

Installation & Operation Manual

GC Series Mass Flow Controllers

BROOKS[®]
INSTRUMENT

Beyond Measure

Essential Instructions

Read before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. These products must be properly installed, operated and maintained to ensure they continue to operate within their normal specifications. The following instructions must be adhered to and integrated into your safety program when installing, operating and maintaining Brooks Instrument products.

- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- Read all instructions prior to installing, operating and servicing the product. If this instruction manual is not the correct manual, please see back cover for local sales office contact information. Save this instruction manual for future reference.

▲ WARNING: Do not operate this instrument in excess of the specifications listed in the Instruction and Operation Manual.

Failure to heed this warning can result in serious personal injury and / or damage to the equipment.

- If you do not understand any of the instructions, contact your Brooks Instrument representative for clarification.
- Follow all warnings, cautions and instructions marked on and supplied with the product.

▲ WARNING: Prior to installation ensure this instrument has the required approval ratings to meet local and national codes.

Failure to heed this warning can result in serious injury and / or damage to the equipment.

- Install your equipment as specified in the installation instructions of the appropriate instruction manual and per applicable local and national codes. Connect all products to the proper electrical and pressure sources.
- Operation: (1) Slowly initiate flow into the system. Open process valves slowly to avoid low surges. (2) Check for leaks around the flow controller inlet and outlet connections. If no leaks are present, bring the system up to the operating pressure.
- Please make sure that the process line pressure is removed prior to service. When replacement parts are required, ensure that qualified people use replacement parts specified by Brooks Instrument. Unauthorized parts and procedures can affect the product's performance and place the safe operation of your process at risk. Look-alike substitutions may result in fire, electrical hazards or improper operation.
- Ensure that all equipment doors are closed and protective covers are in place to prevent electrical shock and personal injury, except when maintenance is being performed by qualified persons.

▲ WARNING: For liquid flow devices, if the inlet and outlet valves adjacent to the devices are to be closed for any reason, the devices must be completely drained. Failure to do so may result in thermal expansion of the liquid that can rupture the device and may cause personal injury.

European Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure gauge greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED).

- The Specifications Section of this manual contains instructions related to the PED directive.
- Products described in this manual are in compliance with EN directive 2014/34/EU.
- All Brooks Instrument mass flow controllers fall under fluid group 1.
- Products larger than 25mm or 1" (inch) are in compliance with EN directive 2014/34/EU.
- Products of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

European Electromagnetic Compatibility (EMC)

The Brooks Instrument (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 2014/68/EU).

Special attention however is required when selecting the signal cable to be used with CE marked equipment.

Quality of the signal cable, cable glands and connectors:

Brooks Instrument supplies a limited selection of high quality cable(s) which meets the specifications for CE certification.

If you provide your own signal cable you should use a cable which is overall completely screened with a 100% shield.

"D" or "Circular" type connectors used should be shielded with a metal shield. If applicable, metal cable glands must be used providing cable screens clamping. The cable screen should be connected to the metal shell or gland and shielded at both ends over 360 Degrees.

The shield should be terminated to an earth ground. Card Edge Connectors are standard non-metallic. The cables used must be screened with 100% shield to comply with CE certification. The shield should be terminated to an earth ground.

For pin configuration: Please refer to the enclosed Instruction Manual.

ESD (Electrostatic Discharge)

▲ CAUTION: This instrument contains electronic components that are susceptible to damage by static electricity. Proper handling procedures must be observed during the removal, installation or other handling of internal circuit boards or devices.

Handling Procedure:

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other safe, suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit boards must be transported in a conductive container. Boards must not be removed from protective enclosure until immediately before installation. Removed boards must immediately be placed in protective container for transport, storage or return to factory.

Comments

This instrument is not unique in its content of ESD (electrostatic discharge) sensitive components. Most modern electronic designs contain components that utilize metal oxide technology (NMOS, SMOS, etc.) Experience has proven that even small amounts of static electricity can damage or destroy these devices. Damaged components, even though they appear to function properly, exhibit early failure.

Section 1 Introduction

Purpose	5
Certifications.....	5
Reference Conditions	6
PC-Based Support Tools.....	6
Modbus RTU Communications.....	7
Dimensions.....	8

Section 2 Installation

Receipt of Equipment	9
Recommended Storage Practice.....	9
Return Shipment.....	9
Transit Precautions.....	9
Removal from Storage.....	9
Gas Connections	9
Installation	10
Special Considerations for Pressure Conditions	11
Electrical Interface	11
Operation Check Procedure Using Analog I/O or Digital.....	12

Section 3 Operation

Configuration and Service Tool	13
Analog	13
Modbus RS-485 Interface.....	13
Warmup	13
Zeroing the Device	13
Calibration	14

Section 4 Maintenance & Troubleshooting

Failure of the Flow Rate or Flow Signal to Achieve Setpoint.....	16
Digital Communications Operation	16
System Checks.....	16
Bench Troubleshooting.....	17
Cleanliness	18

Warranty, Local Sales/Service Contact Information	Back Cover
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Figures

1-1 BCAT USB to 9 Pin Adapter, Dimensions in Inches	6
1-2 GC Series DB9 Modbus via RS-485 Connector and Pinouts.....	7
1-3 GC Series Dimensions	8
4-1 Bench Troubleshoot Circuit.....	17

Tables

1-1 Modbus RTU Specifications	7
1-2 GC Series Fitting Dimensions	8
3-1 GC Series Gas Conversion Factors	14
4-1 Troubleshooting Issue, Possible Cause, Check/Corrective Action	18

Purpose

Thank you for purchasing a Brooks Instrument mass flow device. This manual is an installation and operation manual for your device. If you intend to use this device with digital communications, a separate supplemental manual is also available as part of the operating documentation.

Brooks Instrument mass flow measurement instruments are designed for accurately measuring and rapidly controlling flows of gases. This instruction manual is intended to provide the user with all the information necessary to install, operate, and maintain these devices. This manual is organized into the following sections.

- Section 1 Introduction
- Section 2 Installation
- Section 3 Operation
- Section 4 Maintenance
- Back Cover Warranty, Local Sales/Service Contact Information

It is recommended that this manual be read in its entirety before attempting to operate these devices.

⚠ CAUTION

It is the user’s responsibility to select and approve all materials of construction. Careful attention to metallurgy, engineered materials and elastomeric materials is critical to safe operation.

⚠ WARNING

Do not operate this instrument in excess of the specifications. Failure to heed this warning can result in serious personal injury and/or damage to the equipment.

Certifications

Agency	Certification	Directive	Applicable Standard
CE	EMC	2014/30/EU	EN IEC:61326-1: 2021 EN IEC:61326-2.2: 2021
	RoHS	2011/65/EU 2015/863	EN 63000:2018
	PED	2014/68/EU	Sound Engineering Practice per Article 4.3
N/A	Self-Certified	Designed to meet 61010	UL 61010-1:2012 R7.19 EN 61010-1:2010+A1 CAN/CSA-C22.2 NO. 61010-1-12 + G11 + G12 (R2017) + A1
N/A	REACH	EC 1907/2006	N/A

Reference Conditions

Due to the effects of pressure and temperature on gas compressibility, specific reference conditions must be defined when reporting volumetric flow rates in mass flow terms. For example, the unit SCCM (standard cubic centimeters per minute) represents a volumetric gas flow at a specified standard reference condition, not the actual volumetric flow at the operating pressure and temperature. While the mass flow of a gas remains constant, the reported volumetric flow will vary depending on the standard reference conditions used in the calculation.

Across industries and regions, terminology for reference conditions is inconsistent. The terms “normal conditions” and “standard conditions” are often used interchangeably to describe STP (Standard Temperature and Pressure) for gases. However, the actual temperature and pressure values defined as standard or normal vary worldwide. For example, the Semiconductor Equipment Manufacturing Industry (SEMI) defines standard conditions as 273.15 K (0 °C) and 101,325 Pa (760 torr). Regardless of terminology, it is critical that a gas mass flow rate always specifies the reference temperature and pressure used for volumetric conversion to ensure accuracy and consistency in measurement and reporting.

PC-Based Support Tools

Brooks Instrument provides a PC-based control and service application designed to support customer operational and maintenance needs. For GC Series and other compatible devices, the Brooks Calibration Application Tool (BCAT) can be used to monitor performance, diagnose issues, adjust tuning parameters, and perform calibration. Devices equipped with a compatible interface can connect to BCAT through a dedicated adapter, which allows simultaneous device power and data communication with a PC via USB. The GC Series BCAT Adapter (778Z024AAA) is specifically designed to supply power to the GC device while enabling seamless data transfer to a computer. It includes a 110 V AC to 24 V DC power supply, a USB cable, and a 9-pin D-sub connector to ensure stable and reliable connectivity. Ground the mass flow controller according to the instructions in Section 2 (Installation), Item 4. In-situ calibrations can be performed using the BCAT software. Detailed instructions for installation and operation are provided in the BCAT Supplemental Manual.

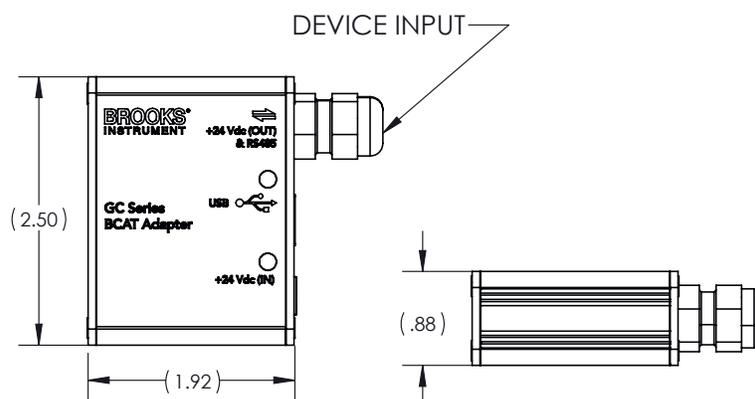


Figure 1-1 BCAT USB to 9 Pin Adapter, Dimensions in Inches

Modbus RTU Communications

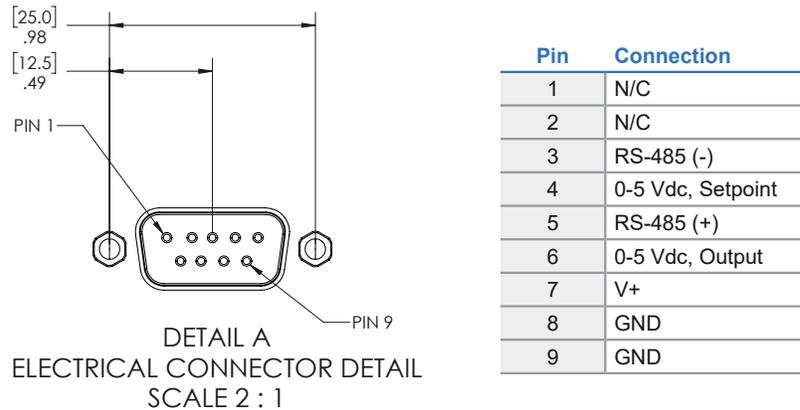


Figure 1-2 GC Series DB9 Modbus via RS-485 Connector and Pinouts

The GC Series is equipped with Modbus RTU digital communications for reliable data exchange using a defined system of registers. Modbus RTU operates over an RS-485 physical layer, allowing for multidrop configurations in which multiple devices share the same communication network. The device supports analog signal options of 0–5 V, 0–10 V, 0–20 mA, or 4–20 mA, with the voltage or current mode pre-configured and fixed at the factory. Supported baud rates include 4,800; 9,600; 19,200; and 38,400 bps. In multidrop installations, proper RS-485 termination and unique device addressing are required to ensure stable communication. Detailed register maps, configuration instructions, and wiring guidelines are provided in the GC Series RS485 Supplemental Manual.

Category	Specification
Protocol	Modbus RTU via RS-485
Start Bits	1
Data Bits	8
Stop Bits	1
Parity	None
Default Baud Rate	38,400
Default Address	1
Maximum Nodes	10

Table 1-1 Modbus RTU Specifications

Dimensions

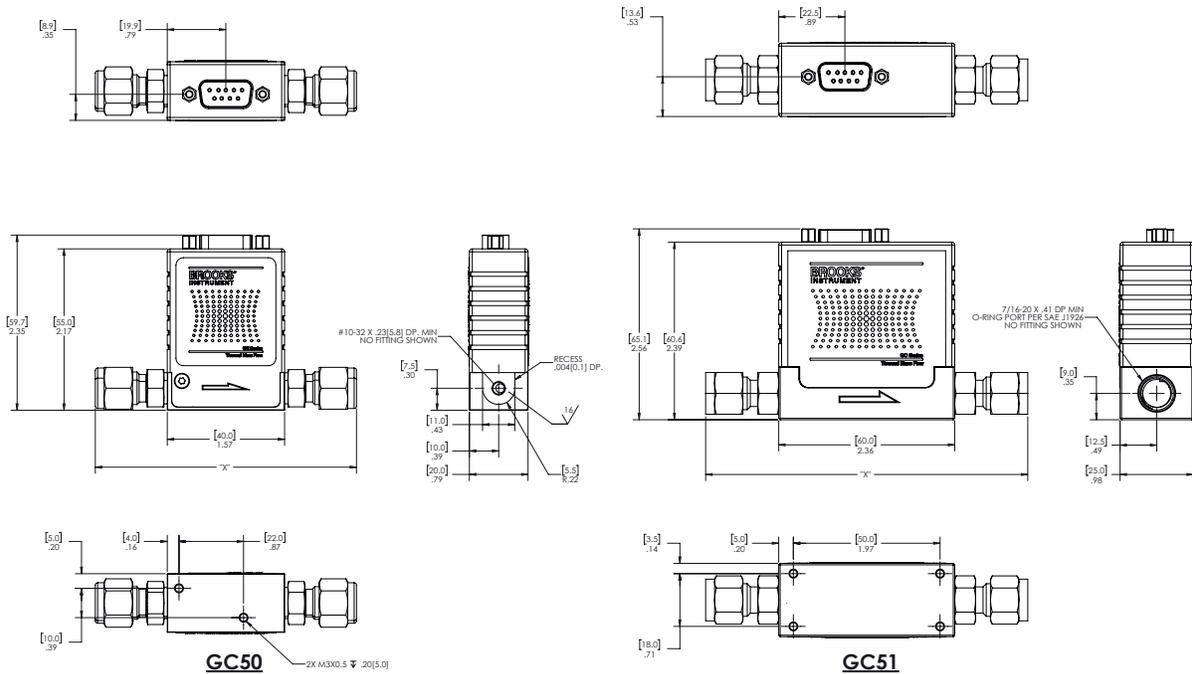


Figure 1-3 GC Series Dimensions

Dimension "X" Table

Connection	GC50	GC51
1/4" Tube	3.50 [89.0]*	4.32 [109.8]*
Compression	2.30 [58.6]**	3.12 [79.3]**
1/4" VCR	3.53 [89.6]	4.18 [106.1]
6mm	3.53 [89.7]*	4.33 [110.0]*
Compression	2.30 [58.6]**	3.13 [79.4]**

*With nut finger tight

**Length from tube locating shoulder of fitting

Table 1-2 GC Series Fitting Dimensions

Receipt of Equipment

Upon receipt of the equipment, inspect the outer packing case for any signs of damage that may have occurred during shipment. If damage is observed, immediately notify the local carrier to address potential liability. Additionally, submit a damage report through the Brooks Instrument Technical Services portal at www.brooksinstrument.com/service-support/contact-technical-services. Remove the envelope containing the packing list, then carefully unpack the instrument, ensuring that all packing materials are retained until the inspection is complete. Verify that all spare parts listed are present and ensure that none are accidentally discarded with the packing materials. Examine the instrument for any visible damage or missing components before proceeding with installation.

Recommended Storage Practice

If intermediate or long-term storage of the equipment is required, it should remain in the original shipping container and be placed in a sheltered location, ideally a warm, dry, heated warehouse. The recommended storage temperature range is between 7°C (45°F) and 32°C (90°F), with a nominal relative humidity of 45% and an allowable range of 25% to 60%. These conditions help prevent corrosion, condensation, and material degradation during storage. When the equipment is removed from storage, perform a visual inspection to confirm that its condition matches the “as received” state prior to installation or operation.

Return Shipment

Before returning any instrument to the factory for service, repair, or evaluation, visit the Brooks Instrument Support website at <https://support.brooksinstrument.com> for detailed instructions on obtaining a Return Materials Authorization Number (RMA#) and completing a required Decontamination Statement. This statement must accompany the returned instrument. In addition, a Material Safety Data Sheet (MSDS) must be provided for any fluid(s) that have been used in the instrument. Failure to supply the completed Decontamination Statement and MSDS will delay processing of the return.

⚠ WARNING

Before returning the device, purge thoroughly with a dry inert gas such as Nitrogen before disconnecting process connections. Failure to correctly purge the instrument could result in fire, explosion or death. Corrosion or contamination may occur upon exposure to air.

Transit Precautions

To safeguard against damage during transit, transport the instrument to the installation site in the same container used for transportation from the factory if circumstances permit.

Removal from Storage

When equipment is removed from storage, perform a visual inspection to confirm that its condition matches the “as received” state. If the equipment has been stored under conditions exceeding the recommended temperature, humidity, or environmental limits, it must be subjected to a pneumatic pressure test in accordance with the applicable vessel codes before being placed into service. This ensures structural integrity and safe operation after extended or suboptimal storage.

Gas Connections

Prior to installation ensure all piping is clean and free from obstructions. Install piping in such a manner that permits easy access to the instrument if removal becomes necessary.

Installation

⚠ CAUTION

When installing the Mass Flow Controller, care should be taken that no foreign materials enter the inlet or outlet of the instrument. Do not remove the protective end caps until time of installation.

⚠ CAUTION

Any sudden change in system pressure may cause mechanical damage to elastomer materials. Damage can occur when there is a rapid expansion of fluid that has permeated elastomer materials. The user must take the necessary precautions to avoid such conditions.

Recommended installation procedures:

1. The Brooks flow instrument should be in a clean, dry atmosphere relatively free from shock and vibration.
2. Leave sufficient room for access to the connector.
3. Install in such a manner that permits easy removal if the instrument requires servicing.

⚠ CAUTION

This product contains a MEMS sensor in the flow path. Ensure that the gas in use is compatible with the product's wetted materials.

4. To ensure stable operation and protection against electromagnetic interference (EMI), the mass flow instrument must be properly grounded. Provision shall be made to connect the device case to a functional earth ground reference. This connection is essential for dissipating static charges and ensuring the integrity of the internal sensor electronics. This can be achieved using the mounting screws, conductive piping, or a shielded electrical connector. If using a shielded connector, ensure the cable shield is terminated at a high-quality ground at the controller or power supply end. Ensure all contact surfaces are free of paint or non-conductive coatings to maintain continuity.

⚠ CAUTION

Grounding Required: Failure to provide a functional earth ground reference can result in hardware failure.

5. The Brooks mass flow instrument can be installed in any orientation.
6. When installing a mass flow instrument with full scale flow rates of 5 lpm or greater, be aware that sharp, abrupt angles in the system piping directly upstream of the controller may cause a small shift in accuracy. If possible, have at least ten pipe diameters of straight tubing upstream of the mass flow instrument.
7. Before installation of the product, please ensure that the pipe debris or particles or any other foreign materials are completely removed.
8. Close the upstream valve, if any, completely.
9. During installation, please make sure no foreign materials (such as water, oil, dirt, particles, etc.) enter the installation pipeline.

10. Make sure the power source is at the off status before connecting electrical wires per the wire definition in Figure 1-2. Please be sure of the power supply range (i.e., 11-27 VDC). If an adapter is used, make sure the adapter meets industrial standards and has all safety certifications.
11. For the data communication wire connection, please follow the description in Table 1-1 and make sure that the wires are correctly connected to the proper ports on your data device/equipment. Data cable length is rated for <3 meters. Please make sure the data cable meets industrial standards with proper shielding. Before starting the flow control process, make sure no leakage is present after the installation

⚠ CAUTION

Since the GC50 control valve may not provide positive shut-off, a separate shut-off valve may be installed downstream for that purpose. It should be noted that a small amount of gas may be trapped between the downstream side of the mass flow controller and the shut-off valve which will result in a surge upon accuation of the shut-off valve. This surge can be reduced in magnitude either by locating the controller and the shut-off valve close together or by moving the shut-off valve upstream of the controller.

Special Considerations for Pressure Conditions

To ensure proper operation the user must be aware of the pressure conditions specified for the device. Inlet and outlet pressure conditions can be found on the device label and calibration sheet. The device was sized and tuned to operate at the specified pressure conditions. If the differential pressure during start up exceeds the specified differential pressure, hydraulic forces may keep the valve from opening and/or controlling properly. In these applications it is important to bring the pressure up in a controlled manner.

Another method is to utilize a bypass valve to allow pressure around the device while ramping up the back pressure to normal operating conditions.

The GC device is not designed for vacuum service and cannot operate under vacuum conditions.

Electrical Interface

The setpoint signal for the GC Series can be supplied as a 0–5 VDC, 0–10 VDC, 0–20 mA, or 4–20 mA analog input. The measured flow output is provided in the same configuration as the input signal. Voltage and current input/output ranges can be reconfigured between 0–10 VDC / 5–10 VDC and 0–20 mA / 4–20 mA; however, re-ranging voltage may result in reduced resolution. At minimum, the instrument must be connected to a supply voltage, supply common, setpoint signal, and output signal. The Brooks electrical interface is engineered for low-loss, noise-resistant signal connections. Supplying a voltage higher than specified can cause permanent damage to the instrument, while insufficient voltage will prevent proper operation.

The GC Series also supports RS-485 digital communications in a multidrop configuration, allowing up to ten devices to be connected to a single computer system using customer-supplied cabling. Valid device addresses range from 1 to 247, excluding address 157. Since standard personal computers do not include RS-485 ports, an RS-232/USB to RS-485 converter or an RS-485 interface card is required to connect to the network. For single-device operation, a dedicated adapter is available that provides both power to the GC Series device and simultaneous USB data communication with a PC.

Operation Check Procedure Using Analog I/O or Digital

1. Mount the mass flow instrument in its final orientation.
2. Apply power to the mass flow instrument and allow approximately 1 minute for the instrument to warm up and stabilize its temperature.
3. Do NOT supply gas to the mass flow instrument. Ensure that the differential pressure across the instrument is zero.
4. Apply a setpoint of zero using analog I/O.
5. If the zero exceeds 0.002% of Full scale, then follow the zeroing procedure found in section 3 "Zeroing the Device"
6. Turn on the gas supply. A positive flow signal may be present due to slight leak through the valve.
7. Supply a setpoint signal between 0-5 V, 0-10 V, 0-20 mA, 4-20 mA.
8. Check the analog output signal. The output signal should match the setpoint signal in accordance with the accuracy specifications.
9. If flow output signal does not match the setpoint, and pressure settings are correct, this could indicate a problem in the instrument. A secondary issue could be the gas type. When checking with a surrogate gas, ensure that there is enough pressure to the device to flow the correct amount of the surrogate gas.

Configuration and Service Tool

Brooks offers BCAT as an available configuration and service software tool for this device. BCAT is available from Brooks Instrument.

Analog

The analog interface can be configured with any of the following input/output options, as specified at the time of order: 0–5 VDC setpoint with 0–5 VDC flow output, 0–20 mA setpoint with 0–20 mA flow output, 4–20 mA setpoint with 4–20 mA flow output, or 0–10 VDC setpoint with 0–10 VDC flow output. All analog signals are accessed through the 9-pin D-sub connector (see Figure 1-1 for pin assignments). The maximum analog output from the instrument is equivalent to 120% of the configured full-scale value, while the minimum analog output corresponds to 0% of full scale, with only a negligible residual signal present.

Modbus RS-485 Interface

The GC Series Mass Flow Controllers from Brooks Instrument use the Modbus RTU protocol over RS-485 for reliable digital communication with master devices like Programmable Logic Controller, Distributed Control Systems, or PCs. This setup enables centralized control to read real-time data and send configuration commands to the instruments. The GC Series adheres to the standard Modbus RTU register-based architecture, allowing full read/write access to operational and diagnostic parameters. For detailed implementation and register mapping, please reference the RS485 Supplemental Manual.

Warmup

With the MEMS sensor, only a short warmup period is necessary to reach the specified accuracy. After warm-up, apply gas pressure then proceed by following the instructions in the following sections.

Zeroing the Device

To assure measurement accuracy, the instrument must be zeroed to the operational installation conditions:

1. Apply power to instrument for approximately 1 minute to reach a stable thermal condition prior to applying flow.
2. Flow the process fluid into the instrument
3. Close the shutoff valve downstream to eliminate any pressure differential across the instrument.
4. Close the valve by applying a setpoint of zero and ensure upstream/downstream pressures are equivalent.
5. After confirming a NO flow condition check the flow signal.

Signal Type Recommended Zero Limits

- a. 0-5 Vdc 0.000 Vdc \pm 10 mV
 - b. 1-5 Vdc 1.000 Vdc \pm 10 mV
 - c. 0-10 Vdc 0.000 Vdc \pm 10 mV
 - d. 0-20 mA 0.000 mA \pm 40 micro Amps
 - e. 4-20 mA 4.000 mA \pm 40 micro Amps
6. Zeroing is performed in BCAT software (Zero sensor) or Modbus communication register found in the RS485 Supplemental manual.

Calibration

Calibration is performed at the factory using the customer-specified gas configuration to ensure optimal accuracy for the intended application. For field calibration, the GC Series can be adjusted using BCAT software in conjunction with appropriate in-field calibration equipment, and the procedure is outlined in the BCAT Supplemental Manual. The device also supports the use of surrogate gases with defined conversion factors; however, switching between different surrogate gas groups is not permitted (Air / CO₂ and He / H₂ group). A user-specified gas factor can be applied to scale measurements when controlling gases other than the calibration gas. This factor is applied on top of the original calibration and can be changed or removed without altering the underlying calibration data.

If your device needs calibration, Brooks Instrument can provide this service at one of its service locations. Visit www.BrooksInstrument.com to locate the service location nearest to you. However, if traceable calibration equipment is available at your facility, calibration software, along with training, is available for purchase.

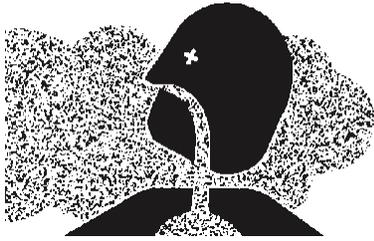
Supported Gases

Fluid Name	Calibration Fluid	GCF ¹	Semi Code
Nitrogen	Air	0.996	13
Air	Air	1.000	8
Oxygen	Air	1.000	15
Carbon Dioxide	Air	0.540	25
	Carbon Dioxide ²	1.000	
Nitrous Oxide	Air	0.525	27
	Carbon Dioxide ²	0.980	
Argon	Air	1.000	4
Carbon Monoxide	Air	1.000	9
Methane	Air	1.030	28
Propane	Air	0.298	89

1. Gas conversion factor from calibration gas to process gas

2. Only applicable for flow rates ≤ 100 SLPM

Table 3-1 GC Series Gas Conversion Factors

	<p>! WARNING</p>
<p>METER/CONTROLLER SEAL COMPATIBILITY</p>	
<p>Products in this manual may contain metal or elastomeric seals, gaskets, O-rings or valve seats. It is the “user’s” responsibility to select materials that are compatible with their process and process conditions. Using materials that are not compatible with the process or process condition could result in the Meter or Controller leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.</p> <p>It is recommended that the user check the Meter or Controller on a regular schedule to ensure that it is leak free as both metal and elastomeric seals, gaskets, O-rings and valve seats may change with age, exposure to process fluid, temperature, and/or pressure.</p>	

No routine maintenance is required on the Brooks mass flow instruments. If an inline filter is used, the filtering elements should be periodically replaced or cleaned.

<p>! WARNING</p>
<p>If it becomes necessary to remove the MFC from the system after exposure to toxic, pyrophoric, flammable or corrosive gas, purge the MFC thoroughly with a dry inert gas such as Nitrogen before disconnecting the gas connections. Failure to correctly purge the MFC could result in fire, explosion or death. Corrosion or contamination of the MFC upon exposure to air, may also occur.</p>

<p>! WARNING</p>
<p>If it becomes necessary to remove the instrument from the system, power to the device must be disconnected.</p>

<p>! CAUTION</p>
<p>It is important that this MFC only be serviced by properly trained and qualified personnel.</p>

Failure of the Flow Rate or Flow Signal to Achieve Setpoint.

1. Insufficient pressure drop across the MFC: If there is not enough pressure differential across the mass flow controller, the orifice cannot pass the full-scale flow rate. To verify this condition, measure the actual inlet-to-outlet pressure drop and compare it with the specification provided on the order. Increase the pressure if necessary.
2. Incorrect gas type or surrogate gas adjustment: If pressure settings are correct but the flow signal does not match the setpoint, the issue may be related to the gas type. When using a surrogate gas, ensure adequate inlet pressure is maintained to achieve the correct equivalent flow. Use the appropriate thermal correction factors to calculate the equivalent flow for the surrogate gas.
3. Orifice clogging: If the MFC valve orifice is clogged, the flow signal will be very low or zero even when adequate pressure is applied to the device.
4. Gas compatibility issues: Units configured for Hydrogen or Helium differ from those configured for other gases due to the high thermal conductivity of these light gases. Using a Hydrogen/Helium-configured device with another gas will prevent the unit from achieving the desired flow. Conversely, using a device configured for gases such as Nitrogen with Hydrogen or Helium will result in erratic control and inability to maintain setpoint.

Digital Communications Operation

Unit fails to control to setpoint. There may be issues with the device network. Ensure communication with a single device at a time and then ensure that addresses are set to differ from one another. Baud rates must be the same to operate in a multidrop configuration. See the RS485 supplemental Instruction Manual for more information.

System Checks

Brooks mass flow instrument is generally used as a component in gas handling systems, which can be complex in nature. It can therefore be very difficult to isolate a malfunction in the system. An inaccurately diagnosed malfunction can cause many hours of unnecessary downtime. If possible, perform the following system checks before removing a suspect mass flow instrument for bench troubleshooting or return to the factory. This is especially true for new systems undergoing commissioning.

1. Verify a low resistance common connection and that the correct power supply voltage and signals are present on the connector of the device.
2. Verify that the process gas connections have been made correctly, and that they have been tested for leaks.
3. If the Mass Flow Controller appears to be functioning but cannot achieve setpoint, verify that there is sufficient inlet pressure and pressure drop at the controller to provide the required flow.

Bench Troubleshooting

1. Establish a proper connection between the Brooks mass flow instrument (using Figure 4-1 as a reference). Switch on the power and allow the instrument to warm-up for 5 minutes. Set the setpoint to zero. Do not connect the device to a gas source yet. Observe the output signal and, if necessary, perform the zero adjustment procedure (See Section 3-4 zeroing function). If the output signal does not zero properly, please contact Brooks Instrument.
2. Connect the instrument to a source of the same gas used for it's original calibration. If pressure settings are correct and flow signal does not match setpoint, a secondary issue could be the gas type. If checking the MFC with a surrogate gas, ensure that there is enough pressure to the MFC in order to flow the correct amount of the surrogate gas. You may have to calculate the equivalent flow using the thermal correction factors.

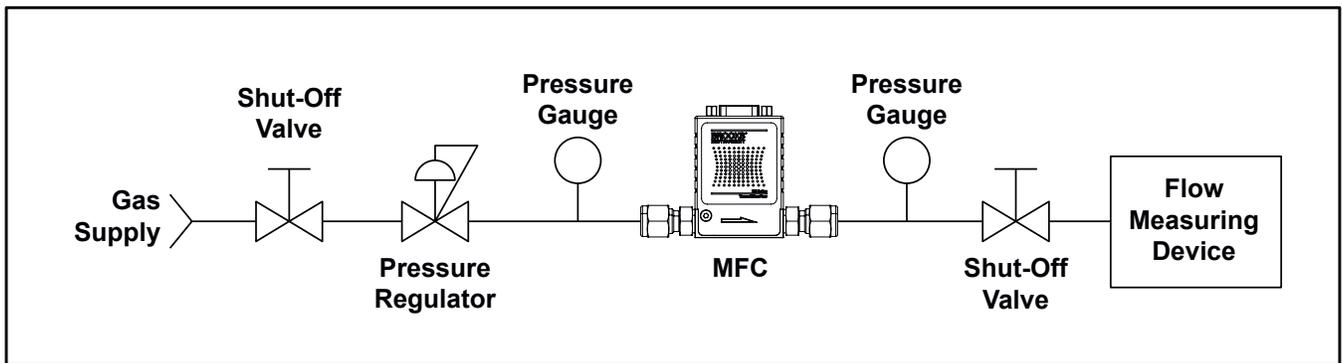


Figure 4-1 Bench Troubleshoot Circuit

Issue	Possible Cause	Check / Corrective Action
Output stays at zero (regardless of Setpoint) and there is flow through the device.	Power is not connected, cable connection incorrect	Connect power, check cable
	Damaged sensor or electronics	Contact Brooks Instrument
Flow cannot be achieved regardless of Setpoint	Clogged Control Valve	Return the device to the factory
	Improperly tuned valve	Utilize BCAT to retune the valve
	Improper gas used	Utilize original factor calibration gas. If problem persists, contact Brooks Instrument
	Damaged sensor or electronics	Contact Brooks Instrument
Indicated flow follows Setpoint at lower Setpoints, but does not reach full scale	Insufficient inlet pressure or pressure drop	Adjust pressures, inspect in-line filters and clean/replace as necessary
	Partially clogged valve	Return the device to the factory, see cleaning procedures
Outlet flow oscillates	Pressure drop or inlet pressure deviates from calibrated values	Adjust pressures to original specifications or use BCAT to retune for new pressure conditions
	Unstable inlet pressure	Check external pressure regulator
	Vibration	Check system vibration surrounding controller
Output signal follows setpoint but will not reach zero	Device requires zeroing	Re-zero device

Table 4-1 Troubleshooting Issue, Possible Cause, Check/Corrective Action

Cleanliness

When deposition makes it necessary to clean the Brooks Digital Series Mass Flow Controller or Mass Flow Meter, use the following procedures:

⚠ WARNING

If it becomes necessary to remove the MFC from the system after exposure to toxic, pyrophoric, flammable or corrosive gas, purge the MFC thoroughly with a dry inert gas such as Nitrogen before disconnecting the gas connections. Failure to correctly purge the MFC could result in fire, explosion or death. Corrosion or contamination of the MFC upon exposure to air, may also occur.

Ensure the flow medium is clean and dry, as any contamination, such as particles or liquid vapors, can impair the accuracy of flow measurements and damage the meter's functionality. If contamination is suspected, have experienced technical personnel inspect and recondition the controller. Avoid using foreign cleansers or other fluids to clean the flow path, as they may cause irreparable damage.

LIMITED WARRANTY

Visit www.BrooksInstrument.com for the terms and conditions of our limited warranty.

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.

SEMINARS AND TRAINING

Brooks Instrument can provide 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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Beyond Measure