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 for purge lines in CVD, LPCVD, Diffusion, Epi processes, semiconductor chamber clean processes and MOCVD purge flows.

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

View GF Series Product Page
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 2 times faster response and settling time compared to other mass flow controllers, enabling:

• Reduced diverted gas consumption and associated abatement costs
• For processes requiring a slow ramped gas turn-on or time critical transitions between flow rates. A user programmable ramp function is provided
• Improved gas blending and dilution in MOCVD

Pressure Tolerant Flow Control
The GF High-Flow's hydraulically balanced valve is inherently less sensitive to line pressure disturbances caused by regulator droop and popping that can drive the traditional (valve) MFC's to over compensate and ring, resulting in flow disturbance that can impact the process, trip excess flow alarms or stir up particles.

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
• 5 µ inch Ra max surface finish standard (10 µ inch Ra on GF101)
Extensive Mechanical Configuration Support
GF101/GF121/GF126 Series supports all metal seal / UHP industry gas connection interface standards for full OEM and process coverage
- 114 mm, C Seal on 1.5” body
- 134.2 mm, 1/2” VCR male on 1.5” body
- 150.4 mm, 1/2” VCR on 1.5 body
- 166 mm, 1/2” VCR on 1.5” body
- 168.6 mm, 1/2” VCR on 1.5” body

Accessories
318Z137BNA: 1/2” VCR adapter to extend 134.2 mm lay length to 177 mm lay length
318Z138BNA: 1/2” VCR adapter to extend 134.2 mm lay length to 192.4 mm lay length

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.

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.

<table>
<thead>
<tr>
<th>Features</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal Seal</td>
<td>High leak integrity. No periodic replacement of aging seals necessary</td>
</tr>
<tr>
<td>Adaptable Mechanical Configurations</td>
<td>Compact footprint enables easy retrofit to existing systems</td>
</tr>
<tr>
<td>Metrology</td>
<td>Measurement accuracy is traceable to international standards</td>
</tr>
<tr>
<td>User Accessible Service Port with Advanced Diagnostics with User-Friendly Interface</td>
<td>Convenient interface to diagnostics for maximum uptime. Ensures device is operating within user specified limits for high yield and maximum uptime</td>
</tr>
<tr>
<td>Corrosion Resistant Hastelloy T-Rise Sensor</td>
<td>Provides unmatched long-term sensor stability ensuring maximum yield and throughput</td>
</tr>
<tr>
<td>Pressure Transient Insensitivity (PTI)</td>
<td>Tighter process control</td>
</tr>
</tbody>
</table>

Product Description
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

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.

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Communication Interface
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### Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GF101</th>
<th>GF121</th>
<th>GF126</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale Flow Range (N., Eq.)</td>
<td>55 to 300 slm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Accuracy</td>
<td>±1% S.P. &gt; 35-100%, ±0.35% F.S. 2-35%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability &amp; Reproducibility</td>
<td>&lt; ± 0.15% S.P.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity</td>
<td>±0.5% F.S. (included in accuracy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time (Setting Time)</td>
<td>&lt; 1 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Transducer</td>
<td>Ability to measure inlet pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control Range</td>
<td>5-100% (Normally Closed Valve)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi Flo</td>
<td>Standard (All typical high flow rate process gases &amp; mixtures supported)</td>
<td></td>
<td></td>
</tr>
<tr>
<td># of Bins</td>
<td>4 Bins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve Shut Down (N.C. Valve)</td>
<td>&lt; 2% of F.S. @ 30 N2 psig/atm out</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero Stability</td>
<td>&lt; ± 0.5% F.S. per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>Span: 0.05% S.P. per °C, Zero: 0.005% F.S. per °C</td>
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</tbody>
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### Ratings

<table>
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<tr>
<th>Parameter</th>
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</thead>
<tbody>
<tr>
<td>Operating Temperature Range</td>
<td>10-50°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Pressure Range</td>
<td>30-90 psid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Operating Pressure</td>
<td>Controller: 75 psig / Meter: 150 psig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proof Pressure</td>
<td>700 psia</td>
<td>700 psia</td>
<td>140 psia</td>
</tr>
<tr>
<td>Design Pressure</td>
<td>800 psia</td>
<td>700 psia</td>
<td>170 psia</td>
</tr>
<tr>
<td>Burst Pressure</td>
<td>3000 psia</td>
<td>3000 psia</td>
<td>500 psia</td>
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### Mechanical

<table>
<thead>
<tr>
<th>Parameter</th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Valve Type</td>
<td>Normally Closed Meter (no valve)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetted Materials</td>
<td>GF101: SEMI F20 HP Compliant, 316L VIM/VAR, Hastelloy C-22, 316L Stainless Steel, 304 Stainless Steel, KM-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GF121/GF126: SEMI F20 UHP Compliant, 316L VIM/VAR, Hastelloy C-22, 316L Stainless Steel, 304 Stainless Steel, KM-45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Finish</td>
<td>10µ inch Ra</td>
<td>5µ inch Ra (0.1 µm Ra)</td>
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</tr>
</tbody>
</table>

### Diagnostics & Display

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

### Electrical

<table>
<thead>
<tr>
<th>Parameter</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Electrical Connection</td>
<td>RS485/Analog via 9-Pin &quot;D&quot; connector, DeviceNet™ via 5-Pin &quot;M12&quot; connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital Communication</td>
<td>RS485+ (model specific), DeviceNet (model specific), RS485 Diagnostic Port (all models)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnostics/Service Port</td>
<td>RS485 via 2.5mm jack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Supply/Consumption</td>
<td>DeviceNet: 545 mA max. @ +11-25 Vdc., 250mA max. @ 24 Vdc. (Under typical operating conditions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RS485/Analog: 6 Watts max @ ±15 Vdc. (±10%) (Under typical operating conditions)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Compliance

<table>
<thead>
<tr>
<th>Parameter</th>
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<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>RoHS Directive (2011/65/EU)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>REACH Directive EC 1907/2006</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Electrical Interface Options**

### Base I/O Options

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

![Base G1 Diagram]

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

![Base DX Diagram]

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 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.** | **Signale** |
--- | --- |
1 | VALUE OFF |
2 | OUTPUT (-0.8 VDC) |
3 | -15 VDC | +24 VDC |
4 | PW1 COM | NC |
5 | -15 VDC | PW1 COM |
6 | SELECTION (-0.8 VDC) |
7 | SIGNAL COMMON |
8 | CASE GROUND |
9 | NOT CONNECTED |
10 | NOT CONNECTED |
11 | SIGNAL COMMON |
12 | CASE GROUND |
13 | NO CONNECTION |

**PDC Ordering Code BX**
Description: G1 base I/O with 7003590 adapter for compatibility with Unit "E", IN "L", "R"

**Pin No.** | **Signale** |
--- | --- |
1 | VALUE OFF |
2 | OUTPUT (-0.8 VDC) |
3 | -15 VDC | +24 VDC |
4 | PW1 COM | NC |
5 | -15 VDC | PW1 COM |
6 | SELECTION (-0.8 VDC) |
7 | SIGNAL COMMON |
8 | CASE GROUND |
9 | NOT CONNECTED |
10 | NOT CONNECTED |
11 | SIGNAL COMMON |
12 | CASE GROUND |
13 | NO CONNECTION |

**PDC Ordering Code: BK**
Description: G1 base I/O with 7003298 adapter for compatibility with Unit UDU15

**Pin No.** | **Signale** |
--- | --- |
1 | VALUE CONTROL |
2 | OUTPUT (-0.8 VDC) |
3 | -15 VDC | +24 VDC |
4 | PW1 COM | NC |
5 | -15 VDC | PW1 COM |
6 | SELECTION (-0.8 VDC) |
7 | SIGNAL COMMON |
8 | CASE GROUND |
9 | NO CONNECTION |
10 | NOT CONNECTED |
11 | SIGNAL COMMON |
12 | CASE GROUND |
13 | NO CONNECTION |

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

**Pin No.** | **Signale** |
--- | --- |
1 | VALUE OFF |
2 | OUTPUT (-0.8 VDC) |
3 | -15 VDC | +24 VDC |
4 | PW1 COM | NC |
5 | -15 VDC | PW1 COM |
6 | SELECTION (-0.8 VDC) |
7 | SIGNAL COMMON |
8 | CASE GROUND |
9 | NOT CONNECTED |
10 | NOT CONNECTED |
11 | SIGNAL COMMON |
12 | CASE GROUND |
13 | NO CONNECTION |

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

<table>
<thead>
<tr>
<th>Fitting Option Code</th>
<th>Seal Type</th>
<th>Dim A</th>
<th>Dim B</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>3/8&quot; C- Seal</td>
<td>92 mm [3.62 in]</td>
<td>106 mm [4.17 in]</td>
</tr>
<tr>
<td>C2</td>
<td>3/8&quot; C- Seal</td>
<td>114 mm [4.49 in]</td>
<td>127 mm [5.00 in]</td>
</tr>
</tbody>
</table>

**Access our library of CAD Drawings**
### Package / Finish Specifications

- **Downstream Condition**
  - XX: Standard
  - X: Vacuum

- **Valve Configuration**
  - C: Normally Closed valve
  - M: Meter (No Valve)

- **Gas or SH MultiFlo Bin**
  - XXXXXX: Specific Gas Code & Range, i.e. "0004" = Argon and "100L" = 100 slpm
  - SH51 055L: Standard Configuration #51, 55,001 sccm N2 Equivalent (0°C Reference)
  - SH52 100L: Standard Configuration #52, 55,002-100,000 sccm N2 Equivalent (0°C Reference)
  - SH53 200L: Standard Configuration #53, 100,001-200,000 sccm N2 Equivalent (0°C Reference)
  - SH54 300L: Standard Configuration #54, 200,001-300,000 N2 Equivalent (0°C Reference)

- **Fitting**
  - V1: 1-1/2" body width, 134mm 1/2"VCR male
  - V2: 1-1/2" body width, 150.4mm 1/2"VCR male
  - V3: 1-1/2" body width, 166mm 1/2"VCR male
  - V4: 1-1/2" body width, 168.6mm 1/2"VCR male
  - Order V1 + SH52 100L: 1-1/2" body width, 177mm 1/2"VCR male
  - Order V1 + SH54 300L: 1-1/2" body width, 192.4mm 1/2"VCR male
  - C1: 1-1/2" body width, 92mm 3/8" C Seal
  - C2: 1-1/2" body width, 114mm 3/8" C Seal

- **Sensor Configuration**
  - O: Default Sensor Orientation

- **Connector Configuration**
  - BX: Cable adapter to 15 pin D Brocks (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 G1 base
  - FX: Cable adapter with 9 pin STEC pin-out & jack screws (w/VTP) (Unit "F"; "O"); adapts SX base
  - G1: 9-Pin D with RS485 (Unit "G")
  - JX: Cable adapter with 9 pin STEC pin-out & jack screws (w/VTP) (Unit "J"; "W"); adapts SX base
  - XX: 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")
  - UX: Cable adapter to 15 pin D (w/VTP) (Unit & TN "U"); adapts SX base

### DeviceNet Standard Configuration Parameters

<table>
<thead>
<tr>
<th>I/O</th>
<th>Connector</th>
<th>Power On State</th>
<th>Full Scale Setting</th>
<th>Full Scale Setting Integer</th>
<th>Full Scale Setting</th>
<th>Poll IO Instance Consumer</th>
<th>Poll IO Instance Producer</th>
<th>Poll IO State Transition</th>
<th>External Baud Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0</td>
<td>DeviceNet</td>
<td>5 Pin Micro</td>
<td>Idle</td>
<td>Count</td>
<td>Integer</td>
<td>6000h</td>
<td>2</td>
<td>7</td>
<td>Executing</td>
</tr>
<tr>
<td>D1</td>
<td>DeviceNet</td>
<td>5 Pin Micro</td>
<td>Idle</td>
<td>Count</td>
<td>Integer</td>
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<td>21</td>
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</tr>
<tr>
<td>D2</td>
<td>DeviceNet</td>
<td>5 Pin Micro</td>
<td>Idle</td>
<td>SCCM</td>
<td>Float</td>
<td>7FFFh</td>
<td>13</td>
<td>19</td>
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<tr>
<td>D3</td>
<td>DeviceNet</td>
<td>5 Pin Micro</td>
<td>Idle</td>
<td>Count</td>
<td>Integer</td>
<td>6000h</td>
<td>22</td>
<td>7</td>
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<tr>
<td>D4</td>
<td>DeviceNet</td>
<td>5 Pin Micro</td>
<td>Executing</td>
<td>Count</td>
<td>Integer</td>
<td>6000h</td>
<td>22</td>
<td>8</td>
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<td>D5</td>
<td>DeviceNet</td>
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<td>DeviceNet</td>
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<tr>
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### Customer Special Request

- XXXX: Customer Special Request Number

### Auto Shut-Off

- A: Auto Shut-Off (Included)
- X: Auto Shut-Off (Not Included) (Must be selected for meter)

### Auto Zero

- A: Auto Zero (Included)
- X: Auto Zero (Not Included)

### Reference Temperature

- 000: 0°C Reference Calibration (Standard) - Default Setting

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**Sample Standard Model Code**

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**Request a Quote**
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.

TRADEMARKS

Brooks.................................................................Brooks Instrument, LLC
All other trademarks are the property of their respective owners.

DS-TMF-GF101-Series-MFC-eng/5-2020