

DATASHEET F-221MI

IN-FLOW F-221MI

Industrial Style High-Pressure Mass Flow Controller for Gases



Industrial Style Gas Mass Flow Controllers for High Pressure / High Delta-P

Bronkhorst® model F-221MI Mass Flow Controllers (MFCs) are suited for accurate measurement and control of flow ranges between 0,3...15 ml_n/min and 0,4...20 l_n/min with an operating pressure up to 200 bar and max. 200 bar pressure difference (ΔP). 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. 0,3...15 ml _n /min max. 0,4...20 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	1:50
Multi fluid capability	Storage of max. 8 calibration curves
Settling time (in control, typical)	2 ... 4 sec.
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	1,5 x 10 ⁻³
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)	200 bar abs
Process connections	compression type or face seal coupling
Seals	Viton®
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

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
LOW FLOW SERIE M-411**

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

Related products



IN-FLOW F-122MI

Min. flow 0,3 ... 15 l/min
Max. flow 5 ... 250 l/min
Pressure rating 200 bar
Compact IP65 design
High accuracy



IN-FLOW F-231MI

Min. flow 0,01...0,5 l/min
Max. flow 0,2...10 l/min
Pressure / ΔP up to 350 bar
Compact design
High accuracy and repeatability



IN-FLOW F-232MI

Min. flow 0,2...10 l/min
Max. flow 2...100 l/min
Pressure / ΔP up to 350 bar
Compact IP65 design
High accuracy and repeatability



Bronkhorst High-Tech designs and manufactures innovative instruments and subsystems for low-flow measurement and control for use in laboratories, machinery and industry. Driven by a strong sense of sustainability and with many years of experience, we offer an extensive range of (mass) flow meters and controllers for gases and liquids, based on thermal, Coriolis and ultrasonic measuring principles. Our global sales and service network provides local support in more than 40 countries. Discover Bronkhorst®!