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8100 Series
High Flow Mass Flow Controllers/Meters

» MultiFlo™ technology for superior performance, reduced inventory and in situ support
» Advanced design using proven technologies used in metal seal 1660 model next generation semiconductor applications
» Best performance and reliability in the industry
» Low cost semiconductor-grade flow controller
» Available with analog, RS485, DeviceNet™ or PROFIBUS™ interfaces

Features at a glance

• For non-corrosive and non-ultraclean process gas applications (32µ inch Ra finish)
• Drop-in replacement for any elastomeric MFC
• Sealed with an elastomeric O-ring, which is inexpensive, well characterized, and offers reliable resealing
• Easy configuration change and maintenance
• Field proven—MTBF of 536,000 hours and ultra-low drift of less than 0.6% per year to reduce year-to-year maintenance and increase uptime
• Better than 0.15% full scale repeatability to provide the same quality run-after-run
• Statistically verified accuracy. Allows you to easily replicate processes from tool-to-tool and fab-to-fab and to use a single MFC over a wide range of flows.
• Minimized dead space for increased accuracy and faster response time under all turn-on conditions
• Valve designed with fewer parts to enhance speed, responsiveness and long-term reliability
• Upstream pressure buffering available for applications with fluctuating inlet pressures
• Compliant with the SEMI standard for Sensor Actuator Network Communications for DeviceNet (SEMI Std. Doc. #2602). Model 8105 specifically designed for full ODVA/SEMI compliance.
• All performance tests per SEMI test methods
• 2 year warranty
The Celerity advantage

- Available on models 8101 and 8105
- Digital control
- Accuracy of ±1% of setpoint compared to ±1% of full scale for model 8100. This allows the use of MultiFlo MFCs over a wide range of conditions while maintaining accuracy. Specifically designed to handle low and high flow of the same gas with the identical accuracy and stability.
- High resolution calibration control that utilizes a 32 point calibration table for each gas resulting in a ten-fold improvement in accuracy.
- MultiFlo MFCs can be programmed for an unlimited number of configurations. They eliminate the need to purchase spares for each application, reducing inventory up to 90%.
- Programmable turn-on response time from less than 1 second up to 20 seconds to meet your process requirements.
- Real time in situ reranging, monitoring, diagnostics and trouble-shooting to reduce equipment downtime and cost of ownership.
- Model 8101 drop-in replacement for analog MFCs has two analog connectors (a 20 pin cardedge and 9 or a 15 pin “D” connector option).

Description

The 8100 Series mass flow controllers are integrated devices that control gas flows using a high precision electromagnetic valve responding to flow measurements through a sensor using the thermal properties of gases. Since the thermal properties of gases are independent of pressure and temperature, this method provides a stable measurement with changing process conditions.

The patented IsoSensor™ is a high stability sensor that produces ultra-low drift, eliminating the need for frequent recalibration. It is attitude insensitive and eliminates thermal siphoning effects.

The precision electromagnetic control valve has a wide dynamic range that provides superior precision and control. It has been subjected to over 8 million cycles with no degradation in performance. It has proven to have superior reliability to piezo actuators and can also operate over a larger pressure range.
8100 Series Standard
High Flow Mass Flow Controllers/Meters

Performance

Settling time (to within 2% of setpoint):
- Fast start ≤ 1.0 sec (per SEMI E17-91)
- Soft start Linear 20% per sec (0 to 100% in 5 sec)

Accuracy:
- 35% to 100% F.S. ±1% setpoint (per SEMI E56-96)
- < 35% F.S. ±0.35% full scale (per SEMI E56-96)
- Repeatability (full scale) ±0.15% (per SEMI E56-96)
- Linearity (full scale) ±0.5% (per SEMI E27-92)

Inlet pressure coefficient 0.007% per psi (N2)

Ambient temp. coefficient
- Zero: 0.05% F.S. per °C
- Span: 0.1% F.S. per °C

Leak integrity 1 X 10^-9 atm-cc/sec (He) (per SEMI E16-90)

Automatic zero
- Standard on 8101/8105 (customer programmable);
- optional on 8100

Zero drift ≤ 0.6% per year without auto zero

Thermal siphoning and attitude sensitivity < 0.1% full scale (30 psi SF 6 )

Operating limits

- Standard flow range 3 sccm to 30 slm (N2 equivalent)
- Control range (full scale) 2-100%
- Valve leak rate ≤ 1% full scale
- Gases Non-corrosive
- Ambient temp. range 0-50°C (32-122°F)
- Maximum operating pressure 3,500 kPa (500 psi)
- Proof pressure 10,500 kPa (1,500 psi)
- Pressure differential range 6.65 to 350 kPa (50 torr to 50 psid)
  - Lower limit depends on gas density and flow range
- Warm-up period 30 minutes
- Mounting position Any position
- Valve Normally closed or normally open

Electrical characteristics

- Input/Output signal:
  - Setpoint input 0-5 VDC linearly proportional to required flow
  - Output monitor 0-5 VDC linearly proportional to flow rate
  - Valve off External: TTL signal
  - Auto shut-off Setpoint < 2% full scale commands valve off
  - Power controller:
    - 8101 (RS485) +15 VDC (160 mA max.), -15 VDC (160 mA max.)
    - 8105 (DeviceNet) +11-25 VDC per ODVA requirements:
      - 600 mA @ 12 VDC, 300 mA @ 24 VDC
    - 8105 (PROFIBUS) +15 VDC (500 mA max.), -15 VDC (500 mA max.)
    - Power meter (analog) +15 VDC (50 mA max.), -15 VDC (50 mA max.)
    - Power consumption
      - 8100 = 4.5 watts max., 8101 = 5 watts max.,
        8105 = 7.2 watts max.
    - CE certified
      - Immune to radiated energy 10 V/m, 30-850 mHz

Mechanical characteristics

- Surface finish 32µ inch Ra
- Fittings 1/8" and 3/8" Swagelok®, 1/4" VCR®, VCO®, Swagelok
- Valve position Downstream or upstream (optional)
- Materials:
  - Wetted components 316L SS/K-M45/304/7MO+
  - Seals Viton®, Neoprene
  - Seat Kel-F®, metal
  - Weight 1.2 kg (2.65 lbs)

Calibration references

- Traceability National Institute of Standards and Technology (N.I.S.T.)
- Standard temperature and pressure
  - 0°C and 760 mm Hg (per SEMI E12-96)

Warranty

- 2 year standard warranty
- Extended warranty option available

Specifications and features are subject to change without notice.
All specifications reflect nitrogen calibration using Mobloc/Mobx’s transfer standards.
Calibration by primary standards and surrogate gases is available as an additional charge option.
CrossChek™ calibration methodology maintains SPC-verified calibration accuracy with
limit (99.7% confidence level).

CrossChek™ metrology system

Celerity’s world-class CrossChek calibration methodology maintains SPC-verified calibration accuracy with ±3 sigma limit (99.7% confidence level) compared to ±1 or 2 sigma limits (67% to 95% confidence level) for other manufacturers.

CrossChek calibration methodology provides ongoing verification of production calibration standards. This ensures consistent and repeatable accuracy performance within ±3 sigma of published specifications. No other flow control company offers the same guarantee.

Model description

8101 MultiFlo Digital control Analog and RS485 interfaces
8105 MultiFlo Digital control DeviceNet or PROFIBUS interface

ANALOG VS. DIGITAL ACCURACY

Setpoint (% Full Scale)

Error (% Setpoint)

±1% Setpoint Accuracy (Digital)
±1% Full Scale Accuracy (Analog)

ANALOG VS. DIGITAL ACCURACY

Setpoint (% Full Scale)

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