

C-Series

Compact, Fast Response Mass Flow Controller & Meter



The C-Series Mass Flow Controller (MFC) is a compact, fast response model using a Micro-Electro-Mechanical Systems (MEMS) based flow sensor for non-corrosive gas applications. The device is available in Full Scale flow rates from 50 sccm to 50 slm (N₂ equivalent) with a control range from as low as 0.1% of Full Scale up to 100% of Full Scale and is also available as a flow meter. Either analog (0 to 5 VDC) or digital (RS485) communications interfaces are available. The required power supply voltage is 24 VDC nominal.

The C-Series compact design is only 1" (25.4 mm) and less than 4.4" (111.8 mm) high. It has standard lengths of 4.88" (124 mm) for 4 VCR® male and 4.54" (113 mm) for ¼" compression seal gas line connections. Downmount versions are also available.

A low thermal mass MEMS sensor provides rapid sensing of flow changes with low noise output. The solid state design of the sensor makes it resistant to water condensation, particles, pressure shock and vibration.

Fast response, wide dynamic control range, and 1% of set point accuracy make this MFC an excellent choice for flow control in critical process applications where non-corrosive gases are used. Typical uses can be found in mass spectroscopy, vacuum coating, bioreactor as well as many other applications. The C Series incorporates a fast-acting solenoid control valve coupled with the flow sensor via the MFC's superior flow signal processing and control algorithm. This results in response times to set point of less than 100 milliseconds.

Product Features

- Ultrafast response time of < 100 msec
- Control range from 0.1% to 100% of Full Scale
- Accuracy of ±0.8% of set point
- Minimal zero and span drift assure long term reproducibility
- Standard length for drop in replacement of other MFCs
- Surface mount interface available for compact gas panel design
- Embedded web browser for setup and diagnostics



Key Benefits

- Achieve and maintain process conditions quickly
- Provide consistent process results device to device
- Provide consistent process results over extended periods

Specifications

Performance

Full Scale Ranges (N ₂ equivalent)	50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 30000, 50000 sccm
Maximum Inlet Pressure	80 psig
Normal Operating Pressure Differential	(with atmospheric pressure at the MFC outlet)
50 to 5000 sccm	10 - 45 psid
10000 to 30000 sccm	15 - 45 psid
50000 sccm	30 - 45 psid
Proof Pressure	232 psi/16 bar
Burst Pressure	1000 psi/70 bar
Typical Control Range	
Digital I/O	0.1% to 100% of Full Scale
Analog I/O	0.2% to 100% of Full Scale
Typical Accuracy	±0.8% of set point for 20 to 100% Full Scale
(with N ₂ calibration gas)	±0.16% of Full Scale for <20% of Full Scale
Repeatability	±0.2% of Reading
Temperature Coefficients	
Zero	≤0.005% of Full Scale/°C
Span	≤0.06% of Reading/°C
Pressure Coefficient	<0.025% of Reading/psi
Typical Response Time ¹	≤100 ms typical above 10% Full Scale, 50 sccm - 5 slm Full Scale models
(per SEMI Guideline E-17-0600)	≤150 ms typical above 10% Full Scale, 10-50 slm Full Scale models
Warm-up Time	≤1 min
(to within 2% of Full Scale of set point)	
Normal Operating Temperature Range	10°C to 50°C (32°F - 122°F)
Storage Temperature	0°C to 60°C (32°F - 140°F)

¹ Response times may vary due to gas type and line pressure conditions.

Mechanical

Fittings (compatible with)	Swagelok® 4 VCR, surface mount (o-ring and w-seal) 1/4" Swagelok compression
Leak Integrity	
External (atm. cc/sec He)	<1 x 10 ⁻⁶
Through Closed Valve	<0.1% of max. Full Scale range using valve closed override command (To assure no flow-through, a separate positive shut-off valve is required.)
Wetted Materials	
Standard	Aluminum, Stainless Steel, Silicon, Silicon Oxide, Silicon Carbide, Viton®, Glob Top
Valve Seat	Viton
Weight	310g (VCR)
Valve Type	Normally Closed

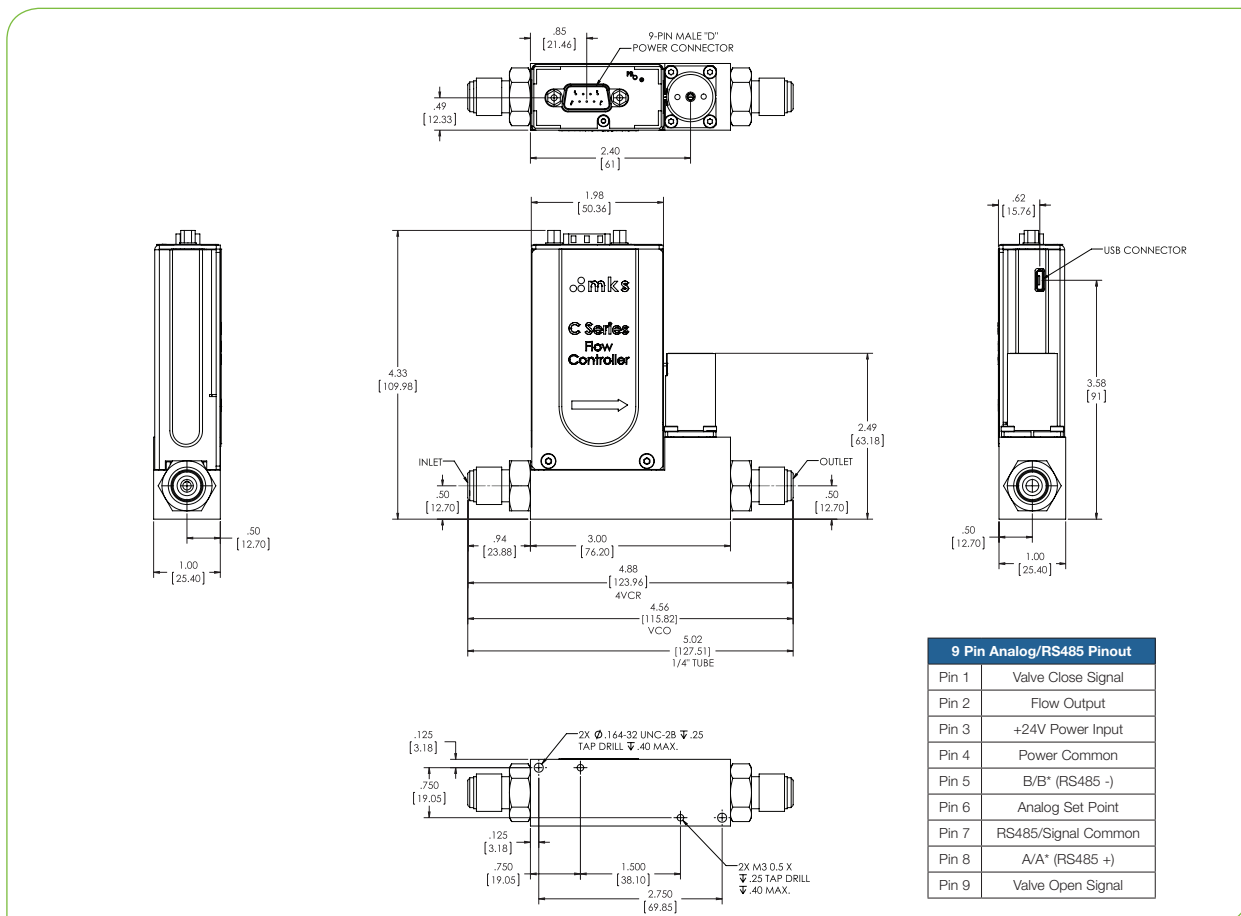
Electrical

Analog I/O

Input Voltage Required	24 VDC ($\pm 10\%$)
Set Point Command Signal	0 to 5 VDC (0 to 10 VDC, optional)
Output Signal	0 to 5 VDC (0 to 10 VDC, optional)
Connector	9-pin Type "D"
Compliance	CE

Digital I/O (RS485)

Input Voltage Required	24 VDC ($\pm 10\%$)
Connector	9-pin Type "D" male (power and comm.)
Data Rate Switch/Selection	No switch; Set data rate via RS485
Comm. Rate (s)	9.6 Kbps; 19.2 Kbps; 38.4 Kbps
Mac ID Switches/Addresses	Set address over RS485; Station addresses 0,0 to 9,9
Network Size	Up to 32 nodes
Visual Indicators	LED PWR, RUN (green)
Compliance	CE



Dimensional Drawing

Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

Ordering Information

Ordering Code Example: CMA10A013102RCV1010

	Code	Configuration
MEMS Mass Flow Controller (Type based on gas and range per bottom table)	CMA10A CMA50A	CMA10A
Gas (Per Semi Standard E52-0703)		
He	001	013
Ar	004	
Air	008	
N ₂	013	
O ₂	015	
SF ₆	110	
C ₄ F ₈	129	
For other gases, please consult Factory		
Flow Range Full Scale		
50 sccm	501	102
100 sccm	102	
200 sccm	202	
500 sccm	502	
1000 sccm	103	
2000 sccm	203	
5000 sccm	503	
10000 sccm	104	
20000 sccm	204	
30000 sccm	304	
50000 sccm	504	
Fittings (compatible with)		
4-VCR Male	R	R
1/4" Compression	S	
Downmount O-ring Seal	C	
W-Seal (1.125" Wide Seal Configuration) - Consult Factory for other options	H	
Connector		
Dual I/O (Analog 9-Pin/RS485 ASCII) RS-485 Primary	R	C
Dual I/O (Analog 9-Pin/RS485 ASCII) Analog Primary	C	
Modbus TCP	M	
Seal Materials		
Viton	V	V
Valve/Device Type		
Normally Closed/MFC	1	1
No Valve/MFM (Same length as MFC)	3	
No Valve/MFM (Reduced Length)*	4	
Reserved #1 (for future use)		
Standard Build	0	0
Firmware (unless otherwise specified)		
RS485/Analog Dual I/O	10	10
Modbus TCP	10	

* Reduced length not available for W-Seal or Downmount O-ring Seal fittings

Gas SEMI#	Gas Symbol	CMA10A		CMA50A	
		Min Full Scale	Max Full Scale	Min Full Scale	Max Full Scale
1	He	23	16000	16001	51000
4	Ar	40	23000	23001	49000
8	Air	15	14000	14001	50000
13	N ₂	15	14000	14001	50000
15	O ₂	14	13000	13001	51000
110	SF ₆	7	7300	7301	13000
129	C ₄ F ₈	4	2100	N/A	N/A



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C Series_10/19

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