DATA SHEET

Mass Flow Controllers

Model GF80

GF80

Metal Sealed, Digital, MultiFlo™ Thermal Mass Flow Meters & Controllers for Gases

Brooks® GF80 thermal mass flow controllers (MFCs) and thermal mass flow meters (MFMs) achieve unprecedented performance, reliability, and flexibility in many gas flow measurement and control applications.

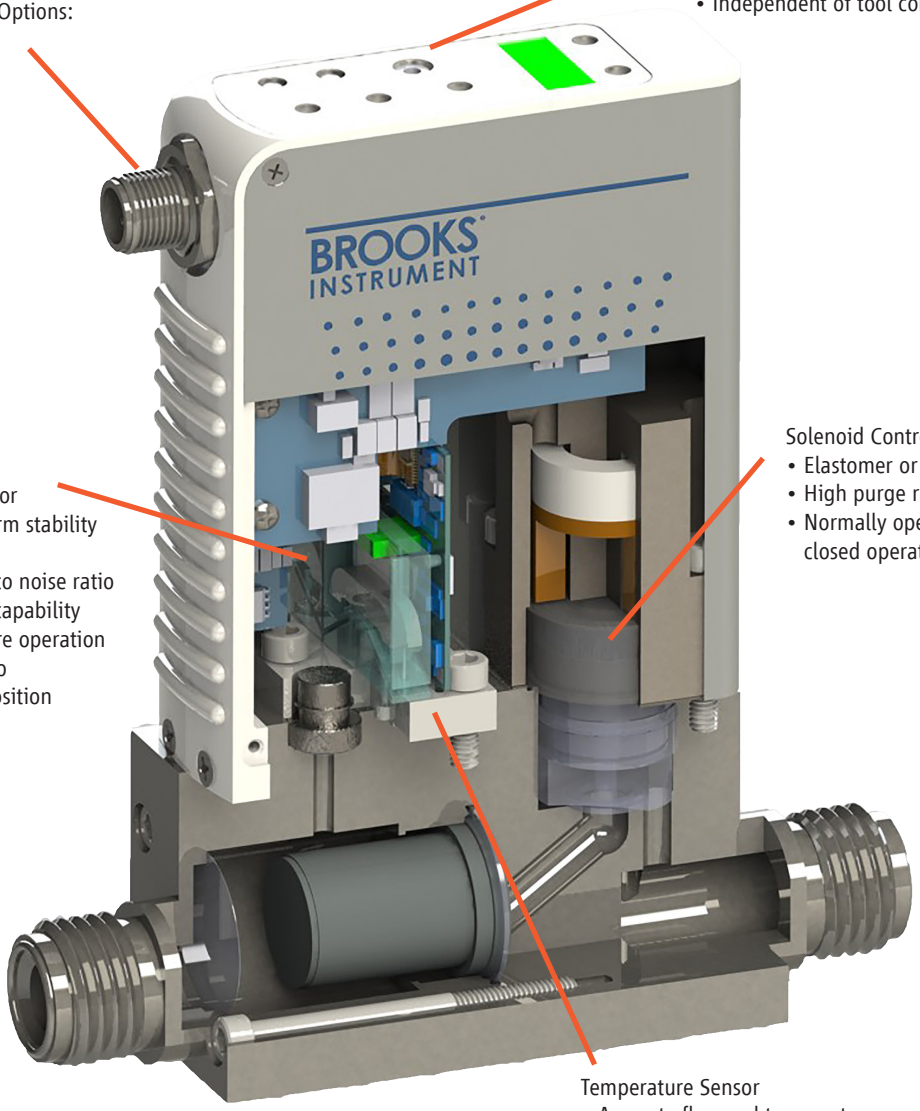
At the heart of the GF80 is Brooks' patented 4th generation MultiFlo™ capable device. MultiFlo overcomes a long-standing limitation of many thermal MFCs – when changing gas types, a simple correction factor, such as the ratio of heat capacities between the calibration gas and new gas, cannot account for accuracy-robbing viscosity and density differences. The Brooks MultiFlo database is built on thousands of native gas runs to establish correction functions that account for both thermal and physical differences among gases making the GF80 Series among the most accurate and flexible MFCs/MFMs available today.

The Brooks GF80 Series is the perfect choice for customers who use thermal mass flow controllers or thermal mass flow meters on a variety of gases, who need to change gas type frequently, or who need to re-range while preserving gas measurement and control accuracy. Some examples:

- OEMs will reduce the number of gas and range-specific MFCs that they inventory
- Solar, biotech, CVD, plasma, glass, web coating, nanotechnology, vacuum processing and similar large users of mass flow meters and mass flow controllers will greatly reduce their gas- and range-specific spares inventory
- R&D, research, and laboratory users can quickly change experiment conditions and achieve much better actual process gas accuracy vs. traditional mass flow devices

With a range of digital and analog I/O options available, GF80 represents an extremely powerful, yet easy, upgrade for existing MFCs or MFMs.

View GF80 Product Page



Features	Benefits
Metal Seal	High internal to external 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
MultiFlo Gas and Range Programmabilty with Diagnostics and User Accessible Port	Select new gas calibrations and full-scale ranges without the trouble and cost of removing the mass flow controller from the gas line. Convenient interface to diagnostics port for maximum uptime. Advanced Service
Corrosion resistant Hastelloy® Sensor	Provides unmatched long-term sensor stability ensuring maximum yield and throughput.

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 plus extensive actual gas testing protocols that provide extremely accurate compensation. MultiFlo also allows the device to be quickly and easily configured for another gas and/or flow range without sacrificing accuracy or range-ability. Selecting a new gas automatically creates a new calibration curve, establishes optimized PID settings for dynamic control, compensates for gas density and viscosity 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 configured 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 60 seconds. Brooks provides an enormous gas database to ensure the maximal value of MultiFlo is realized:

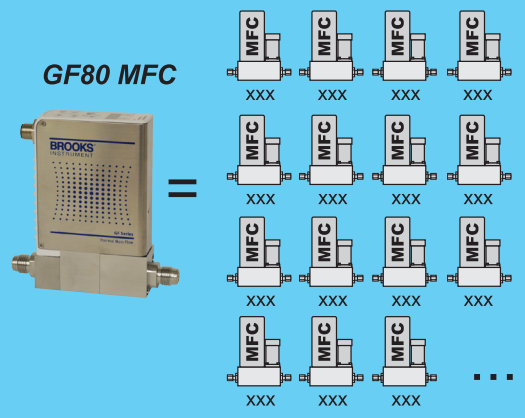
- Dramatically reduces inventory or spares expense
- The MFC full scale flow range can be scaled down typically by a factor of 3:1 with no impact on accuracy, turndown or leak-by specifications for tremendous process flexibility
- Native gas calibration is not required
- Maximum flexibility for research applications

MultiFlo™ Configurator Accessories

MultiFlo kits are available in the following configurations:

778Z010ZZZ	Basic MultiFlo Configurator Kit
A331710003	Cable Assembly 2.5mm
214F027AAA	USB-RS485 converter with DB-9 female
778Z012ZZZ	GF0xx RS485 Analog/Profibus® MultiFlo Configurator Kit w/Power Supply 24 Vdc
A331710003	Cable Assembly 2.5mm
214F027AAA	USB-RS485 converter with DB-9 female
641Z117AAA	Power Supply 24 Vdc with DB-15 female
778Z014ZZZ	GF0xx DeviceNet™ MultiFlo Configurator Kit w/Power Supply 24 Vdc
A331710003	Cable Assembly 2.5mm
214F027AAA	USB-RS485 converter with DB-9 female
641Z117AAA	Power Supply 24 Vdc with DB-15 female
124Z171AAA	Cable, Power, DeviceNet to DB-15 male

*MultiFlo configurator software is available on the Brooks



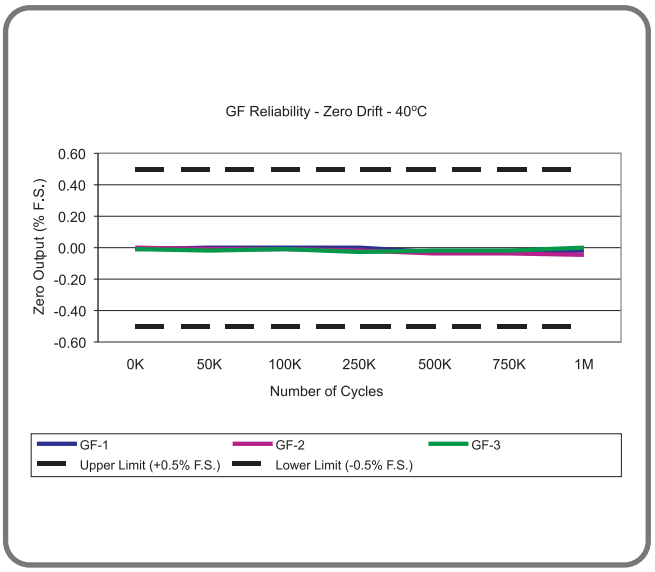
MultiFlo™ technology allows your GF80 to be programmed for thousands of different gases and flow ranges

# of Platforms	Gf80 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! Fewer platforms means more process flexibility and lower cost of spares.

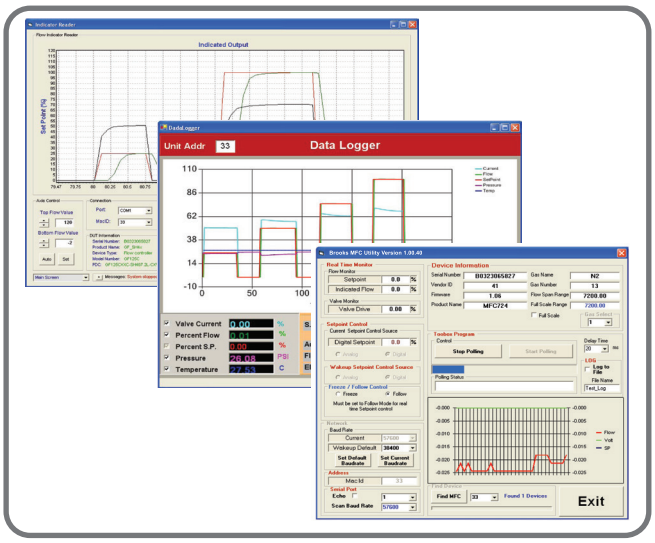
Advanced Thermal Flow Measurement Sensor Brooks' proprietary sensor technology combines:

- 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 an enhanced sensor manufacturing process
- Highly corrosion resistant Hastelloy C-22 sensor tube
- Optimized temperature profile for gases prone to thermal decomposition



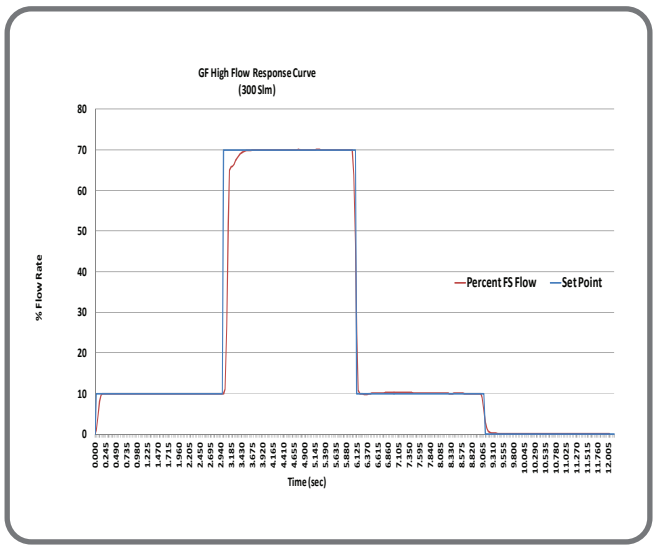
Enhanced Diagnostics

The mass flow controller remains one of the most complex and critical component in gas delivery systems; removing the mass flow controller to determine if it is faulty should be the last resort. In response to this fact, Brooks pioneered smarter mass flow controllers with embedded self test routines and introduced an independent diagnostic/service port to provide the user with access to diagnostic data for troubleshooting without interrupting flow controller operation.



Precise Flow Control

Speed of response and gas stability are often critical requirements for advanced process control applications.



Solar Cell / CVD

Developed to meet the diverse process requirements for solar cells, fiber optics, and the glass and metal coatings markets, the GF80 mass flow controllers offer a single platform solution for diffusion furnaces, thin film deposition, and other difficult applications.

With the GF80 offering metal seals, this single platform can cover complex gas distribution systems. The MultiFlo feature can minimze costly inventory while providing industry leading actual gas accuracy.

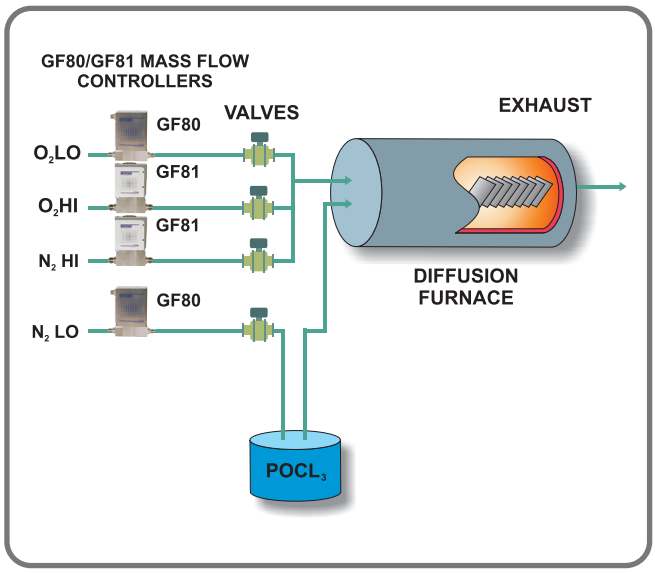
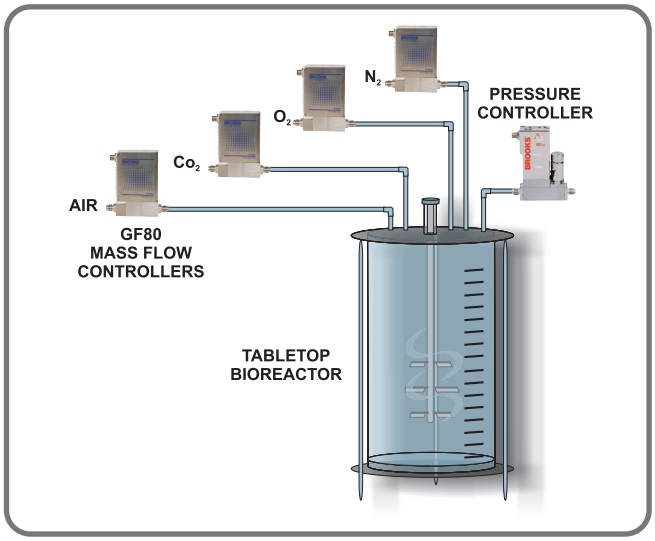


Table Top Bioreactors

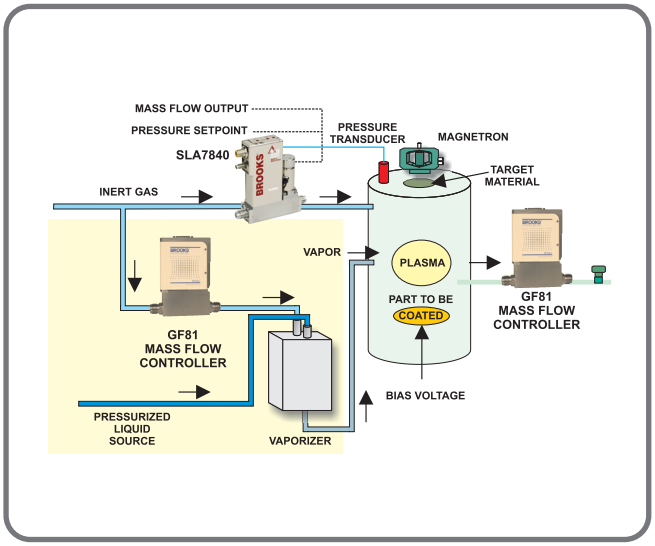
Brooks has earned the leading reputation in controlling gas flows for bioreactor applications. The GF80 mass flow controllers are perfect for controlling dissolved oxygen and pH. The MultiFlo capability can greatly simplify spares inventory and the ordering process. With multiple digital protocol communication options and other advanced features, the GF80 is an ideal device for the bioreactor process.



Vacuum Processes

Brooks offers many products that deliver exceptional performance for vacuum processes. The GF80 mass flow controllers are no exception. With high flow and low flow options, several digital communication protocols offerings, and the MultiFlo capability, the GF80 can serve a wide variety of vacuum porcesses.

With other products like the XacTorr® capacitance manometer and SLA7800 Series pressure controllers, the GF80 makes Brooks a one-stop-shop for instrumentation in vacuum processes.



	GF80
PERFORMANCE	
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	< ± 0.2% S.P.
Linearity	± 0.5% F.S. (included in accuracy)
Response Time (Settling Time)	Normally Closed Valve < 1 sec. (within 2% for steps 0-10 through 0-100%)
Control Range	2-100%
MultiFlo	Optional
Number of Bins	11 bins
Valve Shut Down	< 1% of F.S.
Zero Stability	< ± 0.5% F.S. per year
Pressure Coefficient	0.03% per psi (0-50psi N_2)
Attitude Sensitivity	<0.25% span change @ 90° after rezeroing (N_2 @ 50 psi)
Auto Zero:	Optional: (When Auto Zero is enabled the device performs the zero function once every time the set point returns to zero. To accomplish, simply provide a zero set point.)
Auto shut-off:	The Auto Shut-off feature closes the GF80 valve when the set point drops below 1.5% of full scale
Available Gases:	MultiFlo Capable
RATINGS	
Operating Temperature Range	5-50°C (41-122°F)
Maximum Operating Pressure[1]	150 psig (10 bar)
Differential Pressure Range[1]	3-860 sccm = 7-45 psid, 861-7200 sccm = 15-45 psid, 7201-50000 sccm = 25-45 psid Typical pressure drop, high density gases like Argon gas applications require an additional 10 psid differential pressure
Leak Integrity (External)	$1x10^{-10}$ atm. cc/sec He
MECHANICAL	
Valve Type	Normally Closed, Meter
Primary Wetted Materials	316 Stainless Steel, Hastelloy C-22, 17-7 PH, 430SS
External Seals	316 Stainless Steel
Internal Seals/Valve Seat	316 Stainless Steel
Surface Finish	16µ inch Ra
DIAGNOSTICSc& DISPLAY	
Status Lights:	MFC Health, Network Status
Alarms[1]:	Sensor Output, Control Valve Output, Over Temperature, Power Surge/Sag, Network Interruption
Diagnostic / Service Port:	RS485 via 2.5mm jack
COMPLIANCE	
Environmental Compliance:	CE: EN6126: 2006 (FCC Part 15 & Canada IC-subset of CE testing) Safety EN61010-1 RoHS

[1] Note: Application specific lower supply pressure and/or lower differential pressure operation available through Brooks Customer Special Request (CSR) process.

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Communication Protocol	RS485	Profibus®	DeviceNet™
Electrical Connection	1 x 15-pin Male Sub-D, (A)	1 x 15-pin Male Sub-D/ 1 x 9-pin Female Sub-D	1 x M12 with threaded coupling nut (B)
Analog I/O	0-5 V, 0-10 V, 0-20 mA, 4-20 mA	0-5 V, 0-20 mA, 4-20 mA	
GF80 Power Max./Purge	From +12 Vdc to +24 Vdc: 7 Watt/8 Watt	From +13.5 Vdc to +27 Vdc: 7 Watt/8 Watt	From +11 Vdc to +25 Vdc: 13.6 Watt/15.0Watt

VOLTAGE SETPOINT SPECIFICATIONS			
Nominal Range	0-5 Vdc or 0-10 Vdc	1-5 Vdc	N/A
Full Range	0-11 Vdc	0-5.5 Vdc	N/A
Absolute Max.	25 V (without damage)		N/A
Input Impedence	192 kOhms		N/A
Required Max. Sink Current	0.002 mA		N/A
CURRENT SETPOINT			
Nominal Range	4-20 mA or 0-20 mA		N/A
Full Range	0-22 mA		N/A
Absolute Max.	25 mA (without damage)		N/A
Input Impedence	250 Ohms	125 Ohms	N/A
FLOW OUTPUT (VOLTAGE) SPECIFICATIONS			
Nominal Range	0-5 Vdc or 0-10 Vdc	0-5 Vdc	N/A
Full Range	N(-0.5)-11 Vdc	0-5.5 Vdc	N/A
Min Load Resistance	1 kOhms	1 kOhms	N/A
FLOW OUTPUT (CURRENT) SPECIFICATIONS			
Nominal Range	0-20 mA or 4-20 mA		N/A
Full Range	0-22 mA (@ 0-20 mA); 3.8-22 mA (@ 4-20 mA)		N/A
Max. Load	400 Ohms (for supply voltage: 12-24 Vdc		N/A
ANALOG I/O ALARM OUTPUT[3]			
Type	Open Collector		N/A
Max. Closed (On) Current	25 mA		N/A
Max. Open (Off) Leakage	1µA		N/A
Max. Open (Off) Voltage	30 Vdc		N/A
ANALOG I/O VALVE OVERRIDE SIGNAL SPECIFICATIONS[4]			
Floating/Unconnected	Instrument controls valve to command set point		N/A
VOR < 0.3 Vdc	Valve Closed		N/A
1 Vdc < VOR < 4 Vdc	Valve Normal		N/A
VOR > 4.8 Vdc	Valve Open		N/A
Input Impedence	800 kOhms		

[2]There are three (3) RS485 Protocols:
S-Protocol is a RS485 communication based on HART® command set.
L-Protocol is a RS485 communication compatible with legacy Unit® and Celerity® devices.
A-Protocol is a RS485 communication compatible with Aera® mass flow devices.

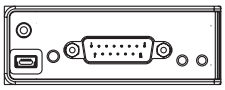
[3]The Alarm Output is an open collector or "contact type" that is CLOSED (on) whenever an alarm is active. The Alarm Output may be set to indicate any one of various alarm conditions.

[4]The Valve Override Signal (VOR) is implemented as an analog input which measures the voltage at the input and controls the valve based upon the measured reading as shown in this section.

Electrical Interface Options

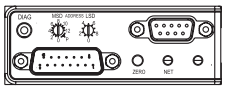
Base I/O Options

Analog / RS485
(S, L, and A Protocols)



Pin No.:	Signals:
1	SETPOINT COMMON
2	FLOW OUTPUT (0-5V, 0-10V)
3	ALARM OUT
4	FLOW OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (+12V to +24Vdc)
6	NC
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V, 0-10V)
9	POWER COMMON
10	FLOW OUT COMMON
11	NC
12	VALVE OVERRIDE INPUT
13	RESERVED
14	RS485B
15	RS485A

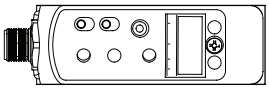
Profibus



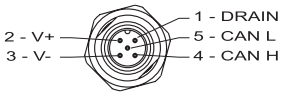
Pin No.:	Signals:
1	SETPOINT COMMON
2	FLOW OUTPUT (0-5V)
3	ALARM OUT
4	FLOW OUTPUT (0-20mA, 4-20mA)
5	POWER SUPPLY (13.5-27V)
6	NC
7	SETPOINT INPUT (0-20mA, 4-20mA)
8	SETPOINT INPUT (0-5V)
9	POWER COMMON
10	FLOW OUT COMMON
11	NC
12	VALVE OVERRIDE INPUT
13	RESERVED
14	NC
15	NC

Pin No.:	Signals:
1	NC
2	NC
3	RXD/TXD - B - red wire
4	NC
5	Ground
6	+5Vdc
7	NC
8	RXD/TXD - A - green wire
9	NC

DeviceNet



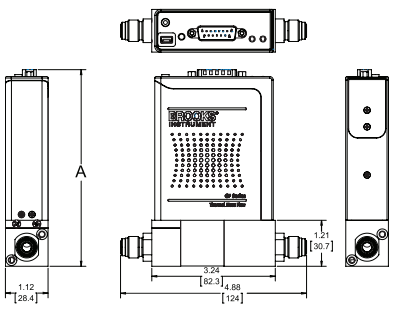
Pin No.:	Signals:
1	DRAIN
2	V+ (11-25 Vdc)
3	V-
4	CAN-H
5	CAN-L



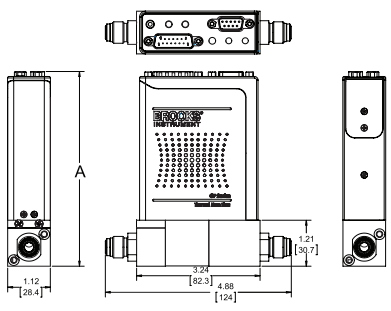
Product Dimensions

GF80 Configurations

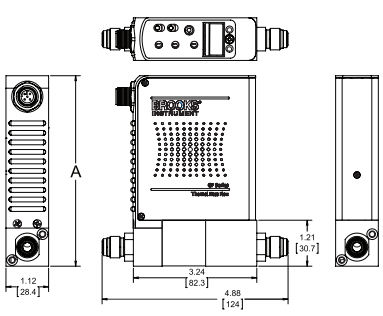
Analog / RS485

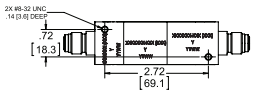


Profibus



DeviceNet





Analog/RS485, Profibus and DeviceNet Models

	Dim "A" in [mm]
Analog / RS485	5.16 [131.1]
Profibus	5.11 [129.8]
DeviceNet	5.00 [127]

Access our library of CAD Drawings

Code Description	Code Option	Option Description[1]
I. Base Model Code	GF080	Metal / Range Flow (0-55 slpm)
II. Configurability	C	MultiFlo Capable. Standard Bins or specific gas range may be selected
	X	Not MultiFlo Capable. Specific gas/range required
III. Special Application	XX	Standard
IV. Valve Configuration	C	Normally Closed Valve
	M	Meter (No Valve)
V. Gas or SH MultiFlo Bin	XXXX XXXX	Specific Gas Code & Range, i.e. "0004" = Argon and "010L" = 10 slpm
	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)
VI. Fitting	VX	1/4" VCR
VII. Downstream Condition	A	Atmosphere
	V	Vacuum
	P	Positive Pressure
VIII. External Seals, Valve Seat	S	Seal Metal / Seat Metal (316 SS)
IX. Communications / Connector	P5	Profibus / Analog (Input 0-5 V; Output 0-5 V); 9-Pin Female D conn. / 15-Pin Male D conn.
	P0	Profibus / Analog (Input 0-20 mA; Output 0-20 mA); 9-Pin Female D conn. / 15-Pin Male D conn.
	P4	Profibus / Analog (Input 4-20 mA; Output 4-20 mA); 9-Pin Female D conn. / 15-Pin Male D conn.
	S5	RS485: (S-Protocol)/Analog (Input 0-5 V; Output 0-5 V)15-Pin Male D (Brooks® Protocol)
	S1	RS485: (S-Protocol)/Analog (Input 0-10 V; Output 0-10 V); 15-Pin Male D (Brooks® Protocol)
	S0	RS485 (S-Protocol)/Analog (Input 0-20 mA ; Output 0-20 mA); 15-Pin Male D (Brooks® Protocol)
	S4	RS485 (S-Protocol)/Analog (Input 4-20 mA; Output 4-20 mA); 15-Pin Male D (Brooks® Protocol)
	L5	RS485 (L-Protocol)/Analog (Input 0-5 V; Output 0-5 V); 15-Pin Male D (Celerity®/Legacy Protocol)
	L1	RS485 (L-Protocol)/Analog (Input 0-10 V; Output 0-10 V); 15-Pin Male D (Celerity®/Legacy Protocol)
	L0	RS485 (L-Protocol)/Analog (Input 0-20 mA; Output 0-20 mA); 15-Pin Male D (Celerity®/Legacy Protocol)
	L4	RS485 (L-Protocol)/Analog (Input 4-20 mA; Output 4-20 mA); 15-Pin Male D (Celerity®/Legacy Protocol)

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	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						

X. Customer Special Request	XXXX	Customer Special Request Number
XI. Auto Shut-Off	A	Auto Shut-Off (Included)
	X	Auto Shut-Off (Not Included)
XII. Auto Zero	X	Auto Zero (Not Included)
XIII. Reference Temperature	00C	0°C Reference
	15C	15°C Reference
	20C	20°C Reference
	70F	21.1°C Reference / 70°F Reference

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

DS-TMF-GF80-G-Series-MFC-eng/2020-12

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