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DS-TMF-GF100-Series-MFC-eng
December, 2016

Data Sheet

GF Series
GF100/GF120/GF125

Thermal Mass Flow



GF100 Series

High Purity/Ultra-High Purity Digital Thermal Mass Flow Devices

Overview

Designed for semiconductor, MOCVD, and other gas flow control applications that require a high purity all-metal flow path, the Brooks® GF100 Series mass flow controllers and meters deliver outstanding performance, reliability, and flexibility. Highlights of the GF Series industry-leading features include: ultra fast 300 millisecond settling time, MultiFlo™ gas and range programmability, optional pressure transient insensitivity (PTI), local display, extremely low wetted surface area, and corrosion resistant Hastelloy® sensor tube and valve seat. The GF100 Series has been marathon tested to over three times the semiconductor industry standard for reliability, ensuring repeatable low-drift performance over time. An independent diagnostic/service port permits users to troubleshoot or change flow conditions without removing the mass flow controller from service.

The flagship GF125 is a second generation multi-variable, pressure transient insensitive mass flow controller. This product builds upon Brooks' leadership position in pressure transient insensitive (PTI) mass flow controller technology, minimizing process gas flow variation due to pressure and temperature fluctuations. The GF125 enables customers to simplify and reduce the size and cost of gas panels by eliminating the need for point of use pressure regulators, pressure transducers, and associated hardware.

MultiFlo™ gas and range programmability, a patented technology developed and refined by Brooks over the last 10 years, has changed the mass flow controller industry by offering customers the ability to select new gas calibrations and full scale ranges without the trouble and cost of removing the mass flow controller from the gas line. The GF Series fourth generation MultiFlo technology continues to lead the market with the most accurate and broadest range performance through extensive refinement and physical validation on critical process gases.

Product Description

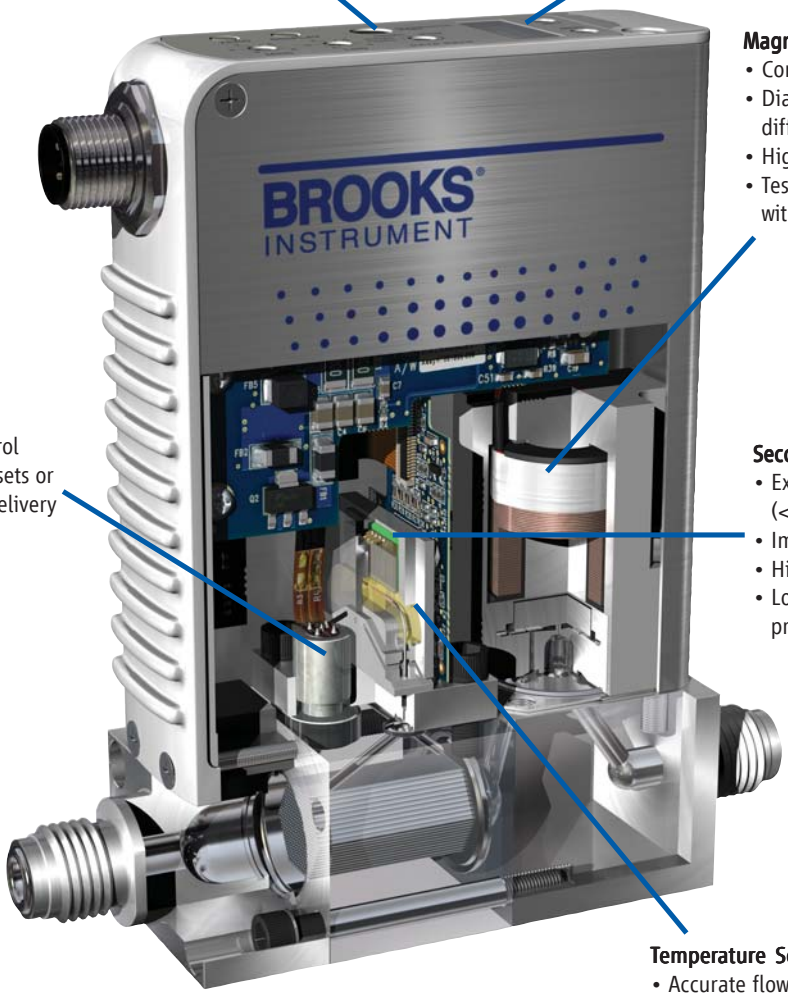
The GF100 Series is a highly configurable platform based on a novel modular architecture. Already widely adopted by semiconductor, vacuum thin film, solar, and related customers, the GF100 Series feature set was carefully selected to enable drop-in replacement and upgrade of most brands of metal-seal mass flow controllers, including the former Celerity, UNIT, Tylan, and Mykrolis brands. With the wide range of options and features available, the GF100 Series provides users with a path to simplification and standardization, greatly reducing spares inventory and support costs.

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Features and Benefits

Convenient Service Port
- Easy diagnostics and troubleshooting
- Independent of tool communication

User Interface
- Easy installation, start-up, and operation



Magnetically Coupled Valve
- Corrosion resistant all metal valve
- Diaphragm free design, unaffected by differential pressure
- High purge rate capability
- Tested for over seven million cycles with no failures

Pressure Sensor
- Stable flow control regardless of upsets or fluctuations in delivery pressure

Second Generation T-Rise Sensor
- Excellent long-term stability (<±0.5% F.S/yr.)
- Improved signal to noise ratio
- High purge rate capability
- Lower temperature operation for gases prone to thermal decomposition

Temperature Sensor
- Accurate flow and temperature measurement over full temperature range
- Real-time compensation for ambient temperature flucuations enable precise gas chemistry control

Features	Benefits
MultiFlo Gas and Range Configurability	Ability to reconfigure the mass flow controller for new gas calibrations and full scale ranges without the time and costs of removing the device from the gas line.
User Accessible Service Port with Advanced Diagnostics with User-Friendly Interface	Convenient interface to diagnostics for maximum uptime. Ensures device is operating within user specified limits for high yield and maximum uptime.
Corrosion Resistant Hastelloy T-Rise Sensor	Provides unmatched long-term sensor stability ensuring maximum yield and throughput.
Pressure Transient Insensitivity (PTI), and Safe Delivery System (SDS) Options	Improves yield. Reduces overall gas panel costs.

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Product Description

Ultra Fast Response

By combining Brooks' patented flow sensor technology with a high speed ARM processor and fast acting diaphragm free valve assembly, the GF100 Series delivers up to 3 times faster response and settling time compared to other mass flow controllers, enabling:

- Improved wafer throughput by reducing nonproductive flow settling steps
- Critical Etch processes requiring ultrafast 1-2 second etch steps
- Reduced diverted gas consumption and associated abatement costs
- Time-sensitive gas delivery steps in Atomic Layer Deposition
- For processes requiring a slow ramped gas turn-on or time critical transitions between flow rates. A user programmable ramp function is provided

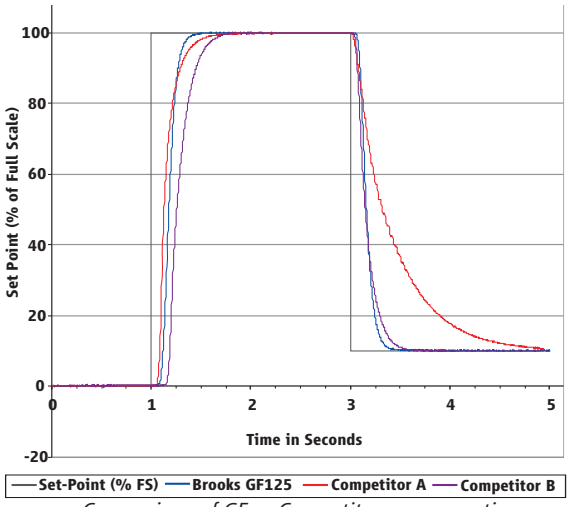
MultiFlo™ Gas and Range Configurability

A major advancement over traditional single point gas conversion factors, Brooks MultiFlo technology delivers up to a three-times improvement in process gas accuracy. This is achieved through advanced gas modeling optimized through actual gas testing providing compensation for non-linear gases. MultiFlo also allows the device to be quickly and easily configured for another gas and/or flow range without sacrificing accuracy or rangability. Selecting a new gas automatically creates a new calibration curve, establishes optimized PID settings for dynamic control, automatically compensates for gas density effects, and ensures smooth, overshoot-free transitions between flow rates with excellent steady-state stability.

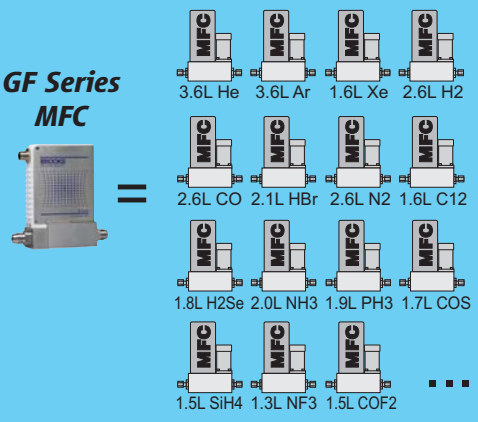
Brooks MultiFlo technology offers unparalleled flexibility; a single device can be programmed for thousands of different gas and flow range configurations.

Re-programming is simple and fast; a new gas and range can be programmed in under 30 seconds. Brooks provides a full gas database to ensure the true value of MultiFlo is realized:

- Dramatically reduces inventory costs
- Mass flow controller full scale flow range can re-scaled down typically by a factor of 3:1 with no impact on accuracy, turndown or leak by specifications, for optimum process and inventory flexibility
- Up to 40% fewer configurations required to support typical etch and CVD processes verses our closest competitor
- Widest process gas coverage through extensive gas library
- Mass flow controllers can be replaced in only a few minutes
- Off-the shelf spares programmability enables rapid process recovery
- Maximum flexibility for research applications



Comparison of GF vs Competitors response time to ascending & decending setpoints



MultiFlo™ technology allows one GF Series to be programmed for thousands of different gases and flow ranges

# of Platforms	GF1xx Series Range	Competitor A 2 Models Range	Competitor B 4 Models Range
1	3 - 10	10	1 - 5
2	11 - 30	17.5	6 - 14
3	31 - 92	30	15 - 27
4	93 - 280	55	28 - 38
5	281 - 860	100	39 - 71
6	861 - 2,600	175	72 - 103
7	2,601 - 7,200	300	104 - 192
8	7,201 - 15,000	550	193 - 279
9	15,001 - 30,000	1,000	280 - 754
10	30,001 - 40,000	1,750	755 - 2,037
11	40,001 - 55,000	3,000	2,038 - 5,500
12		5,500	5,501 - 11,000
13		10,000	11,001 - 30,000
14		22,000	30,0001 - 50,000
15		30,000	
16		50,000	

The Brooks Advantage! Less platforms means more process flexibility and lower cost of spares.

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Product Description

MultiFlo™ Configurator Accessory Kits:

778Z010ZZZ	**Basic MultiFlo Configurator Kit**
	*Software, MultiFlo Configurator
A331710003	Cable Assembly 2.5mm
214F027AAA	USB-RS485 Converter with DB-9 female
778Z011ZZZ	**Basic MultiFlo Configurator Kit w/Power Supply and Adapter Cables**
	*Software, MultiFlo Configurator
A331710003	Cable Assembly 2.5mm
214F027AAA	USB-RS485 Converter with DB-9 female
A332295001	Power Supply MFC
A332297002	Cable, Power, 9-Pin
A332297001	Cable, Power, DeviceNet

* MultiFlo Configurator Software is available on the Brooks Instrument website at: www.BrooksInstrument.com/MultiFlo

Pressure Transient Insensitivity (PTI) (GF125 only)

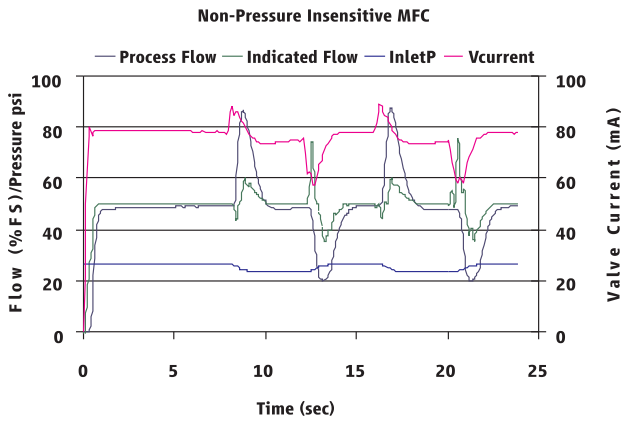
Cost and space constraints are driving gas panel designers to remove point of use pressure regulators and pressure monitoring components, placing more burden on the mass flow controller to control accurately under dynamic pressure conditions. Conventional mass flow controllers react strongly to small inlet pressure fluctuations resulting in unstable performance and unpredictable accuracy (see Non-Pressure Insensitive MFC). This drove Brooks to develop Pressure Transient Insensitive mass flow controller technology (PTI-MFC).

The GF125 PTI-MFC is a second generation PTI-MFC utilizing a patented control algorithm that inverts the pressure signal, compares it to the pre-fluctuation signal and drives real-time valve position compensation to maintain stable flow. Enhanced pressure transient insensitivity is achieved through faster sensing, faster processing, and a reduction in internal dead-volume between the sensors and valve orifice.

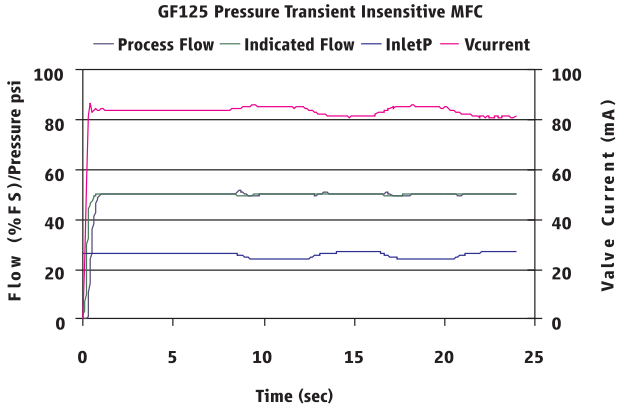
Advanced Thermal Flow Measurement Sensor

Brooks' proprietary sensor technology combines:

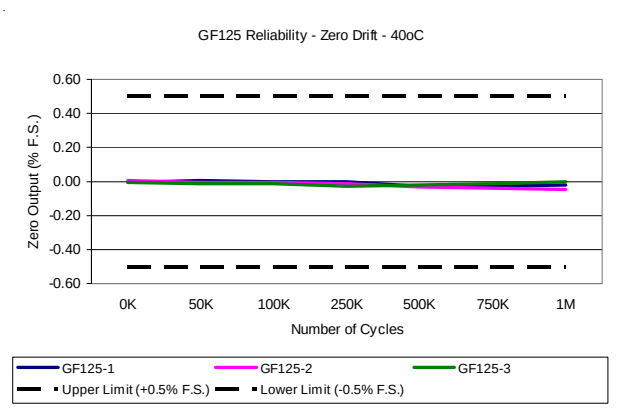
- Improved signal to noise performance for improved accuracy at low setpoints
- Improved reproducibility at elevated temperatures through new isothermal packaging, onboard conditioning electronics with ambient temperature sensing and compensation
- Improved long-term stability through enhanced sensor manufacturing and burn in process
- Highly corrosion resistant Hastelloy C-22 sensor tube
- Optimized temperature profile for gases prone to thermal decomposition
- Unique orthogonal sensor mounting orientation
  - -Eliminates sensor drift caused by valve heating effects
  - -Eliminates thermal siphoning effects for the most common mounting orientations



Pressure Flucuations in Non-Pressure Transient Insensitivty MFC



Stable Pressure with Pressure Transient Insensitivty GF Device



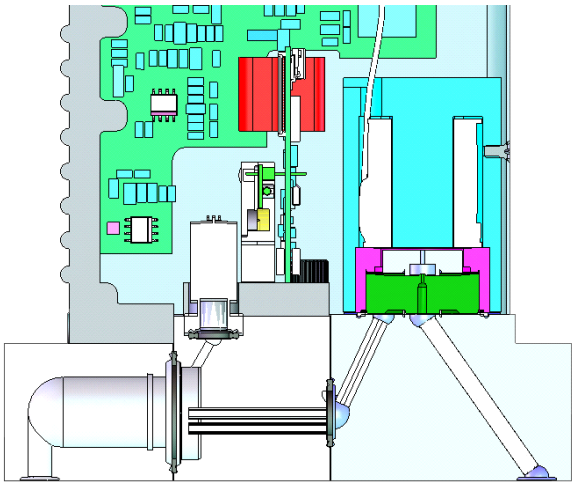
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Product Description

High Purity Flow Path

All metal, corrosion resistant flow path with reduced surface area and un-swept volumes for faster dry-down during purge steps:

- SEMI F-20 compliant wetted flow path
- 4 µ inch Ra max surface finish standard (10 µ inch Ra on GF100)
- Highly corrosion resistant Hastelloy C-22 valve seat and jet orifice



High Purity Flow Path

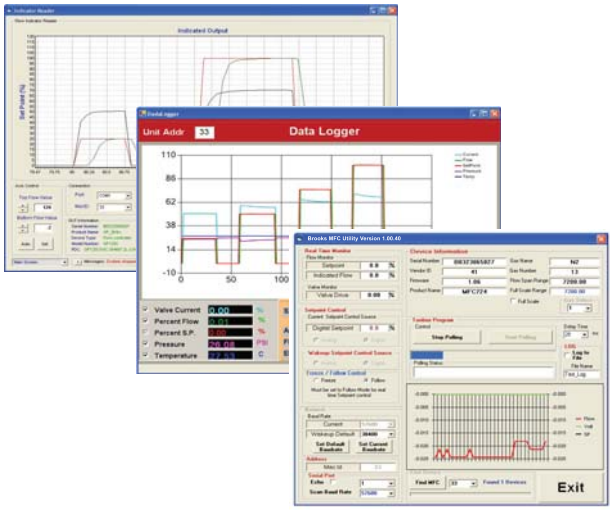
Extensive Mechanical Configuration Support

GF100 Series supports all metal seal / UHP industry gas connection interface standards for full OEM and process coverage

- Downport 80mm and 92mm C-seal and W-Seal, on 1.125" and 1.5" bodies
- Downport 80mm CS seal on 1.5" body
- 124 mm 1/4" VCR Male on 1.5" body

Enhanced Diagnostics

The mass flow controller remains the most complex and critical component in gas delivery systems. When dealing with UHP gas distribution or highly toxic or corrosive gases, removing the mass flow controller to determine if it is faulty should be the last resort. In response to this, Brooks pioneered smarter mass flow controllers with embedded self test routines and introduced an independent diagnostic/service port to provide the user with a simple interface, for troubleshooting without disturbing flow controller operation.



MFC on Gas Box

User Interface

The user interface has a high visibility LCD display that provides a local indication of Flow (%), Temperature (°C), Pressure (PSIA/ KPa) and Network Address, selectable through the Display button. A Zero button provides a simple means to re-zero the mass flow controller as part of scheduled maintenance.

Communication Interface

The GF100 Series supports analog 0-5 Vdc, RS485, and DeviceNet™ communication protocols. A range of low profile adapter cables facilitate replacing older mass flow controllers with the GF100 Series eliminating the need to carry mass flow controllers of same gas/range but different electrical connectors.



Communication Interface

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Product Specifications (Standard GF Series)

Performance	GF100	GF120	GF125
Full Scale Flow Range (N_2 Eq.)	3 sccm to 55 slm		
Flow Accuracy	±1% S.P. > 35-100%, ±0.35% F.S. 2-35%		
Repeatability & Reproducibility	< ± 0.15% S.P.		
Linearity	± 0.5% F.S. (included in accuracy)		
Response Time (Settling Time) Normally Closed Valve	< 1 sec	700ms	300ms (3-860 sccm N2 Eq.) 400ms (861-7200 sccm N2 Eq.) 500ms (7201-30000 sccm N2 Eq.) <700ms (30001-55000 sccm N2 Eq.)
Normally Open Valve	<1.5 sec		
Pressure Insensitivity	Not Applicable		< 5% SP up to 5 psi/sec upstream press. spike
Control Range	2-100% (Normally Closed Valve) 3-100% (Normally Open Valve)		
MultiFlo	standard		
#of Bins	11 bins		
Valve Shut Down (N.C. Valve)	< 1% of F.S.		
Valve Shut Down (N.O. Valve)	2% of F.S.		
Zero Stability	< ± 0.5% F.S. per year		
Temperature Coefficient	Span: 0.05% S.P. per °C, Zero: 0.005% F.S. per °C		

Ratings

Operating Temperature Range	10-50°C	
Differential Pressure Range*	3-860 sccm = 7-45 psid, 861- 7200 sccm = 10-45 psid, 7201-55000 sccm = 15-45 psid *Argon gas applications require an additional 10 psid differential pressure. Low vapor pressure gases require an inlet pressure of > 100 Torr, with vacuum on outlet (example SiCl4). Contact Brooks Technical Support for more information.	
Maximum Operating Pressure	500 psia max	100 psia max
Leak Integrity (external)	$1x10^{-10}$ atm. cc/sec He	

Mechanical

Valve Type	Normally Closed Normally Open Meter (no valve)
Wetted Materials	GF100: SEMI F20 HP Compliant, 316L VIM/VAR, Hastelloy C-22, 316L Stainless Steel, 304 Stainless Steel, KM-45 GF120/GF125: SEMI F20 UHP Compliant, 316L VIM/VAR, Hastelloy C-22, 316L Stainless Steel, 304 Stainless Steel, KM-45

Surface Finish	10µ inch Ra	4µ inch Ra (0.1 µm Ra)

Diagnostics & Display

Status Lights	MFC Health, Network Status
Alarms	Control Valve Output, Network Interruption
Display Type	Top Mount Integrated LCD
Viewing Angle / Viewing Distance	Fixed / 10 feet
Units Displayed / Resolution	Flow (%), Temp. (°C), Pressure (psia, kPa) / 0.1 (unit)

Electrical

Electrical Connection	RS485/Analog via 9-Pin "D" connector, DeviceNet™ via 5-Pin "M12" connector
Digital Communication	RS485+ (model specific), DeviceNet (model specific), RS485 Diagnostic Port (all models)
Diagnostic /Service Port	RS485 via 2.5mm jack
Power Supply/Consumption	DeviceNet: 545mA max. @ +11-25 Vdc., 250mA max. @ 24Vdc RS485/Analog: 6 Watts max @ ±15Vdc. (±10%) or +24 Vdc (±10%)

Compliance

EMC	EC Directive 2004/108/EC CE: EN61326: 2006 (FCC Part 15 & Canada IC-subset of CE testing)
Environmental Compliance	RoHS Directive (2011/65/EU)
	REACH Directive EC 1907/2006

NOTE: See the following Safe Delivery System (SDS) section for optional detailed specifications

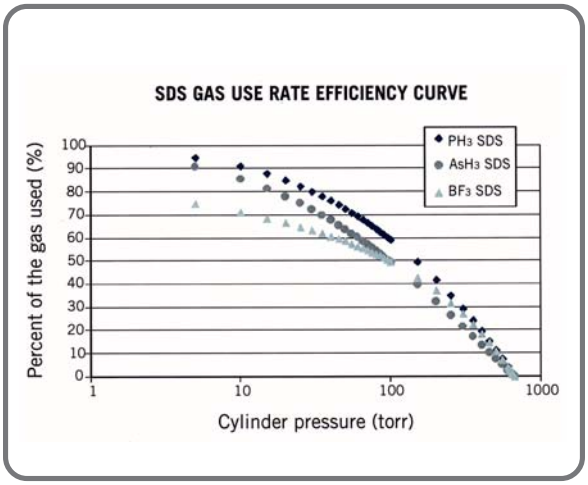
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Product Description GF120 Safe Delivery System (SDS®) Option

The **GF120 Safe Delivery System (SDS®)** is Brooks' state-of-the-art low pressure drop mass flow controller for the delivery of sub atmospheric safe delivery system (SDS) gases used in Implant and Etch processes. The Brooks GF120 (SDS) models are available in full scale flow ranges 4-25 sccm (option GF120XSL) or >25 sccm to 1 slpm (option GF120XSD).

These expensive, hazardous gases are adsorbed onto a solid medium within the gas cylinder, remaining below atmospheric pressure despite containing up to 15 times more dopant than conventional pressurized sources.

The amount of gas that can be extracted from the SDS controlled cylinder is highly dependent upon the final cylinder pressure. This is illustrated in SDS desorption species information in the SDS Gas Use Rate Efficiency Curve. Most of the gas is released at pressures below 100 Torr. The minimum cylinder pressure that can be reached is limited by the conductance of the mass flow controller regulating the flow. Most mass flow controllers require a 50 Torr differential pressure at flow rates of 5 sccm. At this 50 Torr limit, only ~65% of the dopant can be extracted from the adsorbent medium at normal operating temperatures. The **GF120 (SDS)** low pressure operation enables a further 30% of the dopant to be extracted, driving significant cost savings in SDS gases and equipment OEE.



Product Specifications (GF120XSD and GF120XSL) Options

Performance	GF120XSL	GF120XSD
Full Scale Flow Range (N_2 Eq.)	4 - 25 sccm	>25 to 1 slpm
Gases Supported	AsH_3, PH_3, BF_3, SiF_4, Ar, Xe, N_2O, N_2, GeF4, AsF5, PF3, H2Se, HMDSO, HMDSN, H2O***	
MultiFlo Programmable Flow Accuracy	Not Configurable +/-1% S.P. ≥35% F.S. +/-0.35% F.S. <35% F.S.	
Repeatability & Reproducibility	<+/- 0.15% S.P.	
Zero Stability	<=0.6% F.S. per year	
Settling Time (to within ±2% F.S.)	< 3 sec	
Warm Up Time	minimum of 30 minutes	
Leak Integrity	$1X10^{-11}$ atm. cc/sec He	
Valve Shut Down (Leaky by)	<1% F.S.	

Operating Conditions	GF120XSD	GF120XSL
Minimum Operating Inlet Pressure*	4 to 20 sccm ≤ 10 Torr >20 to 50 sccm ≤ 20 Torr >50 sccm to 1 slpm ≤ 50 Torr	
Maximum Pressure	500 psia max	
Pressure Insensitivity	Not Available	
DifferentialPressure**	10 Torr-30 psid typical (1.33-207 kPa typical)	
Valve Configuration	Normally Closed	
Ambient Temperature Range	10°C-50°C	
Zero Temperature Coefficient	Span: 0.05% SP per °C, Zero: 0.005% F.S. per °C	

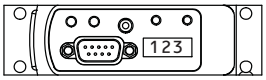
*Performance at minimum inlet pressure will be gas and flow range dependent. Consult Technical Support for details.
**Typical pressure drop. Actual pressure drop will be gas and flow dependent. Consult Technical Support for details.
***Consult factory for other gases.

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Electrical Interface Options

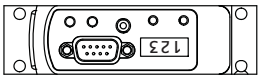
Base I/O Options

PDC Ordering Code G1
Description: Industry standard Analog / RS485 interface



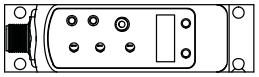
Pin No.	Signals	
1	Valve Control	
2	Output (0-5 Vdc)	
3	+15 Vdc	+24 Vdc
4	Pwr Com	NC
5	-15 Vdc	Pwr Com
6	Setpoint (0-5 Vdc)	
7	Signal Common	
8	RS-485 (DX+)	
9	RS-485 (DX-)	

PDC Ordering Code GX
Description: OEM specific Analog / RS485 interface. Display and top plate re-oriented 180°



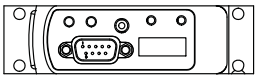
Pin No.	Signals	
1	Valve Control	
2	Output (0-5 Vdc)	
3	+15 Vdc	+24 Vdc
4	Pwr Com	NC
5	-15 Vdc	Pwr Com
6	Setpoint (0-5 Vdc)	
7	Signal Common	
8	RS-485 (DX+)	
9	RS-485 (DX-)	

PDC Ordering Code DX
Description: Industry standard ODVA compliant DeviceNet interface



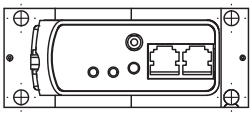
M12 Pin No.	Signals
1	Drain
2	V+ (11-25 Vdc)
3	V-
4	CAN-H
5	CAN-L

PDC Ordering Code TX
Description: Industry standard Analog only interface



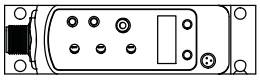
Pin No.	Signals	
1	Valve Control	
2	Output (0-5 Vdc)	
3	+15 Vdc	+24 Vdc
4	Pwr Com	NC
5	-15 Vdc	Pwr Com
6	Setpoint (0-5 Vdc)	
7	Signal Common	
8	No Connection	
9	No Connection	

PDC Ordering Code SX
Description: Industry standard Analog 9-Pin Sub D connector and dual RJ11 RS485 ports



D-Sub Pin No.	Signals	
1	Valve Control	
2	Output (0-5 Vdc)	
3	+15 Vdc	+24 Vdc
4	Pwr Com	NC
5	-15 Vdc	Pwr Com
6	Setpoint (0-5 Vdc)	
7	Signal Common	
8	Signal Common	
9	Valve Test Point	
RJ11 J2 Pin No.	**Signals**	
3	RS-485 (DX-)	
4	RS-485 (DX+)	

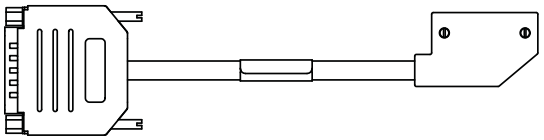
PDC Ordering Code BB
Description: Industry standard ODVA compliant DeviceNet interface, Plus a separate Analog 0-5 Vdc Connector



M12 Pin No.	Signals
1	Drain
2	V+ (11-25 Vdc)
3	V-
4	CAN-H
5	CAN-L
HIROSE Pin No.	**Signals**
1	Flow Out
2	AGND
3	GPIO_CAP0
4	GHD_Earth

All Base I/O options include:
Diagnostic port communication RS485 via 2.5mm jack

I/O Options Using Base Model and Adapter Cable



A range of low profile adapter cables have been developed to support replacing older generation MFC's with different pinout configurations. The base MFC will be either a G1, TX or SX configuration, depending on the product being replaced.

PDC Ordering Code UX
Description: SX base I/O with 7003550 adapter for compatibility with Unit UDU15

Pin No	Signals	
9	VALVE OFF	
6	OUTPUT (0-5 VDC)	
4	+15 VDC	+24 VDC
7	PWR COM	NC
11	-15 VDC	PWR COM
15	SETPOINT (0-5 VDC)	
1,13,14	SIGNAL COMMON	
2	ZERO ALARM	
12	VALVE TEST POINT	
8	CASE GROUND	
3,5,10	NO CONNECTION	

PDC Ordering Code: T1
Description: TX base I/O with 7003551 adapter for compatibility with IFlow DB15 & TN 15 pin

Pin No	Signals	
15	VALVE OFF	
2	OUTPUT (0-5 Vdc)	
5	+15 VDC	+24 VDC
1	PWR COM	NC
6	-15 VDC	PWR COM
8	SETPOINT (0-5 VDC)	
9	COMMON	
10	COMMON	
14	CASE GROUND	
3,4,7	NO CONNECTION	
11,12,13	NO CONNECTION	

PDC Ordering Code: FX / JX
Description: SX base I/O with 7003069 (FX)/7001814 (JX) adapter for compatibility with Unit UDF9/UDJ9

Pin No	Signals	
1	VALVE CONTROL*	
2	OUTPUT (0-5 VDC)	
3	+15 VDC	+24 VDC
4	PWR COM	NC
5	-15 VDC	PWR COM
6	SETPOINT (0-5 VDC)	
7	SIGNAL COMMON	
8	SIGNAL COMMON	
9	VALVE TEST POINT	

PDC Ordering Code: EX
Description: GX base I/O with 7003083 adapter for compatibility with Unit "E", IN "L", "R"

Pin No	Signals	
J	VALVE OFF	
3	OUTPUT (0-5 VDC)	
4	+15 VDC	+24 VDC
2	PWR COM	NC
F	-15 VDC	PWR COM
A	SETPOINT (0-5 VDC)	
B,C,10	SIGNAL COMMON	
1	CASE GROUND	
5, 6, 8, 9	NOT CONNECTED	
I, D, E, H	NOT CONNECTED	
7,G	KEY WAY	
RJ11 J2 Pin No	**RJ11 J3 Pin No**	
3	3	RS-485 (DX-)
4	4	RS-485 (DX+)

PDC Ordering Code: KX
Description: G1 base I/O with 7003298 adapter for compatibility with Unit UDK15

Pin No	Signals	
3	VALVE CONTROL	
2	OUTPUT (0-5 VDC)	
7	+15 VDC	+24 VDC
5	PWR COM	NC
6	-15 VDC	PWR COM
8	SETPOINT (0-5 VDC)	
11,12	SIGNAL COMMON	
15	CASE GROUND	
1, 4, 9, 10, 13, 14	NO CONNECTION	

PDC Ordering Code: BX
Description: G1 base I/O with 7003590 adapter for compatibility with Brooks 15-Pin D

Pin No	Signals	
12	VALVE OVERRIDE	
2	OUTPUT (0-5 VDC)	
5	+15 VDC	+24 VDC
9	PWR COM	NC
6	-15 VDC	PWR COM
8	SETPOINT (0-5 VDC)	
1,10	SIGNAL COMMON	
3,4,7,11	NO CONNECTION	
13,14,15	NO CONNECTION	

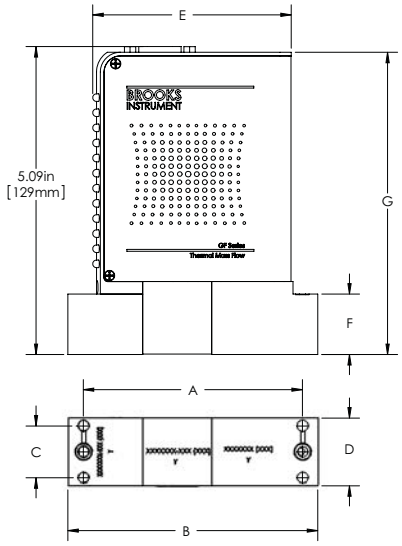
Other adapter options are available for the GF Series. Please contact Brooks Customer Service for more information.

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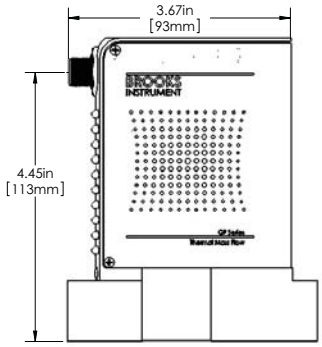
Product Dimensions

Downport Configurations

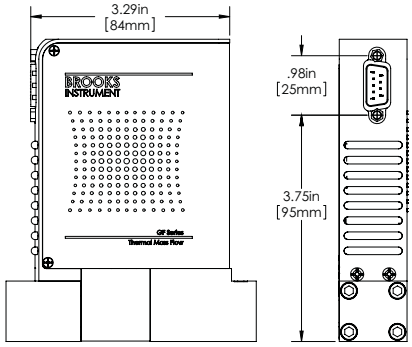
Electrical Connector
G1/GX/TX Specific Dimensions



Electrical Connector
DX/BB Specific Dimensions



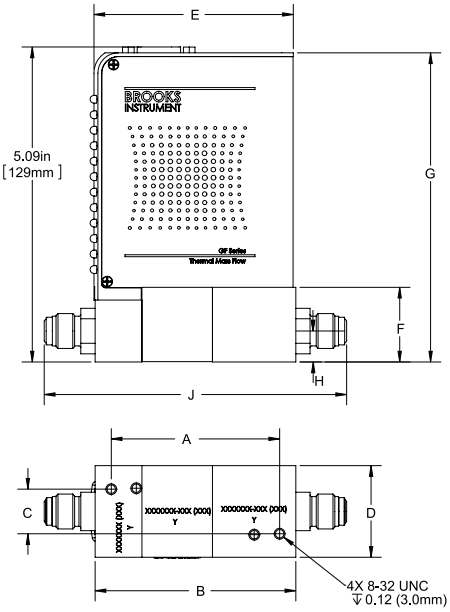
Electrical Connector
SX Specific Dimensions



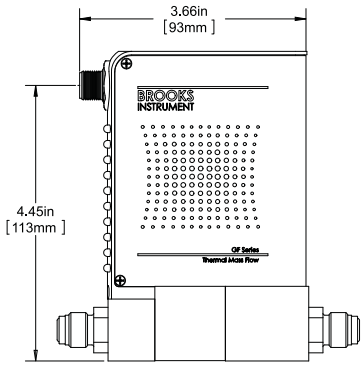
Fitting Option Code	Seal Type	Dim A	Dim B	Dim C	Dim D	Dim E	Dim F	Dim G
CX	C-SEAL	92mm [3.62in]	105mm [4.13in]	22mm [0.86in]	28mm [1.12in]	83mm [3.28in]	25mm [1.00in]	127mm [5.00in]
EX	W-SEAL	79.8mm[3.14in]	93mm [3.66in]	30mm [1.18in]	39mm [1.53in]	72mm [2.82in]	25mm [1.00in]	127mm [5.00in]
WX	W-SEAL	92mm [3.62in]	105mm [4.13in]	22mm [0.86in]	28mm [1.12in]	83mm [3.28in]	25mm [1.00in]	127mm [5.00in]
DX	C-SEAL	79.8mm[3.14in]	93mm [3.66in]	22mm [0.86in]	28mm [1.12in]	72mm [2.82in]	25mm [1.00in]	127mm [5.00in]
YX	W-SEAL	79.8mm[3.14in]	93mm [3.66in]	22mm [0.86in]	28mm [1.12in]	72mm [2.82in]	25mm [1.00in]	127mm [5.00in]
AX	C-SEAL	92mm [3.62in]	105mm [4.13in]	30mm [1.18in]	39mm [1.53in]	83mm [3.28in]	25mm [1.00in]	127mm [5.00in]
BX	W-SEAL	92mm [3.62in]	105mm [4.13in]	30mm [1.18in]	39mm [1.53in]	83mm [3.28in]	25mm [1.00in]	127mm [5.00in]
LX	C-SEAL	92mm [3.62in]	105mm [4.13in]	22mm [0.86in]	28mm [1.12in]	83mm [3.28in]	25mm [1.00in]	127mm [5.00in]

VCR Configurations

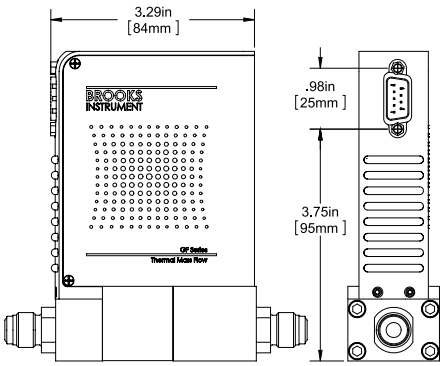
Electrical Connector
G1/GX/TX Specific Dimensions



Electrical Connector
DX/BB Specific Dimensions



Electrical Connector
SX Specific Dimensions



Fitting Option Code	VCR	Dim A	Dim B	Dim C	Dim D	Dim E	Dim F	Dim G	Dim H	Dim J
VX	1/4"	69mm [2.72in]	82mm [3.24in]	18mm [0.72in]	38mm [1.48in]	83mm [3.28in]	31mm [1.21in]	127mm [5.0in]	13mm [0.50in]	124mm [4.88in]
VS	1/4"	69mm [2.72in]	82mm [3.24in]	18mm [0.72in]	28.4mm [1.12in]	83mm [3.28in]	31mm [1.21in]	127mm [5.0in]	13mm [0.50in]	124mm [4.88in]

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Model Code

Code	Description	Code Option	Option Description
I.	Base Model Code	**GF**	High Purity/Ultra High Purity Digital Mass Flow Controllers
II.	Package / Finish Specifications	**100**	Flow range 3 sccm -55 slpm N_2 Eq.; ± 1.0% SP Accuracy; 1 sec Response; 10 Ra
		120	Flow range 3 sccm -55 slpm N_2 Eq.; + 1.0% SP Accuracy; 700 msec Response; 4 Ra
		125	Pressure Transient Insensitive (PTI) Flow range 3 sccm -55 slpm N_2 Eq.; + 1.0% SP Accuracy; 300-700 msec Response; 4 Ra
III.	Configurability	**C**	MultiFlo capable. Standard bins or specific gas/range may be selected.
		X	Not MultiFlo capable. Specific gas/range required. (must select w/ SD, SL or HA special application)
IV.	Special Application	**XX**	Standard
		SL	Safe Delivery System (GF120 Only) Full scale flow range; 4 to 25 sccm, Nitrogen Equivalent
		SD	Safe Delivery System (GF120 Only) Full scale flow range; >25 sccm to 1 slpm, Nitrogen Equivalent
V.	Valve Configuration	**O**	Normally Open valve (not available with SD, SL or HA options)
		C	Normally Closed valve (must select with SD, SL or HA special application)
		M	Meter (No Valve)
VI.	Gas or SH MultiFlo Bin	**XXXX XXXX**	Specific Gas Code & Range, i.e. "0004" = Argon and "010L" = 10 slpm (must select w/ SD, SL or HA special application).
		SH40 010C	Standard Configuration #40, 3-10 sccm Nitrogen Equivalent (0° C Reference)
		SH41 030C	Standard Configuration #41, 11-30 sccm Nitrogen Equivalent (0° C Reference)
		SH42 092C	Standard Configuration #42, 31-92 sccm Nitrogen Equivalent (0° C Reference)
		SH43 280C	Standard Configuration #43,93-280 sccm Nitrogen Equivalent (0° C Reference)
		SH44 860C	Standard Configuration #44, 281-860 sccm Nitrogen Equivalent (0° C Reference)
		SH45 2.6L	Standard Configuration #45, 861-2600 sccm Nitrogen Equivalent (0° C Reference)
		SH46 7.2L	Standard Configuration #46, 2601-7200 sccm Nitrogen Equivalent (0° C Reference)
		SH47 015L	Standard Configuration #47, 7201-15000 sccm Nitrogen Equivalent (0° C Reference)
		SH48 030L	Standard Configuration #48, 15001-30000 sccm Nitrogen Equivalent (0° C Reference)
		SH49 040L	Standard Configuration #49, 30001-40000 sccm Nitrogen Equivalent (0° C Reference)
		SH50 055L	Standard Configuration #50, 40001-55000 sccm Nitrogen Equivalent (0° C Reference)
VII.	Fitting	**VX**	1-1/2" body width, 124mm 1/4" VCR male
		VS	1-1/8" body width, 124mm 1/4" VCR male
		CX	1-1/8" body width, 92mm C Seal
		DX	1-1/8" body width, 79.8mm C Seal
		EX	1-1/2" body width, 79.8mm W Seal
		WX	1-1/8" body width, 92mm W Seal
		YX	1-1/8" body width, 79.8mm W Seal
		AX	1-1/2" body width, 92mm C Seal
		BX	1-1/2" body width, 92mm W Seal
		LX	1-1/8" body width, 92mm C Seal w/Poke Yoke
		AS	1-1/2" body width, 92mm 0.440" large bore C Seal (only for bins SH45-SH50)
VIII.	Downstream Condition	**A**	Atmosphere
		V	Vacuum; Default for SD, SL and HA special application
IX.	Sensor	**O**	Default Sensor Orientation

Model Code continued on next page.

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Model Code (continued)

Code Description	Code Option	Option Description									
X. Connector	**BX**	Cable adapter to 15 pin D Brooks (Unit "B","N") adapts G1 base									
	EX	Cable adapter to Card Edge (w/out VTP), RS485 through RJ11 jacks (Unit"E"; IN "L", "R") adapts GX base (Not Available on 79.8mm fitting DX, YX, EX)									
	FX	Cable adapter with 9 pin STEC pin-out & jack screws (w/VTP) (Unit"F","O") adapts SX base									
	GX	9-Pin D with RS485 (Unit"G"); display and overlay 180° orientation (Not Available on 79.8mm fitting DX, YX, EX)									
	G1	9-Pin D with RS485 (Unit"G") (Not Available on 79.8mm fitting DX, YX, EX)									
	JX	Cable adapter with 9 pin STEC pin-out & jack screws (w/VTP) (Unit"J","W") adapts SX base									
	KX	Cable adapter to MKS 15-Pin D (Unit "K") adapts G1 base									
	SX	9 pin D with STEC pin-out (w/VTP) (Unit"S","Q")									
	TX	9 pin D with UDT9 pin-out (UDT9)									
	T1	Cable adapter to 15 pin D (IFlow DB15 & TN 15 pin) adapts TX base (Not Available on 79.8mm fitting DX, YX, EX)									
	UX	Cable adapter to 15 pin D (w/VTP) (Unit & TN "U") adapts SX base									
	BB	DeviceNet™ Analog (Not Available on 79.8mm fitting DX, YX, EX)									
		DeviceNet Standard Configuration Parameters									
		I/O	Connector	Power On State	Full Scale Setting	Full Scale Setting	Full Scale Setting	Poll IO Instance Producer	Poll IO Instance Consumer	Poll IO State Transition	External Baud Rate
	D0	DeviceNet	5 Pin Micro	Idle	Count	Integer	6000h	2	7	Executing	500KB
	D1	DeviceNet	5 Pin Micro	Idle	Count	Integer	6000h	21	7	Executing	500KB
	D2	DeviceNet	5 Pin Micro	Idle	SCCM	Float	7FFFh	13	19	Executing	500KB
	D3	DeviceNet	5 Pin Micro	Idle	Count	Integer	6000h	22	7	Executing	500KB
	D4	DeviceNet	5 Pin Micro	Executing	Count	Integer	6000h	22	8	Executing	500KB
	D5	DeviceNet	5 Pin Micro	Idle	Count	Integer	6000h	6	8	Executing	500KB
	D6	DeviceNet	5 Pin Micro	Idle	Count	Integer	7FFFh	3	7	Executing	500KB
	D7	DeviceNet	5 Pin Micro	Idle	Count	Integer	7FFFh	6	8	Executing	500KB
	D8	DeviceNet	5 Pin Micro	Idle	Count	Integer	6000h	3	7	Executing	500KB
	D9	DeviceNet	5 Pin Micro	Executing	Count	Integer	6000h	2	7	Executing	500KB
	DA	DeviceNet	5 Pin Micro	Idle	Count	Integer	7FFFh	22	7	Executing	500KB
	DB	DeviceNet	5 Pin Micro	Idle	Count	Integer	6000h	22	8	Executing	500KB
	DC	DeviceNet	5 Pin Micro	Idle	Count	Integer	7FFFh	3	7	Idle	500KB
	DD	DeviceNet	5 Pin Micro	Executing	Count	Integer	7FFFh	22	8	Executing	500KB
	DE	DeviceNet	5 Pin Micro	Executing	Sccm	Float	6000h	15	19	Executing	500KB
	DX	DeviceNet	5 Pin Micro	To be defined by CSR							

Code Description	Code Option	Option Description
XI. Customer Special Request	**XXXX**	Customer Special Request Number; required with "DX, BB" Conn. Option to define DNet settings
XII. Auto Shut-Off	**A**	Auto Shut-Off (Included) Default for SD and SL special application
	X	Auto Shut-Off (Not Included) (Must be selected for meter)
XIII. Auto Zero	**X**	Auto Zero (Not Included)
XIV. Reference Temperature	**000**	0°C Reference Calibration (Standard) - Default Setting

Sample Standard Model Code

I	II	III	IV	V		VI		VII	VIII	IX	X		XI	XII	XIII		XIV
GF	100	C	XX	M	-	SH40010C	-	VX	A	0	GX	-	XXXX	A	X	-	000

Sample Safe Delivery System (SDS) Model Code

I	II	III	IV	V		VI		VII	VIII	IX	X		XI	XII	XIII		XIV
GF	120	X	SD	C	-	XXXXXXXX	-	EX	V	0	SX	-	XXXX	A	X	-	000

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