Thank you for purchasing the Yamato Scientific IK/IM incubator shaker.

For correct use of the incubator shaker, read this manual and the guarantee thoroughly before use. After reading, keep the manual and the guarantee in a safe place for quick reference whenever required.

**WARNING:** Before using this product, carefully read and fully understand the instructions on safety (WARNINGS and CAUTIONS) that appear elsewhere in this manual.
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Symbol Conventions

■ Safety Symbols

The following safety symbols are used on the product and in this manual. Be sure to follow the instructions and requirements on safety described in this manual when handling the product. Yamato Scientific Co., Ltd. assumes no liability for failure to comply with these instructions and requirements.

⚠️ WARNING

A WARNING denotes a potential safety hazard. It calls attention to a procedure, practice, or condition, which, if not correctly performed, adhered to, or manipulated, could result in injury or loss of life. Resulting injuries include wounds, electrical shock, broken bones, and poisoning, which may lead to other diseases and require long-term hospitalization.

⚠️ CAUTION

A CAUTION denotes a potential safety and equipment hazard. It calls attention to a procedure, practice, or condition, which, if not correctly performed, adhered to, or manipulated, could result in injury or loss of property. Resulting injuries include wounds and electrical shock which may not require hospitalization. Resulting property losses include facilities, equipment, and buildings.

■ Symbol Conventions

⚠️ This symbol indicates a WARNING or CAUTION (or note). An instruction that must be followed is associated with this symbol.

🚫 This symbol calls attention to an action that must not be done. The instruction for the prohibited act is associated with this symbol.

❗️ This symbol calls attention to an action that must be done. The instruction for this action is associated with this symbol.
### Safety Precautions

---

#### WARNING

1. **Do NOT Use Where Flammable or Explosive Gases or Vapors Are Present.**
   - Do NOT operate this product where there are flammable or explosive gases or vapors since this product is not explosion-proof. Operation of the product in such an environment constitutes a safety hazard and may cause a fire or electrical shock.

2. **Use Protective Grounding.**
   - Always connect the protective grounding to the ground, to prevent electrical shock or fire due to stray current.

3. **Stop Operation Immediately upon an Abnormal Condition.**
   - If you notice smoke or unusual odors coming from the product, immediately stop using it. It may cause a fire or electrical shock.

4. **Do Not Entangle the Power Cord.**
   - Entangling the power cord will result in overheating and may cause a fire.

5. **Handle the Power Cord Carefully.**
   - Do not bend or twist the power cord, or apply excessive tension to it. This may cause a fire or electrical shock.

6. **Do Not Use Flammable or Explosive Gases or Vapors.**
   - Do NOT use flammable or explosive substances, or materials containing such substances. This may cause an explosion and/or fire.

7. **Do Not Disassemble or Make Modifications.**
   - Do NOT disassemble or modify this product. This may constitute a safety hazard, resulting in an accident including fire or electrical shock.

---

#### CAUTION

**Approaching Thunderstorms**

- If a thunderstorm approaches in the distance, immediately turn off the power. Lightning from the storm may cause a fire or electrical shock.
Note: Models IK400W and IM400W are furnished with a glass door.

**Parts and Their Functions: Exterior**

**Front View**

- Hinge
- Door
- Temperature indicator
- Power switch
- Operation panel

**Rear View**

- Rear cover
- Earth leakage breaker
- Test button
- Left side cover
- Power cord
- Power plug
- Drain pan (provided by user)

**Inside Door**

- Flask
- Clamp ring
- Flask clamp
- Slide rail
- Door switch (set on operation panel)
- Right side cover
- Door handle
- Drawer handle
- Shaking table
- Handle for tray on shaking table
Before Use

Parts and Their Functions: Structural Drawings

**IK Series**

- Flask
- Flask clamp
- Link rod
- Crank
- Bearing
- Shaker motor
- V belt
- V pulley
- Photo slit for rotation speed detection
- Shaking table
- Drawer handle
- Rail
- Guide roller
- Support roller
- Drive shaft
- Control circuit board
- Condenser
- Cooling fan
- Blower fan
- Heater
- Evaporator
- Low-pressure piping
- Defroster solenoid valve
- Path of flow while defrosting
- Capillary tube
- Drier
- Compressor
- High-pressure piping

Unit: mm

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effective width</td>
<td>520</td>
</tr>
<tr>
<td>Effective height</td>
<td>330</td>
</tr>
<tr>
<td>Effective depth</td>
<td>450</td>
</tr>
<tr>
<td>Length of table tray</td>
<td>390</td>
</tr>
<tr>
<td>Width of table tray</td>
<td>390</td>
</tr>
<tr>
<td>Effective width</td>
<td>520</td>
</tr>
<tr>
<td>Effective depth</td>
<td>450</td>
</tr>
<tr>
<td>Effective height</td>
<td>330</td>
</tr>
<tr>
<td>Length of table tray</td>
<td>390</td>
</tr>
<tr>
<td>Width of table tray</td>
<td>390</td>
</tr>
</tbody>
</table>
Before Use

Parts and Their Functions: Structural Drawings

IM Series

Flask
Flask clamp
Crank
Bearing
Shaker motor
V belt
V pulley
Photo slit for rotation speed detection
Drive shaft
Shaking table
Drawer handle
Support arm

Temperature sensor
Thermal insulation
Blower fan
Heater
Evaporator
Low-pressure piping
Defroster
Solenoid valve
Path of flow while defrosting
Capillary tube
Drier
Compressor
High-pressure piping

Control circuit board
Condenser
Cooling fan

Unit: mm

Effective height 310
Effective width 520

Right
Door

Left
Guard thickness 17
Effective depth 510

Width of table tray 390

Rear

Length of table tray 390
## Parts and Their Functions: Operation Panel

<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed indicator</td>
<td>Displays the shaking speed in tenths of the revolutions per minute.</td>
</tr>
<tr>
<td>Speed control knob</td>
<td>Used to increase and decrease the speed.</td>
</tr>
<tr>
<td>Lock knob</td>
<td>Used to lock the speed control knob to prevent operation error.</td>
</tr>
<tr>
<td>Door safety lamp</td>
<td>Lit when the door safety function—to stop shaking if the door is opened—is switched on.</td>
</tr>
<tr>
<td>Door safety key</td>
<td>Used to switch on/off the door safety function—to stop shaking if the door is opened.</td>
</tr>
<tr>
<td>Run/stop key</td>
<td>Used to start and stop shaking.</td>
</tr>
<tr>
<td>Defrost lamp</td>
<td>Lit while defrosting.</td>
</tr>
<tr>
<td>Defrost key</td>
<td>Used to start/stop defrosting if the temperature cannot be regulated during low-temperature operation.</td>
</tr>
<tr>
<td>Temperature set lamp</td>
<td>Lit while the indicator displays the temperature setpoint.</td>
</tr>
<tr>
<td>Temperature set key</td>
<td>Used when setting the temperature setpoint.</td>
</tr>
<tr>
<td>Heater lamp</td>
<td>Lit while the heater is on.</td>
</tr>
<tr>
<td>Freezer lamp</td>
<td>Lit while the freezer is operating.</td>
</tr>
<tr>
<td>Temperature indicator</td>
<td>Displays the setpoint or current internal temperature.</td>
</tr>
<tr>
<td>Increment key</td>
<td>Used to increment the set value.</td>
</tr>
<tr>
<td>Shift up key</td>
<td>Used to move the entry cursor (blinking) and set the entered value in the microcomputer when setting the temperature setpoint.</td>
</tr>
<tr>
<td>Power switch</td>
<td>Used to turn the power on/off.</td>
</tr>
</tbody>
</table>
WARNING

Do NOT Use Where Flammable or Explosive Gases or Vapors Are Present.

Do NOT operate this product where there are flammable or explosive gases or vapors since this product is an arcing device--it produces an arc at power-on--and not explosion-proof. Operation of the product in such an environment may cause a fire or explosion.

Use Protective Grounding.

Always connect the protective grounding to the ground, to prevent electrical shock or fire due to stray current. Do NOT connect the grounding wire to gas supply piping. This may cause a fire.

Do NOT connect the grounding wire to the grounding for telephone lines or lightning rods. This may cause a fire or electrical shock.

A grounded 3-prong power outlet is recommended.

If there is no grounding terminal

If a grounding terminal is not provided by the electric facility, a grounding pole (grounding resistance ≤100 Ω, Japanese Industrial Standard Class 3) must be provided. Since this requires personnel qualified to do electrical work, consult the dealer from whom you purchased this product or the nearest Yamato Scientific sales representative office.
**WARNING**

Observe the Power Rating.

⚠️ Use a power outlet whose rating meets the electric capacity.

**Electric capacity:** 100 V AC, 9 A for all IK/IM series products

🚫 Do not use a multiple-outlet adapter. It may cause overheating.

Avoid Uneven Surfaces.

🚫 Install the product on a level surface. Installing on an uneven surface may cause unanticipated accidents or failures.

---

**Installation Location**

🚫 Avoid the following locations:

- Outdoors
- Where flammable, corrosive, or hazardous gases are present
- Where the ambient temperature is 35°C or higher or 5°C or lower
- Where rapid changes in temperature occur
- Humid or dusty place
- In direct sunlight
- Where flooring is not strong enough to support this product, or on a rack or the like
- Where there is vibration
- Nearby equipment which should be kept away from vibrations

⚠️ A clearance of at least 30 cm is needed on both sides and at the rear (see the figure on the right)
WARNING

Make fine adjustments for precise level installation.

After determining where to install the product, use the four adjusters to support this product securely. At that point, also use a level or the like to insure that the product is precisely level. A forward inclination is especially dangerous since the front door may come open and the shelf inside may slide out from the vibration. After adjusting the adjusters, tighten all the adjusters in place with the lock nuts.

Do not allow the weight of the product to rest on any caster.

After Installation

To avoid injury, take adequate measures to insure that this product will not fall in the event of an earthquake or from mechanical shock.

Drainage of Water

- Water that has condensed inside the incubator is drained through the hose in the rear. Include an adequate-size drain pan
- The hose is as shown in Figure 1 when it is delivered to you; however, the layout can be changed as shown in Figure 2 if it is more suitable for your location.

To change the hose layout

1. First make sure that the power cord is unplugged. Detach the rear cover and louver. To detach the louver, refer to page 23, “Daily Maintenance and Inspection.”
2. Let the end of the hose stick out from the bottom hole as shown in Figure 2.
3. If the hose seems to be too long, you can make it shorter by cutting it with scissors or the like
4. When laying the hose, be careful not to allow it to be in contact with the V pulley or cooling fan.
5. Be careful not to allow the hose to become twisted.
6. To diminish the intrusion of outside air, make a loop in the hose to make a trap.
7. After the change, reattach the rear cover and louver in their original positions.
Installation and Preparation Before Use

⚠️ CAUTION ⚠️

Handle the Power Cord Carefully.

- 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 fire or electrical shock.
- Keep the power cord away from any heating equipment such as a space heater. The cord’s insulation may melt and cause a fire or electrical shock.

If the power cord becomes damaged (wiring can be seen, there is breakage, etc.), immediately turn off the power on the front panel (and the earth leakage breaker at the rear) of the product and shut off the main supply power. Then, contact your nearest dealer for replacement of the power cord. Leaving it as is may cause a fire or electrical shock.

Plug in the power cord before use.
Handling Precautions

Installation and Preparation Before Use

⚠️ **WARNING**

Do Not Use Flammable or Explosive Gases or Vapors.

Do NOT use flammable or explosive substances, or materials containing such substances. This may cause an explosion and/or fire. The substances that must not be used are listed on Page 32 for reference.

Abnormal Condition

If you notice smoke or unusual odors coming from the product, immediately stop using it and contact the dealer or your nearest Yamato Scientific representative office to ask for an inspection. Leaving it as is may cause a fire or electrical shock. Do NOT repair the product yourself--this is highly dangerous.

Do Not Place Hands, Tools or the Like Inside Incubator While It Is Shaking.

Do not place your hand, a tool, or the like inside the incubator while it is shaking. This is very dangerous. Since the shaking table has a great inertia, if your hand or any part of your body is pinched immediately after stopping the operation or while it is shaking at a slower speed, you will be injured.

Even if the door safety function is on, it takes nearly ten seconds for the shaking to stop after the door is opened. Do not touch the table or anything on the table until after the shaking stops completely.

Intrusion of Foreign Matter

Foreign matter which intrudes or is accidentally introduced inside the incubator may affect the internal mechanism such as hindering the action of the shaking table or V pulley, and lead to a failure. If foreign matter gets inside the incubator, immediately turn off both the power switch on the front panel and the earth leakage breaker at the rear and shut off the supply power, and then remove the matter. Leaving it as is may cause an equipment failure, fire, or electrical shock.

⚠️ **CAUTION**

Approaching Thunderstorms

If a thunderstorm approaches in the distance, immediately turn off the power on the front panel (and earth leakage breaker at the rear) and shut off the supply power. Leaving the power turned on may cause a fire or electrical shock.

During Power Failure

While the earth leakage breaker or the power switch is turned off, or during a power failure, the temperature setpoint is backed up by a built-in battery. The shaking speed is retained since it is set with a knob. These features allow an automatic restart with the previous set values after a power recovery.
CAUTION

Defrosting

During operation at low temperatures, the evaporator becomes heavily frosted. This large amount of frost degrades the freezing power, and the temperature then may not be regulated at the setpoint. The use of samples having a large water content especially accelerates frost on the evaporator—be careful. If you observe that the temperature cannot be regulated at the setpoint, press the defrost key to start defrosting.

After being started, defrosting automatically stops after about ten minutes. While defrosting, the internal temperature rises—be careful.

Drainage

Condensation inside the incubator or defrost drain drains through the hose at the rear. Provide an adequate-size drain pan. Check the amount of drainage in the pan frequently to avoid overflow.

Depending on the installation environment and internal temperature, if a glass door is furnished, it may become fogged.

Placement of Samples

- If the optional shelves are used, allow at least a 30% clearance above the samples on each shelf to insure accurate temperature control. Too many samples may disable proper temperature control. The maximum allowable weight is 5 kg(f) per shelf.

- Since the internal temperature is controlled by air circulation, frequent checks should be made that the samples have not dried up. It is especially true if the sample containers are not covered while the freezer is operating that the samples may dry up. When placing samples on an optional shelf, avoid placing them near the fan outlet. This may degrade the temperature control accuracy and the circulating air may affect the samples themselves.
Handling Precautions

![CAUTION](image)

Do Not Use Corrosive Samples.
- A major part of the internal structure is stainless steel (JIS SUS304 – JIS stands for Japanese Industrial Standards); however, strong acids may corrode it–be careful.
- The guard is made of vinyl-chloride rubber, which may be corroded by acids, alkalines, oils, or halide solvents--be careful.

Be Careful Not to Get Burned.
- Be careful not to get burned. The interior and the inside of the door may become extremely hot during and immediately after operation.
- The upper operating temperature limit is 60°C. Do not set the temperature higher than this.

When Opening/Closing Door
- When opening/closing the door, do not get in the way of the door. It may hit you and cause an injury.
- Close the door tightly when operating.

Powering-on after Shutdown
- After turning off the earth leakage breaker or power switch, do not turn the power on again for at least 15 minutes to protect the freezer.

Do Not Step On the Product.
- Do not step on the product. It may fall over or break and cause an injury.

Do Not Place Anything on Top.
- Do not place anything on top of the product. It may fall off and cause an injury.
Placing Flasks

- Open the door and confirm that shaking has stopped.
- Swing the handle out and turn it clockwise 90 degrees, and then draw out the table.

- Hold the tray on the table with both hands and lift it off of the table. Note that the tray does not always have to be removed when placing or taking out flasks.

- Remove the clamp ring from the clamp

- Place a flask in the middle of the clamp so it will sit properly. The clamp closes naturally.
Placing Flasks

- Attach the clamp ring in its correct position as shown in the figure below.
- Attach rings to all the clamps including those with no flasks.
- Place the tray on the table. Confirm that the tray fixing square-washers at the front and back properly fit the grooves of the tray.

⚠️ If improperly attached, the tray may slide off while shaking.

- Hold the drawer handle and push the table in slowly. After completely pushing the table in, turn the handle counterclockwise 90 degrees and swing it in.
- The maximum allowable weight on the tray is 6 kg(f).
Placing Flasks

⚠️ Place flasks properly.

⚠️ Place each flask so its center is aligned with the middle of the clamp and so it sits straight up.

Do not use a flask that does not fit the clamp. Attach the clamp properly by inserting it to the neck of the clamp.

If a clamp ring is not attached properly or if a flask that does not fit the clamp is used, the flask may come loose from the clamp while shaking, thus breaking the flask.
### Setting the Temperature

- Press the temperature set key (SELECT). The indicator then displays the previous temperature setpoint. The temperature set lamp (SET) is lit, indicating that the setting mode is on.
- Press the left cursor key (<) to move the entry cursor (blinking digit) to the digit you wish to change. Pressing this key moves the cursor in the following sequence.

<table>
<thead>
<tr>
<th>End of setting</th>
<th>tens place</th>
<th>ones place</th>
<th>first decimal place</th>
</tr>
</thead>
</table>

- After moving the entry cursor to the desired digit, use the increment key (↑↓) to change the number. Pressing the increment key (↑↓) changes the displayed number in the following sequence.

```
9 ← 8 ← 7 ← · · · · · · · · ← 2 ← 1 ← 0
```

- Pressing the left cursor key (<) once when the cursor is in the tens place (blinking) ends the setting and overwrites the temperature setpoint.
- After ending the setting, press the temperature set key (SELECT) once. The mode then changes to measurement. Even if the temperature set key (SELECT) is not pressed, the mode automatically returns to measurement after ten seconds with no key operation. (If the mode returns from setting to measurement before you have made the setting, i.e., if the mode returns while a digit is blinking, the temperature setpoint is not changed and the temperature is controlled with the previous setpoint.)
- In the measurement mode, the temperature indicator displays the internal temperature and the temperature set lamp SET is off. (It is recommended to verify the new setpoint by pressing the temperature set key (SELECT).)
- The following shows an example of the temperature setting procedures, to change the setpoint to 27.5°C(from the previous setpoint of 31.7°C).

<table>
<thead>
<tr>
<th>Step</th>
<th>Display and Indication Lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>SELECT</td>
</tr>
<tr>
<td>(b)</td>
<td>SET Lit.</td>
</tr>
<tr>
<td>(c)</td>
<td>The temperature display changes as shown below (with the first decimal place blinking).</td>
</tr>
<tr>
<td>(d)</td>
<td>Move the cursor to the ones place.</td>
</tr>
<tr>
<td>(e)</td>
<td>Change the number.</td>
</tr>
<tr>
<td>(f)</td>
<td>Move the cursor to the tens place.</td>
</tr>
<tr>
<td>(g)</td>
<td>Change the number.</td>
</tr>
<tr>
<td>(h)</td>
<td>End the setting.</td>
</tr>
<tr>
<td>(i)</td>
<td>Off. The indicator then displays the internal temperature.</td>
</tr>
</tbody>
</table>
Pressing the key in this mode does not affect the temperature setpoint at all.

The occurrence of a problem in temperature control is indicated by an error display.

(See Page 21, “Safety Systems and Error Codes.”)
Operation

Operating the Shaker

- For safe operation, keep the “door safety” key (Door Safety) switched on.
- Turn the speed control knob to its leftmost position (SLOW side).
  (Turn the knob after loosening the lock knob.)
- Close the door and press the run/stop key (Run/Stop). Shaking then starts.

![Run/Stop Key Status]

- After the shaking starts, slowly turn the speed control knob clockwise to set the speed to the desired level.
  The speed indicator shows the current speed in tenths of the revolutions per minute (e.g., 130 rpm is displayed as \( 13 \)).
- The shaking speed increases and decreases slowly, so it does not follow a quick turning of the knob.
  - To stop the shaking, press the run/stop key (Run/Stop) again.
    Do not open the door until the table stops moving completely (about ten seconds).
- Since the shaking table has a great inertia, if your hand or any part of your body is pinched immediately after stopping the operation or while it is shaking at a slower speed, you will be injured.

### Regarding “Door Safety” Key
- The “door safety” function is a safety mechanism that stops the table when the door is opened. Usually, keep the “door safety” key (Door Safety) switched on.
- Behavior when the “door safety” key (Door Safety) is on (the “door safety” lamp is lit):
  - Shaking stops if the door is opened (but doesn’t stop quickly).
  - Shaking restarts when the door is closed.
- Behavior when the “door safety” key (Door Safety) is off (the “door safety” lamp is off):
  - Shaking continues regardless of whether the door is opened or closed.
  - This may be useful for controlling the speed while observing the shaking status of the samples with the door opened.
- If the run/stop key (Run/Stop) is in ‘STOP’ state, shaking stops regardless of whether the “door safety” key is on or off and whether the door is opened or closed.
Defrosting

- Operation at a low temperature for a long period causes the buildup of frost, which degrades the freezing performance and may disable the temperature from being controlled at the setpoint. In such a case, use the defrosting function.
- Press the defrost key (DEFROST). The defrost lamp then lights up, the internal fan stops, and defrosting starts.
- Defrosting automatically stops in ten minutes. To stop defrosting before that, press the defrost key (DEFROST) again.
- The water from the defrosting will drain out through the drain hose. Provide an adequate-size pan at the end of the hose.
- The internal temperature rises while defrosting—be careful.
- Defrosting does not stop the shaking.
This incubator features safety systems independent of the controller, in addition to the self-diagnostics function of the controller. The table below shows the causes when the safety systems go into effect and the countermeasures to be taken.

If an abnormality such as an operational error or equipment failure occurs, the corresponding error code “ErrX” (where X is a number) appears on the operation panel display and a buzzer sounds. In this case, check the error code and immediately stop operation.

<table>
<thead>
<tr>
<th>Safety System</th>
<th>Display</th>
<th>Causes and Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earth leakage breaker</td>
<td>None</td>
<td>□ Leakage or over-current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contact your nearest service representative office to check for the cause of shutdown of the breaker.</td>
</tr>
<tr>
<td>Automatic overheating protector</td>
<td>None</td>
<td>□ Heating of sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decrease the sample</td>
</tr>
</tbody>
</table>

Error Codes and Corresponding Countermeasures

<table>
<thead>
<tr>
<th>Error Code Display</th>
<th>Description</th>
<th>Countermeasure</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Err1" alt="Err1" /></td>
<td>Disconnection of temperature sensor</td>
<td>Replace the sensor.</td>
</tr>
<tr>
<td><img src="Err3" alt="Err3" /></td>
<td>Short-circuiting of TRIAC</td>
<td>Replace the TRIAC.</td>
</tr>
<tr>
<td><img src="Err4" alt="Err4" /></td>
<td>Disconnection of heater</td>
<td>Replace the heater.</td>
</tr>
</tbody>
</table>

If a problem is detected, the error code appears on the temperature indicator, a buzzer sounds, and then the freezer and heater circuits are shut off.
Daily Maintenance and Inspection

⚠️ **WARNING**

*Do NOT Make Modifications to This Product.*

Disassembly of the product is strictly prohibited. This may cause an electrical shock since there are high-voltage circuits inside the product. Inspection, maintenance, or repair of the internal circuits and mechanisms should be inquired of the dealer or your nearest sales representative office.

Modification is strictly prohibited. This may cause a fire or electrical shock.

---

⚠️ **CAUTION**

Before Maintenance …

*Make sure that you turn off the power on the front panel and the earth leakage breaker at the rear, and shut off the supply power, before maintenance.* Do not do any maintenance work until the internal temperature returns to near room temperature.

*Use a soft, damp cloth to wipe off dirt from the resin moldings and operation panel.* Do not clean the product with a volatile solvent such as a thinner or benzene or cleanser, and do not rub it with a pot cleaner or brush. This may cause a deformity, alteration, or discoloration.

Every Month …

*Follow the procedure below to check the operation of the earth leakage breaker once a month.*

- Plug in the power cord. Do the check with the power turned on.
- Set the earth leakage breaker to on.
- Use the tip of a ball-point pen or the like to press the red test button of the breaker. If the breaker turns off, then it is operating normally.
Daily Maintenance and Inspection

Cleaning the Condenser Slats

Dust adhering to the condenser slats degrades freezing ability and may prevent the temperature from being controlled at the setpoint. To avoid this, clean the condenser approximately once a month.

Cleaning Procedure

(1) Detach the louver on the front as follows.

Unscrew the round-head M4 screws and detach the louver from the front. The louver hangs on the incubator casing with two hooks. Lift it up and pull it off.

(2) Clean the condenser slats with a vacuum cleaner or the like.

Be careful not to bend the aluminum slats when cleaning them.

(3) Reattach the louver in its original position.
Daily Maintenance and Inspection

- **Adjustment of Tension of V Belt**

  Various problems may result from improper tension of the V belt. To avoid these, check and adjust the tension approximately once every six months.

  **Adjustment Procedure**

  1. Make sure that you unplug the power cord before adjustment.
  2. Detach the left and rear covers.

  3. Loosen the four bolts that fix the motor mount plate. (Loosen them only—do not have to remove them.)

  4. Loosen the lock nut and turn the adjuster bolt to adjust the tension of the belt so that the belt deflects by 8 mm when it is pulled by a 2 kgf weight.

  5. After adjustment, tighten the lock nut and then tighten the four fixing bolts.

  6. The following conditions may be observed if the belt is improperly tightened.

    - If the belt is too loose:
      1. Slip (speed does not increase) or heating of the pulley
      2. Wearing or cracking of the V belt
      3. Unusual noises

    - If the belt is too tight:
      1. Abnormal heating (≥110°C) of the motor (normally ≤80°C)
      2. Damage to the motor shaft

  7. If the V belt wears severely, replace it with a new one. The model number of the V belt is M-40.
Daily Maintenance and Inspection

- Inspection and Maintenance of Drawer Handle

⚠️ If the shaking table plays back and forth even when the table is pushed in completely and locked, adjustment of the handle hook is needed.

If it continues to operate with the play left as is, the life of handle and slide rails are shortened.

Adjustment Procedure

1. Loosen the lock nut (1) and slightly tighten (turn clockwise) the lock nut (2).

2. Tighten the lock nut (1)

3. Check the locking condition. If there is still play, repeat steps (1) and (2).

- Inspection of Tray Fixing Square-washers

⚠️ The tray fixing square-washers will wear out after long-term use. If the working face is torn by 1 mm, loosen the screw and rotate the square-washer to change the working face.

⚠️ If both sides are torn, replace it with a new one. The guidelines are, although depending on the operating conditions, to rotate the working face after 5,000 hours and to replace it with a new one after 10,000 hours.
Daily Maintenance and Inspection

- **Inspection of Slide Rails**

  The working surfaces of the steel ball bearings, which are used for the slide rails, become scratched after use. This is normal.

  When the scratches get to be 5 mm long, replace the slide rails with new ones. The slide rails are Model 301-381 from Nihon ACCURIDE.
If Not Using the Product for a Long Period or If Disposing of It

⚠️ WARNING

If Not Using for a Long Period

⚠️ If you will not be using the product for a long period, always turn off the power switch on the front and the earth leakage breaker at the rear and shut off the supply power.

If disposing

⚠️ If you will be disposing the product, keep it out of the reach of children.

For any questions, contact the dealer from whom you purchased the product or the nearest sales representative’s office.
### After-Sales Service and Guarantee

#### Requests for Repairs

If an abnormality occurs, immediately stop the operation, turn off the power switch, and unplug the power cord. Then, contact the dealer from whom you purchased the product or the nearest sales representative's office.

Have the following information on hand:
- Model number of the product
- Serial number of the product
- Date of purchase (Refer to the guarantee or the name plate on the product.)
- Description of failure (in as much detail as possible)

Show the guarantee to the service personnel who visits your site.

#### Guarantee (given with product)

- A certificate of guarantee is given by the dealer or sales representative's office from whom you purchased the product. Check that the name of the dealer and the date of purchase are filled in, read the guarantee thoroughly, and keep it in a secure place.
- The guarantee is good for one year after the date of purchase. According to the guarantee, repairs during this period will be free of charge.
- For repairs after the expiration of the guarantee period, consult the dealer from whom you purchased the product or the nearest sales representative's office. If the product can be repaired, it will be done for a fee per a request from the customer.

#### Minimum Period for Maintenance

**Repair Parts Support**

The supply of maintenance repair parts is guaranteed for at least seven years after a discontinuation of the product. These parts include those needed to maintain the performance of the product.
## Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Causes</th>
<th>Countermeasures</th>
</tr>
</thead>
</table>
| (1) Unusual noise is heard during shaking | 1. The tray is not sitting on the table properly, or a flask clamp is not set properly.  
2. Failure of drawer handle  
3. Improper tension of the V belt | Set them properly.  
Adjust the hook or replace the handle.  
Adjust the tension. |
| (2) The incubator itself shakes during shaking. | 1. An adjuster is not touching the floor.  
2. The floor or rack is not strong enough to support the incubator.  
3. The floor or rack is not level.  
4. The incubator is not installed on a level surface.  
5. Samples are too heavy. | Adjust the adjuster height.  
Change the installation location.  
Change the installation location.  
Adjust the adjuster heights.  
Reduce the weight to under 6 kg(f). |
| (3) The table does not shake. | 1. The power is not turned on.  
2. The run/stop key is not pressed.  
3. The door is not shut(if the “door safety” key is switched on).  
4. Loosen V belt  
5. Foreign matter has gotten jammed in the table.  
6. Foreign matter has gotten jammed in the V pulley. | Turn on the power.  
Press the key to start the shaking.  
Close the door.  
Adjust the tension.  
Remove the foreign matter.  
Remove the foreign matter. |
| (4) The internal temperature does not drop. | 1. There is too much frost.  
2. The room temperature is too high. | Defrost.  
Lower the room temperature to no more than 35°C. |
Wiring Diagram

Note: Common to all models

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Part</th>
<th>Symbol</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Condenser</td>
<td>P-IN-CONT</td>
<td>Temperature control board</td>
</tr>
<tr>
<td>ELB</td>
<td>Earth leakage breaker</td>
<td>POWER</td>
<td>Motor power supply board</td>
</tr>
<tr>
<td>H</td>
<td>Heater</td>
<td>Pt</td>
<td>Temperature sensor</td>
</tr>
<tr>
<td>IND</td>
<td>Temperature indicator board</td>
<td>RF</td>
<td>Freezer</td>
</tr>
<tr>
<td>M1</td>
<td>Shaker motor</td>
<td>S</td>
<td>Power switch</td>
</tr>
<tr>
<td>M2</td>
<td>Fan</td>
<td>SP</td>
<td>Spark killer</td>
</tr>
<tr>
<td>MOTER</td>
<td>Motor control board</td>
<td>TAC</td>
<td>TRIAC</td>
</tr>
<tr>
<td>MS</td>
<td>Door switch</td>
<td>TF1</td>
<td>Transformer</td>
</tr>
<tr>
<td>MV</td>
<td>Defroster solenoid valve</td>
<td>TF2</td>
<td>Transformer</td>
</tr>
<tr>
<td>P</td>
<td>Power plug</td>
<td>X</td>
<td>Main relay</td>
</tr>
<tr>
<td>PL</td>
<td>Speed detector</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

100VAC

Diagram showing connections between various components such as condensers, temperature indicators, power plugs, and motor control boards.
<table>
<thead>
<tr>
<th>Specifications</th>
<th>IK400</th>
<th>IK400W</th>
<th>IM400</th>
<th>IM400W</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature control method</strong></td>
<td>Draft circulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Shaking method</strong></td>
<td>Horizontal back-and-forth</td>
<td>Horizontal rotating</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>5° to 60°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature control accuracy</td>
<td>±0.5°C (at 37°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature distribution accuracy</td>
<td>±1.0°C (at 37°C)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaking speed</td>
<td>Approximately 30 to 200 rpm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaking amplitude</td>
<td>70 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heater</td>
<td>500-W iron-chrome wire heater</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan</td>
<td>Axial fan with a 14/13-W (50/60 Hz) motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaker motor</td>
<td>Fully enclosed 60-W motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior</td>
<td>JIS SUS304 stainless steel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heat insulator</td>
<td>Expanded polystyrene (styrene foam)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Window</td>
<td>Not furnished</td>
<td>Furnished</td>
<td>Not furnished</td>
<td>Furnished</td>
</tr>
<tr>
<td>Freezer</td>
<td>130-W, air-cooled sealed freezer (R130a coolant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaking table</td>
<td>JIS SUS304 stainless steel. The tray must be used.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Control unit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature control</td>
<td>PID control using a microcomputer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature setting and display</td>
<td>Digital setting using the increment and cursor keys. 7-segment green LEDs; display of 3 digits.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed setting and display</td>
<td>Analog setting using a turning knob. 7-segment green LEDs; display of 2 digits.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature sensor</td>
<td>Platinum resistance temperature detector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auxiliary function</td>
<td>Defrost function (continuous 10-minute defrosting after switch-on)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Safety systems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Featured in controller</td>
<td>Self-diagnostics (sensor, heater, TRIAC, main relay)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td>Door switch (“door safety” function), earth leakage breaker</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other specifications</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions&lt;sup&gt;2&lt;/sup&gt;</td>
<td>710 (W) X 650 (D) X 920 (H) mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum load</td>
<td>Nine 500-ml Erlenmeyer flasks (up to 6 kg(f))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum load on optional shelf</td>
<td>Approximately 5 kg/shelf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>100 V AC, 50/60 Hz, 9 A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Approximately 125 kg(f)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction manual</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup>: Reference conditions: temperature 23°±5°C, humidity 65±20%, and with the rated power supply

<sup>2</sup>: Excluding protruding portions
### Parts Common to the IK and IM Series

<table>
<thead>
<tr>
<th>Part</th>
<th>Code Number.</th>
<th>Specification</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature control board</td>
<td>1-01-180-0003</td>
<td>P-IN-CONT (for IK-41)</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Temperature indicator board</td>
<td>1-01-180-0004</td>
<td>IND</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Motor control board</td>
<td>1-01-180-0002</td>
<td>MOTOR</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Motor power supply board</td>
<td>1-01-180-0001</td>
<td>POWER</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Heater</td>
<td>IK41S-40420</td>
<td>500-W iron-chrome wire, 100 V AC</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Temperature sensor</td>
<td>1-16-003-0007</td>
<td>Pt 100 Ω (common for IS-42)</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Evaporator</td>
<td>IN61-20081</td>
<td></td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>TRIAC</td>
<td>1-20-001-0001</td>
<td>400V-30A (with SP)</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Slit</td>
<td>4-36-001-0002</td>
<td>56-180-t0.2</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Door guard</td>
<td>IK41S-30260</td>
<td></td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Earth leakage breaker</td>
<td>2-06-005-0010</td>
<td>BJS153</td>
<td>Matsushita Electric Works, Japan</td>
</tr>
<tr>
<td>Main relay</td>
<td>2-05-010-0002</td>
<td>JH 1a-24V (AR5211)</td>
<td>Matsushita Electric Works, Japan</td>
</tr>
<tr>
<td>Power switch</td>
<td>2-01-008-0001</td>
<td>HLS208K black</td>
<td>FUJISOKU ELECTRIC, Japan</td>
</tr>
<tr>
<td>Photo interrupter for speed detection</td>
<td>1-21-002-0001</td>
<td>GP1S51</td>
<td>Sharp Electric, Japan</td>
</tr>
<tr>
<td>Door switch</td>
<td>2-02-008-0002</td>
<td>B42A05S</td>
<td>OKI, Japan</td>
</tr>
<tr>
<td>Freezer</td>
<td>3-01-003-0002</td>
<td>CAM16YE-A</td>
<td>Toshiba Electric, Japan</td>
</tr>
<tr>
<td>Defroster solenoid valve</td>
<td>3-02-006-0002</td>
<td></td>
<td>SAGINOMIYA, Japan</td>
</tr>
<tr>
<td>Fan</td>
<td>2-15-004-0005</td>
<td>4715PS-10T-B30-100 (with guard)</td>
<td>NMB, Japan</td>
</tr>
<tr>
<td>Shaker motor</td>
<td>2-14-006-0003</td>
<td>6 IK60A-AUL (100 V AC)</td>
<td>ORIENTAL MOTOR, Japan</td>
</tr>
<tr>
<td>V belt</td>
<td>4-19-001-0002</td>
<td>M-40</td>
<td>MITSUBOSHI, Japan</td>
</tr>
<tr>
<td>Bearings for shaker shaft</td>
<td>4-18-001-0004</td>
<td>UCF204</td>
<td>NTN, Japan</td>
</tr>
<tr>
<td>Slide rail</td>
<td>4-30-001-0007</td>
<td>301-381</td>
<td>ACCURIDE, Japan</td>
</tr>
<tr>
<td>Drawer handle</td>
<td>IM41S-30440</td>
<td>A-201</td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Nylon leg for tray</td>
<td>7-02-003-0001</td>
<td>C-30-CS-6</td>
<td>TAKIGEN, Japan</td>
</tr>
<tr>
<td>Handle for tray</td>
<td>7-11-001-0002</td>
<td>A-1075-4</td>
<td>TAKIGEN, Japan</td>
</tr>
</tbody>
</table>
### Parts Common to IK Series

<table>
<thead>
<tr>
<th>Part</th>
<th>Code Number.</th>
<th>Specification</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearings for linkage shaft</td>
<td>4-18-003-0001</td>
<td>UFL000</td>
<td>KOYO, Japan</td>
</tr>
<tr>
<td>Support roller</td>
<td>4-18-004-0002</td>
<td>E-0835</td>
<td>EASTERN SEIKO, Japan</td>
</tr>
<tr>
<td>Guide roller</td>
<td>4-18-004-0002</td>
<td>E-0835</td>
<td>EASTERN SEIKO, Japan</td>
</tr>
<tr>
<td>Auxiliary roller</td>
<td>4-18-004-0001</td>
<td>E-0620</td>
<td>EASTERN SEIKO, Japan</td>
</tr>
</tbody>
</table>

### Parts Common to IM Series

<table>
<thead>
<tr>
<th>Part</th>
<th>Code Number.</th>
<th>Specification</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tray fixing square-washer</td>
<td>IM41S-30210</td>
<td></td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Washer for tray fixing square-washer</td>
<td>IM41S-30220</td>
<td></td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Bearings for supporting arm</td>
<td>IM41S-30060</td>
<td></td>
<td>Yamato Scientific, Japan</td>
</tr>
<tr>
<td>Bearings for drive pin</td>
<td>4-18-007-0001</td>
<td>ASPF201</td>
<td>NTN, Japan</td>
</tr>
<tr>
<td>Bearings for support shaft</td>
<td>4-18-006-0001</td>
<td>UFL001</td>
<td>FYH, Japan</td>
</tr>
<tr>
<td>Bearings for support shaft</td>
<td>4-18-006-0002</td>
<td>UP001</td>
<td>FYH, Japan</td>
</tr>
</tbody>
</table>
### Dangerous Substances

<table>
<thead>
<tr>
<th>Type</th>
<th>Substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explosive</td>
<td>- Ethylene glycol dinitrate (nitroglycerol), glycerine trinitrate (nitroglycerine), cellulose nitrate (nitrocellulose), and other explosive nitrate esters</td>
</tr>
<tr>
<td></td>
<td>- Trinitrobenzene, trinitrotoluene, trinitrophenol (picric acid), and other explosive nitro compounds</td>
</tr>
<tr>
<td></td>
<td>- Acetyl hydroperoxide (peracetic acid), methyl ethyl ketone peroxide, benzoyl peroxide, and other organic peroxides</td>
</tr>
<tr>
<td>Igniting</td>
<td>- Lithium (metal), potassium (metal), sodium (metal), yellow phosphorus, phosphorus sulfide, red phosphorus, celluloid compounds, calcium carbide, lime phosphide, magnesium (powder), aluminum (powder), powder of metals other than magnesium and aluminum, sodium hydrosulfite</td>
</tr>
<tr>
<td>Oxidizing</td>
<td>- Potassium chlorate, sodium chlorate, ammonium chlorate, and other chlorates</td>
</tr>
<tr>
<td></td>
<td>- Potassium perchlorate, sodium perchlorate, ammonium perchlorate, and other perchlorates</td>
</tr>
<tr>
<td></td>
<td>- Potassium peroxide, sodium peroxide, barium peroxide, and other inorganic peroxides</td>
</tr>
<tr>
<td></td>
<td>- Potassium nitrate, sodium nitrate, ammonium nitrate, and other nitrates</td>
</tr>
<tr>
<td></td>
<td>- Sodium chlorite and other chlorites</td>
</tr>
<tr>
<td></td>
<td>- Calcium hypochlorite and other hypochlorites</td>
</tr>
<tr>
<td>Flammable</td>
<td>- Ethyl ether, gasoline, acetaldehyde, propylene chloride, carbon disulfide, and other flammable substances having a flash point of -30°C or higher but lower than 0°C</td>
</tr>
<tr>
<td></td>
<td>- 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 65°C</td>
</tr>
<tr>
<td></td>
<td>- 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</td>
</tr>
<tr>
<td></td>
<td>- 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</td>
</tr>
<tr>
<td>Flammable liquid</td>
<td>- Hydrogen, acetylene, ethylene, methane, ethane, propane, butane, and other flammable substances which assume a gaseous state at 15°C and 1 atm</td>
</tr>
</tbody>
</table>

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