Instruction Manual
for
Linearizing Compensation

ULTRASONIC FLOWMETER

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

⚠Warning	Before use, please read this Instruction Manual thoroughly for your safety operation, as this Manual contains important matters to be surely observed.

⚠Warning	Please always keep this Instruction Manual at hand for your quick reference when necessary.

TOFLO CORPORATION

121-R03

Contents

1-1. Procedures for linearizing compensation

Before performing the linearizing compensation, make sure that the serial number of ultrasonic flowmeter agrees with that of the indicator.

(1) Make the low-cut setting zero “0”.

※ For information on handling, see “Low-cutoff setting” described in the item of 2-1 in this Instruction Manual.

(2) Confirmation of the zero point

Stop flowing in a status of being flowing the fluid to be used, and then confirm that the indicator is representing “zero”.

※ Make the “zero adjustment” described in tthe item of 3-1 in the Manual, when the representation is not “zero” on the indicator.

(3) Actual measuring at full scale

Discharge at he maximum flowrate of the flowmeter (maximum flowrate of the flow ranges), and set the “Setting of the compensating value” as described in the item 4-1 in the Manual.

(4) Setting of each compensating point

Collect the input data just as described in the item 5-5 in the Manual, measure actually flowrates ranging from the maximum flow up to minimum flowrates in sequence and compensate them according to the description on how it operates as explained in the item 5-6 in the Manual.

And also if the adjustment cannot be made in measuring extremely minimal flowrate, set the indicating value at its option and input the most desirable compensating value.

2-1. Setting of the low-cutoff

The low-cutoff is a function compulsorily to cut off the downside of the flow measuring ranges (full scale).

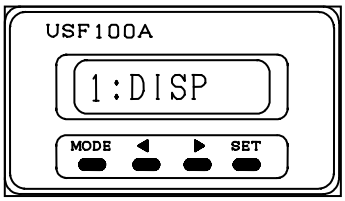
If making the low-cutoff 5% for the 2L/min at full scale, taking for instances, the instantaneous flow indication less than 0.1 L/min is not represented, but is represented by zero. The 4-20mA output, at this time, becomes 4mA if it is less than 4.8mA.

When the flowrate represents zero and fluctuating at zero point, this setting should be set.

● Instructions before setting.

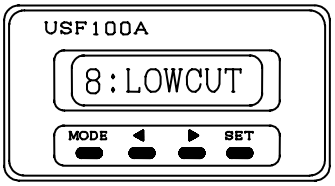
The variation in quantity will be appeared in the integrating value, if the instantaneous flowrates fluctuates despite the fluid is in a status of rest.

In the case like this, set the low-cutoff. However do not set it with an unusually large value, it will be sometimes considered to be zero and sometime will not be integrated, even if the fluid has been running.



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

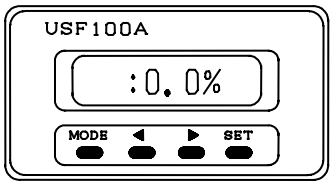
▽



Using < and > keys select low-cutoff setting screen.

After it appeared, press SET key to proceed to the setting screen.

▽

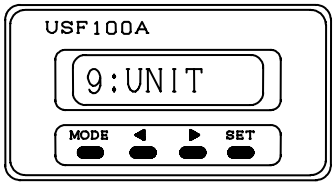


Input screen for the setting value

Using < and > keys set the numerical value. The setting can be made up to 10% at full scale.

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

▽



This is the next setting screen.

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

3-1. Zero adjustment

This is to adjust zero point in the instantaneous flow indication.

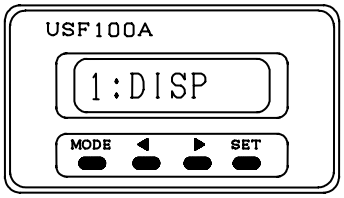
● **Instructions before making zero adjustment**

Carry out the zero adjustment in a stationary state of fluid in the detector.

Perform an aging Aging for about one hour after turning on power and make the zero adjustment in an environmental condition where ambient temperature and fluid temperature have been stabilized.

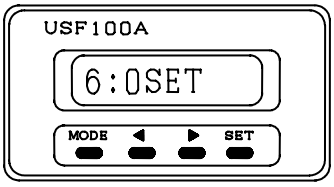
After zero adjustment, be sure to carry out flow measurement after turned off power of this device.

※ **Following zero adjustment, set the desired numerical value for low-cut rate.**



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

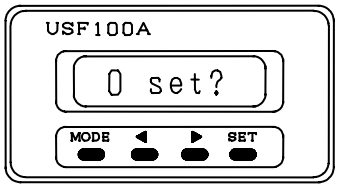
▽



Using < and > keys, select the screen for zero adjustment.

After it appeared, press SET key.

▽

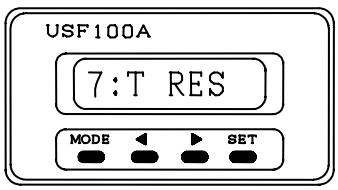


Make sure that the flowrate completely stands still in the detector inside.

After making sure, press SET key while pressing > key to allow automatic zero adjustment and to proceed to the next step.

If the fluid is running, press MODE key not to execute zero adjustment.

▽



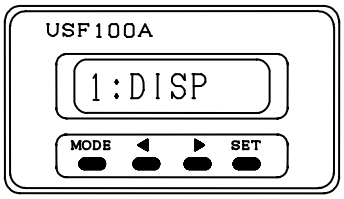
This is the next setting screen.

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

4-1. Setting of compensating value

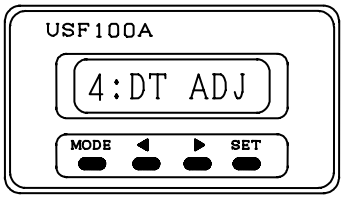
The calibration is carried out so as to agree the actual flowrate with the instantaneous flow indication of flowmeter. The calibration is in principle carried out at the maximum flowrate of flow ranges(at full scale).

The ultrasonic flowmeter is beforehand connected to the master flowmeter.
The flowrates of full scale set in the indicator of ultrasonic flowmeter are ran to the detector of ultrasonic flowmeter through master flowmeter.
Adjust the flowrates so as to agree the indicated value of the master flowmeter with the instantaneous flow indicated values in accordance with following procedures.



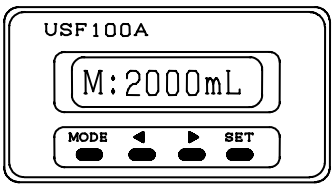
▽

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



▽

Using < and > keys, select the setting screen of the compensating value. After it appeared, press SET key to proceed to setting screen.

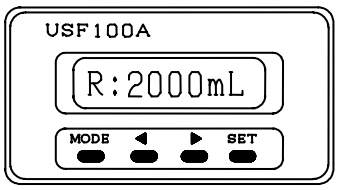


Input window for indicating value of flowmeter

▽

Using < and > keys, input the instantaneous flow indicating values of the ultrasonic flowmeter. Press
SET key to stores new data, and to proceed to the next step.
If you do not store data, press MODE key.

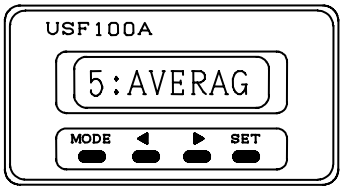
※ If having the range in the indicating value of the ultrasonic flowmeter, input the center value in the fluctuating ranges.



Actual flowrate input window

▽

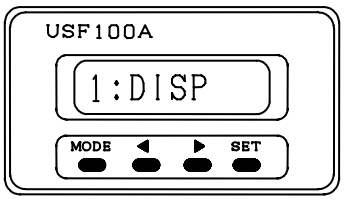
Using < and > keys input actual flowrates (indicated value at master flowmeter).
Press SET key to store new data and proceed to next step.
When you do not need to store data, press MODE key.



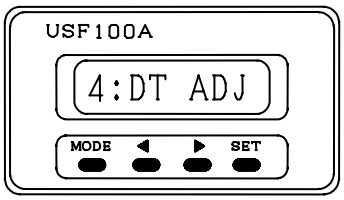
This is a next setting screen.
When you do not proceed to the next step, press MODE key to return to the flow measurement mode.

Compare the indicated value of the master flowmeter with the instantaneous flow indicated value of the ultrasonic flowmeter in order to make sure if the DT-ADJ setting has been made correctly.
If the both flow indicated values are not agreed, change and adjust again the values on the input screen of the flow indication of the flowmeter.

※ If having the range in the indicating value of the ultrasonic flowmeter, input the center value in the fluctuating ranges.



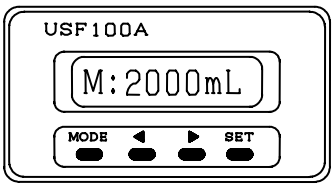
▽



▽

In the screen of the flow measurement condition, press MODE Key to display the screen left.

Using < and > keys, select the setting screen of the compensating value. When the it appeared, press SET key to proceed to the next setting screen.



Input screen of the indicated value on flowmeter

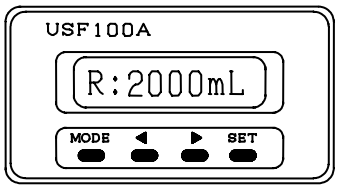
▽

Using < and > keys, change the existing setting value.

[Setting value to input] = [Existing setting value]
— ([Flow indicating value on master flowmeter]
— [Instantaneous flow indicating value of 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.

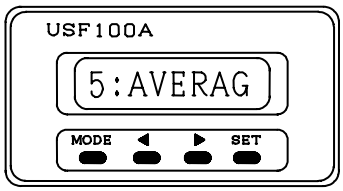
Press SET key to store new data, and proceed to the next step. When you do not need to store data, press MODE key.



Actual flowrate input screen

▽

There is no need to change the existing setting value.
Press SET key and proceed to the next step.

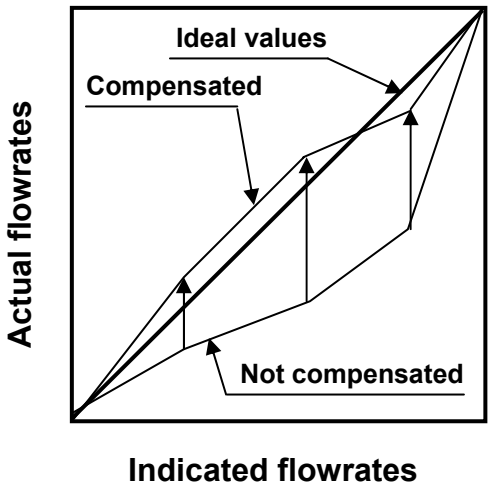


This is the next setting screen.
When you do not need to proceed to the next step, press MODE key to return to the flow measurement condition.

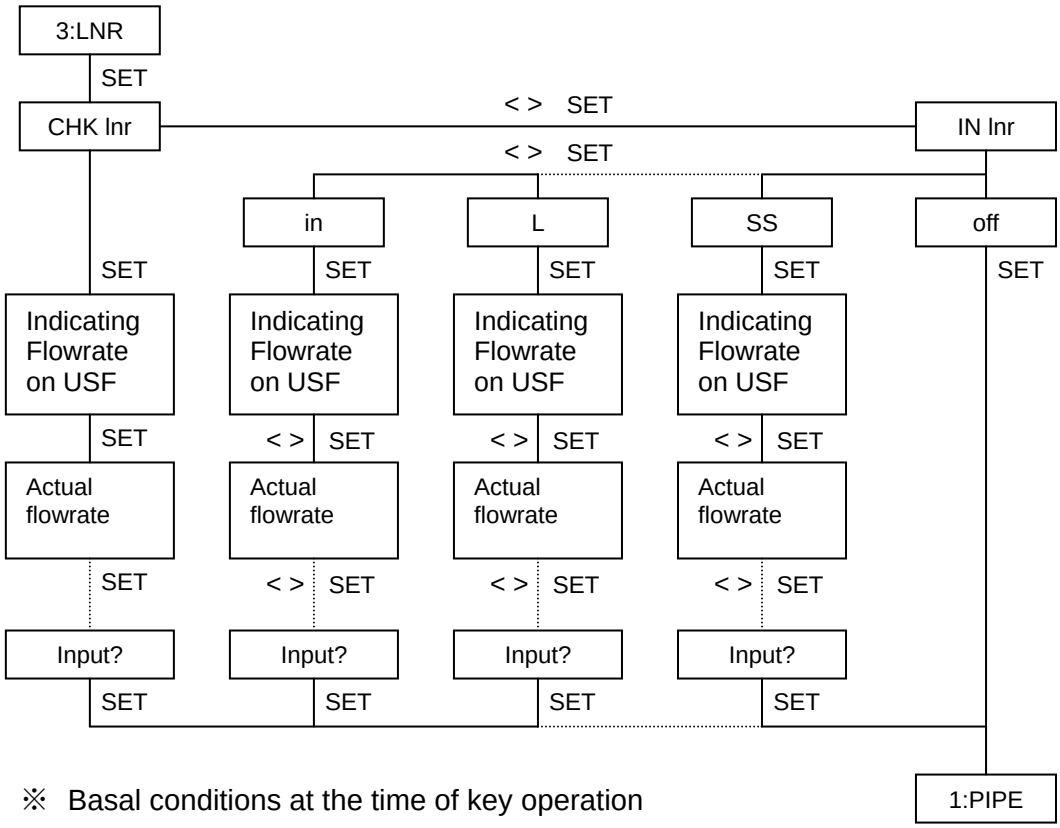
Compare the indicated value of the master flowmeter with the instantaneous flow indicated value of the ultrasonic flowmeter in order to make sure if the DT-ADJ setting has been made correctly.
If the both flow indicated values are not agreed, change and adjust again the values on the input screen of 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.

5-1 General description of the setting of the linearization (Compensating value)

In case that the actually flowing flowrates are different from the indicating flowrates of flowmeter, adjustment can be made for the actual flowrate and the indicated flowrate on the flowmeter by means of multiplying flowmeter by compensating value



5-2. Flowchart for setting of linearization



※ Basal conditions at the time of key operation

MODE: Indication of parameters and noninput of setting

＜ ＞ : Selecting setting and numerical adjustment

S E T: Storing of the setting

5-3. Linearization setting mode

Setting mode varies according to each detector.
Select from the following setting modes in accordance with the detector type to be used.

If the detector type is G05EP・・・・・S S
If the detector type is G10EP・・・・・S
If the detector type is G15EP・・・・・M
If the detector type is G20EP・・・・・L
Common to four types ・・・・・・・i n, o f f

Note 1: When llinearizing, record the previously compensated value. The previously compensated values are deleted at the time they have been updated.
Note 2: When entering the wrong detector designation, the compensated values in other modes are all deleted.

5-4. Explanations for each mode

Compensated points in each linearizing mode are carried out by the following flowrates.

S S mode (Exclusive use for G05EP)
Compensating points: 30, 50, 100, 150, 200, 250, 300, 400, 500 (m l / m i n)

S mode (Exclusive use for G10EP)
Compensated points: 50, 100, 200, 400, 600, 800, 1200, 1600, 2000 (m l / m i n)

M mode (Exclusive use for G15EP)
Compensated points: 0.5, 1, 2, 4, 6, 8, 12, 16, 20 (L / m i n)

L mode (Exclusive use for G20EP)
Compensated points: 2, 3, 5, 10, 20, 30, 40, 50 (L / m i n)

i n mode (Commonly used for four types)
Linealizing compensation can be made up to the maximum 15 points at its optional flowrate
o f f mode (Commonly used for four types)
Linearizing function fails to operate.

Note 1: Make the setting of “1:PIPE” and detector designation of linearizing function the same mode.
Note 2: Use “i n “ mode only when compensating point is deficient in S S, S, M and L modes or when there is no compensating point.

Do not change the setting of “1:PIPE” and “2:I ADJ” at the time when confirming and adjusting the linearization setting mode.

5-5. How to collect input data

How the date are collected to input to the compensating points should be carried out by the compensating points designated by each detector.

How to collect the compensated data

1. Set the instantaneous indicating values of master flowmeter to the compensating flowrates.
2. Collect the indicating flowrates of master flowmeter and the indicating flowrates of USF at the same time.
   If there is a fluctuation in flow indications, the average value is taken as an indicating values between the maximum indicating value and that of minimum.

Note 1: If the differences are large between the actual flowrates and the indicating values of USF, there may be a case that cannot be compensated for linearization.
In that case, calibrate the maximum flowrate on the setting of parameter “4:DTADJ”.

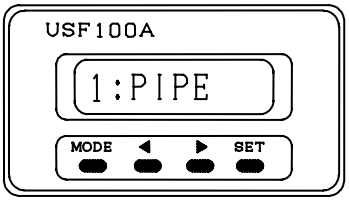
Note 2: If the compensated values are already entered, set the indicating value at its option and enter the most appropriate compensated values(A fine adjustment is made).

5-6. How to input compensated value

At the time when the compensated values are entered in **S S, S, M and L** modes,

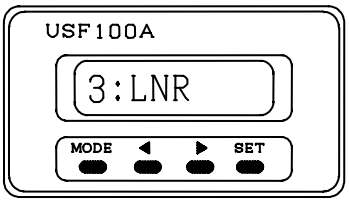
The following is a linearizing mode divided into types respectively.

Collect the data on indicting values of master flowmeter and those of USF at the compensated points of detector to be used beforehand. After entering they are compensated automatically.



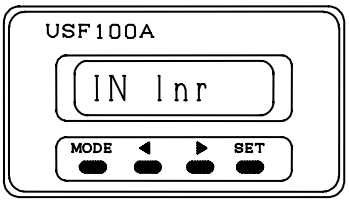
▽

In the condition of the flow indication, press SET key while pressing > key for over one sec. to display the screen left.



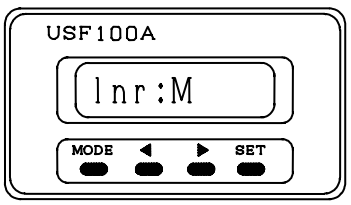
▽

Using < and > keys, select the setting screen for linearization. When it appeared, press SET key.



▽

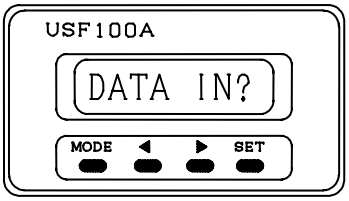
Using < and > keys, select the input setting screen for compensating flowrates.
When it appeared, press SET key.



▽

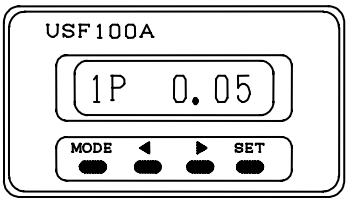
Using < and > keys, select the setting mode suitable for the detector to be used.

i n・・・To compensate the arbitrary flow point
(Commonly used for four types)
S S・・To compensate the fixed flow point (G05EP)
S・・・To compensate the fixed flow point(G10EP)
M・・・To compensate the fixed flow point(G15EP)
L・・・ To compensate the fixed flow point(G20EP)
o f f・・Compensating function fails to operate
Note 1: Make the setting of “1:PIPE” and detector designation of linearizing function the same mode.

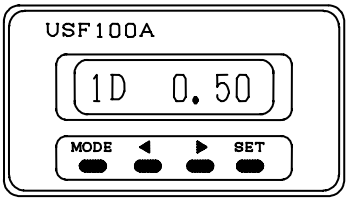


Press SET key to move to the input screen of the compensated flowrate.

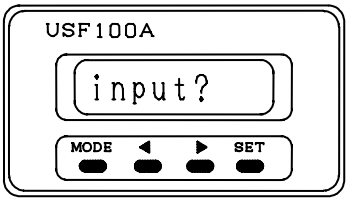
Press MODE key to stop inputting.
Press MODE key when “input ?” is displayed on the screen.
Press MODE key to make it to represent “NOT SET” and terminate the setting.



This is a flowrate input screen on USFreprensentation.
Using < and > keys input the indicating values of flowrate on USF.
When not inputting, press SET key while leaving the numerical value as it is. After input, press SET key to move to the input screen of the actual flowrate.



This is the input screen of actual flowrate. Input the actual flowrate, using < and > keys. When not inputting, press SET key while leaving the numerical value as it is. After input, press SET key to move to the next compensating input screen. Compensate each point in the same manner.

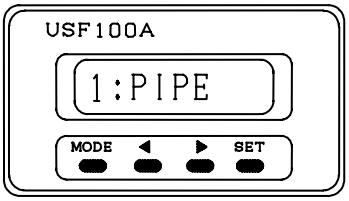


This is the final screen for confirming the input..
Press SET key to store the numerical values where are inputted.
When you do not need to store, press MODE key.
The entered numerical values go back to the setting condition without storing.

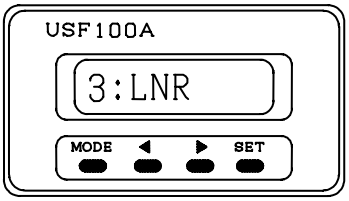
At the time when the compensated values are entered in **i n** mode

This is a linearizing mode to be able to compensate at its optional point. It is possible to input up to 15 points and commonly to use for four types of the detector.

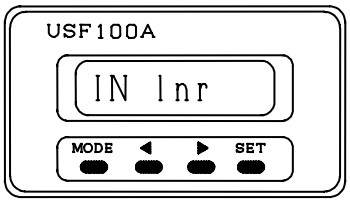
Determine the compensating flowrate beforehand, and collect the data on the actual flowrates and the indicated values on USF. After input, they are compensated automatically.



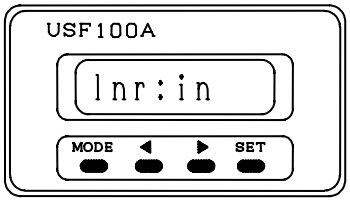
In the condition of the flow indication, press SET key while pressing > key for over one sec. to display the screen left.



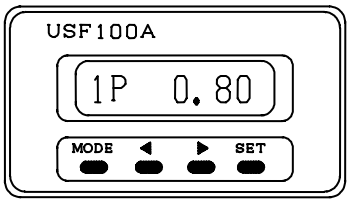
Using < and > keys, select the setting screen for linearization. When it appeared, press SET key.



Using < and > keys, select the input setting screen for compensating flowrates.
When it appeared, press SET key.



Using < and > keys, select " l n r : i n " and press SET key.

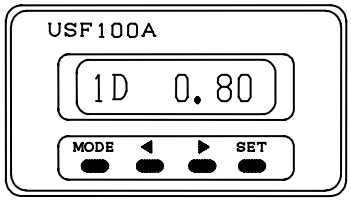


Using < and > keys, input the indicating flowrate on USF indication which is the lowest compensated value.
After input, press SET key.
Units of input flowrate(Determined at the setting of 1 : P I P E)

S S and S modes : m l / m i n
M and L modes : L / m i n

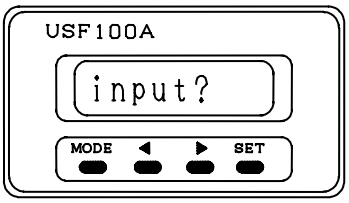
Move to the input screen of actual flowrate.
If no neeed to compensate, input the measured and compensated flowrate as it is. After input, press SET key.

Press MODE key to stop inputting.
Press MODE key, if “input ?” is displayed on the screen.
Display “NOT SET” on the screen and terminate the setting.
This is the input screen of indicating flowrate on USF indication. Using < and > keys, input the indicating flowrate on USF.



This is the input screen of actual flowrate. Using < and > keys, input the actual flowrate.
When not inputting, press SET key while leaving the numerical value as it is. After input, press SET key to move to the next input screen of the compensated flowrate.
Compensate each point in the same manner.

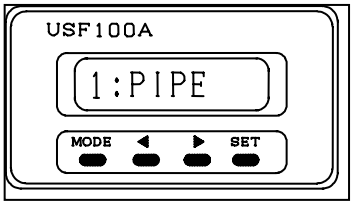
If the 15 points are all not used, press MODE key at the input screen of the indicated value on USF next to the final compensated points.



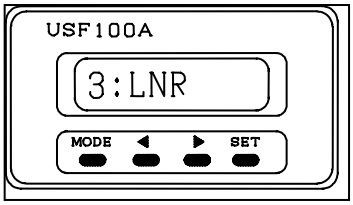
This is the final screen for confirming the input..
Press SET key to store the numerical values which are inputted.
When you do not need to store, press MODE key.
The entered numerical values go back to the setting condition without storing.

At the time when the compensated values are entered in **o f f** mode

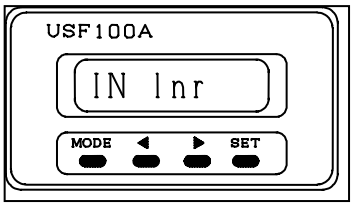
A function of linearization stops operating. All the compensated values by any other linearizing mode are disabled and deleted.



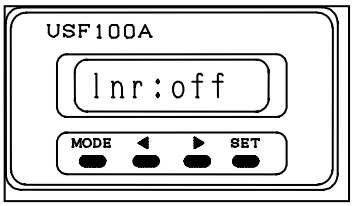
In the condition of the flow indication, press SET key while pressing > key for over one sec. to display the screen left.



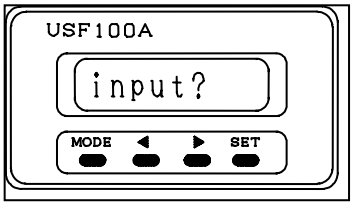
Using < and > keys, select the setting screen for linearization. When it appeared, press SET key.



Using < and > keys, select the input setting screen for compensating flowrates.
When it appeared, press SET key.



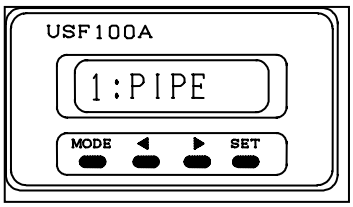
Using < and > keys, select " l n r : o f f " and press SET key.



If you need to set, press SET key.
If you do not need to store, press MODE key.
The entered numerical values are returned to the previous setting condition without storing.

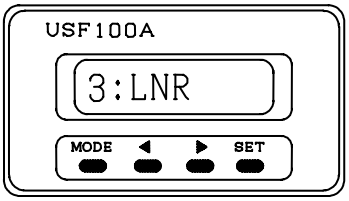
5-7, When confirming the input compensated values,

The existing setting mode and compensated input values can be confirmed.
The detector designation and the change of compensated input values can not be changed.



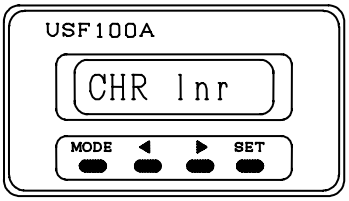
In the condition of the flow indication, press [>] key for one sec. while pressing SET key to display the screen left.

▽



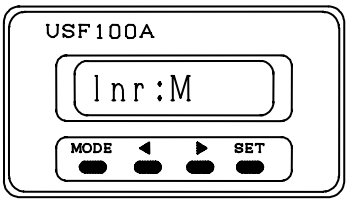
Using [<] and [>] keys, select the setting screen for linearization.
When it appeared, press SET key.

▽



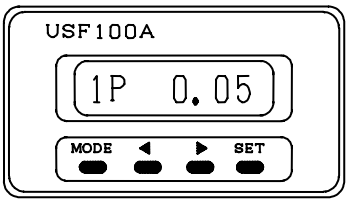
Using [<] and [>] keys, select the confirming screen of the compensated input values.
When it appeared, press SET key.

▽



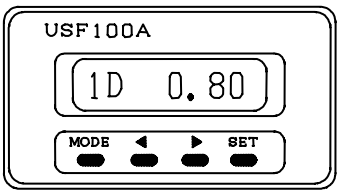
This is the currently setting mode.
After confirmed, press SET key.

▽



This is the currently compensated input values on USF.
After confirmed, press SET key.

▽



This is the current input values of actual flowrate
After confirmed, press SET key. In the same way confirm the input at each point.

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