MEASUREMENT SOLUTIONS

CALDON LEFM Ultrasonic Flowmeters for Liquids

Integrating experience, proven technology, and innovation

sensia

Rockwell Automation + Schlumberger

CALDON LEFM FLOWMETER FIRSTS

1965–70	First chordal multipath flowmeters
1970–75	First nuclear reactor coolant application
1974–75	First crude oil application
1994–99	First measurement uncertainty recapture uprate at nuclear facilities
1995	First military-specification flowmeter
2003	First application for custody transfer of liquid hydrocarbons
2005	First application for custody transfer of LNG
2008	First application for custody transfer of heavy, viscous crude oils up to 3,000 mm²/s

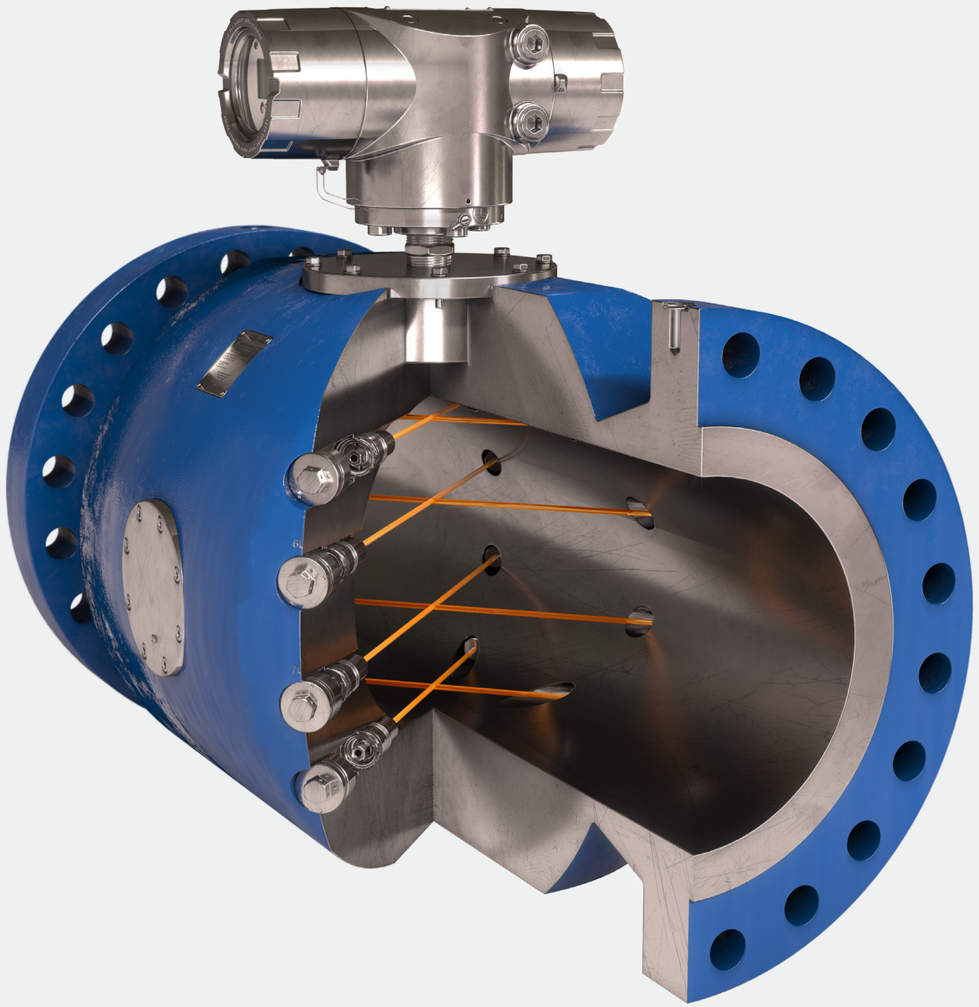
Count on Sensia

Backed by more than 50 years of experience and a history of technological firsts, the Sensia portfolio of CALDON LEFM ultrasonic flowmeters combines experience, innovation, and proven technology into the broadest offering of custody transfer, fiscal, check metering, and leak detection innovations for the liquid hydrocarbon industry. The CALDON LEFM flowmeter series accommodates the largest range of applications, including high-viscosity crude oils and LNG.

CALDON LEFM flowmeters for liquids have become the benchmark around the world. Leveraging expertise from one of the most advanced liquid hydrocarbon calibration laboratories, Sensia offers the most complete capabilities to fit all customer application and service needs.

>50yrs

experience and a history of technological firsts with multipath inline ultrasonic flowmeters



Advantages

+ Compliance with API MPMS Chapter 5.8, International Organization of Legal Metrology (OIML) Recommendation R 117-1 Class 0.3, Measuring Instruments Directive (MID) 2014/32/EU, and NACE MR0175
+ Four- and eight-path chordal designs for optimal linearity and repeatability
+ Industry-leading eight-path chordal design with dramatically reduced sensitivity to swirl and asymmetry effects
+ 5-diameter minimum upstream pipe run and no requirement for flow conditioner, which reduces total cost of ownership
+ Advanced signal processing with real-time diagnostic analysis
+ Reducing nozzle design that delivers improved flow stability and unparalleled accuracy for in-situ proving and for applications with high-viscosity and/or low Reynolds numbers
+ Four- and eight-path designs for cryogenic applications that require custody transfer and allocation performance
+ Transducers that are isolated from the process and outside the pressure boundary for ease of service, if required
+ No recalibration or zeroing required if transducer is replaced
+ In-house transducer manufacturing for maximum quality control
+ Internal resistance temperature detector (RTD) for thermal expansion compensation
+ Continuous logging capabilities
+ Optional corrosion- and contamination-resistant internal coating

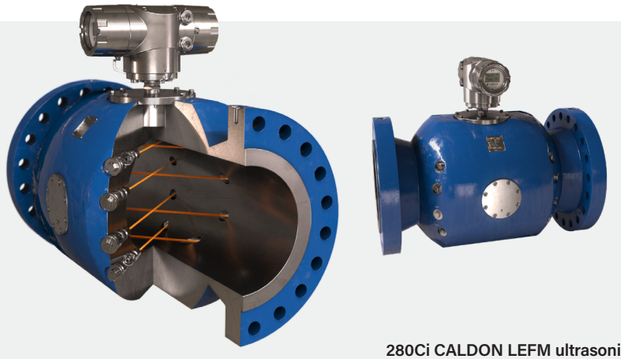
280Ci CALDON LEFM ultrasonic flowmeter

+ 5-diameter minimum upstream pipe run and no requirement for flow conditioner, which reduces total cost of ownership

CALDON LEFM Flowmeter Models for Liquids

280Ci

The eight-path 280Ci CALDON LEFM ultrasonic flowmeter is a compact, high-performance unit designed to meet the most stringent requirements of custody-transfer and fiscal metering applications. The design of the 280Ci model provides a low sensitivity to swirl and flow profile effects and is capable of ±0.1% linearity without requiring a flow conditioner. The flowmeter can be installed with only 5 pipe diameters straight run upstream to achieve premium performance.



280Ci CALDON LEFM ultrasonic flowmeter, which is insensitive to swirl

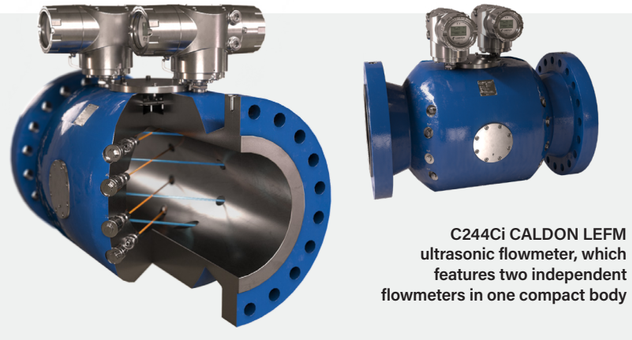
240Ci

The 240Ci CALDON LEFM ultrasonic flowmeter for liquids is designed to achieve ±0.15% linearity in combination with a flow conditioning device, meeting or exceeding the industry standards for performance and reliability.

240Ci CALDON LEFM ultrasonic flowmeter, which enables achieving ±0.15% linearity with a flow conditioning device

244Ci

The 244Ci CALDON LEFM ultrasonic flowmeter is a high-performance unit designed for custody-transfer or fiscal metering applications that features two independent four-path flowmeters in one compact meter body. The four-path-plus-four-path dual-meter design meets all custodytransfer requirements while offering full redundancy and meter-to-meter comparison for in situ validation.



C244Ci CALDON LEFM ultrasonic flowmeter, which features two independent flowmeters in one compact body

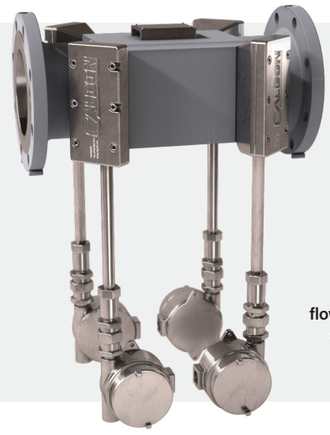
280CiRN

The eight-path 280CiRN CALDON LEFM ultrasonic flowmeter is designed with a reduced bore and a special nozzle-shaped entry in which the velocity profile is stabilized. Repeatability is improved to levels suitable for direct proving, making this meter ideal for replacement of turbine and positive-displacement flowmeters. The velocity-profile related problems of transitional flow at Reynolds numbers below 10,000 are overcome. High-viscosity fluids are measured without compromising performance.

280CiRN CALDON LEFM ultrasonic flowmeter, which overcomes repeatability and velocity-profile-related challenges.

240CiLT-R and 280CiLT-R

The CALDON LEFM 240CiLT-R* four-path ultrasonic flowmeter and CALDON LEFM 280CiLT-R* eight-path ultrasonic flowmeter are designed for measurement of LNG at cryogenic temperatures, providing the performance required for custody transfer, allocation, and check metering. The design of the eight-path 280CiLT-R model has a low sensitivity to swirl and profile effects, thereby eliminating the need for flow conditioning elements and their associated pressure drop while maintaining accuracy suitable for custody transfer.

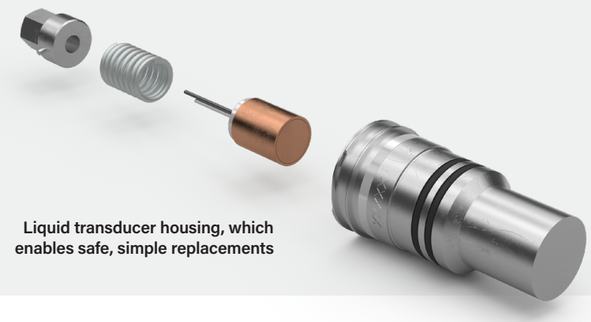


CALDON LEFM 280CiLT-R ultrasonic flowmeter, which is less sensitive to swirl and profile effects

Isolated transducer housing design

Our ultrasonic flowmeters for liquids have transducers that are installed into stainless steel transducer housings. The transducer housing is a pressure boundary between the transducer assembly and the process.

The operator does not have to depressurize the meter if a CALDON LEFM flowmeter transducer should ever need to be replaced. A transducer can be replaced safely with fluid flowing in the meter. The design does not require any special tools or extraction devices for transducer replacement.



Liquid transducer housing, which enables safe, simple replacements

CALDON USM Measurement Advisor software

CALDON USM Measurement Advisor condition-based monitoring (CBM) software helps reduce risks by monitoring key parameters, changes in process conditions, and other factors that affect measurement uncertainty and data integrity in ultrasonic flowmeters.

CALDON USM Measurement Advisor software enables operators to improve decision making by providing intelligent alarms and dynamically adjusted CBM thresholds based on real-time and historical data from CALDON* ultrasonic flowmeter products and process conditions. The easy-to-use, icon-driven software records, displays, reports, and analyzes flowmeter data and compares operating conditions with a set of reference conditions to deliver intelligent insight into meter performance.

The CALDON USM Measurement Advisor Meter Explorer module enables users to clearly visualize meter location using a four-level hierarchy to replicate system structure. This enables high-level or deep-dive analysis. The simple-to-use interface also includes a meter setup wizard and full meter backup and restore facilities.

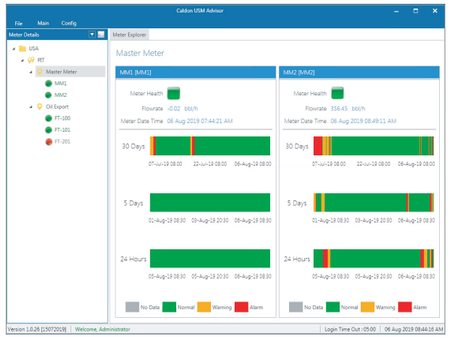
FEATURES

+ Compliance with international standards, including ISO 17089
+ Real-time or time-period data
+ Alarms for meter hard errors, global CBM limits, fingerprint limits
+ Multiple configurable fingerprint data groups
+ Multivariable time-based trending
+ Configurable meter hierarchy
+ Customizable customer logo on reports
+ Easy navigation to all connected meters
+ Meter configuration and setup wizard

CALDON USM Measurement Advisor Software Data Features

Diagnostics Data	Fingerprint Data†
Gain	Gain
Signal-to-noise ratio	Signal-to-noise ratio
% acceptance of pulses	
Speed of sound	Speed of sound
Standard deviation (turbulence)	Standard deviation (%) per path
Normalized path velocities	Normalized path velocities
Flatness	Flatness
Asymmetry	Asymmetry
Swirl‡	Swirl‡
Plane balance‡	Plane balance‡

Output options include screen, historian, and reports.
†Up to 11 variables, depending on meter configuration.
‡8-path meters only.



Meter health status trend for multiple meters at the meter station hierarchy level

Multiple parameters for a single meter at Meter View.

Historical signal-to-noise ratio vs. velocity trend at Path View

Specifications

	Meter Body with Integral Transmitter		Meter Body with Remote Transmitter	
	CE Ex ETL CSA		CE Ex ETL CSA	
Class	II 2 G, Ex d IIC Gb T6	Class I, Div. 1, Groups B,C, & D T6	II 2 G, Ex d IIC Gb T3	Class I, Div. 1, Groups B,C, & D T3C
Temperature, degF [degC]				
2XXCi models	–58 to 158 [–50 to 70]	–58 to 158 [–50 to 70]	–58 to 257 [–50 to 125]	–58 to 257 [–50 to 125]
240CiLT-R and 280CiLT-R models	–	–	–328 to 266 [–200 to 130]†	–328 to 266 [–200 to 130]†

† For temperatures > 158 degF [70 degC], the body shape and weight may be different than shown. Contact Sensia for further details.

Standard Materials of Construction (Compliance with Pressure Equipment Directive [PED])

Meter body and flanges	
2XXCi models	Carbon steel (stainless and duplex optional)
240CiLT-R and 280CiLT-R models	Stainless steel
Transducer housings	Stainless steel (INCONEL® material optional)
Junction boxes and transmitter enclosure	Copper-free aluminum (stainless steel optional)

Consult Sensia for other material options.

Standard End Connections and Maximum Working Pressure

ANSI B16.5 Raised Face	Stainless Steel, psi [bar]	Carbon Steel, psi [bar]
Class 150	275 [19.0]	285 [19.6]
Class 300	720 [49.6]	740 [51.1]
Class 600	1,440 [99.3]	1,480 [102.1]
Class 900	2,160 [148.2]	2,220 [153.2]
Class 1500	3,600 [248.2]	3,705 [255.3]

Consult Sensia for other material options.

Recommended Flow Velocity Range[1]

		Nominal size			
2XXCi	Full bore	< 10 inch [DN 250]		≥ 10 inch [DN 250]	
	Min Velocity, m/s [ft/s]	1.2 [3.9]		0.8 [2.6]	
	Max Velocity, m/s [ft/s]	12 [39.4]		12 [39.4]	
2XXCiRN	Reducing nozzle	All sizes			
	Min Throat Velocity, m/s [ft/s]	1.3 [4.2]			
	Max Throat Velocity, m/s [ft/s]	19.2 [63]			
		Throat/pipe diameter ratio (beta)			
	Typical beta[2] (-)	0.63	0.67	0.72	0.79
	Min Pipe Velocity, m/s [ft/s]	0.51 [1.7]	0.57 [1.9]	0.66 [2.2]	0.80 [2.6]
	Max Pipe Velocity, m/s [ft/s]	7.6 [25]	8.6 [28.3]	10.0 [32.7]	12.0 [39.4]

Typical Maximum and Minimum Flow Rates[3]

Nominal Size, inch [mm]	Flowrate, bbl/h [m³/hr]			
	2XXCi		2XXCiRN	
	Min	Max	Min	Max
4 [100]	223 [35]	2,232 [355]	-	-
6 [150]	506 [81]	5,064 [805]	214 [34]	5,064 [805]
8 [200]	877 [139]	8,770 [1394]	371 [59]	8,770 [1394]
10 [250]	922 [147]	13,823 [2198]	585 [93]	13,823 [2198]
12 [300]	1,322 [210]	19,826 [3152]	839 [133]	19,826 [3152]
14 [350]	1,611 [256]	24,171 [3843]	1,023 [163]	24,171 [3843]
16 [400]	2,135 [339]	32,019 [5091]	1,356 [216]	32,019 [5091]
18 [450]	2,731 [434]	40,968 [6514]	1,734 [276]	40,968 [6514]
20 [500]	3,401 [541]	51,019 [8112]	2,160 [343]	51,019 [8112]
24 [600]	4,962 [789]	74,425 [11833]	3,151 [501]	74,425 [11833]

[1] The velocities stated here are recommended but are not limiting. Higher or lower velocities can be accommodated upon review by Sensia. MID/OIML R117 Certificate TC7381 permits velocities in the range 0.2 to 16.6 m/s for 2XXCi full bore flow meters and 0.2 to 21 m/s throat velocity for 2XXCiRN reducing nozzle flow meters. Flow rates are calculated by multiplying the velocity by the corresponding internal cross-sectional area, with appropriate unit conversions.
[2] The throat diameter over pipe diameter ratio of the reducing nozzle meter (beta) is a variable. Recommended velocities are shown for typical beta values.
[3] Flow rates shown are for indicative purposes only. Additional meter sizes, including larger meters, are available. Please consult Sensia for an appropriate meter sizing. Tabulated rates are based on the recommended flow velocity range for meters sized with Standard wall thickness. 2XXCiRN maximum and minimum flow rates are shown for beta 0.79 and 0.63 respectively; recommended maximum and minimum rates can be calculated by selecting a beta value and its corresponding recommended flow velocity range.

Operation and Performance	240Ci	244Ci	240CiLT-R	280Ci	280CiLT-R	280CiRN
Nominal pipe sizes[1], inch [mm]	4 to 48 [100 to 1,200]	8 to 48 [100 to 1,200]	6 to 36 [150 to 900]	4 to 48 [100 to 1,200]	6 to 36 [150 to 900]	6 to 36 [150 to 900]
Linearity	± 0.15 % over recommended velocity range			± 0.1 % over recommended velocity range		
Typical rangeability (flow rate or velocity turndown corresponding to stated linearity)[2]	10:1 for sizes 4 to 8 inch [DN 100 to DN 200] 15:1 for sizes 10 inch and larger (≥ DN250)					15:1
Recommended minimum Reynolds number[3]	10,000					No limitation
Repeatability	In accordance with the requirements of API Manual of Petroleum Measurement Standards Chapter 5.8, Table B.1, or OIML R117-1 Accuracy Class 0.3					
Custody transfer certification	OIML R117-1 Edition 2007 (E), "Dynamic measuring systems for liquid other than water" Welmec Guide 8.8, "General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measurement Instruments Under the MID." 2XXCi(LT-R) certified pipe velocity range: 0.2 to 16.6 m/s [0.66 to 55 ft/s] 2XXCiRN certified throat velocity range: 0.2 to 21 m/s [0.66 to 70 ft/s]					
Water in oil	CALDON LEFM flowmeters can operate reliably with high water contents provided that the water and oil are well mixed. Typically, the oil and water will be sufficiently well mixed for good ultrasonic meter performance at velocities above 2 m/s [6.5 ft/s]. Meter operation can be affected if the water and oil are not well mixed. Please contact Sensia for further advice on high-water-cut applications.					

[1] Meter images shown in this brochure are MK I, MK III and MK IV meter bodies. MK I to MK V meter bodies may be supplied depending on specific application and project requirements.
[2] Rangeability can be extended upon review of application conditions and accuracy requirements. Meters can operate from zero flow up to velocites in excess of 21 m/s [70 ft/s].
[3] Consult Sensia for additional information on model and beta selection for Reynolds numbers < 10,000

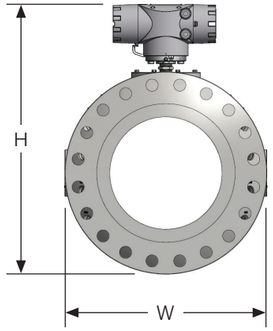
General Specifications	
Electronics	
Power requirements—DC power	
Voltage required, V DC	24 (18 to 30)
Current draw at 24 V DC, A	0.25
Power consumption, W	6
Power requirements—AC power	
Voltage, V AC	120 (60 Hz); 230 (50 Hz)
Voltage range, V AC	108–253
Frequency range, Hz	47–63
Current draw, A	0.14
Power consumption, W	7.3
Protection	Ingress Protection (IP) 66; Association of Electrical Equipment and Medical Imaging Manufacturers (NEMA) Type 4 and 4X
Relative humidity, %	0–95
Operating temperature, degF [degC]	–58 to 158 [–50 to 70]
Local display, px	400 × 240 LCD showing flow, diagnostics data, and alarms
Remote mounting electronics from meter, ft [m]	328 [100]
Analog inputs (three), mA	4–20 configurable
RTD input	Meter body temperature
Analog outputs (two), mA	4–20 (configurable 650-ohm maximum load)
Digital outputs	
Flow	Four pulse output channels
	Programmable K-factor
	Programmable configuration
	1. Dual frequency set-up, 50/50 duty cycle
	Channel B lags channel A by 90° for forward flow
	Channel B leads channel A by 90° for reverse flow
	2. Frequency and direction, 0 duty cycle
	Channel B indicates flow direction
	Forward flow = 0
	Reverse flow = high (5 or 12 V DC)
	3. Alternating, forward-flow frequency on
	Channel A only reverse-flow frequency
	On channel B only 50/50 duty cycle
Alarm status	Four outputs, 0–5 or 0–12 V DC selectable (0 V = alarm)
Communication	Three serial or two serial and HART protocol
	Ethernet (copper or fiber optic) or fiber modem
Meter Body	
Relative humidity, %	0–95
Operating temperature, degF [degC]	–58 to 257 [–50 to 125]
	–328 to 266 [–200 to 130] for LT models

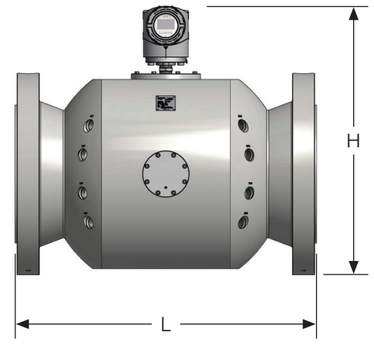
Dimensions and Weights

Dimensions and Weights for 2xxCi and 280CiRN CALDON LEFM Ultrasonic Flowmeters

Nominal Pipe Size, in [mm][1]	Flange ANSI Class	Width (W), in [mm]	Height (H), in [mm]	Length (L), in [mm]	Meter Weight, lbm [kg][2]
4 [100]	150	17.7 [450]	19.2 [487]	21.0 [533]	333 [151]
	300	17.7 [450]	19.7 [500.0]	21.7 [552]	353 [160]
	600	17.7 [450]	20.1 [510.0]	23.5 [597]	384 [174]
	900	17.7 [450]	20.4 [519]	24.5 [622]	419 [190]
	1500	17.7 [450]	20.8 [529]	25.2 [641]	465 [211]
6 [150]	150	17.7 [450]	21.1 [535]	24.0 [610]	494 [224]
	300	17.7 [450]	21.8 [554.0]	24.8 [629]	536 [243]
	600	17.7 [450]	22.6 [573.0]	26.7 [679]	624 [283]
	900	17.7 [450]	23.1 [586]	28.5 [724]	705 [320]
	1500	17.7 [450]	23.3 [592]	31.0 [787]	840 [381]
8 [200]	150	17.0 [432]	23.9 [606]	26.8 [679]	769 [349]
	300	17.0 [432]	24.4 [619]	27.5 [699]	824 [374]
	600	17.0 [432]	25.1 [638]	29.8 [756]	919 [417]
	900	18.5 [470]	26.1 [662]	32.0 [813]	1,111 [504]
	1500	19.0 [483]	26.3 [668]	36.0 [914]	1,334 [605]
10 [250]	150	20.0 [508]	27.4 [695]	28.8 [730]	1,193 [541]
	300	20.0 [508]	27.4 [695]	30.0 [762]	1,279 [580]
	600	20.0 [508]	28.6 [727]	33.3 [845]	1,462 [663]
	900	21.5 [546]	28.4 [722]	35.7 [908]	1,596 [724]
	1500	23.0 [584]	29.2 [741]	41.3 [1,048]	2,090 [948]
12 [300]	150	22.0 [559]	30.4 [773]	31.8 [806]	1,641 [744]
	300	22.0 [559]	30.4 [773]	33.0 [838]	1,754 [795]
	600	22.0 [559]	30.9 [785]	35.5 [902]	1,927 [874]
	900	24.0 [610]	30.9 [786]	39.0 [991]	1,812 [822]
	1500	26.5 [673]	30.9 [786]	45.5 [1,156]	3,067 [1,391]
14 [350]	150	23.8 [603]	32.3 [820]	34.0 [864]	2,011 [912]
	300	23.8 [603]	32.4 [822]	35.3 [895]	2,182 [990]
	600	23.8 [603]	32.7 [831]	37.5 [953]	2,328 [1,056]
	900	25.2 [641]	34.4 [875]	41.3 [1,048]	2,619 [1,188]
	1500	29.5 [749]	34.4 [875]	48.0 [1,219]	3,889 [1,764]
16 [400]	150	27.0 [686]	35.2 [895]	35.8 [908]	2,778 [1,260]
	300	27.0 [686]	35.3 [896]	37.3 [946]	2,992 [1,357]
	600	27.0 [686]	36.0 [916]	40.3 [1,022]	3,262 [1,480]
	900	27.8 [705]	34.8 [884]	43.3 [1,099]	3,373 [1,530]
	1500	27.8 [705]	37.2 [945]	50.7 [1,289]	5,104 [2,315]
18 [450]	150	29.3 [743]	37.2 [946]	38.8 [984]	3,309 [1,501]
	300	29.3 [743]	37.5 [954]	40.3 [1,022]	3,602 [1,634]
	600	29.3 [743]	38.2 [970]	43.3 [1,099]	3,913 [1,775]
	900	31.0 [787]	37.4 [949]	46.3 [1,175]	4,405 [1,998]
	1500	36.0 [914]	39.9 [1,013]	54.0 [1,372]	6,592 [2,990]
20 [500]	150	32.0 [813]	39.6 [1,006]	41.1 [1,045]	4,118 [1,868]
	300	32.0 [813]	40.0 [1,016]	42.5 [1,080]	4,462 [2,024]
	600	32.0 [813]	40.7 [1,035]	46.3 [1,175]	4,886 [2,216]
	900	33.7 [857]	39.8 [1,010]	49.8 [1,264]	5,478 [2,485]
	1500	38.7 [984]	42.2 [1,073]	58.3 [1,480]	8,208 [3,723]
24 [600]	150	37.0 [940]	41.9 [1,063]	45.8 [1,162]	5,555 [2,520]
	300	37.0 [940]	43.9 [1,114]	48.5 [1,232]	6,123 [2,777]
	600	37.0 [940]	44.4 [1,127]	52.3 [1,327]	6,681 [3,030]
	900	41.0 [1,041]	45.3 [1,151]	57.2 [1,454]	8,878 [4,027]
	1500	46.0 [1,168]	47.8 [1,214.0]	66.3 [1,683]	12,694 [5,758.0]

[1] Consult Sensia for sizes larger than 24 in.
[2] Approximate weight for 2XXCi flow meters. Consult Sensia for 2XXCiRN flow meter weight.

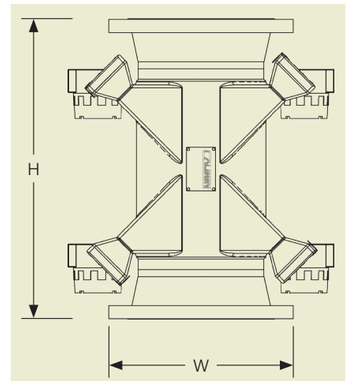


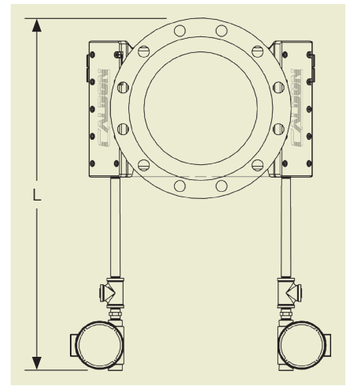


Dimensions and Weights for 240CiLT-R and 280CiLT-R CALDON LEFM Flowmeters

Nominal Pipe Size, in [mm]	Flange ANSI Class	Height (H),† in [mm]	Width (W), in [mm]	Length (L), in [mm]	Weight, lbm [kg]
8 [200]	150	25.6 [650]	14.8 [375]	24.0 [610]	474 [215]
	300	26.4 [671]	15.0 [381]	24.8 [629]	530 [240]
	600	27.1 [688]	16.5 [419]	27.0 [686]	636 [289]
	900	28.1 [714]	18.5 [470]	29.3 [743]	746 [338]
10 [250]	150	27.9 [709]	17.0 [432]	26.0 [660]	714 [324]
	300	28.7 [729]	17.5 [445]	27.2 [692]	792 [359]
	600	29.9 [759]	20.0 [508]	30.5 [775]	990 [449]
	900	30.7 [780]	21.5 [546]	33.0 [838]	1,130 [513]
12 [300]	150	30.4 [772]	19.0 [483]	29.5 [749]	987 [448]
	300	31.2 [792]	20.5 [521]	30.7 [781]	1,107 [502]
	600	31.9 [810]	22.0 [559]	33.2 [844]	1,277 [579]
	900	32.9 [836]	24.0 [610]	36.8 [934]	1,477 [670]
14 [350]	150	32.0 [813]	21.0 [533]	32.0 [813]	1,265 [574]
	300	33.0 [838]	23.0 [584]	33.2 [844]	1,405 [637]
	600	33.4 [848]	23.8 [603]	35.5 [902]	1,605 [728]
	900	34.2 [869]	25.3 [641]	39.3 [997]	1,845 [837]
16 [400]	150	34.4 [874]	23.5 [597]	33.5 [851]	1,467 [666]
	300	35.4 [899]	25.5 [648]	35.0 [889]	1,687 [765]
	600	36.2 [919]	27.0 [686]	38.0 [965]	1,967 [892]
	900	36.5 [927]	27.8 [705]	41.5 [1,054]	2,177 [988]
18 [450]	150	36.2 [919]	25.0 [635]	37.0 [940]	1,614 [732]
	300	37.7 [958]	28.0 [711]	38.5 [978]	1,954 [887]
	600	38.3 [973]	29.3 [743]	41.0 [1,041]	2,264 [1,027]
	900	39.2 [996]	31.0 [787]	44.5 [1,130]	2,674 [1,213]
20 [500]	150	37.8 [960]	27.5 [699]	39.4 [1,000]	1,640 [744]
	300	39.3 [998]	30.5 [775]	40.8 [1,035]	2,080 [943]
	600	40.0 [1,016]	32.0 [813]	43.5 [1,105]	2,460 [1,116]
	900	40.9 [1,039]	33.8 [857]	48.0 [1,219]	2,940 [1,333]
24 [600]	150	42.0 [1,067]	32.0 [813]	44.0 [1,118]	1,991 [903]
	300	44.0 [1,118]	36.0 [914]	45.2 [1,149]	2,631 [1,194]
	600	44.5 [1,130]	37.0 [940]	48.5 [1,232]	3,131 [1,420]
	900	46.5 [1,181]	41.0 [1,041]	55.5 [1,410]	4,471 [2,028]

† Height includes an 8-in nipple extension to penetrate the insulation.
Consult Sensia for other sizes and pressure classes.





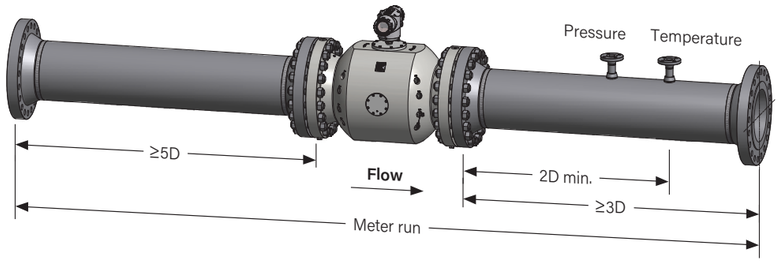
Installation

To limit uncertainty caused by hydraulic effects, we recommend installing the flowmeter in compliance with the following guidelines.

280Ci, 280CiRN, and 280CiLT-R

The adjoining straight pipe should be of the same schedule as the meter. Temperature elements and pressure connections should be located downstream of the meter. The CALDON LEFM eight-path flowmeter models do not normally require the use of a flow conditioning element.

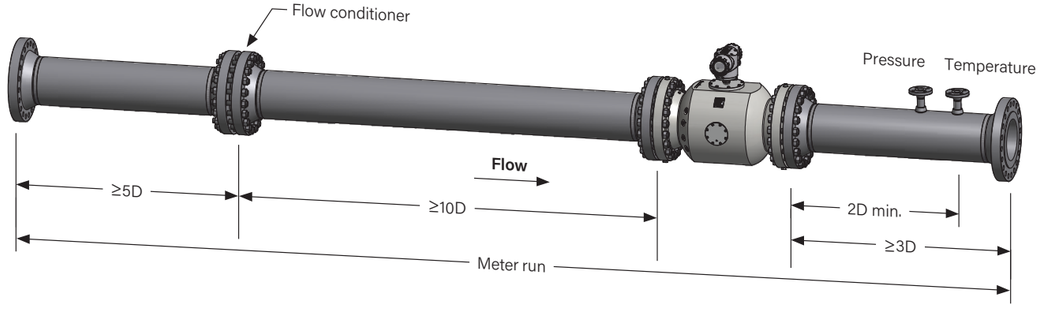
An uninterrupted straight upstream pipe that is 5 pipe diameters (D) in length is adequate in most applications. In adverse geometries where there is a constriction upstream of the meter that is smaller than the diameter of the meter run piping (such as a reduced bore valve), we recommend separating this from the meter by a pipe at least 15 pipe diameters in length. Downstream of the meter, there should be a straight pipe at least 3 pipe diameters in length.



24XCi, 240CiLT-R

The adjoining straight pipe should be of the same schedule as the meter. Temperature elements and pressure connections should be located downstream of the meter. It is recommended that the meter be installed downstream of a 10 diameter pipe section that includes a flow conditioning element at its inlet.

For effective flow conditioning, we recommend an additional straight pipe of minimum 5 diameters in length upstream of the flow conditioner. Downstream of the meter there should be a straight pipe at least 3 pipe diameters in length. If a flow conditioning element is not used, additional uncertainty can be limited by using a straight pipe upstream at least 20 pipe diameters in length and applying strict rules to avoid the introduction of swirl upstream of that 20-diameter length.



For application-specific recommendations or more detailed installation guidance, please consult Sensia.

Hydrocarbon Calibration Laboratory

CALDON LEFM 200 flowmeters are calibrated over a Reynolds number range that corresponds to the actual Reynolds number range the meter encounters in the field. This process ensures that the calibration is appropriate for the range of flow rates and viscosity specified.

The ability to calibrate in house virtually eliminates the need for Sensia to use independent facilities, thereby significantly reducing delivery cycles and errors..

FEATURES

+ Compliance with international standards, including ISO 17089
+ Real-time or time-period data
+ Alarms for meter hard errors, global CBM limits, fingerprint limits
+ Multiple configurable fingerprint data groups
+ Multivariable time-based trending
+ Configurable meter hierarchy
+ Customizable customer logo on reports
+ Easy navigation to all connected meters
+ Meter configuration and setup wizard

Calibration Laboratory Specifications†	
Maximum flow rate	25,000 bbl/h [3,900 m3/h]
Minimum flow rate	63 bbl/h [10 m3/h]
Meter sizes	2- to 24-in [50- to 600-mm] meters can be calibrated using three calibration lines
Master meters	Two 280Ci models—10-in meters installed in parallel
Temperature control	Temperature is controlled within a band of 59–95 degF [15–35 degC] using a 65-ton US chiller system
Viscosity	1.5–200 mm2/s
Uncertainty	±0.04% ball prover 0.03% small volume prover (SVP) ±0.08% master meters 0.04% SVP and turbine meter ±0.09% single-master meter

† Specifications may change without notice.

International Organization for Standardization
ISO
17025
ACCREDITED LABORATORY

Notes:

The Sensia ISO 17025–accredited hydrocarbon calibration laboratory sets us apart from all other ultrasonic flowmeter suppliers.

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