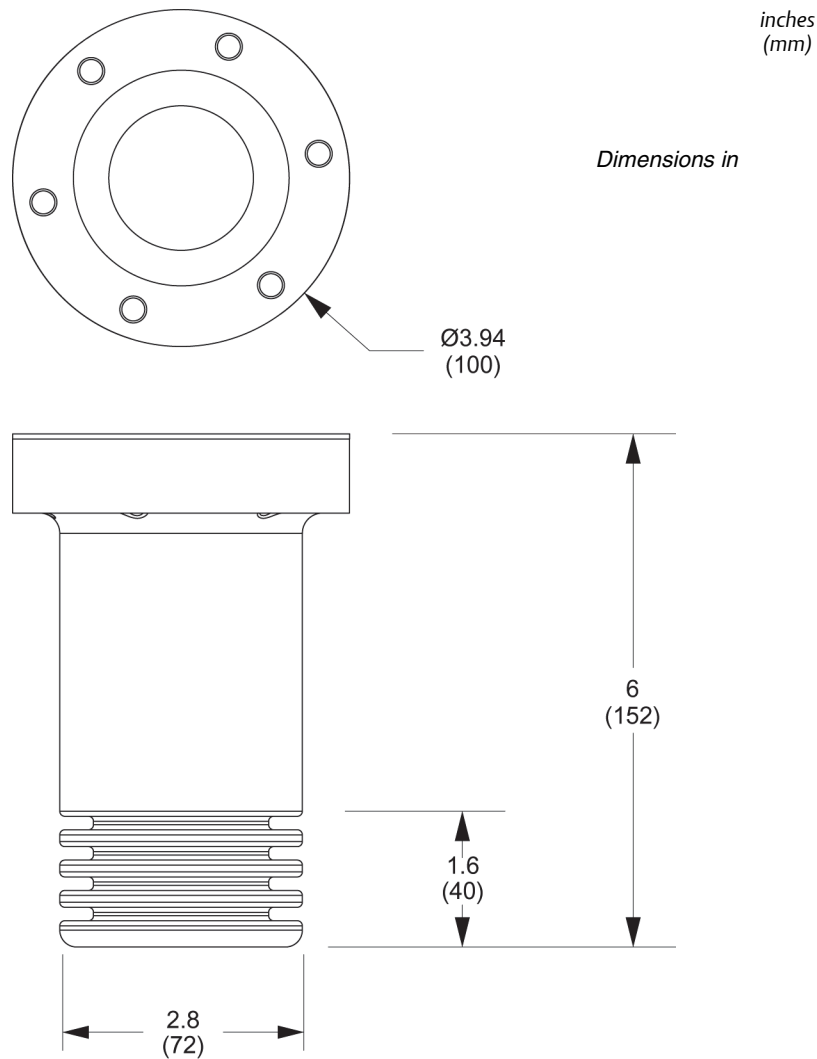


# Additional options for installation and configuration

## Density thermo-well pocket for pipeline installations

To maintain temperature equilibrium between the meter and pipeline, Micro Motion recommends that you install the meter in a density thermo-well pocket directly in the process pipeline (see Density thermo-well pocket dimensions).

**Figure 2: Density thermo-well pocket dimensions**



### Thermo-well pocket kit ordering information

The following pocket kits are available for purchase through Micro Motion. Contact your local sales representative or Micro Motion Customer Support at [flow.support@emerson.com](mailto:flow.support@emerson.com) for more information.

Model code	Description
78109AXXX	Pocket kit ASTM A350LF carbon steel
78109LXXX	Pocket kit ASTM 316L stainless steel



## Required barriers and isolators for hazardous area installations

When installing the meter in a hazardous area, safety barriers and galvanic isolators must be installed between the meter and the signal processing equipment. Micro Motion provides the required barriers and isolators for purchase according to the transmitter output type.

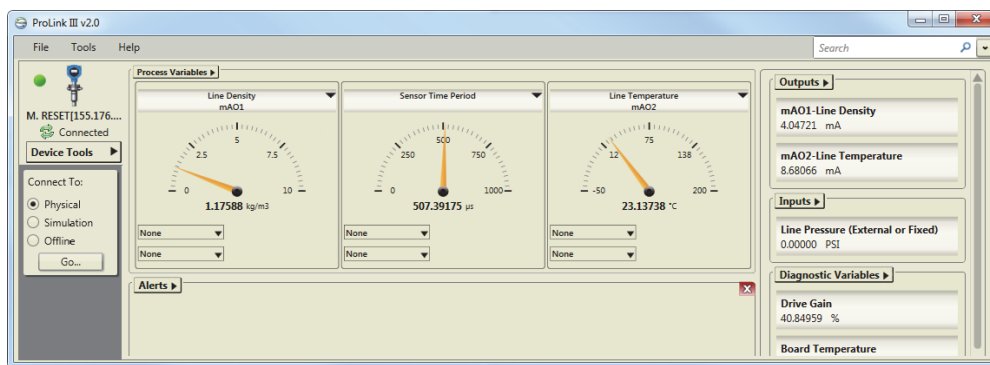
### Safety barrier/galvanic isolator kits ordering information

The following kits are available for purchase through Micro Motion. For more information on ordering these barriers, contact your local sales representative or Micro Motion Customer Support at [flow.support@emerson.com](mailto:flow.support@emerson.com).

Model code	Description	Barrier/Isolator	Output	Notes
BARRIERSETAA	Barrier set, including barriers for all transmitter versions (CH B: mA, TPS, or DO)	MTL7728P+	mA + HART	
		MTL7728P+	mA / TPS / DO	
		MTL7761AC	RS-485	
		MTL7728P+	Power	
ISOLATORSETBB	Isolator set, including isolators for Analog version (CH B: mA)	MTL5541	mA + HART	RS-485 barrier is not isolated.
		MTL5541	mA	
		MTL7761AC	RS-485	
		MTL5523	Power	
ISOLATORSETCC	Isolator set, including isolators for Time Period Signal (TPS)/ Discrete versions (CH B: TPS or DO)	MTL5541	mA + HART	RS-485 barrier is not isolated.
		MTL5532	TPS/DO	
		MTL7761AC	RS-485	
		MTL5523	Power	
BARRIER7787	Barrier for 2-wire GDM, TPS/ Power output	MTL7787+	TPS/Power	Quantity (1)
BARRIER7764	Barrier set for 2-wire GDM, four-wire RTD output	MTL7764+	RTD	Quantity (2)

## ProLink® III software: a configuration and service tool

ProLink® III software is an easy-to-use interface that allows you to view key process variables and diagnostics data for your meter. For more information on ordering the software, contact your local sales representative or Micro Motion Customer Support at [flow.support@emerson.com](mailto:flow.support@emerson.com).



## Ordering information

Model	Description
GDM	Gas Density Meter with Viton O-rings

Code	Sensor calibration range and performance
1	Calibration Accuracy = $\pm 0.1\%$ reading (low limit = 1.5kg/m <sup>3</sup> , high limit = 10 kg/m <sup>3</sup> )
2	Calibration Accuracy = $\pm 0.1\%$ reading (low limit = 9kg/m <sup>3</sup> , high limit = 90 kg/m <sup>3</sup> )
3	Calibration Accuracy = $\pm 0.1\%$ reading (low limit = 25kg/m <sup>3</sup> , high limit = 250 kg/m <sup>3</sup> )
4	Calibration Accuracy = $\pm 0.1\%$ reading (low limit = 40kg/m <sup>3</sup> , high limit = 400 kg/m <sup>3</sup> )
5	Calibration Accuracy = $\pm 0.5\%$ FS, (low limit = 0kg/m <sup>3</sup> , high limit = 3 kg/m <sup>3</sup> )
X <sup>(1)</sup>	ETO sensor calibration range and performance

(1) Requires the factory option X.

Code	Sensor calibration type
A	Standard calibration
B	ISO17025-accredited calibration

Code	Sensor temperature rating
A	Standard -4 F to +185 F (-20 C to +85 C)
B	High temperature -4 F to +257 F (-20 C to +125 C)

Code	Transmitter housing option
A	Integral, aluminum alloy
B	Integral, stainless steel

Code	Transmitter output options
B	Integral transmitter, Channel B = Time Period Signal, Channel A = mA + HART, Channel C = RS485 Modbus
C	Integral transmitter, Channel B = mA output, Channel A = mA + HART, Channel C = RS485 Modbus
D	Integral transmitter, Channel B = Discrete Output, Channel A = mA + HART, Channel C = RS485 Modbus
E	Integral transmitter, fixed outputs, Channel A = mA (temperature), Channel B = Time Period Signal, Channel C = inactive
F	Integral electronics, two-wire Time Period Signal output superimposed on power

Code	Display option
2 <sup>(1)</sup>	Two-line display (not backlit)
3	No display

(1) Not available with transmitter output options codes E or F.

Code	Approvals
Z	ATEX - Intrinsically safe (zone 1)
B	CSA (US and Canada) - Intrinsically safe Class 1 Div. 1 Groups A,B,C,D
E	IECEX - Intrinsically safe (zone 0)
G	Country-specific approval. Requires a selection from the Approvals section of Special tests, certificates, calibrations, and services (optional).

Code	Application configuration
<b>Available with all transmitter output options codes</b>	
0	No application configuration
X <sup>(1)</sup>	ETO analog output configuration (customer data required)
<b>Available with only transmitter output option codes B and E</b>	
7	Process temperature (4mA = -20 °C, 20mA = 85 °C)
8	Process temperature (4mA = -20 °C, 20mA = 125 °C)
9	Process temperature (4mA = 0 °C, 20mA = 100 °C)
<b>Available with only transmitter output option codes C and D</b>	
1	Line density (4mA = Calibration range low limit, 20mA = Calibration range high limit)

(1) Requires the factory option X.

Code	Language (Manual and Software)
<b>Transmitter display language English</b>	
E	English installation manual and English configuration manual
I	Italian installation manual and English configuration manual
M	Chinese installation manual and English configuration manual
R	Russian installation manual and English configuration manual
<b>Transmitter display language French</b>	
F	French installation manual and English configuration manual
<b>Transmitter display language German</b>	
G	German installation manual and English configuration manual
<b>Transmitter display language Spanish</b>	
S	Spanish installation manual and English configuration manual

Code	Future option 1
Z	Reserved for future use

Code	Conduit connections
Z	Standard 1/2-inch NPT fittings (no adapters)
B	M20 stainless steel adapters

Code	Factory options
Z	Standard product
X	Custom (ETO) product

Code	Special tests, certificates, calibrations, and services (optional) <sup>(1)</sup>
<b>Material quality examination tests and certificates</b>	
MC	Material Inspection Certificate 3.1 (Supplier Lot Traceability per EN 10204)
NC	NACE Certificate 2.1 (MR0175 and MR0103)
<b>Pressure testing</b>	
HT	Hydrostatic Test Certificate 3.1 (Pressure retaining parts only)
<b>Sensor completion options</b>	
WG	Witness General
SP	Special Packaging
<b>Instrument tagging</b>	
TG	Instrument tagging - customer information required (max. 24 characters)
<b>Country-specific approvals (select only one when Approvals option G is selected)</b>	
RO	EAC Zone 1 - Hazardous area approval - Intrinsically safe

(1) Multiple test or certificate options may be selected.







**Emerson Automation Solutions Americas**

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

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

**Emerson Automation Solutions Europe/Middle East**

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

**Emerson Automation Solutions Asia Pacific**

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

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