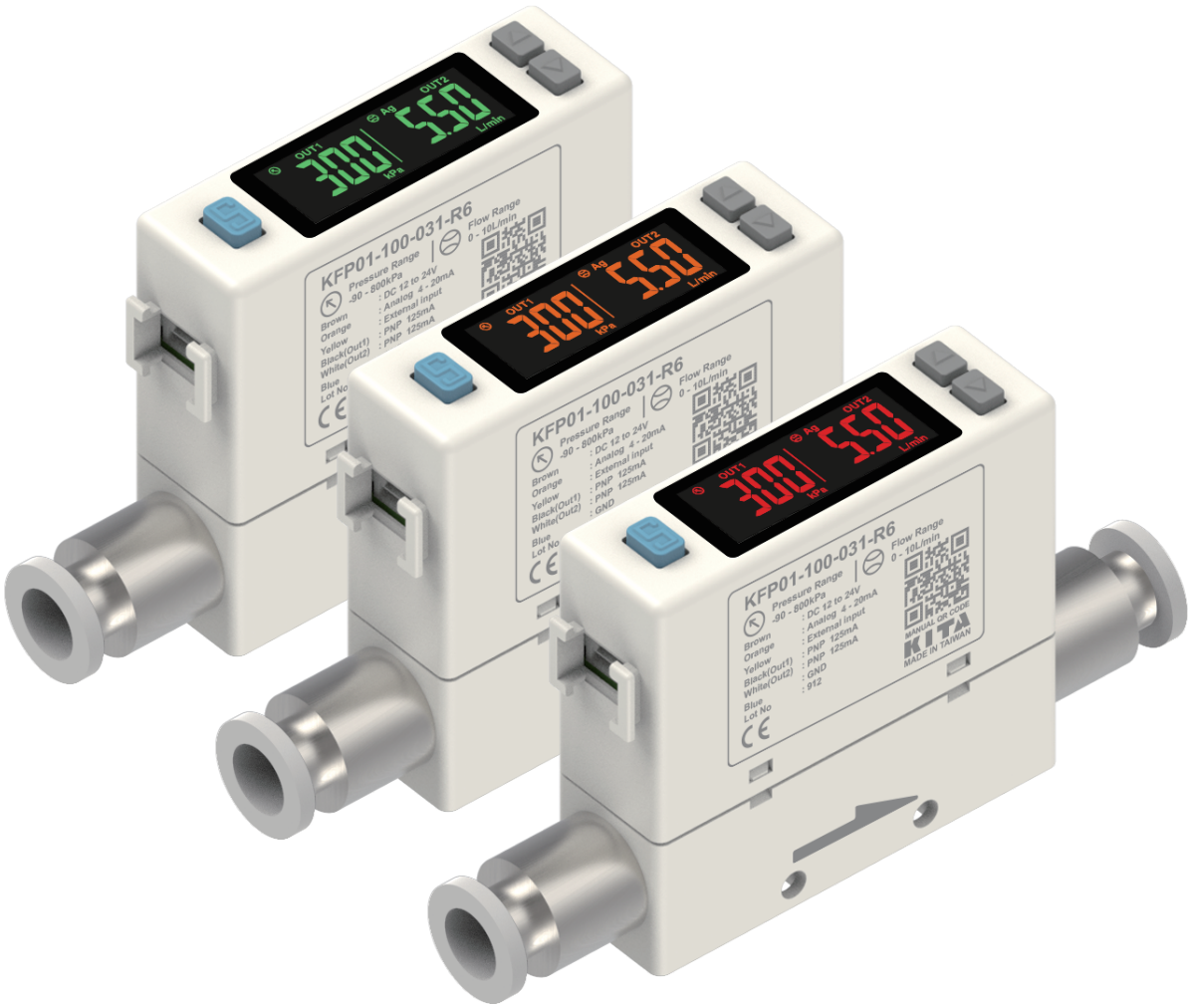
KITA®

INSTRUCTION MANUAL

DIGITAL FLOW AND PRESSURE SENSOR

KFP01 Series



URL http://www.kita.com.tw

Product Safety Instructions

■ This section indicate the levels of risks with the labels of Danger, Warning and Caution.

⚠ **Danger**	Danger indicates high level of risk, will lead to fatal or serious injuries if not avoided.
⚠ **Warning**	Warning indicates medium level of risk, it might cause death or serious injuries.
⚠ **Caution**	Caution indicates low level of risk, it might result in minor injuries, such as scald, electric shock, etc. and the product, equipment and machines might be damaged.

⚠ Warning

■ Precautions for use

① **Operated within the specified voltage.**

Malfunction or damaged product, electric shock or fire may be resulted by exceeding the specified voltage range.

② **Do not exceed the maximum load current.**

It may damage the product.

③ **Do not use any load that generates surges.**

Surge protection is present but applying surge voltage repeatedly will ultimately damage the product.

When using with inductive load (such as relay or solenoid), please install a flyback diode across the load (polarity must be observed).

④ **Observed the internal voltage drop.**

When used at a specified voltage, if the sensor is functional but the load does not work, please check if the operating voltage of the load meets the following formula.

Power Supply voltage	–	Internal voltage drop of sensor	>	Minimum operating voltage of load

⑤ **Do not operate the product outside the specifications.**

The sensor will be damaged by exceeding the flow rate and working pressure.

⑥ **Do not use flammable fluids and/or permeable fluids.**

They may cause fire, explosion or corrosion.

■ Working fluid and working environment

① **Do not use in an explosive gas atmosphere.**

The sensor does not have explosion-proof structure, fire, explosion or corrosion can result.

② **Do not use near a surge voltage generated area.**

Solenoid lifters, high frequency induction furnaces and motors, etc. can generate high surge voltages, if using near the sensor will cause the internal circuit components to deteriorate and cause damages.

③ **Sensors can not withstand lightning strikes.**

The product is CE compliant, but can not resist surge voltage of lightning strikes, take measures to avoid lightening strikes in the system.

④ **Do not use in an environment where sensors could be splashed by water or oil.**

Enclosure rating is IP40, please avoid water or oil splashed environment to prevent adversely effects.

⑤ **Do not use in an environment subject to large temperature cycling.**

Internal components of the sensor will be affected adversely by large heating/cooling cycles other than ordinary changes in temperature.

⑥ **Do not mount the product in locations where it is exposed to radiant heat.**

This could result in damage and/or malfunction.

⚠ Warning

■ Wiring Precautions

① **Check wire color and terminal number when wiring.**
Incorrect wiring can cause permanent damages to the sensor, check wire color and terminal number against the manual before wiring.

② **Avoid repeatedly bending or stretching the lead wire.**
It can cause damage to the sheath, or breakage of the wire.

③ **Confirm wiring insulation**
Please avoid poor insulations (and interference from another circuit, poor insulation between terminals, etc.) it can lead to over current being applied to the product, causing damage.

④ **Do not route wires and cables together with power or high voltage cables.**
The product may malfunction due to interference or noise and surge voltage from power and high voltage cables.

⑤ **Do not short-circuit the load.**
When the load is short-circuited, an error will be displayed. But excess current may cause damage to the sensor.

⑥ **Do not connect wire when the power is on.**
It may cause damages to the sensors/equipment/machines.

■ Installation Precautions

① **Ensure the flow direction of the fluid.**
Please follow the flow direction indicator for installation and piping.

② **Flush out all dirt and dust by air blow before connect the piping to the sensor.**

③ **Do not drop or hit.**
When installation, do not drop, hit or apply excessive shock ($100m/s^2$). Internal damage can cause malfunction even if the housing appears to be undamaged.

④ **Do not install multiple products in close proximity.**
The heat generated from each product could cause the temperature to rise and change the characteristics of product or deterioration of the plastic parts. Please set the products 10mm apart from each other.

⑤ **Hold the sensor body when installing.**
The tensile strength of the cable is 24.5 N and apply excessive pulling force can cause damage to the sensor.

■ Other Precautions

① **After power is supplied, the output will remain off until the display is turned on. Please operate the sensor after the value is shown.**

② **Stop the control systems before perform setting changes.**
During the initial flow and pressure setting, the product will switch the output according to the existing settings until the changes are complete.

⚠ Caution

■ Installation Precautions

① **Please follow the specified tightening torque.**
Over tighten will damage the product.

② **Do not mount the sensor in a place that will be used as a foothold.**
The product may damage if sit or step on it accidentally.

③ **When mounting without a bracket, please use P type self-tapping screw- M3 x L 6mm.**

④ **Do not remove the fixed pin for the One-Touch Fitting.**
To avoid losing the internal parts and cause malfunction.

■ Maintenance Precautions

① **The accuracy could change by 2 to 3% when the piping is removed or replaced.**

② **Do not insert a stick or wire into the piping ports.**

③ **Do not touch the terminals or connectors when power is on.**

⚠ Warning

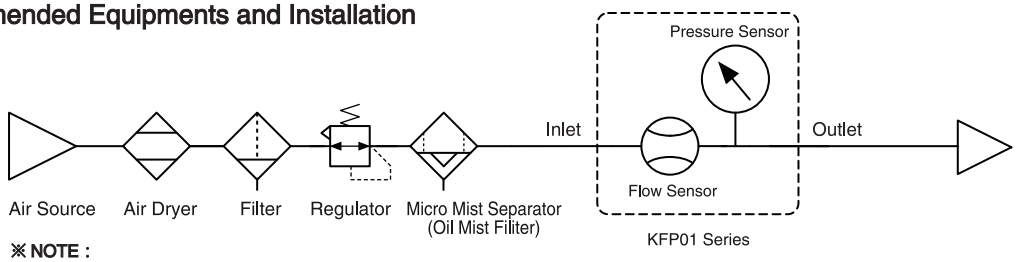
■ Fluid

① **Check the regulator and flow adjustment valve before introducing the fluid.**
If the pressure or flow rate exceeded the specified range, the sensing element may be damaged.

② **The sensing element cannot measure properly if foreign matter adheres to it.**

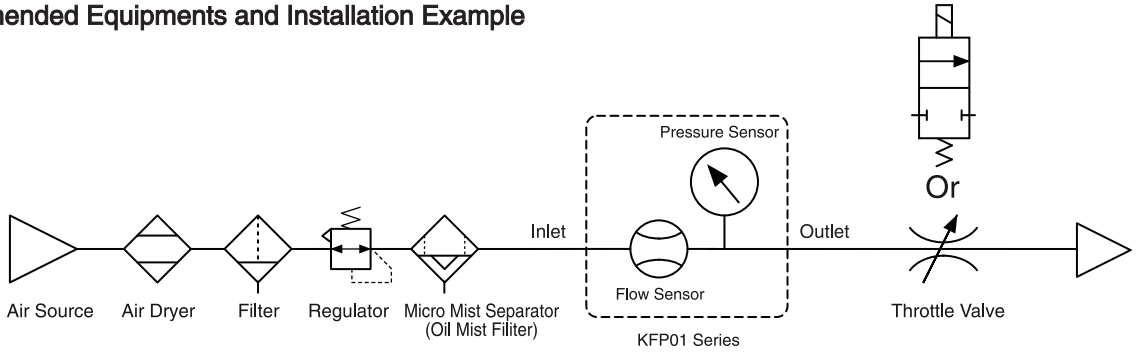
③ **On the inlet side, be sure to install an air filter below the filtration level of 10um.**

④ **Recommended Equipments and Installation**

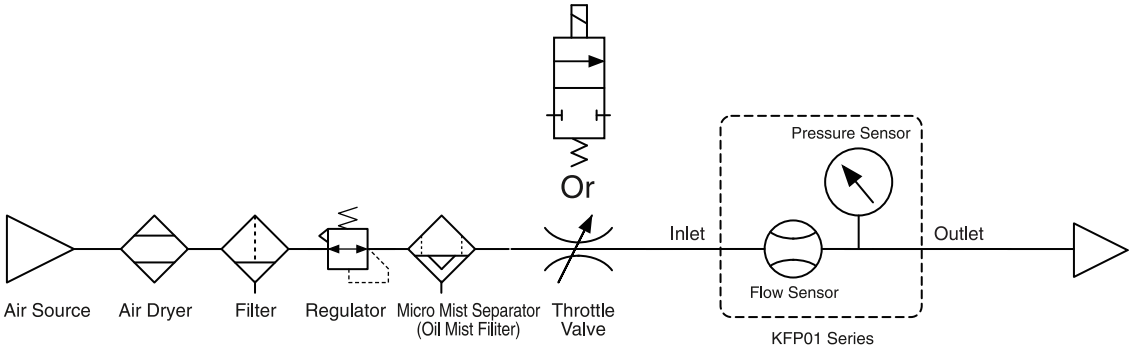


※ **NOTE :**
When measuring the pressure of the inlet side, install a throttle valve or solenoid valve on the outlet side.
When measuring the pressure of the outlet side, install a throttle valve or solenoid valve on the inlet side.

⑤ **Recommended Equipments and Installation Example**



※ **NOTE :** When measuring the pressure of the inlet side, install a throttle valve or solenoid valve on the outlet side.



※ **NOTE :** When measuring the pressure of the outlet side, install a throttle valve or solenoid valve on the inlet side.

Disclaimer

① **Our warranty applies solely to our product, not to any other damages and injuries which occur by earthquakes, fires, the acts by third party, other matters, acts intentionally, acts accidentally, misuse, or other abnormal conditions that are not the responsible of KITA.**

② **Our warranty applies solely to our product, not to any other additional damages (the loses of business profits, business interruption, etc.) incurred due to using or misusing the product.**

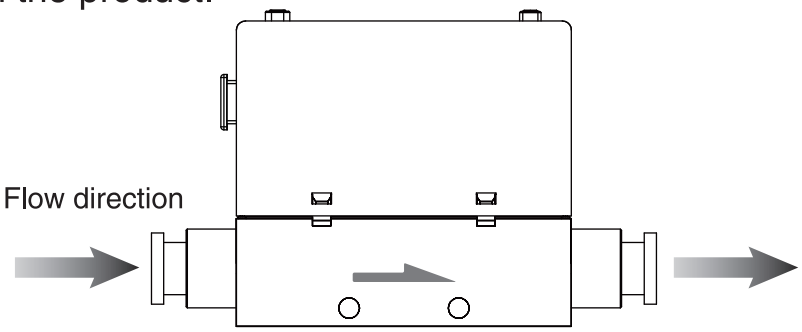
③ **Our warranty excludes any injuries and damages happened by using the product beyond the specified range of catalog or/and not following the instruction manual.**

[CONTENTS]

1 Installation

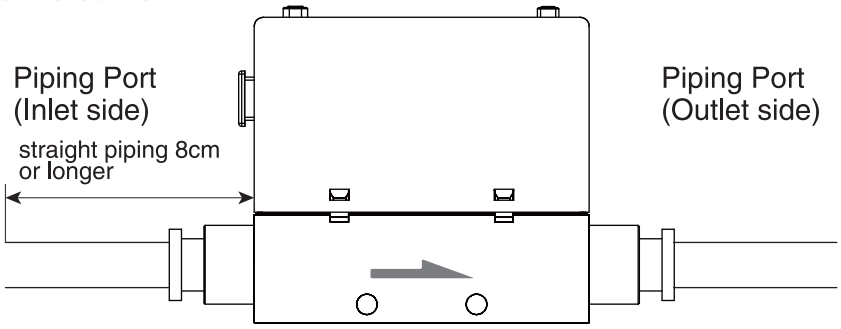
1.1 Piping

Install the pipe by following the arrow indication that shows the air flow direction on the product.



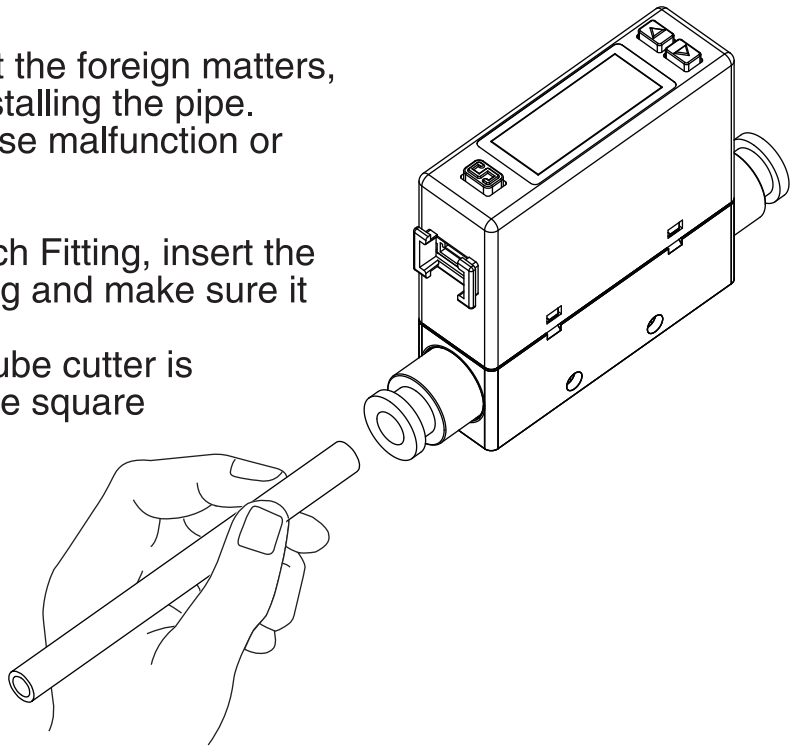
Use straight piping 8cm or longer to connect the Piping Port (Inlet side). If straight piping is not installed, the accuracy may vary by ± 2% F.S..

※Straight Piping: The pipe is without bending and the cross sectional areas of the pipe keeps the same.



Blow the air to flush out the foreign matters, dust and etc. before installing the pipe. Uncleaned air may cause malfunction or damage to the product.

Piping for the One-Touch Fitting, insert the tube firmly into the fitting and make sure it cannot be pulled out.
Also using the proper tube cutter is recommended to ensure square edge tube.

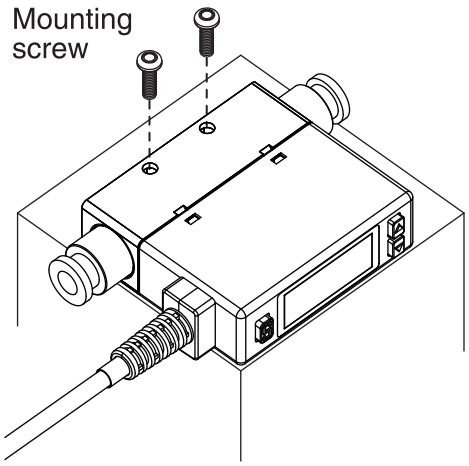


1.2 Mounting Bracket / Optional Parts

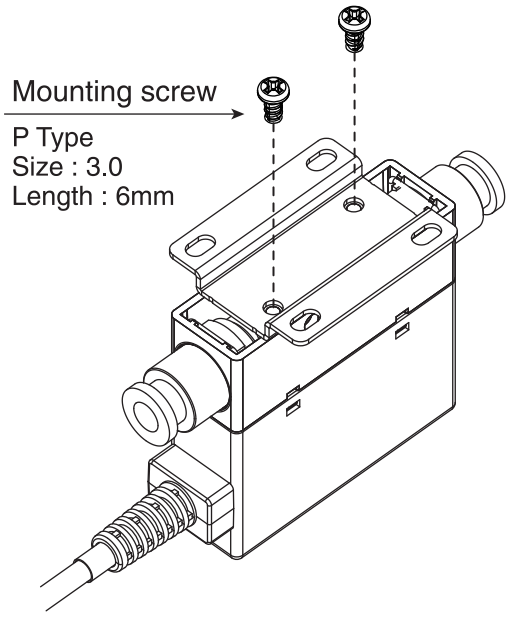
The LCD display may be difficult to see at certain angles.
The sensor can be installed horizontally or vertically, but the flow rates may change because of the installation way of the product or piping.

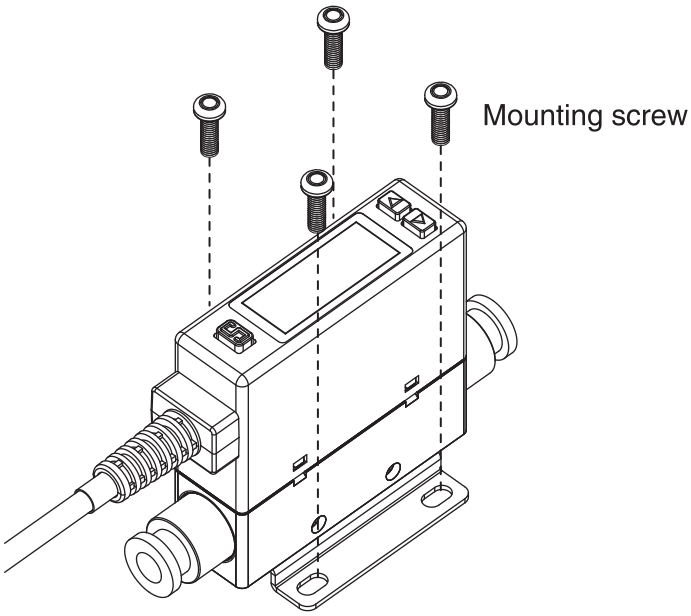
The tightening torque for screws should be under 0.5 ±0.1 N.m.

1 . Horizontal mounting (by Through-Hole)



2 . Bracket mounting



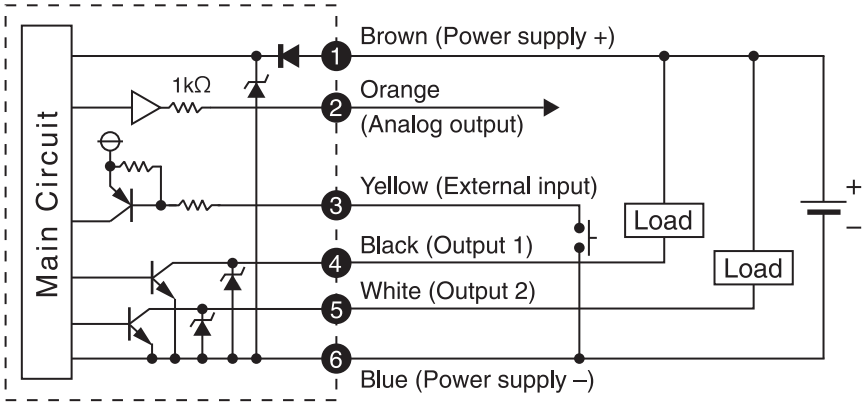


※ The tightening torque for bracket mounting screws should be under 0.5 ± 0.1 N.m.

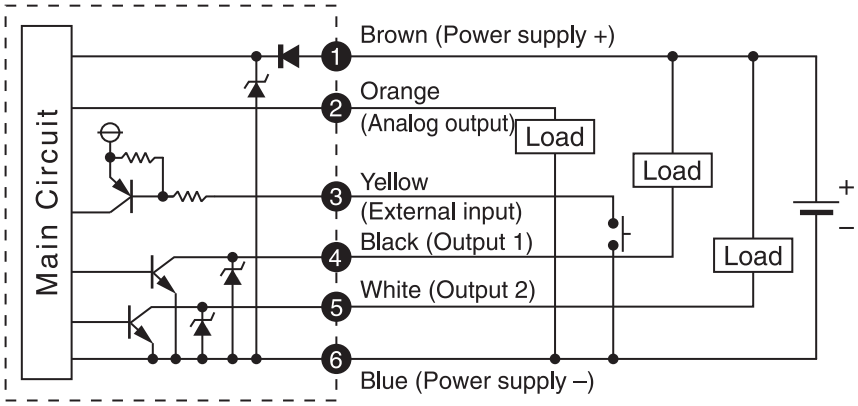
1.3 Wiring Diagrams

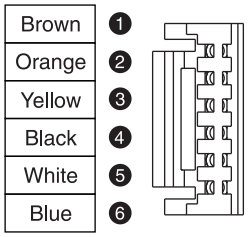
1.3.1 NPN Output, Analog Output and External Input

● NPN Output / Analog Voltage Output / External Input



● NPN Output / Analog Current Output / External Input

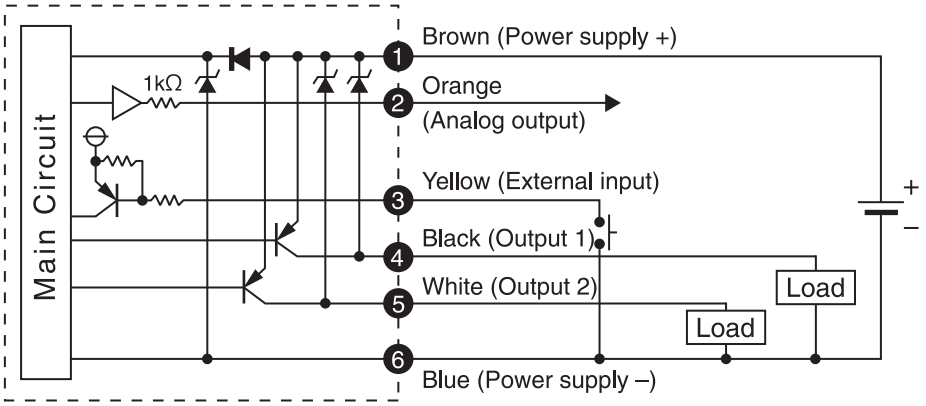




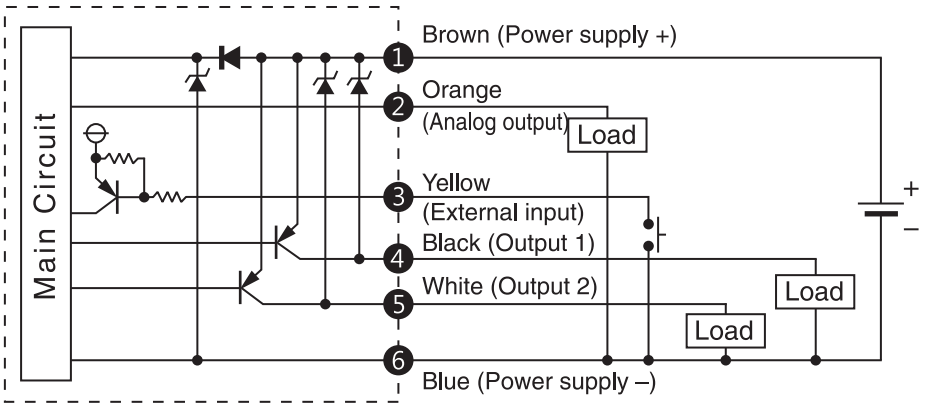
Pin No.	Line color	Content
1	Brown	Power supply (DC 12 to 24V DC)
2	Orange	Analog voltage output : 1 ~ 5V Analog current output : 4 ~ 20mA
3	Yellow	External input
4	Black	Output 1 (Max. load current : 125mA)
5	White	Output 2 (Max. load current : 125mA)
6	Blue	0V (GND)

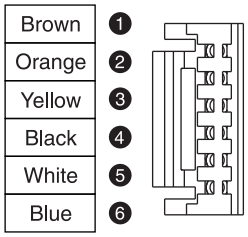
1.3.2 PNP Output, Analog Output and External Input

● PNP Output / Analog Voltage Output / External Input



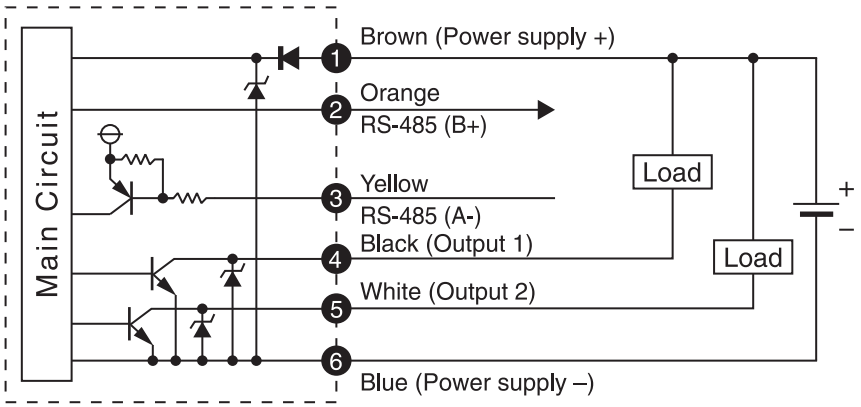
● PNP Output / Analog Current Output / External Input



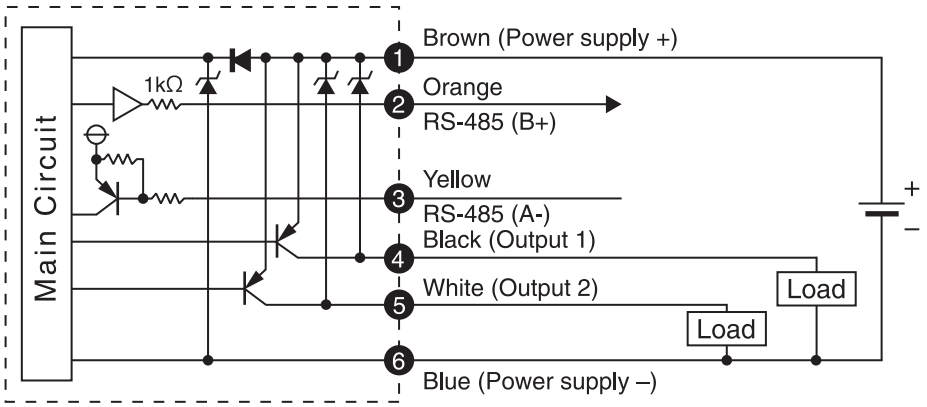


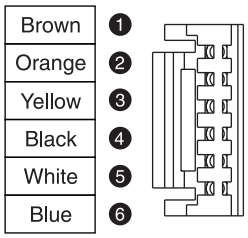
Pin No.	Line color	Content
1	Brown	Power supply (DC 12 to 24V DC)
2	Orange	Analog voltage output : 1 ~ 5V Analog current output : 4 ~ 20mA
3	Yellow	External input
4	Black	Output 1 (Max. load current : 125mA)
5	White	Output 2 (Max. load current : 125mA)
6	Blue	0V (GND)

1.3.3 NPN Output, RS-485 Modbus



1.3.4 PNP Output, RS-485 Modbus

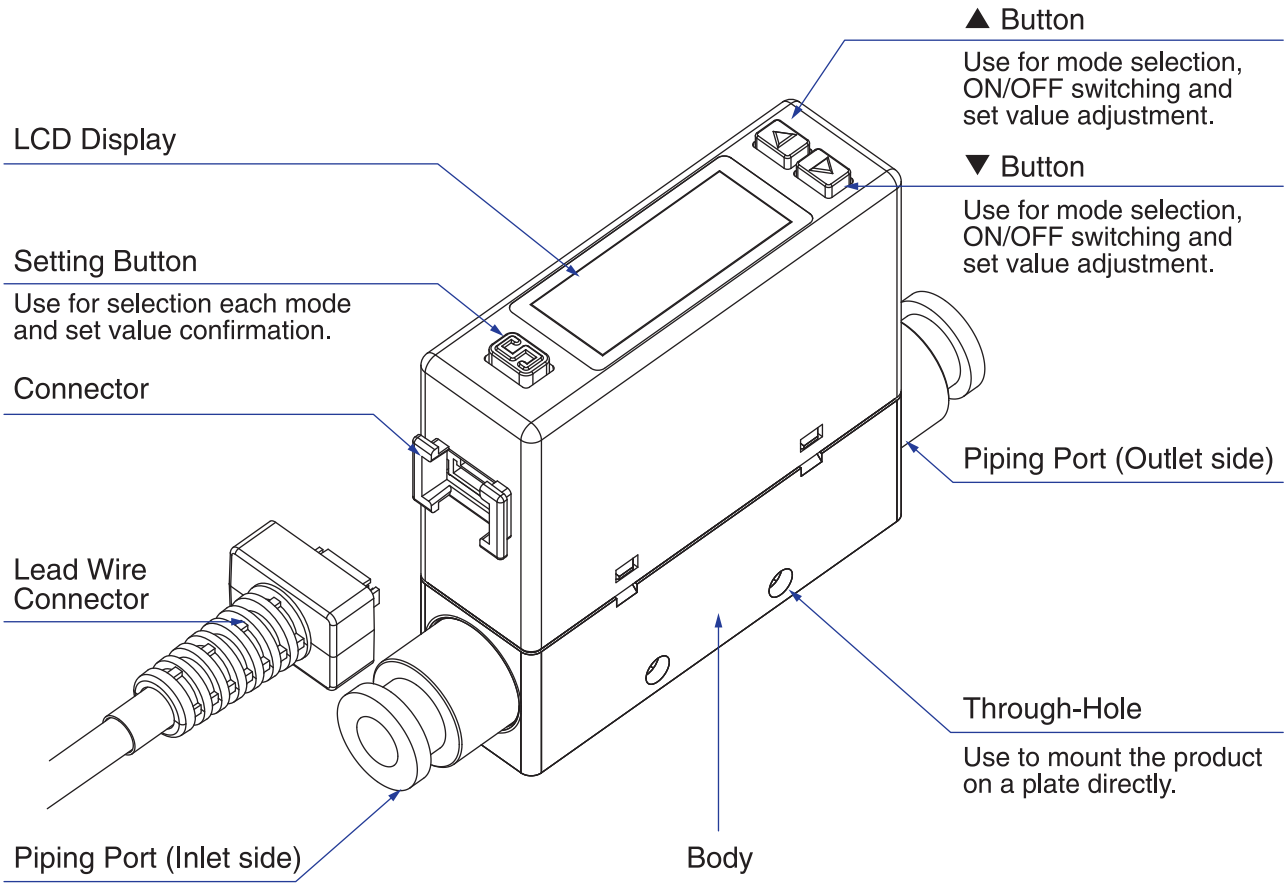


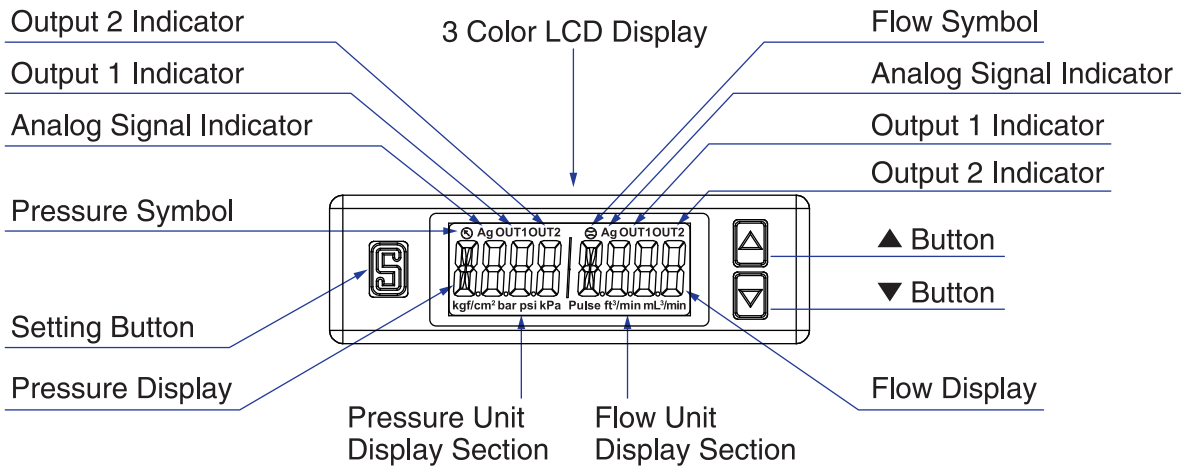


Pin No.	Line color	Content
1	Brown	Power supply (DC 12 to 24V DC)
2	Orange	RS-485 (B+)
3	Yellow	RS-485 (A-)
4	Black	Output 1 (Max. load current : 125mA)
5	White	Output 2 (Max. load current : 125mA)
6	Blue	0V (GND)

2 How to Use

2.1 Names and Functions of Individual Parts





2.2 Function Instruction

● Function Setting Mode

Function Code	Item	Default setting	Explanation
[F-01]	[oUt 1] OUT1 setting	oUt 1	Select Output 1 corresponding to flow sensor or pressure sensor. Set the flow rate or pressure value to switch ON/OFF.
	[oUt 1] OUT1 sensor correspondence	FLoW	
	[FLoW] OUT1 output mode	HYS	
	[oUt 1] OUT1 output type	no	
	[FL- 1] OUT1 set value input	50% of maximum measured flow rate 005：250 mL/min、010：500 mL/min 050：2.50 L/min、100：5.00 L/min 500：25.0 L/min、101：50.0 L/min 201：100 L/min	
	[FH- 1] OUT1 set value input	60% of maximum measured flow rate 005：300 mL/min、010：600 mL/min 050：3.00 L/min、100：6.00 L/min 500：30.0 L/min、101：60.0 L/min 201：120 L/min	
[F-02]	[oUt2] OUT2 setting	oUt2	Select Output 2 corresponding to flow sensor or pressure sensor. Set the flow rate or pressure value to switch ON/OFF.
	[oUt2] OUT2 sensor correspondence	FLoW	
	[FLoW] OUT2 output mode	HYS	
	[oUt2] OUT2 output type	no	
	[FL-2] OUT2 set value input	50% of maximum measured flow rate 005：250 mL/min、010：500 mL/min 050：2.50 L/min、100：5.00 L/min 500：25.0 L/min、101：50.0 L/min 201：100 L/min	
	[FH-2] OUT2 set value input	60% of maximum measured flow rate 005：300 mL/min、010：600 mL/min 050：3.00 L/min、100：6.00 L/min 500：30.0 L/min、101：60.0 L/min 201：120 L/min	
[F-03]	[CLor] LCD Display setting	CLor	Select back light color and display mode.
	[d iSP] LCD Display corresponding to output	oUt 1	
	[d iSP] LCD Display color selection	SoG	
[F-04]	[rESP] Response time selection	rESP	Select the response time for analog output. Pressure sensor: 2.5ms ~ 1500ms Flow sensor: 50ms ~ 1500ms
	[rESP] Flow/Pressure sensor selection	FLoW	
	[FLoW] Response time selection	800(ms)	
[F-05]	[UPdA] Display refresh time selection	UPdA	Display refresh cycle can be set in 200ms, 500ms or 1000ms.
	[UPdA] Flow/Pressure sensor selection	FLoW	
	[UPdA] Display refresh time of flow sensor selection	500(ms)	

Function Code	Item	Default setting	Explanation
[F-06]	[Un it] Unit selection	Un it	Select the UNIT of pressure / flow sensor.
	[FLoW] Flow unit selection	LPn	
	[PrES] Pressure unit selection	Un it	
[F-07]	[rEFE] Flow reference standard selection	rEFE	Select the flow value is shown under standard (ANR) or normal condition (NOR).
	[rEFE] Flow reference standard selection	Anr	
[F-08]	[AnO] Analog output selection	AnO	Select the analog corresponding to pressure or flow sensor.
	[FLoW] Analog output selection	FLoW	
[F-09]	[EEPr] Accumulated value hold selection	EEPr	To save the last accumulated flow value every 2 or 5 minutes.
	[EEPr] Accumulated value hold selection	oFF	
[F-10]	[d iS] Flow sensor display mode selection	d iS	Select to display Instantaneous Flow or Accumulated Flow Mode.
	[dSP] Flow sensor display mode selection	inS	
[F-91]	[ECo] Power-Save mode selection	ECo	Select if turn on power-save mode to reduce power consumption
	[ECo] Power-Save mode selection	no	
[F-92]	[inP] External input selection	inP	Select for Accumulated flow rate zero clear, Auto-Shift or Auto-Shift zero.
	[inP] External input selection	r_r	
[F-93]	[nbUS] Modbus RTU setting	nbUS	Set ID number, baud rate and transmission format.
	[id] ID number setting	1	
	[rAt] Baud rate setting	96 (9600 Bd)	
	[For] Transmission format setting	n8 1	
	[trA] Communications protocol setting	rtU	
[F-94]	[F inE] Fine adjustment Setting	F inE	The displayed value can be adjusted slightly.
	[F inE] Fine adjustment Setting	oFF	
[F-95]	[FoUt] Forced output function	FoUt	To turn the analog ON / OFF forcibly.
	[oUt 1] Forced output function	oFF	
	[oUt2] Forced output function	oFF	
[F-99]	[rESt] Reset to the default setting	rESt	Return to the factory default setting.
	[rSt] Reset to the default setting	oFF	

● Measurement Mode

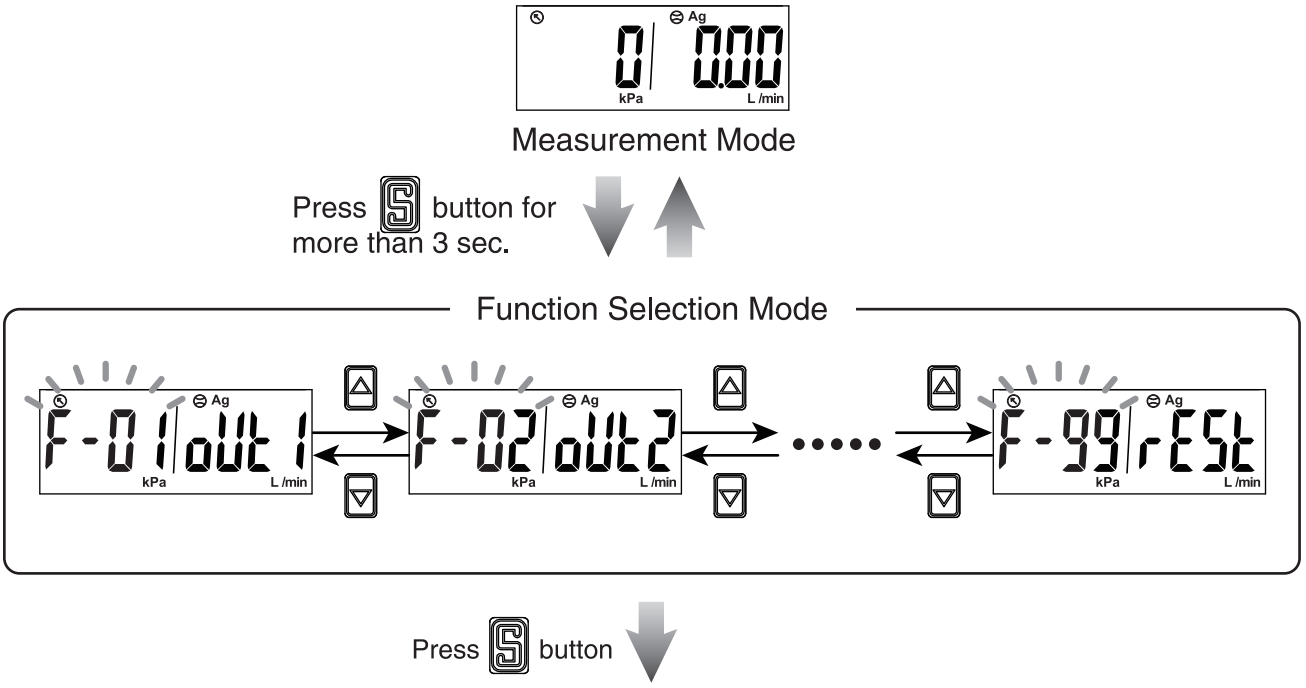
Item	Explanation
Pressure display	Display pressure value.
Flow display	Display instantaneous flow rate.
Accumulated flow rate display	Display accumulated flow rate.
Pressure zero setting	The displayed pressure value can be adjusted to "0".
Instantaneous Flow rate zero setting	The displayed instantaneous flow rate value can be adjusted to "0".
Accumulated flow rate zero clear	The accumulated flow rate can be set to "0".
Peak value display	The maximum pressure or instantaneous flow can be detected when the power is supplied for a period.
Bottom value display	The minimum pressure or instantaneous flow can be detected when the power is supplied for a period.
Key lock/unlock mode	To prevent errors occurring due to unintentional changes of the set values.

2.3 Operation Instructions

Function Selection Mode

At Measurement Mode, press [S] button for more than 3 sec. to display [F-01]. Press [△] or [▽] button to select other setting functions.

Press [S] for 3 sec. at Function Setting Mode to return to Measurement Mode.

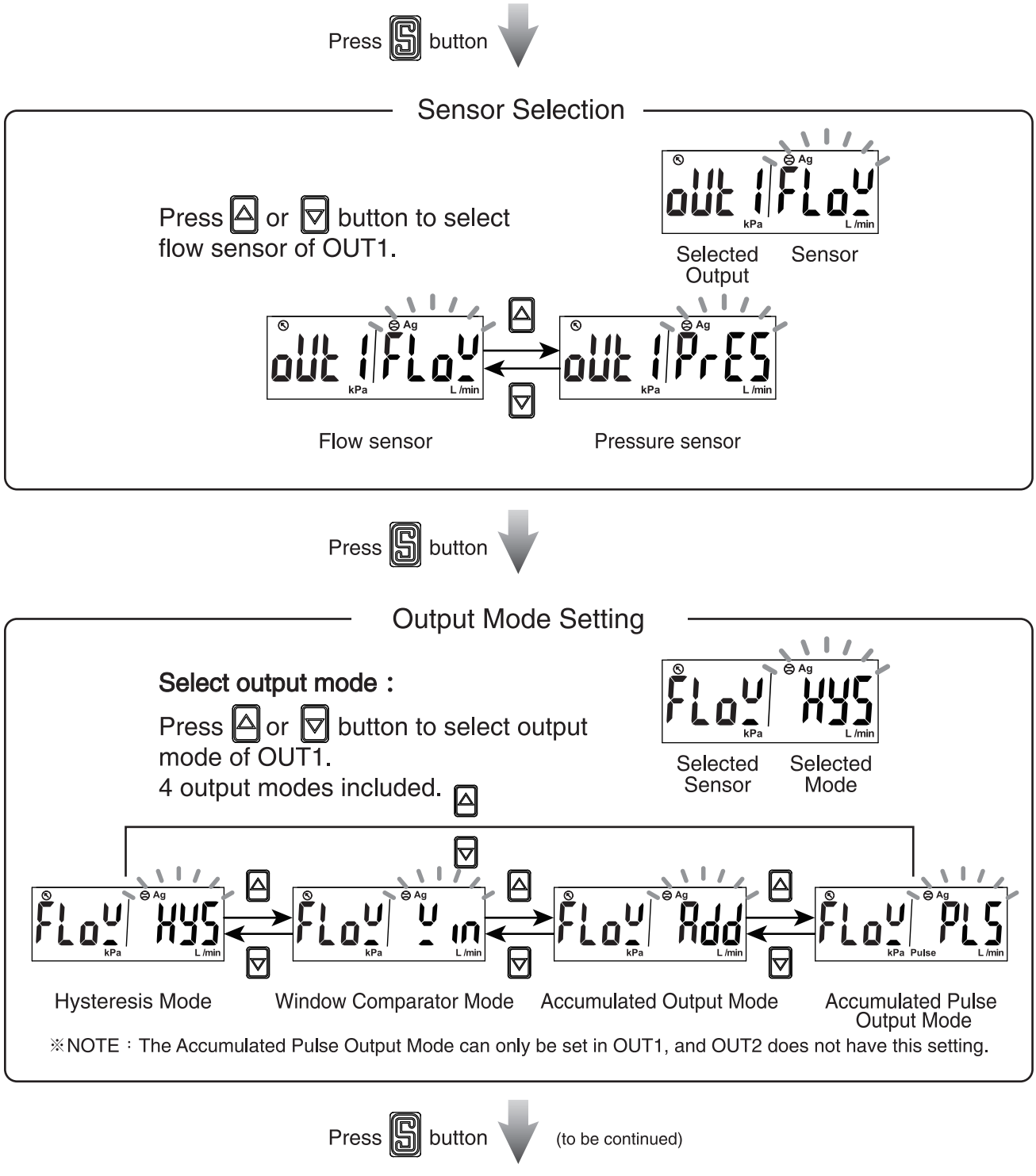


2.3.1 [F-01] OUT1 Setting Selection

Setting corresponding sensor and operating mode of OUT1.

● **1. Flow sensor setting**

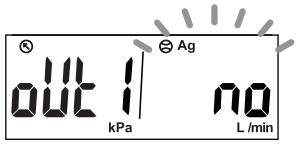
Press ▲ or ▼ button at Function Setting Mode to display [F-01] [out1].



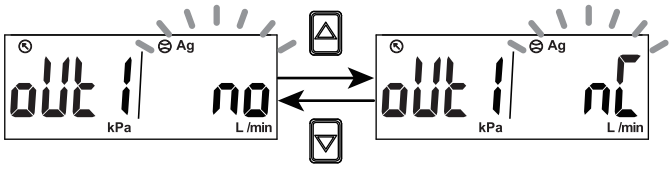
Output Type Setting

OUT1 type setting :

Press ▲ or ▼ button to select OUT1 type.



Selected Output　Selected Mode



NO mode　　NC mode

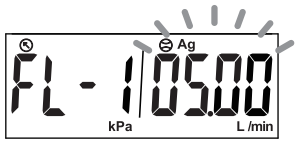
※NOTE：Type setting will not display when Accumulated Pulse Output Mode is set.

Press S button

Set Value Setting

Out1 set value setting :

Press ▲ or ▼ button to adjust the set value.



Selected Mode　Set Value

Hysteresis Mode [HYS] : [FL-1] , [FH-1]

Window Comparator Mode [Y in] : [FL-1] , [FH-1]

Accumlated Output Mode [Add] : [AdL1] , [AdH1]

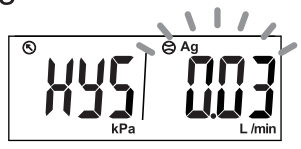
※NOTE：Set value setting will not display when Accumulated Pulse Output is set.

Press S button

Fixed Hysteresis Setting

Fixed hysteresis setting :

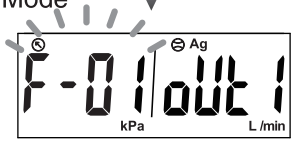
Press ▲ or ▼ button to adjust fixed hysteresis value.



Fixed Hysteresis Mode　Set Value

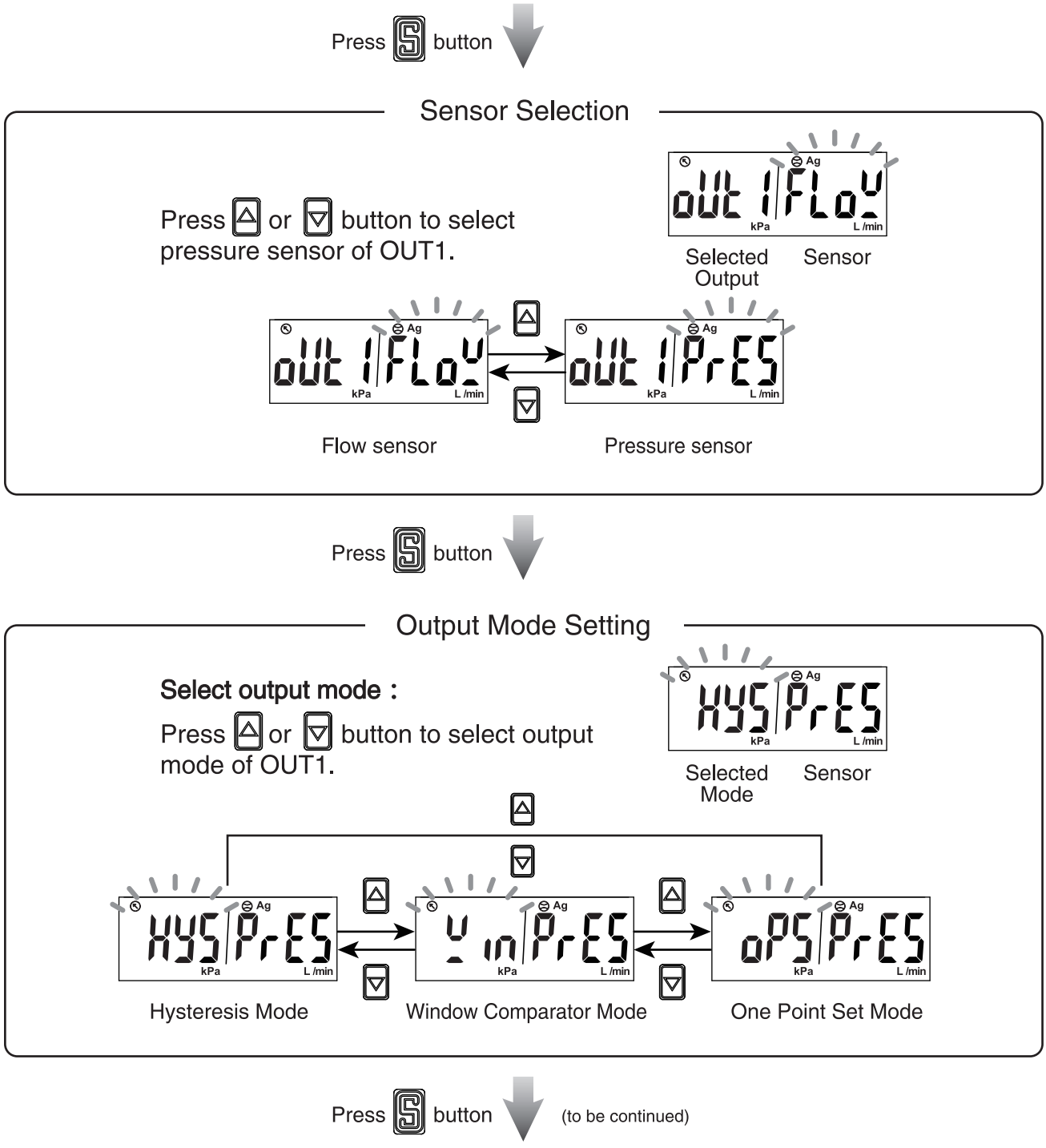
※NOTE：Fixed hysteresis setting will not display when Hysteresis Mode, Accumulated Output Mode and Accumulated Pulse Output Mode is set.

Press S button to return to Function Selection Mode



● 2. Pressure sensor setting

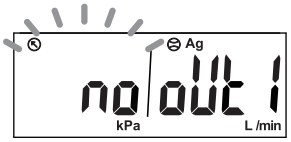
Press ▲ or ▼ button at Function Selection Mode to display [F-01] [oUt 1].



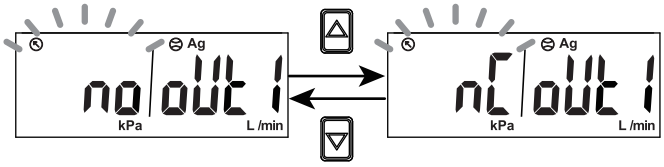
Output Type Setting

OUT1 type setting :

Press ▲ or ▼ button to select OUT1 type.



Selected Mode Output



NO Mode NC Mode

Press S button

Set Value Setting

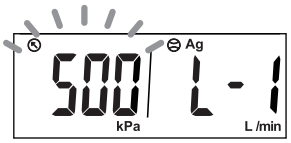
Out1 set value setting :

Press ▲ or ▼ button to adjust the set value.

Hysteresis Mode [HYS] : [L- 1] , [H- 1]

Window Comparator Mode [Y in] : [L- 1] , [H- 1]

One Point Set Mode [oPS] : [P- 1]



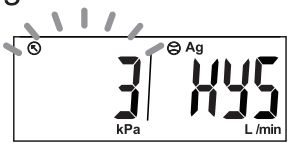
Selected Set Value Mode

Press S button

Fixed Hysteresis Setting

Fixed hysteresis setting :

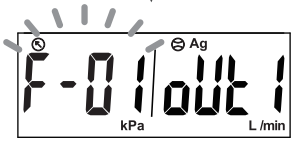
Press ▲ or ▼ button to adjust fixed hysteresis value.



Set Value Fixed Hysteresis Mode

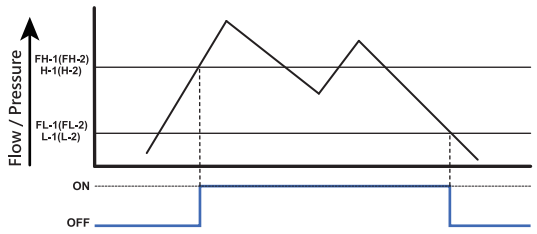
NOTE：Fixed hysteresis setting will not display when Hysteresis Mode is set.

Press S button to return to Function Selection Mode

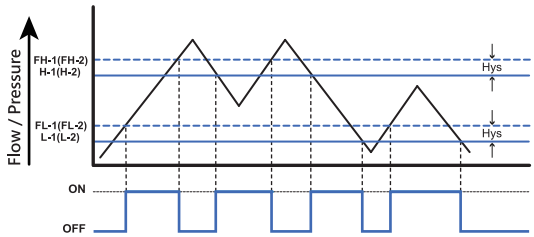


Normal Open Mode

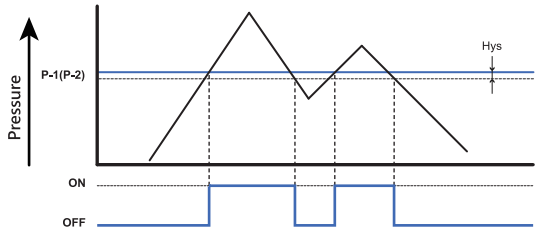
Hysteresis Mode



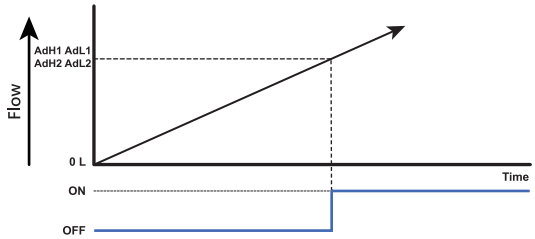
Window Comparator Mode



One Point Set Mode

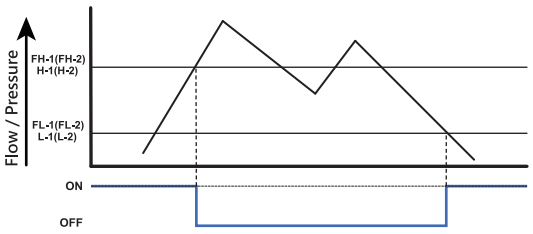


Accumulated Output Mode

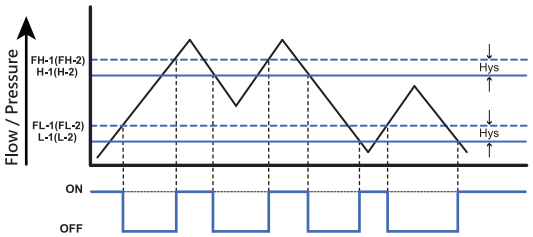


Normal Close Mode

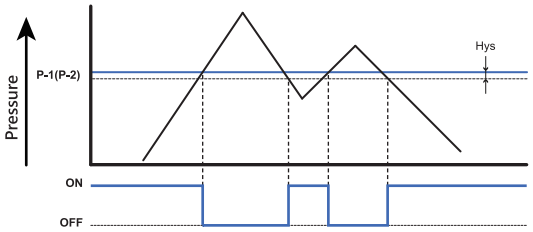
Hysteresis Mode



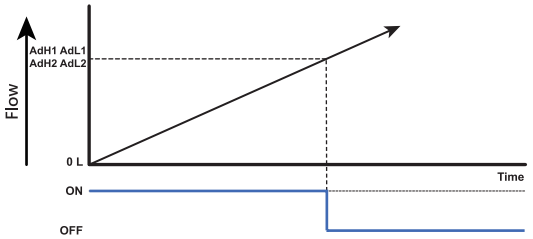
Window Comparator Mode



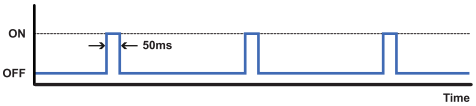
One Point Set Mode



Accumulated Output Mode



Accumulated Pulse Output Mode



Flow Range	500mL	1000mL	5L	10L	50L	100L	200L
Pulse Output Rate	5mL	10mL	0.05L	0.1L	0.5L	1L	2L

【NOTE:】
*1. In case hysteresis is set at less than or equal to 2 digits, switch output may chatter if input pressure fluctuates near the set point.
*2. When using window comparator mode, the difference between two set points must be greater than the fixed hysteresis, otherwise will cause the switch output to malfunction.

2.3.2 [F-02] OUT2 Setting Selection

Setting corresponding sensor and operating mode of OUT2.

1. Press ▲ or ▼ button at function setting mode to start "OUT 2 Setting" [F-02] [oUt2].
2. Check the [F-01] for the same follow setting.

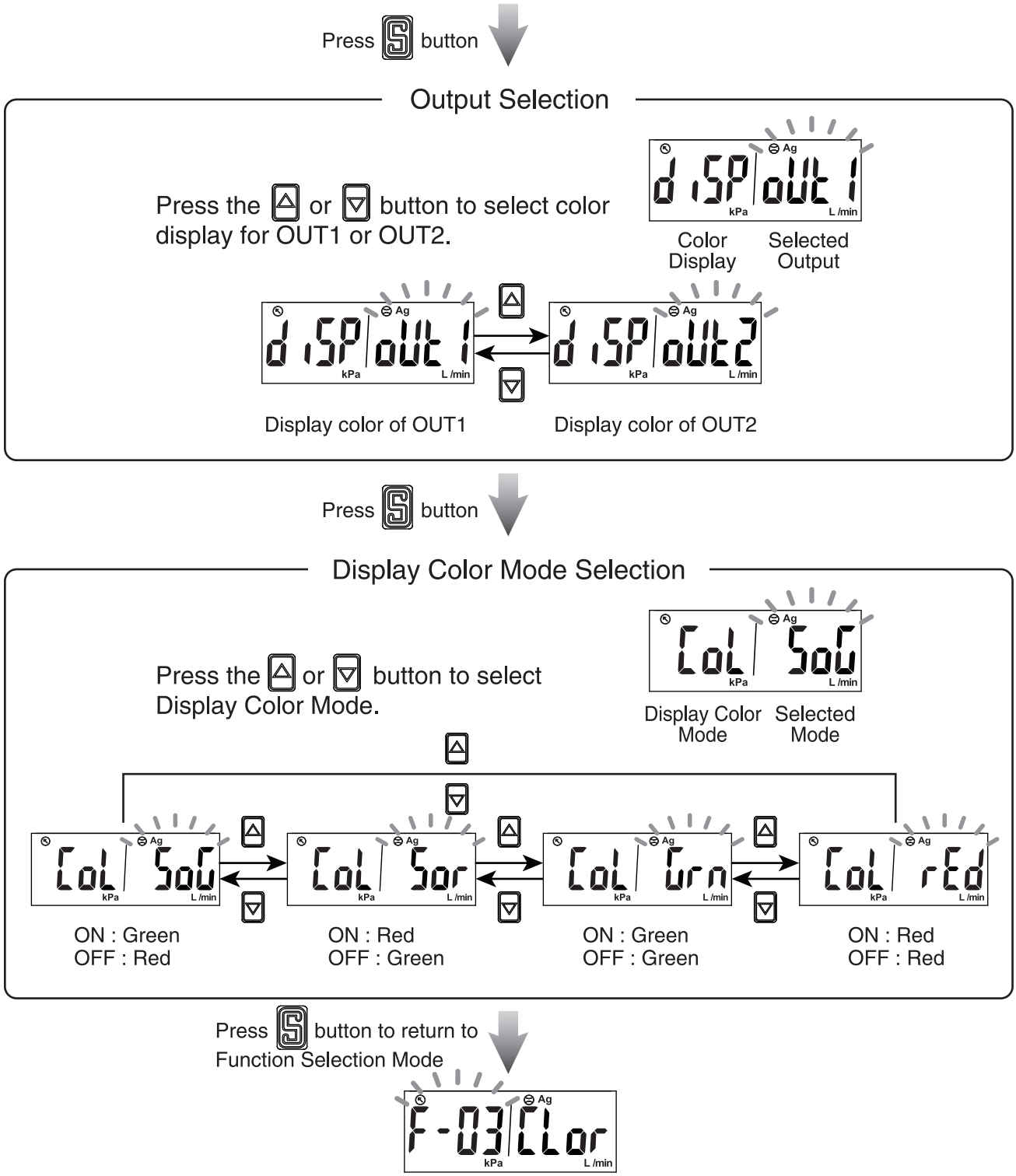
NOTE：The OUT2 Setting dose not have Accumulated Pulse Output Mode.

2.3.3 [F-03] LCD Display Color Selection

4 LCD Display Color Modes of output value selection.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-03] [CLor].

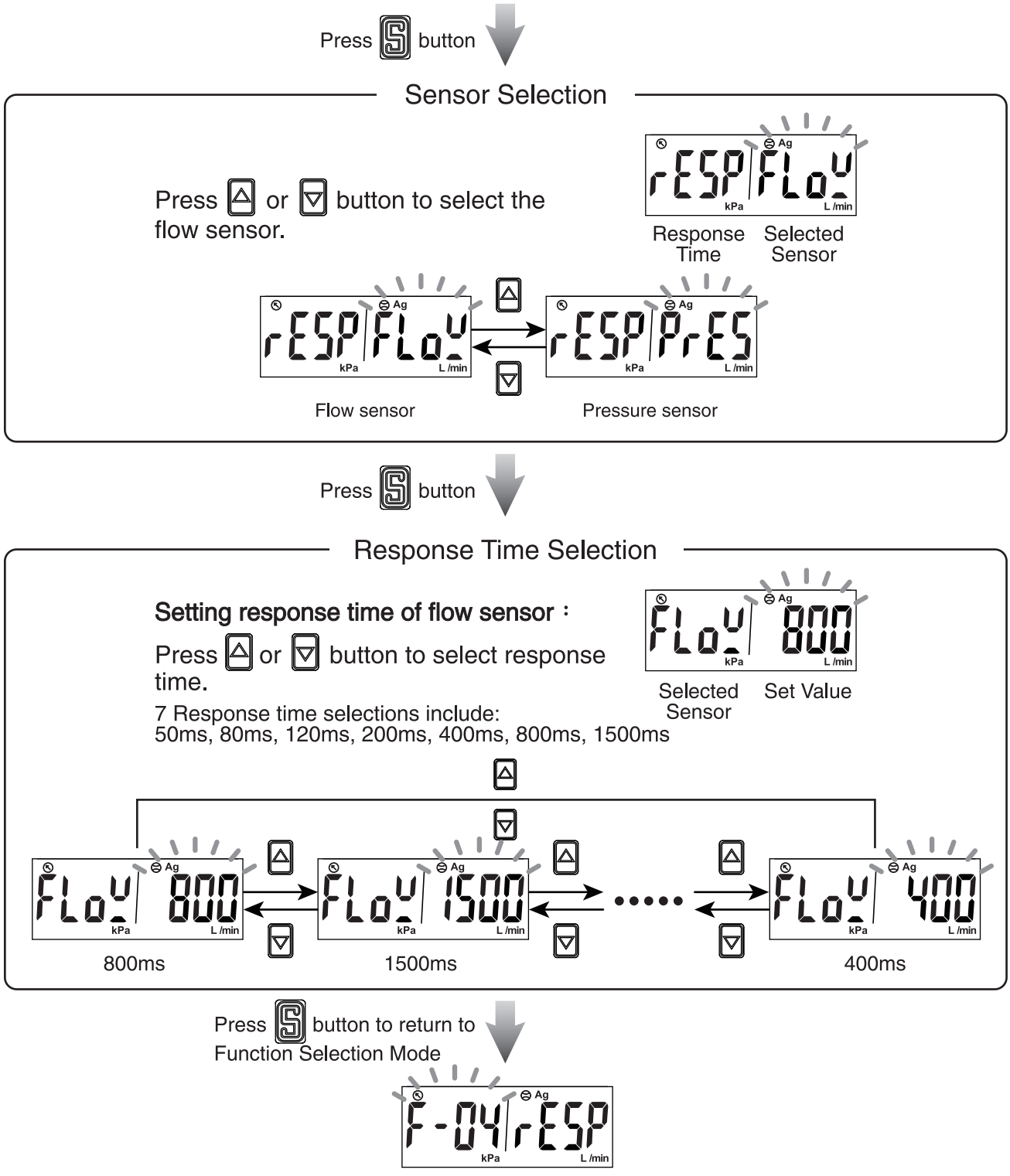


2.3.4 [F-04] Response Time Selection

Select proper response time to avoid switch output chattering.

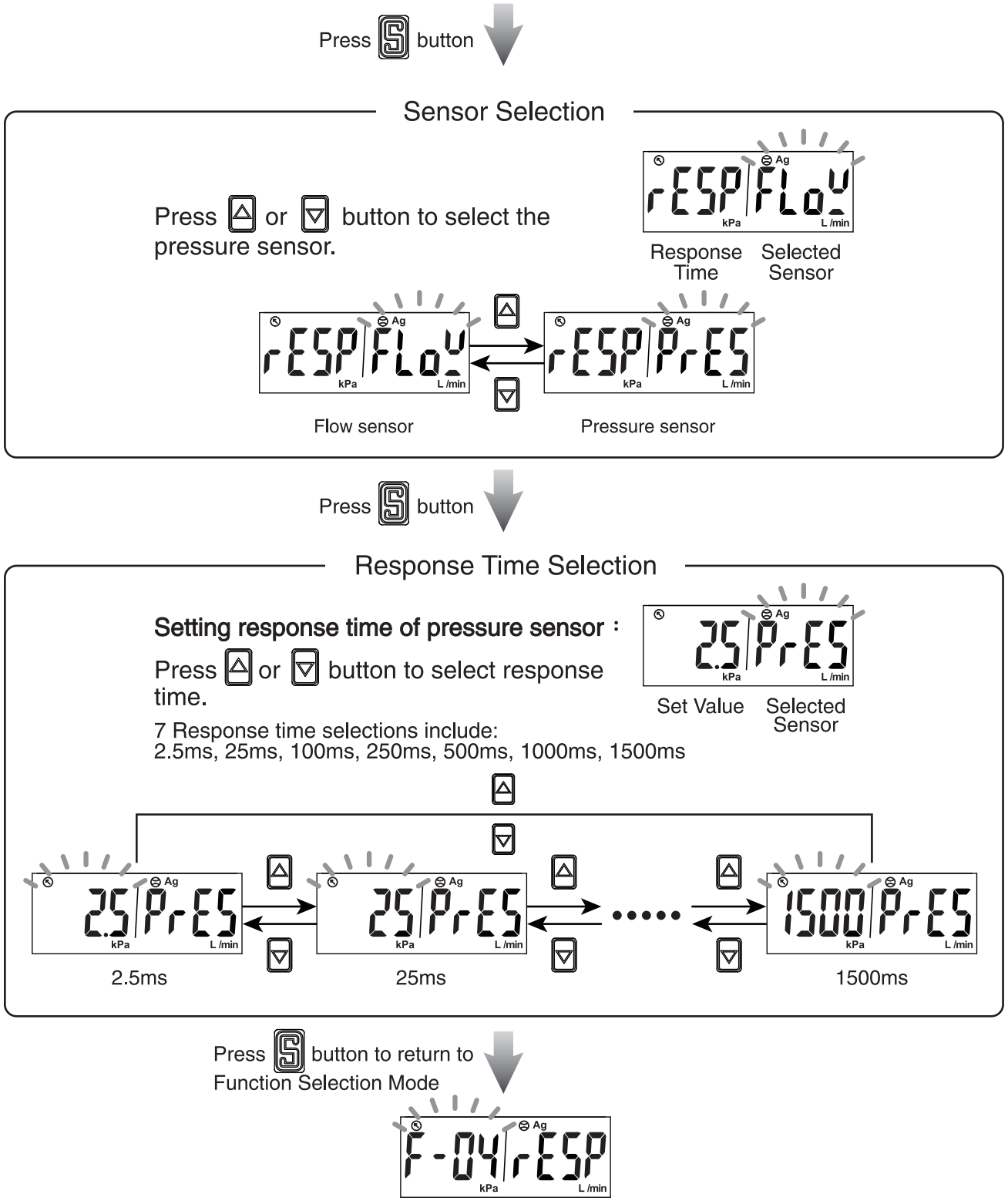
- **1. Flow sensor setting**

  Press ▲ or ▼ button at Function Selection Mode to display [F-04] [rESP].



● 2. Pressure sensor setting

Press ▲ or ▼ button at Function Selection Mode to display [F-04] [rESP].

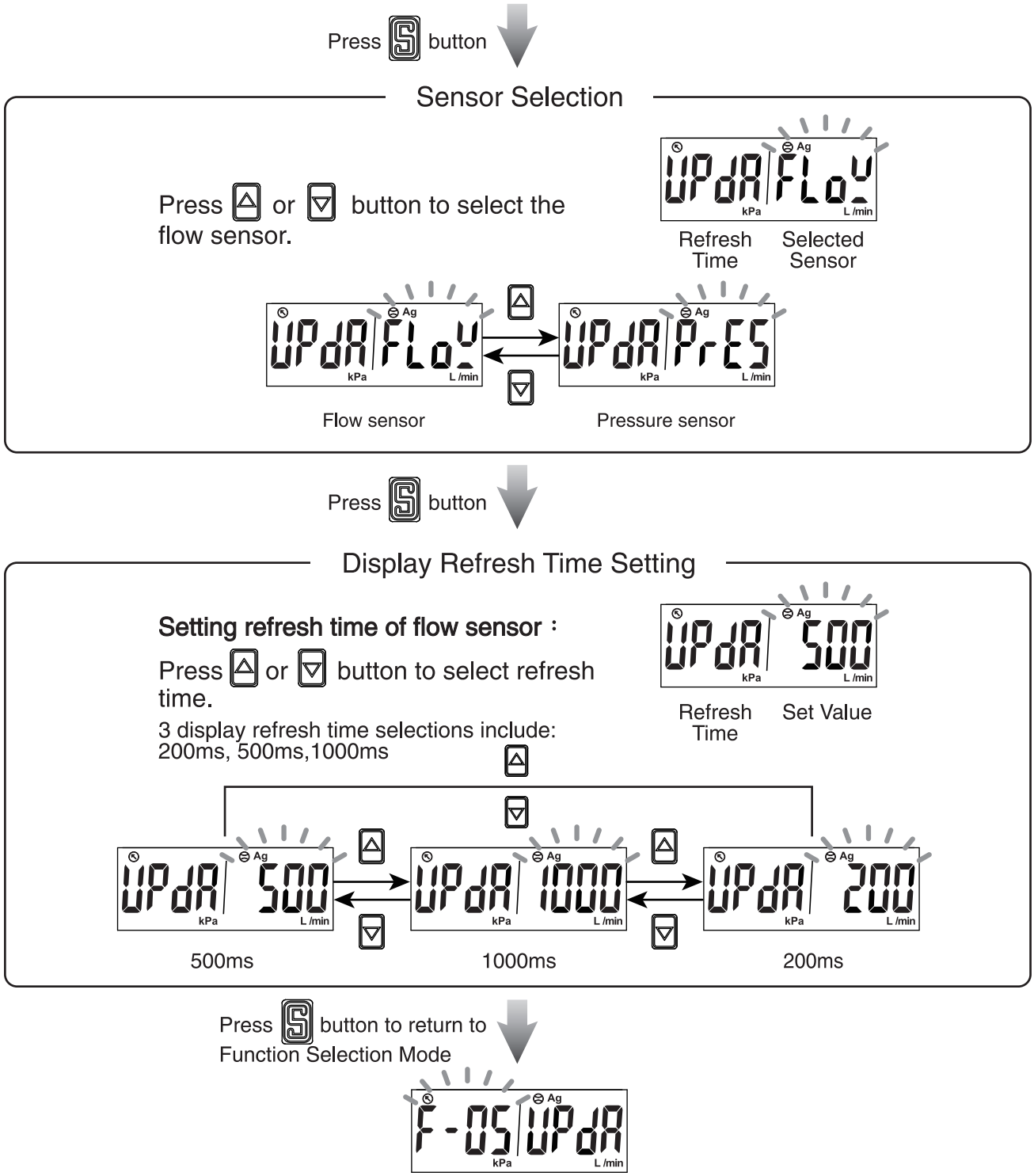


2.3.5 [F-05] Display Refresh Time Selection

Select the proper display refresh time to reduce frequently changing value.

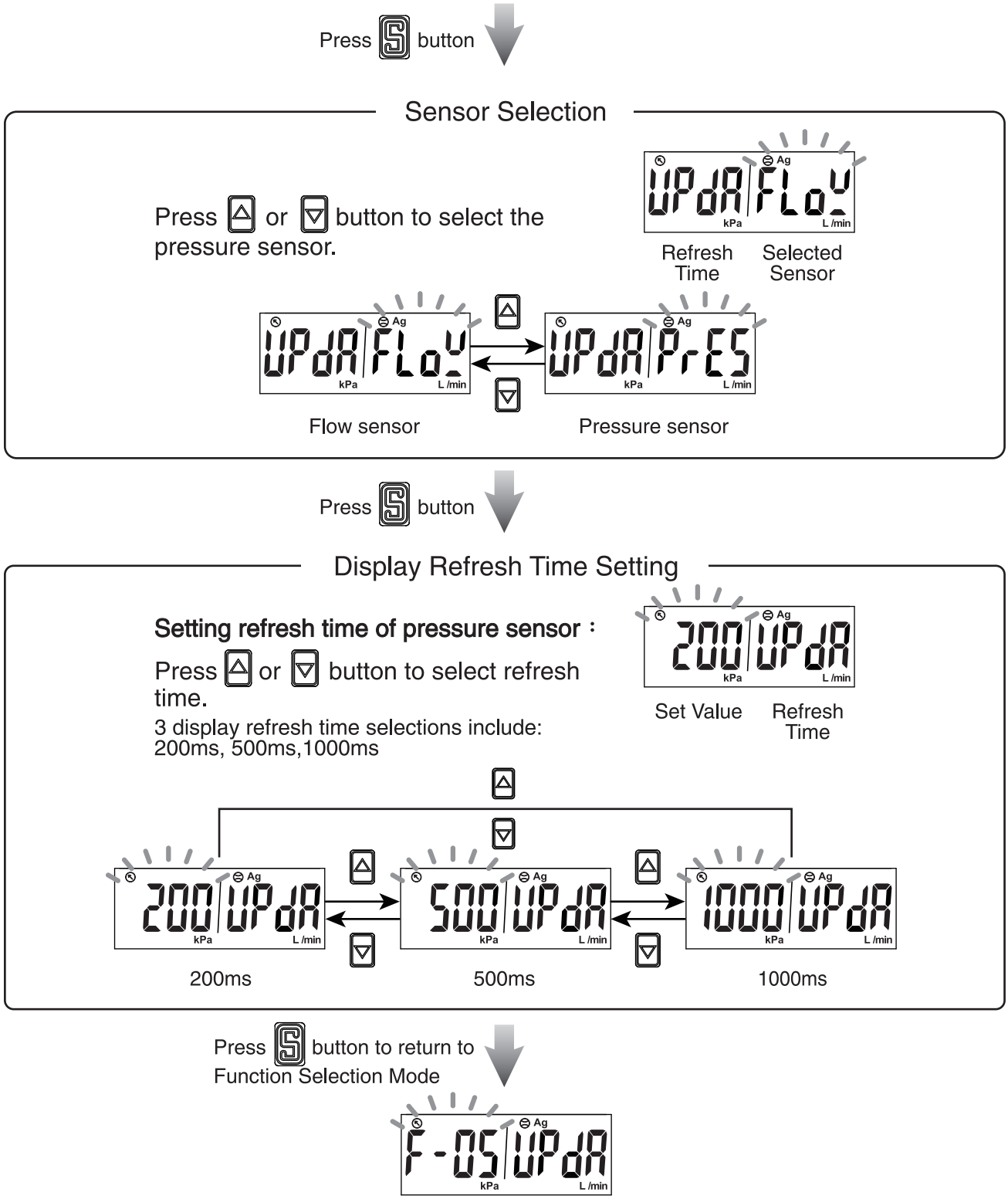
- **1. Flow sensor setting**

  Press ▲ or ▼ button at Function Selection Mode to display [F-05] [UPdA].



● 2. Setting display refresh time of pressure sensor

Press ▲ or ▼ button at Function Selection Mode to display [F-05] [UPdA].

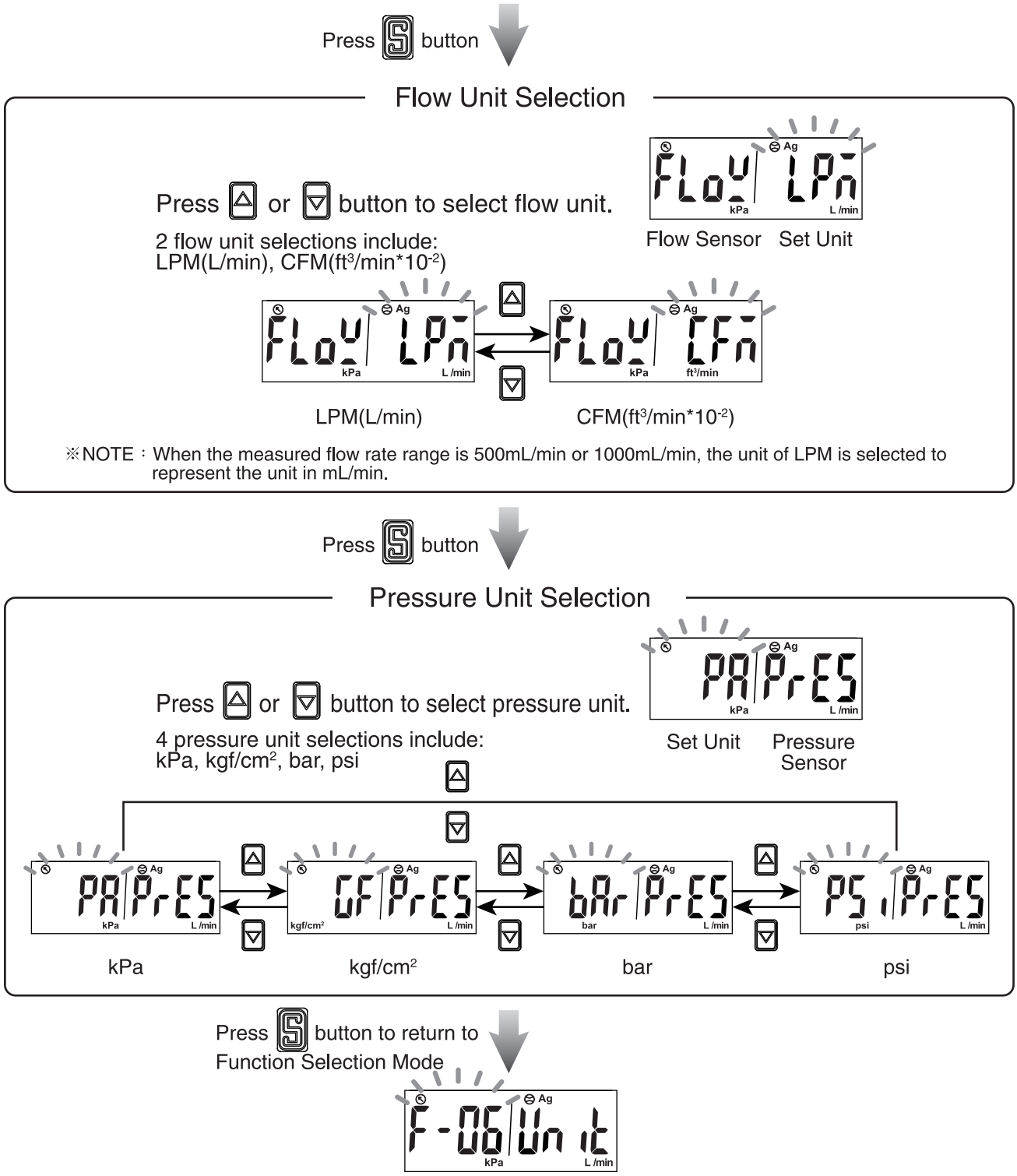


2.3.6 [F-06] Unit Selection

Select the flow unit and pressure unit of the sensor.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-06] [Unit] 。



2.3.7 [F-07] Flow Reference Standard Selection

Select the flow value is shown under standard or normal condition.

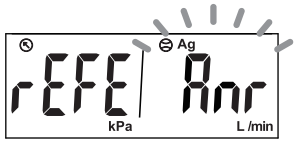
< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-07] [rEFE]。

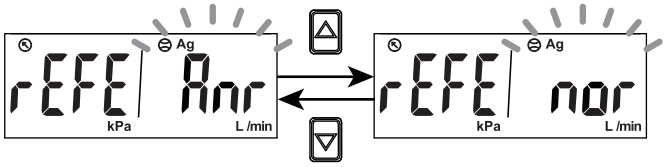
Press S button

Flow Reference Standard Selection

Press ▲ or ▼ button to select the standard or normal condition.



Flow Reference　Selected Condition



Standard conditon (ANR)　Normal condition (NOR)

※NOTE：

1. Stardard condition (ANR): the display value is calculated under 20°C, 1atm.
2. Normal condition (NOR): the display value is calculated under 0°C, 1atm.
3. Flow rate in the specification is the value at standard condition (ANR).

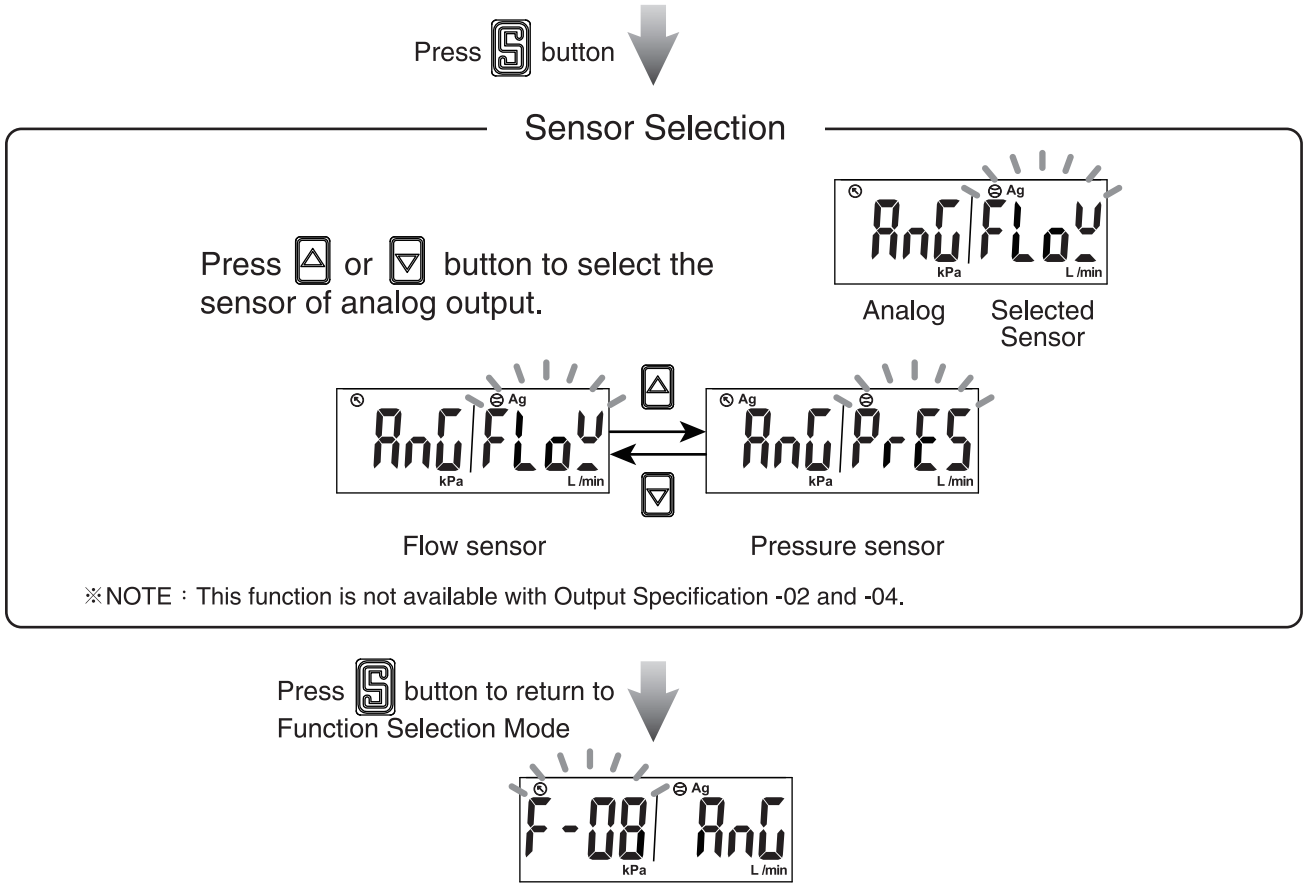
Press S button to return to Function Selection Mode

2.3.8 [F-08] Analog Output Selection

Select the analog output signal is for flow sensor or pressure sensor.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-08] [AnG] .

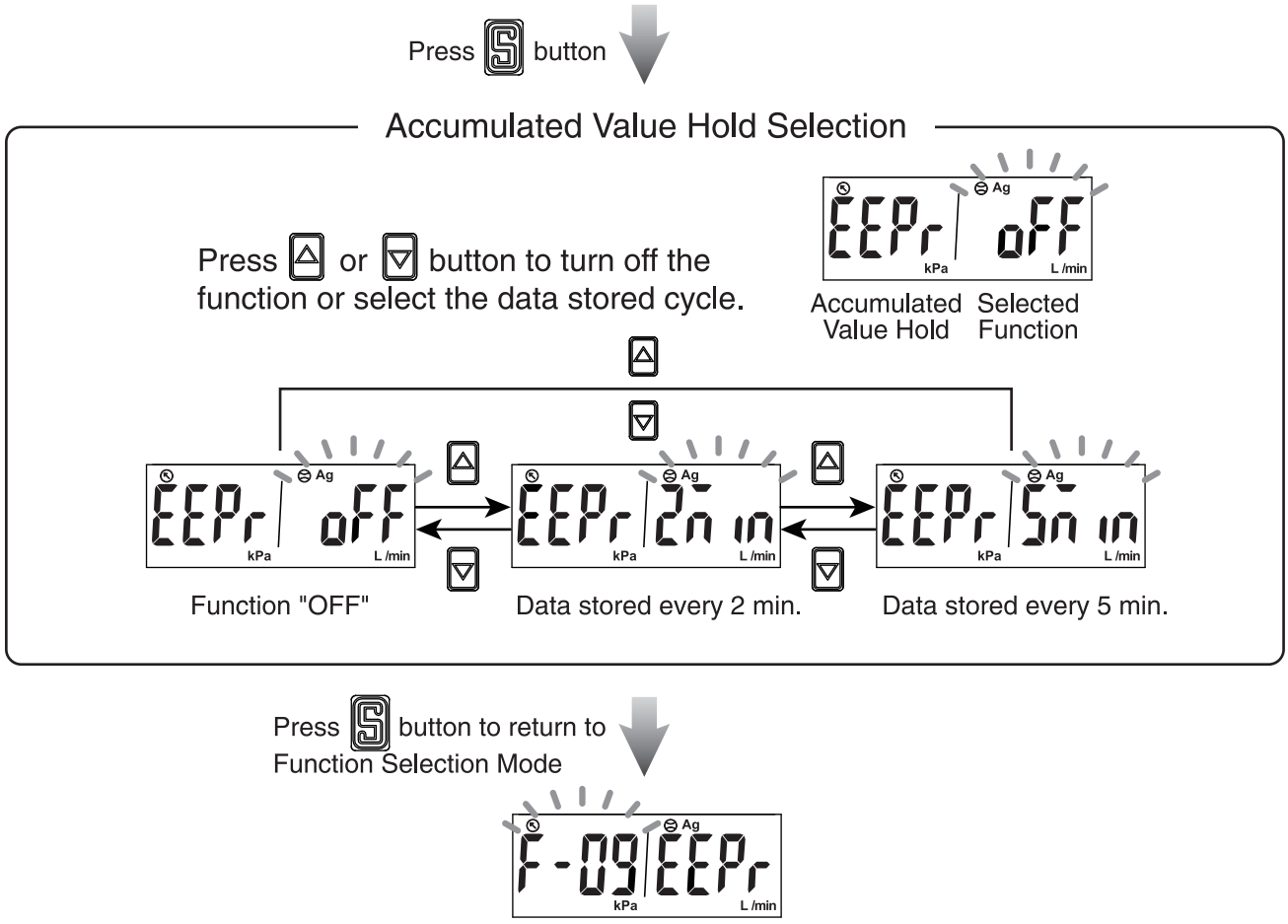


2.3.9 [F-09] Accumulated Value Hold Selection

The default setting is "OFF", the accumulated flow value is zeroed when the power supply is turned off.
Select this function to keep accumulated flow value to be stored in permanent memory and reload the recent saved accumulated value after power supply turns on.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-09] [EEPr]。



※ NOTE：

The maximum writable limit of the memory device is 1 million cycles.
If the sensor is operated 24 hours per day, the durability is calculated as below:

- 5 minutes x 1 million cycles = 5 million minutes = 9.5 years
- 2 minutes x 1 million cycles = 2 million minutes = 3.8 years

2.3.10 [F- 10] Flow Sensor Display Mode Selection

Select to display Instantaneous Flow or Accumulated Flow Mode.

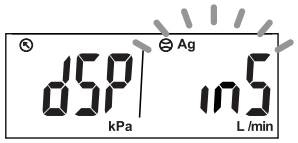
< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F- 10] [d 15] 。

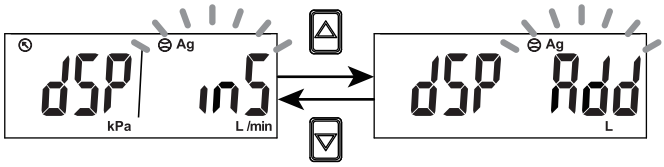
Press S button

Display Mode Selection

Press ▲ or ▼ button to select display mode.



Display Flow　Selected Mode



Instantaneous Flow Mode　Accumulated Flow Mode

※NOTE：When the measured flow rate range is 500mL/min or 1000mL/min, the accumulated flow is selected and the unit will become in mL/min.

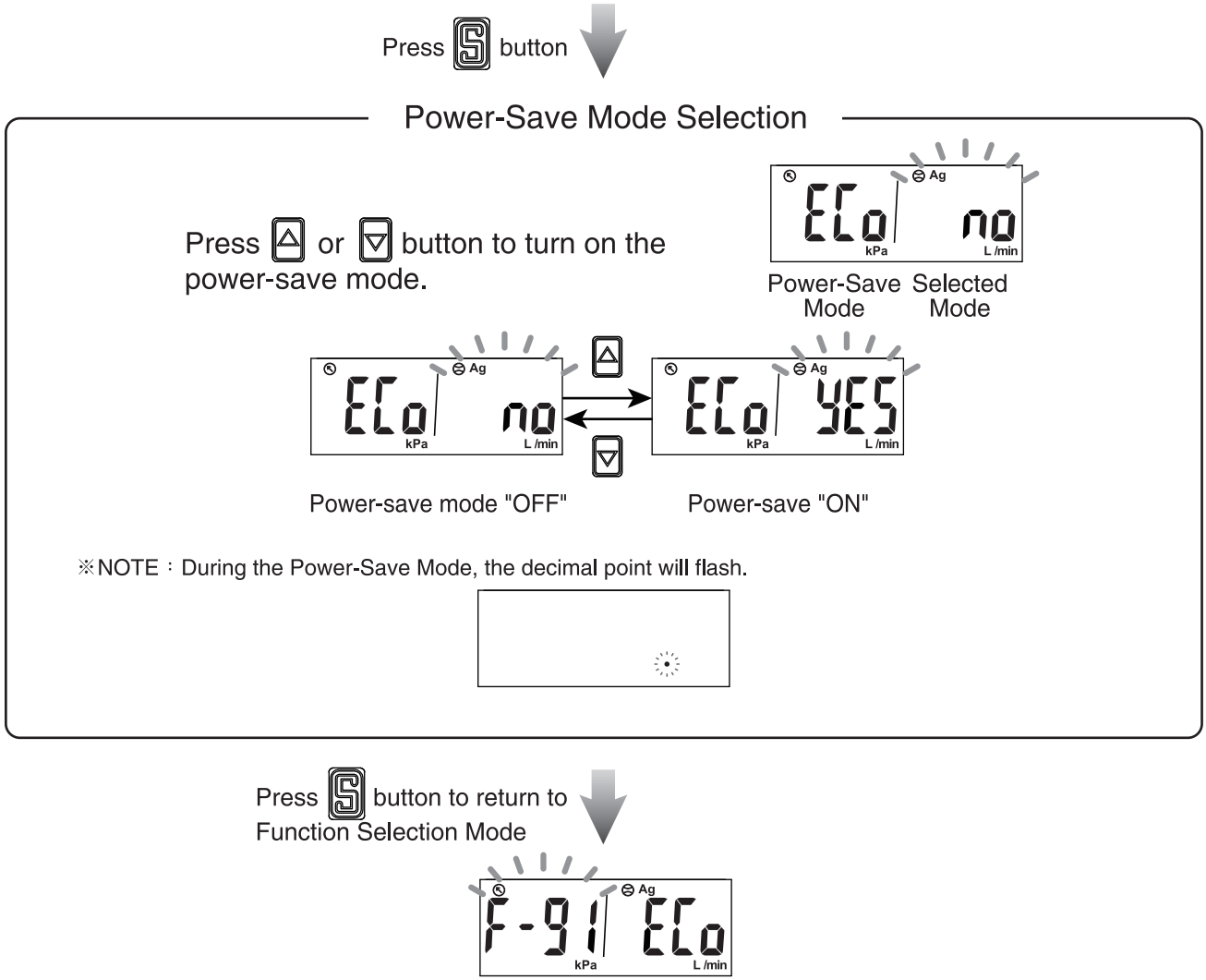
Press S button to return to Function Selection Mode

2.3.11 [F-91] Power-Save Mode Selection

Select Power-Save Mode at Measurement Mode.
During the Power-Save Mode, the main display will turned off if no buttons is pressed in 30 sec., press any keys to leave the Power-Save Mode.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-91] [ECo]。

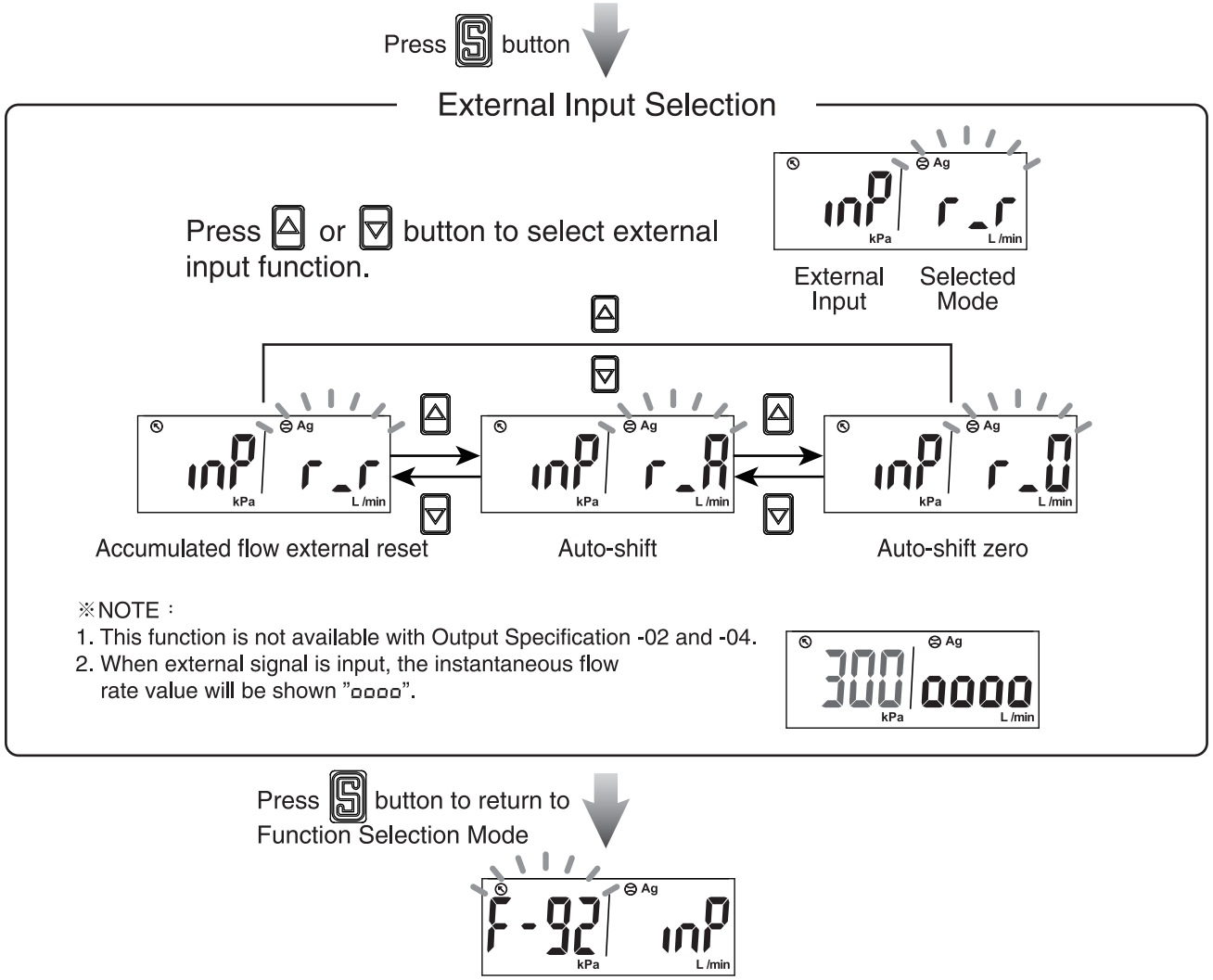


2.3.12 [F-92] External Input Selection

Accumulated flow external reset：The accumulated flow value will reset to "0" when an external input signal is applied.
Auto-shift：The instantaneous flow rate will regard as the standard when the external input signal is applied. The switch output function operates relative to its change.
Auto-shift zero：The instantaneous flow rate is reset to zero to regard as standard when the external input signal is applied. The switch output function operates relative to its change.
This function is only for output 1 corresponding to flow sensor action point. When external signal is input, please connect the input wire to GND for 30 ms or more.

< Operation >

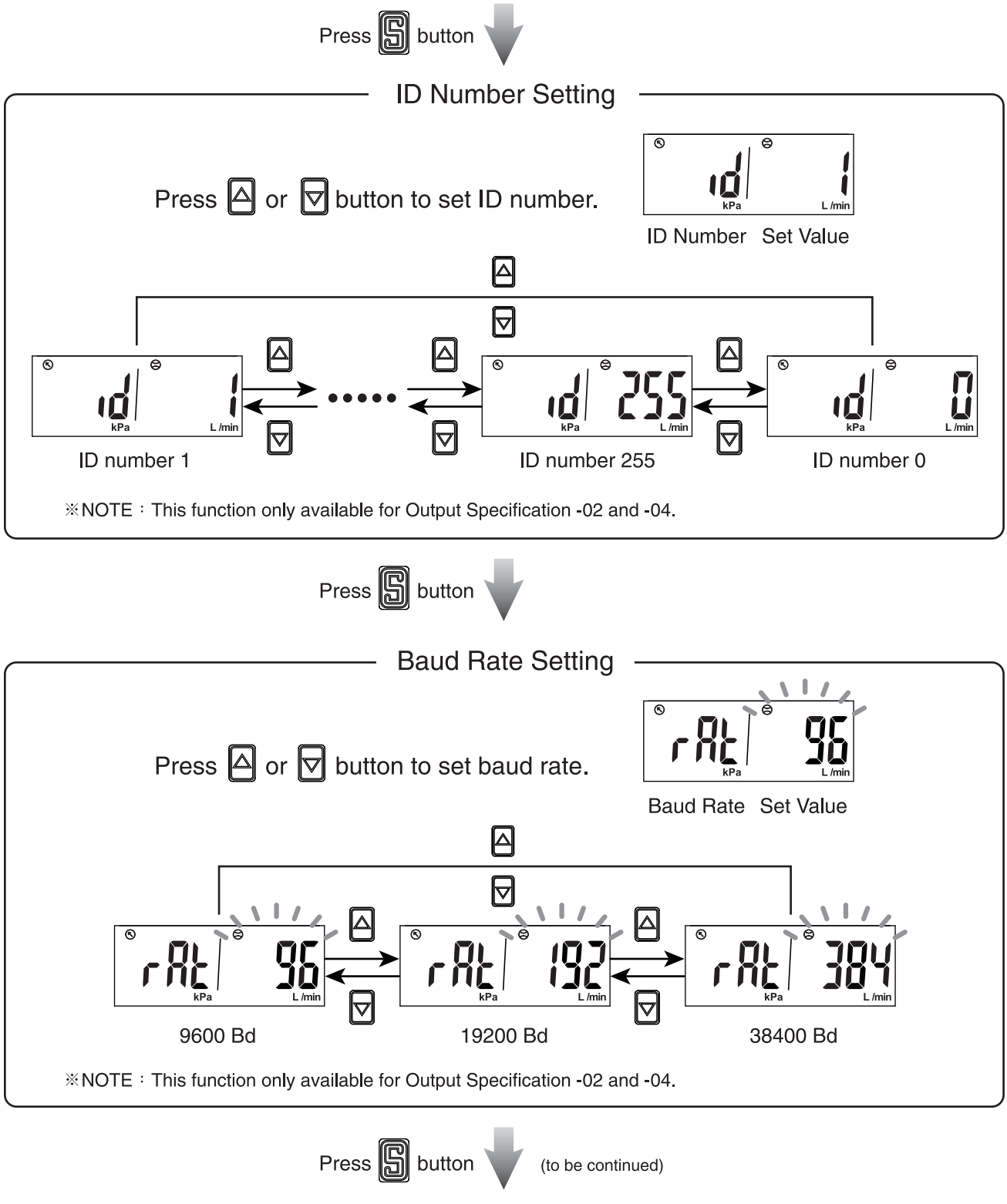
Press ▲ or ▼ button at Function Selection Mode to display [F-92] [inP]。



2.3.13 [F-93] Modbus RTU Setting

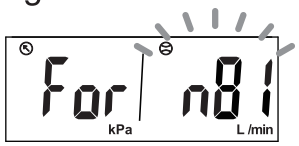
MODBUS transmission protocol can be set according to user requirements.

Press ▲ or ▼ button at Function Selection Mode to display [F-93] [rbUS]。

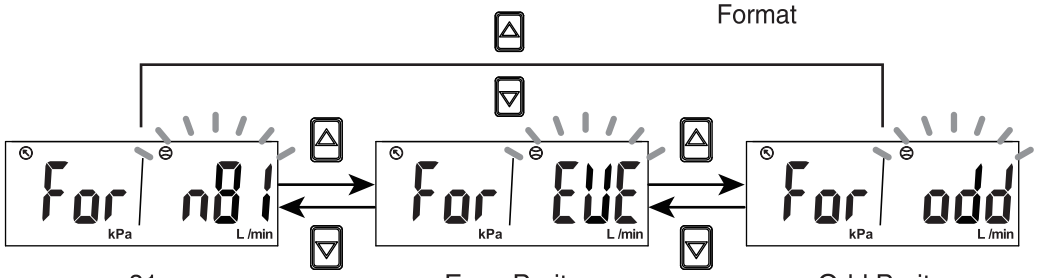


Transmission Format Setting

Press ▲ or ▼ button to set transmission format.



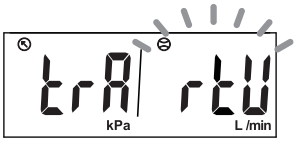
Transmission Format | Set Value



n81 | Even Parity | Odd Parity

※NOTE：This function only available for Output Specification -02 and -04.

Press S button



RTU mode

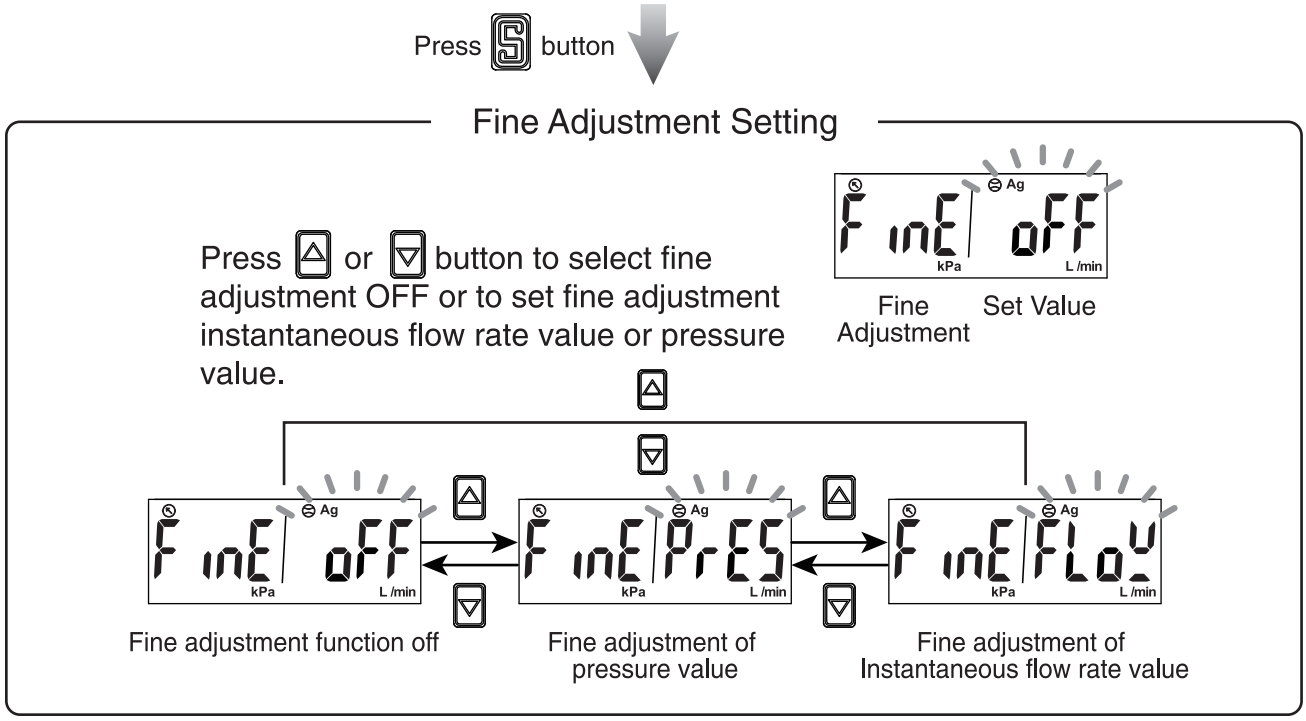
Press S button to return to Function Selection Mode

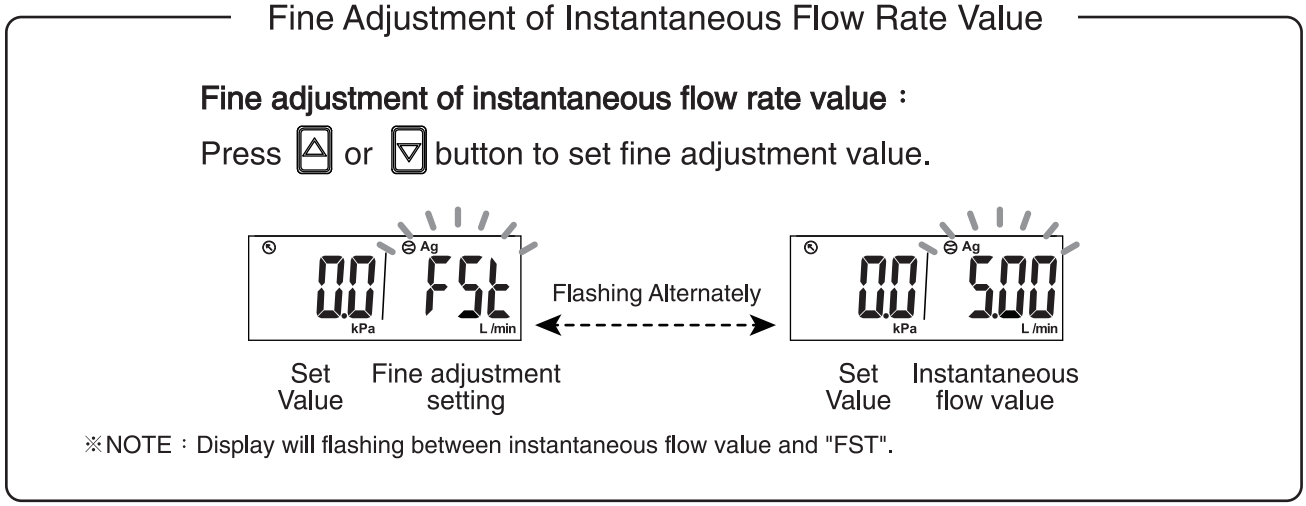
2.3.14 [F-94] Fine Adjustment Setting

This function is to fine adjust flow and pressure display values.
Display values can be calibrated to within ±2.5% R.D.

- **1. Fine adjustment of instantaneous flow value**

  Press ▲ or ▼ button at Function Selection Mode to display [F-94] [F inE]。





● 2. Fine adjustment of pressure value

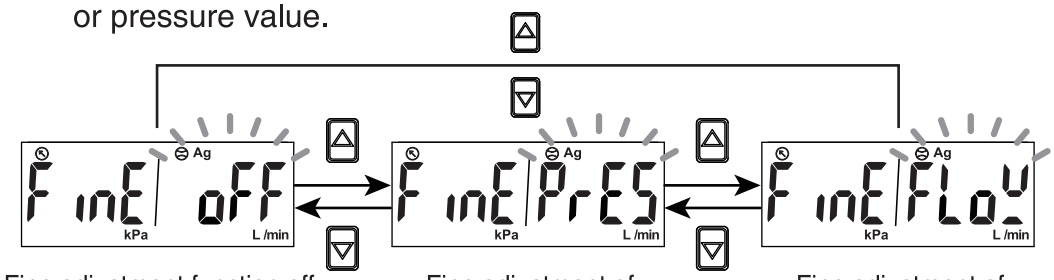
Press ▲ or ▼ button at Function Selection Mode to display [F-94] [F inE]。

Press S button

Fine Adjustment Setting

Press ▲ or ▼ button to select fine adjustment function off or select fine adjustment of instantaneous flow value or pressure value.

Fine Adjustment　Set Value

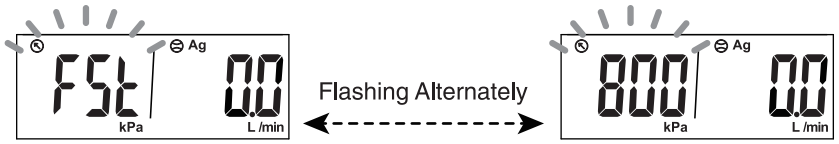


Fine adjustment function off　Fine adjustment of pressure value　Fine adjustment of instantaneous flow value

Fine Adjustment of Pressure Value

Fine adjustment of pressure value：

Press ▲ or ▼ button to setting fine adjustment of display value.



Fine adjustment setting　Set Value　Pressure Value　Set Value

※NOTE：Display will flashing between pressure value and "FST".

Press S button

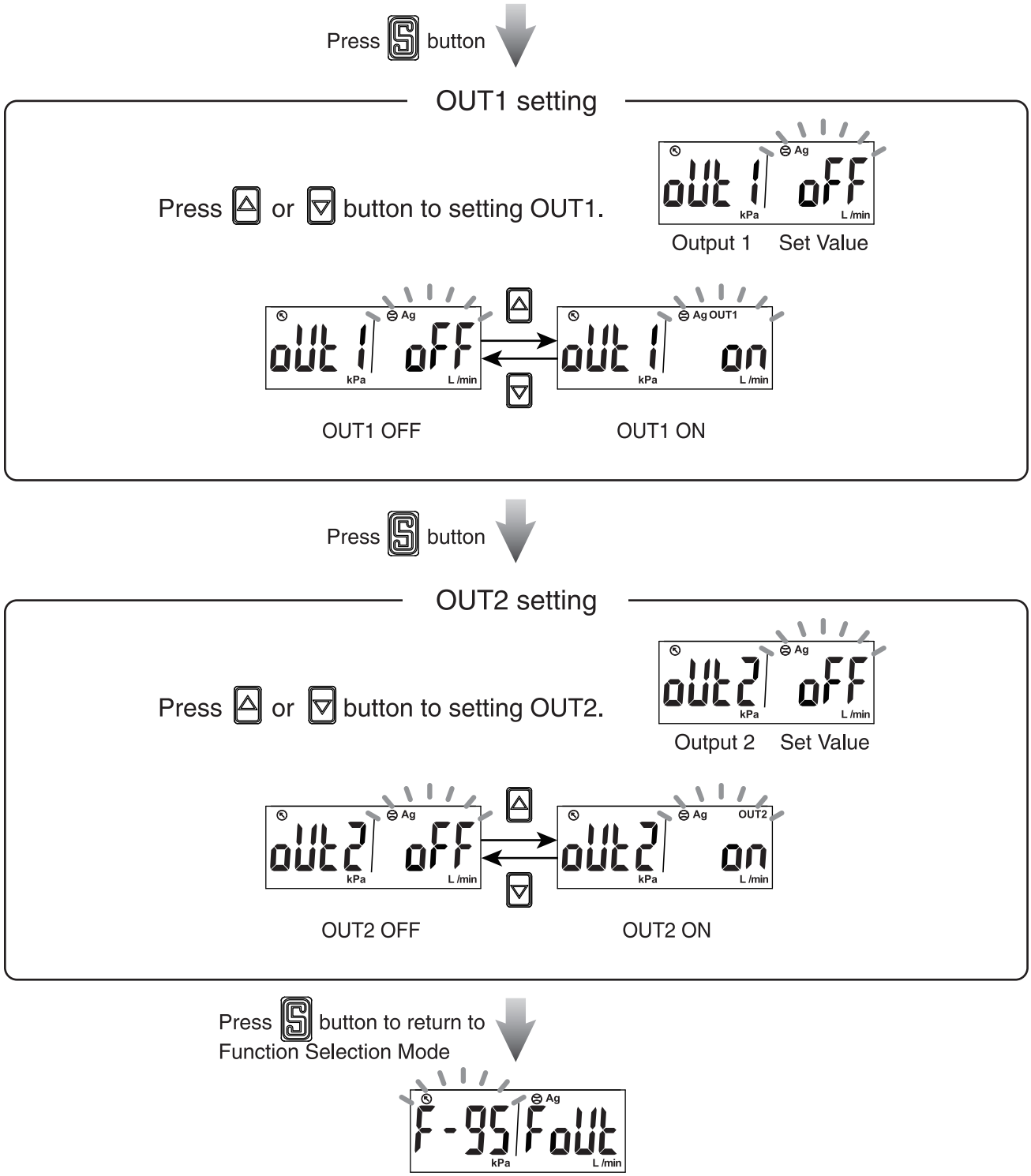
Return to the measurement mode

2.3.15 [F-95] Forced Output Function

To turn the analog ON/OFF forcibly.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-95] [FoUt]。

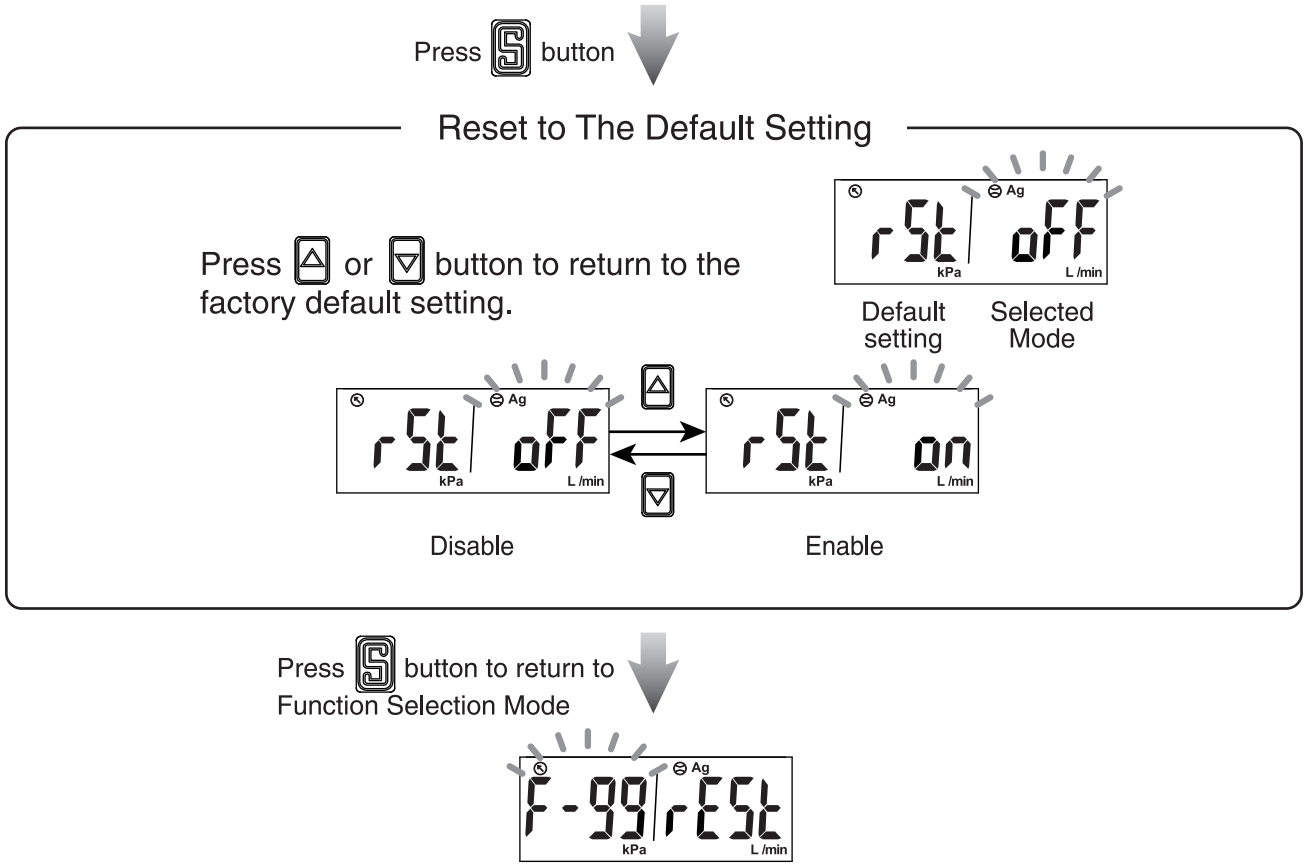


2.3.16 [F-99] Reset to the Default Setting

The factory default settings can be restored.

< Operation >

Press ▲ or ▼ button at Function Selection Mode to display [F-99] [rESt]。

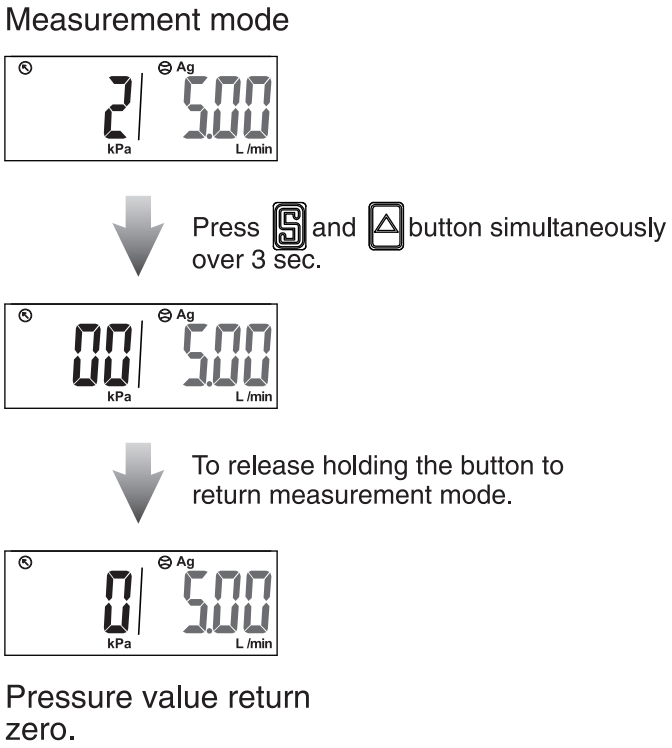


2.3.17 Pressure Zero Adjustment Function

The displayed value can be adjusted to "0" when the pressure is within ±3% of the zero point at the time of shipment from the factory.

< Operation >

Press S and △ button simultaneously over 3 sec. at the measurement mode (not Accumulated flow value display mode) until display [00]. And release holding the button to return measurement mode.

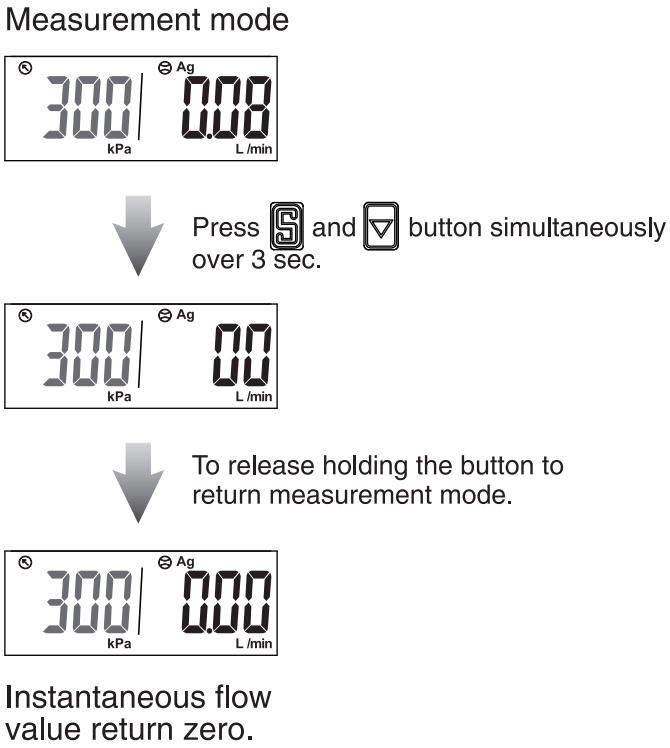


2.3.18 Instantaneous Flow Zero Adjustment Function

The displayed value can be adjusted to "0" when the measured flow is within ±10% F.S. of the zero point at the time of shipment from the factory.

< Operation >

Press S and ▽ button simultaneously over 3 sec. at the measurement mode (not Accumulated flow value display mode) until display [00]. And release holding the button to return measurement mode.



2.3.19 Reset Accumulated Flow Function

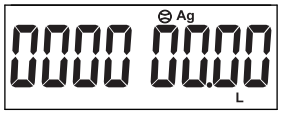
Accumulate flow value return to zero.

< Operation >

Press ▲ and ▼ button simultaneously over 3 sec. at the measurement mode (Accumulated flow value mode) until display zero.
And release holding the button to return measurement mode.

Measurement mode

Press ▲ and ▼ button simultaneously over 3 sec.



Accumulated value display zero.
To release holding the button to return measurement mode.

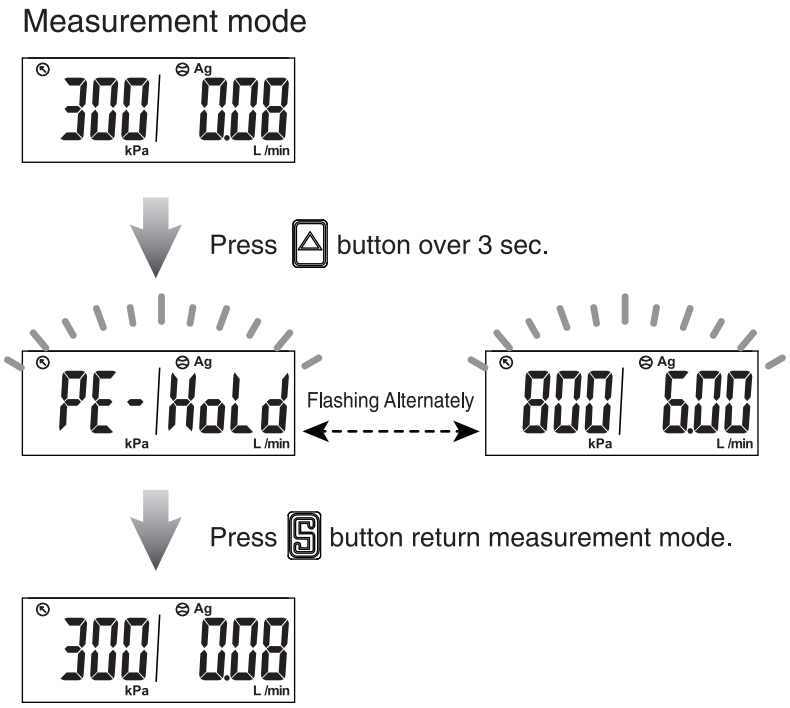
2.3.20 Peak Value Display

The maximum pressure and instantaneous flow, from when the power was supplied to this moment, is detected and updated.

< Operation >

Press [△] button over 3 sec. at the measurement mode. The maximum value will be displayed flashing, and is held.

Press [S] button return to the measurement mode.



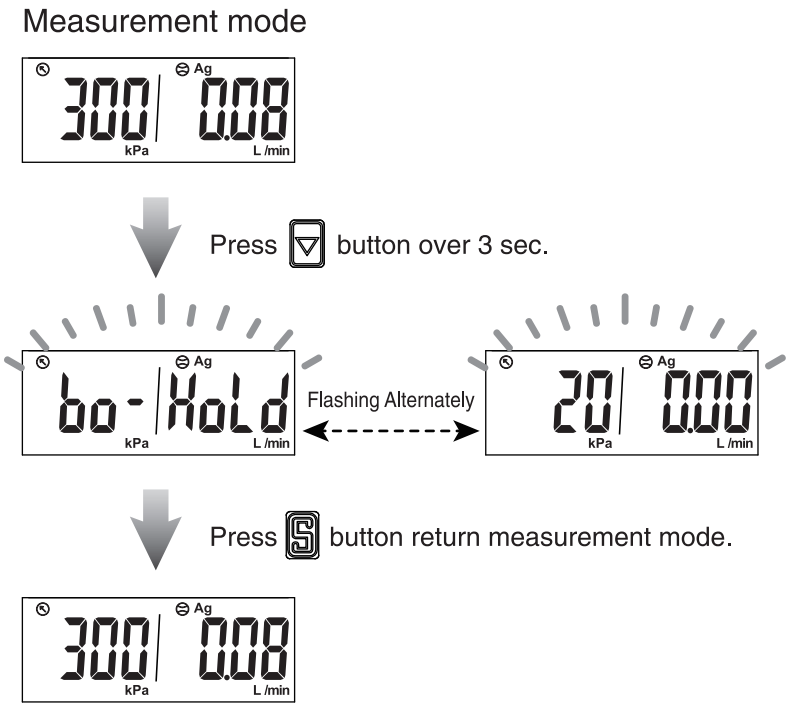
2.3.21 Bottom Value Display

The minimum pressure and instantaneous flow, from when the power was supplied to this moment, is detected and updated.

< Operation >

Press ▽ button over 3 sec. at the measurement mode. The minimum value will be displayed flashing, and is held.

Press S button return to the measurement mode.



2.3.22 Key Lock / Unlock Mode

To prevent errors occurring due to unintentional changes of the set values. If a button operation is performed while the key lock setting is ON, [LoC] [on] is displayed for 1 sec.

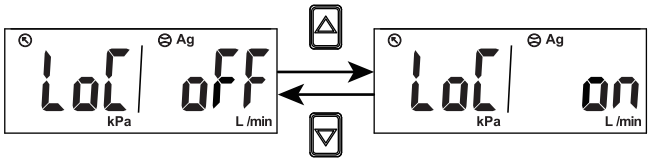
< Operation >

Press S button over 5 sec. at measurement mode to select key lock/unlock setting.

Key Lock / Unlock Setting

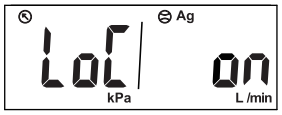
Press ▲ or ▼ button to select locking or unlocking of the key.

Lock Selected Mode



Unlock Lock

※NOTE：If a button operation is performed while the key lock setting is ON, [LoC][on] will displayed.



Displayed for 1 sec.

3 Modbus RTU Instruction

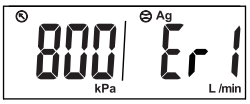
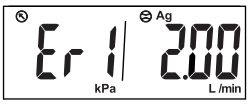
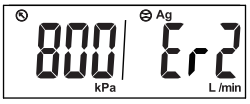
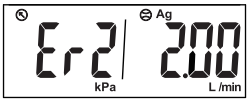
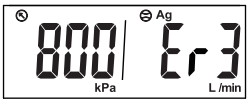
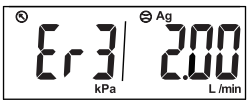
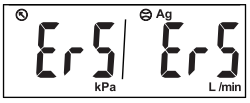
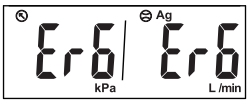
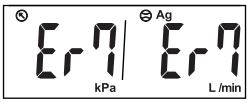
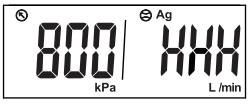
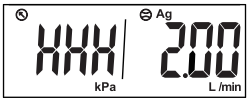
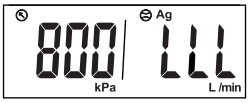
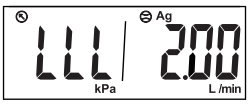
Error Code	Explanation	Operation
0000H	ID Number (0 ~ 255) Range : 0 ~ 255	Read Write
0001H	Baud rate setting 0 : 9600 bps 1: 19200 bps 2 : 38400 bps	Read Write
0002H	Transmission format setting 0 : N.8.1 1 : E.8.1 2 : O.8.1	Read Write
0003H	Communications protocol setting 0 : RTU	Read Write
0004H	Measured flow rate range 005 : 0 ~ 500mL/min 010 : 0 ~ 1000mL/min 050 : 0 ~ 5L/min 100 : 0 ~ 10L/min 500 : 0 ~ 50L/min 101 : 0 ~ 100L/min 201 : 0 ~ 200L/min	Read
0005H	Instantaneous flow value	Read
0006H	Flow unit 0 : LPM (L/min or mL/min) 1 : CFM(ft^3/min)	Read Write
0007H	Decimal place for flow value 0: None 1 : One decimal place 0.1 2 : Two decimal places 0.01 3 : Three decimal places 0.001	Read
0008H	Accumulated flow value (ADL) XXXX 9999	Read
0009H	Accumulated flow value (ADH) 9999 XXXX	Read
000AH	Flow reference standard 0 : ANR (Standard condition) 1 : NOR (Normal condition)	Read Write
000BH	Flow sensor display mode 0 : Instantaneous flow 1 : Accumulated flow	Read Write
000CH	Accumulated value hold 0 : None 1 : 2min /times 2 : 5min/times	Read Write

Error Code	Explanation	Operation
000DH	Flow display refresh time 0 : 200ms 1 : 500ms 2 : 1000ms	Read Write
000EH	Rated pressure range 3 : -0.100 ~ 1.000 MPa	Read
000FH	Display pressure value	Read
0010H	Pressure unit 0 : kPa 1 : Kgf/cm^2 2 : bar 3 : psi	Read Write
0011H	Decimal place for pressure value 1 : One decimal place 0.1 2 : Two decimal places 0.01 3 : Three decimal places 0.001	Read
0012H	Pressure display refresh time 0 : 200ms 1 : 500ms 2 : 1000ms	Read Write
0013H	Fine Adjustment Setting 0 : OFF 1 : FLOW SENSOR 2 : PRESSURE SENSOR	Read Write
0014H	Fine adjustment of display value -25 ~ 25 (-2.5% ~ +2.5%)	Read Write
0015H	Response time of flow sensor 0 : 50ms 1 : 80ms 2 : 120ms 3 : 200ms 4 : 400ms 5 : 800ms 6 : 1500ms	Read Write
0016H	Response time of pressure sensor 0 : 2.5ms 1 : 25ms 2 : 100ms 3 : 250ms 4 : 500ms 5 : 1000ms 6 : 1500ms	Read Write

Error Code	Explanation	Operation
0017H	OUT1 corresponding sensor 0 : FLOW SENSOR 1 : PRESSURE SENSOR	Read Write
0018H	OUT1 output mode FLOW: 0 : HYS, 1 : WIN, 2 : ADD, 3 : PLS PRESSURE: 0: OPS, 1: HYS, 2: WIN	Read Write
0019H	OUT1 output type 0 : N.O. mode 1 : N.C. mode	Read Write
001AH	Flow setting value FL-1	Read Write
001BH	Flow setting value FH-1	Read Write
001CH	Flow setting value ADL1	Read Write
001DH	Flow setting value ADH1	Read Write
001EH	Fixed hysteresis setting for flow value HYS 0 ~ 8	Read Write
001FH	Pressure setting value P-1 or L-1	Read Write
0020H	Pressure setting value H-1	Read Write
0021H	Fixed hysteresis setting for pressure value HYS 0 ~ 8	Read Write
0022H	OUT1 switch 0 : OFF 1 : ON	Read
0023H	OUT2 corresponding sensor 0 : FLOW SENSOR 1 : PRESSURE SENSOR	Read Write
0024H	OUT2 output mode FLOW: 0 : HYS, 1 : WIN, 2 : ADD PRESSURE: 0: OPS, 1: HYS, 2: WIN	Read Write
0025H	OUT2 output type 0 : N.O. mode 1 : N.C. mode	Read Write
0026H	Flow setting value FL-2	Read Write
0027H	Flow setting value FH-2	Read Write

Error Code	Explanation	Operation
0028H	Flow setting value ADL2	Read Write
0029H	Flow setting value ADH2	Read Write
002AH	Fixed hysteresis setting for flow value HYS 0 ~ 8	Read Write
002BH	Pressure setting value P-2 or L-2	Read Write
002CH	Pressure setting value H-2	Read Write
002DH	Fixed hysteresis setting for pressure value HYS 0 ~ 8	Read Write
002EH	OUT2 switch 0 : OFF 1 : ON	Read
002FH	Color display for OUT1 or OUT2 selection 0 : OUT1 1 : OUT2	Read Write
0030H	Display color setting 0 : SOG (Switch on Green) 1 : SOR (Switch on Red) 2 : GRN (Always is Green) 3 : RED (Always is Red)	Read Write
0031H	Power-save mode 0 : NO 1 : YES	Read Write
0032H	Reset to the default setting 0: RECALL	Write
0033H	Instant flow zero adjustment 0 : When over ±10%, error code 03H will show.	Write
0034H	Pressure zero adjustment 0 : When over ±3%, error code 03H will show.	Write
0035H	Reset accumulated flow 0 : Accumulated flow value return to zero	Write
0036H	Key lock/unlock setting 0 : OFF 1 : ON	Read Write
0037H	Switch output 0 : NPN 1 : PNP	Read

4 Error Code Instruction

Error Type	Error Code	Error Condition	Troubleshooting
OUT1 Excess Load Current Error		Output 1 load current is more than 125 mA	Turn power off and check the cause of overload current or lower the current load under 125 mA, then restart.
			
OUT2 Excess Load Current Error		Output 2 load current is more than 125 mA	
			
Zero Adjustment Error		The instant flow is within ±10% F.S. of the zero point.	Perform the zero clear function again under no flow conditions.
		The pressure value is over ±3% F.S. of the zero point.	Perform the zero clear function again under no pressure conditions.
System Error		Memory error	Turn power off, and then restart. If error condition remains, please return to factory for inspection.
		Internal data error	
		Internal data error	
		System parameter error	
Applied Flow/Pressure Error		The instant flow has exceeded the upper limit of the flow display range.	Reduce the flow to the display range.
		The pressure has exceeded the upper limit of the pressure display range.	Reduce the pressure to the display range.
		The instant flow has exceeded the lower limit of the flow display range.	Ensure the flow is in the correct direction.
		The pressure has exceeded the lower limit of the pressure display range.	Reduce the pressure to the display range.

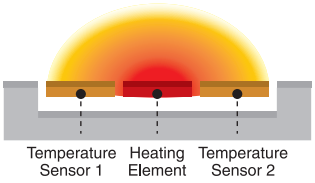
5 Specifications

Model				005	010	050	100	500	101	201
Fluid				Dry air, N_2, Non-corrosive / Non-flammable gas						
Sensor Element	Flow	Measured flow rate range		0 ~ 500 mL/min	0 ~ 1000 mL/min	0 ~ 5 L/min	0 ~ 10 L/min	0 ~ 50 L/min	0 ~ 100 L/min	0 ~ 200 L/min
		Flow Direction		Unidirection						
	Pressure	Rated Pressure Range		-90 ~ 800 kPa						
Display	4 digital * 4 digital, 7 segment LCD display (Red / Green / Orange)									
	Instant Flow Rate	Display Range		0 ~ 500 mL/min	0 ~ 1000 mL/min	0 ~ 5.00 L/min	0 ~ 10.00 L/min	0 ~ 50.0 L/min	0 ~ 100.0 L/min	0 ~ 200 L/min
		Minimum Setting Scale	LPM	1 mL/min	1 mL/min	0.01 L/min	0.01 L/min	0.1 L/min	0.1 L/min	1 L/min
			CFM *1	0.01 ft^3/min	0.01 ft^3/min	0.1 ft^3/min	0.1 ft^3/min	1 ft^3/min	1 ft^3/min	1 ft^3/min
	Accumulated Flow	Display Range		99999999 mL	99999999 mL	999999.99 L	999999.99 L	9999999.9 L	9999999.9 L	99999999 L
		Minimum Setting Scale *1		1 mL	1 mL	0.01 L	0.01 L	0.1 L	0.1 L	1 L
				0.01 ft^3	0.01 ft^3	0.1 ft^3	0.1 ft^3	1 ft^3	1 ft^3	1 ft^3
	Pressure Display	Display Range		-100 ~ 1000 kPa						
		Minimum Setting Scale	kPa	1						
			kfg/cm^2	0.01						
			bar	0.01						
			psi	0.1						
Accuracy	Flow	Guaranteed Range		2 ~ 100 % F.S.						
		Indicator Accuracy		± 3% F.S. ± 1 digit *2						
		Analog Output Accuracy		± 5% F.S. *2						
		Repeatability		± 1% F.S. ± 1 digit *3						
		Linearity		± 3% F.S. *3						
		Temp. Characteristic		± 2% F.S. (15 ~ 35°C) ; ± 5% F.S. (0 ~ 15°C ， 35 ~ 50°C) (compare with *3)						
		Pressure Characteristic		± 5% F.S. ± 1 digit *4						
	Pressure	Guaranteed Range		0 ~ 100 % F.S.						
		Indicator Accuracy		± 2% F.S. ± 1 digit *5						
		Analog Output Accuracy		± 2.5% F.S. *5						
		Repeatability		± 0.2% F.S. ± 1 digit *5						
		Linearity		± 1% F.S. *5						
		Temp. Characteristic		± 2% F.S. (compare with *5)						
Switch Output	2NPN : open collector 2 outputs Max. Load Current : 125 mA Max. Supply Voltage : 28 V DC Voltage Drop : ≤ 1.5 V						2PNP : open collector 2 outputs Max. Load Current : 125 mA Max. Supply Voltage : 24 V DC Voltage Drop : ≤ 1.5 V			
	Response Time	Flow		800 ms (50 ms, 80 ms, 120 ms, 200 ms, 400 ms, 1500 ms selectable)						
		Pressure		2.5 ms (25 ms, 100 ms, 250 ms, 500 ms, 1000 ms, 1500 ms selectable)						
	Output Mode	Flow		Hysteresis Mode, Window Comparator Mode, Accumulated Output, Accumulated Pulse Output						
		Pressure		One Point Set Mode, Hysteresis Mode, Window Comparator Mode						
	Hysteresis			Adjustable						
	Output Short Circuit Proterction			Yes						
	Accumulated Pulse Output *1			5 mL/Pulse	10 mL/Pulse	0.05 L/Pulse	0.1 L/Pulse	0.5 L/Pulse	1 L/Pulse	2 L/Pulse
				0.02 ft^3/Pulse	0.04 ft^3/Pulse	0.2 ft^3/Pulse	0.4 ft^3/Pulse	2 ft^3/Pulse	4 ft^3/Pulse	7 ft^3/Pulse
Analog Output	Voltage Output			Voltage Output Range : 1 ~ 5 V *6 Output Impedance : 1 kΩ						
	Current Output			Voltage Output Range : 4 ~ 20mA *6 Load Impedance : ≤ 300 Ω						
	Response Time			Pressure : ≤ 50 ms ; Flow : ≤ 100 ms						
External Input				Non-voltage input , < 0.4 V , ≥ 30 ms						
Communication interface				RS-485 *7						
Power	Power Supply Voltage			12 ~ 24V DC ± 10 % ， Ripple (P-P) ≤ 10 %						
	Current Consumption			≤ 50 mA						
Environment	Withstand Pressure			1000 kPa						
	Enclosure			IP40						
	Working Fluid Temp.			0 ~ 50°C (No condensation or freezing)						
	Ambient Temp. Range			Operation : 0 ~ 50°C ; Storage : -10 ~ 60°C (No condensation or freezing)						
	Ambient Humidity Range			Operation / Storage : 35 ~ 85 % R.H. (No condensation)						
	Insulation Resistance			≥ 50 MΩ (500V DC , between case and lead wire)						
	Withstand Voltage			1000V AC 1-min (between case and lead wire)						
	Vibration			Total amplitude 1.5 mm or 10 G, 10Hz - 55Hz - 10Hz scan for 1 minute, 2 hours each direction of X, Y and Z						
	Shock			100 m/s^2 (10 G) , 3 times each in direction of X, Y and Z						
	EMC			IEC 61000-6-2, IEC 61000-6-4						
Lead Wire				Ø4 Oil-resistance cable - 26 AWG (0.15 mm^2) - 6 cores						
Port Size	Ø6 mm One-Touch Fitting			●	●	●	●	●		
	Ø8 mm One-Touch Fitting								●	●
Weight (with 2 Meter Lead Wire)				Approx. 107 g (Ø6 port) ; Approx. 110.5 g (Ø8 port)						

NOTE :
1 : CFM (ft^3/min10^{-2}) and ft^3*10^{-2}.
*2 : CONDITION : Inlet Pressure : 300 kPa , Outlet Pressure : 1 atmospheric pressure, 25 °C.
*3 : CONDITION : Outlet Pressure : 1 atmospheric pressure, 25 °C.
*4 : -90 ~ 800 kPa, Outlet Pressure : 1 atmospheric pressure, 25 °C.
*5 :Outlet flow rate = 0 L/min, 25 °C.
*6 : PWM output, corresponding to pressure sensor 0 ~ 1000 kPa.
*7 : This function only available for Output Specification -02 and -04.

6 Thermal Mass Flow Sensor Principles

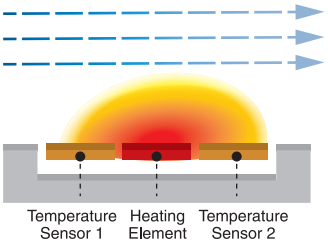
Symmetric Temperature Profile No Flow



(a) : No Flow

In the absence of flow, the heat from the heater spreads evenly left and right, so the temperature distribution is like (a).

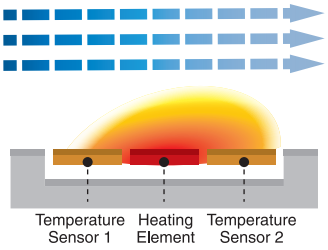
Skewed Temperature Profile Small Flow



(b) : Small Flow

When flow begins, the inlet side is cooled by the flow, the outlet side is warmed by the heat of the inlet side of the heater, and the temperature distribution is like (b).

Skewed Temperature Profile Large Flow



(c) : Large Flow

When the flow increases, it becomes a distribution like (C). Since the temperature distribution before and after the heater is proportional to the flow rate, the flow rate can be determined from the ratio.

7 ORDERING INFORMATION

KFP01 - 005 - 010 - R6

Flow Rate Range

005 : 500 mL/min
010 : 1000 mL/min
050 : 5 L/min
100 : 10 L/min
500 : 50 L/min
101 : 100 L/min
201 : 200 L/min

Output Specifications

010 : 2 NPN output + Analog output 1~5V
011 : 2 NPN output + Analog output 4~20mA
02 : 2 NPN output + RS485
030 : 2 PNP output + Analog output 1~5V
031 : 2 PNP output + Analog output 4~20mA
04 : 2 PNP output + RS485

Port Size

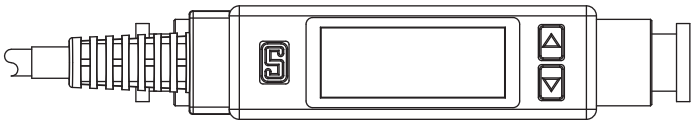
R6 : Ø6 mm, for Flow Rate Range 005, 010, 050, 100, 500.
R8 : Ø8 mm, for Flow Rate Range 101, 201.

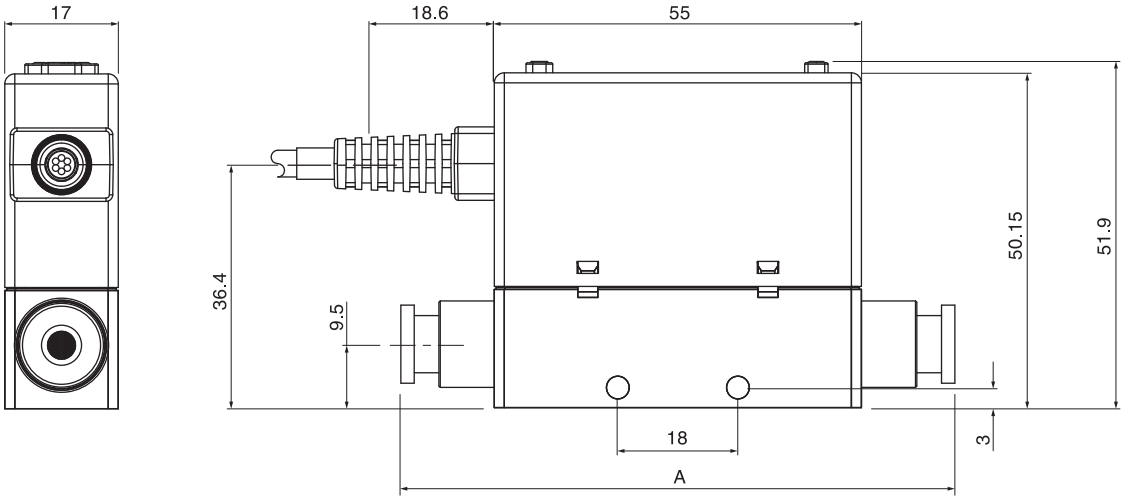
Optional Parts

BT-26 : Mounting bracket

7 Dimensions

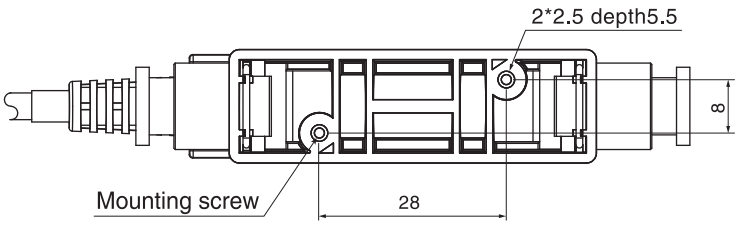
1.Product





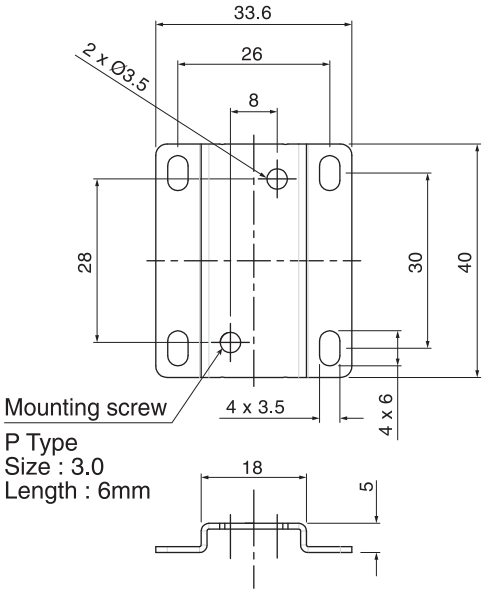
A	
Ø 8	92.1
Ø 6	82.9

(mm)



P Type
Size : 3.0
Length : 6mm

2.Mounting Bracket



P Type
Size : 3.0
Length : 6mm

Unit : mm

8 Construction