



## **Ultrasonic Pipette Washer**

### **Model AW31**

## **Instruction Manual**

First Edition

- Thank you for choosing the AW31 Ultrasonic Pipette Washer from Yamato Scientific Co., Ltd.
- For proper equipment operation, please read this instruction manual thoroughly 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 Co., Ltd.**

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# 1. SAFETY PRECAUTIONS

## 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

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 **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.)

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(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.

 Signifies restriction.  
Specific restrictions will follow symbol.

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

# 1. SAFETY PRECAUTIONS

## Warnings and Cautions



Warning



### DO NOT USE

Do not use the following solutions to wash pipettes:

1. Flammable or explosive cleaning solutions (paint thinner, alcohol, CFC substitute HCFC-141b, etc.)
2. High alkaline detergent solutions (over pH12)
3. Acidic detergent solutions
4. Purified or distilled water

Use of the above fluids may result in fire, explosion, electric shock (1~3) or container overflow, due to failure in the level sensor to properly detect fluid levels (4).



### NEVER operate equipment near combustible gases/fumes

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



### Ground wire MUST be connected properly

- Ground wire 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.
- 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.



### Place in a location with adequate drainage

Do not use AW31 where poor drainage may cause drain water to backup into and flood unit, possibly resulting fire or electric shock hazard.



### DO NOT allow equipment to become wet

- Do not place unit where drainage water or other fluids can splash or spill onto unit.
  - Do not pour water directly onto unit or immerse unit while cleaning.
  - Do not touch power switch when hands are wet.
- Doing any of the above may result in fire or electric shock.



### DO NOT place on unstable surfaces or platforms

Do not place AW31 unit on unstable or unlevel stands, countertops, tables etc. Doing so may cause unit to tip over and/or fall, possibly resulting in equipment damage or personal injury.



### DO NOT insert foreign objects or fluids into equipment

Never insert metal or combustible objects or fluids into unit openings, ventilation ports or exhaust ports. Fire or electric shock, causing serious burns may result.



If a foreign object has fallen inside, turn off main power immediately, then contact a local dealer, or Yamato sales office for assistance. Continuing to operate unit without removing object may cause fire or electric shock.

# 1. SAFETY PRECAUTIONS

## Warnings and Cautions



### Power source

AW31 units are rated for use with AC100V (50/60Hz) power outlets. Attempting to use a differently rated power source may result in fire or electric shock.



### Handle power cable with care



- Never operate this unit with power cable bundled or tangled; and do not modify, bend, forcibly twist or pull on power cable. Doing so may cause fire and/or electrical shock.
- Do not risk damage to power cable by positioning it under desks or chairs, or by pinching it between objects. Doing so may cause fire and/or electrical shock.
- Do not place power cable near kerosene/electric heaters or other heat-generating devices. Doing so may cause power cable insulation to overheat, melt and/or catch fire, which may result in electric shock.
- Turn off main power switch (ELB) immediately and disconnect from facility terminal or outlet, if power cable becomes partially severed or damaged in any way. Failure to do so may result in fire or electric shock.
- Contact a local dealer or Yamato sales office for information about replacing power cable if it becomes damaged.
- Always connect power cable to appropriate facility outlet or terminal.



### DO NOT disassemble or modify

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

For inspection, adjustment or repair, contact a local dealer or Yamato sales office.



## Caution



### DO NOT operate equipment during thunderstorms

In the event of a thunderstorm, terminate operation and turn off main power switch immediately. A direct lightning strike may cause damage to equipment, or result in fire or electric shock.



### Equipment damage/breakage

If AW31 unit tips over or falls and is damaged, or if wash container breaks, turn off main switch and disconnect power cord immediately. Contact a local dealer or Yamato sales office for assistance. Continued operation of damaged equipment may cause further damage, fire or electric shock, and may result in personal injury.



### Cleansing fluid temperature

Cleansing fluid temperature should be less than 40°C. If cleansing fluid exceeds 40°C, heat deformity to plastic components may result.



### Rinse water quantity

Be sure to supply proper amount of water for rinsing. Too much may cause wash container to overflow.

# 1. SAFETY PRECAUTIONS

## Warnings and Cautions



### Filter inspection and cleaning

Inspect filter at bottom of wash container for clogs, everyday before use. If filter is allowed to become clogged, wash container may overflow on rinse cycle, due to poor drainage.



### Avoid high temperature locations

Do not operate AW31 unit where ambient temperature tends to become hot (such as in rooms or labs artificially heated by heat generating devices). Moreover, when operating unit for extended periods, be sure ambient temperature stays below 30°C. Wash container, pipette cage, drain pipe, water supply pipe and wash container lid may become deformed by high ambient temperature.



### Plugging and unplugging power cable

When unplugging the power cable, pull it by the plug, NOT the cable. Pulling the cable may damage it, possibly causing fire or electric shock.



Do not plug or unplug the power cable with wet hands. Doing so may result in electric shock.



### Humidity and dust

Do not use AW31 unit in overly humid or dusty locations. Doing so may result in fire or electric shock.



### Extended out-of-service periods

If unit is to be stored or put out of service for an extended period, be sure to turn off the power switch and disconnect the power cord.



### Confirm equipment stability

Unit may tip over or fall in an earthquake or other unforeseen incident, possibly causing personal injury. Be sure to stabilize unit properly to assure safe operation and a safe work area.



### DO NOT place items on equipment

Never place items of any kind (especially heavy items) on top of AW31 unit. Doing so may compromise stability, causing unit to tip over and/or fall, possibly resulting in personal injury.



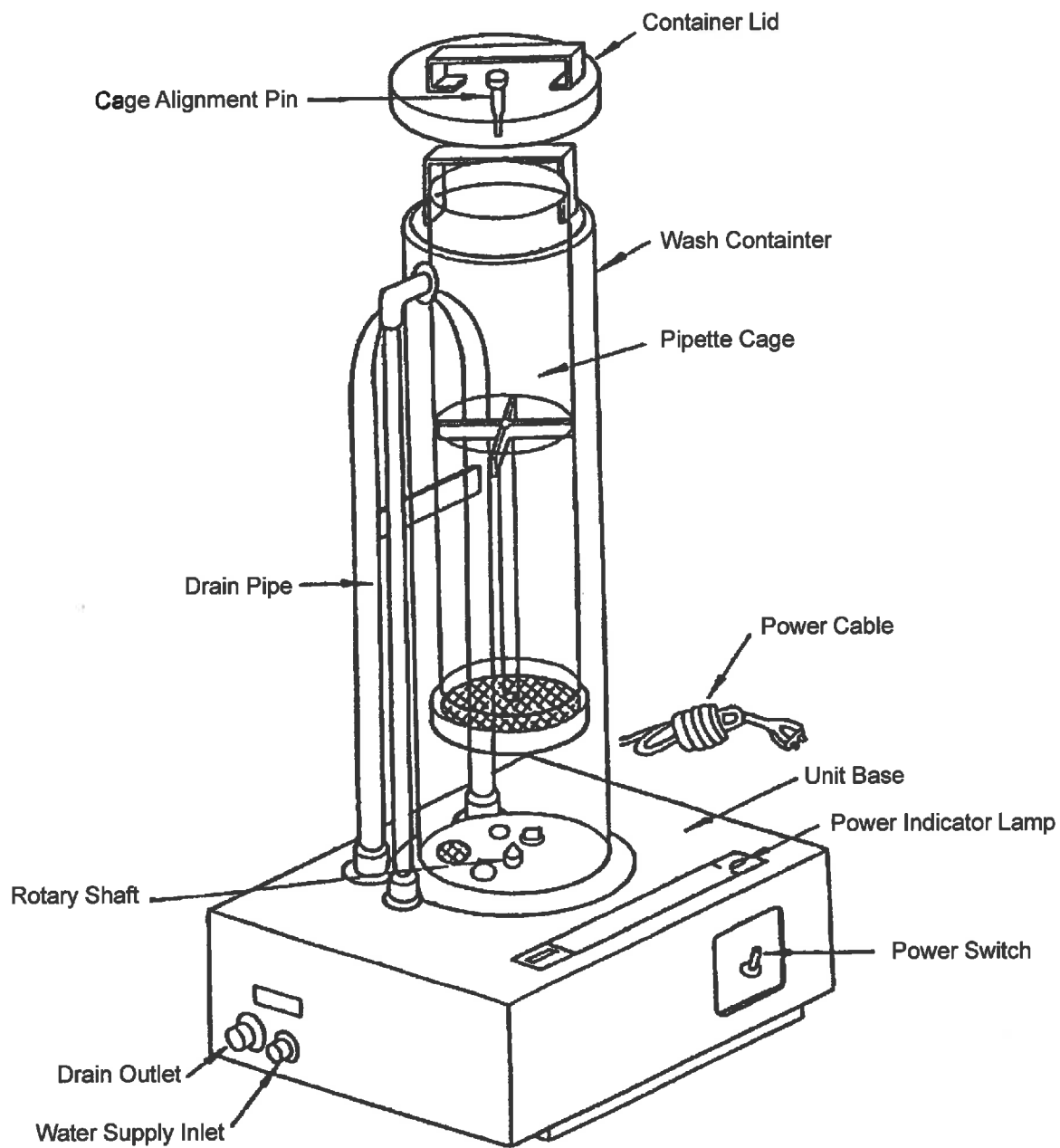
### When performing maintenance

Always disconnect power cable when performing maintenance of any kind. Neglecting to do so, may result in electric shock.

## 2. COMPONENT NAMES AND LOCATIONS

### Main Unit

#### AW31 Unit Overview





## 3. CLEANSING PROCESS

### Process Summary

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The cleansing process consists of a wash cycle, followed by a rinse cycle in the same container.

#### **The Wash Cycle**

The AW31 utilizes ultrasonic waves, emitted from the bottom surface of unit, to break up and free contaminants from glass pipettes as they soak in a detergent bath. A fluid jet stream is also applied to assist in freeing contaminants left on inner and outer pipette surfaces. To ensure an even and uniform wash, pipettes are rotated in a cage while the ultrasonic waves and fluid jet are applied.

#### **The Rinse Cycle**

All detergents from wash cycle are thoroughly rinsed from pipettes by cycling clean water through the wash container. When water level exceeds 100ml ultrasonic waves and a fluid jet stream are applied and pipette cage begins rotating, as in the wash cycle. When water level reaches upper limit, it begins to siphon (drain) off and continues to cycle clean water through the wash container until manually stopped.

## 4. OPERATION PROCEDURE

### Preparation

#### 1. Setup Location

##### **Warning**

**Set up AW31 unit in a location with good drainage.**

Do not place unit where fluids can splash onto outside of unit or where drainage is insufficient, causing fluid to back up and overflow onto base unit. Neglecting this step may cause fire or electric shock.

2. Connect water supply inlet to an appropriate water tap (faucet). Inner diameter of included connection hose is 12mm.
3. Run a hose from the unit drain outlet to an appropriate external drain port. Inner diameter of included drain hose is 25mm.
4. Be sure that hose clamps are securely fastened around water supply inlet and drain outlet.
5. Remove the wing bolts (for transport) from the base of the unit.



## 4. OPERATION PROCEDURE

### Operation Steps

#### Washing

1. Fill wash container with water to approximately 50cm deep (about 10ℓ) and add the specified amount of detergent.
2. Insert pipettes and place lid on wash container.  
Be sure pipette cage is properly aligned and engaged on rotation shaft and that cage alignment pin on lid is properly centered in pipette cage when covering wash container.
3. Be sure that pipettes are fully immersed in fluid.  
If there is an insufficient amount of fluid (pipettes are partially exposed) add water until pipettes are fully immersed.
4. Insert power cable into properly rated outlet and turn on power switch.

#### Rinsing

1. Turn on supplying water tap and adjust cycling speed of unit so that fluid can drain off as fast as it fills and does not overflow. Optimal flow rate is 1~2 liters per minute.
2. Turn on power switch. When water level reaches a depth of 10cm, pipette cage will automatically begin rotating, ultrasonic wave emission starts and rinse cycle begins. When water level is approximately 55cm deep, fluid with detergent and contaminants begins draining off and water continues to cycle through until only clean water is left.

## 5. EFFECTIVE CLEANSING PROCEDURE

### Proper Pipette Handling & Cleansing

To get the most out of the AW31 unit's cleansing potential, be sure to follow the steps below:

1. Put pipettes into water immediately after using and do not allow them to dry out before washing. If pipettes are allowed to dry with contaminants or chemicals on them, they become more difficult to clean.
2. Load pipettes in cage as closely together as possible. When there are only a few pipettes to clean, it is better to put them all together in a single section, rather than separating them out among cage sections.
3. Use a weak to medium alkali detergent with low suds yield and good water dissipation properties.

#### **Warning**

**Do not use acid or high alkaline detergents.**

Using acid and high alkaline detergents may damage the wash container, oscillator plate, etc. possibly causing leaks which result in fire or electric shock.

4. Load pipettes in cage with the tips facing up. This improves the reflux effect inside pipette tubes for better cleaning.
5. Inspect and clean the filter

#### **Warning**

**Inspect filter for clogging everyday before use and clean as necessary.**

The filter located at the bottom of the wash container must be inspected and cleaned everyday before use. If filter becomes clogged, the wash container may overflow during operation.

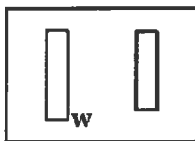
## 6. HANDLING PRECAUTIONS

1. Do not allow air to collect in the drain hose. Fluid will not siphon off and cycle through properly if air becomes trapped in drain lines.
2. The AW31 unit is rated for use at 100V AC. In the event that voltage drops below 90V, machine performance may lag. Conversely, if voltage exceeds 110V, equipment damage may result. Confirm voltage rating before use and be sure that power supply is not susceptible to extreme fluctuations in voltage.
3. Pay particular attention to water flow rate during rinse cycle.  
If flow rate is too slow, water will not be able to drain off properly. If flow rate is too fast, water will not be able to drain off quickly enough to keep up with supply and an overflow may result.

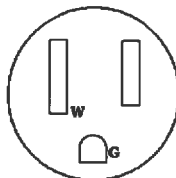
### **Warning**

#### **Power cable precautions**

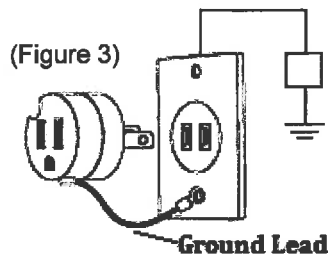
Current safety demands have come to require power and ground wires to be in a single casing that includes a 3 prong plug, and also require outlets to have a receptacle for a ground prong. Thus, for machines rated under AC100V/15A, Yamato utilizes power cables with grounded plugs. Since these cannot be used with traditional outlets (figure 1), and grounded outlets (figure 2) are not available in all locations, it may be necessary to use a ground adapter (figure 3). When using this type of adapter, always attach the ground wire to an appropriate ground terminal nearby. In order to comply with current electricity standards, blade width on ground adapters is wider on one side than the other, and cannot be used with some power strips on the market. For reliability and safety, utilizing only wall outlets, where possible, and avoiding the use of powerstrips is therefore recommended.



(Figure 1)



(Figure 2)



(Figure 3)

**Ground Lead**

## 7. TROUBLESHOOTING

### Troubleshooting Guide

Symptom	Possible Causes	Possible Solutions
1. Power indicator lamp comes on, but pump and oscillator do not operate.	a) Water level in wash container is less than 10cm deep. b) Purified or distilled water is being used. c) Rotary shaft is not properly engaged with pipette cage.	● Fill wash container to over 10cm deep. ● Use tap water. ● Confirm that rotary shaft is properly engaged with pipette cage.
2. Cage does not rotate.	a) Pump is not operating b) Nozzle or filter is clogged. c) Lid and cage are not aligned	● Refer to no. 1 above. ● Clean nozzle and/or filter. ● Align cage and lid.
3. Fluid does not siphon/drain off, even after level exceeds overflow point.		● Slow down the water supply flow rate by adjusting the tap.
4. Drain siphoning does not stop, even after wash container becomes empty.		● Adjust flow of water supply so that it is slower. ● Confirm that no air has built up in drain line.

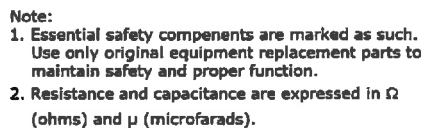
- ◆ If problems persist, turn off power immediately, disconnect power cable from outlet or terminal and contact a local dealer or sales office for assistance.

## 8. SPECIFICATIONS

Model	AW31
<b>Standard Specifications</b>	
Capacity (Pipette Qty.)	1ml pipette – 264pcs.
	5ml pipette – 216pcs.
	10ml pipette – 136pcs.
Water Consumption	1~3l/min.
Ultrasonic Oscillator	High Frequency Output 55W, 28kHz
	Oscillation Plate: Stainless Steel SUS-430
	Oscillator: Magnetostrictive Ball Ferrite
Wash Container Material	Transparent PVC
Base Unit	Stainless Steel SUS-304
Pipette Cage Dimensions	(Inner Ø)138mm x (H)540mm (Outer Ø)146mm x (H)570mm
Overall Dimensions	(W)390mm x (D)400mm x (H)844
Weight	Dry Weight: Approx. 18.5kg Pipette Cage: Approx. 1kg
Power Input	AC100V, 50/60Hz, 2A
Power Consumption	155W
<b>Included Accessories</b>	
	Pipette Cage
	Manual Pump
Water Supply Hose	(Inner Ø)12mm x (L)1.5M
Drain Hose	(Inner Ø)25mm x (L)1.5M
	Detergent



### Wiring Diagram: AW31



## 10. REPLACEMENT PARTS TABLE

Below is a list of replacement parts which can be provided upon request.

	Description	Part Number	Specification Number
1.	Wash Container Lid	W000000118	GFTA0024UCZZ
2.	Cage Alignment Pin	W000000127	LPIN-1003UCZZ
3.	Wash Container Outer Tube	W000000130	LSOU-0023UCZZ
4.	Cage Unit	W000000133	NKAG-0002UCZZ
5.	Cage Base	W000000180	00ZUKAG-INP55
6.	Cage Screw & Nut	W000000181	00ZUS00000067
7.	Cage Handle	W000000182	00ZUS00000068
8.	Cage Base Net	W000000129	LPLTZ0014UCZZ
9.	Siphon Tube H	W000000157	PPIPP0014UCZZ
10.	Water Supply Pipe H	W000000158	PPIPP0030UCZZ
11.	Wash Container Flange	W000000117	GCOVH0055UCZZ
12.	Power Switch	W000000167	QSW-Z1036UCZZ
13.	Base Nozzle	W000000151	PNOZF0009UCZZ
14.	Nozzle Socket	W000000142	PGIDP0014UCZZ
15.	Rotary Shaft	W000000128	LPIV-0002UCZZ
16.	Strainer	W000000164	PSRN-0001UCZZ
17.	Inlet Socket	W000000140	PGIDP0011UCZZ
18.	Drain Socket	W000000141	PGIDP0012UCZZ
19.	Electrode A (lower)	W000000131	LX-BZ0015UCZZ
20.	Electrode B (upper)	W000000132	LX-BZ0016UCZZ
21.	Electrode Rod	W000000126	LANGK0116UCZZ
22.	Electrode Spacer A	W000000163	PSPAX0022UCZZ
23.	Electrode Spacer B	W000000162	PSPAT0023UCZZ
24.	Drain Hose Coupling (large)	W000000138	PGIDP0009UCZZ
25.	Supply Hose Coupling (small)	W000000139	PGIDP0010UCZZ
26.	Water Supply Nozzle	W000000152	PNOZF0010UCZZ
27.	Water Supply Elbow	W000000148	PGUMS0087UC01
28.	Water Drain Hose	W000000149	PHOSD0006UC01N 1.5M
29.	Water Supply Hose	W000000150	PHOSS0007UC01 1.5M
30.	Rubber Hose (I)	W000000147	PGUMM0088UCZZ
31.	Rubber Hose (L)	W000000144	PGUMM0080UCZZ
32.	Rubber Hose (Q)	W000000146	PGUMM0082UCZZ
33.	Rubber Hose (U)	W000000145	PGUMM0081UCZZ
34.	Rubber Hose (N)	W000000143	PGUMM0044UCZZ
35.	Gasket A for Oscillator	W000000154	PPACG0020UCZZ
36.	Gasket B for Cleansing Container	W000000156	PPACG1048UCZZ
37.	Fuse Bracket	W000000165	QFSDH0004UCZZ
38.	Temperature Fuse	W000000166	QFS-T0029UCZZ
39.	CPU Board	W000000021	CPWBN1027UCS1
40.	Pump Motor	W000000160	PPMPL1011UCZZ
41.	Oscillator Unit	W000000160	PPMPL1011UCZZ
42.	Output Transformer	W000000102	DUNTK0018UCZZ
43.	Balance Transformer	W000000103	DUNTK0023UCZZ
44.	Lamp	W000000170	RLMPH0026UCZZ
45.	Hose Pump	W000000173	UPMP-0003UCZZ

## 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 AW units 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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