

Model 6256S

Brooks Smart Metal Sealed / Ultra High Purity Digital Mass Flow Meter and Controller



Brooks Smart Digital Mass Flow Controller

Benefits:

- Compact design, provides mass flow measurement and control of gases from 3 sccm to 30 slpm full scale N₂ equivalent.
- High accuracy, repeatability and immunity to temperature changes delivers improved process performance.
- Provided with proprietary adaptive valve control algorithm to ensure fast response and stable control of gas flow under varying process conditions.
- Long term reliability and negligible zero drift ensures reliable measurement and control.
- Available with PROFIBUS-DP communication protocol or Analog I/O's. Analog I/O's or digital communication via RS-232 or RS-485.
- Tens of thousands of Brooks Smart Mass Flow Meters and Controllers have been installed and are operating successfully in a variety of industries under various process conditions, throughout the world.
- Designed, developed, manufactured and supplied by the first ISO-9001 Quality Certified Process Control company in the world: Brooks Instrument.

Brooks Instrument

INTRODUCTION

Brooks Instrument expands the capability and functionality of their successful Smart Mass Flow Products to include a metal sealed, Ultra High Purity instrument.

This new breed of mass flow controller is available with analog, digital, RS-232, RS-485 or PROFIBUS-DP communication interface protocols.

Brooks Proprietary Adaptive Valve Control makes these Smart Mass Flow Products virtually insensitive to process interference. The Adaptive Valve Control algorithm ensures unrivalled performance and fast control, under varying process conditions.

Brooks' commitment to continuous improvement in safety standards and application flexibility, has resulted in a product that offers industry leading performance. Brooks Instrument continues to excel in performance, features, reliability, serviceability and quality.

FIELD PROVEN PERFORMANCE AND RELIABILITY

- Accuracy: $\pm 0.7\%$ of rate plus $\pm 0.2\%$ F.S. (at calibration conditions).
- Metal seals for outstanding leak integrity and cleanliness with a surface finish better than or (less than) $5\ \mu\text{inch Ra}$.
- Microprocessor-based, Smart electronics.
- Robust Adaptive Valve Control provides rapid response to varying process conditions.
- Analog I/O or digital communication;
RS-232 point-to-point transmission
RS-485 multi-point interconnection
PROFIBUS-DP
- Continuous self-diagnostics
- CE certified.
- More than 30,000 installed & operational worldwide.

FLEXIBILITY

- Designed for easy installation.
- Wide range power supply.
- Selectable analog input/output signals.
- Totalizer function.
- Configuration pin compatible with the Brooks "E" and "I" series.
- Digital communication up to 38k Baud transmission speed selectable for RS-232 or RS-485.
- Self diagnostics and alarm functions via hardware and/or software.
- Up to ten (10) sets of programmable calibration curves.
- Wide flow & pressure range.

PERFORMANCE

RS-485 or RS-232, digital communication provides access to all of the Smart DMFC's functions:

- Detailed information about the Brooks Smart Mass Flow products, provided with PROFIBUS-DP communication.
Profibus Instruction Manual: 541-C-062-AAG
- Accurate Mass Flow measurement and setpoint regulation (controller only), as a percentage or in selectable engineering units.
- Flow totalizer.
- Temperature.
- Operational settings
 - ⇒ Calibration (storage of up to 10 cal. curves)
 - ⇒ PID control setting
 - fast response
 - 'traditional' soft start
 - linear ramp-up/down characteristic
 - adaptive valve control
 - ⇒ Adaptive filtering for signal flow component
- Alarms
 - ⇒ Self-diagnostic
 - EEPROM error
 - database error
 - analogue output error
 - ⇒ Out-of-range indications for
 - setpoint
 - flow
 - valve
 - analog output
 - ⇒ Environmental errors
 - no gas flow detected
 - power supply outside spec. range
 - ambient temp. outside spec. range
 - high and low flow alarms

SERVICEABILITY

The Brooks Smart Mass Flow Meters and Controllers perform continuous self diagnostic routines that immediately identify any anomalous performance in the device, process or environment. Both process and environmental variables are continuously monitored. Alarm situations can be visualized on a computer screen (via digital communication) by utilizing Brooks Model 0160 configuration and user Interface Program.

BROOKS SMART MASS FLOW CONTROLLERS FAST RESPONSE PERFORMANCE

The curves in Figure 1 depict the Mass Flow Controller output signal and actual transitional flow to steady-state when gas flow enters into a process chamber, under a step response command condition.

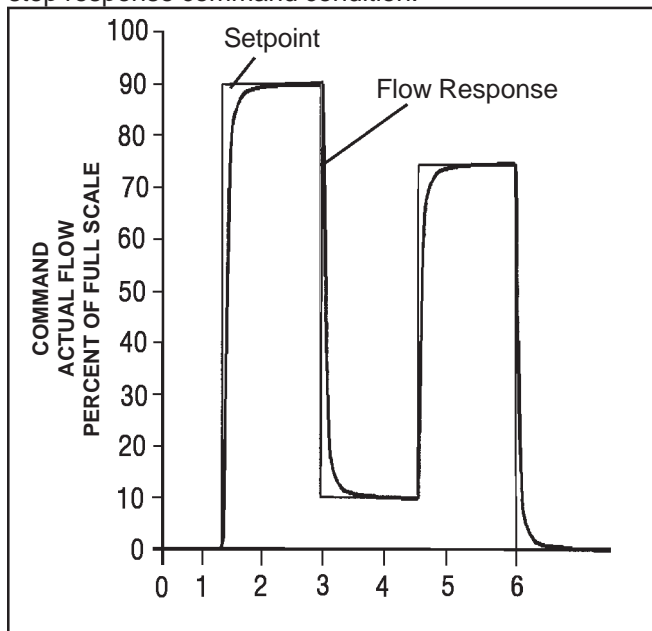


Figure 1 The Response Performance of the Brooks Smart Mass Flow Controllers

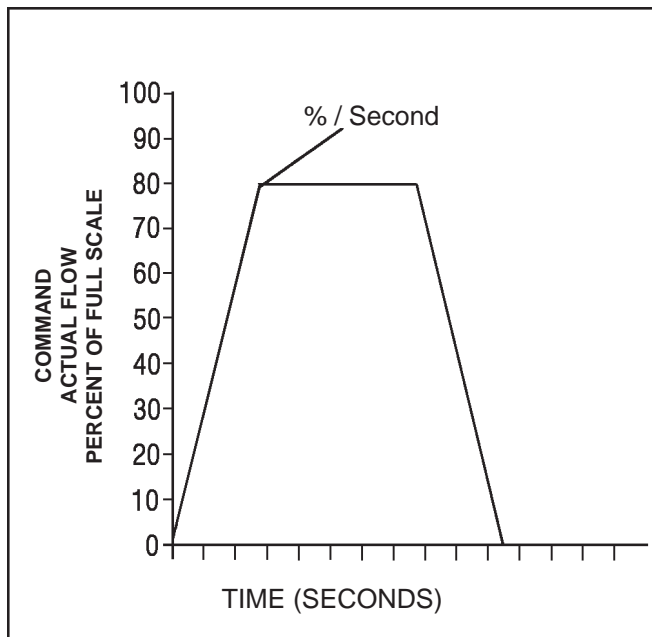


Figure 2: Linear ramp-up and/or ramp-down from 200% per second down to 0.5% per second setpoint change

SELECTABLE SOFT START

Processes requiring injection of gases can be adversely affected by excessive initial gas flow.

This abrupt injection of gas can result in process damage from explosion or initial pressure impact.

These problems are virtually eliminated with the soft start feature.

Traditional soft start or linear ramp up and/or ramp down (See Figure 2) can be factory selected or are selectable via the User Interface.

Linear ramping is adjustable from 200% per second down to 0.5% per second setpoint change. Ramping may be specified at ordering or it is selectable via the User Interface.

PERFORMANCE 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.

Flow Accuracy $\pm 0.7\%$ of rate plus $\pm 0.2\%$ F.S at calibration conditions

Repeatability $\pm 0.25\%$ of rate

Rangeability 50:1 with elastomer valve seat.
(within specified accuracy)
33:1 with metal valve seat.
(within specified accuracy)

Stability Less than $\pm 0.5\%$ of rate per year

Temperature Effect Less than 0.015% / $^{\circ}\text{C}$ of rate shift from original calibration over $0-70^{\circ}\text{C}$

PHYSICAL SPECIFICATIONS

Process Wetted Parts:

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

Mechanical Connections Standard 1/4" VCR.
Optional: C-seal downport.
(Semi spec. 2787.1 4/98)
CS-seal downport.
(Semi spec. 2787.5 4/98)

(Physical Specifications Continued)

Electrical Connections Standard 15-pin D-type connector with (goldplated contacts)

Optional CardEdge adapter or PROFIBUS-DP 9-pin D-type

SPECIFICATIONS

Certification CE certified
Optional use in Zone 2 environment according to the NEN 3410 and NEN-EN 50014.
To be specified at ordering.

Maximum Operating Pressure - 1500 psig (103 bar)

Max. Inlet Pressure 150 psig (10.35 bar)
Recommended for optimum performance

Max. Pressure drop 50 psid (3.45 bar)

Min. Pressure drop 5 psid (0.34 bar)

(Min. Pressure drop depends on gas and range: consult factory).

Setpoint Input*

Voltage: 0 - 5 Vdc or
1 - 5 Vdc input impedance
> 2000 Ohm minimum
or:
0 - 20 mA or 4 - 20 mA
250 Ohm impedance

Analog* Outputs

Voltage: 0 - 5 Vdc or into
1 - 5 Vdc 2000 Ohm min.
and:
0 - 20 mA or 4 - 20 mA
Max. loop resistance 375 Ohm

Alarm (TTL) Open Collector Output, signal grounded when activated. Max. 30 Vdc, 25 mA. or via communication port, when used digitally

Digital*

Communication RS-232 or RS-485
Baudrate 1200, 2400, 3600, 4800, 7200, 9600, 19k2, 38k4**
(Default: RS-232, Baudrate 9600)
PROFIBUS-DP:
Up to 12 Mbit/sec (Self selecting)

Power Supply Mass Flow Meters + 24 Vdc ($\pm 10\%$) @ 90 mA
or
+ 15 Vdc ($\pm 5\%$) @ 90 mA

Power Supply Mass Flow Controllers + 24 Vdc ($\pm 10\%$) @ 370 mA
or
+ 15 Vdc ($\pm 10\%$) @ 285 mA

Temperature Both amb. and process gas:
0-70 °C.

Leak Integrity Inboard to Outboard: 1×10^{-11} atm.
scc/sec. He max.

Security If self-diagnostics detect a failure, the alarm mode will be activated (Open Collector Output via the connector).

Warm up time < 10 minutes; 1% F.S. accuracy.
Performance within specifications:
45 minutes.

Damping Damping from 0 to 10 seconds is possible for the analog flowrate output signal(s).
(default 0.5 seconds)

Response Standard response of the flow output signal < 1 sec.

Settling Time Standard < 1 sec. (to within 2% full scale of final value) for any command and setpoint step.

AVAILABLE OPTIONS

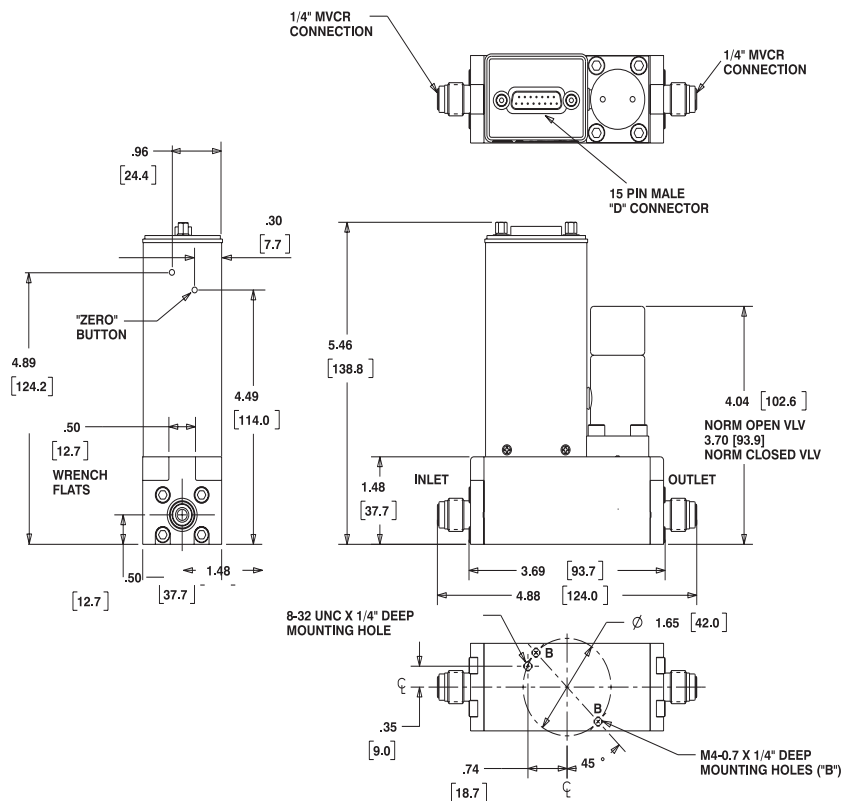
- The Brooks Smart Mass Flow Meters and Controllers (DMFC) are available with analog I/O setting. Brooks' Model 0152/0154 Secondary Control Electronics offers power supply, read out and control independently or in blending mode.
Ask for Design Specifications, DS-0152/0154.
- The Smart DDE, Model 0162 is a Dynamic Data Exchange software from Brooks Instrument. DDE allows you to make bidirectional links between your Windows-based applications and the Brooks Smart Mass Flow Products.
Ask for Design Specifications, DS-0162-E.
- Configuration and user interface program, Model 0160.
Ask for Design Specifications, DS-0160.

* Factory Selectable: To be specified at ordering.

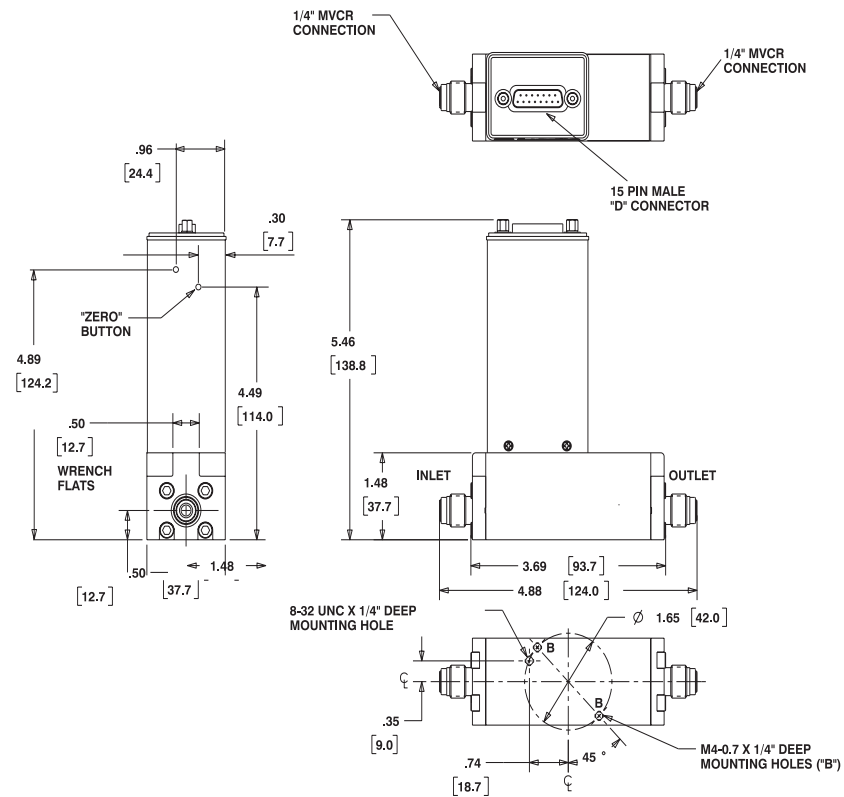
** Not possible for use with Brooks Smart Software

TRADEMARKS

Brooks Brooks Instrument Division, Emerson Electric Co.
Kalrez DuPont Dow Elastomers.
PROFIBUS PROFIBUS International
VCR Cajon Co.
Viton DuPont Dow Elastomers



**Figure 1 Model 6256S - Smart Mass Flow Controller,
1/4" VCR Connections**



**Figure 2 Model 6256S - Smart Mass Flow Meter,
1/4" VCR Connections**

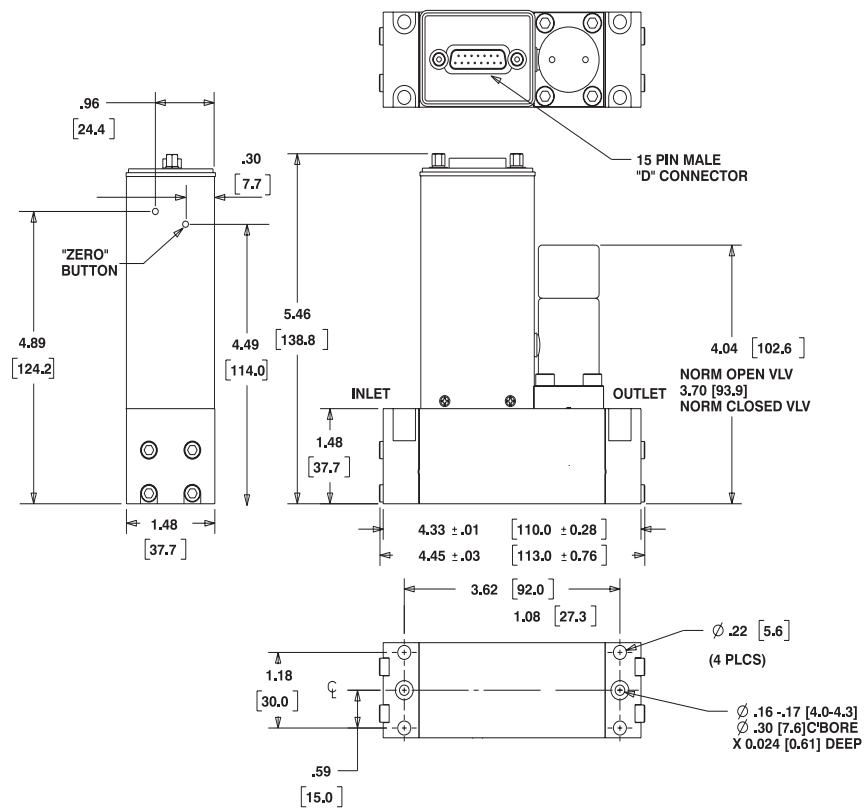


Figure 3 Model 6256S - Smart Mass Flow Controller,
Downport Connections

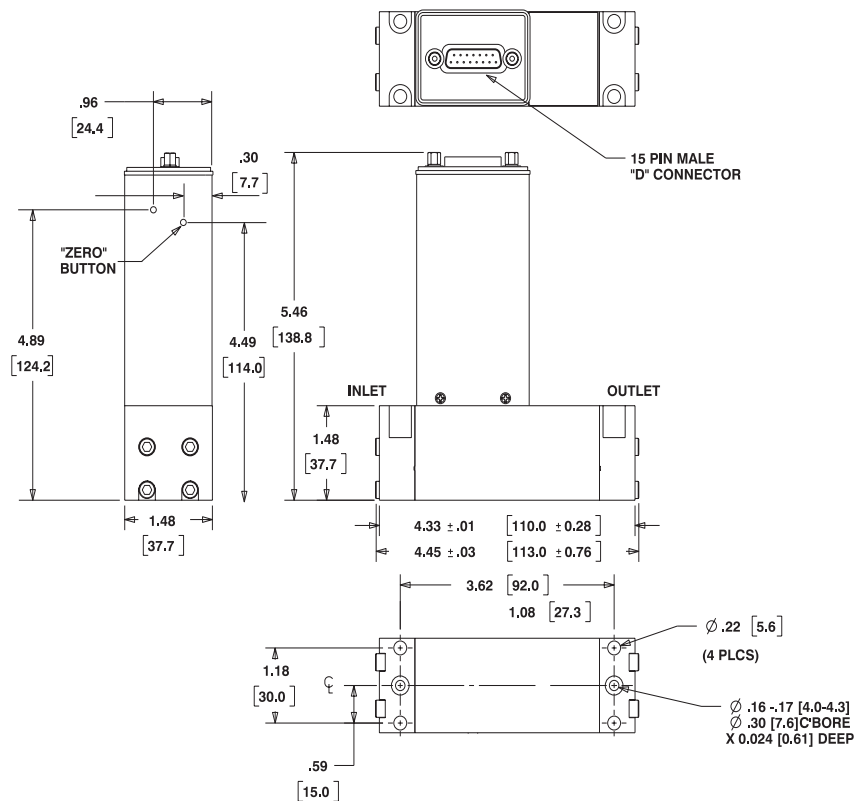


Figure 4 Model 6256S - Smart Mass Flow Meter,
Downport Connections



Specifications Subject to Change Without Notice

Brooks Instrument

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