FB1200 Flow Computer

The FB1200 flow computer measures and controls gas flow for up to two differential pressure or linear meter runs. With a rugged housing and multiple I/O, communications, and power options, the FB1200 provides accurate and reliable flow measurement in the harshest conditions.

The FB1200 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 simplified configuration and ease of use, the FB1200 is also highly configurable and supports multiple flow and fluid property calculations right out of the box. The flexible design provides exactly what is required for each application. The FB1200 can also be equipped with Mobile SCADA™ functionality via Wi-Fi® allowing you to configure the flow computer and retrieve site data more safely than before.

The new flow computers also come with the latest Rosemount™ 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 FB1200 flow computer includes the following key features:

- Increased measurement confidence, reduced measurement uncertainty
- Industry leading differential and static pressure measurement including 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
- Flexible design with configurable I/O and communication ports to meet site needs
- Standard firmware supports global calculations for orifice, cone, Venturi, nozzle, conditioning orifice, turbine, PD, Auto-Adjust and Coriolis
- Flexible PID control with override complimented by configurable logic blocks and effects
- Simple selection of engineering units to suit local requirements
- Global Hazardous Area Approvals – Class 1 Div 1 & 2, ATEX & IEC Ex d & Ex nA
- Mobile SCADA 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

Mobile SCADA™ with Wi-Fi®

The optional Mobile SCADA™ with Wi-Fi® 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.

FB1200

Firmware

The base firmware in the FB1200 flow computer comes with all the calculations, features and functionality required to provide consistent measurement with increased confidence for gas metering and control. The flow computer measures static pressure, differential pressure or pulse frequency, and temperature for up to two meter runs.

The flow computer performs gas flow calculations based on the following set of user selectable global calculations. To fully satisfy local requirements the engineering units are fully user selectable between either U.S. or metric, or a combination of each.

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 7 2006 (pulsed turbine, PD, ultrasonic, and Coriolis meter)
- AGA 11 2013
- Auto-Adjust™ meter

The firmware supports the following property calculations:

- AGA 8 1994 (Detailed, Gross 1 and Gross 2)
- NX-19 1962/MOD/VDI/VDE 2040
- ISO 12213 2009 (parts 2 and 3)
- S-GERG 1991 (Std., Alt 1, Alt 2 and Alt 3)
- GPA 2172 2009 (including saturated vapor calculation)
- ISO 6976 1995 (Superior and Inferior)

The firmware accepts heating value and relative density from any of the following sources:

- Gas Chromatograph (GC)
- Fixed value
- Periodic download from SCADA
- An external signal, such as an analog input
- Calculated based on gas composition

The firmware includes the following flow rates and totals:

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

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 and stations for standard values such as pressure, temperature, differential pressure or frequency as well as meter run and station flow rates. In addition to these standard alarms, the FB1200 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.

History

The FB1200 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 60 variables including flow weighted average data, totals, and gas composition. For averaging, the FB1200 supports either flow weighted or flow dependent which can be linear or formulaic.

The FB1200 can store the following:

- Hourly logs 62 days
- Daily logs 12 months
- Weekly logs 12 months
- Monthly logs 60 months

The flow computer also supports two user periodic logs, the duration or period of each is user selectable between 1 second 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.

Housing

The FB1200 includes an explosion-proof and flame-proof enclosure made of die-cast aluminum 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 with connections for communications, I/O, and power. The end caps provide the ability to fit wire security seals.

Hazardous Area Certifications

The FB1200 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

Power Options

The FB1200 has the following power options available:

- External DC supply
- External DC supply with internal battery back-up
- Solar panel charging internal battery, unit has built-in solar regulator

The internal battery can power the device under normal operating conditions without charging for up to 16 days.

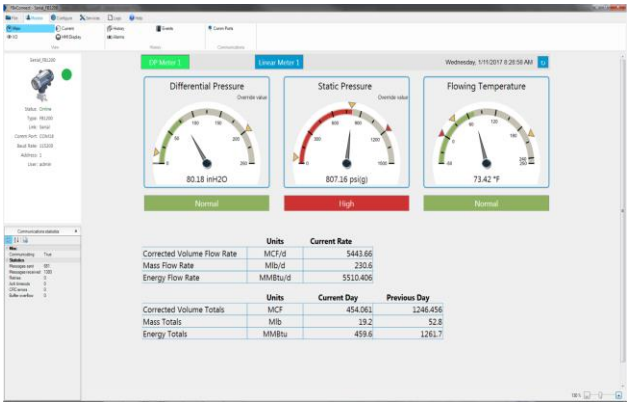
Note: Internal battery option is not available with ATEX or IEC approval.

Configuration Software

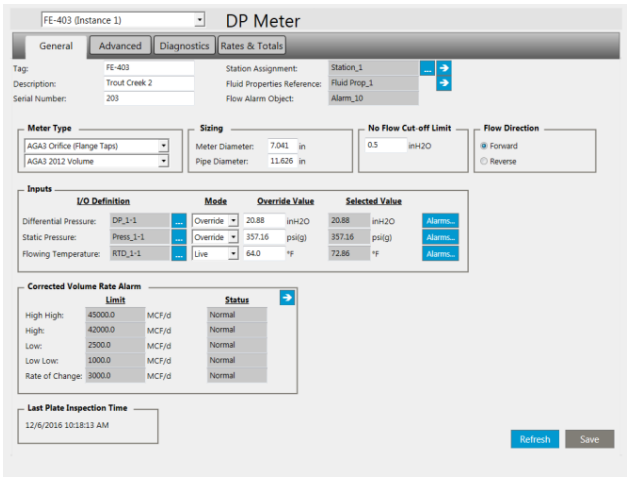
Emerson's new FBxConnect™ tool is a Microsoft® Windows®-based tool that enables you to easily monitor, configure, service, and calibrate the FB1200 flow computer. Designed for ease of use, FBxConnect provides at-a-glance monitoring, quick access to commonly performed tasks, and a guided configuration 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, Ethernet port, or optionally through the Mobile SCADA wireless connection. For more information, refer to product data sheet *FBxConnect* (D301789X012).



Monitor Screen



DP Meter

Security

To secure your valuable process and data, the FB1200 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.

Integral Pressure Sensor Options

The flow computer can be supplied with one of three sensor options to suit your metering needs:

- Integral Multivariable Sensor (MVS) measuring both Static Pressure and Differential Pressure (DP)
- Integral inline static pressure sensor
- NO integral pressure sensor – external transmitters are used

If the FB1200 has an integral sensor, it can also communicate with one remote 4088B transmitter. If it has

no integral sensor it can communicate with one or two remote 4088B transmitters.

Enabled by superior sensor technology and engineered for optimal flow performance, the integral pressure sensor on the flow computer delivers unparalleled accuracy, over a wide range of operating conditions and industry leading stability to ensure you meet standards and regulations.

The pressure sensors on the flow computer can measure DPs of up to 1000" of water / 2500 mBar and static pressures, up to 4000 psi / 275 Bar in either gauge or absolute with accuracies up to 0.075%.

Temperature Input (RTD/PRT)

With industry leading measurement accuracy the temperature measurement of the FB1200 will ensure that you minimize your measurement uncertainty in all operating conditions. The input accepts 2-, 3- or 4-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 FB1200 flow computer's superior static 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.

Inputs and Outputs

Base I/O

In addition to the integral pressure sensor, the FB1200 includes the following I/O points in the base un it:

- Two analog channels - individually software selectable as analog inputs (AI) or analog outputs (AO)
- Two discrete channels - individually software selectable as discrete inputs (DI), discrete outputs (DO), or pulse inputs (PI)
- One RTD/PRT (2-, 3-, or 4 wire)

Analog Inputs (AI) are individually software configurable for either 4 to 20 mA or 1 to 5 Vdc operation.

To keep measurement uncertainty at a minimum when external transmitters are being used, both the AI and AO channels have industry-leading measurement accuracy with an excellent performance over a wide ambient temperature range.

Each Discrete Input (DI) channel can also be software configured to function as a latched DI.

The Discrete Output (DO) channels are solid-state, normally open switches rated at 500 mA, enough to directly drive most samplers. Each DO channel can be software configured as a latched, toggled, momentary, timed duration output (TDO), or scaled pulse output.

The PI channels are most commonly used to interface with turbine meters, Coriolis meters, ultrasonic meters, and positive displacement (PD) meters. The high speed input supports signal up to 10.5 kHz.

Expansion I/O (optional)

In addition to the base I/O provided, the optional 6-point I/O board adds the following I/O capabilities to the FB1200:

- Two additional channels that are individually software selectable as either analog inputs or analog outputs
- Four additional channels that are individually software selectable as discrete inputs, discrete outputs, or pulse inputs

Control

The FB1200 optionally supports control functions including PID control, basic programming through action blocks, effects, and math blocks.

PID Control – The FB1200 supports up to three Proportional, Integral, and Derivative (PID) control loops. Each PID instance supports a primary and an override loop. Each loop has its own user-defined input, output, and override capability.

Typically, a PID control maintains a process variable at set point. If you configure a PID override control, the primary loop is normally in control of the control device but the override loop can take over control of the process if required. A typical example would be primary flow control with a pressure override.

Action Blocks – The FB1200 supports up to 30 action blocks. Action blocks are used in conjunction with effect blocks to monitor a configured condition and to perform an action (effect) when the logic is "true." An action block consists of a user defined Boolean logic statement with two variables. These variables can either be live parameter values or constants.

Multiple action blocks can be chained together to create more complex logic. Each action block includes multiple bypasses, which can temporarily halt the action to be taken for maintenance and safety.

Effects – The FB1200 supports up to ten effects. Effects cause an action to occur when the result of one or more action blocks is active ("true"). Multiple action blocks can cause the same effect, such as shutting a valve or enabling an alert beacon.

You configure an effect by defining an output parameter and the values to write to that parameter when the effect is either active or inactive. You can also configure an active effect to be self-clearing or to require a manual reset.

Math Blocks – The FB1200 supports up to ten math blocks. Math blocks perform mathematical equations using user-defined variables as inputs. Each math block consists of up to

four user-defined variables, three mathematical calculations, and the results of each calculation.

The result of the math block equation can be assigned to a user data point, to drive an output point, to a calculated value or to any other database parameter. Mathematical calculations also support standard math functions (POW, EXP, LOG, SQRT, etc.), constants, and operators.

FBxConnect checks each calculation string for the correct syntax and uses double precision floating point math throughout the calculation.

User Data Points

User data points are configurable storage areas in the data base. These user data points can store the constants / variables that are inputs to the math blocks in addition to the calculated results of math blocks. They can also be used to represent interim calculation values or values of additional inputs or outputs etc. There are eight user data instances, each with a tag and description, 30 integers (split between byte, short and long), 20 single floating points, and 10 double floating points, providing storage for up to 480 variables.

Communications

The FB1200 provides up to five user-selectable communications ports: three serial ports, one Ethernet port, and one optional port that supports Mobile SCADA Wi-Fi (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 – Mobile SCADA with Wi-Fi (802.11 b/g) communications (optional).
- COM5 – Ethernet. 10/100BASE-T twisted pair. Supports up to seven sessions.

The FB1200 supports multiple communications protocols, including DNP3, Modbus master and slave (ASCII and RTU), BSAP, and ROC on the three serial ports and DNP3 on the Mobile SCADA port. In addition, the Ethernet port supports RTU Modbus over TCP/IP protocol (master and slave), DNP3/IP, ROC, and BSAP (pending).

Mounting Options

The FB1200 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, coplanar flange, or inline static pressure options.

FB1200 Flow Computer

CPU Module			
Processor	The central processing unit (CPU) of the flow computer is an NPX® Kinetis® K61 series CPU with an ARM® Cortex® M4 processor.		
Memory	SRAM	8 MB, holds current states of all variables and historical archives.	
	SDRAM	128 MB	
	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. Can communicate to 4088B transmitters.	
	COM4	Mobile SCADA via Wi-FI (optional) 802.11 b/g	
	COM5	Ethernet 10/100 Base-T supports up to 7 sessions (1 Modbus Master, up to 3 DNP3, others selectable between ROC and Modbus Slave)	
Protocols	Serial ports support DNP3, Modbus master and slave (ASCII or RTU), BSAP, and ROC. The Ethernet port supports RTU Modbus over TCP/IP protocol (master and slave), DNP3, and ROC protocol. Wi-Fi supports DNP3 DNP3 includes level 3 protocol subset		
Base I/O			
The base FB1200 includes the following I/O: ▪ 2 channels that are individually software selectable as either analog inputs or analog outputs ▪ 2 channels that are individually software selectable as either discrete inputs, discrete outputs, or pulse inputs ▪ 1 process temperature input (RTD/PRT)			
Expansion I/O (optional)			
6 Channel I/O Board	Provides 6 additional I/O channels in addition to the base I/O. **Note:** Specifications for expansion I/O channels are identical to base I/O channels except where noted.		
	Analog Inputs / Analog Outputs	Quantity	2 channels Each channel is individually software selectable as an AI or AO.

	Discrete Inputs / Discrete Outputs / Pulse Inputs	Quantity	4 channels Each channel is individually software selectable as a DI, DO, or PI.
I/O Specifications			
Analog Inputs	Type	Single-ended	
	Input Range	1 to 5 Vdc or 4 to 20 mA (software selectable)	
		Over Range	1 to 5 Vdc: 0.8 to 5.2 Vdc 4 to 20 mA: 3.2 to 20.8 mA
	Resolution	16 bits	
	Scan Rate	10 samples per second	
	Input Impedance	1 to 5 Vdc Inputs	200 kΩ
		4 to 20 mA Inputs	250 Ω
	Fault Mode	User-entered default value or last good value	
	Software Filter	Software damping is available in FBxConnect configuration software	
	Input Filter	20 HZ @ -3 dB	
	Surge Suppression	30 Vdc	
	Reference Accuracy	+/- 0.05% of span **Note:** To achieve the stated accuracy when analog inputs are used in voltage mode, you must wire analog input reference(s) to the AGND terminals *separately* from the discrete and communication ground references.	
	Ambient Temperature Effect	+/- 0.05% of span per 10°C (18°F) from the calibration temperature	
	Long Term Stability	3 years	
	SNR	87 dB	
	Loop Power	Base I/O	External
		Optional 6-point Expansion I/O	Internal
Analog Outputs	Type	Single-ended, externally sourced	
	Output Range	4 to 20 mA	
	Resolution	14 bits	
	Surge Suppression	30 Vdc	
	Reference Accuracy	+/- 0.1% of span **Note:** To achieve the stated accuracy when analog outputs are used in voltage mode, you must wire analog output reference(s) to the AGND terminals *separately* from the discrete and communication ground references.	
	Ambient Temperature Effect	+/- 0.05% of span per 10°C (18°F) from the calibration temperature	

	Long Term Stability	3 years	
	Fault Mode	User-entered default value or last good value	
	Scan Rate	1 second	
	Surge Suppression	30 Vdc	
	Impedance	Current Mode	Configured to drive a load impedance of 0 to 900 Ω
			250 Ω max with 10 Vdc supply
			900 Ω max with 22.5 Vdc supply
		Voltage Mode	100 kΩ
	Load Loop Resistance	0 to 900Ω	
	Max External Supply	30 Vdc	
	Loop Power	Base I/O	External
		Optional 6 point I/O	internal
Discrete Inputs	Type	Dry contact or an open collector	
	Scan Rate	1 second	
	Input Filter	10 Hz	
	Input Current	Software selectable 66μA or 2mA	
	Voltage Rating	30 Vdc maximum	
	Frequency	10 Hz maximum	
	Input Type	Latched or unlatched	
	Loop Power	Internally sourced	
	Surge Suppression	30 Vdc	
	Fault Mode	User-entered default value or last good value	
Discrete Outputs	Type	Open drain	
	Current	500 mA maximum	
	Operating Voltage Range	30 Vdc maximum	
	Frequency	50 Hz maximum	
	Output Type	Latched, momentary, toggle, TDO, or scaled pulse	
	Surge Suppression	30 Vdc	
	Fault Mode	User-entered default value or last good value	
Pulse Inputs	Type	Dry contact or open collector	
	Frequency	Low Range	0 to 300 Hz
		High Range	0 to 10.5 kHz

	Input Filter	Low Frequency	1 ms software selectable filter
		High Frequency	30 µs software selectable filter
	Input Current	Software selectable 66 µA or 2 mA	
	Voltage Rating	30 Vdc maximum	
	Loop Power	Internally sourced	
	Surge Suppression	30 Vdc	
Temperature Input (RTD/PRT)	Type	2-wire, 3-wire or 4-wire (software selectable)	
	Measuring Range	-200 to +850°C (-328 to 1562 °F)	
	Reference Accuracy	+/- 0.07°C from -30 to 60°C (±0.126 °F from -22 to +140 °F) +/- 0.1°C from -60 to 200°C (±0.18 °F from -76 to +392 °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)
	Resolution	24 bits	
	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	

Integral Sensors

The FB1200 is available with the following integral sensor options:

- Multi-Variable Sensor – providing Differential Pressure and Static Pressure
- Static Pressure Sensor – providing Static Pressure only
- No integral sensor fitted – with interface to 4088B MVS transmitters or analog transmitters

Multivariable Sensor(optional)

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% USL 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)] % per 1000 psi
			Span Error	± 0.2% USL 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)] % per 1000 psi
		Span Error	± 0.2% USL 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)	
DP Range 3: Standard	0 to 1000 Inches H_2O (2.5 bar)		
	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)] % per 1000 psi
		Span Error	± 0.2% USL 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. ▪ 1000" DP range with 0.1% accuracy **only** available with stainless steel sensor and coplanar flange. ▪ 1000" DP range is **not** available with 300 psi static pressure (SP Range 1).		

DP Range 3: Enhanced	0 to 1000 Inches H_2O (2.5 bar)		
	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)] % per 1000 psi
		Span Error	± 0.2% USL 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).		
Static Pressure Input			
The following details are for the static pressure measurement of the MultiVariable sensor			
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) **Note:** When used with 25" H_20 DP Sensor, maximum static pressure is 2000 psi.	
	Absolute	0.5 to 3626 psi_a (0.03 to 250.00 bar) **Note:** When used with 25" H_20 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	

Static Pressure Sensor (optional)

The following section applies to the "in-line" integral static pressure sensor, without differential pressure, which would typically be used with linear meters that provide a pulsed signal for flow.

These static pressure sensors are provided in stainless steel with a 1/2 "– 14 NPT female process connection.

Static Pressure Input	SP Range 1	Gauge	−14.7 to 150 psi_g (−1.01 to 10.34 bar)
		Absolute	0 to 150 psi_a (0 to 10.34 bar)
	SP Range 2	Gauge	−14.7 to 800 psi_g (−1.01 to 55.15 bar)
		Absolute	0 to 800 psi_a (0 to 55.15 bar)
	SP Range 3	Gauge	−14.7 to 4000 psi_g (−1.01 to 275.79 bar)
		Absolute	0 to 4000 psi_a (0 to 275.79 bar)
	Reference Accuracy	Standard	± 0.1% span For spans less than 10:1, ± (0.01 [USL/Span]) % span
		Enhanced	± 0.075% span For spans less than 10:1, ± (0.025 + 0.005 [USL / Span]) % span
	Stability	Standard	± 0.1% USL for 1 year
		Enhanced	± 0.125% USL for 5 years
	Ambient Temperature Effects per 28 °C (50 °F)	Standard	± (0.175% USL) from 1:1 to 30:1 ± (0.225% USL) for 30:1 to 50:1
		Enhanced	± (0.050% USL + 0.125% span) from 1:1 to 30:1 ± (0.060% USL + 0.175% span) for 30:1 to 100:1
	Over Pressure Limit	SP Range 1	1500 psi (103.42 bar)
		SP Range 2	1600 psi (110.32 bar)
		SP Range 3	6000 psi (413.69 bar)
	Burst-Pressure Limit	11,000 psi (758.42 bar)	

Power	
External DC Power Supply	5.7 Vdc to 30 Vdc external supply (Max power at 10 watts)
Optional Rechargeable Lead Acid Battery	Internal mounted 2.9 Ah 6.0 Vdc battery Battery temperature rating -25°C to 60°C (-13°F to 140°F) The battery can power the unit for up to 16 days without any solar charging depending on display and communications and I/O usage, and can be charged by a 6-watt solar panel or from a DC supply for backup **Note:** This option is available **only** with Class 1 Div 2 approval.
Solar Panel and Regulator Options	If ordered with the rechargeable battery option, the FB1200 includes an integral solar regulator Can be supplied with an optional 6 watt 6V solar panel **Note:** This option is available **only** with Class 1 Div 2 approval.
SRAM Battery	Lithium coin cell type BR2335 Life expectancy of 5–7 years with power; 10,000 hours without power

Power Modes

To keep power consumption to a minimum, especially for remote sites, the FB1200 can run in two different power modes, low and standard. The FB1200 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.

Notes:

- Serial connection to a remote 4088B MVS can run in low power mode.
- If PID control, math/logic blocks, or Ethernet communications are enabled, or a serial port set to Modbus master, or the additional 6 channel I/O board is fitted and enabled, the unit will run in the standard power mode.

The local display and Mobile SCADA with Wi-Fi 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 FB1200 Flow Computer Instruction Manual* (D301782X012) 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, single meter run		47 mW @ 6.1Vdc
	Base unit with integral Static Pressure sensor and temperature measurement and pulsed input, single meter run		45 mW @ 6.1Vdc
	Base unit with integral multivariable DP and pressure sensor and temperature measurement, communicating to remote 4088 - dual meter run (4088 externally powered)		82 mW @ 6.1Vdc
	Additional Load Options	Display and Backlight active	292 mW @ 6.1Vdc
		Mobile SCADA	315 mW @ 6.1Vdc
		Mobile SCADA and Display active	337 mW @ 6.1Vdc
		DO active (1 Hz, 50:50 duty cycle, no load)	1 mW @ 6.1Vdc

Standard Power Mode	**Base unit** with integral multivariable DP and pressure sensor and temperature measurement, single meter run	230 mW @ 6Vdc	245 mW @ 12Vdc	287 mW @ 24Vdc

Base unit with integral Static Pressure sensor and temperature measurement and pulsed input), single meter run		244 mW @ 6Vdc	260 mW @ 12Vdc	305 mW @ 24Vdc
Base unit with integral multivariable DP and pressure sensor and temperature measurement, communicating to remote 4088 - dual meter run (4088 externally powered)		278 mW @ 6Vdc	306 mW @ 12Vdc	373 mW @ 24Vdc
Additional Load Options	Display and Backlight active	162 mW @ 6Vdc	168 mW @ 12Vdc	178 mW @ 24Vdc
	Mobile SCADA	189 mW @ 6Vdc	185 mW @ 12Vdc	200 mW @ 24Vdc
	Mobile SCADA and Display active	204 mW @ 6Vdc	207 mW @ 12Vdc	221 mW @ 24Vdc
	DO active (1 Hz, 50:50 duty cycle, no load)	1 mW @ 6Vdc	1 mW @ 12Vdc	1 mW @ 24Vdc
	PI active (10KHz, 50:50 duty square wave)	13 mW @ 6Vdc	14 mW @ 12Vdc	15 mW @ 24Vdc
	Additional 6 channel I/O board fitted	40 mW @ 6Vdc	49 mW @ 12Vdc	80 mW @ 24Vdc
	Ethernet enabled 100 Mbit	435 mW @ 6Vdc	421 mW @ 12Vdc	462 mW @ 24Vdc
	Ethernet active 100 Mbit	459 mW @ 6Vdc	443 mW @ 12Vdc	489 mW @ 24Vdc

Physical		
Construction	Die-cast aluminum, painted, with wire sealable end caps	
Ingress Protection	IEC 60529 IP66 & NEMA 4X	
Dimensions	With Sensor	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)
	Without Sensor	5.995 in. H by 6.0 in. W by 9.426 in. D (152.4 mm H by 152.4 mm W by 239.4 mm D)
Mounting	2 in. pipe or direct manifold	
Wiring	Standard	Size 12 to 28 American Wire Gauge (AWG) (0.3 to 2mm diameter)
	Optional	For units with optional 6-channel expansion card, size 16 to 28 AWG (0.3 to 1.3 mm diameter)
Wiring Access	4 conduit entry points 3/4 in. NPT (standard), M20 (optional)	
Weight	FB1200 with MVS coplanar flange sensor: 6.75 Kg (14.9 lb)	
	FB1200 with static pressure sensor: 5.98 Kg (13.2 lb)	

	FB1200 without sensor: 4.22 Kg (9.3 lb)	
	Internal battery: 0.73 Kg (1.6 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 to 85 °C (−40 to 185 °F)	
Operating Humidity	5 to 95%, non-condensing	
Conformal Coating	All boards are conformal coated and comply with ANS1/1SA S71.04 Class G3 environments	
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 at 10V/m for industrial requirements (deviations < 1% span for RTD and Pressure readings in addition to original specification)
	Emissions	EN 550022 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 Class1, Div 2 Groups A, B, C, D, Temperature Code T4	
		Ambient Temperature	Standard −25 to +80 °C (−13 to +176 °F) With Integral Rechargeable Lead Acid Battery −25 to +60 °C (−13 to +140 °F
		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 d 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 60079-1:2007
		ATEX Cert: DEMKO 15 ATEX 1367X IECEx Cert: UL 15.0044X Ex nA IIC T4 Gc	
		Ambient Temperature II 3 G.	−25°C to +80 °C (−13 to +176 °F)
		Evaluated per Approval Standards	Directive 2014/34/EU EN 60079-0:2012+A11:2013 EN 60079-15:2010 EN 60079-1:2007
		Note: ATEX and IECEx approval requires the use of an external DC power supply.	
Miscellaneous Approvals	RoHS (China)		

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