



Shaker

Model

SA400

Instruction Manual

- First Edition -

- Thank you for purchasing "Shaker, SA400" of Yamato Scientific Co., Ltd.
- To use this unit properly, read this "Instruction Manual" thoroughly before using this unit. Keep this instruction manual around this unit for referring at anytime.



WARNING!:

Carefully read and thoroughly understand the important warning items described in this manual before using this unit.

**Yamato Scientific America Inc.
Santa Clara, CA.**

This paper has been printed on recycled paper.

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Explanation

MEANING OF ILLUSTRATED SYMBOLS

Illustrated Symbols

Various symbols are used in this safety manual in order to use the unit without danger of injury and damage of the unit. A list of problems caused by ignoring the warnings and improper handling is divided as shown below. Be sure that you understand the warnings and cautions in this manual before operating the unit.



WARNING! If the warning is ignored, there is the danger of a problem that may cause a serious accident or even fatality.



CAUTION! If the caution is ignored, there is the danger of a problem that may cause injury/damage to property or the unit itself.

Meaning of Symbols



This symbol indicates items that urge the warning (including the caution). A detailed warning message is shown adjacent to the symbol.



This symbol indicates items that are strictly prohibited. A detailed message is shown adjacent to the symbol with specific actions not to perform.



This symbol indicates items that should be always performed. A detailed message with instructions is shown adjacent to the symbol.

Table of Illustrated Symbols

Warning



Warning,
generally



Warning,
high voltage



Warning,
high temperature



Warning,
drive train



Warning,
explosive

Caution



Caution,
generally



Caution,
electrical shock



Caution,
scald



Caution,
no road heating



Caution,
not to drench



Caution,
water only



Caution,
deadly poison

Prohibit



Prohibit,
generally



Prohibit,
inflammable



Prohibit,
to disassemble



Prohibit,
to touch

Compulsion



Compulsion,
generally



Compulsion,
connect to the
grounding
terminal



Compulsion,
install on a flat
surface



Compulsion,
disconnect the
power plug



Compulsion,
periodical
inspection

Cautions in Using with Safety

Fundamental Matters of “WARNING!” and “CAUTION!”

WARNING!

Do not use this unit in an area where there is flammable or explosive gas

Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned on or off, and fire/explosion may result. (Refer to page12 “List of Dangerous Substances”.)

Always ground this unit

Always ground this unit on the power equipment side in order to avoid electrical shock due to a power surge.

If a problem occurs

If smoke or strange odor should come out of this unit for some reason, turn off the power key right away, and then turn off the circuit breaker and the main power. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

Do not use the power cord if it is bundled or tangled

Do not use the power cord if it is bundled or tangled. If it is used in this manner, it can overheat and fire may be caused.

Do not process, bend, wring, or stretch the power cord forcibly

Do not process, bend, wring, or stretch the power cord forcibly. Fire or electrical shock may result.

Substances that can not be used

Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur.

Do not disassemble or modify this unit

Do not disassemble or modify this unit. Fire or electrical shock or failure may be caused.

CAUTION!

During a thunder storm

During a thunderstorm, turn off the power key immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

Requirements for Installation

WARNING!

1. Always ground this unit



- Be sure to connect the earth wire (the green cable of power cord) to the grounding conductor or ground terminal to prevent accidents caused by electric leakage.
- Do not connect the earth wire to gas or water pipes. If not, fire disaster may be caused.
- Do not connect the earth wire to the ground for telephone wire or lightning conductor. If not, fire disaster or electric shock may be caused.
- Do not use a branching receptacle, which may cause the heat generation.

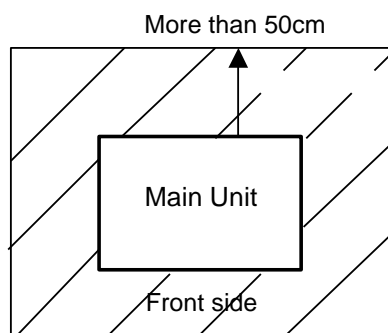
2. Choose a proper place for installation



- Do not install this unit in a place where:
 - ◆ Rough or dirty surface.
 - ◆ Flammable gas or corrosive gas is generated.
 - ◆ Ambient temperature exceeds 35°C.
 - ◆ Ambient temperature fluctuates violently.
 - ◆ There is direct sunlight.
 - ◆ There is excessive humidity and dust.
 - ◆ There is a constant vibration.
- Driving parts are exposed. Do not install this unit to busy place.



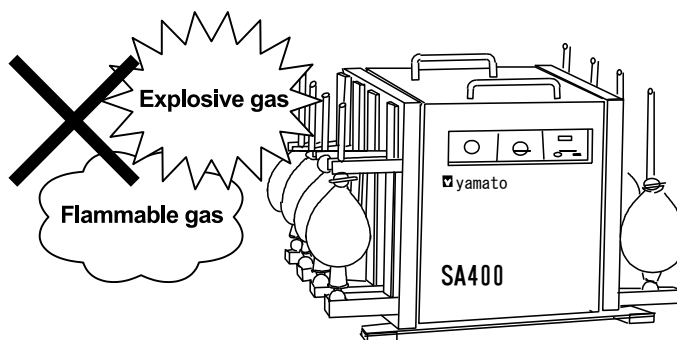
- Install this unit on a stable place with the space as shown below.



3. Do not use this unit in an area where there is flammable or explosive gas



- Never use this unit in an area where there is flammable or explosive gas. This unit is not explosion-proof. An arc may be generated when the power switch is turned ON or OFF, and fire/explosion may result.



NOTE) Glass tools and holders are optional accessories.

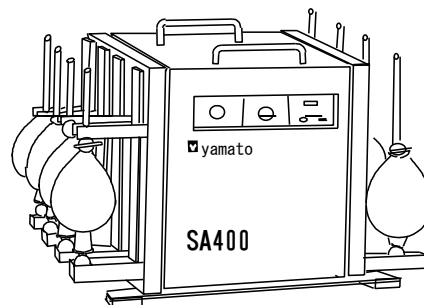
Requirements for Installation

4. Do not modify



- Modification of this unit is strictly prohibited. This could cause a failure.

Do not modify



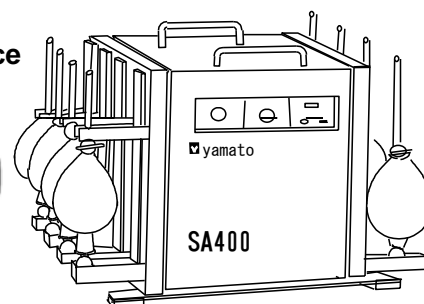
NOTE) Glass tools and holders are optional accessories.

5. Installation on horizontal surface



- Set this unit to the flattest place. Not setting this unit with its 4 legs covered with rubber contacted to the setting place surface evenly could cause the vibration or noise, or cause the unexpected trouble or malfunction.

To the flattest place



NOTE) Glass tools and holders are optional accessories.



CAUTION!

6. Choose a correct power distribution board or receptacle



- Choose a correct power distribution board or receptacle that meets the unit's rated electric capacity.

Electric capacity: 220V AC, 1A

NOTE)

There could be the case that the unit does not run even after turning ON the power. Inspect whether the voltage of the main power is lowered than the specified value, or whether other device(s) uses the same power line of this unit. If the phenomena might be found, change the power line of this unit to the other power line.

Requirements for Installation

7. Before/after installing



- It may cause injury to a person if this unit falls down or moves by the earthquake and the impact. etc..To prevent, take measures that the unit cannot fall down, and not install to busy place.
- Touching the shaking parts may cause injury to a person during the operation. To prevent, take measures that putting up a notice of operating, making an enclosure etc..

8. Handling of power cord



- Do not entangle the power cord. This will cause overheating and possibly a fire.
- Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire and electrical shock.
- Do not lay the power cord under a desk or chair, and do not allow it to be pinched in order to prevent it from being damaged and to avoid a fire or electrical shock.
- Keep the power cord away from any heating equipment such as a room heater. The cord's insulation may melt and cause a fire or electrical shock.

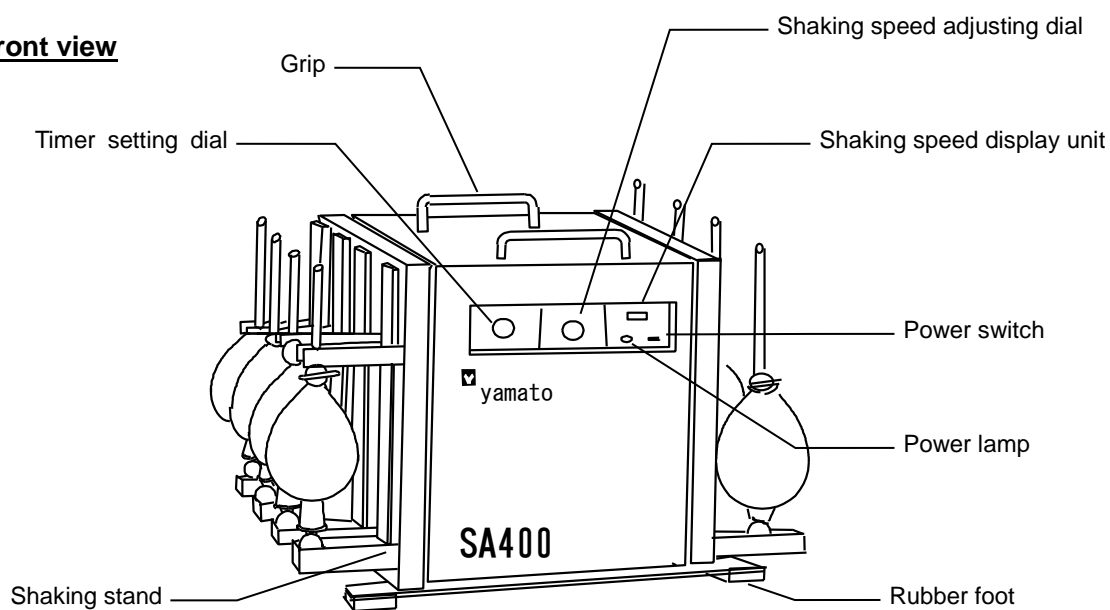


- If the power cord becomes damaged (wiring exposed, breakage, etc.), immediately turn off the power at the rear of this unit and shut off the main supply power. Then contact your nearest dealer for replacement of the power cord. Leaving it may cause a fire or electrical shock.
- Connect the power plug to the outlet which is supplied appropriate power and voltage.

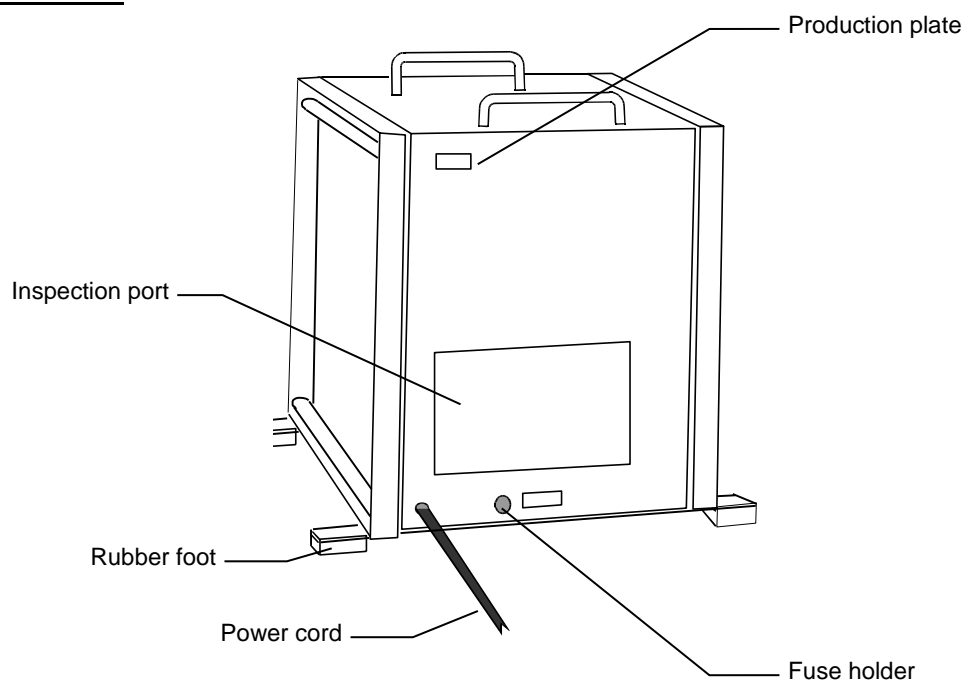
Description and Function of Each Part

Main Unit

Front view



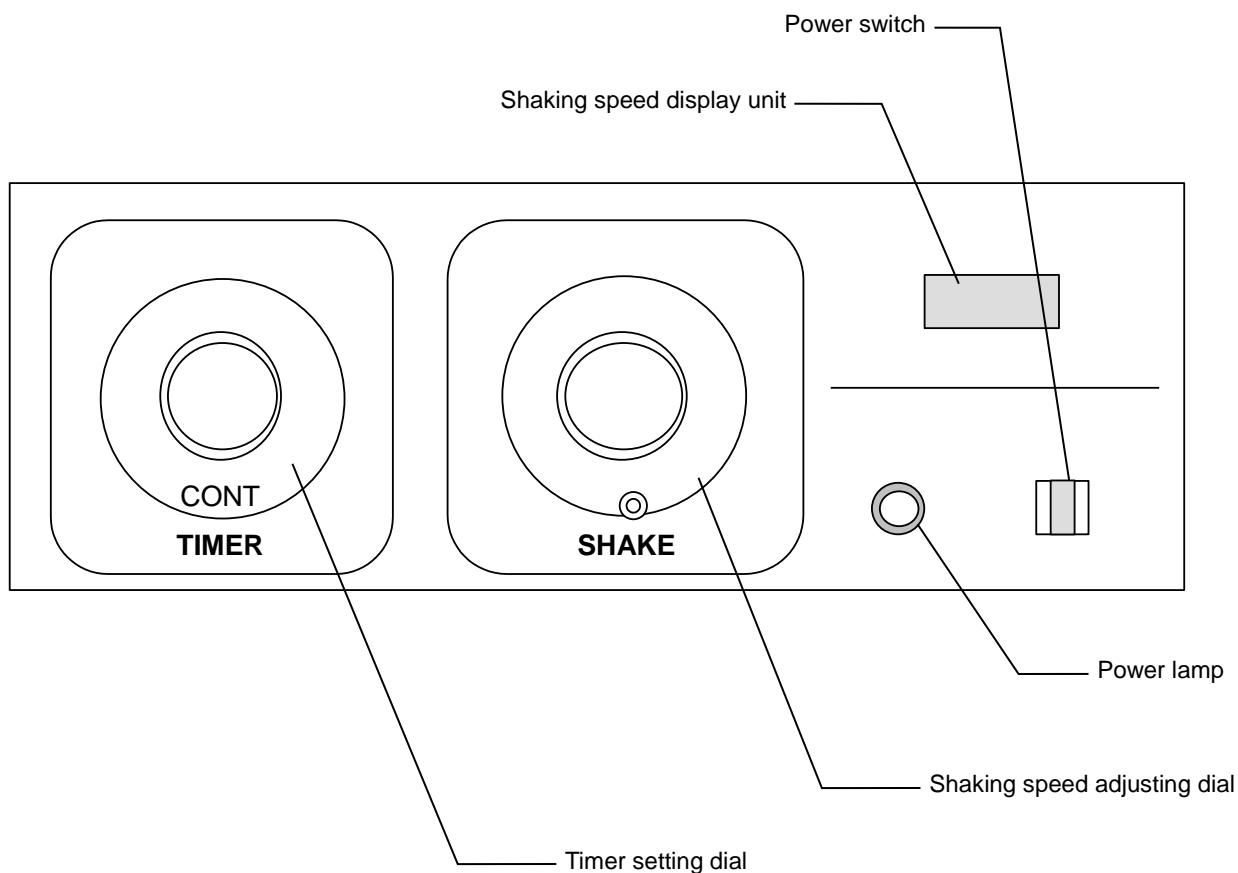
Rear view



NOTE) Glass tools and holders are nonstandard options.

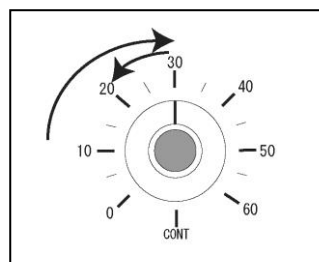
Description and Function of Each Part

Control Panel



Timer Dial

To set timer to a shorter or more precise time interval, rotate dial over 30 min then back to desired setting.



Power Switch	Turn on the power.
Power Lamp	Turn ON the lamp by toggling the power switch.
Shaking Speed Display Unit	Display the shaking number (speed).
Shaking Speed Adjusting Dial	Set the desired shaking speed.
Timer Setting Dial	Set the desired operation time. Setting this dial to "CONT" changes the unit operation status into "Constant".

Sequence of Operation

1. Fix the sample containers.

- Before turning on the power switch, fix the sample containers firmly.
- The quantity of sample containers to be installed is as shown in the following table.

Capacity (ml)	100	200	300	400	500	1000
Holder						
Separating Funnel	10	8	8	8	8	6
Rhoto Holder						
Centrifugal Tube Holder	<u>Applicable centrifugal tube</u> Outer dia.: $\phi 16$ to $\phi 35 \times$ length 110mm to 130mm Mountable up to 18 pcs. on one side					
Test Tube Rack Holder	<u>Dimension of applicable test tube rack</u> Max. dimension: 238W \times 121D \times 105H Mountable up to 2 racks on one side					

2. Turn on the power.

- Before turning on the power switch, check if the timer setting dial is OFF and if the shaking speed adjusting dial is at the lowest speed.
- When the power switch is turned on, the power lamp is ON.

3. Set the shaking time.

- When the sample container is installed, turn the timer setting dial, and set it to the required time (min).
- In continuous operation, adjust the dial position to "CONT".

4. Adjust the shaking speed.

- Set the shaking speed using the shaking speed adjusting dial.
- Set the shaking speed referring to the value displayed on the shaking speed display unit.

CAUTION!

If used at the max shaking speed, such shaking speed could exceed the standard value in the area of commercial power frequency 60 Hz. If shaking is performed in the too wide range, or if the main unit vibrates widely, reduce the speed-regulating dial.


Shaking speed could also rise according to the condition of the load. In such cases, slightly reduce the speed-regulating dial similarly.

CAUTION!


In the early stage after supplying power, the shaking speed may be lower than the set value. Perform the running operation for about 15 min. Then, the shaking speed will stabilize.

WARNING!

If a problem occurs


-  If smoke or strange odor should come out of this unit for some reason, turn off the power key right away, and then turn off the circuit breaker and the main power. Immediately contact a service technician for inspection. If this procedure is not followed, fire or electrical shock may result. Never perform repair work yourself, since it is dangerous and not recommended.

Substances that cannot be used


-  Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit. Explosion or fire may occur. (Refer to page12 “List of Dangerous Substances”.)

CAUTION!


Take care not to load too much sample

-  If too much sample is loaded, the shaking speed will be reduced, or the main unit will vibrate. Do not start operation with any overload.


Do not step on this unit

-  Do not step on this unit. It will cause injury if this unit fall down or break.


Do not put anything on this unit

-  Do not put anything on this unit. It will cause injury if fall.


During a thunder storm

-  During a thunderstorm, turn off the power key immediately, then turn off the circuit breaker and the main power. If this procedure is not followed, fire or electrical shock may be caused.

Speed adjustment


-  The shaking speed of this unit is adjusted appropriately at the shipment from factory. If the power voltage fluctuates widely, or if the motor temperature rises abnormally, the speed could be changed more or less. If any abnormality including abnormal vibration and shaking main unit is detected, reduce the speed by means of the shaking speed adjusting dial. If max. specified revolution is exceeded, the abnormal vibration or noises could be caused, and thus be caused failure.

Operation method


-  Operate this unit with the method specified by this operation manual. If operated in ways other than specified in this operation manual, any failure or accident could be caused. If operated in ways other than specified in this operation manual, the product is not guaranteed.

CAUTION!


Sample installation method

-  The holder for attaching sample is prepared as optional accessory for each separator funnel photo, centrifugal tube, and test tube rack. Select the desired holder, and attach it to the shaking stand of this unit.
In the case of shaking the holder for separator funnel photo, centrifugal tube, and test tube, insert the positioning pin of the holder into the 2 holes of the pipe hole, and secure it tightly.

Preparing timer

-  This unit incorporates a 60-min meter for timer. If it is necessary to operate this unit for a longer time, set the timer to CONT. Continuous operation is available.
The timer accuracy of this unit is around +/-15%. It is not suitable for the shaking that is required precise time setting.

Return after power failure

-  When power is supplied after a power failure, the device automatically starts operation again with the same state as just before the power failure. It is danger that the device starts unattached operation after a power failure. We recommend for you to turn off the switch of this unit if a power failure occurs during operation.

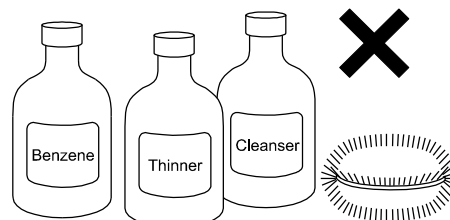
Daily Inspection and Maintenance

WARNING!

- Disconnect the power cable from the power source when doing an inspection or maintenance unless needed.
- Perform the daily inspection and maintenance after returning the temperature of this unit to the normal one.
- Do not disassemble this unit.

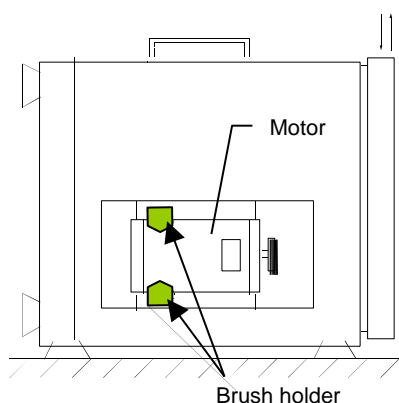
CAUTION!

- Use a well-drained soft cloth to wipe dirt on this unit. Do not use benzene, thinner or cleanser for wiping. Do not scrub this unit. Deformation, deterioration or color change may result in.



Replacement method of Motor Brush

Replacement of Motor Brush



- Since the carbon brush of the motor is worn out as the motor is operated for a long time, replace the carbon brush periodically. Though the timing of the replacement is dependent on the frequency of operation, check such a brush every 6 months.
- When the inspection port cover is removed, the motor can be seen. Two resin holders for fixing the carbon brush are provided in the lower part of the motor. Use a coin, etc. to loosen the groove on top of the holder. Change it with the attached carbon brush, and replace it at the original place.



Two brush holders
(Installed on the other side of this face shown in this photo)

For any questions, contact the dealer who you purchased this unit from, or the nearest sales division in our company.

When not using this unit for long term / When disposing

CAUTION!

When not using this unit for long term...

- Turn off the power and disconnect the power cord.

WARNING!

When disposing...

- Keep out of reach of children.
- Remove the driving parts.
- Treat as large trash.

Environmental protection should be considered

We request you to disassemble this unit as possible and recycle the reusable parts considering to the environmental protection. The feature components of this unit and materials used are listed below.

Component Name	Material
Exterior Parts	
Casing	Iron bonderizing steel plate baked with melamine resin coating
Frame	Iron bonderizing steel plate baked with melamine resin coating
Pipe	Stainless steel SUS304
Plates	Polyethylene (PET) resin film
Shaking parts	
Shaking stand	Iron bonderizing steel plate baked with melamine resin coating
Mounting plate for shaking stand	Iron bonderizing steel plate
Table for mounting motor	Iron bonderizing steel plate
Pulley shaft	Polishing round rod SS41B
Pulley	Aluminum
V belt	Synthetic rubber
Electrical Parts	
Motor	Motor case, rotor, shaft: made of iron Bracket: aluminum Coil: copper wire (epoxy resin insulation coating)
Power cord & wiring materials and others	Wiring materials and circuit boards coated with synthetic rubber and resins

Trouble Shooting

Instances

Condition	Possible Causes	Solution
When turning ON the switch, • Lamp does not light ON. • The device does not start shaking.	Bad connecting in lamp or lamp circuit	Replace or repair
	Defective power switch	Replace
	Failure in timer	Replace
	Fuse is blown	Replace
	Failure in speed control	Replace
	Timer is set to "0"	Resetting timer
Although the unit shakes, • It does not shake smoothly. • It shakes with abnormal noise or shaking.	Loosened or too much tensioned belt	Adjust
	Looseness of pulley, or error position	Replace or adjust
	Worn carbon brush of motor	Replace
	Worn roller	Replace
	Rubber vibration insulator foot failure	Replace
	Non-flat floor	Change setting position
	Unbalanced sample set both left and right	Adjust the balance of both left and right sample
Shaking speed cannot be controlled.	Failure in speed control	Replace
	Defective speed-adjusting volume	Replace
	Defective motor	Replace
	Worn carbon brush	Replace

Before call us...

Condition	Possible Causes
The device does not start when turning on the power switch.	<ul style="list-style-type: none"> • Power plug is not connected to the receptacle correctly. • Power failure. • Fuse is blown. • Timer is set to "0". • The carbon brush of the motor is worn out.
The shaking speed fluctuates in operation.	<ul style="list-style-type: none"> • Too much samples.
Required shaking speed cannot be reached.	<ul style="list-style-type: none"> • Too much samples.

In the case if the error other than listed above occurred, turn off the power switch and primary power source immediately. Contact the shop of your purchase or nearest Yamato Scientific Service Office.

In Case of Request for Repair

If the failure occurs, stop the operation, turn OFF the power switch, and unplug the power plug. Please contact the sales agency that this unit was purchased, or the Yamato Scientific's sales office.

< Check following items before contact >

- ◆ Model Name of Product
 - ◆ Production Number
 - ◆ Purchase Date
 - ◆ About Trouble (in detail as possible)
- } See the production plate attached to this unit.

Minimum Retention Period of Performance Parts for Repair

The minimum retention period of performance parts for repair of this unit is 7 years after discontinuance of this unit.

The "performance part for repair" is the part that is required to maintain this unit.

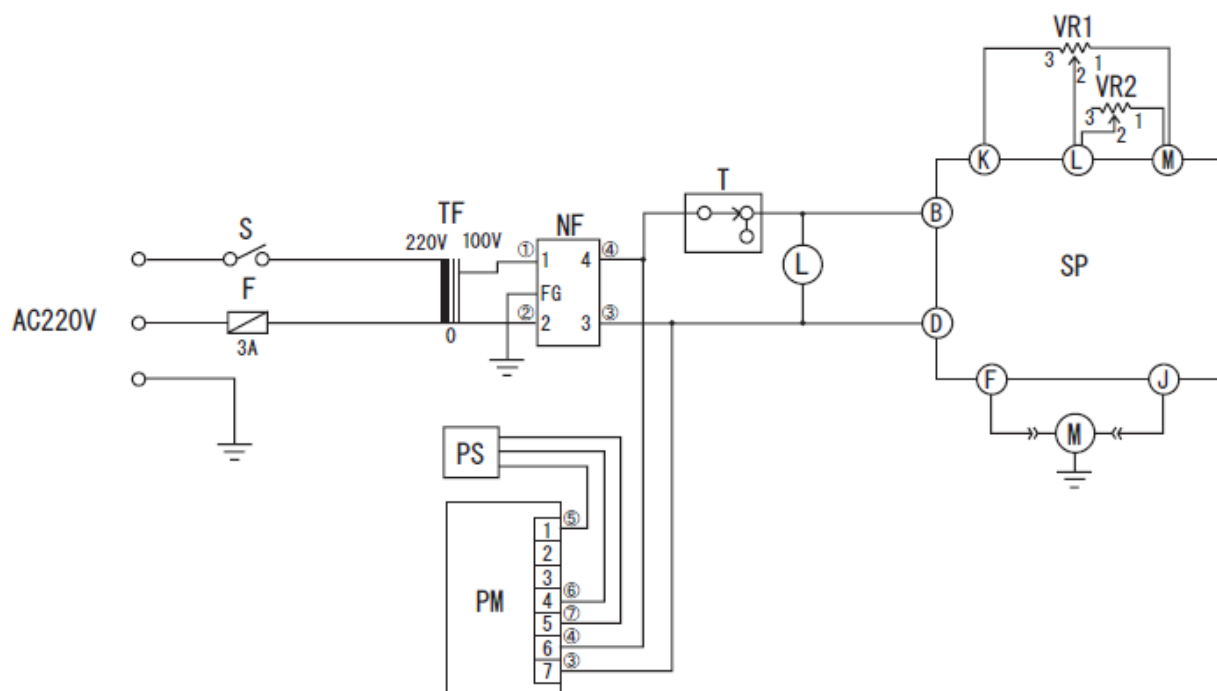
Model	SA400
Shaking method	Reciprocating vertical shaking type (both faces)
Shaking width	40mm
Shaking speed	20 to 300 rpm
Shaking speed controller	Digital setting/Digital display
Max No. of separating funnel photo holder	Using separating funnel photo holder (optional accessory): 100ml x 10, 200ml x 8, 300ml x 8, 500ml x 8, 1000ml x 6
Max No. of test tube	Install test tube rack(s) using test tube rack holder (optional accessory): Test tube rack 238W x 121D x 105H (max.) x 2 stage
Timer	0 to 60 min., Timer/Continuous switching function
Safety devices	Motor protection circuit, Fuse (5A)
Size of shaking stand	460W x 460D
Motor	DC motor
Max. load	10kg x 2
External dimensions	420 W x 460 D x 462H mm (projection is not included)
Weight	Approx. 39Kg
Power supply	220V AC, 50/60Hz, 1A
Accessories	Fuse, Carbon brush, Instruction manual

Optional Accessories

Applicable holder for SA400		
Product code	Name	Specification
232096	Separating funnel photo holder	Common use for SA300/320.
232087	Centrifugal tube holder	Common use for SA300/320. Applicable both vertical and horizontal shaking. (correspond to $\phi 16$ to 35×10 to 130 length)
232088	Test tube rack holder	Common use for SA300/320. Applicable both vertical and horizontal shaking. Applicable test tube rack:: Max. 238W x 121D x 105H Possible to set 2 stages. Correspond to both vertical and horizontal shaking. Common use for both SA300/320.

NOTE)

It needs adjustment when replacing roller and belt. Please ask the nearest our service department.



Electrical Parts List

Name	Code No.	Specification	Manufacturer
Power cord kit	DN005	0.75sq 2M 3cores	Yamato Scientific
Timer	232004-202	SC-2-1H-1a AC125V 3A	Zenkousya Tokei
Main switch	232004-203	PW-2022-01K	Nihon Kaiheiki
Pilot lamp	232004-204	BN-5701 AC110V translucent	Sato Parts
Fuse	232004-206	F7161 5A	Sato Parts
Noise filter	2300010002	ZAG2220-11S	TDK
Shaking speed display unit	LT00038302	MP5Y-4N	Autonics
Adjacent switch	LT00002214	PS17-3DN	Autonics
Motor	2140000029	DMW90 DC 90W	Yamato Scientific
Fuse	232004-206	F7161 5A	Sato Parts
Speed controller	1080060001	Techs AKIBAN	Yamato Scientific
Speed adjusting volume	2120020009	RV16YN10S B303 30K Ω	Tokyo Cosmos
Sub volume	2120020010	RV24YN20S B50 25K Ω	Tokyo Cosmos
Transformer		AD21-500A2	Toyoden

Replacement Parts Table

Part Name	Code No.	Specification	Manufacturer
Roller	232004-124	TOK 1N-19-A 1.5	Yamato Scientific
Rubber foot	232004-141	Neoprene rubber	Yamato Scientific
Speed/Time adjusting dial	7140000028	K100set	Yamato Scientific
V belt	232004-209	JIS-6323 M-29	Sansei Belt
V belt	232004-211	JIS-6323 M-31	Sansei Belt

- ❖ Refer to Page 10 for electrical replacement parts.
- ❖ Expendable supplies are included.

List of Dangerous Substances



Never use explosive substances, flammable substances and substances that include explosive or flammable ingredients in this unit.

EXPLOSIVE

EXPLOSIVE:	Ethylene glycol dinitrate (nitro glycol), Glycerin trinitrate (nitroglycerine), Cellulose nitrate (nitrocellulose), and other explosive nitrate esters
	Trinitrobenzene, Trinitrotoluene, Trinitrophenol (picric acid), and other explosive nitro compounds
	Acetyl hydroperoxide (peracetic acid), Methyl ethyl ketone peroxide, Benzyl peroxide, and other organic peroxides

FLAMMABLE

IGNITING:	Lithium (metal), Potassium (metal), Sodium (metal), Yellow phosphorus, Phosphorus sulfide, Red phosphorus, Celluloid compounds, Calcium carbide, Lime phosphate, Magnesium (powder), Aluminum (powder), Powder of metals other than magnesium and aluminum, Sodium hydrosulfite
OXIDIZING:	Potassium chlorate, Sodium chlorate, Ammonium chlorate, and other chlorate
	Potassium perchlorate, Sodium perchlorate, Ammonium perchlorate, and other perchlorate
	Potassium peroxide, Sodium peroxide, Barium peroxide, and other inorganic peroxide
	Potassium nitrate, Sodium nitrate, Ammonium nitrate, and other nitrate
	Sodium chlorite and other chlorites
INFLAMMABLE LIQUID:	Calcium hypochlorite and other hypochlorites
	Ethyl ether, Gasoline, Acetaldehyde, Propylene chloride, Carbon disulfide, and other flammable substances having a flash point of lower than -30°C
	Normal hexane, ethylene oxide, acetone, benzene, methyl ethyl ketone, and other flammable substances having a flash point of -30°C or higher but lower than 0°C
	Methanol, Ethanol, Xylene, Pentyl acetate (amyl acetate), and other flammable substances having a flash point of 0°C or higher but lower than 30°C
FLAMMABLE GAS:	Kerosene, Light oil (gas oil), Oil of turpentine, Isopentyl alcohol (isoamyl alcohol), Acetic acid, and other flammable substances having a flash point of 30°C or higher but lower than 65°C
	Hydrogen, Acetylene, Ethylene, Methane, Propane, Butane, and other flammable substances which assume a gaseous state at 15°C and 1 atm

(Source: Appendix Table 1 of Article 6 of the Industrial Safety and Health Order in Japan)

Responsibility

Please follow the instructions in this document when using this unit. Yamato Scientific has no responsibility for the accidents or breakdown of device if it is used with a failure to comply. Never conduct what this document forbids. Unexpected accidents or breakdown may result in.

Note

- ◆ The contents of this document may be changed in future without notice.
- ◆ Any books with missing pages or disorderly binding may be replaced.

Instruction Manual for

Shaker

Model SA400

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