

## STANDARD OPERATING PROCEDURE


Title	Eppendorf® Centrifuge 5804/5804 R and 5810/5810 R
Short title	Centrifuge 5804/5804 R/5810/5810 R

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## 1 Purpose

The purpose of this Standard Operating Procedure (SOP) is to describe how to use the Eppendorf 5804/5804R and 5810/5810R centrifuges.

## 2 Scope

This SOP applies to all laboratory staff involved in use the of the Eppendorf 5804/5804R and 5810/5810R centrifuges.

## 3 Abbreviations and definitions

*Abbreviations and definitions included in alphabetical order*

### 3.1 Abbreviations

BNITM	Bernhard Nocht Institute for Tropical Medicine
g (force)	Gravitational force
MTP	Microtiterplate
N/A	Not applicable
PCR	Polymerase Chain Reaction
R	Refrigerated
rcf	Relative centrifugal force: g-force in m/s <sup>2</sup>
rpm	Revolutions per minute
SOP	Standard Operating Procedure
VIR	Department of Virology

### 3.2 Definitions

SOP	A detailed, written instruction to archive uniformity of the performance of a specific function.
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## 4 Responsibilities

Role/Title	Responsibilities/Tasks
Head of Laboratory	Release valid version of the SOP for use in the laboratory.
Designated senior laboratory staff	Take care of the regular review process for the SOP and supervise SOP and process specific trainings and the corresponding documentation.
All laboratory staff	Adherence to the SOP and the user guide for the use of the corresponding devices.

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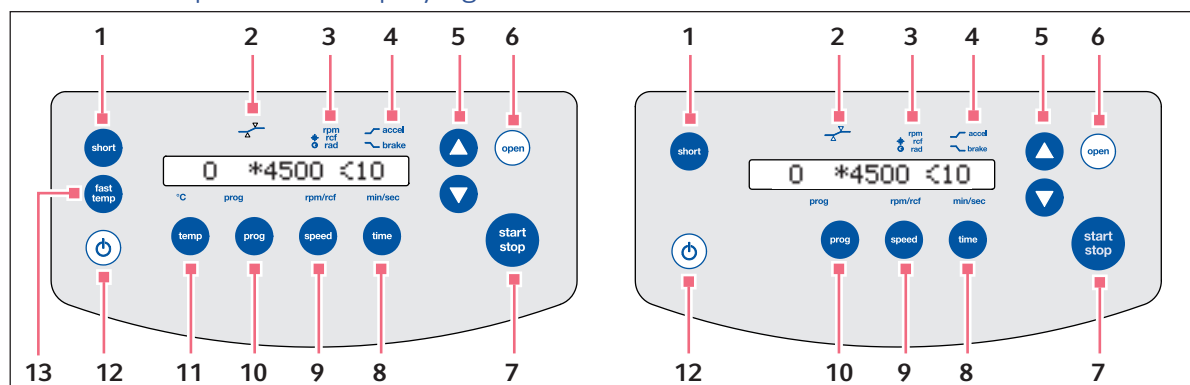
## 5 General description

The versatile centrifuge has a capacity of maximum 4 × 250 ml (centrifuge 5804/5804 R) or 4 × 750 ml (Centrifuge 5810/5810 R) and reaches a maximum of 20913 × g/14000 rpm. The versatility is reflected in the available rotor options. You can select between 12 (centrifuge 5804/5804 R) or 16 (centrifuge 5810/ 5810 R) different rotors to centrifuge the following tubes for your various applications:

- Micro test tubes (0.2 ml to 5.0 ml)
- PCR strips
- Microtainers
- Spin columns
- Cryogenic tubes
- 15 or 50 ml conical centrifuge tubes
- Bottles (175 ml to 750 ml)
- Various tubes (3 ml to 120 ml)
- Microplates
- PCR plates
- Deepwell plates (max. height of 29 mm)
- Slides (with CombiSlide adapter)
- Cell culture flasks

The Centrifuge 5804 R/5810 R has an additional temperature control function for centrifugation between -9°C and 40°C.

### 5.1 Control panel and display figures



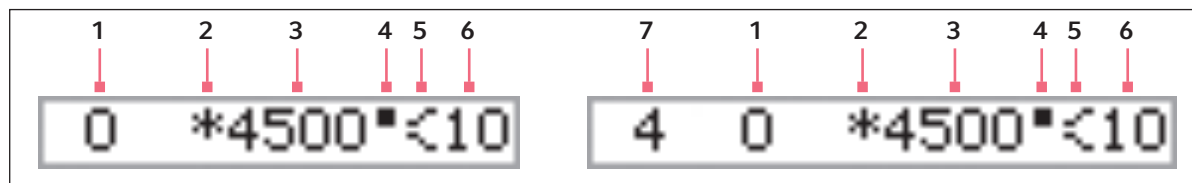
Control panel of the Centrifuge 5804 R/5810 R and the Centrifuge 5804/5810

- 1: Short - Short spin centrifugation
- 2: At set rpm function status
- 3: Speed – no symbol (rpm)/ g-force (rcf) \* / radius setting  $\odot$  indicator
- 4: Symbol for acceleration(  $\nearrow$ ) and braking (  $\searrow$ )
- 5: Arrow keys - Set parameter values
- 6: Open - Release centrifuge lid
- 7: Start/stop - Start or stop centrifugation
- 8: Time - Select run time setting
- 9: Speed - Select speed setting
- 10: Prog - Select or save program
- 11: Temp (Centrifuge 5804 R/5810 R only) - Select temperature setting
- 12: Standby  $\odot$

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### 13: Fast temp (Centrifuge 5804 R/5810 R only) Start FastTemp temperature control run



Display of the centrifuge 5804 R/5810 R and the centrifuge 5804/5810

- 1: Program number
- 2: Symbol for g-force (rcf)
- 3: g-force (rcf)/rotational speed (rpm)
- 4: Symbol flashes when rotor is in motion
- 5: Symbol for acceleration (↗) and braking (↘)
- 6: Centrifugation time
- 7: Temperature (model 5804 R/5810 R only)

## 6 Device requirements

- The Centrifuge is exclusively intended for indoor use
- Minimum distance to other devices and walls: 30 cm
- Resonance free table with horizontal even work surface
- The surrounding area must be well ventilated
- The location is protected against direct sunlight
- Ambient temperature: 10 °C – 35 °C
- Max. relative humidity: 75 %, non-condensing humidity
- Atmospheric pressure: 75 kPa – 106 kPa

## 7 Material and equipment

### 7.1 General

- The device with all its components:
  - Centrifuge 5804 (R)/5810 (R)
  - Rotor key
  - Mains/ power cord
  - Operating manual
  - Set of fuses
  - Condensation water tray (only for the refrigerated centrifuges 5804 R and 5810 R)
- Centrifugation rotor with respective adapters
- Buckets, optionally with aerosol-tight lids

A list of rotors with matching buckets, inlets and lids can be found in the Eppendorf® manual "Centrifugation\_Operating-manual\_Centrifuge-58XX-family". Under no circumstances may unlisted or mismatching rotors, buckets, inlets or lids be used.

### 7.2 Maintenance

- Cloth/ paper towels
- Mild disinfectant

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- Brush
- Swabs
- Lubricant

### 7.3 Storage

The device with all additional product parts and materials are stored under normal laboratory conditions at room temperature.

Storage conditions while the device is not in use:

- Air temperature: -5 °C – 45 °C
- Relative humidity: 10 % – 75 %
- Atmospheric pressure: 70 kPa – 106 kPa

## 8 Safety

- The device and accessories may only be operated by trained and skilled personnel
- Only switch on the device if the device and mains/power cord are undamaged
- In case of danger, disconnect the device from the mains/power supply voltage
- When handling infectious liquids and pathogenic germs, observe the national regulations, the biosafety level of your laboratory, the material safety data sheets, and the manufacturer's application notes
- Use aerosol-tight sealing systems for the centrifugation of these substances

### 8.1 Personal safety

- Personal protective equipment must be worn when operating the centrifuge
- Open the centrifuge lid fully to ensure that the centrifuge lid cannot slam shut and injure you
- Do not reach between the device and centrifuge lid when opening or closing the centrifuge lid
- If the emergency release of the lid is operated, the rotor may continue to rotate for several minutes. Wait for the rotor to stop before activating the emergency release. To check, look through the monitoring glass in the centrifuge lid.
- If rotor lids or caps have come into contact with any organic solvents, they should be cleaned immediately

### 8.2 Device safety

- If unusual noises occur when the centrifuge starts, the rotor or rotor lid may not be properly secured. Immediately press the start/stop key to stop centrifuging
- Load buckets symmetrically with identical tubes or plates.
- Always load all positions of a swing-bucket rotor with buckets
- Only load adapters with suitable tubes or plates
- Always use tubes or plates of the same type (weight, material/density and volume)
- Do not exceed the maximum load of the rotor
- Check the rotor lids and caps regularly for any damage and cracks
- Immediately replace any rotor lids or caps which show cracks or milky stains
- Do not use this device near strong electromagnetic sources

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## 9 Procedural description

### 9.1 Start-up process

#### 9.1.1 Installation of the device

1. Open the box
2. Remove the covering cardboard
3. Remove the accessories
4. Lift the device by the underside in the vicinity of the device feet and place it directly on a suitable lab bench
5. Allow the device to warm up for at least 3 hours (5804/5810) or 4 hours (5804 R/5810 R) to the ambient temperature to prevent damage to the electronic components from condensation and damage to the compressor (only 5804 R/5810 R)
6. Check that the mains/power supply voltage and mains/power frequency match the requirements on the name plate. Centrifuge 5804 R/5810 R with mains/power supply voltage 120 V
7. Connect the centrifuge to the mains/power line and switch it on using the mains/power switch on the right side of the device
  - The open key lights up
  - The display is illuminated
8. Open the centrifuge lid using the open key
9. Use the information included in the delivery package to check that the delivery is complete
10. Check all parts for any transport damage
11. Only 5804 R/5810 R: Insert the condensation water tray at the front of the device into the provided holder

#### 9.1.2 Functional check

- Switch on the centrifuge using the mains power switch or the standby key
- Open the closed centrifuge lid by pressing the open key. The parameter settings of the last run are displayed.
- If this is the case the device is ready for operation

#### 9.1.3 Calibration

N/A

#### 9.1.4 Validation

N/A

### 9.2 Operations

#### 9.2.1 Preparation for centrifugation

1. Switch on the centrifuge using the mains power switch or the standby key
2. Open the closed centrifuge lid by pressing the open key
3. Prerequisites for inserting the rotor:
  - a. When attaching the rotor to or releasing it from the motor shaft, the temperature of the rotor and motor shaft must be within the range of 10 – 30°C
  - b. Remove the buckets before inserting and/or removing the rotor
  - c. Use both hands to pick up the rotor

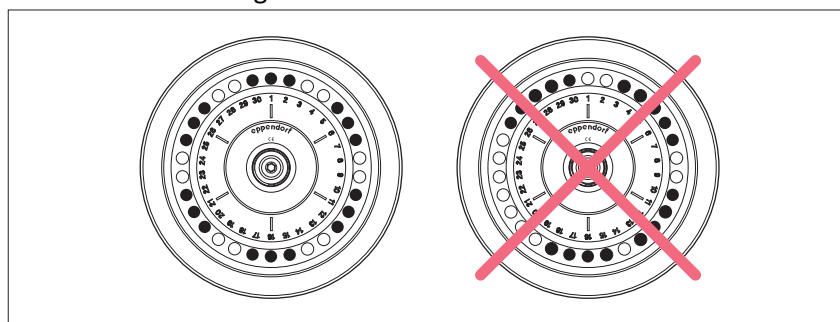


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4. Place the rotor vertically on the motor shaft
5. Insert the supplied rotor key into the rotor nut
6. Turn the rotor key clockwise until the rotor nut is firmly tightened  
Automatic rotor detection: It detects a newly inserted rotor and displays its maximum permitted speed for approximately 2 seconds. G-force (rcf) and speed (rpm) are automatically limited to the maximum permitted value for the rotor
7. Load the rotor

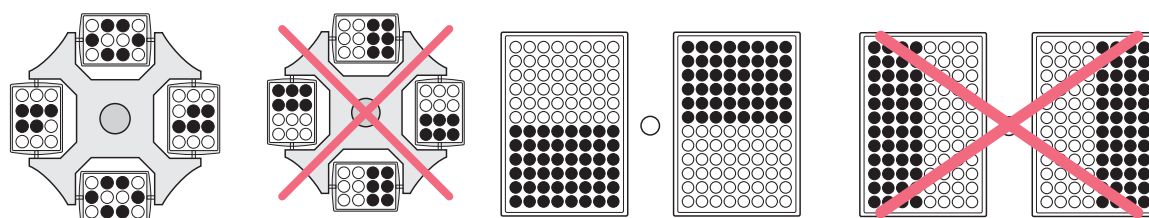
#### 9.2.1.1 Fixed-angle rotors

- Check the maximum load (adapter, tube and contents) per rotor bore. The information about this can be found on the rotor
- Load rotors and adapters only with the tubes intended for them
- Insert tubes opposite each other in pairs into the rotor bores. To ensure symmetric loading, tubes that are arranged opposite each other must be of the same type and contain the same filling quantity
- Attach and tighten the rotor lid



#### 9.2.1.2 Swing-bucket rotors

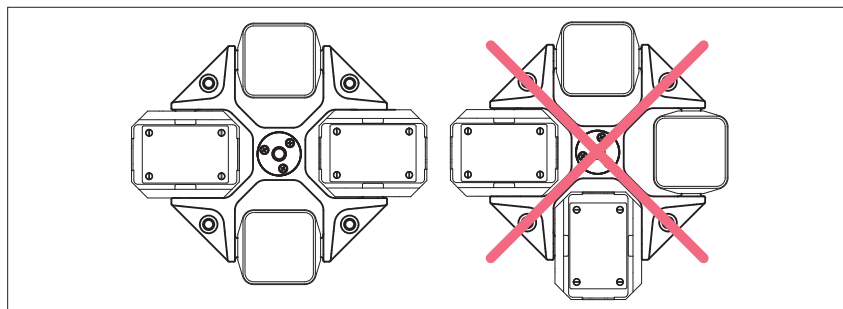
- Prerequisites:
  - The buckets are sorted by weight category. Buckets located opposite each other must belong to the same weight category
  - Always load all positions of a swing-bucket rotor with buckets
  - Load buckets symmetrically with identical tubes or plates
  - Only load adapters with suitable tubes or plates
- Make sure that the bucket grooves are clean. Dirty grooves and pivots prevent the buckets from swinging out evenly
- Hang the buckets into the rotor
- Check to see if all buckets are completely hung and can freely swing out
- Load the buckets symmetrically
- Check the loading of the buckets
- Optional/ if necessary: close the buckets with fitting lids



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#### 9.2.1.2.1 Mixed loading with buckets

Mixed loading of swing-bucket rotors with buckets and plate buckets is possible if these are intended for the rotor. Buckets or plate buckets that are located opposite each other must be of the same type.



Rotor	Mixed loading
S-4-104	<ul style="list-style-type: none"> <li>• 2 buckets for plates (open buckets or plate buckets)</li> <li>• 2 round buckets</li> </ul>
A-4-81/A-4-81-MTP/Flex	<ul style="list-style-type: none"> <li>• 2 buckets (MTP or DWP buckets)</li> <li>• 2 buckets for conical tubes</li> <li>• 2 rectangular buckets</li> </ul>
A-4-44	<ul style="list-style-type: none"> <li>• 2 rectangular buckets</li> <li>• 2 buckets for conical tubes</li> </ul>

Note: If you load the rotors A-4-62 and A-4-62-MTP with a mixed equipment, the rotors are damaged during centrifugation. Load all positions of the A-4-62 and A-4-62-MTP rotors with the same buckets.

#### 9.2.2 Closing the centrifuge lid

- Check the correct attachment of the rotor and rotor lid
- Push down the centrifuge lid until the lid latch engages and the lid is automatically closed
- The centrifuge will close automatically
- The open key lights up blue. ■ appears on the display

#### 9.2.3 Cooling (5804 R/5810 R only)

When the centrifuge is not running the temperature can be adjusted by pressing the "temp" button. (maximum 40°C and minimum -9°C). As soon as the centrifuge is running the display will show the actual temperature instead of the desired temperature and as soon as the selected temperature is reached the centrifuge reacts to temperature changes by flashing at a difference of +/- 3°C. If there is a difference of +/- 5°C the centrifuge stops automatically.

##### 9.2.3.1 FastTemp

This function can be used to start a temperature control run without samples, with a rotor and temperature-specific speed in order to quickly adjust the temperature of the rotor chamber, including the rotor, buckets and adapters, to the previously set temperature.

Prerequisites

- The centrifuge is switched on
- The rotor and rotor lid are attached properly
- The centrifuge lid is closed
- Temperature and g-force (rcf)/speed (rpm) for the centrifugation are set

1. Press the fast temp key

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- During the run the actual temperature is displayed.
- The temperature control run ends automatically when the set temperature is reached. A periodic alarm tone sounds

### 2. Press the start/stop key to end the temperature control run

- When using aerosol-tight buckets, always carry out the FastTemp run at low temperatures without the lids. This prevents the danger of the caps getting stuck by suction due to a vacuum.
  - If this happens, do not pull the sealing clamps or hooks to loosen the cap, but adjust the temperature of the buckets to room temperature so that the caps can be removed easily.

#### 9.2.3.2 Continuous cooling

If the rotor stops, the rotor chamber will be maintained at the target temperature if the following requirements have been met:

- The centrifuge is switched on
- The centrifuge lid is closed
- The set temperature is lower than the ambient temperature
- The centrifuge is not in standby mode

During continuous cooling the following applies:

- The set and actual temperature are displayed alternately
- Irrespectively of the set temperature, the temperature does not go below 4 °C to prevent the rotor chamber from freezing and from increased condensation in the device
- The temperature adjustment takes longer because the rotor is not rotating

To end continuous cooling, open the centrifuge lid or press the standby key.

If the centrifuge is not used for more than 8 hours, the continuous cooling is switched off automatically (ECO shut-off). The device then switches to standby mode. This protects against ice formation in the rotor chamber and increased condensation in the device. With FastTemp you can quickly reach the desired temperature again.

You can also change from automatically switching off continuous cooling after 8 hours (ECO shut-off) to unlimited continuous cooling.

1. When the centrifuge lid is opened, press the temp and prog keys simultaneously - standby 8h appears in the display
2. Press the fast temp key immediately. Endless operation for continuous cooling is activated. Standby endless appears in the display
3. To change back to Standby 8h, repeat the process

#### 9.2.4 Aerosol-tight centrifugation

Aerosol-tight centrifugation is guaranteed only if the rotors and rotor lids intended for this purpose are used. The designation of aerosol-tight fixed-angle rotors always starts with FA. The aerosol-tight rotors and rotor lids of this centrifuge are additionally marked with a red ring on the rotor and a red rotor lid screw.

Aerosol-tight swing-bucket rotors are marked with AT (aerosol-tight). Always use rotors and rotor lids marked aerosol-tight together for aerosol-tight centrifugation. The details specifying in which centrifuge you may use the aerosol-tight rotors and rotor lids can be found on the rotor and on the top of the rotor lid.

Mechanical stresses and contamination by chemicals or other aggressive solvents may impair the aerosol tightness of the rotors and rotor lids.

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Check the integrity of the seals of the aerosol-tight rotor lids or caps before each use.

### 9.2.4.1 *Aerosol-tight centrifugation in a fixed-angle rotor*

- Aerosol-tight fixed-angle rotors have a QuickLock rotor lid
- Replace aerosol-tight rotor lids after 50 autoclaving cycles
- Replace the seals of QuickLock rotor lids after 50 autoclaving cycles
- Replace damaged seals of QuickLock rotor lids

### 9.2.4.2 *Aerosol-tight centrifugation in a swing-bucket rotor*

- For aerosol-tight centrifugation in a swing-bucket rotor, use buckets with aerosol-tight caps
- Replace aerosol-tight caps after 50 autoclaving cycles

## 9.2.5 Centrifuging

### 9.2.5.1 *Centrifugation with time setting*

1. Speed (rpm) setting: press once. g-force (rcf) setting: press repeatedly until the “star” symbol additionally appears in the display  
The displayed g-force (rcf)/speed (rpm) flashes and can be set with the arrow keys.  
For the g-force (rcf) setting also check the set radius
2. Use the arrow keys to set the g-force (rcf)/speed (rpm). The new set value appears in the display
3. Select the runtime setting and set it with the arrow keys
4. 5804 R/5810 R only: select the temperature setting and set it with the arrow keys
5. Start centrifugation. During centrifugation:
  - ■ blinks in the display when the rotor is running
  - 5804 R/5810 R only: the current temperature will be displayed
  - The current g-force (rcf)/speed (rpm) of the rotor is displayed
  - You can display all set values for 2.5 s by pressing a parameter key (Temp, Speed, Time)
  - You can terminate centrifugation early by pressing the start/stop key
  - The centrifuge automatically stops after the set time has elapsed. The elapsed centrifugation will be shown in a blinking display during the braking process
6. Open the centrifuge lid as soon as the “open” key lights up

During the run you can modify the total run time, the temperature (centrifuge 5804 R/ 5810 R only) and the g-force (rcf)/speed (rpm) as well as the acceleration time and the braking time. The new parameters are adopted immediately. The time which has already elapsed is considered in the newly set total run time. Please note that the shortest new total run time that can be set is the elapsed time plus 2 minutes.

### 9.2.5.2 *Centrifuging in continuous operation*

1. Set the g-force (rcf)/speed (rpm) and possibly the temperature as previously described
2. Select the runtime setting  
Set continuous operation below 1 min or above 99 min. The symbol “∞” indicates continuous operation
3. Start centrifugation. During centrifugation:
  - ■ blinks in the display when the rotor is running
  - If the centrifuge runs for more than 99 min, “99” appears in the display

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- 5804 R/5810 R only: the current temperature will be displayed
  - The current g-force (rcf)/speed (rpm) of the rotor is displayed
4. End centrifugation after the desired time. The elapsed centrifugation time will be shown in a blinking display during the braking process
  5. Open the centrifuge lid as soon as the “open” key lights up

### 9.2.5.3 Short spin centrifugation

You can carry out a short spin centrifugation with the currently setting or with the maximum g-force (rcf)/ speed (rpm) of the used rotor

#### 9.2.5.3.1 Setting the speed option

Press and hold down the “short” key with the centrifuge lid open. One of the following options appears in the display:

- rpm max: the rotor accelerates up to its maximum g-force (rcf)/speed (rpm)
- 200 - rpm: the rotor only accelerates up to its set g-force (rcf)/speed (rpm)

Press and hold down the “short” key for more than 3 s with the centrifuge lid open to switch between the rpm max and 200 - rpm options. The selected option appears in the display for 2 s and is retained.

#### 9.2.5.3.2 Starting the short spin centrifugation

1. If 200 - rpm is set, set the g-force (rcf)/ speed (rpm) for the short spin centrifugation
2. 5804 R/5810 R only: set temperature
3. Keep the “short” key pressed to start the short spin centrifugation.
  - SH appears in the display while the rotor is running. The time is counted upwards in seconds
4. Release to end the short spin centrifugation
  - During the braking process, you can restart the centrifugation up to 2 times by pressing the short key again
5. Open the centrifuge lid as soon as the “open” key lights up

### 9.2.6 Removing the rotor

1. Turn the rotor nut counterclockwise using the rotor key
2. Remove the rotor by lifting it vertically
3. 5804 R/5810 R only: Switch off the centrifuge after use, empty the condensation water tray, leave the centrifuge lid fully opened and protect it against closing

### 9.2.7 Modes

You can switch between standby mode and ready state at any time when centrifugation is not performed by pressing the standby key.

Standby mode:

- The display is dark
- The standby key lights red
- 5804 R/5810 R only: The rotor chamber is not cooled

Ready state:


- The centrifugation parameters are displayed
- The standby key lights up in green
- 5804 R/5810 R only : The rotor chamber is cooled when the centrifuge lid is closed

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### 9.2.8 Operating controls and function



#### 9.2.8.1 *Setting the radius*



When you control the rotational speed via the g-force (rcf), and not via the speed (rpm), the internal conversion of speed to g-force takes place by default with the largest radius of the used rotor. You can adapt this radius to an applied adapter:

1. Press several times until the  symbol also appears in the display. The current radius flashes
2. Set the new radius
3. Wait for 3 seconds (if the rotor is stopped: 10 seconds). The changed g-force appears.

#### 9.2.8.2 *Setting the acceleration and braking times*

You can set the acceleration and braking time in the levels 0 to 9. Level 9 is preset (shortest acceleration and braking time).

1. Press twice until the  symbol for acceleration level (accel) appears in the display
2. Select acceleration level 0 to 9
3. Press once until the  symbol for braking level (brake) appears in the display
4. Select braking level 0 to 9. Braking level 0 corresponds to free deceleration

The device only shows the  and  symbols continually when levels 0 to 8 have been set.

#### 9.2.8.3 *Setting the start of run time (at set rpm)*

The centrifuge can count down the set time either immediately from the start of centrifugation or only once 95% of the specified g-force (rcf)/speed (rpm) has been reached (at set rpm). The respective setting is indicated by the flashing triangle in the symbol above the display:

Preset time: the set time is counted down immediately after the start of centrifugation.



At set rpm: the set time is counted down once 95% of the specified g-force (rcf)/ speed (rpm) has been reached.



Hold down the "Start/Stop" key for at least 4 s to switch between the two settings, when pressing the key, both triangles of the symbol will flash in turn.

#### 9.2.8.4 *Saving the program*

You can save the current centrifugation parameters and functions (at set rpm, acceleration and braking times and radius) under up to 35 program numbers.

Prerequisites: Rotor stop

1. Check the parameters and functions to be saved
2. Press "prog" key twice  
The first free program number appears with P... in the display
3. Select the program number (1...9,A...Z)
4. Press and hold "prog" key for 2 seconds  
"Ok" appears in the display. The current centrifugation parameters and functions are saved under the selected program number. Saved programs need to be deleted before overwriting them.

#### 9.2.8.5 *Loading the program*

Prerequisites: Rotor stop

1. Press "prog" once – the program number flashes  
0: centrifugation parameters and functions of the last run

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- 1...9, A...Z: stored programs
2. Select the program number
3. When the centrifuge lid is closed, the centrifugation starts with the loaded centrifugation parameters and functions.  
When the centrifuge lid is open, you can press the start/stop key to return to program 0 or exit the programming mode.

If you change the centrifugation parameters during a run with a stored program, the centrifuge changes to program 0. The stored program remains unchanged. You can also exit the stored program by loading program 0.

### 9.2.8.6 *Deleting the program*

Prerequisites: Rotor stop and the centrifuge lid is open

1. Press "prog" once - the program number flashes
2. Select the program number
3. Within 10 seconds, keep key pressed for 2 seconds  
The following text appears in the display: cleared. The selected program is deleted. You can save new centrifugation parameters and functions under this program number.

### 9.2.8.7 *Special functions*

Display operating hours:

- Prerequisite: Rotor stop
- Press both keys ("time" and "prog") simultaneously
- The previous total run time of the centrifuge (in hours) appears in the display

Switching on/off the warning signal:

- Press both keys ("speed" and "time") simultaneously to change the setting
- "Alarm on" or "Alarm off" appears in the display after 2 s

Exiting the service functions:

- Press both keys ("up" and "down") simultaneously to exit a service function called by mistake.

### 9.2.9 *Emergency release*

If the centrifuge lid cannot be opened, you can activate the emergency release manually. You need the rotor key supplied with the centrifuge.

1. Disconnect the power plug.
2. Remove the plastic cover for the emergency release, which is located in the center on the front side of the device
3. Insert the rotor key into the hexagonal opening behind until some resistance can be felt
4. While keeping the rotor key pressed, turn it in a counterclockwise direction; this will release the centrifuge lid
5. Open the centrifuge lid
6. Remove the rotor key and put the plastic covers back on

## 10 Waste management

N/A

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## 11 Maintenance

### 11.1 Internal

#### 11.1.1 General cleaning/ disinfection instructions

- Use a mild cleaning fluid to clean the accessible surfaces of the device and the accessories
- Do not allow any liquids to penetrate the inside of the housing
- Do not use any aggressive chemicals on the device or its accessories, such as strong and weak bases, strong acids, acetone, formaldehyde, halogenated hydrocarbons or phenol.
- Do not use any corrosive cleaning agents, aggressive solvents or abrasive polishes. Do not incubate the accessories in aggressive cleaning agents or disinfectants for longer periods.
- Do not perform a spray clean/spray disinfection on the housing. Only reconnect the device to the mains/power line when it is completely dry, both inside and outside.
  - If the device has been contaminated by aggressive chemicals, clean it immediately using a mild cleaning agent
- Do not use UV, beta, gamma, or any other high-energy radiation for disinfection
- *Autoclaving:*  
Except for the rotor crosses A-4-81, S-4-72 and S-4-104, all rotors, rotor lids, buckets, carriers, caps and adapters can be autoclaved (121 °C, 20 min). After a maximum of 50 autoclaving cycles, the caps and QuickLock rotor seals must be replaced. Do not use stained, porous or otherwise defective seals. Also note the operating manual of the centrifuge and the supplement sheet on aerosol-tight centrifugation delivered together with the aerosol-tight rotors. The aerosol-tight rotor FA-45-30-11 can be autoclaved at 142°C for 2 hours to destroy prions. Please note that in this case the rotor lid must be replaced after each autoclaving
- *Aerosol tightness:*  
Check that the seals are intact before use!  
QuickLock rotor lid: Replace the sealing ring in the lid groove when it becomes worn. The seals of the rotor S-4-104 can be replaced. Replace the rotor lids with screw cap when the sealing rings on the lid screw and in the lid groove become worn. Regular care of the sealing rings is necessary in order to protect the rotors.  
Aerosol-tight rotors should never be stored with the lids screwed on! In order to prevent damage, lightly grease the lid thread of the aerosol-tight rotors regularly with pivot grease
- *Swing-bucket rotors:*  
Before cleaning the rotor, remove old pivot grease from grooves and pivots. Make sure that the grooves and pivots are clean. Dirty grooves and pivots prevent the buckets from swinging out evenly. After cleaning, lightly lubricate the pivots of the rotor and the grooves of the buckets with pivot grease so that the carriers can move freely in a swinging manner.

#### 11.1.2 Weekly maintenance – cleaning and disinfecting the device

1. Open the lid
2. Switch the device off at the mains/power switch. Disconnect the mains/power plug from the voltage supply
3. Loosen the rotor nut by turning the rotor key counterclockwise
4. Remove the rotor
5. Clean and disinfect all accessible surfaces on the device including the mains/power cord using a damp cloth and recommended cleaning agents
6. Thoroughly clean the rubber seal of the rotor chamber with water



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7. Rub the dry rubber seal with glycerol or talcum powder to prevent it from becoming brittle. Other components of the device, such as the lid latch, lid springs, motor shaft and rotor cone, must not be lubricated
8. Clean the motor shaft with a soft, dry, lint-free cloth. Do not grease the motor shaft
9. Check the motor shaft for damage
10. Check the device for corrosion and damage
11. Leave the centrifuge lid open when the device is not being used
12. Only reconnect the device to the power supply if it is fully dry on the inside and outside

### 11.1.2 Maintenance on demand

#### 11.1.2.1 *Cleaning and disinfecting the rotor.*

After every 200 runs, the centrifuge displays clean rotor three times to remind you about the regular rotor cleaning.

1. Inspect the rotor and accessories for damage and corrosion. Do not use damaged rotors or accessories
2. Clean and disinfect the rotors and accessories with the recommended cleaning agents
3. Clean and disinfect the rotor bores with a bottle brush
4. Rinse the rotors and accessories thoroughly with distilled water. Rinse the rotor bores of fixed-angle rotors particularly thoroughly  
Do not put the rotor into the dishwasher and do not immerse the rotor in liquid as liquid can enter through the openings when doing so
5. Place the rotors and accessories on a towel to dry. Place fixed-angle rotors with the rotor bores facing down so the bores can also dry
6. Clean the rotor cone with a soft, dry, lint-free cloth. Do not lubricate the rotor cone
7. Inspect the rotor cone for damage
8. Place the dry rotor onto the motor shaft
9. Tighten the rotor nut firmly by turning it clockwise with the rotor key
10. Load the fixed-angle rotor with the cleaned adapters or the swing-bucket rotor with the cleaned buckets and adapters, if necessary
11. Leave the rotor lid open when the rotor is not being used

#### 11.1.2.2 Additional care for refrigerated centrifuges (5804 R/ 5810R)

- Empty and clean the condensation water tray regularly and especially after liquid spillage in the rotor chamber. Pull out the condensation water tray at the front right under the device
- Clean the condensation water drain on a regular basis, too, e.g., using a bottle brush
- Regularly free the rotor chamber from ice formations by thawing, by either leaving the centrifuge lid open or by performing a short temperature control run at approx. 30 °C
- To take pressure off the gas spring(s), leave the centrifuge lid open if the centrifuge is not used for a longer period. Residual moisture can escape
- Wipe up the condensation water in the rotor chamber. Use a soft, absorbent cloth for this
- No later than every 6 months, remove any dust deposits from the ventilation slits of the centrifuge using a brush or swab

#### 11.1.2.3 Cleaning glass breakage

When using glass tubes there is a risk of glass breakage in the rotor chamber. The resulting glass splinters are swirled around in the rotor chamber during centrifugation and have a sandblasting effect

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on the rotor and accessories. The smallest glass particles become lodged in the rubber parts (e.g., the motor guide, the rotor chamber seal, and the rubber mats of adapters).

Glass tubes in the rotor chamber may break if the g-force is too high. Broken glass can damage the rotor, accessories and samples. Please note the manufacturer's information on the recommended centrifugation parameters (load and speed).

Effects of glass breakage in the rotor chamber:

- Fine black metal abrasion in the rotor chamber (in metal rotor chambers)
- The surfaces of the rotor chamber and accessories are scratched
- The chemical resistance of the rotor chamber is reduced
- Contamination of samples
- Wear on rubber parts

How to proceed in case of glass breakage

1. Remove all splinters and glass powder from the rotor chamber and accessories
2. Thoroughly clean the rotor and rotor chamber. Thoroughly clean the bores of the fixed-angle rotors, in particular
3. If required, replace the rubber mats and adapters to prevent any further damage
4. Regularly check the rotor bores for deposits and damage

### 11.1.3 Decontamination before shipment

If you are shipping the device to the authorized Technical Service for repairs or to your authorized dealer for disposal please note the following:

1. Observe the information in the decontamination certificate. It is available as a PDF document on our webpage ([www.eppendorf.com/decontamination](http://www.eppendorf.com/decontamination))
2. Decontaminate all the parts you are going to dispatch
3. Include the fully completed decontamination certificate in the shipment

## 11.2 External

External maintenance takes place as soon as the unit or any of its components are no longer functioning properly.

Document all maintenance processes of the corresponding maintenance form.

## 12 Troubleshooting

If you cannot remedy an error with the recommended measures listed below, please contact your local Eppendorf® partner. The contact addresses can be found at [www.eppendorf.com](http://www.eppendorf.com).

### 12.1 Resetting the excess current switch

Thermal excess current switches are mounted as fuses. If the excess current protection is triggered, they set the switch to off. However, they do not automatically switch it on again.

To switch on the excess current switch again, proceed as follows:

1. Switch off the centrifuge using the mains/power switch.
2. Wait for at least 20 s and switch on the centrifuge again.

The excess current switch is reactivated and the centrifuge is ready for operation.

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## 12.2 General errors

Problem	Cause	Solution
No display.	No mains/power connection.	▶ Check the mains/power connection.
Display shows <i>Interrupt</i> after the centrifuge has been switched on.	Mains/power outage.	▶ Check the fuse of the centrifuge (see <i>Resetting the excess current switch on p. 51</i> ). ▶ Check the mains/power fuse of the lab. ▶ Press the <b>open</b> key.
Centrifuge lid cannot be opened.	The rotor is still running.	▶ Wait for the rotor to stop.
	Mains/power outage.	1. Check the fuse of the centrifuge. 2. Check the mains/power fuse of the lab. 3. Activate the emergency lid release.
<i>Clean rotor</i>	200 runs.	▶ Clean the rotor and rotor chamber (see p. 45).
Centrifuge brakes during a short run centrifugation, although the <b>short</b> key is pressed.	The <b>short</b> key was released briefly more than twice (protective function for the drive).	▶ Press the <b>short</b> key continuously during a short run centrifugation.

"see p. XX" refers to the page number of the original Eppendorf manual: Centrifugation\_Operating-manual\_Centrifuge-58XX-family

## 12.3 Error messages

If one of the following error messages appears, proceed as follows:

1. Remove fault (see table above)
2. Press the open key to clear the error message
3. If necessary, repeat centrifugation

Some errors can have various causes. The actual cause is described in the message in the device display (see table below).

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Problem	Cause	Solution
<i>No rotor</i> Centrifuge does not start up.	Missing rotor.	► Insert the rotor.
<i>No rotor</i> Centrifuge does not start up.	Error in the drive or in the rotor detection.	► Switch the centrifuge off and back on again after > 20 s.
<i>Press Open</i>	Centrifuge lid could not be locked.	1. Press the <b>open</b> key. 2. Try again to close the centrifuge lid.
<i>Close lid</i>	Centrifuge lid not closed properly.	► Close the centrifuge lid firmly.
<i>Lift lid</i> The centrifuge lid does not open.	The centrifuge lid cannot open automatically.	► Lift the centrifuge lid manually.
<i>IMBAL</i> The centrifuge shakes when it starts up and then switches off.	The rotor is asymmetrically loaded.	► Load the rotor symmetrically (see p. 26).
<i>ROTOR</i> The centrifuge shakes when it starts up and then switches off.	The rotor is not fastened sufficiently tight.	1. Tighten the rotor nut (see p. 26). 2. Check the rotor cone and motor shaft for grooves and damage.
<i>ROTOR</i> The centrifuge shakes when it starts up and then switches off.	<ul style="list-style-type: none"> <li>Centrifuge was pushed.</li> <li>Table is not stable.</li> </ul>	► Position the centrifuge on a stable table (see p. 21).
<i>SPEED</i> Centrifuge switches off.	Nominal speed too high for rotor.	► Enter the appropriate nominal speed (see p. 65).

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Problem	Cause	Solution
<i>change rotor</i>	The maximum service life of the rotor has been reached. The warning is displayed after 98,000, 99,000 and 99,600 runs (3 times after each run). After 100,000 runs, it is displayed after every run.	► Contact Technical Service.
Temperature display flashes. (only 5804 R/5810 R)	Temperature deviation from set value: $\pm 3$ °C.	<ul style="list-style-type: none"> <li>► Check the settings.</li> <li>► Wait until the set temperature has been reached.</li> <li>► Check unhindered air circulation through the air slots.</li> <li>► Thaw ice or switch off the centrifuge and allow it to cool down.</li> </ul>
<i>Overtemp</i> (only 5804 R/5810 R) Centrifuge switches off and issues a warning tone.	Temperature deviation from set value in the rotor chamber: $\pm 5$ °C.	<ul style="list-style-type: none"> <li>► Check the settings.</li> <li>► Check unhindered air circulation through the air slots.</li> <li>► Thaw ice or switch off the centrifuge and allow it to cool down.</li> </ul>
<i>Clear Memory</i>	Program memory full.	► Delete some programs (see p. 43).
<i>Interrupt</i>	Mains/power failure during a run.	► Check the mains/power connection.
<i>Error 1</i>	Error in the rotational speed measurement system.	► If this error message appears again, test with a different rotor.
<i>Error 2</i>	Imbalance sensor faulty.	► Repeat the run.
<i>Error 3</i>	Error in the rotational speed measurement system.	► Insert and tighten the rotor.
<i>Error 3</i>	Error in the rotational speed measurement system.	► Allow the centrifuge to stand for 12 min when switched on until the <b>open</b> key lights up.
<i>Error 4</i>	Lid latch sensor faulty.	► Switch the centrifuge off and back on again after > 20 s.
<i>Error 5</i>	Prohibited opening of lid or lid switch is defective during a run.	<ol style="list-style-type: none"> <li>1. Wait for the rotor to stop.</li> <li>2. Open the centrifuge lid and then close it again.</li> <li>3. Repeat the run.</li> </ol>
<i>Error 6 or overload</i>	Mains/power supply voltage is too low.	► Check the mains/power supply voltage.
<i>Error 6 or overload</i>	<ul style="list-style-type: none"> <li>• Frequency converter overloaded.</li> <li>• Brake faulty.</li> </ul>	► Switch off centrifuge, allow to cool down for at least 5 min, and then switch on again.
<i>Error 8</i>	<ul style="list-style-type: none"> <li>• Drive fault.</li> <li>• Rotor loose.</li> <li>• Motor defective.</li> </ul>	<ol style="list-style-type: none"> <li>1. Wait for the rotor to stop.</li> <li>2. Tighten the rotor.</li> <li>3. Repeat the run.</li> </ol>
<i>Error 9 to Error 25</i>	Electronics fault.	► Switch the centrifuge off and back on again after > 20 s.

"see p. XX" refers to the page number of the original Eppendorf manual: Centrifugation\_Operating-manual\_Centrifuge-58XX-family

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## 13 References

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## 14 Associated Documents

### 14.1 Tools associated with this SOP

Device maintenance form

### 14.2 Other documents associated with this SOP

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## 15 Document History

Review date	Version number	Brief description of changes
N/A	V01	First release