ELMI laboratory equipment

Centrifuge CM-8S



User manual

QUALITY SYSTEM CERTIFICATION
DNV·GL
ISO 13485

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1 Introduction

CM series centrifuge CM-8S is easy to use and reliable in operation. We ask you to carefully read the user manual and follow the instructions for proper operation and maintenance. This will ensure long and flawless exploitation of the device.

Centrifuge CM-8S is applied to separate solutions into fractions. The device is used in medicine, analytical chemistry, microbiology, virology, clinical biochemistry, etc.

1.1 Technical specification

Rotor rotation speed, RPM	from 100 to 4500
Maximal relative centrifugal force, RCF (G)	3735
Accuracy of rotation speed maintenance, %	±2
Timer range	1 second - 12 h
Rotor speed step (RPM)	1
Centrifugal force step, RCF (G)	1
Timer step	1 second
Number of centrifuge brake levels	6
Noise level (1 m distance, dBA)	no more than 55
Electromagnetic compatibility	according to EN 61326-1: 2013
Ambient conditions:	
Ambient temperature, ºC	from +10 to +40
Relative humidity, %	80
Do not use in humid premises (above 80% humidity)	
Use up to a height of 2000 m above sea level	
Total test tube imbalance limit, g	Refer to pages 10, 11
Mains voltage, V	100-240
Mains frequency, Hz	50-60
Overvoltage category	II
Maximal consumable power, W	320
Size of the device (length x width x height), mm	431x410x247
Approximate weight, kg (without rotor and cord)	14.7
Safety area, cm	30
Max. permitted density of material to be centrifuged	1.2 g/ml
Pollution degree	2

1.2 Content of package

Name	**pcs**
Centrifuge	1
Power cord	1
Rotor	1
Rotor key / emergency lid opening key	1
Rotor nut and spacer	1
User manual	1
Packaging	1

2 Safety precautions

2.1 General safety precautions

- Use only as specified in the operating instructions provided. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- The unit should not be used if it has encountered a physical shock or has been dropped.
- The unit must be stored and transported in a horizontal position (see package label).
- After transport or storage allow the unit to dry out (warm up) 2-3 hours before connecting to mains power.
- Table for centrifuge should possess safety zone of the minimum 30 cm round the centrifuge in accordance with EN-61010-2-20. Persons and hazardous materials must not be in the safety area whilst the centrifuge is in operation.
- Use only original accessories (rotors, adaptors, etc.) provided by the manufacturer and ordered specifically for this model.
- Centrifugation of toxic or radioactive materials is prohibited.

2.2 Electrical safety precautions

- Connect only to the power outlet mains with a voltage corresponding to that on the serial number label.
- Ensure that the switch and plug are easily accessible during use.
- Do not plug the unit into the main outlet without grounding, and do not use extension lead without grounding.
- Before moving the unit, disconnect it from the power outlet mains. To turn off the unit, disconnect the power plug from the mains outlet.
- It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on or inside the equipment. If liquid is split inside the unit, disconnect it from the mains and have it checked by a qualified person.

2.3 Safety precautions during operation

- Do not centrifuge flammable or chemically vigorously reactive materials. If such liquids are spilled in the rotor or rotor chamber the centrifuge must be cleaned with mild soap solution.
- Do not use rotors with visible signs of corrosion, wear or mechanical damage.
- Do not fill in the containers after they are inserted in the rotor.
- Do not leave the operating unit unattended.
- Do not operate the unit in environments with aggressive or explosive chemical mixtures.
- Do not operate the unit if it is faulty or been incorrectly installed.
- For indoor use only.
- Do not use outside laboratory rooms.
- Before using any cleaning or decontamination method except those recommended by the manufacturer, check with the manufacturer that the proposed method will not damage the equipment.
- Cleaning and decontamination may be necessary as a safeguard before laboratory centrifuges, rotors, and any accessories are maintained, repaired, or transferred.
- Do not make modifications to the unit. Be sure to use all the accessories (rotors) recommended by the manufacturer.

2.4 Biological safety precautions

- Without bio seal the centrifuge is not a biosafety system in accordance to EN61010-2-20 and cannot be used for centrifuging hazardous materials contaminated with toxic, radioactive or pathogenic microorganisms.
- Centrifugation of toxic or radioactive materials is prohibited.
- 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.
- Wear your personal protective equipment.
- It is the user's responsibility to carry out appropriate decontamination if hazardous material is spilt on or inside the equipment. For comprehensive regulations about handling germs or biological material of risk group II or higher, please refer to the "Laboratory Biosafety Manual" (source: World Health Organization, Laboratory Biosafety Manual, the current edition).

3 Installation

- Unpack the centrifuge. Please keep the box and packaging materials for transportation or storing.
- If the machine was stored at a temperature below 0°C, make sure it stays at room temperature for at least two hours before turning on.
- Place the centrifuge onto a level, horizontal surface.
- Examine the power plug, power cord and appearance of centrifuge for damage.
- Connect the power cord to the centrifuge, insert the plug in to the socket and press the ON switch at (I) symbol. Display will light up on the control panel.
- Open the lid by pressing the OPEN button.
- Check the rotor, make sure that rotor nut is securely fastened. Try rotating it by hand. There should be no noise or obstacles for smooth run.
- Check the adapters. All the adapters must be equally positioned inside the brackets.
- Check the surrounding of device. Safety distance of 30 cm must be observed around the centrifuge during operation.
- If no other damage or malfunction were determined, the centrifuge is ready to run.

ATTENTION! If there is apparent damages or malfunctions, DO NOT TURN ON the centrifuge without consulting a specialist.

ATTENTION! To finish the unpacking of centrifuge, pull the emergency opening lever to the side (as shown on the figure on page 12) and remove all packaging materials from the rotor.

4 Design of centrifuge

The centrifuge (see Fig. 1) consists of a housing (1) with a cover (2). A motor is placed inside the housing, on the shaft of which a rotor (5) with adapters (6) is fixed using a nut (3) and a spacer (4). The control panel is mounted on the front of the centrifuge and includes "OPEN" (7) and "START / STOP" (8) buttons and digital display (9) with buttons for setting the operating parameters. The main switch and a power cord socket are located on the rear of the device.
The centrifuge has a safety opening system usable in case of power supply absence.

At the base of the centrifuge (see Fig. 2, page 12) on the side of the control panel is a groove for opening the centrifuge lid in case of power supply absence.
The centrifuge lid (2) has a transparent window (10) for speed control (by tachometer).

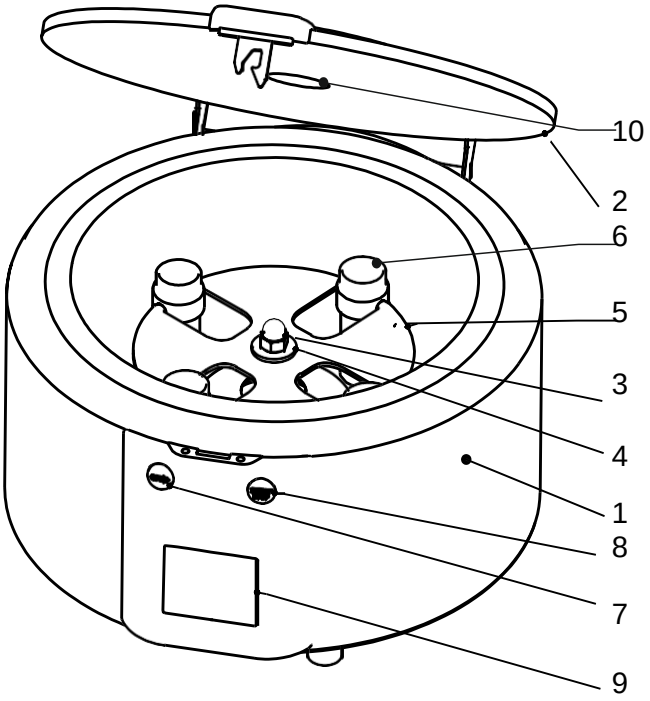
Fig.1



Button to unblock the lid of centrifuge (during centrifugation cycle it duplicates function of "START/STOP" button)



Button to start the centrifugation or to end the cycle before the estimated time



5 Operating

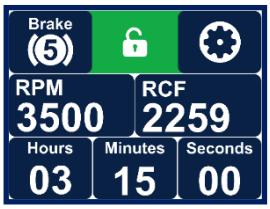
Place the test tubes in the rotor adapters. Please insert the test tubes symmetrically (on the opposite sides). To protect the centrifuge against imbalance, fill in the test tubes up to the same weight. Each test tube should be counterbalanced by another test tube. The total imbalance of test tubes should not exceed allowed value (refer to pages 9, 10). This will reduce the wear on mechanical parts of centrifuge.
For safety reasons the centrifuge lid automatically locks when closed and unlocks at the end of centrifugation cycle. Lid can be unlocked with "OPEN" button but only with stand still rotor.
Settings and adjustments of the parameters of centrifuge must be made before the start of centrifugation cycle with opened or closed lid.

Setting centrifugation parameters

Settings and adjustments of the parameters of centrifuge must be made before the start of centrifugation cycle, with opened or closed lid.
Setting of basic parameters of centrifugation (speed, time, braking level) is performed using the TOUCHSCREEN DISPLAY STANDARD MENU.
To set additional parameters of the centrifuge and configure the programming mode, use the **ADDITIONAL SETTINGS MENU.**

STANDARD MENU

This menu is displayed a few seconds after the centrifuge has been switched on. The following parameters can be displayed and modified:





Rotor rotation speed (revolutions per minute - RPM)



Relative Centrifugal Force, RCF (G)


The centrifuge lid is open


The centrifuge lid is locked



Braking levels (from 1 to 6)

Rotation time (hours, minutes, seconds):




Additional settings menu

SETTING THE ROTATIONAL SPEED OF THE ROTOR

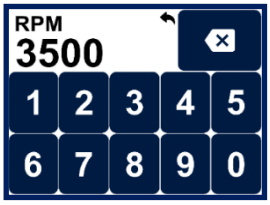


By pressing on the touchscreen display, select the necessary unit of measurement (RPM or RCF):



or


The selected parameter lights on a white background.



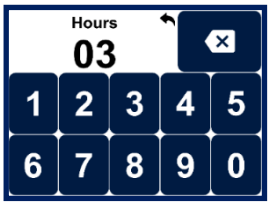
Using the numerical keyboard, enter the desired value of the parameter.



To confirm the entered value of the parameter, press again the selected unit (RPM or RCF) in the upper part of the touchscreen (on a white background).

Using the key , the selected value of the parameter may be adjusted (beginning from the last sign).

SETTING THE ROTATION TIME

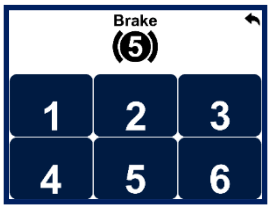


By pressing on the touchscreen display, select the necessary unit of measurement (hours, minutes, seconds).



Using the numerical keys, enter the desired value of the parameter. To confirm the entered value of the parameter, press again the selected units (hours, minutes, seconds) in the upper part of the touchscreen (on a white background).

SETTING THE BRAKING LEVEL



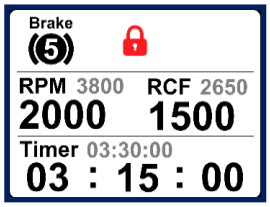
Click on the key 

"Brake" at the right side of the touchscreen display.

Using the numeric keyboard, select the desired braking level (1 to 6).

The time indicated on the numerical keys means the maximum braking time at the maximum rotational speed (3500 RPM). To confirm the set value of the parameter, press again the key "Brake" in the upper part of the touchscreen (on a white background).

USING THE BUTTON "START/STOP" WILL LAUNCH THE CENTRIFUGATION PROCESS



During the centrifugation process, the set parameter values are reflected by grey numbers. The real parameters of the centrifugation process are reflected by black numbers.

Using the additional setting Menu, the additional centrifugation parameters are set. Also, in this menu, the user can create unique user programs.

SETTING ADDITIONAL PARAMETES FOR CENTRIFUGATION

ADDITIONAL SETTINGS MENU



To enter the additional settings menu, press the additional settings menu key  in the standard menu.

To exit the additional settings menu, press the additional settings menu key  one more time (on a white background).

THE FOLLOWING PARAMETERS CAN BE DISPLAYED AND MODIFIED:

 Centrifuge operating modes (standard or programmable);

 Language: the English, German, Spanish, Portugues and Russian languages are selected as the menu language;

 volume of sound signal;

 brightness of the screen;

 information about centrifuge;

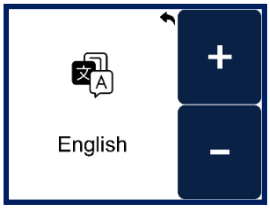
 centrifugal working time tracking meter (hour meter);

 resetting the default settings;

 password setting (for the use by service engineers only).

Attention! During the centrifugation process, additional parameter setting is not possible!

SETTING DISPLAY LANGUAGE



To set the display language, you need to press the Language key  in the Additional Settings Menu; and,

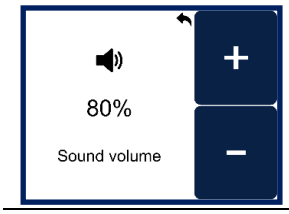
using the navigation keys 

select the desired display language (English, Spanish, Portuguese, Russian German).

To set the selected display language, you need to press the key with the language name (for example, 

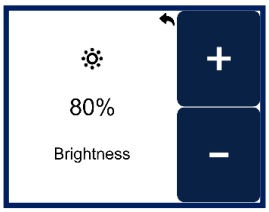
).

SETTING VOLUME FOR SOUND SIGNAL



To set the sound signal volume, you need to press "Sound" key  (Additional Settings Menu); select and set the sound volume (100%, 80%, 60%, 0%). 0% means work without any sound signal.

DISPLAY BRIGHTNESS



To set brightness of the screen, you need to press "Brightness" key , select and set the required screen brightness (100%, 80%, 60%, 10%).

INFORMATION ABOUT THE CENTRIFUGE



For information about the centrifuge, you need to press the key  and scan the screen code.

TIME COUNTING



Indicates the number of hours the centrifuge has worked.

RESTORING FACTORY SETTINGS



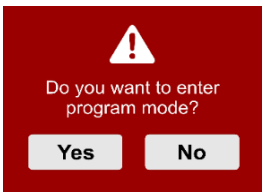
Restoring factory settings allows you to delete all the changes made and the programs created by users as well as to restore the factory settings.

PASSWORD



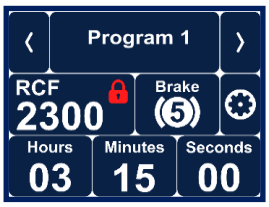
To protect information about the factory settings from unauthorized access, password is set at the factory. The password is available in service instructions. Intended for service engineers and technicians.

PROGRAMMING MODE



Using the programming mode, the user can create and save in the centrifuge's memory his/her own centrifugation programs (up to 8 programs set up by the user)

To activate the programming mode, you need to press the key  and choose the option «Yes» (Do you want to enter program mode? Yes).



Using the touchscreen display keys, you can set the program number or name, as well as the necessary centrifugation parameters (centrifugation speed, centrifugation time and braking levels).



To create the name of the program, you need to press the program's name key, such as "program one";

using the key , delete the unnecessary name and, using the keyboard, enter the name of the program.

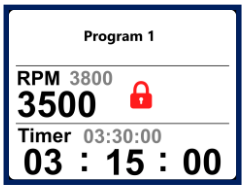
To exit the programming mode, you need to press the "Settings" key  (Settings); and then press the programming mode key 



and switch to the standard mode (Do you want to enter standard mode? Yes).

To delete user-created programs, use the factory reset button  (Additional Settings Menu).

USING THE BUTTON "START/STOP" WILL LAUNCH THE CENTRIFUGATION PROCESS



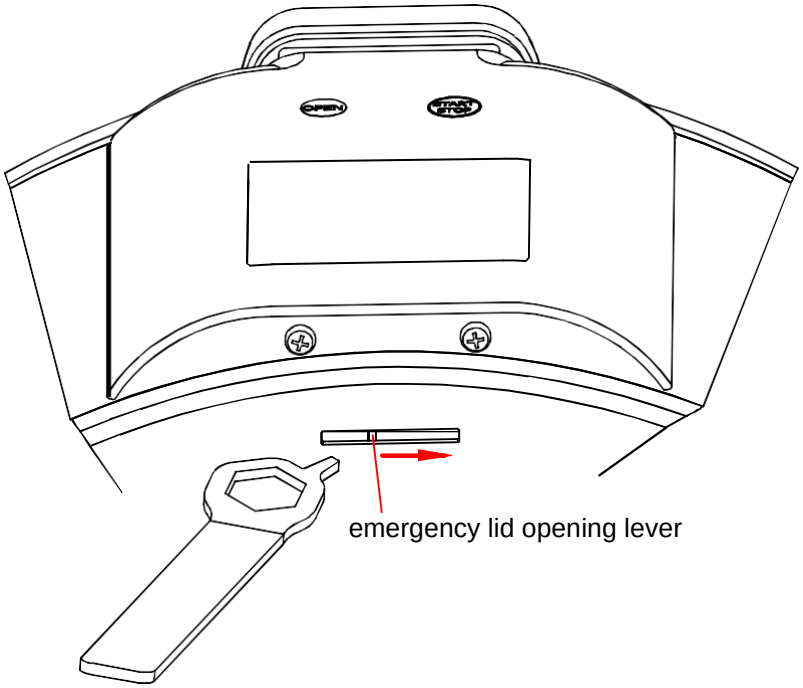
During the centrifugation process, the set parameter values are reflected by grey numbers. The real parameters of the centrifugation process are reflected by black numbers.

Attention! Operation must be stopped immediately if there are any unusual noises or vibration.
Attention! Check the rotor and rubber seal for wear each time before starting the centrifuge.

6 Emergency lid release

To open the lid of centrifuge in case of mains failure or lid lock damage, disconnect the device from mains power supply, wait until the rotor comes to a complete stop then lift the centrifuge and insert the included emergency lid opening key into the groove and move the lever to the side (as it is shown on the figure 2). The lever is located on the bottom of centrifuge in the groove near the control panel.

Fig.2



ATTENTION! NEVER open the lid in emergency procedure when rotor is still turning!

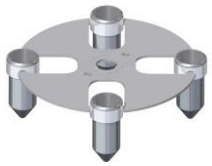
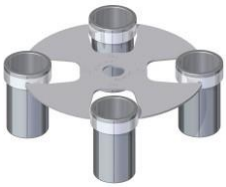
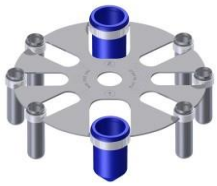
7 Rotor installation and usage

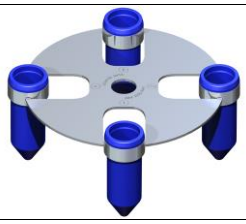
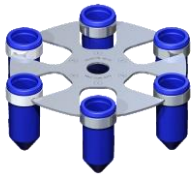
Installation: Place the rotor on the axis. On top of the rotor place a special spacer. Note that the pin of the spacer must get into the groove of the axis. Place the rotor nut on the axis and tighten it with the included rotor key. Before each start check that the rotor is firmly tightened. Disassembly is made in reverse sequence.

Usage: Always load the rotor symmetrically. Each test tube should be counterbalanced by another test tube. By minimizing the difference of weight between the filled test tubes, you reduce the wear of mechanical parts of the centrifuge. If the overall imbalance of test tubes in the rotor exceeds allowed value, the display will show "DISBALANCE" – error code for imbalance. The centrifuge is equipped with rotor detecting system that manages top speed parameter to the rotor type.
Do not use damaged rotors!

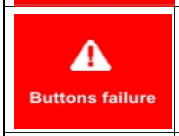
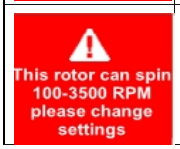
ATTENTION! Samples may contain pathological material, including pathogens of serious diseases. **Always check test tubes for damage before centrifugation, to prevent centrifuge destruction.**

8 Applied rotors

Rotor	Description
	**ROTOR 8M for** 12 adapters. Maximal volume of applied test tubes: 12 ml. Maximal size of applied test tubes (LxD): 115 x 17.5 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 5 g. Weight: 730 g. **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**
	**ROTOR 8M.02 for** 24 adapters. Maximal volume of applied test tubes: 12 ml. Maximal size of applied test tubes (LxD): 120 x 17.5 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 5 g. Weight: 1065 g. **Outer row is loaded first (test tubes L=140 mm, volume 15 ml)** **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**
	**ROTOR 8M.01 for** 4 adapters. Maximal volume of applied test tubes: 50 ml. Maximal size of applied test tubes(LxD): 130 x 30 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 3 g. Weight: 940 g. **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**
	**ROTOR 8M.05 for** 12 adapters with a working angle 10°. Maximal volume of applied test tubes: 15 ml. Maximal size of applied test tubes (LxD): 140 x 17.5 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 5 g. Weight: 800 g. **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**
	**ROTOR 8M.06 for** 6 adapters. Maximal volume of applied test tubes: 50 ml. Maximal size of applied test tubes(LxD): 120 x 30 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 5 g. Weight: 1015 g. **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**
	**ROTOR 8M.03 for** 4 adapters. Maximal size of applied test tubes(LxD): 125 x 44 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 5 g. Weight: 1120 g. **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**
	**ROTOR 6M.07 for** 6 adapters (15 ml test tubes) and 2 adapters 50 ml. Maximal size of applied test tubes (LxD): 115 x 17.5 mm / 130 x 30 mm. Top speed: 3500 rpm. Total test tube imbalance limit: 3 g. Weight: 625 g.
	**ROTOR 8M.10 for** 4 adapters (15 ml test tubes) and 2 adapters 50 ml. Maximal size of applied test tubes (LxD): 115 x 17.5 mm / 135 x 30 mm. Top speed: 4500 rpm. Total test tube imbalance limit: 3 g. Weight: 710 g. **Sterilization in the autoclave at a temperature up to 121 °C is allowed.**

Rotor	Description
	**ROTOR 6M.01 for** 4 adapters. Maximal volume of applied test tubes: 50 ml. Maximal size of applied test tubes (LxD): 130 x 30 mm. Top speed: 3500 rpm. Total test tube imbalance limit: 3 g. Weight: 600 g.
	**ROTOR 6M.06 for** 6 adapters. Maximal volume of applied test tubes: 50 ml. Maximal size of applied test tubes (LxD): 120 x 30 mm. Top speed: 3500 rpm. Total test tube imbalance limit: 5 g. Weight: 655 g.

9 Troubleshooting (Error code table)

Error code	Sound signal	Cause	Correction
	-	No mains power connection. Power failure. No display on screen	Check connection of the power cable
	+	Internal problem	Contact local service office
	+	Total imbalance of test tubes is more than permitted	It is necessary to insert test tubes symmetrically (on the opposite sides). Fill in the test tubes up to the same weight. Each test tube should be counterbalanced by another test tube. Refer to pages 9, 10.
	+	Centrifuge is overheated	Check the air vents of device and give a little time and centrifuge will cool down automatically.
	-	Residual rotation of the rotor	Wait until the rotor is motionless.
	+	Centrifuge lid is left open	Close and press on the lid till you hear a click.
	+	One of control buttons is stuck	Check the buttons for stuck. If the problem remains, contact local service office.
	+	Applied rotor can't spin more than 3500 rpm	Set the rotation speed from 100 to 3500 rpm.

Microprocessor control system self-tests and reports detected faults and errors to the user.

10 Maintenance of centrifuge elements

Laboratory staff must pay special attention to the fact that the centrifuge parts of key importance are not damaged due to safety reasons.

Routine check	Frequency of checks	Not acceptable	Correction
Housing, plug, cord, control system, adapters (external inspection)	After every 160 hours of operation*	Cracks, compression marks, broken coating parts	Replace damaged parts
Condition of rubber parts: engine shock absorbers, instrument legs, sealing gum	Every two years or after every 3600 hours of operation	Cracks, increased rubber hardness	Replace damaged parts
Bearing condition	Every two years or after every 3600 hours of operation	Free motion is more than 0,05 mm, rotation of a rotor with jamming	Replace engine
Engine condition	Every two years or after every 3600 hours of operation	Loose engine mounting screws	Tighten engine mounting screws

*Centrifuge working hours counter is checked in the settings menu (Hour meter)

11 Disinfection and cleaning

Rotor and accessories must be cleaned once a week to avoid corrosion and changes to material.

Attention! Disconnect the centrifuge from mains power supply, remove rotor, and clean it separately. Before any cleaning or decontamination process other than that is recommended by the manufacturer, the user must ask the manufacturer if the planned process does not damage the device.

The rotor, rotor chamber, and the outside of the centrifuge should be cleaned with a soaked gauze or soft cloth. For cleaning, water with soap or other water-soluble mild detergent shall be used. To disinfect use an alcohol-based disinfectant (70% isopropanol/water mixture). If corrosive, toxic or radioactive liquids or pathogenic bacteria are spilled in the rotor or its chamber, the centrifuge must be decontaminated thoroughly.

Rotors are high-quality assemblies which withstand extreme stresses. This stability can be impaired by aggressive chemicals. **Aggressive chemicals can cause** corrosion potentially breaking them and damaging the inside parts, leading to electrical failure.

Damage from UV radiation:
Protective coating of the centrifuge protects it from the sun’s harmful UV rays.
However, do not use beta, gamma, or any other high-energy radiation for disinfection.

12 Transportation and storage

To ensure safety during transportation, the equipment should be packed in the original manufacturers packaging or similar packaging substitute.

Equipment can be transported in any kind of closed transport; make sure that equipment is tightly fixed and transported accordingly to transportation regulations. Equipment should be stored in original manufacturers packaging in dry room with humidity not more than 80% and temperature range of +10 C up to +40 C. It is not recommended to store the equipment more than 36 month.

13 Warranty statements

- Warranty applies to 24-month period from the date of purchasing.
- Malfunctions that occur due to a fault of the manufacturer, during warranty period, are repaired free of charge.
- Warranty is not valid in the following cases:
  - If the serial number label of the manufacturer is damaged.
  - If damage occurs because of
  - incorrect operation, transportation, or storage.
- These documents are necessary if applying for warranty repair:
  - User manual with serial number of the machine.
  - Officially signed report, describing the reasons and circumstances of the equipment malfunctions.
- Warranty repair can be performed only if the equipment is delivered in the original manufacturers packaging or equally safe packaging.
- Before returning for warranty repair ensure that the device is fully cleaned, decontaminated, and does not present any kind of health risk to our staff.
- If the above warranty requirements are not met, repair charges are applied to the customer.
- For all further questions concerning usage and maintenance, please contact manufacturer or product vendor.

14 Disposal

For the disposal of the centrifuge mind the regulations in your country.

15 Labelling

Centrifuge labelling contains:

- name of the manufacturer;
- manufacturer’s contacts;
- name of the medical device;
- the number of the medical device according to the manufacturer’s numbering system (8 characters: XX Y ZZZZ T), where:

XX - year of production, Y - quarter of production, ZZZZ - batch number, T - centrifuge modification;

- rated mains voltage, Hz frequency; maximum rated power; maximal consumable power;
- the Eurasian Conformity mark;
- CE marking;
- warning symbols;
- RoHS WEEE Recycling Sign.

Packaging labeling contains:

- name of the medical device;
- the number of the medical device according to the numbering system of the manufacturer;
- Eurasian Conformity mark;
- Country of Origin;
- handling signs ("Top", "Keep away from moisture");
- name of the manufacturer;
- contacts of the manufacturer.

16 Certificate of approval

Centrifuge CM-8S___N_____has been inspected for the technical conditions and meets all regulations necessary for this class of device.

Quality control person_____
(name) (signature)

Date of manufacture_____

Place for stamp

17 Certificate of sale

Organization_____

Address_____

Phone_____

Vendor _____
(name) (signature)

Date of sale_____

Manufacturers' address
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(+371) 6755 1934
E-mail: info@elmi-tech.com
WWW: www.elmi-tech.com



Video Tutorial
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