

Operating Manual



Refrigerated Centrifuge

1-14K

from serial no. 135550

Please retain for later use!

In case of inquiries please state the following number:

Serial number:

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1 General Information

1.1 Importance of the Operating Manual

A fundamental requirement for the safe and trouble-free operation of the centrifuge is to be familiar with the fundamental safety instructions and all possible hazards.

The operating manual includes important information concerning the safe operation of the centrifuge.

This operating manual and in particular the notes on safety and hazards must be observed by all persons operating the centrifuge.

In addition, the local rules and regulations for the prevention of accidents must be complied with.

1.2 Intended Use

Centrifuges are power-driven machines that separate liquids from solid matter, liquid mixtures, or solid mixtures by centrifugal force. They are solely intended for this purpose. Any other use beyond this area of application is regarded as improper use.

SIGMA Laborzentrifugen GmbH cannot be held liable for any damage resulting from such improper use.

The intended use also includes

- observation of all the notes and instructions included in the operating manual and
- compliance with the care, cleaning, and maintenance instructions.

1.3 Warranty and Liability

The warranty and liability are subject to our "General Conditions" that were distributed to the operator upon the conclusion of the contract.

Warranty and liability claims are excluded if they are due to:

- Improper use.
- Non-compliance with the safety instructions and hazard warnings in the operating manual.
- Improper installation, start-up, operation, and maintenance of the centrifuge.

1.4 Copyright

The copyright concerning the operating manual remains Sigma Laborzentrifugen GmbH.

The operating manual is solely intended for the operator and their personnel. It includes instructions and information that may not be

- duplicated,
- distributed, or
- communicated in any other way

neither in full nor in parts.

Non-compliance may be prosecuted under criminal law.

1.5 Standards and Regulations

EC Declaration of Conformity (page 53).

1.6 Scope of Supply

The centrifuge comprises:

- | | |
|---------------------------------------|---|
| • 1 connection cable | depending on the voltage variant |
| • 1 socket wrench (emergency release) | part no. 930 014 |
| • 1 rotor fastening nut | part no. 80 301 |
| • 20 ml slushing oil | part no. 70 104 |
| • Spare fuses | part no. 70 102 (230V)
or part no. 70 106 (120V) |

Documentation:

Operating Manual incl. EC Declaration of Conformity (page 53)

Accessories

according to your order, our order confirmation, and our delivery note.

2 Design of the Centrifuge

2.1 Overview

- 1 Lid
- 2 Display
- 3 Set key
- 4 Program key
- 5 Arrow keys
- 6 Precool key
- 7 Start / stop key
- 8 Lid key



Fig. 2.1: Total view of the centrifuge

- 9 Mains power input
- 10 Mains switch
- 11 Name Plate (see 2.2)



Fig. 2.2: Rear view of the centrifuge

2.2 Name Plate

- 1 Manufacturer and registered office
- 2 Type name
- 3 Serial number
- 4 Max. speed
- 5 Kinetic energy
- 6 Max. density
- 7 Nominal voltage
- 8 Input fuse
- 9 Symbol for special disposal (see chapter 9)
- 10 CE mark in accordance with the directive 94/9/EC
- 11 Part number
- 12 Year of manufacture
- 13 Power consumption



Fig. 2.3: Example of a name plate

3 Safety

3.1 Marking of the Unit

International symbols used for SIGMA centrifuges:



Gefährliche elektrische Spannung
 Dangerous voltage
 Courant haute tension



Achtung, Betriebsanleitung lesen
 Attention, consult instruction manual
 Attention, consulter mode d'emploi



Ein (Netzverbindung)
 On (Power)
 Marche (mise sous tension)



Aus (Netzverbindung)
 Off (Power)
 Arrêt (mise hors tension)



Schutzleiteranschluss
 Protective earth (ground)
 Liaison à la terre



Erde
 Earth (ground)
 Terre



Netzstecker ziehen
 Unplug mains plug
 Tirer la fiche de prise



Vorsicht Quetschgefahr
 Caution! Risk of bruising
 Attention! Danger de blessure



Drehrichtungspfeil
 Arrow direction of rotation
 Flèche sens de rotation



Heiße Oberfläche
 Hot surface
 Surface chaude



Nicht mit dem Hausmüll entsorgen
 Do not dispose as part of domestic waste
 Ne pas jeter avec les déchets ménager

3.2 Explanation of the Symbols and Notes

This operating manual uses the following names and symbols to indicate hazards:



This symbol stands for a **direct** hazard to the life and health of persons.

Non-observance of these symbols **causes** serious health problems up to life-endangering injuries.



This symbol stands for a **direct** hazard to the life and health of persons due to electrical voltage.

Non-observance of these symbols **causes** serious health problems up to life-endangering injuries.



This symbol stands for a **potential** hazard to the life and health of persons.

Non-observance of these symbols **can** cause serious health problems up to life-endangering injuries.



This symbol indicates a potentially hazardous situation.

Non-observance of these notes can cause minor injuries or damage to property.



This symbol indicates important information.

3.3 Responsibility of the Operator

The operator is responsible to authorise only qualified personnel to work on the machine (see chapter 3.4 "Operating Personnel").

The areas of responsibility of the personnel concerning the operation, maintenance, and care of the unit must be clearly defined.

The safety-conscious work of the personnel in compliance with the operating manual and the relevant EC and national health and safety regulations as well as with the accident prevention regulations must be checked at regular intervals (e.g. every month).

Under the international rules for health and safety at work, the operator is obliged to:

- take measures in order to prevent all danger to life or health during work.
- ensure that centrifuges are operated properly and entirely as intended (see chapter 1.2 "Intended Use", page 9 of this Operating Manual).
- take measures for the safe opening of centrifuges.

3.4 Operating Personnel

Persons operating the unit must

- be familiar with the fundamental regulations concerning workplace safety and accident prevention
- have read and understood this operating manual (and in particular the safety sections and warning notes) and confirmed this with their signature.

3.5 Informal Safety Instructions

- This operating manual is part of the product.
- The operating manual must be kept at the location of use of the centrifuge. Ensure that it is accessible at all times.
- The operating manual must be handed over to any subsequent owner or operator of the centrifuge.
- Any changes made must be added to the operating manual.
- In addition to the operating manual, the general and local rules and regulations concerning the prevention of accidents and the protection of the environment must also be supplied.
- Safety and danger indications on the centrifuge must be kept readable at all times. If necessary, they must be replaced.

3.6 Safety Instructions

3.6.1 Electrical Safety

To reduce the risk of electrical shock, the centrifuge uses a three-wire electrical cord and plug to connect the equipment to earth-ground. To preserve this safety feature:



- Make sure the the wall socket is properly wired and earth-grounded.
- Check that the mains voltage agrees with the nominal voltage listed on the name plate.
- Do not place vessels containing liquid on the centrifuge lid or within the safety distance of 30 cm around the centrifuge. Spilled liquids my get into the centrifuge and damage electrical or mechanical components.
- Work on the power supply system must only be performed by certified electricians.
- Inspect the electrical equipment of the unit regularly. Defects such as loose or burnt cables must be eliminated immediately.

3.6.2 Mechanical Safety

For safe operation of the centrifuge, observe the following:



- Do not open the lid when the rotor is in motion!
- Do not reach into the rotor chamber when the rotor is in motion!
- Do not use the centrifuge if it was installed incorrectly.
- Do not use the centrifuge without panels.
- Do not use the centrifuge if the rotors and inserts show signs of corrosion or other defects.
- Only use the centrifuge with rotors and accessories that have been approved by the manufacturer. In case of doubt contact the manufacturer (see chapter 7.3 "Service Contact").
- Do not hold your fingers between the lid and the housing when closing the lid. Risk of crushing!
- Defective lid relieving devices could cause the centrifuge lid to fall (contact service, if necessary). Risk of crushing!
- Do not hit or move the centrifuge during its operation.
- Do not lean against or rest on the centrifuge during its operation.
- Do not spin any substances that could damage the material of the rotors and buckets of the centrifuge in any way. Highly corrosive substances, for example, damage the material and affect the mechanical strength of the rotors and buckets.
- Stop the centrifuge immediately in the event of a malfunction (see chapter 7 "Malfunctions and Error Correction") or contact the service of SIGMA Laborzentrifugen GmbH (see 7.3 "Service Contact").
- Ensure that all repairs are performed only by authorized and specialized personnel (see chapter 7.3 "Service Contact").

- Prior to any start-up, check the centrifuge, rotor, and accessories for signs of damage that can be discerned from the outside. Special attention must be paid to all of the rubber parts (e.g. motor cover, lid seal, adapter) in terms of visible structural changes. Defective parts must be replaced immediately.
- Open the centrifuge when it is not in use so moisture can evaporate.

3.6.3 Fire Prevention



- Always use fuses with the same type and rating specified.
- Do not spin explosive or inflammable substances .
- Do not use the centrifuge within hazardous locations.

3.6.4 Chemical and Biological Safety

If pathogenic, toxic, or radioactive samples are intended to be used in the centrifuge, it is in the responsibility of the user to ensure that all necessary safety regulations, guidelines, precautions, and practices are adhered to accordingly.



- Spin infectious material in sealed rotors and buckets only in order to prevent the material from leaking into the centrifuge.
- Infectious, toxic, pathogenic, and radioactive substances must be centrifuged in certified rotors and vessels. Take suitable precautions for your own safety if there is a risk of toxic, radioactive, or pathogenic contamination.
- Materials that chemically react with each other with a high level of energy are prohibited.



- Keep informed about local measures to avoid harmful emissions (depending on the substances to be centrifuged).
- Protective clothing is not required for the operation of the centrifuge. The materials to be centrifuged may, however, require special safety measures (e.g. centrifugation of infectious, toxic, radioactive, or pathogenic substances).

3.6.5 Safety Instructions for Centrifugation

For safe operation, observe the following before starting the centrifuge:



- Ensure that the centrifuge was set up properly (see chapter 5 "Set-up and Connection").
- Maintain a safety distance of at least 30 cm (12 inches) around the centrifuge.
- Do not store any dangerous goods in the safety area of the centrifuge.
- Do not stay in the safety area longer than what is absolutely necessary for the operation of the centrifuge.



- Only use the centrifuge with rotors and accessories that have been approved by the manufacturer. We explicitly warn against the use of equipment of poor quality. Breaking glass or bursting vessels can cause dangerous imbalances at high speeds.
- Ensure that the rotor is correctly fitted (see 6.2.2.1 "Installation of the Rotor").
- Observe the instructions on the installation of accessories (see 6.2.2.3).
- The rotor must be loaded symmetrically at equal weights.
- If liquids with a density $> 1.2 \text{ g/cm}^3$ are used, reduce the speed (see 11.3.2 "Density").
- Do not use the centrifuge if the rotor is loaded asymmetrically.
- Do not use the centrifuge with tubes that are excessively long.

3.6.6 Resistance of Plastics

Chemical influences have a strong effect on the polymeric chains of plastics, and therefore, on their physical properties. Plastic parts can be damaged if solvents, acids, or alkaline solutions are used.



- Refer to the resistance data (see chapter 11)!

3.6.7 Service Life of Rotors and Accessories

The rotors and accessories have a limited service life.



- Perform regular checks (at least once per month) for safety reasons!
- Pay special attention to changes, such as corrosion, cracks, material abrasion etc.
- Aluminium rotors must be scrapped after 50,000 cycles or max. 7 years.
- If other data concerning the service life are engraved on the rotor

or accessory, these data shall apply accordingly. For example, a bucket with an engraving "max.cycles = 10.000" has a service life of 10.000 cycles; and a rotor with the engraving "Exp.Date 02/15" must be scrapped in February 2015 at the latest (see fig. 3.1).



Fig. 3.1: Different service life – engraving on the bucket/rotor



- Refer to the table of rotors and accessories with a different service life (see chapter 11 "Appendix")

3.7 Safety Devices

3.7.1 Lid Lock Device

The centrifuge can only be started when the mains power switch is in "ON" position and the lid is properly closed. When the lid lock is locked, the lid can only be opened when the rotor has stopped. In the event of a power failure, it is possible to open the lid manually by way of the emergency release system. (see 7.1.1 "Emergency Lid Release").

3.7.2 System Check

An internal system check monitors the data transfer and sensor signals with regard to plausibility. Malfunctions are indicated by error messages with a number in the speed/rcf display (see 7.2 "Error Codes").

3.7.3 Ground Wire Check

For the ground wire check, there is an equipotential bonding screw on the rear panel of the centrifuge. A ground wire check can be carried out by authorized and specialized personnel using a suitable measuring instrument. Please contact the head of our service team (see 7.3 "Service Contact").

3.8 Measures in the Event of Hazards and Accidents



- If an emergency arises, switch off the centrifuge immediately!
- If in doubt, call the emergency doctor!

3.9 Remaining Hazards

The unit was built state-of-the-art and according to the accepted safety rules. Danger to life and limb of the operator, or of third parties, or impairments of the unit or other material assets cannot be completely excluded when the unit is being used.

Use the unit

- only for the purpose that it was originally intended for (see 1.2) and
- only if it is in a perfect running state.
- Immediately eliminate any problems that can affect safety.

4 Storage and Transport

4.1 Dimensions and Weight

Height:	236 mm
Height with opened lid:	404 mm
Width:	273 mm
Depth:	515 mm
Weight:	19 kg

Fig. 4.1: Dimensions and weight

4.2 Storage Conditions

The centrifuge can be stored for up to a year without any problems.

- Store the centrifuge only in dry rooms.
- The storage temperature must be above -20°C .
- If you would like to store it for more than one year, or if you intend to ship it overseas, please contact the manufacturer.

4.3 Notes on Transport

- The centrifuge is not equipped with a transport safety device.
- When lifting the centrifuge, always reach under the centrifuge from the side.



Caution

The centrifuge weighs approx. 19 kg!

- For transport use a suitable packaging, and if at all possible, the original packaging (see 5.1 accordingly).

5 Set-up and Connection

5.1 Unpacking the Centrifuge

The centrifuge is packaged in a cardboard box.

- Open the box.
- Take out the accessories.
- Remove the upper foam cushion.
- Lift the centrifuge with both foam cushions out of the cardboard box. When lifting the centrifuge, always reach under the centrifuge from the side.



Caution

The centrifuge weighs approx. 19 kg!

- Retain the packaging for any possible future transport of the centrifuge.

5.2 Transport Safety Device

The centrifuge is not equipped with a transport safety device.

5.3 Installation Site

Operate the centrifuge only in closed and dry rooms.

All the energy supplied to the centrifuge is converted into heat and emitted to ambient air.

- Ensure sufficient ventilation.
- Keep a safety distance of at least 30 cm around the centrifuge so that the vents in the centrifuge remain fully effective.
- Do not position the centrifuge near heat generators.
- Avoid direct sunlight (UV radiation).
- The table must be stable and have a solid, even surface.
- Attention: During transport from cold to warmer places, condensational water will collect inside the centrifuge. It is important to allow sufficient time for drying (min. 24 h) before the centrifuge can be used again.

5.4 Power Supply

5.4.1 Connection



The operating voltage on the name plate must correspond to the local supply voltage!

- This **SIGMA** laboratory centrifuge is a unit of safety class I and has a three-wire power cord with a IEC C13 connector.

5.4.2 Fuses on site

Typically, the centrifuges must be protected on-site with 16 Amp L or B fuses.

6 Using the Centrifuge

6.1 Initial Start-Up



Before the initial start-up, please ensure that your centrifuge is properly set up and installed (see chapter 5 "Set-up and Connection").

6.2 Switching the Centrifuge ON

- Press the mains power switch (see Fig. 2.2, page 11).

The centrifuge display then illuminates. The centrifuge is ready for operation.

6.2.1 Opening and Closing the Lid

The lid can be opened if the centrifuge is at a standstill.

- Press the lid key in order to open the lid.

The centrifuge cannot be started if the lid is opened.

- To close, press with both hands slightly on the lid until the lid lock is locked.



- Do not hold your fingers between the lid and the housing when closing the lid. Risk of crushing!

6.2.2 Installation of Rotors and Accessories

6.2.2.1 Installation of the Rotor

- 1 Safety lock
- 2 Rotor lid
- 3 Rotor fastening nut
- 4 Motor shaft
- 5 Angle rotor

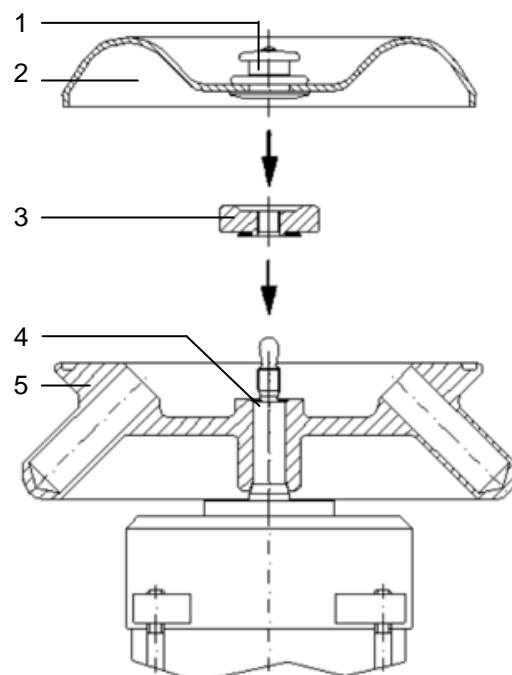


Fig. 6.1:
 Installation of rotor and
 rotor lid

- Open the centrifuge lid by pressing the lid key.
- Unscrew the rotor fastening nut from the motor shaft (counter-clockwise).
- Lower the rotor with its central bore straight down onto the motor shaft.
- Hand-tighten the rotor fastening nut clockwise (corresponds to 1 Nm). The rotor fastening nut and conical spring washer must face the rotor (i.e. the writing must be shown on top).



After frequent use, the rotor tie-down screw must be loosened by some turns, the rotor has to be lifted and fastened again. This must be done once a day or after 20 cycles. This ensures a proper connection between the rotor and the motor shaft.

- Rotors can be used without a cover. This leads, however, to higher levels of noise and temperatures when running.
- Follow the safety instructions and hazard warnings in chapter 3!

6.2.2.2 Installation of the Microhematocrite Rotor

- Unscrew the rotor fastening nut from the motor shaft (anti-clockwise).
- Lower the microhematocrite rotor with its central bore straight down onto the motor shaft.
- Hand-tighten the rotor fastening nut clockwise (corresponds to 1 Nm). The rotor fastening nut and conical spring washer must face the microhematocrite rotor (i.e. the writing must be shown on top).

Operation

- Fill the capillary tubes with blood and seal them at one end with putty or by fusion.
- Place the capillary tubes into the recesses of the rotor with the sealed end against the rubber ring. Ensure that the capillary tubes fit tightly against the rubber ring. The opposite places must be loaded.
- Put the rotor cover on and lock it.
- Close the centrifuge lid.
- Enter the following parameters: speed 13,000 rpm, gravitational field RCF max. 11,903 x g, time approx. 5 min.
- Start the centrifuge.
- Open the centrifuge lid when the rotor has stopped.
- Unlock the rotor cover and lift it off.

Evaluation

- Put the reader onto the rotor.
- Turn the reader and perform a fine adjustment with the aid of the central eccentric mechanism in order to localize the O-point and the maximum liquid point in the capillary tubes. You can now read the percentage value.
- Remove the capillary tubes. Some of the tubes can also be evaluated with the reader outside of the rotor (see the instructions for use on the back of the reader).

6.2.2.3 Installation of Accessories

- Only use inserts that are suitable for the rotor (see 11.1 "Suitable Accessories").
- Always load the opposite inserts/buckets of the rotors with the same accessories and fill to avoid imbalance.

Centrifugation with low capacity: The tubes must be installed symmetrically so that the buckets and their inserts are loaded evenly.

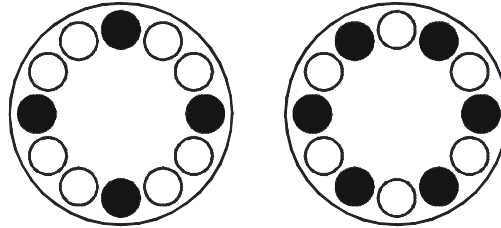


fig. 6.2: Permissible loading of an angle rotor

6.2.2.4 Tubes

- Load the tubes outside of the centrifuge. Liquids in the bores of the rotor cause corrosion .
- Fill the tubes carefully and arrange them according to their weight. Imbalances result in the excessive wear of the bearings.
- Observe the instructions on safety and hazards in chapter 3!

6.3 Operation

6.3.1 Operating Panel

- 1 Centrifuge display
- 2 Set key
- 3 Program key
- 4 Arrow key
- 5 Precool key
- 6 Start/Stop key
- 7 Lid key



Fig. 6.3: Operating Panel

The centrifuge is started directly via the operating panel. When the centrifuge is switched on, all segments will be illuminated for a short time. It is now ready for operation.

6.3.2 Centrifuge Display

The centrifuge display has the following display fields:

- 1 Field for acceleration/ deceleration curves and run mode
- 2 Speed / rcf field
- 3 Time field
- 4 Field for temperature and rotor selection

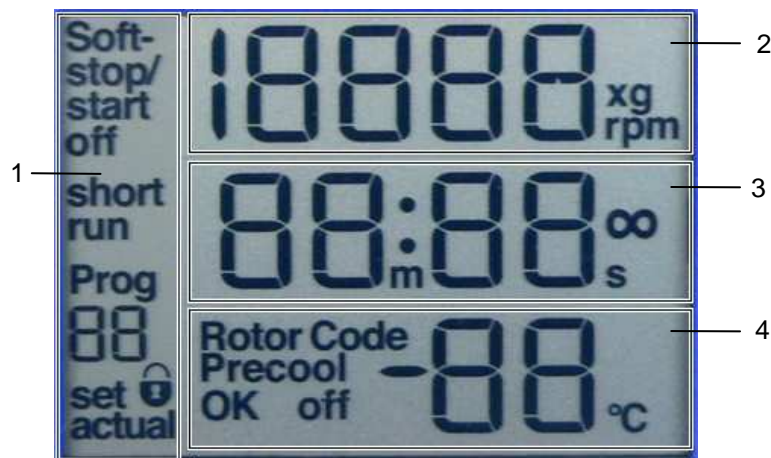


Fig. 6.4: Display, completely active

6.3.3 Starting a Centrifugation Run

The centrifuge is ready for operation when the mains power switch is on and the lid is closed.

- Press the start key in order to start a centrifugation run.

6.3.4 Interrupting a Centrifugation Run

- Press the stop key in order to interrupt a centrifugation run. The centrifugation run will be terminated prematurely.

6.3.5 Interrupting a Deceleration Process

- Press the start key during a deceleration process in order to interrupt it and to restart the centrifuge.

6.3.6 Speed / Relative Centrifugal Force (RCF)

The RCF value is determined by the rotor geometry and speed. The RCF and speed values, therefore, depend on each other. If one of the two values is entered, the other value will be set automatically.

- To preselect a speed value or a RCF value, press the “set” key repeatedly until the corresponding unit flashes on the display.
- Select the desired speed or RCF value via the arrow keys.
- Confirm the selection by pressing the start key.

The data will also be accepted and saved after approx. 20 seconds if no other key is pressed within this time period.

During operation, you can switch from the speed value to the RCF value and vice versa via the arrow keys.

6.3.6.1 Changing the Speed/RCF Value during Centrifugation

The preselected speed or RCF value can be changed during centrifugation.

- Press the “set” key repeatedly until the desired unit flashes on the display.
- Change the speed or RCF value by pressing the arrow keys. The parameters will take effect immediately.

6.3.7 Runtime

The preselected total runtime is displayed in the lower line of the display. During centrifugation, the remaining runtime is displayed. The runtime of the centrifuge can be set at one-second-intervals up to 99 minutes and 59 seconds.

- To select a runtime, press the “set” key repeatedly until the time unit flashes on the display.
- Select the desired runtime by pressing the arrow keys.
- Confirm the selection by pressing the start key.

The data will also be accepted and saved after approx. 20 seconds if no other key is pressed within this time period.

6.3.7.1 Changing the Runtime during Centrifugation

The preselected runtime can be changed during centrifugation.

- Press the “Set” key repeatedly until the time unit flashes on the display.
- Change the desired runtime by pressing the arrow keys. The parameters will be accepted immediately.



If the centrifugation time is changed during the run, the centrifuge will run for the entire new time and will disregard the previous runtime that has already elapsed.

6.3.7.2 Short Run

During the short run, the centrifuge accelerates at maximum power until the maximum speed is reached.

- Keep the start key pressed during the short run.

The message “short run” and the duration of the short run is displayed. When the start key is released, the centrifuge decelerates at maximum power to a standstill.

After the short run, the lid unlocks automatically and the program that was set beforehand is displayed again.

6.3.7.3 Continuous Run

During the continuous run, the runtime of the centrifuge is unlimited and must be stopped manually. The centrifuge accelerates during the continuous run until the set speed is reached.

- To start the continuous run, press the “set” key until the time unit flashes on the display.
- Press the down-key (arrow key) until the display switches from "00:10" to "--:--".

After 99 min 59 sec, any additional runtime will no longer be displayed, but the centrifugation will continue.

- To stop a continuous run, press the start/stop key. The centrifugation will end.
- Enter a runtime. The centrifugation will end after this time.

6.3.7.4 Temperature

The temperature in the rotor chamber is displayed in the lower third of the centrifuge display. The display alternates between the preselected temperature and the actual temperature. The actual temperature is marked by the word "actual" in front of the temperature value.

Temperatures between -10 °C and + 40 °C can be selected.

- Press the "set" key until the temperature unit flashes on the display.
- Select the desired Temperature by pressing the arrow keys.
- Confirm the selection by pressing the start key.

The data will also be accepted and saved after approx. 20 seconds if no other key is pressed within this time period.

6.3.7.5 Precooling Program "Precool"

Depending on the substances to be centrifuged, it may make sense to precool the centrifuge. The precooling prevents the cooled samples in the uncooled centrifuge from heating up to an inadmissible temperature.

Precooling at a standstill may distort the measurement results and subsequently cause increased wear of the mechanical components. This is why the centrifuge has a special program that precools the centrifuge under defined conditions:

- Press the "precool" key to load the precooling program. The display shows 1/3 of the maximum rotor speed and the corresponding RCF value, the runtime field indicates "∞" (continuous run). If the set temperature is above the actual temperature, it is limited to the actual temperature.



Once the precooling program is loaded, the set temperature can only be set to values below the actual temperature. If the limits of the setting range are reached during the setting process, the temperature display flashes for approximately 1 second.

- Press the start key to start the precooling program.

Once the set value is reached and remains stable for one minute, the program ends with the indication "Precool OK".

- Press the "precool" key to terminate the precooling program prematurely. In this case, the indication "Precool off" flashes on the display.

If the precooling program is selected and then deselected without actually being started, the set temperature will be reset to the old value. If, however, the precooling run is started, the limited set temperature will also be used for the following runs, but it will not be saved in the program.

6.3.7.6 Softstart and Softstop Function

The softstart function is used to extend the acceleration time, whereas the softstop function is used to extend the deceleration time. The current combination is shown on the display.

- To activate the softstart and softstop functions, press the "set" key repeatedly until "Soft-stop/start" flashes in the upper left part of the display.
- Press the arrow keys until "Soft-stop/start on" is displayed. The softstart and softstop functions are now activated.
- Press the "set" key until "Soft stop on" is displayed. Only the softstop function will be active and the centrifuge will start at normal speed.
- Press the "set" key until "Soft off" is displayed. The softstart and softstop functions are now deactivated.

The data will be accepted immediately and saved after approx. 20 seconds.

You can also change the settings as described above during a centrifugation run.

6.3.8 Rotor Selection

In the delivery status of the centrifuge, the rotor 12084 is preselected. If another rotor is installed the configuration must be changed, so that the allowed maximum speed of the rotor can be reached.

- To select another rotor, press the "set" key and hold it.
- Press the up-key three times and then release the "set" key.
- Choose the number of the installed rotor out of the following list, by pressing the arrow keys:

Code	1	2	3	4	5
Rotor	11026	11028	12082	12083	12084
Code	6	7	8	9	10
Rotor	12085	12092	12093	12094	12096

- Press the "set" key to confirm the input.

The rcf value will be adjusted automatically to the selected rotor.



The rotor selection will be saved under the corresponding program number.

6.3.9 Programs

The program is used to save or load certain recurrent settings of the centrifuge. 10 different programs can be saved and called up. The precooling program "precool" does not occupy any storage location and cannot be deleted. It is used to cool the centrifuge without vessels (see 6.3.7.5).

6.3.9.1 Saving the current settings

- Press the program key. Then, select a program number by pressing the arrow keys. The display "Prog - - " will now flash.
- Select the correct rotor.
- Press the "set" key repeatedly until the corresponding unit flashes on the display. Select the desired parameters.
- In order to save the data, start the centrifuge or press the "set" key repeatedly until the indication "Prog - -" stops flashing.



Program numbers that are already occupied will be overwritten with the current data.

6.3.9.2 Calling up stored programs

- Press the program key. Then, select a program number by pressing the arrow keys. The display "Prog - - " will now flash.
- Ensure that the correct rotor is selected.
- In order to save the data, start the centrifuge or press the "set" key repeatedly until the indication "Prog - -" stops flashing.

6.4 Switching the Centrifuge OFF

- Open the centrifuge when it is not in use so moisture can evaporate. This prevents the increased wear of the motor bearings.
- Press the mains power switch.

7 Malfunctions and Error Correction

7.1 General Malfunctions

Malfunctions are indicated by error messages with a number in the speed display.

In the event of a fatal error (e.g. a defective lid lock), a certain safety time will be counted down on the display. During this time, "ERR" and "SAFE" flash alternately on the display. When the time is up, "OFF" will be displayed.



Do not switch the centrifuge off until "OFF" is displayed.

This is necessary in order to ensure that the rotor is at a complete standstill.

- Eliminate the source of the problem (see tables in fig. 7.1 and 7.3).
- Acknowledge the error messages with the lid key.

Type of error	Possible reason	Correction
No indication on the display	No power in the mains supply	Check fuse in the mains supply
	Power cord is not plugged in	Plug in power cord correctly
	Mains power switch off	Switch mains power switch on
	Lid is not closed correctly	Close lid.
Centrifuge cannot be started: The set speed value is displayed in an unchanged manner	Several	Power off/on. If the error occurs again, contact service
	The lid lock is not closed correctly	Open and close lid. If the error occurs again, contact service
Centrifuge decelerates during operation and displays an error from 1 to 18 after powering on	Several	Power off/on. If the error occurs again, contact service
Centrifuge decelerates during operation and displays error 19 after powering on	Several	Quit by pressing the lid key
Temperature value cannot be reached	Condenserirty	Contact service

Fig. 7.1: Possible error causes

7.1.1 Emergency Lid Release

In the event of a power failure, it is possible to manually open the centrifuge lid with a socket wrench (part no. 930 014, included in the scope of supply). The opening is located in the bottom plate in the front quarter on the left-hand side.

- Switch the centrifuge off by actuating the mains power switch and unplugging the mains power plug.
- Pull the centrifuge a bit over the edge of the table and jack it up (e.g. on wooden logs). Ensure that the centre of gravity of the centrifuge is still located above the tabletop. If necessary, the unit must be secured by a second person.
- Insert the wrench for the emergency release into the hole (see fig. 7.2, item 1) and attach it to the shaft of the lid lock motor.
- Turn the shaft carefully clockwise with the aid of the wrench until the lid opens.
- Remove the wrench and set the centrifuge upright again.



Fig. 7.2: Opening for the emergency lid release at the bottom of the centrifuge



Do not release the lid unless the rotor is at a standstill and there is no danger to other persons.

If the lid is opened via the emergency lid release during a centrifuge run, the centrifuge will be switched off immediately and decelerate without a brake.

As a general rule, the lock can be opened more easily with the emergency lid release system if the load on it is relieved by exerting slight pressure on the lid.

7.2 Error Codes

Error no.	Kind of error	Measure	Note
1-9	System error	<ul style="list-style-type: none"> allow to slow down power off/on 	All these errors stop the centrifuge or cause it to decelerate brakeless
10-19	Speedometer error	<ul style="list-style-type: none"> allow to slow down power off/on 	
20-29	Motor error	<ul style="list-style-type: none"> power off/on ensure ventilation 	
30-39	EEPROM error	<ul style="list-style-type: none"> allow to slow down power off/on 	With error 34, 35, 36, the centrifuge will stop; with error 37, 38 error message only
40-45	Temperature error (only for refrigerated centrifuges)	<ul style="list-style-type: none"> allow to slow down power off/on allow to cool down provide better ventilation 	
46-49	Imbalance error	<ul style="list-style-type: none"> allow to slow down power off eliminate the imbalance 	
50-59	Lid error	<ul style="list-style-type: none"> press lid key close lid remove foreign matter from the opening of the lid lock device 	With error 50 and 51, the centrifuge will stop
60-69	Process error	<ul style="list-style-type: none"> allow to slow down power off/on 	With error 60 message "power failure during run", with error 61, message "stop after power on"
70-79	Communication error	<ul style="list-style-type: none"> allow to slow down power off/on 	
80-89	Parameter error	<ul style="list-style-type: none"> allow to slow down power off/on provide for better ventilation 	With error 83, error message only
90-99	Other errors	<ul style="list-style-type: none"> check connections 	

Fig. 7.4: Error codes from software version 009



If it is impossible to eliminate the errors, contact the service!

7.3 Service Contact

In the event of queries, malfunctions, or spare part enquiries:

from Germany:

- use the service request form at www.sigma-zentrifugen.de → [Service Area]
- or contact

SIGMA Laborzentrifugen GmbH
An der Unteren Söse 50
37520 Osterode (Germany)
Tel. +49 (0) 55 22 / 50 07-84 25
Fax +49 (0) 55 22 / 50 07-94 25
E-mail: service@sigma-zentrifugen.de

outside Germany:

contact our agency in your country. All agencies are listed at www.sigma-zentrifugen.de → [Contacts] → [Foreign agencies]



- If you would like to utilise our service, please state the type of your centrifuge and its serial number.
- Make use of our service request on the Internet. Please use the request form (see above) on our website.

8 Maintenance and Service

The centrifuge, rotor, and accessories are subject to high mechanical stress. Thorough maintenance performed by the user extends the service life and prevents premature failure.



Caution

If corrosion or other damage occurs due to improper care, the manufacturer cannot be held liable or subject to any warranty claims.

- Use soap water or other water-soluble, mild cleaning agents with a pH value between 6 and 8 for cleaning the centrifuge and the accessories.
- Avoid corrosive and aggressive substances.
- Do not use solvents.
- Do not use agents with abrasive particles.
- Do not expose the centrifuge and rotors to intensive UV radiation or thermal stress (e.g. by heat generators).

8.1 Maintenance

8.1.1 Centrifuge

- Disconnect the power cord from the wall outlet or instrument receptacle before cleaning.
- Carefully remove all liquids, including water and particularly all the solvents, acids, and alkaline solutions from the rotor chamber using a cloth in order to avoid damage to the motor bearings.
- If the centrifuge has been contaminated with toxic, radioactive, or pathogenic substances, clean the rotor chamber immediately with a suitable decontamination agent (depending on the type of contamination).



Warning

Take suitable precautions for your own safety if there is a risk of toxic, radioactive, or pathogenic contamination.

- Grease the motor shaft slightly after cleaning (Grease for load-bearing bolts part no. 70284).

8.1.2 Accessories



Caution

For the care of the accessories, special safety measures must be considered as these are measures that will ensure operational safety at the same time.

- Immediately rinse off the rotor, buckets, or accessories under running water if they have come into contact with any liquids that may cause corrosion. Use a brush for test tubes to clean the bores of angle rotors. Turn the rotor upside down and allow it to dry completely.
- Clean the accessories outside the centrifuge once a week or preferably after each use. Rubber cushions should be removed, cleaned and dried.
- If the rotors or accessories have been contaminated with toxic, radioactive, or pathogenic substances, clean them immediately with a suitable decontamination agent (depending on the type of contamination). Take suitable precautions for your own safety if there is a risk of toxic, radioactive, or pathogenic contamination.
- Dry the accessories with a soft cloth or in a drying chamber at approx. 50°C.

8.1.2.1 Plastic Accessories

The chemical resistance of plastic decreases with rising temperatures (e.g. during drying, see Resistance Data in chapter 11 "Appendix").

- If solvents, acids, or alkaline solutions have been used, clean the plastic accessories thoroughly.

8.1.2.2 Aluminium Accessories

Especially aluminum parts are susceptible to corrosion.

- Acid-containing cleaning agents and alkaline cleaning agents must be avoided.
- Grease aluminum parts at least once a week with slushing oil for protection against corrosion (part no. 70104).

This essentially increases their service life and reduces susceptibility to corrosion.

8.1.3 Rotors

Rotors are produced with highest precision, in order to withstand the permanent high stress with high gravitational fields.

Chemical reactions as well as stress-corrosion (combination of oscillating pressure and chemical reaction) can affect or destroy the metals. Barely detectable cracks on the surface can expand and weaken the material without any visible signs.

Check the material regularly (at least once a month) for

- cracks
 - visible damage of the surface
 - pressure marks
 - signs of corrosion
 - other changes.
- Check the bores of the rotors.
 - Replace any damaged components immediately for your own safety.
 - Grease rotor, lid seal and adapters at least once a week with slushing oil (part no. 70104).

8.1.4 Microhematocrite Rotor

- Remove the microhematocrite rotor for cleaning.
- Wipe the centrifuge chamber clean.
- Replace the rubber ring in the event of wear or glass breakage (part no. 16002 for rotor 11026).

8.2 Sterilization and Disinfection of the Rotor Chamber and Accessories

- Use commercially-available disinfectants such as, for example, Sagrotan[®], Buraton[®], or Terralin[®] (available at chemist's shops or drugstores).
- The centrifuges and the accessories consist of various materials. A possible incompatibility must be considered.
- Before using cleaning or decontamination agents that were not recommended by us, contact the manufacturer to ensure that such a procedure will not damage the centrifuge.
- For autoclaving, consider the continuous heat resistance of the individual materials (see 8.2.1 "Autoclaving").

Please contact us if you have any queries. (see 7.3 "Service Contact").



If dangerous materials (e.g. infectious and pathogenic substances) are used, the centrifuge and accessories must be disinfected.

8.2.1. Autoclaving

The service life of the accessories essentially depends on the frequency of autoclaving and use.

- Replace the accessories immediately when the parts show changes in color or structure or in the occurrence of leaks etc.
- During autoclaving, the caps of the tubes must not be screwed on in order to avoid the deformation of the tubes.

It cannot be excluded that plastic parts, e.g. lids or carriers, may deform during autoclaving.

Accessories	max. temp. (°C)	min. time	max. time	max. cycles
Glass tubes	134-138	3	40	-
Polycarbonate tubes	115-118	30	40	20
Polypropylene copolymer tubes	115-121	30	40	30
Teflon tubes	134-138	3	5	100
Aluminium rotors	134-138	3	20	-
Polycarbonate/Polyallomer lids for angle rotors	115-118	30	40	20
Polysulfone lids for angle rotors	134-138	3	5	100
Aluminium buckets	134-138	3	20	-
Polysulfone caps for buckets	134-138	3	5	100
Rubber adapter	115-118	30	40	-
Round carriers made of polypropylene	115-118	30	40	-
ditto, made of polyallomer and polycarbonate	115-118	30	40	-
Rectangular carriers made of polypropylene	115-118	30	40	-
ditto, made of polyallomer and polycarbonate	115-118	30	40	-

Fig. 8.1: Autoclaving table

8.3 Service



In the event of service work that requires the removal of the panels, there is a risk of electric shock or mechanical injury. Only qualified specialist personnel is authorised to perform this service work.

The centrifuge is subject to high mechanical stress. In order to be able to withstand this high level of stress, high-quality components were used during the production of the centrifuge. Nevertheless, wear cannot be excluded and it may not be visible from the outside. Especially the rubber parts that are – among other things – part of the motor suspension, are subject to ageing.

This is why we recommend having the centrifuge checked by the manufacturer during an inspection once per year in the operating state and once every three years in the dismantled state. Rubber parts should be replaced after three years or a maximum of 15,000 cycles.

Information and appointments:

in Germany:

- use the service request form at www.sigma-zentrifugen.de → [Service Area]
- or contact

SIGMA Laborzentrifugen GmbH
 An der Unteren Söse 50
 37520 Osterode (Germany)
 Tel. +49 (0) 55 22 / 50 07-84 25
 Fax +49 (0) 55 22 / 50 07-94 25
 E-mail: service@sigma-zentrifugen.de

outside Germany:

contact our agency in your country. All agencies are listed at www.sigma-zentrifugen.de → [Contacts] → [Foreign agencies]



- If you would like to utilise our service, please state the type of your centrifuge and its serial number.
- Make use of our service request on the Internet. Please use the request form (see above) on our website.

8.4 Return of defective parts

Although we exercise great care during the production of our products, it may be necessary to return a unit or accessory to the manufacturer.

In order to ensure the quick and economical processing of returns of centrifuges, spare parts, or accessories, we require complete and extensive information concerning the process. Please fill in the following forms completely, sign them, and enclose them with the return package:

1. Declaration of decontamination

As a certified company and due to the legal regulations for the protection of our employees and of the environment, we are obliged to certify the harmlessness of all incoming goods. For this purpose, we require a declaration of decontamination.

- The form must be filled in completely and signed by authorised and specialised personnel only.
- Affix the original form in a clearly visible manner to the outside of the packaging.



If no such declaration is enclosed in the return package, we will perform the decontamination at your expense!

2. Form for the return of defective parts

This form is for the product-related data. They facilitate the assignment, and they enable the quick processing of the return. If several parts are returned together in one packaging, please enclose a separate problem description for every defective part.

- A detailed problem description is necessary in order to perform the repair quickly and economically.
- Please note on the form if you would like to receive a cost estimate. Cost estimates are only prepared upon request and against charge. If an order is placed, these charges will be offset.



The unit must be packaged in a transport-safe manner. Please use the original packaging, if at all possible.

If the product is dispatched to us in unsuitable packaging, you will be charged the cost for returning it to you in new packaging.

The forms can be downloaded online from www.sigma-zentrifugen.de → [Service Area].

9 Disposal

9.1 Disposal of the Centrifuge



In accordance with the directive 2002/96/EC, SIGMA centrifuges are marked with the symbol shown to the left. This symbol means that it is not permissible to dispose of the unit among household trash.

- You can return these centrifuges free of cost to SIGMA Laborzentrifugen GmbH.
- Ensure that the unit is decontaminated. Fill in a declaration of decontamination.
- Comply with any other applicable local rules and regulations.

9.2 Disposal of the Packaging

- Use the packaging to return the centrifuge for disposal or
- Dispose of the packaging, after having separated the individual materials.
- Comply with all local rules and regulations.

10 Technical Data

Manufacturer:	S I G M A Laborzentrifugen GmbH An der Unteren Söse 50 37520 Osterode (Germany)
Type:	1-14K
Electr. Connection: Protection class: IP Code:	see name plate I 20
Connected load (kVA): Power consumption (kW): Max. current consumption (A):	0.32 0.23 1.5 (at 220-240 V / 50-60 Hz))
<u>Performance data</u> Max. speed (rpm): Max. capacity (ml): Max. gravitational field (x g): Max. kin. energy (Nm):	15 000 48 16 602 1 768
<u>Other parameters</u> Time range: Temperature range:	10 sec - 99 min 59 sec, short run, continuous run -10°C to +40°C
<u>Physical data</u> Height (mm): Height with opened lid (mm) : Width (mm): Depth (mm): Weight (kg): EMC as per EN 61326: Noise level (dBA):	236 404 273 515 19.0 Class B 59 (at max. speed)

Fig. 10.1: Technical Data

10.1 Ambient Conditions

- The figures are valid for an ambient temperature of $+23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and a nominal voltage $\pm 10\%$ *. The minimum temperature is $< +4^{\circ}\text{C}$ and depends on the rotor type, speed, and ambient temperature.
- Allowable ambient temperature $+5^{\circ}\text{C}$ to $+35^{\circ}\text{C}$.
- Max. relative humidity of air 80% up to 31°C with a linear decrease to 67% relative humidity of air at 35°C .

* At a nominal voltage of 100V or 200V, a tolerance of $+10\%$ / -5% applies

11 Appendix

11.1 Suitable Accessories

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
12082	Angle rotor 12 x 1.5/2.0 ml, for reaction vials, e.g. no. 15008, 15040, incl. polysulfone lid no. 17882, radius max. 6.2 cm, radius min. 2.9 cm, angle 45°	15 000	15 596
12092	Angle rotor made of polypropylene, 12 x 1.5/2.0 ml, for reaction vials e.g. no. 15008, 15040, incl. polysulfone lid no. 17882, radius max. 6.2 cm, radius min. 2.9 cm, angle 45°	15 000	15 596
12084	Angle rotor 24 x 1.5/2.0 ml, for reaction vials, e.g. no. 15008, 15040, incl. polysulfone lid no. 17882, radius max. 6.6 cm, radius min. 3.8 and 3.0 cm, angle 42/48°	15 000	16 602
12094	Angle rotor made of polypropylene, 24 x 1.5/2.0 ml, for reaction vials e.g. no. 15008, 15040, incl. polysulfone lid no. 17882, angle 42/48° radius max. 6.6 cm, radius min. 3.8 and 3.0 cm	15 000	16 602
12083	Angle rotor 18 x 1.5/2.0 ml, for reaction vials, e.g. no. 15008, 15040 or 18 x 0.25/0.4 ml, e.g. no. 15014, 2 lines, incl. polysulfone lid no. 17882, angle 32/57° radii max. radii min. 6.4 cm 3.2 and 2.5 cm 5.9 cm 3.6 and 2.5 cm	15 000	16 099 14 841
12093	Angle rotor made of polypropylene, 18 x 1.5/2.0 ml, for reaction vials e.g. no. 15008, 15040 or 18 x 0,25/0,4 ml, e.g. no. 15014, 2 lines, incl. polysulfone lid no. 17882, angle 42/48° radii max. radii min. 6.4 cm 3.2 and 2.5 cm 5.9 cm 3.6 and 2.5 cm	15 000	16 099 14 841
12096	Angle rotor made of polypropylene, for 2 PCR-strips with 8 tubes 0.2 ml e.g no. 15042, incl. polysulfone lid no. 17882, angle 45° radius max. 4.8 cm, radius min. 2.1 cm	15 000	12 074
17882	Polysulfone lid for angle rotors		

Adapters and plastic tubes

Part no.	Description
13021	Adapter for PCR-tube 0.2 ml, e.g no. 15042, 1 set = 2 pcs.
13000	Adapter for reaction vials 0.25/0.4 ml no. 15014, 1 set = 2 pcs.
13002	Adapter for reaction vials 0.5/0.75 ml, Ø 7.9/10 x 28/31 mm, e.g. no. 15005, 1 set = 2 pcs.
15042	Reaction vials 0.2 ml, 100 pcs. per pack, suitable for 13021
15014	Reaction vials made of polypropylene 0.4 ml, 100 pcs. per pack, passend in 12083, 12093, 13000
15005	Reaction vials 0.5 ml, 100 pcs. per pack
15008	Reaction vials 1.5 ml, 100 pcs. per pack
15040	Reaction vials 2.0 ml, 100 pcs. per pack

Accessories for microhematocrite capillary tubes

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
11026	Microhematocritrotor incl. lid, suitable for 24 capillary tubes, Ø 1.3 x 50 mm, 19 µl no. 15028, incl. reader no. 17028, usable with reader no. 17026	13 000	11 903
16002	Rubber ring for microhematocritrotor		
15028	Microhematocrite capillary tubes, heparinized, 19 µl, Ø 1.3 x 50 mm, 200 pcs. per pack		
17005	Capillary tube sealing putty (10 plates)		
17026	Reader for use with microhematocritrotor		
17028	Card reader for 1 capillary tube		
17004	Magnifying glass		

Further accessories available upon request.

11.2 Grafical Representation of the Rotors

The graphical representation of the rotors shows the maximum and minimum radii of the accessories used. If necessary, the values must be manually calculated (see 11.3.1 "RCF").

Fig 11.1:
Minimum and maximum radius of an angle
rotor

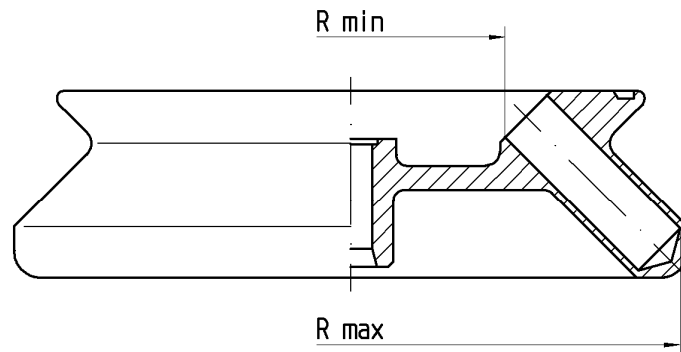
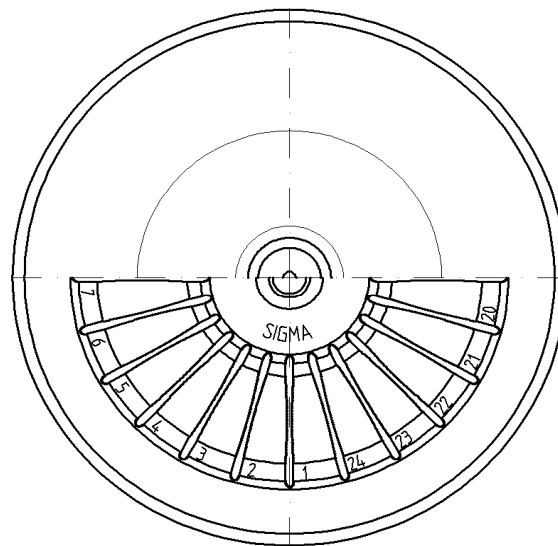


Abb 11.2:
Representation of a microhematocrite rotor



11.3 Formulae - Mathematical Relations

11.3.1 Relative Centrifugal Force (RCF)

The parameters speed, RCF, and the rotor and radius cannot be specified independently. They are interrelated via the following formula:

$$\text{RCF} = 11.18 \times 10^{-6} \times r \times n^2$$

If two values are given, the third value is determined by the equation. If then the speed or the rotation radius is changed, the resulting RCF will be recalculated. If the RCF is altered, the speed will be adapted accordingly under the consideration of the radius.

r = radius in cm

n = speed in rpm

RCF without dimension

11.3.2 Density

If the density of the liquid is higher than 1.2 g/cm³, the maximum permissible speed of the centrifuge is calculated according to the following formula:

$$n = n_{\text{max}} \times \sqrt{(1.2 / \text{Rho})}$$

Rho = density in g/cm³

11.3.3 Speed-Gravitational-Field-Diagram

Additional help can be found in the enclosed speed-gravitational-field-diagram (see fig. 11.3, next page).

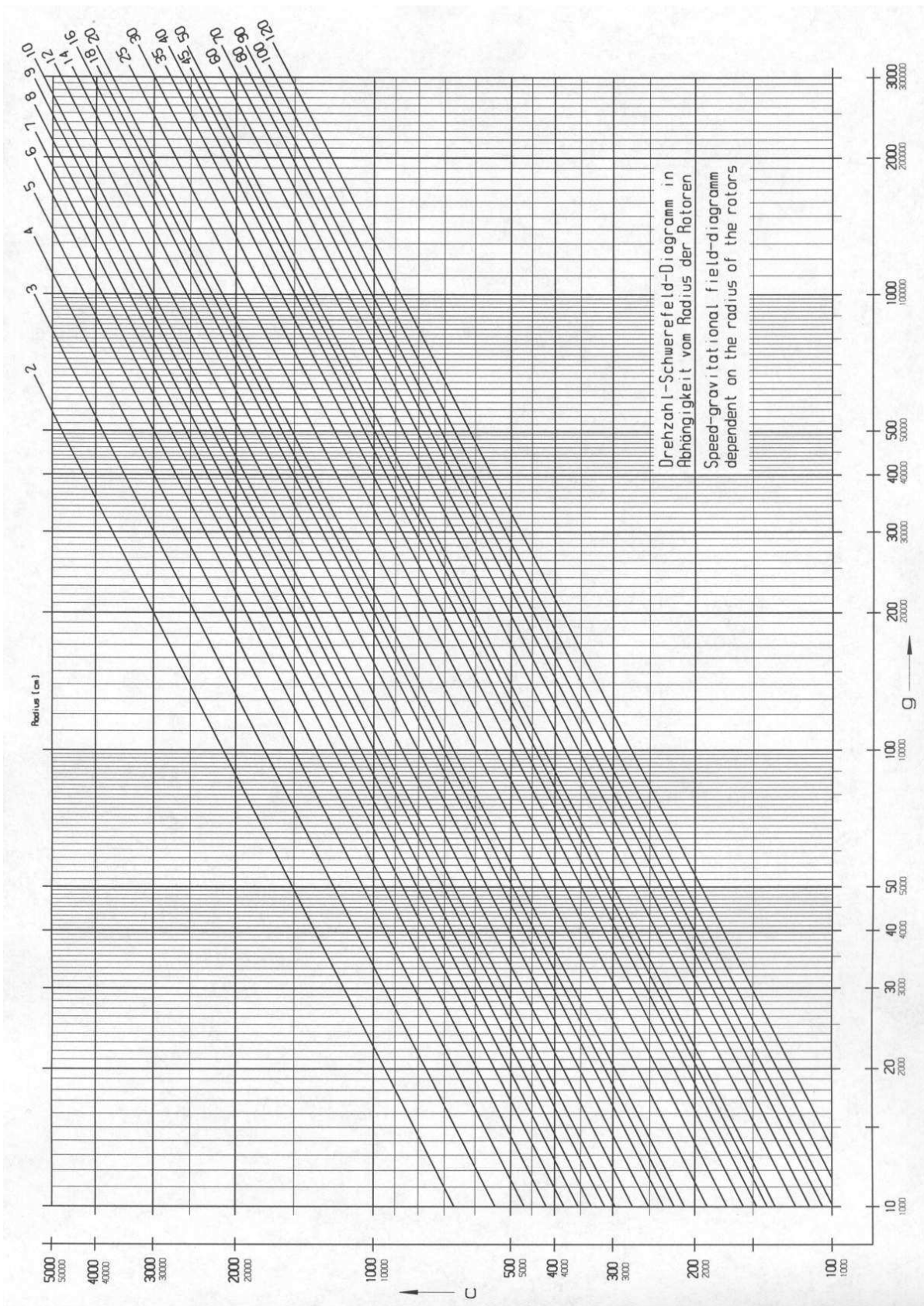


Fig. 11.3: Speed-Gravitational-Field Diagram

Table of rotors and accessories with a different service life



Rotors and accessories with a different service life

If other no data concerning the service life are engraved on the rotor or accessory, rotors and buckets must be checked by the manufacturer after 10,000 cycles. After 50,000 cycles, rotors must be scrapped for safety reasons.

Rotor / bucket	Cycles	Service life ("Exp.Date")	Autoclaving	Suitable for centrifuge	Remarks
11026		7 years		1-14, 1-14K	
12082		7 years		1-14, 1-14K	
12083		7 years		1-14, 1-14K	
12084		7 years		1-14, 1-14K	
12085		7 years		1-14, 1-14K	
12092		5 years	20x	1-14, 1-14K	
12093		5 years	20x	1-14, 1-14K	
12094		5 years	20x	1-14, 1-14K	
12096		5 years	20x	1-14, 1-14K	
12101		5 years	20x	1-15, 1-15K, 1-15P, 1-15PK	
12124		5 years	20x	1-15, 1-15K, 1-15P, 1-15PK	
12126		5 years	20x	1-15, 1-15K, 1-15P, 1-15PK	
9100	15,000			4-15C, 4K15C, 4-16, 4-16K, 6-15, 6K15, 6-16, 6-16K	without engraving, only "spincontrol professional"
12500		7 years		6-15, 6K15, 6-16, 6-16K	
13845	20,000			8K	
13850	10,000			8K	
13860	35,000			8K	
13864	1,000			8K	without engraving
13865	1,000			8K	without engraving
13866	1,000			8K	without engraving

Resistance Data

Resistant at +20 °C

		Concentration	High Density Polyethylene	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, weak	Polytetrafluorethylene	Aluminum
Medium	Formula	[%]	HDPE	PA	PC	POM	PP	PSU	PVC	PVC	PTFE	AL
- no data												
1 resistant												
2 practically resistant												
3 partially resistant												
4 not resistant												
Acetaldehyde	C ₂ H ₄ O	40	3	2	4	2	3	4	4	-	1	1
Acetamide	C ₂ H ₅ NO	saturated	1	1	4	1	1	4	4	-	1	1
Acetone	C ₃ H ₆ O	100	1	1	4	1	1	4	4	-	1	1
Acrylonitrile	C ₃ H ₃ N	100	1	1	4	3	3	4	4	4	1	1
Allyl alcohol	C ₃ H ₆ O	96	1	3	3	2	2	2	2	4	1	1
Aluminum chloride	AlCl ₃	saturated	1	3	2	4	1	-	1	-	1	4
Aluminum sulfate	Al ₂ (SO ₄) ₃	10	1	1	1	3	1	1	1	1	1	1
Ammonium chloride	(NH ₄)Cl	aqueous	1	1	1	2	1	1	1	1	1	3
Ammonium hydroxide	NH ₃ + H ₂ O	30	1	3	4	1	1	2	1	-	1	1
Aniline	C ₆ H ₇ N	100	1	3	4	1	2	4	4	4	1	1
Anisole	C ₇ H ₈ O	100	3	4	4	1	4	4	2	-	1	1
Antimony trichloride	SbCl ₃	90	1	4	1	4	1	-	1	-	1	4
Benzaldehyde	C ₇ H ₆ O	100	1	3	4	1	1	3	4	4	1	1
Benzene	C ₆ H ₆	100	3	2	4	1	3	4	4	-	1	1
Boric acid	H ₃ BO ₃	aqueous	1	3	1	2	1	-	-	-	1	1
Butyl acrylate	C ₇ H ₁₂ O ₂	100	1	2	4	2	3	4	4	4	1	1
Butyl alcohol, normal	C ₄ H ₁₀ O	100	1	1	2	1	1	2	2	4	1	1
Calcium chloride	CaCl ₂	alcoholic	1	4	2	3	1	-	-	4	1	3
Carbon disulfide	CS ₂	100	4	3	4	2	4	4	4	4	1	1
Carbon tetrachloride (TETRA)	CCl ₄	100	4	4	4	2	4	4	4	4	1	1
Chlorine	Cl ₂	100	4	4	4	4	4	4	4	4	1	3
Chlorine water	Cl ₂ x H ₂ O		3	4	4	4	3	-	3	3	1	4
Chlorobenzene	C ₆ H ₅ Cl	100	3	4	4	1	3	4	4	4	1	1
Chloroform	CHCl ₃	100	3	3	4	4	3	4	4	4	1	3
Chromic acid	CrO ₃	10	1	4	2	4	1	4	1	-	1	1
Chromic potassium sulfate	KCr(SO ₄) ₂ x 12H ₂ O	saturated	1	2	1	3	1	-	1	-	1	3
Citric acid	C ₆ H ₈ O ₇	10	1	1	1	2	1	1	1	1	1	1
Citric acid	C ₆ H ₈ O ₇	50	1	3	1	2	1	-	-	-	1	1
Copper sulfate	CuSO ₄ x 5H ₂ O	10	1	1	1	1	1	1	1	1	1	4
Cyclohexanol	C ₆ H ₁₂ O	100	1	1	3	1	1	1	1	4	1	1
Decane	C ₁₀ H ₂₂	100	-	1	2	1	3	-	-	-	1	1
Diaminoethane	C ₂ H ₈ N ₂	100	1	1	3	1	1	-	3	4	1	1
Diesel fuel	—	100	1	1	3	1	1	-	1	3	1	1
Dimethyl formamide (DMF)	C ₃ D ₇ NO	100	1	1	4	1	1	4	3	-	1	1
Dimethyl sulfoxide (DMSO)	C ₂ H ₆ SO	100	1	2	4	1	1	4	4	-	1	1
Dimethylaniline	C ₈ H ₁₁ N	100	-	3	4	2	4	-	-	-	1	1

Resistant at +20 °C

		Concentration	High Density	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chlorid, weak	Polytetrafluorethylene	Aluminum
			Polyethylene	PA	PC	POM	PP	PSU	PVC	PVC	PTFE	AL
Medium	Formula	[%]	HDPE	PA	PC	POM	PP	PSU	PVC	PVC	PTFE	AL
- no data 1 resistant 2 practically resistant 3 partially resistant 4 not resistant												
Dioxane	C ₄ H ₈ O ₂	100	2	1	4	1	3	2	3	4	1	1
Dipropylene glycol (mono)methyl ether	C ₄ H ₁₀ O	100	3	1	4	1	4	4	4	4	1	1
Ethyl acetate	C ₄ H ₈ O ₂	100	1	1	4	1	1	4	4	4	1	1
Ethylene chloride	C ₂ H ₄ Cl ₂	100	3	3	4	1	3	4	4	4	1	1
Ferrous chloride	FeCl ₂	saturated	1	3	1	3	1	1	1	1	1	4
Formaldehyde solution	CH ₂ O	30	1	3	1	1	1	-	-	-	1	1
Formic acid	CH ₂ O ₂	100	1	4	3	4	1	3	3	1	1	1
Furfural	C ₅ H ₄ O ₂	100	1	3	3	2	4	-	-	-	1	1
Gasoline	C ₅ H ₁₂ - C ₁₂ H ₂₆	100	2	1	3	1	3	3	2	-	1	1
Glycerol	C ₃ H ₈ O ₃	100	1	1	3	1	1	1	1	2	1	1
Heptane, normal	C ₇ H ₁₆	100	2	1	1	1	2	1	2	4	1	1
Hexane, n-	C ₆ H ₁₄	100	2	1	2	1	2	1	2	4	1	1
Hydrogen chloride	HCl	5	1	4	1	4	1	1	1	-	1	4
Hydrogen chloride	HCl	concentrated	1	4	4	4	1	1	2	3	1	4
Hydrogen peroxide	H ₂ O ₂	3	1	3	1	1	1	1	1	-	1	3
Hydrogen peroxide	H ₂ O ₂	30	1	4	1	4	1	1	1	-	1	3
Hydrogen sulfide	H ₂ S	10	1	1	1	1	1	1	1	3	1	1
Iodine, tincture of	I ₂		1	4	3	1	1	-	4	4	1	1
Isopropyl alcohol	C ₃ H ₈ O	100	1	1	1	1	1	1	1	4	1	2
Lactic acid	C ₃ H ₆ O ₃	3	1	3	1	2	1	1	2	-	1	1
Magnesium chloride	MgCl ₂	10	1	1	1	1	1	1	1	1	1	1
Mercuric chloride	HgCl ₂	10	1	4	1	3	1	1	1	1	1	4
Mercury	Hg	100	1	1	1	1	1	1	1	3	1	3
Methyl acetate	C ₃ H ₆ O ₂	100	1	1	4	2	1	-	4	4	1	1
Methyl alcohol	CH ₄ O	100	1	2	4	1	1	3	1	3	1	1
Methyl benzene	C ₇ H ₈	100	3	1	4	1	3	4	4	4	1	1
Methyl ethyl ketone (MEK)	C ₄ H ₈ O	100	1	1	4	1	1	4	4	4	1	1
Methylene chloride	CH ₂ Cl ₂	100	4	3	4	3	3	4	4	4	1	1
Mineral oil	—	100	1	1	1	1	1	1	1	-	1	1
Nitric acid	HNO ₃	10	1	4	1	4	1	1	1	-	1	3
Nitric acid	HNO ₃	100	4	4	4	4	4	-	4	-	1	1
Nitrobenzene	C ₆ H ₅ NO ₂	100	3	4	4	3	2	4	4	4	1	1
Oleic acid	C ₁₈ H ₃₄ O ₂	100	1	1	1	2	1	-	1	-	1	1
Oxalic acid	C ₂ H ₂ O ₄ x 2H ₂ O	100	1	3	1	4	1	1	1	1	1	1
Ozone	O ₃	100	3	4	1	4	3	1	1	-	1	2
Petroleum	—	100	1	1	3	1	1	1	1	3	1	1
Phenol	C ₆ H ₆ O	10	1	4	4	4	1	4	1	3	1	1
Phenol	C ₆ H ₆ O	100	2	4	4	4	1	3	4	3	1	1
Phosphoric acid	H ₃ PO ₄	20	1	4	2	4	1	-	-	-	1	4
Phosphorus pentachloride	PCl ₅	100	-	4	4	4	1	-	4	4	1	1

Resistant at +20 °C

		Concentration	High Density Polyethylene	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, weak	Polytetrafluorethylene	Aluminum
Medium	Formula	[%]	HDPE	PA	PC	POM	PP	PSU	PVC	PVC	PTFE	AL
- no data												
1 resistant												
2 practically resistant												
3 partially resistant												
4 not resistant												
Potassium hydrogen carbonate	CHKO ₃	saturated	1	1	2	1	1	-	-	-	1	4
Potassium hydroxide	KOH	30	1	1	4	3	1	1	1	1	1	4
Potassium hydroxide	KOH	50	1	1	4	3	1	1	1	1	1	4
Potassium nitrate	KNO ₃	10	1	1	1	1	1	-	-	-	1	1
Potassium permanganate	KMnO ₄	100	1	4	1	1	1	-	1	-	1	1
Pyridine	C ₅ H ₅ N	100	1	1	4	1	3	4	4	4	1	1
Resorcinol	C ₆ H ₆ O ₂	5	1	4	2	3	1	4	2	-	1	2
Silver nitrate	AgNO ₃	100	1	1	1	1	1	1	1	1	1	4
Sodium bisulfite	NaHSO ₃	10	1	1	2	4	1	-	-	-	1	1
Sodium carbonate	Na ₂ CO ₃	10	1	1	1	1	1	-	-	-	1	3
Sodium chloride	NaCl	30	1	1	1	1	1	1	1	1	1	3
Sodium hydroxide	NaOH	30	1	1	4	1	1	1	1	1	1	4
Sodium hydroxide	NaOH	50	1	1	4	1	1	1	1	-	1	4
Sodium sulfate	Na ₂ SO ₄	10	1	1	1	1	1	1	1	1	1	1
Spirits	C ₂ H ₆ O	96	1	1	1	1	1	1	1	3	1	1
Styrene	C ₈ H ₈	100	4	1	4	1	3	-	4	4	1	1
Sulfuric acid	H ₂ SO ₄	6	1	4	1	4	1	1	1	-	1	3
Sulfuric acid	H ₂ SO ₄	fuming	4	4	4	4	4	4	4	4	1	3
Tallow	—	100	1	1	1	1	1	-	1	1	1	1
Tetrahydrofuran (THF)	C ₄ H ₈ O	100	3	1	4	1	3	4	4	4	1	1
Tetrahydronaphthalene	C ₁₀ H ₁₂	100	3	1	4	1	4	4	4	4	1	1
Thionyl chloride	Cl ₂ SO	100	4	4	4	2	4	4	4	4	1	3
Transformer oil	—	100	1	1	3	3	1	1	1	-	1	1
Trichloroethane	C ₂ H ₃ Cl ₃	100	3	3	4	2	4	4	4	4	1	4
Urea	CH ₄ N ₂ O	10	1	1	1	1	1	-	-	-	1	1
Urine	—	100	1	1	1	1	1	-	1	1	1	2
Vinegar	C ₂ H ₄ O ₂	10	1	4	1	1	1	1	1	1	1	1
Vinegar	C ₂ H ₄ O ₂	90	1	4	4	4	1	3	1	4	1	1
Wax	—	100	-	1	1		1	-	-	-	1	1
Wines	—	100	1	1	1	2	1	1	1	1	1	4
Xylene	C ₈ H ₁₀	100	3	1	4	1	4	4	4	4	1	1
Zinc chloride	SnCl ₂	10	1	4	2	2	1	-	-	-	1	4

EC – DECLARATION OF CONFORMITY

The product named hereinafter was developed, designed, and manufactured in compliance with the relevant, fundamental safety and health requirements of the listed EC directives and norms. In the event of modifications that were not authorised by us or if the product is used in a manner that is not in line with the intended purpose, this declaration will be rendered void.

<i>Product name:</i>	Laboratory Centrifuge
<i>Product type:</i>	1-14K
<i>Order number:</i>	10020, 10021
<i>Directives:</i>	2006/42/EG Machinery Directive 2006/95/EG Low Voltage Directive 2004/108/EG EMC Directive
<i>Normes:</i>	EN 61010-2-020:2006 EN 61000-3-2:2006, A1:2009, A2 :2009 EN 61000-3-3:2008 EN 61326-1:2006

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Osterode, 01.09.2011

Michael Sander

General Manager

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