

## Product Datasheet

# Mass Flow Meter MFM 2100 Mass Flow Controller MFC 2100 series

*High Performance Gas Flow Control for OEMs*

### 1 Introduction



**Figure 1** Mass Flow Meter MFM 2100 and Mass Flow Controller MFC 2100 series available with the following interfaces: RS-232 + analog 0...5V, RS-232 + 4...20 mA, RS-485 half duplex, RS-485 full duplex, PROFINET, EtherCAT. Left: MFC 2162 side port connector and RJ45, Right: MFC 2122 down port connector and D-Sub 9.

**Axetris** offers Mass Flow Meters and Controllers (MFMs/MFCs) for gases with outstanding value to the customer. Proprietary platinum-based MEMS technology, measurement accuracy and highest level in quality production make the MFM 2100 / MFC 2100 the ideal choice for your applications.

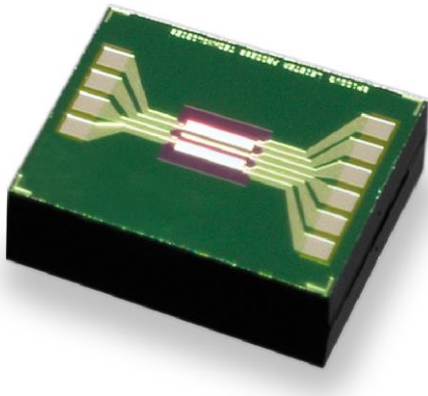
**MFM 2100** series are standalone mass flow meters with both digital and analog output interface. Its exceptional characteristics, i.e. accuracy and response time, make it the first choice when high performance is required.

**MFC 2100** are standalone mass flow controller including an additional high precision PID controller together with a fast acting solenoid valve. Digital and/or analog input / output enable direct, fast and accurate control of the gas flow. The additional valve override functionality allows an immediate setting of the valve to the fully open/closed position or any value in-between.

Compared to conventional mass flow meters and controllers, Axetris products offer a smaller size, higher accuracy, a faster response time and a much higher dynamic range.

### Key Customer Advantages

- Platinum-based MEMS technology
- High accuracy and stability
- Unmatched dynamic range
- Excellent zero point stability
- Ultra-fast response time and settling time
- Excellent repeatability and reproducibility
- Ultra-compact size
- Robust packaging with metal flow channel
- Flow range zooming (optional)



**Figure 2** The Axetris platinum-based MEMS mass flow sensor guarantees excellent stability, repeatability and quick response time over the complete flow range

## Additional features

- Exceptional long term stability
- Digitally calibrated
- Full temperature compensation 0 to 50°C
- Multi-gas/range capability, up to 8 calibration curves are supported
- Calorimetric measurement principle
- High Precision PID controller
- Various digital and analog outputs  
0...5 V, 0...20 mA, RS-232 TTL, RS-232 EIA, RS-485 half duplex, RS-485 full duplex, PROFINET, EtherCAT
- RoHS 2011/65/EU compliant
- NIST traceable calibration

## Main Applications

- Gas chromatography
- Thermal analysis
- Mass spectroscopy
- Leak testing
- Thin-Film process control
- Plasma engineering
- Gas blender/Gas splitter
- CO<sub>2</sub> laser gas control
- Bioreactor control
- Medical applications
- Fuel cells

## 2 Type Overview

The MFM 2100 and MFC 2100 series of mass flow meter and controller is available with six different electronic interfaces (Table 1): RS-232 combined with 0...5 V analog, RS-232 combined with 4...20 mA analog, RS-485 half- and full duplex, as well as PROFINET and EtherCAT. RS-485 supports multi point connection and allows the direct addressing of multiple devices with one single line.

Meter Type	Controller Type	Analog	Digital	Recommended application
MFM 2120	MFC 2122	0...5 V	RS-232 EIA	Digital communication single point system – medium line distances up to 15 m
MFM 2130	MFC 2132	4...20 mA	RS-232 EIA	Digital communication single point system – medium line distances. Harsh environment & flat ribbon cabling
MFM 2140	MFC 2142	None	RS-485 EIA half duplex (HD)	Digital communication multi point system (up to 32 participants) - long electrical line distances (differential mode)
MFM 2150	MFC 2152	None	RS-485 EIA full duplex (FD)	
N.A.	MFC 2162	None	PROFINET	Ethernet (100 Megabit/s BASE-T, up to 100m)
N.A.	MFC 2172	None	EtherCAT	

**Table 1** Type overview MFM 2100 and MFC 2100 series of mass flow devices

### 3 Block Diagrams

#### 3.1 MFM 2100 series mass flow meter

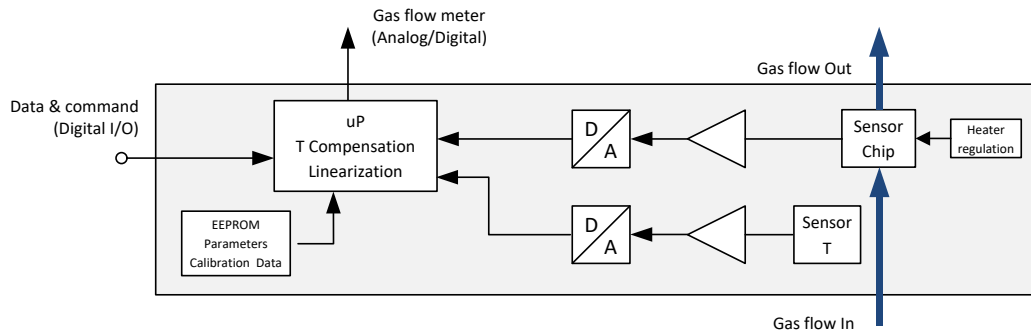


Figure 3: Block diagram of the MFM 2100 series mass flow meter

#### 3.2 MFC 2100 series mass flow controller

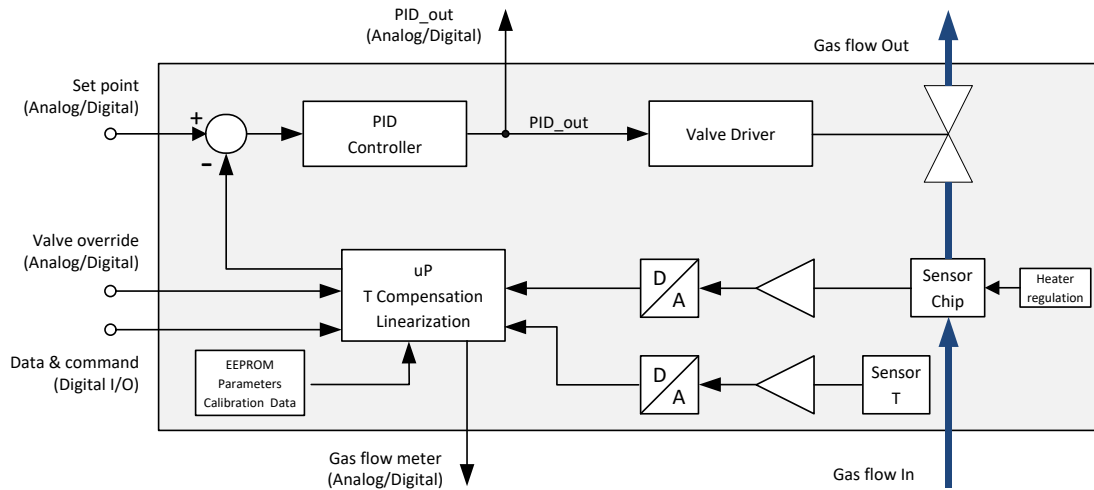


Figure 4: Block diagram of the MFC 2100 series mass flow controller

## 4 Hardware and Flow Performance specifications

### 4.1 Mass Flow Meter 21xx

**Note:** The specification defines typical values for MFMs calibrated with Nitrogen (N<sub>2</sub>) without connection block and housing. Optimal digital noise filter (k-factor) settings are assumed. For specific questions, e.g. other gases and conditions or higher accuracy, contact Axetris.

Test Conditions: Temperature 25 °C, input pressure Pin 4 bara (absolute), vertical mounting position, digital output.

### 4.2 Gas flow

Parameter	Unit	MFM 21xx - A Low Flow	MFM 21xx – B/C Standard	MFM 21xx – D Plus
Full Scale <sup>1</sup>	sccm <sup>2</sup>	20 / 50 / 100 / 150	250 / 1000 / 2000 / 3000	5000 / 7500 / 10000 / 12500 / 15000 / 20000
Gases Available	-	N <sub>2</sub> , Air, O <sub>2</sub> , CO <sub>2</sub> , Ar, He, H <sub>2</sub> Clean, dry, non-corrosive gases, other gases upon request		
Accuracy	% F.S./ % O.R. <sup>3</sup> <i>whichever is greater</i>	25°C ± 0.2% F.S. / ± 1% O.R. <sup>4</sup> 0...50°C ± 0.5% F.S. / ± 2% O.R. <sup>1</sup>		
Temperature Coefficient	-	Temperature effects included in the accuracy spec.		
Resolution	% F.S.	0.01		
Sensor response time	ms	4		
Repeatability	% F.S. / % O.R. <i>whichever is greater</i>	± 0.01% F.S. / ± 0.05% O.R.		± 0.015% F.S. / ± 0.15% O.R. <sup>5</sup>
Dynamic Range		> 1000		> 2500
Input Pressure range	barg (operating)	0...9		
Maximum allowed flow	sccm	1000	F.S. up to 250: 2000 F. S. up to 3000: 10000	75000
Pressure Drop <i>typical values</i>	Pa	35 at 50 sccm	65 at 250 sccm 1800 at 3000 sccm	2000 at 15000 sccm
Leak tightness external	mbar l/s	< 1x10 <sup>-8</sup> He		
External offset zeroing <sup>6</sup>	%	< ± 2 of the F.S. value		Available on request
Position sensitivity	-	Standard calibration position is vertical. Other positions can generate offset, see mounting instructions.		

### 4.3 Mass Flow Controller 21xx

**Note:** The specification defines typical values for MFCs calibrated with Nitrogen (N<sub>2</sub>) without connection block and housing. Optimal digital noise filter (k-factor) settings are assumed. For specific questions, e.g. other gases and conditions or higher accuracy, contact Axetris. Test Conditions: Temperature 25 °C, input pressure Pin 4 bara (absolute), outlet: atmospheric pressure, vertical mounting position, digital output.

<sup>1</sup> Standard full scales available with N<sub>2</sub> calibration; For other full scales, please contact Axetris. Note: Flow Channel selection may differ for other gases

<sup>2</sup> sccm: standard cubic centimetre per minute (0 °C and 1013 mbar absolute)

<sup>3</sup> % F.S.: Percent Full Scale, % O.R.: Percent Of Reading.

<sup>4</sup> For F.S.>15000 sccm, specified accuracy is +/- 2.5% O.R.

<sup>5</sup> For F.S.>15000 sccm, specified repeatability is +/- 0.2% O.R.

<sup>6</sup> Due to the extreme sensitivity of the device, be sure no flow occurs when zeroing. External zeroing is characterized for N<sub>2</sub> and Air, 25 °C, 4 bara inlet pressure. For other gases and conditions contact Axetris. For detailed communication zeroing protocol see Axetris MFM/MFC Data Communication Specifications.

#### 4.4 Gas flow

Parameter	Unit	MFC 21xx - A Low Flow	MFC 21xx – B/C Standard	MFC 21xx – D Plus
Full Scale <sup>1</sup>	sccm <sup>2</sup>	20 / 50 / 100 / 150	250 / 1000 / 2000 / 3000	5000 / 7500 / 10000 / 12500 / 15000 / 20000
Gases Available	-	N <sub>2</sub> , Air, O <sub>2</sub> , CO <sub>2</sub> , Ar, He, H <sub>2</sub> Clean, dry, non-corrosive gases, other gases upon request		
Accuracy	% F.S./% O.R. <sup>3</sup> <i>whichever is greater</i>	25°C ± 0.2% F.S. / ± 1% O.R. <sup>4</sup> 0...50°C ± 0.5% F.S. / ± 2% O.R. <sup>4</sup>		
Temperature Coefficient	-	Temperature effects included in the accuracy spec.		
Resolution	% F.S.	0.01		
Settling time <sup>5</sup>	ms	< 150		
Repeatability	% F.S / % O.R. <i>whichever is greater</i>	± 0.015% F.S. / ± 0.15% O.R. <sup>6</sup>		
Dynamic Range		> 1000		> 2500
Input Pressure range	barg (operating)	0...9 (actual value depends on valve size)		
Differential pressure (Pin - Pout)	bar (Min.)	0.5 (at 3000 sccm)		1.8 (at 15000 sccm) 3.0 (at 20000 sccm)
	bar (Max.)	7		
Maximum allowed flow	sccm	1000	F.S. 250: 2000 F.S. 3000: 10000	75000
Leak tightness external	mbar l/s	< 1x10 <sup>-8</sup> He		
External offset zeroing <sup>7</sup>	%	< ± 2 of the F.S. value		Available only on request
Position sensitivity	-	Standard calibration position is vertical. Other positions can generate offset, see installation instructions.		

#### 4.5 Environmental conditions

<sup>1</sup> Standard full scales available with N<sub>2</sub> calibration; For other full scales, please contact Axetris. Note: Flow Channel selection may differ for other gases

<sup>2</sup> sccm: standard cubic centimetre per minute (0 °C and 1013 mbar absolute)

<sup>3</sup> % F.S.: Percent Full Scale, % O.R.: Percent Of Reading.

<sup>4</sup> For F.S.>15000 sccm, specified accuracy is +/- 2.5% O.R.

<sup>5</sup> The time to reach ±2% of the set point within the range 10-100% F.S.

<sup>6</sup> For F.S.>15000 sccm, specified repeatability is +/- 0.2% O.R.

<sup>7</sup> Due to the extreme sensitivity of the device, be sure no flow occurs when zeroing. External zeroing is characterized for N<sub>2</sub> and Air, 25 °C, 4 bara inlet pressure. For other gases and conditions contact Axetris. For detailed communication zeroing protocol see Axetris MFM/MFC Data Communication Specifications.

Parameter	Unit	Value / Range
Operating temperature	°C	0...50 (0...40 for MFC 2162 and MFC 2172)
Operating ext. humidity	%RH	0...95, non condensing conditions
Storage temperature	°C	-20...80
Protection level	IP	40 (30 for MFC 2162 and MFC 2172)

#### 4.6 Electrical characteristics

Parameter	Unit	Value / Range
Voltage supply DC		
Nominal	V	24 ± 10%
Ripple	mV	< ± 50
Current supply DC, typical		
MFM 2100 series	mA	< 50
MFC 2100 series	mA	< 150
MFC 2162 / 2172	mA	< 200
Max. current supply DC		
MFC 2100 series	mA	< 200
MFC 2162 / 2172	mA	< 250
Start-up time	s	3
Warm-up time		
Deviation < ±0.1%F.S.	s	15
For optimum accuracy	min	15
Analog output		
Resistive loads	kΩ	> 2
Capacitive loads	nF	< 100
Overload protection		
Valve override, set point input	-	DC protected up to supply voltage / ESD protected
Gas flow output	-	ESD protected



## 4.7 Communication interface

Parameter	Unit	Value / Range
Communication interface hardware		
MFM 2120 / MFC 2122	-	Analog 0...5 V, RS-232
MFM 2130 / MFC 2132	-	Analog 4...20 mA, RS-232
MFM 2140 / MFC 2142	-	RS-485 half duplex
MFM 2150 / MFC 2152	-	RS-485 full duplex
MFC 2162 / MFC 2172	-	PROFINET / EtherCAT
Digital input <sup>1</sup>		
Set point (MFC)	dig.	0...65535
Set point (MFC 2162 / 2172)	sccm/uccm	0...Full Scale
Valve override <sup>2</sup> (MFC)		
Channel selection <sup>3</sup>	dig.	0...4095
External offset zeroing <sup>4</sup>	-	Specific protocol
Cut off limit	dig.	1% F.S. (active on request at factory level)
Digital output		
Gas flow	dig.	0...10000 <sub>dec</sub> (0 to 100% F.S.)
Gas flow (MFC 2162 / 2172)	sccm/uccm	0...Full Scale
Temperature <sup>5</sup>	dig.	0...65535
Temperature (MFC 2162 / 2172)	°C	-16...84
Device number	-	Serial number
<i>MFM 2120 and MFC 2122</i>		
Analog input <sup>1</sup>		
Set point (MFC)	V	0...5
Valve override (MFC)	V	0 / 5 (close / fully open in purge mode)
Analog output		
Gas flow	V	0...5
<i>MFM 2130 and MFC 2132</i>		
Analog input <sup>1</sup>		
Set point (MFC)	mA	4...20
Valve override(MFC)	V	0 / 5 (close / fully open in purge mode)
Analog output		
Gas flow	mA	4...20

<sup>1</sup> Analog/Digital inputs for set point and valve override is only available for MFC 2122 with PID controller. Analog valve override input overrides the digital input. If analog input is not defined, the internal PID controller is on. A cut off limit 1% F.S. on analog/digital input can also be activated on request and is factory settable only. For details on the communication interface see, Axetris MFM/MFC Data Communication Specifications

<sup>2</sup> The digital valve override command data must be within the range (0...4095) dec to allow direct control of the external valve (PID control is OFF). Digital value out of this range makes the device returning in selected mode; analog or digital set point with PID control ON. For details on the communication interface see Axetris MFM/MFC Data Communication Specifications.

<sup>3</sup> Standard calibration is N<sub>2</sub> gas, 4 bara inlet pressure, 25 °C, vertical position, one range. Multi-gas/range is available upon request

<sup>4</sup> For digital offset zeroing protocol, see Axetris MFM/MFC Data Communication Specifications.

<sup>5</sup> For decoding digital value into degree Celsius [°C], see Axetris MFM/MFC Data Communication Specifications

## 5 User interface pin assignment and status LEDs

### 5.1 D-SUB connector – 9 pins (RS-232, RS-485, Analog)

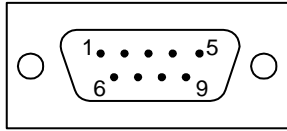


Figure 5: Top view D-SUB 9 poles connector

#### MFM 2120 / MFC 2122 RS-232 / 0...5 V

Pin	I/O Type	Description
1	Power	+ 24 V / ± 10%
2	Power	GND (Power)
3	Digital In	RxD
4	Digital Out	TxD
5	nc	
6	Analog GND	GND
7	Analog Out	Flow value, 0...5V
8	Analog In	Flow Set-point (MFC), 0...5V
9	Analog In	Valve Override (MFC), 0V close / 5V open

#### MFM 2130 / MFC 2132 RS-232 / 4...20 mA

Pin	I/O Type	Description
1	Power	+ 24 V / ± 10%
2	Power	GND (Power)
3	Digital In	RxD
4	Digital Out	TxD
5	nc	
6	Analog GND	GND
7	Analog Out	Flow value, 4...20 mA
8	Analog In	Flow Set-point (MFC), 4...20mA
9	Analog In	Valve Override (MFC), 0V close / 5V open

#### MFM 2140/ MFC 2142 RS-485 Half Duplex (HD)

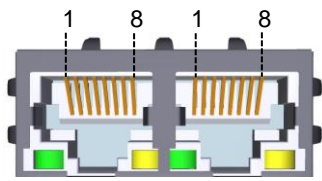

Pin	I/O Type	Description
1	Power	+ 24 V / ± 10%
2	Power	GND
3	Digital	Non inverting Input-Output/ D+
4	Digital	Inverting Input-Output/ D-
5	nc	
6	nc	
7	nc	
8	nc	
9	nc	

#### MFM 2150/ MFC 2152 RS-485 Full Duplex (FD)



Pin	I/O Type	Description
1	Power	+ 24 V / ± 10%
2	Power	GND
3	Digital In	Non Inverting Receiver Input/ R+
4	Digital In	Inverting Receiver Input/ R-
5	nc	
6	nc	
7	Digital Out	Inverting Transmitter Output/ T-
8	Digital Out	Non Inverting Transmitter Output/ T+
9	nc	

Table 2 Pin assignment for D-SUB 9 connector

## 5.2 Ethernet connectors (PROFINET and EtherCAT)

Receptacle	RJ45 Connector	Pin	I/O Type	Description
		1	Digital Out	Tx+
		2	Digital Out	Tx-
		3	Digital In	Rx+
		4	-	Not used
		5	-	Not used
		6	Digital In	Rx-
		7	-	Not used
		8	-	Not used

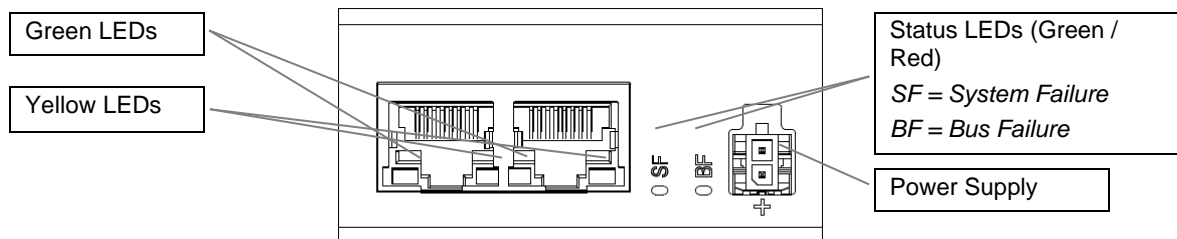
**Table 3** Pin assignment for RJ45 connector (8 pins Ethernet standard)

Receptacle	Connector	Pin	I/O Type	Description
		1	Power	+24 V ± 10%
		2	Power	GND

**Table 4** Pin assignment for Power Supply connector (2 Pin Molex Microfit)

## 5.3 PROFINET

The Axetris mass flow controllers with a PROFINET Interface are equipped with a dual port RJ45 connector. Both Port 1 and Port 2 connector work identically (switch).



**Figure 6** Top view of MFC 2162 with PROFINET interface

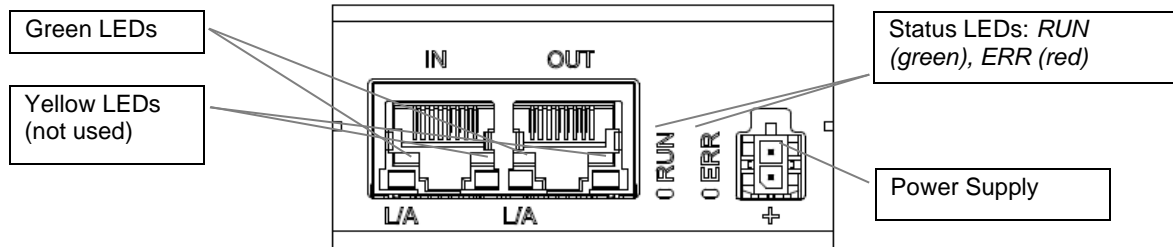
### Ethernet Status LEDs PROFINET IO

LED	Color	State	Meaning
<b>SF</b> (System Failure) General name: COM 0	Dual color LED red/green		
	● Off	Off	No error
	● Red	Flashing (1Hz, 3s)	DCP signal service is initiated via the bus.
<b>BF</b> (Bus Failure) General name: COM 1	Dual color LED red/green		
	● Off	Off	No error
	● Red	Flashing (2Hz)	No data exchange
<b>LINK</b> Ch0, Ch1	LED green		
	● Green	On	The device is linked to the Ethernet
<b>RX/TX</b> Ch0, Ch1	LED yellow		
	● Yellow	Flickering (load dependent)	The device sends/receives Ethernet frames.
	● Off	Off	The device does not send/receive Ethernet frames.

**Table 5** Ethernet Status LEDs for PROFINET IO Device

## 5.4 EtherCAT

The Axetris mass flow controllers with an EtherCAT<sup>1</sup> Interface are equipped with a dual port RJ45 connector. The ports are directional and marked with 'IN' and 'OUT'.



**Figure 7** Top view of MFC 2172 with EtherCAT interface

### Ethernet Status LEDs EtherCAT Slave

LED	Color	State	Meaning
<b>RUN</b> General name: COM 0	LED green		
	● Off	Off	INIT: The device is in INIT state.
	● Green	Blinking (2.5Hz)	PREOPERATIONAL: The device is in PREOPERATIONAL state.
	● Green	Single Flash	SAFEOPERATIONAL: The device is in SAFEOPERATIONAL state.
<b>ERR</b> General name: COM 1	LED red		
	● Off	Off	No error: The EtherCAT communication of the device is in working condition.
	● Red	Blinking (2.5Hz)	Invalid configuration: General Configuration Error Possible reason: State change commanded by master is impossible due to register or object settings.
	● Red	Single Flash	Local error: Slave device application has changed the EtherCAT state autonomously. Possible reason 1: A host watchdog timeout has occurred. Possible reason 2: Synchronization Error, device enters SafeOperational automatically.
<b>L/A IN, L/A OUT</b> Ch0, Ch1	LED green		
	● Green	On	Link: The device is linked to the Ethernet, but does not send/receive Ethernet frames.
	● Green	Flickering (load dependant)	Activity: The device is linked to the Ethernet and sends/receives Ethernet frames.
Ch0, Ch1	LED yellow		
	● Off	Off	The device has no link to the Ethernet.
Ch0, Ch1	LED yellow		
	● Off	Off	This LED is not used.

<sup>1</sup> EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

**Table 6** Ethernet Status LEDs for EtherCAT Slave Device

## 6 Mechanical Characteristics and Standards

### 6.1 Mechanical characteristics

Parameter	Unit	Value / Range
Flow channel	-	Aluminum channel
Wetted Materials	-	Aluminum, Silicon, Silicon nitride, Gold, Platinum, Silicone die-attach, Epoxy, Stainless Steel (1.4301, only MFX 2xxx-D), Brass, Viton™
Output gas directions		Side port / Down port / down port without fittings
Gas fittings options		
Flow block thread	-	9/16-18 UNF-2B (SAE J1926-1 / ISO 725), 1/4" and 1/8" NPT
Tube OD	in.	Standard: 1/8"; optional: 1/4", 3/8", 1/2"
Tube OD	mm	Standard: 6; optional: 8, 10, 12
VCR	in.	1/4", 1/8"
Inlet filter	-	None, an external inlet filter (5-200 µm) is recommended
Weight <sup>1</sup>	g	327 - 340 (depends on variant)
Size <sup>2</sup>	mm	28.8 x 59.5 x 101.4
Fluidic connections	-	See mechanical interface

### 6.2 Standards

All MFx 21xx products (except MFC 2162 / 2172) have been tested for compliance with these EN standards:

	Parameter	Value / Range
EN 61000-6-3: 2007	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards Emission Standard for residential, commercial and light-industrial environments	Comply Emission criteria below class B limit
EN 55011: 2009	Industrial, scientific and medical equipment. Radio-frequency disturbance characteristics. Limits and methods of measurement	Comply Emission criteria below class B limit
EN 61326-1: 2006	Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements	Comply
EN 61000-6-2:2005	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments	Comply

MFC 2162 with PROFINET and MFC 2172 with EtherCAT have been tested for compliance with these EN standards:

- EN 61326-1: 2013
- EN 55011:2016/A1:2017 – Emission criteria below class B limit
- EN 55032:2015 – Emission criteria below class B limit
- EN 61000-6-3-2007+A1
- EN 61000-6-2:2005

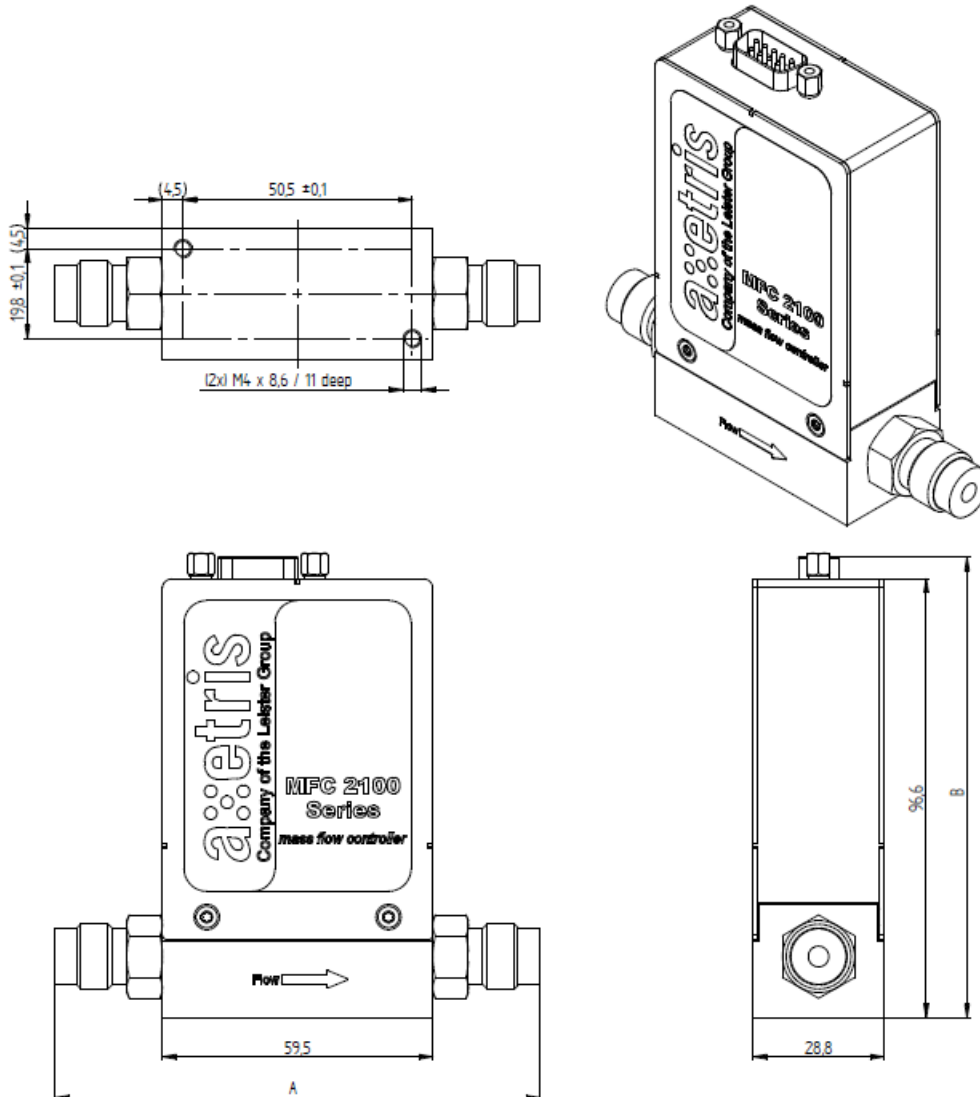
<sup>1</sup> Weight for mass flow controller MFC 2100 series side port without fittings

<sup>2</sup> Size of the body for MFx 2100 series with side port with D-SUB connector and without fittings

MFC 2162 (with PROFINET interface) has been certified according to the process laid out by PROFIBUS and PROFINET International (PI), and corresponds to conformance class CC-B. MFC 2172 (with EtherCAT interface) has been successfully tested with Conformance Test Tool V2.1.0.2.

## 7 Mounting dimensions

### 7.1 MFM 2100 and MFC 2100 series with side port

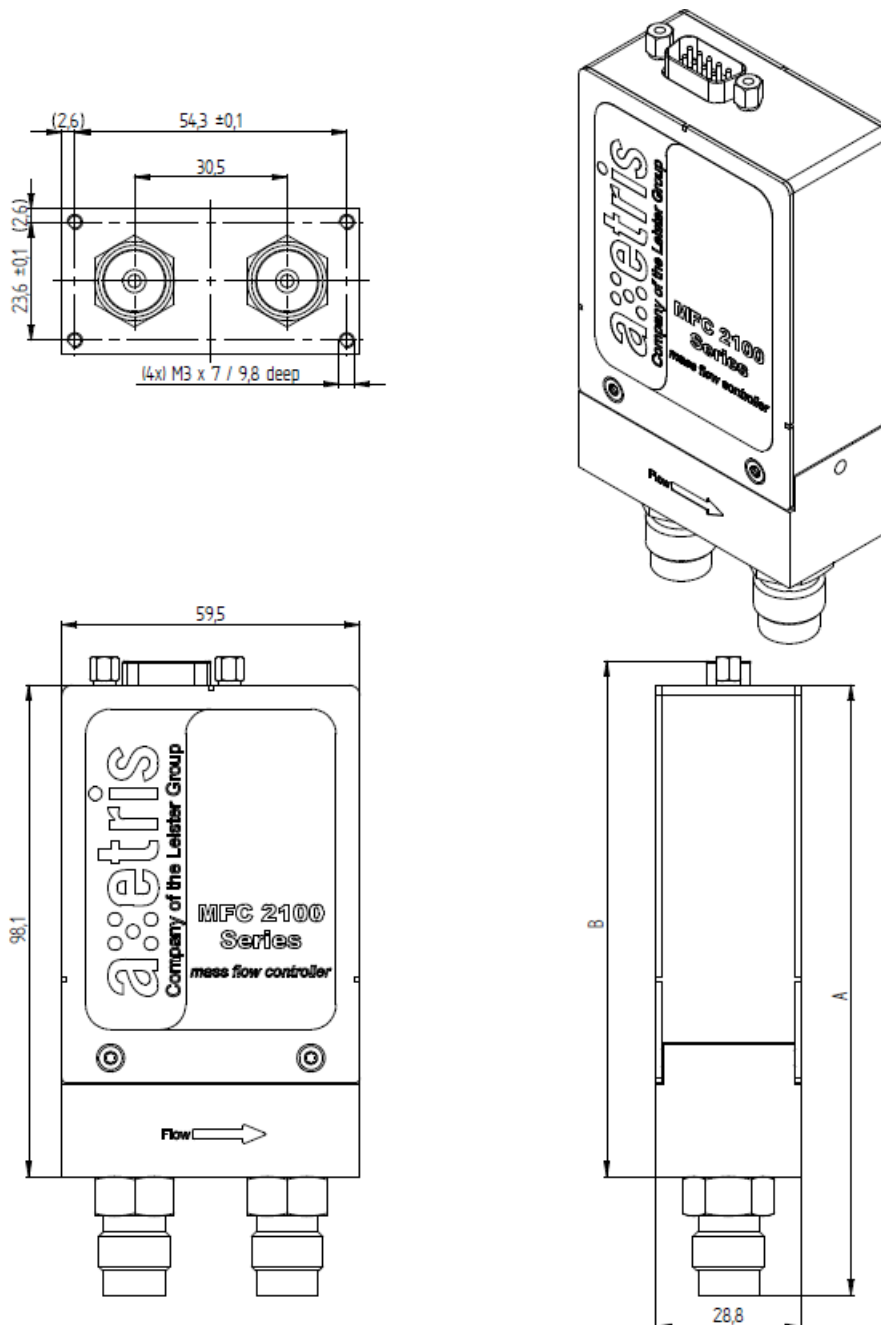


**Figure 8** Mounting dimensions in [mm] of the MFM and MFC 2100 series with side port fittings

Product configuration	Variant connector and Flow connection	Dimension in [mm]*
MFM/ MFC 2100 series with side port	D-SUB 9 pin / M12 / RJ45	B ≈ 101.4 / 114.6 / 98.6
	Tube OD: 1/8, 1/4, 3/8, 1/2 in.	A ≈ 106.2 / 110.8 / 113.9 / 117.9
	Tube OD: 6, 8, 10, 12 mm	A ≈ 110.9 / 112.9 / 114.3 / 119.5
	VCR: 1/8, 1/4 in.	A ≈ 94.5 / 107.3

\*Dimensions may vary according to flow connection block, please consult your Axetris contact for exact dimensions of your product variant

## 7.2 MFM 2100 and MFC 2100 series with down port



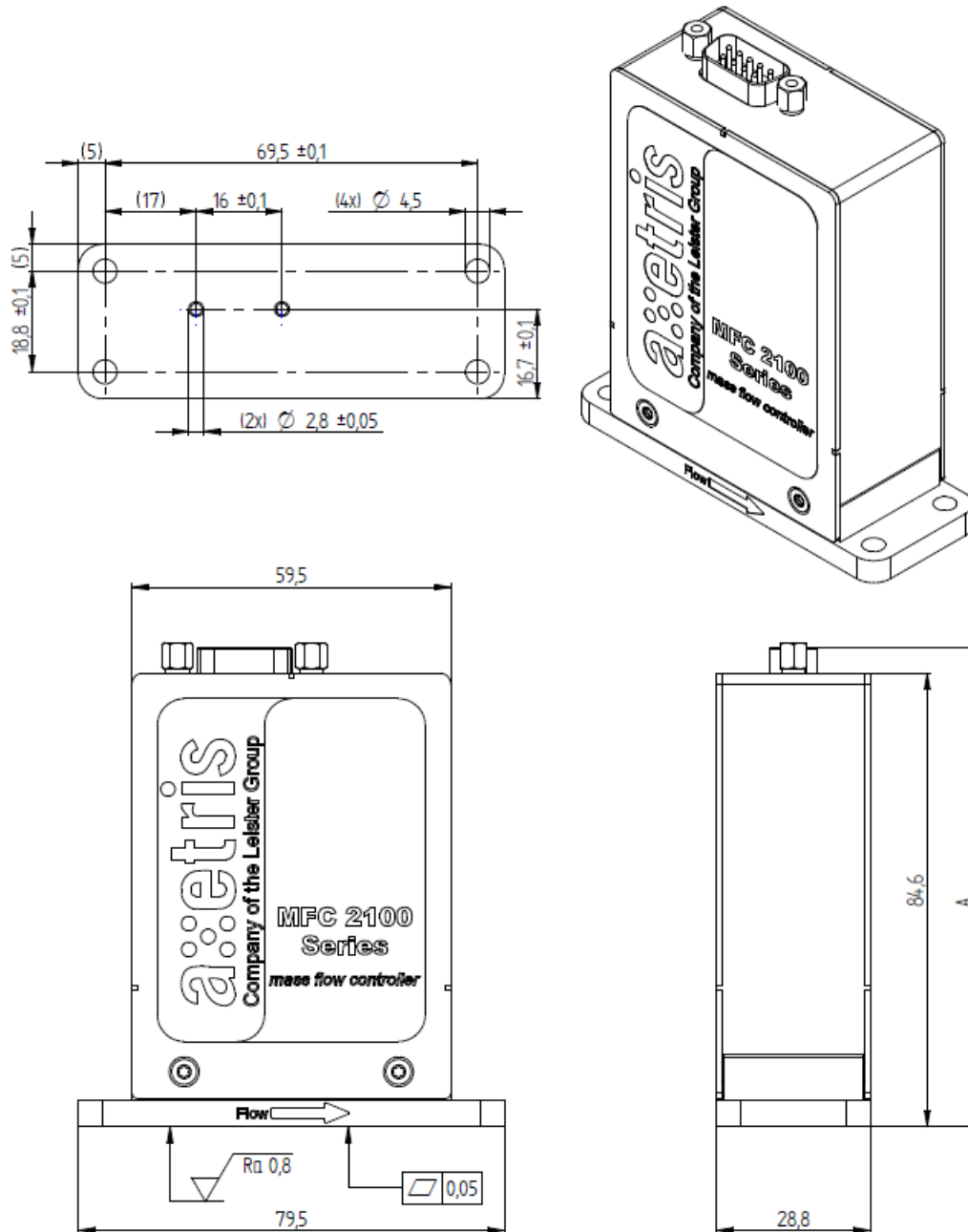
**Figure 9** Mounting dimensions in [mm] of the MFM and MFC 2100 series with down port fittings

<b>Product configuration</b>	<b>Variant connector and Flow connection</b>	<b>Dimension in [mm]*</b>
MFM/ MFC 2100 series down port with fittings	D-SUB 9 pin / M12 / RJ45	B ≈ 102.9 / 116.1 / 100.1
	Tube OD: 1/8, 1/4, 3/8, 1/2 in.	A ≈ 121.5 / 123.8 / 125.3 / 127.3
	Tube OD: 6, 8, 10, 12 mm	A ≈ 123.8 / 124.8 / 125.5 / 128.1
	VCR: 1/8, 1/4 in.	A ≈ 115.6 / 122.0

\*Dimensions may vary according to flow connection block, please consult your Axetris contact for exact dimensions of your product variant



### 7.3 Mounting dimensions MFM 2100 and MFC 2100 series, down port without fittings, for manifold installation



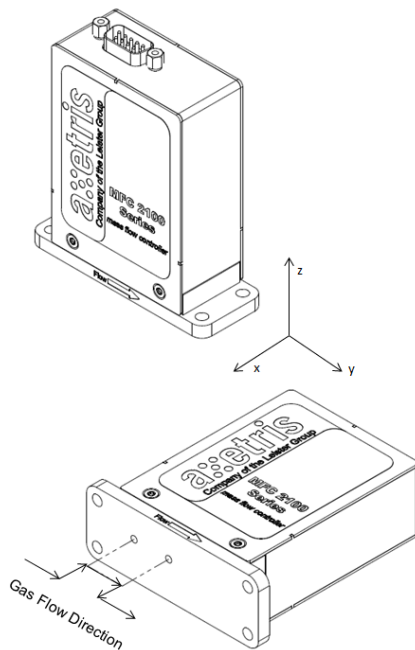
**Figure 10** Mounting dimensions in [mm] of the MFM and MFC 2100 series with down port fittings

Product configuration	Variant connector and Flow connection	Dimension in [mm]
MFM/ MFC 2100 series down port, without fittings	D-SUB 9 pin / M12 / RJ45	A ≈ 89.4 / 102.6 / 86.6

## 8 Installation instructions

The MFM 2100 / MFC 2100 series is calibrated in vertical position (z). All other positions can cause offset depending on pressure and gas conditions.

The device is not symmetric regarding the direction of the gas flow. Therefore the gas flow direction must be as shown in the drawing below.



**Figure 11:** Gas flow direction definition and mounting position (alignment)

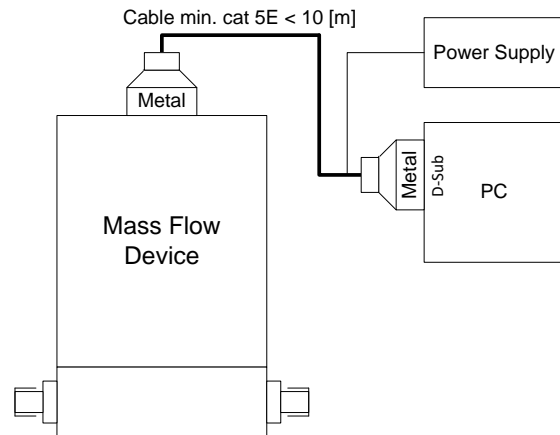
## 9 Electromagnetic compatibility

The MFM / MFC 2100 series fully comply with emission test specifications norm EN 61000-6-3:2007, enhanced with the test norm in standard industrial environment EN 55011:2009. In both tests the emission criteria are below class B limit.

The devices comply with test norms for immunity and emission to EN 61326-1:2006 enhanced with industrial environments test norm EN 61000-6-2:2005.

### Instruments with D-Sub 9 connector

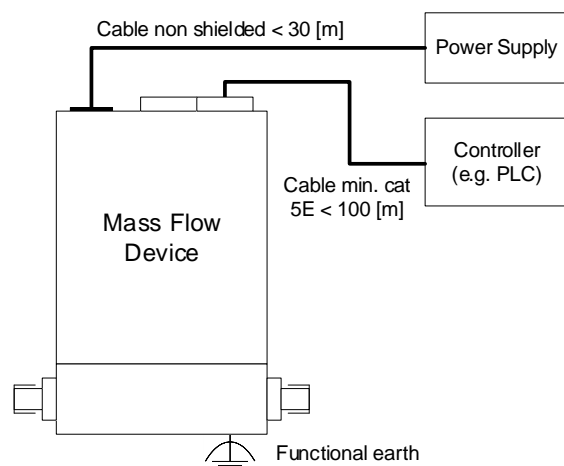
According to the setup of the test, the devices must be connected minimum with cable of category 5E, lengths below 10 m, metalized shielded connectors on both side and individual power supply.



**Figure 12:** EMC / ESD Test device connection setup for instruments with D-Sub 9 connector

### Instruments with Ethernet connector

According to the setup of the test, the devices must be connected minimum with cable of category 5E for communication and lengths below 100m. For power, the maximum cable length is 30m. The instruments are not intended for connection to a DC-network. According to the mounting guidelines for PROFINET and EtherCAT devices, the instrument has to be connected to functional earth.



**Figure 13:** EMC / ESD Test device connection setup for instruments with Ethernet connector

## 10 Caution



### Product damage

- Read all instructions carefully before using the device.
- The MFM anemometric mass flow sensors are not designed to sense liquid flow and damage will result if liquid is passed through the sensor.
- The sensor is not suited for measuring aggressive or corrosive gases. Use only non-corrosive, dry, clean gases. Gas loaded with particles can clog the sensor.
- The appliance must not be used in damp or wet surroundings.
- Use only accessories that are indicated in the instructions for use or are recommended by the manufacturer.
- Failure to comply with these instructions could result in product damage.



### Danger of life

- These sensors employ a heated element.
- The heated element is above the ambient temperature. The sensor must not be used with flammable or explosive gases or mixtures.
- Unprofessional gas handling can cause injury or death. Use should only be performed by qualified personnel.
- Do not use this product as safety or emergency stop device or in any other application where failure of the product could result in personal injury or death.
- For use of the device with gases that might be explosive in case of mixture with oxygen, and for use of the device with oxygen, special guidelines apply. Ensure that state-of-the-art

guidelines are followed, and contact Axetris in case of doubt.

## 11 Important notice / Disclaimer

The information furnished by Axetris is believed to be correct and accurate. However, Axetris shall not be held liable to recipient or any third party of any damages, including but not limited to personal injury, property damage, loss of profits, loss of use, interrupt of business or indirect, special incidental or consequential damages, of any kind, in connection with or arising out of the furnishing, performance or use of technical data herein. No obligation or liability to recipient or any third party shall arise or flow out of Axetris rendering of technical or other services.

The technical specification may change without prior notice.

## 12 Certifications

Axetris is an ISO 9001:2015 certified company. The MFM 2100 / MFC 2100 series is CE and RoHS compliant.



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