GF121 Series

Data Sheet

GF Series
GF101/GF121/GF126

Thermal Mass Flow

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

Overview

Designed for semiconductor, MOCVD, and other gas flow control applications that require a high purity all-metal flow path, the Brooks GF Series mass flow controllers deliver outstanding performance, reliability, and flexibility. The GF101/121/126 extends the GF family to support flow rates up to 300 slpm N2 equivalent. The high flow design utilizes the proven GF sensor design and electronics. This high flow product provides excellent flow stability to target high flow purge lines in CVD, LPCVD, Diffusion, Epi processes, semiconductor chamber clean processes and MOCVD purge flows.

Product Description

Designed for high-flow applications like purge, the GF101/121/126 has all of the features/benefits of the GF100/120/125, but with extended performance for flow rates up to 300 slpm. Compared with competitive products offering a similar flow rate, the compact footprint of the GF101/121/126 allows users to design smaller, more efficient systems. It also provides better actual process gas accuracy over devices that use traditional single point conversion factors when switching to a new gas. The GF101/121/126 Series features an all metal seal flow path for durability and high leak integrity, precise, stable flow control with fast Sub-1 second settling times and 1% of reading accuracy to ensure reliable flow measurement or control in demanding gas flow applications. The GF101/121/126 achieves excellent internal to external leak integrity. A wide range of digital and analog I/O options offers the broadest range of communication protocols making the GF101/121/126 an ideal upgrade for existing MFCs.

Built on a common platform and interface, this series now enables an entire system to use one product platform:

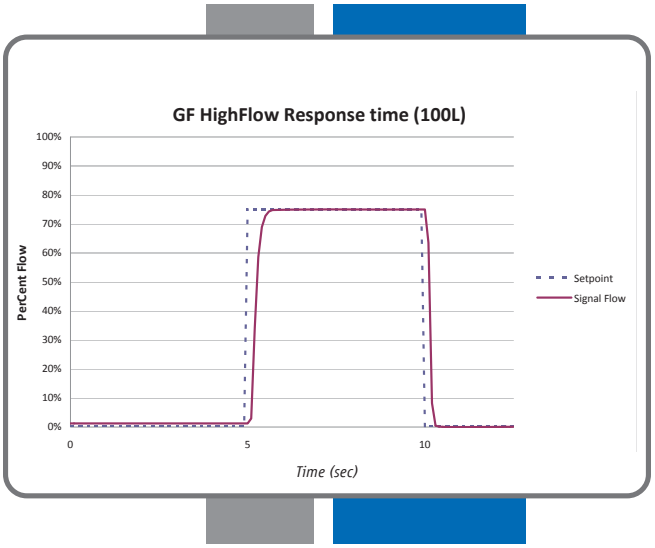
- GF101/121/126 based on the same technology and design as the low flow GFs
  - Same sensor
  - Same electronics
  - Same low power support
- Smaller footprint than competitive MFCs
- Handles flow rates up to 300 slpm
- Metal seal for durability and high leak integrity
- Proprietary sensor technology
- Precise flow control with fast sub-1 second settling time
- 1% of reading accuracy
- Corrosion-resistant Hastelloy C-22 sensor tube

Product Description (continued)

Ultra Fast Response

By combining Brooks' patented flow sensor technology with a high speed ARM processor and fast acting diaphragm free valve assembly, the GF101/GF121/GF126 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



Pressure Transient Insensitivity (PTI) (GF126 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 GF126 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.

Features and Benefits

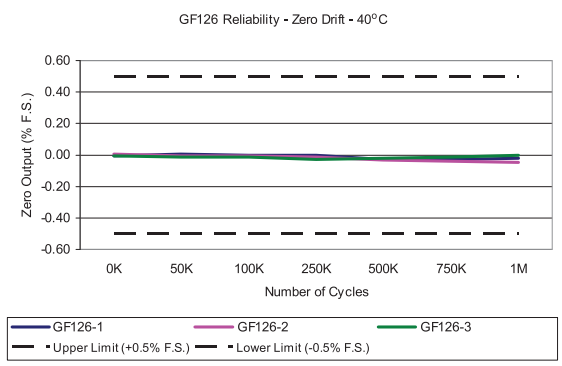
Features	Benefits
Metal Seal	High leak integrity. No periodic replacement of aging seals necessary
Adaptable Mechanical Configurations	Compact footprint enables easy retrofit to existing systems
Metrology	Measurement accuracy is traceable to international standards
User Accessible Service Port with Advanced 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)	Improves yield. Reduces overall gas panel costs

Product Description (continued)

Advanced Thermal Flow Measurement Sensor

Brooks' proprietary sensor technology combines:

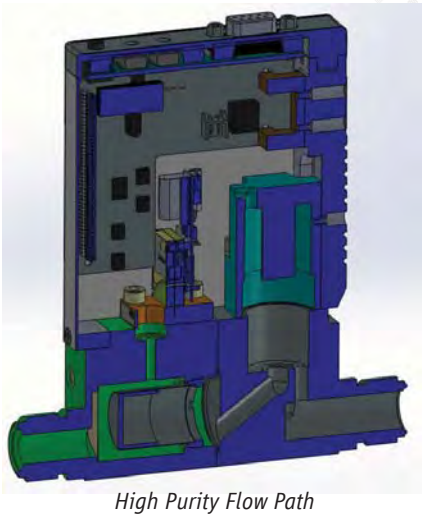
- Improved signal to noise performance for improved accuracy at low setpoints
- Improved reproducibility at elevated temperatures through new isothermal packaging, onboard conditioning electronics with ambient temperature sensing and compensation
- Improved long-term stability through enhanced sensor 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



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 GF101)



High Purity Flow Path

Extensive Mechanical Configuration Support

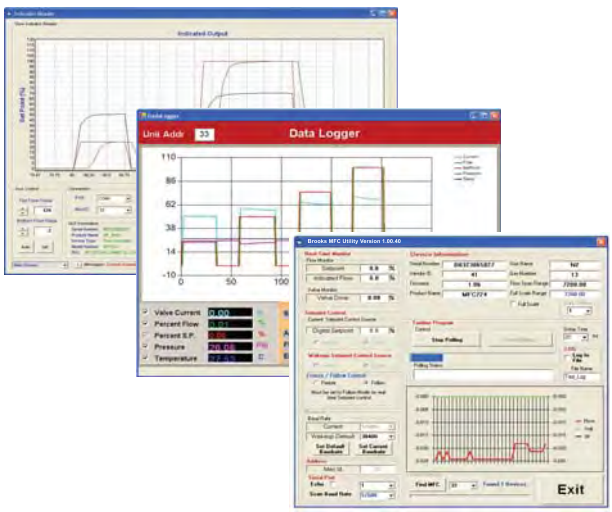
GF101/GF121/GF126 Series supports all metal seal / UHP industry gas connection interface standards for full OEM and process coverage

- 132.4 mm, 1/2" VCR male on 1.5" body
- 92 mm, C Seal on 1.5" body
- 114 mm, C Seal on 1.5" body

Product Description (continued)

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. The display is rotatable with a push button to enable improved readability based on how the MFC is mounted.

Communication Interface

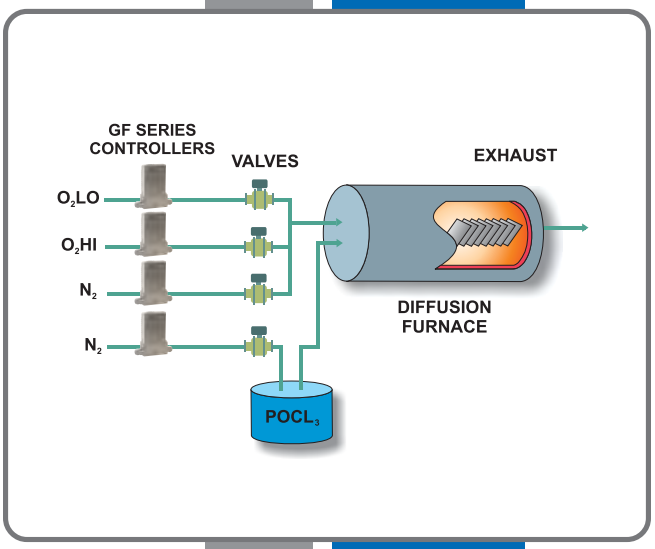
The GF101/GF121/GF126 Series supports analog 0-5 Vdc, RS485, and DeviceNet™ communication protocols. A range of low profile adapter cables facilitate replacing older mass flow controllers with the GF101/GF121/GF126 Series eliminating the need to carry mass flow controllers of same gas/range but different electrical connectors.

Communication Interface

Product Applications

Thin Film - Semiconductor / Solar

Developed to meet the diverse process requirements in semiconductor, LED, vacuum thin film, solar, and related industries, the GF101/GF121/GF126 Series is a single platform solution for advanced etch, chemical vapor deposition (CVD, PECVD, ALD, MOCVD), physical vapor deposition (PVD), rapid thermal processing (RTP), diffusion, and other similar processes.

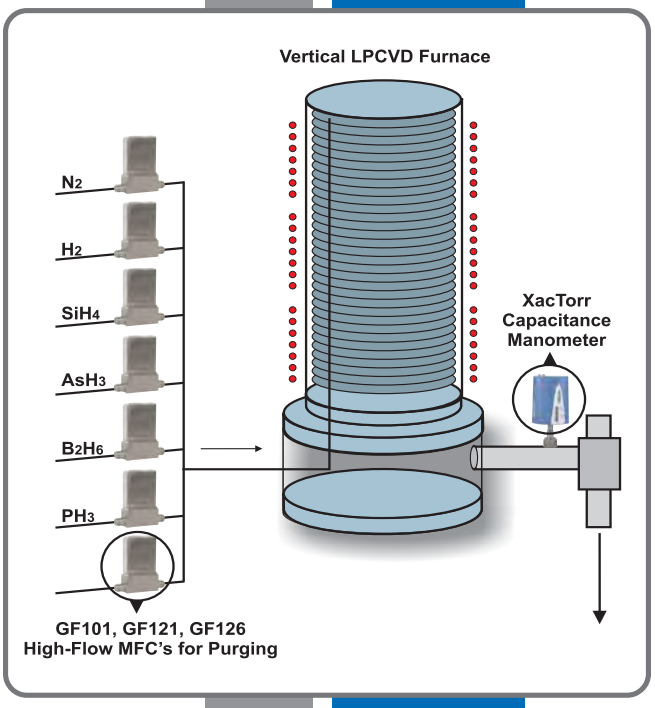


Deposition Process

Chemical Vapor Deposition (CVD), the broadest family of processes, requires a diverse range of gases, precursors and flow rates.

The GF101/GF121/GF126 Series platform has been selected by leading CVD Equipment OEMs requiring an mass flow controller capable of meeting their broad process requirements.

The GF101/GF121/GF126 Series combines operating range (typical 3:1 programmability), process gas accuracy and low pressure drop/low temperature flow sensing to present the optimal feature-set for advanced CVD processing.



Purge

Atmospheric/purge gases are used for purging certain processing systems and equipment when a semiconductor manufacturer is concerned about possible back-contamination of the house purge lines. In addition, semiconductor integrated circuits are conventionally fabricated in clean rooms containing an atmosphere that is controlled to have a very low contamination content. The wafers are manufactured via chemical or other processes, and at times, are very sensitive to oxygen and humidity and other volatile contaminants. In order to avoid the potential damage to the material in process, our GF101/GF121/GF126 Series MFCs are used in systems where the surrounding environment of the wafers and/or reticles are purged with a clean inert gas like nitrogen or clean dry air.

Product Specifications

Performance

	GF101	GF121	GF126
Full Scale Flow Range (N_2 Eq.)	51 to 300 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		
Pressure Coefficient	0.03% per psi (0-50 psi N2)		
Control Range	5-100% (Normally Closed Valve)		
Valve Shut Down (N.C. Valve)	< 2% of F.S. @ 30 N2 psig/atm out		
Zero Stability	< ± 0.5% F.S. per year		
Temperature Coefficient	Span: 0.05% S.P. per °C, Zero: 0.005% F.S. per °C		
Available Gases	N_2, H_2, AR, He, O_2, NH_3 (Consult factory for other gases)		

Ratings

Operating Temperature Range	10-50°C
Differential Pressure Range*	30-90 psid
Maximum Operating Pressure	Controller: 75 psig / Meter: 150 psig
Leak Integrity (external)	$1x10^{-10}$ atm. cc/sec He

Mechanical

Valve Type	Normally Closed Meter (no valve)	
Wetted Materials	GF101: SEMI F20 HP Compliant, 316L VIM/VAR, Hastelloy C-22, 316L Stainless Steel, 304 Stainless Steel, KM-45 GF121/GF126: 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	Sensor Output, Control Valve Output, Over Temperature, Power Surge/Sag, Network Interruption
Display Type **Viewing Angle / Viewing Distance** **Units Displayed / Resolution**	Top Mount Integrated LCD Fixed / 10 feet 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: 545 mA max. @ +11-25 Vdc., 250mA max. @ 24 Vdc RS485/Analog: 6 Watts max @ ±15 Vdc. (±10%)

Compliance

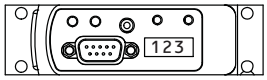
EMC	EC Directive 2004/108/EC CE: EN61326: 2006 (FCC Part 15 & Canada IC-subset of CE testing)
Environmental Compliance	RoHS Directive (2011/65/EU)
	REACH Directive EC 1907/2006

Electrical Interface Options

Base I/O Options

PDC Ordering Code G1

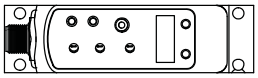
Description: Industry standard Analog / RS485 interface



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

PDC Ordering Code DX

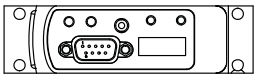
Description: Industry standard ODVA compliant DeviceNet interface



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

PDC Ordering Code TX

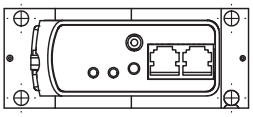
Description: Industry standard Analog only interface



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

PDC Ordering Code SX

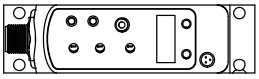
Description: Industry standard Analog 9-Pin Sub D connector and dual RJ11 RS485 ports



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

PDC Ordering Code BB

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

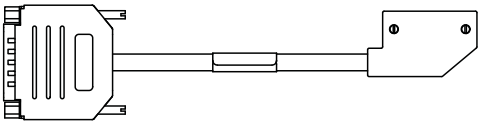


M12 Pin No.	Signals
1	Drain
2	V+ (11-25 Vdc)
3	V-
4	CAN-H
5	CAN-L
HIROSE Pin No.	Signals
1	Flow Out
2	AGND
3	GPIO_CAP0
4	GHD_Earth

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 deveoped 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 compatability with Unit UDU15

Pin No	Signals
9	VALVE OFF
6	OUTPUT (0-5 VDC)
4	+ 15 VDC
7	POWER COMMON
11	- 15 VDC
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 compatability with IFlow DB15 & TN 15 pin

Pin No	Signals
15	VALVE OFF
2	OUTPUT (0-5 VDC)
5	+ 15 VDC
1	COMMON
6	- 15 VDC
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 compatability with Unit UDF9/UDJ9

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

PDC Ordering Code: EX

Description: G1 base I/O with 7003083 adapter for compatability with Unit "E", IN "L", "R"

Pin No	Signals
J	VALVE OFF
3	OUTPUT (0-5 VDC)
4	+ 15 VDC
2	POWER COMMON
F	- 15 VDC
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	
2	3	RS-485 (DX-)
3	4	RS-485 (DX+)

PDC Ordering Code: KX

Description: G1 base I/O with 7003298 adapter for compatability with Unit UDK15

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

PDC Ordering Code: BX

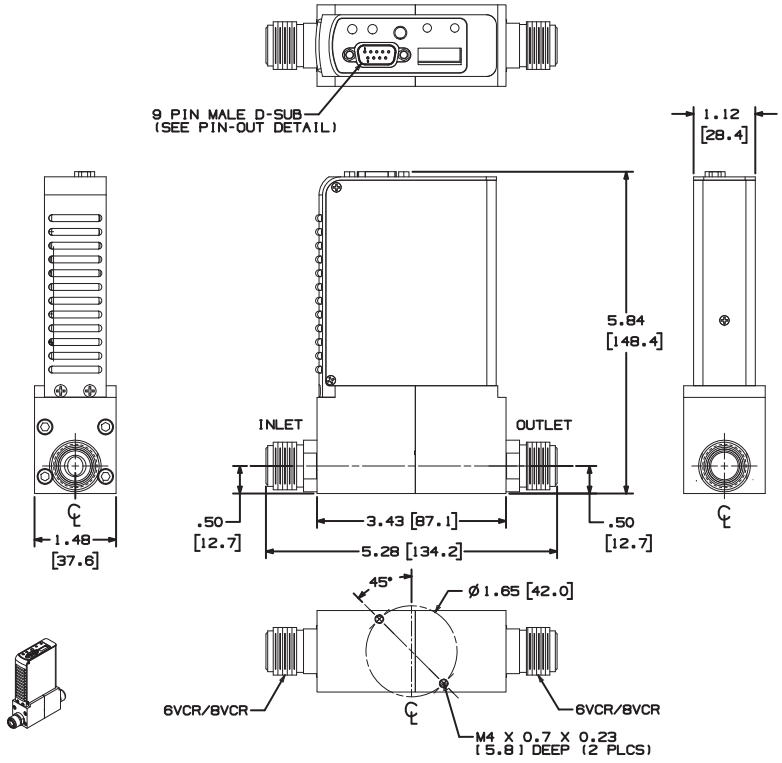
Description: G1 base I/O with 7003590 adapter for compatability with Brooks 15-Pin D

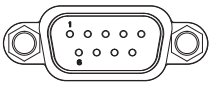
Pin No	Signals
12	VALVE OVERRIDE
2	OUTPUT (0-5 VDC)
5	+ 15 VDC
9	POWER COMMON
6	- 15 VDC
8	SETPOINT (0-5 VDC)
1,10	SIGNAL COMMON
3,4,7,11	NO CONNECTION
13,14,15	NO CONNECTION

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

Product Dimensions

GF101/GF121/GF126 Series - VCR, RS485 Connections

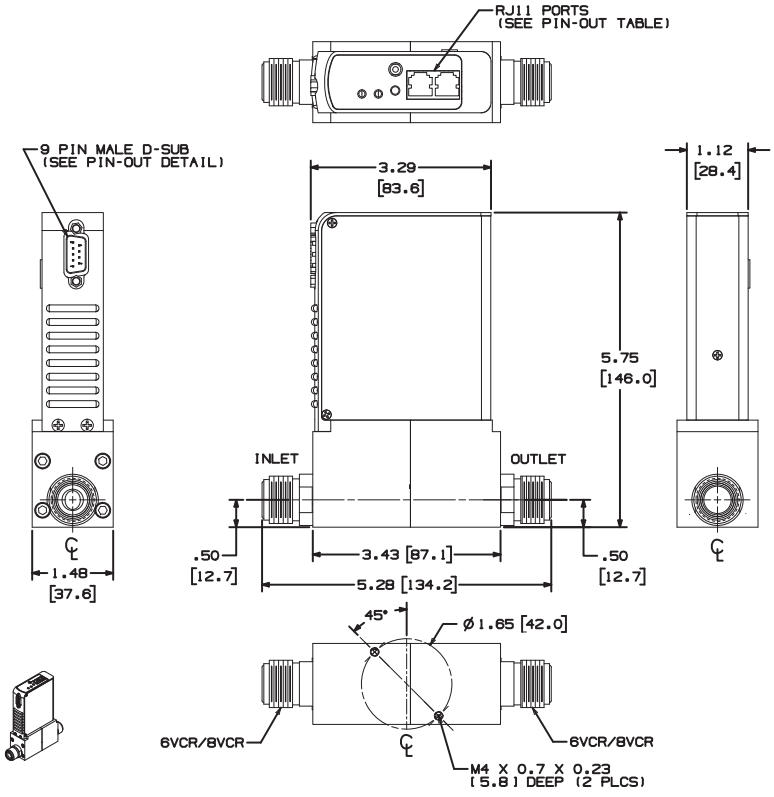


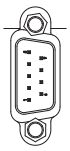


PIN-OUT DETAIL

PIN	SIGNAL
1	VALVE CONTROL
2	OUTPUT (0-5 VDC)
3	+15 VDC
4	POWER COMMON
5	-15 VDC
6	SETPOINT (0-5 VDC)
7	SIGNAL COMMON
8	RS-485 (DX+)
9	RS-485 (DX-)

GF101/GF121/GF126 Series - VCR, RS485/RJ11 Connections



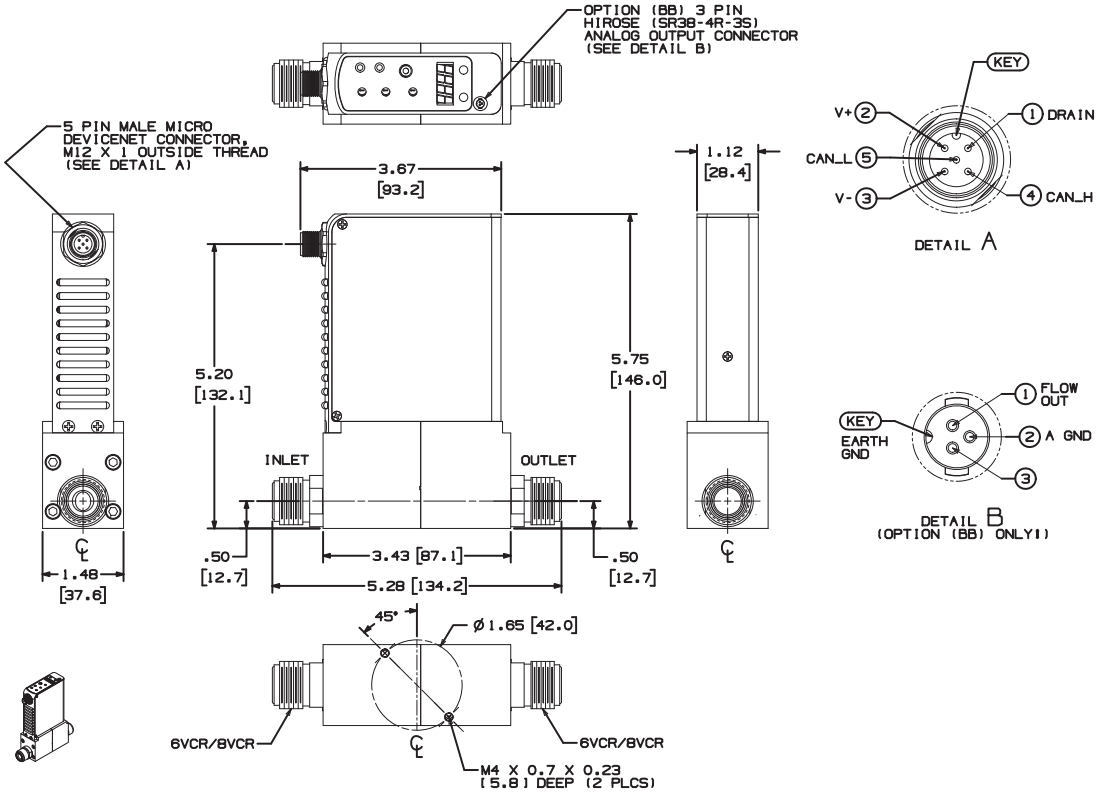


PIN-OUT DETAIL

D-SUB PIN #	SIGNAL
1	VALVE CONTROL
2	OUTPUT (0-5 VDC)
3	+15 VDC
4	POWER COMMON
5	-15 VDC
6	SETPOINT (0-5 VDC)
7	SIGNAL COMMON
8	VALVE TEST POINT
9	RS-485 (DX-)
RJ11 J2 PIN #	SIGNAL
2	RS-485 (DX-)
3	RS-485 (DX+)

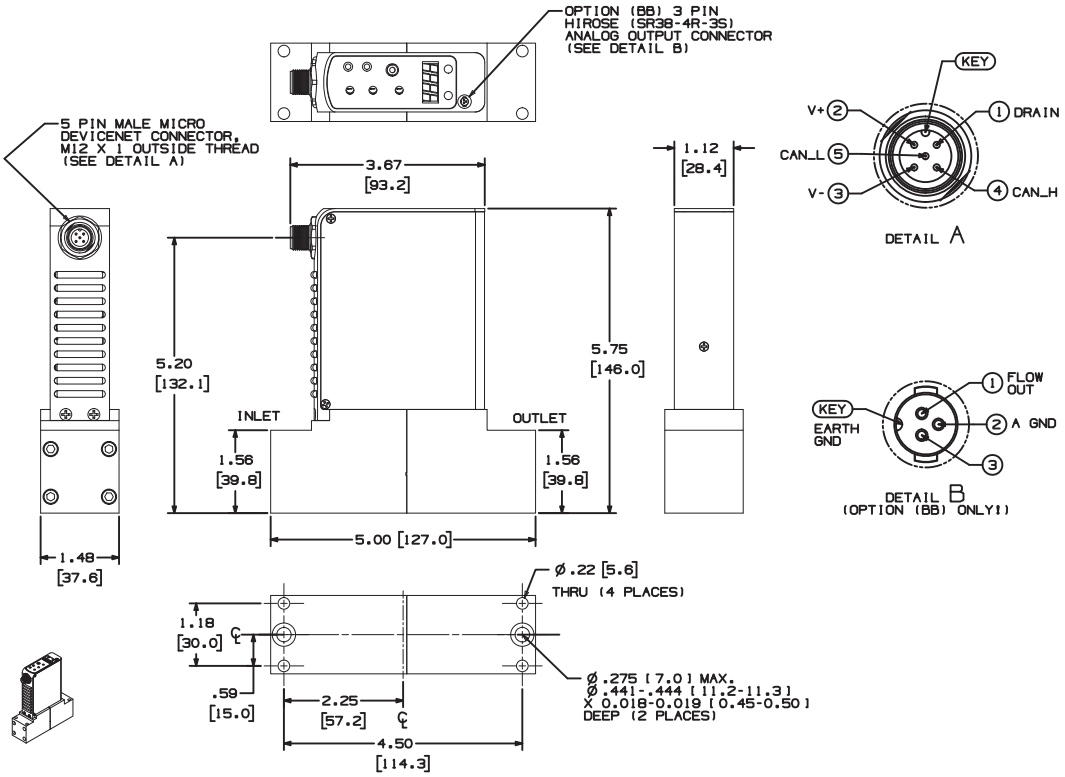
Product Dimensions (continued)

GF101/GF121/GF126 Series - VCR, DeviceNet Connections

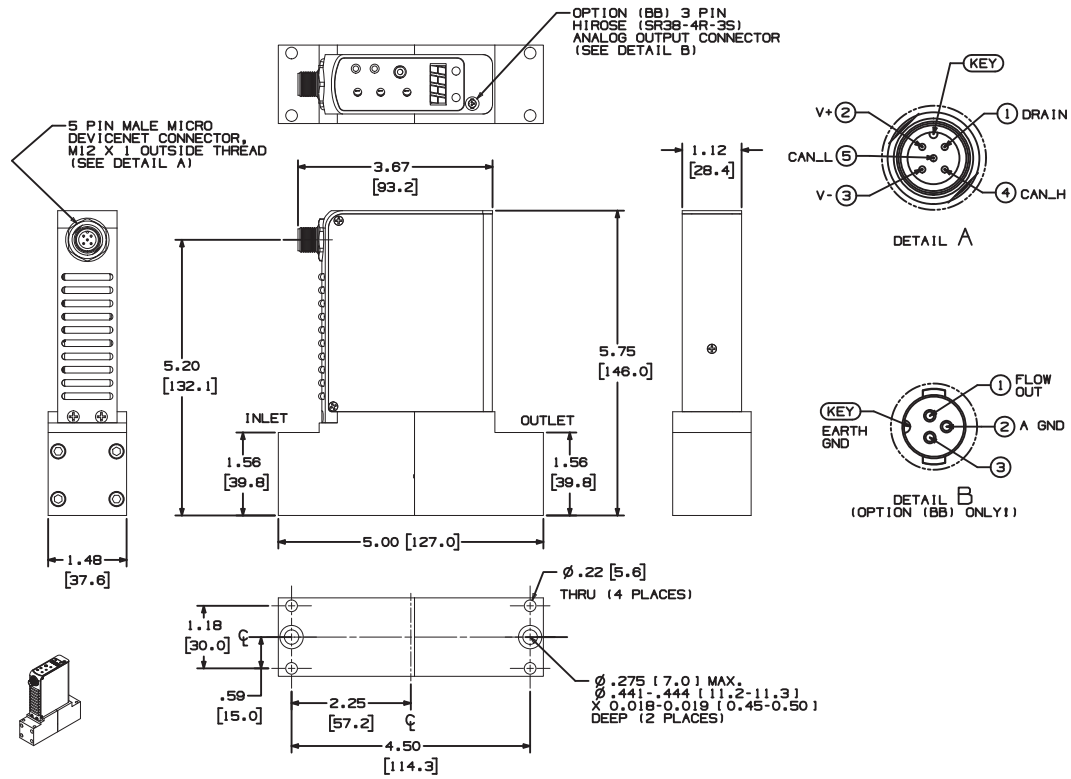


Product Dimensions (continued)

GF101/GF121/GF126 Series - 3/8" C Seal, 92mm, DeviceNet Connections



GF101/GF121/GF126 Series - 3/8" C Seal, 114mm, DeviceNet Connections



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	**101**	Flow range 51 - 300 slpm N_2 Eq.; 1 sec Response; 10 Ra
		121	Flow range 51 - 300 slpm N_2 Eq. 4 Ra
		126	Flow range 51 - 300 slpm N_2 Eq.4 Ra, Pressure Transient Insensitive (PTI)
III.	Configurability	**X**	Not MultiFlo capable. Specific gas/range required
IV.	Special Application	**XX**	Standard
V.	Valve Configuration	**C**	Normally Closed valve
		M	Meter (No Valve)
VI.	Gas	**XXXX XXXX**	Specific Gas Code & Range, i.e. "0004" = Argon and "100L" = 100 slpm
VII.	Fitting	**V1**	1-1/2" body width, 134mm 1/2" VCR male
		C1	1-1/2" body width, 92mm C Seal
		C2	1-1/2" body width, 114mm C Seal
VIII.	Downstream Condition	**A**	Atmosphere
		V	Vacuum
IX.	Sensor	**O**	Default Sensor Orientation
X.	Connector	**BX**	Cable adapter to 15 pin D Brooks (Unit "B","N")
		EX	Cable adapter to card edge (w/out VTP), RS485 through RJ11 jacks (Unit"E"; IN "L", "R"); display and overlay 180° orientation
		FX	Cable adapter with 9 pin STEC pin-out & jack screws (w/VTP) (Unit"F","O")
		G1	9-Pin D with RS485 (Unit"G")
		JX	Cable adapter with 9 pin STEC pin-out & jack screws (w/VTP) (Unit"J","W")
		KX	Cable adapter to MKS 15-Pin D (Unit "K")
		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)
		UX	Cable adapter to 15 pin D (w/VTP) (Unit & TN "U")
		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							

XI.	Customer Special Request	**XXXX**	Customer Special Request Number
XII.	Auto Shut-Off	**A**	Auto Shut-Off (Included)
		X	Auto Shut-Off (Not Included) (Must be selected for meter)
XIII.	Auto Zero	**A**	Auto Zero (Included)
		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	101	X	XX	C	-	0013100L	-	V1	A	0	G1	-	XXXX	A	X	-	000

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:

USA	☎ 888 275 8946	Taiwan	☎ +886 3 5590 988
Europe	☎ +49 351 215 2040	China	☎ +86 21 5079 8828
Japan	☎ +81 3 5633 7100	Singapore	☎ +6297 9741
Korea	☎ +82 31 708 2521		

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

DS-TMF-GF121-Series-MFC-eng (1013)

TRADEMARKS

Brooks ..... Brooks Instrument, LLC
DeviceNet ..... Open DeviceNet Vendors Association, Inc.
Hastelloy ..... Haynes International
MultiFlo ..... Brooks Instrument, LLC
SDS ..... Matheson Tri-Gas and ATMI, Inc.
VCR ..... Cajon Co.

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