FB1100 Flow Computer

The FB1100 is a cost-effective, low-power explosion-proof flow computer that measures and monitors gas flow for a single differential pressure meter run. As well as bringing a new level of measurement confidence, the FB1100 can run independently without external power, for up to one year, making it an ideal replacement for chart recorders.

The FB1100 is part of Emerson's new field mount flow computer family that delivers a convenient approach to remote oil and gas sites by addressing challenges to power, safety, measurement reliability, and accuracy.

Designed for simple configuration and ease of use, the cost effective FB1100 flow computer is focused on metering applications where control is not required.

The FB1100 provides a full audit trail, including enhanced history, alarm and event logs as well as providing a discrete output that can be used to drive an odorizer.

The FB1100 includes power options for the most remote sites and has flexible communication capabilities, including FBxWifi™, for both remote and networked sites.

The new flow computers also come with the latest Rosemount™ multivariable measurement sensor technology, providing high accuracy differential pressure and static pressure measurement with long term stability to help improve measurement confidence and production efficiency.

Features

The FB1100 flow computer includes the following key features:

- Increased measurement confidence, reduced measurement uncertainty
- Measurement and I/O capability focused on metering applications
- Industry leading differential and static pressure measurement including 0.05% of reading accuracy and 5-year stability
- High accuracy temperature measurement including curve matching via the Callendar-Van Dusen equation
- Reduced need to re-calibrate resulting in less time spent on site
- Simplified configuration and set-up with the FBxConnect™ configuration software tool
- Cost-effective alternative to chart recorders
- Flexible design with power and communication options to meet site needs
- Standard firmware supports global calculations for DP metering including orifice, cone, Venturi, nozzle, and conditioning orifice
- Standard firmware supports Properties Calculations for Natural Gas and Pure Gas
- Simple selection of engineering units to suit local requirements
- Global Hazardous Area Approvals – Class 1 Div 1 & 2, ATEX & IEC Ex d & Ex nA
- FBxWifi allows secure local wireless access from safe area
- Ease of integration with support for Modbus, ROC, BSAP and DNP3 protocols
- Enhanced security helps prevent unauthorized access
- Enhanced alarming and historical data storage, improved audit trail
- Superior performance gives better control of your operations and maximizes profits
- API 21.1 compliant

FBxWifi™

The optional FBxWifi communications enables you to connect your laptop or tablet to the flow computer through a secure wireless connection. Once connected wirelessly, you can use FBxConnect configuration software to view process values, edit configuration parameters, and collect logs stored in the flow computer – all from within the safe area.

Aluminum Housing *Stainless Steel Housing*

FB1100

Power Options

The FB1100 has the following power options:

- External DC supply
- External DC supply with internal battery back-up
- Solar panel charging internal battery, FB1100 has internal solar regulator
- Autonomous mode with internal battery powering the FB1100 for 12 months

In "autonomous mode" the FB1100 runs from a single battery for up to 12 months without recharging. The 12-month battery life is based on the FB1100 running in low power mode on a typical remote application with a local collection of history and the use of the optional display for up to 30 minutes per month. This option is an ideal replacement for chart recorders, significantly reducing measurement uncertainty and providing a complete electronic audit trail. The 12-month battery life is achieved under an ambient temperature of 25˚C/77˚F; refer to the table on page 10.

The solar powered option provides up to 25 days of autonomous operation without charge.

Internal battery option is not available with ATEX and IEC approvals.

Firmware

The base firmware in the FB1100 flow computer measures static pressure, differential pressure, and temperature for a single meter run. The flow computer performs gas flow calculations based on those inputs in either U.S., metric, or other user-selectable units based on the calculation type.

The firmware supports the following flow calculations:

- AGA 3 1992/2013 (volume, mass/density, and mass/relative density)
- ISO 5167 1991/1998/2003 (orifice, Venturi, and nozzle)
- Rosemount 405C Compact Orifice and 1595 Conditioning Orifice Plate
- McCrometer V-Cone® and Wafer Cone®
- NUFLO™ Cone
- AGA 9 (Multipath Ultrasonic)

The firmware supports the following property calculations:

- AGA 8 1994 (Detailed, Gross 1 and Gross 2)
- AGA8 2017 Part 1 and Part 2 (GERG 2008)

  Note: AGA8 Part 2 / GERG 2008 provides support for the following pure gases: Nitrogen, Carbon Dioxide, Hydrogen, Oxygen, Carbon Monoxide, Water Vapor, Hydrogen Sulfide, Helium, and Argon
- Speed of Sound calculated via AGA 10 and AGA 8 2017 Part 2
- NX-19 1962, MOD, VDI/VDE 2040, Miller
- ISO 12213 2009 (parts 2 and 3)
- SGERG 1991 (Std., Alt 1, Alt 2 and Alt 3)
- GPA 2172 2009 (including saturated vapor calculation)
- ISO 6976 1995 (superior and inferior, incorporating Technical Corrigendum 2 [1997] and 3 [1999])
- AGA 5 2009

Regarding gas composition, the flow computer can:

- Receive updated gas composition from SCADA;
- Receive manual updates for gas composition through FBxConnect; or
- Use a fixed gas composition

The firmware includes the following flow rates and totals:

- Uncorrected volume
- Corrected (standard) volume
- Mass
- Energy

In addition to the normal totals, the firmware also supports the following fault totals which can be enabled for a gas meter. The conditions to trigger the fault totals are user configurable:

- Uncorrected volume fault totals
- Corrected volume fault totals
- Mass fault totals
- Energy fault totals

The firmware supports a fallback mode when a process variable's value is questionable. The fallback options can be one of the following:

- Use last good value
- Use a fixed fallback value

Alarms and Events

The flow computer supports extensive alarming capability to enhance operational efficiency and improve the audit trail. Alarms are pre-allocated to meter runs for standard values such as pressure, temperature, and differential pressure as well as meter run flow rates. In addition to these standard alarms, the FB1100 provides a number of user alarms that you can assign to other database parameters simply by “filling in the blanks” in user alarm templates in the FBxConnect configuration tool. Storage is provided for the most recent 1000 alarms in the alarm log.

The event log stores the significant events during operation and can be configured to either store all events in a single log of 2000 events or the user can select to store the metrology/legal events in a separate log from the operational events. With the latter option the event log capacity is 1000 metrology events and 1000 operation events.

Automated Checksum Verification (ACV)

As an extended auditing feature, the flow computer provides an option to perform online integrity checks by generating firmware and configuration checksums. The checksum is a 32-bit CRC number which is routinely calculated and compared against the last verified checksum. If a newly calculated checksum does not match with the last verified

checksum, the system generates a checksum error and the flow computer goes into an unverified state.

History

The FB1100 features expanded and flexible history capability to ensure measurement confidence and meet the increasing demands for secure data.

The flow computer has four standard periodic logs available providing hourly, daily, weekly, and monthly history. These logs can contain up to 110 variables including flow weighted average data, totals, and gas composition. For averaging, the FB1100 supports either flow weighted or flow dependent which can be linear or formulaic.

The FB1100 can store the following standard periodic logs for 35 variables. With the flexible history design, the number of variables and the time duration for different periodic logs can be adjusted to meet the application requirement.

- Hourly logs 62 days or 1500 records
- Daily logs 12 months or 365 records
- Weekly logs 12 months or 52 records
- Monthly logs 60 months or 60 records

  Note: This is only the initial default history. With the flexible history design, the number of variables and the time duration for different periodic logs can be adjusted to meet the application requirement.

The flow computer also supports two user periodic logs, the duration or period of each is user selectable between 1 minute and 200 hours. The first user periodic logs include 10 parameters over 4,000 periods and the second contains 20 parameters over 500 periods.

The flow computer with FBxConnect provides pre-formatted EFM reports for hours and days. The format of the reports can be .csv, .pdf or secure pdf.

In addition to the above reports, the flow computers can produce FLOWCAL-complaint. cfx files through the FBxConnect tool as well as calibration reports which contain U.S. Bureau of Land Management specific parameters.

Housing

The FB1100 includes an explosion-proof and flame-proof enclosure made of die-cast aluminum or stainless steel that can operate in an unprotected outdoor environment. Wiring for I/O, communications, and power enters the enclosure through the four conduit fittings. The front end cap provides a viewing window for the optional LCD. The rear end cap provides access to the screw terminals. The end caps can also be fitted with wire security seals.

Hazardous Area Certifications

The FB1100 has the following Global Hazardous Area Approvals:

- North American certification for Class I Division 1 Groups C and D (explosion proof) and Class I Division 2 Groups A, B, C and D
- ATEX and IECEx certification for Exd Zone 1 (flame proof) and Exn Zone 2 hazardous locations

Configuration Software

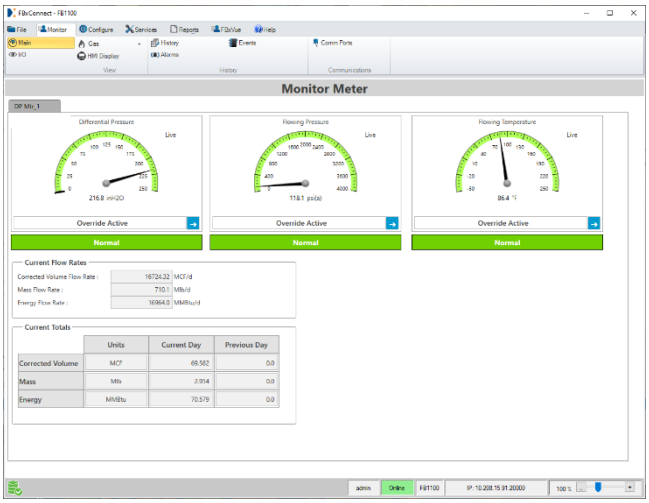
Emerson's new FBxConnect tool is a Microsoft® Windows®-based tool that enables you to easily monitor, configure, service, and calibrate the FB1100 flow computer. Designed for ease of use, FBxConnect provides at-a-glance monitoring, quick access to commonly performed tasks, and a guided configuration process to quickly get your measurement up and running.

The wizard-driven approach simplifies configuration and ensures that you only need to enter the required data once. Whether you are an experienced engineer or a new technician, you can be confident configuration is done correctly the first time.

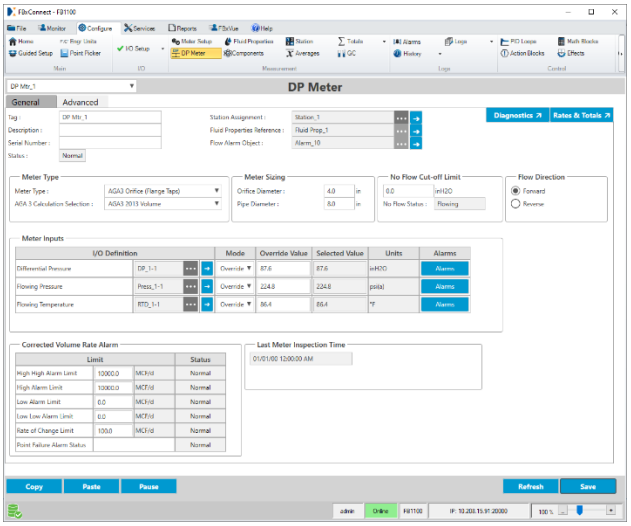
FBxConnect runs on a Windows PC or tablet. You connect securely to the flow computer using one of its serial ports or optionally through the FBxWifi wireless connection. For more information, refer to product data sheet *FBxConnect* (D301789X012).

Multivariable Sensor

Enabled by superior sensor technology and engineered for optimal flow performance, the MVS on the FB1100 delivers unparalleled accuracy over a wide range of operating conditions and industry leading stability. Pressure inputs on the sensor are used to measure differential (up to 1000" of water) and static (absolute or gauge) pressure with an operating range of up to 3600 psi and accuracies of up to 0.05% of reading.



Monitor Screen



DP Meter

Temperature Input (RTD/PRT)

With industry-leading measurement accuracy, the temperature measurement of the FB1100 will ensure that you minimize your measurement uncertainty in all operating conditions. The input accepts two-, three-, or four-wire connections reducing any field wiring induced errors and also supports sensor curve matching utilizing the optional Callendar Van-Dusen constants to define the unique characteristics of the RTD/PRT to further improve process temperature measurement uncertainty.

The FB1100 flow computer's superior static pressure, differential pressure (DP) and temperature measurement performance and stability ensures you meet standards and regulations so you can avoid fines, penalties, leaseholder disputes, and lost revenue. With the advanced measurement, you're getting the most accurate flow reading to ensure you meet your company and regulatory performance requirements.

Discrete Output

The FB1100 includes a single discrete output (DO) which provides the ability to control various discrete output field devices. The DO channel is a solid-state, normally open switch rated at 500 mA, enough to directly drive most odorizers or samplers. The DO channel can be software configured as a latched, toggled, momentary, timed duration output (TDO), or scaled pulse output.

Communications

The FB1100 has three serial communications ports with support for RS-232, RS-422, and/or RS-485 operation, and one port that supports optional FBxWifi (802.11 b/g) communications using DNP3 protocol.

- COM1 – 4-wire serial communications. Software selectable for EIA-232 (RS-232), EIA-422 (RS-422), or EIA-485 (RS-485) operation.
- COM2 – 2-wire serial communications. Software selectable for EIA-232 (RS-232) or EIA-485 (RS-485) operation.
- COM3 – 2-wire serial communications. Software selectable for EIA-232 (RS-232) or EIA-485 (RS-485) operation.
- COM4 –FBxWifi (802.11 b/g) communications (optional).

The FB1100 supports DNP3, Modbus slave (ASCII and RTU), BSAP, and ROC protocols on the three serial ports and DNP3 on the FBxWifi port.

Mounting Options

The flow computer supports either direct mount to a manifold on the pipeline or indirect mounting on a two-inch pipe or pole. A mounting bracket and bolts are available for use with a traditional flange or coplanar flange.

Security

To secure your valuable process and data, the FB1100 provides multi-level role-based access, user account authentication, and password encryption.

The system administrator can set a minimum password length (up to 20 characters) that accommodates lower case, upper case, numbers, and symbols, as well as configure a user lock-out feature that locks out invalid users after a defined number of failed login attempts.

FB1100 Flow Computer

CPU Module			
Processor	The central processing unit (CPU) of the flow computer is an NXP® Kinetis® K61 series CPU with an ARM® Cortex® M4 processor.		
Memory	SRAM	8 MB, holds current states of all variables and historical archives.	
	Flash	128 MB, holds firmware image and configuration files.	
Clock	Type	Real-time clock	
	Accuracy	0 °C to 40 °C	60 seconds/year
		−40 °C to 80 °C	110 seconds/year
	Watchdog Timer	1175 milliseconds	
Diagnostics	Battery voltage monitor, external voltage monitor, SRAM battery status		
Communications			
Ports	COM1	4-wire serial communications. Software selectable for RS-232, RS-422, or RS-485 operation.	
	COM2	2-wire serial communications. Software selectable for RS-232 or RS-485 operation.	
	COM3	2-wire serial communications. Software selectable for RS-232 or RS-485 operation.	
	COM4	FBxWifi (optional) 802.11 b/g	
Protocols	Serial ports support DNP3, Modbus slave (ASCII and RTU), BSAP, and ROC Wi-Fi supports DNP3 DNP3 includes level 3 protocol subset		
Inputs/Outputs			
The base FB1100 includes the following I/O: ▪ 1 multivariable sensor, measures differential pressure and static pressure ▪ 1 process temperature input (PRT/RTD) ▪ 1 discrete output (DO) The I/O of the FB1100 is focused on a standard metering application with a DO that is typically used to drive an odorizer.			
Multivariable Sensor			
The standard Rosemount™ MultiVariable™ sensor has a stainless steel coplanar flange, a stainless steel (316L) diaphragm, and silicone fill fluid. Optional versions include: ▪ A Hastelloy® C-276 sensor diaphragm, a Hastelloy C-276 coplanar flange, with either NACE MRO175/ISO 15156 or MRO103 certification ▪ Stainless steel traditional flange, a stainless steel diaphragm, and silicon fill fluid.			
Differential Pressure Input	DP Range 1	−25 to 25 Inches H_2O (−62.16 to 62.16 mbar)	
		Reference Accuracy	± 0.1% span; For spans less than 5:1, ± (0.025+0.015 [USL/Span]) % span
		Stability	±0.2% USL for 1 year

	Ambient Temperature Effect per 50°F (28°C)	from 1:1 to 30:1	± (0.2% USL + 0.25% span)
		from 30:1 to 50:1	± (0.24% USL + 0.15% span)
	Static Pressure Effects	Zero Error	± 0.25% USL per 1000 psi (69 bar)
		Span Error	± 0.4% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 3	2000 psi (137.89 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
	Notes: ▪ 25-inch sensor is only available with static pressure SP Range 3, maximum pressure limited to 2000 psi. ▪ 25-inch sensor is only available with stainless steel sensor and coplanar flange.		
DP Range 2: Standard	0 to 250 Inches H_2O (623 mbar)		
	Reference Accuracy	± 0.1% span; For spans less than 10:1, ± (0.01 [USL/Span]) % span	
	Stability	±0.1% USL for 1 year	
	Ambient Temperature Effect per 50°F (28°C)	from 1:1 to 30:1	± (0.15% USL)
		from 30:1 to 50:1	± (0.20% USL)
	Static Pressure Effects	Zero Error	± 0.1% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.2 + 0.0001 * (Ps - 2000)] % /1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 1	1600 psi (110.32 bar)
		SP Range 2	3626 psi (250.00 bar)
		SP Range 3	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
	Note: 0.1% Accuracy is not available on traditional flange.		
DP Range 2: Enhanced	0 to 250 Inches H_2O (623 mbar)		
	Reference Accuracy	± 0.075% span; For spans less than 10:1, ± (0.025 +0.005 [USL/Span]) % span	
	Stability	±0.125% USL for 5 years; For ±50 °F (28 °C) temperature changes, up to 1000 psi (68.9 bar) line pressure	

	Ambient Temperature Effect per 50°F (28°C)	± (0.0175% USL + 0.1% span) from 1:1 to 5:1, ± (0.035% USL + 0.125% span) from 5:1 to 100:1	
	Static Pressure Effects	Zero Error	± 0.05% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.1 + 0.0001 * (Ps - 2000)] % /1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 1	1600 psi (110.32 bar)
		SP Range 2	3626 psi (250.00 bar)
		SP Range 3	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
DP Range 2: Enhanced for Flow	0 to 250 Inches H_2O (623 mbar)		
	Reference Accuracy	±0.05% of reading; for readings less than 8:1, ± [0.05 + 0.0023(USL / Rdg)]% reading	
	Stability	±0.125% USL for 5 years; For ±50 °F (28 °C) temperature changes, up to 1000 psi (68.9 bar) line pressure	
	Ambient Temperature Effect per 50°F (28°C)	±0.13% of reading from 1:1 to 5:1, ± [0.13 + 0.04 (USL / RDG)] % of reading from 5:1 to 100:1	
	Static Pressure Effects	Zero Error	± 0.05% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.1 + 0.0001 * (Ps - 2000)] % per 1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 1	1600 psi (110.32 bar)
		SP Range 2	3626 psi (250.00 bar)
		SP Range 3	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
DP Range 2: Extended	0 to 250 Inches H_2O (623 mbar)		
	Reference Accuracy	±0.075% of span for spans 25 to 250 in H2O; For readings above span, ±0.15% reading	
	Stability	±0.125% USL for 5 years; For ±50 °F (28 °C) temperature changes, up to 1000 psi (68.9 bar) line pressure	

	Ambient Temperature Effect per 50°F (28°C)	For units spanned 75 to 250 inH2O, ±(0.025% MSL + 0.125% span) For pressures between span and 250 inH2O, ±(0.025% MSL + 0.125% reading)	
		For units spanned 25 to 75 inH2O, ±(0.09% MSL + 0.03% span) For pressures between span and 250 inH2O, ±(0.09% MSL + 0.03% reading)	
		For pressure readings above 250 inH2O, ±0.15% reading	
	Static Pressure Effects	Zero Error	± 0.05% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.1 + 0.0001 * (Ps - 2000)] % per 1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 1	1600 psi (110.32 bar)
		SP Range 2	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
DP Range 3: Standard	0 to 1000 Inches H_2O (2.5 bar) DP		
	Reference Accuracy	± 0.1% span; For spans less than 10:1, ± (0.01 [USL/Span]) % span	
	Stability	±0.1% USL for 1 year	
	Ambient Temperature Effect per 50°F (28°C)	from 1:1 to 30:1	± (0.15% USL)
		from 30:1 to 50:1	± (0.20% USL)
	Static Pressure Effects	Zero Error	± 0.1% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.2 + 0.0001 * (Ps - 2000)] % /1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 2	3626 psi (250.00 bar)
		SP Range 3	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
	Notes: ▪ 0.1% Accuracy is **not** available on traditional flange.		

DP Range 3: Enhanced	0 to 1000 Inches H_2O (2.5 bar) DP		
	Reference Accuracy	± 0.075% span; For spans less than 10:1, ± (0.025 +0.005 [USL/Span]) % span	
	Stability	±0.125% USL for 5 years; For ±50 °F (28 °C) temperature changes, up to 1000 psi (68.9 bar) line pressure	
	Ambient Temperature Effect per 50°F (28°C)	± (0.0175% USL + 0.1% span) from 1:1 to 5:1, ± (0.035% USL + 0.125% span) from 5:1 to 100:1	
	Static Pressure Effects	Zero Error	± 0.05% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.1 + 0.0001 * (Ps - 2000)] % /1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 2	3626 psi (250.00 bar)
		SP Range 3	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
	Note: 1000" DP range is **not** available with 300 psi static pressure (SP Range 1).		
DP Range 3: Enhanced for Flow	0 to 1000 Inches H_2O (2.5 bar) DP		
	Reference Accuracy	±0.05% of reading; for readings less than 8:1, ± [0.05 + 0.0023(USL / Rdg)] % reading	
	Stability	±0.125% USL for 5 years; For ±50 °F (28 °C) temperature changes, up to 1000 psi (68.9 bar) line pressure	
	Ambient Temperature Effect per 50°F (28°C)	±0.13% of reading from 1:1 to 5:1, ± [0.13 + 0.04 (USL / RDG)] % of reading from 5:1 to 100:1	
	Static Pressure Effects	Zero Error	± 0.05% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.1 + 0.0001 * (Ps - 2000)] % per 1000 psi
		Span Error	± 0.2% of reading per 1000 psi (69 bar)
	Over Pressure Limit	SP Range 2	3626 psi (250.00 bar)
		SP Range 3	3626 psi (250.00 bar)
	Burst Pressure Limit	10,000 psi (689.47 bar)	
	Notes: • 1000" DP range is **not** available with 300 psi static pressure (SP Range 1).		

	DP Range 4: Standard	0 to 2000 psi (137.89 bar)		
		Reference Accuracy	± 0.1% of span; for spans less than 10:1, ± [0.01(USL / span)] % span	
		Stability	±0.1% USL for 1 year	
		Ambient Temperature Effect per 50°F (28°C)	± (0.225% of USL) from 1:1 to 50:1	
		Static Pressure Effects	Zero Error	± 0.2% USL per 1000 psi (69 bar) For Static Pressures above 2000 psi: ± [0.4 + 0.0002* (Ps - 2000)] % per 1000 psi
			Span Error	± 0.2% of reading per 1000 psi (69 bar)
		Over Pressure Limit	SP Range 3	3626 psi (250.00 bar)
		Burst Pressure Limit	10,000 psi (689.47 bar)	
Static Pressure Input	SP Range 1	Gauge	−14.2 to 300 psi_g (−0.98 to 20.68 bar)	
		Absolute	0.5 to 300 psi_a (0.03 to 20.68 bar)	
		Reference Accuracy	Standard	± 0.1% span; For spans less than 5:1, ± [0.017 (USL/Span)] % span
			Enhanced	± 0.075% span; For spans less than 5:1, ±[0.013(USL/Span)] % span
	SP Range 2	Gauge	−14.2 to 1500 psi_g (−0.98 to 103.42 bar)	
		Absolute	0.5 to 1500 psi_a (0. 03 to 103.42 bar)	
		Reference Accuracy	Standard	± 0.1% span; For spans less than 5:1, ± [0.017 (USL/Span)] % span
			Enhanced	± 0.075% span; For spans less than 5:1, ±[0.013(USL/Span)] % span
	SP Range 3	Gauge	−14.2 to 3626 psi_g (−0.98 to 250.00 bar)	
		Absolute	0.5 to 3626 psi_a (0.03 to 250.00 bar)	
		Note: When used with 25” H_2O DP sensor, maximum static pressure is 2000 psi.		

		Reference Accuracy	Standard	± 0.1% span; For spans less than 5:1, ± [0.017 (USL/Span)] % span
			Enhanced	± 0.075% span; For spans less than 5:1, ±[0.013(USL/Span)] % span
	Stability	Standard Accuracy	±0.1% USL for 1 year	
		Enhanced Accuracy	±0.125% USL for 5 years	
	Ambient Temperature Effects per 28°C (50°F)	Standard Accuracy	± (0.175% USL) from 1:1 to 10:1, ± (0.225% USL) from 10:1 to 25:1	
		Enhanced Accuracy	± (0.050% USL + 0.125% span) from 1:1 to 10:1, ± (0.060% USL + 0.175% span) from 10:1 to 25:1	
Inputs				
Temperature Input (RTD/PRT)	Type	Pt100 2-, 3-, or 4-wire (software selectable)		
	Measuring Range	−200 to +850°C (−328 to +1562 °F)		
	Reference Accuracy	+/- 0.1°C from −60 to 200 °C (±0.18 °F from −76 to +392 °F) +/- 0.07°C from −30 to 60 °C (±0.126 °F from −22 to +140 °F)		
	Ambient Temperature Effect	−30 to 60 °C	+/- 0.017 °C per 10 °C (+/- 0.03 °F per 18 °F) from the calibration temperature	
		−60 to 200 °C	+/- 0.034 °C per 10 °C (+/- 0.06 °F per 18 °F) from the calibration temperature	
	Calculation Type	User selectable between	Callendar–Van Dusen	
			IEC 751/DIN 43760 (α 0.00385/°C)	
			IEC (α 0.003920/°C)	
	Scan Rate	1 second		
	Voltage Input Impedance	Greater than 3 MΩ DC		
	Excitation Current	205 μA		
	Surge Suppression	36 Vdc		
	Common Mode Rejection	100 dB at DC		
	Normal Mode Rejection	100 dB at 50/60 Hz		

<table>
<tr><th colspan="3">Outputs</th></tr>
<tr><td rowspan="6">Discrete Output</td><td>Type</td><td>Open drain</td></tr>
<tr><td>Current Mode</td><td>500 mA maximum</td></tr>
<tr><td>Operating Voltage Range</td><td>30 Vdc maximum</td></tr>
<tr><td>Frequency</td><td>50 Hz maximum</td></tr>
<tr><td>Output Type</td><td>Latched, momentary, toggle, TDO, or scaled pulse</td></tr>
<tr><td>Surge Suppression</td><td>30 Vdc</td></tr>
<tr><td></td><td>Fault Mode</td><td>User-entered default value or last good value</td></tr>
<tr><th colspan="3">Power</th></tr>
<tr><td>External DC Power Supply</td><td colspan="2">5.7 Vdc to 30 Vdc external supply (Max power at 10 watts)</td></tr>
<tr><td>Optional Rechargeable Lead Acid Battery</td><td colspan="2">Internal mounted 4.5 Ah 6.0 Vdc battery
The battery can power the unit for up to 25 days without any solar charging depending on display and communications usage, and can be charged by a 6-watt solar panel or from a DC supply for backup
Note: This option is available with Class 1 Div1 and Class 1 Div 2 approvals only.</td></tr>
<tr><td>Lithium Battery Pack</td><td colspan="2">10 Vdc, 41 Ah
Required when using autonomous measurement mode
Allows operation for one year in autonomous measurement mode with monthly data collection and 30 minutes per month of display use. Battery life is affected by ambient temperature, as shown in the following table:
<table>
<tr><th>Ambient Temperature</th><th>Typical Impact on Battery Life</th></tr>
<tr><td>25˚C</td><td>0%</td></tr>
<tr><td>-30˚C</td><td>23%</td></tr>
<tr><td>0˚C</td><td>19%</td></tr>
<tr><td>55˚C</td><td>34%</td></tr>
<tr><td>72˚C</td><td>38%</td></tr>
</table>
Note: This option is available only with Class 1 Div1 and Class 1 Div 2 approvals. Lithium battery shipping restrictions apply.</td></tr>
<tr><td>Solar Panel</td><td colspan="2">If ordered with the rechargeable battery option, the FB1100 includes an integral solar regulator
Can be supplied with an optional 6-watt 6 Vdc solar power
The solar panel input is rated to a maximum of 30V and 1.5A. A minimum of 8V is required to charge the battery.
Note: This option is available only with Class 1 Div1 and Class 1 Div 2 approvals.</td></tr>
<tr><td>SRAM Battery</td><td colspan="2">Lithium coin cell type BR2335 or BR2330
Typical battery life 5-7 years with power; 10,000 hours without power</td></tr>
</table>

Power Modes

To keep power consumption to a minimum, especially for remote sites, the FB1100 can run in two different power modes, low and standard. The FB1100 normally runs in low power mode for standard metering applications.

When running in low power mode, the radio power control function is used to switch to standard power mode and enable the serial ports. During communication periods, the unit uses the standard power mode and then automatically reverts to low power mode when the communication period is over.

The local display and FBxWifi can be configured to switch off after a period of inactivity (configurable between 1 and 60 minutes) or be permanently left on.

When running in low power mode, if you need to use more than the default number of data points for logging, consult the *Emerson FB1100 Flow Computer Instruction Manual* (D301752X012) to determine the possible impact on power consumption.

The figures below are typical power values in mW measured at room temperature.

Low Power Mode	**Base unit** with integral multivariable DP and pressure sensor and temperature measurement			36 mW @ 6Vdc	
	Additional Load Options	Display and Backlight active		296 mW @ 6Vdc	
		FBxWifi		315 mW @ 6Vdc	
		FBxWifi and Display active		340 mW @ 6Vdc	
		DO active (1 Hz, 50:50 duty cycle, no load)		10 mW @ 6Vdc	
Standard Power Mode	**Base unit** with integral multivariable DP and pressure sensor and temperature measurement		209 mW @ 6Vdc	224 mW @ 12Vdc	265 mW @ 24Vdc
	Additional Load Options	Display and Backlight active	162 mW @ 6Vdc	168 mW @ 12Vdc	178 mW @ 24Vdc
		FBxWifi	189 mW @ 6Vdc	185 mW @ 12Vdc	200 mW @ 24Vdc
		FBxWifi and Display active	204 mW @ 6Vdc	207 mW @ 12Vdc	221 mW @ 24Vdc
		DO active (1 Hz, 50:50 duty cycle, no load)	21 mW @ 6Vdc	23 mW @ 12Vdc	20 mW @ 24Vdc

Physical	
Construction	Die-cast aluminum, painted, with wire sealable end caps, or Stainless steel (AISI 316/ASTM CF8M), unpainted, with wire sealable end caps
Ingress Protection	IEC 60529 IP66 & NEMA 4X
Dimensions	11.715 in. H by 6.0 in. W by 9.426 in. D (297.7 mm H by 152.4 mm W by 239.4 mm D)
Mounting	2 in. pipe or direct manifold
Wiring	Size 12 to 28 American Wire Gauge (AWG) (0.3 to 2.0 mm diameter)
Wiring Access	4 conduit entry points 3/4 in. NPT (standard) M20 (optional)
Weight	FB1100 aluminum housing with MVS coplanar flange sensor: 6.75 Kg (14.9 lb)
	FB1100 stainless steel housing with MVS coplanar flange sensor: 13.27 Kg (29.5 lb)
	Optional Lead Acid battery: 0.86 Kg (1.9 lb)
	Optional Lithium Battery: 0.95 Kg (2.1 lb)

Display	Optional backlit liquid crystal display
HMI	20 characters per line; 4 lines in display
Environmental	
Operating Temperature	−40 °C to +80 °C (−40°F to +176 °F) (see ambient temps in Approvals section) **Note:** Please check Approvals section for any restrictions. The display exhibits increased response time and decreased contrast at temperatures below -30°C (−22 °F).
Storage Temperature	−40 °C to +85 °C (−40°F to +185 °F)
Operating Humidity	5 to 95%, non-condensing
Conformal Coating	All boards are conformal coated with a coating that complies with ANSI/ISA 71.04 Class G3 environments.
Environmental Rating	Product conforms to ANSI/ISA 71.04 Class G3 environmental standards with all conduit openings sealed.
Electro Magnetic Compatibility	The following EMC Emissions and Immunity are evaluated per EMC directive 2014/30/EU. Harmonized standards used: EN 61326-2-3-2013 Immunity EN 61326-1-2013 Emissions
Immunity	EN 61000-4-2 (Electro Static Discharge) EN 61000-4-3 (Radiated Immunity) * EN 61000-4-4 (Fast Transients) EN 61000-4-5 (Surges) EN 61000-4-6 (Conducted RF) EN 61000-4-8 (Power Frequency Magnetic Field) EN 61000-4-17 (Voltage Ripple) EN 61000-4-29 (Voltage Dips and Interrupts) *Meets CE compliance 10V/m industrial requirements (deviations < 1% span for RTD and Pressure readings in addition to original specification)
Radiated Emissions	EN 55022 Class A
Vibration	2g over 10 to 150 Hz 1g over 150 to 200 Hz
Approvals	
Product Markings for Hazardous Locations	UL Class 1, Div 1 Groups C, D, Temperature Code, T6 Class 1, Div 2 Groups A, B, C, D, Temperature Code T4 Ambient Temperature: Aluminum enclosure -40 °C to +80°C (-40 °F to +176 °F) (no battery) -40 °C to +80°C (-40 °F to +176 °F) (with rechargeable lead acid battery) -40 °C to +80°C (-40 °F to +176 °F) (with integral lithium battery)

		Evaluated per Approval Standards	Per Class 1, Div 1: UL 1203 5th Ed. UL/IEC 61010-1 Part 1 3rd Ed. CSA C22.2 No. 30-M1986 CSA C22.2 No. 61010-1-12 Part 1 3rd Ed. Per Class 1, Div 2: ANSI/ISA 12.12.01-2015 CSA C22.2 No. 213-15 CSA C22.2 NO. 61010-1-12 Part 1 3rd Ed UL61010-1 Part 1 3rd Ed
	UL	ATEX Cert: DEMKO 15 ATEX 1349X IECEx Cert: IECEx UL 15.0024X Ex db IIB T4 Gb, −40°C to +80°C	
		Ambient Temperature II 2 G. CE	−40 °C to +80 °C (−40 to +176 °F)
		Evaluated per Approval Standards:	Directive 2014/34/EU EN 60079-0:2012+A11:2013 EN 60079-1:2014
		ATEX Cert: DEMKO 15 ATEX 1367X IECEx Cert: UL 15.0044X Ex nA IIC T4 Gc	
		Ambient Temperature II 3 G.	−40 °C to +80 °C (−40 to +176 °F)
		Evaluated per Approval Standards:	Directive 2014/34/EU EN 60079-0:2012+A11:2013 EN 60079-15:2010
		Note: ATEX and IECEx approval requires the use of an external DC power supply.	
Product Markings for Metrology	Measurement (Industry) Canada	Approval No.: AG-0638 Device Type: Conversion Device - Flow Computer Approval Type: Category 3, Type B Approved For: Natural Gas Fiscal Measurement	
Miscellaneous Approvals	Customs Union	EAC TR CU 004/2011, TR CU 020/2011 Conforms to the requirements of the technical regulations of the Customs Union	
	RoHS2	**Device with integral MVS or SP Sensor**: RoHS (2) EU Directive 2011/65/EU: This product may be considered out-of-scope when used for the intended design purpose in a Large Scale Fixed Installation (LSFI). Consult https://www.emerson.com/compliance for up-to-date product information.	
	RoHS	25	
	NIMTT	nt China National Institute of Measurement and Testing Technology Test Report: 201801001329	

NEPSI China	 National Supervision and Inspection Centre for Explosion Protection and Safety of Instrumentation Cert. No. GYJ18.1015X Ex d IIB T4 Gb
	Cert. No. GYJ17.1350X Ex Na IIC T4 Gc
CCOE India	 Chief Controller of Explosives Approval No. A/P/HQ/MH/104/5885 (P420948) Ex db IIB T4 Gb
	Approval No. A/P/HQ/MH/104/5887 (P420946) Ex Na IIC T4 Gc
KOREA (KC)	EMC - Broadcasting and communication Equipment Cert. No. C1E5-0B70-8AB8-9CBC
NMi	 Report Number: NMi-1901499-02 API Chapter 21.1:2013 compliance for “Flow measurement using Electronics Metering Systems – Electronic Gas Measurement” and independent verification for natural gas properties and flow calculations

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