

# DATASHEET F-110C

## EL-FLOW Select F-110C

Digital Thermal Mass Flow Meter for Gases



### Gas Mass Flow Meters for lowest flow rates

Bronkhorst® model F-110C Mass Flow Meters (MFM) are suited for precise measurement of flow ranges between 0,014...0,7 ml<sub>n</sub>/min and 0,6...9 ml<sub>n</sub>/min at operating pressures between vacuum and 100 bar. The MFM consists of a thermal mass flow sensor and a microprocessor based pc-board with signal and fieldbus conversion and a PID controller for optional mass flow control by means of a separately mounted control valve.

EL-FLOW® Select series are equipped with a digital pc-board, offering high accuracy, excellent temperature stability and fast response. The main digital pc-board contains all of the general functions needed for measurement and control. 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. The EL-FLOW® Select design features optional Multi Gas / Multi Range functionality, providing (OEM-) customers with optimal flexibility and process efficiency.

### Technical specifications

#### Measurement / control system

|  |  |
|--|--|
| Flow range (intermediate ranges available)               | min. 0,014...0,7 ml <sub>n</sub> /min<br>max. 0,6...9 ml <sub>n</sub> /min<br>(based on N <sub>2</sub> ) |
| Accuracy (incl. linearity) (based on actual calibration) | ±0,8% Rd plus ±0,2% FS for F-110C-005;<br>±2% FS for F-110C-002  |
| Repeatability  | < 0,2 % RD   |
| Turndown ratio   | up to 1:187,5 (1:50 in analog mode)  |
| Multi fluid capability                                   | storage of max. 8 calibration curves;<br>optional Multi Gas / Multi Range functionality up to 10 bar abs |
| Response time (sensor)                                   | FS < 3 ml <sub>n</sub> /min: 2 sec;<br>FS > 3 ml <sub>n</sub> /min: 1...2 sec                            |
| Operating temperature                                    | -10... +70 °C  |
| Temperature sensitivity                                  | zero: < 0,05% FS/°C; span: < 0,05% Rd/°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  |
| Attitude sensitivity                                     | max. error at 90° off horizontal 0,2% at 1 bar, typical N <sub>2</sub>                                   |
| 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

## Mechanical parts

|                      |   |
|----------------------|---|
| Pressure rating (PN) | 100 bar abs   |
| Process connections  | compression type or face seal (VCR/VCO) couplings   |
| Seals                | standard: Viton®;<br>options: EPDM, Kalrez® (FFKM), FDA and USP Class VI approved compounds |
| Weight               | 0,4 kg  |
| Ingress protection   | IP40  |

## Electrical properties

|                                   |  |                |                |                    |
|-----------------------------------|--|----------------|----------------|--------------------|
| 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

## Ex-proof specifications

## 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  
SERIE M-410 RS**

1/8" female in / male out  
100 bar  
Average porosity 0.5...15 µm

## Related products



**EL-FLOW SELECT F-111B**

Min. flow 0,16...8 mln/min  
Max. flow 0,16...25 ln/min  
Pressure rating 100 bar  
Compact design  
High accuracy



**EL-FLOW SELECT F-200CV**

Min. flow 0,014...0,7 mln/min  
Max. flow 0,18...9 mln/min  
Pressure rating 64 bar  
Compact design  
High accuracy and repeatability



**EL-FLOW SELECT F-120M**

Min. flow 0,2...10 mln/min  
Max. flow 0,3...15 mln/min  
Pressure rating 200 bar  
Compact design  
High accuracy



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