

## FC-5000 SERIES

Displays Flow Rate, Flow Total and Energy



FC-5000

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

### SPECIFICATIONS

FC-5000 Series

#### Power Supply

Input Range	10 to 40Vdc, 9 to 28Vac RMS (50 to 60 Hz)
Max. Power Consumption	8 W (power supply must provide 8 W min.)
Additional Parameters	Isolated from power ground Over-voltage, transient and reverse polarity protected

#### Flow Meter Inputs

Independent Channels	1
Input Range	0.3 Hz to 10 kHz
Configuration Options	Square wave 0 to 30V pulse with 2.5V threshold, Sine wave, zero-centered with 45 mV threshold, Configurable debounce
Excitation Output	12 Vdc source
Voltage	Low: -0.3 to 1.85 Vdc High: 2.5 to 25 Vdc
Impedance	Pullup to 12 Vdc
Vdc Current	±50 mA, short circuit current
Response	100 µs/3.5 ms min pulse (high/low speed)

#### Temperature Inputs

Independent Channels	2
RTD Specifications	50 µA/1000 µA excitation current source 2, 3 and 4-wire compatible (Platinum, 100 and 1000 Ω RTDs, optional two-point or customizable calibration configuration) Callendar-Van Dusen coefficients
Thermistor Specs	Type II thermistors or customizable calibration configuration, Steinhart-Hart coefficients

### Enhanced viewing

Large, backlit graphical display

### Intuitive navigation

Integrated softkeys and full numeric keypad

### Programmable scaled outputs

Outputs transmit rate, total or temperature data via dedicated output channels

### Programmable relays

Enables alarms or totalizing output capabilities for rates, totals and temperatures

### Plug & play terminals

Easy, user-friendly installation

### Rugged application

Robust enclosure, keypad and mechanical relays

### APPLICATIONS

- Interfacing and displaying sensor data
- Energy monitoring, communication, and management

#### Scaled Outputs

Independent Channels	2
Analog Output (Option A)	Configurable to 0 to 5V, 0 to 10V or 4 to 20 mA; Uncertainty: ±0.1% of reading; 16-bit resolution (0 to 10V and 4 to 20 mA), 15-bit resolution (0 to 5V); 200 ms, 90-10% step response; Sourcing analog output signal
Frequency Output (Option F)	TTL, 1 to 4000 Hz, square wave; Uncertainty: ±0.01% reading; Resolution: 0.01 Hz
Additional Parameters	Isolated from power ground Over-voltage, transient and reverse polarity protected Output is multiplexed on the process out pins

#### Digital I/O

Independent Channels	6
Additional Parameters	Isolated from power ground Over-voltage, transient and reverse polarity protected 0 to 30V as input Debounce 0 to 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



**SPECIFICATIONS (CONT.)**

FC-5000 Series

**RELAY OUTPUTS**

Configuration (Option C)	Two Form C mechanical relays
Configuration (Option A)	One Form C mechanical relay One Form A solid state relay
Form C Relay	Load: Resistive Rated carry current: 5A (N.C. or N.O.) Max. switching voltage: 250 Vac, 30 Vdc Min. permissible load: 10 mA at 5 Vdc Coil rating: 5 to 24 Vdc Life expectancy: 5,000,000 operations
Form A Relay (N.O. SPST)	Switching speed: On (0.25 ms), Off (0.02 ms) Current rating (IO): 1A Max. output voltage (VO): 60V Output On-Resistance (R(ON)): 0.5 $\Omega$ @ IF = 5 mA, IO = 1 A Output Withstand Voltage (VO(OFF)): 60-65V @ VF = 0.8V, IO = 250 $\mu$ A, TA = 77° F (25° C)
Additional Parameters	Isolated coil drivers Over-voltage, transient and reverse polarity protected

**NETWORK COMMUNICATIONS**

Protocols	Modbus RTU, Modbus ASCII or BACnet
Physical Layer	EIA-485 (RS-485)
Baud Rates	1200 to 115.2K
Additional Parameters	Two-wire (half-duplex) Over-voltage/ESD Protection Isolated from power ground

**USB COMMUNICATIONS**

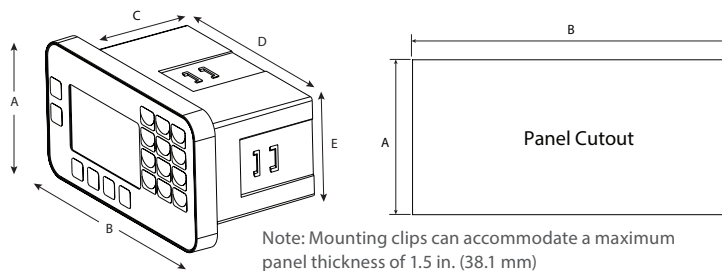
USB (Host)	Type A receptacle (currently not supported)
USB (Device)	Mini-B receptacle (used for field updates)
Additional Parameter	Over-voltage/ESD/transient protected

**DISPLAY/USER INTERFACE**

Keypad	Membrane overlay, domed tactile response keys, keypad interface is protected from ESD
Display	128 x 64 pixel LCD graphical display, LED backlit
Additional Parameter	Protected from EMI/RFI

**PANEL MOUNT**

Dimensional Drawing



	A	B	C	D	E	F	G	H
	HEIGHT	WIDTH	DEPTH	WIDTH	HEIGHT	WIDTH	HEIGHT	HOLE DIA.
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)

Note: All measurements: in. (mm)

**ENVIRONMENTAL RATINGS**

Pollution Degree	2
Altitude	Up to 2000 m (6561 ft)
Over-Voltage Rating	Category II
Ambient Temp.	32 to 130° F (0 to 55° C)
Storage Temp.	-40 to 160° F (-40 to 70° C)
Humidity	0 to 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**

Operator Functions	Unlatch relays, reset totalizers, unlatch relays and reset totalizers
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**PARAMETERS**

Max. Displayed Digits	Rates: Max 8 (7 with decimal) Totals: Max 9 (8 with decimal)
Resolution/Display Precision	Configurable, 0 to 4
Volumetric Flow Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D), Volumetric Flow Total Units	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 (M3), Cubic Feet (FT3), Acre Feet (AC-FT), Oil Barrels (OBBL), Liquid Barrels (LBBL), US Ounces (US OZ), Imperial Ounces (I OZ), Custom (user-specified)
Energy Units	kBTU, BTU, KW, TONS (RT), Custom (user-defined)
Temperature Units	° F (Fahrenheit), ° C (Celsius), R (Rankine) or K (Kelvin)

**WARRANTY**

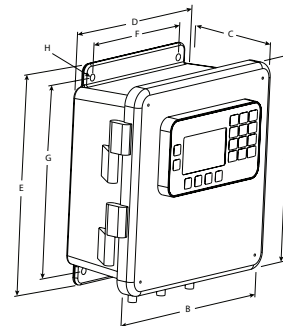
Limited Warranty	1 year
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**AGENCY APPROVALS**

Approvals	CE Marked for Low Voltage Directive and RoHS CSA Marked per Class C225286 and C225206, Process Control Equipment CSA C22.2 No. 61010-1-12, General requirements CAN/CSA-C22.2 No. 61010-1-12 Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements — Tri-national standard with UL 61010-1 and ANSI/ISA-61010-1 (82.02.01)
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**WALL MOUNT**

Dimensional Drawing

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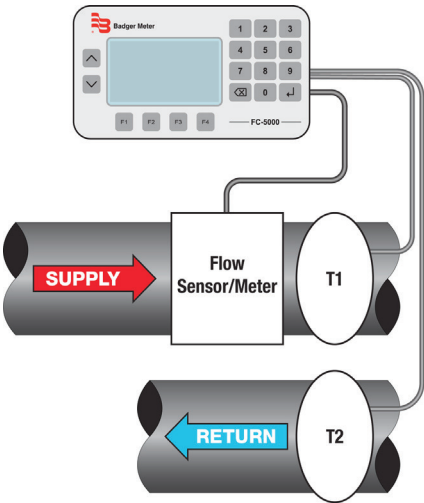
FC-5000 SERIES, CONTINUED

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.

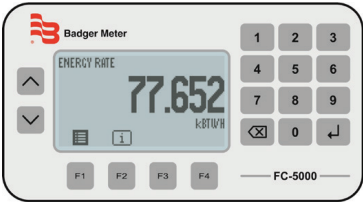
Two temperature sensor inputs can be configured to read RTDs or thermistors and are fully customizable to adapt to application needs. When used in conjunction with fluid flow, hydronic energy rates and total usage are achieved, while conforming to EN1434 standards.

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.



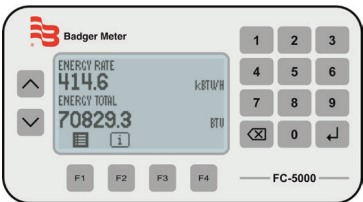
VIEWING CAPABILITIES

Single Display



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

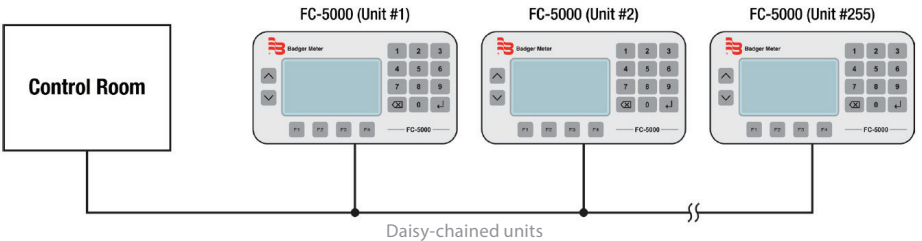
Dual Display



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

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.



ORDERING INFORMATION

FC-5000 Flow Display, Frequency Output

Frequency Output	Energy/BTU Option	Sensor Inputs	Scaled Outputs	Relay Outputs	Digital I/O	Comm.	Mount
BGR - FC5	-	-	-	-	6	A	-
<p>BM = Energy/BTU Monitor FD = Flow Display Only</p> <p>P0 = 1 Pulse (Flow Display Model) P1 = 1 Pulse (Energy/BTU Model) P3 = 2 Pulse*</p> <p>F = 2 Frequency Outputs</p> <p>A = 1 Form C Relay/ 1 Form A Relay C = 2 Form C Relays*</p> <p>A = EIA-485 (RS-485), Modbus, BACnet, USB</p> <p>P = Panel Mount W = Wall Mount (includes NEMA 4X IP67 rated enclosure)</p>							
BGR - FC5 - FD - P3 - F A 6 A - P							

\*Special order. Not available with Energy/BTU version.

FC-5000 Flow Display, Analog Output

Frequency Output	Energy/BTU Option	Sensor Inputs	Scaled Outputs	Relay Outputs	Digital I/O	Comm.	Mount
BGR - FC5	-	-	-	-	6	A	-
<p>BM = Energy/BTU Monitor FD = Flow Display Only</p> <p>P1 = 1 Pulse P2 = 2 Pulse*</p> <p>A = 2 Analog Outputs</p> <p>A = 1 Form C Relay/ 1 Form A Relay C = 2 Form C Relays*</p> <p>A = EIA-485 (RS-485), Modbus, BACnet, USB</p> <p>P = Panel Mount W = Wall Mount (includes NEMA 4X IP67 rated enclosure)</p>							
BGR - FC5 - FD - P2 - A A 6 A - W							

\*Special order.

