EX-FLOW

Ex-Protected Mass Flow Meters and Controllers for Gases

Bronkhorst®

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	TIIS 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 m^3_n/h N_2-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 10…500 m^3_n/h N_2-equivalent.

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 G D Ex ia ta IIC // IIIC T6 T80ºC 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 2 G D Ex eb tb IIC // IIIC T4 T130ºC. (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 m^3_n/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

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

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

Technical specifications

Measurement / control system

Accuracy (incl. linearity) (based on actual calibration)	standard: ±1% FS; other on request (for flow > 1000 m^3_n/h contact factory)
Turndown	1 : 50 (2…100%)
Repeatability	< ±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: < ±0,05% FS/°C; span: < ±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 ± 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: FKM/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 9.27.002N. No modifications permitted without approval of authorised person.

Models and flow ranges (based on N_2)

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

Model	min. flow	max. flow
F-110CX	0,15…7,5 ml_n/min	0,19…9,5 ml_n/min
F-111BX	0,3…15 ml_n/min	0,4…20 l_n/min
F-111AX	0,1…5 l_n/min	2…100 l_n/min
F-112AX	0,8…40 l_n/min	5…250 l_n/min
F-113AX	4…200 l_n/min	25…1250 l_n/min
F-116AX	0,4…20 m^3_n/h	4…200 m^3_n/h
F-116BX	1…50 m^3_n/h	10…500 m^3_n/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_n/h	4…200 m^3_n/h
F-106BX/F-107BX/F-117BX	1…50 m^3_n/h	10…500 m^3_n/h
F-106CX/F-107CX/F-117CX	2…100 m^3_n/h	20…1000 m^3_n/h
F-106DX/F-107DX/F-117DX	3,6…180 m^3_n/h	36…1800 m^3_n/h
F-106EX	8…400 m^3_n/h	80…4000 m^3_n/h
F-106FX	14…700 m^3_n/h	140…7000 m^3_n/h
F-106GX	22…1100 m^3_n/h	220…11000 m^3_n/h

Mass Flow Controllers (MFC); PN64 / PN100

Model	min. flow	max. flow
F-200CX/F-210CX	0,19…9,5 ml_n/min	0,19…9,5 ml_n/min
F-201CX/F-211CX	0,3…15 ml_n/min	0,4…20 l_n/min
F-201AX/F-211AX	0,1…5 l_n/min	2…100 l_n/min
F-202AX/F-212AX	0,6…30 l_n/min	5…250 l_n/min
F-203AX/F-213AX	4…200 l_n/min	25…1250 l_n/min
F-206AX/F-216AX	0,4…20 m^3_n/h	4…200 m^3_n/h
F-206BX/F-216BX	1…50 m^3_n/h	10…500 m^3_n/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_n/min	10…500 ml_n/min
F-231MX	10…500 ml_n/min	0,2…10 l_n/min
F-232MX	0,2…10 l_n/min	2…100 l_n/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 Flow Meters	
0CX	0…0,75 / 0…9,5 ml_n/min
1BX/1CX	0…15 / 0…20000 ml_n/min
1AX	0…5 / 0…100 l_n/min
2AX	0…40 / 0…250 l_n/min
3AX	0…200 / 0…1250 l_n/min
6AX/7AX	0…20 / 0…200 m^3_n/h
6BX/7BX	0…50 / 0…500 m^3_n/h
6CX/7CX	0…100 / 0…1000 m^3_n/h
6DX/7DX	0…180 / 0…1800 m^3_n/h
6EX	0…400 / 0…4000 m^3_n/h
6FX	0…700 / 0…7000 m^3_n/h
6GX	0…1100 / 0…11000 m^3_n/h
for PN64/PN100 Flow Controllers	
0CX	0…9,5 ml_n/min
1CX	0…15 / 0…20000 ml_n/min
1AX	0…5 / 0…100 l_n/min
2AX	0…30 / 0…250 l_n/min
3AX	0…200 / 0…1250 l_n/min
6AX	0…20 / 0…200 m^3_n/h
6BX	0…50 / 0…500 m^3_n/h
for PN400 Flow Controllers	
0MX	0…10 / 0…500 ml_n/min
1MX	0…0,5 / 0…10 l_n/min
2MX	0…10 / 0…100 l_n/min

Connections (in/out)

1	⅛" OD compression type
2	¼" OD compression type
3	6 mm OD compression type
4	12 mm OD compression type
5	½" OD compression type
6	20 mm OD compression type
8	¼" 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	FKM/Viton® (factory standard)
E	EPDM
K	FKM/Kalrez®

Bronkhorst®

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®!

www.bronkhorst.com

Bronkhorst High-Tech B.V.
Nijverheidsstraat 1a
NL-7261 AK Ruurlo, The Netherlands

Tel. +31 573 458800
info@bronkhorst.com

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