

# DATASHEET D-6311-AND-D-6411

## MASS-STREAM D-6311 & D-6411 MFC

Direct Thermal Mass Flow Controller for Gases, IP65 protected



### Compact IP65 Mass Flow Controllers for low flow rates of gases

Bronkhorst® models D-6311 and D-6411 Mass Flow Controllers (MFCs) are suited for precise measurement of flow ranges between 10...200 ml<sub>n</sub>/min and 0,1...2 l<sub>n</sub>/min at operating pressures between vacuum and 10 bar (Aluminium) or 20 bar (Stainless Steel). The MFC consists of a proven inline thermal (CTA) mass flow sensor, a precise control valve and a microprocessor based pc-board with signal and fieldbus conversion. As a function of a setpoint value, the flow controller swiftly adjusts the desired flow rate. The instrument is IP65 compliant and can optionally be equipped with a modern, multi-functional and multi-colour display, with operator buttons on the instrument.

The digital MASS-STREAM™ series is characterized by a high degree of signal integrity and, as an option, up to 8 calibration curves of different gases and process conditions can be memorized in the instrument. In addition to the standard RS232 output the instruments also offer analog I/O. As an option, an on-board interface can be mounted to provide CANopen®, DeviceNet™, EtherCAT®, PROFIBUS DP, PROFINET, Modbus RTU, ASCII or TCP/IP, EtherNet/IP, POWERLINK or FLOW-BUS protocols.

### Technical specifications

#### Measurement / control system

Flow range (intermediate ranges available)	min. 10...200 ml <sub>n</sub> /min max. 0,1...2 l <sub>n</sub> /min (based on N <sub>2</sub> )
Accuracy (incl. linearity) (based on actual calibration)	± 1,0 % RD plus ± 0.5% FS (at calibration conditions)
Repeatability	< 0,2 % FS
Turndown ratio	1:20
Type of gases	almost all gases, compatible with chosen materials
Response time (sensor)	approx. 0,3 sec.
Settling time (in control, typical)	< 2 sec.
Control stability	< 0,2 % FS typical
Operating temperature	0 ... 50 °C
Storage / Transport conditions	with display : 0 ... 50 °C, max. 95% RH (non-condensing); without display : -20 ... +80 °C, max. 95% RH (non-condensing)
Temperature sensitivity	D-63xx : ±0,2% Rd/°C (Air) D-64xx : ±0,1% Rd/°C (Air)
Pressure sensitivity	± 0,3% Rd/bar typical (Air)
Max. Kv-value	6,6 x 10 <sup>-2</sup>

## Measurement / control system

Leak integrity, outboard	tested < 2 x 10 <sup>-8</sup> mbar l/s He
Attitude sensitivity	at 90° deviation from horizontal max. error 0,2 % at 1 bar typical N <sub>2</sub>
Warm-up time	30 min. for optimum accuracy, within 30 seconds for accuracy ±4% FS

## Mechanical parts

Sensor	Stainless steel SS 316 (AISI 316L)
Instrument body	D-63xx : Aluminium AL 50ST/51ST (anodised) or stainless steel SS 316 / D-64xx : Aluminium EN AW-6082-T6 (non-anodised) or stainless steel SS 316
Sieves and rings	Stainless steel SS 316
Pressure rating (PN)	10 bar g for instrument body in aluminium, 20 bar g for instrument body in stainless steel SS 316
Process connections	G1/4" (D-63xx : RP-type cavity / D-64xx : ISO1179-1 cavity) / compression type or face seal (VCR/VCO) couplings
Seals	standard: FKM/Viton®; options: EPDM, FFKM/Kalrez®, FDA and USP Class VI approved compounds
Weight	Aluminium: 1,1 kg Stainless steel: 1,6 kg
Ingress protection	IP65

## Electrical properties

Power supply	+15 ... 24 Vdc ±10%			
Max. power consumption	Supply	Basic model	Add. for fieldbus	Add. for display
	15 V	300 mA	80 mA	30 mA
	24 V	200 mA	50 mA	20 mA
Analog output	0...5 (10) Vdc or 0 (4)...20 mA (sourcing output)			
Digital communication	standard: RS232 options: CANopen®, DeviceNet™, EtherCAT®, PROFIBUS DP, PROFINET, Modbus RTU, ASCII or TCP/IP, EtherNet/IP, POWERLINK or FLOW-BUS			

## Electrical connection

Analog/RS232	8 DIN (male);
PROFIBUS DP	bus: 5-pin M12 (female); power: 8 DIN (male)
CANopen® / DeviceNet™	5-pin M12 (male)
Modbus RTU / FLOW-BUS	5-pin M12 (male)
Modbus TCP / EtherNet/IP / POWERLINK	bus: 2 x 5-pin M12 (female) (in/out); power: 8 DIN (male);
EtherCAT® / PROFINET	bus: 2 x 5-pin M12 (female) (in/out); power: 8 DIN (male)

## Control valve options

### External actuator options to be connected to the controller

## Certification for hazardous areas

## Approvals / certificates

Technical specifications subject to change without notice.

For dimensional drawings and hook-up diagrams please visit the [product page](#) on our [website](#)

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## Recommended accessories



### PIPS SERIES

#### Plug-in Power Supply

For lab-style or  
industrial devices  
Interchangeable plugs  
(Euro, UK, USA,  
Australian, IEC) for  
mains connection

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## Related products



### MASS-STREAM D-6310 & D-6410 MFM

Min. flow 0,01...0,2  
ln/min  
Max. flow 0,1...2 ln/min  
Pressure rating up to 20  
bar  
Rugged sensor and  
housing (IP65)  
Optional integrated TFT  
display



### MASS-STREAM D-6321 & D-6421 MFC

Min. flow 0,05...1 ln/min  
Max. flow 0,35...7 ln/min  
Pressure rating up to 20  
bar  
Rugged sensor and  
housing (IP65)  
Optional integrated TFT  
display