

DATASHEET F-211CI

IN-FLOW F-211CI

Industrial Style Thermal Mass Flow Controller for Gases



Industrial Style Gas Mass Flow Controllers for low flow rates

Bronkhorst® model F-211CI Mass Flow Controllers (MFCs) are suited for accurate measurement and control of flow ranges between 0,16...8 ml_n/min and 0,5...25 l_n/min with pressure ratings up to 100 bar. The MFC consists of a thermal mass flow sensor, a precise control valve and a microprocessor based pc-board with signal and fieldbus conversion. As a function of a setpoint value, the flow controller swiftly adjusts the desired flow rate. The IN-FLOW model is of rugged design (IP65) for use in industrial environments or even Zone 2 hazardous areas, with optional ATEX Cat. 3 or FM Class I, Div. 2 approval.

IN-FLOW 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.

Technical specifications

Measurement / control system

| | |
|--|---|
| Flow range (intermediate ranges available) | min. 0,16...8 ml _n /min max. 0,5...25 l _n /min (based on N ₂) |
| Accuracy (incl. linearity) (based on actual calibration) | ±0,5% Rd plus ±0,1% FS |
| 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 |
| Settling time (in control, typical) | standard: 1...2 seconds option: down to 500 msec |
| Control stability | < ± 0,1 % FS |
| Operating temperature | -10 ... +70 °C for ATEX cat. 3 and FM Class 1 Div 2 : 0...50°C |
| Temperature sensitivity | zero: < 0,05% FS/°C; span: < 0,05% Rd/°C |
| Pressure sensitivity | 0,1% Rd/bar typical N ₂ ; 0,01% Rd/bar typical H ₂ |
| Max. Kv-value | 6,6 x 10 ⁻² |
| Leak integrity, outboard | tested < 2 x 10 ⁻⁹ mbar l/s He |
| Attitude sensitivity | max. error at 90° off horizontal 0,2% at 1 bar, typical N ₂ |

Measurement / control system

| | |
|--------------|---|
| Warm-up time | 30 min. for optimum accuracy 2 min for accuracy $\pm 2\%$ FS |
|--------------|---|

Mechanical parts

| | |
|-------------------------|---|
| Material (wetted parts) | stainless steel 316L or comparable |
| Pressure rating (PN) | 100 bar abs |
| Process connections | compression type or face seal couplings |
| Seals | standard: FKM/Viton®; options: EPDM, FFKM/Kalrez®, FDA and USP Class VI approved compounds |
| Weight | 1,4 kg |
| Ingress protection | IP65 |

Electrical properties

| | | | | |
|------------------------|--|----------------|----------------|--------------------|
| Power supply | +15 ... 24 | | | |
| Max. power consumption | 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; options: CANopen®, DeviceNet™, EtherCAT®, PROFIBUS DP, PROFINET, Modbus RTU, ASCII or TCP/IP, EtherNet/IP, POWERLINK or FLOW-BUS | | | |

Electrical connection

| | |
|---|---|
| Analog/RS232 | 8 DIN (male); |
| PROFIBUS DP | bus: 5-pin M12 (female); power: 8 DIN (male); |
| CANopen® / DeviceNet™ | 5-pin M12 (male); |
| FLOW-BUS/Modbus-RTU/ASCII | 5-pin M12 (male) |
| Modbus TCP / EtherNet/IP / POWERLINK | bus: 2 x 5-pin M12 (female) (in/out); power: 8 DIN (male); |
| EtherCAT®/ PROFINET | bus: 2 x 5-pin M12 (female) (in/out); power: 8 DIN (male); |
| IEC 61010-1 | IEC-61010-1:2010 including national deviations for UL (61010-1:2012) and CSA (C22.2 No. 61010-1-12) |

Control valve options

External actuator options to be connected to the controller

Certification for hazardous areas

Approvals / certificates

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
LOW FLOW SERIE M-411**

1/4" female in / male out
100 bar
Average porosity 0.5...15 µm

Related products



IN-FLOW F-210CI

Min. flow 0,014...0,7 ml/min
Max. flow 0,18...9 ml/min
Pressure rating 100 bar
Compact IP65 design
High accuracy and repeatability



IN-FLOW F-212AI

Min. flow 0,8...40 l/min
Max. flow 5...250 l/min
Pressure rating 100 bar
Compact IP65 design
High accuracy and repeatability



IN-FLOW F-111BI

Min. flow 0,16...8 ml/min
Max. flow 0,16...25 l/min
Pressure rating 100 bar
Compact IP65 design
High accuracy

