

TECHNICAL **GUIDANCE**

For high-accuracy flow rate measurement/
control of various gases

NM-2000 Series

MASS FLOW METER
MASS FLOW CONTROLLER

GENERAL

The NM-2000 series is a thermal mass flow meter that can measure and control the flow rate of various gases. Temperature and pressure fluctuations during measurement have little effect on accuracy because mass flow rate is measured.

The flow range is 5 mL/min (nor) to 500 L/min (nor). It also has RS485 communication, making it suitable for a wide range of applications such as monitoring and control.



FEATURES

- ☐ Either the Mass Flow Meter or Mass Flow Controller can be selected.
- ☐ Ambient temperature compensation function
- ☐ Dual RS485 communication terminal (RJ45) equipped (for multi-communication)
- ☐ Self-diagnosis function
- ☐ Zero adjustment function

APPLICATION EXAMPLES

- Monitoring and controlling gas supplies to industrial facilities
- Gas analyzers
- Constant gas flow rate control
- Gas mixing/separation equipment

MODEL CODE

NM-	□□□□□□	-	□□□□	-	□□	-	□□	□□	□□	□□
Model	2100DC	MFC	0.005-5 L/min (nor)*							
	2200DC		5-50 L/min (nor)*							
	2310DC		0.005-5 L/min (nor)*							
	2320DC		5-250 L/min (nor)*							
	2100DM	MFM	0.005-5 L/min (nor)*							
	2200DM		5-500 L/min (nor)*							
	2300DM	MFM (low price)	10-400 L/min (nor)*							
Range	ABC			See the range code list (p.5).						
Gas					□□	See the gas code list (p.5).				
					ZZ	Others				
Fittings	VCR (equivalent)				V					
	Swagelok (equivalent)				S					
	Flange (MFM only)				F					
	Others				Z					
Meter size	1/4"				1					
	3/8"				2					
	1/2"				3					
	3/4"				4					
	Others				Z					
Output	0 to 5 V DC				1					
	4 to 20 mA DC				2					
	1 to 5 V DC				3					
	Others				Z					
Power supply	24 V DC				1					
	±15 V DC				2					
	Others				Z					

* N2 conversion range

MASS FLOW CONTROLLER SPECIFICATIONS

Model		NM-2100DC	NM-2200DC	NM-2310DC	NM-2320DC
Measurable gas code (see the list (p.5))		Code 00-41			Code 00-17
Valve structure		Normally closed (standard) Normally open (optional)		Normally closed	
N ₂ conversion range	Min.	0.005	> 5	0.005	> 5
L/min (nor)) (*1)	Max.	5	50	5	250
Minimum controllable flow rate (% F.S.)		2			
Response time (sec) (2% to 100% F.S.)		1		2	1
Accuracy (% F.S.)		±1.0			
Linearity (% F.S.)		±0.5			
Repeatability (% F.S.)		±0.2		±0.5	±0.2
Control differential pressure	kPa	50 to 300	Based on N ₂ conversion range: 5 to 20 L/min (nor): 100 to 300 20 to 30 L/min (nor): 150 to 300 30 to 50 L/min (nor): 200 to 300	50 to 300	Based on N ₂ conversion range: 5 to 20 L/min (nor): 50 to 300 20 to 50 L/min (nor): 100 to 300 20 to 100 L/min (nor): 200 to 500 100 to 250 L/min (nor): 400 to 500
Maximum operating pressure (*2)	kPa	300		300	Based on N ₂ conversion range: 5 to 50 L/min (nor): 300 50 to 250 L/min (nor): 500
Proof pressure	kPa	980			
He Leak		<1×10 ⁻¹¹ pa・m³/sec			<1×10 ⁻⁹ pa m³/sec
Ambient and gas temperature	°C	0 to 50			
Temperature effect (*3) (% F.S.)/°C	Zero	0.02		0.05	
	Span	0.02		0.05	
Actuator		Piezo		Solenoid	
Materials of gas contact part	Main unit	SUS316L			
	Valve	SUS316L, PCTFE		PTFE	
	Seal	Ag or Au (*4)			FKM
	Brazing	Nickel (Ni)			
Connection (*5)(*6)	Standard	OD 1/4" SWL, VCR	OD 1/4" SWL, VCR	OD 1/4" SWL, VCR	OD 1/4", 3/8" SWL
	Optional	OD 1/4" VCO	OD 3/8", 1/2" SWL OD 3/8", 1/2" VCR OD 1/4", 3/8", 1/2" VCO	OD 1/4" VCO	OD 1/2" SWL OD 1/4", 3/8", 1/2" VCR OD 1/4", 3/8", 1/2" VCO
Flow rate output signal		0 to 5 V DC, 1 to 5 V DC 4 to 20 mA DC [Load resistance: ≤ 600Ω (for 24 V DC power specification), ≤ 300Ω (for ±15 V DC power specification)]			
Setting signal		0 to 5 V DC, 1 to 5 V DC, 4 to 20 mA DC			
Alarm display		Normal: Green LED blinking, Hi/Lo Alarm: Red LED blinking, Abnormal: Red LED lit			
Alarm output		Open collector (NPN) +30 V DC, 20 mA max			
Zero adjustment		Set via button or communication command			
Communication		RS485 (Modbus RTU)			
Electrical connection		D-Sub 9 pin connector			
Communication connection		RJ45 connector			
Power supply		+15 V DC 80 mA / -15 V DC 20 mA or 24 V DC 90 mA		+15 V DC 90 mA / -15 V DC 160 mA or 24 V DC 200 mA	

(*1) For N₂ conversion details, see page 5.

(*2) For non-standard operating pressure, please contact Tokyo Keiso.

(*3) Temperature effect at 15 to 35°C.

(*4) Determined by the specified gas (see the gas code list (p.5)).

(*5) For connection specifications not listed in the catalog, please contact Tokyo Keiso.

(*6) Swagelok, VCR, and VCO connections use equivalent items.

MASS FLOW METER SPECIFICATIONS

Model		NM-2100DM	NM-2200DM			NM-2300DM	
Measurable gas code (see the list (p.5))		Code 00-41				Code 00-17	
N ₂ conversion range (L/min (nor)) (*1)	Min.	0.005	> 5	> 100	10	> 100	
	Max.	5	100	500	100	400	
Response time (sec) (2% to 100% F.S.)		1					
Accuracy (% F.S.)		±1.0					
Linearity (% F.S.)		±0.5					
Repeatability (% F.S.)		±0.2					
Pressure range	kPa	10 to 980					
Ambient and gas temperature	°C	0 to 50					
Temperature effect (*2) (% F.S.)/°C	Zero	0.02			0.05		
	Span	0.02			0.05		
Proof pressure	kPa	980					
He Leak		<1×10 ⁻¹¹ pa・m ³ /sec			<1×10 ⁻⁹ pa・m ³ /sec		
Materials of gas contact part	Main unit	SUS316L					
	Seal	Ag or Au (*3)			FKM		
	Brazing	Nickel (Ni)					
Fittings (*4)(*5)	Standard	OD 1/4" SWL, VCR	OD 1/4" SWL, VCR		OD 1/4" SWL	OD 3/8" SWL	
	Optional	OD 1/4"VCO	OD 3/8", 1/2" SWL OD 3/8", 1/2", 3/4", 1" VCR OD 1/4", 3/8", 1/2" VCO JIS 10K flange 15A, 20A, or 25A		OD 1/2" SWL OD 1/4", 3/8", 1/2", 3/4" VCR OD 1/4", 3/8", 1/2" VCO JIS 10K flange 15A, 20A		
Flow rate output signal		0 to 5 V DC, 1 to 5 V DC 4 to 20 mA DC [Load resistance: ≤ 600Ω (for 24 V DC power specification), ≤ 300Ω (for ±15 V DC power specification)]					
Alarm display		Normal: Green LED blinking, Hi/Lo Alarm: Red LED blinking, Abnormal: Red LED lit					
Alarm output		Open collector (NPN) +30 V DC, 20 mA max					
Zero adjustment		Set via button or communication command					
Communication		RS485 (Modbus RTU)					
Electrical connection		D-Sub 9 pin connector					
Communication connection		RJ45 connector					
Power supply		+15 V DC 80 mA / -15 V DC 20 mA or 24 V DC 90 mA					

(*1) For N₂ conversion details, see page 5.

(*2) Temperature effect at 15 to 35°C.

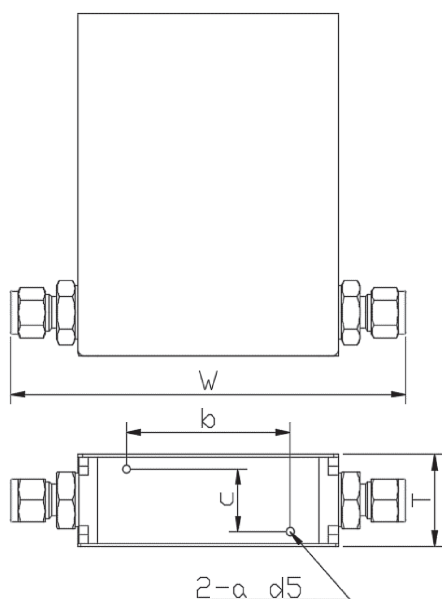
(*3) Determined by the specified gas (see the gas code list (p.5)).

(*4) For connection specifications not listed in the catalog, please contact Tokyo Keiso.

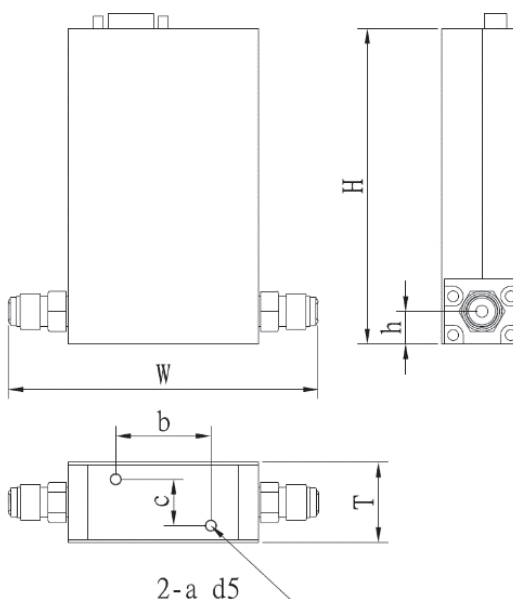
(*5) Swagelok, VCR, and VCO connections use equivalent items.

OUTSIDE DIMENSIONS

- Swagelok connection



- VCR connection



Unit: mm

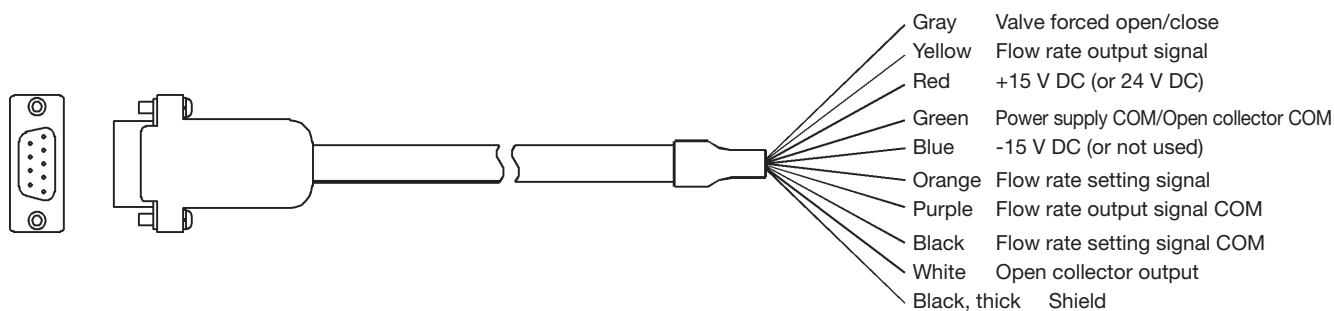
Model		W (*)			T	H	h	Bottom face
		1/4" VCR	1/4" SWL	3/8" SWL				A/B/C
NM-2100DM	NM-2100DC	123.8	127.4	—	32	126	13	A
NM-2200DM	NM-2200DC	155.8	159.4	—	36	134	17	C
—	NM-2310DC	123.8	127.4	—	32	126	13	A
NM-2300DM	NM-2320DC	—	159.4	162.4	36	134	17	B

Bottom face	a	b	c
A	M4	38	18.5
B	M4	68	24.5
C	M5	68	24.5

(*) For face-to-face dimensions other than the standard fittings, please contact Tokyo Keiso.

ACCESSORIES

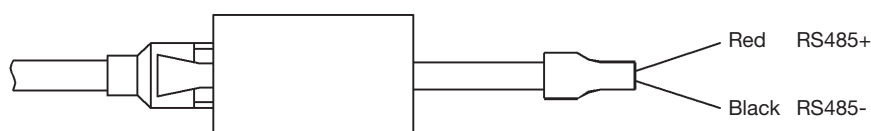
- Signal and power cable: 2 m (standard) up to 5 m [NM-2000DC] or 10 m [NM-2000DM]



- Communication cable (RJ45 connector on both ends): 2 m (standard) or 5 m



- Adapter for communication cable



EXAMPLE OF MODEL SELECTION

To select the product model, use the following formula for N₂ conversion of the range.

For the range and CF (conversion factor), refer to the range code and gas code tables below, respectively.

$$\text{N}_2 \text{ conversion range} = \frac{\text{Range}}{\text{CF of specified gas}}$$

The gas mixture CF can be calculated using the following formula.

$$\text{Gas mixture CF} = \frac{1}{\frac{X_1}{\text{CF}_1} + \frac{X_2}{\text{CF}_2} + \dots}$$

X_n: Constituent ratio of component n (Vol%/100)

CF_n: CF of component n

Example: For NH₃ specifications and 5 L/min (nor) (gas code 20, range code 502),

$$\text{N}_2 \text{ conversion range} = \frac{5}{0.795} \approx 6.289 \text{ L/min (nor)}$$

Therefore, based on catalog pages 3 and 4, the compatible equipment is NM-2200DM or NM-2200DC.

GAS CODE LIST

Code	Gas	Seal	CF	Code	Gas	Seal	CF
00	N ₂	Ag	1.000	20	NH ₃	Au	0.795
01	Air	Ag	1.000	21	NO ₂₍₃₎	Au	0.740
02	O ₂	Ag	0.990	22	HCl	Au	0.990
03	Ar	Ag	1.400	23	HBr	Au	1.040
04	He	Ag	1.400	24	SO ₂	Au	0.620
05	H ₂	Ag	1.010	25	SiF ₄	Au	0.350
06	CO	Ag	1.000	26	SiH ₄	Au	0.645
07	CO ₂	Ag	0.740	27	PH ₃	Au	0.760
08	NO	Ag	0.990	28	B ₂ H ₆	Au	0.440
09	N ₂ O	Ag	0.730	29	WF ₆	Au	0.240
10	Ne	Ag	1.400	30	NF ₃	Au	0.510
11	CH ₄	Ag	0.790	31	BCl ₃	Au	0.470
12	C ₂ H ₂	Ag	0.630	32	BF ₃	Au	0.530
13	C ₂ H ₄	Ag	0.510	33	AsH ₃	Au	0.670
14	C ₂ H ₆	Ag	0.500	34	ClF ₃	Au	0.440
15	C ₃ H ₆	Ag	0.410	35	SiCl ₄	Au	0.315
16	C ₃ H ₈	Ag	0.360	38	CF ₄	Au	0.450
17	C ₄ H ₁₀	Ag	0.260	39	H ₂ S	Au	0.800
18	Cl ₂	Au	0.860	40	TMDS	Au	0.142
19	F ₂	Au	0.1000	41	SF ₆	Au	0.285

RANGE CODE LIST

Code	Range
050	5 mL/min (nor)
100	10 mL/min (nor)
200	20 mL/min (nor)
500	50 mL/min (nor)
101	100 mL/min (nor)
201	200 mL/min (nor)
501	500 mL/min (nor)
102	1 L/min (nor)
202	2 L/min (nor)
502	5 L/min (nor)
103	10 L/min (nor)
203	20 L/min (nor)
303	30 L/min (nor)
503	50 L/min (nor)
104	100 L/min (nor)
204	200 L/min (nor)
254	250 L/min (nor)
404	400 L/min (nor)
504	500 L/min (nor)
ABC	Others*

* Please contact Tokyo Keiso to inquire whether a model corresponding to a range or flow rate unit not listed in the "Code" column can be produced.

* Specification is subject to change without notice.

TOKYO KEISO CO., LTD.

Head Office : Shiba Toho Building, 1-7-24 Shibakoen, Minato-ku, Tokyo 105-8558

Tel : +81-3-3431-1625 (KEY) ; Fax : +81-3-3433-4922

e-mail : overseas.sales@tokyokeiso.co.jp ; URL : <https://www.tokyokeiso.co.jp>