Flow Solutions

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GM51A

1.125" METAL SEALED, DIGITAL MASS FLOW CONTROLLER

The GM51A is a 1.125" (28.6 mm) wide metal sealed MFC well suited for a wide variety of applications requiring flow control capability from 5 sccm to 50 slm Full Scale, N_2 equivalent. The GM51A incorporates the latest in digital flow control electronics along with a well proven, patented thermal sensor and mechanical design.

The GM51A digitally controlled MFC is available with either analog or digital I/O. The digital control electronics utilize the latest in MKS control algorithms providing fast and repeatable response to set point throughout the device control range. Typical response times are on the order of 500 milliseconds. Included is a digital calibration that yields 1% of set point accuracy on the calibration gas. All GM51As include Modbus as an available secondary I/O (excludes PROFINET® and EtherCAT®).

The GM51A is available in 5 sccm to 50 slm Full Scale, N_2 equivalent with multi-gas/multi-range capability. The device has gas parameters for well over a hundred gases and gas mixtures already stored in the device's memory. The user can easily configure the device to any of these gases simply using the device embedded Ethernet user interface and a PC.

The GM51A with 4 VCR fittings is designed with a 1.125" (28.6 mm) width and standard 4.88" (124 mm overall) length allowing it to fit in standard gas systems. It is also available with the 1.125" (28.6 mm) IGS compatible c-seal and w-seal configurations. The GM51A utilizes the standard 3-inch footprint most often used by MFCs in the 5 sccm to 50 slm flow rate range enabling its use without the need to modify existing gas line configurations. The GM51A metal sealed MFC with its electropolished surface finish is well suited for use in high purity process applications. The GM51A is available with a normally closed valve and in an MFM version (not electropolished).

Features & Benefits

- Patented thermal sensor design provides exceptional zero stability
- Percent of set point accuracy (calibration gas) enables precise process control
- Embedded user interface provides the ability to
  - — Easily change device range and user gas reducing inventory requirements
  - — Monitor device functionality and collect performance data in-situ
- 10µ inch electropolished 316L surface finish enables MFC use for high purity applications
- Compatible analog and digital I/O allow the GM51A with most other MKS and competitor MFCs to replace its 1479A counterparts

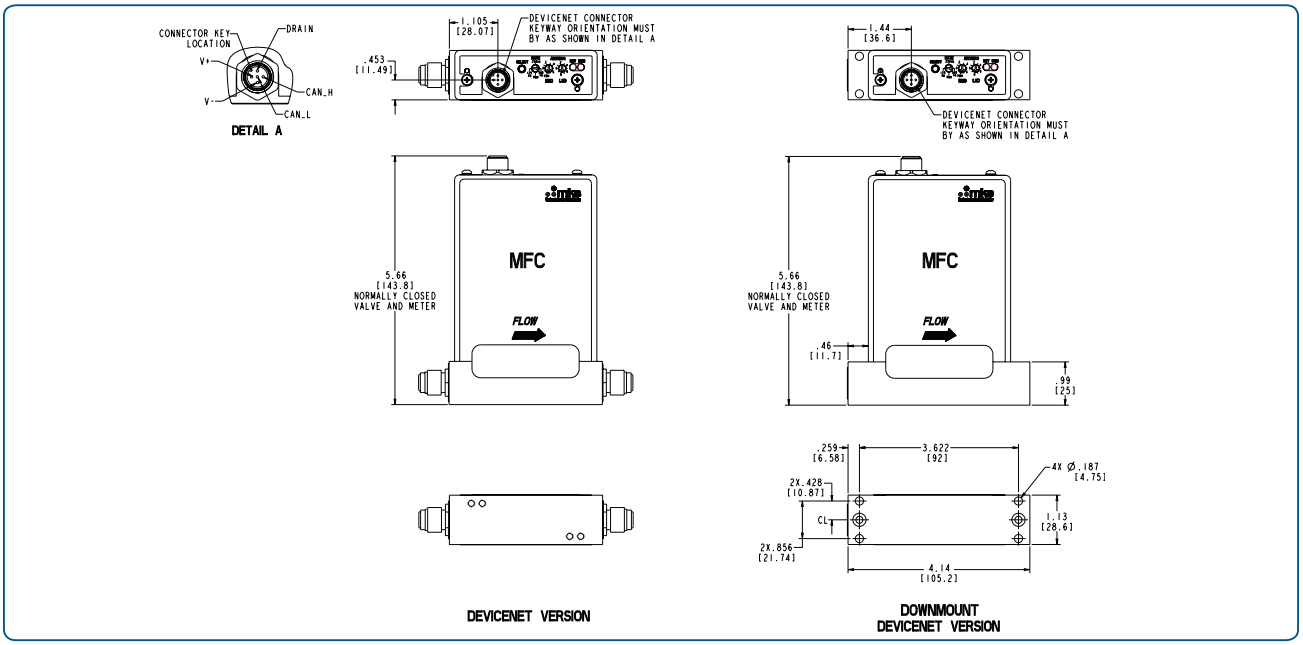
US Patent No 5461913.

Performance

Full Scale Flow Ranges *(N_2 equivalent)*	5 - 50000 sccm
Maximum Inlet Pressure	150 psig (can not exceed pressure differential requirement across MFC)
Normal Operating Pressure Differential *(N_2 Full Scale)*	5 to 5000 sccm; 10 to 40 psid
(with atmospheric pressure at the MFC outlet)	10000 to 20000 sccm; 15 to 40 psid
	30000 to 50000 sccm; 25 to 40 psid
Proof Pressure	1000 psig
Burst Pressure	1500 psig
Control Range	2% to 100% of Full Scale (range on mech.)
Typical Accuracy *(with N_2 calibration gas)*	±1% of set point for 20 to 100% Full Scale
	±0.2% of Full Scale for 2 to 20% Full Scale
	±1% of Reading for Meters
Repeatability	±0.3% of Reading
Resolution	0.1% of Full Scale
Temperature Coefficients	
Zero	<0.05% of Full Scale/°C
Span	<0.08% of Reading/°C
Inlet Pressure Coefficient	<0.02% of Reading/psi
Typical Controller Settling Time	<750 msec., typical above 5% Full Scale
(per SEMI Guideline E-17-0600)	
Warm-up Time	30 minutes
(to within 0.2% of Full Scale of steady state performance)	
Operating Temperature Range (Ambient)	10°C to 50°C
Storage Humidity	0 to 95% relative humidity, non-condensing
Storage Temperature	-20° to 80°C (-4° to 149° F)

Mechanical

Fittings *(compatible with)*	Swagelok® 4 VCR® male, surface mount (c-seal and w-seal)
Leak Integrity	
External (scc/sec He)	<1 x 10^{-10}
Through closed valve	<1.0% of Full Scale at 40 psig inlet to atmosphere
	(To assure no flow-through, a separate positive shut-off valve is required.)
Wetted Materials	
Standard	316L S.S. VAR (equivalent to 316 S.S. SCQ for semiconductor quality), 316 S.S., Elgiloy®, Nickel, KM45
Valve Seat (MFC only)	Teflon®
Surface Finish	
MFC	10µ inch average Ra (electropolished)
MFM	16µ inch average Ra
Weight	Less than 3 lbs (1.4kg)



Dimensional Drawing — DeviceNet™ and Downmount with VCR fittings*

*Note: Unless specified, dimensions are nominal values in inches (mm referenced). *(See manual for additional I/O and fitting types)*

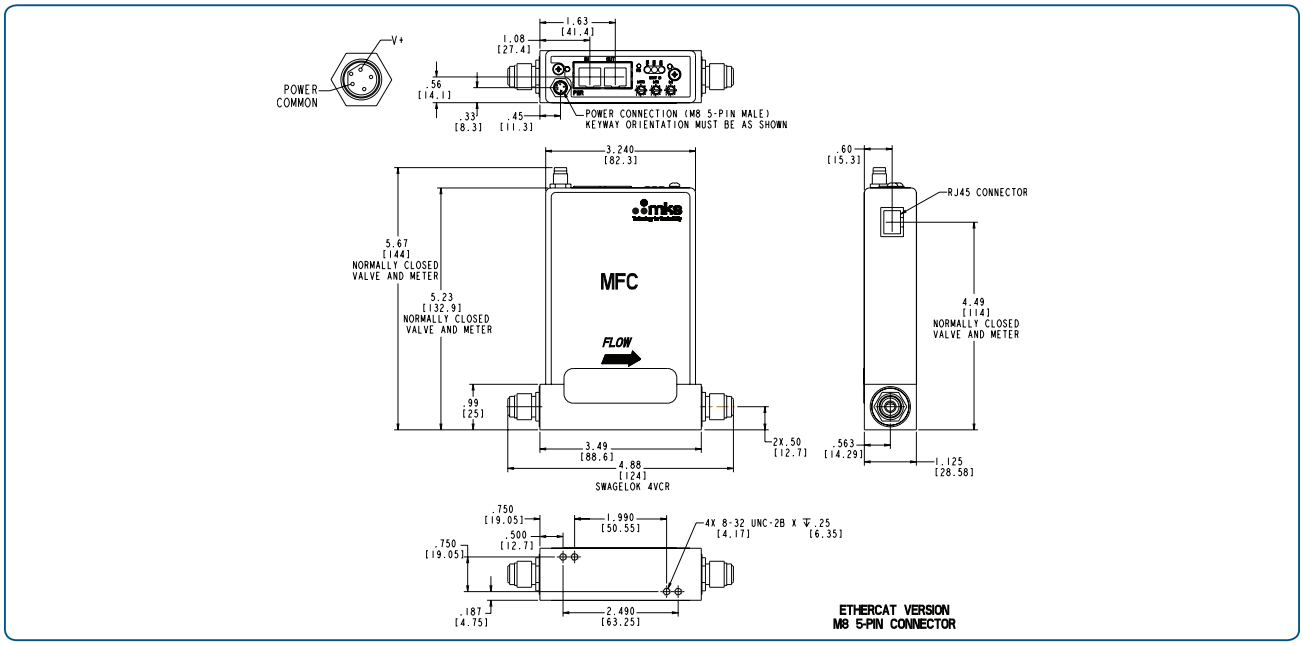
Specifications

Electrical Analog I/O

Input Power Required	+15 to +24 VDC @ (< 4 watts)
Flow Input/Output Signal	
Voltage (0 to 5 VDC)	9 pin Type "D" male
Current (4 - 20 mA)	15 pin Type “D” male
Compliance	CE

Digital I/O

Digital I/O	DeviceNet™	RS485	EtherCAT®	PROFINET®
Input Power Required	+11 to +25 VDC per (< 4 watts)	+15 to +24 VDC (< 4 watts)	+24 VDC (< 5 watts)	+24 VDC (< 5 watts)
Connector	5 pin micro connector (power and comm.)	9 pin Type D male (power and comm.)	2 x RJ-45 (comm.) male, M8 male, 5 pin (power)	2 x RJ-45 (comm.) male, M8 male, 5 pin (power)
Data Rate Switch/Selection	4 positions: 125, 250, 500K (Default), (programmable over network)	No switch Set data rate via RS485	No switch	No switch
Comm. Rate(s)	125 Kbps 250 Kbps 500 Kbps	9.6 Kbps 19.2 Kbps 38.4 Kbps	100 Mbps	100 Mbps
MAC ID Switches/Addresses	2 switches, 10 positions; 0,0 to 6,3 1 to 254	Set address over RS485 Station Addresses 0,0 to 9,9	3 switches, 16 positions	N/A
Network Size	Up to 64 nodes	Up to 32 nodes	Up to 4095 nodes	N/A
Visual Indicators	LED Network (green/red) LED Module (green/red)	LED Comm (green/red) LED Error (green/red)	LED Power (green) LED Run (green) LED Error (red) LED Comm (green)	LED Maint (amber) LED BUS Fault (red) LED Ready (green) LED Sys Fault (red)
Compliance	CE	CE	CE	CE



Dimensional Drawing — EtherCAT® with VCR fittings*

*Note: Unless specified, dimensions are nominal values in inches (mm referenced). *(See manual for additional I/O and fitting types)*

Ordering Information

Ordering Code Example: GM51A013502R6M0020	Code	Configuration
MFC Mass Flow Controller GM51A	GM51A	GM51A
Gas (Per Semi Standard E52-0703)		
For example:		
013 = Nitrogen = N_2	013	013
029 = Ammonia = NH_3	029	
110 = Sulfur Hexafluoride = SF_6	110	
Flow Range Full Scale*		
5 sccm	500	502
10 sccm	101	
20 sccm	201	
50 sccm	501	
100 sccm	102	
200 sccm	202	
500 sccm	502	
1000 sccm	103	
2000 sccm	203	
5000 sccm	503	
10000 sccm	104	
20000 sccm	204	
30000 sccm	304	
50000 sccm	504	
Fittings *(compatible with)*		
Swagelok 4 VCR male	R	R
C-seal surface mount as per SEMI 2787.1	C	
W-seal surface mount as per SEMI 2787.3F	H	
Connector		
EtherCAT®	8	6
DeviceNet™	6	
PROFINET®	9	
RS485 (uses 9 pin connector) (Consult Factory)	5	
Analog 0 to 5 VDC (9 pin D connector)	A	
Analog 0 to 5 VDC (9 Pin D connector), Tied Grounds (Consult Factory)	L	
Analog 0 to 5 VDC (15 pin D connector)	B	
Analog 0 to 5 VDC (15 pin D connector), Tied Grounds (Consult Factory)	M	
Analog 4 to 20 mA (15 pin D connector) (Consult Factory)	H	
Valve/Device Type		
Normally Closed/Mass Flow Controller, Teflon®	M0	M0
No Valve/Mass Flow Meter	30	
Reserved for MKS Future Use		
Standard	0	0
Firmware *(unless otherwise specified)*		
MKS will ship firmware revision current to date.	20	20

* The Full Scale flow rate is designated by a 3 digit number. The first two digits represent the significant digits of the Full Scale flow rate separated by a decimal point. The third digit is the exponent of the power of ten.

Example flow rate code:
254 is 2.5×10^4 or 25000 sccm 153 is 1.5×10^3 or 1500 sccm 601 is 6.0×10^1 or 60 sccm

** The user should consult with their gas supplier on the appropriate elastomer which is compatible with the selected gas.

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