



Operating Manual

Refrigerated Centrifuge

3 - 18 K

from serial no. 133640

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 91).

1.6 Scope of Supply

The centrifuge comprises:

- | | |
|---|----------------------------------|
| • 1 rotor wrench | Part no. 930 100 |
| • 1 tube of grease for load bearing bolts | Part no. 70 284 |
| • 20 ml slushing oil | Part no. 70 104 |
| • 1 connection cable | depending on the voltage variant |

Documentation:

Operating Manual incl. EC Declaration of Conformity (page 91)

Accessories

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

2 Design of the Centrifuge

2.1 Overview

- 1 Lid
- 2 Function knob
- 3 Display
- 4 Lid key
- 5 Stop key
- 6 Start key
- 7 Mains power switch

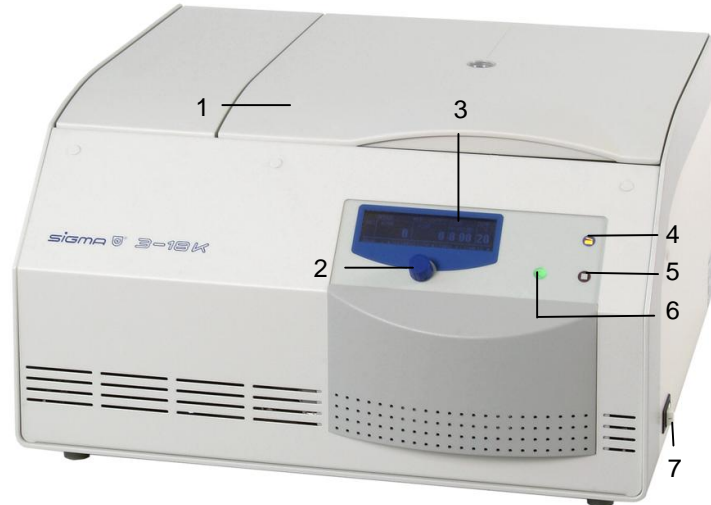


Fig. 2.1: Total view of the centrifuge

- 8 Name plate
(see page 12)
- 9 Mains power input
- 10 Equipotential
bonding screw

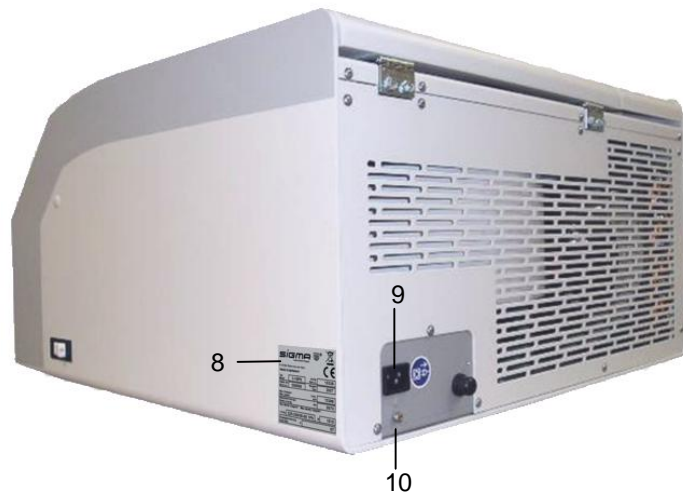


Fig. 2.2: Rear view of the centrifuge

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 1)
- 10 CE mark in accordance with the directive 94/9/EC
- 11 Part number
- 12 Year of manufacture
- 13 Power consumption

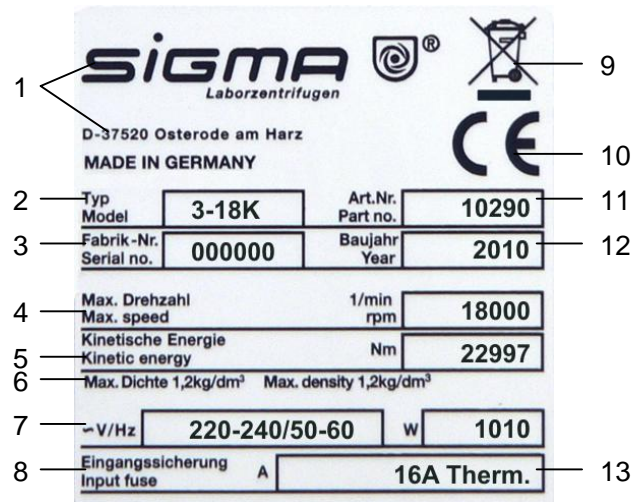


Fig. 2.3: Example of a name plate

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:



Danger

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.



Danger

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.



Warning

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.



Caution

This symbol indicates a potentially hazardous situation.

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



Info

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 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



Warning

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 rotor and buckets are correctly fitted (see 6.2.2 "Installation of Rotors and Accessories").
- 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 6.3.3.6 or 0 and 11.4.2 "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.



Info

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

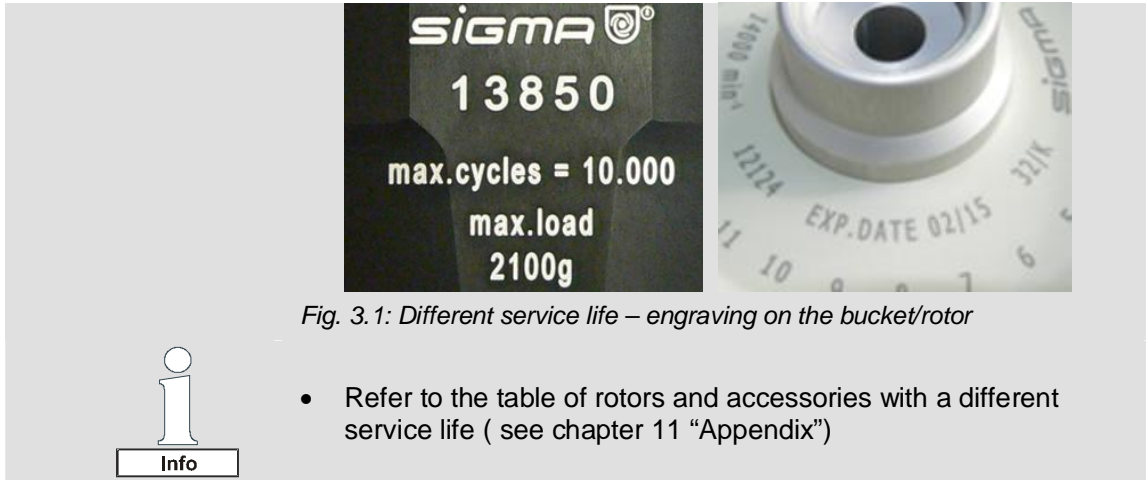
3.6.7 Service Life of Rotors and Accessories

The rotors and accessories have a limited service life.



Warning

- Perform regular checks (at least once per month) for safety reasons!
- Pay special attention to changes, such as corrosion, cracks, material abrasion etc.
- After 10 years, they must be inspected by the manufacturer.
- After 50,000 cycles, the rotor must be scrapped for reasons of safety.
- If other data concerning the service life are engraved on the rotor or bucket, these data shall apply accordingly. For example, a bucket with the 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)!



3.7 Safety Devices

3.7.1 Lid Lock Device

The centrifuge can only be started when the lid is properly closed. The electrical lock must be locked. The lid can only be opened when the rotor has stopped. If the lid is opened by way of the emergency release system during operation, the centrifuge will immediately switch off and decelerate brakeless. If the lid is open, the drive is completely separated from the mains power supply, i.e. the centrifuge cannot be started (see 7.1.1 "Emergency Lid Release").

3.7.2 Standstill Monitoring

Opening of the centrifuge lid is only possible if the rotor is at a standstill. This standstill is checked by the microprocessor.

3.7.3 System Check

An internal system check monitors the data transfer and sensor signals with regard to plausibility. Errors are detected with extreme sensitivity and displayed as error messages in a dialog box (see 7.2 "Error Codes").

3.7.4 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").

3.7.5 Imbalance Monitoring System

A dialog box may pop up or emit a sound signal in order to indicate that the centrifuge is in the inadmissible imbalance range. If the rotor is loaded unevenly, the drive will be switched off in the acceleration phase or during the run.

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:	355 mm
Height with opened lid:	795 mm
Width:	630 mm
Depth:	600 mm
Weight:	78 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

- Install the transport safety device (see 5.2).
- Always lift the centrifuge with a lifting device.
- When lifting the centrifuge, always reach under the centrifuge from the side.



Caution

The centrifuge weighs approx. 78 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 slip-lid box.

- Remove the upper part of the box.
- Take out the box containing the accessories.
- Remove the upper foam cushion.
- Remove the slip-lid box.
- Lift the centrifuge upwards with a lifting device or with a sufficient number of people to lift it safely. When lifting the centrifuge, always reach under the centrifuge from the side.



Caution

The centrifuge weighs approx. 78 kg!

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

5.2 Transport Safety Device

The transport safety device consists of of a foamed plastic ring in the centrifuge chamber.



Caution

The transport safety device must be removed prior to start-up!

Removal:

- Open the lid by pressing the lid key. If the centrifuge is not connected to the power supply, use the emergency release of the lid (see 7.1.1).
- Remove the foamed plastic ring from the rotor chamber, by lifting it carefully on one side.
- Retain the transport safety device for the possibility of the return of the centrifuge.

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!

SIGMA laboratory centrifuges are units of safety class I and have a three-wire power cord with a IEC C13 connector. They are equipped with temperature fuses.

- Switch the unit off by actuating the mains power switch.
- If they have tripped, let the fuses cool down for approximately 2 minutes.
- Switch the unit on. The fuses are reactivated.

5.4.2 Fuses

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 on the right side of the front (see Fig. 2.1, 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 and if the lid key is illuminated.

- Press the lid key in order to open the lid (see 6.3.3.6 "Parameter Menu - Automatic Lid Opening Function").

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

- Open the centrifuge lid by pressing the lid key.
- Unscrew the rotor tie-down screw from the motor shaft (counter-clockwise).
- Lower the rotor with its central bore straight down onto the motor shaft.
- Tighten the rotor tie-down screw clockwise with the supplied rotor wrench with 7,5 Nm. In doing so, hold the rotor at its outer rim.



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.



When using rotors for microtiter plate formats: Ensure that the plate holders are inserted together with the plates into the bucket.

- The lid screw serves for the fastening of the lid onto the rotor only, not for the fastening of the rotor onto the motor shaft.
- Follow the safety instructions and hazard warnings in chapter 3!

6.2.2.2 Installation of Angle Rotors with a Hermetically Sealed Lid

- Screw the rotor cover onto the rotor and tighten it.
- Lower the rotor with the cover onto the motor shaft .
- Insert the rotor tie-down screw into the motor shaft. Tighten the rotor tie-down screw with 7,5 Nm using the supplied rotor wrench so that the spring washer assembly is compressed tightly.
- The rotor can also be used without a cover.
- Slightly grease the rotor and lid seals after cleaning.
- The rotors can be installed or removed with a closed lid after loosening the rotor tie-down screw.
- Follow the safety instructions and hazard warnings in chapter 3!

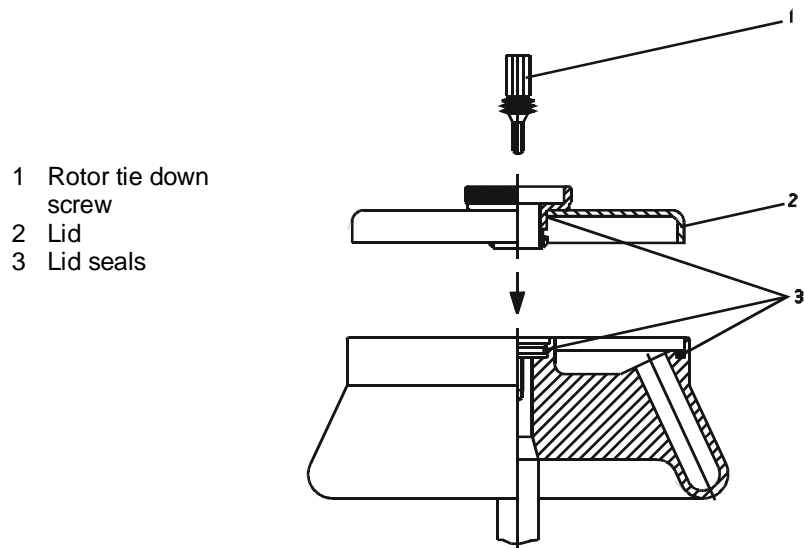


Fig. 6.1: Angel rotor with a hermetically sealed lid

6.2.2.3 Installation of Accessories

- Only use inserts that are suitable for the rotor (see 11.1 "Suitable Accessories").
- All four buckets of the swing-out rotor need to be installed when spinning.
- Always load the opposite inserts/buckets of the rotors with the same accessories and fill to avoid imbalance.

Centrifugation with different tube sizes:

Working with different tube sizes is possible. In this case, however, it is very important that opposite inserts are identical (see Fig. 6.2).

Centrifugation with low capacity: The tubes must be installed symmetrically so that the buckets and their inserts are loaded evenly (see Fig. 6.3).

Fig. 6.2:
Permissible loading of the swing-out rotor with different tube sizes

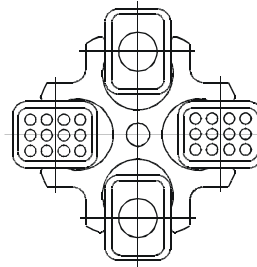
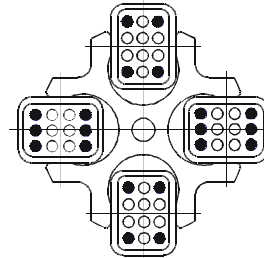


Fig. 6.3:
Permissible loading of the swing-out rotor



6.2.2.4 Adapters

In order to ensure easy handling, even if vessels of various sizes are used, carrier systems were developed.

- Load the opposite carriers with the same number of vessels and with the same weights in order to avoid imbalance.
- If all of the compartments of a carrier are not used, the buckets must be loaded evenly. Loading the edges of a bucket only is not permissible.

6.2.2.5 Tubes

- Load the tubes outside of the centrifuge. Liquids in the buckets or multiple carriers cause corrosion .
- Fill the tubes carefully and arrange them according to their weight. Imbalances result in the excessive wear of the bearings.
- In high-speed angle rotors, the tubes must be filled up to their useful volume (= the volume that is stated for the tube). If the vessels are only partially filled, they will deform. This may result in leaks at the seals that may become loose.
- When using glass tubes, the maximum value of 4,000 x g must not be exceeded (except special high-strength glass tubes; please refer to the information provided by the manufacturer).
- Observe the instructions on safety and hazards in chapter 3!

6.3 Spincontrol Comfort

6.3.1 Operating Panel

- 1 Centrifuge display
- 2 Function key
- 3 Start key
- 4 Stop key
- 5 Lid key



Fig. 6.4: Operating Panel

The centrifuge is started directly via the operating panel. When the centrifuge is switched on, all of the operating keys and displays 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	2	3	
	SPEED	RCF	TIME	TEMP
	SET 2000	814	0:02:00	20
	0	0	2:00	20
	PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶			
	5	6	7	8

- 1 Speed field
- 2 RCF field
- 3 Time field
- 4 Temperature field
- 5 Program field
- 6 Rotor field
- 7 Parameters
- 8 Configurations

Fig. 6.5: Display Spincontrol Comfort

6.3.3 Manual Mode

6.3.3.1 Starting a Centrifugation Run

The centrifuge is ready for operation when the start key is illuminated.

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

6.3.3.2 Interrupting a Centrifugation Run

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

Fast stop:

- Press the stop key for more than one second.

The centrifuge decelerates with the maximum deceleration curve.

"Fast stop" appears in the display.

After a fast stop, the centrifuge lid must be opened before starting a new centrifugation run.

6.3.3.3 Interrupting a Deceleration Process

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

6.3.3.4 Selection, Display, and Modification of Data

The display is in its default state. No area is inverted.

- Select a parameter by pressing or turning the function knob. The selected field will be inverted.
- Press the function knob in order to activate the modification mode. "SET" and the selected area will be inverted.
- Turn the function knob until the desired value is displayed.
- Press the function knob to confirm the selected value and to quit the modification mode. "SET" and the selected area will be deactivated.



Info

After 20 seconds, the modification mode will be left automatically. The current values will be saved.

All entries beyond the permissible limits, or incorrect entries, will not be accepted.

6.3.3.5 Standard Menu

Set

If this area is inverted, the alteration mode is active (here in combination with the speed).

SPEED	RCF	TIME	TEMP
SET 2000	814	0:02:00	20
0	0	2:00	20
PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶			

Fig. 6.6: "Set" function

Speed

In the upper section of the field, the set speed of the centrifuge is displayed. The actual speed is displayed below this value. The values are stated in revolutions per minute (rpm) and depend on the RCF values (see 11.4 "Formulae – Mathematical Relations "). The maximum speed values depend on the rotor that is used.

SPEED	RCF	TIME	TEMP
SET 2000	814	0:02:00	20
0	0	2:00	20
PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶			

Fig. 6.7: Setting the speed

Relative Centrifugal Force (RCF)

The relative centrifugal force is the acceleration that the sample is subjected to. The set value of this parameter is displayed in the upper section of this field, with the actual value shown below. The values are stated in g (gravitational acceleration) and depend on the speed value (see 11.4 "Formulae – mathematical relation"). The maximum RCF values depend on the rotor that is used.

SPEED	RCF	TIME	TEMP
SET 2000	814	0:02:00	20
0	0	2:00	20
PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶			

Fig. 6.8: Setting the rcf-value

Time

The set runtime is displayed in the upper section of this field, with the remaining runtime shown below. The runtime is defined as the period from the start of the centrifuge to the beginning of the deceleration phase. The maximum value is 9 h 59 min. The unit of the programmed centrifugation time is underlined.

SPEED	RCF	TIME	TEMP
SET 2000	814	0:02:00	20
0	0	2:00	20
PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶			

Fig. 6.9: Setting the run time

The set value is indicated in hours, minutes, and seconds. The actual value has the same units as the set value and is displayed in hours:minutes, or in minutes:seconds if the value is below 10 minutes. Values greater than 59 will be automatically converted to the next higher unit.

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 of the centrifuge :

- Starting with the time setting 0:10 (see page 29), turn the knob counter-clockwise or
- Starting with the time setting 09:59, turn the knob clockwise to the next setting. "HOLD" will be displayed. After the start of the centrifuge, the elapsed time will be displayed.

	SPEED	RCF	TIME	TEMP
SET	2000	814	HOLD	20
	0		0 0:00	20
PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶				

Fig. 6.10: Display of a continuous run

- Deactivate the continuous run by pressing the stop key or by entering a specific runtime.

Short Run

- Keep the start key pressed during the short run.

During the short run, the centrifuge accelerates with the maximum acceleration curve until the maximum speed of the rotor is reached.

When the start key is released, the centrifuge decelerates at maximum brake to a standstill.

Temperature

The set value is in the upper section of the area, underneath the actual temperature is displayed. Temperatures between -20 °C and +40 °C can be preselected.



Info

In the centrifuges without an active heater, the temperatures above room temperature depend on the air friction of the turning rotor.

	SPEED	RCF	TIME	TEMP
SET	2000	814	0:02:00	20
	0		0 2:00	20
PROG -- ◄ 11150/13215 ◄ PARA ▶ CONFIG ▶				

Fig. 6.11: Setting the temperature

The centrifuge 3-18KH with a heater enables the preselection of temperatures up to +60°C. The maximum rotor temperature that can actually be reached is 40-60°C, depending on the rotor and speed.

Program

In this field, the number of the actual program is displayed.

- Select the double arrow (⇄) next to the program list and confirm the entry. An overview of all stored programs will be displayed (see 6.3.4 "Program Mode").

The rapid cooling program "RAPID_TEMP" cannot be deleted (see 6.3.3.6 "Parameter Menu").

	SPEED	RCF	TIME	TEMP
SET	2000	814	0:02:00	20
	0	0	2:00	20
PROG -- ⇄ 11150/13215 ⇄ PARA ▶ CONFIG ▶				

Fig. 6.12: Calling up the program list

Rotor Selection list / Automatical Rotor Identification

This field shows the rotor that is currently being used.

	SPEED	RCF	TIME	TEMP
SET	2000	814	0:02:00	20
	0	0	2:00	20
PROG -- ⇄ 11150/13215 ⇄ PARA ▶ CONFIG ▶				

Fig. 6.13: Calling up the rotor selection list

Selection and change of the rotor number on a rotor selection list

- Select the double arrow (⇄) next to the rotor selection list and confirm the entry. An overview with the following data will be displayed:
 - Rotor number, and in some cases together with a bucket
 - max. speed
 - max. gravitational field
 - max. radius for calculation of the gravitational field
 - min. radius

NO	ROTOR	BUCKET	SPEED	RCF	RMAX	RMIN
3	11140	13127	5500	5648	167	80
4	11142		4500	3871	171	42
5	11144	13145	5000	2991	107	63
6	11148		13200	16363	84	44
7	11150	13215	5100	5292	182	88
8	11150	13220	4100	3007	160	113

Fig. 6.14: Rotor selection list

- Select the name of the rotor/bucket combination that is used and confirm it.

Selection of the rotor number in the main menu

- Select the rotor field and confirm it.
- Turn the knob. All of the possible rotor/bucket combinations will be displayed.
- Select a combination and confirm it. The selected combination will be loaded.

Identifying and adapting incorrectly set rotors

The centrifuge automatically identifies the rotor that is being currently used.

- If the system identifies a different rotor than the one that is set, if there are no different buckets for this rotor, and if the speed has not been adapted manually, the rotor input will be adapted automatically. The system will not display a message.
- If the system identifies a different rotor than the one that is set, and if there are different rotor/bucket combinations for this rotor, the system will automatically select the rotor with the lowest speed. The system will display a corresponding message so that the rotor can be selected manually.
- If the system identifies a different rotor than the one that is set, if the speed has been limited, and if there are no rotor/bucket combinations, a message will be displayed.

This prevents the maximum permissible speed from being exceeded.

6.3.3.6 Parameter Menu

For information on how to set the parameters, see 6.3.3.4 "Selection, Display, and Modification of Data".

PARAMETER		<input type="checkbox"/> PRECOOLING
ACCELERATION	9	<input type="checkbox"/> OPEN LID AFTER RUN
DECELERATION	9	<input type="checkbox"/> START DELAY
RADIUS [MM]	182	
DENSI [G/CM ³]	1.2	
		EXIT

Fig. 6.15: Parameter menu

Acceleration

This function is used to select an acceleration curve. One can select a linear rise (curves 0-9) or a quadratic rise (curves 10-19). The acceleration curves 20-29 can be programmed as desired.

Their shape is explained in detail in 11.3.1 "Linear Curves" and 11.3.2 "Quadratic Curves".

Deceleration

This function is used in order to select a curve that decelerates the centrifuge to a standstill. Deceleration curves are inverted images of the acceleration curves and are labelled with identical numbers. Deceleration curve no. 0 represents a brakeless deceleration.

Radius

The radius determines the value of the relative centrifugal force (RCF) that the sample is subjected to. Normally, the maximum RCF value is displayed. If the value is reduced manually, a downward facing arrow (↓) will be displayed in the RCF field.

Density

If the density of the liquid is higher than 1.2 g/cm³, the value must be adapted manually. This, in turn, reduces the maximum final speed (see 11.4.2 “Density“). A downward facing arrow (↓) will be displayed in the speed field. Values between 1.2 and 9.9 g/cm³ are possible.

Standstill Cooling

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.

If the standstill cooling is activated, the centrifuge starts to precool after it is switched on. The lid must be closed.



Unmoved air in the rotor chamber distorts the measuring and control behavior and causes the compressor to freeze overs. At temperatures below 0°C, aqueous liquids will freeze, making sedimentation impossible.

- Ensure that the rotor temperature will not fall below 0 °C if it is at a standstill!

Rapid cooling program "RAPID TEMP"

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 rapidly under defined conditions:

- Select the option “Progr” in the “Standard” menu and confirm the selection. The program list will be displayed.
- Select the program "RAPID TEMP" on the program list and confirm the selection. The display shows 1/3 of the maximum rotor speed and the corresponding RCF value. The deceleration (brake) and acceleration curves correspond to curve 9 and the runtime field indicates “infinite” (continuous run).



The program will only be loaded if the actual temperature is above the set temperature.

The program runs until the set value is reached. Then, a sound signal is issued, and the standstill cooling is activated. The program that was set beforehand will be reloaded.

- Press the stop key to determinate the rapid cooling program prematurely.



The automatic lid opening function is suppressed after a rapid cooling phase in order to prevent the system from reheating.



Caution

An entry will interrupt the rapid cooling program. There will be no message when the set temperature is reached. If no new runtime is entered, the centrifuge will continue to run infinitely (continuous run).

Start Delay

If the start delay is activated, the centrifuge will not start until the preset time has elapsed.

Automatic Lid Opening Function

The Automatic-Lid-Open function must be activated so that the lid opens automatically when the rotor is at a standstill.



Caution

When the lid is open, the cooling is not active. Samples may warm up!

6.3.3.7 Configuration Menu

In the configuration mode, the default settings can be customised and the data can be read off.

CODE	LANGUA.	SCREEN	FINE	CYCLES
EXIT				
BUZZER	SENSOR	INFO	RESET	CURVES

Fig. 6.16: Configuration menu

Code

In order to prevent any unauthorised use of the centrifuge, the following functions can be blocked:

- Saving of programs
- Changing of parameters
- Loading of programs
- Start key

Blocking a function:

- Select the function that is to be blocked.
- Select the button "Activate code".
- Enter a four-digit code and confirm the entry.
- For safety reasons, the code must be entered a second time.

The blocking is now active.

If changes are made to a blocked function, the system will ask for the code prior to executing the change.

Unblocking a function

- Select the button "Delete code".
- Enter the code and confirm the entry.

The function is now unblocked.

Changing the code

- Select the button "Change code".
- Enter the old code and confirm the entry.
- Enter the new code.
- For safety reasons, the code must be entered a second time.

The code is now changed.

Language

The German or English languages can be selected as the menu language.

Screen

Various representation variants enable a zoomed representation of the display:

- RCF and speed in the standard size
- Speed enlarged (zoomed). The RCF display is eliminated.
- RCF enlarged (zoomed). The speed display is eliminated.
- Select the "Display" field in the configuration overview and confirm the selection. The display overview will be displayed.
- In order to set the display "SPEED - (ZOOM)", select the corresponding line and confirm the selection.
- Quit the display by selecting and confirming "EXIT". The system will return to the configuration overview.

After another confirmation, the standard menu will be displayed. The fields "SPEED", "TIME", and "TEMP" are zoomed. The field "RCF" is eliminated.

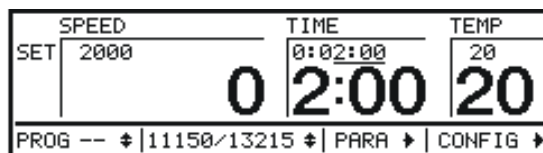


Fig. 6.17: Zoomed speed display

Fine Adjustment

This menu can be used to preselect the set speed in steps of 1 or 10 rpm, and the set time in steps of 1 min or 1 sec.



Regardless of the fine adjustment, the interval will increase if the knob is turned quickly.

Cycles

For each rotor/bucket combination, the number of cycles and runtime are stored.

Buzzer

In this menu, a sound signal can be selected for

- the end of a centrifugation run
- an imbalance message
- an error message.

The duration of the buzzer signal can be specified.

Sensor

The sensor overview shows various system data. In the event of a malfunction, these data facilitate an immediate diagnosis.

Info

The Info overview shows information such as the type of centrifuge, and EPROM version, number of cycles, the total runtime, as well as software version and date.



In the menus "Cycles", "Info", and "Sensor", the values can neither be entered nor changed.

Reset

This function resets the centrifuge and restores the factory settings. All of the programs, parameters, curves, and configurations will be deleted.

Curves

In this submenu, the user-defined acceleration and deceleration curves can be created and edited (see 6.3.3.8).

6.3.3.8 Curves Menu

The Curves menu is a submenu of the configuration menu. The curves function can be used to create user-specific acceleration and deceleration curves. 10 storage locations (no. 20-29) are available for this purpose.

For the interval no. 1, either a linear (LIN) or quadratic (QUAD) acceleration can be selected. The other acceleration curves are always linear.

Creation of the curves for variable accelerations and decelerations

- In the configuration mode, select the field "Curves" and confirm the selection. The curve overview will be displayed.
- Select the time display and confirm the selection.

Enter the desired time for interval no. 1 and confirm the entry. The display for interval no. 2 will be displayed simultaneously.

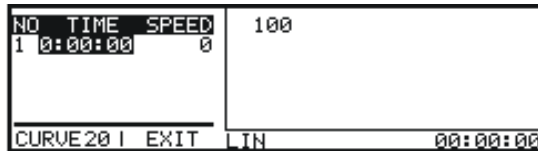


Fig. 6.18: Time value input into interval no. 1

- Select the speed field "SPEED" and confirm the selection.
- Select the speed value and confirm the selection. The curve that is created will be displayed together with the maximum curve speed.

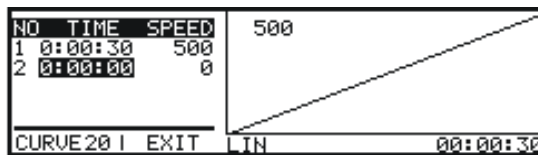


Fig. 6.19: Time value input into interval no. 2

- Activate the time display of the second interval and enter the desired time. The extended curve will be displayed.

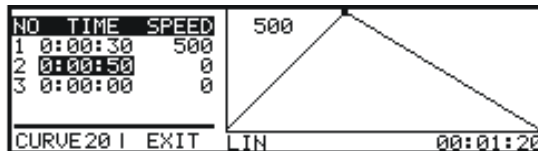


Fig. 6.20: Extended curve

- Select the speed field "SPEED" and enter a speed value. Confirm the entry.
- You can enter up to 10 intervals in this manner.
- Save the curve under a curve number between 20 and 29 together with the current operating parameters.
- Select "EXIT" and quit the curve mode by confirming the entry.

Only acceleration curves are programmed. The corresponding deceleration curves are generated by reflection.

If the curve speed of an interval exceeds the set speed in the operating mode, a dialog box will pop up.

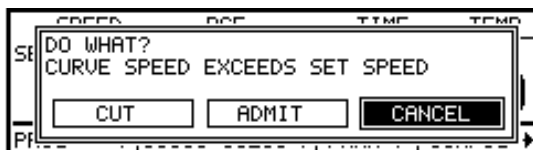


Fig. 6.21: Dialog box concerning the curve speed

- Cut: The curve speed in an interval will automatically be limited to the set speed in the operating mode.
- Admit: The curve speed in an interval will be allowed.
- Cancel: A stop occurs. Starting is impossible without a change of the curve speed in an interval.

Modification of existing curves

- Activate the field "CURVES" in the configuration menu.
- Select the curve that is to be modified and change the individual values as described above.

Centrifugation curves

It is also possible to create centrifugation curves. The following conditions must be fulfilled:

- The preselected maximum final speed of an interval corresponds to the set speed for the centrifugation run.
- The sum of the intervals corresponds to the set time of the centrifugation run. The last speed checkpoint of an interval equals 0.

6.3.3.9 Modification of the Contrast

- Press the stop key and turn the function knob one notch to the left. A dialog box will be displayed.
- Modify the contrast of the centrifuge display and confirm the modification.



Fig. 6.22: Contrast dialog box

6.3.3.10 Imbalance Monitoring

An imbalance dialog box will be displayed in the event of an inadmissible imbalance. The centrifugation run cannot be continued and the centrifuge will be stopped with maximum deceleration power.



Fig. 6.23: Imbalance dialog box

Reason: Improper loading of the centrifuge or a malfunction during the operation (e.g. glass breakage) that in turn prevented the centrifuge from rotating steadily.

- Eliminate the cause of the imbalance (see chapter 7 "Malfunctions and Error Correction") and restart the centrifuge.

6.3.3.11 Modification of Parameter Values during the Centrifugation Run

(see 6.3.3.4 "Selection, Display, and Modification of Data"):

Modification possible	Modification impossible	(De-)Activation possible
Speed	Rotor	Continuous run
RCF	Program	Standstill cooling
Runtime	Radius	Start delay
Temperature	Density	Automatic lid opening function
Acceleration curve		
Deceleration curve		

6.3.4 Program Mode

A program includes all of the data that are required for a centrifugation run.



Attention: Temperature profiles cannot be created!

With a program, certain sedimentation results can be repeated under identical conditions.

Programs can be loaded, executed, modified, and deleted at any time.

A maximum of 50 programs can be stored under the numbers 1 - 50. The rapid cooling program "RAPID_TEMP" does not occupy any storage location and cannot be deleted. It is used to cool the centrifuge without vessels.

"--" means that the values that are currently set are not a stored program.

The programs can be protected against unauthorised use, modification, or deletion with the aid of a code (see 6.3.3.7 "Configuration Menu").

6.3.4.1 Loading a Program

1. Loading a program by entering a program number

- Select the program field ("PROG-") and confirm the selection.
- Turn the knob. As a result, all of the programs that have already been saved and the current ("--") setting will be displayed one after the other.
- Select a program and confirm the selection. A dialog box will be displayed (Fig. 6.25).
- Select "LOAD" and confirm the selection.

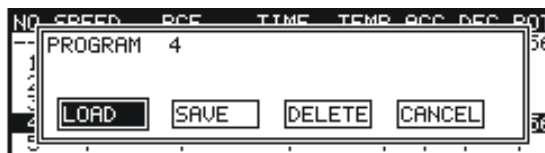


Fig. 6.24: Loading a program

2. Loading a program from the program selection list

- Select the double arrow (⇨) next to the program selection list and confirm the selection. An overview of all of the programs that have already been saved will be displayed. The current setting will be displayed under "-".
- Select a program and confirm the selection. A dialog box will be displayed (Fig. 6.25).
- Select "LOAD" and confirm the selection.

6.3.4.2 Saving a Program

- Enter the parameters that are to be included in the program.
- Select the double arrow (⇨) next to the program selection list and confirm the selection. An overview of all of the programs that have already been saved, and of the free program storage locations will be displayed.
- Select the desired program storage location from the program selection list and confirm the selection. A dialog box will be displayed.
- Select "SAVE" and confirm the selection.

The program is now saved.

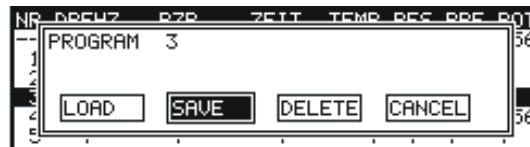


Fig. 6.25: Saving a program

6.3.4.3 Deleting a program

- Select the double arrow (⇨) next to the program selection list and confirm the selection. An overview with all of the programs that have already been saved will be displayed.
- Select the program that is to be deleted and confirm the selection. A dialog box will be displayed.
- Select "DELETE" and confirm the selection.

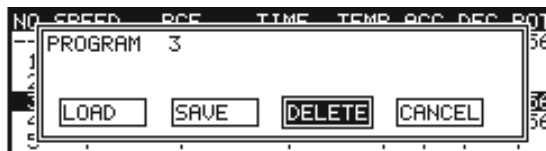


Fig. 6.26: Deleting a program

6.4 Spincontrol Professional

6.4.1 Operating Panel

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

- 1 Start key
- 2 Centrifuge display
- 3 Function knob
- 4 Stop key
- 5 Lid key

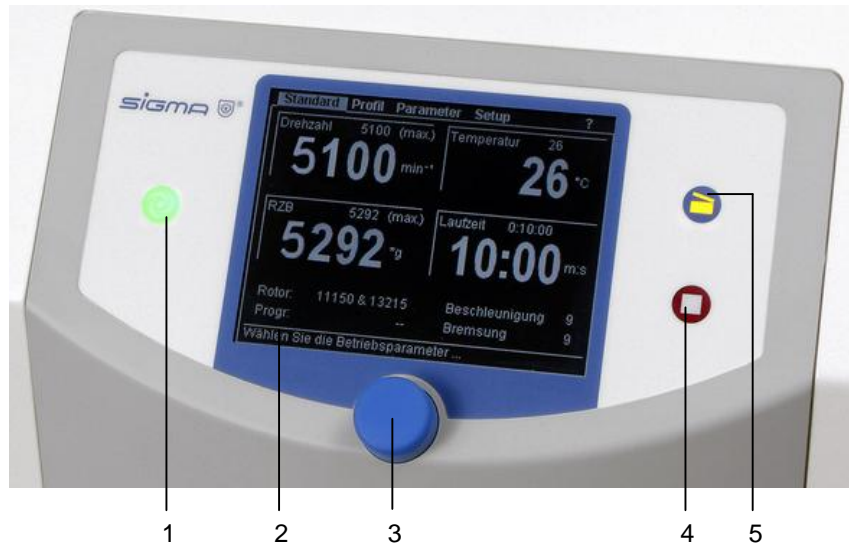


Fig. 6.27: Operating Panel Spincontrol Professional

6.4.2 Centrifuge display

The centrifuge display has the following display fields:

- 1 Menu bar
- 2 Speed field
- 3 RCF field
- 4 Rotor field
- 5 Program field
- 6 Status bar
- 7 Temperature field
- 8 Runtime field
- 9 Acceleration
- 10 Deceleration (brake)

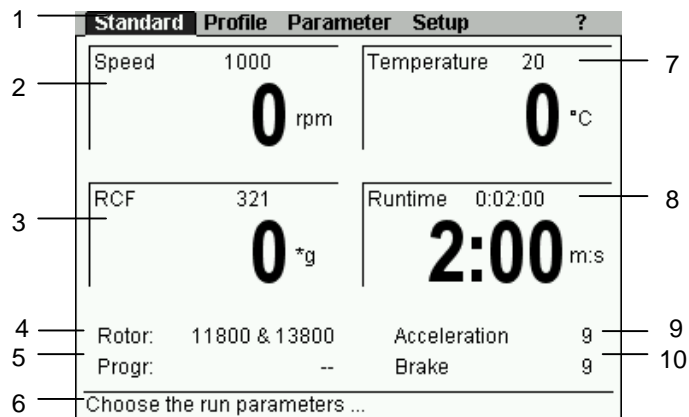


Fig. 6.28: Display Spincontrol Professional

6.4.3 Manual Mode

6.4.3.1 Starting a Centrifugation Run

The centrifuge is ready for operation when the start key is illuminated.

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

6.4.3.2 Interrupting a Centrifugation Run

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

Fast stop:

- Press the stop key for more than three seconds.

The centrifuge decelerates with the maximum deceleration curve.

After a fast stop, the centrifuge lid must be opened before a new centrifugation run can be started.

A fast stop can also be triggered during a normal deceleration, e.g. in order to speed up the deceleration.

When a fast stop is triggered, "FAST STOP" will be displayed in the speed field.

6.4.3.3 Interrupting a Deceleration Process

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

6.4.3.4 Selection, Display, and Modification of Data

The standard menu is displayed. No area is inverted.

- Turn the function knob in order to select a field. The set value of the field starts to flash.
- Press the function knob. The display starts to flash and the modification mode is active.
- Turn the function knob in order to modify the set value of the selected field.
- Press the function knob again to confirm the entry and to quit the modification mode.

6.4.3.5 Standard Menu

Standard	Profile	Parameter	Setup	?
Speed	1000	Temperature	20	
	0 rpm		0 °C	
RCF	321	Runtime	0:02:00	
	0 *g	2:00 m:s		
Rotor:	11800 & 13800	Acceleration	9	
Progr:	--	Brake	9	
Choose the run parameters ...				

Abb. 6.29: Standard Menu

This menu is displayed a few seconds after the centrifuge has been switched on.

The following parameters can be displayed and modified:

Speed

In the upper section of the field, the set speed of the centrifuge is displayed. The actual speed is displayed below this value. The values are stated in revolutions per minute (rpm) and depend on the RCF values (see 11.4 "Formulae – Mathematical Relations "). The maximum speed values depend on the rotor that is used.

Relative Centrifugal Force (RCF)

The relative centrifugal force is the acceleration that the sample is subjected to. The set value of this parameter is displayed in the upper section of this field, with the actual value shown below. The values are stated in g (gravitational acceleration) and depend on the speed value (see 11.4 "Formulae – mathematical relation"). The maximum RCF values depend on the rotor that is used.

Temperature

The set temperature is displayed in the upper section of the area, with the current rotor chamber temperature shown below. Temperatures between -20 °C and +40 °C can be preselected.



In the centrifuges without an active heater, the temperatures above room temperature depend on the air friction of the running motor.

The centrifuge 3-18KH with a heater enables the preselection of temperatures up to +60°C. The maximum rotor temperature that can actually be reached is 40-60°C, depending on the rotor and speed.

Runtime

The set runtime is displayed in the upper section of this field, with the remaining runtime shown below. The runtime is defined as the period from the start of the centrifuge to the beginning of the deceleration phase. The maximum value is 99 h 59 min 59 sec.

In the "Setup" menu, one can specify that the counting of the runtime is not to be started until the set speed is reached (see 6.4.3.8 "Setup Menu"). In this case, the symbol "⌚!" appears in the speed field.

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.

- Select the field "Runtime" and confirm the selection. The display flashes when it is activated
- Select the time 0:00:00 and confirm the selection. "Infinite" will be displayed. After the start of the centrifuge, the elapsed time will be displayed.
- Deactivate the continuous run by pressing the stop key or by entering a specific run time.

Short Run

- Keep the start key pressed during the short run.

During the short run, the centrifuge accelerates with the maximum acceleration curve until the maximum speed of the rotor is reached.

When the start key is released, the centrifuge decelerates at maximum brake to a standstill.

Rotor: Rotor Selection List/ Automatical Rotor Identification

This field shows the rotor that is currently being used.

- Select the field "Rotor" and confirm the selection. A list with all of the possible rotors without buckets is displayed.
- Select the desired rotor. All of the possible rotor/bucket combinations and additional information for each combination will be displayed.
- Select a rotor/bucket combination and confirm the selection. Press the function knob in order to accept the data.

Standard	Profile	Parameter	Setup	?
Rotor 11150			11150 & 13215	
Quadruple swing-out rotor with bucket 13215			11150 & 13220	
Rectangular bucket			11150 & 13221	
Data:			11150 & 13233	
max. 5100 rpm / 5292 * g			11150 & 13234	
Rmin 88 mm			11150 & 13235	
Rmax 182 mm			11150 & 13236	
			11150 & 13350	
Rotor:	11118			}
Progr:	--	Brake		9
Choose a rotor ...				

Fig. 6.30: Rotor Selection List

Identifying and adapting incorrectly set rotors

The centrifuge automatically identifies the rotor that is being currently used.

- If the system identifies a different rotor than the one that is set, if there are no different buckets for this rotor, and if the speed has not been adapted manually, the rotor input will be adapted automatically. The system will not display a message.
- If the system identifies a different rotor than the one that is set, and if there are different rotor/bucket combinations for this rotor, the system will automatically select the rotor with the lowest speed. The system will display a corresponding message so that the rotor can be selected manually.
- If the system identifies a different rotor than the one that is set, if the speed has been limited, and if there are no rotor/bucket combinations, a message will be displayed.

This prevents the maximum permissible speed from being exceeded.

Progr.: Program List

This field in the standard menu shows the program that is currently loaded. When the field is selected, the program list is displayed (for information on how to work with the programs, see 6.4.4 "Program Mode").

The rapid cooling program "RAPID_TEMP" cannot be deleted (see 6.4.3.7 "Parameter Menu, Process").

Standard	Profile	Parameter	Setup	?
Rotor:	11118		RAPID_TEMP	
Bucket:	----		1: Probe1	
Speed:	1000 rpm		2: Empty	
RCF:	154 *g		3: Empty	
Temperature:	20 °C		4: Empty	
Runtime:	00:02:00		5: Empty	
Radius:	138.0 mm		6: Empty	
Density:	1.2 g/cm ³		7: Empty	
Acceleration:	9		8: Empty	
Brake:	9			
Rotor:	11118			}
Progr 1:	Probe1	Brake		9
Choose/Save/Delete a program ...				

Fig. 6.31: Program selection list

Acceleration

This function is used to select an acceleration curve. One can select a linear rise (curves 0-9) or a quadratic rise (curves 10-19). The acceleration curves 20-29 can be programmed as desired.

Their shape is explained in detail in 11.3.1 "Linear Curves" and 11.3.2 "Quadratic Curves".

Deceleration (Brake)

This function is used in order to select a curve that decelerates the centrifuge to a standstill. Deceleration curves are inverted images of the acceleration curves and are labelled with identical numbers.

Deceleration curve no. 0 represents a brakeless deceleration.

6.4.3.6 Profile Menu

This menu shows the profiles that are used. A profile begins and ends with 0 speed. The vertical axis shows the speed and the horizontal axis shows the time.

Changing the scale:

- Select the value that is to be changed. The activated display flashes.
- Change the value and confirm it.

The value is saved.

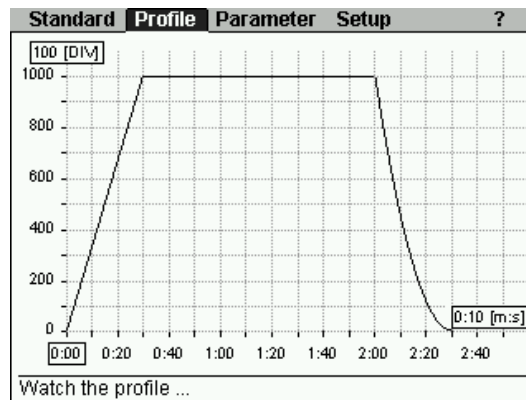


Fig. 6.32: Profile menu

Automatic adaptation of the view

- Select the zero point. The activated display flashes.
- Turn to the left in order to select "auto" and confirm the selection.

The view will now be automatically adapted to the curve.

6.4.3.7 Parameter Menu

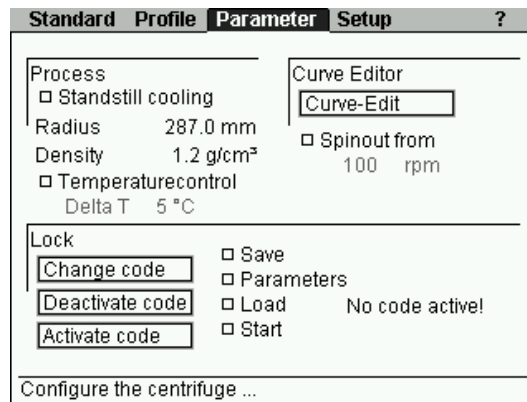


Fig. 6.33: Parameter menu

Process

Standstill cooling

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.

If the standstill cooling is activated, the centrifuge starts to precool after it is switched on. In the runtime field, the symbol "✱" is displayed. The lid must be closed.



Unmoved air in the rotor chamber distorts the measuring and control behavior and causes the compressor to freeze overs. At temperatures below 0°C, aqueous liquids will freeze, making sedimentation impossible.

- Ensure that the rotor temperature will not fall below 0 °C if it is at a standstill!

Rapid cooling program "RAPID TEMP"

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:

- Select the option "Progr" in the "Standard" menu and confirm the selection. The program list will be displayed.
- Select the program "RAPID TEMP" on the program list and confirm the selection. The display shows 1/3 of the maximum rotor speed and the corresponding RCF value. The deceleration (brake) and acceleration curves correspond to curve 9 and the runtime field indicates "infinite" (continuous run).

Standard	Profile	Parameter	Setup	?
Speed	1900	Temperature	-1	
	0 rpm		0 °C	
RCF	557	Runtime	Infinite	
	0 *g	0:00 m:s		
Rotor:	11118	Acceleration	9	
Progr:	RAPID_TEMP	Brake	9	
Close Lid and press START to run RAPID_TEMP!				

Fig. 6.34: Rapid cooling program "RAPID_TEMP"



The program will only be loaded if the actual temperature is above the set temperature.

The program runs until the set value is reached. Then, a sound signal is issued, and the standstill is activated. The program that was set beforehand will be reloaded.

- Press the stop key to determinate the rapid cooling program prematurely.



The automatic lid opening function is suppressed after a rapid cooling phase in order to prevent the system from reheating.



An entry will interrupt the rapid cooling program. There will be no message when the set temperature is reached. If no new runtime is entered, the centrifuge will continue to run infinitely (continuous run).

Radius

The radius determines the value of the relative centrifugal force (RCF) that the sample is subjected to. Normally, the maximum RCF value is displayed. If the value is reduced manually, a downward facing arrow (↓) will be displayed in the RCF field.


Density

If the density of the liquid is higher than 1.2 g/cm³, the value must be adapted manually. This, in turn, reduces the maximum final speed (see 11.4.2 "Density"). A downward facing arrow (↓) will be displayed in the speed field. Values between 1.2 and 9.9 g/cm³ are possible.

Temperature control

The temperature control function is used to set the desired threshold "delta T" in steps of 1°C or 1°F.

- Select the temperature control function and confirm the selection.
- Set the desired threshold "delta T".

If the temperature control function is active, the symbol  is displayed in the temperature display in the standard menu.

In this case, the centrifuge can only be started if the current temperature in the window is between the preset temperature in the standard menu and the threshold "delta T".

If the temperature leaves this window during the centrifugation run, an error message will be displayed and the centrifuge will be decelerated to a complete standstill.

A short run, however, can be started at any time.

Standstill cooling and rapid cooling are also possible at any time.


Lock

In order to prevent any unauthorised use of the centrifuge, the following functions can be blocked:

- Saving of programs
- Changing of parameters
- Loading of programs
- Start key

Blocking a function:

- Select the function that is to be blocked. The preceding functions will also be automatically selected (example: If the Parameter function is selected, the Save function will also be selected).
- Select the button "Activate code".
- Enter a four-digit code and confirm the entry.

The blocking is now active. A padlock symbol  will be displayed in the status line.

If changes are made to a blocked function, the system will ask for the code prior to executing the change.

Unblocking a function

- Select the button "Deactivate code".
- Enter the code and confirm the entry.

The function is now unblocked.

Changing the code

- Select the button "Change code".
- Enter the old code and confirm the entry.
- Enter the new code.
- For safety reasons, the code must be entered a second time.

The code is now changed.

Curve Editor

The Curve Editor function can be used to create and edit user-specific acceleration and deceleration curves.

General information concerning this subject can be found in chapter 11.3 "Acceleration and Deceleration Curves".

Creating and editing an acceleration curve:

- Select the option "Curve Editor". A submenu will be displayed (see Fig. 6.35).
- Select a curve number between 20 and 29 under "Curve". If the selected curve number is already used, the saved curve will be displayed.
- Define the interval number of the process under "Int". For every curve, up to ten intervals can be entered.
- Enter the interval time under "Time", but take the restrictions into consideration (see below).
- Enter the desired acceleration under "RPM" or "RCF", but take the restrictions into consideration (see below). The values are interdependent.
- For the first interval, a linear or quadratic rise can be selected under "QUAD/LIN". All of the other intervals are linear.

The field "Total" shows the total runtime of the process. The maximum runtime of a curve is dependent on the slope of the curve and on the final speed of the rotor.

Restrictions

- Deceleration and acceleration curves may include intervals with a positive slope as well as with a zero slope.
- The slope of the curve intervals may be between 4 rpm min. and 1000 rpm max.
- Square curve intervals are only possible between 0 and 1000 rpm max. If the selected final speed is higher than 1000 rpm, this interval will automatically turn into a linear one above 1000 rpm.
- The possible runtime depends on the maximum possible speed (depending on the rotor) and the slope limitation.

Example 1: Start speed 0 rpm, final speed 100 rpm, a runtime of 1 hour is not possible since the required slope is < 0.03 rpm and, therefore, is outside of the defined range.

Example 2: Start speed 0 rpm, final speed 15,000 rpm, a runtime of 10 seconds is not possible since the required slope is 1500 rpm and, therefore, is outside of the defined range.

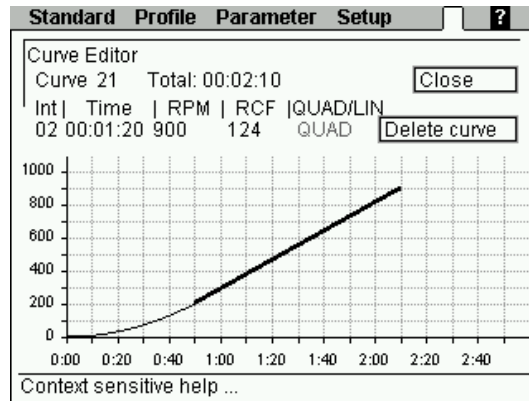


Fig. 6.35: Curve editor

Programmable curves are not profiles. In order to create a profile, they must be combined in a program together with a run phase (see 6.4.4 "Program Mode").

Brakeless deceleration as of a set speed

If this function is active, the drive will be disconnected if the actual speed is below the set speed. As a result, the rotor decelerates and stops in a brakeless manner.



A brakeless deceleration, in particular with heavy rotors and at high speeds, can take a lot of time! (Depending on the rotor and load, the speed will be reduced by approximately 0.5 to 1 rpm per second.)

If the brakeless deceleration is active, "+0" is displayed next to the deceleration curve.

- The brakeless deceleration can be interrupted by a fast stop or by restarting the centrifuge.

6.4.3.8 Setup Menu

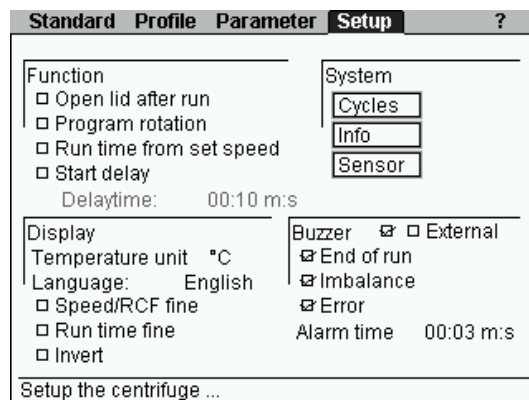


Fig. 6.36: Setup menu

Function

Open lid after run

The Auto-Lid-Open function must be activated so that the lid opens automatically at the end of the operation.



Caution

When the lid is open, the cooling is not active. Samples may warm up!

Program rotation

See chapter 6.4.4.4 "Automatic Program rotation"

Run time from set speed

If this function is active, the runtime will not be measured until the set speed is reached. The clock symbol "⌚!" will be displayed in the runtime field in the standard menu. If a free acceleration curve is selected, this setting has no effect. The symbol will not be displayed although the option is selected.

Start delay

If the start delay function is active, the centrifuge will not start until the preset time has elapsed. The symbol "⌚" will be displayed in the time field.

Display

Temperature unit

- Select between °C (Celsius) and °F (Fahrenheit)

Language

Various languages are available.

If a language is selected by mistake, it can be changed on any screen as follows:

- Press and hold the stop key.
- Turn the function knob one notch to the left and then one notch to the right.
- Release the stop key. The window "Language" will be displayed.
- Select the desired language.

Speed/RCF fine and Runtime fine

This menu can be used to preselect the set speed in steps of 1 rpm (instead of 100 rpm), the rcf-value in steps of 1xg (instead of 10xg), and the set time in steps of 1 min or 1 sec (instead of 10 min or 10 sec).



Info

Regardless of the fine adjustment, the interval will increase if the knob is turned quickly

Invert

This function switches the display from black/white to white/black.

Buzzer

In this menu, a sound signal can be selected for

- the end of a centrifugation run
- an imbalance message
- an error message.

The duration of the buzzer signal can be specified.

External

This function is only available if the centrifuge is equipped with the option for the input and output of data (external signal, floating switch) (see 6.4.4.5).

System

The following system data are displayed:

- Cycles
- Info
- Sensor



Info

In the menus "Cycles", "Info", and "Sensor", the values can neither be entered nor changed.

6.4.3.9 Help menu

The help menu provides short descriptions of the control elements of the selected option.

Activating/deactivating the help function

- Select the question mark in the menu bar and confirm it. Parameters can be changed when the help function is activated.
- Quit the help function by selecting the question mark again.

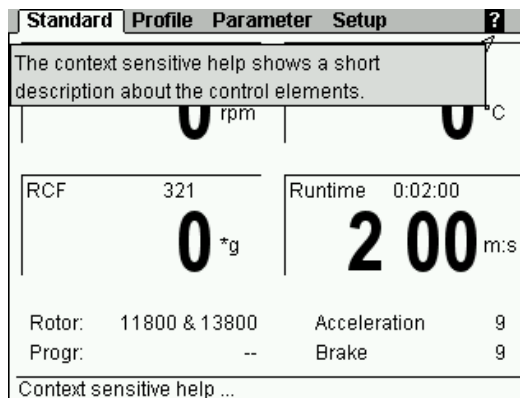


Fig.6.37: Help menu

6.4.3.10 Changing the Contrast

- Press and hold the stop key and turn the function knob one notch to the left. A dialog box will be displayed.
- Adjust the contrast of the centrifuge display and confirm the change.

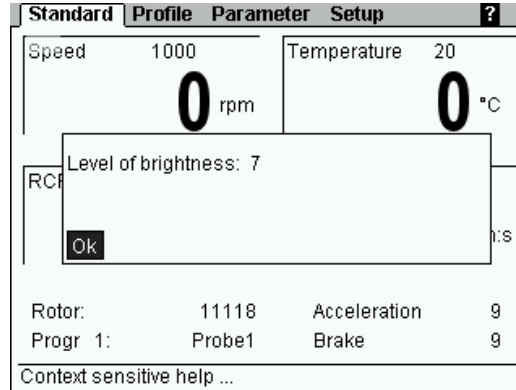


Fig.6.38: Dialog box for changing the contrast

6.4.3.11 Modification of Parameter Values during the Centrifugation Run

(see 6.4.3.4 “Selection, Display, and Modification of Data”):

Modification possible	Modification impossible	(De-)Activating possible
Speed	Rotor	Continuous run
RCF	Program	Standstill cooling
Runtime	Radius	Start delay
Temperature	Density	Automatic lid opening function
Acceleration curve (except for free curves)		
Deceleration curve (brake)		

Parameter changes concerning the speed, RCF, and time do not refer to acceleration or deceleration processes, but rather to the run phase.

6.4.4 Program Mode

A program contains all data that are required for a centrifuge run.



Attention: Temperature profiles cannot be created!

With a program, certain sedimentation results can be repeated under identical conditions.

Programs can be loaded, executed, modified, and deleted at any time.

A maximum of 60 programs can be stored under the numbers 1 - 60. The rapid cooling program "RAPID_TEMP" does not occupy any storage location and cannot be deleted. It is used to cool the centrifuge without vessels.

"--" means that the values that are currently set are not a stored program.

The programs can be protected against unauthorised use, modification, or deletion with the aid of a code (see 0 "Parameter Menu").

6.4.4.1 Loading a Program

- Select the option "Progr" from the "Standard" menu and confirm the selection. The program selection list will be displayed.
- Select the desired program from the list and confirm the selection.

The program is now loaded.

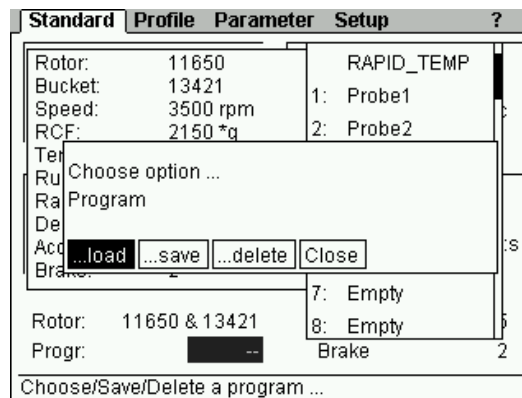


Fig. 6.39: Loading a program

6.4.4.2 Saving a Program

- Enter the parameters that are to be included in the program.
- Select the option „Progr“ and confirm the selection. The program selection list will be displayed.
- Select a storage location from the program selection list.
- Save the program under the desired name. The characters can be entered when the cursor flashes in the text field. Turn the function knob in order to select a character and press it to confirm the selection. Then, press the knob again in order to enter the next characters. The maximum number of characters is 19.
- When the program name is complete, select the option “save” and confirm it.

The program is now saved.

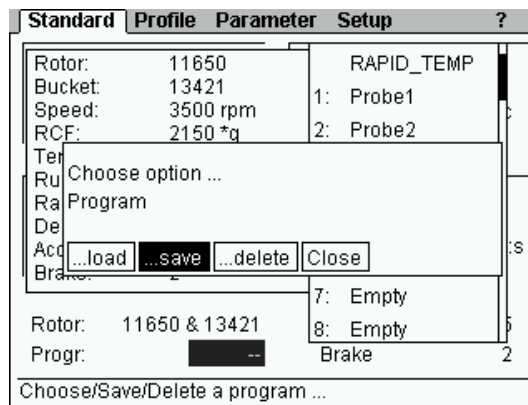


Fig. 6.40: Saving a program

6.4.4.3 Deleting a Program

- Select the option „Progr“ and confirm the selection. The program selection list will be displayed.
- Select the desired program.
- Select the option "Delete" and confirm it.

The program is now deleted.

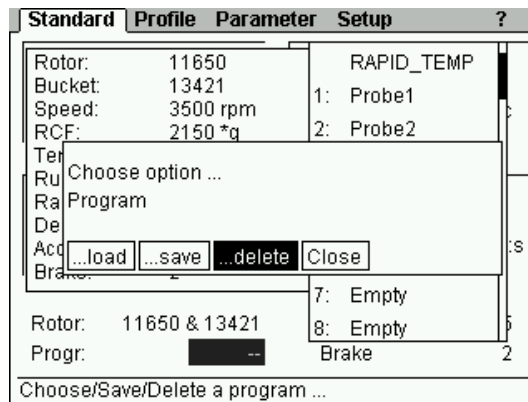


Fig. 6.41: Deleting a program

6.4.4.4 Automatic Program Rotation

With the program rotation, programs can be run directly one after another.

- Select "Program rotation" in the "Setup" menu.

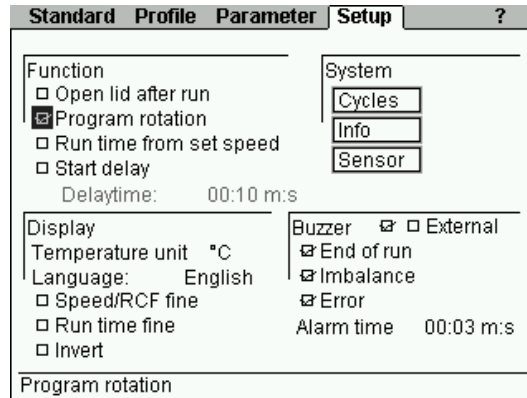


Fig. 6.42: Program rotation function

The current program is loaded and can be started. After the end of the run, the next program will be loaded and started automatically. The rotation ends with the first empty location and restarts from the beginning:

- Example 1: Loading of sample 1
Rotation: sample 1, sample 2, sample 3, sample 1,...
- Example 2: Loading of sample 2
Rotation: sample 2, sample 3, sample 2,...

While the program rotation is active, an arrow is displayed in the program field (see Fig. 6.43).

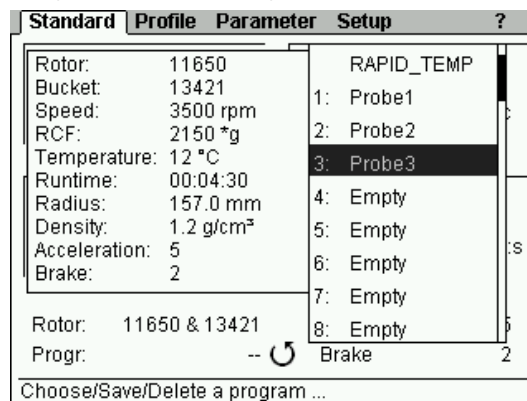


Abb. 6.43: Automatic program rotation

6.4.4.5 Options for Data Input and Output (can be retrofitted)

- Connection for a serial interface
- External signal active DC 24V, 0.5A max. (part no. 17701)
- Floating switch AC 250V max. 6A (part no. 17702)

6.5 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 on the front of the right side.

7 Malfunctions and Error Correction

7.1 General Malfunctions

Malfunctions are indicated by a dialogue box. If the sound signal is activated, it sounds when the error message is displayed.

- Eliminate the source of the problem (see tables in fig. 7.1 and 7.3).
- Acknowledge the error messages by pressing the knob.



Only Spincontrol Comfort:

Error messages that are caused by the power circuit board are marked with a "P" in front of the error code.



Only Spincontrol Professional:

Error messages can be eliminated by pressing the lid key. The error itself will not be eliminated, but the centrifuge can be operated again.

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
	Fuses have tripped	Reactivate temperature fuse (see 5.4.1 "Connection")
	Mains power switch off	Switch mains power switch on
	Lid is not closed correctly	Close lid.
Centrifuge cannot be started: Start key LED is not illuminated	Several	Power off/on. If the error occurs again, contact service
Centrifuge cannot be started: Lid key LED flashes	The lid lock is not closed correctly	Open and close lid. If the error occurs again, contact service
Centrifuge decelerates during operation	Brief mains power failure	Press start key in order to restart the centrifuge
	System error	Power off/on. If the error occurs again, contact service
Centrifuge decelerates during operation, imbalance dialogue box is displayed	- improper loading - Centrifuge is inclined - Drive problem - centrifuge was moved during run	Balance loading and restart the centrifuge. If the error occurs again, contact service
	- ungreased load-bearing bolts	Clean and grease load-bearing bolts

Lid cannot be opened	Lid lock has not released	Unlock the lid manually (see 7.1.1) and contact service
	Lid seal sticks	Clean the lid seal and apply talcum powder
Temperature value cannot be reached	Condenser dirty	Clean the condenser. If the error occurs again, 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.

- Switch off the mains power switch and disconnect the power cord from the socket.
- Remove the plug (1) at the right side of the centrifuge, e.g. with a screw driver (see fig. 7.2).
- First, pull the red string to release the mechanism and then unlock the lid lock by pulling the white string.
- Then, reinsert the plug and quit the error message by switching the centrifuge off/on. Approximately 10 seconds after quitting the lid can be closed again.



The lid may only be unlocked and opened when the rotor is at a standstill.

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



Fig. 7.2: Position of the opening for the emergency lid release

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. 7.3: Error codes



Info

If it is impossible to eliminate the errors, contact the service (see 7.3)!

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, Buckets and Multiple Carriers

Rotors, buckets, and multiple carriers 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 and multiple carriers.
 - 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).
 - Grease the rotor tie-down screw after cleaning with grease for load-bearing bolts (part no. 70284).

8.1.4 Load-bearing Bolts

Only greased load-bearing bolts ensure the even swinging of the buckets, and therefore, the quiet run of the centrifuge. Non-greased bolts can lead to a system shut-down due to imbalances.

- Apply a small quantity of grease (part no. 70284) to the load-bearing bolts of the rotor and the buckets after each cleaning.

8.1.5 Glass Breakage



Caution

- In the case of glass breakage, immediately remove all glass particles (e.g. with a vacuum cleaner). Replace the rubber cushions since even thorough cleaning will not remove all glass particles.

Glass particles will damage the surface coating (e.g. anodizing) of the buckets, which will then lead to corrosion.

Glass particles in the rubber cushions of the buckets will cause glass breakage again.

Glass particles on the pivot bearing of the load-bearing bolts prevent the buckets and carriers from swinging evenly, which will cause an imbalance.

Glass particles in the rotor chamber will cause metal abrasion due to the strong air circulation. This metal dust will not only pollute the rotor chamber, rotor, and materials to be centrifuged but also damage the surfaces of the accessories, rotors, and rotor chamber.

In order to completely remove the glass particles and the metal dust from the rotor chamber:

- Grease the upper third of the rotor chamber with e.g. Vaseline.
- Then, let the rotor rotate for a few minutes at a moderate speed (approximately 2,000 rpm). The glass and metal particles will now collect at the greased part.
- Remove the grease with the glass and metal particles with a cloth.
- If necessary, repeat this procedure.

8.1.6 Condenser

In order to cool the refrigerant that is compressed by the refrigeration unit, a lamellar condenser is used. It is cooled by air.

Dust and dirt obstruct the cooling flow of air. Dust on condenser pipes and lamellas reduces the heat exchange and thus the performance of the refrigeration unit. This is why the installation site should be as clean as possible.

- Check the condenser at least once a month for dirt and clean it if necessary.
- If you have any queries, please contact service (see 7.3 "Service Contact").

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.



If the form does not include a description of the malfunction, neither a refund nor a credit note can be issued. In this case, we reserve the right to dispose of the parts or to return them to you both at your expense.

- 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:	3-18K
Electr. Connection: Protection class: IP Code:	see name plate I 20
Connected load (kVA): Power consumption (kW): Max. current consumption (A):	1.35 1.01 5.5 (at 220-240 V / 50-60 Hz) 6.1 (at 208 V / 60 Hz) 6.8 (at 200 V / 50-60Hz) 11 (at 120 V / 60 Hz)
<u>Performance data</u> Max. speed (rpm): Max. capacity (ml): Max. gravitational field (x g): Max. kin. energy (Nm):	18 000 1 000 30 076 22 997
<u>Other parameters</u> Time range: Spincontrol Comfort Spincontrol Professional Temperature range: Heater (Special equipment): Storage locations: Spincontrol Comfort Spincontrol Professional	short run, continuous run, 10 sec – 9 h 59 min 10 sec – 99 h 59 min -20 to +40°C -20 to +60°C 50 60
<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):	355 795 630 600 78 Class B < 65 (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 .
- Special equipment Heater: In order to reach the stated final temperature, the rotor and buckets must be preheated by running at approximately 1,500 rpm. The maximum rotor temperature that can actually be reached is $40\text{-}60^{\circ}\text{C}$, depending on the rotor and speed.

* 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)
11180	Swing-out rotor, 4 place, for buckets no. 13180, 13190, 13194	4 700	4 223/4 248
13194	Bucket for hexagon adapters no. 18309 - 18312, for culture tubes 15 and 50 ml, 1 set = 2 pcs. radius max. 16.8 cm, radius min. 6.6 cm	4 700	4 149
18310	Hexagon carrier for 4 culture tubes 50 ml, e.g. no. 15151, 1 set = 2 pcs.		
18311	Hexagon carrier for 10 culture tubes 15 ml, e.g. no. 15115, 1 set = 2 pcs.		
13180	Rectangular bucket, for rectangular carriers no. 18000 - 18200, sealable with cap no. 17112, max. tube length 115 mm, 1 set = 2 pcs. radius max. 17.1 cm, radius min. 7.6 cm	4 700	4 223
17112	Rectangular polysulfone sealing cap, clear, incl. 1 set clips no. 17118, 1 set = 2 pcs.		
18002	Rectangular carrier for 20 reaction vials 1.5/2.0 ml, max. Ø 11 mm, e.g. no. 15008, 15040, 1 set = 2 pcs.		
18003	Upper part for 18002 for + 20 reaction vials 1.5/2.0 ml, max. Ø 11 mm, e.g. no. 15008, 15040, 1 set = 2 pcs.		
18005	Rectangular carrier for 20 tubes approx. 5 ml, flat and round bottom, max. Ø 12.0 x 60 - 75 mm, e.g. no. RIA tube 15060, 1 set = 2 pcs.		
18007	Rectangular carrier for 20 tubes approx. 7 ml, flat and round bottom, max. Ø 12.3 x 80 - 105 mm, e.g. no. 15007, 15027, 1 set = 2 pcs.		
18009	Rectangular carrier for 20 round bottom tubes 5 - 6 ml, max. Ø 12.8 x 70 - 90 mm, e.g. no. Hemolyse, RIA tube 15060, 1 set = 2 pcs.		
18010	Rectangular carrier for 12 tubes 10 - 12 ml, flat and round bottom, max. Ø 16.8/17.5 x 60 - 85 mm, e.g. no. 15000, 15010, 15039, 1 set = 2 pcs.		
18012	Rectangular carrier for 12 tubes 6 - 7 ml, max. Ø 13.5/18 x 65 - 90 mm, e.g. Vacutainer, 1 set = 2 pcs.		
18015	Rectangular carrier for 12 tubes 10 - 15 ml, flat and round bottom, max. Ø 17 x 90 - 105 mm, e.g. no. 15015, 15020, 15022, 15023, 15024, 1 set = 2 pcs.		
18016	Rectangular carrier for 4 culture tubes 15 ml no. 15115, 1 set = 2 pcs.		
18017	Rectangular carrier for 10 tubes approx. 15 ml, max. Ø 17.5/19.5 x 80 - 112 mm, e.g. 15015, 15020, 15022, 15023, 15024, Monovettes 9 - 10 ml, 1 set = 2 pcs.		

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
18025	Rectangular carrier for 5 round bottom tubes approx. 25 ml, max. Ø 24 x 85 - 105 mm, e.g. no. 15025, 15026, 1 set = 2 pcs.		
18022	Rectangular carrier for 4 tubes 30 ml, flat bottom or skirt, max. Ø 25/31 x 65 - 95 mm, e.g. Sterilin tube 30 ml, Barloworld Scientific Ltd. , 1 set = 2 pcs.		
18030	Rectangular carrier for 5 round bottom tubes 27 - 30 ml, max. Ø 25.4/27.5 x 80 - 110 mm, e.g. no. 15029, 15030, 15032, 1 set = 2 pcs.		
18050	Rectangular carrier for 2 round bottom tubes, approx. 50 ml, max. Ø 35/38 x 85 - 110 mm, e.g. no. 15049, 15050, 15056, 1 set = 2 pcs.		
18051	Rectangular carrier for 2 round bottom tubes 40 - 50 ml, max. Ø 29/35 x 80 - 110 mm, e.g. no. 13055, 15051, 15052, 1 set = 2 pcs.		
18052	Rectangular carrier for 2 culture tubes 50 ml no. 15151, 1 set = 2 pcs.		
18053	Rectangular carrier for 2 culture tube 50 ml with skirt or flat bottom, max. Ø 29.4/36 x 90 - 120 mm, 1 set = 2 pcs.		
18085	Rectangular carrier for 1 round bottom tube 78 - 85 ml, max. Ø 38/40 x 85 - 112 mm, e.g. no. 13085, 15076, 15080, 1 set = 2 pcs.		
18100	Rectangular carrier for 1 round bottom tube approx. 100 ml, max. Ø 45.5/48 x 85 - 110 mm, e.g. no. 15100, 15102, 15103, 15106, 1 set = 2 pcs.		
18105	Rectangular carrier for 20 tubes approx. 5 ml, flat and round bottom, decantable, max. Ø 12.0 x 60 - 75 mm, e.g. no. RIA tube 15060, 1 set = 2 pcs.		
18107	Rectangular carrier for 20 tubes approx. 7 ml, flat and round bottom, decantable, max. Ø 12.3 x 80 - 105 mm, e.g. no. 15007, 15027, 1 set = 2 pcs.		
18115	Rectangular carrier for 12 glass tubes 10 - 15 ml, decantable, max. Ø 17 x 90 - 105 mm, e.g. no. 15015, 15020, 15022, 15023, 15024, 1 set = 2 pcs.		
18125	Rectangular carrier for 1 bottle 125 ml with flat bottom and screw cap, max. Ø 51 x 90 - 120 mm, e.g. no. 15125, 1 set = 2 pcs.		
18200	Rectangular carrier for 1 bottle with flat bottom and screw cap 200 ml, max. Ø 57 x 90 - 115 mm, e.g. no. 15202, 1 set = 2 pcs.		
11181	Swing-out rotor 48 x 15 ml complete, no. 11180, incl. 2 sets rectangular buckets no. 13180, 2 sets rectangular carriers no. 18015 and 48 PPCO-tubes 15 ml no. 15023 radius max. 17.1 cm, radius min. 7.6 cm	4 700	4 223

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
11182	Swing-out rotor 12 x 50 ml culture tubes complete, no. 11180, incl. 2 sets buckets no. 13190, 2 sets adapters no. 17346 and 12 tubes no. 15151, radius max. 17.2 cm, radius min. 7.5 cm	4 700	4 248
13190	Round bucket, sealable with cap no. 17190, suitable for round carriers Ø 85 mm (no. 17344 – 17400, 17402 without cap), max. tube length 110 mm, 1 set = 2 pcs., radius max. 17.2 cm, radius min. 7.5 cm	4 700	4 248
17190	Round polysulfone sealing cap, clear, 1 set = 2 pcs.		
17350	Round carrier for 24 reaction vials 0.5/0.75 ml, max. Ø 8/10 x 28/31 mm, e.g. no. 15005, 1 set = 2 pcs.		
17351	Round carrier for 12 flat bottom tubes 4 - 7 ml, flat bottom, max. Ø 15.5/18 x 50 - 75 mm, e.g. Monovettes 4 ml, 1 set = 2 pcs.		
17352	Round carrier for 25 round bottom tubes 5 ml, max. Ø 12.5/13.5 x 65 - 80 mm, e.g. no. 15060, RIA tubes, hemolyse tubes, 1 set = 2 pcs.		
17353	Round carrier for 20 reaction vials 1.5/2.0 ml, max. Ø 11 mm, e.g. no. 15008, 15040, 1 set = 2 pcs.		
17354	Round carrier for 16 round bottom tubes 7 ml, max. Ø 12.5 x 85 - 115 mm, e.g. no. 15007, 15027, 1 set = 2 pcs.		
17355	Round carrier for 12 round bottom tubes 10 - 12 ml, max. Ø 16.2/19 x 65 - 90 mm, e.g. no. 15000, 15010, 15039, 1 set = 2 pcs.		
17356	Round carrier for 16 round bottom tubes 5 - 6 ml, max. Ø 13.5/17.5 x 70 - 90 mm, e.g. no. RIA tube 15060, Vacutainer, hemolyse tubes, 1 set = 2 pcs.		
17358	Round carrier for 12 round bottom tubes 10 - 15 ml, max. Ø 17.2/19.5 x 90 - 115 mm, e.g. no. 15015, 15020, 15022, 15023, 15024 and Monovettes 9 - 10 ml, 1 set = 2 pcs.		
17345	Round carrier for 5 culture tubes 15 ml, e.g. no. 15115, 1 set = 2 pcs.		
17362	Round carrier for 5 tube 30 ml, flat bottom or skirt, max. Ø 25/31 x 65 - 95 mm, e.g. Sterilin tube 30 ml, Barloworld Scientific Ltd. , 1 set = 2 pcs.		
17370	Round carrier for 5 round bottom tubes 25 - 30 ml, max. Ø 25.4/29 x 85 - 115 mm, e.g. no. 15025, 15026, 15029, 15030, 15032, 15033, 1 set = 2 pcs.		
17375	Round carrier for 3 round bottom tubes 50 ml, max. Ø 35/38 x 90 - 110 mm, e.g. no. 15049, 15050, 15056, 1 set = 2 pcs.		
17376	Round carrier for 4 round bottom tubes with screw cap 40 - 50 ml, max. Ø 29/34 x 85 - 110 mm, e.g. no. 15051, 15052, (13055 with 13350/13550 only), 1 set = 2 pcs.		
17346	Round carrier for 3 culture tubes 50 ml, e.g. no. 15151, 1 set = 2 pcs.		

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
17344	Round carrier for 3 culture tubes 50 ml with skirt or flat bottom, max. Ø 29.4/36 x 90 - 120 mm, 1 set = 2 pcs.		
17385	Round carrier for 1 tube 78 - 85 ml, max. Ø 38/40 x 85 - 115 mm, e.g. no. 13085, 15076, 15080, 1 set = 2 pcs.		
17390	Round carrier incl. rubber cushion no. 16051, for 1 round bottom tube 100 ml, max. Ø 45/50 x 85 - 110 mm, e.g. no. 15100, 15102, 15103, 15106, 1 set = 2 pcs.		
17393	Round carrier for 1 bottle 175 - 250 ml with pointed bottom angle 60°, max. Ø 61.5 x 120 - 165 mm, e.g. no. 15174, 15175, Corning tubes, 1 set = 2 pcs.		
17395	Round carrier for 1 bottle with flat bottom 125 ml, max. Ø 51 x 90 - 115 mm, e.g. no. 15125, 1 set = 2 pcs.		
17400	Round carrier for 1 bottle with flat bottom 200 ml, max. Ø 57 x 90 - 115 mm, e.g. no. 15202, 1 set = 2 pcs.		
17347	Round carrier for 1 bottle with flat bottom, 250 ml, max. Ø 61.5 x 90 - 125 mm, e.g. no. 15247, 15249; (13255 with 13350/13550 only), 1 set = 2 pcs.		
17401	Round carrier incl. rubber cushion no. 16250 for 1 round bottom tube 175 - 250 ml, max. Ø 57.5 x 90 - 137 mm with 13350 and 150 mm with 13550, e.g. no. 15201, 15206, 15250, 15251, 15254, 1 set = 2 pcs.		
11240	Swing-out rotor for microtiter plates, incl. 1 set buckets no. 13145 and plate holder no. 17977, radius corner 12.7 cm, radius max. 11 cm, radius min. 4.6 cm max. height of plates 64 mm	4 700	3 136 2 716 1 136
11222	Swing-out rotor for microtiter plates, incl. 1 set carriers no. 13222, radius corner 12.3 cm, Radius max. 10.5 cm, Radius min. 6.5 cm max. height of plates 56 mm	3 000	1 238 1 057 654
11133	Swing-out rotor, 4 place, for buckets no. 13104, 13130	5 500	5 445
13130	Bucket, suitable for 3 culture tubes 15 ml no. 15115, sealable with cap no. 17109, 17111, 1 set = 2 pcs.		
13104	Round bucket, sealable with caps no. 17109 and 17111, suitable for round carriers Ø 56.5 no. 17000 - 17101 and bottles 200 ml no. 15202, max. tube length 110 mm, 1 set = 2 pcs. radius max. 16.1 cm, radius min. 5.7 cm	5 500	5 445
17109	Round aluminium sealing cap, 1 set = 2 pcs.		
17111	Round polysulfone sealing cap, clear, 1 set = 2 pcs.		
17006	Round carrier for 12 tubes approx. 5 ml, round and flat bottom, max. Ø 12.5 x 55 - 75 mm, e.g. no. RIA tube 15060, hemolyse, 1 set = 2 pcs.		

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
17007	Round carrier for 12 tubes 7 ml, max. Ø 12.3 x 90 - 105 mm, e.g. no. 15007, 15027, 1 set = 2 pcs.		
17008	Round carrier for 12 reaction vials 1.5/2.0 ml, max. Ø 11 mm, e.g. no. 15008, 15040, 1 set = 2 pcs.		
17027	Round carrier for 7 round bottom tubes 5 - 7 ml, max. Ø 13.5/17.5 x 65 - 90 mm, e.g. Vacutainer, 1 set = 2 pcs.		
17012	Round carrier for 6 tubes approx. 10 ml, max. Ø 16.5/17.5 x 58 - 90 mm, e.g. no. 15000, 15010, 15039, 1 set = 2 pcs.		
17015	Round carrier for 7 tubes 10 - 15 ml, round and flat bottom, max. Ø 16.8 x 90 - 105 mm, e.g. no. 15015, 15023, 15024, 1 set = 2 pcs.		
17018	Round carrier for 4 tubes 9 - 15 ml, round and flat bottom, max. Ø 17/20 x 90 - 110 mm, e.g. no. 15015, 15020, 15022, 15023, 15024, Monovettes 9 - 10 ml, 1 set = 2 pcs.		
17019	Round carrier for 3 culture tubes 15 ml no. 15115, only without cap 17111 or 17109, 1 set = 2 pcs.		
17025	Round carrier for 2 round bottom tubes 25 ml, max. Ø 24.5 x 90 - 105 mm, e.g. no. 15025, 15026, 15033, 1 set = 2 pcs.		
17032	Round carrier for 1 tube 30 ml, flat bottom or skirt, max. Ø 25/31 x 65 - 95 mm, e.g. Sterilin tube 30 ml, Barloworld Scientific Ltd. , 1 set = 2 pcs.		
17030	Round carrier for 2 round bottom tubes 25 - 30 ml, max. Ø 25.4/27.5 x 85 - 110 mm, e.g. no. 15025, 15026, 15029, 15030, 15032, 15033, 1 set = 2 pcs.		
17049	Round carrier for 1 culture tube 50 ml no. 15151, 1 set = 2 pcs.		
17050	Round carrier for 1 round bottom tube 50 ml, max. Ø 35/38 x 85 - 110 mm, e.g. no. 15049, 15050, 15056, 1 set = 2 pcs.		
17052	Round carrier for 1 round bottom tube 40 - 50 ml, max. Ø 29/35 x 85 - 115 mm, e.g. no. 13055, 15051, 15052, 1 set = 2 pcs.		
17085	Round carrier for 1 round bottom tube 78 - 85 ml, max. Ø 38/40 x 85 - 112 mm, e.g. no. 13085, 15076, 1 set = 2 pcs.		
17100	Round carrier for 1 round bottom tube approx. 100 ml, max. Ø 45.5 x 85 - 105 mm, e.g. no. 15100, 15103, 15106, 1 set = 2 pcs.		
17101	Round carrier for 1 round bottom tube 100 ml, max. Ø 45.5 x 85 - 105 mm, e.g. no. 15100, 15102, 15102, 15103, 15106, 1 set = 2 pcs.		
17125	Adapter for 1 bottle with flat bottom and screw cap 125 ml, max. Ø 51 x 90 - 120 mm, e.g. no. 15125, 1 set = 2 pcs.		

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
11132	Swing-out rotor 28 x 15 ml complete, no. 11133, incl. 2 sets buckets no. 13104, 2 sets round carriers no. 17015 and 28 PS-tubes 15 ml no. 15023 radius max. 14.9 cm, radius min. 5.7 cm	5 500	5 039
11224	Swing-out rotor 24 x 1.5 / 2.0 ml, incl. 3 sets buckets no. 13124, for e.g. reaction vials no. 15008, 15040, incl. hermetic aluminium lid no. 17878, the buckets with the slides can be locked in a 90° position at standstill, radius max. 11.3 cm	3 000	1 137
11136	Drum rotor for 6 cassettes no. 14000, 14002, 14020, 14021, for reaction vials (max. 60/192 pcs.), incl. lid no. 17826, radius max. 7 cm, radius min. 3 cm Attention: at speeds above 13,000 rpm, the vials may be damaged!	14 500	16 454
14000	Casset, suitable for 20 reaction vials 0.25/0.4 ml no. 15014, 1 set = 2 pcs.		
14002	Casset, suitable for 10 reaction vials 1.5/2.0 ml, e.g. no. 15008, 15040, 1 set = 2 pcs.		
14020	Casset, suitable for 10 PCR-vials 0.2 or 0.5 ml, 1 set = 2 pcs.		
14021	Casset, suitable for 32 PCR-tubes 0.2 ml, e.g. no. 15042 or 4 strips with max. 8 tubes 0.2 ml, 1 set = 2 pcs.		
11135	Swing-out rotor 24 x 1.5/2.0 ml, incl. 3 sets buckets no. 13124, for e.g. reaction vials no. 15008, 15040, incl. hermetic aluminium lid no. 17879, radius max. 7.4 cm, radius min. 3.5 cm	14 000	16 215
12154	Angle rotor 24 x 1.5/2.0 ml, for e.g. reaction vials no. 15008, 15040, incl. hermetic aluminium lid no. 17829, radius max. 8.2 cm, radius min. 5 cm, angle 45°	18 000	29 703
12131	Angle rotor 30 x 1.5/2.0 ml, for e.g. reaction vials no. 15008, 15040, incl. hermetic aluminium lid no. 17848, radius max. 10 cm, radius min. 6,7 cm, angle 45°	16 400	30 070
12349	Angle rotor 48 x 1.5/2.0 ml, for reaction vials, e.g. no. 15008, 15040, incl. aluminium hermetic lid no. 17349, max. radius 10.0 cm, min. radius 6.5 cm	14 000	21 913
12115	Angle rotor, for 12 PCR-strips with 8 tubes 0.2 ml, e.g. no. 15042, incl. hermetic aluminium lid no. 17875, radius max. 9.8 cm, radius min. 7.2 cm, angle 45°	16 400	21 650/ 29 468
12111	Angle rotor 10 x 10 ml, for tubes no. 15000, 15010, 15039, incl. hermetic aluminium lid no. 17835, radius max. 7.6 cm, radius min. 2,8 cm, angle 35°	18 000	27 530
12157	Angle rotor 20 x 10 ml, for tubes e.g. no. 15000, 15010, 15039, incl. hermetic aluminium lid no. 17841, radius max. 9.8 cm, radius min. 5.9 cm, angle 25°	10 000	10 956
12171	Angle rotor for 12 x 15 ml culture, e.g. no. 15115, incl. hermetic aluminium lid no. 17872, radius max. 9.9 cm, radius min. 4.3 cm, angle 25°	13 500	20 172

Part no.	Description	Max. speed (rpm)	Max. gravitational field (x g)
12158	Angle rotor 6 x 30 ml, for tubes e.g. no. 15029, 15030, 15032, incl. hermetic aluminium lid no. 17842, Radius max. 7.9 cm, radius min. 2.1 cm, angle 30°	18 000	28 616
13059	Adapter for 1 round bottom tube 10 ml, max. Ø 16.2/19 x 75 - 85 mm, e.g. no. 15000, 15010, 15039, 1 set = 2 pcs.		
12150	Angle rotor 6 x 50 ml, for tubes e.g. no. 13055, 15051, 15052, incl. hermetic aluminium lid no. 17837, radius max. 8.4 cm, radius min. 2.1 cm, angle 25°	14 600	20 018
12156	Angle rotor 8 x 50 ml, for tubes e.g. no. 13055, 15051, 15052, incl. hermetic aluminium lid no. 17840, radius max. 9.6 cm, radius min. 3.3 cm, angle 25°	13 800	20 440
19776	Angle rotor for 6 x 50 ml culture, e.g. no. 15151, incl. hermetic aluminium lid no. 17831, radius max. 9.3 cm, radius min. 3.1 cm, angle 25°	14 000	20 379
13060	Adapter for 1 culture tube 15 ml no. 15115, 1 set = 2 pcs.		
13062	Adapter for 1 Greiner tube 15 ml, Ø 17/22 x 95 - 100 mm, 1 set = 2 pcs.		
13079	Bottomadapter for 1 tube 50 ml, e.g. no. 15051, 15052, 1 set = 2 pcs.		
12155	Angle rotor 4 x 80/85 ml, for tubes e.g. no. 13085, 15076, 15080, incl. hermetic aluminium lid no. 17839, radius max. 9.1 cm, radius min. 1.4 cm, angle 30°	14 500	21 390
12159	Angle rotor 6 x 85 ml, for tubes e.g. no. 13085, 15076, 15080, incl. hermetic aluminium lid no. 17843, radius max. 9.8 cm, radius min. 2.8 cm, angle 25°	11 400	14 239
13080	Adapter for 1 culture tube 50 ml, e.g. no. 15151, 1 set = 2 pcs.		
13081	Adapter for 1 culture tube 15 ml, e.g. no. 15115, 1 set = 2 pcs.		
13082	Adapter for 1 tube 50 ml, max. Ø 28.8 x 105 - 115 mm, e.g. no. 13055, 15051, 15052, 1 set = 2 pcs.		
13083	Adapter for 1 tube 30 ml, max. Ø 25.5 x 90 - 100 mm, e.g. no. 15029, 15030, 15032, 1 set = 2 pcs.		
13084	Adapter, for 2 tubes 10 ml, Ø 16/17.5 x 75 - 90 mm, e.g. no. 15000, 15010, 15039, 1 set = 2 pcs.		

Adapters, steel tubes and plastic tubes

Part no.	Description
13000	Adapter for reaction vials 0.25/0.4 ml no. 15014, suitable for 12110, 12131, 12154, 12349, 14002, 17008, 18002, 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, suitable for 12110, 12131, 12154, 12349, 14002, 17008, 18002, Polyallomer, 1 set = 2 pcs.
13021	Adapter for PCR-tube 0.2 ml, e.g. no. 15042, suitable for 12110, 12131, 12154, 12349, 14002, 17008, 18002, Polyallomer, 1 set = 2 pcs.
13062	Adapter for 1 Greiner tube 15 ml, Ø 17/22 x 95 - 100 mm, 1 set = 2 pcs., suitable for 12150, 12159
15005	Reaction vials 0.5 ml, 100 pcs. per pack, suitable for 13002, 17350
15008	Reaction vials 1.5 ml, 100 pcs. per pack, suitable for 12110, 12131, 12154, 12349, 14002, 17008, 17353, 18002
15040	Reaction vials 2.2 ml, 100 pcs. per pack, suitable for 12110, 12131, 12154, 12349, 14002, 17008, 17353, 18002
15014	Reaction vials made of polypropylene 0.4 ml, 100 pcs. per pack, suitable for 13000, 14000
15060	Polystyrene tube 5 ml (RIA), Ø 12 x 75 mm, suitable for 17006, 17356, 18005, 18009
15000	Polyfluor tube 10 ml, Ø 16.1 x 81.1 mm, incl. screw cap, suitable for 12111, 12157, 13084, 17012, 17355, 18010
15010	Polycarbonate tube 10 ml, Ø 16.1 x 81.1 mm, incl. screw cap, suitable for 12111, 12157, 13084, 17012, 17355, 18010
15039	Polypropylene Co-Polymer (PPCO) tube 10 ml, Ø 16.1 x 81.1 mm, incl. screw cap, suitable for 12111, 12157, 13084, 17012, 17355, 18010
15020	Polystyrene tube 14 ml, Ø 17 x 100 mm, max. 4.500 x g, suitable for 17358, 18015, 18115
15021	Polypropylene stopper for tubes no. 15020, 15023
15023	Polypropylene Co-Polymer (PPCO) tube 14 ml, Ø 17 x 100 mm, suitable for 17015, 17358, 18015, 18115
15115	Culture tube Nunc, 15 ml, pointed bottom, polypropylene, incl. screw cap Ø 23 mm, suitable for 13060, 13081, 13130, 17019, 17345, 18016
15029	Polyfluor tube 28 ml, Ø 25.3 x 96 mm, incl. screw cap, suitable for 12158, 13083, 17030, 17370, 18030
15030	Polycarbonate tube 30 ml, Ø 25.3 x 98 mm, incl. screw cap, suitable for 12158, 13083, 17030, 17370, 18030
15032	Polypropylene Co-Polymer (PPCO) tube 27 ml, Ø 25.3 x 97 mm, incl. screw cap, Ø 25,3 x 97 mm, suitable for 12158, 13083, 17030, 17370, 18030
15049	Polycarbonate tube 65 ml, Ø 34 x 100 mm, graduated 1 up to 50 ml in 1 ml increments, suitable for 17050, 17375, 18050
13055	Stainless steel tube 50 ml, Ø 28.5 x 101.5 mm, sealable with cap no. 17054, suitable for 12150, 12156, 13082, 17052, 17376, 18051
17054	Stainless steel sealing cap, suitable for 13055
15051	Polyfluor tube 38 ml, Ø 28.5 x 107 mm, incl. screw cap, suitable for 12150, 12156, 13079, 13082, 17052, 17376, 18051
15052	Polypropylene Co-Polymer (PPCO) tube 42 ml, Ø 28.8 x 107 mm, incl. screw cap, suitable for 12150, 12156, 13079, 13082, 17052, 17376, 18051

Part no.	Description
15151	Culture tube Nunc, 50 ml, pointed bottom, polypropylene, incl. screw cap, suitable for 13080, 17049, 17346, 18052, 19776
13085	Stainless steel tube 85 ml, Ø 38 x 103 mm, sealable with cap no. 17185, suitable for 12155, 12159, 17085, 17385, 18085
17185	Round stainless steel sealing cap, suitable for 13085
15076	Polypropylene Co-Polymer (PPCO) tube 78 ml, Ø 38 x 112 mm, incl. screw cap, suitable for 12155, 12159, 17085, 17385, 18085
15080	Polyfluor tube 81 ml, Ø 38 x 112 mm, incl. screw cap, suitable for 12155, 12159, 17085, 17385, 18085
15102	Polypropylene tube 120 ml, Ø 45 x 100 mm, suitable for 17101, 17390, 18100
15103	Polycarbonate tube 110 ml, Ø 45 x 100 mm, graduated 2 up to 100 ml in 2 ml increments, suitable for 17100, 17101, 17390, 18100
15125	Polypropylene bottle 125 ml, Ø 51 x 99 mm, incl. screw cap, suitable for 17125, 17395, 18125
15202	Polypropylene Co-Polymer (PPCO) bottle 190 ml, Ø 56 x 112 mm incl. screw cap, suitable for 13104, 17400, 18200
13255	Stainless steel bottle 250 ml, Ø 61.4 x 125 mm, sealable with cap no. 17256, suitable for 17347
17256	Round stainless steel sealing cap, suitable for 13255
15247	Polyfluor bottle 250 ml, Ø 61.4 x 122 mm, incl. screw cap, suitable for 17347
15249	Polypropylene Co-Polymer (PPCO) bottle 250 ml, Ø 61.4 x 125 mm, incl. screw cap, suitable for 17347

Centrifuge Glass Tubes

Part no.	Description
15007	Centrifuge glass tube 6 ml, max. 4.000 x g, Ø 12 x 100 mm, suitable for 17007, 17354, 18007, 18107
15027	Centrifuge glass tube 7 ml, max. 4.000 x g, Ø 12 x 100 mm, graduated 1 up to 7 ml in 0.5 ml increments, suitable for 17007, 17354, 18007, 18107
15015	Centrifuge glass tube 10 - 12 ml, max. 4.000 x g, Ø 16 x 100 mm, suitable for 17015, 17358, 18015, 18115
15024	Centrifuge glass tube 12 ml, max. 4.000 x g, Ø 16 x 100 mm, graduated 0.1 ml up to 10 ml in 0.1 ml increments, suitable for 17015, 17358, 18015, 18115
15022	Glass tube 13.5 ml, max. 4.000 x g, Ø 17 x 110 mm, suitable for 12150, 12156 with 16018 and in 12155, 12159 with 16019
15025	Centrifuge glass tube 26 ml, max. 4.000 x g, Ø 24 x 100 mm, suitable for 17025, 18025
15026	Centrifuge glass tube 27 ml, max. 4.000 x g, Ø 24 x 100 mm, graduated 2 up to 25 ml in 0.5 ml increments, suitable for 17025, 18025
15033	Glass tube 32 ml, max. 4.000 x g, Ø 24 x 105 mm, suitable for 12150, 12156 with 16030 and in 12155, 12159 with 16031
15050	Centrifuge glass tube 58 ml, max. 4.000 x g, Ø 34 x 100 mm, suitable for 17050, 17375, 18050
15056	Centrifuge glass tube 58 ml, max. 4.000 x g, Ø 34 x 100 mm, graduated 2 up to 50 ml in 2 ml increments, suitable for 17050, 17375, 18050

Part no.	Description
15100	Centrifuge glass tube 100 ml, max. 4.000 x g, Ø 44 x 100 mm, suitable for 17100, 17101, 17390, 18100
15106	Centrifuge glass tube 97 ml, max. 4.000 x g, Ø 44 x 100 mm, graduated 1 up to 97 ml in 1 ml increments, suitable for 17100, 17101, 17390, 18100
15201	Centrifuge glass tube 200 ml, max. 4.000 x g, Ø 56 x 112 mm, suitable for 17401
15206	Centrifuge glass tube 200 ml, max. 4.000 x g, Ø 56 x 113 mm, graduated 30 up to 150 ml in 2 ml increments, suitable for 17401

Further Accessories

Part no.	Description
16018	Rubber adapter for special glass tube 15 ml no. 15022 and for glass tube no. 15085, suitable for 12150, 12156, 1 set = 2 pcs.
16019	Rubber adapter for special glass tubes no. 15015, 15022 and 15085, suitable for 12155, 12159, 1 set = 2 pcs.
16030	Rubber adapter for glass tube no. 15025, 15033 and 15086, suitable for 12150, 12156, 1 set = 2 pcs.
16031	Rubber adapter for special glass tube 30 ml no. 15033, 15086, for glass tube 25 ml no. 15025, suitable for 12155, 12159, 1 set = 2 pcs.
16906	Rubber cushion for rectangular carrier 5 x 25 ml, suitable for 18025, 1 set = 2 pcs.
16907	Rubber cushion for rectangular carrier 2 x 50 ml, suitable for 18050, 1 set = 2 pcs.
16908	Rubber cushion for rectangular carrier 1 x 100 ml, suitable for 18100, 1 set = 2 pcs.
16909	Rubber cushion for rectangular carrier, suitable for 18005, 18007, 18015, 1 set = 2 pcs.
16910	Rubber cushion for round carriers 17006, 17007, 17012, 17015, 17025, 1 set = 2 pcs.
16911	Rubber cushion for round carriers 1 x 50 ml and 1 x 100 ml, suitable for 17050, 17100, 1 set = 2 pcs.
17112	Rectangular polysulfone sealing cap, clear, incl. 1 set clips no. 17118, suitable for 13180, 1 set = 2 pcs.
17111	Round polysulfone sealing cap, clear, suitable for 13104, 13130, 1 set = 2 pcs.
16251	Sealing ring 58 x 3 mm for bucket no. 13104, 1 set = 2 pcs.
17190	Round polysulfone sealing cap, clear, suitable for 13190, 1 set = 2 pcs.
17927	Table for centrifuge made of sheet-steel, varnished, with 2 doors and space for accessories, movable on lockable castors Dimensions: width 490 mm, depth 647 mm, height 497 mm

Further accessories available upon request.

Maximum speed for tubes

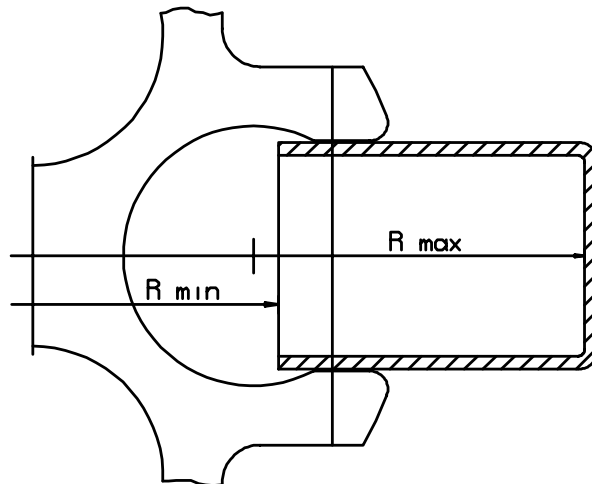
Some tubes, such as centrifuge glass tubes, microtubes, culture tubes, fluoropolymer tubes and especially high-volume tubes can be used in our rotors, buckets, and adapters at higher speeds than their breaking limit.

- Always fill the tubes up to their useful volume (= the volume that is stated for the tube).
- Attention: At speeds above 8,000 rpm, there is an increased risk of breakage, in particular for 250 ml bottles.
- When using glass tubes, the maximum value of 4,000 x g must not be exceeded (except special high-strength glass tubes; please refer to the information provided by the manufacturer).

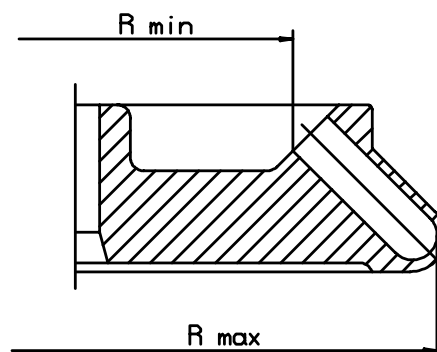
11.2 Grafical Representation of the Rotors

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 11.4.1 "RCF", page 84).

*Fig 11.1:
 Minimum and maximum radius of
 a swing-out rotor*



*Fig. 11.2:
 Minimum and maximum radius of
 an angle rotor*



11.3 Acceleration and Deceleration Curves

11.3.1 Linear Curves

The slope of the fixed acceleration curves defines the time that is required to accelerate the rotor by 1,000 rpm.

Linear as well as quadratic curves are numbered in the direction of increasing acceleration (from right to left).

The deceleration curves are inverted images of the acceleration curves and are assigned the same numbers. An exception is curve 0. It decelerates brakeless.

In general, the runtime, until the set speed is reached, depends on the moment of inertia of the rotor.

Linear slope (curves 0 - 9)

Curve 9 is a special case compared to the other curves. The centrifuge accelerates with maximum power. The runtime, until the set speed is reached, depends solely on the moment of inertia of the rotor.

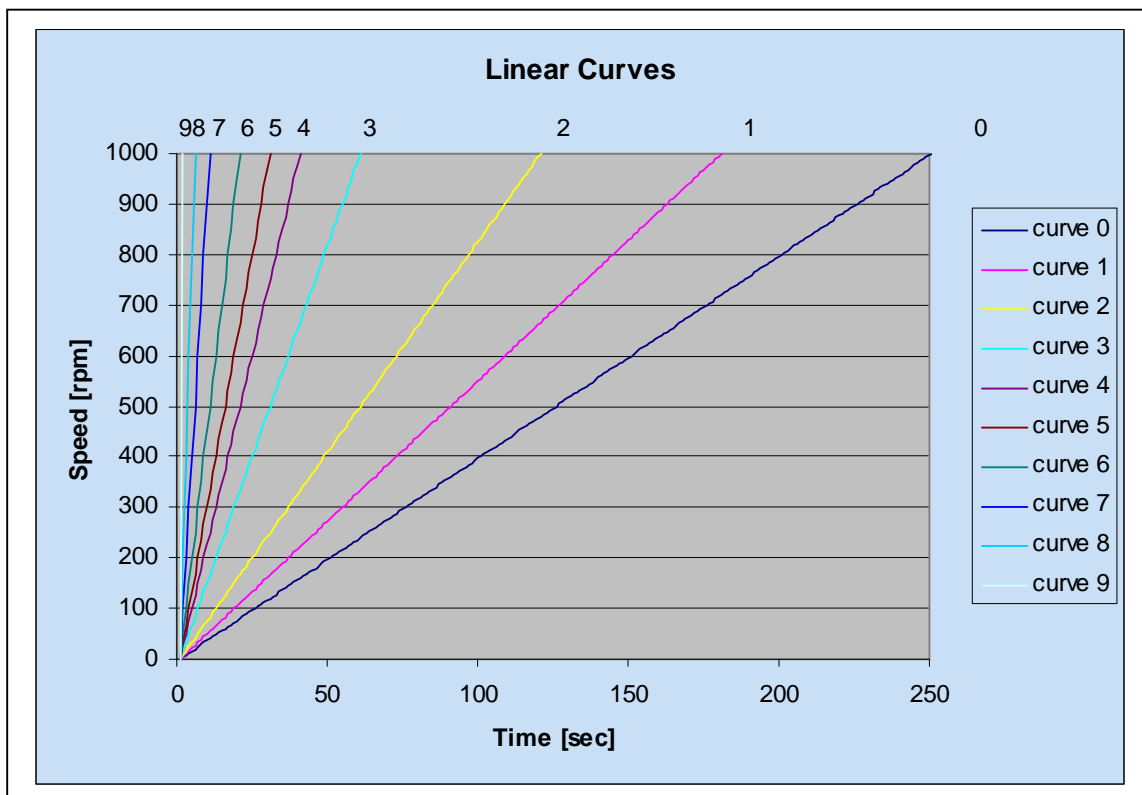


Fig. 11.3: Diagram of linear curves

Linear curve no.	Slope
0	4 [rpm / sec]
1	6 [rpm / sec]
2	8 [rpm / sec]
3	17 [rpm / sec]
4	25 [rpm / sec]
5	33 [rpm / sec]
6	50 [rpm / sec]
7	100 [rpm / sec]
8	200 [rpm / sec]
9	1000 [rpm / sec]

Fig. 11.4: Slope of linear curves

11.3.2 Quadratic Curves

The deceleration curves are inverted images of the acceleration curves and are assigned the same numbers.

Quadratic slope (curves 10 - 19)

Curve 19 is a special case compared to the other curves. The centrifuge accelerates with maximum power. The runtime depends solely on the moment of inertia of the rotor.

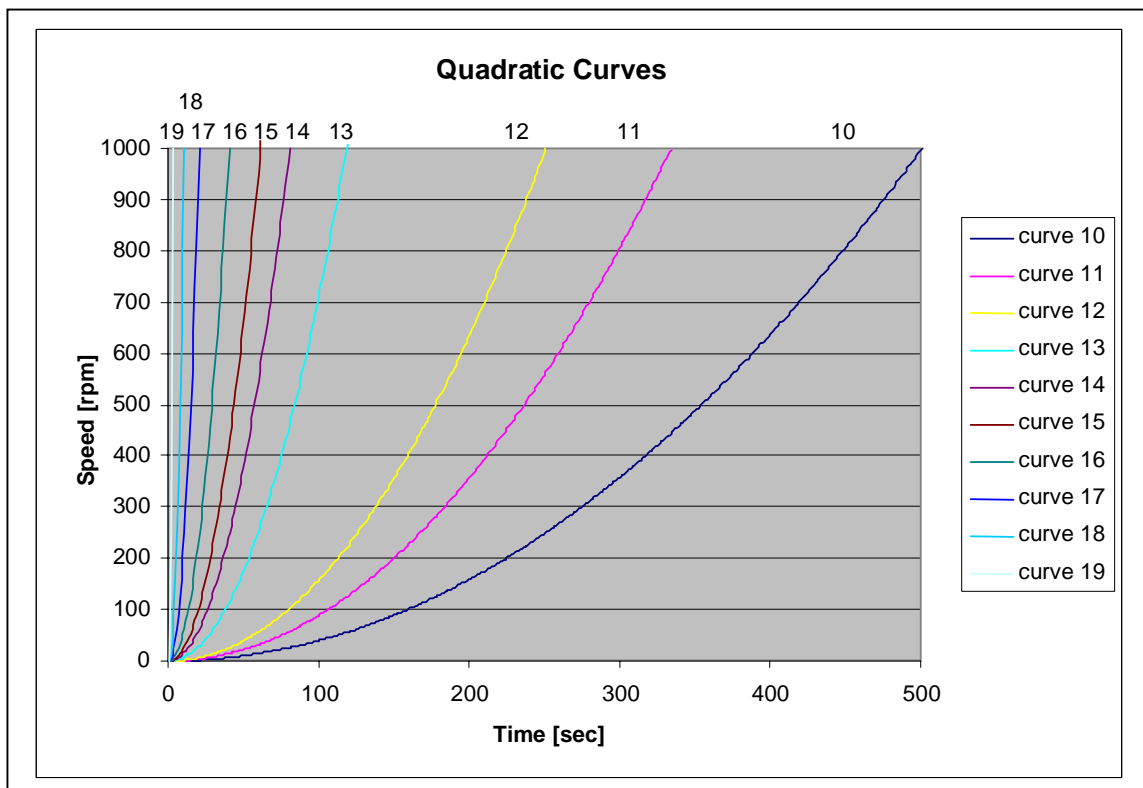


Fig. 11.5: Diagram of quadratic curves

Quadratic curve no.	Time until 1,000 rpm	Slope as of 1,000 rpm
10	500 sec	4 [rpm / sec]
11	333 sec	6 [rpm / sec]
12	250 sec	8 [rpm / sec]
13	118 sec	17 [rpm / sec]
14	80 sec	25 [rpm / sec]
15	60 sec	33 [rpm / sec]
16	40 sec	50 [rpm / sec]
17	20 sec	100 [rpm / sec]
18	10 sec	200 [rpm / sec]
19	2 sec	1000 [rpm / sec]

Fig. 11.6: Slope of quadratic curves

11.4 Formulae - Mathematical Relations

11.4.1 Relative Centrifugal Force (RCF)

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

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

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

11.4.2 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:

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

Rho = density in g/cm³

11.4.3 Speed-Gravitational-Field-Diagram

Additional help can be found in the enclosed speed-gravitational-field-diagram (see fig. 11.7, next page).

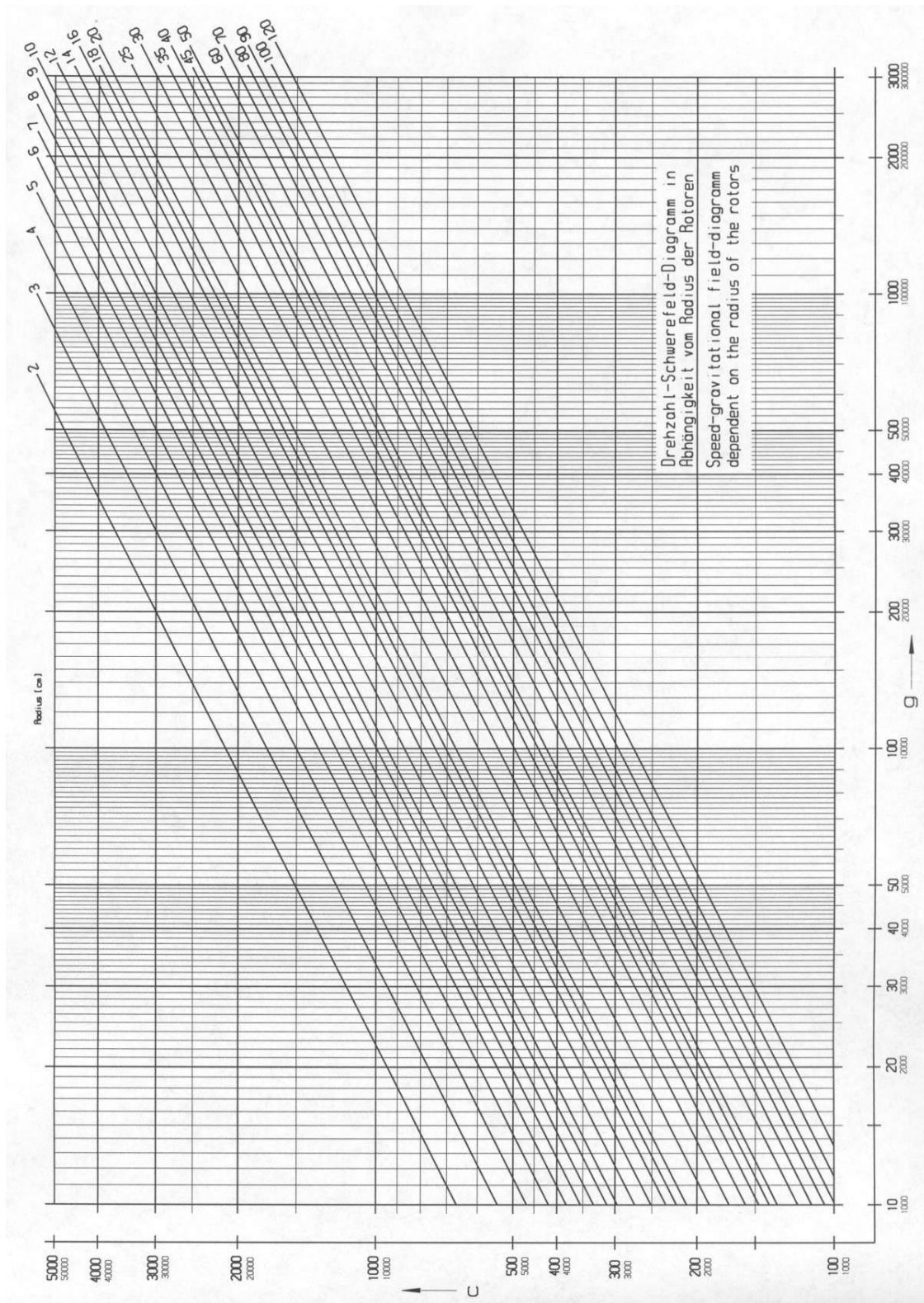


Fig. 11.7: Speed-Gravitational-Field Diagram

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	
13218	20,000			4-16, 4-16K, 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

Resistant at +20 °C

		Concentration	High Density	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, 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

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.

Product name: Laboratory Centrifuge

Product type: Sigma 3-18K

Order number: 10290, 10291, 10292, 10293, 10294, 10295, 10297, 10299,
10314, 10318, 10319

Directives: 2006/42/EG Machinery Directive
2006/95/EG Low Voltage Directive
2004/108/EG EMC Directive

Normes: 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 Sender
General Manager

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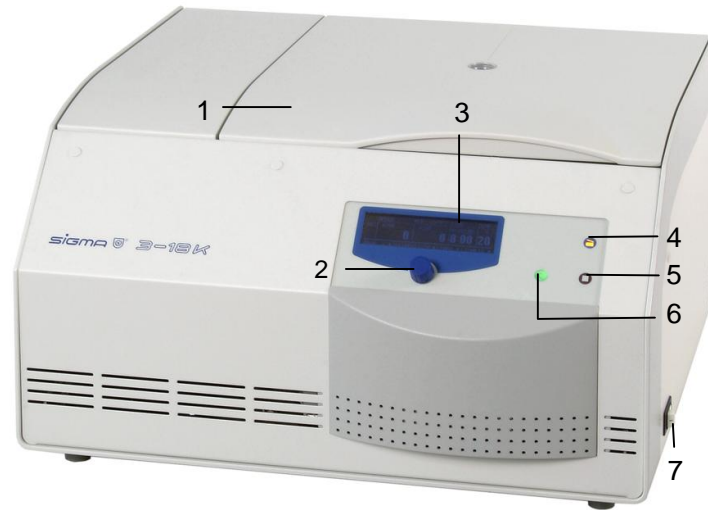
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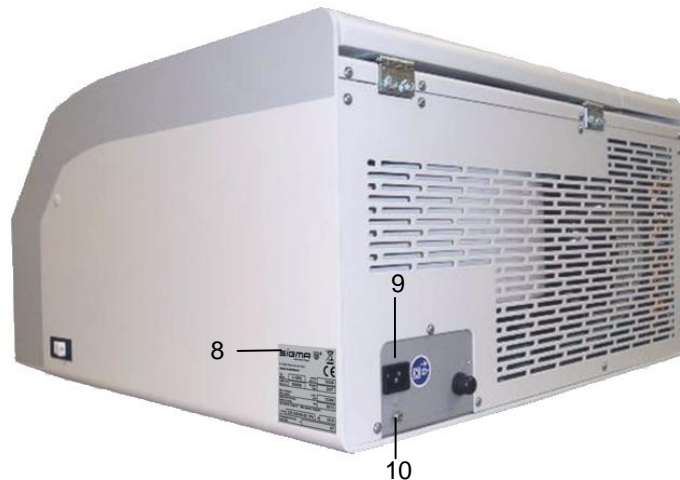
Pay attention to the detailed Operating Manual, especially to the safety instructions in chapter 3!

- 1 Lid
- 2 Function knob
- 3 Display
- 4 Lid key
- 5 Stop key
- 6 Start key
- 7 Mains power switch



Total view of the centrifuge

- 8 Name plate
- 9 Mains power input
- 10 Equipotential bonding screw



Rear view of the centrifuge

1. Before the initial start-up, please ensure that your centrifuge is properly set up and installed (see chapter 5).
2. Press the mains power switch on the right side of the front to switch on the centrifuge.
3. Open the lid and install the rotor according to the detailed operating instructions (see chapter 6.2.2).
4. Close the lid.

5. Enter run parameters:

Spincontrol Comfort

	SPEED	RCF	TIME	TEMP
SET	2000	814	0:02:00	20
	0	0	2:00	20
PROG -- 11150/13215 PARA CONFIG				

Manual Mode

- Select a parameter by pressing or turning the function knob. The selected field will be inverted.
- Press the function knob in order to activate the modification mode. "SET" and the selected area will be inverted.
- Turn the function knob until the desired value is displayed.
- Press the function knob to confirm the selected value and to quit the modification mode. "SET" and the selected area will be deactivated.

Program Mode



- Select the program field ("PROG-") and confirm the selection.
- Turn the knob. As a result, all of the programs that have already been saved and the current ("--") setting will be displayed one after the other.
- Select a program and confirm the selection. A dialog box will be displayed.
- Select "LOAD" and confirm the selection.

Spincontrol Professional

	Standard	Profile	Parameter	Setup	?
Speed	1000		Temperature	20	
	0	rpm		0	°C
RCF	321		Runtime	0:02:00	
	0	*g		2:00	m:s
Rotor:	11800 & 13800		Acceleration	9	
Progr:	--		Brake	9	
Choose the run parameters ...					

Manual Mode

- Turn the function knob in order to select a field. The set value of the field starts to flash.
- Press the function knob. The display starts to flash and the modification mode is active.
- Turn the function knob in order to modify the set value of the selected field.
- Press the function knob again to confirm the entry and to quit the modification mode.

Program Mode

	Standard	Profile	Parameter	Setup	?
Rotor:	11650		RAPID_TEMP		
Bucket:	13421		1: Probe1		
Speed:	3500 rpm		2: Probe2		
RCF:	2150 *g				
Te	Choose option ...				
Ru	Program				
De	Program				
Ac	load	save	delete	Close	
Br					
Rotor:	11650 & 13421		7: Empty		
Progr:	--		8: Empty		
			Brake	2	
Choose/Save/Delete a program ...					

- Select the option "Progr" from the "Standard" menu and confirm the selection. The program selection list will be displayed .
- Select the desired program from the list and confirm the selection.

6. Press the start key to start a centrifugation run.

7. Parameter values can be modified during the centrifugation run as described under "Manual Mode" in this document.

8. The centrifugation run can be interrupted at any time by pressing the stop key.