MASS-STREAM™

Inline Thermal Mass Flow Meters for Gases

> Introduction

MASS-STREAM mass flow meters (MFM) for gases are based on the thermal through-flow measurement principle. Their field-proven design has been exclusively used by Bronkhorst Instruments in Germany since 1997. Unlike thermal bypass flow meters, all gas flows through a straight channel, making MASS-STREAM instruments less sensitive to moisture or particulates and easier to clean.

Mass Flow ONLINE has selected four models for their online sales channel, covering a wide measurement range, from 0,5 to 50 up to 10 to 1000 l_n/min Air equivalent. Each MFM is equipped with an on-board display for indicating actual flow, totalized flow, and alarms.

These instruments find applications in many industries, such as process gas measurement in the food industry, chemical and petrochemical industries, fermentation installations, and biotechnology.

> Technical specifications

Measurement / control system

Accuracy (incl. linearity) (based on actual calibration)	: ± 1,0 % Rd plus ± 0,5 % FS
Turndown	: 1 : 100 (1…100%)
Repeatability	: < ± 0,2% FS
Operating pressure	: 0…10 bar(g)
Response time sensor (63 %)	: approx. 0,9 seconds
Temperature range	: 0…50°C
Temperature sensitivity	: ± 0,1 % Rd / °C (Air)
Leak integrity (outboard)	: < 2 x 10^{-8} mbar l/s He
Attitude sensitivity	: max. error at 90° off horizontal 0,2% FS at 1 bar, typical N_2
Warm-up time	: 30 min. for optimum accuracy, within 30 seconds for accuracy ± 4% FS

Mechanical parts

Sensor	: Stainless steel 316L (AISI 316)
Instrument body	: Aluminium EN AW-6082-T6
Sieves and rings	: Stainless steel SS 316
Process connections	: Female gas thread (ISO1179-1); MS-105: G ¼" BSPP female thread MS-106/108/109: G ½" BSPP female thread (compression fittings optional)
Seals	: FKM (Viton®)
Ingress protection (housing)	: IP65

Electrical properties

Power supply	: +15…24 Vdc ±10%
Power consumption	: approx. 105 mA at 0 % flow approx. 155 mA at 100 % flow
Analog output/command	: 4…20 mA (sourcing output)
Digital communication	: RS232
Electrical connection	: 8 Din (male)

> Models

Model	Flow (Air)	Connection	Analog output	Digital communication
MS-105	up to 50 l_n/min	G ¼"	4…20 mA	RS232
MS-106	up to 200 l_n/min	G ½"	4…20 mA	RS232
MS-108	up to 500 l_n/min	G ½"	4…20 mA	RS232
MS-109	up to 1000 l_n/min	G ½"	4…20 mA	RS232

Max. capacities in ln/min (SLM) per model for various gases	Air	N_2	O_2	Ar	CH_4	CO_2
MS-105	50	50	48	100	30	54
MS-106	200	200	200	400	120	215
MS-108	500	500	500	1000	300	540
MS-109	1000	1000	1000	1200	600	1090

> 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

> On-board FLUIDAT® gas database

Simply select your process gas. With the on-board gas database, switching to another gas or gas mixture is effortless and does not require recalibration. MASS-STREAM mass flow meters come factory calibrated with Air as the standard. If other gases or gas mixtures are used, the on-board gas database (FLUIDAT Onboard) applies the necessary conversion. The conversion depends on the physical properties of the gas and the process parameters, such as media temperature and operating pressure.

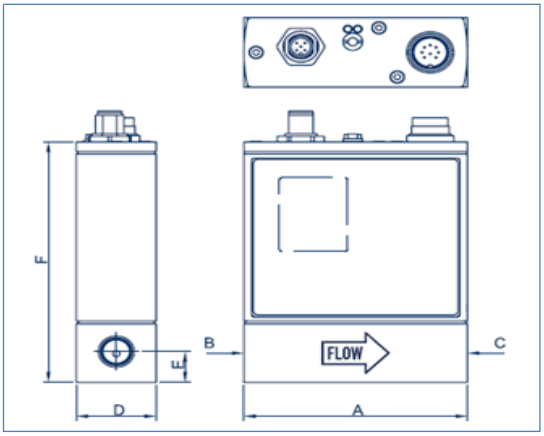
The highly accurate FLUIDAT gas database ensures best-in-class conversion from Air to the customer's gas. Furthermore, the on-board gas database is used for real-time corrections of the flow measurement based on the actual process temperature.

When converting from one gas to another, a small uncertainty is introduced. While gas properties and the conversion model are very accurate, the result may slightly deviate from the theoretically calculated values. With a conversion factor greater than 1, the conversion uncertainty is ≤ 2 x CF (in % FS), and if the conversion factor is less than 1, the conversion uncertainty is ≤ 2 / CF (in % FS). For an estimation of the conversion factor, please visit www.fluidat.com.

> Flow profile and sensitivity

In general, mass flow measurement can be sensitive to variations of the shape of the flow profile. The MASS-STREAM instruments are designed for a consistent, fully developed flow profile in the metering section. Installing a suitable well-sized inlet pipe is recommended for our robust and concurrent precise mass flow measurement. Without an inlet run or insufficient inlet piping conditions severe deviations in the accuracy could possibly occur, whereas the repeatability is not affected.

> Dimensions (in mm) and weights (in kg)



Model	A	B*	C*	D	E	F	Weight (kg)
MS-105	95	G ¼"	G ¼"	34	15	114	1
MS-106	95	G ½"	G ½"	34	16	122	1,1
MS-108	95	G ½"	G ½"	34	16	122	1,1
MS-109	117	G ½"	G ½"	58	25	136	1,4

* ISO 1179-1 cavities

> Features

- Direct inline measurement principle
- Usable for many gases and gas-mixtures
- Mass flow measurement for a wide scope of applications
- Excellent repeatability
- Good response times
- Compact and robust IP65 design
- Body in aluminium (EN AW-6082-T6)
- Sensor made of stainless steel
- Low sensitivity to dirt and humidity
- Measurement without moving parts
- Modern multi-coloured TFT display
    - Operator buttons on the instrument
    - Customized adjustable multi-functional display indicating: actual flow, fluid sets, totalizer with memory and reset, alarm, setup and much more.
- Compatible with Bronkhorst FlowSuite software
- On-board gas database (FLUIDAT Onboard)
- Optional connectors (fittings) according to ISO-1179 standard