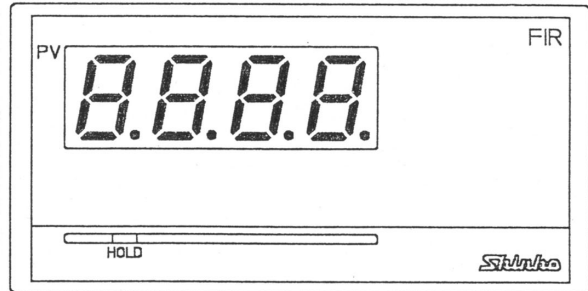


**INSTRUCTION MANUAL
FOR
MICROCOMPUTER BASED
DIGITAL INDICATOR**

FIR-101-M

Thank you for your purchase of our Micro-computer based Digital Indicator FIR-101-M. This manual contains instructions for the mounting, the functions, the operations and the notes when operating the FIR-101-M. Please read and understand this instruction manual before starting operation.



To prevent accidents by mis-handling of this indicator, please arrange to give this manual into the hands of the operator who actually uses our product.

No. FIR11E3 2008.06

. . . Notes to users . . .

Before operating this indicator, please understand about following matters.

⚠ Warning

Turn the power supplied to the instrument off before wiring or checking done. If working or touching the terminal with the power on status, there is a possibility of Electric Shock which can cause severe injury or death. Moreover, the instrument must be grounded before the power supplied to the instrument is turned on.

⚠ Notices

Factory adjusted as [Sensor input: K, Unit: °C, Hold function: Hold, PV filter function: None]. If changing the specifications, they can be changed by internal switches of the FIR-101-M before the power is turned on.

It is advised to provide the protective device against unexpected event owing to the using condition and aged change of the parts.

1.1 Model names

[Example]

F I R - 1 0 1 - M ,

B L , T C



(*): One of the input type is selectable by internal rotary switch and DIP switch from 15 types of input: Thermocouple, RTD, Current and Voltage.

Optional code

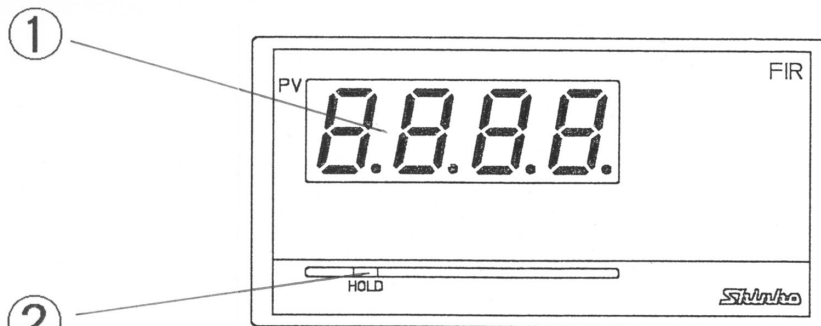
| Code | Description |
|-------|-----------------------------------|
| BK | Color: Black |
| BL | Screw type mounting bracket |
| IP | Dust-proof, Drip-proof |
| TC | Terminal cover |
| P 2 4 | Output for insulated power source |
| GP | PV display Green |

1.2 How to indicate the model nameplate

Model nameplates are put on the case and the bottom of the inner assembly.

| Model nameplate | | [Example] |
|-----------------|-------------------|---------------------------------------------|
| Model name | F I R - 1 0 1 - M | |
| Option codes { | BL, TC | Screw type mounting bracket, Terminal cover |
| Instrument No. | No. | (Indicated only inner assembly) |

2. Name and functions of the sections



(Fig. 2-1)

① PV display

It indicates the Process variable (PV) with red LED.

② PV hold indicator (HOLD □)

Yellow LED is lit when holding the process variable.

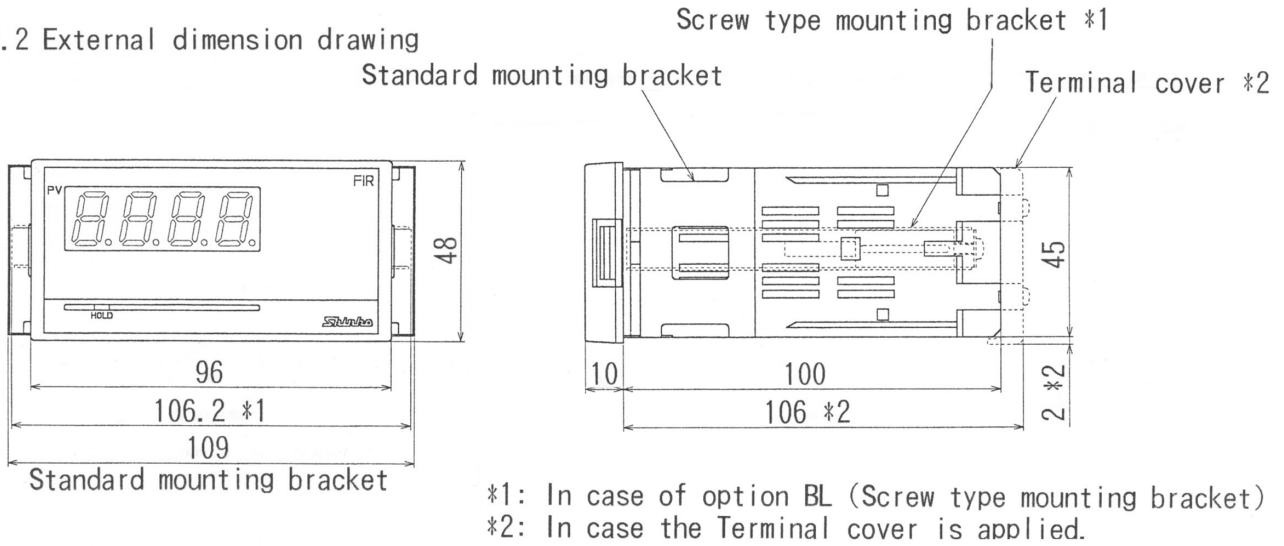
3. Mounting to control panel

3.1 Site selection

Mount the controller in a place with:

- (1) A minimum of dust, and an absence of corrosive gases.
- (2) No mechanical vibrations or shocks.
- (3) No exposure to direct sunlight, an ambient temperature is 0 to 50°C (32 to 122°F) and it does not change suddenly.
- (4) An ambient humidity is 85%RH or less, and non-condensing.
- (5) The controller should be away from the electromagnetic switch of large capacity or cables through which large current flows.
- (6) No water, oil or chemicals and their vapor directly splash.

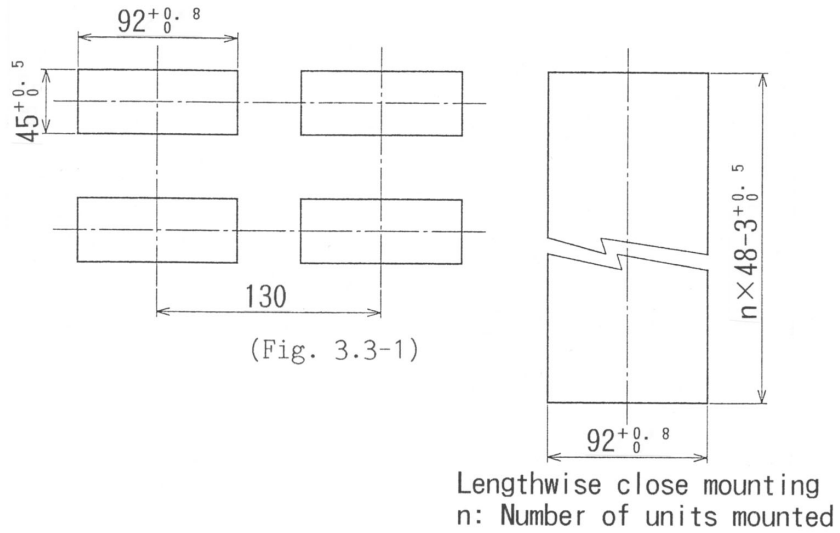
3.2 External dimension drawing



*1: In case of option BL (Screw type mounting bracket)
 *2: In case the Terminal cover is applied.

(Fig. 3.2-1)

3.3 Panel cutout drawing



(Fig. 3.3-1)

3.4 Mounting

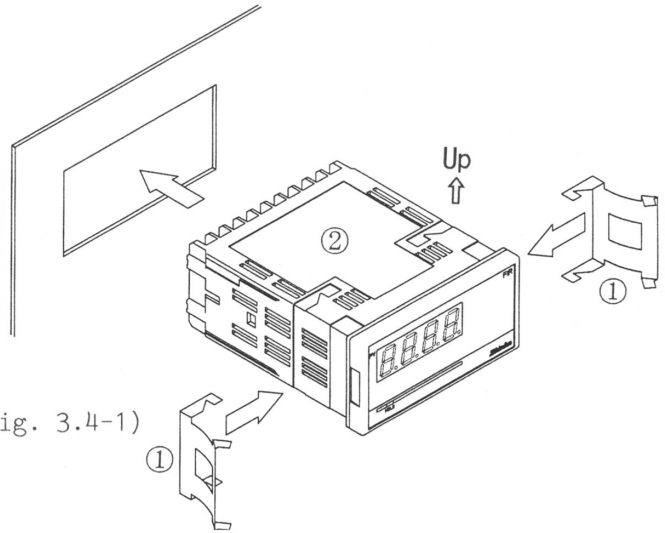
- When using the Standard type of mounting bracket. (One-touch type)

Mounting panel thickness 1 to 3mm

Mount one-touch mounting brackets

① to the body in advance, and then insert the FIR-101-M ② from the front of the panel.

In case Soft front cover (FC-R) is used, the mounting panel thickness will be 1 to 2.5mm.



(Fig. 3.4-1)

- When using the Screw type mounting bracket [Option code: BL].

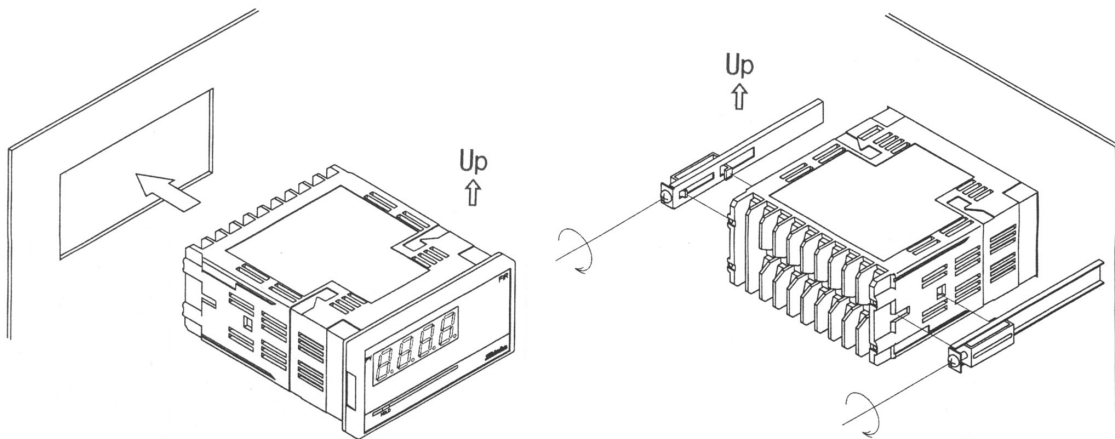
Mounting panel thickness is 1 to 15mm.

Insert the FIR-101 from the front of the panel.

Catch the mounting brackets to the holes right and left of the case, and screw to fix.

⚠ Notice

Do not screw with excessive force, or the case may be bent, because it is made of resin. Torque to screw is approximately 1.2kgf·cm.



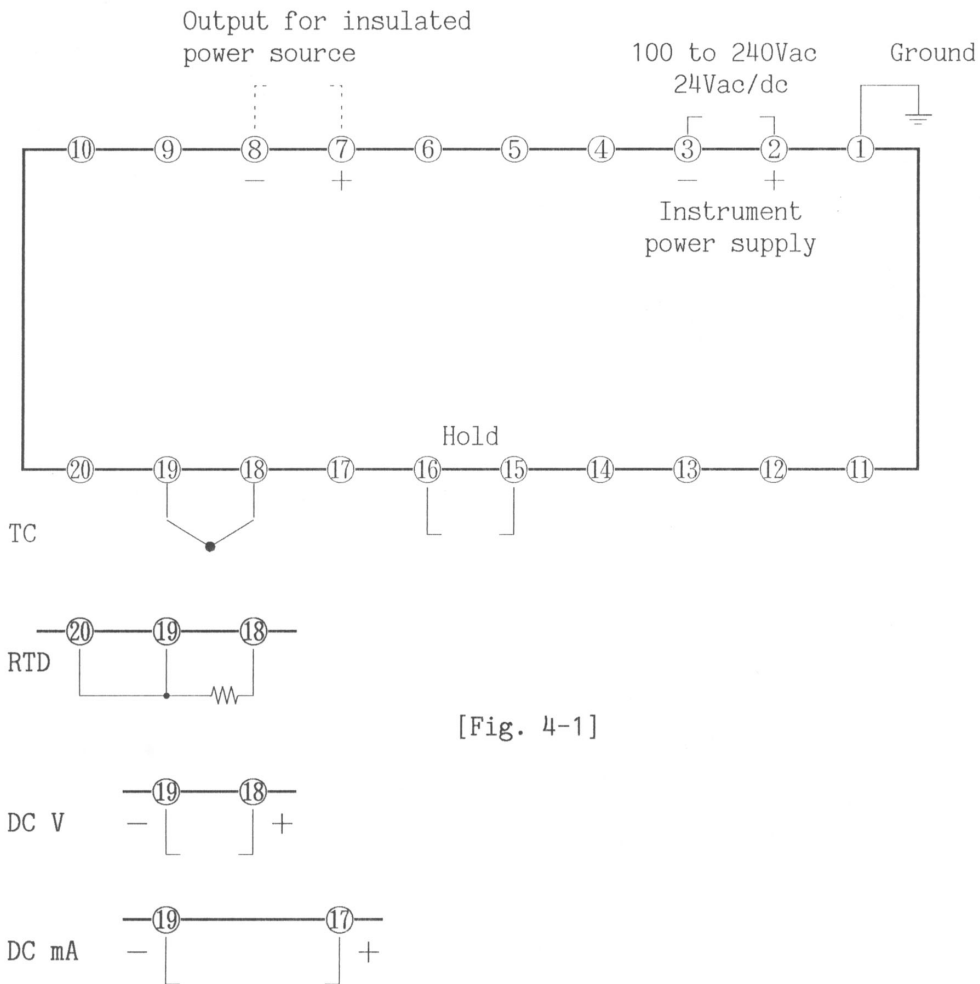
(Fig. 3.4-2)

4. Wiring connection

⚠ Notices

- Use a thermocouple and compensating lead wire applicable to the input specifications of this indicator.
- Use a 3-wire system of RTD applicable to the input specifications of this indicator.
- This indicator has no built-in power switch nor fuse. It is therefore recommended that the units be provided in the circuit near the external indicator.
- In case of 24Vdc, do not make a mistake on the polarity.
- When wiring, keep input wire (Thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.
- Use a thick wire (1.25 to 2.0mm²) for the earth ground.

▪ Terminal arrangements

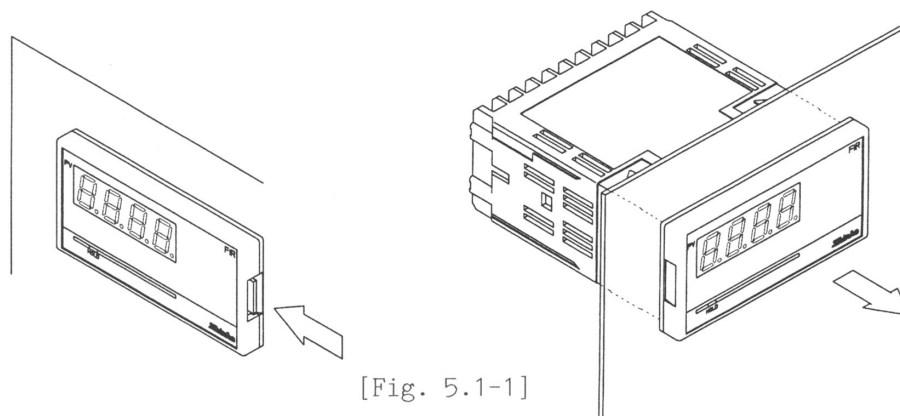


- The terminal block of this instrument is designed to wire from the upper side. Lead wire must be inserted from the upper side of the terminal, and fasten by the terminal screw.
- Dotted line shows the option, no terminal is equipped if it is not specified.

5. Set-up

5.1 Taking the internal assembly out

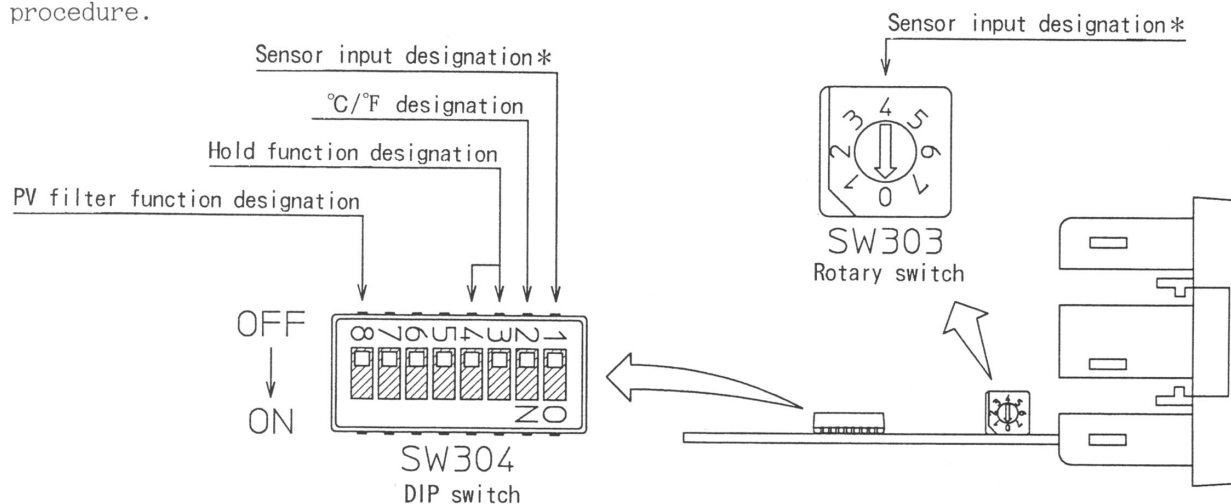
Before the power supplied to this instrument is turned on, take the internal assembly out from the case by pushing the hook (right side of the frame) to arrow direction and holding the notches.



[Fig. 5.1-1]

5.2 Switch setting (multi-function)

Using small slotted screwdriver and tweezers, set the Sensor input, Unit °C or °F, Hold function and PV filter function by rotary switch and DIP switch with following procedure.

















The following items can be designated by the DIP switch (SW304).
Factory adjusted as all switches OFF [shaded].
[Table 5.2-1]

| Item | Sw No. | Designation | Switch Status |
|--------------------|---------------|-------------------------------------|----------------------|
| Sensor input | 1 (*) | K, J, R, B, N, PL-II, Pt100, JPt100 | No.1 OFF |
| | | S, E, T, C, 4~20mA, 0~20mA, 0~1V | No.1 ON |
| °C/°F | 2 | °C | No.2 OFF |
| | | °F | No.2 ON |
| Hold function | 3 and 4 | Hold (PV at that time) | No.3 OFF No.4 OFF |
| | | Peak hold | No.3 ON No.4 OFF |
| | | Bottom hold | No.3 OFF No.4 ON |
| PV filter function | 8 | No PV filter applied | No.8 OFF |
| | | 1 second of PV filter | No.8 ON |

Switch No. 5, 6 or 7 is not used. It is not effective even if it is set to ON side.

*: The sensor input can be designated by the combination of this item and the rotary switch.
(SW303)

Select the sensor type by rotary switch (SW303). Factory adjusted as K, [▨].
 [Table 5.2-2]

| Rotary Sw. No. | DIP Sw. No. 1 | Type of sensor | Scale range | | |
|-------------------------------------------------------------------------------------|---------------|----------------|--------------|-------------------|-------------------|
| | | | °C | °F | |
|  | 0 | OFF | K | -200 to 1370°C | -320 to 2500°F |
|  | 1 | OFF | J | -200 to 1000°C | -320 to 1800°F |
|  | 2 | OFF | R | 0 to 1760°C | 0 to 3200°F |
|  | 3 | OFF | B | 0 to 1820°C | 0 to 3300°F |
|  | 4 | OFF | PL-II | 0 to 1390°C | 0 to 2500°F |
|  | 5 | OFF | N | 0 to 1300°C | 0 to 2300°F |
|  | 6 | OFF | Pt100 | -199.9 to 850.0°C | -199.9 to 999.9°F |
|  | 7 | OFF | JPt100 | -199.9 to 500.0°C | -199.9 to 900.0°F |
|  | 0 | ON | S | 0 to 1760°C | 0 to 3200°F |
|  | 1 | ON | E | 0 to 1000°C | 0 to 1800°F |
|  | 2 | ON | T | -199.9 to 400.0°C | -199.9 to 750.0°F |
|  | 3 | ON | C (W/Re5-26) | 0 to 2315°C | 0 to 4200°F |
|  | 4 | ON | 4 to 20mAdc | 0.0 to 100.0 | |
|  | 5 | ON | 0 to 20mAdc | 0.0 to 100.0 | |
|  | 6 | ON | 0 to 1Vdc | 0.0 to 100.0 | |

5.3 Insertion of the internal assembly

When the set-up is completed, insert the internal assembly into the case. Surely insert the assembly until it is locked by the hook on the right side of the instrument. (sounds click)

⚠ Notice

Do not make a mistake about the top and bottom of the internal assembly. If inserting the assembly into the case by force mistaking the direction, the printed circuit board may be damaged.

6. Measurement

After completion of the mounting to the control panel and wiring connections, check the connection again and turn the power supplied to the FIR-101-M ON.

For approx. 2s after the power ON, the type of sensor and the unit are indicated on PV display (See below table 6-1).

After that, the actual temperature is indicated and starts measurement.

[Table 6-1]

| Input | °C | °F |
|-------------|-------|-------|
| K | t C | t F |
| J | J C | J F |
| R | r C | r F |
| B | b C | b F |
| PL-II | PL2C | PL2F |
| N | n C | n F |
| S | s C | s F |
| E | e C | e F |
| T | r C | r F |
| C | C C | C F |
| Pt100 | Pt C | Pt F |
| JPt100 | JPt C | JPt F |
| 4 to 20mAdc | 42A | 42A |
| 0 to 20mAdc | 02A | 02A |
| 0 to 1Vdc | 01V | 01V |

- How to use the Hold function

Make the terminal between ⑮ and ⑯ short status.

Hold function is canceled if the terminal between ⑮ and ⑯ is open.

- As for the Hold function

Hold : PV display is held at that time.

Peak hold : PV display is held at the maximum value it has ever reached.

Bottom hold: PV display is held at the minimum value it has ever reached.

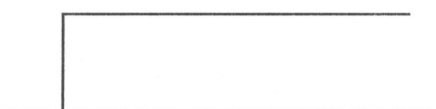
- As for the PV filter function

PV filter function is the function by software having the same effect as CR filter.

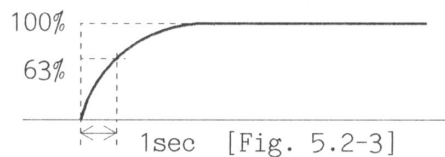
It operates the first order lag of the input value, and suppress the input noise influence.

When the input changes in step state as shown [Fig. 5.2-2], it slowly changes as [Fig. 5.2-3].

1 second of PV filter means the time to reach 63% of input value.



[Fig. 5.2-2]



[Fig. 5.2-3]

7. Other functions

(1) Burnout function

(Upscale)

When the thermocouple or RTD is burnt out or the input value reaches [Rated scale maximum value +1% of rated scale span] or greater, PV display blinks [_ _ _ _].
With the input RTD Pt100 (°F), the rated scale maximum value is 999.9, if the input value is greater than the maximum value, it blinks [_ _ _ _].

(Downscale)

When the input value falls [Rated scale minimum value -1% of rated scale span] or less, PV display blinks [_ _ _ _].
With the input Thermocouple T or RTD, the rated scale minimum value is -199.9, if the input value is less than the minimum value, PV display blinks [_ _ _ _].

(2) Self-diagnostic function

It watches the CPU by watchdog timer, and when any abnormal status is found on the CPU, it makes the indicator to initial status by making all functions off.

(3) Automatic cold junction temperature compensation (Thermocouple input type)

It detects the temperature at the connecting terminal between thermocouple and instrument, and always makes the reference junction electrically to 0°C [32°F] status.

(4) Warm-up indication

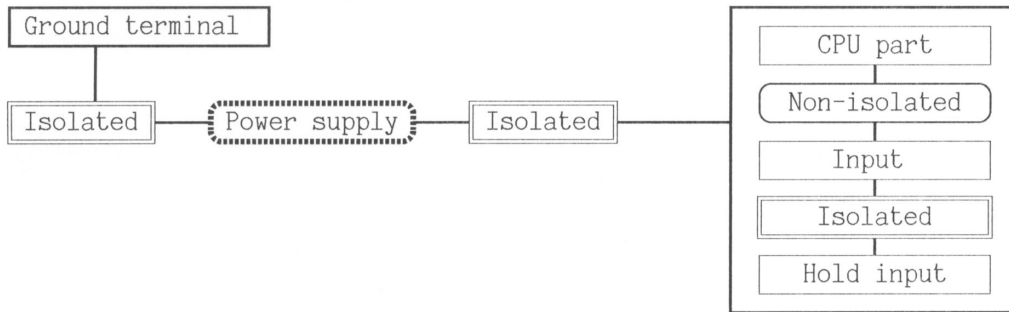
For approximately 2s after the power supplied to the instrument is turned on, the type of input and the unit are indicated on the PV display.

8. Specifications

8.1 Standard specifications

| | |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mounting method | : Flush |
| Display (PV) | : Red LED display, 4 digits, size 14.3(H)×8(W)mm |
| Indicating accuracy | : Thermocouple input: Within $\pm 0.2\%$ of input range full scale ± 1 digit however, for R or S input, range 0 to 200°C (0 to 400°F), within $\pm 4^\circ\text{C}$ (8°F) When B input, range 0 to 300°C (0 to 600°F), without the range of accuracy guarantee (Cold junction compensating accuracy, $\pm 1^\circ\text{C}$, at $25 \pm 25^\circ\text{C}$) |
| RTD input | : Within $\pm 0.2\%$ of input range full scale ± 1 digit |
| Current input | : Within $\pm 0.2\%$ of input range full scale ± 1 digit |
| Voltage input | : Within $\pm 0.2\%$ of input range full scale ± 1 digit |
| Input sampling period | : 0.125 seconds |
| Input | |
| Thermocouple | : K, J, R, S, B, E, T [JIS, IEC], C (W/Re5-26) [ASTM], N (IEC) and PL-II (NBS) External resistance, 100Ω or less When input burnout, Upscale |
| RTD | : Pt100 (JIS, IEC), JPt100 3-wire system Allowable input lead wire resistance, 10Ω or less per wire When input burnout, Upscale |
| Current | : 0 to 20mA _{dc} , 4 to 20mA _{dc} Input impedance, 50Ω When input burnout, 0 to 20mA, the same as 0mA 4 to 20mA, Downscale |
| Voltage | : 0 to 1V _{dc} Input impedance, 1MΩ or greater Allowable input voltage, 5V or less Allowable signal source resistance, 2kΩ or less When input burnout, Upscale |
| Supply voltage | : 100 to 240Vac, 50/60Hz, 24Vac/dc, 50/60Hz |
| Allowable voltage fluctuation | : In case of 100 to 240Vac ... 85 to 264Vac In case of 24Vac/dc 20 to 28Vac/dc |
| Ambient temperature | : 0 to 50°C (32 to 122°F) |
| Ambient humidity | : 35 to 85%RH (non-condensing) |
| Power consumption | : Approx. 15VA |

Circuit insulation configuration



Insulation resistance

10MΩ or greater at 500Vdc

Dielectric strength

Between input terminal and ground terminal, 1.5kVac for 1 minute

Between power terminal and ground terminal, 1.5kVac for 1 minute

Between input terminal and power terminal, 1.5kVac for 1 minute

Weight : Approx. 300 g

External dimension : 96×48×110mm (W×H×D)

Material : Bezel and Case, Flame resistance resin

Color : Bezel and Case, Light gray

Attached functions : Multi-range function
 Multi-function
 Self-diagnostic function
 Automatic cold junction temperature compensating function
 Sensor burnout function [upscale, downscale]
 Warm-up display function

Accessories : Mounting bracket (one-touch type) 1 set
 [When option: BL is applied, screw type of bracket.]
 Instruction manual 1 copy
 Unit nameplate 1 sheet
 Terminal cover 1 piece
 [only when option: TC is applied.]

8.2 Optional specifications

Color black [BK]

Front panel: Dark gray, Case: Black

Screw type mounting bracket [BL]

Panel thickness, 1 to 15mm

Terminal cover [TC]

Electrical shock protecting terminal cover

Drip-proof•Dust-proof [IP]

Drip-proof and Dust-proof specification (IP54)

- Effective only panel surface, case part is excluded.
- The control panel surface to be mounted should be vertical.

Output for insulated power source [P24]

Output: 24±3Vdc (In case load current is 30mA.)

Ripple voltage: within 200mV (In case load current is 30mA.)

PV display Green [GP]

Color of the PV display is green LED.

9. When troubled

When troubled, refer to the following items after checking the power and the wiring.

Warning

Turn the power supplied to the instrument off before wiring or checking done. If working or touching the terminal with the power on status, there is a possibility of Electric Shock which can cause severe injury or death.

| Phenomenon | Presumed cause and the action |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>If [_ _ _ _] is blinking on PV display.</p> | <ul style="list-style-type: none"> • Thermocouple or RTD is burnt out. [In case of Thermocouple] If the input terminal between ⑱ and ⑲ of the instrument is shorted, and if nearby room temperature is indicated, the instrument should be normal and sensor may be burnt out. [In case of RTD] If approx. 100Ω of resistance is connected to the input terminal between A and B of the instrument and between B and B is shorted, and if nearby 0°C (32°F) is indicated, the instrument should be normal and sensor may be burnt out. • Lead wire of thermocouple or RTD is not surely mounted to the instrument terminal. |
| <p>If [_ _ _ _] is blinking on PV display.</p> | <ul style="list-style-type: none"> • Polarity of thermocouple or compensating lead wire is reverse. • Codes (A, B, B) of RTD does not agree with the instrument terminal. |
| <p>If the value on PV display does not change</p> | <ul style="list-style-type: none"> • Hold function is working. ➔ Release the function. |
| <p>If indication of PV display is abnormal or unstable.</p> | <ul style="list-style-type: none"> • Designation of the Sensor input is improper. ➔ Set the Sensor input properly by Rotary switch and DIP switch. • Temperature unit (°C or °F) is mistaken. ➔ Set the unit properly by DIP switch. • Specification of the Thermocouple or RTD is improper. • AC leaks into thermocouple or RTD circuit. • There is an equipment to send out inductive fault or noise near the indicator. |

If happened unclear phenomenon other than above mentioned, make inquiries about the matters at our agency or your shop where purchased.

SHINKO TECHNOS CO.,LTD.
OVERSEAS DIVISION

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