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mks


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 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 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** | 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 set point for 20 to 100% F.S.<br>± 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** *(per SEMI Guideline E-17-0600)* | < 750 msec., typical above 5% F.S. |
| **Warm-up Time** *(to within 0.2% of F.S. of steady state performance)* | < 30 min |
| **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 x $10^{-10}$ |
| Through closed valve | < 1.0% of F.S. at 40 psig inlet to atmosphere<br>(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

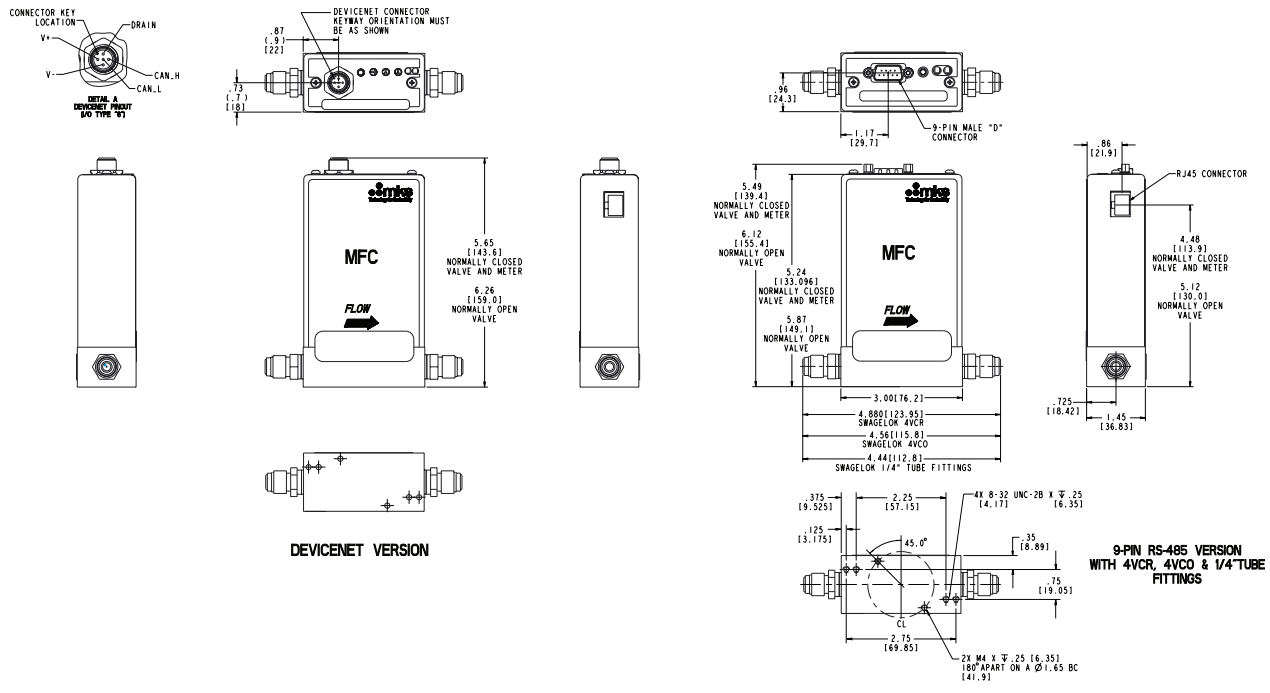
| | |
|---|---|
| **Input Power Required** | +15 to +24 VDC @ (< 4 watts) |
| **Flow Input/Output Signal** | |
| Voltage (0 to 5 VDC) | 15 pin Type "D" male, 9 pin Type "D" male |
| Current (4 to 20 mA) | 15 pin Type "D" male |
| **Compliance** | CE |

# 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)<br>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<br>Set data rate via RS485 | No switch<br>Set data rate via Profibus | No switch | No switch |
| **Comm. Rate(s)** | 125 Kbps<br>250 Kbps<br>500 Kbps | 9.6 Kbps<br>19.2 Kbps<br>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<br>1 to 254 | Set address over RS485<br>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)<br>LED Module (green/red) | LED Comm (yellow)<br>LED Error (red) | LED Comm (green/red)<br>LED Error (green/red) | LED Power (green)<br>LED Run (green)<br>LED Error (red)<br>LED Comm (green) | LED Maint (amber)<br>LED BUS Fault (red)<br>LED Ready (green)<br>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® (1179B Compatible) | 4 (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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