

# DATASHEET F-112AI

## IN-FLOW F-112AI

### 工業型熱式氣體質量流量計



### Industrial Style Gas Mass Flow Meters for medium flow rates

Bronkhorst® model F-112AI Mass Flow Meters (MFM) are suited for precise measurement of flow ranges between 0,8...40 l<sub>n</sub>/min and 1,4...250 l<sub>n</sub>/min with pressure rating between vacuum and 100 bar. The MFM consists of a thermal mass flow sensor and a microprocessor based pc-board with signal and fieldbus conversion and a PID controller for optional mass flow control by means of a separately mounted control valve. 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. The IN-FLOW model features optional Multi Gas / Multi Range functionality, providing (OEM-) customers with optimal flexibility and process efficiency.

### Technical specifications

#### Measurement / control system

Flow range (intermediate ranges available)	min. 0,8...40 l <sub>n</sub> /min max. 1,4...250 l <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; optional Multi Gas / Multi Range functionality up to 10 bar abs
Response time (sensor)	typical: 0,5 sec.
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% FS 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: FKM/Viton®; options: EPDM, FFKM/Kalrez®, FDA and USP Class VI approved compounds
Weight	1,8 kg
Ingress protection	IP65

## Electrical properties

Power supply	+15 ... 24 Vdc			
Max. power consumption meter	Supply	at voltage I/O	at current I/O	extra for fieldbus
	15 V	95 mA	125 mA	<75 mA
	24 V	65 mA	85 mA	<50 mA
Max. Power consumption controller	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

### 電子讀出/控制系統

明亮, 廣角, 1.8" 顯示屏  
(TFT 技術)

友好的操作界面, 菜單4  
個按鍵



BRIGHT SERIES

### 緊湊型本地遠程控制模塊

明亮, 寬角, 1.8" 顯示屏  
操作方便

顯示/操作/配置



PIPS SERIES

### 插頭式電源供應

適用於實驗室或工業風  
格的設備

客戶換插頭 (EURO, UK,  
USA, Australian, IEC) 用  
於主電源連接



IN-LINE FILTER  
MEDIUM FLOW SERIE  
M-422 RS

1/4" female in / male out  
200 bar  
Average porosity 2...20  
 $\mu\text{m}$

## Related products



IN-FLOW F-111AI

最小流量 0,4...20 l/min  
最大流量 0,6...100  
l/min  
額定壓力 100 bar  
緊湊的IP65設計  
高精度



IN-FLOW F-113AI

最小流量 4...200 l/min  
最大流量 8...1670  
l/min  
額定壓力 100 bar  
緊湊的IP65設計  
高精度



IN-FLOW F-202AI

最小流量 0,8...40 l/min  
最大流量 5...250 l/min  
額定壓力 64 bar  
緊湊型IP65設計  
高精度和可重複性



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<sup>®</sup>!