

# DATASHEET F-211AI

## IN-FLOW F-211AI

Industrial Style Thermal Mass Flow Controller for Gases



### Industrial Style Gas Mass Flow Controllers for low/medium flow rates

Bronkhorst® model F-211AI Mass Flow Controllers (MFCs) are suited for accurate measurement and control of flow ranges between 0,4...20 I<sub>N</sub>/min and 2...100 I<sub>N</sub>/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. 0,4...20 I <sub>N</sub> /min max. 2...100 I <sub>N</sub> /min (based on N <sub>2</sub> )
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 <sub>2</sub> ; 0,01% Rd/bar typical H <sub>2</sub>
Max. Kv-value	6,6 x 10 <sup>-2</sup>
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 2 min for accuracy ± 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: Viton®; options: EPDM, Kalrez® (FFKM), FDA and USP Class VI approved compounds			
Weight	1,5 kg			
Ingress protection	IP65			

Electrical properties

Power supply	+15 ... 24 Vdc			
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

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-411 RS

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

Related products



IN-FLOW F-211CI

Min. flow 0,16...8 mln/min  
Max. flow 0,5...25 ln/min  
Pressure rating 100 bar  
Compact IP65 design  
High accuracy and repeatability



IN-FLOW F-212AI

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



IN-FLOW F-111AI

Min. flow 0,4...20 ln/min  
Max. flow 0,6...100 ln/min  
Pressure rating 100 bar  
Compact IP65 design  
High accuracy



**BRONKHORST (UK) LTD**

1 Kings Court

Willie Snaith Road

Newmarket Suffolk CB8 7TG

Tel. +44 1223 833222

[sales@bronkhorst.co.uk](mailto:sales@bronkhorst.co.uk)

