BadgerTouch®

Automated Meter Reading System Remote Module

Models ESERIESBT and HREBT

DESCRIPTION

Applications: The BadgerTouch® Single Remote Module coupled with the next generation E-Series® G2 Ultrasonic meter or the High Resolution Encoder (HR-E®) is a complete electronically encoded close-proximity automated meter reading system, specifically designed for single point remote meter installations. BadgerTouch Remote Modules are supplied as standalone modules for field connection to an E-Series G2 Ultrasonic meter, or to an HR-E encoder for use with all Recordall® Disc, Turbo, Compound, Combo, and Fire Series meters and assemblies.

Communication: Communication is accomplished by using compatible reading devices programmed to read BadgerTouch or Industry Standard ASCII protocols, such as the VersaProbe® reading wands, to interrogate the BadgerTouch Remote Module. The Remote Module responds with the unique meter serial number and the meter reading, transmitting data in approximately 2.5 seconds. In the event a tamper condition exists, the data collector will not receive a reading.

Performance: The BadgerTouch meter reading system offers operating performance in a variety of applications under most climatic conditions. For consistent results, interrogation equipment should be placed in direct contact with the remote read pad.

Meter Reading Validation: Further validation of the meter reading can be made automatically by the data collector, based on comparison of high-low audit fields in the record. If the meter reading is not between these predetermined limits, an error message is displayed on the data collector display.

Wire Connections: The BadgerTouch Remote Module can be installed in new or existing installations where remote meter reading is required. The remote module is connected to the recommended wire that runs between the module and the E-Series Ultrasonic meter or HR-E encoder. A set of terminal screws on the remote module makes this connection. The meter/encoder is provided with a 3, 10 or 25 foot (91, 305, 762 cm) length of wire that is ready for connection to the BadgerTouch Remote Module. See *"Configurations" on page 2* for more information on connections. To provide best results, a maximum of 75 feet of wire (Belden #9770) between the remote module and the meter/encoder is allowed. Other wire types may affect performance. If an additional length of wire is used in addition to that provided, a set of gel splices must be made.

Construction: The BadgerTouch Remote Module enclosure is constructed of a high impact plastic enclosure designed for most remote locations. All internal electronic components are encapsulated to provide environmental protection.

SPECIFICATIONS

Product Compatibility	E-Series G2 Ultrasonic meter; HR-E High Resolution Encoder
Operating Temperature	–5…120° F (–21…49° C)
Storage Temperature	–5…120° F (–21…49° C)
Humidity	0…100% Condensing
Ultraviolet	Remote enclosure is UV protected for outdoor installation.
Construction	The Remote Module has a high impact weatherproof plastic enclosure containing encapsulated electronics and reading coil.
Hardware	Two terminal screws for connecting the meter/encoder lead wire to the Remote Module.
Dimensions	3.30 in. (84 mm) diameter 1.50 in. (38 mm) height
Weight	6 ounces (Module only)

CONFIGURATIONS

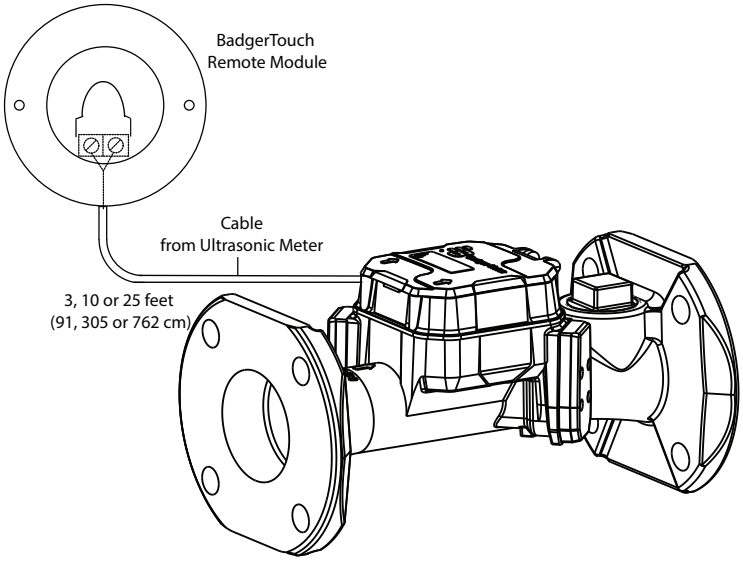

Figure 1: BadgerTouch single remote configuration with E-Series G2 Ultrasonic meter

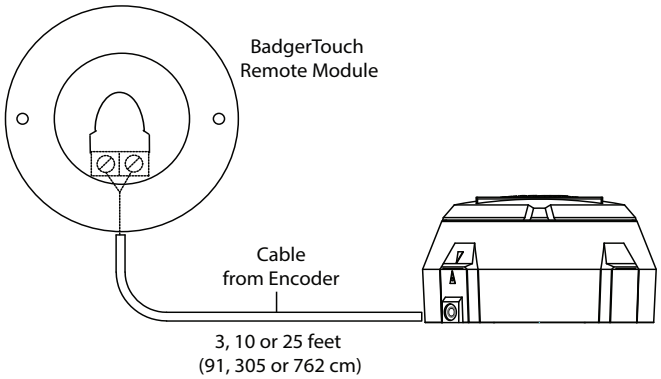

Figure 2: BadgerTouch single remote configuration with HR-E encoder

BadgerTouch®

Automated Meter Reading System Pit Module
Model ESERIESBT and HREBT

DESCRIPTION

Applications: The BadgerTouch® Pit Module with Twist Tight® connector for connectivity with a next generation E-Series® G2 Ultrasonic meter or High Resolution Encoder (HR-E®) is a complete electronically encoded close-proximity automated meter reading system, specifically designed for pit meter installations. This system can be used with E-Series G2 Ultrasonic meters, and with the HR-E encoder for use with all Recordall® Disc, Turbo, Compound, Combo and Fire Series meters and assemblies. The Pit Module is designed to fit pit lid configurations up to 2 inches thick.

Communication: Communication is accomplished by using compatible reading devices programmed to read BadgerTouch or Industry Standard ASCII protocols, such as the VersaProbe® reading wands, to interrogate the BadgerTouch Pit Module. The Pit Module responds with its serial number and water meter reading, and transmits data in approximately 2.5 seconds. In the event a tamper condition exists, the data collector will not receive a reading.

Performance: The BadgerTouch automated meter reading system offers superior operating performance in pit applications and is designed for totally submerged environments. The Pit Module allows readings under many conditions where ice, sand or dirt may impede direct contact with the read pad. For consistent results, interrogation equipment should be placed in direct contact with the pit read pad.

Meter Reading Validation: Further validation of the meter reading can be made automatically by the data collector based on comparison of high-low audit fields in the record. If the meter reading is not between these predetermined limits, an error message is displayed on the data collector display.

Wire Connections: The BadgerTouch Pit Module is available with a Twist Tight connector for easy connection and installation in the field to an E-Series G2 Ultrasonic meter or HR-E encoder.

Construction: The BadgerTouch Pit Module is constructed from high impact plastic material that is designed for mounting directly through the pit lid. There is a plastic cover that locks the Pit Module in place. Inside the pit, an integral plastic locking nut is used to secure the Module firmly in place next to the pit lid. All electronic components internal to the enclosure are encapsulated to provide environmental protection.

SPECIFICATIONS

Product Compatibility	E-Series G2 Ultrasonic meter; HR-E High Resolution Encoder
Operating Temperature	–5…120° F (–21…49° C)
Storage Temperature	–5…120° F (–21…49° C)
Humidity	0…100% Condensing
Construction	High impact plastic pit lid nut, adjustment nut, and encapsulated read coil within the plastic Pit Module.
Dimensions	3.30 in. (84 mm) Height (w/o coil) 3.96 in. (101 mm) Width (at top)
Weight	7 ounces (Module only)

Also see *"Configurations" on page 2*.

CONFIGURATIONS

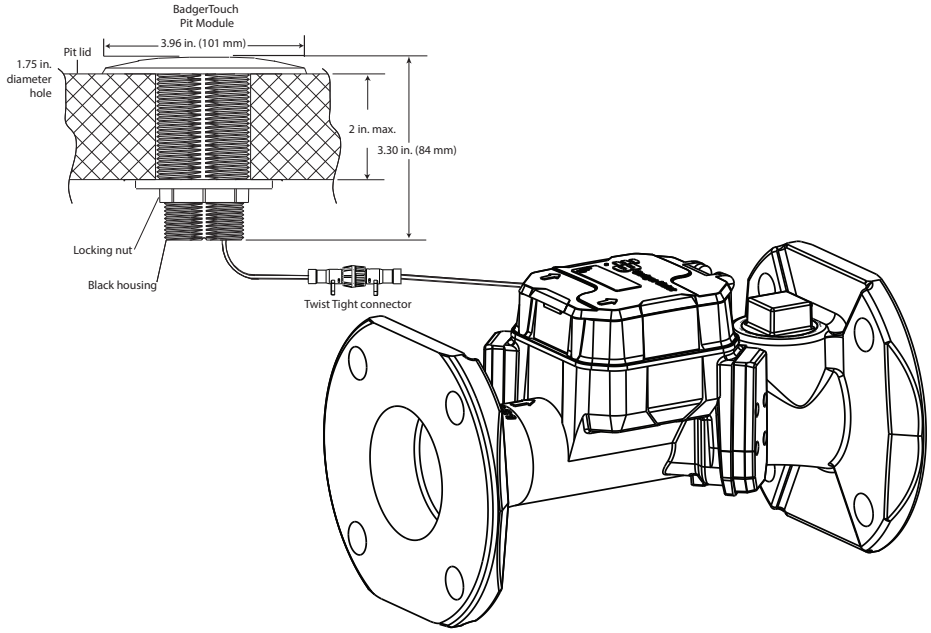

Figure 1: BadgerTouch Pit Module connected to E-Series G2 Ultrasonic meter

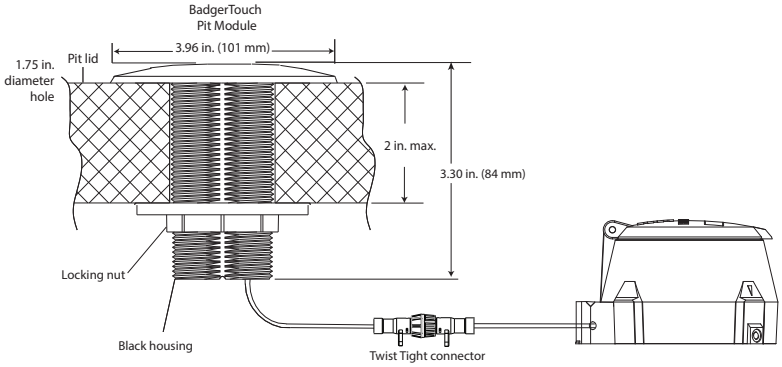

Figure 2: BadgerTouch Pit Module connected to the HR-E encoder

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Legacy Document Number: BT-T-04-EN

HR-RED

High Resolution Remote Electronic Display

APPLICATION

The High Resolution Remote Electronic Display (HR-RED) is designed to provide remote visual readings when connected directly to Badger Meter high resolution products: HR-E®, HR-E LCD, HR-E LCD 4-20 encoders, or E-Series® Ultrasonic meters. The HR-RED is used to read compatible encoder products that are not easily accessible or are in difficult to read locations. Installations such as those inside houses or buildings, meter vaults, or dangerous industrial locations are ideal for the HR-RED.

OPERATION

The HR-RED is a battery operated device. When attached to Badger Meter high resolution encoders or high resolution E-Series Ultrasonic meters, the unit is designed to provide the same output resolution as the encoder, up to 9 digits for Badger Meter products. It also displays the encoder serial number. To conserve battery life the HR-RED is awakened only when the internal acoustic switch is activated. This is easily accomplished by tapping the target circle on the register display.

How the meter reading displays depends on the output resolution. The letters "RD" display to the left of the digits. Decimal points do not display.

6 digit output or less: "RD" and all digits appear at the same time, right-justified, and display for 10 seconds.

EXAMPLE of 6 digit meter reading

<displays for 10 sec>	**RD 123456**

7 or 8 digit output: "RD" appears by itself for 2 seconds. Then the complete meter reading (up to 8 digits) displays for 10 seconds.

EXAMPLE of 8 digit meter reading

<displays for 2 sec>	**RD**
<displays for 10 sec>	**12345678**

9 digit output: "RD" appears, followed by the first of the 9 digits, and displays for 5 seconds. Then the remaining 8 digits display for 10 seconds.

EXAMPLE of 9 digit meter reading

<displays for 5 sec>	**RD 1**
<displays for 10 sec>	**23456789**

After the meter reading displays, the serial number of the encoder or meter displays. Then the HR-RED returns to sleep mode.

Tap Target Circle to Activate

TAMPER-PROOF FEATURES

The HR-RED is supplied with an anti-tamper indicator. Any time the connection is interrupted, a visual alarm appears on the display.

There is no maintenance since the electronics and battery are fully encapsulated in the housing and not accessible. The unit is also supplied with a tamper resistant Torx® seal screw to prevent access to the unit.

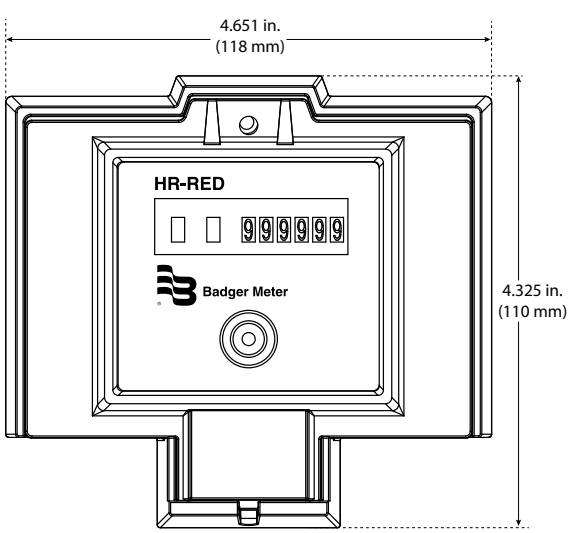
FEATURES

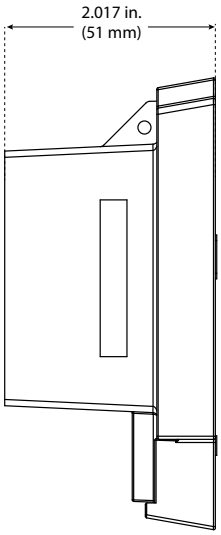
- Environmentally sealed
- Tamper indicators
- Designed for use with any Badger Meter high resolution encoder or E-Series Ultrasonic meter
- Torx seal screw security
- Acoustic "TAP" switch for viewing
- 10 year calculated battery life

SPECIFICATIONS

Operating Temperature	–4…140° F (–20…60° C)
Encoder Compatibility	HR-E, HR-E LCD, HR-E LCD 4-20, E-Series Ultrasonic meter
Dimensions	L 4.651 in. (118 mm) × H 4.325 in. (110 mm) × W 2.017 in. (51 mm)
Weight	9 oz (255 g)
Display	LCD, 8 characters, 0.25 inches high
Battery Life	10 years, 3.6V lithium battery
Construction	High impact thermoplastic, weather and UV resistant

DIMENSIONS





NOTE: Refer to the *HR-RED Installation Data Sheet* available in the Resource Library at *www.badgermeter.com* for installation instructions.

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Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Europe, Middle East Branch Office | Badger Meter Europe | PO Box 341442 | Dubai Silicon Oasis, Head Quarter Building, Wing C, Office #C209 | Dubai / UAE | +971-4-371 2503
Slovakia | Badger Meter Slovakia s.r.o. | Racianska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 21-06 Parkway Parade | Singapore 449269 | +65-63464836
China | Badger Meter | 7-1202 | 99 Hangzhong Road | Minhang District | Shanghai | China 201101 | +86-21-5763 5412
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

Badger Meter

HR-E High Resolution Encoder

DESCRIPTION

Applications: The High Resolution Encoder (HR-E) is designed for use with all current Recordall® Disc, Turbo, Compound, Combo and Fire Series meters and assemblies. The HR-E provides connectivity with Badger Meter ORION® and GALAXY® AMR/AMI endpoints, BadgerTouch® modules and other AMR/AMI technology solutions approved by Badger Meter.

Electronic Resolution: Encoder output from the HR-E includes eight-dial resolution to AMR/AMI endpoints and the option of four, five, six, seven or eight-dial resolution for touch applications. Refer to tables on the next page for details.

Mounting: The HR-E in its shroud assembly uses a bayonet mount compatible with all Recordall Disc, Turbo, Compound and Fire Series meters and assemblies. The bayonet mount allows positioning of the register in any of four orientations for visual reading convenience. The HR-E can be removed from the meter without disrupting water service.

Magnetic Drive: A direct-drive, high-strength magnetic coupling, through the meter body to the wetted magnet, provides reliable and dependable register coupling.

Local Indication: The HR-E face features an eight-dial mechanical odometer wheel stack and a flow finder with a calibrated test circle.

Tamper-Resistant Features: Unauthorized removal of the HR-E is inhibited by the option of a tamper detection seal wire screw, tamper-resistant TORX® seal screw, or the proprietary tamper-resistant keyed seal screw. Each can be installed at the meter site or at the factory.

Construction: The housing of the HR-E is constructed of a strengthened glass lens top and a corrosion-resistant metal bottom. Internal construction materials are thermoplastic for long life and high reliability. The encoder gearing is self-lubricating thermoplastic to minimize friction and provide long, reliable life. The shroud assembly is thermoplastic.

Temperature: The operating range of the HR-E is – 40…140° F (– 40…60° C). The water meter should not be subjected to temperatures below freezing.

Sealing: The HR-E encoder is permanently sealed to eliminate the intrusion of moisture, dirt or other contaminants. The HR-E achieves true water resistance due the unique adhesive technology used to seal the glass dome to the corrosion-resistant metal bottom. Due to this sealing process, the HR-E exceeds all applicable requirements of AWWA Standard C707. With leak rates less than 10-6 cc/sec, as tested by a helium mass spectrometer, the HR-E is suitable for installation in all environments, including meter pits subject to continuous submergence.

Electrical: The electronic circuitry is designed to provide immunity to electrical surges and transients per IEC1000-4-2, IEC1000-4-4. Operation of the HR-E is dependent on the wire length limitations of connected AMR/AMI equipment.

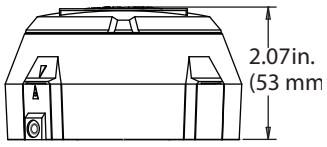
SPECIFICATIONS

Encoder Type	Straight reading, permanently sealed, magnetic drive
Unit of Measure	U.S. Gallons, Cubic Feet, Cubic Meters, clearly identified on encoder face
Number Wheels	Eight with 5/32 inch high numerals
Test Circle	360° circle with ten major increments, ten divisions each
Weight	10 ounces
Humidity	0…100% condensing when equipped with potted lead wire, 0…95% non-condensing with screw-terminal wire connections
Temperature	– 40…140° F (– 40…60° C)
Signal Output	Industry Standard ASCII Format
Visual Resolution	1/100th of Test Circle
Electronic Resolution	8-dial resolution for AMR/AMI; 4, 5, 6, 7 or 8-dial resolution for BadgerTouch
Signal Type	3-wire synchronous for AMR/AMI solutions (red=clock/power, black=ground, green=data) 2-wire asynchronous for Touch solutions
Power Source	External

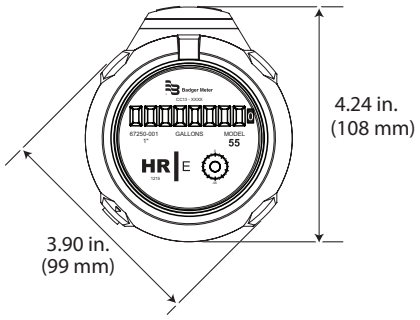
Operating Characteristics: The reading obtained by an AMR/AMI device is sensed directly from the position of the encoder's odometer using internal LED light paths to determine the exact position of each number wheel. This technology eliminates electromechanical contacts that could wear out, and provides greater long-term performance.

Wire Connections: The HR-E is available with an in-line connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for a field splice connection or fully prewired to an AMR/AMI endpoint. A terminal screw version of the HR-E is also available. This version features a tamper-resistant cap over the three-wire terminals. The HR-E with terminal screws is designed for indoor installations in protected environments such as residential basements.

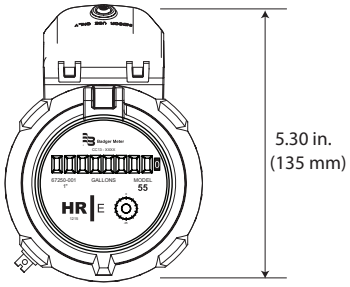
DIMENSIONAL DRAWINGS



Side view



With wire lead



With terminal screws

Top view

MEASUREMENT RESOLUTION

The minimum electronic resolution of the HR-E is as noted below (8-Dial Reading). To verify the correct resolution for your application, contact Badger Meter Customer Service.

Recordall Disc Series	Size (in.)	8-Dial Resolution (gal)	8-Dial Resolution (ft^3)	8-Dial Resolution (m^3)
M25/MLP	5/8	0.1	0.01	0.001
M25/MLP	3/4	0.1	0.01	0.001
M35	3/4	0.1	0.01	0.001
M40	1	0.1	0.01	0.001
M55	1	0.1	0.01	0.001
M70	1	0.1	0.01	0.001
M120	1-1/2	1	0.1	0.01
M170	2	1	0.1	0.01

Fire Service Series	8-Dial Resolution (gal)	8-Dial Resolution (ft^3)	8-Dial Resolution (m^3)
3 in.	1	0.1	0.01
4 in.	1	0.1	0.01
6 in.	10	1	0.1
8 in.	10	1	0.1
10 in.	10	1	0.1

Recordall Turbo Series	Size (in.)	8-Dial Resolution (gal)	8-Dial Resolution (ft^3)	8-Dial Resolution (m^3)
T160	1-1/2	1	0.1	0.01
T200	2	1	0.1	0.01
T450	3	1	0.1	0.01
T1000	4	1	0.1	0.01
T2000	6	10	1	0.1
T3500	8	10	1	0.1
T5500	10	10	1	0.1
T6200	12	100	10	0.1
T6600	16	100	10	1
T10000	20	100	100	1

Recordall Compound Series	Size (in.)	8-Dial Resolution (gal)	8-Dial Resolution (ft^3)	8-Dial Resolution (m^3)
High Side T200	2	1	0.1	0.01
Low Side M25	2	0.1	0.01	0.001
High Side T450	3	1	0.1	0.01
Low Side M25	3	0.1	0.01	0.001
High Side T1000	4	1	0.1	0.01
Low Side M35	4	0.1	0.01	0.001
High Side T2000	6	10	1	0.1
Low Side M35	6	0.1	0.01	0.001

Resolution stated as individual high and low readings.

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Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
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HR-RED

High Resolution Remote Electronic Display

APPLICATION

The High Resolution Remote Electronic Display (HR-RED) is designed to provide remote visual readings when connected directly to Badger Meter high resolution products: HR-E®, HR-E LCD, HR-E LCD 4-20 encoders, or E-Series® Ultrasonic meters. The HR-RED is used to read compatible encoder products that are not easily accessible or are in difficult to read locations. Installations such as those inside houses or buildings, meter vaults, or dangerous industrial locations are ideal for the HR-RED.

OPERATION

The HR-RED is a battery operated device. When attached to Badger Meter high resolution encoders or high resolution E-Series Ultrasonic meters, the unit is designed to provide the same output resolution as the encoder, up to 9 digits for Badger Meter products. It also displays the encoder serial number. To conserve battery life the HR-RED is awakened only when the internal acoustic switch is activated. This is easily accomplished by tapping the target circle on the register display.

How the meter reading displays depends on the output resolution. The letters "RD" display to the left of the digits. Decimal points do not display.

6 digit output or less: "RD" and all digits appear at the same time, right-justified, and display for 10 seconds.

EXAMPLE of 6 digit meter reading

<displays for 10 sec>	**RD 123456**

7 or 8 digit output: "RD" appears by itself for 2 seconds. Then the complete meter reading (up to 8 digits) displays for 10 seconds.

EXAMPLE of 8 digit meter reading

<displays for 2 sec>	**RD**
<displays for 10 sec>	**12345678**

9 digit output: "RD" appears, followed by the first of the 9 digits, and displays for 5 seconds. Then the remaining 8 digits display for 10 seconds.

EXAMPLE of 9 digit meter reading

<displays for 5 sec>	**RD 1**
<displays for 10 sec>	**23456789**

After the meter reading displays, the serial number of the encoder or meter displays. Then the HR-RED returns to sleep mode.

Tap Target Circle to Activate

TAMPER-PROOF FEATURES

The HR-RED is supplied with an anti-tamper indicator. Any time the connection is interrupted, a visual alarm appears on the display.

There is no maintenance since the electronics and battery are fully encapsulated in the housing and not accessible. The unit is also supplied with a tamper resistant Torx® seal screw to prevent access to the unit.

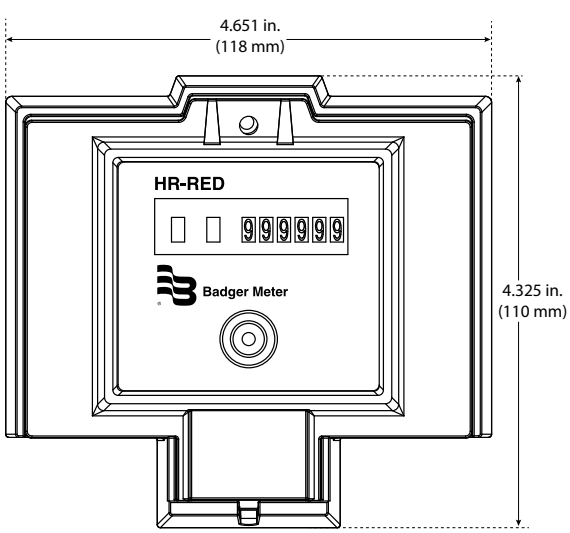
FEATURES

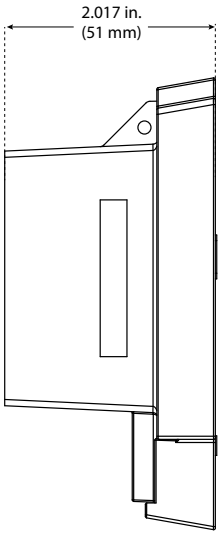
- Environmentally sealed
- Tamper indicators
- Designed for use with any Badger Meter high resolution encoder or E-Series Ultrasonic meter
- Torx seal screw security
- Acoustic "TAP" switch for viewing
- 10 year calculated battery life

SPECIFICATIONS

Operating Temperature	–4…140° F (–20…60° C)
Encoder Compatibility	HR-E, HR-E LCD, HR-E LCD 4-20, E-Series Ultrasonic meter
Dimensions	L 4.651 in. (118 mm) × H 4.325 in. (110 mm) × W 2.017 in. (51 mm)
Weight	9 oz (255 g)
Display	LCD, 8 characters, 0.25 inches high
Battery Life	10 years, 3.6V lithium battery
Construction	High impact thermoplastic, weather and UV resistant

DIMENSIONS





NOTE: Refer to the *HR-RED Installation Data Sheet* available in the Resource Library at *www.badgermeter.com* for installation instructions.

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China | Badger Meter | 7-1202 | 99 Hangzhong Road | Minhang District | Shanghai | China 201101 | +86-21-5763 5412
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

Badger Meter

HR-E® LCD 4-20 Encoder

DESCRIPTION

The High Resolution 4-20 encoder (HR-E LCD 4-20) is a fully electronic, solid-state encoder with no moving parts. It is designed for use with all current Badger Meter® Recordall® Disc Series, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies. These solid-state units produce a standard encoded output as well as a 4-20 mA DC output signal through a dual output wire design. The HR-E LCD 4-20 encoder provides connectivity with Badger Meter ORION® AMR/AMI endpoints and other AMR/AMI technology solutions approved by Badger Meter.

NOTE: For more detailed information, see the user manual, *High Resolution LCD Encoders*, available at *www.badgermeter.com*.

Field Programmable: The HR-E LCD 4-20 encoder comes standard as factory programmed, with the option for field programming the unit of measure, meter type, meter model, digit resolution from the encoder, billing units, rate-of-flow time and units, and the analog output. Programming is performed through the IR port via a computer using the Programmer software, version 2.0.0 or greater.

Output Resolution: Standard encoded output is 9 digits. The 4-20 signal from the encoder is proportional to the flow of fluid passing through the meter. Power for the 4-20 output signal device can be obtained from a 9…50V DC control loop. The default 20 mA setting of the signal is defined in the resolution chart.

Status Indicators: Icons on the encoder face indicate encoder status and alarm conditions. Status indicators are sent as part of the encoder extended message to AMR/AMI systems such as ORION Cellular, Fixed Network and Migratable endpoints that are capable of receiving an extended message. The details can also be read through an IR interface.

Mounting: The fully potted encoder assembly has a bayonet mount compatible with all Recordall Disc, Turbo Series, Compound Series, Combo Series and Fire Series meters and assemblies. The bayonet mount positions the encoder in any of four orientations for visual reading convenience. The encoder can be removed from the meter without disrupting water service.

Magnetic Drive Communication: The encoder detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable meter monitoring.

Tamper-resistant Features: Unauthorized removal of the encoder is inhibited by a tamper-resistant Torx seal screw. Torx seal screws are provided as standard accessories. Optional proprietary tamper-proof screws are also available.

In addition, the encoder is resistant to magnetic tampering. The encoder detects an attempted tamper—as well as encoder removal—and displays a tamper alarm in either situation. Approved endpoints capable of receiving the alarms, such as ORION Cellular, Fixed Network and Migratable endpoints, can then report the tamper condition to the meter reading software.

Construction: The housing of the HR-E LCD 4-20 encoder is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. A patented epoxy potting comprises the encoder bottom. Due to this unique sealing, the HR-E LCD 4-20 exceeds all applicable requirements of AWWA Standard C707.

Wire Connections: The encoder is available with dual output wire connections. The encoder side wire is available with an in-line connector for easy connection to AMR/AMI endpoints, or a flying lead for field splice connection. The 4-20 side is available with a flying lead for easy connection in the field.

Operating Characteristics: The encoder is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model screen is displayed. Upon sensing two revolutions of the meter magnet, the encoder goes into normal operation mode. The display then automatically toggles between these four modes:

- 9-digit consumption displays for 45 seconds.
- 6-digit consumption (segmented leak detector in this mode) displays for 5 seconds.
- Rate of flow displays for 5 seconds.
- Meter model displays for 5 seconds.

SPECIFICATIONS

Encoder Type	Permanently sealed, electronic LCD absolute encoder with analog output and field-programmable option
Encoder Display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit and 6-digit consumption (segmented leak detector in this mode), rate of flow, meter model
Unit of Measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters and liters
Flow Rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: –40…140° F (– 40…60° C) Max. ambient for 1 hr: 150° F (66° C) Electronics & Display: 14…140° F (–10…60° C)
Status Indicators	Electronic and visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or encoder removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Encoder Output	Industry standard ASCII format Three-wire synchronous for AMR/AMI solutions Red = clock/power; Black = ground; Green = data
Analog Output	Two-wire/passive
Input Voltage Range	9…50V DC supply
Current	4…20 mA
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)
Battery	Lithium thionyl chloride AA cell, fully encapsulated within encoder housing
Battery Life	20 years (calculated)

DIMENSIONAL DRAWINGS

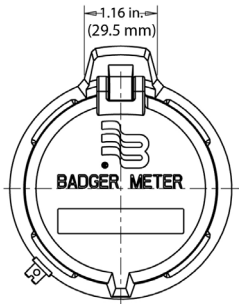

Figure 1: Top view

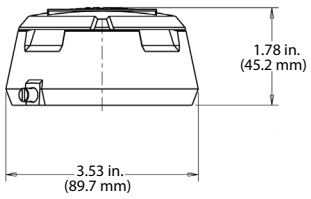

Figure 2: Front view

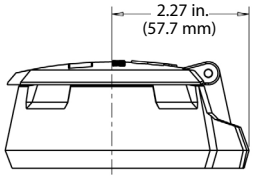

Figure 3: Left side view

MEASUREMENT RESOLUTION

The HR-E LCD 4-20 default output resolutions are as noted below.

Recordall Disc Series	Size (in.)	Encoder Output			Analog Output
		9-dial (gal)	9-dial (ft^3)	9-dial (m^3)	20 mA Set point (gpm)
LP	5/8, 5/8 x 3/4	0.01	0.001	0.0001	20
M25	5/8, 5/8 x 3/4	0.01	0.001	0.0001	25
M35	3/4	0.01	0.001	0.0001	35
M40	1	0.01	0.001	0.0001	40
M55	1	0.01	0.001	0.0001	55
M70	1	0.01	0.001	0.0001	70
M120	1-1/2	0.1	0.01	0.001	120
M170	2	0.1	0.01	0.001	170

Recordall Turbo Series	Size (in.)	Encoder Output			Analog Output
		9-dial (gal)	9-dial (ft^3)	9-dial (m^3)	20 mA Set point (gpm)
T160	1-1/2	0.1	0.01	0.001	200
T200	2	0.1	0.01	0.001	310
T450	3	0.1	0.01	0.001	550
T1000	4	0.1	0.01	0.001	1250
T2000	6	1	0.1	0.01	2500
T3500	8	1	0.1	0.01	4500
T5500	10	1	0.1	0.01	7000
T6200	12	10	1	0.01	8800
T6600	16	10	1	0.01	13200
T10000	20	10	1	0.01	19800

Recordall Compound Series	Size (in.)	Encoder Output			Analog Output
		9-dial (gal)	9-dial (ft^3)	9-dial (m^3)	20 mA Set point (gpm)
High Side T200	2.	0.1	0.01	0.001	200
Low Side M25	2.	0.01	0.001	0.0001	25
High Side T450	3	0.1	0.01	0.001	450
Low Side M25	3	0.01	0.001	0.0001	25
High Side T1000	4	0.1	0.01	0.001	1000
Low side M35	4	0.01	0.001	0.0001	35
High Side T2000	6	1	0.1	0.01	2000
Low Side M35	6	0.01	0.001	0.0001	35
High Side T3500	8	1	0.1	0.01	—
Low side M120	8	0.1	0.01	0.001	—

NOTE: For Fire Service Meters and Assemblies, please refer to appropriate Disc and TSM information provided above.

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México | Badger Meter de las Americas, S.A. de C.V. | Pedro Luis Ogazón N°32 | Esq. Angelina N°24 | Colonia Guadalupe Inn | CP 01050 | México, DF | México | +52-55-5662-0882
Europe, Eastern Europe Branch Office (for Poland, Latvia, Lithuania, Estonia, Ukraine, Belarus) | Badger Meter Europe | ul. Korfantego 6 | 44-193 Knurów | Poland | +48-32-236-8787
Europe, Middle East and Africa | Badger Meter Europa GmbH | Nurtinger Str 76 | 72639 Neuffen | Germany | +49-7025-9208-0
Europe, Middle East Branch Office | Badger Meter Europe | PO Box 341442 | Dubai Silicon Oasis, Head Quarter Building, Wing C, Office #C209 | Dubai / UAE | +971-4-371 2503
Slovakia | Badger Meter Slovakia s.r.o. | Racianska 109/B | 831 02 Bratislava, Slovakia | +421-2-44 63 83 01
Asia Pacific | Badger Meter | 80 Marine Parade Rd | 21-06 Parkway Parade | Singapore 449269 | +65-63464836
China | Badger Meter | 7-1202 | 99 Hangzhong Road | Minhang District | Shanghai | China 201101 | +86-21-5763 5412
Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

HR-RED

High Resolution Remote Electronic Display

APPLICATION

The High Resolution Remote Electronic Display (HR-RED) is designed to provide remote visual readings when connected directly to Badger Meter high resolution products: HR-E®, HR-E LCD, HR-E LCD 4-20 encoders, or E-Series® Ultrasonic meters. The HR-RED is used to read compatible encoder products that are not easily accessible or are in difficult to read locations. Installations such as those inside houses or buildings, meter vaults, or dangerous industrial locations are ideal for the HR-RED.

OPERATION

The HR-RED is a battery operated device. When attached to Badger Meter high resolution encoders or high resolution E-Series Ultrasonic meters, the unit is designed to provide the same output resolution as the encoder, up to 9 digits for Badger Meter products. It also displays the encoder serial number. To conserve battery life the HR-RED is awakened only when the internal acoustic switch is activated. This is easily accomplished by tapping the target circle on the register display.

How the meter reading displays depends on the output resolution. The letters "RD" display to the left of the digits. Decimal points do not display.

6 digit output or less: "RD" and all digits appear at the same time, right-justified, and display for 10 seconds.

EXAMPLE of 6 digit meter reading

<displays for 10 sec>	**RD 123456**

7 or 8 digit output: "RD" appears by itself for 2 seconds. Then the complete meter reading (up to 8 digits) displays for 10 seconds.

EXAMPLE of 8 digit meter reading

<displays for 2 sec>	**RD**
<displays for 10 sec>	**12345678**

9 digit output: "RD" appears, followed by the first of the 9 digits, and displays for 5 seconds. Then the remaining 8 digits display for 10 seconds.

EXAMPLE of 9 digit meter reading

<displays for 5 sec>	**RD 1**
<displays for 10 sec>	**23456789**

After the meter reading displays, the serial number of the encoder or meter displays. Then the HR-RED returns to sleep mode.

Tap Target Circle to Activate

TAMPER-PROOF FEATURES

The HR-RED is supplied with an anti-tamper indicator. Any time the connection is interrupted, a visual alarm appears on the display.

There is no maintenance since the electronics and battery are fully encapsulated in the housing and not accessible. The unit is also supplied with a tamper resistant Torx® seal screw to prevent access to the unit.

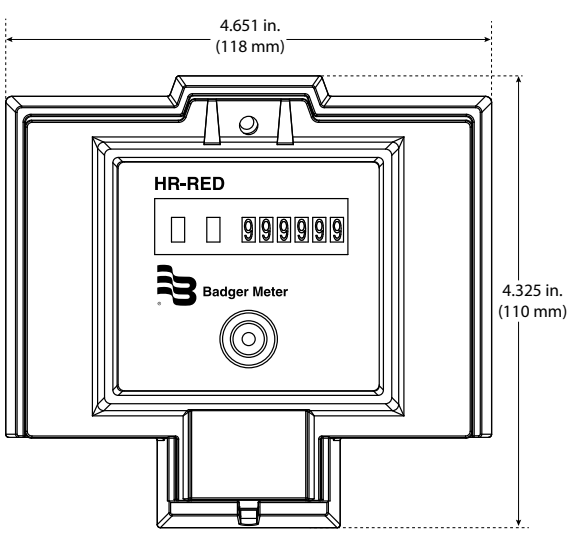
FEATURES

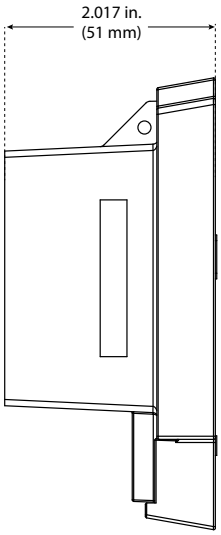
- Environmentally sealed
- Tamper indicators
- Designed for use with any Badger Meter high resolution encoder or E-Series Ultrasonic meter
- Torx seal screw security
- Acoustic "TAP" switch for viewing
- 10 year calculated battery life

SPECIFICATIONS

Operating Temperature	–4…140° F (–20…60° C)
Encoder Compatibility	HR-E, HR-E LCD, HR-E LCD 4-20, E-Series Ultrasonic meter
Dimensions	L 4.651 in. (118 mm) × H 4.325 in. (110 mm) × W 2.017 in. (51 mm)
Weight	9 oz (255 g)
Display	LCD, 8 characters, 0.25 inches high
Battery Life	10 years, 3.6V lithium battery
Construction	High impact thermoplastic, weather and UV resistant

DIMENSIONS





NOTE: Refer to the *HR-RED Installation Data Sheet* available in the Resource Library at *www.badgermeter.com* for installation instructions.

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Switzerland | Badger Meter Swiss AG | Mittelholzerstrasse 8 | 3006 Bern | Switzerland | +41-31-932 01 11

Encoders
High Resolution Encoders

HR-E® LCD Encoder

DESCRIPTION

Applications: The High Resolution encoder (HR-E LCD) is a fully electronic, solid-state encoder with no moving parts. It is designed for use with all current Badger Meter Recordall® Disc, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies. The HR-E LCD provides connectivity with Badger Meter ORION® and GALAXY® AMR/AMI endpoints and other AMR/AMI technology solutions approved by Badger Meter.

NOTE: For more detailed information, refer to the document *HR-E LCD Encoder User Manual*, available at *www.badgermeter.com*.

Field Programmable: The HR-E LCD encoder comes standard as factory programmed to customer specifications, with the option for field programming the unit of measure, meter type, meter model, digit resolution from the encoder, billing units, and rate-of-flow time and units. Programming is performed through the IR port via a computer.

Electronic Resolution: Standard encoded output from the HR-E LCD is nine digits.

Status Indicators: Status indicators are sent as part of the encoder extended message to AMR/AMI systems such as ORION Cellular, Fixed Network and Migratable endpoints that are capable of receiving an extended message. The details can also be read through an IR interface.

Mounting: Icons on the HR-E LCD encoder face indicate encoder status and alarm conditions. The fully potted encoder assembly has a bayonet mount compatible with all Recordall Disc, Turbo Series, Compound Series, Combo Series and Fire Series meters and assemblies. The bayonet mount positions the encoder in any of four orientations for visual reading convenience. The HR-E LCD encoder can be removed from the meter without disrupting water service.

Magnetic Drive Communication: The HR-E LCD encoder detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable encoded communication.

Tamper-resistant Features:
Unauthorized removal of the HR-E LCD encoder is inhibited by a tamper-resistant Torx® seal screw. Torx seal screws are provided as standard accessories. Optional proprietary tamper-proof screws are also available.

Magnetic sensors detect and report an attempted encoder removal. In addition, the HR-E LCD encoder is resistant to magnetic tampering. The encoder detects an attempted tamper—as well as encoder removal—and sends a tamper alarm in either situation. Approved endpoints capable of receiving the alarms, such as ORION Cellular, Fixed Network and Migratable endpoints, can then report the tamper condition to the meter reading software.

SPECIFICATIONS

Encoder type	Straight reading, permanently sealed, electronic LCD absolute encoder with field-programmable option
Encoder display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit and 6-digit consumption (segmented leak detector in this mode), rate of flow, meter model
Unit of measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters clearly identified on register face
Flow rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…60° C (– 40…140° F) Max. ambient for 1 hr: 70° C (158° F) Electronics & Display: –10…60° C (14…140° F)
Status indicators	Electronic and visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or encoder removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Signal output	Industry standard ASCII format
Signal type	Three-wire synchronous for AMR/AMI solutions Red = clock/power; Black = ground; Green = data
Battery	Lithium thionyl chloride AA cell, fully encapsulated within encoder housing
Battery Life	20 years (calculated)

Badger Meter

ENC-DS-01763-EN-06 (January 2021)

Product Data Sheet

Construction: The housing of the HR-E LCD encoder is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. An epoxy potting (patented design - 8,482,908) comprises the encoder bottom. Due to this unique sealing, the HR-E LCD exceeds all applicable requirements of AWWA Standard C706 and C707.

Wire Connections: The HR-E LCD encoder is available with an in-line connector for easy connection and installation to AMR/AMI endpoints. It is also available with a flying lead for a field splice connection, or fully prewired to an AMR/AMI endpoint.

Operating Characteristics: The HR-E LCD encoder is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model screen is displayed. Upon sensing two revolutions of the meter magnet, the encoder goes into normal operation mode. The display then automatically toggles between these four modes:

- 9-digit consumption displays for 45 seconds.
- 6-digit consumption (segmented leak detector in this mode) displays for 5 seconds.
- Rate of flow displays for 5 seconds.
- Meter model displays for 5 seconds.

DIMENSIONAL DRAWINGS

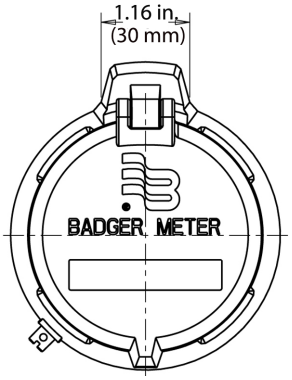

Figure 1: Top view

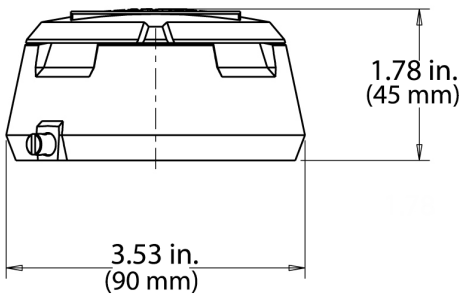

Figure 2: Front view

MEASUREMENT RESOLUTION

The electronic encoder output resolution of the HR-E LCD is as noted below.

Recordall Disc Series	Size (in.)	9-dial encoder output (gal)	9-dial encoder output (ft^3)	9-dial encoder output (m^3)
LP	5/8, 5/8 x 3/4	0.01	0.001	0.0001
M25	5/8 , 5/8 x 3/4	0.01	0.001	0.0001
M35	3/4	0.01	0.001	0.0001
M40	1	0.01	0.001	0.0001
M55	1	0.01	0.001	0.0001
M70	1	0.01	0.001	0.0001
M120	1-1/2	0.1	0.01	0.001
M170	2	0.1	0.01	0.001

Recordall Turbo Series	Size (in.)	9-dial encoder output (gal)	9-dial encoder output (ft^3)	9-dial encoder output (m^3)
T160	1-1/2	0.1	0.01	0.001
T200	2	0.1	0.01	0.001
T450	3	0.1	0.01	0.001
T1000	4	0.1	0.01	0.001
T2000	6	1	0.1	0.01
T3500	8	1	0.1	0.01
T5500	10	1	0.1	0.01
T6200	12	10	1	0.01
T6600	16	10	1	0.01
T10000	20	10	1	0.01

Recordall Compound Series	Size (in.)	9-dial encoder output (gal)	9-dial encoder output (ft^3)	9-dial encoder output (m^3)
High Side T200	2	0.1	0.01	0.001
Low Side M25	2	0.01	0.001	0.0001
High Side T450	3	0.1	0.01	0.001
Low Side M25	3	0.01	0.001	0.0001
High Side T1000	4	0.1	0.01	0.001
Low side M35	4	0.01	0.001	0.0001
High Side T2000	6	1	0.1	0.01
Low Side M35	6	0.01	0.001	0.0001
High Side T3500	8	1	0.1	0.01
Low side M120	8	0.1	0.01	0.001

NOTE: For Fire Service Meters and Assemblies, please refer to appropriate Disc and TSM information provided above.

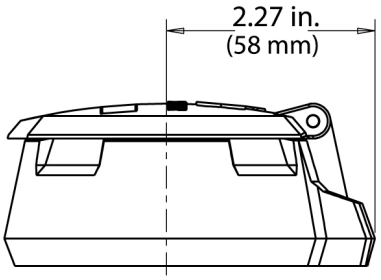

Figure 3: Left side view

SMART WATER IS *BADGER METER*

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HR-LCD Pulse

Scaled Register

Description

The High Resolution Pulse scaled register (HR-LCD Pulse) is a fully electronic, solid-state register with no moving parts. It is designed for use with all current Badger Meter® Recordall® Disc Series, Turbo Series and Compound Series meters. These solid-state units produce a scaled output.

NOTE: For more detailed information, see the user manual, *High Resolution LCD Registers*, available at *www.badgermeter.com*.

Field Programmable

The HR-LCD Pulse register comes standard as factory programmed, with the option for field programming the unit of measure, meter type, meter model, rate-of-flow time and units. Programming is performed through the IR port via a computer using the Programmer software, version 2.0.0 or greater.

Output Resolution

The output resolution table in this document lists the minimum output resolution for all Recordall meters.

Scaled Output

- The scaled output is a switch closure output defined as: green wire = positive, black wire = negative.
- The scaled digital output from the register has a default resolution of 1/10th of the register test circle (resolution may vary in some cases).
- The movement of the meter magnet is converted to a square wave signal that is available as a scaled output through a solid-state relay.
- The scaled output is a solid-state relay.
- The nominal pulse output width is programmable from 30…100 msec.
- Resolution of the output is defined in the registration section.
- This digital pulse output is compatible with most totalizers and batch controllers.

Power

Power for the device can be obtained from a 9…50V DC control loop.

Mounting

The fully potted register assembly has a bayonet mount compatible with all Recordall meters. The bayonet mount positions the register in any of four orientations for visual reading convenience. The register can be removed from the meter without disrupting water service.

Magnetic Drive Communication

The register detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable meter monitoring.

Tamper-Resistant Features

Unauthorized removal of the register is inhibited by a tamper-resistant Torx® seal screw. Torx seal screws are provided. Optional proprietary tamper-proof screws are also available.

In addition, the register is resistant to magnetic tampering. The register detects any attempted tamper or register removal and displays the status indicator/alarm condition icon.

Construction

The housing of the register is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. A patented epoxy potting comprises the register bottom. Due to this unique sealing, the register exceeds all applicable requirements of AWWA Standard C707.

Operating Characteristics

The register is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model screen is displayed. Upon sensing two revolutions of the meter magnet, the register goes into normal operation mode. The display then automatically toggles between these modes:

- 9-digit consumption displays for 50 seconds
- Rate of flow displays for 5 seconds
- Meter model displays for 5 seconds

SPECIFICATIONS

Register Type	Permanently sealed, electronic LCD register with scaled output, as well as a field-programmable option
Register Display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit consumption, rate of flow, meter model
Unit of Measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters
Flow Rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…140° F (– 40…60° C) Max. ambient for 1 hr: 150° F (66° C) Electronics & Display: 14…140° F (–10…60° C)
Status Indicators	Visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or register removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Scaled Output	Solid-state relay
Max. Voltage	30V DC
Current	100 mA
Pulse Width	50 ms (programmable 30…100 ms)
Power	
Input Voltage Range	9…50V DC supply
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)
Battery	Lithium thionyl chloride AA cell, fully encapsulated within register housing
Battery Life	10 years based on default settings and typical operating range

DIMENSIONAL DRAWINGS

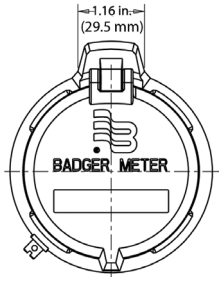

Figure 1: Top view

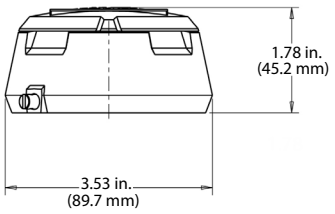

Figure 2: Front view

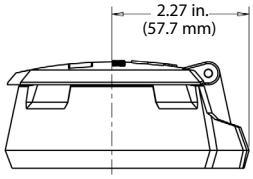

Figure 3: Left side view

MEASUREMENT RESOLUTION

The HR-LCD Pulse default output resolutions are as noted below.

Recordall Disc Series

Model	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
LP	5/8	1	10	100
M25	5/8	1	10	100
M35	3/4	1	10	100
M40	1	1	10	100
M55	1	1	10	100
M70	1	1	10	100
M120	1-1/2	0.10	1	10
M170	2	0.10	1	10

Recordall Turbo Series

Model	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
T160	1-1/2	0.10	1	10
T200	2	0.10	1	10
T450	3	0.10	1	10
T1000	4	0.10	1	10
T2000	6	0.01	0.10	1
T3500	8	0.01	0.10	1
T5500	10	0.01	0.10	1
T6200	12	0.001	0.01	0.10
T6600	16	0.001	0.01	0.10
T1000	20	0.001	0.01	0.10

Recordall Compound Series

Model	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
High Side T200	2	0.10	1	10
Low Side M25	2	1	10	100
High Side T450	3	0.10	1	10
Low Side M25	3	1	10	100
High Side T1000	4	0.10	1	10
Low side M35	4	1	10	100
High Side T2000	6	0.01	0.10	1
Low Side M35	6	1	10	100
High Side T3500	8	0.01	0.10	1
Low side M120	8	0.10	1	10

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Badger Meter

HR-LCD 4-20 Scaled/Unscaled Register

DESCRIPTION

The High Resolution 4-20 scaled/unscaled register (HR-LCD 4-20 scaled/unscaled) is a fully electronic, solid-state register with no moving parts. It is designed for use with all current Badger Meter® Recordall® Disc Series, Turbo Series, Compound Series, Combo Series and Fire Service meters and assemblies. These solid-state units produce a scaled/unscaled output as well as a 4-20 mA DC output signal through a dual output wire design.

NOTE: For more detailed information, see the user manual, *High Resolution LCD Encoders*, available at *www.badgermeter.com*.

Field Programmable: The HR-LCD 4-20 scaled/unscaled register comes standard as factory programmed, with the option for field programming the unit of measure, meter type, meter model, rate-of-flow time and units, and the analog output. Programming is performed through the IR port via a computer using the Programmer software, version 2.0.0 or greater.

Output Resolution: The output resolution table in this document lists the minimum output resolution for all Recordall meters.

Scaled Output:

- The scaled output is a switch closure output defined as: red wire = positive, black wire = negative.
- The scaled digital output from the register has a default resolution of 1/10th of the register test circle (resolution may vary in some cases).
- The movement of the meter magnet is converted to a square wave signal that is available as a scaled output through a solid-state relay.
- The scaled output is a solid-state relay to provide isolation from the 4-20 mA output.
- The nominal pulse output width is programmable from 30…100 msec.
- Resolution of the output is defined in the registration section.
- This digital pulse output is compatible with most totalizers and batch controllers.

Unscaled Output:

- The unscaled output is a switch closure output defined as: green wire = positive, black wire = negative.
- The movement of the meter magnet is converted to a square wave signal that is available as an unscaled output through a solid-state relay.
- The unscaled output is a solid state relay to provide isolation from the 4-20 mA output.
- Resolution of the output is defined in the registration section.
- The unscaled output will only be active when the device is powered by the 4-20 mA output.
- This digital pulse output is compatible with most totalizers and batch controllers.

Analog Output:

- The input pulses generated within the transmitter assembly are converted to a standard 4-20 mA control signal.
- This signal is proportional to the flow of fluid passing through the flow meter.

- Power for the device can be obtained from a 9…50V DC control loop.
- The default 20mA setting of the signal is defined in the registration section.

Mounting: The fully potted register assembly has a bayonet mount compatible with all Recordall meters. The bayonet mount positions the register in any of four orientations for visual reading convenience. The register can be removed from the meter without disrupting water service.

Magnetic Drive Communication: The register detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable meter monitoring.

Tamper-resistant Features: Unauthorized removal of the register is inhibited by a tamper-resistant Torx® seal screw. Torx seal screws are provided. Optional proprietary tamper-proof screws are also available.

In addition, the register is resistant to magnetic tampering. The register detects any attempted tamper or register removal and displays the status indicator/alarm condition icon.

Construction: The housing of the register is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. A patented epoxy potting comprises the register bottom. Due to this unique sealing, the register exceeds all applicable requirements of AWWA Standard C707.

Wire Connections: The register is available with dual output wire connections. Both the scaled/unscaled wire and the 4-20 wire are available with flying leads for easy connection in the field.

Operating Characteristics: The register is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model screen is displayed. Upon sensing two revolutions of the meter magnet, the register goes into normal operation mode. The display then automatically toggles between these modes:

- 9-digit consumption displays for 50 seconds
- Rate of flow displays for 5 seconds
- Meter model displays for 5 seconds

SPECIFICATIONS

Register Type	Permanently sealed, electronic LCD register with scaled/unscaled and analog output, as well as a field-programmable option
Register Display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit consumption, rate of flow, meter model
Unit of Measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters
Flow Rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…140° F (– 40…60° C) Max. ambient for 1 hr: 150° F (66° C) Electronics & Display: 14…140° F (–10…60° C)
Status Indicators	Visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or register removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Scaled/Unscaled Output	Solid-state relay
Max. Voltage	30V DC
Current	100 mA
Pulse Width	50 ms (programmable 30…100 ms)
Analog Output	Two-wire/passive
Input Voltage Range	9…50V DC supply
Current	4…20 mA
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)
Battery	Lithium thionyl chloride AA cell, fully encapsulated within register housing
Battery Life	10 years based on default settings and typical operating range

DIMENSIONAL DRAWINGS

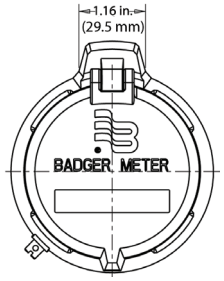

Figure 1: Top view

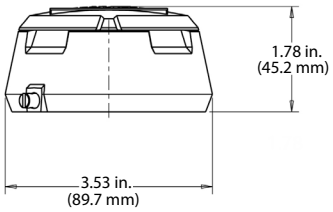

Figure 2: Front view

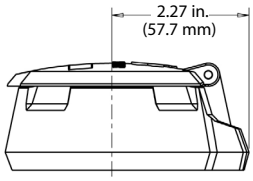

Figure 3: Left side view

MEASUREMENT RESOLUTION

The HR-LCD 4-20 scaled/unscaled default output resolutions are as noted below.

Recordall Disc Series

Model	Size (in.)	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
		gal	ft³	m³	gal	ft³	m³	20 mA Set point (gpm)
LP	5/8	1	10	100	228.415	1708.661	60337.105	20
M25	5/8	1	10	100	198.334	1483.641	52391.084	25
M35	3/4	1	10	100	126.678	947.621	33462.863	35
M40	1	1	10	100	89.783	671.621	23716.632	40
M55	1	1	10	100	58.065	434.358	15338.279	55
M70	1	1	10	100	46.773	349.884	12355.278	70
M120	1-1/2	0.10	1	10	23.866	178.533	6304.435	120
M170	2	0.10	1	10	14.565	108.950	3847.303	170

Recordall Turbo Series

Model	Size (in.)	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
		gal	ft³	m³	gal	ft³	m³	20 mA Set point (gpm)
T160	1-1/2	0.10	1	10	1.537	11.494	405.894	200
T200	2	0.10	1	10	1.537	11.494	405.894	310
T450	3	0.10	1	10	1.598	11.954	422.109	550
T1000	4	0.10	1	10	1.665	12.455	439.820	1250
T2000	6	0.01	0.10	1	0.150	1.123	39.639	2500
T3500	8	0.01	0.10	1	0.151	1.131	39.939	4500
T5500	10	0.01	0.10	1	0.198	1.481	52.308	7000
T6200	12	0.001	0.01	0.10	0.129	0.963	34.006	8800
T6600	16	0.001	0.01	0.10	0.016	0.116	4.107	13200
T1000	20	0.001	0.01	0.10	0.009	0.067	2.382	19800

Recordall Compound Series

Model	Size (in.)	Scaled (pulse/unit)			Unscaled (pulse/unit)			Analog Output
		gal	ft³	m³	gal	ft³	m³	20 mA Set point (gpm)
High Side T200	2	0.10	1	10	1.537	11.494	405.894	200
Low Side M25	2	1	10	100	198.334	1483.641	52391.084	25
High Side T450	3	0.10	1	10	1.598	11.954	422.109	450
Low Side M25	3	1	10	100	198.334	1483.641	52391.084	25
High Side T1000	4	0.10	1	10	1.665	12.455	439.820	1000
Low side M35	4	1	10	100	126.678	947.621	33462.863	35
High Side T2000	6	0.01	0.10	1	0.150	1.123	39.639	2000
Low Side M35	6	1	10	100	126.678	947.621	33462.863	35
High Side T3500	8	0.01	0.10	1	0.151	1.131	39.939	—
Low side M120	8	0.10	1	10	23.866	178.533	6304.435	—

NOTE: For Fire Service Meters and Assemblies, please refer to appropriate Disc and TSM information provided above.

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HR-LCD Pulse

Scaled Register

Description

The High Resolution Pulse scaled register (HR-LCD Pulse) is a fully electronic, solid-state register with no moving parts. It is designed for use with all current Badger Meter® Recordall® Disc Series, Turbo Series and Compound Series meters. These solid-state units produce a scaled output.

NOTE: For more detailed information, see the user manual, *High Resolution LCD Registers*, available at *www.badgermeter.com*.

Field Programmable

The HR-LCD Pulse register comes standard as factory programmed, with the option for field programming the unit of measure, meter type, meter model, rate-of-flow time and units. Programming is performed through the IR port via a computer using the Programmer software, version 2.0.0 or greater.

Output Resolution

The output resolution table in this document lists the minimum output resolution for all Recordall meters.

Scaled Output

- The scaled output is a switch closure output defined as: green wire = positive, black wire = negative.
- The scaled digital output from the register has a default resolution of 1/10th of the register test circle (resolution may vary in some cases).
- The movement of the meter magnet is converted to a square wave signal that is available as a scaled output through a solid-state relay.
- The scaled output is a solid-state relay.
- The nominal pulse output width is programmable from 30…100 msec.
- Resolution of the output is defined in the registration section.
- This digital pulse output is compatible with most totalizers and batch controllers.

Power

Power for the device can be obtained from a 9…50V DC control loop.

Mounting

The fully potted register assembly has a bayonet mount compatible with all Recordall meters. The bayonet mount positions the register in any of four orientations for visual reading convenience. The register can be removed from the meter without disrupting water service.

Magnetic Drive Communication

The register detects movement of the wet side meter magnet with magnetic sensors to provide reliable and dependable meter monitoring.

Tamper-Resistant Features

Unauthorized removal of the register is inhibited by a tamper-resistant Torx® seal screw. Torx seal screws are provided. Optional proprietary tamper-proof screws are also available.

In addition, the register is resistant to magnetic tampering. The register detects any attempted tamper or register removal and displays the status indicator/alarm condition icon.

Construction

The housing of the register is constructed of an engineered polymer enclosure and a polycarbonate lens. For long-term performance, the enclosure is fully encapsulated, weatherproof, and UV-resistant to withstand harsh environments and to protect the electronics in flooded or submerged pit applications. A patented epoxy potting comprises the register bottom. Due to this unique sealing, the register exceeds all applicable requirements of AWWA Standard C707.

Operating Characteristics

The register is shipped in storage mode so a meter status alarm is not triggered. In storage mode, the meter model screen is displayed. Upon sensing two revolutions of the meter magnet, the register goes into normal operation mode. The display then automatically toggles between these modes:

- 9-digit consumption displays for 50 seconds
- Rate of flow displays for 5 seconds
- Meter model displays for 5 seconds

SPECIFICATIONS

Register Type	Permanently sealed, electronic LCD register with scaled output, as well as a field-programmable option
Register Display	Status indicators, unit of measure, billing units, automatic toggle between 9-digit consumption, rate of flow, meter model
Unit of Measure	U.S. gallons, Imperial gallons, cubic feet, cubic meters, and liters
Flow Rate	Seconds, minutes, and hours
Numerals	7 mm (0.28 in.) high
Weight	11 ounces
Humidity	0…100% condensing
Temperature	Storage: – 40…140° F (– 40…60° C) Max. ambient for 1 hr: 150° F (66° C) Electronics & Display: 14…140° F (–10…60° C)
Status Indicators	Visual icons for: meter functioning correctly, meter alarm (indicates temperature limits exceeded, magnetic tamper or register removal), reverse flow, suspected leak, 30-day no usage, end of battery life
Scaled Output	Solid-state relay
Max. Voltage	30V DC
Current	100 mA
Pulse Width	50 ms (programmable 30…100 ms)
Power	
Input Voltage Range	9…50V DC supply
Max. Load Resistance (Ohms)	50 Ohms + 50 Ohms (supply voltage - 9V)
Battery	Lithium thionyl chloride AA cell, fully encapsulated within register housing
Battery Life	10 years based on default settings and typical operating range

DIMENSIONAL DRAWINGS

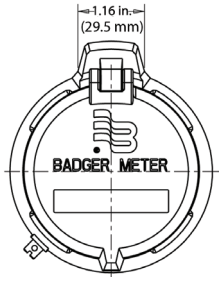

Figure 1: Top view

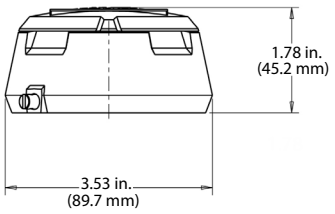

Figure 2: Front view

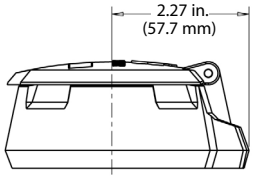

Figure 3: Left side view

MEASUREMENT RESOLUTION

The HR-LCD Pulse default output resolutions are as noted below.

Recordall Disc Series

Model	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
LP	5/8	1	10	100
M25	5/8	1	10	100
M35	3/4	1	10	100
M40	1	1	10	100
M55	1	1	10	100
M70	1	1	10	100
M120	1-1/2	0.10	1	10
M170	2	0.10	1	10

Recordall Turbo Series

Model	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
T160	1-1/2	0.10	1	10
T200	2	0.10	1	10
T450	3	0.10	1	10
T1000	4	0.10	1	10
T2000	6	0.01	0.10	1
T3500	8	0.01	0.10	1
T5500	10	0.01	0.10	1
T6200	12	0.001	0.01	0.10
T6600	16	0.001	0.01	0.10
T1000	20	0.001	0.01	0.10

Recordall Compound Series

Model	Size (in.)	Scaled (pulse/unit)		
		gal	ft³	m³
High Side T200	2	0.10	1	10
Low Side M25	2	1	10	100
High Side T450	3	0.10	1	10
Low Side M25	3	1	10	100
High Side T1000	4	0.10	1	10
Low side M35	4	1	10	100
High Side T2000	6	0.01	0.10	1
Low Side M35	6	1	10	100
High Side T3500	8	0.01	0.10	1
Low side M120	8	0.10	1	10

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Blancett®
Turbine Flow Meters

Flow Monitor

B3100 Series

DESCRIPTION

The B3100 Series flow monitor is a flexible, durable, easy-to-use platform for your flow metering applications. Our trusted flow metering technology now offers a new flow monitor with more options and features than ever before with the B3100 Series.

APPLICATIONS

The B3100 monitor is suitable for application in a wide variety of metering needs. A few of the more common industries are:

- Secondary oil recovery applications
- Remediation and reclamation
- Fracture/refracture
- Coal bed methane
- Regulatory compliance and environmental accountability
- Industrial chemicals
- Aggressive chemical processing applications
- Semiconductor manufacturing
- Fertilizer production and dispensing
- Pesticide manufacture
- Liquid batching and water cooling

FEATURES

- Explosion-proof according ATEX, IECEx, FM and CSA c-us
- Rugged 1 in. NPT thread for flow meter mounting
- Data logging to survey information
- USB communication for configuration using a programming cable
- Modbus RS485 communication option.
- Easy configuration via PC with free downloadable software
- Easy K-factor and engineering unit configuration for volumetric or mass readings
- Display shows flow rate, total, measuring units and a flow rate indicating speedometer
- Seven-digit flow rate/total and 11-digit accumulated total
- Easy configuration with clear alphanumerical display
- Bright LED backlight
- Auto backup of settings and running totals
- Power requirements: Loop powered or battery
- Operational temperature – 40…158° F (– 40…70° C)
- Sixteen-point linearization of the flow curve, with interpolation
- Field operation via through-the-glass keypad

PART NUMBER CONSTRUCTION

Blancett B3100 Display				-	
Model					
Blancett B3100 Display	**B31**				
Model					
Explosion Proof* – Battery & Loop Power		**Z**			
Mounting					
Meter			**M**		
Units of Measure					
Customer Selectable					**CS**

*For hazardous locations, the monitor must be installed on an explosion-proof rated meter. To maintain compliance, kit P/N B280-757 for meter mounting is required.

Badger Meter

DSY-DS-02303-EN-03 (June 2021)

Product Data Sheet

SPECIFICATIONS

Display	Dimensions	Ø 2.56 × 1.77 in. (65 × 45 mm)
	Digits	Seven 0.47 in. (12 mm) and eleven 0.28 in. (7 mm) digits. Various symbols and measuring units
	Refresh rate	User definable: 8 times/sec – 30 sec
	Speedometer	To indicate the actual flow rate, the bar graph range is 0…100% in 20 blocks, each block is 5%
Ambient Operating Temperature	– 40…158° F (– 40…70° C)	
Enclosure	Sealing	Silicone
	Control keys	Three infra-red keys with operation through-the-glass front window
	Rating	NEMA 4×, NEMA 7, NEMA 8, NEMA 9, IP66, IP67
	Type	Die-cast aluminum Ex d enclosure
	Dimensions	4.41 × 5.24 × 5.83 in. (112 × 133 × 148 mm) W × H × D
	Entry thread	2 × 3/4 in. NPT (T1), 1 × 1 in. NPT (T2)
Power Requirements	Battery powered	Long life Lithium battery; lifetime depends on settings and configuration; Up to approx. 3 years **NOTE:** The battery can power the backlight for a short time after a keypad touch
	Loop powered	Loop powered, analog output; 11…27V DC; Minimum 3.5 mA **NOTE:** The loop powered analog output cannot power the backlight
	Power supply	9…27V DC; Consumption max. 3W
Sensor Excitation	All power sources	Terminal S3: 3V DC for pulse signals and 1.2 V DC for coil pickup, I_{out} max. 100 µA
Terminal Connections	Removable plug-in terminal strip; Wire max. 1.5 mm^2 and 2.5 mm^2	
Data Protection	EEPROM backup of all settings; Backup of running totals every minute; Data retention is 10 years	
	Configuration settings can be password protected	
Hazardous Area	CSA c-us / FM	Class I, Division 1, Grps A, B, C, D
		Class II/III, Division 1, Grps E, F, G
		Class I, Zone 1, AEx d IIC T6/T5 Gb
		Zone 21, Aex tb IIIC T85°C/T100°C Db
Directives and Standards	EMC	EN 61326-1; FCC 47 CFR part 15
	LVD	EN/IEC 61010-1
	ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-1; EN/IEC 60079-31
	CSA	CSA 22.2 No. 25, CSA 22.2 No. 30, No. 61010-1-12
	RoHS	EN 50581
	IP & TYPE	EN 60529; NEMA 250
	FM	Class 3600, 3615, 3616, 3810
	UL	UL 61010-1
Input	Pulse Flow Meter	Coil / sine wave (COIL-HI: 20 mVpp or COIL-LO: 90 mVpp sensitivity selectable), NPN, PNP, reed switch, NAMUR, active pulse signals 8 or 24V DC
	Frequency	Min. 0 Hz, max. 10k Hz for total and flow rate; Maximum frequency depends on signal type and internal low-pass filter; For example, a reed switch with low-pass filter: max. frequency 120 Hz
	K-Factor	0.000010…9,999,999 with variable decimal position
	Low-pass filter	Available for all pulse signals
	External reset total	
Digital Output	Pulse	Transmitting linearized accumulated total
	Frequency	500 Hz max; Pulse length user-definable from 1 msec to 10 sec
	One passive transistor output (NPN), not isolated; 300 mA to 50V @ 77° F (25° C)	
Analog Output	General	Transmitting linearized flow rate
	Galvanically isolated, loop powered 4…20 mA output	
	Accuracy	12 bit; Error 0.03% @ 68° F (typical 25 ppm/°F); analog output signal can be scaled to any desired range
Communication	Reading display information, reading/writing all configuration settings and data log extraction	
	Modbus RTU, RS485 2-wire, bus termination without resistor for low power solutions	
	Addressing	Maximum 247 addresses
	Baud rate	1200, 2400, 4800, 9600, 19K2, 38K4

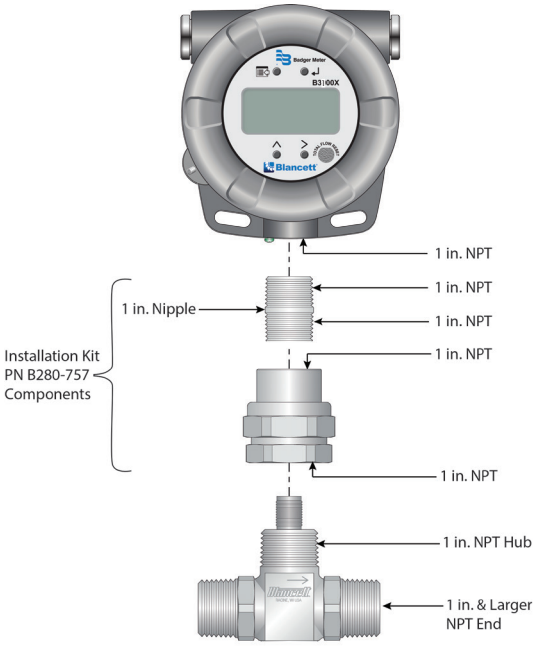
SPECIFICATIONS (CONTINUED)

Data Logging	Function	Records process data over time with real time clock
		Each log contains flow rate, total, accumulated total, time/date stamp and log number
	Interval logs	Every: 1 min, 5 min, 10 min, 15 min, 30 min, 1 hr, 2 hr, 3 hr, 4 hr, 6 hr, 8 hr or disable Max 1500 interval logs
	Daily logs	Configurable time once/twice per day or disable; Max 600 daily logs
	Event logs	When settings change (manual/Modbus) restart/power failure, factory reset, cleared total or error event; Max 724 event logs
	Extraction	Via USB (CU) or Modbus communications or USB programming cable
Operational	Displayed information	Linearized flow rate and/or total; Linearized total and accumulated total; Indicating speedometer for flow rate; Total can be reset to zero
	Total Digits	7 digits
	Total Units	L, m^3 US gal, igal, cf, il bbl, kg, ton, US ton, lb or none
	Total Decimals	0, 1, 2, or 3 **NOTE:** Total can be reset to zero.
	Accumulated Total Digits	11 digits
	Accumulated Total Units/ Decimals	According to selection for total **NOTE:** Accumulated total cannot be reset to zero.
	Flow Rate Digits	7 digits
	Flow Rate Units	mL, L, m^3, mg, g, kg, ton, US ton, US gal, igal, Oil bbl, lb, cf, rev, none, scf, nm^3, nL or p
	Bar graph Speedometer	20 blocks,; each block is 5% of total span
	Flow Rate Decimals	0, 1, 2, or 3
	Flow Rate Time Units	sec, min, hr, day

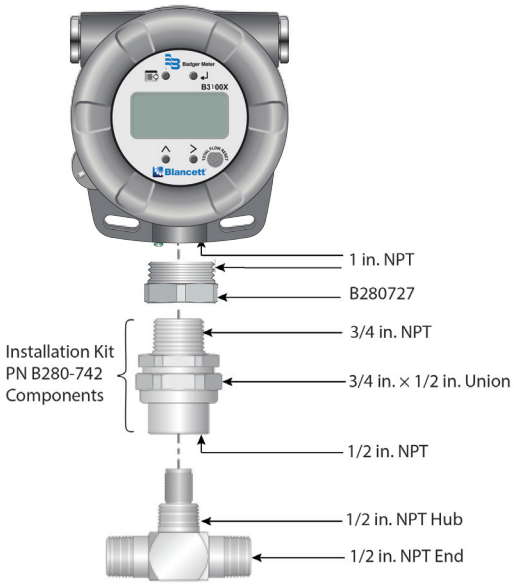
ACCESSORIES

Part Number	Description
B280-757	Explosion-proof Meter Mount Kit, 1 in. connections
B280-742 and B280-727	Explosion-proof Meter Mount Kit, 1/2 in. connections
B310001	USB Programming Cable
B310010	Wall Mounting Kit
B310011	Pipe Mounting Kit (requires wall mounting kit)
B310028	Replacement Battery

Meter Mounting Kits

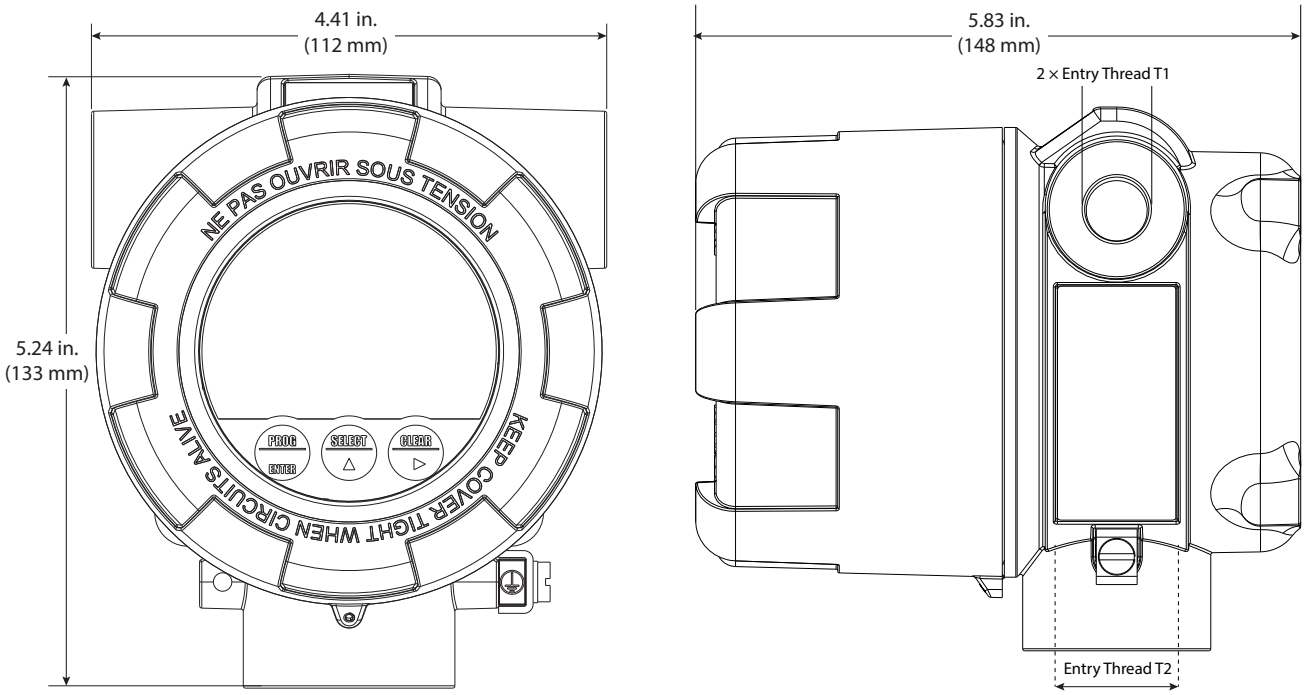


Turbine with 1 in. NPT hub size



Turbine with 1/2 in. NPT hub size

DIMENSIONS



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Blancett®
Turbine Flow Meters

Flow Monitor

B3150 Series

DESCRIPTION

The B3150 Series flow monitor is a flexible, durable, easy-to-use platform for your flow metering applications. Our trusted flow metering technology now offers a new flow monitor with more options and features than ever before with the B3150 Series.

APPLICATIONS

The B3150 monitor is suitable for application in a wide variety of metering needs. A few of the more common industries are:

- Secondary oil recovery applications
- Remediation and reclamation
- Fracture/refracture
- Coal bed methane
- Regulatory compliance and environmental accountability
- Industrial chemicals
- Aggressive chemical processing applications
- Semiconductor manufacturing
- Fertilizer production and dispensing
- Pesticide manufacture
- Liquid batching and water cooling

FEATURES

- Explosion-proof according ATEX, IECEx, FM and CSA c-us
- Integrated HART 7 communications protocol
- Rugged 1 in. NPT thread for flow meter mounting
- USB communication for configuration using a programming cable
- Modbus RS485 communication option.
- Easy configuration via PC with free downloadable software
- Easy K-factor and engineering unit configuration for volumetric or mass readings
- Display shows flow rate, total, measuring units and a flow rate indicating speedometer
- Seven-digit flow rate/total and 11-digit accumulated total
- Easy configuration with clear alphanumerical display
- Bright LED backlight
- Auto backup of settings and running totals
- Power requirements: Loop powered or battery
- Operational temperature – 40…158° F (– 40…70° C)

- Sixteen-point linearization of the flow curve, with interpolation
- Field operation via through-the-glass keypad

PART NUMBER CONSTRUCTION

Blancett B3150 Display [ ][ ][ ] - [ ]

Model				
Blancett B3150 Display	**B31**			
Model				
Explosion Proof* – Battery and Loop Power With HART		**5**		
Mounting				
Meter			**M**	
Units of Measure				
Customer Selectable				**CS**

*For hazardous locations, the monitor must be installed on an explosion-proof rated meter. To maintain compliance, kit P/N B280-757 for meter mounting is required.

HART® COMMUNICATION PROTOCOL

Badger Meter

DSY-DS-03102-EN-03 (May 2024)

Product Data Sheet

SPECIFICATIONS

Display	Dimensions	Ø 2.56 × 1.77 in. (65 × 45 mm)
	Digits	Seven 0.47 in. (12 mm) and eleven 0.28 in. (7 mm) digits. Various symbols and measuring units
	Refresh rate	User definable: 8 times/sec – 30 sec
	Speedometer	To indicate the actual flow rate, the bar graph range is 0…100% in 20 blocks, each block is 5%
Ambient Operating Temperature	– 40…158° F (– 40…70° C)	
Enclosure	Sealing	Silicone
	Control keys	Three infra-red keys with operation through-the-glass front window
	Rating	NEMA 4×, NEMA 7, NEMA 8, NEMA 9, IP66, IP67
	Type	Die-cast aluminum Ex d enclosure
	Dimensions	4.41 × 5.24 × 5.83 in. (112 × 133 × 148 mm) W × H × D
	Entry thread	2 × 3/4 in. NPT (T1), 1 × 1 in. NPT (T2)
Power Requirements	Battery powered	Long life Lithium battery; lifetime depends on settings and configuration; Up to approx. 3 years **NOTE:** The battery can power the backlight for a short time after a keypad touch
	Power supply	9…27V DC; Consumption max. 3W
Sensor Excitation	All power sources	Terminal S3: 3V DC for pulse signals and 1.2 V DC for coil pickup, I_{out} max. 100 µA
Terminal Connections	Removable plug-in terminal strip; Wire max. 1.5 mm² and 2.5 mm²	
Data Protection	EEPROM backup of all settings; Backup of running totals every minute; Data retention is 10 years	
	Configuration settings can be password protected	
Hazardous Area	CSA c-us / FM	Class I, Division 1, Grps A, B, C, D
		Class II/III, Division 1, Grps E, F, G
		Class I, Zone 1, AEx d IIC T6/T5 Gb
		Zone 21, Aex tb IIIC T85° C/T100° C Db
Directives and Standards	EMC	EN 61326-1; FCC 47 CFR part 15
	LVD	EN/IEC 61010-1
	ATEX / IECEx	EN/IEC 60079-0; EN/IEC 60079-1; EN/IEC 60079-31
	CSA	CSA 22.2 No. 25, CSA 22.2 No. 30, No. 61010-1-12
	RoHS	EN 50581
	IP and TYPE	EN 60529; NEMA 250
	FM	Class 3600, 3615, 3616, 3810
	UL	UL 61010-1
Input	Pulse Flow Meter	Coil / sine wave (COIL-HI: 20 mVpp or COIL-LO: 90 mVpp sensitivity selectable), NPN, PNP, reed switch, NAMUR, active pulse signals 8 or 24V DC
	Frequency	Min. 0 Hz, max. 10k Hz for total and flow rate; Maximum frequency depends on signal type and internal low-pass filter; For example, a reed switch with low-pass filter: max. frequency 120 Hz
	K-Factor	0.000010…9,999,999 with variable decimal position
	Low-pass filter	Available for all pulse signals
	External reset total	
Digital Output	Pulse	Transmitting linearized accumulated total
	Frequency	500 Hz max; Pulse length user-definable from 1 msec to 10 sec
	One passive transistor output (NPN), not isolated; 300 mA to 50V @ 77° F (25° C)	
Analog Output	General	Transmitting linearized flow rate
	Galvanically isolated, loop powered 4…20 mA output	
	Accuracy	12 bit; Error 0.03% @ 68° F (typical 25 ppm/° F); analog output signal can be scaled to any desired range
Communication	Reading display information, reading/writing all configuration settings	
	HART Communication protocol, Revision 7.0	
	Addressing	Selectable 0…63
	Loop resistance	250 Ω
	Liftoff Voltage	11V

SPECIFICATIONS (CONTINUED)

Operational	Displayed information	Linearized flow rate and/or total; Linearized total and accumulated total; Indicating speedometer for flow rate; Total can be reset to zero
	Total Digits	7 digits
	Total Units	L, m^3 US gal, igal, cf, il bbl, kg, ton, US ton, lb or none
	Total Decimals	0, 1, 2, or 3 **NOTE:** Total can be reset to zero.
	Accumulated Total Digits	11 digits
	Accumulated Total Units/ Decimals	According to selection for total **NOTE:** Accumulated total cannot be reset to zero.
	Flow Rate Digits	7 digits
	Flow Rate Units	mL, L, m^3, mg, g, kg, ton, US ton, US gal, igal, Oil bbl, lb, cf, rev, none, scf, nm^3, nL or p
	Bar graph Speedometer	20 blocks,; each block is 5% of total span
	Flow Rate Decimals	0, 1, 2, or 3
	Flow Rate Time Units	sec, min, hr, day

ACCESSORIES

Part Number	Description
B280-757	Explosion-proof Meter Mount Kit, 1 in. connections
B280-742 and B280-727	Explosion-proof Meter Mount Kit, 1/2 in. connections
B310001	USB Programming Cable
B315010	Wall Mounting Kit
B315011	Pipe Mounting Kit (requires wall mounting kit)
B315028	Replacement Battery
B315001	B3150 Electronics Module, Service

Meter Mounting Kits

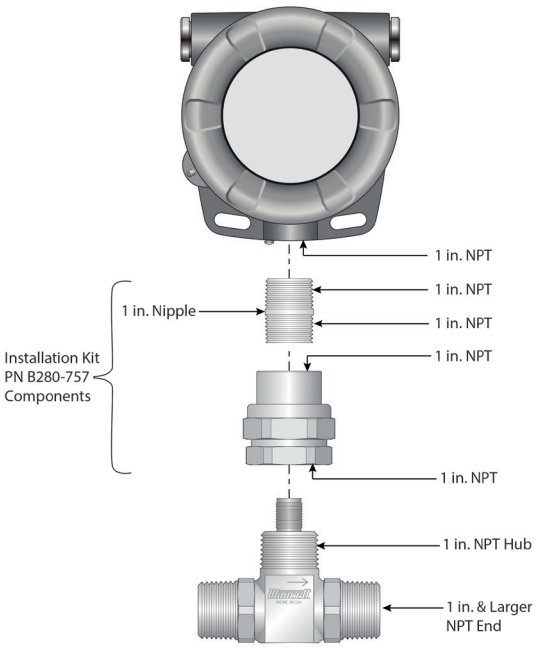


Figure 1: Turbine with 1 in. NPT hub size

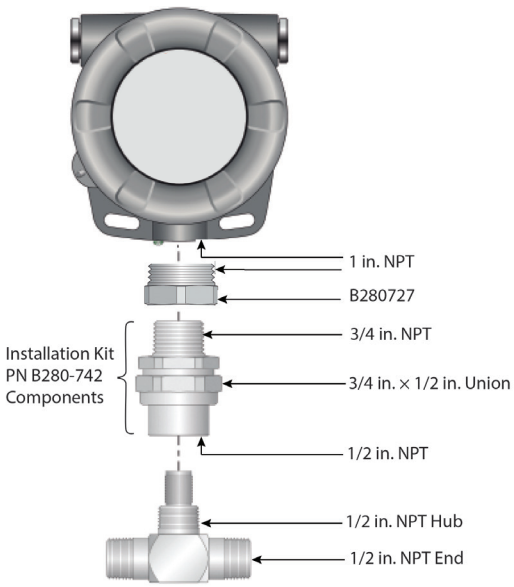
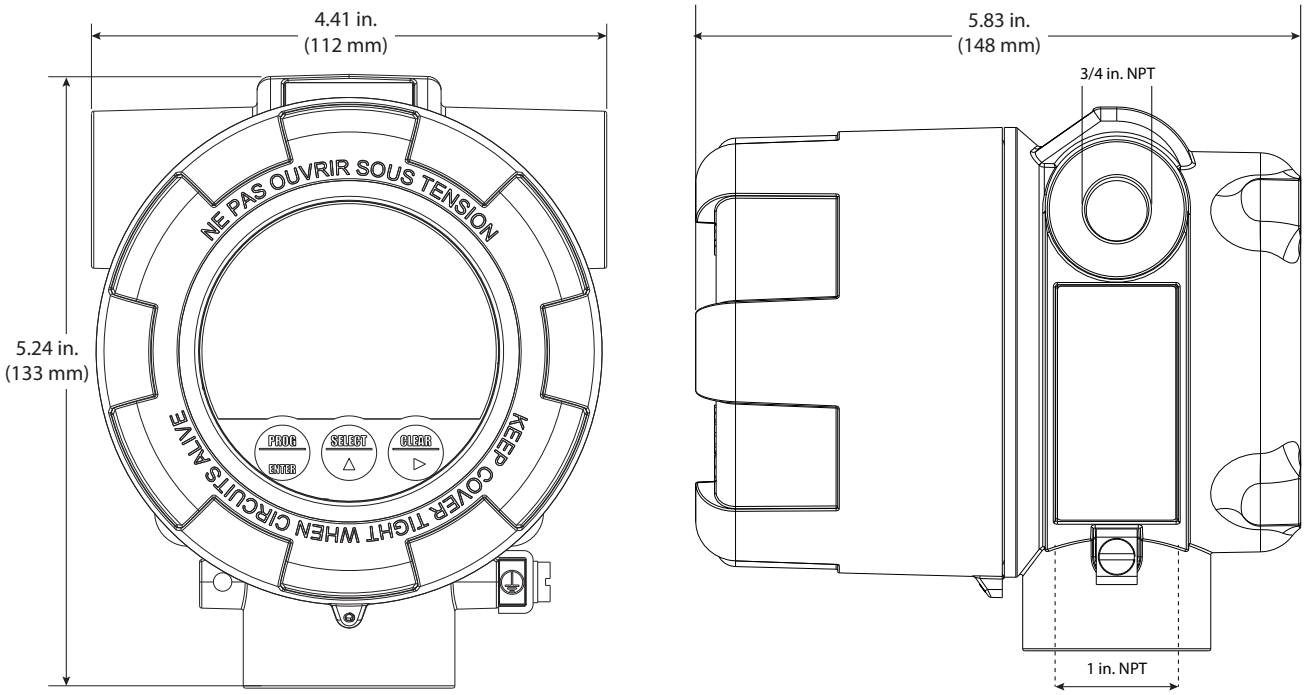


Figure 2: Turbine with 1/2 in. NPT hub size

DIMENSIONS



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Integrated Flow Computer IFC15L

Extended Range Fluid Compensation Flow Meter Interface

DESCRIPTION

The IFC15L is the ultimate electronic processor, providing total compensation to enhance flow meter accuracy, while extending the linear flow range. This compact design has dual rotor frequency inputs, and temperature inputs for single or dual rotor turbine flow meters. The IFC15L tracks all variables to compensate for viscous and inertial effects due to fluid temperature. Our enhanced DSP technology allows exceptional signal characterization and fast response to output data in engineering units. Meeting the demanding requirements of the aerospace, automotive, process control and test and measurement industries, the IFC15L provides significant improvements in flow meter accuracy under extreme temperature conditions.

Figure 1: IFC15L "N" type enclosure mounted on a dual rotor turbine flow meter

Figure 2: IFC15L "X" type enclosure mounted on a dual rotor turbine flow meter

FEATURES

- Conformance to SAE ARP 4990 temperature calculations
- Less than 1 mS response
- Blade averaging to enhance low flow resolution
- Integral temperature amplifier
- Multiple outputs (freq, analog, RS485)
- Roshko and Strouhal correlation, using 16-bit resolution
- Configurable interface software allows fluid selection and configuration of outputs

BENEFITS

- Improved flow measurement accuracy and range
- Dynamic response, with fully compensated output
- Easy interface to DAQ System
- One device for multiple signals
- No external amplifiers or signal conditioners necessary

APPLICATIONS

- Engine test cells and test stands
- Precision monitoring
- On-board automotive and aerospace testing
- Control loop
- Custody transfer

OPTIONS

- Rate and total display
- Imbedded or remote mounting
- OEM flight and commercial designs

SOFTWARE INTERFACE

IFC15L software graphical user interface is intuitively easy and allows powerful characterization of the process signals, output signals and liquid properties.

Provides:

- Identification and comments
- Input linearization
- Output characterization
- Instantaneous data
- Liquid properties
- Data logging
- Configuration and service history
- Stores and recalls configuration software compatible with Windows 7 or 10

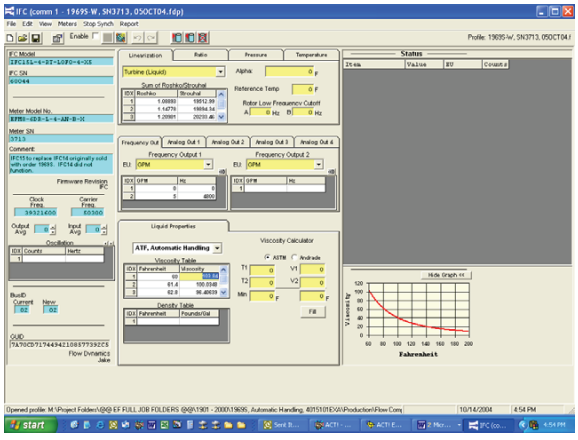

Figure 3: IFC15L software graphical user interface

CONNECTIONS

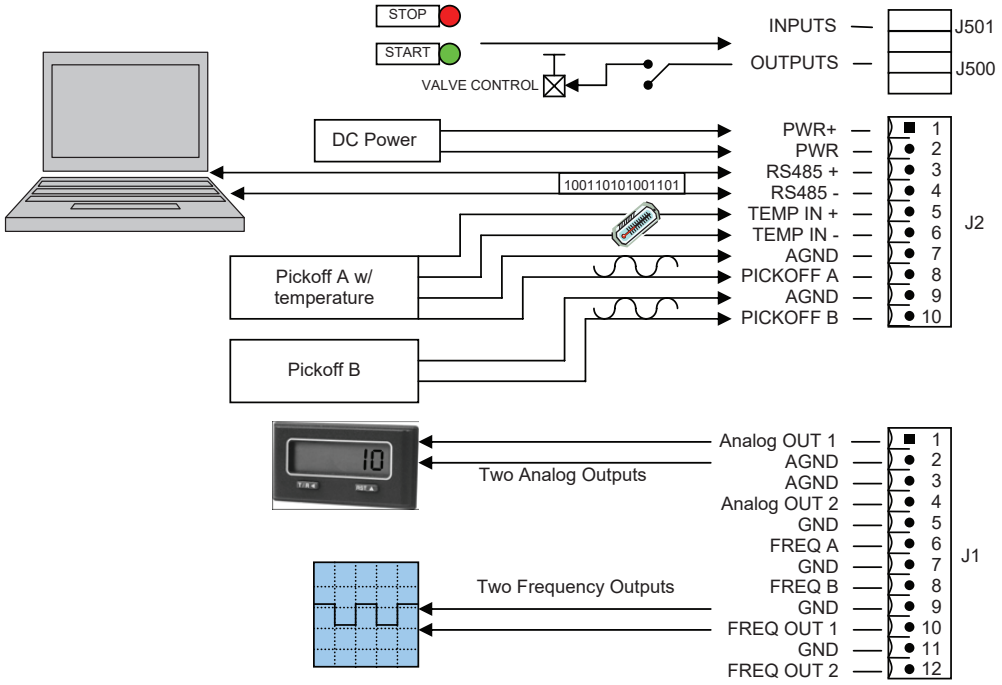

Figure 4: IFC15L connections

ORDERING MATRIX

IFC15L - 4 - RT - 0000 4 – N – XXX

Power
4 = DC Power

Flow Meter Input
R = RF, 10 Ohm, 1 mH Coil
O = 0 . . . 5V DC TTL Pulse

Temperature Input
T = 10K Ohm Thermistor
V = Voltage 0 . . . 10V DC
L = Voltage 0 . . . 5V DC
C = Current 4…20 mA

Frequency 1 and 2 Outputs
L = Linearized Flow Rate Out
S = Summed Raw Frequency
T = Flow Total Out
U = Temperature Out
0 = Not Used

Special Code
Blank = Standard Configuration

Enclosure
N = NEMA 4 Aluminum
X = NEMA 4 SP WET LOC. Aluminum
C = NEMA 4X, MS Connectors
CD = NEMA 4X, MS Connectors, Display
R = Remote NEMA 4x, Integral Cables
RD = Remote NEMA 4x, Integral Cables, Display

Communications
4 = RS485, ASCII Protocol

Analog 1 and 2 Outputs
F = 0 . . . 5V DC Linearlized Flow Rate Out
G = 0 . . . 10V DC Linearized Flow Rate Out
M = 4 . . . 20 mA Linearized Flow Rate Out
T = 0 . . . 5V DC Temperature Out
U = 0 . . . 10V DC Temperature Out
V = 4 . . . 20 mA Temperature Out
0 = Not Used

SPECIFICATIONS

Input Power	24V DC nominal	15…32V DC, 0.120 amps maximum, (excluding 4…20 mA)	
	Note: 18…32V DC power required for analog output		
Flow Meter Input Type	Pulse TTL	Frequency range	1 Hz…5 kHz
		Impedance	5.8 Ω…5V DC
	RF Carrier	Frequency range	5 Hz…3 kHz
		Inductance	1 mH
		Oscillator frequency	Adjustable 55…65 kHz
Temperature Input Type	Thermistor	10 kΩ	
	Current	4…20 mA	
	Voltage	0…10V DC or 0…5V DC	
Linearization	Flow meter K-factor	Number of points	2…200
		Interpolation method	Linear
		Correlation	Strouhal-Roshko (per ARP4990 publication)
	Temperature	Number of points	2…50
		Interpolation method	Linear
	Viscosity	Number of points	2…100
		Interpolation method	Linear
		Correlation	ASTM D341-93, Andrades Equation or user-defined
	Density	Number of points	2…50
		Interpolation method	Linear
Outputs	Variables available for output	Linearized volume flow rate	
		Linearized mass flow rate	
		Flow total	
		Temperature	
	Frequency (2 frequency output channels)	0…5 V TTL, 0.6…16,000 Hz	
		Transmission distance	250 ft maximum
	Analog (2 analog output channels)	0…5V DC, 0…10V DC or 4…20 mA	
		Voltage	Linearized, scaled
		Zero offset	Less than 5 m
		Current	Linearized, scaled
		Maximum load	500 Ω max. load resistance (4…20 mA)
Performance	Accuracy	Linearized frequency	0.1% of reading
		Linearized analog	0.1% of full scale
		Thermistor	±0.5° C (does not include sensor uncertainty)
		Analog input (temperature)	16 bit A/D resolution
	Linearization latency	0.8…2.0 ms + period of input	
Environment	Temperature	Operating	–40…185° F (–40…85° C)
		Storage	–67…257° F (–55…125° C)
	Humidity	0…85% RH non-condensing	
	Enclosure	NEMA 4 or NEMA 4 CLI GR.CD CL II GR.EFG CL.III WET LOC. Aluminum	
Communication	Interface	RS485, serial USART connection to personal computer (with serial cable)	
	Baud	Output	115K
		Programming	115K
		Data Bits	8
		Stop Bit	1
		Parity	None

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Cox Turbine Flow Meters

Flow Processor

IFC15BBA

DESCRIPTION

The Cox IFC15BBA Flow Processor is a programmable electronic processor, providing total compensation to enhance flow meter accuracy, while extending the linear flow range. Packaging is provided for remote, direct or embedded mounting to support most installation or application requirements.

The compact design includes both single and bidirectional dual frequency inputs from 10 Ohm pickups, as well a thermistor input. The IFC15BBA processor tracks all variables to compensate for viscous and inertial effects, using proven Strouhal-Roshko algorithms. Enhanced digital signal processor technology allows for exceptional signal characterization using a 32-bit floating point processor at 150 MHz, capable of producing a 1 millisecond speed of response.

Features	Benefits
Rotor blade pulse averaging	Enhanced low-flow resolution and output smoothing
Strouhal-Roshko computation, using 16-bit resolution	Dynamic response to changing conditions with fully compensated output
Dual outputs provide both frequency and analog signals	Easily interfaces to data acquisition or control system
Internal amplifier and signal conditioners	No need for additional amplifiers or signal conditioners, yielding cost savings
Assignable outputs	User assigned output variables allows for greater ease of system integration

APPLICATIONS

Meeting the demanding requirements of the aerospace, automotive, industrial processing, and test and measurement industries, the IFC15BBA processor provides significant improvements in flow meter performance under varying process conditions. The processor thrives in, but is not limited to, the following applications:

- Precision monitoring
- Engine test cells and test stands
- On-board automotive and aerospace testing
- Control loops
- Custom OEM flight and commercial applications

MODEL NUMBERS

Description	Part Number
Remote 6-pin, 10-pin connectors	IFC15BBA-4-RT-4-C
Remote 8-pin, 14-pin connectors Compatible with EC80 cables	IFC15-R-RM1
Integral mount, flying leads Compatible with EC80 cables	IFC15-R-XP1
Integral mount, flying leads	IFC15BBA-4-RT-4-X

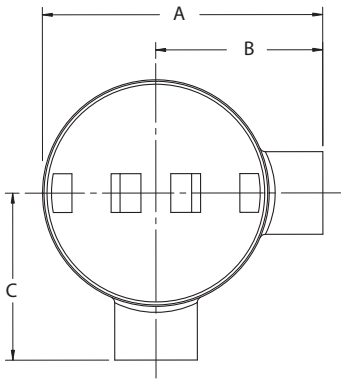
PRINCIPLE OF OPERATION

The IFC15BBA flow computer reads the signals from one or two pickups on a turbine meter, such as a Cox dual rotor meter, and compensates for varying fluid and viscosity conditions. Fully compensated and linearized volumetric flow rates, totals and temperature are examples of flow parameters that can be selected as outputs or viewed through serial communications, included software program or an embedded rate indicator (depending on product configuration).

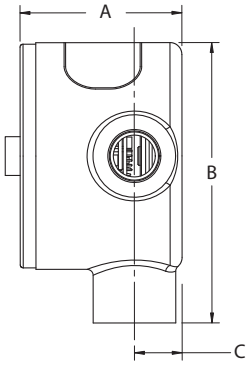
Varying fluid temperature and viscosity conditions can be compensated for by means of a universal viscosity curve. In addition, Strouhal-Roshko algorithms are applied for a more comprehensive compensation method, taking into consideration all the secondary effects to which the meter is sensitive, like the expansion and contraction of the meter bore diameter. Inferred mass flow rate is achieved by extracting the density value of a known fluid from a stored temperature/density table, which is multiplied by the volumetric flow rate. When the quadrature inputs are applied, the IFCL15BBA processor can measure bidirectional flow.

DIMENSIONS

IFC15BBA-4-RT-X Integral Mount
IFC15-R-XP1



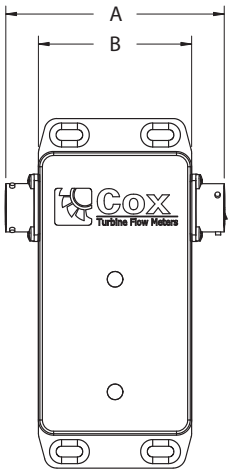
Front View



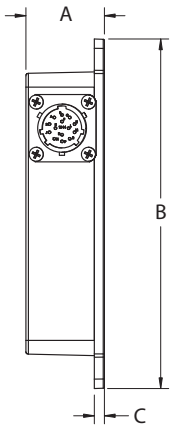
Side View

	Front View	Side View
A	4.70 in. (119.38 mm)	2.71 in. (68.83 mm)
B	2.80 in. (71.12 mm)	4.70 in. (119.38 mm)
C	2.80 in. (71.12 mm)	0.80 in. (20.32 mm)

IFC15BBA-4-RT-C Remote
IFC15-R-RM1 Remote



Front View



Side View

	Front View	Side View
A	3.40 in. (86.36 mm)	1.22 in. (30.99 mm)
B	2.38 in. (60.45 mm)	5.43 in. (137.92 mm)
C	—	0.16 in (4.06 mm)

SPECIFICATIONS

Performance	**Linearized Frequency**	± 0.1% of reading
	Linearized Analog Output	± 0.1% of full scale
	Process Latency	100 µs
Input Power	**Nominal**	9…32V DC
Temperature Environment	**Operating**	–40…185° F (–40…85° C)
	Storage	–67…257° F (–55…125° C)
	Humidity	0…80% RH, non-condensing
Flow Meter Input Type (A and B/Quadrature) (Two Independent Channels)	**RF Carrier** 10 Ohm Pickup	Carrier frequency range: 25…65 kHz
		Frequency range: 5 Hz…5.0 kHz
Temperature Input	**Type**	Thermistor 10k Ohm
	Usable Range	–65…365° F (–55…185° C)
Frequency Output (Two Independent Channels)	**Output**	0…5V, TTL, 1…20,000 Hz, square wave 50% duty cycle
	Measurement	Linearized flow rate, raw rotor frequency, summed rotor frequency (dual rotor) or total flow (accumulation)
	Minimum Load Impedance	10k Ohm (linearized flow), 5k Ohm (raw flow)
Analog Output	**Resolution**	16-bit resolution
	Channel	4…20 mA, 0…5V DC or 0…10V DC; linearized flow rate or temperature
	Load Impedance (4…20 mA)	500 Ohms maximum
EIA-485 Serial Data	**Baud**	115k
	Update Rate	Selectable, 0.1 sec minimum
	Data Bits	8
	Stop Bit	1
	Parity	None
Enclosure Environmental Rating	**Blind Remote**	Aluminum enclosure with MS Connectors, weatherproof mounting flange
	Remote with Rate Indicator	Aluminum enclosure with MS Connectors, weatherproof mounting flange
	Blind Integral	NEMA 4 (IP65) with 1/2 in. NPT Class 1, Groups C and D Class 2, Groups E, F and G Class 3, WET LOC — Cast Aluminum
Rate Indicator	**Display**	8 digits, 0.46 in. (11.7 mm) high digits, transmissive LCD with green/red LED backlight
Remote Cable Length	**Flow Meter to IFC15BBA**	10 ft (3 m)
	IFC15BBA to DAQ or Control System	100 ft (30.5 m)
Software	Conforms to SAE ARP4990 calculations for temperature	

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Badger Meter

Industrial Flow Computer

FC-5000 Flow Computer

DESCRIPTION

The Badger Meter® FC-5000 is a microprocessor-driven device designed for flow monitoring. The FC-5000 Flow Computer is compatible with the complete line of Badger Meter industrial flow meters and temperature sensors, creating a solution to totalize and indicate fluid flows. Many years of experience in the industrial market has allowed Badger Meter to incorporate features indispensable in control operations.

Features	Benefits
Large, backlit graphical display	Provides enhanced viewing capabilities, near and far from the device
Integrated softkeys and full numerical keypad	Promotes intuitive navigation and programming
100-point linearization	Provides higher resolution for improved linearization
Sensor data display screen	Allows user to view raw and calculated flow data, both to and from the device, including flow data and temperature readings. Additionally, users can see relay, output and digital I/O statuses
Plug-and-play terminals	Provides easier, user-friendly installation
User-programmable relay configuration	Enables alarms or totalizing output capabilities for rates, totals and temperatures
User-programmable scaled outputs	Outputs transmit rate, total or temperature data via dedicated output channels
Robust enclosure, keypad and mechanical relays	Provides application ruggedness

PROGRAMMABILITY

Features	Programming Options
Fluid Properties	Custom fluid characteristics can be stored for calculations and reference.
Digital I/O	Ability to reset relays, totals or both remotely via the 6 available I/O ports.
Scaled Outputs	Fully configurable outputs that can be assigned to rates, totals and temperature.
Relay Outputs	Fully configurable relays that can be assigned to rates, totals and temperature as either a totalizing output or alarm indication. Option to enable/disable latching functionality.
Display Properties	Adjustable contrast and brightness for readability and controlling power consumption.
Stored or Custom Units of Measure	Ability to select from a list of standardized units of measure, or complete the customized option with labels and quantity assignments.
Passcodes	User-defined passcodes to manage advanced configuration parameters and reset functions.
Sensor Inputs	Accurate and fast programming of flow and temperature sensors with preprogrammed selection lists.

OPERATION

Input signal—in the form of sine waves or pulses from open collector transistors or dry contact closures—can be scaled to any unit of measure for totalization and instantaneous rate-of-flow indication. Linearized volumetric flow rate and totals are examples of flow parameters that can be viewed on the panel display or through Modbus communications.

Units configured with a temperature sensor input can compensate for changes in fluid viscosity when process temperature varies. The expansion and contraction of the flow meter housing due to thermal effects is also compensated for by means of proven Roshko/Strouhal algorithms.

Dedicated analog or frequency output channels provide scaled outputs that are assignable to parameters such as flow rate, total and temperature. A user defined damping function can be applied for improved stability of the flow readings.

FLEXIBILITY

- Non-volatile memory preserves all configured settings and totalization values during power failure
- Low voltage AC/DC power
- Dynamic menu selection and programming reduces potential programming errors
- Ability to restore to factory programmed settings

Product Data Sheet

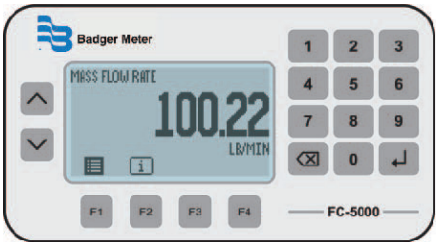
VIEWING CAPABILITIES

Quickly toggle views on the *Home* screen to switch from or to:

- FLOW RATE (*Figure 1*)
- FLOW TOTAL (*Figure 1*)
- FLOW RATE AND FLOW TOTAL (Dual Display) (*Figure 2*)
- MASS FLOW RATE
- MASS FLOW TOTAL
- MASS FLOW RATE AND MASS FLOW TOTAL

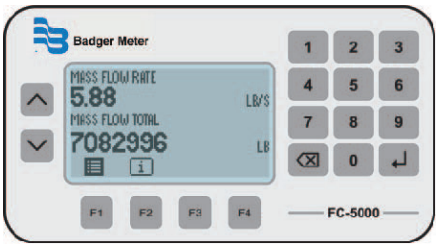
Dual Sensor Input configurations also allow for a second flow sensor, indicated by rate/total CH2:

- FLOW RATE 1 OR 2
- FLOW TOTAL 1 OR 2
- FLOW RATE 1 OR 2 AND FLOW TOTAL 1 OR 2
- MASS FLOW RATE 1 OR 2
- MASS FLOW TOTAL 1 OR 2
- MASS FLOW RATE 1 OR 2 AND MASS FLOW TOTAL 1 OR 2



- Flow Rate
- Flow Total
- Mass Flow Rate
- Mass Flow Total

Figure 1: Single display



- Flow Rate and Flow Total
- Mass Flow Rate and Mass Flow Total

Figure 2: Dual display

ACCESSORIES

RTDs	
Part No.	**Description**
8RTD100	Replacement RTD Element
8RTD106B	1/4 in. NPT; BR; ADJ Depth; 6 in. Leads
8RTD116B	3/4 in. NPT; BR TW; 1-5/8 in. Depth; 1/2 in. Conduit Conn.
8RTD116S	3/4 in. NPT; SS TW; 1-5/8 in. Depth; 1/2 in. Conduit Conn.
8RTD125	3/4 in. NPT; SS TW; 2-1/2 in. Depth; 1/2 in. Conduit Conn.
8RTD140	3/4 in. NPT; SS TW; 4 in. Depth; 1/2 in. Conduit Conn.
8RTD160	3/4 in. NPT; SS TW; 6 in. Depth; 1/2 in. Conduit Conn.

Table 1: RTD part numbers

Thermistors

Part No.	Description
8T106B	1/4 in. NPT; BR Thermistor; ADJ Depth
8T106S	1/4 in. NPT; SS Thermistor; ADJ Depth
8T116B	3/4 in. NPT; BR Thermowell; 1-5/8 in. Depth
8T116S	3/4 in. NPT; SS Thermowell; 1-5/8 in. Depth
8T125	3/4 in. NPT; SS Thermowell; 2-1/2 in. Depth
8T140	3/4 in. NPT; SS Thermowell; 4 in. Depth
8T160	3/4 in. NPT; SS Thermowell; 6 in. Depth
8T180	3/4 in. NPT; SS Thermowell; 8 in. Depth
67002	Replacement Thermistor Element

Table 2: Thermistor part numbers

Consult the factory or your local representative for availability, pricing and delivery estimates for additional parts and accessories.

EIA-485 (RS-485) NETWORK

All FC-5000 BTU Monitors come equipped with an EIA-485 (RS-485) physical layer, and use Modbus RTU protocols, selectable and programmed in the firmware. Up to 255 FC-5000 products can be run on a single daisy-chain network and be individually queried for flow/energy rate, positive flow/energy accumulator, supply temperature, return temperature and other information.

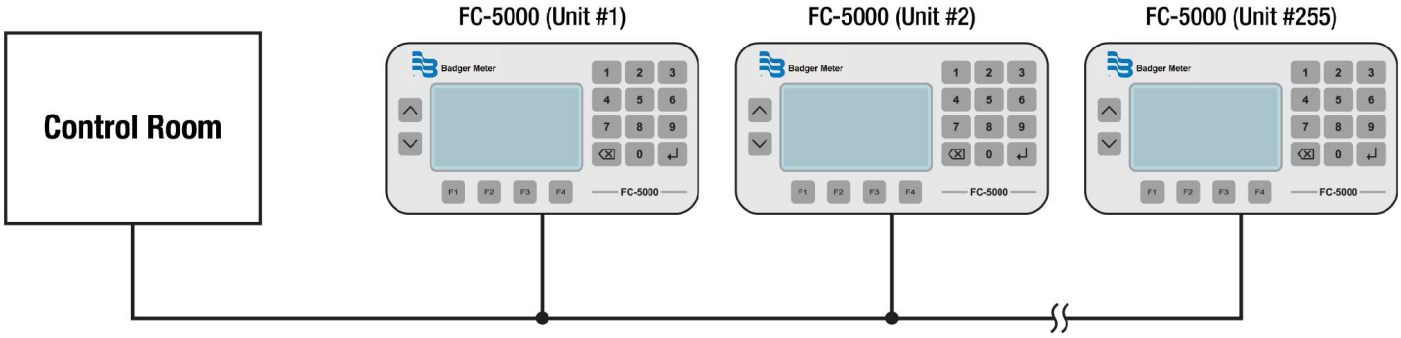
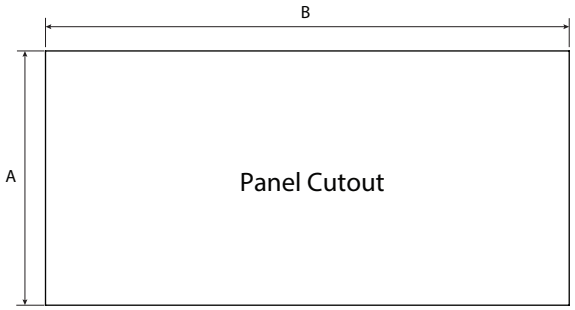


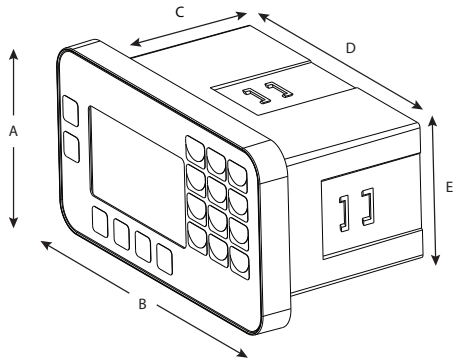
Figure 3: Daisy-chained units

DIMENSIONS

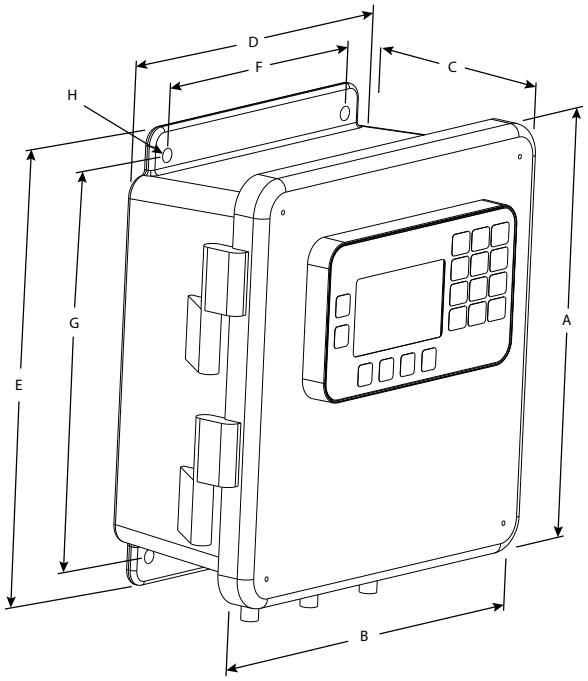
Panel Mount Unit

Mounting clips can accommodate a maximum panel thickness of 1.5 in. (38.1 mm).





Wall Mount Unit



	A	B	C	D	E	F	G	H
	Height in. (mm)	**Width in. (mm)**	**Depth in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Hole Dia. in. (mm)**
Panel Cutout	2.65 (67.31)	5.40 (137.16)	—	—	—	—	—	—
Panel Mount Unit	3.50 (89.00)	6.22 (158.00)	3.07 (78.00)	5.38 (136.65)	2.54 (64.52)	—	—	—
Wall Mount Unit	9.38 (238.25)	9.38 (238.25)	4.88 (123.95)	8.00 (203.20)	9.56 (242.83)	6.00 (152.40)	8.75 (222.25)	0.31 (7.87)

SPECIFICATIONS

Power Supply	Input range 10…40V DC and 9…28V AC RMS	
	AC input voltage frequency range 50…60 Hz	
	Maximum 8 Watts power consumption	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
Flow Meter Input	Input Range: 0.3 Hz…10 kHz	
	One (1) or two (2) independent channels	
	Configurable as square wave 0…30V pulse with 2.5V threshold	
	Configurable as sine wave, zero-centered with 45 mV threshold	
	Configurable debounce	
	Excitation Output	12V DC source
	Voltage	Low: –0.3…1.85V DC
		High: 2.5…25V DC
	Impedance	Pullup to 12V DC
	VDC Current	±50 mA, short circuit current
	Response	100 µs/3.5 ms min pulse (high/low speed)
Scaled Outputs	Two (2) independent channels	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
	Output is multiplexed on the process out pins	
	Analog Output (option A)	Configurable to 0…5V, 0…10V or 4…20 mA
		Uncertainty: ±0.1% of reading
		16-bit resolution (0…10V and 4…20 mA), 15-bit resolution (0…5V)
		200 ms, 90-10% step response
		Sourcing analog output signal
	Frequency Output (option F)	TTL, 1…4000 Hz, square wave
		Uncertainty: ±0.01% reading
		Resolution: 0.01 Hz
Digital I/O	Six (6) independent channels	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
	0…30 Volts as input	
	Debounce	
	0…5V, TTL, 200 ms 90-10% step response, driving < 0.1 uF	
Relay Outputs	2 Form C mechanical	
	Isolated coil drivers	
	Over-voltage, transient and reverse polarity protected	
Network Communications	**Network Types/Communication Protocols**	Modbus RTU, Modbus ASCII or BACnet
	Physical Layer	EIA-485 (RS-485)
	Baud Rates	1200…115.2K
	Two-wire (half-duplex)	
	Over-voltage/ESD Protection	
	Isolated from power ground	
USB Communications	**USB (HOST)**	Type-A Receptacle | Currently not supported
	USB (DEVICE)	Mini-B Receptacle (used for field updates)
	Over-voltage/ESD/transient protected	

Display/User interface	**Keypad**		Membrane overlay, domed tactile response keys
	Display		128 × 64 pixel LCD graphical display, LED backlit
	Protected from EMI/RFI		
	Keypad interface is protected from ESD		
Flow Calculation	Uncertainty: ± 0.01%		
	Adjustable FIR/IIR filtering		
Environmental Ratings	**Pollution Degree**		2
	Altitude Restriction		Up to 2000 m (6561 ft)
	Over-Voltage Rating		Category II (CAT II)
	Ambient Temperature Range		32…130° F (0…55° C)
	Storage Temperature Range		–40…160° F (–40…70° C)
	Humidity		0…85%, non-condensing
Weights (Approx.)	**Panel Mount**		1.25 lb (0.57 kg)
	Wall Mount (Including Unit)		4.54 lb (2.06 kg)
Operator Functions	Unlatch Relays, Reset Totalizer, Unlatch Relays and Reset Totalizer, Inhibit Flow Channels		
Parameters	**Maximum Displayed Digits**	**Rates**: Max 8 (7 with decimal)	
		Totals: Max 9 (8 with decimal)	
	Resolution/ Display Precision	Configurable, 0…4	
	Volumetric Flow Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D)		US Gallons (US GAL), Imperial Gallons (I GAL), Mega US Gallons (US MGAL), Mega Imperial Gallons (I MGAL), Liters (L), Mega Liters (ML), Cubic Meters (M^3), Cubic Feet (FT^3), Acre Feet (AC-FT), Oil Barrels (OBBL), Liquid Barrels (LBBL), US Ounces (US OZ), Imperial Ounces (I OZ), Custom (user-specified)
	Volumetric Flow Total Units		
	Mass Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D)		Pounds (LB), Kilograms (KG), Custom (user-specified)
	Mass Total Units		
	Temperature Units	° F (Fahrenheit), ° C (Celsius), R (Rankine) or K (Kelvin)	

PART NUMBERING CONSTRUCTION

FC5	-	FM	-	P2	-			6	A	-	

FC-5000 Flow Computer

FUNCTION

Flow Computer — FM

SENSOR INPUTS

Two Pulse / One Temperature — P2

SCALED OUTPUTS

Two Analog Outputs — A

Two Frequency Outputs — F

RELAY OUTPUTS

One Form C Relay / One Form A Relay — A

Two Form C Relays — C

DIGITAL INPUTS/OUTPUTS

Six Programable Inputs/Outputs — 6

COMMUNICATIONS

EIA-485(RS-485); Modbus; BACnet; USB — A

MOUNTING METHOD

Panel Mount — P

Wall Mount | Includes NEMA 4X (IP67) Rated Enclosure — W

FC5	-	FM	-		-	F		6	A	-	

FC-5000 Flow Computer

FUNCTION

Flow Computer — FM

SENSOR INPUTS

One Pulse — P0

Two Pulse — P3

SCALED OUTPUTS

Two Frequency Outputs — F

RELAY OUTPUTS

One Form C Relay / One Form A Relay — A

Two Form C Relays — C

DIGITAL INPUTS/OUTPUTS

Six Programable Inputs/Outputs — 6

COMMUNICATIONS

EIA-485(RS-485); Modbus; BACnet; USB — A

MOUNTING METHOD

Panel Mount — P

Wall Mount | Includes NEMA 4X (IP67) Rated Enclosure — W

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Badger Meter

Industrial Flow Computer

FC-5000 BTU Monitor

DESCRIPTION

The Badger Meter® FC-5000 is a microprocessor-driven device designed for energy/BTU and flow monitoring. The FC-5000 BTU Monitor is compatible with the complete line of Badger Meter industrial flow meters and temperature sensors, creating a solution to monitor hydronic energy usage, flow rate and totals. Many years of experience in the industrial market has allowed Badger Meter to incorporate features indispensable in control operations.

Features	Benefits
Large, backlit graphical display	Provides enhanced viewing capabilities, near and far from the device
Integrated softkeys and full numerical keypad	Promotes intuitive navigation and programming
Sensor data display screen	Allows user to view raw and calculated flow data, both to and from the device, including flow data, energy usage and temperature readings. Additionally, users can see relay, output and digital I/O statuses
Plug-and-play terminals	Provides easier, user-friendly installation
User-programmable relay configuration	Enables alarms or totalizing output capabilities for rates, totals and temperatures
User-programmable scaled outputs	Outputs transmit rate, total or temperature data via dedicated output channels
Robust enclosure, keypad and mechanical relays	Provides application ruggedness

PROGRAMMABILITY

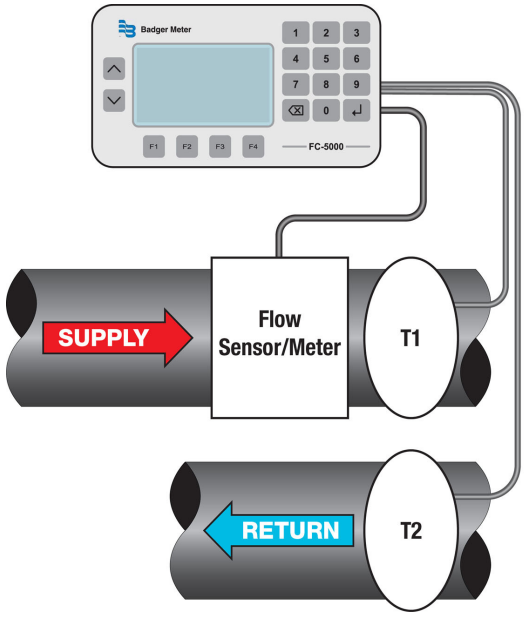
Features	Programming Options
Fluid Properties	Custom fluid characteristics can be stored for calculations and reference.
Digital I/O	Ability to reset relays, totals or both remotely via the 6 available I/O ports.
Scaled Outputs	Fully configurable outputs that can be assigned to rates, totals and temperature.
Relay Outputs	Fully configurable relays that can be assigned to rates, totals and temperature as either a totalizing output or alarm indication. Option to enable/disable latching functionality.
Display Properties	Adjustable contrast and brightness for readability and controlling power consumption.
Stored or Custom Units of Measure	Ability to select from a list of standardized units of measure, or complete the customized option with labels and quantity assignments.
Passcodes	User-defined passcodes to manage advanced configuration parameters and reset functions.
Sensor Inputs	Provides accurate and fast programming of flow and temperature sensors with preprogrammed selection lists.

OPERATION

Input signal—in the form of sine waves or pulses from open collector transistors or dry contact closures—can be scaled to any unit of measure for totalization and instantaneous rate-of-flow indication. Energy rate and flow totals are examples of parameters that can be viewed on the panel display or through communications protocols such as BACnet or Modbus.

Two temperature sensor inputs can be configured to read RTDs or thermistors and are fully customizable to adapt to application needs. When used in conjunction with fluid flow, hydronic energy rates and total usage are achieved, while conforming to EN1434 standards.

Additionally, dedicated analog or frequency output channels provide scaled outputs that are assignable to parameters such as energy rate, total and temperature. A user defined damping function can be applied for improved stability of the flow readings.



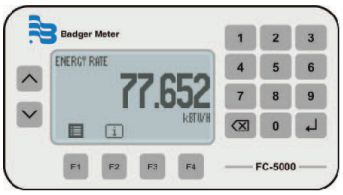
Product Data Sheet

FLEXIBILITY

- Non-volatile memory preserves all configured settings and totalization values during power failure
- Low voltage AC/DC power
- Dynamic menu selection and programming reduces potential programming errors
- Ability to restore to factory programmed settings

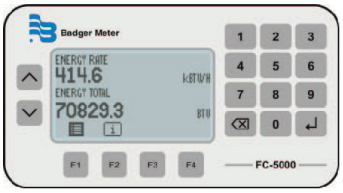
VIEWING CAPABILITIES

Quickly toggle views on the *Home* screen to switch between:



- Flow Rate
- Flow Total
- Energy/BTU Rate
- Energy/BTU Total

Figure 1: Single display



- Flow Rate and Flow Total
- Energy/BTU Rate and Energy/BTU Total

Figure 2: Dual display

ACCESSORIES

RTDs

Part No.	Description
8RTD100	Replacement RTD Element
8RTD106B	1/4 in. NPT; BR; ADJ Depth; 6 in. Leads
8RTD116B	3/4 in. NPT; BR TW; 1-5/8 in. Depth; 1/2 in. Conduit Conn.
8RTD116S	3/4 in. NPT; SS TW; 1-5/8 in. Depth; 1/2 in. Conduit Conn.
8RTD125	3/4 in. NPT; SS TW; 2-1/2 in. Depth; 1/2 in. Conduit Conn.
8RTD140	3/4 in. NPT; SS TW; 4 in. Depth; 1/2 in. Conduit Conn.
8RTD160	3/4 in. NPT; SS TW; 6 in. Depth; 1/2 in. Conduit Conn.

Table 1: RTD part numbers

Thermistors

Part No.	Description
8T106B	1/4 in. NPT; BR Thermistor; ADJ Depth
8T106S	1/4 in. NPT; SS Thermistor; ADJ Depth
8T116B	3/4 in. NPT; BR Thermowell; 1-5/8 in. Depth
8T116S	3/4 in. NPT; SS Thermowell; 1-5/8 in. Depth
8T125	3/4 in. NPT; SS Thermowell; 2-1/2 in. Depth
8T140	3/4 in. NPT; SS Thermowell; 4 in. Depth
8T160	3/4 in. NPT; SS Thermowell; 6 in. Depth
8T180	3/4 in. NPT; SS Thermowell; 8 in. Depth
67002	Replacement Thermistor Element

Table 2: Thermistor part numbers

Consult the factory or your local representative for availability, pricing and delivery estimates for additional parts and accessories.

EIA-485 (RS-485) NETWORK

All FC-5000 BTU Monitors come equipped with an EIA-485 (RS-485) physical layer, and use BACnet or Modbus RTU protocols, selectable and programmed in the firmware. Up to 255 FC-5000 products can be run on a single daisy-chain network and be individually queried for flow/energy rate, positive flow/energy accumulator, supply temperature, return temperature and other information.

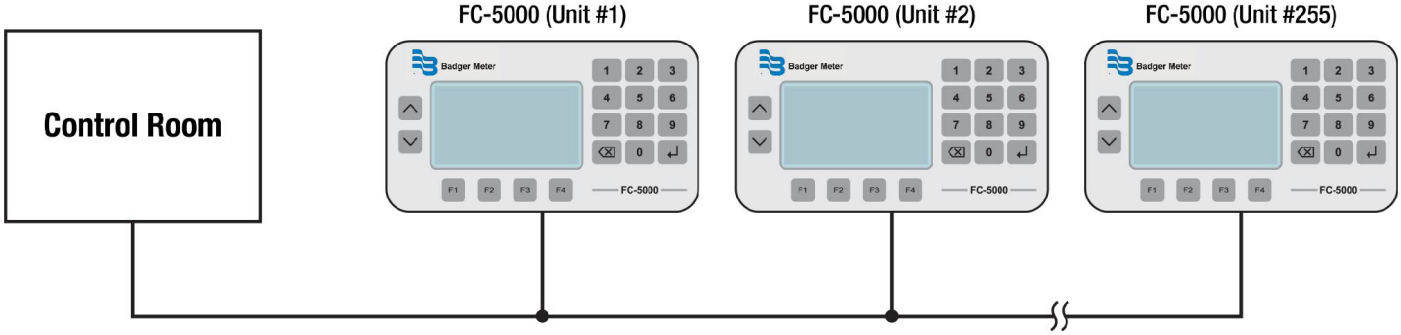
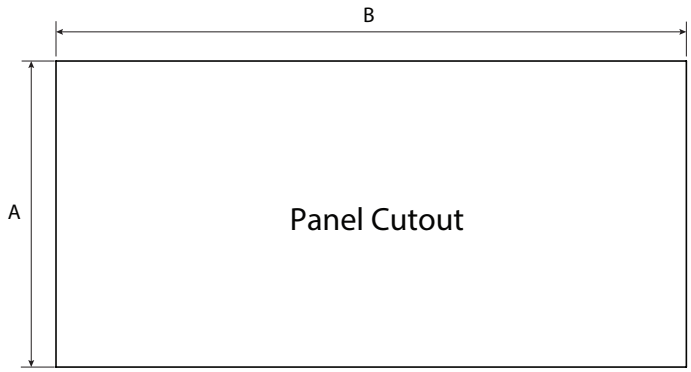


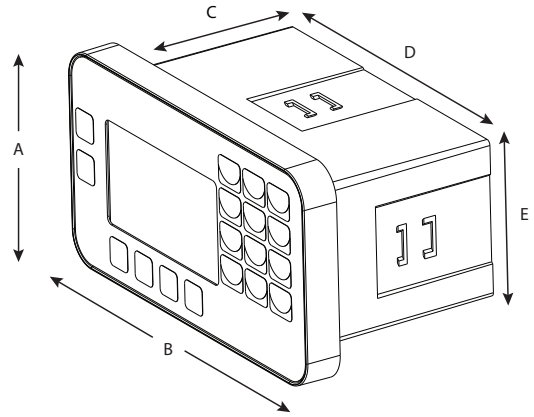
Figure 3: Daisy-chained units

DIMENSIONS

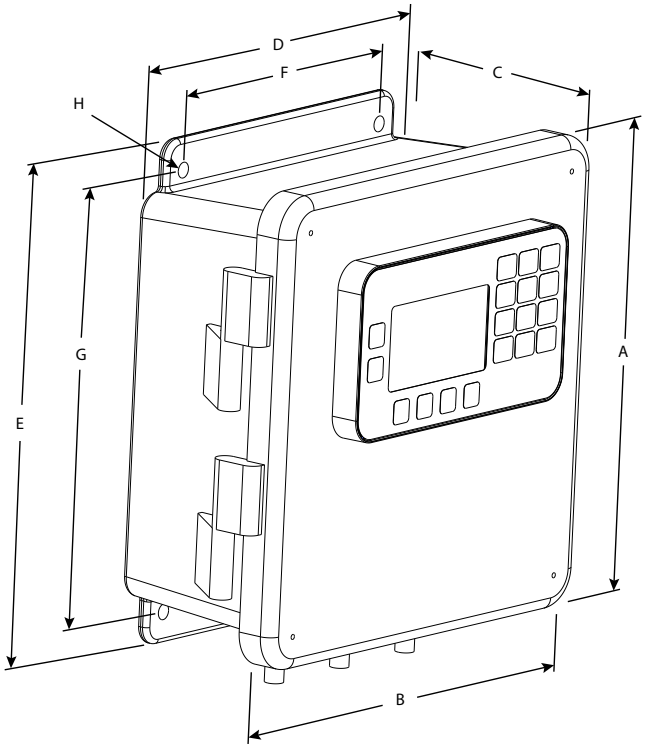
Panel Mount Unit

Mounting clips can accommodate a maximum panel thickness of 1.5 in (38.1 mm).





Wall Mount Unit



	A	B	C	D	E	F	G	H
	Height in. (mm)	**Width in. (mm)**	**Depth in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Hole Dia. in. (mm)**
Panel Cutout	2.65 (67.31)	5.40 (137.16)	—	—	—	—	—	—
FC-5000 Unit	3.50 (89.00)	6.22 (158.00)	3.07 (78.00)	5.38 (136.65)	2.54 (64.52)	—	—	—
Wall Mount Unit	9.38 (238.25)	9.38 (238.25)	4.88 (123.95)	8.00 (203.20)	9.56 (242.83)	6.00 (152.40)	8.75 (222.25)	0.31 (7.87)

SPECIFICATIONS

Power Supply	Input range: 10…40V DC and 9…28V AC RMS (50…60 Hz)		
	Maximum power consumption: 8 Watts (power supply must provide 8 watts at minimum)		
	Isolated from power ground		
	Over-voltage, transient and reverse polarity protected		
Flow Meter Input	Input Range: 0.3 Hz…10 kHz		
	One (1) independent channel		
	Configurable as square wave 0…30V pulse with 2.5V threshold		
	Configurable as sine wave, zero-centered with 45 mV threshold		
	Configurable debounce		
	Excitation Output	12V DC source	
	Voltage	Low: –0.3…1.85V DC	
		High: 2.5…25V DC	
	Impedance	Pullup to 12V DC	
	VDC Current	±50 mA, short circuit current	
	Response	100 µs/3.5 ms min pulse (high/low speed)	
Temperature Inputs	Two (2) independent channels		
	RTD Specifications	50 µA/1000 µA Excitation current source	
		2, 3 and 4-wire compatible	Platinum, 100 and 1000 Ohm RTDs
			Optional two-point or customizable calibration configuration
		Callendar-Van Dusen coefficients	
	Thermistor Specifications	Type II Thermistors or customizable calibration configuration	
		Steinhart-Hart coefficients	
Scaled Outputs	Two (2) independent channels		
	Isolated from power ground		
	Over-voltage, transient and reverse polarity protected		
	Output is multiplexed on the process out pins		
	Analog Output (option A)	Configurable to 0…5V, 0…10V or 4…20 mA	
		Uncertainty: ±0.1% of reading	
		16-bit resolution (0…10V and 4…20 mA), 15-bit resolution (0…5V)	
		200 ms, 90-10% step response	
		Sourcing analog output signal	
	Frequency Output (option F)	TTL, 1…4000 Hz, square wave	
		Uncertainty: ±0.01% reading	
		Resolution: 0.01 Hz	
Digital I/O	Six (6) independent channels		
	Isolated from power ground		
	Over-voltage, transient and reverse polarity protected		
	0…30V as input		
	Debounce		
	0…5V, TTL, 200 ms 90-10% step response, driving < 0.1 uF		
Calculations	**Flow Calculation**	Uncertainty: ± 0.01%	
		Adjustable FIR/IIR filtering	
	BTU Calculation	Meets EN 1434 requirements	

Relay Outputs	Configuration Option "**C**"	Two (2) Form C Mechanical Relays	
	Configuration Option "**A**"	One (1) Form C Mechanical Relay and One (1) Form A Solid State Relay	
	Isolated coil drivers		
	Over-voltage, transient and reverse polarity protected		
	Form C Relay	**Load**	Resistive
		Rated Carry Current	5 A (N.C. or N.O.)
		Maximum Switching Voltage	250V AC, 30V DC
		Minimum Permissible Load	10 mA at 5V DC
		Coil Rating	5…24V DC
		Life Expectancy	5,000,000 operations
	Form A Relay (N.O. SPST)	**Switching Speed**	On (0.25 ms), Off (0.02 ms)
		Current Rating (I_O)	1 A
		Maximum Output Voltage (V_O)	60V
		Output On-Resistance ($R_{(ON)}$)	0.5 Ohms (Ω) @ I_F = 5 mA, I_O = 1 A
		Output Withstand Voltage ($V_{O(OFF)}$)	60-65V @ V_F = 0.8V, I_O = 250 µA, T_A = 77° F (25° C)
Network Communications	**Network Types/Communication Protocols**	Modbus RTU, Modbus ASCII or BACnet	
	Physical Layer	EIA-485 (RS-485)	
	Baud Rates	1200…115.2K	
	Two-wire (half-duplex)		
	Over-voltage/ESD Protection		
	Isolated from power ground		
USB Communications	**USB (HOST)**	Type-A Receptacle | Currently not supported	
	USB (DEVICE)	Mini-B Receptacle (used for field updates)	
	Over-voltage/ESD/transient protected		
Display/User interface	**Keypad**	Membrane overlay, domed tactile response keys	
	Display	128 × 64 pixel LCD graphical display, LED backlit	
	Protected from EMI/RFI		
	Keypad interface is protected from ESD		
Environmental Ratings	**Pollution Degree**	2	
	Altitude Restriction	Up to 2000 m (6561 ft)	
	Over-Voltage Rating	Category II (CAT II)	
	Ambient Temperature Range	32…130° F (0…55° C)	
	Storage Temperature Range	–40…160° F (–40…70° C)	
	Humidity	0…85%, non-condensing	
Weights (Approx.)	**Panel Mount**	1.25 lb (0.57 kg)	
	Wall Mount (Including Unit)	4.54 lb (2.06 kg)	
Operator Functions	Unlatch Relays, Reset Totalizers, Unlatch Relays and Reset Totalizers		
Parameters	**Maximum Displayed Digits**	**Rates:** Max 8 (7 with decimal)	
		Totals: Max 9 (8 with decimal)	
	Resolution/Display Precision	Configurable, 0…4	
	Volumetric Flow Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D)	US Gallons (US GAL), Imperial Gallons (I GAL), Mega US Gallons (US MGAL), Mega Imperial Gallons (I MGAL), Liters (L), Mega Liters (ML), Cubic Meters (M^3), Cubic Feet (FT^3), Acre Feet (AC-FT), Oil Barrels (OBBL), Liquid Barrels (LBBL), US Ounces (US OZ), Imperial Ounces (I OZ), Custom (user-specified)	
	Volumetric Flow Total Units		
	Energy Units	kBTU, BTU, KW, TONS (RT), Custom (user-defined)	
	Temperature Units	° F (Fahrenheit), ° C (Celsius), R (Rankine) or K (Kelvin)	

PART NUMBERING CONSTRUCTION

Badger Meter

FC-5000 BTU Monitor

FC5	-	BM	-	P1	-			6	A	-	

FUNCTION

BTU Monitor	BM

SENSOR INPUTS

One Pulse / Two Temperature	P1

SCALED OUTPUTS

Two Analog Outputs	A
Two Frequency Outputs	F

RELAY OUTPUTS

One Form C Relay / One Form A Relay	A
Two Form C Relays	C

DIGITAL INPUTS/OUTPUTS

Six Programable Inputs/Outputs	6

COMMUNICATIONS

EIA-485(RS-485); Modbus; BACnet; USB	A

MOUNTING METHOD

Panel Mount	P
Wall Mount | *Includes NEMA 4X (IP67) Rated Enclosure*	W

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Badger Meter

Industrial Flow Computer

FC-5000 Flow Display

DESCRIPTION

The Badger Meter® FC-5000 is a microprocessor-driven device designed for flow monitoring. The FC-5000 Flow Display is configurable to accept outputs from one or two flow meters and is compatible with the complete line of Badger Meter industrial flow meters, creating a solution to monitor flow rate and totals. Many years of experience in the industrial market has allowed Badger Meter to incorporate features indispensable in control operations.

Features	Benefits
Large, backlit graphical display	Enhanced viewing capabilities, near and far from the device
Integrated softkeys and full numerical keypad	Promotes intuitive navigation and programming
Sensor data display screen	View raw and calculated flow data, both to and from the device, including flow data, relay, output and digital I/O statuses
10-point linearization	Electronically corrects for variances in K-factor over the flow meter's usable range
Plug-and-play terminals	Easier, user-friendly installation
User-programmable relay configuration	Enables alarms or totalizing output capabilities for flow rates or totals
User-programmable scaled outputs	Transmit rate and total data via dedicated output channels
Robust enclosure, keypad and mechanical relays	Application ruggedness

PROGRAMMABILITY

Features	Programming Options
Digital I/O	Reset relays, totals or both remotely via the 6 available I/O ports.
Scaled Outputs	Fully configurable outputs that can be assigned to rates or totals.
Relay Outputs	Fully configurable relays that can be assigned to rates or totals as either a totalizing output or alarm indication. Option to enable/disable latching functionality.
Display Properties	Adjustable contrast and brightness for readability and controlling power consumption.
Stored or Custom Units of Measure	Select from a list of standardized units of measure, or complete the customized option with labels and quantity assignments.
Passcodes	User-defined passcodes to manage advanced configuration parameters and reset functions.
Sensor Inputs	Provides accurate and fast programming of flow sensors with preprogrammed selection lists.

OPERATION

Input signal—in the form of sine waves or pulses from open collector transistors or dry contact closures—can be scaled to any unit of measure for totalization and instantaneous rate-of-flow indication. Flow rate and flow total are examples of parameters that can be viewed on the panel display or through a communications protocol such as Modbus.

Additionally, dedicated analog or frequency output channels provide scaled outputs that are assignable to parameters such as flow rate and flow total. A user defined damping function can be applied for improved stability of the flow readings.

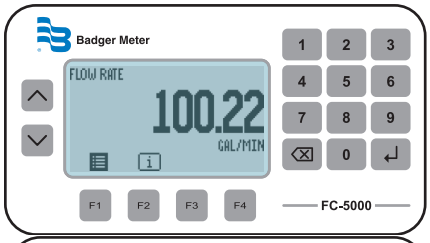
FLEXIBILITY

- Non-volatile memory preserves all configured settings and totalization values during power failure
- Low voltage AC/DC power
- Dynamic menu selection and programming reduces potential programming errors
- Ability to restore to factory programmed settings

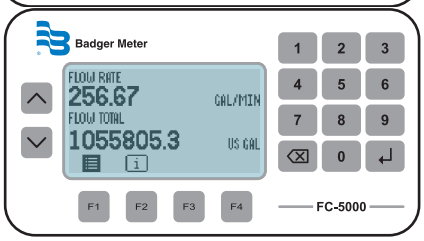
Product Data Sheet

VIEWING CAPABILITIES

Single Input Configurations

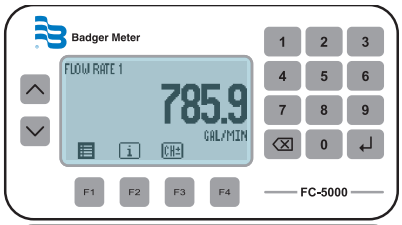


- Flow Rate
- Flow Total

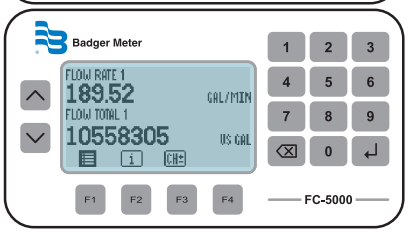


- Flow Rate and Flow Total

Dual Input Configurations



- Flow Rate 1 or Flow Rate 2
- Flow Total 1 or Flow Total 2



- Flow Rate 1 and Flow Total 1
- Flow Rate 2 and Flow Total 2

EIA-485 (RS-485) NETWORK

All FC-5000 Flow Displays come equipped with an EIA-485 (RS-485) physical layer, and use Modbus RTU protocols, selectable and programmed in the firmware. Up to 255 FC-5000 products can be run on a single daisy-chain network and be individually queried for flow rate, positive flow accumulator and other information.

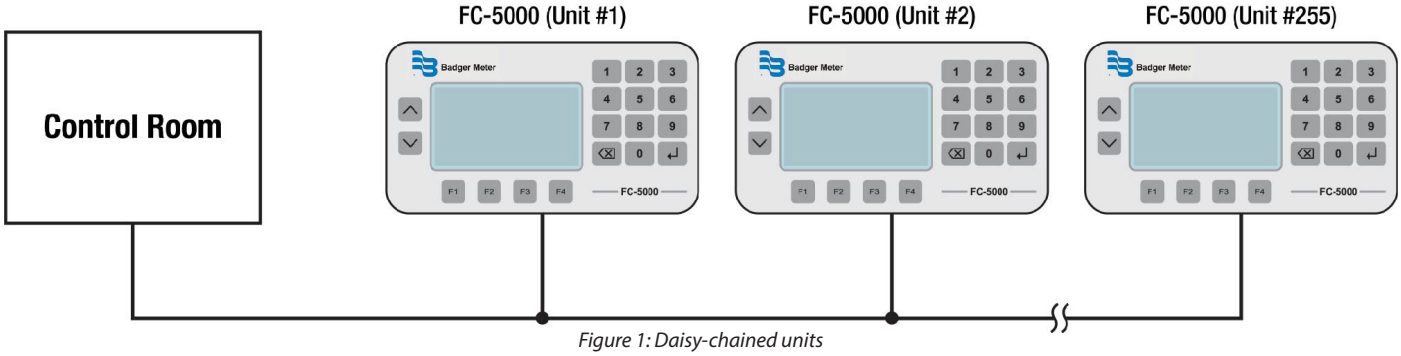
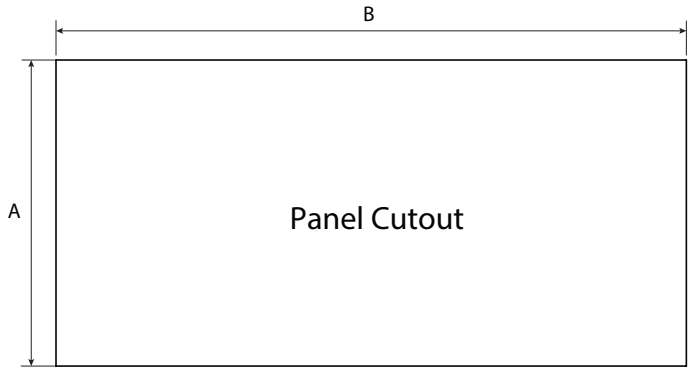


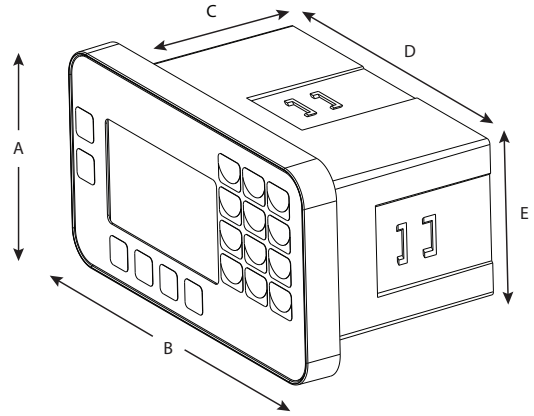
Figure 1: Daisy-chained units

DIMENSIONS

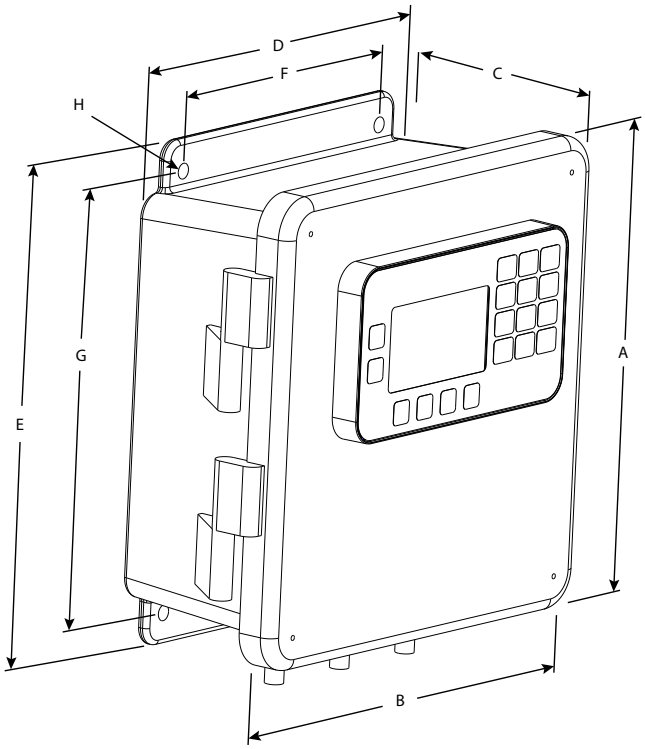
Panel Mount Unit

Mounting clips can accommodate a maximum panel thickness of 1.5 in (38.1 mm).





Wall Mount Unit



	A	B	C	D	E	F	G	H
	Height in. (mm)	**Width in. (mm)**	**Depth in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Hole Dia. in. (mm)**
Panel Cutout	2.65 (67.31)	5.40 (137.16)	—	—	—	—	—	—
FC-5000 Unit	3.50 (89.00)	6.22 (158.00)	3.07 (78.00)	5.38 (136.65)	2.54 (64.52)	—	—	—
Wall Mount Unit	9.38 (238.25)	9.38 (238.25)	4.88 (123.95)	8.00 (203.20)	9.56 (242.83)	6.00 (152.40)	8.75 (222.25)	0.31 (7.87)

SPECIFICATIONS

Power Supply	Input range: 10…40V DC and 9…28V AC RMS (50…60 Hz)	
	Maximum power consumption: 8 Watts (power supply must provide 8 watts at minimum)	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
Flow Meter Input	Input Range: 0.3 Hz…10 kHz	
	One (1) or two (2) independent channels	
	Configurable as square wave 0…30V pulse with 2.5V threshold	
	Configurable as sine wave, zero-centered with 45 mV threshold	
	Configurable debounce	
	Excitation Output	12V DC source
	Voltage	Low: –0.3…1.85V DC
		High: 2.5…25V DC
	Impedance	Pullup to 12V DC
	VDC Current	±50 mA, short circuit current
	Response	100 µs/3.5 ms min pulse (high/low speed)
Scaled Outputs	Two (2) independent channels	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
	Output is multiplexed on the process out pins	
	Analog Output (option A)	Configurable to 0…5V, 0…10V or 4…20 mA
		Uncertainty: ±0.1% of reading
		16-bit resolution (0…10V and 4…20 mA), 15-bit resolution (0…5V)
		200 ms, 90-10% step response
		Sourcing analog output signal
	Frequency Output (option F)	TTL, 1…4000 Hz, square wave
		Uncertainty: ±0.01% reading
		Resolution: 0.01 Hz
Digital I/O	Six (6) independent channels	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
	0…30V as input	
	Debounce	
	0…5V, TTL, 200 ms 90-10% step response, driving < 0.1 uF	
Calculations	**Flow Calculation**	± 0.01% uncertainty
		Adjustable FIR/IIR filtering

Relay Outputs	Configuration Option "**C**"		Two (2) Form C Mechanical Relays	
	Configuration Option "**A**"		One (1) Form C Mechanical Relay and One (1) Form A Solid State Relay	
	Isolated coil drivers			
	Over-voltage, transient and reverse polarity protected			
	Form C Relay	**Load**	Resistive	
		Rated Carry Current	5 A (N.C. or N.O.)	
		Maximum Switching Voltage	250V AC, 30V DC	
		Minimum Permissible Load	10 mA at 5V DC	
		Coil Rating	5…24V DC	
		Life Expectancy	5,000,000 operations	
	Form A Relay (N.O. SPST)	**Switching Speed**	On (0.25 ms), Off (0.02 ms)	
		Current Rating (I_O)	1 A	
		Maximum Output Voltage (V_o)	60V	
		Output On-Resistance ($R_{(ON)}$)	0.5 Ohms (Ω) @ I_F = 5 mA, I_O = 1 A	
		Output Withstand Voltage ($V_{O(OFF)}$)	60-65V @ V_F = 0.8V, I_O = 250 µA, T_A = 77° F (25° C)	
Network Communications	**Network Types/Communication Protocols**		Modbus RTU, Modbus ASCII or BACnet	
	Physical Layer		EIA-485 (RS-485)	
	Baud Rates		1200…115.2K	
	Two-wire (half-duplex)			
	Over-voltage/ESD Protection			
	Isolated from power ground			
USB Communications	**USB (HOST)**		Type-A Receptacle | Currently not supported	
	USB (DEVICE)		Mini-B Receptacle (used for field updates)	
	Over-voltage/ESD/transient protected			
Display/User interface	**Keypad**		Membrane overlay, domed tactile response keys	
	Display		128 × 64 pixel LCD graphical display, LED backlit	
	Protected from EMI/RFI			
	Keypad interface is protected from ESD			
Environmental Ratings	**Pollution Degree**		2	
	Altitude Restriction		Up to 2000 m (6561 ft)	
	Over-Voltage Rating		Category II (CAT II)	
	Ambient Temperature Range		32…130° F (0…55° C)	
	Storage Temperature Range		–40…160° F (–40…70° C)	
	Humidity		0…85%, non-condensing	
Weights (Approx.)	**Panel Mount**		1.25 lb (0.57 kg)	
	Wall Mount (Including Unit)		4.54 lb (2.06 kg)	
Operator Functions	Unlatch Relays, Reset Totalizers, Unlatch Relays and Reset Totalizers			
Parameters	**Maximum Displayed Digits**		**Rates**	Max 8 (7 with decimal)
			Totals	Max 9 (8 with decimal)
	Resolution/Display Precision		Configurable, 0…4	
	Volumetric Flow Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D)		US Gallons (US GAL), Imperial Gallons (I GAL), Mega US Gallons (US MGAL), Mega Imperial Gallons (I MGAL), Liters (L), Mega Liters (ML), Cubic Meters (M^3), Cubic Feet (FT^3), Acre Feet (AC-FT), Oil Barrels (OBBL), Liquid Barrels (LBBL), US Ounces (US OZ), Imperial Ounces (I OZ), Custom (user-specified)	
	Volumetric Flow Total Units			

PART NUMBER CONSTRUCTION

FC-5000 Flow Display

FC5 - FD - [ ] - F [ ] 6 A - [ ]

Frequency Output

FUNCTION							
Flow Display	FD						
SENSOR INPUTS							
One Pulse		P0					
Two Pulse		P3					
SCALED OUTPUTS							
Two Frequency Outputs			F				
RELAY OUTPUTS							
One Form C Relay / One Form A Relay				A			
Two Form C Relays				C			
DIGITAL INPUTS/OUTPUTS							
Six Programable Inputs/Outputs					6		
COMMUNICATIONS							
EIA-485(RS-485); Modbus; BACnet; USB						A	
MOUNTING METHOD							
Panel Mount							P
Wall Mount | Includes NEMA 4X (IP67) Rated Enclosure							W

FC-5000 Flow Display

FC5 - FD - [ ] - A [ ] 6 A - [ ]

Analog Output

FUNCTION							
Flow Display	FD						
SENSOR INPUTS							
One Pulse		P1					
Two Pulse		P2					
SCALED OUTPUTS							
Two Analog Outputs			A				
RELAY OUTPUTS							
One Form C Relay / One Form A Relay				A			
Two Form C Relays				C			
DIGITAL INPUTS/OUTPUTS							
Six Programable Inputs/Outputs					6		
COMMUNICATIONS							
EIA-485(RS-485); Modbus; BACnet; USB						A	
MOUNTING METHOD							
Panel Mount							P
Wall Mount | Includes NEMA 4X (IP67) Rated Enclosure							W

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Cox® Turbine Flow Meters

Flow Computer

FC30

DESCRIPTION

The Cox FC30 is a multi-functional flow computer, providing users with linearized and temperature compensated flow rates and totals. Several features enhance flow meter accuracy and usability, in both gas and liquid applications. The FC30 is offered with 40-point linearization, Strouhal-Roshko compensation, batching routines and inferred mass measurement capability. Both pressure and temperature sensor inputs also come standard for display as well as compensation calculations.

This versatile flow computer provides users with an easy to read display, programmable front panel and an intuitive firmware menu structure. Soft key assignments are user defined for the various inputs and outputs to meet application requirements. When ordered with a flow meter, the FC30 is factory programmed to customer specifications.

Features	Benefits
EIA-232 Serial Communication	Data log, print or communicate with a host PC.
Multiple Isolated Outputs	Analog and pulse outputs are isolated to protect flow data from electrical noise.
10 Selectable Fluid Tables	Preset tables allow for multiple fluid selections to minimize downtime between fluid changes.
Precision Temperature Compensation Methods	Temperature fluid viscosity compensation and bore diameter corrections are accomplished using Strouhal/Roshko equations.
Service/Test Mode	During a start-up, users can print out the system configuration, monitor inputs and exercise outputs.
Batching	Several batching functions are available to provide compensation options in the batching process.

APPLICATION

The FC30 Flow Computer was designed for gas and liquid applications with potentially varying process conditions. The ability to program the flow computer with universal viscosity curve (UVC) calibrations with a temperature input provides compensation by means of Strouhal-Roshko algorithms. Having the capability of these advanced compensation techniques makes the FC30 versatile in a variety of fluid and temperature environments. The FC30 is preloaded with several types of fluids, but any fluid property can be entered into the selection menu.

- Water
- Skydrol® 500B-4
- 50/50 Ethylene Glycol/Water
- Air
- Gaseous Propane
- MIL-PRF-7024
- MIL-PRF-5606
- MIL-PRF-23699
- JET A-1
- Diesel
- Menthol

Badger Meter

CXX-DS-01164-EN-04 (September 2024)

Product Data Sheet

OPERATION

The FC30 accepts all types of pulse generating flow meters. Linearized volumetric flow rates, totals, temperature, pressure and density are examples of flow parameters that can be viewed on the panel display or through serial communications.

Varying fluid temperature and viscosity conditions can be compensated for by means of a universal viscosity curve. In addition, Strouhal-Roshko algorithms are applied for a more comprehensive compensation method, taking into consideration all the secondary effects, of which the meter is sensitive, like the expansion and contraction of the meter bore diameter. Inferred mass is achieved by taking the volumetric flow measurement, multiplied by the density of the fluid medium, derived from actual temperature and pressure readings. In addition, to displaying and transferring rates and totals, the FC30 is programmable to provide several different batching routines with alarms.

SOFTWARE

The setup program provides users with a means of configuring, monitoring and controlling the FC30 over the EIA-232 serial port. The software consists of several menu tabs, which are organized in groups containing like configuration and monitoring functions. The software program is capable of resetting alarms and totalizers, while also monitoring outputs in real-time.

INSTALLATION

The FC30 is a panel mounted flow computer. It should be located in an area with a clean, dry atmosphere which is relatively free of shock and vibration. Also, it should be mounted in an area within the environmental ratings of the enclosure. See *"Dimensions" on page 4* for proper mount spacing.

SPECIFICATIONS

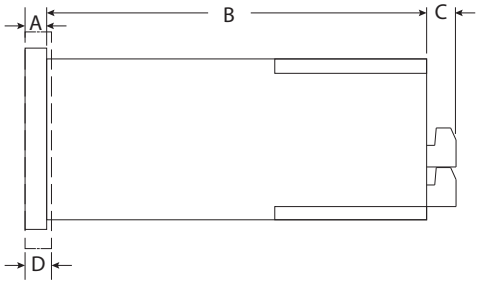
CE Compliant, UL/CUL Listed

Power Requirements	**110V AC**	85…127V rms at 50/60 Hz
Linearization	40-point linearization table	
Internal Equations	Strouhal-Roshko, API 2540 and AGA-7	
Environmental	**Operating Temp**	32…122° F (0…50° C)
	Storage Temp	–40…185° F (–40…85° C)
	Humidity	0…95%, non-condensing
	Panel Rating	NEMA 4 (IP66)
Display	**Type**	2 × 20 character display, backlit LCD or VFD
	Character Size	0.2 inches
	Keypad	16-Key Membrane
Excitation Voltage	5, 12 or 24V DC at 100 mA	
Relay Outputs	Two (four optional), form C contacts. The relay outputs are menu assignable to (individually for each relay) low rate alarm, high rate alarm, pre-warning alarm, preset alarm or general purpose warning (security).	
Flow Input (Pulse)	One input available for single rotor turbine flow meters	
	Input Impedance	10 KΩ nominal
	Pull-up Resistance	10 KΩ to 5V DC (menu selectable)
	Pull-down Resistance	10 KΩ to common
	Trigger Level (Menu Selectable)	High Level Input: Logic On (3…30V DC), Logic Off (0…1V DC) Low Level Input (Mag Pickoff): Sensitivity (10 or 100 mV)
	Minimum Count Speed	Menu Selectable
	Maximum Count Speed	Menu Selectable: 40, 3000 or 20,000 Hz
	Overvoltage Protection	50V DC

Control Inputs	Switch Inputs are menu selectable for *Start*, *Stop*, *Reset*, *Lock*, *Inhibit*, *Alarm Acknowledge*, *Print,* or *Not Used*.		
	Input Scan Rate	10 per second	
	Logic 1	4…30V DC	
	Logic 0	0…0.8V DC	
	Input Impedance	100 k Ohms	
	Control Activation	Positive Edge or Pos. Level based on product definition for switch usage	
Auxiliary/ Compensation Input	Two auxiliary/compensation inputs are available and are menu selectable for temperature, pressure and density or not used. These inputs are used for calculating compensated flow output. It can also be used as a general purpose input for display and alarming.		
	Accuracy	± 0.02% of Full Scale at 68° F (20° C)	
	Input Ranges	Voltage	0…10V DC, 0…5V DC or 1…5V DC
		Current	4…20 MA or 0….20 mA
	Operation	Ratiometric	
	Resolution	16-bit	
	Refresh Rate	1 per second minimum	
	Automatic Fault Detection for signal over-range and under-range, broken current loop, RTD shot, RTD open, user defined fault modes		
	Fault Protection	Reverse Polarity	No ill effects
		Over-Voltage Limit	50V DC
	Temperature Resolution	0.01° C	
	RTD	100 Ohm, 3-Wire DIN RTD	
Serial Communication	EIA-232 available for use in printing, data recording and communication with a computer		
Isolated Analog Output	The analog output is menu assignable to correspond to the uncompensated volume rate and corrected volume rate, mass rate, temperature, pressure, density, volume total, corrected volume total or mass total.		
	Accuracy	0.05% of Full Scale at 68° F (20° C)	
	Ranges	4…20 mA or 0…20 mA	
	Resolution	12 bit	
	Refresh Rate	1 per second minimum	
	Temperature Drift	<200 ppm/°C	
	Maximum Load	1000 Ohms	
	Averaging	User entry of damping constant to cause a smooth control action	
Isolated Pulse Output	The isolated pulse output is menu assignable to uncompensated volume total and compensated volume total or mass total		
	Form	Open Collector	
	Maximum on Current	25 mA	
	Maximum on Voltage	30V DC	
	Saturation Voltage	1V DC	
	Maximum off Current	0.1 mA	
	Pulse Duration	10 mS or 100 mS (user selectable)	
	Pulse Output Buffer	256	
	Fault Protection	Reverse polarity: shunt diode	

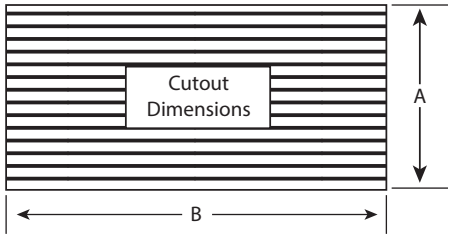
DIMENSIONS

Top View



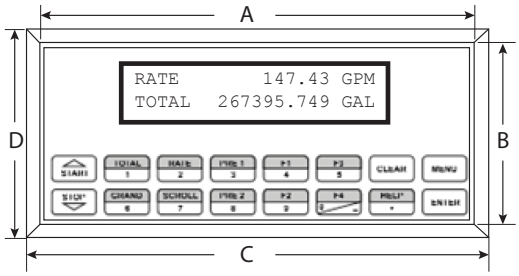
A	0.28 in. (7.2 mm)
B	6.15 in. (156 mm)
C	0.5 in. (13 mm)
D	0.4 in. (10 mm)

Cutout



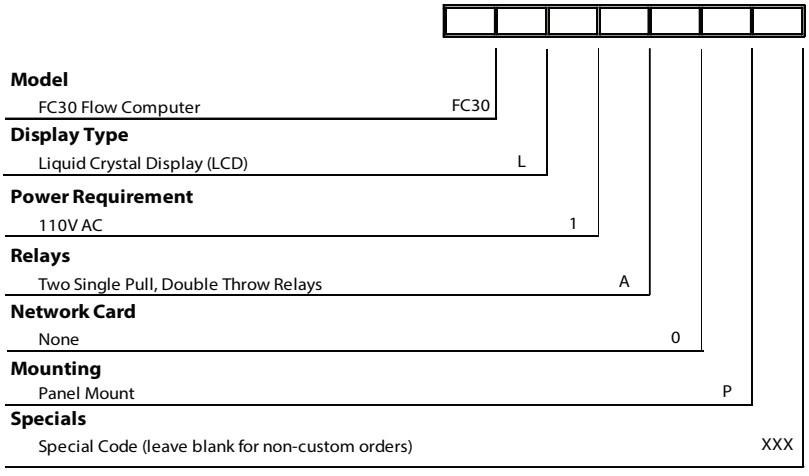
A	2.68 in. (68 mm)
B	5.43 in. (138 mm)

Front View



A	5.67 in. (144 mm)
B	2.83 in. (72 mm)
C	6.18 in. (157 mm)
D	3.43 in. (87 mm)

MODEL NUMBER



Cox Turbine Flow Meters

Flow Processor

EC80

DESCRIPTION

The Cox EC80 Flow Processor is a programmable electronic processor, providing total compensation to enhance flow meter accuracy, while extending the linear flow range. Packaging is provided for remote, direct or embedded mounting to support most installation or application requirements.

The compact design includes both single and dual frequency inputs from 4 or 10 Ohm pickups, as well an RTD input. The EC80 processor tracks all variables to compensate for viscous and inertial effects, using proven Strouhal-Roshko algorithms. Enhanced DSP technology allows for exceptional signal characterization using a 32-bit floating point processor at 150 MHz, capable of producing a 1 millisecond speed of response.

Features	Benefits
Rotor blade pulse averaging	Enhanced low-flow resolution and output smoothing
Strouhal-Roshko computation, using 16-bit resolution	Dynamic response to changing conditions with fully compensated output
Dual outputs provide both frequency and analog signals	Easily interfaces to data acquisition or control system
Internal amplifier and signal conditioners	No need for additional amplifiers or signal conditioners, yielding cost savings
Assignable outputs	User assigned output variables allows for greater ease of system integration

APPLICATIONS

Meeting the demanding requirements of the aerospace, automotive, industrial processing, and test and measurement industries, the EC80 processor provides significant improvements in flow meter performance under varying process conditions. The processor thrives in, but is not limited to, the following applications:

- Precision monitoring
- Engine test cells and test stands
- On-board automotive and aerospace testing
- Control loops
- Custom OEM flight and commercial applications

MODEL NUMBERS

Description	Part Number
Remote	EC80-R-RM1N-N
Remote with Rate Indicator	EC80-R-RM2N-N
Integral Mount	EC80-R-XP1N-N
Integral Mount with Rate Indicator	EC80-R-RM2N-N-007

CUSTOMIZATION

The EC80 processor design permits custom configurations, allowing you to directly embed the flow processor into the flow meter OEM housing design. Greater customization ability and adherence to application requirements makes the EC80 processor a versatile robust solution for unique applications. Benefits to having the meter electronics embedded onto the flow meter include:

- 100% interchangeability of the flow meter while maintaining the same scaled outputs
- Signal conditioning for temperature sensors embedded in the flow meter
- Compact packaging
- Close coupling to protect signal integrity

PRINCIPLE OF OPERATION

The EC80 processor accepts all types of square wave pulse inputs. Fully compensated and linearized volumetric flow rates, totals and temperature are examples of flow parameters that can be viewed through serial communications, included software program or an embedded rate indicator (depending on product configuration).

Varying fluid temperature and viscosity conditions can be compensated for by means of a universal viscosity curve. In addition, Strouhal- Roshko algorithms are applied for a more comprehensive compensation method, taking into consideration all the secondary effects to which the meter is sensitive, like the expansion and contraction of the meter bore diameter. Inferred mass flow rate is achieved by extracting the density value of a known fluid from a stored temperature/density table, which is multiplied by the volumetric flow rate.

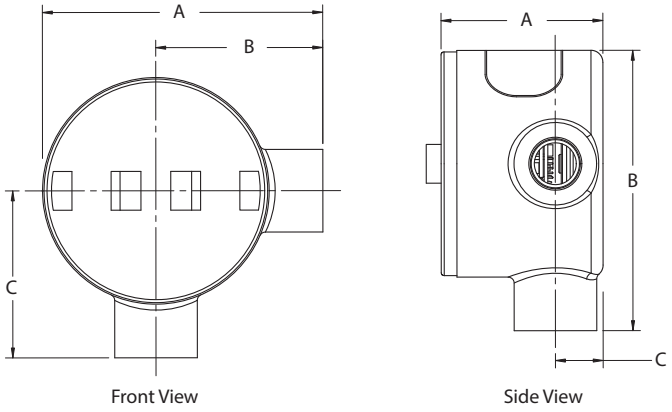
Badger Meter

CXX-DS-01269-EN-04 (November 2021)

Product Data Sheet

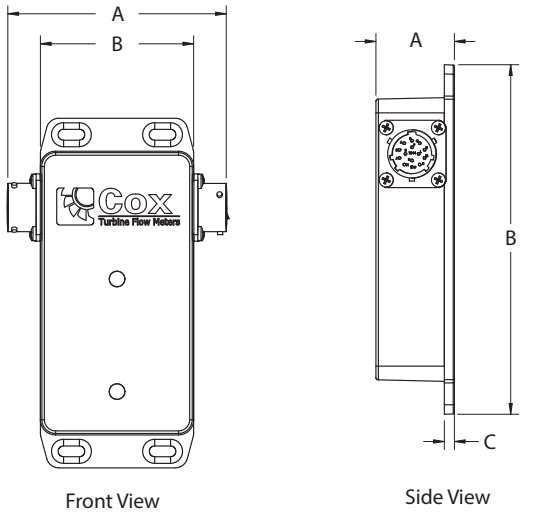
DIMENSIONS

EC80-R-XP1N-N Integral Mount



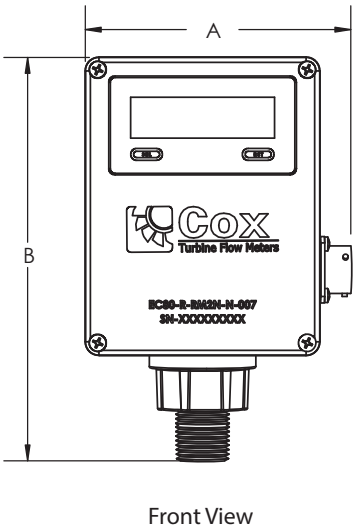
	Front View	Side View
A	4.70 in. (119.38 mm)	2.71 in. (68.83 mm)
B	2.80 in. (71.12 mm)	4.70 in. (119.38 mm)
C	2.80 in. (71.12 mm)	0.80 in. (20.32 mm)

EC80-R-RM1N-N Remote



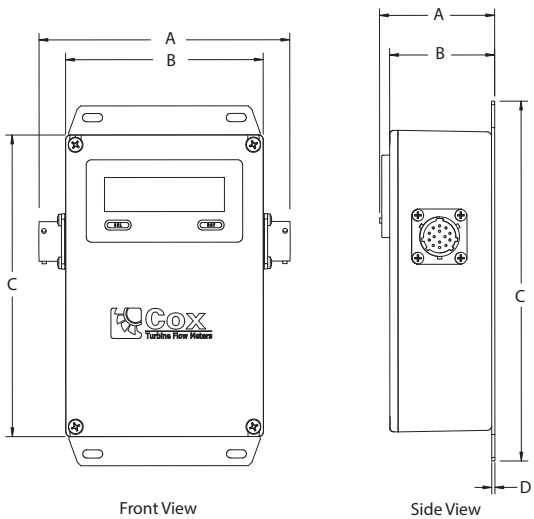
	Front View	Side View
A	3.40 in. (86.36 mm)	1.22 in. (30.99 mm)
B	2.38 in. (60.45 mm)	5.43 in. (137.92 mm)
C	—	0.16 in (4.06 mm)

EC80-R-RM2N-N-007 Integral with Rate Indicator



	Front View
A	4.2 in. (106.68 mm)
B	6.4 in. (162.56 mm)

EC80-R-RM2N-N Remote with Rate Indicator



	Front View	Side View
A	4.75 in (120.65 mm)	2.18 in. (55.37 mm)
B	3.74 in. (95.00 mm)	1.99 in. (50.55 mm)
C	5.71 in. (145.03 mm)	6.81 in. (172.97 mm)
D	—	0.06 in. (1.52 mm)

SPECIFICATIONS

Performance	**Linearized Frequency**	± 0.1% of reading
	Linearized Analog Output	± 0.1% of full scale
	Process Latency	100 µs
Input Power	**Nominal**	24V DC, 2W maximum
	With Digital Output	7…32V DC
	With Analog Output	12…32V DC
Temperature Environment	**Operating**	–40…185° F (–40…85° C)
	Storage	–67…257° F (–55…125° C)
	Humidity	0…80% RH, non-condensing
Flow Meter Input Type (A and B) (Two Independent Channels)	**Pulse TTL Compatible (A and B)**	Frequency range: 5 Hz…5.0 kHz
	RF Carrier 4 or 10 Ohm Pickup	Carrier frequency range: 25…65 kHz
		Frequency range: 5 Hz…5.0 kHz
RTD Temperature Input 4-Wire	**Type**	100 Ohm platinum, 0.00385 alpha
	Usable Range	–65…365° F (–55…185° C)
Analog Input (For Temperature)	**Response**	5 Hz Sine Response
	Voltage	0…5V or 0…10V DC
	ADC Resolution	12 bit (1/4096)
	Input Impedance	>100k Ohms
Raw Frequency Output (Two Independent Channels)	**Output**	0…5V, TTL, 5…3500 Hz, square wave
	Minimum Load Impedance	5k Ohm minimum load
Frequency Output (Two Independent Channels)	**Output**	0…5V, TTL, 1…20,000 Hz, square wave 50% duty cycle
	Measurement	Linearized flow rate, raw rotor frequency, summed rotor frequency (dual rotor) or total flow (accumulation)
	Minimum Load Impedance	10k Ohm (linearized flow), 5k Ohm (raw flow)
Analog Outputs (Two Independent Channels)	**Resolution**	16-bit resolution
	Channel One	4…20 mA, 0…5V DC or 0…10V DC; linearized flow rate or temperature
	Channel Two	0…5V DC or 0…10V DC; linearized flow rate or temperature
	Load Impedance (4…20 mA)	500 Ohms maximum
EIA-485 Serial Data	**Baud**	115k
	Update Rate	Selectable, 0.1 sec minimum
	Data Bits	8
	Stop Bit	1
	Parity	None
Enclosure Environmental Rating	**Blind Remote**	Aluminum enclosure with MS Connectors, weatherproof mounting flange
	Remote with Rate Indicator	Aluminum enclosure with MS Connectors, weatherproof mounting flange
	Blind Integral	NEMA 4 (IP65) with 1/2 in. NPT Class 1, Groups C and D Class 2, Groups E, F and G Class 3, WET LOC — Cast Aluminum
	Integral with Rate Indicator	Aluminum enclosure with MS Connectors, weatherproof
Rate Indicator	**Display**	8 digits, 0.46 in. (11.7 mm) high digits, transmissive LCD with green/red LED backlight
Remote Cable Length	**Flow Meter to EC80**	10 ft (3 m)
	EC80 to DAQ or Control System	100 ft (30.5 m)
Software	Conforms to SAE ARP4990 calculations for temperature	

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Blancett®
Turbine Flow Meters

Flow Monitor

B3000 Series

DESCRIPTION

The B3000 Series flow monitor is a flexible, durable, easy-to-use platform for your flow metering applications. Our trusted flow metering technology now offers a new flow monitor with more options and features than ever before with the B3000 Series.

OPERATION

This monitor is capable of accepting low-level frequency input signals typically found in turbine flow sensors. The output signal for these type of sensors is a frequency proportional to the rate of flow. The B3000 monitor uses the frequency information to calculate flow rate and total flow. Through the use of the programming buttons, you can select rate units, total units and unit time intervals among other functions. If required, the flow monitor can easily be reconfigured in the field. Finally, you can choose between simultaneously showing rate and total, or alternating between rate and grand total.

The monitor is available in three levels of functionality and two packaging options. The base model provides all the functions necessary for the most common flow metering applications. The advanced version adds communications capabilities over an RS485 bus using Modbus RTU and control outputs. The third version is a solar-powered model (NEMA 4X only).

Packaging options include a polycarbonate, NEMA 4X version and an aluminum explosion proof enclosure.

APPLICATIONS

The B3000 monitor is suitable for application in a wide variety of metering needs. A few of the more common industries are:

- Secondary oil recovery applications
- Remediation and reclamation
- Fracture/refracture
- Coal bed methane
- Regulatory compliance and environmental accountability
- Industrial chemicals
- Aggressive chemical processing applications
- Semiconductor manufacturing
- Fertilizer production and dispensing
- Pesticide manufacture
- Liquid batching and water cooling

FEATURES

- Robust alarm parameters provide faster warning when something changes in the process or pipeline.
- Greater control and greater visibility of batch operations.
- Advanced connectivity options allow you to connect meters to your network for remote monitoring and process automation capabilities.
- Solar, battery, and 4…20 milliamperes loop power options provide the ability to install in a remote location and be up and running immediately, maintain readings and settings during power loss, and a battery life up to 6 years.
- Updated display and totalization options provide more flow information, including simultaneous display of rate and total as well as standard, batch and grand totals.
- Various mounting and enclosure options provide a B3000 model for your operation.

Badger Meter

DSY-DS-00691-EN-16 (September 2024)

Product Data Sheet

PART NUMBER CONSTRUCTION

Blancett B3000 Display

				-		-
Model						
Blancett B3000 Display	**B30**					
Model						
Base		**B**				
Advanced		**A**				
Solar		**S**				
Mounting						
Meter			**M**			
Remote			**R**			
Swivel			**S**			
Units of Measure						
Customer Selectable					**CS**	
For European Units Only						**E**

Blancett B3000 Explosion-proof Display

				-		-
Model						
Blancett B3000 Explosion-proof Display	**B30**					
Model						
Base, Explosion-proof*, Battery & Loop Power		**X**				
Advanced, Explosion-proof*, Battery & Loop Power		**Z**				
Mounting						
Remote			**R**			
Units of Measure						
Customer Selectable					**CS**	
For European Units Only						**E**

*For hazardous locations, the monitor has to be installed on an explosion-proof rated meter.

Blancett monitors and meters should be assembled by the customer for each specific application. Since it is not possible for Badger Meter to know where or how these products will be installed, it is the customer's responsibility to select the proper components to meet their application. The customer is responsible for adhering to all applicable codes where the product(s) are installed. Certified components must be installed in the Hazardous location application, using a certified installer to meet all applicable codes. These codes could be the National Electric Code, Canadian Electric Code, any and all local, state, and other codes that are applicable. The local electrical inspector should be consulted for specific questions regarding compliant installations.

SPECIFICATIONS (PAGE 1 OF 2)

Display	Common	Simultaneously shows Rate and Total	
		5 x 7 Dot Matrix LCD, STN Fluid	
	B30A/B/S	6 Digit Rate, 0.5 inch (12.7 mm) numeric	
		7 Digit Total, 0.5 inch (12.7 mm) numeric	
		Engineering Unit Labels 0.34 inch (8.6 mm)	
	B30X/Z	6 Digit Rate, 0.37 inch (9.4 mm) numeric	
		7 Digit Total, 0.37 inch (13 mm) numeric	
		Engineering Unit Labels 0.24 inch (6.1 mm)	
	Annunciators	Alarm 1(1), Alarm 2 (2), Battery Level (▯▯▯▯), RS485 Communications (COM)	
Power	B30A/B/X/Z	Auto switching between internal battery and external loop power; B30A/Z includes isolation between loop power and other I/O	
		Battery	3.6V DC lithium D Cell gives up to 6 years of service life
		Loop	4…20 mA, two wire, 25 mA limit, reverse polarity protected, 7V DC loop loss
	B30S	Internal battery (3.6V DC Nicd) provides up to 30 days of power after 6…8 hours exposure of the integrated photovoltaic cell to direct sunlight	
Inputs	Magnetic Pickup	Frequency Range	1…3500 Hz
		Frequency Measurement Accuracy	±0.1%
		Over Voltage Protection	28V DC
		Trigger Sensitivity	30 mV_{p-p} (High) or 60 mV_{p-p} (Low) - (selected by circuit board jumper)
	Amplified Pulse	Direct connection to amplified signal (pre-amp output from sensor)	
Outputs	Analog 4…20 mA	4…20 mA, two-wire current loop. 25 mA current limit	
	Totalizing Pulse	One pulse for each **L**east **S**ignificant **D**igit (LSD) increment of the totalizer	
		Pulse Type (selected by circuit board jumper)	Opto-isolated (Iso) open collector transistor
			Non-isolated open drain FET
		Maximum Voltage	28V DC
		Maximum Current Capacity	100 mA
		Maximum Output Frequency	16 Hz
		Pulse Width	30 mSec fixed
	Status Alarms B30A/Z	Type	Open collector transistor
			Adjustable flow rate with programmable dead band and phase.
		Maximum Voltage	28V DC
		Maximum Current	100 mA
		Pullup Resistor	External required (2.2 k Ohm minimum, 10 k Ohm maximum)
	Status Alarms B30B/S/X	None	
Modbus Digital Communications	B30A/Z	Modbus RTU over RS485, 127 addressable units / 2-wire network, 9600 baud, long integer and single precision IEEE754 formats; retrieve: flow rate, job totalizer, grand totalizer, alarm status and battery level; write: reset job totalizer, reset grand totalizer	
	B30B/S/X	None	
Data Configuration and Protection	B30A/B/X/Z	Two four-digit user selectable passwords; level one password enables job total reset only, level two password enables all configuration and totalizer reset functions **Not applicable on solar powered units.**	

SPECIFICATIONS (PAGE 2 OF 2)

<table>
<tr><td rowspan="9">Certifications</td><td rowspan="5">Safety</td><td>B30A/B/S</td><td colspan="5">Class I Division 1, Groups C, D; Class II, Division 1 Groups E, F, G; Class III for US and Canada. Complies with UL 913 and CSA C22.2 No. 157-92</td></tr>
<tr><td rowspan="4">B30X/Z</td><td colspan="5">Class I Division 1 Groups B, C, D; Class II, Division 1, Groups E, F, G; Class III for US and Canada Complies with UL 1203 and CSA C22.2 No. 30-M1986</td></tr>
<tr><td colspan="5">ATEX II 2 G Ex db IIC T4 Gb and ATEX II D Ex tb IIIC T135 °C Db</td></tr>
<tr><td colspan="5">Complies with Directive 2014/34/EU and S.I. 2016/1107</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="4">Entity Parameters</td><td>B30A/B only</td><td>4…20 mA Loop: Vmax = 28V DC</td><td>Imax = 26 mA</td><td>Ci = 0.5 µF</td><td>Li = 0 mH</td></tr>
<tr><td>B30A/B/S only</td><td>Pulse Output: Vmax = 28V DC</td><td>Imax = 100 mA</td><td>Ci = 0 µF</td><td>Li = 0 mH</td></tr>
<tr><td>B30A/B/S only</td><td>Reset Input: Vmax = 5V DC</td><td>Imax = 5 mA</td><td>Ci = 0 µF</td><td>Li = 0 mH</td></tr>
<tr><td>B30A only</td><td>RS485: Vmax = 10V DC</td><td>Imax = 60 mA</td><td>Ci = 0 µF</td><td>Li = 0 mH</td></tr>
<tr><td>B30A/B/S only</td><td>Turbine Input: Voc = 2.5V</td><td>Isc = 1.8 mA</td><td>Ca = 1.5 µF</td><td>La = 1.65 H</td></tr>
<tr><td>EMC</td><td colspan="5">2004/108/EC and S.I. 2016/1091</td></tr>
<tr><td>Measurement Accuracy</td><td>Common Accuracy</td><td colspan="5">0.05%</td></tr>
<tr><td>Response Time (Damping)</td><td>Common Response Time</td><td colspan="5">1…100 seconds response to a step change input, user adjustable</td></tr>
<tr><td rowspan="5">Environmental Ratings</td><td>Pollution Degree</td><td colspan="5">2</td></tr>
<tr><td>Use</td><td colspan="5">Indoor/Outdoor</td></tr>
<tr><td>Ambient Temperature</td><td colspan="5">–22…158° F (–30…70° C)</td></tr>
<tr><td>Humidity</td><td colspan="5">0…90%, non-condensing</td></tr>
<tr><td>Altitude Restriction</td><td colspan="5">2000 m (6561 ft)</td></tr>
<tr><td rowspan="2">Materials and Enclosure Ratings</td><td>B30A/B/S</td><td colspan="5">Polycarbonate, stainless steel, polyurethane, thermoplastic elastomer, acrylic; NEMA 4X/IP 66</td></tr>
<tr><td>B30X/Z</td><td colspan="5">Copper free, epoxy-coated, aluminum, buna seal, NEMA 4X/IP66</td></tr>
<tr><td rowspan="5">Engineering Units</td><td>Liquid</td><td colspan="5">US Gallons, Liters, Oil Barrels (42 US gallons), Liquid Barrels (31.5 US gallons), Cubic Meters, Million US Gallons, Cubic Feet, Million Liters, Acre Feet</td></tr>
<tr><td>Gas</td><td colspan="5">Cubic Feet, Thousand Cubic Feet, Million Cubic Feet, Standard Cubic Feet, Actual Cubic Feet, Normal Cubic Meters, Actual Cubic Meters, Liters</td></tr>
<tr><td>Rate Time</td><td colspan="5">Seconds, minutes, hours, days</td></tr>
<tr><td>Totalizer Exponents</td><td colspan="5">0.00, 0.0, x1, x10, x100, x1000</td></tr>
<tr><td>K factor Units</td><td colspan="5">Pulses/US gallon, pulses/cubic meter, pulses/liter, pulses/cubic foot</td></tr>
</table>

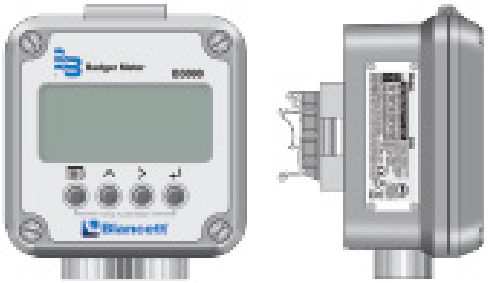
MOUNTING STYLES

Meter Mount

- Monitor is assembled to the flow meter, creating a compact flow measurement system.
- NEMA 4X (IP 66) enclosure.

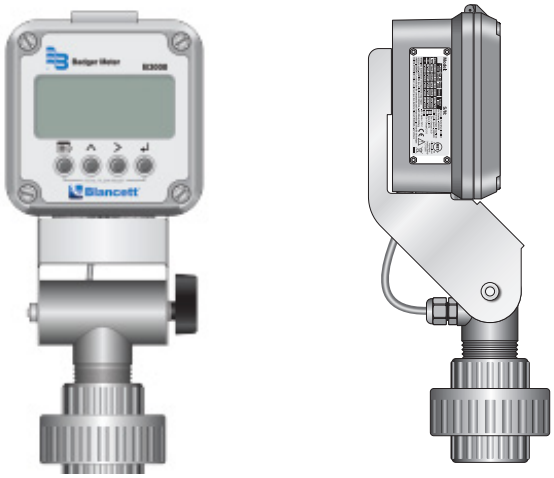
Remote Mount

- Ideal when monitor needs to be located away from flow meter. Suitable for high temperature, excessive noise or inaccessible areas.
- NEMA 4X (IP 66) enclosure.
- Panel, DIN rail, and pipe mounting hardware included.
- Cable lengths from 10…100 ft (3…30.5 m) sold separately.



Swivel Mount

- Capable of adjustment pivot of 180 degrees for ease of viewing.
- NEMA 4X (IP 66) enclosure.
- Remote Swivel mount also available, consult factory for details.
- Offers additional protection from elements.

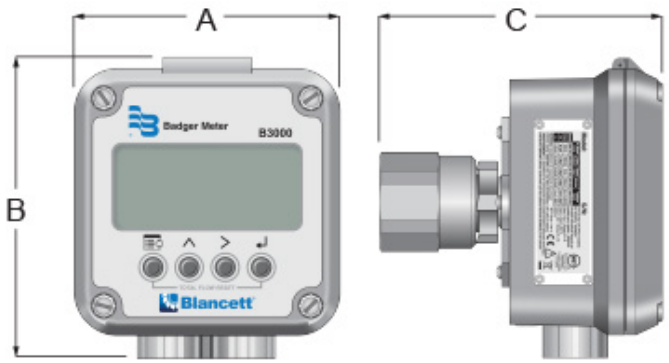


Explosion Proof

- Ideal for hazardous locations.
- NEMA 4X (IP 66) enclosure.
- Rugged compact design.
- Remote or meter mount.

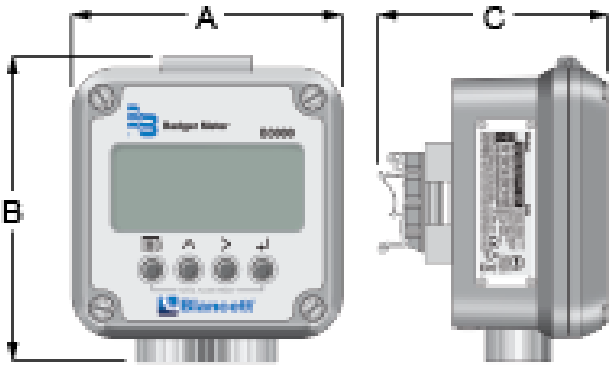
DIMENSIONS

Meter Mount



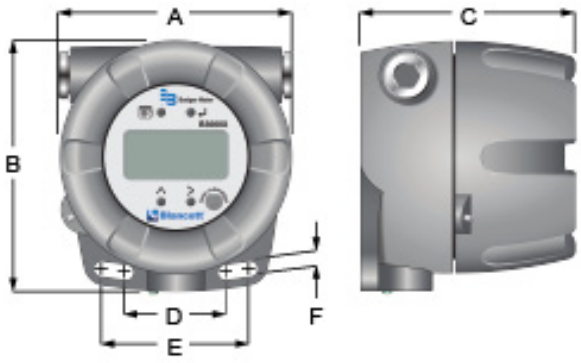
A	B	C
4.50 in. (114.3 mm)	5.08 in. (129.0 mm)	4.78 in. (121.4 mm)

Remote Mount



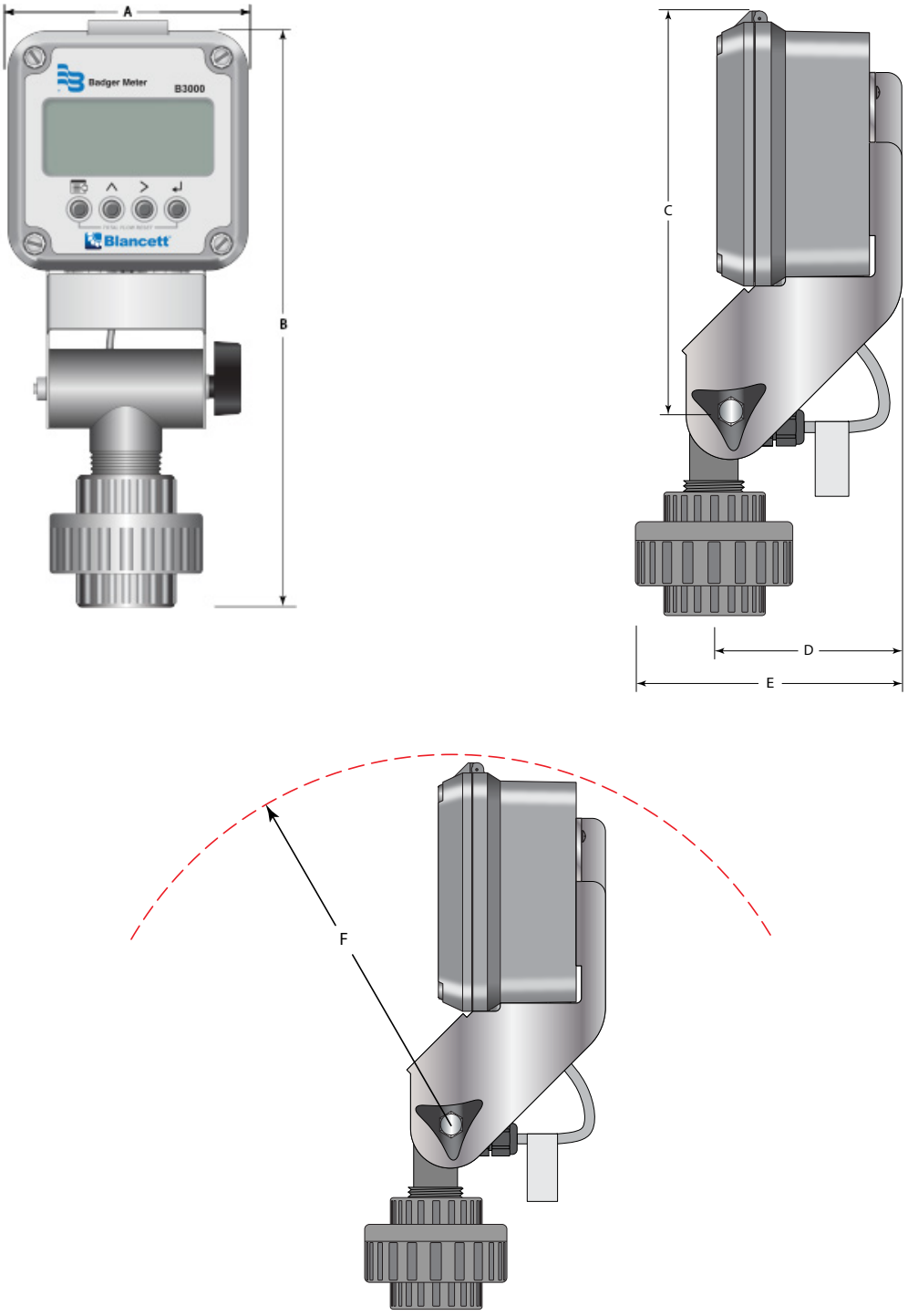
A	B	C
4.50 in. (114.3 mm)	5.08 in. (129.0 mm)	3.80 in. (96.5 mm)

Explosion Proof



A	B	C	D	E	F
5.25 in. (133.4 mm)	5.65 in. (143.5 mm)	4.86 in. (123.4 mm)	2.25 in. (57.1 mm)	3.35 in. (85.1 mm)	0.33 in. (8.4 mm)

Swivel Mount

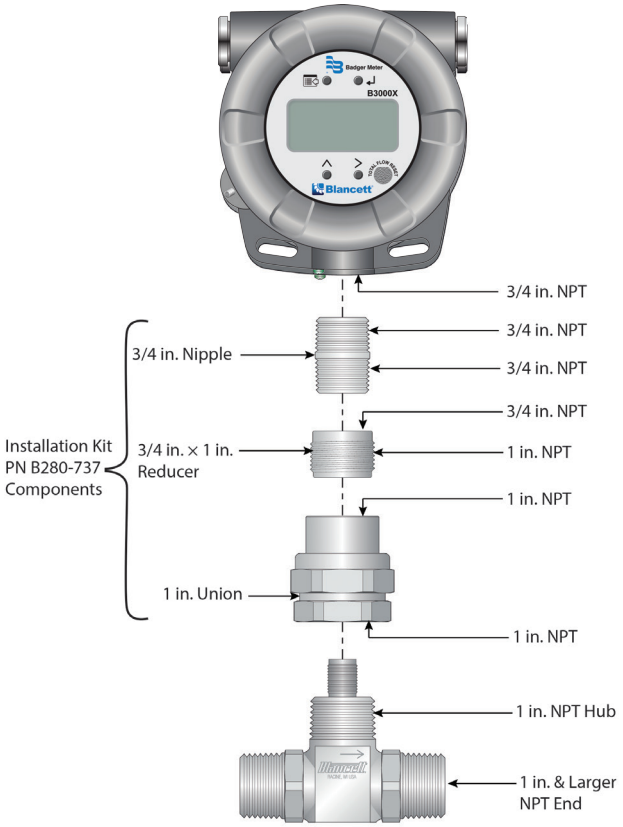


A	B	C	D	E	F
4.50 in. (114.3 mm)	10.9 in. (276.9 mm)	6.90 in. (175.4 mm)	3.21 in. (81.5 mm)	4.25 in. (107.9 mm)	7.00 in. (177.8 mm)

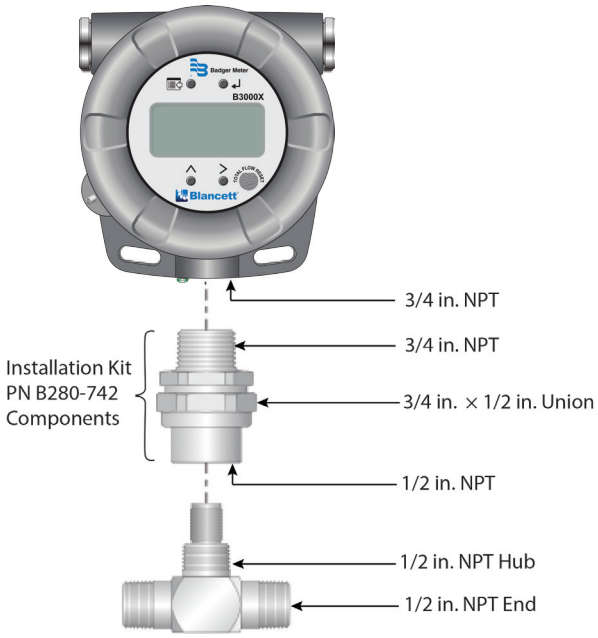
ACCESSORIES

Part Number	Description
B280-737	Explosion-proof Meter Mount Kit, 1 in. connections
B280-742	Explosion-proof Meter Mount Kit, 1/2 in. connections

Meter Mounting Kits



Turbine with 1 in. NPT hub size



Turbine with 1/2 in. NPT hub size

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Blancett®
Turbine Flow Meters

Flow Monitor

B2900 Series

DESCRIPTION

The B2900 flow monitor incorporates state-of-the-art, digital signal processing technology, designed to provide exceptional flexibility at a very affordable price. Though it is designed for use with Blancett flow sensors, this monitor can be used with almost any flow sensor producing a low amplitude AC output or contact closure signal.

OPERATION

This monitor can accept low-level frequency input signals typically found in turbine flow sensors. The output signal for these types of sensors is a frequency proportional to the rate of flow. The B2900 monitor uses the frequency information to calculate flow rate and total flow. Through the use of the programming buttons, you can select rate units, total units and unit time intervals among other functions. If required, the monitor can easily be re-configured in the field. Finally, you can choose between simultaneously showing rate and total, or alternating between rate and grand total.

The monitor provides advanced communication capabilities over an RS485 bus using Modbus RTU and control outputs.

The package is a polycarbonate NEMA 4X enclosure.

APPLICATIONS

The B2900 monitor is suitable for application in a wide variety of metering needs. A few of the more common industries are:

- Secondary oil recovery applications
- Remediation and reclamation
- Fracture/refracture
- Coal bed methane
- Regulatory compliance and environmental accountability
- Industrial chemicals
- Aggressive chemical processing applications
- Semiconductor manufacturing
- Fertilizer production and dispensing
- Pesticide manufacture
- Liquid batching and water cooling

FEATURES

- Robust alarm parameters provide faster warning when something changes in the process or pipeline.
- Greater control and greater visibility of batch operations.
- Advanced connectivity options allow you to connect meters to your network for remote monitoring and process automation capabilities.
- Updated display and totalization options provide more flow information, including simultaneous display of rate and total as well as standard, batch and grand totals.
- Various mounting options provide a B2900 model for your operation.

PART NUMBER CONSTRUCTION

				-	
Model					
Blancett B2900 Display	**B29**				
Model					
Advanced		**A**			
Mounting					
Meter			**M**		
Remote			**R**		
Swivel			**S**		
Handheld			**H**		
Units of Measure					
Customer Selectable					**CS**

Badger Meter

DSY-DS-01565-EN-06 (April 2021)

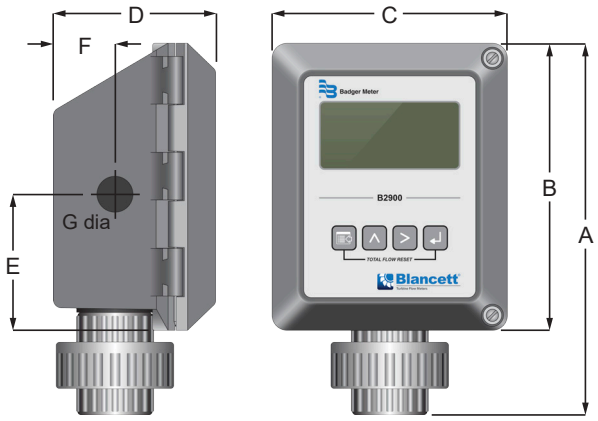
Product Data Sheet

SPECIFICATIONS

Display	Common	Simultaneously shows Rate and Total			
		5 x 7 Dot Matrix LCD, STN Fluid			
	6 Digit Rate, 0.5 inch (12.7 mm) numeric				
	7 Digit Total, 0.5 inch (12.7 mm) numeric				
	Engineering Unit Labels 0.34 in. (8.6 mm)				
	Annunciators	Alarm 1(🔔), Alarm 2 (🔔), Battery Level (▯▯▯▯), RS485 Communications (COM)			
Power	Auto switching between internal battery and external loop power; includes isolation between loop power and other I/O				
	Battery	3.6V DC lithium D Cell gives up to 6 years of service life **Note**: Modbus enabled at baud rate of 19,200 or higher without loop power reduces battery life to 1 year			
	Loop	4…20 mA, two wire, 25 mA limit, reverse polarity protected, 7V DC loop loss			
Inputs	Magnetic Pickup	Frequency Range	1…3500 Hz		
		Frequency Measurement Accuracy	±0.1%		
		Over Voltage Protection	28V DC		
		Trigger Sensitivity	30 mV_{p-p} (High) or 60 mV_{p-p} (Low) - (selected by circuit board jumper)		
	Amplified Pulse	Direct connection to amplified signal (pre-amp output from sensor)			
Outputs	Analog 4…20 mA	4…20 mA, two-wire current loop			
		25 mA current limit			
	Totalizing Pulse	One pulse for each **L**east **S**ignificant **D**igit (LSD) increment of the totalizer			
		Pulse Type (selected by circuit board jumper)	Opto-isolated (Iso) open collector transistor		
			Non-isolated open drain FET		
		Maximum Voltage	28V DC		
		Maximum Current Capacity	100 mA		
		Maximum Output Frequency	16 Hz		
		Pulse Width	30 mSec fixed		
	Status Alarms	Type	Open collector transistor		
			Adjustable flow rate with programmable dead band and phase.		
		Maximum Voltage	28V DC		
		Maximum Current	100 mA		
		Pullup Resistor	External required: 2.2 k ohm minimum, 10 k ohm maximum		
Modbus Digital Communications	Modbus RTU over RS485, 127 addressable units / 2-wire plus ground network, selectable baud rate: 9600, 19200, 38400, 57600 or 115200, long integer and single precision IEEE754 formats; retrieve: flow rate, job totalizer, grand totalizer, alarm status and battery level; write: reset job totalizer, reset grand totalizer				
Data Configuration and Protection	Two four-digit user selectable passwords; level one password enables job total reset only, level two password enables all configuration and totalizer reset functions				
Certifications	Safety	Intrinsically Safe Class I Division 1, Groups C, D; Class II, Division 1 Groups E, F, G			
	Entity Parameters	4…20 mA Loop: Vmax = 28V DC	Imax = 26 mA	Ci = 0.5 µF	Li = 0 mH
		Pulse Output: Vmax = 28V DC	Imax = 100 mA	Ci = 0 µF	Li = 0 mH
		Reset Input: Vmax = 5V DC	Imax = 5 mA	Ci = 0 µF	Li = 0 mH
		RS485: Vmax = 10V DC	Imax = 60 mA	Ci = 0 µF	Li = 0 mH
		Turbine Input: Voc = 2.5V	Isc = 1.8 mA	Ca = 1.5 µF	La = 1.65 H
	EMC	IEC61326-1; 2004/108/EC			
Measurement Accuracy	Common Accuracy	0.05%			
Response Time (Damping)	Common Response Time	1…100 seconds response to a step change input, user adjustable			
Environmental Limits	Common Limits	–22…158° F (–30…70° C); 0…90% humidity, non-condensing;			
Materials and Enclosure Ratings	Polycarbonate, stainless steel, polyurethane, thermoplastic elastomer, acrylic; NEMA 4X/IP 66 meter, remote and swivel mount; NEMA/UL/CSA Type 4X (IP-66)				
Engineering Units	Liquid	US Gallons, Liters, Oil Barrels (42 gallon), Liquid Barrels (31.5 gallon), Cubic Meters, Million Gallons, Cubic Feet, Million Liters, Acre Feet			
	Gas	Cubic Feet, Thousand Cubic Feet, Million Cubic Feet, Standard Cubic Feet, Actual Cubic Feet, Normal Cubic Meters, Actual Cubic Meters, Liters			
	Rate Time	Seconds, minutes, hours, days			
	Totalizer Exponents	0.00, 0.0, X1, x10, x100, x1000			
	K-factor Units	Pulses/US Gallon, Pulse/cubic meter, pulses/liter, pulses/cubic foot			

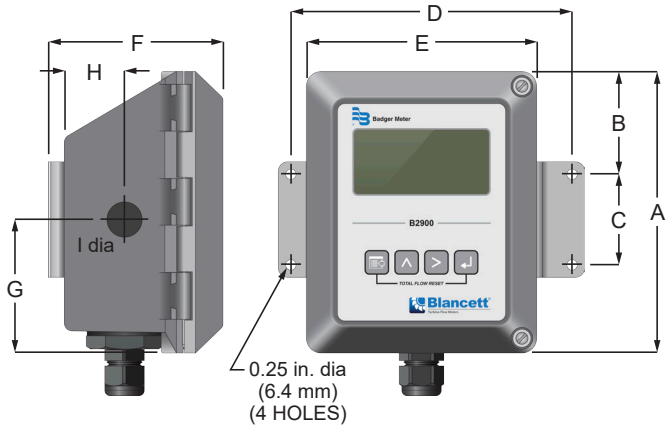
MOUNTING OPTIONS AND DIMENSIONS

Meter Mount



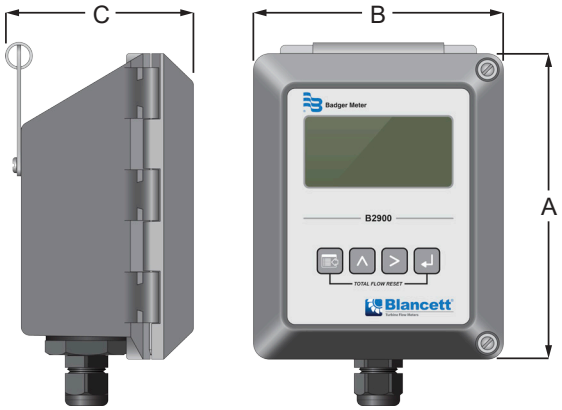
A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G dia in. (mm)
9.25 (235.0)	7.00 (177.8)	5.75 (146.0)	4.00 (101.6)	3.45 (87.6)	1.50 (38.1)	0.875 (22.2)

Remote Mount



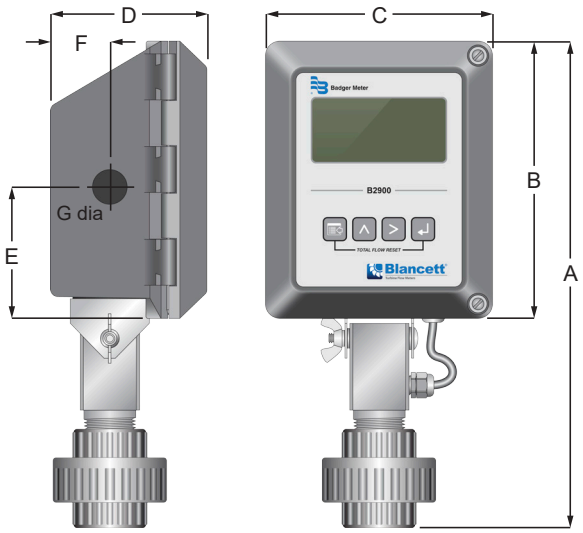
A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G in. (mm)	H in. (mm)	I dia in. (mm)
7.00 (177.8)	2.40 (61.0)	2.25 (57.2)	7.00 (177.8)	5.75 (146.0)	4.38 (111.2)	3.45 (87.6)	1.50 (38.1)	0.875 (22.2)

Handheld



A in. (mm)	B in. (mm)	C in. (mm)
7.00 (177.8)	5.75 (146.0)	4.38 (111.2)

Swivel Mount



A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	F in. (mm)	G dia in. (mm)
12.25 (311.2)	7.00 (177.8)	5.75 (146.0)	4.00 (101.6)	3.45 (87.6)	1.50 (38.1)	0.875 (22.2)

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Flo-tech
Hydraulic Diagnostic Products

Digital Displays

F6700/F6750 and F6600/F6650

DESCRIPTION

Flo-tech digital displays are designed for use with Flo-tech Activa, Ultima and Classic Flow Meters, but can be used with any frequency or analog output flow meter. The displays are powered by an AC or DC power source, and can be configured with a variety of communication protocols and units of measure. Basic functions include flow, temperature and pressure indication, totalization, alarm processing, and process control.

In addition to flow rate frequency signals derived from meter, the F6600/F6650 models accept inputs from switch contacts and outputs from CMOS or TTL circuits. These displays provide 6 different indications including counter A, counter B, counter C, rate, rate maximum, and rate minimum. Annunciators indicate which variable is being displayed.

F6600/F6650

F6700/F6750

FEATURES

F6700/F6750

- AC or DC power
- Five digit rate and total display
- 4…20 mA or 0…10V DC input
- Built-in transmitter power supply
- Three expansion card slots
- NEMA 4X/IP 65 rated enclosure
- CE compliant

F6600/F6650

- AC or DC power
- Six digit rate and total display
- Frequency input
- Built-in transmitter power supply
- Three expansion card slots
- NEMA 4X/IP 65 rated enclosure
- CE compliant

APPLICATIONS

Flo-tech digital displays are suitable for several flow metering applications where remote flow monitoring is required. Typical applications include:

- Hydraulic diagnostics, monitoring and test stands
- Mobile construction and marine equipment
- General industrial processes

PROGRAMMING

When ordered with a flow meter, flow meter data is configured and programmed at the factory. Replacement units can be programmed in the field via the front panel display, or at the factory if the flow meter serial number is provided.

Badger Meter

DSY-DS-02152-EN-03 (November 2021)

Product Data Sheet

OPERATION

Frequency or analog output signals generated from a flow metering device are interpreted by the display, and then calculated to provide a volumetric flow rate based on the flow meter properties. Flow rate units are scaled based on the configuration of the display. For flow sensor arrays that are configured with an additional pressure and/or temperature sensors, the digital displays have available inputs to accept and display these parameters.

Flow rate, pressure and temperature readings can be transmitted through the various communication protocols.

ADDITIONAL PRODUCTS

Part Number	Description	Use
F6542	Form C relay module	The optional plug-in card requires customer installation and setup. Use this feature with a display that includes a serial communication card (RS-232 or EIA-485).
F5140	K-factor scaler	Must be used with Flo-tech flow meters configured with frequency output and sizes SAE 8, G1/4 or equivalent.

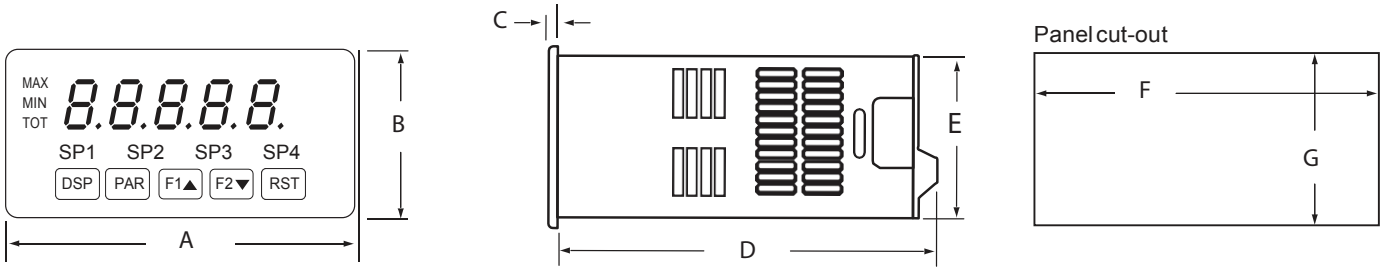
NOTE: For additional set point alarm options, consult the factory.

Expansion Cards

Analog Output	A linear DC output signal card can be set up to provide a 4…20 mA, 0…20 mA or 0…10V DC signals and can be scaled independent of the input range.
Communication	Optional plug-in cards to facilitate digital communications. See *"Model Number" on page 4* for options.
Setpoint Alarms	Select from dual FORM-C relays (5 Amp), Quad Form-A relays (3 Amp) or either sinking or sourcing quad open collector logic outputs.

NOTE: The analog output and communication cards will be installed at the factory at the time of order. They may be installed at a later date if ordered separately. The setpoint alarm cards are available for customer installation and configuration only.

DIMENSIONS



A*	B*	C	D	E	F	G
3.80 in. (96.5 mm)	1.95 in. (49.5 mm)	0.10 in. (2.5 mm)	4.10 in. (104.1 mm)	1.75 in. (44.5 mm)	3.62 in. (92.0 mm)	1.77 in. (45.0 mm)

*F6700/F6750 is shown, dimensions are the same for F6600/F6650

SPECIFICATIONS

F6700/F6750

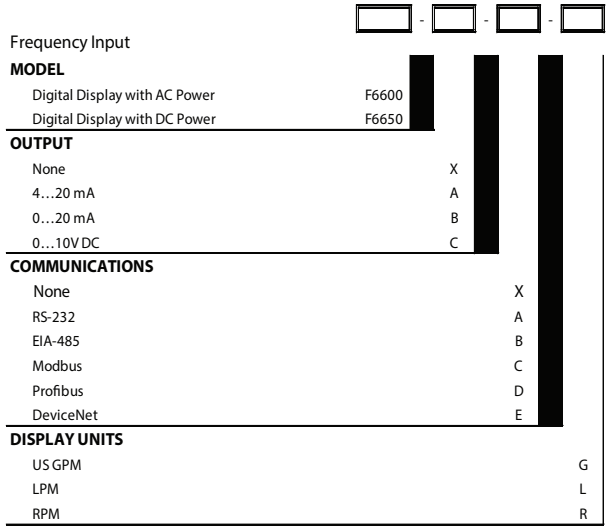
Display	5-digit, 0.56 in. sunlight-readable red LED	
Power	AC	85…250V AC, 50/60 Hz, 15 VA
	DC	11…36V DC, 11 W
A/D Converter	16-bit resolution	
A/D Conversion Rate	20 readings/sec	
Display Update Rate	1…20 updates/sec	
Sensor Inputs	4…20 mA or 0…10V DC	
Transmitter Power	24V DC, ±5%, regulated 50 mA max	
Totalizer Time Base	Second, minute, hour or day	
Total	9 digits, display alternates between high order and low order readouts	
Linearization Data Point Pairs	Selectable from 2…16	
Operating Temperature	32…122° F (0…50° C); 32…113° F (0…45° C) with all three plug-in cards installed	

F6600/F6650

Display	6-digit, 0.56 in. sunlight-readable red LED	
	Rate	5-digit max, ±0.01% accuracy
	Counter	8-digit max, >6 digits alternates between high order and low order
Power	AC	85…250V AC, 50/60 Hz, 18 VA
	DC	11…36V DC, 14 W
Sensor Power	12V DC, ±10%, 100 mA max, short circuit protected	
Inputs	Magnetic pickup	
	Frequency Range	0.01 to 34 K Hz
	Trigger Sensitivity	80 mV p-p
	Over Voltage Protected	±40 V peak
Operating Temperature	32…122° F (0…50° C); 32…113° F (0…45° C) with all three plug-in cards installed	

MODEL NUMBER

Frequency Input



Frequency Input					
MODEL					
Digital Display with AC Power	F6600				
Digital Display with DC Power	F6650				
OUTPUT					
None		X			
4…20 mA		A			
0…20 mA		B			
0…10V DC		C			
COMMUNICATIONS					
None			X		
RS-232			A		
EIA-485			B		
Modbus			C		
Profibus			D		
DeviceNet			E		
DISPLAY UNITS					
US GPM				G	
LPM				L	
RPM				R	

Analog Input

Analog Input					
MODEL					
Digital Display with AC Power	F6700				
Digital Display with DC Power	F6750				
OUTPUT					
None		X			
4…20 mA		A			
0…20 mA		B			
0…10V DC		C			
COMMUNICATIONS					
None			X		
RS-232			A		
EIA-485			B		
Modbus			C		
Profibus			D		
DeviceNet			E		
DISPLAY UNITS					
US GPM				G	
LPM				L	
RPM				R	
PSI				P	
BAR				B	
KG/CM2				K	
Mpa				M	
°F				F	
°C				C	

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Digital Displays

F6700/F6750 and F6600/F6650

DESCRIPTION

Flo-tech digital displays are designed for use with Flo-tech Activa, Ultima and Classic Flow Meters, but can be used with any frequency or analog output flow meter. The displays are powered by an AC or DC power source, and can be configured with a variety of communication protocols and units of measure. Basic functions include flow, temperature and pressure indication, totalization, alarm processing, and process control.

In addition to flow rate frequency signals derived from meter, the F6600/F6650 models accept inputs from switch contacts and outputs from CMOS or TTL circuits. These displays provide 6 different indications including counter A, counter B, counter C, rate, rate maximum, and rate minimum. Annunciators indicate which variable is being displayed.

F6600/F6650

F6700/F6750

FEATURES

F6700/F6750

- AC or DC power
- Five digit rate and total display
- 4…20 mA or 0…10V DC input
- Built-in transmitter power supply
- Three expansion card slots
- NEMA 4X/IP 65 rated enclosure
- CE compliant

F6600/F6650

- AC or DC power
- Six digit rate and total display
- Frequency input
- Built-in transmitter power supply
- Three expansion card slots
- NEMA 4X/IP 65 rated enclosure
- CE compliant

APPLICATIONS

Flo-tech digital displays are suitable for several flow metering applications where remote flow monitoring is required. Typical applications include:

- Hydraulic diagnostics, monitoring and test stands
- Mobile construction and marine equipment
- General industrial processes

PROGRAMMING

When ordered with a flow meter, flow meter data is configured and programmed at the factory. Replacement units can be programmed in the field via the front panel display, or at the factory if the flow meter serial number is provided.

Badger Meter

DSY-DS-02152-EN-03 (November 2021)

Product Data Sheet

OPERATION

Frequency or analog output signals generated from a flow metering device are interpreted by the display, and then calculated to provide a volumetric flow rate based on the flow meter properties. Flow rate units are scaled based on the configuration of the display. For flow sensor arrays that are configured with an additional pressure and/or temperature sensors, the digital displays have available inputs to accept and display these parameters.

Flow rate, pressure and temperature readings can be transmitted through the various communication protocols.

ADDITIONAL PRODUCTS

Part Number	Description	Use
F6542	Form C relay module	The optional plug-in card requires customer installation and setup. Use this feature with a display that includes a serial communication card (RS-232 or EIA-485).
F5140	K-factor scaler	Must be used with Flo-tech flow meters configured with frequency output and sizes SAE 8, G1/4 or equivalent.

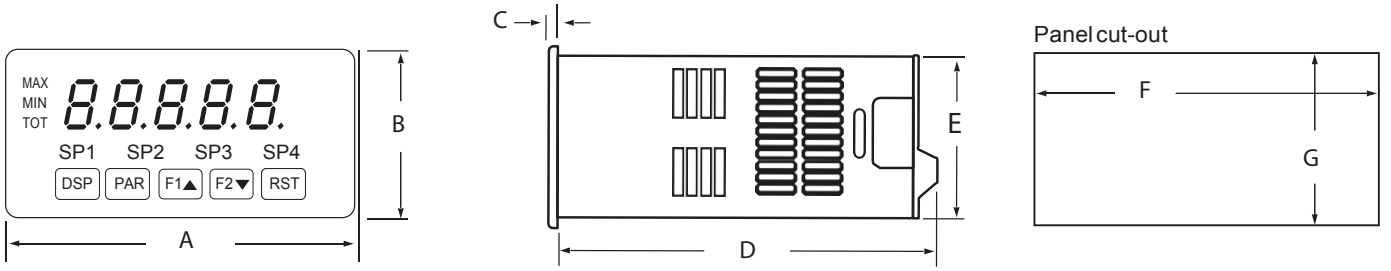
NOTE: For additional set point alarm options, consult the factory.

Expansion Cards

Analog Output	A linear DC output signal card can be set up to provide a 4…20 mA, 0…20 mA or 0…10V DC signals and can be scaled independent of the input range.
Communication	Optional plug-in cards to facilitate digital communications. See *"Model Number" on page 4* for options.
Setpoint Alarms	Select from dual FORM-C relays (5 Amp), Quad Form-A relays (3 Amp) or either sinking or sourcing quad open collector logic outputs.

NOTE: The analog output and communication cards will be installed at the factory at the time of order. They may be installed at a later date if ordered separately. The setpoint alarm cards are available for customer installation and configuration only.

DIMENSIONS



A*	B*	C	D	E	F	G
3.80 in. (96.5 mm)	1.95 in. (49.5 mm)	0.10 in. (2.5 mm)	4.10 in. (104.1 mm)	1.75 in. (44.5 mm)	3.62 in. (92.0 mm)	1.77 in. (45.0 mm)

*F6700/F6750 is shown, dimensions are the same for F6600/F6650

SPECIFICATIONS

F6700/F6750

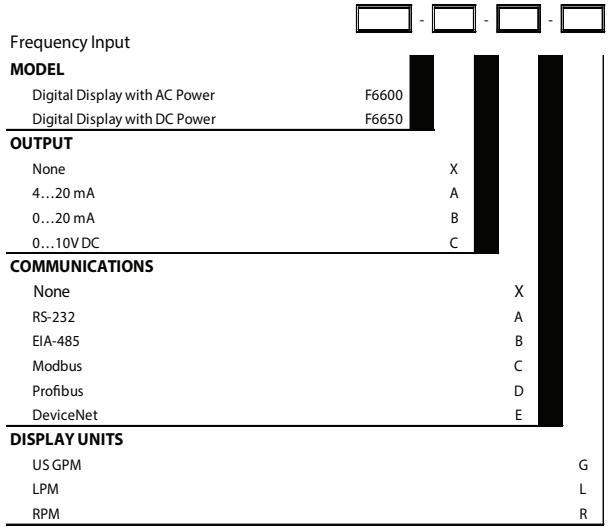
Display	5-digit, 0.56 in. sunlight-readable red LED	
Power	AC	85…250V AC, 50/60 Hz, 15 VA
	DC	11…36V DC, 11 W
A/D Converter	16-bit resolution	
A/D Conversion Rate	20 readings/sec	
Display Update Rate	1…20 updates/sec	
Sensor Inputs	4…20 mA or 0…10V DC	
Transmitter Power	24V DC, ±5%, regulated 50 mA max	
Totalizer Time Base	Second, minute, hour or day	
Total	9 digits, display alternates between high order and low order readouts	
Linearization Data Point Pairs	Selectable from 2…16	
Operating Temperature	32…122° F (0…50° C); 32…113° F (0…45° C) with all three plug-in cards installed	

F6600/F6650

Display	6-digit, 0.56 in. sunlight-readable red LED	
	Rate	5-digit max, ±0.01% accuracy
	Counter	8-digit max, >6 digits alternates between high order and low order
Power	AC	85…250V AC, 50/60 Hz, 18 VA
	DC	11…36V DC, 14 W
Sensor Power	12V DC, ±10%, 100 mA max, short circuit protected	
Inputs	Magnetic pickup	
	Frequency Range	0.01 to 34 K Hz
	Trigger Sensitivity	80 mV p-p
	Over Voltage Protected	±40 V peak
Operating Temperature	32…122° F (0…50° C); 32…113° F (0…45° C) with all three plug-in cards installed	

MODEL NUMBER

Frequency Input



Frequency Input					
MODEL					
Digital Display with AC Power	F6600				
Digital Display with DC Power	F6650				
OUTPUT					
None		X			
4…20 mA		A			
0…20 mA		B			
0…10V DC		C			
COMMUNICATIONS					
None			X		
RS-232			A		
EIA-485			B		
Modbus			C		
Profibus			D		
DeviceNet			E		
DISPLAY UNITS					
US GPM				G	
LPM				L	
RPM				R	

Analog Input

Analog Input					
MODEL					
Digital Display with AC Power	F6700				
Digital Display with DC Power	F6750				
OUTPUT					
None		X			
4…20 mA		A			
0…20 mA		B			
0…10V DC		C			
COMMUNICATIONS					
None			X		
RS-232			A		
EIA-485			B		
Modbus			C		
Profibus			D		
DeviceNet			E		
DISPLAY UNITS					
US GPM				G	
LPM				L	
RPM				R	
PSI				P	
BAR				B	
KG/CM2				K	
Mpa				M	
°F				F	
°C				C	

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Flo-tech
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Digital Displays

F6700/F6750 and F6600/F6650

DESCRIPTION

Flo-tech digital displays are designed for use with Flo-tech Activa, Ultima and Classic Flow Meters, but can be used with any frequency or analog output flow meter. The displays are powered by an AC or DC power source, and can be configured with a variety of communication protocols and units of measure. Basic functions include flow, temperature and pressure indication, totalization, alarm processing, and process control.

In addition to flow rate frequency signals derived from meter, the F6600/F6650 models accept inputs from switch contacts and outputs from CMOS or TTL circuits. These displays provide 6 different indications including counter A, counter B, counter C, rate, rate maximum, and rate minimum. Annunciators indicate which variable is being displayed.

F6600/F6650

F6700/F6750

FEATURES

F6700/F6750

- AC or DC power
- Five digit rate and total display
- 4…20 mA or 0…10V DC input
- Built-in transmitter power supply
- Three expansion card slots
- NEMA 4X/IP 65 rated enclosure
- CE compliant

F6600/F6650

- AC or DC power
- Six digit rate and total display
- Frequency input
- Built-in transmitter power supply
- Three expansion card slots
- NEMA 4X/IP 65 rated enclosure
- CE compliant

APPLICATIONS

Flo-tech digital displays are suitable for several flow metering applications where remote flow monitoring is required. Typical applications include:

- Hydraulic diagnostics, monitoring and test stands
- Mobile construction and marine equipment
- General industrial processes

PROGRAMMING

When ordered with a flow meter, flow meter data is configured and programmed at the factory. Replacement units can be programmed in the field via the front panel display, or at the factory if the flow meter serial number is provided.

Badger Meter

DSY-DS-02152-EN-03 (November 2021)

Product Data Sheet

OPERATION

Frequency or analog output signals generated from a flow metering device are interpreted by the display, and then calculated to provide a volumetric flow rate based on the flow meter properties. Flow rate units are scaled based on the configuration of the display. For flow sensor arrays that are configured with an additional pressure and/or temperature sensors, the digital displays have available inputs to accept and display these parameters.

Flow rate, pressure and temperature readings can be transmitted through the various communication protocols.

ADDITIONAL PRODUCTS

Part Number	Description	Use
F6542	Form C relay module	The optional plug-in card requires customer installation and setup. Use this feature with a display that includes a serial communication card (RS-232 or EIA-485).
F5140	K-factor scaler	Must be used with Flo-tech flow meters configured with frequency output and sizes SAE 8, G1/4 or equivalent.

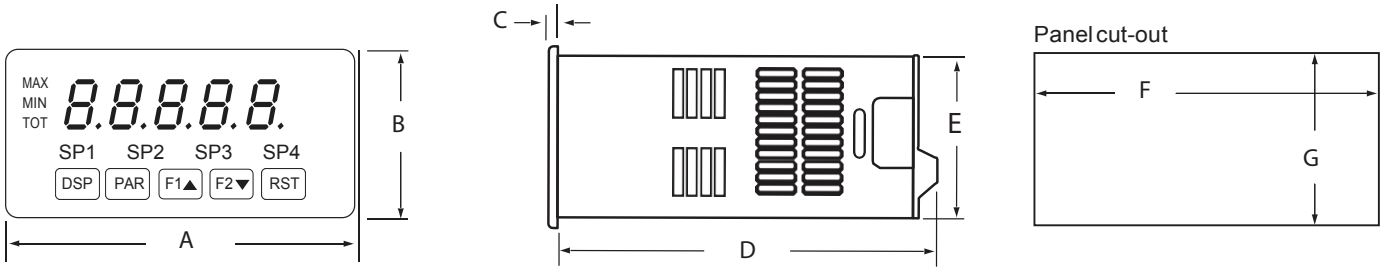
NOTE: For additional set point alarm options, consult the factory.

Expansion Cards

Analog Output	A linear DC output signal card can be set up to provide a 4…20 mA, 0…20 mA or 0…10V DC signals and can be scaled independent of the input range.
Communication	Optional plug-in cards to facilitate digital communications. See *"Model Number" on page 4* for options.
Setpoint Alarms	Select from dual FORM-C relays (5 Amp), Quad Form-A relays (3 Amp) or either sinking or sourcing quad open collector logic outputs.

NOTE: The analog output and communication cards will be installed at the factory at the time of order. They may be installed at a later date if ordered separately. The setpoint alarm cards are available for customer installation and configuration only.

DIMENSIONS



A*	B*	C	D	E	F	G
3.80 in. (96.5 mm)	1.95 in. (49.5 mm)	0.10 in. (2.5 mm)	4.10 in. (104.1 mm)	1.75 in. (44.5 mm)	3.62 in. (92.0 mm)	1.77 in. (45.0 mm)

*F6700/F6750 is shown, dimensions are the same for F6600/F6650

SPECIFICATIONS

F6700/F6750

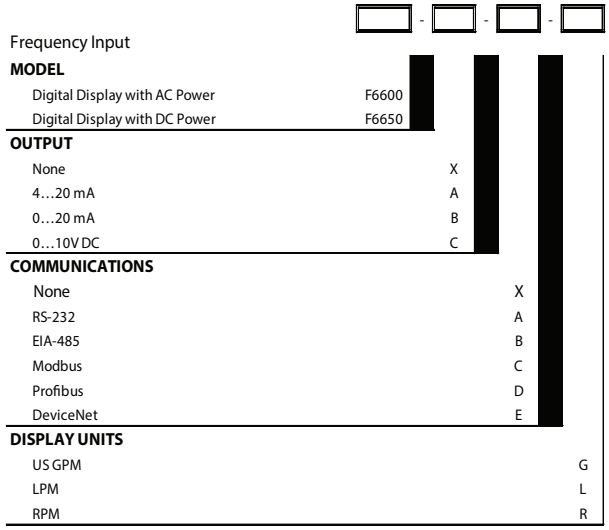
Display	5-digit, 0.56 in. sunlight-readable red LED	
Power	AC	85…250V AC, 50/60 Hz, 15 VA
	DC	11…36V DC, 11 W
A/D Converter	16-bit resolution	
A/D Conversion Rate	20 readings/sec	
Display Update Rate	1…20 updates/sec	
Sensor Inputs	4…20 mA or 0…10V DC	
Transmitter Power	24V DC, ±5%, regulated 50 mA max	
Totalizer Time Base	Second, minute, hour or day	
Total	9 digits, display alternates between high order and low order readouts	
Linearization Data Point Pairs	Selectable from 2…16	
Operating Temperature	32…122° F (0…50° C); 32…113° F (0…45° C) with all three plug-in cards installed	

F6600/F6650

Display	6-digit, 0.56 in. sunlight-readable red LED	
	Rate	5-digit max, ±0.01% accuracy
	Counter	8-digit max, >6 digits alternates between high order and low order
Power	AC	85…250V AC, 50/60 Hz, 18 VA
	DC	11…36V DC, 14 W
Sensor Power	12V DC, ±10%, 100 mA max, short circuit protected	
Inputs	Magnetic pickup	
	Frequency Range	0.01 to 34 K Hz
	Trigger Sensitivity	80 mV p-p
	Over Voltage Protected	±40 V peak
Operating Temperature	32…122° F (0…50° C); 32…113° F (0…45° C) with all three plug-in cards installed	

MODEL NUMBER

Frequency Input



Frequency Input					
MODEL					
Digital Display with AC Power	F6600				
Digital Display with DC Power	F6650				
OUTPUT					
None		X			
4…20 mA		A			
0…20 mA		B			
0…10V DC		C			
COMMUNICATIONS					
None			X		
RS-232			A		
EIA-485			B		
Modbus			C		
Profibus			D		
DeviceNet			E		
DISPLAY UNITS					
US GPM				G	
LPM				L	
RPM				R	

Analog Input

Analog Input					
MODEL					
Digital Display with AC Power	F6700				
Digital Display with DC Power	F6750				
OUTPUT					
None		X			
4…20 mA		A			
0…20 mA		B			
0…10V DC		C			
COMMUNICATIONS					
None			X		
RS-232			A		
EIA-485			B		
Modbus			C		
Profibus			D		
DeviceNet			E		
DISPLAY UNITS					
US GPM				G	
LPM				L	
RPM				R	
PSI				P	
BAR				B	
KG/CM2				K	
Mpa				M	
°F				F	
°C				C	

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Transmitters

Series 340 BN/MB Btu Energy Transmitter

DESCRIPTION

The 340 BN/MB Btu Energy Transmitter from Badger Meter® is an economical, compact device for sub-metering applications using the BACnet or Modbus® communications protocol.

The 340 BN/MB Btu Energy Transmitter calculates thermal energy using the signal from a flow sensor installed in a hydronic heating or chilled water system, and the signals from two 10 kΩ temperature thermistors, 100 Ω RTDs or 1000 Ω RTDs installed in the system's inlet and outlet points. The flow input may be provided by any Data Industrial sensor and many other pulse or sine wave signal flow sensors.

The on-board microcontroller and circuitry make precise measurements and produce accurate, drift-free outputs. The 340 BN/MB Btu Energy Transmitter is programmed using Badger Meter Windows®-based software. Calibration information for the flow sensor type and pipe size may be preselected or entered by the user in the field. While the unit is connected to a PC or laptop computer, real-time flow rate, flow total, temperatures, energy rate and energy total are available.

340 BN/MB Ordering Matrix

EXAMPLE:	8340 BN/MB	—	xx
SERIES			
Btu Energy Transmitter w/ output	8340 BN/MB		
OPTIONS			
Transmitter Only			00
With Metal Enclosure			02
With Plastic Enclosure			03
With DIN Rail Mounting Clips			04

The 340 BN/MB Btu Energy Transmitter features three indicator LEDs to verify the sensor input signal, network link and pulse output.

The 340 BN/MB Btu Energy Transmitter communicates via RS485.

The compact cast body measures 3.65 × 2.95 inches (93 × 75 mm) and can be easily mounted on panels, DIN rails or enclosures.

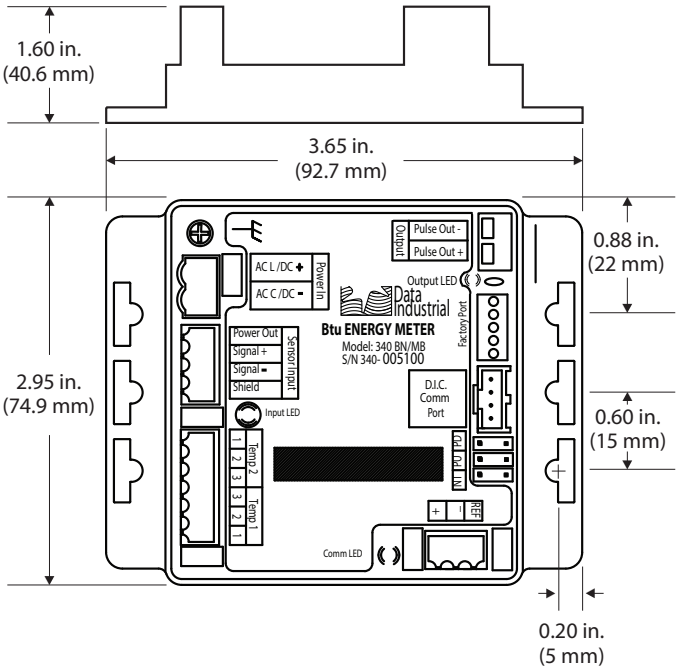

Figure 1: Overall dimensions

SPECIFICATIONS

Power	
Power supply	12…24V AC
	12…35V DC
Current draw:	115 mA max. at 12V DC
Flow Sensor Input	
Pulse Type Sensors:	
Signal amplitude	2.5V DC threshold
Signal limits	Vin < 12V (DC or AC peak)
Frequency range	4…1000 Hz
Pull-up:	15V DC @ 2k Ω source Impedance
Sine Wave Sensors:	
Signal amplitude	30 mV p-p threshold
Signal limits	Vin < 12V (DC or AC peak)
Frequency	4…1000 Hz
Power Out Terminal	15V DC ± 1V DC @ 500 Ω source Impedance
Temperature Sensor (2 of same type required) Input	
• 10k Ω thermistor, 2 wire, type II, 10k Ω @ 25° C (77° F)	
• 100 Ω platinum RTD, DIN calibration curve, conforms to IEC-751 Standard	
• 1000 Ω platinum RTD, DIN calibration curve, conforms to IEC-751 Standard	
Calibration range of measurement	0…150° C (32…302° F)
Communication Port	RS-485 with termination, pull-up and pull-down jumpers
Pulse Output	
• Isolated solid-state switch in any standard or custom total units	
• Adjustable 50 ms to 1.0 second pulse output width in 50 ms increments	
Maximum sinking current:	100 mA @ 36V DC
Temperature	
Operating	0…70° C (32…158° F)
Storage	– 40…85° C (– 40…185° F)
Weight	4.8 oz with connector headers installed
Sensor Calibration	
Badger Meter	Use K and offset values provided in sensor manual
Other Sensors	Check with respected manufacturer of flow sensor and with factory
Units of Measure	
Flow Measurement:	
Rate	gpm, gph, l/sec, l/min, l/hr, ft^3/sec, ft^3/min, ft^3/hr, m^3/sec, m^3/min, m^3/hr
Total	Gallons, Gallons X 100, Gallons X 1000, Liters, Cubic Feet, Cubic Meters
Energy Measurement:	
Rate	kBtu/min, kBtu/hr, kW, MW, hp, tons
Total	Btu, kBtu, MBtu, kWh, MWh, kJ, MJ
Temperature Measurement	Fahrenheit, Centigrade
Programming	
• Requires PC or laptop running Windows operating system	
• Data Industrial 340BN/MB Programming Kit 840134-0002 containing software and Data Industrial Series programming cable is required for programming and setup	

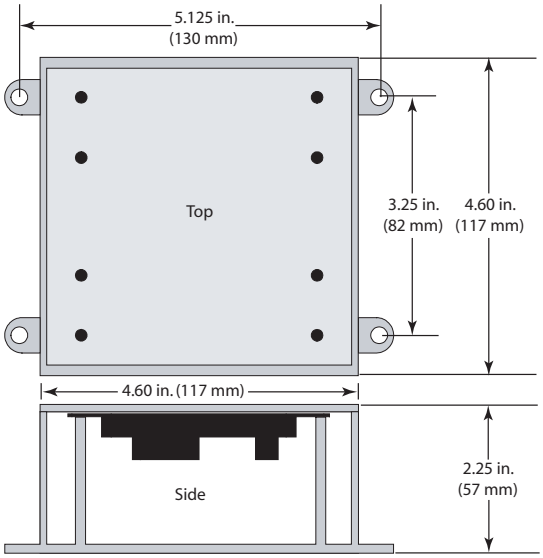

Figure 2: Plastic enclosure dimensions

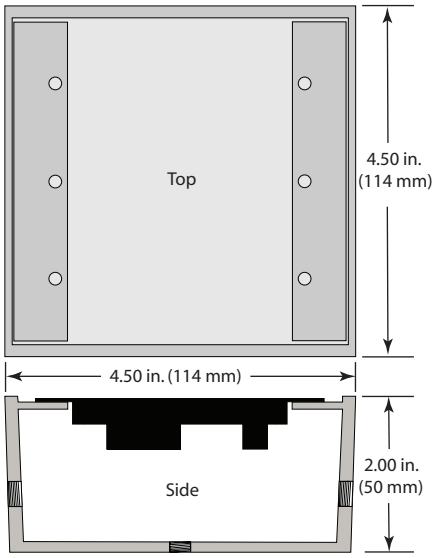

Figure 3: Metal enclosure dimensions

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Impeller
Data Industrial®

Flow Sensors

Series 220PVCS Insertion Style Flow Sensors

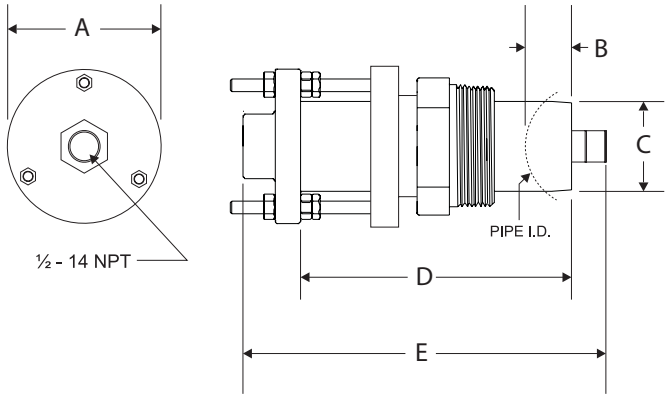
DESCRIPTION

The Data Industrial® Series 200 flow sensors from Badger Meter® feature a six-bladed impeller design with a proprietary non-magnetic sensing mechanism. The forward swept impeller shape provides higher, more consistent torque and is less prone to be fouled by waterborne debris. The forward curved shape coupled with the absence of magnetic drag provides improved operation and repeatability at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate. The signal can travel up to 2000 ft between the flow sensor and the display unit without the need for amplification. All sensors except irrigation versions are supplied with 20 ft of Belden type 9320 two-conductor shielded cable.

MODEL 220PVCS

The 220PVCS flow sensor is an insertion style flow sensor constructed of non-metallic materials for all wetted parts. These sensors are designed for service in corrosive liquids. The metallic trim, in non-wetted areas, is 316 stainless steel. The sensor mounts in a 2 in. NPT thread and may be attached to the pipe with a saddle or other types of mounting hardware.

DIMENSIONS



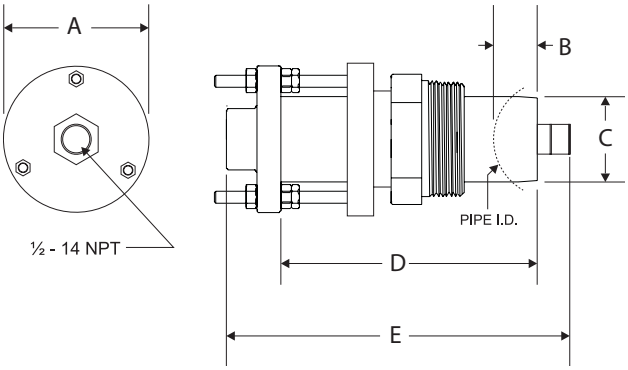
A	B	C	D	E
3-1/4 in.	1-1/2 in.	1-9/10 in.	8 in.	9-11/16 in.
83 mm	38 mm	48 mm	203 mm	249 mm

Figure 1: Dimensions for 220PVCS

SPECIFICATIONS

Wetted Materials	Impeller & Bearing: Tefzel®
	Shaft: Zirconia ceramic
	Housing: Glass reinforced polyphenylene sulfide (PPS)
	O-Ring: Ethylene propylene (EPDM)
	Sleeve & Mounting Adapter: Polyvinyl chloride (PVC)
Trim	316 stainless steel
Maximum Pressure	100 psi (6.9 bar) @ 68° F (20° C)
Recommended Design Flow Range	0.5…30 ft/sec (0.15…9.1 m/sec) Initial detection below 0.3 ft/sec (0.09 m/sec)
Accuracy	± 1.0% of full scale over recommended design flow range
Repeatability	± 0.3% of full scale over recommended design flow range
Linearity	± 0.2% of full scale over recommended design flow range
Transducer Excitation	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 uA (typical)
	OFF State (V_{High}) = Supply voltage – (600 uA * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Output Frequency	3.2…200 Hz
Output Pulse Width	5 msec ±25%
Electrical Cable for Standard Sensor Electronics	20 ft (6 m) of 2-conductor 20 AWG shielded UL type PTLC wire provided for connection to display or analog transmitter unit. Rated to 221° F (105° C). May be extended to a maximum of 2000 ft (610 m) with similar cable and insulation appropriate for application.
Electrical Cable for IR Sensor Electronics	48 in. (122 cm) of UL style 116666 copper solid AWG 18 wire with direct burial insulation. Rated to 221° F (105° C).
Certifications	CE certified

DIMENSIONS



A	B	C	D	E
3-1/4 in.	1-1/2 in.	1-9/10 in.	8 in.	9-11/16 in.
83 mm	38 mm	48 mm	203 mm	249 mm

Figure 2: Dimensions for 220PVCS

PART NUMBERING CONSTRUCTION

Example:	2	20	PVS	00	0	5	-	1	0	2	2
STYLE											
Standard Flow		20									
MATERIAL											
PVC Sleeve w/Stainless Steel Trim			PVS								
SIZE											
Insert Style for pipe sizes 3" and up				00							
ELECTRONICS HOUSING											
PPS					0						
ELECTRONICS											
Standard Flow (STANDARD)						5					
IR-Irrigation						6					
O-RING											
Viton®								0			
EPDM (STANDARD)								1			
Buna N								8			
SHAFT											
Zirconia Ceramic									0		
Tungsten Carbide (STANDARD)									2		
316 Stainless Steel									6		
IMPELLER											
Nylon (STANDARD)										1	
Tefzel®										2	
BEARING											
UHMWPE (STANDARD)											1
Tefzel®											2
Teflon®											3

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Impeller
Data Industrial®

Flow Sensors

Series 220SS Insertion Style Flow Sensors

DESCRIPTION

The Data Industrial® Series 200 flow sensors from Badger Meter® feature a six-bladed impeller design with a proprietary non-magnetic sensing mechanism. The forward swept impeller shape provides higher, more consistent torque and is less prone to be fouled by waterborne debris. The forward curved shape coupled with the absence of magnetic drag provides improved operation and repeatability at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate. The signal can travel up to 2000 feet between the flow sensor and the display unit without the need for amplification. All sensors except irrigation versions are supplied with 20 feet of Belden type 9320 two-conductor shielded cable.

MODEL 220SS (STAINLESS STEEL)

The 220SS sensors are used in most general flow measuring applications in metallic or non-metallic pipes. The sensor mounts in a 2 in. NPT pipe saddle or Threadolet® for installation in pipe sizes from 3 inches to more than 40 in. Positioning nuts on the three threaded retaining rods allow the sensor to be accurately positioned to a standard insertion depth of 1-1/2 in. into the pipe. When this insertion depth is maintained, and there are at least 10 upstream and 5 downstream diameters of straight uninterrupted flow, an accuracy of +/–1 percent of full scale can be obtained from flow velocities of 0.5…30 feet/second (± 4.0 percent of reading within calibration range).

SPECIFICATIONS

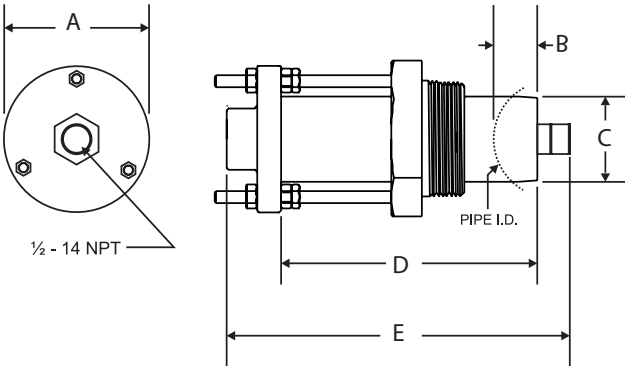
Wetted Materials for all Sensors	See *"Part Number Construction" on page2*
Sensor Sleeve and Hex Adapter	Series 300 stainless steel
Temperature Ratings	Standard version: 221° F (105° C) continuous service
	High temperature version: 285° F (141° C) continuous service; 305° F (150° C) peak temperature (limited duration)
Pressure Ratings	**At 100° F** 400 psi | **At 300° F (High Temperature Version Only)** 325 psi
Recommended Design Flow Range	0.5…30 ft/sec (0.15…9.1 m/sec) Initial detection below 0.3 ft/sec (0.09 m/sec)
Accuracy	± 1.0% of full scale over recommended design flow range
Repeatability	± 0.3% of full scale over recommended design flow range
Linearity	± 0.2% of full scale over recommended design flow range
Transducer Excitation	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 µA (typical)
	OFF State (V_{High}) = Supply voltage – (600 µA * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Output Frequency	3.2…200 Hz
Output Pulse Width	5 msec ±25%
Electrical Cable for Standard Sensor Electronics	20 ft (6 m) of 2-conductor 20 AWG shielded UL type PTLC wire provided for connection to display or analog transmitter unit. Rated to 221° F (105° C). May be extended to a maximum of 2000 ft (610 m) with similar cable and insulation appropriate for application.
Electrical Cable for IR Sensor Electronics	48 in. (122 cm) of UL style 116666 copper solid AWG 18 wire with direct burial insulation. Rated to 221° F (105° C).
Certification	CE certified

Badger Meter

SEN-DS-02245-EN-05 (October 2021)

Product Data Sheet

DIMENSIONS



A	B	C	D	E
3 in.	1-1/2 in.	1-3/4 in.	5-1/4 in.	7-1/8 in.
76 mm	38 mm	44 mm	133 mm	181 mm

Figure 1: Dimensions for 220SS

PART NUMBERING CONSTRUCTION

Standard Sensor

Example: 2	20	SS	00	0	5	-	1	2	1	1	
STYLE											
Standard Flow	20										
MATERIAL											
Stainless Steel		SS									
SIZE											
Insert Style for pipe sizes 3" and up			00								
ELECTRONICS HOUSING											
PPS				0							
ELECTRONICS											
Standard Flow (STANDARD)					5						
IR-Irrigation					6						
O-RING											
Viton®							0				
EPDM (STANDARD)							1				
Buna N							8				
SHAFT											
Zirconia Ceramic								0			
Tungsten Carbide (STANDARD)								2			
316 Stainless Steel								6			
IMPELLER											
Nylon (STANDARD)									1		
Tefzel®									2		
BEARING											
UHMWPE (STANDARD)										1	
Tefzel®										2	
Teflon®										3	

High Temperature Sensor

Example:	2	20	SS	00	4	8	-	0	2	2	3

STYLE

Standard Flow — 20

MATERIAL

Stainless Steel — SS

SIZE

Insert Style for pipe sizes 3" and up — 00

ELECTRONICS HOUSING

PEEK — 4

ELECTRONICS

High Temperature — 8

O-RING

Viton® — 0

SHAFT

Tungsten Carbide (STANDARD) — 2

IMPELLER

Tefzel® — 2

BEARING

Teflon® — 3

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Impeller Data Industrial®

Flow Sensors

Series 220BR Insertion Style Flow Sensors

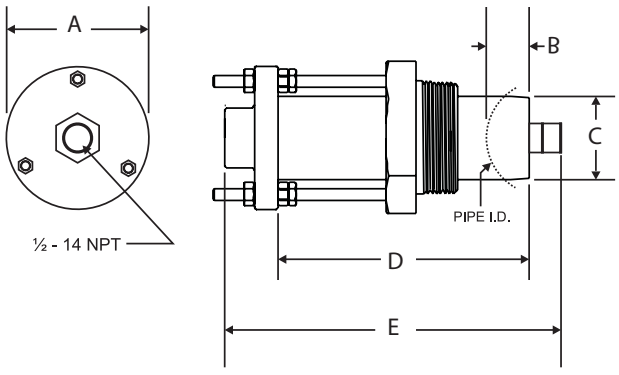
DESCRIPTION

The Data Industrial® Series 200 flow sensors from Badger Meter® feature a six-bladed impeller design with a proprietary non-magnetic sensing mechanism. The forward swept impeller shape provides higher, more consistent torque and is less prone to be fouled by waterborne debris. The forward curved shape coupled with the absence of magnetic drag provides improved operation and repeatability at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate. The signal can travel up to 2000 feet between the flow sensor and the display unit without the need for amplification. All sensors except irrigation versions are supplied with 20 feet of Belden type 9320 2-conductor shielded cable.

MODEL 220BR (BRASS)

220BR sensors are used in most general flow measuring applications in metallic or non-metallic pipes. The sensor mounts in a 2 in. NPT pipe saddle or Threadolet® for installation in pipe sizes from 3 in. to more than 40 in. Positioning nuts on the three threaded retaining rods allow the sensor to be accurately positioned to a standard insertion depth of 1-1/2 in. into the pipe. When this insertion depth is maintained, and there are at least 10 upstream and 5 downstream diameters of straight uninterrupted flow, an accuracy of +/–1 percent of full scale can be obtained from flow velocities of 0.5…30 feet/second (± 4.0 percent of reading within calibration range).

DIMENSIONS



A	B	C	D	E
3 in.	1-1/2 in.	1-3/4 in.	5-1/4 in.	7-1/8 in.
76 mm	38 mm	44 mm	133 mm	181 mm

Figure 1: Dimensions for 220BR

SPECIFICATIONS

Wetted Materials for all Sensors	See *"Part Number Construction" on page 2*
Sensor Sleeve and Hex Adapter	Sleeve: Admiralty brass, UNS C44300
	Hex adapter: Lead-free brass, C89833
Temperature Ratings	Standard version: 221° F (105° C) continuous service
	High temperature version: 285° F (141° C) continuous service; 305° F (150° C) peak temperature (limited duration)
Pressure Ratings	**At 100° F** / **At 300° F (High Temperature Version Only)**
	400 psi / 325 psi
Recommended Design Flow Range	0.5…30 ft/sec (0.15…9.1 m/sec) Initial detection below 0.3 ft/sec (0.09 m/sec)
Accuracy	± 1.0% of full scale over recommended design flow range
Repeatability	± 0.3% of full scale over recommended design flow range
Linearity	± 0.2% of full scale over recommended design flow range
Transducer Excitation	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 uA (typical)
	OFF State (V_{High}) = Supply voltage – (600 µ * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Output Frequency	3.2…200 Hz
Output Pulse Width	5 msec ±25%
Electrical Cable for Standard Sensor Electronics	20 ft (6 m) of 2-conductor 20 AWG shielded UL type PTLC wire provided for connection to display or analog transmitter unit. Rated to 221° F (105° C). May be extended to a maximum of 2000 ft (610 m) with similar cable and insulation appropriate for application.
Electrical Cable for IR Sensor Electronics	48 in. (122 cm) of UL style 116666 copper solid AWG 18 wire with direct burial insulation. Rated to 221° F (105° C).
Certifications	CE certified

Badger Meter

SEN-DS-02246-EN-05 (November 2021)

Product Data Sheet

PART NUMBERING CONSTRUCTION

Standard Sensor

Example:	2	20	BR	00	0	5	-	1	2	1	1

STYLE
- Standard Flow: 20

MATERIAL
- Brass: BR

SIZE
- Insert Style for pipe sizes 3" and up: 00

ELECTRONICS HOUSING
- PPS: 0

ELECTRONICS
- Standard Flow (STANDARD): 5
- IR-Irrigation: 6

O-RING
- Viton®: 0
- EPDM (STANDARD): 1
- Buna N: 8

SHAFT
- Zirconia Ceramic: 0
- Tungsten Carbide (STANDARD): 2
- 316 Stainless Steel: 6

IMPELLER
- Nylon (STANDARD): 1
- Tefzel®: 2

BEARING
- UHMWPE (STANDARD): 1
- Tefzel®: 2
- Teflon®: 3

High Temperature Sensor

Example:	2	20	BR	00	4	8	-	0	2	2	3

STYLE
- Standard Flow: 20

MATERIAL
- Brass: BR

SIZE
- Insert Style for pipe sizes 3" and up: 00

ELECTRONICS HOUSING
- PEEK: 4

ELECTRONICS
- High Temperature: 8

O-RING
- Viton®: 0

SHAFT
- Tungsten Carbide (STANDARD): 2

IMPELLER
- Tefzel®: 2

BEARING
- Teflon®: 3

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Oval Gear
Industrial Oval Gear Flow Meters

Industrial Oval Gear

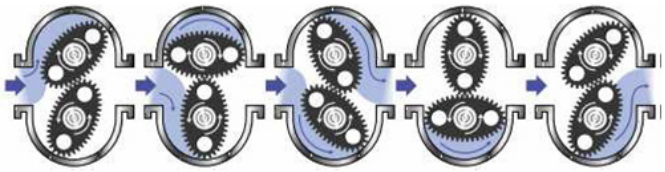
Meters and Registers

DESCRIPTION

The Industrial Oval Gear Meter is a modular flow meter design, economical yet highly accurate and rugged. Due to the rugged nature of this particular flow measurement technology, the industrial Oval Gear Meter can be used in a number of applications where conventional meters are not acceptable.

OPERATION PRINCIPLE

Fluid enters the inlet port and then passes through the metering chamber. Inside the chamber, fluid forces the internal gears to rotate before exiting through the outlet port. Each rotation of the gears displaces a specific volume of fluid. As the gears rotate, a magnet on each end of the gear pass a reed switch in the top-mounted register's circuit board. The reed switches send pulses to the microprocessor in the register to change the LED display segments. The oval gear meter can be used in conjunction with a variety of industrial registers.



ADVANTAGES

- Highest quality, made in Germany
- Cost effective and commercially competitive product due to the most up to date automated production techniques
- Wide range of sizes, materials, displays and component options
- Most items ex stock for fast delivery, benefit from low shipping cost
- Local support, worldwide

FEATURES

- High accuracy and repeatability
- Insensitive to viscosity change – Maintains accuracy
- Not affected by pulsating flows
- Can be mounted in tight pipework and any orientation
- Most industrial communications and outputs available
- Custom options available
- ATEX approval

APPLICATIONS

Whether the liquid being measured is very viscous or highly corrosive, the oval gear meter can handle it. The industrial oval gear is designed for a variety of chemical applications including petroleum based fluids, water solutions, and any other liquid compatible with the materials of construction.

Badger Meter

IOG-DS-03385-EN-09 (October 2023)

Product Data Sheet

PROCESS CONNECTIONS

Port Size	Housing Material	NPT/BSP	ANSI 150#	ANSI 300#	DIN	Tri-Clamp®
1/8 in.	Stainless	1450 psi (100 bar)	n/a	n/a	n/a	n/a
1/4 in.	PVDF	230 psi (16 bar)				
	Stainless	1450 psi (100 bar)				
	Aluminum	940 psi (65 bar)				
1/2 in.	Stainless	3000 psi (210 bar)	275 psi (20 bar)	790 psi (55 bar)	230 psi (16 bar)	230 psi (16 bar)
	Aluminum	2000 psi (140 bar)	n/a	n/a	n/a	n/a
3/4 in.	PVDF	230 psi (16 bar)	n/a	n/a	n/a	n/a
	Stainless	3000 psi (210 bar)	275 psi (20 bar)	790 psi (55 bar)	230 psi (16 bar)	230 psi (16 bar)
	Aluminum	2000 psi (140 bar)	n/a	n/a	n/a	n/a
1 in.	Stainless	3000 psi (210 bar)	275 psi (20 bar)	790 psi (55 bar)	230 psi (16 bar)	230 psi (16 bar)
	Aluminum	2000 psi (140 bar)	n/a	n/a	n/a	n/a
1 in. HF	PVDF	230 psi (16 bar)	n/a	n/a	n/a	n/a
	Stainless	3000 psi (210 bar)	275 psi (20 bar)	790 psi (55 bar)	230 psi (16 bar)	230 psi (16 bar)
	Aluminum	2000 psi (140 bar)	275 psi (20 bar)	790 psi (55 bar)	230 psi (16 bar)	n/a
1-1/2 in.	Stainless	720 psi (50 bar)	275 psi (20 bar)	720 psi (50 bar)	230 psi (16 bar)	230 psi (16 bar)
	Aluminum	720 psi (50 bar)	275 psi (20 bar)	720 psi (50 bar)	230 psi (16 bar)	n/a
2 in.	Stainless	580 psi (40 bar)	275 psi (20 bar)	580 psi (40 bar)	230 psi (16 bar)	145 psi (10 bar)
	Aluminum	580 psi (40 bar)	275 psi (20 bar)	580 psi (40 bar)	230 psi (16 bar)	n/a
3 in.	Stainless	360 psi (25 bar)	275 psi (20 bar)	360 psi (25 bar)	230 psi (16 bar)	n/a
	Aluminum	360 psi (25 bar)	275 psi (20 bar)	360 psi (25 bar)	230 psi (16 bar)	n/a

High pressure ratings on request

SPECIFICATIONS

Housing and connection by size	
Sizes	1/8 in., 1/4 in., 1/2 in., 3/4 in., 1 in., 1 in. HF, 1-1/2 in., 2 in. and 3 in.
Aluminum	NPT, BSP, 150# flange, DIN flange EN 1092-1/05
Stainless	NPT, BSP, 150# or 300# flange, DIN flange Tri-Clamp®
PVDF	BSP, NPT

Operating temperature	**Housing**	**Oval gears**
Stainless steel	-22° F … 240° F (-30° C … 120° C)	-22° F … 240° F (-30° C … 120° C)
Plastic (PPS/LCP)	-22° F … 176° F (-30° C … 80° C)	-22° F … 176° F (-30° C … 80° C)
Aluminum	-22° F … 240° F (-30° C … 120° C)	
PVDF	14° F … 140° F (-10° C … 60° C)	
Storage temperature for all units	-67° F / 257° F (-55° C / 125° C)	

Viscosity
Max 1000 mPas with standard rotors / 500000 mPas with high viscosity rotors

FLOW RANGE

Port Size	l/min	gpm	Fluid viscosity	Accuracy (%)	Accuracy PVDF (%)	Repeatability (%)
1/8 in.	0.017 … 0.83	0.0044 … 0.22	>5.0 cP	±1.0	—	±0.03
	0.034 … 0.83	0.0088 … 0.22	<5.0 cP	±1.5	—	±0.03
1/4 in. LF*	0.04 … 1.6	0.01 … 0.4	>5.0 cP	±1.0	±1.5	±0.03
	0.09 … 1.6	0.02 … 0.4	<5.0 cP	±1.5	±2.5	±0.03
1/4 in.*	0.25 … 8.3	0.067 … 2.2	>5.0 cP	±1.0	±1.5	±0.03
	0.44 … 8.3	0.11 … 2.2	<5.0 cP	±1.5	±2.5	±0.03
1/2 in.	1 … 30	0.25 … 8.0	>5.0 cP	±0.5	—	±0.03
	2 … 25	0.5 … 6.6	<5.0 cP	±1.5	—	±0.03
3/4 in.	2 … 60	0.5 … 16	>5.0 cP	±0.5	±1.5	±0.03
	4.5 … 53	1.2 … 14	<5.0 cP	±1.5	±2.5	±0.03
1 in.	2.3 … 68	0.6 … 18	>5.0 cP	±0.5	±1.5	±0.03
	5.3 … 60	1.4 … 16	<5.0 cP	±1.5	±2.5	±0.03
1 in. HF	5.7 … 170	1.5 … 45	>5.0 cP	±0.5	—	±0.03
	9.5 … 150	2.6 … 40	<5.0 cP	±1.5	—	±0.03
	5.7 … 120	1.5 … 31	>5.0 cP	—	±1.5	±0.03
	9.5 … 120	2.6 … 31	<5.0 cP	—	±2.5	±0.03
1-1/2 in.	9.5 … 245	2.5 … 65	>5.0 cP	±0.5	—	±0.03
	15 … 227	4.0 … 60	<5.0 cP	±1.5	—	±0.03
2 in.	15 … 380	4.0 … 100	>5.0 cP	±0.5	—	±0.03
	23… 380	6.0 … 100	<5.0 cP	±1.0	—	±0.03
3 in.	20 … 700	5.0 … 185	>5.0 cP	±0.5	—	±0.03
	38 … 700	10 … 185	<5.0 cP	±1.0	—	±0.03

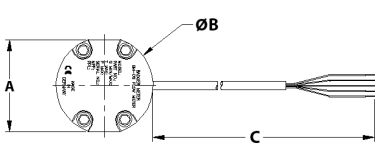
*Special calibration with the following viscosities is possible for the 1/8 in. and 1/4 in. meters.

MATERIAL OF CONSTRUCTION

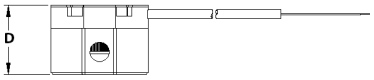
Port Size	Housing	Cover	Spindle	Gears	Bearings	O-Ring	Bolts
1/8 in.	316 SS	316 SS	316 SS	316 SS	Graphite	Viton	316 SS
1/4 in.	316 SS	316 SS		316 SS	Graphite		
	6061/6082 Al	6061/6082 Al		PPS			
1/2 in.	316 SS	316 SS		316 SS	Graphite		
	6061/6082 Al	6061/6082 Al		LCP or PPS			
3/4 in.	316 SS	316 SS		316 SS	Graphite	Aflas	
	6061/6082 Al	6061/6082 Al		LCP or PPS			
1 in.	316 SS	316 SS		316 SS	Graphite		
	6061/6082 Al	6061/6082 Al		LCP or PPS			
1 in. HF	316 SS	316 SS		316 SS	Graphite	EPDM	
	6061/6082 Al	6061/6082 Al		PPS			
1- 1/2 in.	316 SS	316 SS		316 SS	Graphite		
	6061/6082 Al	6061/6082 Al		PPS		Kalrez	
2 in.	316 SS	316 SS		316 SS	Graphite		
	6061/6082 Al	6061/6082 Al		PPS			
3 in.	316 SS	316 SS		316 SS	Graphite		
	6061/6082 Al	6061/6082 Al		PPS			

NOTE: All PVDF devices are supplied with Hastelloy-C spindles.

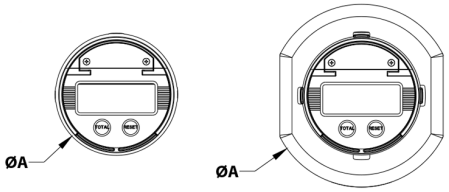
DIMENSIONS



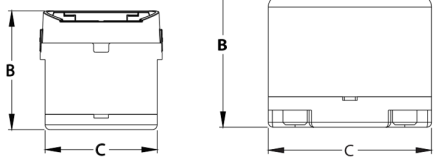
Sizes 1/4" LF



Sizes 1/4" LF

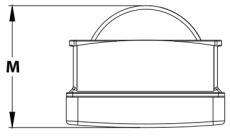


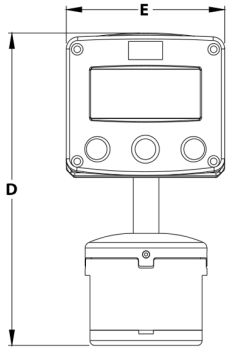
ILR 700 through 740



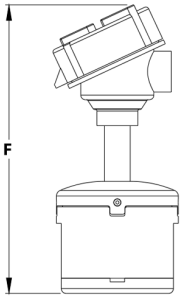
Sizes 1/2", 3/4", 1", 1" HF

Sizes 1-1/2", 2", 3"

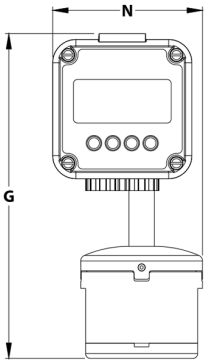




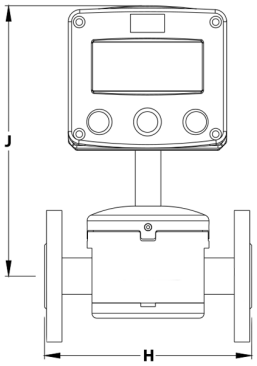
ER-420 (F-Series)

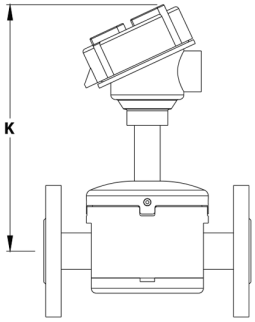


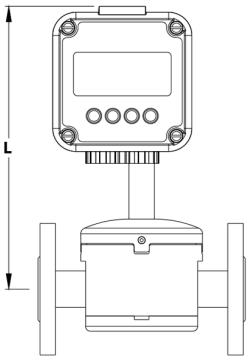
ILR-741



ER-500





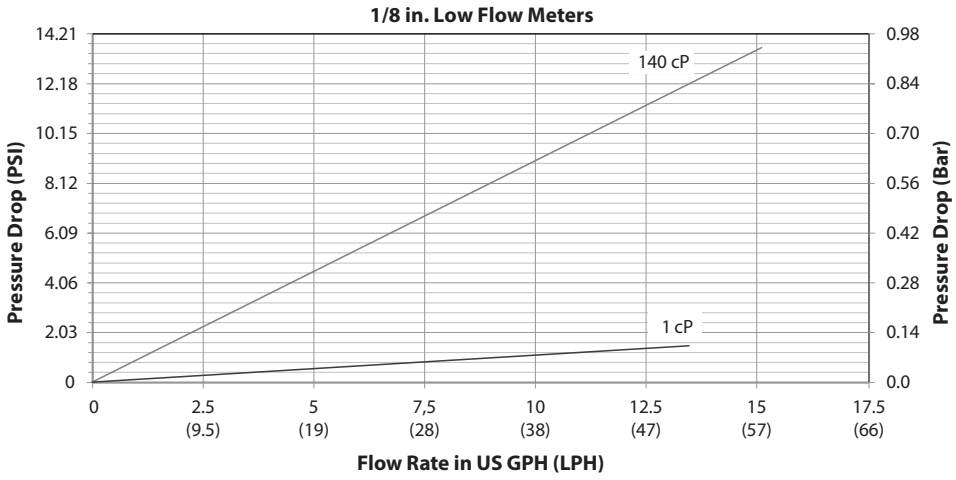


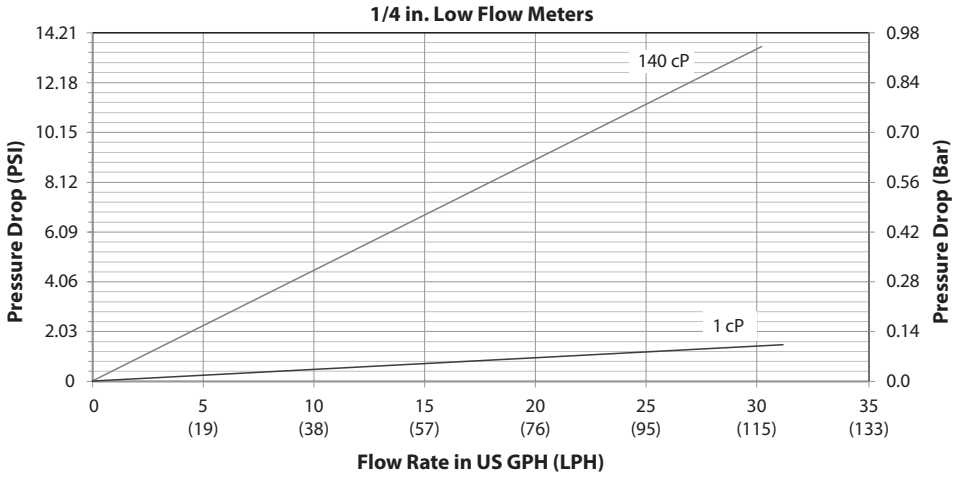
Sizes 1/2", 3/4", 1", 1" HF, 1-1/2", 2", 3"

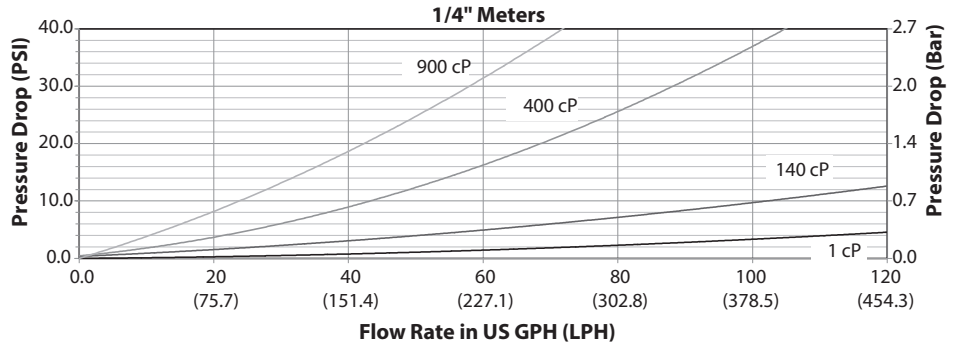
Port Size	A	B	C	D	E	F	G	H	J	K	L	M	N
1/8 in.	2.05 in. (52 mm)	2.17 in. (55 mm)	118 in. (3000 mm)	0.79 in. (20 mm)	—	—	—	—	—	—	—	—	—
1/4 in. LF	2.05 in. (52 mm)	2.17 in. (55 mm)	118 in. (3000 mm)	1.54 in. (39 mm)	—	—	—	—	—	—	—	—	—
1/4 in.	2.05 in. (52 mm)	2.17 in. (55 mm)	118 in. (3000 mm)	1.54 in. (39 mm)	—	—	—	—	—	—	—	—	—
1/2 in.	3.94 in. (100 mm)	3.44 in. (87.5 mm)	3.62 in. (92 mm)	9.70 in. (246.4 mm)	5.12 in. (130 mm)	8.93 in. (226.8 mm)	10.10 in. (256.5 mm)	6.69 in. (170 mm)	8.45 in. (214.6 mm)	7.68 in. (195.1 mm)	8.89 in. (225.8 mm)	3.94 in. (100.2 mm)	4.84 in. (122.9 mm)
3/4 in.	3.94 in. (100 mm)	3.84 in. (97.5 mm)	3.62 in. (92 mm)	10.10 in. (256.5 mm)	5.12 in. (130 mm)	9.33 in. (236.9 mm)	10.50 in. (266.7 mm)	6.69 in. (170 mm)	8.70 in. (220.9 mm)	7.93 in. (201.4 mm)	9.14 in. (232.2 mm)	3.94 in. (100.2 mm)	4.84 in. (122.9 mm)
1 in.	3.94 in. (100 mm)	3.84 in. (97.5 mm)	3.62 in. (92 mm)	10.10 in. (256.5 mm)	5.12 in. (130 mm)	9.33 in. (236.9 mm)	10.50 in. (266.7 mm)	6.69 in. (170 mm)	8.70 in. (220.9 mm)	7.93 in. (201.4 mm)	9.14 in. (232.2 mm)	3.94 in. (100.2 mm)	4.84 in. (122.9 mm)
1 in. HF	3.94 in. (100 mm)	3.89 in. (98.9 mm)	3.62 in. (92 mm)	10.15 in. (257.8 mm)	5.12 in. (130 mm)	9.38 in. (238.3 mm)	10.55 in. (268.0 mm)	6.69 in. (170 mm)	8.60 in. (218.4 mm)	7.83 in. (198.8 mm)	9.04 in. (229.6 mm)	3.94 in. (100.2 mm)	4.84 in. (122.9 mm)
1-1/2 in.	5.51 in. (140 mm)	4.93 in. (125.3 mm)	4.92 in. (125 mm)	11.15 in. (283.2 mm)	5.12 in. (130 mm)	10.38 in. (263.7 mm)	11.51 in. (292.4 mm)	8.35 in. (212 mm)	8.90 in. (226.1 mm)	8.13 in. (206.5 mm)	9.31 in. (236.5 mm)	N/A	N/A
2 in.	5.91 in. (150 mm)	5.34 in. (135.6 mm)	5.28 in. (134 mm)	11.60 in. (294.6 mm)	5.12 in. (130 mm)	10.83 in. (275.1 mm)	11.96 in. (303.8 mm)	10.39 in. (264 mm)	9.16 in. (232.7 mm)	8.39 in. (213.1 mm)	9.57 in. (243.1 mm)	N/A	N/A
3 in.	8.27 in. (210 mm)	6.35 in. (162 mm)	7.09 in. (180 mm)	12.57 in. (319.3 mm)	5.12 in. (130 mm)	11.80 in. (299.7 mm)	12.93 in. (328.4 mm)	13.54 in. (344 mm)	9.58 in. (243.3 mm)	8.81 in. (223.8 mm)	9.99 in. (253.8 mm)	N/A	N/A

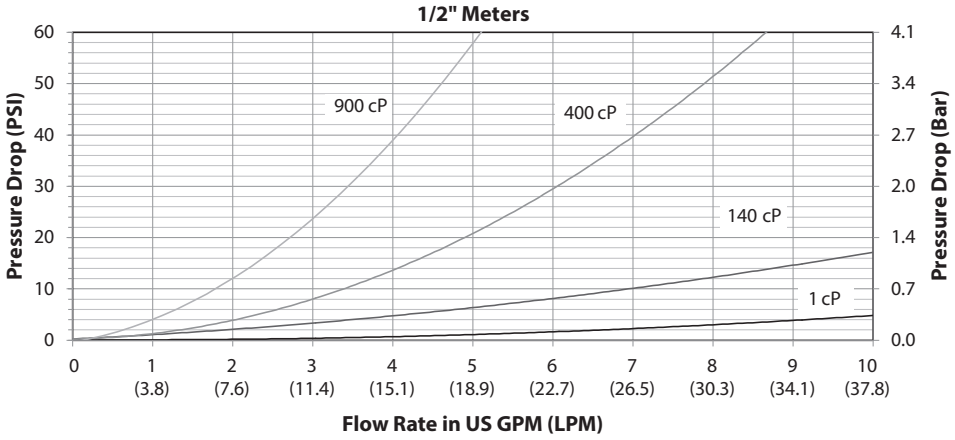
NOTE: ILR register series not compatible with 3 in. meter.

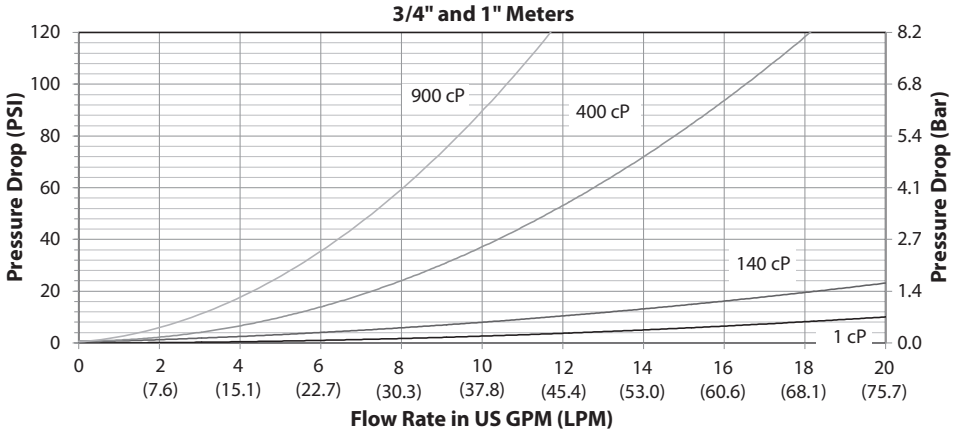
PRESSURE DROP VS. FLOW RATE

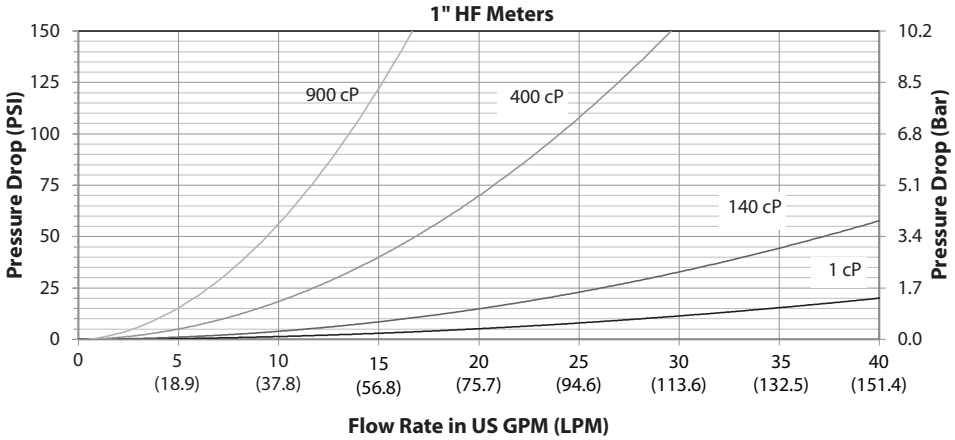


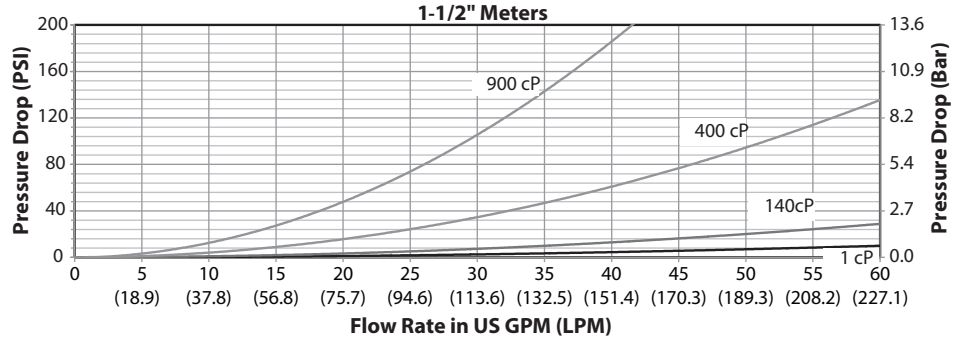


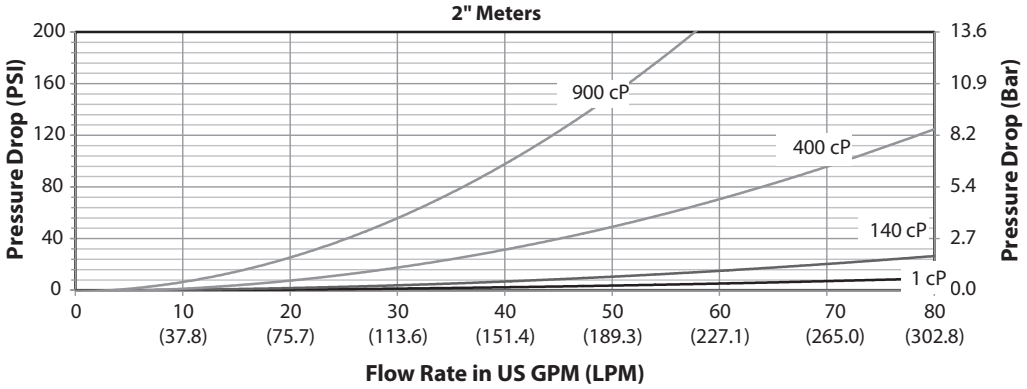


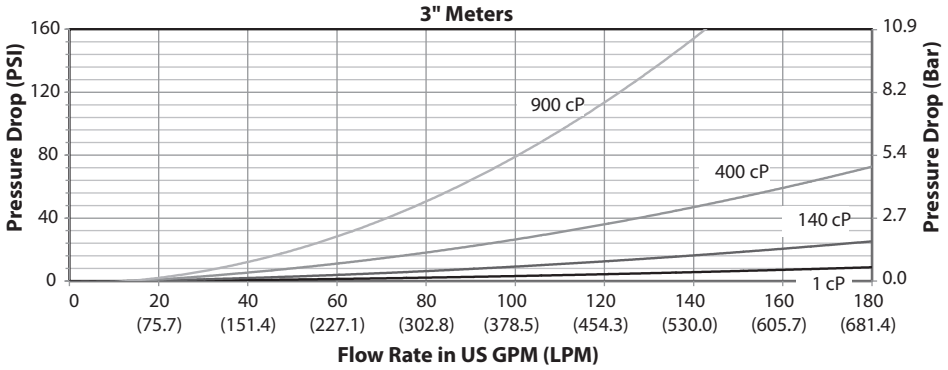

1/2" Meters
Pressure Drop (PSI)
Pressure Drop (Bar)
900 cP
400 cP
140 cP
1 cP
0 10 20 30 40 50 60
0.0 0.7 1.4 2.0 2.7 3.4 4.1
0 1 2 3 4 5 6 7 8 9 10
(3.8) (7.6) (11.4) (15.1) (18.9) (22.7) (26.5) (30.3) (34.1) (37.8)
Flow Rate in US GPM (LPM)


3/4" and 1" Meters
Pressure Drop (PSI)
Pressure Drop (Bar)
900 cP
400 cP
140 cP
1 cP
0 20 40 60 80 100 120
0.0 1.4 2.7 4.1 5.4 6.8 8.2
0 2 4 6 8 10 12 14 16 18 20
(7.6) (15.1) (22.7) (30.3) (37.8) (45.4) (53.0) (60.6) (68.1) (75.7)
Flow Rate in US GPM (LPM)


1" HF Meters
Pressure Drop (PSI)
Pressure Drop (Bar)
900 cP
400 cP
140 cP
1 cP
0 25 50 75 100 125 150
0.0 1.7 3.4 5.1 6.8 8.5 10.2
0 5 10 15 20 25 30 35 40
(18.9) (37.8) (56.8) (75.7) (94.6) (113.6) (132.5) (151.4)
Flow Rate in US GPM (LPM)


1-1/2" Meters
Pressure Drop (PSI)
Pressure Drop (Bar)
900 cP
400 cP
140cP
1 cP
0 40 80 120 160 200
0.0 2.7 5.4 8.2 10.9 13.6
0 5 10 15 20 25 30 35 40 45 50 55 60
(18.9) (37.8) (56.8) (75.7) (94.6) (113.6) (132.5) (151.4) (170.3) (189.3) (208.2) (227.1)
Flow Rate in US GPM (LPM)


2" Meters
Pressure Drop (PSI)
200
160
120
80
40
0
13.6
10.9
8.2
5.4
2.7
0.0
Pressure Drop (Bar)
900 cP
400 cP
140 cP
1 cP
0
10 (37.8)
20 (75.7)
30 (113.6)
40 (151.4)
50 (189.3)
60 (227.1)
70 (265.0)
80 (302.8)
Flow Rate in US GPM (LPM)


3" Meters
Pressure Drop (PSI)
160
120
80
40
0
10.9
8.2
5.4
2.7
0.0
Pressure Drop (Bar)
900 cP
400 cP
140 cP
1 cP
0
20 (75.7)
40 (151.4)
60 (227.1)
80 (302.8)
100 (378.5)
120 (454.3)
140 (530.0)
160 (605.7)
180 (681.4)
Flow Rate in US GPM (LPM)

INDUSTRIAL LINE REGISTERS
Type ILR 700, 701, 740, 741, 750

Description

The electronic register module contains a microprocessor board powered by a lithium battery. It can be programmed to batch in liters, pints, quarts, or gallons and will totalize in liters or gallons. A calibration factor and unit of measure are programmed during factory test. Unlike mechanical registers, these units can be electronically recalibrated in the field when necessary.
A 6 digit LC display, accurate to three decimal places, shows the exact amount of fluid that has passed through the meter. The entire register module is protected from normal wear and tear by a rugged, shock resistant housing.
If the total dispensed exceeds 999.999 then the display will shift and only 2 digits will be displayed after the decimal point, 9999.99 and will continue to shift to the maximum value of 999999. After reaching 999999 the batch totalizer will rollover to 0.000. The batch totalizer is reset to zero when the reset button is depressed.
The register also has a resettable totalizer that requires that the total and reset button both be depressed to reset (hold the "Total" button, then press the "Reset" button to reset this totalizer while resettable totalize is displayed). This would be used for multiple batch totalization purposes.
The register´s life time totalizer is 11 digits and will either be in gallons or liters based on the unit of measure selected. Pushing and holding the total button while the life time totalizer is displayed will display the full 11 digit life time totalizer value.

Operation

Industrial Oval Gear Meter has magnets on the gears that cause the reed switches to send pulses to the register as they rotate.

The register is in a sleep mode until it detects these pulses caused by fluid going through the meter. The micro-processor in the register then measures the flow and will display either the batch totalization or the flow rate of the fluid going through the meter on the 6 digit display.

The registers batch totalizer is a 6 digit display with three places of resolution after the decimal point.

Features

- Large six digit LCD display
- Display in liters, pints, quarts or gallons, freely programmable
- 11 digits, non-resettable lifetime totalizer and 6 digits, resettable totalizer
- ILR series: -4° F … 176° F (-20° C … 80° C)
- Replaceable long life battery
- Calibration factor saved in non-volatile memory
- 9 point linearization (ILR 750, ILR 701). Test medium is water
- Scalable pulse output (ILR 750)
- 4 … 20 mA output (ILR 750)
- Protection class IP65

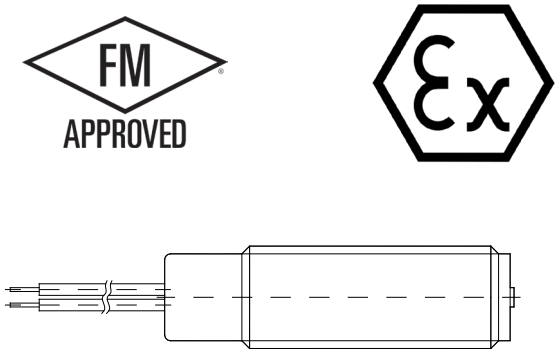
Register Model	Register features	Temperature Ranges
ILR 700 Standard register	Flow rate or totalizer display selectable in the programming menu Selectable unit of measure	-4 … 176° F (-20 … 80° C)
ILR 701	9 point linearization	
ILR 750 pulse output 4 … 20 mA output	Scalable pulse output Ability to set pulse output length Analog 4 … 20 mA output representing the flow rate of the meter Minimum and maximum values can be set for analog output 9 point linearization	

NOTE: The ILR 701 and 750 all have the standard features of the ILR 700.

ILR 740 Transmitter	Transmitter (reed switch)	-40 … 257° F (-40 … 125° C)
ILR 741 Transmitter	NEMA 4x enclosure and adapter	
ER 420 (F110) Flow rate/Totalizer	Refer to the ER 420 product data sheet and user manual for additaional, detailed information.	-22 … 176° F (-30 … 80° C)
ER 500 Flow rate/Totalizer	Refer to the ER 500 product data sheet and user manual for additaional, detailed information.	-22 … 158° F (-30 … 70° C)

NOTE: The ILR register series is not compatible with 3 in. meters.

NPN AND PNP SENSOR FOR HAZARDOUS LOCATION



Specifications

Switching function	Open collector
Output type	NPN or PNP 3-wire (2 versions available)
Supply voltage	5 … 30 V DC (I ≤ 15 mA)
Supply current	100 mA max (Pmax = 0.66 watt)
Effective internal inductivity	Ci ≤ 12 nF
Effective internal inductance	Li ≤ 0 µH
Cable length	118 inch (3 meters)
Material	Stainless steel 1.4404 (316L)
Protection class	IP66 / IP67

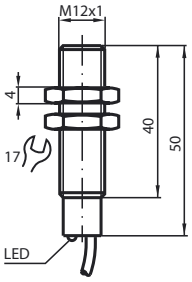
Marking

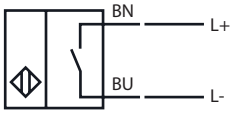
USA	Intrinsically safe Class I, II, III, Division 1 GROUP ABCDEFG T6 to T5
Canada	Intrinsically safe Class I, Division 1 GROUP ABCD T6 to T5 Class I, Zone 0, Ex ia IIC T6 to T5
ATEX	Ex II 1G Ex ia IIC T6 to T4 Ga
IIECEx	Ex ia IIC T6 to T4 Ga

NAMUR SENSOR

CE 0102

FM APPROVED





Specifications

Switching function	Normally open (NO)
Output type	NAMUR 2-wire
Nominal voltage	Uo 8.2 V (Ri approx. 1 kΩ)
Effective internal inductivity	Ci ≤ 15 nF; a cable length of 32.8 feet (10 m) is considered
Effective internal inductance	Li ≤ 35 µH; a cable length of 32.8 feet (10 m) is considered
Switch state indicator	LED (yellow)
Ambient temperature	-13 … 158° F (-25 … 70° C)
Cable length	78 inch (2 meters) (PVC)
Core cross-section	0.34 mm^2
Material	Stainless steel 1.4404 (316L)
Protection class	IP66 / IP67

Marking

Namur	CE 0102 / Ex II2G Ex ib IIC T6 Gb

REED AND HALL BOARD

Description

Using the reed or hall board, unscaled pulses can be transmitted from the meter to an evaluation instrument like a SPS or a flow computer. The size of the meter can be selected by the slide switch on the circuit board, so all meter sizes

1/2 … 3 in. are covered with only one circuit board. Further slide switches on the hall board enable various settings, as pulse doubling, pull-up resistance or signal invertion. As well both outputs can be used with only one or two separated power supplies.

Pulse Factors for ILR 740, Reed and Hall Board

Size	Pulse per gallon	Pulse per liter
1/8 in.	17032	Approx. 4500
1/4 in. LF*	8213.4	Approx. 2170
1/4 in.*	1476	Approx. 390
1/2 in.	378.5	100
3/4 in.	249.8	66
1 in.	249.8	66
1 in. HF	162.8	43
1-1/2 in.	64.4	17
2 in.	34.1	9
3 in.	11.4	3

* 2 pulse outputs: 1 reed, 1 hall, standard for all 1/8 in. and 1/4 in. meters.

Features

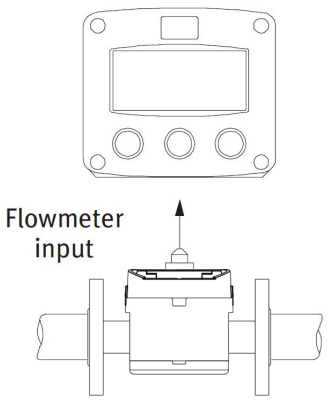
- One reed or hall board for all meter sizes (1/2 in. … 3 in.)
- Meter size can be selected on the cicuit board
- Available in stainless steel 316, aluminum and POM (for PVDF version)
- Two pulse outputs each via reed or hall 90° out-of-phase to detect the flow direction
- Hall board with optional pulse doubling and optional pull-up resistor
- Hall signal with option for positive or negative edge
- Power supply for Hall 24V DC

ER420 [F-SERIES (F012, F018, ER420 (F110), F131)]

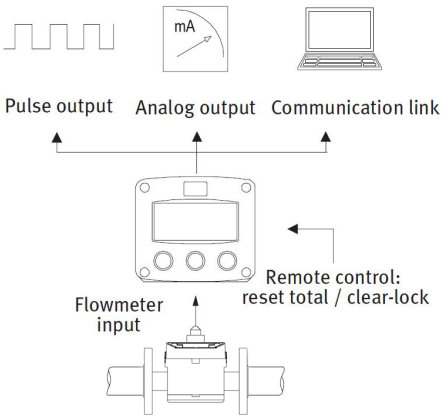
Features

- With the ER420 (F-Series) the following signals types can be processed: Turbine sine wave (coil) pick-ups, reed switches, hall-effect sensors and other active or passive.
- Analog output (0)4 … 20 mA or 0 … 10 V DC
- Temperature ranges -22 … 176° F (-30 … 80° C)
- Modbus via RS232, RS485 or TTL interface
- Scaled pulse output
- HART 7.0 option
- Meter control
- ER420 (F110) Temperature Range
- ATEX markings for gas and dust applications are:
  II 1 G Ex ia IIC T4
  II 1 D Ex iaD 20 IP 65/67 T 100° C

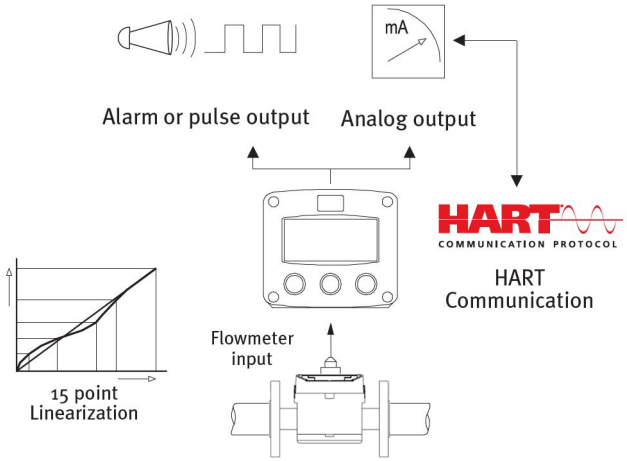
Overview Application F012



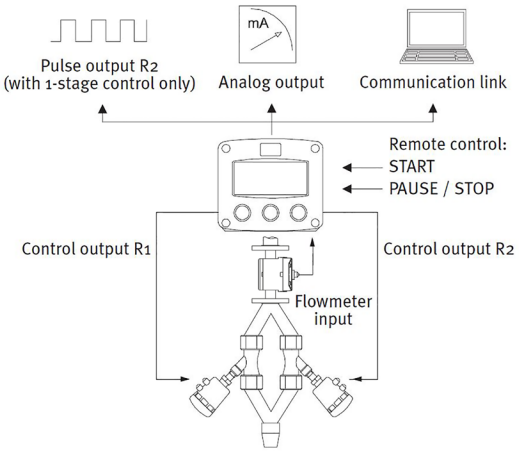
Overview Application ER420 (F110)



Overview Application F018



Overview Application F131



FLOW MONITOR ER-500

Input

Frequency range	1 … 3500 Hz
Frequency accuracy	±0.1 %
Over voltage protection	28 V DC

Outputs

Analog:	4 … 20 mA

Totalizing Pulse

Optoisolated (ISO) open collector transistor, non-isolated open drain FET.

Status Alarms

Open collector transistor, adjustable flow rate with programmable dead band and phase.

Modbus

Modbus RTU over RS485, 127 addressable units / 2-wire network, 9600 baud, long integer and single precision IEEE754 formats; retrieve: flow rate, job totalizer, grand totalizer, alarm status and battery level; write: reset job totalizer, reset grand totalizer.

Protection Class

NEMA 4X/IP 66

For more information, see the data sheet "Flow Monitor ER-500".

Features

- Compact size.
- High accuracy and repeatability (0.05 %).
- Flexibility of installation options.
- Robust alarm parameters provide faster warning when something changes in the process or pipeline.
- Advanced connectivity options allow you to connect meters to your network for remote monitoring and process automation capabilities.
- Flexible power options include battery and 4 … 20 mA loop power, providing a number of benefits including: The ability to install in remote location and be up and running immediately.
- Maintains readings and settings in the event of a power loss, and pro-long the life of the batteries for up to 6 years.
- An updated display and enhanced totalization options provide more flow information at your fingertips, including display of rate and total at the same time and standard, batch and grand totals.

PART NUMBER CONSTRUCTION

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - M3 - [ ][YF] - [ ]

METER SIZE (LINE SIZE)		
1/8 in (6 mm)	1,0 - 50 liter per hour	001
BASE MATERIAL 1/8" (6 mm)		
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
ROTORS		
STANDARD		ST
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
REED / HALL	Pulser reed switch free of potential / pulser hall sensor 3-wire external powered 6-24 VDC	T8
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	TM
F001	Wall mount remote display with pulse output and analog output, units - l/min, l/hr,… 3 decimals	FW
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - M3 - [ ][ ] - [ ]

METER SIZE (LINE SIZE)												
1/4 in (8 mm) LOW FLOW	2,4 - 100 liter per hour	L02										
BASE MATERIAL 1/4", 1/4" LOW FLOW (8 mm, 8 mm LOW FLOW)												
ALUMINUM (6061/6081) BODY / STAINLESS STEEL (316L) ROTORS			AS									
ALUMINUM (6061/6081) BODY / RYTON (PPS) ROTORS			AR									
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS			SS									
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS			SR									
KYNAR (PVDF) BODY / STAINLESS STEEL (316L) ROTORS			KS									
KYNAR (PVDF) BODY / RYTON (PPS) ROTORS			KR									
ROTORS												
STANDARD				ST								
PROCESS CONNECTION												
NPT, STANDARD FEMALE					NAA							
BSP, STANDARD FEMALE					BAA							
SEALS												
FKM/VITON						V						
TFE(P)/AFLAS						A						
FFKM/KALREZ						K						
EPDM						E						
REGISTRATION												
METER MOUNTED TRANSMITTERS												
REED / HALL	Pulser reed switch free of potential / pulser hall sensor 3-wire external powered 6-24 VDC						T8					
REMOTE REGISTRATION												
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)							RD				
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)							RE				
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)							RF				
F012A	8-30VDC / Battery / Backlight							TA				
F012B	8-30VDC / Battery / Backlight / intrinsically safe							TB				
F012C	115 - 230 VAC / Backlight							TC				
F018A	8-30VDC / Battery / Backlight / HART 7.0							TD				
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe							TE				
F110A	8-30VDC / Battery / Backlight / Analog+pulse output							TF				
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe							TG				
F110C	115-230VAC / Backlight / Analog+pulse output							TH				
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output							TI				
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output							TJ				
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs							TK				
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs							TL				
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe							TN				
F131D	24VDC / Backlight / Batch / 2 Relay outputs							TM				
F001	Wall mount remote display with pulse output and analog output, units - l/min, l/hr,… 3 decimals							FW				
ER-500S	24VDC / Battery / Analog+Pulse output							PR				
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485							PA				
NONE								XX				
UNIT OF MEASURE/PROGRAMMING												
LITERS									LTR			
NONE									XXX			
REMOTE CABLE LENGTH												
3M STANDARD CABLE										M3		
NONE										WW		
CERTIFICATION												
NONE											W	
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY											F	
SILICON FREE											L	
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE											E	
SERIALIZATION METER												
YR MFG 8D, NONE												YF
NONE												XX
Additional Options												
5 POINT CALIBRATION REPORT												BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)												BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)												BC
NONE												XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - M3 - [ ][ ] YF - [ ]

METER SIZE (LINE SIZE)		
1/4 in (8 mm)	15 - 500 liter per hour	002
BASE MATERIAL 1/4", 1/4" LOW FLOW (8 mm, 8 mm LOW FLOW)		
ALUMINUM (6061/6081) BODY / STAINLESS STEEL (316L) ROTORS		AS
ALUMINUM (6061/6081) BODY / RYTON (PPS) ROTORS		AR
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS		SR
KYNAR (PVDF) BODY / STAINLESS STEEL (316L) ROTORS		KS
KYNAR (PVDF) BODY / RYTON (PPS) ROTORS		KR
ROTORS		
STANDARD		ST
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
REED / HALL	Pulser reed switch free of potential / pulser hall sensor 3-wire external powered 6-24 VDC	T8
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	TM
F001	Wall mount remote display with pulse output and analog output, units - l/min, l/hr,… 3 decimals	FW
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][ ] YF - [ ]

METER SIZE (LINE SIZE)		
1/2 in (15 mm)	1 ~ 30 l/min (0.25 ~ 8 USG/min)	005
BASE MATERIAL 1/2" - 3/4" - 1" (15 mm, 20 mm, 25 mm)		
ALUMINUM (6061/6081) BODY / VECTRA (LCP) ROTORS		AV
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS		SR
STAINLESS STEEL (316L) BODY / VECTRA (LCP) ROTORS		SV
ROTORS		
STANDARD		ST
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
ASME; CLASS 150 FLG; RF (Only for SST housing)		FAA
ASME; CLASS 300 FLG; RF (Only for SST housing)		FAB
DIN; PN 16 FLG (Only for SST housing)		FEC
TRI-CLAMP (DIN 32676) (Only for SST housing)		TAA
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
ILR-740	Unscaled Pulse Output (w/ 3 meter cable)	T1
ILR-741	Unscaled Pulse Output (no cable)	T2
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)	T3
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)	T4
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)	T5
REED	Reed switch board with cable gland (no cable)	T6
HALL	Hall board with cable gland (no cable)	T7
METER MOUNTED REGISTRATION / BATCH CONTROLLERS		
ILR-700	Standard display rate / total / total resettable	D1
ILR-701	Display rate / total / total resettable / Linearization	D2
ILR-750	Display rate / total / total resettable / pulse out / 4-20mA / Linearization / 6-24VDC (w/3 meter cable)	D3
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC	AA
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC	A4
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED	AL
F012A	8-30VDC / Battery / Backlight	FA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	FB
F012C	115 - 230 VAC / Backlight	FC
F018A	8-30VDC / Battery / Backlight / HART 7.0	FD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	FE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	FF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	FG
F110C	115-230VAC / Backlight / Analog+pulse output	FH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	FI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	FJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	FK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	FL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	FN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	FM
ER-500S	24VDC / Battery / Analog+Pulse output	ER
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	EA
NONE		XX
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	g+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	TM
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][ ] YF - [ ]

METER SIZE (LINE SIZE)														
3/4 in (20 mm)	2 ~ 60 l/min (0.5 ~ 16 USG/min)	007												
BASE MATERIAL 1/2" - 3/4" - 1" (15 mm, 20 mm, 25 mm)														
ALUMINUM (6061/6081) BODY / VECTRA (LCP) ROTORS			AV											
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS			SS											
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS			SR											
STAINLESS STEEL (316L) BODY / VECTRA (LCP) ROTORS			SV											
KYNAR (PVDF) BODY / RYTON (PPS) ROTORS			KR											
KYNAR (PVDF) BODY / VECTRA (LCP) ROTORS			KV											
ROTORS														
STANDARD				ST										
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**				HV										
PROCESS CONNECTION														
NPT, STANDARD FEMALE					NAA									
BSP, STANDARD FEMALE					BAA									
ASME; CLASS 150 FLG; RF (Only for SST housing)					FAA									
ASME; CLASS 300 FLG; RF (Only for SST housing)					FAB									
DIN; PN 16 FLG (Only for SST housing)					FEC									
TRI-CLAMP (DIN 32676) (Only for SST housing)					TAA									
SEALS														
FKM/VITON						V								
TFE(P)/AFLAS						A								
FFKM/KALREZ						K								
EPDM						E								
REGISTRATION														
METER MOUNTED TRANSMITTERS														
ILR-740	Unscaled Pulse Output (w/ 3 meter cable)						T1							
ILR-741	Unscaled Pulse Output (no cable)						T2							
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)						T3							
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)						T4							
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)						T5							
REED	Reed switch board with cable gland (no cable)						T6							
HALL	Hall board with cable gland (no cable)						T7							
METER MOUNTED REGISTRATION / BATCH CONTROLLERS														
ILR-700	Standard display rate / total / total resettable						D1							
ILR-701	Display rate / total / total resettable / Linearization						D2							
ILR-750	Display rate / total / total resettable / pulse out / 4-20mA / Linearization / 6-24VDC (w/3 meter cable)						D3							
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC						AA							
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC						A4							
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED						AL							
F012A	8-30VDC / Battery / Backlight						FA							
F012B	8-30VDC / Battery / Backlight / intrinsically safe						FB							
F012C	115 - 230 VAC / Backlight						FC							
F018A	8-30VDC / Battery / Backlight / HART 7.0						FD							
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe						FE							
F110A	8-30VDC / Battery / Backlight / Analog+pulse output						FF							
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe						FG							
F110C	115-230VAC / Backlight / Analog+pulse output						FH							
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output						FI							
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output						FJ							
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs						FK							
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs						FL							
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe						FN							
F131D	24VDC / Backlight / Batch / 2 Relay outputs						FM							
ER-500S	24VDC / Battery / Analog+Pulse output						ER							
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485						EA							
NONE							XX							
REMOTE REGISTRATION														
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)							RD						
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)							RE						
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)							RF						
F012A	8-30VDC / Battery / Backlight							TA						
F012B	8-30VDC / Battery / Backlight / intrinsically safe							TB						
F012C	115 - 230 VAC / Backlight							TC						
F018A	8-30VDC / Battery / Backlight / HART 7.0							TD						
F018B	ght / HART 7.0 / intrinsically safe							TE						
F110A	8-30VDC / Battery / Backlight / Analog+pulse output							TF						
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe							TG						
F110C	115-230VAC / Backlight / Analog+pulse output							TH						
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output							TI						
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output							TJ						
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs							TK						
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs							TL						
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe							TN						
F131D	24VDC / Backlight / Batch / 2 Relay outputs							TM						
ER-500S	24VDC / Battery / Analog+Pulse output							PR						
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485							PA						
NONE								XX						
UNIT OF MEASURE/PROGRAMMING														
LITERS									LTR					
NONE									XXX					
REMOTE CABLE LENGTH														
3M STANDARD CABLE										M3				
NONE										WW				
CERTIFICATION														
NONE											W			
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)											F			
SILICON FREE											L			
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)											E			
SERIALIZATION METER														
YR MFG 8D, NONE												YF		
NONE												XX		
Additional Options														
5 POINT CALIBRATION REPORT														BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)														BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)														BC
NONE														XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][ ] YF - [ ]

METER SIZE (LINE SIZE)		
1 in (25 mm)	2,3 ~ 68 l/min (0.6 ~ 18 USG/min)	010
BASE MATERIAL 1/2" - 3/4" - 1" (15 mm, 20 mm, 25 mm)		
ALUMINUM (6061/6081) BODY / VECTRA (LCP) ROTORS		AV
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS		SR
STAINLESS STEEL (316L) BODY / VECTRA (LCP) ROTORS		SV
ROTORS		
STANDARD		ST
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
ASME; CLASS 150 FLG; RF (Only for SST housing)		FAA
ASME; CLASS 300 FLG; RF (Only for SST housing)		FAB
DIN; PN 16 FLG (Only for SST housing)		FEC
TRI-CLAMP (DIN 32676) (Only for SST housing)		TAA
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
ILR-740	Unscaled Pulse Output (w/ 3 meter cable)	T1
ILR-741	Unscaled Pulse Output (no cable)	T2
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)	T3
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)	T4
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)	T5
REED	Reed switch board with cable gland (no cable)	T6
HALL	Hall board with cable gland (no cable)	T7
METER MOUNTED REGISTRATION / BATCH CONTROLLERS		
ILR-700	Standard display rate / total / total resettable	D1
ILR-701	Display rate / total / total resettable / Linearization	D2
ILR-750	Display rate / total / total resettable / pulse out / 4-20mA / Linearization / 6-24VDC (w/3 meter cable)	D3
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC	AA
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC	A4
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED	AL
F012A	8-30VDC / Battery / Backlight	FA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	FB
F012C	115 - 230 VAC / Backlight	FC
F018A	8-30VDC / Battery / Backlight / HART 7.0	FD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	FE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	FF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	FG
F110C	115-230VAC / Backlight / Analog+pulse output	FH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	FI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	FJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	FK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	FL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	FN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	FM
ER-500S	24VDC / Battery / Analog+Pulse output	ER
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	EA
NONE		XX
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	g+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	TM
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][ ] - YF - [ ]

METER SIZE (LINE SIZE)												
1 in (25 mm) HIGH FLOW 5,7 ~ 170 l/min (1,5 ~45 USG/min)	H10											
BASE MATERIAL 1" HF, 1-1/2", 2", 3" (15 mm HF, 40 mm, 50 mm, 80 mm)												
ALUMINUM (6061/6081) BODY / STAINLESS STEEL (316L) ROTORS	AS											
ALUMINUM (6061/6081) BODY / RYTON (PPS) ROTORS	AR											
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS	SS											
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS	SR											
KYNAR (PVDF) BODY / RYTON (PPS) ROTORS	KR											
ROTORS												
STANDARD		ST										
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV										
PROCESS CONNECTION												
NPT, STANDARD FEMALE			NAA									
BSP, STANDARD FEMALE			BAA									
ASME; CLASS 150 FLG; RF			FAA									
ASME; CLASS 300 FLG; RF			FAB									
DIN; PN 16 FLG			FEC									
TRI-CLAMP (DIN 32676) (Only for SST housing)			TAA									
SEALS												
FKM/VITON				V								
TFE(P)/AFLAS				A								
FFKM/KALREZ				K								
EPDM				E								
REGISTRATION												
METER MOUNTED TRANSMITTERS												
ILR-740	Unscaled Pulse Output (w/ 3 meter cable)				T1							
ILR-741	Unscaled Pulse Output (no cable)				T2							
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)				T3							
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)				T4							
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)				T5							
REED	Reed switch board with cable gland (no cable)				T6							
HALL	Hall board with cable gland (no cable)				T7							
METER MOUNTED REGISTRATION / BATCH CONTROLLERS												
ILR-700	Standard display rate / total / total resettable				D1							
ILR-701	Display rate / total / total resettable / Linearization				D2							
ILR-750	Display rate / total / total resettable / pulse out / 4-20mA / Linearization / 6-24VDC (w/3 meter cable)				D3							
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC				AA							
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC				A4							
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED				AL							
F012A	8-30VDC / Battery / Backlight				FA							
F012B	8-30VDC / Battery / Backlight / intrinsically safe				FB							
F012C	115 - 230 VAC / Backlight				FC							
F018A	8-30VDC / Battery / Backlight / HART 7.0				FD							
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe				FE							
F110A	8-30VDC / Battery / Backlight / Analog+pulse output				FF							
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe				FG							
F110C	115-230VAC / Backlight / Analog+pulse output				FH							
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output				FI							
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output				FJ							
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs				FK							
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs				FL							
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe				FN							
F131D	24VDC / Backlight / Batch / 2 Relay outputs				FM							
ER-500S	24VDC / Battery / Analog+Pulse output				ER							
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485				EA							
NONE					XX							
REMOTE REGISTRATION												
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)					RD						
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)					RE						
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)					RF						
F012A	8-30VDC / Battery / Backlight					TA						
F012B	8-30VDC / Battery / Backlight / intrinsically safe					TB						
F012C	115 - 230 VAC / Backlight					TC						
F018A	8-30VDC / Battery / Backlight / HART 7.0					TD						
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe					TE						
F110A	acklight / Analog+pulse output					TF						
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe					TG						
F110C	115-230VAC / Backlight / Analog+pulse output					TH						
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output					TI						
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output					TJ						
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs					TK						
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs					TL						
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe					TN						
F131D	24VDC / Backlight / Batch / 2 Relay outputs					TM						
ER-500S	24VDC / Battery / Analog+Pulse output					PR						
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485					PA						
NONE						XX						
UNIT OF MEASURE/PROGRAMMING												
LITERS							LTR					
NONE							XXX					
REMOTE CABLE LENGTH												
3M STANDARD CABLE								M3				
NONE								WW				
CERTIFICATION												
NONE									W			
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)									F			
SILICON FREE									L			
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)									E			
SERIALIZATION METER												
YR MFG 8D, NONE										YF		
NONE										XX		
Additional Options												
5 POINT CALIBRATION REPORT											BA	
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)											BB	
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)											BC	
NONE											XX	

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][YF] - [ ]

METER SIZE (LINE SIZE)		
1-1/2 in (40 mm)	9,5 ~ 246 l/min (2.5 ~ 65 USG/min)	015
BASE MATERIAL 1" HF, 1-1/2", 2", 3" (15 mm HF, 40 mm, 50 mm, 80 mm)		
ALUMINUM (6061/6081) BODY / STAINLESS STEEL (316L) ROTORS		AS
ALUMINUM (6061/6081) BODY / RYTON (PPS) ROTORS		AR
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS		SR
ROTORS		
STANDARD		ST
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
ASME; CLASS 150 FLG; RF		FAA
ASME; CLASS 300 FLG; RF		FAB
DIN; PN 16 FLG		FEC
TRI-CLAMP (DIN 32676) (Only for SST housing)		TAA
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
ILR-740	Unscaled Pulse Output (w/ 3 meter cable)	T1
ILR-741	Unscaled Pulse Output (no cable)	T2
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)	T3
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)	T4
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)	T5
REED	Reed switch board with cable gland (no cable)	T6
HALL	Hall board with cable gland (no cable)	T7
METER MOUNTED REGISTRATION / BATCH CONTROLLERS		
ILR-700	Standard display rate / total / total resettable	D1
ILR-701	Display rate / total / total resettable / Linearization	D2
ILR-750	Display rate / total / total resettable / pulse out / 4-20mA / Linearization / 6-24VDC (w/3 meter cable)	D3
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC	AA
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC	A4
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED	AL
F012A	8-30VDC / Battery / Backlight	FA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	FB
F012C	115 - 230 VAC / Backlight	FC
F018A	8-30VDC / Battery / Backlight / HART 7.0	FD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	FE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	FF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	FG
F110C	115-230VAC / Backlight / Analog+pulse output	FH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	FI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	FJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	FK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	FL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	FN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	FM
ER-500S	24VDC / Battery / Analog+Pulse output	ER
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	EA
NONE		XX
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	g+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	TM
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][ ] YF - [ ]

METER SIZE (LINE SIZE)		
2 in (50 mm)	15 ~ 379 l/min (4 ~ 100 USG/min)	020
BASE MATERIAL 1" HF, 1-1/2", 2", 3" (15 mm HF, 40 mm, 50 mm, 80 mm)		
ALUMINUM (6061/6081) BODY / STAINLESS STEEL (316L) ROTORS		AS
ALUMINUM (6061/6081) BODY / RYTON (PPS) ROTORS		AR
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
STAINLESS STEEL (316L) BODY / RYTON (PPS) ROTORS		SR
ROTORS		
STANDARD		ST
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
ASME; CLASS 150 FLG; RF		FAA
ASME; CLASS 300 FLG; RF		FAB
DIN; PN 16 FLG		FEC
TRI-CLAMP (DIN 32676) (Only for SST housing)		TAA
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
ILR-740	Unscaled Pulse Output (w/ 3 meter cable)	T1
ILR-741	Unscaled Pulse Output (no cable)	T2
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)	T3
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)	T4
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)	T5
REED	Reed switch board with cable gland (no cable)	T6
HALL	Hall board with cable gland (no cable)	T7
METER MOUNTED REGISTRATION / BATCH CONTROLLERS		
ILR-700	Standard display rate / total / total resettable	D1
ILR-701	Display rate / total / total resettable / Linearization	D2
ILR-750	Display rate / total / total resettable / pulse out / 4-20mA / Linearization / 6-24VDC (w/3 meter cable)	D3
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC	AA
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC	A4
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED	AL
F012A	8-30VDC / Battery / Backlight	FA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	FB
F012C	115 - 230 VAC / Backlight	FC
F018A	8-30VDC / Battery / Backlight / HART 7.0	FD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	FE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	FF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	FG
F110C	115-230VAC / Backlight / Analog+pulse output	FH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	FI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	FJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	FK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	FL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	FN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	FM
ER-500S	24VDC / Battery / Analog+Pulse output	ER
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	EA
NONE		XX
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	g+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	TM
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

Industrial Oval Gear Meter
Model IOG

OG - [ ] - [ ][ ] - [ ] - [ ] - [ ][ ] - LTR - [ ] - [ ][ ] YF - [ ]

METER SIZE (LINE SIZE)		
3 in (80 mm)	19 ~ 700 l/min (5 ~ 185 USG/min)	030
BASE MATERIAL 1" HF, 1-1/2", 2", 3" (15 mm HF, 40 mm, 50 mm, 80 mm)		
ALUMINUM (6061/6081) BODY / STAINLESS STEEL (316L) ROTORS		AS
STAINLESS STEEL (316L) BODY / STAINLESS STEEL (316L) ROTORS		SS
ROTORS		
STANDARD		ST
HIGH VISCOSITY ROTORS **(MODIFIED ROTORS)**		HV
PROCESS CONNECTION		
NPT, STANDARD FEMALE		NAA
BSP, STANDARD FEMALE		BAA
ASME; CLASS 150 FLG; RF		FAA
ASME; CLASS 300 FLG; RF		FAB
DIN; PN 16 FLG		FEC
SEALS		
FKM/VITON		V
TFE(P)/AFLAS		A
FFKM/KALREZ		K
EPDM		E
REGISTRATION		
METER MOUNTED TRANSMITTERS		
ILR-741	Unscaled Pulse Output (no cable)	T2
NAMUR	Namur sensor / unscaled (w/ 2 meter cable)	T3
PNP	Open collector Sensor PNP / unscaled (w/ 3 meter cable)	T4
NPN	Open collector Sensor NPN / unscaled (w/ 3 meter cable)	T5
REED	Reed switch board with cable gland (no cable)	T6
HALL	Hall board with cable gland (no cable)	T7
METER MOUNTED REGISTRATION / BATCH CONTROLLERS		
ER-420-AC	Scalable Rate/Flow Counter w/ 4-20 mA, 115-230V AC	AA
ER-420-DC	Scalable Rate/Flow Counter w/ 4-20 mA, 24V DC	A4
ER-420-LP	Scalable Rate/Flow Counter w/ 4-20 mA, LOOP POWERED	AL
F012A	8-30VDC / Battery / Backlight	FA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	FB
F012C	115 - 230 VAC / Backlight	FC
F018A	8-30VDC / Battery / Backlight / HART 7.0	FD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	FE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	FF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	FG
F110C	115-230VAC / Backlight / Analog+pulse output	FH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	FI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	FJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	FK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	FL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	FN
F131D	24VDC / Backlight / Batch / 2 Relay outputs	FM
ER-500S	24VDC / Battery / Analog+Pulse output	ER
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	EA
NONE		XX
REMOTE REGISTRATION		
ER-420-AC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 115-230 VAC)	RD
ER-420-DC	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, 24V DC)	RE
ER-420-LP	ER-420 (Scaleable Rate/Flow Counter w/ 4-20mA, LOOP POWERED)	RF
F012A	8-30VDC / Battery / Backlight	TA
F012B	8-30VDC / Battery / Backlight / intrinsically safe	TB
F012C	115 - 230 VAC / Backlight	TC
F018A	8-30VDC / Battery / Backlight / HART 7.0	TD
F018B	8-30VDC / Battery / Backlight / HART 7.0 / intrinsically safe	TE
F110A	8-30VDC / Battery / Backlight / Analog+pulse output	TF
F110B	8-30VDC / Battery / Analog+pulse output / intrinsically safe	TG
F110C	115-230VAC / Backlight / Analog+pulse output	TH
F110D	8-30VDC / Battery / Backlight/RS485-2 wire / Analog+pulse output	TI
F110E	115-230VAC / Backlight/RS485-2 wire / Analog+pulse output	TJ
F131A	8-30VDC / Battery / Backlight / Batch / 2 transistor outputs	TK
F131B	115-230VAC / Backlight / Batch / 2 Relay outputs	TL
F131C	8-30VDC / Battery / Batch / 2 transistor outputs / Intrinsically safe	TN
F131D	/ Batch / 2 Relay outputs	TM
ER-500S	24VDC / Battery / Analog+Pulse output	PR
ER-500A	24VDC / Battery / Analog+Pulse output/ Modbus RS485	PA
NONE		XX
UNIT OF MEASURE/PROGRAMMING		
LITERS		LTR
NONE		XXX
REMOTE CABLE LENGTH		
3M STANDARD CABLE		M3
NONE		WW
CERTIFICATION		
NONE		W
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY (Only for SST BODY with SST ROTORS available)		F
SILICON FREE		L
ADDITIONAL DOCUMENTATIONS FOR FOOD INDUSTRY and SILICONE FREE (Only for SST BODY with SST ROTORS available)		E
SERIALIZATION METER		
YR MFG 8D, NONE		YF
NONE		XX
Additional Options		
5 POINT CALIBRATION REPORT		BA
LINEARIZATION with 5-POINT CALIBRATION REPORT (ILR-750 and ILR-701 only)		BB
3.1 MATERIAL CERTIFICATE (certificates for pressurized parts, Aluminum or Stainless housings only)		BC
NONE		XX

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Mechanical Register Non-Resettable

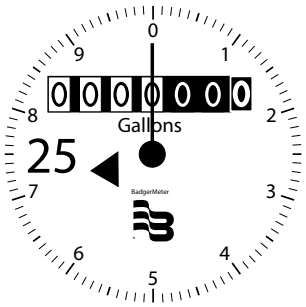
Model RCDL

DESCRIPTION

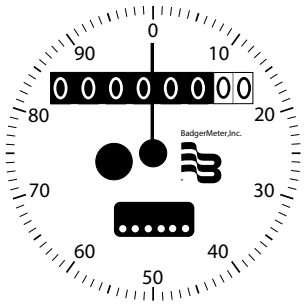
The Recordall® (RCDL) non-resettable mechanical register is a basic totalizer used for inventory and process control where totalization is the only functional need of the product.

OPERATION

The model RCDL register is available on RCDL Disc meters and Industrial Turbo meters. The standard RCDL register for the RCDL Disc meters is designed for metering liquids up to 120° F and is available in several units of measure. On the Industrial Turbo meters, the register is designed to meter liquids up to 250° F. These higher temperature units are available in U.S. gallons for both styles of meters, in liters for Disc meters, and in cubic meters for Industrial Turbo meters. If the higher temperature register is selected for use on the RCDL Disc meter, the appropriate higher temperature rated Disc meter option must be used.



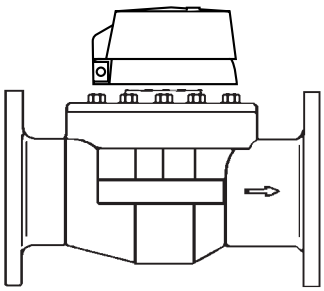
Model 25 nutating Disc meter with standard dial face in U.S. gallons



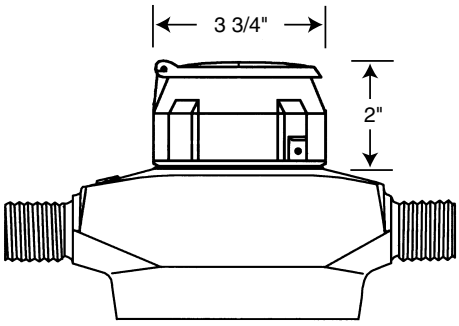
2 in. Industrial Turbo meter dial face in U.S. gallons

FEATURES

- Register Temperature Ratings:
  - RCDL Disc: Standard 120° F
  - Optional 250° F
  - Industrial Turbo: 250° F
- 6 digit non-resettable totalizer
- Weight: 3 lbs



RCDL (Register) shown on Turbo meter



RCDL (Register) shown on Disc meter

Product Data Sheet

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Legacy Document Number: ITB-104-03

Impeller
Data Industrial®

Flow Sensors

SDI Series Insert Style Flow Sensors, Stainless Steel
NSF/ANSI/CAN Standards 61 and 372 Certified

DESCRIPTION

The Data Industrial SDI Series insert flow sensors from Badger Meter offer accurate liquid flow measurement in closed pipe systems in an easy to install economical package. SDI Series insert flow sensors comply with the lead-free provisions of the Safe Drinking Water Act, are certified to NSF/ANSI/CAN Standards 61 and 372.

Impeller sensors offer a quick response to changes in flow rate and are well suited to flow control and batch type applications in addition to flow monitoring. The four-bladed impeller design is rugged, non-fouling and does not require custom calibration. Coupled with the proprietary patented digital detection circuit, the sensor measures flows from under 0.5 ft/sec (0.15 m/sec) to more than 20 ft/sec (6.1 m/sec) regardless of the conductivity or turbidity of the liquid. The standard frequency output produces a low impedance square wave signal proportional to flow rate that may be transmitted up to 2000 ft (610 m) without amplification. The SDI Series includes:

- Single direction powered insert with raw, scaled pulse and analog output
- Bidirectional powered insert with analog and scaled pulse output
- Battery powered insert with a local or remote display and scaled pulse output

APPLICATIONS

SDI insert style flow sensors are intended for general clean liquid flow measurement applications.

FUNCTIONALITY

These insert style sensors are intended for direct installation into pipelines through a 1 in. (25 mm) tap. The pipeline must be out of service and not under pressure at the time of installation. For any pipeline that is in service at the time of installation or cannot be de-pressurized and drained for service, the SDI hot tap model equipped with isolation valves is recommended.

Three different stem lengths in both the direct insert and hot tap versions accommodate pipe diameters 1-1/2…36 in. (38…914 mm) depending on the pipe material and tapping methods. Larger sizes usually require the use of hot tap models.

In pipe sections with at least 10 diameters of straight pipe upstream of the sensor and 5 diameters of straight pipe downstream, accuracies of ±1% of rate may be achieved when the flow sensor is installed at the correct insertion depth and properly aligned.

HOT TAP SENSORS (OPTIONAL)

Hot tap sensors feature an isolation valve and mounting hardware to install or remove the sensor from a pipeline that would be difficult to shut down or drain. In a true hot tap installation the sensor is mounted in the pipe under pressure by attaching a service saddle or weld-on fitting to the pipe and mounting the isolating valve to the threaded connection. A hole is then cut in the wall of the pipe through the valve using a commercial tapping machine with a 1 in. size cutter. Once the hole is cut, the tapping machine is removed and the valve is shut. Then the sensor assembly is mounted to the isolation valve and extended into the pipeline to measure flow. Even in new construction a hot tap sensor may be appropriate for service considerations. The hot tap sensor is constructed of 316 stainless steel and is rated for service to 1000 psi at 70° F (21° C) (see *"Maximum Pressure Rating for SST Stem" on page 4*). The sensor installs in a 1 in. NPT tap for both wet and dry installations. The small stem diameter allows the sensor to be inserted into the pressurized pipeline by hand without the need for an installation tool. Mounting hardware holds the sensor firmly in place at the correct depth and alignment.

BATTERY POWERED SENSORS (OPTIONAL)

Battery powered versions are complete flow measuring systems providing a local or remote programmable display of rate, total or both, powered by a C size lithium battery that has a five year life span.

OUTPUT CONFIGURATIONS

Standard Frequency

Sensor output is a pulse proportional to flow. The signal is similar to all 200 Series flow sensors and will interface with all existing Data Industrial transmitters and monitors. The power supply to the sensor and the output signal from the sensor is carried on the same two wires. Wire connections are made at screw terminals on removable headers inside the NEMA 4X housing.

Analog Output

The sensor is also available with a two-wire loop powered 4…20 mA output. The analog output is produced by an onboard micro-controller for precise, drift-free signals. Sensors may be preprogrammed at the factory or field programmed using the a computer with the programming kit and Windows® based software program. All information is stored in the flow sensor nonvolatile memory.

Scaled Pulse Output

The scaled pulse is produced by an onboard micro-controller for precise, accurate outputs. This option may be programmed to produce an isolated solid state contact closure scaled to any number of engineering units of measure. Sensors may be preprogrammed at the factory or field programmed using the a computer with the programming kit and Windows® based software program. All information is stored in nonvolatile memory in the flow sensor. This is a four-wire option.

Bidirectional Flow, Analog Output

This option provides a programmable 4…20 mA signal proportional to flow rate and a contact closure to indicate the direction of flow. The unit may be preprogrammed at the factory or field programmed using a computer with the programming kit and Windows® based software program. The user can program the unit for pipe size, flow scale and the direction of flow. This is a six-wire option.

Bidirectional Flow, Scaled Pulse Output

This option provides the user with a choice of outputs. In one case the sensor provides an output scaled to the required number of engineering units on one set of terminals and a contact closure to indicate the direction of flow on another. The other choice provides two isolated scaled pulse outputs, one for each direction. Programming the output choice, pipe size, output scale and direction of flow by the user are also accomplished by using a computer with the programming kit and Windows® based software program. This option also requires six wires.

Display Options

All models except the standard frequency output version may also be equipped with a display. Integrated into the NEMA 4X housing, the eight digit LCD may be programmed to show rate of flow, flow total or toggle between the two. Bidirectional models also show flow direction.

The eight character 3/8 in. LCD is mounted on the sensor visible through a lens at the top of the electronics housing.

For battery powered versions only, an optional remote display is available where the LCD is located in a wall mount NEMA 4 enclosure. The remote may be connected to the flow sensor up to a maximum of 50 ft (15 m) away using extension cables.

SPECIFICATIONS

Wetted Materials	Sensor stem, mounting adapter, isolation valve, and nipple:	316 Stainless steel
Sensor Tip	Polyphenylene sulfide (PPS)	
	Polyetheretherketone (PEEK)	
O-rings, Bearings, Shaft	See ordering matrix	
Operating Temperature	Electronics	14…150° F (–10…65° C)
	LCD	–4…150° F (–20…65°C)
Maximum Pressure Rating Stainless Steel (Non Shock)	1000 psi (68.9 bar) @ 70° F (21° C)	
	900 psi (62 bar) @ 100° F (37.8° C)	
	670 psi (46.1 bar) @ 140° F (60° C)	
	225 psi (15.5 bar) @ 180° F (82° C)	
	600 psi (41.3 bar) @ up to 140° F (60° C)	
	225 psi (15.5 bar) @ 180° F (82° C)	
Optimum Design Flow Range	1…20 ft/sec. (0.30…6 m/sec.)	
	Extended flow range < 0.5…20 fps	
Pressure Drop	0.5 psi or less at 10 ft/sec (3 m/sec.) for all pipe sizes 1.5 in. (38 mm) diameter and up	
Accuracy	Standard: to ±1% of rate over optimum flow range	
Straight Pipe Requirement	Install sensor in straight pipe section with a minimum distance of 10 diameters upstream and 5 diameters downstream to any bend, transition, or obstruction.	
Repeatability	±0.5%	
Enclosure	Sensor- battery	Polypropylene with Viton® sealed acrylic cover. Meets NEMA 6P specifications
	Sensor	Polypropylene with Viton® sealed acrylic cover. Meets NEMA 4X specifications
	Remote	Polycarbonate w/ Neoprene® sealed cover. Meets NEMA 4X specifications.
Programming	Battery powered version	A8ASDIB-20 programming kit
	Bidirectional, pulse, and analog versions	USB to DIC converter programming kit (840134-0002)
Display (Optional)	8 character, 3/8 in. (10 mm) LCD	
	STN (Super Twisted Nematic) display	
	Annunciators for rate, total, totalizer multipliers, low battery, flow direction	
Accessories	USB to DIC converter programming kit (840134-0002)	
	8ASDIB-20 programming kit	
	Battery powered version	807101 5 ft (1.5 m) extension cable
		807108 10 ft (3 m) extension cable
		807102 20 ft (6 m) extension cable
		807109 50 ft (15 m) extension cable

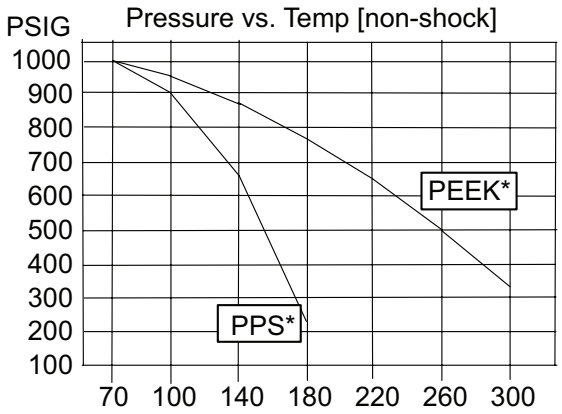
Power Specifications

		Unidirectional			Bidirectional		Battery Operated
		Raw Pulse Option 0	Analog Loop Option 1	Scaled Pulse Option 2	Analog Loop Option 5	Scaled Pulse Option 6	Scaled Pulse Option 2
Number of Wire Connections		**2**	**2**	**4**	**6**	**6**	**2**
Pulse Units	Operating Voltage	8…35V DC	n/a	12…30V AC 12…35V DC	12…30V AC 12…35V DC	12…30V AC 12…35V DC	n/a
	Overvoltage Protection	30V AC ± 40V DC	± 40V DC	30V AC ± 40V DC	30V AC ± 40V DC	30V AC ± 40V DC	n/a
	Quiescent Current Draw @ 12V DC or 24V AC	330 µA typical	Software-controlled current of 3.5…20.5 mA	< 2.0 mA	< 5.0 mA	< 5.0 mA	n/a
	Short Circuit Current	50 mA typical	n/a	> 100 mA	For direction > 100 mA	> 100 mA	> 100 mA
	Output Frequency	800 Hz max	n/a	Scaled by customer	n/a	Scaled by customer	Scaled by customer
	Output Pulse Width	5 mS below 100 Hz	n/a	Adjustable 50 mS to 5.0 seconds in 50 mS increments	n/a	Adjustable 50 mS to 5.0 seconds in 50 mS increments	Selectable 50 mS 100 mS 250 mS
	Output Isolation	n/a	n/a	Opto-isolated	Opto-isolated	Opto-isolated	Opto-isolated
Analog Units	Operating Voltage	n/a	8…25V DC	n/a	8…25V DC	n/a	n/a
	Output Response Time	n/a	Varies with programmable filter	n/a	Varies with programmable filter	n/a	n/a

The battery operated version is powered by a C size lithium battery with a five year life span

Maximum Pressure Rating for SST Stem

(Note: PPS or PEEK Tip)



ORDERING MATRIX

SDI Series Single Direction Insert Powered Version Ordering Matrix

8SDI	0	H1	N	0	0	-	0	2	0	0
MATERIAL										
Stainless Steel / PPS Tip	0									
Stainless Steel / Peek Tip	2									
TYPE										
Direct Insert for Pipe 1½" - 10" *		D1								
Direct Insert for Pipe 12" - 36" *		D2								
Direct Insert 36" - 60" *		D3								
Hot Tap for Pipe 1½" - 10" *		H1								
Hot Tap for Pipe 12" - 36" *		H2								
Hot Tap for Pipe 36" - 60" *		H3								
ELECTRONIC HOUSING										
NEMA 4X			N							
OUTPUT										
Standard Frequency Pulse				0						
Analog 4-20mA				1						
Scaled Pulse				2						
DISPLAY										
No Display					0					
LCD Option **(requires output option 1 or 2)**					1					
O-RING										
Viton®							0			
EPDM							1			
SHAFT										
Tungsten Carbide [Standard]								2		
IMPELLER										
Stainless Steel									0	
BEARING										
Torlon®										0

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

SDI Series Bidirectional Insert Powered Ordering Matrix

	8SDI	0	H1	N	5	0	-	0	2	0	0
MATERIAL											
Stainless Steel / PPS Tip		0									
Stainless Steel / PEEK Tip		2									
TYPE											
Hot Tap for Pipe 1½" - 10" *			H1								
Hot Tap for Pipe 12" - 36" *			H2								
Hot Tap for Pipe 36"- 60" *			H3								
ELECTRONIC HOUSING											
NEMA 4X				N							
OUTPUT											
Bi-Directional 4-20mA + Direction					5						
Bi-Directional Scaled Pulse					6						
DISPLAY											
No Display						0					
LCD Option						1					
O-RING											
Viton®								0			
EPDM								1			
SHAFT											
Tungsten Carbide [Standard]									2		
IMPELLER											
Stainless Steel										0	
BEARING											
Torlon®											0

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

SDI Series Battery Powered Ordering Matrix

	8SDI	0	D1	B	N	1	-	0	2	0	0
MATERIAL											
Stainless Steel / PPS Tip		0									
Stainless Steel / PEEK Tip		2									
TYPE											
Direct Insert for Pipe 1-1/2" thru 10" *			D1								
Direct Insert for Pipe 12" thru 36" *			D2								
Direct Insert 36" - 60" *			D3								
Hot Tap for Pipe 1-1/2" thru 10" *			H1								
Hot Tap for Pipe 12" thru 36" *			H2								
Hot Tap for Pipe 36" - 60" *			H3								
ELECTRONIC HOUSING											
Battery Powered/NEMA 6				B							
OUTPUT											
No Output					N						
Scaled Pulse					2						
2 Pulse Output					9						
DISPLAY											
LCD Option						1					
Remote Display/NEMA 4X						2					
O-RING											
Viton®								0			
EPDM								1			
SHAFT											
Tungsten Carbide [Standard]									2		
IMPELLER											
Stainless Steel										0	
BEARING											
Torlon®											0

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

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Impeller
Data Industrial®

Flow Sensors

Insert Style Flow Sensors, Brass

DESCRIPTION

The Data Industrial SDI Series brass insert flow sensors from Badger Meter offer accurate liquid flow measurement in closed pipe systems in an easy to install economical package. Impeller sensors offer a quick response to changes in flow rate and are well suited to flow control and batch type applications in addition to flow monitoring. The four-bladed impeller design is rugged, non-fouling and does not require custom calibration. Coupled with the proprietary patented digital detection circuit, the sensor measures flows from under 0.5 ft/sec (0.15 m/sec) to more than 20 ft/sec (6.1 m/sec) regardless of the conductivity or turbidity of the liquid. The standard frequency output produces a low impedance square wave signal proportional to flow rate that may be transmitted up to 2000 ft (610 m) without amplification. The SDI Series includes:

- Single direction powered insert with raw, scaled pulse and analog output
- Battery powered insert with a local or remote display and scaled pulse output

APPLICATIONS

SDI insert style flow sensors are intended for general clean liquid flow measurement applications.

FUNCTIONALITY

These insert style sensors are intended for direct installation into pipelines through a 1 in. (25 mm) tap. The pipeline must be out of service and not under pressure at the time of installation. For any pipeline that is in service at the time of installation or cannot be de-pressurized and drained for service, the SDI hot tap model equipped with isolation valves is recommended.

Three different stem lengths in both the direct insert and hot tap versions accommodate pipe diameters 1-1/2…36 in. (38…914 mm) depending on the pipe material and tapping methods. Larger sizes usually require the use of hot tap models.

In pipe sections with at least 10 diameters of straight pipe upstream of the sensor and 5 diameters of straight pipe downstream, accuracies of ±1% of rate may be achieved when the flow sensor is installed at the correct insertion depth and properly aligned.

BATTERY POWERED SENSORS (OPTIONAL)

Battery powered versions are complete flow measuring systems providing a local or remote programmable display of rate, total or both, powered by a C size lithium battery that has a five year life span.

Badger Meter

SEN-DS-04206-EN-03 (August 2024)

Product Data Sheet

OUTPUT CONFIGURATIONS

Standard Frequency

Sensor output is a pulse proportional to flow. The signal is similar to all 200 Series flow sensors and will interface with all existing Data Industrial transmitters and monitors. The power supply to the sensor and the output signal from the sensor is carried on the same two wires. Wire connections are made at screw terminals on removable headers inside the NEMA 4X housing.

Analog Output

The sensor is also available with a two-wire loop powered 4…20 mA output. The analog output is produced by an onboard micro-controller for precise, drift-free signals. Sensors may be preprogrammed at the factory or field programmed using the a computer with the programming kit and Windows® based software program. All information is stored in the flow sensor nonvolatile memory.

Scaled Pulse Output

The scaled pulse is produced by an onboard micro-controller for precise, accurate outputs. This option may be programmed to produce an isolated solid state contact closure scaled to any number of engineering units of measure. Sensors may be preprogrammed at the factory or field programmed using the a computer with the programming kit and Windows® based software program. All information is stored in nonvolatile memory in the flow sensor. This is a four-wire option.

Display Options

All models except the standard frequency output version may also be equipped with a display. Integrated into the NEMA 4X housing, the eight digit LCD may be programmed to show rate of flow, flow total or toggle between the two.

The eight character 3/8 in. LCD is mounted on the sensor visible through a lens at the top of the electronics housing.

For battery powered versions only, an optional remote display is available where the LCD is located in a wall mount NEMA 4 enclosure. The remote may be connected to the flow sensor up to a maximum of 50 ft (15 m) away using extension cables.

SPECIFICATIONS

Wetted Materials	Sensor stem, mounting adapter and nipple:	Brass, B16, UNS C36000
Sensor Tip	Polyphenylene sulfide (PPS)	
	Polyetheretherketone (PEEK)	
O-rings, Bearings, Shaft	See ordering matrix	
Operating Temperature	Electronics	14…150° F (–10…65° C)
	LCD	–4…150° F (–20…65°C)
Maximum Pressure Rating (Non Shock)	600 psi (41.3 bar) up to 140° F (60° C)	
	225 psi (15.5 bar) up to 180° F (82° C)	
Optimum Design Flow Range	1…20 ft/sec. (0.30…6 m/sec.)	
	Extended flow range < 0.5…20 fps	
Pressure Drop	0.5 psi or less at 10 ft/sec (3 m/sec.) for all pipe sizes 1.5 in. (38 mm) diameter and up	
Accuracy	Standard: to ±1% of rate over optimum flow range	
Straight Pipe Requirement	Install sensor in straight pipe section with a minimum distance of 10 diameters upstream and 5 diameters downstream to any bend, transition, or obstruction.	
Repeatability	±0.5%	
Enclosure	Sensor- battery	Polypropylene with Viton® sealed acrylic cover. Meets NEMA 6P specifications.
	Sensor	Polypropylene with Viton® sealed acrylic cover. Meets NEMA 4X specifications.
	Remote	Polycarbonate w/ Neoprene® sealed cover. Meets NEMA 4X specifications.
Programming	Battery powered version	8ASDIB-20 programming kit
	Pulse and analog versions	USB to DIC converter programming kit (840134-0002)
Display (Optional)	8 character, 3/8 in. (10 mm) LCD	
	STN (Super Twisted Nematic) display	
	Annunciators for rate, total, totalizer multipliers, low battery, flow direction	
Accessories	USB to DIC converter programming kit (840134-0002)	
	8ASDIB-20 programming kit	
	Battery powered version	807101 5 ft (1.5 m) extension cable
		807108 10 ft (3 m) extension cable
		807102 20 ft (6 m) extension cable
		807109 50 ft (15 m) extension cable

Power Specifications

		Unidirectional			Battery Operated
		Raw Pulse Option 0	**Analog Loop Option 1**	**Scaled Pulse Option 2**	**Scaled Pulse Option 2**
Number of Wire Connections		**2**	**2**	**4**	**2**
Pulse Units	Operating Voltage	8…35V DC	n/a	12…30V AC 12…35V DC	n/a
	Overvoltage Protection	30V AC ± 40V DC	± 40V DC	30V AC ± 40V DC	n/a
	Quiescent Current Draw @ 12V DC or 24V AC	330 µA typical	Software-controlled current of 3.5…20.5 mA	< 2.0 mA	n/a
	Short Circuit Current	50 mA typical	n/a	> 100 mA	> 100 mA
	Output Frequency	800 Hz max	n/a	Scaled by customer	Scaled by customer
	Output Pulse Width	5 mS below 100 Hz	n/a	Adjustable 50 mS to 5.0 seconds in 50 mS increments	Selectable 50 mS 100 mS 250 mS
	Output Isolation	n/a	n/a	Opto-isolated	Opto-isolated
Analog Units	Operating Voltage	n/a	8…25V DC	n/a	n/a
	Output Response Time	n/a	Varies with programmable filter	n/a	n/a

The battery operated version is powered by a C size lithium battery with a five year life span

ORDERING MATRIX

SDI Series Brass Single Direction Insert Powered Version Ordering Matrix

	8SDI	0	D1	N	0	0	-	0	2	0	0
MATERIAL											
Brass / PPS Tip ***(not available with hot tap)***		1									
TYPE											
Direct Insert for Pipe 1½" - 10" *			D1								
Direct Insert for Pipe 12" - 36" *			D2								
Direct Insert 36" and UP*			D3								
ELECTRONIC HOUSING											
NEMA 4X				N							
OUTPUT											
Standard Frequency Pulse					0						
Analog 4-20mA					1						
Scaled Pulse					2						
DISPLAY											
No Display						0					
LCD Option **(requires output option 1 or 2)**						1					
O-RING											
Viton®								0			
EPDM								1			
AFLAS								2			
SHAFT											
Tungsten Carbide [Standard]									2		
IMPELLER											
Stainless Steel										0	
BEARING											
Torlon®											0
Ketron											2

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

SDI Series Battery Powered Ordering Matrix

8SDI	1	D1	B	N	1	-	0	2	0	0
MATERIAL										
Brass / PPS Tip **(not available with hot tap)**	1									
TYPE										
Direct Insert for Pipe 1-1/2" thru 10" *		D1								
Direct Insert for Pipe 12" thru 36" *		D2								
Direct Insert 36" and UP*		D3								
ELECTRONIC HOUSING										
Battery Powered/NEMA 6			B							
OUTPUT										
No Output				N						
Scaled Pulse				2						
2 Pulse Output				9						
DISPLAY										
LCD Option					1					
Remote Display/NEMA 4X					2					
O-RING										
Viton®							0			
EPDM							1			
AFLAS							2			
SHAFT										
Tungsten Carbide [Standard]								2		
IMPELLER										
Stainless Steel									0	
BEARING										
Torlon®										0

* Pipe size is for reference only. Depending on pipe size, tapping saddle or existing hardware, longer sensor length may be required. Consult the factory. For material details, consult the factory.

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Impeller Data Industrial®

Sensor

Series 735 Plastic Tee Type Flow Sensor

DESCRIPTION

The Series 735 Impeller flow sensors feature a four-blade impeller design, using a proprietary, non-magnetic sensing technology. When used in conjunction with any Badger Meter® flow monitor or transmitter, the sensor provides an accurate reading of the rate of liquid flow as well as total accumulated flow. A number of sensor models are offered, which cover applications for a wide range of pipe sizes and pressure/temperature specifications.

OPERATING PRINCIPLE

As the liquid flow turns the impeller, a low impedance signal is transmitted with a frequency proportional to the flow rate. An internal preamplifier allows the pulse signal to travel up to 2000 ft (609.6 m) without further amplification. The impeller bearing assembly, shaft and O-rings are replaceable in the field. Sensors of similar type are interchangeable, so there is no need for recalibration after servicing or replacement.

FEATURES

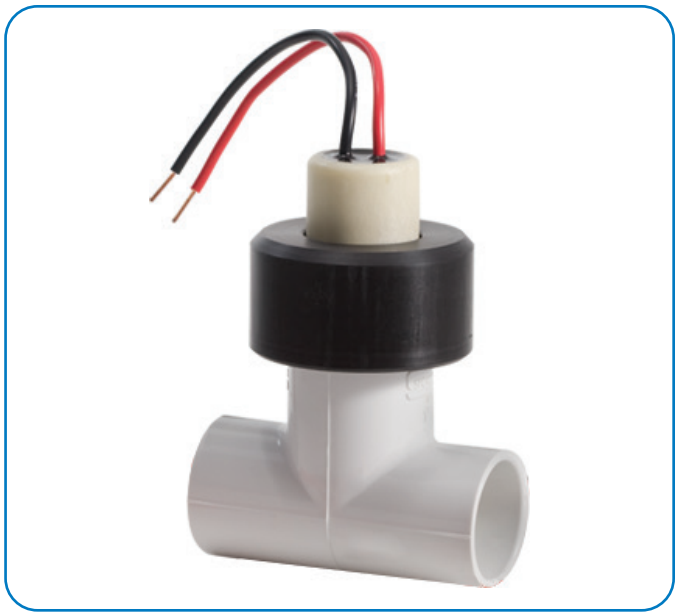
- Modified PVC tee with solvent weld socket end connections and a removable PPS sensor insert.
- Available sizes include 1/2 in., 3/4 in. and 1 in.
- Threaded BSP adapters.

IR SENSOR

Designed for below grade applications such as irrigation, municipal and groundwater monitoring where the flow rates are between 2…20 ft/sec. (0.61…6.1 m/sec.) and temperatures are below 110° F (43.3° C). IR sensors are supplied with two single conductor, 18 AWG solid copper wire leads.

ORDERING MATRIX

Example: 7	35	PV	05	0	6	-	1	2	0	1
STYLE											
Tee Mounted Insert Sensor	35										
MATERIAL											
PVC (.5", .75", 1" Sch 40 only)		PV									
SIZE											
0.5"			05								
0.75"			07								
1"			10								
0.5" with BSP Adapters			06								
0.75" with BSP Adapters			08								
1" with BSP Adapters			11								
ELECTRONICS HOUSING											
PPS				0							
ELECTRONICS											
IR-Irrigation					6						
O-RING											
EPDM							1				
SHAFT											
Tungsten Carbide								2			
IMPELLER											
300 SST									0		
BEARING											
UHMWPE										1	



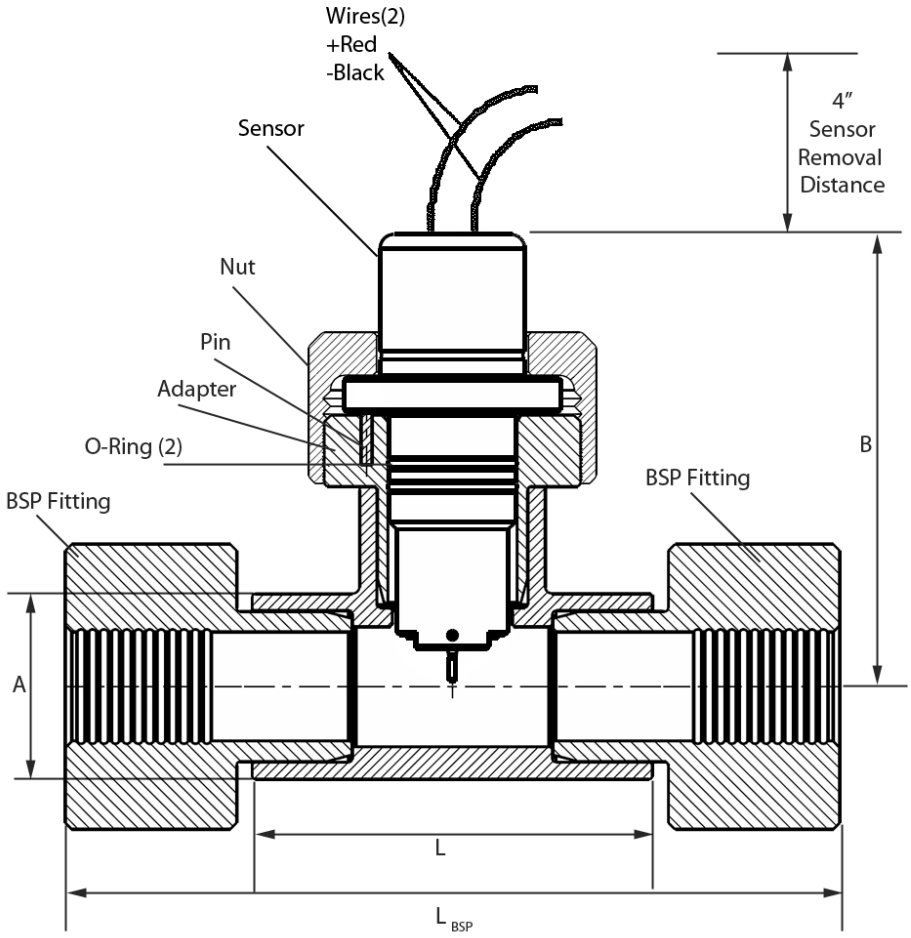
SPECIFICATIONS

Wetted Materials (except tees)	See *"Ordering Matrix"*
Materials	
Tee	PVC Type 1, white
Adapter	PVC Type 1, gray
BSP Fitting	PVC Type 1
Sensor Housing	PPS
Retaining Nut	Acetal copolymer, black
Locating Pin	300SST
Impeller	300SST
Shaft	Tungsten Carbide
Bearing	UHMWPE
O-Rings	EPDM
Wires	18 AWG Irrigation Wire (solid copper)
Pressure, Temperature Ratings	150 psig @ 73° F (22.8° C) 75 psig @ 110° F (43.3° C)
Recommended Design Flow Range	2…20 FPS
Accuracy	± 3.0% of full scale over recommended design flow range
Repeatability	± 1.5% of full scale over recommended design flow range
Linearity	± 1.5% of full scale over recommended design flow range
Transducer Excitation	Quiescent current 600 uA @ 8…35V DC max. Quiescent voltage (Vhigh) Supply Voltage — (600 uA*Supply impedance) ON State (Vlow) Max. 1.2V DC @ 40 mA current limit (15W + 0.7V DC)
Output Frequency	3.2…200 Hz
Output Pulse Width	5 msec ± 25%
Electrical Cable for IR Sensor Electronics	UL Style 116666 copper solid AWG 18 wire w/ direct burial insulation. Rated to 105° C.

Badger Meter®

Product Data Sheet

DIMENSIONS



A Soc Size, NPS	B Centerline to Top	L	L_{BSP} Optional
1/2 in. [Ø 0.840"]	3.85 in. (97.8 mm)	3.06 in. (77.7 mm)	6.086 in. (154.6 mm)
3/4 in. [Ø 1.050"]	3.85 in. (97.8 mm)	3.31 in. (84.1 mm)	6.775 in. (172.1 mm)
1 in. [Ø 1.315"]	3.94 in. (100.1 mm)	3.50 in. (88.9 mm)	6.775 in. (172.1 mm)

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Impeller Flow Sensor

Data Industrial®

Series 4000

DESCRIPTION

The Series 4000 Flow Sensor has an in-line, flow-through design using a tangential six bladed impeller.

The Series 4000 Flow Sensor is available in 1/2 in., 3/4 in. and 1 in. pipe sizes and is molded of PVC or PVDF materials. The compact design allows the Series 4000 flow sensor to replace old style magnetic sensors with little or no piping changes.

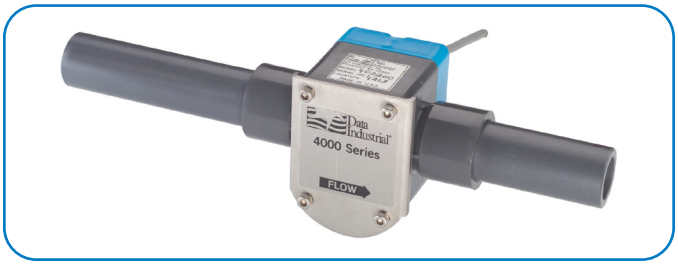
The proprietary non-magnetic detection circuit is available with two outputs: a low-impedance, 3-wire, 5V DC square wave signal (that can be pulled up to 20V) capable of traveling up to 2000 ft (609 m) without amplification, or a 2-wire, loop-powered, 4…20 mA current analog signal. These two signal formats are compatible with most data acquisition or PLC equipment.

PVDF versions are compatible with all PVDF piping systems including SYGEF, KYNAR, SUPER PROLINE and SANITECH. Adapters are available for use with other plastic or metallic piping systems.

FEATURES

- 4…20 mA analog output programmable in field.
- Enhanced versions can accurately measure flow rates as low as 0.25 fps.
- Flow detection electronics can be serviced or replaced without opening the pipe. No exposure to wetted parts.
- Impeller bearings and shaft can be easily replaced without removing the sensor from the pipe.
- Documented operating service life in high temperature ultra-pure water throughout 40 months of continuous 24 hr/day operation.
- Superior particle-shedding performance verified by independent laboratory testing. Particle sizes from 0.1 micron to 1.0 micron representing "on wafer" metallic contamination (ELYMAT) and liquid-born particles were monitored.
- CE tested and approved by an independent laboratory.

The analog output is controlled by an on-board microprocessor and digital circuitry producing precise drift free signals. The unit is programmed from a PC using Windows® based software and a connection cable. Units may be pre-programmed at the factory or field programmed. All programming information is stored in non-volatile memory in the sensor.



Mechanical Specifications	Nominal Pipe Size	1/2 in. (20 mm), 3/4 in. (25 mm), 1 in. (32 mm)	
	End Connections	PVC PVDF	Plain end pipe Socket weld/union
	Standard Flow Range	1…20 fps	
	Low Flow Range	0.25…8 fps	
	Accuracy	Better than 1%	
	Repeatability	± 0.5%	
	Max Temp Rating	PVC PVDF	140° F (60° C) 220° F (104° C)
	Max Pressure Rating	PVC PVDF	350 psi @ 73° F (23° C) 275 psi @ 65° F (18° C)
Electrical Specifications	Cable	Digital Output 3-wire Analog Output 2-wire	
	Signal Digital Output	5V CMOS and LSTTL compatible, can be forced up to 20 volts by an external pull-up resistor	
	Analog Output	4…20 mA analog output with offset compensation for ripple less than 0.25% of full scale	
	Sink Current	2…10 mA	
Power	Digital Output	Supply voltage 9…20V DC Supply current 2 mA maximum	
	Analog Output	10…35V DC. Loop power supply voltage and loop series resistance must make sure that the device voltage remains within these limits over the 4…20 mA output span	
	Accessories	840134-0002 USB Converter Model A301-20 programming kit with 20 foot cable	

CE

Badger Meter

SEN-DS-00333-EN-04 (October 2021)

Product Data Sheet

SERIES 4000 ORDERING MATRIX

Example	4	0	0	7	10	-	0	0	2	2

Series

4000	4

Style

Standard Flow	0
Enhanced Flow (available with 1/2 in. and 3/4 in. only)	1

Size

1/2 in.	0
3/4 in.	1
1 in.	2

Material

PVC furnished with schedule 80 tail pieces	2
PVDF socket	3
PVDF union threaded	4
PVDF with unions and socket ends	5
PVDF with 316 stainless steel FNPT union end	7
PVDF with CPVC socket union end	9

Electronics

Pulse output	00
Pulse output with EFI foil shield	01
Pulse output with CE housing	05
4…20 mA analog output	10
4…20 mA analog output with EFI foil shield	11
4…20 mA with CE housing	15

O-Ring (set of 3 rings)

Viton®	0
EPDM	1

Shaft

Zirconia Ceramic	0
Hastelloy® C	1
Tungsten Carbide	2
316 Stainless Steel	6
Tantalum	7

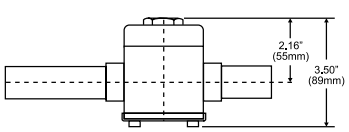
Impeller

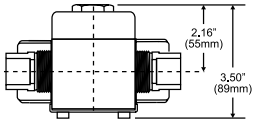
Tefzel®	2

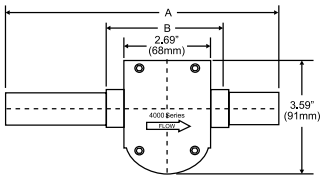
Bearing

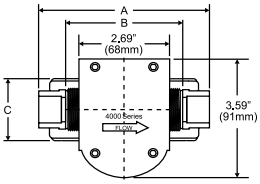
UHMWPE	1
Tefzel	2
Teflon®	3

Dimensions









PVC			PVDF			
Model	**A**	**B**	**Model**	**A**	**B**	**C**
1/2 in.	8.77 in. ± 0.25 in. (222 mm ± 6.35 mm)	4.33 in. (104 mm)	1/2 in.	5.03 in. (128 mm)	3.54 in. (90 mm)	1.85 in. (47 mm)
3/4 in.	10.57 in. ± 0.25 in. (268 mm ± 6.35 mm)	4.69 in. (119 mm)	3/4 in.	5.55 in. (141 mm)	3.92 in. (100 mm)	2.24 in. (57 mm)
1 in.	13.03 in. ± 0.25 in. (331 mm ± 6.35 mm)	5.40 in. (137 mm)	1 in.	6.10 in. (155 mm)	4.32 in. (110 mm)	2.52 in. (64 mm)

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Impeller
Data Industrial®

Flow Sensors

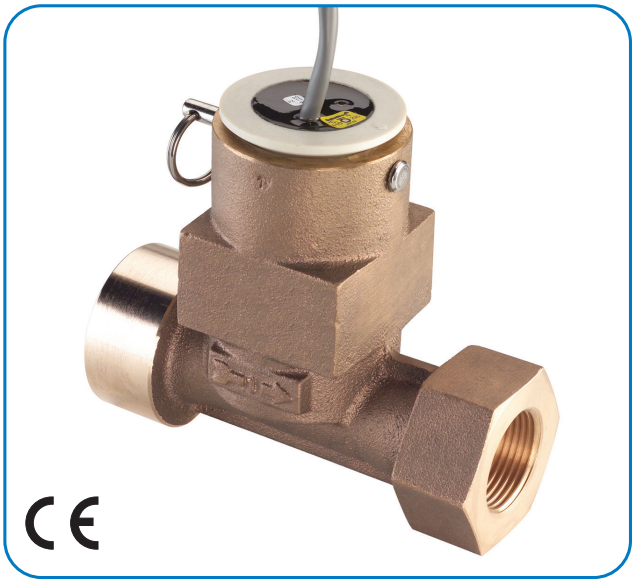
Series 250 Metallic Tee Flow Sensors

DESCRIPTION

The Series 250 flow sensor from Badger Meter® features a six-bladed impeller design with a proprietary non-magnetic sensing mechanism, mounted in a cast bronze housing, with female NPT threads.

The unique impeller design is less prone to be fouled by waterborne debris. The forward curved shape coupled with the absence of magnetic drag provides improved operation and repeatability even at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate. The signal can travel up to 2000 ft (610 m) between the flow sensor and the receiving unit without the need for amplification.

All sensors except irrigation versions are supplied with 20 ft (610 cm) of 2-conductor 20 AWG shielded UL type PTLC 221° F (105° C) cable and meet CE standards for noise immunity and susceptibility.



FEATURES

- Sensor electronics easily removed from the tee
- Impeller, bearing and shaft are easily replaced in the field, without changing calibration
- Two-wire sensor. Power and signal transmit on a single pair of wires, up to a distance of 2000 ft (610 m)
- Digital signal easily interfaced with transmitters, monitors or PLCs

APPLICATIONS

- Energy management and building management systems
- BTU sub-metering systems
- Cooling tower treatment systems
- Condensate return lines

SPECIFICATIONS

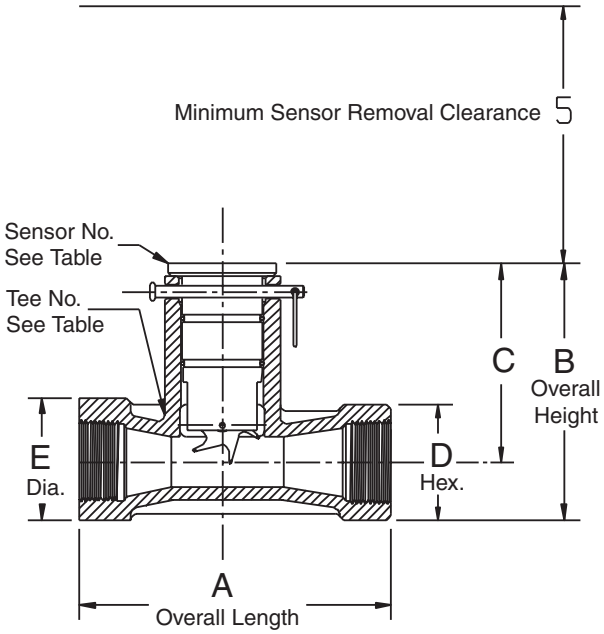
Wetted Materials	See *"Part Number Construction" on page 3*
Tee for 250B	Cast Bronze Alloy conforming to REACH and RoHS Requirements
Maximum Temperature	*Standard electronics*: 221° F (105° C)
	Irrigation electronics: 150° F (66° C)
Maximum Pressure at 100° F	400 psi
Recommended Design Flow Range	0.3…15 ft/sec (0.15…9 m/sec)
Accuracy	± 1.0% of rate
Repeatability	± 0.7% over recommended design flow range
Linearity	± 0.7% over recommended design flow range
Rangeability	60:1
Transducer Excitation	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 uA (typical)
	OFF State (V_{High}) = Supply voltage – (600 uA * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Electrical Cable for IR Sensor Electronics	48 in (122 cm) of UL style 116666 copper solid AWG 18 wire with direct burial insulation. Rated to 221° F (105° C).
Electrical Cable for Standard Sensor Electronics	20 ft (610 cm) of 2-conductor AWG 20 with AWG 22 drain wire shielded UL type PTLC wire provided for connection to display or transmitter unit. Rated to 221° F (105° C). May be extended to a maximum of 2000 ft (610 m) with similar cable and insulation appropriate for application.
Certifications	CE certified

Badger Meter

SEN-DS-01555-EN-08 (April 2023)

Product Data Sheet

DIMENSIONS



Series No. Complete	Sensor No.	Tee No.	NPT	A	B	C	D	E
250B-0.5	See Matrix	813168T	1/2 - 14	4.0 in. (102 mm)	4.67 in. (119 mm)	3.61 in. (92 mm)	N/A	1.63 in. (41 mm)
250B-0.75	See Matrix	813169T	3/4 - 14	4.0 in. (102 mm)	4.67 in. (119 mm)	3.61 in. (92 mm)	N/A	1.63 in. (41 mm)
250B-1.0	See Matrix	81940T	1.00 - 11.5	5.45 in. (138 mm)	4.75 in. (121 mm)	3.75 in. (95 mm)	2.0 in. (51 mm)	2.12 in. (54 mm)
250B-1.25	See Matrix	81941T	1.25 - 11.5	6.06 in. (154 mm)	5.0 in. (127 mm)	3.88 in. (99 mm)	2.25 in. (57 mm)	2.38 in. (60 mm)
250B-1.5	See Matrix	811193T	1.50 - 11.5	6.5 in. (165 mm)	5.19 in. (132 mm)	3.94 in. (100 mm)	2.5 in. (64 mm)	2.62 in. (67 mm)

Figure 1: Dimensions

PART NUMBER CONSTRUCTION

Standard Sensor

	Example: 2	50	BR	05	0	5	-	1	2	1	1
STYLE											
Cast Bronze Tee		50									
MATERIAL											
Brass			BR								
SIZE											
0.5"				05							
0.75"				07							
1"				10							
1.25"				12							
1.5"				15							
ELECTRONICS HOUSING											
PPS					0						
ELECTRONICS											
Standard Flow (STANDARD)						5					
IR-Irrigation						6					
O-RING											
Viton®								0			
EPDM (STANDARD)								1			
Buna N								8			
SHAFT											
Zirconia Ceramic									0		
Tungsten Carbide (STANDARD)									2		
316 Stainless Steel									6		
IMPELLER											
Nylon (STANDARD)										1	
Tefzel®										2	
BEARING											
UHMWPE (STANDARD)											1
Tefzel®											2
Teflon®											3

High Temperature Sensor

	Example: 2	50	BR	05	4	8	-	0	2	2	3
STYLE											
Cast Bronze Tee		50									
MATERIAL											
Brass			BR								
SIZE											
0.5"				05							
0.75"				07							
1"				10							
1.25"				12							
1.5"				15							
ELECTRONICS HOUSING											
PEEK					4						
ELECTRONICS											
High Temperature						8					
O-RING											
Viton®								0			
SHAFT											
Tungsten Carbide									2		
IMPELLER											
Tefzel®										2	
BEARING											
Teflon®											3

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Impeller
Data Industrial®

Flow Sensors

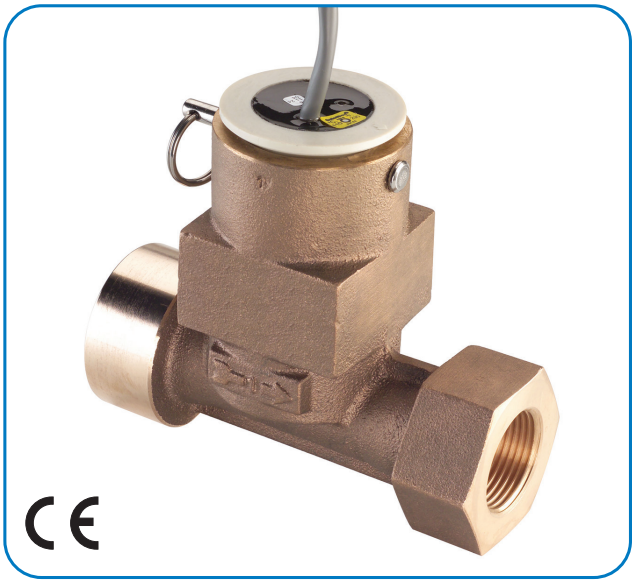
Series 250 Metallic Tee Flow Sensors

DESCRIPTION

The Series 250 flow sensor from Badger Meter® features a six-bladed impeller design with a proprietary non-magnetic sensing mechanism, mounted in a cast bronze housing, with female NPT threads.

The unique impeller design is less prone to be fouled by waterborne debris. The forward curved shape coupled with the absence of magnetic drag provides improved operation and repeatability even at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate. The signal can travel up to 2000 ft (610 m) between the flow sensor and the receiving unit without the need for amplification.

All sensors except irrigation versions are supplied with 20 ft (610 cm) of 2-conductor 20 AWG shielded UL type PTLC 221° F (105° C) cable and meet CE standards for noise immunity and susceptibility.



FEATURES

- Sensor electronics easily removed from the tee
- Impeller, bearing and shaft are easily replaced in the field, without changing calibration
- Two-wire sensor. Power and signal transmit on a single pair of wires, up to a distance of 2000 ft (610 m)
- Digital signal easily interfaced with transmitters, monitors or PLCs

APPLICATIONS

- Energy management and building management systems
- BTU sub-metering systems
- Cooling tower treatment systems
- Condensate return lines

SPECIFICATIONS

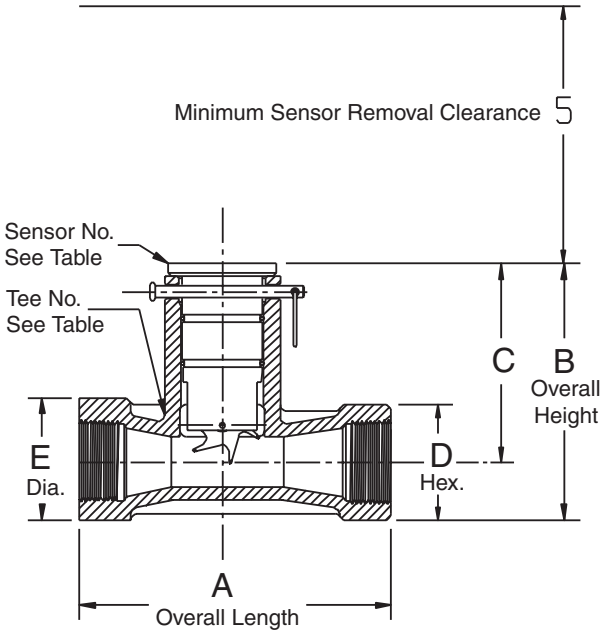
Wetted Materials	See *"Part Number Construction" on page 3*
Tee for 250B	Cast Bronze Alloy conforming to REACH and RoHS Requirements
Maximum Temperature	*Standard electronics*: 221° F (105° C)
	Irrigation electronics: 150° F (66° C)
Maximum Pressure at 100° F	400 psi
Recommended Design Flow Range	0.3…15 ft/sec (0.15…9 m/sec)
Accuracy	± 1.0% of rate
Repeatability	± 0.7% over recommended design flow range
Linearity	± 0.7% over recommended design flow range
Rangeability	60:1
Transducer Excitation	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 uA (typical)
	OFF State (V_{High}) = Supply voltage – (600 uA * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Electrical Cable for IR Sensor Electronics	48 in (122 cm) of UL style 116666 copper solid AWG 18 wire with direct burial insulation. Rated to 221° F (105° C).
Electrical Cable for Standard Sensor Electronics	20 ft (610 cm) of 2-conductor AWG 20 with AWG 22 drain wire shielded UL type PTLC wire provided for connection to display or transmitter unit. Rated to 221° F (105° C). May be extended to a maximum of 2000 ft (610 m) with similar cable and insulation appropriate for application.
Certifications	CE certified

Badger Meter

SEN-DS-01555-EN-08 (April 2023)

Product Data Sheet

DIMENSIONS



Series No. Complete	Sensor No.	Tee No.	NPT	A	B	C	D	E
250B-0.5	See Matrix	813168T	1/2 - 14	4.0 in. (102 mm)	4.67 in. (119 mm)	3.61 in. (92 mm)	N/A	1.63 in. (41 mm)
250B-0.75	See Matrix	813169T	3/4 - 14	4.0 in. (102 mm)	4.67 in. (119 mm)	3.61 in. (92 mm)	N/A	1.63 in. (41 mm)
250B-1.0	See Matrix	81940T	1.00 - 11.5	5.45 in. (138 mm)	4.75 in. (121 mm)	3.75 in. (95 mm)	2.0 in. (51 mm)	2.12 in. (54 mm)
250B-1.25	See Matrix	81941T	1.25 - 11.5	6.06 in. (154 mm)	5.0 in. (127 mm)	3.88 in. (99 mm)	2.25 in. (57 mm)	2.38 in. (60 mm)
250B-1.5	See Matrix	811193T	1.50 - 11.5	6.5 in. (165 mm)	5.19 in. (132 mm)	3.94 in. (100 mm)	2.5 in. (64 mm)	2.62 in. (67 mm)

Figure 1: Dimensions

PART NUMBER CONSTRUCTION

Standard Sensor

	Example: 2	50	BR	05	0	5	-	1	2	1	1
STYLE											
Cast Bronze Tee		50									
MATERIAL											
Brass			BR								
SIZE											
0.5"				05							
0.75"				07							
1"				10							
1.25"				12							
1.5"				15							
ELECTRONICS HOUSING											
PPS					0						
ELECTRONICS											
Standard Flow (STANDARD)						5					
IR-Irrigation						6					
O-RING											
Viton®								0			
EPDM (STANDARD)								1			
Buna N								8			
SHAFT											
Zirconia Ceramic									0		
Tungsten Carbide (STANDARD)									2		
316 Stainless Steel									6		
IMPELLER											
Nylon (STANDARD)										1	
Tefzel®										2	
BEARING											
UHMWPE (STANDARD)											1
Tefzel®											2
Teflon®											3

High Temperature Sensor

	Example: 2	50	BR	05	4	8	-	0	2	2	3
STYLE											
Cast Bronze Tee		50									
MATERIAL											
Brass			BR								
SIZE											
0.5"				05							
0.75"				07							
1"				10							
1.25"				12							
1.5"				15							
ELECTRONICS HOUSING											
PEEK					4						
ELECTRONICS											
High Temperature						8					
O-RING											
Viton®								0			
SHAFT											
Tungsten Carbide									2		
IMPELLER											
Tefzel®										2	
BEARING											
Teflon®											3

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Impeller
Data Industrial®

Flow Sensors

Series 225BR, 226BR, 226SS Hot Tap Flow Sensors

DESCRIPTION

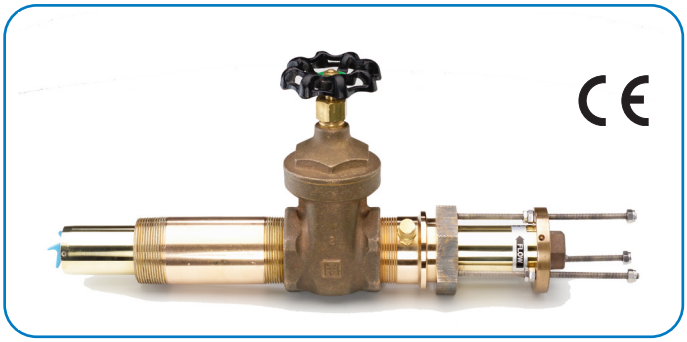
The Series 200 flow sensors feature a six-bladed impeller design with a proprietary non-magnetic sensing mechanism. The forward swept impeller shape provides higher, more consistent torque and is less prone to be fouled by water borne debris. The forward curved shape coupled with the absence of magnetic drag provides improved operation and repeatability at lower flow rates. This is especially true where the impeller is exposed to metallic or rust particles found in steel or iron pipes. As the liquid flow turns the impeller, a low impedance square wave signal is transmitted with a frequency proportional to the flow rate. The signal can travel up to 2000 ft (610 m) between the flow sensor and the display unit without the need for amplification. All sensors except irrigation versions are supplied with 20 ft (6 m) of 2-conductor 20 AWG shielded UL type PTLC 221° F (105° C) cable.

MODEL 225BR AND 226BR/226SS SENSORS

The 225BR and 226BR/226SS flow sensors are used for flow measuring applications in most metallic or non-metallic pipes where it would be difficult to shut down or drain the line for installation or service. The 225 flow sensor features a gate valve for isolation. The 226 flow sensor uses a ball valve. If the pipe is to be hot tapped, the ball valve is recommended. The sensor mounts in a 2 in. NPT pipe saddle or Threadolet® for installation in pipe sizes from 3…40 in. Positioning nuts on the three threaded retaining rods allow the sensor to be accurately positioned to a standard insertion depth of 1-1/2 in. into the pipe.

When this insertion depth is maintained and there are at least 10 upstream and 5 downstream diameters of straight uninterrupted flow, an accuracy of ±1 percent of full scale can be obtained between flow velocities of 0.5…30 feet/second. Each sensor has an isolation valve and pipe nipple to allow the sensor to be installed in a pressurized pipe. This is accomplished by first attaching a saddle or Threadolet to the pipe and screwing the nipple and isolation valve into the saddle or Threadolet fitting. A hole is then drilled through the pipe using a commercial tapping machine. When completed, the tapping apparatus is removed, the isolation valve is closed, and the sensor is installed using the Model HTT Hot Tap Tool. For installation information, see the *Hot Tap Flow Sensor, Series 225/226, Application Data Shee*t, available in the Resource Library at *www.badgermeter.com*.

NOTE: The overall length of the sensor tube is 18 in. (46 cm), however, a clearance height of 35 in. (89 cm) should be allowed for the fully extended length of the sensor tube outside the isolation valve.



SPECIFICATIONS

Wetted Materials for All Sensors	See *"Part Number Construction" on page 3*
Sensor Sleeve and Hex Adapter for 225BR and 226BR	*Sleeve:* Admiralty Brass, UNS C44300 *Hex Adapter:* Lead-free Brass C89833
Sensor Sleeve and Hex Adapter for 226SS	316 Series Stainless Steel
Temperature Ratings	*Standard Version:* 221° F (105° C) continuous service *Irrigation Electronics:* 150°F (66° C)
Pressure Ratings	**Model** / **At 100° F** / **At 300° F (High Temperature Model Only)** 225BR / 300 psi / 210 psi 226BR / 400 psi / 250 psi 226SS / 400 psi / 300 psi
Recommended Design Flow Range	0.5…30 ft/sec Initial detection below 0.3 ft/sec
Accuracy	± 1.0% of full scale over recommended design flow range ± 4.0% of reading within calibration range
Repeatability	± 0.3% of full scale over recommended design flow range
Linearity	± 0.2% of full scale over recommended design flow range
Transducer Excitation	Supply voltage = 8V DC min. 35V DC max. Quiescent current = 600 uA (typical) OFF State (V_{High}) = Supply voltage – (600 uA * Supply impedance) ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Output Frequency	3.2…200 Hz
Output Pulse Width	5 msec ±25%
Electrical Cable for Standard Sensor Electronics	20 feet (6 m) of 2-conductor 20 AWG shielded U.L. type PTLC wire provided for connection to display or analog transmitter unit. Rated to 105° C. May be extended to a maximum of 2000 feet (610 m) with similar cable and insulation appropriate for application.
Electrical Cable for IR Sensor Electronics	48 in. (122 cm) of U.L. Style 116666 copper solid AWG 18 wire with direct burial insulation. Rated to 221° F (105° C).

Badger Meter

SEN-DS-01556-EN-07 (October 2021)

Product Data Sheet

DIMENSIONS

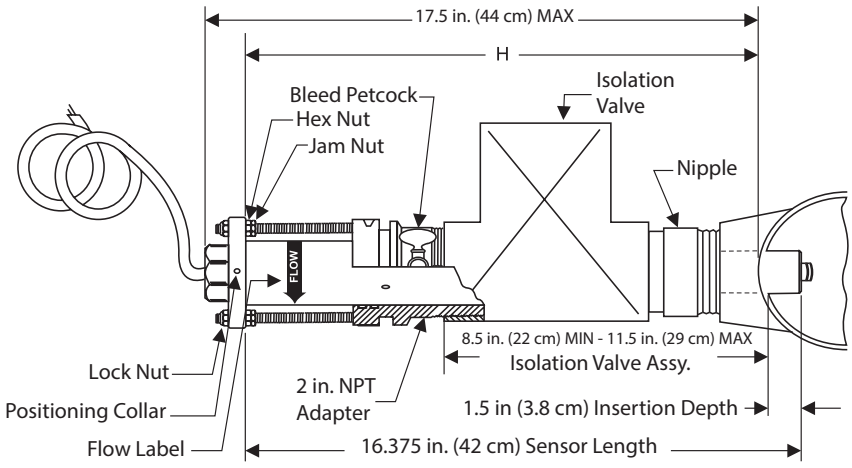


Figure 1: 225/226 Dimensions

NOTE: All dimensions are for reference only. To remove the flow sensor, there must be 25 in. (89 cm) clearance above the outside wall of the pipe. A cutting tool may require additional clearance.

PART NUMBER CONSTRUCTION

225 Standard Sensor

Example:	2	25	BR	00	0	5	-	1	2	1	1
STYLE											
Hot Tap Insert - Gate Valve		25									
MATERIAL											
Brass			BR								
SIZE											
Insert Style				00							
ELECTRONICS HOUSING											
PPS					0						
ELECTRONICS											
Standard Flow (STANDARD)						5					
IR-Irrigation						6					
O-RING											
Viton®								0			
EPDM (STANDARD)								1			
Buna N								8			
SHAFT											
Zirconia Ceramic									0		
Tungsten Carbide (STANDARD)									2		
316 Stainless Steel									6		
IMPELLER											
Nylon (STANDARD)										1	
Tefzel®										2	
BEARING											
UHMWPE (STANDARD)											1
Tefzel®											2
Teflon®											3

225 High Temperature Sensor

	Example: 2	25	BR	00	4	8	-	0	2	2	3
STYLE											
Hot Tap Insert - Gate Valve		25									
MATERIAL											
Brass			BR								
SIZE											
Insert Style				00							
ELECTRONICS HOUSING											
PEEK					4						
ELECTRONICS											
High Temperature						8					
O-RING											
Viton®								0			
SHAFT											
Tungsten Carbide (STANDARD)									2		
IMPELLER											
Tefzel®										2	
BEARING											
Teflon®											3

226 Standard Sensor

	Example: 2	26	SS	00	0	5	-	1	2	1	1
STYLE											
Hot Tap Insert - Ball Valve		26									
MATERIAL											
Brass			BR								
Stainless Steel (Model 226 Only)			SS								
SIZE											
Insert Style				00							
ELECTRONICS HOUSING											
PPS					0						
ELECTRONICS											
Standard Flow (STANDARD)						5					
IR-Irrigation						6					
O-RING											
Viton®								0			
EPDM (STANDARD)								1			
Buna N								8			
SHAFT											
Zirconia Ceramic									0		
Tungsten Carbide (STANDARD)									2		
316 Stainless Steel									6		
IMPELLER											
Nylon (STANDARD)										1	
Tefzel®										2	
BEARING											
UHMWPE (STANDARD)											1
Tefzel®											2
Teflon®											3

226 High Temperature Sensor

	Example: 2	26	SS	00	4	8	-	0	2	2	3
STYLE											
Hot Tap Insert - Ball Valve		26									
MATERIAL											
Brass			BR								
Stainless Steel (Model 226 Only)			SS								
SIZE											
Insert Style				00							
ELECTRONICS HOUSING											
PEEK					4						
ELECTRONICS											
High Temperature						8					
O-RING											
Viton®								0			
SHAFT											
Tungsten Carbide (STANDARD)									2		
IMPELLER											
Tefzel®										2	
BEARING											
Teflon®											3

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Impeller Data Industrial®

Transmitters

Model 330 Programmable Relay Control

OVERVIEW

The Model 330 is a compact, programmable relay control transmitter capable of converting the signal from a Badger Meter flow sensor into a flow switch.

With an onboard microcontroller and digital circuitry, the Model 330 is programmed using a Windows® based computer program. This eliminates the need to set dip switches or potentiometers and produces precise, accurate and drift free control of the relay outputs. In addition to accepting the Badger Meter square wave signal, the Model 330 can accept other pulse and sine wave inputs.

The compact cast epoxy body measures 1.75 in. (44 mm) x 2.75 in. (70mm) x 1.5 in. (38mm) and can easily be mounted to panels, DIN rails or enclosures. With multiple inputs, ease of use and a variety of enclosures, the Model 330 is a powerful, competitively priced relay control device.

APPLICATIONS

Combined with a flow sensor the Model 330 can be used in a variety of "Flow Switch" applications.

- Flow/no flow indicator
- High flow/low flow alarm monitor
- Booster pump control
- Multiple pump staging
- Leak control

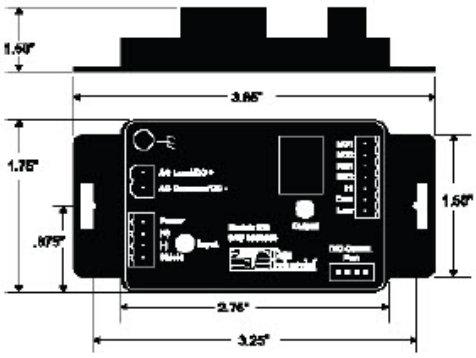

Figure 1: Model 330 dimensions

FEATURES

Relay Output	The Model 330 output is a pair of single pole relays, one normally open and one normally closed. Both relays act in unison to the programmed parameters.
Selectable Alarm Type	The Model 330 can be programmed as a high flow alarm where the relays are energized when the flow rate exceeds the set point, and/or as a low flow alarm where the reverse is true and the relays energize when the flow rate falls below the set point.
Programmable Set & Release Points	The set point—the flow rate where the relays are energized—is programmed independently from the release point— the flow rate where they are de-energized. This adjustable deadband prevents relay chatter and control cycling.
Programmable Time Delays	This feature provides a time delay between crossing the set or release point and energizing or de-energizing the relay. This feature allows surges in the flow to dampen out before the control circuit reacts.
Latch Feature	The latch maintains the relays in the energized state until manually reset, even when the alarm condition has been satisfied.
Remote Reset	Remote reset allows all the control parameters of the Model 330 to be reset by an external signal.
Alarm Status	Using the Windows software, the actual flow rate status of relays and time delay counters can be observed, providing great diagnostic tools.

SPECIFICATIONS

Power			
Power Supply Options	12…28V AC RMS, 200mA max	12…40V DC, 100mA max	
Flow Sensor Input			
All Sensors	Excitation voltage 3 wire sensors: 9.1 V DC 500 Ω source impedance		
Pulse Type Sensors			
Signal Amplitude	2.5V DC threshold		
Signal Limits	Vin < 35V (DC or AC peak)		
Frequency	0…10 kHz		
Pull-up	2 kΩ		
Sine Wave Sensors			
Signal Amplitude	10 mV p-p threshold		
Signal Limits	Vin < 35V (DC or AC peak)		
Frequency	0…10 kHz		
Relay	1 form A, 1 form B		
Contact Ratings	5A @ 30V DC	5A @ 125V AC	5A @ 250V AC
Time Delay	1…9999 second delay between flow point and relay actuation		
Transient Suppression	Designed to withstand a 5000 volt, 1/2 microsecond, 100 kHz ring wave		
Sensor Calibration			
Badger Meter Sensors	Use K and Offset values provided in sensor owner's manual		
Other Sensors	Check with factory		
Units of Measure			
Flow Measurement Rate	gpm, gph, l/sec, l/min, l/hr, ft3/sec, ft3/min, ft3/hr, m3/sec, m3/min, m3/hr		
Programming	Requires computer running Windows 7, XP or Vista		
Operating Temperature	–25…70°C	–20…158°F	
Storage Temperature	–40…85°C	–40…185°F	
Weight	4.8 oz with headers installed		
Accessories	840134-0002 programming kit with cable and software		

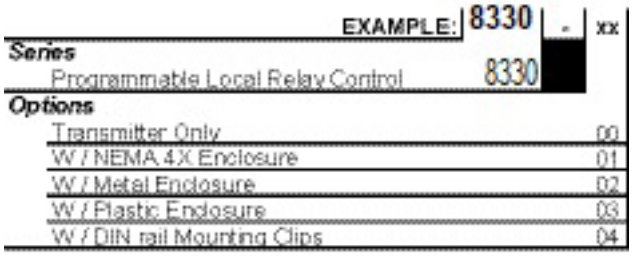

Figure 2: Model 330 ordering matrix

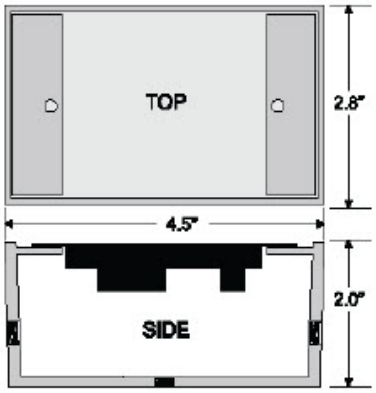

Figure 3: Optional enclosure (330-02 and 330-03)

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Transmitters

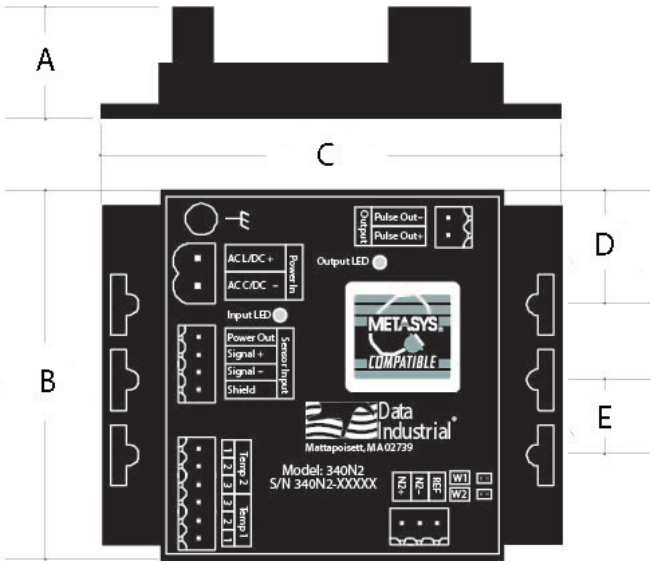
Model 340N2 Btu

DESCRIPTION

The Model 340N2 Btu transmitter from Badger Meter is an economical, compact device for sub-metering applications using Johnson Controls Metasys® Network Companion and Facilitator Supervision System.

The Model 340N2 transmitter calculates thermal energy in a closed pipe hydronic system by integrating the flow and temperature inputs. The transmitter can accept the signal from most Badger Meter raw pulse flow sensors, as well as many other pulse and sine wave devices. Temperature inputs are accepted from standard 10 kΩ (Type II) thermistors.

The onboard microcontroller and digital circuitry make precise measurements and produce accurate, drift-free outputs. The Model 340N2 transmitter is commissioned using Badger Meter Windows® based software. Calibration information for the flow sensor, type and pipe size can be pre-selected or entered in the field. When a PC or laptop computer is connected, the same data that is transmitted across the N2 network is shown in real time. This includes flow rate, flow total, energy rate, energy total, supply and return temperatures, and Delta T.



A	B	C	D	E
1.60 in.	2.95 in.	3.65 in.	.88 in.	.60 in.
41 mm	75 mm	93 mm	22 mm	15 mm

Figure 1: Transmitter dimensions

ORDERING MATRIX

	EXAMPLE:	340N2	–	xx
Series				
Btu Transmitter		340N2		
Options				
Transmitter Only				00
w/ Metal Enclosure				02
w/Plastic Enclosure				03
w/ DIN Rail Mounting Clips				04

The Model 340N2 transmitter features two LEDs to verify input and output signals.

The pulse output for the Model 340N2 transmitter is an isolated solid state switch closure that is user programmed for units of energy or flow. The output pulse width is adjustable from 50 milliseconds to 5 seconds.

The N2 output is an RS-485 compliant signal.

The Model 340N2 transmitter operates on AC or DC power supplies ranging from 12…24 volts.

The compact cast epoxy body measures 3.65 x 2.95 inches (93 x 75 mm) and can be easily mounted on panels, DIN rails or in enclosures.

Badger Meter

XMT-DS-01632-EN-06 (December 2021)

Product Data Sheet

SPECIFICATIONS

Power		
Power Supply Options	12…35V DC ±5%	12…24V AC ±10%
Current Draw	60 mA at 12V DC	
Flow Sensor Input		
All Sensors	Separate excitation voltage is provided for three wire sensors 7.9…11.4V DC with 270 Ω source impedance	
Pulse Type Sensors		
Signal Amplitude	2.5V DC threshold	
Signal Limits	Vin < 35V (DC or AC peak)	
Frequency	0.4…1.0 kHz	
Pull-up	To 9.1V DC with 2 kΩ	
Sine Wave Sensors		
Signal Amplitude	10 mV p-p threshold	
Signal Limits	Vin < 35V (DC or AC peak)	
Frequency	0.4…1.0 kHz	
Temperature Sensor Input	Two required: 10 kΩ thermistor, 2 wire, type II, 10 kΩ at 77° F (25° C)	
Pulse Output		
Opto-isolated solid state switch		
Operating voltage range	0…±60V (DC or AC peak)	
Closed (on) state	Load current, 700 mA max. over operating temperature range	
	On-resistance, 700 mΩ max. over operating temperature range	
Open (off) state	Leakage at 158º F (70° C) <1µA at 60V (DC or AC peak)	
N2 Output	RS-485 output compliant with EIA/TIA-485 standards	
Operating Temperature	–20…158° F	–29…70° C
Storage Temperature	–40…185° F	–40… 85° C
Weight	4.8 oz with headers installed	
Sensor Calibration		
Data Industrial	Use K and offset values provided in sensor owners manual	
Other Sensors	Check with factory	
Units of Measure		
Flow	Rate: gpm, gph, l/sec, l/min, l/hr, ft3/sec, ft3/min, ft3/hr, m3/sec, m3/min, m3/hr	
	Total: gallons, liters, cubic feet, cubic meters	
Energy	Rate: kBtu/min, kBtu/hr, kW, MW, hp, tons	
	Total: Btu, kBtu, MBtu, kWh, MWh, kJ, MJ	
Temperature Units	Fahrenheit	Centigrade
Programming	Requires PC or laptop running Windows® 7, XP or Vista and A302-20 programming kit	
Accessories	A302-20 programming kit	

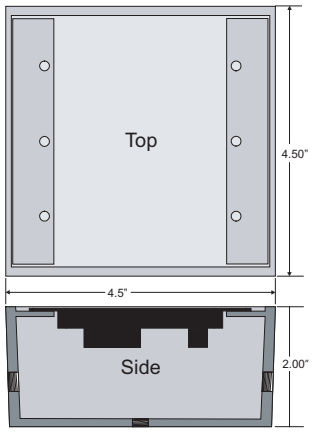


Figure 2: Metal box dimensions

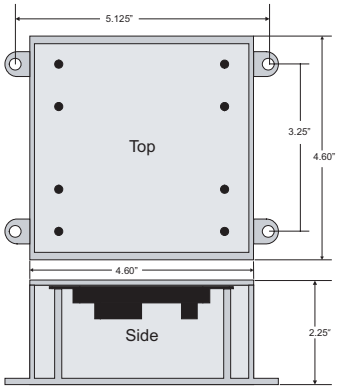


Figure 3: Plastic enclosure dimensions

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Transmitters

Series 340 BN/MB Btu Energy Transmitter

DESCRIPTION

The 340 BN/MB Btu Energy Transmitter from Badger Meter® is an economical, compact device for sub-metering applications using the BACnet or Modbus® communications protocol.

The 340 BN/MB Btu Energy Transmitter calculates thermal energy using the signal from a flow sensor installed in a hydronic heating or chilled water system, and the signals from two 10 kΩ temperature thermistors, 100 Ω RTDs or 1000 Ω RTDs installed in the system's inlet and outlet points. The flow input may be provided by any Data Industrial sensor and many other pulse or sine wave signal flow sensors.

The on-board microcontroller and circuitry make precise measurements and produce accurate, drift-free outputs. The 340 BN/MB Btu Energy Transmitter is programmed using Badger Meter Windows®-based software. Calibration information for the flow sensor type and pipe size may be preselected or entered by the user in the field. While the unit is connected to a PC or laptop computer, real-time flow rate, flow total, temperatures, energy rate and energy total are available.

340 BN/MB Ordering Matrix

EXAMPLE:	8340 BN/MB	—	xx
SERIES			
Btu Energy Transmitter w/ output	8340 BN/MB		
OPTIONS			
Transmitter Only			00
With Metal Enclosure			02
With Plastic Enclosure			03
With DIN Rail Mounting Clips			04

The 340 BN/MB Btu Energy Transmitter features three indicator LEDs to verify the sensor input signal, network link and pulse output.

The 340 BN/MB Btu Energy Transmitter communicates via RS485.

The compact cast body measures 3.65 × 2.95 inches (93 × 75 mm) and can be easily mounted on panels, DIN rails or enclosures.

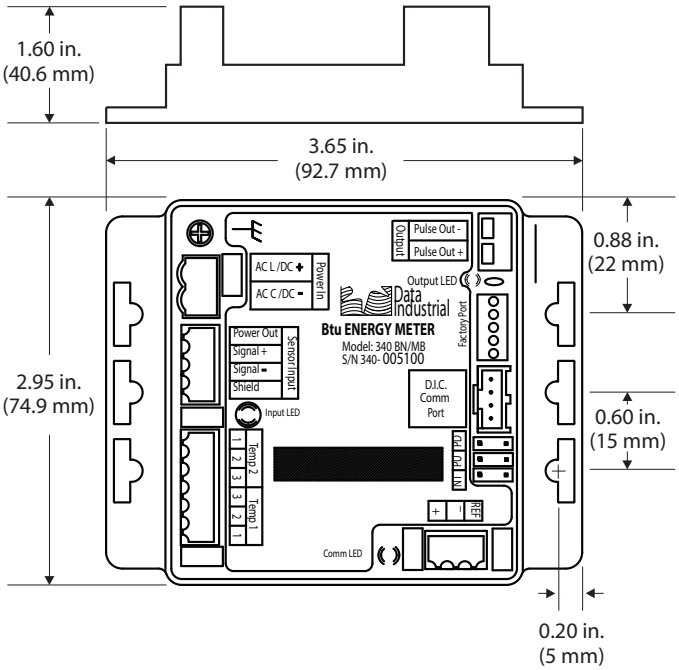

Figure 1: Overall dimensions

SPECIFICATIONS

Power	
Power supply	12…24V AC
	12…35V DC
Current draw:	115 mA max. at 12V DC
Flow Sensor Input	
Pulse Type Sensors:	
Signal amplitude	2.5V DC threshold
Signal limits	Vin < 12V (DC or AC peak)
Frequency range	4…1000 Hz
Pull-up:	15V DC @ 2k Ω source Impedance
Sine Wave Sensors:	
Signal amplitude	30 mV p-p threshold
Signal limits	Vin < 12V (DC or AC peak)
Frequency	4…1000 Hz
Power Out Terminal	15V DC ± 1V DC @ 500 Ω source Impedance
Temperature Sensor (2 of same type required) Input	
• 10k Ω thermistor, 2 wire, type II, 10k Ω @ 25° C (77° F)	
• 100 Ω platinum RTD, DIN calibration curve, conforms to IEC-751 Standard	
• 1000 Ω platinum RTD, DIN calibration curve, conforms to IEC-751 Standard	
Calibration range of measurement	0…150° C (32…302° F)
Communication Port	RS-485 with termination, pull-up and pull-down jumpers
Pulse Output	
• Isolated solid-state switch in any standard or custom total units	
• Adjustable 50 ms to 1.0 second pulse output width in 50 ms increments	
Maximum sinking current:	100 mA @ 36V DC
Temperature	
Operating	0…70° C (32…158° F)
Storage	– 40…85° C (– 40…185° F)
Weight	4.8 oz with connector headers installed
Sensor Calibration	
Badger Meter	Use K and offset values provided in sensor manual
Other Sensors	Check with respected manufacturer of flow sensor and with factory
Units of Measure	
Flow Measurement:	
Rate	gpm, gph, l/sec, l/min, l/hr, ft^3/sec, ft^3/min, ft^3/hr, m^3/sec, m^3/min, m^3/hr
Total	Gallons, Gallons X 100, Gallons X 1000, Liters, Cubic Feet, Cubic Meters
Energy Measurement:	
Rate	kBtu/min, kBtu/hr, kW, MW, hp, tons
Total	Btu, kBtu, MBtu, kWh, MWh, kJ, MJ
Temperature Measurement	Fahrenheit, Centigrade
Programming	
• Requires PC or laptop running Windows operating system	
• Data Industrial 340BN/MB Programming Kit 840134-0002 containing software and Data Industrial Series programming cable is required for programming and setup	

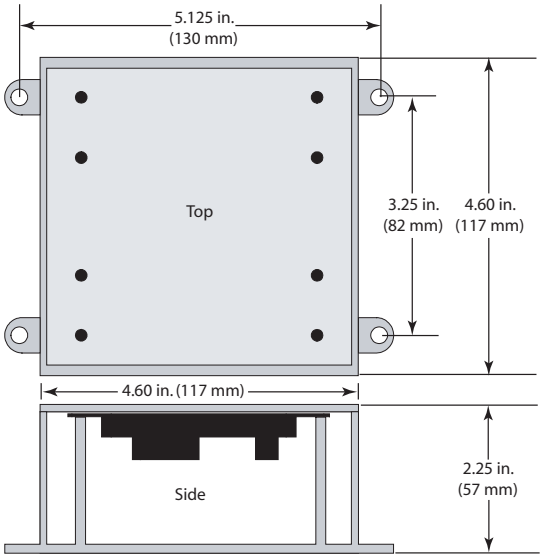

Figure 2: Plastic enclosure dimensions

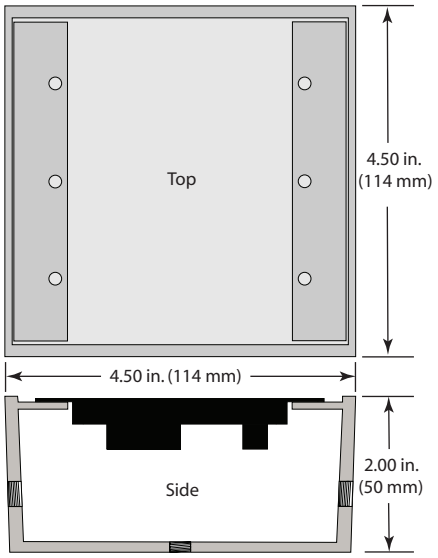

Figure 3: Metal enclosure dimensions

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