

# Mass Flow Meters, Controllers and Manifolds



Available with:

PROFINET

EtherCAT®



Swiss  
made



Analytical Instrumentation



Thin Film Processes



Industrial Leak Testing



Bioreactors and Fermentors

The Axetris thermal mass flow sensor chip is the building block for devices that deliver highest performance in a range of OEM applications.



## Overview

Axetris offers OEM Mass Flow Meters (MFM), Controllers (MFC) and Manifolds for gases of outstanding value to the customer. The platinum-based MEMS-based thermal mass flow technology guarantees excellent accuracy and repeatability in combination with high speed and an unmatched dynamic range. The advantages of the unique technology, combined with smart software processing and robust packaging, make Axetris Mass Flow Devices an ideal choice for demanding OEM applications.

The Axetris mass flow technology is used by many leading companies in the field of gas chromatography, leak testing, thermal analysis, mass spectroscopy, thin film deposition, plasma engineering and more.

A broad range of standard modules and products are available. These modules provide OEM customers with an easy and seamless integration of the leading thermal mass flow technology into their products.



Wide range of mass flow meters, controllers and manifolds to meet OEM needs.

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## MEMS-based Thermal Mass Flow Technology

### **Complete range**

From ultra compact mass flow meters and controllers for gases, to highly integrated, customized manifold units for measuring and controlling multiple gases, the latest Axetris MFM/MFC 2000 product range is suited for a wide range of applications.

### **Best-in-class repeatability and reproducibility**

MEMS-based thermal mass flow technology, combined with innovative electronic design, delivers best-in-class repeatability and reproducibility, eliminating the need for re-calibration, while enabling negligible instrument drift and excellent long-term stability.

### **High accuracy and quick reaction time**

High accuracy and quick reaction time open new possibilities for the controlling of gases with a speed and precision not possible before. This capability enables: tighter control of process parameters, increased system throughput and reduced carrier gas consumption.

### **Compact size**

The compact size of the Axetris mass flow meters and controllers lets you add new functionality while reducing the size and weight.

### **Low flow**

The innovative flow channel design allows for precise measurement and control of extremely low flows with unmatched repeatability and stability.

### **Unmatched dynamic range**

The unsurpassed high dynamic range of more than 1000:1 enables broad range measurement and control of flow within a single unit.

### **Multi-gas/multi-range capability**

Each module can be configured for different flow ranges and/or different gases, thus reducing the part complexity.

### **Full calibration and intelligent temperature compensation**

Each Axetris MFM/MFC 2000 unit is delivered fully-calibrated and temperature compensated. The calibration is NIST traceable.

### **Broad gas and flow range**

The MFM/MFC 2000 products are available for a broad range of non-aggressive gases with full scale flow ranges from below 20 sccm to 20000 sccm (standard cubic centimeters per minute). Even higher flow ranges can be reached with an external bypass.

### **Tailor-made for OEM needs**

Axetris mass flow products are supplied with the exact configuration required to excel under specific application conditions – with real gas calibrations, and a range of options for reference conditions, digital filter settings, electrical and mechanical interfaces to choose from.





# Specifications

	Technical Data		Standard
Gas	Flow range <sup>1)</sup>		0 – 20,000 sccm
	Gas Type	Standard Gases	N <sub>2</sub> , O <sub>2</sub> , Air, Ar, CO <sub>2</sub> , He, H <sub>2</sub> up to 8 gas calibration curves on one device
		Optional Gases	SF <sub>6</sub> , C <sub>4</sub> F <sub>8</sub> , CF <sub>4</sub> , CHF <sub>3</sub> , CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> , N <sub>2</sub> O etc.
Calibration conditions	Standard cubic centimeter per minute	sccm	Reference conditions: t = 0°C, P = 1013 mbar absolute Optionally, user-defined standard conditions (uccm) are available on request
Performance	Accuracy <sup>2)</sup>	25°C	+/- 0.2 % F.S. +/- 1 % O.R. (whichever is greater)
		0...50°C	+/- 0.5 % F.S. +/- 2 % O.R. (whichever is greater)
	Repeatability <sup>3)</sup>	Controller	+/- 0.015 % F.S. +/- 0.15 % O.R. (whichever is greater)
	Response time	Sensor	4 ms
	Settling time	Controller	150 ms
Operating conditions	Temperature	Operating	0...50°C
	Humidity	Non-condensing	5...95 % R.H.
	Pressure range	Operating Burst pressure	0...10 bar <sup>4)</sup> 30 bar
	Gas compatibility		Non-aggressive gases
Electronic interface	Digital interface	Protocol Input Output Connectors	RS232 (TTL level), RS232, RS485 HD/FD, PROFINET®, EtherCAT Set point, gas and range selection, valve override Flow PID control, temperature D-SUB9, 9SHR, MicroM, RJ45
	Analog input	Set point Valve override	0...5 V or 4...20 mA Force valve to open / close / normal position
	Analog output	Flow PID	0...5 V or 4...20 mA 0...5 V
Fluid	Interface	Material Connectors	Aluminium (Stainless Steel versions available on request) Down port / Side port
	Available female windings		9/16-18 SAE, 1/8" ISO, 1/4" NPT, 1/8" NPT, 10-32 UNF
	Tube fittings		Standard dimensions available
	Leak tightness	Meter	1 × 10 <sup>-9</sup> mbar l/s He
Power	Voltage	MFM 202x	12 V ± 10 %
		MFC 2022	24 V ± 10 %
		MFM 21x0, MFC 21x2	24 V ± 10 %
Size	L × W × H	MFM 2020 - A	34 × 16.4 × 48.5 mm
		MFC 2022 - A	50.5 × 25 × 48.5 mm
		MFM 21x0, MFC 21x2	59.5 × 28.8 × 96.6 mm
Weight		MFM 2020 - A	34 g
		MFC 2022 - A	106 g
		MFM 21x0	274 g
		MFC 2122	336 g

Technical data and specifications are subject to change without prior notice.

- Standard full scales available with nitrogen calibration – for other full scales, please contact Axetris.
- Typical values only. For detailed specifications for all variants, consult the product datasheet or contact Axetris.  
For F.S. > 15,000 sccm, standard accuracy value is +/- 2.5 % O.R.
- For F.S. > 15,000 sccm, standard repeatability value is +/- 0.2 % O.R.
- For MFCs the maximum operating pressure depends on the valve type. Contact Axetris for more details.

\* Operating temperature range may vary for certain product variants, please consult the product datasheet or contact Axetris.

F.S. : Full Scale  
O.R. : Of Reading

## Standard Product Range

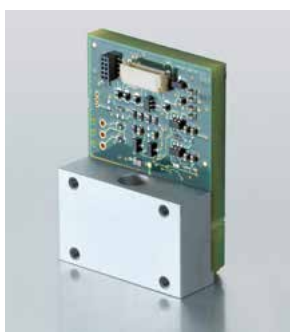
	Type	Output							Input							Supply		
		Flow						Temp.	PID Control Signal	Set point					Valve override		Voltage	
		0...5 V	4...20 mA	Digital RS232	Digital RS485	PROFINET®	EtherCAT			Digital	0...5 V	0...5 V	4...20 mA	Digital RS232	Digital RS485	PROFINET®		EtherCAT
OEM Meter	MFM 2020 MFM 2220	•		• TTL				•										12 V 24 V
	MFM 2230		•	•				•										24 V
	MFM 2240 MFM 2250				• HD • FD			•										24 V
	MFM 2021 MFM 2221	•		• TTL				•	•	•		• TTL				•	•	12 V 24 V
OEM Meter with bidirectional measurement	MFM 2023 MFM 2223	•		• TTL				•										12 V 24 V
	MFM 2233		•	•				•										24 V
	MFM 2243 MFM 2253				• HD • FD			•										24 V
Standalone Meter	MFM 2120	•		•				•										24 V
	MFM 2130		•	•				•										24 V
	MFM 2140 MFM 2150				• HD • FD			•										24 V
	OEM Controller	MFC 2022 MFC 2222	•		• TTL				•	•	•		• TTL				•	•
MFC 2232			•	•				•			•	•				•	•	24 V
MFC 2242 MFC 2252					• HD • FD			•				• HD • FD				•	•	24 V
Standalone Controller	MFC 2122	•		•				•		•		•				•	•	24 V
	MFC 2132		•	•				•			•	•				•	•	24 V
	MFC 2142 MFC 2152				• HD • FD			•				• HD • FD				•	•	24 V
	MFC 2162					•		•					•				•	24 V
	MFC 2172						•	•						•			•	24 V

For a complete list of product variants, contact Axetris.



# Mass Flow Meters, Controllers and Manifolds

## Meters



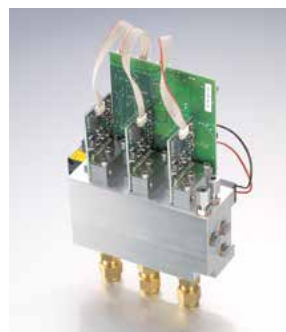
MFM 2020  
MFM 2021

## Controllers



MFC 2022

## Manifolds / Systems



MFY 20000  
Series



MFM 2100  
Series



MFC 2100  
Series



MFC 2100  
Series with  
integrated  
shut-off valve

Note: Typical pictures are shown only. For the actual design variant and availability contact Axetris.

## Customized gas manifolds – available as gas mixing or splitting systems

By integrating several mass flow meters, a pressure sensor and controller modules into one common manifold, Axetris can build highly compact, customer-specific systems to precisely meet your needs. In contrast to conventional manifolds using standard mass flow controllers, an integrated manifold can be built in a more compact and cost-effective way.



## Advantages

- **MEMS technology**

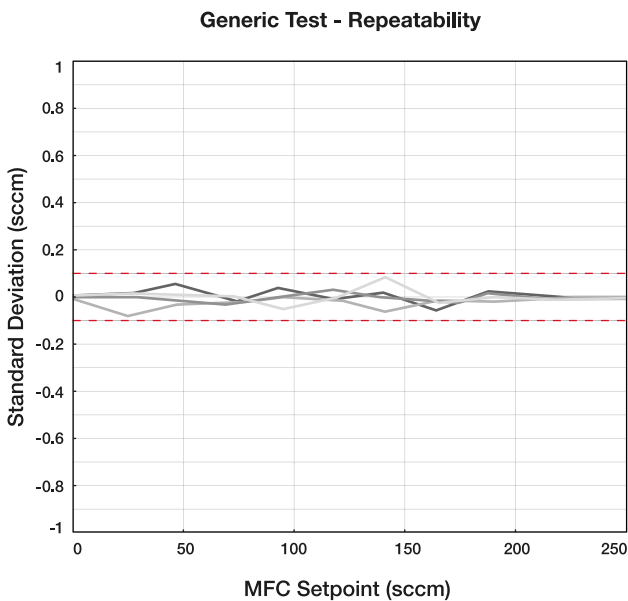
→ *Benefit from state-of-the-art thermal mass flow technology*

The entire MFM/MFC product range, based on Axetris' proprietary mass flow sensor chip, is designed and manufactured in our class 100 cleanroom facilities in Switzerland.

- **Excellent accuracy and repeatability**

→ *Achieve highest system performance*

The platinum-based MEMS thermal mass flow technology guarantees industry-leading accuracy, long-term stability and repeatability.



Excellent repeatability down to sub-sccm flows translates to highest instrument performance (Graph: Repeatability Test according to SEMI E56-0309)

- **Modularity**

→ *Tailor-made to suit OEM needs*

From OEM mass flow meters and controllers up to complex gas handling systems, the modular concept of Axetris products ensures that you receive the product functionality you need.

- **Miniature size**

→ *One of the smallest footprints in the industry*

The perfect match for compact designs.



- **Design support**

→ *Together*

With a team of experienced fluid dynamics engineers, state-of-the-art simulation tools and an advanced test and measurement laboratory, the Axetris team stands by your side with technology, product and integration support.

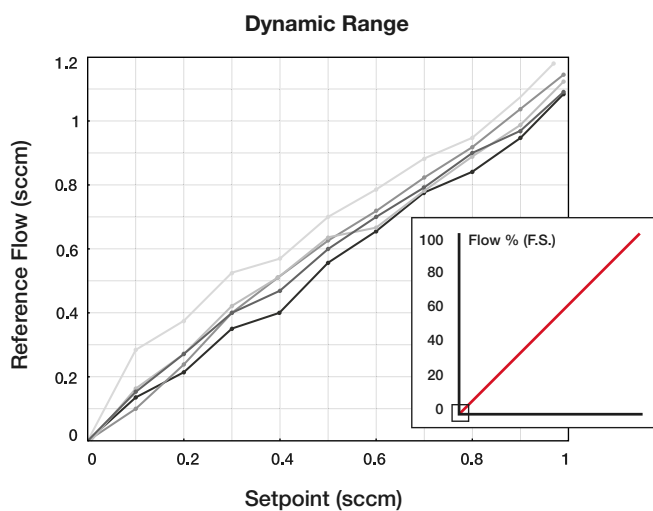




- **Unmatched dynamic range**

→ *Build flexibility into your design*

Axetris mass flow devices achieve a dynamic range upwards of 1000:1. This means flexibility over a wide flow range, and reduced complexity because of a lower number of mass flow device variants required.

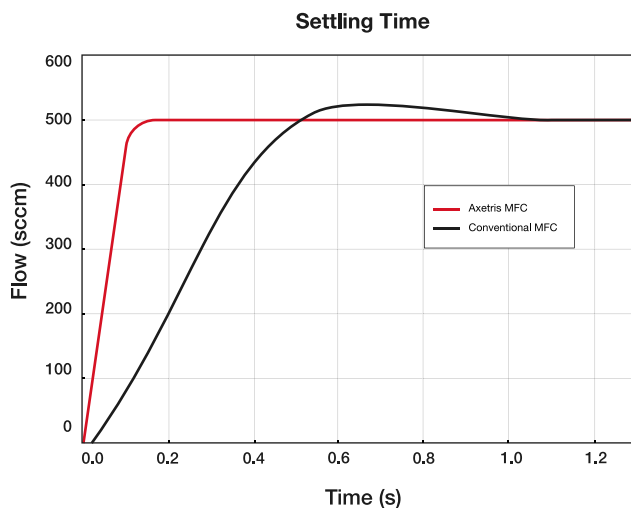


Unmatched dynamic range of better than 1000:1 means instrument flexibility and cost savings (Graph: Flow Control performance at flows < 1 sccm of MFCs with full scale of 1000 sccm)

- **Quick reaction time**

→ *Achieve tight process control*

Lightning-fast response – a flow sensor  $t_{90}$  of below 4 ms, and a MFC settling time of 150 ms – means you can control flow even under variable process conditions.



Lightning-fast settling time of Axetris MFCs means quick process control even under varying conditions (Graph: Axetris MFC compared with a conventional MFC)



## Mass Flow Devices for OEM Applications

### **Analytical Instruments**

Gas flow control in sampling systems

### **Gas Chromatography**

Sample injection and carrier gas control

### **Mass Spectrometry**

Collision cell gas flow control

### **Elemental Analysis**

Combustion and detection control

### **Leak Testing**

Air or helium-based leak testing systems

### **Bioreactors and Fermentors**

Gas concentration control in biological processes

### **Thin Film Process Control**

Physical vapor deposition processes

### **Medical Devices and Oxygenators**

Ventilators and breath applications

“The excellent dynamic range helped us reduce MFC variants and build more flexible instruments”

“Extremely low pressure drops for our leak testing solutions”

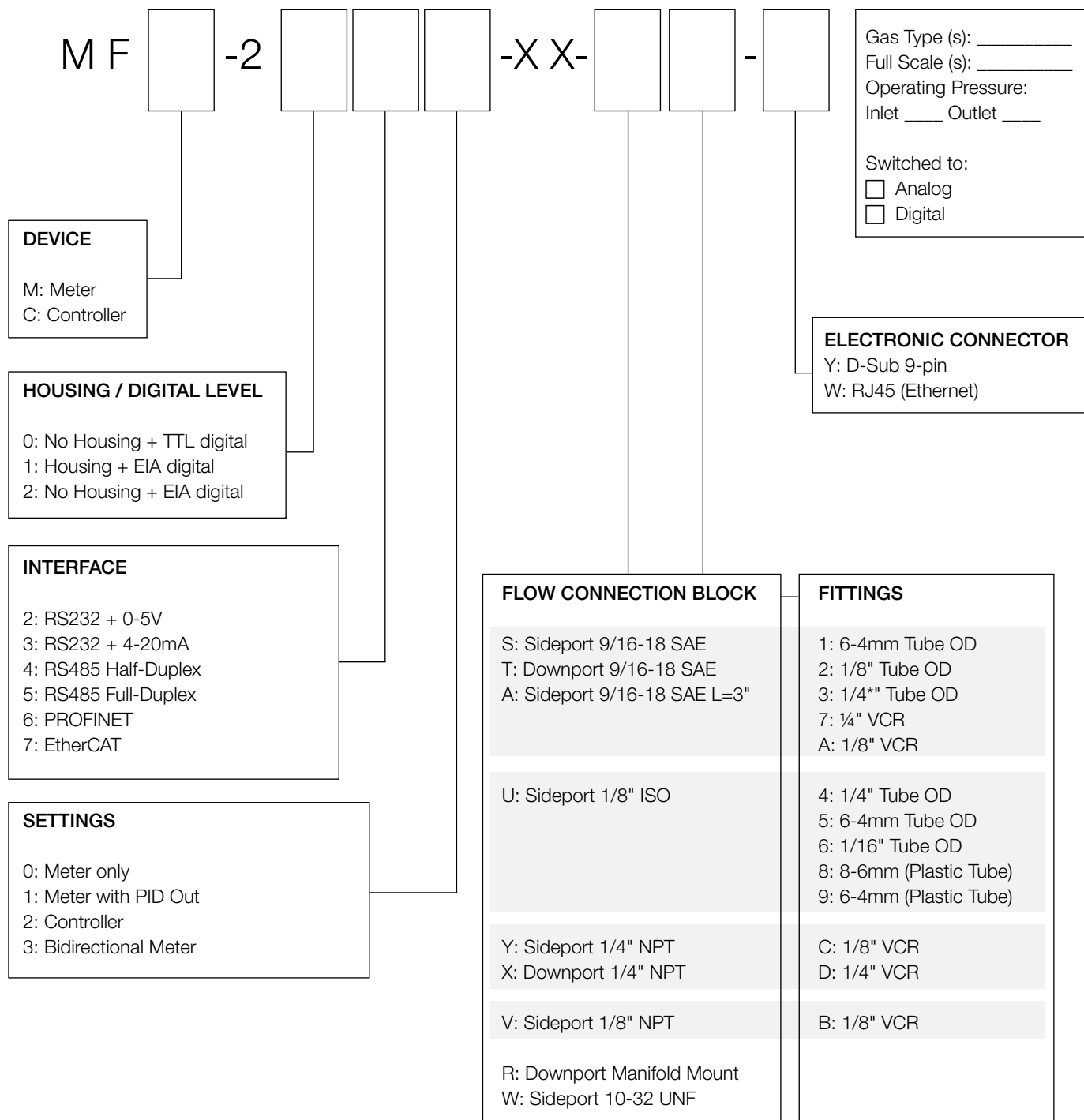
“Very reproducible results; no need for regular calibration”

“Reaction speed helped us simplify our control loop and save costs”



# Product Selection Key

e.g. MFC 2172-BE-S0-W



Not all feature combinations are possible. For support with product selection, please contact Axetris

## About Axetris AG

Axetris serves OEM customers with micro-optical components, micro technology-based (MEMS) infrared light sources, mass flow meters and controllers, and laser gas detection modules used in industrial, telecom, environmental, medical, analytical and automotive applications.

Our multi-disciplinary and highly skilled engineering and manufacturing teams combine broad experience in design, manufacturing and metrology from MEMS components to advanced optical and electronic sensor modules. Axetris supports its customers with in-depth application know-how. Customers benefit from excellent product value, consistent high product quality and outstanding customer support. OEMs rely on Axetris worldwide as a competent partner for customer-specific solutions from concept to volume production. Axetris is ISO 9001:2015 certified and operates its own 6-inch to 8-inch wafer MEMS foundry for its own products and contract manufacturing for external customers. A wafer back end, a sensor assembly and calibration facility under clean room conditions completes the manufacturing infrastructure of Axetris.



Corporate Headquarters of the Leister Group, Switzerland



Corporate Headquarters of the Leister Group, Switzerland

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