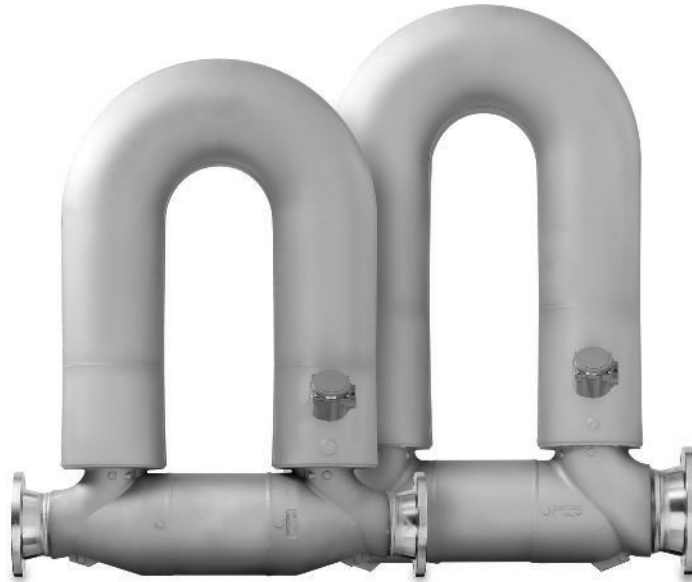


Product Data Sheet

PS-001041, Rev. D
March 2009

Micro Motion® ELITE® High Capacity Coriolis Flow and Density Meters

Micro Motion® ELITE® High Capacity Coriolis meters offer unparalleled flow and density measurement performance in a large size meter.



Best precision flow and density measurement in a meter that fits large line sizes

- Unique design delivers unparalleled measurement sensitivity and stability
- Guarantees consistent, reliable performance over the widest flow range
- In-situ meter verification delivers fast, actionable, simplified performance checks

Superior performance in the most challenging applications

- Industry standard for custody transfer and critical process control
- Best two-phase flow capability for batching, loading, and entrained air applications
- Immune to fluid, process, or environmental effects for superb measurement confidence

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 ELITE High Capacity flow and density meters

Micro Motion Coriolis meters from Emerson Process Management meet a vast range of application needs, ranging from extreme low-flow up to high-flow, high-capacity lines. Cryogenic, hygienic, high-temperature, and high-pressure—Micro Motion meters can handle them all. Micro Motion meters are available with a variety of wetted parts to ensure the best material compatibility.

Coriolis meters. Coriolis meters offer dramatic benefits over traditional volumetric measurement technologies. Coriolis meters:

- Deliver accurate and repeatable process data over a wide range of flow rates and process conditions.
- Provide direct inline measurement of mass flow and density, and also measure volume flow and temperature—all from a single device.
- Have no moving parts, so maintenance costs are minimal.
- Have no requirements for flow conditioning or straight pipe runs, so installation is simplified and less expensive.
- Provide advanced diagnostic tools for both the meter and the process.

ELITE High Capacity Coriolis Meters. Micro Motion® ELITE® High Capacity Meters are the leading meters for precision flow and density measurement. ELITE meters offer the most accurate measurement available for virtually any process fluid, while exhibiting exceptionally low pressure drop. Every ELITE meter features standard secondary containment, and is available with stainless steel wetted parts and a wide variety of process connections to meet your every need.

Now with in-situ meter verification, ELITE delivers the best in measurement and ease of use for critical applications. ELITE meters offer the best measurement performance for mass, density, and volume, regardless of process or environmental conditions. ELITE meters provide measurement capability for two-phase flow, liquid, and gas custody transfer.

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Liquid flow performance

		Mass			Volume ⁽¹⁾			
		lb/min	metric tons/h	kg/h	gal/min	l/h	bbl/hr	m ³ /h
Maximum flow rate	CMFHC2	54,000	1,470	1,470,000	6,471	1,470,000	12,520	1,470
	CMFHC3	94,000	2,550	2,550,000	11,227	2,550,000	21,730	2550
Mass flow accuracy⁽²⁾		±0.10% of rate ⁽³⁾						
Volume flow accuracy⁽²⁾		±0.10% of rate ⁽³⁾						
Repeatability		±0.05% of rate ⁽³⁾						
Zero stability		lb/min		kg/h				
	CMFHC2	2.5		68.0				
	CMFHC3	5.0		136.4				

- (1) Specifications for volumetric flow rate are based on a process-fluid density of 1 g/cm³ (1000 kg/m³). For fluids with density other than 1 g/cm³ (1000 kg/m³), the volumetric flow rate equals the mass flow rate divided by the fluid's density.
- (2) Stated flow accuracy includes the combined effects of repeatability, linearity, and hysteresis. All specifications for liquids are based on reference conditions of water at 68 to 77 °F (20 to 25 °C) and 15 to 30 psig (1 to 2 bar), unless otherwise noted.
- (3) When flow rate is less than zero stability / 0.001, accuracy = ±[(zero stability / flow rate) × 100]% of rate, and repeatability = ±[½(zero stability / flow rate) × 100]%.

Gas flow performance

When selecting sensors for gas applications, measurement accuracy is a function of fluid mass flow rate independent of operating temperature, pressure, or composition. However, pressure drop through the sensor is dependent upon operating temperature, pressure, and fluid composition. Therefore, when selecting a sensor for any particular gas application, it is highly recommended that each sensor be sized using Micro Motion's product selector, available at www.micromotion.com.

		Mass		Volume ⁽¹⁾	
		lb/min	kg/h	SCFM	Nm ³ /h
Typical flow rates					
Air ⁽²⁾	CMFHC2	1215	33,067	16,155	27,462
	CMFHC3	1900	51,818	25,587	43,474
Natural gas ⁽³⁾	CMFHC2	4450	121,109	102,797	174,744
	CMFHC3	8500	231,332	196,353	333,780
Mass flow accuracy		±0.35% of rate ⁽⁴⁾			
Repeatability		±0.20% of rate ⁽⁴⁾			

- (1) Standard (SCFM) reference conditions are 14.7 psia and 68 °F. Normal (Nm³/h) reference conditions are 1.013 bar-a and 0 °C.
- (2) Typical flow rates that produce approximately 5 psid (0.34 bar) pressure drop on air at 68 °F (20 °C) and 100 psi (6.8 bar).
- (3) Typical flow rates that produce approximately 30 psid (2.07 bar) pressure drop on natural gas (MW 16.675) at 68 °F (20 °C) and 500 psi (34 bar).
- (4) When flow rate is less than zero stability / 0.0035, accuracy equals ±[(zero stability / flow rate) × 100]% of rate and repeatability equals ±[½(zero stability / flow rate) × 100]% of rate.

Density performance (liquid only)

	g/cm ³	kg/m ³
Accuracy⁽¹⁾	±0.0005	±0.5
Repeatability	±0.0002	±0.2
Range	up to 5	up to 5000

(1) Accuracy includes the combined effects of repeatability, linearity, and hysteresis. Specifications are based on reference conditions of water at 68 to 77 °F (20 to 25 °C) and 15 to 30 psig (1 to 2 bar), unless otherwise noted.

Environmental effects

Process temperature effect

Process temperature effect is defined as:

- For mass flow measurement, the worst-case zero offset due to process fluid temperature change away from the zeroing temperature.
- For density measurement, the maximum measurement offset due to process fluid temperature change away from the density calibration temperature.

Process temperature effect

	% of maximum flow rate per °C	density accuracy per °C ⁽¹⁾	
		g/cm ³	kg/m ³
CMFHC2	±0.0002500	±0.000015	±0.015
CMFHC3	±0.0002500	±0.000015	±0.015

Pressure effect

Pressure effect is defined as the change in sensor flow and density sensitivity due to process pressure change away from the calibration pressure. Pressure effect can be corrected.

Pressure effect on mass flow accuracy

	% of rate per psi		% of rate per bar	
	<i>liquid</i>	<i>gas</i>	<i>liquid</i>	<i>gas</i>
CMFHC2	-0.0016	-0.0016	-0.023	-0.023
CMFHC3	-0.002	-0.002	-0.029	-0.029

Pressure effect on density accuracy

	g/cm ³ per psi	kg/m ³ per bar
CMFHC2	-0.0000028	-0.041
CMFHC3	-0.0000025	-0.037

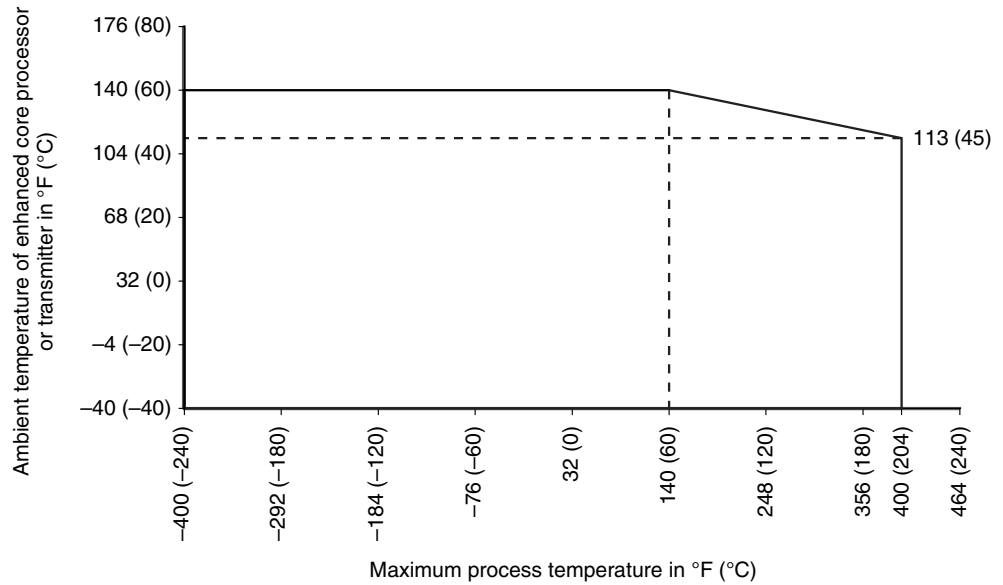
(1) For -100 °C and above.

Temperature specifications

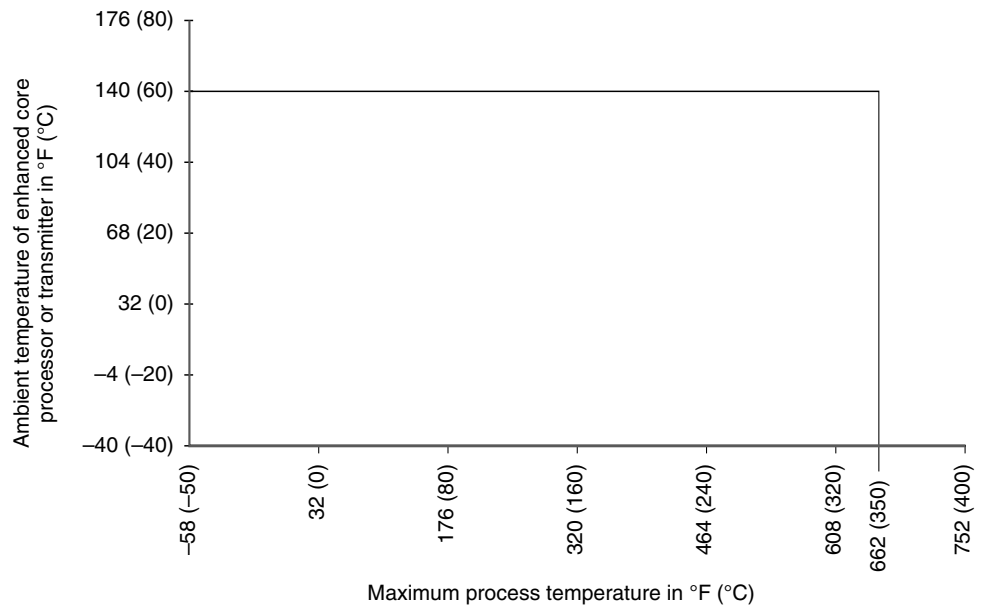
Accuracy $\pm 1\text{ }^{\circ}\text{C} \pm 0.5\%$ of reading in $^{\circ}\text{C}$

Repeatability $\pm 0.2\text{ }^{\circ}\text{C}$

Temperature limits⁽¹⁾⁽²⁾⁽³⁾ Standard models



High-temperature models



- (1) When ambient temperature is below $-40\text{ }^{\circ}\text{F}$ ($-40\text{ }^{\circ}\text{C}$), an enhanced core processor or Model 2400S transmitter must be heated to bring its local ambient temperature to between $-40\text{ }^{\circ}\text{F}$ ($-40\text{ }^{\circ}\text{C}$) and $+140\text{ }^{\circ}\text{F}$ ($+60\text{ }^{\circ}\text{C}$). Long-term storage of electronics at ambient temperatures below $-40\text{ }^{\circ}\text{F}$ ($-40\text{ }^{\circ}\text{C}$) is not recommended.
- (2) Temperature limits may be further restricted by hazardous area approvals. See page 7.
- (3) The extended mount option allows the sensor case to be insulated without covering the transmitter, enhanced core processor, or junction box, but does not affect temperature ratings.

Pressure ratings

		psi	bar
Sensor rating ⁽¹⁾⁽²⁾	CMFHC2	1480	102
	CMFHC3	1480	102

PED compliance Sensors comply with council directive 97/23/EC of 29 May 1997 on Pressure Equipment

		Burst pressure ⁽³⁾	
		psi	bar
Housing rating ⁽³⁾	CMFHC2	1075	74.1
	CMFHC3	1092	75.2

(1) Process connection rating may differ from sensor rating. Please choose process connections accordingly.

(2) For operating temperatures above 300 °F (148 °C), pressure needs to be derated as follows. Linear interpolation may be used between values. Process connection derating may differ from sensor rating.

up to 300 °F (up to 148 °C)	None
at 400 °F (at 204 °C)	7.2% derating
at 500 °F (at 260 °C)	13.8% derating
at 600 °F (at 316 °C)	19.2% derating
at 650 °F (at 343 °C)	21.0% derating

(3) The housing of high-temperature models is not rated for burst pressure.

Power consumption

Meter with enhanced core processor	4 watts maximum
Meter with Model 2400S transmitter	7 watts maximum

Hazardous area classifications

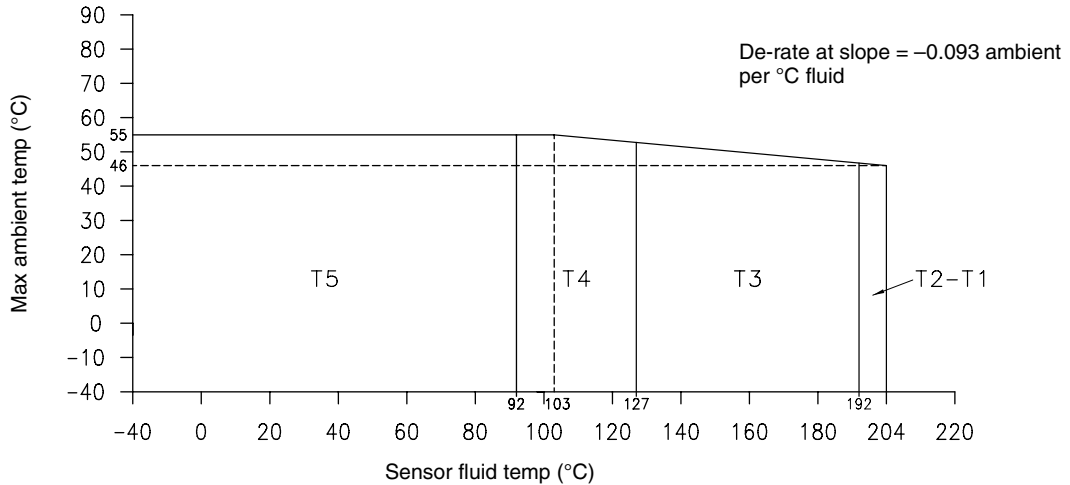
CSA and CSA C-US

Sensor with enhanced core processor	Ambient temperature: $-40\text{ }^{\circ}\text{F}$ to $+140\text{ }^{\circ}\text{F}$ ($-40\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$) Class I, Div 1, Groups C and D Class I, Div 2, Groups A, B, C and D
Sensor with Model 2400S transmitter	Ambient temperature: $-40\text{ }^{\circ}\text{F}$ to $+140\text{ }^{\circ}\text{F}$ ($-40\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$) Class I, Div. 2, Groups, A, B, C, and D

ATEX and IECEx

IECEX	Sensor with enhanced core processor	Ex ib IIB T1–T5
	Sensor with Model 2400S transmitter	Ex nA II T1–T5
ATEX	Sensor with enhanced core processor	CE 0575 Ex II 2G Ex ib IIB T1–T5 ⁽¹⁾ II 2D Ex tD A21 IP65 T ⁽¹⁾ °C
	Sensor with Model 2400S transmitter	CE 0575 Ex II 3G Ex nA II T1–T5 ⁽¹⁾ II 3D Ex tD A22 IP65 T ⁽¹⁾ °C

Standard models (CMFHC3M and CMFHC2M) with enhanced core processor



Note 1: Use the temperature graph to determine the temperature class for a given fluid and ambient temperature. The maximum surface temperature T for dust is as follows: T5: 95 °C, T4: 130 °C, T3: 195 °C, T2 to T1: 207 °C.

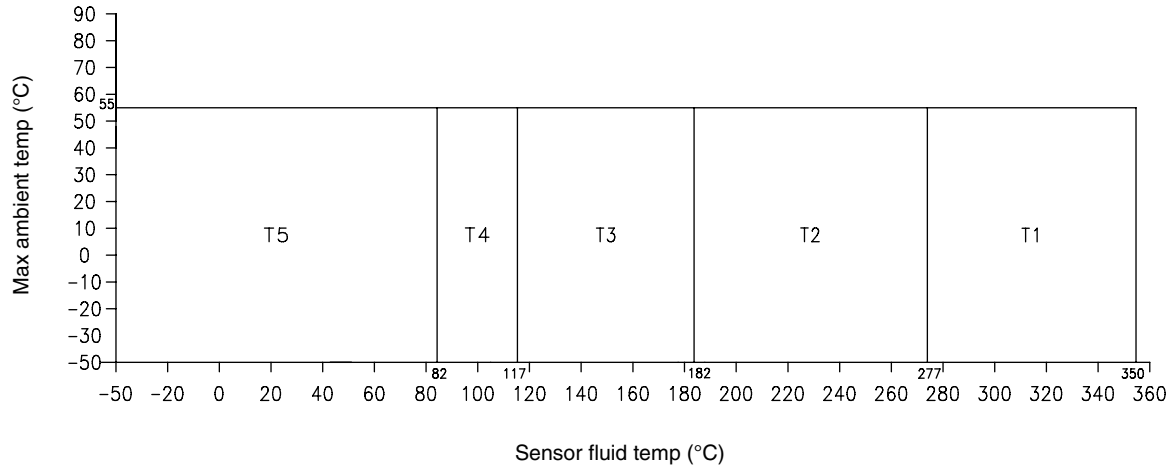
Ambient temperature range Ta $-40\text{ }^{\circ}\text{C}$ to $+55\text{ }^{\circ}\text{C}$

(1) Refer to the temperature graph.

Hazardous area classifications *continued*

ATEX and IECEx

High-temperature models (CMFHC3A and CMFHC2A) with enhanced core processor



Note 1: Use the temperature graph to determine the temperature class for a given fluid and ambient temperature. The maximum surface temperature T for dust is as follows: T5: 95 °C, T4: 130 °C, T3: 195 °C, T2: 290 °C, T1: 363 °C. The minimum ambient and process fluid temperature allowed for dust is -40 °C.

Ambient temperature range Ta -50 °C to +55 °C

Materials of construction

Wetted parts⁽¹⁾	316L stainless steel
Housing	304L stainless steel
Enhanced core processor	Polyurethane-painted aluminum or 300-series stainless steel ⁽²⁾ ; NEMA 4X (IP65)
Model 2400S transmitter	Polyurethane-painted aluminum or 300-series stainless steel ⁽²⁾ ; NEMA 4X (IP65)

(1) General corrosion guides do not account for cyclical stress, and therefore should not be relied upon when choosing a wetted material for your Micro Motion sensor. Please refer to the Micro Motion corrosion guide for proper material compatibility information.

(2) 316L stainless steel is available.

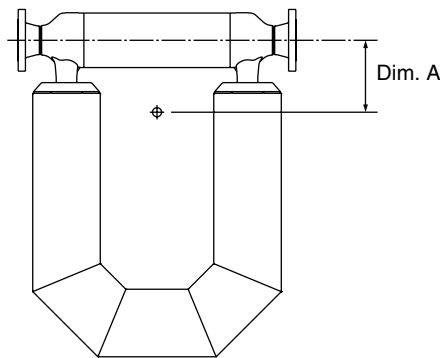
Weight and center of gravity

Weight includes the weight of the sensor with CL150 weld neck raised face flanges, plus the weight of the enhanced core processor or Model 2400S transmitter.

		lb	kg
Weight	CMFHC2	546	248
	CMFHC3	785	356

Center of gravity is based on a sensor with integral enhanced core processor or Model 2400S transmitter, with meter empty of fluid. Value shown with CL150 flange. Exact center of gravity will vary with the weight of the flange.

		Dim. A (in)	Dim. A (mm)
Center of gravity	CMFHC2	13.3	338
	CMFHC3	14.3	365

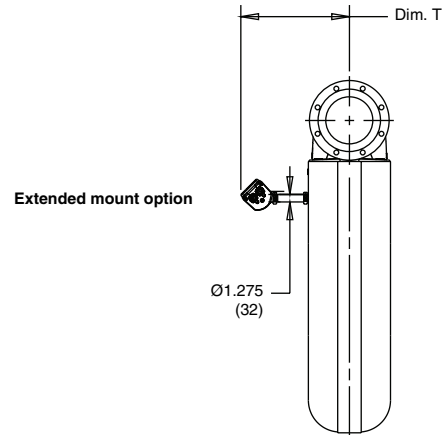
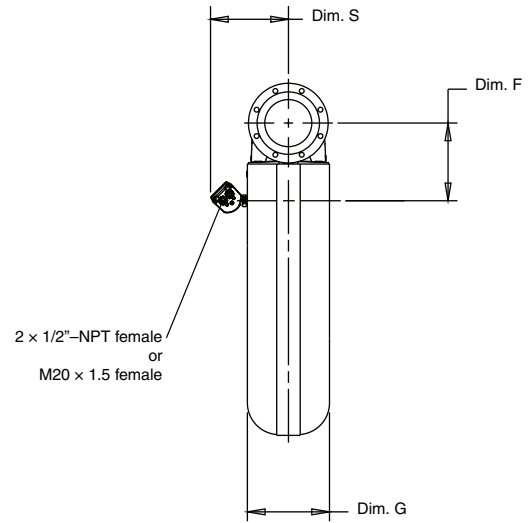
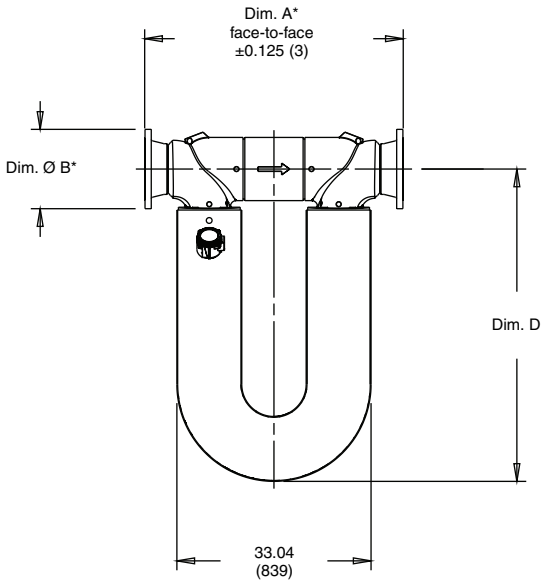


Dimensions

Model CMFHC2M and CMFHC3M

Dimensions in inches
(mm)

Flow →



Model	Dimensions ⁽¹⁾				
	D	F	G	S ⁽²⁾	T ⁽²⁾
CMFHC2	48.6 (1235)	12.3 (313)	12.8 (324)	12.7 (321)	18.0 (458)
CMFHC3	53.1 (1350)	13.2 (336)	14.0 (355)	13.3 (339)	18.5 (469)

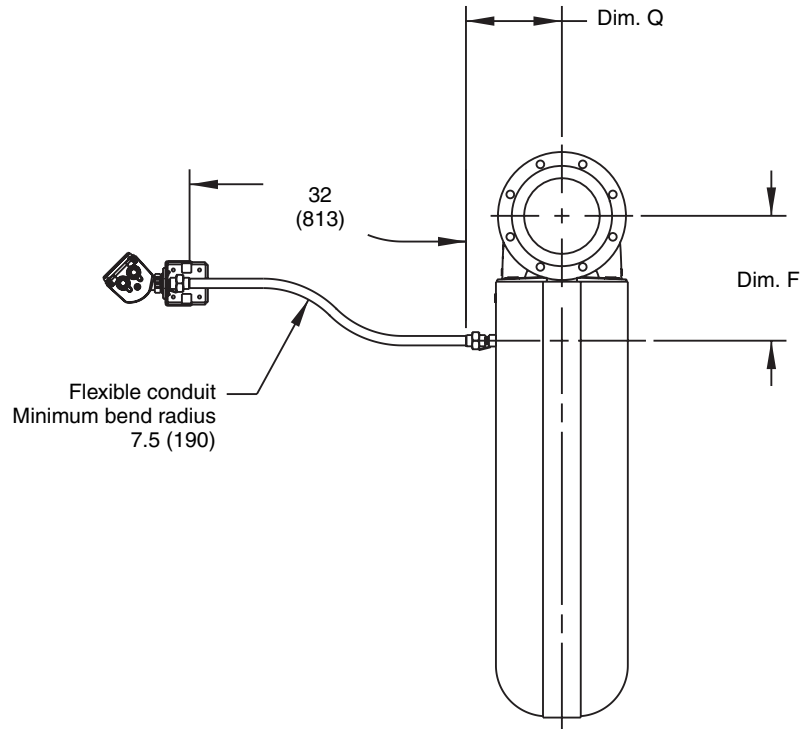
(1) For dimensions A and B, see fittings tables on page 13.

(2) Dimensions S and T will vary depending on transmitter/enhanced core processor housing material.

Dimensions *continued*

Models CMFHC2A and CMFHC3A

Dimensions in *inches*
(*mm*)



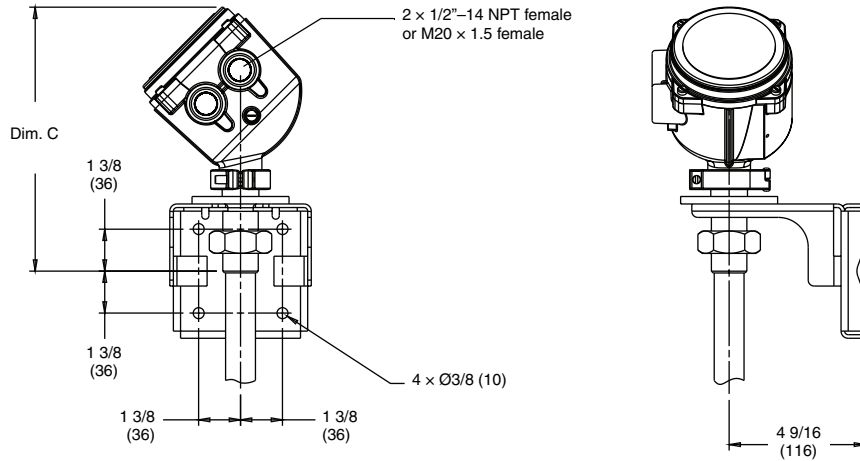
* For additional sensor dimensions, see page 10.

Model	Dimensions	
	F	Q
CMFHC2A	12.3 (313)	9.0 (228)
CMFHC3A	13.2 (336)	10.2 (258)

Dimensions *continued*

Electronics mounted on high-temperature sensor flexible conduit

Dimensions in *inches*
(*mm*)



Electronics interface option

Dim. C

0	Model 2400S transmitter, painted aluminum housing	8 7/8 (225)
	Model 2400S transmitter, stainless steel housing	9 1/4 (235)
2	Enhanced core processor, painted aluminum housing	8 7/8 (225)
3	Enhanced core processor, stainless steel housing	9 1/4 (235)

Fitting options

	Fitting code	Dim. A face-to-face inches (mm)	Dim. B outside diameter inches (mm)
CMFHC2 fitting options⁽¹⁾			
6-inch ANSI CL150 weld neck raised face flange	451	42.81 (1087)	11.00 (279)
6-inch ANSI CL300 weld neck raised face flange	452	43.60 (1107)	12.50 (318)
6-inch ANSI CL600 weld neck raised face flange	453	45.56 (1157)	14.00 (356)
6-inch ANSI CL900 weld neck raised face flange	821	47.30 (1201)	15.00 (381)
8-inch ANSI CL150 weld neck raised face flange	810	43.75 (1111)	13.50 (343)
8-inch ANSI CL300 weld neck raised face flange	811	44.51 (1131)	15.00 (381)
8-inch ANSI CL600 weld neck raised face flange	818	46.75 (1187)	16.50 (419)
8-inch ANSI CL900 weld neck raised face flange	819	49.01 (1245)	18.50 (470)
DN150 PN40 weld neck flange; EN 1092-1 Form B1	822	41.71 (1059)	11.81 (300)
DN150 PN100 weld neck flange; EN 1092-1 Form B2	823	44.86 (1139)	13.98 (355)
DN150 PN160 weld neck flange; EN 1092-1 Form B2	824	45.88 (1165)	13.98 (355)
DN200 PN40 weld neck flange; EN 1092-1 Form B1	801	42.68 (1084)	14.76 (375)
DN200 PN100 weld neck flange; EN 1092-1 Form B2	802	45.99 (1168)	16.93 (430)
DN200 PN160 weld neck flange; EN 1092-1 Form B2	803	46.77 (1188)	16.93 (430)
CMFHC3 fitting options⁽¹⁾			
8-inch ANSI CL150 weld neck raised face flange	810	43.75 (1111)	13.50 (343)
8-inch ANSI CL300 weld neck raised face flange	811	44.51 (1131)	15.00 (381)
8-inch ANSI CL600 weld neck raised face flange	818	46.75 (1187)	16.50 (419)
8-inch ANSI CL600 lap joint flange	812	46.75 (1187)	16.50 (419)
8-inch ANSI CL900 weld neck raised face flange	819	49.01 (1245)	18.50 (470)
10-inch ANSI CL150 weld neck raised face flange	813	43.87 (1114)	16.00 (406)
10-inch ANSI CL300 weld neck raised face flange	814	45.01 (1143)	17.50 (445)
10-inch ANSI CL600 weld neck raised face flange	815	47.37 (1203)	20.00 (508)
10-inch ANSI CL600 lap joint flange	816	49.75 (1264)	20.00 (508)
10-inch ANSI CL600 weld neck raised face PD replacement flange	817 ⁽²⁾	44.05 (1119)	20.00 (508)
10-inch ANSI CL900 weld neck raised face flange	820	49.51 (1258)	21.50 (546)
DN200 PN40 weld neck flange; EN 1092-1 Form B1	801	42.68 (1084)	14.76 (375)
DN200 PN100 weld neck flange; EN 1092-1 Form B2	802	45.99 (1168)	16.93 (430)
DN200 PN160 weld neck flange; EN 1092-1 Form B2	803	46.77 (1188)	16.93 (430)
DN250 PN40 weld neck flange; EN 1092-1 Form B1	804	44.02 (1118)	17.72 (450)
DN250 PN100 weld neck flange; EN 1092-1 Form B2	805	48.11 (1222)	19.88 (505)
DN250 PN160 weld neck flange; EN 1092-1 Form B2	806	47.99 (1218)	20.28 (515)

(1) Fittings listed here are standard options. Other types of fittings are available. The face to face dimensions for any custom fittings ordered using a 998 or 999 fitting code are not represented in this table. It is necessary to confirm face to face dimensions of these fittings at time of ordering. Contact your local Micro Motion representative.

(2) Not available with Model CMFHC3A.

Ordering information

Model	Product description
Standard models	
CMFHC2M	Micro Motion Coriolis ELITE sensor; 6 to 8-inch (150 to 200 mm); 316L stainless steel
CMFHC3M	Micro Motion Coriolis ELITE sensor; 8 to 10-inch (200 to 250 mm); 316L stainless steel
High-temperature models	
CMFHC2A	Micro Motion Coriolis ELITE sensor; 6 to 8-inch (150 to 200 mm); high temperature; 316L stainless steel
CMFHC3A	Micro Motion Coriolis ELITE sensor; 8 to 10-inch (200 to 250 mm); high temperature; 316L stainless steel
Code	Process connections
###	See process fitting options on page 13.
Code	Case options
N	Standard pressure containment
Code	Electronics interface
For standard models	
0	Model 2400S transmitter
1	Extended mount Model 2400S transmitter
2	4-wire polyurethane-painted aluminum integral enhanced core processor for remote mount transmitters
3	4-wire stainless steel integral enhanced core processor for remote mount transmitters
4	4-wire polyurethane-painted aluminum integral extended mount enhanced core processor for remote mount transmitters
5	4-wire stainless steel integral extended mount enhanced core processor for remote mount transmitters
For high-temperature models	
0	Model 2400S transmitter
2	4-wire polyurethane-painted aluminum integral enhanced core processor for remote mount transmitters
3	4-wire stainless steel integral enhanced core processor for remote mount transmitters
Code	Conduit connections
Electronics interface codes 0 and 1	
A	No gland
Electronics interface codes 2, 3, 4, and 5	
B	1/2-inch NPT — no gland
E	M20 — no gland
F	Brass/nickel cable gland (cable diameter 0.335 to 0.394 inches [8.5 to 10 mm])
G	Stainless steel cable gland (cable diameter 0.335 to 0.394 inches [8.5 to 10 mm])
Continued on next page	

Ordering information

Code	Approvals
Electronics interface codes 0 and 1	
M	Micro Motion Standard (no approval)
N	Micro Motion Standard / PED compliant
2	CSA Class I, Div. 2
V	ATEX Category 3 (Zone 2) / PED compliant
3	IECEX Zone 2
Electronics interface codes 2, 3, 4, and 5	
M	Micro Motion Standard (no approval)
N	Micro Motion Standard / PED compliant
A	CSA C-US (U.S.A. and Canada)
Z	ATEX Category 2 (Zone 1) / PED compliant
I	IECEX Zone 1
Code	Language
A	Danish installation manual
D	Dutch installation manual
E	English installation manual
F	French installation manual
G	German installation manual
H	Finnish installation manual
I	Italian installation manual
J	Japanese installation manual
M	Chinese installation manual
N	Norwegian installation manual
O	Polish installation manual
P	Portuguese installation manual
S	Spanish installation manual
W	Swedish installation manual
C	Czech installation manual
B	Hungarian CE requirements document and English installation manual
K	Slovak CE requirements document and English installation manual
T	Estonian CE requirements document and English installation manual
U	Greek CE requirements document and English installation manual
L	Latvian CE requirements document and English installation manual
V	Lithuanian CE requirements document and English installation manual
Y	Slovenian CE requirements document and English installation manual
Code	Calibration options
Z	0.10% mass flow and 0.0005 g/cm ³ (0.5 kg/m ³) density
Code	Measurement application software
Z	No measurement application software
Code	Factory options
Z	Standard product
X	ETO product
Typical Model Number: CMFHC3M 801 N 2 E Z E Z Z Z	

Micro Motion—The undisputed leader in flow and density measurement



World-leading Micro Motion measurement solutions from Emerson Process Management deliver what you need most:

Technology leadership

Micro Motion introduced the first reliable Coriolis meter in 1977. Since that time, our ongoing product development has enabled us to provide the highest performing measurement devices available.

Product breadth

From compact, drainable process control to high flow rate fiscal transfer—look no further than Micro Motion for the widest range of measurement solutions.

Unparalleled value

Benefit from expert phone, field, and application service and support made possible by more than 600,000 meters installed worldwide and over 30 years of flow and density measurement experience.

 www.micromotion.com

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