

EX-FLOW



THERMAL MASS FLOW METERS AND CONTROLLERS FOR GASES



FLOW CAPACITIES (AIR):

MIN. 0...7,5 ml_n/min; MAX. 0...11000 m³_n/h

ELECTRICAL PROTECTION II 2 G EEx ib IIC T4

PRESSURE RATINGS UP TO 700 BAR

HOUSING PROTECTION IP65

FAST RESPONSE TIME

NO MOVING PARTS

BRONKHORST
HI-TEC

BRONKHORST HIGH-TECH B.V.



PRODUCTION AND SERVICE IN EUROPE, NORTH AMERICA AND ASIA

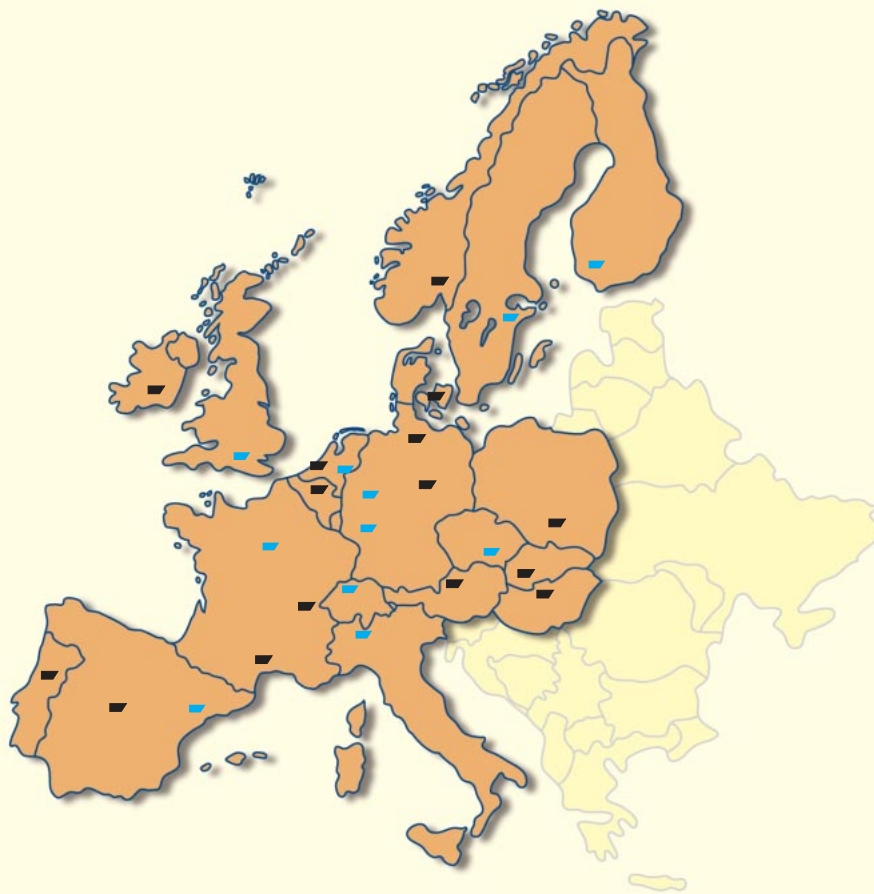
■ The company was formed in 1981 and has been established at Ruurlo, Netherlands since 1983. Today it offers the broadest range of thermal mass flow equipment in the world.

There are instruments for laboratory applications, general industrial use and ex-proof installations. Satisfied customers, state-of-the-art innovations and a high product quality have always been the cornerstones of the success of Bronkhorst High-Tech. In 1987 the company was awarded the prestigious 'King-William I' award for young, successful enterprises. In 1992 it qualified for ISO 9001 certification and in 1995 the company was certified ISO 14001 for meeting the international standards for environmental management.

Bronkhorst High-Tech have signed agreements with Porter Instruments Company, USA and with Oval Techno Corporation, Japan in order to ensure that similar products are manufactured close to the users. Service and repairs are also available from these locations.

The sales and service organisation in Europe is shown on the right hand page. The number of service stations is expanding rapidly to better support our customers.

Furthermore Bronkhorst High-Tech is represented in the following overseas countries: Australia, New Zealand, Israel, India, South-Africa, Korea and Brazil.



- SALES REPRESENTATION
- SALES REPRESENTATION WITH SERVICE AND CALIBRATION

This brochure describes the EX-FLOW series; mass flow meters and controllers for use in pilot and production plants in hazardous environments. For applications where ex-proof is not required we offer the EL-FLOW series for laboratory type applications and IN-FLOW for industrial applications (see last page or our general catalogue).

CONTENTS	PAGE
Production plants, service and sales organization	2 - 3
Condensed new features in this brochure	3
Measuring principle	4
EX-FLOW Mass Flow Meters for Gases	5 - 6
EX-FLOW Mass Flow Controllers for Gases	7 - 8
Technical specifications	9
Model number code EX-FLOW	10
Digital readout systems	11
Other BRONKHORST HI-TEC products	12

THE MEASURING PRINCIPLE

GENERAL

The flowmeters of the EX-FLOW series are thermal mass flowmeters in rugged construction for use in hazardous areas. The measuring head model X 100 is tested according ATEX 100a Directive 94/9/EC and approved under EC-Type Examination Number: KEMA 01ATEX1172, protection II 2 G EEx ib IIC T4. This stands for:

- II 2 G = ATEX group and category
- EEx ib IIC T4 = CENELEC Marking
- ib = intrinsically safe Zone 1
- IIC = highest gas group with a minimum ignition energy of 20 mJ, with gases such as acetylene or hydrogen.
- T4 = max. surface temperature of 135 °C

The electronic housing has IP65 ingress protection.

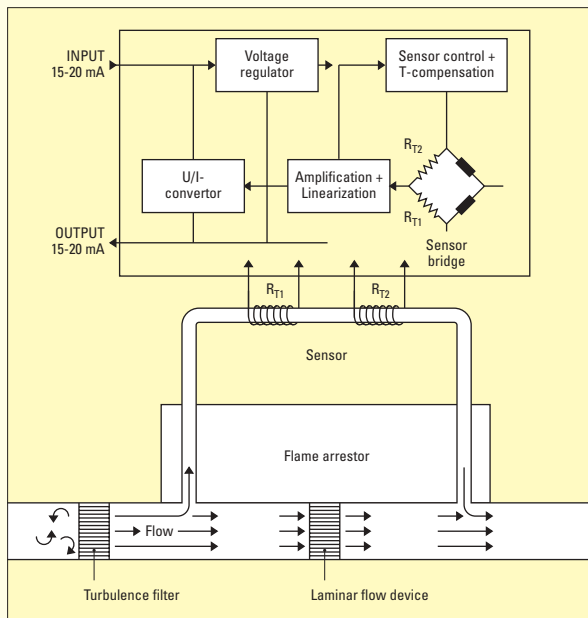


FIGURE A

PRINCIPLE OF OPERATION

As shown in figure A a part of the gas flows through the sensor. Coils R_1 and R_2 have a dual function: on the one hand they constitute a heater, on the other hand they serve to measure the temperatures T_1 and T_2 .

These resistances move apart with increasing flow as shown in figure B. The formula for ΔT indicates that the difference in temperature is directly proportional with mass flow rate.

Both the dual function of R_1 and R_2 and the linear output signal of 15-20 mA are typical of EX-FLOW instruments. This relates to meeting certain limitations stipulated in the regulations.

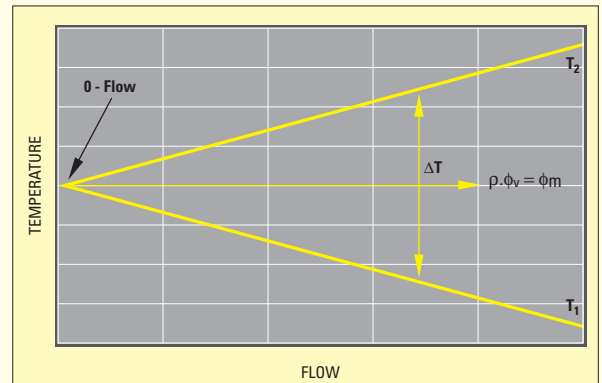


FIGURE B

$$\Delta T = k \cdot C_p \cdot \rho \cdot \phi_v$$

or

$$\Delta T = k \cdot C_p \cdot \phi_m$$

- ΔT = $T_2 - T_1$ in Kelvin
- C_p = Specific heat
- ρ = Density
- ϕ_v = Volume flow
- ϕ_m = Mass flow

FEATURES

The patented flow splitter, indicated as laminar flow device in figure A, constitutes a strictly proportional flow split between main and by-pass flow. Together with the temperature compensation circuitry, indicated in the right hand top corner of figure A, it makes it possible to achieve directly linear mass flow measurement.

The block on which the measuring head is mounted, is constructed in such a way that it fits to most current Hi-Tec base blocks and at the same time serves as flame arrester.

FLOW CONTROL

For flow control applications valves with explosion proof certified coils are available. There are two different coils:

Coil XB: protection II 1 G/D EEx ia IIC T6

Coil XC: protection II 2 G/D IP6X T 130°C EEx me II T4

Further particulars about control valves and technical specifications are stated in pages 7 through 9.

EX-FLOW MASS FLOW METERS FOR GASES

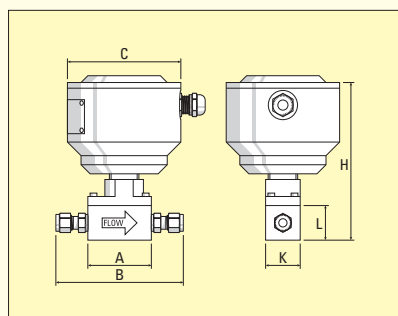
GENERAL

The newly developed measuring head can be mounted on most current Bronkhorst Hi-Tec series. Thanks to this there is now more versatility in flow ranges and pressure ratings. The linearization is integrated. This implies that the user can provide his own signal converters and intrinsically safe power supplies in as far as these conform to the BHT specifications (see electrical specifications, page 9).

A complete system warranty can only be provided by BHT if all components are supplied by BHT.

It is now also possible to convert previously supplied standard instruments to explosion proof instruments.

Apart from the ex-proof mass flow meters Bronkhorst High-Tech also supplies ex-proof pressure transducers and controllers for pressure ranges between 2-100 mbar and 8-700 bar. For more information please apply for the specification sheet.



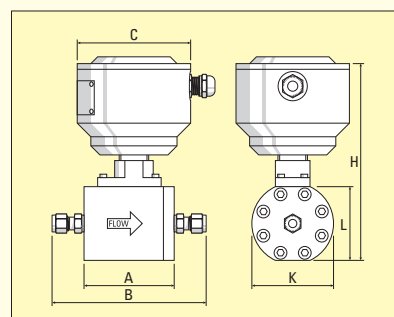
MODEL	DIMENSIONS (MM)						WEIGHT (KG)
	A	B	C	H	K	L	
F-110X	47	100	82	130	25	25	1,0
F-111X	47	100	82	130	25	25	1,0
F-120MX	60	106	82	135	30	30	0,8
F-121MX	60	114	82	135	30	30	0,9
F-130MX	60	106	82	135	30	30	0,8
F-131MX	60	114	82	135	30	30	0,9

SPECIFICATIONS

The characteristic properties of Bronkhorst Hi-Tec mass flow meters are also found in the ex-proof instruments:

- No moving parts.
- Short response time.
- No need for flow computer, temperature and pressure measurement.
- Low pressure drop.
- Pressure ratings up to 700 bar.
- Also available with control valve for complete, compact flow or pressure control loops.

There are mass flow meters for mounting between flanges (F-106), instruments with flanged connections (F-107) and mass flow meters with compression type couplings. The latter type is shown below.



MODEL	DIMENSIONS (MM)						WEIGHT (KG)
	A	B	C	H	K	L	
F-112AX	65	119	82	158	59	53	1,9
F-113AX	112	182	82	172	74	67	3,6
F-116AX	174	244	82	196	74	66	5,4
F-116BX	192	278	82	214	89	84	8,2
F-122MX/F-132MX	77	131	82	160	69	55	2,6
F-123MX/F-133MX	120	190	82	198	99	93	7,0
F-126AX/F-136AX	219	289	82	237	110	100	14,4
F-126BX/F-136BX	254	337	82	266	137	129	23,8
F-141MX	124	-	82	162	69	57	3,7
F-142MX	125	-	82	181	99	76	5,5
F-143MX	178	-	82	237	142	132	20,9

Certified drawings are available on application. All specifications are subject to change without notice.

FLOW RANGES (BASED ON N₂)

minimum	maximum	intermediate values	PRESSURE RATING / MODEL			
			100 bar	200 bar	400 bar	700 bar
0,15.....7,5 ml _n /min	0,3.....15 ml _n /min	possible	F-110X	F-120MX	F-130MX	-
0,3.....15 ml _n /min	0,3.....15 l _n /min	possible	F-111X	F-121MX	F-131MX	F-141MX
0,2.....15 l _n /min	5.....250 l _n /min	possible	F-112AX	F-122MX	F-132MX	F-142MX
2.....25 l _n /min	25.....1250 l _n /min	possible	F-113AX	F-123MX	F-133MX	F-143MX
0,4.....20 m ³ _n /h	4.....200 m ³ _n /h	possible	F-116AX	F-126AX	F-136AX	-
1.....50 m ³ _n /h	10.....500 m ³ _n /h	possible	F-116BX	F-126BX	F-136BX	-

EX-FLOW MASS FLOW METERS FOR GASES

■ SERIES F-106X:

Instruments for mounting between flanges according to DIN up to PN40 or ANSI 150 lbs/300 lbs.

Smallest range (N₂): 0,4...20 m³_n/h.

Highest range (N₂): 220...11000 m³_n/h.

■ SERIES F-107X/F-117X:

Instruments with flanged connections according to DIN or ANSI.

F-107X: DIN PN40, ANSI 150 lbs, ANSI 300 lbs.

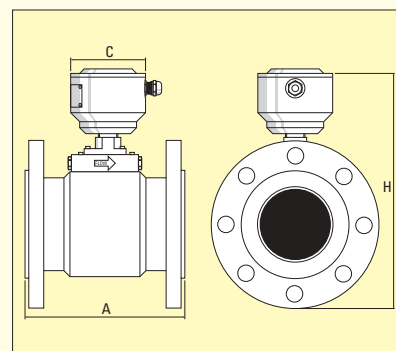
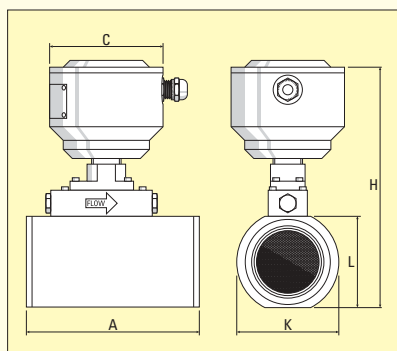
F-117X: DIN PN100; other on application.

Smallest range (N₂): 0,4...20 m³_n/h.

Highest range (N₂): 36...1800 m³_n/h.

■ FIELDS OF APPLICATION FOR EX-PROOF INSTRUMENTS

Everybody immediately, and usually only, thinks of process gases in the chemical and petro chemical industries. In such environments ex-proof is normally a must. You may also think of powder plants (mills, silo installation) gas distribution systems, etc. Thanks to the very large measuring range (1:50) Bronkhorst Hi-Tec mass flow meters are especially suitable for hydrogenation processes and similar reactions, and gas totalization with strongly fluctuating flow, such as heating or biogas production.



DIN	ANSI	MODEL	DIMENSIONS (MM)					L	WEIGHT (KG)
			A	C	H	K			
DN40	1½"	F-106AX	125	82	198	75	67	4,2	
DN50	2"	F-106BX	125	82	211	85	80	4,8	
DN80	3"	F-106CX	125	82	239	115	109	7,0	
DN100	4"	F-106DX	125	82	270	145	139	9,7	
DN150	6"	F-106EX	125	82	325	198	194	13,5	
DN200	8"	F-106FX	125	82	377	249	246	18,3	
DN250	10"	F-106GX	125	82	442	313	311	27,2	

Dimensions and weights of other models on application. All specifications subject to change without notice.

MODEL	DIMENSIONS (MM)					WEIGHT (KG)
	A	C	H (DIN, PN40)	H (DIN, PN100)	H (ANSI, 150 LBS)	
F-107AX	200	82	241	-	230	8,5
F-107BX	200	82	254	-	249	10,0
F-107CX	200	82	286	-	282	15,5
F-107DX	200	82	316	-	316	20,0
F-117AX	225	82	-	254	-	12,4
F-117BX	225	82	-	269	-	17,3
F-117CX	225	82	-	304	-	24,6
F-117DX	225	82	-	337	-	35,4

■ FLOW RANGES (BASED ON N₂)

smallest range	highest range	intermediate values	PRESSURE RATING / MODEL	
			40 bar	100 bar
0,4.....20 m ³ _n /h	4.....200 m ³ _n /h	possible	F-106AX/F-107AX	F-117AX
1.....50 m ³ _n /h	10.....500 m ³ _n /h	possible	F-106BX/F-107BX	F-117BX
2.....100 m ³ _n /h	20.....1000 m ³ _n /h	possible	F-106CX/F-107CX	F-117CX
3,6.....180 m ³ _n /h	36.....1800 m ³ _n /h	possible	F-106DX/F-107DX	F-117DX
8.....400 m ³ _n /h	80.....4000 m ³ _n /h	possible	F-106EX	
14.....700 m ³ _n /h	140.....7000 m ³ _n /h	possible	F-106FX	
22.....1100 m ³ _n /h	220.....11000 m ³ _n /h	possible	F-106GX	

EX-FLOW MASS FLOW CONTROLLERS FOR GASES

GENERAL

To convert a mass flow meter to a mass flow controller, a control valve is added. The instruments of the model series F-111X and F-112AX can be supplied with a close coupled separate valve. The electrical connection of flow meter and control valve to the intrinsically safe E-7000 readout system is done with separate cables. The readout system contains a controller function p.c. board to complete the control loop.

The instruments starting with a figure 2 in the model number (that is F-203AX thru F-216BX) are mass flow meters and control valves integrated in one base block. The electrical connection is the same as for separate valves.

CONTROL VALVES

Are available in two different types of protection determined by the coil:

Coil XB: protection II 1 G/D EEx ia IIC T6, requires an intrinsically safe power supply.

Coil XC: protection II 2 G/D IP6X T 130°C EEx me II T4, encapsulated, no intrinsically safe power supply required.

DIRECT ACTING VALVES F-001AC

Consist of a valve module that can be mounted into a base block. This may be a separate valve F-001AC-X, or an MFC (F-203AX, F-206AX/BX, F-213AX or F-216AX/BX). In the larger valves/controllers this valve module is used as a pilot valve (see below).

VARY-P VALVE F-033C, F-042C

Are 2-stage control valves, pressure rating 700 bar max. The pilot valve acts as described above. The second stage is a patented pressure compensation valve. These valves maintain a constant ΔP of 4 bar across the first stage. Thanks to this feature both inlet- and outlet pressures may change without affecting the functioning of the Vary-P-Valve.

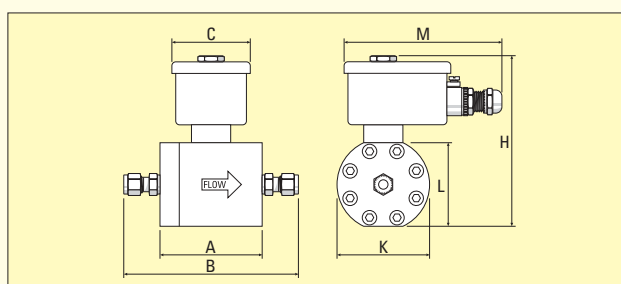
PILOT-OPERATED VALVES F-002AC, F-003AC, F-003BC

Are indirect-acting valves that make use of a complete Vary-P-valve (as described above) as a pilot. Thanks to this unique construction they are also pressure compensated. The pilot controls the pressure on rear side of a spring loaded cylinder, of which the front side is exposed to the inlet pressure of the main valve. The cylinder provides the positioning force for the main valve. In case the pressure difference is bigger than the

spring force, the main valve opens.

Block diagrams of the various valves are found in the EL-FLOW brochure.

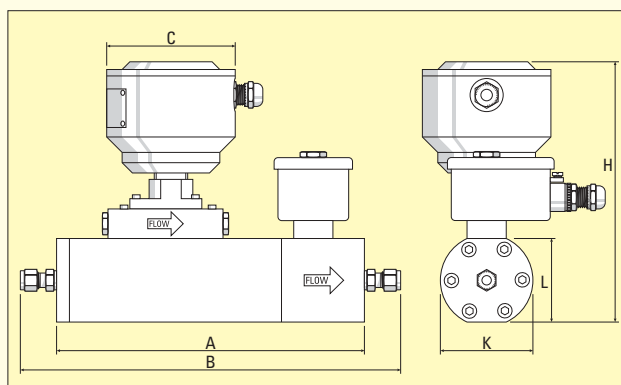
DIMENSIONAL DRAWING CONTROL VALVE



MODEL	DIMENSIONS (MM)							WEIGHT (KG)
	A	B	C	H	K	L	M	
F-001AC	47	100	50	82	25	25	106	0,5
F-002AC	78	131	50	110	59	53	106	1,5
F-003AC	97	167	50	124	74	67	106	3,2
F-003BC	114	197	50	141	89	84	106	5,1
F-033C	77	130	50	118	69	55	106	2,3
F-042C	129	-	50	66	99	76	106	6,6

Dimensions of control valves with XB-coils are identical, only dimension M=104 mm.

DIMENSIONAL DRAWING MASS FLOW CONTROLLER



MODEL	DIMENSIONS (MM)						WEIGHT (KG)
	A	B	C	H	K	L	
F-203AX/F-213AX	171	240	82	172	74	67	5,5
F-206AX/F-216AX	233	303	82	196	74	67	7,5
F-206BX/F-216BX	251	337	82	214	89	84	10,7
F-230MX/F-231MX/ F-232MX	115	169	82	161	69	56	4,1
F-240MX/F-241MX/ F242MX	153	-	82	181	99	76	8,7

EX-FLOW MASS FLOW CONTROLLER FOR GASES

FLOW CAPACITIES (BASED ON N₂)

MFM + Valve	smallest	highest
F-111X + F-001AC	0,3...15 ml _n /min	0,15 l _n /min
F-111X + F-002AC	0,15 l _n /min	0,315 l _n /min
F-112AX+F-002AC	0,315 l _n /min	5,0250 l _n /min
MFC with integral valve		
F-203AX/F-213AX	0,525 l _n /min	251250 l _n /min
F-206AX/F-216AX	0,420 m ³ _n /h	4200 m ³ _n /h
F-206BX/F-216BX	150 m ³ _n /h	10500 m ³ _n /h
F-230MX/F-240MX	0,2....10 ml _n /min	10...500 ml _n /min
F-231MX/F-241MX	0,010,5 l _n /min	0,210 l _n /min
F-232MX/F-242MX	0,210 l _n /min	2100 l _n /min

THE RIGHT CHOICE OF INSTRUMENT

And selection of the corresponding model number requires a certain experience and knowledge of the product. With this brochure we endeavour to give the necessary information. However, if you do not wish to determine the model number yourself, then Bronkhorst High-Tech or your local distributor will gladly do it for you. All you need to do is provide the required information requested on page 10, and we will make the selection to offer the best solution.



NEW SENSOR BRINGS LOWER COSTS AND INCREASED FIELDS OF APPLICATION

With the new ex-proof sensor as described on page 4 it has become possible to use all the standard HI-TEC models. For flows between 0,3...15 ml_n/min and 25...1250 l_n/min only a 400 bar pressure rating unit could be offered in the past. That implied higher costs. Now all instruments, also the lower cost models for lower operating pressures, are available in ex-proof.

A summary of the most important instruments and information on the special achievements of Bronkhorst High-Tech can be found in the new EL-FLOW® brochure, which you should request, if you do not already have a copy.

FIELDS OF APPLICATION

Some examples of typical applications are shown on page 6. In addition we detail herewith some typical applications for controllers:

- the making of defined gas mixtures in laboratories;
- pilot plants in engineering studies;
- fermentation and bio-technology;
- burner control;
- hydrogen techniques.

DIGITAL READOUT SYSTEM INCREASES PERFORMANCE AND SAFETY

Many ex-proof instruments combine the advantage of short-circuit protection with the limitation of the traditional 4...20 mA input/output signal. However, the Bronkhorst Hi-Tec digital readout system E-7000 described in detail on page 11, offers great flexibility in selection of output and command signals: 0...5 V, 0...10 V, 0...20 mA, 4...20 mA. In addition a command signal of 1...5 V is possible. For digital communication with PCs the E-7000 series can be equipped with an RS232/FLOW-BUS or a PROFIBUS-DP/FLOW-BUS interface.

Furthermore there are the user friendly advantages of digital HI-TEC systems. See also page 11.

Also in ex-proof instruments the advantages of polynomial calibrations can be utilised. For specific applications the accuracy can be improved to ± 0,5% of reading plus ± 0,1% of full scale.

TECHNICAL SPECIFICATIONS EX-FLOW

MEASUREMENT SYSTEM

ACCURACY	standard calibration: $\pm 1\%$ of full scale (up to 1200 m ³ _n /h)
(AT CALIBRATION UNDER OPERATING CONDITIONS)	polynomial calibration: $\pm 0,5\%$ of reading plus $\pm 0,1\%$ of full scale
REPRODUCIBILITY	< 0,1% full scale
REPEATABILITY	< 0,2% of reading
TIME CONSTANT	approx. 5 sec.
CONTROL STABILITY	< $\pm 0,1\%$ full scale (typical for 1 l _n /min N ₂)
PRESSURE SENSITIVITY	0,1%/bar typ. N ₂ 0,01%/bar typ. H ₂
ATTITUDE SENSITIVITY	max. error 0,015% at 1 bar N ₂ and 90° change
VIBRATION SENSITIVITY	negligible
TEMPERATURE SENSITIVITY	zero point approx. 0,05% of full scale/°C span approx. 0,05% of reading/°C
LEAK INTEGRITY	tested < 1 x 10 ⁻⁹ mbar l/s He. Additional pressure test at 1,5 times the max. stated operating pressure
RFI	in conformity with CE

MECHANICAL PARTS

PROCESS CONNECTIONS	see model number code; other on application
MATERIAL WETTED PARTS	stainless steel AISI 316L or comparable
MATERIAL ELECTRONIC HOUSING	aluminium
SEALS	Viton, EPDM, elast. PTFE, other on application
SURFACE QUALITY	Ra 0,2...0,6 µm

OPERATING LIMITS

RANGE	2%...100%
TYPES OF GASES	all gases compatible with AISI 316L
TEMPERATURE	EX-FLOW Sensor: -10°C up to +70°C XB-coil: -40°C up to +65°C XC-coil: -40°C up to +65°C
PRESSURE	vacuum up to 700 bar.
WARMING-UP TIME	30 min for optimum accuracy, 2 min for accuracy $\pm 2\%$ of full scale

ELECTRICAL PROPERTIES

SIGNAL CIRCUIT	in type of explosion protection intrinsic safety EEx ib IIC, only for connection to a certified intrinsically safe circuit with the following maximum values: U _i = 28 V, I _i = 98 mA, P _i = 686 mW. The effective internal capacitance between: Terminals 1 and 3: C _i = 1 nF; Terminal 2 and the housing: C _i = 120 nF; The effective internal inductance: L _i = 0,1 mH.
OUTPUT SIGNAL	15...20 mA (linear) Terminal connection M12, Housing IP 65.
XB-COIL (II 1 G/D EEx ia IIC T6)	Coil voltage max. 28 V/110 mA; 295 Ohm at 20°C, cable gland PG 9.
XC-COIL (II 2 G/D IP6X T 130°C EEx me II T4)	Coil voltage max. 24 V; 65 Ohm at 20°C, cable gland M16x1,5; P _{max} = 9 W at 20°C.

■ CALIBRATION

References

The calibration is done with equipment certified by the Netherlands Measurement Institute (NMI) and is in accordance with the European and most important other countries' regulations.

System

Precision glass bore cylinders with mercury seal, or for higher capacities volumetric flowmeters with temperature and pressure compensation.

Gases

If possible, every instrument is calibrated under its operating conditions. A number of standard gases are available.

Gasdata

A substantial data base is available for determining the physical properties such as density, viscosity and specific heat under operating conditions (usually not available in standard gas books). All this data is extremely important for the calculation of the conversion factor. The calculation is automatically performed in the calibration programme.



MODEL NUMBER CODE EX-FLOW

INSTRUMENTS WITH COMPRESSION COUPLINGS

F - N N NAA - HEE - N N - A

BASE BLOCK

0	Valve only
1	Sensor
2	Sensor + integral valve

PRESSURE RATING

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

SENSOR RANGE

0X	07,5 up to 0.....15 ml _n /min
1X	015 up to 0.....15000 ml _n /min
2AX	015 up to 0.....250 l _n /min
3AX	0100 up to 0.....1250 l _n /min
6AX	020 up to 0.....200 m ³ _n /h
6BX	050 up to 0.....500 m ³ _n /h

INLET	CONNECTION	OUTLET
1	1/8" Compression coupling	1
2	1/4" Compression coupling	2
3	6 mm Compression coupling	3
4	12 mm Compression coupling	4
5	1/2" Compression coupling	5
6	20 mm Compression coupling	6
8	1/4" Face seal coupling	8
9	other	9

SEALS

E	EPDM
P	Elast. PTFE
V	Viton
Z	other

FLOWMETERS FOR MOUNTING BETWEEN FLANGES

F-1 N NAX - HEE - NN - A

PRESSURE RATING

0	40 bar
1	100 bar

SENSOR RANGE

6AX	Mounting between flanges	0..20 - 0..200 m ³ _n /h
6BX	Mounting between flanges	0..50 - 0..500 m ³ _n /h
6CX	Mounting between flanges	0..100 - 0..1000 m ³ _n /h
6DX	Mounting between flanges	0..180 - 0..1800 m ³ _n /h
6EX	Mounting between flanges	0..400 - 0..4000 m ³ _n /h
6FX	Mounting between flanges	0..700 - 0..7000 m ³ _n /h
6GX	Mounting between flanges	0..1100 - 0..11000 m ³ _n /h
7AX	Flanged connection	0..20 - 0..200 m ³ _n /h
7BX	Flanged connection	0..50 - 0..500 m ³ _n /h
7CX	Flanged connection	0..100 - 0..1000 m ³ _n /h
7DX	Flanged connection	0..180 - 0..1800 m ³ _n /h

CONNECTION

01	Mounting between flanges	DIN PN 10
02	Mounting between flanges	DIN PN 16
03	Mounting between flanges	DIN PN 40
06	Mounting between flanges	ANSI 150 lbs
07	Mounting between flanges	ANSI 300 lbs
13	Flanged connection	DIN PN 40
15	Flanged connection	DIN PN 100
26	Flanged connection	ANSI 150 lbs
27	Flanged connection	ANSI 300 lbs
28	Flanged connection	ANSI 600 lbs
99	other	

SEALS

E	EPDM
P	Elast. PTFE or equivalent
V	Viton
Z	other

The model number code serves primarily to identify instruments. When making enquiries or placing orders we determine the correct model number in accordance with the following

Enquiry and ordering information.

In order to furnish the optimum instrument for your application we request you to state: type of gas, flow range, operating temperature and pressure (for controllers supply pressure and back pressure), electrical connection, desired output signal, type of process connection and seals. Based on this information we

perform the following actions/calculations:

- Convert the desired flow to N₂-equivalent flow, i.e., divide the desired flow by the conversion factor as calculated by FLUIDAT.
- Only for controllers, check if the pressure differential across the valve (ΔP) is within the limits.
- Only for controllers, check if the FLUIDAT calculated K_v-value is within the specifications allowed.

DIGITAL READOUT SYSTEMS

■ SERIES E-7000

The Bronkhorst Hi-Tec FLOW-BUS Series E-7000 offers the user a menu driven device with the possibility to define and control mass flow meters/controllers, pressure transducers/controllers or other instruments. The μ -processor based readout/control modules are now also available for explosion proof instruments.

■ FEATURES

A user-friendly indication/control/alarm/totalization module, menu driven with 5 push buttons for:

- Isolation amplifier for intrinsically safe operation of the field mounted instruments.
- Indication of measured value in 2-line, 16-character display in percent or direct indication, combined with totalized quantity or preset quantity.
- Internal/external command.
- Master/slave control.
- Totalization or batch functions.
- Programmable alarm functions.
- NO/NC relays for status outputs.
- Programming of polynomial function.

■ SPECIFICATIONS

Housing/Electrical Data:

- 14 TE modules for mounting in:
 - 3 HE 1/2" table top or rack housing (max. 2 ch.).
 - 3 HE 19" table top or rack housing (max. 4 ch.).
- Output signals/command signals 0...5 (10) Vdc, 0 (4)...20 mA.
- Power supply 100...240 Vac, (50...60 Hz) or 24 Vac/Vdc. One power supply module (04/03) can serve at least two R/C modules (20/21/22).
- Sub-D Connector for instrument connection.
- Sub-D Connector for analog I/O functions.
- Sub-D Connector for connection to FLOW-BUS (RS485).

■ MODEL NUMBER CODE READOUT SYSTEMS

E-7 N N 0 - NN NN NN

HOUSING

1	1/2 19" Table top	(42TE)
2	19" Table top	(84TE)
3	1/2 19" Rack	(42TE)
4	19" Rack	(84TE)

POWER SUPPLY

0	100240 Vac
1	220240 Vac
2	110120 Vac
3	24 Vac
4	24 Vdc
9	other

MODULES

01	Blind front
03	Blind front with power supply
04	Blind front with power supply, mains entry and cable
With indication and push buttons = R/C	
20	R/C intrinsically safe power supply for "Ex" meter
21	R/C intrinsically safe power supply for "Ex" meter and valve with XB-coil, incl. controller
22	R/C intrinsically safe power supply for "Ex" meter and valve with XC-coil, incl. controller
00	None
99	Other (specify)

■ ADDITIONAL CODE FOR THE SIGNALS

NN - EAA

A	0 5 V
B	0 10 V
C	0 20 mA
D	4 20 mA
E	15 20 mA

The identification of the R/C-modules is furnished with the appropriate input and output signals:

1. Letter (E) Output signal flowmeter
2. Letter (A..D) Output signal readout system
3. Letter (A..D) Input signals readout system (ext. command/master)

Example: 20-EDD R/C Module for "Ex" meter (15-20 mA Output) with 4-20 mA Input/Output for the module.



2-CHANNEL MODEL E-7300-04-20-20

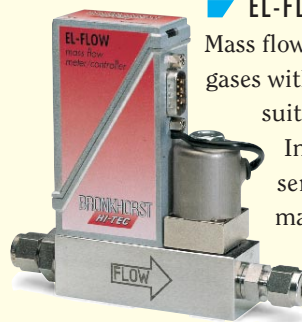
OTHER BRONKHORST-HI-TEC PRODUCTS

In addition to the instruments of the EX-FLOW series described in this catalogue we would like to identify some other product groups within our range of instruments and their corresponding brochures.



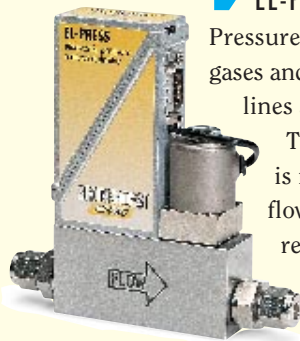
IN-FLOW

Mass flow meters and controllers for gases suitable for industrial applications, especially thanks to their IP 65 protection. Not only can instruments similar to the EL-FLOW® and LOW-ΔP-FLOW series be supplied in this way, but moreover instruments can be supplied suitable up to 11000 m³_n/h as described in the IN-FLOW brochure.



EL-FLOW®

Mass flow meters and controllers for gases with an electronic housing suitable for laboratory conditions. Instruments of the EL-FLOW® series are the only ones on the market that can control flow ranges between 0...1 ml_n/min and 0...1250 l_n/min between vacuum and 400 bar in one range of instruments. The particular versatility in flow ranges and in operating conditions have made EL-FLOW® the best sold and proven instrument series.



EL-PRESS

Pressure transducers and controllers for gases and liquids are built along the same lines as the EL-FLOW® instruments. The only difference is that there is no laminar flow device, and the flow sensor is replaced by a piezo-resistive pressure transducer. The measuring ranges are between 2...100 mbar abs. or relative, and 8...400 bar.

Upstream or downstream pressures up to 100 bar are controlled with integrally mounted control valves. For higher pressures separate control valves are used.



LIQUI-FLOW®

Mass flow meters and controllers for liquids in ranges between 0,1...5 g/h and 0,4...20 kg/h (water equivalent). LIQUI-FLOW® flow meters only require a small differential pressure.

In spite of measurement without a by-pass the rise in temperature of the fluid is minimal; only approx. 1...5 °C.

This greatly limits the danger of evaporation or degradation of the fluid. For even smaller ranges Bronkhorst High-Tech offers the μ-Flow series; smallest range: 12,5...250 mg/h (water equivalent).

If one or more instruments described here are of interest to you, then please do not hesitate to contact your distributor.

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HI-TEC

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