

# **CF-220 Centrifuge**

**User Manual**

revvity

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This product has been engineered for safety; however, basic safety precautions and common sense must always be demonstrated when using any electrical product.

- DO NOT attempt to modify any part of this product.
- DO NOT allow the machine to be submerged in any liquid.
- DO NOT use in any setting other than an indoor laboratory.
- DO NOT plug power cord into an incorrect outlet or subject it to an incorrect voltage.
- Use this product only for its intended purpose.
- DO NOT use attachments not recommended by the manufacturer.
- DO NOT operate the product if it is damaged in any way.
- Keep this product away from heated surfaces.
- DO NOT modify the plug or cord that is provided. If the plug will not fit the outlet, have the proper outlet installed by a qualified electrician.
- DO NOT operate the product with the safety ground disconnected.

# 1. SAFETY INFORMATION

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

## 1.1 WARNING SYMBOLS

The following are the warning symbols that are used in this manual.



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

## 1.2 SAFETY INSTRUCTIONS

In the interest of your own personal safety, always observe the following safety instructions:

- Do not use rotors and buckets, which show clear signs of corrosion or mechanical defects. Please check the accessories at regular intervals.
- Always load the rotor with the same test tubes on all positions or symmetrically with the pairs of the same test tubes. 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 according to the rotation axis.
- Please use only the original accessories for centrifugation.
- 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 may 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.
- Fluids or materials used for cleaning and disinfecting should be disposed of in accordance with approved laboratory regulations.
- 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 fixed-angle rotors.
- Density of the liquid must not be exceeded 1.2 g/ml at maximum rotational speed.
- During longer spin times, test tubes may heat up. Observe the requirements and regulations specified by test tube manufacturer.
- The use of organic solvents and reagents may have adverse effect on the stability of plastic test tubes.
- 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 severe inner damage to the rotor material.
- Please clean your rotors regularly using a neutral cleaning liquid (e.g. Extran). This will protect the rotors and maintain their service life.

## 2. INTRODUCTION

### 2.1 INTENDED USE

The CF-220 Centrifuge is a universal laboratory centrifuge. It is designed for use in medical, scientific and industrial laboratories, for separating the substances with different specific densities by centrifugal force. In particular, it is intended for preparation of human samples (body fluids), in approved test tubes, before further analysis. The maximum rotational speed of 15,500 RPM gives the centrifugal force of 23,100 x rcf.

### 2.2 BASIC EQUIPMENT

The following is enclosed with the centrifuge:

- 1 User's manual
- 1 Hexagonal rotor key
- 1 Power cord

### 2.3 UNPACKING

**The weight of the centrifuge is 31.7 lbs. (14.4 kg). To prevent possible injuries, at least two people should lift and carry the centrifuge by holding it at the bottom from opposite sides.**

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 together with another person.



**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, which are allowed only in the original packaging.

### 2.4 INSTALLING THE CENTRIFUGE

The centrifuge should only be operated indoors. Place the centrifuge on a stable, solid, horizontal and clean surface, without vibrations. Make sure that the centrifuge is not exposed to direct sunlight. To ensure sufficient ventilation, there should be enough clearance on all sides of the centrifuge. It must be far enough away from the wall and other devices. 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.



**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, which can occur, when you bring the device from a cold environment to a warm environment.**

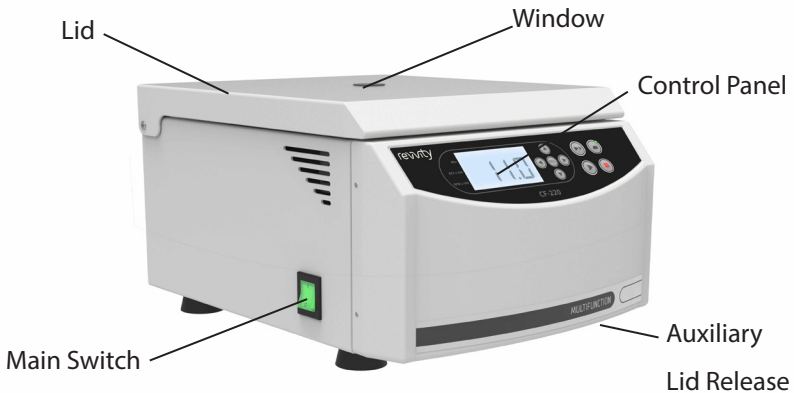
Before connecting the centrifuge to the mains power supply, check that the mains voltage and frequency correspond to the specifications on the name label of the centrifuge. The mains cable of the centrifuge may only be connected to a properly grounded wall socket with a protective earth conductor.

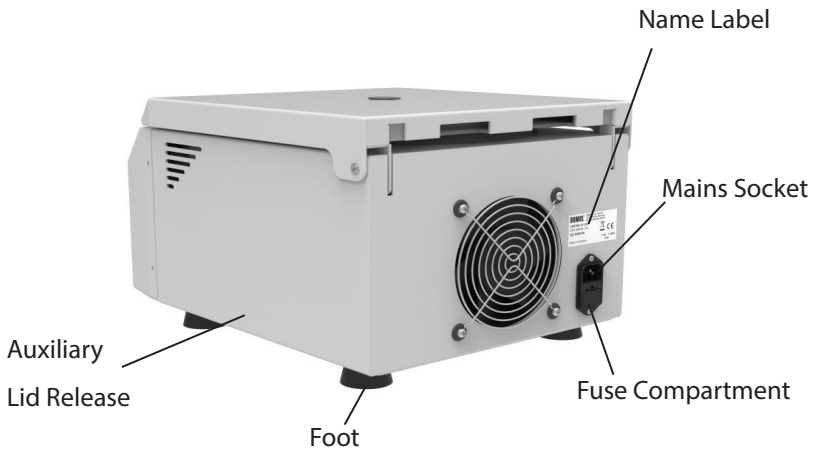
To disconnect the mains supply from the centrifuge in the event of malfunction, an emergency switch separate from the centrifuge must be available. This switch should be outside the room, where the centrifuge is installed, or next to the entrance to the room.

## 2.5 OVERALL VIEW

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

### CF-220 Centrifuge:

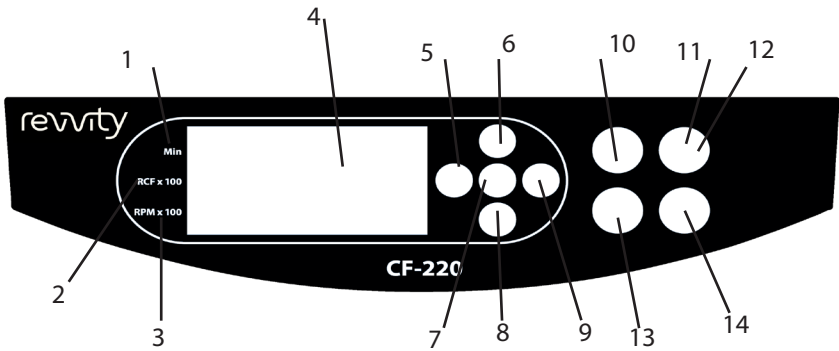




### 3. OPERATION

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




#### CF-220 Centrifuge:






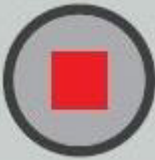


## DESCRIPTION:

1	Unit for Time (min)
2	Unit for Centrifugal Force (rcf x 100)
3	Unit for Rotational Speed (rpm x 100)
4	Display
5	LEFT Key
6	UP Key
7	PROGRAM Key
8	DOWN Key
9	RIGHT Key
10	FAST SPIN Key
11	LID Key
12	LID Indicator
13	START Key
14	STOP Key

## 3.1 KNOB AND KEY FUNCTIONS

	By pressing this key, you select operation parameters in the left direction.
	By pressing this key, you increase the set value of selected operation parameter for one step. By pressing and holding this key, the value is increasing quickly.
	By pressing this key, you can set the programs. LID indicator starts to blink. Then select new program with UP and DOWN keys and confirm it by pressing the PROGRAM key. LID indicator stops blinking. If you want to change the values of parameters of an existing program, use LEFT and RIGHT keys for selecting the parameters, and then UP and DOWN keys for setting of parameters values, when LID indicator is blinking. Confirm new settings by pressing the PROGRAM key. By pressing the LID key anytime during this procedure, you can cancel the program setting without saving the new settings.

	<p>By pressing this key, you decrease the set value of selected operation parameter for one step. By pressing and holding this key, the value is decreasing quickly.</p>
	<p>By pressing this key, you select operation parameters in the right direction.</p>
	<p>By pressing and holding this key, you perform the fast spin. The centrifuge runs for as long as you hold the key pressed. Time of run in seconds is displayed and message RUN is blinking on the display. The acceleration and braking levels are fixed to 9 (the highest), and they can't be changed. When you release the key, the braking procedure of the rotor is activated, and the centrifuge stops.</p>
	<p><u>SHORT PRESS:</u> By pressing this key, you open the lid of the centrifuge. When the lid opens, LID indicator turns off. When closing the lid, press it down with your hands, until it locks up. When the lid is closed, LID indicator turns on. LID indicator also turns off during the run of the centrifuge and thus indicates that you can't open the lid during the run.</p> <p><u>LONG PRESS:</u> By pressing and holding this key, you set the lid latch to initial position. This is needed in case of power failure during the opening of the lid, when lid latch motor stops in undefined position. When power returns, it could happen that you can't open or close the lid. If this happens, press the key for approximately five seconds, until you hear the sound of lid latch motor, then release it. After that, you will be able to open and close the lid normally</p>
	<p>By pressing this key, you start the run of the centrifuge. Message RUN appears on the display and thus indicates that the centrifuge is running. During acceleration of the rotor, acceleration level AcX is displayed, and then the selected operation parameter displays. At the end of the set running time or manual stopping of the centrifuge, the braking procedure of the rotor is activated, and the centrifuge stops. The next run is possible, when the rotor stops completely.</p>
	<p>By pressing this key, you stop the run of the centrifuge. During deceleration of the rotor, deceleration level brX is displayed, and when the centrifuge stops, selected operation parameter displays, and message RUN turns off.</p>



## 3.2 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 front of the left side of the centrifuge. All segments are displayed on the display at first, then program version (VX.X), then centrifuge type and then centrifuge model CF-220, and finally the value of last displayed operation parameter is displayed.

The values of operation parameters (rotational speed, centrifugal force, run time, acceleration and braking level) are automatically set to the last used values.

## 3.3 OPENING AND CLOSING OF THE LID



By pressing the LID key, you open the lid of the centrifuge. When the lid is open, LID indicator turns off. When closing the lid, press it down with your hands, until it locks up. When the lid is closed, LID indicator turns on. LID indicator also turns off during the run of the centrifuge and thus indicates that you can't open the lid during the run.

**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!**

## 3.4 ROTOR MOUNTING AND DISMOUNTING

**Before attaching the rotor on the motor axle, make sure that axle and rotor are clean and undamaged. Wipe all fixing surfaces (motor axle and rotor cone) with clean soft cloth. Thus you will avoid potential damages to the axle and motor.**

- Mount the rotor on the motor axle and firmly tighten the rotor nut by turning it clockwise, using the supplied hexagonal rotor key.
- To dismount the rotor, turn the rotor nut counter-clockwise, using the hexagonal rotor key and then remove the rotor.



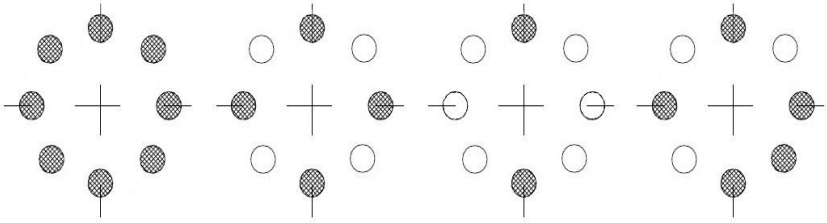
**Do not use the rotors, rotor lids and test tubes, which are mechanically or chemically damaged or with visible corrosion defects!**



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

### 3.5 ROTOR LOADING

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:

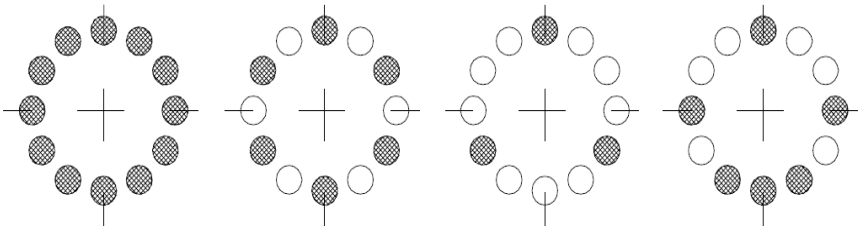


CORRECT

CORRECT

CORRECT

WRONG



CORRECT

CORRECT

CORRECT

WRONG

**NOTE:**







The centrifuge is equipped with imbalance sensor, to ensure safety. Imbalance at high speed may cause test tube breakage, leak or rotor crash. Therefore, additional care should be taken depending on the samples loaded.



**In case of rotor imbalance during operation, the centrifuge will automatically stop, and the display will show error message IMBAL OUR.**

## 3.6 SETTING THE ROTATIONAL SPEED AND CENTRIFUGAL FORCE

By pressing LEFT and RIGHT keys, select the operation parameter you wish to set (rotational speed, centrifugal force, run time, acceleration level and braking level). Then use UP and DOWN keys to set the value of selected operation parameter.

	<ul style="list-style-type: none"> <li>• <b>Rotational speed</b> (indicator RPM is displayed) Rotational speed can be set in steps of 100 RPM, from 200 to 15500 RPM. The maximum rotational speed is automatically set according to the rotor type in use.</li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Relative Centrifugal Force</b> Relative centrifugal force can be set in steps of 100 x g, from 0 to 23100 x g. Relative centrifugal force is calculated regarding to the radius of used rotor, so the minimum and maximum forces are dependent on the rotor type.</li> </ul>
 	<ul style="list-style-type: none"> <li>• <b>Run time</b> (indicator TIME is displayed) Run time can be set between 0.1 and 99.5 minutes. Time setting is possible in 10 seconds steps. By pressing UP key after 99.5 is displayed or DOWN key after 0.1 is displayed, you can set continuous operation (HLD on display). NOTE: 0.1 = 10 s, 9.5 = 9 min 50 s, 10.0 = 10 min, 99.5 = 99 min 50 s</li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Acceleration level (AcX)</b> Acceleration level can be set from 0 to 9. Level 0 means very slow acceleration, level 9 very fast acceleration.</li> </ul>
	<ul style="list-style-type: none"> <li>• <b>Braking level (brX)</b> Braking level can be set from 0 to 9. Level 0 means stopping without braking, level 9 maximum braking</li> </ul>

### NOTE:

All the operation parameters can be changed during the operation of the centrifuge, and it starts to work with the new settings after that.

### Changing of run time during the operation:

You should be aware, that when you extend run time, the difference between newly set and originally set time is added to current time, and when you shorten run time, the difference is subtracted.

**Example:** The centrifuge started with time set to 10 minutes. It has been running for 3 minutes. Then you changed the time to 5 minutes. The centrifuge will run for another 2 minutes.

## 3.7 PROGRAM SETTING

You can save 100 programs, with different operational parameters, in the centrifuge memory.

**NOTE:**

You can cancel the procedure for program setting by pressing the LID key and return to standby mode without confirming the data.



If you want to use the existing program, follow the next procedure:

Press the PROGRAM key to enter the setting of programs. LID indicator starts to blink. Then select new program with UP and DOWN keys and confirm it by pressing the PROGRAM key. LID indicator stops blinking. Operation parameters of selected program are set.

If you want to change the existing program, follow the next procedure:


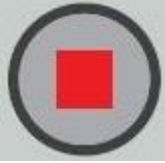
Press the PROGRAM key to enter the setting of programs. LID indicator starts to blink. Then select the program that you want to change with UP and DOWN keys. After that, use LEFT and RIGHT keys for selecting the parameters, and then UP and DOWN keys for setting of parameters values. Confirm new settings by pressing the PROGRAM key. LID indicator stops blinking. Operation parameters of selected program are set.

The following table shows factory preset values of operation parameters for all 100 programs:

<b>Program</b>	<b>Rotational Speed (RPM)</b>	<b>Run Time (min)</b>	<b>Acceleration Level (AcX)</b>	<b>Braking Level (brX)</b>
0	1,000	10	6	6
1	8,000	5	9	9
2	10,000	10	6	6
3	10,000	5	9	9
4	12,000	10	6	6
5	14,000	5	9	9
6	14,000	10	6	6
7	15,000	5	9	9
8	15,000	10	6	6
9	3,000	5	5	5
10	3,000	5	5	5
11	3,000	5	5	5
:	3,000	5	5	5
99	3,000	5	5	5

## 3.8 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 or select a suitable program.

	<p>By pressing the START key, you start the run of the centrifuge. Message RUN appears on the display and thus indicates that the centrifuge is running. During acceleration of the rotor, acceleration level AcX is displayed, and then the selected operation parameter displays. During the run of the centrifuge, LID indicator also turns off, and thus indicates that you can't open the lid during the run.</p> <p>At the end of the set running time or manual stopping of the centrifuge, the braking procedure of the rotor is activated, and the centrifuge stops. The next run is possible, when the rotor stops completely.</p>
	<p>By pressing the STOP key, you stop the run of the centrifuge. During deceleration of the rotor, deceleration level brX is displayed, and when the centrifuge stops, selected operation parameter displays, and message RUN turns off. LID indicator also turns on, and thus indicates that you can open the lid.</p>



**Do not move or knock the centrifuge during operation!**

## 3.9 ROTOR RECOGNITION

Several rotors can be used (RA 24/2, RA 12/5, RA 12/12, RA 8/15, RA 6/50, RA 4/PCR, RH 24), so rotor recognition is executed automatically every time the centrifuge starts, and maximum rotational speed is set (6,000 RPM or 15,500 RPM), to correspond with the inserted rotor.

Rotor	RA 24/2	RA 12/5	RA 12/12	RA 8/15	RA 6/50	RA 4/PCR	RH 24
Code	437480	449201	447993	438526	438545	449767	449568
Max. speed (rpm)	15,500	15,500	6,000	6,000	6,000	15,500	15,500

## 3.10 DISPLAY OF THE SET VALUES DURING THE RUN

During the run, the centrifuge shows the current values of the operation parameters on display. If you wish to check the set values of the parameters, select the desired parameter by pressing the LEFT and RIGHT keys, and then press once on one of the keys UP, DOWN or PROGRAM. Display shows the set value of the parameter for approximately two seconds, and then the current value is displayed again.

## 3.11 FAST SPIN



By pressing and holding the FAST SPIN key, you perform the fast spin. The centrifuge runs for as long as you hold the key pressed. Time of run in seconds is displayed and message RUN is blinking on the display. The acceleration and braking levels are fixed to 9 (the highest), and they can't be changed. When you release the key, the braking procedure of the rotor is activated, and the centrifuge stops.

## 3.12 RESET OF LID LATCH



By pressing and holding the LID key, you set the lid latch to initial position. This is needed in case of power failure during the opening of the lid, when lid latch motor stops in undefined position. When power returns, it could happen that you can't open or close the lid. If this happens, press the key for approximately five seconds, until you hear the sound of lid latch motor, then release it. After that, you will be able to open and close the lid normally.

## 3.13 AUXILIARY 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 auxiliary 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 bottom side of the centrifuge, behind the front right foot, there is a plastic plug, which you pull out of the hole. There is a string fastened to the plug. Pull the string vertically downwards to open the lid of the centrifuge. Then insert the string and the plug back in the hole.

## 3.14 AUTOMATIC BRAKING AFTER POWER RESTORATION

If power failure occurs during the operation of the centrifuge, the rotor may continue rotating for several minutes, before it stops. When power returns, the centrifuge checks if the rotor is still rotating. If it is still rotating, then the display shows message brE. The centrifuge begins with the automatic rotor braking, which is performed with preset braking level. When rotor stops, displayshows error message ERROR E45 and thus warns you, that power failure occurred during operation and the centrifugation was interrupted. By pressing the STOP key, you exit from error display and go back to stand-by mode. You can use the centrifuge again.



## 4. MAINTENANCE AND CLEANING OF THE CENTRIFUGE

### 4.1 REGULAR SERVICE

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

### 4.2 CLEANING THE CENTRIFUGE

After every centrifugation, 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 and soft cloth. 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 rotor key. 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.

### 4.3 CLEANING THE ROTOR

The rotor and accessories must be regularly cleaned to prevent contamination and corrosion caused by residue. Check the rotor and accessories 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!**

To avoid the damage to the rotor, replace the sealing rings regularly.

### 4.4 ROTOR STERILIZATION

The rotors are autoclavable at the temperature of 121°C, for 20 minutes. After the rotor has been autoclaved for a maximum of twenty times, seals of the rotor must be replaced (this is valid for rotors with seals).

## 5. TROUBLESHOOTING

Review the information below to troubleshoot the operating problems.

### 5.1 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 display shows message ERROR and number of the error EXX (XX is the error number). For the list of errors, see below table.

DISPLAY	PROBLEM	SOLUTION	WHO REPAIRS
<b>ERROR E12</b>	Speed deviates for more than $\pm 500$ RPM / 5 s	Check rotor, motor and frequency regulator	Service
		Electronics error	Service
<b>ERROR E13</b>	Speed sensor error	Check speed sensor	Service-SP
		Check speed sensor	Service
		Electronics error	Service
<b>ERROR E14</b>	Rotor speed too high (maximum rotor speed exceeded for more than 500 RPM)	Reduce speed	User
		Check speed sensor	Service-SP
<b>ERROR E30</b>	Imbalance to high	Check rotor loading arrangement	User
		Check the samples weight in the rotor	User
		Check if the rotor and rotor lid are fastened	User
		Check the rotor and the lid	User
		Check speed sensor	Service-SP
		Repeat the balancing procedure	Service
<b>ERROR E31</b>	Imbalance sensor	Check imbalance sensor	Service-SP
		Check imbalance sensor	Service
		Electronics error	Service
<b>ERROR E41</b>	Voltage too low on the DC link (below 150 V)	Check power supply	Service

DISPLAY	PROBLEM	SOLUTION	WHO REPAIRS
<b>ERROR E42</b>	Voltage overload on the DC link (over 400 V)	Reduce braking level	User
		Wait 10 min, for the braking resistor to cool down	User
		Error on power regulator	Service
		Error on braking resistor	Service
<b>ERROR E43</b>	Driver temperature too high (over 80 °C)	Reduce speed	User
		Check motor	Service
		Error on power regulator	Service
<b>ERROR E44</b>	Current overload of the moto	Repeat run	User
		Reduce acceleration level	User
		Check start-up parameters	Service-SP
		Check motor	Service
		Error on power regulator	Service
<b>ERROR E45</b>	Power failure during the run	Repeat run	User
<b>ERROR E50</b>	The lid of the centrifuge open	Close the lid of the centrifuge	User
<b>ERROR E51</b>	Lid latch not engaged	Open and close the lid of the centrifuge again	User
		Check lid sensors	Service-SP
---	After 20 minutes of standstill centrifuge goes to sleep mode (display backlight turns off, lines below on the display are shown)	Press any key	User

**Note:** SP = service parameters

## 5.2 EXIT FROM ERROR DISPLAY



**By pressing the STOP key, you exit from error display and go back to stand-by mode.**

**If error is still displayed, turn off the main switch of the centrifuge and turn it on again.**

**If the centrifuge still doesn't return to stand-by mode, call service!**

## 5.3 USER'S PARAMETERS

With user's parameters, you can check and set some of the operational properties of the centrifuge. For entering to user's parameters, the centrifuge must be in stand-by mode. Simultaneously press the LEFT and RIGHT keys. The first parameter shows on display (ror).

Then you can select the parameters by pressing the LEFT and RIGHT keys. If you want to change the setting of the parameter, press the PROGRAM key, to display the current value of the parameter. Then change the setting of the parameter by pressing the UP and DOWN keys and confirm it by pressing on the PROGRAM key. The name of parameter, which you've just set, is shown again. Then you can continue the setting of user's parameters using the above procedure, or you can exit to stand-by mode by pressing the START key.

DISPLAY		PARAMETER DESCRIPTION
PARAMETER	SETTING	
ror	86	Radius (mm) of currently used rotor. The value can be set by pressing the UP and DOWN keys. (25 - 200 mm)
rSP	15500	Maximal permitted speed for currently used rotor. (6000 RPM or 15500 RPM)
SLI	dIS	Automatic start of operation at lid closing. The setting can be chosen by pressing the UP and DOWN keys. (dIS = disable, Enb = enable)
OLI	dIS	Automatic opening of the lid at operation stop. The setting can be chosen by pressing the UP and DOWN keys. (dIS = disable, Enb = enable)
bSE	dIS	Block the changing of operation parameters during the operation of the centrifuge. The setting can be chosen by pressing the UP and DOWN keys. (dIS = disable, Enb = enable)
tIn	dEC	Decreasing or increasing of time display. The setting can be chosen by pressing the UP and DOWN keys. (dEC = decreasing, InC = increasing)
bEP	Enb	Turn on the beeper. The setting can be chosen by pressing the UP and DOWN keys. (dIS = disable, Enb = enable)

**Note:** Values in SETTING column of the above table are factory default values of user's parameters. Values are informative only, and they depend on inserted rotor and individual centrifuge.

## 5.4 REPLACING THE CENTRIFUGE FUSES

### CF-220 Centrifuge:



Mains Socket

Fuse  
Compartment

The following fuses are required for the CF-220 Centrifuge:

2 x 6.3AT 250V (230V)

2 x 10AT 250V (120V)

- Unplug mains plug from the mains socket.
- By pressing the locking device on the bottom side of the fuse compartment, the fuse holder is released and you can pull it out.
- Replace fuses.
- Insert fuse holder and push it, until it locks.

## 6. TECHNICAL DATA

### **CF-220 Centrifuge:**

Part Numbers:	CF-220-220 - 230 V CF-220-120 - 120 V
Power Supply:	230 V $\pm$ 10%, 50/60 Hz 120 V $\pm$ 10%, 50/60 Hz
Power Consumption:	450 W
Fuses:	230 V = 2 x 6.3 A T 120 V = 2 x 10 A T
Protection Class:	I
Rotational Speed:	200 to 15,000 RPM
Maximum Centrifugal Force:	23,100 rcf
Maximum Load:	6 x 50 mL
Maximum Kinetic Energy:	5000 Nm
Maximum Density of Material:	1.2 g/ml
Maximum Noise Level:	$\leq$ 60 dB(A)
Run Time:	10 s to 99 min and continuous, step 10 s
Number of Programs:	100 programs
Acceleration Levels:	10
Deceleration:	10 (Level 0 without braking)
Ambient temperature:	2 to 35 °C
Maximum relative humidity:	75%, non-condensing
Operating altitude:	2000 m
Dimensions (W x D X H):	W: 11" (28.0 cm), D: 14.6" (37.0 cm) H: 8.9" (22.6 cm)
Weight:	37.7 lbs. (14.4 kg)

## 7. APPENDIX

### 7.1 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:

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

RCF .....Relative centrifugal force ( x g)

r .....Radius of the rotor (cm)

n .....Rotational speed (RPM)

### 7.2 CALCULATION OF MAXIMUM PERMITTED ROTOR SPEED

Users are responsible and must consider the limitations for maximum permitted rotor speed and about correct rotor load.

The maximum permitted speed for each type of rotor is marked on each rotor. It is defined for the use of samples with maximum density of 1.2 g/cm<sup>3</sup>.

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

$$M = ( 1.2 \times n^2 / S )^{1/2}$$

M        Reduced maximum permitted rotor speed

n        Maximum permitted rotor speed for samples with density of 1.2 g/cm<sup>3</sup>

S        Density of used sample

### 7.3 EQUIPMENT DECONTAMINATION

If infectious materials get into the centrifugal chamber, on the rotors or accessories, they must be appropriately decontaminated. They may only be decontaminated by hand with soft cloth and liquids, which contain the following ingredients: ethanol, n-propanol, ethyl hexanol. After using disinfectants, remove the disinfectant residue by wiping it with a damp cloth. The surfaces must be dried immediately after disinfecting.

You must perform the decontamination before the device is shipped to the service and before it is sent to disassembly after the end of the life cycle.

## 7.4 TRANSPORT AND STORAGE

Transport and storage are allowed only in the original packaging. Remove the rotor from the centrifuge before transport and storage.

The centrifuge is heavy. To prevent possible injuries, be careful when lifting and carrying the centrifuge. Use a transport aid for transferring the device.

Permissible environmental conditions for transport and storage of the equipment:

- Ambient temperature: - 25 to 60 °C
- Relative humidity: 10 to 75 %

## 7.5 EQUIPMENT DISPOSAL

This equipment is marked with the crossed-out wheeled bin symbol, to indicate that this equipment may not be disposed of as unsorted municipal waste.

It's your responsibility to correctly dispose of your equipment at life-cycle end, by handing it over to an authorized facility for separate collection and recycling of waste equipment. It's also your responsibility to decontaminate your equipment in case of biological, chemical or radiological contamination, and so protect the persons involved in the disposal and recycling of the equipment from health hazards.

For more information about where you can dispose of your waste equipment, please contact your local dealer, from whom you purchased the equipment.

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







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