

**CALDON**

### *Product Specifications*

*LEFM® 220CA*

*Ultrasonic Flow Meters*

- ✓ *Custody transfer performance*
- ✓ *Ideally suited for:*
  - *lighter products and crudes*
  - *turbine meter upgrades*
  - *varying or multiple product applications*
  - *large flow ranges*
- ✓ *Provable*
- ✓ *Flow stream and performance diagnostics*



## SIZES, MAXIMUM FLOW RATES and K FACTORS

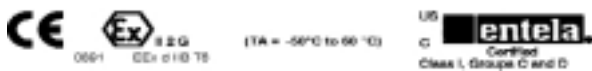
### Meter Construction

The Caldon LEFM 220CA meter body is designed and manufactured in accordance with ASME B31.3 Process Piping Code or the Pressure Equipment Directive (PED) 97/23/EC and is suitable for handling pressurized liquid hydrocarbons. It has four (4) piezoelectric transducer modules (typically 0.5MHz, 1.0MHz or 1.6MHz) forming two (2) chordal paths. These are mounted in pressure containing housings and can be replaced while the meter body is under operating conditions.

### Electrical Approvals

The meter meets the requirements of NFPA 70 for use in Class 1, Division 1, Groups C and D hazardous locations and UL/cUL. It meets the requirements for NEMA 4X and NEMA 7. It is certified by ATEX (CENELEC IIB) for use in EExd IIB flameproof applications and has an ingress protection rating of IP66.

### Compact Transmitter (Approvals Pending)



### Meter Body (Approvals Pending)



SIZE		NOMINAL MAXIMUM FLOW BPH	K FACTOR P/Bbl	NOMINAL MAXIMUM FLOW m <sup>3</sup> /h	K FACTOR P/m <sup>3</sup>
INCHES	DN				
4	100	2,050	2,000	325	12,600
6	150	4,650	1,000	740	6,300
8	200	8,150	500	1,290	3,150
10	250	12,800	350	2,030	2,200
12	300	19,300	250	3,070	1,570
14	350	23,600	200	3,750	1,000
16	400	28,700	150	4,560	940
18	450	41,000	100	6,500	630
20	500	50,000	85	7,900	530
24	600	72,000	60	11,500	380
26	650	87,000	45	13,900	280
28	700	100,000	40	16,200	240
30	750	115,000	35	18,700	220
32	800	130,000	30	21,300	185
34	850	150,000	25	24,200	165
36	900	165,000	25	27,200	145
40	1,000	205,000	20	32,600	125

K Factor is based on ~ 1.1 KHz at max. nom. rate. Other K factors can be programmed but must be between 4Hz and 10 KHz at all operating flow rates.

## STANDARD MATERIALS of CONSTRUCTION

Meter Body	Stainless Steel	Carbon Steel
Flanges	316 Forged Stainless Steel	Forged Carbon Steel – ASTM A105
Body	Cast Stainless Steel – CF8M (316)	Cast Carbon Steel – ASTM A216 Gr WCB
Manifold	304 Stainless Steel	304 Stainless Steel
Manifold Covers	316 Stainless Steel	316 Stainless Steel
Transducer Housings	316 Stainless Steel	316 Stainless Steel
Junction Boxes (optional)	Epoxy Painted Copper-Free Aluminum	Epoxy Painted Copper-Free Aluminum
<b>Compact Transmitter Enclosure</b>		
EX – NEMA 7/4X	Copper-Free Aluminum	Copper-Free Aluminum

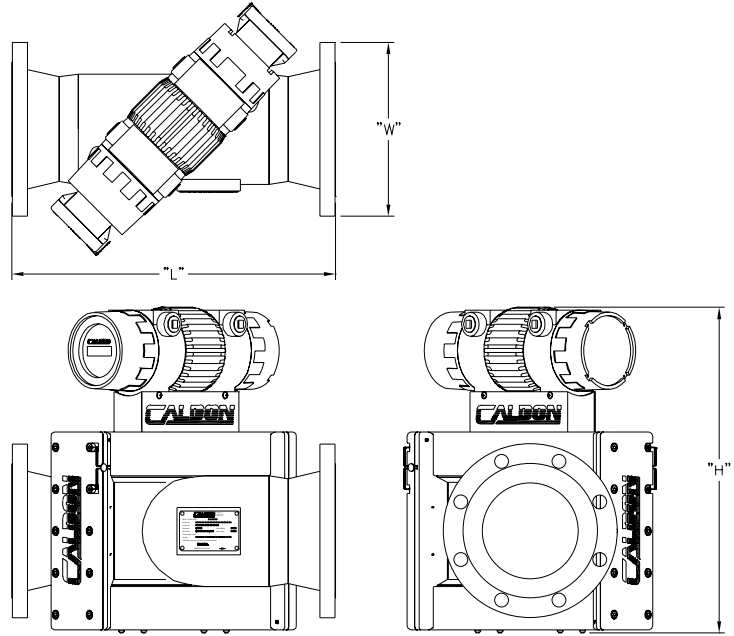
## STANDARD END CONNECTIONS and MAXIMUM WORKING PRESSURES

Maximum Working Pressure -20° F to 100° F (-29° C to 38° C)

ANSI B16.5 Raised Face	Stainless Steel	Carbon Steel
Class 150	275 psi ( 18.96 Bars)	285 psi (19.65 Bars)
Class 300	720 psi (49.64 Bars)	740 psi (51.02 Bars)
Class 600	1,440 psi (99.29 Bars)	1,480 psi (102.05 Bars)
Class 900	2,160 psi (148.93 Bars)	2,220 psi (153.07 Bars)
Class 1500	3,600 psi (248.22 Bars)	3,705 psi (255.46 Bars)

**DIMENSIONS and WEIGHTS for LEFM 220CA  
METER BODY with COMPACT ELECTRONICS**

Pipe Size Inches (DN)	ANSI Class	L		W		H		Un-Packed Weight	
		Inches	(mm)	Inches	(mm)	Inches	(mm)	lbs.	(kg)
4 (100)	150	18.0	(457)	11.0	(280)	17.9	(454)	153	(70)
	300	18.8	(477)	11.0	(280)	18.4	(467)	170	(77)
	600	20.5	(521)	11.0	(280)	18.8	(476)	204	(93)
	900	21.5	(546)	11.5	(292)	19.1	(486)	222	(101)
	1500	22.3	(565)	12.3	(311)	19.5	(496)	266	(121)
6 (150)	150	20.5	(521)	12.8	(324)	19.8	(502)	226	(103)
	300	21.3	(540)	12.8	(324)	20.5	(521)	260	(118)
	600	23.2	(590)	14.0	(356)	21.3	(540)	338	(154)
	900	25.0	(635)	15.0	(381)	21.8	(553)	396	(180)
	1500	27.5	(699)	15.5	(394)	22.0	(559)	506	(230)
8 (200)	150	24.0	(610)	14.8	(375)	22.0	(559)	377	(171)
	300	24.8	(629)	15.0	(381)	22.8	(578)	433	(196)
	600	27.0	(686)	16.5	(419)	23.5	(597)	539	(244)
	900	29.3	(743)	18.5	(470)	24.5	(623)	649	(294)
10 (250)	150	26.0	(660)	17.0	(432)	24.4	(619)	559	(253)
	300	27.2	(692)	17.5	(445)	25.1	(638)	637	(289)
	600	30.5	(775)	20.0	(508)	26.4	(670)	835	(379)
	900	33.0	(838)	21.5	(546)	27.1	(689)	975	(442)
12 (300)	150	29.5	(749)	19.0	(483)	26.9	(683)	773	(351)
	300	30.7	(781)	20.5	(521)	27.6	(702)	893	(405)
	600	33.2	(844)	22.0	(559)	28.4	(721)	1063	(482)
	900	36.8	(934)	24.0	(610)	29.4	(746)	1263	(573)
14 (350)	150	32.0	(813)	21.0	(533)	28.6	(727)	992	(450)
	300	33.2	(844)	23.0	(584)	29.6	(753)	1132	(513)
	600	35.5	(902)	23.8	(603)	30.0	(762)	1332	(604)
	900	39.3	(997)	25.3	(641)	30.8	(781)	1572	(713)
16 (400)	150	33.5	(851)	23.5	(597)	30.9	(784)	1156	(524)
	300	35.0	(889)	25.5	(648)	31.9	(810)	1376	(624)
	600	38.0	(965)	27.0	(686)	32.6	(829)	1656	(751)
	900	41.5	(1054)	27.8	(705)	33.0	(838)	1866	(846)
18 (450)	150	37.0	(940)	25.0	(635)	32.7	(830)	1259	(571)
	300	38.5	(978)	28.0	(711)	34.2	(868)	1599	(725)
	600	41.0	(1041)	29.3	(743)	34.8	(884)	1909	(866)
	900	44.5	(1130)	31.0	(787)	35.7	(906)	2319	(1052)
20 (500)	150	39.4	(1000)	27.5	(699)	34.9	(887)	1404	(637)
	300	40.8	(1035)	30.5	(775)	36.4	(925)	1844	(836)
	600	43.5	(1105)	32.0	(813)	37.2	(944)	2224	(1009)
	900	48.0	(1219)	33.8	(857)	38.0	(966)	2704	(1226)
24 (600)	150	44.0	(1118)	32.0	(813)	39.2	(995)	1717	(779)
	300	45.2	(1149)	36.0	(914)	41.2	(1046)	2357	(1069)
	600	48.5	(1232)	37.0	(940)	41.7	(1058)	2857	(1296)
	900	55.5	(1410)	41.0	(1041)	43.7	(1109)	4197	(1904)
26 (650)	150	43.5	(1105)	34.3	(870)	41.3	(1049)	1904	(864)
	300	48.5	(1232)	38.3	(972)	43.3	(1100)	2514	(1140)
28 (700)	150	45.9	(1165)	36.5	(927)	43.4	(1103)	2091	(948)
	300	51.5	(1308)	40.8	(1035)	45.5	(1157)	2891	(1311)
30 (750)	150	48.8	(1239)	38.8	(984)	45.5	(1157)	2288	(1038)
	300	54.5	(1384)	43.0	(1092)	47.7	(1211)	3228	(1464)
32 (800)	150	51.4	(1305)	41.8	(1060)	48.0	(1220)	2585	(1172)
	300	57.5	(1461)	45.3	(1149)	49.8	(1265)	3585	(1626)
34 (850)	150	53.8	(1366)	43.8	(1111)	50.0	(1271)	2742	(1244)
	300	60.2	(1530)	47.5	(1207)	51.9	(1319)	3952	(1792)
36 (900)	150	56.4	(1432)	46.0	(1168)	52.2	(1325)	3028	(1374)
	300	63.0	(1600)	50.0	(1270)	54.2	(1376)	4298	(1950)



**GENERAL SPECIFICATIONS**

	Compact Electronics	Meter Body
<b>Voltage</b>	24 VDC	
<b>Power</b>	10W	
<b>Relative Humidity</b>	0-100%	0-100%
<b>Operating Temperature</b>	-40F to 140F (-40C to 60C)	-328F to 464F (-200C to 240C)
<b>Hazardous Area Approval</b>	ATEX Class I Div. I Groups C, D	-58F to 199F (-50C to 93C) -31F to 284F (-35C to 140C)
<b>Local Display</b>	Yes	
<b>Remote Mounting From Meter</b>	328 Feet (100 meters)	
<b>Analog Input(s)</b>	One, 4-20 mA Configured for temperature, pressure or density.	
<b>Analog Output(s)</b>	One, 4-20 mA Any process variable measured by the meter is available as an analog output.	
<b>Pulse Output(s)</b>	Two 0-5V (continuous 50/50 duty cycle, programmable K factor). The outputs are 90° out of phase for flow indication.	
<b>Digital Output(s)</b>	0 or 5V for flow direction or 0 or 5V for alarm.	
<b>Serial Communication</b>	ModBus RTU: RS-485 (2) – Up to 3,900 feet (1,200 meters)	

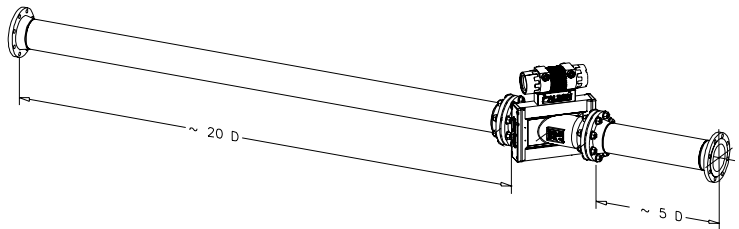
GENERAL PERFORMANCE	
<b>Linearity</b>	± 0.15% over 5:1 nominal flow range <sup>1</sup> from max. flow with recommended flow condition ± 0.2% over 10:1 nominal flow range <sup>1</sup> from max. flow with recommended flow condition Reynolds number ≥ 5000
<b>Repeatability</b>	± 0.027% (API MPMS, Chapter 5.8, Table B-1)
<b>Long Term Stability</b>	Linearity is unaffected by usage
<b>Water in Oil<sup>2</sup></b>	For water volumes up to 10% and velocities above 6.5 fps (2.0 mps), the meter will measure the total volume with no change in performance. Below 6.5 fps (2.0 mps) the performance depends on the separation of the water
<b>Extended Ranges</b>	Contact Caldon for applications with viscosity above 500 cSt for applicability
<b>Custody Transfer Performance Approval (Pending)</b>	OIML R 117 Edition 1995 (E) Accuracy Class 0.3

<sup>1</sup> Nominal Flow Range will increase for values of linearity >0.20%

<sup>2</sup> Call Caldon for special applications outside these ranges.

### Installation

To obtain the best possible performance for an LEFM 220CA, there are some basic minimum installation requirements. The meter should have upstream straight pipe of the same schedule as the meter. Process temperature and pressure should be measured downstream of the meter. It is generally recommended that the LEFM 220CA meter be installed 20 diameters downstream of a straightening plate-type conditioning element. Contact Caldon for recommendations for specific applications. There should be at least 3 to 5 diameters of straight pipe of the same nominal diameter as the meter downstream. These conditions minimize the possibility of significant flow profile distortions and swirl. Where installation guidelines cannot be met, consult with Caldon to determine acceptable application options.



U.S. Patents: 5546813, 5597962, 5639972, 5705753; Korea Patent: 208678; Canada Patent: 2107.750; Taiwan Patents: NI-080038, UM-119114. U.S. and foreign patents pending.

© LEFM is a registered trademark of Caldon, Inc. All rights reserved.

#### Headquarters

Caldon, Inc.  
1070 Banksville Ave  
Pittsburgh, PA 15216  
Tel: +1 412-341-9920  
Fax: +1 412-341-9951

#### Manufacturing

Caldon, Inc.  
Parkway West Industrial Park  
101 Parkway View Drive - Bldg 1  
Pittsburgh, PA 15205

#### U.K. Sales Office

Caldon, Ltd.  
Tiebridge Farm, North Houghton  
Stockbridge, Hants SO 20 6LQ  
Tel: +44 (0) 870-850-8855  
Fax: +44 (0) 870-850-5558