

# **CF-350 Centrifuge**

**User Manual**

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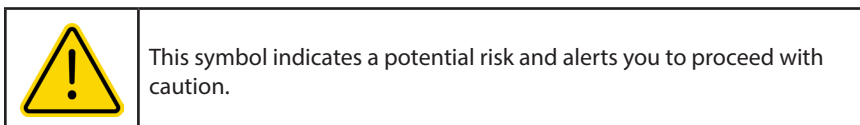
- DO NOT attempt to modify any part of this product.
- DO NOT allow the machine to be submerged in any liquid.
- DO NOT use in any setting other than an indoor laboratory.
- DO NOT plug power cord into an incorrect outlet or subject it to an incorrect voltage.
- Use this product only for its intended 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.



## 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-350 is a laboratory centrifuge intended to be used in 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 15,000 RPM gives the centrifugal force of  $21,630 \times g$ .

### 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 63.9 lbs. (29 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.

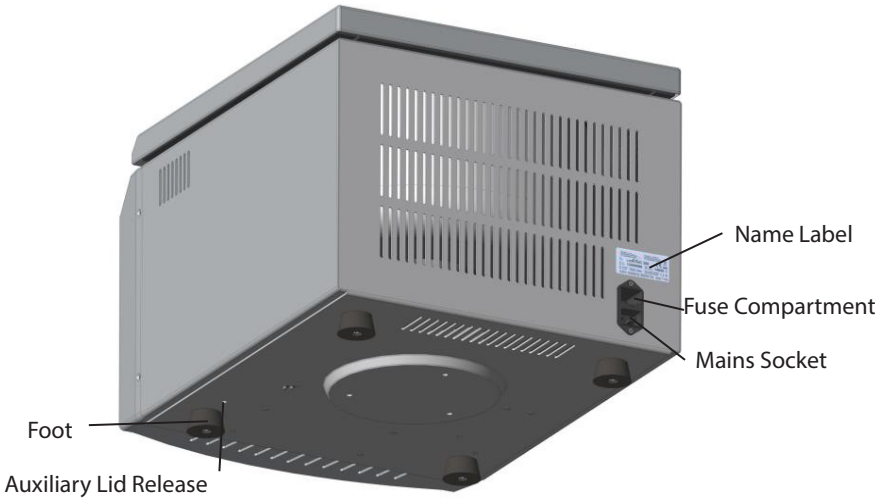
To disconnect the mains supply from the centrifuge in the event of malfunction, an emergency switch separate from the centrifuge must be available. This switch should be outside the room, where the centrifuge is installed, or next to the entrance to the room.

## 2.5 OVERALL VIEW

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

### CF-350 Centrifuge:

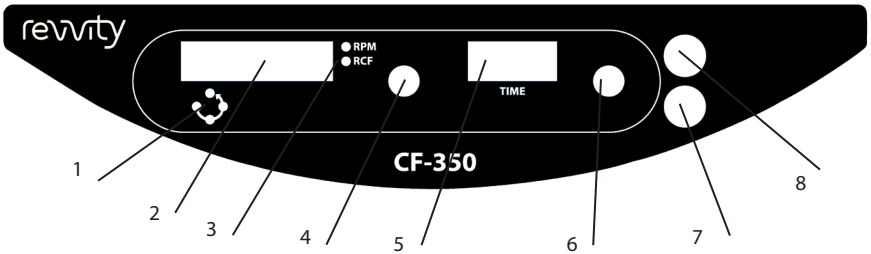




### 3. OPERATION

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

#### CF-350 Centrifuge:



## DESCRIPTION:

1	Run Indicator (four lamps)
2	Display for rotational speed (RPM) and centrifugal force (RCF)
3	Indicator for selection indication between rotational speed (RPM) and centrifugal force (RCF)
4	Knob for setting and selecting between rotational speed (RPM) and centrifugal force (RCF)
5	Display for time, acceleration level (AcX) and braking level (brX)
6	Knob for setting and selecting between time, acceleration level (AcX) and braking level (brX)
7	START/STOP Key
8	LID Key (with lamp)

### 3.1 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 (eights) are displayed on both displays first, then centrifuge model and program version (X.XX), then lines, and finally the values of operation parameters are displayed. The values of operation parameters (rotational speed, centrifugal force, run time, acceleration and braking level) are automatically set to the last used values. Now you can open the lid by pressing the lid opening key. When the lid is open, the lamp on the lid opening key turns off.

Then insert the rotor to the centrifuge and tighten it firmly with rotor key. Load the rotor symmetrically with test tubes. Close the centrifuge lid by pressing it down with your hands, until it locks up. The lamp on the lid opening key lights up. If the lamp doesn't light up, it means that the lid is still open. In that case open and close the lid again.



**Before attaching the rotor, make sure that the axle and rotor are clean and undamaged.  
Do not move or knock the centrifuge during operation!**

## 3.2 KNOB AND KEY FUNCTIONS

	<p><b>SHORT PRESS:</b> By pressing this key, you start and end the run of the centrifuge. When you press the key for the first time, the centrifuge starts to run. When you press it again, the centrifuge stops. The next run is possible, when the rotor stops completely. The running of the centrifuge is displayed by four circularly lighting lamps below rotational speed display (run indicator). 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.</p> <p><b>LONG PRESS:</b> By pressing and holding this key, you start quick run. The centrifuge is running as long as you hold the key pressed. Time of run in seconds is displayed on time display. The acceleration and braking levels are fixed at 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><b>SHORT PRESS:</b> By pressing this key, you open the lid of the centrifuge. When the lid opens, the key lamp turns off. When closing the lid, press it down with your hands, until it locks up. When the lid is closed, the key lamp lights. The key lamp turns off during the run of the centrifuge and thus indicates, that you can't open the lid during the run.</p> <p><b>LONG PRESS:</b> 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. In that case, hold the key pressed for approximately two seconds, until you hear the sound of lid latch motor, then release it immediately. Then you will be able to open and close the lid normally once again.</p>



**When closing the lid, make sure to place your fingers on the top side of the lid and never in the gap between the lid and the housing of the centrifuge!**



### 3.3 SETTING THE ROTATIONAL SPEED AND CENTRIFUGAL FORCE

By rotating this knob, you change the values of the parameters. By rotating the knob to clockwise direction, the values are increasing, and by rotating it to counter-clockwise direction, they are decreasing. By pressing on the knob you choose between:



• **Rotational speed** (lamp RPM lights)

Rotational speed can be set from 200 to 15000 RPM in steps by 10 RPM.

The maximal rotational speed value is automatically set regarding to the type of used rotor.



• **Relative Centrifugal Force** (lamp RCF lights)




Relative centrifugal force can be set from 4 to 21630 x g in steps by 10 x g.

Relative centrifugal force is calculated regarding to the radius of used rotor, so the minimal and maximal forces are dependent on the rotor type.

### 3.4 SETTING RUN TIME, ACCELERATION AND BRAKING LEVEL

By rotating this knob, you change the values of the parameters. By rotating the knob to clockwise direction, the values are increasing, and by rotating it to counter-clockwise direction, they are decreasing.

By pressing on the knob you choose between

	<p>• <b>Run time</b></p> <p>Run time can be set between 0.10 and 99.5 minutes. Time setting from 0.10 to 9.59 minutes is possible in 1 second steps. Between 10.0 and 99.5 minutes the setting is possible in 10 second steps. By rotating the knob to the clockwise direction after 99.5 is displayed, or to the counterclockwise direction after 0.01 is displayed, you can set continuous operation (HLd on display).</p>
	<p>• <b>Acceleration level (AcX)</b></p> <p>Acceleration level can be set from 0 to 9. Level 0 means very slow acceleration, level 9 very fast acceleration.</p>
	<p>• <b>Braking level (brX)</b></p> <p>Braking level can be set from 0 to 9. Level 0 means stopping without braking and level 9 maximal braking.</p>

**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.

**Run time can be changed 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.

If the centrifuge is running in continuous operation mode (HLd), changing of time during the operation is not possible.

**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.

## 3.5 PROGRAM SETTING



You can save up to a 100 programs, with different settings of operation parameters, in the centrifuge memory.

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

- By longer pressing on the time setting knob (more than 2 seconds), you enter to the preset programs of the centrifuge (PrOG XX). The lamp on the lid opening key starts to blink.
- By rotating the time setting knob, select one of the 100 preset programs, which you want to use.
- By short pressing on the lid opening key, confirm program selection and return to previous mode. The key lamp stops blinking, which means, that you are no longer in program setting mode. Operation parameters set in selected program are displayed on display.

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

- By longer pressing on the time setting knob (more than 2 seconds), you enter to the preset programs of the centrifuge (PrOG XX). The lamp on the lid opening key starts to blink.
- By rotating the time setting knob, select the program, which you want to change.
- By longer pressing on the lid opening key, you enter the programming mode. The key lamp is still blinking.
- With both knobs, set the desired values of centrifuge operation parameters (rotational speed, run time, acceleration level and braking level).
- When you finish entering new values, return to programs display (PrOG XX), by short pressing on the lid opening key. The key lamp is still blinking.
- If you want to change another program, select it by rotating the time setting knob, and repeat the above procedure. Otherwise skip this step.
- By rotating the time setting knob, select a program, which you want to use.
- By short pressing on the lid opening key, confirm program selection and return to previous mode. The key lamp stops blinking, which means, that you are no longer in program setting mode. Operation parameters set in selected program are displayed on display.

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

Program	Rotational speed (RPM)	Run time (min)	Acceleration level (AcX)	Braking level (brX)
PROG 0	8000	10	6	6
PROG 1	8000	5	9	9
PROG 2	10000	10	6	6
PROG 3	10000	5	9	9
PROG 4	12000	10	6	6
PROG 5	12000	5	9	9
PROG 6	14000	10	6	6
PROG 7	14000	5	9	9
PROG 8	15000	10	6	6
PROG 9	15000	5	9	9
PROG 10	3000	5	5	5
:	3000	5	5	5
PROG 99	3000	5	5	5

### 3.6 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.



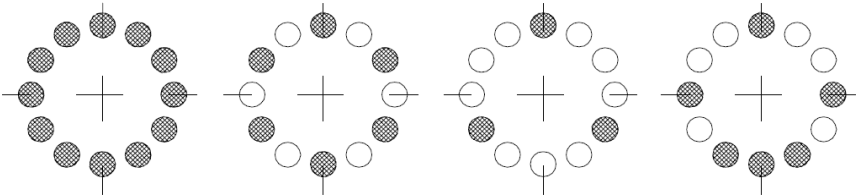
**Do not use the rotors, rotor lids and test tubes, which are mechanically or chemically damaged or with visible corrosion defects!**



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

# 3.7 ROTOR LOADING

Test tubes in the rotor must always be loaded symmetrically. You may use only approved test tubes. Weight difference of the samples in test tubes should be as low as possible in order to avoid potential damages of the motor and to minimize running noise and vibration. Following are examples of correctly and wrongly loaded rotors:

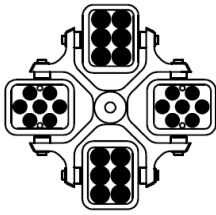


CORRECT

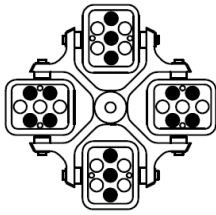
CORRECT

CORRECT

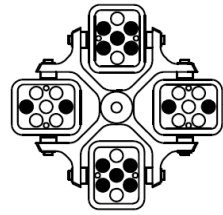
WRONG



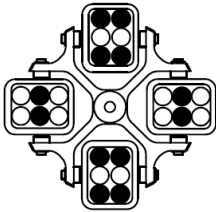
CORRECT



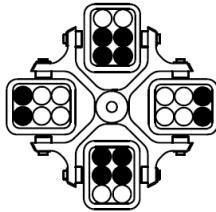
CORRECT



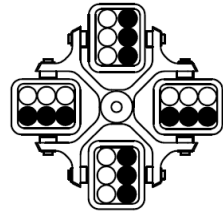
CORRECT



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.**

## 3.8 ROTOR RECOGNITION

Rotor recognition is executed automatically, every time when the centrifuge starts. If you've just changed the rotor, centrifuge stops, and display shows ROTOR CHG. Press START/STOP key to clear this message. New maximal rotor speed is automatically set, to correspond to the inserted rotor. To start the centrifuge again, press START/STOP key again.

<b>Rotor</b>	<b>RA 6/50</b>	<b>RA 24/2</b>	<b>RA 30/2</b>	<b>RA 24/2 AERO</b>	<b>RA 16/5</b>	<b>RA 30/15</b>	<b>RA 6/PCR</b>
<b>Part Num- ber</b>	448914	228442	228451	375944	403055	454656	273335
<b>Max. speed (rpm)</b>	4,400	15,000	13,000	15,000	13,000	4,400	13,000
<b>Rotor</b>	<b>RH 24</b>	<b>RA 30/12</b>	<b>RM 2/3</b>	<b>RS 4/100</b>	<b>RS 4/200</b>	<b>RC 12</b>	
<b>Part Num- ber</b>	246701	454655	270848	450653	383672	349771	
<b>Max. speed (rpm)</b>	13,000	4,400	3,000	4,400	4,400	2,500	

## 3.9 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.



**Turn off the main switch of the centrifuge. Wait until rotor fully stops. Check this by looking through the lid window!**

**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.**

## **3.10 DISPLAY OF THE SET VALUES DURING THE RUN**

The centrifuge shows the current values of the operation parameters on displays. If you wish to check the set values of the parameters, rotate the desired parameter knob for one step. Display will show the set value of the parameter for approximately one second. After that, display will automatically return to the current value.

## 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. 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 temperature display and the program display show message Er, while speed display and time display show the error message. For the list of errors, see below table.

DISPLAY		PROBLEM	SOLUTION	WHO REPAIRS
SPEED	TIME			
ROTOR	CHG	Rotor Change	Repeat Run	User
	SEN	Rotor Sensor	Check rotor is in the centrifuge	User
			Check rotor sensor	Service-SP
			Check rotor sensor	Service
			Electronics error	Service
	SPD	Rotor is still turning	Wait till rotor stops	User
	HI	Rotor speed too high	Reduce speed	User
Check rotor sensor			Service-SP	
IMB	SEN	Imbalance sensor	Check imbalance sensor	Service-SP
			Check imbalance sensor	Service
			Electronics error	Service
	OUR	Imbalance too high	Check rotor loading arrangement	User
			Check the sample weight in the rotor	User
			Check if the rotor and rotor lids are fastened	User
			Check the rotor and lid	User
			Check rotor sensor	Service-SP
			Repeat the balancing procedure	Service
LID	OPN	Centrifuge lid open	Close the lid of the centrifuge	User
	SEN	Lid latch not engaged	Open and close the lid of the centrifuge again	User
			Check lid sensors	Service-SP

DISPLAY		PROBLEM	SOLUTION	WHO
SPEED	TIME			REPAIRS
MOTOR	SEN	Speed sensor error	Check speed sensor	Ser-vice-SP
			Check speed sensor	Service
			Electronics error	Service
	SPD	Speed deviates for more than $\pm 500$ RPM / 5 s	Check rotor, motor and frequency regulator	Service
			Electronics error	Service
DRIVE	HIV	Voltage overload on the DC link	Reduce braking level	User
			Error on frequency regulator	Service
			Electronics error	Service
	LOV	Voltage too low on the DC link	Check power supply	User
	OC	Current overload of the motor	Repeat run	User
			Reduce acceleration level	User
			Check start-up parameters	Ser-vice-SP
			Check motor	Service
			Error on frequency regulator	Service
	HOT	Driver temperature too high	Reduce speed	User
			Check motor	Service
			Error on frequency regulator	Service
	MAINS	INT	Power failure during the run	Repeat run
----	---	After 1 hr of standstill the centrifuge goes into sleep mode	Pres any key	User

**Note:** SP = service parameters

## 5.2 EXIT FROM ERROR DISPLAY



By pressing **START/STOP** key, you exit from error display and go back to stand-by position.

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 position, call service!

## 5.3 USER'S PARAMETERS

With user's parameters, you can check the data of currently used rotor and the centrifuge.

For entering to user's parameters, the centrifuge must be in stand-by position, and then simultaneously press time and speed knobs and hold them for about 2 seconds.

When the first parameter is displayed, release the knobs. You can check the parameters by rotating the time knob. To exit from user's parameters, press **START/STOP** key

DISPLAY		PARAMETER DESCRIPTION
SPEED	TIME	
2	nr	Number of currently used rotor.
98	rOr	Radius (mm) of currently used rotor. The value can be set by rotating the speed knob. (25 - 200 mm)
13000	rOS	Maximal permitted speed for currently used rotor.
26.0	InH	Imbalance value for currently used rotor over 3000 RPM. Expressed in percentage of the maximal value, which was set at calibration procedure of imbalance sensor.
25.0	InL	Imbalance value for currently used rotor below 3000 RPM. Expressed in percentage of the maximal value, which was set at calibration procedure of imbalance sensor.
23	HrS	Number of working hours of the centrifuge.
4	Hr3	Number of working hours of rotor number 3 (RS 4/100).
DISAB	SLI	Automatic start of operation at lid closing. The setting can be chosen by rotating the speed knob. (DISAB = disable, EnABL = enable)
DISAB	OLI	Automatic opening of the lid at operation stop. The setting can be chosen by rotating the speed knob. (DISAB = disable, EnABL = enable)
DISAB	BSE	Blockade of operation parameters settings during the operation. The setting can be chosen by rotating the speed knob. (DISAB = disable, EnABL = enable)

DISPLAY		PARAMETER DESCRIPTION
SPEED	TIME	
DISAB	tIn	Decreasing or increasing of time display. The setting can be chosen by rotating the speed knob. (DECrE = decreasing, InCrE = increasing)
EnABL	BEP	Turn on the beeper. The setting can be chosen by rotating the speed knob. (DISAB = disable, EnABL = enable)

**NOTE:** Values in SPEED column of the above table are factory default values of user's parameters.

## 5.4 REPLACING THE CENTRIFUGE FUSES

### CF-350 Centrifuge:



Mains Socket

Fuse  
Compartment

The following fuses are required for CF-350 Centrifuge:

2 x 10AT 250V (230V)

2 x 16AT 250V (120V)

- Unplug mains plug from the mains socket.
- By pressing the locking device on the bottom side of the fuse compartment, 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-350 Centrifuge:**

Code:	CF-350-220 - 230 V CF-350-120 - 120 V
Power supply:	230 V $\pm$ 10%, 50/60 Hz 120 V $\pm$ 10%, 50/60 Hz
Power consumption:	500W
Fuses:	230 V = 2 x 10 AT 120 V = 2 x 16 AT
Protection class:	I
Rotational speed:	200 to 15,000 RPM
Maximum centrifugal force:	21,630 x g
Maximum load:	4 x 200 mL
Maximum kinetic energy:	5020 Nm
Max. density of material to be centrifuged:	1.2 g/ml
Noise level at max. speed:	$\leq$ 62 dB(A)
Run time:	10s to 99 min 50 s, continuous operation(HOLD)
Number of programs:	100 programs
Acceleration:	levels from 0 to 9
Deceleration:	levels from 0 to 9(0 - no braking)
Ambient temperature:	2 to 35 °C
Maximum relative humidity:	85%, non-condensing
Dimensions (W x D X H):	W: 15.9" (40.5 cm), D: 19.7" (50.0 cm), H: 12.8" (32.5 cm)
Weight:	49.6 lbs. (22.5 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:

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

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

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

n ..... Rotational speed (RPM)

### 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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