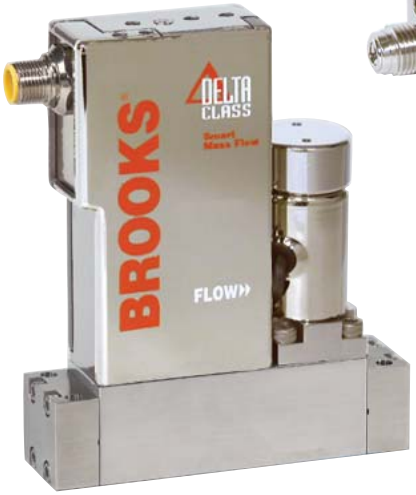
Installation and Operation Manual
X-TMF-SLA7800-MFC-eng
Part Number: 541B046AAG
August, 2009

Brooks® Models SLA7850 - SLA7860 Mass Flow Controllers & Meters

Model SLA7850S
Analog I/O
9-pin D-Connector
VCR Fittings

Model SLA7850S
Analog I/O
15-pin D-Connector
VCR Fittings



Model SLA7850D
Digital I/O
DeviceNet Downport

BROOKS® INSTRUMENT

Essential Instructions

Read this page before proceeding!

Brooks Instrument designs, manufactures and tests its products to meet many national and international standards. Because these instruments are sophisticated technical products, you must properly install, use and maintain them 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, using and maintaining Brooks Products.

- 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.
- 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.
- Inform and educate your personnel in the proper installation, operation and maintenance of the product.
- 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.
- To ensure proper performance, use qualified personnel to install, operate, update, program and maintain the product.
- 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, except when maintenance is being performed by qualified persons, to prevent electrical shock and personal injury.

Pressure Equipment Directive (PED)

All pressure equipment with an internal pressure greater than 0.5 bar (g) and a size larger than 25mm or 1" (inch) falls under the Pressure Equipment Directive (PED). The Directive is applicable within the European Economic Area (EU plus Norway, Iceland and Liechtenstein). Pressure equipment can be traded freely within this area once the PED has been complied with.

- Section 1 of this manual contains important safety and operating instructions related to the PED directive.
- Meters described in this manual are in compliance with EN directive 97/23/EC module H *Conformity Assessment.*
- All Brooks Instrument Flowmeters fall under fluid group 1.
- Meters larger than 25mm or 1" (inch) are in compliance with category I, II, III of PED.
- Meters of 25mm or 1" (inch) or smaller are Sound Engineering Practice (SEP).

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 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 cards 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.

Dear Customer,

We appreciate this opportunity to service your flow measurement and control requirements with a Brooks Instrument device. Every day, flow customers all over the world turn to Brooks Instrument for solutions to their gas and liquid low-flow applications. Brooks provides an array of flow measurement and control products for various industries from biopharmaceuticals, oil and gas, fuel cell research and chemicals, to medical devices, analytical instrumentation, semiconductor manufacturing, and more.

The Brooks product you have just received is of the highest quality available, offering superior performance, reliability and value to the user. It is designed with the ever changing process conditions, accuracy requirements and hostile process environments in mind to provide you with a lifetime of dependable service.

We recommend that you read this manual in its entirety. Should you require any additional information concerning Brooks products and services, please contact your local Brooks Sales and Service Office listed on the back cover of this manual or visit www.BrooksInstrument.com

Yours sincerely,

Brooks Instrument

THIS PAGE WAS INTENTIONALLY LEFT BLANK

Figures

Tables

1-1 Scope

Thank you for purchasing a Brooks Instrument SLA7800 Series device. This manual Part Number 541B046AHG is a complete installation and operation manual for your instrument.

1-2 Purpose

The Brooks® SLA7800 Series are mass flow measurement devices 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 the Brooks SLA7800 Series devices. This manual is organized into the following sections:

Section 1	Introduction
Section 2	Installation
Section 3	Operation
Section 4	Maintenance & Troubleshooting
Section A	CE Certification
Back Cover	Warranty, Local Sales/Service Contact Information

It is recommended that this manual be read in its entirety before attempting to operate or repair the SLA7800 Series devices.

1-3 Description

Brooks Instrument's SLA7800 Series devices are a 1.125" wide profile metal sealed thermal mass flow measurement and control instrument, which offer unparalleled flexibility and performance. The SLA7800 Series devices are designed for use in advanced gas handling systems. The result is the most accurate, repeatable, and responsive MFC on the market today!

Superior Valve Technology
The coplanar valve offers unmatched performance. Due to its simplified construction, the valve exhibits superior repeatability, stability, and response time. Mass flow controllers are less sensitive to pressure variations in the process because of the larger valve control range. The coplanar valve also offers lower leak-by rates compared to other metal sealed controllers. These advancements ensure a more stable process over time.

Highly Adaptable Configurations
The 1.125" body offers a compact, space saving footprint. The SLA7800 Series is easily retrofitable to existing gas box designs that utilize the traditional 1.5" MFC body platform. Likewise, the all-digital electronics is adaptable and allows the SLA7800 Series to serve as a direct replacement for existing analog products bringing with them greatly improved accuracy and reliability.

Broad Array of Communication Options
Brooks offers traditional 0-5 volt and 4-20 mA analog options as well as RS-485 digital communications ("S-protocol", based on HART®). Brooks also offers control interface with DeviceNet™, a high-speed (up to 500k baud) digital communication network. Brooks' communication capabilities

and device-profiles have been certified by the ODVA™ (Open DeviceNet Vendor's Association). Other network protocols are in development. Talk to your Brooks representative about your specific needs.

Reduced Cost of Ownership
The SLA7800 Series allows multi-gas and multi-range capabilities to reduce customer inventory. Storage and pre-programming of up to 10 gas calibrations easily permits users to switch between different gases and ranges on a single device. Also, the greater control range provided by the co-planar valve gives users the option to decrease the number of parts needed to control their entire process.

Zero Drift Diagnostic Option
The Zero Drift Diagnostic is an advanced diagnostic now offered on the 7850S MFC, which detects and alerts the user when the flow sensor zero drifts by more than user specified limits.

1-4 Specifications

PERFORMANCE CHARACTERISTICS:

Fow Ranges
Models SLA7850/SLA7860
Any range from 0-3 sccm to 0-50 slpm N_2Eq.

⚠ WARNING

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

Control Range
Turndown 100:1 (for any FS range from 1-50 slpm)
Turndown 50:1 (for FS range below 1 slpm)

Accuracy
±1.0% of rate, including linearity (20% to 100% full scale),
±0.2% of full scale (below 20% full scale.)

Repeatability
±0.2% of rate

Analog I/O Pin Connections for 9-pin D-Connector:

Function	9-pin D-conn
Valve Override, Input	**1**
Flow Signal, 0-5 volt, Output (+)	**2**
Power Supply, +13.5 Vdc to +27 Vdc (+)	**3**
Power Supply, Common (-)	**4**
Not connected	**5**
Setpoint, 0-5 Vdc, Input (+)	**6**
Flow Signal, Common Output, (-)	**7**
Setpoint, Command Input (-)	**8**
Not Connected	**9**

Analog I/O Pin Connections for 15-pin D-Connector:

Function	15-pin D-Conn
Setpoint, Common Input (-)	**1**
Flow Signal, 0(1) -5 volt, Output (+)	**2**
TTL Alarm, open collector, Output (+)	**3**
Flow Signal, 0(4)-20 mA, Output (+)	**4**
Power Supply, +13.5 Vdc to +27 Vdc(+)	**5**
Not Connected	**6**
Setpoint, 0(4)-20 mA, Input (+)	**7**
Setpoint, 0(1)-5 Vdc, Input (+)	**8**
Power Supply, Common (-)	**9**
Flow Signal, Common, Output, (-)	**10**
Reference, +5 Vdc, Output (+)	**11**
Valve Override, Input	**12**
Calibration Select Input	**13**
RS-485 Common B (-)	**14**
RS-485 Common A (+)	**15**

Temperature Sensitivity
Zero: Less than 0.035% F.S. per °C
Span: Less than 0.1% of rate per °C

Settling Time
Less than one second to within ±2% full scale of final value for a 0-100% step per SEMI Guideline E17-91.

Valve Leak-By
< 0.5% F.S.

Pressure Equipment Directive (PED) 97/23/EC
See Table 1-1 Below

Table 1-1 PED Rating

Mass Flow Controller	Flow Ranges N_2 Equivalent Ratings			Pressure	PED Module H Category
Models	**Min. F.S.**	**Max F.S.**	**Unit**	**Bar**	
SLA7850/ SLA7860	3.0	50,000	sccm	100 Bar	SEP

Mounting Attitude Sensitivity
0.2% of FS maximum deviation after rezeroing

Leak Integrity
Inboard to Outboard: $1x10^{-10}$ atm scc/sec Helium max.

Ambient Temperature Limits
Operating: 0°C to 65°C (32°F to 149°F)
Non-Operating: -25°C to 100°C (-13°F to 212°F)

Maximum Operating Pressure Range
1500 psig (10,342 kPa) maximum recommended pressure.
150 psig (106.2 kPa) and below recommended for best performance.

Differential Pressure Range
5-50 psid (broader depending on the customer conditions; consult factory for details.)
(34.5-344.7 kPa)
(259-2586 torr)
* For flows above 30 slpm N_2 eq., 30 psid minimum required.
*Standard temperature and pressure are in accordance with SEMI Standard E12-96: 0°C and 101.32 kPa (760 torr).

Physical:

⚠ 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.

Materials of Construction
316L Vacuum Arc Remelt (VAR), 316L
and high-alloy ferritic stainless steel.
External/internal seals: Nickel
Valve seat: 17-7PH stainless steel - standard

Process Connections
Integral 1/4" male VCR™
CS Seal (SEMI 2787.5 or SEMI F82-0304 R1-1)
C Seal (SEMI 2787.1 or SEMI F82-0304 R1-2)
W Seal (SEMI 2787.3 or SEMI F82-0304 R1-3)

Outline Dimensions
Refer to Figures 1-2 through 1-8

Electrical Characteristics:

Electrical Connections
Analog I/O option: 9-pin D-connector or 15-pin D-Connector, male
DeviceNet I/O option: 5-pin Micro-Connector, male
RS-485 option: 15-pin D-Connector, male

Power Supply Voltage
Analog I/O option: 13.5 Vdc to 27 Vdc
(traditional -15 Vdc pin is ignored)
DeviceNet I/O option: nominal = 11-25 Vdc

Power Requirements:	**Watts typ.**	**Watts Max.**
Analog I/O or RS-485 option, with valve: VIN = 27 Vdc Valve = Full Open	4.2	4.6
DeviceNet I/O option, with valve: VIN = 25 Vdc Valve = Full Open	6.3	6.9

RS-485 Communications

The Brooks Digital Series is equipped with RS-485 communication capability.
Refer to Table 1-3 (Analog I/O pin connections), that enables the device to communicate via a personal computer for process control. Baud rate selections for the Brooks Digital Series related to RS-485 are:
1200, 2400, 4800, 9600, 19200 and 38400 baud and can be selected via the Brooks Service Suite™.

The RS-485 is essentially a multi-drop connection.
It allows a maximum of 32 devices to be connected to a computer system. IBM-compatible PC's are not equipped with RS-485 ports as standard. An RS-232 to RS-485 converter or RS-485 interface board is therefore required to connect an RS-485 network to a standard pc. The RS-485 bus, a daisy chain network, meaning that the wires are connected at the units as in Figure 1-1.

This form of multi-drop capable communication provides access to many of the Brooks Digital Series functions for "control and monitor" operations, including:

- Accurate setpoint adjustment and flow output measurement (including units of measure selection)
- Valve Override (controller only)
- Flow Totalizer
- Alarm status and settings
- Soft Start Control (controller only)

Reference the Brooks document "S-protocol Communication Command Description for Smart *II*" for more details regarding the capabilities of the RS-485 communication interface.

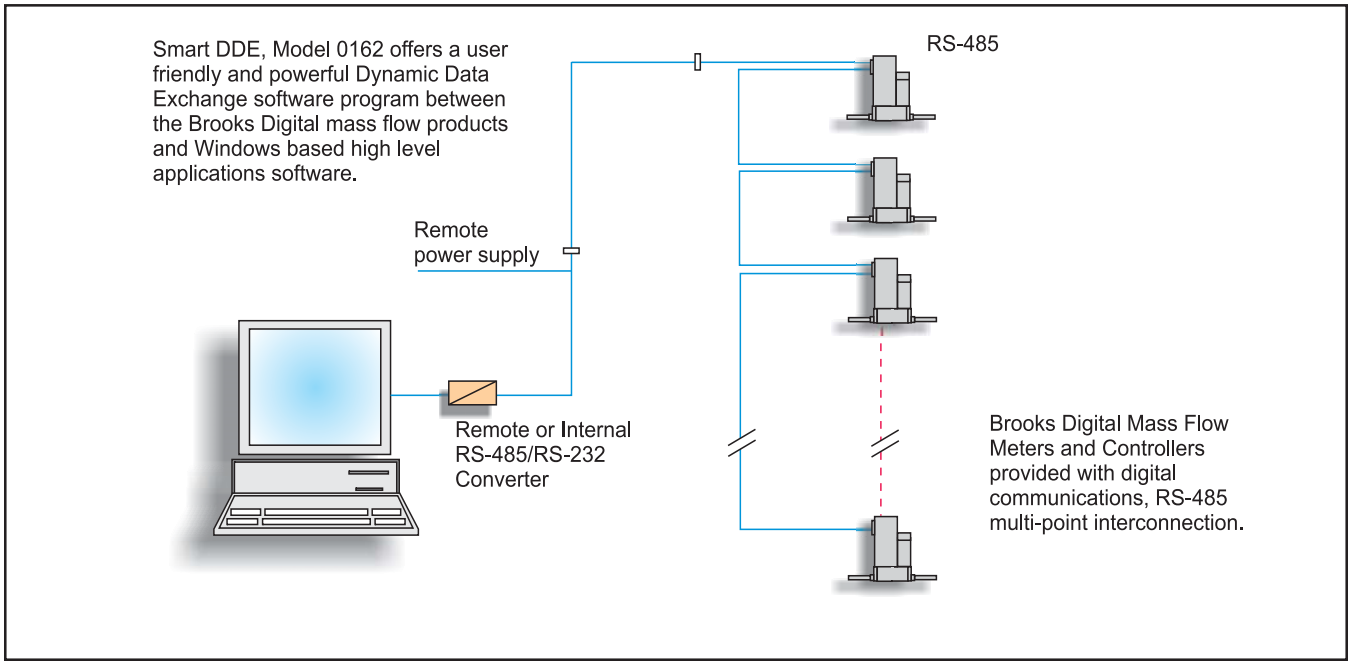


Figure 1-1 General Wiring

DeviceNet Communications

The Brooks Digital Series is also available with DeviceNet communication capability. DeviceNet is an open digital protocol capable of high speeds and easy system connectivity. Brooks Instrument has several of its devices available on this popular networking standard, and is a member of ODVA (Open DeviceNet Vendors Association), the governing standard body for DeviceNet.

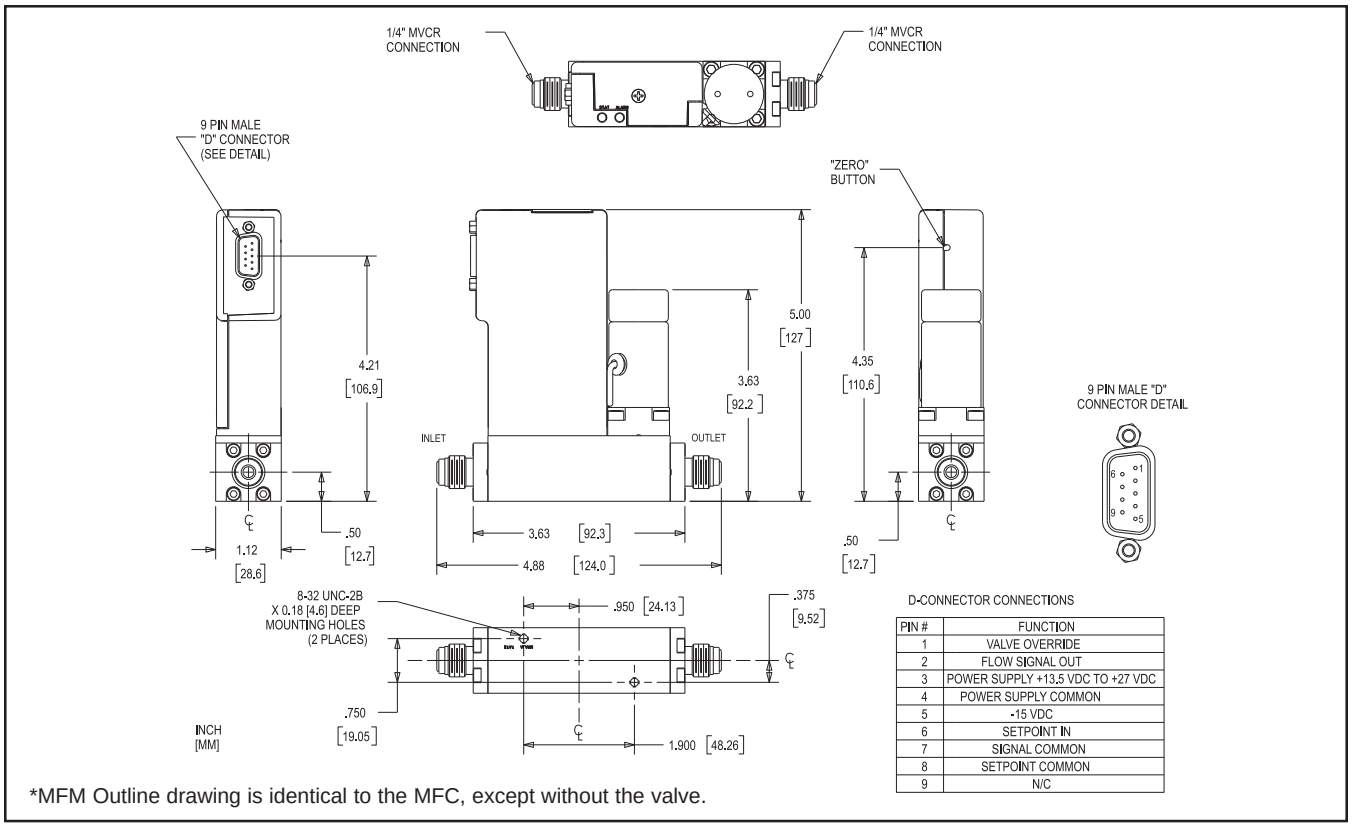
DeviceNet is similar to the RS-485 standard in that it is a multi-drop connection that allows a maximum of 64 devices to be connected on the same network. Baud rate selections for DeviceNet products are 125K, 250K and 500K and can be selected via MAC ID switches mounted on the device.

The DeviceNet communication link also provides access to many of the Brooks Digital Series functions for “control and monitor” operations, including:

- Accurate setpoint adjustment and flow output measurement (including units of measure selection)
- PID Settings (controller only)
- Valve Override (controller only)
- Calibration Gas Select
- Soft Start Control (controller only)

Depending on the type of device you've purchased, reference one of the following Brooks documents for more details regarding the capabilities of the DeviceNet protocol:

X-DeviceNet-MFC-eng for MFCs,
X-DeviceNet-PC-eng for PCs and
X-DeviceNet-RT-eng for RTs.

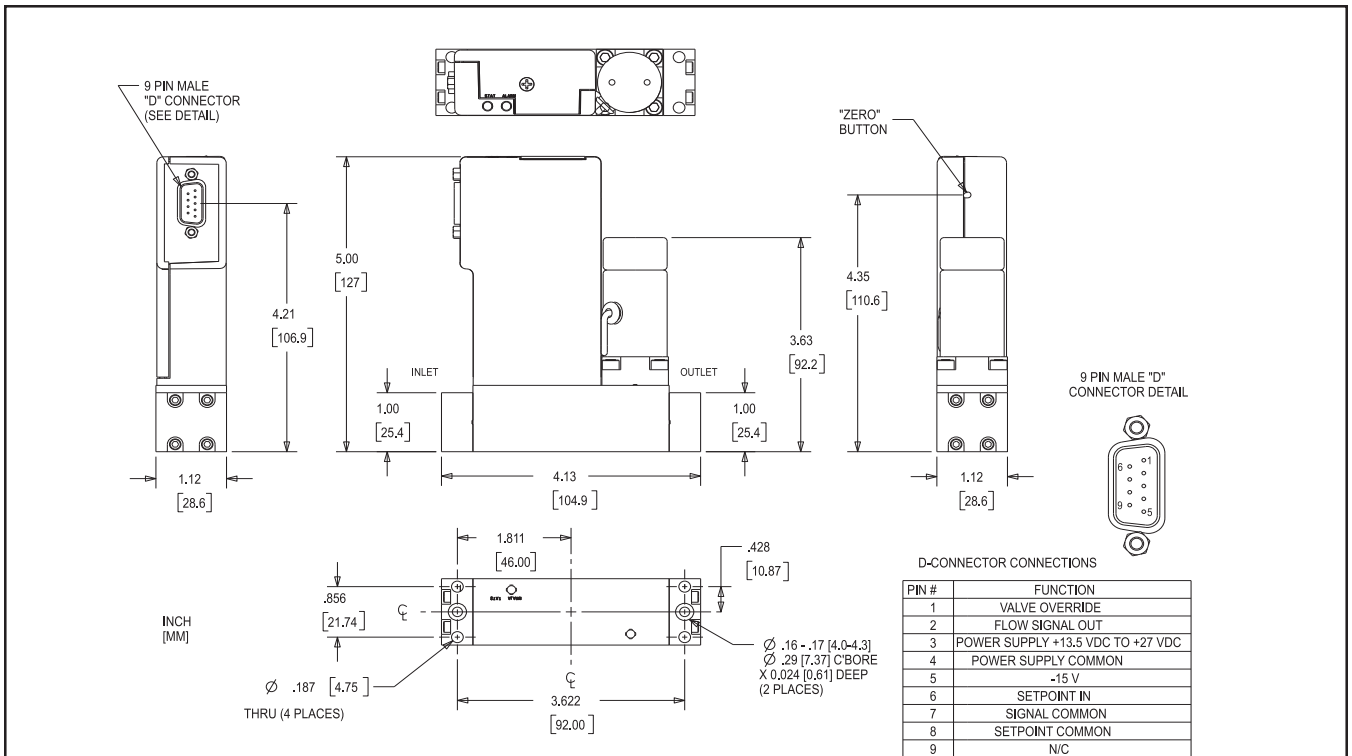


D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	VALVE OVERRIDE
2	FLOW SIGNAL OUT
3	POWER SUPPLY +13.5 VDC TO +27 VDC
4	POWER SUPPLY COMMON
5	-15 VDC
6	SETPOINT IN
7	SIGNAL COMMON
8	SETPOINT COMMON
9	N/C

*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-2 Model SLA7850S MFC Analog I/O 9-pin D-Connector with VCR Fittings.

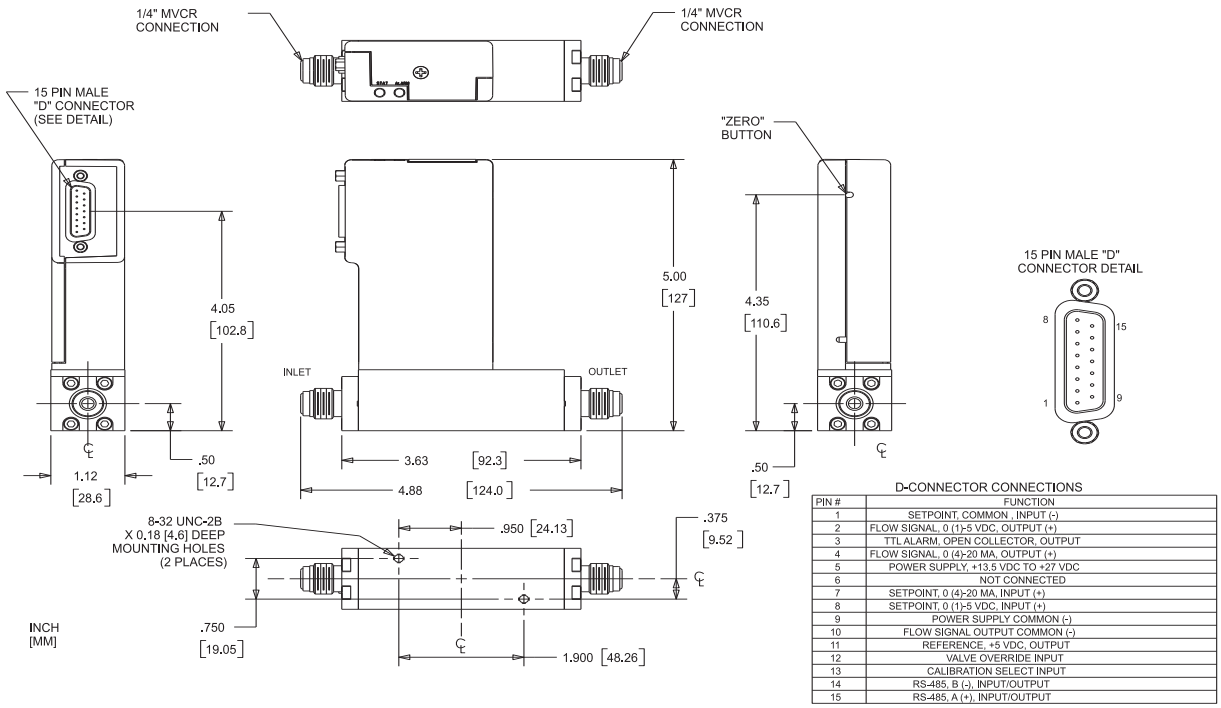


D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	VALVE OVERRIDE
2	FLOW SIGNAL OUT
3	POWER SUPPLY +13.5 VDC TO +27 VDC
4	POWER SUPPLY COMMON
5	-15 V
6	SETPOINT IN
7	SIGNAL COMMON
8	SETPOINT COMMON
9	N/C

*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-3 Model SLA7850S MFC Analog I/O 9-pin D-Connector with Downport Connections (C-seal).

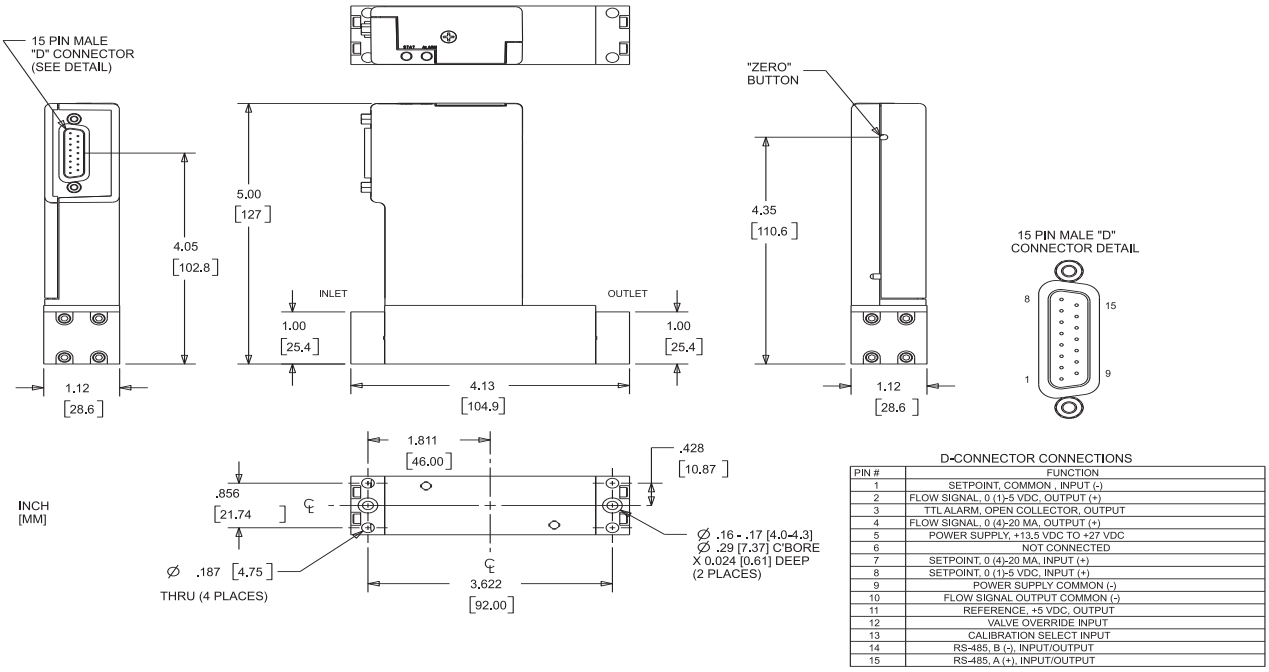


D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	SETPOINT, COMMON , INPUT (-)
2	FLOW SIGNAL, 0 (1)-5 VDC, OUTPUT (+)
3	TTL ALARM, OPEN COLLECTOR, OUTPUT
4	FLOW SIGNAL, 0 (4)-20 MA, OUTPUT (+)
5	POWER SUPPLY, +13.5 VDC TO +27 VDC
6	NOT CONNECTED
7	SETPOINT, 0 (4)-20 MA, INPUT (+)
8	SETPOINT, 0 (1)-5 VDC, INPUT (+)
9	POWER SUPPLY COMMON (-)
10	FLOW SIGNAL OUTPUT COMMON (-)
11	REFERENCE, +5 VDC, OUTPUT
12	VALVE OVERRIDE INPUT
13	CALIBRATION SELECT INPUT
14	RS-485, B (-), INPUT/OUTPUT
15	RS-485, A (+), INPUT/OUTPUT

*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-4 Model SLA7850S MFC Analog I/O 15-pin D-Connector with VCR Fittings.

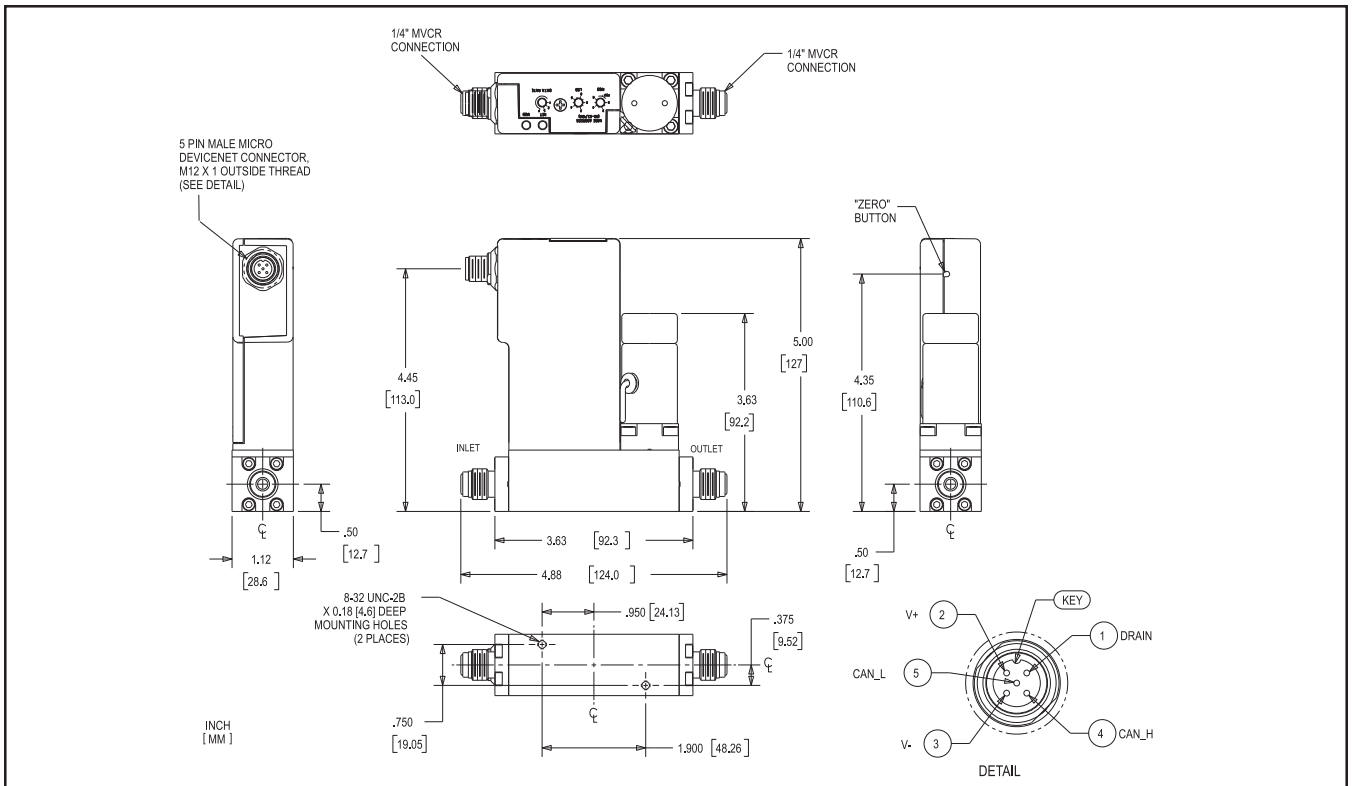


D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	SETPOINT, COMMON , INPUT (-)
2	FLOW SIGNAL, 0 (1)-5 VDC, OUTPUT (+)
3	TTL ALARM, OPEN COLLECTOR, OUTPUT
4	FLOW SIGNAL, 0 (4)-20 MA, OUTPUT (+)
5	POWER SUPPLY, +13.5 VDC TO +27 VDC
6	NOT CONNECTED
7	SETPOINT, 0 (4)-20 MA, INPUT (+)
8	SETPOINT, 0 (1)-5 VDC, INPUT (+)
9	POWER SUPPLY COMMON (-)
10	FLOW SIGNAL OUTPUT COMMON (-)
11	REFERENCE, +5 VDC, OUTPUT
12	VALVE OVERRIDE INPUT
13	CALIBRATION SELECT INPUT
14	RS-485, B (-), INPUT/OUTPUT
15	RS-485, A (+), INPUT/OUTPUT

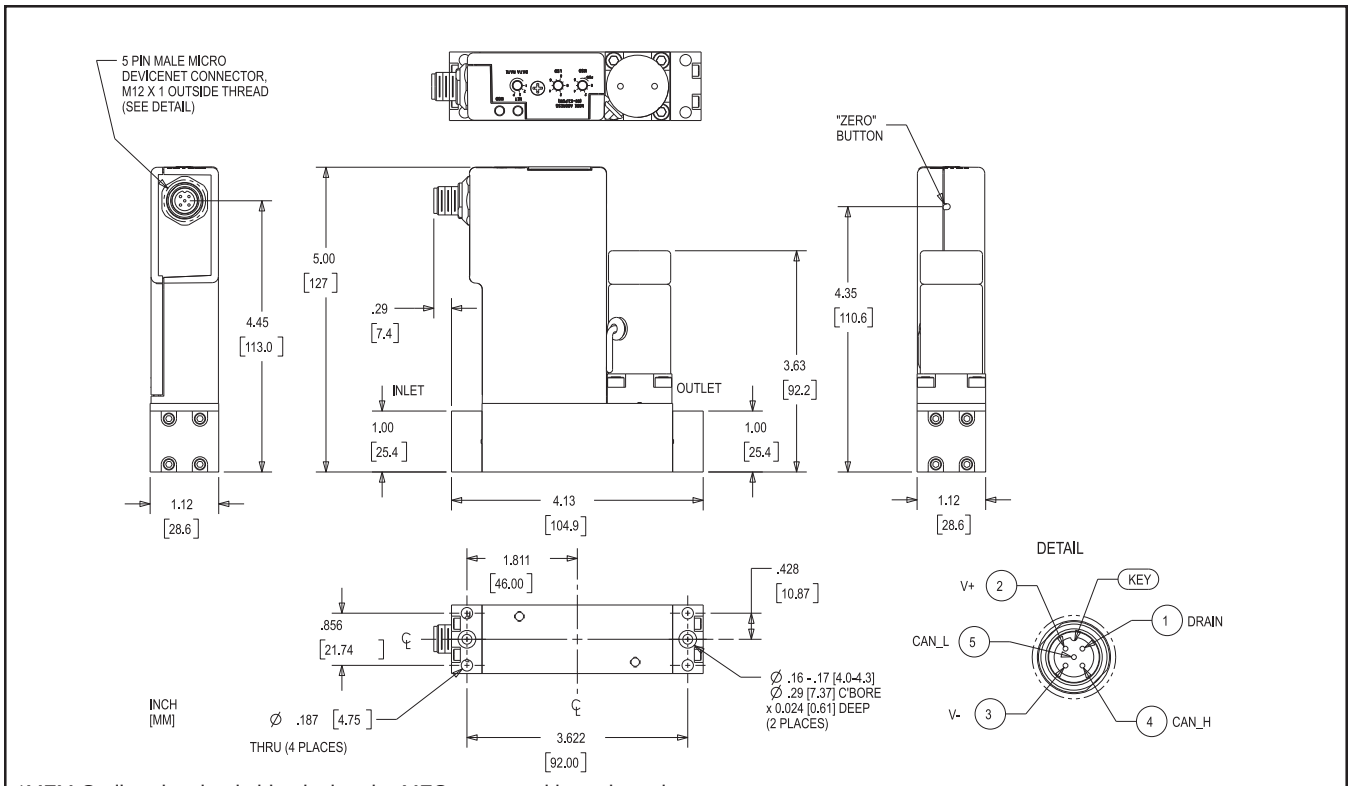
*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-5 Model SLA7850S MFC Analog I/O 15-pin D-Connector with Downport Connections (C-seal).



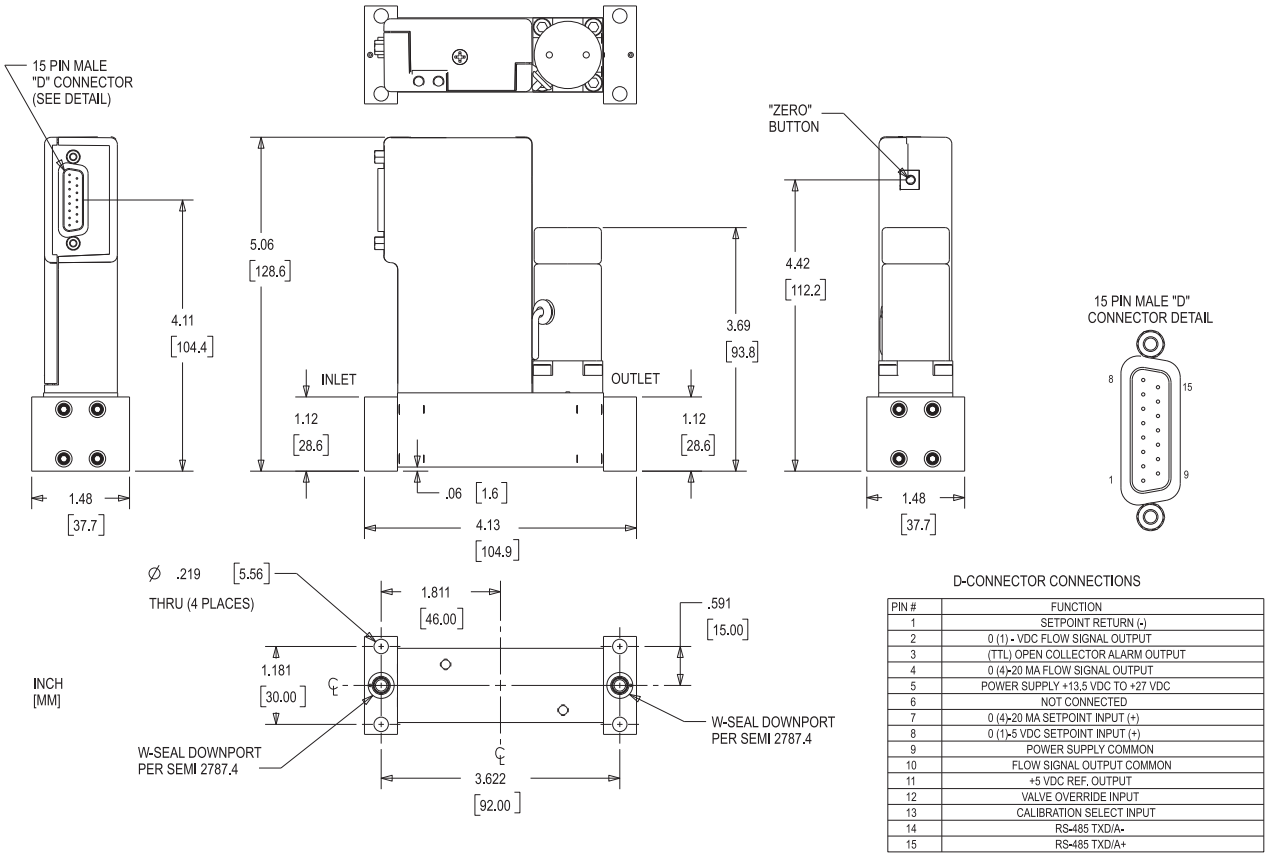
*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-6 Model SLA7850D MFC DeviceNet Digital I/O with VCR Fittings.



*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-7 Model SLA7850D MFC DeviceNet Digital I/O with Downport Connections (C-seal).



D-CONNECTOR CONNECTIONS

PIN #	FUNCTION
1	SETPOINT RETURN (-)
2	0 (1) - VDC FLOW SIGNAL OUTPUT
3	(TTL) OPEN COLLECTOR ALARM OUTPUT
4	0 (4)-20 MA FLOW SIGNAL OUTPUT
5	POWER SUPPLY +13,5 VDC TO +27 VDC
6	NOT CONNECTED
7	0 (4)-20 MA SETPOINT INPUT (+)
8	0 (1)-5 VDC SETPOINT INPUT (+)
9	POWER SUPPLY COMMON
10	FLOW SIGNAL OUTPUT COMMON
11	+5 VDC REF. OUTPUT
12	VALVE OVERRIDE INPUT
13	CALIBRATION SELECT INPUT
14	RS-485 TXD/A-
15	RS-485 TXD/A+

*MFM Outline drawing is identical to the MFC, except without the valve.

Figure 1-8 Model SLA7850S MFC 15-pin D-Connector Analog I/O with 1-1/2" Downport Connections (W-seal).

2-1 General

This section provides installation instructions for the SLA7800 Series devices. Figure 1-1 through Figure 1-7 show the SLA7800 Series dimensions, gas connections and electrical connection locations for devices.

2-2 Receipt of Equipment

When the instrument is received, the outside packing case should be checked for damage incurred during shipment. If the packing case is damaged, the local carrier should be notified at once regarding his liability. A report should be submitted to your nearest Product Service Department.

Brooks Instrument
407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554 FLOW (3569)
Tel (215) 362 3700
Fax (215) 362 3745
E-mail: BrooksAm@BrooksInstrument.com
www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel +31 (0) 318 549 300
Fax +31 (0) 318 549 309
E-mail: BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel +81 (0) 3 5633 7100
Fax +81 (0) 3 5633 7101
Email: BrooksAs@BrooksInstrument.com

Remove the envelope containing the packing list. Outside of your clean area, carefully remove the equipment from the packing case. Make sure spare parts are not discarded with the packing material. Inspect for damaged or missing parts.

This device has been assembled, calibrated and double-vacuum bagged in a Class 100 clean room. In your semi-clean area,remove the outer bag only. Pass your SLA7800 Series Metal Seal Mass Flow device into your clean area. Remove the second clean room compatible bag only when the equipment is ready to be tested and/or installed in your clean system.

2-3 Recommended Storage Practice

If intermediate or long-term storage of equipment is required, it is recommended that the equipment be stored in accordance with the following:

a. In the original vacuum bag and shipping container.
b. In a sheltered area with the following conditions:
1. Ambient temperature 21°C (70°F) nominal, 32°C (90°F) maximum and 7°C (45°F) minimum.
2. Relative humidity 45% nominal, 60% maximum and 25% minimum.

2-4 Return Shipment

Prior to returning any instrument to the factory, contact your nearest Brooks location for a Return Materials Authorization Number (RMA#). This can be obtained from one of the following locations:

Brooks Instrument
407 W. Vine Street
P.O. Box 903
Hatfield, PA 19440 USA
Toll Free (888) 554 FLOW (3569)
Tel (215) 362 3700
Fax (215) 362 3745
E-mail: BrooksAm@BrooksInstrument.com
www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
P.O. Box 428
6710 BK Ede, Netherlands
Tel +31 (0) 318 549 300
Fax +31 (0) 318 549 309
E-mail: BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
Tel +81 (0) 3 5633 7100
Fax +81 (0) 3 5633 7101
Email: BrooksAs@BrooksInstrument.com

Instrument must have been purged in accordance with the following:

⚠ WARNING

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

All flow instruments returned to Brooks requires completion of Form RPR003-1, Brooks Instrument Decontamination Statement, along with a Material Safety Data Sheet (MSDS) for the fluid(s) used in the instrument. Failure to provide this information will delay processing by Brooks personnel. Copies of these forms can be downloaded from the Brooks website www.BrooksInstrument.com or are available from any Brooks Instrument location listed above.

2-5 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.

2-6 Removal from Storage

Upon removal of the instrument from storage, a visual inspection should be conducted to verify its "as-received" condition. If the instrument has been subject to storage conditions in excess of those recommended (See Section 2-3), it should be subjected to a pneumatic pressure test in accordance with applicable vessel codes. To maintain an instrument's ultraclean integrity, this service should be performed by the factory or one of the certified service centers.

2-7 Gas Connections

Standard inlet and outlet connections supplied on the SLA7800 Series devices are 1/4"(M) VCR or Downport surface mount per Semi 2787 or Semi F82-0304. 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.

2-8 In-Line Filter

It is recommended that an in-line filter be installed upstream from the mass flow controller to prevent the possibility of any foreign material entering the flow sensor or control valve. The filtering element should be replaced periodically or ultrasonically cleaned.

Table 2-1. Recommended Filter Size.

Maximum Flow Rate	Recommended Filter
100 sccm	1 micron
500 sccm	2 micron
1 to 5 slpm	7 micron
10 to 30 slpm	15 micron
30 to 50 slpm	40 micron

2-9 Installation

⚠ CAUTION

When installing the Mass Flow Controller or Meter, 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:

a. The SLA7800 Series device should be located in a clean, dry atmosphere relatively free from shock and vibration.
b. Leave sufficient room for access to Self-zero function push-button.
c. Install in such a manner that permits easy removal if the instrument requires servicing.

⚠ CAUTION

When used with a reactive (sometimes toxic) gas, contamination or corrosion may occur as a result of plumbing leaks or improper purging. Plumbing should be checked carefully for leaks and the instrument purged with clean, dry N_2 before use.

d. The SLA7800 Series device can be installed in any position. However, mounting in orientations other than the original factory calibration (see calibration data sheet supplied with the instrument) can result in a ±0.2% maximum full scale shift after rezeroing.

⚠ CAUTION

Use caution when installing surface mount (downported) controllers. Most metal seals can not be reused after compression. Follow the seal manufacturers' recommendations for installation. Tighten the mounting screws in 10in-lb (1.1 n-m) increments such that the seal undergoes uniform compression. Final torque values depends on the screw and hardware material and lubrication.

e. When installing a mass flow controller with 1/4" (m) VCR end fittings and with full scale flow rates of 10 slpm 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 controller.

⚠ CAUTION

Since the Model SL7950 control valve is designed as a control valve only, it 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 actuation of the shut-off valve. This surge can be reduced in magnitude either by locating the controller and the shut-off valve closer together or by moving the shut-off valve upstream of the controller.

2-10 Electrical Interface (Analog I/O)

The setpoint signal is supplied as a 0(1) to 5 Vdc or 0(4)-20 mA analog signal. All signals are supplied via the 15-pin D-Connector. For an analog unit the minimum set of connections which must be made to the MFC and MFM includes +13.5 - 27 Vdc, supply common, and a setpoint signal.

The Brooks Digital electrical interface is designed to facilitate low-loss, quiet signal connections. Separate returns (commons) are supplied for the analog setpoint, analog flow signal, and the power supply. These commons are electrically connected together on the PC board.

Analog I/O Versions

- Signal Common
- Signal Output (Voltage or Current)
- +13.5 - 27 Vdc Supply
- Setpoint Input (Voltage or Current)
- Setpoint Common
- Supply Common
- Chassis Ground (via unit body)

Refer to Section for pin connections
Refer to Figures 2-1, 2-2, 2-3, 2-4, 2-5, 2-6 and 2-7 for electrical I/O connections

(The Brook's MFC acts as a current sink to a setpoint input signal. The 0/4-20 mA setpoint signal should be "driven" into the MFC input by a controlled current source. Reference Brook's device specifications for the setpoint input impedance.)

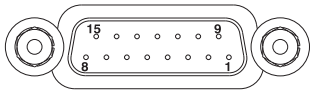
(*The Brook's MFC acts as the current source when providing a 0/4-20 mA output signal to the load. The output signal is "driven" by the MFC into the customer load. Reference Brook's device specifications for maximum load capacity.)*

⚠ NOTICE

The Brooks (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 89/336/EEC). Special attention is required when selecting the signal cable to be used with CE marked equipment.

Brooks supplies high quality cables which meet the specifications for CE certification. If you provide your own signal cable you should use a cable which is completely screened with a 100% shield. D-Connectors should also be shielded using a metal shield. If applicable, metal cable glands must be used to provide cable screen 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. See Appendix A for CE Certification of Mass Flow Equipment.

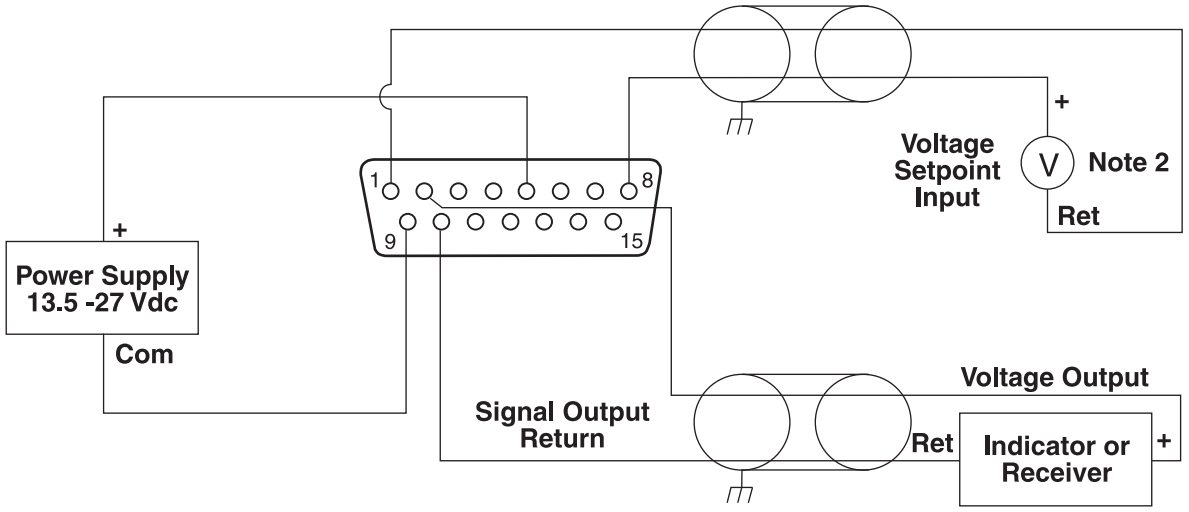
15 PIN MALE
D-CONNECTOR



*BROOKS READ OUT SIDE SUB D (15 PIN)	MFC / MFM PIN	FUNCTION	WIRE COLOR
6	1	**Setpoint**, Common Input (-)	BLACK
10	2	**Flow Signal**, 0(1)-5 volt, Output (+)	WHITE
9	3	**TTL Alarm**, Open Collector, Output (+)	RED
2	4	**Flow Signal**, 0(4)-20 mA, Output (+)	GREEN
13	5	**Power Supply**, +13.5 Vdc to +27 Vdc (+)	ORANGE
14	6	**Not Connected**	BLUE
3	7	**Setpoint**, 0(4)-20 mA, Input (+)	WHT/BLK
5	8	**Setpoint**, 0(1)-5 volt, Input (+)	RED/BLK
12	9	**Power Supply**, Common (-)	GRN/BLK
8	10	**Flow Signal**, Common, Output (-)	ORG/BLK
4	11	**Reference**, +5 Vdc, Output (+)	BLU/BLK
7	12	**Valve Override**, Input	BLK/WHT
1	13	**Calibration Select**, Input	RED/WHT
11	14	**RS-485**, Common B (-) Input/Output	GRN/WHT
15	15	**RS-485**, Common A (+) Input/Output	BLU/WHT

* Brooks Read Out Models 0151, 0152, 0154, 0254
See Table 3-1 for Resistor values

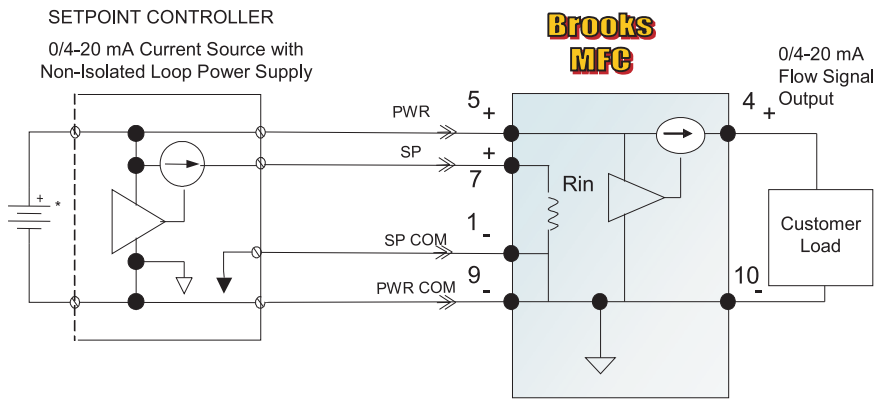
Figure 2-1 D-Connector Shielded Cable Hookup Diagram, Voltage I/O Version



Voltage Signal: Setpoint and Output

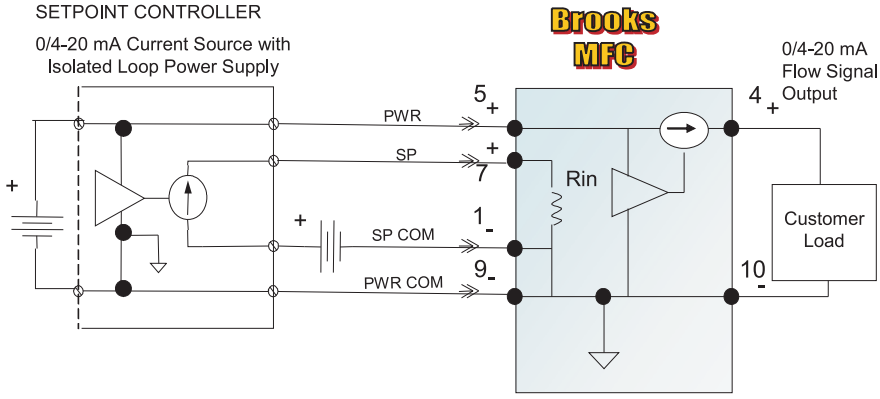
Notes:
1. The returns for the command input and current output are not isolated from power supply common.
2. Tie cable shields to ground at one end only. (MFC only)
3. Current and Voltage I/O may not be used simultaneously.

Figure 2-2 Common Electrical Hookups for 15-pin D-Connector Voltage I/O Version



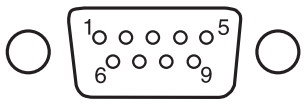
Note: Setpoint common, flow signal output common, and power supply common are connected internally in the MFC. Reference Brook's device specifications for power supply voltage and setpoint input impedance.
Input: The 4/20 mA setpoint signal is "driven" into the MFC input using a controlled source.
Output: The 4/20 mA output signal is "sourced" by the MFC into the customer load.

Figure 2-3 Recommended Wiring Configuration for Current Signals (Non-Isolated Power Supply)



Note: Setpoint common, flow signal output common, and power supply common are connected internally in the MFC. Reference Brook's device specifications for power supply voltage and setpoint input impedance.
Input: The 4/20 mA setpoint signal is "driven" into the MFC input using a controlled source.
Output: The 4/20 mA output signal is "sourced" by the MFC into the customer load.

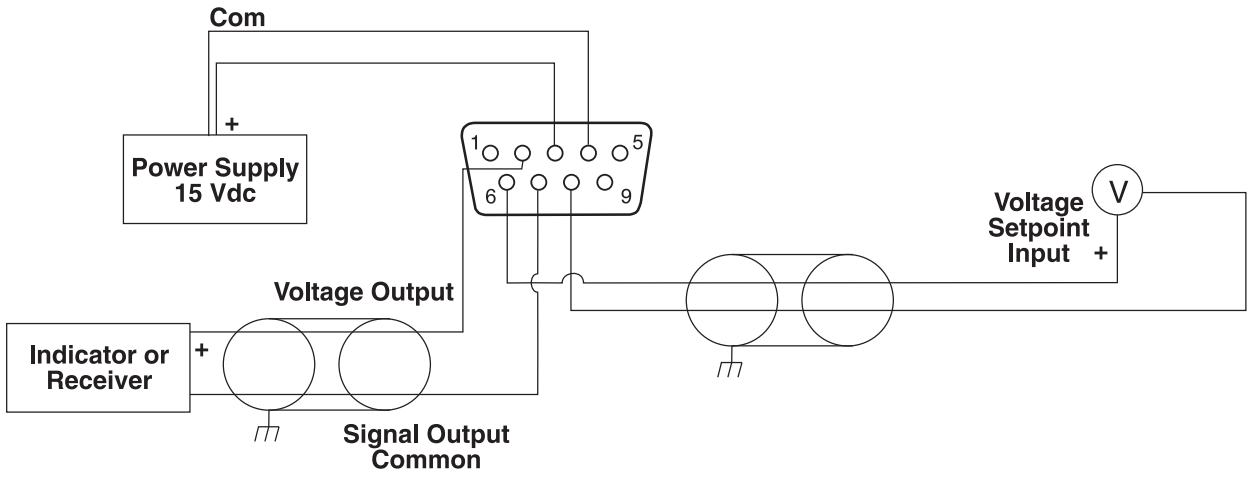
Figure 2-4 Recommended Wiring Configuration for Current Signals (Isolated Power Supply)



Analog I/O Pin Connections for 9-pin D-Connector:

Function	9-pin D-conn
Valve Override, Input	**1**
Flow Signal, 0-5 volt, Output (+)	**2**
Power Supply, +13.5 Vdc to +27 Vdc (+)	**3**
Power Supply, Common (-)	**4**
Not connected	**5**
Setpoint, 0-5 Vdc, Input (+)	**6**
Flow Signal, Common Output, (-)	**7**
Setpoint, Command Input (-)	**8**
Not Connected	**9**

Figure 2-5 9-pin D-Connector Shielded Cable Hookup Diagram - Voltage I/O Version.



Voltage Signal: Setpoint and Output

Notes:
1. The commons for the setpoint input and signal output are not isolated from power supply common.
2. The cable shields should connect to ground at one end only.

Figure 2-6 Common Electrical Hookups for 9-pin D-Connector Voltage I/O Version.

2-11 Operation Check Procedure (Analog I/O)

a. Mount the MFC in its final orientation.

b. Apply power to the MFC and allow approximately one hour for the instrument to warm up and stabilize its temperature.

c. Do NOT supply gas to the MFC. Ensure that the differential pressure across the MFC is zero.

d. Check the MFC zero.

e. The analog output signal should be equivalent to 0.0 ± 0.2% FS (0.000 ± 0.010 Vdc). If the zero exceeds one of these limits, follow the re-zeroing procedure in Section 3-5.

f. Turn on the gas supply. A positive flow signal may be present due to valve leak-thru. At 0% setpoint the flow signal output < 0.5% FS.

g. If flow signal at 0% setpoint is > 0.5%, then there is too much leak through across valve seat and orifice. MFC would need to be reworked to adjust valve shutoff.

h. Supply a setpoint voltage between 1 and 5 Vdc.

i. Check the MFC analog output signal. The output voltage signal should match the setpoint voltage (± 20mV) within 10 seconds after the setpoint is changed.

j. If flow output signal does not match setpoint, and pressure settings are correct, this could indicate a problem in the MFC. A secondary issue could be the gas type. When checking with a surrogate gas, ensure that there is enough pressure to the MFC in order to flow the correct amount of the surrogate gas.

Example:

Checking an MFC calibrated for 100 sccm SF6 (sulfur hexafluoride). The sensor factor using N_2 (nitrogen) is 0.27, therefore the equivalent N_2 needed is 100/0.27 = 370.4 sccm. This may require a pressure increase to make this flow rate.

2-12 Electrical Interface (DeviceNet I/O)

Power and network signals are interfaced to the device through the standard 5-pin Micro-connector on the device. This connector is specified in the DeviceNet Specification, Vol. 1, Section 9-3.6.3 and is defined as a male, sealed, micro-style connector. The figure below illustrates the electrical connections to the device.

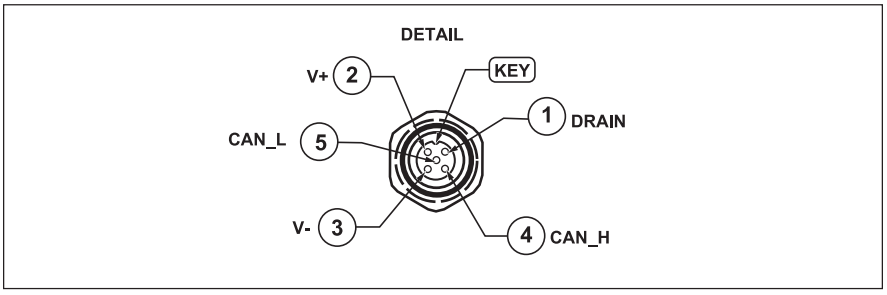


Figure 2-7 5-pin Shielded Cable Hookup Diagram - Voltage I/O Versions.

2-13 Operation Check Procedure (DeviceNet I/O)

a. Mount the MFC in its final orientation.

b. Apply power to the MFC and allow approximately one hour for the instrument to warm up and stabilize its temperature.

c. Do NOT supply gas to the MFC. Ensure that the differential pressure across the MFC is zero.

d. Check the MFC zero.

e. The output signal should be equivalent to 0.0 ± 0.2% FS in the appropriate DeviceNet units of measure (UOM). If the zero exceeds one of these limits, follow the re-zeroing procedure in Section 3-5.

f. Turn on the gas supply. A positive flow signal may be present due to valve leak-thru. At 0% setpoint the flow signal output < 0.5% FS.

g. If flow signal at 0% setpoint is > 0.5%, then there is too much leak through across valve seat and orifice. MFC would need to be reworked to adjust valve shutoff.

h. Provide the proper UOM setpoint beween 20% and 100% FS to the MFC.

i. Check the MFC output signal UOM. It should match the setpoint UOM value within ± 0.2% FS in less than 10 seconds after setpoint change.

j. If flow output signal does not match setpoint, and pressure settings are correct, this could indicate a problem in the MFC. A secondary issue could be the gas type. When checking with a surrogate gas, ensure that there is enough pressure to the MFC in order to flow the correct amount of the surrogate gas.

Example:
Checking an MFC calibrated for 100 sccm SF6 (sulfur hexafluoride). The sensor factor using N_2 (nitrogen) is 0.27, therefore the equivalent N_2 needed is 100/0.27 = 370.4 sccm. This may require a pressure increase to make this flow rate.

k. Specifically for a DevcieNet MFC, there may be problems associated with the network communication link. One common problem is due to data type mismatches of the Input\Output (I\O) Assemblies. For proper communication over the DeviceNet network, the MFC must be set up with the same I\O Assembly as the network master. Confirm these I\O settings are correct. Note this information and all other detailed DeviceNet information is available in the DeviceNet supplement instruction manual, X-DPT-DeviceNet-Digital-MFC-eng.

2-14 DeviceNet Features

Information regarding DeviceNet capability for the Brooks SLA7800 Series is available in the DeviceNet Supplemental Instruction manual. (X-DPT-DeviceNet-SLA7000-MFC-eng) Part Number 541B059AHG

3-1 Overview

This section contains the following information:

• Theory of Operation

• Features

3-2 Theory of Operation for Flow Measurement

The thermal mass flow measurement system consists of two components: the restrictor and the flow sensor. Figure 3-1 contains a diagram of the flow stream through the MFC with an enlarged view of the flow sensor. Gas flow entering the MFC is separated into two paths; one straight through the restrictor and the other through the flow sensor. This is represented in Figure 3-1 where the total flow A+B enters the MFC and is separated into streams A and B. The streams are joined again at the far side of the restrictor.

The separation of the flow streams is caused by the restrictor. During flow conditions there will be a pressure differential across the restrictor which forces gas to flow in the sensor.

The pressure difference caused by the restrictor varies linearly with total flow rate. The sensor has the same linear pressure difference versus flow relationship. The ratio of sensor flow to the flow through the restrictor remains constant over the range of the MFC (A/B = constant). The full scale flow rate of the MFC is established by selecting a restrictor with the correct pressure differential for the desired flow.

The flow sensor is a very narrow, thin-walled stainless steel tube. Onto this tube are built upstream and downstream temperature sensing elements on either side of a heating element. Constant power is applied to the heater element, which is located at the midpoint of the sensor tube. During no-flow conditions, the amount of heat reaching each temperature sensor is equal, so temperatures T1 and T2 (Fig. 3-1) are equal. Gas flowing through the tube carries heat away from the upstream temperature sensor and toward the downstream sensor. The temperature difference, T2 - T1, is directly proportional to the gas mass flow. The equation is:

$DT = A \times P \times Cp \times m$

Where,
DT = Temperature difference T2 - T1 (°K)
A = Constant of proportionality (S^2-°K^2/kJ^2)
P = Heater Power
Cp = specific heat of the gas at constant pressure (kJ/kg - °K)

m = Mass Flow (kg/s)

A bridge circuit and a differential amplifier interpret the temperature difference and generate an electrical signal directly proportional to the gas mass flow rate.

3-3 Features

Note: All Model SLA7850 mass flow controllers are configured at the factory according to customer order and do not require adjustment. Not all features are available on all instruments.

The SLA7800 Series is a full-featured digital MFC. The SLA7800 Series performs much like a traditional analog MFC, but with improved accuracy, step response and valve control. The analog interface matches that of Brooks' popular analog MFCs so the SLA7800 Series can be retrofitted into tools using analog MFCs. Other versions of the SLA7800 Series can provide a variety of digital protocols, for example DeviceNet.

The SLA7800 Series is capable of storing up to 10 different sets of gas calibration data. Each set includes a calibration curve, PID controller settings, valve performance data, and information about the calibration conditions. The SLA7800 Series can contain calibrations for different gases or for the same gas at multiple conditions (pressures, full-scale flow rates). Section 3-5 Analog Mode of Operation describes more information about the data contained in the calibration table and how to access the data.

Calibrations will appear in the calibration table in the same order as they appeared on the SLA7800 Series customer order, unless otherwise specified. The first listed gas will appear as calibration #1, the second as calibration #2 and so on. Note that unless specified otherwise on the customer order SLA7800 Series devices containing a single calibration will have that calibration stored in calibration #1.

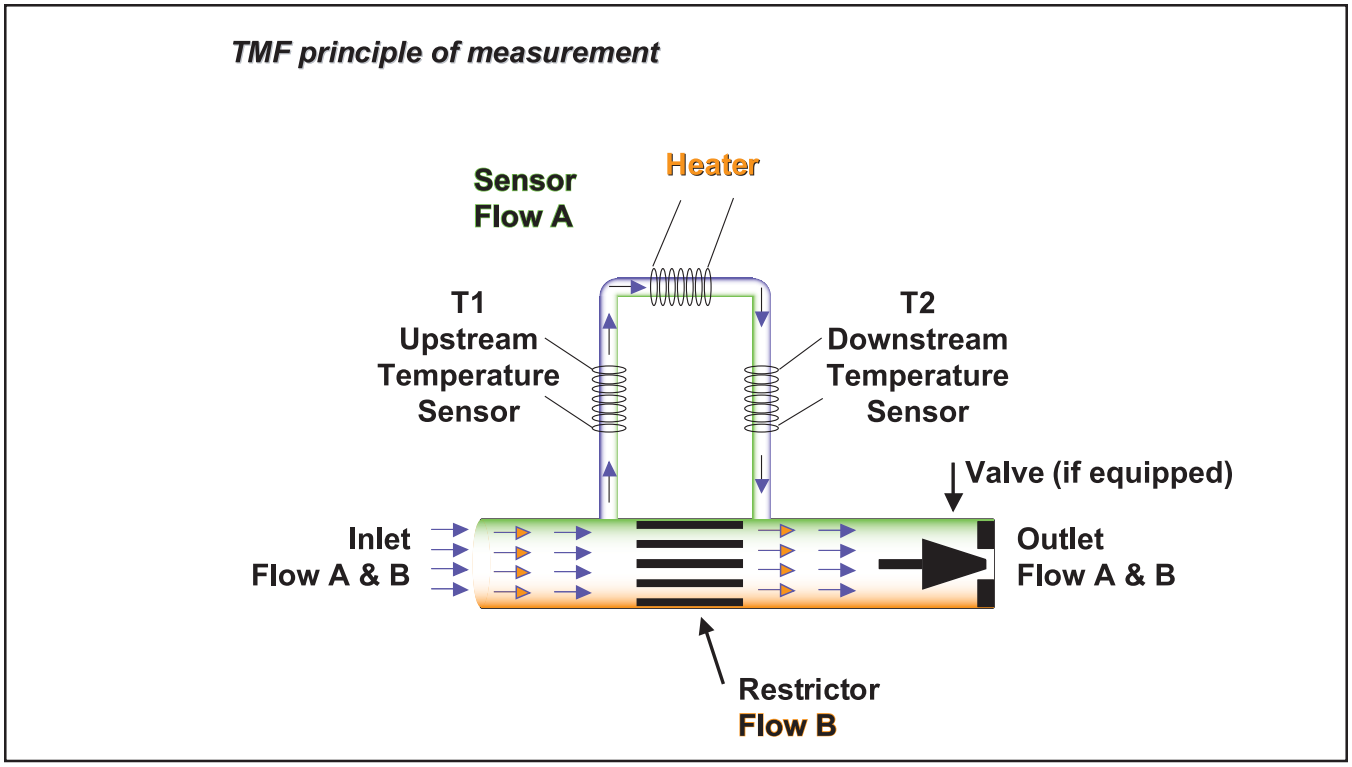


Figure 3-1 Flow Sensor Operational Diagram.

3-4 Adaptive Valve Control

The SLA7800 Series offers a feature, called adaptive valve control, which allows the instrument to learn about the process gas and operating conditions. If multiple calibrations are being used, the adaptive valve control procedure must be performed separately for each calibration. This function is disabled on MFC's when they are shipped.
The adaptive valve control process requires that the process gas be supplied to the SLA7800 Series at the pressure and temperature which will exist during the process.
If the system conditions have changed so substantially that the SLA7800 Series becomes unstable, the adaptive valve control algorithm determines new gains which will stabilize the instrument and restore the step response to the factory performance level.

3-5 Analog Mode of Operation

NOTE: Read Section 3-3, Features, before reading this section.

A. Functional Description

The analog interface is consistent with other Brooks analog MFCs. This includes a 0-5 volt setpoint input, 0-5 volt flow signal output and Valve Override input.
Before operating the SLA7800 Series device, apply power and warm-up the instrument for approximately one hour. After warm-up, apply gas pressure then proceed by following the instructions in the following sections.

B. Analog Setpoint

This input allows the user to establish the MFC setpoint. The usable range of this input is from 0 to 5.5 Vdc which corresponds to 0 to 110% of the MFC full scale flow rate. Setpoints below 50 mV will be treated as 0 volt setpoints. For setpoints below 0 Vdc the MFC behaves as if a 0 Vdc setpoint is present. Setpoints above 5.5 Vdc will cause a setpoint of at least 110% FS.

C. Analog Flow Signal

This output is used to indicate the flow signal. The range of this signal is from -0.5 to 5.5 Vdc, with the range of 0 to 5.5 Vdc corresponding to a calibrated flow signal of 0 to 110% of the full scale flow rate. A negative flow signal indicates reverse flow through the device, but is NOT calibrated. The analog flow signal is capable of resolving signals to 1.0 mV.

D. Valve Override

This input allows the valve to be forced to its most closed state or its most open state, regardless of setpoint. If this input is not electrically connected the MFC will operate according to the current values of the MFC setpoint. If this input is held at 0 Vdc, the valve will be forced to its most closed state. If this input is held to +15 Vdc the valve will be forced to its most open state.

F. Zeroing the MFC (Self-zero)
It may be desirable to re-zero the flow sensor if it is operated at its temperature extremes or if it is positioned in an attitude other than that specified on the customer order.
Note: Before zeroing the instrument, zero pressure differential MUST be established across the device. If there is pressure across the instrument during the zero process, any detected flow through the sensor will be misinterpreted as the zero flow reading. This will result in calibration inaccuracy during normal operation.

Once zero differential pressure is established and verified, press the recessed, momentary push-button (Self-zero button) located on the side of the device (see Fig. 3-2) to start the Self-zero function.

The zero process requires approximately 500 milliseconds. During this time, the device will set its output signal to 0.0 Vdc.

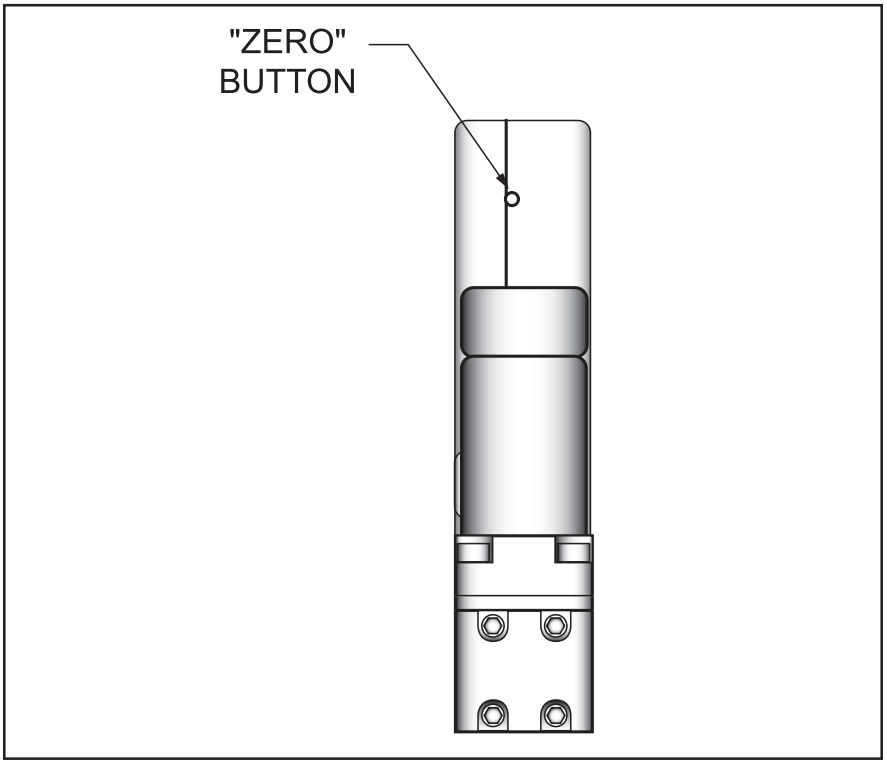


Figure 3-2 Externally Accessible Adjustment

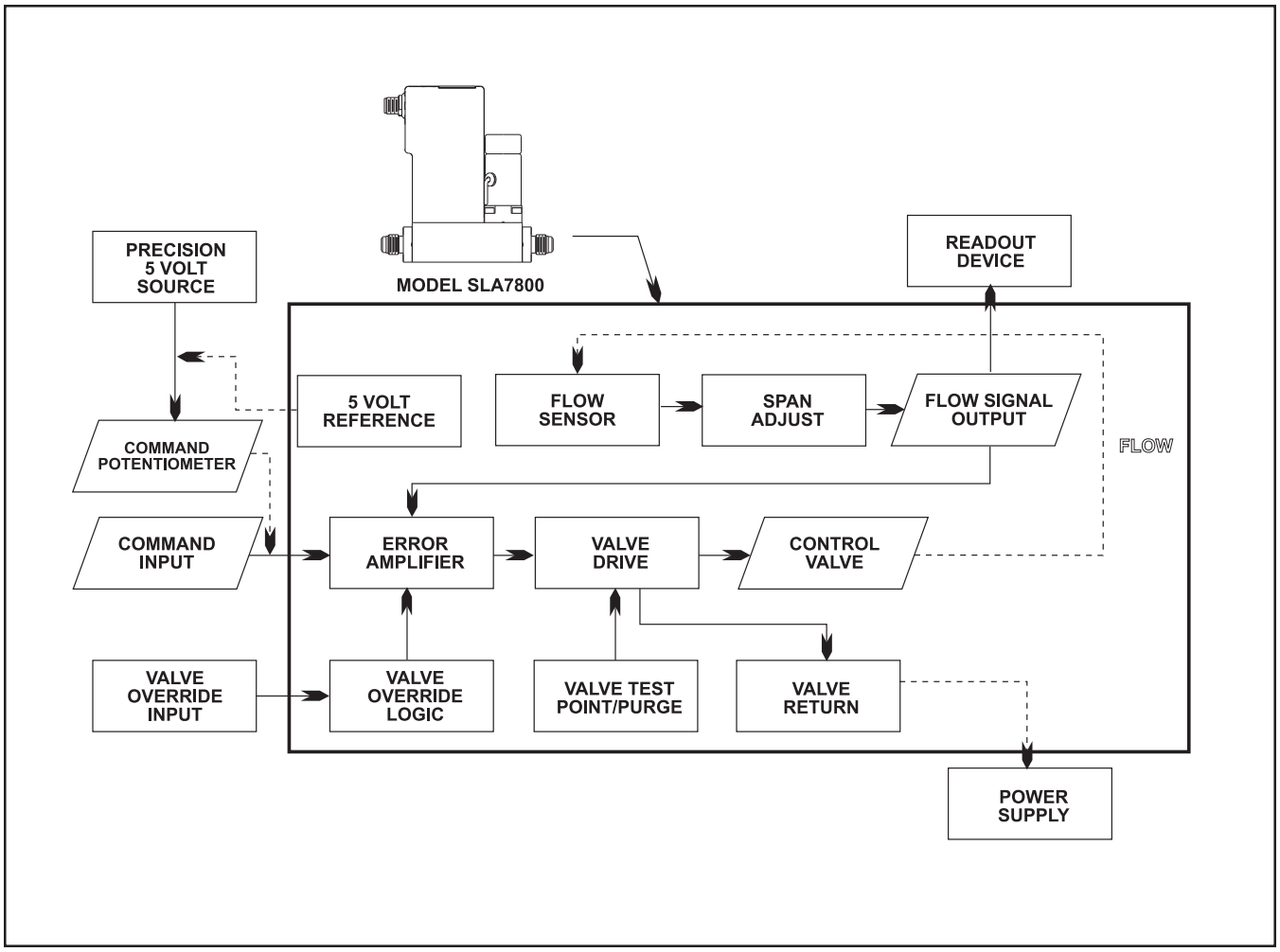


Figure 3-3 Flow Control System Block Diagram.

THIS PAGE WAS INTENTIONALLY LEFT BLANK

4-1 Overview

No routine maintenance is required on the SLA7800 Series devices. If an in-line filter is used, the filtering elements should be periodically replaced. This section provides the following information:

- Troubleshooting
- Gas Conversion Factors
- Orifice Sizing*****
- Restrictor Sizing

⚠ WARNING

METER/CONTROLLER SEAL COMPATIBILITY

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 conditions could result in the Meter or Controller leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.

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.

⚠ WARNING

If it becomes necessary to remove the instrument from the system, power to the device must be disconnected.

4-2 Troubleshooting

⚠ CAUTION

It is important that this device only be serviced by properly trained and qualified personnel.

Analog or DeviceNet Version
This section contains suggestions to help diagnose MFC related problems in the gas distribution system and answers commonly asked questions.

Failure of the flow rate or flow signal to achieve the setpoint.

1. Insufficient pressure drop across the SLA7800 Series device (low or no pressure). If there is not enough pressure differential across the MFC, it is impossible for the MFC's orifice to pass the full scale flow rate. To check for this condition, compare the actual inlet/outlet pressure drop with that specified on the order. Increase the pressure if necessary.

2. 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.
3. Setpoint is below minimum. MFCs may have a settable low flow cutoff for the setpoint command. If setpoint is below this value, then MFC will not attempt to control.

4. Clogged sensor tube. If the MFC sensor tube is clogged, the flow signal will be very low or zero while the actual flow will be at the valve's maximum rate.

Flow signal matched setpoint but actual flow is not correct.

5. Clogged restrictor. If the MFC restrictor becomes clogged, a much larger portion of the flow stream will pass through the sensor rather than going straight through the restrictor. The symptom of this condition is a substantially reduced actual flow with a flow signal which matches the setpoint.

Flow rate in excess of 100% at zero setpoint.

6. Valve Override pin set to open. If valve override (VOR) pin is active, the valve will be forced open or closed. Set this pin to its normal level before setting a setpoint.

Flow/Flow signal 'unstable'.

7. SLA7800 Series MFC performance is tuned during calibration at the conditions specified on the order. If the conditions in use (inlet and outlet pressure, temperature, attitude, gas or mixture type) are different or become different over time, the MFC may not perform as it did when it left the factory.

DeviceNet Version Only

Failure of the flow rate or flow signal to achieve the setpoint.

8. Specifically for a DevcieNet MFC, there may be problems associated with the network communication link. One common problem is due to data type mismatches of the Input\Output (I\O) Assemblies. For proper communication over the DeviceNet network, the MFC must be set up with the same I\O Assembly as the network master. Confirm these I\O settings are correct. Note this information and all other detailed DeviceNet information is available in the DeviceNet supplement instruction manual, X-DeviceNet-MFC-eng, Part Number 541B059AHG.

Questions
Analog Version
What is the purpose of the LED on top of the SLA7800 Series MFC?

The LED on top of the MFC should normally be lit GREEN. This signifies the MFC is in proper working mode. If the LED is lit RED this signifies a critical fault has occurred in the MFC. Please contact the factory for instructions.
DeviceNet Version
What is the purpose of the LED's on top of the SLA7800 Series MFC?

There are two LED's on top of a DevcieNet version MFC. The LED labeled 'MOD' is used to indicate Module status. This LED should normally be lit GREEN. If the 'MOD' LED is lit RED this signifies a critical fault has occurred in the MFC. Please contact the factory for instructions.
The LED labeled 'NET' is used to indicate NETWORK status. Note the 'NET' LED can have 4 distinct operational states. For more complete details on these LED's, reference the DeviceNet supplement instruction manual, X-DeviceNet-MFC-eng, Part Number 541B059AHG.

What is the purpose of the Rotary Switchess on top of the SLA7800 Series MFC?

Two of the rotary switches are labeled ‘ADDRESS’. These two switches are used to configure the MAC ID of MFC when used on the DeviceNet network. MAC ID stands for Media Access Control Identifier and is used to set the unique address of the device on the network. The possible range of addresses is 00 to 63. The out-of-box MAC ID setting is 63.

The third rotary switch is labeled ‘RATE’. This switch sets the baud rate of the MFC for communicating over the DeviceNet network. The out-of-box default setting is 125K baud.

For more complete details on these switches, reference the DeviceNet supplement instruction manual, X-DeviceNet-MFC-eng, Part Number 541B059AHG.

Analog or DeviceNet Version
What is the purpose of the recessed push-button on the side of the MFC?

This push-button is used to start a self-zero function. Do NOT press this button unless you are performing this function as described in the Section 3-5, F.

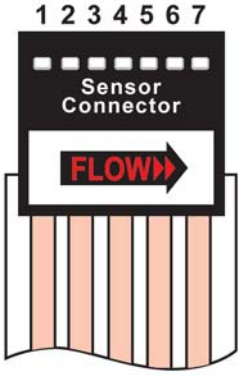
⚠ CAUTION

The sensor of the Model SLA7850 and Model SLA7860 is not removable. Do not attempt to disassemble or remove the sensor from the body. Removing the two hold-down screws may cause irreparable damage to the sensor tube and leakage of the process gas.

Table 4-1 Sensor Troubleshooting

SENSOR SCHEMATIC

PIN NO.	FUNCTION
1	Heater
2	Upstream Temperature Sensor (Su)
3	Downstream Temperature Sensor (Sd)
4	Sensor Common
5	Heater Common
6	Thermistor
7	Thermistor



Flex Circuit Wire Numbers

Remove the sensor connector from the PC Board for this procedure.

OHMMETER CONNECTION	RESULT IF ELECTRICALLY FUNCTIONAL
Pin 1 or 4 to meter body	Open circuit on ohmmeter. If either heater (1) or sensor common (4) are shorted, an ohmmeter reading will be obtained.
Pin 4 to Pin 2	Nominal 1100 ohms reading, depending on temperature and ohmmeter current.
Pin 4 to Pin 3	
Pin 5 to Pin 1	Nominal 1000 ohm reading.
Pin 6 to Pin 7	Nominal 580 ohm reading.

4-3 Gas Conversion Factors

If a mass flow controller is operated on a gas other than the gas it was calibrated with, a scale shift will occur in the relation between the output signal and the mass flow rate. This is due to the difference in heat capacities between the two gases. This scale shift can be approximated by using the ratio of the molar specific heat of the two gases or by sensor conversion factor. Consult factory or nearest Brooks Instrument rep for a list of sensor conversion factors. To change to a new gas, multiply the output reading by the ratio of the gas factor for the desired gas by the gas factor for the calibration gas used.

$$\text{Actual Gas Flow Rate} = \text{Output Reading} \times \frac{\text{Factor of the New Gas}}{\text{Factor of the Calibration Gas}}$$

Example:

The controller is calibrated for Nitrogen.

The desired gas is Carbon Dioxide (CO_2)
The output reading is 75 sccm when Carbon Dioxide is flowing.

Then 75 x 0.74 = 55.5 sccm of (CO_2)
In order to calculate the conversion factor for a gas mixture, the following formula should be used:

Where,
P_1 = percentage (%) of gas 1 (by volume)
P_2 = percentage (%) of gas 2 (by volume)

$$\text{Sensor Conversion Factor}_{\text{Mixture}} = \frac{100}{\frac{P_1}{\text{Sensor Conversion Factor}_1} + \frac{P_2}{\text{Sensor Conversion Factor}_2} + \frac{P_3}{\text{Sensor Conversion Factor}_3}}$$

P_n = percentage (%) of gas n (by volume)

Example: The desired gas is 20% Helium (He) and 80% Chlorine (Cl) by volume. The desired full scale flow rate of the mixture is 20 slpm. Sensor conversion factor for the mixture is:

$$\text{Mixture Factor} = \frac{100}{\frac{20}{1.386} + \frac{80}{.876}} = .945$$

Nitrogen equivalent flow = 20/.945 = 21.16 slpm Nitrogen

It is generally accepted that the mass flow rate derived from this equation is only accurate to ±5%. The sensor conversion factors given in Table 4-3 are calculated based on a gas temperature of 21°C and a pressure of one atmosphere. The specific heat of most gases is not strongly pressure, and/or temperature, dependent. However, gas conditions that vary widely from these reference conditions may cause an additional error due to the change in specific heat caused by pressure and/or temperature.

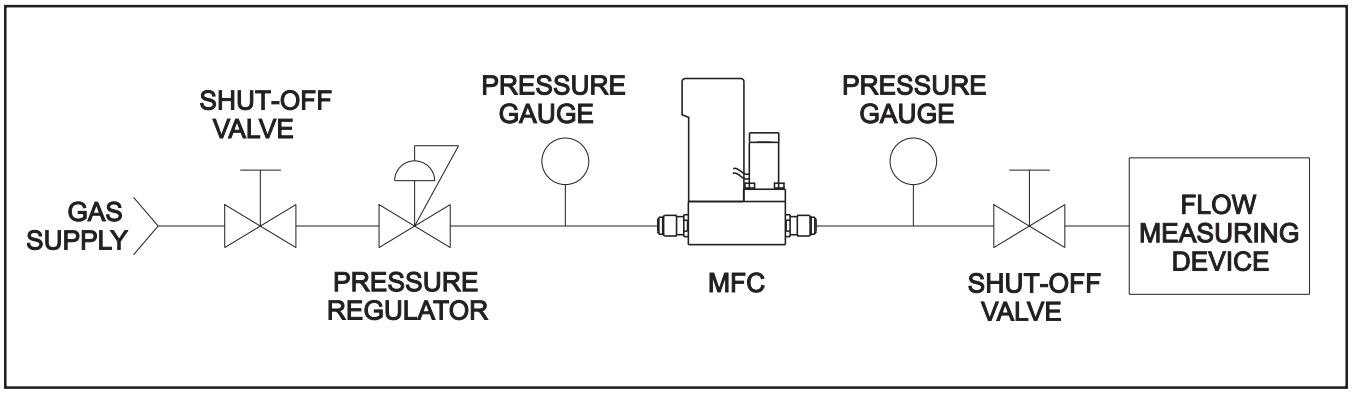


Figure 4-1 Bench Troubleshooting Circuit

4-4 Orifice Sizing

The flow controller's orifice is factory-sized to a preselected gas, operating pressure and flow range. Note that the orifice is marked with its size in thousandths of an inch. When changing the gas operating pressure (inlet or outlet), or flow range consult the factory for re-sizing information

Table 4-2 Orifice Capacities

Orifice Size (inches)	Minimum Flow Rate (sccm)	
	0°C	(21.1°C)
0.0013	5.3	(5.7)
0.002	12.5	(13.5)
0.003	39.2	(42.2)
0.004	82.5	(88.9)
0.0055	190	(205)
0.007	374	(403)
0.010	748	(806)
0.014	1364	(1469)
0.020	2673	(2879)
0.032	6490	(6991)
0.048	12980	(13980)
0.062	22000	(2879)
0.078	30000	(34400)
0.093	42500	(45800)
0.120	69300	(74700)

Inlet Pressure = 10 psig
Outlet Pressure = 10 inches of water (0.4 psig) or less
Note: Flow Rate based on Nitrogen

4-5 Restrictor Sizing

The restrictor assembly is a ranging device for the sensor portion of the controller. It creates a pressure drop which is linear with flow rate. This diverts a sample quantity of the process gas flow through the sensor. Each restrictor maintains a ratio of sensor flow to restrictor flow, however, the total flow through each restrictor is different. Different restrictors (active area) have different pressure drops and produce controllers with different full scale flow rates. For a discussion of the interaction of the various parts of the controller, you are urged to review Section 3-2, Theory of Operation.

If the restrictor assembly has been contaminated with foreign matter, the pressure drop versus flow characteristics will be altered and it must be cleaned or replaced. It may also be necessary to replace the restrictor assembly when the mass flow controller is to be calibrated to a new flow rate.

Restrictor assembly replacement should be performed only by trained personnel. Consult Factory / Service Center.

Restrictors
The SLA7800 Series MFC uses two types of restrictor assemblies depending on full scale flowrate and expected service conditions.

1. Wire mesh for Nitrogen equivalent flow rates above 3.4 slpm. These restrictor assemblies are made from a cylinder of wire mesh and are easily cleaned if they become contaminated in service.
2. Anti-Clog Laminar Flow Element (A.C.L.F.E.) - This type of restrictor assembly is used for Nitrogen equivalent flow rates less than 3.4 slpm.

If a mixture of two or more gases is being used, the restrictor selection must be based on a Nitrogen equivalent flow rate of the mixture.

Example:
The desired gas is 20% Helium (He) and 80% Chlorine (Cl) by volume. The desired full scale flow rate of the mixture is 20 slpm. Sensor conversion factor for the mixture is:

$$\text{Mixture Factor} = \frac{100}{\frac{20}{1.386} + \frac{80}{.876}} = .945$$

Nitrogen equivalent flow = 20/.945 = 21.16 slpm Nitrogen. In this example a Size 4 Wire Mesh Assembly would be selected.

Table 4-3 SLA7800 Series Standard Restrictors

Size	Range SCCM Nitrogen Equivalent Flow*		Part Number	
	Low	High	ACLFE	Wire Mesh
D	8.038	11.38	S110Z275BMG	
G	22.05	31.23	S110Z278BMG	
J	43.23	61.21	S110Z280BMG	
M	118.6	167.9	S110Z283BMG	
P	232.5	329.3	S110Z285BMG	
Q	325.4	460.9	S110Z286BMG	
R	455.7	645.3	S110Z287BMG	
U	1250.	1771.	S110Z290BMG	
W	2451.	3471.	S110Z292BMG	
1	6724.	9523.		S110Z317BMG
3	13176.	30060.		S110Z226BMG
5	28500.	50000.		S110Z417BMG

*Materials: BMG = 316 Stainless Steel Electropolished

NOTES: • If two sizes are allowed because of overlap, select the larger size.
• Restrictor size not required to enter order.

4-1 Overview

No routine maintenance is required on the SLA7800 Series devices. If an in-line filter is used, the filtering elements should be periodically replaced. This section provides the following information:

- Troubleshooting
- Gas Conversion Factors
- Orifice Sizing*****
- Restrictor Sizing

⚠ WARNING

METER/CONTROLLER SEAL COMPATIBILITY

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 conditions could result in the Meter or Controller leaking process fluid outside the pressure boundary of the device, resulting in personnel injury or death.

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.

⚠ WARNING

If it becomes necessary to remove the instrument from the system, power to the device must be disconnected.

4-2 Troubleshooting

⚠ CAUTION

It is important that this device only be serviced by properly trained and qualified personnel.

Analog or DeviceNet Version
This section contains suggestions to help diagnose MFC related problems in the gas distribution system and answers commonly asked questions.

Failure of the flow rate or flow signal to achieve the setpoint.

1. Insufficient pressure drop across the SLA7800 Series device (low or no pressure). If there is not enough pressure differential across the MFC, it is impossible for the MFC's orifice to pass the full scale flow rate. To check for this condition, compare the actual inlet/outlet pressure drop with that specified on the order. Increase the pressure if necessary.

2. 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.
3. Setpoint is below minimum. MFCs may have a settable low flow cutoff for the setpoint command. If setpoint is below this value, then MFC will not attempt to control.

4. Clogged sensor tube. If the MFC sensor tube is clogged, the flow signal will be very low or zero while the actual flow will be at the valve's maximum rate.

Flow signal matched setpoint but actual flow is not correct.

5. Clogged restrictor. If the MFC restrictor becomes clogged, a much larger portion of the flow stream will pass through the sensor rather than going straight through the restrictor. The symptom of this condition is a substantially reduced actual flow with a flow signal which matches the setpoint.

Flow rate in excess of 100% at zero setpoint.

6. Valve Override pin set to open. If valve override (VOR) pin is active, the valve will be forced open or closed. Set this pin to its normal level before setting a setpoint.

Flow/Flow signal 'unstable'.

7. SLA7800 Series MFC performance is tuned during calibration at the conditions specified on the order. If the conditions in use (inlet and outlet pressure, temperature, attitude, gas or mixture type) are different or become different over time, the MFC may not perform as it did when it left the factory.

DeviceNet Version Only

Failure of the flow rate or flow signal to achieve the setpoint.

8. Specifically for a DevcieNet MFC, there may be problems associated with the network communication link. One common problem is due to data type mismatches of the Input\Output (I\O) Assemblies. For proper communication over the DeviceNet network, the MFC must be set up with the same I\O Assembly as the network master. Confirm these I\O settings are correct. Note this information and all other detailed DeviceNet information is available in the DeviceNet supplement instruction manual, X-DeviceNet-MFC-eng, Part Number 541B059AHG.

Questions
Analog Version
What is the purpose of the LED on top of the SLA7800 Series MFC?

The LED on top of the MFC should normally be lit GREEN. This signifies the MFC is in proper working mode. If the LED is lit RED this signifies a critical fault has occurred in the MFC. Please contact the factory for instructions.
DeviceNet Version
What is the purpose of the LED's on top of the SLA7800 Series MFC?

There are two LED's on top of a DevcieNet version MFC. The LED labeled 'MOD' is used to indicate Module status. This LED should normally be lit GREEN. If the 'MOD' LED is lit RED this signifies a critical fault has occurred in the MFC. Please contact the factory for instructions.
The LED labeled 'NET' is used to indicate NETWORK status. Note the 'NET' LED can have 4 distinct operational states. For more complete details on these LED's, reference the DeviceNet supplement instruction manual, X-DeviceNet-MFC-eng, Part Number 541B059AHG.

What is the purpose of the Rotary Switchess on top of the SLA7800 Series MFC?

Two of the rotary switches are labeled ‘ADDRESS’. These two switches are used to configure the MAC ID of MFC when used on the DeviceNet network. MAC ID stands for Media Access Control Identifier and is used to set the unique address of the device on the network. The possible range of addresses is 00 to 63. The out-of-box MAC ID setting is 63.

The third rotary switch is labeled ‘RATE’. This switch sets the baud rate of the MFC for communicating over the DeviceNet network. The out-of-box default setting is 125K baud.

For more complete details on these switches, reference the DeviceNet supplement instruction manual, X-DeviceNet-MFC-eng, Part Number 541B059AHG.

Analog or DeviceNet Version
What is the purpose of the recessed push-button on the side of the MFC?

This push-button is used to start a self-zero function. Do NOT press this button unless you are performing this function as described in the Section 3-5, F.

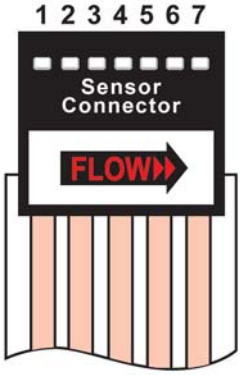
⚠ CAUTION

The sensor of the Model SLA7850 and Model SLA7860 is not removable. Do not attempt to disassemble or remove the sensor from the body. Removing the two hold-down screws may cause irreparable damage to the sensor tube and leakage of the process gas.

Table 4-1 Sensor Troubleshooting

SENSOR SCHEMATIC

PIN NO.	FUNCTION
1	Heater
2	Upstream Temperature Sensor (Su)
3	Downstream Temperature Sensor (Sd)
4	Sensor Common
5	Heater Common
6	Thermistor
7	Thermistor



Flex Circuit Wire Numbers

Remove the sensor connector from the PC Board for this procedure.

OHMMETER CONNECTION	RESULT IF ELECTRICALLY FUNCTIONAL
Pin 1 or 4 to meter body	Open circuit on ohmmeter. If either heater (1) or sensor common (4) are shorted, an ohmmeter reading will be obtained.
Pin 4 to Pin 2	Nominal 1100 ohms reading, depending on temperature and ohmmeter current.
Pin 4 to Pin 3	
Pin 5 to Pin 1	Nominal 1000 ohm reading.
Pin 6 to Pin 7	Nominal 580 ohm reading.

4-3 Gas Conversion Factors

If a mass flow controller is operated on a gas other than the gas it was calibrated with, a scale shift will occur in the relation between the output signal and the mass flow rate. This is due to the difference in heat capacities between the two gases. This scale shift can be approximated by using the ratio of the molar specific heat of the two gases or by sensor conversion factor. Consult factory or nearest Brooks Instrument rep for a list of sensor conversion factors. To change to a new gas, multiply the output reading by the ratio of the gas factor for the desired gas by the gas factor for the calibration gas used.

$$\text{Actual Gas Flow Rate} = \text{Output Reading} \times \frac{\text{Factor of the New Gas}}{\text{Factor of the Calibration Gas}}$$

Example:

The controller is calibrated for Nitrogen.

The desired gas is Carbon Dioxide (CO_2)
The output reading is 75 sccm when Carbon Dioxide is flowing.

Then 75 x 0.74 = 55.5 sccm of (CO_2)
In order to calculate the conversion factor for a gas mixture, the following formula should be used:

Where,
P_1 = percentage (%) of gas 1 (by volume)
P_2 = percentage (%) of gas 2 (by volume)

$$\text{Sensor Conversion Factor}_{\text{Mixture}} = \frac{100}{\frac{P_1}{\text{Sensor Conversion Factor}_1} + \frac{P_2}{\text{Sensor Conversion Factor}_2} + \frac{P_3}{\text{Sensor Conversion Factor}_3}}$$

P_n = percentage (%) of gas n (by volume)

Example: The desired gas is 20% Helium (He) and 80% Chlorine (Cl) by volume. The desired full scale flow rate of the mixture is 20 slpm. Sensor conversion factor for the mixture is:

$$\text{Mixture Factor} = \frac{100}{\frac{20}{1.386} + \frac{80}{.876}} = .945$$

Nitrogen equivalent flow = 20/.945 = 21.16 slpm Nitrogen

It is generally accepted that the mass flow rate derived from this equation is only accurate to ±5%. The sensor conversion factors given in Table 4-3 are calculated based on a gas temperature of 21°C and a pressure of one atmosphere. The specific heat of most gases is not strongly pressure, and/or temperature, dependent. However, gas conditions that vary widely from these reference conditions may cause an additional error due to the change in specific heat caused by pressure and/or temperature.

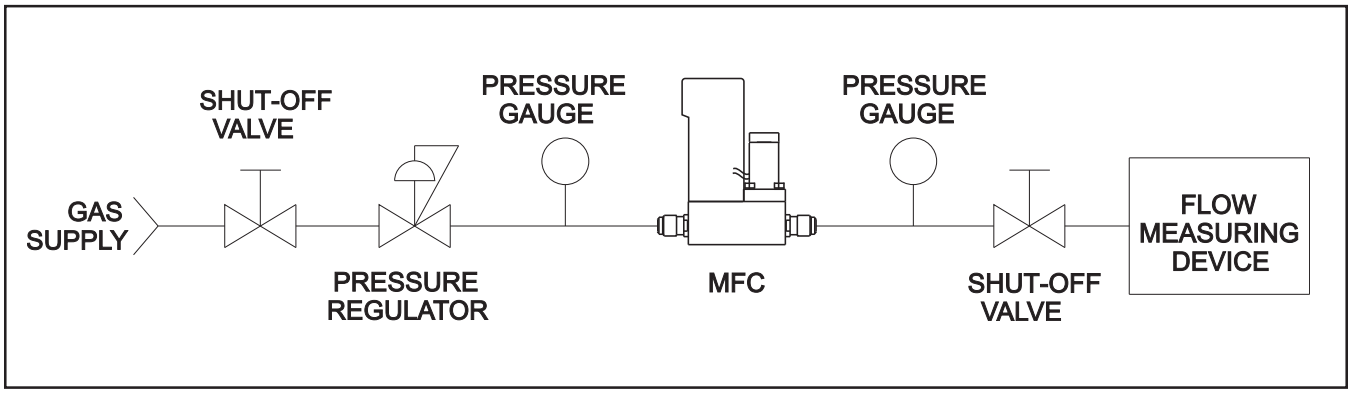


Figure 4-1 Bench Troubleshooting Circuit

4-4 Orifice Sizing

The flow controller's orifice is factory-sized to a preselected gas, operating pressure and flow range. Note that the orifice is marked with its size in thousandths of an inch. When changing the gas operating pressure (inlet or outlet), or flow range consult the factory for re-sizing information

Table 4-2 Orifice Capacities

Orifice Size (inches)	Minimum Flow Rate (sccm)	
	0°C	(21.1°C)
0.0013	5.3	(5.7)
0.002	12.5	(13.5)
0.003	39.2	(42.2)
0.004	82.5	(88.9)
0.0055	190	(205)
0.007	374	(403)
0.010	748	(806)
0.014	1364	(1469)
0.020	2673	(2879)
0.032	6490	(6991)
0.048	12980	(13980)
0.062	22000	(2879)
0.078	30000	(34400)
0.093	42500	(45800)
0.120	69300	(74700)

Inlet Pressure = 10 psig
Outlet Pressure = 10 inches of water (0.4 psig) or less
Note: Flow Rate based on Nitrogen

4-5 Restrictor Sizing

The restrictor assembly is a ranging device for the sensor portion of the controller. It creates a pressure drop which is linear with flow rate. This diverts a sample quantity of the process gas flow through the sensor. Each restrictor maintains a ratio of sensor flow to restrictor flow, however, the total flow through each restrictor is different. Different restrictors (active area) have different pressure drops and produce controllers with different full scale flow rates. For a discussion of the interaction of the various parts of the controller, you are urged to review Section 3-2, Theory of Operation.

If the restrictor assembly has been contaminated with foreign matter, the pressure drop versus flow characteristics will be altered and it must be cleaned or replaced. It may also be necessary to replace the restrictor assembly when the mass flow controller is to be calibrated to a new flow rate.

Restrictor assembly replacement should be performed only by trained personnel. Consult Factory / Service Center.

Restrictors
The SLA7800 Series MFC uses two types of restrictor assemblies depending on full scale flowrate and expected service conditions.

1. Wire mesh for Nitrogen equivalent flow rates above 3.4 slpm. These restrictor assemblies are made from a cylinder of wire mesh and are easily cleaned if they become contaminated in service.
2. Anti-Clog Laminar Flow Element (A.C.L.F.E.) - This type of restrictor assembly is used for Nitrogen equivalent flow rates less than 3.4 slpm.

If a mixture of two or more gases is being used, the restrictor selection must be based on a Nitrogen equivalent flow rate of the mixture.

Example:
The desired gas is 20% Helium (He) and 80% Chlorine (Cl) by volume. The desired full scale flow rate of the mixture is 20 slpm. Sensor conversion factor for the mixture is:

$$\text{Mixture Factor} = \frac{100}{\frac{20}{1.386} + \frac{80}{.876}} = .945$$

Nitrogen equivalent flow = 20/.945 = 21.16 slpm Nitrogen. In this example a Size 4 Wire Mesh Assembly would be selected.

Table 4-3 SLA7800 Series Standard Restrictors

Size	Range SCCM Nitrogen Equivalent Flow*		Part Number	
	Low	High	ACLFE	Wire Mesh
D	8.038	11.38	S110Z275BMG	
G	22.05	31.23	S110Z278BMG	
J	43.23	61.21	S110Z280BMG	
M	118.6	167.9	S110Z283BMG	
P	232.5	329.3	S110Z285BMG	
Q	325.4	460.9	S110Z286BMG	
R	455.7	645.3	S110Z287BMG	
U	1250.	1771.	S110Z290BMG	
W	2451.	3471.	S110Z292BMG	
1	6724.	9523.		S110Z317BMG
3	13176.	30060.		S110Z226BMG
5	28500.	50000.		S110Z417BMG

*Materials: BMG = 316 Stainless Steel Electropolished

NOTES: • If two sizes are allowed because of overlap, select the larger size.
• Restrictor size not required to enter order.

Dansk

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Emne	**:**	**Tillæg til instruktions manual.**
Reference	**:**	**CE mærkning af Masse Flow udstyr**
Dato	**:**	**Januar-1996.**

Brooks Instrument har gennemført CE mærkning af elektronisk udstyr med succes, i henhold til regulativet om elektrisk støj (EMC direktivet 89/336/EEC).

Der skal dog gøres opmærksom på benyttelsen af signalkabler i forbindelse med CE mærkede udstyr.

Kvaliteten af signal kabler og stik:

Brooks lever kabler af høj kvalitet, der imødekommer specifikationerne til CE mærkning.

Hvis der anvendes andre kabel typer skal der benyttes et skærmet kabel med hel skærm med 100% dækning.

Forbindelses stikket type “D” eller “cirkulære”, skal være skærmet med metalhus og eventuelle PG-forskruninger skal enten være af metal eller metal skærmet.

Skærmen skal forbindes, i begge ender, til stikkets metalhus eller PG-forskruningen og have forbindelse over 360 grader.

Skærmen bør være forbundet til jord.

“Card Edge” stik er standard ikke af metal, der skal derfor ligeledes benyttes et skærmet kabel med hel skærm med 100% dækning.

Skærmen bør være forbundet til jord.

Forbindelse af stikket; venligst referer til vedlagte instruktions manual.

Med venlig hilsen,

Deutsch

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Subject	**:**	**Nachtrag zur Bedienungsanleitung.**
Referenz	**:**	**CE Zertifizierung für Massedurchflußgeräte**
Datum	**:**	**Januar-1996.**

Nach erfolgreichen Tests enstprechend den Vorschiften der Elektromagnetischen Verträglichkeit (EMC Richtlinie 89/336/EEC) erhalten die Brooks-Geräte (elektrische/elektronische Komponenten) das CE-Zeichen.

Bei der Auswahl der Verbindungskabel für CE-zertifizierte Geräte sind spezielle Anforderungen zu beachten.

Qualität der Verbindungskabel, Anschlußstecker und der Kabeldurchführungen

Die hochwertigen Qualitätskabel von Brooks entsprechen der Spezifikation der CE-Zertifizierung.

Bei Verwendung eigener Verbindungskabel sollten Sie darauf achten, daß eine

100 %igenSchirmababdeckung des Kabels gewährleistet ist.

“D” oder “Rund” -Verbindungsstecker sollten eine Abschirmung aus Metall besitzen.

Wenn möglich, sollten Kabeldurchführungen mit Anschlußmöglichkeiten für die Kabelabschrimung verwendet werden.

Die Abschirmung des Kabels ist auf beiden Seiten des Steckers oder der Kabeldurchführungen über den vollen Umfang von 360 ° anzuschließen.

Die Abschirmung ist mit dem Erdpotential zu verbinden.

Platinen-Steckverbindunger sind standardmäßige keine metallgeschirmten Verbindungen. Um die Anforderungen der CE-Zertifizierung zu erfüllen, sind Kabel mit einer 100 %igen Schirmababdeckung zu verwenden.

Die Abschirmung ist mit dem Erdpotential zu verbinden.

Die Belegung der Anschlußpins können Sie dem beigelegten Bedienungshandbuch entnehmen.

English

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Subject	**:**	**Addendum to the Instruction Manual.**
Reference	**:**	**CE certification of Mass Flow Equipment**
Date	**:**	**January-1996.**

The Brooks (electric/electronic) equipment bearing the CE mark has been successfully tested to the regulations of the Electro Magnetic Compatibility (EMC directive 89/336/EEC).

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 supplies 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 screen 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 a 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 a earth ground.

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

Español

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Asunto	**:**	**Addendum al Manual de Instrucciones.**
Referencia	**:**	**Certificación CE de los Equipos de Caudal Másico**
Fecha	**:**	**Enero-1996.**

Los equipos de Brooks (eléctricos/electrónicos) en relación con la marca CE han pasado satisfactoriamente las pruebas referentes a las regulaciones de Compatibilidad Electro magnética (EMC directiva 89/336/EEC).

Sin embargo se requiere una atención especial en el momento de seleccionar el cable de señal cuando se va a utilizar un equipo con marca CE.

Calidad del cable de señal, prensaestopas y conectores:

Brooks suministra cable(s) de alta calidad, que cumple las especificaciones de la certificación CE .

Si usted adquiere su propio cable de señal, debería usar un cable que esté completamente protegido en su conjunto con un apantallamiento del 100%.

Cuando utilice conectores del tipo “D” ó “Circular” deberían estar protegidos con una pantalla metálica. Cuando sea posible, se deberán utilizar prensaestopas metálicos provistos de abrazadera para la pantalla del cable.

La pantalla del cable deberá ser conectada al casquillo metálico ó prensa y protegida en ambos extremos completamente en los 360 Grados.

La pantalla deberá conectarse a tierra.

Los conectores estandar de tipo tarjeta (Card Edge) no son metálicos, los cables utilizados deberán ser protegidos con un apantallamiento del 100% para cumplir con la certificación CE.

La pantalla deberá conectarse a tierra.

Para ver la configuración de los pines: Por favor, consultar Manual de Instrucciones adjunto.

Français

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Sujet : Annexe au Manuel d'Instructions.
Référence : Certification CE des Débitmètres Massiques à Effet Thermique.
Date : Janvier 1996.

Messieurs,

Les équipements Brooks (électriques/électroniques) portant le label CE ont été testés avec succès selon les règles de la Compatibilité Electromagnétique (directive CEM 89/336/EEC).

Cependant, la plus grande attention doit être apportée en ce qui concerne la sélection du câble utilisé pour véhiculer le signal d'un appareil portant le label CE.

Qualité du câble, des presse-étoupes et des connecteurs:

Brooks fournit des câbles de haute qualité répondant aux spécifications de la certification CE.

Si vous approvisionnez vous-même ce câble, vous devez utiliser un câble blindé à 100 %.

Les connecteurs « D » ou de type « circulaire » doivent être reliés à la terre.

Si des presse-étoupes sont nécessaires, ceux ci doivent être métalliques avec mise à la terre.

Le blindage doit être raccordé aux connecteurs métalliques ou aux presse-étoupes sur le pourtour complet du câble, et à chacune de ses extrémités.

Tous les blindages doivent être reliés à la terre.

Les connecteurs de type « card edge » sont non métalliques. Les câbles utilisés doivent être blindés à 100% pour satisfaire à la réglementation CE.

Tous les blindages doivent être reliés à la terre.

Se référer au manuel d'instruction pour le raccordement des contacts.

Greek

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

α :Προσθήκη στο Εγχειρίδιο Οδηγιών.
ικά :Πιστοποίηση CE των Οργάνων Μέτρησης Παροχής Μάζας.
ρομηνία :Ιανουάριος - 1996

Κυρίες και Κύριοι,

Τα όργανα (ηλεκτρικά/ηλεκτρονικά) της Brooks τα οποία φέρουν το σήμα CE έχουν επιτυχώς ελεγχθεί σύμφωνα με τους κανονισμούς της Ηλεκτρο-Μαγνητικής Συμβατότητας (EMC ντιρεκτίβα 89/336/EEC).
Οπωσδήποτε χρειάζεται ειδική προσοχή κατά τήν επιλογή του καλωδίου μεταφοράς του σήματος το οποίο (καλώδιο) πρόκειται να χρησιμοποιηθεί με όργανα που φέρουν το σήμα CE.

Ιοιότητα του καλωδίου σήματος των στυπιοθλιπτών και των συνδέσμων .

Η Brooks κατά κανόνα προμηθεύει υψηλής ποιότητας καλώδια τα οποία πληρούν τις προδιαγραφές για πιστοποίηση CE.
Εάν η επιλογή του καλωδίου σήματος γίνει από σας πρέπει να χρησιμοποιήσετε καλώδιο το οποίο να φέρει εξωτερικά πλήρες πλέγμα και να παρέχει θωράκιση 100%.

Οι σύνδεσμοι τύπου "D" ή "Κυκλικοί" των καλωδίων, πρέπει να θωρακίζονται με μεταλλική θωράκιση. Εάν είναι εφαρμόσιμο, πρέπει να χρησιμοποιούνται μεταλλικοί στυπιοθλίπτες καλωδίων που να διαθέτουν ακροδέκτη σύνδεσης του πλέγματος του καλωδίου.
Το πλέγμα του καλωδίου πρέπει να συνδέεται στο μεταλλικό περίβλημα ή στον στυπιοθλίπτη και να θωρακίζεται και στα δύο άκρα κατά 360 μοίρες.
Η θωράκιση πρέπει να καταλήγει σε κάποιο ακροδέκτη γείωσης.

Οι σύνδεσμοι καρτών είναι μη-μεταλλικοί, τα καλώδια που χρησιμοποιούνται πρέπει να φέρουν πλέγμα θωράκισης 100% για να υπακούουν στην πιστοποίηση CE.
Η θωράκιση πρέπει να καταλήγει σε κάποιο ακροδέκτη γείωσης.

Για την διάταξη των ακροδεκτών: Παρακαλούμε αναφερθείτε στο εσώκλειστο εγχειρίδιο Οδηγιών.

Italiano

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Oggetto : Addendum al manuale di istruzioni.
Riferimento : Certificazione CE dei misuratori termici di portata in massa
Data : Gennaio 1996.

Questa strumentazione (elettrica ed elettronica) prodotta da Brooks Instrument, soggetta a marcatura CE, ha superato con successo le prove richieste dalla direttiva per la Compatibilità Elettomagnetica (Direttiva EMC 89/336/EEC).

E' richiesta comunque una speciale attenzione nella scelta dei cavi di segnale da usarsi con la strumentazione soggetta a marchio CE.

Qualità dei cavi di segnale e dei relativi connettori:

Brooks fornisce cavi di elevata qualità che soddisfano le specifiche richieste dalla certificazione CE. Se l'utente intende usare propri cavi, questi devono possedere una schermatura del 100%.

I connettori sia di tipo "D" che circolari devono possedere un guscio metallico. Se esiste un passacavo esso deve essere metallico e fornito di fissaggio per lo schermo del cavo.

Lo schermo del cavo deve essere collegato al guscio metallico in modo da schermarlo a 360° e questo vale per entrambe le estemità.

Lo schermo deve essere collegato ad un terminale di terra.

I connettori "Card Edge" sono normalmente non metallici. Il cavo impiegato deve comunque avere una schermatura del 100% per soddisfare la certificazione CE.

Lo schermo deve essere collegato ad un terminale di terra.

Per il corretto cablaggio dei terminali occorre fare riferimento agli schemi del manuale di istruzioni dello strumento.

Nederlands

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Onderwerp : Addendum voor Instructie Handboek
Referentie : CE certificering voor Mass Flow Meters & Controllers
Datum : Januari 1996

Dames en heren,

Alle CE gemarkeerde elektrische en elektronische produkten van Brooks Instrument zijn met succes getest en voldoen aan de wetgeving voor Electro Magnetische Compatibiliteit (EMC wetgeving volgens 89/336/EEC).

Speciale aandacht is echter vereist wanneer de signaalkabel gekozen wordt voor gebruik met CE gemarkeerde produkten.

Kwaliteit van de signaalkabel en kabelaansluitingen:

- Brooks levert standaard kabels met een hoge kwaliteit, welke voldoen aan de specificaties voor CE certificering.
  Indien men voorziet in een eigen signaalkabel, moet er gebruik gemaakt worden van een kabel die volledig is afgeschermd met een bedekkingsgraad van 100%.
- "D" of "ronde" kabelconnectoren moeten afgeschermd zijn met een metalen connector kap. Indien kabelwartels worden toegepast, moeten metalen kabelwartels worden gebruikt die het mogelijk maken het kabelscherm in te klemmen
  Het kabelscherm moet aan beide zijden over 360° met de metalen connectorkap, of wartel verbonden worden.
  Het scherm moet worden verbonden met aarde.
- "Card-edge" connectors zijn standaard niet-metallisch. De gebruikte kabels moeten volledig afgeschermd zijn met een bedekkingsgraad van 100% om te voldoen aan de CE certificering.
  Het scherm moet worden verbonden met aarde.

Voor pin-configuraties a.u.b. verwijzen wij naar het bijgesloten instruktie handboek.

Hoogachtend,

Norsk

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Vedrørende	**:**	**Vedlegg til håndbok**
Referanse	**:**	**CE sertifisering av utstyr for massestrømsmåling og regulering**
Dato	**:**	**Januar 1996**

Til den det angår

Brooks Instrument elektrisk og elektronisk utstyr påført CE-merket har gjennomgått og bestått prøver som beskrevet i EMC forskrift om elektromagnetisk immunitet, direktiv 89/336/EEC.

For å opprettholde denne klassifisering er det av stor viktighet at riktig kabel velges for tilkobling av det måletekniske utstyret.

Utførelse av signalkabel og tilhørende plugger:

· Brooks Instrument tilbyr levert med utstyret egnet kabel som møter de krav som stilles til CE-sertifisering.

· Dersom kunden selv velger kabel, må kabel med fullstendig, 100% skjerming av lederene benyttes.

"D" type og runde plugger og forbindelser må være utført med kappe i metall og kabelnipler må være utført i metall for jordet innfesting av skjermen. Skjermen i kabelen må tilknyttes metallet i pluggen eller nippelen i begge ender over 360°, tilkoblet elektrisk jord.

· Kort-kantkontakter er normalt utført i kunststoff. De tilhørende flatkabler må være utført med fullstendig, 100% skjerming som kobles til elektrisk jord på riktig pinne i pluggen, for å møte CE sertifiseringskrav.

For tilkobling av medleverte plugger, vennligst se håndboken som hører til utstyret.

Vennlig hilsen

Português

Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Assunto	**:**	**Adenda ao Manual de Instruções**
Referência	**:**	**Certificação CE do Equipamento de Fluxo de Massa**
Data	**:**	**Janeiro de 1996.**

O equipamento (eléctrico/electrónico) Brooks com a marca CE foi testado com êxito nos termos do regulamento da Compatibilidade Electromagnética (directiva CEM 89/336/EEC).

Todavia, ao seleccionar-se o cabo de sinal a utilizar com equipamento contendo a marca CE, será necessário ter uma atenção especial.

Qualidade do cabo de sinal, buchas de cabo e conectores:

A Brooks fornece cabo(s) de qualidade superior que cumprem os requesitos da certificação CE.

Se fornecerem o vosso próprio cabo de sinal, devem utilizar um cabo que, na sua totalidade, seja isolado com uma blindagem de 100%.

Os conectores tipo "D" ou "Circulares" devem ser blindados com uma blindagem metálica. Se tal for necessário, deve utilizar-se buchas metálicas de cabo para o isolamento do aperto do cabo.

O isolamento do cabo deve ser ligado à blindagem ou bucha metálica em ambas as extremidades em 360º.

A blindagem deve terminar com a ligação à massa.

Os conectores "Card Edge" não são, em geral, metálicos e os cabos utilizados devem ter um isolamento com blindagem a 100% nos termos da Certificação CE..

A blindagem deve terminar com ligação à massa.

Relativamente à configuração da cavilha, queiram consultar o Manual de Instruções.

Suomi
Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Asia **: Lisäys Käyttöohjeisiin**
Viite **: Massamäärämittareiden CE sertifiointi**
Päivämäärä **: Tammikuu 1996**

Brooksin CE merkillä varustetut sähköiset laitteet ovat läpäissyt EMC testit (direktiivi 89/336/EEC).
Erityistä huomiota on kuitenkin kiinnitettävä signaalikaapelin valintaan.

Signaalikaapelin, kaapelin läpiviennin ja liittimen laatu

Brooks toimittaa korkealaatuisia kaapeleita, jotka täyttävät CE sertifikaatin vaatimukset. Hankkiessaan signaalikaapelin itse, olisi hankittava 100%:sti suojattu kaapeli.

“D” tai “Circular” tyyppisen liitimen tulisi olla varustettu metallisuojalla. Mikälì mahdollista, tulisi käyttää metallisia kaapeliliittimiä kiinnitettäessä suojaa.

Kaapelin suoja tulisi olla liitetty metallisuojaan tai liittimeen molemmissa päissä 360°:n matkalta.

Suojan tulisi olla maadoitettu.

“Card Edge Connector”it ovat standarditoimituksina ei-metallisia. Kaapeleiden täytyy olla 100%: sesti suojattuja jotta ne olisivat CE sertifikaatin mukaisia.

Suoja on oltava maadoitettu.

Nastojen liittäminen; katso liitteenä oleva manuaali.

Ystävällisin terveisin,

Svensk
Brooks Instrument
407 West Vine St.
Hatfield, PA 19440
U.S.A.

Subject **: Addendum to the Instruction Manual**
Reference **: CE certification of Mass Flow Equipment**
Date **: January 1996**

Brooks (elektriska / elektronik) utrustning, som är CE-märkt, har testats och godkänts enligt gällande regler för elektromagnetisk kompabilitet (EMC direktiv 89/336/EEC).

Speciell hänsyn måste emellertid tas vid val av signalkabel som ska användas tillsammans med CE-märkt utrustning.

Kvalitet på signalkabel och anslutningskontakter:

Brooks levererar som standard, kablar av hög kvalitet som motsvarar de krav som ställs för CE-godkännande.

Om man använder en annan signalkabel ska kabeln i sin helhet vara skärmad till 100%. “D” eller “runda” typer av anslutningskontakter ska vara skärmade. Kabelgenomföringar ska vara av metall alternativt med metalliserad skärmning.

Kabelns skärm ska, i bada ändar, vara ansluten till kontakternas metallkåpor eller genomföringar med 360 graders skärmning.

Skärmen ska avslutas med en jordförbindelse.

Kortkontakter är som standard ej metalliserade, kablar som används måste vara 100% skarmade för att överensstämma med CE-certifieringen.

Skärmen ska avslutas med en jordförbindelse.

För elektrisk anslutning till kontaktstiften hänvisas till medföljande instruktionsmanual.

THIS PAGE WAS INTENTIONALLY LEFT BLANK

LIMITED WARRANTY

Seller warrants that the Goods manufactured by Seller will be free from defects in materials or workmanship under normal use and service and that the Software will execute the programming instructions provided by Seller until the expiration of the earlier of twelve (12) months from the date of initial installation or eighteen (18) months from the date of shipment by Seller. Products purchased by Seller from a third party for resale to Buyer ("Resale Products") shall carry only the warranty extended by the original manufacturer.
All replacements or repairs necessitated by inadequate preventive maintenance, or by normal wear and usage, or by fault of Buyer, or by unsuitable power sources or by attack or deterioration under unsuitable environmental conditions, or by abuse, accident, alteration, misuse, improper installation, modification, repair, storage or handling, or any other cause not the fault of Seller are not covered by this limited warranty, and shall be at Buyer's expense.
Goods repaired and parts replaced during the warranty period shall be in warranty for the remainder of the original warranty period or ninety (90) days, whichever is longer. This limited warranty is the only warranty made by Seller and can be amended only in a writing signed by an authorized representative of Seller.

BROOKS SERVICE AND SUPPORT

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required.
For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

CUSTOMER SEMINARS AND TRAINING

Brooks Instrument can provide customer seminars and dedicated training to engineers, end users and maintenance persons.

Please contact your nearest sales representative for more details.

HELP DESK

In case you need technical assistance:

Americas	☎ 1 888 554 FLOW
Europe	☎ +31 (0) 318 549 290
Asia	☎ +81 (0) 3 5633 7100

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

Brooks Instrument
407 West Vine Street
P.O. Box 903
Hatfield, PA 19440-0903 USA
T (215) 362 3700
F (215) 362 3745
E-Mail BrooksAm@BrooksInstrument.com
www.BrooksInstrument.com

Brooks Instrument
Neonstraat 3
6718 WX Ede, Netherlands
T +31 (0) 318 549 300
F +31 (0) 318 549 309
E-Mail BrooksEu@BrooksInstrument.com

Brooks Instrument
1-4-4 Kitasuna Koto-Ku
Tokyo, 136-0073 Japan
T +81 (0) 3 5633 7100
F +81 (0) 3 5633 7101
E-Mail BrooksAs@BrooksInstrument.com