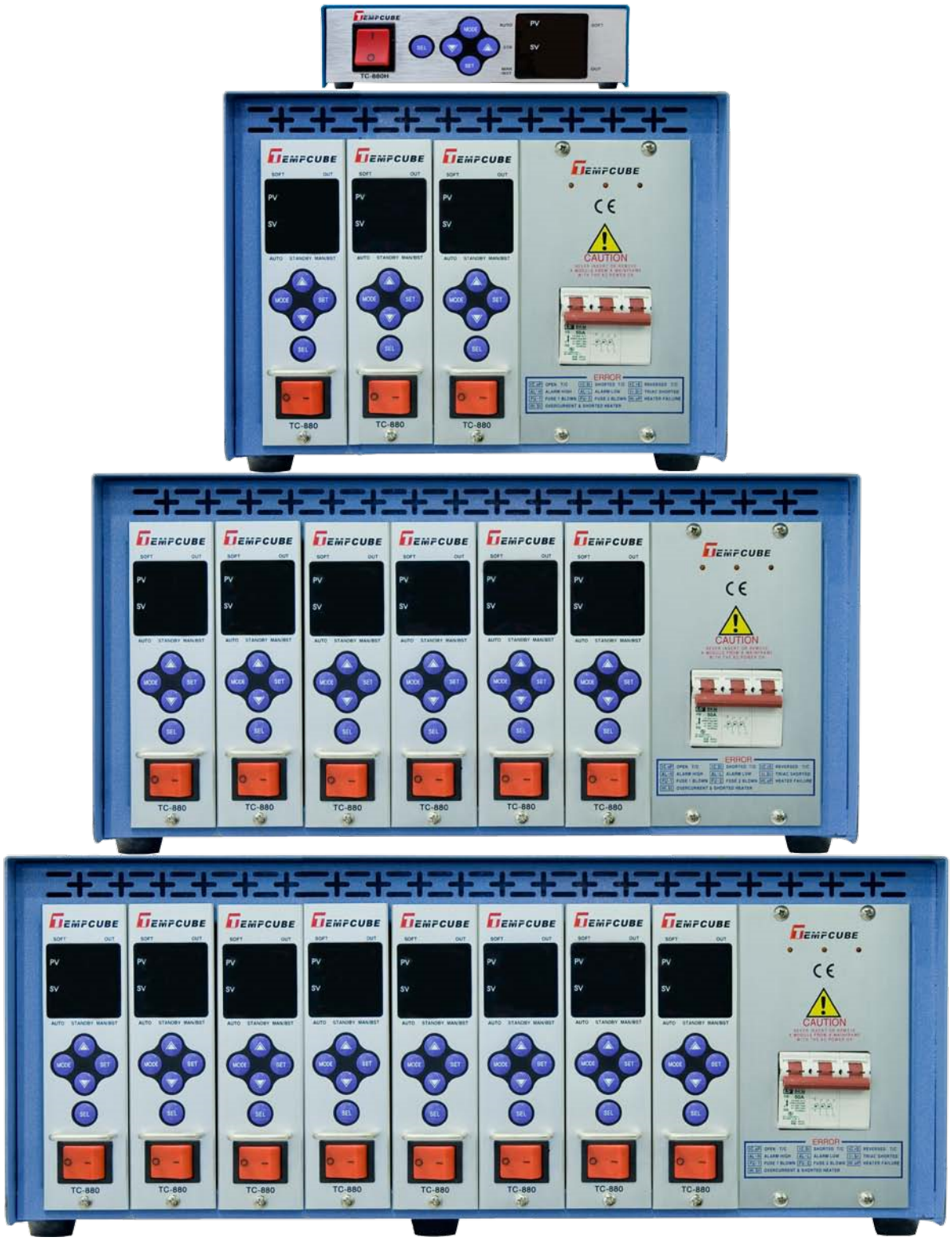
Instruction Manual

Temperature Controller

TEMPCUBE

Model : TC-880
TC-880H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Contents

1. Features

The Controller is a device that has a function to maintain the desired temperature consistently by sensing the state of Hot Runner System by use of high-intellectual computer system named MICOM and input proper power.
It has several important functions as below for precise temperature control.

- PID Control

PID Control is a method in order to maintain temperature at the set temperature accurately by controlling output power reflecting proportion, integration, and differntiation values.

- Auto Tuning

Auto tuning is a function to extract the governing factors through analyzing capacity of the heaters and heat constant of the mold(characteristics of latent heat and released heat). It helps precise control of temperature regardless of environmental change.

- Output Type

• PWM Mode

Precise temperature control can be achieved.
But electic noise is bigger than that in SSR mode.

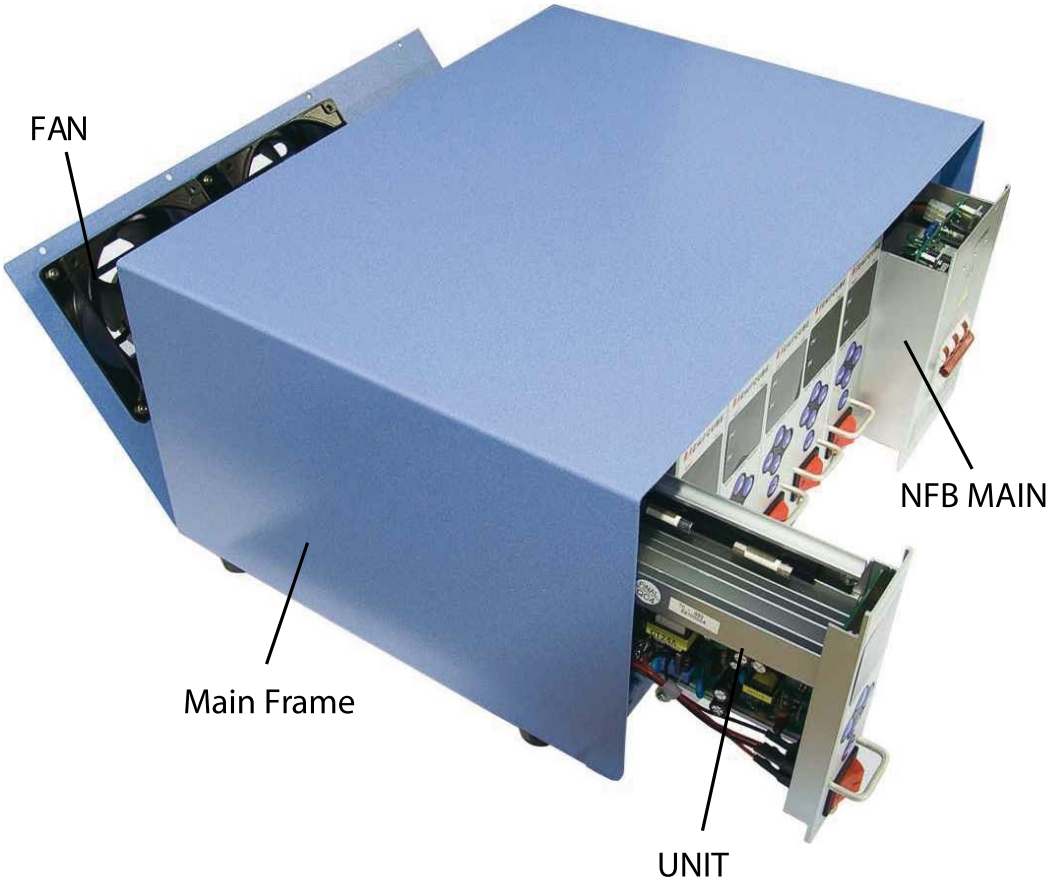
• SSR Mode

Electric noise is small.
But the specific temperature controlling ability is inferlor to PWM mode.

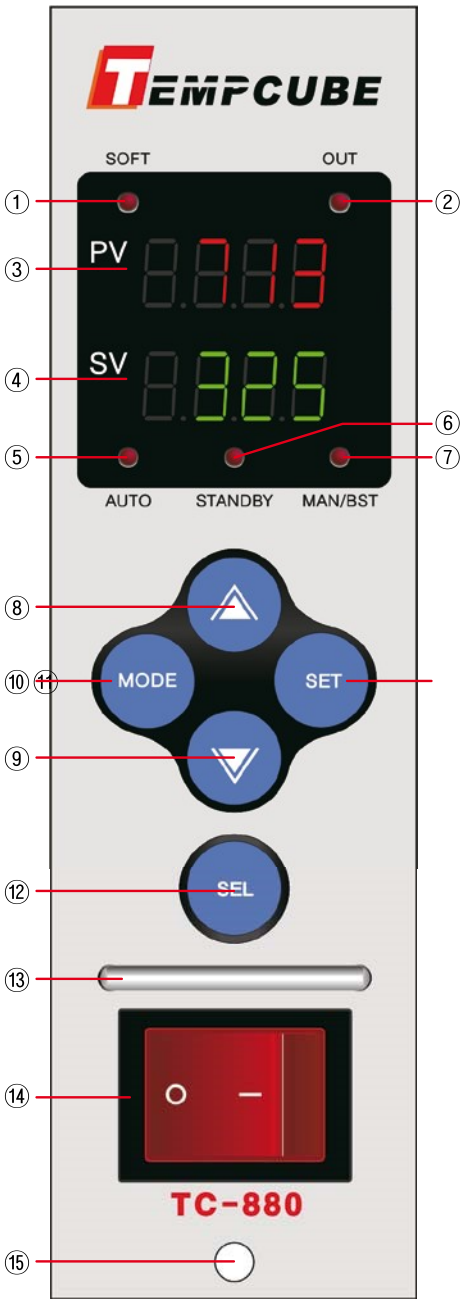
2. Control Unit Specification

Thermocouple Calibration Accuracy	0.1 ℃
Control Accuracy	±0.3 ℃ from Set point
Control Algorithm	PID, Auto Tuning
Manual Mode	Power compensation for incoming voltage variation (0 ~ 65%)
Operation Range	30 ~ 400 ℃ (86 ~ 752 ℉)
Power Output Range	15Amp/Zone (3600W/Zone)
Standby Temperature	User selectable (30~400 ℃)
Boost Mode	1 ~ 99min. 0 ~ 65 % output
Sensor	Thermocouple Type J, K
Cold Junction Compensation	Internal to enclosure
External Resistance	10Meg.Ohms
Temperature Variation	Due to T/C Length None
Input Voltage	90 ~ 250VAC, 50/60 Hz
Operation Conditions	0 ~ 50 ℃ Up to 90% humidity (Non-condensing)

3. Basic Structure of Controller



4. Nama of Components



① SOFT LED : Display SOFT Operation

② OUT LED : Display Power Output State

③ PV FND : Display measured temperature of Hot Runner System. (Red 4 DIGIT-Set value)

④ SV FND : Displays the Set Temperature of Hot Runner System.(Green 4 DIGIT-Set value)

⑤ AUTO LED : Display [Auto] Mode is selected.

⑥ STAND BY LED :
Display [Stand-By] Mode is selected.

⑦ MAN/BST LED :
Blink : Display [Manual] Mode is selected.
ON : Display [Boost] Mode is selected.

⑧ : Value increase Key

⑨ : Value decrease Key

⑩ MODE : Mode change Key
Selection/Conversion Key

⑪ SET : Function Conversion Key

⑫ SEL : Converse to [Auto], [Stand-By], [Manual] mode

⑬ Module handle

⑭ UNIT power switch

⑮ UNIT Lock Bolt

5. Operating Modes

■ Auto Mode

Auto mode is normal operation mode in which the temperature is controller and maintained automatically in accordance with the set degree.

- Display Conversion : When MODE key is pressed, the display on SV is Converted as the following orders, [Set Temperature] ⇒ [Output%] ⇒ [Ampere] ⇒ [Set Temperature].

■ Stand-By Mode

Lower setting temperature for the given time and revert to pre-condition after the given time to save energy.

- Holding SEL key for 1 second in AUTO mode will convert it into [Stand-By] mode.
- Temperature setting value (SV) is changed into % rate on the basis of the Set Temperature during [Stand-By] mode is working.

■ Manual Mode

User can adjust power output by using ▲ and ▼ key for emergency manual option at his will.

- When SEL key is pressed twice, for 1 seconds each at the [Auto] mode, it turns into [Manual] mode.
- If sensor detects any disconnection of Thermocouple (tC.oP), or Thermocouple short (tC.St), it is converted into Manual mode automatically for an emergency operation mode.

■ Boost Mode

It is possible to reach to setting temperature rapidly with output % rate on the basis of maximum output, regardless of PID control in Boost Mode.

- Press ▼ and SEL key together for 1 second to convert to [Auto] mode and [Boost] mode.

6. Basic Function

- Basic system check and setting status are displayed for 3 seconds when the power turned on.
- [Auto] mode is operated basically.

- You can control setting temperature by ▲ and ▼ key.
  Unit digit can be selected by SET key.

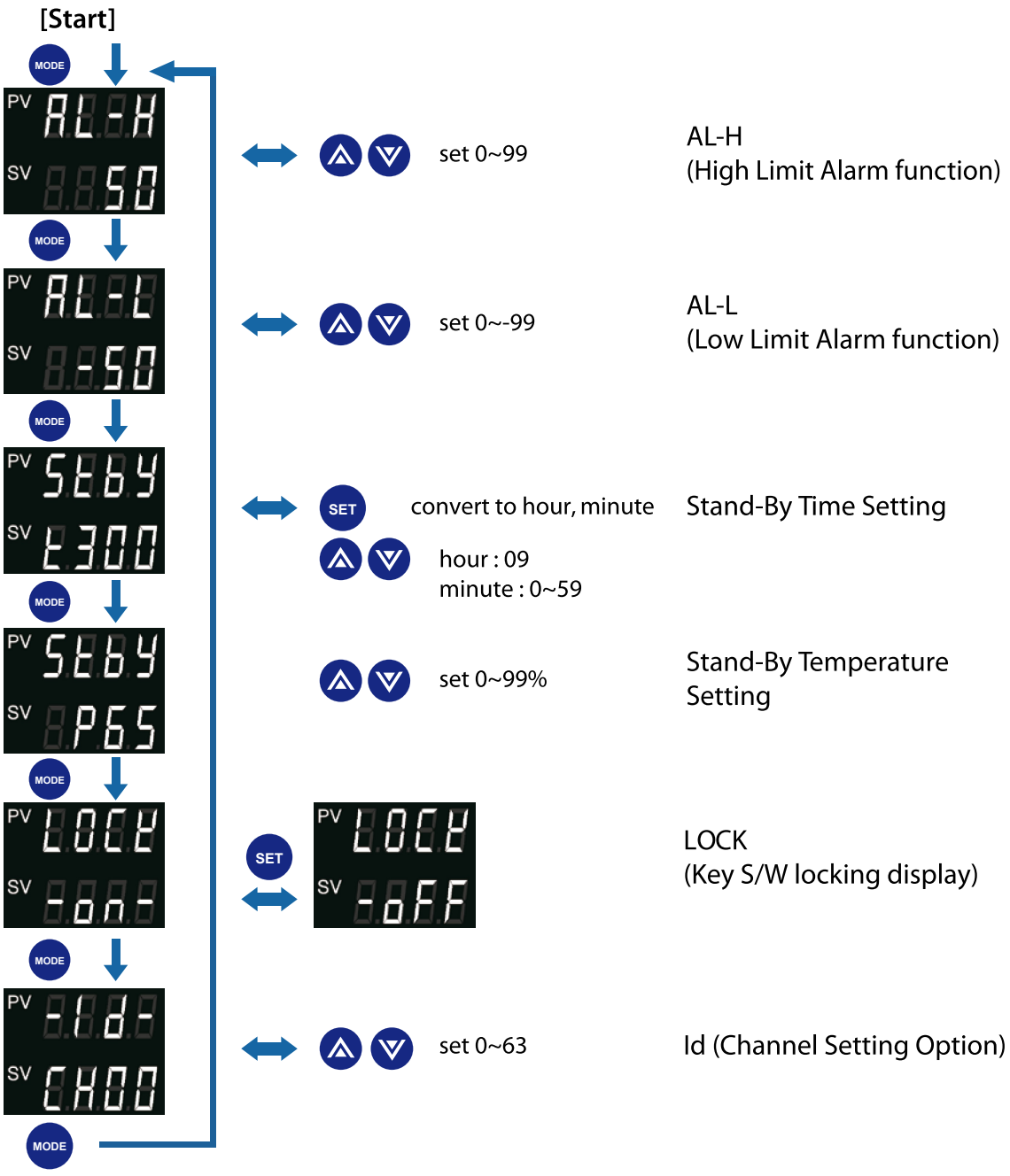
- Press SEL key for 1 second to convert mode among [Auto]/[Stand-By]/[Manual].

- Press ▼ and SEL key together for 1 second to convert mode between [Auto]/[Boost].

7. Menu Setting

7.1 Menu Setting

Press MODE key for 3 seconds to start user's setting menu.



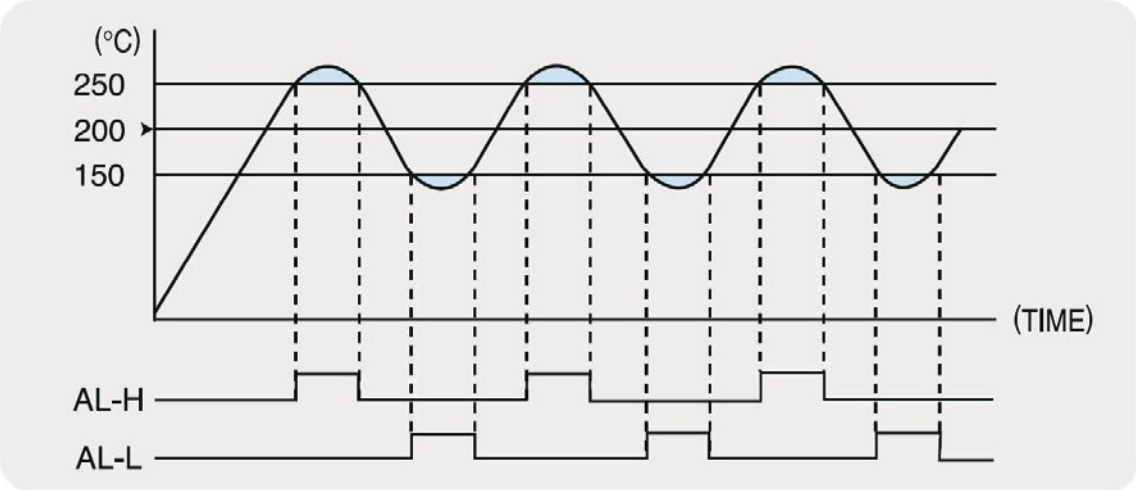
▶ To save as Set Value, press MODE and SET keys together.
Or present value is replaced automatically as Set Value unless any key is pressed for 5 seconds.

7.1.1 AL-H (High Limit Alarm function)

On the basis of the Set Temperature, when the temperature becomes higher than setting value, the AL-H function is operated.

7.1.2 AL-L (Low Limit Alarm Function)

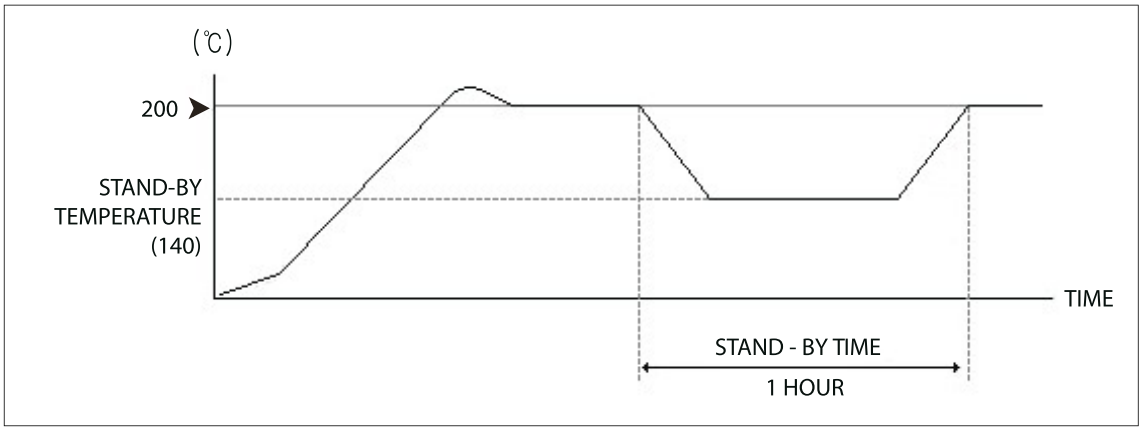
On the basis of the set temperature, when the temperature is lower than the low limit setting value, the AL-L function is operated.



ex) In case SV (Temperature Setting) : 200, AL-H(High Limit Alarm) : 50,
AL-L(Low Limit Alarm) : -50
⇒ AL-H start at 250 of measured temperature, AL-L at 150

7.1.3 Stby (Stand-By Setting)

Lower set temperature for the given time and revert to pre-condition after the given time to save energy.
ex) In case SVT(Temperature Setting) : 200, t(Stand-By time) : 1 hour (1:00),
P(Stand-By temperature) : P.70?
⇒ Stand-By mode is 140 which is 70% of mode set temperature.



7.1.4 Lock (key S/W locking device)

This is a function to prevent from the change of parameter by mistakes of user.

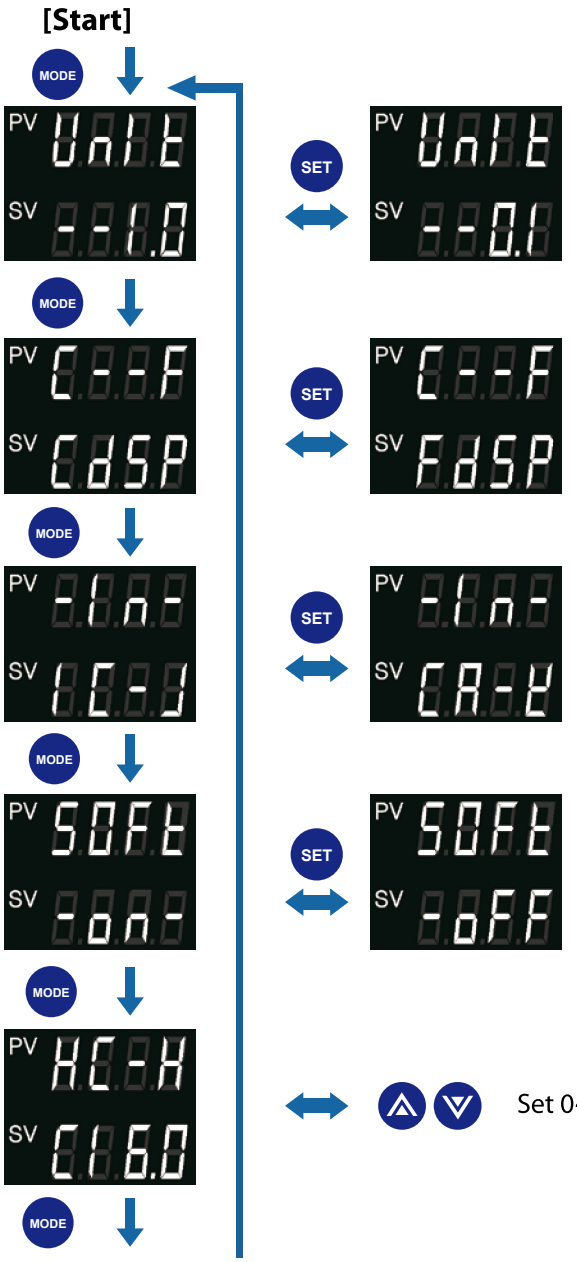
7.1.5 Id (Channel Setting-Option)

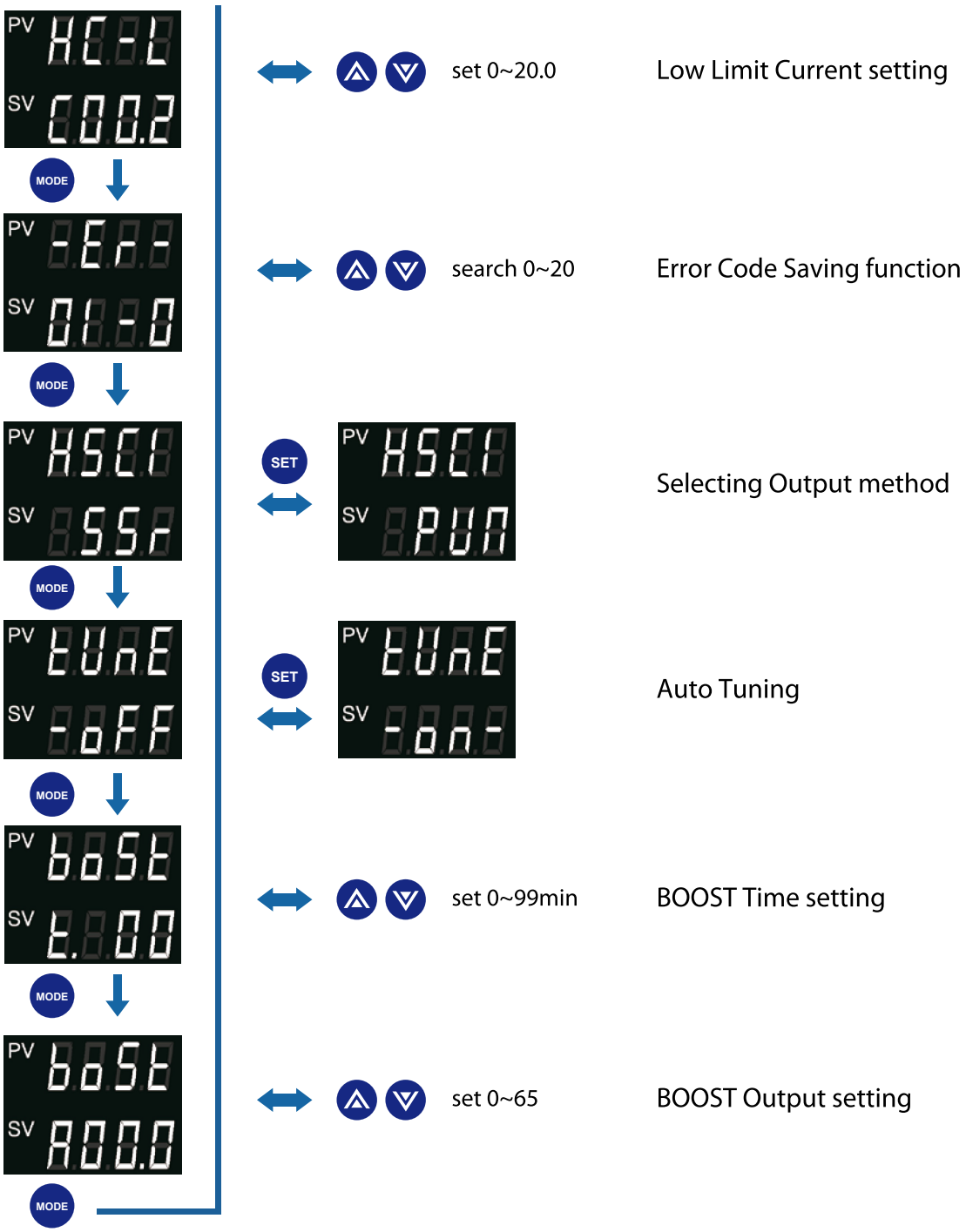
This is provided to help the intergrated management for many controller units.
The computer in Central Control Office could control each Unit according to it's own ID number.

- Integrated Management system must be installed additionally in order to use integrated management Function.

7.2 Supplier's Setting Menu

■ Press MODE and SET keys together for 5 seconds under LOCK OFF mode.




PV HC-L
SV C00.2
MODE
set 0~20.0
Low Limit Current setting
PV -Er-
SV 01-0
MODE
search 0~20
Error Code Saving function
PV HSCI
SV SSr
MODE
SET
PV HSCI
SV PUN
Selecting Output method
PV tUnE
SV -oFF
MODE
SET
PV tUnE
SV -on-
Auto Tuning
PV boSt
SV t.00
MODE
set 0~99min
BOOST Time setting
PV boSt
SV A00.0
MODE
set 0~65
BOOST Output setting

7.2.1 UnIt (Temperature display Unit Setting)

This is a function to select Temperature Units displayed.
You can choose 1.0 or 0.1 for temperature units.

7.2.2 C—F (Celsius and Fahrenheit degrees selection)

Each Celsius or Fahrenheit degrees can be selected for temperature units.

7.2.3 –In- (Sensor Selecting Function)

You can select sensor (J, K) what you want to use.

7.2.4 SoFt (Soft Start setting)

This helps to avoid humidity-caused damage in heater, by outputting 30% of input power for 1 minute at the beginning of power supply in order to check connection state of a heater and sensors, and start smooth control action at low heat state.

7.2.5 HC-H (High Limit Current Setting)

This is provided to detect malfunction of the heater(disconnection).
It displays " HtSt" alarm sign, and stops output, when the current becomes bigger than the high limit.

7.2.6 HC-L (Low Limit Current Setting)

This is a function to detect malfunction of the heater(disconnection).
It displays " Ht-oP" alarm sign, and stops output when the current is smaller than the Low Limit.

7.2.7 –Er- (Error Code saving function)

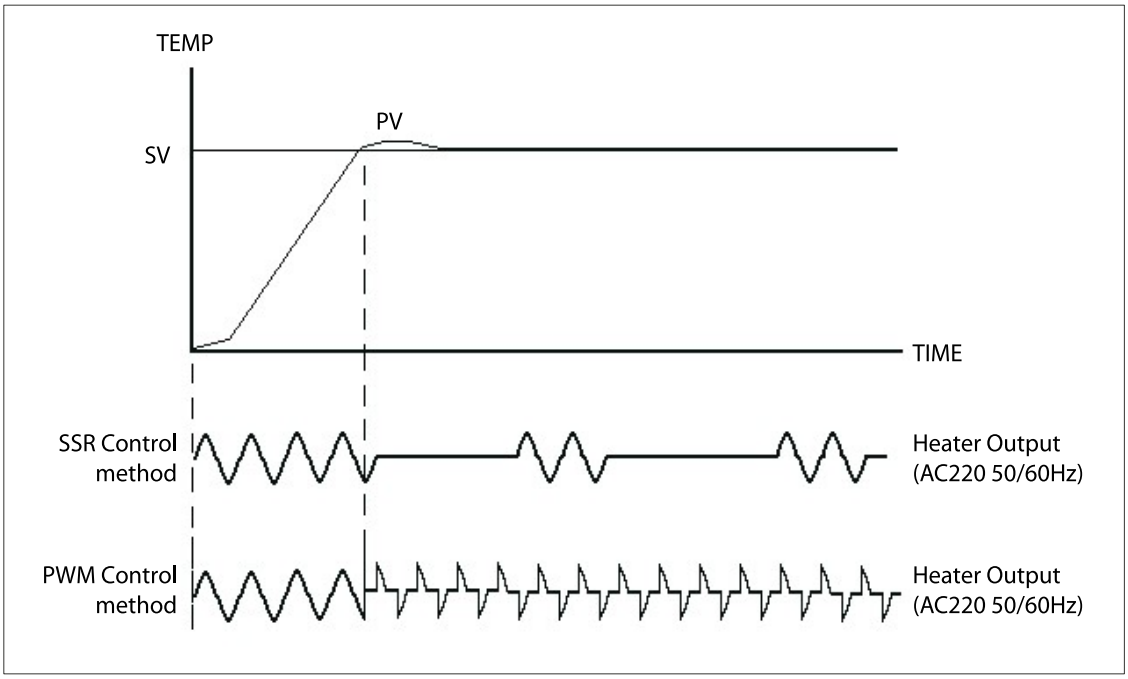
Error codes are saved in memory in order of sequence so it is possible to search errors.

■ Table of Error Code

Error Code	Display	Content
1	FU-1	Fuse 1 Disconnection
2	FU-2	Fuse 2 Disconnection
3	tCoP	Thermocouple disconnection
4	tCSt	Thermocouple Short-Circuit
5	tCrE	Thermocouple Polarity Reverse
6	AL-H	High Limit Alarm
7	AL-L	Low Limit Alarm
8	HtoP	Heater Disconnection
9	HtSt	Heater over-current
10	trSt	Triac Short

7.2.8 HSCi (Selecting Output Method)

PWM or SSR is available depending on the user's choice considering environment.



7.2.9 tUnE (Auto Tuning)

Re-tuning automatically according to heater's features when it is failed to control temperature.

7.2.10 boost (Boost function)

Increase temperature of heater rapidly.

8. Error Code display

■ ERROR code display function

NO	Error Classfication	Descriptions
1	Malfunction on Temperature sensor	- Disconnection, short or reversed polarity of sensor can be cheched. When disconnection or short is detected, it is converted into [manual operation dome] automatically, and power output will be continued to maintain at the set temperature. This function helps to prevent interrupion in production due to malfunction of a sensor, and output power can be adjusted manually at will. - On error occurrence, Sensor disconnection (Tc.OP), Sensor short(Tc.ST), Sensor reversed(Tc.RE) could be displayed on PV. When the problem is solved, power must be put again to recover Normal operation.
2	Malfunction on Heater	- Disconnection, Short Circuit and over current of heater can be detected. Short suatus of output device(SSR, TRIAC, RELAY) can be checked also. - On error occurrence, Heater Disconnection (HT.OP), Heater short(HT.ST), TRIACE short(TR.ST) could be displayed on SV. When the problem is solved, power must be put again to recover normal operation.
3	Fuse Disconnection	- In case the fuse blown out, related fuse number is displayed on SV. - When the problem is solved, power must be put again to recover normal operation.

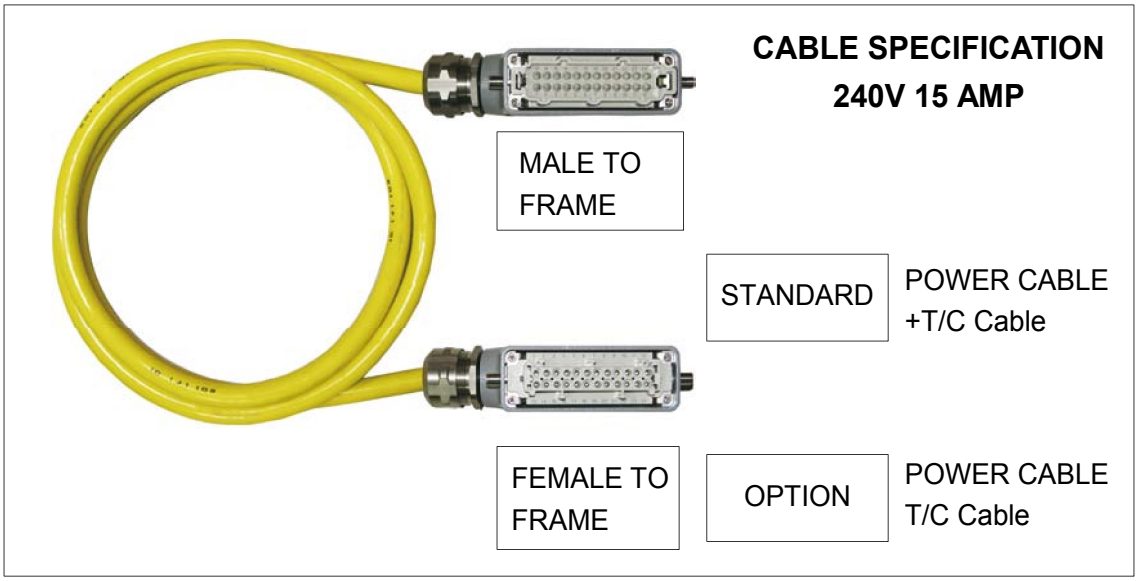
■ ERROR Signs

Reference 7.2.7 Table of Error Code.

9. Connector & Cable

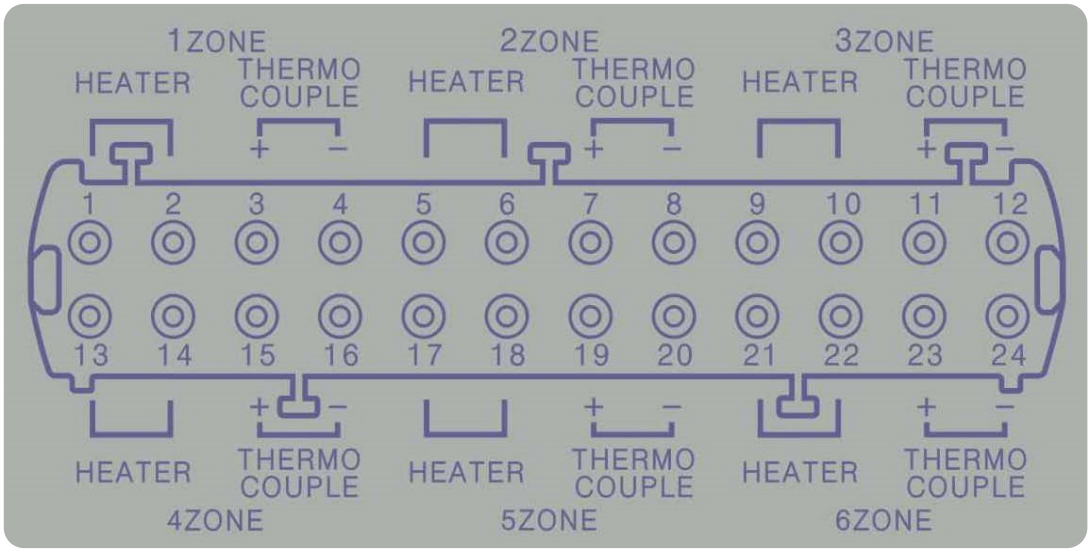
Connector means a component attached to the end part of cable in order to make it easy to connect/disconnect the wire to the mold/controller.

Various kinds of connectors are used depending on load capacities.

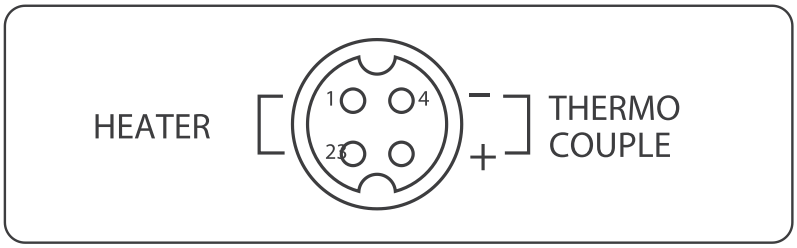


9.1 How to wire a heater and T/C in connectors

■ 24Pin Connector



■ 4Pin Connector (Round Jack)



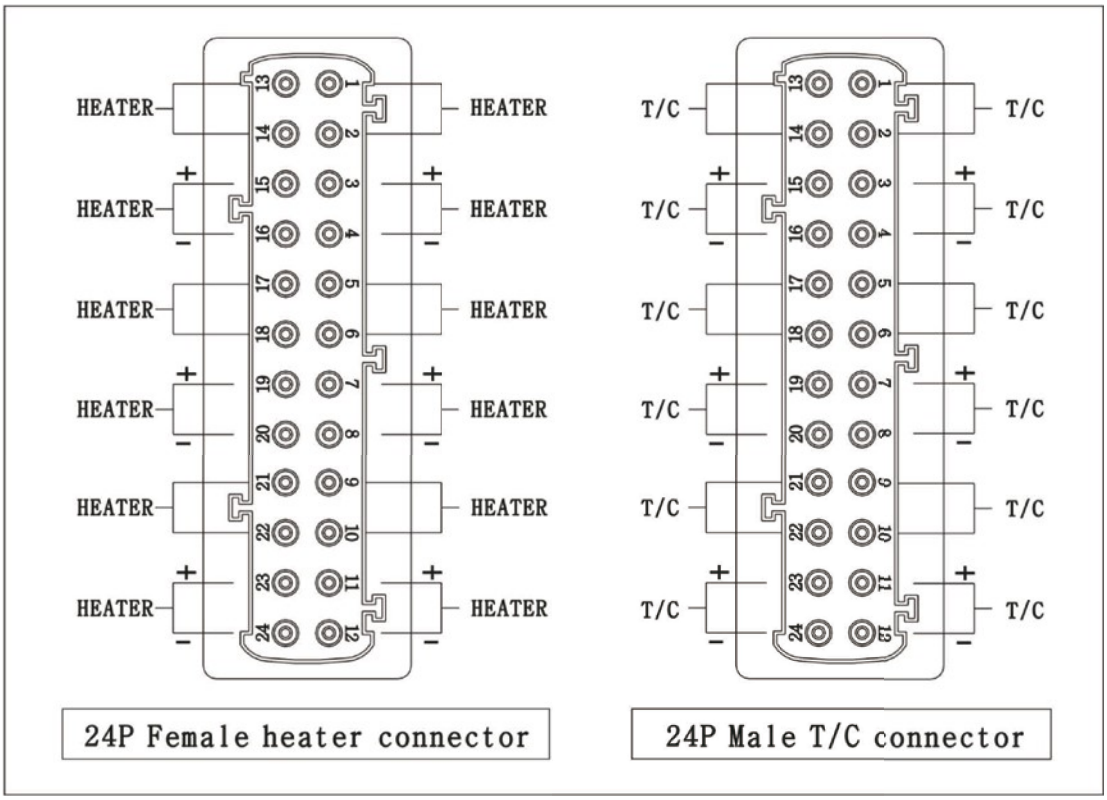
9.2 Standard Specification

Female Connector is attached to the mainframe, and TempCube supply it with 4 pins and 24 pins as the same to the following standard.

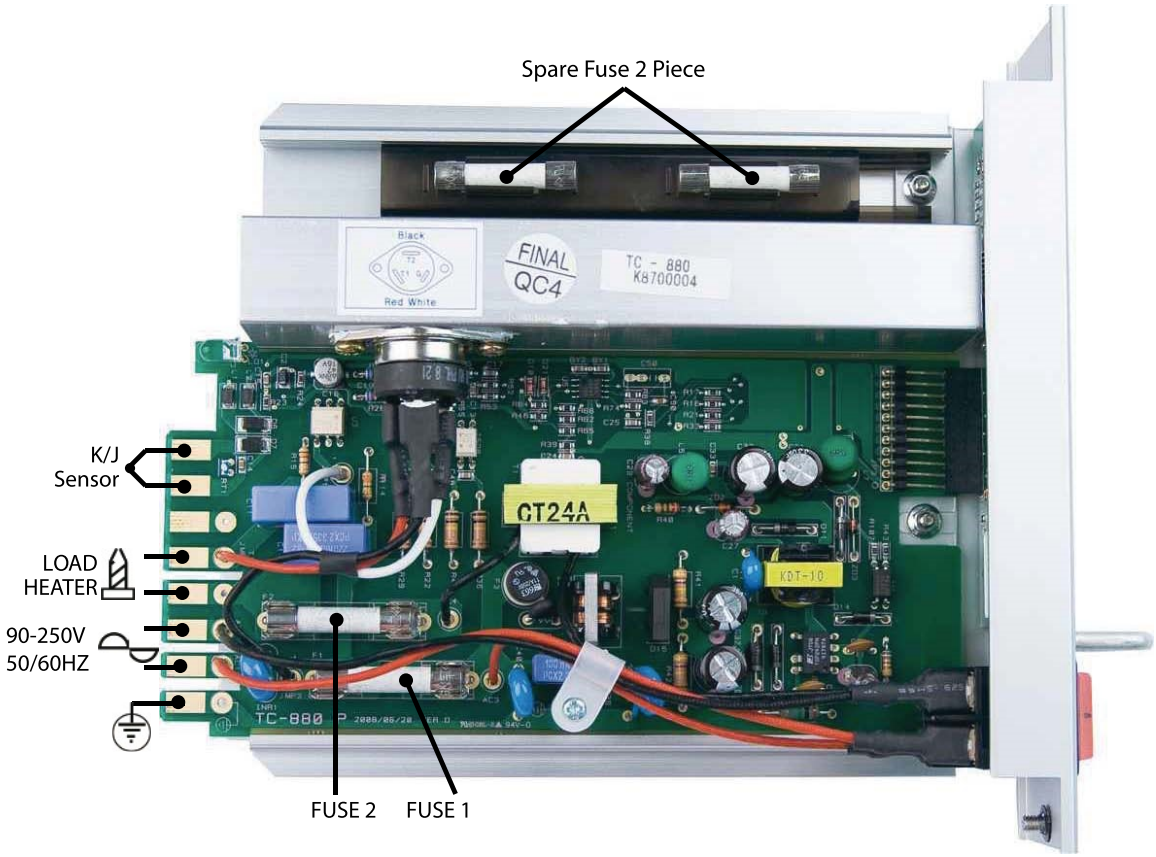
No	Controller	Connector	EA
1	1 Zone	4P Round Jack	1 EA
2	3 Zone	24P	1 EA
3	4 Zone	24P	1 EA
4	6 Zone	24P	1 EA
5	8 Zone	24P	2 EA
6	12 Zone	24P	2 EA

9.3 Options

As for option in wiring, separate power lines from that of T/C can be selected depending on customer's preference.
But also the other connector out of standard could be equipped when those are supplied from customer. In case that, a cable is fabricated according to special order, controller connector must be fabricated in accordance with the cable specification.

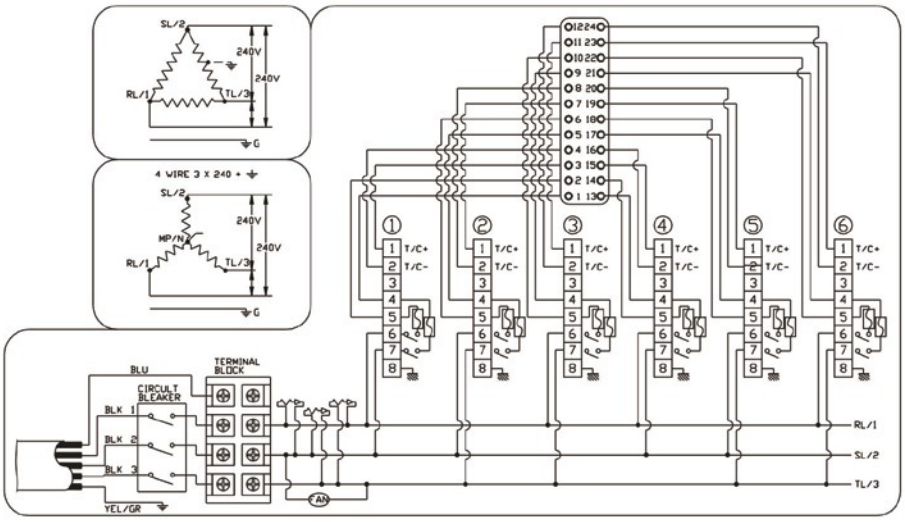


10. Diagram for Terminal Connection & Structure

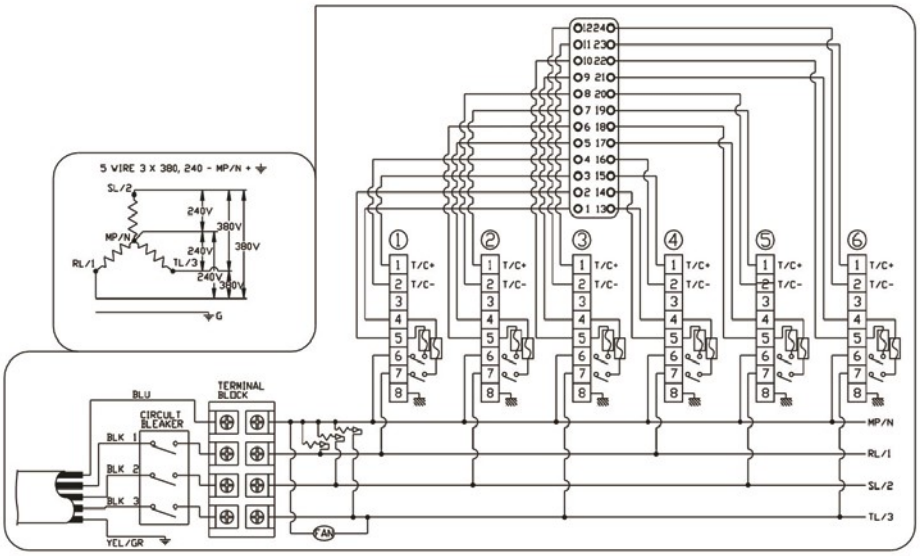


11. Electric Wiring Diagram

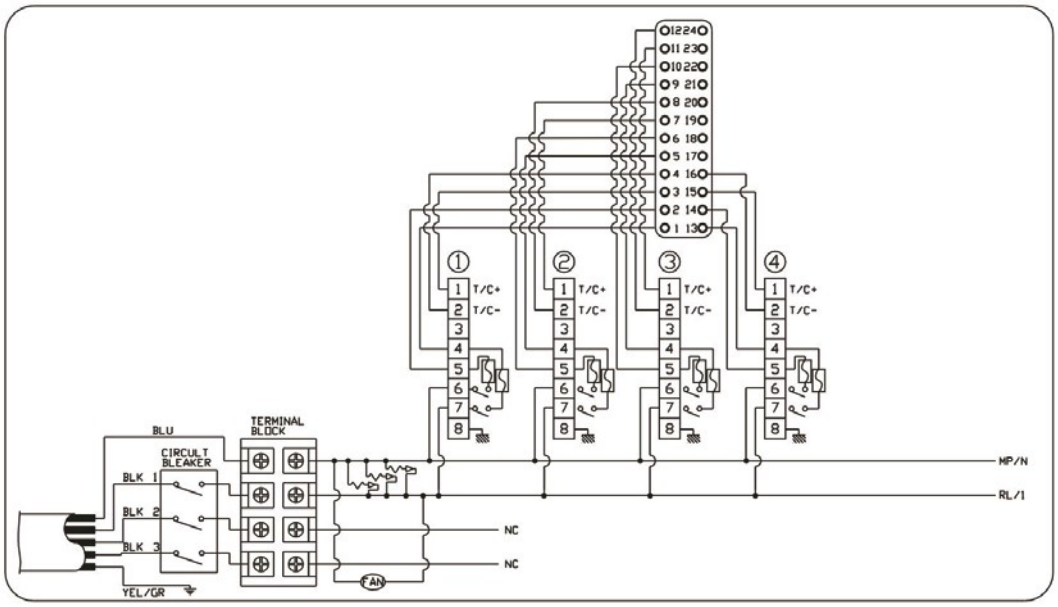
11.1 240V 3 Phase 3 Line type



11.2 380V / 440V 3 Phase 4 Line type

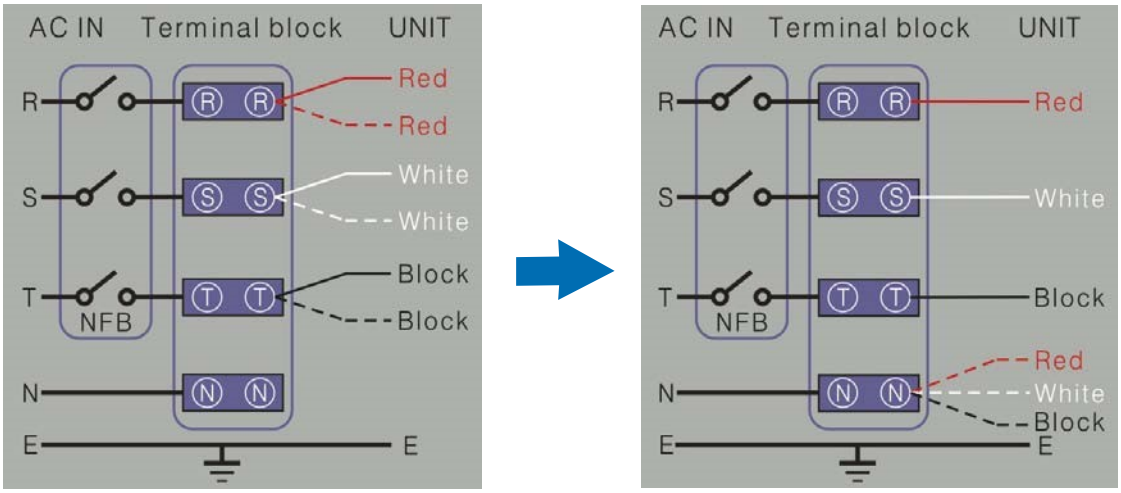


11.3 240V 1 Phase 2 Line type



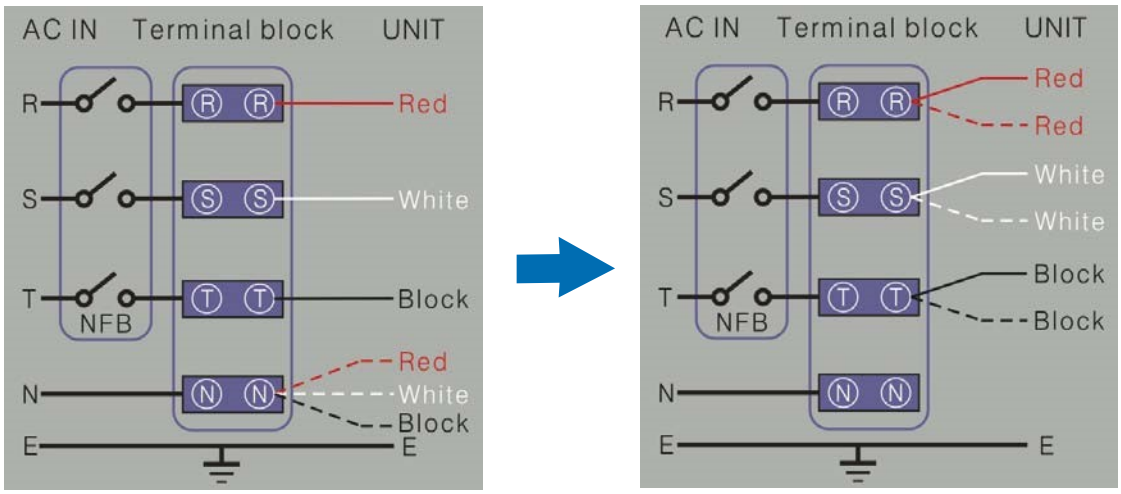
12. Wiring Modification Method

12.1 Re-wiring from AC 240V to AC380/440V for supply voltage



1. AC Main Power off.
2. Power switch off on controller.
3. Open the back cover of controller.
4. Separate all 3 white-sleeved wires from L1, L2 and L3.
   And plug all 3 white-sleeved wired into N.
5. Connect input power line, N line (white-sleeved wire) to main powr line N.
6. Above picture is the status after re-wiring.

12.2 Re-wiring from AC380/440V to AC240V for supply voltage



1. AC Main Power off.
2. Power Switch off on controller.
3. Open the back cover of controller.
4. Separate all white-sleeved wires from N.
   Plug red wire into L1, white wire into L2, and black wire into L3.
5. Separate input power line N(blue) line from N.
6. Above picture is the status after re-wiring.

13. Default Value

■ Default value of user's menu

No.	Menu	Value	
1	SV (Setting temperature)	200℃	
2	AL-H (High Limit Alarm)	50℃	
3	AL-L (Low Limit Alarm)	-50℃	
4	Stand-By	t(Stand-By Time)	1.00(1 hour)
		P(Stand-by temperature rate)	75% (150 ℃)
5	Lock	OFF	
6	-Id-	CH00	

■ Default value of Supplier Menu

No.	Menu	Value
1	[-In-] (Sensor Type)	J or K (optional)
2	[C—F] (Celsius / Fahrenheit)	CdSP(domestic) / FdSP(foreign)
3	Unit (Temperature Unit)	1.0
4	SoFt (Soft Start Function)	On
5	HC-H (High Limit Current)	C16.0
6	HC-M (Minimum Current)	C0.02
7	-Er- (Error history)	0.1-0
8	HSCI (Output Method)	PWM

14. Check points for the Trouble shooting

No	Phenomenon	Probable Causes	Check point
1	[tc.OP] on PV	· Sensor(T/C) was disconnected	· Check T/C wire with tester · When disconnected, replace it
2	[tc.St] on PV	· Sensor(T/C) wire is short on output side	· Check if T/C wire is mal-contacted at connector or pressed by mold
3	[tc.Re] on PV	· +/- polarity of sensor (T/C) is changed	· Check connection and change polarity of T/C at connector attached to mold
4	[hT.oP] on SV	· Heater was disconnected	· Check resistance of heater with tester, if it is blown out, replace heater
5	[ht.st] on SV	· Short circuit in heater or short in heaater wire · Capacity of heater is too high (15A or more)	· Check short circuit of heater or short in heater line with tester · Make wiring so that capacity of heater may lower than 15A
6	[tr.St] on SV	· TRIAC attached to heat radiator board is damaged	· Check pin in TIRAC · 2 or 3 pins may be in short circuit
7	[F--1] on SV	· F1 fuse is disconnected by momentary over-current	· Replace F-1 fuse (250V 15A)
8	[F--2] on SV	· F2 fuse is disconnected by momentary over-current	· Replace F-2 fuse (250V 15A)

No	Phenomenon	Probable Causes	Check Point
9	Temperature rises continously	· TRIAC attached to heat radiation board of Controller is damaged.	· Check pin in TRIAC · 2 or 3 pins may be in short circuit
10	Temperature drops continously	· FS1 or FS2 fuse blown out · Heater blown out · Heater wire disconnection · Sensor (T/C) disconnection	· Change fuse (250V 15A) · Check resistance of heater with tester · Check connection of heater · Check sensor disconnection
11	Severe temperature deviation between SetTemp&Sensing Temp.	· Sensor Contact is unstable · Sensor type is different each other	· Check contact state of sensor · Check sensor type · Try to retuning
12	Controller tempe-rature rises, but heater in actual mold is overheated	· T/C wire is pressed by mold or its coat is peeled, so as to contact mold or line	· Check and replace T/C wire
13	Setting temperature of controller equals with present temperature, but the heater in actual mold is overheated or cold.	· T/C(sensor) type between mold and controller is different. ex) CA(K)→IC(J) IC(J)→CA(K)	· Make T/C(sensor) type of mold equal with that of controller

15. Security Marks

	DANGEROUS VOLTAGE INSIDE
	DISCONNECT AC POWER BEFORE SERVICING