Instruction Manual

C3100 & C3200

LC-8 Laboratory centrifuge with 8 x 15ml rotor



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LC-8 centrifuge is uniquely designed to meet a wide range of applications in both the clinical and research laboratory. An eight-position rotor is included and designed to directly accept test tubes of 10ml (16x100mm) and 15ml (17x120mm) conical or 15ml (16x125mm) round bottom. Adapters for use with all popular sizes of blood collection tubes 2ml, 5ml and 7ml tubes up to 13x100mm (Ø x L) are included. The Adapter-Set is also available as spare part (Order number: 521-3346). The rotor can be easily removed from the chamber for cleaning.

The back-lit, liquid crystal display provides full control over the set run time and rotational speed. The rotational speed can be set/viewed in RPM or RCF and acceleration/deceleration levels can be easily adjusted in the advanced settings mode.

To ensure safety, the digital microprocessor ensures that the lid has been closed and that the safety lid lock is engaged prior to starting a centrifugation cycle. In addition, an advanced imbalance detection system constantly monitors the balance and vibration, automatically bringing the rotor to a stop if an imbalance is detected.

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Table of Contents

Warning	**5**
Safety information	**5**
Package contents	**6**
Unpacking	**6**
Installation	**6**
Intended use	**7**
Symbols and conventions	**7**
Product specifications	**7**
Overview	**8**
Description of knobs and switches	**9**
Control panel	**9**
Operational keys	**10**
Getting Started	**11**
Turning on the centrifuge	**11**
Opening and closing of the lid	**11**
Important Guidelines	**12**
Rotor mounting and dismounting	**12**
Imbalance indicator	**12**
Operation	**13**
Pre-selecting speed/RCF	**13**
Pre-selecting run time, acceleration and braking level	**13**
Starting and stopping the centrifuge	**14**
Quick spin	**14**
Emergency lid release	**15**
Troubleshooting	**15**
Error messages	**15**

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General maintenance 16
- **Regular service** 16
- **Cleaning the centrifuge** 16
- **Cleaning the rotor** 17
- **Rotor sterilization** 17
- **Shipping** 17

Calculations 18
- **Calculation of centrifugal force** 18
- **Calculation of maximum permitted rotor speed** 18

Technical Service 19

Warranty 19

Compliance with local laws and regulations 20

Equipment disposal 20

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Warning

Before using the machine, make sure to read and understand this manual thoroughly. Keep the manual close to the machine, and easily accessible to all users.
Improper operation can cause injury to persons or damage to the equipment.

Safety information

Please follow the guidelines below and read this manual in its entirety to ensure safe operation of the unit.

- Do not use rotors and shields, which show clear signs of corrosion or mechanical defects. Please check the accessories at regular intervals.
- Always load the rotor in a balanced way by weight to prevent negative consequences of unbalanced rotor, like damaged bearings and motor axle, or inadequate results of centrifugation. Equal or equally loaded test tubes must be symmetrically arranged.
- Do not move or knock the centrifuge during operation!
- Repairs must only be performed by an authorized service technician.
- The centrifuge may only be used for specified applications. It should not be used in a hazardous or potentially flammable environment or for centrifugation of explosive or highly reactive substances.
- When handling toxic, aggressive, or radioactive materials, observe national regulations or regulations defined by World Health Organization.
- Only use the approved cleaning and disinfectant methods and materials outlined in this manual
- If any liquids are spilled in the rotor chamber, on the rotor or accessories, the surfaces must be cleaned immediately. You can use a damp cloth and mild soap solution. This is particularly important for the cleaning of the bores of the rotors.
- Density of the liquid must not be exceeded 1.2 g/ml at maximum rotational speed.
- The use of organic solvents and reagents may have adverse effect on the stability of plastic parts.
- Rotors are high-grade components which are subjected to extreme mechanical strain. Aluminium rotors are protected against corrosion.
- Please ensure that the rotors are protected from mechanical damage. Even slight scratches and cracks can cause damage.
- Please clean your rotors regularly using a neutral cleaning liquid such as isopropyl alcohol (70% solution). This will protect the rotors and maintain their service life.

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Package contents

Description	Quantity
LC-8 centrifuge with rotor	1
Instruction manual	1
Rubber gaskets tube adapters	8
Rotor nut wrench	1
Power cord	2

Unpacking

Open the carton box. Take out the accessories and remove the packaging material. Reach with your hands under the centrifuge and lift it from the box.



When lifting the centrifuge, never hold it by the front or top plastic part of the housing or by the lid, as the appliance may get damaged!

Retain the packaging material for any subsequent transport or storage.

Installation

Place the centrifuge on a stable, solid, level, and clean surface. Make sure that the centrifuge is not exposed to direct sunlight. To ensure sufficient ventilation, according to recommendations of the EN 61010-2-020 standard, a safety clearance of 30 cm should be observed around the centrifuge during operation. Please remove all objects from this area.
If the centrifuge isn't levelled, imbalances can occur and the centrifuge can be damaged. Do not place anything under the centrifuge feet to level the centrifuge.



If you bring the device from a cold environment to a warm environment, after installation, it is recommended that you wait for some time, before connecting the centrifuge to the mains power supply. This prevents damage to electronic components due to condensation.

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Before connecting the centrifuge to the mains power supply, check that the mains voltage and frequency correspond to the specifications on the name label of the centrifuge. The mains cable of the centrifuge may only be connected to a properly grounded wall socket.
To disconnect the mains supply from the centrifuge in the event of malfunction, an emergency switch separate from the centrifuge must be available. This switch should be outside the room, where the centrifuge is installed, or next to the entrance to the room.

Intended use

LC-8 is a non-refrigerated laboratory centrifuge. It is designed for use in laboratory research, for separating the substances with different specific densities, by centrifugal force. Not intended for in vitro diagnostic use. The maximum rotational speed of 3500 RPM or 5000 RPM (Plus model) gives the centrifugal force (RCF) of 1500 xg or 3070 xg respectively.

Symbols and conventions

The following chart is an illustrated glossary of the symbols that are used in this manual.

	This symbol indicates a potential risk and alerts you to proceed with caution.

Product specifications

Power supply:	230 V ±10%, 50 / 60 Hz
Power consumption:	150 W
Electric current:	2 A
Fuses:	2 x 6.3AT 250V
Protection class:	I
Rotational speed:	400 to 3500 RPM (Plus model: 5000 RPM)
Speed increment:	100 RPM
Maximum centrifugal force (RCF):	1500 xg (Plus model: 3070 xg)
Rotor radius	10.98 cm
Maximum capacity:	8 x 15 ml
Maximum kinetic energy:	450 Nm
Max. density of material to be centrifuged:	1.2 g/ml
Noise level at max. speed:	≤ 62 dB(A)
Timer:	20 s to 99 min
Acceleration:	Adjustable
Deceleration:	Adjustable

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Ambient temperature:	2 °C to 35 °C
Maximum relative humidity:	75%, non-condensing
Dimensions (W x D x H):	295 x 365 x 210 mm
Weight:	6.8 kg

We reserve the right to alter specification details without prior notice or liability!

Overview

Main parts of the centrifuge are designated on the following pictures:

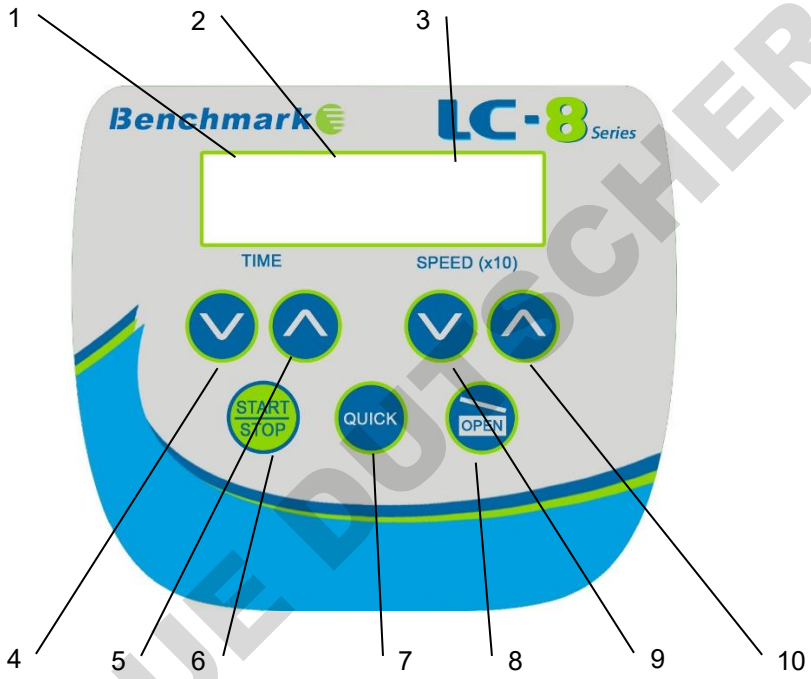




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 Main switch	By turning on the main switch, you turn on the power of the centrifuge. By turning off the main switch, you turn off the power of the centrifuge.

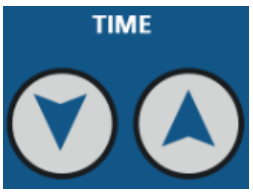
Control panel



1	Display of time
2	Lid open/closed indicator
3	Display of RPM / RCF
4	Button to adjust time down
5	Button to adjust time up
6	Start / Stop button
7	Quick spin button
8	Open lid button
9	Button to adjust speed down
10	Button to adjust speed up

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Operational keys

 SPEED	By pressing this key, you can set the rotational speed (RPM) or centrifugal force (RCF). When indicator RPM is lit, you can set the rotational speed, and when indicator RCF is lit, you can set the centrifugal force. Set new values by pressing the UP or DOWN arrow keys. To switch from RPM to RCF display press UP and DOWN key simultaneously.
 TIME	By pressing this key, you can set the time (TIME), Set the time using the UP and DOWN arrow keys.
 START/STOP	By pressing this key, the centrifuge run starts. While running, if you press the key again, it will stop the run.
 QUICK SPIN	By pressing and holding this key, you perform the quick spin. The centrifuge runs for as long as you hold the key pressed. Time of run in seconds is displayed on time display. When you release the key, the run will stop as normal.
 FAST SPIN	By pressing this key, you open the lid of the centrifuge. When closing the lid, press it down with your hands, until it locks.

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Getting Started

Before using the centrifuge for the first time, familiarize yourself with the control panel and the functions of the knob and keys/icons.

Turning on the centrifuge

Use the enclosed power cord to connect the centrifuge to the mains power supply.

Turn on the main switch, which is located on the back side of the centrifuge.
The values of operation parameters are automatically set to the last used values.

Opening and closing of the lid

	By pressing this key, you open the lid of the centrifuge. When closing the lid, press it down with your hands, until it locks.



Always open the centrifuge lid completely, to prevent it from falling!
When closing the lid, make sure to always place your fingers on the top side of the lid and never in the gap between the lid and the housing of the centrifuge, otherwise you could crush your fingers!

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Important Guidelines

- Mount the rotor on the motor axle and firmly tighten the rotor nut by turning it clockwise, using the supplied rotor key.

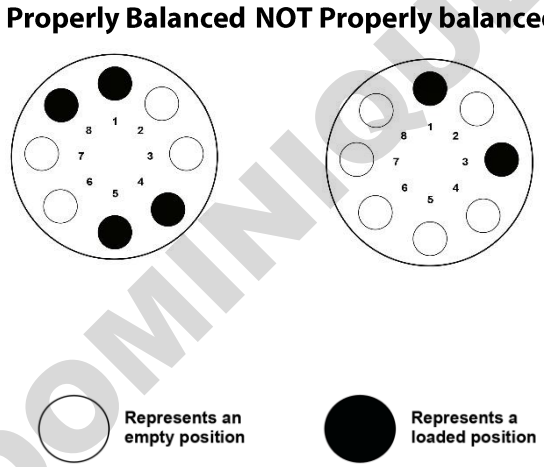
- To dismount the rotor, turn the rotor nut counter clockwise, using the rotor key and then remove the rotor.

Do not use the rotors and test tubes, which are mechanically or chemically damaged or with visible corrosion defects!

The rotor must always be securely fastened. Do not begin with centrifugation before the rotor has been securely fastened!

Imbalance indicator

The centrifuge is fitted with an imbalance detector, to ensure safety.
Imbalance at high speed may indicate a tube breakage or leak. Therefore additional care should be taken depending on the samples loaded.
You must always load the rotor with test tubes symmetrically. You may only use approved test tubes. Weight difference of the samples in test tubes should be as low as possible in order to avoid potential damages to the motor and to minimize running noise and vibration.
Following are examples of correctly and wrongly loaded rotors:



If an imbalance is detected, the centrifuge will automatically stop and an error alarm will sound.

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Operation

Pre-selecting speed/RCF

By pressing the SPEED arrow key, you can set the rotational speed (RPM). To view the centrifugal force (RCF), hold the UP and DOWN speed arrows simultaneously.
• **Rotational speed** (indicator RPM is lit) Rotational speed can be set from 400 to 5,000 RPM in steps of 100 RPM. The maximum rotational speed is automatically set.
• **Relative Centrifugal Force** (indicator RCF is lit) Relative centrifugal force can be set but is tied to the corresponding RPM increments

Pre-selecting run time

By pressing the TIME UP and DOWN keys, you can set the time (TIME),
• **Run time can be set from 20s to 99min 59s**

Acceleration and braking level

• **Acceleration / Deceleration adjustments can be done in the menu settings**
1. Press and hold the “Speed down arrow” and the “open” button for 3 seconds. The display will show the letters “LK” 2. Use the “UP speed arrow” to select menu # 8 and press “open” button to enter. The display will read “RP” 3. Use the “open” button once to access the “TA” menu for acceleration rates, and once more to access the “TS” menu for deceleration rates. 4. Use the speed arrows to adjust the setting for either menu. The adjustable range is from 20 to 200 in steps of 1. Each value is approximately one second for either setting.

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Acceleration rate set at 20 = 20s to reach max. speed
Acceleration rate set at 100 = 95s to reach max. speed
Acceleration rate set at 200 = 186s to reach max. speed

Deceleration rate set at 20 = 34s to stop rotor
Deceleration rate set at 100 = 105s to stop rotor
Deceleration rate set at 200 = 197s to stop rotor

Press “open” to store each value before moving to the next menu.
5. Press and hold the “Speed down arrow” and the “open” button for 3 seconds to return to the main display.

Starting and stopping the centrifuge

Before starting the centrifuge, turn on the main switch, open the centrifuge lid, insert the rotor and load it with test tubes, close the centrifuge lid and set the operation parameters.

	By pressing the START/STOP key, you start or stop the run of the centrifuge. After the expiration of set running time or after manual stopping of the centrifuge by pressing the START/STOP key again, the braking procedure of the rotor is activated and the centrifuge stops. The next run is possible, when the rotor stops completely.



Do not move or knock the centrifuge during operation!

Quick spin

	By pressing and holding the QUICK key, you perform the quick spin. The centrifuge will run as long as you hold the key pressed. Time of run is displayed on the time display. When you release the key, the braking procedure of the rotor is activated and the centrifuge stops.

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Emergency lid release

In case of power failure, the lid can be opened manually. If power failure occurs during the operation of the centrifuge, the rotor may continue rotating for several minutes, before it stops.



Before emergency lid release, turn off the main switch of the centrifuge and wait until rotor fully stops. Check this by looking through the lid window. Otherwise, injury from rotating rotor may occur!

On the lower half of the front of the housing, by the front right foot, there is a plastic plug. Use a sturdy thin edge to pull the plug from the hole. There is a string fastened to the plug. Pull the string to open the lid of the centrifuge. Reinsert when finished.

Troubleshooting

Review the information below to troubleshoot operating problems.

Error messages

If an error occurs during the operation of the centrifuge, an error message appears on the display, and the centrifuge stops automatically. The program display shows message Er, For the list of errors, see below table.

Error	Cause	Solution
No display	No main power connection. Power Failure	Plug in mains cable on both sides Check the mains fuse
Lid can't be opened	Power Failure Rotor is still spinning Lid lock failure	Use emergency lid release. Contact Service
Centrifuge Shakes during acceleration	Rotor not loaded symmetrically	Stop centrifuge run and load symmetrically
Er=01	Open lock failure	Contact service
Er=02	Close lock failure	Contact service
Er=08	Motor failure	Contact service
Er=09	Imbalance failure, or centrifuge weight not loaded symmetrically	Re-load centrifuge symmetrically, contact service
Er=10	Motor failure Hall sensor failure	Check sensor height, re-connect hall sensor line, contact service
Er=11	Motor driving board failure	Re-connect driving board, contact service

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General maintenance

Regular service

We recommend having the centrifuge and associated rotors checked by authorized service at least once every 2 years. You must thoroughly clean and disinfect the centrifuge prior to service.

Cleaning the centrifuge

Please remove any condensed water from the rotor chamber using a soft, absorbent cloth. After use, leave the centrifuge lid open, so the inside can dry out.

For regular cleaning of the outside surface of the centrifuge and the rotor chamber, use mild neutral detergent. Make sure that no liquid penetrates the inside of the housing.
Open the lid of the centrifuge and turn off the main switch. Disconnect the power cord from mains socket. Remove the rotor with included wrench. Clean all accessible surfaces of the device and accessories at least once a week and every time, when contaminated.
After cleaning with detergent, the rubber seal around the rotor chamber should be thoroughly cleaned with water and lubricated with glycerine, to prevent it from becoming brittle.

For cleaning and disinfection, use only neutral cleaners and disinfectants. Before cleaning or decontaminating the centrifuge, using means and methods not recommended in this manual, you should consult with the manufacturer, in order to avoid the damage to the centrifuge.
To ensure safe and long operation of the centrifuge, please avoid the use of aggressive chemicals, which can damage the centrifuge, rotor and accessories. Please check them regularly for damage caused by corrosion.

Cleaning intervals:

For the sake of personal, environmental, and material protection, it is your duty to clean and if necessary disinfect the centrifuge on a regular basis.

Maintenance	**Recommended interval**
Clean rotor chamber	Daily or when contaminated
Clean rotor	Daily or when contaminated
Accessories	Daily or when contaminated

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Refrain from using any other cleaning or decontamination procedure than those recommended here, if you are not entirely sure that the intended procedure is safe for the equipment.
Use only approved cleansers.

Cleaning the rotor

The rotor and accessories must be regularly cleaned to prevent contamination and corrosion caused by residue. Check the rotor and the centrifuge housing monthly. This applies in particular to the rotor bores. For cleaning the rotor use a neutral cleaning liquid. This will protect the rotor and extend its service life.



Do not use damaged rotors and accessories for centrifugation!

Rotor sterilization

The rotor is autoclavable at 121 °C, for 20 minutes.

Shipping

Before shipping the centrifuge, please bear the following in mind:
The centrifuge must be clean and decontaminated.

The decontamination must be confirmed with a decontamination certificate. Contact customer service for more details.

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Calculations

Calculation of centrifugal force

For the calculation of the centrifugal force (RCF), stated as a multiple of the gravitational force "g", use the following formula:

$RCF = 11.18 \times r \times (n / 1000)^2$

RCF ..... Relative centrifugal force (xg)
r ..... Radius of the rotor (cm)
n ..... Rotational speed (RPM)

Calculation of maximum permitted rotor speed

If you need to use higher density samples, maximum permitted rotor speed must be reduced according to the following formula:

$M = (1.2 \times n^2 / S)^{½}$

M ..... Reduced maximum permitted rotor speed
n ..... Maximum permitted rotor speed for samples with density of 1.2 g/cm^3
S ..... Density of used sample

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Technical service

Web Resources

www.benchmarkscientific.com

Warranty

Benchmark warrants that this product will be free from defects in material and workmanship for a period of two (2) years from date of delivery. If a defect is present, Benchmark will, at its option and cost, repair, replace, or refund the purchase price of this product to the customer, provided it is returned during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication, or from ordinary wear and tear. If the required maintenance and inspection services are not performed according to the manuals and any local regulations, such warranty turns invalid, except to the extent, the defect of the product is not due to such non-performance.

Items being returned must be insured by the customer against possible damage or loss. This warranty shall be limited to the aforementioned remedies. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

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Compliance with local laws and regulations

The customer is responsible for applying for and obtaining the necessary regulatory approvals or other authorisations necessary to run or use the product in its local environment. Benchmark will not be held liable for any related omission or for not obtaining the required approval or authorisation, unless any refusal is due to a defect of the product.

Equipment disposal



This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste.
Instead it's your responsibility to correctly dispose of your equipment at lifecycle end by handling it over to an authorized facility for separate collection and recycling. It's also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect from health hazards the persons involved in the disposal and recycling of the equipment.
For more information about where you can drop off your waste of equipment, please contact your local dealer from whom you originally purchased this equipment.

By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Thank you

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