

# F-230MI

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## IN-FLOW F-230MI

Industrial Style High-Pressure Mass Flow Controller for Gases

- High accuracy, excellent repeatability
- Fast response
- Operating pressure / delta-P up to 400 bar
- Compact, rugged design (IP65, dust and waterproof)
- Virtually pressure and temperature independent



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

Bronkhorst® model F-230MI Mass Flow Controllers (MFCs) are suited for accurate measurement and control of flow ranges between 0,2...10 ml<sub>n</sub>/min and 10...500 ml<sub>n</sub>/min with an operating pressure up to 400 bar and max. 400 bar pressure difference ( $\Delta P$ ). 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 DeviceNet™, PROFIBUS DP, PROFINET, Modbus, or FLOW-BUS protocols.

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### Technical specifications

## Measurement / control system

Flow range, based on N <sub>2</sub> (intermediate ranges available)	min. 0,2...10 ml <sub>n</sub> /min max. 10...500 ml <sub>n</sub> /min
Accuracy (incl. linearity) (based on actual calibration)	±0,5% Rd plus ±0,1% FS
Turndown	1:50
Multiple fluid capability	storage of max. 8 calibration curves
Repeatability	< 0,2% Rd
Settling time (controller)	2...4 seconds
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>
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	400 bar abs
Min. ΔP	6 bar dif.
Max. ΔP	up to 400 bar dif.
Process connections	compression type or face seal couplings
Seals	standard: Viton <sup>®</sup> ; options: EPDM, Kalrez <sup>®</sup> (FFKM)
Ingress protection (housing)	IP65

## Electrical properties

Power supply	+15...24 Vdc		
Max. power consumption	Supply	at voltage I/O	at current I/O
	15 V	290 mA	320 mA
	24 V	200 mA	215 mA
PROFIBUS DP	add 53 mA (15 V supply) or 30 mA (24 V supply)		
PROFINET	add 77 mA (15 V supply) or 48 mA (24 V supply)		
DeviceNet™	add 48 mA (24 V supply)		
Analog output/command	0...5 (10) Vdc or 0 (4)...20 mA (sourcing output)		
Digital communication	standard: RS232; options: PROFIBUS DP, PROFINET, DeviceNet™, Modbus RTU or ASCII, FLOW-BUS		

## Electrical connection

Analog/RS232	8 DIN (male);
PROFIBUS DP	bus: 5-pin M12 (female); power: 8 DIN (male);
PROFINET	bus: 2 x 5-pin M12 (female) (in/out); power: 8 DIN (male);
Devicenet™	5-pin M12 (male);
FLOW-BUS/Modbus-RTU/ASCII	5-pin M12 (male)

Technical specifications and dimensions subject to change without notice.

For dimensional drawings and hook-up diagrams please visit the [productpage](#) on our [website](#)

## Recommended accessories



### E-8000 - DIGITAL READOUT / CONTROL SYSTEMS

Bright, wide angle, 1.8" display (TFT technology)

User friendly operation, menu driven with 4 push buttons



### BRIGHT - COMPACT LOCAL READOUT/CONTROL MODULE

Bright, wide angle, 1.8" display

User friendly operation

Indication/operation/configuration



### PIPS - PLUG-IN POWER SUPPLY

For lab-style or industrial devices

Interchangeable plugs (Euro, UK, USA, Australian, IEC) for mains connection

## Related products



**IN-FLOW F-231MI**

Min. flow 0,01...0,5 l/min  
Max. flow 0,2... 10 l/min  
Pressure /  $\Delta P$  up to 400 bar  
Compact design  
High accuracy and repeatability



**IN-FLOW F-130MI**

Min. flow 0,2 ... 10 ml/min  
Max. flow 0,3 ... 15 ml/min  
Pressure rating 400 bar  
Compact IP65 design  
High accuracy



**BRONKHORST HIGH-TECH B.V.**

Nijverheidsstraat 1A  
NL-7261 AK Ruurlo (NL)  
Tel. [+31 573 45 88 00](tel:+31573458800)  
[info@bronkhorst.com](mailto:info@bronkhorst.com)