

B-Series

Thermal Mass Flow

Pressure and Temperature Insensitive Mass Flow Controllers

Overview

The Brooks B-Series sets a new standard in gas mass flow control. Whether you are flowing gas to a CVD chamber, chemical research reactor, fuel cell test stand, or any other important application, the quality of your results can be no better than the performance of your gas mass flow controller. The B-Series is a fully RoHS compliant device designed to minimize all sources of gas flow inaccuracy, giving you exceptional stability, robust resistance to flow variation due to pressure and temperature fluctuations, and extremely low valve leak-by. Unique advanced diagnostics permit you to verify device performance in-situ and the on-board user interface makes changing and monitoring parameters a snap. Additionally, the B-Series can simplify and reduce the cost of gas panels by minimizing the need for separate pressure regulators, pressure transducers, and the associated mounting hardware.

Product Description

Built on a standard 1.125 inch wide platform with a powerful user interface and display, the B-Series provides a compact flow measurement and control solution eliminating the need for costly temperature and pressure control devices and systems. The B-Series incorporates sophisticated internal self-diagnostic routines that continuously check and report the health of the device. An easy to use service port provides additional diagnostic capability, minimizing the need to remove the mass flow controller from service.

Pressure Insensitivity

The B-Series actively measures line pressure and adjusts the control valve to virtually eliminate actual flow and flow signal variation due to pressure fluctuations.

Temperature Insensitivity

The output of every B-Series mass flow controller is characterized over the full operating temperature range providing superior measurement and control accuracy regardless of process or ambient temperature conditions.

Ultra Fast Response

The B-Series mass flow controller combines a superior thermal mass flow sensor with the unique coplanar valve and advanced control algorithms to provide ultra fast response.

Advanced Diagnostics

The B-Series has a variety of alarm and diagnostic capabilities including the patent pending Valve Leak-By Diagnostic and the exclusive Zero Drift Diagnostic. These advanced diagnostics combine to provide the user with a real time in-situ method to verify that the device is performing within user specified limits.



Model B950

Product Description

User Interface

The user interface has an LCD display where the user can view flow signal, temperature, pressure, and alarm status. Using the push buttons the user can scroll through all of the options, change engineering units, and re-zero the device. The DeviceNet MAC ID and baud rate switches are also accessible from the top interface simplifying installation and startup.

Convenient Service Port

There is a convenient service port available by lifting a captured plug on the top of the device. This service port along with Brooks Service Suite provides easy access to the device for diagnostics and troubleshooting.

Multi-Gas / Multi-Range

The B-Series is capable of storing up to nine different sets of gas calibration data. Each set includes a calibration curve, PID controller settings, valve performance data, and information about the calibration conditions. The calibrations can be for different gases or for the same gas at multiple conditions (pressures, full-scale flow rates).

RoHS Compliant

Fully RoHS compliant per EU Directive 2002/95.

Superior Valve Technology

The Brooks coplanar valve is standard on all B-Series devices. This valve enables minimum valve leak by, wide turndown, super fast response, and superior actual flow stability.

Adaptable Mechanical Configurations

The B-Series is built on a standard 1.125 inch platform but can easily retrofit to existing gas box designs with the traditional 1.5 inch footprint.

Calibration Systems / Accuracy

Every Brooks mass flow controller is calibrated on a primary standard traceable to national and international standards (e.g. NIST). Improvements to our calibration systems and processes and enhancements to the device firmware provide superior flow measurement accuracy and repeatability. (Reference Graph)

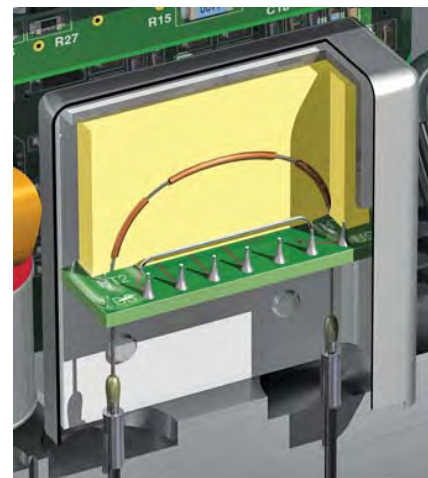
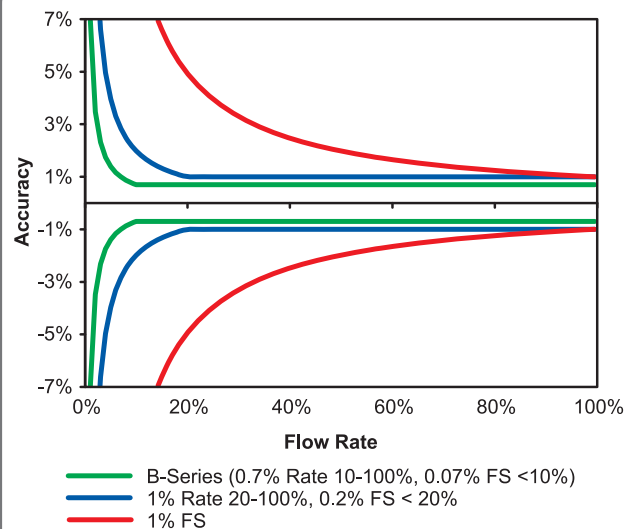
Three Wire Sensor

Thermal mass devices work by heating a sensor tube and measuring the temperature difference between two points on the sensor tube. The Brooks sensor is made up of three wires (two unheated and a heated one) while most of our competitors' sensors are made up of just two heated wires. Brooks' three-wire sensor design dramatically reduces the likelihood of drift for improved accuracy because:

- The sensors are unheated resulting in a relatively low change in resistance
- The sensors are not heated and cooled as they are in a two-wire sensor design which can cause gaps between the sensor and the bypass tube
- A single amplifier drives one heater in the three-wire sensor design versus different amplifiers driving two heater/sensors in the two-wire sensor design which can cause a mismatch in resistance

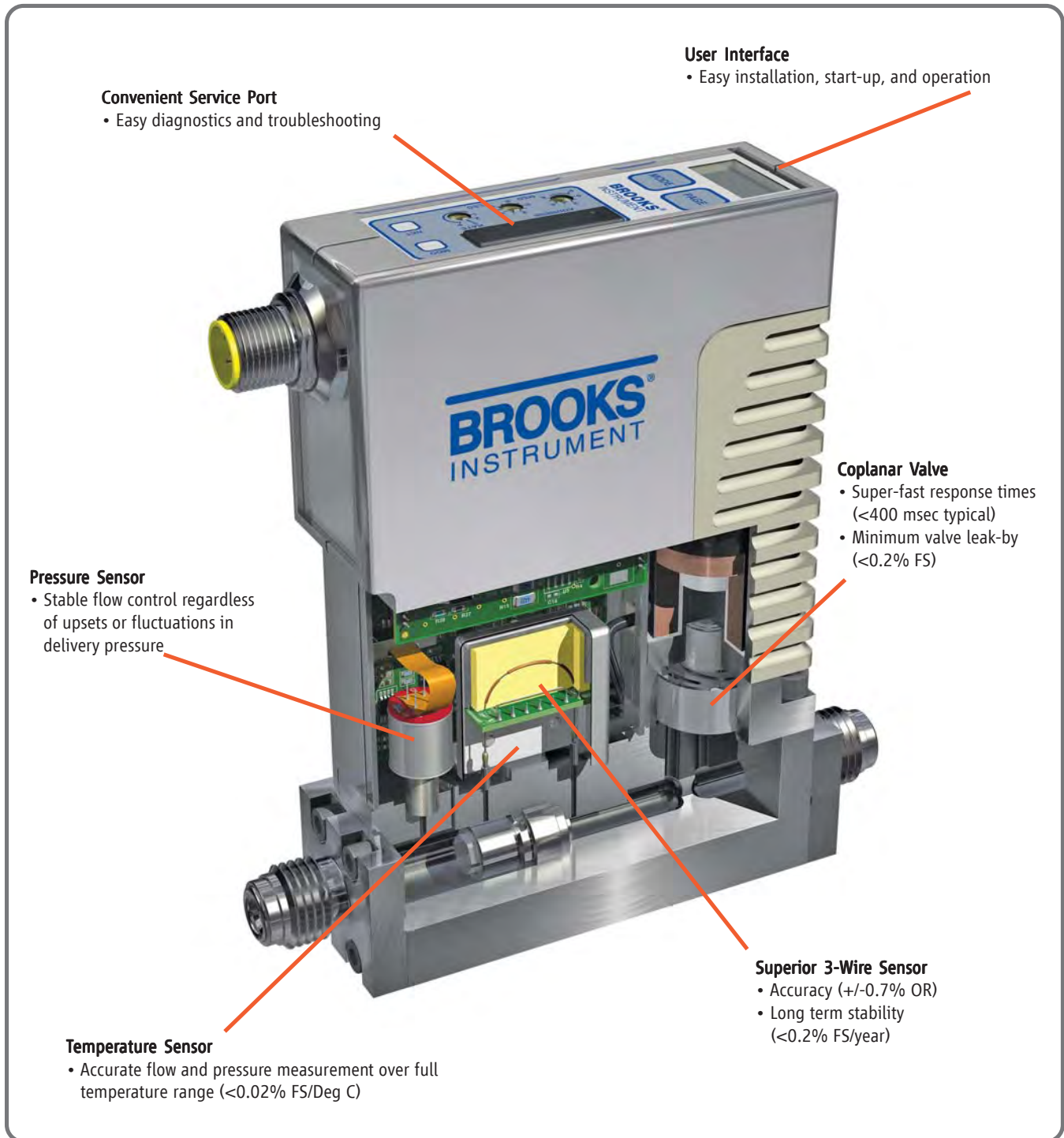


B-Series User Interface and Service Port



Brooks' Three-wire Sensor

Features and Benefits

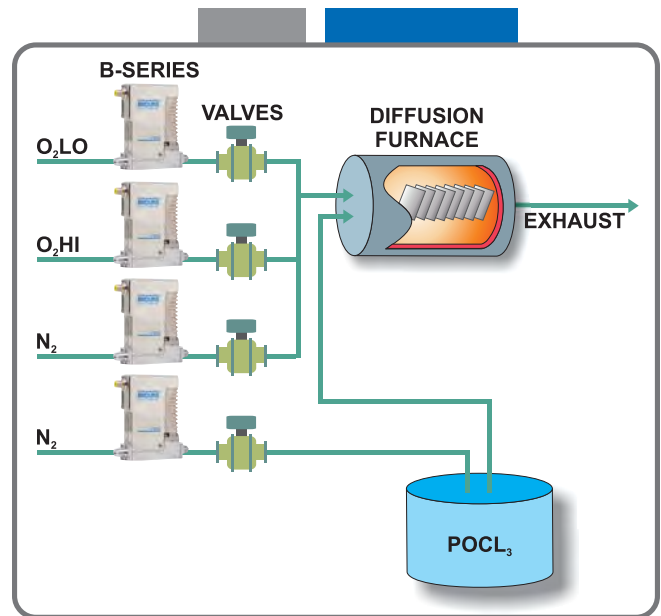


Features	Benefits
Pressure Insensitive Temperature Insensitive	Improves yield. Reduces overall gas panel costs. Improves yield. Reduces overall equipment costs.
User Interface User Accessible Service Port	Simplifies installation and startup for maximum uptime. Convenient interface to diagnostics for maximum uptime.
Advanced Diagnostics Superior Valve Technology	Ensures device operating within user specified limits for high process yield and maximum uptime. Minimum leak-by, maximum turndown and fast response reduces overall gas panel cost and increases throughput.
Adaptable Mechanical Configurations Calibration Systems	Easily retrofit to existing systems. Measurement accuracy is traceable to international standards.
Three Wire Sensor	Provides unmatched long-term sensor stability ensuring maximum yield and throughput.

Product Applications

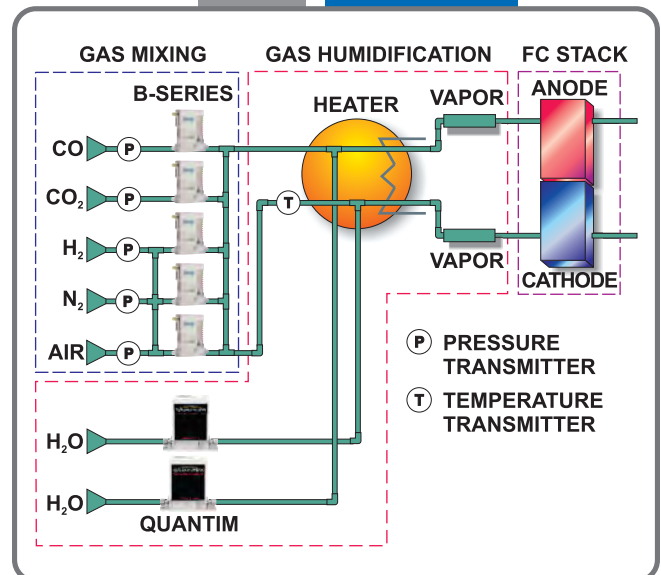
Thin Film - Semiconductor / Solar

Demanding applications in semiconductor and solar cell manufacturing including but not limited to CVD, etch, and diffusion will benefit from the advanced features of the Brooks B-Series pressure and temperature insensitive mass flow controllers. The B-Series allows equipment manufacturers to eliminate pressure regulators, pressure sensors, and displays reducing the footprint and cost of the gas panel and the end users get superior performance, uptime, yield, and throughput.



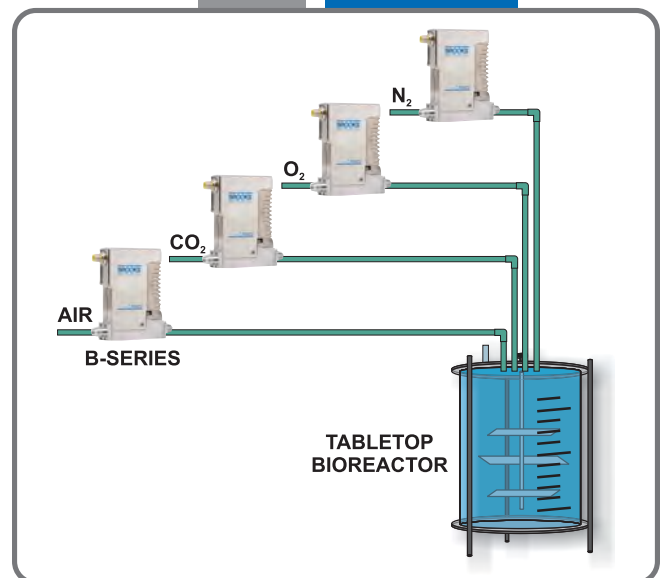
Alternative Energy - Fuel Cell

Fuel cell test stands used to simulate environmental conditions and measure the efficiency of the fuel cell rely on accurate, fast responding, stable mass flow controllers with wide turndown. The Brooks B-Series pressure and temperature insensitive mass flow controller is ideal for these challenging applications because it can achieve sub-500 msec response and additionally provides flow immunity to pressure spikes and temperature changes.



Life Science - Biotechnology

Leading edge biotechnology applications require precise flow control regardless of upsets in delivery pressure. The Brooks B-Series pressure and temperature insensitive mass flow controller allows simplified manifold gas delivery systems without compromising the flow control, response, and stability.



Product Specifications

Performance

Full Scale Flow Range	Control Range	Settling Time (step change >5% FS)
3 sccm to 1 slpm	50:1	<1 sec (<800 msec typical)
1 slpm to 30 slpm	100:1	<1 sec (<400 msec typical)
30 slpm to 50 slpm	100:1	<1 sec (<800 msec typical)
Flow Accuracy	+/- 0.7% of rate (10 to 100% FS) +/- 0.07% FS (< 10% FS)	
Flow Repeatability	0.2% of rate (5 to 100% FS)	
Valve Leak-By	<0.2% FS	
Long Term Flow Sensor Drift	<0.2% FS / year	
Pressure Insensitivity	1.5% of rate per psi for pressure transients 1-7 psid per 0.1 sec., up and down (5-100% FS)	
Pressure Measurement Range	0-100 psia (0-689.5 Kpa)	
Pressure Measurement Accuracy	+/- 0.5% FS including linearity, hysteresis, repeatability, zero and span offset	
Flow Sensitivity to Pressure	< 0.005% FS / psi (N ₂ eq)	
Temperature Measurement Range	0-70 Deg C (32-158 Deg F)	
Temperature Measurement Accuracy	+/- 2 Deg C during thermally static conditions	
Flow Sensitivity to Temperature	Zero 0.02% FS / Deg C Span 0.025% FS / Deg C	

Ratings

Leak Integrity (inboard to outboard)	1x10 ⁻¹⁰ atm scc/sec Helium max	
Ambient Temperature Limits	Operating	0-50 Deg C (32-122 Deg F)
	Non-Operating	0-70 Deg C (32-158 Deg F)
Operating Pressure Range	100 psia (689.5 Kpa) 7-100 psia (48.3 - 689.5 kPa)	
Pressure Equipment Directive (97/23/EC)	Conforms to Standard Engineering Practice	
Differential Pressure Range	3 sccm to 30 slpm FS	5-70 psi (34.5 - 482.6 kPa) Broader depending on process conditions. Contact Factory.
	>30 slpm FS	30-70 psi (206.8 - 482.6 kPa)
Mounting Attitude Sensitivity	0.2% of FS maximum deviation after re-zeroing	
Particulate	Zero (0) particles / ft ³ > 0.1 microns. < 4 particles / ft ³ > 0.02 microns.	

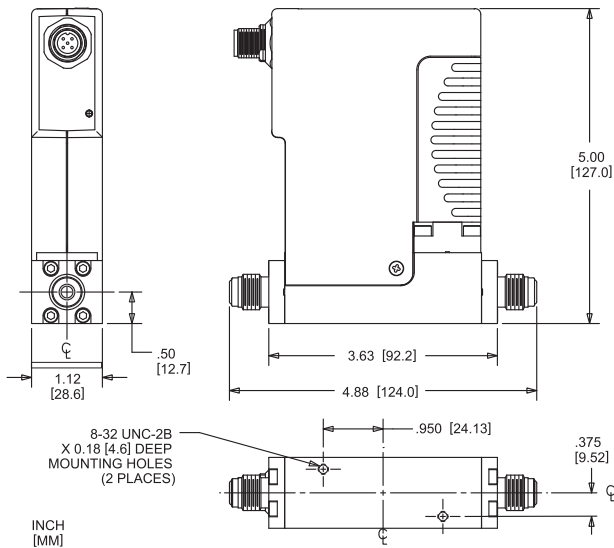
Mechanical

Internal Surface Finish	Electro polished, 5 micro inch (0.13mm micrometer) Ra in accordance with SEMI F19-95 Section 7	
Valve Operation	Normally Closed	
Materials of Construction	External/internal seals	Nickel
	Valve seat	17-7PH stainless steel
	Other	316L Vacuum Arc Remelt (VAR), 316L and high-alloy ferritic stainless steel
Process Connections	1.125 inch platform	1/4" M-VCR™, C Seal (SEMI F82-0304 R1-1), CS Seal (SEMI 2787.5), W Seal (SEMI F82-0304 R1-3)
	1.5 inch platform	C Seal (SEMI 2787.1), CS Seal (SEMI 2787.5), W Seal (SEMI 2787.3)
Dimensions	See Page 6	

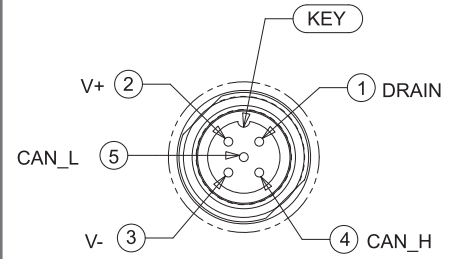
Electrical

Display	5 1/2 digit backlit LCD
Electrical Connections	DeviceNet I/O Option: 5-pin Micro-Connector, male. See Page 6
Power Supply Voltage	DeviceNet I/O Option: 11-25 Vdc
Power Requirements	Typical: 6.3 watts
	Maximum: 7.7 watts
Digital Communications	DeviceNet I/O Option: <ul style="list-style-type: none"> Complies with ODVA™ MFC Device Profile Complies with Semiconductor SIG Capable of: poll I/O, cyclic and change of state messaging Sensor, valve, calibration, tuning, diagnostic, and other internal data available to support fast commissioning MAC-ID and Baudrate rotary switches, and two bi-color status LEDs

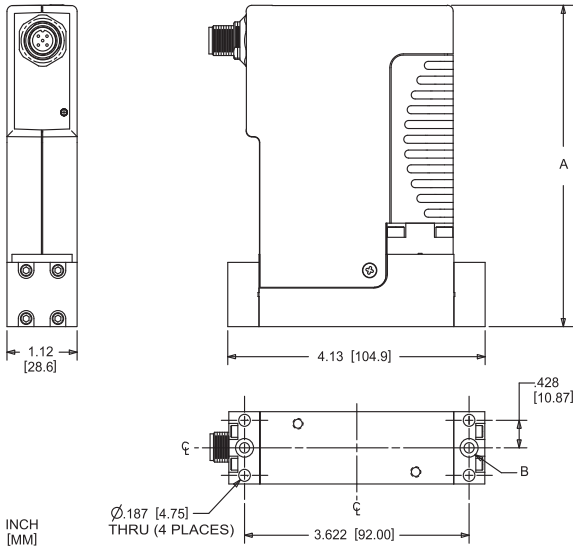
Product Dimensions



Model B950
1/4" MVCR

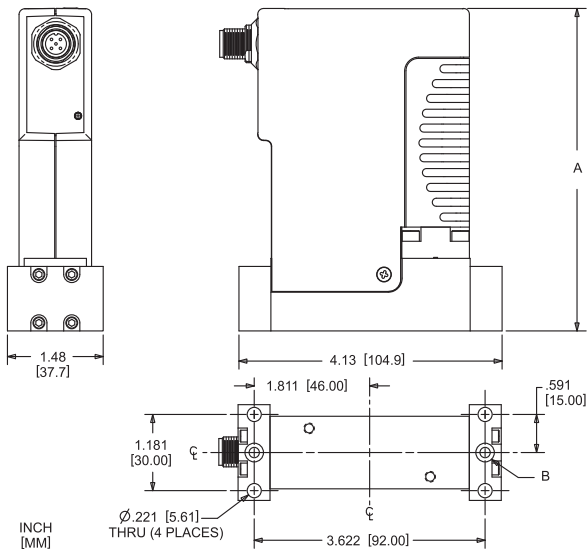


5 Pin Male Micro DeviceNet Connector
M12 x 1 Outside Thread



Connection Type	A	B
'C' Seal Downport, 1-1/8"	5.00 [127.0]	Ø .16 - .17 [4.0 - 4.3], Ø .29 [7.37] C'Bore x 0.24 [0.61] Deep (2 places)
'W' Seal Downport, 1-1/8"	5.06 [128.6]	W-Seal Downport per SEMI F82-0304 R1-3
'CS' Seal Downport, 1-1/8"	5.06 [128.6]	Ø .16 - .17 [4.0 - 4.3], Ø .443 [11.25] C'Bore x 0.019 [0.48] Deep (2 places)

Model B950
'C' Seal, 'W' Seal, 'CS' Seal Downport 1-1/8"



Connection Type	A	B
'C' Seal Downport, 1-1/2"	5.00 [127.0]	Ø .16 - .17 [4.0 - 4.3], Ø .29 [7.37] C'Bore x 0.24 [0.61] Deep (2 places)
'W' Seal Downport, 1-1/2"	5.06 [128.6]	W-Seal Downport per SEMI 2787.4
'CS' Seal Downport, 1-1/2"	5.06 [128.6]	Ø .16 - .17 [4.0 - 4.3], Ø .443 [11.25] C'Bore x 0.019 [0.48] Deep (2 places)

Model B950
'C' Seal, 'W' Seal, 'CS' Seal Downport Downport 1-1/2"

Model Code

Code Description	Code Option	Option Description
I. Base Model Code	B	B-Series Mass Flow
II. Package / Finish Specifications	9	UHP
III. Function	5	Mass Flow Controller
IV. Body Size	0	3 ccm - 50 lpm
V. Digital I/O Communications	D	DeviceNet I/O
VI. Diagnostics / Enhancements	A	Standard
	E	Zero Drift / Leak-by Diagnostic
VII. Model Revision Level	A	Rev. A
VIII. Mechanical Connections	1E	1/4" VCR
	1K	1.5" C-seal Downport
	1N	1.5" CS-seal Downport
	1R	1.5" W- Seal Downport
	1U	1.125" C-seal Downport
	1V	1.125" CS-seal Downport
1W	1.125" W- Seal Downport	
IX. Seal Material / Surface Finish	G	Metal / UHP 5Ra
X. Valve Seat Material	G	Metal
XI. Valve Type	1	Normally Closed
XII. Analog I/O Communications	A	None - Digital Communications only
XIII. Pressure Transducer/Display	3	Integral Pressure Transducer and Digital Display
XIV. Digital Configurable Gas / Range	0	N/A - Sized for maximum turndown (standard)
XV. Certification	1	Safe Area

Sample Model Code

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
B	9	5	0	D	E	A	1E	G	G	1	A	3	0	1

Brooks Service and Support

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required. For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users, and maintenance persons.

Please contact your nearest sales representative for more details.

HELP DESK

In case you need technical assistance:

Americas ☎ 1 888 554 FLOW
Europe ☎ +31 (0) 318 549 290
Asia ☎ +81 (0) 3 5633 7100

Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

TRADEMARKS

Brooks Brooks Instrument, LLC
Brooks Service Suite Brooks Instrument, LLC
DeviceNet Open DeviceNet Vendors Association, Inc.
ODVA Open DeviceNet Vendors Association, Inc.
VCR Cajon Co.

DS-TMF-B-Series-MFC-eng (0209)



Brooks Instrument
407 West Vine Street
P.O. Box 903
Hatfield, PA 19440-0903 USA
T (215) 362 3700
F (215) 362 3745
E-Mail BrooksAm@BrooksInstrument.com
www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
T +31 (0) 318 549 300
F +31 (0) 318 549 309
E-Mail BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
T +81 (0) 3 5633 7100
F +81 (0) 3 5633 7101
E-Mail BrooksAs@BrooksInstrument.com