GARG ELECTROHEAT

Induction Melting Machine
Owner's Manual

Index

Note of Thanks

We take the opportunity to thank you for vesting your interest in our product. We strongly recommend that you study carefully 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	:	230 Volts
Current	:	14 A (Max)
Power	:	3.5 KW (Approx.)
Capacity	:	1/2 Kg. (Gold 24 Carat)
Max. Temp.	:	$1200^{0}C$
Frequency	:	Medium Frequency
Crucible	:	Graphite 1/2 Kg. (Standard)
Time to first Melt	:	8 - 10 Minutes (Approx.)
Water Circulation	:	5 Liters per Minute (Min.)
Water Temperature	:	$45^{0}C$ (Max.)
Weight	:	60 Kg. (Approx)
Dimensions	:	15′′ X 18′′ X 30′′ (WXDXH)

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 15 A plug output for machine and 15/5 A plug output for Chiller (if using).
- Always check for water temperature. If it goes above 45^{0}C stop the machine and wait for temperature to go down.
- 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.
- **Please do not use hard water.**

Water connection Diagram :
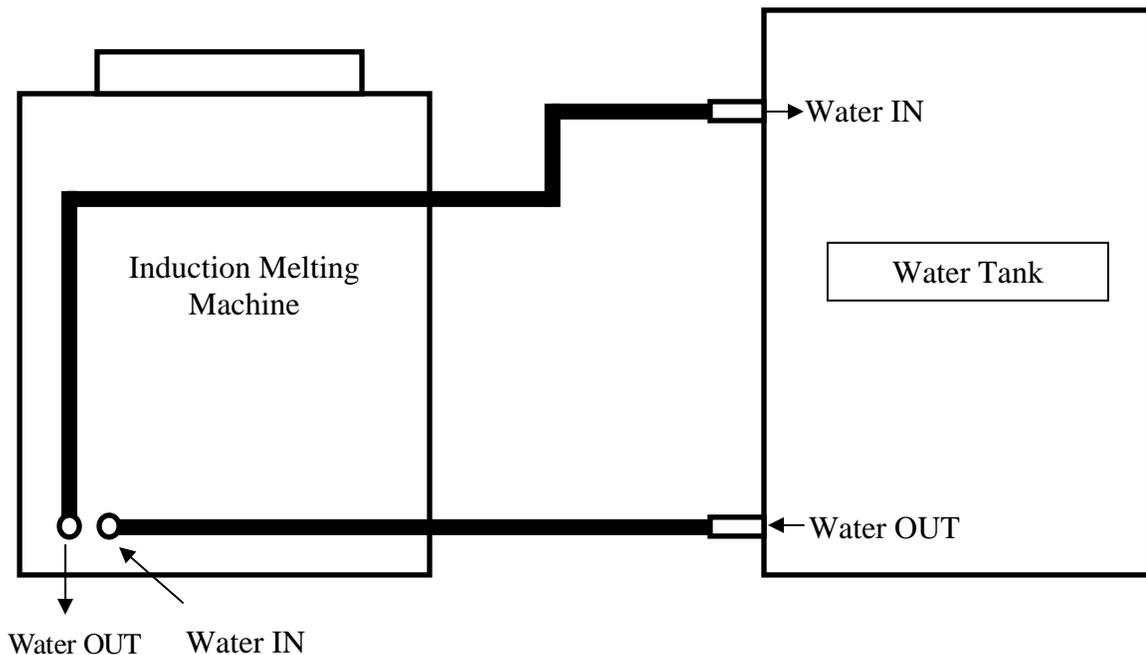
Operating the Machine

- First set up the machine as discussed above.
- Turn ON the POWER. A fan will start at the backside and water pump will also start.
- Turn ON the Tripper. The red HF OFF indicator will glow. If red LED/Buzzer of Water Fail sounds than check the water circulation. The temperature controller will boot and will display room temperature in some moments.
- If the water is flowing and red LED/Buzzer of "water fail" still sounds then check the water pressure switch settings.
- Confirm that the crucible is in the place (Very Very Important). Without Crucible Machine will not start and the NO CRUCIBLE signal will remain ON. As you will put the crucible in place it should turn off.
- Set the required temperature as detailed in temperature controller's manual and marked.
- Press HF 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 1000^0C within 6 - 8 Minutes (Approx).
- When the melting is done turn the machine off by pressing red HF 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 HF 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 in place.
   * If it is in place check that it 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.

   * Fuse is open. Replace it.
   * Check the transformer primary and secondary.

6. Water does not come out of the machine or the water flow is very slow or the water out temperature is very high.

   * Maybe the water circulation path is not clear. Try and clear the water tubes. You may use air pressure to clear the water line.

7. For any other reason please let your maintenance person open the machine and run it and note the status of LEDs on the PCB and contact us at the address and telephone nos. provided.

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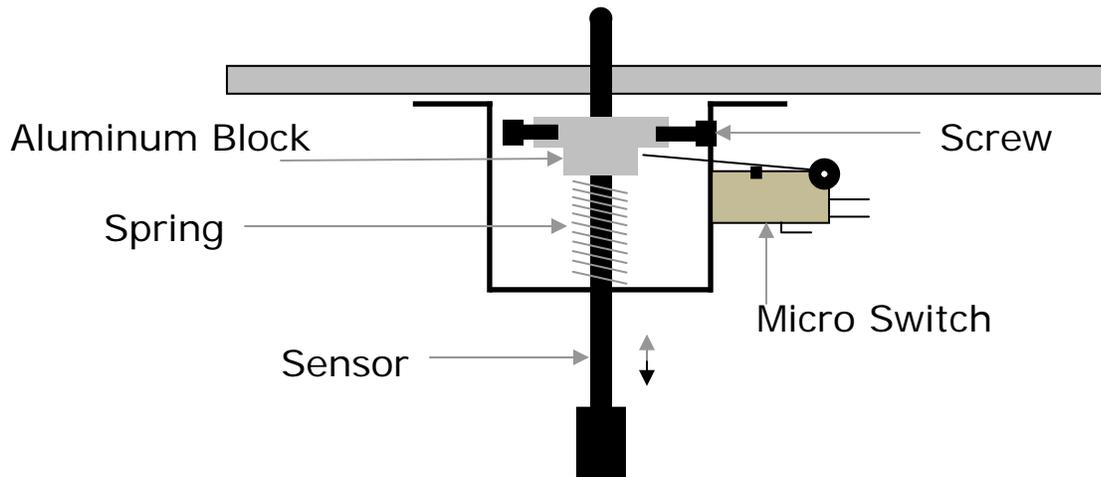
A] Loosen the screw on Aluminum Block so that sensor can move.
B] Place the crucible and adjust the sensor so that sensor lifts the crucible by 5 - 8 mm.
C] Now tighten the screws. In this case when you place the crucible the spring is pressed by 5-10 mm and the micro switch will record that crucible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

Electrical Diagrams
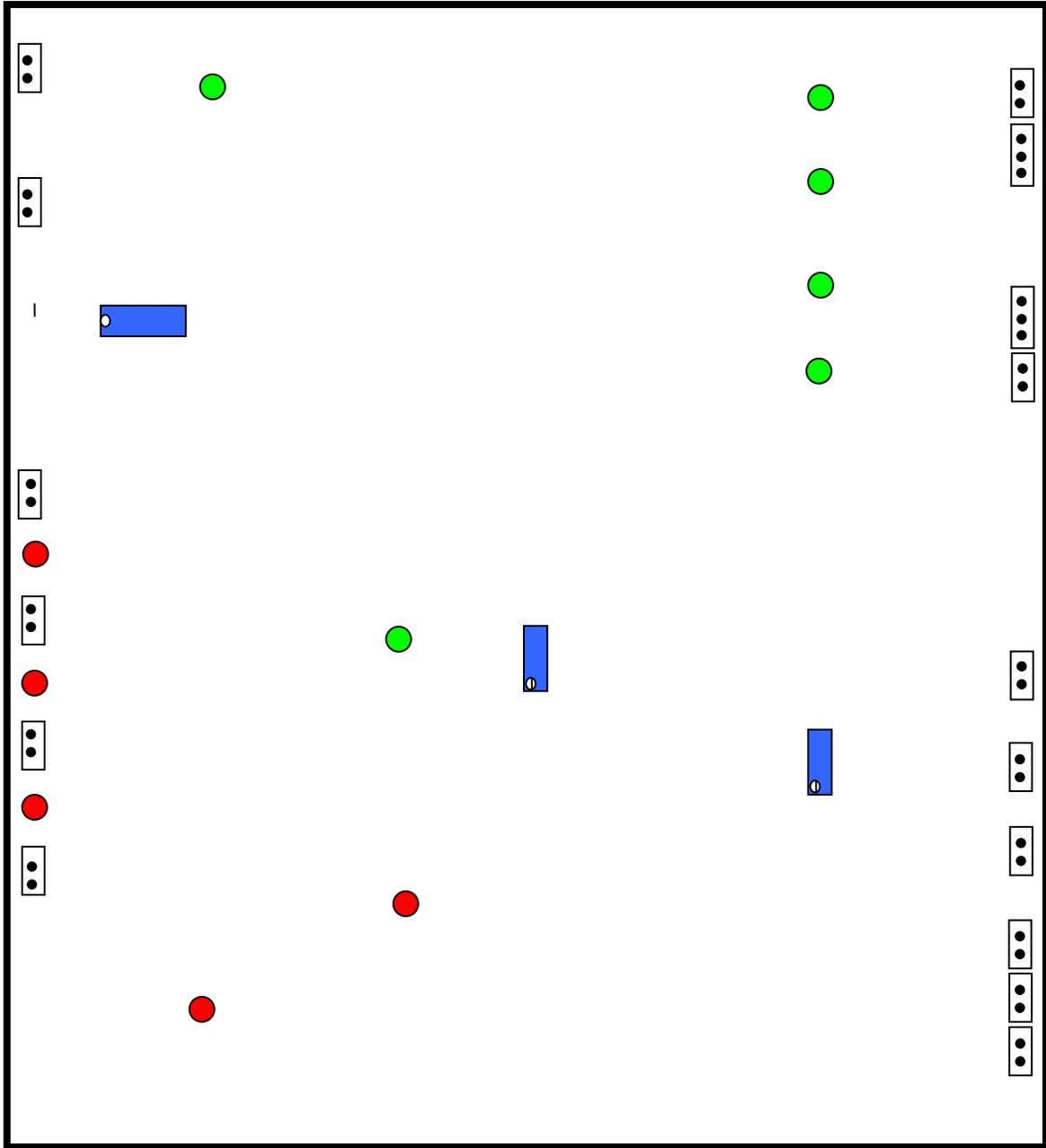
Main Board

Warranty Conditions

1. We Warrantee the Induction Gold Melting Machine of 1/2Kg against all manufacturing defects during 12 months from the date of sale by us or through our dealers.

2. The warrantee 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.

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 useris 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			

-10-

3 Parts Description

48×48   **96×48**   **48×96**   **72×72/96×96**
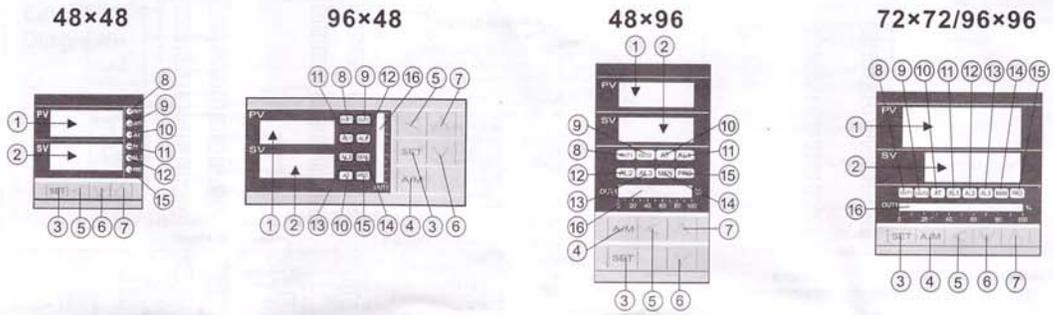
SYMBOL		NAME	FUNCTION
PV	①	Measured value (PV)display	Displays PV or various parameter symbols(Red)
SV	②	Setting value (SV)display	Displays SV or various parameter set values(Green)
SET	③	Set Key	Used for parameter calling up and set value registration
A/M	④	Auto/Manual key	Switches between Auto(PID) 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

-11-

96×48/48×96

A.Power Supply

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

H.CT Input

B.Control Output

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

OUT2 — Relay SSR mA/V
- 6
- 7

C.Input

mA/V RTD TC/mV
- 17 17 17
- 18 18 18
- 19 19 19
- 20 20 20

(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 NC 11
- 4 NO NO 12 7
- 5 COM COM 13

E.Transmission

TRS
- 12
- 13

G.Communication
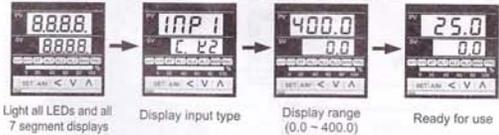
RS232 RS485 TTL
- RD— 14 Dx− 14 RD— 14
- SD— 15 Dx+ 15 SD— 15
- SG— 16 SG— 16

F.Remote

Remote SV
- 14
- 15

96×96

A.Power Supply

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

H.CT Input

CT
- 14
- 15

E.Transmission

TRS
- 39
- 40

F.Remote

Remote SV
- 14
- 15

B.Control Output

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

OUT2 Relay SSR mA/V
- 6
- 7

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

OUT1 (1 φ Zero Cross Control)
- 31 G1
- 33 G2
- 39 TG1
- 40 PROT

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

OUT1 (1 φ Phase Angle Control)
- 31 G1
- 32 K1
- 33 G2
- 34 K2
- 35 G3
- 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
- 17 17 17
- 18 18 18
- 19 19 19
- 20 20 20

D.Alarm

AL1 AL2 AL3
- 3 NC NC 11
- 4 NO NO 12
- 5 COM COM 13

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

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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
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.

Press SET Key
To display parameter AT.

Press ◁ Key
To change AT setting.

Press △ Key
Change AT to " YES "

Press SET Key
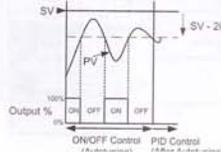Start Autotuning process (AT lamp will be lighted on)
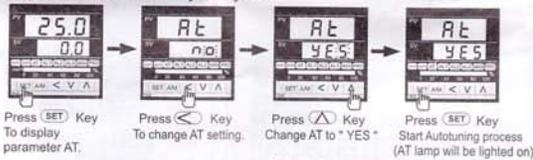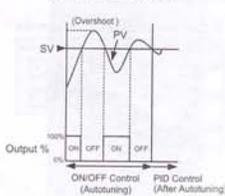
Autotuning ATVL=0

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.

4.Change the Alarm value:

Change AL1 value to"5.0"(AL1 active ,if PV exceeds SV over 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.
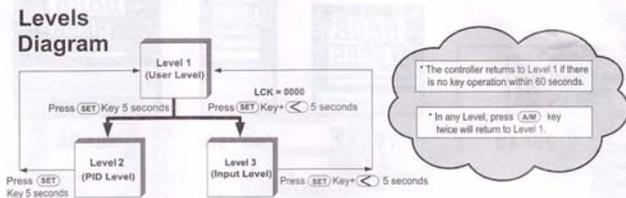
5.Alarm mode type (Referenced for ALD1/ALD2/ALD3)

(▲ : SV   △ : Alarm set value)

01 / 14	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, ON / OFF AL
02	Deviation low alarm with hold action*	15	Process high alarm	08	System failed alarm* (ON) Normal / Failed, OFF / ON AL
12	Deviation low alarm	06	Process low alarm with hold action*	18	System failed alarm* (OFF) Normal / Failed, ON / OFF AL
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 :

-12-

Levels Diagram


```
                    Level 1
                   (User Level)

                          LCK = 0000

Press (SET) Key 5 seconds    Press (SET) Key+ < 5 seconds

      Level 2                      Level 3
     (PID Level)                 (Input Level)

Press (SET)            Press (SET) Key+ < 5 seconds
Key 5 seconds
```

* 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'' 5''	
Output Limt	OUtL 100.0	
Autotuning	At YES/no	
Alarm1 set value	AL 1 0.0	
Heater current display (HBA set value	c 0.0 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)
. 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
db 1 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
. 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.
rAmF	RAMF :RAM Failed
	Controller needs to be repaired.

Level 3 (Input Level)

INP1 K2	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
UA.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"

-13-

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