

# DATASHEET F-102D

## LOW-ΔP-FLOW F-102D

Mass Flow Meter for low pressure drop or corrosive gas service



### Thermal Mass Flow Meters for low pressure drop or corrosive gas applications

Bronkhorst® model F-102D Mass Flow Meters (MFMs) are suited for precise measurement of flow ranges between 0,28...14 I<sub>N</sub>/min and 0,5...25 I<sub>N</sub>/min (N<sub>2</sub>-equivalent). The instruments are particularly suited for corrosive gases or applications with very low differential pressure (ΔP). Compared to conventional instruments, LOW-ΔP-FLOW meters have larger flow channels to minimize the risk of clogging, facilitate cleaning and purging, and cause lower pressure drop (the sensor only requires 0,5 to 5 mbar).

The integrated digital pc-board provides signal and fieldbus conversion as well as PID controller functionality for optional mass flow control by means of a (separately mounted) control valve. In addition to the standard RS232 output the instruments also offer analog I/O. As an option, an on-board interface can be mounted to provide CANopen®, DeviceNet™, EtherCAT®, PROFIBUS DP, PROFINET, Modbus RTU, ASCII or TCP/IP, EtherNet/IP, POWERLINK or FLOW-BUS protocols.

### Technical specifications

#### Measurement / control system

|                                                          |                                                                                                       |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Flow range (intermediate ranges available)               | min. 0,28...14 I <sub>N</sub> /min<br>max. 0,5...25 I <sub>N</sub> /min<br>(based on N <sub>2</sub> ) |
| Accuracy (incl. linearity) (based on actual calibration) | ± 1 % FS                                                                                              |
| Repeatability                                            | < 0,2 % RD                                                                                            |
| Turndown ratio                                           | 1:50 (2...100%)                                                                                       |
| Max. operating pressure                                  | 10 bar g                                                                                              |
| Multi fluid capability                                   | Storage of max. 8 calibration curves                                                                  |
| Response time (sensor)                                   | 1 ... 2 sec.                                                                                          |
| Operating temperature                                    | -10 ... +70 °C                                                                                        |
| Mounting                                                 | horizontal                                                                                            |
| Temperature sensitivity                                  | < 0,1% FS/°C                                                                                          |
| Pressure sensitivity                                     | 0,1% Rd/bar typical N <sub>2</sub> ; 0,01% Rd/bar typical H <sub>2</sub>                              |
| Leak integrity, outboard                                 | tested < 2 x 10 <sup>-9</sup> mbar l/s He                                                             |
| Warm-up time                                             | 30 min. for optimum accuracy<br>2 min for accuracy ± 2% FS                                            |

#### Mechanical parts

|                         |                                                                                               |
|-------------------------|-----------------------------------------------------------------------------------------------|
| Material (wetted parts) | stainless steel 316L or comparable;<br>other on request                                       |
| Process connections     | compression type or face seal (VCR/VCO) couplings                                             |
| Seals                   | standard: FKM/Viton®;<br>options: EPDM, FFKM/Kalrez®, FDA and USP Class VI approved compounds |
| Weight                  | 0,6 kg                                                                                        |
| Ingress protection      | IP40                                                                                          |

## Electrical properties

|                                   |                                                                                                                                                    |                |                |                    |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|--------------------|
| Power supply                      | +15 ... 24 Vdc                                                                                                                                     |                |                |                    |
| Max. power consumption meter      | Supply                                                                                                                                             | at voltage I/O | at current I/O | extra for fieldbus |
|                                   | 15 V                                                                                                                                               | 95 mA          | 125 mA         | <75 mA             |
|                                   | 24 V                                                                                                                                               | 65 mA          | 85 mA          | <50 mA             |
| Max. Power consumption controller | Supply                                                                                                                                             | at voltage I/O | at current I/O | extra for fieldbus |
|                                   | 15 V                                                                                                                                               | 290 mA         | 320 mA         | <75 mA             |
|                                   | 24 V                                                                                                                                               | 200 mA         | 215 mA         | <50 mA             |
| Analog output                     | 0...5 (10) Vdc or 0 (4)...20 mA (sourcing output)                                                                                                  |                |                |                    |
| Digital communication             | standard: RS232;<br>options: PROFIBUS DP, CANopen®, DeviceNet™, PROFINET, EtherCAT®, Modbus RTU, ASCII or TCP/IP, EtherNet/IP, POWERLINK, FLOW-BUS |                |                |                    |

## Electrical connection

|                                         |                                                                      |
|-----------------------------------------|----------------------------------------------------------------------|
| Analog/RS232                            | 9-pin D-connector (male);                                            |
| PROFIBUS DP                             | bus: 9-pin D-connector (female);<br>power: 9-pin D-connector (male); |
| CANopen® / DeviceNet™                   | 5-pin M12-connector (male);                                          |
| FLOW-BUS/Modbus-RTU/ASCII               | RJ45 modular jack                                                    |
| Modbus TCP / EtherNet/IP /<br>POWERLINK | 2 x RJ45 modular jack (in/out);                                      |
| EtherCAT® / PROFINET                    | 2 x RJ45 modular jack (in/out);                                      |

## Control valve options

## External actuator options to be connected to the controller

## Certification for hazardous areas

## Approvals / certificates

Technical specifications subject to change without notice.

For dimensional drawings and hook-up diagrams please visit the [product page](#) on our [website](#)

## Recommended accessories



### E-8000 SERIES

#### Digital Readout / Control Systems

Bright, wide angle, 1.8" display (TFT technology)  
User friendly operation, menu driven with 4 push buttons



### BRIGHT SERIES

#### Compact Local R/C Module

Bright, wide angle, 1.8" display  
User friendly operation  
Indication/operation/configuration



### PIPS SERIES

#### Plug-in Power Supply

For lab-style or industrial devices  
Interchangeable plugs (Euro, UK, USA, Australian, IEC) for mains connection



### IN-LINE FILTER MEDIUM FLOW SERIE M-422

1/4" female in / male out  
200 bar  
Average porosity 2...20  $\mu\text{m}$

## Related products



### LOW-ΔP-FLOW F-101E

Min. flow 0,028...1,4  
In/min  
Max. flow 0,24...12  
In/min  
Pressure rating up to 10  
bar  
Very low pressure drop  
Suitable for corrosive  
gases



### LOW-ΔP-FLOW F-102E

Min. flow 0,17...8,5  
In/min  
Max. flow 1...50 In/min  
Pressure rating up to 10  
bar  
Very low pressure drop  
Suitable for corrosive  
gases



### LOW-ΔP-FLOW F-102DI

Min. flow 0,28...14  
In/min  
Max. flow 0,5...25 In/min  
Pressure rating up to 10  
bar  
Low ΔP, easy to purge  
Compact IP65 design



### LOW-ΔP-FLOW F-202DV

Min. flow 0,28...14  
In/min  
Max. flow 0,5...25 In/min  
Pressure rating up to 10  
bar  
Low ΔP, easy to purge  
Compact design