Micro Motion® Fork Density Meters

Direct insertion density meter

Rugged, accurate density and concentration measurement

- Continuous, real-time measurement in pipelines, bypass loops and tanks
- Accurate measurement of density (±1 kg/m³) and concentration (±0.1%)
- Wide range of corrosion-resistant materials for aggressive liquid measurement

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 installation
- Application-specific factory configurations ensure fit-for-purpose operation

Installation flexibility and compatibility

- Optimized design insensitive to vibration, temperature and pressure variations
- Unique direct insertion design in lengths of up to 4 m (13 ft)
- Supports multiple protocols for connection to DCS, PLC, and flow computers



Compact Density Meter

Fork Density Meter

Gas Density Meter

Specific Gravity Meter

Fork Viscosity Meter Heavy Fuel Viscosity Meter

Peak performance precision density meter Direct insertion

Fiscal gas density meter

Gas specific gravity

High performance multi-variable viscosity meter

Multi-variable marine and power HFO viscosity meter



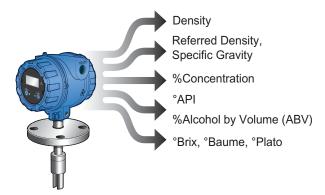


Micro Motion® Fork Density Meters

Micro Motion® fork density meters provide precision liquid density measurement in tank and pipeline applications. The fork density meters use vibrating fork technology to measure density directly, and can be used in process control where density is the primary control parameter for the end product or as an indicator of another quality control parameter, such as %solids or %concentration.

Application configurations

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



Retrofit capabilities

Full backwards compatibility that provides the same form and fit as the Micro Motion 7826/7828 direct insertion density meters.



Integral transmitter

Supports Time Period Signal (TPS), Analog (4-20 mA), HART, WirelessHART®, Modbus RS-485 and FOUNDATION fieldbus™ 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.

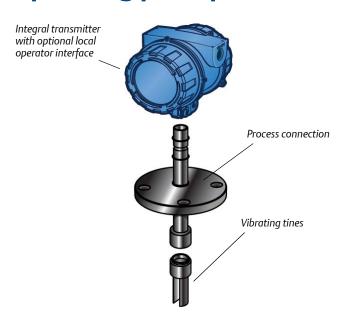


ProLink® III software

An easy-to-use interface that allows you to view key process variables and diagnostics data.



Operating principle



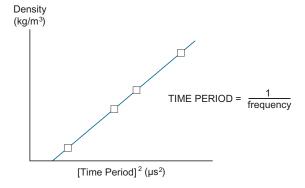
Vibrating fork technology

- A fully welded fork assembly is mounted directly into the liquid to be measured.
- The fork tines are vibrated piezo-electrically at its natural frequency.
- The tines' natural frequency changes with the density of the surrounding liquid.



Temperature measurement

- An integral class 'B' RTD measures the vibrating fork 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.

Performance specifications

Density measurement

Specification	Value	
Accuracy ⁽¹⁾	±1.0 kg/m³	±0.001 g/cm ³
Operating density range ⁽²⁾	0–3000 kg/m³	0- 3 g/cm ³
Repeatability	±0.1 kg/m³	±0.0001 g/cm ³
Process viscosity effect ⁽³⁾	■ No effect for 0–50 cP ■ ±4 kg/m³ (±0.004 g/cm³) for 50–200 cP	
Process temperature effect (corrected) ⁽⁴⁾	±0.1 kg/m³ per °C	±0.0001 g/cm³ per °C
Process pressure effect (corrected)	None	

⁽¹⁾ Stated accuracy is for calibrated range 600–1250 kg/m³ (0.6–1.25 g/cm³). Accuracy can be affected by the liquid viscosity. See the product configuration manual for more detail on entering an offset for the effects.

Temperature measurement

Specification	Value	
Operating temperature range – short stem	−50 °C to +200 °C	−58 °F to +392 °F
Operating temperature range – long stem	–40 °C to +150 °C	−40 °F to +302 °F
Integral temperature measurement	■ Technology: 100 Ω RTD ■ Accuracy: BS1904 Class, DIN 43760 Class B	

Pressure ratings

Actual maximum operating pressures are limited by the process connection rating. For Zirconium flanges, the maximum operating pressure is dependent on the working temperature.

Specification	Value	
Maximum operating pressure – short stem ⁽¹⁾	207 bar	3000 psi
Maximum operating pressure – long stem	100 bar	1450 psi
Test pressure	Tested to 1.5 times the maximum operating pressure	
PED compliance	Not applicable	

⁽¹⁾ For short-stem meters with a cone seat fitting, the maximum operating pressure is 100 bar (1450 psi).

⁽²⁾ The viscosity of the liquid can be up to a maximum of 500 cP.

⁽³⁾ For viscosities between 200–500 cP, the process viscosity effect increases with the viscosity up to a maximum of ±19 kg/m³ (±0.019 g/cm³). This effect can be significantly reduced by performing an onsite calibration.

⁽⁴⁾ Temperature effect is the maximum measurement offset due to process fluid temperature changing away from the factory calibration temperature.

Transmitter specifications

Available transmitter versions

			Output channels	
Typical application	Transmitter version ⁽¹⁾	Α	В	С
General purpose measurementDCS/PLC connection	Analog	4–20 mA + HART (passive)	4–20 mA (passive)	Modbus/RS-485
·	Processor for remote-mount 2700 FOUNDATION fieldbus™ transmitter	Disabled	Disabled	Modbus/RS-485
General purpose measurement with output switchDCS/PLC connection	Discrete	4–20 mA + HART (passive)	Discrete output	Modbus/RS-485
 Flow Computer/Signal Converter connection 	Time Period Signal (TPS)	4–20 mA + HART (passive)	Time Period Signal (TPS)	Modbus/RS-485

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

Local display

Design	Features	
Physical	 Segmented two-line LCD screen. Can be rotated on transmitter, in 90-degree increments, for ease of viewing. Suitable for hazardous area operation. Optical switch controls for hazardous area configuration and display. Glass lens. Three-color LED indicates meter and alert status. 	
Functions	 View process variables. View and acknowledge alerts. Configure mA and RS-485 outputs. Supports Known Density Verification (KDV). Supports multiple languages. 	

Process measurement variables

Variables	Value	
Standard	 Density Temperature Drive gain External temperature (when external device connected) 	
Derived	The derived output variables vary, depending on the application configuration of the meter. Referred density (Concentration) Referred density (API Tables 53A, 53B) Specific gravity (Concentration) Alcohol Alcohol proof API Balling Baume Brix Plato Mass Solids Twaddle	
Derived (when external device connected)	 User-defined calculation output Mass flow Net solids flow Enhanced concentration accuracy Referred density (API Tables 53A, 53B with live pressure input) Tank mass 	

Additional communication options

The following communications accessories are purchased separately from the meter.

Туре	Description	
FOUNDATION fieldbus™	Micro Motion® remote-mount Model 2700 transmitter with FOUNDATION fieldbus	
	■ One Foundation fieldbus H1 connection provided.	
WirelessHART [®]	Wireless HART is available via the THUM adapter	
HART [®] 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. Refer to the detailed approval specifications, including temperature graphs for all meter configurations, and safety instructions that can be found on the product page at the Micro Motion web site (at www.micromotion.com).

ATEX	
Zone 1 Flameproof	Without display (Analog, TPS, Discrete versions only)
	(€ 0575 ⟨Ex⟩ ■ II 1/2G Ex d IIC T6 Ga/Gb
	Remote connection to 2700 FOUNDATION fieldbus transmitters:
	(€ 0575 ⟨Ex⟩ ■ II 1/2G Ex d [ib] IIC T6 Ga/Gb
Zone 2	Without display (All transmitter versions)
	C € ⟨Ex⟩ ■ II 3G Ex nA IIC T6 Gc
	With display (Analog, TPS, Discrete versions only)
	C € ⟨Ex⟩ ■ II 3G Ex nA IIC T4 Gc
CSA	
Explosion proof	Without display (all transmitter versions)
	Class I, Division 1, Groups C & D
	■ Class I, Division 2, Groups A, B, C & D
	Class II, Division 1, Groups E, F & G
	With display (Analog, TPS, Discrete versions only)
	■ Class I, Division 2, Groups A, B, C & D
IECEx	
Zone 1 Flameproof	Without display (Analog, TPS, Discrete versions only)
	■ Ex d IIC T6 Ga/Gb
	Remote connection to 2700 FOUNDATION fieldbus transmitters:
	■ Ex d [ib] IIC T6 Ga/Gb
Zone 2	Without display (All transmitter versions)
■ Ex nA IIC T6 Gc	
	With display (Analog, TPS, Discrete versions only)
	■ Ex nA IIC T4 Gc

Environmental specifications

Туре	Rating	
Electromagnetic compatibility	All versions conform to the latest international standards for EMC, and are certified compliant with EN 61326	
Ambient temperature	-40 °C to +65 °C	
Ingress protection rating	IP66/67, CSA Type 4	

Power requirements

Туре	Description
DC Power requirements	■ 24 VDC, 0.65 W typical, 1.1 W maximum
	■ Minimum recommended voltage: 21.6 VDC with 1000 ft of 24 AWG (300 m of 0.20 mm2) power-supply cable
	■ At startup, power source must provide a minimum of 0.5 A of short-term current at a minimum of 19.6 V at the power input terminals.

Physical specifications

Materials of construction

Component	Material	
Wetted parts	Short-stem meter	
	■ 304 or 316L stainless steel	
	■ Alloy C22, B3, or 400	
	■ Titanium	
	■ Zirconium	
	Long-stem meter	
	■ Alloy C22 for meters up to 2 m (6.5 ft) long	
	 316L stainless steel for meters up to 4 m (13 ft) long 	
Tine finish	Standard, PFA coated, DLC (Diamond-like carbon) coated, or electro-polished ⁽¹⁾	
Transmitter housing	Polyurethane-painted aluminum	

⁽¹⁾ PFA and DLC coating are applied only to the tines for anti-stick properties, not for corrosion protection.

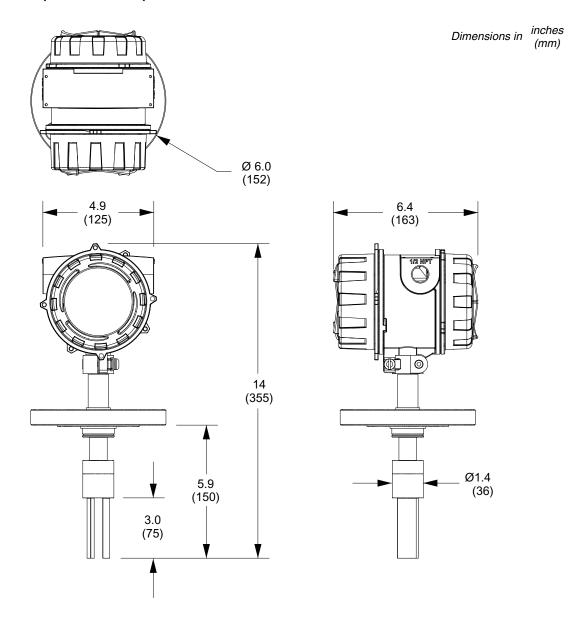
Weight

Specification	Value	
Weight – short stem (typical)	6.7 kg	15 lbs
Weight – long stem	Dependent on stem length (contact Micro Motion)	

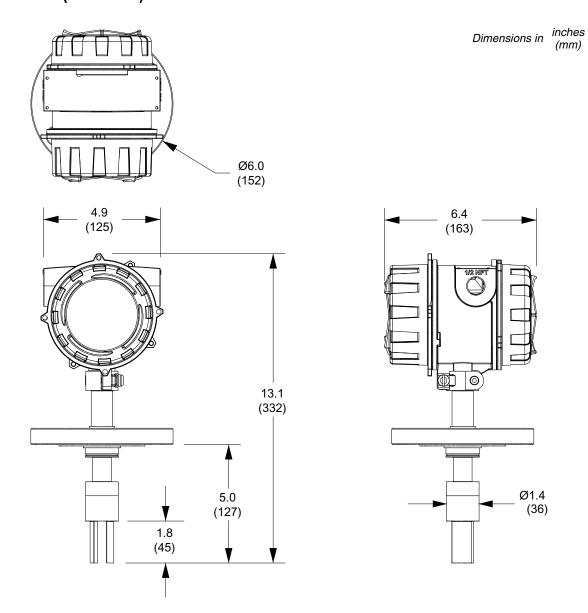
Dimensions

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).

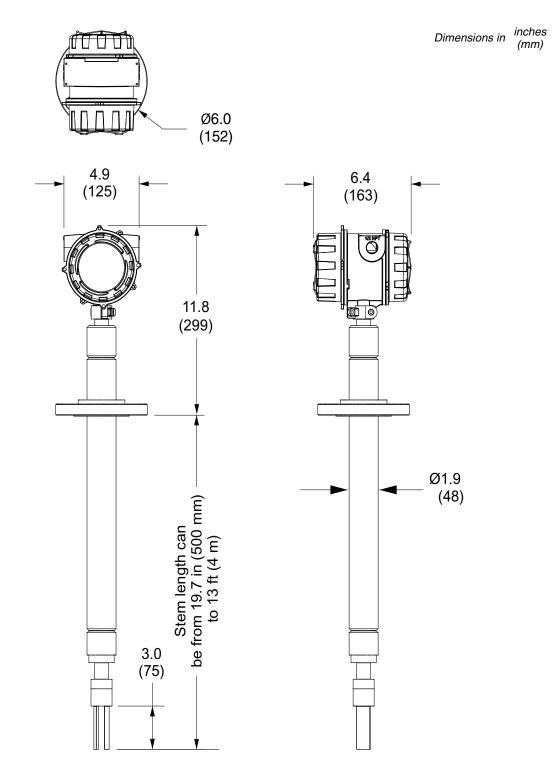
Short-stem meter (standard tines)



Short-stem meter (short tines)



Long-stem meter



Ordering information

Model	Description	
FDM	Insertion fork density meter	
Code	Sensor Calibration Range and Performance	
1	Standard: Accuracy $\pm 1~kg/m^3$ ($\pm 0.001g/cm^3$)over Density Range 600-1250 kg/m 3 (0.6-1.25 g/cm 3) - Viscosity limit 500 cP, [Standard tine length: 75 mm (3 in)]	
2	Standard: Accuracy ±1 kg/m³ (±0.001g/cm³) over Density Range 600-1250 kg/m³ (0.6-1.25 g/cm³)-Viscosity limit 20,000 cP, [Short tine length: 45 mm (1.8 in)]	
Code	Stem Length	
1	0 mm: no stem extension and with standard spigot	
2	500 mm (19.7 in) with removable transit cover	
3	750 mm (29.5 in) with removable transit cover	
4	1000 mm (39.4 in) with removable transit cover	
5	1500 mm (59.1 in) with removable transit cover	
6	2000 mm (78.7 in) with removable transit cover	
X ⁽¹⁾	Special order (ETO) stem length — available up to 4 m (13 ft)	
Code	Materials of Wetted Parts (including process connection)	
Available with all stem length codes		
Α	316L stainless steel, standard finish tines	
С	316L stainless steel, electro-polished tines	
F	316L stainless steel, PFA laminated tines	
L	316L stainless steel, DLC (Diamond-like carbon) coated tines	
E	Alloy C22, standard finish tines	
Available only	with stem length code 1 or X	
D	Alloy C22, electro-polished tines	
G	Alloy C22, PFA laminated tines	
V ⁽²⁾	304 stainless steel, standard finish tines	
T ^{(2) (3)}	Titanium, standard finish tines	
U ⁽²⁾	Alloy B3, standard finish tines	
N ⁽²⁾⁽⁴⁾	Zirconium, Zr 702 standard finish tines	
X ⁽¹⁾	Special order (ETO) Material of wetted parts	
Code	Process Connections	
	all stem length codes	
720	2-inch, CL150, ASME B16.5, blind flange, raised face	
721	2-inch, CL300, ASME B16.5, blind flange, raised face	
722	2-inch, CL600, ASME B16.5, blind flange, raised face	
723	DN50, PN16, EN 1092-1, blind flange, Type B1	
724	DN50, PN40, EN 1092-1, blind flange, Type B1	
725	DN50, PN100, EN 1092-1, blind flange, Type B1	
999 ⁽¹⁾	Special order (ETO) process connection	
Available only	with stem length code 1	
726	2-inch, CL900, ASME B16.5, blind flange, raised face	
727	2-inch, CL1500, ASME B16.5, blind flange, raised face	
728 ⁽⁵⁾⁽⁶⁾	3-inch, Tri-clamp compatible, ASME BPE, Hygienic flange	

Code	Process Connections (continued)
729	1-1/2 inch, Cone-seat compression fitting, 316/316L
	nly with stem length code 2, 3, 4, 5, 6 or X
730 ⁽⁷⁾	No connections (for open tanks)
Code	Sensor Calibration Types
	vith all stem lengths
A	Free stream
В	2-inch schedule 40 boundary [Viscosity limits = 200 cSt (T piece), 1000 cSt (782791 Flow Through Chamber)]
D	2-inch schedule 80 boundary [Viscosity limit = 200 cSt (T piece)]
E	3-inch schedule 80 boundary [Viscosity limit = 1000 cSt (782791 Flow Through Chamber)]
X ⁽¹⁾	Special order (ETO) calibration type
	nly with stem length codes 1 or X
G ⁽⁸⁾	3-inch Hygienic (Viscosity limits = 1000 cSt)
Code	Transmitter Housing Option
A	Integral, Aluminum alloy
Code	Transmitter outputs option
A ⁽⁹⁾ (10)	Integral processor for remote mount 2700 FOUNDATION fieldbus™ transmitter (Channels A & B inactive)
В	Integral transmitter, Channel B = Time Period Signal, Channel A = mA + HART, Channel C = Modbus/RS-485
C	Integral transmitter, Channel B = mA output, Channel A = mA + HART, Channel C = Modbus/RS-485
D	Integral transmitter, Channel B = Discrete output, Channel A = mA + HART, Channel C = Modbus/RS-485
Code	Display Option
	vith approvals codes M, 2, V and 3 only
2	Two-line display (non-backlit)
	vith all approvals codes
3	No display
Code	Approvals
	vith all sensor calibration range and performance codes
M	Micro Motion standard (no approval)
Available w	vith sensor calibration range and performance codes 1 and 2 only
A	CSA (US and Canada) - Explosion-proof
F	ATEX - Zone 1 IIC flameproof
I ⁽¹⁰⁾	IECEx - Zone 1 IIC flameproof
2	CSA Class 1, Div 2 (US and Canada)
V	ATEX - Equipment category 3 (Zone 2)
3	IECEx - Zone 2
Т	TIIS - IIC sensor (not available for quotes outside of Japan)
Code	Application Configuration ⁽¹¹⁾
	th all wetted materials codes
00	No application configuration
11	Degrees API (4 mA = 0°, 20 mA = 100°): (Process temperature = 0 °C to 60 °C)
12	Line density (4 mA = 500 kg/m³, 20 mA = 1500 kg/m³): (Process temperature = -40 °C to +140 °C)
13	Referred Density to API tables (metric) (4 mA = 500 kg/m³, 20 mA = 1500 kg/m³): (Process temperature = -40 °C to +140 °C)
50 ⁽¹²⁾	% NaOH Concentration (4 mA = 0%, 20 mA = 50%) (Process temperature = 0 °C to 80 °C)
59 ⁽¹²⁾	% KOH Concentration (4 mA = 0%, 20 mA = 40%) (Process temperature = 0 °C to 90 °C)

Code	Application Configuration (continued)
96	Process temperature (4 mA = -50 °C, 20 mA = 200 °C)
97	Process temperature (4 mA = -50 °C, 20 mA = 150 °C)
98	Process temperature (4 mA = 0 °C, 20 mA = 100 °C)
XX ⁽¹⁾	Special order (ETO) analog output configuration (customer data required)
Available wi	th wetted materials codes A, C, F, E, D, and G only
21	% Alcohol (4 mA = 0%, 20 mA = 20%): (Process temperature = 0 °C to 40 °C)
22	% Alcohol (4 mA = 0%, 50 mA = 100%): (Process temperature = 40 °C to 70 °C)
23	% Alcohol (4 mA = 80%, 20 mA = 100%): (Process temperature = 50 °C to 90 °C)
24	Alcohol proof (4 mA = 100, 50 mA = 200): (Process temperature = 50 °C to 70 °C)
25	Alcohol proof (4 mA = 160, 50 mA = 200): (Process temperature = 50 °C to 90 °C)
26	% Methanol Concentration (4 mA = 35%, 20 mA = 60%): (Process temperature = 0 °C to 40 °C)
27	% Ethylene Glycol Concentration (4 mA = 10%, 20 mA = 50%): (Process temperature = -20 °C to 40 °C)
31	°Brix (sucrose) (4 mA = 0°, 20 mA = 40°): (Process temperature = 0 °C to 100 °C)
32	°Brix (sucrose) (4 mA = 30°, 20 mA = 80°): (Process temperature = 0 °C to 100 °C)
41	°Balling (4 mA = 0°, 20 mA = 20°): (Process temperature = 0 °C to 100 °C)
64	% HFCS - 42 (4 mA = 0%, 20 mA = 50%): (Process temperature = 0 °C to 100 °C)
65	% HFCS - 55 (4 mA = 0%, 20 mA = 50%): (Process temperature = 0 °C to 100 °C)
66	% HFCS - 90 (4 mA = 0%, 20 mA = 50%): (Process temperature = 0 °C to 100 °C)
71	°Plato (4 mA = 0°, 20 mA = 30°): (Process temperature = 0 °C to 100 °C)
Available wi	th wetted materials codes H and U only
51	% NaOH Concentration (4 mA = 0%, 20 mA = 74%): (Process temperature = 80 °C to 100 °C)
Available wi	th wetted materials codes A, C, F, E, D, G, U, and N only
53	% H2SO4 Concentration (4 mA = 0%, 20 mA = 20%): (Process temperature = 0 °C to 24 °C)
Available wi	th wetted materials codes E, D, G, and U only
54	% HNO3 Concentration (4 mA = 0%, 20 mA = 93%): (Process temperature = 0 °C to 38 °C)
Available wi	th wetted materials codes E, D, G, U and N only
55	% H2SO4 Concentration (4 mA = 0%, 20 mA = 25%): (Process temperature = 0 °C to 50 °C)
Available wi	th wetted materials codes A,C, F, E, D, G and U only
56	% H2SO4 Concentration (4 mA = 75%, 20 mA = 93%): (Process temperature = 24 $^{\circ}$ C to 38 $^{\circ}$ C)
Available wi	th wetted materials codes N and A only
57	% HNO3 Concentration (4 mA = 0%, 20 mA = 70%): (Process temperature = 0 °C to 50 °C)
Available wi	th wetted materials code N only
58	% HNO3 Concentration (4 mA = 0%, 20 mA = 100%): (Process temperature = 5 °C to 30 °C)
61	% HCl Concentration (4 mA = 0%, 20 mA = 5%): (Process temperature = 0 °C to 90 °C)
62	% HCl Concentration (4 mA = 0%, 20 mA = 32%): (Process temperature = 0 °C to 49 °C)
Code	Language (Manual and Software)
Transmitte	r display language English
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
Transmitte	r display language French
F	French installation manual and English configuration manual

Code	Language (Manual and Software) (continued)
Transmitte	er display language German
G	German installation manual and English configuration manual
Transmitte	er display language Spanish
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)
В	M20 stainless steel adapters
Code	Factory Options
Z	Standard product
Χ	Special order (ETO) product
Code	Special Tests and Certificates, Tests, Calibrations and Services (Optional) ⁽¹³⁾
Material Q	uality Examination Tests and Certificates
MC	Material Inspection Certificate 3.1 (Supplier Lot Traceability per EN 10204)
NC	NACE Certificate 2.1 (MR0175 and MR0103)
Pressure T	esting
HT	Hydrostatic Test Certificate 3.1 (Pressure retaining parts only)
Dye Penet	rant Examination
D1	Dye Penetrant Test Package 3.1 (Sensor only; Liquid Dye Penetration NDE Qualification)
Weld Exar	nination
WP	Weld Procedure Package (Weld Map, Weld Procedure Specification, Weld Procedure Qualification Record, Welder Performance Qualification)
Positive M	aterial Testing (select only one from this group)
PM	Positive Material Test Certificate 3.1 (without carbon content)
PC	Positive Material Test Certificate 3.1 (including carbon content)
Sensor Co	npletion Options
WG	Witness General
SP	Special Packaging
Instrumen	t Tagging
TG	Instrument Tagging - customer information required (max. 24 characters)

- Requires Factory Option X.
- (2) Available with process connections 720, 721, 723, 724 & 999 only.
- Requires 2700 with mounting option H [4- wire connection option (power and communications)]. (3)
- Not available with Sensor Calibration Range And Performance code 2.
- Available with calibration types A or G only.
- (6) Available only with Materials of wetted parts codes A, C and F only.
- Available with Approvals code M only. Note that maximum pressure rating is 100 bar maximum. (7)
- Available only with process connection 728. (8)
- (9) Requires remote-mount Model 2700 transmitter with mounting option H 4 wire connection option (power and communications).
 (10) With Transmitter Output Options code A, all signal outputs on the integrally mounted transmitter are disabled, except for the Modbus/RS-485 communications which is used for communication to the Model 2700 transmitter.
- When Transmitter Outputs model code is B, C or D, the application configuration low & high limits are also programmed as the Channel A mA output 4 mA and 20 mA points.
- (12) Not available with Materials of Wetted Parts code T (Titanium).
- (13) Multiple test or certificate options may be selected.

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