Laboratory Equipment Pty Ltd

INSTRUCTION MANUAL FOR HOT PLATE MAGNETIC STIRRER

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1 Safety Instructions

	Connect the device to an earthed power supply to ensure safety of machine and experiment; connect the power as the machine required.
	This equipment is forbid to use in inflammable and explosive, poisonous and strong corrosive experiments.
	Make sure horizontal installation.
	Non–professionals are not allowed to disassemble and repair this machine.
	Pay attention to the set temperature while dealing with the inflammable matters.
	Make sure dry the resin container, if the temperature is setting too high by accident, the container would be dis–solved and then fall on the heater to cause fire.
	Overfilled of sample will lead to overheat of working room under parts, which will dissolve the inflammable material and cause fire.
	While the machine is working, don’ t touch the top, window and exhaust port of the device to protect from high–temperature burns.
	Read the instruction book before operation.

- When work, ware the personal guard to avoid the risk from:
  – Splashing and evaporation of liquids
  – Release of toxic or combustible gases.

- Set up the instrument in a spacious area on a stable, clean, non–slip, dry and fireproof surface, do not operate the instrument in explosive atmospheres, with hazardous substances or under water.

- Gradually increase the speed, reduce the speed if:
  – The stirring bar breakaway because of too high speed.
  – The instrument is not running smoothly, or container moves on the stage.

- Temperature must always be set to at least 25℃ lower than the fire point of the media used.

- Beware of hazards due to:
  – Flammable material or media with a low boiling temperature
  – Overfilling of media
  – Unsafe container

- Process pathogenic materials only in closed vessels.

- If the case of the stirrer bar is PTFE, please note:
  Elemental fluorine, three fluoride and alkali metals will corrode the PTFE and Halogen alkenes make it expansion at room temperature Molten alkali, alkaline earth metals or their solution, as well as the power in second and third ethnic of the Periodic Table of elements will have chemical reaction with PTFE when temperature reaches 300 ~400 ℃

- Check the instrument and accessories before hand for damage each time you use them.

- When using metal vessels, do not place the temperature sensors on the bottom of the vessel.
  Placing sensors on the vessel bottom can cause excessively high temperature to be measured especially in media which have poor conductivity. The tip of the measuring sensor must be at least 5mm from the vessel bottom, a distance of 10mm is ideal.
- The instrument can only be disconnected from the main power supply by pulling out the mains plug or the connector plug.
- The voltage stated on the label must correspond to the main power supply.
- Ensure that the mains power supply cable does not touch the heating base plate. Do not cover the device.
- Keep away from high magnetic field.
- Observe the minimum distances between the devices, between the device and the wall and above the assembly (min.100mm).

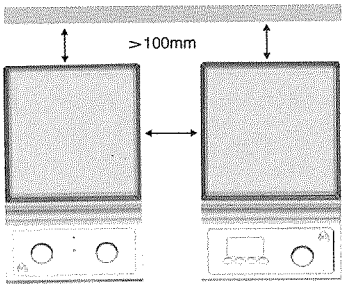


Figure 1

2 Proper Uses

The instrument is designed for mixing and / or heating liquids in schools, laboratories or factories.

3 Inspections

3.1 Receiving Inspection

Unpack the equipment carefully and check for any damages which may have arisen during transport. If it happens, please contact manufacturer for technical support.

Note:

If there is any apparent damage to the system, Please do not plug it into the power line.

3.2 Listing of Items

The packing includes the following items:

With Magnetic Stirrer	
Items	Qty
Main unit	1
Power Cable	1
Stirrer bar	1
User Manual	1
Rack with Rods	1
Fuse	1

Table 2

Without Magnetic Stirrer	
Items	Qty
Main unit	1
Power Cable	1
User Manual	1
Rack with Rods	1
Fuse	1

Table 3

Please check the instrument and appendix with the packing list when you first open the instrument packing case. If you find there is something wrong with the instrument and the appendix, do contact the vendor or the producer.

4 Trial Runs

- Make sure the required operating voltage and power supply voltage match.
- Ensure the socket must be earthed reliably.
- Ensure the power be off
- Plug in the power cable, ensure the power be on and begin initializing.
- Add the medium into the vessel with a stirring bar if with the magnetic stirrer function.
- Put the vessel on the work plate.
- Set the rated stirring speed and start stirring.
- Observe the stirring bar and LCD display.
- Set the rated temperature and start heating.
- Observe the real temperature on LCD display.
- Stop the heating and stirring functions.

If these operations above are normal, the device is ready to operate. If these operations are not normal, the device may be damaged during transportation, please contact manufacture for technical support.

5 Control Panel

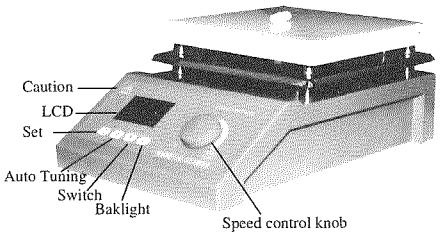


Figure 2

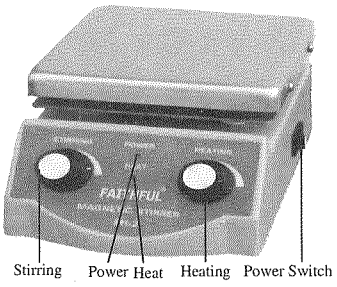


Figure 3

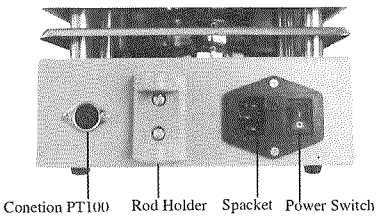


Figure 4

6 Operating Modes

6.1 Magnetic stirrer with hot plate operation:

- Place the equipment on level worktable, and then put the container with liquid one the hotplate.
- Switch on the power accords with the machine, then power indicator light will be lighten; turn on the power of regulation knob, and turn the knob clockwise, then the working indicator light will be lighten; in the process of regulating, the light intensity changes according to different regulation position, and the temperature rises as well.

Note:

- Adjust the speech slowly, please adjust the speech when the appear the follows condition:
  a、Too high speech makes the stir breakaway.
  b、The equipment appears move on the heating plate.
- The power must accord with the machine.
- Make sure the power line has safety distance from the heating plate.
- When the machine meets fault, please cut off the Electricity first.

6.2 Hot Plate without stirring operation:

- Clean the hot plate on the steady platform and make sure there was no water, dirt and other dirty things on the hot plate.
- Put the beaker with the sample or other vessel on the hot plate.
- Switch on the supply power, the light on and the hot plate is under the working.
- Turn on the knob clockwise slowing to increase the heating power and anticlockwise to decrease the heating power.
- When the hot plate working, the operator must pay attention the test result to avoid dangerous.
- After the test finish, turn off the power and waiting for the hot plate temperature down, store the hot plate after make sure the plate temperature not high.

6.3 Digital type operation for SH–4C:

6.3.1 Control Panel Instructions

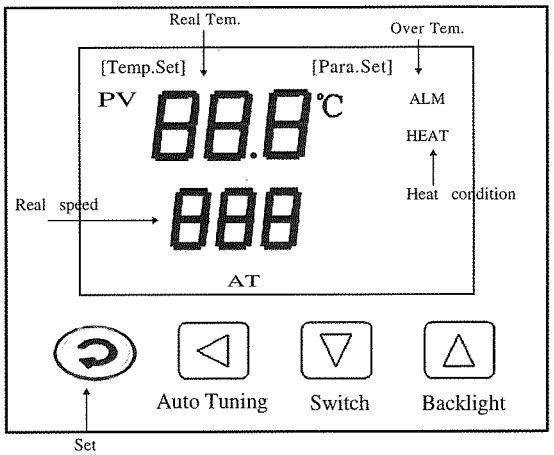


Figure 5

Key Definition:

: Setting or checking the temperature value and inter parameters.

: Without set condition, press the key about five seconds, you can open or close the auto tuning program; within Set Condition, press the key, you can Move the set value.

: In setting state, click this key to decrease set value, long press this key to enable the set value continuously decrease.

: Press the key to open or close the backlight in the normal display status; in setting state, click this key to increase set value, long press this key to enable the set value continuously increase.

6.3.2 Operation and Use of Methods

• On power–up, all signs are lighted. The controller display "dS–1" on the upper display window and range value on the lower display window. After three seconds, the controller will be into normal display status.

• Temperature Setting Function

Press " ⓢ " to enter setting mode, The controller display "SP" on the upper display window and set value on the lower display window; Using " ◁ " " ▽ " " △ " to change the set value that you want. Press " ⓢ " again, the controller will exit setting mode, and set value will be auto saved.

• Over Temperature Alarm

When there is an over temperature alarm, The buzzer sounds, "ALM" alarm identifier lights. If the over temperature alarm produces due to change the set value, alarm identifier lights all the same, but the buzzer does not sounds.

Over temperature alarm, controller will automatically disconnect the heating output.

• Temperature Measurement Abnormal Alarm

The controller displays "Er-2" on the upper display window, It means that the temperature sensor faults, temperature exceeds the measuring range or controller itself faults. Controller will automatically disconnect the heating output , the buzzer sounds, "ALM" alarm identifier lights. Please check over the temperature sensor and wiring carefully.

• If the controller displays "SEr" on the upper display window, it means the temperature sensor falls off, "ALM" alarm identifier lights, Please check over the temperature sensor carefully.

• In setting status, Without any key press in one minute, the controller will be return normal display status.

• You can press any key to make it silence when the buzzer sounds.

6.3.3 Self-tuning function

In the normal display status, the controller will enter the PID auto-tuning program by pressing the " ◁ " button for five seconds, "AT" identifier flashes, it will be not flash when PID auto-tuning program is completed. When it is running of the auto-tuning of PID, it can be stopped by pressing the " ◁ " for five seconds again. When the auto-tuning program is over, one group of PID parameters make the controller work in the best state can be calculated automatically.

6.3.4 The Internal Temperature Parameters Setting

In normal displays status , press " ⓢ " for three seconds, the controller display "Lc" on the upper display window, password value is displayed on the lower of display window . press " ◁ " , " ▽ " and " △ " , changing the password value. press " ⓢ " again, If the password value is correct, controller will automatically enter the internal temperature parameters state. press " ⓢ " once more, each parameter value can be modified. Then press " ⓢ " for three seconds, you can exit the internal temperature parameters state, and each parameter will be auto saved.

Parameter list one

Parameter indicator	Name	Instruction of the function	Setting range(factory set value)
Lc-	Password	Lc=3, you can enter the parameters listed	0
P-	Proportional	Adjustment of proportional function	(1 ~ rH) 30
I-	Integration	Adjustment of integration function	(1 ~ 1000) 200
d-	Differential	Adjustment of differential function	(0 ~ 1000) 100
T-	Control cycle	The control cycle of temperature control	(1 ~ 60S) 5
rH1	Channel one full-scale vale	The maximum temperature setting value	(0 ~ 400℃)400

Table 4

Parameter list two

Parameter indicator	Name	Instruction of the function	Setting range(factory set value)
Lc–	password	Lc=9, you can enter the parameters listed	0
EnS	Sensor Selection	0: Use the first channel sensor control,measuring the plate temperature 2: Use the second channel sensor control,measuring the liquid temperature	(0 ~ 2) 2
AL2	Channel two alarm value	The Channel two temperature is beyond "SP+AL2" , the ALM indicator lights, the buzzer sounds,the heat output turns off	(0 ~ 100℃)10
Pb2	Channel two zero point adjust	Update the measurement error(zero error) Pb2= actual value – measured value	(–99 ~ 99℃)0
PK2	Channel two full point adjust	Update the measurement error(full error) PK2=1000 × (actual value measured value) / measured value	(–999 ~ 999)0
rH2	Channel two full–scale vale	The maximum temperature setting value	(0 ~ 400℃)400

Table 5

6.3.5. Wiring

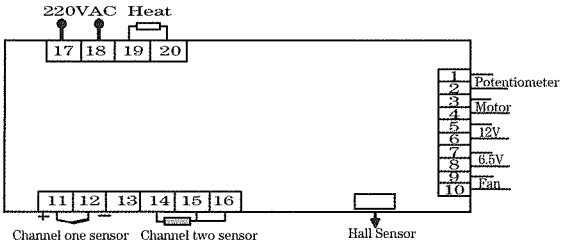


Figure 6

Note:

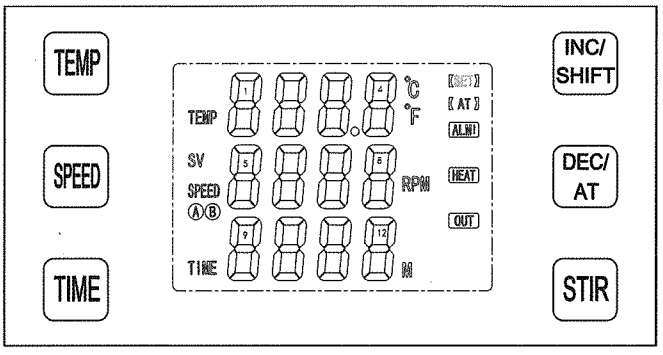
The controller can control the heating load within 1000 Watt!!!

6.4 Digital type operation for SH–II–4C:

6.4.1. Main technical specifications and requirements

- 1) The temperature sensor
  The first senor: PT100 thermal resistance; The second senor: K type thermocouple
- 2) Range of Temperature setting: 0~400 ℃; Range of Temperature measurement: –30~409 ℃
- 3) Basic error of temperature measurement: < 0.5%
- 4) Range of Time setting: 0~9999 minutes (hours); Timing error: <1%
- 5) Speed sensor: Hall element
- 6) Speed setting range: 200~2000RPM
- 7) Ambient temperature: –10~60 ℃; Relative humidity: <85%RH

6.4.2. Panel indication



Definitions of button:

- 1. "TEMP" button: In the non-set state, click the button can set or view the temperature set point and its internal parameters.
- 2. "SPEED" button: In the non-set state, click the button can set or view the speed set point and its internal parameters.
- 3. "TIME" button: In the non-set state, click the button can set all-running time. End of the timer runs, click the button can restart the temperature control.
- 4. "INC/SHIFT" button: In the non-set state, long press this button for 3 seconds to switch between two channel temperature and automatically save. In the setting status, click the button to increase the set value. If press and hold the button, the set value will increase continuously.
- 5. "DEC/AT" button: In the non-set state, long press this button for 6 seconds to enter temperature self-tuning selection state. In the setting state, click the button to reduce the set value. If press and hold the button, the set value will reduce continuously.
- 6. "STIR" button: Start or stop stirring.

6.4.3. Operation and using

- 1. When the controller is powered on, the up window of the controller shows the graduation and the instrument model (P2-C), the middle window of the controller show the versioning(FSv1), the controller will get into the normal view state after 3 seconds.
- 2. Temperature, Speed and Time Setting

  In the non-set state, press the "TEMP" button, get into the temperature setting state. The display window show the temperature set value and flicker. Users can edit the temperature setting value by using the "INC/SHIFT", "DEC/AT" buttons. Then press the "TEMP" button again. The controller will return to the normal view state, the setting value will be saved automatically.

  The setting way of speed and time is same as of temperature.

- 3. Timing Function

  Using the countdown timing, timing function has two modes can be choosed, operation timing or constant temperature timing. Time unit can choose hours or minutes. Buzzer time after timing end can be set, the detailed setting method can be found in the internal parameter table 1.

  When the time is set to "0", it indicates the controller will run continuously.

  When the time is over "0", if you choose the operation timing, the controller begins to time once powered on. If you choose constant temperature timing, the controller begins to time until the temperature reaches the set value. During the timing, the time window of controller displays the rest running time, the "TIME" indicator light flashes. Once the time period is over, the time window of controller display the "END" prompt, the speed window of controller display the "OFF" prompt, the buzzer will sound. At this time, the controller can be restart by resetting the timer time.
- 4. Stir (speed) Function

  The controller is powered on, stir function is disabled, the middle window display "OFF". Click "STIR" button, enable stir function, the middle window display speed measurements, and click "STIR" button again, it will return to stop state.
- 5. Temperature Control Function

  In the non-set state, long press this button for 3 seconds to switch between two channel temperature. When switching to the first temperature control, the prompt " " light, and switching to the second temperature control, the prompt " " light.
- 6. Over Temperature Alarm

  When the temperature deviation on over temperature alarm occurs, buzzer beep sound call, " ALM!" character lit ,disconnect the heating output ,If the change of the temperature setting value and the alarm ,the "ALM!" character lit ,but the buzzer does not call.
- 7. Abnormal alarm for temperature measurement

  If the up window of the controller show the prompt "E-X", it indicates that the temperature sensor has some faults or temperature exceeds the measuring range or the controller itself is faulty, the controller will cut off the heat-output automatically, the buzzer will sounds continuously, "ALM!" indicator light is lit on, Please check the temperature sensor and its wiring carefully.

E–1: indicates the second way temperature fault (K type thermocouple);
E–2: indicates the first way temperature fault (PT100 thermal resistance);
E–3: indicates the environment temperature fault.

- 8. Press any key to mute the buzzer tweet.

6.4.4. Auto–tuning of PID

- Use auto–tuning function when the temperature control is not good. the temperature will have a greater impact during the Auto–tuning process, The users should understands this before using that function.
- In the non–set state, press the **"DEC/AT"** button for 6s, the controller will get into the pre–Auto–tuning state, the up window of the controller show the prompt **"AT"** , the middle window of the controller show the values, user can press the **"DEC"** or **"INC"** button to choose to show "0" of "1" prompt, when it shows the prompt "1" , press the **"TEMP"** button, the controller will run the auto–tuning program, the **"AT"** light flashes, after auto–tuning end, the light stops flashing, parameter value is saved automatically. In the auto–tuning process, press the **"DEC/AT"** button for another 6s, the controller will stop the auto–tuning program.
- During the Auto–tuning process, if Over–temperature alarms, the buzzer does not beep, "**ALM!**" warning light is not lit, the Heat–Out will be cut off; the **"TEMP"** button is invalid.

6.4.5. Internal parameters settings

- In the non–set state, Press the **"TEMP"** button for 3s, controller will display the password prompt **"Lc"** . Adjust the password to the required value, then press the **"TEMP"** button again, it will run into the internal parameter setting state. If press the **"TEMP"** button for another 3s, it will return to the running state, the setting value will be saved automatically.

Parameter table –1

Parameter prompt	Name	Instruction of the function	(Setting range) factory set value
Lc	Password key	When Lc=3, enter the next parameters.	0
P	Proportional band	Adjustment of proportional function.	(0.1～300.0℃) 30.0
I	Integration time	Adjustment of integration function.	(1～1000s) 200
d	Differential time	Adjustment of differential function.	(0～1000s) 150
T	Control cycle	The temperature control cycle.	(1～60s) 5
doT1	Sensitivity of the first sensor	0：SP without a decimal point, 1：SP has a decimal point.	(0～1) 0
AH1	Over-temp alarm in the first sensor	When selecting the first channel sensor work. If "SV>(SP+AH1)" , the "ALM!" light turns on. The buzzer sounds and the heating output turns off.	(0～100.0℃) 20.0
Pb1	Zero point adjust in the first sensor	When selecting the first channel sensor work. For error correction generated when the low temperature measurement. Pb1= actual value － measure value	(-50.0～50.0℃) 0.0
PL1	Full point adjust in the first sensor	When selecting the first channel sensor work. For error correction generated when the high temperature measurement. PL1=1000 × (actual value － measure value) / measure value.	(-999～999) 0
SPH	Maximum set point	The maximum temperature set point.	(0～400.0℃) 400.0

Parameter table –2

Parameter prompt	Name	Instruction of the function	(Setting range) factory set value
Lc	Password key	When Lc=9, enter the next parameters.	0
FoP	Temp-point of fan-on	If "Ambient temperature>FoP", fan start work.	(0～80℃) 40
FcP	Temp-point of fan-off	If "Ambient temperature<FcP", fan stop work.	(0～80℃) 30
ndT	Timer mode	0: With timer function, the under window displays the running time when the measured temperature reaches to the setting value. 1: With timer function, the under window always displays the running time.	(0～1) 0
Hn	Timer unit	0: Minute; 1: Hour.	(0～1) 0
SPd	Constant temp Deviation	When SP >= (SV - SPd), the Controller get into the Constant-temp State.	(0.1～100.0℃) 0.5

EST	Timing Over Buzzer time	If the timing work is over, the Buzzer will beep for EST seconds. Note: if EST=9999, it means the buzzer will beep continuously.	(0～9999s) 60
PoT	"**STIR**"butto-n effective time	"**STIR**" button will be effective until the button is pressed continuously Pot seconds.	(0～10s) 2
AH2	Over-temp alarm in the second sensor	When selecting the second channel sensor work. If "SV>(SP+AH2)", the "ALM!" light turns on. The buzzer sounds and the heatin g output turns off.	(0～100℃) 20
Pb2	Zero point adjust in the second sensor	When selecting the second channel sensor work. For error correction generated when the low temperature measurement. Pb2 = actual value – measure value	(-50～50℃) 0
PL2	Full point adjust in the second sensor	When selecting the second channel sensor work. For error correction generated when the high temperature measurement. PL2 = 1000×（actual value – measure value）/ measur e value.	(-999～999) 0

Parameter table –3

Parameter prompt	Name	Instruction of the function	(Setting range) factory set value
Lc	Password key	When Lc=27, enter the next parameters.	0
Fc	Temperature unit	0:Centigrade; 1:Fahrenheit.	(0～1) 0

Parameter table –4

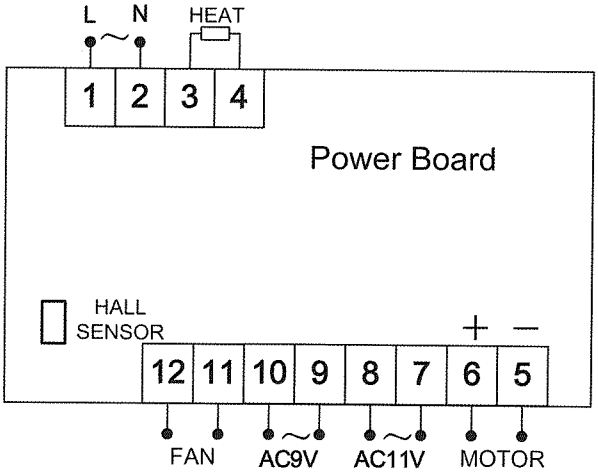
Parameter prompt	Name	Instruction of the function	(Setting range) factory set value
Lc	Password key	When Lc=67, enter the next parameters.	0
rST	Reset to default values	0: cancel to reset to default value; 1:confirm to reset to default value.	(0～1) 0

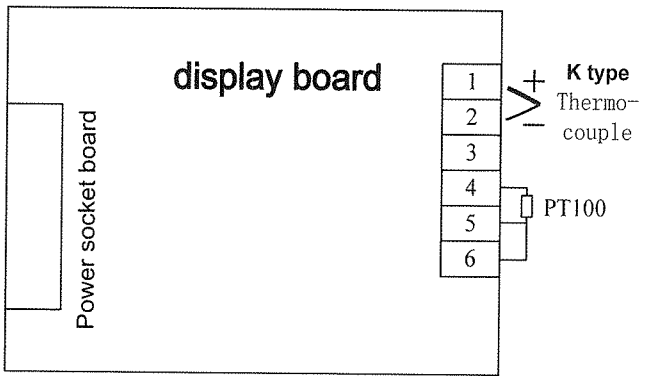
In the non–set state, Press the "SPEED" button for 3s, controller will display the password prompt "Lc" . Adjust the password to the required value, then press the "SPEED" button again, it will run into the motor parameter setting state. If press the "SPEED" button for another 3s, it will return to the running state, the setting value will be saved automatically.

Parameter table –5

Parameter prompt	Name	Instruction of the function	(Setting range) factory set value
Lc	Password key	When Lc=3, enter the next parameters.	0
Pd	Proportional band	Adjustment of proportional function.	(1～99) 40
Id	Integration time	Adjustment of integration function.	(1～99) 2
InT	Speed rise time	Time required when speed from minimum to maximum.	(5～60) 10
dET	Slow down time	Time required when speed from maximum to minimum.	(5～60) 10
SdL	Minimum set point	The minimum speed set point.	(60～SdH) 200
SdH	Maximum set point	The maximum speed set point.	(SdL～6000) 2000
PoL	Pole pairs	Motor pole pairs	(1～32) 1
db	False range	False speed display range.	(0～99) 5

6.4.6. Wiring





7 Faults

Instruments can’ t be power ON

– Check whether the power cable is plugged

– Check whether the fuse is broken or loose

Fault in power on self test

– Switch OFF the unit, then switch ON and reset the instruments to factory default setting.

- Temperature cannot reach set point
  – Check whether the safety temperature value is set too low
- Stir speed cannot reach set point
  – Excessive medium viscosity may cause abnormal speed reduction of the motor
- Heating cannot be started after set the temperature , or stirring cannot be started when adjust the control knob.
  – Check the control panel has damages which may have arisen during transport.

If these faults are not resolved, please set the instruments to factory default setting, or take the unit to your technical service center, or contact with the manufacturer.

8 Maintenance and Cleaning

- Proper maintenance can keep instruments working in a good state and lengthen its lifetime.
- Be careful not spray the cleanser into the instrument when cleaning.
- Unplug t he power line when cleaning.
- Only use cleanser that we advised as below:

Dyes	Isopropyl alcohol
Construction materials	Water containing tenside/
	isopropyl alcohol
Cosmetics	Water containing tenside/
	isopropyl alcohol
Foodstuffs	Water containing tenside
Fuels	Water containing tenside

Table 6

- Wear the proper protective gloves during cleaning of the instrument.
- Before using other method for cleaning or decontamination, the user must contact the manufacturer ascertain that this method does not destroy the instrument.
- The enamel makes the hotplate easier to care for and more resistant to acids and bases. Because of it, however, the heating plate is also more susceptible to extreme fluctuations in temperature and the force of impact. This can result in cracks forming or the coating flaking off.
- The instrument must be cleaned and put it into the initial packaging carton before sending to service for repair, avoiding the contamination of hazardous.
- Use the instrument in a dry clean room and temperature stable environment.

9 Storage and transportation

- Keep it in dry and clean room with good ventilation and no corrosive gas
- prevent it from wetting by the rain and avoid violent collision in transportation.

10 Main technical parameters

Model	Voltage (V)	Speed r.p.m	Heating Power	Max.Vol (ml)	Max.Temp. (plate)	Hot Plate size(mm)
SH-2A	220V/50Hz Or 110V/60Hz	-	180	-	380	120 × 120
SH-2B		100 ~ 2000	-	2000	-	
SH-2			180		380	
SH-3A		-	500	-	380	170 × 170
SH-3B		100 ~ 2000	-	5000	-	
SH-3			500		380	
SH-4A		-	600	-	380	190 × 190
SH-4B		100 ~ 2000	-	5000	-	
SH-4			600		380	
SH-4C						
SH-II-4C						
SH-5A/C	220V/50Hz	-	1200	-	350	300x300
SH-6A/C		-	1800	-	350	350x450
SH-7A/C		-	2000	-	350	400x400
SH-8A/C		-	2800	-	350	350x600
SH-9A/C		-	3000	-	350	400x600

Table 7

11 Working condition

Ambient temperature: 5~40℃;
Ambient humidity: ≤90%;
Voltage: 220V ± 10%, 50/60Hz or 110V+/-10%, 50/60Hz