CAMERON
A Schlumberger Company

CALDON LEFM Ultrasonic Flowmeters for Liquids

Integrating experience, proven technology, and innovation

280Ci CALDON LEFM ultrasonic flowmeter.

Contents

CALDON LEFM Ultrasonic Flowmeters for Liquids

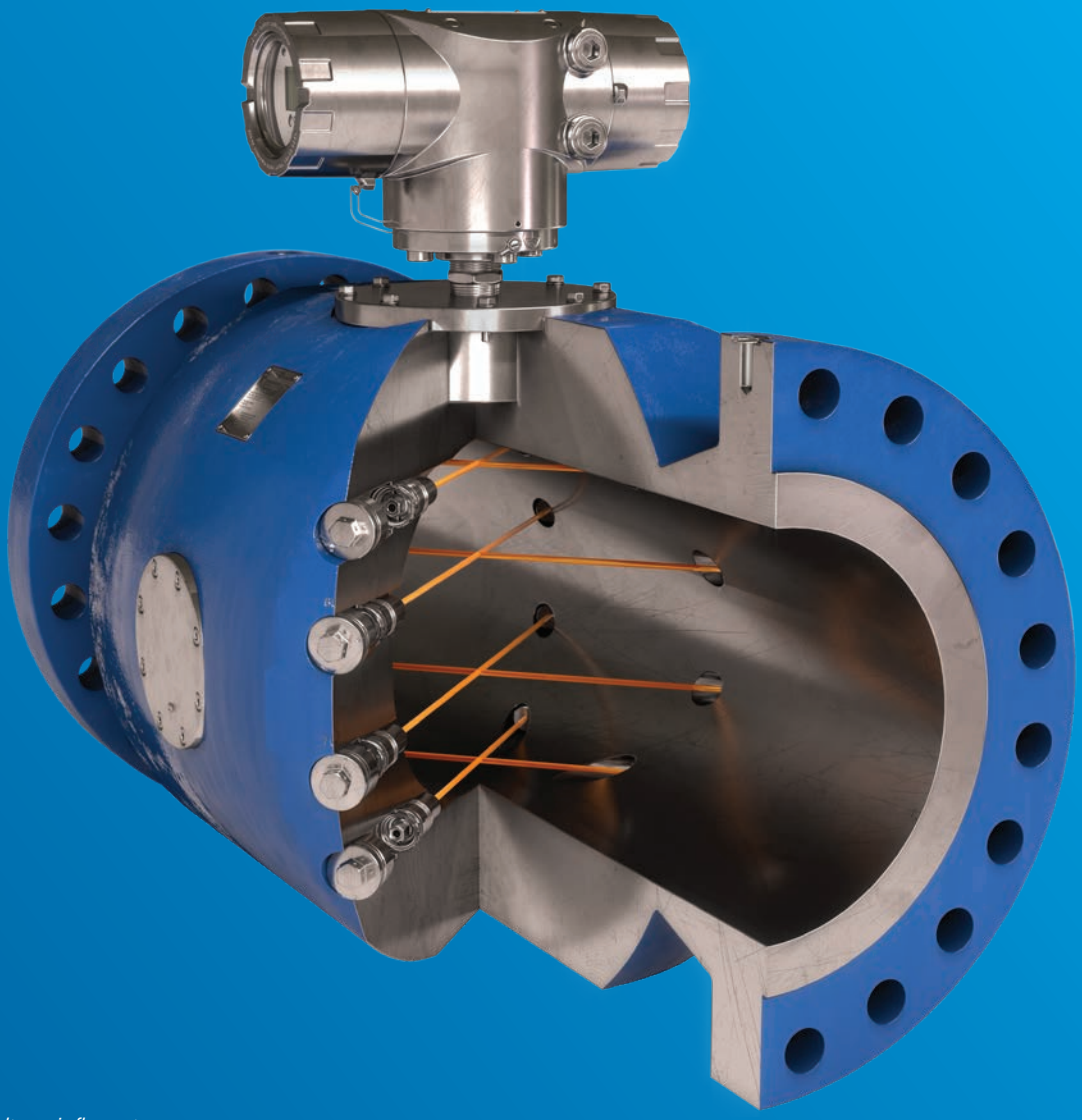
Count on Cameron

Backed by more than 50 years of experience and a history of technological firsts, the Cameron 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, Cameron offers the most complete capabilities to fit all customer application and service needs.

CALDON LEFM Flowmeter Technology Firsts

1965–70	First chordal multipath flowmeters
1970–75	First nuclear reactor coolant application
1974–75	First flowmeter for crude oil applications
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 mm^2/s



280Ci CALDON LEFM ultrasonic flowmeter.

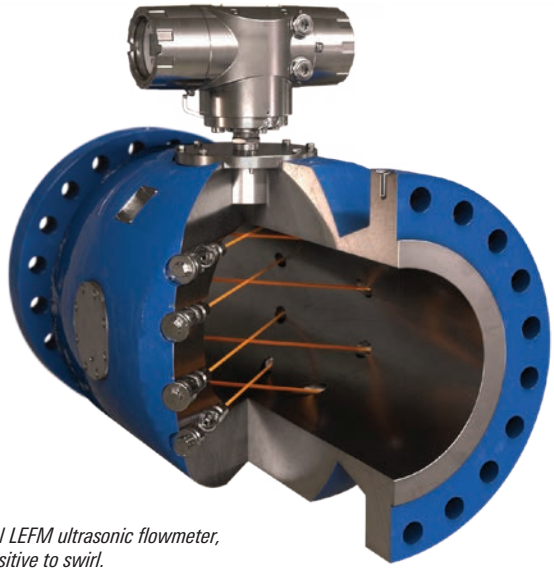
Advantages

- 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
- Reduced nozzle design that delivers improved flow stability for unparalleled accuracy in proving applications with high-viscosity and low Reynolds number applications
- 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

CALDON LEFM Flowmeter Models for Liquids

280Ci

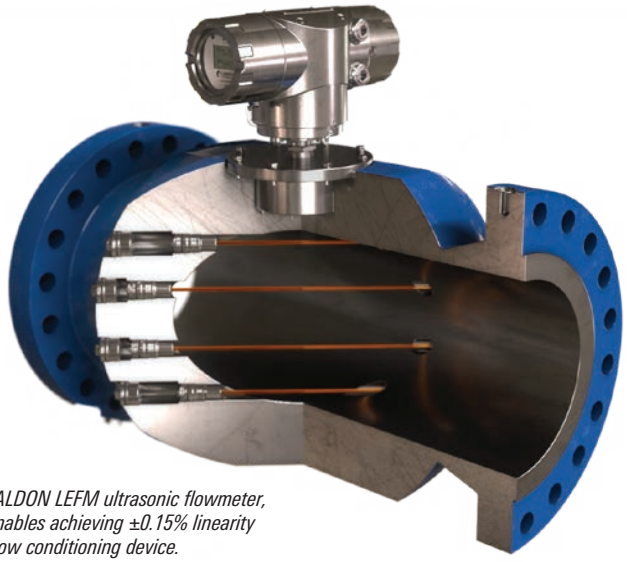
The eight-path 280Ci CALDON LEFM ultrasonic flowmeter is a compact, high-performance unit designed to meet the most stringent requirements of custody-transfer and fiscal metering applications. The design of the 280Ci model provides a low sensitivity to swirl and flow profile effects and is capable of ±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

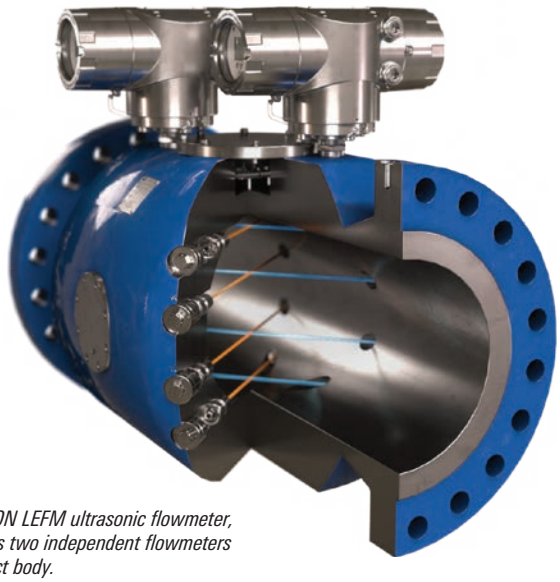
The 240Ci CALDON LEFM ultrasonic flowmeter for liquids is designed to achieve ±0.15% linearity in combination with a flow conditioning device, meeting or exceeding the industry standards for performance and reliability.



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

244Ci

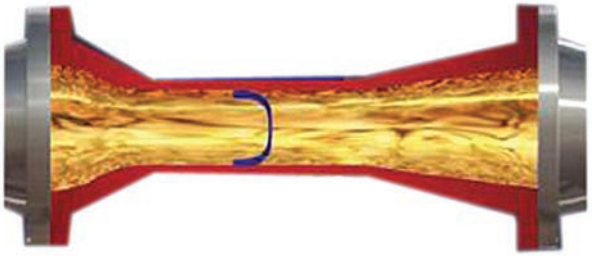
The 244Ci CALDON LEFM ultrasonic flowmeter is a high-performance unit designed for custody-transfer or fiscal metering applications that features two independent four-path flowmeters in one compact meter body. The four-path-plus-four-path dual-meter design meets all custody-transfer requirements while 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 liquid velocity profile is stabilized to overcome transitional flow problems at Reynolds numbers below 10,000. High-viscosity fluids are measured without compromising performance. Repeatability is improved to levels suitable for direct proving, making this meter ideal for replacement of turbine and positive-displacement flowmeters.



Challenging transitional flow rates stabilized by a patented reduced-bore inlet design.

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

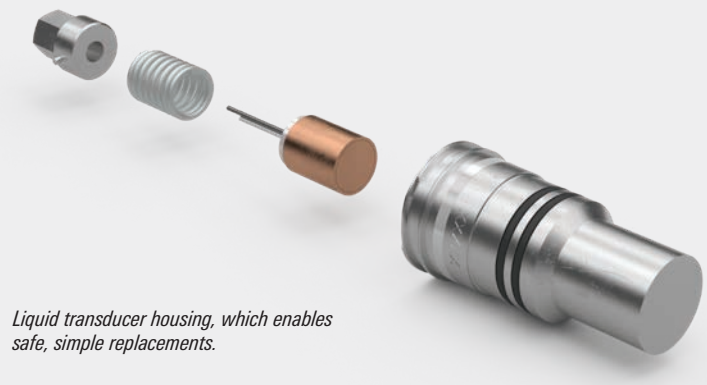
240CiLT-R and 280CiLT-R

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 Advisor software

CALDON USM 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 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 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.

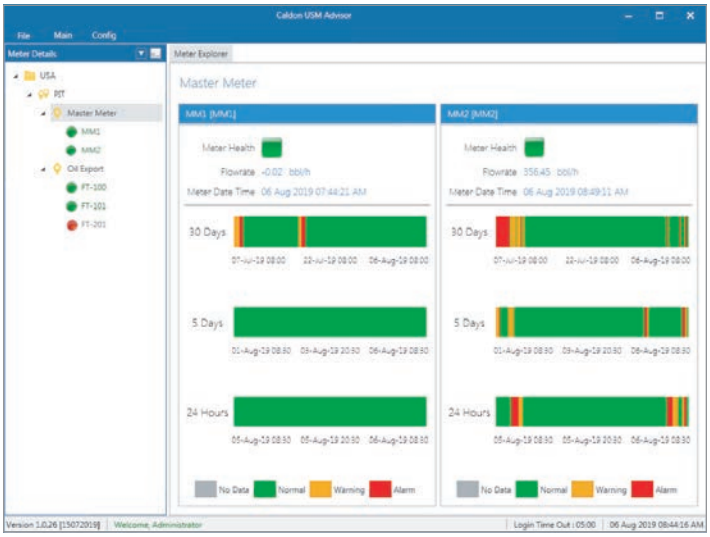
Features

- Compliance with international standards, including ISO 17089
- Real-time or time-period data
- Alarms for meter hard errors, global CBM limits, and 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
- Zoomable display and timeframes
- Four role-based levels of access
- User logon and password for data security

CALDON USM 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	
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 Cameron 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 Cameron 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 Cameron for other material options.

Sizes and Flow Rates

Nominal Size, in [mm]	Flow Rate, bbl/h [m^3/h]			
	2XXCi		2XXCiRN	
	Q_{min}	Q_{max}	Q_{min}	Q_{max}
4 [100]	223 [36]	2,230 [355]	–	–
6 [150]	506 [81]	5,060 [805]	214 [34]	3,220 [511]
8 [200]	877 [139]	8,770 [1,390]	371 [59]	5,570 [885]
10 [250]	922 [147]	13,800 [2,200]	585 [93]	8,780 [1,400]
12 [300]	1,320 [210]	19,800 [3,150]	839 [133]	12,600 [2,000]
14 [350]	1,610 [256]	24,200 [3,840]	1,020 [163]	15,300 [2,440]
16 [400]	2,130 [339]	32,000 [5,090]	1,360 [216]	20,300 [3,230]

Sizes and Flow Rates

Nominal Size, in [mm]	Flow Rate, bbl/h [m^3/h]			
	2XXCi		2XXCiRN	
	Q_{min}	Q_{max}	Q_{min}	Q_{max}
18 [450]	2,730 [434]	41,000 [6,510]	1,730 [276]	26,000 [4,140]
20 [500]	3,400 [541]	51,000 [8,110]	2,160 [343]	32,400 [5,150]
24 [600]	4,960 [789]	74,400 [11,800]	3,150 [501]	47,300 [7,510]
26 [650]	5,850 [930]	87,800 [14,000]	3,720 [591]	55,700 [8,860]
28 [700]	6,820 [1,080]	102,000 [16,300]	4,330 [688]	64,900 [10,300]
30 [750]	7,850 [1,250]	118,000 [18,700]	4,990 [793]	74,800 [11,900]
32 [800]	8,960 [1,430]	134,000 [21,400]	5,690 [905]	85,400 [13,600]

Operation and Performance	240Ci, 244Ci, and 240CiLT-R	280Ci and 280CiLT-R	280CiRN
Linearity	±0.15% over nominal flow range	±0.10% over nominal flow range	±0.10% over nominal flow range
Repeatability	In accordance with the requirements of API Manual of Petroleum Measurement Standards Chapter 5.8, Table B.1 or OIML R 117-1 Accuracy Class 0.3		
Flow range relative to nominal maximum†	10:1 for sizes 4 to 8 in [DN 100 to DN 200]		15:1
	≥ 15:1 for sizes 10 in and larger [≥DN 250]		
Recommended minimum Reynolds number	10,000	10,000	No limitation
Custody transfer certification	OIML R 117-1 Edition 2007 (E), "Dynamic measuring systems for liquids other than water"		
	WELMEC Guide 8.8, "General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring Instruments Under the MID"		
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 6.5 ft/s [2 m/s]. Meter operation and performance can be affected if the water and oil are not well mixed. Please contact Cameron for further advice on high-water-cut applications.		

Nominal pipe sizes,‡ in [mm]	240Ci	244Ci	240CiLT-R	280Ci	280CiLT-R	280CiRN
	4 to 48 [100 to 1,200]	8 to 48 [100 to 1,200]	6 to 36 [150 to 900]	4 to 48 [150 to 1200]	6 to 36 [150 to 900]	6 to 24 [150 to 600]

†From nominal maximum flow, range can be extended when linearity requirements are relaxed.

‡For nominal sizes larger than 48 in [1,200 mm], contact Cameron.

For sizes 4 and 6 in and flange ratings Cl 900 and 1500, the previous-generation body shape can be used.

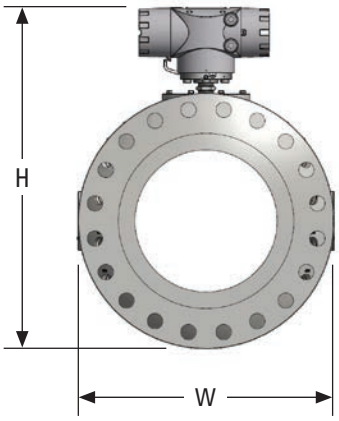
General Specifications	
Electronics	
Power requirements—DC power	
Voltage required, V DC	24 (18 to 30)
Current draw at 24 V DC, A	0.25
Power consumption, W	6
Power requirements—AC power	
Voltage, V AC	120 (60 Hz); 230 (50 Hz)
Voltage range, V AC	108–253
Frequency range, Hz	47–63
Current draw, A	0.14
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

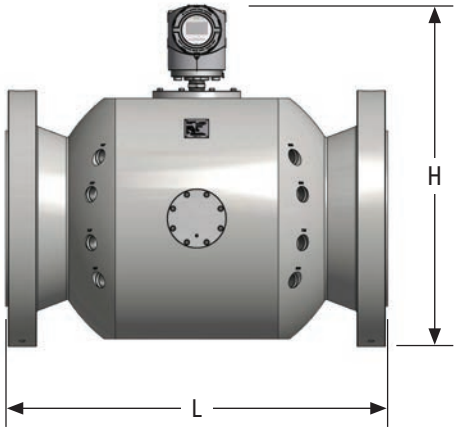
Dimensions and Weights

Dimensions and Weights for 240Ci, 280Ci, and 244Ci CALDON LEFM Ultrasonic Flowmeters

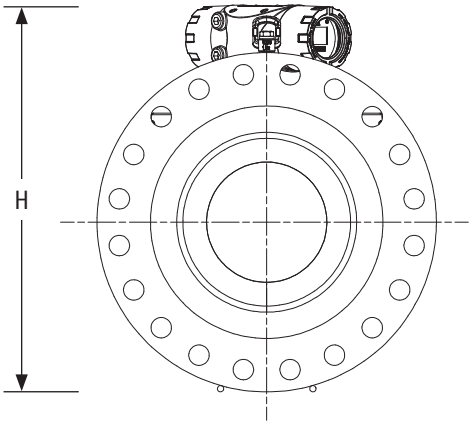
Nominal Pipe Size, in [mm]	Flange ANSI Class	Width (W), in [mm]	Height (H), in [mm]	Length (L), in [mm]	Meter Weight, lbm [kg]
4 [100]	150	17.7 [450]	19.2 [487]	21.0 [533]	333 [151]
	300	17.7 [450]	19.7 [500.0]	21.7 [552]	353 [160]
	600	17.7 [450]	20.1 [510.0]	23.5 [597]	384 [174]
	900	17.7 [450]	20.4 [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]

Consult Cameron for sizes larger than 24 in.

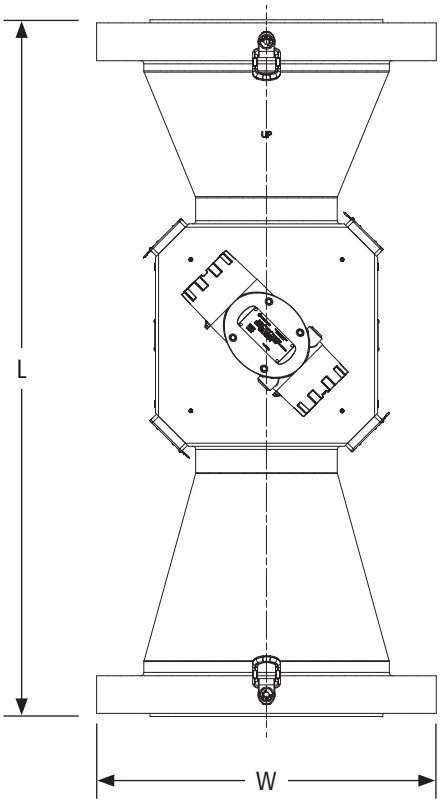




Dimensions and Weights for 280CiRN CALDON LEFM Flowmeter with Compact Transmitter					
Nominal Pipe Size, in [mm]	**Flange ANSI Class**	**Height (H), in [mm]**	**Max. Width (W), in [mm]**	**Length (L), in [mm]**	**Weight with Transmitter, lbm [kg]**
6 [150]	150	20.2 [513]	17.7 [450]	29.52 [749.8]	382 [173]
	300	20.9 [532]	17.7 [450]	29.52 [749.8]	433 [196]
	600	21.7 [551]	17.7 [450]	29.52 [749.8]	523 [237]
	900	22.2 [564]	17.7 [450]	30.12 [765.1]	606 [275]
	1500	22.4 [570]	17.7 [450]	29.64 [752.9]	727 [330]
8 [200]	150	22.3 [567]	17.7 [450]	35.92 [912.3]	587 [266]
	300	23.1 [586]	17.7 [450]	35.92 [912.3]	665 [302]
	600	23.8 [605]	17.7 [450]	35.92 [912.3]	813 [369]
	900	24.8 [630]	17.7 [450]	36.40 [924.7]	1,005 [456]
	1500	25.1 [637]	17.7 [450]	34.98 [888.5]	1,193 [541]
10 [250]	150	23.6 [598]	17.7 [450]	40.28 [1,023.1]	659 [299]
	300	24.3 [618]	17.7 [450]	40.28 [1,023.1]	781 [354]
	600	25.6 [649]	17.7 [450]	40.28 [1,023.1]	1,053 [478]
	900	26.3 [668]	18.5 [470]	41.19 [1,046.1]	1,290 [585]
	1500	27.1 [687]	19.0 [483]	39.87 [1,012.6]	1,713 [777]
12 [300]	150	26.3 [668]	17.7 [450]	46.11 [1,171.2]	997 [452]
	300	27.1 [687]	17.7 [450]	46.11 [1,171.2]	1,150 [522]
	600	27.8 [706]	20.0 [508]	46.11 [1,171.2]	1,488 [675]
	900	28.8 [732]	21.5 [546]	47.07 [1,195.7]	1,882 [854]
	1500	30.1 [764]	23.0 [584]	45.21 [1,148.5]	2,687 [1,219]
14 [350]	150	28.2 [716]	19.0 [483]	50.21 [1,275.4]	1,363 [618]
	300	29.2 [741]	20.5 [521]	50.21 [1,275.4]	1,628 [738]
	600	29.6 [751]	22.0 [559]	50.21 [1,275.4]	1,959 [889]
	900	30.3 [770]	24.0 [610]	51.23 [1,301.1]	2,433 [1,104]
	1500	32.4 [824]	26.5 [673]	50.59 [1,285.0]	3,724 [1,689]
16 [400]	150	29.4 [748]	21.0 [533]	55.37 [1,406.5]	1,521 [690]
	300	30.4 [773]	23.0 [584]	55.37 [1,406.5]	1,855 [841]
	600	31.2 [792]	23.8 [603]	55.37 [1,406.5]	2,388 [1,083]
	900	31.6 [802]	25.3 [641]	57.05 [1,449.1]	2,867 [1,300]
	1500	33.9 [862]	29.5 [749]	54.10 [1,374.0]	4,539 [2,059]
18 [450]	150	31.4 [799]	23.5 [597]	61.63 [1,565.4]	1,993 [904]
	300	32.9 [837]	25.5 [648]	61.63 [1,565.4]	2,451 [1,112]
	600	33.6 [852]	27.0 [686]	61.63 [1,564.4]	3,184 [1,444]
	900	34.4 [875]	27.8 [705]	62.98 [1,599.8]	4,034 [1,830]
	1500	36.9 [938]	32.5 [826]	60.12 [1,526.9]	6,145 [2,787]
20 [500]	150	33.4 [849]	25.0 [635]	65.93 [1,674.7]	2,416 [1,096]
	300	34.9 [887]	28.0 [711]	65.93 [1,674.7]	2,953 [1,340]
	600	35.7 [906]	29.3 [743]	65.93 [1,674.7]	4,018 [1,823]
	900	36.6 [929]	31.0 [787]	67.70 [1,719.5]	5,017 [2,276]
	1500	39.1 [992]	36.0 [914]	63.98 [1,625.1]	7,546 [3,423]
24 [600]	150	36.9 [938]	27.5 [699]	77.11 [1,958.6]	3,357 [1,523]
	300	38.9 [989]	30.5 [775]	77.11 [1,958.6]	4,274 [1,939]
	600	36.9 [938]	32.0 [813]	77.11 [1,958.6]	4,986 [2,262]
	900	37.8 [960]	33.8 [857]	78.88 [2,003.6]	6,127 [2,779]
	1500	40.3 [1,024]	38.8 [984]	74.42 [1,890.2]	8,757 [3,972]



16-in × 10-in CALDON LEFM 280CiRN ultrasonic flowmeter, side view.

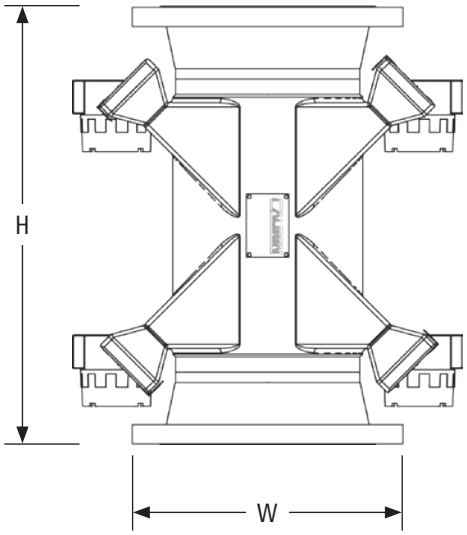


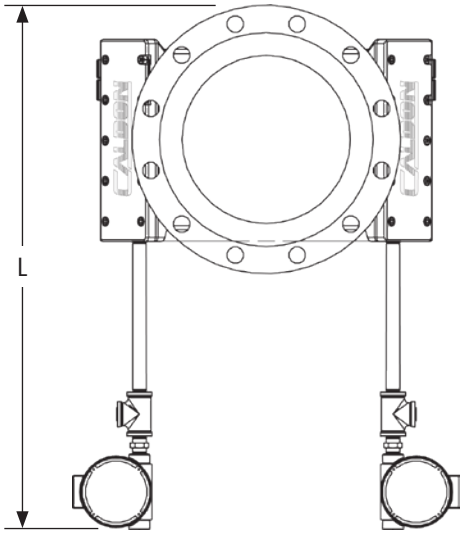
16-in × 10-in CALDON LEFM 280CiRN ultrasonic flowmeter, top view.

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 Cameron for other sizes and pressure classes.





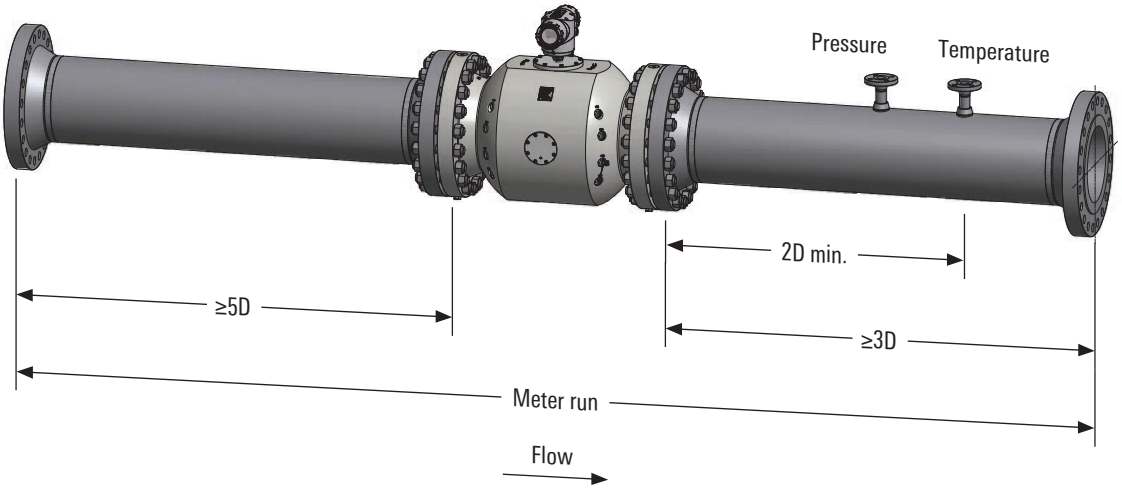
Installation

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

280Ci, 280CiRN, and 280CiLT-R

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

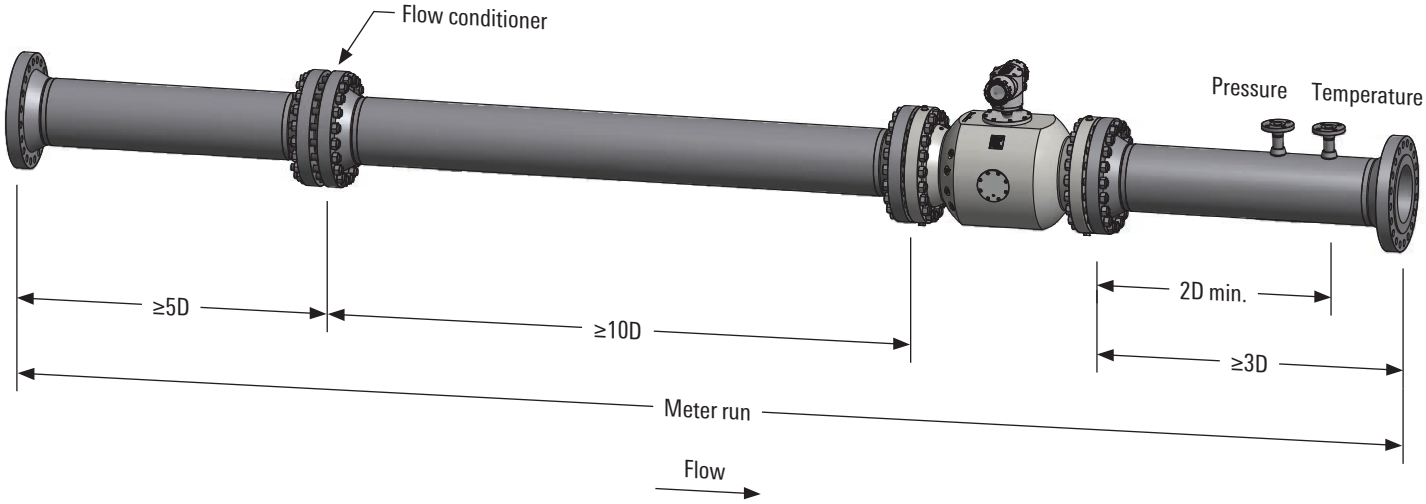
An uninterrupted upstream pipe that is 5 pipe diameters (D) in length is adequate in most applications. In adverse geometries where there is a constriction upstream of the meter that is smaller than the diameter of the meter run piping (such as a reduced bore valve), we recommend separating this from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



24XCi, 240CiLT-R

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

Hydrocarbon Calibration Laboratory

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

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 Cameron to use independent facilities, thereby significantly reducing delivery cycles and errors.

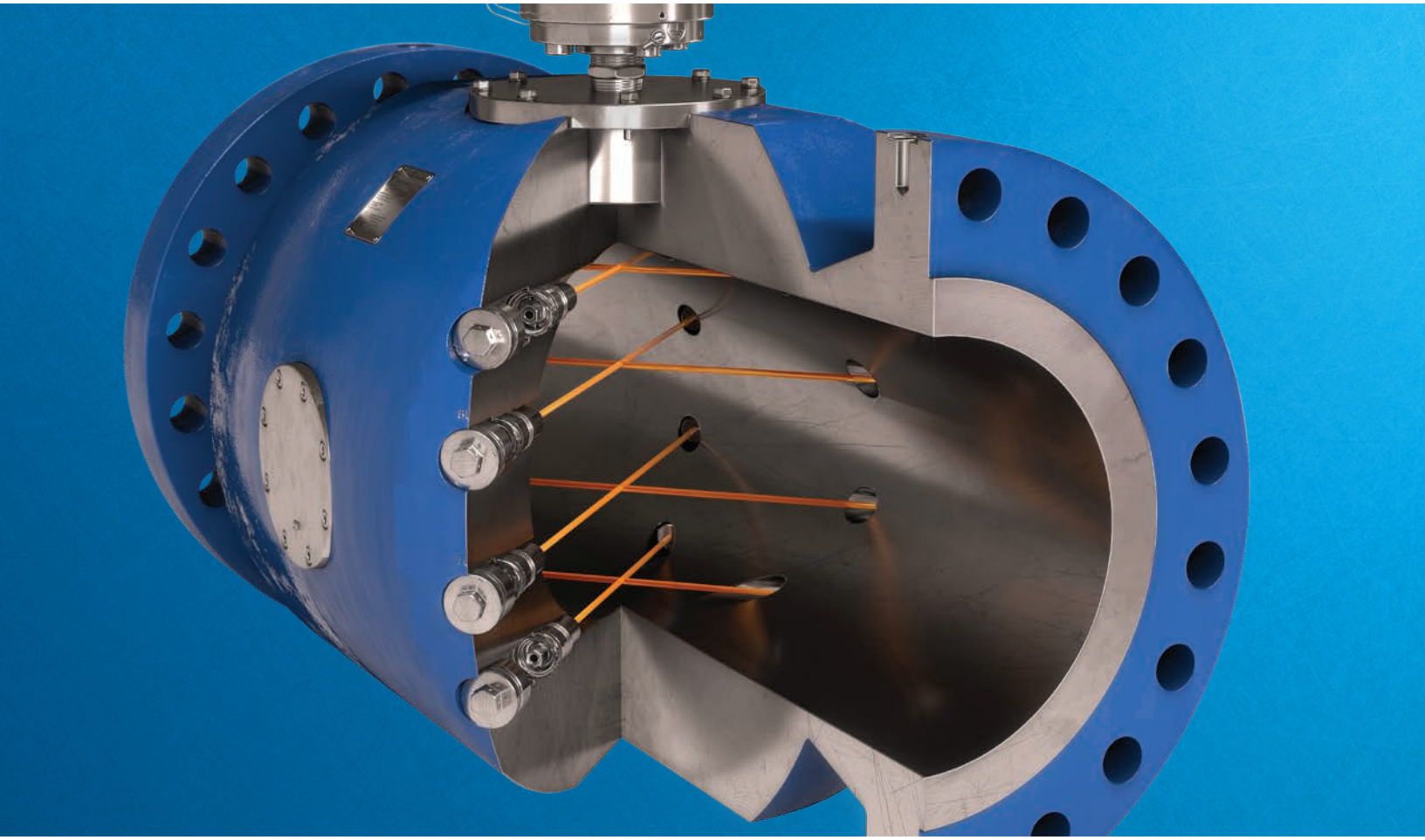
NVLAP®
CALIBRATION
NVLAP LAB CODE 200813-0

Calibration Laboratory Specifications[†]		
Maximum flow rate	25,000 bbl/h [3,900 m^3/h]	
Minimum flow rate	63 bbl/h [10 m^3/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-tonUS chiller system	
Viscosity	1.5–200 mm^2/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.

Notes

CALDON LEFM Ultrasonic Flowmeters for Liquids



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