

**G A R G**  
**ELECTROHEAT**

**Induction Melting Machine**

(4 Kg - 24C)

**Owner's Manual**

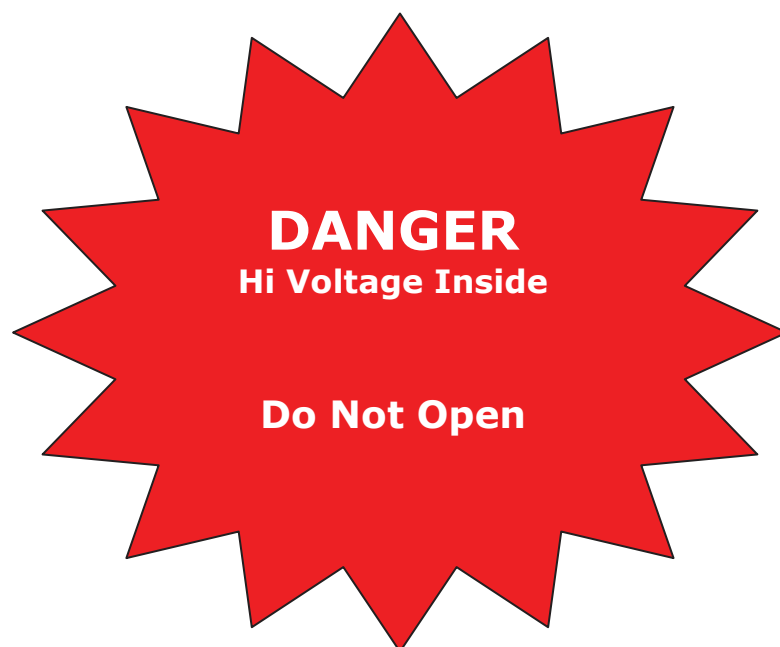
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## **Note of Thanks**

We take this opportunity to thank you for vesting your interest in our product. We strongly recommend that you should carefully read the operating instructions before attempting to operate the unit. We also recommend noting and displaying the precautions where the machine is installed.

**Warning** : Please do not attempt to open the machine when it is running. It may be extremely hazardous, as very high voltage exists inside the machine. Trained professionals only should open this machine.



## **Machine Specifications**

|                    |   |                            |
|--------------------|---|----------------------------|
| Voltage            | : | 415 Volts / 3 Phase        |
| Current            | : | 11 A (Max) / Per Phase     |
| Power              | : | 7.5 KW (Approx.)           |
| Capacity           | : | 4 Kg. (24 Kt Gold)         |
| Max. Temp.         | : | 1200 <sup>0</sup> C        |
| Frequency          | : | Medium Frequency           |
| Crucible           | : | Graphite 4 Kg              |
| Time to first Melt | : | 6-8 Minutes (Approx.)      |
| Water Circulation  | : | 8 Liters per Minute (Min.) |
| Water Temperature  | : | 45 <sup>0</sup> C (Max.)   |
| Weight             | : | 200 Kg. (Approx)           |

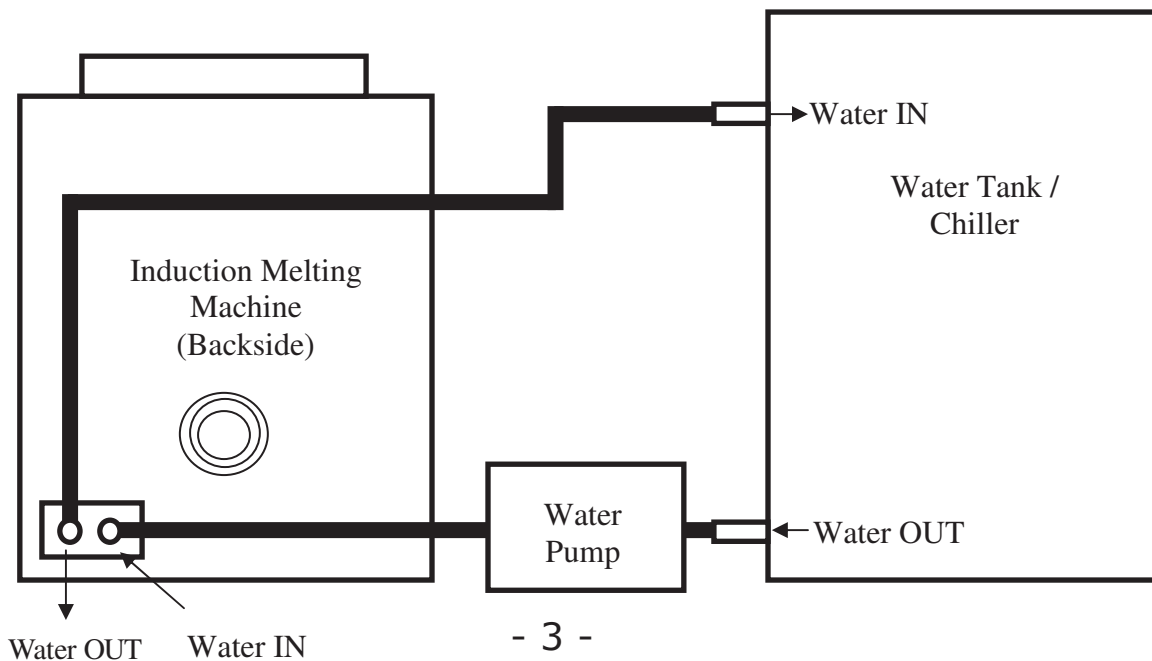
## Machine Settings

Please follow the steps as below to set up the machine

- Place the machine in airy place (if possible) at least 6" from the wall.
- Make the water connections as indicated at the backside of the machine.
- There should be provision for 20 A / 3 Ph. RYBN&E output for machine and 15/5 A plug output for Chiller (if using).
- Always check for water temperature. If it goes above 45°C stop the machine and wait for temperature to go down. It should not go below 18 deg. C.
- **If the electricity fails in the middle of the operations or for any other reason machine stops when the crucible is hot please take out the hot crucible and place cold crucible in place.**

**IMPORTANT : PLEASE DO NOT USE HARD WATER**

Water connection Diagram :



## Operating the Machine

- First set up the machine as discussed above.
- Turn ON the POWER. A fan will start at the backside.
- Turn ON the Tripper. The red POWER OFF indicator will glow and red Buzzer of Water Fail will also Buzz. The temperature controller will boot and will display room temperature in some moments.
- Turn ON the Water Pump. The red Buzzer of water fail should put off.
- Confirm that the proper crucible (4 Kg graphite) is in the place. An indicator is provided to show whether crucible is present or not. Machine will not start without Crucible.
- Set the required temperature as detailed in temp. controller's manual and marked with ink.
- Press POWER ON green push button to start the machine.
- The ampere meter will display the current taken by the machine and temperature controller will start raising the temperature on the display.
- The machine reaches 1050<sup>0</sup>C within 6-8 Minutes (Approx).
- When the melting is done, turn the machine off by pressing red POWER OFF push button.
- Now you may take out the crucible for casting or any other application.
- For next melting place the crucible in its place and press green POWER ON push button.
- When the work is done and red push button is pressed, keep the water running until temperature goes below 100<sup>0</sup>C. It is advisable to keep the crucible out of the machine when the work is done.
- When machine sensor shows 100<sup>0</sup>C you may turn off the water and the tripper of the machine.

## Troubleshooting

Please note that a trained electrician should open the machine. Please disconnect the machine from Power before opening. Always discharge the capacitors first and then proceed for repairing.

1. Machine does not start no display on temperature controller and no LED indication.
  - \* Wire from tripper is disconnected.
  - \* Wire from mains connector is open or loose.
  - \* Check the three-pin plug for wire connections.
  - \* Check the mains chord continuity.
2. Machine stops in the mid of melting and water fail LED glows.
  - \* Check the output of the water for proper pressure.
  - \* Check the water line for clogging.
  - \* If everything is fine set the screw on water pressure switch and adjust for that pressure.
3. Machine starts, current builds and then machine trips.
  - \* Check that crucible is not very thin if so please replace by a new one.
  - \* Reduce the power by power-adjustment knob and restart.
  - \* If the problem persists again reduce the power and restart.
4. Machine Turns ON but current does not built, Temperature controller shows some odd display.
  - \* Sensor is open. Replace it.

5. Machine Turns ON but current does not built, Temperature controller shows Room Temperature.

\* Check the Fuse, if it is open. Replace it.

\* Check the transformer primary connections, if found open or loose please correct it.

6. Water is very hot at the outlet or no water at all.

\* Check the water circulation inside the machine maybe there is some sharp bend in the pipe. If yes please remove the sharp bend and let the water flow.

\* If there is no sharp bend then there may be a water clog in heat sink. You may use air pressure to clean the water clog.

7. For any other reason please call us at the address and telephone nos. provided.

PLEASE DISPLAY THE FOLLOWING AT THE WORKING AREA

**\* TURN OFF THE MACHINE BY RED PUSH BUTTON WHEN YOU WANT TO TAKE OUT THE CRUCIBLE \***

**\* PLEASE INSURE THE PROPER WATER FLOW WHEN THE CRUCIBLE IS HOT INSIDE THE MACHINE \***

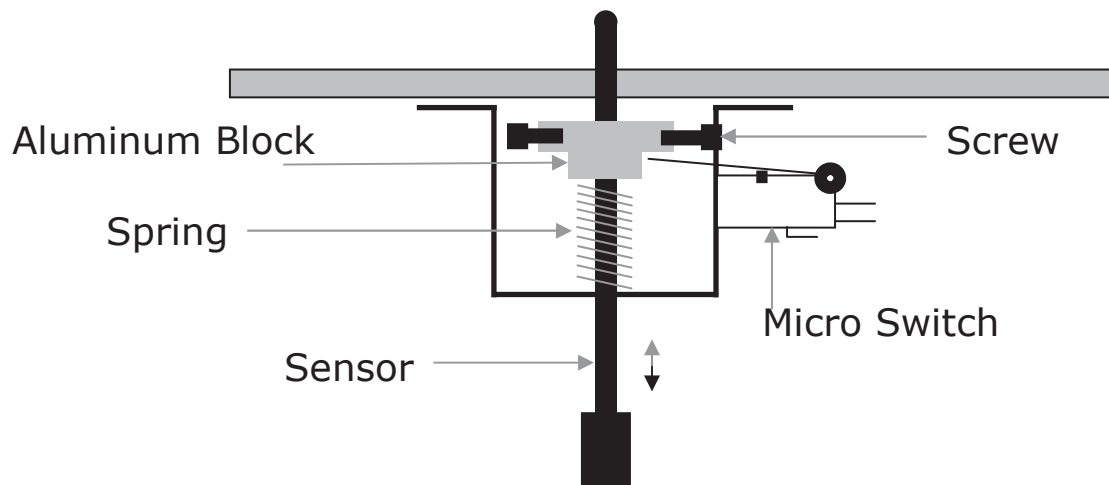
**\* TURN OFF THE WATER SUPPLY ONLY WHEN THE TEMPERATURE INDICATOR READS 200 OR BELOW \***

**\* INSURE THAT YOUR WATER TEMPERATURE IS BETWEEN 20 AND 30 DEG. CENTIGRADE.**



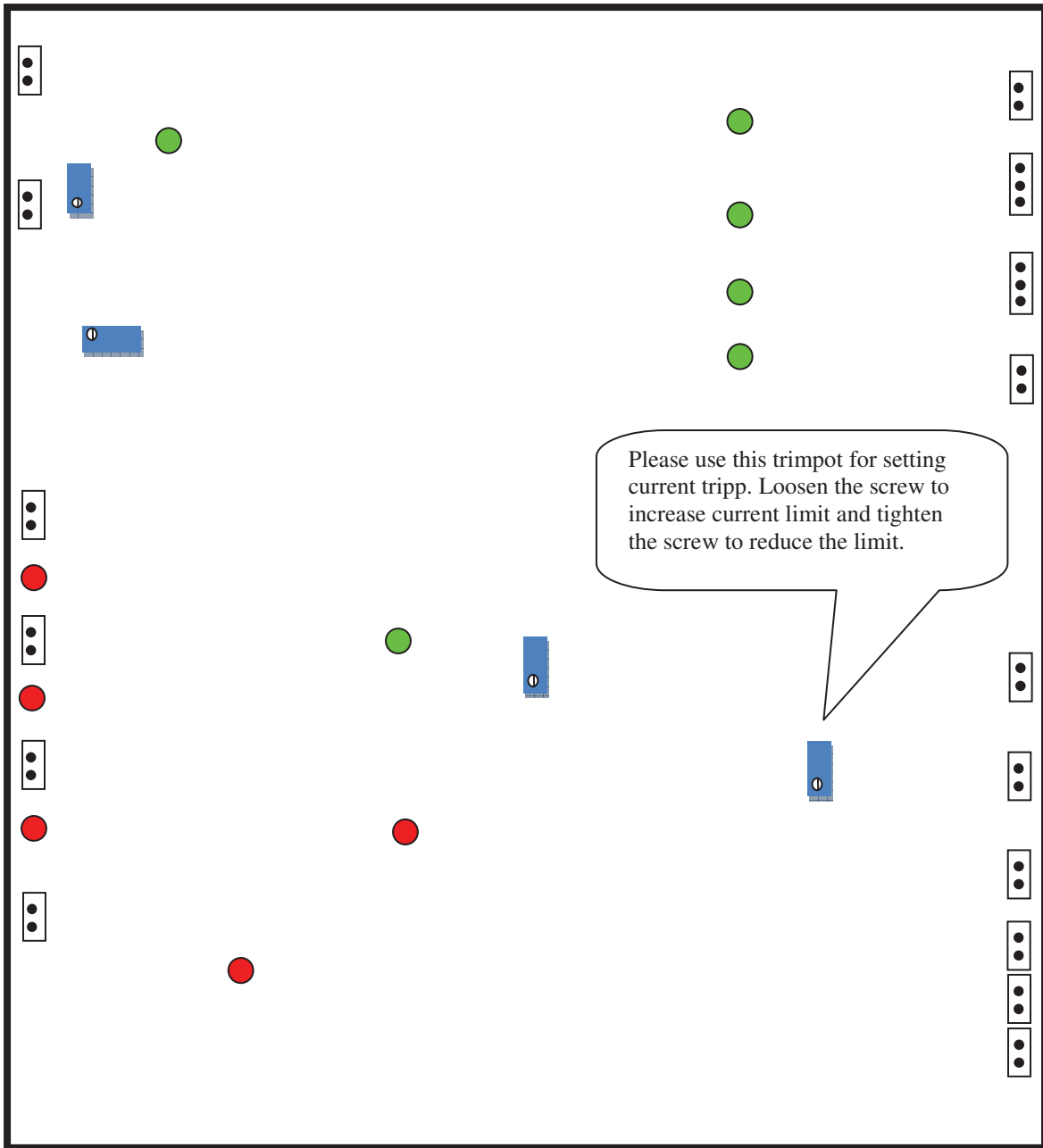
8. When you place the crucible but "NO CRUCIBLE" Light does not stop and machine does not start.

In this case you will have to adjust the sensor of the machine as directed in diagram below.



- A] Loosen the screw on Aluminum Block so that sensor can move.
- B] Place the crucible and adjust the sensor so that sensor lifts the crucible by 5 - 8 mm.
- C] Now tighten the screws. In this case when you place the crucible the spring is pressed by 5-10 mm and the micro switch will record that crucible is in place.
- D] Make sure that when you place the crucible the NO CRUCIBLE signal stops.

# Electrical Diagrams



Main Control Board

## Wire connection Diagram

Please use 20A 4 pole MCB

|        |        |           |
|--------|--------|-----------|
| Red    | -----> | Phase I   |
| Yellow | -----> | Phase II  |
| Blue   | -----> | Phase III |
| Black  | -----> | Neutral   |
| Green  | -----> | Earth     |

## **Warranty Conditions**

- 1. We Guarantee the Induction Gold Melting Machine of 4Kg against all manufacturing defects during 12 months from the date of sale by us or through our dealers.**
  
- 2. The guarantee will become INVALID**
  - a) If the machine is not operated as per instruction given in the manual.**
  
  - b) If the agreed payment terms and other conditions of sale are not followed.**
  
  - c) If the customer resale the machine to other party.**
  
  - d) If the customer tries to open the machine and creates any fault deliberately.**
  
- 3. The non-working of the machine is to be communicated to us immediately giving full details of the complaints and defects noticed. On receipt of this, we will give suitable instructions regarding the repair of machine and will send our representative for service.**

# Temperature Controller Manual

## User's Manual Digital PID Controller



### 1 Notice

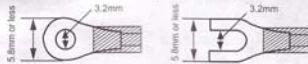
Please confirm the specification of controllers is to totally with your requirement before using it, also read this user's manual in detail.

#### ⚠ Danger

1. Danger ! Electric Shock !  
DON'T touch AC power wiring terminal when controller has been powered !  
Keep the power off until all of the wiring are completed !

#### ⚠ Warning

1. Please confirm the AC power wiring to controller is correct, otherwise it would be caused aggravated damage on controller.  
(48x48 connecting with Pin 1 and 6, 96x48/72x72/48x96/96x96 with Pin 1 and 2).
2. Be sure to use the rated power supply(AC85~265V or DC24V), otherwise it would be caused aggravated damage on controller.
3. Please confirm wires are connected with correct terminal (Input, Output).
4. Use M3 screw-compatible crimp-on terminals with an insulation sleeve, as shown below



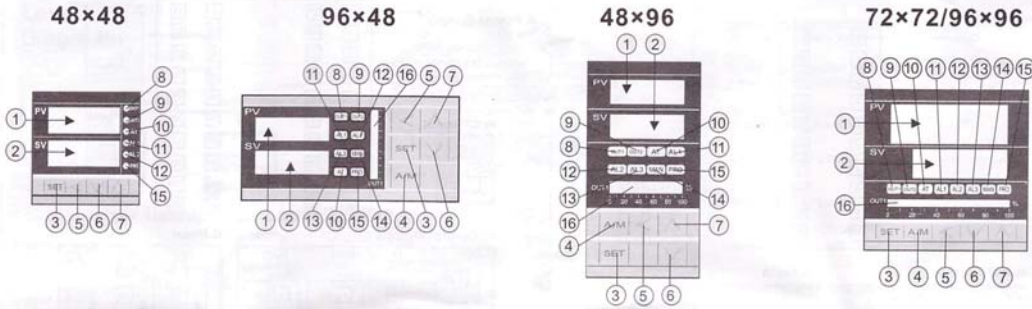
Torque : 0.4 N.m (4kgf.cm)

5. Avoid to install controller in following spaces:
  - I. A place where the ambient temperature may reach beyond the range from 0 to 50°C
  - II. A place where the ambient humidity may reach beyond the range from 50 to 85% RH.
  - III. A place where the controller likely to come into contact with water, oil, chemicals, steam and vapor.
  - IV. A place where the controller is subject to interface with static electricity, magnetism and noise.
6. For thermocouple(TC) input, use shield compensating lead wire.
7. For RTD input, use shield wires which have low resistance and no resistance difference between the 3 wires.

### 2 External Dimension and Panel Cutout < Unit : mm >

|       |  |  |  |
|-------|--|--|--|
| 48x48 |  |  |  |
| 96x48 |  |  |  |
| 72x72 |  |  |  |
| 48x96 |  |  |  |
| 96x96 |  |  |  |

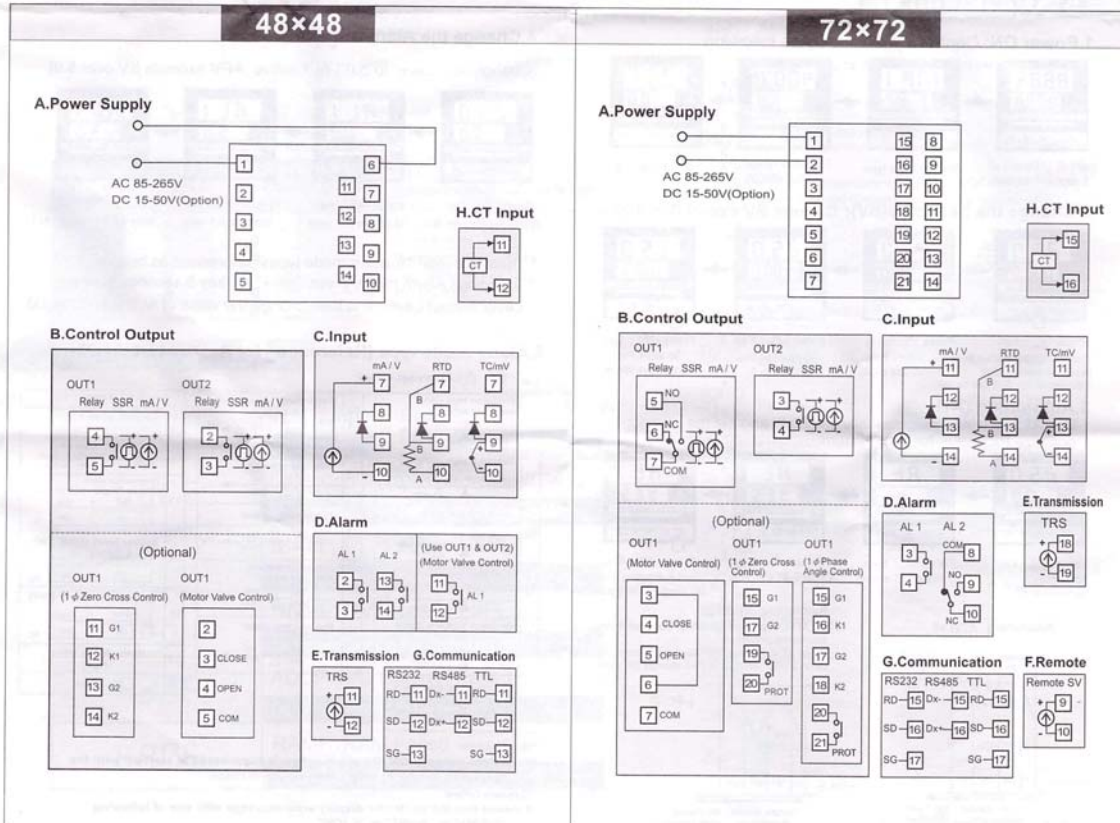
### 3 Parts Description

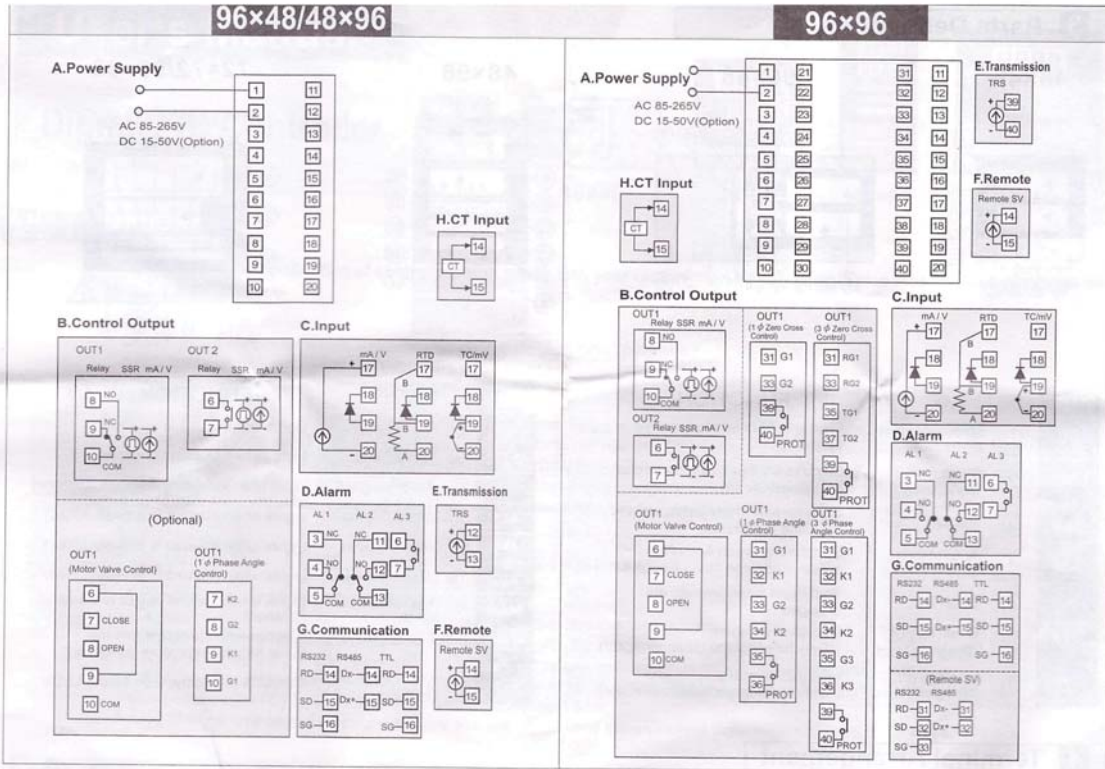


| SYMBOL | NAME                        | FUNCTION  |
|--------|-----------------------------|---|
| PV ①   | Measured value (PV) display | Displays PV or various parameter symbols (Red)            |
| SV ②   | Setting value (SV) display  | Displays SV or various parameter set values (Green)       |
| SET ③  | Set Key                     | Used for parameter calling up and set value registration  |
| A/M ④  | Auto/Manual key             | Switches between Auto (PID) output mode and Manual output |
| < ⑤    | Shift Key                   | Shift digits when settings are changed                    |
| ∨ ⑥    | Down Key (*Program Hold)    | Decrease numbers (*Only for programmable controller)      |
| ∧ ⑦    | Up Key (*Program Run)       | Increase numbers (*Only for programmable controller)      |

| SYMBOL | NAME                       | FUNCTION  |
|--------|----------------------------|---|
| OUT1 ⑧ | OUT1 lamp                  | Lights when OUT1 is on (Green)                                  |
| OUT2 ⑨ | OUT2 lamp                  | Lights when OUT2 is on (Green)                                  |
| AT ⑩   | Autotuning lamp            | Lights when Autotuning is activated (Orange)                    |
| AL1 ⑪  | Alarm 1 lamp               | Lights when Alarm 1 is activated (Red)                          |
| AL2 ⑫  | Alarm 2 lamp               | Lights when Alarm 2 is activated (Red)                          |
| AL3 ⑬  | Alarm 3 lamp               | Lights when Alarm 3 is activated (Red)                          |
| MAN ⑭  | Manual output lamp         | Lights when manual output is activated (Orange)                 |
| PRO ⑮  | Program Running lamp       | Flashes when program running (Only for programmable controller) |
| OUT% ⑯ | Output % Bar-Graph display | Output % is displayed on 10-dot LEDs                            |

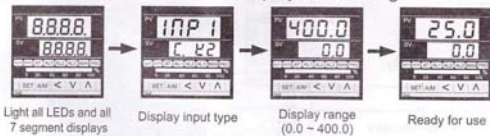
### 4 Terminal Arrangement





## 5 Operations

### 1. Power ON: Controller will display as following



Light all LEDs and all 7 segment displays    Display input type    Display range (0.0 ~ 400.0)    Ready for use

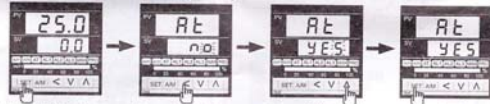
### 2. Change the Set Value(SV): Change SV from 0.0 to 100.0



Press <Key> Key    Press <Key> Key    Press <Key> Key    Press <Key> Key  
To display parameter AT.    To change AT setting.    Change AT to "YES" \*    Start Autotuning process (AT lamp will be lighted on)

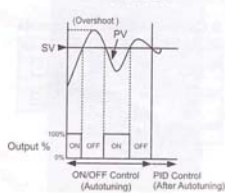
### 3. Autotuning (AT):

Use AT function to automatically calculate and set the optimize PID value for your system.

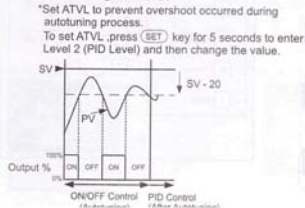


Press <Key> Key    Press <Key> Key    Press <Key> Key    Press <Key> Key  
To display parameter AT.    To change AT setting.    Change AT to "YES" \*    Start Autotuning process (AT lamp will be lighted on)

Autotuning ATVL=0

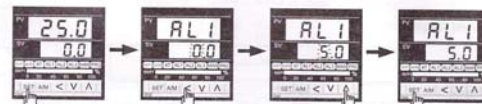


Autotuning ATVL=20



### 4. Change the Alarm value:

Change AL1 value to "5.0" (AL1 active, if PV exceeds SV over 5.0)



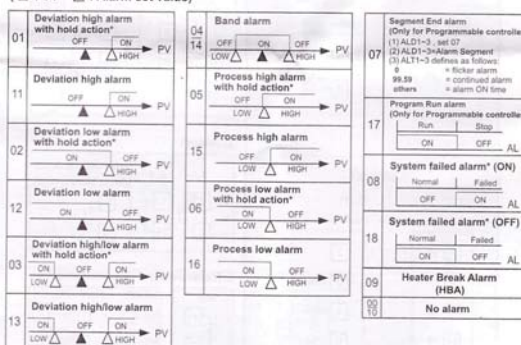
Press <Key> Key    Press <Key> Key    Press <Key> Key    Press <Key> Key  
To display parameter AL1    To change AL1 value    Increase AL1 value    Store the new value of AL1

\* There are total 16 alarm mode types, referenced as below:

\* To change Alarm mode, press <Key> + <Key> 5 seconds to enter Level 3 (Input Level) and then change the value of ALD1/ALD2/ALD3.

### 5. Alarm mode type (Referenced for ALD1/ALD2/ALD3)

(▲ : SV ▲ : Alarm set value)

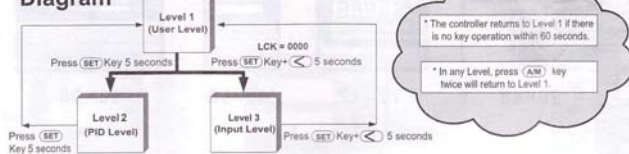


\*Hold action: When Hold action is ON, the alarm action is suppressed at start-up until the measured value(PV) enters the non-alarm range.

\*System failed: It means that the controller display error message with one of the following :

## 6 Parameter List

### Levels Diagram



### Level 1 (User Level)

|                        |      |       |
|------------------------|------|-------|
| Process Value          | PV1  | 5.1   |
| Set Value              | SV1  | 0.0   |
| Output Limit           | OUTL | 100.0 |
| Autotuning             | AT   | 0.0   |
| Alarm 1 set value      | AL1  | 0.0   |
| Heater current display | CY1  | 0.0   |
| HBA set value          | HBA  | 0.0   |
| Alarm 2 set value      | AL2  | 0.0   |
| Alarm 3 set value      | AL3  | 0.0   |

### Level 2 (PID Level)

|      |      |  |   |
|------|------|--|---|
| P1   | 3.0  | Proportional band 1 (For output 1)     | Range : 0.0~200.0% ON/OFF control if set to 0 (0.0)                             |
| I1   | 2.40 | Integral time 1 (For output 1)         | Range : 0~3600 seconds PD control if set to 0                                   |
| D1   | 6.0  | Derivative time 1 (For output 1)       | Range : 0~600 seconds PI control if set to 0                                    |
| DB   | 0    | Dead-band time                         | Don't care  |
| ATOL | 0    | Auto tuning offset value               | Range : 0~USPL  |
| CYT1 | 1.0  | Output 1 cycle time                    | Range : 0~150 seconds Relay output : 10 Voltage pulse output : 1, mA output : 0 |
| HYS1 | 1    | Hysteresis for output 1 ON/OFF control | Range : 0~1000  |
| P2   | 3.0  | Proportional band 2 (For output 2)     | The same with P1  |
| I2   | 2.40 | Integral time 2 (For output 2)         | The same with I1  |
| D2   | 6.0  | Derivative time 2 (For output 2)       | The same with D1  |
| CYT2 | 1.0  | Output 2 Cycle time                    | The same with CYT1  |
| HYS2 | 1    | Hysteresis for output 2 ON/OFF control | The same with HYS1  |
| GAP1 | 0    | Control gap 1 (For output 1)           | Set point of output 1 (Heating side) =SV - GAP1                                 |
| GAP2 | 0    | Control gap 2 (For output 2)           | Set point of output 2 (Cooling side) =SV + GAP2                                 |
| LCK  | 0000 | Function lock                          |   |

| LCK  | Levels entering available |                     |                       | Parameters which can be changed    |
|------|---------------------------|---------------------|-----------------------|------------------------------------|
|      | Level 1 (User Level)      | Level 2 (PID Level) | Level 3 (Input Level) |                                    |
| 0000 | ⊙                         | ⊙                   | ⊙                     | All parameters (Factory set value) |
| 1111 | ⊙                         | ⊙                   | ---                   | All parameters                     |
| 0100 | ⊙                         | ⊙                   | ---                   | All parameters except Level 3      |
| 0110 | ⊙                         | ⊙                   | ---                   | Parameters in Level 1              |
| 0001 | ⊙                         | ---                 | ---                   | SV* and "LCK"                      |
| 0101 | ⊙                         | ⊙                   | ---                   | Only "LCK"                         |

## 7 Error Displays

|      |  |   |
|------|--|---|
| IN1E | IN1E : Input 1 Error                     | Check whether input loop is opened or wiring incorrect. |
| CJCE | CJCE : Cold Junction Compensation Failed | Check the compensation diode outside controller.        |
| UUU1 | UUU1 : PV is above USPL                  | Check whether the input value is correct or not.        |
| NNN1 | NNN1 : PV is below LSPL                  | Check whether the input value is correct or not.        |
| ADCF | ADCF : A/D Convert Failed                | Controller needs to be repaired.                        |
| RAMF | RAMF : RAM Failed                        | Controller needs to be repaired.                        |

### Level 3 (Input Level)

|      |  |  |
|------|--|--|
| INP1 | Input type selection   |  |
| RNL1 | Analog input low limit calibration (Used for mA and V input)                           | Range : -1999 ~ 9999   |
| RNH1 | Analog input high limit calibration (Used for mA and V input)                          | Range : 0 ~ 9999   |
| DP   | Decimal point position (Available for mA and V input)                                  | 0000 · 000.0 · 00.00 · 0.000   |
| LSPL | Lower Set-Point Limit  | Scaling Low Limit  |
| USPL | Upper Set-Point Limit  | Scaling High Limit   |
| RNL2 | Remote input low limit calibration   | Range : -1999 ~ 9999   |
| RNH2 | Remote input high limit calibration  | Range : 0 ~ 9999   |
| ALD1 | Alarm mode of AL1  | Range: 00~19 Refer to "Alarm mode type"  |
| ALT1 | Alarm time of AL1  | Range : 0~99 Min 59 Secs 0=Flicker Alarm · 99=59=Continued Others=On delay time (If ALD=07, ALT means alarm on time) |
| ALD2 | Alarm mode of AL2  | The same with ALD1   |
| ALT2 | Alarm time of AL2  | The same with ALT1   |
| ALD3 | Alarm mode of AL3  | The same with ALD1   |
| ALT3 | Alarm time of AL3  | The same with ALT1   |
| HYSR | Hysteresis of all Alarm  | Range : 0~1000   |
| CLO1 | Output 1 low limit calibration (Used for mA and V output)                              | Range : 0 ~ 9999   |
| CHO1 | Output 1 high limit calibration (Used for mA and V output)                             | Range : 0 ~ 9999   |
| CLO2 | Output 2 low limit calibration (Used for mA and V output)                              | The same with CLO1   |
| CHO2 | Output 2 high limit calibration (Used for mA and V output)                             | The same with CHO1   |
| CLO3 | Retransmission low limit calibration   | The same with CLO1   |
| CHO3 | Retransmission high limit calibration  | The same with CHO1   |
| RUCL | Full run time of proportional motor (Used for proportional motor valve control output) | Range : 5~200 seconds  |
| WAR  | Used for programmable controller to wait continued operation                           | 0=Not wait Others=Wait value   |
| SEL  | Communication Protocol Selection   | MODBUS RTU / MODBUS ASCII / TAIE   |
| bits | Communication Bits Configuration   | 0_81 / O_82 / E_81 / E_82  |
| IDNO | ID number  | Range : 0 ~ 255  |
| BAUD | Baudrate   | 2400 / 4800 / 9600 / 19200 / 38400 bps   |
| SVOS | SV compensation  | Range : -1000~1000   |
| PVOS | PV compensation  | Range : -100.0~500.0   |
| UNIT | Unit of PV & SV  | C(°C) / F(°F) / A(Analog)  |
| PVFL | PV Filter  | PV will response faster if PVFT is smaller.  |
| CRSC | Reserved   |  |
| QUD  | Action mode  | Heat / Cool  |
| OPRD | Control algorithm  | PID / Fuzzy  |
| HZ   | Frequency  | 50 / 60HZ  |



## **Our contact Details**

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