G A R G

ELECTROHEAT

Induction Melting Machine

(6 Kg – 24Kt)

Owner's Manual

Index

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.

DANGER
Hi Voltage Inside

Do Not Open
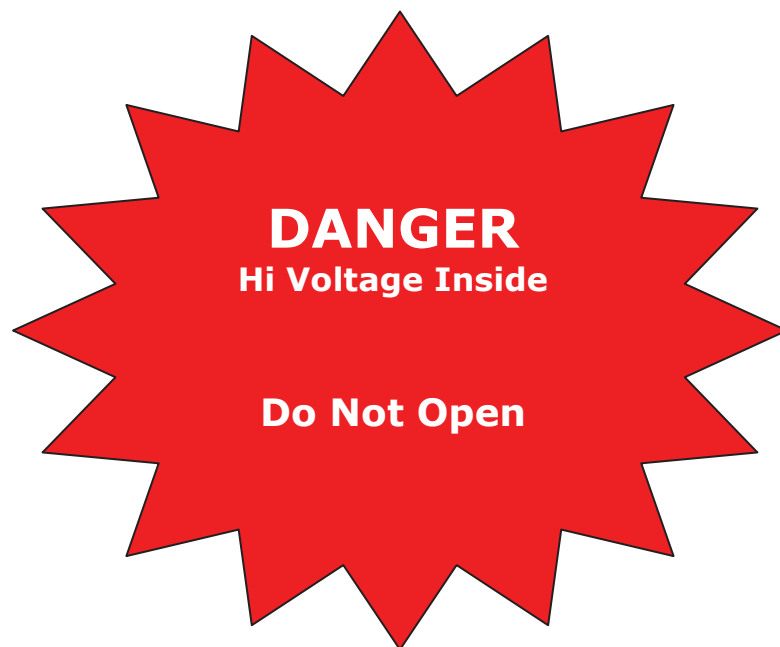
Machine Specifications

Voltage	:	415 Volts / 3 Phase
Current	:	13 A (Max) / Per Phase
Power	:	9.0 KW (Approx.)
Capacity	:	6 Kg. (24 Kt Gold)
Max. Temp.	:	1200^0C
Frequency	:	Medium Frequency
Crucible	:	Graphite 6 Kg
Time to first Melt	:	6-8 Minutes (Approx.)
Water Circulation	:	8 Liters per Minute (Min.)
Water Temperature	:	45^0C (Max.)
Weight	:	220 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 45^0C 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 any cold crucible in place.

Water connection Diagram :

Induction Melting Machine (Backside)

Water OUT   Water IN

Water IN

Water Tank / Chiller

Water OUT
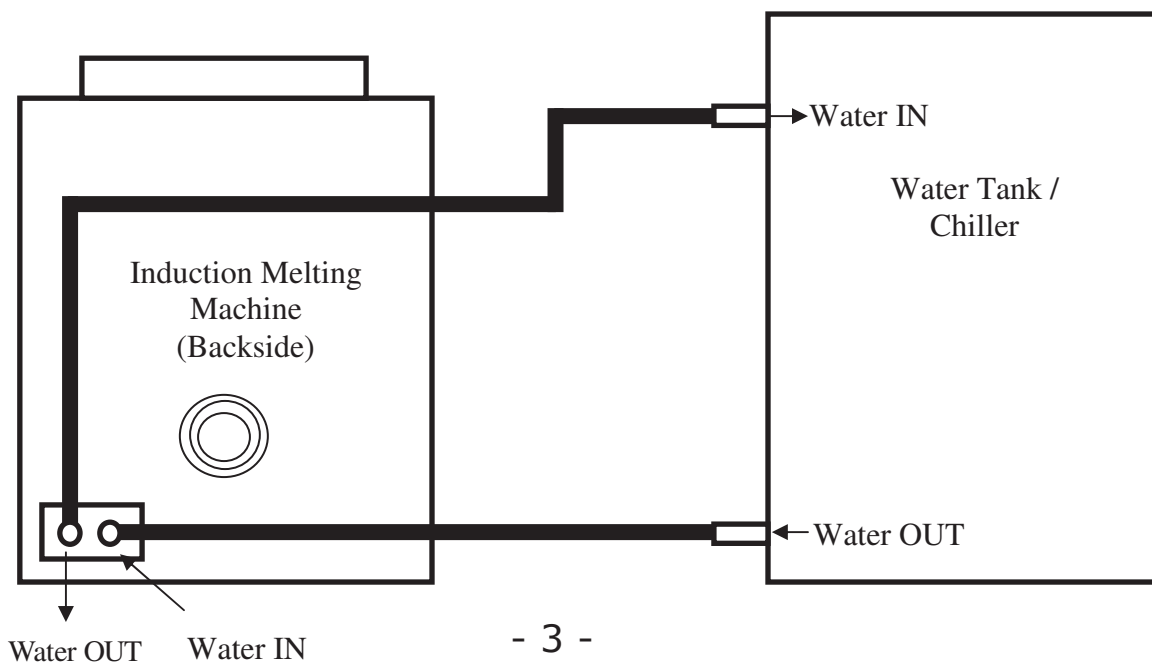
Operating the Machine

- 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 weather 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 1050^0C 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 100^0C. It is advisable to keep the crucible out of the machine when the work is done.
- When machine sensor shows 100^0C 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.
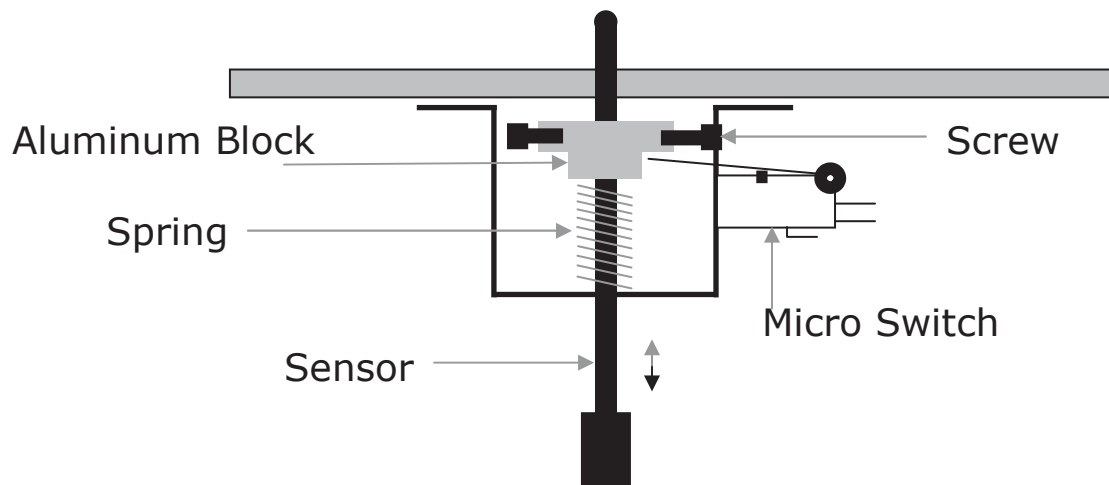
A] Loosen the screw on Aluminum Block so that sensor can move.
B] Place the crucible and adjust the sensor so that sensor lifts the crucible by 5 - 8 mm.
C] Now tighten the screws. In this case when you place the crucible the spring is pressed by 5-10 mm and the micro switch will record that crucible is in place.
D] Make sure that when you place the crucible the NO CRUCIBLE signal stops.

Electrical Diagrams

Please use this trimpot for setting current tripp. Loosen the screw to increase current limit and tighten the screw to reduce the limit.
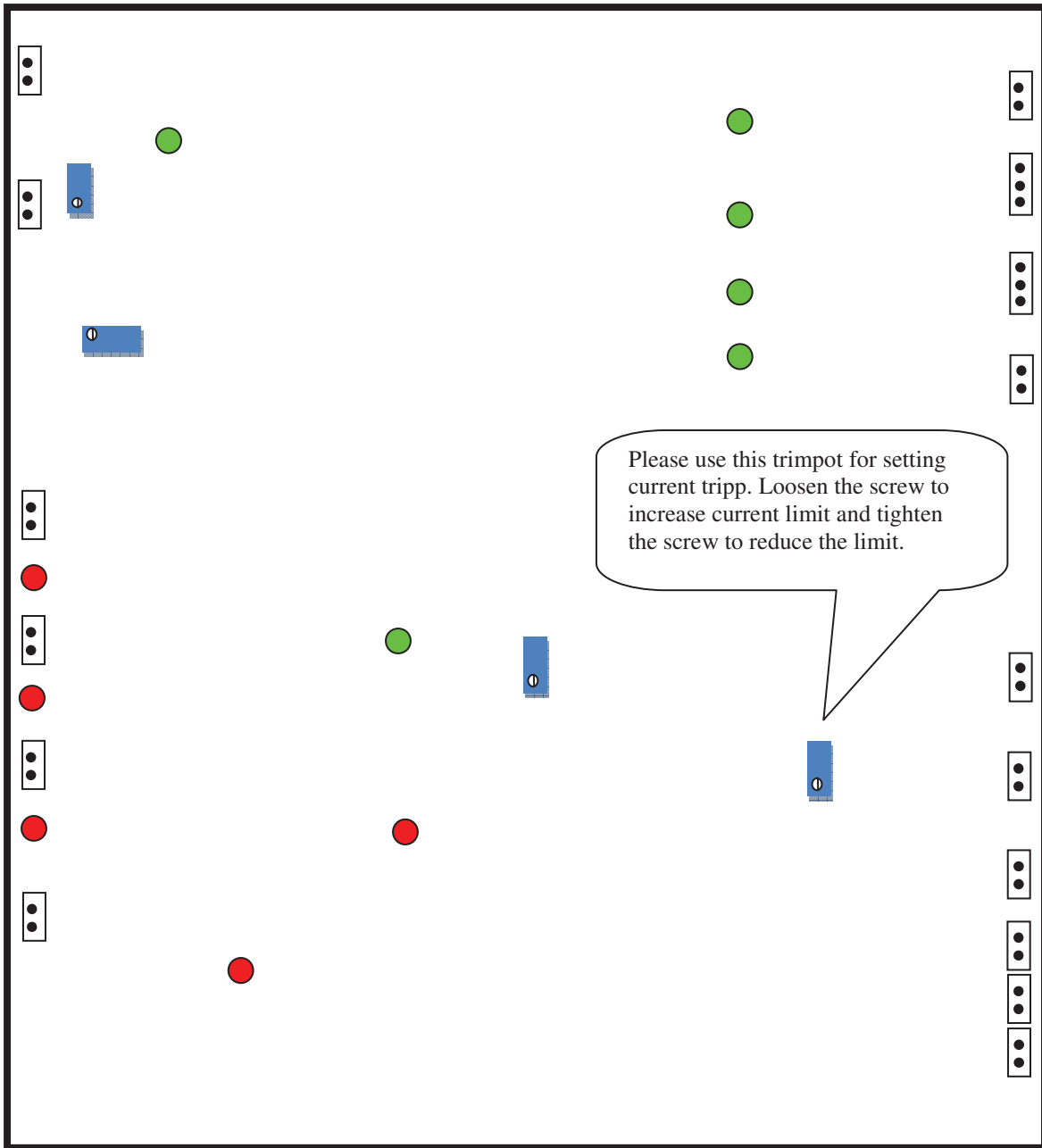
Main Control Board

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

48×48   96×48   72×72   48×96   96×96

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.
   (48×48 connecting with Pin 1 and 6, 96×48/72×72/48×96/96×96 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
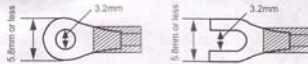
   Torque : 0.4 N.m (4kgf.cm)

5. Avoid to install controller in following spaces:
   I.   A place where the ambient temperature may reach beyond the range from 0 to 50℃
   II. A place where the ambient humidity may reach beyond the renge from 50 to 85% RH.
   III. A place where the the 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 ⟩

48×48			
96×48			
72×72			
48×96			
96×96			

☞ 3 Parts Description

48×48

96×48

48×96

72×72/96×96
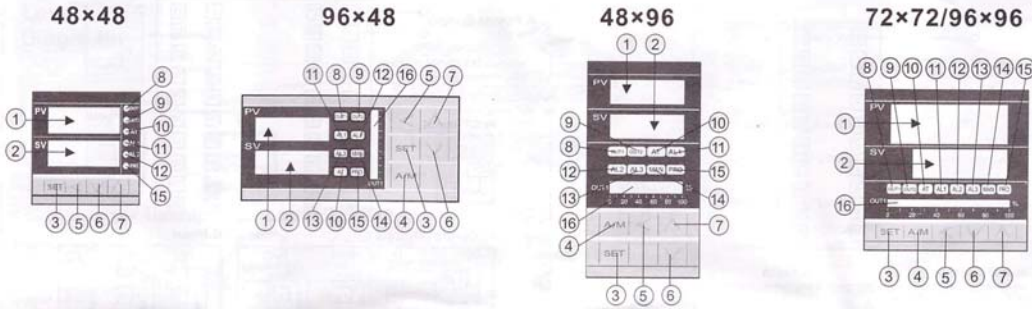
SYMBOL		NAME	FUNCTION
PV	①	Measured value (PV)display	Displays PV or various parameter symbols(Red)
SV	②	Setting value (SV)display	Displays SV or various parameter set values(Green)
SET	③	Set Key	Used for parameter calling up and set value registration
A/M	④	Auto/Manual key	Switches between Auto(PID) 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

48×48

72×72

- 12 -

96×48/48×96

A.Power Supply

AC 85-265V
DC 15-50V(Option)

H.CT Input

CT

B.Control Output

OUT1 / OUT2
Relay SSR mA/V

C.Input

mA/V RTD TC/mV

(Optional)

OUT1 (Motor Valve Control)
6
7 CLOSE
8 OPEN
9
10 COM

OUT1 (1 φ Phase Angle Control)
7 K2
8 G2
9 K1
10 G1

D.Alarm

AL1 AL2 AL3
3 NC
4 NO
5 COM COM

E.Transmission

TRS

G.Communication

RS232 RS485 TTL
RD—14 Dx—14 RD—14
SD—15 Dx+—15 SD—15
SG—16 SG—16

F.Remote

Remote SV
14
15

96×96

A.Power Supply

AC 85-265V
DC 15-50V(Option)

H.CT Input

CT

E.Transmission

TRS

F.Remote

Remote SV

B.Control Output

OUT1 Relay SSR mA/V
8 NO
9 NC
10 COM

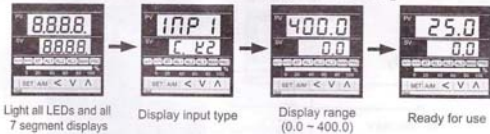OUT1 (1 φ Zero Cross Control)
31 G1
33 G2
39
40 PROT

OUT1 (3 φ Zero Cross Control)
31 RG1
33 RG2
35 TG1
37 TG2
39
40 PROT

OUT2 Relay SSR mA/V
6
7

OUT1 (Motor Valve Control)
6
7 CLOSE
8 OPEN
9
10 COM

OUT1 (1 φ Phase Angle Control)
31 G1
32 K1
33 G2
34 K2
35
36 PROT

OUT1 (3 φ Phase Angle Control)
31 G1
32 K1
33 G2
34 K2
35 G3
36 K3
39
40 PROT

C.Input

mA/V RTD TC/mV

D.Alarm

AL1 AL2 AL3
3 NC
4 NO
COM COM

G.Communication

RS232 RS485 TTL
RD—14 Dx—14 RD—14
SD—15 Dx+—15 SD—15
SG—16 SG—16

(Remote SV)
RS232 RS485
RD—31 Dx—31
SD—32 Dx+—32
SG—33

---

5 Operations

1.Power ON: Controller will display as following

8.8.8.8. / INP C.K2 / 400.0 0.0 / 25.0 0.0

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
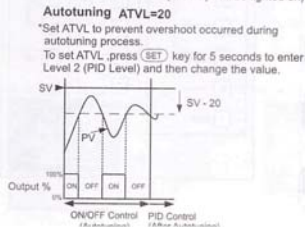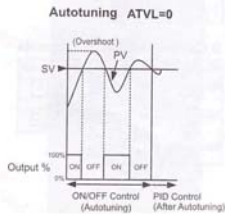
25.0 000.0 / 25.0 0.000 / 25.0 1.00.0 / 25.0 100.0

Press < Key
The SV number started to flash.The flashing digit indicates which digit can be set.

Press < Key
To select the hundreds digit.

Press ∧ Key
To change the number to 1.

Press SET Key
To store the new set value.

3.Autotuning (AT):

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

25.0 0.0 / At no / At YES / At YES

Press SET Key
To display parameter AT.
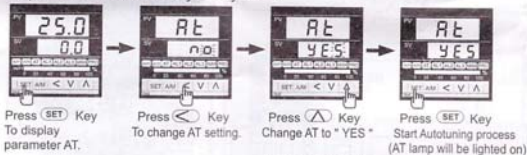
Press < Key
To change AT setting.

Press ∧ Key
Change AT to " YES "

Press SET Key
Start Autotuning process (AT lamp will be lighted on)

Autotuning ATVL=0

(Overshoot)
SV PV
Output % ON OFF ON OFF
ON/OFF Control (Autotuning) PID Control (After Autotuning)

Autotuning ATVL=20

*Set ATVL to prevent overshoot occurred during autotuning process.
To set ATVL ,press SET key for 5 seconds to enter Level 2 (PID Level) and then change the value.

SV PV SV - 20
Output % ON OFF ON OFF
ON/OFF Control (Autotuning) PID Control (After Autotuning)

4.Change the Alarm value:

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

25.0 0.0 / AL1 0.0 / AL1 5.0 / AL1 5.0

Press SET Key
To display parameter AL1
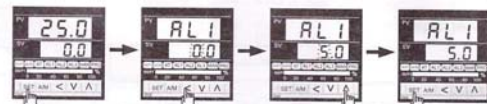
Press < Key
To change AL1 value

Press ∧ Key
Increase AL1 value

Press SET Key
Store the new value of AL1

* There are total 16 alarm mode types ,referenced as below:
* To change Alarm mode, press SET + < 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)

No	Alarm	No	Alarm	No	Alarm
01	Deviation high alarm with hold action*	04/14	Band alarm	07	Segment End alarm (Only for Programmable controller) (1) ALD1~3 , set 07 (2) ALD1~3=Alarm Segment (3) ALT1~3 defines as follows: 0 = flicker alarm 99.59 = continued alarm others = alarm ON time
11	Deviation high alarm	05	Process high alarm with hold action*	17	Program Run alarm (Only for Programmable controller) Run / Stop
02	Deviation low alarm with hold action*	15	Process high alarm	08	System failed alarm* (ON) Normal / Failed
12	Deviation low alarm	06	Process low alarm with hold action*	18	System failed alarm* (OFF) Normal / Failed
03	Deviation high/low alarm with hold action*	16	Process low alarm	09	Heater Break Alarm (HBA)
13	Deviation high/low alarm			00/10	No alarm

*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 following :

- 13 -

6 Parameter List

Levels Diagram


```
Level 1
(User Level)

Press (SET) Key 5 seconds          Press (SET) Key+ (<) 5 seconds
                        LCK = 0000

Press (SET)    Level 2              Level 3       Press (SET) Key+ (<) 5 seconds
Key 5 seconds  (PID Level)          (Input Level)
```

* The controller returns to Level 1 if there is no key operation within 60 seconds.

* In any Level, press (A/M) key twice will return to Level 1.
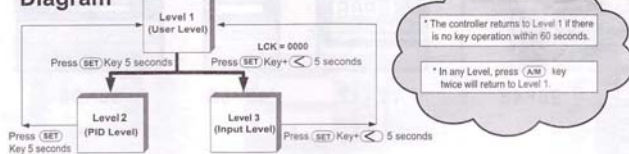
Level 1 (User Level)

Process Value SetValue	P.v 5.v	
Output Limt	OUtL 100.0	
Autotuning	At YES/no	
Alarm 1 set value	AL 1 0.0	
Heater current display (c 0.0) HBA set value	0.0	it will show, when HBA function enable
Alarm 2 set value	AL 2 0.0	
Alarm 3 set value	AL 3 0.0	Display If P1=0

Display if output2 is provided

Level 2 (PID Level)

P 1 3.0	Proportional band 1 (For output 1)	Range : 0.0~200.0% ON/OFF control if set to 0 (0.0)
I 1 240	Integral time 1 (For output 1)	Range : 0~3600 seconds PD control if set to 0
d 1 60	Derivative time 1 (For output 1)	Range : 0~900 seconds PI control if set to 0
dbI 0	Dead-band time	Don't care
At.'L 0	Auto tuning offset value	Range : 0~USPL
CYt1 10	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
P 2 3.0	Proportional band 2 (For output 2)	The same with P1
I 2 240	Integral time 2 (For output 2)	The same with I1
d 2 60	Derivative time 2 (For output 2)	The same with D1
CYt2 10	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	

Display If P2=0

Return to "P1"

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

in 1E	**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.
UUU 1	**UUU1 : PV is above USPL** Check whether the input value is correct or not.
nnn 1	**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.
rA_F	**RAMF :RAM Failed** Controller needs to be repaired.

Level 3 (Input Level)

INP1 K 2	Input type selection	
ANL1 0	Analog input low limit calibration (Used for mA and V input)	Range : -1999 ~ 9999
ANH1 5000	Analog input high limit calibration (Used for mA and V input)	Range : 0 ~ 9999
d P 0000	Decimal point position (Available for mA and V input)	0000 , 000.0 , 00.00 , 0.000
L.SPL 0.0	Lower Set-Point Limit	Scaling Low Limit
U.SPL 400.0	Upper Set-Point Limit	Scaling High Limit
ANL2 0	Remote input low limit calibration	Range : -1999 ~ 9999
ANH2 5000	Remote input high limit calibration	Range : 0 ~ 9999
ALd1 11	Alarm mode of AL1	Range:00~19 Refer to "Alarm mode type"
ALt1 99.59	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 0	Alarm mode of AL2	The same with ALD1
ALt2 99.59	Alarm time of AL2	The same with ALT1
ALd3 0	Alarm mode of AL3	The same with ALD1
ALt3 99.59	Alarm time of AL3	The same with ALT1
HYSA 0.0	Hysteresis of all Alarm	Range : 0~1000
CLO1 230	Output 1 low limit calibration (Used for mA and V output)	Range : 0 ~ 9999
CHO1 3600	Output 1 high limit calibration (Used for mA and V output)	Range : 0 ~ 9999
CLO2 230	Output 2 low limit calibration (Used for mA and V output)	The same with CLO1
CHO2 3600	Output 2 high limit calibration (Used for mA and V output)	The same with CHO1
CLO3 0	Retransmission low limit calibration	The same with CLO1
CHO3 5000	Retransmission high limit calibration	The same with CHO1
rU.CY 5	Full run time of proportional motor (Used for proportional motor valve control output)	Range : 5~200 seconds
öA.t 0.0	Used for programmable controller to wait continued operation	0=Not wait Others=Wait value
SEtA 0000		
PSL rtU	Communication Protocol Selection	MODBUS RTU / MODBUS ASCII / TAIE
b.tS o.81	Communication Bits Configuration	O _ 81/ O _ 82 / E _ 81/ E _ 82
Id.no 1	ID number	Range : 0 ~ 255
bAUd 384	Baudrate	2400 / 4800 / 9600 / 19200 / 38400 bps
S.'OS 0.0	SV compensation	Range : -1000~1000
P.'OS 0.0	PV compensation	Range : -100.0~500.0
UnIt C	Unit of PV & SV	C(°C) / F(°F) / A(Analog)
P.'Ft 200	PV Filter	PV will responese faster if PVFT is smaller.
CASC 0.0	Reserved	
OUd HEAt	Action mode	Heat / Cool
OPAd P.d	Control algorithm	PID / Fuzzy
H= 60H=	Frequency	50 / 60HZ

Return to "INP1"

Our contact Details

Garg Electroheat
D-118, Ansa Industrial Estate,
Saki Vihar Road,
Andheri(E),
Mumbai – 400072.

Tel.   : 91 - 22 – 28576335 (Works)

Fax.   : 91 – 22 – 40058576

Mobile : 91 – 98922 16523 (Rajesh)

Email   : gargelectroheat@gmail.com
Website   : www.gargelectroheat.com