

8100 Series

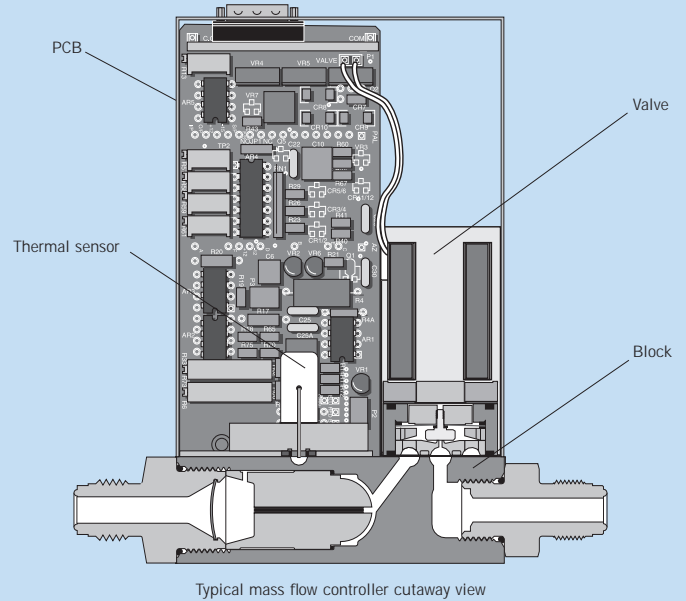
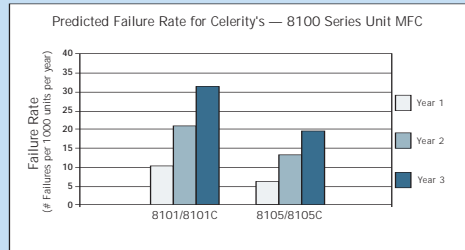
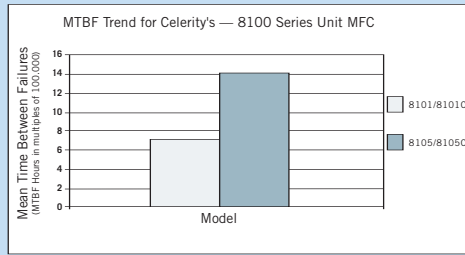
High Flow Mass Flow Controllers/Meters

- » 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 (32 μ 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

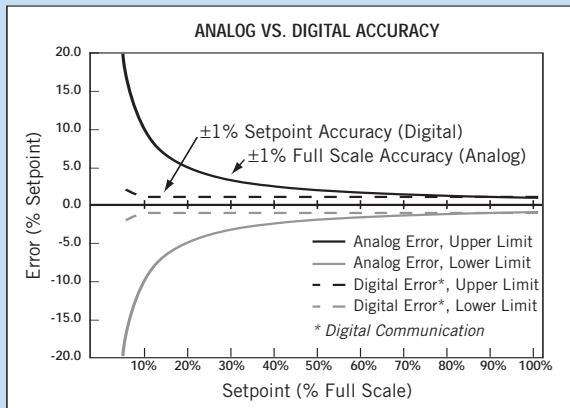
- Available on models 8101 and 8105
- Digital control
- Accuracy of $\pm 1\%$ of setpoint compared to $\pm 1\%$ of full scale for model 8100. This allows the use of MultiFlo MFCs over a wide range of conditions while maintaining accuracy. Specifically designed to handle low and high flow of the same 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.



Digital models 8101 and 8105 have an accuracy of $\pm 1\%$ of setpoint, while the analog model 8100 has an accuracy of $\pm 1\%$ of full scale. (Accuracy chart reflects primary standard calibration option.)

Model description

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

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.

Warranty

- 2 year standard warranty
- Extended warranty option available

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.	$\pm 1\%$ setpoint ($\pm 3\sigma$ per SEMI E56-96)
< 35% F.S.	$\pm 0.35\%$ full scale ($\pm 3\sigma$ per SEMI E56-96)

Repeatability (full scale)

$\pm 0.15\%$ (per SEMI E56-96)

Linearity (full scale)

$\pm 0.5\%$ (per SEMI E27-92)

Inlet pressure coefficient

0.007% per psi (N_2)

Ambient temp. coefficient

Zero: 0.05% F.S. per $^{\circ}C$; Span: 0.1% F.S. per $^{\circ}C$

Leak integrity

1×10^{-9} atm-cc/sec (He) (per SEMI E16-90)

Automatic zero

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

Zero drift

$\leq 0.6\%$ per year without auto zero

Thermal siphoning and altitude sensitivity

< 0.1% full scale (30 psi SF_6)

Operating limits

Standard flow range

3 sccm to 30 slm (N_2 equivalent)

Control range (full scale)

2-100%

Valve leak rate

$\leq 1\%$ full scale

Gases

Non-corrosive

Ambient temp. range

0-50 $^{\circ}C$ (32-122 $^{\circ}F$)

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 psid¹)

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:

8105 (PROFIBUS)

600 mA @ 12 VDC, 300mA @ 24 VDC

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

32 μ 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 $^{\circ}C$ and 760 mm Hg (per SEMI E12-96)

Specifications and features are subject to change without notice.

All specifications reflect nitrogen calibration using Molbloc/Molbox™ transfer standards.

Calibration by primary standards and surrogate gases is available as an additional charge option.

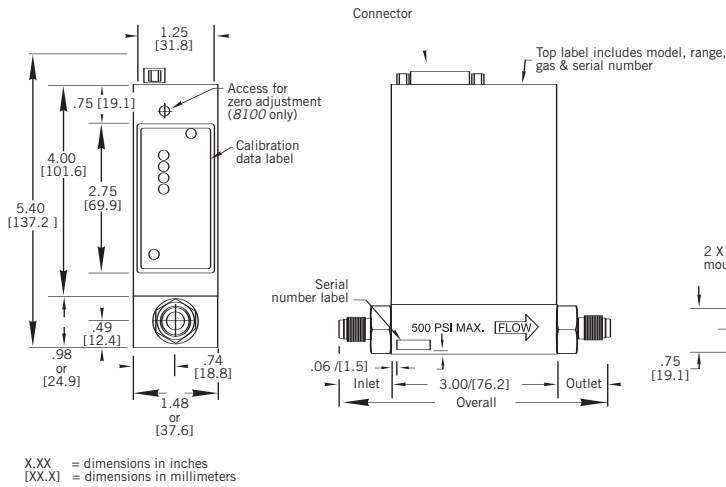
CrossChek™ calibration methodology maintains SPC-verified calibration accuracy with $\pm 3\sigma$ limit (99.7% confidence level).

8100 Series Product Configuration

C	8101	High Performance, Elastomer Seals, RS485 Digital and Analog Interface (Select Analog Connector Below)
C	8101C	High Performance, Elastomer Seals, Configurable MultiFlo, RS485 Digital and Analog Interface (Select Analog Connector Below)
M		High Performance, Elastomer Seals, RS485 Digital and Analog Interface (Select Analog Connector Below)
C	8105	High Performance, Elastomer Seals, Network Interface (Select DeviceNet or PROFIBUS Below)
C	8105C	High Performance, Elastomer Seals, Configurable MultiFlo, RS485 Digital and Analog Interface (Select Analog Connector Below)
M		High Performance, Elastomer Seals, Network Interface (Select DeviceNet or PROFIBUS Below)
	A	Auto Shut-off
	X	No Auto Shut-off
	F	Fast Start < 1 Second Response
	S	5 Second Linear Soft Start
	T	6-10 Second Soft Start
	V	10-15 Second Soft Start
	X	No Valve (Mass Flow Meter)
	====>	Specify Pre-programmed Gas and Full Scale Range (example: Argon="0004" and 30 sccm="030C")
	SC10	010C Configurable MultiFlo. 3-10 sccm N ₂ Equivalent
	SC11	030C Configurable MultiFlo. 11-30 sccm N ₂ Equivalent
	SC12	090C Configurable MultiFlo. 31-90 sccm N ₂ Equivalent
	SC13	250C Configurable MultiFlo. 91-250 sccm N ₂ Equivalent
	SC14	750C Configurable MultiFlo. 251-750 sccm N ₂ Equivalent
	SC15	002L Configurable MultiFlo. 751-2,000 sccm N ₂ Equivalent
	SC16	006L Configurable MultiFlo. 2,001-6,000 sccm N ₂ Equivalent
	SC17	015L Configurable MultiFlo. 6,001-15,000 sccm N ₂ Equivalent
	SC18	030L Configurable MultiFlo. 15,001-30,000 sccm N ₂ Equivalent
	8S	1/8" Swagelok
	4S	1/4" Swagelok
	4R	1/4" VCR
	40	1/4" VCO
	HOV	Horizontal Or Vertical Mounting Attitude (Standard)
	HOS	Horizontal Or Side
	A	Atmospheric Downstream Pressure
	V	Vacuum Downstream Pressure
	V F	Viton O-Ring/Kel-F Seat
	N F	Neoprene O-Ring/Kel-F Seat
	V M	Viton O-Ring/Metal Seat
	V X	Viton O-Ring - No Valve (Mass Flow Meter)
	B	15 Pin "D" Connector (UDB15) Brooks Pin-out 0-5 VDC
	D	DeviceNet (8105 only)
	E	Cardedge Connector 0-5 VDC
	I	15 Pin "D" Connector (UDI15) 4-20mA
	K	15 Pin "D" Connector (UDK15) MKS Pin-out 0-5 VDC
	L	Cardedge Lockdown Connector 0-5 VDC
	P	PROFIBUS (8105 only)
	S	9 Pin "D" Connector (UDS 9) 0-5 VDC STEC Pin-out
	T	9 Pin "D" Connector (UDU9) Unit 0-5 VDC
	U	15 Pin "D" Connector (UDU15) 0-5 VDC
	XXXX	Customer Special Request (CSR) Consult Factory
	O	Normally Open
	C	Normally Closed (Standard)
	X	No Valve (Mass Flow Meter)
	S	Standard (Valve Downstream)
	B	Buffered (Valve Upstream)
	X	No Valve (Mass Flow Meter)
	A	Auto-Zero Enabled
	X	Auto-Zero Disabled
	32X	32μ inch Ra Finish
	00	0°C Reference Calibration (Standard)
	XX	Custom Reference Calibration (20°C=20)

Example:

C	8100	A	F	0013	100C	8S	HOV	A	V	F	U	XXXX	C	S	X	32X	00
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Fitting type	Overall	Inlet	Outlet
1/8 SW Male	4.32 in./109.7 mm	0.66 in./16.8 mm	0.66 in./16.8 mm
1/4 SW Male	4.44 in./112.8 mm	0.72 in./18.3 mm	0.72 in./18.3 mm
1/4 VCR Male	4.88 in./124.0 mm	0.94 in./23.9 mm	0.94 in./23.9 mm
1/4 VCO Male	4.56 in./115.8 mm	0.78 in./19.8 mm	0.78 in./19.8 mm
3/8 Swagelok	4.76 in./120.9 mm	0.88 in./22.4 mm	0.88 in./22.4 mm



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