

Datasheet D-6471/DR3

Mass Flow Controllers for Low- ΔP Applications



D-6471/DR3 Mass Flow Controller for low- ΔP applications

> Introduction

Bronkhorst® model D-6471/DR3 Mass Flow Controllers (MFCs) are suited for precise measurement of flow ranges between 300...3000 l_n/min at operating pressures between 30 mbar and 5 bar. 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-color 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 PROFINET, PROFIBUS DP, CANopen®, DeviceNet™, Modbus RTU, ASCII or TCP/IP, EtherCAT®, EtherNet/IP, POWERLINK or FLOW-BUS protocols.

> Benefits

- Compact size, high flows (Kv-max. 3.0)
- Low power consumption (3.7 W)
 - Saves money on power supply
 - Lower costs of ownership
- Powering possible by fieldbus, no additional power lines for valve needed, simple cable layout
- Easy access to membrane for service and cleaning purposes
- Master/Slave available, e.g. for burner ratio control

> Applications

The D-6471/DR3 MFC is intended for gas flow control applications with limited pre-pressure or when a low pressure drop is required:

- Burner gases
- Industrial furnace processes
- Low pressure gas distribution systems, e.g. for natural gas or municipal gas
- Biogas applications
- Fermenter processes
- Heat and surface treatment

Note: For optimal operation of the D-6471/DR3, please follow these installation instructions:

- The nominated inlet pressure (P1) must be fully available directly at the inlet of the instrument.
- Ensure a stable flow profile at the inlet (no turbulences).
 - Without flow straightener: 20 x the pipe diameter straight metal pipe at the inlet, 6 x the pipe diameter straight metal pipe at the outlet.
 - With flow straightener: 10 x the pipe diameter straight metal pipe at the inlet, 4 x the pipe diameter straight metal pipe at the outlet.

> Technical specifications

Measurement / control system

Flow range (based on N ₂)	: min. 6...300 l _n /min max. 60...3000 l _n /min
Accuracy (at calibration conditions)	: ±1.0% Rd ± 0.5% FS
Repeatability	: < ± 0.2 %FS
Turndown ratio	: up to 1:50
Fluids	: all gases, compatible with materials
Settling time (in control, typical)	: approx. 2 sec.
Control stability	: < ± 0.2% FS typical
Operating temperature	: 0...50°C
Temperature sensitivity	: < ± 0.1% Rd/°C (Air)
Leak integrity	: outboard: 1 x 10 ⁻⁶ mbar/l/s He; through valve: < 1% FS @ 30 mbar(d)
Maximum operating pressure	: 5 bar(g)
Pressure sensitivity	: < ± 0.3% Rd/bar (Air)
Min. required ΔP for control	: ≥ 30 mbar(d)
Max. allowed ΔP	: 2 bar(d)
Max. Kv-value	: 3.0
Attitude sensitivity max. error	: at 90° deviation from horizontal 0.2% at 1 bar typical N ₂
Warm-up time	: 30 min. for optimum accuracy, within 30 seconds for accuracy < ± 4% FS

Mechanical parts

Material (wetted parts)

Sensor	: stainless steel SS316 (AISI 316L)
Instrument body	: aluminum EN AW-6082-T6
Membrane	: fiber (PET) reinforced FKM
Seals	: FKM / Viton®
Pressure rating	: 5 bar(g) for instrument body in aluminum
Process connections	: 1" BSPP (G1"; ISO 1179-1 cavities), straight inlet/outlet run for optimal performance
Ingress protection (housing)	: IP65
Certification	: CE / RoHS

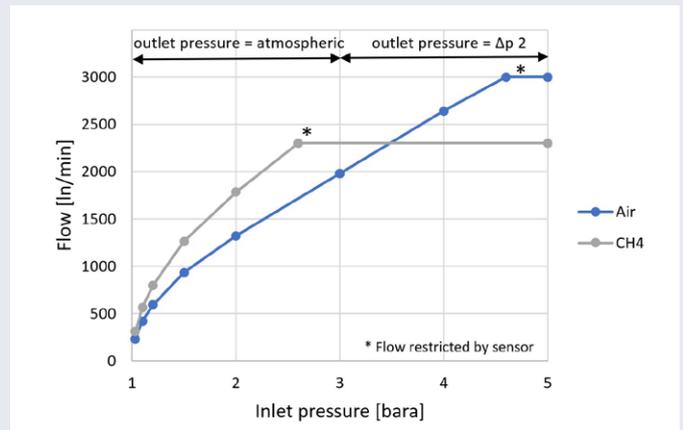
Electrical connection

Analog/RS232	: 8 DIN (male)
PROFIBUS DP	: bus: 5-pin M12 (female) power: 8 DIN (male)
CANopen / DeviceNet™	: 5-pin M12-connector (male)
Modbus TCP / EtherCat® / Ethernet/IP / PROFINET / POWERLINK	: bus: 2 x 4-pin M12-connector (female) power: 8 DIN (male)
FLOW-BUS / Modbus RTU / ASCII	: 5-pin M12-connector (male)

Electrical properties

Power supply (single rail)	: +15...24 Vdc ±10%
Power consumption	: 3.5 W typical at 24 Vdc for fieldbus: add +0.9 W for display: add +0.5 W
Analog output (0...100%)	: 0...5 (10) Vdc, min. load impedance > 2 kΩ; 0 (4)...20 mA (sourcing), max. load impedance < 375 Ω
Analog setpoint (0...100%)	: 0...5 (10) Vdc, min. load impedance > 100 kΩ; 0 (4)...20 mA, load impedance ~250 Ω
Digital communication	: standard RS232 ; options: PROFINET, PROFIBUS DP, CANopen, DeviceNet™, Modbus RTU, ASCII or TCP/IP, EtherCAT®, EtherNet/IP, POWERLINK, FLOW-BUS

> Flow vs inlet pressure

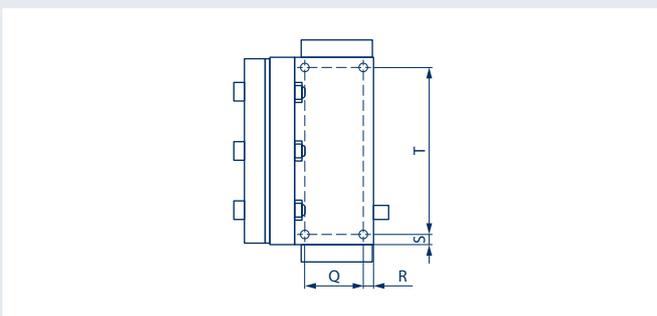
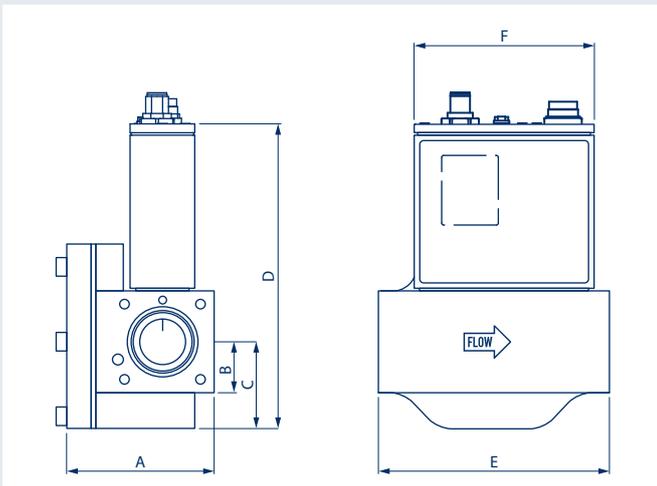


Technical specifications subject to change without notice.

> Options and accessories

- Free software support for operation, monitoring, optimizing or to interface between digital instruments and MS Windows software
- Multi-functional display with operator buttons
- PiPS Plug-in Power Supply
- Flow straightener, as alternative or addition for a straight inlet run > 20 x pipe diameter (note: this causes additional pressure drop).

> Dimensions (mm) and weight (kg)



Model	Dimensions in mm										
	A	B	C	D	E	F	Q	R	S	T	Weight (kg)
D-6471/DR3	81	25	54	166	130	95	35,5	4,5	6	98	2.0



D-6471/DR3 Mass Flow Controller - rear side