DATASHEET FF-M1X

FLEXI-FLOW Compact FF-M1x

Built-to-Order Mass Flow and Pressure Meter for Gases

Mass Flow/Pressure Meter for Low Gas Flows

FLEXI-FLOW Compact models FF-M10 and FF-M11 Compact Mass Flow / Pressure Meters are suited for accurate measurement of flow ranges between 0…500 ml_n/min and 0…20 l_n/min at operating pressures between vacuum and 17 bar(a). The instrument combines a swift and stable thermal mass flow sensor based on capillary MEMS technology with a precise and proven by-pass construction. Due to the unique, internationally patented **TCS Technology (Through Chip Sensor)**, accurate mass flow measurement, virtual independent of variations in temperature and line pressure is established. In combination with integrated temperature and up- and downstream pressure sensors, the embedded database for 22 gases allows accurate, on-board conversion. The **multi-parameter** instruments provide the user with useful process information:
- Model FF-M10: flow + temperature
- Model FF-M11: flow + temperature + up- and downstream pressure

Technical specifications

Measurement / control system

Flow range (intermediate ranges available)	min. 0…500 ml_n/min max. 0…20 l_n/min (based on N_2)
Pressure ranges	FF-M10: not available / FF-M11: 0...17 bar(a)
Accuracy (incl. linearity) (based on actual calibration)	Up to ±0,5% Rd plus ±0,1% FS (N_2/Air/O_2); for other gases add conversion uncertainty; see multi gas table;
Repeatability	Flow sensor: < ±0,2% Rd; Pressure sensors: < ±0,2% FS
Turndown ratio	up to 1:1000
Max. operating pressure	16 bar g
Multi Gas / Multi Range	embedded gas data for 22 unique gases plus any mixture of these gases
Response time (sensor)	< 30 ms (T_{63})
Long term stability	< 0,5% FS over period of 3 years; then < 0,2% FS per year
Operating temperature	0 … 50 °C
Storage / Transport conditions	-20 … +80 °C, max. 95% RH (non-condensing)
Mounting	any position, attitude sensitivity negligible
Temperature sensitivity	Flow sensor: zero 0,015% FS/°C; span 0,05% Rd/°C; Pressure sensors: zero 0,16 mbar/°C; span 0,05% Rd/°C
Temperature accuracy	± 0,2 °C (instrument body temperature)
Accuracy pressure sensors	±0,5% FS

Measurement / control system

Pressure sensitivity	standard: < 0,15% Rd/bar typical N_2; with pressure correction: typical factor 5 improved
Leak integrity, outboard	tested < 2 x 10^{-9} mbar l/s He

Mechanical parts

Instrument body	Aluminium or Stainless steel (selectable)
Material (wetted parts)	aluminium, stainless steel, silicon nitride, epoxy, aluminium oxide, glass
Surface quality	< 1,6 mu Ra (<0,8 mu Ra for stainless steel body)
Pressure rating (PN)	16 bar(g) / 250 psig
Process connections	default: BSPP female thread (ISO1179-1) optional: compression fittings, push-in or face seal fittings (VCO/VCR)
Seals	default: FKM 51415; for other materials contact factory
Weight	200 g with Aluminium body, 300 g with SS 316 body
Ingress protection	IP40

Electrical properties

Power supply	24 Vdc ± 10%
Max. power consumption	0,35 Watt
Digital communication	Modbus RTU or FLOW-BUS (selectable)
Support interface	USB-C port for easy setup; Optional Bluetooth connection for monitoring
Electrical connection	9-pin D-sub (male)
Certification	CE / UKCA / KC

Electrical connection

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

Related products

FLEXI-FLOW COMPACT FF-C1X

- Flow 0…500 mln/min up to 0…20 ln/min
- Accuracy ±0,5% Rd + ±0,1% FS
- Multi-parameter (P+T output options)
- Fast response (TCS technology)

FLEXI-FLOW MULTI-CHANNEL SOLUTIONS

- Multi-channel Mass Flow/Pressure Control
- Very compact assembly
- Economical solution
- Optional shut-off valves or mixing chamber

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Bronkhorst High-Tech designs and manufactures innovative instruments and subsystems for low-flow measurement and control for use in laboratories, machinery and industry. Driven by a strong sense of sustainability and with many years of experience, we offer an extensive range of (mass) flow meters and controllers for gases and liquids, based on thermal, Coriolis and ultrasonic measuring principles. Our global sales and service network provides local support in more than 40 countries. Discover Bronkhorst®!