Low-Speed Centrifuge

406

User's Manual

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GYROZEN

Designed to suit your exact needs

Wide range of modern centrifuges for a wide variety of laboratory applications

THE BEST FUNCTIONAL QUALITY

- Manufactured and tested to IEC standards, stable spinning operation within +/-2% variation
- Steady and soft deceleration with dynamic brake technology
- Automatic recognition and alarms for imbalance, over-speed and over-heat
- Automatic RPM/RCF conversion

SAFETY and ROBUSTNESS

- Safety door lock mechanism ensures the door is locked whilst in operation mode
- Unique door-drop protection protects the operator and samples when loading and unloading
- Automatic detection and alarms for imbalance, excess speed and heating
- Automatic door-open scheme with safety level of aperture depth not to damage operators
- Emergency door-lock release helps to open the instrument when power blackout or
- The Aerosol tight buckets and rotors prevent contamination and ensures safety
- Autoclavable and corrosion resistant rotors ensure safety and long life
- High-quality cabinets with scratch resistant powder coated finish

CONVENIENCE IN OPERATION

- Intutive control pannel with easy to use
- Easy to need LCD display with bright white lettering on a blue LCD background
- Automatic RPM/RCF conversion for prompt detection of g-force
- Easy to check actual rpm through the top window of door
- Program memory for up to 10 programs
- Soft spin key for for gentle acceleration and deceleration
- Automatic door-opeing function when rotor is statics, for easy retrivel of samples
- A large assortment of rotors, fixed angle or swing-out with buckets and adaptors

EASY CUSTOMIZATION

- Any rotors, sample containers, and adaptors can be manufactured according to customer' s specification
- Flexibility of including any additional functions or programs in need

ECO-FRIENDLY MANUFACTURING

- Dust free AC induction motor
- Very quiet operation at lesser than 56 dB

CONTENTS

1. Meanings of Symbols & Safety Precautions

1-1. Meanings of Symbols

1-1-1. Symbols on the device

Symbol	Meaning	Symbol	Meaning
	Attention and warning.		Attention and warning for electric shock
	Attention and warning for rotor coupling.		Attention and warning for door opening and closing
	Attention and warning for correct way of sample balancing in the rotor.		Indicate a hole for manual door opening in case of emergency

1-1-2. Symbols in this document

Symbol	Meaning	Symbol	Meaning
	This symbol refers to safety relevant warnings and indicates possible dangerous outcomes.	☞	Note. This symbol refers to the important reminder.

1-2. Safety Precautions

Before using the instrument, please read this operation manual to ensure correct usage through understanding. Incorrect handling of the instrument could possibly result in personal injury or physical damage on the instrument or its accessories.

1. ALWAYS locate the instrument on a flat, rigid and stable table capable of withstanding the weight of the instrument and its spinning operation.

2. ALWAYS make a safety zone of 30 cm around the centrifuge to indicate that neither hazardous materials nor persons should be permitted within the area during operation.

    ✓ ALWAYS position the instrument with enough space on each side of instrument to ensure proper air circulation.

3. ALWAYS install the instrument within a temperature and humidity controlled environment. (Permissible ambient temperature: +5°C ~ +35 °C, Relative humidity: ≤ 85%)

4. Before connecting the power, check the rated voltage.

5. Should not use unapproved rotors and accessories.

    ✓ Only use rotors from Gyrozen Co., Ltd. with appropriate centrifugal tubes and suitable adaptors to embrace sample containers tightly enough inside rotors.

6. Before operating the instrument, check if the rotor and the rotor lid are securely fastened.

    ✓ Should operate the instrument with a rotor properly installed and secured to the motor shaft.

7. Mount the rotor on the motor shaft properly, check it with spinning manually.

8. Do not stop the rotor by touching with hand during the instrument is running.

9. Emergency door open should be performed only when spinning is completely stopped.

10. Should not exceed the rated speed or specific gravity. Samples whose density is greater than 1.2g/ml must have reduced maximum rotational speed to avoid rotor failure.

11. The sample content should not exceed 80% of total capacity of a tube. Otherwise, it would cause spillage of sample fluid and even the tube breakage.

12. ALWAYS load the tubes symmetrically with evenly weighted samples to avoid rotor imbalance. If necessary, use the water blank to counterbalance the unpaired sample.

13. The operation speed should not exceed the highest value of the individual guaranteed g-forces of each centrifuge, rotor, bucket or adaptors and sample container, especially the guaranteed g-force of sample container should not be neglected.

14. The rotors should be cleaned and kept dry after every use for longer life and safety.

15. ALWAYS disconnect the power supply prior to maintenance care and service to avoid electrical shock.

16. ALWAYS use proven disinfection procedures after centrifuging biohazardous materials.

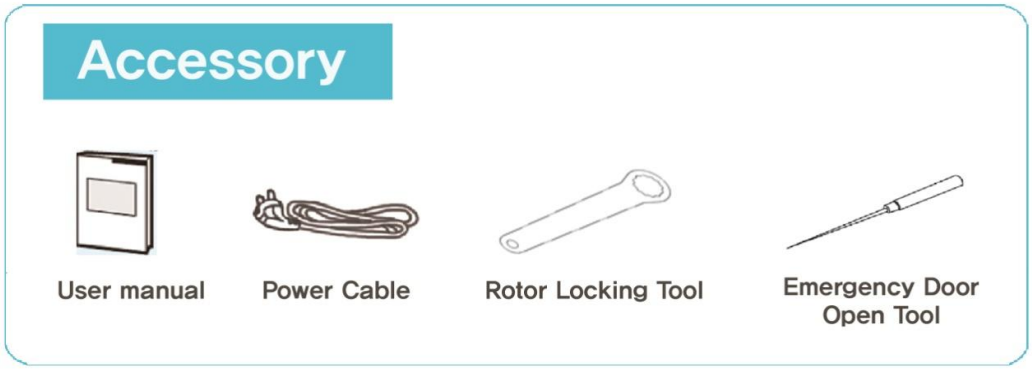
17. Should not centrifuge flammable, toxic, radioactive, explosive, or corrosive materials.

18. When it is necessary to use toxic or radioactive materials or pathogenic micro-organisms which belong to the Risk Group II of WHO: "Laboratory Bio-safety Manual," should follow national regulations.

- ✓ Do not place dangerous materials within 30 cm distance around the instrument, and that is also recommended by IEC 61010-2-020.
- ✓ Use the emergency door open function only when the door button on the control panel is dumb under the condition of complete stop of rotor running.
- ✓ Never try to open or move the instrument if it is not completely stopped.
- ✓ If the power input is more than +/- 10% of the recommended voltage or fluctuates frequently, it may cause malfunction of the instrument and often result serious damage.
- ✓ Install the instrument at the place without any kinds of corrosive gases.

2. Product Description & Technical Specifications

2-1. Product Description



Cat no. GZ-406 includes GRA-12-6.

2-2. Technical Specifications

Max. RPM/RCF	4,000 rpm/ 2,075 xg
Max. capacity	6 x 15 ml
Time control	Timed, < 100 min or continuous
RPM/RCF conversion	Yes
Noise level	≤52 dB
Acc/Dec(sec)	≤20 sec / ≤20 sec
Program memory	10
Imbalance cutout	Yes
Safety lid lock	Yes
Lid drop protection	Yes
Automatic door release at completion	Yes
Power supply(V/Hz)	220/50~60 (110V optional)
Power requirement(VA)	120
Dimension(W x D x H, mm)	296 x 412 x 206
Weight without rotor (Kg)	17.5
CE mark	Yes
Cat. No.	GZ-406

3. Installation

3-1. Power On/Off and Door Release

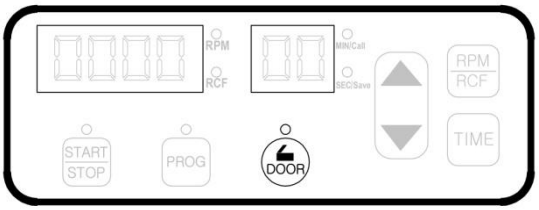
3-1-1. Power On/off

Action

1. Connect the AC Power cord at the power socket on the right back of the instrument.
2. Turn on the instrument by pressing a switch on the right side of the instrument.
3. Press the 'Door' button to open the door.

3-1-2. Door Release

Action



1. For opening the door, press the [DOOR] button.
   - ➢ The door is automatically opened after completion spinning with beeping sound.
   - ➢ Close the door until hearing clank shut.
   - ➢ When the door is opened, the door LED turns on.

☞

- ✓ The door is not opened while the instrument is running.
- ✓ If the door is opened, the instrument could not be operated even with pressing the 'Start' button.
- ✓ Power Failure: If there is any power failure during operation, door is not opened with 'Door' button. Door can be opened only when the operation is completely stopped and the power is on again. If you want to open the door at the power failure, please refer to '4-6. Emergency Door Open'.

3-2. Rotor coupling and disassembling

Action

1. Before coupling a rotor, clean the motor shaft and chamber with soft dry towel.

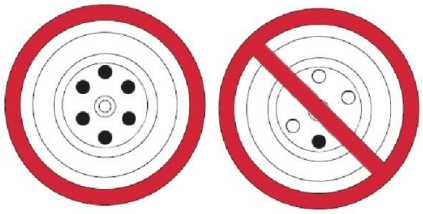
2. Mount a proper rotor into the motor shaft. Put the Washa () at the center hole of the rotor and assemble it with Door Locking Nut ().
    - To assemble the rotor: Rotate the Door Locking Nut clockwise until tightly assembled.
    - To disassemble the rotor: Rotate the Door Locking Nut counterclockwise.

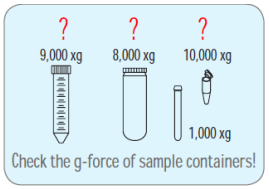
3. Load the 15ml stainless steel sleeves at every hole.

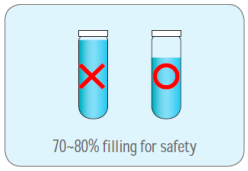
3-3. Positioning of Sample Tubes

1. Before loading sample tubes, check the water drop or dirt in the rotor hole or inner adaptor.
    - If there is a water drop or dirt in the rotor hole or inner adaptor, remove it with soft dry cloth.
2. Tubes should be placed in the rotor with same amount of samples at symmetrical positions.
    - Only use appropriate centrifugal tubes and do not exceed the speed beyond the tube's max. g-force.
    - For safety, fill the sample for 70~80% in the tubes.

Correct Way of Sample Balancing & Tube Usage





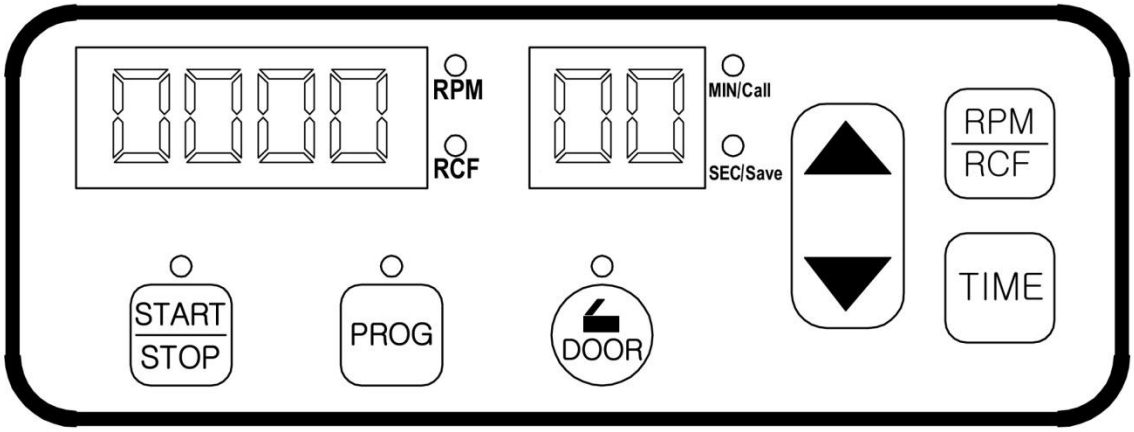


If the number of samples is not in pair, please load the control tubes at each symmetrical position. Otherwise, it results noise and vibration, which eventually damage the instrument.

☞ For safety, the 'Imbalance Cut Off' function will be occurred, if there is imbalance of loading tubes (Error 8, Imbalance error). Please refer to 6. Trouble Shooting.

4. Operation

4-1. Key Functions of Control Panel



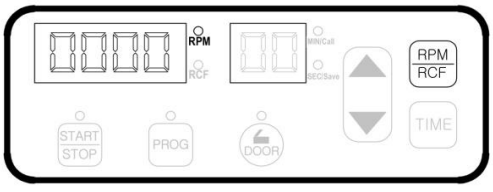
☐ START/STOP	Use to start or stop operation
☐ PROG	Use to save a set of setting values or recall the saved program number
☐ Door	Use to open the instrument lid
☐ RPM/RCF	For automatic conversion of RPM/RCF and to set the speed
☐ TIME	Use to set time, available range up to 99 min (00: continuous)

4-2. Setting RPM/RCF

▶ Maximum RPM/RCF: 4,000 RPM/ 2,700 x g

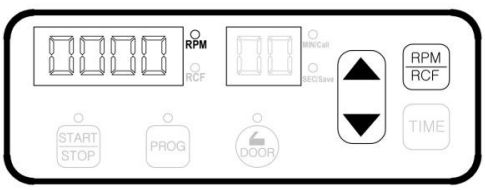
Action

4-2-1. Setting RPM



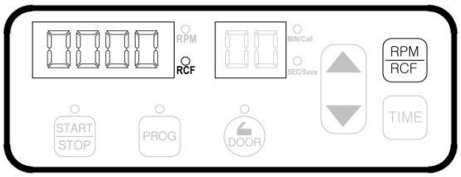
▶ Speed setting unit: 10rpm or 100rpm

1. Press the [RPM/RCF] button once.
   - ➢ RPM MODE is generated by pressing a [RPM/RCF] button once.



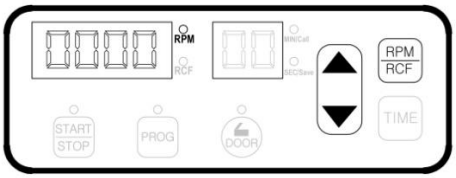
2. Press the [▲▼] buttons to change input value.
   - ➢ After keeping holding finger on the [▲▼] buttons for 5 seconds, the unit of setting value is changed to 100 rpm from 10rpm.
3. Press the [RPM/RCF] button again for saving.

4-2-2. Setting RCF



▶ Speed setting unit: 1 rcf or 10 rcf

1. Press the [RPM/RCF] button twice.
   - ➢ RCF MODE is generated by pressing a [RPM/RCF] button twice.
2. Press the [▲▼] buttons to change input value.
   - ➢ After keeping holding finger on the [▲▼] buttons for 5 seconds, the unit of setting value is changed to 10 rcf from 1 rcf.
3. Press the [RPM/RCF] button again for saving.

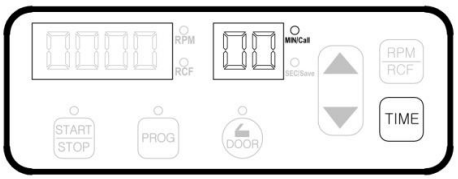


4-3. Setting Time

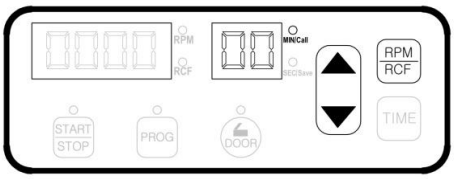
▶ Speed setting unit: 1min. or 10min./ 1 sec. or 10 sec

Action

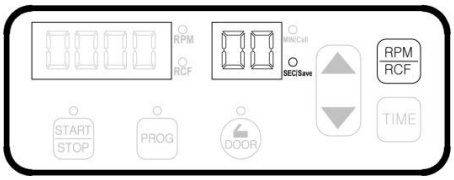
4-3-1. Setting MIN.



1. Press the [TIME] button once.
   - ➢ Minutes MODE is generated with pressing a [TIME] button once.
2. Press the [▲▼] buttons to change input value.
   - ➢ After keeping holding finger on the [▲▼] buttons for 5 seconds, the unit of setting value is changed to 10min from 1 min.
3. Press the [TIME] button again for saving.



4-3-2. Setting SEC.



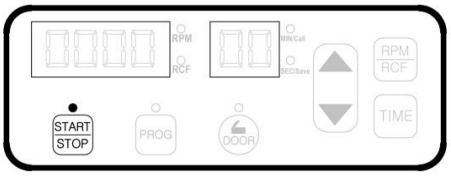
1. Press the [TIME] button twice.
   - ➢ Seconds MODE is generated with pressing a [TIME] button twice.
2. Press the [▲▼] buttons to change input value.
   - ➢ After keeping holding finger on the [▲▼] buttons for 5 seconds, the unit of setting value is

changed to 10 sec. from 1 sec.

3. Press the [TIME] button again for saving.

4-4. Start/Stop

Action

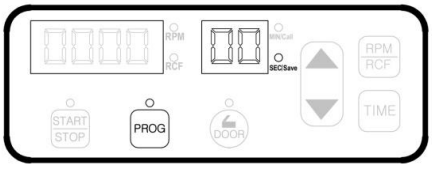


1. After setting RPM/RCF and Time, press [START/STOP] button.
   - ➢ During running, a 'Start LED' is turned on.
   - ➢ In case of pressing the [START/STOP] button during running, the running is stopped.

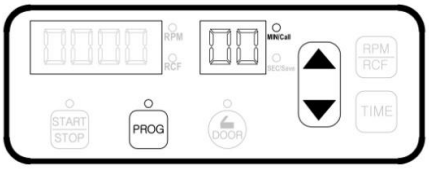
4-5. Program Saving & Recalling

Action

4-5-1. Program Saving

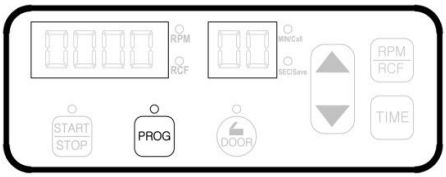


1. Set parameters. (Refer to 4-2 ~ 4-3)
2. Press the [PROG] button longer than 3 seconds to save your preferred set values.
   - ➢ The LED of [PROG] button and SEC/Save is turned on.

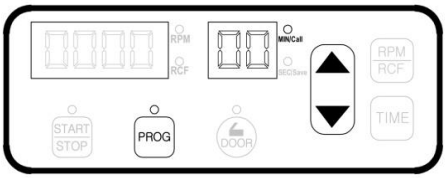


3. Input the program number by using [▲▼] button.
   - ➢ Save up to 10 programs
4. Press the [PROG] button again to complete the saving.
   - ➢ The setting value is saved
   - ➢ If you do not press the [PROG] buttons for 5 second, the setting mode is cleared.

4-5-2. Program Recalling



1. To recall the saved program, just press the [PROG] button shortly.
   - ➢ The LED of [PROG] and MIN/Call is turned on.
2. Check the program number to call and enter the program number you want to recall by pressing [▲▼] button.



3. Press [PROG] button once again.
   - ➢ The setting values are displayed according to your saved number.
   - ➢ If you do not press the [PROG] buttons for 5 second, the setting mode is cleared.

4-6. Emergency Door Open

For emergency door opening, you can use the Emergency Door Open Tool as long as the instrument is completely stopped.

The door can be unlocked manually with Emergency Door Open Tool through the emergency opening hole.

1. Find the emergency hole at the left side of the instrument
2. Insert the Emergency Door Open Tool into the hole and push it until the door is released.

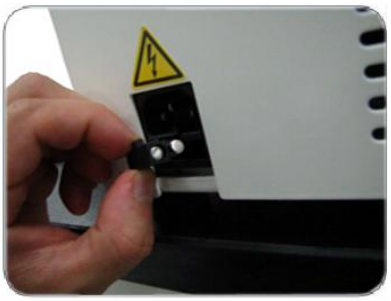
> ⚠ Manual opening should be performed only when spinning is completely stopped. Otherwise, harmful damage will be accompanied to not only operators but samples.
> After opening the door manually, it is recommended to wait until normal electricity comes back.

4-7. Fuse replacement

When the power is not turned on, please check the connection of power consent / power switch.
Replace the fuse as following instruction, if the power is still not turned on.

Action

1. Separate the AC Power Cord at the back of the instrument and push the flat-head screwdriver for bring out the fuse case.



2. Replace the damaged fuse with new one from the fuse case and then connect in the power.

5. Maintenance

5-1. Outer part of instrument

1. Clean the outside of the instrument with dry soft cloth. If necessary, dip the cloth in neutral detergent and clean contaminated area. Keep completely dry after cleaning.
2. Do not use any volatile chemicals such as alcohol and benzene, etc.
3. Be careful not to make scratches on the surface of the instrument. The scratches can cause corrosion on the surface of the instrument.

✓ If any rust appears, clean it with neutral detergents and keep dry.

5-2. Chamber

1. Keep dry inside the chamber after every use.
2. If the chamber is contaminated, dip the cloth in neutral detergent and clean contaminated area.

5-3. Shaft

1. Always make special attention to clean the motor shaft to avoid any imbalance problem due to the contaminants.
2. After using the instrument, take out the rotor from the shaft, and clean the shaft with dry soft cloth to keep dry.

5-4. Rotor

1. If any parts are contaminated with samples, clean the rotor with soft wet cloth and keep the rotor dry.
2. Be careful not to make scratches inside or on the surface of rotors. Any small scratches can cause corrosion of the rotor and big damage to the instrument.
3. If you do not use the instrument, keep the rotor separately from the motor shaft and stand it upside down.

5-5. Transportation of the instrument

1. If you need to move or ship the instrument, be cautious to protect the motor shaft from any physical impact or turbulence.
2. Do not mount a rotor in any cases of movement. Fill inside the chamber with proper materials to keep the motor shaft on place and not to be influenced by physical pressure.

6. Trouble Shooting

6-1. Check list

Symptom	Check list
Power failure	Connect the AC Power cord and make sure that the line is completely connected between the instrument and power outlet. Check the power switch is turned on. (Please refer to 3-1. Power on/off and Door Release)
Can't be started	If the door is not closed completely, the instrument can't run. Check the Door LED on the display window and close the door completely.
Can't open the door	If the power is out, check the main fuse for the laboratory to supply the power. If it is not solved in shortly, open the door with the Emergency Door Tool manually for safety of sample. (Please refer to 4-6. Emergency Door Open)
Can't close the door	Remove the dirt at the door latch and then close the door completely again. If the door seems not being closed by mechanical reason, please contact our service team.
Noise and vibration during running	Please check the balanced status of both the table and the instrument.
	Please re-check the coupling status of the following three matches to minimize the noise 1. the balanced way of coupling of the rotor into the motor shaft 2. the completeness of fixing of the Rotor Locking Nut on the rotor 3. the matching status of Rotor Lid with the rotor (Please refer to 3-2. Rotor coupling and disassembling)
	Check balances of samples in the rotor. (Please refer to 3-3. Positioning of Sample Tubes) and load the same weight of samples symmetrically.

6-2. Error Code

If the instrument shows the error code with beeping sound, press [STOP] button to stop the beeping sound and press [Enter] button to release of the error status and make the instrument go to the default setting again.

Error	Possible Causes	Actions
Error 1 or Error 9	RPM Sensor	- Shut off the power supply, and then, turn on the power switch again to check the instrument. - If the error code shows continuously although you try to operate again, please call Gyrozen Field Service Engineer.
Error 2	Door	- If the door is not closed completely, this message is appeared. -Remove the dirt at the door latch and then close the door completely again. Check the Door LED on the display window. If it is not solved in shortly, open the door with emergency door tool manually for safety of sample. (Please refer to 4-6. Emergency Door Open)
Error 3	Motor Overheating	- If the motor is overheated, this message is appeared. -Shut off the power supply for an hour, and then turn on the power switch for checking the instrument. - If the error code shows continuously, please call Gyrozen Field Service Engineer.
Error 4	Low Voltage	- If the power input of Power supply (V/Hz) is 10% less than required power, this message is appeared. - Shut off the power supply and then check the voltage of the Power supply (V/Hz). - Use AVR to provide proper power.
Error5	High Voltage	- If the power input of Power supply (V/Hz) is 10% more than required power, this message is appeared. - Shut off the power supply and then check the voltage of the Power supply (V/Hz). - Use AVR to provide proper power.
Error 6	Over Speed	- If the instrument is spun with over speed, there will be some problems

		in the overload of motor and the output of motor. - Shut off the power supply, and then, turn on the power switch again to check the instrument.
Error 7	Software	- If the installed software has bugs, this message is appeared. - Tuning the firmware (Download)*
Error 8	Imbalance	- Check weight-balances of samples (Please refer to 3-3. Positioning of Sample Tubes) and then turn off and on the instrument for checking.

* Any wire disconnection or tuning of the instrument must be performed only by a service engineer who is authorized by GYROZEN Co., Ltd.

7. Rotors and Accessories

Angle Rotor, GRA-15-6

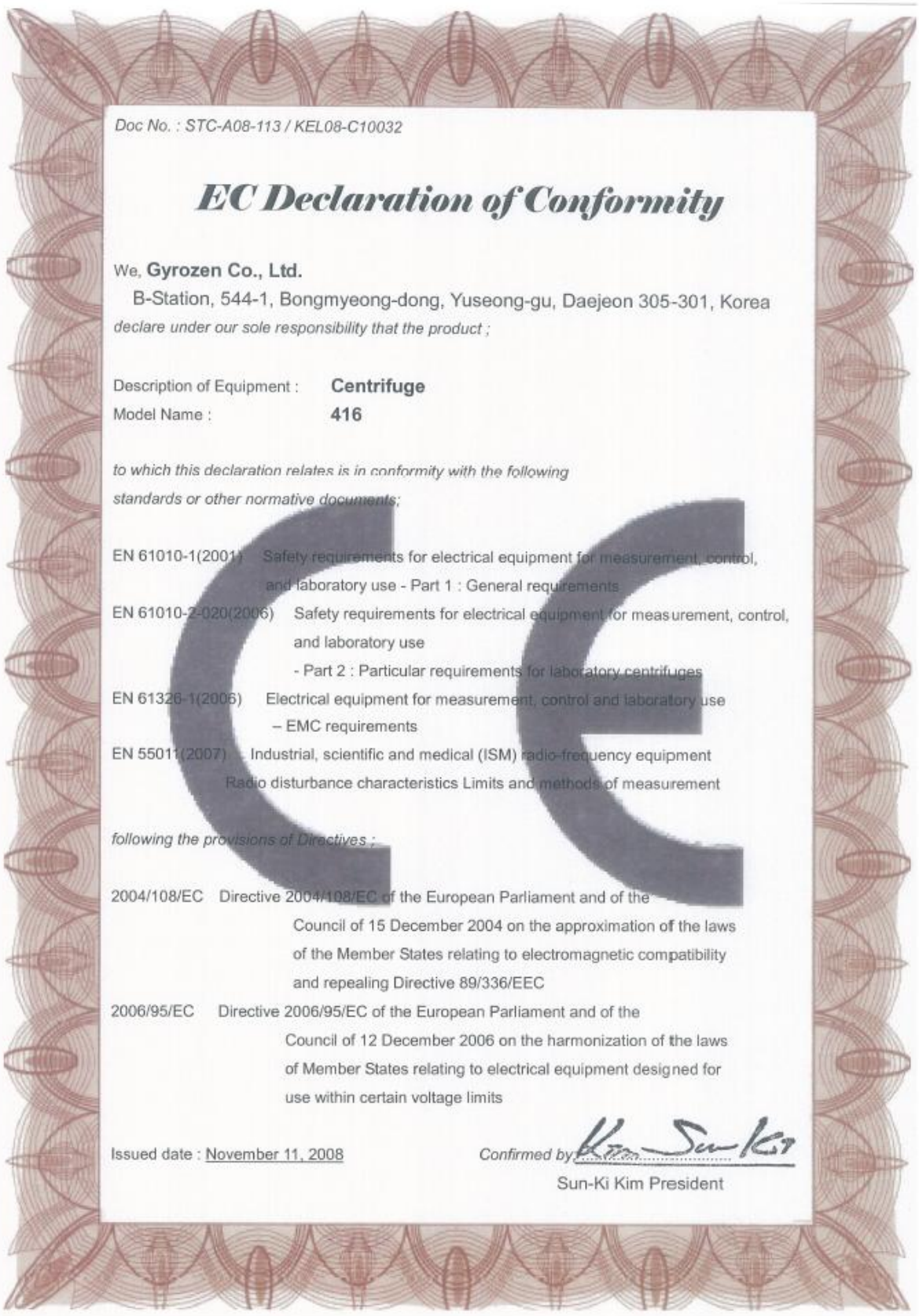
6 x 15 mℓ
∢ 45°
Hole diameter (mm) : 18
Max height for tube fit (mm) : 130

Tube						
Tube capacity(mℓ)	3	4	5	10	15	15 mℓ conical
Adaptor				None	None	None
Cat. No.	GAS-3(15)	GAS-4(15)	GAS-5(15)	-	-	-
Adaptor bore (Φxℓ, mm)	13 x 63	13 x 65	13 x 85	-	-	-
Radius(mm)	95.5	98.5	111	115	116	112
Max.RPM	4,000					
Max.RCF(g-Force)	1,703	1,762	1,986	2,057	2,075	2,003

Stainless Steel 15 mℓ Sleeve
GSR-15-TA
Sleeve bore (Φx h, mm) : 18 x 97.5
Radius(mm): 125
Max. RPM : 4,000
Max. RCF(g-force) : 2,875

8. Product Range

9. CE



Doc No. : STC-A08-113 / KEL08-C10032

EC Declaration of Conformity

We, **Gyrozen Co., Ltd.**
B-Station, 544-1, Bongmyeong-dong, Yuseong-gu, Daejeon 305-301, Korea
declare under our sole responsibility that the product ;

Description of Equipment : **Centrifuge**
Model Name : **416**

to which this declaration relates is in conformity with the following standards or other normative documents;

EN 61010-1(2001) Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1 : General requirements
EN 61010-2-020(2006) Safety requirements for electrical equipment for measurement, control, and laboratory use
- Part 2 : Particular requirements for laboratory centrifuges
EN 61326-1(2006) Electrical equipment for measurement, control and laboratory use – EMC requirements
EN 55011(2007) Industrial, scientific and medical (ISM) radio-frequency equipment Radio disturbance characteristics Limits and methods of measurement

following the provisions of Directives ;

2004/108/EC Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC
2006/95/EC Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits

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Confirmed by Kim Sun Ki
Sun-Ki Kim President