Aichi tokei

250205

Ultrasonic Flow Meter for Fuel Gas Management ATZTA UW

(80A, 100A, 150A)

Instruction Manual

Introduction

Thank you very much for purchasing the Ultrasonic Flow Meter UW Series for Management of Fuel Gas this time. Please be sure to read this Instruction Manual to use this product correctly and safely and to prevent accident.

Please arrange for operators who actually use this product to know the context of this Instruction Manual surely. This Instruction Manual is necessary for performing maintenance, too. Please keep the Manual in a safe place until this product is disposed of.

Confirmation of package contents

Upon delivery of the product, confirm that the following items are contained in the package before using the product:

UW package contents

Name	Quantity	Remarks
Ultrasonic flow meter	1	
Operation manual (this document)	1	
Hexagonal wrench	1	
Flange gasket	2	Option
Bolt set (Bolts, plain washers, nuts)	Complete set	Option
Display section cover	1	Option

If there is any incorrect item, shortage, or any defect in the external appearance, please contact your nearest branch or sales office.

Safety concerns

To ensure the safe use of this product and to prevent an accident or an unexpected situation, instructions to which attention must be paid are indicated with the following symbols.

Structure of warning indications

Danger	Incorrect handling by ignoring to follow instructions of this symbol may lead to imminent danger of death or serious injury.
Warning	Incorrect handling by ignoring to follow instructions of this symbol may lead to possibility of death or serious injury.
Caution	Incorrect handling by ignoring to follow instructions of this symbol may lead to injury and/or properties loss (product damage, etc.).

	This symbol indicates acts requiring “caution” and that improper operation may result in an accident.
	This symbol indicates “prohibited” acts.
	This symbol indicates “mandatory” acts that you should observe strictly.

Precautions for use

Danger	1. Do not use for applications that require safety, such as nuclear, railroad, aircraft, vehicle, playground equipment, etc. 2. Do not modify the product. 3. Do not use the product for foods, drinks, medical purposes, etc., because it is not designed for sanitary specifications. 4. Do not use the product in the atmosphere of an inflammable gas, etc., because it is not designed for explosion-proof specifications. The meters do not conform to ATEX (explosion-proof) directive (2014/34/EU).

Working environment and applicable fluid

Caution	1. For this product, do not use gases other than Natural gas (12A, 13A) and nitrogen. 2. The temperature and humidity ranges are as follows. City gas: -10 to +40°C and 90%RH or lower, Nitrogen: -10 to +60°C and 90%RH or lower. When using this product, be sure to observe the operating pressure range (atmospheric pressure to 500 kPa or atmospheric pressure to 1000 kPa (gauge pressure)). 3. Avoid usage in an atmosphere containing a corrosive gas (chlorine, hydrogen sulfide, etc.) and/or for an application to a fluid containing a corrosive gas. 4. This product is not of a perfect waterproof structure (IP64). Do not install it at a place that may be submerged in water. 5. Install the flow meter as far away from an electric noise source as possible. If you install the flow meter near an electric noise source, it is recommended to use a shield wire as a cable which is connected to the flow meter. In this case, ground the shield wire to FG of any device other than the flow meter. 6. The installation of a sunshade is recommended if the flow meter is exposed to direct sunlight. 7. The accuracy stipulated in the specifications may not be satisfied under the environment where there is pulsation. It is recommended to install the flow meter at a location where there is little pulsation. 8. If sharp pressure change occurs, such as when gas in the pipe is discharged, correct measurement may not be performed. For this reason, after the fluid is changed to the subject fluid for measurement, reboot the power or reconnect the battery while no fluid flows (0 m3/h). 9. For the type without pressure sensor, set the operating gas setting pressure (gauge pressure) [F12]. (If the setting value and actual pressure do not match, the flow-rate measurement accuracy may not be satisfied.) 10. When you use the flow-rate conversion function at high elevations, set the atmospheric pressure of the working environment [F19]. (If this setting is not made, a range caused by conversion may become larger.)

Working environment and applicable fluid

Caution	11. When installing the flow meter near a governor, etc., install it upstream; installing it downstream is not recommended. (An incorrect flow-rate measurement may occur due to an effect of the governor, etc.)
	12. After the subject fluid for measurement is set, turn on the power while no fluid flows (0 m^3/h).
	13. Since the variance of the instantaneous flow-rate may become larger due to an effect of the governor, it is recommended to set 16 times to the instantaneous flow-rate moving average number of times [F15].

Cautions for operations

Caution	This product is not a specified measuring instrument defined in Japanese measurement law.

Storage

Caution	1. Store the flow meter at a place away from fire and not exposed to direct sunlight. 2. Do not place any combustible material, inflammable substance, and heating body in the periphery of the flow meter. 3. Store this product at a place whose ambient temperature is -20 to +70°C and where no dew condensation occurs.

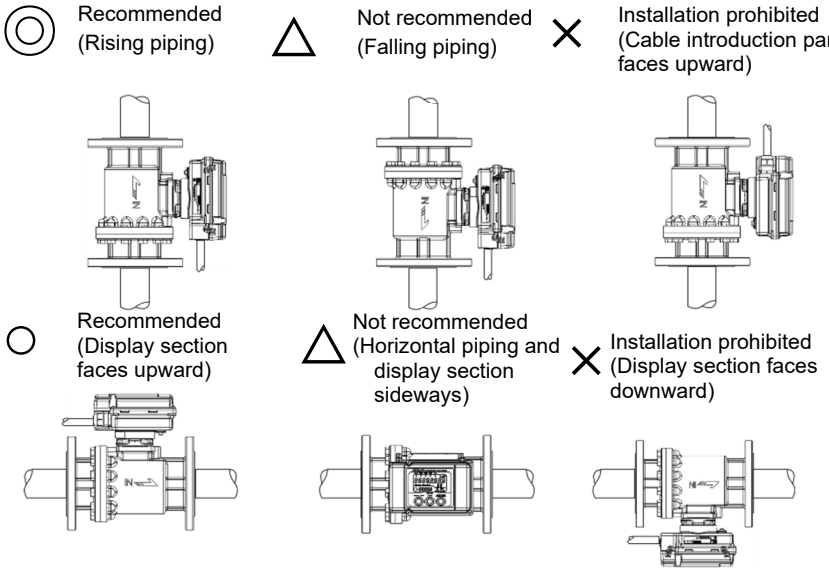
Piping

Warning

1. Do not climb on this product or use it as a foothold.
2. Do not carry and/or install this product as holding its display section.

Caution

1. When you install the flow meter, be sure to turn off its power.
   After the flow meter is installed, set the subject fluid for measurement and turn on the power while no fluid flows (0 m^3/h).
2. In the case of new piping, install the product after sufficient cleaning of the pipe(s).
3. It is recommended to use rising piping to install the flow meter if the air contains oil mist, dust, or other materials. If oil mist and/or dust accumulates inside this product, it may cause performance failure and/or defects. Installation in which the “display section faces downward” and the “cable introduction part faces upward” cannot be performed.



4. Do not install the flow meter in sections where it will be subjected to significant compression forces, tensile loads, and other loads after it is installed.
5. Install the product along with the flow direction indicated on the product.
6. Do not drop the product, hit it, or apply excessive impact.
7. When turning the display section, do not apply force to any direction other than the rotational direction.
   In case any force is applied to direction to pull up or push down the display section, the display may come off which can lead to breaking of the internal wires, etc., or may not rotate smoothly.
8. When making piping connections, make sure that foreign material such as weld chips, debris, sealing tape, and sealant do not make their way into the pipe.
9. When tightening the pipe, do not apply excessive torque.
10. Use hexagonal bolts of the following lengths to avoid interference with the display section and body. Recommended bolt specification for 80A/100A: M16 × 55 mm, and for 150A: M20 × 65 mm

Wiring

Danger	1. When performing wiring work, follow the instructions in this Instruction Manual. 2. Use the product within the rating. 3. Do not use the product on a voltage exceeding permissible load.
Caution	1. Do not place the product's external connection cable together with or near to power supply line(s) or power line(s), etc. of other devices. 2. Electrical isolation of a remote counter (a receiver) from others is recommended. 3. Do not pull the cable connected to the terminal mount forcibly. 4. Ensure that the tip of the cable connected to the terminal mount is not soaked in water during wiring work, etc. 5. When connecting the power supply wire to the terminal mount, be careful not to short-circuit it. Use an external power supply having a short-circuit protecting function. 6. Be sure to perform the wiring work in a state that power supply from the external power supply is interrupted. 7. Do not perform operation and the wiring work with wet hands. 8. For external power supply type (24 VDC, 100 VAC), install a power switch to the power supply system for this product to prevent electrical shock when connecting and disconnecting cables to and from a power supply terminal. 9. For external power supply type (24 VDC), when you ground power supply, ground the 0V terminal. Since the casing is conducted with GND (signal ground), if the 24V(+) terminal is grounded, it is to be short-circuited with the FG of your device. For this reason, be sure not to ground the 24V(+) terminal. 10. For external power supply type (100 VAC), do not connect the ground wire of the cable to the flow meter. 11. For external power supply type (24 VDC, 100 VAC), do not ground the positive terminal of the analog output line. Since the casing is conducted with SG (0 V), if the positive terminal of the analog output line is grounded, a current loop which bypasses analog output is formed, and analog output is not transmitted correctly. 12. Connect the internal battery when you use the flow meter. [Internal Battery Type] *Battery life: 5 years after the power is turned ON. (Standard conditions: Temperature 20°C, humidity 65%RH) 13. When you replace the internal battery, follow the instructions given in this instruction manual. Perform the switch operation (press SW1 and SW2 at the same time for 3 sec or more while the entire LDC is turned ON and the symbol and unit flicker every 2 sec) and confirm that the screen indicating completion of battery replacement is displayed ("1" and the symbol and unit flicker every 2 sec).

Disassembling and inspection

Caution	1. Do not disassemble this product. 2. When fluid flow is normal, the pilot lamp will blink. If it does not blink, please contact your nearest branch or sales office.

Disposal

Warning	1. This product contains a lithium battery, and therefore be sure not to dispose of it in the general disposal route. [Internal Battery Type] 2. Be sure not to put this product into fire. It may cause fire and/or explosion. 3. Since the flow meter is made by putting metals and resin parts together, it must be discarded as industrial waste.

Ultrasonic Flow Meter for Fuel Gas Management UW Series

Instruction Manual

● Table of Contents

1. Overview

1-1. Outline of product

This product is an ultrasonic flow meter mainly for fuel gas and capable of measuring the flow-rate at atmospheric pressure up to 500 kPa or 1000 kPa.
The flow meter is installed to pipes by being tightened between pipe flanges.

In addition, the flow meter is certified according to the following standards. (Except 100 VAC and nominal diameter 150 A types.)

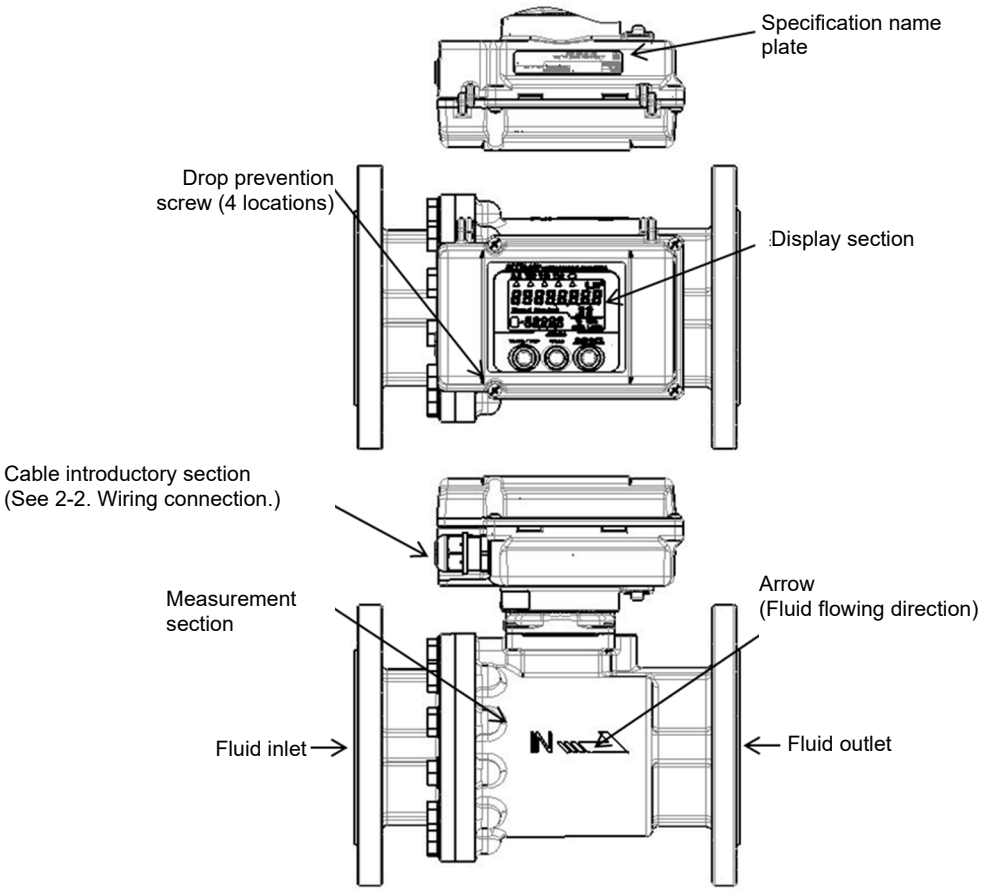
EN61326-1:2013 table 2 (EMS)
EN55011:2009+A1:2010 Group 1 Class A (EMI)

1-2. Model configuration

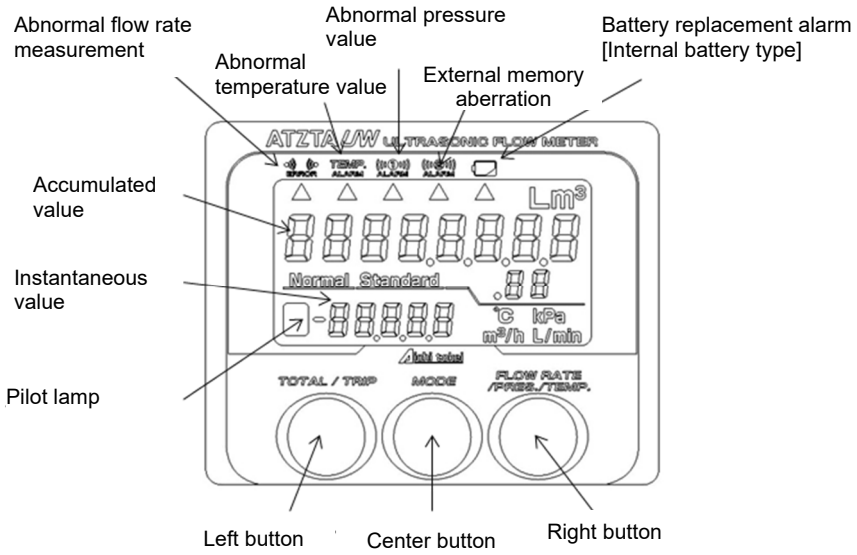
Basic model	Nominal diameter		Compensation category	Power supply		Flow direction		Gas type	Description
UW									
	80								80A
	100								100A
	150								150A
			0						Type without pressure sensor
			500						Type with pressure sensor:500kPa
			1000						Type with pressure sensor:1000kPa
				BT					Dedicated lithium battery
				DC					24 VDC ±10%
				AC					100 VAC ±10%
						L			Left → Right
						R			Right → Left
						U			Down → Up
						D			Up → Down
								13A	Natural gas(13A.12A)
								N2	Nitrogen

1-3. Name of each part

1) Flow meter main unit

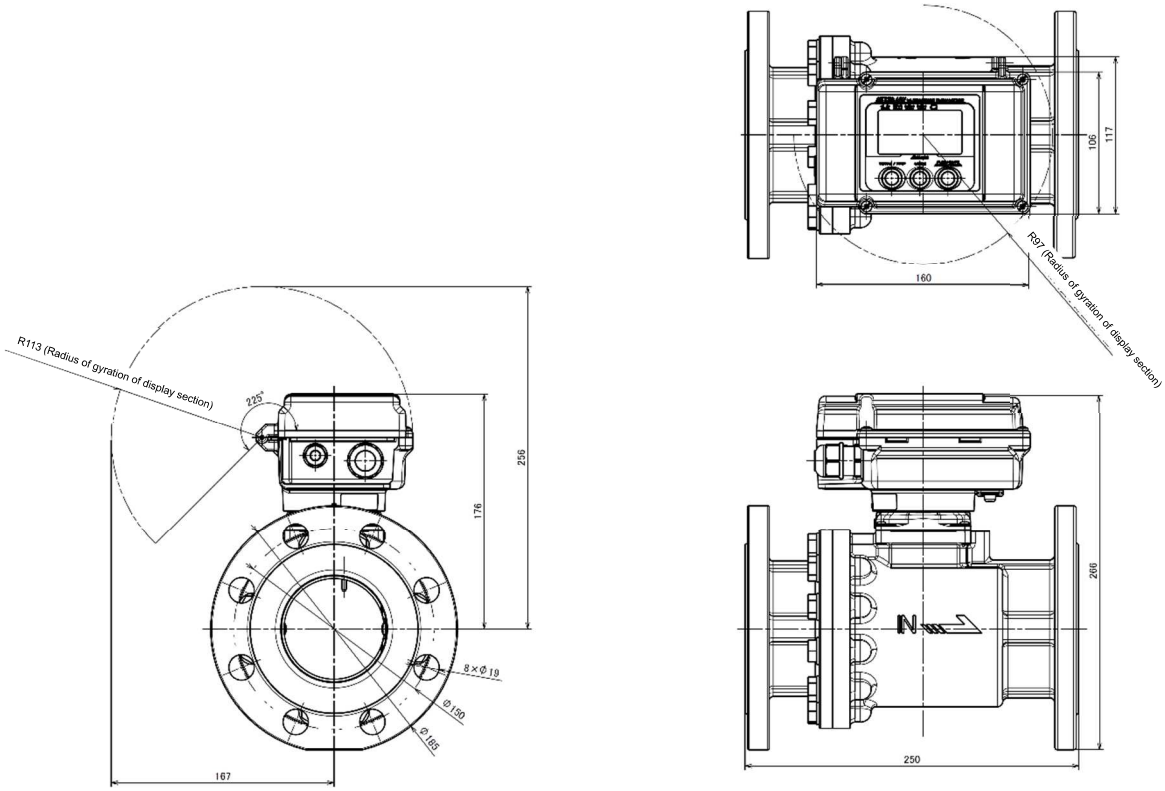


2) Display section



*For button operation, refer to “4. Operation Procedure”

1-4. Dimension drawing



Model	Connection diameter	Size (mm)				Mass (kg)
		W	L	H	h	
UW80	JIS10K80A-RF	180	250	266	176	Approx. 12.5
UW100	JIS10K100A-RF	210	250	299	199	Approx. 10.7
UW150	JIS10K150A-RF	280	300	359	224	Approx. 19.4

Use hexagonal bolts of the following lengths to avoid interference with the display section and body.
Recommended bolt specification for 80A/100A: M16 × 55 mm, for 150A: M20 × 65 mm

2. Before using the product

With this flow meter, items concerning measurement, output, and communication can be set.

At the time of purchase, the standard factory delivery settings have been made, and the user can use the flow meter as it is. Change the settings according to the usage, if needed.

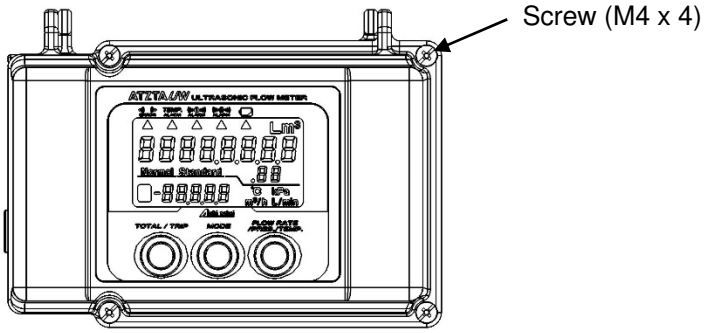
The settings can be changed by button operation and RS485 communication (24 VDC type and 100 VAC type only). For details, see “4.3 Setting of parameters” in “4. Operation Procedure”.

It is recommended to perform the settings of the flow meter prior to installation.

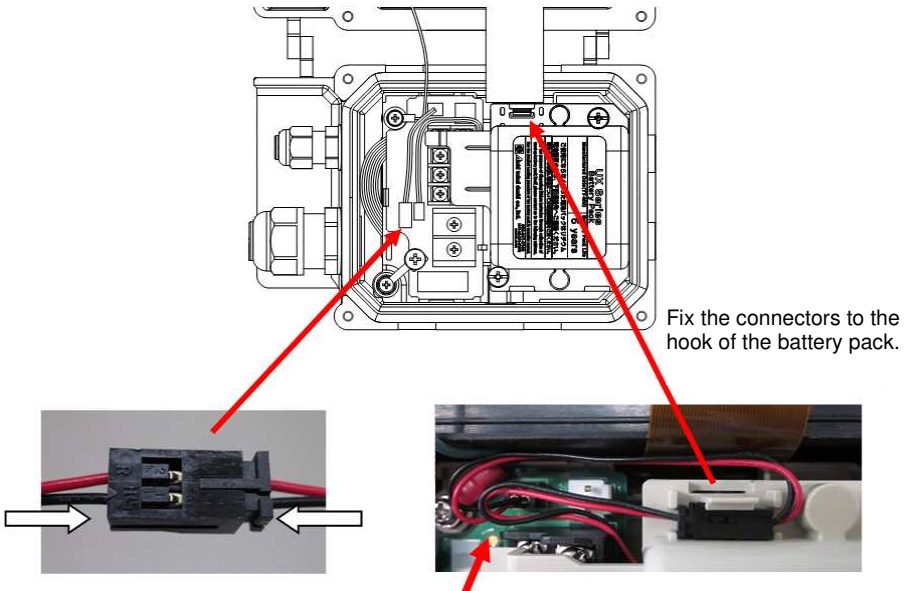
2-1. Connection of battery

In the internal battery type, the battery is not connected upon shipment. Connect the battery connectors correctly in accordance with the following procedure before using the product.

1) Loosen the screws at the 4 locations shown in the figure and open the cover.
(The screws cannot be removed from the cover to prevent them from dropping.)

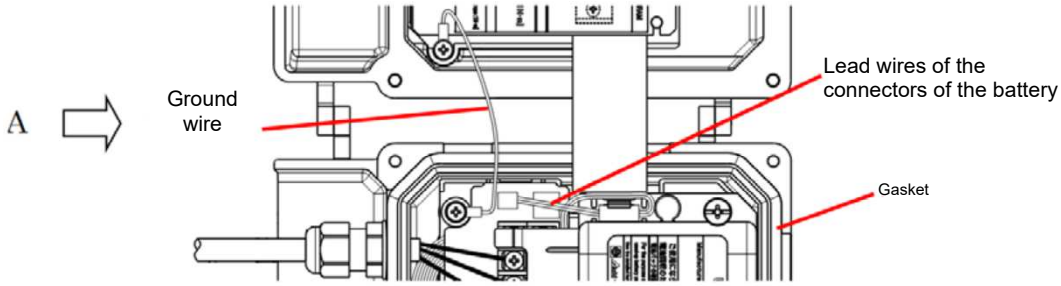


2) Connect the connectors of the battery and fix them to the hook of the battery pack.

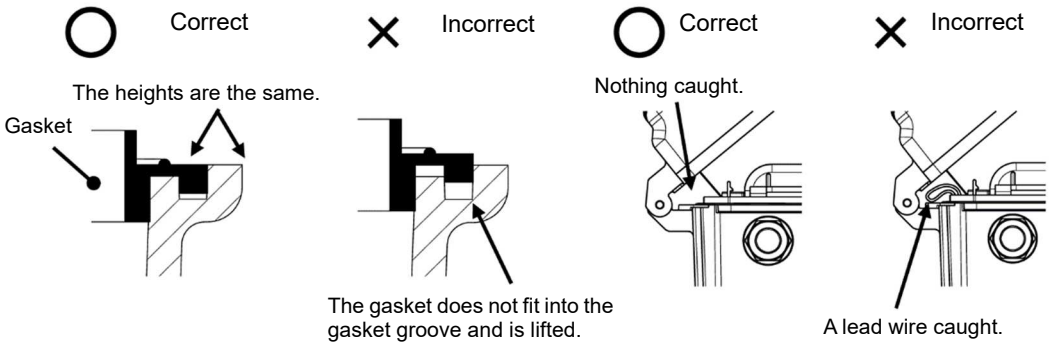


Note: If you use the product without fixing the connectors, it may cause a failure.

3) Check that the gasket fits in the gasket groove and close the cover.
Close the cover carefully so that the earth wire and the lead wire of battery connector may not be caught by the cover.

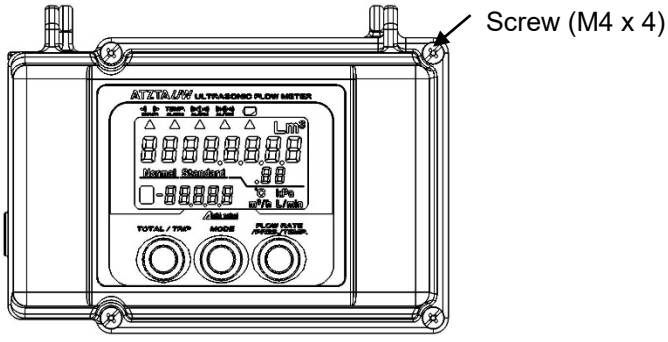


[Arrow A]



4) Tighten the screws at the 4 locations shown in the figure.
Recommended tightening torque: 1.0 ±0.1 N•m

Note: If the screws are not tightened enough or tightened with excessive torque, it may cause entry of water and/or breakage.



[About battery life expectancy and replacement of battery]

The expected life of the internal battery is 5 years. [This is the life expectancy under the standard conditions of temperature 20°C and humidity 65%RH. The actual life varies according to the installed environment (piping condition (near the governor, etc.) and temperature).]

This product contains a lithium battery, and therefore be sure not to dispose of it in the general disposal route.

*For replacement of the battery, please contact your nearest branch or sales office.

2-2. Wiring connection

When you connect an external output cable or connect a cable for external power input in 24 VDC type and 100 VAC type, insert each cable into the section shown in the figure in accordance with the following procedure.

The GND (signal ground) is connected to the casing.

Utilize an isolated power supply or an external connection equipment, as necessary.

Note: Perform wiring connection of an external connection device in accordance with its operation manual.

[Reference] Max. cable length: 100 m

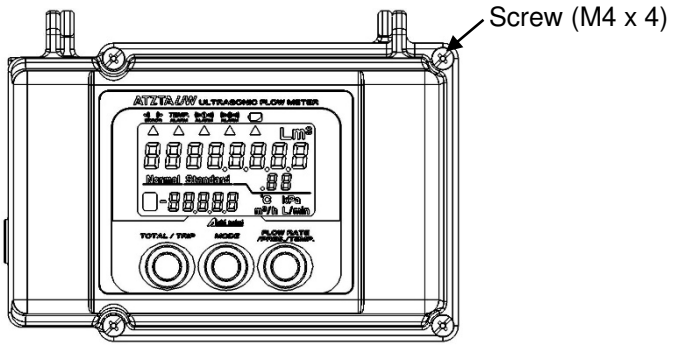
This is the operation range under our test conditions (VCTF, 0.3 sq). The operation range may change according to the installation environment, connection device, and cable type, etc.

Note that if you use a longer cable, signals may be attenuated, and noise is easily overlaid.

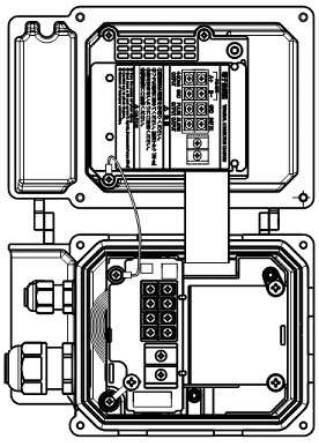
○ Procedure

Loosen the screws at the 4 locations shown in the figure and open the cover.

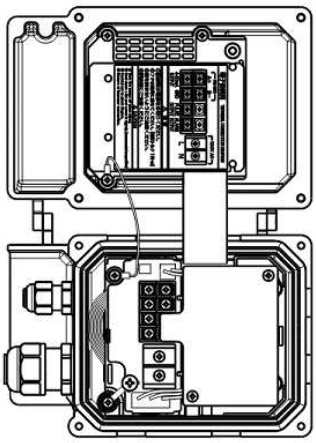
The screws cannot be removed from the cover to prevent them from dropping.



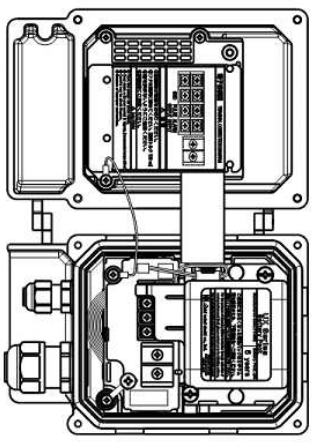
The state when the cover is opened varies according to the power supply type as shown below.



24 VDC type



100 VAC type



Internal battery type

Connect the cable.

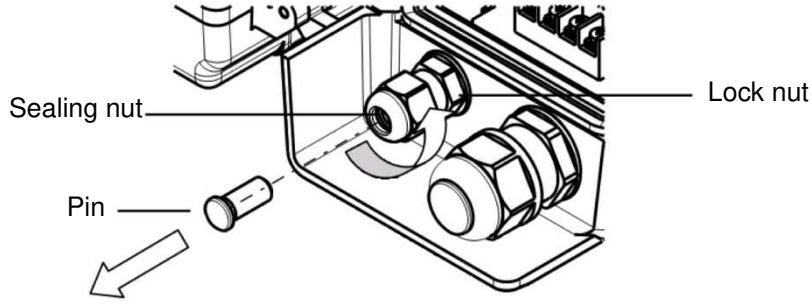
Procedure to connect the cable for external output

(When you do not connect the cable for external output, the procedures (1) to (4) are not required.)

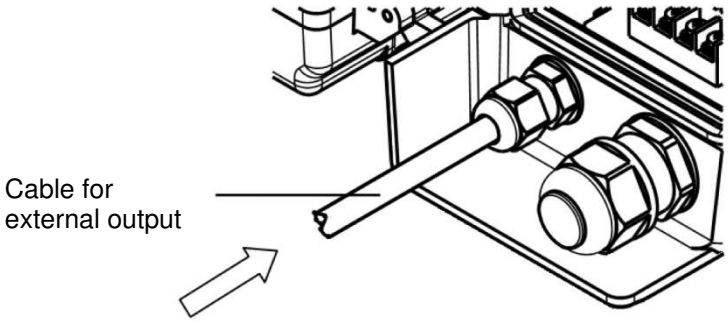
Applicable cable size: φ4 to 6.8 mm (Example: VCTF, 0.3 sq, 3-core to 8-core)
Terminal mount: M3

If you install the flow meter near an electric noise source, use a shield wire as a cable which is connected to the terminal block and ground the shield.
Applicable cable size: φ4 to 6.8 mm (MVVS 0.3 sq, 2-core to 6-core)

(1) Loosen the sealing nut at the introductory part for an external output cable and pull out the pin. Be careful not to loosen the lock nut by mistake.



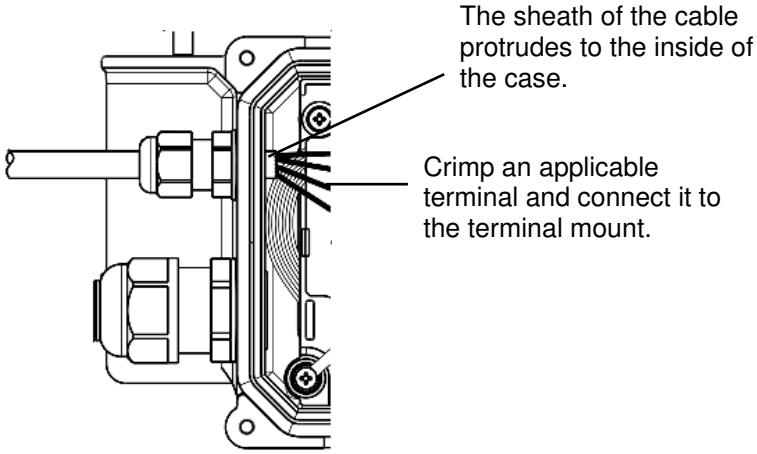
(2) Insert the cable into the introductory part for the cable.



(3) Make sure that the sheath of the cable gets into the inside of the case, crimp an applicable terminal on the cable, and connect the cable to the terminal mount.

Screw size: M3
Recommended tightening torque: 0.5 ±0.1 N•m

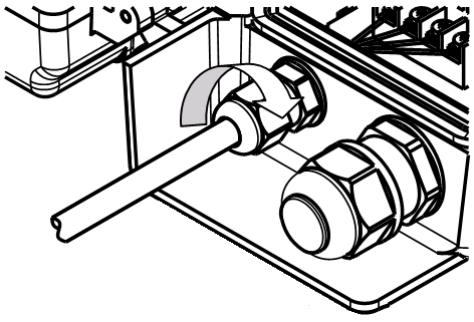
* Note that incorrect wiring may cause a failure. Note that the usable terminal mount varies according to the power supply type. (For the usage of each terminal mount, see “Terminal Connection Diagram” affixed inside of the cover or “Wiring Connection of Each Power Supply Type” on pages 12 and 13.)



(4) Tighten the sealing nut.

Recommended tightening torque: 1.0 ±0.1 N•m

If a torque wrench is not available, the method of tightening the nut at appropriate torque is to manually tighten the sealing nut completely, or tighten it with a tool, and when you feel load, retighten it by 90° (= 1/4 rotation). Do not tighten further. (Excessive torque may damage cables, break seal nut and cause entry of water due to seal deformation.)



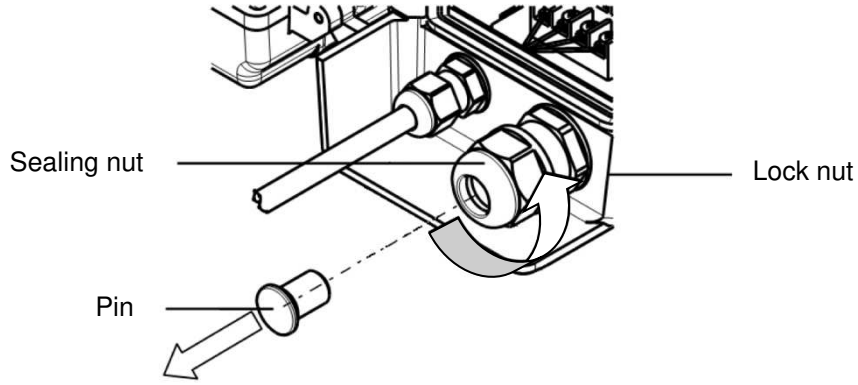
Procedure to connect the cable for external power input

(When you do not connect the cable for external power input, the procedures (5) to (8) are not required.)

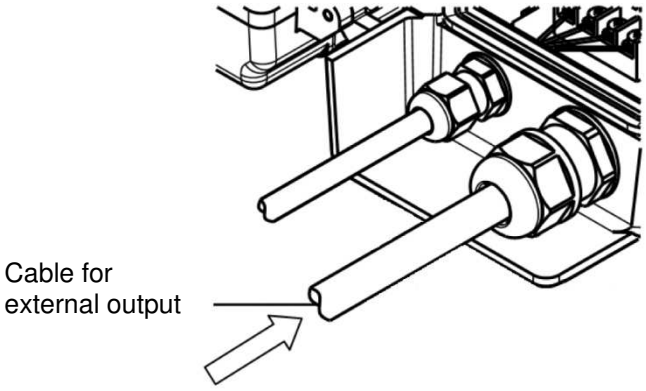
Applicable cable size:	φ6.5 to 12.5 mm (Example: CV 2 sq 2-core, CVV 1.25 sq 2-core)
Terminal mount:	M3 (in case of 24 VDC), M4 (in case of 100 VAC)

If you install the flow meter near an electric noise source, use a shield wire as a cable which is connected to the terminal block and ground the shield.

(5) Loosen the sealing nut at the introductory part for an external power input cable and remove the pin. Be careful not to loosen the lock nut by mistake.



(6) Insert the cable into the introductory part for the cable.



(7) Make sure that the sheath of the cable gets into the inside of the case, crimp an applicable terminal on the cable, and connect the cable to the terminal mount.

[In the case of 24 VDC type]

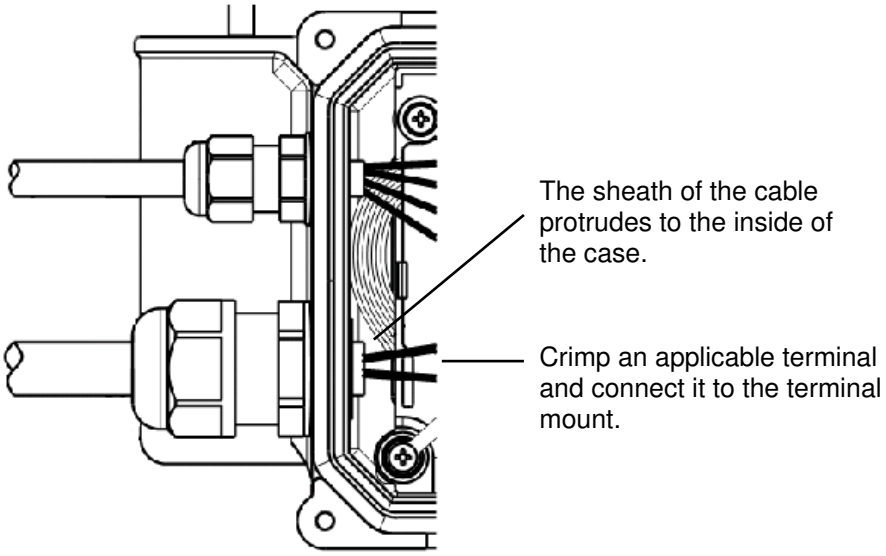
Screw size: M3
Recommended tightening torque: 0.5 ±0.1 N•m

[In the case of 100 VAC type]

Screw size: M4
Recommended tightening torque: 1.0 ±0.1 N•m

Note: The cover of the terminal mount is removed at the time of wiring connection. Be sure to restore it after wiring connection is finished.

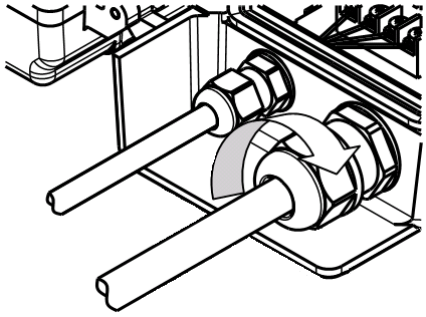
* Note that incorrect wiring may cause a failure. Note that the usable terminal mount varies according to the power supply type. (For the usage of each terminal mount, see “Terminal Connection Diagram” affixed inside of the cover or “Wiring Connection of Each Power Supply Type” on pages 12 and 13.)



(8) Tighten the sealing nut.

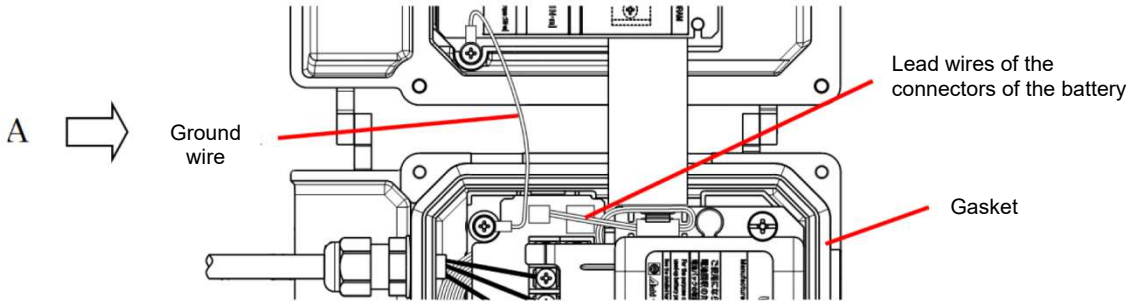
〔Recommended tightening torque: 1.5 ±0.1 N•m〕

If a torque wrench is not available, the method of tightening the nut at appropriate torque is to manually tighten the sealing nut completely, or tighten it with a tool, and when you feel load, retighten it by 90° (= 1/4 rotation). Do not tighten further. (Excessive torque may damage cables, break seal nut and cause entry of water due to seal deformation.)

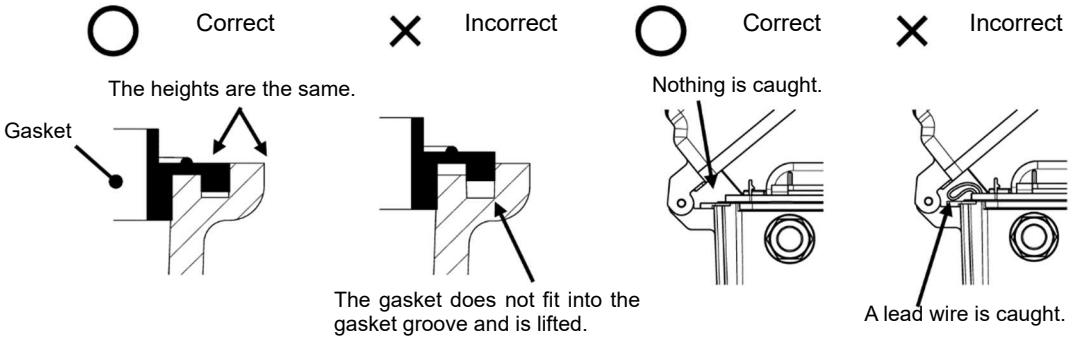


Check that the gasket fits in the gasket groove and close the cover.

Close the cover carefully so that the ground wire and the lead wire of battery connector may not be caught by the cover.



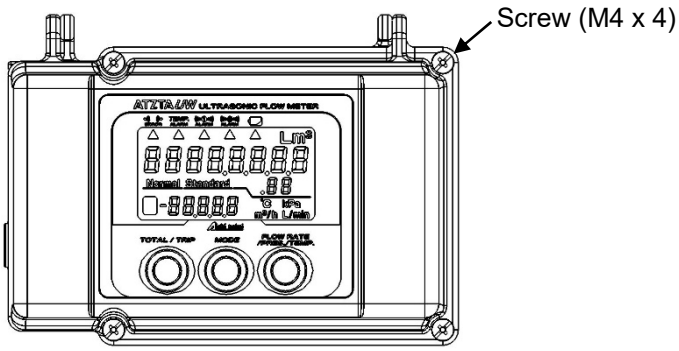
[Arrow A]



Tighten the screws at the 4 locations shown in the figure.

(Recommended tightening torque: 1.0 ±0.1 N•m)

Note: If the screws are not tightened enough or tightened with excessive torque, it may cause entry of water and/or breakage.



“Wiring Connection of Each Power Supply Type” is shown below.
For the usage of each terminal block, see “Terminal Connection Diagram” affixed inside of the cover.

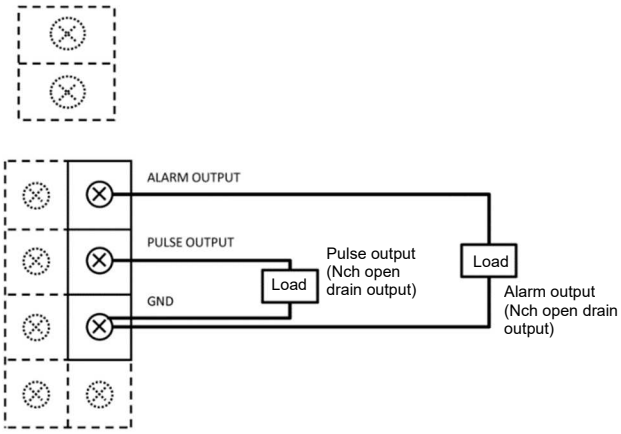


Fig. 1 Wiring Connection [Internal Battery Type]

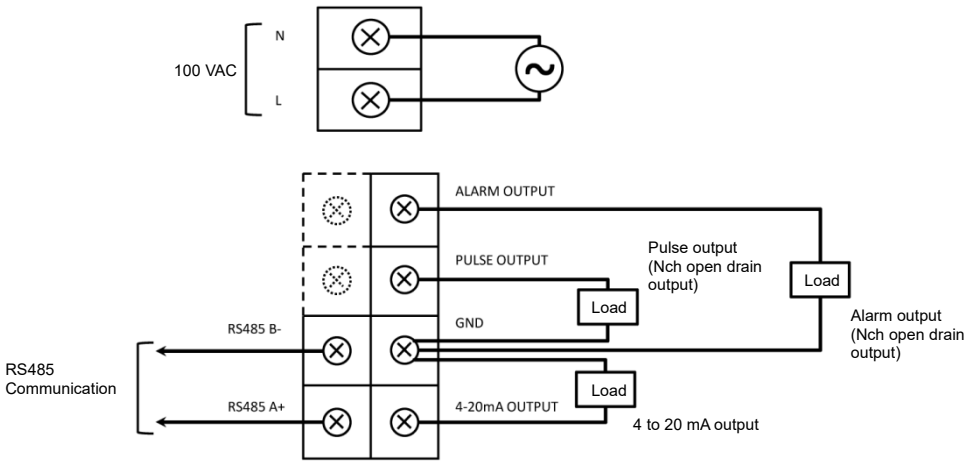


Fig. 2 Wiring Connection [100 VAC Type]

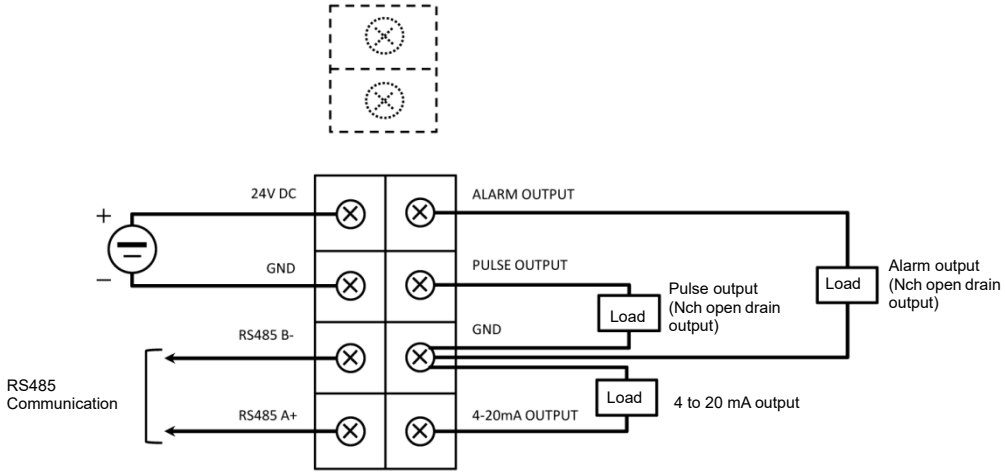


Fig. 3 Wiring Connection [24 VDC Type]

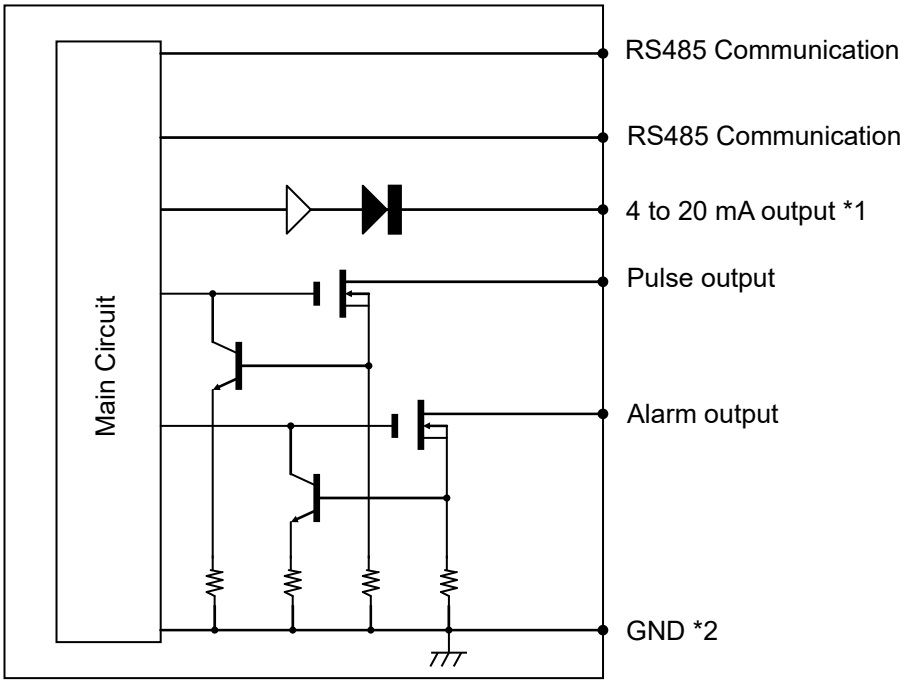


Fig. 4-1 Input/Output Circuit Diagram

*1 Load resistance 400 Ω or less

*2 The GND (signal ground) is connected to the casing.

Take the following measures, as necessary.

- For 24 VDC type, use an insulation type power supply.
- Install a pulse isolator to isolate signals between the flow meter and a receiver.
- Use an insulating bolt, insulating washer, etc., to isolate the casing and pipes.

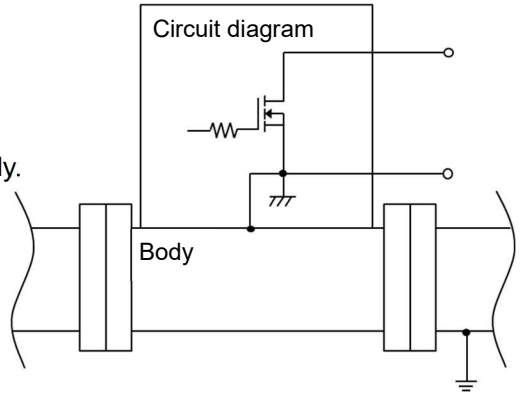


Fig. 4-2 Relationship of the casing and the GND (signal ground)
(Example: Pulse output)

2-3. Installation

Precautions for installation and recommended piping conditions are listed in 1) to 12).

⚠ The measurement may not be performed correctly under certain conditions, so be sure to read the following.

1) Match the arrow on the meter with the forward flow direction of the fluid.
2) Fig. 5-1 shows the recommended lengths of the straight pipe sections according to the piping conditions for this flow meter.

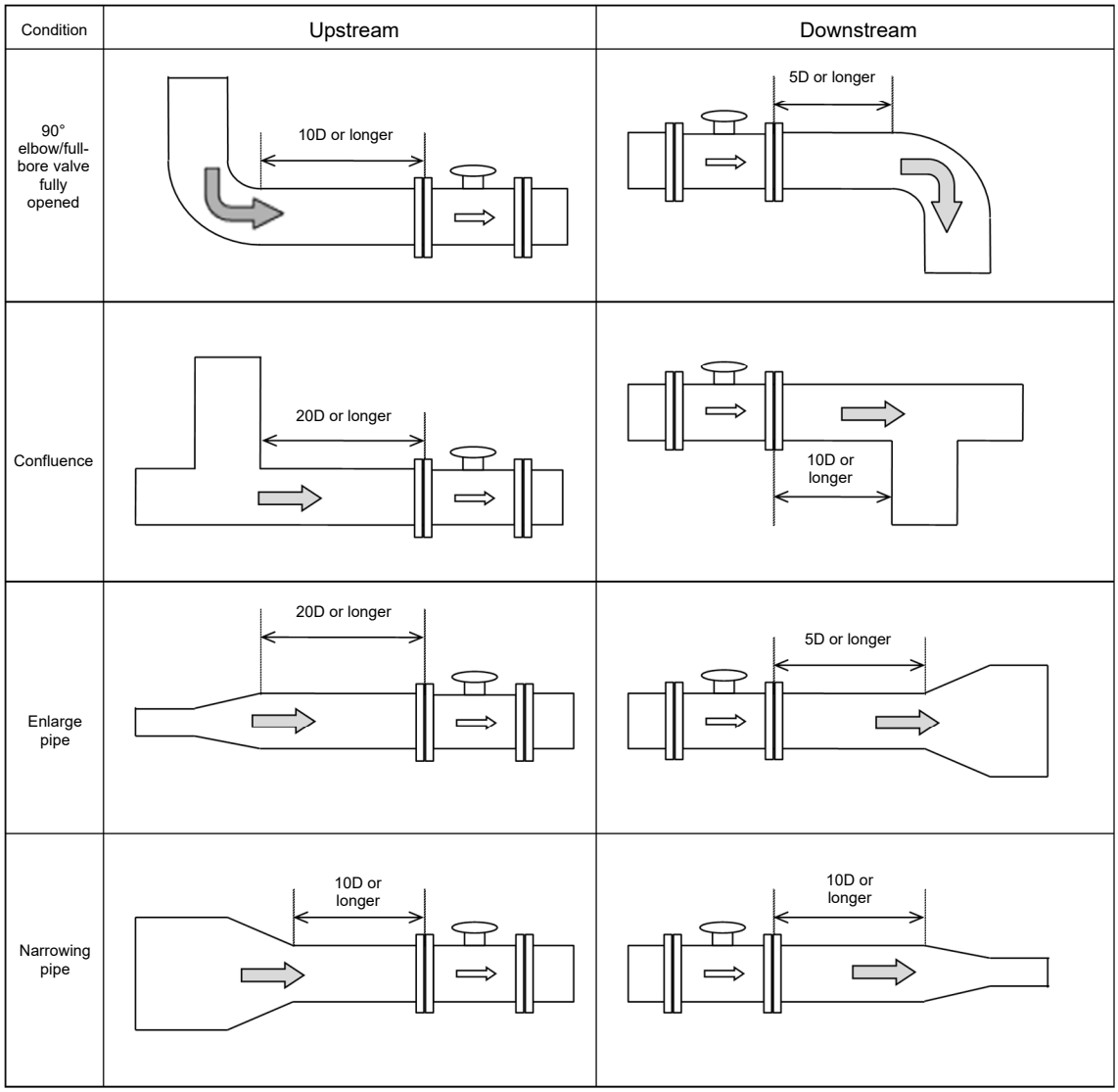


Fig. 5-1 Recommended Straight Pipe Length 1 (D: Nominal diameter)

3) When installing the flow meter near a pressure reducing valve or a flow control valve, ultrasonic noise may be generated inside the piping. Therefore, be sure to strictly follow the “Required Straight Pipe Length L” as shown in Fig. 5-2 below.

In particular, <u>when installing the flow meter downstream of a pressure reducing valve, etc., note that there are major restrictions to follow. (If the conditions are not satisfied, the measurement may not be possible.)</u>

$$\text{Required straight pipe length L (mm)} = 10D + \text{Differential pressure (kPa)} \times Dx \frac{\text{Maximum velocity used (m/s)}}{20\ (\text{m/s})} \times (0.8)^{\text{Elbow number}}$$

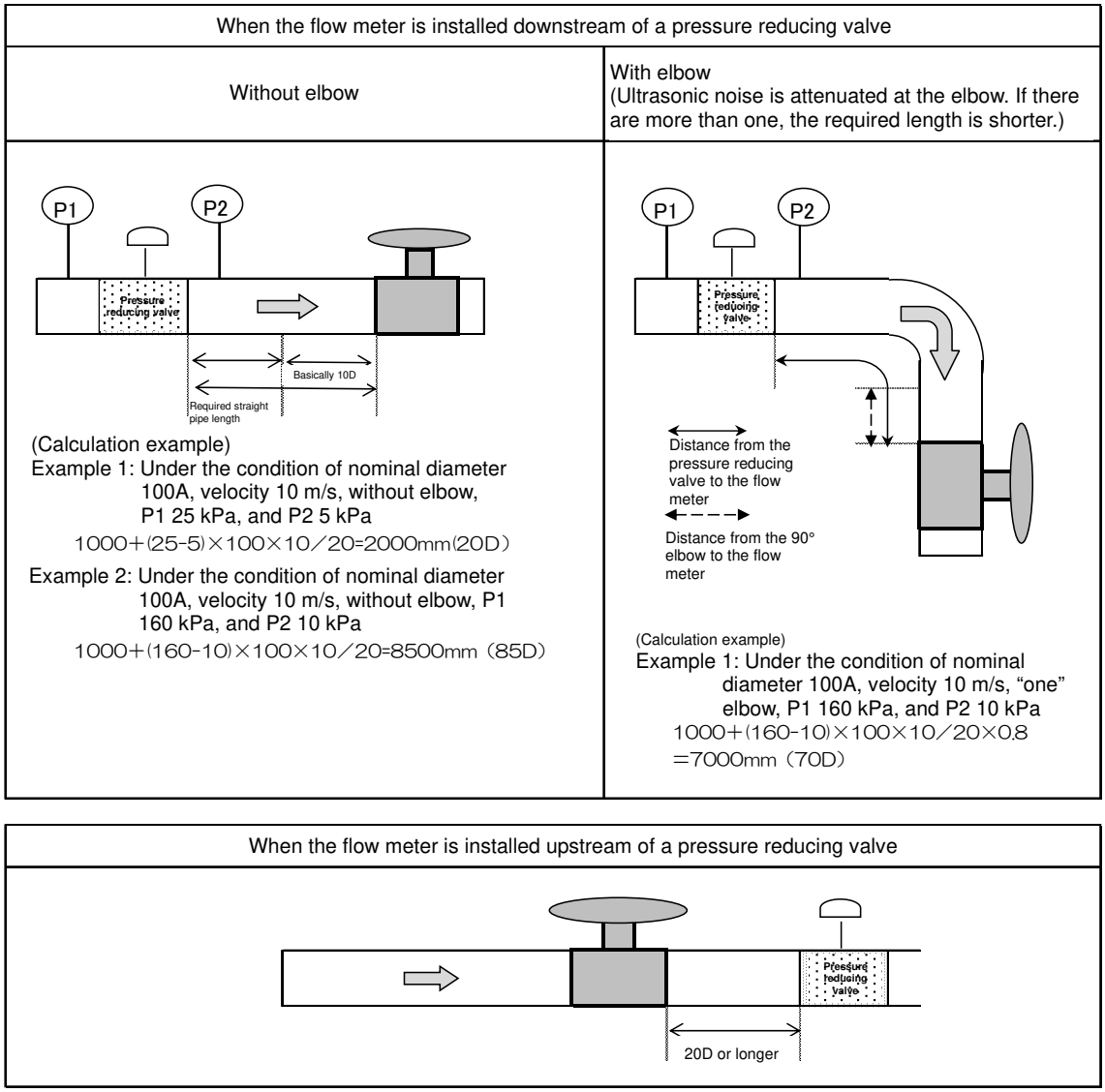


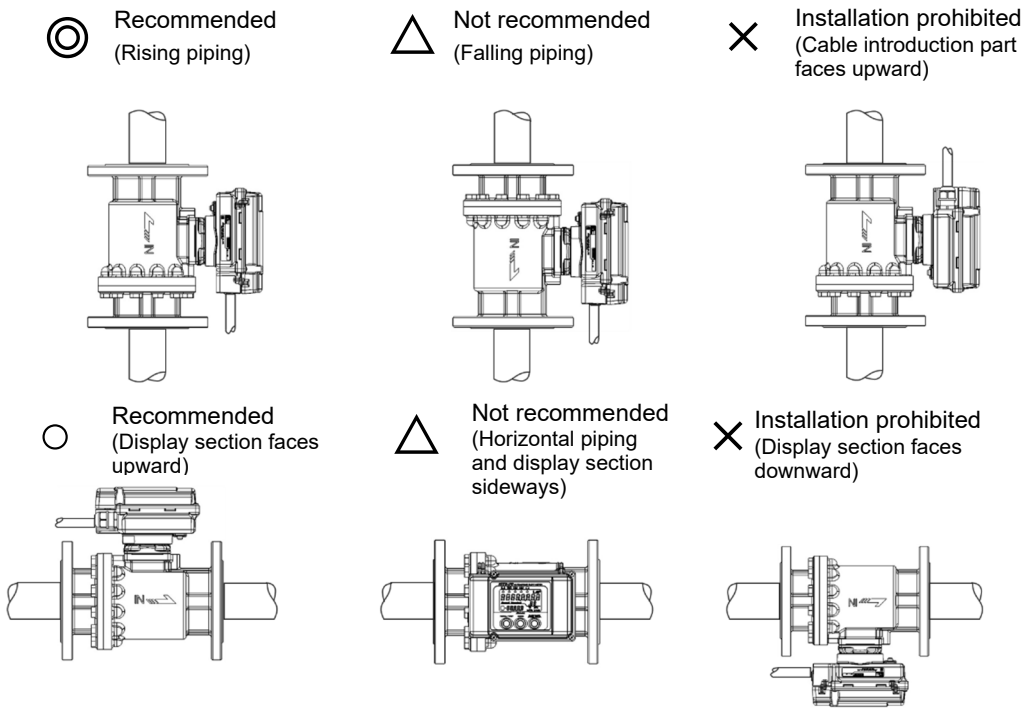
Fig. 5-2 Recommended Straight Pipe Length 2 (D: Nominal diameter)
(When installing the flow meter near a pressure reducing valve or a flow control valve)

4) This product can be installed indoors or outdoors, in either horizontal or vertical piping.

Installation in which the “display section faces downward” and the “cable introduction part faces upward” cannot be performed.

It is recommended to use rising piping to install the flow meter if the air contains oil mist, dust, or other materials.

If oil mist and/or dust accumulates inside this product, it may cause performance failure and/or defects.



This product does not have a complete waterproof structure (IP64). Do not install it at a place that may be submerged in water.

If the flow meter is exposed to direct sunlight, providing a sunshade or using the optional cover is recommended.

5) Use hexagonal bolts of the following lengths to avoid interference with the display section and body.

Recommended bolt specification for 80A/100A: M16 x 55 mm

Recommended bolt specification for 150A: M20 x 65 mm

6) Make sure that the flange gaskets do not protrude into the interior of the pipes.

When making piping connections, make sure that foreign material such as weld chips, debris, sealing tape, and sealant do not make their way into the pipe. In the case of new piping, install the product after sufficient cleaning of the pipe(s).

7) Do not install the flow meter in sections where it will be subjected to significant compression forces, tensile loads, and other loads after it is installed.

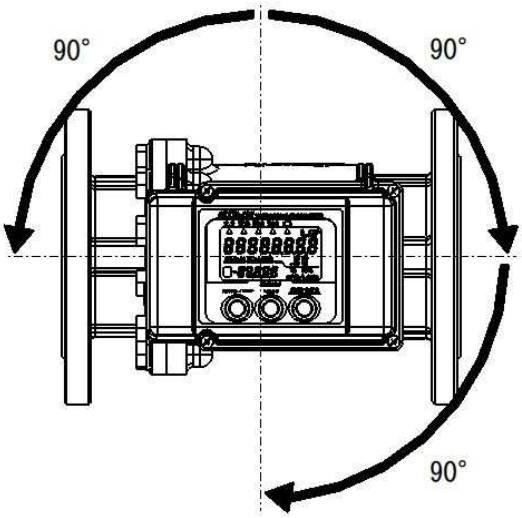
8) When piping, do not touch the inside of the main unit, especially the ultrasonic sensor. In addition, do not drop the product, hit it, or apply excessive impact.

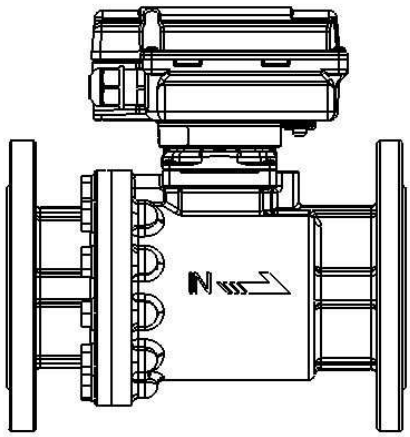
⃠ Do not hold the display section of the flow meter or the signal cable protection tube.

9) The direction of the display section can be changed by rotating. To change the direction of the display section, loosen the set screw at its neck part using an M4 hex wrench and then rotate the display section. Once it is in the desired orientation, always make sure to tighten the set screw to fix the display section in place.

In addition, when the position of the display section is set to D or U in the flow direction, be sure to open the display section slowly because if the display section is opened vigorously, it may come into contact with the meter and the flange of the piping, resulting in damage.

* When rotating the display section, do not apply a force in a direction other than the rotating direction.
  In case any force is applied to direction to pull up or push down the display section, the display may come off which can lead to breaking of the internal wires, etc., or may not rotate smoothly.
  A feeling of being stuck or unsmooth rotation during the rotation is indication of possibility that force is being applied in a direction other than the direction of rotation. In the case, stop applying force once and check if force direction and the way of rotation are correct.
* The display section can be rotated by 180° clockwise and 90° counterclockwise in the flow direction L (left to right of the display section) as seeing from the display side. It cannot be rotated more than the rotation range.

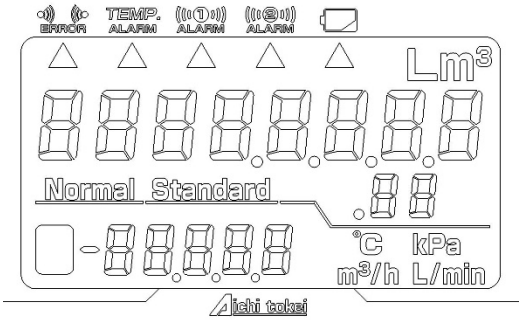




3. Startup procedure

After the subject fluid for measurement is set, turn on the power while no fluid flows (0 m^3/h).

3-1. When the power is turned on

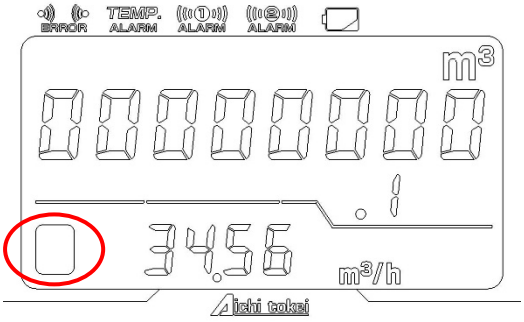


When the power is turned on, check that the entire LCD is turned on, and the symbols and units flicker every 2 sec.

The display is switched to the measurement mode in approx. 1 min.

3-2. When operation starts

When you are running the meter for the first time, gradually open the valve and check that the pilot lamp is flickering. A flickering pilot lamp indicates that the fluid is flowing.



4. Operation Procedure

This product consists of the startup mode, measurement mode, setting mode, and test mode. Using the 3 buttons, you can switch the modes and displays, and make various local settings.

For arrangement of the left button, center button, and right button, see Fig. 6.

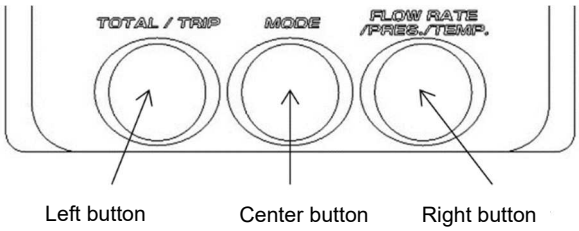


Fig. 6. Button arrangement

For button operations for each operation mode, follow the table below.

Table 1 Button operation for each mode

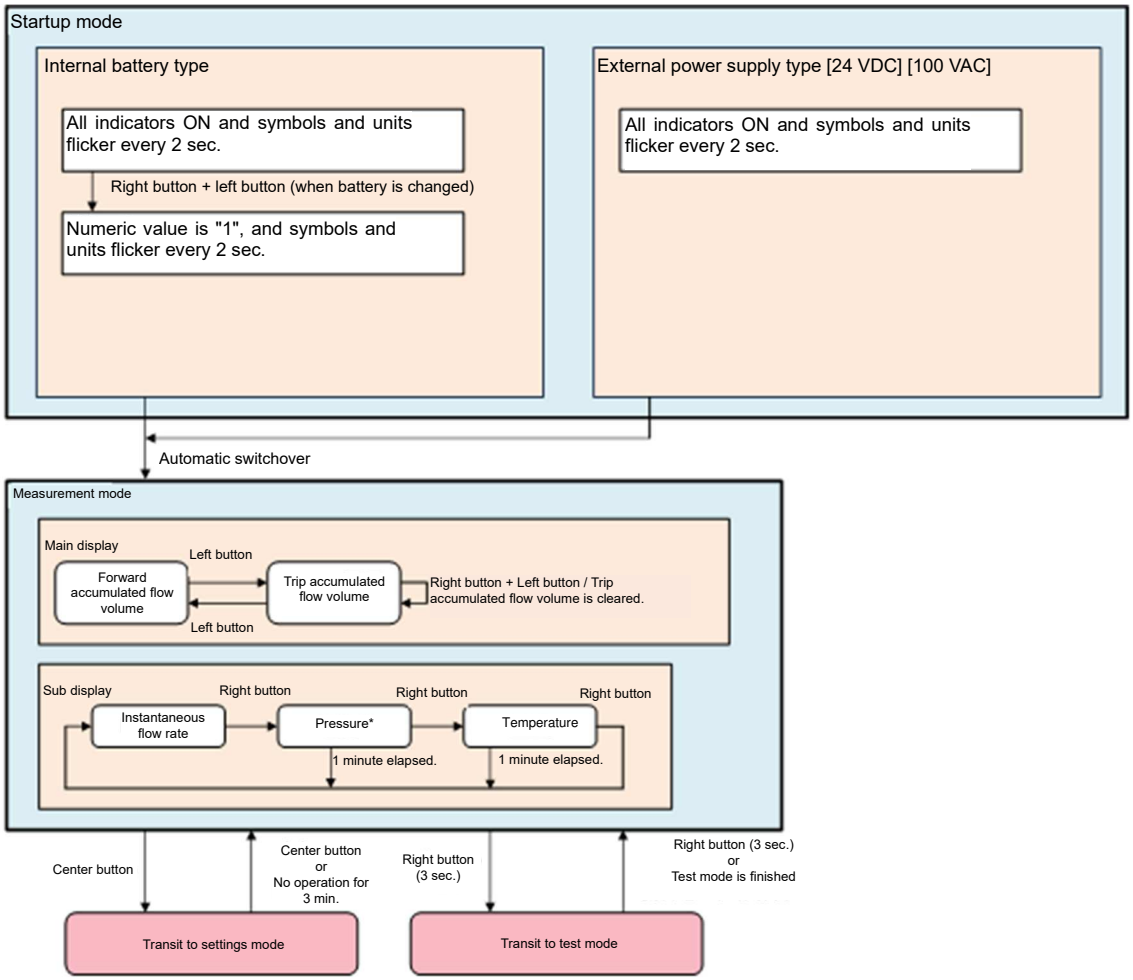
Position and name of button		Startup mode	Measurement mode	Setting mode		Test mode
Button position	Name			Local setting display	Detailed setting	
Left	SW1		Switchover between total accumulated flow volume and trip accumulated flow volume	Switchover to the next setting item	Switchover of setting contents Change of the flickering digit	
Right	SW2		Switchover between instantaneous flow-rate [m^3/h], pressure[3], and temperature	Switchover to the previous setting item	Change of the value at flickering digit	Switchover to measurement mode*
			Switchover to test mode*			
Center	SW3		Switchover to setting mode	Switchover to measurement mode		
	SW1+SW2[1]	Completion of replacement of battery*	Clearing of trip accumulated flow volume[2]	Switchover between local setting and detailed setting		

1) “SW1+SW2” denotes steps where both switches must be pressed simultaneously.

2) By pressing SW1 and SW2 simultaneously while the trip accumulated flow volume is displayed, the trip accumulated flow volume can be cleared.

3) The operating gas setting pressure is displayed in the type without pressure sensor, and the measured pressure is displayed in the type with pressure sensor.

* You need to press the switches for 3 sec or more



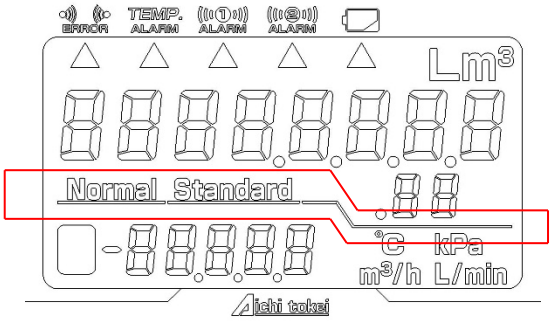
* “Pressure” in sub display: The operating gas setting pressure is displayed in the type without pressure sensor, and the measured pressure is displayed in the type with pressure sensor.

Fig. 7 Button operation in measurement mode and switchover to each mode

4-1. Display of measurement values (measurement mode)

4-1-1. Conversion display

The partition line varies according to the conversion setting.



"Without conversion"

" With conversion (Normal conversion)"

Normal

" With conversion (Standard conversion)"

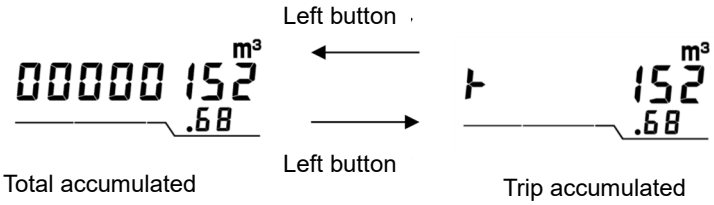
Standard

4-1-2.Display of accumulated flow volume

The number of digits displayed varies according to the conversion setting.

(Total accumulated flow rate)	□□□□□□□□. □	[m^3]	8 integers and 1 decimal place (actual flow rate of 80A)
	□□□□□□□□□□	[m^3]	10 integers (conversion flow rate of 80A; and actual flow rate and conversion flow rate of 100A, 150A)
(Trip accumulated flow rate)	□□□□□□□. □	[m^3]	7 integers and 1 decimal place (actual flow rate of 80A)
	□□□□□□□□□	[m^3]	9 integers (conversion flow rate of 80A; and actual flow rate and conversion flow rate of 100A, 150A)

Every time you press the left button, the trip accumulated flow volume and total accumulated flow volume are displayed in turn in the main display.



By pressing the left button and right button simultaneously while the trip accumulated flow volume is displayed, the trip accumulated flow volume is cleared.

If the trip accumulated flow volume exceeds 9999999.9, 0000000.0 is displayed without zero suppress, and the accumulation operation continues.

(Trip accumulated flow volume 10000152.6 [Normal•m^3])

4-1-3. Display of instantaneous flow-rate, temperature, pressure

The number of the display digits of each item is shown below.

[Instantaneous flow-rate]

(Less than 1000)	□□□. □□	[m^3/h]	3 integers and 2 decimal places
(1000 or more)	□□□□. □	[m^3/h]	4 integers and 1 decimal place

[Temperature]

	□□. □	[°C]	2 integers and 1 decimal place

[Pressure]

	□□□□. □	[kPa]	4 integers and 1 decimal place

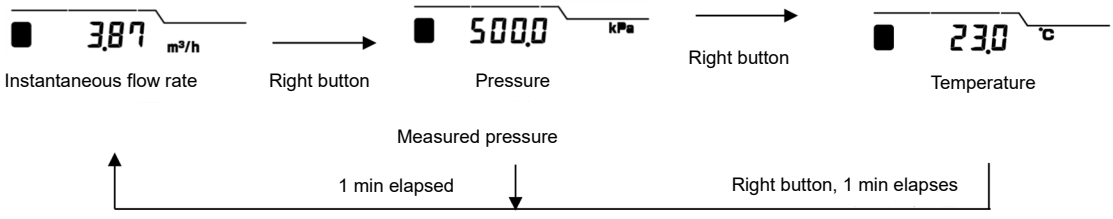
* The content of the pressure display is different between the type without pressure sensor and the type with pressure sensor.

Type without pressure sensor: Operating gas setting pressure (The partition line is turned off.)

Type with pressure sensor: Measurement value (The partition line is turned on.)

Every time the “right button” is pressed, the sub display will cycle from Pressure to Temperature and then to instantaneous flow-rate.

One minute after pressure or temperature is displayed, the display will automatically transit to the instantaneous flow-rate display.



4-2. Measurement of very small flow-rate (Test mode)

The test mode is a function to temporarily cancel the low flow cutoff.

Please use the test mode under conditions where there is no flow.

You can transit to the test mode by pressing the “right button” for 3 seconds in the measurement mode, and this will allow you to measure very small flow-rates.

In the test mode, the units in the sub display (“m^3/h”, “kPa”, “°C”) flicker every 0.5 sec.

You can select 3 min, 60 min, or unlimited as the test mode time, and when the specified time elapses, the mode will automatically transit to the measurement mode. The mode will transit to the measurement mode if the “right button” is pressed for 3 seconds or longer again in the test mode.

If the flow-rate value in the instantaneous flow-rate display is (+)0.01 or larger, or the pilot lamp is flickering, there is a possibility* of a leakage at the downstream of the meter.

If “- (minus)” is displayed in the instantaneous flow-rate display, there is a possibility* of a leakage at the upstream of the meter.

* Possibility of leakage: Please note that this is strictly a possibility as the displayed value also includes zero flow-rate offset, internal convection and other factors.

The instantaneous flow-rate display in test mode is rounded off to the second decimal point.

Examples: Measurement value: 0 to 0.004 [m^3/h] → Display: 0.00 [m^3/h]

Measurement value: -0.004 to 0 [m^3/h] → Display: -0.00 [m^3/h]

4-3. Setting of parameters (Settings mode)

Press the “center button”, and you will transit to the settings mode. If you press the “center button” again, you will transit from the settings mode to measurement mode. If no operation is performed in the settings mode for 3 minutes, the mode will automatically transit to the measurement mode.

In the setting mode, you can change setting contents described in “Table 4. Setting items and contents in Settings mode“ (page 32).

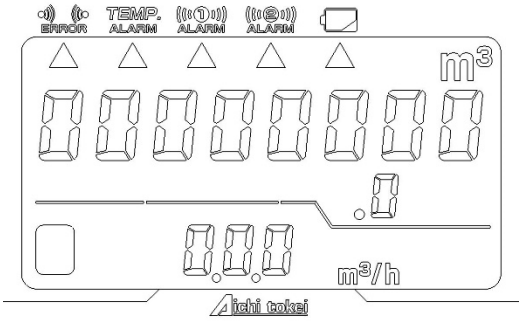
For button operation in the settings mode, see Display Switchover Diagram in the settings mode Figs. 8 to 10 (pages 43 to 45).

* The same settings can be made via RS485 communication. Make settings via RS485 communication under conditions where button operations may be difficult, such as when the flow meter is used at heights.
Refer to communication specifications “TS-UW-001-1” for details on the communication features.

Communication specifications are available for download on our website.

5. Alarm Display

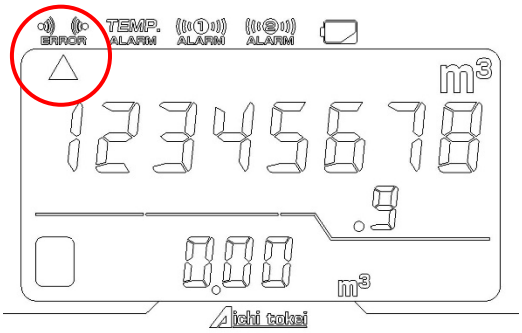
In the alarm display, "▲" corresponding to the applicable alarm is turned on.



5-1. Abnormal flow rate measurement

When the ultrasonic signal is small and cannot be received, "Abnormal flow rate measurement" is turned on, and "0.00" is displayed as the instantaneous flow-rate value. The accumulation stopped as the accumulated flow volume value just before the error occurrence remains displayed.

Check that there is no foreign material which prevents transmission of ultrasonic and/or oil and other fluid are not affixed in the pipe. When "Abnormal flow rate measurement" is turned on even if no foreign material is affixed and/or stationed, please contact your nearest branch or sales office.



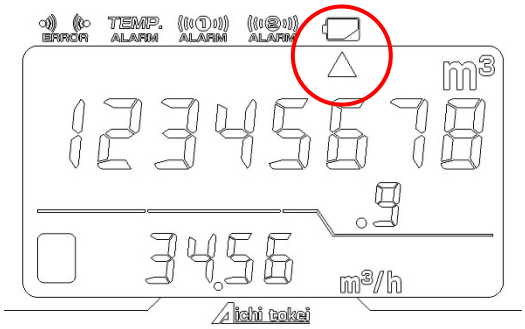
(Note) Actions when the meter is first run

At the time of installation and start of operation of the flow meter, there are cases where "Abnormal flow rate measurement" is turned on due to excessive flow and/or mixture of air and gas upon conversion of air into gas. After conversion is completed and the fluid is stabilized, "Abnormal flow rate measurement" will be turned off. (This is not an error.)

5-2. Battery replacement alarm [Internal Battery Type]

When 5 years (including storage period) have passed after the battery connector was connected (the power was turned on), “battery replacement alarm” is turned on to inform the user that it is time to replace the battery. While measurement continues even after “battery replacement alarm” is turned on, it is recommended to replace the battery as soon as possible when “battery replacement alarm” is turned on.

When you replace the battery, please contact your nearest branch or sales office.

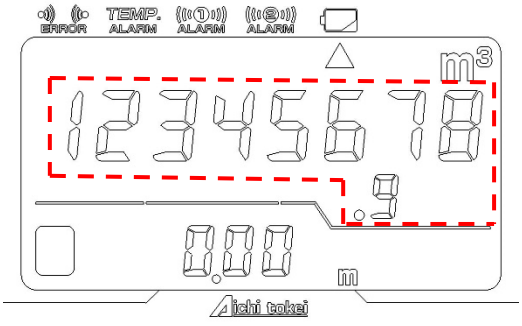


When the remaining battery becomes low after “battery replacement alarm” is turned on, the “accumulated volume flickers every 0.5 sec” as showing the battery is approaching to the end of life. The measurement operation is stopped, “0.00” is displayed as the instantaneous flow-rate display, and the accumulation is stopped as the accumulated flow volume value just before the alarm is turned on.

Replace the battery immediately.

When you replace the battery, please contact your nearest branch or sales office.

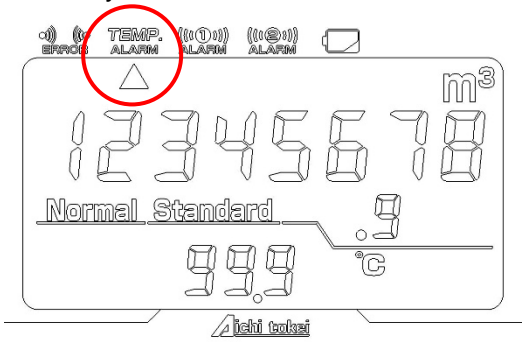
The battery life is 5 years or more under the normal condition, but the end of the battery may be displayed within 5 years depending on the ambient temperature. (If it is less than 5 years, the voltage drop ▲ does not light and the accumulated flow value flickers. The same applies if the battery has not been replaced even after performing the reset process for the voltage drop ▲.)



In this state, you can switch the total accumulated flow volume display and trip accumulated flow volume display using the left button; and the instantaneous flow-rate, temperature, and pressure display using the right button. However, you cannot switch the mode to the settings mode using the center button.

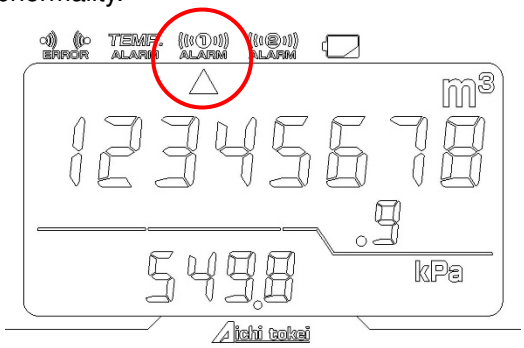
5-3. Abnormal temperature value

When an error of the temperature value is detected, “Abnormal temperature value” is turned on. When an error of the temperature value is detected, “0.00” is displayed as the instantaneous flow-rate, and an abnormal value is displayed as the temperature. As for the accumulated flow volume value in the main display section, the accumulation process stops and the display shows the value immediately prior to the abnormality.



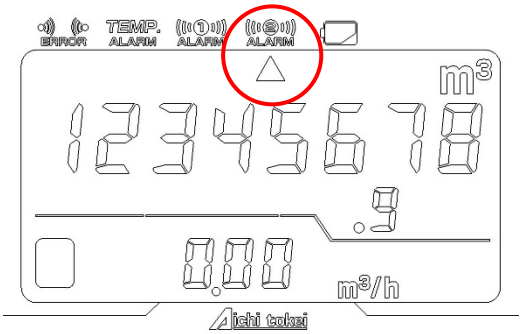
5-4. Abnormal pressure value (Type with pressure sensor)

When an error of the pressure value is detected, “Abnormal pressure value” is turned on. When an error of the pressure value is detected, “0.00” is displayed as the instantaneous flow-rate, and an abnormal value is displayed as the pressure value. As for the accumulated flow volume value in the main display section, the accumulation process stops and the display shows the value immediately prior to the abnormality.



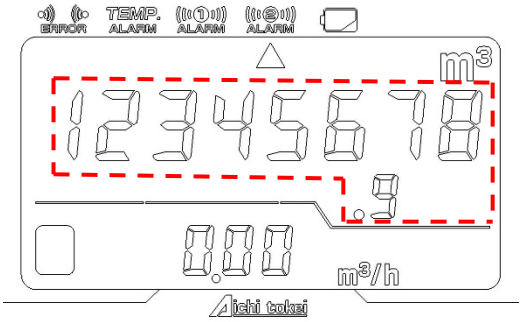
5-5. External memory abnormality

When abnormality data is detected upon recovery of the accumulated value when the power is turned on by setting of communication or button operation, and external power supply type (24 VDC, 100 VAC), “External memory aberration” is turned on. When “External memory abnormality” is turned on, check and reset the setting value. If “External memory abnormality” is not turned off even after all the data is reset, there is a possibility of a failure. Please contact the company you purchased the product from or our branch or sales office.



When an error of internal data is detected, the “accumulated flow volume flickers every 0.5 sec”.

There is a possibility of a failure. Please contact the company you purchased the product from or our branch or sales office



5-6. In the case of power outage (DC type, AC type)

Power outage detection

If it is determined that the power supply voltage has decreased, the measurement is stopped and the LCD is turned off as a power outage detection.

Recovering from a power outage

When the power supply voltage is restored, the meter resumes the measurement and turns on the LCD.

The accumulated flow volume and trip accumulated flow volume are saved (the previously saved value is overwritten) every 5 minutes after the power is turned on. When the flow meter recovers from a power outage, the accumulated flow volumes saved just before a power outage occurs are restored, and accumulation is performed using these values.

When the flow meter recovers from a power outage, the accumulated flow volumes are displayed in the upper LCD.

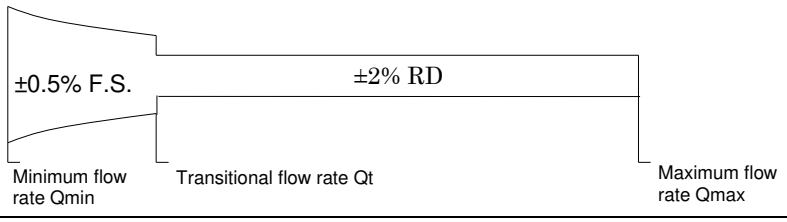
6. Troubleshooting

Timing	Phenomenon	Possible cause	Remedial action
Immediately after installation	Abnormal flow rate measurement "ERROR" is turned on. (See page 24.)	Gas replacement operation is underway.	When the replacement operation is finished, the abnormal flow rate measurement is turned off.
		The meter is used outside the range of the specifications (such as installation conditions, gas type, pressure, and temperature).	Check that the safety concerns and specifications [pages 29 and 30] are complied with.
		There is a major source of electrical noise near the flow meter.	Take a measure to eliminate the noise source or shield the flow meter. Use a shield wire as a cable which is connected to the terminal mount and ground the shield.
	The flow meter does not start accumulation immediately after installation.	Gas replacement operation is underway.	Check to see if the partition line between the main and sub-displays is flickering. When the replacement operation is finished, accumulation starts.
	The instantaneous flow-rate shows a negative value.	The direction of the fluid flow and the flow direction of the meter are opposite of each other.	Check to see that the arrow on the surface of the flow meter is pointing in the direction of the fluid flow.
During operation	Battery replacement alarm "" is turned on (See page 25).	The internal battery needs to be replaced.	It indicates the necessity to replace the internal battery. (Contact your nearest Aichi Tokei Denki branch or sales office.)
	The accumulated flow volume flickers.	The battery reaches its life expectancy.	It indicates that the internal battery reaches its life expectancy. (Contact your nearest Aichi Tokei Denki branch or sales office.)
		Internal memory aberration occurs.	It indicates the possibility of an internal memory failure. (Contact your nearest Aichi Tokei Denki branch or sales office.)
	The instantaneous flow-rate appears to be fluctuating.	The pressure fluctuates frequently.	The flow meter operates correctly. Installation of the meter in a place where there is little change in pressure is recommended to make accurate measurements.
		There is pulsation.	The flow meter operates correctly. Installation of the meter in a place where there is little pulsation is recommended to make accurate measurements.
		The meter is used outside the range of the specifications (such as installation conditions, gas type, pressure, and temperature).	Check that the safety concerns and specifications [pages 29 and 30] are complied with.
	The instantaneous flow-rate does not fall to zero even there is no flow.	Gas is convecting in the pipe.	The flow meter operates correctly.
		Test mode is on.	When the units in the sub display flicker, the test mode is on. Turn it off according to need. (See Test mode [page 23].)
		The meter is used outside the range of the specifications (such as installation conditions, gas type, pressure, and temperature).	Check that the safety concerns and specifications [pages 29 and 30] are complied with.
	The instantaneous flow-rate is too large.	"Conversion flow rate (Normal or Standard)" display is set.	Check to see that the correct value unit for the application is used. (For how to change the unit, see Setting of flow meter [page 37].)
	The instantaneous flow rate does not seem to change.	There is excessive flow rate larger than the specifications.	Use the meter within the scope of its specifications. (For the specifications, see [pages 29 and 30].)
		Adjustment of ultrasonic measurement is underway.	The flow meter operates correctly. This should typically complete in about 30 seconds.
	The instantaneous flow rate is too small.	The display shows the "Actual flow-rate (m^3)".	Check to see that the correct value unit for the application is used. (For how to change the unit, see Setting of flow meter [page 37].)
	There is no "0" displayed in the upper digit of the accumulated flow volume.	The display shows the trip accumulated flow volume.	The flow meter operates correctly. (For how to restore the forward accumulated flow volume, see the operation of the display section [page 19].)

7. Specifications

List

UW [Nominal diameter] / [Pressure] [Power supply] / [Flow direction] / [Gas type]

<table>
<tr><td colspan="3">Model</td><td>UW80</td><td>UW100</td><td>UW150</td></tr>
<tr><td colspan="3" rowspan="2">Connection of pipe</td><td colspan="3">Flange</td></tr>
<tr><td>JIS10K80A-RF</td><td>JIS10K100A-RF</td><td>JIS10K150A-RF</td></tr>
<tr><td rowspan="3">Maximum operating pressure</td><td colspan="2">Type without pressure sensor</td><td colspan="3">1000 kPa</td></tr>
<tr><td colspan="2">Type with pressure sensor (500 kPa)</td><td colspan="3">500 kPa</td></tr>
<tr><td colspan="2">Type with pressure sensor (1000 kPa)</td><td colspan="3">1000 kPa</td></tr>
<tr><td colspan="3">Gas type for measurement</td><td colspan="3">Natural gas (12A, 13A), Nitrogen</td></tr>
<tr><td rowspan="3">Power supply/Power consumption</td><td colspan="2">Battery</td><td colspan="3">Dedicated lithium battery (5-year life expectancy under 20°C and 65%RH)</td></tr>
<tr><td colspan="2">AC power supply</td><td colspan="3">100 VAC ±15% / 10 W or less (when analog output is 22 mA)</td></tr>
<tr><td colspan="2">DC power supply</td><td colspan="3">24 VDC ±10% / 2 W or less (when power supply voltage is 26.4 V and analog output is 22 mA)</td></tr>
<tr><td>Flow-rate range (actual flow-rate)[*1)]</td><td colspan="2">13A, 12A, N2</td><td>+3.3 to +330 m³/h</td><td>+5.0 to +500 m³/h</td><td>+12.0 to +1200 m³/h</td></tr>
<tr><td rowspan="3">Accuracy</td><td>Minimum flow rate Qmin to Transitional flow rate Qt</td><td>±0.5% F.S.</td><td>+3.3 to +33 m³/h</td><td>+5.0 to +50 m³/h</td><td>+12.0 to +120 m³/h</td></tr>
<tr><td>Transitional flow rate Qt to Maximum flow rate Qmax</td><td>±2.0% RD[*5)]</td><td>+33 to +330 m³/h</td><td>+50 to +500 m³/h</td><td>+120 to +1200 m³/h</td></tr>
<tr><td colspan="3"></td><td colspan="3"> 
</td></tr>
<tr><td colspan="3">Compensation of temperature/pressure</td><td colspan="3">Disabled/Enabled (Normal/Standard conversion)</td></tr>
<tr><td colspan="3">Conversion accuracy</td><td colspan="3">±1.5% RD
(At 23°C and 500 or 1000 kPa)</td></tr>
<tr><td rowspan="2">Display</td><td colspan="2">Main display section</td><td colspan="3">Accumulated flow volume: 8 integers and 1 decimal place (actual flow rate of 80A)
10 integers (conversion flow rate of 80A; and actual flow rate and conversion flow rate of 100A, 150A)
Trip accumulated flow rate: 7 integers and 1 decimal place (actual flow rate of 80A)
9 integers (conversion flow rate of 80A; and actual flow rate and conversion flow rate of 100A, 150A)
Abnormal flow measurement, abnormal temperature value, abnormal pressure value, external memory abnormality, and battery replacement alarm (battery-powered meter only), etc.</td></tr>
<tr><td colspan="2">Sub display section</td><td colspan="3">Instantaneous flow rate display digits: 5 digits (floating point)
Temperature display digits: 2 integers and 1 decimal place
Pressure display digits: 4 integers and 1 decimal place</td></tr>
</table>

Model		UW80	UW100	UW150
Output	Analog	(Power-driven meter only) 4 to 20 mADC (Load resistance 380 Ω or smaller) Select from Instantaneous flow rate, Temperature, and Pressure. Standard: Instantaneous flow rate		
	Pulse	Nch open drain output (Max. load 24 VDC, 50 mA) Output 1 (accumulated pulse): Standard: 1000 L/P (Select from 100, 1000, and 10000 L/P.) Duty 20 to 80% Output 2 (alarm): (Power-driven) Select the upper/lower limit alarm, the upper limit alarm of accumulated value, or error alarm (Battery-driven) Select the battery voltage drop alarm, upper/lower limit alarm, or error alarm		
	Communication*2)	(Power-driven only) Complies with RS485 Modbus/RTU (4800/9600 bps)		
Fluid temperature		(Natural gas 12A, 13A) -10 to +40°C, (Nitrogen) -10 to +60°C		
Operating environment temperature/humidity		-10 to +60°C, 90%RH *No condensation		
Protection structure*3)		Indoor/outdoor IP64 (JIS C 0920)		
Mass		Approx. 12.5 kg	Approx. 10.7 kg	Approx. 19.4 kg
Others		CE marking, UKCA marking, RoHS Directive compliant (Each nominal diameter 100 VAC type and UW150 are not compliant with CE and UKCA.)		

*1) See Table 2 and Table 3 (page 31) for the conversion flow-rate range.

*2) Detailed specifications are available for download on our website.

*3) If the flow meter is exposed to direct sunlight, providing a sunshade or using the optional cover is recommended.

*4) The pressure value displayed on the LCD screen starts from 5 kPa. For communication (analog, pulse, RS485), it outputs even if it is 5 kPa or less. The output data is updated at a measurement interval of 1 minute for built-in battery type meter and 0.5 seconds for external power supply type meter.

Glossary of terms used in specifications

- Actual flow rate

  Cubic volume of the fluid which flows per unit of time. The actual flow rate changes depending on the temperature and pressure of fluid. The unit of fluid is m^3/h.

- Normal conversion flow rate

  The volumetric flow rate obtained by converting the temperature and pressure with which the actual flow rate is measured into 0°C and 1 atmosphere (1 atm). The unit of fluid is m^3/h (Normal).

- Standard conversion flow rate

  The volumetric flow rate obtained by converting the temperature and pressure with which the actual flow rate is measured into the conversion standard temperature and conversion standard pressure. The unit of fluid is m^3/h (Standard).

  The conversion standard temperature (-10 to 60°C) and conversion standard pressure (0.00 to 10.00 kPa) can be changed by buttons and communication (external power supply type (24 VDC, 100 VAC) only).

Table 2. Normal conversion flow-rate values [m^3/h (Normal)] [Conversion example]

Pressure (kPa)			0 (atmospheric pressure)		20		100		1000	
Temperature (°C)			0	30	0	30	0	30	0	30
Actual flow rate (m^3/h)	80A	3.3	3.30	2.97	3.95	3.56	6.56	5.91	35.88	32.32
		330	330.00	297.33	395.15	356.03	655.77	590.84	3587.65	3232.44

Conversion standard temperature = 0°C,
Conversion standard pressure = 0 kPa (gauge pressure)

Table 3. Standard conversion flow rate value [m3/h (Standard)] [Conversion example]

Pressure (kPa)			0 (atmospheric pressure)		20		100		1000	
Temperature (°C)			0	30	0	30	0	30	0	30
Actual flow rate (m^3/h)	80A	3.3	3.47	3.13	4.16	3.75	6.90	6.22	37.76	34.02
		330	347.32	312.93	415.89	374.71	690.18	621.85	3775.93	3402.08

Conversion standard temperature = 20°C,
Conversion standard pressure = 2 kPa (gauge pressure)

8. Setting of parameters

It is recommended to perform the settings of the flow meter prior to installation.

On this product, setting of the items shown in Table 4 can be made by button operation and RS485 communication.

At the time of factory shipment, the standard factory delivery settings in Table 4 are set, and the user can use the flow meter as it is. Change the settings according to the usage, if needed.

For operation and setting of buttons, see “4.3 Setting of parameters” in “4. Operation Procedure”.

For setting by RS485 communication, see communication specifications “TS-UW-001-1”.

Communication specifications are available for download on our website.

Table 4. Setting items and contents in Settings mode

Panel display	Corresponding setting item	Scope of setting contents	Setting contents upon factory shipment
F01	Flow-rate conversion selection	OFF/ON	Type without pressure sensor: OFF Type with pressure sensor: ON
F02	Conversion standard temperature	-10 to 60°C	0°C
F03	Conversion standard pressure (Gauge pressure)	0.00 to 10.00 kPa	0.00 kPa
F04	Output pulse constant	100,1000,10000 L/P	1000 L/P
F05	Analog output Full scale flow-rate	0.0 to +99999.9 m^3/h	80A: 5000 m^3/h 100A: 7000 m^3/h 150A: 17000 m^3/h
F06	Switchover of analog output	Instantaneous flow-rate, temperature, pressure *The “pressure” option is available only for the type with pressure sensor.	Instantaneous flow rate
F07	Alarm output selection	Flow rate upper and lower limit alarm (Flo), Accumulated value upper limit alarm (FLrt), Battery voltage alarm (bAt), Error alarm output (Err)	Flow rate upper and lower limit alarm output
F08	Alarm output lower limit	0.0 to +99999.9 m^3/h	0.0 m^3/h
F09	Alarm output upper limit	0.0 to +99999.9 m^3/h	99999.9 m^3/h
F10	Alarm output Hysteresis width	0.0 to +9999.9 m^3/h	0.0 m^3/h
F11	State of alarm output contact	n.OP. (Normally open), n.CL. (Normally closed)	n.OP. (Normally open)
F12	Operating gas setting pressure (Gauge pressure)	0.00 to 1000.00 kPa *Only for type without pressure sensor	10 kPa
F13	Communication bit rate	4800 bps, 9600 bps	9600 bps
F14	RTU address	001 to 247	001
F15	Instantaneous flow-rate moving average number of times	1 to 16 times	4 times

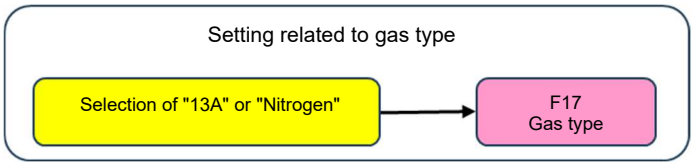
Panel display	Corresponding setting item	Scope of setting contents	Setting contents upon factory shipment
F16	Test mode time selection	3 min., 60 min., Unlimited	3 min.
F17	Gas type selection	Natural gas, Nitrogen	*The gas type specified by the customer upon order is set.
F18	Low flow cutoff value	See “F18” in “8-1. Details of setting items”.	80A: 1.3 m^3/h 100A: 2.0 m^3/h 150A: 4.8 m^3/h
F19	Atmospheric pressure of the working environment (Absolute pressure)	0.0 to 200.0 kPa	101.3 kPa
F20	Selection of with or without pressure value moving averaging	No (1 time), Yes (10 times) *Only for type with pressure sensor	Yes (10 times)
F21	With or without pressure zero-cut	OFF/ON *Only for type with pressure sensor	ON
F22	Analog output selection in case of abnormality	1 mA or less, 22 to 23 mA	1 mA or less

The setting items can be divided mainly into 3 categories.

1) Items related to fluid
2) Items related to measurement and display
3) Items related to output

Setting of items related to fluid

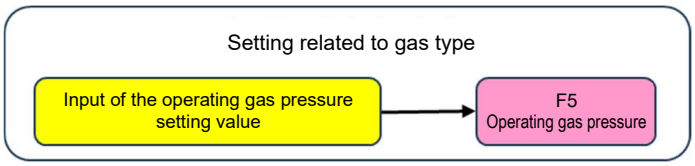
(1) Setting related to gas type [F17]



Set the gas type to be used. Since the gas type specified upon order is set at the time of factory shipment, there is no need to change this setting.

“Air” displayed in the selection screen is designed for maintenance, and therefore you cannot select it for normal use.

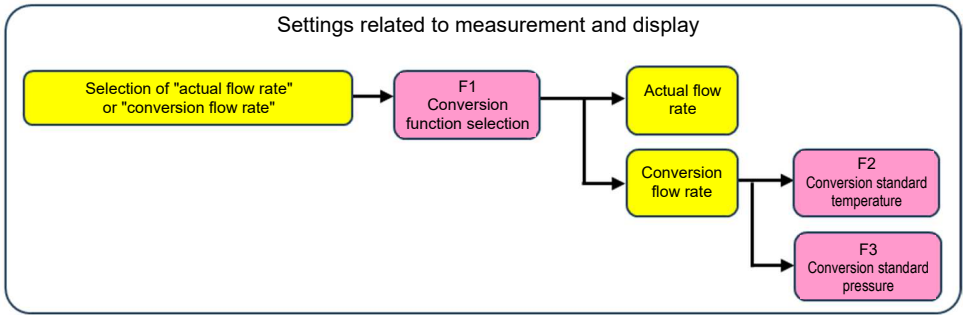
(2) Setting related to pressure [F12] (Available only for type without pressure sensor)



Set the pressure value of the environment in gauge pressure.

Example: When the pressure value in the operating environment is 2.0 kPa in gauge pressure: Setting value in [F12] “2.0”

Setting of items related to measurement and display



(1) Setting of flow-rate conversion function selection [F1]

Set “Actual flow-rate” or “Conversion flow-rate”. When “Conversion flow rate” is selected, the accumulation display, instantaneous display, and output signal correspond to the converted flow rate based on the settings of [F2] and [F3].

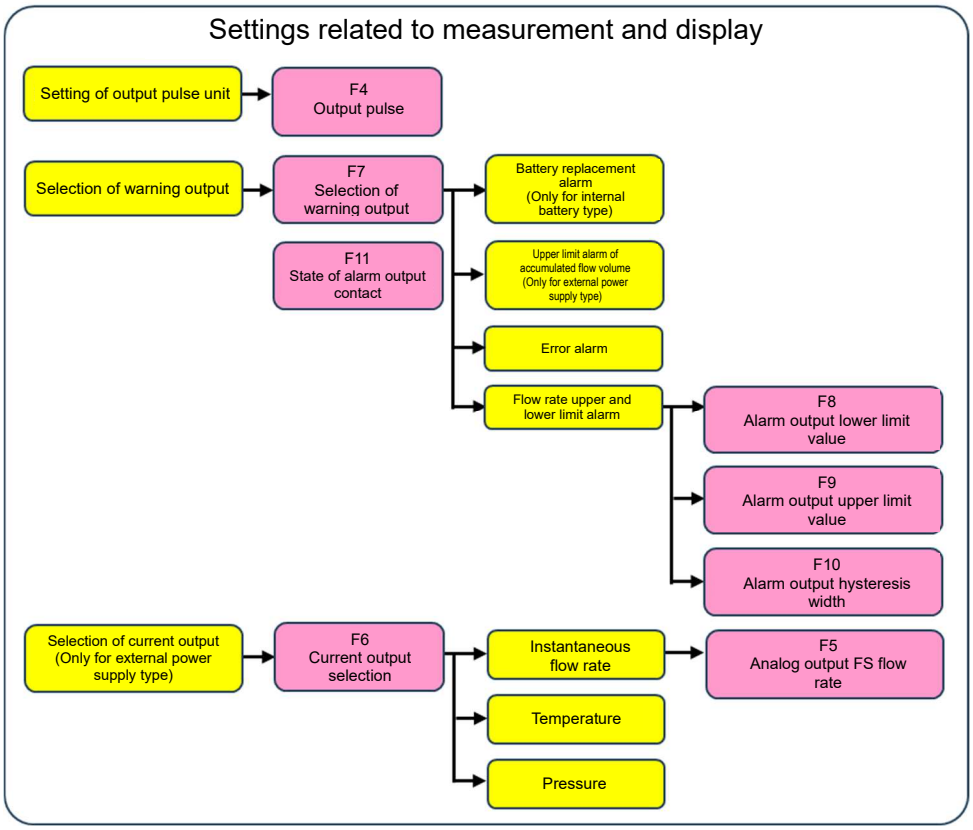
When the setting of [F1] Flow-rate conversion selection is changed, the setting value of [F4] Output pulse constant is automatically changed to 1000 L/P. After the setting of [F1], set [F4] again as necessary.

(2) Setting of conversion standard temperature [F2] and setting of conversion standard pressure [F3]

When you select “Conversion flow rate” in [F1], set the standard temperature and pressure to be used for conversion. When the conversion standard temperature [F2] is set to 0°C and the conversion standard pressure [F3] is set to 0.0 kPa, the conversion flow rate becomes the normal conversion flow rate. When the conversion standard temperature [F2] is set to 0°C and the conversion standard pressure [F3] is set to any value other than 0.0 kPa, the conversion flow rate becomes the standard conversion flow rate.

When you select “Actual flow rate” in [F1], the settings of the conversion standard temperature [F2] and conversion standard pressure [F3] become invalid.

Setting of items related to output



(3) Setting of output pulse constant [F4]

When you use pulse output, set the output pulse constant according to the usage in advance.

(4) Setting of alarm output selection [F7]

The selectable alarm output items vary according to the power supply type as shown below:

Built-in battery type: Flow rate upper/lower limit alarm, battery replacement alarm, or error alarm

External power supply type (24 VDC, 100 VAC):
Flow rate upper/lower limit alarm, upper limit alarm of accumulated flow volume, or error alarm

Flow rate upper/lower limit alarm can be output and stopped at any flow-rate value. When you select this function, set the alarm output lower limit value [F8], alarm output upper limit value [F9], and alarm output hysteresis width [F10].

(5) Switchover of analog output [F6]

As the analog output type, you can select instantaneous flow-rate, temperature, or pressure according to the usage.

When you select instantaneous flow-rate, current based on the maximum flow-rate value setting of analog output [F5] is output.

When you select temperature, 4 mA is output at -10°C, and 20 mA is output at +60°C.

You can select pressure only for type with pressure sensor.

Type with pressure sensor (500 kPa):	4 mA is output at 0 kPa, and 20 mA at 500 kPa
Type with pressure sensor (1000 kPa):	4 mA is output at 0 kPa, and 20 mA at 1000 kPa

(6) Setting of maximum flow-rate value of analog output (Analog output F.S. flow-rate) [F5]

When you use the analog output [F6] for instantaneous flow-rate, it is recommended to set the full scale flow-rate (F.S. flow-rate) of analog output based on the maximum flow-rate. It is recommended to set a numeric value with allowance as the setting value of the F.S. flow-rate.

For reference, a conversion example is shown in Table 2. Table 3(page 31).

8-1. Details of setting items

For [Pressure] and [Power supply] types, items are displayed only for corresponding models, not for other models.

- [F1] About flow-rate conversion selection

  As the flow-rate conversion, you can select the actual flow-rate, normal conversion flow-rate, or standard conversion flow-rate.
  You can select the actual flow-rate, normal conversion flow-rate, or standard conversion flow-rate using the settings of [F1] Flow-rate conversion selection, [F2] Conversion standard temperature, and [F3] Conversion standard pressure. (See Table 5)

Table 5. Display/output values based on [F1] to [F3] settings

[F1] Flow-rate conversion selection	[F2] Conversion standard temperature, [F3] Conversion standard pressure	Flow rate
No	-	Actual flow rate
Yes	0°C and 0.00 kPa	Normal conversion flow rate
	Other than “0°C and 0.00 kPa”	Standard conversion flow rate

If you select “Yes” for conversion, the “Normal” or “Standard” lamp above the partition line will flash, and the accumulated flow volume display, instantaneous flow-rate display, and output signal will all correspond to the converted flow volume.

If you select “No” for conversion, the “Normal” or “Standard” lamp above the partition line will be turned OFF, and the accumulated flow volume display, instantaneous flow-rate display, and output signal will all correspond to the actual flow-rate.

When flow-rate conversion selection is set (and even if the setting is not changed), the output pulse constant is automatically changed to 1000 [L/P], which is set at the time of factory setting.

Example: When “No” is changed to “Yes”
Output pulse constant 100 [L/P], No conversion
↓ “Yes” is selected.
Output pulse constant 1000 [L/P], Normal flow-rate or Standard flow-rate

Conversion is internally calculated as shown below.
$Qn = (T + t0) / (T + t1) \times (P + p1) / (P + p0) \times Qr$
Qr : Actual flow-rate [m^3/h]
Qn : Conversion flow-rate [(Normal or Standard)•m^3/h]
T : 273.15 [K] (Absolute temperature of 0°C)
t1 : Measured temperature [°C]
t0 : Conversion standard temperature [°C] (Set in Settings mode [F2])
P : 101.3 [kPa abs] (Absolute pressure of 1 atm)
p0 : Conversion standard pressure (Set in Settings mode [F3])
p1 : Measured pressure value (gauge pressure) [kPa]

When you use both the external output function and conversion flow-rate, it is recommended to set the output constant in reference to the conversion example Table 2 and Table 3 (page 31).

- [F2] About conversion standard temperature

  When you select “Conversion flow rate” in [F1] Flow rate conversion selection, set the temperature to be used as the standard for conversion.

  The value can be set within the range of -10 to 60ºC in 1ºC steps.

  When you select “Actual flow rate”, the setting of the conversion standard temperature becomes invalid.

- [F3] About conversion standard pressure

  When you select “Conversion flow rate” in [F1] Flow rate conversion selection, set the pressure to be used as the standard for conversion.
  When you select “Actual flow rate”, the setting of the conversion standard pressure becomes invalid.

- [F4] About output pulse constant

  Select the output pulse constant from “100”, “1000”, and “10000”.

  (Unit is [L/P].)

  This setting may not be available depending on the combination of the model and flow-rate conversion selection.
  An option indicating that the item cannot be selected is not displayed. (See Table 6.)

Table 6. Output pulse constant

Model	Nominal diameter	Conversion	Pulse constant [L/P]		
			100	1000	10000
UW	80, 100, 150	OFF	○	○	○
		ON		○	○

○	Selectable
	Not selectable

When the setting of [F1] Flow-rate conversion selection is changed, the setting value of [F4] Output pulse constant is automatically changed to 1000 [L/P]. After the setting of [F1], set [F4] again if necessary.

- [F5] About full scale flow-rate for analog output (DC or AC type)
  Set the full scale flow-rate value when the instantaneous flow-rate is set in [F6] Switchover of analog output. When you use analog output for the conversion flow rate, set the converted full scale flow-rate.

The flow rate values shown below are set at the time of factory shipment.

	[Nominal diameter]	Full scale flow-rate value [m^3/h]
UW	80	5000 m^3/h
	100	7000 m^3/h
	150	17000 m^3/h

- [F6] About switchover of analog output (DC or AC type)

  Select the output signal of analog output from “Instantaneous flow-rate (Flo)”, “Temperature (tEP)”, and “Pressure (PrS)”. Note that “Pressure” can be selected only for type with pressure sensor. (“Pressure” is not displayed for type without pressure sensor.)

- [F7] About alarm output selection

  The selectable alarm output items vary according to the power supply type as shown below:

  Built-in battery type: Flow rate upper/lower limit alarm, battery replacement alarm, or error alarm

  External power supply type (24 VDC, 100 VAC):
  Flow rate upper/lower limit alarm, upper limit alarm of accumulated flow volume, or error alarm

  <Flow rate upper and lower limit alarm output>

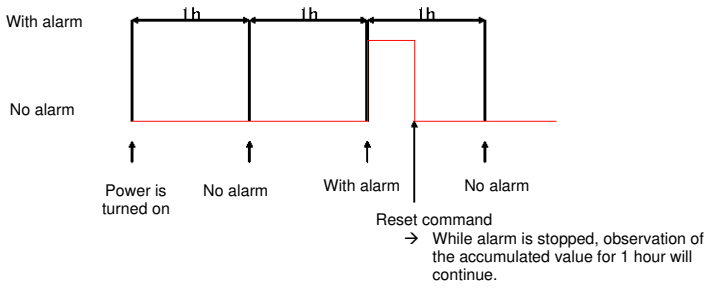
  In alarm output, an alarm signal is output when the instantaneous flow-rate exceeds the alarm output upper limit value [F9] or it becomes lower than the alarm output lower limit value [F8]. An alarm signal is stopped when the instantaneous flow-rate exceeds the (alarm output lower limit value [F8] + alarm output hysteresis width [F10]) or it becomes lower than the (alarm output upper limit value [F9] - alarm output hysteresis width [F10]) while an alarm is output.
  Make the setting in a way that the (alarm output upper limit value [F9]) > (alarm output lower limit value [F8] + alarm output hysteresis width [F10]).

  <Battery replacement alarm>

  When 5 years (including storage period) have passed after the battery connector was connected (the power was turned on), an alarm signal will be output as the time to replace the battery.

  <Upper limit alarm of accumulated flow volume>

  When the accumulated flow volume for 1 hour after the power is turned on becomes higher than the specified accumulated flow volume, an alarm signal is output, and that state is kept for 1 hour.
  When a message to reset the accumulated value upper limit alarm is accepted through communication, the alarm output is stopped, but observation of the accumulated value per hour continues.



  The upper value of the accumulated flow volume is set via communication.

  * Refer to communication specifications “TS-UW-001-1” for details.
    Communication specifications are available for download on our website.

<Error alarm>
An alarm signal is output when an abnormal flow measurement, abnormal temperature value, or abnormal pressure value is detected.

- [F8] About alarm output lower limit

  Set the flow-rate value at the lower limit side of the upper/lower limit flow-rate alarm output [F7]. When it is used by “conversion flow-rate”, set the conversion value.

- [F9] About alarm output upper limit

  Set the flow-rate value at the upper limit side of the upper/lower limit flow-rate alarm output [F7]. When it is used by “conversion flow-rate”, set the conversion value.

- [F10] About hysteresis width for alarm output

  With regard to the flow-rate value defined for the upper limit [F9] and lower limit [F8] of the upper/lower limit flow-rate alarm output [F7], set the flow-rate range to stop the alarm output. When it is used by “conversion flow-rate”, set the conversion value.

  For instance, when the upper limit of the flow-rate is set to 7.00 [m^3/h], the lower limit of the flow-rate is set to 2.00 [m^3/h], and alarm output hysteresis width is set to 1.00 [m^3/h], an alarm is output when the flow rate exceeds 7.00 [m^3/h], and the alarm stops when the flow rate becomes lower than 6.00 [m^3/h] at the upper limit side. Likewise, at the lower limit side, an alarm is output when the flow rate becomes lower than 2.00 [m^3/h], and the alarm stops when the flow rate becomes larger than 3.00 [m^3/h].

- [F11] About state of alarm output contact

  As the state of the alarm output contact, select either “Normally open (n.OP.)” or “Normally closed (n.CL.).”

  Set this to “Normally open” in case of using a battery-powered signal receiving device.

- [F12] About operating gas setting pressure (type without pressure sensor)

  Set the pressure value of the environment in gauge pressure.

  Set the value in the range of 0 to 1000.0 [kPa] in increments of 0.1 [kPa].

- [F13] About communication bit rate (DC or AC type)

  Select either “4800 bps (4800)” or “9600 bps (9600)” for your communication bit rate.

- [F14] About RTU address (DC or AC type)

  Select a value from 001 to 247 for the RTU address.

- [F15] About instantaneous flow-rate moving average number of times

  Select the moving average number of times for display and output of the instantaneous flow-rate. The moving average number of times is set to 4 times (04) upon factory shipment, and the immediate 4 measurement values are adopted.

  While there is no need to change the moving average number of times under normal usage, you can select from 1 to 16 times. When you select 1 time, “no moving average” is set.

- [F16] About test mode time selection

  You can select the test mode time. At the time of factory shipment, “3 min. (3)” is set. You can select “60 min. (60)” and “Unlimited (--)” in addition to 3 min.

- [F17] Gas type selection

  Select “Natural gas (13A)” or “Nitrogen (n2)” according to the type of gas to be measured.

  “Air” displayed in the selection window is designed for maintenance, and therefore you cannot select it for normal use.

  Since the gas type specified upon order is set at the time of factory shipment, there is no need to change this setting under normal use.

- [F18] Low flow cutoff value

  Set the low flow cutoff value where the instantaneous flow-rate is 0 m^3/h.

  The settable range is defined as 0 ≤ Low flow cutoff value ≤ Q. (See Table 7)

  When you use analog output for the conversion flow rate, set the converted full scale flow-rate.

  The unit of flow rate is the flow rate selected in the flow-rate conversion selection [F1].

Table 7. Upper limit of low flow cutoff value

Model	Flow-rate Q [m^3/h]
UW80	3.30
UW100	5.00
UW150	12.00

- [F19] Atmospheric pressure (absolute pressure) of the working environment

  Set the atmospheric pressure of the working environment in absolute pressure [kPa].
  At the time of factory shipment, 101.3 [kPa] is set.
  There is no need to change this setting under normal use. However, if the setting value at the time of factory shipment is used at a high elevation place, error in accuracy occurs when calculating the conversion flow-rate.
  The relationship among the elevation, atmospheric pressure, and maximum error in accuracy is shown in Table 8. (Reference value)

Table 8. Atmospheric pressure of the working environment

Elevation [m]	Atmospheric pressure (absolute pressure) [kPa]	Max. error in accuracy [%] (Atmospheric pressure of the working environment: 101.3 kPa; Measured pressure value: 0 kPa (gauge pressure))
0	101.3	±0.0
200	98.9	+2.4
400	96.6	+4.9
1000	89.9	+12.7

- [F20] Selection of with or without pressure value moving averaging (type with pressure sensor)

  Select either “With averaging (10)” or “No averaging (1)” for pressure values.

  If “With averaging” is selected, the moving average value of the 10 most recently measured pressures is used for display and output.

- [F21] With or without pressure zero-cut (type with pressure sensor)

  Select “With zero-cut (on)” or “Without zero-cut (OFF)” for zero-cut of pressure value. If “With zero-cut (on)” is selected, in the case that the measured pressure value is less than 5 [kPa], the pressure value is indicated and output as 0 [kPa]. In the case the setting of “pressure value averaging” is “With averaging”, zero-cut judgment is to be done based on the pressure value of moving average after such averaging.

- [F22] Analog output selection in case of abnormality

  Select the analog output value to be output in the event of an error from “1 mA or less” or “22 to 23 mA”. This setting value is applied to the conditions in the table below.

Item	Switchover of analog output		
	Instantaneous flow rate	Temperature	Pressure
Battery replacement alarm			
Abnormal flow rate measurement	F22	Continued	Continued
Abnormal temperature value	F22	F22	Continued
Abnormal pressure value	F22	Continued	F22
External memory abnormality (External memory abnormality lights.)	Continued		
External memory abnormality (Accumulated flow volume flickers.)	F22		
Power outage	1 mA or less		

F22 : Value selected in “[F22] Analog output selection in case of abnormality”

Continued : Value correlated to the measured value (same output as normal)

A diagram showing the display changeover in each setting mode is given below.

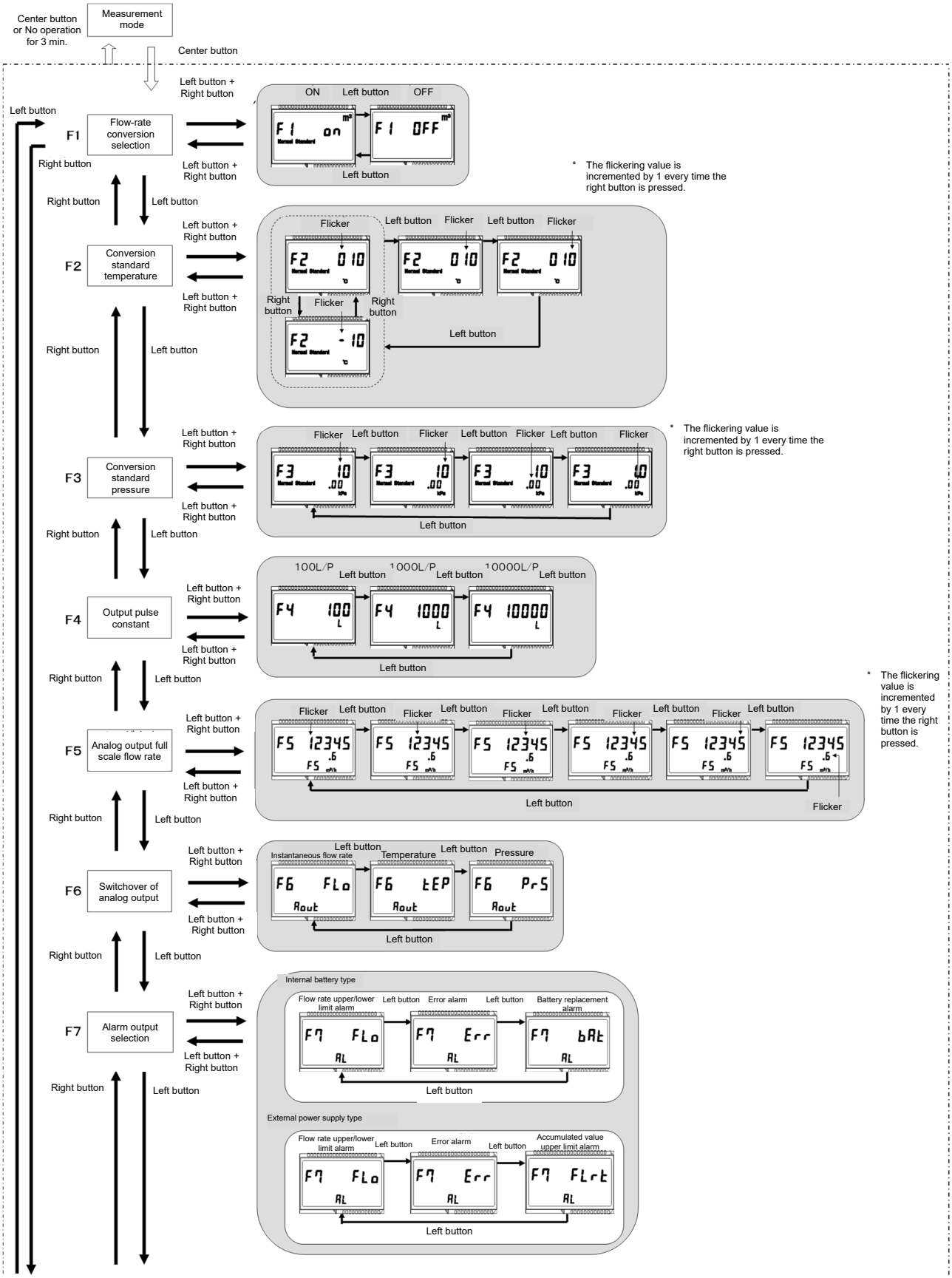


Fig. 8. Display changeover in each setting mode

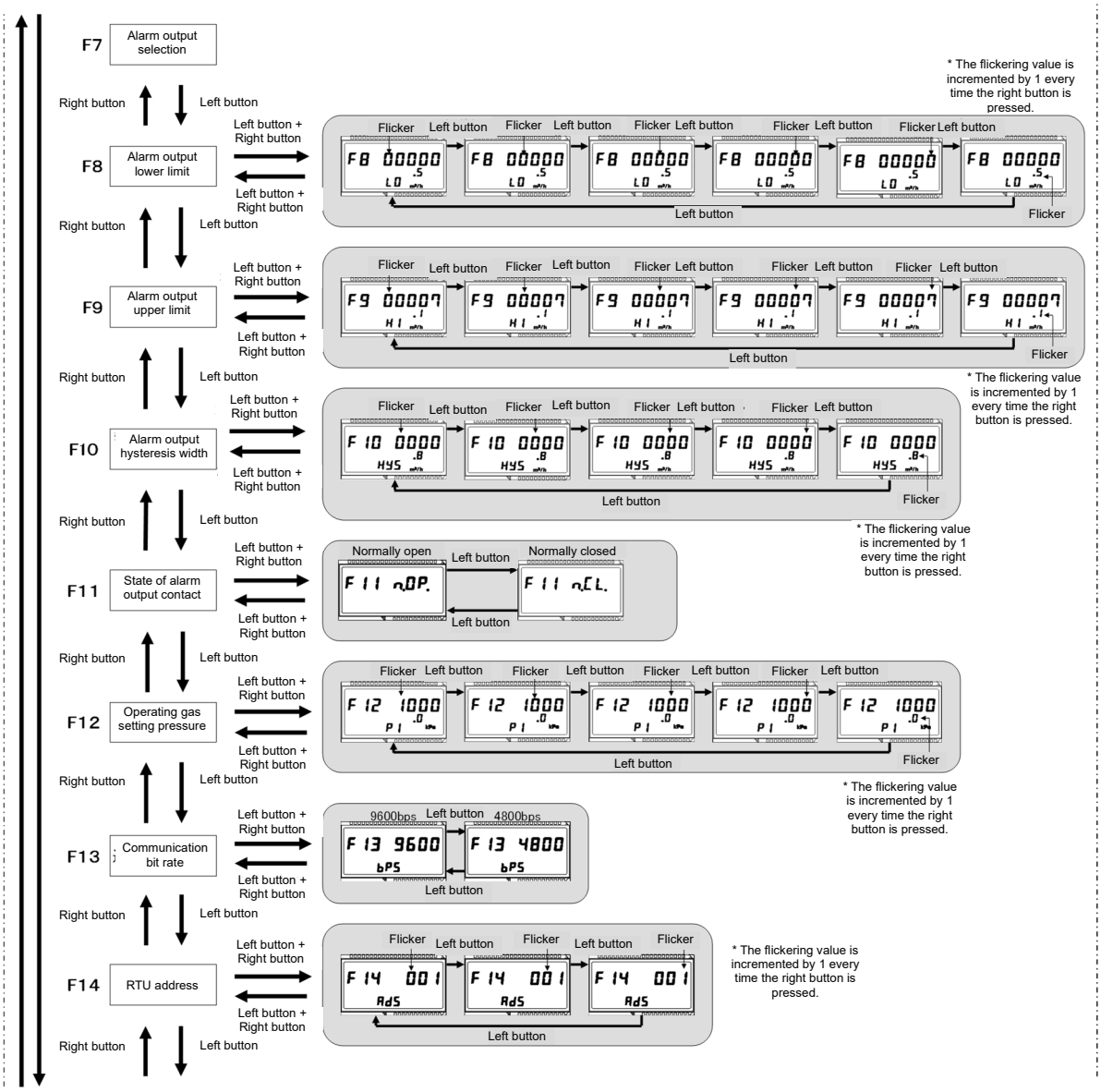


Fig. 9. Display changeover in each setting mode

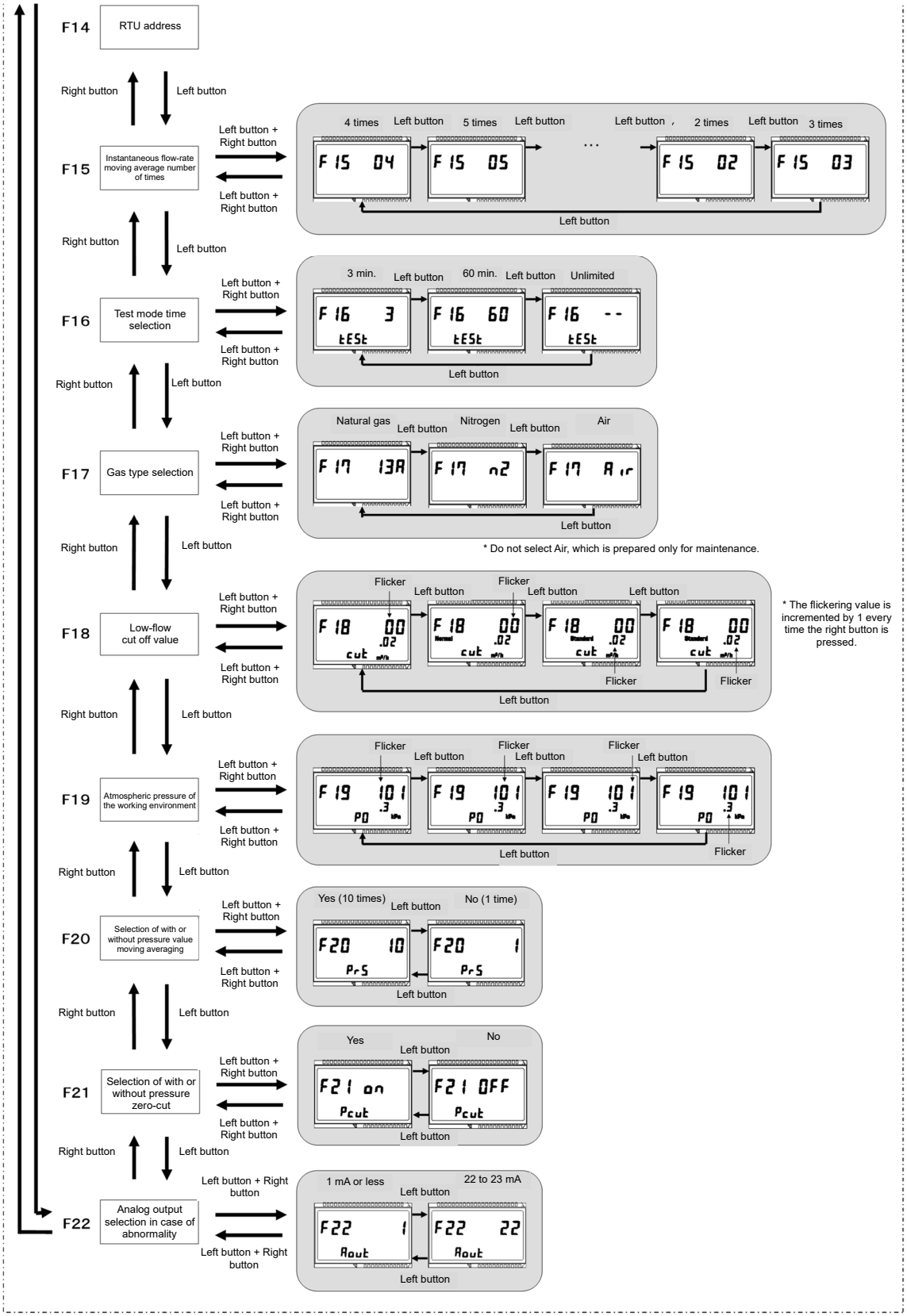


Fig. 5. Display changeover in each setting mode

Warranty and after-sale service

1) Warranty period

For the period of one year after purchase, in case of a failure that is explicitly attributable to our manufacturing process, we will exchange the product for free.

2) Scope of warranty

The following are not included in the scope of warranty.
Failure caused by force majeure, such as natural disaster, etc.
Disassembly or alteration of the product
Failure caused by mishandling
Failure caused by use in excess of the scope of the specifications (environment, etc.)
Other cases determined to be not attributable to our responsibility

Warranty specified here applies to our product itself, and any damage (loss and/or damage of any products other than our product, lost earning, and lost opportunity, etc.) incurred by the customer due to a failure of our product is excluded from the scope of warranty.

3) Requesting for service

Regardless of whether or not your warranty has expired, please contact the company you purchased the product from or our branch or sales office with the product name, model, construction work number, serial number, and a detailed description of the failure.

Warning

4) Points to note for long-term use

[Designed standard operating period] 10 years

The designed standard operating period refers to the standard period in which the product can be used after installation without safety problems against time-related degradation under the standard conditions (environment temperature 20°C, environment humidity 65%RH).

If you use the product longer than the designed standard operating period, safety problems of the product itself may occur such as deterioration of water-proof/dust-proof performance, smoke, fire, and electrical shock, etc.

If the designed standard operating period has passed, please use the product as checking if there is any failure in the product and consider replacing it with a new one.

The designed standard operating period is different from the warranty period. It does not guarantee that a general failure will not occur.

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○ Contact

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