User Manual

Combi 508

Multi-purpose Centrifuge

Date of Purchase _____

Serial No. _____

Place of Purchase _____

hanil

Combi 508

Manufacturer : Hanil Scientific Inc.

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UM-Combi 508(E)(Rev.4)2026.07.13

CONTENTS

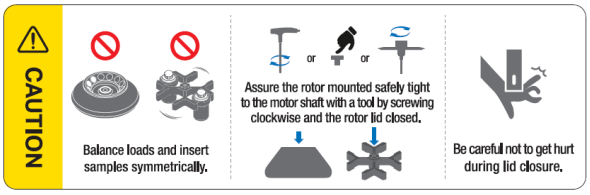
This manual contains detailed instructions for using the centrifuge Combi 508.

To ensure proper use and maintenance of the product, please read the manual before use.

1. Safety information

1.1 Safety label

Users should not remove any labels attached to this unit without permission.

Label	Information
	Mark indicating danger and warning
	Attention and warning for electric shock
	Mark indicating biological hazard
	Mark indicating earth grounding
	Mark manual lid open hole and rotation direction
	Rotor insertion, sample loading and lid closing caution sign

1.2 Safety label information related to the user manual

Label	Information
	Mark indicating danger and warning
	Attention and warning for electric shock
	Mark indicating biological hazard
	Mark indicating explosion warning
	Mark indicating crushing of hands
	Disconnect the electrical plug from the socket
	Refer to the user manual
	Wear protective gloves
	Wear safety shoes

1.3 safety level

Label and color	Information
	Danger! A hazardous situation which can result in death or serious injury.
	Warning! A potentially hazardous situation which can result in serious injury.
	Caution! A potentially hazardous situation which can result in minor injury.
	Note It contains important information regarding the use and damage of the equipment.

1.3.1 safety message

	**Danger!**
	**Risk of electric shock or fire due to failure to check product ratings.** • Ensure that the device rating matches the rating you ordered, and the power cable is suitable for the device's power socket and the service environment. Incorrect connection may cause electric shock or fire. If the product is different from the ordered specifications, please contact your place of purchase.
	**Risk of electric shock due to incorrect power connection.** • Use only the power cable provided with the device. • Plug the power plug into a grounded outlet. Contact your facility's maintenance team or an electrical professional to ensure that the outlet is grounded. • If using a power strip, connect the product after checking the grounding and rated capacity. • Install the device so that the power cable cannot be stepped on. • Do not place anything on the power cable.

	Danger!
  	**Precautions when using, storing, and transporting the product.** • Before storing the device, clean and store the device and accessories according to the management procedures. Otherwise, problems with the performance and stability of the product and accessories may occur. • Before storing or transporting, turn off the power to the product and close the lid. • Before transporting this product, remove the rotor if there is an installed one. Otherwise, the motor shaft may be damaged by the vibration generated when transporting the product. • When carrying the product, there is a risk of injury, so wear personal protective equipment. • Maintain balance while transporting to avoid damage to the device and its components from impacts.
	**Risk of injury due to incomplete installation!** • Ensure the fixed-angle rotor lid is fully locked before use. Operating the fixed-angle rotor without the lid locked can result in loud noise and serious damage. • If you hear any strange noise or sound when the centrifuge is operating, the rotor or rotor lid may not be installed properly. Immediately press the Start/Stop key to stop the product.
	**Do not install in environments with explosion or fire hazard.** • Do not install the device in environments where explosions or fires could occur. • Do not place the device near any materials that may generate a flammable or explosive atmosphere.
	**Risk of product damage due to liquid permeation.** • Be careful to prevent liquids from entering the device, as this can damage electrical, electronic, and mechanical components. • Do not place containers filled with liquids on top of or near the product.
 	**Risk of electric shock if the power is not disconnected.** • Before cleaning the device, ensure it has completely stopped, then turn off all power sources, and unplug the product from the electrical outlet.

	Danger!
	**Risk of electric shock due to skipped drying.** • After cleaning, washing, and removing any contamination, ensure all parts of the device are completely dry before connecting the power source.
 	**Before washing, guidance.** • The product should be placed on a flat surface before cleaning or washing. • When moving the device to another location, clean and disinfect both the exterior and interior before relocation. • Put on appropriate personal protective equipment before cleaning or decontaminating. • When performing tasks such as cleaning, disinfecting, or decontamination, follow the safety regulations of your institution.
	**Before return the device, guidance.** • When returning products or parts for service, repair, or disposal, disinfect or remove any contaminants. • Be sure to fill out a "Decontamination Confirmation Form" and send it together with the device. The "Decontamination Confirmation Form" can be downloaded from the Documents section of the SUPPORT tab on the www.ihanil.com website.
	**Risk of component damage due to exceeding sterilization tolerances.** • When sterilizing by high-pressure steam, do not exceed the specified temperature and time limits (121°C, 20 minutes). Exceeding the tolerances may result in component deformation or device malfunction.

	Warning!
	**Risk due to pathogenic, infectious, toxic, and radioactive materials.** • When handling pathogenic, infectious, toxic, and radioactive materials, observe laboratory biosafety guidelines, applicable national regulations, and the Material Safety Data Sheet (MSDS). • If the material belongs to risk group Ⅱ, refer to the Laboratory Biosafety Manual. • When handling hazardous materials, wear personal protective equipment. • If the centrifuge becomes contaminated with pathogenic, toxic, or radioactive materials, the contaminated material must be thoroughly removed, and necessary measures such as ventilation or isolation must be taken. • If safety measures are not taken, accidents of infection, poisoning, and radioactive exposure may occur.

	Warning!
	**Risk of damage to products and parts due to mechanical or chemical damage.** • Do not use damaged, cracked, or corroded products or parts. • Do not use corrosive chemicals such as strong bases, weak bases, strong acids, cesium, silver, mercury, other heavy metals, phenol, formaldehyde, etc. • If the device or accessories are contaminated, turn off the power immediately and clean it. • Organic solvents may cause damage to the rotor. • After using organic solvents, immediately clean the accessories and the device used.
	**Risk of product damage or accident if the product is impacted or moved during operation.** • Do not move the product while it is in operation. • Do not lean or place objects on the product while it is in operation. • The device gets impacted during operation or movement, which may cause device damage or accidents.
	**Risk of electric shock due to damage to the product and power cord.** • Use a complete product with no external or internal damage. • Do not use a damaged or worn-down power cord.
	**Risk of electric shock due to damaged housing.** • Check the condition of the device housing before connecting to power. If the device housing is damaged or incomplete, there is a risk of electric shock due to high voltage inside. Please contact your supplier or the service team of Hanil Scientific Inc.
	**Risk of crushing when opening and closing the lid.** • When opening and closing the lid, be careful of your fingers. • After closing the lid, you must double-check the closed state. • The device will not start working unless the lid is closed. • When opening the lid, ensure it is fully opened so that it does not close back to its original position.
	**Risk of injury from spinning rotor.** • Do not contact the spinning rotor with your hands or tools. • Do not open the lid or release the lid lock system while the rotor spins.

	Warning!
	**Damage to the rotor due to incorrect rotor handling.** • Do not lift the rotor by holding the angle rotor lid. The rotor may fall, causing rotor damage or injury. • Always use both hands when handling the rotor. • Check the rotor weight, and do not handle some heavy rotors alone. • Ensure the pivot connections between the rotor and buckets are free of damage or foreign objects. After installation, check that the buckets rotate smoothly. If movement is not smooth, apply lubricant.
	**Product damage and risk of injury from loose rotors.** • If the rotor is not tightened securely or installed correctly, Significant vibration and noise may occur. • Stop using the device immediately if you notice severe vibrations or noise.
	**Precaution when installing the rotor.** • Be sure to install a fit tube type that matches the rotor hole shape (diameter, height, bottom shape). • Install buckets in all positions of the swing-out rotor.
	**Disconnect the power after stopping operation**. • Before opening the lid in an emergency, be sure to turn off all power and unplug the cable from the outlet after the device has stopped working.
	**Risk of injury and sample damage when opening the lid manually.** • Manual lid opening must be performed after the machine has completely stopped rotating. Failure to follow this may result in damage to the sample or the user. • Do not close the lid immediately after the emergency opening. Wait for the power to be restored before using the device normally. • Only use the manual lid open in an emergency.
	**Risk of product damage due to insufficient or belated maintenance.** • Follow the maintenance cycles and procedures recommended by the manufacturer. • Select the disinfection method under applicable laboratory and legal regulations. • When performing maintenance, check that the device and parts are not damaged or defective. • Perform regular inspections of electrical safety, a device, parts, etc. at least every 12 months at an official service center of Hanil Scientific Inc. • Contact us for information on main body parts and consumables.

	Caution!
	**Risk of sample damage from heated parts.** • Make sure that the temperature control performance of the centrifuge matches the sample specifications. • For non-refrigerated centrifuges, depending on operating time, speed, and ambient temperature, the temperature of the motor, chamber, rotor, and samples may rise above ambient temperature. • If the sample temperature is important, proceed with the test and check it before use.
	**Risk of product damage due to imbalance.** • After placing the device on a flat and firm surface, balance adjustment must be performed. • If the product is installed imbalanced, it may cause vibration, noise, and failure.
	**Risk of crushing hands when installing the rotor.** • When installing or removing the rotor, be careful with your hands. • Use the provided Rotor Locking Tool to install or remove the rotor.
	**Precautions when inserting the sample tubes.** • If the density of the entire sample exceeds 1.2 g/mL, the maximum rotation speed should be reduced to prevent rotor overload and rotor damage.
	**Risk of product damage due to tube overloading.** • Use only tubes designed specifically for centrifuges. • Check the maximum RCF (g-force) value for each tube specified by the tube manufacturer and do not use more than the maximum RCF (g-force). • Always fill to the capacity specified by the tube manufacturer. • If no allowable capacity is provided, fill the tubes to a level where the centrifuged contents do not spill out.
	**Risk of injury from deformed or open tubes** • Tubes may be deformed or damaged due to autoclaves, organic solvents, etc. • Check the condition of the tubes before using them. • Do not use the deformed or damaged tubes. • Tightly seal all tube covers before use.
	**Risk of product damage and injury due to breakage when using glass tubes.** • Glass tubes may break during centrifugation, causing glass fragments to scatter or be contaminated. • When cleaning broken tubes, wear appropriate personal protective equipment and remove them.

	Caution!
	**Risk of shaft damage due to non-horizontal.** • If the product is not in a level position, it may cause imbalance or damage to the motor shaft.
	**Do not use metal-based cleaning tools.** • Do not use the metal scrubbing or wire brush. This will peel off the product coating and cause corrosion.
	**Risk of injury and product damage due to the use of unauthorized accessories and spare parts.** • Use only provided the rotors, parts, and accessories by Hanil Scientific Inc. Hanil Scientific Inc. is not responsible for damages to the device or accidents caused by using parts and accessories not recommended.
	**Risk of incorrect installation of the adapter** • For 2-stage or 3-stage adapters, ensure that the adapter handles are properly seated in the grooves on both sides of the last top adapter. • Incomplete installation of the 2-stage or 3-stage adapter may result in loss of sample during centrifugation, as well as damage to the adapter and significant damage to the product.

	Note!
	**Risk of product damage due to condensation.** • If When moving the device from a cold environment to a warm environment, condensation can occur and damage electronic components. Ensure the device is fully dry at room temperature for a minimum of 4 hours before referring to [3.3 Power Connection] for connection instructions.
	• When you receive the device, carefully check the appearance of the packaging to ensure that it has not been damaged during transportation on a flat surface where the product will not slip. • If the product packaging is damaged, please get in touch with the supplier immediately. • Contact information can be found at the bottom of the user manual and on the label affixed to the product.
	• The device should be installed so that the power switch, plug, and outlet are easily accessible to the user.

	Note!
	**Electrical requirements** • The rated voltage is 220-230 V~(110-110 V~ optional), and if the voltage varies by more than ±10% from the standard voltage, it may affect the device's precision and reliability. • Ensure a stable power supply to avoid damage to the various components inside the centrifuge. • This device is used with a 220-230 V~(110-110 V~ optional) rated voltage.
	Check Rotor connection • Before use, make sure that the rotor is securely fastened to the motor shaft. **Check Rotor Lid installation** • If you operate a fixed angle rotor, make sure that the rotor lid is properly locked. If not, it may cause very loud noise and serious damage.
	Manual lid open • When the lid cannot be opened automatically and the device is not powered, samples can be removed from the rotor using this method..
	Do not store bleach • Use freshly made 10% bleach for disinfection each time. • Bleach loses its effectiveness after 24 hours when diluted with water, so use it immediately without storing it.

1.4 General Considerations

Before using this product, be sure to read the user manual carefully and observe all safety precautions. This will help prevent malfunctions that may occur during use.

1. Always make sure that the device is fixed on a safe level surface that can withstand shaking and the weight of the device during operation. If the device operates with a tilted shaft, it may cause great vibration and product damage.
2. Do not move the device during operation, and leave a safe space within 30 cm around the centrifuge for user safety and surroundings. Ensure there is always enough space around the device for proper air circulation.
3. Install the device in a location where temperature and humidity can be controlled.
4. Before connecting the power, the rated voltage should be checked. Using the device with an incorrect voltage connection can cause damage to the equipment and pose a risk of personal injury.
5. Use only rotors and recommended parts and accessories provided by Hanil Scientific Inc. Hanil Scientific Inc. is not responsible for damages to the product or accidents caused by using parts and accessories not recommended.
6. The chamber must always be kept dry before using the centrifuge.
7. Before using the device, make sure that the rotor and rotor lid are securely locked. The rotor must be properly installed and securely locked onto the shaft before use. If the rotor lid detaches during rotation, it can cause significant damage to the product or the sample.
8. Ensure the rotor is securely locked on the motor shaft by manually.
9. Do not use your hand to stop the rotor while the device is running.
10. The emergency lid opening should only be used when the device has completely stopped.
11. If the density of the entire sample exceeds 1.2 g/mL, the maximum rotation speed should be reduced to prevent rotor overload and rotor damage.
12. Samples should be filled only up to the capacity specified by the tube manufacturer. Otherwise, the tube may break or the sample solution may leak.
13. To prevent unbalanced rotors, tubes should always be symmetrically loaded with well-balanced (weight, material, density and volume) samples. If necessary, you can use water to achieve symmetry and balance.

14. The operating speed should not be higher than the individual maximum g-values of the centrifuge, rotor, bucket or adapter and sample tube. In particular, the maximum g-value of the sample tube should not be neglected.
15. The rotor should be cleaned and dried after each use to ensure long life and safety.
16. The rotor must be handled with care as it can corrode when exposed to cleaning agents like strong acids, strong bases, cesium, silver, or salts.
17. Turn off the power switch after using the device.
18. Always disconnect the power supply during long periods of non-use, cleaning, regular maintenance, or servicing to avoid electric shock.
19. After centrifugation of biological materials, follow validated disinfection procedures.
20. Do not centrifugation flammable, toxic, radioactive, explosive, or corrosive substances.
21. If it is necessary to use toxic or radioactive substances or pathogenic microorganisms belonging to WHO Risk Group Ⅱ, the national regulations of the "Laboratory Bio-safety Manual" must be observed.

1.5 Electric safety

	Danger!
	**Risk of electric shock or fire due to failure to check product ratings.** • Ensure that the device rating matches the rating you ordered, and the power cable is suitable for the device's power socket and the service environment. Incorrect connection may cause electric shock or fire. If the product is different from the ordered specifications, please contact your place of purchase.
	**Risk of electric shock due to incorrect power connection.** • Use only the power cable provided with the device. • Plug the power plug into a grounded outlet. Contact your facility's maintenance team or an electrical professional to ensure that the outlet is grounded. • If using a power strip, connect the product after checking the grounding and rated capacity. • Install the device so that the power cable cannot be stepped on. • Do not place anything on the power cable.

	Warning!
	**Risk of electric shock due to damage to the product and power cord.** • Use a complete product with no external or internal damage. • Do not use a damaged or worn-down power cord.

	Note!
	**Risk of product damage due to condensation.** • If When moving the device from a cold environment to a warm environment, condensation can occur and damage electronic components. Ensure the device is fully dry at room temperature for a minimum of 4 hours before referring to [3.3 Power Connection] for connection instructions.

1. If you have the following emergencies, shut off the power supply and unplug the power cord from outlet and contact your Supplier or Hanil Scientific Inc.
   - Unusual noises or smell from the device.
   - Damage or wear on a power cord.
   - Breakdown of circuit breaker, fuse or safety device.
   - If you spill liquid on the device.
   - If the device is damaged.

1.6 Use Conditions, Storage, Transportation

	Danger!
  	**Precautions when using, storing, and transporting the product.** • Before storing the device, clean and store the device and accessories according to the management procedures. Otherwise, problems with the performance and stability of the product and accessories may occur. • Before storing or transporting, turn off the power to the product and close the lid. • Before transporting this product, remove the rotor if there is an installed one. Otherwise, the motor shaft may be damaged by the vibration generated when transporting the product. • When carrying the product, there is a risk of injury, so wear personal protective equipment. • Maintain balance while transporting to avoid damage to the device and its components from impacts.

Use Conditions

Usage Environment	Indoor (without direct sunlight)
Indoor Temperature	5 to 40℃
Relative Humidity	Maximum relative humidity of 80% (non-condensing)
Pressure	500 ~ 1,060 hPa
Maximum Altitude	2 000 m
Overvoltage Category	II
Pollution Degree	2

Storage & Transportation

Ambient Temperature	-18 to 40℃
Humidity	10 ~ 90%

2. Product Description

2.1 Intended use

The device is used mainly in the laboratory to separate the components through centrifugal force.

2.2 Intended use

This device must be operated by a professional who has received professional education, training and specialized skills for the using procedure.

2.3 Safety Features Functions

- Error Alarm

If a problem occurs with the device, an error code displays with a sound.
Detailed error codes are in [6.2. Error codes].

- Apply steel frame

The chamber is installed in a steel frame, and the inside of the lid is also made of steel plate to prevent damage that occurs inside the chamber from being ejected externally.

2.4 Structure

① Lid : Protects the inner chamber and prevents the rotor from escaping in case of danger.

② Lid Latch: A part that keeps the lid closed.

③ RPM measuring window: A part that measures the rotor speed with a tachometer.

④ Chamber: A space where the rotor is installed and can rotate.

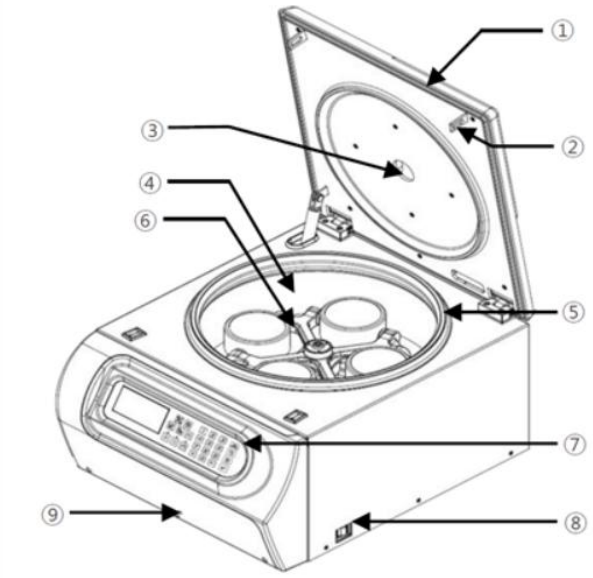
⑤ Lid Packing: Packing that seals the lid when the rotor rotates to circulate air effectively.

⑥ Rotor: Connected to the motor shaft, it holds and rotates the sample.

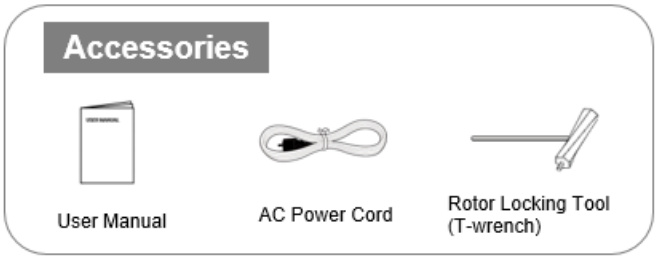
⑦ Control Panel: Used to set time and speed.

⑧ Power Switch: A switch for ON/OFF after connecting the power.

⑨ Emergency Open Hole: A device that allows manual opening of the lid in case of an emergency such as a power outage.



2.5 Components



※ Rotor sold separately (see 7. Rotor & Accessories)

2.6 Technical Specifications

Max. RPM/RCF	Fixed angle	8,000 rpm / 8,279 xg
	Swing out	4,000 rpm / 3,515 xg
Max. Capacity	Fixed angle	6 x 85 m L
	Swing out	4 x 750 mL
Time control		Timed < 2hr , continuous
Program memory		100
ACC/DEC ramps		10 / 10
Noise level		< 65 dB
Imbalance cutout		Yes
Power Supply (V/Hz)		220-230 V~, 50/60 Hz (100-110 V~ , 50/60 Hz optional)
Power Requirement (VA)		1.0 kVA
Weight without rotor		61 kg
Dimension (W x D x H)		530 x 676 x 400 mm
Cat No.		CB-508

3. Preparation before use

3.1 Packing Inspection

	Note!
	• When you receive the device, carefully check the appearance of the packaging to ensure that it has not been damaged during transportation on a flat surface where the product will not slip. • If the product packaging is damaged, please get in touch with the supplier immediately. • Contact information can be found at the bottom of the user manual and on the label affixed to the product.

1. After purchasing the centrifuge, open the packaging and verify the contents of the components.

▶ Refer to [2.5. Components] to check the list of components.

3.2 Installation

3.2.1 Selecting the location

Only certified companies and personnel from Hanil Scientific Inc. are authorized to install the device. Please verify and comply with the following guidelines during installation.

	Note!
	• The device should be installed so that the power switch, plug, and outlet are easily accessible to the user.

	Danger!
	**Do not install in environments with explosion or fire hazard.** • Do not install the device in environments where explosions or fires could occur. • Do not place the device near any materials that may generate a flammable or explosive atmosphere.

1. Installation on hard and flat ground.

▶ Centrifuge should be installed on hard and flat place.

▶ If the centrifuge is installed in an inclined place, the shaft can be bent due to the weight of the rotor.

2. Install it in a location where smooth ventilation is possible.

▶ Keep at least 30 cm of space around the device for safe use.

3. Constant temperature/humidity

▶ Centrifuge equipped with sensitive electronic components which is fragile with humidity and temperature. Please refer to [1.6 Use Conditions, Storage, Transportation] for information regarding temperature and humidity.

▶ Do not install it near direct sunlight or heating devices.

4. Avoid the corrosive gas

▶ Install the centrifuge in a place where corrosive gas is not generated.

5. Avoid installing the device in areas with electromagnetic radiation.

▶ Do not expose the device or accessories to an environment or near equipment that generates electromagnetic radiation. This may reduce the performance and stability of the device and accessories.

3,3 Power Connection

	**Warning!**
	**Risk of electric shock due to damaged housing.** • Check the condition of the device housing before connecting to power. If the device housing is damaged or incomplete, there is a risk of electric shock due to high voltage inside. Please contact your supplier or the service team of Hanil Scientific Inc.

1) Connect the AC power cord to the power socket on the right back of the main unit and put the plug into the outlet.

2) Press the power switch [ON/OFF] located on the right side of the main unit in the ON direction [ON].

▶ If you do not hear a beep when initially powering on the device, it may be defective.
Please contact the place of purchase.

	**Note!**
	**Electrical requirements** • The rated voltage is 220-230 V~(100-110V~ Optional), and if the voltage varies by more than ±10% from the standard voltage, it may affect the device's precision and reliability. • Ensure a stable power supply to avoid damage to the various components inside the centrifuge. • This device is used with a 220-230 V~(100-110V~ Optional) rated voltage.

3.4 Opening the Lid

	Warning!
	**Risk of crushing when opening and closing the lid.** • When opening and closing the lid, be careful of your fingers. • After closing the lid, you must double-check the closed state. • The device will not start working unless the lid is closed. • When opening the lid, ensure it is fully opened so that it does not close back to its original position.
	**Risk of injury from spinning rotor.** • Do not contact the spinning rotor with your hands or tools. • Do not open the lid or release the lid lock system while the rotor spins.

1) Opening the Lid

▶ Press the Lid button while the power is connected.

2) Closing the Lid

▶ Put both hands on the lid and close it with light force.

3.5 Installing/Removing the rotor

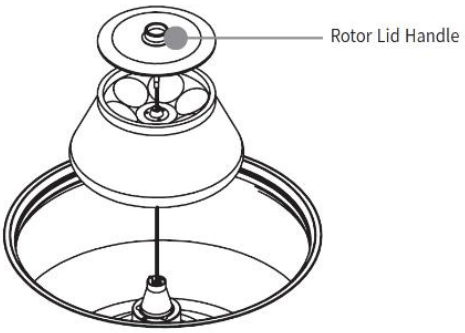
	Warning!
	**Damage to the rotor due to incorrect rotor handling.** • Use only the rotors recommended by Hanil Scientific Inc. • Do not use rotors, buckets, or adapters with visible corrosion or mechanical defects • Do not lift the rotor by holding the angle rotor lid. The rotor may fall, causing rotor damage or injury. • Always use both hands when handling the rotor. • Check the rotor weight, and do not handle some heavy rotors alone. • Ensure the pivot connections between the rotor and buckets are free of damage or foreign objects. After installation, check that the buckets rotate smoothly. If movement is not smooth, apply lubricant.
	**Product damage and risk of injury from loose rotors.** • If the rotor is not tightened securely or installed correctly, Significant vibration and noise may occur. • Stop using the device immediately if you notice severe vibrations or noise.

⚠	**Caution!**
	**Risk of crushing hands when installing the rotor.** • When installing or removing the rotor, be careful with your hands. • Use the provided Rotor Locking Tool to install or remove the rotor..

[**Installing/Removing the Angle Rotor**]

When removing or replacing the rotor, please follow the steps below.

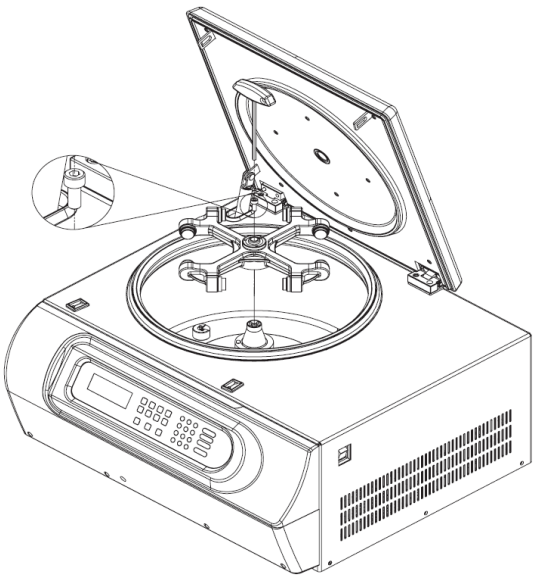
1. Before installing the rotor remove any foreign object or moisture from the chamber.
2. Load the rotor vertically onto the motor shaft.
3. Put the rotor lid on the rotor body.
4. Turn the rotor lid handle clockwise until it secured.
   - ▶ Installing : Turn the lid handle clockwise
   - ▶ Removing : Turn the lid handle counterclockwise
5. Ensure that the rotor is fully locked.
   - ▶ If the rotor lid is not properly secured, it may lead to accidents. Make sure it is securely fastened.



[**Installing/Removing the Swing Rotor**]

1. Before installing the rotor remove any foreign object or moisture from the chamber.
2. Load the rotor vertically onto the motor shaft.
3. Put the rotor lid on the rotor body.
4. Using a Rotor Locking Tool, Turn the rotor lid handle clockwise until it secured.
   - ▶ Installing : Turn the lid handle clockwise
   - ▶ Removing : Turn the lid handle counterclockwise
5. Ensure that the rotor is fully locked.

▶ If the rotor lid is not properly secured, it may lead to accidents. Make sure it is securely fastened.

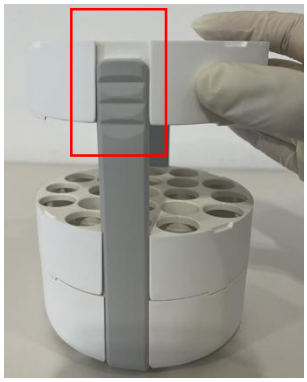


	Note!
	Check rotor installation before operation • Before using it, make sure that the rotor is securely fastened to the motor shaft. **Check rotor lid installation** • For the fixed angle rotor, make sure the rotor lid is completely locked.

6) Check the maximum load and height per bucket (adapter, container, or plate and contents).

7) Make sure the adapter fits the sample tube correctly.

	Precautions!
	Risk of incorrect installation of the adapter • For 2-stage or 3-stage adapters, ensure that the adapter handles are properly seated in the grooves on both sides of the last top adapter. • Incomplete installation of the 2-stage or 3-stage adapter may result in loss of sample during centrifugation, as well as damage to the adapter and significant damage to the product.



▶ Ensure that the adapter handles fit properly into the grooves on both sides of the adapter.

Correct

Incorrect

3.6 Loading Tubes

	**Warning!**
	**Precaution when installing the rotor.** • Be sure to install a fit tube type that matches the rotor hole shape (diameter, height, bottom shape). • Install buckets in all positions of the swing-out rotor.

	**Caution!**
	**Precautions when inserting the sample tubes.** • If the density of the entire sample exceeds 1.2 g/mL, the maximum rotation speed should be reduced to prevent rotor overload and rotor damage.
	**Risk of product damage due to tube overloading.** • Use only tubes designed specifically for centrifuges. • Check the maximum RCF (g-force) value for each tube specified by the tube manufacturer and do not use more than the maximum RCF (g-force). • Always fill to the capacity specified by the tube manufacturer. • If no allowable capacity is provided, fill the tubes to a level where the centrifuged contents do not spill out.
	**Risk of injury from deformed or open tubes** • Tubes may be deformed or damaged due to autoclaves, organic solvents, etc. • Check the condition of the tubes before using them. • Do not use the deformed or damaged tubes. • Tightly seal all tube covers before use.
	**Risk of product damage and injury due to breakage when using glass tubes.** • Glass tubes may break during centrifugation, causing glass fragments to scatter or be contaminated. • When cleaning broken tubes, wear appropriate personal protective equipment and remove them.

1) Before loading sample tubes, check the moisture or any foreign material in the rotor hole.

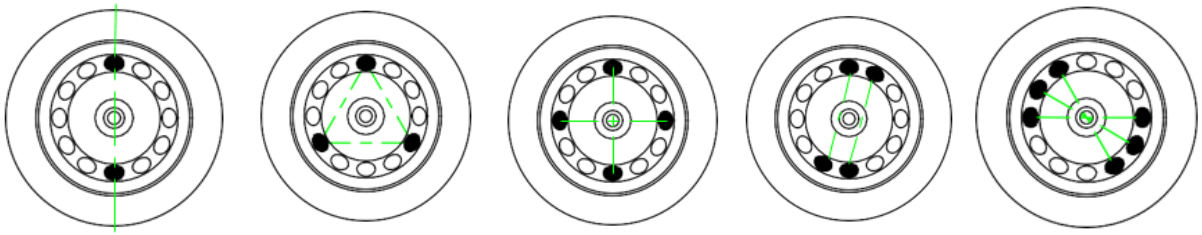
▶ If there is any foreign material or moisture, remove it with soft dry cloth.

2) Tubes should be symmetrically inserted with well-balanced (weight, material, density, and volume) samples. If an appropriated balance is not provided, unexpected accidents can result from a damaged rotor or centrifuge.

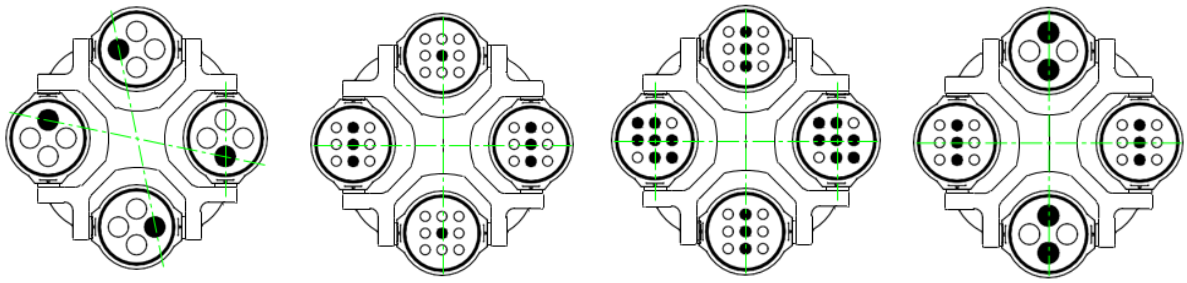
▶ Ensure that only centrifuge-compatible tubes are used, verify the maximum RCF values provided by the tube manufacturer, and do not use them beyond the specified limits.

▶ sample should be filled up to the recommended volume by tube manufacturer.
if the manufacturer of the tube has not specified the maximum level, fill the tubes so that the centrifuged substance does not run out of the vessel during centrifugation.

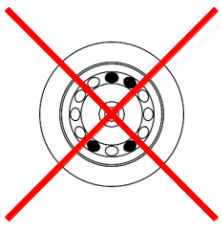
Correct loading examples for fixed angle rotors



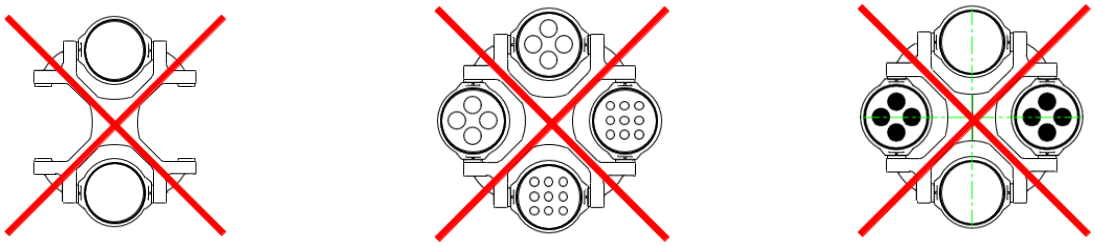
Correct loading examples for swing out rotors



Incorrect loading examples for fixed angle rotors



Incorrect loading examples for swing out rotors



3.7 Recommended Tubes for Angle Rotors

Rotor	Adaptor	Bore (Ø x L, mm)	Tube Capacity	Tube	Tube Material	Max. g-force(xg)	Tube dimension O.D. x h, mm
A10-12	-	16.3 x 74.5	10 mL	Nalgene 3119-0010	PPCO	50,000 xg	16.1 x 80.5
A15S-12	-	17 x 96	15 mL	Nalgene 3110-0160 (cap available separately DS3111-0018)	PPCO	50,000 xg	15.8 x 112.8
A15c-12	-	17 X 115	15 mL conical	FALCON 352096 Eppendorf 0030122151	PP	12,000 xg 19,500 xg	17 x 120 17 x 121
A50-6 A50-8	-	29 x 100	50 mL	Nalgene 3118-0050 Nalgene 3119-0050	PC PPCO	50,000 xg 100,605 xg	28.8 x 106.4 28.8 x 105.9
	TR15(50)	17 x 94	50 mL	Nalgene 3110-0150 (cap available separately DS3111-0016)	PPCO	50,000 xg	15.8 x 112.8
	TR15c(50)	17 x 105	15 mL conical	FALCON 352096 Eppendorf 0030122151 Corning 430052	PP	12,000 xg 19,500 xg 12,000 xg	17 x 120 17 x 121 17 x 118.5
A50c-6	-	30 x 108.6	50 mL conical	FALCON 352070	PP	16,000 xg	30 x 115
A85-6	-	38.3 x 95	85 mL	Nalgene 3118-0085	PC	50,000 xg	38.2 x 105.2
	TR50(85)	29 x 95	50 mL	Nalgene 3118-0050 3119-0050	PC PPCO	50,000 xg 100,605 xg	28.8 x 106.4 28.8 x 105.9
	TR50c(85)	29.5 x 100	50 mL conical	Orange 4440100N FALCON 352070 SPL 50050	PP PP PP	12,000 xg 16,000 xg 14,000 xg	30 x 114 30 x 115 30 x 115
	TR15(85)	17 x 94	15 mL	Nalgene 3110-0150 (cap available separately DS3111-0016)	PPCO	50,000 xg	15.8 x 112.8
	TR15c(85)	17 x 100	15 mL conical	FALCON 352096	PP	12,000 xg	17 x 120

Tube Material

PPCO : Polypropylene copolymer

PP : Polypropylene

PC : Polycarbonate

Swing-out Rotor: S750-4

Adaptor	Bore (Ø x L, mm)	Tube	Tube Capacity	Tube Material	Max. g-force(xg)	Tube dimension O.D. x h, mm
-	99 x 103 (B750)	Thermo 75003699	750 mL	Polypropylene	-	98 x 133
TR500(750)	75.5 x 98.7	Hanil HI_TB-w500	500 mL	PP		73.7 x 143
TR500c(750)	99 x 57.8	Corning 431123	500 mL	PP	6,000 xg	95.5 x 148.6
TR250(750)	62.3 x 87	Nalgene 3120-0250	250 mL conical	PPCO	13,200 xg	61.8 x 125.2
		Nalgene 3122-0250		PC	27,500xg	61.8 x 125.2
		Autofil 1801-RLS		PP	8,250xg	61 x 127
		Autofil1803-RLS		PP	27,500xg	61 x 127
		Autofil 1802-RLS		PC	8,250xg	61 x 127
		Autofil 1804-RLS		PC	31,700xg	61 x 127
TR50-7	29.2 x 97	Nalgene 3118-0050 Nalgene 3119-0050	50 mL	PC PPCO	50,000xg 100,605xg	28.8 x 106.4 28.8 x 105.9
TR50c-5	29 x 91	FALCON 352070	50 mL conical	PP	16,000xg	30 x 115
TR15-19	17.2 x 87	BD vacutainer 7.5mL~10mL Φ16mm x h 75~100mm	7.5 ~10 mL	-	-	16 x 75~100
		vacuette 7~9 mL tubes Φ16mm x h 100mm	7~ 9 mL	-	-	16 x 100
		Nalgene 3110-0150 (cap available separately DS3111-0016)	15 mL	PPCO	50,000 xg	15.8 x 112.8
T15c-14	17 x 89	SPL 50015	15 mL conical	PP	9,000 xg	17 x 120
		Eppendorf 0030122151		PP	19,500 xg	17 x 121
T10-21	16 x 87	BD vacutainer 7.5~10 mL Φ16mm x h 75~100mm	7.5 ~10 mL	-	-	16 x 75~100
		vacuette 7~9 mL tubes Φ16mm x h 100mm	7~ 9 mL	-	-	16 x 100
T5-24	13.2 x 60 (3 mL)	BD 1.8ml~7 mL vacutainer Φ13mm x h 75~100mm	1.8~7 mL	-	-	13 x 75~100
	13.2 x 87 (5 mL)	vacuette 1~ 6 mL tubes Φ13mm x h 75~100mm	1~ 6 mL	-	-	13 x 75~100

Tube Material

PPCO : Polypropylene copolymer

PP : Polypropylene

PC : Polycarbonate

Swing-out Rotor: S500-4

Adaptor	Bore (Ø x L, mm)	Tube	Tube Capacity	Tube Material	Max. g-force(xg)	Tube dimension O.D. x h, mm
TR500(500)	73 x 125	Hanil HI_TB-w500	500 mL	PP		73.7 x 143
TR250(500)	62 x 100	Nalgene 3120-0250	250 mL	PPCO	13,200 xg	61.8 x 125.2
		Nalgene 3122-0250		PC	27,500xg	61.8 x 125.2
		Autofil 1801-RLS		PP	8,250xg	61 x 127
		Autofil1803-RLS		PP	27,500xg	61 x 127
		Autofil 1802-RLS		PC	8,250xg	61 x 127
		Autofil 1804-RLS		PC	31,700xg	61 x 127
TR100(500)	38.5 x 84.5	Beckman 345775	94 mL	PP	40,000 xg	32 x 102
TR50-4	29.5 x 85.5	Nalgene 3118-0050	50 mL	PC	50,000xg	28.8 x 106.4
		Nalgene 3119-0050		PPCO	100,605xg	28.8 x 105.9
TR50c-3	30 x 90	Orange 4440100N	50 mL conical	PP	12,000 xg	30 x 114
		Falcon 352070			16,000 xg	30 x 115
		Eppendorf 0030122178			19,500 xg	30 x 116.2
TR15-19	16.5 x 85	BD vacutainer 7.5mL~10mL Φ16mm x h 75~100mm	7.5 ~10 mL	-	-	16 x 75~100
		vacuette 7~9 mL tubes Φ16mm x h 100mm	7~ 9 mL	-	-	16 x 100
T15c-7	17 x 95.5	SPL 50015	15 mL conical	PP	9,000 xg	17 x 120
		Eppendorf 0030122151			19,500xg	17 x 121
		Orange 4440300N			10,000xg	16.8 x 118.8
T10-9	17 x 64	BD vacutainer 7.5~10 mL Φ16mm x h 75~100mm	7.5 ~10 mL	-	-	16 x 75~100
		vacuette 7~9 mL tubes Φ16mm x h 100mm	7~ 9 mL	-	-	16 x 100
		Nalgene 3119-0010	10 mL	PP	50,000xg	16.1 x 80.5
TR5-9	13 x 64	BD 1.8mL~7mL vacutainer Φ13mm x h 75~100mm	1.8ml~7ml	-	-	13 x 75~100
		vacuette 1~ 6 mL tubes Φ13mm x h 75~100mm	1~ 6 ml tubes	-	-	13 x 75~100

Tube Material

PPCO : Polypropylene copolymer

PP : Polypropylene

PC : Polycarbonate

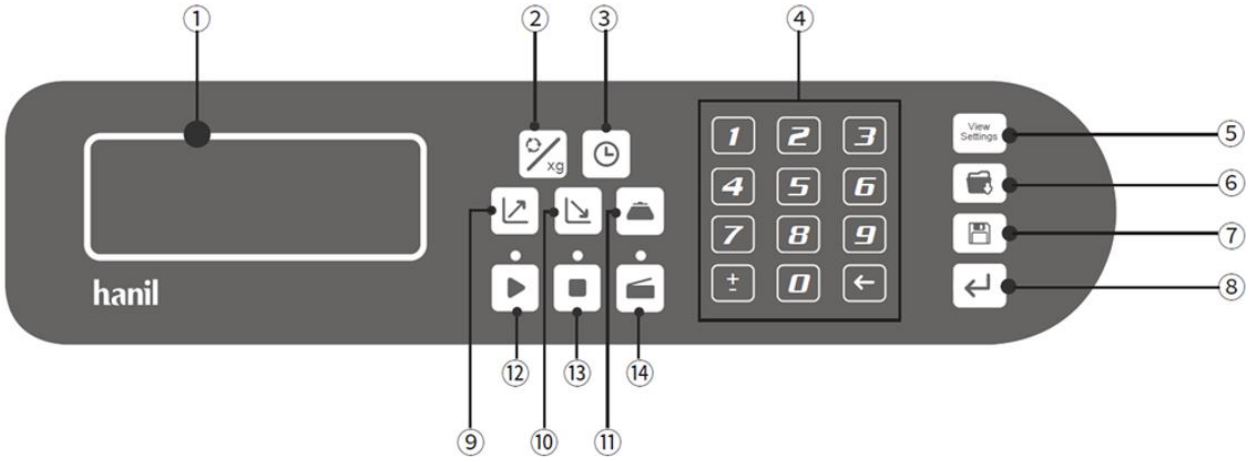
4. Operation

	Danger!
	**Risk of product damage due to liquid permeation.** • Be careful to prevent liquids from entering the device, as this can damage electrical, electronic, and mechanical components. • Do not place containers filled with liquids on top of or near the product.

	Warning!
	**Risk due to pathogenic, infectious, toxic, and radioactive materials.** • When handling pathogenic, infectious, toxic, and radioactive materials, observe laboratory biosafety guidelines, applicable national regulations, and the Material Safety Data Sheet (MSDS). • If the material belongs to risk group Ⅱ, refer to the Laboratory Biosafety Manual. • When handling hazardous materials, wear personal protective equipment. • If the centrifuge becomes contaminated with pathogenic, toxic, or radioactive materials, the contaminated material must be thoroughly removed, and necessary measures such as ventilation or isolation must be taken. • If safety measures are not taken, accidents of infection, poisoning, and radioactive exposure may occur.
	**Risk of damage to products and parts due to mechanical or chemical damage.** • Do not use damaged, cracked, or corroded products or parts. • Do not use corrosive chemicals such as strong bases, weak bases, strong acids, cesium, silver, mercury, other heavy metals, phenol, formaldehyde, etc. • If the device or accessories are contaminated, turn off the power immediately and clean it. • Organic solvents may cause damage to the rotor. • After using organic solvents, immediately clean the accessories and the device used.
	**Risk of product damage or accident if the product is impacted or moved during operation.** • Do not move the product while it is in operation. • Do not lean or place objects on the product while it is in operation. • The device gets impacted during operation or movement, which may cause device damage or accidents.

	Caution!
	Risk of sample damage from heated parts. • Make sure that the temperature control performance of the centrifuge matches the sample specifications. • For non-refrigerated centrifuges, depending on operating time, speed, and ambient temperature, the temperature of the motor, chamber, rotor, and samples may rise above ambient temperature. • If the sample temperature is important, proceed with the test and check it before use.

4.1 Control Panel



Button	Description
① Display	- Indicate Speed/Time/Temperature/Acc.Dec.
② Speed	- Press once : Setting the RPM / Press twice: Setting the RCF
③ Time	- Setting run time
④ Numeric buttons	- Enter a value using the numeric buttons
⑤ View Setting	- Verifying the setting parameters during centrifugation
⑥ Program call	- Saving a program
⑦ Program save	- Calling up a program
⑧ Enter	- Press the enter after setting the parameters
⑨ Acceleration	- Setting acceleration step
⑩ Deceleration	- Setting deceleration step
⑪ Rotor ID.	- When rotor id is not identified automatically, enter the rotor ID. manually
⑫ Start	- Starting centrifugation
⑬ Stop	- Stopping centrifugation
⑭ Lid	- Opening the lid

4.2 Setting Rotor ID. Manually

Note!

- This device automatically recognizes the rotor ID, but if there is a recognition error, please manually enter the ID and use it.

When rotor id is not identified automatically, enter the rotor ID. manually.

1. Loading the rotor
2. Close the lid.
3. Press the Rotor ID. button.
4. Set the Rotor ID. using the numeric buttons.
5. Press the Enter button.

Rotor	Rotor ID
A0.2-48	18
A2.0-24	1
A2.0-36	14
A10-12	2
A15-12	4
A15c-12	8
A50-6	5
A50c-6	6
A50c-8	15
A50-8	7
A85-6	9
S500-4	12
S750-4	13

4.3 Setting Speed

To switch the RPM↔RCF setting mode, press the Speed button twice.

[Setting RPM]

1. RPM setting mode : Press the Speed button once.

   (If it is displayed as xg, press the Speed button twice to change it to RPM, then press the Speed button once.

   ▶ RPM setting mode: The rpm indicator blinks on the display screen.

2. Press the numeric buttons to set the desired RPM value(rpm).

3. Press the Enter button.

[Setting RCF]

1. RCF setting mode : Press the Speed button once.

   (If it is displayed as rpm, press the Speed button twice to change it to RCF, then press the Speed button once.

   ▶ RCF setting mode: The xg indicator on the display screen blinks.

2. Press the numeric buttons to set the desired RCF value(xg).

3. Press the Enter button.

4.4 Setting Run Time

1. Press the Time button.

   ▶ Time setting mode: Time 00:00:00 display flashes.

2. Press the numeric buttons to set the desired run time.

   ▶ Up to 99hr 99min 99sec

   ▶ Setting the time to 0 enables continuous operation (Continuous Run).

3. Press the Setup/Enter button.

4.5 Setting Acceleration/Deceleration (ACC/DEC)

1. Press the ACC or DEC button.

▶ Acceleration setting mode: ACC (↗) display flashes.

▶ Deceleration setting mode: DEC (↘) display flashes.

2. Press the numeric buttons to set the desired ACC or DEC rate.

▶ ACC rate: 0~9 / DEC rate: 0~9

▶ The larger the acceleration setting step number, the faster the acceleration speed. The smaller the number, the slower the acceleration speed.

▶ The larger the deceleration setting step number, the faster the deceleration speed. The smaller the number, the slower the deceleration speed.

3. Press the Enter button.

4.6 Saving/Calling up a Program

	**Note!** • When operating the device under various conditions, you can save the settings such as speed and time in advance and then call them up and use them immediately when needed.

[Saving]

1. Enter the desired speed, time, acceleration, and deceleration settings.

▶ Program Setting Mode: The program indicator (P:0) will blink on the display screen.

2. Press the Program Save button.

3. Press the numeric buttons to set the desired program number.

▶ Up to 0~99: 100.

4. Press the Enter button.

	**Note!** • Program calls are designed to call programs stored between 00 and 99.

[Calling up]

1. Press the Program Call button.

▶ Program Setting Mode: The program indicator (P:0) will blink on the display screen.

2. Press the numeric buttons to set the desired program number.

3. Press the Enter button.

4.7 Start/Stop a Run

[Start a run]

1. Check all parameters are correct.

2. Press the Start button.

▶ If the lid is not completely closed, pressing the Start button will not work.

[Stop a run]

1. Press the Stop button

4.8 Checking the Cycle Count

1) Press and hold the View Setting button for 3 seconds while the device is in a stopped state.

▶ A Cycle popup will appear, allowing you to check the cumulative cycle count.

2) Press the Enter button to dismiss the pop-up.

4.9 Emergency Lid open

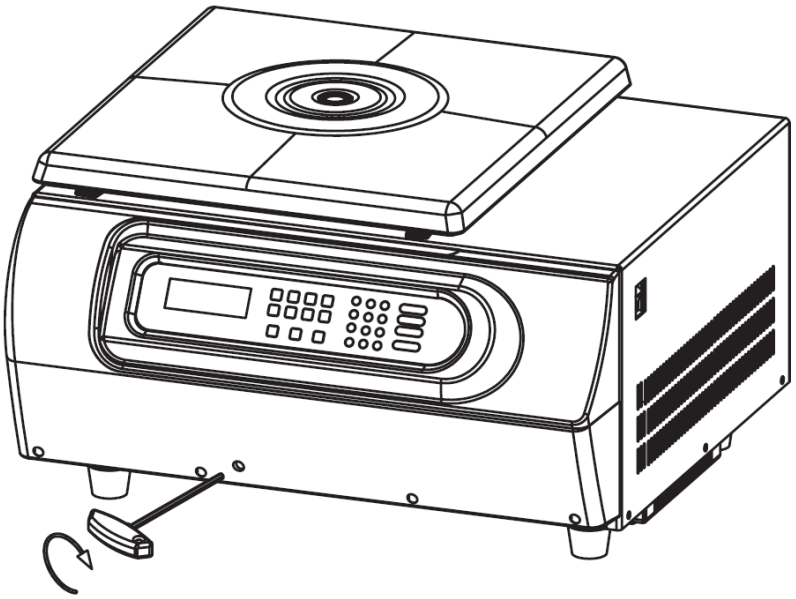
	Note!
	Manual lid open • When the lid cannot be opened automatically and the device is not powered, Samples can be removed from the rotor using this method.

	Warning!
	Disconnect the power after stopping the operation. • Before opening the lid in an emergency, be sure to turn off all power and unplug the cable from the outlet after the device has stopped working.
	Risk of injury and sample damage when opening the lid manually. • Manual lid opening must be performed after the machine has completely stopped rotating. Failure to follow this may result in damage to the sample or the user. • Do not close the lid immediately after the emergency opening. Wait for the power to be restored before using the device normally. • Only use the manual lid open in an emergency.

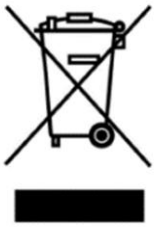
1) Turn off the main power switch. Wait for the rotor to stop spinning.

2) Find the emergency lid release open hole on the front side of the device.

3) Insert the Rotor Locking Tool (T-wrench) into the hole and turn it clockwise to open the Lid.



4.9 Disposal



Directive 2012/19/EU is the basis for the disposal of waste electrical and electronic equipment (WEEE) with in the European Community.

The waste disposal guidelines of the individual EC countries might vary. If necessary, contact your supplier.

This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste.

Protecting the environment and preventing pollution spread require proper disposal of both the equipment and waste.

This product cannot be disposed of as household waste. When disposing of the equipment and waste, always follow the waste disposal regulations and guidelines in your country.

5. Maintenance

5.1 Storage and management method after use

Be sure to unplug the power cord from the outlet before cleaning.

[Unit]

1) If the device is contaminated due to sample leakage, clean it with a soft cloth soaked in neutral detergent. Then, dry completely with a dry soft cloth.

2) Do not use chemicals such as alcohol, benzene, toluene, etc., as they can damage the device.

3) Be careful not to create scratches on the surface of the device during movement or cleaning.

▶Do not use cleaning tools with rough surfaces that may scratch equipment during cleaning.

Any scratches on the surface may cause rust.

▶In case of rust due to prolonged dampness after use, clean the rust with a neutral detergent and dry it with a cloth.

[Chamber]

1) Keep dry inside the chamber after every use.

2) In case of chamber contamination, immediately dampen a soft sponge with lukewarm water and neutral detergent, clean the area, and then wipe it dry with a soft cloth.

[Shaft]

1) If foreign matter adheres to the shaft and causes unstable rotation, it can cause imbalance problems during high-speed rotation, so it is important to keep it clean.

2) After using the instrument, take out the rotor from the shaft, and wipe the shaft with dry soft cloth to keep it dry.

3) If the rotor cannot be removed from the shaft, do not remove the rotor with excessive force. Contact a service center.

[Rotor]

1) If an acid, base solution, or solution spills from the tube, immediately wipe it off with a soft cloth dampened with warm water and store it in a dry place.

2) Check the tube holes or buckets of the fixed angle rotor for contamination of the solution and keep it dry. Fixed angle rotors during a long time of non-use, separate the rotor lid and store the main body upside down.

5.2 User checklist

	**Warning!**
	**Risk of product damage due to insufficient or belated maintenance.** • Follow the maintenance cycles and procedures recommended by the manufacturer. • Select the disinfection method under applicable laboratory and legal regulations. • When performing maintenance, check that the device and parts are not damaged or defective. • Perform regular inspections of electrical safety, a device, parts, etc. at least every 12 months at an official service center of Hanil Scientific Inc. • Contact us for information on main body parts and consumables. • Dust accumulation in the vent may cause device failure or fire.

1) Check that the connection point of the rotor hub is not separated or bent.

2) Rotate the shaft manually and check if there is any noise or if it rotates smoothly.

3) Visually inspect the rotor for any cracks, clean the connection points, and check for any signs of wear.

4) Set the time to 10 minutes and use a stopwatch to verify the accuracy of the time.

5) Prepare four pieces of paper of the same size (2 cm wide x 15 cm long) and place them evenly spaced on the rubber packing of the chamber upper part with the lid open.
Close the lid. If the lid is completely sealed, the paper won't slide smoothly when pulled due to friction.

5.3 Cleaning and decontamination

	Danger!
 	**Risk of electric shock if the power is not disconnected.** • Before cleaning the device, ensure it has completely stopped, then turn off all power sources, and unplug the product from the electrical outlet.
	**Risk of electric shock due to skipped drying.** • After cleaning, washing, and removing any contamination, ensure all parts of the device are completely dry before connecting the power source.
 	**Before washing, guidance.** • The product should be placed on a flat surface before cleaning or washing. • When moving the device to another location, clean and disinfect both the exterior and interior before relocation. • Put on appropriate personal protective equipment before cleaning or decontaminating. • When performing tasks such as cleaning, disinfecting, or decontamination, follow the safety regulations of your institution.
	**Before return the device, guidance.** • When returning products or parts for service, repair, or disposal, disinfect or remove any contaminants. • Be sure to fill out a "Decontamination Confirmation Form" and send it together with the device. The "Decontamination Confirmation Form" can be downloaded from the Documents section of the SUPPORT tab on the www.ihanil.com website.
	**Risk of product damage due to liquid permeation.** • Be careful to prevent liquids from entering the device, as this can damage electrical, electronic, and mechanical components. • Do not place containers filled with liquids on top of or near the product.
	**Risk of component damage due to exceeding sterilization tolerances.** • When sterilizing by high-pressure steam, do not exceed the specified temperature and time limits (121°C, 20 minutes). Exceeding the tolerances may result in component deformation or device malfunction.

	**Warning!**
	**Risk of damage to products and parts due to mechanical or chemical damage.** • Do not use damaged, cracked, or corroded products or parts. • Do not use corrosive chemicals such as strong bases, weak bases, strong acids, cesium, silver, mercury, other heavy metals, phenol, formaldehyde, etc. • If the device or accessories are contaminated, turn off the power immediately and clean it. • Organic solvents may cause damage to the rotor. • After using organic solvents, immediately clean the accessories and the device used.

	**Caution!**
	**Do not use metal-based cleaning tools.** • Do not use the metal scrubbing or wire brush. This will peel off the product coating and cause corrosion..

	**Note!**
	**Do not store bleach** • Use freshly made 10% bleach for disinfection each time. • Bleach loses its effectiveness after 24 hours when diluted with water, so use it immediately without storing it.

5.3.1 Cleaning

1) In the event of a spill or contamination, promptly clean all internal and external parts of the centrifuge, including the chamber, motor shaft, and rotor, using a suitable decontamination agent.

2) Check the chemical resistance before applying any decontamination agent.

5.3.2 Disinfection

1) Disinfect using 10% bleach (1 part undiluted bleach, 9 parts water).

2) 2. Weekly disinfect the exterior of the centrifuge.

3) 3. disinfect the interior of the centrifuge (chamber, lid inner, motor cover, shaft, rotor, buckets, adapters, and tube rack) at least once a month.

5.3.3 Decontamination of hazardous materials

1) Radioactive materials

▶ Radioisotope contamination can be removed by first cleaning with 50% ethanol, followed by cleaning with 10% SDS. Gloves or all materials used to clean radioactive materials should be collected together and disposed of properly according to laboratory regulations.

2) Biologically hazardous materials

▶ If the dirt or spill is in a sealed container (rotor or bucket), only the sealed container should go through the decontamination process.

▶ check that no damaged areas and small holes have occurred in the rotor or bucket that could allow hazardous materials to escape.

6. Troubleshooting

6.1 Check list

Before contacting the service center for any problems with the centrifuge, please check the following.

Symptom	Check List
Power failure..	Please refer to [3.3 Power Connection] to check if the power plug is disconnected.
Can't be operated.	If the lid does not close, it will not operate. Please refer to [3.4 Opening the Lid] to check the lid status and ensure it is closed properly.
Lid cannot be opened.	If the power goes out, check the power plug connection status in [3.3 Power Connection]. If the problem does not resolve within a short time, please refer to [4.6 Emergency lid open] and open the lid manually to protect the sample.
Lid cannot be closed.	Check for any foreign objects at the lid latch. If present, remove the object and close the lid.
Noise and vibration during running.	If the installation location of the main unit is unstable, please check the horizontal alignment and stability of the main unit. Reinstall it on a flat surface, ensuring it is level.
	If the rotor attachment state is not good, after removing the rotor, check the outside of the rotor, and if there are any damaged areas, immediately stop using the rotor. Also, if the attachment method is incorrect, please refer to [3.5. Installing/Removing the rotor] to correctly attach the rotor.
	If the tube insertion is asymmetric or the weights do not match, please refer to [3.6 Loading Tubes] to verify the tube weights and insert them symmetrically.

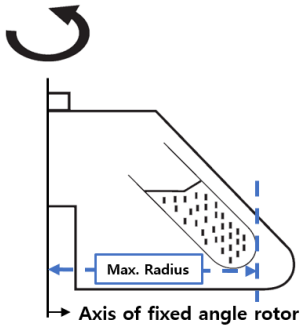
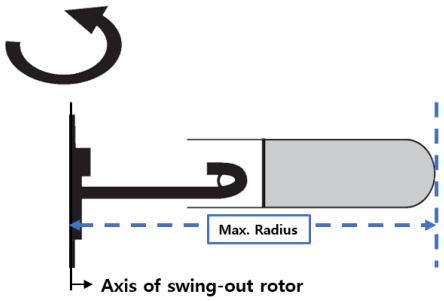
6.2 Error codes

If an error occurs while the device is operating or on standby, an error number will appear on the display and a sound will be emitted. If the problem persists after taking the measures below, please contact a Service Engineer of your local Hanil's partner.

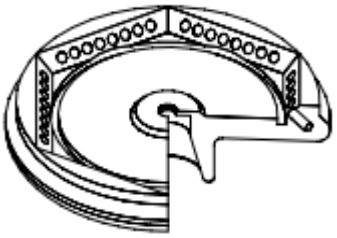
Error	Message	Cause	Recommended Action
E1	Motor start error	Occurs when 200rpm is not reached within 2 seconds after motor operation.	- Check the connector connection. - Check the rotor is installed tightly.
E2	Lid open error	Occurs when the lid is opened during operation.	- Check the lid latch for foreign objects. - Restart the device.
E3	Motor over-heat	Temp. rises inside of the motor.	- Check the stator of motor. - Restart the device after 1 hour.
E4	Low Speed error	Cannot reach 100rpm within 2sec. after start the run.	- Restart the device.
E5	Over speed	10% over the set RPM. Incorrect tuning of motor and controller.	- Check controller and motor. - Restart the device.
E6	System error	Error in control system.	- Restart the device.
E7	Imbalance error	Imbalance is detected.	- Check the rotor is installed tightly. - Check the proper loading of tubes. - Check the stable ground or worktable.
E8	Lift Lid	Deceleration Motor failure or cable missing. Lid cannot be opened after operation.	- Check the cable is connected. - Perform the emergency open.
E9	Lid lock error	Lid sensor failure. Lid sensor cable is not connected.	- Check the lid sensor. - Connect the lid sensor cable.
E10	Unknow Rotor ID	No Rotor. Rotor is not recognized. Foreign matter in the rotor and sensor.	- Install the rotor. - Check the rotor drive or rotor id disk for foreign objects.
E11	Lmb Not, Connect	Imbalance sensor failure or cable is disconnected.	- Check the cable connection.

7. Rotor & Accessories

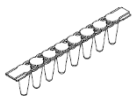
⚠	**Caution!**
⚠	**Precautions when inserting the sample tubes.** • If the density of the entire sample exceeds 1.2 g/mL, the maximum rotation speed should be reduced to prevent rotor overload and rotor damage.
⚠	**Risk of injury and product damage due to the use of unauthorized accessories and spare parts.** • Use only provided the rotors, parts, and accessories by Hanil Scientific Inc. Hanil Scientific Inc. is not responsible for damages to the device or accidents caused by using parts and accessories not recommended.

❗	**Mean of Max. Radius** Max. Radius of each rotor means the distance from the rotor hole or bucket to the inside edge of the adapter bore based on the rotor axis.	
	 max. radius of Fixed angle rotor	 max. radius of Swing-out rotor

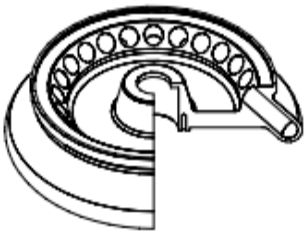
Angle Rotor, A0.2-48



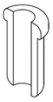
- Capacity : 48 x 0.2mL
- Max. RPM / RCF : 8,000 / 6,361
- Hole angle from axis during rotation : ∠ 45°

Tube		
Tube capacity(mL)	0.2	0.2(PCR strip)
Tube Dimension (Φ x L, mm)	6 x 8	6 x 8
Radius(mm)	88.9	88.9
Max. RCF (xg)	6,361	6,361

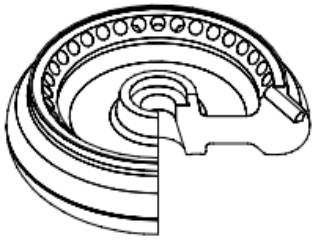
Angle Rotor, A2.0-24



- Capacity : 24 x 1.5/2.0mL
- Max. RPM / RCF : 8,000 / 5,781
- Hole angle from axis during rotation : ∠ 40°

Tube			
Tube capacity(mL)	0.2	0.5	1.5 / 2.0
Tube Dimension (Φ x L, mm)	6 x 8	8x30	11 x 38
Adapter			None
Cat No.	TR0.2(2)	TR0.5(2)	None
radius (mm)	67	76.5	80.8
Max. RCF (xg)	4,795	5,473	5,781

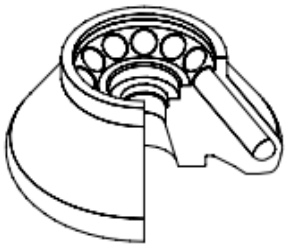
Angle Rotor, A2.0-36



- Capacity : 36 x 1.5/2.0 mL
- Max. RPM / RCF : 8,000 / 8,279
- Hole angle from axis during rotation : ∠ 30°

Tube			
Tube capacity(mL)	0.2	0.5	1.5 / 2.0
Tube Dimension (Φ x L, mm)	6 x 8	8x30	11 x 38
Adapter			None
Cat No.	TR0.2(2)	TR0.5(2)	None
radius (mm)	100	111	115.7
Max. RCF (xg)	7,155	7,942	8,279

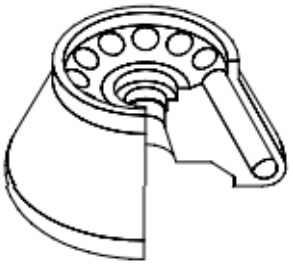
Angle Rotor, A10-12



- Capacity : 12 x 10 mL
- Max. RPM / RCF : 8,000 / 6,089
- Hole angle from axis during rotation : ∠ 36°

Tube	
Tube capacity(mL)	10
Tube Dimension (Φ x L, mm)	16 x 82
radius (mm)	85.1
Max. RCF (xg)	6,089

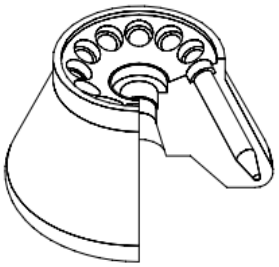
Angle Rotor, A15S-12



- Capacity : 12 x 15 mL
- Max. RPM / RCF : 8,000 / 6,876
- Hole angle from axis during rotation : ∠ 25°

Tube	
Tube capacity(mL)	16
Tube Dimension (Φ x L, mm)	18 x 108.5
radius (mm)	96.1
Max. RCF (xg)	6,876

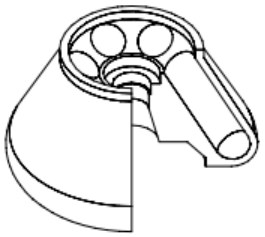
Angle Rotor, A15c-12



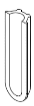
- Capacity : 12 x 15 mL conical
- Max. RPM / RCF : 8,000 / 7,112
- Hole angle from axis during rotation : ∠ 25°

Tube	
Tube capacity(mL)	15(conical)
Tube Dimension (Φ x L, mm)	17 x 120
radius (mm)	99.4
Max. RCF (xg)	7,112

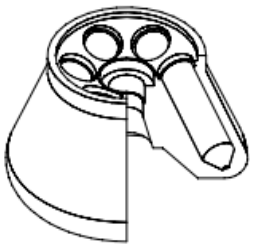
Angle Rotor, A50-6



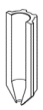
- Capacity : 6 x 50 mL
- Max. RPM / RCF : 8,000 / 6,876
- Hole angle from axis during rotation : ∠ 30°

Tube						
Tube capacity(mL)	15	15 conical	25mL conical	25mL conical	30	50
Tube Dimension (Φ x L, mm)	16 x 120	17 x 120	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108
Adapter						None
Cat No.	TR15(50)	TR15c(50)	TR25c(50)	TR25c(50)	TR30(50)	None
radius (mm)	89.9	91	76	76	90.4	96.1
Max. RCF (xg)	6,433	6,511	5,438	5,438	6,468	6,876

Angle Rotor, A50c-6



- Capacity : 6 x 50 mL conical
- Max. RPM / RCF : 8,000 / 6,511
- Hole angle from axis during rotation : ∠ 23°

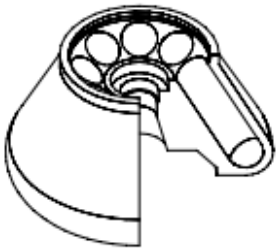
Tube						
Tube capacity(mL)	15 conical	25mL conical	25mL conical	30	50	50 conical
Tube Dimension (Φ x L, mm)	17 x 120	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108	29.5 x 118
Adapter						None
Cat No.	TR15c(50c)	TR25c(50c)	TR25c(50c)	TR30(50c)	TR50(50c)	None
radius (mm)	86.2	75.5	75.5	87.5	88.5	91
Max. RCF (xg)	6,168	5,402	5,402	6,261	6,332	6,511

Angle Rotor, A50c-8

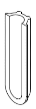
- Capacity : 8 x 50 mL conical
- Max. RPM / RCF : 8,000 / 7,906
- Hole angle from axis during rotation : ∠ 25°

Tube						
Tube capacity(mL)	15 conical	25 mL conical	25 mL conical	30	50	50 mL conical
Tube Dimension (Φ x L, mm)	17 x 120	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108	29.5 x 118
Adapter						None
Cat No.	TR15c(50c)	TR25c(50c)	TR25c(50c)	TR30(50c)	TR50(50c)	None
radius (mm)	105.7	95	95	107	108	110.5
Max. RCF (xg)	7,563	6,797	6,797	7,656	7,728	7,906

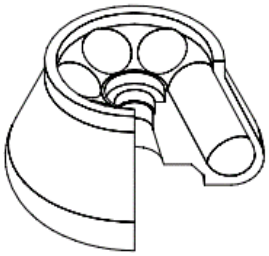
Angle Rotor, A50-8



- Capacity : 8 x 50 mL
- Max. RPM / RCF : 8,000 / 7,076
- Hole angle from axis during rotation : ∠ 30°

Tube						
Tube capacity(mL)	15	15 conical	25mL conical	25mL conical	30	50
Tube Dimension (Φ x L, mm)	16 x 120	17 x 120	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108
Adapter						None
Cat No.	TR15(50)	TR15c(50)	TR25c(50)	TR25c(50)	TR30(50)	None
radius (mm)	92.8	93.9	78.8	78.8	93.2	98.9
Max. RCF (xg)	6,640	6,719	5,639	5,639	6,669	7,076

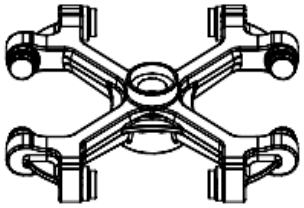
Angle Rotor, A85-6



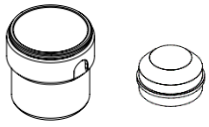
- Capacity : 6 x 85 mL
- Max. RPM / RCF : 8,000 / 6,983
- Hole angle from axis during rotation : ∠ 25°

Tube								
Tube capacity(mL)	15	15 conical	25 conical	25	30	50	50	85
Tube Dimension (Φ x L, mm)	16 x 120	17 x 120	28.8 x 83	28.8 x 78.5	25.7x101.4	29 x 108	29.5x118	38 x 106
Adapter								None
Cat No.	TR15(85)	TR15c(85)	TR15c(85)	TR15c(85)	TR30(85)	TR50(85)	TR50c(85)	None
radius (mm)	89	89.2	80.3	80.3	91.6	92.9	93	97.6
Max. RCF (xg)	6,368	6,382	5,746	5,746	6,554	6,647	6,654	6,983

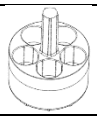
Swing Rotor, S750-4

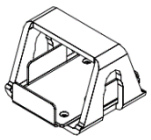


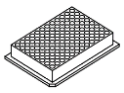
- 4 loadings
- Max. RPM : 4,000
- Hole angle from axis during rotation : ∠ 90°

 750mL Bucket with a cap, **B750S**  750mL Bucket. **B750**	Max. RPM / RCF : 4,000 / 3,515 Max. Radius (mL) : 196.5 Hole dimension (Ø x L, mm) : 99 x 103 Hole bottom type : Flat

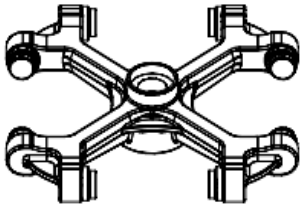
Tube						
Tube capacity(mL)	2.0~4 VT	4~7 VT	8~10 VT	15	15 conical	50
Tube Dimension (Φ x L, mm)	12.5 x 75	13 x 100	16 x 100	16 x 120	17 x 120	29 x 108
Adapter						
Cat No.	TR5-24(750)	TR5-24(750)	TR10-21(750)	TR15-19(750)	TR15c-14(750)	TR50-7(750)
Max. RCF (xg)	3,461	3,461	3,461	3,461	3,497	3,497

Tube						
Tube capacity(mL)	50 conical	250	250 conical	500	500 conical	750
Tube Dimension (Φ x L, mm)	29.5 x 118	61.5 x 128	60 x 163	73.5 x 142	96.2 x 147	97 x 152
Adapter						None
Cat No.	TR50c-5(750)(V1)	TR250(750)	TR250c(750)	TR500(750)	TR500c(750)	None
Max. RCF (xg)	3,470	3,481	3,470	3,476	3,497	3,515

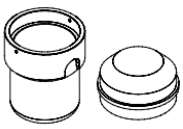
 MTP holder, **TM96(750-4)**	Max. RPM / RCF : 4,000 / 2,925 Max. Radius (mL) : 163.5 Holder inner dimension (W x D, mm) : 88 x 128.5

Tube	
Plate capacity	MTP
Rotor capacity	1 / 4
radius(mm)	163.5
Max. RCF(xg)	2,925

Swing Rotor, S500-4

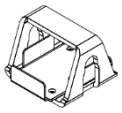


- 4 loadings
- Max. RPM : 4,000
- Hole angle from axis during rotation : ∠ 90°

 500mL Bucket with a cap, **B500**	Max. RPM / RCF : 4,000 / 3,470 Max. Radius (mL) : 194 Hole dimension (Ø x L, mm) : 80 x 111 Hole bottom type : Flat

Tube					
Tube capacity(mL)	5	10	15	15 Conical	50
Tube Dimension (Φ x L, mm)	13 x 100	16 x 100	16 x 120	17 x 120	29 x 108
Adapter					
Cat No.	TR5-9(500)	TR10-9(500)	TR15-9(500)	TR15c-7(500)	TR50-4(500)
Max. RCF (xg)	3,363	3,363	3,390	3,408	3,390

Tube				
Tube capacity(mL)	50 Conical	85	250	500
Tube Dimension (Φ x L, mm)	29.5 x 118	38 x 106	61.5 x 128	73.5 x 142
Adapter				
Cat No.	TR50c-3(500)	TR100(500)	TR250(500)	TR500(500)
Max. RCF (xg)	3,399	3,390	3,390	3,470

 MTP holder, **TM96(500-4)**	Max. RPM / RCF : 4,000 / 2,755 Max. Radius (mL) : 154 Holder inner dimension (W x D, mm) : 87 x 128.5

Tube	
Plate capacity	MTP
Rotor capacity	1 / 4
radius(mm)	154
Max. RCF(xg)	2,755

RECYCLABLE

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