

FLEXI-FLOW™

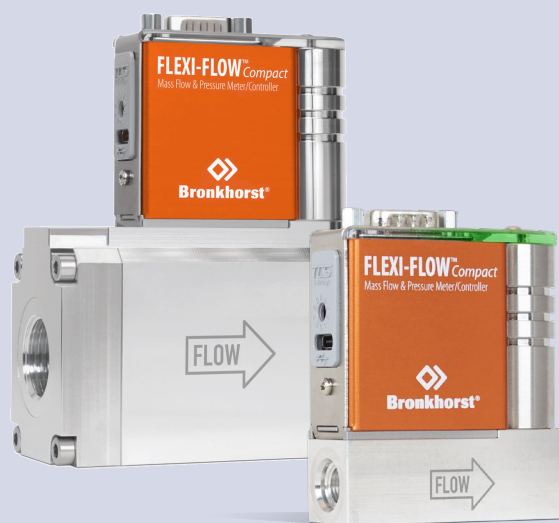
Smart Thermal Mass Flow Meters for Gases

> Introduction

FLEXI-FLOW Compact mass flow meters (MFM) for gases are based on the thermal through-flow measurement principle using advanced Through Chip Sensor (TCS) technology. It's a multi-parameter instrument for mass flow and temperature. This innovative design has been developed by Bronkhorst to deliver fast and stable flow measurements with high accuracy.

Mass Flow ONLINE has selected six models for their online sales channel, covering a wide measurement range, from 5 to 500 ml_n/min and from 5 to 500 l_n/min Air equivalent. Each MFM is equipped with an on-board gas database (22 unique gases). Using the USB-C service port and Bronkhorst FlowSuite software, you can easily switch from one gas to another.

FLEXI-FLOW is ideal for applications such as bioreactors, fuel cells, high-end burners, plasma spray, leak testing, ALD, reactive sputtering, and various analytical instruments.



> Technical specifications

Measurement / control system

Accuracy (incl. linearity)	: ± 1.5 % Rd plus ± 0.5 % FS (based on actual calibration)
Turndown	: 1 : 50 (2...100%)
Repeatability	: < ± 0.2% Rd
Operating pressure	: 0.8...17 bar(a)
Response time sensor (63%)	: < 30 ms
Temperature range	: 0...50°C
Temperature sensitivity	: ± 0.05% Rd / °C
Leak integrity (outboard)	: < 2 x 10 ⁻⁹ mbar l/s He
Accuracy temperature sensor	: ± 2 °C (instrument body temperature)
Multi Gas / Multi Range	: embedded gas data for 22 unique gases plus any mixture of these gases
Mounting	: any position, attitude sensitivity negligible

Mechanical parts

Material (wetted parts)	: aluminum, stainless steel, silicon nitride, epoxy, aluminum oxide, glass
Process connections	: female gas thread (ISO1179-1); FF-101/103/105: G 1/8" BSPP female thread FF-107/109/111: G 1/2" BSPP female thread (compression fittings optional)
Seals	: FKM 51415 (Viton®)
Ingress protection (housing)	: IP40

Electrical properties

Power supply	: 24 Vdc ±10%
Power consumption	: 0.5 Watt
Digital communication	: Modbus-RTU / FLOW-BUS
Electrical connection	: 9-pin D-sub male

> Max. capacities per model for various gases

Model	Flow unit	Air	N ₂	O ₂	H ₂	Ar	He	CH ₄	CO ₂
FF-101	mln/min	5	5	4.5	5	4	7	4	3.5
FF-103	mln/min	50	50	45	50	40	70	40	35
FF-105	mln/min	500	500	450	500	400	700	400	350
FF-107	ln/min	5	5	4.5	5	4	7	4	3.5
FF-109	ln/min	50	50	45	50	40	70	40	35
FF-111	ln/min	500	500	450	500	400	700	400	350

> Warranty

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

Although all specifications in this datasheet are believed to be accurate, the right is reserved to make changes without notice or obligation.



Mass Flow
ONLINE

> Multi gas table

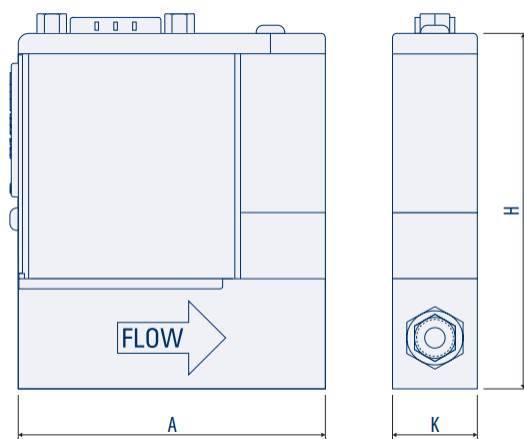
To determine which model is suitable for process gases other than N₂, the full-scale flow must be multiplied by the below-mentioned "flow factor". The highly accurate on-board FLUIDAT[®] gas database ensures best in class conversion from N₂ to the customer gas. When converting one gas to another, a small uncertainty is introduced. Although gas properties and conversion model are very accurate, mechanical tolerances can cause slight deviations from the theoretical conversion values.

Name	Gas Formula	Full scale factor (MFM)	Remarks
Acetylene	C ₂ H ₂	0,6	pure gas only
Air	Air	1	
Allene	C ₃ H ₄ #1	0,4	
Argon	Ar	1,3	
Carbon dioxide	CO ₂	0,7	Max. 10 bar
Carbon monoxide	CO	1	
Cyclopropane	C ₃ H ₆ #1	0,4	
Deuterium	D ₂ #1	1	
Ethane	C ₂ H ₆	0,5	
Ethylene	C ₂ H ₄	0,6	Max. 10 bar
Helium	He	1,4	
Propyne	C ₃ H ₄ #2	0,4	
Hydrogen	H ₂	1	
Krypton	Kr	1	
Methane	CH ₄	0,8	
Neon	Ne	1,4	
Nitrogen	N ₂	1	
Oxygen	O ₂	1	
Propylene	C ₃ H ₆ #2	0,4	Max. 10 bar
Propane	C ₃ H ₈	0,3	
Perfluoropropane	C ₃ F ₈	0,15	Max. 10 bar
Nitrous oxide	N ₂ O	0,7	

> Features

- Unique TCS (Through Chip Sensor)
- Usable for many gases and gas-mixtures
- Mass flow measurement for a wide scope of applications
- Fast response times
- Multi parameter (Flow and Temperature)
- Namur NE107 status indication
- Compact IP40 design
- Separate USB-C communication interface
- Bluetooth communication
- Easy to configure
- MTBF 145 years
- Advanced diagnostics functionalities
- Optional connectors (fittings) according to ISO-1179 standard

> Dimensions (in mm) and weights



Model	A	H	K	Weight (kg)	Connections*
FF-101	60	68	20	0.25	G 1/8"
FF-103	60	68	20	0.25	G 1/8"
FF-105	60	68	20	0.25	G 1/8"
FF-107	60	68	20	0.25	G 1/8"
FF-109	89	106	40	0.65	G 1/2"
FF-111	89	106	40	0.65	G 1/2"

* ISO 1179-1 cavities

Bronkhorst distributor



MASS-FLOW ONLINE BV
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