

# Instruction Manual

## Digital Thermocouple & Resistance Thermometer Model 481B

I-02227

### 1. Preface

- Please take care that this instruction manual is certainly delivered to the person in charge of operating this instrument.
- Unpack the product and confirm that the following items are included.  
(1) 481B main unit      (2) Instruction manual

For safe use of this product, please observe the following warning and caution.

In order to help the users' safe use of the products, the following symbol marks are used in this manual.

#### **WARNING**

This is the warning to avoid the danger when it is assumed that such danger as may cause fatal accident or severe injury to a user occurs in case that the product is mishandled.

#### **CAUTION**

This is the caution to avoid the danger when it is assumed that such danger as may cause minor injury to a user or generate only physical obstacle occurs in case that the product is mishandled.

#### **WARNING**

- There is no power on-off switch on the model 481B. It immediately starts to operate after turning the power.
- Do not touch terminals when turning the power on.

#### **CAUTION**

Preserve followings for your safety.

- The rated data is, however, defines with more than 15 minutes warming-up times.
- When the product is installed in the cabinet, perform the appropriate heat radiation to keep less than 50 °C in it.
- Avoid the close-contacted mounting of the meter. The rise of internal temperature affects the life of product.
- Do not install under the following conditions.
  - Where it is exposed to direct sunlight, dust, corrosive gases, rain, etc.
  - Where ambient temperature or humidity is high.
  - Where it is exposed to excessive noise or static electricity.
  - Where there is constant vibration or shock.
- Store the instrument within the specified temperature range for storage (-20~70°C).
- When the front panel or the case becomes dirty, wipe it with soft cloth.  
For heavy dirt, wipe it lightly with the soft cloth wetted with the neutral cleaner thinned by water, and finish the cleaning with dry cloth. Do not use organic solvent like benzene or paint thinner as they may deform or discolor the case.

## 2. Standard Specifications

### 2.1 Model Designation

Model Name 481B -□-□-□

1 2 3

#### [1] Measuring Input

##### ● Thermocouple Thermometer

Model	Temperature Sensor	Measuring Range	Accuracy *1	Overload
481B-01	R	400~1600°C	$\pm(0.3\% \text{ of rdg} + 3^\circ\text{C})$	DC $\pm$ 100V
481B-02	K	0~1200°C	$\pm(0.3\% \text{ of rdg} + 2^\circ\text{C})$ *2 $\pm(0.3\% \text{ of rdg} + 3^\circ\text{C})$ *3	DC $\pm$ 100V
481B-04	J	0~300°C	$\pm(0.3\% \text{ of rdg} + 2^\circ\text{C})$	DC $\pm$ 100V
481B-05	T	0~400°C	$\pm(0.3\% \text{ of rdg} + 2^\circ\text{C})$	DC $\pm$ 100V

\*1 Accuracy: Defined at 23°C $\pm$ 5°C, 45~75%RH.

\*2 0~400°C

\*3 401~1200°C

Temperature coefficient : Defined at  $\pm$ 300ppm/°C, 0~50°C

Standard junction :  $\pm$ 2°C

compensation : Calibration with the mV thermoelectricity input in accordance with JIS C-1602-1995.

Burnout display : -1□□□(□ is blank)

Linearizer : Analog tangential approximation

Resolution : 1°C

Response time: : Approx. 1.5 sec.

External resistance: : 200  $\Omega$  or less

##### ● Resistance Thermometer

Model	Temperature Sensor	Measuring Range	Accuracy *1	Overload
481B-11	Pt100 $\Omega$	-100.0~199.9°C	$\pm(0.2\% \text{ of rdg} + 0.3^\circ\text{C})$ *2 $\pm(0.2\% \text{ of rdg} + 0.2^\circ\text{C})$ *3	DC $\pm$ 10V

\*1 Accuracy: Defined at 23°C $\pm$ 5°C, 45~75%RH.

\*2 -100.0~-0.1°C

\*3 0.0~199.9°C

Temperature coefficient : Defined at  $\pm$ 200ppm/°C, 0~50°C

Calibration with the resistance values of standard resistant element in accordance with JIS C-1604-1997.

Over-range display : 1□□□(□ is blank)

Resolution : 0.1°C

Response time: : Approx. 1.5 sec.

External resistance: : 5  $\Omega$  or less per one lead wire

#### [2] Power Source Voltage

Code	Power Source Voltage
3	AC100V (90~132V)
5	AC200V (180~250V)
9	DC24V $\pm$ 10%

#### [3] Display Color

Code	Description
Blank	Red LED
G	Green LED

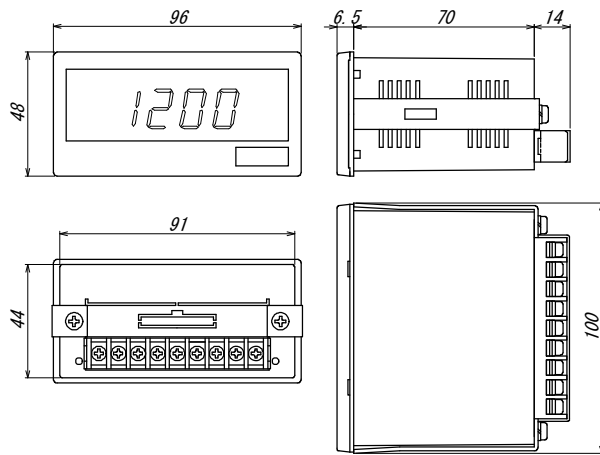
## 2.2 General Specifications

Display	: Red or green LED (character height 14.2mm)
Sampling Rate	: 2.5 times/sec.
Input Configuration	: Single ended, floating input
A/D Conversion	: Dual slope integration system
Noise Rejection	: Power source line penetrating noise 1000V
Withstanding Voltage	: Input terminals - Case : AC1500V for 1 min. Power source terminals - Case : AC1500V for 1 min. Power source terminals - Input terminals : AC1500V for 1min.
Insulation Resistance	: DC500V 100M $\Omega$ or more
Power Source Voltage	: AC90~132V or 180~250V 50/60Hz DC24V $\pm$ 10%
Power Consumption	: AC power source ... approx. 2VA DC24V power source ... approx. 70mA
Operating Temperature	: 0~50°C
Storage Temperature	: -20~70°C
Weight	: AC power source models ... approx. 290g DC power source models ... approx. 190g
Mounting Method	: Fastening from rear of the panel by metal brackets

## 2.3 Unit Labels (attached)

Sticker of °C is adhered on the product.

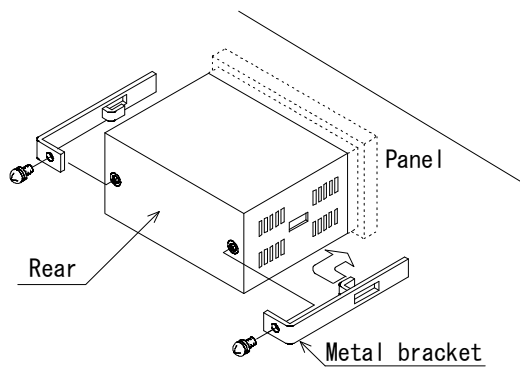
### 2.4 Dimensions



Unit : mm

### 2.5 Installation

Remove the metal brackets at both sides, Insert the instrument from the front and fix it by the brackets.



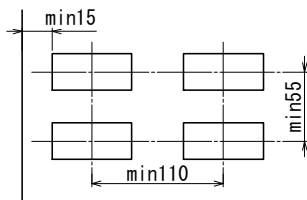
Panel cut-out dimension:  $92^{+0.8/0} \times 45^{+0.6/0}$  mm

Allowable panel thickness: 0.6~6mm

**Note:** Recommended thickness for the panel of aluminum is 1.5mm or more to avoid deformation of the panel.

Optimum torque of fixing screws: 0.25~0.39N·m

Mounting pitch

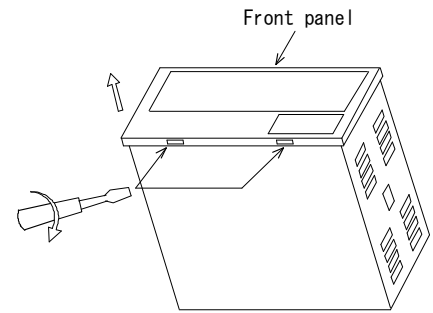


### ⚠ CAUTION

- Do not overtighten the mounting bracket.
- When plural mounting, pay attention to ventilation to cool down in the panel.

### 2.6 Removal of Front Panel

Insert (-) screwdriver into the dips at the low end of instrument and remove the front panel.

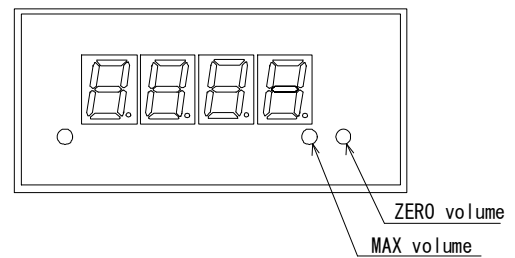


Wrench the panel open with (-) screwdriver.

### 2.7 Removal of Board

- ① Remove the screws on the rear terminal blocks.
- ② Remove the front panel and take the board out, slightly and gently expanding the case up and downward.
- ③ When getting the board back into the case, insert it pressing softly the lower side of the display board.

### 2.8 Layout of Front Panel Inside



- MAX Volume  
MAX volume is the volume for adjustment of full scale.
- ZERO Volume  
ZERO volume is the volume for adjustment of zero.

### 3. Terminal Arrangement and Explanation

<b>⚠ WARNING</b>
<ul style="list-style-type: none"> <li>● To avoid an electrical shock, turn the power off when wiring.</li> <li>● Do not wire with moistened hands. Locate away from the wet place.</li> <li>● Do not touch terminals when turning the power on.</li> </ul>

<b>⚠ CAUTION</b>
<ul style="list-style-type: none"> <li>● Power supply and load should be within the suitable range.</li> <li>● Do not miswiring.</li> </ul>

#### 3.1 Terminal & Connector Arrangement

##### ● Lower Row Terminals

Note: ( )=DC power source models.

Thermocouple Thermometer

Terminal Code	+	-	NC	NC	S	NC	GND(NC)	P2(+)	P1(-)
	1	2	3	4	5	6	7	8	9
Function	Input		-	-	Shield	-	Ground	Power Supply	

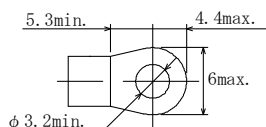
Resistance Thermometer

Terminal Code	A	B	NC	B	S	NC	GND(NC)	P2(+)	P1(-)
	1	2	3	4	5	6	7	8	9
Function	Input		-	Input	Shield	-	Ground	Power Supply	

Terminal screws: M3

Fastening torque: 0.46~0.62N·m

Crimp terminal: As shown on the right.



#### 3.2 Explanation of Lower Row Terminals

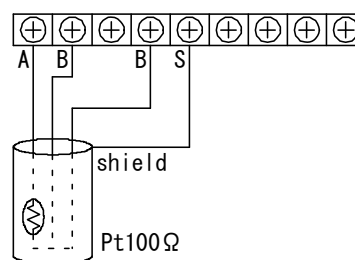
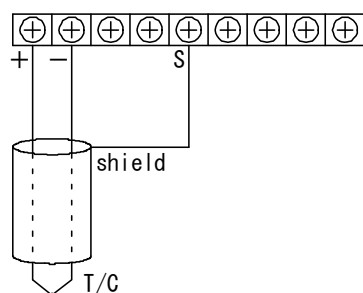
##### ● Measurement Inputs

**Thermocouple Thermometer (+, -)**

Connect one of the specified types of thermocouple with correct polarity.

**Resistance Thermometer (A, B, B)**

Connect Pt100Ω 3-wire type. In case that 2-wire type is used, make a short-circuit between B and B.



##### ● NC

They are open terminal but do not use them as relay terminal.

##### ● Shield (S)

In case of fear that the input line is affected by external noise, it is effective to make a shielding for the input.

##### ● Ground (GND)

In case of fear that the noise is frequently generated on the power source line, it is effective to earth the ground terminal directly to the ground. If the instruments is not affected by environmental noise, the grounding can be omitted. In this case, take care for the ground terminal not to touch other input terminals, as it is charged with neutral electric potential of power source voltage.

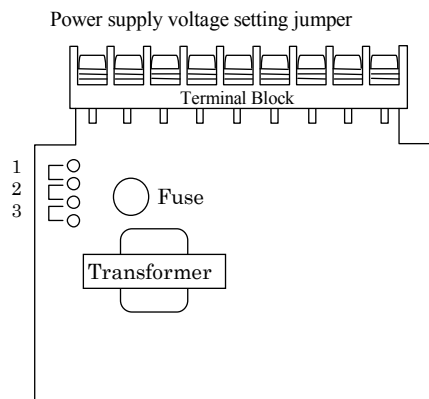
● **Power Supply [P1(-), P2(+)]**

The power source voltage to be supplied to the instrument is specified on the terminal plate at delivery from factory.

- AC100V ..... Use the instrument within the range AC90~132V
  - AC200V ..... Use the instrument within the range AC180~250V
- For the AC power source models, the voltage AC90~132V or AC180~250V can be selected by changing a jumper connection provided on the internal board. When the power source voltage is changed, do not forget to change an indication of voltage on the terminal plate accordingly.

Operating Voltage	Jumper Connections		
	1	2	3
AC90~132V	Short-circuited	Open	Short-circuited
AC180~250V	Open	Short-circuited	Open

- DC24V: Use the instrument with DC24C±10%.  
Connect +24V to P2 (+) and 0V to P1 (-).



**⚠ CAUTION**

- Do not use the product with the voltage out of the rated range as it may cause breakage of the products.
- Do not connect the DC power supply polarity in reverse. Otherwise, the DPM 481B will be broken.

**4. Calibration**

In order to maintain long term accuracy, periodical maintenance at an interval of about one year is recommended. The calibration volumes are provided inside the front mask. Make a calibration of the instrument in the ambience of 23°C±5°C, 75%RH or less.

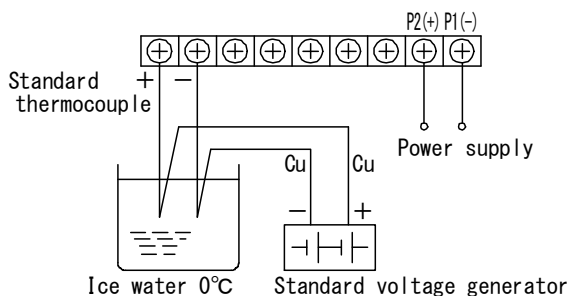
**Calibration of Thermocouple Thermometer**

● **With Actual Measurement**

To calibrate the instrument by measuring the fixed temperature points with the thermocouple actually used. A zero point of ice water, boiling point of water, constant temperature water or oil, temperature calibration system of metal coagulation, etc. can be used as the fixed temperature point.

● **With Standard Thermoelectricity**

Make a connection of standard voltage generator, cold junction circuit (ice water in the pot) and standard thermocouple for calibration as shown below.



Set the output of standard voltage generator to 0mV and adjust the ZERO volume until the digital display displays 0°C. Next, set the output of voltage generator to the respective maximum mV value of each thermocouple type shown below and adjust the MAX volume until the digital display displays the maximum value.

Model	Sensor	Values
481B-01	R	1600°C=18.849mV
481B-02	K	1200°C=48.838mV
481B-04	J	300°C=16.327mV
481B-05	T	400°C=20.872mV

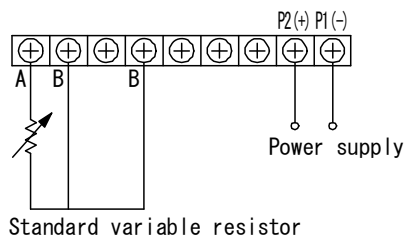
**Calibration of Resistance Thermometer**

● **With Actual Measurement**

To calibrate the instrument by measuring the fixed temperature points with the resistance thermometer actually used. A zero point of ice water, boiling point of water, constant temperature water or oil, temperature calibration system of metal coagulation, etc. can be used as the fixed temperature point.

● **With Standard Variable Resistor**

Connect a standard variable resistor as shown below.



Set the variable resistor to 100Ω and adjust the ZERO volume until the digital display displays 0°C. Next, set the variable resistor to 172.16Ω and adjust the MAX volume until the digital display displays 190.0°C.

● **Platinum Resistance**

**Resistance values of standard resistance element Pt100Ω**

Temp. °C	-100	-50	0	50	100	150	200
Pt Ω	60.26	80.31	100.00	119.40	138.51	157.33	175.86

## **Tsuruga Electric Corporation**

### **Osaka Headquarters**

1-3-23, Minamiumiyoshi, Sumiyoshi-ku, Osaka, Japan 〒558-0041  
TEL 81-6 -6692-6700, FAX 81-6 -6609- 8115  
E-mail: cs.info@tsuruga.co.jp

### **Yokohama Office**

1-29-15, Shinyokohama, Kohoku-ku, Yokohama, Kanagawa, Japan 〒222-0033

### **Tokyo Office**

5-25-16, Higashigotanda, Shinagawa-ku, Tokyo, Japan 〒141-0022

### **Nagoya Office**

Sun Park Higashi Betsuin Bld. 2F  
5-19, Oicho, Naka-ku, Nagoya, Aichi, Japan 〒460-0015

### **Osaka Plant**

1-3-23, Minami Sumiyoshi, Sumiyoshi-ku, Osaka, Japan 〒558-0041

### **Shiga Plant**

122, Kawasaki-Cho, Nagahama, Shiga, Japan 〒526-0846

[www.tsuruga.co.jp](http://www.tsuruga.co.jp)