Magnetic Stirrer with Hot Plate

Mag-Mixer

MH520

Instruction Manual

First Edition

- **Thank you for choosing Mag-Mixer MH520 from Yamato Scientific Co., Ltd.**
- **For proper equipment operation, please read and become thoroughly familiar with this instruction manual before use. Always keep equipment documentation safe and close at hand for convenient future reference.**

Warning: Read instruction manual warnings and cautions carefully and completely before proceeding.

Yamato Scientific America Inc.
Santa Clara, CA

Printed on recycled paper

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Explanation of Symbols

A Word Regarding Symbols

Various symbols are provided throughout this text and on equipment to ensure safe operation. Failure to comprehend the operational hazards and risks associated with these symbols may lead to adverse results as explained below. Become thoroughly familiar with all symbols and their meanings by carefully reading the following text regarding symbols before proceeding

Warning Signifies a situation which may result in serious injury or death (Note 1.)

Caution Signifies a situation which may result in minor injury (Note 2) and/or property damage (Note 3.)

(Note 1) Serious injury is defined as bodily wounds, electrocution, bone breaks/fractures or poisoning, which may cause debilitation requiring extended hospitalization and/or outpatient treatment.

(Note 2) Minor injury is defined as bodily wounds or electrocution, which will not require extended hospitalization or outpatient treatment.

(Note 3) Property damage is defined as damage to facilities, equipment, buildings or other property.

Symbol Meanings

Signifies warning or caution.
Specific explanation will follow symbol.

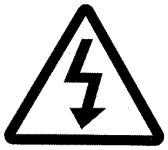
Signifiies restriction.
Specific restrictions will follow symbol.

Signifies an action or actions which operator must undertake.
Specific instructions will follow symbol.

Symbol Glossary

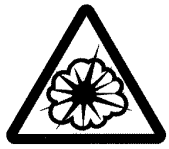
Warning


General Warning


Danger!: High Voltage


Danger!: Extremely Hot


Danger!: Moving Parts


Danger!: Blast Hazard

Caution


General Caution


Caution: Shock Hazard!


Caution: Burn Hazard!

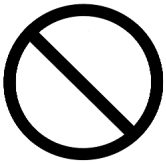

Caution: Do Not Heat Without Water!


Caution: May Leak Water!

Caution: Water Only


Caution: Toxic Chemicals

Restriction


General Restriction

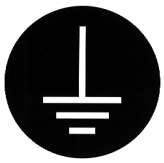

No Open Flame


Do Not Disassemble


Do Not Touch

Action


General Action Required


Connect Ground Wire

Level Installation


Disconnect Power


Inspect Regularly

⚠ WARNING

NEVER operate equipment near combustible gases/fumes.

- Do not operate unit near flammable and explosive gases/fumes. Unit is NOT fire or blast resistant. Negligent use could cause a fire/explosion.

DO NOT touch hot surface

- Top plate becomes hot during operation or right after operation. Use caution when handling unit. Fire or burn injury may result.

Always ground equipment.

- Always ground equipment properly to avoid electric shock.

DO NOT operate equipment when abnormalities are detected.

- In the event that smoke or any unusual odor begins emitting from unit, or if any other abnormalities are detected, turn off power switch and disconnect power cable. Continued operation under such conditions may result in fire or electric shock.

DO NOT operate equipment with power cable bundled or tangled

- Operating unit with power cable bundled or otherwise tangled, may cause power cable to overheat and/or catch fire.

DO NOT damage power cable

- Damaging power cable by forcibly bending, pulling or twisting may cause fire or electric shock to the operator.

NEVER use explosive or flammable substances

- Attempting to use explosive or flammable substances with this unit may cause explosion or fire.

NEVER disassemble or modify equipment

- Do not attempt to disassemble unit. Contacting live parts or rotating parts with bare hands may result in electric shock or personal injury. Do not dismantle unit.
- Attempting to modify this unit in any way, may cause fire or electric shock

⚠ CAUTION

DO NOT operate equipment during thunderstorms.

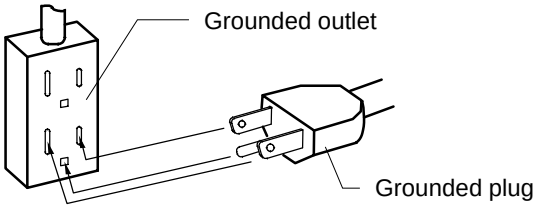
- In the event of a thunderstorm, turn off power switch, and shut off power supply source immediately.

⚠ WARNING

1. Ground wire MUST be connected properly. （with external transformer for AV115V）

- Ground wire (green) must be connected to a proper grounding line or terminal in order to prevent electric shock.
- Never connect ground wire to gas lines or water pipes. Fire hazard may result.
- Never connect ground wire to telephone grounding lines or to lightning conductor rods. Doing so may result in fire or electrical shock.
- Never insert multiple plugs into a single outlet. Doing so may result in power cable overheating, fire or drop in voltage.

Connect to grounded outlet



When no ground terminal is found

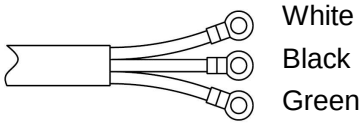
Contact original dealer of purchase, a local electrician or Yamato sales office for location-specific electrical requirements.

（with external transformer for AC220V）

Require to ground by Electrical Equipment Technical Standards Section 19-calss D(Grounding Resistance Max. 100Ω) in Japan, if grounding terminal is not provided. Please contact with local dealer, local electrician, or Yamato Customer Service Center.

Connect the terminals firmly to switch board of facilities or appropriate power plug.

Power plug itself will not be included as an accessory of this Equipment. Connect to the power supply facilities that meet the electric capacity.



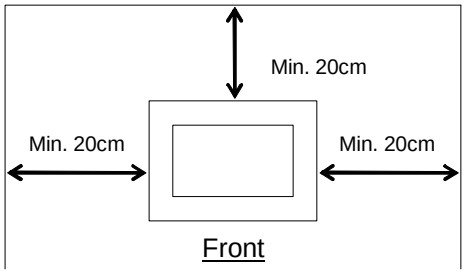
Core color	Wiring on the distribution board
White	Ground side
Black	Voltage side
Green	Earth

- Never connect grounding wire to gas line pipe, water line pipe or telephone grounding wire due to fire or electric shock.

2. Choose an appropriate installation site

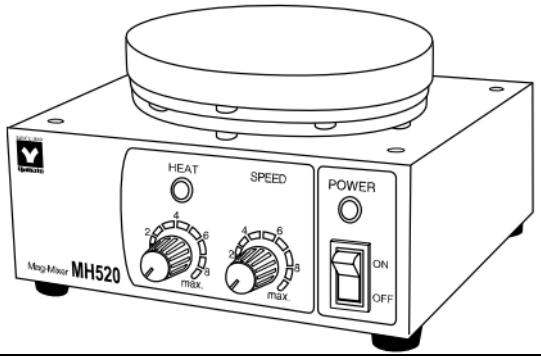
- DO NOT install unit:
  - where flammable or corrosive gases/fumes may be present
  - where ambient temperature will exceed 35℃
  - where ambient temperature will fluctuate
  - in excessively humid or dusty locations
  - in direct sunlight
  - where there is constant vibration

- Install unit in a location with sufficient space, as specified below.



3. Install in a location free of flammables and explosives

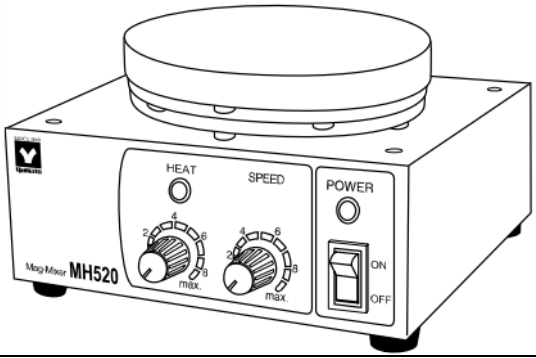
- Never install near flammables or explosives of any kind. This unit is NOT fire or blast resistant. Simply switching the main power ON or OFF can produce a spark, which can then be relayed during operation, causing a fire or explosion when near flammable or explosive fluids, chemicals or gases/fumes.



4. DO NOT disassemble or modify.

- Never attempt to disassemble or modifiy this unit. Doing so may cause malfunction, fire or electric shock.

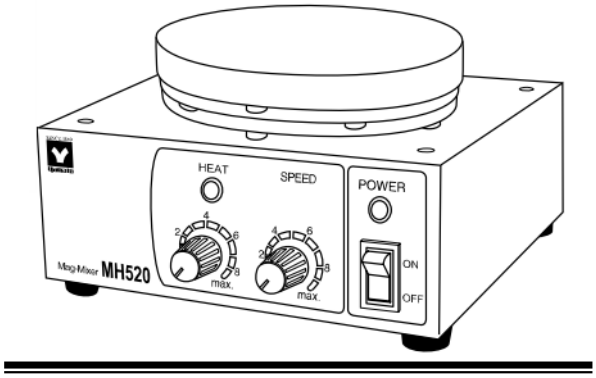
No modification



5. Install unit on a level surface.

- Install unit on a level and even surface. Ensure that all the weight is uniformly distributed over four rubber feet to prevent abnormal vibrations/noise which may lead to possible complications and/or equipment malfunction.

Level installation



⚠ CAUTION

6. Select frequency suitable to power source

Switch power supply frequency (50Hz/60Hz) with frequency selector switch on the rear of unit in accordance with power source. Using at different frequencies of power source may cause malfunction or failure.

7. Connect to a properly rated power supply

- Use a dedicated power supply that matches electric capacity.

  Electric capacity: Single phase 100V with external transformer for 115V or 220V
  115V AC 5.5A 220V AC 3A

Check the line voltage on outlet or terminal to be used and properly evaluate whether to utilize a line being shared by other equipment. If unit is not activated by turning on power switch, take an appropriate course of action, such as connecting unit to a dedicated power source.

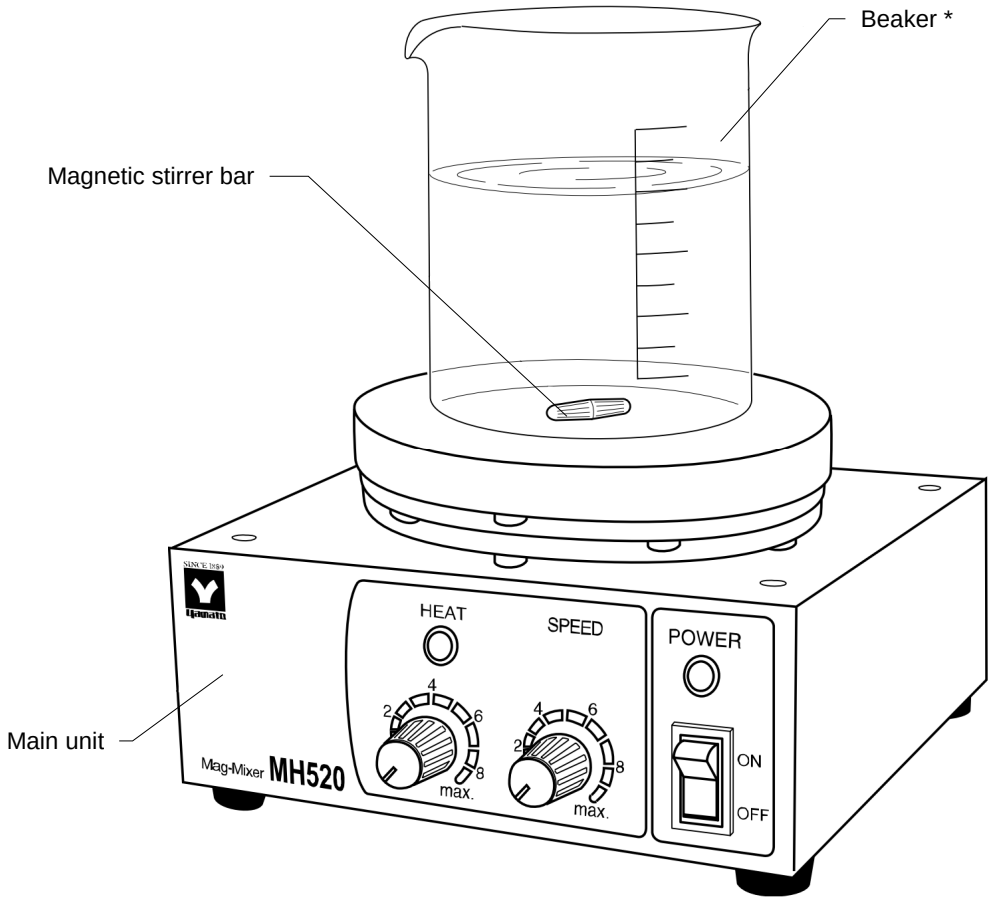
8. Handle power cable with care

- DO NOT operate equipment with power cable bundled or tangled. Doing so may cause power cable to overheat and/or catch fire.
- Do not modifiy, bend, forcibly twist or pull on power cable. Doing so may cause fire and/or electric shock.
- Do not risk damage to power cable by positioning it under desks or chairs, or by allowing it to be pinched in between objects. Doing so may cause fire and/or electric shock.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices. Doing so may cause power cable insulation to overheat, be damaged and/or catch fire, which may result in electric shock.
- Turn off power switch immediately and disconnect from facility outlet, if power cable becomes partially severed or damaged in any way. Failure to do so may result in fire or electric shock.
- Connect power plug securely to the outlet.

COMPONENT NAMES AND FUNCTIONS

Beaker placement

MH520 employs magnetic stirrer bar to agitate solutions. Built-in heater allows to stir sample solution while increasing its temperature.

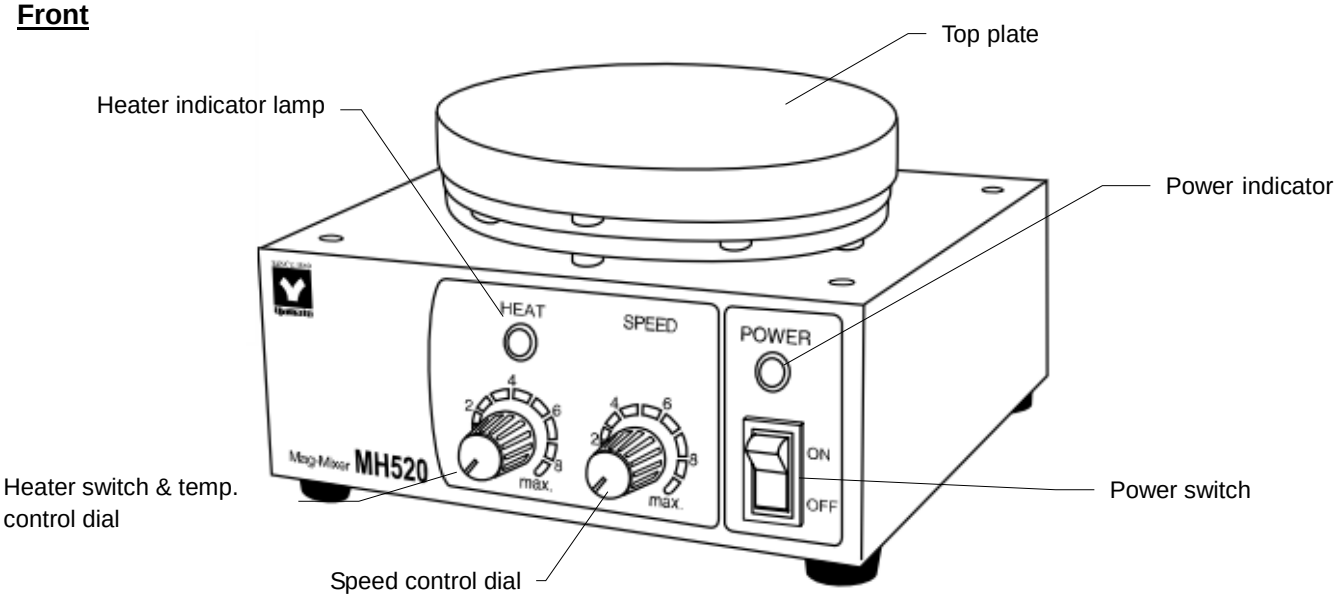


*beaker not included

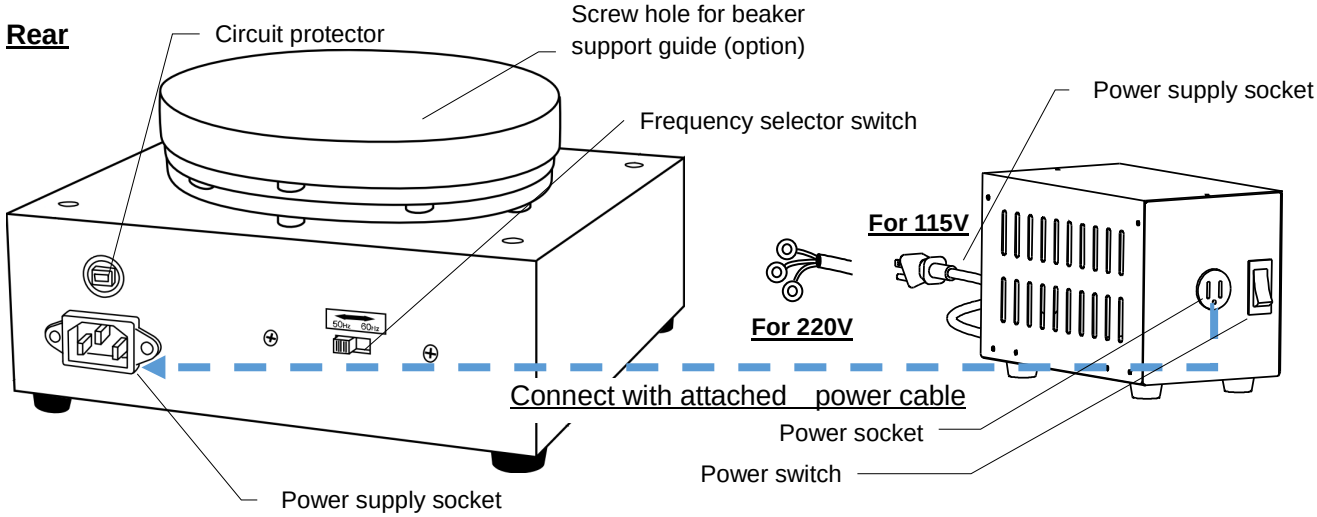
COMPONENT NAMES AND FUNCTIONS

Main Unit

Front



Rear



Power switch	Pressing upper side to ON turns power on, and unit begins operation. Pressing lower side to OFF shuts off power supply.
Power indicator lamp	Illuminates in green when main power is on.
Speed control dial	Controls rotation speed. Turn clockwise to increase speed.
Heater switch & temp. control dial	Turn clockwise to "on" to start the energization control of heater. Turning further will control temperature. Turn the dial clockwise to increase temperature and counterclockwise to decrease.
Heater indicator lamp	Illuminates in red when heater is on.
Top plate	A beaker or other container filled with sample should be placed at the center of this plate.
Circuit protector	Shuts off power in the event of an electrical surge or current overload.
Power supply socket	Connect the included power cable.
Frequency selector switch	Switch power supply frequency (50Hz/60Hz) according to power source.
Screw holes for beaker support guide	Screw holes (in the four corners) for attaching beaker support guide (option). Blocked with screws at the factory shipment.

OPERATION PROCEDURE

The compact table-top MH520 stirrer with its free-moving magnetic stirrer bar is beneficial for mixing a variety of solutions. Moreover, built-in heater facilitates dissolving various substances.

1. Setup (see P.7)

① Ensure that power switch is OFF before installing unit.

② Place a container filled with sample solution on top plate. Note that excessive amount of solution may overflow or splash when stirred. Always pour adequate amount of sample solution in response to the rotation speed.

③ The heat may increase volume of solution, possibly causing solution to overflow or splash. Also adjust the sample quantity and rotation speed according to setting temperature.

④ Heating sample solution can decrease its viscosity. Adjust rotation speed and pay attention to the status/amount of sample in order to prevent solution from spattering.

2. Operation (see P.8)

① Ensure that power switch is OFF, speed control dial is in “min” position, and heater switch & temp. control dial is OFF before starting operation.

< OPERATION PROCEDURES >

① Press the power switch to ON.

② Turn speed control dial gradually to set desired rotation speed while carefully watching the state of agitation. Increasing speed abruptly may send the stirrer bar flying, damaging container or causing sample to splash

③ Turn the heater switch & temp. control dial to ON, then turn it further to set desired temperature for heating sample solution. The temperature on top plate will rise up to approximately 325℃ when temperature setting is at “max” (at room temperature 20℃). Time is required for the whole sample to reach the objective temperature. Check the sample temperature as appropriate until it stabilizes.

④ When operating unit for an extended period while heating sample solution, fluid will gradually evaporate decreasing the volume. Ensure adequate amount of solution in the sample container.

⚠ WARNING

Hazardous substances

Never attempt to process explosives, flammables or any items which contain explosives or flammables. Fire or explosion may result. See "LIST OF HAZARDOUS SUBSTANCES" (P.17)

DO NOT operate equipment when abnormalities are detected.

If unit begins emitting smoke or abnormal odors for reasons unknown, turn off power switch immediately, disconnect power cable from power supply, and contact original dealer of purchase or Yamato sales office for inspection. Continuing to operate without addressing abnormalities may cause fire or electric shock, resulting in serious injury or death. Never attempt to disassemble or repair unit. Repairs should be always be performed by a certified technician.

⚠ CAUTION

DO NOT step on equipment.

Units are not designed to support bodily weight and equipment damage or personal injury may result.

DO NOT place objects on equipment.

Do not place any objects on unit. Such objects may cause equipment malfunction or fall, resulting in personal injury.

DO NOT allow corrosive chemicals to spill on equipment.

MH520 units feature anti-corrosion ceramic coating over aluminum plates. They are, however, susceptible to damage from strong acid chemicals and due diligence should be given to keep corrosive chemicals from spilling onto unit. In the event of a chemical spill, clean unit as thoroughly and as quickly as possible to avoid damage or malfunction.

Viscous solutions

Fluid volume specification range for this unit is 50-5000ml, and mixing rpm range is 150-1,300rpm. These specifications ranges are not guaranteed, however, for processing viscous (thick) fluid solutions.

Start at low speed

Always start operation at low speed. Turning on the power with the dial set to high or maximum speed will cause the motor to spin abruptly, which may send the stirrer bar flying, damaging container or causing sample to splatter.

Increase mixing speed gradually.

Gradually increase mixing speed while watching solution mixture status closely. Increasing speed too quickly may send the stirrer bar off center and into the sides of the container, possibly causing damage or breakage.

Heating samples

Check sample condition at times when heating. The temperature of sample solution may exceed intended temperature, causing damage to container or fluid spatter since it requires time for whole sample to attain uniform and stable temperature.

DO NOT operate equipment during thunderstorms.

In the event of a thunderstorm, turn off power switch and disconnect power cable immediately. A direct lightning strike may cause equipment damage, fire or electric shock, resulting in serious injury or death.

Use as directed.

Operate this unit only as directed in this manual. Utilizing equipment for anything other than for that which it is intended may cause malfunction, damage, serious personal injury or death
Read instruction manual thoroughly before use. Likewise, using non-Yamato components to modify, customize or in attempt to otherwise improve unit design is not recommended and may void warranty.

Inspection and Maintenance

⚠ WARNING

- Turn off power and disconnect power cable before conducting inspection and maintenance, unless otherwise necessary.
- Always perform maintenance on unit when the temperature of the top plate has fallen to room temperature.
- Do not attempt to disassemble unit.

⚠ CAUTION

- Clean unit using a soft, damp cloth. Never use benzene, paint thinner, scouring powder, scrubbing brush or other abrasives and solvents to clean unit. Superficial damage and/or discoloration, as well as deformity to some components may result.

Extended Storage/Unit Disposal

⚠ CAUTION

Extended storage

- Turn off power switch and disconnect power cable from facility outlet or terminal.

⚠ WARNING

Disposal

- Do not leave unit in a location where children may have access
- Remove all the moving parts.
- Dispose as bulky or industrial waste.

Disposal Considerations

Yamato Scientific Co., Ltd. strongly recommends disassembling unit, as far as is possible, in order to separate parts and recycle them in contribution to preserving the global environment. Major components and materials, comprising MH520 units are listed in the table below

Component Name	Material
Exterior Parts	
Outer covering	Steel plate melamine resin baking finish
Labels	Polyethylene (PET) resin film
Top plate	
Top plate	Aluminum, ceramic coating
Stirrer bar	Alnico (magnet), 4 Fluorinated resin coating on outer periphery
Electrical parts	
Motor	Casing, rotor, shaft: steel Bracket: aluminum Coil: copper wire (resin insulation coating)
Power cable, wiring, others	Resin-coated wiring materials and circuit boards

TROUBLESHOOTING

Symptom	Possible causes
Unit does not run when power is turned on.	• Power switch is OFF • Power cable is not properly connected to outlet. • Power failure in progress • Fuse is blown. Call for service if the fuse blows again in a short time after replacement
Solution not mixing properly.	• Installation surface is not even or stable. • Installation surface is not level. • Sample containter is not centered on top plate.
Temperature does not rise when the heater switch is turned on.	• Power switch is OFF • Power failure in progress • Fuse is blown. Call for service if the fuse blows again in a short time after replacement

If problem persists or does not fall under any of errors above, turn off power immediately, disconnect power cable and contact original dealer of purchase or Yamato sales office for assistance.

Requests for Repair

When a problem occurs, terminate operation immediately, turn off power switch and disconnect power cable. Contact original dealer of purchase or Yamato sales office for assistance.

< The following information is required for all repairs. >

- ●Model name
- ●Serial number
- ●Date (year/month/day) of purchase
- ●Description of problem in as much detail as possible

} Refer to warranty card.

Be sure to present warranty card to Yamato service representative

Keep warranty card with care. (attached separately)

- ●Warranty card is given by local dealer or one of Yamato sales offices. Date of purchase of this equipment and other information should be filled in warranty card
- ●Warranty period is 1 (one) year from date of purchase. Repair this Equipment for free of charge according to the contents on warranty card.
- ●Consult with original dealer of purchase or Yamato sales office for any repair after warranty ended. Charged repair service of this equipment will be available on customer’s request when it can be maintained functional by its repair.

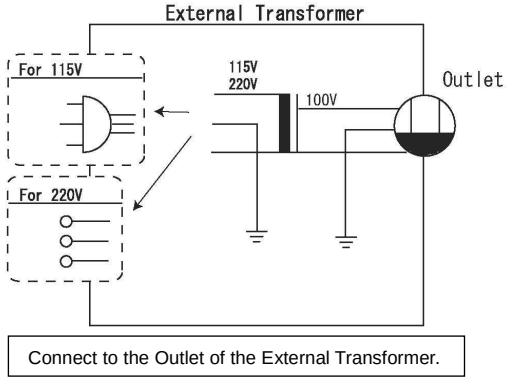
Guaranteed Supply Period for Repair Parts

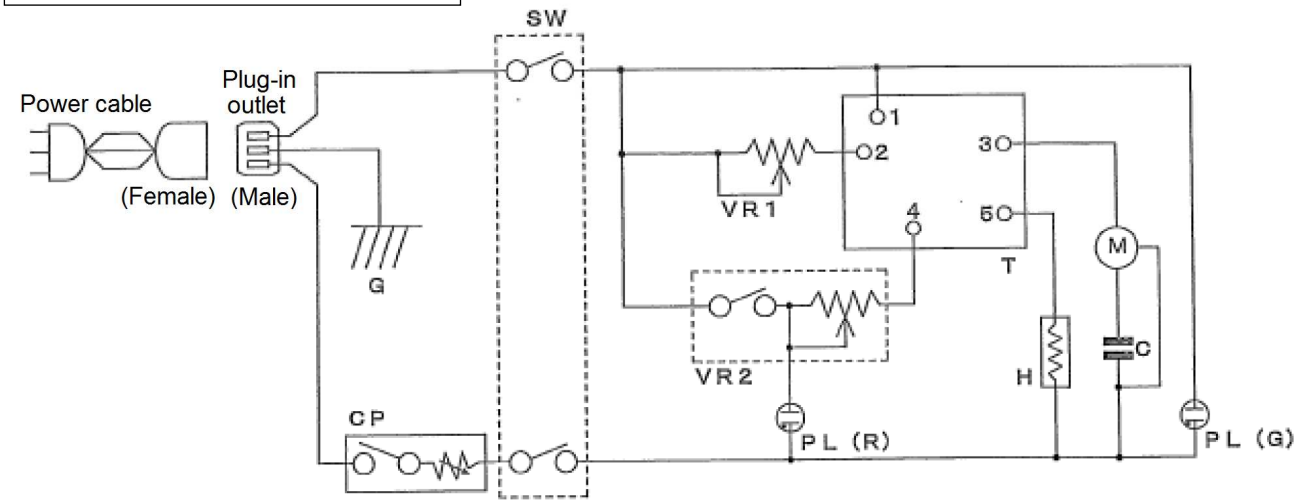
Guaranteed maximum supply period for repair parts is 7 (seven) years from date of discontinuation for this unit.
"Repair parts" is defined as components which, when installed, allow for continued unit operation.

SPECIFICATIONS

Model	MH520
Top plate material	Aluminum, ceramic coating
Top plate diameter	φ168mm
Stirring capacity	50-5,000ml
Motor rotation speed	Approx. 150-1,150rpm (50Hz)/Approx. 150-1,300rpm (60Hz)
Heater	470W
Temperature control	Triac input control
Hot plate temperature	Max. 325℃
Motor	Induction motor, phase control & electromagnetic break combination
Power supply (50/60hz)	**Single phase 100V with external transformer for 115V or 220V**
	115V AC 5.5A / 220V AV 3A
External dimensions (W×D×H mm)	190x223x123 (includes protrusions)
Weight	Approx. 3.1 kg
Accessories	Magnetic stirrer bar 40mm: 1pc, power cable

WIRING DIAGRAM





Symbol	Component	Specification	
	Power cable	AYCS-212	Yamato Scientific
	Plug-in outlet	AC-P01CF01	Sato parts
SW	Power switch	JW-M21RKK	Nihon Kaiheiki
CP	Circuit protector	NRF110-10A	Yamato Scientific
VR1	Motor control	RV24YN20SB104	Yamato Scientific
VR2	Heater control	250KΩ w/ switch	Yamato Scientific
T	Circuit boards (heater/motor control)	C-77A	Yamato Scientific
H	Heater	Mica heater 470W	Yamato Scientific
M	Motor	IM-C6A2S	Yamato Scientific
C	Motor capacitor	200V AC 1.5μF	Yamato Scientific
OUTPUT	External outlet receptacle	WCF1041B	Yamato Scientific
PL(R)	Pilot lamp (red)	BN-9-E1-R	Sato parts
PL(G)	Pilot lamp (green)	BN-9-E1-G	Sato parts
TF	Transformer	UD11-01KB2(for 115V) AD21-01KB2(for 220V)	Yamato Scientific

LIST OF HAZARDOUS SUBSTANCES

DO NOT use explosives, flammables or substances containing them for this unit.

Exercise extreme caution when it is necessary to use any substances listed below, and it must be done under strict supervision and control.

Explosive substances	①Nitroglycol, Glycerine trinitrate, Cellulose Nitrate and other explosive nitrate esters
	②Trinitrobenzen, Trinitrotoluene, Picric Acid and other explosive nitro compounds
	③Acetyl Hydroperoxide, Methyl Ethyl Ketone Peroxide, Benzoyl Peroxide and other organic peroxides
	④Metallic Azide, including Sodium Azide, etc.
Combustible substances	①Metal “Lithium” ②Metal “Potassium” ③Metal “Natrium” ④Yellow Phosphorus ⑤Phosphorus Sulfide ⑥Red Phosphorus⑦Phosphorus Sulfide ⑧Celluloids, Calcium Carbide (a.k.a, Carbide)⑨Lime Phosphide⑩Magnesium Powder ⑪Aluminum Powder ⑫Metal Powder other than Magnesium and Aluminum Powder ⑬Sodium Dithionous Acid (a.k.a., Hydrosulphite)
Oxidizing substances	①Potassium Chlorate, Sodium Chlorate, Ammonium Chlorate, and other chlorates
	②Potassium Perchlorate, Sodium Perchlorate, Ammonium Perchlorate, and other perchlorates
	③Potassium Peroxide, Sodium Peroxide, Barium Peroxide, and other inorganic peroxides
	④Potassium Nitrate, Sodium Nitrate, Ammonium Nitrate, and other nitrates
	⑤Sodium Chlorite and other chlorites
	⑥Calcium Hypochlorite and other hypochlorites
Flammable substances	①Ethyl Ether, Gasoline, Acetaldehyde, Propylene Chloride, Carbon Disulfide, and other substances having ignition point of 30 or more degrees below zero.
	②n-hexane, Ethylene Oxide, Acetone, Benzene, Methyl Ethyl Ketone and other substances with ignition point between 30 degrees below zero and less than zero.
	③Methanol, Ethanol, Xylene, Pentyl n-acetate, (a.k.a. amyl n-acetate) and other substances having ignition point of between zero and less than 30 degrees.
	④Kerosene, Light Oil, Terebinth Oil, Isopenthyl Alcohol (a.k.a. Isoamyl Alcohol), Acetic Acid and other substances having ignition point of between 30 degrees and less than 65 degrees.
Combustible gas	Hydrogen, Acetylene, Ethylene, Methane, Ethane, Propane, Butane and other gases combustible at 15°C, ambient air pressure.

Limited Liability

Always operate equipment in strict compliance to the handling and operation procedures set forth by this instruction manual.
Yamato Scientific Co., Ltd. assumes no responsibility for malfunction, damage, injury or death, resulting from negligent equipment use.
Never attempt to disassemble, repair or perform any procedure on Mag-Mixer MH520 which are not expressly mandated by this manual. Doing so may result in equipment malfunction, serious personal injury or death.

Notice

- **Instruction manual descriptions and specifications are subject to change without notice.**
- **Yamato Scientific Co., Ltd. will replace flawed instruction manuals (pages missing, pages out of order, etc.) upon request.**

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