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## Hotplate

HSD334-01  
HSD326-01

# MANUAL

Thank you very much for selecting Mi-sung products.

For your safety, please read the following before using.

### Main products

- Temp controller
- ▣ Heating Tape
- Hot plate
- Digital
- ▣ Mantle, Analog
- Mantle, Rota Mantle
- ▣ Digital Stirrer
- Analog stirrer

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## General Information

Unpack your item carefully and inspect for damage and report such damage or missing parts to your supplier right away.

Read your instruction manual carefully. Take time to save time while working with your item.

Make sure that every user has read and understood the instruction manual.

Please store the instruction manual in a place easily accessible to every user.

## Safety Information

Please comply with all safety and accident-prevention regulations as in force for laboratory work!

Use extra care when working with flammable substance; refer to safety data sheets.

When connecting your item with your local power supply, please make sure your item is designed for your local supply voltage; go by data plate on the item.

Turn your power switch OFF whenever the item is not used, or before disconnecting the plug.

Use extra care when working in the vicinity of flammable and explosive substances. Motor are non-sparking type, however, the item itself is not explosion proof.

Please do not connect your instrument without a protective ground outlet.

Your item requires a solid stand.

## Warning

### To avoid electrical shock, always:

1. Use a properly grounded electrical outlet of correct voltage and current handling capacity.
2. Disconnect from power supply before servicing.

### To avoid personal injury:

1. Do not use in the presence of flammable or combustible materials; fire or explosion may result.  
This item contains components which may ignite such materials.
2. Keep the item clean. Use non-abrasive cleaner. Alkali spills, hydrofluoric acid spills or phosphoric acid spills may damage the item and lead to thermal failure. Unplug unit and remove spills promptly. Do not immerse unit for cleaning.
3. Do not remove or modify grounded power plug. Use only properly grounded outlets to avoid shock hazard.  
Not rated for use in hazardous atmospheres.
4. Use appropriate hand and eye protection when handling hazardous chemicals.
5. Do not use in highly corrosive atmospheres; corrosive fumes and spill may damage your item and internal components.

## Caution

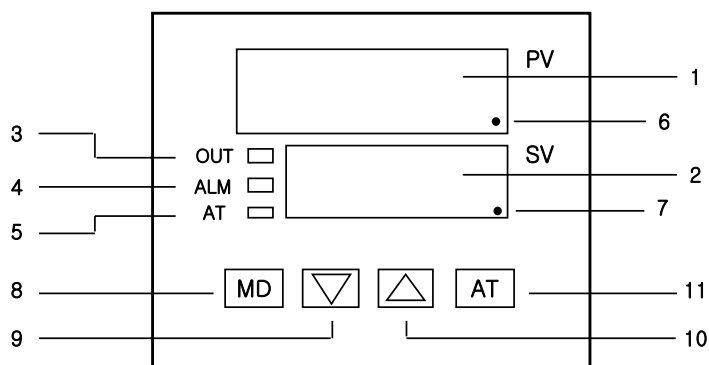
Space instrument 12 inches away from combustible materials under any conditions.

## 1. Specifications

MODEL	Hot plate & Magnetic stirrer(Multi-position)	
	HSD334-01	HSD326-01
	Range	Max. 350℃

Temperature	Accuracy	$\pm 1^{\circ}\text{C}$	
	Controller	Digital PID auto-tuning	
	Timer	99hr 59min	
Heater power		1400W	1200W
Stirring	Positions	4 positions	6 positions
	Speed	150 ~ 1500rpm	
	Speed display	Digital	
	Rotation	1.Right 2.Left(operation) 3.Auto reverse(reverse time setting)	
	Timer	99hr 59min	
		Capacity(H2O)	Up to 1000mL      Up to 500mL
Speed controller		Feed-back control	
Top plate		Ceramic coated top plate	
Dimensions	Plate area(mm)	300 x 300	300 x 210
	Overall(WxDxH)	310 x 430 x 120	310 x 340 x 120
Electrical supply		AC220V 50/60Hz or AC110V 50/60Hz	

## 2.Functional Description(TIC)



1) Displays processing value(PV) : Displays processing value in controlling and each kind of parameters in parameter set

2) Displays set value and parameter set(SV) : Displays set value in controlling and parameter value in parameter set. Press key No.9, then displays the remaining time.

3) Lamp of output control(OUT)

4) Warning lamp of highest and lowest(ALM)

5) Auto-tuning lamp(AT) :Press key No.11, then it starts PID auto-tuning with flickering of the lamp and the lamp turns off when it is finish.

6) Timer lamp: Press No.10 key of the Timer during controlling, then lamp will be flickered. After a set time, the light will be on; at a time, tEND will be appeared on SV. To back to the initial stage, press Up key more than 2 sec.

7) LBA Control lamp: It will be on when Control Loop Disconnection alarm appears.

8) Mode set key: Press it more than 2sec., the system will be changed to parameter set.

9) Down key(remaining time display key):Press it, set value decreases; Press more than 2sec, set value decreases consecutively. Press it for several sec. during timer ON, remaining time will be flickered.

10) Up key(Time ON/OFF key): If you press it, the set value goes up one by one; if you press it more than 2sec, the set value goes up consecutively. If you press it during controlling, you can turn on/off the timer.

11) Auto Tuning Key: After parameter set, press AT more than 2sec., AT lamp(5times) will be flickered and calculating PID automatically.

### 3. How to set parameter

#### 1) Parameter Set

Turned on, then PV displays current temp.; SV displays a set valve.

If you press the MODE key at this stage more than 2sec, parameter set is available.

If you press the MODE key, kinds of parameter will be changed one by one.

(See the following table.)

No.	Symbol	Setting Date	Description	Initial value
1	SV	Set Value	Set of the temperature required	30
2	tIm	Control ending Time set	* H.m display→Hours,Minutes Unit:00H01m~99H59m – Up key can modulate ON/OFF. The Timer begins working after current temp reaches set temp. After a set time reaches, it stops ending Control output . *The TIMER does not work in case of '0 set'.	0
3	ALS	Alarm mode set	9 Alarm modes display in picture form. You can set appropriate alarm mode by using up/down keys. See Alarm mode variables. (option)	----
4	ALH	High alarm	It sets the heighest Alarm limit. (It is absolute value)	0
5	ALL	Low alarm	It sets the lowest alarm limit. (It is absolute value)	0
6	P	Proportional band	Possible to set a 0.1% unit within 0.1~999.8% range.	Automatic ally set for Auto Tuning
7	I	Intergral time	Possible to set a 1sec–unit within 5~9998 sec. range.	
8	d	Derivative time	Possible to set a 1sec–unit within 0~2500sec.range.	
9	LbA	Control loop break alarm	Possible to set a 1sec–unit withing 0~9998sec.range.	
10	InS	Input value	Possible to set a 0.1℃–unit withing –100.0℃ ~100.0℃ range.	0.0 or 1.0
11	LOC	Set data lock	LOCK → Preventing from changing set value on → Impossible to change parameter set oFF → Possible to change parameter set	oFF
12	PASS		Manufacturer Moder	

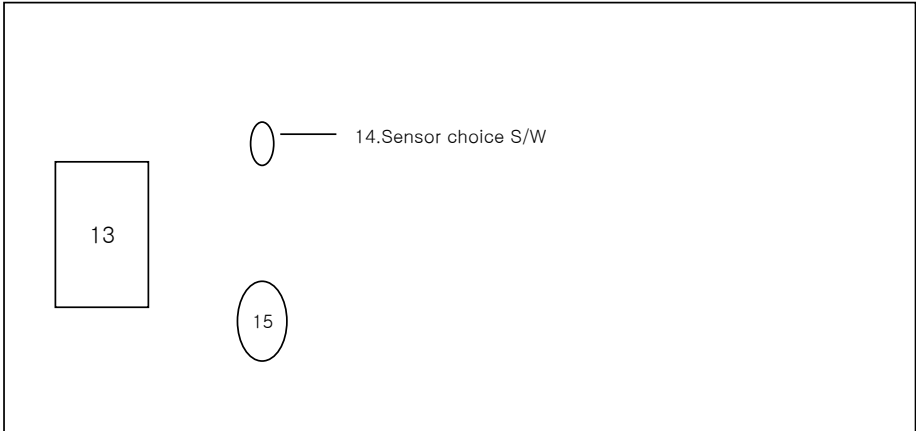
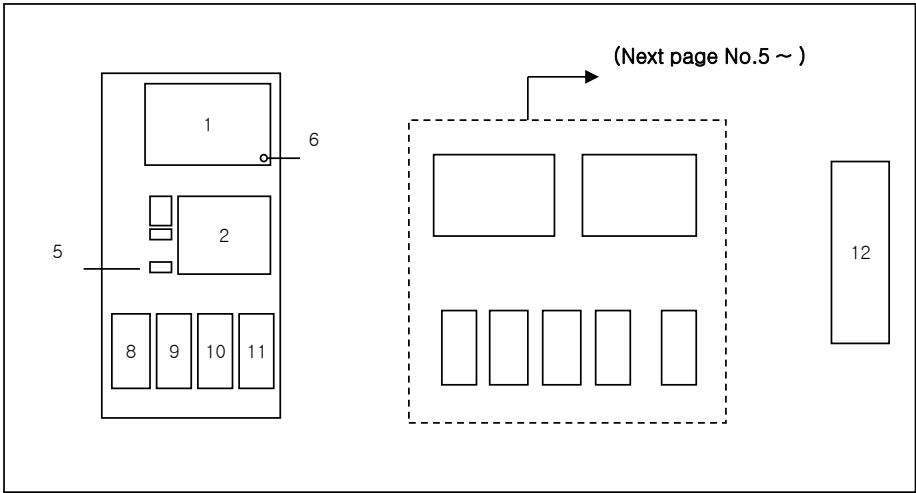
- A. After completing parameter set , press the MODE key longer than 2sec.: you can finish parameter set.  
 PV displays current temperature, SV displays set temperature; then, controlling begins.
- B. Press AT key more than 2sec, then the modulating system process automatically Auto-Tuning.

Plate size \	P	I	d	LbA
300 x 210	1.0	811	206	1622
300 x 300	1.0	799	199	1598

※Constant value could be changed on auto-tuning.

※Use auto-tuning in case on big difference on the temperature.

### 4. How to use



#### To use temp. controller

- 1-1.Connect the sensor on No.15 terminal of the rear side(Use external sensor)
- 1-2.If sensor is connected on No.15 terminal on the rear side, take it out and use internal sensor.
- 2.Connect No. 13 of the rear side with an electric outlet and switch on the instrument by No.12 of the rear side..
- 3.Press No. 8 key of the front side, then the parameter to set temperature will be appeared.

Su
200

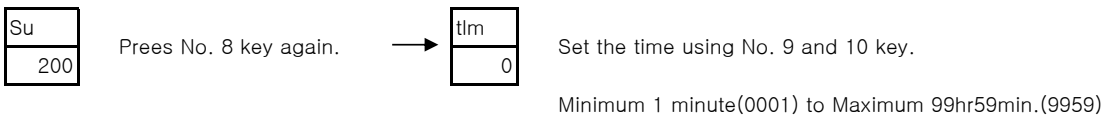
Press No.9 (downturn) and No.10 (upward) to set the required temperature.

4. After setting of the temeprature, press No.8 key on the front side for 2 seconds, then the temperature

controller runs on initial condition.

### To use Timer

1.Press No.8 key on the front side for 2seconds, then the parameter to set temperature will be appeared.



2.After setting of time, press No. 8 key on the front side, then it return to the initia condition.

3.Press No.10 key on the front side for 2 seconds on timer run, then No. 6 lamp will be switched on and off.

In case that time is not setted, it does not run.

4.Press No. 10 key for 2seconds on timer run, then it stop to run..

5.Press No. 9 key for 2 seconds, then the temperature display shows the remaining time.

Press No. 9 key again for 2 seconds, then the temperature display shows setting value.

6.In case that the set of time is finished, "tEND" is showed and press No.10key to back to the initial condition.

1.Use without auto-tuning but do it in case of a big temperature difference.

2.Press No.11 key, then it starts with switching on and off.

3.Temperature error could be happened on auto-tuning but it is controlled correctly when auto-tuning is finished..

4.Temperature go higher than the setting value first time but it is returned to normal condition immediately.

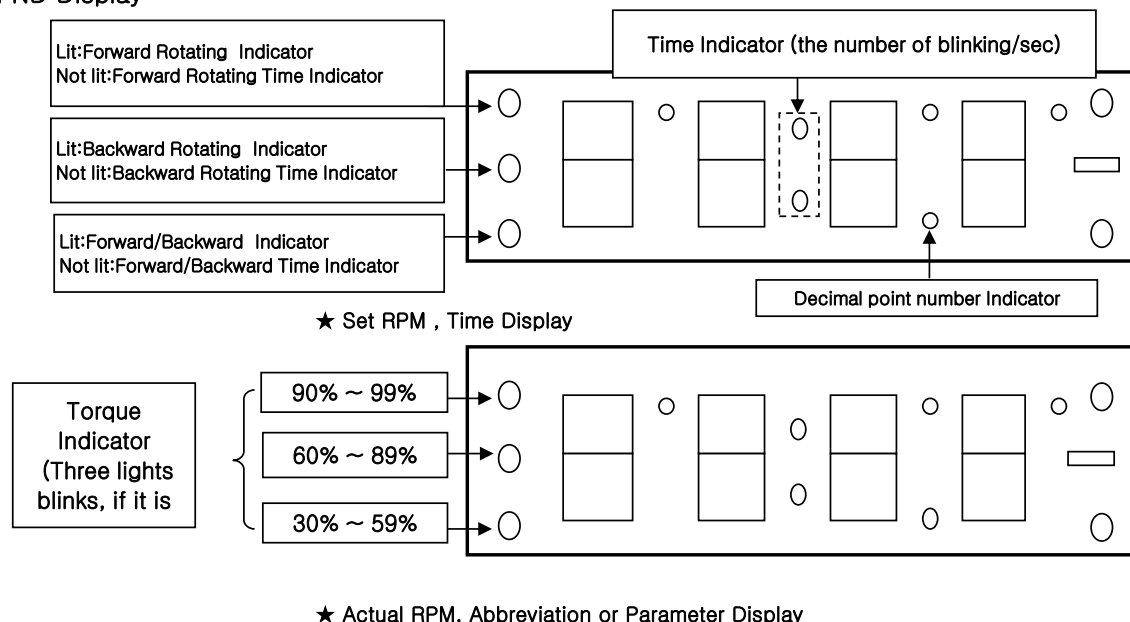
(Over-shoot condition)

5.In case that temperature goes down, it is differ as per the charater of the liquid and the ambient condition.

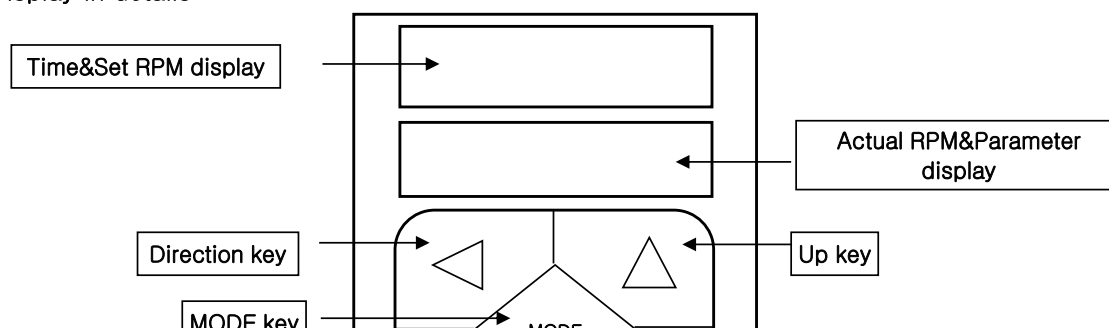
6.Be careful so that the contents are overflowed from the vessel. It makes the malfunction and damage of the instrument.

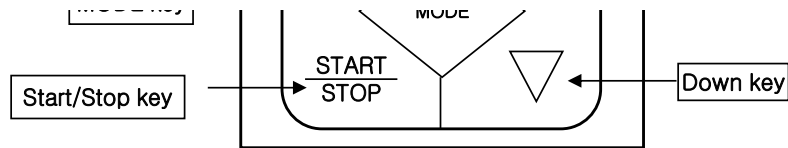
7.In case that the replacement of the sensor or the switch of internal and external sensor are needed, switch off the power and make it. If it is made under power ON, it cause a wrong operation.

### 5. FND Display

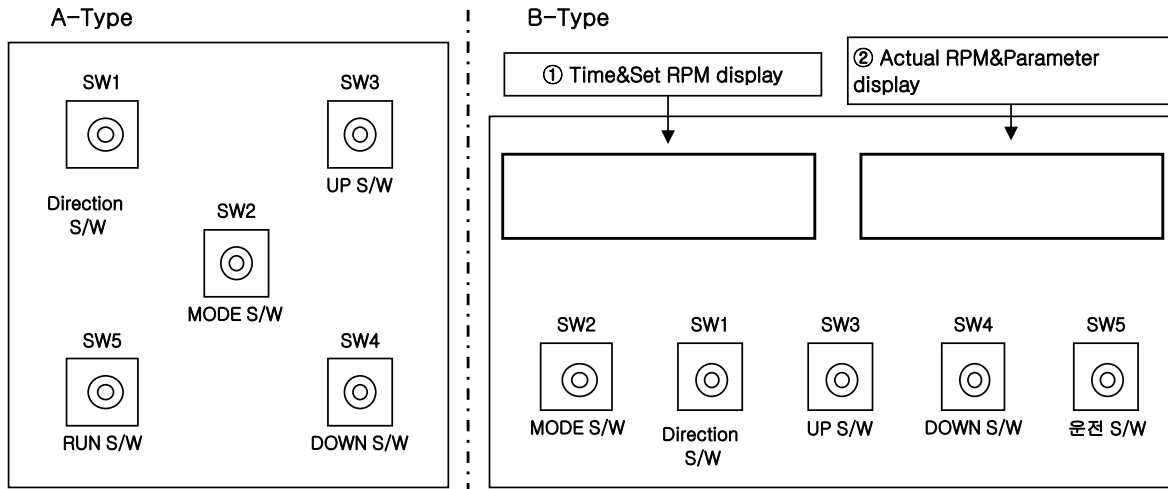


### 6. Display in details





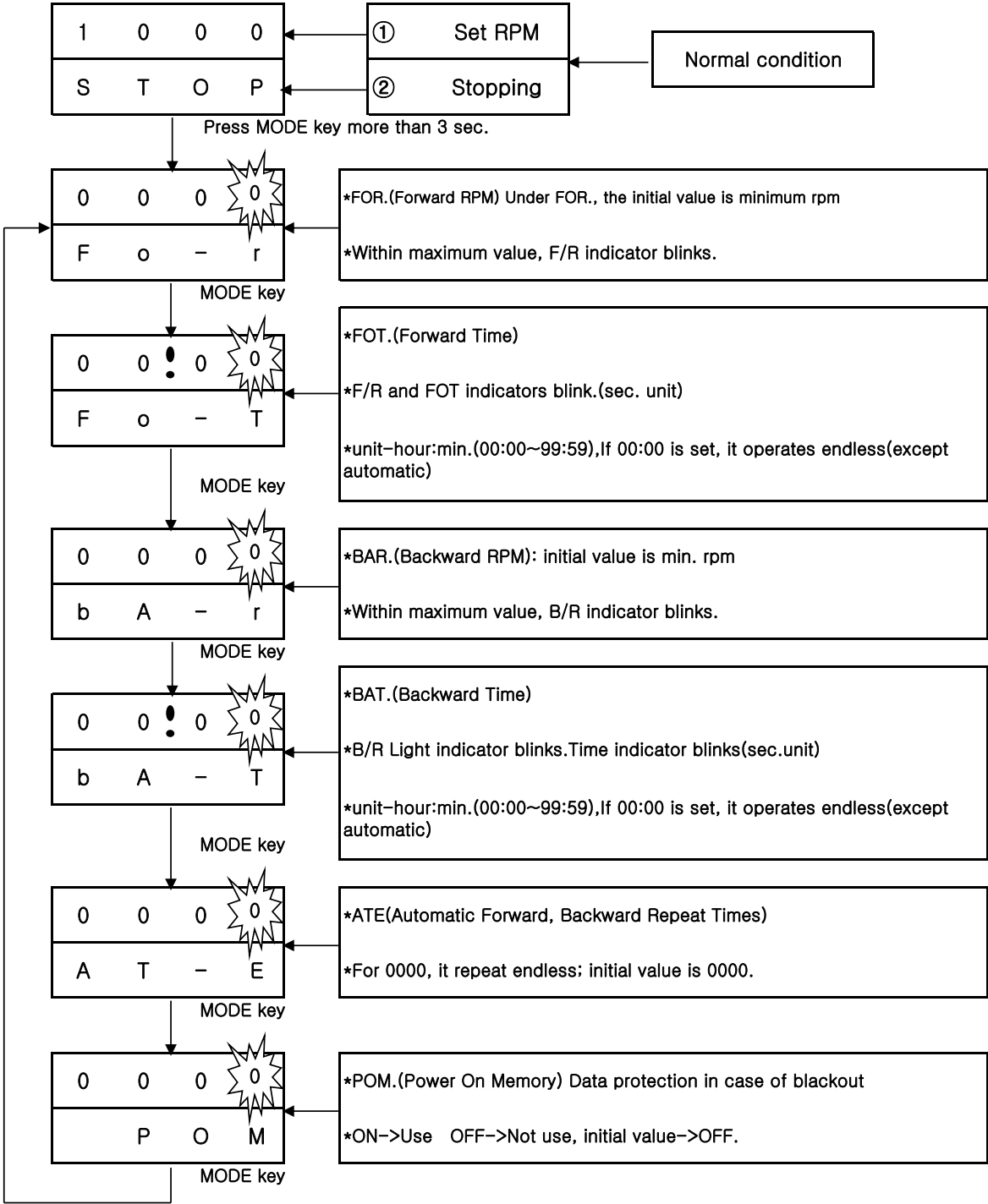
7. Function of each S/W TYPE(It could be changed by A-Type or B-Type as per each product)



1. 'Direction' key : This key alters numeral line changes at the setting phage.  
Under nomal motor phase, the 'Direction' key alters the display from remaining time to set RPM in turns.(vise versa)
2. 'Mode' key : This key can be applicable to every mode.  
Under normal phase, at stop mode, this key allows to change the mode from forward, backward, automaic operation systematically.
3. 'UP' key : Set mode can be increased.
4. 'Down' key : Set mode can be decreased.
5. Start/Stop key : This key can operate or stop the motor.

8. Description of each parameter

\* Turn on power, then last set RPM will be displayed on forward rotation.



- \* Direction key 4, Up key 5 and Down key 6 can alter the mode.
- \* To return to nomarl phase, press MODE Key more than 3 sec.(memory fuction)

## 9. Operation

### 1. Forward Rotating Mode(F/R Mode)

- 1)To execute F/R mode, press Mode S/W, F/R and Operating S/W orderly.
- 2)By pressing UP/DOWN S/W, you can modulate rpm under operation(to maximum rpm).
- 3)Under operation, it is possible to see remaining time by pressing direction S/W.
- 4)If set time is 00:00, there is no time limitation for consecutive operation.
- 5)Under a pause phase, you can see operating time by pressing direction S/W right.(a min unit)

### 2. Backward Rotating Mode(B/R Mode)

- 1)In order to execute B/R mode, after pressing mode S/W, chose B/R, then press Operating S/W.
- 2)By pressing UP/DOWN S/W, you can modulate rpm under operation(to maximum rpm).
- 3)Under operation, it is possible to see remaining time by pressing direction S/W.
- 4)If set time is 00:00, there is no time limitation for consecutive operation.
- 5)Under a pause phase, you can see operating time direction S/W right.(a min unit)

### 3. Automatic Operating Mode

- 1)To execute this mode, press mode S/W, automatic operating, operating S/W in order.
- 2)If FOT, BAT is not set, Error-1 occurs.
- 3)Under automatic operation, you cannot modulate rpm.
- 4)Under operation, it is possible to see remaining time and repeating times(F/B rotating) by pressing direction S/W.
- 5)If set time is 00:00, there is no time limitation for consecutive operation.
- 6)Under a pause phase, you can see operating time and repeating times by pressing direction S/W.(min/times)

## 10. Description of Operation

\*Turn on power, then last set RPM will be displayed on forward rotation.

In forward rotating operation

Ex) FOR 900 , FOT 00:01 setting

BAR 500 , BAT 00:05 setting

Normal Action(Forward rotation)

Display	F/R Indicator is lit.
Time executed	The number of blinking/sec (display)
Press Direction key; remaining time → set RPM (in turns)	
Motor → Forward rotating with 900RPM(1 min.later, the motor stops).	

In backward rotating operation

Ex) FOR 900 , FOT 00:01 setting

BAR 500 , BAT 00:05 setting

Normal Action(Backward rotation)

Display	B/R Indicator is lit.
Time executed	The number of blinking/sec(display)
Press Direction key; remaining time → set RPM (in turns)	
Motor → Backward rotating with 500RPM(5 min.later, the motor stops).	

In automatic rotating operation -1

Ex) FOR 900 , FOT 00:01 setting

BAR 500 , BAT 00:05 setting

ATE 0000 setting

Normal Action

Display	A/R indicator is lit.(For F/R, F/R Indicator is lit. For B/R, B/R Indicator is lit.)
Press 'Direction' key; remaining time → set RPM (in turns)	
Motor → F/R for 1 min. with 900RPM; 5 sec later, 1 min of B/R 900rpm; 5 sec.later F/R again.. Unlimited repeat	

In automatic rotating operation -2

Ex) FOR 900 , FOT 00:01 setting

BAR 500 , BAT 00:05 setting

ATE 0005 setting

Normal Action

Display	A/R Indicator is lit.(For F/R, F/R Indicator is lit. For B/R, B/R Indicator is lit.)
Time action	F/B Rotating time blinks(when motor executed)
Press 'Direction' key; remaining time → set RPM (in turns)	
Motor → F/R for 1 min. with 900RPM; 5 sec later, 1 min of B/R 900rpm; 5 sec.later F/R again.5 times of F/R puls B/R, it pauses.	



## 11. Display of each parameter

RAT(Ratio)	rA7
RPM(MAX.RPM)	rPn7
FOR(Forward Operating RPM)	Fo-r
BAR(Backward Rotating RPM)	bA-r
ATE(Automatic Total Times)	A7-E
POW(Motor Power)	PouJ
M-R(Max.RPM of motor)	n7-r
Error-1	Er-1
ON	on

PAU (Pause)	PAU
SAT(Soft start time)	SA7
FOT(Forward Operating Time)	Fo-7
BAT(Backward RotatingTime)	bA-7
Power failure compensation	Pon7
STOP	Stop
PERCENT(%)	Pro
Error-2	Er-2
OFF	oFF

## 12. Miscellaneous [Key explanation in details and other operating sets]

### 1. Description of each S/W

#### 1) S/W1 : Direction S/W

Condition	Operation mode	Description of operation	Remark
Operation	Forward rotating	Display of remaining time==>Display of setting RPM (Repeat)	
	Backward rotating	Display of remaining time==>Display of setting RPM (Repeat)	
	Automatic Mode	Remaining Time for Forward(Backward) Rotating==>Repeated Remaining Time for Forward(Backward) Rotating==>Remaining Time for Forward(Backward) Rotating (Repeat)	
Stop	Forward rotating	Forward rotating==>Forward rotating Set rpm indicator (repeat)	It indicates operating time and F(B)/R repeating times before pausing.
	Backward rotating	Forward rotating==>Forward rotating Set rpm indicator (repeat)	
	Automatic Mode	F/R==>B/R rpm==>B/R Time ==>F/B Repeat Times==>B/R rpm Indicator (repeat)	

## 2) S/W2 : MODE S/W

- ① When S/W2 is pressed under a pause mode: backward => automatic => forward rotating will be displayed in turns.

## 3) S/W3,S/W4 : UP/DOWN S/W

- ① There is no function under pause mode.
- ② Under F/B rotating (but automatic), this key allows to increase/decrease set rpm.
- ③ Rpm modulation limit is from min.rpm to max.rpm.
- ④ Even if rpm was modulated under operation, a stop mode alters it to previously set rpm.

## 4) S/W5 : Operating/Stop S/W

- ① When the motor executes, this key stops it. (vice versa)
- ② Under automatic mode, if F/B rotating time is not set, it causes Error-1. (see Error)
- ③ In case of every error, it does not allow operation.

## 13. Explanation for error message and solution

### 1. Error-1: Set-time Error

- 1) It occurs when F/B rotating time (under automatic operation) is not set.
- 2) To solve the problem, set operation time.

### 2. Error-2 : MOTOR Over-current Error (PROGRAM Sensing)

- 1) It occurs when motor executes more than 91% over its capacity, consecutively 10 seconds.
- 2) The output is different from motor to motor (or from RPM to RPM).
- 3) To solve the problem, turn off the motor first, then turn on again.

### 3. Error-3 : Reach out of Minimum RPM

- 1) It occurs when minimum RPM cannot be achieved within 10 sec. of operation.
- 2) Stirrer=100RPM (Output RPM=100/gear rates)
- 3) To solve the problem, turn the motor off/on again.

### 4. Error-4 : If motor stops during the operation, Error-4 will be displayed.

- 1) Sense works only under rotating process.
- 2) Sense delay time: before set RPM- within 10 sec. after set time- 0.2s.  
Set RPM is less than 500 (Motor)- after 5sec. after Set RPM executed.
- 3) If rotating is not occurs from beginning of operation, it can categorize in Error-3.
- 4) To solve the problem, turn the motor off/on again.

### 5. Error-5 : Motor sensor error

- 1) Motor sense output problem
- 2) To solve the problem, turn the motor off/on again.

### 6. Error-6 : MOTOR Over-current Error (HARDWARE Sensing)

- 1) FET (MOTOR output device) Error or MOTOR Interior Problems
- 2) Soon after sensing problems, error occurs.
- 3) To solve the problem, turn the motor off/on again.
- 4) For consecutive errors, check motor or PCB.

## 14. Miscellaneous

1. If there is no input for more than 60 sec. at MODE or PARAMETER level, then the display will return to the standard phase.
2. Under normal operation, RPM changes are available by pressing Up/Down Key (Maximum RPM Setting).  
--> This function is not available under automatic operation. Set-time is not changed.
3. Under automatic operation, by pressing 'Direction' Key, the display will be turned AUT time to Set RPM.
4. For PARAMETER setting, press MODE Key more than 3 sec.
5. At the beginning of setting, by pressing MODE Key, the display will be changed for the following turns:  
Forward Rotating-> Backward Rotating-> Automating Operation.
6. When over-loaded, 3EA of torch (more than 90%) will blink at the same time. After 5 sec. it pauses.  
--> Within 5 sec (less than 90%), it executes normally. In order to reset, turn off/on the motor.
7. Numerical value changes: for upward, 0->1->2->3...8->9->0->1. for downward, reverse turns.