

# TF

# TECHNICAL GUIDANCE

INDICATION, TOTALIZATION, 2-POINT ALARM,  
DC4 to 20mA AND PULSE OUTPUT BY ONE UNIT

## TF-2000N series

ALL-IN-ONE MINI THERMAL MASS FLOWMETER

### OUTLINE

TF-2000N MINI THERMAL MASS FLOWMETER is for the measurement of mass flow rate of various gases without being influenced by changes in pressure and temperature. TF-2000N has LCD indication of flow rate and totalization. Also, functions of scaled output pulse and DC4 to 20 mA are provided. In addition, two point field adjustable alarm contacts are provided. TF-2000N can be operated by DC24V power supply. As mentioned above, one unit provides all necessary functions for flow measurement. Full function and wide Line-up of TF-2000N cover various applications.

### FEATURES

- ❑ Wide range of process connection  
Rc 1/4" screw to 3" flanges are available. They are useful with the extensive use in general process, air conditioning and gas supply line etc.
- ❑ Simultaneous indication of flow rate and totalization  
Large size, two line LCD is provided!
- ❑ Output of current, Pulse and Alarm functions are provided.  
Remote indication, batch processing and safety operations are achieved by one unit.
- ❑ Up to six kinds of gas can be chosen  
Max. 6 different gases can be preset for switch selection.
- ❑ Mass flow measurement  
Flow measurement is not influence of the change in pressure and temperature.

### STANDARD SPECIFICATION

Fluid	Gas (Gas containing more than 10% of hydrogen or helium, or mixed gas of hydrogen or helium with CnHm is unsuitable.)
Scale range	Min. 0 to 2L/min (nor) Max. 0 to 750m <sup>3</sup> /h (nor)
Rangeability	1 : 20 (std.)
Gas press.	- 0.07 to 1.0MPa (std.)
Gas temp.	0 to 60°C
Temp. change effect	Within ±0.1% F.S./°C
Press. change effect	Within ±0.1% F.S./0.1MPa
Response	1 sec. for 90%
Material	Tube : SUS316 Sensor : Combination of SUS316, Glass, CTFE and PT Seal : Viton or CR Housing : AC2A
Finish	Housing: Munsell: N8.5 Stainless body not painted
Construction	Waterproof (Equiv. to IP65)
Installation	Horizontal or Vertical
Ambient temp.	0 to 60°C
Cable entry	2 × G1/2 (terminal: M3 screw)
Power supply	DC24V (DC22V to 27V)
Consumption	Approx. 5.5W

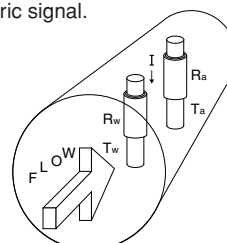


- ❑ Excellent in durability  
Excellent durable sensor supported by old know-how is used.
- ❑ Low pressure drop  
Low pressure drop type is about 2kPa at max. flow
- ❑ High speed response  
90% response within a second and also corresponding to batch processing and total flow rate control
- ❑ Stabilization of Flow rate display and current output  
By setting up a filter coefficient, flow display and current output can be stabilized.
- ❑ Loop check function  
Operation of equipment can be checked in the condition without flowing gas.

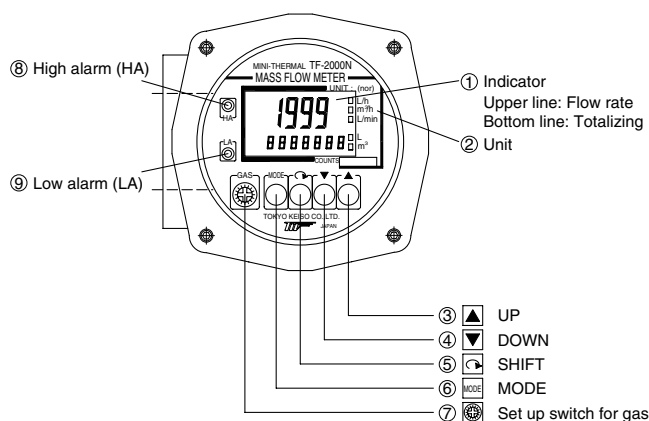
### OPERATION PRINCIPLE

Temperature detection sensor  $R_a$  and velocity detection sensor  $R_w$  are installed in the gas flow path of TF-2000N MINI THERMAL MASS FLOWMETER. The internal electronic circuits keep the temperature gap between  $R_w$  ( $T_w$ ) and  $R_a$  ( $T_a$ =Gas temp.) constant by supplying electric current  $I$ . The transferred heat from  $R_a$  to passed gas ( $R_w I^2$ ) is proportional to the mass flow rate of the gas to be measured which can be calculated from supplied current  $I$ . The detection of mass is not influenced by the change in gas pressure and temperature because it is compensated by the internal software, and finally the measurement is made, completely independent of any operating conditions.

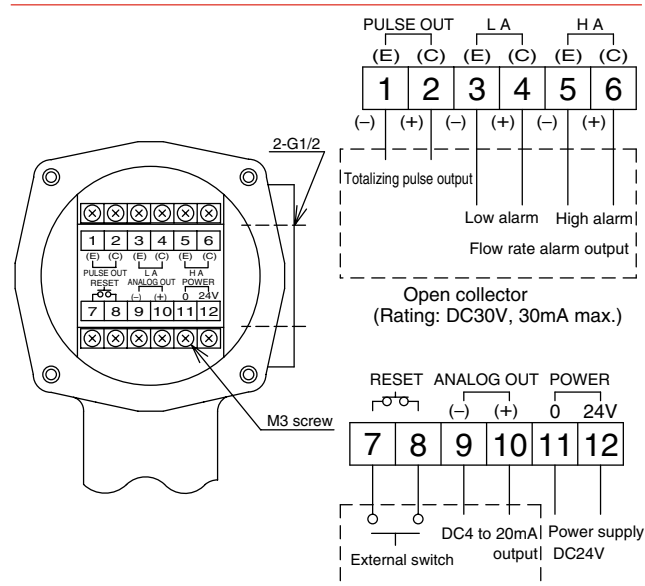
The flow rate is calculated from the supplied current  $I$  and outputted in the form of electric signal.



## FRONT PANEL AND FUNCTION



## TERMINAL



Indication	Flow rate: 4 digits Totalization: 7 digits	LCD Height: 13mm LCD Height: 6mm
Accuracy	Flow rate : $\pm 2\%$ F.S. $\pm 1$ dig. Totalization : $\pm 2.1\%$ F.S. Totalizing count : 60 to 18000c/h	
Low cut off	Std. 5%F.S. (Depending on rangeability) Flow rate, Totalization, Current output, Pulse output	
Output	Current output Output : DC4 to 20mA (Load resistance 500ohms or less) Max. output value: (Approx.) 21.0mA Accuracy : $\pm 2\%$ F.S.	
	Pulse output Output : Open collector Rating : DC30V, 30mA Max. Pulse width : (Approx.) 100ms fixed Pulse rate : Synchronized with pulse count	
	Flow rate alarm output Output : Open collector Action : "ON" when operating (with Red LED for operating confirmation) Rating : DC30V, 30mA Max. Setting : Push key at front panel No. of points : 2 points (H + L alarm) Setting range: 0 to 100% of F.S. Hysteresis : 1.0%F.S. fixed	
Data backup	Setting of parameter and totalizing value is memorized by EEPROM. (Retaining: For 10 years)	

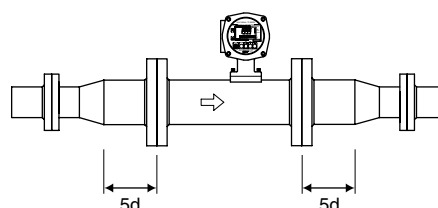
## CAUTION FOR INSTALLATION

- Straight run for upstream and downstream (d: diameter)

Model	Upstream	Downstream
TF-2211N	Unnecessary	Unnecessary
TF-2221N		
TF-2231N		
TF-2241N		
TF-2251N	5d (*1, 2)	5d (*1, 2)

Model	Upstream	Downstream
TF-2421N	5d (*3)	Unnecessary (*3)
TF-2431N		
TF-2441N		

- \*1 The tolerance of the pipe with the different connection from flowmeter is  $\pm 1$  size. Install the necessary straight run with the same connection as flowmeter.

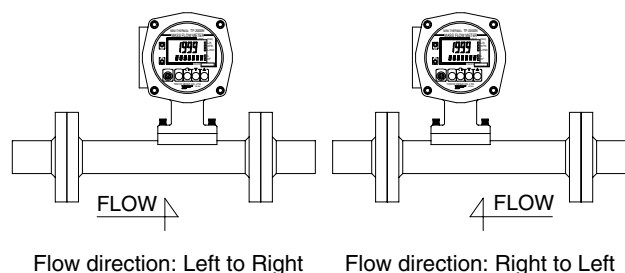


- \*2 Use the pipe less than Sch. 80 for Rc screw connection.  
\*3 Installation of the pipe is the same connection of flowmeter.

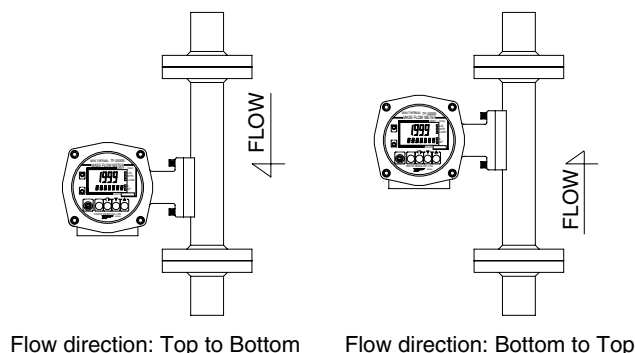
- Before installing the flowmeter onto process piping, flush and clean the whole piping.
- Install valves downstream if any.
- Use the shielded cable for wiring and do not locate it near to power supply line etc. to avoid the electric noise.
- There is the arrow mark showing the flow direction. Make the installation so that the measured gas can flow as per the arrow marking.

## INSTALLATION POSTURE

### ● Horizontal installation

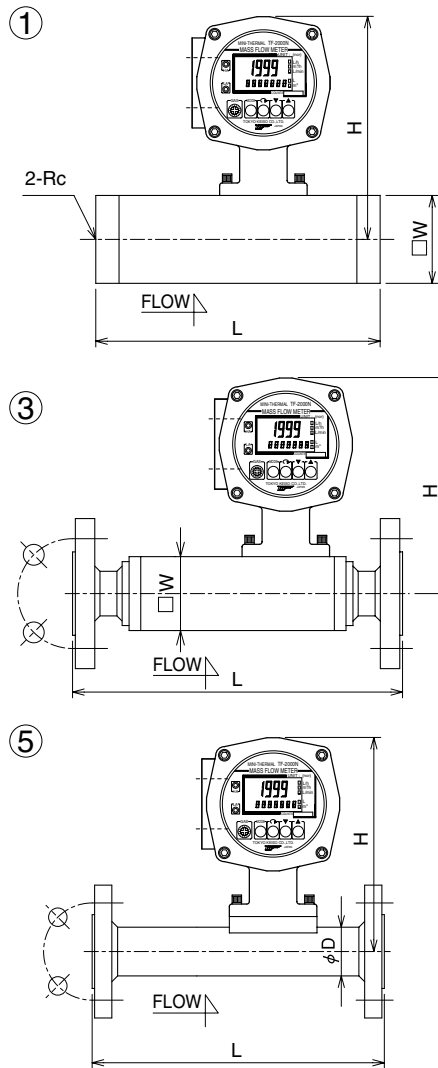


### ● Vertical installation

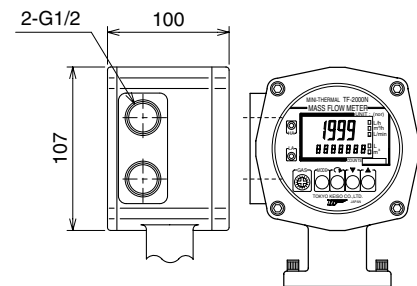


- \* When installing vertically, indicator can be placed on the right-hand side. Specify to that effect when ordering. At this time, cable entry is on the upper side, so waterproof treatment shall be performed.

## DIMENSION (mm)



## DIMENSION OF INDICATOR



Model	Fig.	Process connection	L	W (D)	H	Mass (Approx.)
TF-2211N	①	Rc 1/4, 3/8, 1/2 Female screw	108	38	162	2.9 kg
	②	OD 1/4 SWL	159			3.2 kg
		OD 3/8 SWL	162			
		OD 1/2 SWL	166			
	③	JIS 10K 15A Flange	196			4.4 kg
JIS 10K 20A Flange		4.7 kg				
JIS 10K 25A Flange		5.5 kg				
TF-2221N	①	Rc 1/4, 3/8, 1/2 Female screw	120	38	162	3.0 kg
	②	OD 1/4 SWL	171			3.3 kg
		OD 3/8 SWL	176			
		OD 1/2 SWL	181			
	③	JIS 10K 15A Flange	208			4.5 kg
JIS 10K 20A Flange		4.8 kg				
JIS 10K 25A Flange		5.6 kg				
TF-2231N	①	Rc 1/4, 3/8, 1/2 Female screw	135	38	162	4.2 kg
	②	OD 1/4 SWL	188			4.5 kg
		OD 3/8 SWL	191			
		OD 1/2 SWL	196			
	③	JIS 10K 15A Flange	223			5.7 kg
JIS 10K 20A Flange		6.0 kg				
JIS 10K 25A Flange		6.8 kg				
TF-2241N	①	Rc 3/8, 1/2, 3/4 Female screw	160	45	166	4.9 kg
	②	OD 3/8 SWL	216			5.2 kg
		OD 1/2 SWL	221			
		OD 3/4 SWL	230			
	③	JIS 10K 15A Flange	254			6.4 kg
JIS 10K 20A Flange		6.7 kg				
JIS 10K 25A Flange		7.5 kg				
TF-2251N	④	Rc 1 Female screw	195	50	166	3.3 kg
		Rc 1 1/4 Female screw	215	60	175	3.2 kg
		Rc 1 1/2 Female screw	230	65	177	3.3 kg
		Rc 2 Female screw	270	75	183	4.0 kg
	⑤	JIS 10K 25A Flange	195	34	166	5.0 kg
		JIS 10K 32A Flange	215	43	175	5.5 kg
		JIS 10K 40A Flange	230	49	177	5.7 kg
		JIS 10K 50A Flange	270	61	183	6.8 kg
		JIS 10K 65A Flange	290	77	191	9.4 kg
		JIS 10K 80A Flange	320	89	198	10.4 kg
TF-2421N	①	Rc 1/2 Female screw	145	38	162	2.9 kg
②	JIS 10K 15A Flange	233	4.9 kg			
TF-2431N	①	Rc 3/4 Female screw	160	45	166	3.6 kg
②	JIS 10K 20A Flange	254	5.7 kg			
TF-2441N	①	Rc 1 Female screw	190	54	170	4.7 kg
	②	JIS 10K 25A Flange	290			6.9 kg

Model code										Description	
TF-2				N			—		—		
Type	2									Standard type	
	4									Low pressure drop type	
Range	1									Max. 120L/min (nor)	
	2									Max. 250L/min (nor)	
	3									Max. 500L/min (nor)	
	4									Max. 1000L/min (nor)	
	5									Max. 750m³/h (nor)	
Output			1							DC4 to 20mA, Pulse, Alarm output	
Scale range [L/min (nor)]					020					0 to 2 L/min (nor)	TF-2211N
					030					0 to 3 L/min (nor)	
					050					0 to 5 L/min (nor)	
					080					0 to 8 L/min (nor)	
					100					0 to 10 L/min (nor)	
					150					0 to 15 L/min (nor)	
					200					0 to 20 L/min (nor)	
					300					0 to 30 L/min (nor)	
					500					0 to 50 L/min (nor)	
					800					0 to 80 L/min (nor)	
					101					0 to 100 L/min (nor)	
					121					0 to 120 L/min (nor)	
					151					0 to 150 L/min (nor)	
					201					0 to 200 L/min (nor)	TF-2221N/ TF-2421N
					251					0 to 250 L/min (nor)	
					301					0 to 300 L/min (nor)	TF-2231N/ TF-2431N
					401					0 to 400 L/min (nor)	
					501					0 to 500 L/min (nor)	TF-2241N/ TF-2441N
					601					0 to 600 L/min (nor)	
					801					0 to 800 L/min (nor)	
102					0 to 1000L/min (nor)						
Full scale range (A·B) × 10 <sup>6</sup> [m³/h (nor)] Ex.) 50m³/h (nor) → 500					ABC					0 to 750m³/h (nor) (Refer to Table 1.)	TF-2251N
					P					Rc female screw	Refer to P.3 for process connection of each model
					S					SWL	
					F					JIS10K flange	
					04					1/4B	
					06					10mm (3/8B)	
					15					15mm (1/2B)	
					20					20mm (3/4B)	
					25					25mm (1B)	
					32					32mm (1 1/4B)	
					40					40mm (1 1/2B)	
					50					50mm (2B)	
					65					65mm (2 1/2B)	
					80					80mm (3B)	
					R	Flow direction		Left to Right (Std.)			
					L	Right to Left					
					U	Bottom to Top					
					D	Top to bottom					

Table 1. TF-2251N Scale range

Unit: m³/h (nor)

Connection	Gas	AIR	N <sub>2</sub>	O <sub>2</sub>	CO	CO <sub>2</sub>	Ar	NH <sub>3</sub>	CH <sub>4</sub>	C <sub>2</sub> H <sub>6</sub>	C <sub>3</sub> H <sub>8</sub>	C <sub>4</sub> H <sub>10</sub>	13A
25	Min.	0 to 30	0 to 30	0 to 30	0 to 30	0 to 30	0 to 30	0 to 23	0 to 15	0 to 17	0 to 14	0 to 12	0 to 15
	Max.	0 to 75	0 to 75	0 to 75	0 to 75	0 to 75	0 to 75	0 to 57	0 to 38	0 to 42	0 to 35	0 to 30	0 to 37
32	Min.	0 to 65	0 to 65	0 to 65	0 to 65	0 to 65	0 to 65	0 to 49	0 to 33	0 to 36	0 to 30	0 to 26	0 to 32
	Max.	0 to 150	0 to 150	0 to 150	0 to 150	0 to 150	0 to 150	0 to 114	0 to 75	0 to 84	0 to 69	0 to 60	0 to 74
40	Min.	0 to 90	0 to 90	0 to 90	0 to 90	0 to 90	0 to 90	0 to 68	0 to 45	0 to 50	0 to 41	0 to 36	0 to 44
	Max.	0 to 200	0 to 200	0 to 200	0 to 200	0 to 200	0 to 200	0 to 152	0 to 100	0 to 112	0 to 92	0 to 80	0 to 98
50	Min.	0 to 140	0 to 140	0 to 140	0 to 140	0 to 140	0 to 140	0 to 106	0 to 70	0 to 78	0 to 64	0 to 56	0 to 69
	Max.	0 to 320	0 to 320	0 to 320	0 to 320	0 to 320	0 to 320	0 to 243	0 to 160	0 to 179	0 to 147	0 to 128	0 to 157
65	Min.	0 to 220	0 to 220	0 to 220	0 to 220	0 to 220	0 to 220	0 to 167	0 to 110	0 to 123	0 to 101	0 to 88	0 to 108
	Max.	0 to 520	0 to 520	0 to 520	0 to 520	0 to 520	0 to 520	0 to 395	0 to 260	0 to 291	0 to 239	0 to 208	0 to 255
80	Min.	0 to 320	0 to 320	0 to 320	0 to 320	0 to 320	0 to 320	0 to 243	0 to 160	0 to 179	0 to 147	0 to 128	0 to 157
	Max.	0 to 750	0 to 750	0 to 750	0 to 750	0 to 750	0 to 750	0 to 570	0 to 375	0 to 420	0 to 345	0 to 300	0 to 368

\* Specification is subject to change without notice.

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