

# CALDON LFM 280CiLT-R and 240CiLT-R

## Ultrasonic flowmeters

### APPLICATIONS

- LNG measurement at cryogenic temperatures
- Custody transfer measurement
- Allocation measurement at shared facilities

### ADVANTAGES

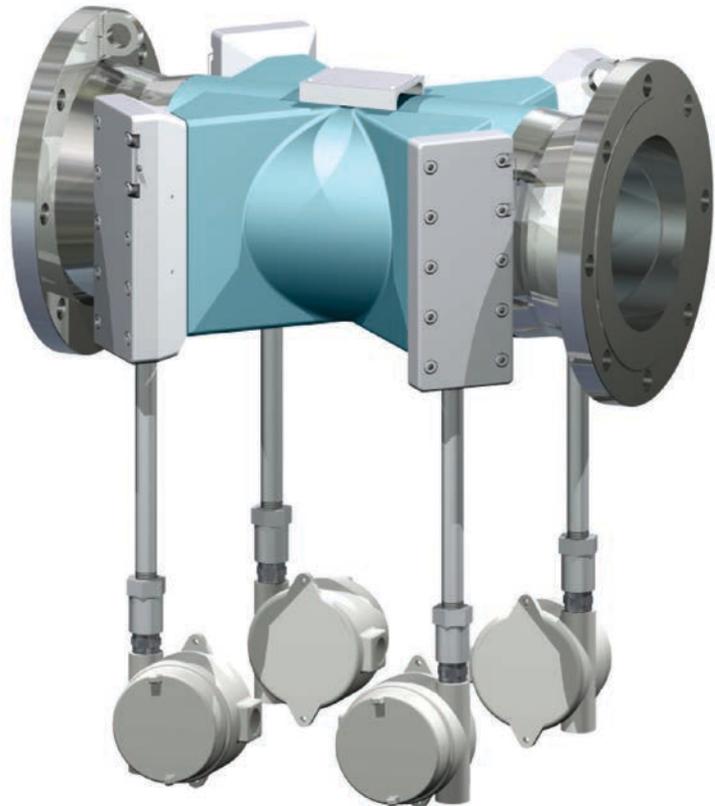
- Full bore — no obstructions or pressure drop
- No flow-conditioning element required
- Immunity to effects of swirl (CALDON LFM 280CiLT-R flowmeter model only)
- Superior flow stream and performance diagnostics
- Remote mounted compact transmitter
- Custody transfer certification: International Organization of Legal Metrology (OIML) standard R 117, accuracy class 0.3

CALDON\* ultrasonic flowmetering products provide a durable, stable, and low-cost-of-ownership measurement option. CALDON LFM 280CiLT-R\* eight-path and CALDON LFM 240CiLT-R\* four-path ultrasonic flowmeters cover a broad range of measurement demands and provide users with metering horsepower and precision, whether for custody transfer, check or allocation metering, or leak detection and line balance applications.

CALDON LFM 280CiLT-R and CALDON LFM 240CiLT-R ultrasonic flowmeters are specifically designed for measurement of LNG at cryogenic temperatures, offering a high level of performance. The eight-path CALDON LFM 280CiLT-R flowmeter is virtually immune to the effects of swirl and less sensitive to other installation effects, thereby eliminating the need for flow-conditioning elements and their associated pressure drop. This immunity to installation effects enables it to be laboratory calibrated for unmatched installed accuracy, making it ideal for custody transfer and allocation measurement.

### Meter construction

The flowmeters' bodies are designed and manufactured in accordance with ASME B31.3 process piping code and are suitable for handling pressurized liquid hydrocarbons. They have 8 or 16 piezoelectric transducer modules forming either four or eight chordal paths. The transducers are mounted in pressure-containing housings and can be replaced from outside the meter body, behind the pressure boundary.



*CALDON LFM 280CiLT-R ultrasonic flowmeter.*

# CALDON LEFM 280CiLT-R and 240CiLT-R

## Installation

To limit uncertainty caused by hydraulic effects, 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 flowmeters do not normally require the use of a flow conditioning element to meet the uncertainty specifications herein.

- An uninterrupted upstream pipe five diameters in length is adequate for the CALDON LEFM 280CiLT-R flowmeter in most applications.
- In situations 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), it is recommended that this be separated from the CALDON LEFM 280CiLT-R flowmeter by a pipe of at least 15 pipe diameters in length.
- An uninterrupted upstream pipe of 20 pipe diameters in length is adequate for the CALDON LEFM 240CiLT-R flowmeter in most applications.
- Downstream of the meter there should be a straight pipe at least three pipe diameters in length.

## Technical Specifications

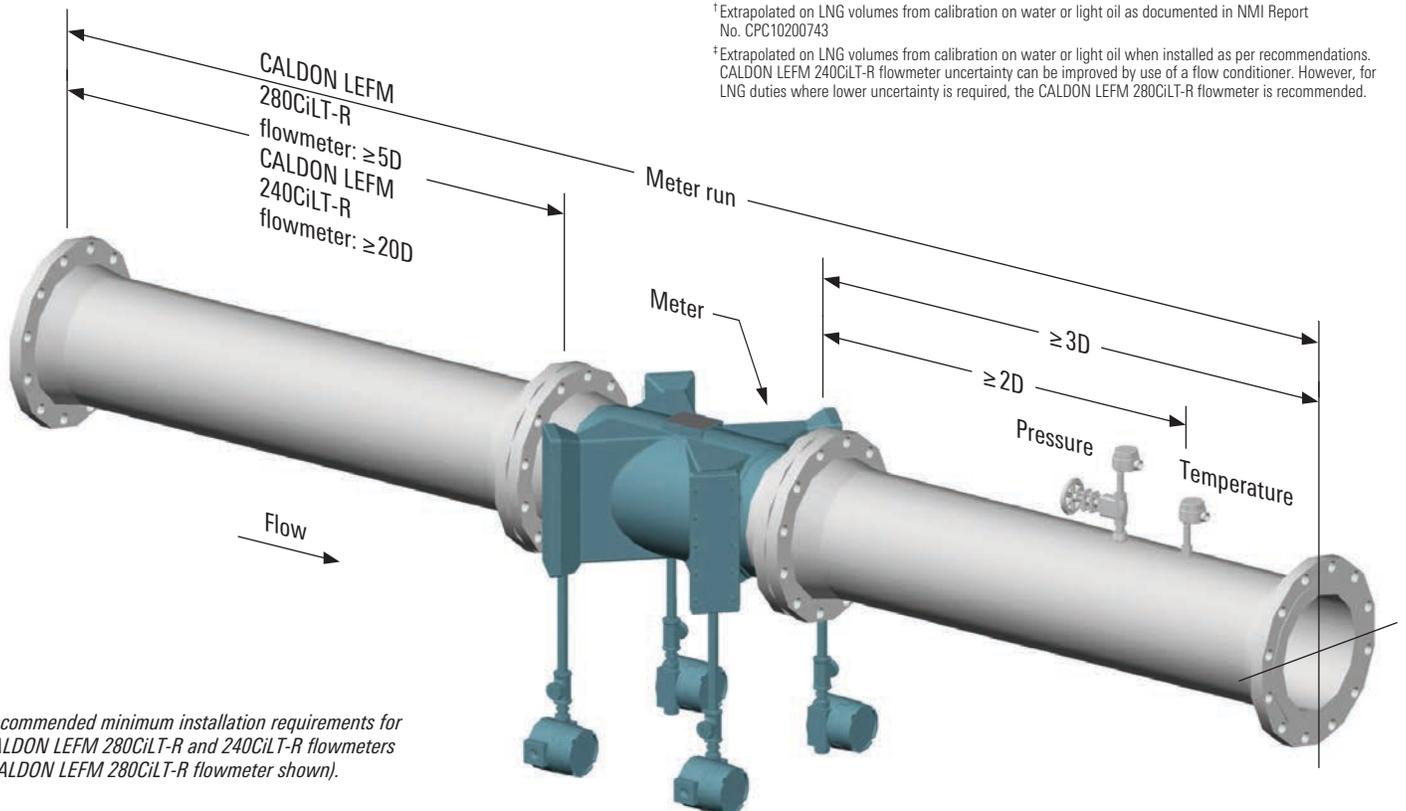
Size, in [mm]	Nominal Size	Nominal Maximum Flow, bbl/h [m <sup>3</sup> /h]	K-Factor, P/bbl [P/m <sup>3</sup> ]
6 [152]	150	4,650 [740]	1,000 [6,300]
8 [203]	200	8,150 [1,290]	500 [3,150]
10 [254]	250	12,800 [2,030]	350 [2,200]
12 [305]	300	19,300 [3,070]	250 [1,570]
14 [356]	350	23,600 [3,750]	200 [1,000]
16 [406]	400	28,700 [4,560]	150 [940]
18 [457]	450	41,000 [6,500]	100 [630]
20 [508]	500	50,000 [7,900]	85 [530]
24 [610]	600	72,000 [11,500]	60 [380]
26 [660]	650	87,000 [13,900]	45 [280]
28 [711]	700	100,000 [16,200]	40 [240]
30 [762]	750	115,000 [18,700]	35 [220]
32 [813]	800	130,000 [21,300]	30 [185]
34 [864]	850	150,000 [24,200]	25 [165]
36 [914]	900	165,000 [27,200]	25 [145]

## General Performance

	CALDON LEFM 280CiLT-R Flowmeter	CALDON LEFM 240CiLT-R Flowmeter
Linearity over nominal flow range, %	±0.10	±0.15
Measurement uncertainty, %	±0.18% <sup>†</sup>	±0.5% <sup>‡</sup>
Nominal flow range from nominal maximum flow		
For 8 in and smaller	10:1	10:1
For 10 in and larger	15:1	15:1

<sup>†</sup> Extrapolated on LNG volumes from calibration on water or light oil as documented in NMI Report No. CPC10200743

<sup>‡</sup> Extrapolated on LNG volumes from calibration on water or light oil when installed as per recommendations. CALDON LEFM 240CiLT-R flowmeter uncertainty can be improved by use of a flow conditioner. However, for LNG duties where lower uncertainty is required, the CALDON LEFM 280CiLT-R flowmeter is recommended.



Recommended minimum installation requirements for CALDON LEFM 280CiLT-R and 240CiLT-R flowmeters (CALDON LEFM 280CiLT-R flowmeter shown).

# CALDON LFM 280CiLT-R and 240CiLT-R

## General Specifications

### Electronics

#### Power requirements—DC power

Voltage, VDC 24 (18 to 30)

Current draw at 24 VDC, A 0.25

Power consumption, W 6

#### Power requirements—AC power

Voltage, VAC [Hz] 120 or 230 [60 or 50]

Voltage range, VAC 108 to 253

Frequency range, Hz 47 to 63

Current draw, A 0.14

Power consumption, W 7.3

Relative humidity, % 0 to 95

Operating temperature, degF [degC] -58 to 158 [-50 to 70]

Local display, pixel 400 × 240 LCD showing flow, diagnostics data, and alarms

Remote mounting electronics from meter, ft [m] 328 [100]

Analog inputs (three), mA 4–20 configured for pressure, temperature, or other

RTD input Meter body temperature

Analog outputs (two), mA 4–20 (650-ohm maximum load)

#### Digital outputs

Flow Four pulse output channels

Programmable K-factor

Programmable configuration

1. Dual frequency setup, 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, 50/50 duty cycle  
Channel B indicates flow direction  
Forward flow = 0  
Reverse flow = high (5–12 VDC)

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 VDC or 0–12 VDC selectable (0 volts = alarm)

Communication Three serial

Ethernet or fiber modem

### Meter Body

Relative humidity, % 0 to 95

Operating temperature, degF [degC] -320 to 284 [-196 to 140]

### Materials

Meter body Stainless steel (standard)

Flanges Stainless steel (standard)

Manifold 316 stainless steel

Manifold covers 316 stainless steel

Transducer housings 316 stainless steel

Junction boxes Epoxy painted copper-free aluminum

#### Compact transmitter

NEMA 7/4 Copper-free aluminum

NEMA 7/4X Optional cast stainless steel CF8M (316)

### Ingress Protection

Transmitter and meter body Ingress Protection Rating 66 (IP66)

# CALDON LEFM 280CiLT-R and 240CiLT-R

## CALDON LEFM SystemLink G3 technology

CALDON LEFM SystemLink G3\* user interface software technology enables access to real-time diagnostic data, historical data, and event logs from a ultrasonic flowmeter by using an Ethernet or fiber-optic modem connection. Historical data and event logs are stored within the technology transmitter, enabling later retrieval and giving operators the ability to monitor and analyze critical diagnostics, helping prevent unplanned downtime.



## Features

- Health overview report shows the current meter status as well as meter process measurements, including flow rate, temperature, and pressure
- Detailed charts and graphs present the meter diagnostic information in an easy-to-understand format with alarm limits that help identify issues
- User-defined reference points are built using the meter's stored data and enable the user to graphically compare them against current meter performance; for example, current performance can be compared against calibration or commissioning data
- Data can be exported as both predefined PDF reports or to customer-defined Microsoft Excel® spreadsheets.



## Calibration laboratory

The Cameron Hydrocarbon Calibration Laboratory is a state-of-the-art facility located in Pittsburgh, Pennsylvania, USA. Every Series 200 ultrasonic flowmeter in the CALDON technologies portfolio is calibrated in this laboratory using up to three oils. The ability to use multiple oils enables calibration over a Reynolds number range that includes that of the customer's application. This ensures meter performance will be unaffected by changes in flow rate and viscosity once the meter is installed.

[cameron.slb.com/measurement](http://cameron.slb.com/measurement)

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