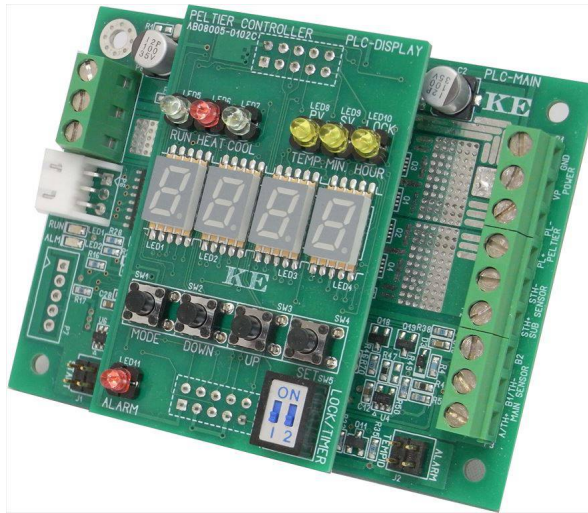


TEC (Peltier) Controller PLC-24V10AL(-PT/-TH) Quick Start Manual (Rev.1.10)



Thank you for purchasing the TEC (Peltier) Controller **PLC-24V10AL**.
Read these operating instructions carefully to ensure effective use of all the performances
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.

This quick start manual explains the basic functions and usage of the TEC (Peltier)
Controller **PLC-24V10AL**. For more detailed functions, more advanced usage methods and
optional specifications, please download the reference manual, option manual and technical
manual from the Kurag Electronics website.

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 Kurag Electronics website.
Please contact the address listed below.

KURAG ELECTRONICS WEB site: <http://kurag.o.oo7.jp/kurag-el/>

E-mail (Peltier Controller Support): kurag.tslab@biz.nifty.jp

KURAG ELECTRONICS LLC



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1. 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. This product is 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 related human life. 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

- ✓ PLC-24V10AL-PT and PLC-24V10AL-TH are TEC (Peltier) temperature controller.
- ✓ The differences of the specification from the base model PLC-24V10A are as follows.

Item	PLC-24V10A	PLC-24V10AL-PT	PLC-24V10AL-TH
Main temperature sensor	Pt100 / NTC thermistor	Pt100	NTC thermistor (*1)
Peltier driving voltage	3V to 24V	7V to 24V(*2)	
Temperature range	Pt100: -50°C to 150°C NTC thermistor: -40°C to 100°C	-40°C to 100°C	
DC Fan output	Direct / 5V fixed / 12V fixed	Direct	

(*1) NTC thermistor $R_{25}=10\text{kohm}$. It is selectable the type of NTC thermistor by using the dedicated setting software.

(*2) Driving voltage depends on supply voltage. It can be driven from 0.5 V for dual power supply operation.

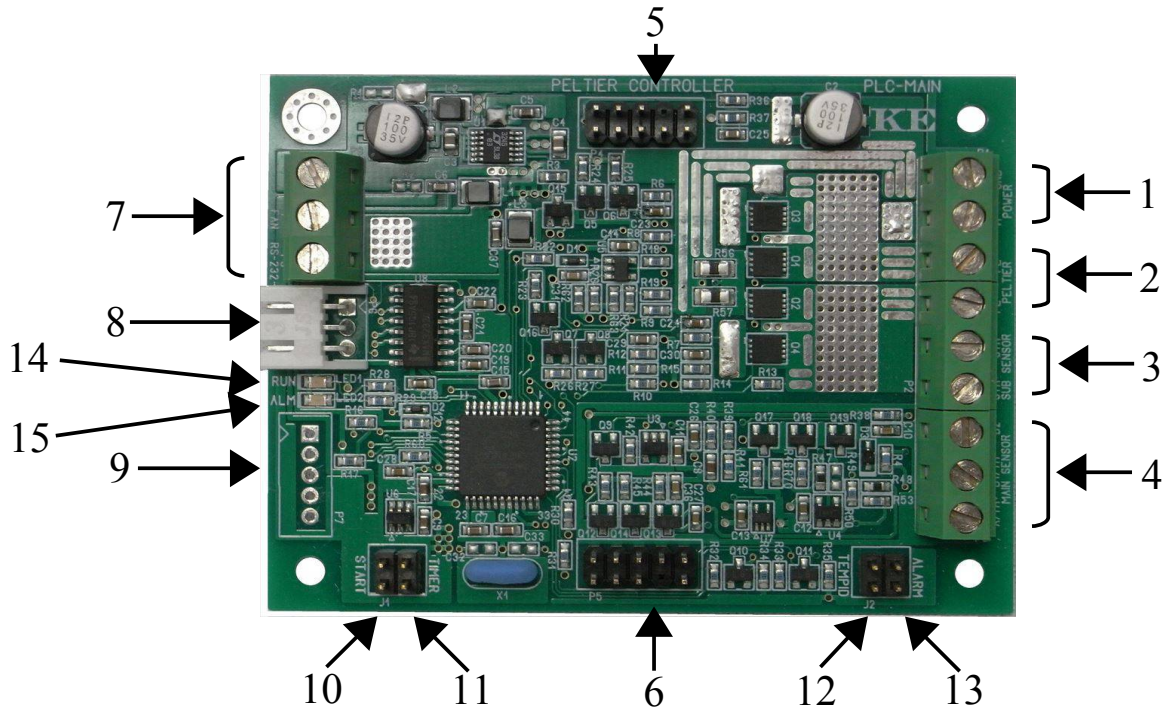
- ✓ High driving current up to 10A by the PWM drive
- ✓ The digital PID control
- ✓ Sub temperature sensor for monitoring (NTC thermistor $R_{25}=10\text{kohm}$)
- ✓ Temperature monitoring function (indicator function)
- ✓ DC fan connection terminal with rotational pulse input
- ✓ Continuous operation and timer operation by stand-alone operation
- ✓ Stackable display board for stand-alone operation
- ✓ When an alarm occurs, the cause code of the alarm is displayed on the display board.
- ✓ External control input (Start / Timer) / Parallel output (Indicator / Alarm)
- ✓ Operation lock function to prevent mis-operation
- ✓ Same form factor (same dimension) as previous model of PLC series (PLC-24V6A, etc.)
- ✓ RS-232 serial communication port
- ✓ It is possible to control from the personal computer by using RS-232 serial command.
- ✓ Free control software and setting software are available from Kurag Electronics website.

3. Contents

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

Name	Main board	Display board	Main with display
PLC-24V10AL Main Board	✓		✓
PLC-24V10A Display Board		✓	✓
RS-232 Cable	✓		✓
Quick Start Manual	✓	✓	✓

4. Names of parts and functions (Main board)



1. Power supply terminal

The range of supply voltage is DC 7V to 24V (single power supply).

2. TEC (Peltier) element terminal

3. Sub temperature sensor terminal

4. Main temperature sensor terminal

5. / 6. Connectors to Display Board

7. DC fan terminal

DC fan terminal for heat sinking. (up to 500 mA)

The same voltage as power supply voltage can be outputted for a standard product.

8. A connector for a RS-232 communication cable

Connector to connect an attached RS-232 cable for external control.

9. The connector for factory use (no part is mounted)

10. / 11. A terminal for external control (START / TIMER)

A start/stop of temperature control operation and timer operation are controllable by connecting and switching on and off for these terminals.

12. / 13. Parallel output (INDICATOR / ALARM)

Open collector outputs to notify the indicator and alarm status.

14. / 15. Status LED lamps (RUN / ALARM)

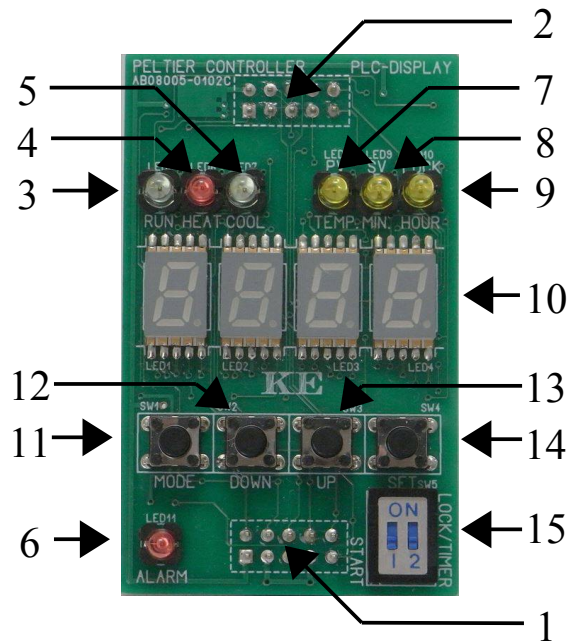
LED lamps to display the product operation status.

14. RUN: Turn-on during control operation. Blinking during reverse protection

15. ALM; Blinking when alarm occur. Turn-on during temperature indicator works.

* When the display board is connected, these LED lamps are turned-off.

5. Names of parts and functions (Display board)



1. / 2. Connectors to Main Board

The connectors combine a display board with a main board.

3. / 4. / 5. Operation status LED lamps

These LED lamps display the product operation status.

3. The temperature control is at work: Lights up "RUN" (GREEN)

4. The heater mode is at work: Lights up "HEAT" (RED)

5. The cooler mode is at work: Lights up "COOL" (GREEN)

6. Alarm LED lamp

When alarm occurred, blinks "ALARM" (RED) and the operation is stopped.

7. / 8. / 9. Display status LED lamps

These LED lamps display the content of 7 segments LED displays. It blinks during a setting and lights up continuously after decision or during display.

7. Display the temperature: Lights up "TEMP." (YELLOW)

8. Display the time (unit: minute): Lights up "MIN." (YELLOW)

9. Display the time (unit: hour): Lights up "HOUR." (YELLOW)

10. 7 segment LED (4 digit)

This LED displays the temperature or time.

11. MODE key 12. DOWN key 13. UP key 14. SET key

These keys are for setting of temperature or timer operation.

15. Operation switch

Position of switch is upper side ON: Start

Position of switch is lower side OFF: Stop

SW1: Start/Stop the continuous operation.

SW2: Start/Stop the timer operation.

6. Connection

To connect the 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.

* Connection for dual power supply, please refer the PLC-24V10AL reference manual.

1) Connecting the display board to the main board

* The connection is already established in case of main with display set.

Please align the direction of a substrate, and the position of two connectors, and insert straightly.

If the direction is wrong or the position of each connector is shifted, you can not perform the connection physically. In that case, please do not insert by force.

2) Connecting power supply

Name	Pin	Connection
POWER	VP	Power supply + (DC 7V to 24V)
	GND	Power supply - (Ground)

* Please use a wiring material with sufficient current capacity.

3) Connecting Peltier element

Name	Pin	Connection
PELTIER	PL+	Please connect the each lead wire of Peltier device respectively as follows. The surface of Peltier device which should be temperature-controlled is cooling when a current flows from PL+ to PL-.
	PL-	

* Please use a wiring material with sufficient current capacity.

4) Connecting temperature sensor

Name	Pin	PLC-24V10AL-PT		PLC-24VAL-TH
		3-wire Pt sensor	2-wire Pt sensor	NTC thermistor
MAIN SENSOR	A/TH+	A	A	Th+
	B1/TH-	B	B	Th-
	B2	B	Short with B1/TH-	Open
SUB SENSOR	STH+	Th+		
	STH-	Th-		

* Only NTC thermistor is supported as the sub sensor. Pt sensor can not be connected to the sub sensor.

5) Connecting DC fan

Name	Pin	Connection
FAN	F-	GND
	F+	Vcc * Please connect after checking the rated voltage of the fan motor.
	FS	PULSE * Please connect if a pulse sensor is equipped.

* Only supports direct output, the same voltage as power supply voltage is outputed to F+ (Vcc).

6) Connecting of communication cable

When you want to operate this product by communication commands, please connect the attached RS-232 communication cable.

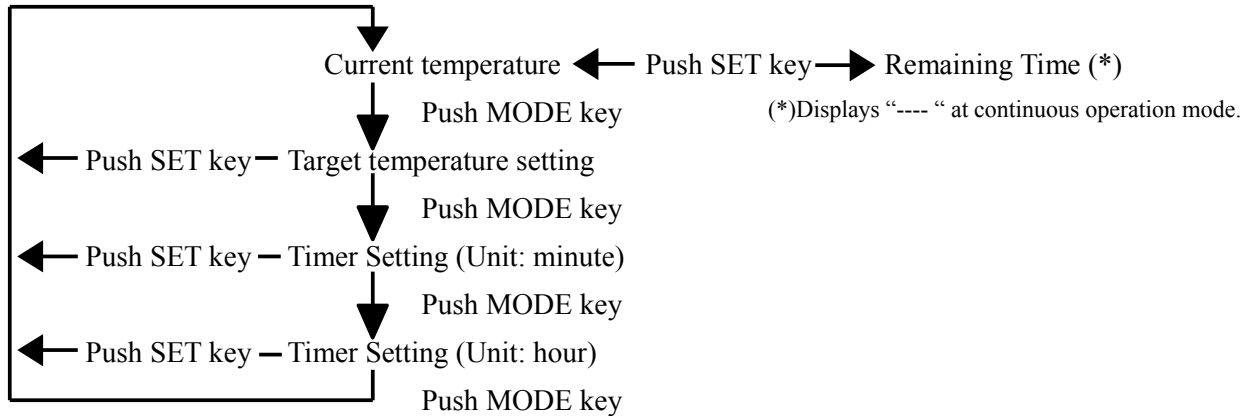
*Do not connect any cable except for the attached RS-232 communication cable.

7. Operation

* About operation on lock mode, please refer the PLC-24V10AL reference manual.

Display change by MODE key

Every time when MODE key is pushed, the display of 7 segment LED changes as follows.



Operation procedure of continuous mode

- 1) Pressing the MODE key to change the display to the target temperature setting mode.
(TEMP. LED blinks)
- 2) Set the desired temperature using UP/DOWN keys.
 - * A fast setting is available by pressing the button continuously.
 - * The target temperature can be set within the preset temperature range.
- 3) Pressing SET key to complete the target temperature. (Displays current temperature)
- 4) Slide the START switch to "ON". (Start the temperature control)
- 5) Slide the START switch to "OFF". (Stop the temperature control)
 - * The target temperature is stored in the memory even if the power is turned off.

Operation procedure of timer mode

- 1) Set the target temperature using UP/DOWN keys as same as continuous mode.
- 2) Press the MODE key to display the timer setting mode (unit: minute or hour).
(MIN. or HOUR LED blinks)
- 3) Press the UP/DOWN keys to change the timer setting.
 - * A fast setting is available by pressing the button continuously.
- 4) Press the SET key to complete the timer setting. (Displays current temperature)
 - * The unit of "minute" or "hour" which was set up at the last becomes effective.
- 5) Slide the timer switch of this unit to "ON". (Start the timer)
 - * If a start switch is already "ON", the timer mode is started from that point.
 - * If a START switch is turned off, slide both of START switch and TIMER switch to "ON" simultaneously.
- 6) A remaining time of timer is displayed if the SET key is pressed.
(Displays current temperature if the SET key is pressed again)
- 7) When the timer reached the setup time, the operation is automatically stopped.
 - * If a TIMER switch is turned off before the end of a timer, temperature control is kept in the continuous mode.
 - * If a TIMER switch is turned off and turned on again, the timer will start again from the beginning.
 - * The setting of the timer is stored in the memory even if the power is turned off.

8. Alarm and protect functions

Once the alarm is occurred, the ALARM LED is blinking and the temperature operation control is stopped.

Each function can be set to ON or OFF by the dedicated software.

Moreover, change of a detection reference value can be changed about some functions.

Name	Cause code	Description
Temperature sensor	Main: --- 1 Sub: --- 7	An alarm occurs when the temperature sensor is not connected or disconnected.
Power supply	Under: --- 3 Over: --- 4	An alarm occurs when the power supply voltage is out of the preset reference range.
Peltier current	Under: --- 5 Over: --- 6	An alarm occurs when the Peltier current is out of the preset reference value range.
Fan stop	--- 2	When using DC fan with pulse sensor (3 wire type), rotation pulse from fan is not detected about 5 seconds or more, an alarm occurs.
Peltier polarity	--- 8	An alarm occurs when the temperature control operation is continued with the polarity of the Peltier element reversely connected
Reverse protection	RUN LED blinking	When the drive polarity is reversed, the temperature control operation is temporarily stopped, and the Peltier element is protected from over current. (It restarts automatically)

9. Specifications

Item	-PT	-TH	Remarks
Power supply	DC 7V to 24V		Single power supply
Consumption (Main)	150mA (Max)		Not include Peltier drive current and DC fan drive current
Consumption (Display)	90mA (Max)		
Peltier drive voltage	7V to 24V		Single power supply, 0.5V to 24V on dual power supply
Peltier drive current	10A (Max)		Limited by the internal resistance and the thermo-electromotive force of Peltier element
Peltier drive method	PWM		Cooling / Heating bipolar drive
Main temperature sensor	Pt100 (*1)	NTC thermistor (*2)	(*1) 3-wire and 2-wire Pt sensor are supported (*2) Sensor type is selectable by the setting software
Sub temperature sensor	NTC thermistor		* Sensor type is selectable by the setting software
Control method	Digital PID Control		
Control temperature range	-40°C to +100°C		
Setting / display resolution	0.1°C		
Timer range	0.1min to 999.9min 0.1hour to 720hour		Accuracy of time: +/-1%
Operation temperature/ humidity	10 to 40°C / 5 to 85%RH		No condensation
Storage temperature/ humidity	-20 to 60°C / 5 to 90%RH		No condensation

TEC (Peltier) Controller PLC-24V10AL(-PT/-TH) Quick Start Manual
 Date: August 13, 2017 (Rev.1.10)
 Developer: T.S. Laboratory Corporation URL <http://tslab.com/>
 Manufacturer: Kurag Electronics LLC URL <http://kurag.o.oo7.jp/kurag-el/>