# GM51A

## 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 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).


## Product Features

- 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™, PROFINET and RS485) or analog (0 to 5 VDC or 4 to 20 mA) I/O

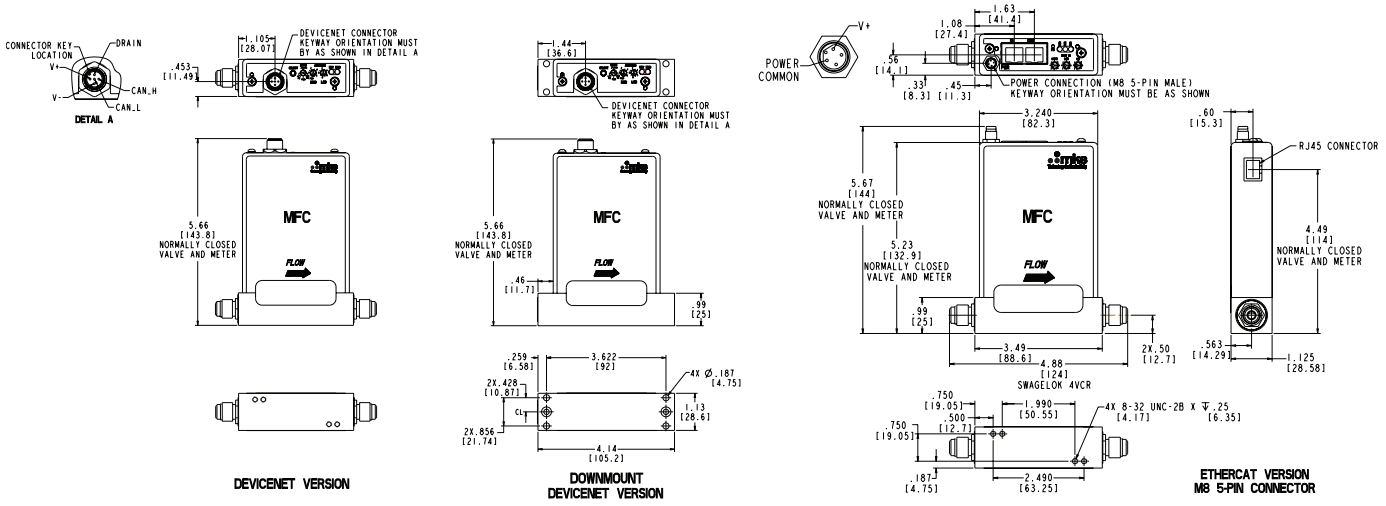
### Key Benefits

- Patented thermal sensor design provides exceptional zero stability
- Percent of set point accuracy (calibration gas) enables precise process control

## Specifications

| | | |
|---|---|---|
| **Performance** | | |
| **Full Scale Flow Ranges ($N_2$ equivalent)** | | 5 - 50000 sccm |
| **Maximum Inlet Pressure** | **MFC**<br>**MFM** | • 150 psig (can not exceed pressure differential requirement across MFC)<br>• 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<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 Full Scale (range on mech.) |
| **Typical Accuracy (with $N_2$ calibration gas)** | | • ±1% of Reading for 20 to 100% Full Scale<br>• ±0.2% of Full Scale for 2 to 20% Full Scale<br>• ±1% of Reading for meters |
| **Repeatability** | | ±0.3% of Reading |
| **Resolution** | | 0.1% of Full Scale |
| **Temperature Coefficients** | **Zero**<br>**Span** | • <0.05% of Full Scale/°C<br>• <0.08% of Reading/°C |
| **Inlet Pressure Coefficient** | | <0.02% of Reading/psi |
| **Warm-up Time (to within 0.2% of Full Scale of steady state performance)** | | 30 minutes |
| **Typical Controller Settling Time (per SEMI Guideline E-17-0600)** | | <750 msec., typical above 5% Full Scale |
| **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<br>• C-seal surface mount<br>• W-seal surface mount |
| **Leak Integrity** | **External (scc/sec He)**<br>**Through Closed Valve** | • $<1 \times 10^{-10}$<br>• <1.0% of Full Scale at 40 psig inlet to atmosphere<br>(To assure no flow-through, a separate positive shut-off valve is required.) |
| **Wetted Materials** | **Standard**<br><br>**Valve Seat (MFC only)** | • 316L S.S. VAR (equivalent to 316 S.S. SCQ for semiconductor quality), 316 S.S., Elgiloy®, Nickel, KM45<br>• Teflon® |
| **Surface Finish** | **MFC**<br>**MFM** | • 10µ inch average Ra (electropolished)<br>• 16µ inch average Ra |
| **Weight** | | <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)**<br>**Current (4 to 20 mA)** | • 15 pin Type "D" male, 9 pin Type "D" male<br>• 15 pin Type "D" male |
| **Compliance** | | CE |

| 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 (yellow) LED Error (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 Drawings: DeviceNet™, Downmount with VCR® fittings* and EtherCAT® with VCR fittings**

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

## Ordering Information

| Ordering Code Example: GM51A013502R8M0020 | Code | Configuration |
|---|---|---|
| **Model** | | |
| MFC Mass Flow Controller GM51A | GM51A | GM51A |
| **Gas (per Semi Standard E52-0703)** | | |
| 013 = Nitrogen = $N_2$<br>029 = Ammonia = $NH_3$<br>110 = Sulfur Hexafluoride = $SF_6$ | 013<br>029<br>110 | 013 |
| **Flow Range Full Scale*** | | |
| 5 sccm<br>10 sccm<br>20 sccm<br>50 sccm<br>100 sccm<br>200 sccm<br>500 sccm<br>1000 sccm<br>2000 sccm<br>5000 sccm<br>10000 sccm<br>20000 sccm<br>30000 sccm<br>50000 sccm | 500<br>101<br>201<br>501<br>102<br>202<br>502<br>103<br>203<br>503<br>104<br>204<br>304<br>504 | 502 |
| **Fittings (compatible with)** | | |
| Swagelok 4 VCR male<br>C-seal surface mount<br>W-seal surface mount | R<br>C<br>H | R |
| **Connector** | | |
| EtherCAT<br>DeviceNet<br>RS485 (uses 9 pin connector)<br>PROFINET<br>Analog 0 to 5 VDC (9 pin D connector)<br>Analog 0 to 5 VDC (9 Pin D connector), Tied Grounds<br>Analog 0 to 5 VDC (15 pin D connector)<br>Analog 0 to 5 VDC (15 pin D connector), Tied Grounds<br>Analog 4 to 20 mA (15 pin D connector) | 8<br>6<br>5<br>9<br>A<br>L<br>B<br>M<br>H | 8 |
| **Valve/Device Type** | | |
| Normally Closed/Mass Flow Controller, Teflon®<br>No Valve/Mass Flow Meter | M0<br>30 | M0 |
| **Reserved** | | |
| 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 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.*

www.MKSINST.com

GM51A_10/21
©2012-2021 MKS Instruments, Inc.
Specifications are subject to change without notice.

MKS products provided subject to the US Export Regulations. Export, re-export, diversion or transfer contrary to US law (and local country law) is prohibited. US Patent No 5461913. mksinst™ is a trademark of MKS Instruments, Inc. or a subsidiary of MKS Instruments, Inc. All other trademarks cited herein are the property of their respective owners.