OPERATION MANUAL

Ultrasonic Flowmeter

USF100A-G05EP
USF100A-G10EP
USF100A-G15EP
USF100A-G20EP

⚠Warning	Before using, please read this Operation Manual thoroughly and fully understand the contents of this manual for your safety operation.
⚠Warning	Please always keep this Operation Manual at hand for your quick reference when necessary.

CE FC

TOFLO CORPORATION

35-R06

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Before using the Ultrasonic Flowmeter,

Warning

- Before using the USF100A Series Ultrasonic flowmeter, read this Operation Manual carefully to become familiar with how it works.
- Please always keep this Operation Manual at hand for your quick reference when necessary.
- Relating to the original usage of this Ultrasonic Flowmeter and the instructions stated in the Operation Manual, fully understand the contents instructed, and always comply with them.

  Strictly observe the Instructions stated above. Failure to observe those instructions can result in injury and/or accident.

《 Relating to Operation Manual 》

- The contents of the Operation Manual are subject to change for the improvement of product, performance and functions without prior notice.
- It is prohibited partially or totally to reprint or make copies the Operation Manual without permission.
- Please feel free to contact us at the nearest sales office should the Operation Manual be lost.
- Every effort has been made on our part for the contents of the Operation Manual, but if you found out any doubtful point and mistake, or omission by any chance in this Operation Manual, we would appreciate it if you could contact us at the nearest sales office.

1. Safety Precaution

Warning Before using this Ultrasonic flowmeter, please read this Operation Manual thoroughly, and be sure to comply with instructions, since this Manual contains very important contents for your safety and proper operation.

(Design precaution)

① Operate the ultrasonic flowmeter under the specified voltage.
It may cause malfunction should the voltage be too low, and may cause damage to the device, or fire should the voltage be too high.

② Operate the ultrasonic flowmeter under the specified pressure.
The Teflon-made detector may be in the danger of the break should it be used in excess of the rated pressure.

③ Operate the ultrasonic flowmeter within the range of the operating temperature.
It may cause malfunction, damage to the devices, or fire should the operating temperature be used in excess of the range of the operating temperature.

④ Always keep the detector tube filled fully with fluid. Should it not be filled fully with fluid, ultrasonic wave is shut off with gas and cannot send and receive the ultrasonic wave, and disables the detector for flow measurement. Even if having carried out flow measurement, it may cause it to read inaccurately.

⑤ Relating to the installation attitude of the detector, decide it with reference to this manual.
Care should be exercised so as not to cause air bubble trapping, or liquid trapping.

⑥ If trying to connect the input and output signals to the ultrasonic flowmeter, design them in reference to this operation manual. In input signal there is an integrated data resetting input, and in the output signals there are 4-20mADC output and open collector output, however if applied overcurrent, overvoltage or overload, it may cause damage to the devices. Inadequate current or voltage can cause it to malfunction.

⑦ When mounting the indicator to panel, allow 150mm deep or more clearance behind rear considering attaching and removing the coaxial cable.

(Installation precaution)

① Carefully unpack the detector in a place where air is clean. Since the detector has been packed in a clean room after cleaned it, a great care should be taken for depositing dirt and handling.

② Make sure that the slotted holes in four places have been fixed with screws. If the detector is used in a floating state in the air, forced stress may exert on the IN/OUT tube of the detector.

③ A flow direction of the fluid calls a great attention not to mistake when mounting the detector. Should it be mounted in the opposite direction, plus / minus in the indication would be upside down and 4-20mADC output would be fixed to 4mA.

④ The flow control valve should be installed to the outlet side of the detector.
Should any throttle, such as valve, etc, be provided at inlet side of the detector, air bubbles might occur due to pressure reduction (cavitation) , and might cause the detector to disable for flow measurement.

⑤ Since the flow indicator has not been constructed in water-and moisture-proof structure, it may not be installed in places where condensation of humidity and spray will occur.

⑥ Do not use the detector while immersing it in the liquid.

(Wiring)

① Make correct connection to the indicator upon confirmation of the terminal pin numbers.
Miswiring may cause damage to the device or malfunction. Care should be exercised on making correct connection with reference to this Manual.

② Do not apply any tension to wiring to the terminal block of the indicator.
If not, it may cause disconnection.

③ Wiring should be performed away from power line.
If not, it may cause malfunction caused by noises and error in flow measurement.

④ Output terminal may not be short-circuited.
If not, it may cause damage to the devices.

⑤ Correctly connect two coaxial cable connectors coming from the detector to the indicator no to mistake the IN side for OUT side. Since the indicator connectors are color-coded(red and black), connect so as to conform to the color of the coaxial cable connector cover. Should it be connected reversely, plus / minus in the indication would be upside down and 4-20mADC output would be fixed to 4mA.

(Operating Environment)

① In no event may the ultrasonic flowmeter be used in explosive atmosphere.
If not, it may cause explosion disaster.

② Do not use the ultrasonic flowmeter in place where surge will occur.
The use in places where a significant surge such as an electromagnetic valve and rotating machine will occur may cause damage to the device, or malfunction.

③ Operate the ultrasonic flowmeter within the specified operating temperature.
Should it be used in excess of the specified ranges of the operating temperature, the devices would be overheated, thereby causing damage, or fire.

④ Operate the ultrasonic flowmeter in the environment where an electromagnetic induction interference will not occur. Should it be subjected to a strong electromagnetic induction interference, it may cause malfunction or erroneous flow measurement.

⑤ Use the ultrasonic flowmeter in places where relative humidity is less than 80% and condensation of humidity will not occur.

⑥ Operate the ultrasonic flowmeter in place where is less mechanical vibration.
It may cause cable disconnection should it be subjected to vibration.

(Fluids)

① In no event may any inflammable fluid be used.
If not, it may cause explosion or fire.

② Prevent fluid from getting air bubbles mixed in.
Air bubbles in fluid may reflect ultrasonic wave, thereby causing unstable measurement or disabling it for flow measurement.

③ Prevent the detector form depositing air bubbles inside the detector tube.
Should air bubbles be get mixed into fluid which is running at extremely slow speed, it may deposit on ultrasonic wave sending and receiving face inside of the detector tube, and may sometimes disable it for flow measurement.

④ Do not let foreign matter get mix into fluid.
Air bubbles in fluid may reflect ultrasonic wave, thereby causing unstable measurement or disabling it for flow measurement.

⑤ There may be in the case where viscosity is too high to measure flowrate.

⑥ With depending on the operating fluid and temperature, it may have an affect on the flow accuracy.

(Precaution for installing coupling joint)

① Use the tube as it is without cutting, since the tube length has been designed suitably for use in each ultrasonic flowmeter.

② When installing the coupling joints through inserting sleeve into the tube and through deforming the tube shape, carry out them after the tubes have been fully warmed up. If having wormed up insufficiently, it may cause crack and damage to the tube.

(Other application)

Since the detector cap has been water-proofed and tightened at specified torque, in no event should the cap be turned. If not, not alone the water-proof effect may be lost, but the sensitivity to ultrasonic waves may be affected adversely.

We highly appreciate your purchasing the USF100A-G type Ultrasonic Flow Meter.
We would like to request you to read this Operation Manual thoroughly and use it properly.

2. General description

The Ultrasonic Flow Meter USF100A-G Series is comprised of an indicator (Control part) and a detector (Sensor part). The indicator performs to transmit and receive the ultrasonic waves, and measures flowrate obtained by a propagation time difference which propagates the ultrasonic wave along the stream and on the contrary propagates the ultrasonic wave against the stream.

The detector has a structure in which the two vibrators are arranged in order to ultrasonic waves in the both ends of the horseshoe shaped flow path where fluid is to intervene.

By utilizing the ultrasonic waves, it enables to measure flowrate in noncontact with the fluid, and since the material coming into contact with liquid is Teflon, it is most suitable for measuring the highly-purity fluid.

3. Accessories and the prodctuct specifications

3-1Confirmation of accessories

Check if the following articles have been all set.

- Ultrasonic Flowmeter indicator ·····1 unit
- Ultrasonic Flowmeter detector·····1 unit

3-2Confirmation of Product specifications

The indicator is commonly used for each series, but the detector dimensions vary according to each series.

Make certain the delivered product to ensure that the nominal designation and dimensions specified agree with those you ordered.

■ Nominal designation

USF100A-G□EP

Std.

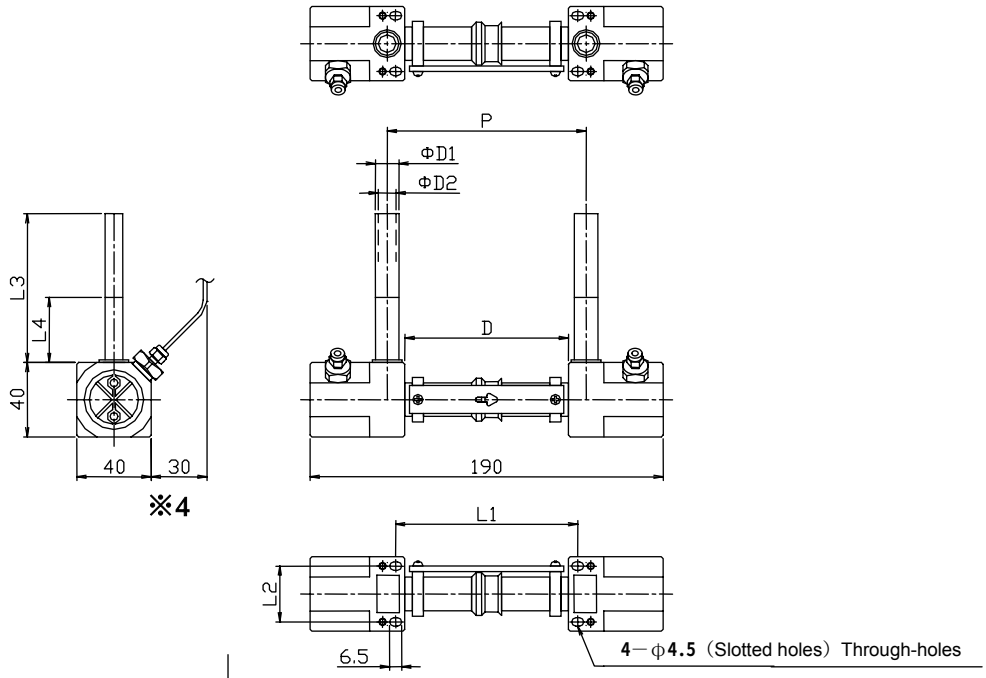
- 05 • • • Maximum 0.5 L/min (Flowrate equivalent to purified water)
- 10 • • • Maximum 2 L/min (Flowrate equivalent to purified water)
- 15 • • • Maximum 20 L/min (Flowrate equivalent to purified water)
- 20 • • • Maximum 50 L/min (Flowrate equivalent to purified water)

■ Standard dimensions

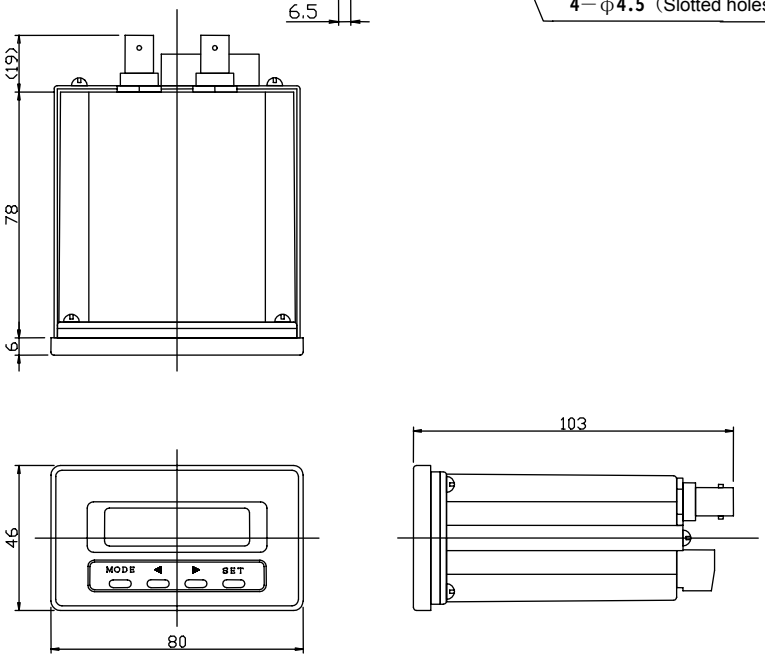
Std.	Flowrates	Dimensions							
		D	L1	L2	L3	L4	P	ϕD1	ϕD2
G05	50 – 500 mL/min	90	100	30	60	30	110	9.53	6.33
G10	50 – 2000 mL/min	90	100	30	60	30	110	9.53	6.33
G15	0.5 – 20 L/min	86	100	30	80	40	105	12.7	9.53
G20	2 – 50 L/min	72	84	32	100	55	100	19.0	15.8

※ **The flowrates shown above indicate the ones that are equivalent to the purified water.**
※ **The L1 and L2 show location dimensions of the screw cramp for mounting.**
※ **To install the coupling joints, the installation should be performed with reference to "Precaution for installing coupling joint "(on page 3).**
※ **Allow 30 mm or more clearance behind rear considering the water resistant connectors and the coaxial cables.**

Detector



Indicator



3-3 Performance

●Accuracy: G05EP Within FS±1.5%(±7.5mL/min) (Flowrate equivalent to purified water)
G10EP Within FS±1%(±20mL/min) (Flowrate equivalent to purified water)
G15EP Within FS±1%(±0.2L/min) (Flowrate equivalent to purified water)
G20EP Within FS±1%(±0.5L/min) (Flowrate equivalent to purified water)

※ The flow accuracy stated above are the ones for the instantaneous flowrates.

● Withstand pressure : 0.5MPa(G)

● Operating temperature ranges : 0 – 50℃(Non condensing)

- Indicator -

●Detection method: Propagation time difference

●Flow display: Instantaneous value or integrating value

●Input signals: Integrating value resetting input

※ TTL level or 5V-CMOS level, low pulse 20msec or more.
No-voltage contact input or transistor open collector

●Output signals: Measuring output: 4-20mADC

※ Maximum load resistance: 300Ωat ±12VDC of the power supply voltage
800Ωat ±24VDC of the power supply voltage

: Open collector output

Open collector output 1 ..... Select from comparison, integrating pulse and frequency output.

Open collector output 2 ..... Select from comparison and Fail output

- Comparative output: Instantaneous values can be used for upper and lower limit alarms.
  Integrating values can be used for the alarm of the setting flowrate.
- Frequency output: Fixed at maximum 3KHz at the full scale of the flowrate
  (Output ranges: 20Hz – 3kHz)
  Flowrate at full scale (Setting ranges: 0 – 50 L/min)
- Integrating pulse output
  G05EP and G10EP: The setting flowrates can be changed ranging from 0.01L to 99.99L per one pulse (To set STEP : 0.01)
  G15EP and G20EP: The setting flowrates can be changed ranging from 0.1L to 99.9L per one pulse (To set STEP : 0.1).
- Fail output:

※ **Open collector output ratings**

◎ Sink current : Maximum 100mA ◎ Impressed voltage : Maximum ＋35V(VoL=1.3V)

●Oscillating frequency : 1 MHz (Output 1 W)

●Backup : EEPROM (It backs up various type of the setting data, when changing the data. The integrated values are backed up by the minute.)

●Power supply voltage: Power consumption : 80mA at 112VDC and 48mA at 24VDC

- Detector -

●Heat resistance: 80℃

●Material coming into contact with the liquid: New PFA

●Cable length: 5m(Coaxial cable shielded with Teflon)

4. Installation

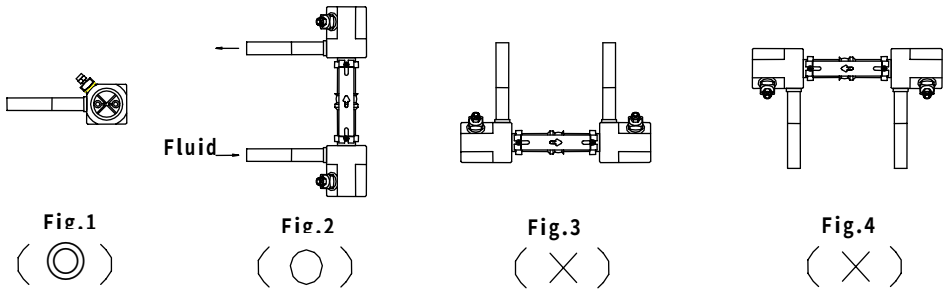
4-1 Installation location

To install the indicator and detector, the following locations should be selected.

- Location where is less mechanical vibration.
- Location where is no corrosive gas
- Location where is 0 to 50℃ in ambient temperature and is not subjected to direct sunlight
- Location where is not subjected to direct high radiation heat
- Location where is not influenced by electromagnetic induction interference.
- Location where is less than 80% in relative humidity and condensation of humidity will not occur.

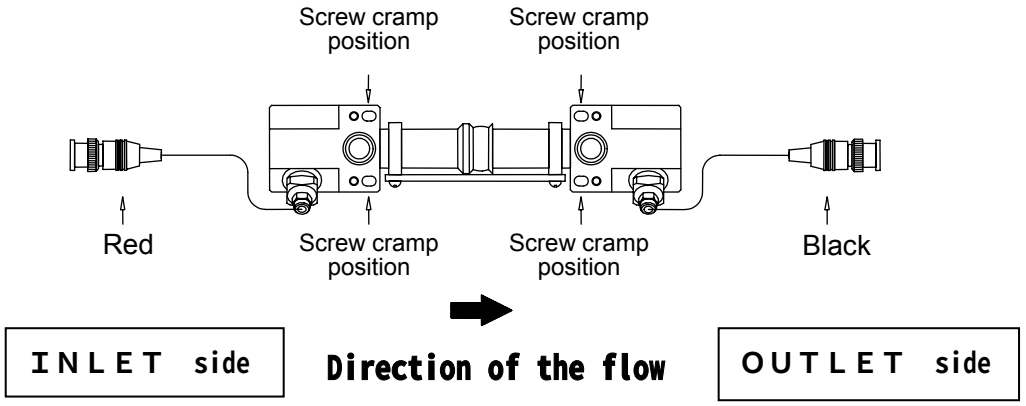
4-2 Installation attitude of the detector

- For installation attitude, it is strongly recommended to install the detector as shown in Fig. 1 or 2. The best attitude in installing the detector is as shown in Fig.1
- In the case of Fig.3, the fluid will be trapped should it stop flowing and in the case of Fig. 4, air may be trapped if air bubbles get mixed.



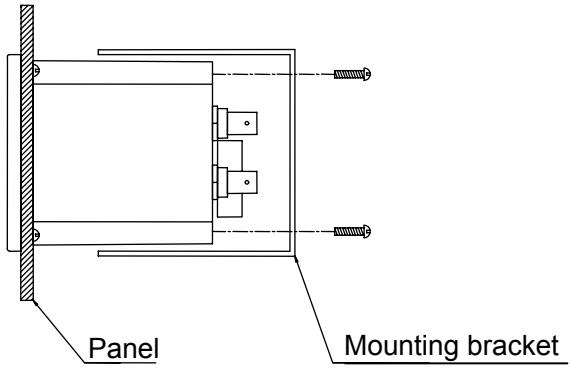
4-3 Installing the detector

- Coaxial cable connectors coming from the detector are color-coded.
- Since red connector should be located on IN side, and black one is on OUT side.
  A great care should be exercised so as not to wrongly wire.
- Securely mount the detector with four pan head screws (M4x50, SUS) through the slotted holes located in four places indicating with the following arrowhead.
- Do not cut off or extend the cable.

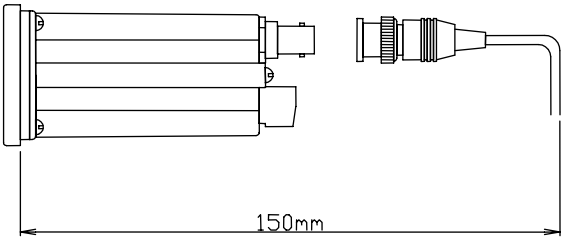


4-4 Installing the indicator

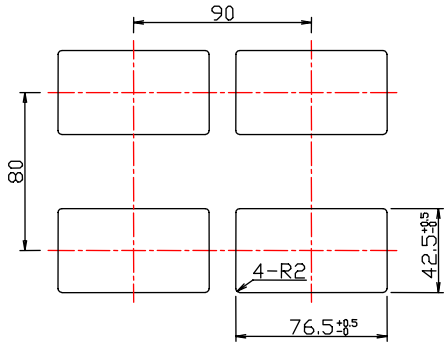
- Insert the indicator into a panel from the front side.
- To install it to panel, it will be installed by using the accessory bracket, though, but **care should be taken so as not to cramp excessively with two screws attached.**



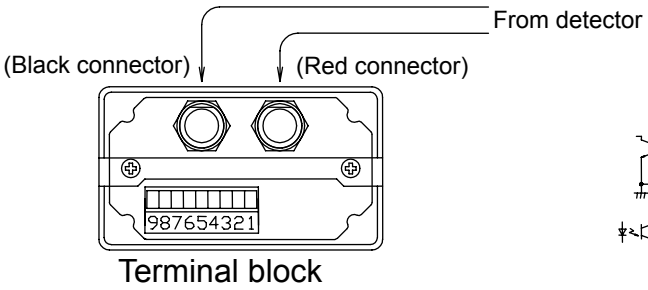
- For Panel cut-out dimensions are shown as follows.
- Mounting panel is maximum 5mm in the thickness.
- Allow 150mm or more clearance behind rear considering attaching and removing the coaxial cable connectors.



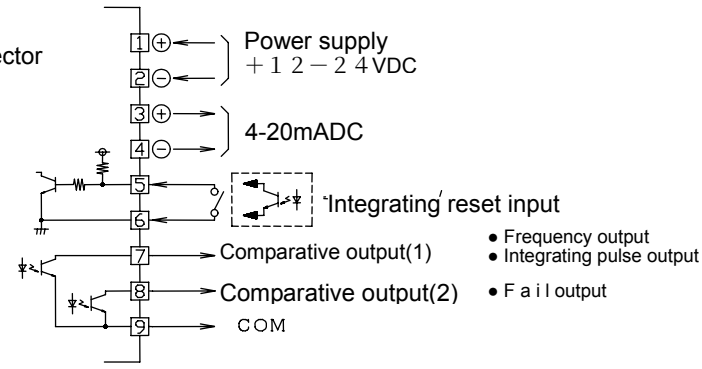
For panel cut-out dimensions



4-5 Wiring to the indicator



Terminal block



Terminal block array

Wiring should be carried out with reference to the Figures above.

- When wiring, peel off wire sheath, insert wires into the top holes on the terminal pin number, then tighten screws securely with a small size slotted screwdriver.

> When wiring or inspecting, make sure that power supply has been turned off.
> If not, it may cause an electric shock.

4-5-1 Connection to the power supply

(Terminal block to be used: Numbered ① - ②).

Apply the power voltage between ＋12VDC and ＋24VDC.(Allowable range: ＋11.4VDC to ＋26.4VDC)

Pin number ① is plus, and pin number ② is grounding (GND): Be careful to make correct connection.

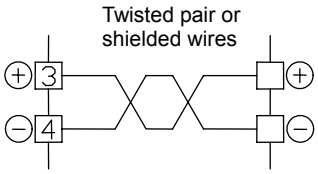
4-5-2 Connection to current output

(Terminal block to be used: Numbered ③ - ④)

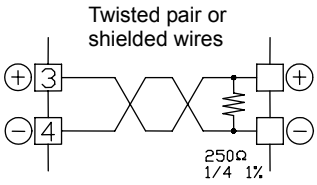
The current output at 4-20mADC can be directly entered to the 4-20mA input of Industrial standard. If converting into the 1-5VDC, put the metal-covered resistor (250Ω 1/4W ±1%) into the both end of the input at 1-5VDC. Provided that in this case the resistance error of ±1% is to be included.

Pin number ③ is plus and the pin number ④ is grounding(GND): Be careful to make correct connection.

● **In the case of connecting to Industrial Standard of 4-20mADC input**



●**In the case of connecting to 1-5VDC input**

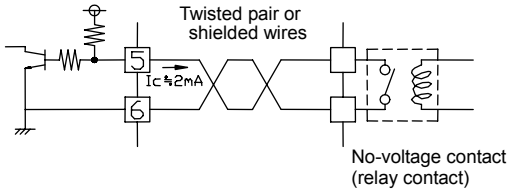


4-5-3 Connection to the integrating reset input

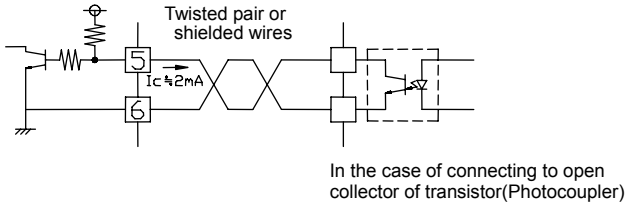
(Terminal block to be used: Numbered ⑤ - ⑥)

Once the pin numbered ⑤ - ⑥ have been short-circuited in the open state, and open it again so that the integrating flow reset is executed. It is needed for the range of integrating flow reset pulse width to be 20msec or more. Connect to the no-voltage contact (Relay contact) or connect to the open collector of transistor. It is also possible to connect to the TTL IC and 5V-CMOS IC.

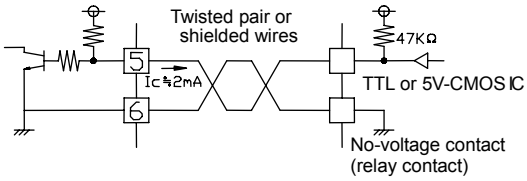
●In the case of connecting to no-voltage contact



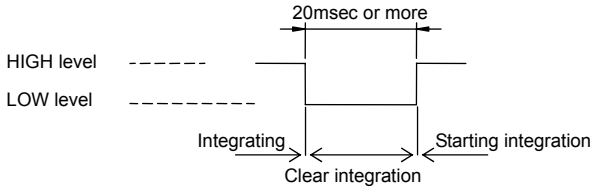
●In the case of connecting to open collector of transistor



●In the case of connecting to no-voltage contact



●Pulse width of integrating reset input



4-5-4 Connection to the open collector output 1 and 2

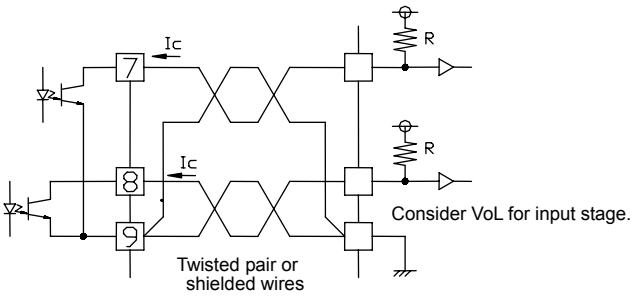
The connection to the open collector output has two systems, one is for open collector output 1 corresponding to the numbered pin ⑦ - ⑨ of the terminal block, the other is for open collector output 2 corresponding to the numbered pin ⑧ - ⑨ of the terminal block. Only one kind of output can be set per one system.

Since the open collector output has been isolated with photocoupler, it is needed to put pull-up resistor into the outside. The Ic of sink current is maximum100mA.

If it is anticipated to cause malfunction by external noise, the resistor R will be determined so as to make it larger, though, but ordinarily determine the R to be approximately between 5mA and 30mA.

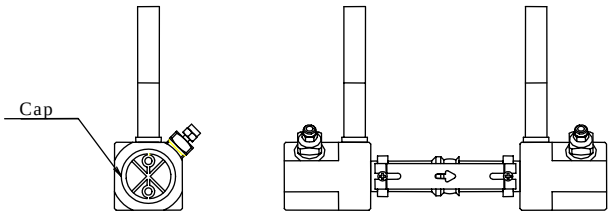
The impressed voltage applied to pin numbered ⑦ - ⑨ and ⑧ - ⑨ is maximum 35V.

Open collector output voltage is 1.3V.



5. Precaution for handling

● Because the detector cap is processed in water-proof, never turn it.



The cap is tightened at specified torque. In no event should it be turned.

If not, not alone the water-proof effect may be lost, but exert an effect on the sensitivity to ultrasonic waves adversely.

● The indicator is paired with the detector. When purchasing plurality of ultrasonic flowmeters, use them so as to agree with the manufacturing numbers.

● At the time when shipping from factory, the instantaneous flow indicating values and the actually flow measured values and the 4-20mA have been calibrated by using master flowmeter. The compensated parameters and the 4-20mA calibrated parameters of the flowmeter should not be changed.

● Operate the ultrasonic flowmeter under the rated temperature and pressure.

6. Flow measurement

After having completed installing and wiring to the indicator as well as making up pipe to the detector, turn power on, and feed fluid. Error(Fail) will be displayed if the fluid has not been present, but flow would be indicated on the liquid crystal display of the flowmeter and available for flow measurement should the fluid flow.

- Either instantaneous value or the integrating value can be selected in the flow indication. Selection should be made with reference to the item 7 “Setting of parameters”.
- The comparative output can be set either for the instantaneous value or for the integrating value (two systems).

  The comparison result can be taken out from external output terminals.

  The comparative output of the instantaneous values can be utilized for the purpose of the alarm at upper/lower limits, and those of the integrated values can also be utilized for the purpose of the alarm reached the setting flowrate and for driving the stop valve.

※ The comparative output cannot be set in a status of using the frequency output, integrating pulse output and Fail output.

- Integrating values can be reset by external input signal. (Active Low)

※ Output at 4-20mADC

With respect to the instantaneous flow indication on the positive side, the 4-20mA is, in proportion to this, produced from the external terminal, but the instantaneous flow indication on the negative side is fixed to the 4mA.

※ Precaution for measuring flow

- Ultrasonic waves are interrupted, thereby causing it to read inaccurately and/or malfunction should air bubbles be present in the fluid.
- Air bubbles would be deposited on the ultrasonic wave-sending and receiving-face in the detector tube should air bubbles be present in the fluid in the extremely slow velocity, thereby disabling it for flow measurement.
- Should the fluid flow initially into the piping pathway (particularly should the systems set up), air bubbles would be mixed in, though, and air bubbles might sometimes deposit on ultrasonic wave-sending and receiving face in the detector tube should the fluid flow in extremely slow velocity. Producing air bubbles on this surface can cause it to read out inaccurately and/or malfunction.

  Flash out air bubbles by means of opening and shutting valve, when setting up.
- Turn on the power switch of the indicator in such status that the detector is filled fully with fluid and velocity is at 0. If turned on in the status that the fluid is running, errors may occur in the initial setting at the time of starting up the indicator, and may fail to measure.

7. Setting of parameters

There are twelve items in the setting of parameters as follows.

① Setting for changing over flow indication ·····(1:DISP)

② Setting of output forms and ranges at 4-20mADC ·····(2:I OUT)

③ Setting of open collector output ····· (3:OC.OUT)

④ Setting of the compensated value ·····(4:DTADJ)

⑤ Setting of the moving average processing number ····· (5:AVERAG)

⑥ Zero adjustment····· (6:0 SET)

⑦ Deletion of the integrated flowrate ····· (7:T RES)

⑧ Setting of Low Cut ·····(8:LOWCUT)

⑨ Setting of unit of indication·····(9:UNIT)

⑩ Setting of sampling time ····· (10:INTVL)

⑪ Setting of decimal place in the flow indicating values (For G15EP and G20EP only) ·····

..... (11:FIG)

⑫ Protection against parameter setting (Protection function) ····· (12:PROT)

※ To make sure and change the preset parameters, perform them with reference to this item. Be sure that the setting contents should not be changed until after they have been registered.

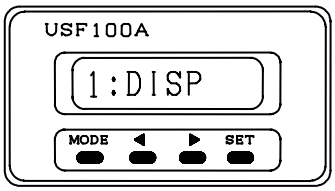
※ If changed the parameters, quit the loop of the parameters and press the SET key repeatedly, until the next parameter appears. (The data are not stored, if having not quit the loop of the parameters by means of SET key).

※ The setting of compensated value described in the item ④ may influence on the performance (Accuracy) of this Ultrasonic flowmeter. It should be noted that if it was reset by the customers, it shall not be covered by the performance warranty of this Ultrasonic flowmeter.

※ The flow measurement stops processing during settings of the parameters are being performed. . Accordingly the last action done just before the setting of the parameters have been performed are held in the operational state of each input/output signal.

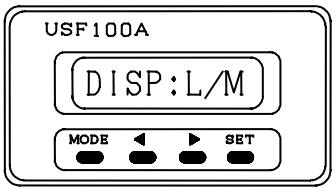
7-1 Setting of changing over the flow indication

This is to select which flow indication should be carried out in either instantaneous value or integrating value.



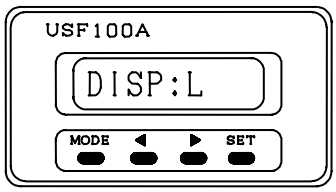
In the flow measurement mode, the left screen appears if pressing g **MODE** key. After it appeared, press **SET** key to proceed to setting screen.

▽



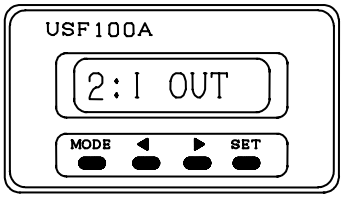
Instantaneous flow indication

Select either indication of instantaneous flow or integrating flow using ◄ and ► keys.
Press **SET** key to proceed to the next setting item. If you do not store data, press **MODE** key.



Integrating flow indication

▽



This is the next setting screen.
Press **MODE** key to return to the flow measurement mode.

Note:

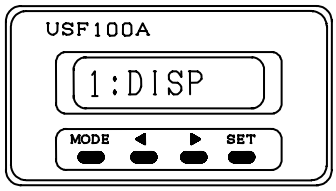
- Display range of instantaneous flowrate
  0 – 9999 mL/M indicating at mL/M
  0 – 9999 L/M indicating at L/M
  0 – 2641 G/M indicating at GA/M
- Display range of integrated flowrate
  Maximum 999999mL(6 digits) indicating at mL
  Maximum 9999999L (7 digits) indicating at L
  Maximum 264169GA indicating at GA

(In the case of G05EP and G10EP, both units of mL and L can be selected, but in the case of G15EP and G20EP, it is L indication only).

7-2 Setting of the output forms and ranges at 4-20mADC

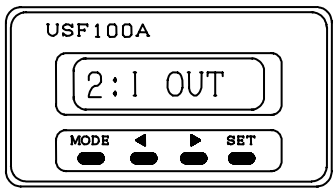
The output flowrates at 4mA and 20mA of the current output 4-20mADC are respectively to be set in the flow measurement.

If the actual flowrate is less than the one set to 4mA, it is fixed to 4mA and cannot be produced in no more than it. Also if the actual flowrate is more than the one set to 20mA, it is fixed to 20mA and cannot be produced in no less than it.



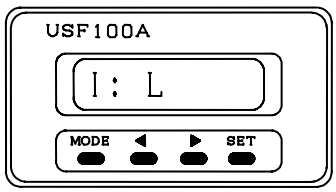
In the flow measurement mode, press **MODE** key to display the left screen.

▽



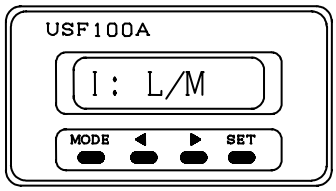
Using ◄ and ► keys, select the 4-20mA setting screen.
After it appeared, press **SET** key to proceed to the setting screen.

▽



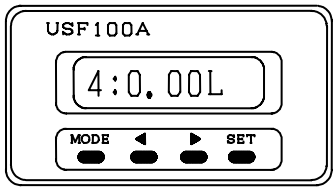
Integrating flow output

Using ◄ and ► keys, select either instantaneous flow output or integrating flow output.
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.



Instantaneous flow output

▽

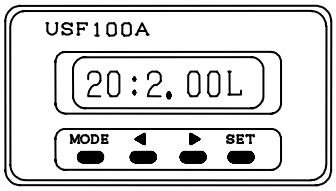


Using ◄ and ► keys, set the flowrate at 4mA output.
For the setting range, refer to the next page.
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.

※ When selected the integrating flowrate output in the output form, there is no setting of 4mA output.

※ For the setting flowrate at the time when producing the 4mA, set the smaller amount of flowrate than that of the setting value
at 20mA output.

▽



▽

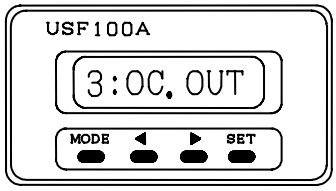
Using ◄ and ► keys, set the flowrate at the time when producing at 20mA output.

Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.

※ The setting flowrate at the time when producing the 20mA, set larger amount of flowrate than that of setting value at 4mA output.

※ The setting values which have been set here becomes the full scale values described in the item 7-8 “Setting of Low Cut ”.



This is the next setting screen.

Press **MODE** key to return to the flow measurement mode. If you do not proceed to the next step.

Output setting range

※ The setting ranges of 4mA and 20mA are both the same ones.
When changing the setting, be sure to set the flowrate value of 20mA output larger than that of 4mA output.

	Output setting of instantaneous flowrate	Output setting of Integrating flowrate
G05EP:	Maximum 0.50 L/M (Setting: STEP: 0.01)	Maximum 10.00L (Setting: STEP:0.01)
G10EP:	Maximum 2.00L/M (Setting: STEP: 0.01)	Maximum 10.00L (Setting: STEP:0.01)
G15EP:	Maximum 20.0L/M(Setting: STEP: 0.1)	Maximum 50.0L (Setting: STEP:0.1)
G20EP:	Maximum 50.0L/M (Setting: STEP: 0.1)	Maximum 50.0L (Setting: STEP:0.1)

7-3 Setting of open collector output

The output form of open collector output will be set.
There are two systems in the external output and each of them can be set by one kind, respectively.

The setting function of open collector output 1 (CH 1)

- Comparative output (Alarm output)
  Comparing the measured flowrate of the flowmeter with the comparative setting flowrate, external output is carried out.
  The comparisons applied to are as follows.
  Instantaneous flowrate : Upper limit / lower limit alarm
  Integrating flowrate: Alarm for the setting flowrate(Active High/Active Low)

- Integrating pulse output
  Set the flowrate per one pulse and one pulse is produced when reached the setting value.
  Open collector output turns “OFF ” at the time when one pulse is produced.(Active High)
  At the time when fluid stops flowing, open collector output turns “ON”.

- Frequency output

  The measured flowrate of the flowrate produces in terms of the specified frequency (Maximum 3KHz).

  ※ At the time when fluid stops flowing, open collector output turns “ON”.

The setting function of open collector output 2 (CH 2)

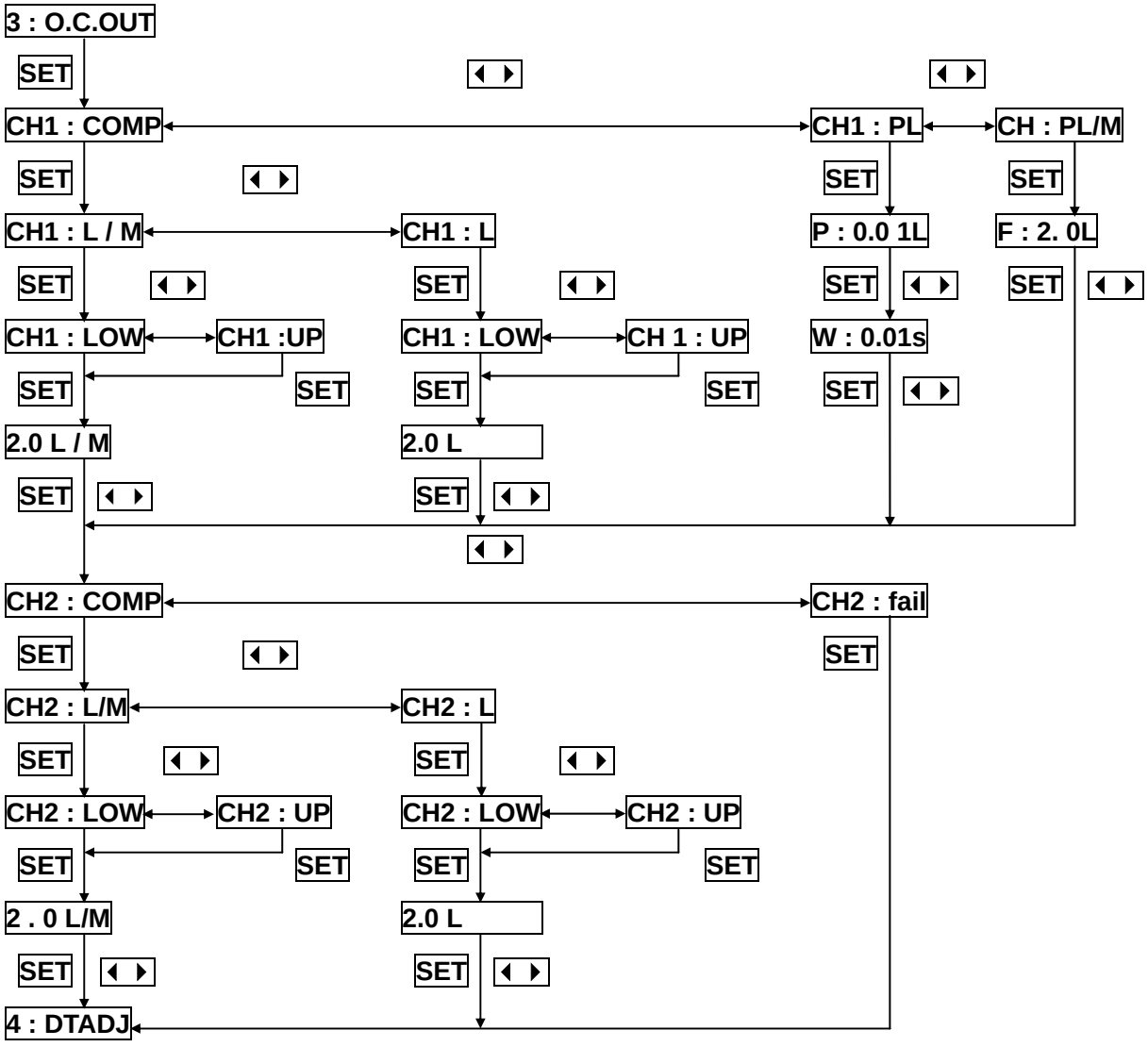
- Comparative output(Alarm output)

  The same setting can be made as CH1.
- Fail output

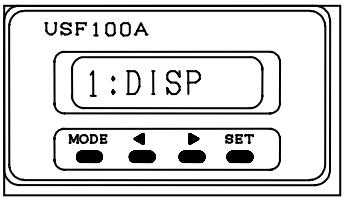
  The measuring error on the flowmeter is produced.

  ※ At the time of Fail, open collector output turns “ON”.

Flowchart of the open collector output

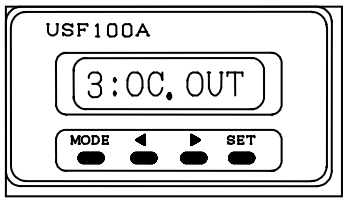


Setting of the open collector output 1(CH1)



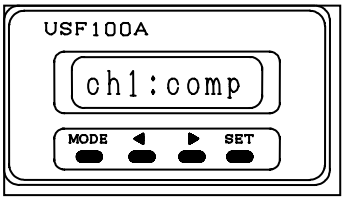
In the flow measurement mode, press **MODE** key to display the left screen.

▽



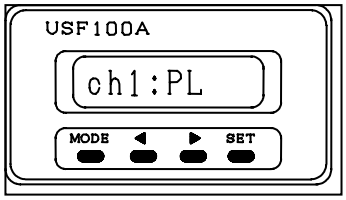
Using ◄ and ► keys, select the comparative output setting screen.
If the screen appears, press **SET** key to proceed to the next setting screen.

▽

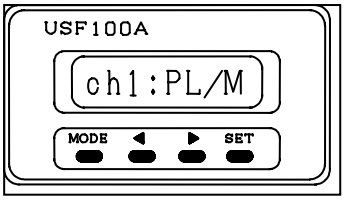


Sitting of comparative output

The screen displays the setting of the output form in open collector output (CH1). Using ◄ and ► keys, select the output form of open collector output1(CH1). Press **SET** key to proceed to the next step. When you do not store data, press **MODE** key.



Setting of integrating pulse

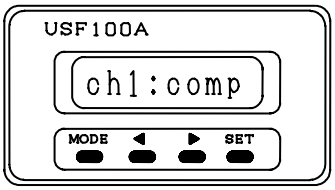


Setting of frequency output

If selecting the comparative output, **proceed to** **the procedure A.**
If selecting the integrating pulse output, **proceed to** **the procedure B.**
If selecting the frequency output, **proceed to** **the procedure C.**

Procedure A (At the time when selecting the comparative output CH 1)

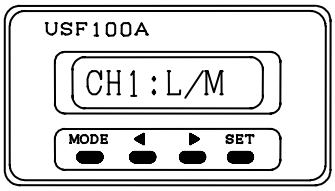
The settings of the output form and the comparative value for the comparative output are performed.



This shows the selected screen of comparative output CH1.

Press **SET** key to proceed to the next setting screen.

▽



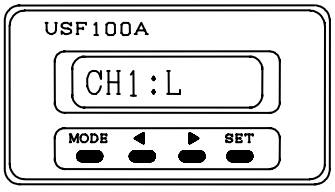
Instantaneous comparative setting value 1

This shows the setting screen of comparative output CH 1.

Using ◄ and ► keys, select the object of CH 1 from instantaneous flowrate and integrating flowrate.

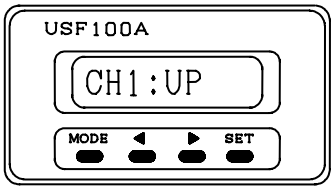
Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.



Integrating comparative setting value 1

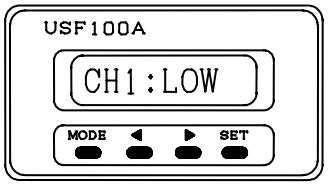
▽



ON at upper limit

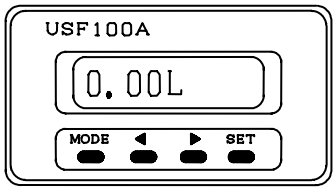
Using ◄ and ► keys, select either let the open collector turn “ON” (ON at upper limit), when flowrate exceeds the comparative value, or let the open collector turn ”ON” (ON at lower limit), when flowrate lowers the comparative values (1). Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.

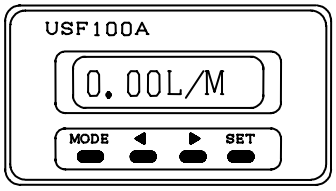


ON at lower limit

▽

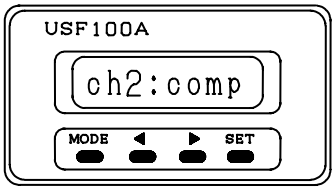


When selecting integrating flowrate



When selecting instantaneous flowrate

▽



Using ◄ and ► keys, set the flowrate to be compared (comparative value(1)).

Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.

※The unit of flowrate is L/M, when selecting the instantaneous flowrate.

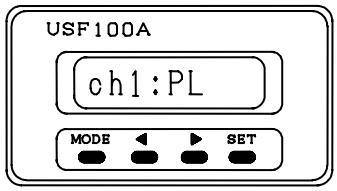
※The unit of flowrate is L, when selecting the integrating flowrate.

This is the next setting screen.

Move to the setting of open collector output 2(CH2).

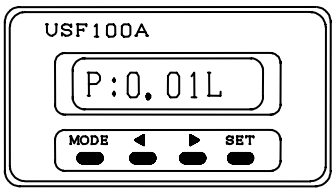
Procedure B (At the time when selecting the integrating pulse output)

The setting is carried out for the flowrate and the pulse width per one pulse at the time of flow measurement.



This is the setting screen for the integrating pulse output.
Press **SET** key to proceed to the setting screen.

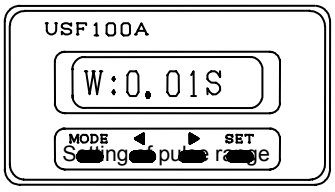
▽



Flowrate setting per 1 pulse

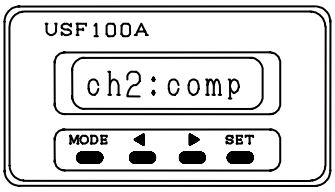
This screen shows the setting for the integrating pulse output.
Using ◄ and ► keys, input the flowrate per one pulse.
G05EP and G10EP: Maximum 99.99L (Setting step:0.01)
G15EP and G20EP: Maximum 99.9L (Setting step:0.1)
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.

▽



Using ◄ and ► keys set the integrating pulse width(Off time).
The setting can be made up to 2.00S at maximum. (Setting step:0.01)
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.

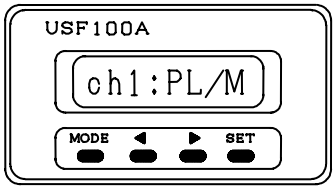
▽



This is the next setting screen.
Move to the setting of the open collector output 2(CH2).

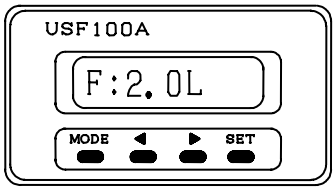
Procedure C (At the time when selecting the frequency output)

The setting is carried out for the range of the maximum flowrate (Full scale) at output frequency during the flow measurement. It outputs the 0 Hz in the stationary state of fluid and outputs 3KHz at FS.
In the case of the counter flow of the fluid (indicating the negative indication), it outputs 0Hz. Also it does not output more frequency than 3KHz, even though it has been flowing more than the flowrate at full scale.



This is the screen selected for frequency output.
Press **SET** key to proceed to the next setting screen.

▽

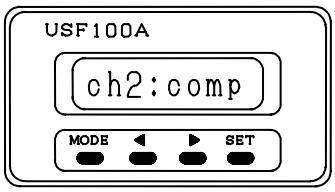


▽

Using ◄ and ► keys, set the flowrate at full scale.
Setting flow ranges (Setting step:0.1)

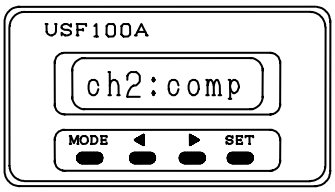
- G05EP: 0 – 0.5 L
- G10EP: 0 – 2.0 L
- G15EP: 0 – 20.0 L
- G20EP: 0 – 50.0 L

Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.



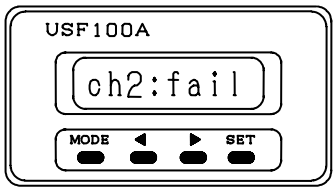
This is the next setting screen.
Move to the setting of the open collector output 2 (CH2).

Setting of the open collector output 2(CH2)



Setting of comparative output

This screen shows the setting for the output form of open collector output 2(CH2).
Using ◄ and ► keys, select the output form of open collector output 2 (CH2).
Press **SET** key to proceed to the next step. When you do not store data, press **MODE** key.



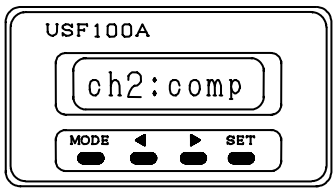
Setting of Fail output

※ At the time when selecting Fail output, press the **SET** key to set the output and the next setting item **"4:DT ADJ"** appears on the screen.

Move to the procedure D, if selecting the comparative output.

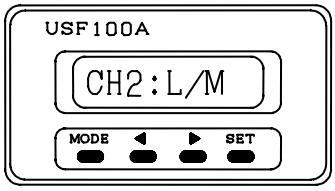
Procedure D (At the time when selecting the comparative output CH2)

The setting of the output form and comparative value are carried out for the comparative output.



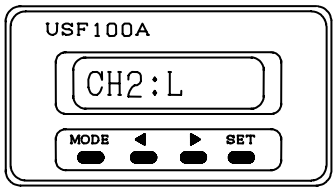
This is the selected screen of the comparative output CH2.
Press **SET** key to proceed to the next setting screen.

▽



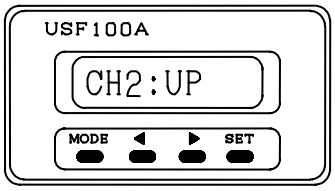
Setting of instantaneous comparative value 2

This screen shows the setting for the comparative output CH 2.
Using ◄ and ► keys select the comparative output CH 2 applied to from the instantaneous flow and integrating flow.
Press **SET** key to proceed to the next step. When you do not store data, press **MODE** key.

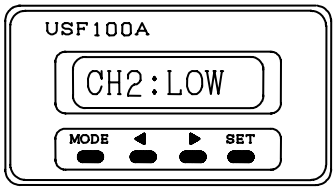


Setting of integrating comparative value 2

▽



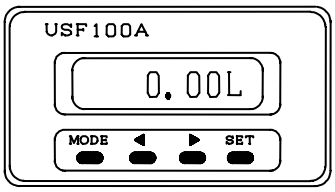
Upper limit ON



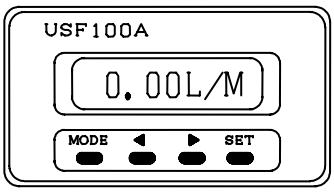
Lower limit ON

Using ◄ and ► keys select either let the open collector turn “ON” (ON at upper limit), when flowrate exceeds the comparative value (2), or let the open collector turn “ON” (ON at lowear limit), when flowrate lowers than the comparative values (2).
Press **SET** key to proceed to the next step. When you do not store data, press **MODE** key.

▽

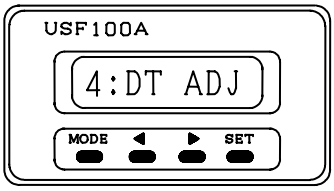


When selecting integrating flowrate



When selecting instantaneous flowrate

▽



Using ◄ and ► keys set the flowrate to be compared (comparative value(2)).

Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.

※The unit of flowrate is L/M, when selecting the instantaneous flowrate.

※The unit of flowrate is L, when selecting the integrating flowrate.

This is the screen showing the next setting item.

When you do not proceed to the next step, press **MODE** key to return to the flow measurement mode.

7-4 Setting the compensating value

The calibration is carried out so as to agree the actual flowrate with the instantaneous flow indication of the flowmeter. The calibration is in principle carried out in terms of the maximum values of the flow ranges (full scale).

- **Precaution before calibrating**

Keep the fluid in stationary state and make sure that instantaneous flowrate has been zero. If deviated from the zero point, make the zero adjustment described in the item 7-6.

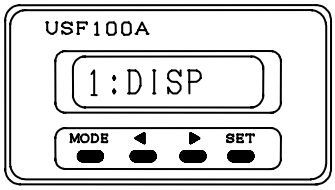
If attempting to make a zero adjustment and the item 7-8 Low Cut has been set, make the setting value of the Low Cut "0", since the zero state cannot be confirmed after having made zero adjustment.

※ Return the Low Cut setting values to the original ones after zero adjustment has been made.

Connect the supersonic flowmeter to the master meter beforehand.

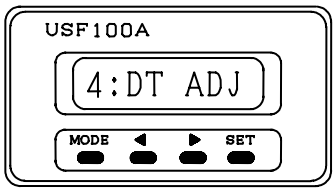
Flow the amount of the flow at full scale which has been configured to the indicator of ultrasonic flowmeter to the detector of ultrasonic flowmeter through the master flowmeter.

The adjustment should be made in the following procedures so as to make the indicated value of master flowmeter accord with the linstantaneous flow indication of ultrasonic flowmeter.



In the flow measurement mode, press **MODE** key to display the screen left.

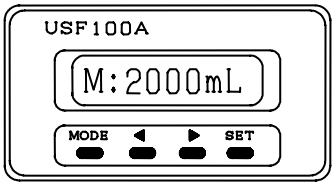
▽



Using ◄ and ► keys select the screen for setting of compensating value.

If this screen appears, press **SET** key to proceed to the next screen.

▽



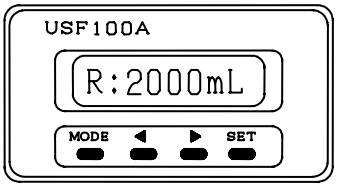
Input screen for indicating value of flowmeter

Using ◄ and ► keys, input the instantaneously indicating value of the ultrasonic flowmeter.

Press **SET** key to proceed to the next step. If you do not store data, press **MODE** key.

※ If there is a wide range in the flow indicating value on the ultrasonic flowmeter, input the center value of the widely fluctuating width.

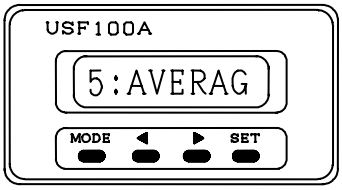
▽



Actual flowrate input screen

Using ◄ and ► keys, input the actual flowrate (indicated value on the Master flowmeter). Press **SET** key to proceed to the next step. When you do not store data, press **MODE** key.

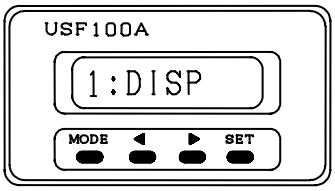
▽



This is the next setting screen.
When you do not need to proceed to next step, press **MODE** key to return to the flow measurement.

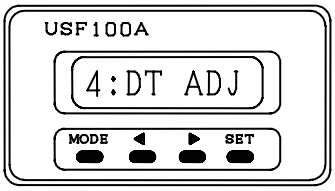
Compare the indicating value of the master flowmeter with the instantaneous flow indicating value of the ultrasonic flowmeter in order to make sure if the DT-ADJ setting has been made correctly.
If the flow indicating values are both not agreed, change the input screen of the flow indication and furthermore adjust it so as to agree the flow indicating value in accordance with the following procedures.

※ If there is a wide range in the flow indicating value on the ultrasonic flowmeter, read out the center value of the widely fluctuating width.



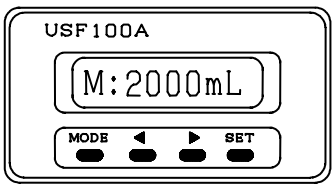
In the flow measurement mode, press **MODE** key to display the left screen.

▽



Using ◄ and ► keys select the setting screen of the compensated value.
If the screen appears, press **SET** key to proceed to the next setting screen.

▽



Input screen of
the indicated value of flowmeter

▽

Using ◄ and ► keys change the existing setting value.

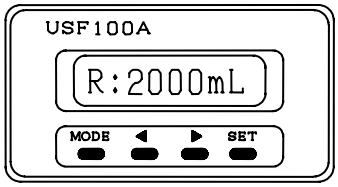
[Setting value to input] =

[Existing setting value] − ([Indicating flowrate on Master flowmeter] − [Instantaneous flow indicating value on ultrasonic flowmeter])

The formula above should be a target for the setting.
If increasing the existing setting values, the instantaneous flow indicating value of the ultrasonic flowmeter decreases, and if decreasing the existing setting values, the instantaneous flow indicating value of the ultrasonic flowmeter increases.

Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.

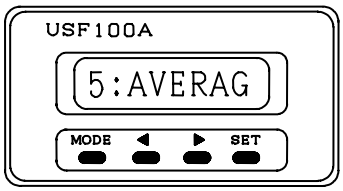


Input screen for actual flowrate

▽

There is no need to change the existing setting value.

Press **SET** key to proceed to the next step.



This is the next setting screen.

When you do not proceed to the next step, press **MODE** key to return to the flow measurement mode.

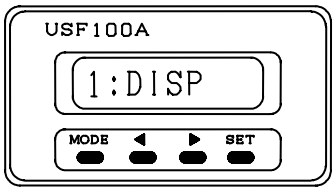
Compare the indicating value of the master flowmeter with the instantaneous flow indicated value of the ultrasonic flowmeter in order to ensure that the DT-ADJ setting has been made correctly.

If the flow indicating values are not agreed, change and adjust again the values on the input screen of the flow indication of the flowmeter.

A fine adjustment should be further made repeatedly until the instantaneous flow indicated values of the ultrasonic flowmeter get into the range of the error at full scale.

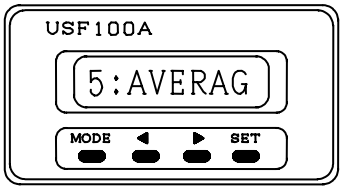
7-5 Setting of the moving average processing number

The setting intends to suppress fluctuation of indicating value in the flow measurement.
When the setting is N number of times, the present indicating values are the average of the measured values where is subtracted one time from N times in the past. The steady and stable flow measurement can be performed by using in conjunction with the sampling time in the item 7-10.



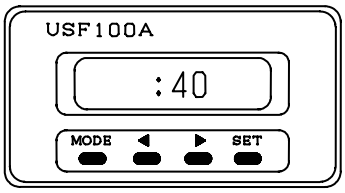
In the flow measurement screen, press **MODE** key to display the left screen.

▽



Using ◄ and ► keys select the setting screen of the moving average processing number. If the screen appears, press **SET** key to proceed to the setting screen.

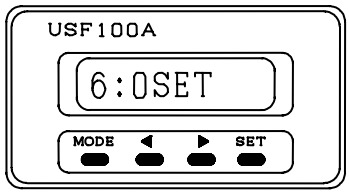
▽



Input screen for setting value

Using ◄ and ► keys set the numerical value. If the fluctuation in the instantaneous flow indicating values is too great to read it out, make the numerical values greater and set it.
The setting can be made up to maximum 200 times.(Setting step:1).
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.

▽



This is the next setting screen.
When you do not proceed to the next step, press **MODE** key to return to the flow measurement.

7-6 Zero adjustment

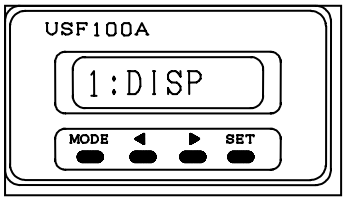
This adjustment is made to conform to the zero point in the instantaneous flow indication.

- Precaution prior to making zero adjustment

Make a zero adjustment in a stationary state of fluid in the detector.

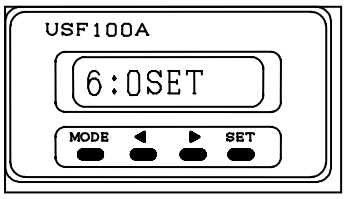
Make the setting value of the item 7-8 Low Cut "0".

Aging should be performed for approx one hour after turning on power supply to get the ambient operating temperature and the fluid temperature stabilized.



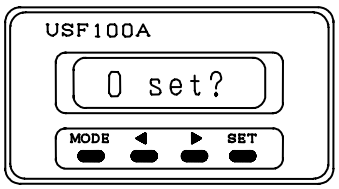
In the flow measurement mode, press **MODE** key to display the left screen.

▽



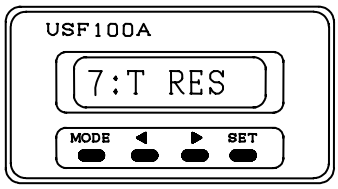
Using ◄ and ► keys select the screen for zero adjustment.
If the screen appears, press **SET** key.

▽



Make sure to ensure that the flowrate has been standing still inside the detector.
After having done, press **SET** key while pressing ► key to allow automatic zero adjustment and to proceed to the next step.
If you do not make a zero adjustment(to cancel), press **MODE** key to stop executing.

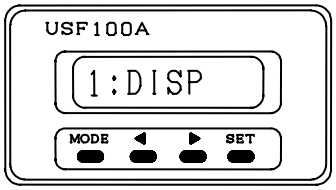
▽



This is the next setting screen.
When you do not proceed to the next setting, press **MODE** key to return to the flow measurement.

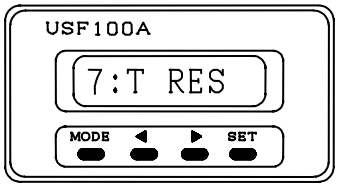
7-7 Erasing of integrated flowrate

The supersonic flowmeter stores the total amount of flowrates (Integrated fowrate) which have been flowed up to now. These data can be erased to zero compulsorily (to bring it back to zero).



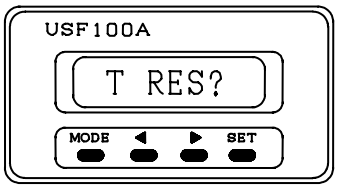
In the flow measurement mode, press **MODE** key to display the left screen.

▽



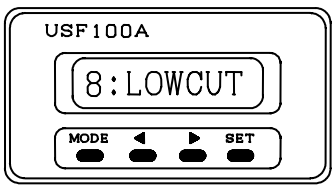
Using ◄ and ► keys select the setting screen of the integrated flowrate erasing.
If it appears, press **SET** key to proceed to the next setting screen.

▽



Press **SET** key, while pressing ► key to erase the integrated flowrate, and proceed to the next step. If you do not need to erase, press **MODE** key.

▽



This is the next setting screen.
When you do not proceed to the next , press **MODE** key to return to return to the flow measurement.

Note:

The integrated flowrates can be erased even by the integrating reset input signal on the terminal block as well.

7-8 Setting of Low Cut

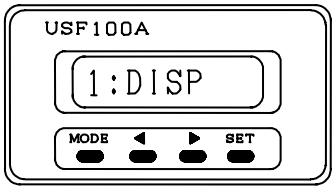
Low Cut is a function to make it to bring a downside of the flow measurement range (Full scale) to zero compulsorily. Assume that, taking for instance, if the Low Cut has been set to 5% for 2 L/min at full scale, the flow indication less than 0.1 L/min is not indicated and becomes zero.

In this case of 4-20mA output, 4.8mA or lower becomes 4mA.

This setting should be done at the time zero point seems to be fluctuated when flowrate is zero.

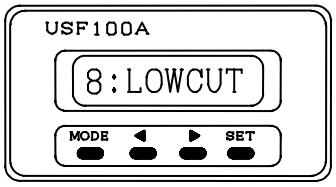
- **Precaution before setting**

If zero point fluctuates in the instantaneous flow indication, despite the fluid stops flowing, increase or decrease will occur in the integrated values. Set the Low Cut in such a case. Provide that if the Low Cut has been set greatly, the flowrate is regarded as zero and is not integrated even if the fluid has been flowed and accordingly do not set it to the larger one unnecessarily.



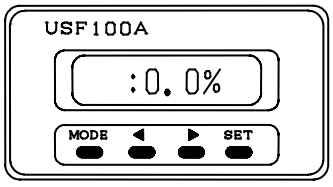
In the flow measurement mode, press **MODE** key to display the screen left.

▽



Using ◄ and ► keys, select the Low Cut setting screen.
If it appears, press **SET** key to proceed to the next setting screen.

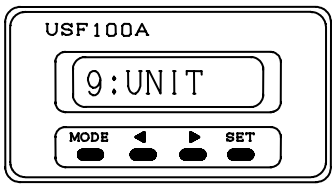
▽



Input screen of the setting value

Using ◄ and ► keys, set the numerical value.
The setting can be carried out up to 10% of the full scale(Setting flowrate at the time when producing 20mA of 4-20mADC).
Press **SET** key to proceed to the next setting.
When you do not store data, press **MODE** key.

▽

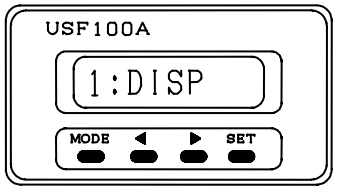


This is the next setting screen.
When you do not proceed to the next setting, press **MODE** key to return to the flow measurement mode.

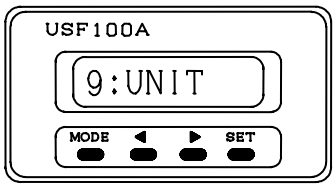
7-9 Setting of the units of the indication

The indicating unit of the flowrate is designated.

In the G05EP and G10EP three kinds of units (L /mL / gal) can be chosen and two kinds of units (L / gal) can be chosen in the G15EP and G20EP.

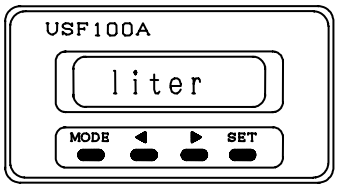


In the flow measurement mode, press **MODE** key to display the screen left.



Using ◄ and ► keys, select the setting screen of the units of indication.

If it appears, press **SET** key to proceed to the next screen.



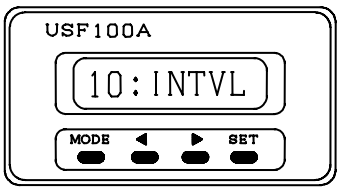
Using ◄ and ► keys, set the units of indication.

G05EP and G10EP: liter / milliliter / US gal

G15EP and G20EP: liter / US gal

Press **SET** key to proceed to the next setting.

When you do not store data, press **MODE** key.



The screen returns to the display screen of the initial setting item.

When you do not proceed to the next setting, press **MODE** key to return to the flow measurement mode.

※ **The following units for each part vary with changing the designation of the indicating units.**

Units of indication	When measuring flowrate		When setting parameters					
	Inst.	Int.	DISP		I OUT		OC.OUT	
			Inst.	Int.	Inst.	Int.	Inst.	Int.
liter	L/M	L	L/M	L	L/M	L	L/M	L
milliliter	mL/M	mL	L/M	L	L/M	L	L/M	L
US gal	G/M	GA	GA/M	GAL	GAL/M	GAL	GA/M	GAL

※ One litter corresponds to 0.26417 gallons (USA).

※ Some errors subject to occur due to the conversion to the original indicating value when converting the unit of indication.

7-10 Setting of the sampling time

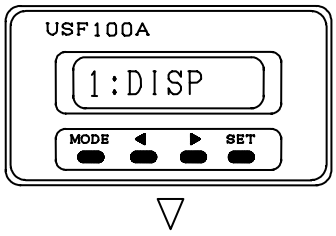
This is the setting of the sampling time for the flow indication and the flow measuring output.

The stable flow measurement can be obtained by using in conjunction with the moving average processing described in the items of 7-5.

- **Precaution when setting**

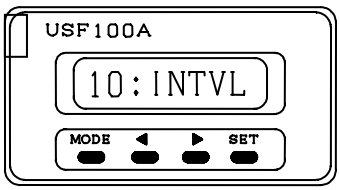
This setting should be used in the case that the flowrate fluctuates greatly and also the flow indication and the flow measuring output fluctuates.

While using it in conjunction with the moving average processing, and if having set the sampling time so greatly, the response is deteriorated.



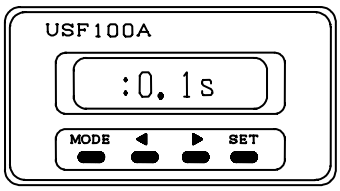
In the flow measurement mode, press **MODE** key to display the left screen.

▽



Using ◄ and ► keys select the sampling time setting screen.
If it appears, press **SET** key to proceed to next setting screen.

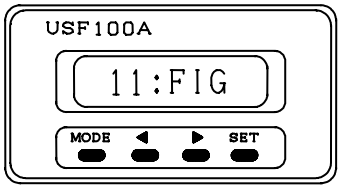
▽



Input screen for setting value

Using ◄ and ► keys, set the numerical value.
The setting can be set up to the maximum 10.0s. (Setting step: 0.1).
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.

▽



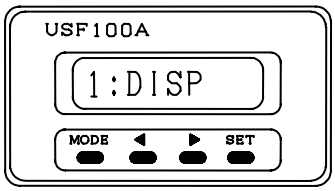
This is the next setting screen.
When you do not proceed to the next setting, press **MODE** key to return to the flow measurement mode.

7-11 Setting of the decimal place in the flow indicating values

The setting will be made for the decimal place in the flow indicating values.

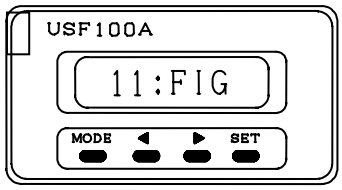
- **Precaution when setting**

It does not function at the time when setting the indication at mL in G05EP and G10EP.



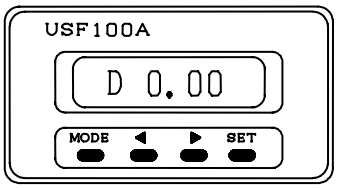
In the flow measurement mode, press **MODE** key to display the left screen.

▽



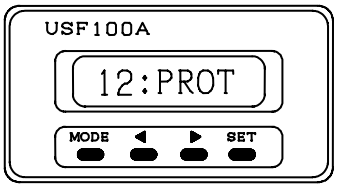
Using ◄ and ► keys select the setting screen of the decimal place.
If it appears on the screen, press **SET** key to proceed to the next setting screen.

▽



Using ◄ and ► keys, set the decimal place.
Press **SET** key to proceed to the next step.
When you do not store data, press **MODE** key.

▽



This is the next setting screen.
When you do not proceed to the next step, press **MODE** key to return to the flow measurement mode.

※ The settable digit varies with the indicating units.

	Milliliter Liter	US	gal
G05EP	0.0 (Fixed)	0.00	0.000
G10EP	0 (Fixed)	0.00	0.000
G15EP	—	0.00	0.000
G20EP	—	0.00	0.000

7-12 Protection of the parameter setting (Protecting function)

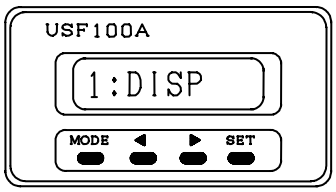
This is a function to protect the existing parameter setting contents (Change prohibition).

This setting is used to protect from a careless change.

- **Precaution when setting**

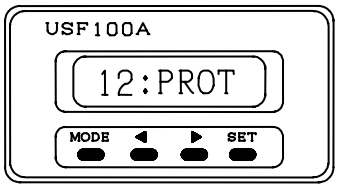
If turning “ON” the protecting function, all the parameters except this function cannot be changed.

Turn “OFF” the protecting function, when changing the setting.



In the flow measurement mode, press **MODE** key to display the left screen.

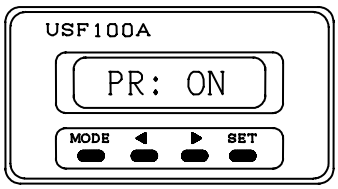
▽



Using ◄ and ► keys, select the setting screen of the protecting function.

If it appears, press **SET** key to proceed to the next setting screen.

▽

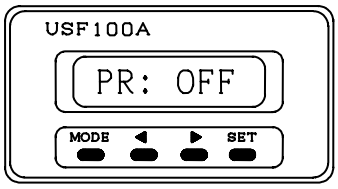


Protection is ON

Using ◄ and ► keys, select either to turn on or turn off.

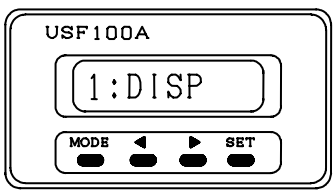
Press **SET** key to proceed to the next step.

When you do not store data, press **MODE** key.



Protection is OFF

▽



This is the next setting screen.

When you do not proceed to the next setting screen, press **MODE** key to return to the flow measurement mode.

8. Trouble shooting

Symptoms	Causes	Measures to take
Flow indication not indicated(Power supply is in the OFF state.)	Abnormality in power supply voltage and current.	Check the supply voltage, apply the rated voltage and current. Burnout is considered due to excessive voltage.
	Connected wiring to terminal block numbered pin ① - ② disconnected or fails to make contact.	Check the connected wiring to the terminal block numbered ① - ②.
Remains in Fail display as it is and instantaneous flow indication fluctuates greatly.	Coaxial cable connector coming from indicator fails to make contact.	Coaxial cable connector should be correctly connected.
	Coaxial cable coming from detector disconnected.	Indicator and detector should be replaced in pairs.
	Coaxial cable disconnected inside the detector.	Indicator and detector should be replaced in pairs.
	Air bubbles deposited on the face of sending and receiving ultrasonic wave in the detector.	Air bubbles should be once flushed away by keeping the flow velocity up.
	No liquid exists in the detector interior.	Fluid is fed into the tube interior of the detector.
Instantaneous flow indication remains “0”.	Since LOW CUT has been greatly set, flowrate is regarded as “0”.	LOW CUT is set to necessity minimum.
Integrating flow indication remains “0”. and not integrated.	Connected wiring to terminal block of indicator numbered ⑤ - ⑥ short circuited.	Check the connected wiring to the terminal block numbered ⑤ - ⑥. If not short-circuited, indicator get out of order.
	Since LOW CUT has been greatly set, flowrate is regarded as “0”.	LOW CUT is set to necessity minimum.
Integrating flow indication increases and decreases in spite of being stationary state of fluid.	Zero point of instantaneous flow indication shifts either to positive side or negative side.	Make zero adjustment in a stationary state of fluid. If the deviation from zero point is not adjusted, enter LOW CUT.
Instantaneous flow indication not conformed to 4-20mADC output.	Calibrating parameter (setting value) of 4-20mADC output has not been correctly set.	Correctly enter the parameter (setting value) of 4-20mADC, based on the test results made when shipping from factory.
Output at 4-20 mA DC not come out.	Connected wiring to terminal block of indicator numbered ③ - ④ disconnected, or fails to make contact.	Check the connected wiring to the terminal block numbered ③ or ④.

Symptoms	Causes	Measures to take
Integrated flowrate is not zeroed (reset) by external input signal.	Connected wiring to Indicator terminal block numbered pin ⑤ - ⑥ disconnected and fails to make contact.	To confirm the connected wiring numbered ③ or ④.
	Input pulse range to Indicator terminal block numbered ⑤ - ⑥ narrow.	To make input pulse range more than 20msec.
	Input pulse to indicator terminal block numbered ⑤ - ⑥ is HIGH pulse.	To make input pulse LOW pulse.
Open collector output 1 not produced.	Connected wiring to Indicator terminal block numbered ⑦ - ⑨ fails to make contact.	To confirm connected wiring to terminal block numbered ⑦ or ⑨.
	Connected wiring to Indicator terminal block numbered ⑦ - ⑨ fails to make contact.	To confirm connected wiring to terminal block numbered ⑦ - ⑨.
	Parameter not set correctly.	Correctly to input in accordance with Operation Manual.
Open collector output 2 not produced.	Connected wiring to Indicator terminal block numbered ⑧ - ⑨ Disconnected.	To confirm connected wiring to terminal block numbered ⑧ or ⑨.
	Connected wiring to Indicator terminal block numbered ⑧ - ⑨ fails to make contact.	To confirm connected wiring to terminal block numbered ⑧ - ⑨.
	Parameter not set correctly.	Correctly to input in accordance with Operation Manual.

※We would like you to contact us, if you consider it to be abnormal or defective in the Ultrasonic Flowmeter.

9. Error display

If abnormality arises during the flow measurement, error message(Fail) appears on the indicator.

Fail : At the time when the sending and receiving waveforms cannot be received.

: At the time when the time difference between sending and receiving waves cannot be measured.

Possible causes are considered as follows.

- A lot of air bubbles are contained in the fluid.
- Air bubbles are deposited on the ultrasonic wave –sending and receiving faces of the detector.
- Viscosity of fluid is too high
- Excessive flowrates
- No fluid exists inside the tube of the detector.
- Coaxial cable connector coming from the detector is disconnected.

10. Warranty period

Warranty period of the product shall be one year from date of purchase.

(For one year commencing from the next month of the month shipped from factory)

Warranty certificate
For
ultrasonic flowmeter modeled
USF100A

<table>
<tr><td colspan="2">Model:</td><td colspan="2">Serial No.:</td></tr>
<tr><td>Warranty period</td><td>One year</td><td colspan="2">Date Purchased:
Month Day Year</td><td rowspan="2">To customer:
Please fill in your name and address with a ball-point pen immediately after purchasing, and keep it with care.

To dealer:
Please turn over this warranty certificate to the customer upon filling out the delivery date that the customer purchased and dealer‘s name of you.</td></tr>
<tr><td rowspan="3">To Customer</td><td>Address</td><td colspan="2"></td></tr>
<tr><td rowspan="2">Name</td><td colspan="2"></td><td rowspan="2">Dealer’s name, address and Tel No. :</td></tr>
<tr><td colspan="2"></td></tr>
</table>

This warranty certificate shall not be taken effect until the customer and dealer have filled out all the necessary items on this warranty certificate.

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Osaka-Fu 533-0033
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Fukuoka Sales Office: 2F K-2 bldg.
8-5 Hakataekiminami, 5-chome Hakata ward, Fukuoka City
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