

MADECO MDCM2 Series

Digital Thermal Mass Flow Meters and Controllers for Gas

MADECO MDCM2 Series

MDCM2 Mass Flow Meters and Controllers for gas applications have a housing designed for laboratory and clean processing conditions. The instruments are truly unique in their capability to measure and control flow ranges between 0,014...0,7 ml_n/min and 8...1670 l_n/min with pressure rating between vacuum and 400 bar – all in one range of instruments. This versatility in flow ranges and in operating conditions has ensured that the MDMF series remains our most popular and field proven of instruments.

Today's MDCM2 series are equipped with a digital pc-board, offering high accuracy, excellent temperature stability and fast response (settling times t_{90} down to 500 msec). The main digital pc-board contains all of the general functions needed for measurement and control. In addition to the standard RS232 output the instruments also offer analog I/O. Furthermore, an integrated interface board provides DeviceNet™, PROFIBUS DP, Modbus, EtherCAT, PROFINET or FLOW-BUS protocols.

Selectable gases and flow ranges

The MDMF design features optional Multi-Gas / Multi Range functionality, providing (OEM-) customers with extra flexibility and process efficiency. Users of MDCM2 Series in pilot plants or laboratories can rescale their instruments on site, saving time and money; substantial costs for stock keeping, (dis)mounting and also for service and recalibration are no longer applicable. Our free and easy-to-use software tool "FlowTune" enables the user to change the instrument's configuration swiftly via the RS232 port of a lap-top.

Mass Flow Controllers for every application

There is a standard direct acting valve for common applications, a pilot operated valve for high flow rates, the so-called Vary-P valve that can cope with 6 up to 400 bar ΔP and a bellows valve for applications with very low differential pressure.



MDCM2 features

- fast response, excellent repeatability
- high accuracy
- virtually pressure and temperature independent
- pressure ratings up to 400 bar
- optional metal sealed and downported constructions

Digital features

- DeviceNet™, PROFIBUS DP, Modbus-RTU/ASCII, EtherCAT, PROFINET or FLOW-BUS slave; RS232 interface
- optional Multi Gas / Multi Range functionality up to 10 bar
- storage of max. 8 calibration curves
- alarm and counter functions
- control characteristics user-configurable

Technical specifications

Measurement / control system

Accuracy (incl. linearity)	standard: $\pm 0,5\%$ Rd plus $\pm 0,1\%$ FS
(based on actual calibration)	$\pm 0,8\%$ Rd plus $\pm 0,2\%$ FS for F-110C-005/F-200CV-005 $\pm 2\%$ FS for F-110C-002/F-200CV-002
Turndown	1 : 50 (in digital mode up to 1:187,5)
Repeatability	$< 0,2\%$ Rd
Settling time (controller)	standard: 1...2 seconds option: down to 500 msec
Control stability	$< \pm 0,1\%$ FS (typical for 1 l _v /min N ₂)
Operating temperature	-10...+70°C
Temperature sensitivity	zero: $< 0,05\%$ FS/°C; span: $< 0,05\%$ Rd/°C
Pressure sensitivity	0,1% Rd/bar typical N ₂ ; 0,01% Rd/bar typical H ₂
Leak integrity, outboard	tested $< 2 \times 10^{-9}$ mbar l/s He
Attitude sensitivity	max. error at 90° off horizontal 0,2% at 2 bar, typical N ₂
Warm-up time	30 min. for optimum accuracy 2 min. for accuracy $\pm 2\%$ FS

Mechanical parts

Material (wetted parts)	stainless steel 316L or comparable
Process connections	compression type or face seal couplings
Seals	standard: Viton®; options: EPDM, Kalrez®, FFKM)
Ingress protection (housing)	IP40

Electrical properties

Power supply	+15...24 Vdc		
Max. power consumption	Supply	at voltage I/O	at current I/O
	Meter:	15 V 24 V	95 mA 65 mA
Controller:	15 V 24 V	290 mA 200 mA	320 mA 215 mA
	Extra for fieldbus: PROFIBUS DP	add 53 mA (at 15 V) or 30 mA (at 24 V)	
(if applicable)	EtherCAT®	add 66 mA (at 15 V) or 41 mA (at 24 V)	
	PROFINET	add 77 mA (15 V supply) or 48 mA (24 V supply)	
	DeviceNet™	add 48 mA (at 24 V)	
Analog output/command	0...5 (10) Vdc or 0 (4)...20 mA (sourcing output)		
Digital communication	standard: RS232 options: PROFIBUS DP, DeviceNet™, EtherCAT®, Modbus-RTU/ASCII, PROFINET, FLOW-BUS		

Electrical

Analog/RS232	9-pin D-connector (male);
PROFIBUS DP	bus: 9-pin D-connector (female); power: 9-pin D-connector (male);
DeviceNet™	5-pin M12-connector (male);
EtherCAT®/ PROFINET	2 x RJ45 modular jack (in/out)
FLOW-BUS/Modbus-RTU/ASCII	RJ 45 modular jack

Technical specifications and dimensions subject to change without notice.

Modeles and flow range (based on Air)

Mass Flow Meters (MFM); PN100 (pressure rating 100 bar)

Model	min. flow	max. flow
MDCM2-110C	0,014...0,7 ml _v /min	0,06...9 ml _v /min
MDCM2-111B	0,16...8 ml _v /min	0,16...25 l _v /min
MDCM2-111AC	0,4...20 l _v /min	0,6...100 l _v /min
MDCM2-112AC	0,8...40 l _v /min	1,4...250 l _v /min
MDCM2-113AC	4...200 l _v /min	8...1670 l _v /min

For ranges of 200 or 400 bar rated MFMs see model number identification.

Mass Flow Controllers (MFC); PN64 / PN100

Model	min. flow	max. flow
MDCM2-200CV/F-210CV ¹⁾	0,014...0,7 ml _v /min	0,06...9 ml _v /min
MDCM2-201CV/F-211CV ¹⁾	0,16...8 ml _v /min	0,16...25 l _v /min
MDCM2-201AV/F-211AV ¹⁾	0,4...20 l _v /min	0,6...100 l _v /min
MDCM2-202AV/F-212AV ²⁾	0,8...40 l _v /min	1,4...250 l _v /min
MDCM2-203AV/F-213AV ³⁾	4...200 l _v /min	8...1670 l _v /min

¹⁾ K_v-max = 6,6 x 10⁻² ²⁾ K_v-max = 0,4 ³⁾ K_v-max = 1,5

Mass Flow Controllers (MFC); PN200

Model	min. flow	max. flow
MDCM2-220M ⁴⁾	0,2...10 ml _v /min	3...15 ml _v /min
MDCM2-221M ⁴⁾	0,3...15 ml _v /min	0,4...20 l _v /min

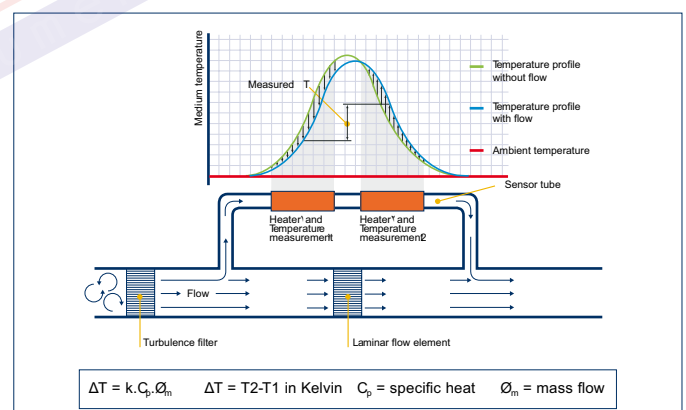
⁴⁾ K_v-max = 1,65 x 10⁻³

MFCs for high-pressure / high-ΔP applications; PN400

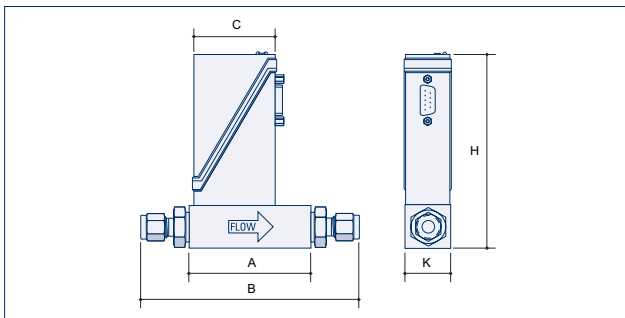
Model	min. flow	max. flow
MDCM2-230M	0,2...10 ml _v /min	10...500 ml _v /min
MDCM2-231M	10...500 ml _v /min	0,2...10 l _v /min
MDCM2-232M	0,2...10 l _v /min	2...100 l _v /min

Thermal mass flow measuring principle

The heart of the thermal mass flow meter/controller is the sensor, that consists of a stainless steel capillary tube with resistance thermometer elements. A part of the gas flows through this bypass sensor, and is warmed up by heating elements. Consequently the measured temperatures T₁ and T₂ drift apart. The temperature difference is directly proportional to mass flow through the sensor. output is proportional to the total mass flow rate.



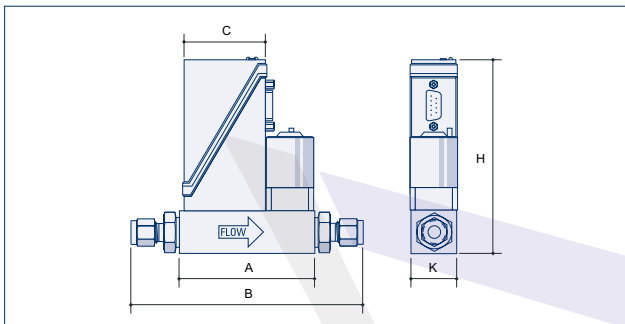
Dimensions



Mass Flow Meter

Model	A	B	C	H	K	Weight (kg)
MDCM2-110C (1/8" OD)	47	98	47	111	25	0,4
MDCM2-111B (1/4" OD)	69	126	47	111	25	0,5
MDCM2-111AC (1/4" OD)	69	126	47	123	26	0,6
MDCM2-112AC (1/2" OD)	65	130	47	139	59	1,3
MDCM2-113AC (1/2" OD)	112	179	47	153	74	3,0

Dimensions in mm.



Mass Flow Controller

Model	A	B	C	H	K	Weight (kg)
MDCM2-200CV/MDMF-210CV (1/8" OD)	77	128	47	111	25	0,6
MDCM2-201CV/MDMF-211CV (1/4" OD)	77	134	47	111	25	0,6
MDCM2-201AV/MDMF-211CV (1/4" OD)	78	135	47	123	26	0,7
MDCM2-202AV/MDMF-212AV (1/2" OD)	112	169	47	139	59	2,1
MDCM2-203AV/MDMF-213AV (1/2" OD)	171	238	47	153	74	4,9
MDCM2-220M/MDMF-221M (1/4" OD)	85	139	47	126	28	0,9
MDCM2-230M/MDMF-231M/MDMF-232M (1/4" OD)	115	172	47	163	69	3,4

Dimensions in mm.

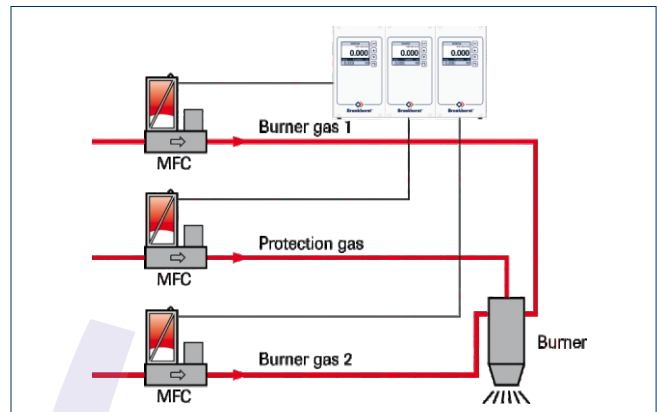
Fields of application

The MDCM2 series have been successfully applied in a wide variety of both OEM and laboratory applications in the following markets (typically):

- Semiconductor processing
- Analysis and environmental measurements
- Burner control
- Vacuum technology
- Surface treatment installations
- Process control in food, pharmaceutical and (petro-) chemical industries

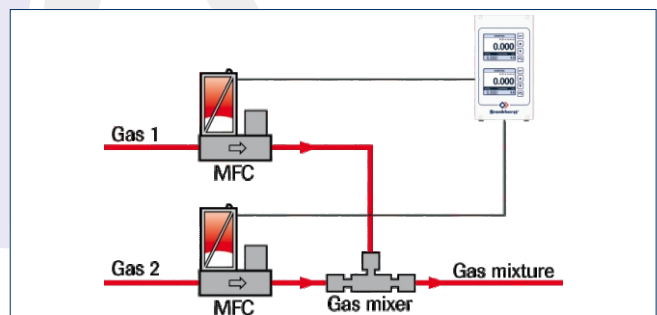
To give an impression of the many varied applications, we hereby sketch some basic examples. In reality, these applications are commonly far more complex and with far more variations and adaptations.

Burner control



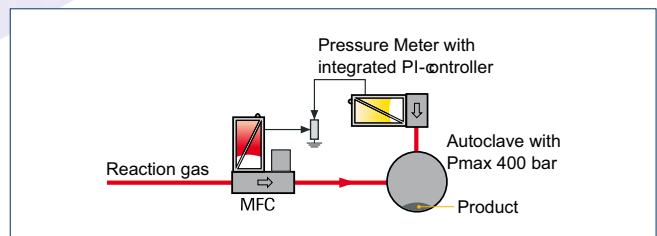
Burner control using Mass Flow Controllers brings many advantages compared to conventional systems, where flow is adjusted through needle valves. When burner orifices get clogged or when gas supply pressure varies, an MFC will automatically adapt to the changed conditions. For the control of relatively large flows with low differential pressure, which is typical for natural gas or CH₄, MADECO offers mass flow meters with separate pressure compensated bellows valves.

Making gas mixtures



MFC's are often used to make precise and stable mixtures of two or more gases. A MADECO PS/Readout system can be applied to maintain the ratio of mixed gases by operating in master-slave mode. In the example above, the flow range of gas 1 is much smaller than the other. For this purpose Bronkhorst developed a gas mixer, to guarantee a homogeneous gas mixture.

Feeding of reactors



Flow control is often combined with the control of reactor pressure, using an MDCM2 back pressure controller, or as depicted, an MDMF Pressure Meter with integrated PI-controller. Typical applications: high pressure hydrogenation systems and autoclave processes using a 400 bar rated Mass Flow Controller with Vary-P control valve.

Table with minimum and maximum flow ranges for MDCM2 instruments suitable for Multi Fluid / Multi Range functionality (valid for operating conditions from 0.8 to 10 bar abs and 0 to 70°C)

MFM Model #	MFC Model #	Air flow ranges		Min/Max flow ranges for other gases										
		Minimum/Nominal/Maximum		Ar	CH ₄	C ₂ H ₆	CO	CO ₂	H ₂	He	N ₂	N ₂ O	O ₂	
MDCM2-110C - 002	MDCM2-200CV - 002	Min. 0.014 - 0.7 mL/min Nom. 0.014 - 2 mL/min Max. 0.014 - 5 mL/min	Min Max	0.02 - 1 0.02 - 6	0.012 - 0.6 0.012 - 3.5	0.008 - 0.4 0.008 - 2	0.014 - 0.7 0.014 - 5	0.012 - 0.6 0.012 - 3	0.014 - 0.7 0.014 ₅	0.02 - 1 0.02 - 7	0.014 - 0.7 0.014 - 5	0.012 - 0.6 0.012 - 3	0.014 - 0.7 0.014 - 5	mL/min
MDCM2-110C - 005	MDCM2-200CV - 005	Min. 0.06 - 3 mL/min Nom. 0.06 - 5 mL/min Max. 0.06 - 9 mL/min	Min Max	0.07 - 3.5 0.07 - 9.5	0.04 - 2 0.04 - 5.5	0.028 - 1.4 0.028 - 4	0.06 - 3 0.06 - 9	0.04 - 2 0.04 - 4.5	0.06 - 3 0.06 - 7.2	0.07 - 3.5 0.07 - 10	0.06 - 3 0.06 - 9	0.04 - 2 0.04 - 4.5	0.06 - 3 0.06 - 9	
MDCM2-111B - 020	MDCM2-201CV - 020	Min. 0.16 - 8 mL/min Nom. 0.16 - 20 mL/min Max. 0.16 - 30 mL/min	Min Max	0.2 - 10 0.2 - 30	0.11 - 5.5 0.11 - 18	0.08 - 4 0.08 - 13	0.16 - 8 0.16 - 30	0.14 - 7 0.14 - 16	0.144 - 7.2 0.144 - 25	0.2 - 10 0.2 - 35	0.16 - 8 0.16 - 30	0.12 - 6 0.12 - 16	0.16 - 8 0.16 - 30	
MDCM2-111B - 050	MDCM2-201CV - 050	Min. 0.4 - 20 mL/min Nom. 0.4 - 50 mL/min Max. 0.4 - 75 mL/min	Min Max	0.54 - 27 0.54 - 75	0.34 - 17 0.34 - 47	0.22 - 11 0.22 - 34	0.4 - 20 0.4 - 75	0.3 - 15 0.3 - 39	0.42 - 21 0.42 - 65	0.56 - 28 0.56 - 90	0.4 - 20 0.4 - 75	0.3 - 15 0.3 - 38	0.4 - 20 0.4 - 73	
MDCM2-111B - 100	MDCM2-201CV - 100	Min. 0.8 - 40 mL/min Nom. 0.8 - 100 mL/min Max. 0.8 - 150 mL/min	Min Max	1.12 - 56 1.12 - 150	0.64 - 32 0.64 - 95	0.42 - 21 0.42 - 70	0.8 - 40 0.8 - 150	0.62 - 31 0.62 - 79	0.84 - 42 0.84 - 130	1.12 - 56 1.12 - 180	0.8 - 40 0.8 - 150	0.6 - 30 0.6 - 77	0.8 - 40 0.8 - 140	
MDCM2-111B - 200	MDCM2-201CV - 200	Min. 1.6 - 80 mL/min Nom. 1.6 - 200 mL/min Max. 1.6 - 300 mL/min	Min Max	2.4 - 120 2.4 - 300	1.3 - 65 1.3 - 190	0.88 - 44 0.88 - 140	1.6 - 80 1.6 - 300	1.22 - 61 1.22 - 150	1.68 - 84 1.68 - 260	2.4 - 120 2.4 - 360	1.6 - 80 1.6 - 300	1.2 - 60 1.2 - 150	1.6 - 80 1.6 - 290	
MDCM2-111B - 500	MDCM2-201CV - 500	Min. 4 - 200 mL/min Nom. 4 - 500 mL/min Max. 4 - 750 mL/min	Min Max	5.4 - 270 5.4 - 750	3.2 - 160 3.2 - 470	2.2 - 110 2.2 - 340	4 - 200 4 - 750	3 - 150 3 - 390	4.2 - 210 4.2 - 650	5.6 - 280 5.6 - 900	4 - 200 4 - 750	3 - 150 3 - 380	4 - 200 4 - 730	
MDCM2-111B - 1K0	MDCM2-201CV - 1K0	Min. 8 - 400 mL/min Nom. 8 - 1000 mL/min Max. 8 - 1500 mL/min	Min Max	11.2 - 560 11.2 - 1500	6.4 - 320 6.4 - 950	4.2 - 210 4.2 - 680	8 - 400 8 - 1500	6.2 - 310 6.2 - 790	8.4 - 420 8.4 - 1300	11.2 - 560 11.2 - 1800	8 - 400 8 - 1500	6 - 300 6 - 770	8 - 400 8 - 1400	
MDCM2-111B - 2K0	MDCM2-201CV - 2K0	Min. 16 - 800 mL/min Nom. 16 - 2000 mL/min Max. 16 - 3000 mL/min	Min Max	24 - 1200 24 - 3000	13 - 650 13 - 1900	8.8 - 440 8.8 - 1300	16 - 800 16 - 3000	12.2 - 610 12.2 - 1500	16.8 - 840 16.8 - 2600	24 - 1200 24 - 3600	16 - 800 16 - 3000	12 - 600 12 - 1500	16 - 800 16 - 2900	
MDCM2-111B - 5K0	MDCM2-201CV - 5K0	Min. 0.04 - 2 L/min Nom. 0.04 - 5 L/min Max. 0.04 - 7.5 L/min	Min Max	0.054 - 2.7 0.054 - 7.5	0.032 - 1.6 0.032 - 4.7	0.022 - 1.1 0.022 - 3.3	0.04 - 2 0.04 - 7.5	0.03 - 1.5 0.03 - 3.9	0.042 - 2.1 0.042 - 6.5	0.056 - 2.8 0.056 - 9	0.04 - 2 0.04 - 7.5	0.03 - 1.5 0.03 - 3.8	0.04 - 2 0.04 - 7.3	
MDCM2-111B - 10K	MDCM2-201CV - 10K	Min. 0.08 - 4 L/min Nom. 0.08 - 10 L/min Max. 0.08 - 15 L/min	Min Max	0.112 - 5.6 0.112 - 15	0.064 - 3.2 0.064 - 9.5	0.042 - 2.1 0.042 - 6.9	0.08 - 4 0.08 - 15	0.062 - 3.1 0.062 - 7.9	0.084 - 4.2 0.084 - 13	0.112 - 5.6 0.112 - 18	0.08 - 4 0.08 - 15	0.06 - 3 0.06 - 7.7	0.08 - 4 0.08 - 14	
MDCM2-111B - 20K	MDCM2-201CV - 20K	Min. 0.16 - 8 L/min Nom. 0.16 - 20 L/min Max. 0.16 - 25 L/min	Min Max	0.2 - 10 0.2 - 25	0.13 - 6.5 0.13 - 16	0.088 - 4.4 0.088 - 11	0.16 - 8 0.16 - 25	0.122 - 6.1 0.122 - 14	0.168 - 8.4 0.168 - 25	0.24 - 12 0.24 - 30	0.16 - 8 0.16 - 25	0.12 - 6 0.12 - 14	0.16 - 8 0.16 - 25	
MDCM2-111AC - 50K	MDCM2-201AV - 50K	Min. 0.4 - 20 L/min Nom. 0.4 - 50 L/min Max. 0.4 - 75 L/min	Min Max	0.54 - 27 0.54 - 75	0.32 - 16 0.32 - 47	0.22 - 11 0.22 - 34	0.4 - 20 0.4 - 75	0.3 - 15 0.3 - 39	0.42 - 21 0.42 - 65	0.56 - 28 0.56 - 90	0.4 - 20 0.4 - 75	0.3 - 15 0.3 - 38	0.4 - 20 0.4 - 73	
MDCM2-111AC - 70K	MDCM2-201AV - 70K	Min. 0.6 - 30 L/min Nom. 0.6 - 70 L/min Max. 0.6 - 100 L/min	Min Max	0.9 - 45 0.9 - 100	0.5 - 25 0.5 - 60	0.4 - 20 0.4 - 45	0.6 - 30 0.6 - 100	0.5 - 25 0.5 - 50	0.6 - 30 0.6 - 90	0.9 - 45 0.9 - 125	0.6 - 30 0.6 - 100	0.5 - 25 0.5 - 50	0.6 - 30 0.6 - 90	
MDCM2-112AC - M10	MDCM2-202AV ¹⁾ - M10	Min. 0.8 - 40 L/min Nom. 0.8 - 100 L/min Max. 0.8 - 150 L/min	Min Max	1.12 - 56 1.12 - 150	0.64 - 32 0.64 - 95	0.42 - 21 0.42 - 68	0.8 - 40 0.8 - 150	0.62 - 31 0.62 - 79	0.84 - 42 0.84 - 130	1.12 - 56 1.12 - 180	0.8 - 40 0.8 - 150	0.6 - 30 0.6 - 77	0.8 - 40 0.8 - 140	
MDCM2-112AC - M20	MDCM2-202AV ¹⁾ - M20	Min. 1.4 - 70 L/min Nom. 1.4 - 200 L/min Max. 1.4 - 250 L/min	Min Max	2 - 100 2 - 250	1.1 - 55 1.1 - 170	0.7 - 35 0.7 - 120	1.4 - 70 1.4 - 250	1 - 50 1 - 130	1.4 - 70 1.4 - 200	2 - 100 2 - 300	1.4 - 70 1.4 - 250	1 - 50 1 - 130	1.4 - 70 1.4 - 250	
MDCM2-113AC - M50	MDCM2-203AV ¹⁾ - M50	Min. 4 - 200 L/min Nom. 4 - 500 L/min Max. 4 - 750 L/min	Min Max	5.4 - 270 5.4 - 750	3.2 - 160 3.2 - 470	2.2 - 110 2.2 - 340	4 - 200 4 - 750	3 - 150 3 - 390	4.2 - 210 4.2 - 650	5.6 - 280 5.6 - 900	4 - 200 4 - 750	3 - 150 3 - 380	4 - 200 4 - 730	
MDCM2-113AC - 1M0	MDCM2-203AV ¹⁾ - 1M0	Min. 8 - 400 L/min Nom. 8 - 1000 L/min Max. 8 - 1670 L/min	Min Max	11.2 - 560 11.2 - 1670	6.4 - 320 6.4 - 900	4.2 - 210 4.2 - 750	8 - 400 8 - 1500	6.2 - 310 6.2 - 850	8.4 - 420 8.4 - 1350	11.2 - 560 11.2 - 1850	8 - 400 8 - 1670	6 - 300 6 - 840	8 - 400 8 - 1500	

¹⁾ Multi Gas / Multi Range option not available for these models

Multi Gas / Multi Range features

- Rangeability up to 187,5 : 1
- Flexible, user-programmable ranges and gas types
- Easy-to-use configuration software
- Multi Gas / Multi Range functionality up to 10 bar; pressure rating up to 100 bar
- High accuracy and repeatability

Notes

- Multi Gas / Multi Range is optional on the MDCM2 series and must be requested at the point of ordering
- Extended rangeability for digital communication only; turndown 50:1 when using analog I/O options
- The selected orifice of the control valve may limit the rangeability
- Standard accuracy (based on actual calibration): $\pm(0,5\% \text{ RD} + 0,1\% \text{ FS})$; $\pm 0,8\% \text{ Rd plus } \pm 0,2\% \text{ FS}$ for F-110C-005/F-200CV-005; $\pm 2\% \text{ FS}$ for F-110C-002/F-200CV-002
- Maximum range for gases not mentioned in this list; rule of thumb: nominal range for Air x Conversion Factor; e.g. F-111B - 1K0: maximum range for $\text{SF}_6 = 1000 \times 0.27 = 270 \text{ ml}_n/\text{min}$
- Minimum range for gases not mentioned in this list; rule of thumb: minimum range for Air x Conversion Factor; e.g. F-111B - 1K0: minimum range for $\text{SF}_6 = 400 \times 0.27 = 108 \text{ ml}_n/\text{min}$



Model number identification

MDCM2- N N NAA - NNN - A A A - NN - A

Base

0	Valve only
1	Meter
2	Controller

Pressure rating

0	64 bar
1	100 bar
2	200 bar
3	400 bar

Ranges

for PN64/PN100 Flow Meters/Controllers	
0C/0CV	0...0,7 / 0...9 ml _v /min
1B/1CV	0...8 / 0...25000 ml _v /min
1AC/1AV	0...20 / 0...100 l _v /min
2AC/2AV	0...40 / 0...250 l _v /min
3AC/3AV	0...200 / 0...1670 l _v /min

for PN200/PN400 Flow Meters	
0M	0...10 / 0...15 ml _v /min
1M	0...15 / 0...20000 ml _v /min
2M	0...10 / 0...250 l _v /min
3M	0...200 / 0...1250 l _v /min

for PN200 Flow Controllers	
0M	0...100 / 0...15 ml _v /min
1M	0...15 / 0...20000 ml _v /min

for PN400 Flow Controllers	
0M	0...10 / 0...500 ml _v /min
1M	0...0,5 / 0...10 l _v /min
2M	0...10 / 0...100 l _v /min

Nominal range

Factory selected

Communication (I/O)

A	RS232 + analog (n/c control)
B	RS232 + analog (n/o control)
D	RS232 + DeviceNet™ (n/c control)
E	RS232 + DeviceNet™ (n/o control)
M	RS232 + Modbus (n/c control)
N	RS232 + Modbus (n/o control)
P	RS232 + PROFIBUS (n/c control)
Q	RS232 + PROFIBUS (n/o control)
R	RS232 + FLOW-BUS (n/c control)
S	RS232 + FLOW-BUS (n/o control)
T	RS232 + EtherCAT® (n/c control)
U	RS232 + EtherCAT® (n/o control)
V	RS232 + PROFINET (n/c control)
W	RS232 + PROFINET (n/o control)

Analog output

A	0...5 Vdc
B	0...10 Vdc
F	0...20 mA sourcing
G	4...20 mA sourcing

Supply voltage

D	+15...24 Vdc
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Connections (in/out)

1	1/8" OD compression type
2	1/4" OD compression type
3	6 mm OD compression type
4	12 mm OD compression type
5	1/2" OD compression type
6	20 mm OD compression type
8	1/4" Face seal male
9	other

Internal seals

V	Vitor® (factory standard)
E	EPDM
K	Kalrez®(FFKM)





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