Design Specifications
DS-5964
November, 1998
(Supersedes issue dated January, 1994)

High Performance Metal Sealed Mass Flow Controller

- Electropolished wetted surfaces (optional)
- Enhanced process (5 Ra) internal finish
- All metal seals
- Particulate free
- High purity VAR 316L stainless steel
- Enhanced response to command changes
- Helium leak check ports
- Class 100 assembly and calibration
- High leak integrity (less than 10^{-11} atm-cc/sec He)
- Normally Closed Valve (Normally Open Valve optional)
- Wide flow range (0.06 sccm through 30,000 sccm N_2)
- Insensitive to mounting attitude
- Electrically activated valve override
- Low command flow cutoff
- TTL compatible "valve off" and purge function
- Available with all popular process connections
- Downport C-Seal (optional)

Model 5964 Mass Flow Controller with Card Edge

Model 5964 Downported Mass Flow Controller with Card Edge

DESCRIPTION

The Brooks® Model 5964 Metal Sealed Mass Flow Controller offers state of the art performance in gas flow measurement and control. It combines the outstanding leak integrity of metal seals, ultraclean internal surface finish (5 Ra) for particulate-free delivery and enhanced response for rapid process applications. A leader in its class, the Brooks Model 5900 Series MFC's redefine Ultra Clean Performance by providing molecular contamination levels which are less than half the industry standard. The superior design also allows for very rapid gas changeover. All of this makes the Model 5964 the best solution for even the most challenging application.

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 fully closed. The control valve can be latched fully open or closed by activating the valve override circuit.

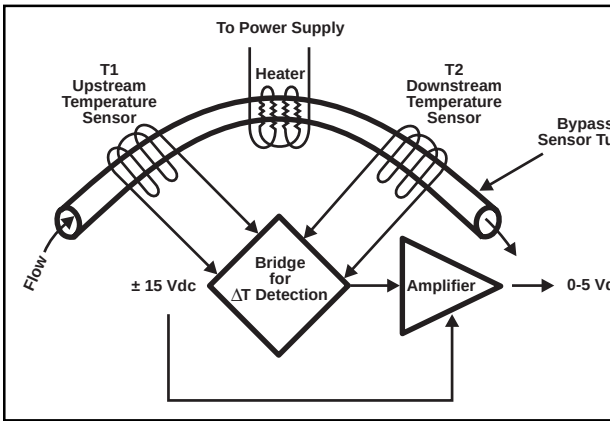


Figure 1 Principle of Operation

SPECIFICATIONS

⚠ 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.

PERFORMANCE CHARACTERISTICS:

Flow Ranges*
Any range from 0 to 3 sccm to 0-30,000 sccm Nitrogen equivalent.
***Standard: 0°C and 101 kPa (760 Torr). Per SEMI Guideline E12-96. For full scale flow rates greater than 50 sccm Nitrogen equivalent.**

Control Range
2-100% with elastomeric valve seat
3-100% with metal valve seat

Accuracy
±1% Full Scale including linearity at calibrated conditions.
±1.5 Full Scale including linearity for flow ranges greater than 20 slpm.

Particulate
Zero particles per cubic foot greater than 0.1 microns under process conditions. Less than 4 particles per cubic foot greater than 0.02 microns under process conditions.

Repeatability
0.25% of rate

Settling Time
Less than 1 second to within 2% full scale of final value for a 0-100% command step. Per SEMI Guideline E17-91.

Mounting Attitude Sensitivity
±0.5% full scale maximum deviation from specified accuracy after rezeroing

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
±0.008% per psi up to 150 psig (N_2)

RATINGS:

Operating Pressure
1,500 psig; 150 psig maximum recommended pressure for enhanced response performance; 5-50 psid pressure drop (minimum pressure drop depend on gas and range: consult factory)

Leak Integrity
Inboard to outboard 1 x 10^{-11} atm. cc/sec. Helium max.

PHYSICAL:
Materials of Construction
316L, 316L VAR (Vacuum Arc Remelt) and high alloy ferritic stainless steel.
External seals: Nickel Plated SS, Nickel.
Internal seals: Nickel.
Valve Seat: 316L, Viton®, Buna-N, Kalrez® or Teflon®.

Dimensions
Refer to Figures 1 and 2

Process Connections
1/4" Male VCR™
Downport C-Seal

ELECTRICAL CHARACTERISTICS:
Electrical Connections
Card edge: 30 microinch gold flashing over low stress nickel-plated copper or 15 Pin D-Connector (DA-15P)

Command Input
0-5 Vdc (200 k ohms input resistance)

Output Signal
0 to 5 Vdc (2,000 ohm or greater load)

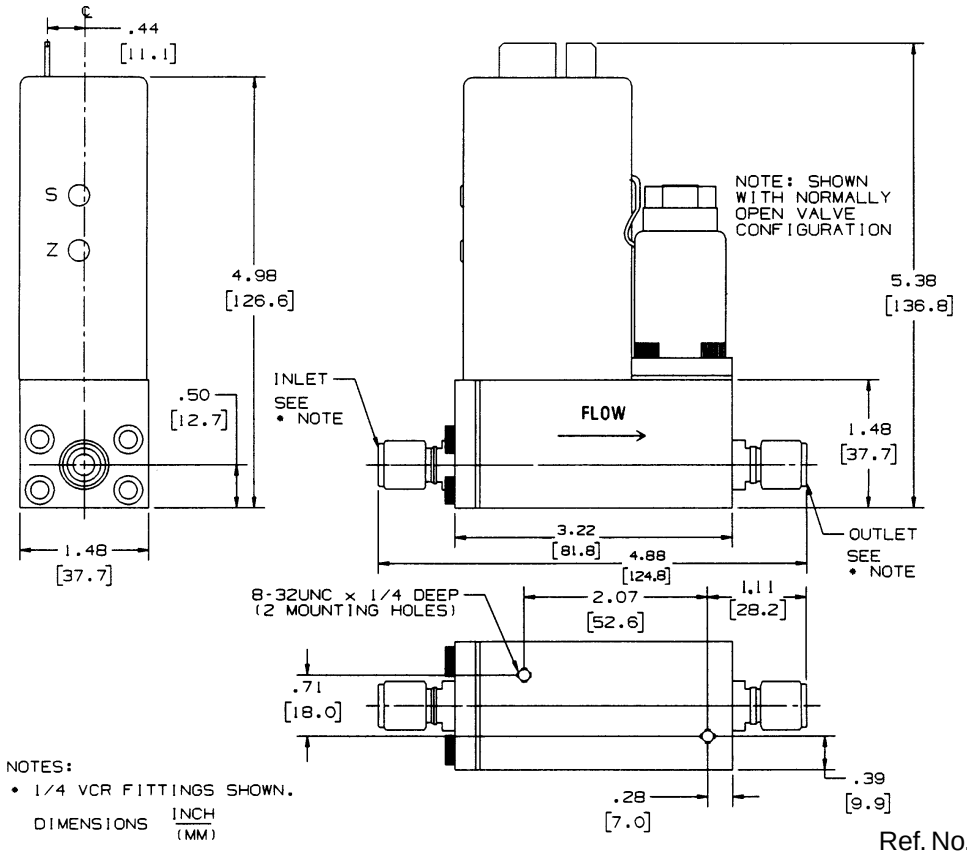
5 Volt Reference Output
5 Volts ±0.2 (±0.01 Vdc) maximum load 2 k ohms
±0.09% full scale per 1% power supply voltage variation

Power Requirements
N.C. Valve (or N.O. Valve with flow less than 2.5 slpm): 3.25 Watts max., +15 Vdc @ 35 mA -15 Vdc @ 180 mA
N.O. Valve with flow rate greater than 2.5 slpm: 10.5 Watts max., +15 Vdc @ 350 mA, -15 Vdc @ 350 mA

Power Supply Sensitivity
±0.09% full scale per 1% power supply voltage variation

Specifications Subject to Change Without Notice

Tubing Connections



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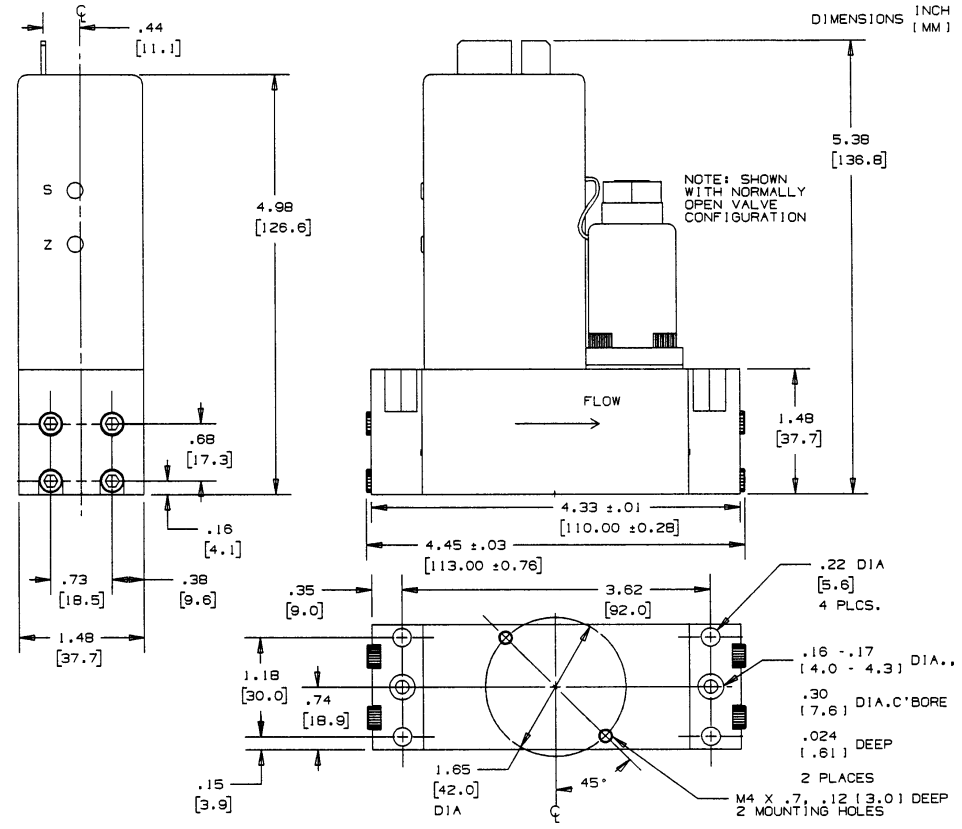

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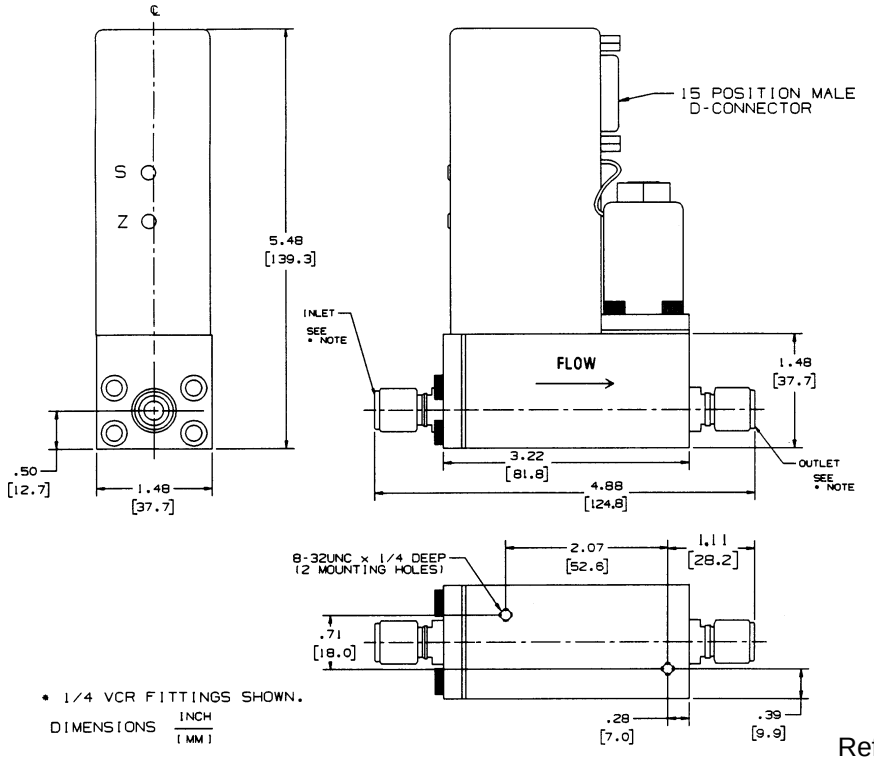
Figure 1 Model 5964 Card Edge Dimensions

Tubing Connections



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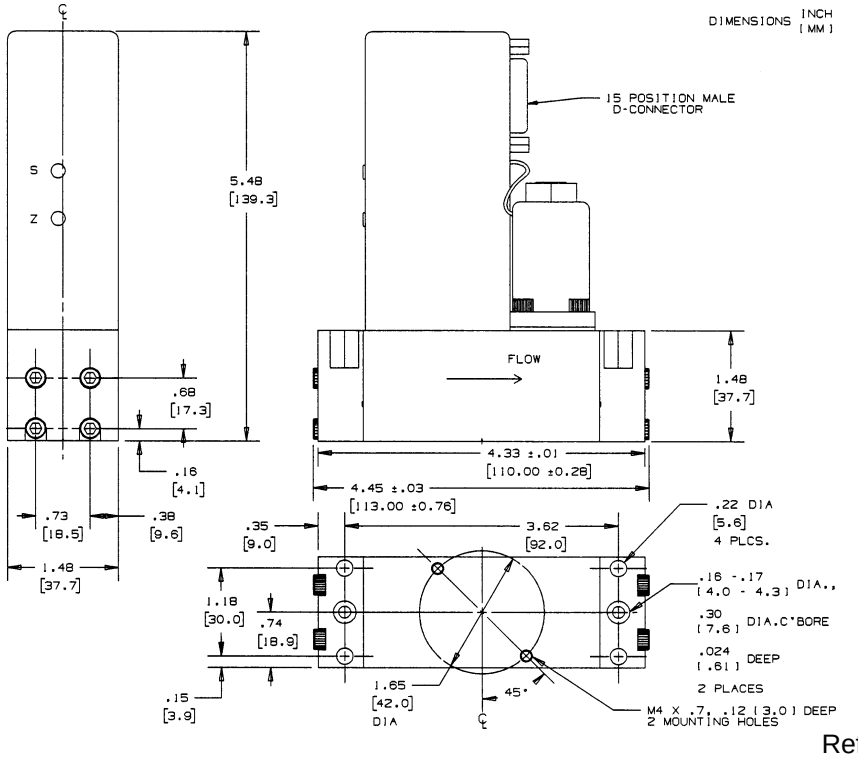

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Figure 2 Model 5964 D-Connector Dimensions

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