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Find the *Brooks Instrument SLA6850V1EGB1A2A1* at our website: *Click HERE*

**Data Sheet**
DS-TMF-SLA6800-MFC-eng
August, 2009

# Brooks® Delta Class Metal-Sealed Mass Flow Controllers and Meters Models SLA6850/51 to SLA6860-61

**General Features:**

- All-Metal seals, High leak integrity (less than $1x10^{-10}$ atm-cc/sec He)
- Industry leading sensor stability. Long term drift performance of < 0.2% per year. Increasing tool throughput by reducing maintenance and eliminating periodic recipe adjustment.
- Accuracy: ±1% of rate or (setpoint) including linearity.
- TruCal™ (option) process gas calibration available for a variety of gases. TruCal reduces measurement errors that result from the property differences between process gases and surrogate calibration gases, resulting in superior accuracy and performance!
- Digital software can store 10 selectable calibration and flow ranges. Spares inventories are reduced by limiting the number of individual MFCs required, lowering inventory holding costs.




**Control Response:**

- Settling Time of less than 800ms for all step changes.
- Proprietary Adaptive Valve Control algorithm assure that unexpected variations in process conditions do not cause flow to deviate from setpoint.
- Insensitive to mounting attitude

**Analog I/O:**

- 15-pin
- 0-5 Volt setpoint and flow signals
- Single sided +15 Volt DC power supply
- Separate ‘valve-override’ signal
- Compatible with Brooks' Model 0150 series secondary electronics

**DeviceNet™ Communication Option:**

- Easy Commissioning and Reduced System Wiring
- Accessibility of sensor, valve, calibration, tuning, diagnostic, and other internal data, to support fast commissioning and streamlining of controller insitu preventive maintenance.
- MAC-ID, Baudrate rotary switches, and two bi-color status LEDs - to ease setup and addressing as well as status confirmation.
- Standard Device-Profile, ODVA certified Semiconductor-SIG certified
- Capable of: Polled, Bit-Strobe, Cyclic, & Change-of-State messaging.



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Model SLA6860D
EM Series Digital I/O
DeviceNet, MFM

## DESCRIPTION

Brooks Instrument's Delta Class EM Series metal sealed thermal mass flow measurement and control product line offers unparalleled flexibility and performance. Our latest EM-family combines the benefits of the superior accuracy of the TruCal™ process gas calibration system with the rapid settling time achieved with Brooks' proprietary Adaptive Valve Control algorithm. The result is the most accurate, repeatable, and responsive controller on the market today!

Brooks now offers control interface with DeviceNet™, a high-speed (up to 500k baud) digital communication network adopted by the Semiconductor industry. Brooks' communications capabilities and device-profile have been certified by the ODVA (Open DeviceNet Vendors' Association). Other network protocols are in development. Talk to your Brooks representative about your specific needs.

The MFC's microprocessor uses a multi-point calibration curve, to deal with residual sensor non-linearity, yielding a highly accurate process signal. The microprocessor then executes Brooks' proprietary Adaptive Valve Control algorithm to rapidly adjust the valve actuation to match setpoint.

Process data and commands may be 'wired' using either traditional 5 volt analog connections or digital communications networks, the measurement and control performance is the same!

The SLA6800 family of products takes advantage of modular design in both mechanical and electrical construction. This modularity allows for simplified customer ordering and factory configuration, enabling Brooks to more easily meet the ever changing needs of our global customers. Brooks' production flexibility translates into reduced lead times for our customers. This flexibility allows for the efficient production of products using both traditional analog connections or leading edge network-communications protocols.

The SLA6800 series of controllers can directly replace existing analog products bringing with them greatly improved accuracy, utilizing multiple-point calibrations. Brooks' patented TruCal process is also available, in either analog or digital modes, reducing measurement errors resulting from property differences between process gases and the calibration gas. Analog and digital applications will see settling time improvements with an insensitivity to varying process conditions, due to Brooks' proprietary Adaptive Valve Control algorithm.

### Analog I/O Pin Connections:

| Signal: | 15-pin D-conn |
|---|---|
| Setpoint/Command Common | **1** |
| Flow/Signal Out | **2** |
| +15 Vdc Power | **5** |
| Setpoint/Command In | **8** |
| Power Supply Common | **9** |
| Output Signal Common | **10** |
| +5 Vdc Reference | **11** |
| Valve Override | **12** |
| Calibration Select Pin | **13** |
| Chassis Ground | **14** |
| no-connections | **3, 4, 6, 7, 15** |

Dotted line = Setpoint
Black line = Flow Output
White line = LFE Flow

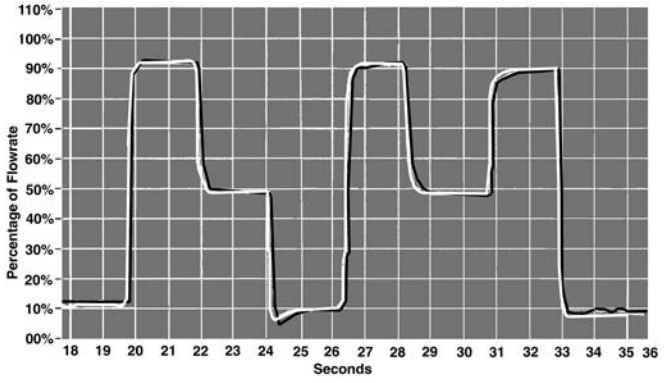



*Figure 1 Response Chart*



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## PERFORMANCE CHARACTERISTICS:

### Flow Ranges**
Models SLA6850 & SLA6860
Any range from 0-3 sccm to 0-30,000 sccm $N_2$ eq.
Models SLA6851 & SLA6861
Any range from 20-100 slpm $N_2$ eq.
Up to 200 slpm $H_2$ flows possible (consult factory)
****Standard: 0° and 101kPa (760 Torr). Per SEMI Guideline E12-96. For full scale flow rates greater than 50 sccm Nitrogen equivalent.**

### Control Range
(50:1) - elastomeric valve seat
(33:1) - metal valve seat

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

### Repeatability
±0.20% of rate

### Temperature Sensitivity
Zero: Less than 0.075% F.S. per °C
Span: Less than ±1% F.S. shift over 10-50°C range

### Settling Time
Actual flow:
Less than 800 ms to within ±2% full scale of final value for a 0-100% step per SEMI Guideline E17-91.
(See Figure 1)

## RATINGS:
### Operating Pressure
1500 psig maximum
150 psi (10.35 bar) maximum operating pressure recommended for optimal performance

### Pressure Differential Range
Model SLA6850
5-50 psid (3.45 bar max.)
Model SLA6851
10-50 psid (3.45 bar max.)
Minimum and Maximum pressure drop depends on gas and full scale flow rate (consult factory)

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

### Ambient Temperature Limits
Operating: 0°C to 60°C (32°F to 140°F)
Non-Operating: -25°C to 100°C (-13°F to 212°F)

### Fluid Temperature Limits
0°C to 65°C (32°F to 149°F)

## PHYSICAL:
### Materials of Construction
316L Vacuum Arc Remelt (VAR), 316L, and high-alloy ferritic stainless steel.
External/internal seals: Nickel
Valve seat: 316L stainless steel - standard
Internal Wetted Surface Finish: 32 Ra

### Outline Dimensions
Refer to Figures 2-7.

### Process Connections
1/4" male VCR™
CS Seal (SEMI spec. 2787.5 4/98)
C Seal (SEMI spec. 2787.1 4/98)

## ELECTRICAL CHARACTERISTICS:

### Electrical Connections
Analog I/O option: 15-pin, male
Digital I/O DeviceNet option: 5-pin Micro-Connector male,

### Power Supply Voltage
Analog I/O option: +15 Vdc, ±5%
(traditional -15 Vdc pin is ignored)
Digital I/O DeviceNet option: nominal = 11-25 Vdc

| Power Requirements | Watts, typ. | Watts, max. |
|---|---|---|
| Analog I/O option, no valve: | 1.35 | 1.8 |
| Analog I/O option, with valve: | 2.6 | 4.0 |
| Digital I/O DeviceNet option, no valve: | 1.62 | 3.8 |
| Digital I/O DeviceNet option, with valve: | 4.9 | 7.6 |

### Setpoint Input (Analog I/O option only)
0-5 Vdc: Input will accept signals to 5.5 Vdc (110% F.S.).
Input resistance: 360K ohm min.

### Flow Output (Analog I/O option only)
0-5 Vdc into 2K ohm minimum load.
Output will indicate process variable up to 6 Vdc (120% F.S.).

### Valve Override Signal (Analog I/O option only)
Left floating/unconnected – instrument controls valve to command setpoint
Connected to signal at or above 5.0 Volts
– valve is forced open
Connected to signal at or below 0.0 Volts
– valve is forced closed

### 5 Volt Reference Signal (Analog I/O option & 15 PIN only)
For use with potentiometer command setpoint input ±0.2%, into 1K ohm (minimum load)

### Calibration-Select Signal (15 Pin Only)
Select one of ten gases and P.I.D. tuning settings in analog mode.



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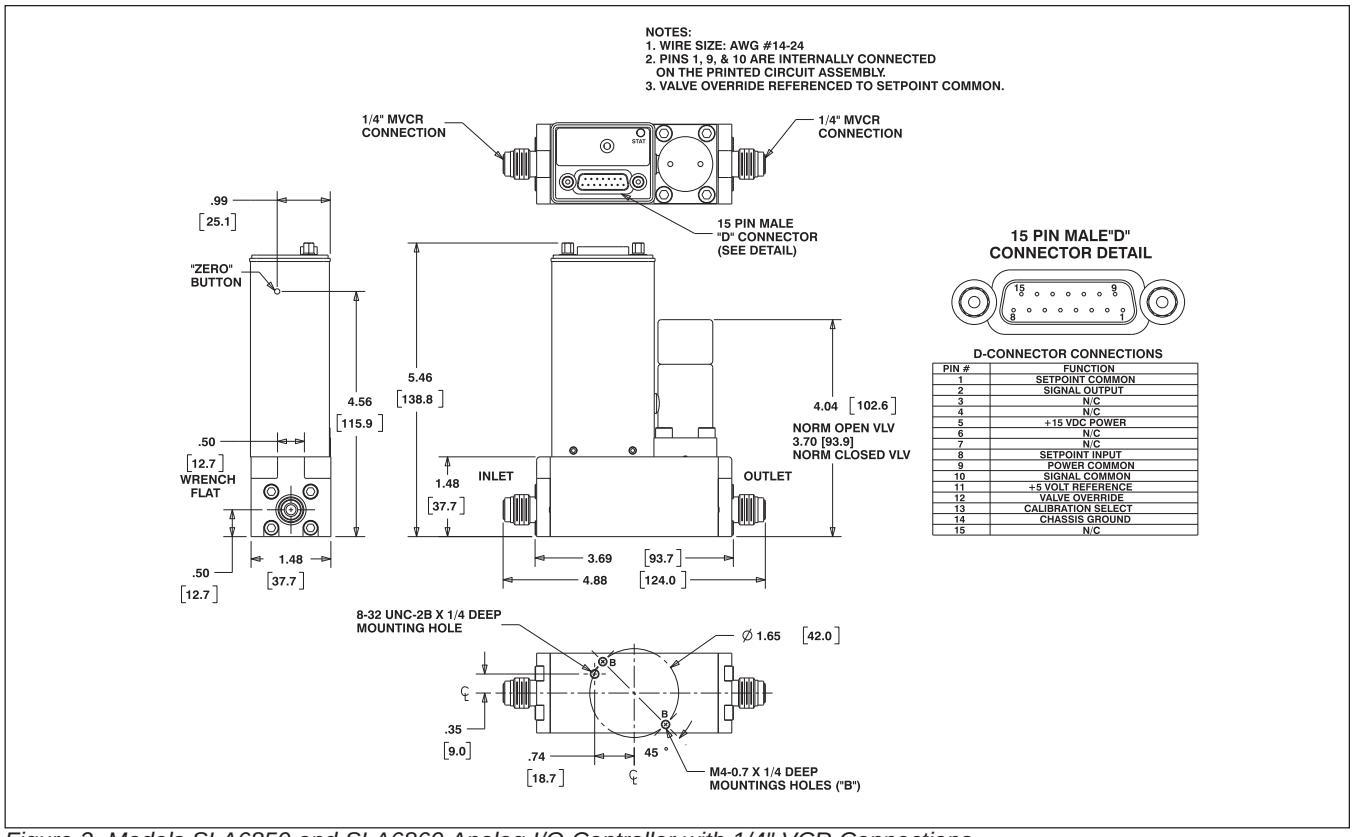



*Figure 2 Models SLA6850 and SLA6860 Analog I/O Controller with 1/4" VCR Connections*

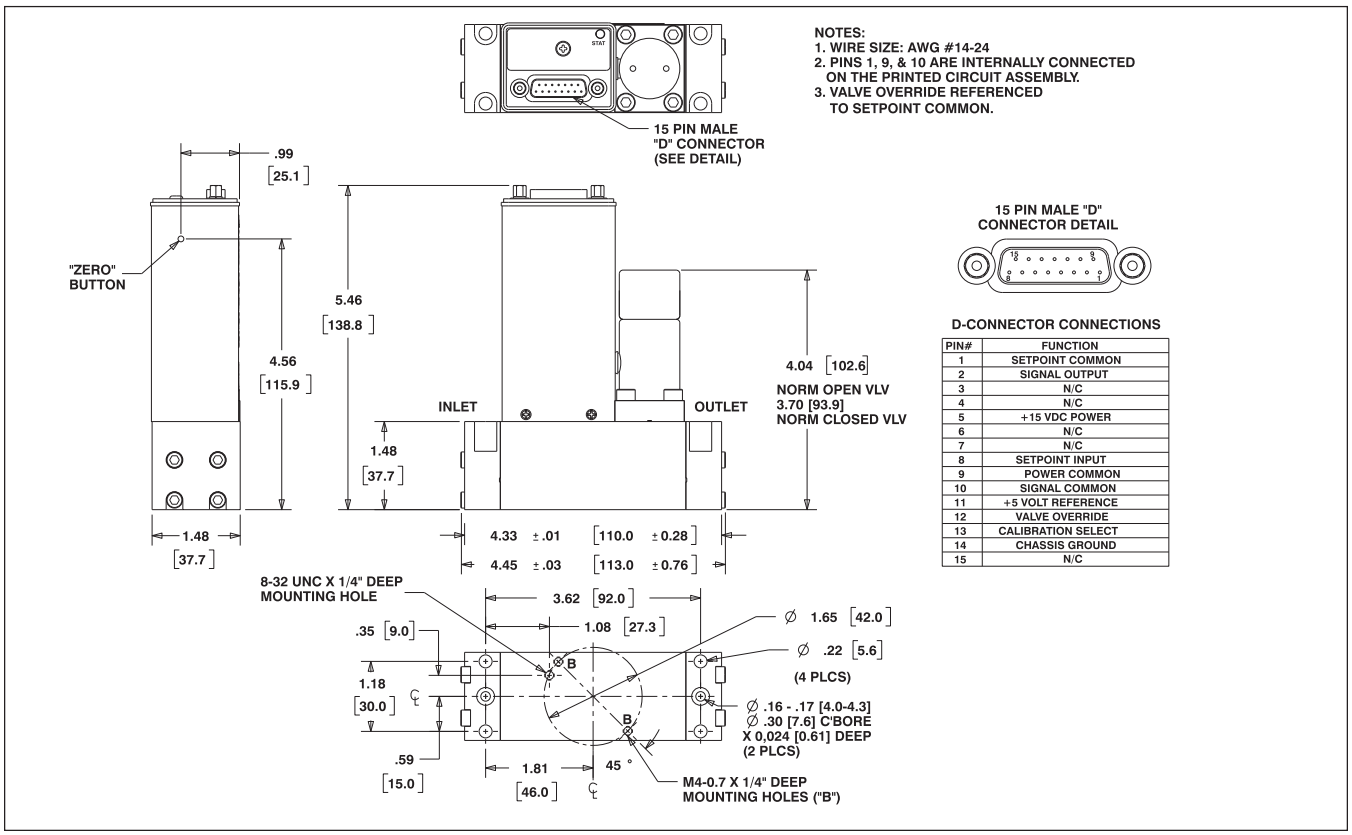



*Figure 3 SLA6850 and SLA6860 Analog I/O Controller with Downport (IGS) 'C' or 'CS' Seal Connections*



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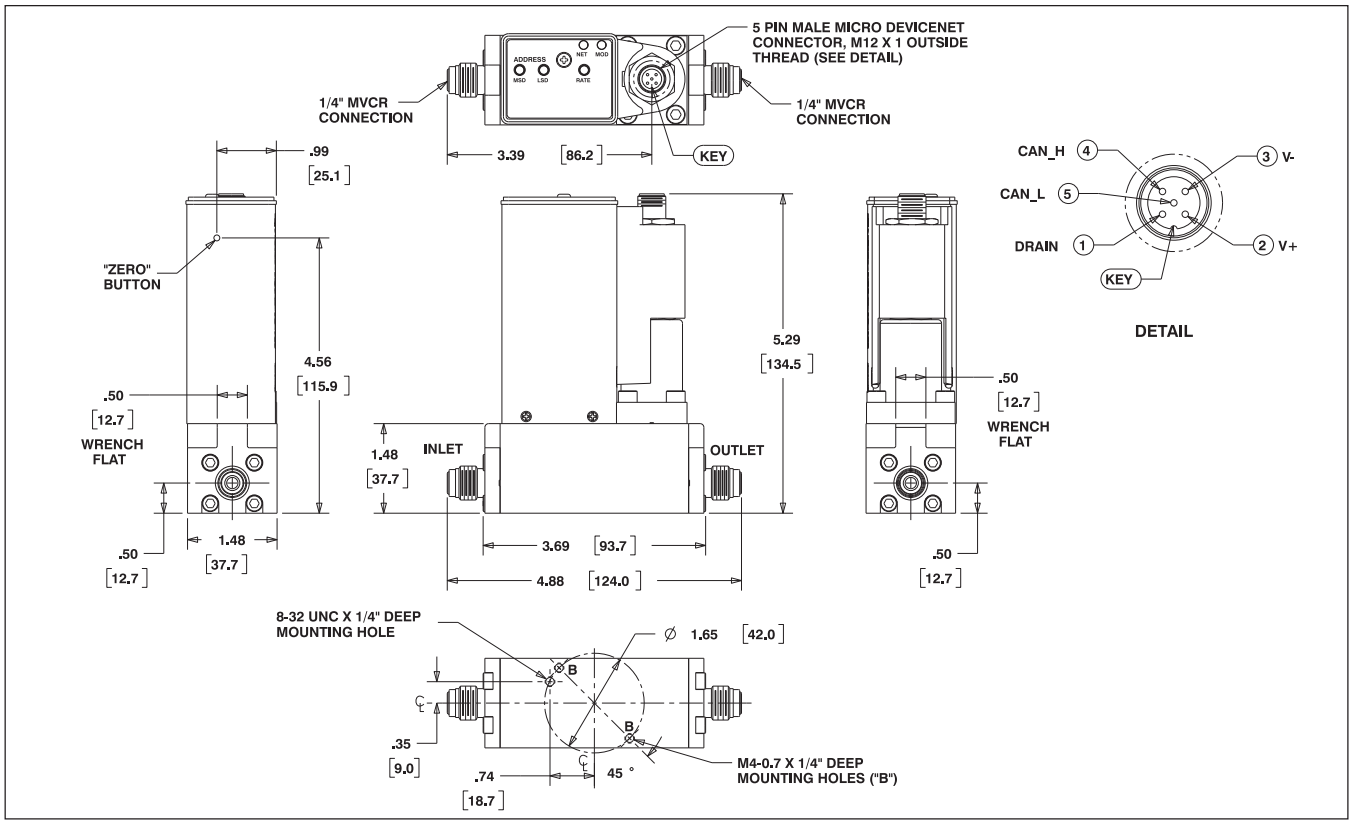



*Figure 4 SLA6850 and SLA6860 Digital I/O DeviceNet Controller with 1/4" VCR Connections*

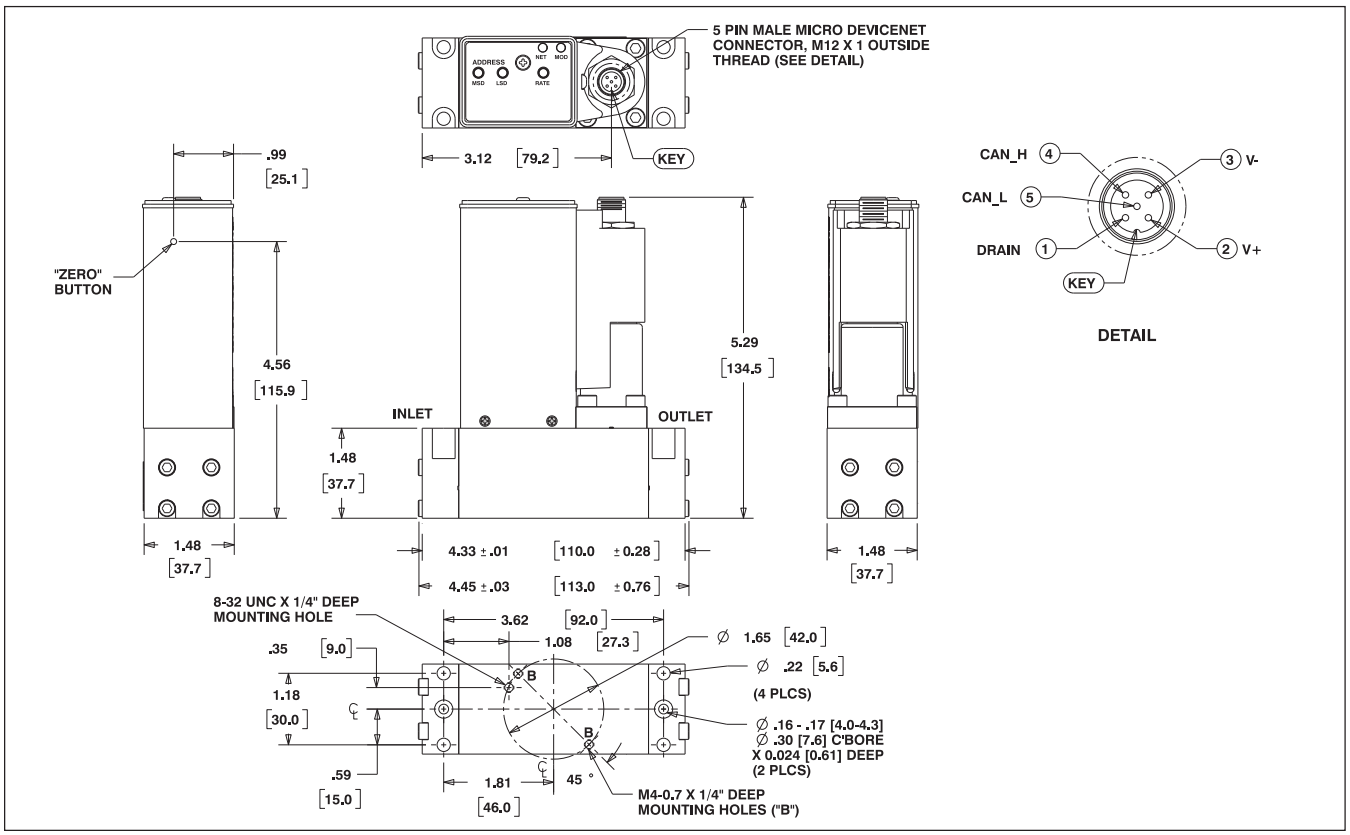
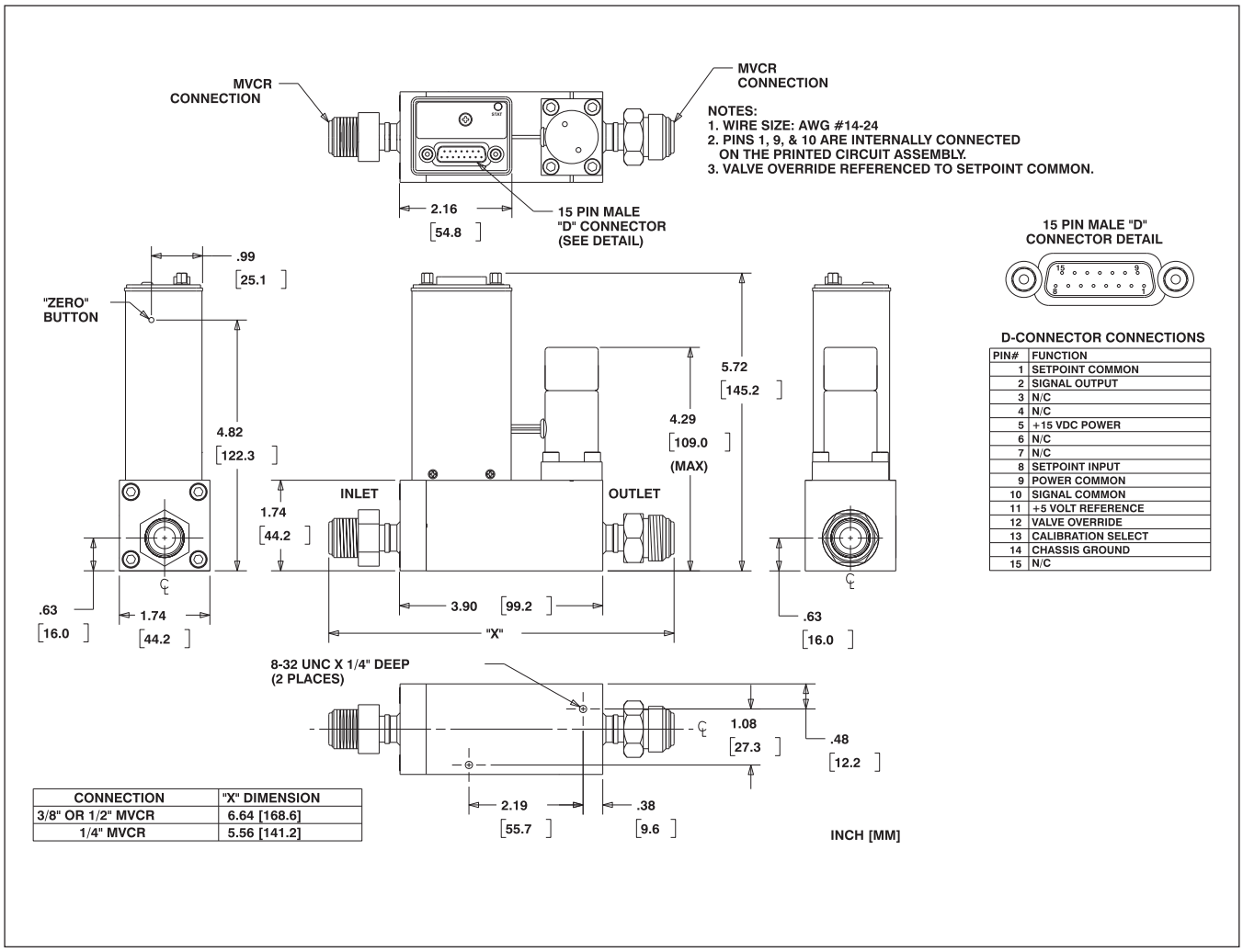



*Figure 5 SLA6850 and SLA6860 Digital I/O DeviceNet Controller with Downport (IGS) 'C' or 'CS' Seal Connections*



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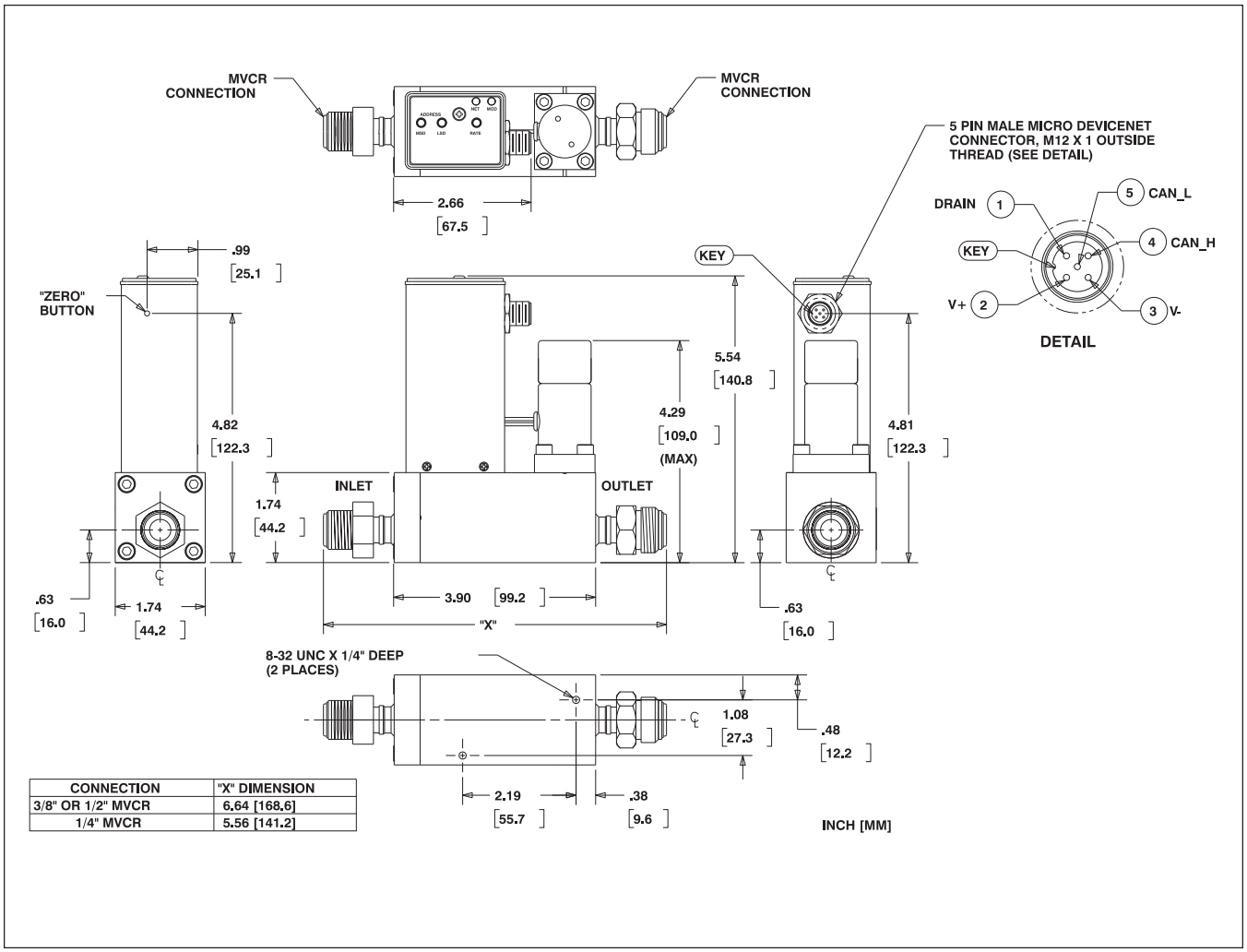

| PIN# | FUNCTION |
|---|---|
| 1 | SETPOINT COMMON |
| 2 | SIGNAL OUTPUT |
| 3 | N/C |
| 4 | N/C |
| 5 | +15 VDC POWER |
| 6 | N/C |
| 7 | N/C |
| 8 | SETPOINT INPUT |
| 9 | POWER COMMON |
| 10 | SIGNAL COMMON |
| 11 | +5 VOLT REFERENCE |
| 12 | VALVE OVERRIDE |
| 13 | CALIBRATION SELECT |
| 14 | CHASSIS GROUND |
| 15 | N/C |

| CONNECTION | "X" DIMENSION |
|---|---|
| 3/8" OR 1/2" MVCR | 6.64 [168.6] |
| 1/4" MVCR | 5.56 [141.2] |

*Figure 6 Models SLA6851 and SLA6861 Analog I/O Controller with 1/4" VCR Connections*



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| CONNECTION | "X" DIMENSION |
|---|---|
| 3/8" OR 1/2" MVCR | 6.64 [168.6] |
| 1/4" MVCR | 5.56 [141.2] |

*Figure 7 Models SLA6851 and SLA6861 DeviceNet I/O Controller with 1/4" VCR Connections*



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## 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

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

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TruCal ..... Brooks Instrument, LLC
VCR ..... Cajon Co.

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