

GP200 Series

Metal Sealed, Digital, Ultra-High Purity
Pressure-based Mass Flow Controllers for Gases



GP200 Series is the first inlet and outlet pressure insensitive P-MFC, designed specifically for semiconductor applications. Its unique differential pressure sensor technology, coupled with its downstream valve architecture, removes the current limitations of pressure-based mass flow controllers.

Our sophisticated, proprietary MultiFlo™ gas model is embedded within each GP200 enabling on-the-fly gas & range reconfiguration for maximum process flexibility, while its ultra-fast, highly repeatable matched transient response and dynamic cross-talk insensitivity enables tighter process control. The GP200 platform provides the most precise process gas delivery over the widest range of operating conditions in the industry for seamless drop-in replacement and upgrade of traditional pressure-based mass and thermal flow controllers.

Features	Benefits
True Differential Pressure Measurement	Brooks patented differential pressure sensor reduces the measurement uncertainty associated with separate absolute sensors, for enhanced accuracy and repeatability.
Lower Inlet Pressure Option	Low pressure drop laminar flow element and DP sensor enables accurate measurement of critical low pressure etch gases including SiCl ₄ , BCl ₃ , C ₄ F ₆
Cross-Talk Insensitive	During extreme pressure supply disruptions of up to 40 psi/sec, flow rate will be held within $\pm 1\%$ of setpoint to maintain process control.
Matched Transient Response	Ultra-fast and highly repeatable ascending and descending flow stabilization enables tighter process control.
Downstream Valve Architecture	Downstream valve architecture enables flow delivery into high pressures (up to 1200 Torr) and fast-closing valve reduces non-productive recipe wait times that are found in upstream MFC valve designs.
Zero Leak-by Control Valve	Valve shut down (up to $\leq 0.005\%$ of full scale) to minimize the first wafer effect, improve tool matching, and wafer-to-wafer uniformity
High Flow Rate Capability	Supports all process flow needs with just nine (9) standard bin configurations for maximum flexibility

Product Specifications

Performance

Full Scale Flow Range	3 sccm to 50,000 sccm F.S. N ₂ Equivalent	
Process Gas Flow Accuracy ¹	Zero Leak Valve: <±1% S.P. (5 – 100% F.S.) <±0.05% F.S. (0.5 - 5% F.S.)	Metal Seal Valve: <±1% S.P. (5-100% F.S.) <±0.05% F.S. (2-5% F.S.)
Control Range ²	0.5 - 100% F.S.	2 - 100% F.S.
Repeatability & Reproducibility	5-100% = ±0.15% of S.P. 0.5-5% = ±0.015% of F.S	5-100% = ±0.15% of S.P. 2-5% = ±0.015% of F.S
Transient Response & Flow Settling Time	280 ±20 ms Matched Transient Response, for any ascending or descending non-zero setpoint (Fast Response Option available via Customer Special Request.)	
Valve Leak-by	Zero Leak Valve: <0.005% of F.S. of the bin (Bins 42-46) <0.02% of F.S. of the bin (Bins 40-41) (@ 45 psia to VAC)	Metal Seal Valve: <0.15% of F.S. of the bin (@ 45 psia to VAC)
Supply Pressure Insensitivity/Cross-Talk	<±1% S.P. up to 40 psi/sec inlet pressure spike	
Steady State Back Pressure Insensitivity	Insensitive to steady state back pressure	
Dynamic Back Pressure Insensitivity	Maintains accuracy during disturbance from vacuum to 1200 Torr over a period of 1 sec	
Zero Stability	<±0.15% F.S. per year	
Temperature Coefficient	Zero: 0.005% F.S. per °C Span: 0.05% S.P. per °C	
Number of Standard Configurations	Nine (9) standard bin ranges	
Dynamic Gas and Range Programmability	Device may be configured via single tool command in less than 1 second or via BEST software with independent USB diagnostic port	
Attitude Insensitivity	Insensitive to device orientation after re-zeroing	

Ratings

Operating Temperature Range ³	10 – 60°C
Operating Inlet Pressure ⁴	<15 psia for Low Pressure (LP) bins, configurable based on application 15 to 30 psia 25 to 40 psia 35 to 50 psia 45 to 60 psia
Operating Outlet Pressure ³	Vacuum to Atmosphere Up to 1200 Torr for some applications
Differential Pressure Range	Min: 7 psid typical Max: up to 50 psid
External Leak Integrity	1 x 10 ⁻¹⁰ atm cc/sec He
Proof Pressure	100 psia, CT Bin Devices (70 psia for Helium and Helium mixtures on CT Bin Devices) 45 psia, LP Bin Devices
Design Pressure	150 psia
Burst Pressure	1000 psia

Mechanical

Valve Type	Normally Closed
Wetted Materials	316L, Hastelloy C-22, 316/316L Stainless Steel, 304 Stainless Steel, KM-45, PCTFE
Surface Finish	5µ inch Ra avg.

¹ For analog control, adder of <±0.05% F.S. applies

² For best performance lowest controllable setpoint should be equivalent to 1% FS of the bin at 35 psia for bins CT40/LP40 due to extreme low flow.
This is equivalent to 0.1 sccm N₂

³ Device should be zeroed at ambient operating temperature per Brooks Instrument recommended procedure

⁴ Consult Brooks Configurator and Bin Tables for specific product sizing and configurable, gas-specific, inlet pressure options.

Product Specifications

Diagnostics & Display

Status Lights	DeviceNet: MFC Health, Network Status EtherCAT: Run, Error, Power, Network Status Analog/RS485: Network Status
Alarms ⁵	Process Control Deviations, Flow High/Low, Temperature High/Low, Pressure High/Low, Voltage Input High/Low, Communication Alarms, Hardware Failures, Page Create Errors, Warmup Alarm (alarms are model specific)
Display Type	Top Mount Integrated LCD
Viewing Angle/Viewing Distance	Rotatable / 10 ft
Units Displayed/Resolution	Flow (%), Temp. (°C), Pressure (psia, kPa) / 0.1 (unit)

Electrical

Digital Communication	DeviceNet™, EtherCAT®, RS485 (model specific)
Electrical Connection	DeviceNet™ via 5-Pin M12 connector EtherCAT® via RJ45 jacks, Power via 5-pin M8 connector 0-5V Analog/RS485 (L-Protocol) via 9-pin D-Connector
Independent Diagnostics Service Port	RS485 via micro-USB
DeviceNet Power Supply/Consumption	545mA max. @ +11-25 Vdc, 250mA max. @ 24 Vdc (under typical operating conditions)
EtherCAT Power Supply/Consumption	360mA max @ +18-30 Vdc, 270mA max @ 24 Vdc (under typical operating conditions)
Analog/RS485 Power Supply/Consumption	6 Watts max @ ± 15 Vdc (±10%) or +24Vdc (±10%) (under typical operating conditions)

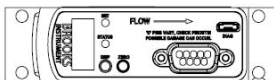
Compliance

EMC	2014/30/EU EMC Directive EN:61326-1: 2013
Environmental Compliance	2011/65/EU & 2015/863/EU RoHS Directive EC 1907/2006 REACH Directive

⁵ For full list of alarms available consult GP200 Supplemental Communication Manuals at www.BrooksInstrument.com

Electrical Interface Options

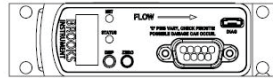
Base I/O Options



Description: Industry standard
Analog / RS485 interface

Model Code Option: G1

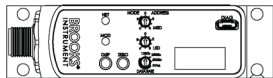
Pin	Signals
1	Valve Control
2	Output (0-5 Vdc)
3	+15 Vdc +24 Vdc
4	Pwr Com NC
5	-15 Vdc Pwr Com
6	Setpoint (0-5 Vdc)
7	Signal Common
8	RS-485 (DX+)
9	RS-485 (DX-)



Description: Industry standard
Analog only interface

Model Code Option: TX

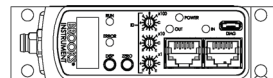
Pin	Signals
1	Valve Control
2	Output (0-5 Vdc)
3	+15 Vdc +24 Vdc
4	Pwr Com NC
5	-15 Vdc Pwr Com
6	Setpoint (0-5 Vdc)
7	Signal Common
8	No Connection
9	No Connection



Description: Industry standard
ODVA compliant DeviceNet interface

Model Code Option: DX

Pin	Description
1	Drain
2	V+ (11 - 25 Vdc)
3	V-
4	CAN-H
5	CAN-L



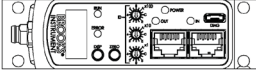
Description: Industry standard
EtherCAT

Model Code Option: E0

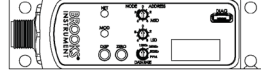
Pin	Signals
1	+24V
3	Power Common

GP200 Series - Downport Configurations

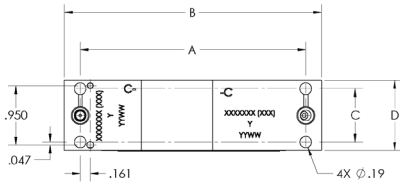
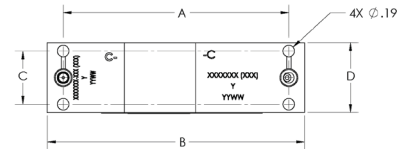
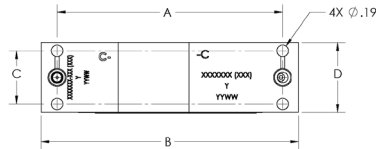
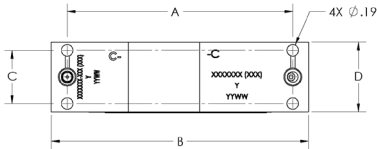
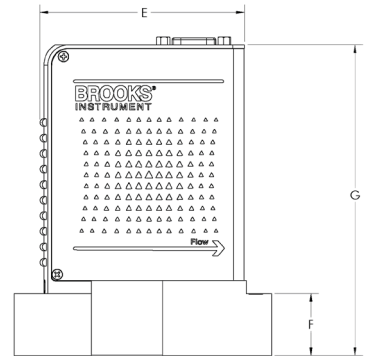
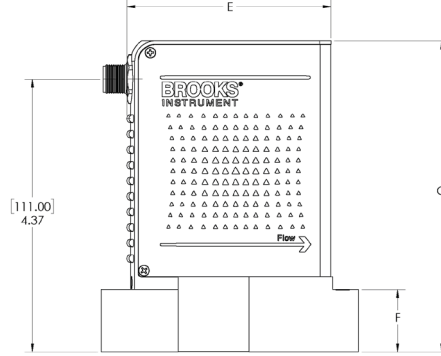
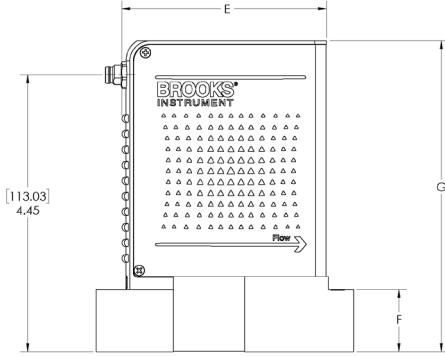
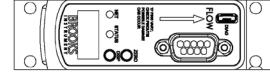
ELECTRICAL CONNECTOR
E0 SPECIFIC DIMENSIONS



ELECTRICAL CONNECTOR
DX, D0-DE SPECIFIC DIMENSIONS



ELECTRICAL CONNECTOR
G1/TX SPECIFIC DIMENSIONS



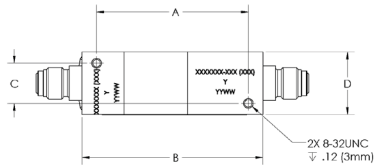
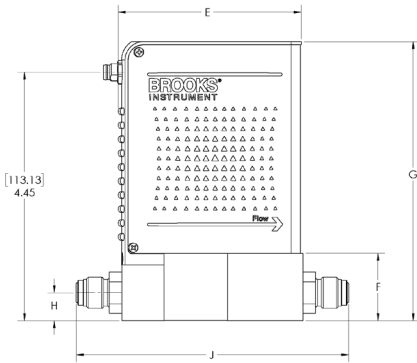
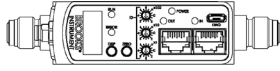
POKE YOKE CONFIGURATION

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]
WX	W-SEAL	92mm [3.62in]	105mm [4.13in]	22mm [0.86in]	28mm [1.12in]	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]

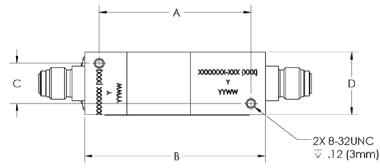
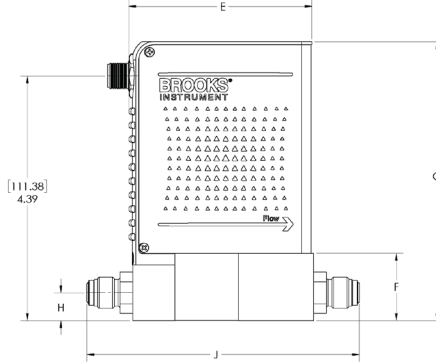
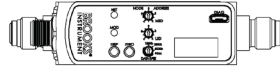
Product Dimensions

GP200 Series - VCR Configurations

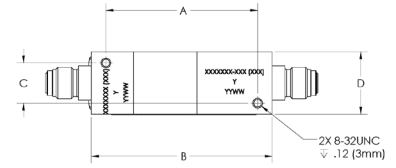
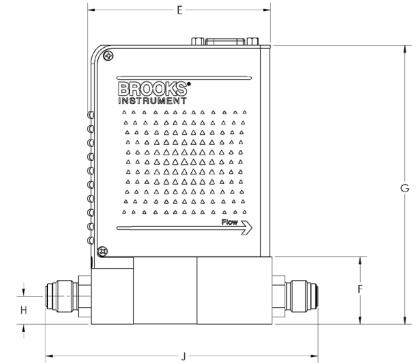
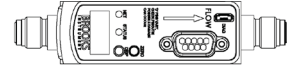
ELECTRICAL CONNECTOR
E0 SPECIFIC DIMENSIONS



ELECTRICAL CONNECTOR
DX, DO-DE SPECIFIC DIMENSIONS



ELECTRICAL CONNECTOR
G1/TX SPECIFIC DIMENSIONS



Fitting Option Code	VCR	Dim A	Dim B	Dim C	Dim D	Dim E	Dim F	Dim G	Dim H	Dim I
VS	1/4"	69mm [2.72in]	82mm [3.24in]	18mm [0.72in]	28.4mm [1.12in]	83mm [3.28in]	31mm [1.21in]	127mm [5.00in]	13mm [0.50in]	124mm [4.88in]

Code Description	Code Option	Option Description	
I. Base Model Code	GP200	Ultra-High Purity Pressure-Based Mass Flow Controllers	
II. Valve Configuration	P	Positive Shut-off/Zero Leak-by Valve ⁶	
	C	Normally Closed Valve with Metal Valve Seat	
III. Gas and Range ⁷	0013 010C	10 sccm F.S. N ₂ Equivalent, CT40 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 030C	30 sccm F.S. N ₂ Equivalent, CT41 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 100C	100 sccm F.S. N ₂ Equivalent, CT42 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 300C	300 sccm F.S. N ₂ Equivalent, CT43 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 001L	1,000 sccm F.S. N ₂ Equivalent, CT44 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 003L	3,000 sccm F.S. N ₂ Equivalent, CT45 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 010L	10,000 sccm F.S. N ₂ Equivalent, CT46, Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 025L	25,000 sccm F.S. N ₂ Equivalent, CT47 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
	0013 045L	45,000 sccm F.S. N ₂ Equivalent, CT48 Standard Bin Configuration at 35 psia inlet, vacuum outlet	
IV. Bin Configuration Type ⁷	Option	Bin Type	Bin Configuration
	CT40	Standard Type (CT) Bin	Standard Bin Configuration #40
	CT41		Standard Bin Configuration #41
	CT42		Standard Bin Configuration #42
	CT43		Standard Bin Configuration #43
	CT44		Standard Bin Configuration #44
	CT45		Standard Bin Configuration #45
	CT46		Standard Bin Configuration #46
	CT47		Standard Bin Configuration #47
	CT48		Standard Bin Configuration #48
	LP40	Low Pressure (LP) Bin	Low Pressure Bin Configuration #40
	LP41		Low Pressure Bin Configuration #41
	LP42		Low Pressure Bin Configuration #42
	LP43		Low Pressure Bin Configuration #43
	LP44		Low Pressure Bin Configuration #44
	LP45		Low Pressure Bin Configuration #45
LP46	Low Pressure Bin Configuration #46		
V. Fitting	CX		1-1/8" body width, 92mm C Seal
	WX	1-1/8" body width, 92mm W Seal	
	VS	1-1/8" body width, 124mm 1/4" VCR male	
	LX	1-1/8" body width, 92mm C Seal w/Poke Yoke	

⁶ Zero Leak Valve Option not currently available with bins CT47-CT48

⁷ Consult Brooks Configurator or Bin Tables for specific Product Sizing Options

Code Description

Code Option Option Description

VI. Communications/Connector	E0	EtherCAT Communication								
	G1	9-Pin D-Connector with Analog/RS485 Communication								
	TX	9-Pin D-Connector with Analog Only								
	Option	I/O	Power On State	Full Scale Setting	Full Scale Setting	Full Scale Setting	Poll I/O Instance Producer	Poll I/O Instance Consumer	Poll I/O State Transition	External Baud Rate
	D0	DeviceNet	Idle	Count	Integer	6000h	2	7	Executing	500KB
	D1	DeviceNet	Idle	Count	Integer	6000h	21	7	Executing	500KB
	D2	DeviceNet	Idle	SCCM	Float	7FFFh	13	19	Executing	500KB
	D3	DeviceNet	Idle	Count	Integer	6000h	22	7	Executing	500KB
	D4	DeviceNet	Executing	Count	Integer	6000h	22	8	Executing	500KB
	D5	DeviceNet	Idle	Count	Integer	6000h	6	8	Executing	500KB
	D6	DeviceNet	Idle	Count	Integer	7FFFh	3	7	Executing	500KB
	D7	DeviceNet	Idle	Count	Integer	7FFFh	6	8	Executing	500KB
	D8	DeviceNet	Idle	Count	Integer	6000h	3	7	Executing	500KB
	D9	DeviceNet	Executing	Count	Integer	6000h	2	7	Executing	500KB
	DA	DeviceNet	Idle	Count	Integer	7FFFh	22	7	Executing	500KB
	DB	DeviceNet	Idle	Count	Integer	6000h	22	8	Executing	500KB
	DC	DeviceNet	Idle	Count	Integer	7FFFh	3	7	Idle	500KB
DD	DeviceNet	Executing	Count	Integer	7FFFh	22	8	Executing	500KB	
DE	DeviceNet	Executing	SCCM	Float	6000h	15	19	Executing	500KB	
DX	To be defined by Customer Special Request									
VII. Customer Special Request	XXXX	Customer Special Request (Consult factory for new requests)								
VIII. Minimum Inlet Pressure ⁷	15	15 psia minimum inlet pressure, ~15-30 psia inlet pressure range								
	25	25 psia minimum inlet pressure, ~25-40 psia inlet pressure range								
	35	35 psia minimum inlet pressure, ~35-50 psia inlet pressure range								
	45	45 psia minimum inlet pressure, ~45-60 psia inlet pressure range								
IX. Downstream Condition	V	Vacuum								
	A	Atmosphere								
	P	Positive Pressure (760 Torr up to 1200 Torr)								
X. Auto Shut-off	A	Auto Shut Off (Included)								
	X	Auto Shut Off (Not Included)								
XI. Reference Temperature	00C	0°C Reference Calibration (Standard)								

Sample Model Code

I	II	III	IV	V	VI	VII	VIII	IX	X	XI
GP200	C	0013003L	CT45	CX	E0	XXXX	35	V	A	00C

Brooks is committed to assuring all of our customers receive the optimal 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.

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.

TRADEMARKS

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Data-Sheet-GP200-EN/2024-10

The logo for Contech, featuring the word 'Contech' in a bold, white, sans-serif font with a horizontal line under the 't'.

Av. Dr. Lino de Moraes Leme, 1.094
Vila Paulista – São Paulo/SP – 04360-000.
+55 11 5035-0920
Atendimento@contechind.com.br

www.contechind.com.br