SINCE 1889

Yamato

Stirrer

Model LT400A/400B
Model LT400C/400D
Model LT500A/500B

Second edition

- **Thank you very much for purchasing this Yamato LT series stirrer.**
- **Please read the "Operating Instructions" and "Warranty" before operating this unit to assure proper operation. After reading these documents, be sure to store them securely together with the "Warranty" at a handy place for future reference.**

⚠Warning: Before operating the unit, be sure to read carefully and fully understand important warnings in the operating instructions.

Yamato Scientific Co., Ltd.

Table of contents

1. Safety precautions

Explanation of pictograms

About pictograms

A variety of pictograms are indicated in this operating instruction and on products to assure safe operation. Possible results from improper operation ignoring them are classified as follows.
Be sure to fully understand the descriptions below before proceeding to the text.

Warning	Indicates a situation which may result in death or serious injury (Note 1)
Caution	Indicates a situation which may result in minor injury (Note 2) and property damage (Note 3).

(Note 1) Serious injury means a wound, an electrical shock, a bone fracture or intoxication that may leave after effects or require hospitalization or outpatient visits for a long time.
(Note 2) Minor injury means a wound or an electrical shock that does not require hospitalization or outpatient visits for a long time.
(Note 3) Property damage means damage to facilities, devices and buildings or other properties.

Meanings of pictograms

This pictogram indicates a matter that encourages the user to adhere to warning (“caution” included).
Specific description of warning is indicated near this pictogram.

This pictogram indicates prohibitions
Specific prohibition is indicated near this pictogram.

This pictogram indicates matters that the user must perform.
Specific instruction is indicated near this pictogram.

同じであれば貼付け

1. Safety precautions

List of symbols

Warning

General warnings

Danger!:
High voltage

Danger!:
High temperature

Danger!:
Moving part

Danger!: Hazard
of explosion

Caution

General cautions

Electrical shock!

Burning!

Caution for no
liquid heating!

Caution for water
leak!

For water only

Poisonous
material

Prohibitions

General bans

Fire ban

Do not
disassemble

Do not touch

Compulsions

General
compulsions

Connect ground
wire

Install levelly

Pull out the power
plug

Regular
inspection

1. Safety precautions

Warning • Cautions

⚠ Warning

Never operate the unit in an atmosphere containing flammable or explosive gas

Never operate the unit in an atmosphere containing flammable or explosive gas.
Otherwise, an explosion or a fire may result since the unit is not explosion-proof.
See section “13. List of dangerous materials” on page 15.

Be sure to connect the ground wire.

Be sure to connect the ground wire correctly. Otherwise, electrical leak may result and cause an electrical shock or a fire.

Ban on operation when an abnormality occurs

When a smoke or a unusual odor is seen or sensed, immediately turn the power of the main unit off and pull out the power plug. A fire or an electrical shock may result.

Never use electrical power cords bundled.

When these are used bundled, they might overheat causing a fire.

Take care not to damage electrical power cords.

Avoid tightly bend, pull with a strong force or twist to prevent electrical power cords from damaging. A fire or an electrical shock may result.

Never use an explosive or a flammable material with this unit.

Never use an explosive material, a flammable material or a material containing them. An explosion or an electrical shock may result.
See section “13. List of dangerous materials” on page 15.

Never try to disassemble or alter the unit.

Never try to disassemble or alter the unit. A malfunction, a fire or an electrical shock may result.

⚠ Caution

When a thunder is heard.

When a thunder is heard, turn the main power off immediately. A malfunction, fire or an electrical shock may result.

2. Before operating the unit

Precautions when installing the unit

1. Carefully select an installation site.

Take special care not to install the unit at a place described below:

- Uneven surfaces or dirty surfaces
- Where flammable gas or corrosive gas exists
- Where the ambient temperature is 35℃ or more
- Where humidity is high
- Where vibration is severe

Assure sufficient space around the unit.

2. Install the unit on a level surface.

Install the unit on a level surface. If the whole bottom surface of the unit does not contact the surface evenly, vibrations or noises may result. This might cause unexpected troubles or malfunctions.

3. Installation

The unit might fall down or move by an earthquake or an impact resulting a personal injury. We recommend making safety measures such as to avoid installing the unit at a place other than busy places.

4. Never operate the unit in an atmosphere containing flammable or explosive gas.

Never operate the unit in an atmosphere containing flammable or explosive gas. Otherwise, an explosion or a fire may result since the unit is not explosion-proof.
See the section “13. List of dangerous materials” on page 1 for flammable and explosive gases.

5. Be sure to connect the power plug to the dedicated wall outlet.

Use a power distribution panel or a wall outlet that meets the electrical capacity of the unit. (The unit can be operated with the power supply voltage in the range of VAC100～VAC125.)

Electrical capacity:	LT400A/B/C/D	100V～125V 200VA±10% (2A at VAC100; 1.7A at VAC120)
	LT500A/B	100V～125V 400VA±10% (4A at VAC100; 3.3A at VAC120)

2. Before operating the unit

6. Handling of a power cord

Never use electrical power cords bundled. When these are used bundled, they might overheat causing a fire.

Do not convert, forcibly bend, twist or pull the power cord. Otherwise, a fire or an electrical shock may result.

Do not place the power cord under a desk or a chair, or sand between objects to avoid it from being damaged.
Otherwise, a fire or an electrical shock may result.

Do not place the power cord close to a stove or other heat generating device. Sheath of the cord may burn and result in a fire or an electrical shock.

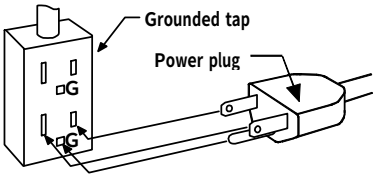
If the power cord should be damaged (exposure of core wire or disconnection), immediately turn the main unit off and ask your dealer to replace the cord. Otherwise, a fire or an electrical shock may result.

Connect the power cord to an appropriate wall outlet.

7. Be sure to connect the ground wire.

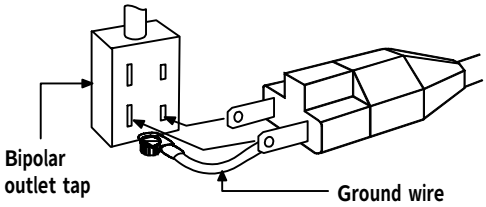
- When the unit has no ground terminal, class 3 grounding work is necessary and please consult your dealer or our nearest sales office.
- Securely connect to an outlet.

We recommend use of a ground type outlet tap.



When there is no ground terminal.
In this case, class 3 grounding work is necessary and please consult your dealer or our nearest sales office.

When a bipolar type outlet tap is used

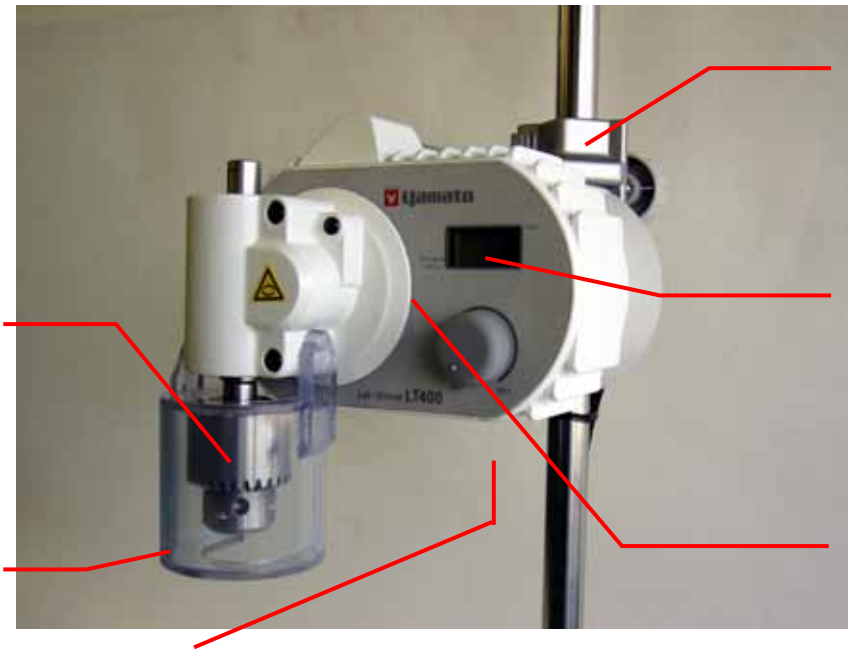


Insert the ground adaptor included as an option, into a power plug confirming the polarity of the outlet. Connect the grounding wire (green) of the ground adaptor to the ground terminal on the power supply equipment.

- Do not connect the grounding wire to any parts or lines other than a correct grounding terminal such as a gas pipe, a water pipe or a telephone line.
  Otherwise, an accident or a malfunction may result.
- Stirring work handles liquid in nature and uses chemical, poisonous or other dangerous liquids. Never fail to connect the ground wire to prevent an accident since a small amount of leak current always occurs at the stirrer just like other devices and the total amount of such current will be unignorable when some tens of stirrers are operated on the same power source.

3. Names and functions of parts

Main body



The rating sticker indicating the model number and the serial number of the product is found on the rear panel of the main body.

Symbol	Name	Functions
①	Torque indicator	Displays rotations of the stirring motor in [rpm]. Displays 【- - - -】 blinking while the thermal protector is activated.
②	Speed adjusting knob with a power switch	This is a speed adjusting knob with a power switch. Turn this knob clockwise to turn power on and increase the rotation speed.
③	Drill chuck for φ8㎜	Up to φ8 stirring axis can be held using the attached special chuck handle.
④	Clamp	The main body is fixed onto the stand with the clamp attached.
⑤	Safety cover	This is a safety cover for preventing catching something during rotation.

Rack, stirring axis and stirring blades are optional.

Overview and features of the product

Overview

LT series stirrers include LT400A and LT500A with higher torque, LT400B and LT500B with well-balanced speed and torque, LT400C with high speed and LT400D with high speed to support different applications.
The product has been designed to provide user-friendliness and safety with a light-weight aluminum die-cast body, an SUS chuck, a current restricting circuit for overload protection, and a thermal protector to enable stirring work as expected.

Features

- The product will not damage laboratory environment thanks to its outstanding quietness.
- A highly sensitive feedback system keeps the set speed even with changing viscosity during stir.
- A brushless motor is employed.
- Noise prevention measures for optimal work environment
  The product has been so designed that does not generate noises which may give influence on other devices and unlikely to malfunction even when it receives noises.
- More safety-oriented design
  For protection against overload, double or triple safety mechanisms have been employed in the current limiting circuit such as a thermal protector, a brushless motor without a spark, highly air-tight body and the safety cover for preventing catching an object.

4. Operating procedures

Preparation for operation • operation

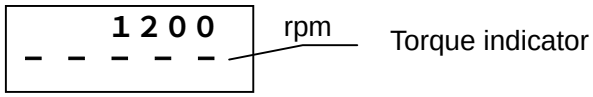
From installation of the unit to starting operation

1. Preparation
   (1) Select a stable installation site such as on a laboratory table.
   (2) Prepare a stable rack with shaft diameter of 20φ～25φ.
   (We recommend use of special Y-type rack sold separately.))
   (3) Prepare a special φ8 stirring shaft and special stirring blades sold separately.

2. Installing the main unit
   (1) Fix the main unit to the rack shaft using the clamp holders attached.
   (2) Loosen the drill chuck and securely fix the stirring shaft with the chuck handle.
   (3) Install the stirring blades and the safety cover.
   (4) Make sure that the speed adjusting knob is at OFF and connect the power plug into the power outlet.

3. Operating the unit
   Set a container and set the speed adjusting knob to the rpm you want.

   The torque indicator on the torque indicator displays load in five steps on LED.
   Over load status is notified by blinking indications on the torque indicator when load exceeding the maximum torque is applied.



⚠ When rotation is stopped because of the thermal protector, turn power OFF and wait for about 30 minutes until the temperature inside the motor is cooled down and change liquid viscosity or blade shape that caused overheat to reduce load to the motor.
The internal thermal protector shuts off current to the motor when the temperature rises beyond the upper limit to prevent burnout of the motor.

Optional accessories

Product code No.	Item name	Specifications
231086	Y-shaped rack	Shaft diameter 25 mm x length 725 mm
231384	Stirrer shaft	Shaft diameter φ8×500 mm L
231077	Stirrer blades: Four blades	Diameter 75 mm Attaching screw M5
231076	Stirrer blades: Four blades	Diameter 60 mm Attaching screw M5
231075	Stirrer blades: Four blades	Diameter 40 mm Attaching screw M5
231065	Stirrer blades: Two blades	Diameter 100 mm Attaching screw M5
231083	Stirrer blades: Two blades	Diameter 28mm Attaching screw M5
280081	Blades for narrow port	Two blades 45 mm Attaching screw M5
231385	Glass blade	Shaft diameter φ8×500 ㎜ L Two blades, diameter 60 ㎜
231064	Turbine with a disc	Diameter 100 mm Attaching screw M5
231062	Turbine with a disc	Diameter 60 mm Attaching screw M5
231386	Turbine with a disc for two-step operation	For φ8, diameter 60 ㎜

5. Cautions on handling

⚠ Warning

1. About substances that cannot be used for the unit

Never use an explosive substance a flammable substance or a substance containing them for this device. An explosion or an electrical shock may result.
See section “13. List of dangerous materials” on page 15.

2. Ban on use/countermeasures when an error occurs

If smoke is emerges on the unit or an odd odor is felt, immediately turn the switch on the main unit off, remove the power plug and contact your dealer or a Yamato sales office for inspection.
Otherwise, a fire or an electrical shock may result. The user shall never attempt to repair the unit to avoid any possible dangers.

3. Do not attempt to modify the unit.

The user shall never try to modify the unit; other wise, an accident, a malfunction, a fire or an electrical shock may result.

⚠ Caution

1. When a thunder is heard.

When a thunder is heard, turn the switch off and remove the power plug immediately. Otherwise, a lightning strike may result and cause a fire.

2. About recovery from power outage.

Since it is dangerous if the unit resumes operation unmanned when it recovers from power outage, be sure to turn power switch off when power outage occurs.

6. Maintenance procedures

Daily inspection/maintenance

Be sure to perform daily inspection and maintenance to assure reliable operation of the unit.

⚠ Warning

- Be sure to pull out the power cord unless necessary before trying to do inspection and maintenance works.
- Start these works after the device has returned to the normal temperature.
- Never try to disassemble the unit.

⚠ Caution

- Wipe off any dirt with a tightly wrung soft cloth. Never try to clean the unit with benzene, thinner or scouring powder, or rub with a scrubbing brush. Deformation, degradation or discoloration may result.

7. When the unit is not to be used for a long time or when disposing

When the unit is not to be used for a long time or when disposing

⚠ Caution

When the unit is not going to be used for a long time
- Turn the power switch off and pull out the power cord.

⚠ Warning

When disposing the unit
- Do not leave the unit in the area where children may have access.
- Remove the power cord before disposing the unit.
- In general, dispose the unit as a bulky waste.

Notes about disposition

Always pay attention to the preservation of the global environment.

- We highly recommend taking the unit apart as far as possible for separation or recycling to contribute to the preservation of the global environment. Major components and materials for the unit are as follows:

Names of major components	Major materials
Major exterior components	
Exterior	Steel plate Melamine resin baking finish, aluminum, stainless steel
Major electric parts	
Switches and relays	Resin, cupper and other composite parts
Boards	Glass fiber and other composite parts
Power cord	Resin sheath, cupper, nickel and other composite parts
Wiring material	Flame-retardant vinyl, cupper, nickel and other composite parts
Stickers	Resin material

8.Troubleshooting

Safety device and error codes

If you drop an object in liquid or liquid fall into the motor in the stirrer, immediately turn the power switch OFF and remove the power plug. Turning power on again after drying only may cause an electrical shock and is extremely dangerous. Contact your dealer or one of our sales offices for inspection.

◆

[Error codes]

Confirm the error code and immediately stop operation.

Indication	Possible causes and measures
1：Loc	Displayed when the motor shaft is caught for two minutes or more in the operating status. Forced stopping of operation. Turn power on again for recovery.
2：Err1	Motor over speeding stop. It is detected when the motor shaft rotation exceeds 4255rpm. Forced stopping of operation. Turn power on again for recovery.
3：－－－	Thermal stop. Detection of thermal stop activated by motor overheating. Automatic recovery after recovered from thermal stop.

When a malfunction is suspected

If any of the symptoms below occurs

Symptom	**Check**
Is the unit is overloaded?	When rotation is stopped because of the thermal protector, turn power OFF and wait for about 30 minutes until the temperature inside the motor is cooled down and change liquid viscosity or blade shape that caused overheat to reduce load to the motor.
Turning the power switch on will not activate the unit.	● Check if the power supply is on. ● Check if the power outage is occurring.

◆ If the symptom does not match any of the above, immediately turn the power switch on the main unit off, pull out the power plug from the power supply and contact your dealer or one of our sales offices.

About maintenance

Do not attempt to perform test of the insulation resister tester (megger test) that will damage the internal circuit boards

9. After sales service and warranty

When requesting a repair

If any trouble occurs, immediately stop operation, turn the GFI off, pull out the power plug and contact your dealer or our sales office.

Information necessary for requesting a repair

- Model name of the product
- Serial number
- Date (y/m/d) of purchase

} See the warranty card or the nameplate installed on the unit. See 3. Names and functions of parts on page 6.

- Description of trouble (as in detail as possible)

Be sure to indicate the warranty card to our service representative.

Warranty card (attached separately)

- Warranty card is given by your dealer or one of our sales offices and please fill in your dealer, date of purchase and other information and store securely.
- Warranty period is one full year from the date of purchase. Repair service for free is available according to the conditions written on the warranty card.
- For repairs after the warranty period consult your dealer or one of our sales offices. Paid repair service is available on your request when the product's functionality can be maintained by repair.

Minimum holding period of repair parts

The minimum holding period of repair parts for this product is seven years after end of production.
Repair parts here refer to parts necessary for maintaining performance of the product.

10. Specifications

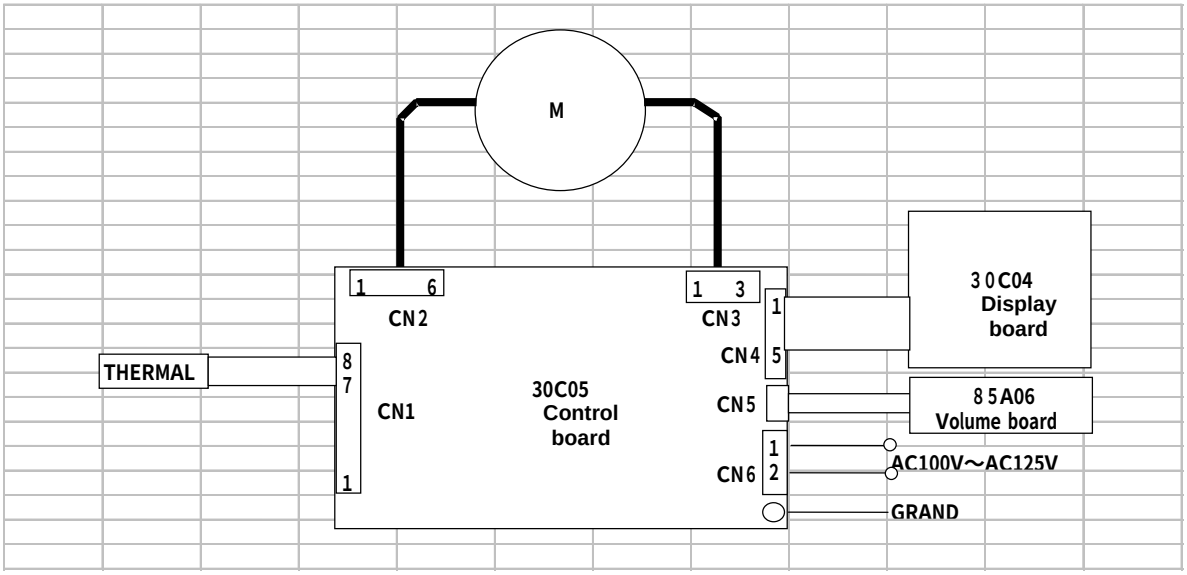
LT400 series

Model	LT400A	LT400B	LT400C	LT400D
Application	For high viscosity	For middle viscosity	For middle to low viscosity	For low viscosity
Rotation speed	10～300 rpm	15～600 rpm	25～1200 rpm	60～3000 rpm
Rated torque	0.9N・m (9.0 kgf・cm)	0.5N・m (6.0 kgf・cm)	0.3N・m (3.0 kgf・cm)	0.1N・m (1.0 kgf・cm)
Motor	DC brushless motor B type insulation Output:35W			
Rotation control	Feedback control			
Panel indication	Rotation speed: four digits digital, overload indication, torque indicator (20% for one scale)			
Chuck	SUS drill chuck for φ8 mm			
Safety device	Current limiting circuit Thermal protector: motor coil temperature: 110℃ Safety cover			
Power cord	Power cord with a 3p plug: 2m			
Power • power consumption	Single phase: 100V～120V±10% for 50/60 Hz 200VA			
Dimensions • weight	Main body：146W×154D×165H mm 2.4 kg			
Included items	Clamp holder x 1, safety cover x 1 Operating manual x 1, warranty card x 1			

LT500 series

Model	LT500A	LT500B
Application	For middle viscosity	For middle viscosity
Rotation speed	15～600 rpm	25～1200 rpm
Rated torque	0.9N・m (9.0 kgf・cm)	0.5N・m (6.0 kgf・cm)
Motor	DC brushless motor B type insulation Output: 65W	
Rotation control	Feedback control	
Panel indication	Rotation speed: four digits digital, overload indication, torque indicator (20% for one scale)	
Chuck	SUS drill chuck for φ8 mm	
Safety device	Current limiting circuit Thermal protector: motor coil temperature: 90℃ Safety cover	
Power cord	Power cord with a 3p plug: 2m	
Power • power consumption	Single phase: 100V～120V±10% for 50/60 Hz 400VA	
Dimensions • weight	Main body: 146W x 154D x 165H mm 2.4kg	
Included items	Clamp holder x 1, safety cover x 1 Operating manual x 1, warranty card x 1	

11. Wiring diagram



Symbol	Part name	Symbol	Part name
70C05	LT500 control circuit board	85A06	Speed adjusting volume
30C05	LT400 control circuit board	M	DC brushless motor
30C04	LCD circuit board	THERMAL	Thermal sensor

12. List of replacement parts

Part name	Code No.	Specifications	Manufacturer
Drill chuck	LT00009868	For SUS φ8	Yamato Scientific
Chuck handle	LT00009869		Yamato Scientific
Safety cover	LT00009870		Yamato Scientific
Brushless motor	LT00009871	FZ4047	Yamato Scientific
Control circuit board for LT400	LT00009872	30C05	Yamato Scientific
For LT500	LT00010325	70C05	Yamato Scientific
Display circuit board	LT00009873	30C04	Yamato Scientific
Volume	LT00009874	85A06	Yamato Scientific
Power cord	LT00009875	3P	Yamato Scientific

Do not attempt to perform test of the insulation resister tester (megger test) that will damage the internal circuit boards.

13. List of dangerous materials

Never use an explosive substance a flammable substance or a substance containing them for this device.

Explosive substance	Explosive substance	① Nitroglycol, glycerine trinitrate, cellulose nitrate and other explosive nitrate esters
		② Trinitrobenzen, trinitrotoluene, picric acid and other explosive nitro compounds
		③ Acetyl hydroperoxide, methyl ethyl ketone peroxide, benzoyl peroxide and other organic peroxides
Flammable substances	Explosive substances	Metal “lithium”, metal “potassium”, metal “natrium”, yellow phosphorus, phosphorus sulfide, red phosphorus, celluloids, calcium carbide (a.k.a, carbide), lime phosphide, magnesium powder, aluminum powder, metal powder other than magnesium and aluminum powder, sodium dithionous acid (a.k.a., hydrosulphite)
	Oxidizing substances	① Potassium chlorate, sodium chlorate, ammonium chlorate, and other chlorates
		② Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates
		③ Potassium peroxide, sodium peroxide, barium peroxide, and other inorganic peroxides
		④ Potassium nitrate, sodium nitrate, ammonium nitrate, and other nitrates
		⑤ Sodium chlorite and other chlorites
		⑥ Calcium hypochlorite and other hypochlorites
	Flammable substances	① Ethyl ether, gasoline, acetaldehyde, propylene chloride, carbon disulfide, and other substances with ignition point at a degree 30 or more degrees below zero.
		② n-hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone and other substances with ignition point between 30 degrees below zero and less than zero.
		③ Methanol, ethanol, xylene, pentyl acetate, (a.k.a.amyl acetate) and other substances with ignition point between zero and less than 30 degrees.
		④ Kerosene, light oil, terebinth oil, isopenthyl alcohol (a.k.a. isoamyl alcohol), acetic acid and other substances with ignition point between 30 degrees and less than 65 degrees.
	Combustible gas	Hydrogen, acetylene, ethylene, methane, ethane, propane, butane and other Substance which is a flammable gas at 15 degrees, one air pressure.

(Quoted from the separate table 1 in Article 6, the enforcement order of the Industrial Safety and Health Law)

14. Standard installation manual

*Install the product according to the following: (Confirm separately for optional items or special specifications)

Model	Serial number	Date	Installation mgr. (company name)	Installation mgr.	Judgment

№	Item	Implementation method	TOC No. Reference page of the operating instruction manual	Judgment
Specifications				
1	Included items	Check for number of staffs against the included item field	10.Specifications field P.13	
2	Installation	・Visual check of environmental conditions Caution: Take care for environment	2. Before operating the unit ・On the installation site P.4	
		・Securing a space		
Operation-related matters				
1	Source voltage	・Measure the user side voltage (distribution board • outlet) with a tester ・Measure voltage during operation (shall meet the specifications) Caution: Always use a plug that meets the specification for attaching to the GFI.	2. Before operating the unit ・Power supply is…. P.4 ・Be sure to connect the ground wire. P.5 10.Specifications • Specification-power supply P.13	
2	Operation start	・Starts operation Set to the maximum speed and make sure the stable status	4. Operating procedures P.7 5. Cautions on handling P.8	
Description				
1	Operational descriptions	Explain operations of each component according to the operational instructions	1. Safety precautions P.1～ ～13.List of dangerous materials 15	
2	Error codes	Explain the customer about error codes and procedures for release according to the operational instructions	8. Troubleshooting ～9.After sales service and warranty P.11～12	
3	Maintenance and inspection	Explain operations of each component according to the operational instructions	6. Maintenance procedures ・Daily inspection/ maintenance P.9	
4	Completion of installation Entries	・Fill in the installation date and the installation mgr. on the nameplate of the main unit ・Fill in necessary information to the warranty card and hand it over to the customer ・Explanation of the route for after-sales service	9. After sales service and warranty P.12	

⚠ **Never attempt to perform megger test using an insulation resistance tester. The stirrer will malfunction due to the structure of the circuits.**

Limited liability

Be sure to use the unit strictly following the handling and operating instructions in this operating instruction.
Yamato Scientific Co., Ltd. assumes no responsibility for an accident or a malfunction caused by use of this product in any way not specified in this operating instruction.
Never attempt to perform matters prohibited in this operation instruction.
Otherwise, an unexpected accident may result.

Notice

- **Descriptions in this operating instruction are subject to change without notice.**
- **We will replace a manual with a missing page or paging disorder.**

Operating instruction
Stirrer
LT400A/400B/400C/400D
LT500A/500B
Second edition 1 November 2004

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