Sigma 1-14

from serial no. 146194



Laboratory centrifuge

Operating Manual

Please retain for later use!

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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, or maintenance of the centrifuge.

1.4 Copyright

The copyright concerning the operating manual remains with Sigma Laborzentrifugen GmbH.

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

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

Non-compliance may be prosecuted under criminal law.

1.5 Standards and regulations

These operating instructions have been created in accordance with the relevant European standards and regulations (see chapter 11.4 - "EC Declaration of conformity").

1.6 Scope of supply

The centrifuge comprises:

- 1 power cord with IEC C13 connector
- 1 spanner for emergency lid release part no. 930 014
- 1 rotor fastening nut part no. 80 301

Documentation

Operating manual incl. EC declaration of conformity
(see chapter 11.4 - "EC Declaration of conformity")

Accessories

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

2 Layout and mode of operation

2.1 Layout of the centrifuge

2.1.1 Functional and operating elements

1 Lid
2 Display
4 Name plate (see chapter 6.3.1 - "User interface")
3 User interface (see chapter 2.1.2 - "Name plate")



Fig. 1: Total view of the centrifuge

5 Mains power switch
6 Mains power input



Fig. 2: Rear view of the centrifuge

2.1.2 Name plate

1 Manufacturer
2 Power consumption
3 Max. speed
4 Max. kinetic energy
5 Product name
6 Part number
7 Serial number
8 Nominal voltage
9 Product designation
10 Input fuse
11 CE mark in compliance with the directive 2006/42/EC
12 Symbol for special disposal (see chapter 9 - "Disposal")
13 Date of manufacture
14 Consult operating manual
15 Max. permissible density

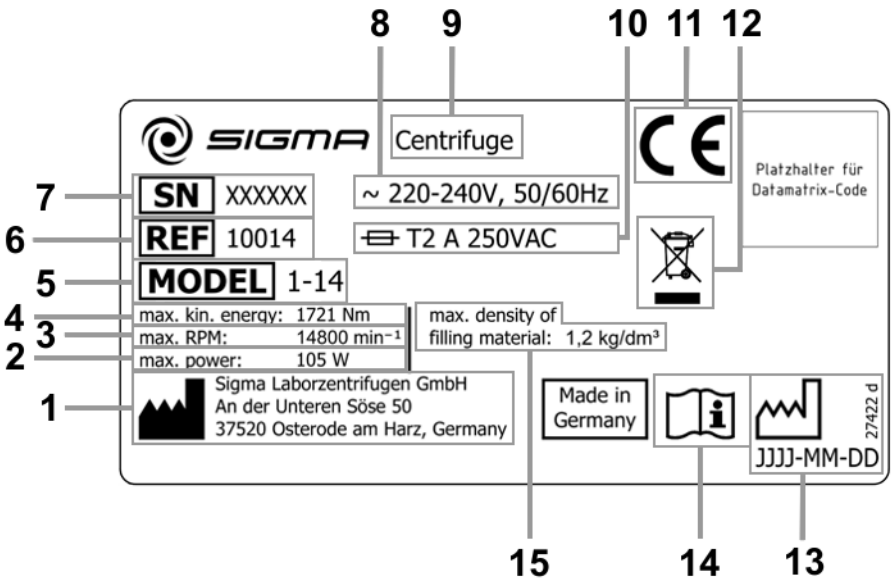


Fig. 1: Example of a name plate

2.2 Mode of operation

2.2.1 Centrifugation principle

Centrifugation is a process for the separation of heterogeneous mixtures of substances (suspensions, emulsions, or gas mixtures) into their components. The mixture of substances, which rotates on a circular path, is subject to centripetal acceleration that is several times greater than the gravitational acceleration.

Centrifuges use the mass inertia inside the rotor chamber for separating the substances. Due to their higher inertia, particles or media with a higher density travel outwards. In doing so, they displace the components with a lower density, which in turn travel towards the centre.

The centripetal acceleration of an object inside a centrifuge, as the effect of centripetal force, depends on the distance between the object and the axis of rotation as well as on the angular velocity. It increases linearly as a function of the distance with regard to the axis of rotation and quadratically as a function of the angular velocity. The bigger the radius in the rotor chamber is and the higher the speed is, the higher the centripetal acceleration is. However, the forces acting on the rotor also increase.

2.2.2 Area of application

Depending on the area of application of the centrifuge and also on the particle size, solids content, and volume throughput of the mixture of substances that is to be centrifuged, there are different types of centrifuges.

The areas of application go from household use as a salad spinner or honey separator up to specialised technical applications in the clinical, biological, or biochemical context:

- For numerous clinical examinations, cellular material must be separated from the liquid to be analysed. The normal separation process can be sped up considerably by using laboratory centrifuges.
- In the metal-working industry, centrifuges are used for separating oil from metal cuttings. Dairies use centrifuges in order to separate cow’s milk into cream and low-fat milk.
- Particularly big centrifuges are used in the sugar industry for separating the syrup from the crystalline sugar.
- Ultracentrifuges are predominantly used in biology and biochemistry in order to isolate particles, e.g. viruses. They are specifically designed for high speeds up to 500,000 rpm. The rotor moves in a vacuum in order to avoid air friction.

2.2.2.1 Speed, radius, and relative centrifugal force

The acceleration g, which the samples are subject to, can be increased by increasing the radius in the rotor chamber and by increasing the speed. These three parameters are interdependent and linked with each other via the following formula:

Relative centrifugal force RCF = 11.18 x 10^{-6} x r x n^2

r = radius in cm
n = speed in rpm
RCF without any dimension

If two values are entered, the third value is determined by way of the stated formula. If, afterwards, the speed or the radius is changed, the resulting relative centrifugal force will be recalculated automatically by the control unit. If the RCF is changed, the speed will be adapted while the specified radius is maintained.

The speed-gravitational-field-diagram provides an overview of the relationship between speed, radius, and RCF.

2.2.2.2 Density

The laboratory centrifuge is suitable for the separation of constituents of different densities in mixtures with a maximum density of 1.2 g/cm^3. All information concerning the speed of rotors and accessories refers to liquids with a density corresponding to this specification. If the density is above this value, the maximum permissible speed of the centrifuge must be reduced based on the following formula:

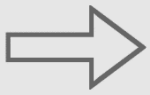
$n = n_{max} \times \sqrt{(1.2/\rho)}$

ρ = density in g/cm^3

3 Safety

3.1 Marking of the unit

The following symbols are used on this centrifuge:

I	On (Power)		Arrow indicating the direction of rotation
0	Off (Power)		Emergency release system
	Name plate (see chapter 2.1.2 - "Name plate")		CE mark in compliance with the directive 2006/42/EC
	Do not dispose as part of domestic waste		Consult operating manual
	NRTL mark (only for the USA and Canada)		RCM mark (only for Australia)
	China RoHS 2 mark (only for China)		California Proposition 65 mark (only for the USA)

NOTE	Safety indications on the centrifuge must be kept readable at all times. If necessary, they must be replaced.
NOTE	The marking varies depending on the version and country of destination of the centrifuge.

3.2 Explanation of the symbols and notes

In this operating manual, the following names and symbols to indicate hazards are used:

 **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.
 **NOTE**	This symbol indicates important information.

3.3 Responsibility of the operator

The operator is responsible for authorising only qualified personnel to work on the centrifuge (see chapter 3.4 - "Requirements concerning the 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").
- take protective measures against fire and explosion when working with hazardous substances.
- take measures for the safe opening of centrifuges.

The operator must perform a risk assessment concerning potential accidents in connection with the centrifuge and take design-related countermeasures, if necessary.

The centrifuge has to be maintained regularly (see chapter 8 - "Maintenance and service").

Components that are not in a perfect state must be replaced immediately.

3.4 Requirements concerning the personnel



DANGER

Risk of injury if the personnel are not sufficiently qualified

If unqualified personnel perform work on the centrifuge or are present in the danger zone of the centrifuge, hazards result that can cause serious injuries and considerable damage to property.

- Ensure that all the tasks are performed by personnel with the corresponding qualifications.
- Ensure that unqualified personnel stay clear of the danger zones.



DANGER

Risk of fatal injury to unauthorised persons due to hazards in the danger zone or work area

Unauthorised persons who do not fulfil the requirements described herein are not aware of the hazards in the work area. This is why there is a risk of serious or even fatal injuries for unauthorised persons.

- Ensure that unauthorised persons stay clear of the danger zone and work area.
- If in doubt, address these persons and instruct them to leave the danger zone and work area.
- Interrupt any running work if unauthorised persons are present in the danger zone or work area.

This manual uses the following personnel qualifications for various areas of activity:

Qualified electrician

Due to their special training, knowledge, experience and familiarity with the relevant standards and regulations, qualified electricians are in the position to perform work on electrical systems and to autonomously identify and prevent possible hazards.

Qualified electricians have been specifically trained for the environment in which they work and they are familiar with all the relevant standards and regulations.

Qualified electricians must fulfil the requirements as set out in the applicable legal provisions concerning the prevention of accidents.

Specialised personnel

Due to their special training, knowledge, experience and familiarity with the relevant regulations, specialised personnel are in the position to perform any tasks assigned to them and to autonomously identify and prevent possible hazards.

Operating personnel

Only trained, specialised personnel are authorised to operate the unit. The persons operating the unit must

- be familiar with the fundamental health, safety, and accident prevention regulations,
- have read and understood this operating manual, in particular the safety sections and warning notes, and confirmed this with their signature,
- have been instructed in the operation and maintenance of this centrifuge.

3.5 Informal safety instructions

- This operating manual is a 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, additions or updates received 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

As protection against electric shock, the centrifuge is equipped with an earthed mains power cable and connector. To ensure the effectiveness of this safety feature, the following must be ensured:



DANGER

- Ensure that the wall socket is properly wired and grounded.
- Check that the mains voltage agrees with the nominal voltage listed on the name plate.
- Ensure that the mains power cable is intact prior to using the centrifuge. Damaged or faulty mains power cables must be replaced immediately.
- Do not place vessels containing liquid on the centrifuge lid or within the safety distance of 30 cm around the centrifuge. Spilled liquids may get into the centrifuge and damage electrical or mechanical components.
- Service tasks or repairs of the electrical system for which the housing needs to be removed must only be carried out by authorised specialist personnel.
- Inspect the electrical equipment of the unit regularly. Defects such as loose or burnt cables must be eliminated immediately.
- Following the completion of any type of repair or service, the authorised specialist personnel must perform final inspection and testing in compliance with the relevant standards (see chapter 8.3 - "Maintenance and service").

3.6.2 Mechanical safety

In order to ensure the safe operation of the centrifuge, observe the following:



WARNING

- 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 the service department, 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.



WARNING

- 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. Eliminate the malfunction (see chapter 7 - "Malfunctions and error correction") or inform the service department of the manufacturer (see chapter 7.3 - "Service contact").
- Ensure that all repairs are performed only by authorised and specialised personnel.
- 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, and adapters) in terms of visible structural changes. Defective parts must be replaced immediately.
- Open the centrifuge when it is not in use so that moisture can evaporate.

3.6.3 Fire prevention



DANGER

- 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.



DANGER

- Infectious, toxic, pathogenic, and radioactive substances may only be used in special, certified containment systems with a bio-seal in order to prevent the material from being released.
- 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.



WARNING

- 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:



WARNING

- Ensure that the centrifuge was set up properly (see chapter 5 - "Set-up and connection").
- Keep a safety range of at least 30 cm free around the centrifuge as well as with regard to walls and other devices.
- Do not store any dangerous goods in the centrifuge area.
- Do not stay in the safety area longer than what is absolutely necessary for the operation of the centrifuge.
- Only use the centrifuge with rotors and accessories that have been approved by the manufacturer. We explicitly warn against the use of equipment of poor quality. Breaking glass or bursting vessels can cause dangerous imbalances at high speeds.
- Ensure that the rotor and buckets are correctly fitted (see chapter 6.2.2.1 - "Installation of a rotor").
- Observe the instructions on the installation of accessories (see chapter 6.2.2.2 - "Installation of accessories").
- The rotor must be loaded in a rotationally symmetrical manner at equal weights.
- If liquids with a density > 1.2 g/cm^3 are used, reduce the speed (see chapter 2.2.2.2 - "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.



NOTE

- Refer to the resistance data (see chapter 11.3 - "Resistance data")!

3.6.7 Safety of rotors and accessories

3.6.7.1 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 = 15000" has a service life of 15,000 cycles, and a rotor with the engraving "Exp. date 01/27" must be scrapped in January 2027 at the latest (see figure).
- If a specification concerning the maximum number of cycles **and** a specification concerning the service life (i.e. a date) are provided, the specification that occurs first shall apply.



Fig. 2: Different service life – engraving on the bucket/rotor

NOTE

- Refer to the table of the service life of rotors and accessories (see chapter 11.2 - " Table of the service life of rotors and accessories ")!

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 chapter 7.1.1 - "Emergency lid release").

3.7.2 System check

An internal system check monitors the data transfer and sensor signals with regard to plausibility. The system continuously performs a self-check and identifies malfunctions. Malfunctions are indicated by error messages with a number in the speed/rcf display (see chapter 7.2 - "Table of error codes").

3.8 Measures in the event of hazards and accidents



DANGER

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

3.9 Remaining hazards

The centrifuge was built in accordance with the state of the art and in compliance with the generally recognized safety rules. However, 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 chapter 1.2 - "Intended use").
- Use the unit 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

	Sigma 1-14
Height:	176 mm
Height with open lid:	310 mm
Width:	212 mm
Depth:	266 mm
Weight:	6 kg

4.2 Storage conditions

The centrifuge can be stored in its original packaging for up to a year.

- Store the centrifuge only in dry rooms.
- The permissible storage temperature is between -20°C and +60°C.
- If you would like to store it for more than one year, or if you intend to ship it overseas, please contact the manufacturer.

4.3 Notes on transport

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



CAUTION

The centrifuge weighs approx. 6 kg!

- For transport use suitable packaging and, if at all possible, the original packaging (see chapter 4.4 - "Packaging").

4.4 Packaging

The centrifuge is packaged in a cardboard box.

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



CAUTION

The centrifuge weighs approx. 6 kg!

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

4.5 Transport safety device

The centrifuge is not equipped with a transport safety device.

5 Set-up and connection

5.1 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 the ambient air.

- Ensure sufficient ventilation.
- Keep a safety range of at least 30 cm free around the centrifuge as well as with regard to walls or other devices so that the vents in the machine remain unobstructed and fully effective.
- Do not subject the centrifuge to thermal stress, e.g. by positioning it 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.

5.2 Power supply

5.2.1 Type of connection



DANGER

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



CAUTION

The mains power plug is an isolating device which is why it must be accessible at all times.

Sigma centrifuges are units of protection class I. The centrifuges of this model series have a three-wire power cord with an IEC C13 connector.



NOTE

The removable power cord must not be longer than 3 m!

The power cord must not be replaced with a power cord of inadequate rating!

5.2.2 Customer-provided fuses

Typically, the centrifuge must be protected with 16 Amp B fuses that are to be provided by the customer.



NOTE

To ensure safe disconnection in the event of a fault, an AC/DC-sensitive RCD (residual current device) must be integrated in the wiring system of the building.

6 Using the centrifuge

6.1 Initial start-up



DANGER

- 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.

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

6.2.1 Opening and closing the lid

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

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

The centrifuge cannot be started if the lid is opened.

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



WARNING

Do not place 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 a rotor

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

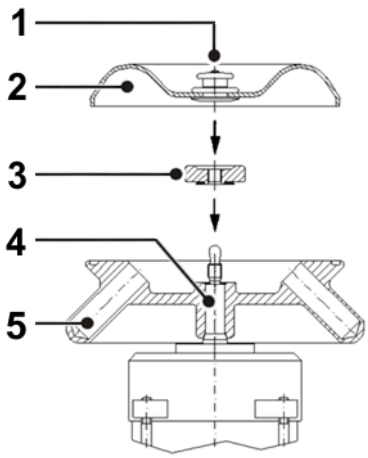


Fig. 3: Installation of rotor and rotor lid

- Open the centrifuge lid by pressing the lid key.
- Unscrew the rotor fastening nut from the motor shaft (counter-clockwise).
- Lower the rotor with its central bore straight down onto the motor shaft.
- Tighten the rotor fastening nut clockwise with 3 Nm. The rotor fastening nut and conical spring washer must face the rotor (i.e. the writing must be shown on top).

1 Conical spring washer

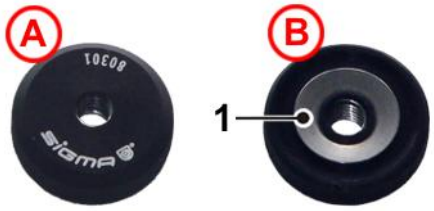


Fig. 4: Rotor fastening nut from above (A) and from below (B)

- To lock the snap-on lid, pull the safety lock in the middle of the lock upwards and put the lid on the rotor. The snap-on lid will be locked when the safety lock is released.
- Follow the safety instructions and hazard warnings (see chapter 3 - "Safety")!

WARNING

Loosen and tighten the rotor tie-down screw at regular intervals (depending on the frequency of use) to ensure a proper connection between the rotor holder and the motor shaft.

NOTE

Rotors can be used without a cover. This leads, however, to higher levels of noise and temperatures when running.

Removing a rotor

- Unscrew the rotor fastening nut from the motor shaft (counter-clockwise) and remove the rotor.

6.2.2.2 Installation of accessories

- Only use tubes that are suitable for the rotor.
- Always load the axial symmetrical inserts of the rotors with the same accessories and fill to avoid imbalance.

Centrifugation with low capacity

- Install the tubes axial symmetrically so that the rotor is loaded evenly.
- It is not permissible to load angle rotors on only one axis.

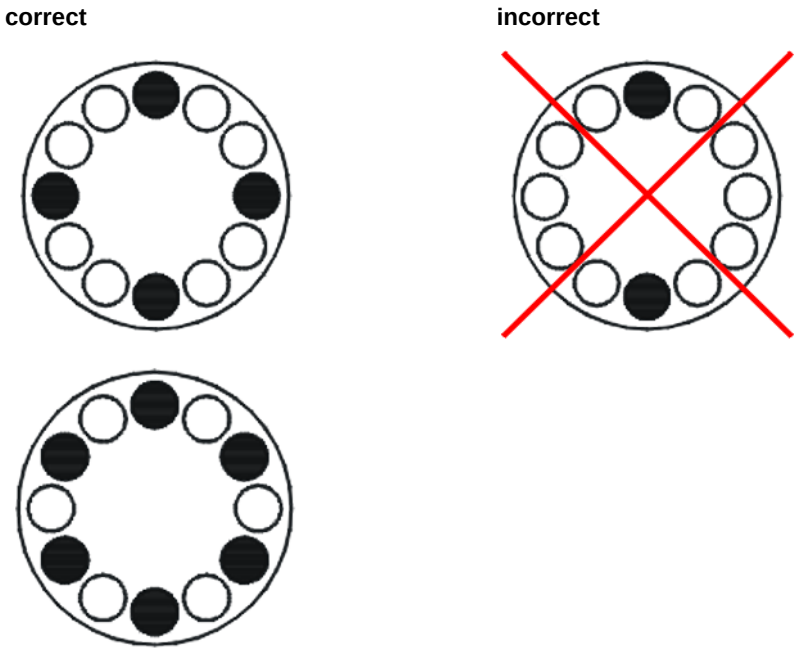


Fig. 5: Permissible and impermissible loading of an angle rotor (example illustration)

6.2.2.3 Vessels

- Load the vessels outside of the centrifuge. Liquids in the bores of the rotor cause corrosion.
- Fill the vessels carefully and arrange them according to their weight. Imbalances result in the excessive wear of the bearings.
- After the centrifugation, remove the vessels carefully in order to prevent the samples from mixing.
- Follow the safety instructions and hazard warnings (see chapter 3 - "Safety")!

6.3 Control System "Spincontrol Basic"

6.3.1 User interface

1 Display
2 Select key
3 Arrow keys
4 Lid key
5 Start/Stop key



Fig. 6: User interface

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

6.3.2 Display

The centrifuge display has the following display fields:

1 Speed / RCF field
2 Field for acceleration / deceleration curves and run mode
3 Time field

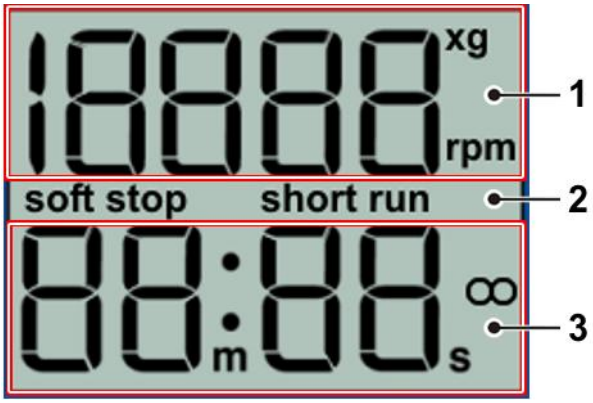


Fig. 7: Display, completely active

6.3.3 Starting a centrifugation run

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

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

During the centrifugation run, "actual" will be displayed in the lower left-hand area of the display.

6.3.4 Interrupting a centrifugation run

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

6.3.5 Interrupting a deceleration process

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

6.3.6 Speed / Relative centrifugal force (RCF)

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

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

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

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

6.3.6.1 Changing the speed/RCF value during centrifugation

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

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

6.3.7 Runtime

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

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

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

6.3.7.1 Changing the runtime during centrifugation

The preselected runtime can be changed during centrifugation.

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

NOTE

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

6.3.7.2 Short run

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

- Keep the start/stop key pressed during the short run.

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

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

6.3.7.3 Continuous run

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

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

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

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

6.3.8 Softstart and softstop function

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

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

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

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

6.3.9 Rotor selection

In the delivery status of the centrifuge, the rotor 12094 is preselected. If another rotor is installed the configuration must be changed, so that the allowed maximum speed of the rotor can be reached.

- To select another rotor, press the "select" key and hold it for approx. 2 seconds.
- Choose the number of the installed rotor out of the following list, by pressing the arrow keys:

Kennzahl	1	2	3	4	5
Rotor	--	12082	--	12084	--

Kennzahl	6	7	8	9	10
Rotor	12092 12097	--	12094	12096	--

- Press the select key to confirm the input.

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

6.4 Switching the centrifuge off

- Open the centrifuge when it is not in use so that moisture can evaporate.
- Switch the centrifuge off by pressing the mains power switch.

7 Malfunctions and error correction

7.1 General malfunctions

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

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



WARNING

Do not switch the centrifuge off until “OFF” is displayed! This is necessary in order to ensure that the rotor is at a complete standstill.

- Eliminate the source of the problem (see tables below).
- Acknowledge the error messages with the lid key.

Type of error	Possible reason	Correction
No indication on the display	No power in the mains supply	Check fuse in the mains supply
	Power cord is not plugged in	Plug in power cord correctly
	Mains power switch off	Switch mains power switch on
	Lid is not closed correctly	Close the lid
Centrifuge cannot be started: The set speed value is displayed in an unchanged manner	Several possible causes	Netz aus/ein. Falls sich der Fehler wiederholt, Service verständigen
	The lid lock is not closed correctly	Open and close lid. If the error occurs again, contact service
Centrifuge decelerates during operation and displays an error from 1 to 18 after powering on	Several possible causes	Power off/on. If the error occurs again, contact service
Centrifuge decelerates during operation and displays error 19 after powering on	Several	Acknowledge by pressing the lid key
Lid cannot be opened	Lid locks have not released	Unlock the lid manually (see chapter 7.1.1 - "Emergency lid release")and contact service
Temperature value cannot be reached (only for refrigerated centrifuges)	Condenser dirty	Contact service

7.1.1 Emergency lid release

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

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



Fig. :8 Opening for the emergency lid release at the bottom of the centrifuge



WARNING

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

If the lid is opened via the emergency lid release during a centrifuge run, the centrifuge will be switched off immediately and decelerate in a brake-less manner.

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

7.2 Table of error codes

Error no.	Kind of error	Measures	Note
1-9	System error	• Allow to slow down • Power off/on	All these errors stop the centrifuge or cause it to decelerate brakeless
10-19	Speedometer error	• Allow to slow down • Power off/on	
20-29	Motor error	• Power off • Ensure ventilation	
30-39	EEPROM error	• Allow to slow down • Power off/on	With error 34, 35, and 36, the centrifuge will stop; with error 37 and 38 only an error message will be given
40-45	Temperature error (only for refrigerated centrifuges)	• Allow to slow down • Power off • Allow to cool down • Provide better ventilation (only air-cooled centrifuges) • Provide sufficient water throughput (only water-cooled centrifuges)	
46-49	Imbalance error (only for centrifuges with imbalance monitoring system)	• Allow to slow down • Power off • Eliminate the imbalance	
50-59	Lid error	• 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	• Allow to slow down • Power off/on	With error 60, the message "power failure during run"will be displayed, with error 61, the message "stop after power on" will be displayed
70-79	Communication error	• Allow to slow down • Power off/on	
80-89	Parameter error	• Power off • Allow to cool down • Provide for better ventilation	With error 83, error message only
90-99	Other errors	• Check connections • Provide sufficient water throughput (only water-cooled centrifuges)	



NOTE

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

7.3 Service contact

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

From Germany:

Contact

Sigma Laborzentrifugen GmbH
An der Unteren Söse 50
37520 Osterode (Germany)
Tel. +49 (0) 55 22 / 50 07-44 44
E-mail: support.lab@sigma-zentrifugen.de

Outside Germany:

Contact our agency in your country. All agencies are listed at www.sigma-zentrifugen.de → [Sales Partners]

NOTE

- If you would like to utilise our service, please state the type of your centrifuge and its serial number.

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.

8.1 General

- The centrifuge and accessories are made from different materials. Please check for any possible incompatibilities.
- Prior to using cleaning agents and disinfectants other than those recommended, the user must consult with the manufacturer to ensure that they will not damage the centrifuge or its accessories.
- For autoclaving, the long-term temperature resistance of the individual materials must be observed (see chapter 8.1.1 - "Autoclaving").
- Do not subject the centrifuge or rotors to strong UV radiation (e.g. exposure to direct sunlight) or thermal stress (e.g. caused by heat generators).



DANGER

When using hazardous substances (e.g. infectious or pathogenic substances), it is mandatory to disinfect the centrifuge and its accessories.



WARNING

For your own protection, always take appropriate precautions if there is a risk of toxic, radioactive or pathogenic contamination. Wear personal protective equipment.

Frequency of the required activities

Chapter	Activity	Frequency
8.1.1	**Cleaning**	
8.1.1.1	Cleaning of the centrifuge	As required
8.1.1.2	Cleaning of the rotors	As required
8.1.1.3	Cleaning of the adapters	As required
8.1.2	**Disinfection**	
8.1.2.1	Disinfection of the centrifuge	As required
8.1.2.2	Disinfection of the rotors	As required
8.1.2.3	Disinfection of the adapters	As required

Chapter	Activity	Frequency
8.2	**Maintenance**	
8.2.1	Inspection of the centrifuge for signs of damage	Monthly
8.2.1	Greasing of the motor shaft	After cleaning
8.2.2	Check of the rotors and adapters for signs of damage	Monthly
8.2.2	Greasing of the rotor tie-down screw	After cleaning

8.1.1 Cleaning

- Use soapy water or other water-soluble, mild cleaning agents with a pH value between 6 and 8 for cleaning the centrifuge and its accessories.
- Clean the centrifuge by hand only.
- The water temperature must be < 40°C.
- Avoid corrosive and aggressive cleaning agents.
- Do not use any solvents.
- Do not use any agents with abrasive substances.



CAUTION

Ensure that no liquid penetrates the inside of the centrifuge. Otherwise, electrical or mechanical components can be damaged.

8.1.1.1 Cleaning of the centrifuge

1. Open the lid.
2. Disconnect the centrifuge from the power supply.
3. Remove the rotors and buckets (see chapter 6.2.2 - "Installation of rotors and accessories").
4. Clean the housing and the rotor chamber with the specified cleaning agents and a soft, lint-free cloth.
5. Remove any cleaning agent residues completely with water and a soft, lint-free cloth.
6. After cleaning, dry the surfaces with a soft, lint-free and absorbent cloth.

8.1.1.2 Cleaning of rotors



CAUTION

Do not clean the accessories in a dishwasher!

The dishwasher will remove the anodised coating of the adapters and carriers, thereby leading to cracks in areas under stress.

1. Clean the rotor and buckets with the specified cleaning agents and a soft, lint-free cloth.
2. To clean narrow holes, use a test tube brush with a wool tip and then rinse the holes with water.
3. Remove any cleaning agent residues completely with water and a soft, lint-free cloth.
4. Dry the rotor and buckets with a soft, lint-free and absorbent cloth or in a drying cabinet at 50°C maximum.
5. To dry the holes, let the rotor dry lying upside down on a surface.

8.1.1.3 Cleaning of adapters

1. Clean the adapters with the specified cleaning agents and a soft, lint-free cloth.
2. To clean narrow holes, use a test tube brush with a wool tip and then rinse the holes with water.
3. Remove any cleaning agent residues completely with water and a soft, lint-free cloth.
4. Dry the adapters with a soft, lint-free and absorbent cloth.
5. To dry the holes, let the adapter dry lying upside down on a surface.

8.1.2 Disinfection



NOTE

Prior to a disinfection, the cleaning steps described in chapter 8.1.1 - "Cleaning" must have been performed.

8.1.2.1 Disinfection of the centrifuge

- To disinfect the centrifuge (control panel, contact surfaces and rotor chamber), use an alcohol-based surface disinfectant with a concentration between 30% and 75% (e.g. Bacillol® AF).
- Disinfect the lid window and the display (acrylic glass), motor cover (silicone) and (screen-printed) labelling with a disinfectant that is suitable for the material (e.g. Bacillol® 30 sensitive tissues). Never use a surface disinfectant with a high alcohol concentration!
- Follow the manufacturer's instructions regarding the application time and concentration of the disinfectant.

1. Open the lid.
2. Disconnect the centrifuge from the power supply.
3. Remove the rotors and buckets (see chapter 6.2.2 - "Installation of rotors and accessories").
4. Wipe down the housing and rotor chamber with the above-mentioned disinfectant and a soft, lint-free cloth.
5. Comply with the specified application time.
6. Let the disinfected surfaces dry completely.

8.1.2.2 Disinfection of rotors

- To disinfect the rotors, use an alcohol-based surface disinfectant with a concentration between 30% and 75% (e.g. Bacillol® AF).
- Follow the manufacturer's instructions regarding the application time and concentration of the disinfectant.

1. Wipe down the rotor with the above-mentioned disinfectant and a soft, lint-free cloth.
2. To disinfect narrow holes, fill them with the disinfectant without entrapping any air.
3. Ensure complete wetting.
4. Comply with the specified application time.
5. Let the disinfected rotor dry completely.

8.1.2.3 Disinfection of adapters

- To disinfect the adapters, use an alcohol-based surface disinfectant with a concentration between 30% and 75% (e.g. Bacillol® AF).
- Follow the manufacturer's instructions regarding the application time and concentration of the disinfectant.

1. Wipe down the adapters with the above-mentioned disinfectant and a soft, lint-free cloth.
2. To disinfect narrow holes, fill them with the disinfectant without entrapping any air.
3. Ensure complete wetting.
4. Comply with the specified application time.
5. Let the disinfected adapters dry completely.

8.1.1 Autoclaving

The service life of the accessories primarily depends on the autoclaving frequency and their general frequency of use.

- Replace the accessories immediately if you notice any leaks or any changes in the colour or structure, etc.
- When autoclaving, in order to prevent the vessels from being deformed, ensure that the caps are not screwed onto the vessels.

NOTE

The possibility of plastic parts, such as covers or racks, becoming deformed during autoclaving cannot be ruled out.

NOTE

The specified autoclaving parameters exclusively refer to the material resistance and not to the degree of sterility.

Category	Type of accessory	Material abbreviation	121°C 20 min	Notes
Rotors and covers	Aluminium rotors	AL	yes	
	Polypropylene rotors	PP	no	
	Polycarbonate covers for angle rotors	PC	no	
	Polyallomer covers for angle rotors	PA	no	
	Polysulfone covers for angle rotors	PSU	yes	100 cycles max.
Buckets and caps	Aluminium buckets	AL	yes	
	Polyamide buckets	PA	no	13035, 13296, 13299
	Polyphenylsulfone caps	PPSU	yes	100 cycles max.
	Polysulfone caps	PSU	yes	100 cycles max.
Adapters	Polyallomer racks	PA	no	
	Polyallomer racks	PC	no	
	Polyallomer racks	PP	no	
Vessels	Stainless steel vessels and bottles	--	yes	
	Glass vessels	--	yes	
	Polyethylene vessels	PE	no	
	Polyflor vessels	PF	yes	100 cycles max.
	Polycarbonate vessels	PC	no	
	Polypropylene copolymer vessels	PPCO	yes	20 cycles max.
	Polystyrene vessels	PS	no	
Additional equipment	Stainless steel taring weights for blood bag systems	--	yes	

8.2 Maintenance tasks

8.2.1 Maintenance of the centrifuge

- Liquids, such as water, solvents, acids and lyes, must be removed from the rotor chamber immediately using a cloth. This prevents the motor bearings from being damaged.
- In the event of a contamination with toxic, radioactive or pathogenic substances, clean the inside of the centrifuge immediately with a suitable decontamination agent depending on the type of contamination (see chapter 8.1.1 - "Cleaning"and chapter 8.1.2 - "Disinfection").
- After every cleaning process, grease the motor shaft slightly with a small amount of heavy-duty grease for load-bearing bolts and distribute the grease with a cloth so that it forms a thin layer.
- Perform a visual inspection of the centrifuge at least monthly to detect the following signs of damage:
  - Cracks
  - Visible surface damage
  - Pressure marks
  - Signs of corrosion
  - Other changes

8.2.2 Maintenance of rotors and adapters



CAUTION

The special precautions for the care of the accessories must be strictly observed.

These are measures to ensure operational safety!

- Liquids that may cause corrosion must be immediately removed completely from the rotor and accessories by way of a cloth.
- In the event of a toxic, radioactive or pathogenic contamination of the rotors and accessories, clean them immediately with a suitable decontamination agent depending on the type of contamination. For your own protection, always take appropriate precautions if there is a risk of toxic, radioactive or pathogenic contamination (see chapter 8.1.1 - "Cleaning" und chapter 8.1.2 - "Disinfection").

Rotors and accessories are manufactured with the highest levels of precision in order to withstand the continuous, extreme levels of stress with their area of application with high centrifugal force.

Chemical reactions and pressure corrosion (a combination of alternating pressure and chemical reactions) can attack or destroy the structure of metals. Barely detectable cracks on the surface expand and weaken the material without leaving any clearly visible signs.

- This is why the material must be checked regularly, at least monthly, for the following:
  - Cracks
  - Visible surface damage
  - Pressure marks
  - Signs of corrosion
  - Other changes
- Check the holes of rotors.
- Damaged parts must be replaced immediately for your own safety.
- After every cleaning process, grease the rotor tie-down screw slightly with a small amount of heavy-duty grease for load-bearing bolts and distribute the grease with a cloth so that it forms a thin layer.
- Comply with the special requirements for the use of plastic accessories (see chapter 8.2.2.1 - "Plastic accessories").

8.2.2.1 Plastic accessories

The chemical resistance of plastic decreases with rising temperatures (e.g. during drying) (see chapter 11.3 - "Resistance data").

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



WARNING

Plastic accessories must not be greased!

8.2.3 Broken glass



CAUTION

In the event of glass breakage, all shards must be removed immediately and completely (e.g. with a vacuum cleaner). Rubber cushions must be replaced since even thorough cleaning cannot remove all the glass particles.



CAUTION

There is a risk of injury due to sharp shards when removing the broken glass from the motor chamber.

- Wear personal protective equipment (e.g. gloves).

Potential consequences of broken glass

- Broken glass damages the surface coating (e.g. anodised aluminium) of the buckets, thereby causing corrosion.
- Broken glass on the rubber cushions of the buckets causes more glass breakage.
- Broken glass in the swivel bearings of the load-bearing bolts prevents the buckets and multiple carriers from swinging out evenly, thereby causing imbalance.
- Broken glass in the rotor chamber causes metallic abrasion due to the strong air circulation. This fine metal dust not only strongly contaminates the rotor chamber, rotor and samples, but it also damages the surface of the accessories, rotors and rotor chamber.

Removing broken glass and metal dust from the rotor chamber

1. Apply a thick layer of petroleum jelly or similar to the upper third of the rotor chamber.
2. Then, let the rotor rotate for a few minutes at medium speed (approx. 2,000 rpm). During this process, dust and glass particles will be bound in the grease.
3. Then, remove the grease together with the dust and glass particles by way of a cloth.
4. If necessary, repeat this process.

8.3 Maintenance and service



DANGER

In the case of maintenance or service requiring the removal of the housing panels, there is a risk of electric shock or mechanical injury.

- Maintenance and service tasks must only be carried out by authorised and specialised personnel.
- Following the completion of any type of maintenance or service, the authorised and specialised personnel must perform final inspection and testing in compliance with the relevant standards (see below).

The centrifuge is subject to high mechanical load. In order to withstand this stress, high-quality components are installed during the production of the centrifuge. However, wear may occur and it may not be visible from the outside. Especially rubber parts, which can be found in the motor suspension assembly, are subject to ageing.

Centrifuges used in Germany are subject to mandatory testing as per the information sheet of the German Berufsgenossenschaft Rohstoffe und chemische Industrie FBRCI-025 (November 2023):

- Every 1-2 years in operating condition
- Every 3-4 years in dismantled condition

We recommend the following:

- The motor suspension elements (rubber parts of the motor suspension) should be replaced every 3 to 4 years.
- The centrifuge should be tested annually in operating condition during an inspection performed by the manufacturer and every three years in dismantled condition.

Repair, modification and requalification (repeat test)

After any repair, modification or requalification (repeat test), an electrical safety test must be carried out by a qualified electrician in accordance with DIN EN 61010-1.

The specified test in accordance with DGUV V3, DIN EN 61010-1 must be performed for centrifuges made by Sigma. The test is considered as passed if the specified limits are complied with.

A measurement in accordance with VDE 0701-0702 leads to higher values, which is due to a different measurement method. If the limit values are also complied with in this case, the test is also considered as passed. If the limit values are exceeded, a test in accordance with DIN EN 61010-1 is mandatory.

These services can be agreed as part of a maintenance contract.

www.sigma-zentrifugen.de → [Service] → [Overhaul and repair]



8.4 Return of defective centrifuges or 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, enclose them with the return package, and send them together with the product to:

Sigma Laborzentrifugen GmbH
An der Unteren Söse 50
37520 Osterode (Germany)

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.



NOTE

We will return the part/unit if no declaration of decontamination is provided!

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.

NOTE

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 return the part/unit to you at your expense.

- Upon request, we will prepare and submit to you a cost estimate prior to performing the repair. Please confirm such cost estimate within 14 days. If the cost estimate has still not been confirmed after 4 weeks, we will return the defective part/unit. Please note that you must bear the incurred costs.

3. Pick-up order

Upon request, we will commission a forwarding agent to collect the unit. In this case, complete the pick-up order and return it to us by e-mail.

NOTE

The defective part/unit must be packaged in a transport-safe manner. Please use the original packaging for the unit, 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] → [Overhaul and repair].

9 Disposal

9.1 Disposal of the centrifuge



In accordance with the directive 2012/19/EU, 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 waste.

- You can return these centrifuges free of cost to Sigma Laborzentrifugen GmbH.
- Ensure that the unit is decontaminated. Fill in a declaration of decontamination (see chapter 8.4 - "Return of defective centrifuges or parts").
- 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	Sigma Laborzentrifugen GmbH An der Unteren Söse 50 37520 Osterode (Germany)
Type:	1-14
Connection requirements	
Electrical connection: Protection class: IP code:	see name plate I 20
Power consumption (W): Input fuse (AT):	105 2.0 (at 220-240 V / 50/60 Hz) 4.0 (at 100-120 V / 50/60 Hz)
Performance data	
Max. speed (rpm): Max. capacity (ml): Max. gravitational field (x g) Max. kinetic energy (Nm):	14,800 48 16,163 1,721
Other parameters	
Time range:	10 sec to 99 min 59 sec, short run, continuous run
Physical data	
Height (mm): Height with opened lid (mm): Width (mm): Depth (mm): Weight (kg):	176 310 212 266 6.0
Noise level (dB(A)):	< 60 (at max. speed)

10.1 Ambient conditions

- The figures are valid for an ambient temperature of +23°C and a nominal voltage ± 10 %.

NOTE

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

- For indoor use only.
- Maximum altitude 2,000 m above sea level.
- Allowable ambient temperature +5°C to +40°C.
- Max. allowable relative humidity of air 80% from 5°C up to 31°C with a linear decrease to 50% relative humidity of air at 40°C.
- Pollution degree 2.

10.2 Technical documentation

For environmental reasons, the comprehensive technical documentation of the centrifuge (e.g. circuit diagrams) and the safety data sheets of the manufacturers of refrigerants and lubricants are not attached to this documentation.

You can order these documents from our service department.

11 Appendix

11.1 Range of accessories

The complete list of accessories can be downloaded from www.sigma-zentrifugen.de.

11.1.1 Rotor radii

The information in the accessories table concerning the radius refers to the values of the respective rotor as shown below. The radius calculation is described in chapter 2.2.2.1 - "Speed, radius, and relative centrifugal force".

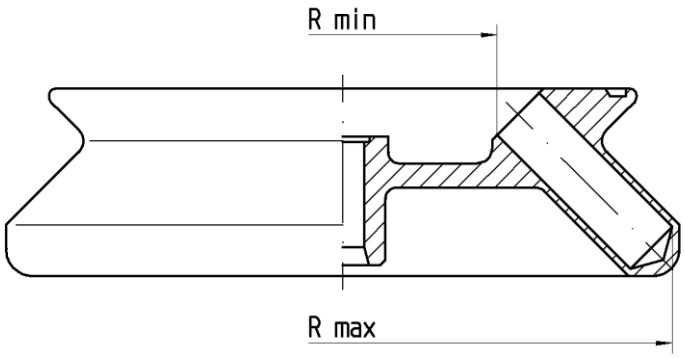


Fig. 9 Minimum and maximum radius of an angle rotor

11.2 Table of the service life of rotors and accessories

- The rotors and accessories must be put out of service after 10 years. Any use after this period may be permissible in individual cases after an inspection performed by the manufacturer.
- If a specification concerning the maximum number of cycles and a specification concerning the service life (i.e. a date) are provided, the specification that occurs first shall apply.
- After 50,000 cycles, rotors must be scrapped for safety reasons.

Rotor / bucket	Cycles	Service life ("Exp.Date")	Suitable for centrifuge	Remarks
12082		7 years	1-14, 1-14K	
12084		7 years	1-14, 1-14K	
12092		5 years	1-14, 1-14K	
12094		5 years	1-14, 1-14K	
12096		5 years	1-14, 1-14K	
12097		5 years	1-14, 1-14K	
12134		5 years	1-16, 1-16K	
12135		5 years	1-16, 1-16K	
12137		5 years	1-16, 1-16K	
91429		7 years	1-7	
13035			2-7	Do not grease the load-bearing bolts of the rotor
13296	35,000	5 years	2-7, 2-16KL, 2-16KHL	Do not grease the load-bearing bolts of the rotor
13299		5 years	2-7, 2-7 Cyto, 2-16KL, 2-16KHL, 3-30KS, 3-30KHS	Do not grease the load-bearing bolts of the rotor
13221	10,000		4-16S, 4-16KS, 4-16KHS, 6-16S, 6-16HS, 6-16KS, 6-16KHS	
9100	35,000		4-5KL, 4-16S, 4-16KS, 4-16KHS, 6-16S, 6-16HS, 6-16KS, 6-16KHS	
9366	15,000		4-5KL, 4-16S, 4-16KS, 4-16KHS, 6-16S, 6-16HS, 6-16KS, 6-16KHS	
13218	20,000		4-5KL, 4-16S, 4-16KS, 4-16KHS, 6-16S, 6-16HS, 6-16KS, 6-16KHS	
12600		7 years	6-16S, 6-16HS, 6-16KS, 6-16KHS	
13625	20,000		6-16S, 6-16HS, 6-16KS, 6-16KHS	
13635	25,000		6-16S, 6-16HS, 6-16KS, 6-16KHS	
13650	20,000		6-16S, 6-16HS, 6-16KS, 6-16KHS	
13860	15,000	10 years	8KBS	
11805	15,000	10 years	8KBS, 8KS	
11806		10 years	8KBS, 8KS	
12505	30,000		8KS	
13845	20,000		8KS	
13850	10,000	10 years	8KS	
13890	25,000		8KS Clinic	

11.3 Resistance data

NOTE

The data refer to resistance at 20°C.

- no data 1 resistant 2 practically resistant 3 partially resistant 4 not resistant		Concentration	High Density Polyethylene	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, soft	Polytetrafluorethylene	Acrylonitrile-butadiene-caoutchouc	Aluminium
Medium	**Formula**	**[%]**	**HDPE**	**PA**	**PC**	**POM**	**PP**	**PSU**	**PVC**	**PVC**	**PTFE**	**NBR**	**AL**
Acetaldehyde	C_2H_4O	40	3	2	4	2	3	4	4	-	1	4	1
Acetamide	C_2H_5NO	saturated	1	1	4	1	1	4	4	-	1	-	1
Acetone	C_3H_6O	100	1	1	4	1	1	4	4	-	1	4	1
Acrylonitrile	C_3H_3N	100	1	1	4	3	3	4	4	4	1	4	1
Allyl alcohol	C_3H_6O	96	1	3	3	2	2	2	2	4	1	1	1
Aluminium chloride	$AlCl_3$	saturated	1	3	2	4	1	-	1	-	1	1	4
Aluminium sulfate	$Al_2(SO_4)_3$	10	1	1	1	3	1	1	1	1	1	1	1
Ammonium chloride	$(NH_4)Cl$	aqueous	1	1	1	2	1	1	1	1	1	1	3
Ammonium hydroxide	$NH_3 + H_2O$	30	1	3	4	1	1	2	1	-	1	-	1
Aniline	C_6H_7N	100	1	3	4	1	2	4	4	4	1	4	1
Anisole	C_7H_8O	100	3	4	4	1	4	4	2	-	1	4	1
Antimony trichloride	$SbCl_3$	90	1	4	1	4	1	-	1	-	1	-	4
Benzaldehyde	C_7H_6O	100	1	3	4	1	1	3	4	4	1	4	1
Benzene	C_6H_6	100	3	2	4	1	3	4	4	-	1	4	1
Boric acid	H_3BO_3	aqueous	1	3	1	2	1	-	-	-	1	1	1
Butyl acrylate	$C_7H_{12}O_2$	100	1	2	4	2	3	4	4	4	1	-	1
Butyl alcohol, normal	$C_4H_{10}O$	100	1	1	2	1	1	2	2	4	1	1	1
Calcium chloride	$CaCl_2$	alcoholic	1	4	2	3	1	-	-	4	1	1	3
Carbon disulfide	CS_2	100	4	3	4	2	4	4	4	4	1	3	1
Carbon tetrachloride (TETRA)	CCl_4	100	4	4	4	2	4	4	4	4	1	3	1
Chlorine	Cl_2	100	4	4	4	4	4	4	4	4	1	-	3
Chlorine water	$Cl_2 \times H_2O$		3	4	4	4	3	-	3	3	1	-	4
Chlorobenzene	C_6H_5Cl	100	3	4	4	1	3	4	4	4	1	4	1
Chloroform	$CHCl_3$	100	3	3	4	4	3	4	4	4	1	4	3

- no data 1 resistant 2 practically resistant 3 partially resistant 4 not resistant		Concentration	High Density Polyethylene	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, soft	Polytetrafluorethylene	Acrylonitrile-butadiene-caoutchouc	Aluminium
Medium	**Formula**	**[%]**	**HDPE**	**PA**	**PC**	**POM**	**PP**	**PSU**	**PVC**	**PVC**	**PTFE**	**NBR**	**AL**
Chromic acid	CrO_3	10	1	4	2	4	1	4	1	-	1	4	1
Chromic potassium sulphate	$KCr(SO_4)_2 \times 12H_2O$	saturated	1	2	1	3	1	-	1	-	1	-	3
Citric acid	$C_6H_8O_7$	10	1	1	1	2	1	1	1	1	1	1	1
Citric acid	$C_6H_8O_7$	50	1	3	1	2	1	-	-	-	1	1	1
Copper sulphate	$CuSO_4 \times 5H_2O$	10	1	1	1	1	1	1	1	1	1	1	4
Cyclohexanol	$C_6H_{12}O$	100	1	1	3	1	1	1	1	4	1	2	1
Decane	$C_{10}H_{22}$	100	-	1	2	1	3	-	-	-	1	2	1
Diaminoethane	$C_2H_8N_2$	100	1	1	3	1	1	-	3	4	1	1	1
Diesel fuel	—	100	1	1	3	1	1	-	1	3	1	1	1
Dimethyl formamide (DMF)	C_3D_7NO	100	1	1	4	1	1	4	3	-	1	3	1
Dimethyl sulfoxide (DMSO)	C_2H_6SO	100	1	2	4	1	1	4	4	-	1	-	1
Dimethylaniline	$C_8H_{11}N$	100	-	3	4	2	4	-	-	-	1	-	1
Dioxane	$C_4H_8O_2$	100	2	1	4	1	3	2	3	4	1	3	1
Dipropylene glycol (mono)methyl ether	$C_4H_{10}O$	100	3	1	4	1	4	4	4	4	1	-	1
Ethyl acetate	$C_4H_8O_2$	100	1	1	4	1	1	4	4	4	1	4	1
Ethylene chloride	$C_2H_4Cl_2$	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_2O	30	1	3	1	1	1	-	-	-	1	2	1
Formic acid	CH_2O_2	100	1	4	3	4	1	3	3	1	1	2	1
Furfural	$C_5H_4O_2$	100	1	3	3	2	4	-	-	-	1	4	1
Gasoline	C_5H_{12} - $C_{12}H_{26}$	100	2	1	3	1	3	3	2	-	1	1	1
Glycerol	$C_3H_8O_3$	100	1	1	3	1	1	1	1	2	1	1	1
Heptane, normal	C_7H_{16}	100	2	1	1	1	2	1	2	4	1	1	1
Hexane, n-	C_6H_{14}	100	2	1	2	1	2	1	2	4	1	1	1
Hydrogen chloride	HCl	5	1	4	1	4	1	1	1	-	1	2	4
Hydrogen chloride	HCl	concentrated	1	4	4	4	1	1	2	3	1	4	4
Hydrogen peroxide	H_2O_2	3	1	3	1	1	1	1	1	-	1	3	3
Hydrogen peroxide	H_2O_2	30	1	4	1	4	1	1	1	-	1	3	3
Hydrogen sulphide	H_2S	10	1	1	1	1	1	1	1	3	1	3	1
Iodine, tincture of	I_2		1	4	3	1	1	-	4	4	1	1	1

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- no data 1 resistant 2 practically resistant 3 partially resistant 4 not resistant		Concentration	High Density Polyethylene	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, soft	Polytetrafluorethylene	Acrylonitrile-butadiene-caoutchouc	Aluminium
Medium	**Formula**	**[%]**	**HDPE**	**PA**	**PC**	**POM**	**PP**	**PSU**	**PVC**	**PVC**	**PTFE**	**NBR**	**AL**
Isopropyl alcohol	C_3H_8O	100	1	1	1	1	1	1	1	4	1	-	2
Lactic acid	$C_3H_6O_3$	3	1	3	1	2	1	1	2	-	1	1	1
Magnesium chloride	$MgCl_2$	10	1	1	1	1	1	1	1	1	1	1	1
Mercuric chloride	$HgCl_2$	10	1	4	1	3	1	1	1	1	1	1	4
Mercury	Hg	100	1	1	1	1	1	1	1	3	1	1	3
Methyl acetate	$C_3H_6O_2$	100	1	1	4	2	1	-	4	4	1	-	1
Methyl alcohol	CH_4O	100	1	2	4	1	1	3	1	3	1	2	1
Methyl benzene	C_7H_8	100	3	1	4	1	3	4	4	4	1	4	1
Methyl ethyl ketone (MEK)	C_4H_8O	100	1	1	4	1	1	4	4	4	1	4	1
Methylene chloride	CH_2Cl_2	100	4	3	4	3	3	4	4	4	1	-	1
Mineral oil	—	100	1	1	1	1	1	1	1	-	1	1	1
Nitric acid	HNO_3	10	1	4	1	4	1	1	1	-	1	4	3
Nitric acid	HNO_3	100	4	4	4	4	4	-	4	-	1	4	1
Nitrobenzene	$C_6H_5NO_2$	100	3	4	4	3	2	4	4	4	1	4	1
Oleic acid	$C_{18}H_{34}O_2$	100	1	1	1	2	1	-	1	-	1	3	1
Oxalic acid	$C_2H_2O_4 \times 2H_2O$	100	1	3	1	4	1	1	1	1	1	2	1
Ozone	O_3	100	3	4	1	4	3	1	1	-	1	4	2
Petroleum	—	100	1	1	3	1	1	1	1	3	1	1	1
Phenol	C_6H_6O	10	1	4	4	4	1	4	1	3	1	3	1
Phenol	C_6H_6O	100	2	4	4	4	1	3	4	3	1	3	1
Phosphoric acid	H_3PO_4	20	1	4	2	4	1	-	-	-	1	2	4
Phosphorus pentachloride	PCl_5	100	-	4	4	4	1	-	4	4	1	-	1
Potassium hydrogen carbonate	$CHKO_3$	saturated	1	1	2	1	1	-	-	-	1	-	4
Potassium hydroxide	KOH	30	1	1	4	3	1	1	1	1	1	-	4
Potassium hydroxide	KOH	50	1	1	4	3	1	1	1	1	1	-	4
Potassium nitrate	KNO_3	10	1	1	1	1	1	-	-	-	1	1	1
Potassium permanganate	$KMnO_4$	100	1	4	1	1	1	-	1	-	1	3	1
Pyridine	C_5H_5N	100	1	1	4	1	3	4	4	4	1	4	1
Resorcinol	$C_6H_6O_2$	5	1	4	2	3	1	4	2	-	1	-	2
Silver nitrate	$AgNO_3$	100	1	1	1	1	1	1	1	1	1	2	4

- no data 1 resistant 2 practically resistant 3 partially resistant 4 not resistant		Concentration	High Density Polyethylene	Polyamide	Polycarbonate	Polyoxymethylene	Polypropylene	Polysulfone	Polyvinyl chloride, hard	Polyvinyl chloride, soft	Polytetrafluorethylene	Acrylonitrile-butadiene-caoutchouc	Aluminium
Medium	**Formula**	**[%]**	**HDPE**	**PA**	**PC**	**POM**	**PP**	**PSU**	**PVC**	**PVC**	**PTFE**	**NBR**	**AL**
Sodium bisulphite	$NaHSO_3$	10	1	1	2	4	1	-	-	-	1	1	1
Sodium carbonate	Na_2CO_3	10	1	1	1	1	1	-	-	-	1	-	3
Sodium chloride	NaCl	30	1	1	1	1	1	1	1	1	1	1	3
Sodium hydroxide	NaOH	30	1	1	4	1	1	1	1	1	1	2	4
Sodium hydroxide	NaOH	50	1	1	4	1	1	1	1	-	1	2	4
Sodium sulfate	Na_2SO_4	10	1	1	1	1	1	1	1	1	1	1	1
Spirits	C_2H_6O	96	1	1	1	1	1	1	1	3	1	-	1
Styrene	C_8H_8	100	4	1	4	1	3	-	4	4	1	4	1
Sulphuric acid	H_2SO_4	6	1	4	1	4	1	1	1	-	1	2	3
Sulphuric acid	H_2SO_4	fuming	4	4	4	4	4	4	4	4	1	4	3
Tallow	—	100	1	1	1	1	1	-	1	1	1	1	1
Tetrahydrofuran (THF)	C_4H_8O	100	3	1	4	1	3	4	4	4	1	3	1
Tetrahydronaphthalene	$C_{10}H_{12}$	100	3	1	4	1	4	4	4	4	1	-	1
Thionyl chloride	Cl_2SO	100	4	4	4	2	4	4	4	4	1	-	3
Tin chloride	$SnCl_2$	10	1	4	2	2	1	-	-	-	1	1	4
Transformer oil	—	100	1	1	3	3	1	1	1	-	1	1	1
Trichloroethane	$C_2H_3Cl_3$	100	3	3	4	2	4	4	4	4	1	4	4
Urea	CH_4N_2O	10	1	1	1	1	1	-	-	-	1	1	1
Urine	—	100	1	1	1	1	1	-	1	1	1	-	2
Vinegar	$C_2H_4O_2$	10	1	4	1	1	1	1	1	1	1	2	1
Vinegar	$C_2H_4O_2$	90	1	4	4	4	1	3	1	4	1	-	1
Wax	—	100	-	1	1		1	-	-	-	1	-	1
Wines	—	100	1	1	1	2	1	1	1	1	1	-	4
Xylene	C_8H_{10}	100	3	1	4	1	4	4	4	4	1	4	1

11 Appendix

11.4 EC Declaration of conformity

EC Declaration of Conformity

in accordance with the EC Machinery Directive 2006/42/EC, annex II, part 1, section A

Product designation	Laboratory centrifuge
Product name	Sigma 1-14
Order number	10014, 10015
Manufacturer	Sigma Laborzentrifugen GmbH An der Unteren Söse 50 37520 Osterode Germany
Authorised representative for CE matters	Alexander Hörsting

The product named hereinabove 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 the manufacturer or if the product is used in a manner that is not in line with the intended purpose, this declaration will be rendered void.

Directives	Machinery Directive	2006/42/EC
	Low Voltage Directive	2014/35/EU
	EMC Directive	2014/30/EU
	RoHS Directive	2011/65/EU
	Delegated RoHS Directive	(EU) 2015/863
Norms		EN 61010-2-020:2017 EN IEC 61326-1:2021

Osterode, 2025-11-04

Dr. Michael Sander, Managing Director

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11 Appendix

11.5 Declaration of conformity – China RoHS 2

DECLARATION OF CONFORMITY

China RoHS 2 (Administrative Measures for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products)

Laboratory centrifuge models: Sigma 1-14, 1-14K, 1-7, 1-16, 1-16K, 2-7, 2-16P, 2-16KL,2-16KHL, 3-16L, 3-16KL, 3-18KS, 3-18KHS, 3-30KS, 3-30KHS, 4-5L, 4-5KL; 4-5KRL, 4-16S, 4-16KS, 4-16KHS, 6-16S, 6-16HS, 6-16KS, 6-16KHS, 8KS, 8KBS

Sigma Laborzentrifugen GmbH has made reasonable effort to avoid the use of hazardous substances in the products it manufactures (laboratory centrifuges).

A Product Conformity Assessment (PCA) was performed in order to determine whether the concentration of harmful substances in all homogeneous materials of the component parts is above or below the MCV limit (Maximum Concentration Value limit) as defined in GB/T 26572:

Mercury and its compounds: 0.1 % Cadmium (Cd) and its compounds: 0.01 %

Lead (Pb) and its compounds: 0.1 % Hexavalent chromium (Cr (VI)) and its compounds: 0.1 %

Polybrominated biphenyls (PBB): 0.1 % Polybrominated diphenyl ethers (PBDE): 0.1 %

表1 产品中有害物质的名称及含量
Table 1: Name and content of hazardous substances in the product

部件名称 Component part (PCA)	有害物质 Hazardous substance					
	铅 Lead (Pb)	汞 Mercury (Hg)	镉 Cadmium (Cd)	六价铬 Hexavalent Chromium (Cr (VI))	多溴联苯 Poly-brominated biphenyls (PBB)	多溴二苯醚 Polybromi-nated diphenyl ethers (PBDE)
Electronic PCB, cables	X[1)]	O	O	O	O	O
Display	O	O	O	O	O	O
Housing	X[2)]	O	O	O	O	O
Base, metal, accessories	X[2)]	O	O	O	O	O

本表格依据SJ/T 11364的规定编制。
This table is made according to SJ/T 11364.

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O:	表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。 Indicates that the content of the harmful substance in all homogeneous materials of the component part is below the limit as defined in GB/T 26572.)
X:	表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。（企业可在此处，根据实际情况对上表打“X”的技术原因进行进一步说明。） Indicates that the content of the harmful substance in at least one homogeneous material of the component part exceeds the limit as defined in GB/T 26752. (Contact the manufacturer for further technical information according to the actual situation.)
1)	Contains parts in compliance with exemptions 6c, 7c.I, 7c.II and 37 of 2011/65/EU RoHS.
2)	Contains parts in compliance with exemptions 6a, 6b and 6c of 2011/65/EU RoHS.

Apart from the exemptions given in this table, none of the substances listed above have been intentionally added to the product or metallic coatings.

Sigma Laborzentrifugen GmbH
An der Unteren Söse 50
37520 Osterode
Germany

Osterode, 2024-04-25

i. V.

M. Weigoni, Director of Procurement

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