



# Type GV50A

## ELASTOMER SEALED, DIGITAL MASS FLOW CONTROLLER

The GV50A is a general purpose, elastomer sealed MFC well suited for a wide variety of applications requiring flow control capability from 10 sccm to 50 slm FS, N<sub>2</sub> equivalent. The GV50A incorporates the latest in digital flow control electronics along with a well proven, patented thermal sensor and mechanical design.

The GV50A digitally controlled MFC is available with either RS485 or DeviceNet 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 600 to 800 milliseconds. Included is a digital calibration that yields 1% of setpoint accuracy on the calibration gas. The I/O protocols are designed so that the GV50A can easily replace the RS485 and DeviceNet versions of the 2179A with minor coding required.

The GV50A incorporates a normally closed, diaphragm type positive shut-off valve. This shut-off valve provides closure to  $4 \times 10^{-9}$  scc/sec of Helium. The design of the GV50A incorporates a minimal use of elastomers. There is only one external elastomer seal and elastomer valve plug. Otherwise, all wetted surfaces are of metal. The GV50A comes standard with Viton® seals along with options for Buna, Neoprene® or Kalrez® allowing for the device's use with gases requiring one of these alternatives.

## 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
- Compatible RS485 and DeviceNet™ profiles allow the GV50A to replace its 2179A counterparts
- Integral, normally closed diaphragm type shut-off valve provides positive shut-off to  $4 \times 10^{-9}$  scc/sec He
- CE Mark and RoHS Compliance – meeting requirements for the European Union



## Performance

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|                                                                                                              |                                                                                                            |
|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Full Scale Flow Ranges</b> ( $N_2$ equivalent)                                                            | 10 sccm to 50000 sccm                                                                                      |
| <b>Maximum Inlet Pressure</b>                                                                                | 150 psig<br>(cannot exceed pressure differential requirement across MFC)                                   |
| <b>Normal Operating Pressure Differential</b> ( $N_2$ F.S.)<br>(with atmospheric pressure at the MFC outlet) | 10 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 |
| <b>Proof Pressure</b>                                                                                        | 1000 psig                                                                                                  |
| <b>Burst Pressure</b>                                                                                        | 1500 psig                                                                                                  |
| <b>Control Range</b>                                                                                         | 2% to 100% of F.S.                                                                                         |
| <b>Typical Accuracy</b> (with $N_2$ calibration gas)                                                         | $\pm 1\%$ of setpoint for 20 to 100% F.S.<br>$\pm 0.2\%$ of F.S. for 2 to 20% F.S.                         |
| <b>Repeatability</b>                                                                                         | $\pm 0.3\%$ of Reading                                                                                     |
| <b>Resolution</b>                                                                                            | 0.1% of Full Scale                                                                                         |
| <b>Temperature Coefficients</b>                                                                              |                                                                                                            |
| Zero                                                                                                         | $< 0.05\%$ of F.S./ $^{\circ}\text{C}$                                                                     |
| Span                                                                                                         | $< 0.08\%$ of Rdg./ $^{\circ}\text{C}$                                                                     |
| <b>Inlet Pressure Coefficient</b>                                                                            | $< 0.02\%$ of Rdg./psi                                                                                     |
| <b>Typical Controller Settling Time</b><br>(per SEMI Guideline E-17-0600)                                    | $< 500$ msec., typical above 5% F.S.                                                                       |
| <b>Warm-up Time</b><br>(to within 0.2% of F.S. of steady state performance)                                  | $< 30$ min                                                                                                 |
| <b>Operating Temperature Range (Ambient)</b>                                                                 | $10^{\circ}\text{C}$ to $50^{\circ}\text{C}$                                                               |
| <b>Storage Humidity</b>                                                                                      | 0 to 95% Relative Humidity, non-condensing                                                                 |
| <b>Storage Temperature</b>                                                                                   | $-20^{\circ}$ to $80^{\circ}\text{C}$ ( $-4^{\circ}$ to $149^{\circ}\text{F}$ )                            |

## Mechanical

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|                                     |                                                                                                                                                                                                      |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fittings</b> (compatible with)   | Swagelok® 4 VCR®, Swagelok VCO®, or Swagelok                                                                                                                                                         |
| <b>Leak Integrity</b>               |                                                                                                                                                                                                      |
| External (scc/sec He)               | $< 1 \times 10^{-9}$                                                                                                                                                                                 |
| Through closed control valve        | Up to 10K valve $< 0.1\%$ of FS at 40 psig to atmosphere<br>20K - 50K valve $< 1.0\%$ of FS at 40 psig to atmosphere<br>(To assure no flow-through, a separate positive shut-off valve is required.) |
| Through shut-off valve (scc/sec/He) | $< 4 \times 10^{-9}$                                                                                                                                                                                 |
| <b>Wetted Materials</b>             |                                                                                                                                                                                                      |
| Standard                            | 316L S.S. VAR (equivalent to 316 S.S. SCQ for semiconductor quality),<br>316 S.S., Elgiloy®, Nickel, Kel-F                                                                                           |
| Seals and Valve Seat                | Viton, Buna-N, or Neoprene                                                                                                                                                                           |
| <b>Surface Finish</b>               | $16\mu$ inch average Ra                                                                                                                                                                              |
| <b>Weight</b>                       | less than 3 lbs (1.4kg)                                                                                                                                                                              |

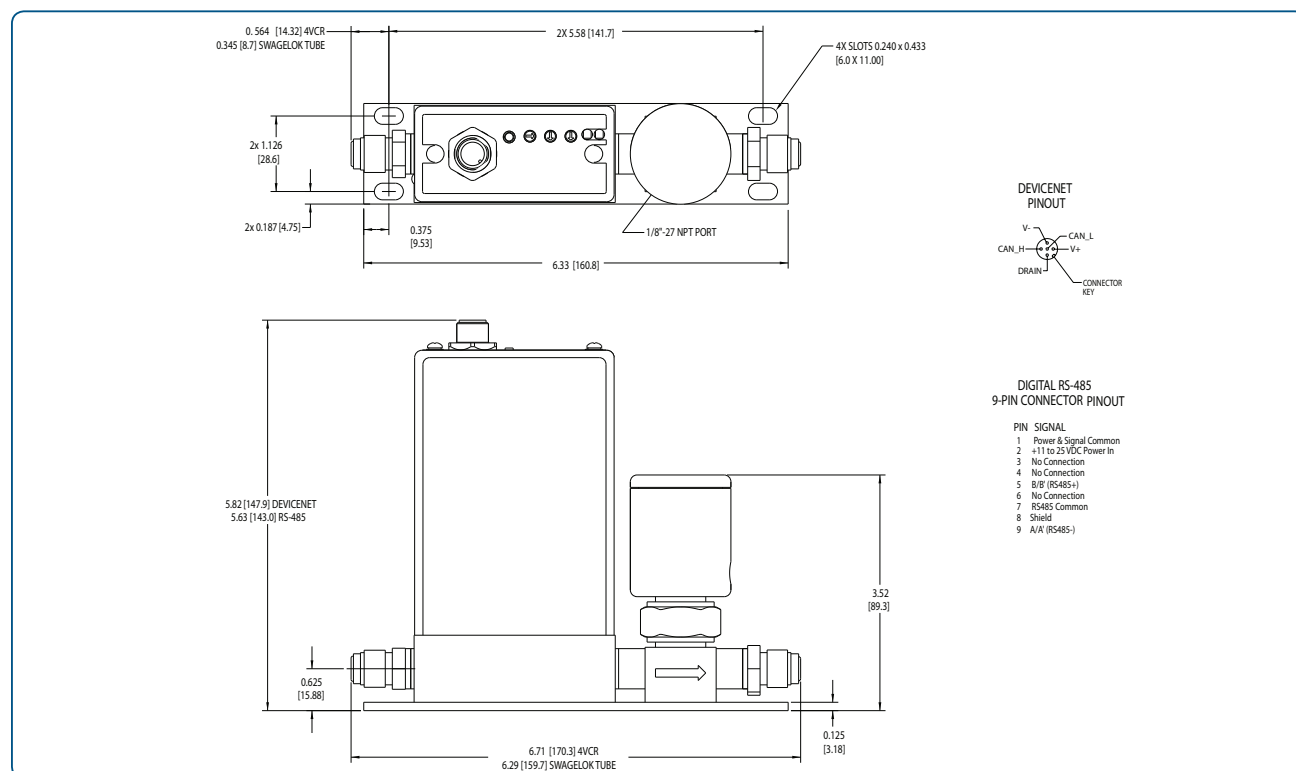


## Specifications (cont'd)

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

| Digital I/O                     | DeviceNet™                                                                                                                                                                        | RS-485                                                                                                                                          |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Power Required            | +11 to +25 VDC per DeviceNet specification (@ <3.5 watts)                                                                                                                         | +15 to +24 VDC @ 350mA max                                                                                                                      |
| Connector                       | 5 pin microconnector (DeviceNet)                                                                                                                                                  | 9 pin Type D male                                                                                                                               |
| Data Rate Switch                | 4 positions: 125, 250, 500K (Default), PGM (programmable over the network)                                                                                                        | 9.6, 19.2, 38.4K (Default)<br>Set Data Rate via RS485                                                                                           |
| Data Rate/Network Length        | Data Rate (User Selectable)<br>125 Kbps, 500 meters (1,640 feet)<br>250 Kbps, 250 meters (820 feet)<br>500 Kbps, 100 meters (328 feet)                                            | Data Rate (User Selectable)<br>9.6 Kbps, 1200 meters (4,000 feet)<br>19.2 Kbps, 1200 meters (4,000 feet)<br>38.4 Kbps, 1200 meters (4,000 feet) |
| MAC ID Switches/Addresses       | 2 switches, 10 positions; 0,0 to 6,3 are hardware ID numbers; 7,0 to 9,9 are software ID numbers; (6,4 to 6,9 are unused and, if selected will default to hardware ID number 6,3) | Set address over RS485<br>Available MAC ID's are 3,2 to 9,9.                                                                                    |
| Network Size                    | Up to 64 nodes                                                                                                                                                                    | Up to 32 nodes                                                                                                                                  |
| Network Topology                | Linear (trunkline/dropline) power and signal on same network cable                                                                                                                | Master/slave                                                                                                                                    |
| Visual Communication Indicators | LED network status (green/red)<br>LED module status (green/red)                                                                                                                   | LED Comm (green/red)<br>LED Error (green/red)                                                                                                   |

## Dimensional Drawing



### Dimensional Drawing — RS-485 and DeviceNet™ with VCR Fittings

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



## Ordering Information

| Ordering Code Example: GV50A013502R6V010                                    |     | Code  | Configuration |
|-----------------------------------------------------------------------------|-----|-------|---------------|
| Type MFC Mass Flow Controller GV50A                                         |     | GV50A | GV50A         |
| Gas (Per Semi Standard E52-0703)                                            |     |       |               |
| For example:                                                                |     |       |               |
| 013 = Nitrogen = N <sub>2</sub>                                             | 013 |       | 013           |
| 029 = Ammonia = NH <sub>3</sub>                                             | 029 |       |               |
| 110 = Sulfur Hexafluoride = SF <sub>6</sub>                                 | 110 |       |               |
| Flow Range Full Scale*                                                      |     |       |               |
| 10 sccm                                                                     | 101 |       | 502           |
| 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             |
| Swagelok 4 VCO male                                                         | G   |       |               |
| ¼" Swagelok                                                                 | S   |       |               |
| Connector                                                                   |     |       |               |
| DeviceNet™                                                                  | 6   |       | 6             |
| RS485 (uses 9 pin connector)                                                | 5   |       |               |
| Profibus™                                                                   | 4   |       |               |
| Seal Materials**                                                            |     |       |               |
| Viton                                                                       | V   |       | V             |
| Buna-N                                                                      | B   |       |               |
| Neoprene                                                                    | N   |       |               |
| 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 x 10<sup>4</sup> or 25000 sccm

153 is 1.5 x 10<sup>3</sup> or 1500 sccm

601 is 6.0 x 10<sup>1</sup> 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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