



## 500/600 Series II

Mass Flow Meters and Controllers

aerospace  
climate control  
electromechanical  
filtration  
fluid & gas handling  
hydraulics  
pneumatics  
process control  
sealing & shielding



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# 500/600 Series II Mass Flow

The original 500/600 Series Digital Mass Flow Products introduced the Porter standard of versatility and cost effectiveness to digital MFC's. The new 500/600 SERIES II instruments take those concepts to a higher level. The instruments in the new SERIES II product line feature expanded flow ranges; from 0.014 - 0.7 cc/min up to 33 - 1670 l/min and are available with maximum operating pressures up to 5800 PSIA. SERIES II Mass Flow Products can be factory configured to include up to 8 gas type and flow range combinations with an effective turn down ratio of 150:1. In addition they can be configured with Porter's Flow Parameter Adjust (FPA) feature. FPA offers increased flexibility by providing user selection of both flow ranges and gas types while maintaining high accuracy and up to 150:1 effective turndown ranges for measurement and control.

A newly developed software tool and available connection hardware allows communication with the MFC through a Laptop USB port. With this package, the selection of different gas types and flow ranges is simple and intuitive. As a result, Original Equipment Manufacturers are able to significantly reduce the variety of spare instruments they keep in stock, thereby reducing the cost of ownership. Users of MFC's in pilot plants or laboratories can rescale their instruments on site, saving time and cost.



## Available Models

| MFM Model Number | MFC Model Number | Flow Range                               |
|------------------|------------------|--|
| 510C             | 600CV            | 0.014 - 0.7 ml/min up to 0.18 - 9 ml/min |
| 511B             | 601CV            | 0.16 - 8 ml/min up to 0.5 - 25 l/min     |
| 511AC            | 601AV            | 0.4 - 20 l/min up to 5 - 100 l/min       |
| 512AC            | 602AV            | 0.8 - 40 l/min up to 1.4-250 l/min       |
| 513AC            | 603AV            | 4 - 200 l/min up to 33 - 1670 l/min      |

**Note:** The flow ranges listed are the minimum and maximum nitrogen (N<sub>2</sub>) flow ranges available for each given model. Intermediate flow ranges are available. For correct sizing when operating parameters are questionable, please consult the factory. All flow ranges are at standard conditions of 14.7 PSIA and 70°F (21.1°C)

## Product Features

- Gas flow ranges from 0 - 0.7 ml/min up to 0 - 1670 l/min
- Operating pressures up to 5800 PSIA
- High accuracy and repeatability
- Storage of max. 8 calibration curves
- User configurable control characteristics
- Flow Parameter Adjust functionality up to 150 PSIA
- Effective rangeability <150:1
- Analog or digital: RS-232, DeviceNet™, Profibus-DP®, Modbus-RTU™

# Specifications

## Measurement / Control System

|   |   |
|---|---|
| Accuracy (incl. linearity)<br>(based on actual calibration) | Standard: $\pm 0.5\%$ Reading plus $\pm 0.1\%$ Full Scale<br>( $\pm 1\%$ Full Scale for ranges 3-5 ml/min;<br>$\pm 2\%$ Full Scale for ranges < 3 ml/min) |
| Turndown  | 1 : 50 (in digital mode up to 1 : 187.5)  |
| Repeatability   | <0.2% Reading   |
| Settling Time (Controller)                                  | Standard: 1-2 seconds   |
| Control Stability   | < $\pm 0.1\%$ Full Scale (typical for 1 l/min N <sub>2</sub> )  |
| Operating Temperature                                       | -10°C to +70°C  |
| Temperature Sensitivity                                     | Zero: <0.05% Full Scale/°C; span: <0.05% Reading/°C   |
| Pressure Sensitivity  | 0.1%/ATM typical N <sub>2</sub> ; 0.01%/ATM typical H <sub>2</sub>  |
| Leak Integrity, outboard                                    | Tested < 2 x 10 <sup>-9</sup> mbar l/s He   |
| Attitude Sensitivity  | Max. error at 90° off horizontal 0.2% at 1 ATM, typical N <sub>2</sub>  |
| Warm-Up Time  | 30 min. for optimum accuracy<br>2 min. for accuracy $\pm 2\%$ Full Scale  |

## Mechanical Parts

|                                |   |
|--------------------------------|---|
| Material (wetted parts)        | Stainless steel 316L or comparable                      |
| Surface Quality (wetted parts) | Ra= 0.8µm typical                                       |
| Process Connections            | Compression or face seal fittings                       |
| Seals                          | Standard: Viton® (FKM)<br>Options: EPDM, Kalrez® (FFKM) |
| Ingress Protection (housing)   | IP40  |

## Electrical Properties

|                       |   |
|-----------------------|---|
| Power Supply          | +15-24 Vdc  |
| Power Consumption     | Meter: 70 mA;<br>Controller: max. 320 mA;<br>Add 50 mA for Profibus®, if applicable |
| Analog Output/Command | 0-5 (10) Vdc or 0 (4)-20 mA – specify – (Sourcing output)                           |
| Digital Communication | Standard: RS-232<br>Options: Profibus-DP®, DeviceNet™, Modbus™                      |

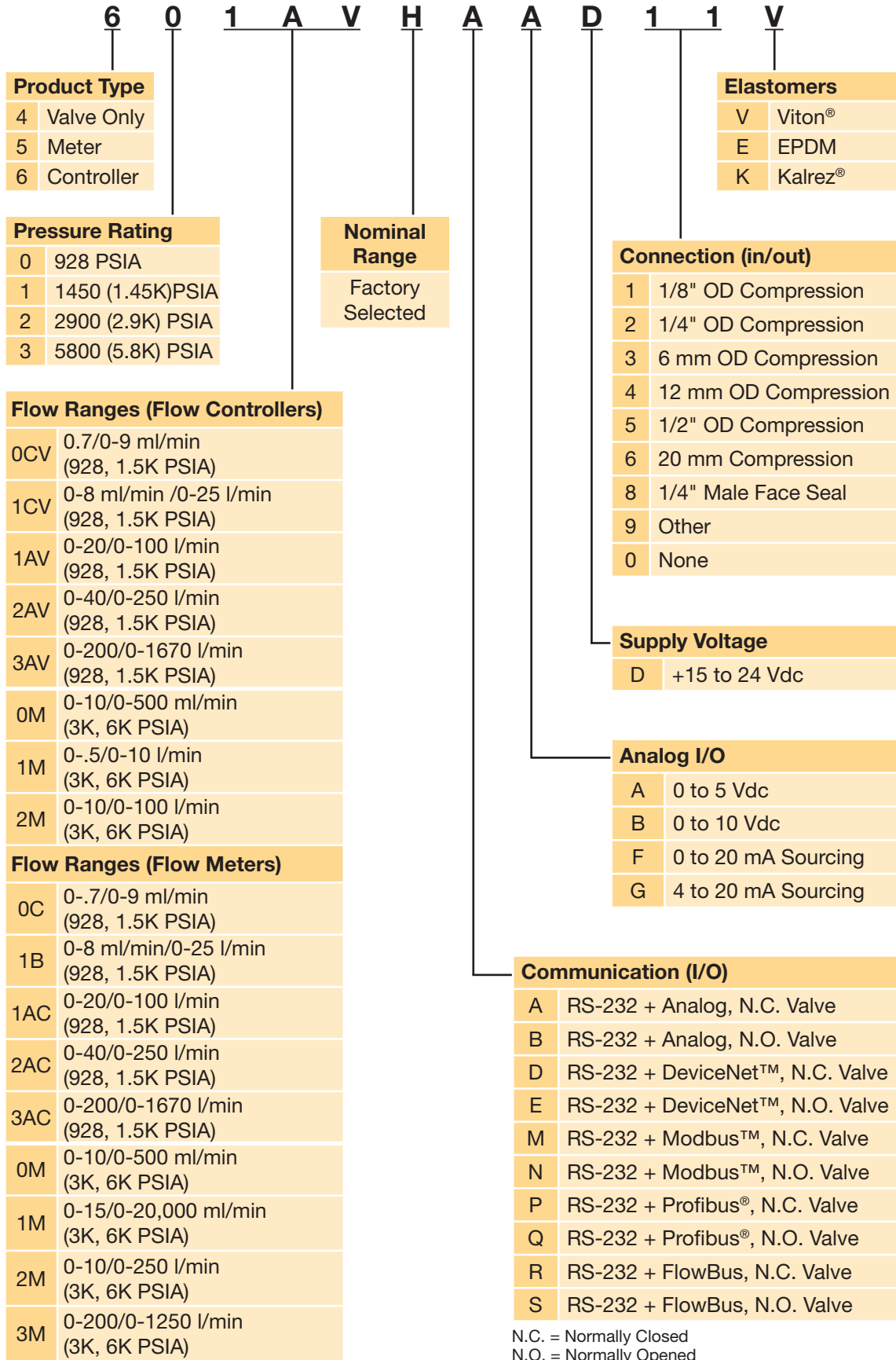
## Electrical Connection

|                      |  |
|----------------------|--|
| Analog/RS-232        | 9-pin D-connector (male)   |
| Profibus-DP®         | Bus: 9-pin D-connector (female)<br>Power: 9-pin D-connector (male) |
| DeviceNet™           | 5-pin M12-connector (male)   |
| Modbus-RTU™/FLOW-BUS | RJ45 modular jack  |

Technical specifications and dimensions subject to change without notice.

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# Model Number and Description



# Minimum / Maximum Flow Ranges for Typical Gases

(Valid for operating conditions from 12 to 150 PSIA and 0°C to 70°C)

| Model Number  | Min/Max Range | Ar        | CH <sub>4</sub> | C <sub>2</sub> H <sub>6</sub> | CO        | CO <sub>2</sub> |          |
|---------------|---------------|-----------|-----------------|-------------------------------|-----------|-----------------|----------|
| 510C / 600CV  | Min           | 0.02-1    | 0.012-0.6       | 0.008-0.4                     | 0.014-0.7 | 0.012-0.6       | ml / min |
|               | Max           | 0.07-9.5  | 0.04-5.5        | 0.028-4                       | 0.06-9    | 0.04-4.5        |          |
| 511B / 601CV  | Min           | 0.2-10    | 0.11-5.5        | 0.08-4                        | 0.16-8    | 0.14-7          | l / min  |
|               | Max           | 0.2-25    | 0.13-16         | 0.088-11                      | 0.16-25   | 0.122-14        |          |
| 511AC / 601AV | Min           | 0.54-27   | 0.32-16         | 0.22-11                       | 0.4-20    | 0.3-15          | l / min  |
|               | Max           | 0.9-100   | 0.5-60          | 0.4-45                        | 0.6-100   | 0.5-50          |          |
| 512AC / 602AV | Min           | 1.12-56   | 0.64-32         | 0.42-21                       | 0.8-40    | 0.62-31         | l / min  |
|               | Max           | 2-250     | 1.1-170         | 0.7-120                       | 1.4-250   | 1-130           |          |
| 513AC / 603AV | Min           | 5.4-270   | 3.2-160         | 2.2-110                       | 4-200     | 3-150           | l / min  |
|               | Max           | 11.2-1670 | 6.4-900         | 4.2-750                       | 8-1500    | 6.2-850         |          |

| Model Number  | Min/Max Range | H <sub>2</sub> | He        | Air / N <sub>2</sub> | N <sub>2</sub> O | O <sub>2</sub> |          |
|---------------|---------------|----------------|-----------|----------------------|------------------|----------------|----------|
| 510C / 600CV  | Min           | 0.014-0.7      | 0.02-1    | 0.014-0.7            | 0.012-0.6        | 0.014-0.7      | ml / min |
|               | Max           | 0.06-7.2       | 0.07-10   | 0.06-9               | 0.04-4.5         | 0.06-9         |          |
| 511B / 601CV  | Min           | 0.144-7.2      | 0.2-10    | 0.16-8               | 0.12-6           | 0.16-8         | l / min  |
|               | Max           | 0.168-25       | 0.24-30   | 0.16-25              | 0.12-14          | 0.16-25        |          |
| 511AC / 601AV | Min           | 0.42-21        | 0.56-28   | 0.4-20               | 0.3-15           | 0.4-20         | l / min  |
|               | Max           | 0.6-90         | 0.9-125   | 0.6-100              | 0.5-50           | 0.6-90         |          |
| 512AC / 602AV | Min           | 0.84-42        | 1.12-56   | 0.8-40               | 0.6-30           | 0.8-40         | l / min  |
|               | Max           | 1.4-200        | 2-300     | 1.4-250              | 1-130            | 1.4-250        |          |
| 513AC / 603AV | Min           | 4.2-210        | 5.6-280   | 4-200                | 3-150            | 4-200          | l / min  |
|               | Max           | 8.4-1350       | 11.2-1850 | 8-1670               | 6-840            | 8-1500         |          |

## Notes:

- Flow parameter adjust is optional on the Series II and must be requested at the point of ordering
- Extended rangeability for digital communication only; turndown 50:1 when using analog I/O options
- The selected orifice of the control valve may limit the rangeability
- Standard accuracy ( based on actual calibration): +(0.5% RD + 0.1% FS); ranges from 0 - 5 to 0 - 10 ml/min: ±1% FS; ranges ≤ 0-5 ml/min: ±2% FS
- Series II factors for gas not in the above table are available from the factory

**⚠ WARNING – USER RESPONSIBILITY**

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