TECHNICAL GUIDANCE

BEST COST PERFORMANCE ACHIEVED

TC-3000 Series

MINI-THERMAL MASS FLOW CONTROLLER

OUTLINE

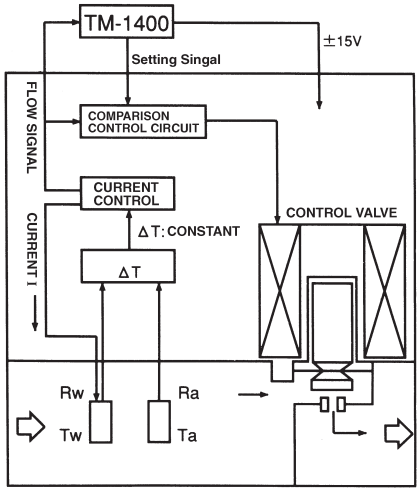
TC-3000 ***MINI-THERMAL MASS FLOW CONTROLLER*** is developed based on the technology of **TF-1000 series** ***MINI-THERMAL MASS FLOWMETER*** which have been accepted by the market for long time with high reputation.
Highly accurate measurement and control of various kinds of gases are conducted free from change of process operation condition, i. e. pressure, temperature..., etc.
Thanks to simple design construction, remarkable competitive price level has been possible for easy usage in wide application.
TM-1400, DIN 72×72 compact All-in One converter, is available for simplified installation and wiring.

FEATURES

- ❏ COST
  TC-3000 has broken the previous idea for cost of Mass Flow controller.
- ❏ EASY MEASUREMENT
  Thermal theory based mass flow measurement eliminates compensation data processing for change of process condition.
- ❏ ALL-THROUGH DESIGN
  Eliminating by-pass sensor piping which is common on ordinary mass flow controllers. TC-3000 is insensitive against dust or particles in process gases.
- ❏ WIDE RANGE COVERAGE
  TC-3000 covers maximum 800L/min (nor) flow range.
- ❏ ANALOG OUTPUT VERSION
  24 V DC power supply + 4 to 20 mA DC output version (TC-3100S) is available standard control loop.
- ❏ ALL-IN-ONE CONVERTER
  TM-1400 converter offers simple installation and wiring with lowest instrumentation cost.

OPERATION PRINCIPLE

In **TC-3000**, Sensor **Rw** is heated by feeding electric current I. Temp. sensor **Ra** is not heated and detect gas temperature. The feeding current I is controlled by electonics to keep the difference of temperature of **Rw** and **Ra** constant.
The heat which is transferred to gas to be measured from Rw is the function of mass flow rate which passes through Rw. Thus, the mass flow rate of the gas can be calculated by the factor of feeding current I.
The value of I is converted into flow rate signal and sent to comparison/ control circuit.
In this circuit, the flow rate signal and control signal are compared and Control valve is controlled so that the two signals are equal.
Normal close type solenoid valve is adopted for small/ medium size, and solenoid valve controlled Diaphragm valve is used for large sizes.



STANDARD SPECIFICATION

❑TC-3000 CONTROLLER UNIT

GAS TO BE MEASURED	All kinds of gases, except gases containing more than 10%(VOL) of H_2 or He and mixtures of H_2 or He and CnHm.				
RANGE	**TC-3100S**	**TC-3100**	**TC-3300**	**TC-3600**	**TC-3800**
SCALE RANGE	Min. 0 to 2L/min(nor)	Max. 0 to 100L/min(nor)	0 to 300L/min(nor)	0 to 600L/min(nor)	0 to 800L/min(nor)
MAX. GAS PRESS.	0.98MPa				
GAS TEMP.	5 to 50℃				
CONTROL RANGE	2 to 100% of Full Scale				
RESPONSE TIME	Within 2 sec.		Within 4 sec.		
CONTROL DP RANGE	2 to 70L/min(nor)···0.06 to 0.3MPa 70 to 100L/min(nor)···0.07 to 0.3MPa		0.15 to 0.34MPa	0.18 to 0.44MPa	0.20 to 0.44MPa
PROCESS CONN.	Rc1/4, OD1/4 Swagelok		Rc3/4, Rc1		Rc1
FLOW OUTPUT SIGNAL	4 to 20 mA DC(0 to 100%)	0 to 5 V DC(0 to 100%)			
FLOW CONTROL INPUT SIGNAL	4 to 20 mA DC(0 to 100%)	0 to 5 V DC(0 to 100%)			
OUTPUT, CONTROL ACCURACY	±2%F.S. (at 25°C)				
TEMP. EFFECT	SPAN : ±0.1%F.S./℃ Max. ZERO : ±0.01%F.S./℃ Max.				
GAS CONTACT MATERIAL	BODY : SUS316, SCS14(TC-3100/3100S) SENSOR : Combination of SUS316, Pt, Glass, CTFE CONTROL VALVE : SUS430(TC-3100/3100S), *SHOMAC(TC-/3600/3800) SEAL : FKM or CR				
POWER SUPPLY	21 to 27 V DC, 330mA	±15 V DC $^{+150mA}_{-200mA}$	±15 V DC $^{+150mA}_{-320mA}$	±15 V DC $^{+150mA}_{-200mA}$	
ELEC. CONN.	M3 screw terminal	Exclusive connector			
AMB HUMID.	85% RH(To be free from condensation)				
WEIGHT	0.8kg		6.0kg	5.1kg	

* : Specially high purity Ferrite system Stainless steel(High corrosion resitant and strong magnetic material)

❑TM-1400 CONVERTER UNIT

INDICATION		STANDARD SPECIFICATION
	INDICATION	$3^1/_2$ digit Red colour LED(H; 10.2mm)
	SCALING FACTOR	FACTORY SET
	ACCURACY	Sensor accuracy ±0.1% F.S. ±1 dig
ANALOG OUTPUT		STANDARD SPECIFICATION
	4 to 20 mA DC	Max. load 550Ω
		Output Accuracy : ±0.1% F.S. on to Sensor Accuracy
	0 to 5 V DC	Resistance load : ≧5KΩ
		Output Accuracy : As per Sensor Accuracy
CONTROL SETTING		STANDARD SPECIFICATION
	EXTERNAL SETTING SIGNAL	4 to 20 mA DC : Ri 250Ω
		0 to 5 V DC : Ri 100kΩ
		1 to 5 V DC : Ri 100kΩ
	MANUAL SETTING	10 rotation POT., 1% resolutionality
		Proportional setting of external signal
		External Control Signal
	OPTION	Soft Start Function (5 sec. setting)
	POWER SUPPLY	85 to 240 V AC, 50/60Hz
	CONSUMPTION	Approx 15VA
	ELEC. CONN.	Sensor : Exclusive Connector
		Ext. : M3, Screw terminal
	MOUNTING	Panel mount
		DIN 72 × 72, Installation fitting provided
	ENCLOSURE	In-door use (IP 20)
	AMB. TEMP.	0 to +50℃
	AMB. HUMID.	85%RH (to be free from condensation)
	WEIGHT	550g

❑ CONNECTION CABLE

Connection cables are available as follows.
End of cable model code: length in “meters” to be filled.
(Ex: SC-CM cable 2m → “SC-CM-02”)

Type	Application	Length
SC-CM-□□	TC-3000 ↔TM-1400	Standard 2m (Max. 100m)
SC-TC-□□	TC-3000 ↔power supply (prepared by customer)	Standard 2m (Max. 100m)

MODEL CODE

❑TC-3000 CONTROLLER UNIT

TC-3		–		–			Description	
Size	**100**						MAX 100L/min (nor)	
	100S							
	300						MAX 300L/min (nor)	
	600						MAX 600L/min (nor)	
	800						MAX 800L/min (nor)	
Full scale			**020**				2L/min (nor)	TC-3100/3100S
			100				10L/min (nor)	
			300				30L/min (nor)	
			500				50L/min (nor)	
			700				70L/min (nor)	
			101				100L/min (nor)	
			201				200L/min (nor)	TC-3300
			301				300L/min (nor)	
			601				600L/min (nor)	TC-3600
			801				800L/min (nor)	TC-3800
Connection type					**R**		Rc Thread	TC-3100/3100S TC-3300/3600/3800
					S		Swagelok	TC-3100/3100S
Connection size						**04**	1/4''	TC-3100/3100S
						12	3/4''	TC-3300/3600
						16	1''	TC-3300/3600/3800

❑TM-1400 CONVERTER UNIT

TM-14		**0**	**–**	**2**		Description
Analog output	**1**					4 to 20 mA DC
	2					0 to 5 V DC
Flow setting			**–**	**2**		External setting / With manual setting change
External setting signal					**0**	Not provided
					1	4 to 20 mA DC
					2	0 to 5 V DC
					3	1 to 5 V DC

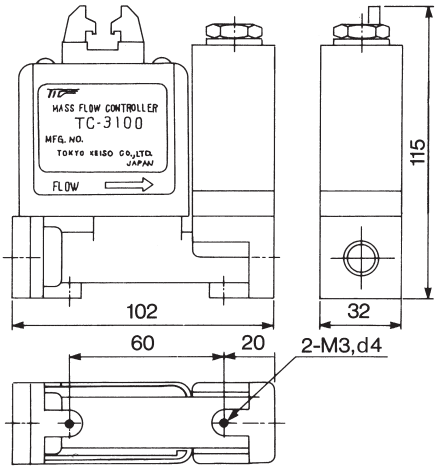
CAUTION ON USE

- Install the unit horizontally with its connector facing upwards.
- The primary pressure should be the same as the operating pressure as specified in the inquiry.
- Install the unit so that the arrow on the unit matches the flow direction of fluid.

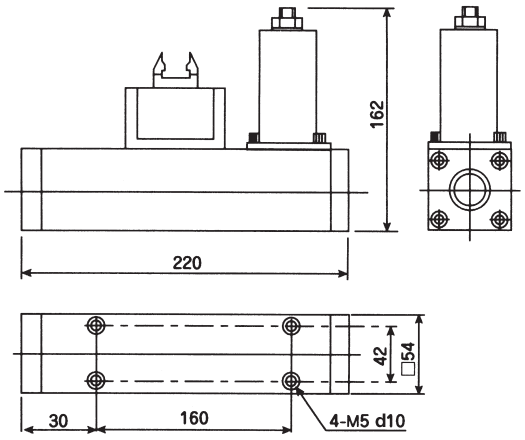
DIMENSION(mm)

❑TC-3000 CONTROLLER UNIT

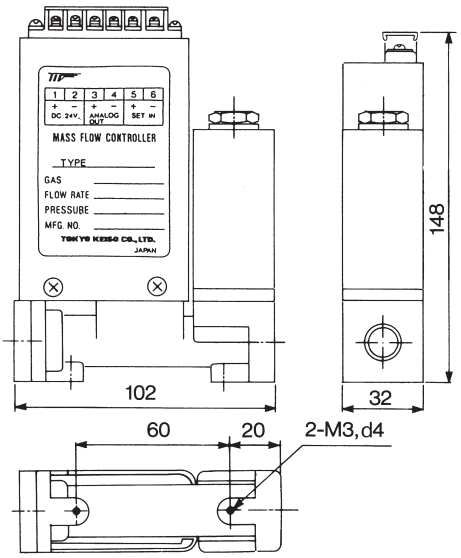
● TC-3100



● TC-3300



● TC-3100S



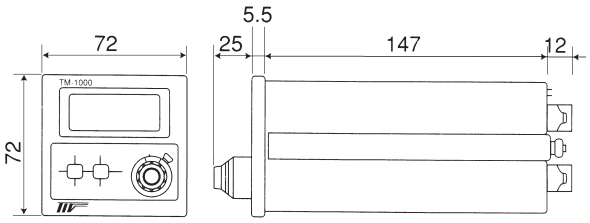
● TC-3100S TERMINAL

TERMINAL OF TC-3100S

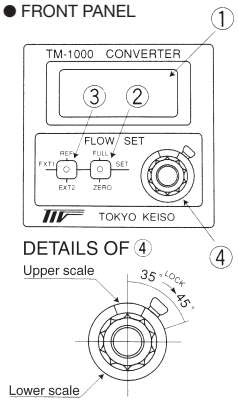
No		Description
1	+	24 V DC Powersupply
2	–	
3	+	4 to 20 mA DC Flow signal output
4	–	
5	+	4 to 20 mA DC Setting signal input
6	–	

❑TM-1400 CONVERTER UNIT

● TM-1400

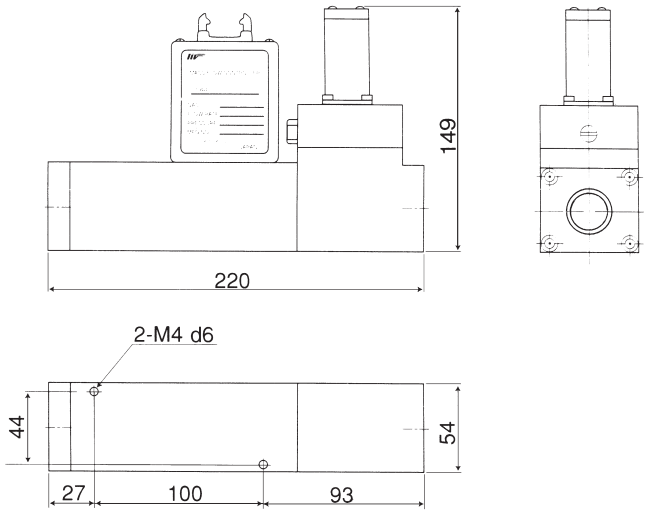


● FRONT PANEL

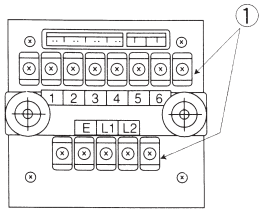


No.	NAME	DESCRIPTION	
①	Indicator	$3^1/_2$ digit LED	
②	Flow setting switch	FULL	100% of full scale
		SET	Ref. to ③
		ZERO	0% of full scale
③	Flow setting signal switch	②to be set "SET"	
		REF	Acc. to Dial setting (0 to 100% of full scale)
		EXT(1)	Acc. to Dial setting × External signal
		EXT(2)	Acc. to External signal
④	Flow setting dial	10 rotation analog dial(1% resolution)	
		Clockwise	Increase
		C-Clockwise	Decrease
		Upper scale	10% graduation
		Lower scale	1% graduation

● TC-3600/3800



● REAR PANEL

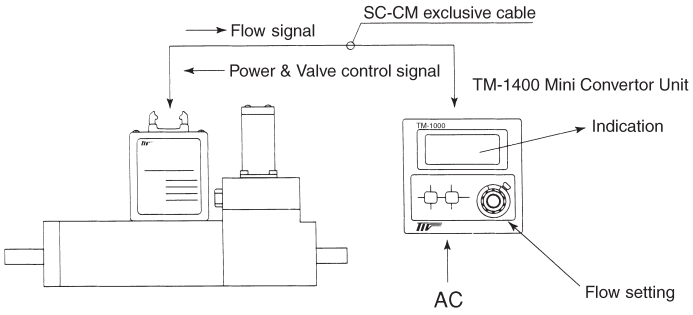


TERMINAL

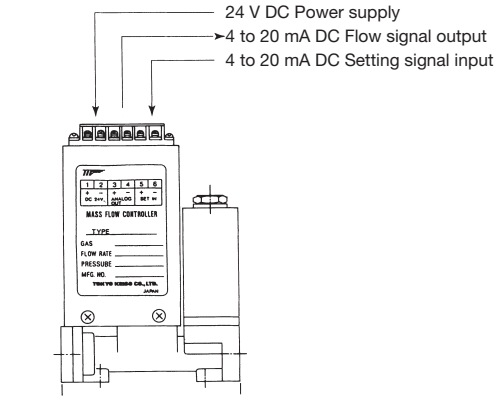
No		Contents
1	+	Analog output
2	–	
3		Disabled
4		
5	+	External setting input signal
6	–	
E		NC
L1		DC24V power supply
L2		

APPLICATION EXAMPLE

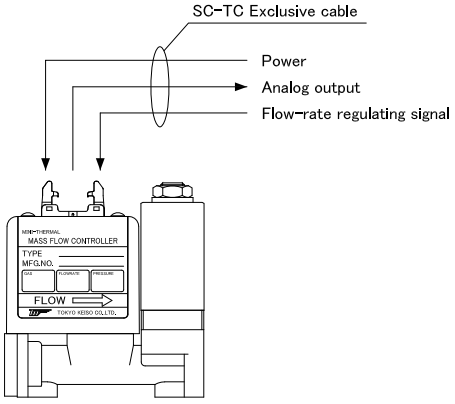
❑ GENERAL CONTROL PROCESS



TC-3100 MINI THERMAL MASS FLOW CONTROLLER
TC-3300/3600/3800 MINI THERMAL MASS FLOW CONTROLLER

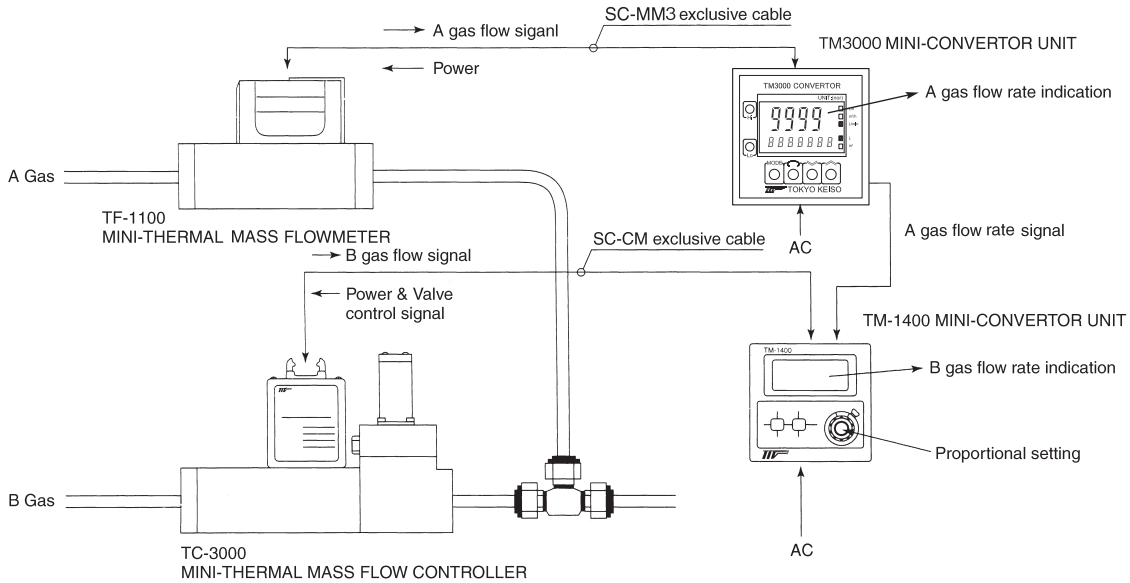


TC-3100S MINI THERMAL MASS FLOW CONTROLLER



TC-3100 MINI THERMAL MASS FLOW CONTROLLER
TC-3300/3600/3800 MINI THERMAL MASS FLOW CONTROLLER

❑ PROPORTIONAL MIXING PROCESS



This is an example of mixing of A and B gas in a given proportion. The flow rate of A gas is measured by TF-1000 series Mini-Thermal Mass flowmeter and its signal is input to TM-1400 as External setting signal. At TM-1400 Converter, freely adjustable setting dial is provided for set gas proportion and TM-1400 sends valve signal to TC-3000 Mini-Thermal Massflow Controller to control the operation of control valve.

* Specification is subject to change without notice.

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