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 electronics 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 MINI-THERMAL MASS FLOW CONTROLLER

GAS TO BE MEASURED
- All kinds of gases, except gases containing more than 10% (VOL) of H2 or He and mixtures of H2 or He and CnHm.

RANGE
- TC-3100S: 0 to 1000L/min (nor) Max. 1000L/min (nor)
- TC-3100: 0 to 1000L/min (nor) Max. 1000L/min (nor)
- TC-3300: 0 to 3000L/min (nor)
- TC-3600: 0 to 6000L/min (nor)
- TC-3800: 0 to 8000L/min (nor)

SCALE RANGE
- The primary pressure should be the same as the operating pressure as specified in the inquiry.

MAX. GAS PRESS.
- 0.98Mpa

GAS TEMP.
- 5 to 50°C

CONTROL RANGE
- 2 to 100% of Full Scale

RESPONSE TIME
- Within 2 sec.

CONTROL DP RANGE
- 2 to 100% of Full Scale

PROC. CONN.
- Rc1/4, OD1/4 Swagelok

FLOW OUTPUT SIGNAL
- 4 to 20 mA DC (0 to 100%)

GAS CONTACT MATERIAL
- SUS316, SCS14

TEMP. EFFECT
- ±0.1%FS/°C Max.

WEIGHT
- 0.8kg

AMB. HUMID.
- 85% RH (to be free from condensation)

ELEC. CONN.
- DIN 72, Installation fitting provided

POWER SUPPLY
- 85 to 240 V AC, 50/60Hz

RESPONSE TIME
- Within 4 sec.

CONSUMPTION
- Approx 15VA

ELEC. CONN.
- Ext. : M3, Screw terminal

ERROR
- ±0.01%F.S.

MAINTENANCE
- Not provided

 indications:
- 3 1/2 digit Red colour LED (H : 10.2mm)

STANDARD SPECIFICATION

TM-1400 CONVERTER UNIT

INDICATION
- 3 1/2 digit Red colour LED (H : 10.2mm)

CALIBRATION FACTORY SET

ACCURACY
- Sensor accuracy ±0.1% F.S. ±1 dig

STANDARD SPECIFICATION

Max. load 550Ω

Output Accuracy: ±0.1% F.S. on to Sensor Accuracy

Resistance load: ±5Ω

Output Accuracy: As per Sensor Accuracy

4 to 20 mA DC

Output Accuracy: ±0.1% F.S. on to Sensor Accuracy

0 to 5 V DC

Resistance load: ±5Ω

EXTERNAL SETTING SIGNAL
- 4 to 20 mA DC : R = 250Ω

0 to 5 V DC : R = 10KΩ

1 to 5 V DC : R = 10KΩ

MANUAL SETTING
- 10 rotation POT., 1% resolutionality

PROPORTIONAL SETTING OF EXTERNAL SIGNAL
- Proportional setting of external signal

EXTERNAL CONTROL SIGNAL
- External Control Signal

OPTION
- Soft Start Function (5 sec. setting)

STANDARD SPECIFICATION

PULSE RATE
- 60 to 120000/0 (5,555)

PULSE WIDTH
- 100ms

PULSE FREQUENCY
- Vce=50Vmax, Vsat=1.2Vmax, Ice=20mAmax

MAX. GAS PRESS.
- 0.98MPa

RANGE
- TC-3100S TC-3100 TC-3300 TC-3600 TC-3800

GAS TO BE MEASURED
- All kinds of gases, except gases containing more than 10% (VOL) of H2 or He and mixtures of H2 or He and CnHm.

CONSTRUCTION
- SUS316, Pt, Glass, CTFE

ENCLOSURE
- In-door use (IP 20)

AMBIENT TEMP.
- 0 to +50°C

AMBIENT HUMID.
- 85%RH (to be free from condensation)

WEIGHT
- 550g

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.
APPLICATION EXAMPLE

- **GENERAL CONTROL PROCESS**

- **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.*