



TECHNICAL GUIDANCE

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

TF-2000T Series

ALL-IN-ONE MINI THERMAL MASS FLOWMETER

OUTLINE

TF-2000T 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-2000T 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-2000T 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-2000T 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 and scale range can be chosen
Up to 6 different gases and scale ranges can be preset using keys.
- ❑ 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 ³ /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 [Excluding TF-2251T] SUS304 or SUS316 [TF-2251T] (SUS304 only as for the flange connection) Sensor : Combination of SUS316, Glass, CTFE and PT Seal : FKM 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

Installation & flow directions: Horizontal and Left to Right (standard) set up at factory.

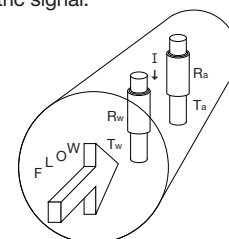


- ❑ Excellent in durability
Excellent durable sensor supported by old know-how is used.
- ❑ Low pressure drop
Low pressure drop type is about 2kPa at max. flow
- ❑ High speed response
90% response within a second and also corresponding to batch processing and total flow rate control
- ❑ Stabilization 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.

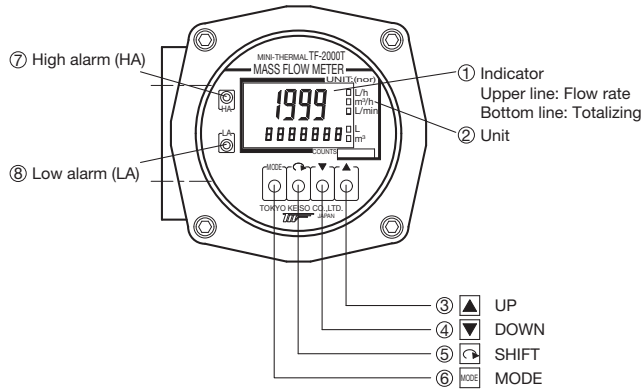
OPERATION PRINCIPLE

Temperature detection sensor Ra and velocity detection sensor Rw are installed in the gas flow path of TF-2000T MINI THERMAL MASS FLOWMETER. The internal electronic circuits keep the temperature gap between Rw (Tw) and Ra (Ta=Gas temp.) constant by supplying electric current I. The transferred heat from Ra to passed gas (RwI^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.

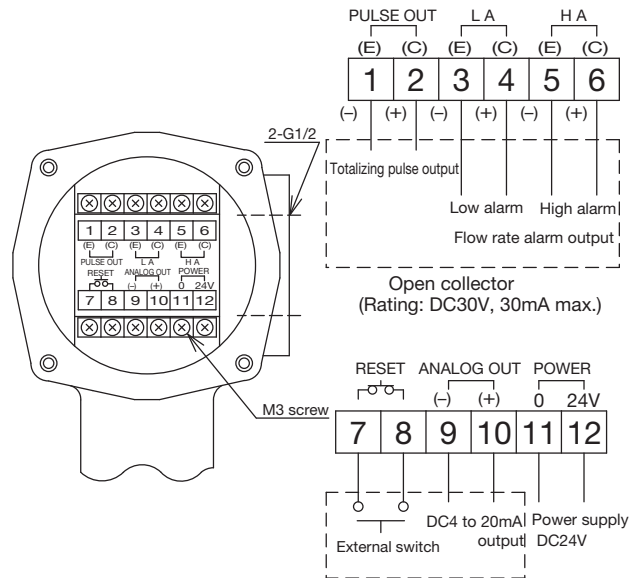


FRONT PANEL AND FUNCTION



* Use the MODE key for gas setting.

TERMINAL

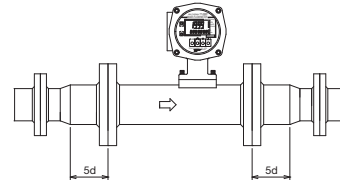


CAUTION FOR INSTALLATION

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

Model code	Upstream	Downstream	Model code	Upstream	Downstream
TF-2211T	Unnecessary	Unnecessary	TF-2421T	5d (*3)	Unnecessary (*3)
TF-2221T					
TF-2231T					
TF-2241T					
TF-2251T	5d (*1, 2)	5d (*1, 2)			

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

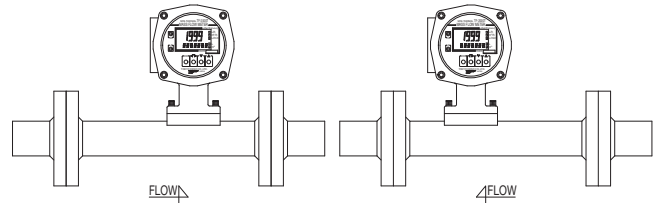


*2 Use the pipe less than Sch. 80 for Rc screw connection.
*3 Installation of the pipe is the same connection of flowmeter.

- 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.

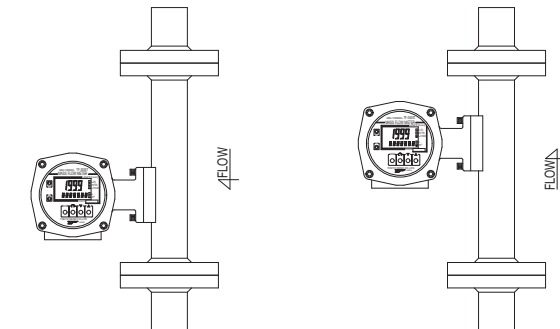
INSTALLATION POSTURE

● Horizontal installation



Flow direction: Left to Right Flow direction: Right to Left

● Vertical installation

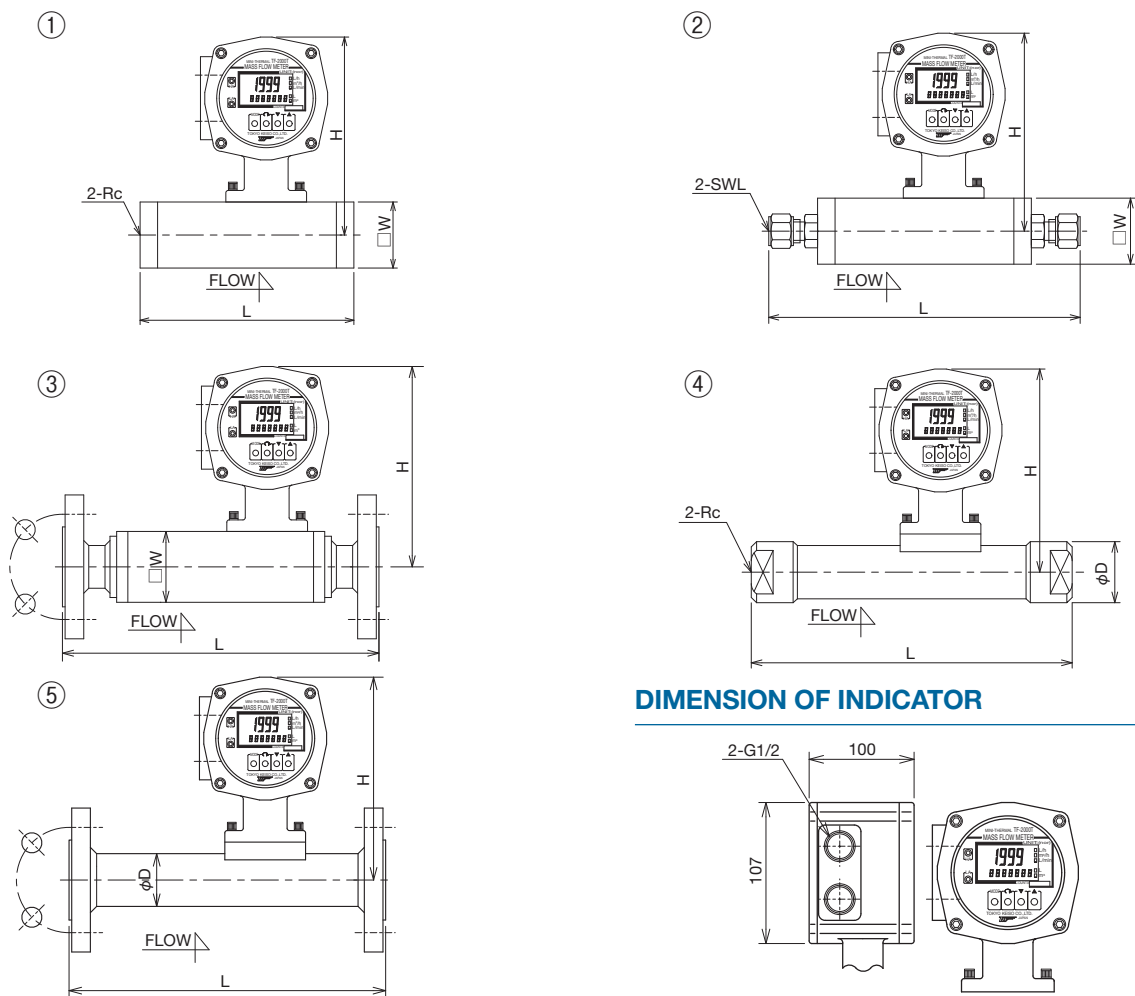


Flow direction: Top to Bottom Flow direction: Bottom to Top

* 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.

Indication	Flow rate : 4 digits LCD Height: 13mm Totalization: 7 digits LCD Height: 6mm
Accuracy	Flow rate : $\pm 2\%$ F.S. ± 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.) 24.0mA 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 accuracy: $\pm 1.0\%$ F.S. Setting range : 0 to 100% of F.S. Hysteresis : $1 \pm 0.5\%$ F.S. fixed
Data backup	Setting of parameter and totalizing value is memorized by EEPROM. (Retaining: For 10 years)

DIMENSION (mm)



DIMENSION OF INDICATOR

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

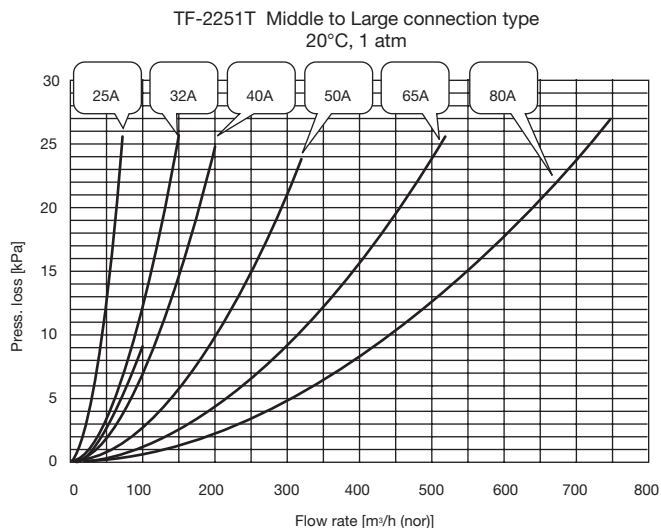
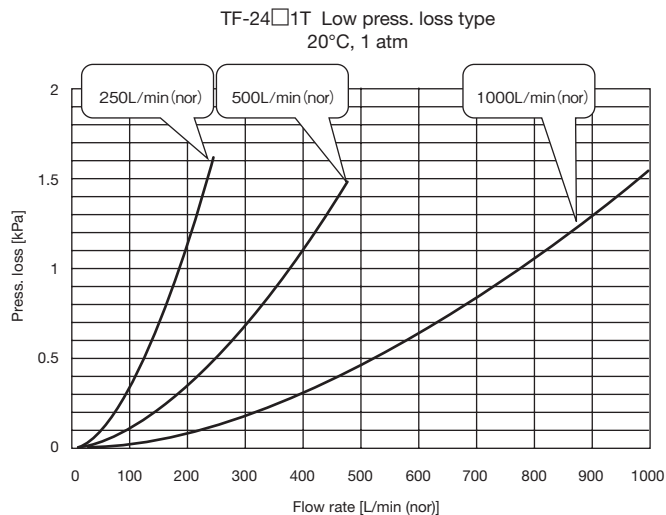
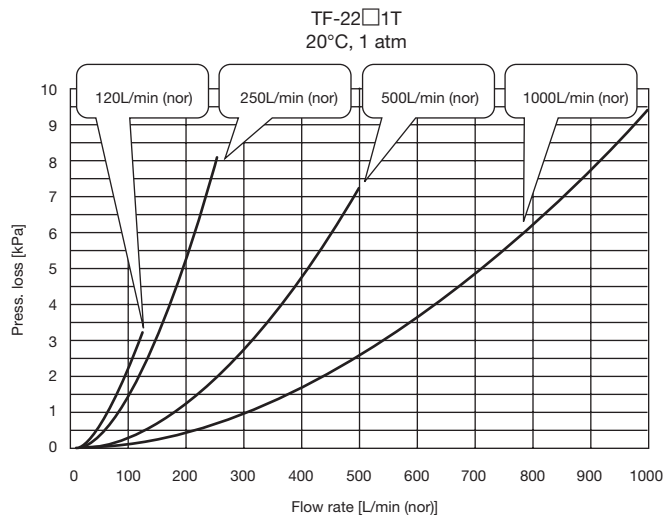
Model code										Description				
TF-2				T	—	—	—	—	—		Standard type			
Type	2				—	—	—	—	—		Low pressure drop type			
	4				—	—	—	—	—					
Scale range	1				—	—	—	—	—		Max. 120L/min (nor)			
	2				—	—	—	—	—		Max. 250L/min (nor)			
	3				—	—	—	—	—		Max. 500L/min (nor)			
	4				—	—	—	—	—		Max. 1000L/min (nor)			
	5				—	—	—	—	—		Max. 750m ³ /h (nor)			
Output		1			—	—	—	—	—		DC4 to 20mA, Pulse, Alarm output			
Scale range [L/min (nor)]					— 020	—	—	—	—		0 to 2 L/min (nor)			
					— 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)			
					— 251	—	—	—	—		0 to 250 L/min (nor)			
					— 301	—	—	—	—		0 to 300 L/min (nor)			
					— 401	—	—	—	—		0 to 400 L/min (nor)			
					— 501	—	—	—	—		0 to 500 L/min (nor)			
					— 601	—	—	—	—		0 to 600 L/min (nor)			
					— 801	—	—	—	—		0 to 800 L/min (nor)			
				— 102	—	—	—	—		0 to 1000 L/min (nor)				
Full scale range (A·B) × 10 ^c [m ³ /h (nor)] Ex.) 30m ³ /h (nor)→300 400m ³ /h (nor)→401 750m ³ /h (nor)→751					—	ABC					Max. 750m ³ /h (nor) (Refer to Table 1.)			
Main material SUS316 excluding TF-2251T					4						SUS304			
					6						SUS316			
Connection rating						P	—				Rc female screw			
						S	—				SWL			
						F	—				JIS10K flange			
Connection size						04	—				1/4"			
						06	—				10mm (3/8")			
						15	—				15mm (1/2")			
						20	—				20mm (3/4")			
						25	—				25mm (1")			
						32	—				32mm (1-1/4")			
						40	—				40mm (1-1/2")			
						50	—				50mm (2")			
						65	—				65mm (2-1/2")			
						80	—				80mm (3")			
Flow direction						R	Left to Right (Std.)							
						L	Right to Left							
						U	Bottom to Top							
						D	Top to bottom							

Table 1. TF-2251T Full scale

Unit: m³/h (nor)

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

PRESSURE LOSS (The following graphic chart is data in case of air.)



* Specification is subject to change without notice.

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