Operation Manual of
Gas Control Turbine Meter
TBZ Series

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NOTE

1. Production of Model TBZs60, TBZs150, and TBZs300 has been discontinued.
2. Specifications are subject to change without notice.

REVISION RECORD

1st revision: June 12, 2003
2nd revision: August 7, 2003
3rd revision: February 15, 2005 (Renewal of page 7)

1. Specifications

Model		TBZ60	TBZ150	TBZ300
Flow range (m3/h)		6～60	12.5～150	30～300
Max. pressure (kPa)		350 or 980		
Accuracy	Flow measurement portion	±1% FS		
	Arithmetic display portion *1	±2% RS max.		
Display	Integrating flow (Total)	LCD 9 digits, Minimum reading 10 litters		
	Integrating flow (Trip)	LCD 8 digits, Minimum reading 10 litters		
	Instantaneous flow-rate	LCD 4 digits, Minimum reading 0.1 m3/h		
	Temperature	LCD 3 digits, Minimum reading 0.1℃ *2		
	Pressure	LCD 3 digits, Minimum reading 1 kPa *3		
Temperature / pressure compensation		Built-in temperature and pressure sensors *4		
Connection		1 1/2B Flange (JIS 10K)	2B Flange (JIS 10K)	3B Flange (JIS 10K)
Applicable temperature range (℃)		−10 ～ +60		
Installation position		Horizontal, Vertical (Display portion turns)		
Measurable gas		Natural gas, LPG, Air, etc.		
Battery		Built-in lithium battery with a life of 7 years (Approx.)		
Pulse output		2 types of open collector output (Unit pulse *5, High density pulse *6)		
Installation		Indoor / outdoor (Rain-proof structure)		
Material		Casing: Stainless steel, Display: Aluminum alloy, Flange: Cast iron		
Weight (kg)		5.3	6.0	9.4
Temperature sensor		Platinum resistance bulb temperature sensor JIS Class A		
Pressure sensor		Ceramic capacitance-type pressure sensor		

*1: Accuracy refers to the total cumulative accuracy of the temperature sensor, pressure sensor, numerical processor, and display (Not applicable to actual flow models. Accuracy for a standard condition conversion model (maximum pressure: 980 kPa) is ±3% max.

*2: This is only applicable to standard condition conversion models (with temperature / pressure compensation).

*3: This is only applicable to standard condition conversion models (with temperature / pressure compensation and pressure compensation).

*4: No compensation is to be made by actual flow models. For models with only pressure compensation, a temperature sensor is not equipped. Also, there are two types of pressure sensors --- a high precision type (for models of the maximum working pressure 350 kPa) and intermediate precision type (for models of the maximum working pressure 980kPa).

*5: In case of pressure and/or temperature compensation type TBZ, this unit pulse is to be compensated.

*6: Even though TBZ of pressure and/or temperature compensation type, this high-density pulse is not to be compensated.

Gas to be measured

Gases that do not corrode the following materials may be applicable basically.

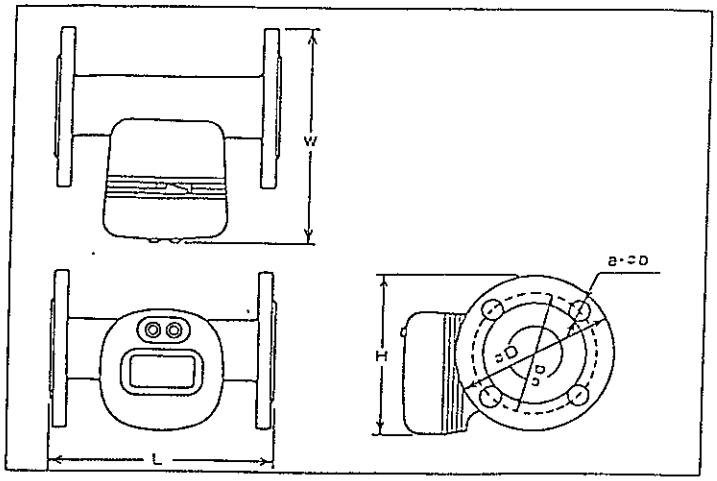
Measuring pipe:	Stainless steel
Flange:	Cast iron
Ball bearing:	Stainless steel, PTFE resin
Turbine rotor:	Plastic
Magnet:	Ferrite, coated with epoxy resin

Applicable gases *7	Non-applicable gases
Natural gas, Coal gas, Dry air, Propane, Butane, Nitrogen, Carbon dioxide, Carbon monoxide, Inactive gas, and others	Hydrogen chloride, Chlorine, Ammonia, Sulfur dioxide, Chlorine dioxide, Hydrogen Cyanide, Fluorine, and others

*7: Gas must be dry and clean.

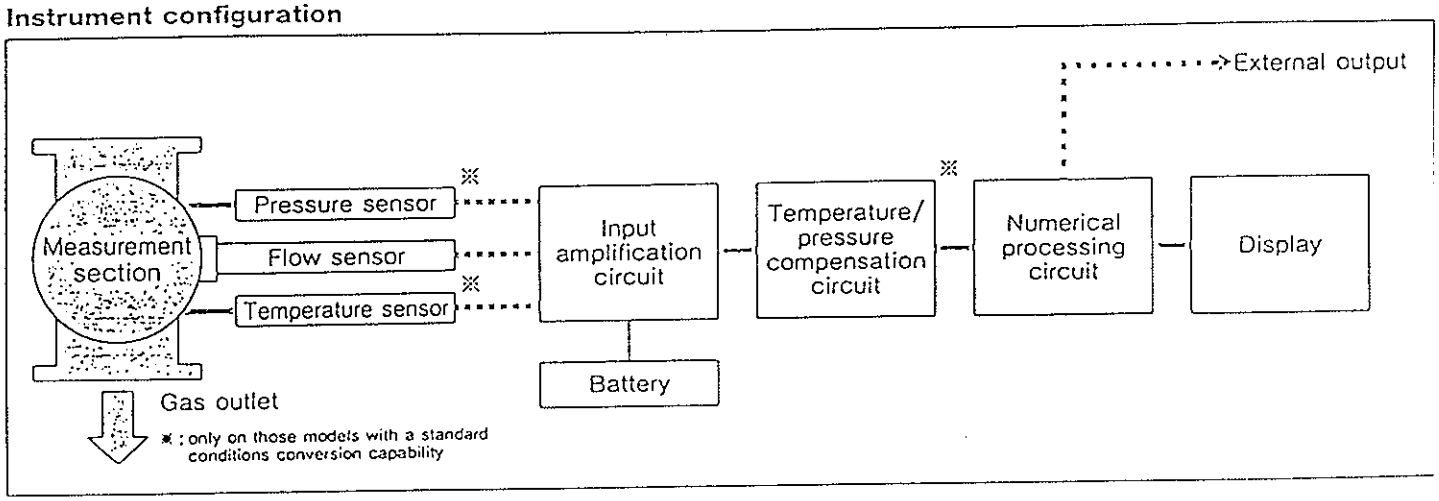
2. Dimensions and Configuration

Dimensions



Dimensions / Model	L	H	W	JIS 10K Flange			
				φD	φd	a-φb	Dia.
TBZ60	200	150	197	140	105	4-19	1½B
TBZ150	220	158	211	155	120	4-19	2B
TBZ300	250	185	246	185	150	8-19	3B

Instrument configuration



3. Installation and piping procedures

Before its installation, please make sure that your working conditions comply with the turbine gas meter's specifications described on its nameplate (Maximum working pressure, temperature range, flow-rate range, compensation function, output pulses, etc.).

1) As this turbine gas meter has rainproof structure, installation under eaves is available.

2) The turbine gas meter, which allows both horizontal and vertical installations, is applicable for various gases. *8

3) At upstream and downstream of the turbine gas meter, preparation of straight pipe zones of 10D (length of 10 times of the pipe diameter) or more is necessary. This measure is especially indispensable if there is a place where pipe size is narrowed with a valve, etc.

4) As the display-protection-cover applied at the time of packing of the turbine gas meter can be stood up by itself with placing one of its walls (except the wall above the display) on the floor as Figure 1 shows, it contributes to the easy installation. Do not remove the protection cover until completion of installation work.

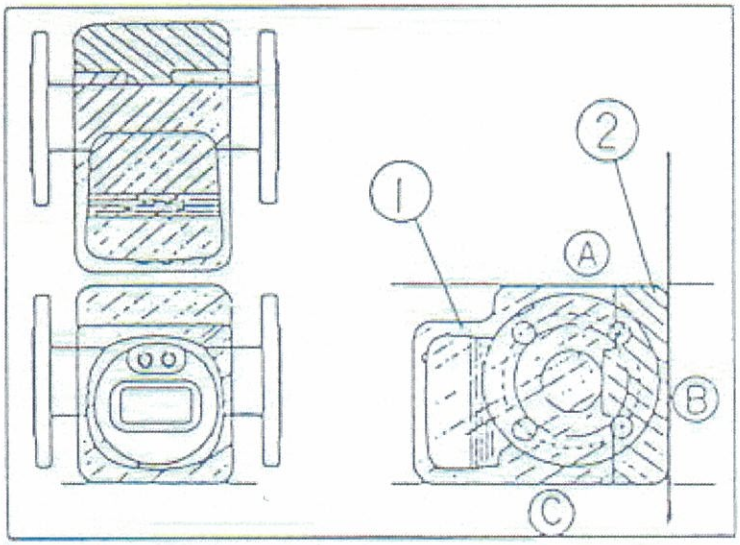
5) Select position and piping method so that impact pressure is not to be given to the turbine gas meter.

6) If only the direction of gas flow meets the arrow mark on the casing, the other installation direction of the measuring pipe can be freely selected. Also, by loosening the screw (M3 hexagonal socket head cap screw) underneath the display approximately 4 mm (8 turns), the display portion can be rotated at each 90° interval. For instance, in case the original flow direction of the turbine gas meter is left to right, rotating the display 180° clockwise makes the applicable flow direction to right to left, 90° clockwise makes it to upward, and 90° counterclockwise makes the same to downward. After the rotation, tighten the screw to fix the display (See Figure 2).

7) During the installation, make sure not to let foreign materials such as weld chips, dirt, waste sealant, etc. into the turbine gas meter. If necessary, execute dust purge before the meter installation.

8) Keep the meter and its output signal wire apart at least 1 – 2m from any of control instruments (ex: an electromagnetic valve), noise sources (ex: a power cable), etc.

*8
- Its adoption is limited to dry and clean gas.
- Install a proper strainer (200 meshes) at upstream of the turbine gas meter.
- Do not install the meter in a place where oil mist and/or dust powder, etc., waft.



Walls Ⓐ, Ⓑ, and Ⓒ of the display-protection-cover

After the completion of the meter installation, remove the cover ①, and then pull off the cover ② upward or downward.

Figure 1

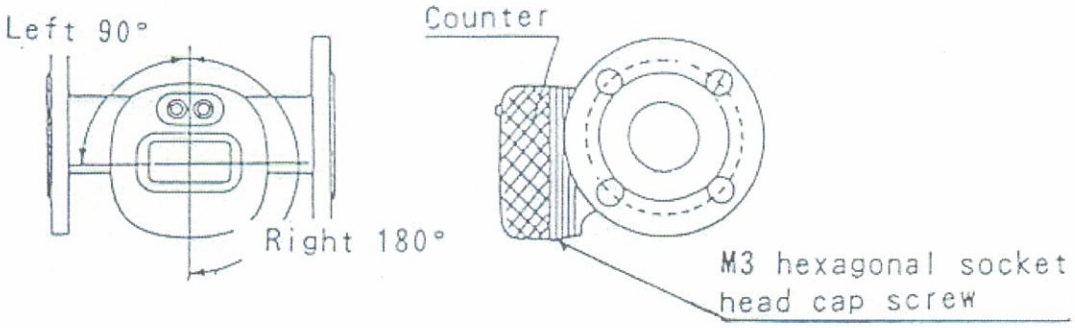


Figure 2

4. Operation starting procedure

1) If any foreign materials remain in the piping, the turbine may be damaged. Therefore, all of the same should be completely removed.
2) At the initial operation, gradually open a valve and check that the pilot is flashing. Flashing of the pilot indicates that the turbine is rotating and gas is flowing.

5. Inspection procedure

1) Note that disassembling of the turbine gas meter is prohibited.

2) If the pilot of the display does not flash though gas flows, remove the meter from piping. Then, lightly breathe into the meter and check whether the pilot flashes. In case the pilot does not flash, check if there is any adherence of dust, etc., inside the meter and remove the same as occasion demands.

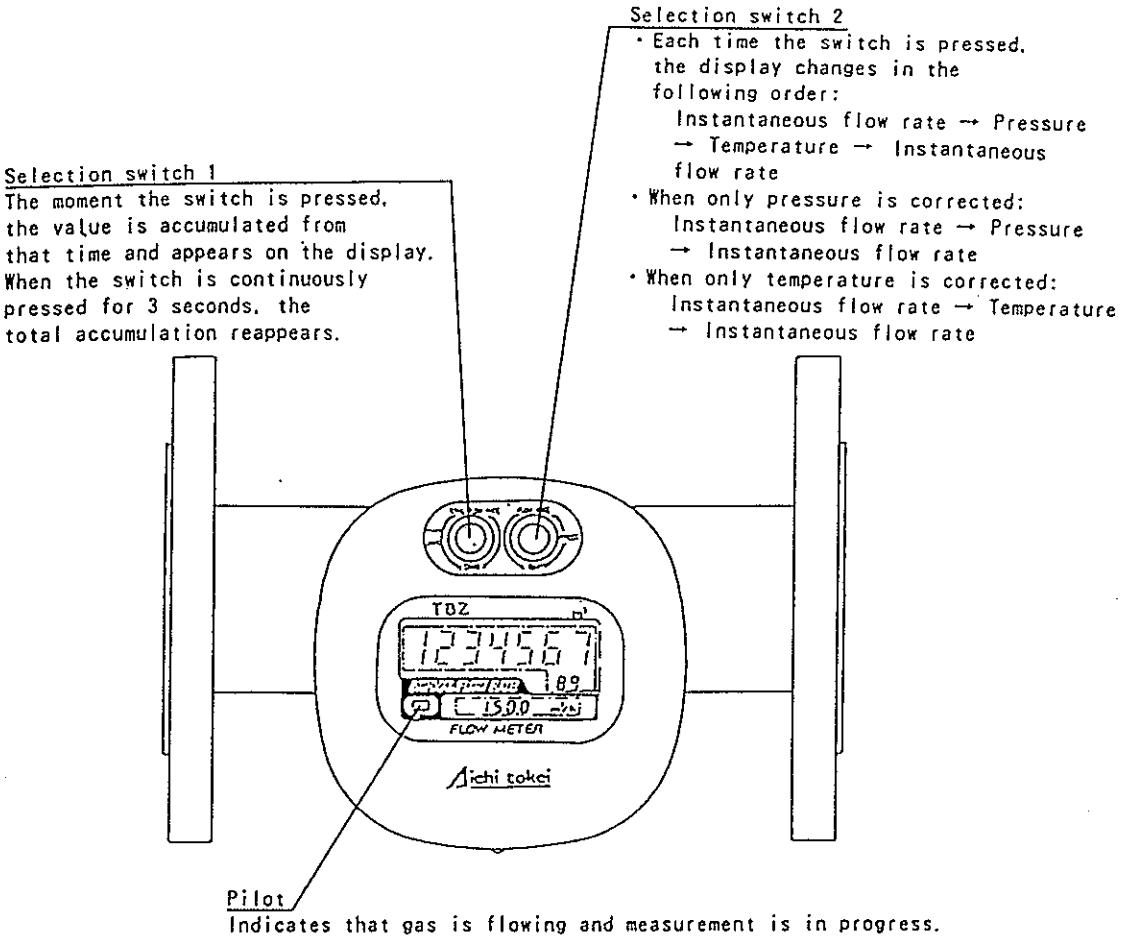
   a. As for dust around the outer portion of the turbine rotor, there is possibility that giving the meter a slight shock removes the same. *9
   b. If seal-material is adhered and removing the same is not possible at a worksite, send the meter to the manufacturer for repairing (The repairing shall be charged in principal).

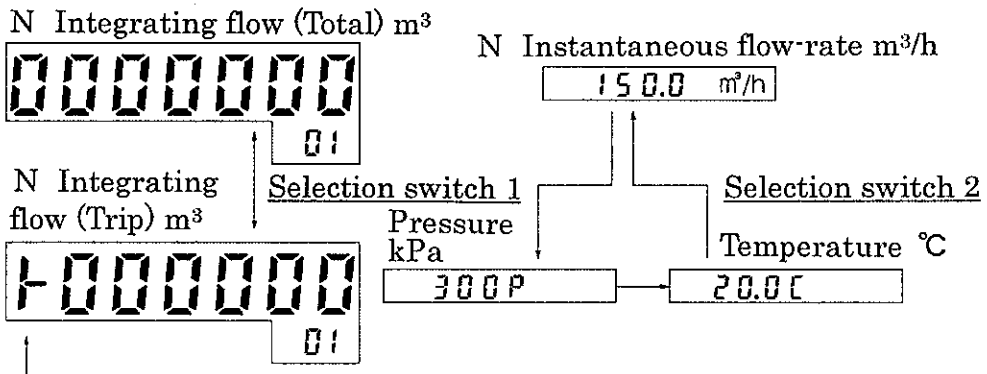
3) After the removal of dust, etc., lightly breath into the meter again. And, if the pilot flashes, it is the evidence of recovery to normal.

4) In case the meter does not recover to normal nevertheless the above-mentioned measures, send the meter to the manufacturer for repairing (ditto as the above).

*9: As the meter is a precision measuring instrument, giving the meter a strong shock and hitting the meter with a thing are prohibited.

6. Display functions





The Integrating Flow (Total) is accumulated independently of the display and is never reset.

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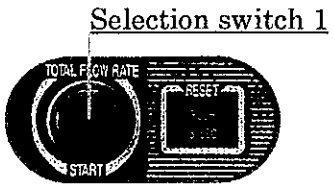
In case of Actual Flow Type Model TBZ□-0
(No Temperature / Pressure Compensation Type):
There is only one switch (Selection switch 1), which is to switchover Integrating flow (Total) m³ and Integrating flow (Trip) m³. Instantaneous flow-rate is always indicated at the lower LCD display.



7. Output signals

Standard specification

Type	Output signal form	Kind of pulse	Pulse unit	Pulse width	Maximum applicable voltage	Maximum ON current
TBZ	Open collector	Unit pulse *5	100 [(N)L/p]	40 (msec)	24 (V)	20 (mA)
	Open collector	High-density pulse *6	Approx. B (cm^3/p) *10	———	24 (V)	10 (mA)

*5: In case of pressure and/or temperature compensation type TBZ, this unit pulse is to be compensated.

*6: Even though TBZ of pressure and/or temperature compensation type, this high-density pulse is not to be compensated.

*10: $cm^3/p = cc/p$

High-density pulse (indicated on a nameplate of each meter as "output (B)"

Model	TBZ60	TBZ150	TBZ300
B (cm^3/p)	Approx. 180	Approx. 470	Approx. 920

8. Application examples

- Management and control of gas flow rate of combustion equipment such as burner, boiler, and furnace
- Management and control of gas flow rate of gas engines
- Management and control of gas flow rate of intermediate and compact water-cooling and heating equipment
- Management and control of flow rate of gas refrigerator
- Management and control of gas flow rate as one of the factory instrumentation
- Management and control of gas flow rate of cooling and heating equipment in integrated buildings
- Management and control of flow rate of various gases related to biotechnology
- Management of factory air for each line and control of compressor running time (as power saving operation)
- Various experiment apparatus in which gas flow rate is involved

In addition to the use of a single meter, the use of meters by installing multiple TBZ each for equipment unit for the management and control of gas flow may be useful with its effect of accelerating the rationalization of energy, especially in a factory where the gas flow control is carried out for the whole company.

9. Service life

Its service life is approx. 7 years in normal service condition. At high temperature, the expiry of the battery life may be approx. 5 years. *11 *12

*11: As TBZ is designed as a disposal type meter, its battery cannot be changed in case of the run-out-of-battery in principal. Even if the battery (together with the measuring portion and the rubber gaskets) is changed, because life of the electronic parts such as display, sensors, etc. is approx. 10 years, the meter is to have served its time only until then.

*12: Flashing of a number at the biggest-digit position of the integrating flow volume indication is the alarm that the meter is to be run-out-of-the-battery soon (Only the pressure / temperature compensation types have this alarm function). In the case, soonest preparation of a spare meter for replacement is recommended.

10. Guarantee

1) Guarantee period
The turbine meter is guaranteed for a period of one year after shipment, against defect in manufacturing.

2) Guarantee scope
The turbine meter is guaranteed only against defects in materials and workmanship. Tokyo Gas Engineering assumes no responsibility for any damage incidental to the failure of the body and for any other failure caused by the following reasons.
   a. Force majeures such as an act of God.
   b. Improper handling
   c. Use under improper working environment.
   d. Abuse beyond the limit of the rating specification, misuse, disassembly and modification made by any unauthorized person.
   e. Any others not attributable to Tokyo Gas Engineering *13

*13: Typical example
   - Damage or defects caused by any foreign matter attracted by the built-in magnet, for example, iron particles.
   - Damage or defects caused by foreign matter in piping.
   - Damage or defects caused by stagnant water, oil, etc. in the body.