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

① Do not use corrosive or flammable gas or liquid with this product.

② 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 Please turn off the power before connecting the product to the circuit control system. The solenoid valve driver is without short-circuit protection. If the red wire and the black wire contact, a short circuit will cause the solenoid valve control switch to burn out to damage the product.

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 | | KP93 |
|---|---|---|
| Rated pressure range | | -100.0 ~ 100.0kPa |
| Set pressure range | | -105.0 ~ 105.0kPa |
| Withstand pressure | | 500kPa |
| Fluid | | Filtered Air, Non-corros / Non-flammable gas |
| Set pressure resolution | kPa | 0.1 |
| | kgf/cm² | 0.001 |
| | bar | 0.001 |
| | psi | 0.01 |
| | inHg | 0.1 |
| | mmHg | 1 |
| Power supply voltage | | 24V DC ±10%, Ripple (P-P) ≤ 10% |
| Current consumption | | ≤ 40 mA (With no load) |
| Switch output | | NPN or PNP open collector<br>Max. load current : 125 mA<br>Max. supply voltage : 24V DC<br>Residual voltage : ≤ 1.5V |
| Command input | | NPN type<br>Low-voltage input (Reed or Solid state),<br>Low level : 0.4V DC or less, 10 ms or longer input  —  PNP type<br>High-voltage input (Reed or Solid state),<br>High level : 20 ~24V DC, 10 ms or longer input |
| Solenoid valve max. load current | | 200mA@24V DC max. |
| Repeatability | | ±0.2% F.S. ±1 digit |
| Response time | | ≤ 2.5ms (chattering-proof function: 2.5ms, 20ms, 100ms,500ms, 1000ms and 1999ms selectable) |
| Output short circuit protection | | OUT : Yes , V-sol / D-sol : None |
| Display | | 3 ½ digit LED 7display (RED) (Sampling rate : 5 times / sec.) |
| Indicator accuracy | | ±2% F.S. ±1 digit |
| Switch on indicator | | OUT : Green , Command 1 V-Sol output : Red |
| Environment | Enclosure | IP40 |
| | Ambient temp. range | Operation:0 ~ 50℃, Storage:-10 ~ 60℃ (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 | ≥ 50MΩ (at 500V DC, between case and lead wire) |
| | Vibration | Total amplitude 1.5mm or 10G,10Hz-150Hz-10Hz scan for 1 minute, two hours each direction of X, Y and Z |
| | Shock | 980m/s²(100G), 3 times each in direction of X, Y and Z |
| Temperature characteristic | | ±2% F.S. of detected pressure (25℃) at temp. ( Range of 0 ~ 50℃ ) |
| Port | | L port / M5 port / None |
| Lead wire | | Ø4 Oil-resistance cable ( PVC ) - 26 AWG ( 0.15 mm² ) - 5 cores |
| Weight | | Approx. 58g (with 2 meter lead wire) |

## B  ORDERING INFORMATION

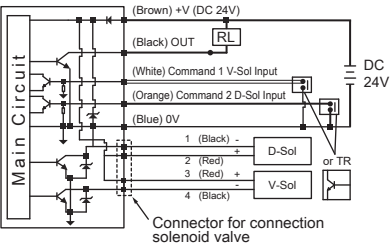**K P 9 3 - 0 1 - ☐**

**Output Specifications**

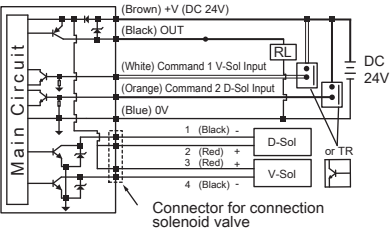01 : NPN Output
03 : PNP Output

**Piping Direction**

Blank : None
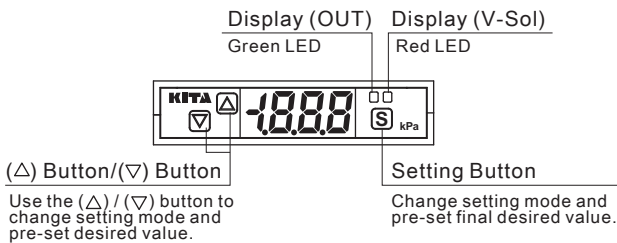L : L Port
M5 : M5 Port

## C  OUTPUT CIRCUIT WIRING DIAGRAMS

**KP93 - 01- ☐**
NPN Output



**KP93 - 03- ☐**
PNP Output



## D  PANEL DESCRIPTION



Display (OUT) — Green LED
Display (V-Sol) — Red LED

(△) Button/(▽) Button
Use the (△) / (▽) button to change setting mode and pre-set desired value.
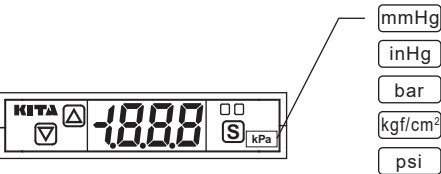
Setting Button
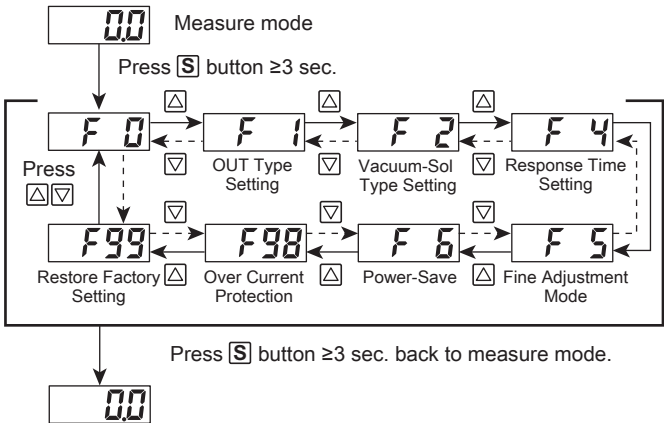Change setting mode and pre-set final desired value.

## E  CHANGE PRESSURE UNIT TAG

When the pressure setting is not kPa, please remove the pressure unit tag and place the selected tag on the indicated area of the faceplate to assure the pressure unit is not misemployed and that setting error does not occur.
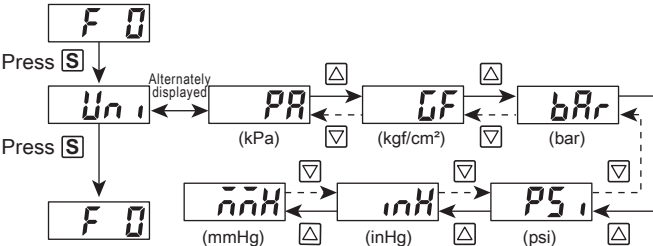


mmHg
inHg
bar
kgf/cm²
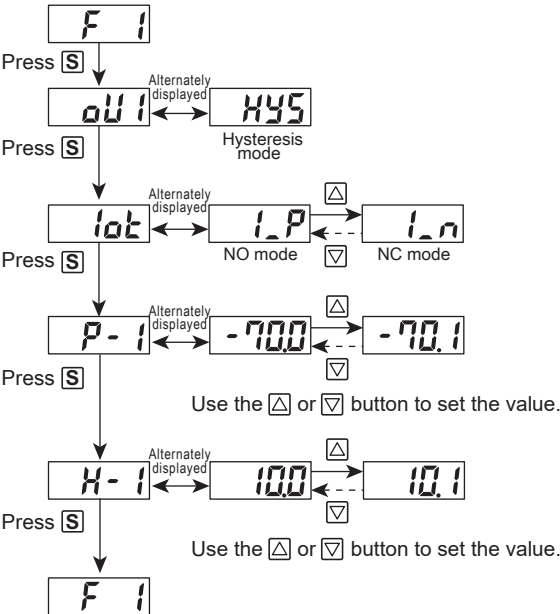psi

## F  BASIC SETTING MODE

**1** Function Selecting Mode



**0.0** Measure mode

Press **S** button ≥3 sec.

F 0 — Press △▽
F 1 — OUT Type Setting
F 2 — Vacuum-Sol Type Setting
F 4 — Response Time Setting
F 5 — Fine Adjustment Mode
F 6 — Power-Save
F 98 — Over Current Protection
F 99 — Restore Factory Setting

Press **S** button ≥3 sec. back to measure mode.

**0.0**

**2** Unit Setting (F0)



F 0
Press **S**
Un 1
Press **S**
F 0

Alternately displayed:
PA (kPa)
GF (kgf/cm²)
bAr (bar)
mmH (mmHg)
inH (inHg)
PS i (psi)

**3** OUT Type Setting (F1)



F 1
Press **S**
oU 1 ↔ HYS  Hysteresis mode
Press **S**
Iot ↔ 1_P (NO mode) / 1_n (NC mode)
Press **S**
P - 1 ↔ -70.0 / -70.1
Press **S**
Use the △ or ▽ button to set the value.
H - 1 ↔ 10.0 / 10.1
Press **S**
Use the △ or ▽ button to set the value.
F 1

## F  BASIC SETTING MODE

### 4  Vacuum-Sol Command Output Setting  (F2)

```
      F 2
```
Press S

Alternately displayed

```
2ot  ⟷  2.P  →  2.n
```
△ / ▽

NC solenoid valve    NO solenoid valve

Press S

Alternately displayed

```
X-2  ⟷  5.0  ←  5.1
```
△ / ▽

Use the △ or ▽ button to set the value.

Press S

Alternately displayed

```
X-3  ⟷  0.0  ←  0.1
```
△ / ▽

Use the △ or ▽ button to set the value.

Press S

Alternately displayed

```
X-4  ⟷  1.0  ←  1.1
```
△ / ▽

Use the △ or ▽ button to set the value.

```
      F 2
```

### 5  Response Time Setting  (F4)

```
      F 4
```
Press S

Alternately displayed

```
rES  ⟷  2.5  →  20  →  100
           (2.5ms)  (20ms)  (100ms)

       1999  ←  1000  ←  500
      (1999ms)  (1000ms)  (500ms)
```
△ / ▽

Press S

```
      F 4
```

### 6  Display Fine Adjustment Mode  (F5)

```
      F 5
```
Press S

Alternately displayed

```
F in  ⟷  oFF  →  on
            (*1)
```
△ / ▽

【NOTE：】(*1 ) When Fine adjustment setting to "oFF", end of this setting.

Press S

Alternately displayed

```
FSt  ⟷  0.0   Current measured value
```

Use △ or ▽ button to change the set value.

Press S

Alternately displayed

```
FSC  ⟷  0.0   Adjusted value (Percent)
```

Press S

This function eliminates slight differences in the numbers displayed.  Displayed values of the pressure sensor can be calibrated to within ±2.5% R.D.

±2.5% R.D.

Displayed pressure value

0

Applied pressure

— :Factory setting display value set prior to shipment

▨ :Display calibration range

```
      F 5
```

R.D. (Real Detect)
【NOTE：】 Setting resolution is ±0.1% R.D.

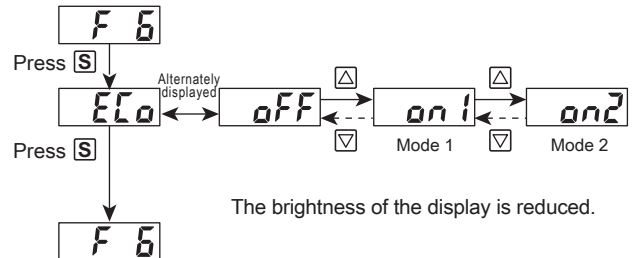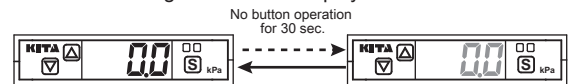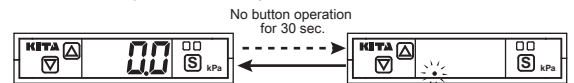### 7  Power-Save Mode  (F6)

◎ During Power-Save mode, the main display will turned off if no buttons is pressed after 30 seconds.

◎ During Power-Save mode, the output LCD may not be synchronize with the output. It is normal and will not affect output operation.

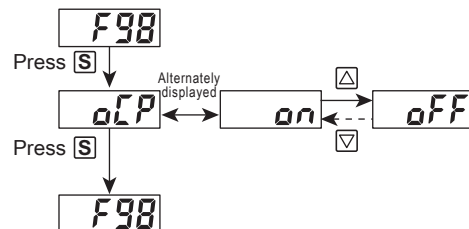◎ Press any button to turn-on main display temporarily.

```
      F 6
```
Press S

Alternately displayed

```
ECo  ⟷  oFF  →  on 1  ←  on2
```
△ / ▽

Mode 1    Mode 2

Press S

```
      F 6
```

The brightness of the display is reduced.

Mode 1 : The brightness of the display is reduced.

No button operation for 30 sec.

```
KITA  △▽  0.0  S  kPa  ⟷  KITA  △▽  0.0  S  kPa
```

Mode 2 : Only the decimal point flashes.

No button operation for 30 sec.

```
KITA  △▽  0.0  S  kPa  ⟷  KITA  △▽       S  kPa
```

### 8  Over Current Protection  (F98)

```
      F98
```
Press S

Alternately displayed

```
oCP  ⟷  on  ←  oFF
```
△ / ▽

Press S

```
      F98
```

### 9  Restore Factory Setting  (F99)

```
      F99
```
Press S

Alternately displayed

```
in i  ⟷  oFF  ←  on
```
△ / ▽

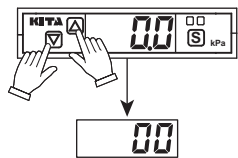Press S

```
      F99
```

Select "on" to restore to factory settings.
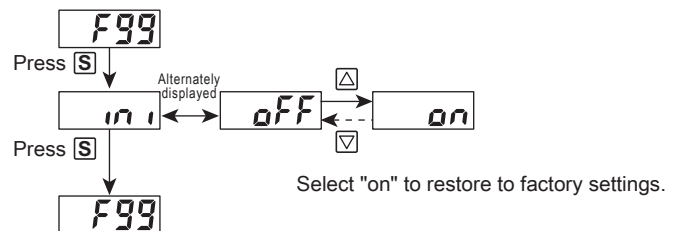
## G ZERO POINT SETTING

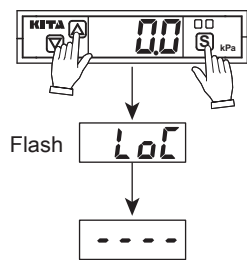Press △ and ▽ button during measurement mode for more than 3 sec. until "00" is shown.



※Zero resetting is possible only with an atmospheric pressure equivalent to 2% or less of F.S.

## H KEY LOCK MODE

Key lock mode can prevent operation mistakes.

Press △ button and S button at the same time for 3 sec.



Flash

LoC

- - - -

※Unlock setting : Press △ button and S button at the same time until the UnC is displayed.

## I OPERATION MODE

See below for the energy saving control operation and the set values which are preset to the switch.
If the operation shown below does not cause any problems, keep these setting.

**Operation of OUT**
When the pressure exceeds the set value (P-1), the pressure switch turns ON.
When the pressure decreases below the set value (P-1) by the hysteresis value (H-1), the switch turns OFF.
The default setting are P-1 : -70.0 kPa and H-1 : 10.0 kPa.

**Operation of V-Sol**
Supply pilot valve: V-Sol is turned on by the signal for suction.
Suction starts by the generation of vacuum pressure.
When the vacuum pressure reaches the set value (P-1 – H-3 : OFF point of supply pilot valve signal), the supply pilot valve is turned OFF.
After that, when the vacuum level decreases and reaches the suction switch ON point (P-1 + H-2 : Supply pilot valve signal ON point), the supply pilot turns on again to maintain the vacuum.
After the supply pilot valve is turned off, the vacuum pressure will decrease.
When the vacuum pressure reaches the suction switch ON point (P-1 + H-2 : ON point of supply pilot valve signal), the solenoid valve for supply will turn ON again and increase the vacuum pressure.
Afterwards, the supply pilot valve repeats this ON and OFF cycle.
Area in which setting of H-2 is prohibited can be set by the range in which H-4 : supply pilot valve signal is prohibited to input. ( H-1≥ H-2 + H-4 )
The default settings are P-1 : -70.0 kPa, H-1 : 10.0 kPa, H-2 : 5.0 kPa, H-3 : 0.0 kPa, H-4 : 1.0 kPa.
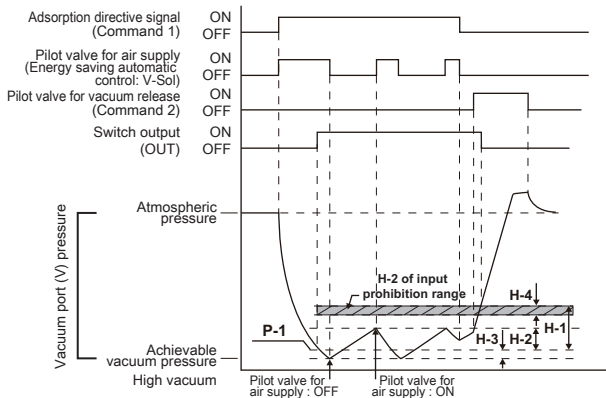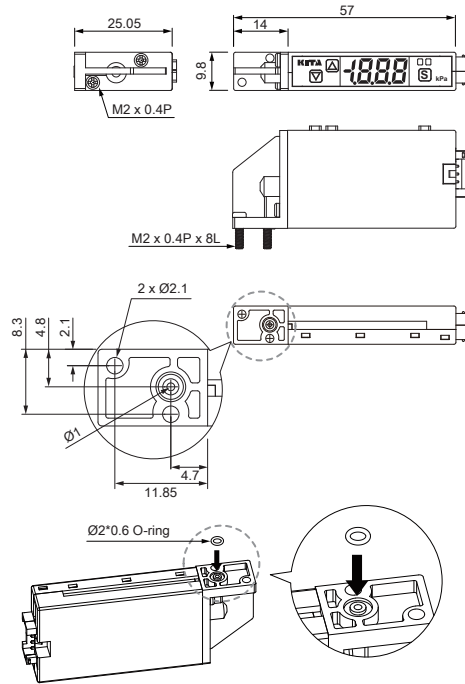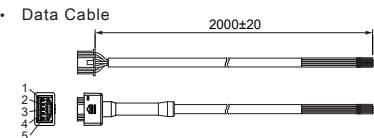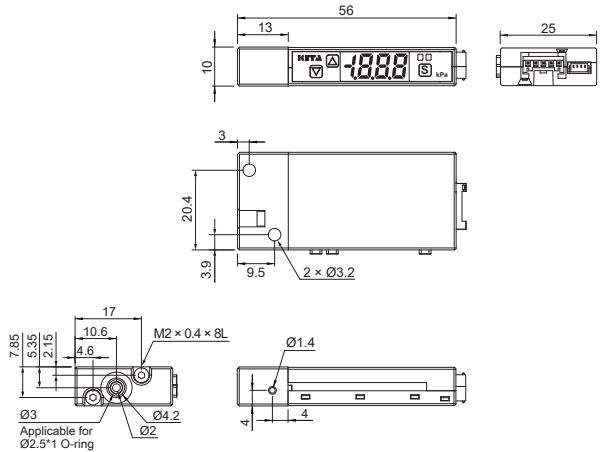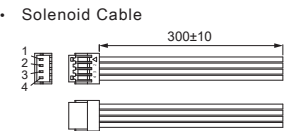


## J DIMENSIONS

**1.** KP93 - □
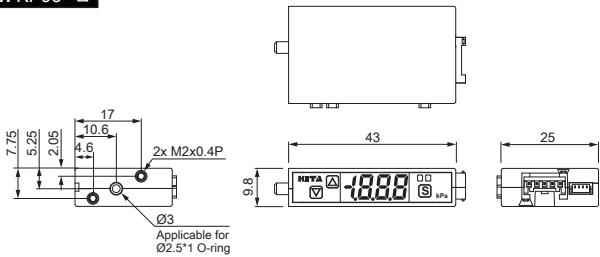


**2.** KP93 - □ - L



**2.** KP93 - □ - M5



- Data Cable



| PIN NO. | Data Cable Color |
|---|---|
| 1 | DC(+)(Brown) |
| 2 | Command 2 D-Sol Input (Orange) |
| 3 | Command 1 V-Sol Input (White) |
| 4 | OUT (Black) |
| 5 | DC(-)(Blue) |

- Solenoid Cable



| PIN NO. | Solenoid Cable Color | Solenoid Function |
|---|---|---|
| 1 | D-Sol (-) (Black) | Break solenoid valve |
| 2 | D-Sol (+) (Red) | |
| 3 | V-Sol (+) (Red) | Vacuum solenoid valve |
| 4 | V-Sol (-) (Black) | |

Unit : mm

## K PRESSURE UNIT CONVERSION TABLE

| From \ To | kPa | kgf/cm² | mmHg | psi | bar | inHg |
|---|---|---|---|---|---|---|
| 1 kPa | 1 | 0.010197 | 7.500616 | 0.145038 | 0.010000 | 0.2953 |
| 1 kgf/cm² | 98.0665 | 1 | 735.559 | 14.2233 | 0.980665 | 28.95979 |
| 1 mmHg | 0.13332 | 0.0013595 | 1 | 0.019336 | 0.0013332 | 0.039370 |
| 1 psi | 6.895 | 0.07031 | 51.7157 | 1 | 0.06895 | 2.036074 |
| 1 bar | 100.0000 | 1.01972 | 750.062 | 14.5038 | 1 | 29.52998 |
| 1 inHg | 3.386388 | 0.034530 | 25.40000 | 0.491141 | 0.033863 | 1 |

## L ERROR CODE INSTRUCTION

| Error Type | | Error Code | Error Condition | Troubleshooting |
|---|---|---|---|---|
| Excess load current error | out | Er1 | Out load current is more than 125mA. | Turn power off and check the cause of overload current or lower the current load under spec., then restart. |
| Residual pressure error | | Err | During zero reset, ambient pressure is over ±2% F.S. | Change input pressure to ambient pressure and perform zero reset again |
| Applied pressure error | | LLL | Supply pressure exceeds the upper limit of pressure setting. | Adjust the pressure within operating pressure range. |
| System error | | Er4 | Internal system error Internal data error | Turn power off, and then restart. If error condition remains, please return to factory for inspection. |