EL-FLOW® Prestige

World's most versatile Mass Flow Meters / Controllers for Gases

Enjoy the benefits!

- **Innovative sensor**
  gradient insensitive, accurate temperature and pressure correction, high linearity
- **Ingenious laminar flow element**
  perfect flow split
- **Improved control valve**
  reliable, reproducible, outstanding dynamic behavior
- **Upgraded electronics**
  versatile flow control algorithms, embedded intelligence, reduced power consumption

Cutting edge technology

EL-FLOW Prestige is the next generation of Bronkhorst® Mass Flow Meters/ Controllers for gases. Nearly all core components have been redesigned and many improvements and innovations have been incorporated. With this new series Bronkhorst introduced the "Differential Temperature Balancing" technology, ensuring a superb sensor stability. New, power efficient micro-processors with innovative multistage control loops have been applied to achieve enhanced dynamic behavior. The new metal housing is of robust yet compact design.

Adaptable to your process

The control performance of EL-FLOW Prestige Mass Flow Controllers is factory adjusted to swiftly respond to setpoint changes, without overshoot. Moreover, the controllers are highly resistant to mechanical shocks and pressure fluctuations, which may be caused by other devices consuming gas from the same source. As an option the MFCs can be tuned for extra fast response (settling times $\tau_{98\%}$ down to 500 msec) or extra smooth control, depending on the requirements of the user's process. The dynamic behavior can also be tuned on site easily, by adjusting the controller speed settings via FlowTune™, or by using our software tool FlowPlot™. This free tool can also be used for device diagnostics or alarm and counter settings.

Reduce your cost of ownership

The mass flow meters and controllers can be supplied in full scale ranges from 0,7 ml_n/min up to 20 l_n/min Air-equivalent at max. 64 or 100 bar (1000 or 1500 psi) pressure rating. Like previous Bronkhorst instruments, EL-FLOW Prestige offers high flexibility due to the multi-gas/multi-range functionality. This functionality, now extended to 25 gases, is easily accessible via the FlowTune™ software or PLC; there is no need to disconnect the instrument from your system. For additional gas types the user can calculate accurate fluid properties for conversion by means of our free, online software tool Fluidat® on the Net. Users of EL-FLOW Prestige instruments can rescale their instruments on site, saving time and money for dismounting and recalibration. Furthermore, original equipment manufacturers (OEMs) are able to drastically reduce the variety of spare instruments kept on stock and thus reduce the cost of ownership.

Select the I/O options of your preference

Numerous input/output options can be offered through the programmable sub-D 9-pin connector. In addition to the various analog signal options and the standard RS232 communication, there are such options as RS485 communication, digital frequency/pulse output, alarm output/reset, valve purge/close and analog valve output. Furthermore Bronkhorst offers various integrated fieldbus options: DeviceNet™, PROFIBUS DP, PROFINET, Modbus RTU/ASCII, EtherCAT® and FLOW-BUS. The latter is an RS485 based fieldbus, specifically designed by Bronkhorst for their mass flow metering and control solutions. For the convenience of customers working with LabVIEW™ (graphical software by National Instruments) Bronkhorst provides a certified plug & play instrument driver for instruments with FLOW-BUS™ interface.

Customise your flow device

- User configurable control characteristics
- Gases selectable from embedded database
- Analog I/O or digital communication (RS232 / RS485 / fieldbus)
- Various on-board alarm and counter functions
- Wide choice of seals and process adapters
- Normally Closed / Normally Opened control valve function
- Optional, integrated shut-off valve

Bronkhorst®

Technical specifications

Measurement / control system

Accuracy (incl. linearity)	: standard: ±0,5% Rd plus ±0,1% FS
(based on actual calibration)	(±0,8% Rd plus ±0,2% FS for ranges 3...5 ml_n/min;
	±1% Rd plus ±1% FS for ranges < 3 ml_n/min)
Repeatability	: < 0,2% Rd
Turndown	: 1 : 150; in analog mode 1 : 50
Multi Gas/Multi Range gases	: embedded gas data for Air, N2, Ar, H2, O2, CO,
	CO2, He, CH4, SiH4, NH3, C2H2, C2H4, C2H6, Kr,
	C3H6 #2 (propene), C2F6, C3H8, NF3, N2O,
	H2S, Cl2, SF6, NO, Xe, plus any mixture of
	maximum 5 of these gases.
Settling time	: fast: < 500 msec
	standard: < 1 sec
	slow: < 2 sec
Operating temperature	: -10…70°C
Temperature sensitivity	: zero: < 0,02% FS/°C; span: < 0,025% Rd/°C
Pressure sensitivity	: < 0,15% Rd/bar typical N2;
	< 0,02% Rd/bar N2 (incl. pressure correction option)
Leak integrity, outboard	: tested < 2 x 10^{-9} mbar l/s He
Attitude sensitivity	: max. error at 90° off horizontal 0,07% FS
	at 1 bar, typical N2
Warm-up time	: 30 min. for optimum accuracy

Mechanical parts

Material (wetted parts)	: stainless steel 316L or comparable,
	degreased for use on oxygen (O2)
Process connections	: compression type or face seal couplings
Seals	: standard: Viton®;
	options: EPDM, Kalrez® (FFKM),
	FDA and USP Class VI approved compounds
	(model FG-201CS excluded)

Electrical properties

Power supply	: +15…24 Vdc		
Max. power consumption (controllers based on normally closed valve, pin 5 not used) :			
	Supply	at voltage I/O	at current I/O
Meter	15 V	69 mA	92 mA
	24 V	45 mA	63 mA
Controller	15 V	202 mA	225 mA
	24 V	128 mA	146 mA
If applicable: PROFIBUS DP	add 53 mA (15 V supply) or 30 mA (24 V supply)		
PROFINET	add 76 mA (15 V supply) or 48 mA (24 V supply)		
EtherCAT®	add 66 mA (15 V supply) or 41 mA (24 V supply)		
DeviceNet™	add 48 mA (24 V supply)		
Analog output/command	: 0...5 (10) Vdc or 0 (4)…20 mA (sourcing output)		
Digital communication	: standard: RS232;		
	options: PROFIBUS DP, DeviceNet™, PROFINET,		
	EtherCAT®, Modbus RTU or ASCII, FLOW-BUS		

Electrical connection

Analog/RS232	: 9-pin D-connector (male);
PROFIBUS DP	: bus: 9-pin D-connector (female);
	power: 9-pin D-connector (male);
DeviceNet™	: 5-pin M12-connector (male);
EtherCAT®/PROFINET	: 2 x RJ45 modular jack (in/out)
Modbus/FLOW-BUS	: RJ45 modular jack
CE	: EMC 2014/30/EU, RoHS 2011/65/EU,
IEC 61010-1	: 2010
Ingress protection (housing)	: IP40

Technical specifications and dimensions subject to change without notice.

Models and flow ranges (based on N_2)

Mass Flow Meters

Model	Flow range (N_2)	Pressure rating
FG-110C	0,014…0,7 ml_n/min up to 0,18…9 ml_n/min	100 bar(g)/1500 psi(g)
FG-111B	0,14…7 ml_n/min up to 0,4…20 l_n/min	100 bar(g)/1500 psi(g)

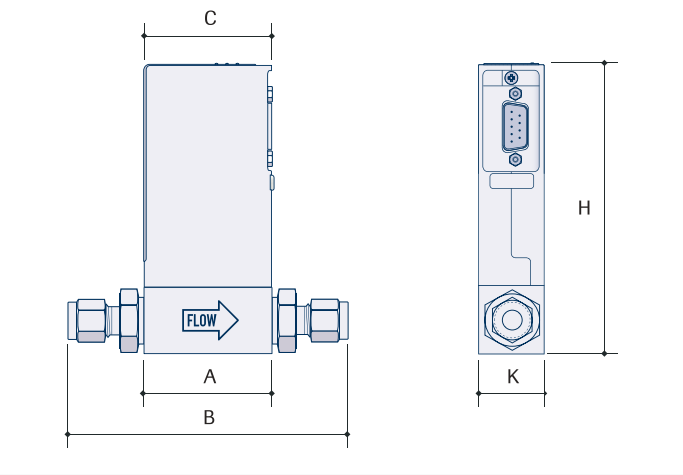
Mass Flow Controllers

Model	Flow range (N_2)	Pressure rating
FG-200CV	0,014…0,7 ml_n/min up to 0,18…9 ml_n/min	64 bar(g)/1000 psi(g)
FG-210CV	0,014…0,7 ml_n/min up to 0,18…9 ml_n/min	100 bar(g)/1500 psi(g)
FG-201CV	0,14…7 ml_n/min up to 0,4…20 l_n/min	64 bar(g)/1000 psi(g)
FG-211CV	0,14…7 ml_n/min up to 0,4…20 l_n/min	100 bar(g)/1500 psi(g)

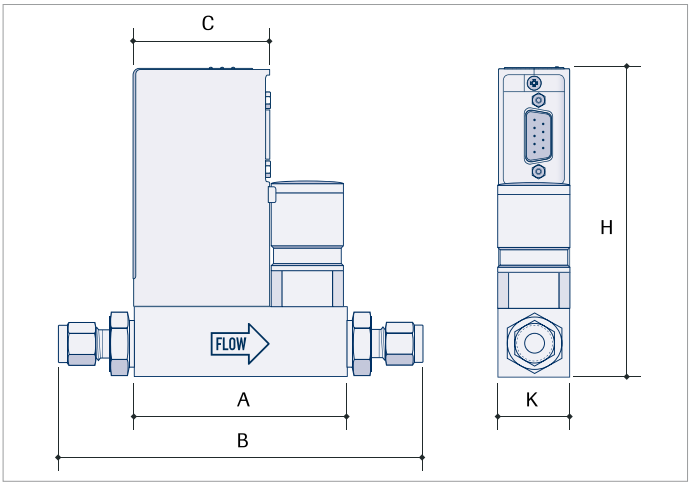
Mass Flow Controller with integrated shut-off valve

Model	Flow range (N_2)	Pressure rating
FG-201CS	0,14…7 ml_n/min up to 0,4…20 l_n/min	10 bar(g)/150 psi(g)

Dimensions (in mm) and weights (in kg)



Model	A	B	C	H	K	Weight (kg)
FG-110C (1/8"OD)	47	98	50	112	25	0.5
FG-111B (1/4"OD)	69	126	50	112	25	0.6



Model	A	B	C	H	K	Weight (kg)
FG-200CV / FG-210CV (1/8"OD)	77	128	50	112	25	0,7
FG-201CV / FG-211CV (1/4" OD)	77	134	50	112	25	0,7
FG-201CS (1/4"OD)	120	177	50	118	30	1,3

Customized Input/Output configurations

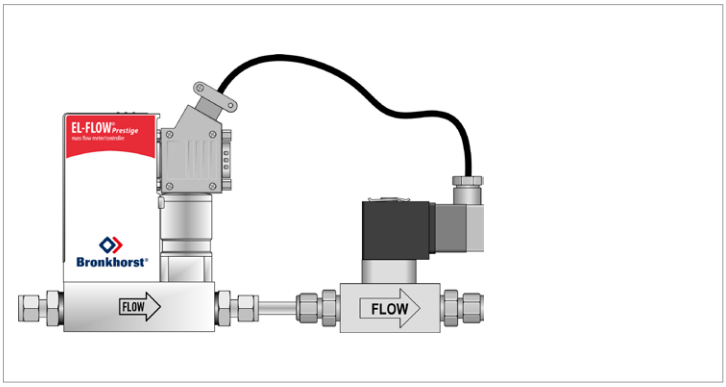
Besides the obvious I/O-options for measured and setpoint values via analog signals, RS232 or fieldbus communication, EL-FLOW Prestige features a programmable pin (pin 5) at the 9-pin sub-D connector for customized I/O configurations. This functionality can be used for advanced operations such as digital frequency/pulse output, alarm output/reset, processing an external setpoint signal, valve purge/close and analog valve output. Some options are specified in the model number identification, however, numerous other settings can be programmed on request. Please contact your local distributor to discuss your requirements.

EL-FLOW Prestige model FG-110C Mass Flow Meter

The following typical examples give an impression of the possibilities for customized I/O solutions

Shut-off valve activation

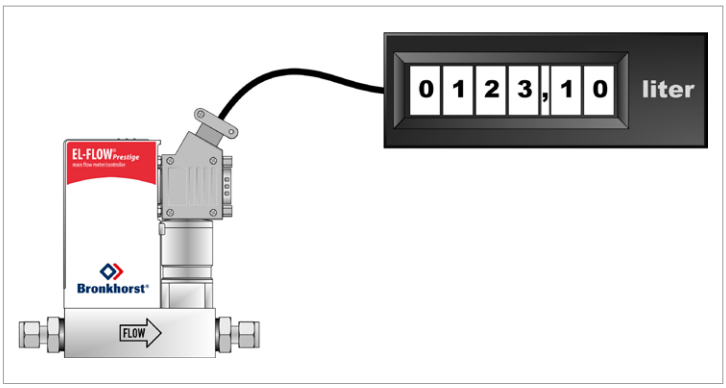
The digital output of the programmable pin 5 (9-pin sub-D connector) can be used to activate a shut-off valve. For instance, a shut-off valve can be programmed to close when the MFC's setpoint is zero, to ensure that the gas line is absolutely closed. Alternatively the valve may be activated upon a certain alarm value or when a preset counter value has been reached. This functionality makes the use of valve terminals superfluous.



Shut-off valve activation

Digital pulse output

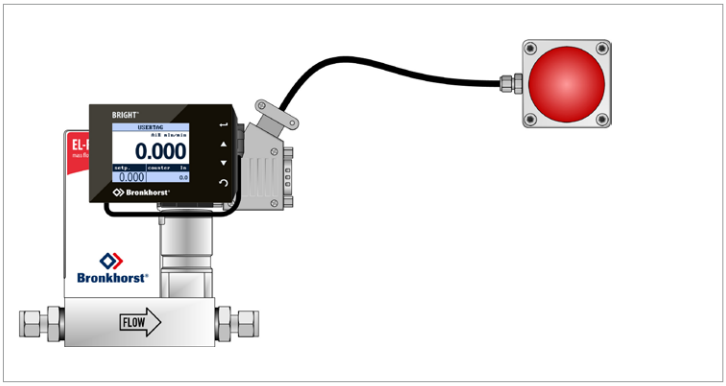
The programmable pin 5 (9-pin sub-D connector) can be set for a pulse output per quantity, as defined by the user. This pulse can be fed directly to remote totalizing counters, digital readout devices or control instrumentation.



Digital pulse output

External reset counter

EL-FLOW Prestige instruments offer alarm and counter functions as a standard feature. To reset the counter value, e.g. locally displayed by a BRIGHT R/C-module, the user should operate the push-buttons. Alternatively, using the digital input option of the programmable pin 5, an external input signal can be sent to the instrument to reset the counter.



External reset counter

Model number identification

FG - N N NAA - N N N - NN - A - A A - AAA

Base

1	Meter
2	Controller

Pressure rating

0	64 bar(g) / 1000 psi(g)
1	100 bar(g) / 1500 psi(g)

Flow range

0C(V)	0,014...0,7 / 0,18...9 ml_n/min
1B	0,14...7 ml_n/min / 0,4...20 l_n/min
1CV/1CS	0,14...7 ml_n/min / 0,4...20 l_n/min

Communication

A	RS232 + analog (n/c control)
B	RS232 + analog (n/o control)
D	RS232 + DeviceNet (n/c control)
E	RS232 + DeviceNet (n/o control)
M	RS232 + Modbus* (n/c control)
N	RS232 + Modbus* (n/o control)
P	RS232 + PROFIBUS (n/c control)
Q	RS232 + PROFIBUS (n/o control)
R	RS232 + FLOW-BUS (n/c control)
S	RS232 + FLOW-BUS (n/o control)
T	RS232 + EtherCAT (n/c control)
U	RS232 + EtherCAT (n/o control)
V	RS232 + PROFINET (n/c control)
W	RS232 + PROFINET (n/o control)

* Default Modbus RTU, optional Modbus ASCII

Analog output

A	0...5 Vdc
B	0...10 Vdc
F	0...20 mA sourcing
G	4...20 mA sourcing

Supply voltage

D	+15...24 Vdc

Connections

0	None
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
8	1/4" Face Seal Male
9	Other

Seals

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

Controller mode

A	Analog control
D	Digital control

Digital communication via 9-pin D-connector

A	RS232 – FLOW-BUS (default)
B	RS485 – FLOW-BUS
C	RS485 – Modbus RTU
D	RS485 – Modbus ASCII

Customized IO options (pin 5, advanced operation)

A1V	0…10 Vdc output, controller (default) Analog signal for pump or external valve steering (control signal only)
B1V	4…20 mA output, controller Analog signal for pump or external valve steering (control signal only)
C3A	Digital output, min/max alarm During a min/max alarm, pin 5 is pulled down to 0 Vdc
C4A	Digital output, counter alarm During a counter alarm, pin 5 is pulled down to 0 Vdc
C5S	Digital output, enabled by setpoint (for shut-off control) Pin 5 is pulled down to 0 Vdc at a controller setpoint, e.g. for shut-off valve activation
C0I	Digital output, high/low switch via remote parameter (e.g. for shut-off valve activation) Pin 5 is pulled down to 0 Vdc when writing value '1' to parameter 'IO Switch Status', this is undone by writing value '0'
D9E	Digital frequency output, measure Measurement value is translated to a frequency within given frequency range
F9B	Digital pulse output, batch counter Pin 5 is pulled down to 0 Vdc when a given batch size is reached (during a given pulse length)
H1E	4…20 mA input, external sensor Sensor input, this function disables the internal sensor
I3C	Digital input, controller mode valve close Valve closes when pin 5 is connected to 0 Vdc
I8C	Digital input, controller mode valve purge Valve is fully opened when pin 5 is connected to 0 Vdc
I1R	Digital input, reset counter The counter resets when pin 5 is connected to 0 Vdc
I2R	Digital input, reset alarm The alarm resets when pin 5 is connected to 0 Vdc

Warranty

All instruments and accessories are warranted for a period of 3 years from delivery date.

Round the clock support

Bronkhorst is a worldwide organization with its Head Office located in Ruurlo, The Netherlands. Our Customer Service Department offers 'seven days a week' support to customers in every part of the world. Our specialist teams are available to you to fulfill the needs of pre- and aftersales support, on-site inspection & calibration and start-up assistance.

Bronkhorst®

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