

## For your safety, please read the following before using.

- ① Suggest to connect, install, and set up by professional technicians.
- ② Do not use corrosive or flammable gas or liquid with this product.  
Please use within the rating pressure range. Do not apply pressure beyond recommended maximum withstand pressure, permanent damage to the pressure sensor may occur.
- ③ Do not drop, hit or allow excessive shock. Even if switch body appears undamaged, internal components may be broken and can cause malfunction.
- ④ Turn power off before connecting wiring. Wrong wiring or short circuit will damage and / or cause malfunction.
- ⑤ Do not use in environment containing steam or oil vapor.
- ⑥ This product is not explosion-proof rated. Do not use in atmosphere containing flammable or explosive gases.
- ⑦ Wiring for pressure sensor should avoid power source line and high voltage line. If use in the same circuit, noise may cause malfunction.
- ⑧ Sensors at end-of-life must be disposed of in accordance with E-Waste regulations of the country/region, NOT disposed of with regular garbage.

## A SPECIFICATIONS

MODEL		KP48E
Rated pressure range		-101.3 ~ 1000.0 kPa
Set pressure range		-101.3 ~ 1000.0 kPa
Withstand pressure		1500 kPa
Fluid		Filtered air, Non-corrosive / Non-flammable gas
Set Pressure Resolution	kPa	0.1
	kgf/cm <sup>2</sup>	0.001
	bar	0.001
	psi	0.01
	inHg	0.1
	mmHg	1
	mmAq (mmH <sub>2</sub> O)	1 (※1)
Power supply voltage		15 ~ 24 V DC · Ripple (P-P) ≤ 10 %
Current consumption		≤ 40 mA (With no load)
Switch output		2 NPN : open collector 2 outputs Max. load current : 150 mA Max. supply voltage : 30 V DC Residual voltage : ≤ 1 V 2 PNP : open collector 2 outputs Max. load current : 150 mA Max. supply voltage : 24 V DC Residual voltage : ≤ 1 V
Repeatability (※2)		± 0.2% S.R. (Ambient temperature 25±3°C)
Hysteresis	One point set mode	Adjustable (※3)
	Hysteresis mode	
	Window comparator mode	
Response time of digital filter (※4)		oFF, 25 ms, 100 ms, 250 ms, 500 ms, 1000 ms, 1500 ms, 3000 ms selectable
Overcurrent protection		Yes
Display		4 ½ digital, 7 segment LCD display ( Red / White / Pink / Orange ) Sampling rate : 0.2, 0.5, 1 sec. / time selectable
Indicator accuracy (※2)		<b>C</b> -100.0 ~ 100.0 kPa ± 1 % S.R. <b>P</b> -100.0 ~ 1000.0 kPa ± 0.5 % S.R. <b>V</b> -101.3 ~ 0.0 kPa ± 1 % S.R. <b>A</b> -101.3 ~ 1000.0 kPa ± 0.5 % S.R. (Ambient temperature 25±3°C)
Switch on indicator		Orange indicator 1 : OUT1 & Orange indicator 2 : OUT2
Analog output (Voltage output)		Output voltage : 0 ~ 10 V ± 0.5 % F.S. Linearity : ± 0.5 % F.S. Output impedance : about 2 kΩ
Analog output (Current output)		Output current : 4 ~ 20 mA ± 0.5 % F.S. Linearity : ± 0.5 % F.S. Max. load impedance : 250Ω at power supply of 15V 600Ω at power supply of 24V Min. load impedance : 5 Ω
Environment	Enclosure	IP40
	Ambient temp. range	Operation : 0 ~ 50°C · Storage : -10 ~ 60°C (No condensation or freezing)
	Ambient humidity range	Operation/Storage : 35 ~ 85 % RH (No condensation)
	Withstand voltage	1000V AC in 1-min. (between case and lead wire)
	Insulation resistance	≥ 50 MΩ (at 500V DC) (between case and lead wire)
	Vibration	Double amplitude 1.5 mm or 10G, 10Hz ~ 150Hz ~ 10Hz (1-minute sweep), 2 hours each in X, Y, and Z axes
Shock		100 m/s <sup>2</sup> ( 10 G ), 3 times each in direction of X, Y and Z
Temperature characteristic		± 0.5 % F.S. of detected pressure (25°C) at temp. (Range of 0 ~ 50°C)
Communication Interface (※5)		RS485 Modbus RTU
Port size		F1 : R1/8, M5 ; F3 : G1/8 ( BSPP ), M5 ; M5 : M5 female thread
Lead wire		Ø4 PVC - 26 AWG ( 0.15 mm <sup>2</sup> ) - 5 cores
Weight		Approx. 67g (with 2 meter lead wire)

- ※ 1. In mmAq, actual value equals displayed value × 10.  
 ※ 2. S.R.: Set range  
 ※ 3. Hysteresis value is adjustable within 1 ~ 8 digits for one point set mode and window comparator mode.  
 ※ 4. When digital filter function is OFF, the response time is 4ms ~ 6ms.  
 ※ 5. This function is only available for Output Specification 02R and 04R.

## B ORDERING INFORMATION

**K P 4 8 E - 0 1 0 - F 1**

### Output Specifications

010 : 2 NPN Output & Analog Output ( 0 ~ 10 V )  
 011 : 2 NPN Output & Analog Output ( 4 ~ 20 mA )  
 030 : 2 PNP Output & Analog Output ( 0 ~ 10 V )  
 031 : 2 PNP Output & Analog Output ( 4 ~ 20 mA )  
 02R : 1 NPN Output + RS485  
 04R : 1 PNP Output + RS485

### Pressure Port

F1 : R1/8, M5  
 F3 : G1/8 ( BSPP ), M5  
 M5 : M5 female thread

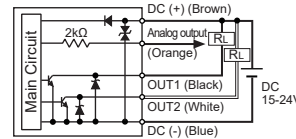
### Optional Parts

BT-22 : Mounting bracket PA-C : Panel adapter  
 BT-23 : Mounting bracket PA-D : Panel adapter + Front protective lid

## C OUTPUT CIRCUIT WIRING DIAGRAMS

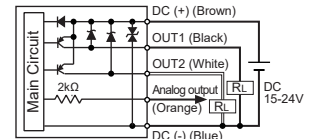
### KP48E - 010 - □

2 NPN + Analog Output ( 0 ~ 10 V )



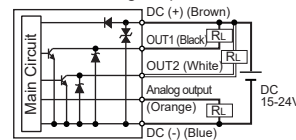
### KP48E - 030 - □

2 PNP + Analog Output ( 0 ~ 10 V )



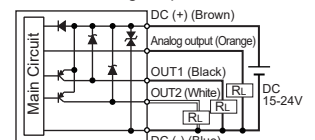
### KP48E - 011 - □

2 NPN + Analog Output ( 4 ~ 20 mA )



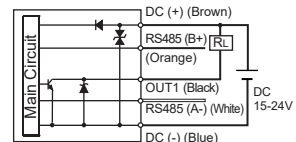
### KP48E - 031 - □

2 PNP + Analog Output ( 4 ~ 20 mA )



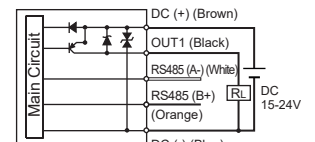
### KP48E - 02R - □

1 NPN + RS485

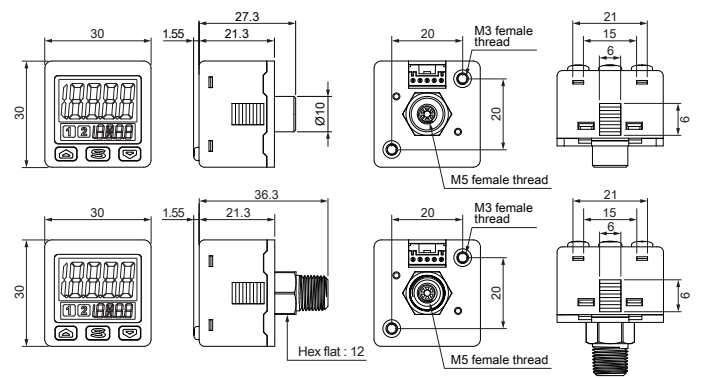


### KP48E - 04R - □

1 PNP + RS485



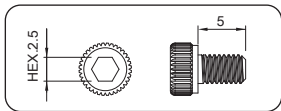
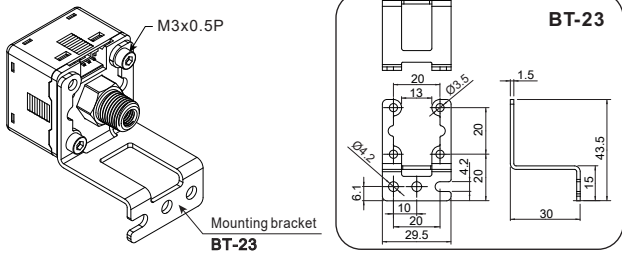
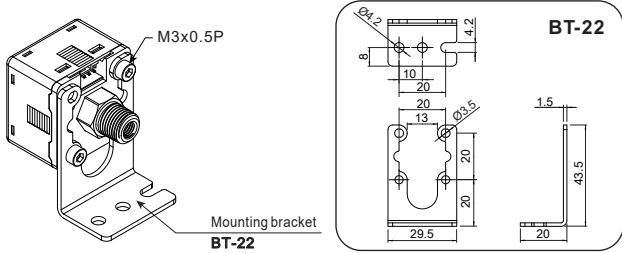
## D DIMENSIONS



Unit : mm

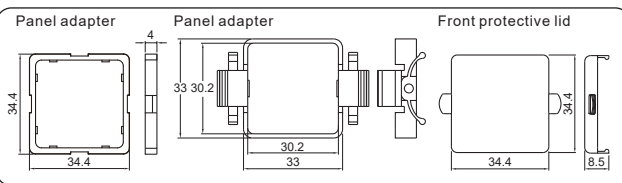
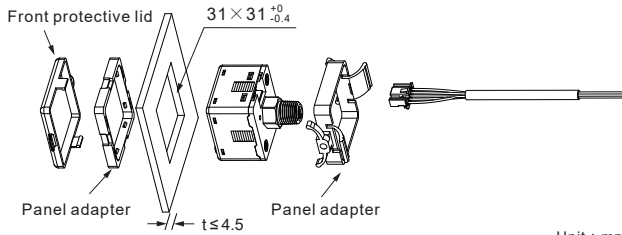
## E OPTIONAL PARTS DIMENSIONS

### ① Mounting bracket

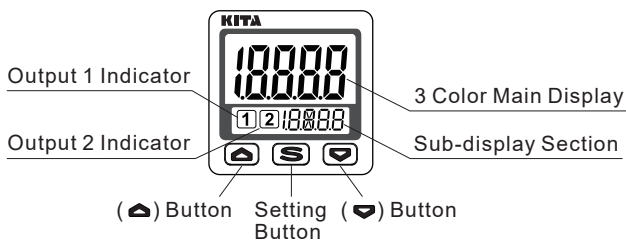


**Caution :**  
 ※1. Use 2.5 mm hexagonal wrench.  
 ※2. The length of screw should be 5mm.  
 ※3. Tightening torque 5 kgf · cm

### ② Panel Mounting

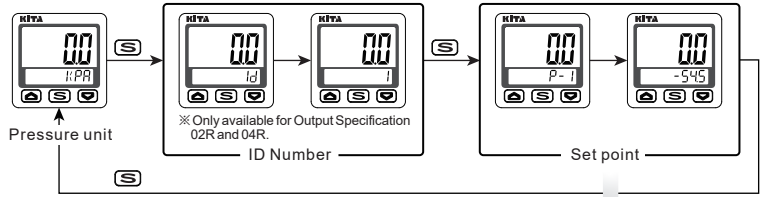


## F PANEL DESCRIPTION



## G SUB-DISPLAY DISPLAY SETTING

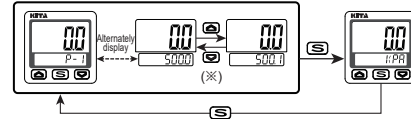
In measure mode (※), press (S) button to switch pressure unit / ID number / set point, and set the set point. ※ KP48E is power-on and not in the function setting or checking state.



### Setting Condition 1

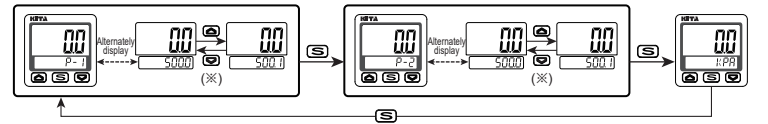
OUT 1 : " oP5 " (One point set mode)  
 OUT 2 : " oFF " (Not used)

※ Press (▲) or (▼) button to adjust set value.



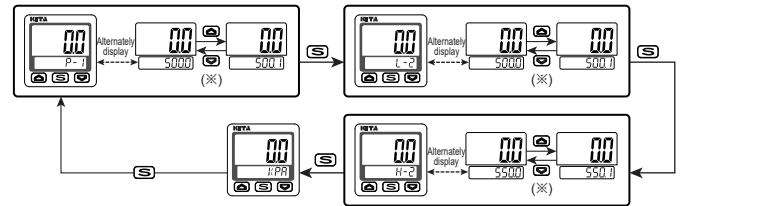
### Setting Condition 2

OUT 1 : " oP5 " (One point set mode)  
 OUT 2 : " oP5 " (One point set mode)



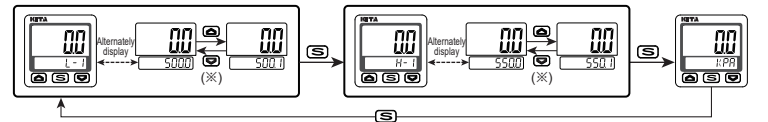
### Setting Condition 3

OUT 1 : " oP5 " (One point set mode)  
 OUT 2 : " HYS " (Hysteresis mode) or " Win " (Window comparator mode)



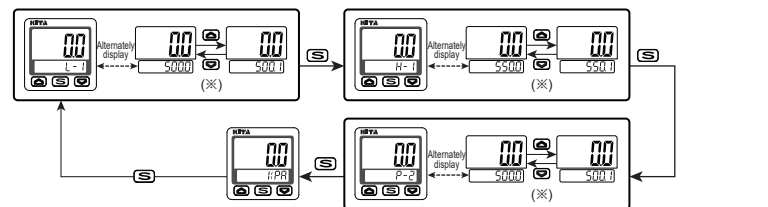
### Setting Condition 4

OUT 1 : " HYS " (Hysteresis mode) or " Win " (Window comparator mode)  
 OUT 2 : " oFF " (Not used)



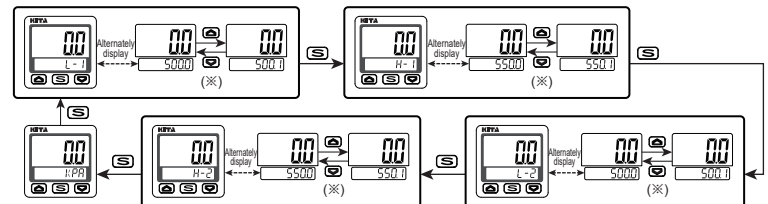
### Setting Condition 5

OUT 1 : " HYS " (Hysteresis mode) or " Win " (Window comparator mode)  
 OUT 2 : " oP5 " (One point set mode)



### Setting Condition 6

OUT 1 : " HYS " (Hysteresis mode) or " Win " (Window comparator mode)  
 OUT 2 : " HYS " (Hysteresis mode) or " Win " (Window comparator mode)

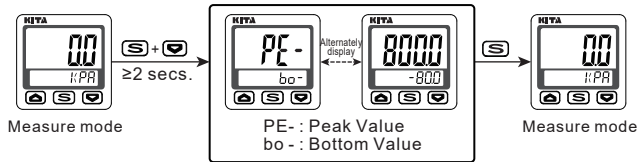


## H ZERO POINT SETTING

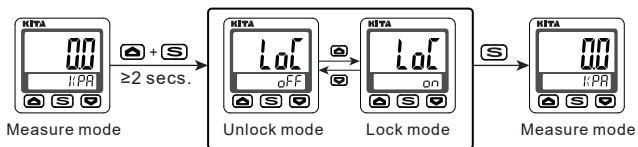
Press the **↵** + **⏻** button at the same time until the "00" is shown.



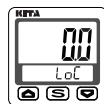
## I PEAK/BOTTOM HOLD FUNCTION



## J KEY LOCK/UNLOCK MODE



- Use key lock mode to prevent unauthorized or accidental tampering setting values.
- When lock mode is selected, panel will display "LoL".



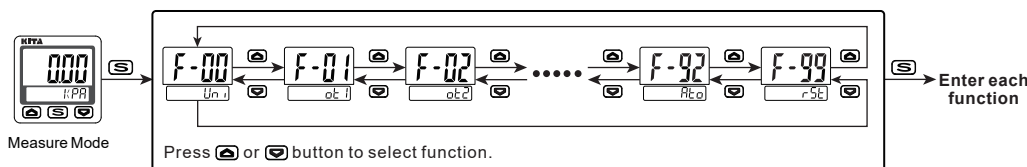
## K ERROR CODE INSTRUCTION

Error Type	Error Code	Error Condition	Troubleshooting
Excess load current error	Er 1	Output 1 load current is more than 150 mA	Turn power off and check the cause of overload current or lower the current load under 150 mA, then restart.
	Er 2	Output 2 load current is more than 150 mA	
Residual pressure error	Er 3	During zero point setting, ambient pressure is over ±3% F.S.	Change input pressure to ambient pressure and perform zero point setting again.
Applied pressure error	HHH	Supply pressure exceeds the upper limit of pressure setting.	Adjust the pressure within operating pressure range.
System error	Er 4	Internal system error	Turn power off, and then restart. If error condition remains, please return to factory for inspection.
	Er 5	Internal system error	
	Er 6	Internal data error	
	Er 7	Internal data error	

## N OPERATION INSTRUCTIONS

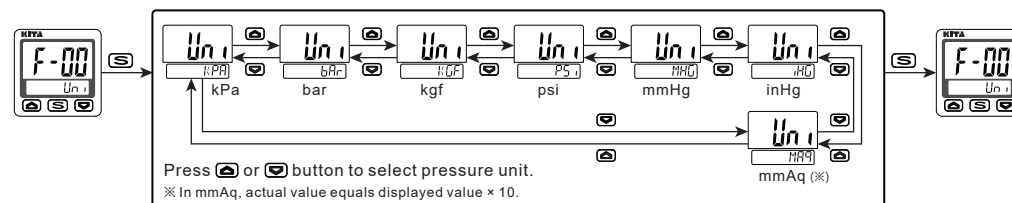
### Function Selection

In Measure Mode, press **↵** button for more than 3 sec. to display [ F-00 ] [ Un ].  
Press **↵** for 3 sec. to return to Measure Mode.



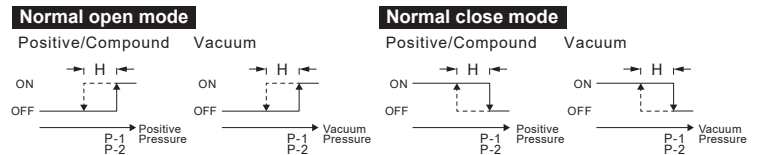
### [ F-00 ] Unit Setting

Press **↵** or **⏻** button at Function Selection to [ F-00 ] [ Un ].

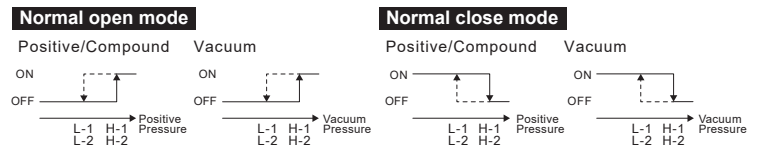


## L OUTPUT MODE

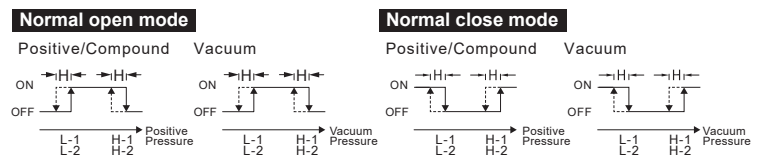
### (1) One point set mode :



### (2) Hysteresis mode :



### (3) Window comparator mode :



- [ 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.

## M PRESSURE UNIT CONVERSION TABLE

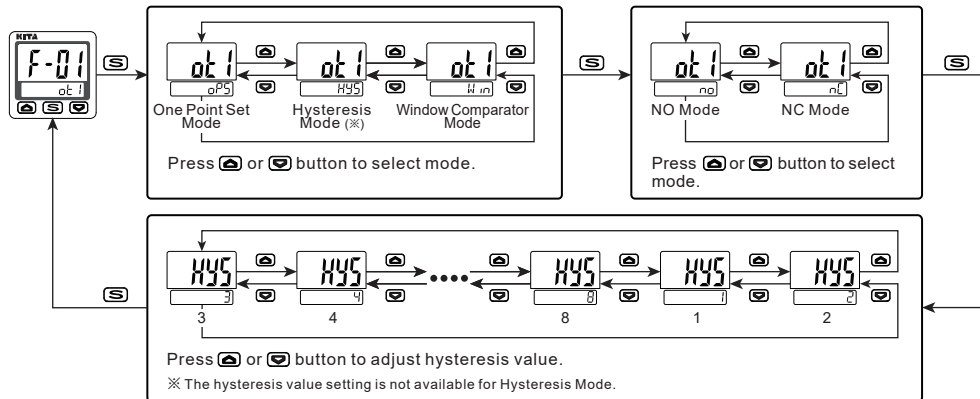
From	To	kPa	kgf/cm <sup>2</sup>	mmHg	psi	bar	inHg	mmAq
1 kPa	1	0.010197	7.500616	0.145038	0.010000	0.2953	101.97	
1 kgf/cm <sup>2</sup>	98.0665	1	735.559	14.2233	0.980665	28.95979	10000	
1 mmHg	0.13332	0.0013595	1	0.019336	0.0013332	0.039370	13.595	
1 psi	6.895	0.07031	51.7157	1	0.06895	2.036074	703.1	
1 bar	100.0000	1.01972	750.062	14.5038	1	29.52998	10197.2	
1 inHg	3.386388	0.034530	25.40000	0.491141	0.033863	1	345.30	
1 mmAq	0.009806	0.0001	0.0735559	0.001423	0.000098	0.0029	1	

※ In mmAq, actual value equals displayed value × 10.

## N OPERATION INSTRUCTIONS

### [ F-01 ] OUT1 Setting

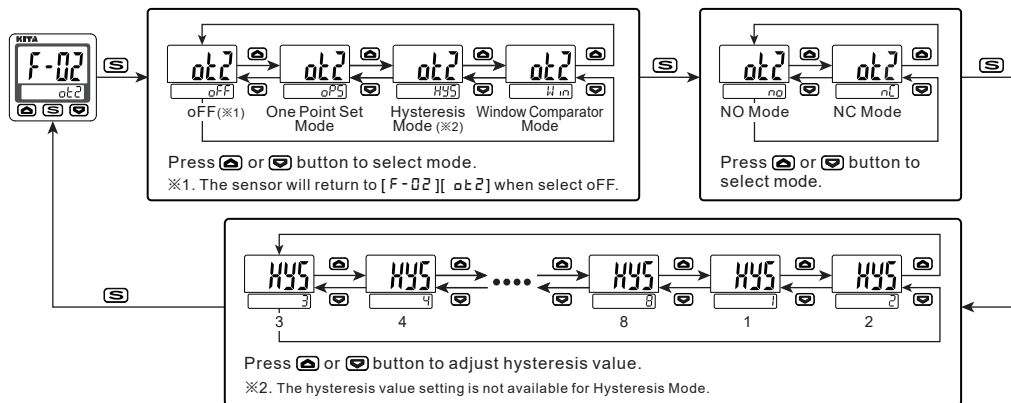
Press or button at Function Selection to [ F-01 ] [ oE1 ].



### [ F-02 ] OUT2 Setting

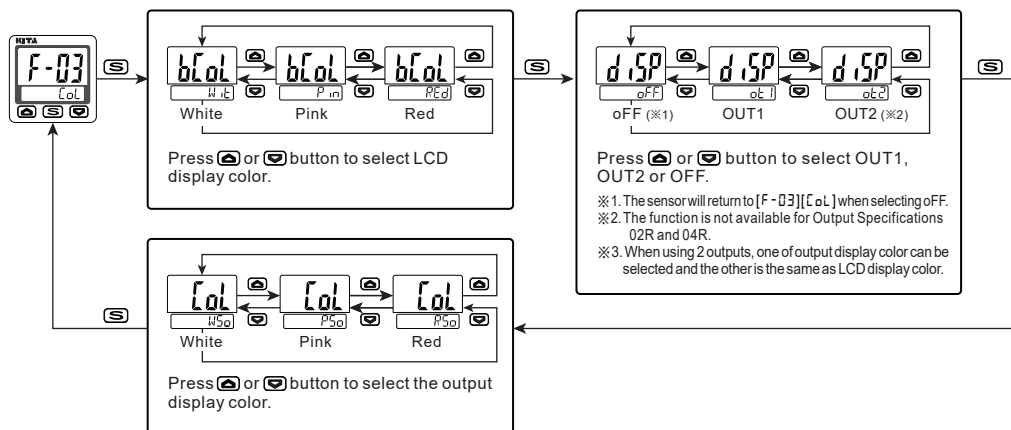
※ Not available for Output Specification 02R and 04R.

Press or button at Function Selection to [ F-02 ] [ oE2 ].



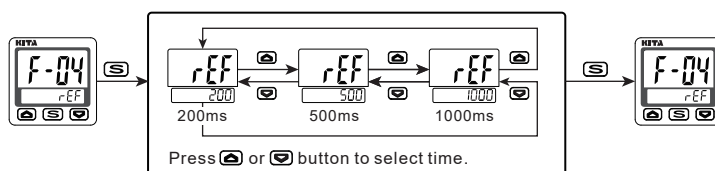
### [ F-03 ] LCD Display Color Setting

Press or button at Function Selection to [ F-03 ] [ CoL ]. The color of LCD display and output display can be different.



### [ F-04 ] Sampling Rate Setting

Press or button at Function Selection to [ F-04 ] [ rEF ].

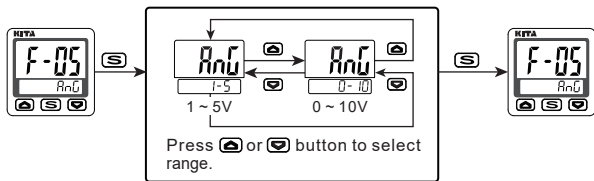


## N OPERATION INSTRUCTIONS

### [ F-05 ] Voltage Analog Output Range Setting

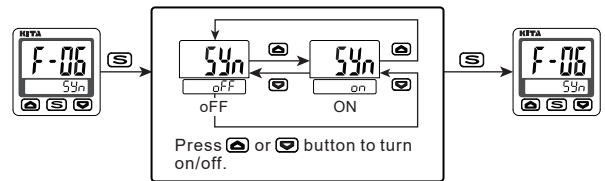
※ The function is not available for analog current output and Modbus.

Press or button at Function Selection to [ F-05 ] [ RnG ].



### [ F-06 ] Output & Display Sync

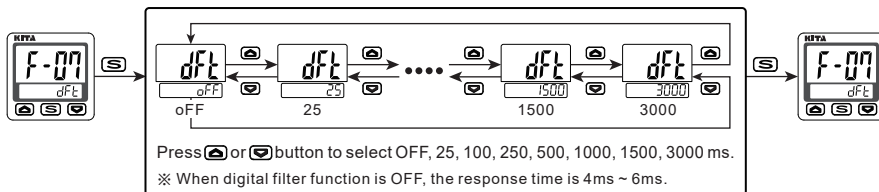
Press or button at Function Selection to [ F-06 ] [ Szn ].



※ When turning on the sync function, the value of analog output and switch output will be the same as display value.

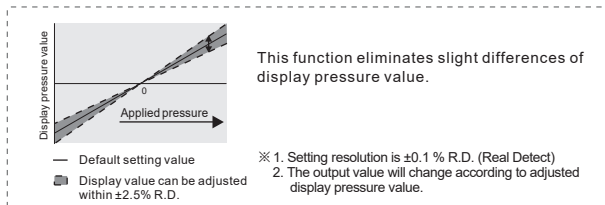
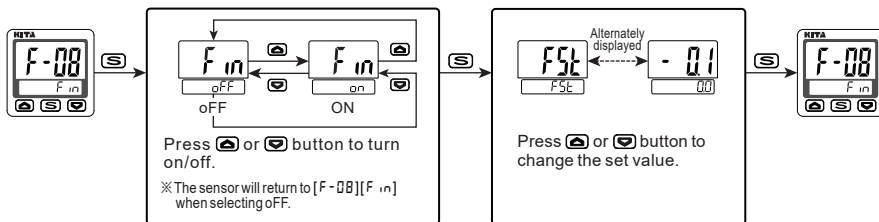
### [ F-07 ] Response Time of Digital Filter Setting

Press or button at Function Selection to [ F-07 ] [ dFt ].



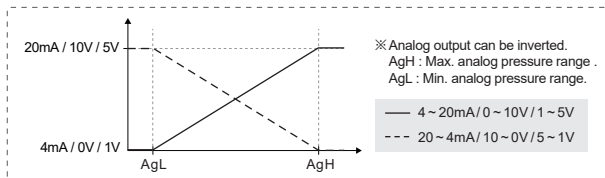
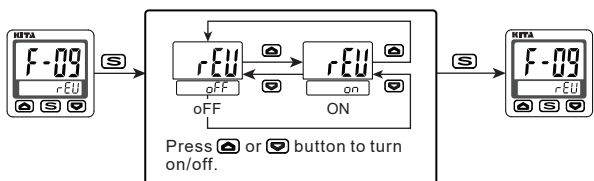
### [ F-08 ] Fine Adjustment Setting

Press or button at Function Selection to [ F-08 ] [ F.in ].



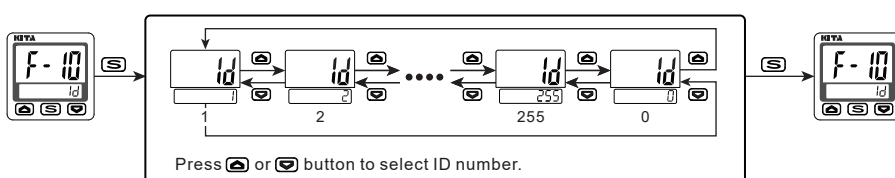
### [ F-09 ] Invert Analog Output Setting

Press or button at Function Selection to [ F-09 ] [ rEU ].



### [ F-10 ] RTU ID Number Setting

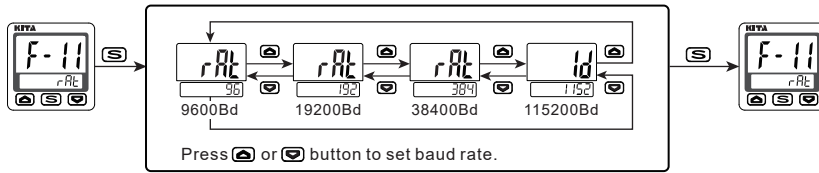
Press or button at Function Selection to [ F-10 ] [ Id ].



## N OPERATION INSTRUCTIONS

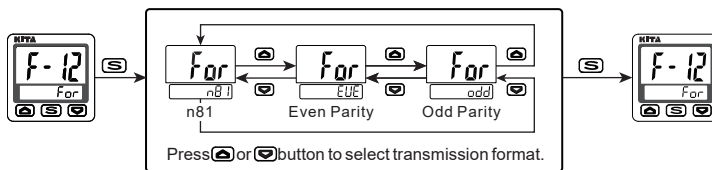
### [ F-11 ] RTU Baud Rate Setting

Press **[S]** or **[M]** button at Function Selection to [ F-11 ] [ rAL ].



### [ F-12 ] RTU Transmission Format Setting

Press **[S]** or **[M]** button at Function Selection to [ F-12 ] [ For ].

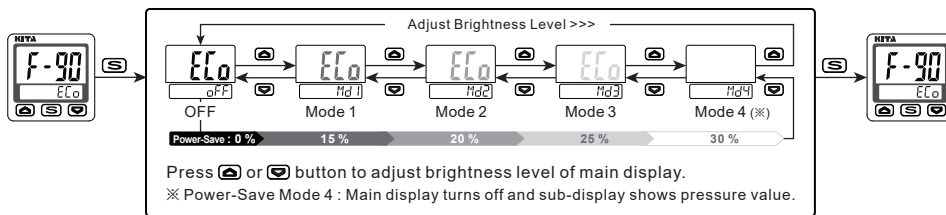


### [ F-90 ] Power-Save Mode Setting

Press **[S]** or **[M]** button at Function Selection to [ F-90 ] [ Eco ].

When Power-Save Mode turns on,

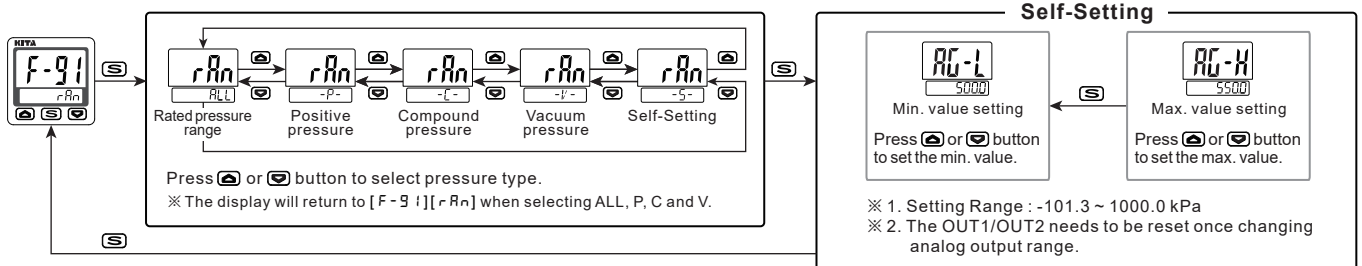
1. the main-display will be into the selected mode (Mode1 ~ 4), if no buttons are pressed after 30 seconds.
2. the output indicator may not sync, but the sensor still work functionally.
3. press any button back to measure mode.



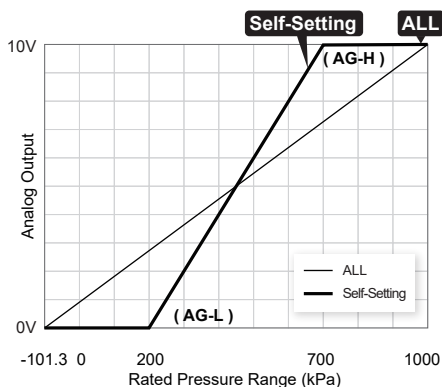
### [ F-91 ] Analog Output Range Setting

※ Not available for Output Specification 02R and 04R.

Press **[S]** or **[M]** button at Function Selection to [ F-91 ] [ rAn ].



Example:



Output mode	Set point	ALL Rated pressure	P Positive pressure	V Vacuum pressure	C Compound pressure	S Self-Setting	
OPS		500.0	500.0	-50.0	50.0	500.0	
Win H		550.0	550.0	-55.0	55.0	550.0	
Win L		500.0	500.0	-50.0	50.0	500.0	
Hys H		550.0	550.0	-55.0	55.0	550.0	
Hys L		500.0	500.0	-50.0	50.0	500.0	
Analog Output Range Setting		ALL (Rated pressure)	-101.3 ~ 1000.0	P (Positive pressure)	-100.0 ~ 1000.0	V (Vacuum pressure)	-101.3 ~ 0.0
		C (Compound pressure)	-100.0 ~ 100.0	S (Self-Setting)	AG-L ~ AG-H		

Pressure Unit : kPa

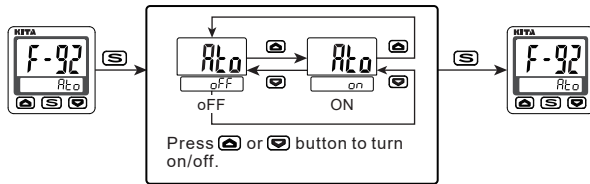
Default set point :

Output mode	Set point	ALL Rated pressure	P Positive pressure	V Vacuum pressure	C Compound pressure	S Self-Setting
OPS		500.0	500.0	-50.0	50.0	500.0
Win H		550.0	550.0	-55.0	55.0	550.0
Win L		500.0	500.0	-50.0	50.0	500.0
Hys H		550.0	550.0	-55.0	55.0	550.0
Hys L		500.0	500.0	-50.0	50.0	500.0

## N OPERATION INSTRUCTIONS

### [ F-92 ] Auto Zero Point Setting

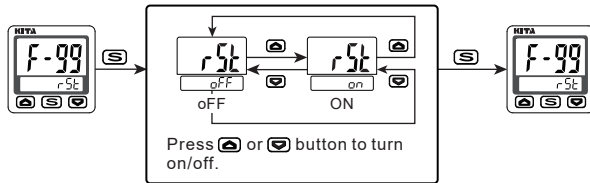
Press or button at Function Selection to [ F-92 ] [ Rto ].



- ※ 1. When the setting turns on, the display value will be 0 automatically every 10 secs and not be recorded after power off, then will be 0 automatically after supplying power again.
- ※ 2. The auto zero range is  $\pm 1\%$  F.S.

### [ F-99 ] Reset to the Default Setting

Press or button at Function Selection to [ F-99 ] [ rSt ].



## O COMMUNICATION PROTOCOL (Modbus RTU)

Function Code	Description	Operation
0000	ID Number ( Range : 0 ~ 255 )	Read Write
0001	Pressure type ( 0 : ALL )	Read
0002	Pressure value ( Range : -32768 ~ 32767 )	Read
0003	Unit setting ( 0 : kPa , 1 : kgf/cm <sup>2</sup> , 2 : bar , 3 : psi , 4 : inHg , 5 : mmHg , 7 : mmAq )	Read Write
0004	Decimal place ( Range : 0 ~ 4 )	Read
0005	Switch output mode ( 0 : OPS , 1 : HYS , 2 : WIN )	Read Write
0006	Switch output mode ( 0 : NO , 1 : NC )	Read Write
0007	Response time of digital filter ( 0 : 5ms , 1 : 25ms , 2 : 100ms , 3 : 250ms , 4 : 500ms , 5 : 1000ms , 6 : 1500ms , 7 : 3000ms )	Read Write
0008	Display color selection ( 0 : White , 1 : Red , 2 : Pink )	Read Write
0009	Hysteresis value ( Range : 0 ( 1 digit ) ~ 7 ( 8 digits ) )	Read Write
000A	Power-Save mode ( 0 : OFF , 1 : Mode 1 , 2 : Mode 2 , 3 : Mode 3 , 4 : Mode 4 )	Read Write
000B	Fine adjustment ( Range : -25 ( -2.5% ) ~ 25 ( 2.5% ) )	Read Write
000C	Baud rate ( 0 : 9600 bps , 1 : 19200 bps , 2 : 38400 bps , 3 : 115200 bps )	Read Write

Function Code	Description	Operation
000D	Transmission format ( 0 : None , 1 : Even , 2 : Odd )	Read Write
000E	Communications protocol ( 0 : RTU )	Read
000F	Reset to default setting ( 0 : ON )	Write
0010	Switch set point ( P-1 or L-1 ) ( Range : According to pressure type and unit )	Read Write
0011	Switch set point ( H-1 ) ( Range : According to pressure type and unit )	Read Write
0012	Switch output state ( 0 : OFF , 1 : ON )	Read
0013	Key lock/unlock mode ( 0 : Unlock , 1 : Lock )	Read Write
0014	Switch output type ( 0 : NPN , 1 : PNP )	Read
0015	Sampling rate ( 0 : 200ms , 1 : 500ms , 2 : 1000ms )	Read Write
0016	Zero point setting ( 0 : ON )	Write
0017	Auto zero point ( 0 : OFF , 1 : ON )	Read Write
0018	LCD display color output selection ( 0 : OFF , 1 : OUT1 )	Read Write
0019	Output LCD display color selection ( 0 : White , 1 : Red , 2 : Pink )	Read Write
0020	Output & Display sync ( 0 : OFF , 1 : ON )	Read Write

※ Each read command is limited to 10 registers maximum.