

TEC (Peltier) Controller sPLC-10 Instruction Manual

(Rev. 1. 10)



Thank you for purchasing the TEC (Peltier) Controller **sPLC-10**.
Read these operating instructions carefully to ensure effective use of all the performance this product as to offer, and then use the product properly. In particular, **please be sure to read "Cautions on use" before use**. After reading these operating instructions, be sure to store them in a place where they can be readily consulted whenever necessary.

Technical support and after-sales service

About support, such as an inquiry about this product, a request for repair, and download of application software, and after-sale service, it is accepted at the WEB site of our company. Please contact the address listed below.

KURAG ELECTRONICS WEB site: <http://kurag.o.oo7.jp/kurag-el/>
Peltier Controller Support: kurag.tslab@biz.nifty.jp

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Cautions on use

- ✓ The use of Kurag Electronics(KE) products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
- ✓ The exports of KE products or technology from one country to another are governed by the relevant security laws and regulation of the countries involved in the transaction. Prior to shipment of KE product to another country, assure that all local rules governing that export are known and followed.
- ✓ You agree to comply with all applicable international and national laws that apply to the Product, including Japanese Export Trade Control Order, as well as end-user, end-use, and destination restrictions issued by Japanese and other governments.
- ✓ We can bear absolutely no responsibility whatsoever for any direct or indirect damage that may occur due to the use of this product in your applications.
- ✓ This product is to be used with general industrial product, but not designed or manufactured to be used under such special conditions and environments as nuclear energy control, aerospace, transportation, medical equipment, various safety equipment or equipment which require high level reliability that may cause personal death when it is failed. We assume no liability for any direct or indirect damages that may occur due to applying this product to such equipment or apparatus.
- ✓ If you notice smoke, strange smells or noise coming from the product, cut off the power supply. Continued use of the product in these conditions will result in fire or electric shock.
- ✓ If a liquid like water or foreign objects like pins and clips which have conductivity adhere to the product, cut off the power supply immediately. Continued use of the product in these conditions will result in fire or electric shock.
- ✓ If the product is dropped or strongly shocked or excess power added, cut off the power supply immediately. Continued use of the product in these conditions will result in fire or electric shock.
- ✓ When electric power is connected to the product, be careful to apply the proper voltage specified in the product specification. Improper voltage may cause malfunction or destroy the circuit. Moreover, please do not use it with the power supply voltage exceeding the rated voltage/current of the peltier device to be connected. (A same voltage is supplied to the peltier device.) Please confirm the polarity of connections. If a mistake made, regarding polarity, it may result in fire or electric shock, and it may cause malfunction of the product or peltier device.
- ✓ When you install this product into equipment or wiring the circuit, don't turn on the power until work is completed. A large current flows into wiring of a power supply or a peltier device. So please select the wiring material with suitable diameters.
- ✓ Do not operate at temperatures or humidity, etc. beyond the range of specifications.
- ✓ Please do not use it in a dusty place, the place where direct sun beam hit and the environment where corrosive gases exist. If a dew condensation is generated, you should not use the product until it dries completely.
- ✓ Never attempt to perform dismantle or modification. And when the product breaks down, do not repair it by yourself. If the product broke down, please consult to our support dept.
- ✓ Failure to heed this instruction may cause in fire, electric shock, personal injury or malfunction.

1. Cautions on use (continued)

- ✓ Do not touch directly the electrical components which are mounted on the printed wiring board. And please take care not to charge the static electricity to the electrical components.
- ✓ To transport this product, it should be put in the shipping carton, or please put a printed circuit board into an anti-static bag or a conductive bag, and pack up using suitable shock absorbing material so that vibration and a shock are not added.
- ✓ Dispose of the product according to all national laws and regulations.

2. General

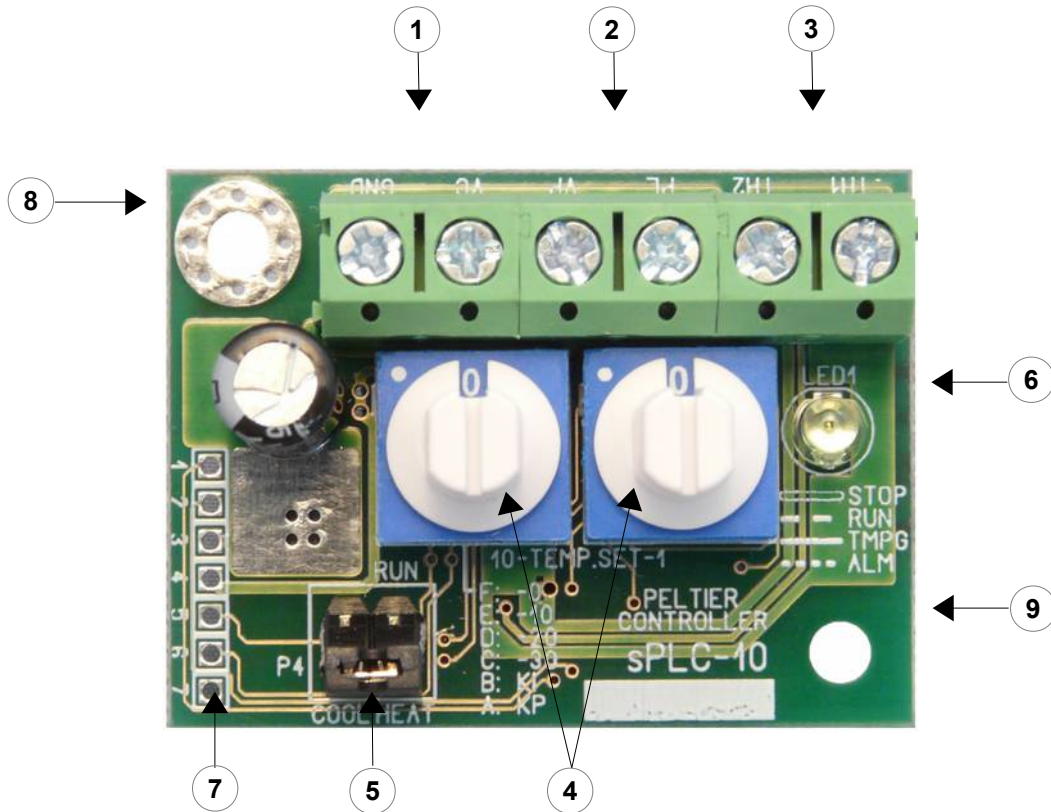
- Built-in type TEC (Peltier) temperature controller and driver.
- Ultra small size 40mm(W)x30mm(D)x18.5mm(H) for easy installation
- Maximum drive power is 24V/8A with PWM drive.
- In single power supply the drive voltage range is 5V ~ 24V.
- In dual power supply the drive voltage range is 1V ~ 24V.
- NTC thermistor is suitable for the thermal sensor of this product.
- Digital PI control
- Monopolar drive (Cool/Heat selectable)
- Setting temperature range is -39°C ~ +99°C by 1°C step.
- Start/Stop operation by short socket or external switch.
- An indication LED for operation status monitoring.

3. Contents

- Listed items are included in this product package.
- Please check that these items are included.

| Name | Quantity | Remarks |
|--------------------|----------|--------------------------------|
| sPLC-10 | 1 | |
| Short socket | 1 | It is inserted at RUN terminal |
| Instruction Manual | 1 | |

4. Names of parts and functions



1 Power terminal (VC.GND)

Power supply for control circuit. Voltage range is 5V~24V.

2 TEC(Peltier) terminal (VP, PL)

Connect TEC(Peltier)

3 Temperature sensor terminal (TH1,TH2)

Connect NTC thermistor

4 Rotary switches to set target temperature

5 Control terminal (RUN-COOL/HEAT)

6 Indication LED

Indicate operation status by lights out, blinking and lights on.

7 Jig port for manufacturing

It is used only for manufacturing. Do not connect anything.

8 Mounting hole (concurrently FG terminal) 9 Mounting hole

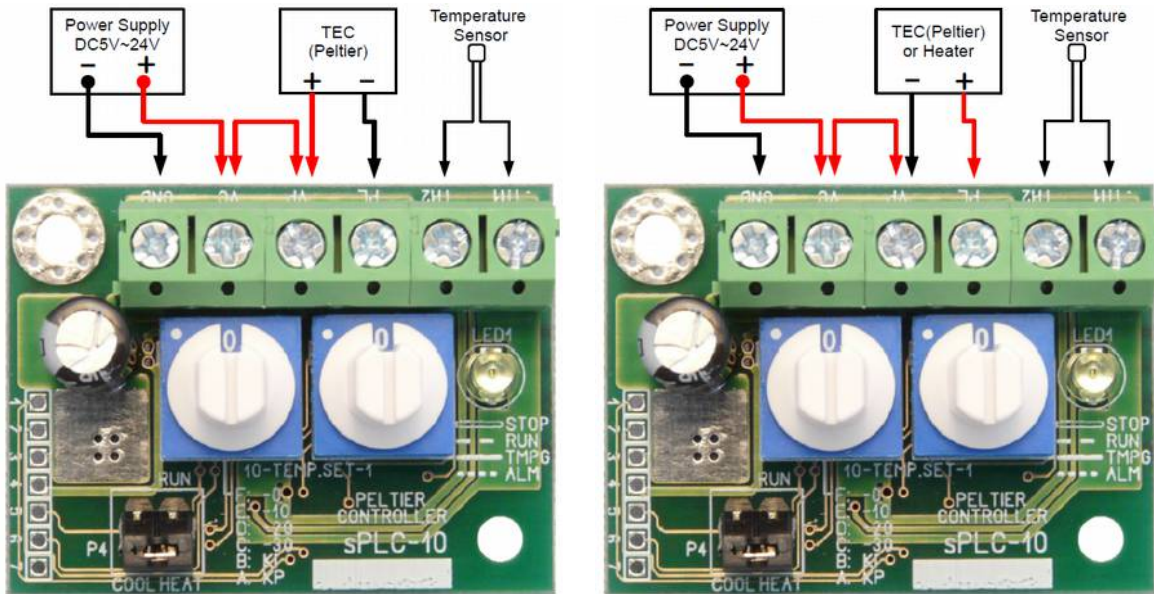
Diameter: 3.2mm

(*) By short-circuiting in short pad SP1 of the bottom side, it is able to contact circuit GND to the chassis.

5. Connection (Single power supply)

This is screw terminal block. Please strip the covering of an electric wire about 5 mm, and insert to the terminal and keep certain tightening torque using screwdriver.

(*) Please loosen enough the screw before inserting a wire in a terminal.



Connection for cooling operation

Connection for heating operation

(*) The polarity of TEC(Peltier) is different by cooling and heating.

1) Connection of power supply

| Name | Description |
|------|---|
| VC | Connect plus of power supply (DC5V~24V). Connect VP and VC or short the short pad SP2. * SP2 is located bottom side of the board. |
| GND | Connect minus of power supply. |

2) Connecting of TEC(Peltier)

| Name | Cooling | Heating |
|------|---|---|
| VP | The surface of TEC(Peltier) which should be temperature-controlled is cooling when a current flows from VP to PL. | The surface of TEC(Peltier) which should be temperature-controlled is heating when a current flows from VP to PL. |
| PL | (VP: Red wire, PL: Black wire) | (VP: Black wire, PL: Red wire) |

(*) The colors of the lead wire of the TEC(Peltier) may be different.

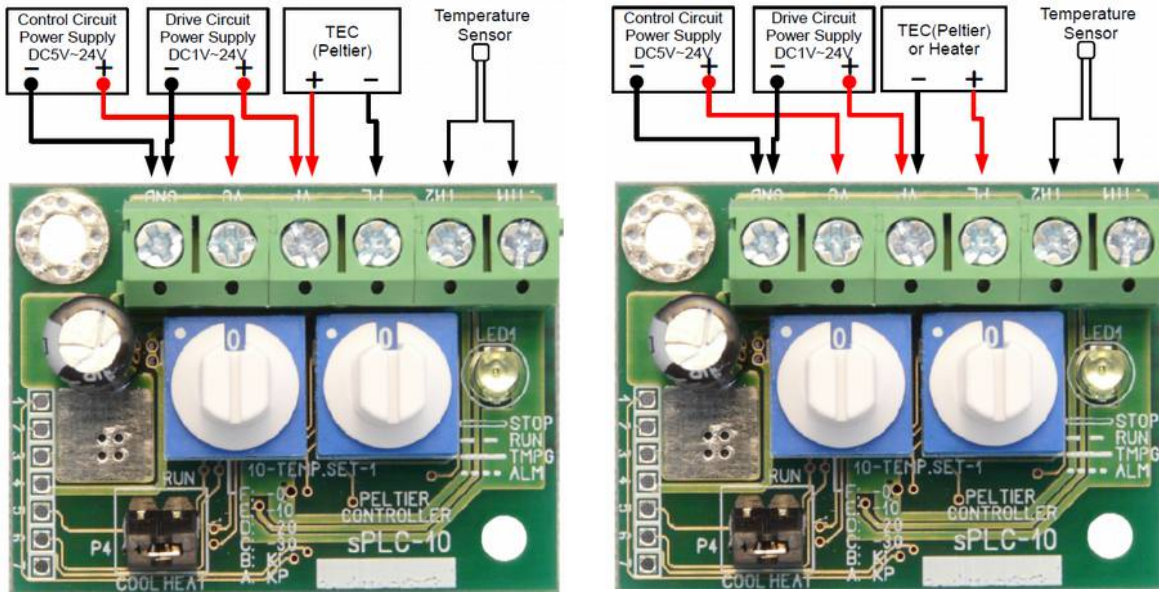
3) Connecting of temperature sensor

| Name | Description |
|------|---|
| TH1 | Connect temperature sensor (NTC thermistor). |
| TH2 | (*) Sensing current flows into TH2 from TH1. |

6. Connection (Dual power supply)

This is screw terminal block. Please strip the covering of an electric wire about 5 mm, and insert to the terminal and keep certain tightening torque using screwdriver.

(* Please loosen enough the screw before inserting a wire in a terminal.



Connection for cooling operation

Connection for heating operation

(* The polarity of TEC(Peltier) is different by cooling and heating.

(* When turn on power, please turn on control circuit first then turn on TEC drive circuit.

(* When turn off power, please turn off TEC drive circuit first then turn off control circuit.

1) Connection of control circuit power supply

| Name | Description |
|------|--|
| VC | Connect plus of power supply (DC5V~24V). |
| GND | Connect minus of power supply. |

2) Connection of TEC(Peltier) drive circuit power supply

| Name | Description |
|------|--|
| VP | Connect plus of power supply (DC1V~24V). |
| GND | Connect minus of power supply. |

2) Connecting of TEC(Peltier)

| Name | Cooling | Heating |
|------|---|---|
| VP | The temperature-controlled surface of TEC(Peltier) is cooling when a current flows from VP to PL. (VP: Red wire, PL: Black wire) | The temperature-controlled surface of TEC(Peltier) is heating when a current flows from VP to PL. (VP: Black wire, PL: Red wire) |
| PL | | |

(* The colors of the lead wire of the TEC(Peltier) may be different.

3) Connecting of temperature sensor

| Name | Description |
|------|--|
| TH1 | Connect temperature sensor (NTC thermistor). |
| TH2 | (* Sensing current flows into TH2 from TH1. |

7. Operation

1) Target temperature setting

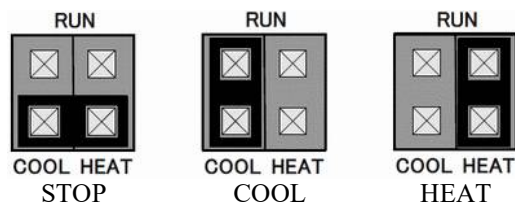
Target temperature is set by 2 digit rotary switches.

Minus temperature is set by using C~F of 10's place.

(*) A and B of 10's place are used for PI parameter setting.

| Target temperature | Rotary switch setting | |
|--------------------|-----------------------|---------------------|
| | 10's place (16steps) | 1's place (10steps) |
| -39°C | C | 9 |
| -25°C | D | 5 |
| -13°C | E | 3 |
| -10°C | E | 0 |
| -7°C | F | 7 |
| 0°C | 0 (or F) | 0 |
| +17°C | 1 | 7 |
| +99°C | 9 | 9 |

2) Start/Stop temperature control operation



Cooling operation

- 1) Insert the short socket to “COOL” position (Start temperature control operation)
- 2) The indication LED is blinking slowly until reaching the target temperature.
- 3) When the sensor temperature is within +/-1°C, the indication LED lights on continuously.
- 4) Pull out the short socket. (Stop temperature control operation)

Heating operation

- 1) Insert the short socket to “HEAT” position (Start temperature control operation)
- 2) The indication LED is blinking slowly until reaching the target temperature.
- 3) When the sensor temperature is within +/-1°C, the indication LED lights on continuously.
- 4) Pull out the short socket. (Stop temperature control operation)

(*) It is able to use switch or relay instead of the short socket.

8. Alarm functions

This product has function of ALARM as follows. Once the ALARM is occurred, the indication LED is blinking fast. And the control operation is stopped automatically.

| Name | Description |
|--------------------------|---|
| Temperature sensor alarm | This alarm is generated by the temperature sensor, un-connecting or wire disconnection. |

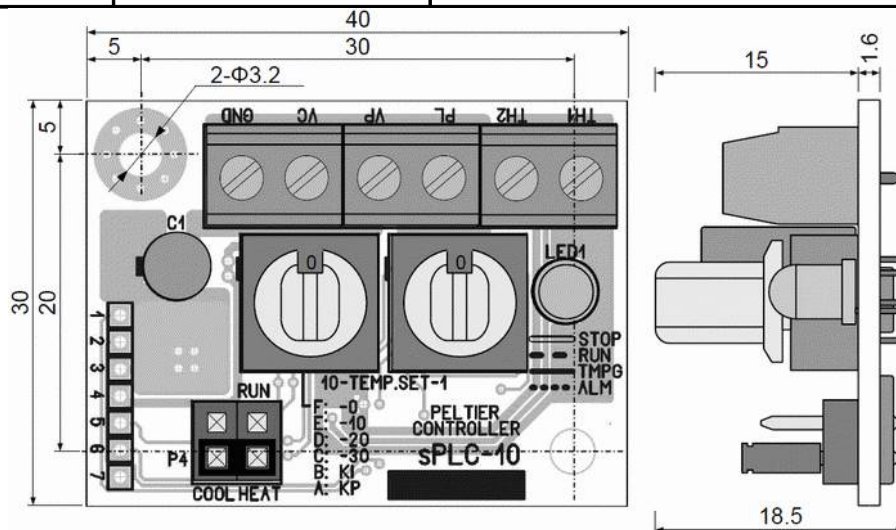
[IMPORTANT] Protection of TEC(Peltier) drive voltage and current

This product does not have any protect function for TEC(Peltier) drive voltage and current. External protector (such as Fuse) is strongly recommended.

9. Specifications

| Item | Value | Remarks |
|---------------------------------|-------------------------|--|
| Supply voltage | DC 5V~24V | Single power supply |
| Supply voltage (VC) | DC 5V~24V | Dual power supply |
| Supply voltage (VP) | DC 1V~24V | VC: for control circuit VP: for drive circuit |
| Current consumption | 100mA (Max) | Not include TEC(Peltier) drive current |
| Peltier drive voltage | 24V (Max) | Drive voltage is dependent on power supply voltage. |
| Peltier drive current | 6A (Max) | Maximum current is limited by power supply voltage, and internal resistance and thermoelectromotive force of Peltier device. |
| Peltier drive method | PWM voltage drive | Monopolar drive (Heat/Cool selectable) |
| Temperature sensor | NTC Thermistor | Standard: R25=10kohm, B=3435 (SEMITEC 103JT) |
| Control method | Digital PI Control | Proportional-integral control |
| Temperature range | -39 ~ +99 °C | |
| Setting resolution | 1 °C | Set by rotary switches |
| Operation temperature/ humidity | 10 ~ 40 °C 5 ~ 85%RH | No condensation |
| Storage temperature/ humidity | -20~60 °C 5~90%RH | No condensation |
| Dimension | 40(W)x30(D)x18.5(H) mm | |
| Weight | 15g | |

Dimensions
Unit: mm



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Date: March 14, 2017 (Rev.1.10)

Developer: T.S. Laboratory Corporation URL <http://tslab.com/>

Manufacturer: Kurag Electronics LLC URL <http://kurag.o.o07.jp/kurag-el/>