Datasheet F-111BX

Ex-Proof Mass Flow Meters for Gases

> Introduction

Bronkhorst High-Tech EX-FLOW Mass Flow Meters (MFMs) models F-111BX are suited for precise gas flow measurement in ATEX Zone 1 hazardous areas. The MFM should be connected to a power supply with galvanic isolation / preamplifier / readout system (located in the safe zone). The flow range and wetted materials are determined depending of the type of gas and the process conditions of the application.

The intrinsically safe measuring head is tested according to ATEX 95 Directive 94/9/EC and approved under EC-Type Examination Number: KEMA 01ATEX1172, protection II 2 G Ex ib IIC T4 Gb.

EL-FLOW Mass Flow Meter model F-111BX

> Technical specifications

Measurement system

Accuracy (incl. linearity; based on actual calibration)	: ±1% FS
Turndown	: 1 : 50 (2 … 100%)
Repeatability	: < ± 0,2% Rd
Time constant	: 5 seconds
Operating temperature	: -10…+70°C;
Temperature sensitivity	: zero: < ± 0,05% FS/°C; span: < ± 0,05% Rd/°C
Leak integrity	: < ± 2 x 10^{-9} mbar l/s He
Attitude sensitivity	: max. error at 90° off horizontal 0,2% FS 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 Pressure rating	: 100 bar (For ranges of 200, 400 or 700 bar rated MFMs please contact factory)
Process connections	: compression type or face seal couplings;
Seals	: standard : Viton®; options: EPDM, FFKM
(Kalrez®) Ingress protection (housing)	: IP65

Although all specifications in this datasheet are believed to be accurate, the right is reserved to make changes without notice or obligation.

Electrical properties

Signal circuit	: in type of explosion protection intrinsic safety Ex ib IIC, only for connection to a certified intrinsically safe circuit with the following maximum values: Ui = 28 V, Ii = 98 mA, Pi = 686 mW The effective internal capacitance between: Terminals 1 and 3: Ci = 1 nF; Terminals 2 and housing: Ci = 120 nF; Effective internal inductance: Li = 0,1 mH
Output signal	: 15…20 mA (linear) Terminal connection, cable gland M16x1,5

> Ranges (based on Air)

Model	minimum	maximum
F-111BX	0,2…10 ml_n/min	0,4…20 l_n/min

Intermediate ranges are available

> Model number identification

F – N N NNA – AAA – NN – A

Base
1 Meter

Pressure rating
1 100 bar

Ranges
1BX 0,2…10 ml_n/min / 0,4…20 l_n/min

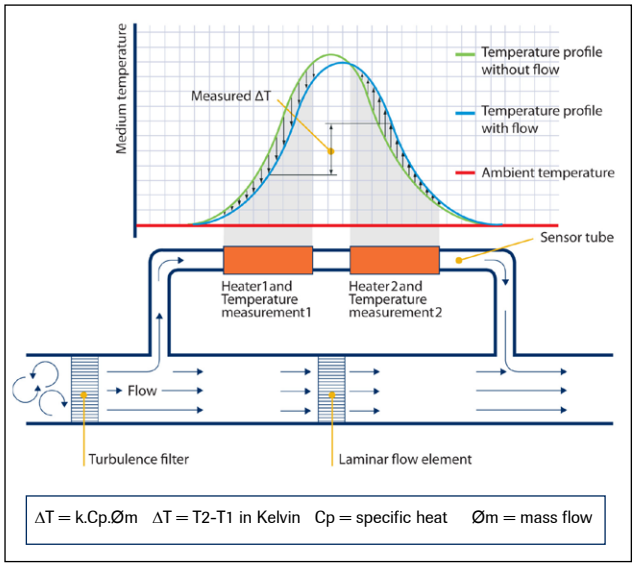
Analog output
HEE 15…20 mA (linear)

Internal seals
V Viton® (factory standard)
E EPDM
K FFKM (Kalrez®)

Connections (in/out)
1 1/8" OD compression type
2 ¼" OD compression type
3 6 mm OD compression type
8 ¼" Face seal male
9 other
0 none

> Thermal mass flow measuring principle

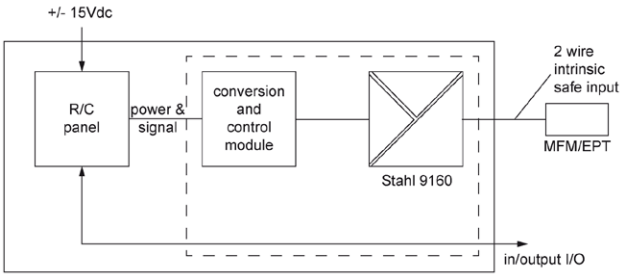
The heart of the thermal mass flow meter/controller is the sensor, that consists of a stainless steel capillary tube with resistance thermometer elements. A part of the gas flows through this bypass sensor, and is warmed up heating elements. Consequently the measured temperatures T_1 and T_2 drift apart. The temperature difference is directly proportional to mass flow through the sensor. In the main channel Bronkhorst High-Tech applies a patented laminar flow element consisting of a stack of stainless steel discs with precision-etched flow channels. Thanks to the perfect flow-split the sensor output is proportional to the total mass flow rate.



Functional scheme of the thermal mass flow sensor

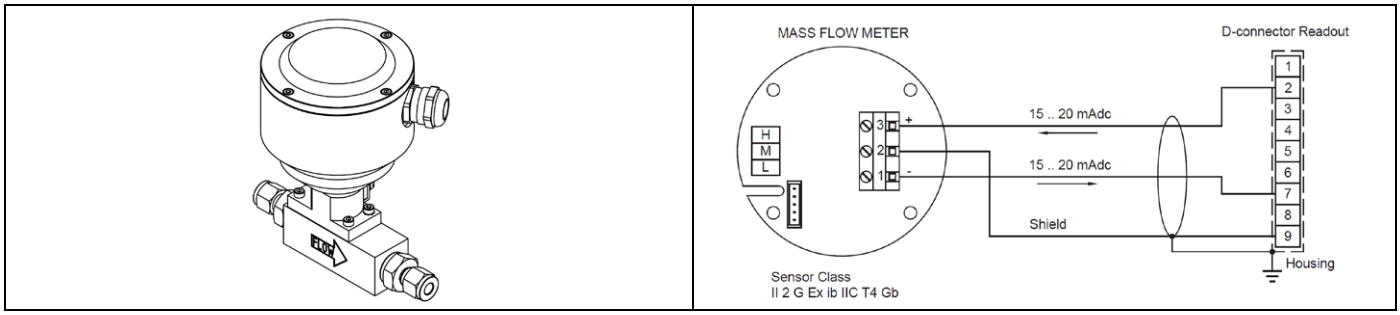
> EX-FLOW system set-up

An EX-FLOW mass flow control system consists of a flow metering part and a power supply/readout unit. The latter contains the signal conversion, controller function, power supply with galvanic separation and optional safety barrier.

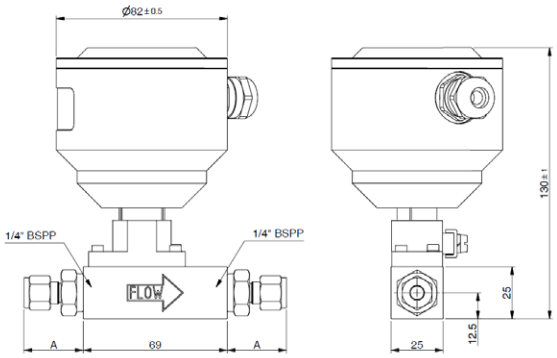


Functional scheme of the digital PC-board

> Hook-up diagram for analog communication



> Dimensions (mm) and weight (kg)



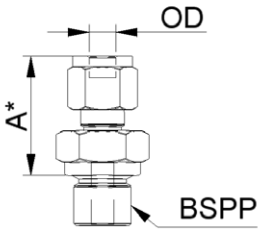
Weight: 1 kg

Dimension table adapters (RS-type)

Compression type	1/4"BSPP Size A
adapter 3 mm OD	26.1
adapter 6 mm OD	28.4
adapter 8 mm OD	29.4
adapter 10 mm OD	30.2
adapter 12 mm OD	32.5
adapter 1/8" OD	26.1
adapter 1/4" OD	28.4
adapter 3/8" OD	29.9
adapter 1/2" OD	32.7

Face-seal male	Size A
adapter 1/4" inlet	23.2

Compression type



*) Dimension A is typical finger-tight.

> Options and accessories

- IN-LINE filters for protection against particulates	
- E-7000 Power Supply	
- Interconnecting cables	

> Alternatives

- EX-FLOW model F-201CX/F-211CX, Ex-Proof Mass Flow Controller for min. 0,22 ... 11 ml_n/min and max. 0,4 ... 20 l_n/min	
- EX-FLOW model F-111AX, Ex-Proof Mass Flow Meter for min. 0,1 ... 5 l_n/min and max. 2 ... 100 ml_n/min	
- IN-FLOW model F-111BI, IP65 protected Mass Flow Meter, with optional ATEX approval for Zone 2, for min. 0,16 ... 8 ml_n/min and max. 0,16 ... 25 l_n/min	

Related drawing 9.27.074A. No modifications permitted without approval of authorised person.