mks
Technology for Productivity

Flow Measurement & Control

WWW.MKSINST.COM

# Type 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 FS, $N_2$ 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 setpoint throughout the device control range. Typical response times are on the order of 500 milliseconds. Included is a digital calibration that yields 1% of setpoint 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.

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 also available in an MFM version (not electropolished).

## Features & Benefits

- Patented thermal sensor design provides exceptional zero stability
- Percent of setpoint 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 (RS485, Devicenet and Profibus) I/O allow the GM50A to replace its 1479A counterparts
- CE Mark and RoHS Compliance – meeting requirements for the European Union

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** *($N_2$ F.S.)* *(with atmospheric pressure at the MFC outlet)* | 5 to 5000 sccm; 10 to 40 psid<br>10000 to 20000 sccm; 15 to 40 psid<br>30000 to 50000 sccm; 25 to 40 psid |
| **Proof Pressure** | 1000 psig |
| **Burst Pressure** | 1500 psig |
| **Control Range** | 2% to 100% of F.S. (range on mech.) |
| **Typical Accuracy** *(with $N_2$ calibration gas)* | ± 1% of setpoint for 20 to 100% F.S. |
| | ± 0.2% of F.S. for 2 to 20% F.S. |
| **Repeatability** | ± 0.3% of Reading |
| **Resolution** | 0.1% of Full Scale |
| **Temperature Coefficients** | |
| Zero | < 0.05% of F.S./°C |
| Span | < 0.08% of Rdg./°C |
| **Inlet Pressure Coefficient** | < 0.02% of Rdg./psi |
| **Typical Controller Settling Time** | < 750 msec., typical above 5% F.S. |
| *(per SEMI Guideline E-17-0600)* | |
| **Warm-up Time** | < 30 min |
| *(to within 0.2% of F.S. 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® or ¼" Swagelok compression seal, surface mount |
| **Leak Integrity** | |
| External (scc/sec He) | < 1 x $10^{-10}$ |
| Through closed valve | < 1.0% of F.S. 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 |
| 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 CE Compliant to EMC Directive 2004/108/EC

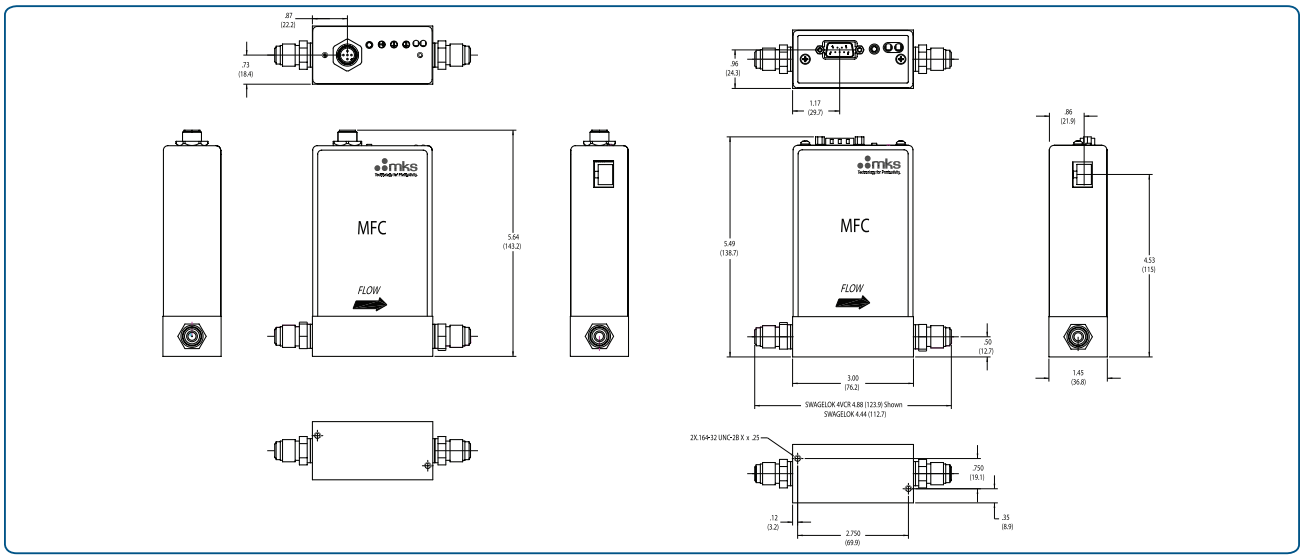
| | |
|---|---|
| **Input Power Required** | +15 to +24 VDC @ (< 4 watts) |
| **Flow Input/Output Signal** | |
| Voltage (0 to 5 VDC) | 15 pin Type "D" male, 9 pin Type "D" male |
| Current (4 to 20 mA) | 15 pin Type "D" male |

# Specifications (cont'd)

## Digital I/O CE Compliant to EMC Directive 2004/108/EC

| Digital I/O | DeviceNet™ | RS-485 | Profibus® |
|---|---|---|---|
| **Input Power Required** | +11 to +25 VDC per DeviceNet specification (< 4 watts) | +15 to +24 VDC (< 4 watts) | +15 to +24 VDC (< 4 watts) |
| **Connector** | 5 pin microconnnector (DeviceNet) | 9 pin Type D male | 9 pin Type D male (power) and 9 pin Type D female (comm.) |
| **Data Rate Switch/ Selection** | 4 positions: 125, 250, 500K (Default), PGM (programmable over the network) | No switch<br>Set Data Rate via RS485 | No switch<br>Set Data Rate via Profibus |
| **Data Rate** | Data Rate (User Selectable)<br>125 Kbps<br>250 Kbps<br>500 Kbps | Data Rate (User Selectable)<br>9.6 Kbps<br>19.2 Kbps<br>38.4 Kbps | Data Rate (User Selectable)<br>9.6 Kbps to 12 Mbps |
| **MAC ID Switches/Addresses** | 2 switches, 10 positions; 0,0 to 6,3<br>1 to 254 | Set address over RS485<br>Station Addresses 0,0 to 9,9 | 2 switches, 10 positions |
| **Network Size** | Up to 64 nodes | Up to 32 nodes | Up to 99 nodes |
| **Network Topology** | Linear (trunkline/dropline) power and signal on same network cable | Master/slave | Master/slave |
| **Visual Communication Indicators** | LED network status (green/red)<br>LED module status (green/red) | LED Comm (yellow)<br>LED Error (red) | LED Comm (green/red)<br>LED Error (green/red) |

# 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: GM50A013502R6M010 | Code | Configuration |
|---|---|---|
| Type 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)* | | |
| Swagelok 4 VCR male | R | R |
| ¼" Swagelok | S | |
| C-seal surface mount as per SEMI 2787.1 | C | |
| W-seal surface mount as per SEMI 2787.3F | H | |
| **Connector** | | |
| DeviceNet™ | 6 | 6 |
| RS485 (uses 9 pin connector) | 5 | |
| Profibus™ | 4 | |
| Analog 0 to 5 VDC (9 pin D connector) | A | |
| Analog 0 to 5 VDC (15 pin D connector) | B | |
| Analog 4 to 20 mA (15 pin D connector) | H | |
| **Device Type** | | |
| Mass Flow Controller | M | M |
| Mass Flow Meter | 3 | |
| **Reserved for MKS Future Use** | | |
| Standard | 0 | 0 |
| **Firmware** | | |
| Unless otherwise specified, MKS will ship firmware revision current to date | 10 | 10 |

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

Example Flowrate code:
254 is $2.5 \times 10^4$ or 25000 sccm
153 is $1.5 \times 10^3$ or 1500 sccm
601 is $6.0 \times 10^1$ or 60 sccm

Technology for Productivity

**Global Headquarters**

2 Tech Drive, Suite 201
Andover, MA 01810

Tel: 978.645.5500
Tel: 800.227.8766 (in U.S.A.)
Web: www.mksinst.com

GM50 - 5/13
© 2012 MKS Instruments, Inc.
All rights reserved.

MKS products provided subject to the US Export Regulations. Diversion or transfer contrary to US law is prohibited.

Specifications are subject to change without notice. mksinst™ is a trademark of MKS Instruments, Inc., Andover, MA. Swagelok® and VCR® are registered trademarks of Swagelok Marketing Co., Solon, OH. Teflon® is a registered trademark of E.I. Dupont, Wilmington, DE. Elgiloy® is a registered trademark of Elgiloy Limited Partnership, Elgin, IL. DeviceNet™ is a trademark of the Open DeviceNet Vendor Association, Coral Springs, FL. Profibus™ is a trademark of Profibus International, Karlsruhe, Germany.