

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_n/min and 2...100 I_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. 0,4...20 I _n /min max. 2...100 I _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
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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	1,5 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

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-211CI

Min. flow 0,16...8 ml/min
Max. flow 0,5...25 l/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-111AI

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

