USER MANUAL

LOW-SPEED CENTRIFUGE
T04B

hanil

LOW SPEED CENTRIFUGE
T04B

Research Use Only

- Product name :Centrifuge
- Model name : T04B

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The contents in this user manual are subject to change for device improvement.

Original Instruction

UM-T04B(E)(Rev.2), 20220526

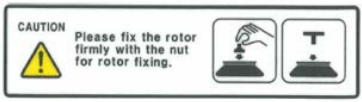
CONTENTS

1. Safety warnings and cautions

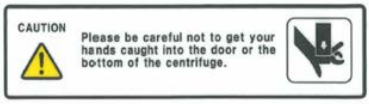
1.1. Safety label

Caution sign indicating danger and warning

Electric shock hazard caution sign

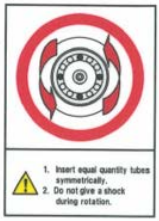


Rotor insertion, tightning caution indication warning



Lid closure caution indication warning

Bucket mounting caution warning



Symmetrical insertion of tubes caution warning

In case of Emergency, the hole position to open the lid manually

1.2. Conditions of use, storage or transport

• The device and the accessories may only be stored in dry rooms

-Use Condition-
Indoor use
Ambient temperature 5℃~ 40℃
Maximum relative humidity 30%~85%
Air pressure 500~1060hpa

• Only lift and transport the device with sufficient number of helpers.

-Transport & Storage -
Ambient temperature -10℃~40℃
Maximum relative humidity 10%~90%
Air pressure 500~1060hpa

1.3. Precautions for safety

Centrifugal separators are dangerous because they use a high-speed rotating body.
Safety precautions are to prevent personal injury, product damage,
and breakdown from possible dangers during use.

Please observe all safety measures described in this manual.

1. The centrifuge must be installed horizontally on a level surface. If the shaft is operated in an inclined state, a large vibration or damage to the device may occur.
2. Before connecting the centrifuge to power, check the voltage to be used. If it is connected with the wrong voltage, it may cause damage to the device and personal injury.
3. Use only the rotor and recommended parts and accessories provided by Hanil Scientific Inc. We are not responsible for any damage to the device or accidents resulting from the use of non- recommended parts and accessories.
4. The sample must be used in a centrifugal separator tube, and must be used within the maximum xg value of the tube.
5. In the case of centrifuging dangerous substances (pathogenic, toxic, radioactive substances, etc.), it is necessary to sufficiently grasp the physical properties of the substance and take necessary safety measures.
6. If the centrifuge is contaminated with pathogenic, toxic or radioactive substances, the contaminants must be thoroughly removed and necessary measures such as ventilation or isolation must be taken.
7. Substances that can generate volatile or explosive vapors cannot be centrifuged.
8. When the rotor comes into contact with cleaning solutions such as strong acids or strong bases or cesium/silver/salt, it will cause a chemical reaction and corrosion will begin.
9. The rotor chamber must be kept dry at all times before using the centrifuge.
10. Do not exceed the maximum RPM / RCF. If the rotor is subjected to a centrifugal force that exceeds the allowable rotation limit, the rotor will be deformed and damaged.
11. Before centrifugation, the sample must be balanced.
12. It is forbidden to touch or move the rotating rotor.
13. The rotor must be accurately fixed to the rotating shaft, and the rotor used with the rotor lid must be securely fastened and used. If the lid comes off during rotation, it may cause serious damage to the product and sample.
14. Do not block the air ventilation for proper air flow which keep the centrifuge from overheating.
15. Do not put any objects into the openings of the centrifuge.
16. Never use a tool to remove the lid or guard.
17. When requesting repair, the user must remove contaminants in advance.
18. Maintenance must be performed by a technician authorized by Hanil Scientific Inc.
19. For product repair, contact the place of purchase.
20. When operating according to the IEC61010-2-020 standard, the safety distance (30 cm) around the centrifuge must be observed for smooth instrument operation and the safety of users and the surrounding environment.
21. Turn off the device switch after using the device.
22. Disconnect and store the power cord from the power outlet before cleaning the machine or when not in use for a long time.

2. Product composition and information

2.1. Appearance

Rotor - optional

2.2 Components

Components				
User manual	AC Power Cord	Rotor Locking Tool	Emergency Lid Open Tool	Grease (Lubricant)
				

2.3. Technical Specifications

Max RPM / RCF	Angle Rotor : 4,000 / 2,773 xg Swing Rotor : 4,000 / 2,774 xg
Max Capacity	Angle rotor : 10 x 50 mL Swing rotor : 4 x 100mL
Time Control	Pulse, timed < 100min or continuous
Time Counting	Selectable, at set speed or from starting
Time display	Min : Sec
Program memory	100
LCD display parameters	RPM (RCF), Operation status, Lid Open / Close, Min : Sec, ACC, DEC
Chamber material	Stainless Steel
Noise level (dependent on rotor)	≤60 dB
ACC / DEC	ACC : 9 / DEC : 10
RCF / RPM conversion	Yes
Touch type numerical key input	Yes
Imbalance cutout	Yes
Safety lid lock	Yes
Lid drop protection	Yes
Automatic lid release at completion	Yes
Key lock function	Yes

Power supply (V / Hz)	220-230V~ 50/60Hz (110V optional)
Power requirement	340VA
Weight without rotor	25.7 kg
Dimention (W x D x H)	375 x 506 x 265 mm

2.4 Intended Use

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

3. Product installation

3-1. Unpacking

1. After purchasing the centrifuge, open the box and check the components.
   Centrifuge (T04B) / User Manual / AC power cord / Emergency lid open tool / Rotor locking tool / Grease

3-2. Power connection

1. Connect the AC power cord to the power socket located on the back of the main body and connect the power plug to the outlet.

▶ Please check the rated voltage to be used.

2. Press the power switch button [I / O] located on the right side of the main unit in the ON direction [I].

▶ The setting value used just before is displayed with a beep sound.

▶ When the device is shipped, the default value is Max.rpm per rotor, 10 minutes.

If the voltage changes by more than ±10% from the standard voltage, precise reliability cannot be obtained when using. In addition, since it may damage various parts in the centrifuge, you must ensure that constant power is supplied.

3.3 Lid open

Used to open the lid. When Lid is closed, the lamp is off, and when it is open, the lid lamp is turned on.

1. When the lid is closed (Lid lamp is off), press [Open].

▶ Lid lamp lights up when Lid is open.

3.4 Rotor mounting and removal

1. Before assembling the rotor, remove dirt or moisture from the motor shaft and rotor with a dry cloth.

Swing Out Rotor

2. After mounting the rotor to the central shaft in the chamber, fix it using the provided rotor locking tool.

▶ Rotor mounting: clockwise rotation

▶ Rotor removal: counterclockwise rotation

▶ Hold the rotor with one hand and turn the rotor locking tool with the other to fix or remove.

▶ When using, the rotor must be equipped with the identical bucket.

▶ Make sure that there is no dust or foreign material in the joint area between the rotor and bucket.

▶ Manually rotate the rotor to check that all installed buckets are smoothly unfolded. If the unfolding is not smooth or the unfolding angle is not the same, apply Lubricant (grease) to the rotor and pivot joint (rotor clasp).

Fixed Angle Rotor

2. After mounting the rotor to the central shaft in the chamber, fix it using the provided rotor locking tool.

▶ Rotor mount: clockwise rotation

▶ Rotor removal: counterclockwise rotation

▶ Hold the rotor with one hand and rotate the rotor locking tool with the other to fix or remove.

▶ When using, sleeves must be installed in all holes of the rotor.

Before use, make sure that the rotor is firmly connected to the motor shaft.

3.5 Tube mounting

· Use the tube for centrifuge recommended by Hanil Scientific Inc, and do not use it above the allowable standard after checking the maximum RCF value for each tube.

·Samples are accurately measured in the same amount/density and placed in each tube, then the tubes must be mounted on the rotor so that they are symmetrical to each other. At this time, if the volume of the sample to be symmetrical is different, severe vibration when the rotor rotates or serious damage to the rotor and motor rotation shaft may be caused.

·Balancing with a balance should be performed to minimize the difference in weight of the tubes containing the sample.

·Even if the number of tubes is the same, they will be asymmetrical according to their positions, so when inserting tubes into centrifugal tubes facing each other, you must also check the positions. If the number of tubes is not symmetrical, you must use an extra tube and insert it to balance the same weight as the other tubes.

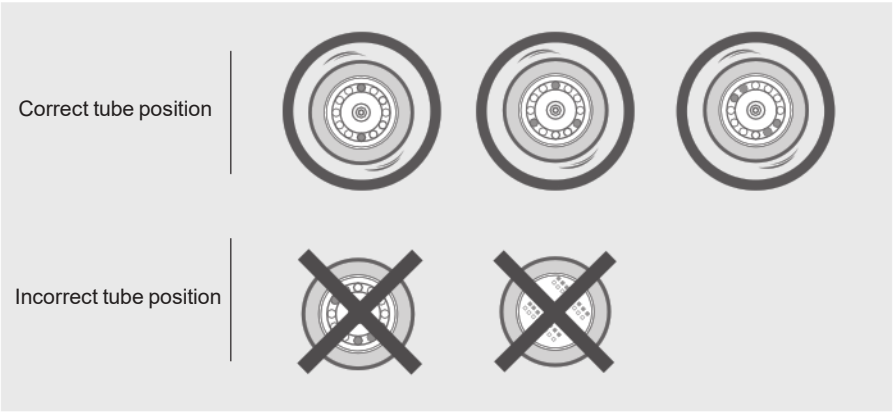
1. Before inserting the sample tube, check that there is no foreign matter or moisture inside the rotor hole or bucket.

▶ If there is any foreign matter or moisture, be sure to remove it with a dry cloth.

2. Sample tubes must be placed and mounted symmetrically.

▶ The tube filled with the sample, there should be no difference in weight and the density should be symmetrically and evenly arranged.

▶ Tubes for centrifuges must be used. Max. It should be used after checking the RCF value. Do not use beyond acceptable standards.



3.6 Enter rotor ID

Must enter the rotor ID correctly so that the RPM / RCF can be converted correctly.

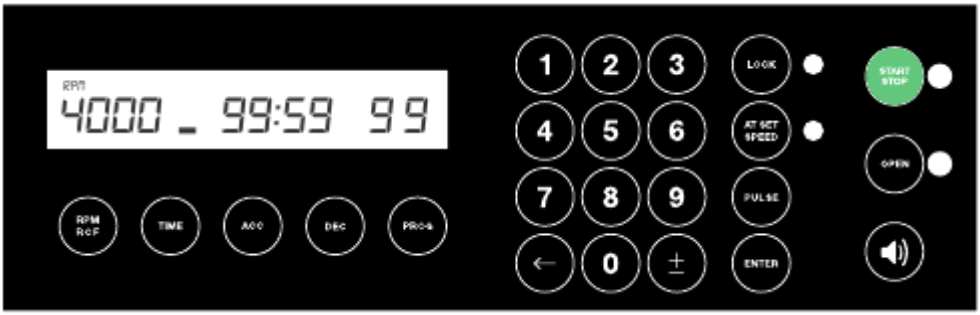
1. If you press the Program button for 2 seconds, the Rotor information window appears.

▶ While the Rotor Information window is displayed, enter the Rotor information using the number buttons.

Rotor	Rotor ID
SO-50-4	1
AO-50-10	2
AO-50c-10	3
SO-100-4	4
AO-15-24	5
SO-15-6	6
SO-MW-a2	7

4. How to use

4.1 Control Panel



□ RPM/RCF

The rotation speed is indicated in RPM/RCF, and mutual conversion is possible by pressing the RPM / RCF button.

Control interval : 1

□ Pulse

The pulse button is for when press & hold, to accelerate up to maximum speed and decelerate when the button is not pressed.

□ Time

The time can be set in “minute” and “second”, and up to 99 minutes 59 seconds or continuous operation is possible.

Control interval : 1 Min / 1 Sec

□ START/STOP

It is used to start and stop centrifugation.

□ ACC/DEC

The acceleration speed in the start and stop section can be set in 9 steps and the deceleration speed in 10 steps (natural deceleration: 0).

Control interval : 1

□ Lock

Set a lock mode that prevents setting values from being changed during operation.

□ PROG

Up to 100 programs can be saved and can be called up every time they are used.

□ AT SET SPEED

For accurate time management, it supports AT SET SPEED mode in which time is counted after reaching the set speed.

□ Open

When the lid is closed, you can open the lid.

□ Sound

Change the sound height and the number of end sounds.

Control interval : 1

4.2 Speed setting

The speed setting value is displayed as RPM and RCF, and is automatically calculated through interlocking.

1. Press [RPM/RCF]

▶ Press 1/2 → RPM/RCF setting mode

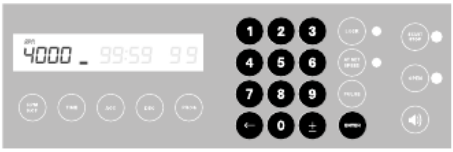
▶ Entering the setting mode, RPM or RCF is displayed on the display screen.

2. Enter the setting value using the numeric keypad and press [Enter].

▶ Press [Enter] to save the set speed value.

▶ RPM/RCF value is changed in units of 1 rpm/ 1xg.

▶ If you enter the setting value incorrectly, press [←] and re-enter the setting value.



▶ If you do not enter the setting value for 15 seconds, the setting mode is canceled.

4.3 Time setting

The time can be set in "minute" and "second", up to 99 minutes 59 seconds or continuous operation (00 minutes 00 seconds setting) is possible.
In addition, AT SET SPEED time mode (time counting after reaching the set speed) is supported for accurate time management.

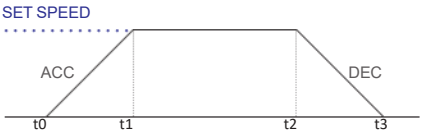
4.3.1 AT SET SPEED mode setting

1. Press [AT SET SPEED] once.

▶ AT SET SPEED mode → Lamp on
(time counting after reaching the set speed)

Time mode definition (ALL mode / At set Speed mode)

For accurate time management, the time mode can be set to ALL mode (time increases with start) and At set Speed mode (time increases after reaching the set speed).



- ALL mode : From t0 to t2
- At set Speed mode : From t1 to t2

4.3.2 “Second” / “Minute” setting

1. Press [TIME] once.

▶"Second" input mode switching

2. To enter "seconds", enter the setting value using the numeric keypad and press [Enter].

▶Press [Enter] → Switch to the "minute" input mode

▶Changes in 1 second increments

▶If you enter the setting value incorrectly, press [←] and re-enter the setting value.

▶If you do not enter the setting value for 15 seconds, the setting mode is canceled.

3. To enter "minute", enter the setting value using the numeric keypad and press [Enter].

▶Press [Enter] → save time last

▶Changes every minute.

▶If you enter the setting value incorrectly, press [←] and re-enter the setting value.

▶If you do not enter the setting value for 15 seconds, the setting mode is canceled.

4.4 Acceleration/deceleration (ACC/DEC) setting

Acceleration speed can be set up to 9 steps and deceleration speed up to 10 steps (natural deceleration:0) for sensitive sample protection and clean layer separation.

1. Press [ACC] to set acceleration of
   [DEC] to set deceleration.

2. To enter ACC or DEC value, use the numeric keypad to enter the setting value and press [Enter].

▶ACC is set in 1~9 steps

(ACC:9 fastest acceleration section)

▶DEC is set in 0~9 steps

(DEC:0 natural deceleration)

▶Press [Enter] → final storage of ACC/DEC values

▶If you enter the setting value incorrectly, press [←] and re-enter the setting value.

4.5 Pulse (Short Spin)

The [Pulse] button is for when press & hold, to accelerate up to maximum speed and decelerate when the button is not pressed.

1. Set the desired acceleration and deceleration steps.
2. Press the [pulse] button more than 2 sec.

▶ While pressing [Pulse], the equipment will accelerate up to maximum RPM.
▶ By stop pressing the [Pulse], the equipment will decelerate to stop.

4.6 Start/stop

Can be used to start or stop motion. During operation, the Start/Stop lamp is indicated by lighting.

4.6.1 Start

1. After setting the speed and time, etc.,
press the [Start/Stop] button.

▶ The [Start/Stop] lamp lights up during operation.

▶ Operation starts only when the lid is closed.

▶ When [Enter] is input during operation,
it indicates the set value just before the start button is pressed.

4.6.2 Stop

1. If you want to end the operation,
press the [Start/Stop] button.

▶ During deceleration → [Start/Stop] lamp blinks

▶ Press the [Start/Stop] button during operation,
it will decelerate immediately.

▶ If you press the [Start/Stop] button during deceleration,
it decelerates rapidly to DEC 9 steps regardless of the setting step.

▶ Final stop → lid open/display:
End text display/Sound ringing

▶ The display end message moves to the main by pressing one of the buttons on the control panel.

4.7 Change setting value during operation

1. If you want to change the setting value during operation, press the mode button and enter the setting value to be changed.

▶ Speed / time / ACC / DEC setting value can be changed during operation.

▶ The changed time input value does not reflect the initial time setting value.

4.8 Key lock setting

1. During operation, press the [KEY LOCK] button.

▶ Press [KEY LOCK] → Set lock mode

▶ When the KEY LOCK button is pressed while the lock mode is set, the lock mode is released with the message UNLOCK displayed on the display.

4.9 Save and recall program

Program storage: When operating the device under various conditions, setting values such as speed and time can be saved in advance and then recalled and used immediately as needed.

1. Press the [PROG] button twice.

▶ Display → Save flashing

2. Set the program number indicating the location to save with the numeric keys and press [Enter].

▶ Press [Enter] → The program set with the SAVED message displayed on the display is finally saved.

▶ Up to 100 programs can be stored.

▶ If you do not enter the setting value for 15 seconds, the setting mode is canceled.

Program call: It is designed to call the program stored between 00 and 99.

1. Press [PROG] once.

▶Display→ CALL flashing

2. Enter the program number to be called and press [Enter].

▶Press [Enter] → Program call

▶The set values (speed, time, acc/dec, etc.) of the called program are displayed on the display screen.

▶If you do not enter the setting value for 15 seconds, the setting mode is canceled.

4.10 Sound setting

The level of the sound that sounds at the end of the operation can be adjusted from 0 to 10 steps (silent: 0).

1. Press [Sound].

▶Press [Sound] → Display: Sound LEVEL indication

2. Check "Sound LEVEL" on the display screen, enter the sound size using the numeric keypad, and press [Enter].

▶Press [Enter] → Save the sound height setting value

▶Sound level→0~10 steps (0: silent)

4.11 Set the number of end tones

You can adjust the number of ending sounds that sound at the end of the operation up to 99 (0~99, silent: 0).

1. Press and hold [AT SET SPEED] for 2 seconds or longer.

▶[AT SET SPEED]
Press for more than 2 seconds

→ Enter end tone count mode

(Display screen: Sound RPT displayed)

2. Check “Sound RPT” on the display screen, enter the number of end tones using the numeric keypad, and then press [Enter].

▶Press [Enter] → save the set value of the number of end tones

▶Number of end sounds → 0~99 times
(0: No end tone, 99: End tone repeats 99 times)

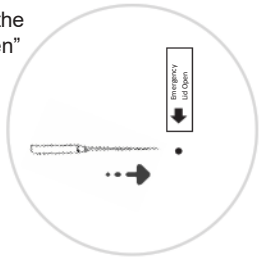
4.12 Manual lid opening in case of emergency

This method is used to remove the sample mounted on the rotor when the lid cannot be opened automatically because the main body is not supplied with power.

1. After confirming that the inner rotor is completely stopped, check the hole at the end of the arrow direction of the “Emergency Door Open” label on the left side.

2. Push the provided Emergency Door Open Tool vertically.

▶Lid opens manually with a “click” sound.



Manual lid opening must be performed after the machine has completely stopped rotating.
If this is not followed, it may damage the sample and the user, so be careful.
Do not close the lid immediately after emergency opening, wait until the power supply starts, and use it in a normal way.

5. Maintenance

Main body

1. If the exterior is contaminated, wash it with soapy water on a soft cloth and wipe it with a dry cloth to prevent moisture from remaining.
2. Do not use chemicals such as alcohol, benzene, benzol, or thinner as they may damage it.
3. Be careful not to scratch the surface while cleaning or moving the external surface.

▶ If the surface is scratched, there is a possibility of rust.

▶ If rust is formed by leaving it wet for a long time, remove it with a neutral detergent and wipe it with a dry cloth.

Chamber

1. After use, always dry the inside of the chamber.
2. If the chamber is contaminated, wipe with a mild detergent and wipe with a soft cloth to prevent moisture.

Shaft

1. If rotation is unstable due to foreign substances on the shaft, it may cause imbalance problems due to high-speed rotation,so it must be kept clean at all times.
2. After completing the experiment, remove the rotor from the rotating shaft, dry it with a dry cloth, and keep it dry.
3. If the rotor does not separate from the rotating shaft, do not remove the rotor with excessive force and contact a service center.

Rotor

1. If an acid, basic solution, or solution spills from the tube, immediately wipe it off with a soft cloth dampened with warm water and store in a dry place.
2. The tube hole of the Fixed Angle rotor or the bucket of the rotor should be checked for contamination of the solution from time to time and kept dry. It is recommended to store it upside down when not in use for a long time.

6. Problem solving

6.1 Checklist before reporting a malfunction

If there is a problem with the centrifuge, check the following before requesting a service center.

Symptom	Check list
No power	[Refer to [3.2 Power Connection] and check if the power plug is removed.
Does not work	If Lid is not closed, it will not work. Refer to [3.3 Lid Open] and check the Lid status of the lamp and close the Lid well.
Lid does not open.	When the power supply is interrupted, check the power plug connection in [3.2 Power Connection]. If it is not resolved in a short time, open the lid manually by referring to [4.12 Manual Lid Release in Emergency] for sample protection.
Lid does not close.	Check if there is any foreign substance on the lid clasp, if there is, remove the foreign substance and close the lid.
Vibration and noise appear during operation.	If the installation position of the main body is unstable, check the level of the main body and whether it is fixed, and re-install it horizontally on a flat surface.
	If the rotor installation is poor, check the exterior of the rotor after removing the rotor and stop using the rotor immediately if there is any damage. Also, if the mounting method is wrong, refer to [3.4 Rotor Mounting and Removal] to install the rotor correctly.
	If the tube insertion is asymmetrical or the weight is not correct, refer to [3.5 Mounting the sample tube] to check the tube weight and insert it symmetrically.

6.2 Error message information

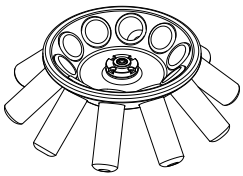
If the problem persists after taking the following measures, please contact the service center.

Error code	Description	Action
Error 1	Motor start error: Occurs when the motor does not reach 200 rpm within 2 seconds after starting the operation.	Check the rotor rotation through the lid's center window.
Error 2	Lid Open : Occurs when Lid is opened during operation.	1) Check the lid closed. 2) Check the Lid lamp status.
Error 3	Motor Overheating : Occurs when the motor overheats.	1) Remove any heat-generating devices around the centrifuge, check if the centrifuge vent is blocked or clogged with foreign substances, and take measures so that the heat generated from the centrifuge can be dissipated smoothly. 2) Turn off the power, stop using the product for about an hour (open the lid at this time), and turn the power on again to check.
Error 4	Low Voltage : Occurs when the supply voltage is below -10%.	1) Check the supply voltage. 2) If it is less than +10% of the rated voltage, install an AVR to supply the rated voltage.
Error 5	High Voltage : Occurs when the supply voltage is above +10%.	1) Check the supply voltage. 2) If it is more than +10% of the rated voltage, install an AVR to supply the rated voltage.
Error 6	Overspeed : Occurs when 1,000 RPM or more is higher than the set speed.	Turn off the power and turn it on again to check the operation status again.
Error 7	Firmware Program : Occurs due to a system error in the control unit.	Turn off the power and turn it on again to check the operation status again.
Error 8	Imbalance : Occurs when the sample balance is not correct.	1) Check that the weight of the sample inserted in the rotor is the same and that it is inserted symmetrically. 2) Check if there is any imbalance in the device due to the level of the floor, and if there are any factors that cause the device to move, remove and reinstall to balance. 3) Remove the rotor and wipe off any foreign matter on the shaft and the connection part, and check that there is no bending of the motor shaft. If there is no problem, align the threads of the rotor and the motor shaft and tighten them completely. 4) Check if the tube or bottle is crushed or spilled.
Error 9	RPM Sensing : Occurs when the sensor is defective or the motor cannot rotate.	1) Check if the rotor is rotating through the lid center window. 2) Turn the rotor by hand and check the RPM change in the display window.
Error 15	Motor Temperature Sensor : Occurs when the temperature sensor on the motor is not recognized.	Turn off the power and turn it on again to check the operation status again.
Error 17	Communication error: Occurs when communication between Main-Display-I/O Boards is not available.	Turn off the power and turn it on again to check the operation status again.
Error 20 ~ 27	Lid error : Occurs when the Lid Sensor does not operate normally.	Turn off the power and turn it on again to check the operation status again.

7. Rotor & Accessories

Angle Rotor, AO-50-10

- **Capacity : 10 x 50 mL or 50 mL Conical**
- **Max. RPM / RCF : 4,000 / 2,549**
- **Hole angle rotation : ∠ 45°**
- **Hole dimension (Ø x L,mm) : 32.2 x 13.5**
- **Supplied with 10 sleeves, No ID ring**

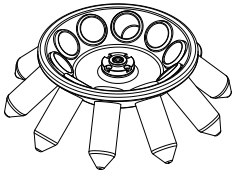


50 mL Sleeve, B50(A50)
- Capacity : 50 mL
- Max. RMP / RCF : 4,000 / 2,549
- Hole dimension (Ø x L,mm) : 30 x 99
- Hole bottom type : Flat bottom with rubber pad
- Max. height for tube fit (mm) : 130
- Supplied with 3.5 mm thick NBR pad

Tube									
Tube capacity (mL)	14 mL	15	15 mL conical	25mL conical	25mL conical	30	50	50 mL conical	50 mL conical (Skirt)
Tube Dimension (Φ x L,mm)	15.7 x 96	16 x 120	17 x 120	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108	29.5 x 118	29.5 x 118
Adapter								None	None
Cat No.	TR14(50)	TR15(50)	TR15(50)	TR25c(50)	TR25c(50)	TR30(50)	TR50(50)	TR50c(50)	-
Adaptor hole dimension (Φ x L,mm)	17.2 x 75	17.2 x 87	17.2 x 87	27.1 x 14.1	27.1 x 14.1	26 x 86.5	29.5 x 14	29.5 x 17.5	-
Adaptor hole bottom type	Round	Open	Open	Conical	Conical	Round	Round	Conical	-
Max. radius (mm)*	141.9	141.9	141.9	115	115	135	135.5	142.5	142.5
Max. RCF (g-force)*	2,538	2,538	2,538	2,057	2,057	2,415	2,424	2,549	2,549

Angle Rotor, AO-50c-10

- **Capacity : 10 x 50 mL or 50 mL Conical**
- **Max. RPM / RCF : 4,000 / 2,549**
- **Hole angle rotation : ∠ 45°**
- **Hole dimension (Ø x L,mm) : 32.2 x 13.5**
- **Supplied with 10 sleeves, No ID ring**



50 mL Sleeve, B50(A50c)
- Capacity : 50 mL
- Max. RPM / RCF : 4,000 / 2,508
- Hole dimension (Ø x L,mm) : 31 x 99
- Hole bottom type : Conical
- Max. height for tube fit (mm) : 130

Tube						
Tube capacity (mL)	15 mL conical	25mL conical	25mL conical	30	50	50 mL conical
Tube Dimension(Φ x L,mm)	17 x 120	28.8x83	28.8x78.5	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)	-
Adaptor hole dimension (Φ x L,mm)	17 x 105	27.1x14.1	27.1x14.1	26x83.8	27.9 x 11	-
Adaptor hole bottom type	Conical	Conical	Conical	Round	Round	-
Max. radius (mm)*	139.6	115	115	135.5	136.1	140
Max. RCF (g-force)*	2,497	2,057	2,057	2,424	2,435	2,508

Angle Rotor, AO-15-24

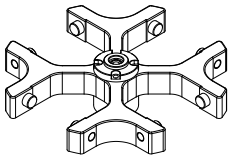
- **Capacity : 24 x 15 mL (12 outer, 12 inner)**
- **Max. RPM / RCF : 4,000 / 2,773**
- **Hole angle rotation : ∠ 45°**
- **Hole dimension (Ø x L,mm) : 20.4 x 10**
- **Rotor dimension / weight (net, Ø x L, mm / g) : 223 x 59 / 1,170**
- **Supplied with 24 sleeves**

15 mL Sleeve, B15/10
- Capacity : 15 mL
- Max. RPM / RCF : 4,000 / 2,700
- Hole dimension (Ø x L,mm) : 18 x 87
- Hole bottom type : Flat bottom with rubber pad
- Max. height for tube fit (mm) : 125(120 for conical / wider cap)
- Supplied with 4.0 mm thick NBR pad

Tube								
Tube capacity (mL)	2.0 ~ 4 mL VT	4 ~ 7 mL VT	5 mL conical	5 mL conical	14 mL	8 ~ 10 mL VT	15	15 mL conical
Tube Dimension (Φ x L,mm)	13 x 75	13 x 100	16 x 59	16 x 67	15.7 x 96	16 x 100	16 x 120	17 x 120
Adapter						None	None	None
Cat No.	TR3(15)	TR5(15)	TR5c(15)	TR5c(15)	TR14(15)	-	-	-
Adaptor hole dimension (Φ x L,mm)	13.5 x 61	13.5x85	14 x 20	14 x 20	16.5 x 7	-	-	-
Adaptor hole bottom type	Round	Open	Conical	Conical	Round	-	-	-
Max. radius (mm)*	Inner 116.3 Outer 132.3	Inner 136.8 Outer 152.8	Inner 105.3 Outer 121.3	Inner 105.3 Outer 121.3	Inner 126.5 Outer142.5	Inner 138 Outer 155	Inner 138 Outer 155	Inner 138 Outer 155
Max. RCF (g-force)*	Inner 2,080 Outer 2,367	Inner 2,447 Outer 2,733	Inner 1,884 Outer 2,170	Inner 1,884 Outer 2,170	Inner 2,263 Outer 2,549	Inner 2,469 Outer 2,773	Inner 2,469 Outer 2,773	Inner 2,469 Outer 2,773

Swing Rotor, SO-100-4

- 4 loadings
- Max. RPM : 4,000
- Angle from axis during rotation: ∠ 90°
- Rotor dimension / weight (Ø x L,mm/g) : 206.3 x 46 / 810
- Supplied with a lubricant
- No ID ring



100 mL Bucket with a Cap, BB100bs

- Max. RPM / RCF : 4,000 / 2,774
- Max. Radius (mm) : 155.1
- Hole dimension (Ø x L,mm) : 47 x 99
- Max. height for tube fit (mm) : 120(w/cap) / 130(w/o cap)
- Hole bottom type : Flat
- Supplied with a cap and an O-ring
- No cap version is available

Tube									
Tube capacity (mL)	1.5~2.0	2.0mL (cap)	5 mL conical	5 mL conical	2.6~7	4~10	15	15 mL conical	15 mL conical
Tube Dimension (Φ x L,mm)	11 x 38	10.1x46	16 x 59	16 x 67	13 x 75	16 x 100	16 x 120	17 x 120	17 x 120
Adapter									
Cat No.	TR2-6(100)	TR2-6(100)	TR5c-3(100)	TR5c-3(100)	TR7-5(100)	TR10-5(100)	TR15-3(100)	TR15c-3(100)	TR15c (100)
Rack capacity (ea / 4)	6 / 24	6 / 24	3/12	3/12	5 / 20	5 / 20	3 / 12	3 / 12	3 / 12
Adaptor hole dimension (Φ x L,mm)	11 x 39	11 x 39	17.2 x 52	17.2 x 52	13.5 x 60	16 x 60	17.5 x 105	17.2 x 106.5	17.2 x 106.5
Adaptor hole bottom type	Round	Round	Conical	Conical	Flat	Flat	Flat	Conical	Conical
Max. height tube fit (mm)	115	115	75	75	115	115	120	120	120
Max. radius (mm)*	150.1	150.1	110.1	110.1	150.1	150.1	152.1	155.1	155.1
Max. RCF (g-force)*	2,685	2,685	1,969	1,969	2,685	2,685	2,721	2,774	2,774

Tube								
Tube capacity (mL)	25mL conical	25mL conical	30	50	50 mL conical	50 mL conical(Skirt)	85	100
Tube Dimension (Φ x L,mm)	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108	29.5 x 118	29.5 x 118	38 x 106	44 x 115
Adapter								
Cat No.	TR25c(100)	TR25c(100)	TR30(100)	TR50(100)	TR50c(100)	TR50sc(100)	TR85(100)	TR100(100)
Rack capacity (ea / 4)	1/ 4	17.2x52	26x86	29.5 x 95.9	30 x 100	29.8x100	38.5 x 96.4	44.2 x 93
Adaptor hole dimension (Φ x L,mm)	17.2x52	17.2x52	26x86	29.5 x 95.9	30 x 100	29.8x100	38.5 x 96.4	44.2 x 93
Adaptor hole bottom type	Conical	Conical	Round	Round	Conical	Flat	Round	Round
Max. height tube fit (mm)	118	118	118	118	120	120	118	118
Max. radius (mm)*	153.5	153.5	153.5	153	153	153	153.5	150.1
Max. RCF (g-force)*	2,746	2,746	2,746	2,737	2,737	2,737	2,746	2,685

50 mL Conical Bucket, Bd50c
Max. RPM / RCF 4 : 4,000 / 2,774
Max. Radius (mm) : 155.1
Hole dimension (Ø x L, mm) : 30 x 89

Max. height for tube fit (mm) : 125
Hole bottom type : Conical

Tube						
Tube capacity (mL)	15 mL 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)	-
Bucket capacity(ea / 4)	2/8	2/8	2/8	2/8	2/8	2/8
Adaptor hole dimension (Φ x L,mm)	17 x 105	27.1 x 14.1	27.1 x 14.1	26 x 83.8	27.9 x 11	-
Adaptor hole bottom type	Conical	Conical	Conical	Round	Round	-
Max. radius (mm)*	152.5	118.5	118.5	143.9	144.1	155.1
Max. RCF (g-force)*	2,728	2,120	2,120	2,574	2,578	2,774

15 mL Dual Conical Bucket with a Cap, BBd15cb
- Max. RPM / RCF : 4,000 / 2,774
- Max. Radius (mm) : 155.1

- Hole dimension (Ø x L,mm) : 17 x 97.5
- Max. height for tube fit (mm) : 120 (w/cap) / 125 (w/o cap)
- Hole bottom type : Conical
- Supplied with a cap and O-ring
- No cap version is available

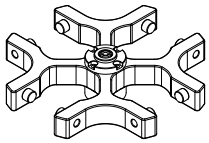
Tube				
Tube capacity (mL)	5 mL conical	5 mL conical	14 mL	15 mL conical
Tube Dimension (Φ x L,mm)	16 x 59	16 x 67	15.7 x 96	17 x 120
Adapter				None
Cat No.	TR5c(15c)	TR5c(15c)	TR14(15c)	-
Bucket capacity(ea / 4)	2/8	2/8	2/8	2/8
Adaptor hole dimension (Φ x L,mm)	14.8 x 20	14.8 x 20	16 x 7.8	-
Adaptor hole bottom type	Conical	Conical	Round	-
Max. radius (mm)*	102	102	155.1	155.1
Max. RCF (g-force)*	1,826	1,826	2,059	2,774

15 mL Bucket, B15-8
- Max. RPM / RCF : 4,000 / 2,719
- Max. Radius (mm) : 152
- Hole dimension (Ø x L,mm) : 17 x 86
- Hole bottom type : Flat
- Max. height for tube fit (mm) : 115
- Supplied with 3.0 mm thick NBR rubber pad

Tube									
Tube capacity (mL)	2.0~4 mL VT	4~7 mL VT	5 mL conical	5 mL conical	14 mL	8~10 mL VT	15 mL glass	15 mL open top	15
Tube Dimension (Φ x L,mm)	13 x 75	13 x 100	16 x 59	16 x 67	15.7 x 96	16 x 100	16 x 100	16 x 114	16 x 120
Adapter						None	None	None	None
Cat No.	TR3(15)	TR5(15)	TR5c(15)	TR5c(15)	TR14(15)	-	-	-	-
Bucket capacity (ea / 4)	8 / 32	8 / 32	4 / 16	4 / 16	4 / 16	8 / 32			2 / 8
Adaptor hole dimension (Φ x L,mm)	13.5 x 61	13.5 x 85	14 x 20	14 x 20	16.5 x 7	-	-	-	-
Adaptor hole bottom type	Round	Open	Conical	Conical	Round	-	-	-	-
Max. height tube fit (mm)	88	115	75	75	103.5	115	115	115	125 (center)
Max. radius (mm)*	125	156.6	112	112	140.5	152	152	152	152
Max. RCF (g-force)*	2,236	2,719	2,003	2,003	2,513	2,719	2,719	2,719	2,719

Swing Rotor, SO-50-4

- 4 loadings
- Max. ROM : 4,000
- Angle from axis during rotation : ∠ 90°
- Rotor dimension / weight (Ø x L, mm / g) : 206.3 x 46 / 800
- No ID ring



50 mL Bucket, B50
- Max. RPM / RCF : 4,000 / 2,700
- Max. Radius (mm) : 150.9
- Hole dimension (Ø x L,mm) : 30.5 x 91
- Max. height for tube fit (mm) : 125
- Hole bottom type : Flat
- Supplied with 4.0 mm thick NBR pad

Tube									
Tube capacity (mL)	14 mL	15	15 mL conical	25mL conical	25mL conical	30	50	50 mL conical	50 mL conical (Skirt)
Tube Dimension (Φ x L,mm)	15.7 x 96	16 x 120	17 x 120	28.8 x 83	28.8 x 78.5	25.7 x 101.4	29 x 108	29.5 x 118	29.5 x 118
Adapter									None
Cat No.	TR14(50)	TR15(50)	TR15(50)	TR25c(50)	TR25c(50)	TR30(50)	TR50(50)	TR50c(50)	-
Adaptor hole dimension (Φ x L,mm)	17.2 x 75	17.2 x 87	17.2 x 87	27.1 x 14.1	27.1 x 14.1	26 x 86.5	29.5 x 14	29.5 x 17.5	-
Adaptor hole bottom type	Open	Open	Open	Conical	Conical	Round	Round	Conical	-
Max. radius (mm)*	150.9	150.9	150.9	118.6	118.6	143.6	143.6	150.9	150.9
Max. RCF (g-force)*	2,700	2,700	2,700	2,122	2,122	2,569	2,569	2,700	2,700

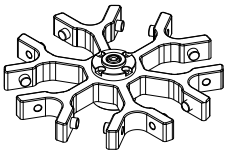
150 mL Conical Bucket, B50c
- Max. RPM / RCF : 4,000 / 2,700
- Max. Radius (mm) : 150.9
- Hole dimension (Ø x L,mm) : 29.5 x 91.5
- Max. height for tube fit (mm) : 125
- Hole bottom type : Conical

Tube						
Tube capacity (mL)	15 mL 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						
Cat No.	TR15c(50c)	TR25c(50c)	TR25c(50c)	TR30(50c)	TR50(50c)	-
Adaptor hole dimension (Φ x L,mm)	17 x 105	27.1 x 14.1	27.1 x 14.1	26 x 83.8	27.9 x 11	-
Adaptor hole bottom type	Conical	Conical	Conical	Round	Round	-
Max. radius (mm)*	150.9	119.9	119.9	145.3	145.5	150.9
Max. RCF (g-force)*	2,700	2,145	2,145	2,599	2,578	2,700

15 mL Dual Conical Bucket, Bd15c
- Max. RPM / RCF : 4,000 / 2,700
- Max. Radius (mm) : 150.9
- Hole dimension (Ø x L,mm) : 17 x 91.5
- Max. height for tube fit (mm) : 120
- Hole bottom type : Conical

Tube				
Tube capacity (mL)	5 mL conical	5 mL conical	14 mL	15 mL conical
Tube Dimension (Φ x L,mm)	16 x 59	16 x 67	15.7 x 96	17 x 120
Adapter				None
Cat No.	TR5c(15c)	TR5c(15c)	TR14(15c)	-
Adaptor hole dimension (Φ x L,mm)	14.8 x 20	14.8 x 20	16 x 7.8	-
Adaptor hole bottom type	Conical	Conical	Round	-
Max. radius (mm)*	98.6	98.6	131.6	150.9
Max. RCF (g-force)*	1,826	1,826	2,354	2,700

Swing Rotor, SO-15-6

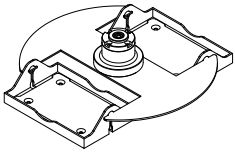


- 6 loadings
- Max. RPM : 4,000
- Angle from axis during rotation: ∠ 90°
- Rotor dimension / weight (Ø x L,mm / g) : 198.2 x 44 / 573
- No ID ring

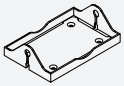
15 mL Dual Round Bucket, Bd15
- Max. RPM / RCF : 4,000 / 2,737
- Max. Radius (mm) : 153
- Hole dimension (Ø x L,mm) : 17 x 88
- Max. height for tube fit (mm) : 122
- Hole bottom type : Flat with rubber pad
- Supplied with 3.0 mm thick NBR rubber pad

Tube					
Tube capacity (mL)	2.0~4 mL VT	4~7 mL VT	8~10 mL VT	15 mL glass	15 mL open top
Tube Dimension (Φ x L,mm)	13 x 75	13 x 100	16 x 100	16 x 100	16 x 114
Adapter			None	None	None
Cat No.	TR3(15)	TR5(15)	-	-	-
Bucket capacity (ea / 4)	2 / 12	2 / 12	2 / 12	2 / 12	2 / 12
Adaptor hole dimension (Φ x L,mm)	13.5 x 61	13.5 x 85	-	-	-
Adaptor hole bottom type	Round	Open	-	-	-
Max. height tube fit (mm)	95	123	123	123	123
Max. radius (mm)*	126	153	153	153	153
Max. RCF (g-force)*	2,164	2,737	2,737	2,737	2,737

Swing Rotor, S-mw-2



- 2 loadings
- Max. RPM : 4,000
- Angle from axis during rotation: ∠ 90°
- Rotor dimension / weight (Ø x L, mm / g) : 240 x 46 / 546
- No ID ring



Microplate Bucket, P-mw
- Max. RPM / RCF : 4,000 / 2,000
- Max. Radius (mm) : 111.8
- Hole dimension (w x d ,mm) : 86.5 x 128.5
- Max. height for tube fit (mm) : 35
- Hole bottom type : Flat bottom with ABS pad
- Supplied with 3.0 mm thick ABS pad

Tube	
Tube capacity (mL)	MTP
Tube Dimension (Φ x L,mm)	86 x 128 x15
Bucket capacity(ea / 2)	2/4

8. Declaration of Conformity

hanil

DECLARATION OF CONFORMITY

We, Hanil Scientific Inc. hereby declare under our sole responsibility that the product(s) listed below conform to the European Union directives and standards identified in this declaration.

Nous, Hanil Scientific Inc., déclarons sous notre seule responsabilité que le produit (s) indiqués ci-dessous sont conformes aux directives de l'Union européenne et les normes définies dans la présente déclaration.

Nosotros, Hanil Scientific Inc., por la presente declaro bajo nuestra responsabilidad exclusiva que el producto (es) en la lista por debajo de ajustarse a las normas y las directivas de la Unión Europea, identificadas en esta declaración.

Wir, Hanil Scientific Inc., hiermit unter eigener Verantwortung, dass das Produkt (s), die unter die Richtlinien der Europäischen Union und Normen, die in dieser Erklärung.

Description of Product	**Centrifuge**
Model Name	T04B

Relevant Directives/ Harmonised Standards

Machinery	2006/42/EC	as last amended	EN ISO 12100:2010
Low Voltage	2014/35/EU	as last amended	IEC 61010-1:2010/A1:2016 IEC 61010-2-020:2016
EMC	2014/30/EU	as last amended	EN 61326-1:2013 EN 61326-2-6:2013 EN 55011:2016/A1:2017
RoHS	2011/65/EU	as last amended	EN IEC 63000:2018

Additional applied standards IEC 61326-1:2020, CISPR 11:2015/A1:2016/A2:2019

Test Report. Ref.

ACTS-2021-SC-045
KES-EM-21T0761
KES-EM-21T0762
RT22R-S0952

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May 26, 2022

Yongjoo Kim / CEO

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