

SERVICE MANUAL

Magnetic Stirrer 5''

MS-H-Pro Digital Hotplate Magnetic Stirrer

MS-Pro Digital Magnetic Stirrer

MS-H-S Classic Hotplate Magnetic Stirrer

MS-S Classic Magnetic Stirrer

MS-H-Pro+ Digital Hotplate Magnetic Stirrer

MS-H-ProT Digital Hotplate Magnetic Stirrer



VERSION20170204

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Chapter 1: Working Principle

1.1 Introduction

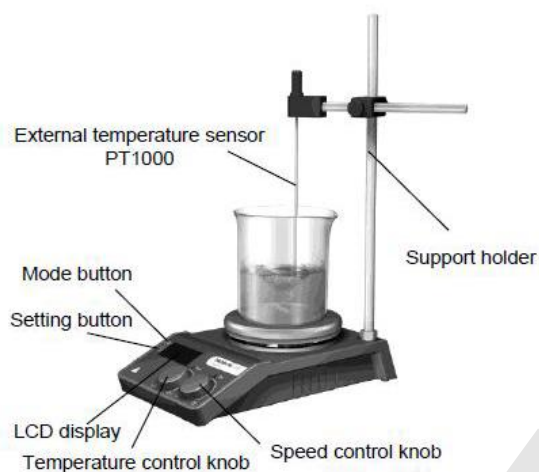


Fig. 1

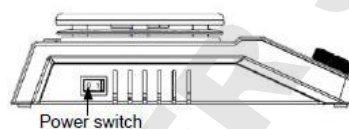


Fig. 2

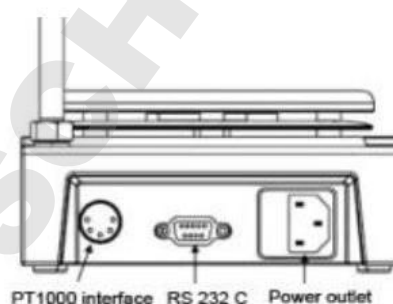


Fig. 3

You can mix the sample in vessel by Magnetic Stirrer with stir bar. When you operate Magnetic Stirrer (MS-H-Pro & MS-H-S&MS-H-Pro+&MS-H-ProT) with heating function, hotplate can be heated up to 340 °C from room temperature.

Fig. 1-3 is the diagram of MS-H-Pro+ Digital Hotplate Magnetic Stirrer. There are mode button, setting button, LCD display, temperature control knob and speed control knob on instrument control panel; power switch, on the side of instrument; PT1000 interface, RS232 interface and power outlet on the rear of the instrument. After properly connect the power cord and turn on power switch, users are able to set experimental conditions on the control panel by temperature control knob and speed control knob, and the setting values and actual values are displaying on LCD screen in real-time.

Temperature sensor support holder and the external temperature sensor are optional, and along with digital hotplate model MS-H-Pro+ which can be used to monitor and control the sample temperature in vessel.

For the settings and functions of control panel, see below::

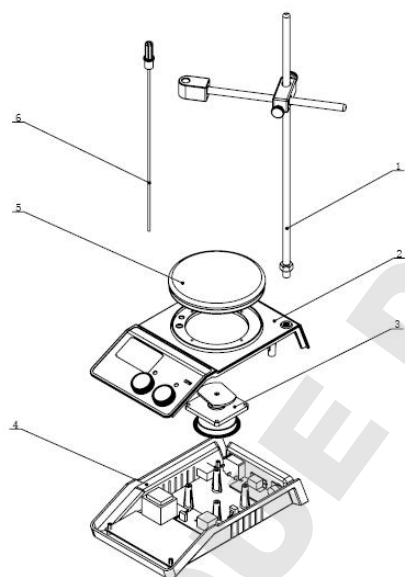
	Temperature Control Knob	Speed Control Knob	LCD display	Mode Button	Setting Button	PT1000 Interface	RS232 Interface	PT1000
MS-H-Pro	Type I	Type I	✓	✓	✓	✓	✓	✓
MS-Pro		Type I	✓	✓	✓		✓	

MS-H-S	Type II	Type II						
MS-S		Type II						
MS-H-Pro+	Type I	Type I	✓	✓	✓	✓	✓	✓
MS-H-ProT	Type I	Type I	✓	✓	✓	✓	✓	✓

Type I Knob: The knob of Digital Magnetic Stirrer can be unlimited rotated and pressed to start. Rotate the button to set parameters and press the button to start/stop running.

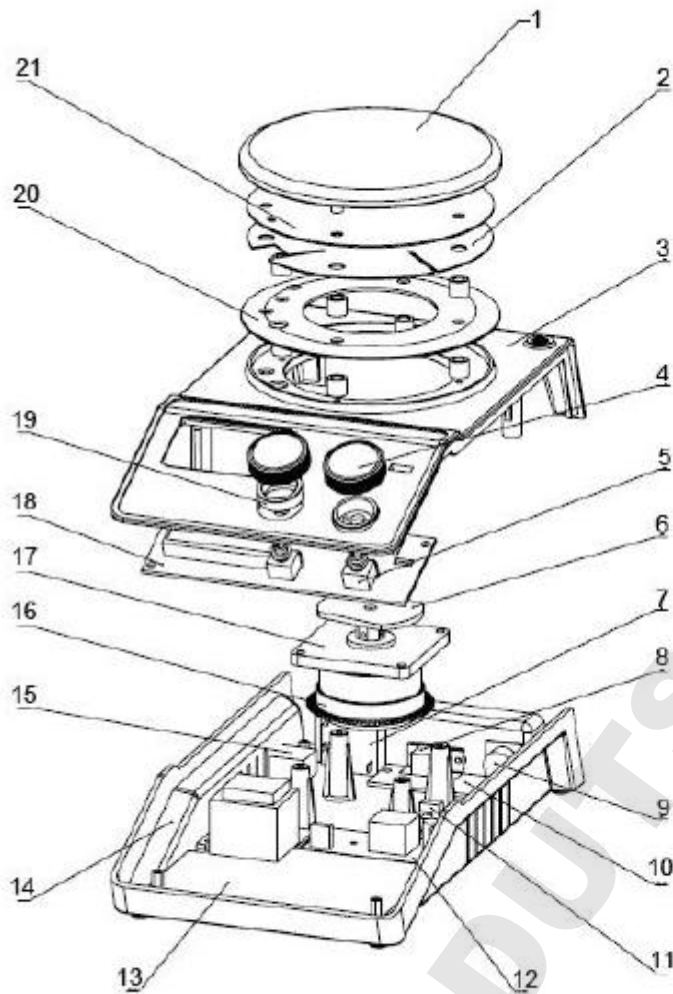
Type II Knob: The knob of Analog Magnetic Stirrer can be limited rotated. There is a stop point when being rotated and can only be rotated more than half a circle. Rotate the button to set parameters and start running.

1.2 Structure



1	Frame
2	Upper Guard Module
3	Motor Module
4	Under Guard Module
5	Heating Plate
6	Temperature Sensor

图 4



21	Heating Component
20	Baffle
19	Support
18	Master Control Board
17	Motor Module
16	Shaft Encoder
15	Switch
14	Under Housing
13	Motor Board
12	Power Board
11	Photoelectric Switch
10	Interface Board
9	Connection PT1000
8	RS232
7	Coupler of Power Supply
6	Magnet
5	Encoders
4	Knobs
3	Upper Cover
2	Setting Plate
1	Work Plate

Fig. 5

Fig. 4 illustrates the spitted structural components of MS-H-Pro, and Fig. 5 is the exploded view of MS-H-Pro. Hotplate module includes hotplate (enamel or stainless steel surface), Heating Component, setting plate and baffle etc. Upper cover module consisted of upper cover, Master Control Board, knobs, key film and so forth. Motor module includes motor, magnet, shaft encoder. Under housing module under housing, Motor Board, power supply, power outlets, interface board, RS232 interface, sensor interface, photoelectric switch and so on.on.

Power supply: 220V (or 110V) → Power outlets → Motor Board → transformer (to 9V) → power supply relay for system control → power supply control of Work Plate

Stirring: motor drives the magnet fixed on it to rotate synchronously when turn the motor on, which forms a varying magnetic field; the varying magnetic field drives stir bar to rotate synchronously with motor, for stirs the target sample.

Speed feedback: The motor speed can be accurately measured by the shaft encoder fixed on the motor along with photoelectric switch and return a feedback. (MS-H-Pro & MS-Pro)

Heating: There are two sets of built-in temperature sensors (thermistors) at the place where the Work Plates are fixed, and the feedback end of temperature sensor is connected to Master Control Board. Thereof, one set of temperature measurement circuit is for temperature control, and the other is for temperature protection, to avoid hardware failure's devastating injury to users. (MS-H-Pro & MS-H-S)

LCD display: Master Control Board is connected to Motor Board and displays user's settings and current operating information on equipment. (MS-H-Pro & MS-Pro)

External temperature sensor & support holder: Sensor support holder is installed in mounting hole of upper cover, and external temperature sensor is fixed on the sensor support holder. Plug PT1000 into the interface at the rear of instrument to monitor the temperature of target sample. (To be suitable for MS-H-Pro and is optional.)

Chapter 2: Removal and Installation of Instrument

When instrument failure occurs, first, you should conduct a failure analysis; if the failure is caused by the damage of instrument hardware, the related component must be repaired or replaced. Here are the relevant contents of the replacement and disassembly of instrument.

2.1 Removal

Tool: Cross screwdriver



Step 1:

Turn over the instrument, remove and remain the screws marked with red circle.



Step 2:

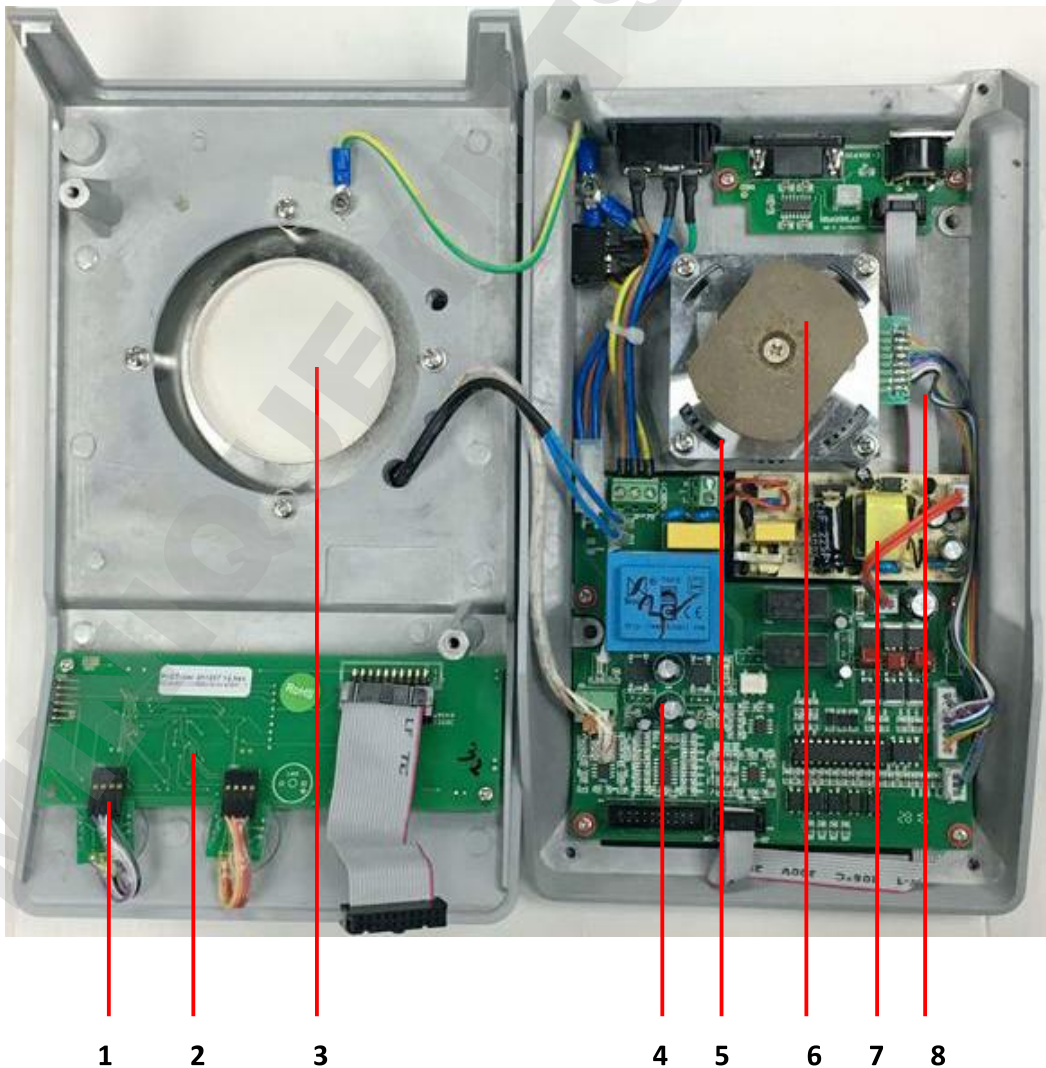
Lift the upper cover and unplug the cable.



Step 3:

Turn the upper cover upside down as shown in the left figure, and place it on the clean desktop. Be careful not to scratch ceramic top plate by hard objects.

2.2 Main parts illustration



Type	1 Encoder	2 Master Control Board	3 Heating Component	4 Driven Board	5 Motor component	6 Magnet	7 Photoelectric switch	8 Power Board
MS-H-Pro+(220v)	18100123	18100850	18100059	18100721	18800038	18100028	18100118	18100065
MS-H-Pro+(110v)	18100123	18100850	18100060	18100725	18800038	18100028	18100118	18100065
MS-H-Pro(220v)	18100123	18100879	18100059	18100872	18800038	18100028	18100118	18100065
MS-H-Pro(110v)	18100123	18100879	18100060	18100316	18800038	18100028	18100118	18100065
MS-H-ProT(220v)	18100123	18101073	18100059	18100721	18800038	18100028	18100118	18100065
MS-H-ProT(110v)	18100123	18101073	18100060	18100725	18800038	18100028	18100118	18100065
MS-H-S(220V)	18100124	18100412	18800049	18100295	18800038	18100028	/	18100065
MS-H-S(110V)	18100124	18100114	18100060	18101456	18800038	18100028	/	18100065
MS-Pro(220v)	18100123	18100879	/	18100872	18800038	18100649	18100118	18100065
MS-Pro(110v)	18100123	18100879	/	18100316	18800038	18100649	18100118	18100065
MS-S(220v)	18100114	18100295	/	18100295	18800038	18100649	/	18100065
MS-S(110v)	18100114	18100295	/	18100295	18800038	18100649	/	18100065

2.3 Circuit Connections (MS-H-ProT)



Step 1:

Circuit connections are performed at the red circle icon. Before close the upper cover and install instrument, please carefully check the cable is connected correctly.



Step 2:

During connecting wires on the switch power supply, as shown at the red circle of left figure, please note the poles "L" and "N" on power supply must be plugged in line with the corresponding poles "L" and "N" on the terminals of the Motor Board. The cable on the right side that ensures the black cable end is at the left of the Motor Board, lower of power supply.

2.4 Replacement of the fuse



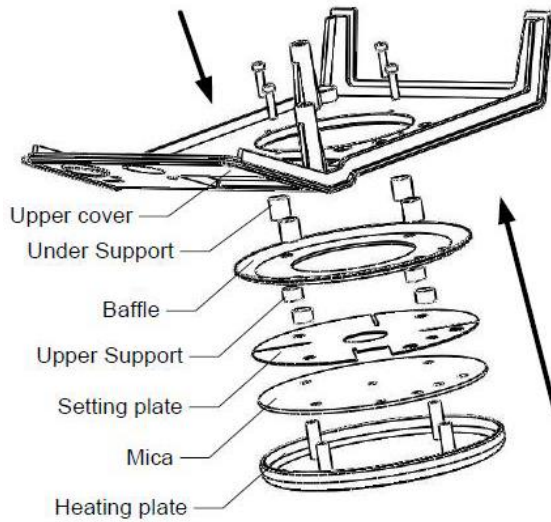
When switch off, inspect the fuse, fuse can be removed by a tool and check if the fuse is fine. if it is defective, replace with a new one.

2.5 Replacement of hotplate models (for MS-H-Pro, MS-H-S, MS-H-Pro+, MS-H-ProT)



Step 1:

Unplug the cable marked with red circles, as shown in figure.



Step 2:

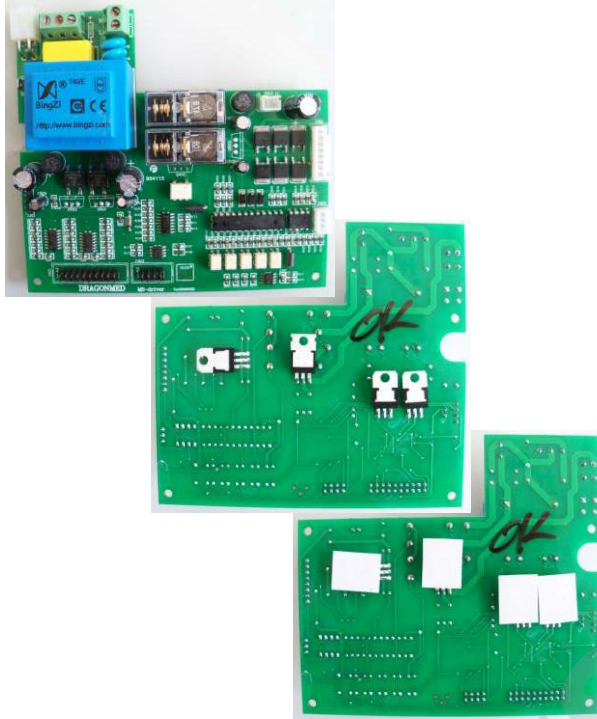
Remove hotplate components as shown in the figure and install a new component in the corresponding location. If the replacements include heating component, you only need to install setting plate, upper support, baffle, under support, etc. Please note upper support and under support have different size, follow original instrument assembly sequence to install and replace.

2.6 Replacement of driver board



Step 1:

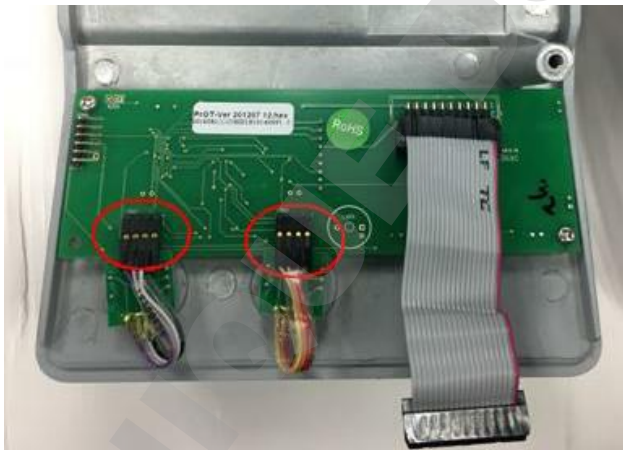
Pull out the cables marked with red circles, remove the screws and ceramic gaskets (marked with green circles) of fixing Motor Board by tool and keep them to be properly preserved, as shown in the figure.



Step 2:

Turn over the new replacing Motor Board; apply silicone pads onto the components, as shown in the figure. Please note the silicone pads must completely cover the components. Then carry on circuit connections and tighten the screws.

2.7 Replacement of master control board (for MS-H-Pro, MS-Pro, MS-H-Pro+, MS-H-ProT)



Step 1:

Pull out the cables marked with red circles, remove the screws (marked with purple circles) of fixing Master Control Board by tool and keep them to be properly preserved, as shown in the figure.

Step 2:

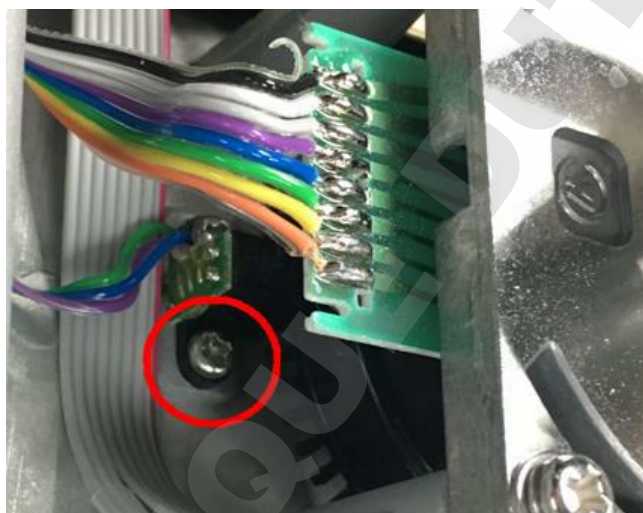
Remove off protective film on the LCD screen of Master Control Board. Then carry on circuit connections and tighten the screws.

2.8 Replacement of motor component



Step 1:

Pull out the cables marked with red circles, remove the screws (marked with green circles) of fixing motor by tool and keep them to be properly preserved, as shown in the figure.



Step 2:

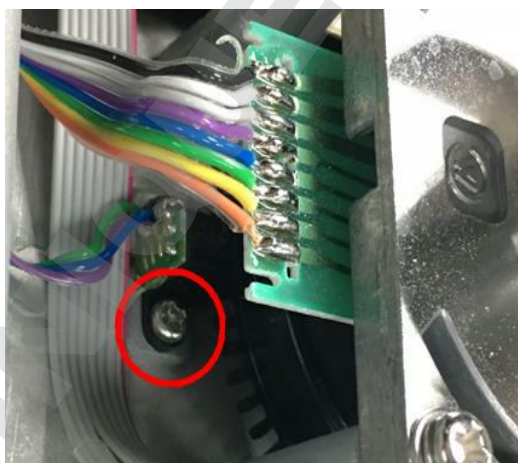
When you replaced a new motor, the shaft encoder on the motor must match with photoelectric switch. When motor is turning, shaft encoder cannot be frictional contact with photoelectric switch. You can try to fine-tune motor position and then lock it with screws. After having plugged the motor cable, adjust the motor position so that it is in the right position of under housing, and don't touch the moving parts.

2.9 Replacement of Photoelectric switch



Step 1:

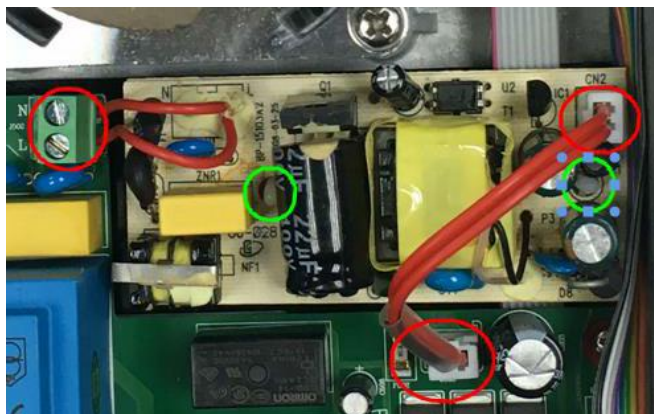
Unplug the cable marked with red circles, as shown in figure.



Step 2:

Remove the screws (marked with green circle) of fixing motor by tool and keep them to be properly preserved. When you replaced a new photoelectric switch, the shaft encoder on the motor must match with photoelectric switch. When motor is turning, shaft encoder cannot be frictional contact with photoelectric switch. You can try to fine-tune shaft encoder position and then lock it with screws. After having plugged photoelectric switch feedback cable, adjust the cable position so that it is in the right position of under housing and don't touch the moving parts.

2.10 Replacement of power board



Step 1:

Remove the cables marked with red circles, and remove the plastic screws marked with green circles by tool and keep them to be properly preserved, as shown in the figure.

Step 2:

Note: during the replacement of new switch power supply and cables, as shown in red circle of left figure. The poles "L" and "N" on power supply must be plugged in line with the corresponding poles "L" and "N" on the terminals of the Motor Board. The right cable in the figure ensures the black cable end is at the left of the Motor Board, lower of power supply.

2.11 Replacement of interface board



Step 1:

Unplug arranging wire marked with red circles, remove the screws marked with green circles and films by a tool and keep them to be properly preserved, as shown in the figure.

Step 2:

Replace with a new interface board, connect the cables and fix screws, as shown in the figure.

Chapter 3: trouble shooting

FAULT CODE	PROBLEM	CAUSE	SOLUTION
E01	No operation response (LED off)	No power supply	Check and connect the power supply, then power on again
		The power switch put off	Put on the power switch
		The fuse is broken	Replace the fuse
		Connection is failure	As shown in the chapter 2.2, open the instrument and check all the connection, re-connect.
E02	Instrument heating doesn't	No setting target temperature	Set a target temperature, and the temperature indicator is on.
		The drive board is failure	Replace the drive board, please reference chapter 2.3
		The power board is failure	Replace power board
		The heating component is failure	Replace the heating component
E03	Instrument stirring doesn't	No setting target temperature	Set a target temperature, and the temperature indicator is on.
		The drive board is failure	Replace the drive board, please reference chapter 2.3
		The power board is failure	Replace power board
		The heating component is failure	Replace the heating component
E04	Temperature control isn't accurate	the drive board is failure	Replace the drive board, please reference chapter 2.3
		The heating component is failure	Replace the heating component
E05	Speed control doesn't accurate	The connection of photoelectric switch is loosen	Reconnect it.
		The photoelectric switch is failure	Replace the photoelectric switch

Chapter 4: Test method

4.1 No operation response (LCD off)

4.1.1 Check under switch off



Fuse

When switch off, inspect the fuse. Fuse can be removed by a tool and check if the fuse is fine. If it is defective, replace with a new one.

4.1.2 Check under switch on



Step 1: Connect arranging wire
In accordance with the method in removal of section 3.a, Chapter 1, remove upper cover and under housing. Lift upper cover to check if the wires of Master Control Board and Motor Board are reliable connection. If wires are loose, then plug wires firmly, and close upper cover and restart the instrument to confirm whether it works.

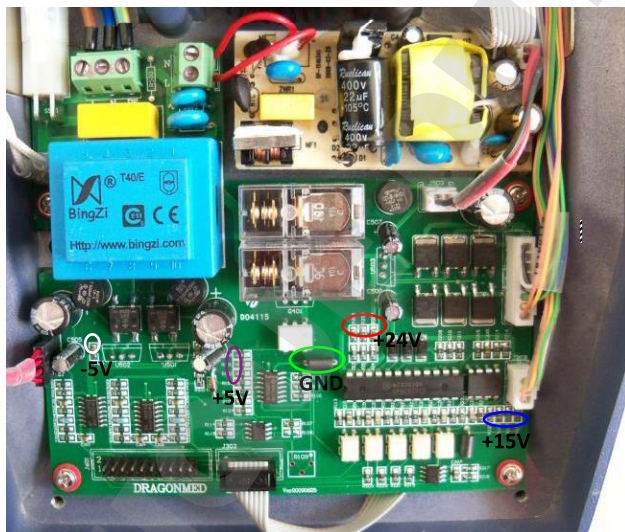


Step 2: 220V power cord

If it does not work, pull out the wires of Master Control Board, turn over upper cover, and use a multimeter to check cable connection status. Adjust the multimeter to short circuit, respectively put the two probes of multimeter at both sides of red circle, green circle and blue circle, to test if both of them are reliable connection.

Step 3: Test Motor Board

If the instrument does not work after power on, use a multimeter to test Motor Board. As shown in the figure, adjust the multimeter to DC voltage, use black probe tip to contact any end of "GND" magnetic ring; use red probe tip to contact any one of the tops of three "+24V" resistors, any one of the left sides of four "+5V" resistors, any one of the bottoms of four "+15V" resistors, the top of "-5V" capacitor, to inspect if the Motor Board is normal (normal voltage value is between $\pm 10\%$). If any measure value of +5V, +15V, -5V is not correct, replace the Motor Board. If the status of +24V is not correct, refer to the next step.

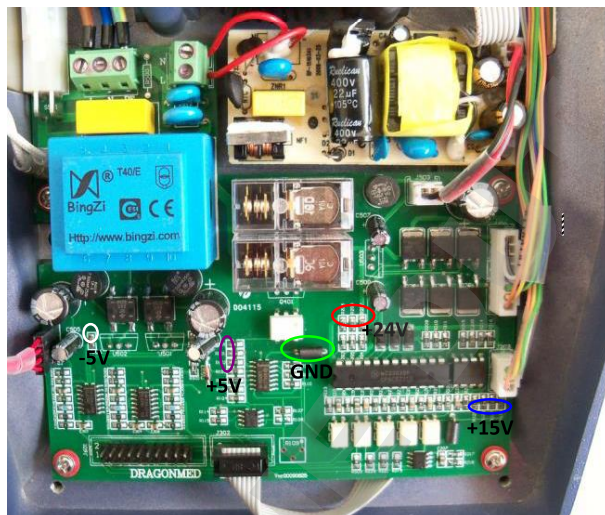


Step 4: Check the switch power supply

If +24V of Motor Board is not correct, as shown, check if the cable plugging is correct and reliable (L corresponding to L, N corresponding to N, red and black ends of cable as shown in figure). If the connection is wrong or insecure, adjust and re-test +24V of Motor Board. If it is not still normal, need to replace the switch power supply.



4.2 Instrument does not heating

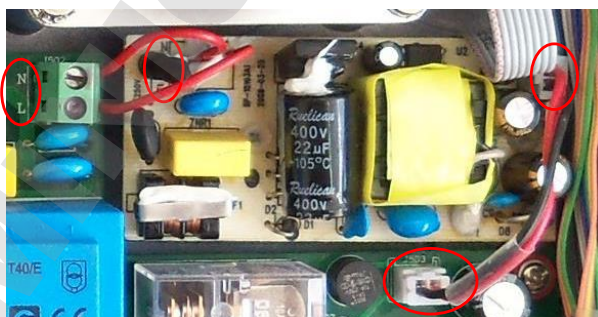


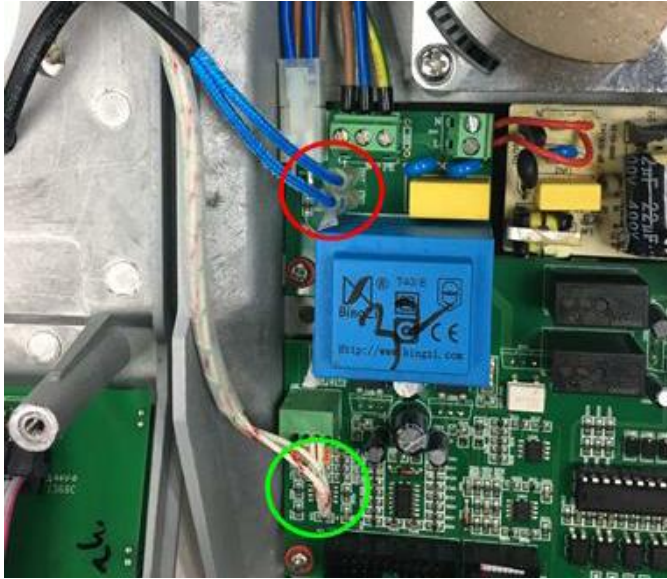
Step 1: check Motor Board

As shown in the figure, adjust multimeter to the DC Voltage, use black probe tip to contact any end of "GND" magnetic ring; use red probe tip to contact any one of the tops of three "+24V" resistors to inspect if the Motor Board is in normal (normal voltage measurement value is between $\pm 10\%$). If the status of +24V is not correct, refer to the next step.

Step 2: Check the switch power supply

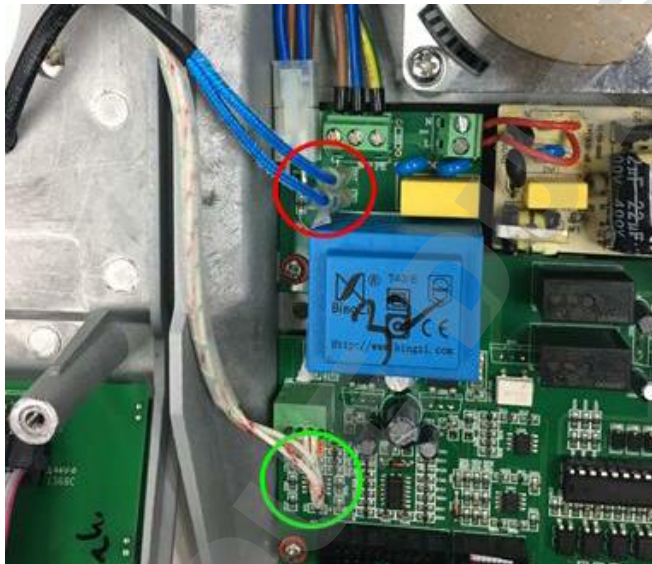
If +24V of Motor Board is not correct, check if the cable plugging is correct and reliable (L corresponding to L, N corresponding to N, red and black ends of cable as shown in figure). If the connection is wrong or insecure, adjust and re-test +24V of Motor Board. If it is still not normal, need to replace the switch power supply.





Step 3: Check Heating Component

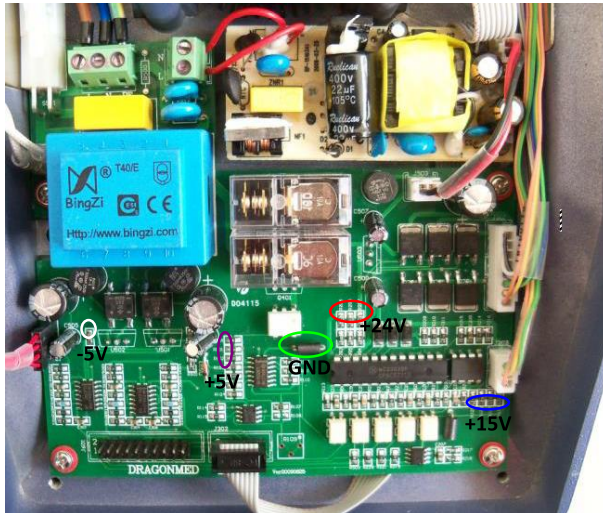
If the Motor Board and switch power supply work, pull out mica terminal marked with red circle, as shown in the figure. Use resistance multimeter to test mica resistance. The mica resistance range of 220V is 108 --132 Ω , and the mica resistance range of 110V is 27 -- 33 Ω . If the mica resistance exceeds the normal range, please replace it.



Step 4: Check the thermometer

If the problem unresolved, pull out the thermometer marked with green circle, as shown in the figure. Please note two terminals should pull out for test. Use the resistance multimeter to respectively measure each terminal of two wires. Check if the resistance is between 1k --2k Ω . If the resistance is beyond this range, replace the heating kits.

4.3 instrument doesn't stirring



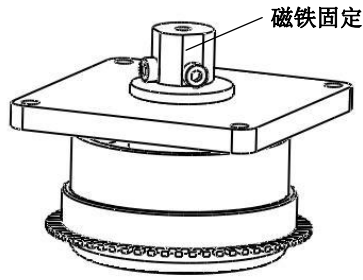
Step 1: check Motor Board
 As shown in the figure, adjust multimeter to the DC Voltage, use black probe tip to contact any end of "GND" magnetic ring; use red probe tip to contact any one of the tops of three "+24V" resistors, to inspect if the Motor Board is in normal (normal voltage measurement value is between $\pm 10\%$). If the +24V is not correct, see the next step.

Step 2: Check the switch power supply

If +24V Motor Board is not correct, as shown, check if the cable connection is correct and reliable (L corresponding to L, N corresponding to N, red and black ends of cable as shown in figure). If the connection is wrong or insecure, adjust and re-test +24V of Motor Board. If it is not still normal, need to replace the switch power supply.



Step 3: Check the motor
 If the Motor Board and switch power supply work, please check if the contact of wire marked with red circle are reliable, and check whether the wire welding marked with green circle is in short circuit.



Step 4: Check the magnet
 If the problem unresolved, please check whether the magnet is fixed reliably on motor shaft as shown in figure.

4.4 Temperature control is not accurate

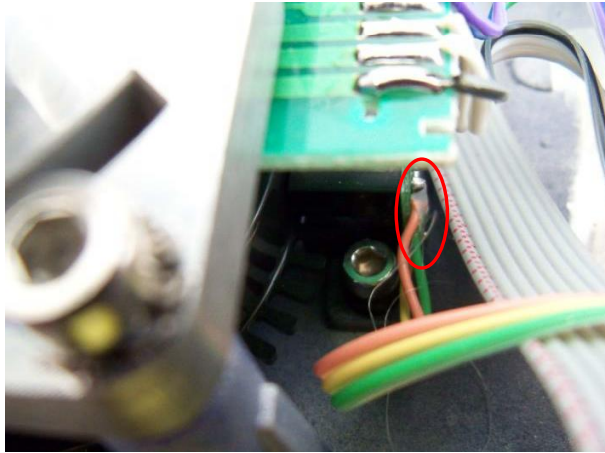


Step 1: Check the thermometer
 Pull out the thermometer marked with green circle as shown in the figure. Please note two terminals should pull out for test. Use the resistance multimeter to respectively measure wire ends of two terminals. Check if the resistance is between 1k--2k Ω . If the resistance is beyond this range, replace the heating kits.

4.5 The speed is not accurate



Step 1: Check connection of photoelectric switch
 Referring to the figure, check if the photoelectric switch and DC circuit board are reliable connection.



Step 2: Check position of photoelectric switch

Referring to the figure, check if there is a short circuit on the photoelectric switch, and if the fixed screws were loosed, adjusts the position of photoelectric switch and fixation. If the problem remains unresolved, replace the photoelectric switch.

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