

## Data Sheet

DS-TMF-5851EM-MFC-eng

October, 2008

# Brooks® Model 5851EM

## Metal Seal High Flow Mass Flow Controller



### GENERAL FEATURES

- High leak integrity (less than  $10^{-10}$  atm-cc/sec He)
- Electropolished wetted surfaces (optional)
- Enhanced process (5 Ra avg.) internal surface finish (optional)
- Normally closed valve (normally open valve optional)
- Particulate free
- High purity VAR 316L Stainless Steel
- High flow capability 100 slpm  $N_2$  (200 slpm  $H_2$ )
- Fast response to command changes
- Helium leak check ports
- Class 100 assembly and calibration
- Negligible flow overshoot/undershoot
- Insensitive to mounting attitude
- TTL compatible "valve off" function
- Electrically activated valve override
- Low command flow cutoff
- Available with all popular process connections
- 0(4)-20mA I/O, 24 Vdc power supply (optional)

## Brooks® Model 5851EM

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### DESCRIPTION

The Brooks® Model 5851EM Metal Seal Mass Flow Controller offers state of the art performance in high flow gas measurement and control. It combines the outstanding leak integrity of metal seals with a variety of options which allow maximum application flexibility. The heart of the Model 5851EM is the highly stable sensor which provides an electrical output signal linear with flow rate. This signal is used for indicating, recording and/or control purposes without the need for an auto-zero circuit.

### PRINCIPLE OF OPERATION

The operating principle of the Brooks Mass Flow Controller is thermodynamic. A precision power supply directs heat to the midpoint of the sensor tube carrying the flow. On the same tube equidistant upstream and downstream of the heat input, are resistance temperature measuring elements.

With no flow, the heat reaching each temperature element is equal. With increasing flow, the flowstream carries heat away from the upstream element, T1 and an increasing amount towards the downstream element T2. An increasing temperature difference develops between the two elements and this difference is proportional to the amount of gas flowing or the mass flow rate. A bridge circuit interprets the temperature difference and an amplifier provides the output to the control circuitry as well as a 0-5 Vdc output signal.

The control circuitry compares the command set-point to the flow signal and positions the precision solenoid control valve. When the command signal is below 1% of full scale, the control valve is positioned to fully closed. The control valve can be latched fully open or closed by activating the valve override circuit.

### SPECIFICATIONS

#### Performance Characteristics:

#### Flow Ranges

Any full scale flow from 10 slpm\* to 100 slpm nitrogen equivalent, up to 200 slpm H<sub>2</sub>. Higher H<sub>2</sub> flows possible, consult factory.

**\*Standard pressure and temperature in accordance with SEMI (Semiconductor Equipment and Materials International) standard 0°C and 101 kPa (760 Torr).**

#### Operating Conditions

**Power:** ±15 Vdc (±5%) at 350 mA dc, 10.5 watts

**Ambient Temperature:** 41 to 149°F (5-65°C)

**Pressure:** 1500 psig

**(PED) Pressure Equipment Directive (97/23/EC)**  
as Sound Engineering Practice (SEP)

**Differential Pressure:** 10 to 50 psid pressure drop (min. pressure drop depends on gas and range - consult factory)

**Accuracy:** ±1% full scale including linearity at calibrated conditions.

**Repeatability:** 0.25% of rate

**Settling Time:** Less than 3 seconds to within 2% full scale of final value for a 0-100% command step. Per SEMI Guideline E17-91.

**Particulate:** Zero particles per cubic foot greater than 0.1 micron under process conditions. Less than 1 particle per cubic foot greater than 0.02 microns under process conditions with enhanced processing.

**Control Range:** 50 to 1 (with elastomeric valve seat)

**Leak Integrity:** Inboard to outboard.  $1 \times 10^{-10}$  atm cc/sec He

#### Command Input

0 to 5 Vdc (200 k ohms input resistance)

#### Output Signals

0 to 5 Vdc (Maximum load 2 k ohms)

5 Volts ±0.2% Reference (max. load 2 k ohms)

#### Performance Sensitivities

##### Temperature Sensitivity:

Zero: Less than ±0.075% full scale per °C

Span: Less than ±1.0% full scale shift over 10-50°C range

**Pressure Sensitivity:** ±0.03% per psi up to 150 psig (N<sub>2</sub>)

##### Power Supply Sensitivity:

±0.09% full scale over total power supply voltage

±15 Vdc (±5%) at 350 mAdc

10.5 watts power consumption

**Mounting Attitude Sensitivity:** ±0.5% full scale max. deviation from specified accuracy after re-zeroing.

#### Physical Characteristics:

##### Materials of Construction

316L, 316L VAR (vacuum arc remelt) and high alloy ferritic stainless steel. external / internal seals: Nickel 200. Valve Seat: 316L, Viton® fluoroelastomers, Buna-N, Kalrez® or Teflon®.

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## Process Connections

Integrally welded to body —

Standard: 1/4" VCR™ with 0.250" bore

Optional: 1/2" ATW Tube Stub

3/8" - 1/2" VCR

1/2" ACLIT

## Electrical Characteristics:

### Electrical Connections

Card edge: 30 microinch gold flashing over low stress nickel-plated copper

D-Connector: DA 15 P

Dimensions: See Figure 1

EMC DIRECTIVE (89/336/EEC) per EN 61326.

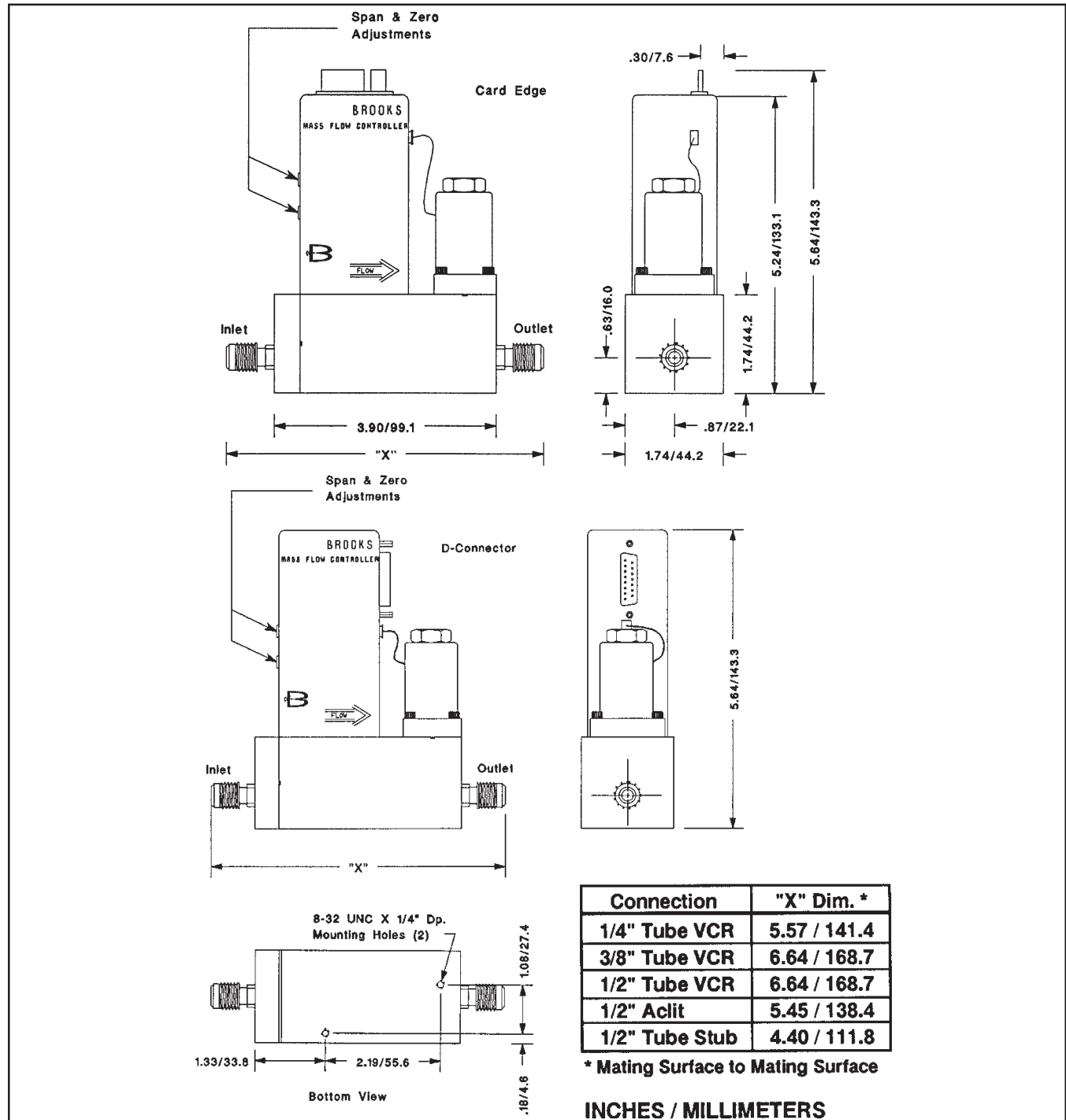


Figure 1 Dimensions

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### **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. The primary standard calibration equipment to calibrate our flow products is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit [www.BrooksInstrument.com](http://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  
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Due to Brooks Instrument's commitment to continuous improvement of our products, all specifications are subject to change without notice.

### **TRADEMARKS**

Brooks ..... Brooks Instrument, LLC  
Emerson ..... Emerson Electric Co.  
Kalrez ..... DuPont Dow Elastomers  
Teflon ..... E. I. DuPont de Nemours & Co.  
VCR ..... Cajon Co.  
Viton ..... DuPont Performance Elastomers



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