
	INSTALLATION & OPERATION MANUAL	Document No	FATZ13028-P-F821-001
		Rev	A
		Data	Mar, 04, 2014
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## ITEM : Metal Tube Flowmeter

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## INSTRUCTION FOR USAGE OF FLOWMETER

### 1. Introduction

The general structure of metal taper tubes is identical to that of transparent taper tubes. However, metal taper tubes are designed to measure opaque liquids and high-temperature, high-pressure steam (or liquids) that transparent taper tubes cannot measure; certified metal taper tubes for high-pressure gas are also being manufactured. These types have major differences in Float Part and Indicating Part.

### 2. Structure


The inflow and outflow ports of most taper tubes are unibody, and materials such as stainless steel and PVC are used to manufacture. Especially, lining and coating are used for highly corrosive liquids.

The appearance of a float is not much different from that of a transparent taper tube. However, a bar is attached to the upper and/or lower part of the float so that the bar moves in accordance with the movement of the float. There are three types of floats: directly indicating, indirectly indicating, and indirectly-indicating transmitting. In the case of a 'directly indicating' float, a liquid is measured by installing a transparent pipeline such as hard glass on the upper or lower part of a taper tube and seeing through the location of the bar inside the pipeline. 'Indirectly indicating' type has a magnet inside, and an exterior magnet measures and transmits the degree of change of float. 'Indirectly-indicating transmitting' method has remote transmission function added to the indicating part of the 'indirectly indicating' float.

The transmit signal of the 'indirectly-indicating transmitting' float has DC 4~20mA in electronics or 20~100 kPa or 19.6~98.1 kPa in accumulated pulse transmission, alarm transmission, or air method. 0~100% of each signal corresponds with 0~100% of the flux readings.

As mentioned earlier, because metal taper tubes are designed to measure liquids that transparent taper tubes cannot measure, a variety of equipment is also sold to meet various needs of customers.

In the case of a float to measure the flux of gas or steam, a liquid damper to prevent the float's hunting and/or a gas damper which does not use damper fluid are attached. For 'indirectly indicating' and 'indirectly-indicating transmitting' floats that measure a gas whose temperature exceeds 150°C, radiator fins that are aimed to reduce the heat from the 'indicate-transmit part'. Moreover, jackets to prevent coagulation or solidification of high-viscosity liquids due to a fall in surrounding temperature are being used.

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### 3. Feature

- 3.1. Robust and easy-to-handle
- 3.2. A large measurement range with high accuracy
  - A. Accuracy:  $\pm 3.0$  % F.S
  - B. Flow rate range: 10 : 1
  - C. Can be applied to a wide variety of liquids
  - D. Can measure flow rates ranging from high to low
  - E. Can be applied to highly corrosive liquids
  - F. Can be used as explosion-proof products
  - G. Can measure a wide range of pressure

### 4. Usage

In order to properly use a rotameter, one must first peruse the preceding manual which outlines the requirements for each rotameter and choose the one that best suits one's needs. Then, proper storage, installation, measurement, handling, inspection, and repair are necessary

#### 4.1 Storage and Installation

Follow the storage instructions as specified in the manual for each rotameter.


##### 4.1.1 Storage

Find a place where there is less risk to be directly affected by rain or water and less vibration or shock from the ground. Generally, the temperature and the humidity of the storage area should be as follows.

- A. Temperature: -10 ~ 60 °C
- B. Humidity: Below 80%RH

##### 4.1.1 Installation


- A. After choosing a place where there is less shock from the ground, install a taper tube or a compressor with its central axis perpendicular to the ground.
- B. While installing, secure enough space for maintenance, calibration and replacement of moving parts and other parts.
- C. To install a glass tube flow meter, anchor pipe securely so that the stress which originates from the pipe does not affect the glass tube.

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- D. If a flow meter is heavy, install a rotameter support bar so that the pipe does not bend.
- E. If counter-current flow and water hammer are to occur, install counter-current stop valve at the downstream.
- F. Install a strainer at the upper stream, if necessary.
- G. Before installing a flow meter, remove all foreign substances within pipelines through flushing.
- H. When cleansing the interior of a flow meter with the flow meter installed in the pipeline, install cleaning pipelines if necessary.

#### 4.2 Measurement and Handling

- 4.2.1 Open the valve, and let the liquid slowly flow into the flow meter. Once the indicator is stabilized, start measuring. The valve should be opened slowly, and the flow rate should be controlled using the valve located at the downstream of the flow meter.
- 4.2.2 When a glass tube is used, temperature and pressure must not change radically.
- 4.2.3 In the case of a direct indicator, measure in accordance with liquid reading method of moving parts.
- 4.2.4 In the case of an indirectly indicating transmitting float, adjust the zero-point if necessary.
- 4.2.5 When taper tubes, compressors, or moving parts are contaminated, they must be cleaned, if necessary.
- 4.2.6 When the density and the viscosity of a liquid are to change, readings must be corrected, if necessary. The temperature and the pressure of the liquid whose readings must be corrected should be obtained at the upper stream of the flow meter. The accuracy of the measurement should be within  $\pm 1.0$  % of the liquid's absolute pressure and absolute temperature.

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4.2.7 Should there be concern over the change in the viscosity of the liquid being measured or the failure in the moving parts due to the change in the degree of condensation of contained moisture, the following measures shall be taken.

- A. In the case of a liquid whose viscosity rises at a lower temperature, the exterior of the flow meter must be heated or kept warm.
- B. A liquid which coagulates at a lower temperature must be kept warm even at the times when not in use.
- C. In the case of a humid gas, the exterior of the flow meter must be kept warm.

4.2.8 In the case of a slurry liquid, inject steam, warm water or water into the upper part of the flow meter, if necessary. The amount of injection should be insignificant relative to the measurement accuracy of the liquid

#### 4.3 Calibration

If the density, temperature, pressure, humidity, and viscosity of a liquid passing through a flow meter are different from the requirements, calibration to the readings is required. Refer to each article on JIS Z 8761 [Measuring Liquids with Float-Type Rotameter] Sec.8 [Calibration] or Sec. 4.7 [Calibration] in the same manual for more information on calibration

#### 4.4 Inspection, Repair and Correction

##### 4.4.1 When to inspect and repair

- A. After a certain period of time
- B. After cleaning a disassembled flow meter
- C. When reusing after a long period of time
- D. When higher accuracy is needed
- E. If there seems to be any problem

##### 4.4.2 Inspection and Repair

###### A. General

Inspect and repair flow meters, which are in use, as outlined below.

- a. Check the degree of abrasion and damage of the moving part, and perform mass test and correction if necessary. If there is any damage on the edge of the float, it must be replaced with a new one.

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b. Check the degree of contamination and damage of the taper tube, and if necessary, cleanse and correct the tube. Mass test on a moving part: After cleansing the moving part of a flow meter, calculate the mass. Then, find the difference between the mass of the flow meter and the initial mass. If the difference is larger than 4% of the initial mass, correction is needed.

B. Inspection on a converter

Apply a certain degree of displacement, and see if the converter works properly. If there seems to be any problem, repair or correct the converter.

C. Correction

Correction, in accordance with JIS B 7552 Sec. 3.2, must be performed as described below.

- a Gravimetric Method
- b Volume Method
- c Comparative Method

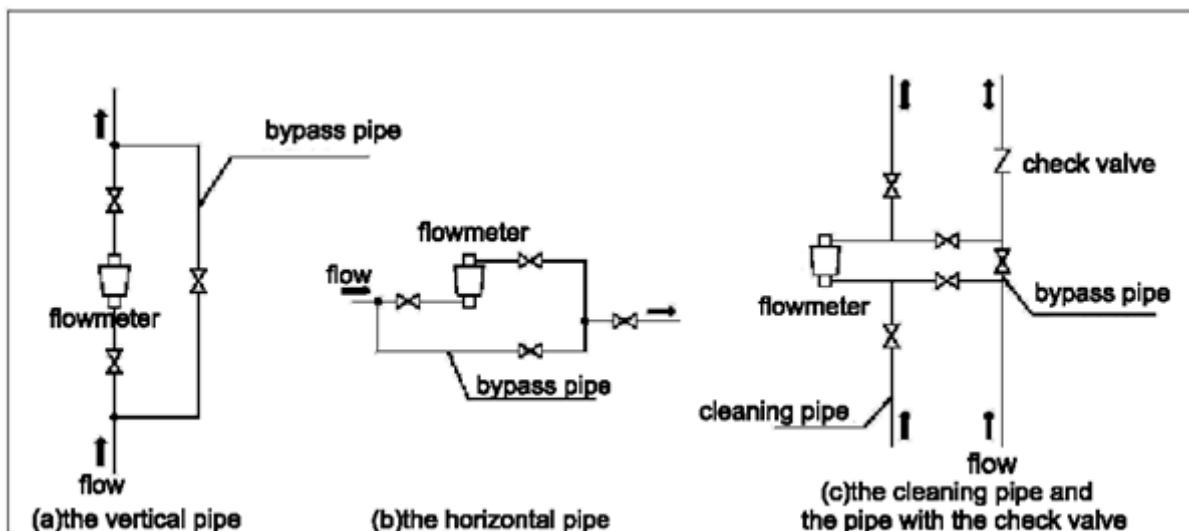



Figure 1 : the example of the pipe


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## 5. Trouble shooting

### Metal tube Management standards


Manage list				Standard	Management standards			Treatment
Division		List	action		Normal check	Regular checks		
M E T A L  T U B E	B O D Y	1	BODY Gas seal Installation	No leakage Vertical installation	○	○	6month	Check and installation
		2	TAPER (1) Contamination (2) corrosion (3) Mount problem (4) coating problem	clean no corrosion No deformation No coating problem			1year	Check and Decomposition clean Check and repair Check and change check
		3	FLOAT (1) corrosion (2) Fluid solid (3) wear (4) axis bend (5) weight and viscosity change	No corrosion clean no wear no bending no change viscosity			1year	Check and part item change Check and change Check and clean Weight check.
		4	MAGNETIC COUPLE Magnetic loss	change			1year	Check and change
M E T A L  T R A N S M I T T E R  T U B E	T R A N S M I T T E R	1	Indicator Components Move components	Check the movement	○		1year	Check manual
		2	Electric Transmitter Pneumatic transmitter Component proportional to motion	<ul style="list-style-type: none"> <li>• output : DC 4~20mA</li> <li>• pneumatic output : 20~100kPag or 19.6~98.1kPa (0.2~1.0 kgf/cm<sup>2</sup>)</li> </ul>	○		1year	Test meter or gauge connection adjust component by hand manual
		3	Alarm Alarm contact	Setting high and low	○		6month	Alarm check by hand manual
		4	Power input pneumatic DC Pneumatic	DC 24V 140kPa (137kPag 1.4kgf/cm <sup>2</sup> )	○		1year	Check by the Am meter pressure gauge
	1		Zero No flowing	○		6month	Check the float	
	2		Safety All signal safety	○	○	Every weeks	Check Change flow and pulsating	



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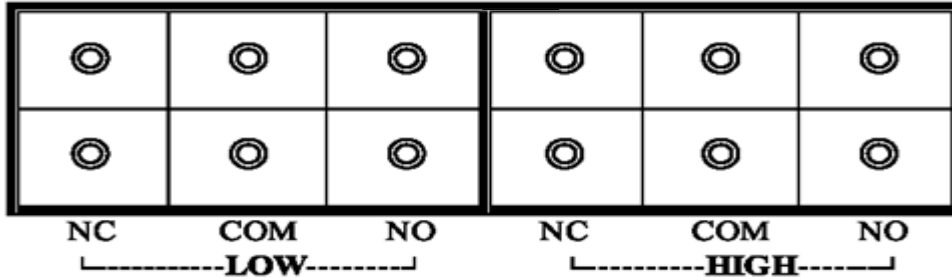
### Operational Problems

	Problem	Treatment
1	Dust clogged, the fluid solidification	Pipe cleaning, strainers at entrance check,
2	Float axle was bent	Float shaft repair Install an anti-shock damper and spring
3	The magnet inside the float stuck in the iron powder	Iron powder is removed Magnetic strainer installation
4	Indicators do not move	Turn off the power of magnets to move equipment and repair Check rotation of the bearing is removed and the dust
5	Temperature rise due to the problem of resin materials	New Products Parts Exchange Select a product specification , Suitable for metal
7	Reduce the performance of magnetic	New Products Parts Exchange 400 degrees, reducing the magnetic performance
8	Air bubbles in the liquid, Moisture in the gas	Being mixed is the accuracy problem Therefore, make sure you install flowmeters
9	Residual air	Remove air. The problem is low flow
10	Department of Pipeline Leakage	Tighten and check gasket
11	Corrosion of Weldments	Selected New Materials and new welding.
12	Cracks caused by pipe weight Cracks caused by vibrations	Weight resolved and Vibration Troubleshooting
13	Transmitter connection problem	Cutting links ,bending links check New Products Parts Exchange
14	Transmitter cannot adjust by manual	New Products Parts Exchange Pneumatic transmitter pilot hole clean
15	Power disconnection	Check connection
16	The transmitter signal is not constant	New Products Parts Exchange
17	Pneumatic transmitter : Output range is narrower	Air tube leak, bellows leak, Reduced elastic springs Connection check Nozzle part clean , air supply filter change
18	Electric transmitter : Axis of dust and moisture	Rotor Replacement and Repair
19	Forward link transmitter worn	Tightening and replacing
20	Inside transmitter have moisture and oil	Clean
21	Vibration wear	Exchange and Remove vibration causes
22	Contact with electrical wiring problems	Make connections

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## 6. Wiring Diagram(CAE Series : 2-SPDT)

### 6.1. CABLE LINE



### 6.2 WIRING METHOD

#### ① Setting the Low Alarm

- Ⓐ If you want that the low alarm goes off when the value is less than low standard value, connect NC and COM lines.
- Ⓑ If you want that the low alarm goes off when the value is more than low standard value, connect NO and COM lines.

#### ② Setting the High Alarm

- Ⓐ If you want that the high alarm goes off when the value is more than high standard value, connect NC and COM lines.
- Ⓑ If you want that the high alarm goes off when the value is less than high standard value, connect NO and COM lines.

### 6.3 SETTING THE VALUE OF ALARM

**\*NOTE**

▶ **Needle for the alarm :**

- Low value : blue needle
- High value : red needle

- ① Open the cover of it.
- ② Loosen the cross recessed head screws.
- ③ Set the needle of high and low in it.
- ④ Fasten down the cross recessed head screws again