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EL-PRESS

Electronic Pressure Meters and Controllers



Pressure ranges:

min. 0-100 mbar; max. 0-400 bar

High accuracy and repeatability

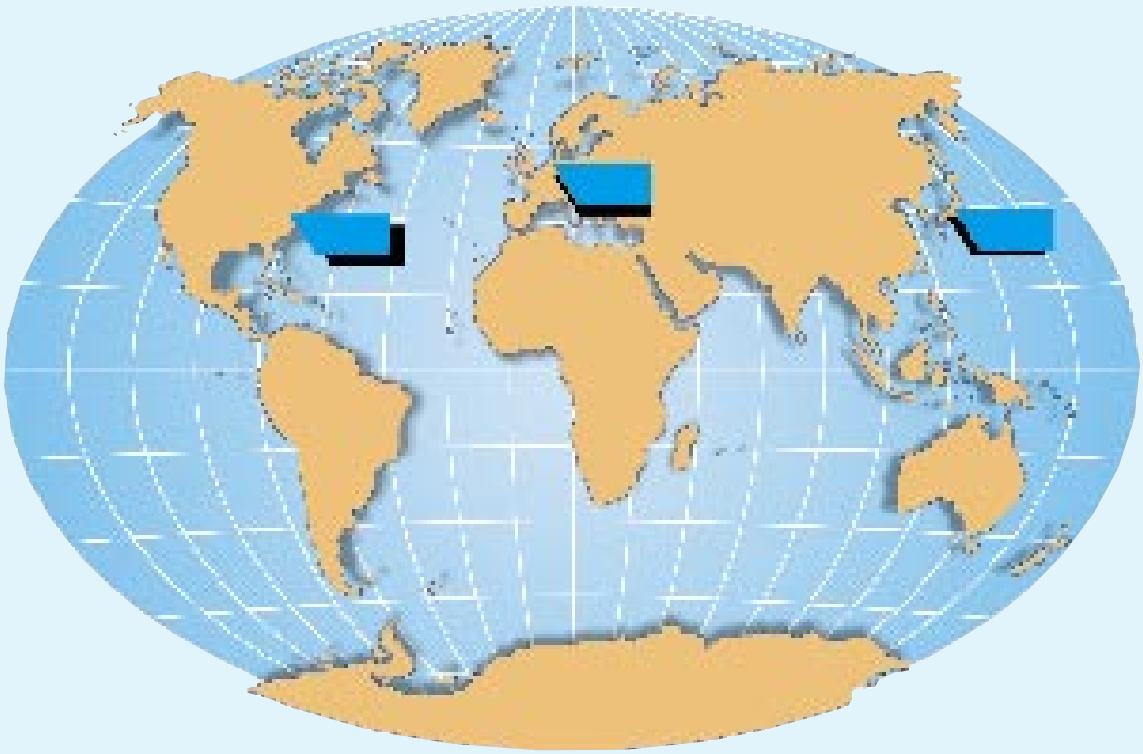
Compact arrangement

For liquids and gases

Thru-flow design

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.

Bronkhorst High-Tech have signed agreements with Porter Instruments Company for the North American markets and with Oval Corporation for the Asian markets 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.



Sales representation
Sales representation with service and calibration

This brochure describes the instruments of the EL-PRESS series. These Electronic Pressure Meters and Controllers for gases and liquids are of modular construction. Absolute, relative and differential pressure sensors are available. All metal sealed Pressure Meters/Controllers of the COMBI-FLOW series are described in a separate brochure. Furthermore your local distributor will gladly advise you on ex-proof pressure measurement and control systems. For Bronkhorst Hi-Tec's product line of Mass Flow Meters/Controllers please refer to page 15 or our general brochure.

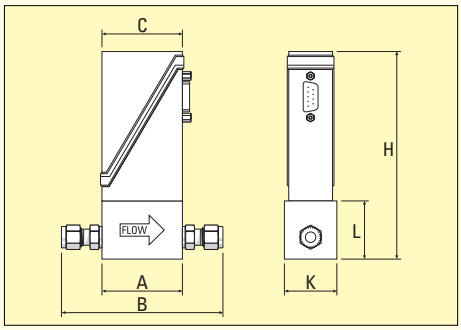
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EL-PRESS Electronic Pressure Meters

General

The EL-PRESS series P-500 Electronic Pressure Meters have a well-proven compact thru-flow design, and are available in pressure ranges from 100 mbar up to 400 bar, both in absolute pressure and relative pressure. In the range of 100 mbar up to 15 bar a differential pressure transmitter can also be supplied. The instruments are of modular construction with an electronic housing suitable for common laboratory type ambient conditions. In order to convert an electronic pressure transmitter to a controller, a control valve is used; normally the control valve would be integrated (see next page), but it can also be mounted separately.



Pressure Meter

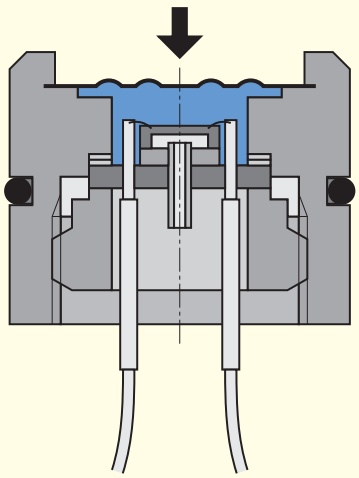
	Dimensions (mm)						Weight
Model	A	B	C	H	K	L	(kg)
P-502C/P-512C/P-522C/P-532C	47	97	47	123	30	37	0,4

Differential Pressure Meter

	Dimensions (mm)						Weight
Model	A	B	C	H	K	L	(kg)
P-506C	55	105	47	116	30	30	0,4



EL-PRESS P-506C EPT



Cross sectional drawing of a pressure sensor

Principle of operation

The Bronkhorst Hi-Tec EL-PRESS pressure sensor is a piezo resistive bridge on the surface of a silicon chip. This chip is drilled out on its reverse side, giving the inside of the chip the form of a pressure diaphragm whose thickness determines the pressure range. When a pressure acts on this chip, the diaphragm flexes, and the resistor values of the bridge alter in proportion to the pressure. The measuring cell is separated from the external pressure by a thin, sensitive stainless steel diaphragm, and the sealed off cavity between diaphragm and cell is filled with oil.

Pressure ranges (intermediate ranges are available)

Pressure Meters (absolute or relative)

Model P-502C	min. 2 .....100 mbar	max. 1,28 .....64 bar
Model P-512C	min. 1,28 .....64 bar	max. 2 .....100 bar
Model P-522C	min. 2 .....100 bar	max. 4 .....200 bar
Model P-532C	min. 4 .....200 bar	max. 8 .....400 bar

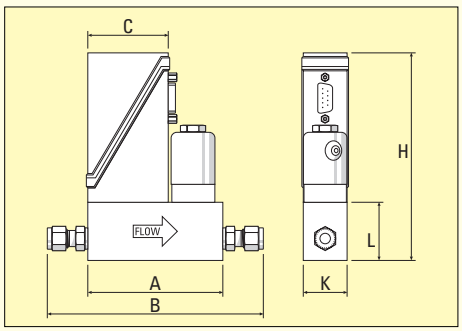
Differential Pressure Meters

Model P-506C	min. 2 .....100 mbar	max. 0,3 .....15 bar

EL-PRESS Electronic Pressure Controllers

General

The EL-PRESS Electronic Pressure Controllers are compact devices, comprising an integrated pressure transducer and control valve for K_v-values up to 6,6 x 10^{-2}. For higher flows we recommend to use a separate P-500 pressure transducer, preferably to be mounted outside the flow stream to eliminate frictional losses, and a special, patented Bronkhorst Hi-Tec control valve for K_v-values up to 6,0. To cope with high differential pressure a VARY-P control valve can be offered; the maximum possible differential pressure across this device is 400 bar.



Forward Pressure Controller

	Dimensions (mm)						Weight
Model	A	B	C	H	K	L	(kg)
P-602C/P-612C	77	127	47	123	25	37	0,7

Back Pressure Controller

	Dimensions (mm)						Weight
Model	A	B	C	H	K	L	(kg)
P-702C/P-712C	77	127	47	123	25	37	0,7



EL-PRESS P-702C EPC

For pressure control applications with small pressure differences, series F-004 bellows operated valves can be offered. See pages 8 and 9 for a description of the various control valves.

Fields of application

Chromatography

Programmable pressure profile in

- gas chromatography
- liquid chromatography

Biotechnology

- Fermenter pressure control

Semiconductor Industry

- Vapour pressure control MOCVD
- Chamber pressure control in CVD and sputtering equipment

Surface treatment technology

- Source pressure control ($TiCl_4$)
- Protective gas pressure control in aluminium extrusion moulding processes

Research laboratories

- Pressure control in combustion studies
- Liquid level control in reactor vessels

Pressure ranges (intermediate ranges are available)

Forward Pressure Controllers (absolute or relative)

Model P-602C	min. 5 .....100 mbar	max. 3,2 .....64 bar
Model P-612C	min. 3,2 .....64 bar	max. 5 .....100 bar*

Back Pressure Controllers (absolute or relative)

Model P-702C	min. 20 .....100 mbar	max. 12,8 .....64 bar
Model P-712C	min. 12,8 .....64 bar	max. 20 .....100 bar*

* For pressures up to 400 bar select P-532C Pressure Meter with F-033C Control Valve

EL-PRESS *@digital* PRESSURE METERS/CONTROLLERS

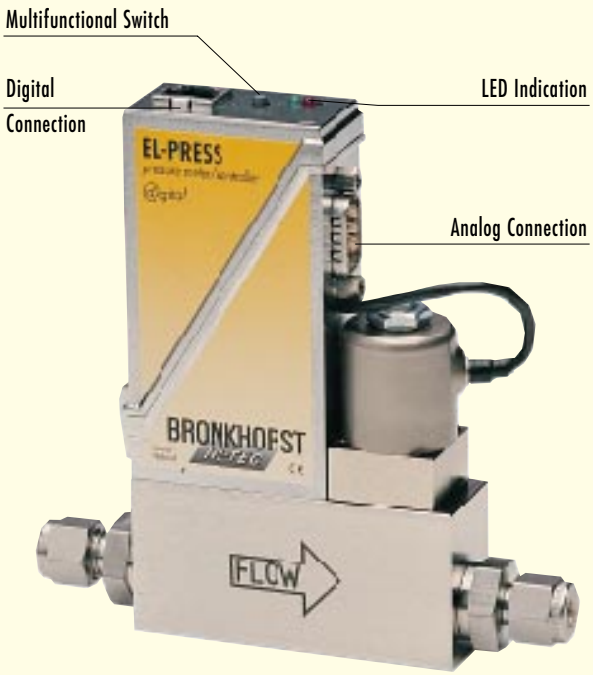
GENERAL

Pressure meters and controllers in the EL-PRESS series are also available in a digital version. EL-PRESS *@digital* is based on a completely new digital p.c. board on which the sensor signal is sent direct to a micro processor. By doing so an optimum signal stability and accuracy is achieved. An integral alarm function continuously checks the difference between the setpoint and the measured value. In addition the instrument checks itself through an integral, self diagnosis routine. Controller settings can be remote-adjusted via FLOW-BUS, Bronkhorst High-Tech's RS-485 based fieldbus for digital instruments.

The instruments are available with both a digital FLOW-BUS input and output and with the common command and measuring signals of 0...5 (10) Vdc or 0 (4)...20 mA. Thanks to this feature digital instruments can replace analog instruments in existing installations. In computer controlled processes the advantages of communication by FLOW-BUS can be utilised. Additionally it is possible to use E-7000/E-7001 PS/Readout systems for local operation and power supply.

To support PC controlled process control Bronkhorst High-Tech has devised various software programmes, for instance a DDE-server for parameter exchange with MS WINDOWS application programmes. Furthermore Bronkhorst High-Tech offers an RS-232 interface as part of the E-7000 series read-outs or a FLOW-BUS-interface as a PC/ISA-card.





EL-PRESS P-702C *@digital* PRESSURE CONTROLLER

SPECIFICATIONS

- Digital Pressure Meter/Controller
- Digital input/output RS-485 (FLOW-BUS operation) or analog (0...5 (10) V, 0 (4)...20 mA)
- Interchangeable with analog instruments
- In-situ self-diagnosis
- Alarm functions
- Fast (adjustable) response controller
- Single rail power supply +15 Vdc / +24 Vdc

FLOW-BUS

- Fieldbus for 120 channels
- Max. bus length 2.5 km
- Baudrate 187.5 kBaud
- Digital readout series E-7000 / E-7001
- Interfaces for PC; RS-232 module or PC-card with ISA-slot.

Software support by PC (IBM compatible)

- DDE-server for parameter exchange between FLOW-BUS and process control and visualisation software under MS WINDOWS (e.g. SCADA packages such as Intouch, Labview, Genesis, Windmill)
- Library with FLOW-BUS routines for MS WINDOWS, FLOWBUS.DLL.

Technical Specifications EL-PRESS

Measurement system

Accuracy (incl. Linearity)	±0,5% of full scale
Repeatability	<0,1% of full scale
Response time sensor	<0,1 s.
Control stability	< ±0,1% full scale (typical for 1 l_n/min N_2 at specified process volume)
Attitude sensitivity	max. error 0.015% at 1 bar N_2 and 90° change
Temperature sensitivity	0,1% of full scale/°C
Supply voltage sensitivity	zero at correct supply voltages (acc. to electr. data)
Leak integrity	tested < 2 x 10^{-9} mbar l/s He
(see SEMI E 18-91)	Additional pressure test at 1,5 times the max. stated operating pressure
RFI	CE approved design

Mechanical parts

Process connections	see model number code; other on application
Materials of construction	stainless steel AISI 316L or comparable
Seals	Viton, EPDM, elast. PTFE, other on application
Surface quality	Ra 0,2...0,6 µm

Operating limits

Pressure rangeability	Measurement 1 : 50 Control (with flow range 1 : 50) P-602C/P-612C 1 : 20 P-702C/P-712C 1 : 5 P-500 series with separate control valve up to 1 : 50 (depending on application)
Types of gases or liquids	all fluids compatible with AISI 316L
Temperature	-10 °C up to +70 °C
Warming-up time	30 min for optimum accuracy, 2 min for accuracy ±2% of full scale

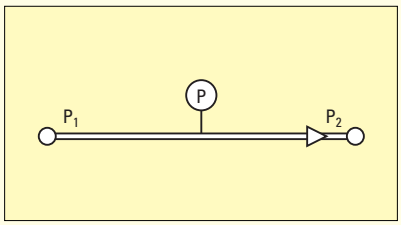
Electrical properties

Supply voltage	analog: +15 V, 45 mA; add for control valve 180…250 mA - 15 V, 20 mA digital: +15 Vdc or +24 Vdc, to be advised power consumption EPT: 120 mA (max.), EPC: 350 mA (max.)
Output signal (short circuit protected)	analog: 0...5 V, 0...10 V, min. load impedance > 2 kOhm 0 (4)...20 mA, max. load impedance < 375 Ohm digital: RS-485 (FLOW-BUS)
Setpoint signal	analog: 0 (1)...5 V, 0...10 V, input resistance min. 1 MOhm digital: RS-485 (FLOW-BUS)
Reference signal	analog: 5 V (10 V), min. load impedance > 2 kOhm
Electrical connection	analog: male, 9-pin sub-D connector digital: female, 8-pin RJ45 modular jack connector

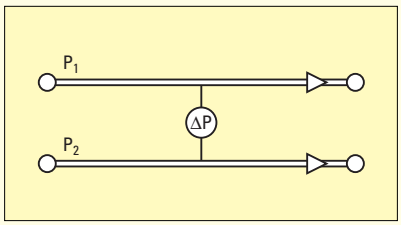
Calibration

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

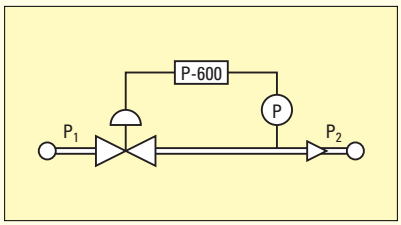
Configurations



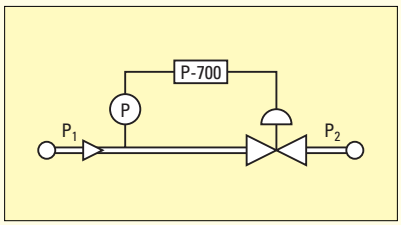
Pressure Measurement



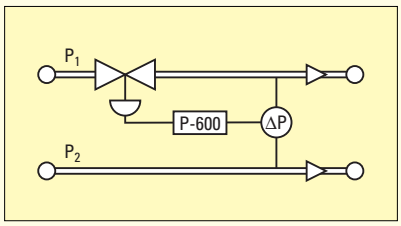
ΔP-Measurement



Forward Pressure Control



Back Pressure Control

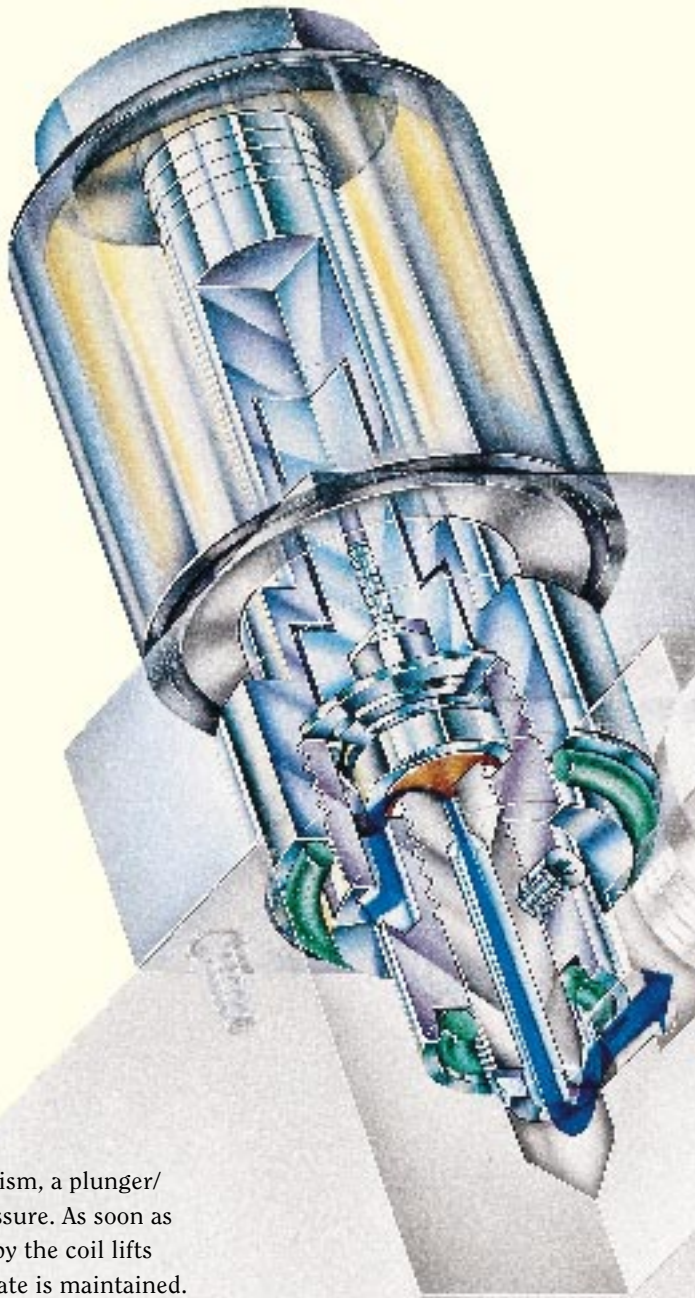


ΔP-Control

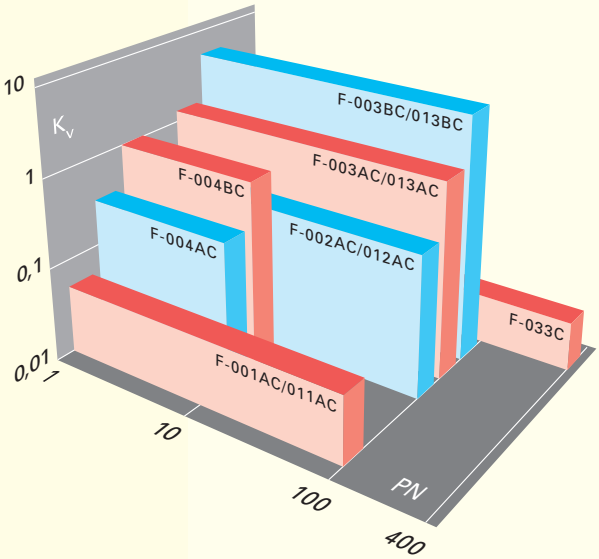
Control Valves

The control valve can be supplied as an integral part of an EL-PRESS pressure controller, or as a separate component. It is a proportional, electro magnetic control valve with extremely fast and smooth flow control characteristics.

With reference to the specific fields of application there are different series of Bronkhorst Hi-Tec control valves. The optimum choice is made together with your distributor after having studied the operating conditions and requirements. But for those of you that want detailed information, the most important features of the various models are summarised here (see also the graph printed below).



Graphic display of K_v and max. pressure



Principle of operation

In the neutral position (no valve voltage supply), the control mechanism, a plunger/orifice system, is closed by means of a spring and the differential pressure. As soon as the controller supplies sufficient voltage, the magnetic force caused by the coil lifts the plunger, until the forces are in balance and the desired gas flow rate is maintained. The valve is normally closed. In the normally opened version the plunger/orifice control mechanism is closed by the ΔP and the magnetic force.

Summary of types and models

Type	Model	K_v max.	ΔP min.	ΔP max.	PN
Direct acting	F-001AC, F-011AC	6,6 x 10^{-2}	-	3,6...50 bar*	100
Vary-P	F-033C	5,1 x 10^{-2}	6 bar	400 bar	400
Pilot-operated	F-002AC, F-012AC	0,4	1,3 bar	20 bar	100
	F-003AC, F-013AC	1,5	1,6 bar	20 bar	100
	F-003BC, F-013BC	6,0	1,6 bar	20 bar	100
Bellows	F-004AC	0,3	-	5 bar	10
	F-004BC	1,0	-	5 bar	10

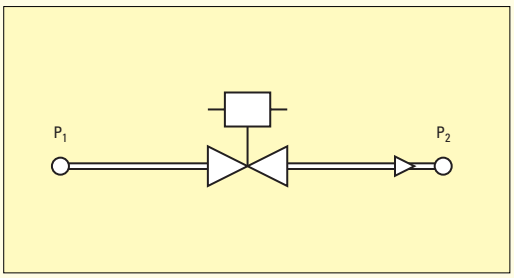
* depending on K_v-value.

Advantages

- Modular
- Compact
- Simple
- Electro-chemically polished
- User replaceable

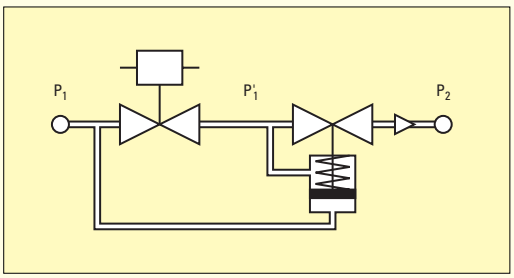
Direct Acting Valve F-001AC

The valve consists of a valve module (see picture) that is mounted onto a base block. The base block may constitute a separate control valve F-001AC, or an EPC (P-602C, P-702C). The valve module is also used as pilot valve in bigger valves and controllers.



Vary-P Valve F-033C

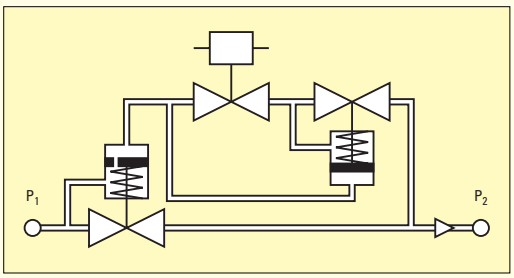
This is a patented 2-phase control valve. The flow control section is the valve module as described above. The other section is a pressure compensation valve; the latter maintains a constant ΔP across the first section (P_1-P'_1) of 4 bar. By doing so both the inlet pressure P_1 and the outlet pressure P_2 may change without having any impact on the Vary-P Valve function.





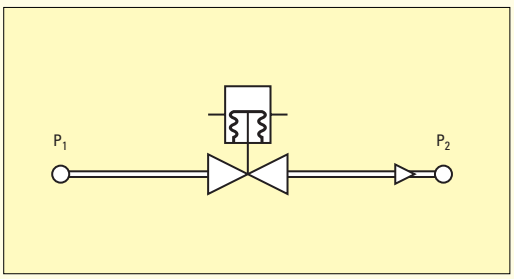
Pilot-Operated Valves F-002AC, F-003AC, F-003BC

Are patented indirect acting control valves and use a complete Vary-P Valve as described above, as pilot valve. Hence they are also pressure compensated. The pilot controls the pressure on the back side of a spring loaded cylinder, of which the front side is subject to the inlet pressure of the main valve. This cylinder furnishes the power for the main valve. As soon as the ΔP becomes bigger than the spring force, the main valve, will open.



Pressure compensated Bellow Valves F-004AC/F-004BC

Are direct acting control valves as the above-mentioned F-001AC series. They are also closed by spring force. A bellows compensates the closing force acting on the plunger to such a degree that only a very small magnetic force is required and in this way large orifices can be opened, which is impossible in the F-001AC design as it would cause oscillation. The bellows pressure compensated design, however, enables us to smoothly control large flows at extremely low pressures.



Model number identification

P	—	N	N	NA	—	A	A	—	N	N	—	A	—	NNNA

Base

5	Sensor only
6	Valve + Sensor (regulates downstream pressure)
7	Sensor + valve (regulates upstream pressure)

Pressure rating

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

Style sensor

2C	Absolute/Relative pressure
6C	Differential pressure

PC board

F	Analog controller, N/C
G	Analog controller, N/O
R	Digital controller, N/C
S	Digital controller, N/O

Output signal

A	0...5 V
B	0...10 V
C	0...20 mA sinking
D	4...20 mA sinking
F	0...20 mA sourcing
G	4...20 mA sourcing
Z	other

Inlet Connection Outlet

1	⅛" compression type	1
2	¼" compression type	2
3	6 mm compression type	3
4	12 mm compression type	4
5	½" compression type	5
6	20 mm compression type	6
8	¼" face seal	8
9	other	9

Seals

E	EPDM
P	Elastomeric PTFE
V	Viton (factory standard)
Z	Other

Range sensor

	Absolute pressure
00A1	100…200 mbara
002A	0,2…1,2 bara
005A	1,2…4 bara
020A	4…15 bara
100A	15…100 bara
400A	100…400 bara

	Relative pressure**
00R1	100…200 mbarg
002R	0,2…1 barg
004R	1…4 barg
020R	4…15 barg

** for relative pressure ranges higher than 15 barg an absolute sensor is used

	Differential pressure
00D1	100…200 mbard
002D	0,2…1 bard
005D	1…4 bard
020D	4…15 bard

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: operating pressure (for controllers upstream and downstream pressure and also the process volume), type of gas or liquid, flow and operating temperature, electrical connection, desired output signal, type of process connection and seals.

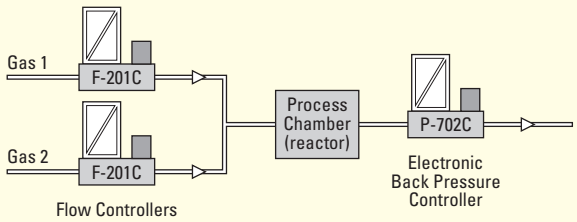
Based on this information we perform the following actions/calculations:

- Determination of the pressure range to be measured or controlled.
- 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.

Examples of some applications

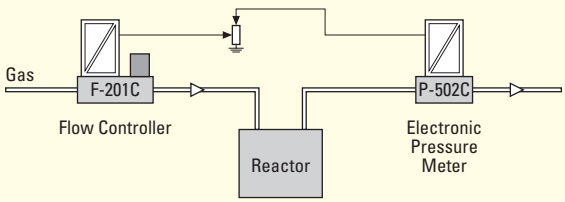
It is of course impossible to picture the possible number of applications. Here is a limited quantity of basic examples, which are often seen with some variations. However, identical or similar configurations are used in totally different applications. Therefore please consider the ones pictured here as examples for solving common applications.

Back pressure control independent of gas mix and total flow



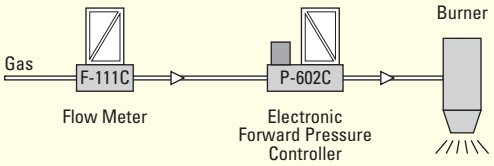
A gas mixture is formed by EL-FLOW Mass Flow Controllers. In a process chamber the effect of the catalyst on certain reactions is tested. The pressure in the process chamber is controlled to the desired level by means of an EL-PRESS Back Pressure Controller, independent of the total flow and/or the composition of the mixture.

Pressure control with adjustable flow



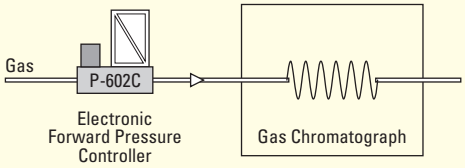
The control valve of the EL-FLOW F-201C Mass Flow Controller (MFC) forms a closed loop pressure control system with the EL-PRESS P-502C Pressure Transducer: the Mass Flow Meter of the MFC measures the required flow rate to maintain the set pressure level. The setpoint voltage divider enables the user to adjust the maximum flow to build up desired pressure levels. Restriction of the maximum flow may for safety reasons be important in certain processes.

Pressure control combined with flow measurement



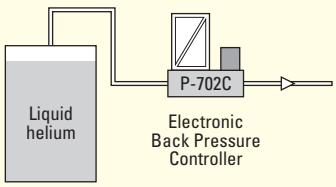
This arrangement of an EL-FLOW Mass Flow Meter with, in series, an EL-PRESS Forward Pressure Controller is used in burner test applications, or tests to check the inlet pressure dependence of the capacity of mechanical pressure regulators, or the tolerance on the bore of orifices, etc.

Forward Pressure Control in G.C. (gas chromatography)



In Gas-Chromatography there is an increasing need to automate all required parameters. The EL-PRESS Forward Pressure Controller enables the user to select a desired pressure profile for the analyses, whereby the pressure is kept constant to a very precise value, even at very low flow rates.

Compensation of atmospheric pressure changes



Superconducting coils, which are used to generate magnetic fields, are cooled by liquid helium. Depending on the temperature exchange gaseous helium should be vented. With a manually controlled outlet the variation of the atmospheric pressure disturbs the magnetic field. By using an EL-PRESS P-702C Back Pressure Controller the pressure for the superconducting coils is kept constant, thus eliminating the negative effects of atmospheric pressure variations.

Readout Systems with Integrated Power Supply

The wide selection in readout systems

Bronkhorst High-Tech offers a wide range of single- and multi-channel systems, using both digital and analog operation

The readout systems make much more possible than providing command signals to a number of controllers, for instance for making defined gas mixtures. The parameter to be controlled by the flowrate can also be temperature, process pressure, pH-value, and the command signals for these can be directly provided to the flow control loop. In combination with computers or PLCs ramp functions or other programmable process phases can be realised .

This brochure does not lend itself to show all the possibilities how to build control systems; your local distributor will gladly discuss your particular application with you in detail.

In addition there is the feature to program up to eight polynomial functions of calibration curves to achieve an accuracy of ± 0,5% of the measured value plus ± 0,1% of full scale.



E-7000 Single channel module

FLOW-BUS single-channel module

Series E-7000

The digital single-channel control module was developed by Bronkhorst High-Tech B.V. for mass flow and pressure measurement and control systems. Its application is not limited to operation in combination with Bronkhorst Hi-Tec mass flow controllers and pressure controllers, but it can also be used with other transmitters or transducers, or in master/slave control systems.
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 single-channel module offers the possibility to show tag numbers, measurement identifications, fluid names and totalizing units on top of the measurement and command signals in percent of max. flow or direct reading units.

Features

A user-friendly Indication/Control/Alarm/Totalization module, menu driven with 5 push buttons for:

- Use with digital or analog instruments,
- Indication of measured value on a 2-line, 16-figure 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 max. 8 polynomial functions.

FLOW-BUS multi-channel configurations

Based on the single-channel module it is easy to form multi-channel units. Three channels fit in a ½ 19" housing and six channels can be housed in a 19" table top or rack mounting unit.

Specifications

Housing:

- Cassette for panel mounting (1 channel) 96 x 144 mm.
- Table top housing (1 channel) 76 x 134 x 260 mm.
- Table top or rack housing (max. 3 channels) 3 HE ½ 19"
- Table top or rack housing (max. 6 channels) 3 HE 19"

Electrical data

- Power supply 100...240 Vac, 50...60 Hz or 24 Vac/Vdc.,
- Output signals/command signals 0...5 (10) Vdc, 0 (4)...20 mA,
- Sub-D Connector for instrument connection,
- Sub-D Connector for analog I/O functions,
- RJ 45 Connector for connection to FLOW-BUS,
- Max. power output +15 Vdc 1,5 A, -15 Vdc 150 mA.

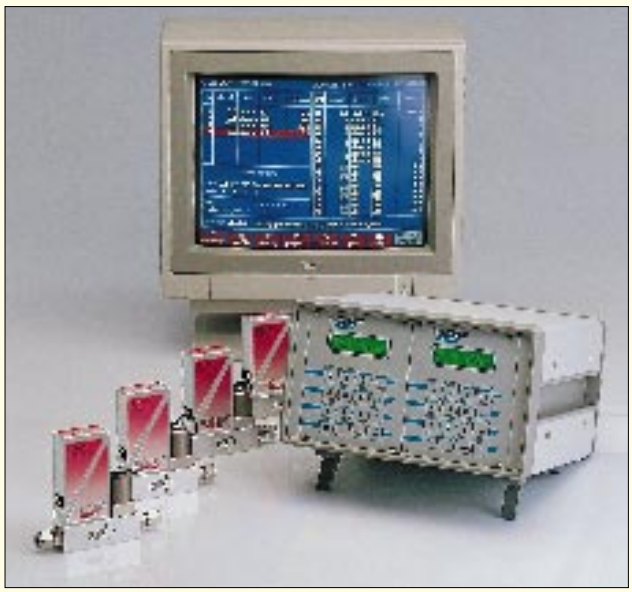


E-7100 3-channel execution

FLOW-BUS Digital Readout System

Series E-7001 (former E-6000 Series)

The FLOW-BUS E-7001 Series, a proven concept used in the E-6000 series, comprises intelligent modular readout systems with easy push-button operation and LCD indication.



E-7001 System components

Functional modules

- AD/DA Converter for 1 to 4 channels,
- Indication and control module for max. 32 channels,
- Totalization and alarm module with 8 totalizing and 8 limit functions,
- RS-232 host module as serial interface to host computer.
- I/O module with reset inputs and relay outputs for totalization and alarm modules.
- Communication software is included.

FLOW-BUS is a multi-channel system with a large number of possibilities such as storage of gas conversion factors, internal or external command, master/slave control, direct or percent indication, remote operation through the RS-232 interface and programming of polynomial functions for increased accuracy ± 0,5% of reading plus ± 0,1% of full scale).

FLOW-BUS Digital Readout System

Series E-7002

This series comprises modular readout systems built up from E-7000 and E-7001 modules.
Tailer-made systems with non-standard functions are also included in this series.

Readout Systems with Integral Power Supply

Analog standard readouts

Series E-5700

This series comprises standardised models for use with analog Mass Flow and Pressure Meters/Controllers for common basic requirements.
It is a simple, low cost unit for users who do not require the advanced features of the FLOW-BUS Series.

- E-5752: 2-channel system, table top model
- E-5762: 2-channel system, panel mount (96 x 144 mm)

- E-5714: 4-channel system, ½ 19" table top model
- E-5734: 4-channel system, ½ 19" for rack mounting

- E-5716: 6-channel system, ½ 19" table top model
- E-5736: 6-channel system, ½ 19" for rack mounting

Functions

- 1 Indicator per 2 channels, with selector switch,
- 1 Command potentiometer per channel,
- 1 Internal/external command signal switch,
- 100...240 Vdc power supply.



E-5752 2-channel PS/Readout



E-5736 6-channel PS/Readout

Electrical data

- Power supply 100…240 Vac
- Suitable for connection of instruments with output signal 0..5 (10) Vdc.
- Ext. output and/or setpoint signals: 0…5 (10) Vdc; 0 (4) …20 mA (to be advised).
- Sub-D socket for instrument connection.
- Sub-D socket for analog I/O function.
- Max. power output +15 Vdc, 2 A / -15 Vdc, 300 mA.

Other Bronkhorst Hi-Tec Products

In addition to the instruments of the EL-PRESS series described in this catalogue we would like to show some other product groups within our range of instruments. Separate brochures for these are available on request from your distributor.



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…3 ml_n/min and 0…1250 l_n/min between vacuum and 400 bar in one range of instruments. This versatility in flow ranges and in operating conditions have made EL-FLOW® our best selling and field proven instrument series.



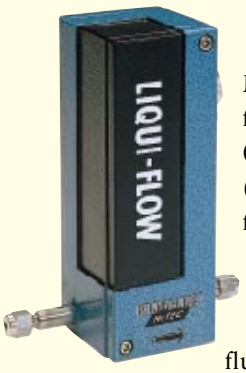
EX-FLOW

Mass Flow Meters and Controllers for gases in rugged construction with approval for use in hazardous areas.
The measuring ranges are from 0.2…10 ml_n/min up to 220…11.000 m^3_n/h.
The Mass Flow Meter has CENELEC (PTB) approval according to EEx ib II C T4. The electronic housing is IP 65. The control valves have K_v-values between 5,7 x 10^{-5} and 6,0 and conform to CENELEC EEx e II T4 or EEx ib II C T6, depending on type of coil specified.



IN-FLOW

Mass Flow Meters and Controllers for gases suitable for applications in industrial environments and in 'Zone 2', due to their IP 65 protection. Not only can the EL-FLOW® and LOW-ΔP-FLOW series be supplied in this way, but moreover instruments can be supplied suitable up to 11.000 m^3_n/h as described in the IN-FLOW brochure.



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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