GREYSTONE

ACCURACY BY DESIGN

# ULTRASONIC LIQUID FLOW TRANSDUCER

## Models CSLF

## Precision flow control/sensing

**FEATURES:**

- Dual Sensor, Bi-directional
- 2 Selectable ranges per model
- Loop-powered 4-20mA output
- Zero pressure drop
- Several pipe sizes available
- Choice of connection type
- No moving parts
- Plug 'n Play

***Peace of mind through reliable flow monitoring***

GREYSTONE HAS AN **ISO 9001** REGISTERED QUALITY SYSTEM

## DESCRIPTION:

The CSLF series of ultrasonic liquid flow transducers are designed for use with building automation, energy management, and process control systems. Models include various sizes and connection types for liquid flow measurement.

The CSLF series ultrasonic liquid flow transducers are ideal for the measurement pf flow rates of acoustically conductive liquids including most clean liquids and many liquids with entrained solids.

Main advantages include excellent long term stability, no pressure drop, broad fluid compatibility, high accuracy and low cost. Also, there are no moving parts.

At the heart of the transmitter is a proprietary mixed signal ASIC which allows sophisticated timing, control and transducer drive circuitry to be combined on a single integrated circuit. The ASIC uses a special algorithm that is an improvement upon the standard single-path measurement technique. Using the "sing around" method, the ultrasonic transducer alternates between transmitting and receiving to measure differences in flight time between upstream and downstream transmissions. A sound pulse is transmitted from an upstream transducer towards a downstream transducer like a traditional time-of-flight measurement. However, the received sound pulse then triggers a second downstream transmission that then triggers a third and so on for a specfic number of cycles. This process is repeated in the upstream direction.

Because it takes an average flight time over multiple cycles to compute the difference in flight times, the approach yields a significant improvement in timing accuracy when compared with the time-of-flight difference of a single pulse in each direction. This algorithm, combined with the pico-second timing resolution of the ASIC, provides the precise time measurement capability necessary for compact, small diameter ultrasonic meters.

The output of the transmitter is unaffected by changes in fluid temperature, density and viscosity as the flow calculation is independent of the speed of sound.

Wetted materials include ULTEM® encapsulated ultrasonic transducers with a choice of elastomer seals and epoxy coated carbon steel body material.

### CSLFB

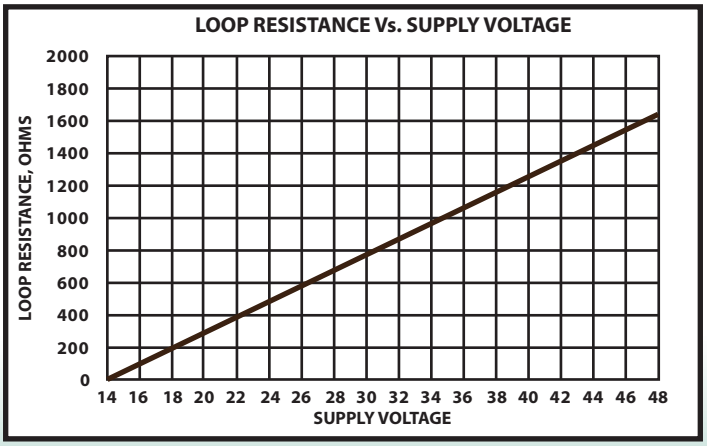
### CSLFC

## DESCRIPTION:

Flow Range..... Bi-directional, field selectable per table (Standard Models)
Accuracy..... ±0.75% of full scale
Operating Temperature..... -40˚ to 87.8˚ C (-40˚ to 190˚F)
Response Time..... User selectable, 2 or 10 seconds
Viscosity Range..... 0.2 to 150 sCt (0.2 to 150 mPas)
Liquid Density..... 30.6 to 74.9 lb/cu.ft. (490 to 1200 kg/m$^3$)
Max. Working Pressure..... CSLFB - 3/4" to 2": 250 PSI (17.2 bars)
CSLFB - 3": 210 PSI (14.5 bars)
CSLFC - 4" to 10": 200PSA (13.8 bars)
Pipe Sizes..... 3/4", 1", 1.5", 2", 3", 4", 6", 8", 10"
Pipe Connections..... 3/4" to 2" - Female NPT or BSP
3" - ASME 150 or DIN 16 Flange
4" to 10" - ASME Class 150 Flange
Electrical Enclosure..... Integral to body casting with gasketed cover; One 1/2" NPT conduit connection (plugged when model ordered with metric threads) and one M16 x 1.5 connection (plugged when model ordered with NPT threads)
Electrical Connections..... Screw Terminal connections on PC board
Enclosure Rating..... NEMA 4 (IP65)
Power Supply..... 18 to 36 Vdc
Ultrasonic Transducers..... ULTEM® Encapsulated
Seals..... EPDM, Buna-N, Neoprene®, FKM or other
Body Material..... CSLFB - Brass (UNS C83600)
CSLFC - Schedule 40, epoxy coated, carbon steel
Output Signal..... Analog, 2 wire, 4-20 mA; Output is 4 mA from zero to min. flow (see Standard Model table)
Error Detection..... An optically isolated sink output is activated under certain detectable fault conditions, such as transducer failure or overly noisy output due to flow stream anomalies, as might be seen due to excessive bubble entertainment. The optional fault output is an optically isolated NPN transistor capable of sinking up to 10 mA from a voltage source of no more than 48 Vdc.
Direction of Flow..... Optional output to indicate direction of flow is available. Activation or deactivation of an optically isolated 10 mA sink output indicates flow direction. Error detection is not available when this option is ordered.
Optional Temp. Sensor..... 3 wire RTD, 100 Ω, Platinum, 0.06% accuracy. Built into transducer shell for monitoring process temperature. Optional 8 pin electrical connector standardly recommended with this option.

**DP/DS Panel Meter/Display Option:**

Power Supply..... Loop-powered
Display Size..... 4½ Digit LED, 0.6"
Case..... NEMA 4X
Versions..... DP Option: Displays 0-100% F.S.
DS Option: Scaled to customer requirement



# FLOW TRANSDUCER: PRODUCT ORDERING INFORMATION

| MODEL | Product Description |
|---|---|
| **CSLFB** | Flow Transducer, 2 selectable ranges |

| CODE | Style |
|---|---|
| **34** | 3/4" |
| **10** | 1.0" |
| **15** | 1.5" |
| **20** | 2" |
| **30** | 3" |

| CODE | Pipe Size |
|---|---|
| **NPT** | Female National Pipe Thread (3/4" to 2") |
| **BSP** | Female British Standard Pipe Thread (G) (3/4" to 2") |
| **ASME** | ASME Class 150 Flange (3" only) |
| **DIN** | DIN Class 16 Flange (3" only) |

| CODE | Units of measure |
|---|---|
| **G** | Gallons per Minute (U.S.) |
| **L** | Liters per Minute |

| CODE | Transducer Seal |
|---|---|
| **E** | EPDM (Ethylene propylene diene M-class rubber) |
| **B** | Buna-N |
| **N** | Neoprene® |
| **V** | FKM (Fluorinated elastomers) |

| CODE | Options |
|---|---|
| - | None |
| **DF** | Direction of flow output (Digital) |
| **R** | 100 Ω Platinum RTD |
| **DP** | Display % F.S. |
| **DS** | Display in Engineering units - Specify |

| CSLFB | 34 | NPT | G | B | - |
|---|---|---|---|---|---|

Greystone Energy Systems, Inc. reserves the right to make design modifications without prior notice.

**EXAMPLE:** **3/4" c/w NPT connection, Range GPM, & Buna-N seal = CSLFB34NPYGB**

***For non-listed ranges, specify model followed by full span value:**
**Example CSLFB15-50G = 50 GPM, at 20mA or CSLF-200L = 200LPM @ 20mA**

| Model | Pipe Size/Thread Size | | *Field Selectable Full Scale Ranges (GPM) Min. | Max. | *Field Selectable Full Scale Ranges (LPM) Min. | Max. |
|---|---|---|---|---|---|---|
| CSLFB34 | 3/4" NPT or BSP | L | 0.23 | 15 | 0.90 | 60 |
| | | H | 0.38 | 25 | 1.50 | 100 |
| CSLFB10 | 1" NPT or BSP | L | 0.45 | 30 | 1.70 | 115 |
| | | H | 0.75 | 50 | 3.00 | 200 |
| CSLFB15 | 1.50" NPT or BSP | L | 0.60 | 40 | 2.30 | 150 |
| | | H | 1.20 | 80 | 4.50 | 300 |
| CSLFB20 | 2.0" NPT or BSP | L | 0.90 | 60 | 3.40 | 225 |
| | | H | 1.80 | 120 | 6.80 | 455 |
| CSLFB30 | 3" ASME Class 150 Flange 80 mm DIN Class 150 Flange | L | 3.00 | 200 | 11.00 | 750 |
| | | H | 6.00 | 400 | 23.00 | 1500 |
| | * Other F.S. ranges can be specified | | | | | |

## FLOW TRANSDUCER: PRODUCT ORDERING INFORMATION

| MODEL | Product Description |
|---|---|
| CSLFC | Flow Transducer, 2 selectable ranges |

| CODE | Pipe Size |
|---|---|
| 4 | 4" |
| 6 | 6" |
| 8 | 8" |
| 10 | 10" |

| CODE | Units of measure |
|---|---|
| G | Gallons per Minute (U.S) |
| L | Liters per Minute |

| CODE | Transducer Seal |
|---|---|
| E | EPDM (Ethylene propylene diene M-class rubber) |
| B | Buna-N |
| N | Neoprene® |
| V | FKM (Fluorinated elastomers) |

| CODE | Options |
|---|---|
| - | None |
| DF | Direction of flow output (Digital) |
| R | 100 Ω Platinum RTD |
| DP | Display % F.S. |
| DS | Display in Engineering units - Specify |

| CSLFC | 8 | G | B | - |
|---|---|---|---|---|

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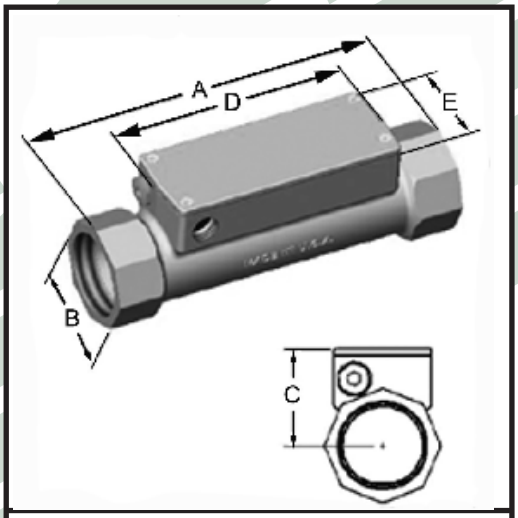
**EXAMPLE:** **8" pipe, GPM, c/w Buna-N seal = CSLFC8GB**

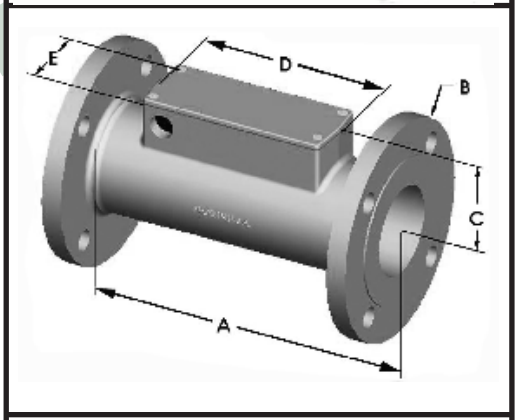
***For non-listed ranges, specify model followed by full span value:**
**Example CSLFC300G = 300 GPM, at 20mA or CSLFC4-750L = 750LPM @ 20mA**

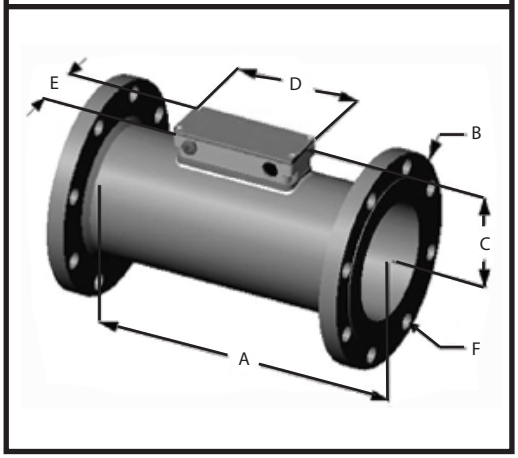
| Model | Pipe Size | | *Field Selectable Full Scale Ranges (GPM) Min. | Max. | *Field Selectable Full Scale Ranges (LPM) Min. | Max. |
|---|---|---|---|---|---|---|
| CSLFC4 | 4" | L | 4.5 | 300 | 17 | 1150 |
| | | H | 7.5 | 500 | 29 | 1900 |
| CSLFC6 | 6" | L | 9 | 600 | 35 | 2300 |
| | | H | 18 | 1200 | 68 | 4500 |
| CSLFC8 | 8" | L | 15 | 1000 | 57 | 3800 |
| | | H | 30 | 2000 | 114 | 7600 |
| CSLFC10 | 10" | L | 22.5 | 1500 | 86 | 5700 |
| | | H | 45 | 3000 | 165 | 11000 |

* F.S. ranges can be specified can be user specified to 125% of each stated high (H) range with no change to specifications and to 25% of each low (L) range with some specification modification. Consult factory.

## ENCLOSURE DIMENSIONS:




**CSLFB Dimensions (3/4" - 2")**

| Size/Connection | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Inches | mm | Inches | mm | Inches | mm | Inches | mm | Inches | mm |
| 3/4" & 1" | 9.20 | 234 | 1.62 | 41.10 | 2.06 | 52.30 | 6.40 | 163 | 2.40 | 61.00 |
| 1-1/2" & 2" | 9.88 | 251 | 2.75 | 69.90 | 2.51 | 63.80 | 6.40 | 163 | 2.40 | 61.00 |

**CSLFB Dimensions (3" Only)**

| Size/Connection | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Inches | mm | Inches | mm | Inches | mm | Inches | mm | Inches | mm |
| 3" ASME 150 | 11.00 | - | ø7.50 | - | 3.16 | - | 6.50 | - | 2.50 | - |
| 80 mm DIN 16 | - | 280 | - | 190 | - | 84.00 | - | 165 | - | 63.50 |

**CSLFC Dimensions (3" - 10")**

| Pipe Size | Dimensions (Inches) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | Bolt Circle Diameter | No. of Holes |
| 4" | 13.00 | 9.00 | 4.00 | 6.54 | 2.62 | 0.75 | 7.50 | 8 |
| 6" | 16.00 | 11.00 | 5.09 | 6.54 | 2.62 | 0.88 | 9.5 | 8 |
| 8" | 18.00 | 13.50 | 6.11 | 6.54 | 2.62 | 0.88 | 11.75 | 8 |
| 10" | 22.00 | 16.00 | 7.18 | 6.54 | 2.62 | 1.00 | 14.25 | 12 |



GREYSTONE

ACCURACY BY DESIGN

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*Greystone Energy Systems Inc. is one of North America's largest ISO registered manufacturers of HVAC sensors and transducers for Building Automation Management Systems. We have conscientiously established a worldwide reputation as an industry leader by maintaining leading-edge design technology, prompt technical support, and a commitment to on-time deliveries. We take pride in our Quality Management System which is ISO 9001 certified, assuring our customers of consistent product reliability.*

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