



EX-FLOW

Ex-Protected Mass Flow Meters and Controllers for Gases



› Introduction

Bronkhorst High-Tech B.V., the European market leader in thermal Mass Flow Meters/Controllers and Electronic Pressure Controllers, offers innovative solutions for many different applications in many different markets. The instruments are made to customers' specification, in various styles, suitable for use in laboratory, industrial environment, hazardous areas, semiconductor or analytical installations.

› EX-FLOW series for hazardous areas

The Mass Flow Meters of the EX-FLOW series are of rugged design for gas flow applications in hazardous environments.

This intrinsically safe measuring head is IECEx and ATEX tested and can be used up to Zone 1 or EPL Gb flammable gas atmospheres with an ambient temperature up to +70°C with marking II 2 G Ex ib IIC T4 Gb.

Certifications

EU	ATEX KEMA 01ATEX1172
WW	IECEX DEK14.0060
JP	TIS 検・第TC21584号
KOR	KCs 제2019-048293-01-1호

The housing of the electronics compartment is rated to IP65. Mass Flow Meters can be supplied in ranges starting from 0,16...8 ml_n/min up to 11000 m³/h N₂-equivalent, with pressure rating between vacuum and 700 bar. In combination with control valves, either integrated or separate, Mass Flow Controllers can be offered up to 7,5...375 m³/h N₂-equivalent.



Example of a multi-channel E-8000 power supply/readout system (to be located in the safe area)

› Mass Flow Controllers for every application

The control valve can be furnished as an integral part of an EX-FLOW Mass Flow Controller (MFC), or as a separate component. It is a proportional, electromagnetic control valve with fast and smooth control characteristics. With reference to the specific field of application there are different series of control valves. There is a standard direct acting valve for common applications, a pilot operated valve for high flow rates and the so-called Vary-P valve with a pressure rating of 400 or 700 bar, that can cope with up to 400 bar ΔP. All valves are equipped with explosion protected certified coils, available in two executions:

- ◆ Coil type XB: protection method "intrinsically safe"; rated for use up to Zone 0/20 in Gas and Dust Ex-atmospheres with marking II 1 GD Ex ia ta IIC/IIIC T6 T80°C Ga Da.
- ◆ Coil type XC: protection method "increased safety"; rated for use up to Zone 1/21 Gas and Dust Ex-atmospheres with marking II 1 GD Ex eb tb IIC/IIIC T4 T130°C Gb Db. (Equivalent IECEx Gb Db rating on request)

The electrical connection of flow meter and control valve to the power supply/readout system (located in the safe zone) is achieved via separate cables. The readout system contains a controller function pc-board to complete the control loop.

› Power supply and readout

An EX-FLOW MFM or MFC should be connected to an E-8000 Series power supply / readout system with certified and integrated intrinsically safe galvanic isolation inputs and outputs. This unit must be installed in the safe area. The actual configuration is of an on request modular build, according to the number and execution of the instruments to be connected.

› General EX-FLOW features

- ◆ Typical Ex-system rating: ATEX Equipment Category 2, Zone 1 (Gas) or IECEx EPL Gb
- ◆ Flow ranges from 0,16...8 ml_n/min up to 220...11000 m³/h
- ◆ Pressure ratings up to 700 bar

› Fields of application

- ◆ Process gas measurement or control in (petro-) chemical industries
- ◆ Fuel cell technology
- ◆ Gas distribution systems
- ◆ Hydrogenation processes
- ◆ Gas consumption measurement for internal accounting
- ◆ Heating or biogas production



F-106AX Ex-protected Mass Flow Meter for high flow ranges

Technical specifications

Measurement / control system

Accuracy (incl. linearity) (based on actual calibration)	standard: $\pm 1\%$ FS; other on request (for flow > 1000 m ³ /h contact factory)
Turndown	1 : 50 (2...100%)
Repeatability	< $\pm 0,2\%$ Rd
Time constant	5 seconds
Operating temperature	EX-FLOW sensor: -10...+70°C; XB-coil: -40...+ 65°C XC-coil: -40...+ 65°C
Temperature sensitivity	zero: < $\pm 0,05\%$ FS/°C; span: < $\pm 0,05\%$ Rd/°C
Leak integrity	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
Warm-up time	30 min. for optimum accuracy; 2 min for accuracy $\pm 2\%$ FS

Mechanical parts

Material (wetted parts)	stainless steel 316L or comparable
Process connections	compression type or face seal couplings; wafer type on series F-106; DIN or ANSI flanges on series F-107
Seals	standard: Viton® options: EPDM, FFKM (Kalrez®), FDA and USP Class VI approved compounds
Ingress protection (housing)	IP65

Electrical properties

Output signal	15...20 mA (linear) Terminal connection, cable gland M16x1,5
I/O signals via PS/Readout (located in safe area)	analog: 0...5 Vdc, 0...10 Vdc, 0...20 mA, 4...20 mA; digital: RS232, PROFIBUS DP, DeviceNet™, Modbus RTU or ASCII, PROFINET, EtherCAT®, FLOW-BUS
XB-coil	Coil voltage max. 28 V/110mA; 295 Ohm at 20°C, cable gland M20x1,5
XC-coil	Coil voltage max. 24 V; 65 Ohm at 20°C, cable gland M20x1,5; Pmax = 9W at 20°C

Technical specifications subject to change without notice.

Related drawing 9.27.002M. No modifications permitted without approval of authorised person.

Models and flow ranges (based on N₂)

Mass Flow Meters (MFM); PN100 (pressure rating 100 bar)

Model	min. flow	max. flow
F-110CX	0,16...8 ml _r /min	0,2...10 ml _r /min
F-111BX	0,2...10 ml _r /min	0,4...20 l _r /min
F-111AX	0,1...5 l _r /min	2...100 l _r /min
F-112AX	0,2...10 l _r /min	5...250 l _r /min
F-113AX	2...100 l _r /min	25...1250 l _r /min
F-116AX	0,4...20 m ³ /h	4...200 m ³ /h
F-116BX	1...50 m ³ /h	7,5...375 m ³ /h

For ranges of 200, 400 or 700 bar rated MFMs please contact factory.

High-Flow MFMs; PN10 / PN16 / PN25 / PN40 / PN100

Model	min. flow	max. flow
F-106AX/F-107AX/F-117AX	0,4...20 m ³ /h	4...200 m ³ /h
F-106BX/F-107BX/F-117BX	1...50 m ³ /h	10...500 m ³ /h
F-106CX/F-107CX/F-117CX	2...100 m ³ /h	20...1000 m ³ /h
F-106DX/F-107DX/F-117DX	3,6...180 m ³ /h	36...1800 m ³ /h
F-106EX	8...400 m ³ /h	80...4000 m ³ /h
F-106FX	14...700 m ³ /h	140...7000 m ³ /h
F-106GX	22...1100 m ³ /h	220...11000 m ³ /h

Mass Flow Controllers (MFC); PN64 / PN100

Model	min. flow	max. flow
F-200CX/F-210CX	0,2...10 ml _r /min	0,2...10 ml _r /min
F-201CX/F-211CX	0,22...11 ml _r /min	0,4...20 l _r /min
F-201AX/F-211AX	0,1...5 l _r /min	2...100 l _r /min
F-202AX/F-212AX	0,2...10 l _r /min	5...250 l _r /min
F-203AX/F-213AX	2...100 l _r /min	25...1250 l _r /min
F-206AX/F-216AX	0,4...20 m ³ /h	4...200 m ³ /h
F-206BX/F-216BX	1...50 m ³ /h	7,5...375 m ³ /h

Contact factory for max. Kv-values (depending of coil type).

MFCs for high-pressure / high-ΔP applications; PN400

Model	min. flow	max. flow
F-230MX	0,2...10 ml _r /min	10...500 ml _r /min
F-231MX	10...500 ml _r /min	0,2...10 l _r /min
F-232MX	0,2...10 l _r /min	2...100 l _r /min

For ranges of 700 bar rated MFCs please contact factory.



F-112AX Mass Flow Meter



F-202AX Mass Flow Controller



F-107CX Mass Flow Meter for high flow ranges (flanged type)

Model number identification

F - N N NAA - HEE - NN - A

Base

0	Valve only
1	Meter
2	Controller

Pressure rating

0	64 bar
1	100 bar
2	200 bar
3	400 bar
4	700 bar

Ranges

for PN64/PN100 Flow Meters/Controllers

0CX	0...0,7 / 0...9 ml _v /min
1BX/1CX	0...8 / 0...25000 ml _v /min
1AX	0...20 / 0...100 l _v /min
2AX	0...40 / 0...250 l _v /min
3AX	0...200 / 0...1670 l _v /min
6AX/7AX	0...20 / 0...200 m ³ _v /h
6BX/7BX	0...50 / 0...500 m ³ _v /h
6CX/7CX	0...100 / 0...1000 m ³ _v /h
6DX/7DX	0...180 / 0...1800 m ³ _v /h
6EX	0...400 / 0...4000 m ³ _v /h
6FX	0...700 / 0...7000 m ³ _v /h
6GX	0...1100 / 0...11000 m ³ _v /h

for PN200/PN400 Flow Meters

0MX	0...10 / 0...15 ml _v /min
1MX	0...15 / 0...15000 ml _v /min
2MX	0...10 / 0...250 l _v /min
3MX	0...200 / 0...1250 l _v /min

for PN400 Flow Controllers

0MX	0...10 / 0...500 ml _v /min
1MX	0...0,5 / 0...10 l _v /min
2MX	0...10 / 0...100 l _v /min

Connections (in/out)

1	1/8" OD compression type
2	1/4" OD compression type
3	6 mm OD compression type
4	12 mm OD compression type
5	1/2" OD compression type
6	20 mm OD compression type
8	1/4" Face seal male
9	other

Mounting between flanges

01	mounting betw. flange	DIN PN10
02	mounting betw. flange	DIN PN16
03	mounting betw. flange	DIN PN40
06	mounting betw. flange	ANSI 150 lbs
07	mounting betw. flange	ANSI 300 lbs
13	Flanged connections	DIN PN40
15	Flanged connections	DIN PN100
26	Flanged connections	ANSI 150 lbs
27	Flanged connections	ANSI 300 lbs
28	Flanged connections	ANSI 600 lbs
99	other	

Internal seals

V	Viton®
E	EPDM
K	Kalrez® (FFKM)

