Flow Solutions

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GM50A

METAL SEALED, DIGITAL MASS FLOW CONTROLLER

The GM50A is a general purpose, 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 GM50A incorporates the latest in digital flow control electronics along with a well proven, patented thermal sensor and mechanical design.

The GM50A 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. The GM50A's analog and digital I/O can easily be used to replace those same I/O types of the 1479A MFCs. All GM50As include Modbus as an available secondary I/O (excludes PROFINET® and EtherCAT®).

The GM50A 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 GM50A metal sealed MFC with its electropolished surface finish is well suited for use in high purity process applications. The GM50A is available with either a normally closed or normally open valve. The GM50A is also available 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
- Wide choice of digital (EtherCAT, DeviceNet™, Profibus®, PROFINET and RS485) or analog (0 to 5 VDC or 4 to 20 mA) I/O

US Patent No 5461913.

Performance

Full Scale Flow Ranges *(N_2 equivalent)*	5 - 50000 sccm
Maximum Inlet Pressure	
MFC	150 psig (cannot exceed pressure differential requirement across MFC)
MFM	500 psi
Normal Operating Pressure Differential *(N_2 Full Scale)* *(with atmospheric pressure at the MFC outlet)*	5 to 5000 sccm; 10 to 40 psid 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 *(per SEMI Guideline E-17-0600)*	<750 msec., typical above 5% Full Scale
Warm-up Time *(to within 0.2% of Full Scale of steady state performance)*	30 minutes
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 176° F)

Mechanical

Fittings *(compatible with)*	Swagelok® 4 VCR® male, 1/4" Swagelok compression seal, surface mount, Swagelok 8 VCR male, 1/8" Swagelok, 1/2" Swagelok, 6 mm Swagelok, 8 mm Swagelok, KF16, 3/8" Swagelok, 12mm Swagelok, 2 VCR male
Leak Integrity	
External (scc/sec He)	$<1 \times 10^{-10}$
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)

Electrical Analog I/O

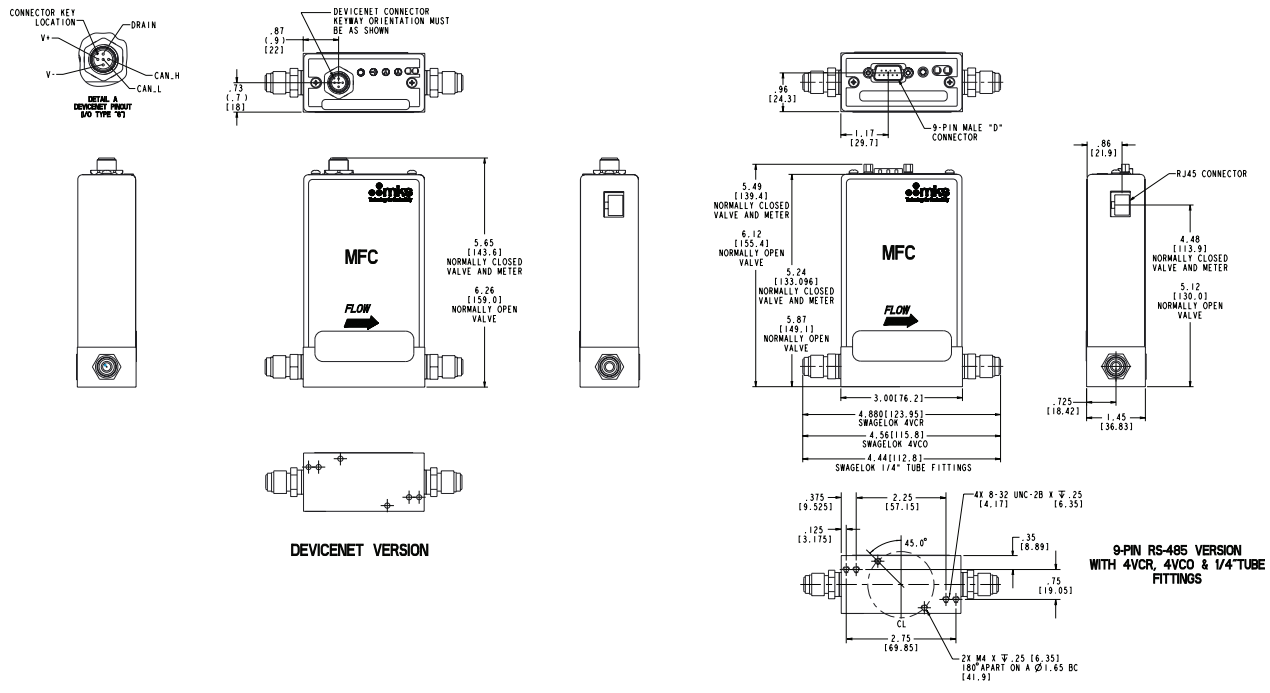
Input Power Required	+15 to +24 VDC @ (<4 watts)
Flow Input/Output Signal	
Voltage (0 to 5 VDC)	15 pin Type "D" male, 9 pin Type "D" male
Current (4 to 20 mA)	15 pin Type "D" male
Compliance	CE

Specifications

Digital I/O

Digital I/O	DeviceNet™	RS485	Profibus®	EtherCAT®	PROFINET®
Input Power Required	+11 to +25 VDC per (< 4 watts)	+15 to +24 VDC (< 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.)	9 pin Type D male (power) 9 pin Type D female (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 Set data rate via Profibus	No switch	No switch
Comm. Rate(s)	125 Kbps 250 Kbps 500 Kbps	9.6 Kbps 19.2 Kbps 38.4 Kbps	9.6 Kbps to 12 Mbps	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	2 switches, 10 positions	3 switches, 16 positions	N/A
Network Size	Up to 64 nodes	Up to 32 nodes	Up to 99 nodes	Up to 4095 nodes	N/A
Visual Indicators	LED Network (green/red) LED Module (green/red)	LED Comm (yellow) LED Error (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	CE

Dimensional Drawing



Dimensional Drawing — DeviceNet™ and RS485 with VCR fittings*

**(See manual for additional I/O and fitting types)*

Note: Unless specified, dimensions are nominal values in inches (mm referenced).

Ordering Information

Ordering Code Example: GM50A013502R6M020	Code	Configuration
MFC Mass Flow Controller GM50A	GM50A	GM50A
Gas (Per Semi Standard E52-0703)		
For example:		013
013 = Nitrogen = N_2	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)*		
6 mm Swagelok	M	R
8 mm Swagelok	E	
10 mm Swagelok	P	
12 mm Swagelok	F	
1/8" Swagelok (for 1000 sccm N_2 equivalent or below)	A	
1/4" Swagelok	S	
1/2" Swagelok	K	
3/8" Swagelok	J	
Swagelok 4 VCR male	R	
Swagelok 8 VCR male	T	
C-seal surface mount as per SEMI 2787.1	C	
W-seal surface mount as per SEMI 2787.3F	H	
KF16	U	
Swagelok 2 VCR (for 1000 sccm N_2 equivalent or below)	B	
Connector		
EtherCAT	8	6
DeviceNet	6	
RS485 (uses 9 pin connector)	5	
Profibus (1480 Compatible)	4	
Profibus (1179B Compatible)	3	
PROFINET	9	
Analog 0 to 5 VDC (9 pin D connector)	A	
Analog 0 to 5 VDC (9 Pin D connector), Tied Grounds	L	
Analog 0 to 5 VDC (15 pin D connector)	B	
Analog 0 to 5 VDC (15 pin D connector), Tied Grounds	M	
Analog 4 to 20 mA (15 pin D connector)	H	
Analog 0 to 5VDC (15 Pin D Connector), Brooks	E	
Analog 0 to 5VDC (15 Pin D Connector), Celerity	U	
Valve/Device Type		
Normally Closed/Mass Flow Controller, Teflon®	M0	M0
No Valve/Mass Flow Meter	30	
Normally Open/Mass Flow Controller, Teflon®	PT	
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 x 10^4 or 25000 sccm 153 is 1.5 x 10^3 or 1500 sccm 601 is 6.0 x 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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